PATERSON GROUP

Geotechnical Investigation

Proposed Residential Development

2736 10th Line Road
Beckwith, Ontario

Prepared for 1384341 Ontario Ltd.

Report PG7307-1 Revision 3 dated October 15, 2025

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by 1384341 Ontario Ltd. to conduct a geotechnical investigation for the proposed residential development to be located at 2736 10th Line Road in the township of Beckwith, Ontario (refer to Figure 1 – Key Plan in Appendix 2 for the general site location).

The objectives of the geotechnical investigation were to:

- Determine the subsoil and groundwater conditions at this site by means of test pits.
- Provide geotechnical recommendations pertaining to the design of the proposed development including construction considerations which may affect the design.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and includes geotechnical recommendations pertaining to the design and construction of the subject development as they are understood at the time of writing this report.

Investigating for the presence or potential presence of contamination on the subject property was not part of the scope of the present investigation. Therefore, the present report does not address environmental issues.

2.0 Proposed Development

Based on the available drawings, it is understood that the proposed development will consist of low-rise, single unit dwellings with either one basement level or of slab-on-grade construction, with associated driveways and landscaped areas, as well as a local right-of-way (ROW).

It is further understood that the proposed development will be privately serviced by private groundwater supply wells and septic sewer systems.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the current geotechnical investigation was carried out on September 20, 2024, and consisted of advancing a total of 23 test pits to a maximum depth of 1.6 m below the existing ground surface. The test pit locations were distributed in a manner to provide general coverage of the proposed development, taking into consideration existing site features. The approximate locations of the test pits are shown on Drawing PG7307-1 – Test Hole Location Plan included in Appendix 2.

The test pits were excavated using an excavator and backfilled with the excavated soil upon completion. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer. The test pitting procedure consisted of excavating to the required depth at the selected locations, and sampling and testing the overburden.

Sampling and In-Situ Testing

Soil samples were recovered from the sidewalls of the test pits. All soil samples were visually inspected and classified on site. The soil samples were placed in sealed plastic bags and transported to our laboratory for further examination and classification. The depths at which the soil samples were recovered from the test pits are shown as G on the Soil Profile and Test Data sheets presented in Appendix 1.

The subsurface conditions observed in the test pits were recorded in detail in the field. The soil profiles are logged on the Soil Profile and Test Data Sheets in Appendix 1 of this report.

Groundwater

Where present, groundwater infiltration levels and soil color changes were recorded in all test pits prior to backfilling. The groundwater observations are further discussed in Section 4.3 and are presented in the Soil Profile and Test Data Sheets in Appendix 1.

3.2 Field Survey

The test pit locations, and the ground surface elevations at each test pit location, were surveyed by Paterson using a handheld GPS unit, and referenced to a geodetic datum. The test pit locations are presented on Drawing PG7307-1 – Test Hole Location Plan in Appendix 2.

3.3 Laboratory Review and Testing

Soil samples were collected during the excavation of the test pits, and visually examined in our laboratory to review the results of the field logging. A total of 3 grain size distribution and hydrometer tests were completed on selected soil samples from the field investigation. The results of the laboratory testing are presented in Subsection 4.3 and on the Grain Size Distribution and Hydrometer Test Results sheets presented in Appendix 1.

3.4 Analytical Testing

One (1) soil sample was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. The sample was tested to determine the concentration of sulphate and chloride, the resistivity and the pH of the sample. The results are presented in Appendix 1 and are discussed further in Section 6.7.

4.0 Observations

4.1 Surface Conditions

Prior to the geotechnical field program, the subject site consisted of vacant, undeveloped land covered in mature vegetation. At the time of the geotechnical field program, tree clearing had been conducted throughout a portion of the site and an access road was constructed bisecting site in a northwest-southeast orientation to provide access to the excavator. The remainder of the site remains undeveloped and vegetated. A local wetland is present in the centre of the site on the south side of the access road.

The subject site is bordered to the northwest by Lake Park Road, to the northeast by a residential subdivision, to the southeast by Tenth Line Road and to the southwest by a residential subdivision and undeveloped, vacant land. The site is generally flat with local undulations and a gradual downward slope from northeast to southwest from an approximate geodetic elevation of 145 to 140 m.

4.2 Subsurface Profile

Overburden

Generally, the subsurface profile at the subject site consists of topsoil underlain by silty sand and/or glacial till followed by bedrock, or topsoil directly underlain by bedrock.

The silty sand consists of compact to dense, brown to light brown, medium to fine-grained silty sand with gravel. The glacial till consists of compact to very dense, brown to light brown, fine silty sand to sandy silt with gravel, trace to some clay and occasional cobbles and boulders.

Bedrock

Practical refusal to excavation on the bedrock surface was encountered in all test pits at approximate depths ranging from 0.1 to 1.6 m below the existing ground surface.

Based on available geological mapping, the subject site straddles a bedrock formation contact between interbedded dolomite and sandstone of the March Formation within the northwest and dolomite of the Oxford Formation in the southeast, with an approximate drift thickness between 0 and 3 m.

Reference should be made to the Soil Profile and Test Data sheets presented in Appendix 1 for details of the soil profiles encountered at each test pit location. Photographs of the completed test pits are also provided in Appendix 1.

Grain Size Distribution and Hydrometer Testing

Table 1 – Summary of Grain Size Distribution and Hydrometer Testing Results

Test Hole	Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
TP 5-24	0.5-0.6	8.7	38.8	42.4	10.1
TP 8-24	0.5-0.6	63.5	3.0	30.5	3.0
TP 14-24	0.7-0.8	23.3	39.5	31.9	5.2

4.3 Groundwater

All test pits were noted to be dry upon completion with no groundwater infiltration into the sidewalls of the test pits, with the exception of test pit TP11-24, in which groundwater infiltration was observed within the test pit sidewalls at a depth of 1.10 m below the existing ground surface.

Long-term groundwater levels can also be estimated based on the observed colour, moisture content and consistency of the recovered soil samples. Based on these observations, the long-term groundwater table is expected to be located within the bedrock.

It should be noted that groundwater levels are subject to seasonal fluctuations, therefore, the groundwater levels could vary at the time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed development. It is anticipated that the proposed residential dwellings will be founded on conventional spread footings placed on a glacial till or clean, surface-sounded bedrock bearing surface, or on lean concrete, which is placed directly over the clean, surface sounded bedrock.

It is anticipated that bedrock removal, and the removal of large boulders may be required for building construction and servicing installation. Therefore, all contractors should be prepared for the removal of bedrock and large boulders within the subject site.

Due to the absence of a silty clay deposit, the subject site will not be subjected to a grade raise restriction.

The above and other considerations are further discussed in the following sections.

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and deleterious fill, such as those containing organic or deleterious materials, should be stripped from under the proposed building and other settlement sensitive structures.

Bedrock Removal

Bedrock removal can be accomplished by hoe ramming where the bedrock is weathered and/or where only small quantities of the bedrock need to be removed. Sound bedrock may be removed by line drilling in conjunction with controlled blasting and/or hoe ramming.

Prior to considering blasting operations, the blasting effects on the existing services, buildings, and other structures should be addressed. A pre-blast or pre-construction survey of the existing structures located in the proximity of the blasting operations should be carried out prior to commencing site activities. The extent of the survey should be determined by the blasting consultant and should be sufficient to respond to any inquiries or claims related to the blasting operations.

The blasting operations must be planned and conducted under the supervision of a licensed professional engineer who is also an experienced blasting consultant.

Vibration Considerations

Construction operations are also the cause of vibrations, and possibly, sources of nuisance to the community. Therefore, means to reduce the vibration levels should be incorporated in the construction operations to maintain, as much as possible, a cooperative environment with the residents.

The following construction equipment could be a source of vibrations: piling rig, hoe ram, compactor, dozer, crane, truck traffic, etc. Vibrations, whether caused by blasting operations or by construction operations, could be the cause of the source of detrimental vibrations on the nearby buildings and structures. Therefore, it is recommended that all vibrations be limited.

Two parameters are used to determine the permissible vibrations, namely, the maximum peak particle velocity and the frequency. For low frequency vibrations, the maximum allowable peak particle velocity is less than that for high frequency vibrations. As a guideline, the peak particle velocity should be less than 15 mm/s between frequencies of 4 to 12 Hz, and 50 mm/s above a frequency of 40 Hz (interpolate between 12 and 40 Hz).

It should be noted that these guidelines are for today's construction standards. Considering that these guidelines are above perceptible human level and, in some cases, could be very disturbing to some people, it is recommended that a pre-construction survey be completed to minimize the risks of claims during or following the construction of the proposed buildings.

Fill Placement

Engineered fill used for grading beneath the proposed building should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. This material should be tested and approved prior to delivery. The fill should be placed in maximum 300 mm thick loose lifts and compacted by suitable compaction equipment. Fill placed beneath the propose building should be compacted to a minimum 98% of the Standard Proctor Maximum Dry Density (SPMDD).

Non-specified existing fill, along with site-excavated soil, can be used as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids.

If this material is to be used to build up the subgrade level for areas to be paved, it should be compacted in thin lifts to at least 98% of the material's SPMDD.

If excavated rock is to be used as fill, it should be suitably fragmented to produce a well-graded material with a maximum particle size of 300 mm. Where this fill material is open-graded, a woven geotextile may be required to prevent adjacent finer materials from migrating into the voids, with associated loss of ground and settlements. Site-generated blast rock fill should be compacted using a suitably sized smooth drum vibratory roller when considered for placement. This can be assessed at the time of construction.

Under winter conditions, if snow and ice is present within the blast rock fill below future basement slabs, then settlement of the fill should be expected and support of a future basement slab and/or temporary supports for slab pours will be negatively impacted and could undergo settlement during spring and summer time conditions. The geotechnical consultant should complete periodic inspections during fill placement to ensure that snow and ice quantities are minimized.

5.3 Foundation Design

Bearing Resistance Values

Footings placed on a compact to very dense, undisturbed glacial till can be designed using a bearing resistance value of **200 kPa** at serviceability limit states (SLS) and a factored bering resistance value of **300 kPa** at ultimate limit states (ULS). A geotechnical resistance factor of 0.5 was applied to bearing resistance value at ULS.

An undisturbed soil bearing surface consists of one which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

Footings supported directly on clean, surface-sounded bedrock, or on lean concrete in-filled trenches, which are placed directly over the clean surface-sounded bedrock, can be designed using a factored bearing resistance value at ultimate limit states (ULS) of **1,500 kPa**. A geotechnical resistance factor of 0.5 was applied to the bearing resistance value at ULS.

A clean, surface-sounded bedrock bearing surface should be free of loose materials, and have no near surface seams, voids, fissures or open joints which can be detected from surface sounding with a rock hammer.

Lean Concrete Filled Trenches

Where bedrock is encountered below the design underside of footing (USF) elevation, lean concrete (minimum **17 MPa** 28-day compressive strength) can be used to raise the subgrade from the clean, surface sounded bedrock up to the USF elevation. Typically, the excavation side walls will be used as the form to support the concrete. The additional width of the concrete poured will suffice in providing a direct transfer of the footing load to the underlying clean, surface sounded bedrock.

The effectiveness of this operation will depend on the ability of maintaining vertical trenches until the lean concrete can be poured. It is suggested that once the bottom of the excavation is exposed, an assessment by Paterson personnel should be completed to determine the water infiltration and stability of the excavation sidewalls extending to the bedrock surface.

The trench excavation should be at least 300 mm wider than all sides of the footing at the base of the excavation. The excavation bottom should be relatively clean using the hydraulic shovel only (workers will not be permitted in the excavation below a 1.5 m depth). Once approved by the geotechnical engineer, lean concrete can be poured up to the proposed founding elevation.

Settlement

Footings placed on a soil bearing surface and designed using the bearing resistance values at SLS given for the soil bearing surface will be subjected to potential post construction total and differential settlements of 25 and 20 mm, respectively.

Footings supported directly on clean, surface sounded bedrock and design for the bearing resistance values provided above will be subject to negligible post-construction total and differential settlements.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels.

Adequate lateral support is provided to a stiff silty clay above the groundwater table when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in situ soil of the same or higher capacity as the bearing medium soil.

Adequate lateral support is provided to a sound bedrock bearing medium when a plane extending down and out from the bottom edge of the footing at 1H:6V (or flatter) passes only through sound bedrock or a material of the same or higher capacity as the bedrock, such as concrete. Weathered bedrock will require a lateral support zone of 1H:1V (or flatter).

Bedrock/Soil Transition

Where a building is founded partly on bedrock and partly on soil, it is recommended to decrease the soil bearing resistance value by 25% for the footings placed on soil bearing media to reduce the potential long-term total and differential settlements.

Also, at the soil/bedrock and bedrock/soil transitions, it is recommended that the upper 0.5 m of the bedrock be removed for a minimum length of 2 m (on the bedrock side) and replaced with nominally compacted OPSS Granular A or Granular B Type II material. The width of the sub-excavation should be at least the proposed footing width plus 0.5 m.

Steel reinforcement, extending at least 3 m on both sides of the 2 m long transition, should be placed in the top part of the footings and foundation walls.

5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Class C**. A higher seismic site class (such as Class A or B), may be achievable. However, a site-specific shear wave velocity test is required to accurately determine the applicable seismic site classification for foundation design of the proposed building, as defined in Table 4.1.8.4.A of the Ontario Building Code (OBC) 2024. If required, Paterson can conduct the site-specific shear wave velocity test.

Soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest version of the OBC 2024 for a full discussion of the earthquake design requirements.

5.5 Basement Slab/Slab on Grade Construction

With the removal of all topsoil and deleterious materials within the footprint of the proposed building additions, the native soil surface, free of organics, or approved engineered fill surface will be considered an acceptable subgrade on which to commence backfilling for floor slab construction.

Where existing fill or native soil containing significant organic content, is encountered below the floor slab, provisions should be made to remove the material from within the building footprint and replace the fill with OPSS Granular A or Granular B Type II compacted to a minimum 98% of the material's SPMDD. It is recommended that the upper 200 mm for basement slabs and 300 mm for slab-on grade of sub-floor fill consists of 19 mm clear crushed stone.

It is also acceptable to use workable, site excavated soil material, free of deleterious materials and organics, below the floor slab and outside the lateral support zone of the proposed footings provided the material is placed under dry conditions and above freezing temperatures, reviewed and approved by Paterson prior to placement. The backfill should be compacted using a vibratory roller making several passes under the full supervision of Paterson field personnel. A minimum 300 mm thick cap layer of OPSS Granular A or Granular B Type II should be placed over the backfill material and compacted to a minimum 98% of the material's SPMDD.

All backfill material within the footprint of the proposed building should be placed in maximum 300 mm thick loose layers and compacted to a minimum of 98% of the SPMDD.

5.6 Pavement Design

For design purposes, the pavement structure presented in the following tables could be used for the design of flexible pavement structures for at-grade parking areas, local roadways and access lanes, and local roadways with bus traffic.

Table 2 – Recommended Asphalt Pavement Structure – Car-Only Parking Areas

Thickness (mm)	Material Description
50	**Wear Course** – Superpave 12.5 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
300	**SUBBASE** – OPSS Granular B Type II
SUBGRADE – In situ soil or bedrock, or OPSS Granular B Type I or II material placed over in situ soil or bedrock.	

Table 3 – Recommended Asphalt Pavement Structure – Heavy-Duty Parking Areas, Local Roadways and Access Lanes	
Thickness (mm)	**Material Description**
40	**Wear Course** – Superpave 12.5 Asphaltic Concrete
50	**Binder Course** – Superpave 19.0 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
300	**SUBBASE** – OPSS Granular B Type II
SUBGRADE – In situ soil or bedrock, or OPSS Granular B Type I or II material placed over in situ soil or bedrock.	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material.

Weak subgrade conditions may be experienced over service trench fill materials. This may require the use of a woven geotextile, such as Terratrack 200 or equivalent, thicker subbase or other measures that can be recommended at the time of construction as part of the field observation program.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's SPMDD using suitable compaction equipment.

Pavement Structure Drainage

Satisfactory performance of the pavement structure is largely dependent on maintaining the contact zone between the subgrade material and the base stone in a dry condition. Failure to provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing load carrying capacity.

6.0 Design and Construction Precautions

6.1 Foundation Drainage & Waterproofing

Foundation Drainage

Perimeter foundation drainage systems are recommended for the proposed buildings. The systems should consist of a 150 mm diameter perforated and corrugated plastic pipe, surrounded on all sides by 150 mm of 19 mm clear crushed stone, which is placed at the footing level around the exterior perimeter of the structure. The pipe should have positive outlet, such as a gravity connection to the storm sewer.

Underslab Drainage (Slab-on-Grade)

For slab-on-grade products, underslab drainage is recommended to control water infiltration below the floor slab. For preliminary design purposes, it is recommended that 150 mm perforated pipes be placed at approximate 6 m centres underlying the floor slab. The requirement and spacing of the underslab drainage system should be confirmed by the geotechnical consultant at the time of completing the excavation when water infiltration can be better assessed.

Foundation Backfill

Backfill against the exterior sides of the foundation walls should consist of free draining, non frost susceptible granular materials. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls, unless used in conjunction with a drainage geocomposite board, such as Delta Drain 6000, connected to the perimeter foundation drainage system. Imported granular materials, such as clean sand or OPSS Granular B Type II granular material, should otherwise be used for this purpose.

Sidewalks and Walkway Backfill

Backfill material below sidewalk and walkway subgrade areas, or other settlement sensitive surfaces, should consist of free draining, non-frost susceptible material placed in maximum 300 mm thick loose lifts and compacted to at least 98% of its SPMDD under dry and above-freezing conditions.

6.2 Protection of Footings Against Frost Action

Perimeter foundations of heated structures are required to be insulated against the deleterious effects of frost action. A minimum 1.5 m thick soil cover, or an equivalent thickness of soil cover and foundation insulation, should be provided in this regard.

Exterior unheated foundations, such as isolated piers, are more prone to deleterious movement associated with frost action than the exterior walls of the structure, and require additional protection, such as soil cover of 2.1 m, or an equivalent combination of soil cover and foundation insulation.

However, foundations which are founded directly on clean, surface-sounded bedrock with no cracks or fissures, and **reviewed and approved by Paterson at the time of construction**, are not considered frost susceptible and do not require soil cover.

Where the bedrock is deemed to be frost susceptible by Paterson's field personnel, foundation insulation will need to be provided or the frost susceptible bedrock will need to be removed and replaced with lean concrete (minimum 17 MPa 28-day strength).

6.3 Excavation Side Slopes

The side slopes of excavations in the overburden materials should either be cut back at acceptable slopes or should be retained by shoring systems from the start of the excavation until the structure is backfilled. For the proposed development, it is anticipated that sufficient room will be available for the greater pat of the excavation to be undertaken by open-cut methods (i.e. unsupported excavations).

Overburden

The excavation side slopes in the overburden soils, above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. A flatter slope is required for excavation below groundwater level, such as 3H:1V. The subsurface soil at this site is considered to be mainly Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box is used to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by "cut and cover" methods and excavations will not be left open for extended periods of time.

Bedrock

Excavation side slopes in sound bedrock can be carried out using almost vertical side walls. A minimum 1 m horizontal ledge should be left between the bottom of the overburden excavation and the top of the bedrock surface to provide an area to allow for potential sloughing or to provide a stable base for the overburden shoring system. Where sufficient space for the horizontal ledge is not available, it is recommended that concrete blocks be used to retain the overburden soils.

6.4 Pipe Bedding and Backfill

A minimum 150 mm of OPSS Granular A should be placed for bedding for sewer or water pipes when placed on a soil subgrade. When placed on a bedrock subgrade, the bedding thickness should be increased to 300 mm. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to a minimum of 300 mm above the obvert of the pipe, should consist of OPSS Granular A (concrete or PSM PVC pipes) or sand (concrete pipe). The bedding and cover materials should be placed in maximum 225 mm thick lifts and compacted to a minimum of 99% of its SPMDD.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) and above the cover material should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD.

It should generally be possible to re-use the site generated fill materials (moist, not wet) above the cover material if excavation and filling operations are carried out in dry and non-freezing weather conditions. All cobbles larger than 200 mm in their longest direction should be segregated from re-use as trench backfill.

6.5 Groundwater Control

It is anticipated that groundwater infiltration into the excavation should be low to moderate and controllable using open sumps. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

Permit to Take Water

A temporary Ministry of Environment, Conservation and Parks (MECP) permit to take water (PTTW) may be required if more than 400,000 L/day of ground and/or surface water are to be pumped during the construction phase. At least 4 to 5 months should be allowed for completion of the application and issuance of the permit by the MECP.

For typical ground or surface water volumes being pumped during the construction phase, typically between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Persons as stipulated under O.Reg. 63/16.

Impacts to Neighbouring Properties

Given the shallow bedrock present within the subject site and the distance to the neighbouring structures, no issues are expected with respect to groundwater lowering that would cause adverse impacts to adjacent structures surrounding the proposed development.

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project. The subsoil conditions at this site consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures using straw, propane heaters and tarpaulins or other suitable means. In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

Trench excavations and pavement construction are also difficult activities to complete during freezing conditions without introducing frost into the subgrade or in the excavation walls and bottoms. Precautions should be taken if such activities are to be carried out during freezing conditions. Additional information could be provided, if required.

6.7 Corrosion Potential and Sulphate

The results of analytical testing show that the sulphate content is less than 0.1%. This result is indicative that Type 10 Portland cement (normal cement) would be appropriate for this site. The chloride content and the pH of the sample indicate that they are not significant factors in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity is indicative of a non-aggressive corrosive environment above the groundwater table and slightly aggressive corrosive environment below the groundwater table.

7.0 Recommendations

It is a requirement for the foundation design data provided herein to be applicable that a material testing and observation program be performed by the geotechnical consultant. The following aspects of the program should be performed by Paterson:

- ❑ Review and inspection of the installation of the foundation drainage systems.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❑ Observation of all subgrades prior to backfilling.
- ❑ Field density tests to determine the level of compaction achieved.
- ❑ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued upon the completion of a satisfactory inspection program by the geotechnical consultant.

All excess soil must be handled as per ***Ontario Regulation 406/19: On-Site and Excess Soil Management*.**

8.0 Statement of Limitations

The recommendations provided are in accordance with the present understanding of the project. Paterson requests permission to review the recommendations when the drawings and specifications are completed.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests immediate notification to permit reassessment of our recommendations.

The recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work. The latter should evaluate the factual information provided in this report and determine the suitability and completeness for their intended construction schedule and methods. Additional testing may be required for their purposes.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than 1384341 Ontario Ltd., or their agents, is not authorized without review by Paterson for the applicability of our recommendations to the alternative use of the report.

Paterson Group Inc.

Owen R. Canton, B.Eng. Faisal I. Abou-Seido, P.Eng.

Report Distribution:

- ❑ Thomas Cavanagh Construction Ltd. (email copy)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

GRAIN SIZE DISTRIBUTION AND HYDROMETER TEST RESULTS

ANALYTICAL TESTING RESULTS

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 410582.21 **NORTHING:** 4995284.21 **ELEVATION:** 145.04

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP 1-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics		0							145
0.25m [144.79m]									
GLACIAL TILL: Compact to dense, brown silty sand, with gravel, trace clay, occasional cobbles			G 1						
0.80m [144.24m]									
End of test pit		1							144
Practical refusal on bedrock surface at 0.80 m depth									
(Test pit dry upon completion)		2							143
		3							142
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 410523.97 **NORTHING:** 4995330.17 **ELEVATION:** 145.67

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP 2-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							145
TOPSOIL and organics 0.28m [145.39m]			G 1						
GLACIAL TILL: Compact to dense, brown silty sand, with gravel, trace clay, occasional cobbles and boulders 0.70m [144.97m]			G 2						
End of test pit Practical refusal on bedrock surface at 0.70 m depth (Test pit dry upon completion)		1							144
		2							143
		3							142
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 410491.75 **NORTHING:** 4995385.64 **ELEVATION:** 144.16

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP 3-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							144
TOPSOIL and organics									
0.46m [143.70m]									
Compact, brown **SILTY** medium **SAND**, with gravel			G 1						
0.70m [143.46m]									
GLACIAL TILL: Compact to dense, light brown silty fine sand to sandy silt, with gravel, some clay, occasional cobbles and boulders		1	G 2						143
1.54m [142.62m]									
End of test pit									
Practical refusal on bedrock surface at 1.54 m depth		2							142
(Test pit dry upon completion)									
		3							141
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 410441.92 **NORTHING:** 4995435.88 **ELEVATION:** 144.29

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP 4-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.27m [144.02m]		0							144
End of test pit Practical refusal on bedrock surface at 0.27 m depth (Test pit dry upon completion)		1							143
		2							142
		3							141
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 410392.68 **NORTHING:** 4995471.75 **ELEVATION:** 144.04

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP 5-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics		0							144
0.27m [143.77m]									
GLACIAL TILL: Dense, light brown silty sand to sandy silt, with gravel, some clay			G 1						
		1	G 2						143
1.30m [142.74m]									
End of test pit									
Practical refusal on bedrock surface at 1.30 m depth		2							142
(Test pit moist upon completion)									
		3							141
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 410397.97 **NORTHING:** 4995535.49 **ELEVATION:** 143.67

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP 6-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / ∆ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							143
TOPSOIL and organics									
0.34m [143.33m]									
GLACIAL TILL: Compact to dense, light brown silty fine sand to sandy silt, with gravel, occasional cobbles and boulders			G 1						
0.60m [143.07m]									
End of test pit		1							142
Practical refusal on bedrock surface at 0.60 m depth									
(Test pit dry upon completion)		2							141
		3							140
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 410362.47 **NORTHING:** 4995573.11 **ELEVATION:** 143.66

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP 7-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics		0							
0.37m [143.29m]									
GLACIAL TILL: Dense, light brown silty fine sand, with gravel, occasional cobbles and boulders			G 1						143
0.80m [142.86m]									
End of test pit		1							142
Practical refusal on bedrock surface at 0.80 m depth		2							141
(Test pit dry upon completion)		3							140
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 410324.87 **NORTHING:** 4995712.16 **ELEVATION:** 142.70

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP 8-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / ∆ REMOULDED SHEAR STRENGTH, Cur (kPa) / ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics		0							
0.40m [142.30m]									
GLACIAL TILL: Compact to dense, light brown silty fine sand to sandy silt, with gravel			G 1						142
0.80m [141.90m]									
End of test pit		1							141
Practical refusal on bedrock surface at 0.80 m depth		2							140
(Test pit dry upon completion)		3							139
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 410218.72 **NORTHING:** 4995586.93 **ELEVATION:** 144.13

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP 9-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							144
TOPSOIL and organics 0.25m [143.88m]									
GLACIAL TILL: Compact to dense, brown silty fine sand, with gravel, trace clay, occasional cobble sand boulders 0.60m [143.53m]			G 1						
End of test pit Practical refusal on bedrock surface at 0.60 m depth (Test pit dry upon completion)		1							143
		2							142
		3							141
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 410211.06 **NORTHING:** 4995690.06 **ELEVATION:** 141.77

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP10-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							141
TOPSOIL and organics 0.40m [141.37m]									
Compact, brown **SILTY SAND**, with gravel 0.70m [141.07m]			G 1						
GLACIAL TILL: Compact to very dense, brown silty sand to sandy silt, with gravel, trace clay, occasional cobbles and boulders 1.60m [140.17m]		1	G 2						140
End of test pit Practical refusal on bedrock surface at 1.60 m depth (Test pit dry upon completion)		2							139
		3							138
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 410169.24 **NORTHING:** 4995815.21 **ELEVATION:** 140.21

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP11-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.24m [139.97m]		0							140
Compact, brown **SILTY SAND**, with gravel 0.70m [139.51m]			G 1						
GLACIAL TILL: Compact to dense, light brown silty fine sand to sandy silt, with gravel, some clay occasional cobbles 1.20m [139.01m]		1	G 2						139
End of test pit Practical refusal on bedrock surface at 1.20 m depth (Groundwater infiltration was observed at 1.10 m depth)		2							138
		3							137
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 410088.38 **NORTHING:** 4995889.34 **ELEVATION:** 140.13

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP12-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics		0							140
0.29m [139.84m]									
End of test pit									
Practical refusal on bedrock surface at 0.29 m depth		1							139
(Test pit dry upon completion)		2							138
		3							137
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 409970.04 **NORTHING:** 4995867.34 **ELEVATION:** 141.88

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP13-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.27m [141.61m]		0							141
End of test pit Practical refusal on bedrock surface at 0.27 m depth (Test pit dry upon completion)		1 2 3 4							140 139 138

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 409996.07 **NORTHING:** 4995979.67 **ELEVATION:** 140.62

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP14-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / ∆ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							140
TOPSOIL and organics 0.35m [140.27m]									
GLACIAL TILL: Light brown, silty sand to sandy silt, with gravel, occasional cobbles 1.00m [139.62m]		1	G 1						139
End of test pit Practical refusal on bedrock surface at 1.00 m depth (Test pit dry upon completion)		2							138
		3							137
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 409940.11 **NORTHING:** 4996019.75 **ELEVATION:** 140.59

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP15-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.35m [140.24m]		0							140
End of test pit Practical refusal on bedrock surface at 0.35 m depth (Test pit dry upon completion)		1 2 3 4							139 138 137

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 409945.67 **NORTHING:** 4996070.18 **ELEVATION:** 140.62

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP16-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE: TYPE AND NO.	SAMPLE: RECOVERY (%)	SAMPLE: N, Nc OR RQD	SAMPLE: WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.19m [140.43m]		0							140
End of test pit Practical refusal on bedrock surface at 0.19 m depth (Test pit dry upon completion)		1 2 3 4							139 138 137

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 409902.22 **NORTHING:** 4996152.46 **ELEVATION:** 140.38

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP17-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							140
TOPSOIL and organics 0.30m [140.08m]									
End of test pit Practical refusal on bedrock surface at 0.30 m depth (Test pit dry upon completion)		1							139
		2							138
		3							137
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 409939.69 **NORTHING:** 4996195.01 **ELEVATION:** 140.49

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP18-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics		0							140
0.38m [140.11m]									
GLACIAL TILL: Compact to dense, brown silty fine sand, with gravel, occasional cobbles		1	G 1						139
			G 2						
1.30m [139.19m]									
End of test pit Practical refusal on bedrock surface at 1.30 m depth (Test pit dry upon completion)		2							138
		3							137
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 409773.93 **NORTHING:** 4996222.38 **ELEVATION:** 142.03

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP19-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80	REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80	PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE											
TOPSOIL and organics 0.08m [141.95m]		0									142
End of test pit											
Practical refusal on bedrock surface at 0.08 m depth		1									141
(Test pit dry upon completion)		2									140
		3									139
		4									

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 409698.78 **NORTHING:** 4996170.94 **ELEVATION:** 141.99

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP20-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.21m [141.78m]		0							
End of test pit Practical refusal on bedrock surface at 0.21 m depth (Test pit dry upon completion)		1							141
		2							140
		3							139
		4							138

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 409720.70 **NORTHING:** 4996300.35 **ELEVATION:** 140.19

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP21-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics		0							140
0.27m [139.92m]									
Compact, brown **SILTY** fine **SAND**, with gravel			G 1						
0.51m [139.68m]									
End of test pit		1							139
Practical refusal on bedrock surface at 0.51 m depth									
(Test pit dry upon completion)		2							138
		3							137
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 409762.86 **NORTHING:** 4996350.81 **ELEVATION:** 140.03

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP22-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.28m [139.75m]		0							140
End of test pit Practical refusal on bedrock surface at 0.28 m depth (Test pit dry upon completion)		1							139
		2							138
		3							137
		4							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

10th Line Road Subdivision, Beckwith Township

COORD. SYS.: UTM ZONE 18N **EASTING:** 409675.70 **NORTHING:** 4996330.34 **ELEVATION:** 139.22

PROJECT: Proposed Subdivision Development

BORINGS BY: Backhoe / Excavator

REMARKS:

DATE: September 20, 2024

FILE NO. : PG7307

HOLE NO. : TP23-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N, Nc OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE		0							139
TOPSOIL and organics 0.40m [138.81m]									
Compact to dense, light brown **SILTY SAND** to **SANDY SILT**, with gravel			G 1						
1.10m [138.12m]		1							138
End of test pit Practical refusal on bedrock surface at 1.10 m depth (Test pit dry upon completion)		2							137
		3							136
		4							

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
Dxx	-	Grain size which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2 / (D10 \times D60)$
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

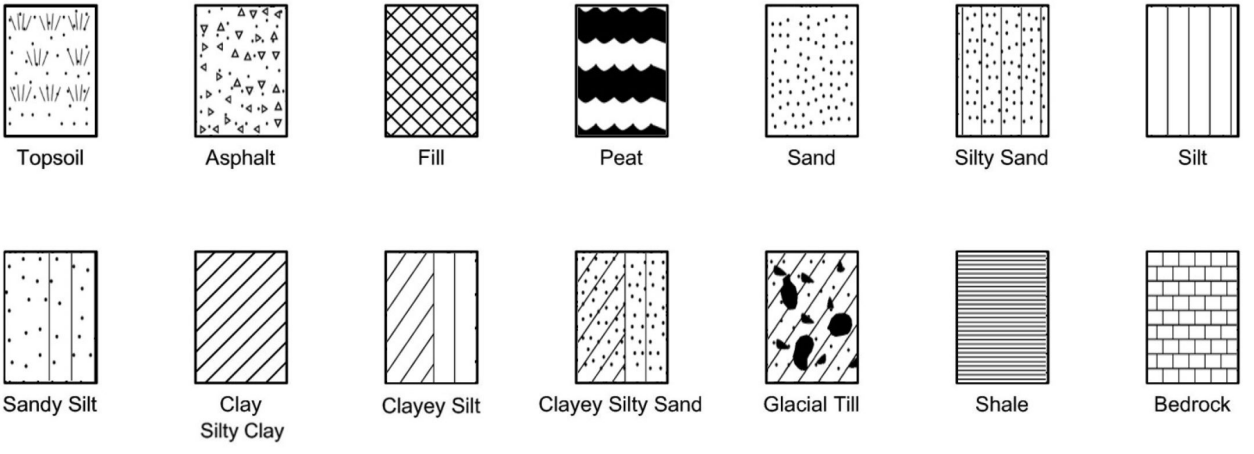
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

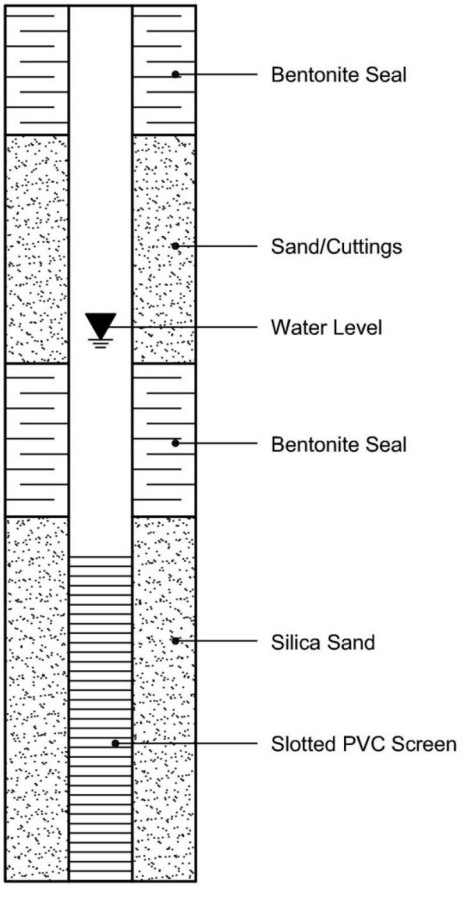
SYMBOLS AND TERMS (continued)

STRATA PLOT

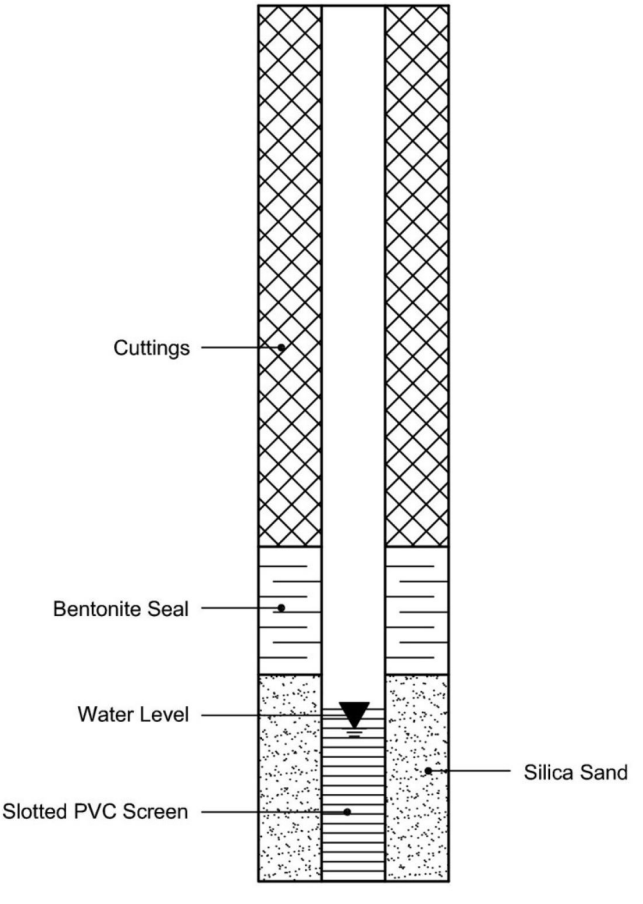


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



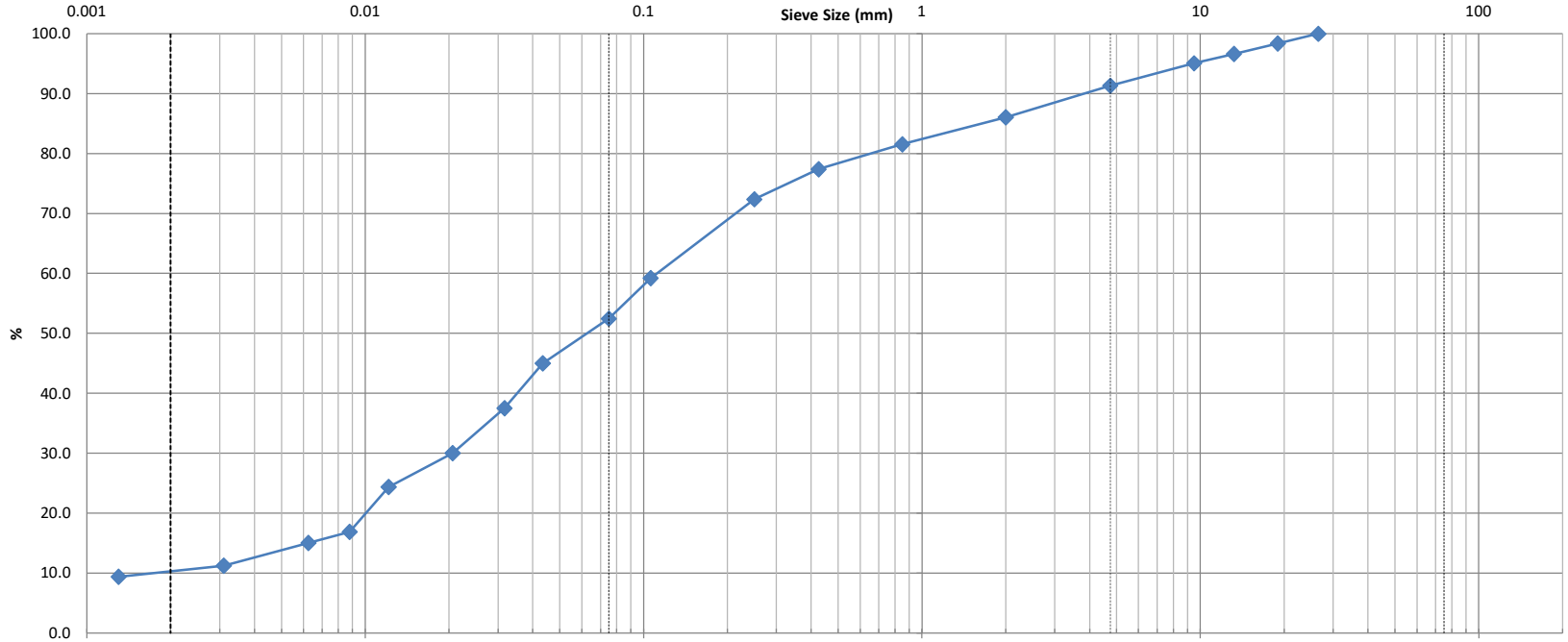
PIEZOMETER CONSTRUCTION



PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Cavanagh Developments	DEPTH:	0.5 - 0.6	FILE NO:	PG7307/PH4717
CONTRACT NO.:		BH OR TP No.:	TP5-24 G1	LAB NO:	57059
PROJECT:	2870 10th Line Road, Beckwith, ON			DATE RECEIVED:	2-Oct-24
				DATE TESTED:	3-Oct-24
DATE SAMPLED:	19-Sep-24			DATE REPORTED:	17-Oct-24
SAMPLED BY:	Deepak			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						12.6%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					8.7	38.8		42.4		10.1	

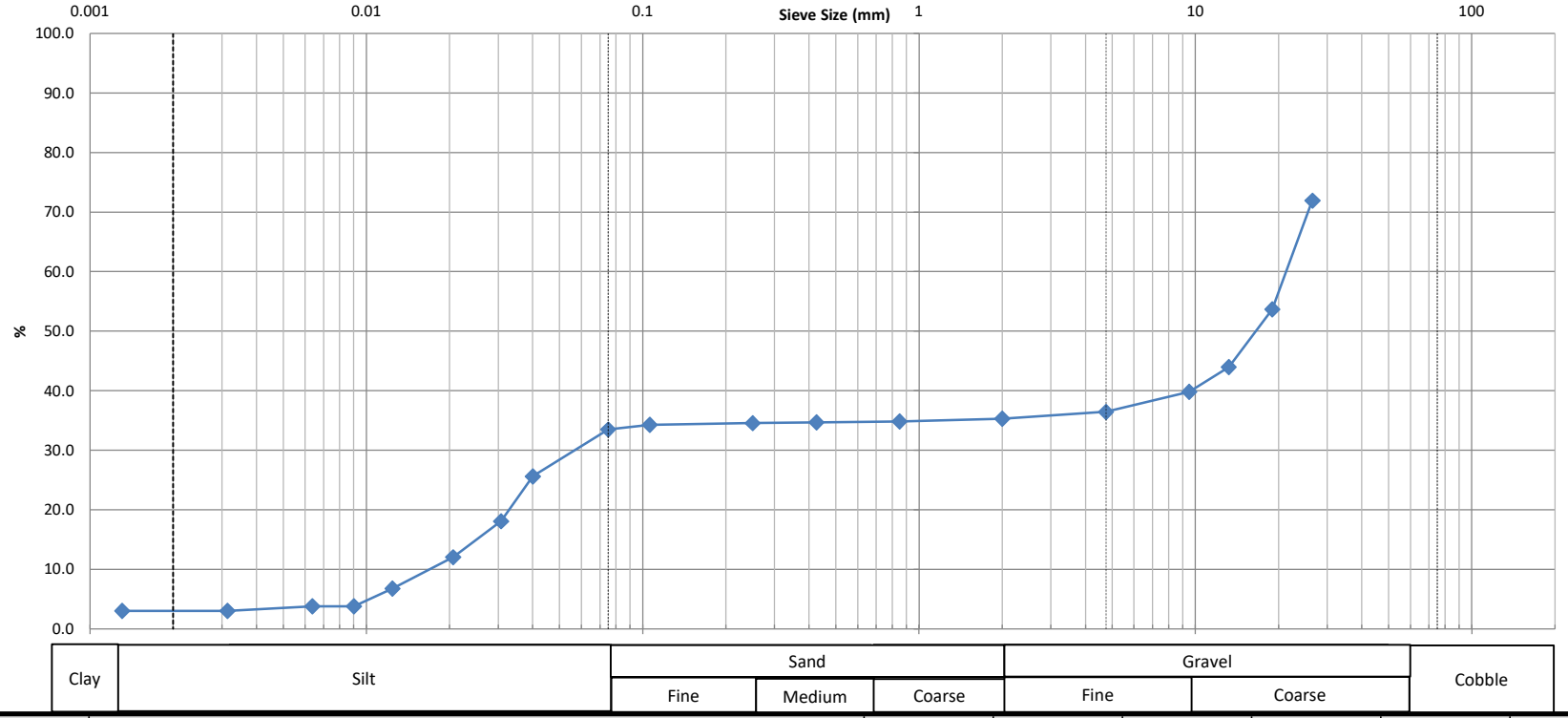
Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Cavanagh Developments	DEPTH:	0.5 - 0.6	FILE NO:	PG7307/PH4717
CONTRACT NO.:		BH OR TP No.:	TP8-24 G1	LAB NO:	57060
PROJECT:	2870 10th Line Road, Beckwith, ON			DATE RECEIVED:	2-Oct-24
				DATE TESTED:	3-Oct-24
DATE SAMPLED:	19-Sep-24			DATE REPORTED:	17-Oct-24
SAMPLED BY:	Deepak			TESTED BY:	D.K



Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						10.7%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					63.5	3.0		30.5		3.0	

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

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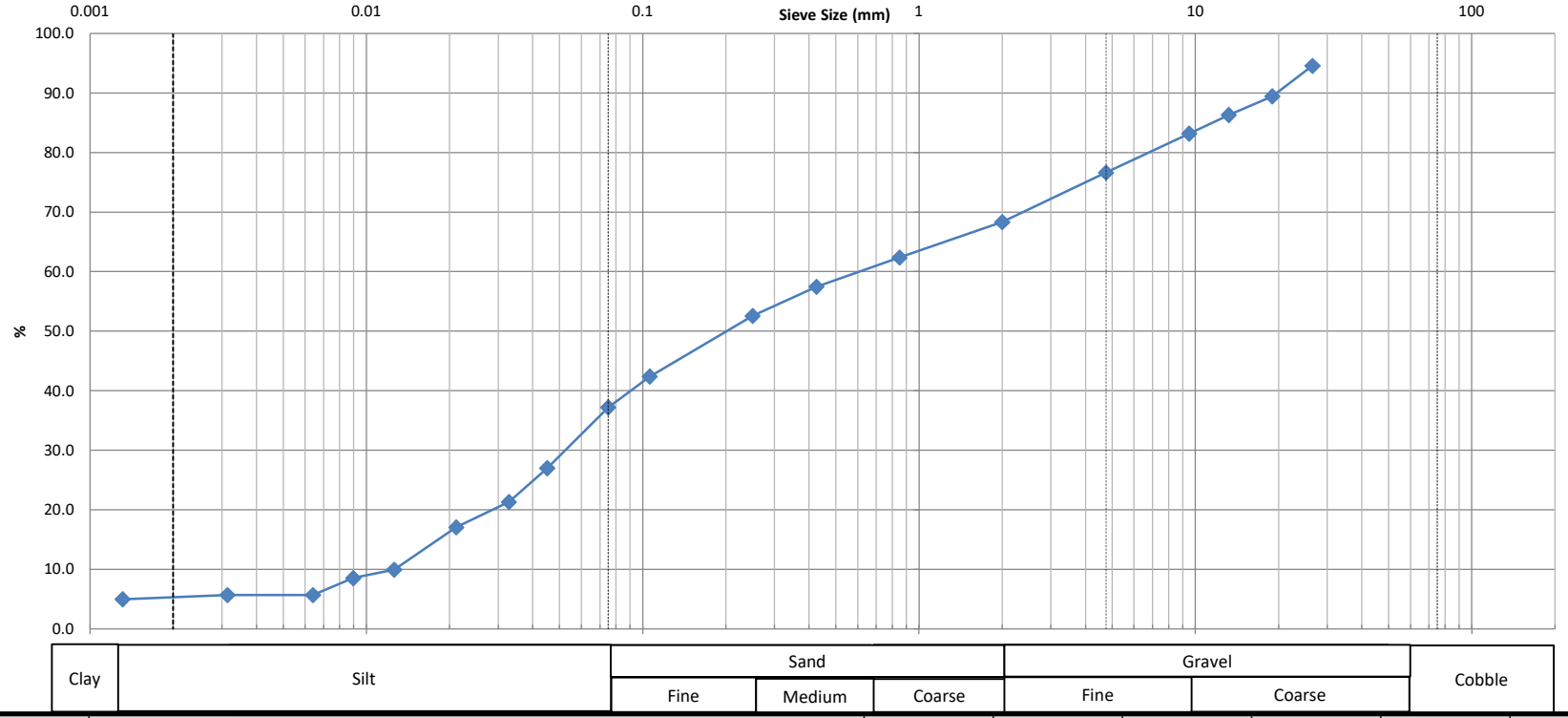
SIEVE ANALYSIS
ASTM C136

CLIENT:	Cavanagh Developments	DEPTH:	0.7 - 0.8	FILE NO:	PG7307/PH4717
CONTRACT NO.:		BH OR TP No.:	TP14-24 G1	LAB NO:	57061
PROJECT:	2870 10th Line Road, Beckwith, ON			DATE RECEIVED:	2-Oct-24
				DATE TESTED:	3-Oct-24
DATE SAMPLED:	19-Sep-24			DATE REPORTED:	17-Oct-24
SAMPLED BY:	Deepak			TESTED BY:	D.K



Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						8.3%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					23.3	39.5		31.9		5.2	

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

Certificate of Analysis

Report Date: 30-Sep-2024

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 25-Sep-2024

Client PO: **61369**

Project Description: PG7307

	Client ID:	TP10-24 G2	-	-	-		
	Sample Date:	24-Sep-24 09:00	-	-	-	-	-
	Sample ID:	2439308-01	-	-	-		
	Matrix:	Soil	-	-	-		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	91.0	-	-	-	-	-
General Inorganics							
pH	0.05 pH Units	7.68	-	-	-	-	-
Resistivity	0.1 Ohm.m	107	-	-	-	-	-
Anions							
Chloride	10 ug/g	<10	-	-	-	-	-
Sulphate	10 ug/g	<10	-	-	-	-	-

APPENDIX 2

FIGURE 1 – KEY PLAN

DRAWING PG7307-1 – TEST HOLE LOCATION PLAN

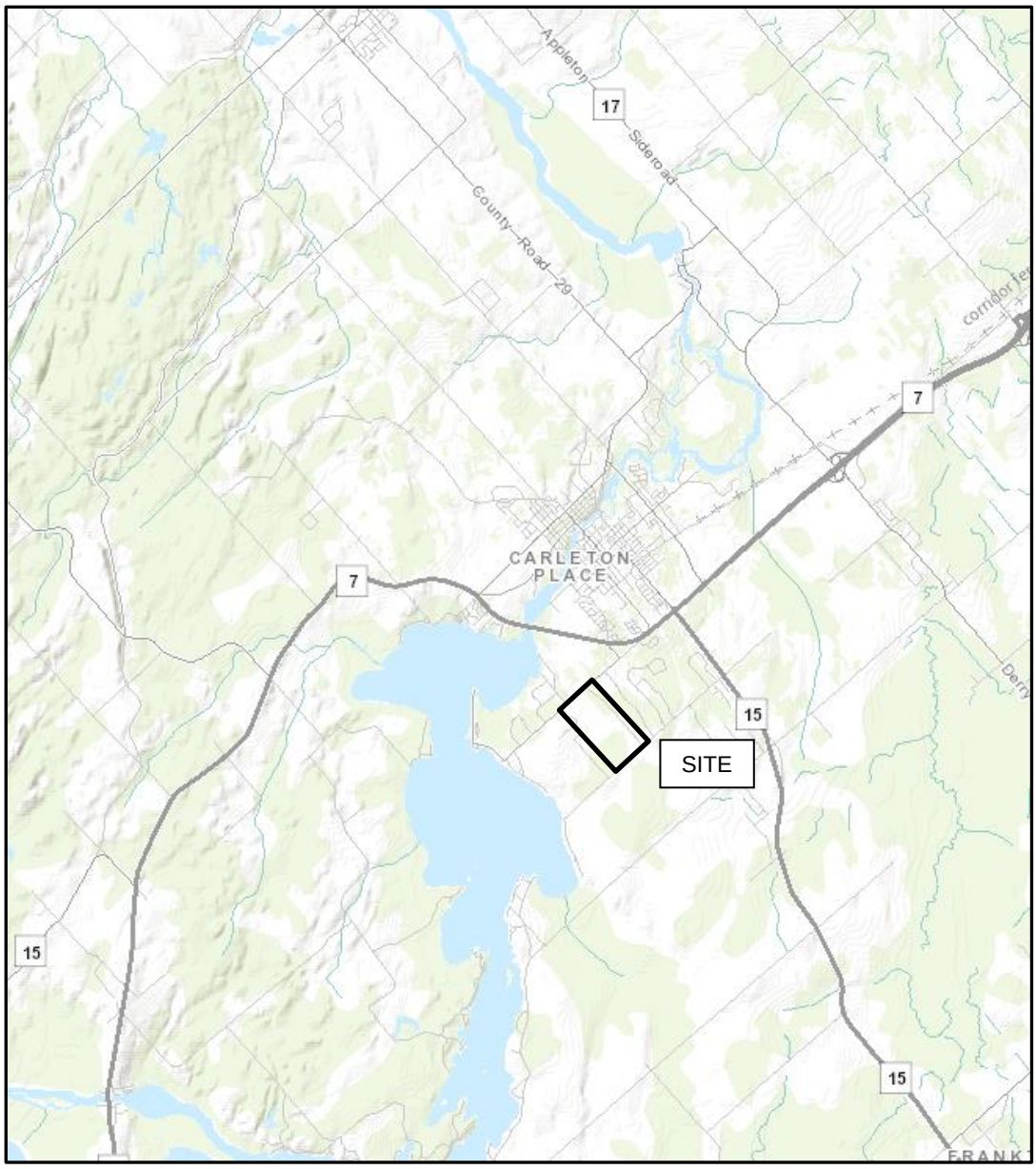
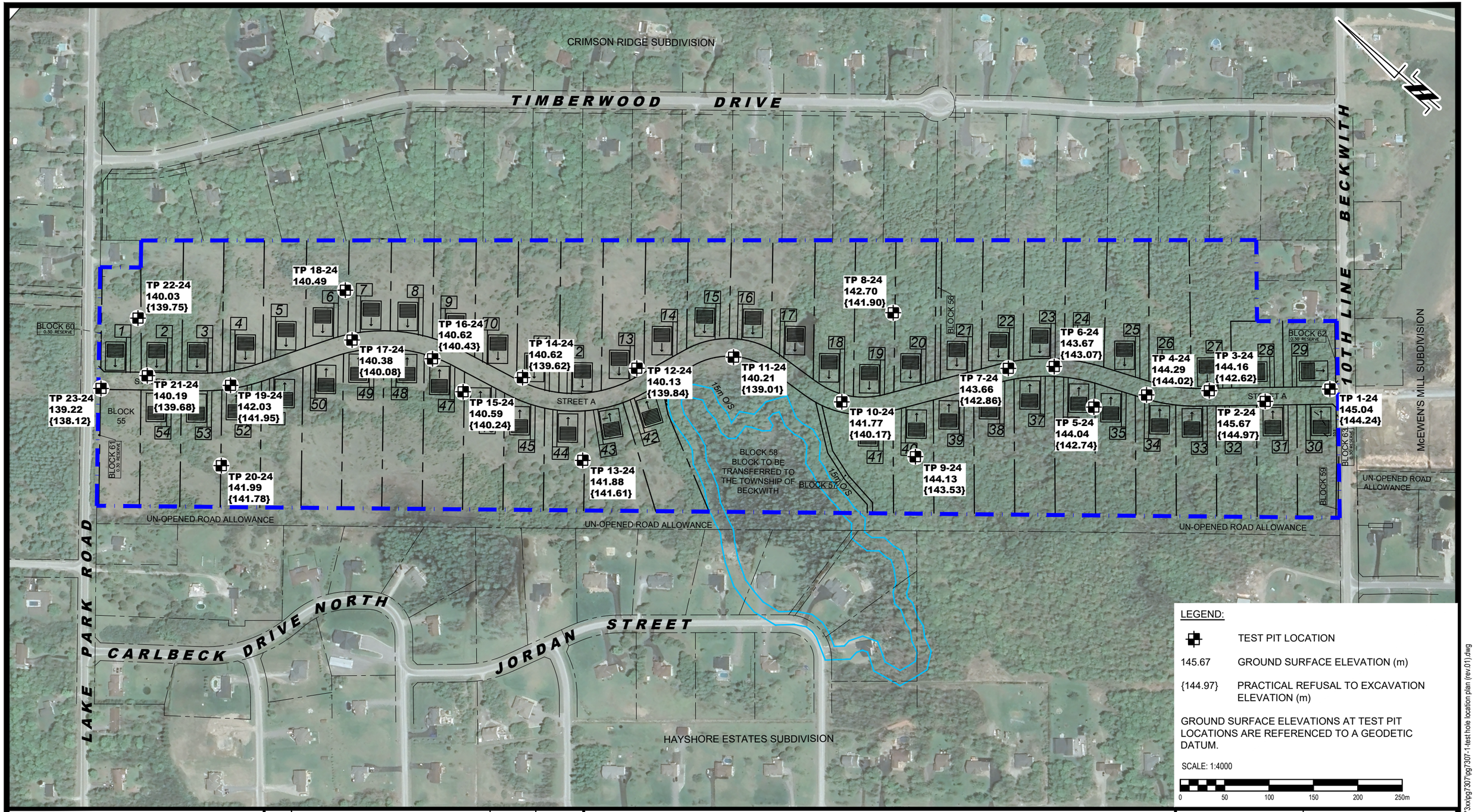


FIGURE 1

KEY PLAN

PATERSON GROUP



LEGEND:

	TEST PIT LOCATION
145.67	GROUND SURFACE ELEVATION (m)
{144.97}	PRACTICAL REFUSAL TO EXCAVATION ELEVATION (m)

GROUND SURFACE ELEVATIONS AT TEST PIT LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:4000

0 50 100 150 200 250m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL
1	REVISED WITH UPDATED SITE PLAN	10/15/2025	OC

1384341 ONTARIO LTD.
GEOTECHNICAL INVESTIGATION
PROPOSED SUBDIVISION DEVELOPMENT
10TH LINE ROAD SUBDIVISION
BECKWITH, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:4000	Date: 03/2025
Drawn by: ZS	Report No.: PG7307-1
Checked by: OC	Dwg. No.: PG7307-1
Approved by: FA	Revision No.: 1

11x17

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