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A REPORT TO
FRONTENAC FOREST ESTATES INC.

GEOTECHNICAL INVESTIGATION FOR PROPOSED RESIDENTIAL DEVELOPMENT

DERRY ROAD EAST AND EIGHTH LINE

TOWN OF MILTON

REFERENCE NO. 2101-S026

MAY 2021

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1.0 INTRODUCTION

In accordance with the authorization dated January 18, 2021, from Ms. Ashley Traynor, Development Coordinator of Trinison Management Corp. and on behalf of Frontenac Forest Estates Inc., a geotechnical investigation was carried out at a land parcel located at Derry Road East and Eighth Line in the Town of Milton.

The purpose of the investigation was to reveal the subsurface conditions and determine the engineering properties of the disclosed soils for the development of a residential subdivision. The geotechnical findings and recommendations for the proposed development are presented in this report.

2.0 SITE AND PROJECT DESCRIPTION

The Town of Milton is situated in the physiographical region known as the Horseshoe Moraine, comprises of complex till ridges with interspersed kame moraines, moulded till plains, outwash plains and spillways. Peel ponding (glacial lake) also invaded the region and eroded parts of the till plain, which have been filled with lacustrine sand, silt, clay and/or reworked till. Shale bedrock of Queenston Formation is known to occur in the region at shallow to moderate depths.

The subject property is located on the south side of Derry Road, between Eighth Line and Trafalgar Road in the Town of Milton. It is almost rectangular in shape, comprising an area of 79.7 hectares. At the time of investigation, the property was a farmland, with a treed area in the south portion. The existing site gradient is relatively flat, descending gently towards the south and west.

It is understood that the proposed development will be a residential subdivision, with municipal services and roadways meeting urban standards. The site plan and details of the development, however, is not available at the time of report preparation.

3.0 FIELD WORK

The field work, consisting of forty-eight (48) sampled boreholes in a grid pattern of approximately 150 m apart, was performed between February 8 and 25, 2021, at the locations shown on the Location Plan, Drawing No. 1. These boreholes extended to a depth of 4.9 m to 10.8 m from grade.

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 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.

To facilitate a hydrogeological assessment by R.J. Burnside & Associates Ltd., monitoring wells were installed at five (5) selected borehole locations, with a shallow and deep well cluster at one location. The wells at this location are provided with suffix of 's' or 'd', representing the shallow well and deep well, respectively. The depth and details of the monitoring wells are shown on the corresponding Borehole Logs.

The ground elevation at each borehole location was obtained using a hand-held Global Navigation Satellite System (GNSS) equipment.

4.0 SUBSURFACE CONDITIONS

The investigation has disclosed that beneath a topsoil veneer, the site is underlain by a stratum of glacial till, with localized sandy silt deposit. The glacial till beds onto the shale bedrock at various depths.

Detailed descriptions of the subsurface conditions are presented on the Borehole Logs, comprising Figures 1 to 49, inclusive. The revealed stratigraphy is plotted in the Subsurface Profiles, Drawing Nos. 2 to 8. The engineering properties of the disclosed soils are discussed herein.

4.1 **Topsoil** (All Boreholes)

The boreholes were drilled in the farm field. The revealed topsoil ranges from 13 to 30 cm in thickness. Due to farming activities, thicker topsoil layers and ploughed earth can be anticipated in places between and beyond the borehole locations.

4.2 **Glacial Till** (All Boreholes)

The silty clay till was encountered predominantly in the soil stratigraphy, with a weathered zone up to 1.2 m from grade and occasional sand layers. It consists of a random mixture of particle sizes ranging from clay to gravel, with the silt and clay being the dominant fraction. Grain size analyses were performed on two representative samples; the results are plotted on Figure 50.

In twelve (12) boreholes, the clay till extends to a depth between 2.1 to 7.1 m from grade, overlying a sandy silt till stratum. The silt till has a similar structure with the silty clay till, consisting of a random mixture of particle sizes ranging from clay to gravel, with the sand and silt being the dominant fraction. A tactile examination of the soil samples indicated that the till is slightly cemented. Grain size analyses were performed on 6 representative samples and the results are plotted on Figures 51 and 52.

In fifteen (15) boreholes, the glacial till extends to a depth of 4.3 to 10.2 m from grade, overlying the weathered shale or sandy silt deposit. The remaining boreholes were terminated in the glacial till stratum, at a depth ranging from 6.1 to 10.7 m from the prevailing ground surface. Intermittent hard resistance to augering or penetration of the soil sampler was encountered, indicating the presence of cobbles and boulders.

The obtained 'N' values range from 2 to over 100 blows per 30 cm, indicating the silty clay till is soft to hard and the sandy silt till is dense to very dense. The soft to firm clay till is restricted in the weathered zone near the ground surface.

The Atterberg Limits of three (3) representative clay till samples were established. The results are plotted on the Borehole Logs and summarized below, indicating the clay till is low to medium in plasticity:

Liquid Limit	23%, 25% and 32%
Plastic Limit	15%, 16% and 19%

The water content of the clay till and silt till samples were determined. The water content of the clay till samples ranges from 7% to 36%, generally in a moist condition, having the samples on the wet side near the ground surface due to weathering. The water content of the silt till samples ranges from 7% to 15%, indicating moist conditions in the lower stratigraphy. The engineering properties of the glacial till are given below:

- High frost susceptibility and high soil-adfreezing potential.
- Low water erodibility.
- Low permeability, with an estimated coefficient of permeability of 10^{-6} to 10^{-7} cm/sec, a percolate rate between 60 and 100 min/cm and the runoff coefficients are:

Slope	
0% - 2%	0.15
2% - 6%	0.20
6% +	0.28

- The shear strength is derived from consistency and is augmented by internal friction.
- The till stratum will be stable in relatively steep slopes; however, prolonged exposure will allow the sand seams to slough, which may lead to local sliding.
- A poor pavement-supportive material, with an estimated California Bearing Ratio (CBR) value of 4% to 6%.
- Moderately high corrosivity to buried metal, with an estimated electrical resistivity of 3000 to 4000 ohm·cm.

4.3 **Sandy Silt** (Borehole 43)

The sandy silt deposit was encountered beneath the clay till at a depth of 4.0 m. It is fine grained, with occasional sand seams and layers. The borehole terminated in the sandy silt deposit at a depth of 6.2 m from grade.

The obtained 'N' values are over 100 blows per 30 cm of penetration, indicating the deposit is very dense in relative density. The natural water content values of the soil samples are 12% and 15%, indicating moist and very moist conditions.

The engineering properties of the sandy silt deposit are given below:

- High frost susceptibility, with high soil-adfreezing potential.
- High water erodibility; it is susceptible to migration through small openings under seepage pressure.
- Semi-permeable, with an estimated coefficient of permeability of 10^{-5} cm/sec and runoff coefficients of:

Slope	
0% - 2%	0.11
2% - 6%	0.16
6% +	0.23

- The shear strength is density dependent.
- In excavation, the silt will slough and run slowly with seepage bleeding from the cut face.
- Poor pavement-supportive material, with an estimated CBR value of 4% to 5%.
- Moderate corrosivity to buried metal, with an estimated electrical resistivity of 4500 to 5000 ohm·cm.

4.4 **Shale Bedrock** (Boreholes 1, 2, 5, 8, 25, 26, 27, 32, 38, 40, 42, 45, 47 and 48)

Weathered shale was penetrated in fourteen (14) boreholes by augering, at a depth of 4.3 to 10.2 m, or between El. 193.3 m (Borehole 5) and 183.0 m (Borehole 47). Refusal to augering on probable bedrock was also contacted in two other boreholes, at a depth of 4.9 m and 6.1 m from grade.

The shale is reddish-brown or grey colour, indicating a Queenston formation of mudstone and limy shale. It is susceptible to disintegration and swelling upon exposure to air and water, with subsequent reversion to a clay soil. The excavated spoil will contain a large amount of hard limy and sandy rock slabs, rendering it virtually impossible to obtain uniform compaction. Unless the rock spoil is sorted, it is considered unsuitable for reuse in engineering applications.

The weathered rock can be excavated with considerable effort by a heavy-duty excavator equipped with a rock-ripper; however, excavation will become progressively more difficult with depth. Excavation into the sound bedrock will require the aid of pneumatic hammering.

In sound shale excavation, slight lateral displacement of the excavation walls is often experienced. This is due to the release of residual stress stored in the bedrock mantle and the swelling characteristic of the rock.

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 +
Silty Clay Till	7 to 36	16	12 to 20
Sandy Silt/Silt Till	7 to 15	12	7 to 15
Shattered Shale	6 to 10	14	10 to 18

The above values show that the in-situ soils are mostly suitable for 95% or + Standard Proctor compaction, except the weathered clay till, which will have to be screened to segregate the topsoil and deleterious material and aerated before reuse for structural backfill. Aeration can be achieved by spreading the wet soil thinly on the ground in the dry and warm weather.

The shale is susceptible to disintegration and reverts to a clay soil. Only the shale spoil that has been exposed to weathering or disintegration, free of rock slabs, can be used as structural backfill. If broken rock mixed with shattered shale is used to backfill a particular area, the backfill can only be visually monitored in the degree of compaction.

When compacting the till and shattered on the dry side of the optimum, the compactive energy will frequently bridge over the chunks in the soil and be transmitted laterally into the soil mantle. Therefore, the lifts must be limited to 20 cm or less (before compaction). Boulders over 15 cm in size must be sorted and removed from the backfill.

5.0 GROUNDWATER CONDITION

Upon the completion of borehole drilling, free groundwater was recorded in nineteen (19) boreholes, at a depth of 1.8 to 7.0 m from grade, or between El. 193.6 m and 184.2 m. The remaining boreholes remained dry throughout the investigation process.

The recorded groundwater is plotted on the borehole logs. They represent the perched groundwater in the sand and silt within the glacial till deposit. Continuous groundwater, however, is not evident in the boreholes within the depth of investigation.

6.0 DISCUSSION AND RECOMMENDATIONS

The investigation has disclosed that beneath a topsoil veneer, the site is underlain by a stratum of glacial till, with localized sandy silt deposit. The glacial till beds onto the shale bedrock at various depths, below 4.3 m to 10.2 m from grade, or between El. 193.3 m and 183.0 m.

Perched groundwater was recorded in nineteen (19) boreholes, at a depth of 1.8 to 7.0 m from grade, or between El. 193.6 m and 184.2 m. Continuous groundwater, however, is not evident in the boreholes within the depth of investigation.

The proposed development will be a residential subdivision, with municipal services and roadways meeting urban standards. The site plan and details of the development, however, is not available at the time of report preparation. The geotechnical findings warranting special consideration for the proposed project are presented below:

1. The topsoil must be removed for site development. It can be stockpiled and re-used for landscaping purposes only.
2. The site can be re-graded with an engineered fill for development. The weathered soils and disturbed soils must be subexcavated, sorted free of topsoil and organics before reuse for engineered fill or structural backfill.
3. The proposed structures, underground services and road pavement can be constructed on the engineered fill or sound native soils.
4. Additional review of the proposed development plan will be necessary to provide recommendations appropriate for medium rise or high rise development and facilities for stormwater management.

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 site can be re-graded with an engineered fill for development. The requirements for engineered fill are presented below:

1. The topsoil must be removed.
2. The weathered soils should be subexcavated. It can be reused after segregation of organics and aerated, before recompaction in layers.
3. The native soil subgrade must be inspected and proof-rolled prior to any fill placement.
4. Inorganic soils must be used for the fill, and they must be uniformly compacted in lifts 20 cm thick to 98% or + of the maximum Standard Proctor dry density 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 dry density.
5. 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.
6. 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.
7. The engineered fill must not be placed during the period where freezing ambient temperatures occur either persistently or intermittently. This is to ensure that the fill is free of frozen soils, ice and snow.
8. The fill operation must be fully supervised and monitored by a technician under the direction of a geotechnical engineer.
9. The engineered fill envelope and finished elevations must be clearly and accurately defined in the field, and they must be precisely documented.
10. 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 re-certification.
11. Foundations founded on engineered fill must be reinforced in the footings and in the upper section of the foundation walls. It should be designed by a structural engineer to allow distribution of stress induced by the abrupt differential settlement (about 15 mm) in engineered fill.

12. 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 and service pipes 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.

6.2 **Foundation**

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

- Maximum Bearing Pressure at Serviceability Limit State (SLS) = 150 kPa
- Factored Bearing Pressure at Ultimate Limit State (ULS) = 240 kPa

The total and differential settlements of structures designing for the bearing pressure at SLS are estimated within 25 mm and 20 mm, respectively.

Higher design bearing pressures may be used in some areas, for mid-rise or high rise buildings. The founding conditions for foundation design should be confirmed by drilling additional boreholes according to the location and the types of buildings.

During construction, the foundation subgrade should be inspected by the geotechnical engineer or a senior geotechnical technician to ensure that the revealed conditions are compatible with the foundation design requirements.

Foundations exposed to weathering or in unheated areas should have at least 1.2 m of earth cover for protection against frost action.

If groundwater seepage is encountered in excavation, the foundation must be poured immediately after subgrade inspection or the subgrade should be protected by a concrete mud-slab immediately after exposure. This will prevent construction disturbance and costly rectification of the bearing subsoil.

The building foundation should meet the requirements specified in the latest Ontario Building Code. The structures should be designed to resist an earthquake force using Site Classification ‘C (dense soil or soft rock).

6.3 Basement Construction

The conventional basement structures should be provided with a drainage system (Drawing No. 9) at the wall base and damp-proofing of the perimeter walls. The subdrains should be encased in a fabric filter to protect them against blockage by silting.

The perimeter walls should be designed to sustain a lateral earth pressure calculated using the soil parameters stated in Section 6.9. Any applicable surcharge loads adjacent to the basement must also be considered in the wall design.

The basement floor subgrade should consist of sound natural soils or well compacted earth fill. The floor slab should be constructed on a granular base of at least 20 cm thick, consisting of 19-mm Crusher-Run Limestone, or equivalent, compacted to 100% Standard Proctor dry density (SPDD).

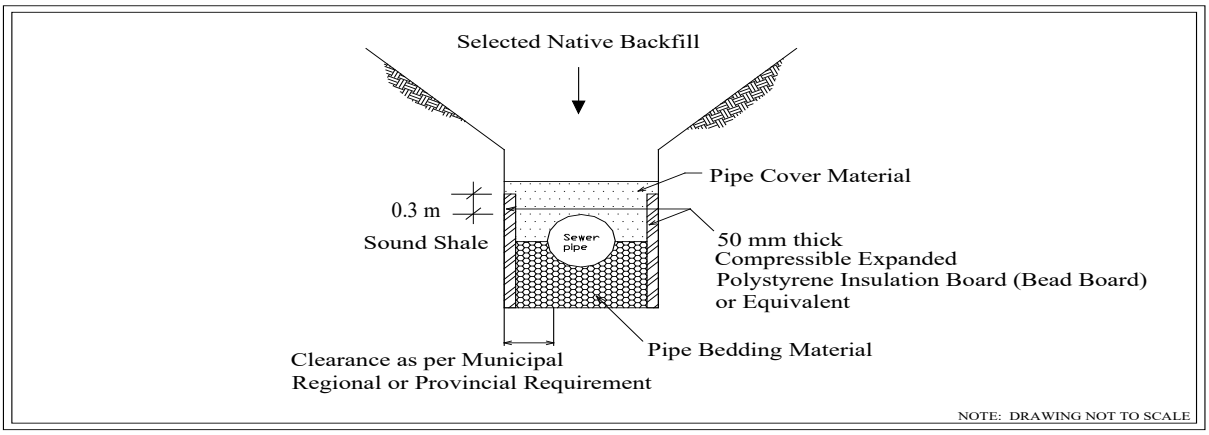
6.4 Underground Services

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 98% SPDD.

A Class 'B' bedding is recommended for the underground services construction. It should consist of compacted 19-mm Crusher-Run Limestone, or equivalent, as approved by a geotechnical engineer.

Where the service pipe is to be placed into the sound bedrock, the trench sides should be sloped rather than vertical, due to the residual stress relief and the swelling characteristics of the shale. The side slopes should be no steeper than 2 vertical: 1 horizontal. Alternatively, a wider trench can be excavated and the rock face can be lined with a Styrofoam as a cushioning layer, and backfilled with sand up to 0.3 m above the crown of the pipe. The recommended scheme is illustrated in Diagram 1.

Diagram 1 - Sewer Installation in Sound Shale



The pipe joints into the manholes and catch basins must be leak-proof to prevent the migration of fines through the joints. Openings to subdrains and catch basins should be shielded with a fabric filter to prevent blockage by silting.

A soil cover of at least two times the diameter of the pipe should be in place at all times after pipe installation, to prevent pipe floatation when the trench is deluged with water derived from precipitation.

The on-site soils are moderately high corrosivity to ductile iron pipes and metal fittings; therefore, the underground services should be protected against soil corrosion. For estimation for the anode weight requirements, the electrical resistivities of the disclosed soils can be used. The proposed anode weight must meet the minimum requirements as specified by the Town of Milton and Region of Halton.

6.5 **Backfilling in Trenches and Excavated Areas**

The backfill in service trenches should be compacted to at least 98% SPDD, particularly below concrete floor subgrade and in the zone within 1.0 m below the pavement. The material should be compacted with the water content at 2% to 3% drier than the optimum.

Selected on site inorganic soils are suitable for use as trench backfill. Wet soils will require aeration prior to its use as structural backfill. The till should be sorted free of oversized boulders (over 15 cm in size).

The excavated shale should either be pulverized to sizes less than 15 cm and thoroughly mixed with the overburden soils, or the trench can be backfilled by levelling the debris using a bulldozer with lifts no more than 20 cm (loose) in thickness. Compaction should be carried out by a vibratory sheepsfoot roller. Another alternative is the flooding method. This practice has proved to be successful with the reason being that the broken shale fragments absorb the water and swell, allowing sufficient time for the voids in the backfill to collapse and any remaining voids would largely be filled by swelling of the shale fragments.

In normal construction practice, the problem areas of pavement settlement largely occur adjacent to manholes, catch basins, services crossings, foundation walls and columns, it is recommended that granular backfill should be used.

The narrow trenches for services crossings should be cut at 1 vertical:2 horizontal so that the backfill in the trenches can be effectively compacted. Otherwise, soil arching in the trenches will prevent achievement of the proper compaction. In confined areas where the desired slope cannot be achieved or the operation of a proper kneading-type roller cannot be facilitated, imported granular fill, which can be appropriately compacted by using a smaller vibratory compactor, must 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 granular material 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 (OPSS 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.
- In areas where the underground services construction is carried out during 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.

6.6 Sidewalk, Garages and Driveways

The on-site soils are mostly frost susceptible and the ground will be subject to frost heaving during cold weather. The sidewalk in open areas, thus, should be designed to tolerate the ground movement.

In areas where ground movement cannot be tolerated, the pavement or sidewalk can be constructed on a free-draining granular base of 0.3 to 1.2 m thick, depending on the degree of tolerance for settlement. These measures, with proper drainage at the bottom, will minimize the movement by preventing the accumulation of water in the granular base.

The driveway at the entrance to the garage must be backfilled with non-frost-susceptible granular material, with a frost taper at a slope flatter than 1 vertical:3 horizontal. In areas where frost susceptible material is present beneath the garage floor slab, the subgrade must be insulated with 50-mm Styrofoam, or its thermal equivalent.

6.7 Pavement Design

The pavement design for local, collector and minor arterial roads is presented in Table 2.

Table 2 - Pavement Design

Course	Thickness (mm)	Specifications
Asphalt Surface	40	OPSS HL3
Asphalt Binder Local Road Collector Road Minor Arterial Road	 50 80 100	OPSS HL8
Granular Base	150	20-mm Crusher Run Limestone
Granular Sub-base Local Road Collector Road Minor Arterial Road	 300 375 375	OPSS Granular 'B', Type II

In preparation of pavement subgrade, topsoil and compressible material should be removed. The final subgrade must be proof-rolled using a heavy roller or loaded dump truck. Any soft spot as identified must be subexcavated, backfilled with selected dry inorganic material and compact in layers.

The subgrade within 1.0 m below the underside of the granular sub-base must be compacted to at least 98% SPDD, with the water content at 2% to 3% drier than its optimum. All the granular bases should be compacted in 150 to 200 mm lifts to 100% SPDD.

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.

6.8 Stormwater Management Facilities

At the time of report preparation, the location and design of stormwater management facilities have not been finalized.

Based on the borehole findings, the subsoil in the development is expected to consist generally of glacial till, with seams and layers of sand and sandy silt.

Depending on the layout and design of the proposed facilities, an impervious clay liner should be specified in area where the sand or sandy silt is encountered. The on-site soil of silty clay till can be used for the construction of liner.

The liner thickness will depend on the invert of the facility and the groundwater conditions in the vicinity. The thickness of the liner must be further assessed once the design of the pond has been established.

If an earth berm is to be constructed in the retention facility, topsoil and badly weathered soils must be removed and the subgrade must be proof-rolled. The berm should consist of selected on site material, free of organics and compacted to 98% SPDD.

The side slopes of the stormwater management facility should be maintained at a stable slope not steeper than 3 Horizontal (H) to 1 Vertical (V) above the wet perimeter, and flatter than 4H to 1V below the wet perimeter. The final slopes must be vegetated and/or sodded to prevent runoff erosion.

The foundation of control structures should extend into the sound natural soils below the frost depth or scouring depth, whichever is greater. A Maximum Allowable Soil Pressure (SLS) of 150 kPa and a Factored Ultimate Soil Bearing Pressure (ULS) of 240 kPa are recommended for the design of control structures.

6.9 Soil Parameters

The recommended soil parameters for the project design are given in Table 3.

Table 3 - Soil Parameters

Unit Weight and Bulk Factor	**Bulk Unit Weight γ (kN/m^3)**	**Estimated Bulk Factor**	
		Loose	**Compacted**
Glacial Till	22.0	1.30	1.05
Weathered Soils and Sandy Silt	21.5	1.25	1.00
Lateral Earth Pressure Coefficients	**Active K_a**	**At Rest K_o**	**Passive K_p**
Compacted Earth Fill	0.40	0.55	2.50
Glacial Till and Sandy Silt	0.30	0.45	3.30
Coefficients of Friction			
Between Concrete and Granular Base			0.50
Between Concrete and Sound Natural Soils			0.35
Maximum Allowable Soil Pressure (SLS) For Thrust Block Design			
Engineered Fill and Sound Natural Soils			50 kPa

6.10 **Excavation**

Excavation should be carried out in accordance with Ontario Regulation 213/91. The types of soils are classified in Table 4.

Table 4 - Classification of Soils for Excavation

Material	**Type**
Weathered Shale/Glacial Till	2
Weathered Soil/Sandy Silt	3

Perched groundwater was recorded in some boreholes, at a depth of 1.8 to 7.0 m from grade, or between El. 193.6 m and 184.2 m. Groundwater seepage from perched water may be contacted in excavation. The amount of water is anticipated to be slow in rate and limited in quantity. It can be collected in sump pits and remove by conventional pumping where necessary. Continuous groundwater, however, is not evident in the boreholes within the depth of investigation.

Prospective contractors may be asked to assess the subsurface conditions by digging test pits to the intended depth of excavation. These test pits should be allowed to remain open for a few hours to assess the trenching conditions and the dewatering scheme for excavation.

7.0 LIMITATIONS OF REPORT

This report was prepared by Soil Engineers Ltd. for the account of Frontenac Forest Estates Inc. and for review by the designated consultants, financial institutions, government agencies and contractors. The material in the report reflects the judgment of Kelvin Hung, P.Eng., and Bennett Sun, P.Eng., in light of the information available to it at the time of preparation.

Use of the report is subject to the conditions and limitations of the contractual agreement. Any use which a Third Party makes of this report, and/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

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 1

FIGURE NO.: 1

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 25, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
194.2	Ground Surface							
0.0	**30 cm TOPSOIL**	1	DO	2	0		19 frost	
	Brown, soft to hard							
	weathered	2	DO	20	1		13	
		3	DO	20	2		11	
	SILTY CLAY TILL	4	DO	57			10	
		5	DO	84	3		10	
	some sand, a trace of gravel occ. cobbles and boulders				4			
		6	DO	57	5		9	
188.6								
5.6	Reddish-brown, weathered **SHALE BEDROCK**				6		6	
188.0		7	DO	50/8				
6.2	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Dry on competion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 2

FIGURE NO.: 2

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 11, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
195.7	Ground Surface							
0.0	**20 cm TOPSOIL**				0			
	Firm to hard	1	DO	7			23 frost	
	weathered	2	DO	19	1		12	
	SILTY CLAY TILL	3	DO	32	2		13	
	some sand, a trace of gravel occ. cobbles and boulders	4	DO	50			11	
		5	DO	50	3		9	
	brown grey				4			Dry on competion
190.9		6	DO	50/15			8	
4.8	Reddish-brown, weathered				5			
	SHALE BEDROCK				6		10	
189.3		7	DO	50/15				
6.4	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 3

FIGURE NO.: 3

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 9, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
196.9	Ground Surface							
0.0	**30 cm TOPSOIL**	1	DO	3	0		25 frost	
	Soft to hard — weathered	2	DO	22	1		15	
		3	DO	29	2		12	
	SILTY CLAY TILL	4	DO	37			11	
		5	DO	54	3		11	
	some sand, a trace of gravel occ. cobbles and boulders — brown / grey				4			
		6	DO	24	5		10	
	occ. sand layer at 6.1 m				6		12	▽
190.6		7	DO	50/10				
6.3	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

W.L. @ El. 191.3 m on completion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 4

FIGURE NO.: 4

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 8, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
197.3	Ground Surface							
0.0	**23 cm TOPSOIL**				0			
	Stiff to hard	1	DO	8			20	frost
	weathered	2	DO	18	1		14	
		3	DO	23	2		12	
	SILTY CLAY TILL	4	DO	27			13	
		5	DO	49	3		12	
	some sand, a trace of gravel occ. cobbles and boulders — brown grey				4			
		6	DO	30	5		10	
191.1		7	DO	50/10	6		10	
6.2	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

W.L. @ El. 193.6 m on completion

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 5

FIGURE NO.: 5

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 8, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
197.6	Ground Surface							
0.0	**18 cm TOPSOIL**				0			
	Brown, stiff to hard	1	DO	10			24	frost
	weathered	2	DO	23	1		18	
	SILTY CLAY TILL	3	DO	28	2		12	
	some sand, a trace of gravel occ. cobbles and boulders	4	DO	32			12	
		5	DO	58	3		8	
193.3					4			
4.3	Reddish-grey, weathered	6	DO	50/13			8	
	SHALE BEDROCK				5			
191.4		7	DO	50/8	6		7	
6.2	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Dry on competion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 6

FIGURE NO.: 6

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 25, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
195.2	Ground Surface							
0.0	**23 cm TOPSOIL**				0			
	Soft to hard	1	DO	3				
	weathered	2	DO	37	1			
		3	DO	37	2			
	SILTY CLAY TILL	4	DO	31				
		5	DO	47	3			
	some sand, a trace of gravel occ. cobbles, boulders and shale fragments — brown grey				4			
		6	DO	50/15				
					5			
188.8		7	DO	50/15	6			
6.4	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Dynamic Cone: 25 (1), 15 (2), 14 (3), 11 (4), 11 (5), 9 (6), 8 (7)

Dry on competion

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 7

FIGURE NO.: 7

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow-Stem

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 26, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
194.4	Ground Surface							
0.0	**23 cm TOPSOIL**				0			
	Stiff to hard	1	DO	10			24	frost
	weathered	2	DO	16	1		13	
		3	DO	27	2		11	
	SILTY CLAY TILL	4	DO	61			11	
	brown grey	5	DO	81	3		9	
	some sand, a trace of gravel occ. cobbles and boulders				4			
189.5		6	DO	50/8			11	
4.9	**END OF BOREHOLE**				5			
	Refusal to augering, probable bedrock				6			
	Installed 50 mm Ø monitoring well to 4.9 m completed with 1.5 m screen Sand backfill from 2.7 m to 4.9 m Bentonite seal from 0.0 m to 2.7 m Provided with a protective steel casing.				7			
					8			
					9			
					10			
					11			
					12			
					13			

Dry on competion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 8

FIGURE NO.: 8

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 9, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
195.3	Ground Surface							
0.0	**30 cm TOPSOIL**	1	DO	4	0		29 frost	
	Soft to hard							
	weathered	2	DO	9	1		26	
		3	DO	25	2		23	
		4	DO	48			13	
	SILTY CLAY TILL	5	DO	57	3		12	
	some sand, a trace of gravel occ. cobbles and boulders	6	DO	60	4 5		10	
189.1					6			
6.2	Reddish-brown, weathered	7	DO	50/13			10	
	SHALE BEDROCK				7			
187.6		8	DO	50/13			10	
7.7	**END OF BOREHOLE**				8 9 10 11 12 13			W.L. @ El. 188.3 m on completion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 9

FIGURE NO.: 9

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 8, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
195.9	Ground Surface							
0.0	**20 cm TOPSOIL**				0			
	Stiff to hard	1	DO	9			25	frost
	weathered	2	DO	10	1		18	
		3	DO	29			13	
	SILTY CLAY TILL				2			
		4	DO	46			11	
		5	DO	39	3		11	
	some sand, a trace of gravel occ. cobbles and boulders — brown / grey				4			Dry on competion
		6	DO	50/5			8	
					5			
189.7		7	DO	50/15	6		11	
6.2	**END OF BOREHOLE**							
					7			
					8			
					9			
					10			
					11			
					12			
					13			

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 10

FIGURE NO.: 10

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 8, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
196.7	Ground Surface							
0.0	**15 cm TOPSOIL**				0			
	Stiff to hard	1	DO	10			19	frost
	weathered	2	DO	29	1		14	
		3	DO	63	2		13	
	SILTY CLAY TILL	4	DO	27			11	
		5	DO	51	3		11	
	some sand, a trace of gravel occ. cobbles and boulders				4			
	brown grey	6	DO	50/10	5		10	
190.5		7	DO	50/13	6		7	
6.2	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Dry on competion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 11

FIGURE NO.: 11

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 25, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
194.2	Ground Surface							
0.0	**15 cm TOPSOIL**				0			
	Brown, stiff to hard	1	DO	8			27	
	weathered	2	DO	16	1		15	
		3	DO	44	2		26	
	SILTY CLAY TILL	4	DO	39			15	
		5	DO	42	3		15	
	some sand, a trace of gravel occ. cobbles and boulders				4			
		6	DO	60	5		11	
188.1		7	AS	50/0	6			▽
6.1	**END OF BOREHOLE**							
	Refusal on shale bedrock				7			
					8			
					9			
					10			
					11			
					12			
					13			

W.L. @ El. 188.7 m on completion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 12

FIGURE NO.: 12

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 11, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
195.1	Ground Surface							
0.0	**23 cm TOPSOIL**				0			
	Stiff to hard — weathered	1	DO	9			19	frost
		2	DO	20	1		16	
		3	DO	30	2		13	
	SILTY CLAY TILL	4	DO	45			12	
		5	DO	32	3		10	
	some sand, a trace of gravel occ. cobbles and boulders — brown grey				4			Dry on competion
		6	DO	44	5		11	
		7	DO	26	6		11	
188.5								
6.6	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 13

FIGURE NO.: 13

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 9, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
195.8	Ground Surface							
0.0	**15 cm TOPSOIL**				0			
	Stiff to hard	1	DO	9			23	frost
	weathered	2	DO	21	1		14	
		3	DO	27	2		13	
		4	DO	39			12	
	SILTY CLAY TILL	5	DO	42	3		11	
	brown grey				4			
	some sand, a trace of gravel occ. cobbles and boulders	6	DO	21	5		11	
		7	DO	38	6		9	
188.7					7			
7.1	Brown/grey, very dense	8	DO	50/13			9	
	SANDY SILT TILL				8			
	traces to some clay and gravel occ. cobbles and boulders							
186.5		9	DO	50/15	9		7	
9.3	**END OF BOREHOLE**				10			
					11			
					12			
					13			

Dry on competion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 14

FIGURE NO.: 14

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 8, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
197.0	Ground Surface							
0.0	**18 cm TOPSOIL**				0			
	Stiff to hard	1	DO	11			25 frost	
	weathered	2	DO	23	1		15	
		3	DO	27	2		14	
	SILTY CLAY TILL	4	DO	30			12	
		5	DO	47	3		11	
	some sand, a trace of gravel occ. cobbles and boulders				4			
	brown grey	6	DO	20	5		11	
					6			
190.4		7	DO	38			8	
6.6	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Dry on competion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 15

FIGURE NO.: 15

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 8, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
197.4	Ground Surface							
0.0	**15 cm TOPSOIL**				0		frost	
	Stiff to hard	1	DO	14			18	
	weathered	2	DO	18	1		23	
		3	DO	25	2		14	
	SILTY CLAY TILL	4	DO	38			12	
		5	DO	65	3		12	
	some sand, a trace of gravel occ. cobbles and boulders				4			
	occ. sand and silt layers at 4.5 m	6	DO	20	5		14	W.L. @ El. 192.8 m on completion
	brown grey				6			
190.8		7	DO	71			10	
6.6	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 16

FIGURE NO.: 16

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 25, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
195.6 / 0.0	Ground Surface							
	18 cm TOPSOIL				0		28	
	Firm to hard — weathered	1	DO	6				
		2	DO	32	1		13	
		3	DO	29			13	
	SILTY CLAY TILL				2			
		4	DO	51			12	
		5	DO	35	3		12	
	some sand, a trace of gravel occ. cobbles and boulders — brown grey				4			
		6	DO	23	5		11	
		7	DO	48	6		8	
189.0 / 6.6	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			Dry on competion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 17

FIGURE NO.: 17

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 12, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
195.4	Ground Surface							
0.0	**18 cm TOPSOIL**				0			
	Stiff to hard	1	DO	10			29	frost
	weathered	2	DO	18	1		15	
		3	DO	20			14	
	SILTY CLAY TILL				2			
		4	DO	31			11	
		5	DO	45	3		12	
	some sand, a trace of gravel occ. cobbles and boulders				4			
	brown grey	6	DO	22	5		12	
					6			
188.8		7	DO	47			10	
6.6	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

W.L. @ El. 189.9 m on completion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 18

FIGURE NO.: 18

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 9, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
195.4	Ground Surface							
0.0	**15 cm TOPSOIL**				0			
	Stiff to hard	1	DO	9			17	frost
	weathered	2	DO	14	1		14	
		3	DO	25	2		13	
		4	DO	29			12	
	SILTY CLAY TILL	5	DO	30	3		11	
	brown grey				4			
	some sand, a trace of gravel occ. cobbles and boulders	6	DO	24	5		10	
		7	DO	29	6		8	
188.3					7			
7.1	Brown, very dense	8	DO	50/10			10	W.L. @ El. 188.1 m on completion
	SANDY SILT TILL				8			
	traces to some clay and gravel occ. cobbles and boulders							
186.1		9	DO	50/13	9		11	
9.3	**END OF BOREHOLE**				10			
					11			
					12			
					13			

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 19

FIGURE NO.: 19

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 9, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
196.7	Ground Surface							
0.0	**25 cm TOPSOIL**				0			
	Firm to hard — weathered	1	DO	7			23 frost	
		2	DO	23	1		17	
		3	DO	24	2		14	
	SILTY CLAY TILL	4	DO	41			11	
		5	DO	24	3		10	
	some sand, a trace of gravel occ. cobbles and boulders — brown grey				4			Dry on competion
		6	DO	20	5		13	
		7	DO	21	6		10	
190.1								
6.6	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 20

FIGURE NO.: 20

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 10, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
197.8	Ground Surface							
0.0	**20 cm TOPSOIL**				0			
	Stiff to hard — weathered	1	DO	13			22	frost
		2	DO	19	1		14	
		3	DO	28	2		11	
	SILTY CLAY TILL	4	DO	50/13			11	
		5	DO	37	3		13	
	some sand, a trace of gravel occ. cobbles and boulders — brown grey				4			
		6	DO	22	5		11	
					6			
191.2		7	DO	25			11	
6.6	**END OF BOREHOLE**				7			
	Installed 50 mm Ø monitoring well to 6.1 m completed with 1.5 m screen Sand backfill from 4.0 m to 6.1 m Bentonite seal from 0.0 m to 4.0 m Provided with a protective steel casing.				8			
					9			
					10			
					11			
					12			
					13			

Dry on competion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 21

FIGURE NO.: 21

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 12, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
196.0	Ground Surface							
0.0	**20 cm TOPSOIL**				0			
	Firm to hard	1	DO	7			17	frost
	weathered	2	DO	21	1		16	
		3	DO	28			15	
	SILTY CLAY TILL				2			
		4	DO	47			11	
		5	DO	39	3		11	
	some sand, a trace of gravel occ. cobbles and boulders — brown grey				4			Dry on competion
		6	DO	23	5		10	
					6			
189.4		7	DO	29			12	
6.6	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 22

FIGURE NO.: 22

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 19, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
195.6	Ground Surface							
0.0	**23 cm TOPSOIL**				0			
	Stiff to hard	1	DO	9			24	frost
	weathered	2	DO	24	1		13	
		3	DO	30			13	
		4	DO	45	2		13	
	SILTY CLAY TILL	5	DO	36	3		12	
	brown grey	6	DO	17	4		14	
	some sand, a trace of gravel occ. sand seams and layers, cobbles and boulders	7	DO	29	5		10	
		8	DO	50/15	6		8	
186.2		9	DO	50/8	7		12	
9.4	**END OF BOREHOLE**				8			
					9			
					10			
					11			
					12			
					13			

Dry on competion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 23

FIGURE NO.: 23

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 18, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
196.5	Ground Surface							
0.0	**25 cm TOPSOIL**				0			
	Stiff to hard	1	DO	15			20 frost	
	weathered	2	DO	22	1		14	
		3	DO	29	2		13	
	SILTY CLAY TILL	4	DO	36			13	
	brown grey	5	DO	39	3		13	
	some sand, a trace of gravel occ. cobbles and boulders				4			
		6	DO	19	5		13	
					6			
189.9		7	DO	23			13	
6.6	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Dry on competion

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 24

FIGURE NO.: 24

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 10, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
196.6	Ground Surface							
0.0	**23 cm TOPSOIL**				0			
	Stiff to hard	1	DO	10			21	frost
	weathered	2	DO	18	1		14	
		3	DO	23			14	
					2			
	SILTY CLAY TILL	4	DO	36			13	
		5	DO	42	3		11	
	some sand, a trace of gravel occ. cobbles and boulders				4			Dry on competion
	brown grey	6	DO	17			10	
					5			
					6			
190.0		7	DO	19			11	
6.6	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 25

FIGURE NO.: 25

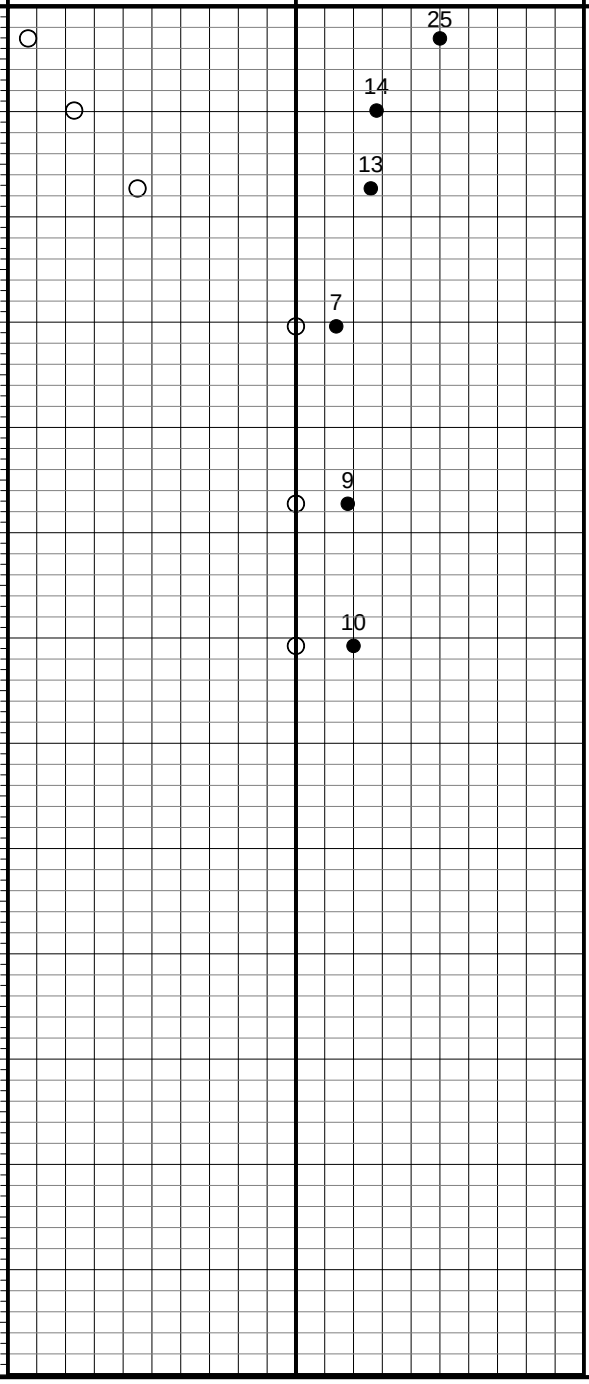
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 25, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
193.5	Ground Surface							
0.0	**23 cm TOPSOIL**				0			
	Brown, firm to hard	1	DO	7				
	weathered							
	SILTY CLAY TILL	2	DO	23	1			
	some sand, a trace of gravel occ. cobbles and boulders	3	DO	45				
191.4					2			
2.1	Very dense							
	auger grinding							
	SANDY SILT TILL	4	DO	50/8	3			
	traces to some clay and gravel occ. cobbles and boulders				4			
	brown grey							
188.8								
4.7	Grey to reddish-brown, weathered	5	DO	50/10	5			
	SHALE BEDROCK							
187.4					6			
6.1	**END OF BOREHOLE**	6	DO	50/5				
					7			
					8			
					9			
					10			
					11			
					12			
					13			



W.L. @ El. 188.0 m on completion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 26

FIGURE NO.: 26

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 12, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
193.7	Ground Surface							
0.0	**20 cm TOPSOIL**				0			
	Very stiff to hard	1	DO	18			28	frost
	weathered	2	DO	11	1		16	
		3	DO	28			13	
	SILTY CLAY TILL				2			
		4	DO	36			10	
		5	DO	50/13	3		11	
	some sand, a trace of gravel occ. cobbles and boulders				4			
188.9		6	DO	50/15			7	
4.8	Reddish-brown, weathered				5			
	SHALE BEDROCK							
187.4		7	DO	50/3	6		6	
6.3	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Dry on competion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 27

FIGURE NO.: 27

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 19, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
194.6	Ground Surface							
0.0	**15 cm TOPSOIL**				0			
	Very stiff to hard	1	DO	19			23	frost
	weathered	2	DO	13	1		18	
		3	DO	26	2		14	
	SILTY CLAY TILL	4	DO	34			15	
		5	DO	36	3		13	
	brown grey				4			Dry on competion
	some sand, a trace of gravel occ. cobbles and boulders	6	DO	21	5		13	
		7	DO	29	6		11	
		8	DO	50/15	7		8	
186.6					8			
8.0	Grey, weathered							
	SHALE BEDROCK				9		8	
185.3		9	DO	50/15				
9.3	**END OF BOREHOLE**				10			
					11			
					12			
					13			

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 28

FIGURE NO.: 28

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 18, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
196.3	Ground Surface							
0.0	**20 cm TOPSOIL**				0			
	Stiff to hard	1	DO	15			23	frost
	weathered	2	DO	18	1		15	
		3	DO	17			18	
					2			
	SILTY CLAY TILL	4	DO	36			17	
		5	DO	34	3		12	
	some sand, a trace of gravel occ. cobbles and boulders				4			
	brown / grey	6	DO	26			13	
					5			
					6			
189.7		7	DO	15			15	
6.6	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Dry on competion

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 29

FIGURE NO.: 29

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 10, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
196.6 / 0.0	Ground Surface							
	13 cm TOPSOIL				0			
	Stiff to hard — weathered	1	DO	10			22 frost	
		2	DO	19	1		17	
		3	DO	37			13	
	SILTY CLAY TILL				2			
		4	DO	44			11	
		5	DO	34	3		12	
	some sand, a trace of gravel occ. cobbles and boulders — brown grey				4			Dry on competion
		6	DO	17			13	
					5			
					6			
190.0		7	DO	16			16	
6.6	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 30

FIGURE NO.: 30

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 25, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
193.9 / 0.0	Ground Surface				
	25 cm TOPSOIL	1	DO	6	0
	Brown, firm to very stiff				
	weathered	2	DO	22	1
	SILTY CLAY TILL				
	some sand, a trace of gravel occ. cobbles and boulders	3	DO	27	2
191.8 / 2.1	Brown, very dense	4	DO	50/15	
		5	DO	50/8	3
	SANDY SILT TILL				4
	traces to some clay and gravel occ. cobbles and boulders	6	DO	50/13	5
187.4 / 6.5	**END OF BOREHOLE**	7	DO	50/10	6
					7
					8
					9
					10
					11
					12
					13

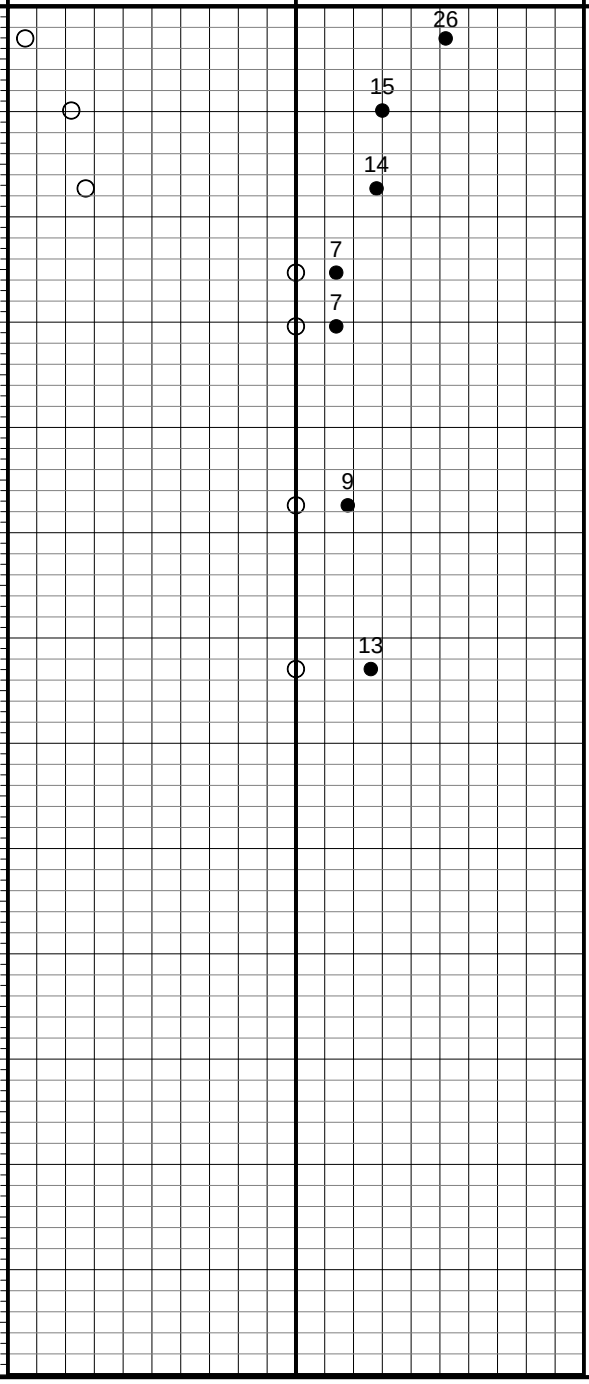
Dynamic Cone (blows/30 cm) 10 30 50 70 90

Shear Strength (kN/m²) 50 100 150 200

Penetration Resistance (blows/30 cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 20 30 40



WATER LEVEL

W.L. @ El. 192.1 m on completion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 31

FIGURE NO.: 31

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 12, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
194.1	Ground Surface							
0.0	**23 cm TOPSOIL**				0			
	Brown, stiff to hard	1	DO	13			26	frost
	weathered							
	SILTY CLAY TILL	2	DO	20	1		15	
	some sand, a trace of gravel occ. cobbles and boulders	3	DO	50/5			12	
192.0					2			
2.1	Very dense	4	DO	50/13			11	
		5	DO	50/13	3		9	
	SANDY SILT TILL							
	traces to some clay and gravel occ. cobbles and boulders	6	DO	50/5	4		8	
	brown grey				5			
188.0		7	DO	50/5	6		7	
6.1	**END OF BOREHOLE**							
	Refusal on boulder				7			
	Installed 50 mm Ø monitoring well to 3.8 m completed with 1.5 m screen Sand backfill from 1.7 m to 3.8 m Bentonite seal from 0.0 m to 1.7 m Provided with a protective steel casing.				8			
					9			
					10			
					11			
					12			
					13			

W.L. @ El. 192.0 m on completion

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 32

FIGURE NO.: 32

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 19, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
195.3	Ground Surface							
0.0	**15 cm TOPSOIL**				0			
0.1	Brown, very stiff to hard	1	DO	20			25	
	weathered						frost	
		2	DO	20	1		15	
		3	DO	18			17	
					2			
		4	DO	43			13	
	SILTY CLAY TILL	5	DO	37	3		13	
					4			
		6	DO	69			9	
					5			
	some sand, a trace of gravel occ. cobbles and boulders	7	DO	50/13	6		8	
					7			
		8	DO	50/13			8	
					8			
		9	DO	50/13	9		9	
185.1					10			
10.2	Reddish-brown, weathered **SHALE BEDROCK**						7	
184.5		10	DO	50/13				
10.8	**END OF BOREHOLE**				11			
					12			
					13			

Dry on competion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 33

FIGURE NO.: 33

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 18, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
195.1	Ground Surface							
0.0	**15 cm TOPSOIL**				0			
	Brown, very stiff to hard	1	DO	18			20 frost	
	weathered	2	DO	23	1		13	
	SILTY CLAY TILL	3	DO	29			13	
	some sand, a trace of gravel occ. cobbles and boulders	4	DO	35	2		12	▽
		5	DO	45	3		12	W.L. @ El. 192.7 m on completion
191.1 4.0	Grey, dense				4			
	SANDY SILT TILL	6	DO	35	5		14	
	traces to some clay and gravel occ. cobbles and boulders				6			
188.5		7	DO	48			10	
6.6	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 34

FIGURE NO.: 34

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 10, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
194.8	Ground Surface							
0.0	**18 cm TOPSOIL**				0			
	Very stiff to hard	1	DO	18			26	frost
	weathered	2	DO	25	1		15	
		3	DO	24			15	
					2			
	SILTY CLAY TILL	4	DO	44			12	
		5	DO	46	3		12	
	some sand, a trace of gravel occ. cobbles and boulders							
	brown grey				4			Dry on competion
		6	DO	18			15	
					5			
					6			
188.2		7	DO	41			9	
6.6	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 35

FIGURE NO.: 35

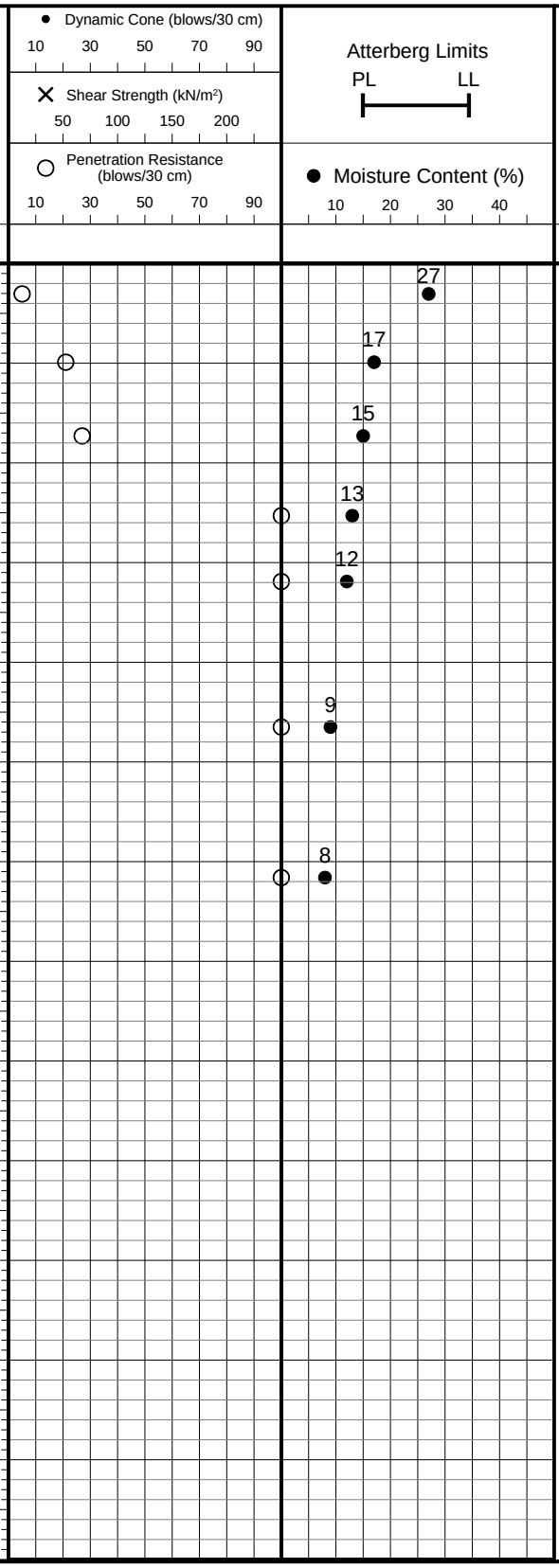
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 24, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
193.6 / 0.0	Ground Surface				
	20 cm TOPSOIL				0
	Brown, firm to hard	1	DO	5	
	weathered	2	DO	21	1
	SILTY CLAY TILL	3	DO	27	
					2
	some sand, a trace of gravel occ. cobbles and boulders	4	DO	50/13	
		5	DO	50/8	3
189.6 / 4.0	Grey, very dense				4
		6	DO	50/10	
	SANDY SILT TILL				5
	traces to some clay and gravel occ. cobbles and boulders				
187.4 / 6.2	**END OF BOREHOLE**	7	DO	50/8	6
					7
					8
					9
					10
					11
					12
					13



WATER LEVEL: Dry on competion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 36

FIGURE NO.: 36

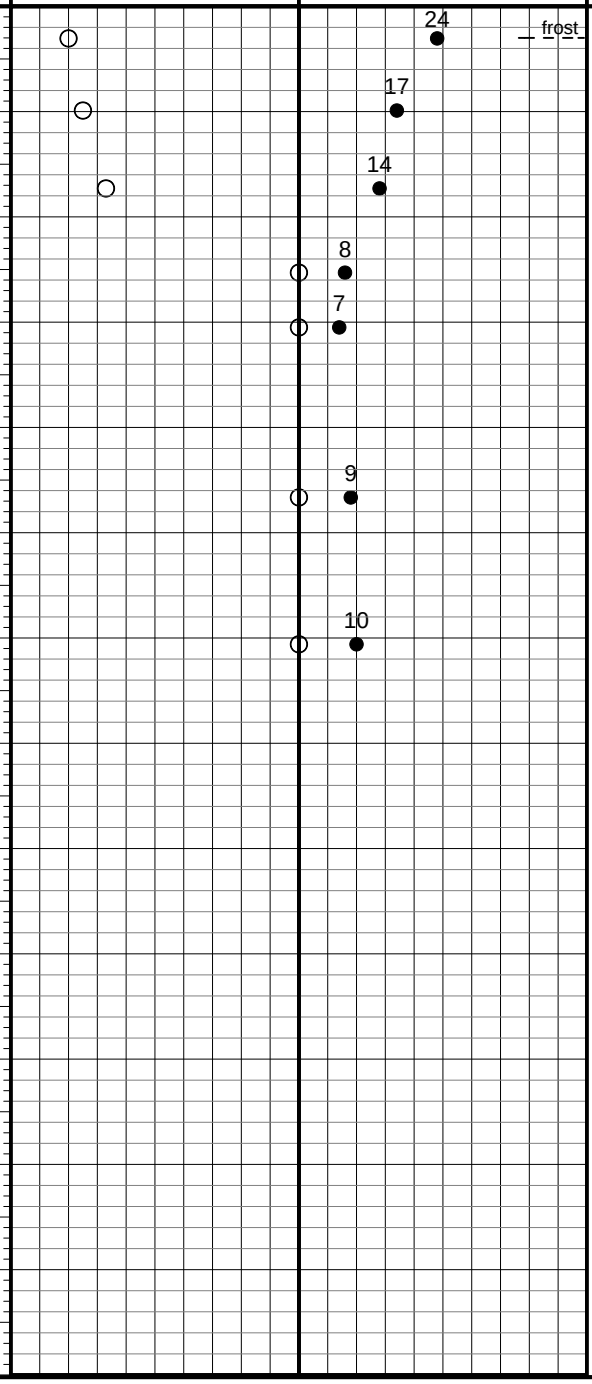
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 17, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
193.9 / 0.0	Ground Surface				
	18 cm TOPSOIL				0
	Brown, very stiff to hard	1	DO	20	
	weathered				
	SILTY CLAY TILL	2	DO	25	1
	some sand, a trace of gravel occ. cobbles and boulders	3	DO	33	
191.8 / 2.1	Brown, very dense				2
		4	DO	50/15	
		5	DO	50/10	3
	SANDY SILT TILL				
					4
	traces to some clay and gravel occ. cobbles and boulders	6	DO	50/13	
					5
187.8 / 6.1	**END OF BOREHOLE**	7	DO	50/8	6
					7
					8
					9
					10
					11
					12
					13



WATER LEVEL

W.L. @ El. 188.3 m on completion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 37

FIGURE NO.: 37

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 23, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
194.8	Ground Surface				
0.0	**20 cm TOPSOIL**				0
	Brown, very stiff to hard	1	DO	18	
	weathered	2	DO	21	1
	SILTY CLAY TILL	3	DO	23	
					2
	some sand, a trace of gravel occ. cobbles and boulders	4	DO	46	
		5	DO	50/8	3
190.8					
4.0	Very dense				4
		6	DO	50/13	
					5
		7	DO	50/15	6
	SANDY SILT TILL				7
		8	DO	50/8	
					8
	traces to some clay and gravel occ. cobbles and boulders	9	DO	50/5	9
	brown / grey				10
184.1					
10.7	**END OF BOREHOLE**	10	DO	50/3	11
					12
					13

Dynamic Cone (blows/30 cm) 10 30 50 70 90

Shear Strength (kN/m²) 50 100 150 200

Penetration Resistance (blows/30 cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 20 30 40

Moisture Content values: 32 frost; 15; 14; 12; 11; 8; 8; 7; 9; 11

WATER LEVEL

W.L. @ El. 186.6 m on completion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 38

FIGURE NO.: 38

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 18, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
195.1	Ground Surface							
0.0	**23 cm TOPSOIL**				0			
	Stiff to hard — weathered	1	DO	15			24 frost	
		2	DO	26	1		14	
		3	DO	30			12	
	SILTY CLAY TILL				2			
		4	DO	47			11	
		5	DO	39	3		11	
	some sand, a trace of gravel occ. cobbles and boulders — brown grey				4			
		6	DO	50			10	
189.2					5			
5.9	Reddish-brown				6			
188.7	**SHALE BEDROCK**	7	DO	50/13			7	
6.4	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Dry on competion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 39

FIGURE NO.: 39

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 10, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
195.1	Ground Surface							
0.0	**20 cm TOPSOIL**				0			
	Stiff to hard	1	DO	14			22	frost
	weathered	2	DO	25	1		15	
		3	DO	24	2		13	
	SILTY CLAY TILL	4	DO	51			11	
		5	DO	47	3		12	
	some sand, a trace of gravel occ. sand layer, cobbles and boulders				4			
	brown grey	6	DO	24	5		10	
188.5		7	DO	63	6		10	
6.6	**END OF BOREHOLE**				7			
	Installed 50 mm Ø monitoring well to 6.1 m completed with 1.5 m screen Sand backfill from 4.0 m to 6.1 m Bentonite seal from 0.0 m to 4.0 m Provided with a protective steel casing.				8			
					9			
					10			
					11			
					12			
					13			

W.L. @ El. 193.0 m on completion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 40d

FIGURE NO.: 40

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow-Stem

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 24, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
190.7	Ground Surface							
0.0	**20 cm TOPSOIL**				0			
	Brown, soft to very stiff	1	DO	4			26	
	weathered	2	DO	26	1		15	
	SILTY CLAY TILL	3	DO	20			15	
	some sand, a trace of gravel occ. cobbles and boulders	4	DO	26	2		11	
		5	DO	29	3		14	
186.7								
4.0	Brown, very dense				4			
	SANDY SILT TILL	6	DO	68	5		8	
	traces to some clay and gravel occ. cobbles and boulders							
184.7								
6.0	Reddish-brown, weathered	7	DO	50/10	6		8	
	SHALE BEDROCK	8	DO	50/15	7		9	
		9	AS	50/0	8		8	
181.3					9			
9.4	**END OF BOREHOLE**				10			
	Refusal to augering.				11			
	Installed 50 mm Ø monitoring well to 9.4 m completed with 1.5 m screen Sand backfill from 7.3 m to 9.4 m Bentonite seal from 0.0 m to 7.3 m Provided with a protective steel casing.				12			Dry on competion
					13			

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 40s

FIGURE NO.: 41

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow-Stem

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 24, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES: Number	SAMPLES: Type	SAMPLES: N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
190.7	Ground Surface							
0.0	**20 cm TOPSOIL**				0			
	Brown, soft to very stiff							
	weathered							
	SILTY CLAY TILL				1			
	some sand, a trace of gravel occ. cobbles and boulders				2			
					3			
186.7								
4.0	Brown, very dense				4			
	SANDY SILT TILL							
	traces to some clay and gravel occ. cobbles and boulders				5			
184.6								
6.1	**END OF BOREHOLE**				6			
	Installed 50 mm Ø monitoring well to 6.1 m completed with 1.5 m screen Sand backfill from 4.0 m to 6.1 m Bentonite seal from 0.0 m to 4.0 m Provided with a protective steel casing.				7			
					8			
					9			
					10			
					11			
					12			
					13			

Dry on competion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 41

FIGURE NO.: 42

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 17, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
191.5	Ground Surface							
0.0	**20 cm TOPSOIL**				0			
	Brown, stiff to very stiff	1	DO	14			28	frost
	weathered	2	DO	23	1		17	
		3	DO	29	2		14	
	SILTY CLAY TILL	4	DO	56			13	
		5	DO	50/13	3		12	
	some sand, a trace of gravel occ. sand layers, cobbles and boulders	6	DO	50/15	4		11	
185.4 6.1	**END OF BOREHOLE**	7	DO	50/3	5 6			W.L. @ El. 185.7 m on completion
					7 8 9 10 11 12 13			

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 42

FIGURE NO.: 43

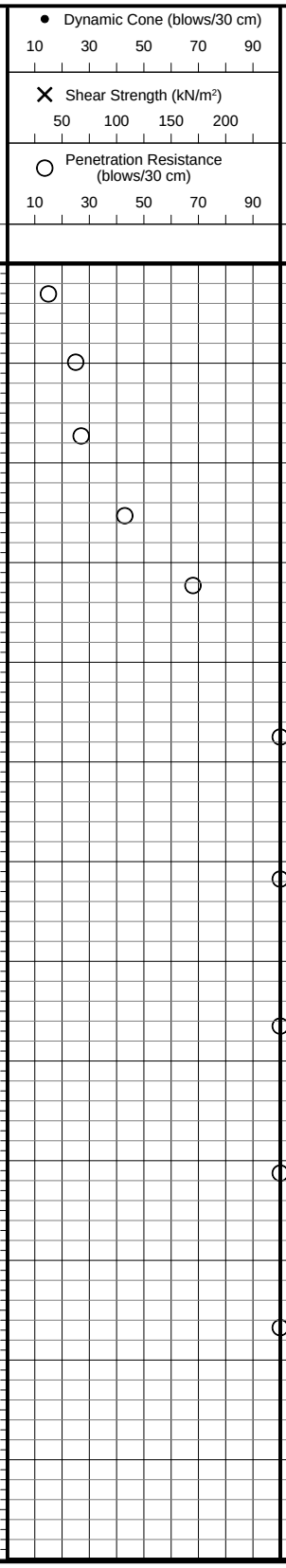
PROJECT DESCRIPTION: Proposed Residential Development

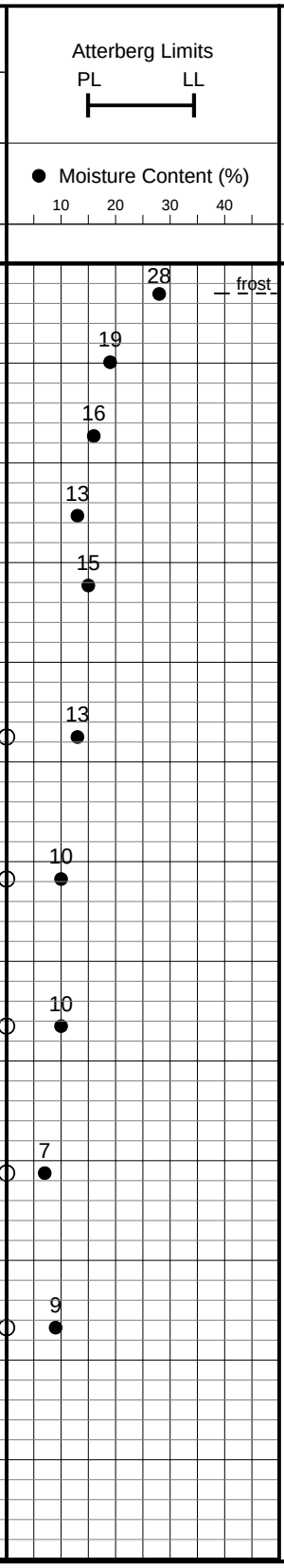
METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 23, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
193.1	Ground Surface				
0.0	**20 cm TOPSOIL**				0
	Brown, stiff to hard	1	DO	15	
	weathered	2	DO	25	1
		3	DO	27	2
	SILTY CLAY TILL	4	DO	43	
		5	DO	68	3
	some sand, a trace of gravel occ. cobbles and boulders				4
		6	DO	50/15	5
187.5					
5.6	Brown, very dense	7	DO	50/15	6
	SANDY SILT TILL				7
		8	DO	50/10	
	traces to some clay and gravel occ. cobbles and boulders				8
183.9		9	DO	50/5	9
9.2	Reddish-brown, weathered				
	SHALE BEDROCK				10
182.4		10	DO	50/5	
10.7	**END OF BOREHOLE**				11
					12
					13





WATER LEVEL

W.L. @ El. 187.0 m on completion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 43

FIGURE NO.: 44

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 12, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
193.2	Ground Surface							
0.0	**25 cm TOPSOIL**				0			
	Brown, stiff to hard	1	DO	15			26	frost
	weathered	2	DO	15	1		18	
	SILTY CLAY TILL	3	DO	30			13	
	some sand, a trace of gravel occ. cobbles and boulders	4	DO	36	2		12	
		5	DO	49	3		13	
189.2								
4.0	Brown, very dense				4			
	SANDY SILT	6	DO	50/15			12	
	traces to some clay occ. sand seams and layers				5			
187.0		7	DO	50/15	6		15	
6.2	**END OF BOREHOLE**							
					7			
					8			
					9			
					10			
					11			
					12			
					13			

Cave-in @ El. 188.5 m on completion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 44

FIGURE NO.: 45

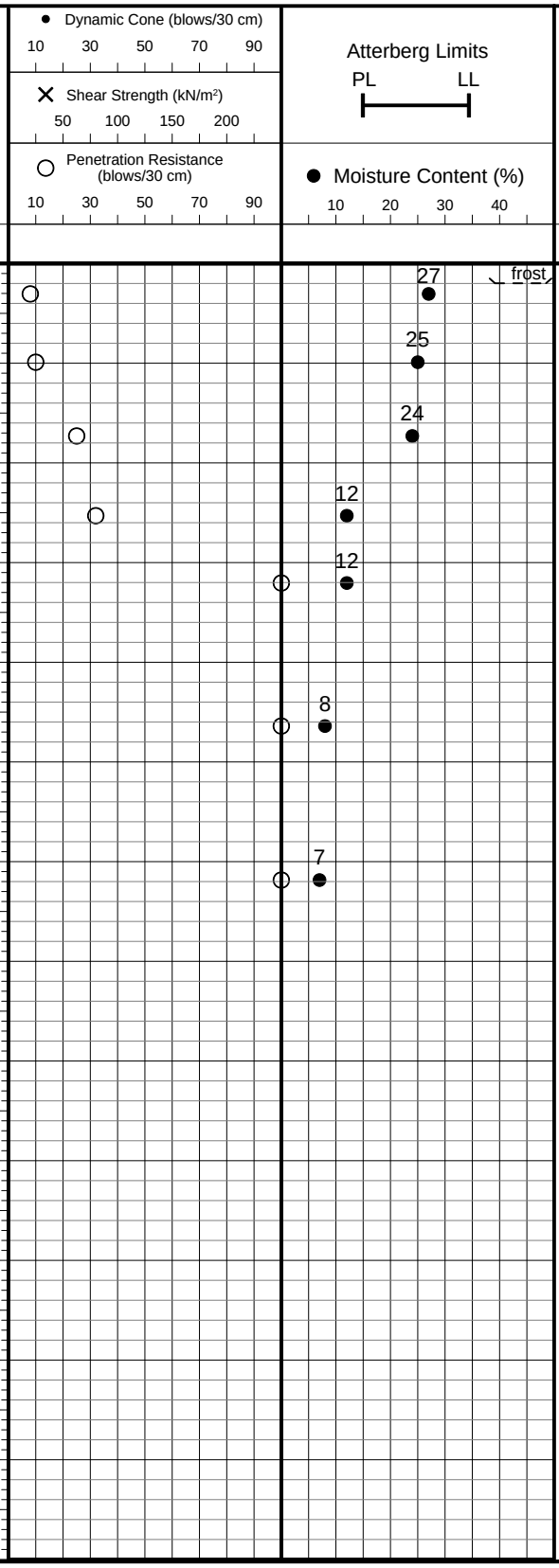
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 10, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
193.0 / 0.0	Ground Surface				
	30 cm TOPSOIL	1	DO	8	0
	Brown, stiff to hard				
	weathered	2	DO	10	1
	SILTY CLAY TILL	3	DO	25	2
	some sand, a trace of gravel occ. cobbles and boulders	4	DO	32	3
		5	DO	50/10	
189.0 / 4.0	Brown, very dense				4
	SANDY SILT TILL	6	DO	50/8	5
	traces to some clay and gravel occ. sand seams, cobbles and boulders				
186.8 / 6.2	**END OF BOREHOLE**	7	DO	50/8	6
					7
					8
					9
					10
					11
					12
					13



WATER LEVEL

W.L. @ El. 187.2 m on completion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 45

FIGURE NO.: 46

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 23, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
190.1	Ground Surface							
0.0	**28 cm TOPSOIL**	1	DO	6	0		34	
0.3	Brown, firm to hard							
	weathered	2	DO	26	1		17	
		3	DO	27	2		17	
	SILTY CLAY TILL	4	DO	35			15	
	brown grey	5	DO	50/8	3		16	
	some sand, a trace of gravel occ. cobbles and boulders	6	DO	28	4 5		21	
184.3								
5.8	Reddish-brown, weathered				6			
183.8	**SHALE BEDROCK**	7	DO	50/3			7	
6.3	**END OF BOREHOLE**				7 8 9 10 11 12 13			

W.L. @ El. 184.6 m on completion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 46

FIGURE NO.: 47

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 17, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
190.3	Ground Surface							
0.0	**20 cm TOPSOIL**				0			
	Brown, stiff to hard	1	DO	10			31 frost	
	weathered	2	DO	50/3	1		22	
		3	DO	23			14	
	SILTY CLAY TILL				2			
		4	DO	28			14	
		5	DO	33	3		16	
	some sand, a trace of gravel occ. silt layer, cobbles and boulders — brown / grey				4			Dry on competion
		6	DO	50/15			9	
					5			
183.9		7	DO	50/10	6		13	
6.4	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 47

FIGURE NO.: 48

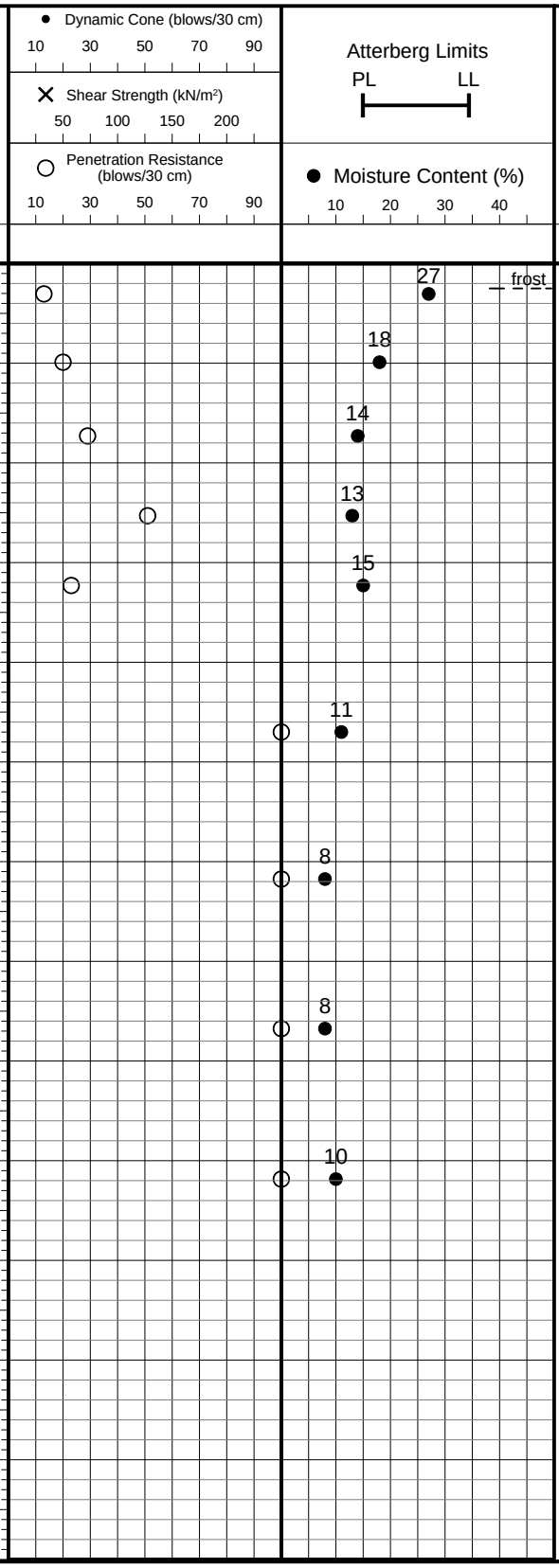
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 17, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
190.9	Ground Surface				
0.0	**20 cm TOPSOIL**				0
	Stiff to hard	1	DO	13	
	weathered	2	DO	20	1
		3	DO	29	2
		4	DO	51	
	SILTY CLAY TILL	5	DO	23	3
	brown grey				4
	some sand, a trace of gravel occ. cobbles and boulders	6	DO	50/5	5
	grey brown				6
		7	DO	50/15	
183.0					7
7.9	Reddish-brown, weathered	8	DO	50/15	8
	SHALE BEDROCK				
181.7					9
9.2	**END OF BOREHOLE**	9	DO	50/3	
					10
					11
					12
					13



WATER LEVEL

W.L. @ El. 184.2 m on completion

Soil Engineers Ltd.

JOB NO.: 2101-S026

LOG OF BOREHOLE NO.: 48

FIGURE NO.: 49

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight-Auger

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

DRILLING DATE: February 18, 2021

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) / Shear Strength (kN/m²) / Penetration Resistance (blows/30 cm)	Atterberg Limits PL LL / Moisture Content (%)	WATER LEVEL
191.4	Ground Surface							
0.0	**23 cm TOPSOIL**				0			
	Brown, stiff to hard	1	DO	11			36 frost	
	weathered	2	DO	21	1		15	
		3	DO	20	2		13	
	SILTY CLAY TILL	4	DO	24			13	
		5	DO	27	3		13	
	some sand, a trace of gravel occ. cobbles and boulders — brown / grey				4			
		6	DO	32	5		10	
185.6								
5.8	Reddish-brown, weathered				6			
185.2	**SHALE BEDROCK**	7	DO	50/13			8	
6.2	**END OF BOREHOLE**				7			
					8			
					9			
					10			
					11			
					12			
					13			

Dry on competion

Soil Engineers Ltd.

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

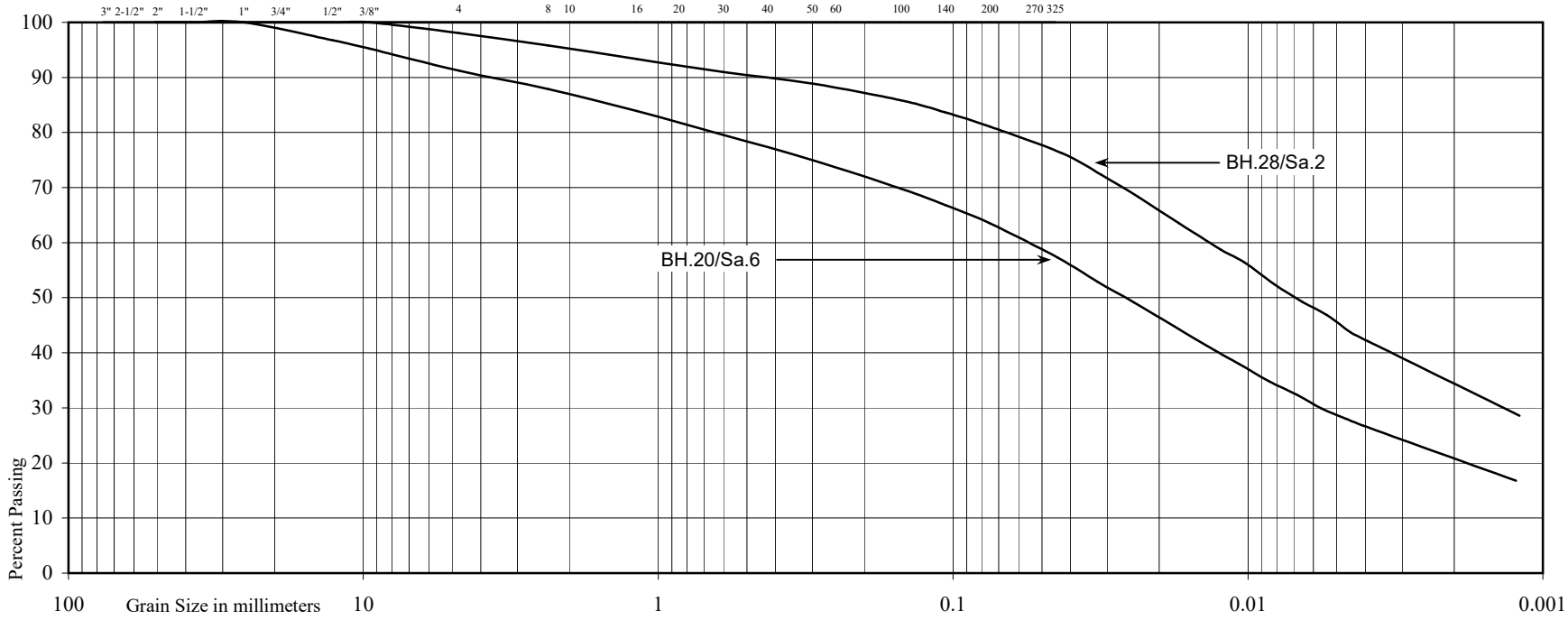
Reference No: 2101-S026

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL			SAND				SILT	CLAY
COARSE		FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project:	Proposed Residential Development	
Location:	Southwest Quadrant of Derry Road and Eighth Line, Town of Milton	
Borehole No:	20	28
Sample No:	6	2
Depth (m):	4.8	1.0
Elevation (m):	193.0	195.3

BH./Sa.	20/6	28/2
Liquid Limit (%) =	25	32
Plastic Limit (%) =	16	19
Plasticity Index (%) =	9	13
Moisture Content (%) =	11	15
Estimated Permeability (cm./sec.) =	10^{-7}	10^{-7}

Classification of Sample [& Group Symbol]: SILTY CLAY TILL
some sand, a trace of gravel

Figure: 50

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

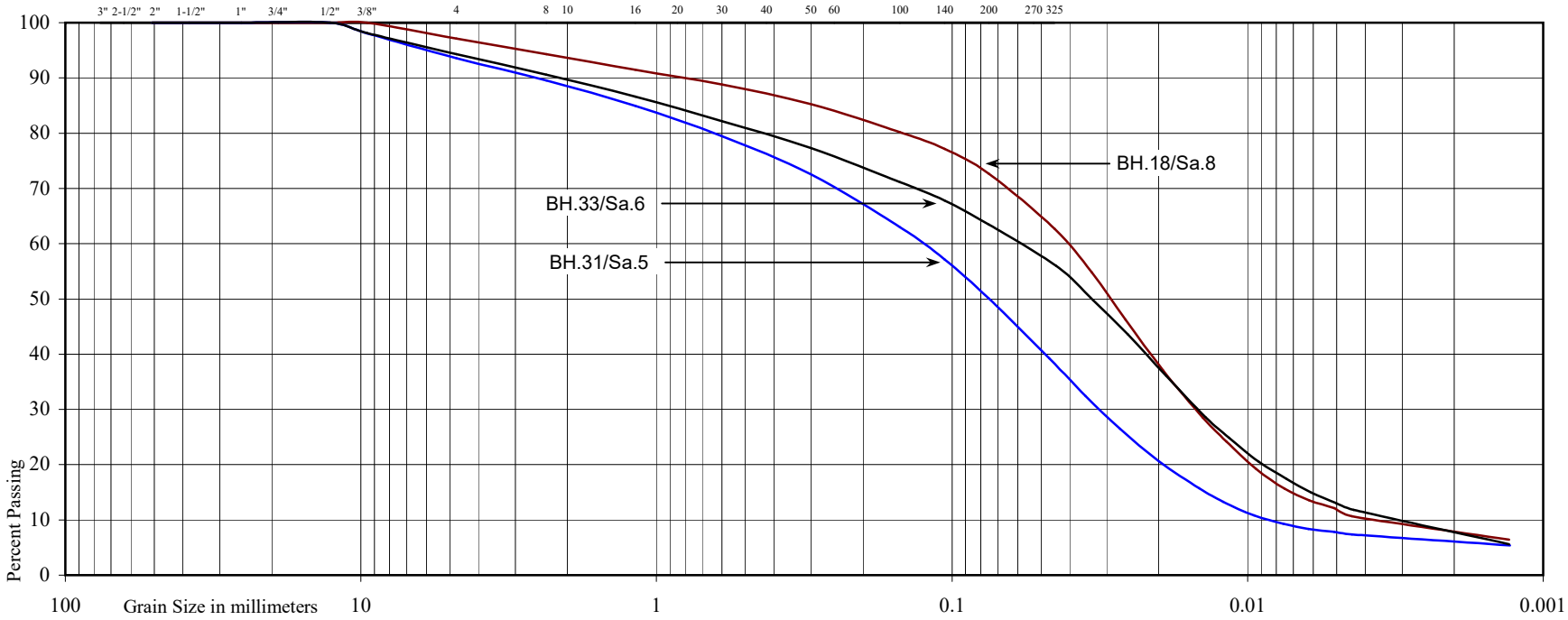
Reference No: 2101-S026

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Residential Development

Location: Southwest Quadrant of Derry Road and Eighth Line, Town of Milton

Borehole No:	18	31	33
Sample No:	8	5	6
Depth (m):	7.8	3.2	4.8
Elevation (m):	187.6	190.9	190.3

BH./Sa.	18/8	31/5	33/6
Liquid Limit (%) =	-	-	-
Plastic Limit (%) =	-	-	-
Plasticity Index (%) =	-	-	-
Moisture Content (%) =	-	-	-
Estimated Permeability (cm./sec.) =	10 $^{-6}$	10 $^{-5}$	10 $^{-6}$

Classification of Sample [& Group Symbol]: SANDY SILT TILL
traces of clay and gravel

Figure: 51

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

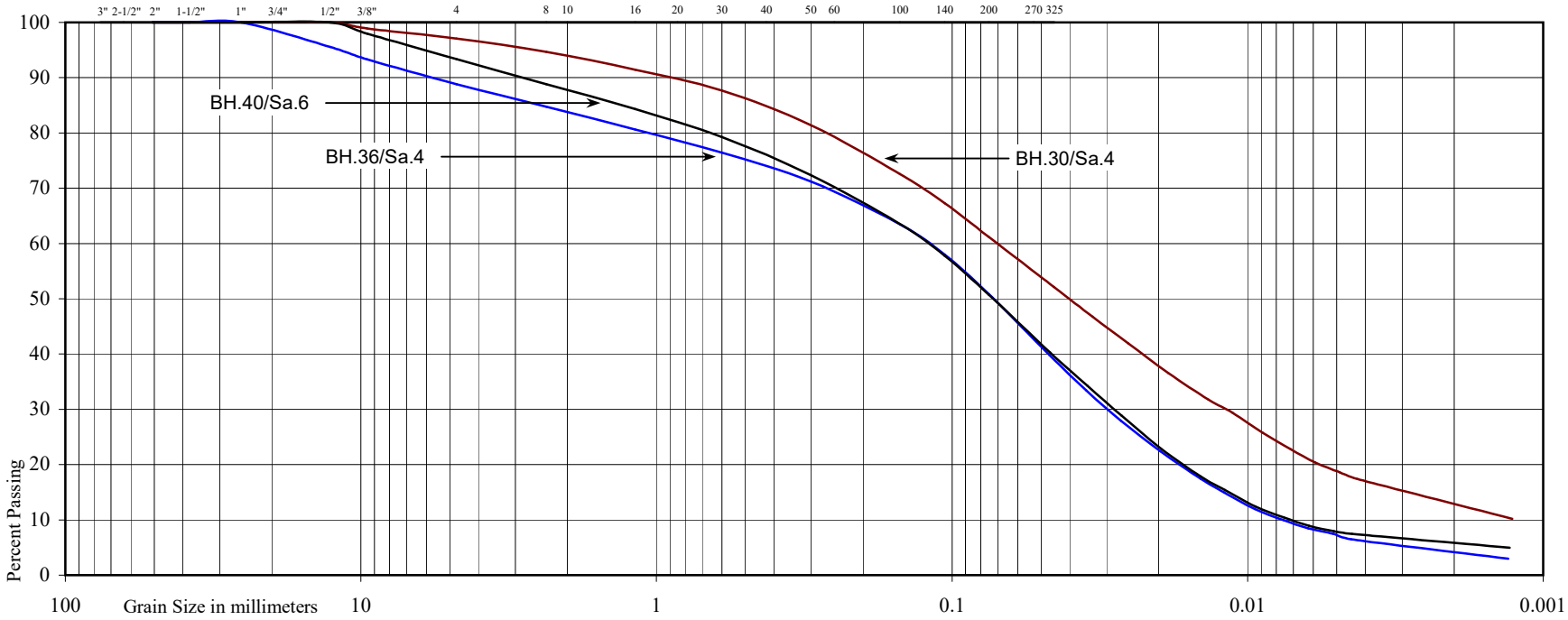
Reference No: 2101-S026

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Residential Development

Location: Southwest Quadrant of Derry Road and Eighth Line, Town of Milton

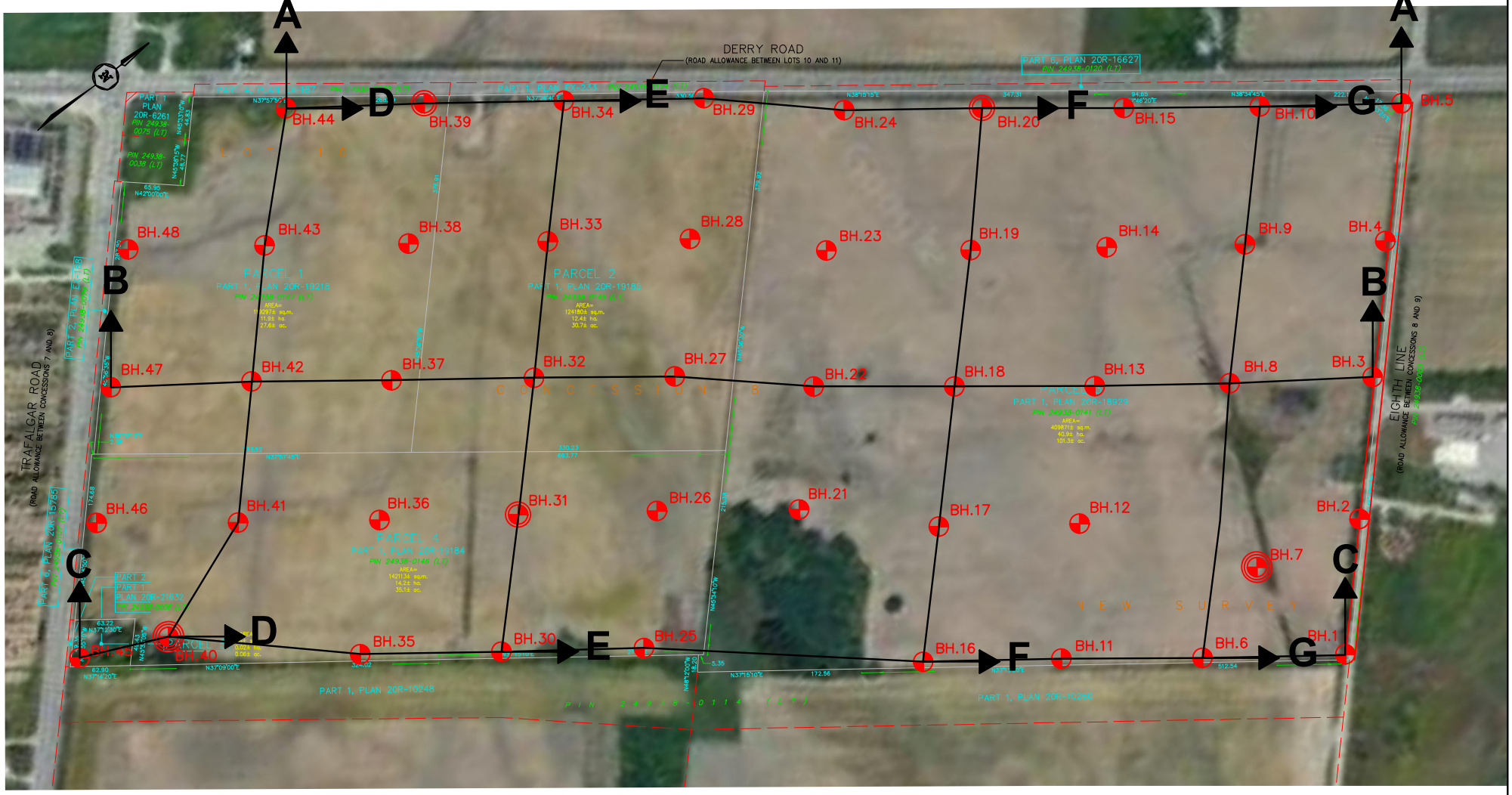
Borehole No:	30	36	40d
Sample No:	4/5	4	6
Depth (m):	2.6/3.0	2.6	4.8
Elevation (m):	191.3/190.9	191.3	185.9

BH./Sa.	30/4/5	36/4	40/6
Liquid Limit (%) =	-	-	-
Plastic Limit (%) =	-	-	-
Plasticity Index (%) =	-	-	-
Moisture Content (%) =	7	8	8
Estimated Permeability (cm./sec.) =	10^{-6}	10^{-5}	10^{-5}

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

traces to some clay and gravel

Figure: 52



LEGEND

- Borehole with 2 monitoring wells
- Borehole with 1 monitoring well
- Borehole

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90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8005

BOREHOLE AND MONITORING WELL LOCATION PLAN

SITE: Derry Road between Eighth Line and Trafalgar Road, Town of Milton

DESIGNED BY: –	CHECKED BY: –	DWG NO.: 1	
SCALE: 1: 6000	REF. NO.: 2101–S026	DATE: May 2021	REV 1

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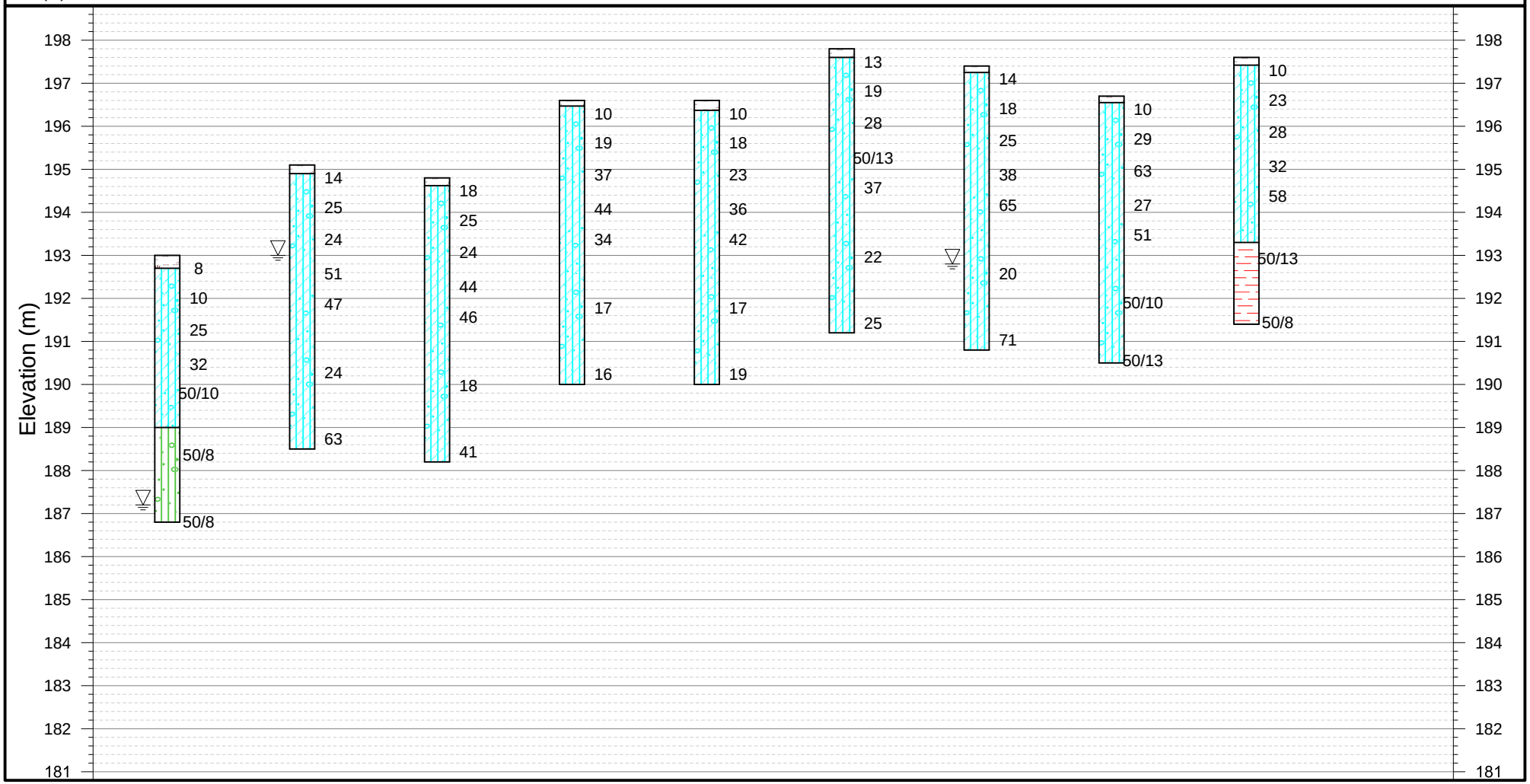
SUBSURFACE PROFILE
DRAWING NO. 2
SCALE: AS SHOWN
CROSS-SECTION A-A

JOB NO.: 2101-S026
REPORT DATE: May 2021
PROJECT DESCRIPTION: Proposed Residential Development

PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

LEGEND
TOPSOIL | SANDY SILT TILL | SILTY CLAY TILL | SHALE

WATER LEVEL (END OF DRILLING)



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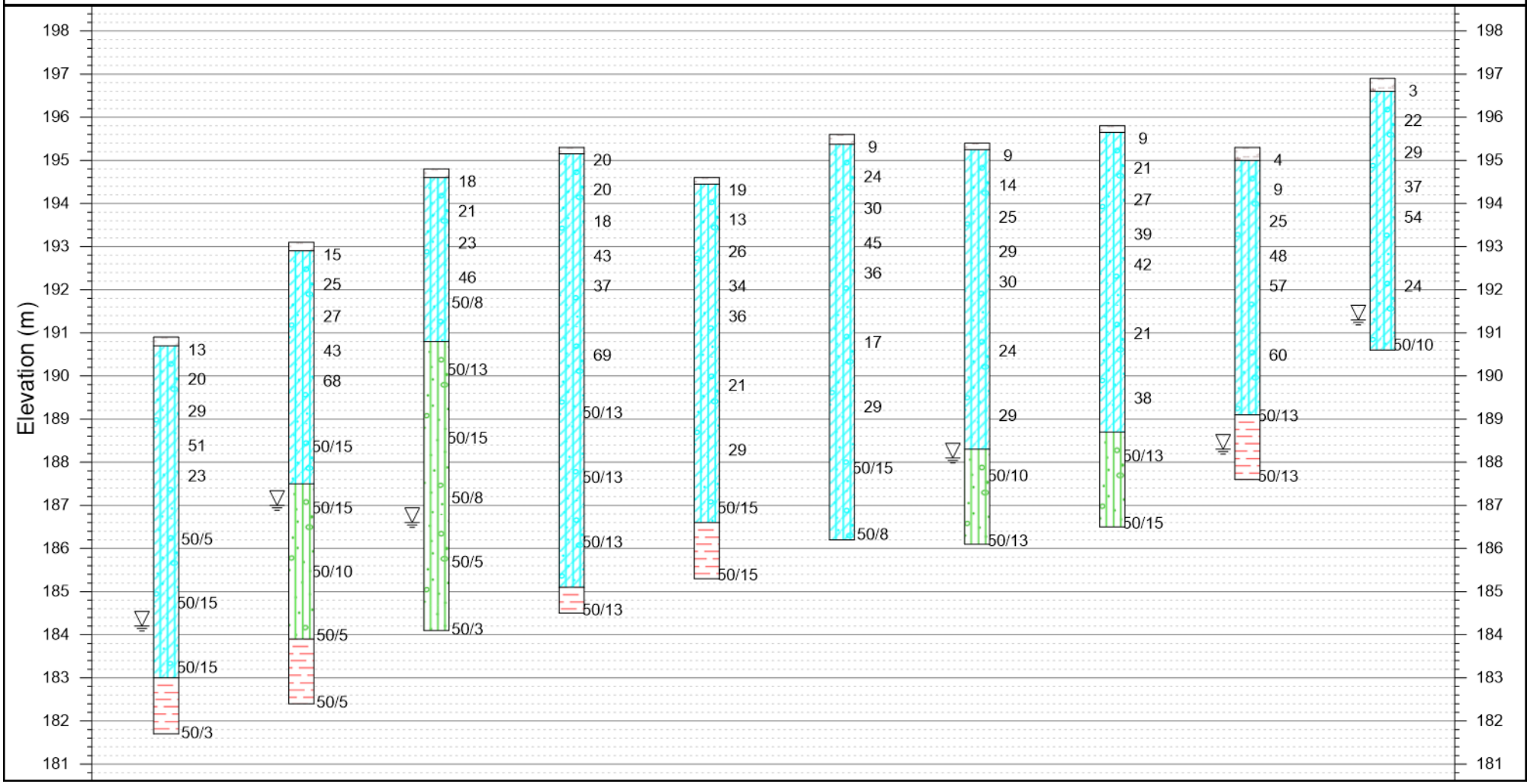
SUBSURFACE PROFILE
DRAWING NO. 3
SCALE: AS SHOWN
CROSS-SECTION B-B

JOB NO.: 2101-S026
REPORT DATE: May 2021
PROJECT DESCRIPTION: Proposed Residential Development
PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

LEGEND
TOPSOIL | SANDY SILT TILL | SILTY CLAY TILL | SHALE
WATER LEVEL (END OF DRILLING)



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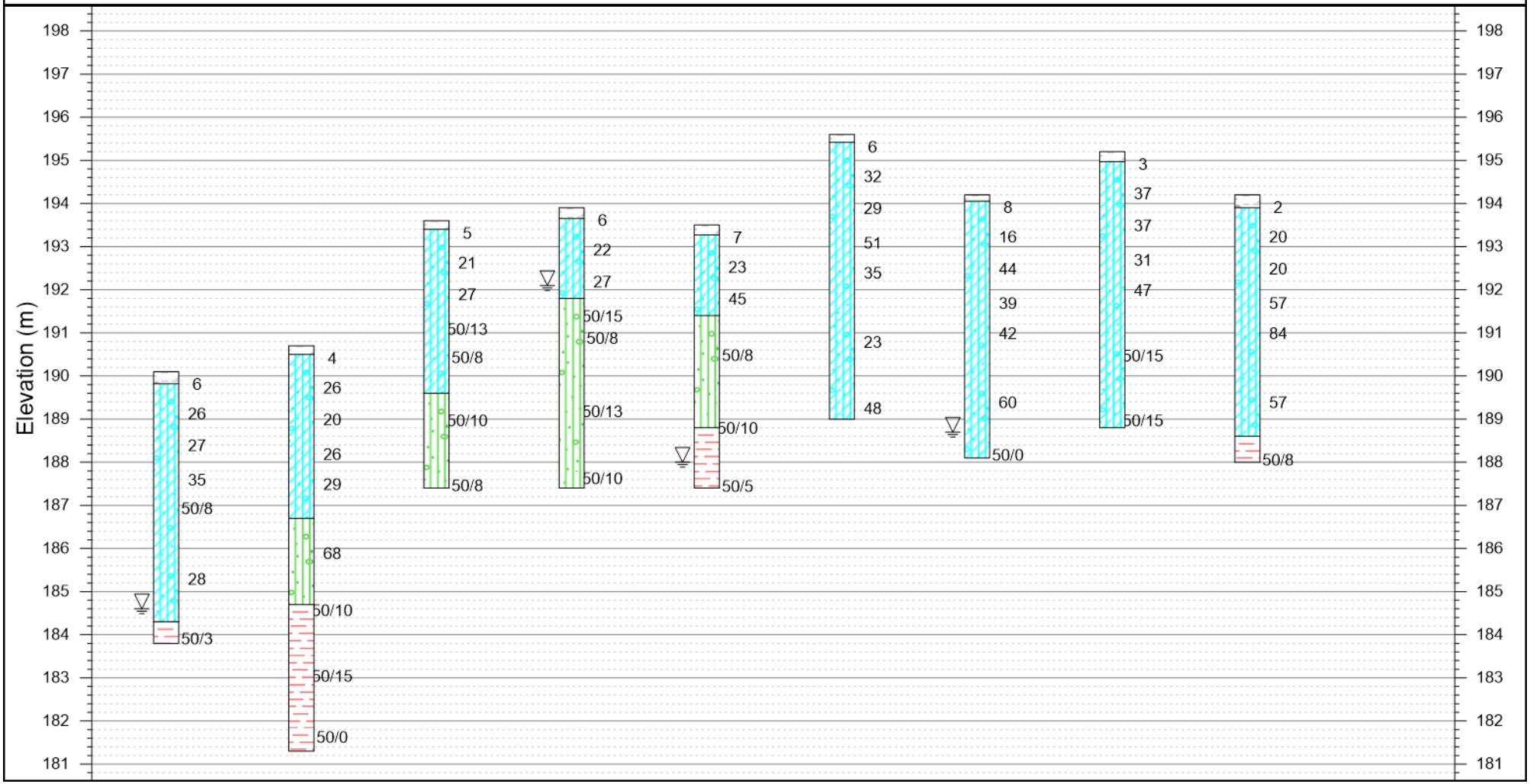
SUBSURFACE PROFILE
DRAWING NO. 4
SCALE: AS SHOWN
CROSS-SECTION C-C

JOB NO.: 2101-S026
REPORT DATE: May 2021
PROJECT DESCRIPTION: Proposed Residential Development
PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

LEGEND
TOPSOIL | SANDY SILT TILL | SILTY CLAY TILL | SHALE
WATER LEVEL (END OF DRILLING)



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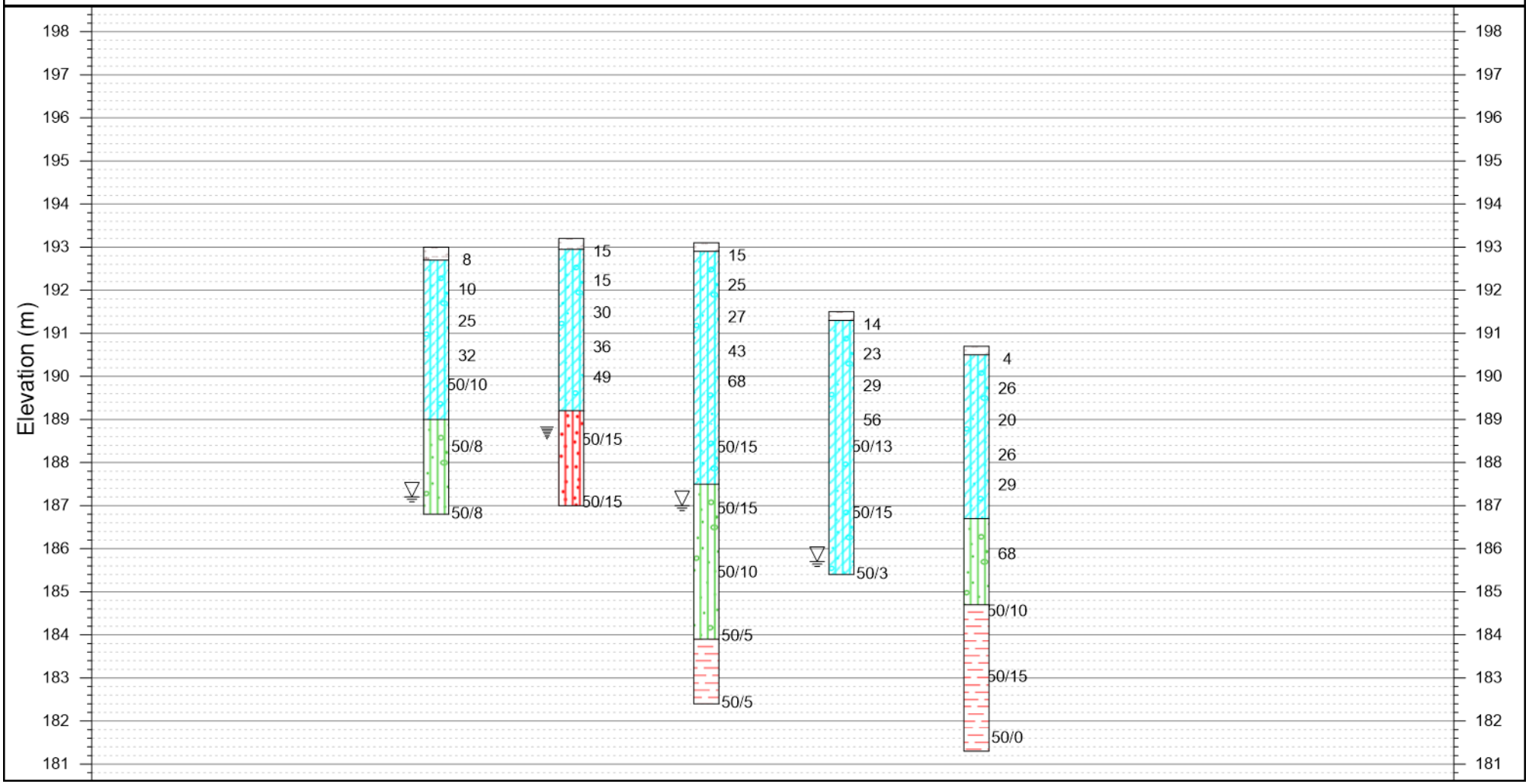
SUBSURFACE PROFILE
DRAWING NO. 5
SCALE: AS SHOWN
CROSS-SECTION D-D

JOB NO.: 2101-S026
REPORT DATE: May 2021
PROJECT DESCRIPTION: Proposed Residential Development
PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

LEGEND

TOPSOIL | SANDY SILT TILL | SILTY CLAY TILL | SHALE | SANDY SILT

WATER LEVEL (END OF DRILLING) CAVE-IN



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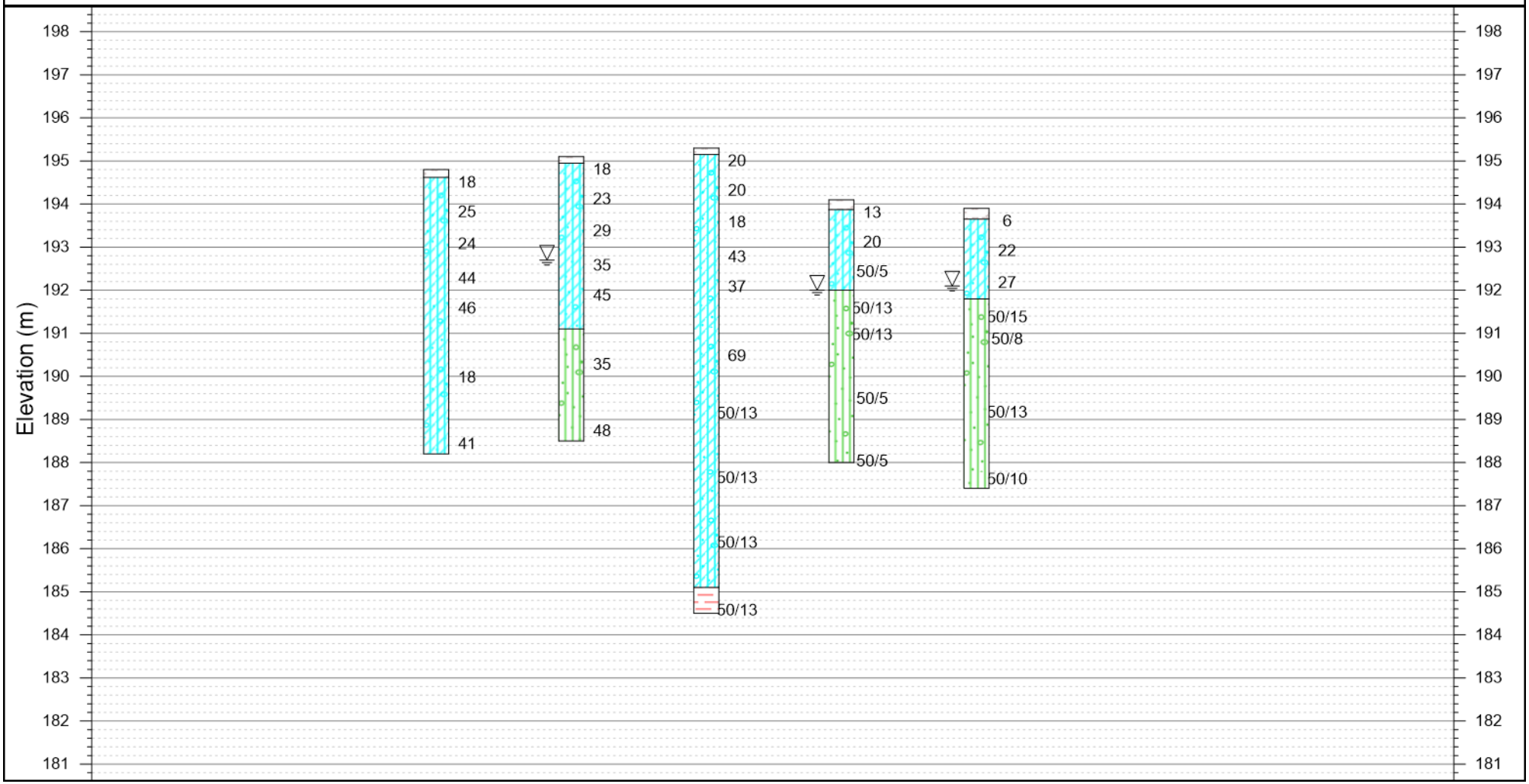
SUBSURFACE PROFILE
DRAWING NO. 6
SCALE: AS SHOWN
CROSS-SECTION E-E

JOB NO.: 2101-S026
REPORT DATE: May 2021
PROJECT DESCRIPTION: Proposed Residential Development
PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

LEGEND
TOPSOIL | SANDY SILT TILL | SILTY CLAY TILL | SHALE

▽ WATER LEVEL (END OF DRILLING)



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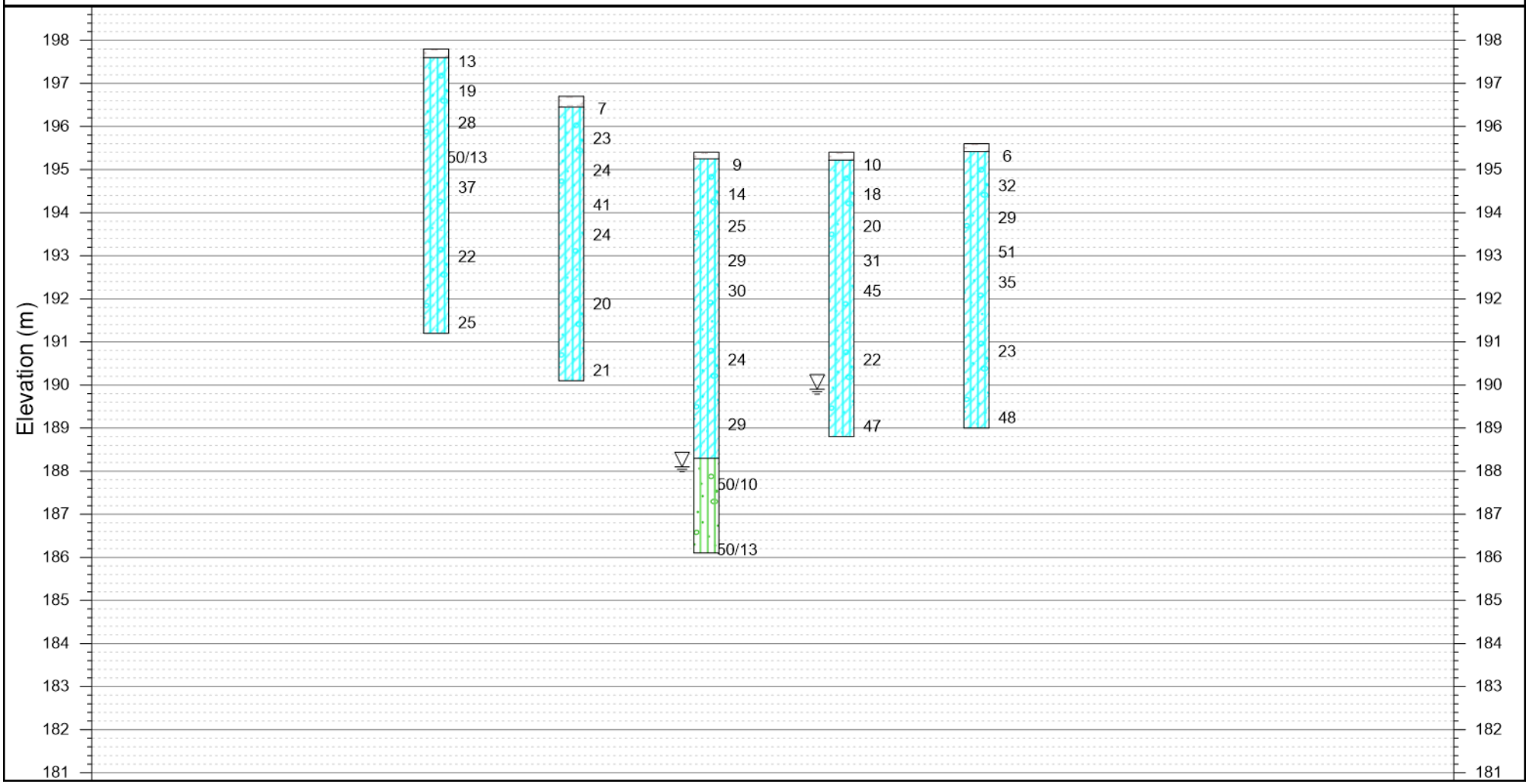
SUBSURFACE PROFILE
DRAWING NO. 7
SCALE: AS SHOWN
CROSS-SECTION F-F

JOB NO.: 2101-S026
REPORT DATE: May 2021
PROJECT DESCRIPTION: Proposed Residential Development
PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

LEGEND
TOPSOIL | SANDY SILT TILL | SILTY CLAY TILL
WATER LEVEL (END OF DRILLING)



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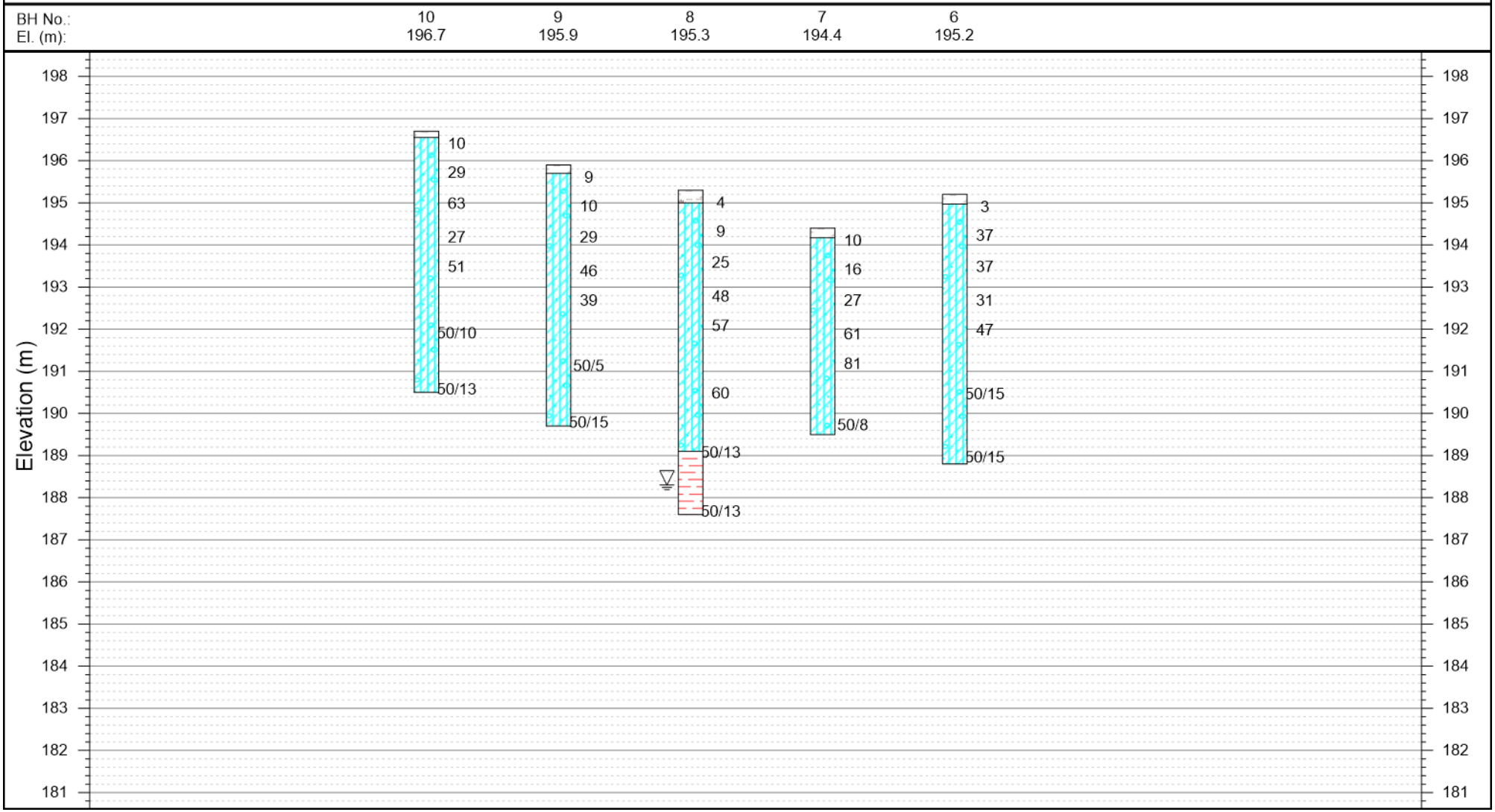
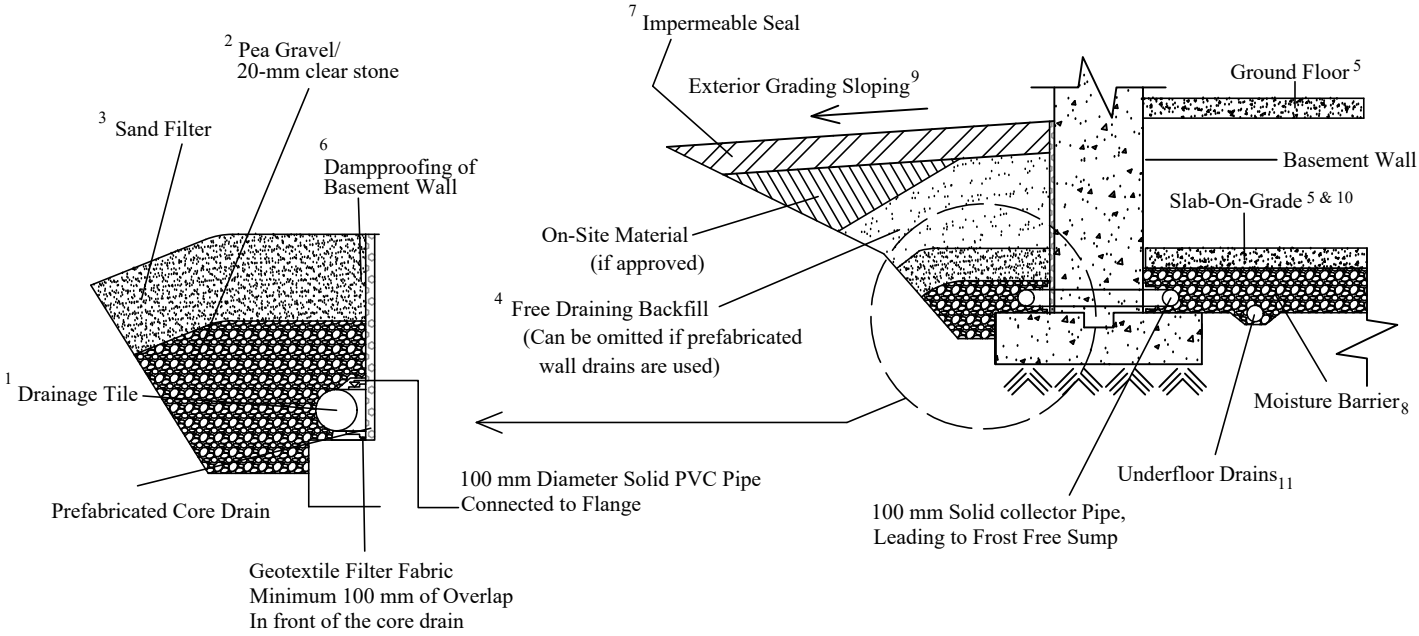
SUBSURFACE PROFILE
DRAWING NO. 8
SCALE: AS SHOWN
CROSS-SECTION G-G

JOB NO.: 2101-S026
REPORT DATE: May 2021
PROJECT DESCRIPTION: Proposed Residential Development
PROJECT LOCATION: Derry Road East, between Eighth Line and Trafalgar Road
Town of Milton

LEGEND
TOPSOIL | SILTY CLAY TILL | SHALE
WATER LEVEL (END OF DRILLING)





NOTES:

1. **Drainage tile**: consists of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
   Invert to be at minimum of 150 mm (6") below underside of basement floor slab.

2. **Pea gravel**: at 150 mm (6") on the top and sides of drain. If drain is not placed on concrete footing, provide 100 mm (4") of pea gravel below drain.
   The pea gravel may be replaced by 20 mm clear stone provided that the drain is covered by a porous geotextile membrane of Terrafix 270R or equivalent.

3. **Filter material**: consists of C.S.A. fine concrete aggregate. A minimum of 300 mm (12") on the top and sides of gravel.
   This may be replaced by an approved porous geotextile membrane of Terrafix 270R or equivalent.

4. **Free-draining backfill**: OPSS Granular 'B' or equivalent, compacted to 95% to 98% (maximum) Standard Proctor dry density.
   Do not compact closer than 1.8 m (6') from wall with heavy equipment.
   This may be replaced by on-site material if prefabricated wall drains (Miradrain) extending from the finished grade to the bottom of the basement wall are used.

5. **Do not backfill** until the wall is supported by the basement floor slab and ground floor framing, or adquate bracing.

6. **Dampproofing** of the basement wall is required before backfilling

7. **Impermeable backfill seal** of compacted clay, clayey silt or equivalent. If the original soil in the vicinity is a free-draining sand, the seal may be omitted.

8. **Moisture barrier**: 20-mm clear stone or compacted OPSS Granular 'A', or equivalent. The thickness of this layer should be 150 mm (6") minimum.

9. **Exterior Grade**: slope away from basement wall on all the sides of the building.

10. **Slab-On-Grade** should not be structurally connected to walls or foundations.

11. **Underfloor drains*** should be placed in parallel rows at 6 to 8 m (20'-25') centre, on 100 mm (4") of pea gravel with 150 mm (6") of pea gravel on top and sides. The invert should be at least 300 mm (12") below the underside of the floor slab.
    The drains should be connected to positive sumps or outlets. Do not connect the underfloor drains to the perimeter drains.

* Underfloor drains can be deleted where not required.

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Details of Perimeter Drainage System

SITE Derry Road East between Eighth Line and Trafalgar Road, Town of Milton			
DESIGNED BY K.L.	**CHECKED BY** B.S.	**DWG NO.** 9	
SCALE N.T.S.	**REF. NO.** 2101-S026	**DATE** May 2021	**REV** -