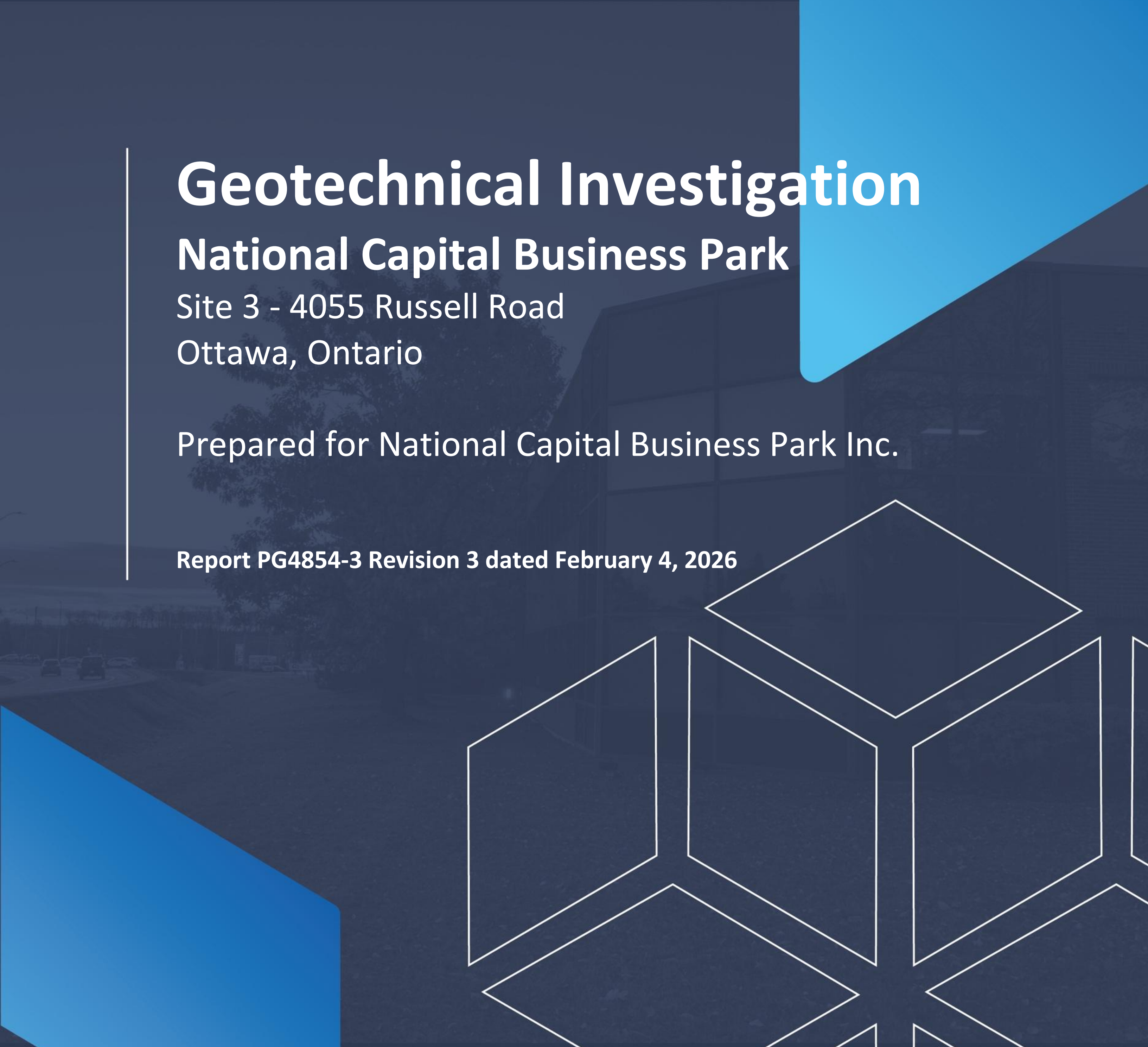
Geotechnical Investigation

National Capital Business Park

Site 3 - 4055 Russell Road
Ottawa, Ontario

Prepared for National Capital Business Park Inc.

Report PG4854-3 Revision 3 dated February 4, 2026



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1.0 Introduction

Paterson Group (Paterson) was commissioned by the National Capital Business Park Inc. to conduct a geotechnical investigation for the proposed National Capital Business Park – Site 3 to be located at 4055 Russell Road in the City of Ottawa (refer to Figure 1 - Key Plan in Appendix 2 of this report 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 holes.

☐ Provide geotechnical recommendations pertaining to design of the proposed development including construction considerations which may affect the design.

This 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.

2.0 Proposed Development

Based on the available drawings, the proposed development at the subject site will consist of 5 commercial slab-on-grade structures (Buildings A1, A2, A3, B and E) with footprints ranging from approximately 3,000 to 25,000 m^2. Buildings A1, A2, A3, and B will be located on the west side of the ravine, in Phase 3A, and Building E will be located on the east side of the ravine, in Phase 3B.

The proposed buildings will generally be surrounded by asphalt-paved access lanes and parking areas with landscaped margins.

It is also understood that the proposed development will be municipally serviced.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The recent geotechnical investigation was conducted on January 16 and 19, 2026, consisting of 5 boreholes (BH 1-26 to BH 5-26) advanced to a maximum depth of 7.7 m below the existing ground surface. Previous investigations were conducted at this site in November 2021, consisting of 29 test pits (TP 1-21 through TP 29-21) excavated to a maximum depth of 4.7 m below existing grade, and in August 2019, consisting of 11 boreholes (BH 1 through BH 11) advanced to a maximum depth of 9.0 m.

The test hole locations were distributed in a manner to provide general coverage of the subject site, taking into consideration underground utilities and site features. The test hole locations are shown on Drawing PG4854-7 - Test Hole Location Plan included in Appendix 2.

The test pits were completed using a hydraulic shovel and backfilled with the excavated soil upon completion. The boreholes were drilled using a track-mounted drill rig operated by a two-person crew. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer.

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 present in Appendix 1.

Soils samples were recovered from the boreholes using two different techniques, namely, sampled directly from the auger flights (AU) or collected using a 50 mm diameter split-spoon (SS) sampler. All samples were visually inspected and initially classified on site. The auger and split-spoon samples were placed in sealed plastic bags and transported to our laboratory for further examination and classification. The depths at which the auger and split spoon samples were recovered from the boreholes are shown as AU and SS, respectively, on the Soil Profile and Test Data sheets presented in Appendix 1.

A Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split spoon samples. The SPT results are recorded as "N" values on the Soil Profile and Test Data sheets. The "N" value is the number of blows required to drive the split spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

Undrained shear strength testing, using a vane apparatus, was carried out at regular intervals of depth in cohesive soils.

The overburden thickness was evaluated by a dynamic cone penetration test (DCPT) at borehole BH 10. The DCPT consists of driving a steel drill rod, equipped with a 50 mm diameter cone at the tip, using a 63.5 kg hammer falling from a height of 760 mm. The number of blows required to drive the cone into the soil is recorded for each 300 mm increment.

The subsurface conditions observed in the test holes 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

Open hole groundwater levels were recorded in the test pits. Additionally, monitoring wells were installed in boreholes BH 3, BH 6, and BH 9. The remaining boreholes were fitted with flexible polyethylene standpipes to permit monitoring of the groundwater levels subsequent to the completion of the sampling program.

3.2 Field Survey

The test hole locations, and ground surface elevation at each test hole location, were surveyed by Paterson using a handheld GPS and referenced to a geodetic datum. The location of the boreholes and ground surface elevation at each test hole location are presented on Drawing PG4854-7 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Review

Soil samples were recovered from the subject site and visually examined in our laboratory to review the results of the field logging.

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 submitted to determine the concentration of sulphate and chloride, the resistivity, and the pH of the samples. The results are presented in Appendix 1 and are discussed further in Section 6.7.

4.0 Observations

4.1 Surface Conditions

The majority of the subject site was previously undeveloped and consisted of agricultural lands with trees and bushes in localized areas. A residential dwelling and agricultural buildings were also located within the southwestern portion of the subject site. However, beginning in 2021, clearing and grubbing of the site had begun, and by 2025 buildings A2 and B had been constructed on the eastern portion of the site.

The site is bordered to the northwest by Hydro Ottawa infrastructure, to the northeast and east by Highway 417, to the southeast by Hunt Club Road, and to the southwest and west by Russell Road. A creek and ravine also bisect through the southern portion of the site. The ground surface across the site slopes gently upward from east to west with approximate geodetic elevations of 67 to 71.5 m.

4.2 Subsurface Profile

Overburden

Generally, the soil profile at the test hole locations consists of a 30 to 410 mm thickness of topsoil which is generally underlain by a silty sand layer and/or silty clay deposit. Fill material, consisting of brown silty clay with sand, gravel and cobbles, was encountered underlying the topsoil layer at boreholes BH 1-26 and BH 2-26, and extended to approximate depths of 0.7 and 1.5 m, respectively. A loose to compact, brown silty sand was observed underlying the topsoil within the southern half of the subject site and extended to approximate depths of 0.3 to 2.9 m below the existing ground surface.

A silty clay deposit was encountered underlying the topsoil and/or silty sand at all test holes with the exception of boreholes BH 3 and BH 4. The silty clay was observed to consist a hard to stiff, brown silty clay crust, becoming a very stiff to firm, grey silty clay at approximate depths of 1.4 to 3.0 m below the existing ground surface. Generally, the silty clay was observed to extend to maximum depths of 1.4 to 5.2 m. However, it should be noted that the silty clay was observed to extend to an approximate depth of 6.7 and 9 m at boreholes BH 3-26 and BH 10, located near the northwest limits of the subject site.

A glacial till deposit was encountered underlying the sandy silt and/or silty clay at approximate depths ranging from 1.4 to 9 m below the existing ground surface. The glacial till deposit was generally observed to consist of a brown to grey silty clay with sand, gravel, cobbles, and boulders.

Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for specific details of the soil profiles encountered at each test hole location.

Bedrock

Practical refusal to excavation on the bedrock surface was encountered in the test pits at depths ranging from approximately 2.2 to 3.6 m below the existing ground surface, while practical refusal to augering was encountered in the boreholes at depths ranging from approximately 2.3 to 7.7 m. Practical refusal to the DCPT was encountered at a depth 10.2 m at borehole BH 10. Based on available geological mapping, bedrock in the area of the subject site consists of shale of the Carlsbad Formation with overburden drift thicknesses between 2 to 10 m depth.

4.3 Groundwater

All test pits, with the exception of TP 15-21, were observed to be dry upon completion. The measured groundwater levels in the monitoring wells and standpipe piezometers are presented in Table 1 below:

Table 1 - Summary of Groundwater Levels

Test Hole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Dated Recorded
		Depth (m)	Elevation (m)	
TP 15-21	67.52	3.00	64.52	November 16, 2021
BH 3*	71.57	3.87	67.70	September 18, 2019
BH 4	67.49	Inaccessible	-	September 27, 2019
BH 5	68.91	Inaccessible	-	September 27, 2019
BH 6*	70.60	1.01	69.59	September 18, 2019
BH 7	71.39	2.19	69.20	September 27, 2019
BH 8	68.59	3.76	64.83	September 27, 2019
BH 9*	70.95	1.17	69.78	September 18, 2019
BH 10	70.69	Blocked	-	September 27, 2019
BH 11	66.78	Blocked	-	September 27, 2019
BH 1-26	68.86	2.13	66.73	January 27, 2026
BH 2-26	68.97	0.58	68.39	January 27, 2026
BH 3-26	69.92	Blocked	-	January 27, 2026
BH 4-26	70.29	1.10	69.19	January 27, 2026
BH 5-26	70.04	Blocked	-	January 27, 2026

Note: The ground surface elevation at each test hole location was surveyed using a handheld GPS unit and referenced to a geodetic datum.
*Denotes Groundwater Monitoring Well

The groundwater can also be estimated based on the colouring, consistency and moisture levels of the recovered samples. Based on these observations, the long-term groundwater table can be expected at approximately **2 to 3 m** below ground surface.

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

The recorded groundwater levels are also provided on the applicable Soil Profile and Test Data sheet presented in Appendix 1.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed development. It is recommended that the proposed buildings be constructed with conventional spread footings bearing on the undisturbed, stiff silty clay and/or undisturbed, compact silty sand.

Due to the presence of a silty clay layer, the proposed development will be subjected to grade raise restrictions, which are discussed in detail in Section 5.3.

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 materials, should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures.

Existing foundation walls and other construction debris should be entirely removed from within the building perimeters. Under paved areas, existing construction remnants such as foundation walls should be excavated to a minimum of 1 m below final grade.

Subgrade Preparation

If a silty sand subgrade is encountered at the underside of slab or footing elevation, and observed to be in a loose state of compactness, the material should be proof rolled using suitable vibratory equipment making several passes under dry conditions and above freezing temperatures, and approved by Paterson at the time of construction.

Fill Placement

Fill placed for grading beneath the proposed buildings should consist, unless otherwise specified, of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. The imported fill 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 building should be compacted to a minimum of 98% of the standard Proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil could be placed as general landscaping fill and beneath exterior parking where settlement of the ground surface is of minor concern. These materials should be spread in lifts with a maximum thickness of 300 mm and 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 95% of the material's SPMDD.

5.3 Foundation Design

Conventional Spread Footings for Building A1

For Building A1, strip footings, up to 3 m wide, and pad footings, up to 5 m wide, placed on undisturbed, stiff silty clay or compact silty sand, or on engineered fill which is placed directly over the undisturbed stiff silty clay or compact silty sand, can be designed using a bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **225 kPa**.

Conventional Spread Footings for Building A3

For Building A3, strip footings, up to 2 m wide, and pad footings, up to 4 m wide, placed on undisturbed, stiff silty clay or compact silty sand, or on engineered fill which is placed directly over the undisturbed stiff silty clay or compact silty sand, can be designed using a bearing resistance value at serviceability limit states (SLS) of **80 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **120 kPa**.

Conventional Spread Footings for Buildings A2, B and E

For Buildings A2, B and E strip footings, up to 3 m wide, and pad footings, up to 6 m wide, placed on undisturbed, stiff silty clay or compact silty sand, or on engineered fill which is placed directly over the undisturbed stiff silty clay or compact silty sand, can be designed using a bearing resistance value at serviceability limit states (SLS) of **200 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **300 kPa**.

Settlement

An undisturbed soil bearing surface consists of a surface from 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 designed using the above-noted bearing resistance values at SLS will be subjected to potential post-construction total and differential settlements of 25 and 20 mm, respectively.

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, compact silty sand, or engineered fill 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.

Permissible Grade Raise Recommendation

Consideration must also be given to potential settlements which could occur due to the presence of the silty clay deposit and the combined loads from the proposed footings, any groundwater lowering effects, and grade raise fill. The foundation loads to be considered for the settlement case are the continuously applied loads which consist of the unfactored dead loads and the portion of the unfactored live load that is considered to be continuously applied. For buildings, a minimum value of 50% of the live load is often recommended by Paterson. A post-development groundwater lowering of 0.5 m was assumed.

Our permissible grade raise recommendations for the subject site are presented in **Drawing PG4854-8 - Permissible Grade Raise Plan** in Appendix 2. It should be noted that the permissible grade raise values provided are based on typical landscaping fill materials. Further, within the proposed building footprints, a live load of 12 kPa on the slab-on-grade has been assumed. If heavier fill materials such as blast rock are used, or heavier live loads will be present on the floor slab, then the permissible grade raise restriction would need to be reduced.

If higher than permissible grade raises are required, preloading with or without a surcharge, lightweight fill, and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction total and differential settlements.

5.4 Design for Earthquakes

Shear wave velocity testing was completed for the subject site to accurately determine the applicable seismic site classification for the proposed development in accordance with Table 4.1.8.4.-A of the Ontario Building Code (OBC) 2024. The shear wave velocity testing was completed by Paterson personnel. The results of the shear wave velocity test are provided in Figures 2 and 3 in Appendix 2.

Field Program

The seismic array testing location was placed in an approximate north-south direction as presented in Drawing PG4854-7 - Test Hole Location Plan in Appendix 2. Paterson field personnel placed 24 horizontal 2.4 Hz. geophones mounted to the surface by means of two 75 mm ground spikes attached to the geophone land case. The geophones were spaced at 2 m intervals and connected by a geophone spread cable to a Geode 24 Channel seismograph.

The seismograph was also connected to a computer laptop and a hammer trigger switch attached to a 12-pound dead blow hammer. The hammer trigger switch sends a start signal to the seismograph. The hammer is used to strike an I-Beam seated into the ground surface, which creates a polarized shear wave. The hammer shots are repeated between 4 and 8 times at each shot location to improve signal to noise ratio.

The shot locations are also completed in forward and reverse direction (i.e.- striking both sides of the I-Beam seated parallel to the geophone array). The shot locations were 15, 3, and 2 m away from the first and last geophone, and at the centre of the seismic array.

Data Processing and Interpretation

Interpretation for the shear wave velocity results were completed by Paterson personnel. Shear wave velocity measurement was made using reflection/refraction methods. The interpretation is performed by recovering arrival times from direct and refracted waves.

The interpretation is repeated at each shot location to provide an average shear wave velocity, V_{s30}, of the upper 30 m profile, immediately below the building foundations. The layer intercept times, velocities from different layers and critical distances are interpreted from the shear wave records to compute the bedrock depth at each location.

The bedrock velocity was interpreted using the main refractor wave velocity, which is considered a conservative estimate of the bedrock velocity due to the increasing quality of the bedrock with depth. It should be noted that as bedrock quality increases, the bedrock shear wave velocity also increases.

Site Class for Building Footings within 3 m of Bedrock Surface (Building B)

Based on our testing results, the average overburden shear wave velocity is **383 m/s**, while the bedrock shear wave velocity is **1,891 m/s**.

Based on this the V_{S30} was calculated using the standard equation for average shear wave velocity provided in the OBC 2024, and as presented below:

$$V_{s30} = \frac{Depth_{of\ interest}(m)}{\left(\frac{Depth_{Layer1}(m)}{V_{s_{Layer1}}(m/s)} + \frac{Depth_{Layer2}(m)}{V_{s_{Layer2}}(m/s)}\right)}$$

$$V_{s30=} \frac{30\ m}{\left(\frac{3\ m}{383\ m/s} + \frac{27\ m}{1{,}891\ m/s}\right)}$$

$$V_{s30=}\ 1{,}356\ m/s$$

Based on the results of the shear wave velocity testing, the average shear wave velocity V_{s30} is **1,356 m/s** for buildings with conventional spread footings founded within 3 m of the bedrock surface. Therefore, a **Site Class $X_{1,356}$** is considered applicable for the design of the proposed buildings in this scenario, as per Table 4.1.8.4.A of the OBC 2024. This is anticipated to apply for **Building B**, where the bedrock surface was encountered at an approximate average geodetic elevation of 65.1 m.

Site Class for Building Footings slightly greater than 3 m above the Bedrock Surface (Buildings A1, A2, A3 and E)

As per the OBC 2024, where building foundations are more than 3 m above the bedrock surface, the highest seismic site class which can be used is X_{760}. Therefore, due to the depth of the bedrock surface encountered at Buildings A1, A2, A3 and E, a **Site Class X_{760}** will apply for those buildings.

It should also be noted that the soils at the subject site are not considered susceptible to liquefaction.

5.5 Slab on Grade Construction

With the removal of all topsoil and deleterious materials within the footprints of the proposed buildings, the native soil will be considered to be an acceptable subgrade surface on which to commence backfilling for the floor slab. The upper 200 mm of sub-slab fill should consist of an OPSS Granular A crushed stone. All backfill material within the footprints of the proposed buildings should be placed in maximum 300 mm thick loose lifts and compacted to at least 98% of its SPMDD.

Any soft areas should be removed and backfilled with appropriate backfill material. OPSS Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab.

5.6 Pavement Design

Car only parking areas, access lanes and heavy truck parking areas are anticipated at this site. The proposed pavement structures are shown in Tables 2 and 3.

Table 2 - Recommended Pavement Structure - Car Only Parking Areas

Thickness (mm)	Material Description
50	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill	

Table 3 - Recommended Pavement Structure
Access Lanes and Heavy Truck Parking Areas

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
450	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project. The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 99% of the material's SPMDD using suitable vibratory equipment, noting that excessive compaction can result in subgrade softening.

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 I or II material.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

A perimeter foundation drainage system is considered optional for the proposed structures at the subject site, as it would help minimize frost heave of paved and landscaped areas in the vicinities of the proposed buildings. Where utilized, the system should consist of a 150 mm diameter perforated corrugated plastic pipe, surrounded on all sides by 150 mm of 19 mm clear crushed stone, placed at the footing level around the exterior perimeter of the structures. The pipe should have a positive outlet, such as a gravity connection to the catch basins or running drainage ditches.

Backfill against the exterior sides of the foundation walls should consist of free-draining, non frost susceptible granular materials, such as clean sand or OPSS Granular B Type I granular material. 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. A geocomposite drainage board, such as Miradrain G100N or Delta Drain 6000, connected to the perimeter foundation drainage system is recommended.

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 of 1.5 m of soil cover, or an equivalent combination of soil cover and foundation insulation, should be provided for adequate frost protection of heated structures.

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

6.3 Excavation Side Slopes

The side slopes of excavations in the soil and fill 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. It is expected that sufficient room will be available for the greater part of the excavation to be undertaken by open-cut methods (i.e., unsupported excavations).

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level. Excavations below the groundwater level should be cut back at a maximum slope of 1.5H:1V. The subsoil at this site is considered to be mainly a 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 be used at all times 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.

6.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent Material Specifications and Standard Detail Drawings from the Department of Public Works and Services, Infrastructure Services Branch of the City of Ottawa.

The pipe bedding for sewer and water pipes should consist of at least 150 mm of OPSS Granular A material. Where the bedding is located within the firm grey silty clay, the thickness of the bedding material should be increased to a minimum of 300 mm as directed by the geotechnical consultant at the time of construction. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of its SPMDD. The bedding material should extend at least to the spring line of the pipe.

The cover material, which should consist of OPSS Granular A, should extend from the spring line of the pipe to at least 300 mm above the obvert of the pipe. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of its SPMDD.

It should generally be possible to re-use the moist (not wet) brown silty clay above the cover material if the excavation and filling operations are carried out in dry weather conditions. Wet silty clay materials will be difficult to re-use, as the high-water contents make compacting impractical without an extensive drying period.

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) should match the soils exposed at the trench walls to reduce potential 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.

To reduce long-term lowering of the groundwater at this site, clay seals should be provided within the service trenches excavated through the silty clay deposit. The seals should be at least 1.5 m long (in the trench direction) and should extend from trench wall to trench wall. The seals should extend from the frost line and fully penetrate the bedding, subbedding and cover material. The barriers should consist of relatively dry and compactable brown silty clay placed in maximum 225 mm thick loose layers and compacted to a minimum of 95% of the SPMDD. The clay seals should be placed at the site boundaries and at strategic locations at no more than 60 m intervals in the service trenches excavated through the silty clay deposit.

6.5 Groundwater Control

Groundwater Control for Building Construction

It is anticipated that groundwater infiltration into the excavations should be 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.

Dewatering Permit

Under the current regulations enacted by the Ministry of Environment, Conservation and Parks (MECP), any dewatering in excess of 50,000 L/day requires a registration on the Environmental Activity and Sector Registry (EASR), provided that dewatering is related to construction. If the dewatering is not related to construction, a Permit to Take Water obtained from the MECP will be required.

In the event that an EASR is required to facilitate dewatering of the proposed development, a minimum of 3 to 4 weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan, to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. Should a Permit to Take Water be required, a minimum of five to six months should be allotted for completion of the permit, due to the minimum review period imposed by the MECP.

Impacts on Neighbouring Properties

As the proposed buildings will be slab-on-grade structures, it is not anticipated that they will be founded below the long-term groundwater level. As a result, long-term groundwater lowering is not anticipated, and therefore no adverse effects are expected to neighbouring properties.

Further, as the proposed slab-on-grade structures will be setback from the site limits, no impacts to the neighbouring properties are anticipated as a result of excavation at the subject site.

Green’s Creek Collector Sewer

Due to the depth of the Green’s Creek Collector sewer and its setback from the proposed buildings, it is not currently anticipated that foundation loads from the proposed buildings will be induced on this sewer pipe.

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 slightly to moderately aggressive corrosive environment.

6.8 Slope Stability Analysis

The slope conditions were reviewed by Paterson field personnel on December 5, 2019, as part of the previous investigation. One (1) slope cross-section was studied within the subject site as the worst-case scenario. The cross-section location is presented on Drawing PG4854-7 - Test Hole Location Plan attached to the current report.

The existing slopes of the confined valley corridor located within the southeast limits of the site were reviewed. The upper valley corridor walls were observed to be well vegetated and stable with no signs of active erosion. A 1 to 2 m wide watercourse was observed at the base of the slope, with an approximate 100 mm to 500 mm depth and minimal flow.

An analysis was carried out to determine the slope stability under proposed conditions.

Slope Stability Analysis

The slope stability analysis was modeled in SLIDE, a computer program which permits a two-dimensional slope stability analysis calculating several methods including the Bishop’s method, which is a widely accepted slope analysis method. The program calculates a factor of safety, which represents the ratio of the forces resisting failure to forces favoring failure. Theoretically, a factor of safety of 1.0 represents a condition where the slope is stable.

However, due to intrinsic limitations of the calculation methods and the variability of the subsurface soil and groundwater conditions, a factor of safety greater than 1.0 is generally required for the failure risk to be considered acceptable. A minimum factor of safety of 1.5 is generally recommended for conditions where the slope failure would comprise permanent structures.

An analysis considering seismic loading was also completed. A horizontal acceleration of 0.16g was considered for the seismic loading condition. A factor of safety of 1.1 is considered to be satisfactory for stability analyses including seismic loading.

As noted above, 1 slope cross-section (Section B-B) was studied as the worst-case scenario within the subject site. It should be noted that details of the slope height and slope angle at the cross-section locations are presented in Figures 4 and 5 in Appendix 2 and are based on the topographic data provided on Drawing PG4854-7 - Test Hole Location Plan in Appendix 2.

Analysis Results

The static analysis results for slope Section B-B are presented in Figure 4 in Appendix 2. Based on the results of our analysis, the factor of safety for the slope was greater than 1.5 for the proposed conditions under static analysis. Further, the results of the analysis with seismic loading are shown in Figure 5 in Appendix 2. The results indicate that the factor of safety for the slope is greater than 1.1 for the proposed conditions under seismic analysis.

As the slope was determined to be stable under static and seismic conditions for the section analyzed, a stable slope allowance is not considered to be required for the Limit of Hazard Lands setback.

Toe Erosion and Erosion Access Allowance

The slope along the valley corridor wall in the vicinity of the watercourse (Section B-B) was generally observed to be vegetated with grass, small brush, and occasional trees. Further, flow from the creek in the watercourse at the base of the slopes was observed to be minimal. In consideration of these observations, a toe erosion allowance of 2 m is recommended for the slopes in the vicinity of the watercourse.

A 6 m erosion access allowance is also recommended to be applied from the top of slope for the slopes adjacent to the existing watercourse, to allow for future maintenance of these slopes.

Limit of Hazard Lands and Recommendations

The Limit of Hazard Lands Setback line for the proposed development is presented on Drawing PG4854-7 - Test Hole Location Plan in Appendix 2. The Limit of Hazard Lands line along the watercourse consists of a 6 m erosion access allowance and a 2 m toe erosion allowance, taken from the top of slope.

It is recommended that the existing vegetation and mature trees not be removed from the slope faces as the presence of the vegetation reduces surficial erosion activities. If the existing vegetation needs to be removed along the slope faces, it is recommended that a 100 to 150 mm of topsoil mixed with a hardy seed or an erosional control blanket be placed across the exposed slope face.

7.0 Recommendations

It is recommended that the following be carried out by Paterson once details of the proposed development are available:

- ☐ Review of detailed grading, servicing, landscaping and structural plan(s), from a geotechnical perspective.
- ☐ Review of architectural plans pertaining to groundwater suppression systems, underfloor drainage systems and waterproofing details for elevator shafts.

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:

- ☐ Observation of all bearing surfaces prior to the placement of concrete.
- ☐ Sampling and testing of the concrete and fill materials used.
- ☐ 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 soils, with the exception of engineered crushed stone fill, generated by construction activities that will be transported on-site or off-site should 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 National Capital Business Park Inc., 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.

Feb. 4, 2026
S. S. DENNIS
100519516

Scott Dennis

Kevin A. Pickard, P.Eng.

Scott S. Dennis, P.Eng.

Report Distribution:

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APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ANALYTICAL TESTING RESULTS

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4055 Russell Road, Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 375911.93 **NORTHING:** 5027751.02 **ELEVATION:** 68.86

PROJECT: Proposed Development

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** January 19, 2026

FILE NO. : **PG4854**

HOLE NO. : **BH 1-26**

SAMPLE DESCRIPTION

GROUND SURFACE

TOPSOIL: with organics 0.03m [68.83m]

FILL: Brown silty clay with gravel 0.69m [68.17m]

Hard, brown **SILTY CLAY** 2.74m [66.12m]

GLACIAL TILL: Hard, brown silty clay with gravel, occasional cobbles 3.05m [65.81m]

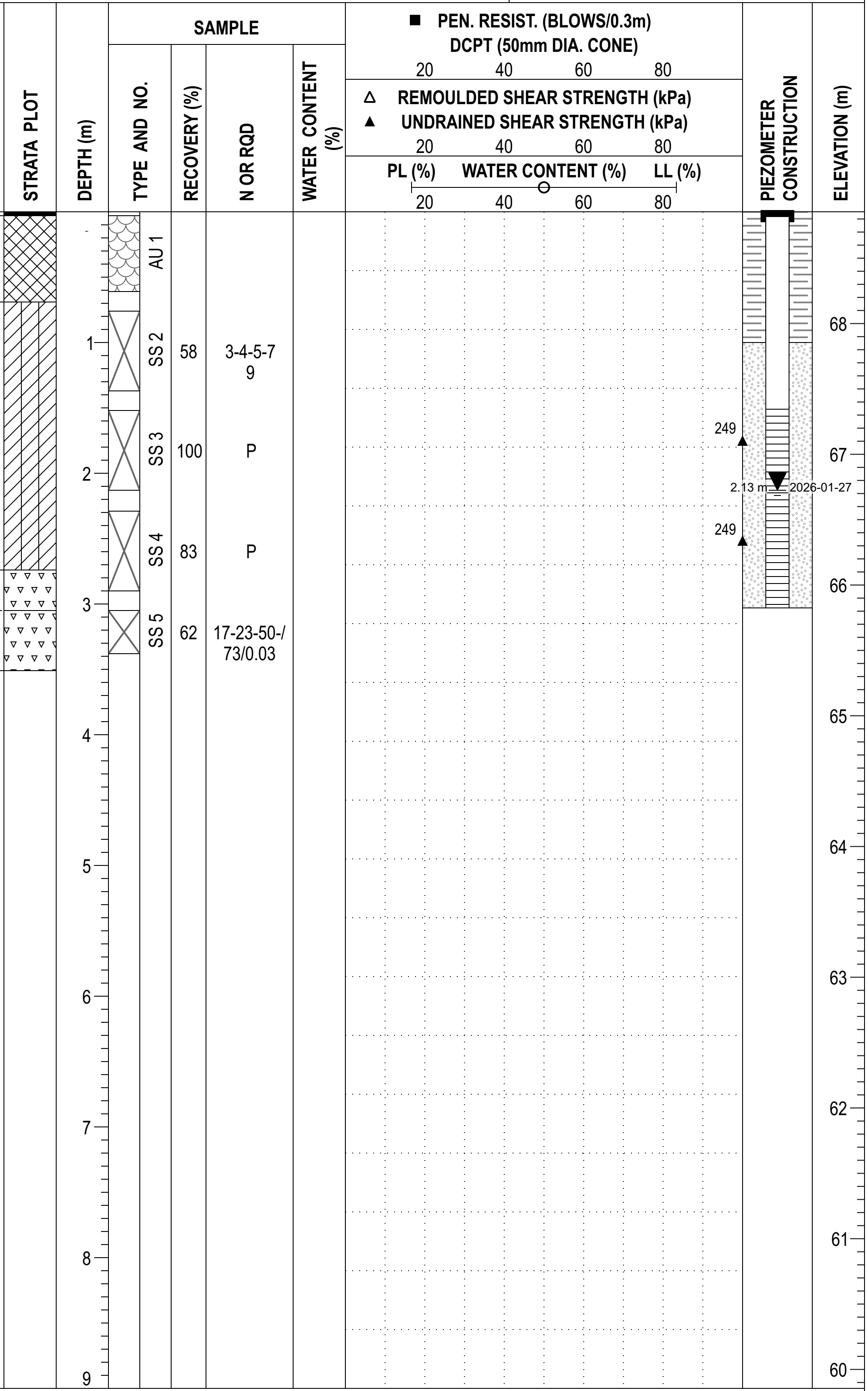
GLACIAL TILL: Very dense, brown silty sand with gravel and shale fragments 3.51m [65.34m]

End of Borehole

Practical refusal to augering at 3.51 m depth

(GWL at 2.13 m depth - January 27, 2026)

SAMPLE TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)
AU 1			
SS 2	58	3-4-5-7 9	
SS 3	100	P	
SS 4	83	P	
SS 5	62	17-23-50-/ 73/0.03	



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4055 Russell Road, Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 375719.80 **NORTHING:** 5027888.88 **ELEVATION:** 68.97

PROJECT: Proposed Development

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010

DATE: January 19, 2026

FILE NO. : PG4854

HOLE NO. : BH 2-26

SAMPLE DESCRIPTION

GROUND SURFACE

TOPSOIL: with organics — 0.03m [68.94m]

FILL: Brown silty clay with sand, gravel and cobbles — 0.69m [68.28m]

FILL: Brown silty clay, trace gravel and topsoil — 1.45m [67.52m]

Hard, brown **SILTY CLAY**

- Very stiff below 3.0 m depth

- Grey by 3.8 m depth

- Stiff below 4.5 m depth

5.94m [63.03m]

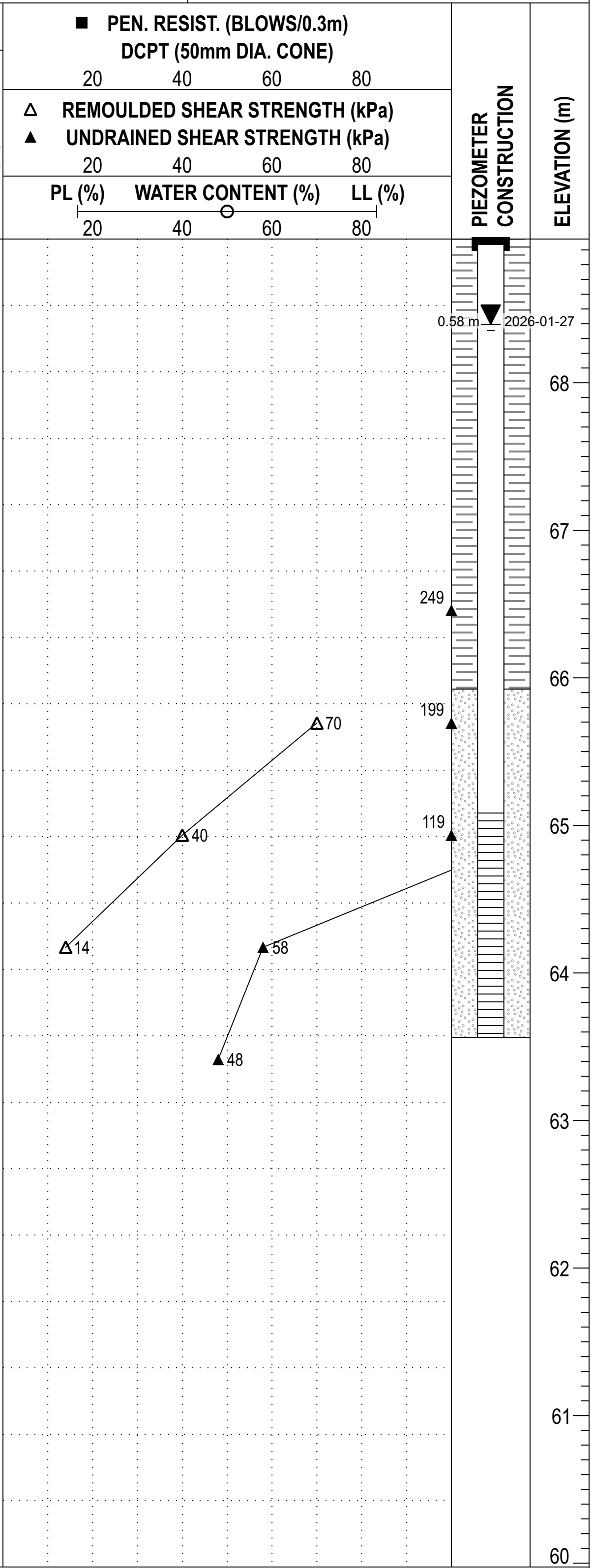
GLACIAL TILL: Very dense, brown silty sand with gravel and shale fragments — 6.27m [62.70m]

End of Borehole

Practical refusal to augering at 6.27 m depth

(GWL at 0.58 m depth - January 27, 2026)

TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)
AU 1			
SS 2	33	3-4-5-4 9	
SS 3	100	2-3-4-5 7	
SS 4	100	P	
SS 5	100	P	
SS 6	100	P	
SS 7	106	50-/-/-/ 50/0.13	



DEPTH (m): 1 2 3 4 5 6 7 8 9

DISCLAIMER: THE DATA PRESENTED IN THIS SHEET IS THE PROPERTY OF PATERSON GROUP AND THE CLIENT FOR WHOM IT WAS PRODUCED. THIS SHEET SHOULD BE READ IN CONJUNCTION WITH ITS CORRESPONDING REPORT. PATERSON GROUP IS NOT RESPONSIBLE FOR THE UNAUTHORIZED USE OF THIS DATA.

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4055 Russell Road, Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 375526.48 **NORTHING:** 5027763.33 **ELEVATION:** 69.92

PROJECT: Proposed Development

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** January 19, 2026

FILE NO. : PG4854

HOLE NO. : BH 3-26

SAMPLE DESCRIPTION

GROUND SURFACE

TOPSOIL: with organics 0.05m [69.87m]

Very stiff, brown **SILTY CLAY**

- Grey and stiff by 2.2 m depth

- Firm by 5.3 m depth

6.78m [63.14m]

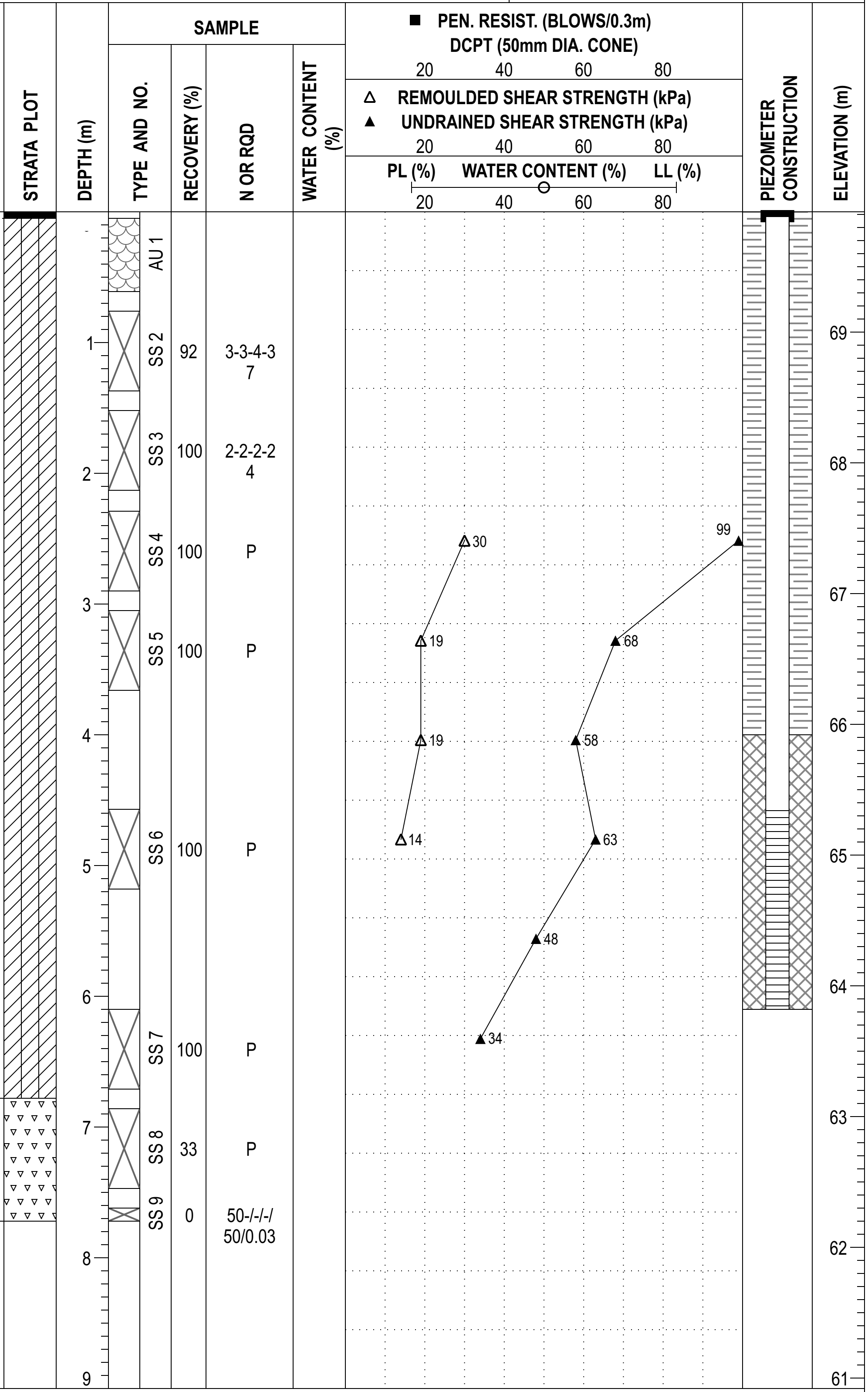
GLACIAL TILL: Very dense, grey silty sand with gravel, cobbles and shale fragments

7.72m [62.20m]

End of Borehole

Practical refusal to augering at 7.72 m depth

(BH Blocked on - January 27, 2026)



TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)
AU 1			
SS 2	92	3-3-4-3 7	
SS 3	100	2-2-2-2 4	
SS 4	100	P	
SS 5	100	P	
SS 6	100	P	
SS 7	100	P	
SS 8	33	P	
SS 9	0	50-/-/-/ 50/0.03	

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4055 Russell Road, Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 375682.86 **NORTHING:** 5027719.05 **ELEVATION:** 70.29

PROJECT: Proposed Development

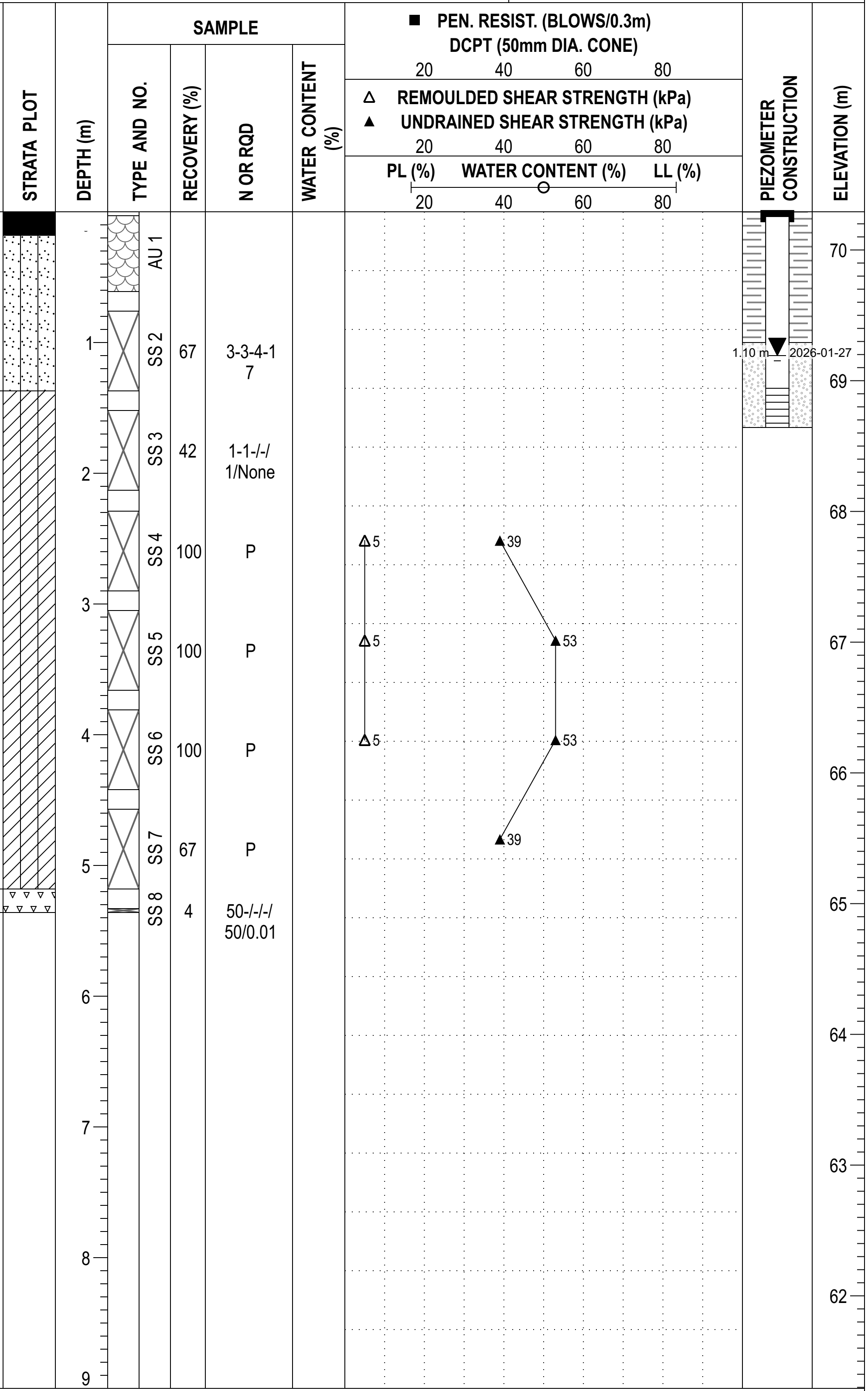
ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010

DATE: January 16, 2026

FILE NO. : **PG4854**

HOLE NO. : **BH 4-26**



SAMPLE DESCRIPTION	Depth to base
GROUND SURFACE	
TOPSOIL: with organics and sand	0.18m [70.11m]
Compact, brown **SILTY SAND**	1.37m [68.92m]
Firm to stiff, grey **SILTY CLAY** - Stiff by 3.0 m depth - Firm by 4.5 m depth	5.18m [65.11m]
GLACIAL TILL: Grey silty sand with gravel and clay	5.36m [64.93m]

End of Borehole

Practical refusal to augering at 5.36 m depth

(GWL at 1.10 m depth - January 27, 2026)

TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)
AU 1			
SS 2	67	3-3-4-1 7	
SS 3	42	1-1-/-/ 1/None	
SS 4	100	P	
SS 5	100	P	
SS 6	100	P	
SS 7	67	P	
SS 8	4	50-/-/-/ 50/0.01	

REMOULDED SHEAR STRENGTH (kPa)	UNDRAINED SHEAR STRENGTH (kPa)
5	39
5	53
5	53
	39

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

4055 Russell Road, Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 375769.56 **NORTHING:** 5027603.78 **ELEVATION:** 70.04

PROJECT: Proposed Development

ADVANCED BY: Track Mounted Drill Rig

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** January 16, 2026

FILE NO. : PG4854

HOLE NO. : BH 5-26

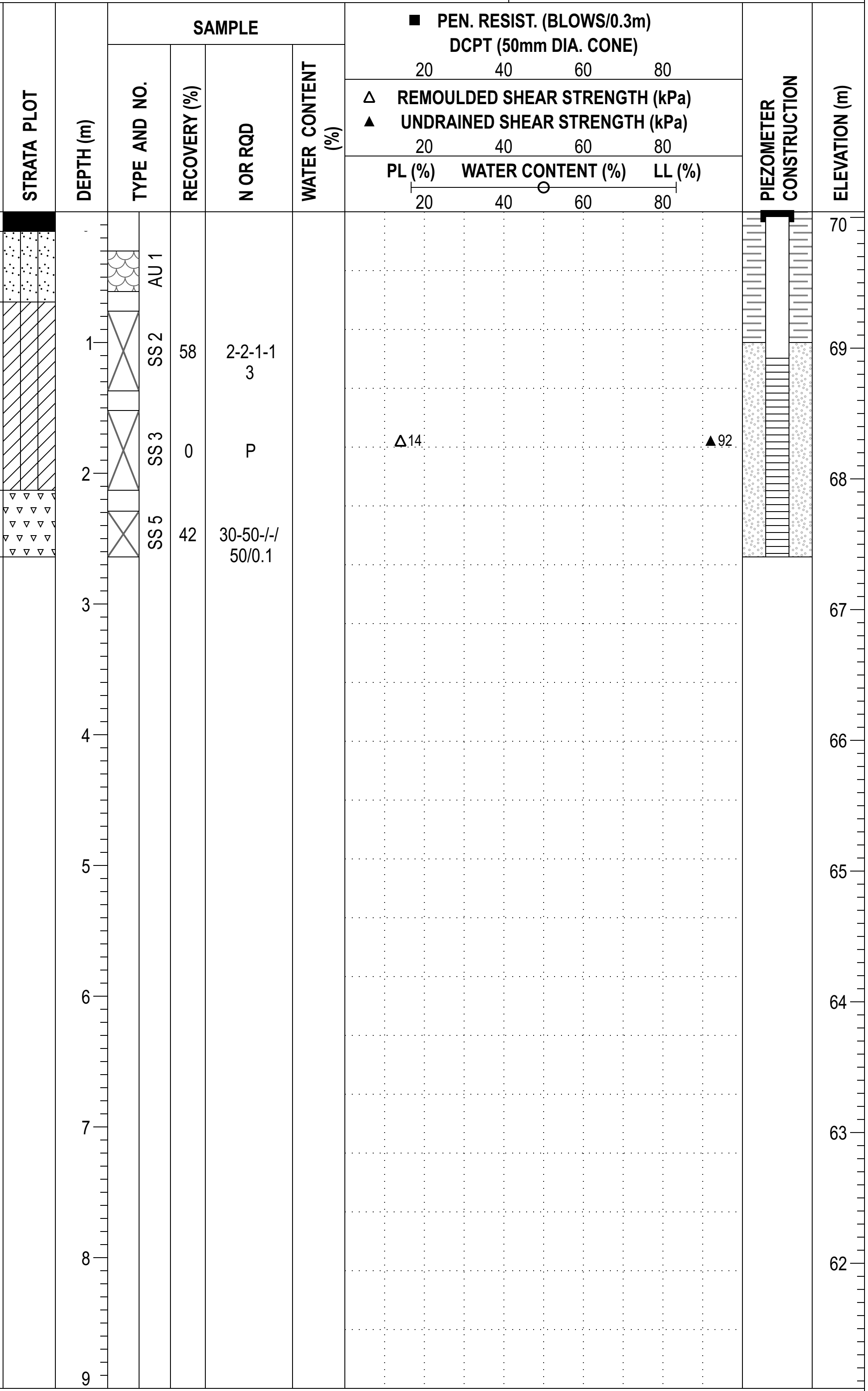
SAMPLE DESCRIPTION	
GROUND SURFACE	
TOPSOIL: with organics and sand	0.15m [69.89m]
Brown **SILTY SAND**	0.69m [69.35m]
Stiff, grey **SILTY CLAY**	2.13m [67.91m]
GLACIAL TILL: Very dense, grey silty sand with gravel, trace clay, some shale	2.64m [67.40m]

End of Borehole

Practical refusal to augering at 2.64 m depth

(BH Blocked - January 27, 2026)

TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)
AU 1			
SS 2	58	2-2-1-1 3	
SS 3	0	P	
SS 5	42	30-50-/-/ 50/0.1	



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG4854

REMARKS

HOLE NO. TP 1-21

BORINGS BY Excavator

DATE November 5, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	68.23		
TOPSOIL 0.23	■	G	1						
Very stiff to stiff, brown **SILTY CLAY** with sand, trace topsoil 0.56	▨	G	2						
	▨	G	3						
- sand content decreasing with depth									
End of Test Pit									
(TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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DATUM Geodetic

REMARKS

BORINGS BY Excavator

DATE November 5, 2021

FILE NO. PG4854

HOLE NO. TP 2-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	67.80		
TOPSOIL 0.25	■	G	1						
Stiff to very stiff, brown **SILTY CLAY**, trace sand 0.36	▨	G	2						
End of Test Pit (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

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DATUM Geodetic

FILE NO. PG4854

REMARKS

HOLE NO. TP 3-21

BORINGS BY Excavator

DATE November 5, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	67.35		
TOPSOIL 0.30	■	G	1						
Stiff to very stiff, brown **SILTY CLAY** with sand 0.41	▨	G	2						
End of Test Pit (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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FILE NO. **PG4854**

REMARKS

HOLE NO. **TP 4-21**

BORINGS BY Excavator

DATE November 5, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20 40 60 80)	Piezometer Construction
GROUND SURFACE						0	66.98		
TOPSOIL		G	1						
0.41									
Stiff to very stiff, brown **SILTY CLAY** with sand 0.51		G	2						
End of Test Pit									
(TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
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DATUM Geodetic

REMARKS

BORINGS BY Excavator

DATE November 5, 2021

FILE NO. PG4854

HOLE NO. TP 5-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	66.91		
TOPSOIL 0.30	■	G	1						
Stiff to very stiff, brown **SILTY CLAY** trace sand 0.46	▨	G	2						
End of Test Pit									
(TP dry upon completion)									

Water Content % axis: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

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DATUM Geodetic

REMARKS

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DATE November 5, 2021

FILE NO. PG4854

HOLE NO. TP 6-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	66.95		
TOPSOIL 0.23	■	G	1						
Stiff to very stiff, brown **SILTY CLAY**, trace sand 0.36	▨	G	2						
End of Test Pit (TP dry upon completion)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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REMARKS

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FILE NO. PG4854

HOLE NO. TP 7-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	67.26		
TOPSOIL 0.10	■	G	1						
Stiff to very stiff, brown **SILTY CLAY,** trace sand 0.48	▨	G	2						
End of Test Pit (TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

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REMARKS

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DATE November 5, 2021

FILE NO. PG4854

HOLE NO. TP 8-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	67.93		
TOPSOIL 0.25	■	G	1						
Stiff to very stiff, brown **SILTY CLAY**, trace sand 0.36	▨	G	2						
End of Test Pit									
(TP dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

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DATUM Geodetic

FILE NO. PG4854

REMARKS

HOLE NO. TP 9-21

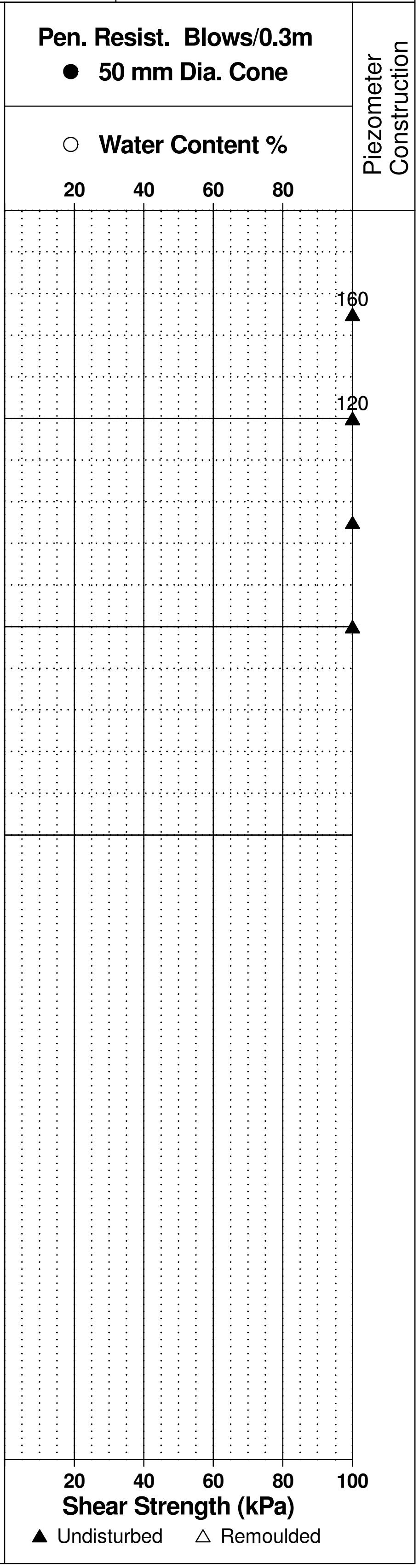
BORINGS BY Excavator

DATE November 16, 2021

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	67.53
TOPSOIL 0.20						
Very stiff, brown **SILTY CLAY** 2.20	G	1			1	66.53
					2	65.53
GLACIAL TILL: Hard, brown silty clay, some sand and gravel, occasional cobbles and boulders 3.00	G	2				
End of Test Pit					3	64.53

TP terminated on bedrock surface at 3.00m depth.

(TP dry upon completion)



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. **PG4854**

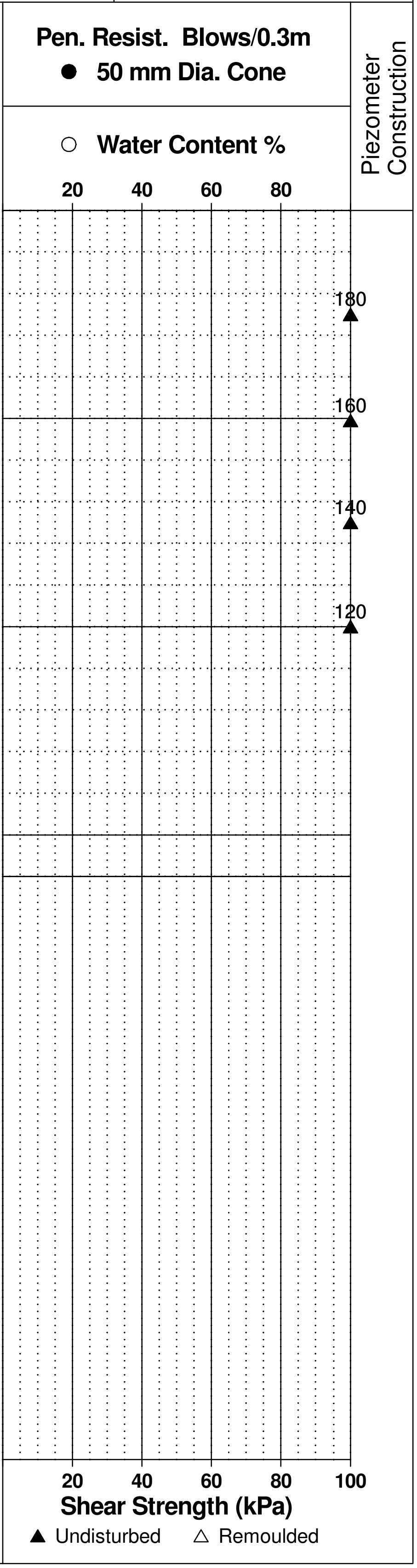
REMARKS

HOLE NO. **TP10-21**

BORINGS BY Excavator

DATE November 16, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	67.33
TOPSOIL 0.20		G	1				
Very stiff, brown **SILTY CLAY** 2.20		G	2			1	66.33
						2	65.33
GLACIAL TILL: Hard, brown silty clay, some sand and gravel, occasional cobbles and boulders 3.20		G	3			3	64.33
End of Test Pit TP terminated on bedrock surface at 3.20m depth. (TP dry upon completion)							



SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

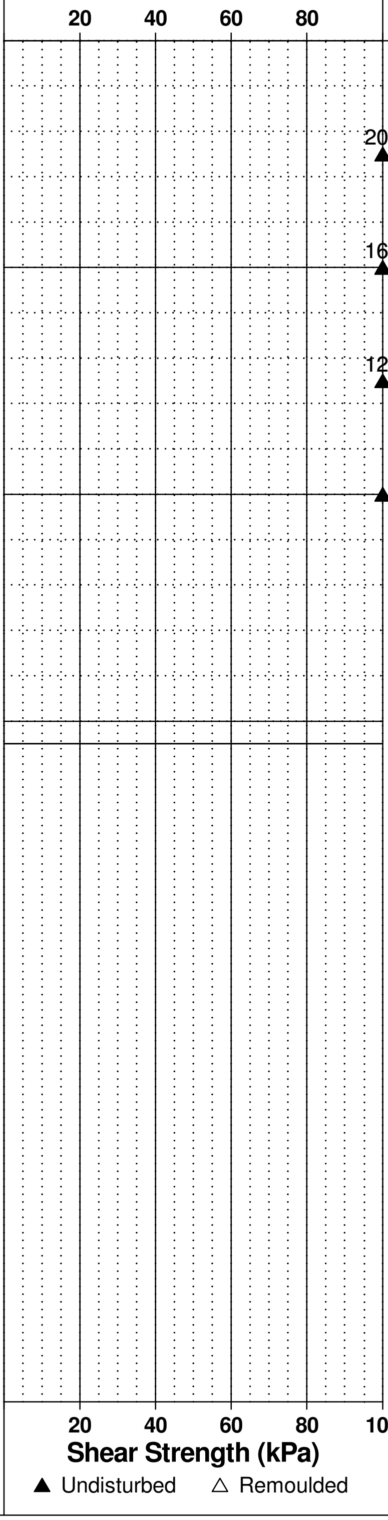
BORINGS BY Excavator

DATE November 16, 2021

FILE NO. PG4854

HOLE NO. TP11-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	67.05
TOPSOIL 0.20							
Hard to very stiff, brown **SILTY CLAY**		G	1			1	66.05
2.10						2	65.05
GLACIAL TILL: Hard, brown silty clay, some sand and gravel, occasional cobbles and boulders		G	2				
3.10						3	64.05
End of Test Pit TP terminated on bedrock surface at 3.10m depth (TP dry upon completion)							



Piezometer Construction

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SOIL PROFILE AND TEST DATA

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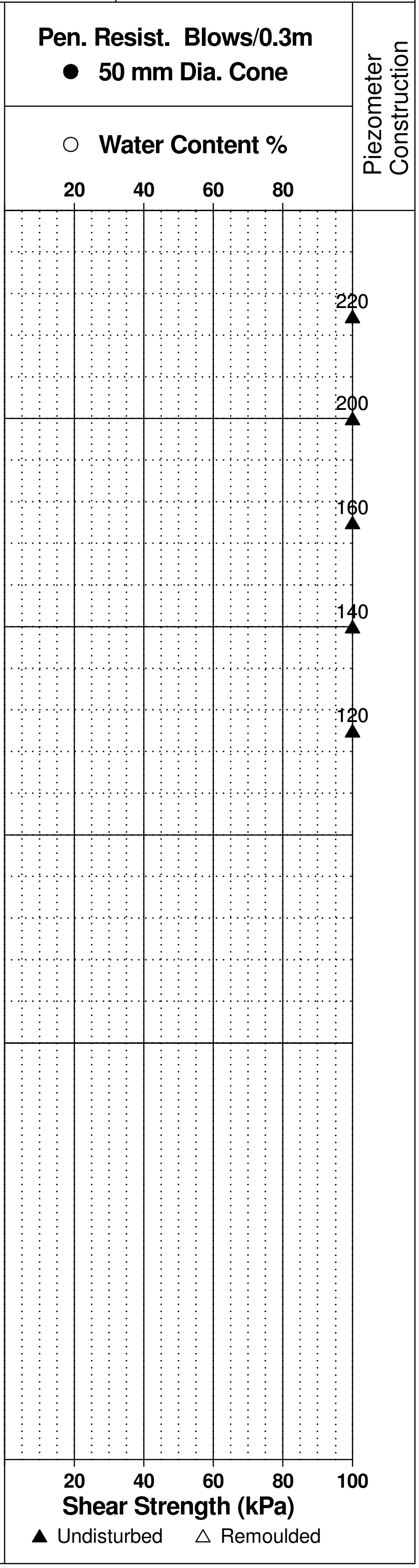
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic
REMARKS
BORINGS BY Excavator
DATE November 16, 2021
FILE NO. PG4854
HOLE NO. TP12-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	66.91
TOPSOIL 0.20							
Hard to very stiff, brown **SILTY CLAY**		G	1			1	65.91
						2	64.91
2.80							
GLACIAL TILL: Hard, brown silty clay, some sand and gravel, occasional cobbles and boulders		G	2			3	63.91
4.00						4	62.91
End of Test Pit (TP dry upon completion)							



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SOIL PROFILE AND TEST DATA

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Proposed Buildings A2 and B - 4055 Russell Road
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DATUM Geodetic

REMARKS

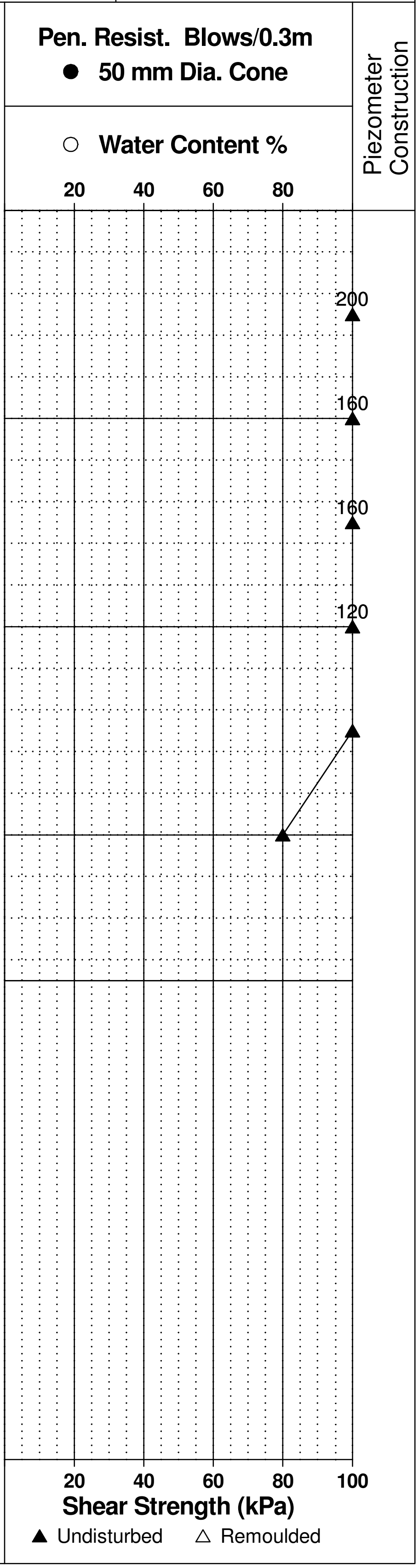
BORINGS BY Excavator

DATE November 16, 2021

FILE NO. PG4854

HOLE NO. TP13-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	66.89
TOPSOIL 0.20							
Hard to very stiff, brown **SILTY CLAY**		G	1			1	65.89
						2	64.89
3.50						3	63.89
GLACIAL TILL: Hard, brown silty clay, some sand and gravel, occasional cobbles and boulders 3.70		G	2				
End of Test Pit (TP dry upon completion)							



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG4854

REMARKS

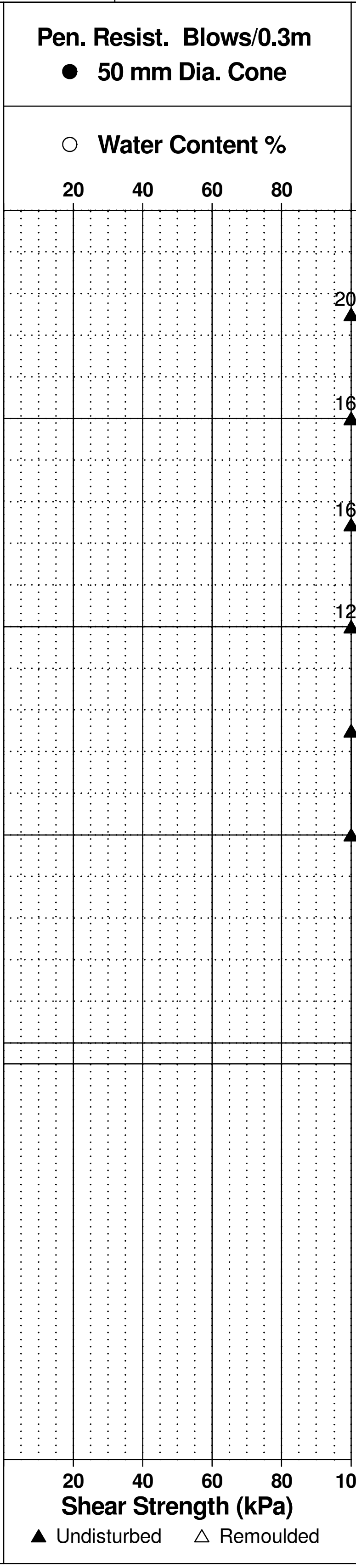
HOLE NO. TP14-21

BORINGS BY Excavator

DATE November 16, 2021

SOIL DESCRIPTION	Strata depth (m)	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE					
TOPSOIL	0.20				
Hard to very stiff, brown **SILTY CLAY**	3.90	G	1		
GLACIAL TILL: Hard, brown silty clay, some sand and gravel, occasional cobbles and boulders	4.10	G	2		
End of Test Pit					
(TP dry upon completion)					

DEPTH (m)	ELEV. (m)
0	67.04
1	66.04
2	65.04
3	64.04
4	63.04



Piezometer Construction

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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

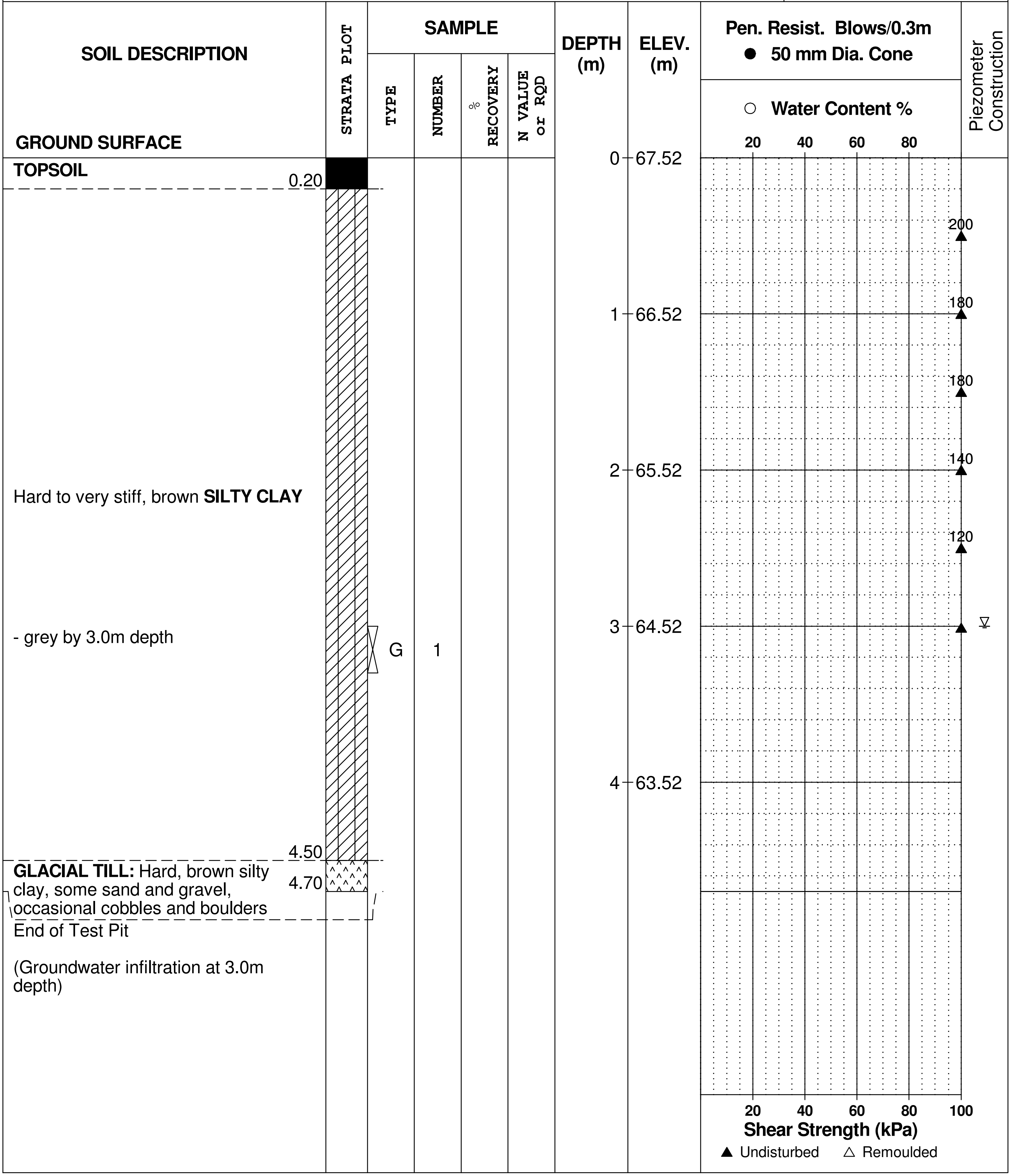
REMARKS

BORINGS BY Excavator

DATE November 16, 2021

FILE NO. PG4854

HOLE NO. TP15-21



SOIL DESCRIPTION	TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	67.52
TOPSOIL 0.20						
					1	66.52
Hard to very stiff, brown **SILTY CLAY**					2	65.52
- grey by 3.0m depth	G	1			3	64.52
					4	63.52
4.50 **GLACIAL TILL:** Hard, brown silty clay, some sand and gravel, occasional cobbles and boulders 4.70						

End of Test Pit

(Groundwater infiltration at 3.0m depth)

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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator

DATE November 16, 2021

FILE NO. PG4854

HOLE NO. TP16-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE					
TOPPSOIL	0.20				
Hard to very stiff, brown **SILTY CLAY**	3.20	G	1		
GLACIAL TILL: Dense, brown silty sand, some gravel, trace clay	3.30				

End of Test Pit

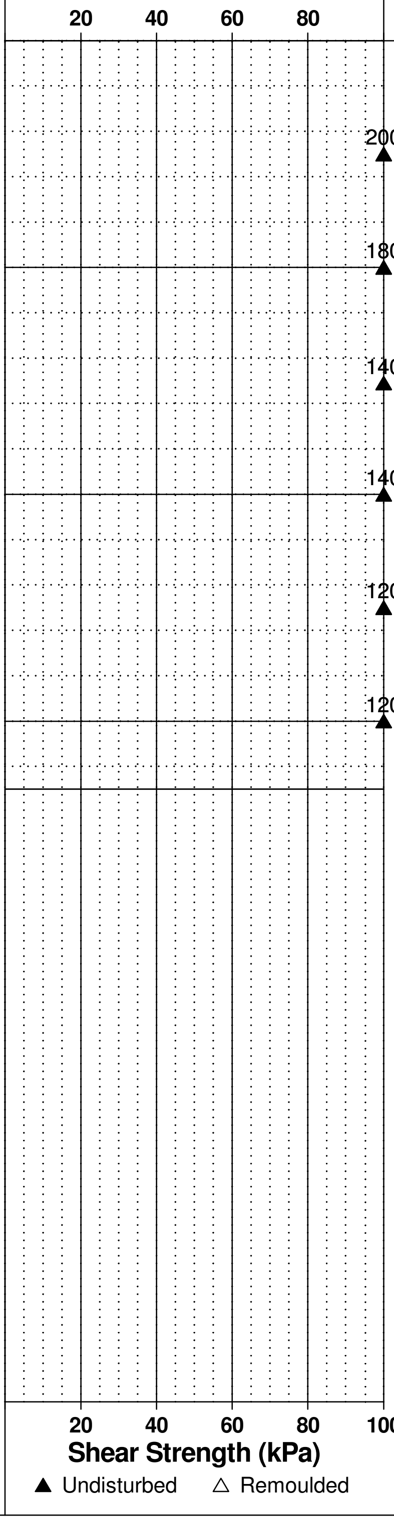
TP terminated on bedrock surface at 3.30m depth

(TP dry upon completion)

DEPTH (m)	ELEV. (m)
0	67.49
1	66.49
2	65.49
3	64.49

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**

○ **Water Content %**



Shear Strength (kPa)

▲ Undisturbed △ Remoulded

Piezometer Construction

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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. **PG4854**

REMARKS

HOLE NO. **TP17-21**

BORINGS BY Excavator

DATE November 16, 2021

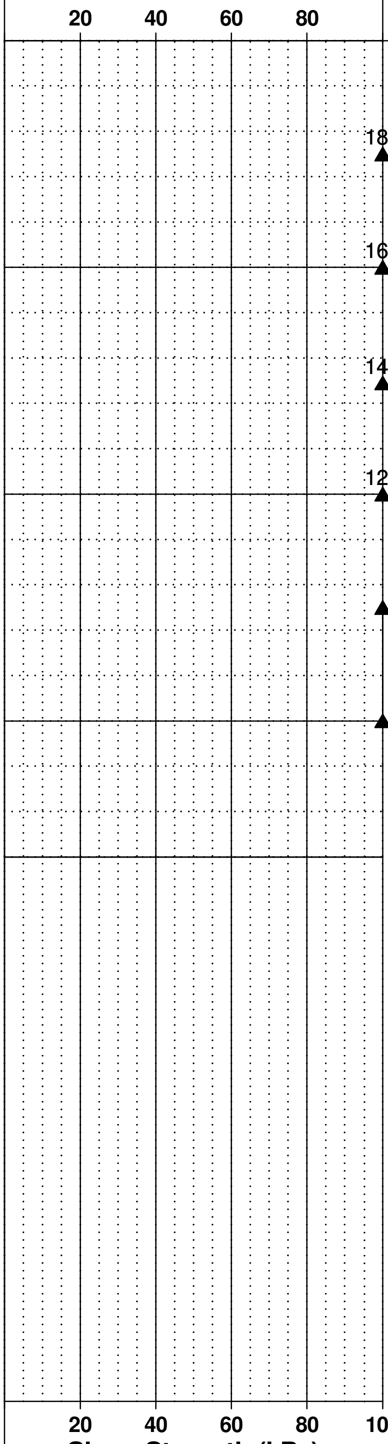
SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	66.86
TOPSOIL 0.20	■						
Very stiff, brown **SILTY CLAY**	▨					1	65.86
	▨	G	1				
	▨					2	64.86
- grey by 3.0m depth	▨					3	63.86
3.60							
End of Test Pit TP terminated on bedrock surface at 3.60m depth (TP dry upon completion)							

Pen. Resist. Blows/0.3m

● 50 mm Dia. Cone

○ Water Content %

Piezometer Construction



Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

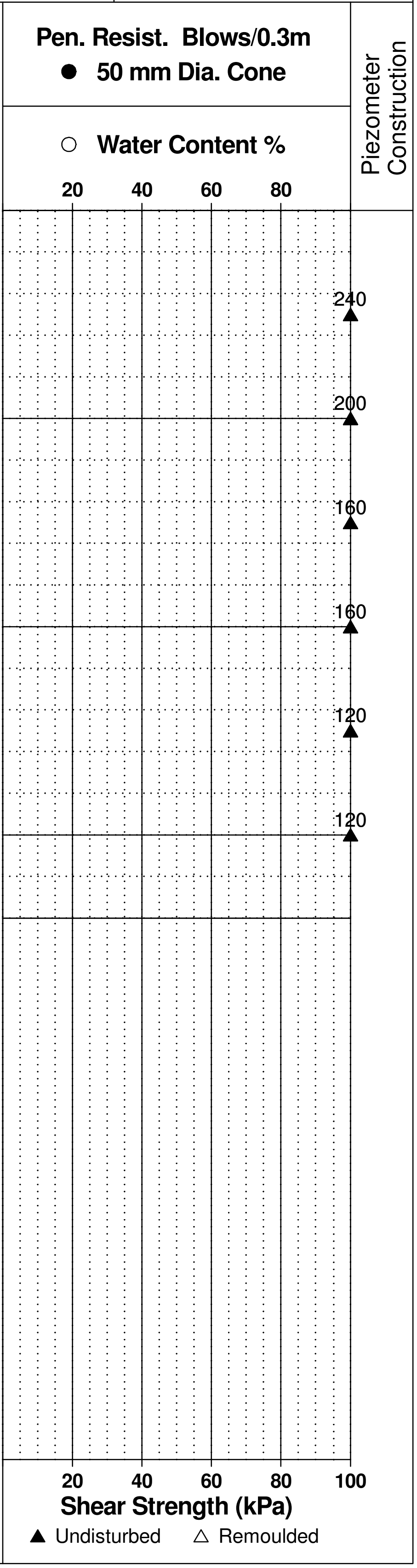
BORINGS BY Excavator

DATE November 16, 2021

FILE NO. PG4854

HOLE NO. TP18-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	66.96
TOPSOIL 0.20	■						
Hard to very stiff, brown **SILTY CLAY**	▨					1	65.96
						2	64.96
- grey by 2.5m depth		G	1				
3.40						3	63.96
End of Test Pit TP terminated on bedrock surface at 3.40m depth (TP dry upon completion)							



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator

DATE November 16, 2021

FILE NO. PG4854

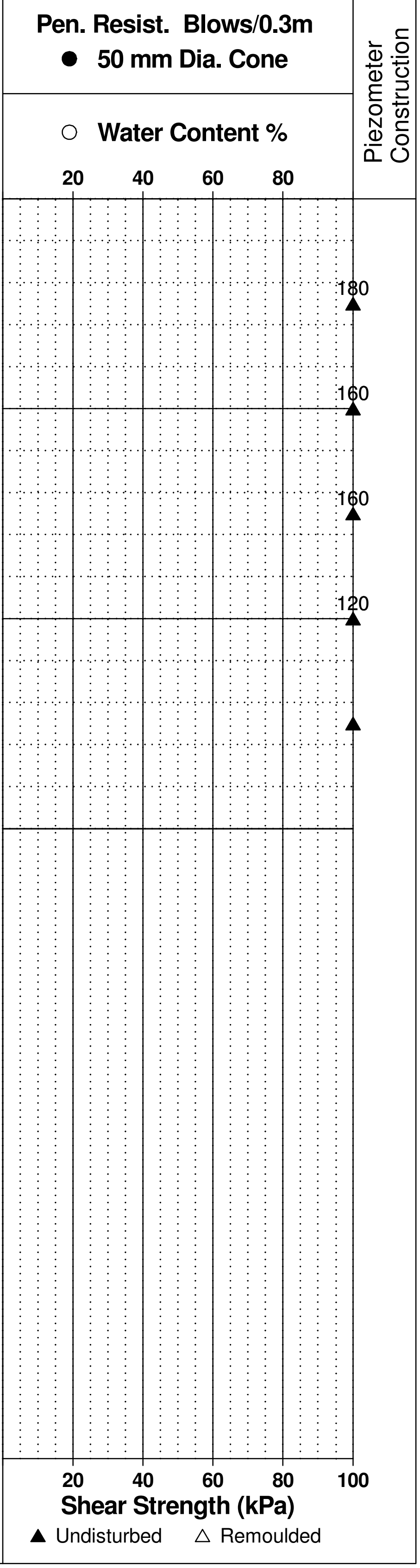
HOLE NO. TP19-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	67.17
TOPSOIL 0.20							
Very stiff, brown **SILTY CLAY**		G	1			1	66.17
						2	65.17
2.80							
GLACIAL TILL: Hard, brown silty clay, some sand and gravel 3.00		G	2			3	64.17

End of Test Pit

TP terminated on bedrock surface at 3.00m depth

(TP dry upon completion)



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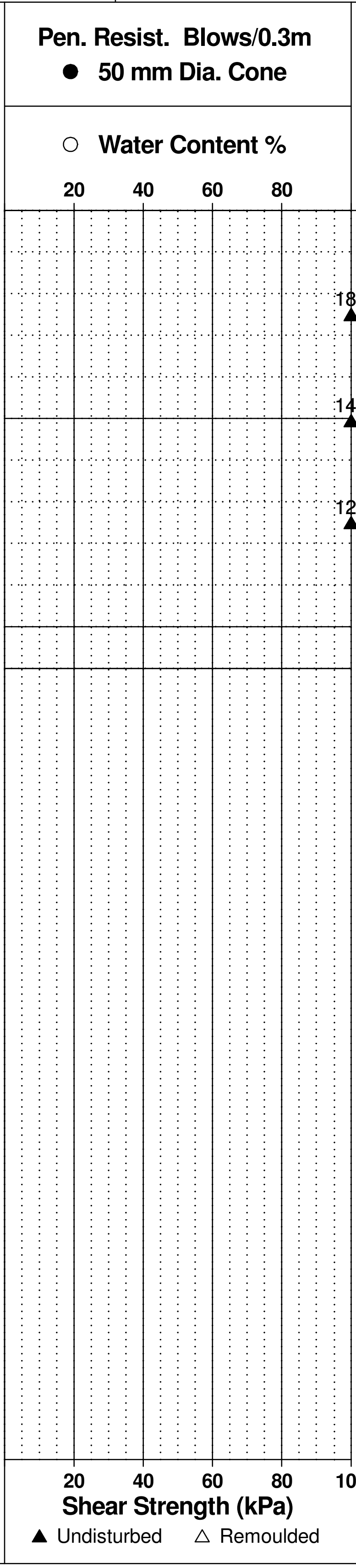
SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic
REMARKS
BORINGS BY Excavator
DATE November 16, 2021
FILE NO. PG4854
HOLE NO. TP20-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	67.24
Very stiff, brown **SILTY CLAY**							
						1	66.24
		G	1				
1.50							
GLACIAL TILL: Hard, brown silty clay, some sand and gravel, occasional cobbles and boulders		G	2				
						2	65.24
2.20							
End of Test Pit TP terminated on bedrock surface at 2.20m depth (TP dry upon completion)							



Piezometer Construction

SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

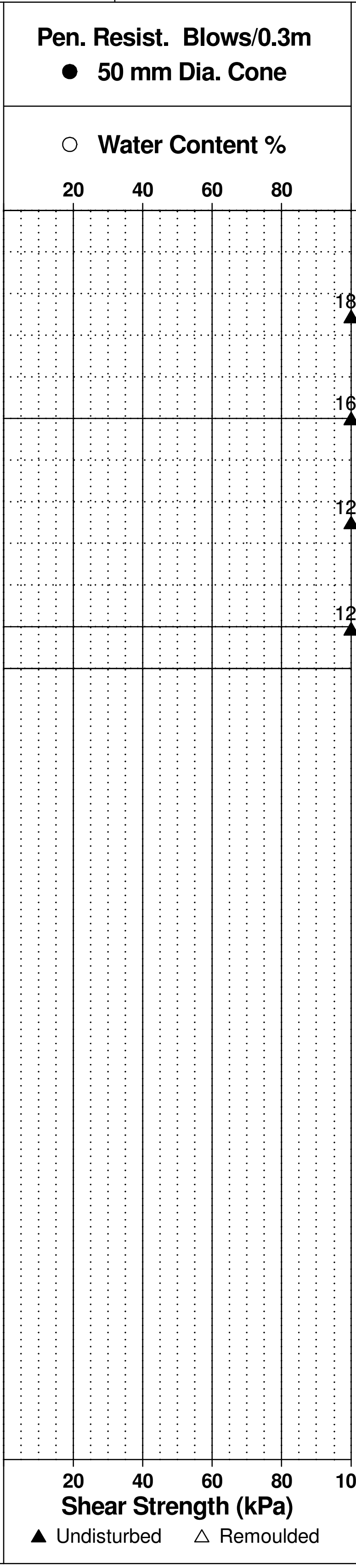
BORINGS BY Excavator

DATE November 16, 2021

FILE NO. PG4854

HOLE NO. TP21-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Piezometer Construction
GROUND SURFACE						0	66.87	
Very stiff, brown **SILTY CLAY**	▨	G	1			1	65.87	
2.00 **GLACIAL TILL:** Hard, brown silty clay, some sand and gravel, occasional cobbles and boulders		G	2			2	64.87	
2.20 End of Test Pit (TP dry upon completion)								



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

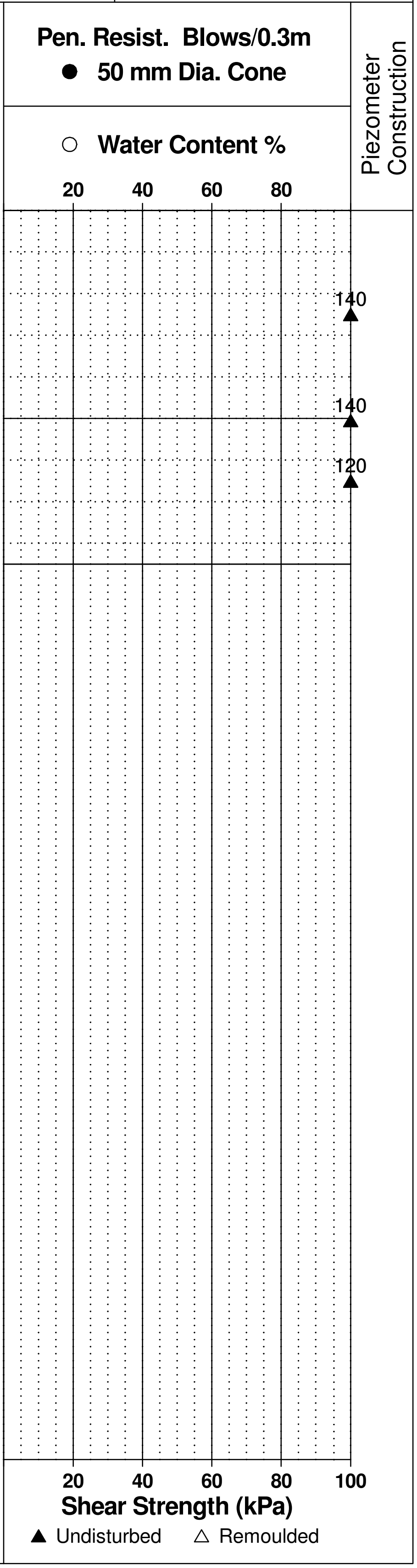
BORINGS BY Excavator

DATE November 16, 2021

FILE NO. PG4854

HOLE NO. TP22-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	67.16
Very stiff, brown **SILTY CLAY**	▨	G	1			1	66.16
1.40							
GLACIAL TILL: Hard, brown silty clay, some sand and gravel, occasional cobbles and boulders	^^^	G	2				
1.70							
End of Test Pit (TP dry upon completion)							



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator

DATE November 16, 2021

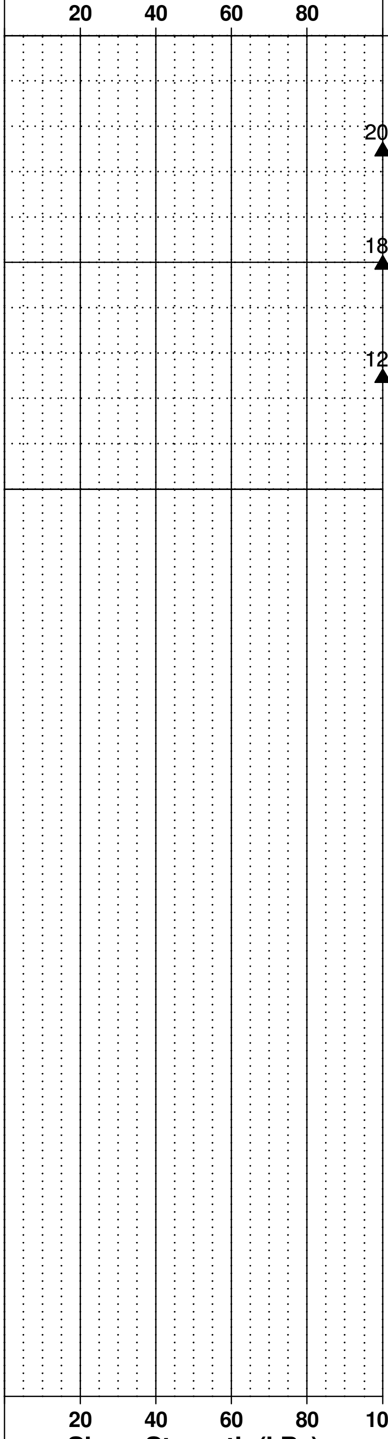
FILE NO. PG4854

HOLE NO. TP23-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Piezometer Construction
GROUND SURFACE						0	67.32	
Hard to very stiff, brown **SILTY CLAY**	▨	G	1			1	66.32	
1.80								
GLACIAL TILL: Hard, brown silty clay, some sand and gravel, occasional cobbles and boulders	^^^					2	65.32	
2.00								
End of Test Pit (TP dry upon completion)								

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %



Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG4854

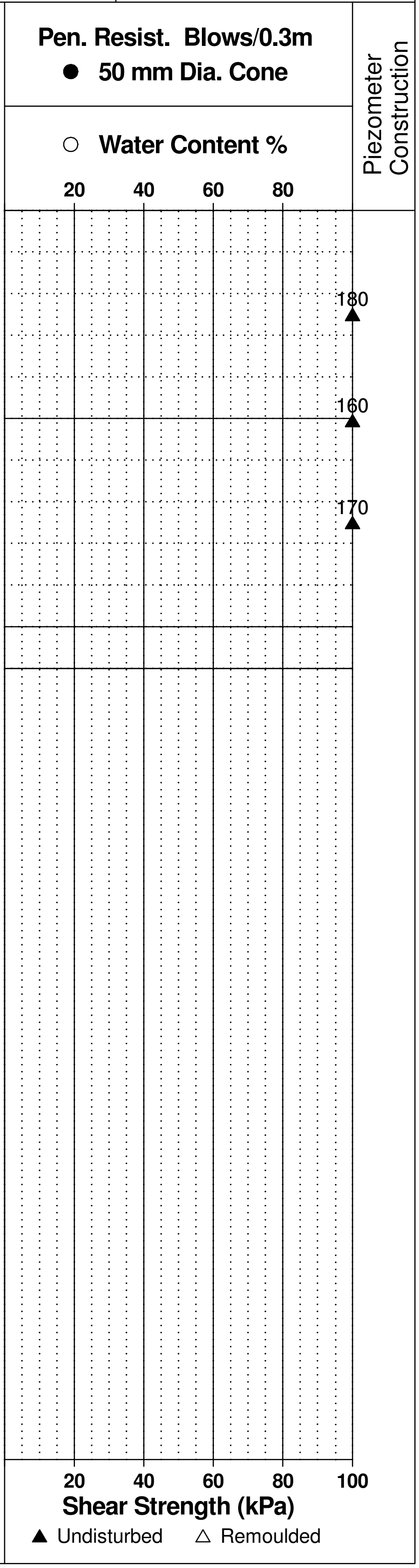
REMARKS

HOLE NO. TP24-21

BORINGS BY Excavator

DATE November 16, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	67.69
Very stiff, brown **SILTY CLAY**	▨	G	1			1	66.69
1.80 **GLACIAL TILL:** Hard, brown silty clay, some sand and gravel	^^^	G	2			2	65.69
2.20 End of Test Pit TP terminated on bedrock surface at 2.20m depth. (TP dry upon completion)							



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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG4854

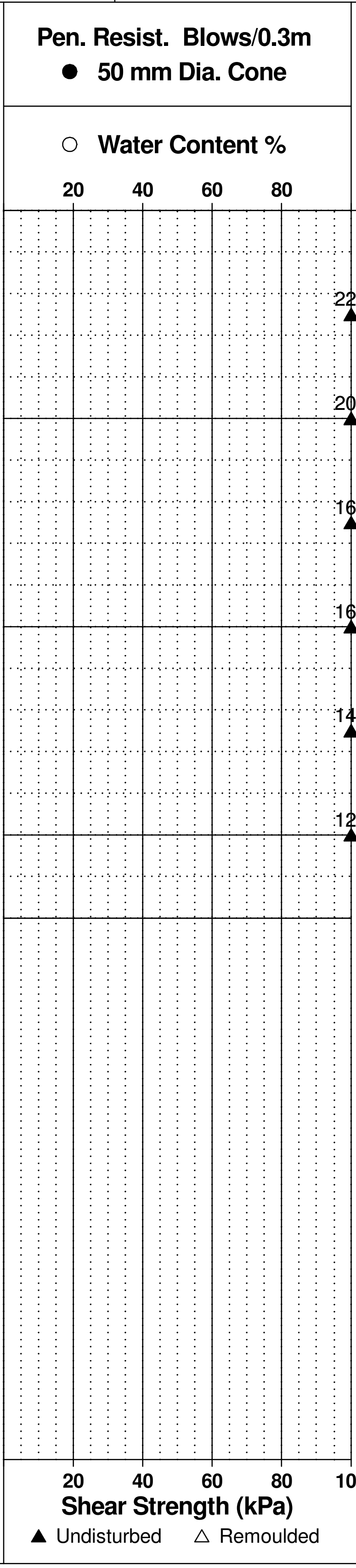
REMARKS

HOLE NO. TP25-21

BORINGS BY Excavator

DATE November 16, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	68.76
Loose to compact, brown **SILTY SAND** 0.40		G	1				
Hard to very stiff, brown **SILTY CLAY**		G	2			1	67.76
						2	66.76
3.20						3	65.76
GLACIAL TILL: Hard, brown silty clay, some sand and gravel, occasional cobbles and boulders 3.40							
End of Test Pit (TP dry upon completion)							



Piezometer Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG4854

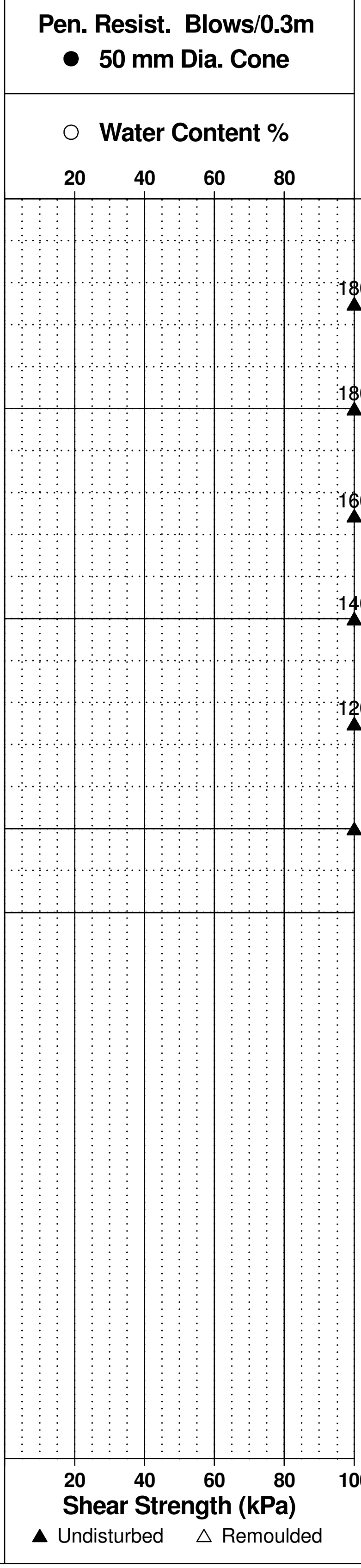
REMARKS

HOLE NO. TP26-21

BORINGS BY Excavator

DATE November 16, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	69.04
Loose to compact, brown **SILTY SAND** 0.30		G	1				
						1	68.04
Very stiff, brown **SILTY CLAY** 3.30		G	2				
						2	67.04
						3	66.04
GLACIAL TILL: Hard, brown silty clay, some sand and gravel, occasional cobbles and boulders 3.40							
End of Test Pit (TP dry upon completion)							



Piezometer Construction

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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

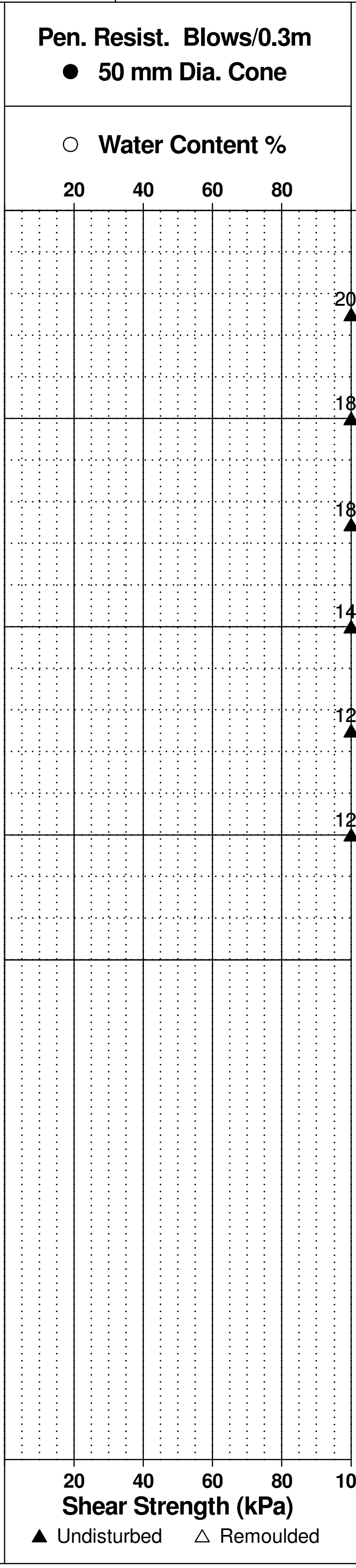
BORINGS BY Excavator

DATE November 16, 2021

FILE NO. PG4854

HOLE NO. TP27-21

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	69.72
Loose to compact, brown **SILTY SAND**	G	1				
0.50						
					1	68.72
Hard to very stiff, brown **SILTY CLAY**	G	2				
					2	67.72
					3	66.72
3.50						
GLACIAL TILL: Hard, brown silty clay, some sand and gravel						
3.60						
End of Test Pit (TP dry upon completion)						



Piezometer Construction

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SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. **PG4854**

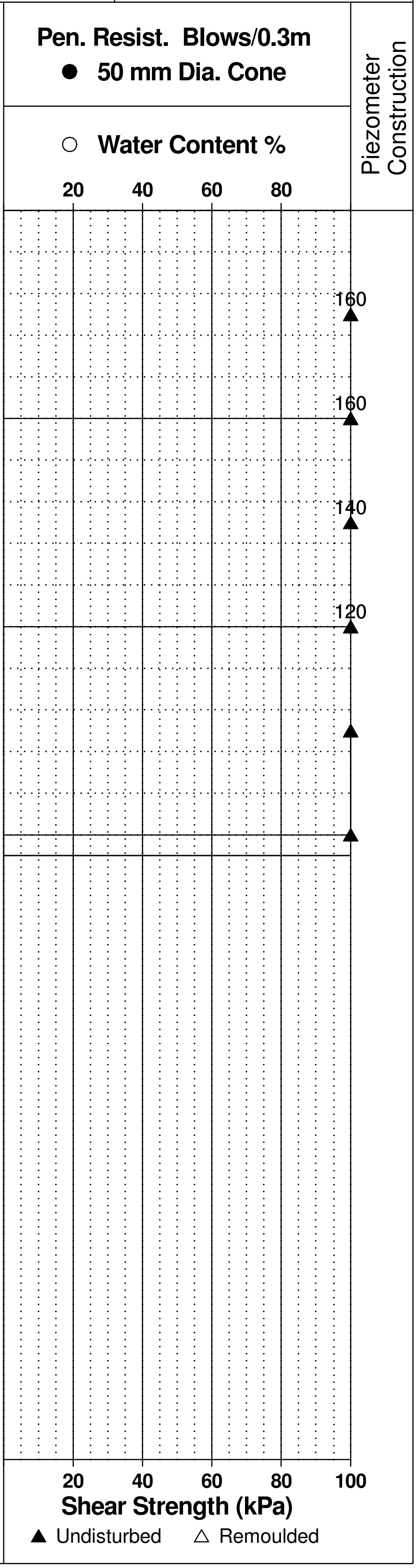
REMARKS

HOLE NO. **TP28-21**

BORINGS BY Excavator

DATE November 16, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	69.18
Loose to compact, brown **SILTY SAND** 0.30		G	1				
Very stiff, brown **SILTY CLAY**						1	68.18
		G	2			2	67.18
3.00						3	66.18
GLACIAL TILL: Hard, brown silty clay, some sand and gravel, occasional cobbles and boulders 3.10							
End of Test Pit (TP dry upon completion)							



SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Proposed Buildings A2 and B - 4055 Russell Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. **PG4854**

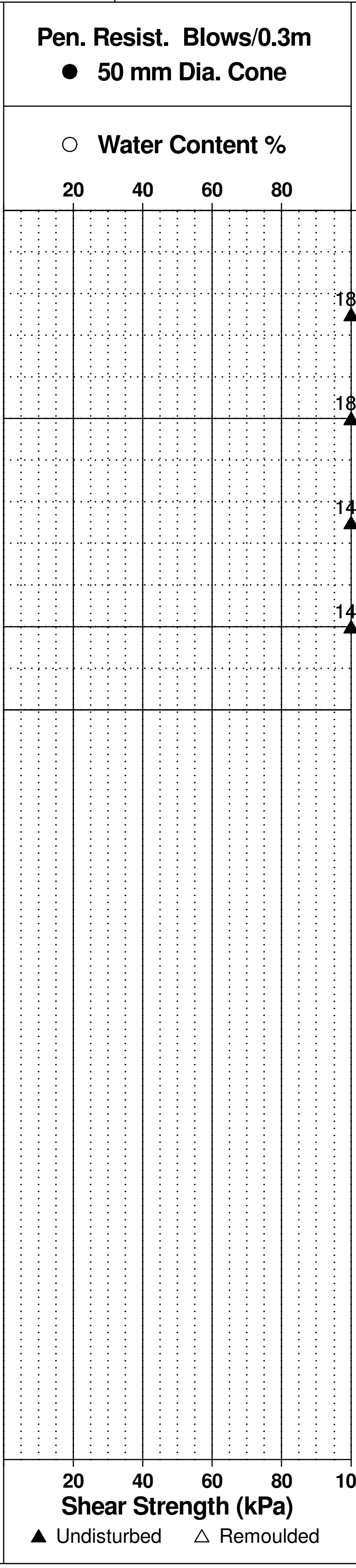
REMARKS

HOLE NO. **TP29-21**

BORINGS BY Excavator

DATE November 16, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Piezometer Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			
GROUND SURFACE						0	68.13	
Very stiff, brown **SILTY CLAY**		G	1			1	67.13	
2.10						2	66.13	
GLACIAL TILL: Hard, brown silty clay, some sand and gravel, occasional cobbles and boulders		G	2					
2.40								
End of Test Pit TP terminated on bedrock surface at 2.40m depth. (TP dry upon completion)								



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SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Proposed Commercial / Industrial Complex
4055 and 4120 Russell Road, Ottawa, Ontario

DATUM Ground surface elevations provided Annis, O'Sullivan, Vollebekk Ltd.

REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 August 28

FILE NO. PG4854

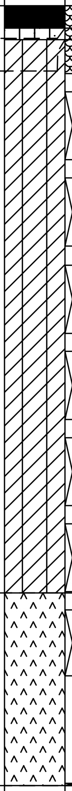
HOLE NO. BH 1

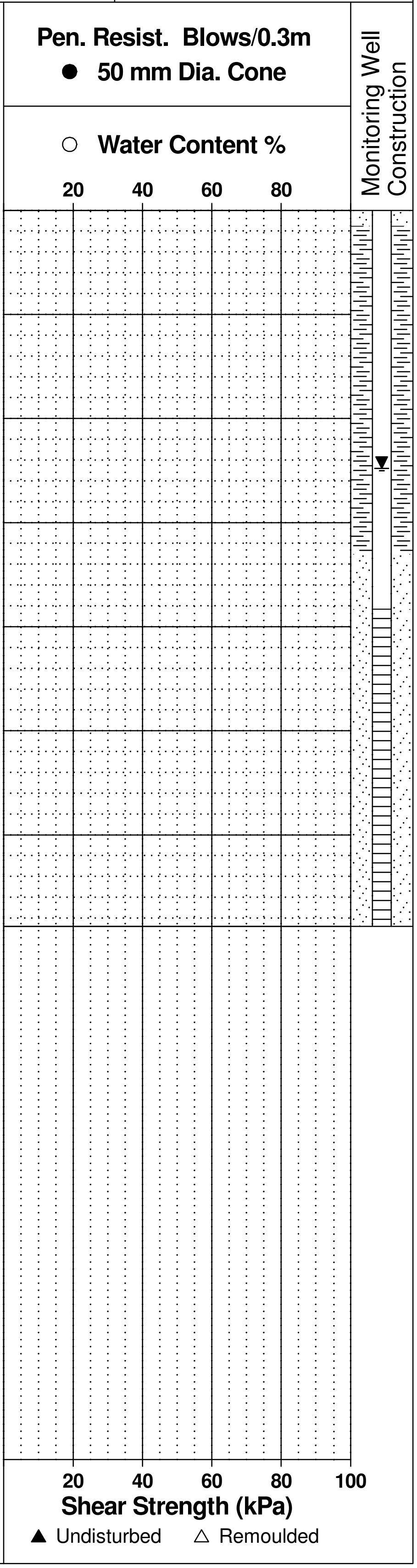
SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	69.48
TOPSOIL 0.20	AU	1				
Brown **SILTY SAND** 0.30						
Brown **SILTY CLAY**	SS	2	38	5	1	68.48
	SS	3	100	5	2	67.48
	SS	4	100	4		
- grey by 3.0m depth	SS	5	100	3	3	66.48
	SS	6	100	3	4	65.48
5.18	SS	7	62	6	5	64.48
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles and boulders	SS	8	43	8	6	63.48
6.88	SS	9	100	50+		

End of Borehole

Practical refusal to augering at 6.88m depth

(GWL @ 2.48m - Sept. 18, 2019)





SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Proposed Commercial / Industrial Complex
4055 and 4120 Russell Road, Ottawa, Ontario

DATUM Ground surface elevations provided Annis, O'Sullivan, Vollebekk Ltd.

REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 August 28

FILE NO. PG4854

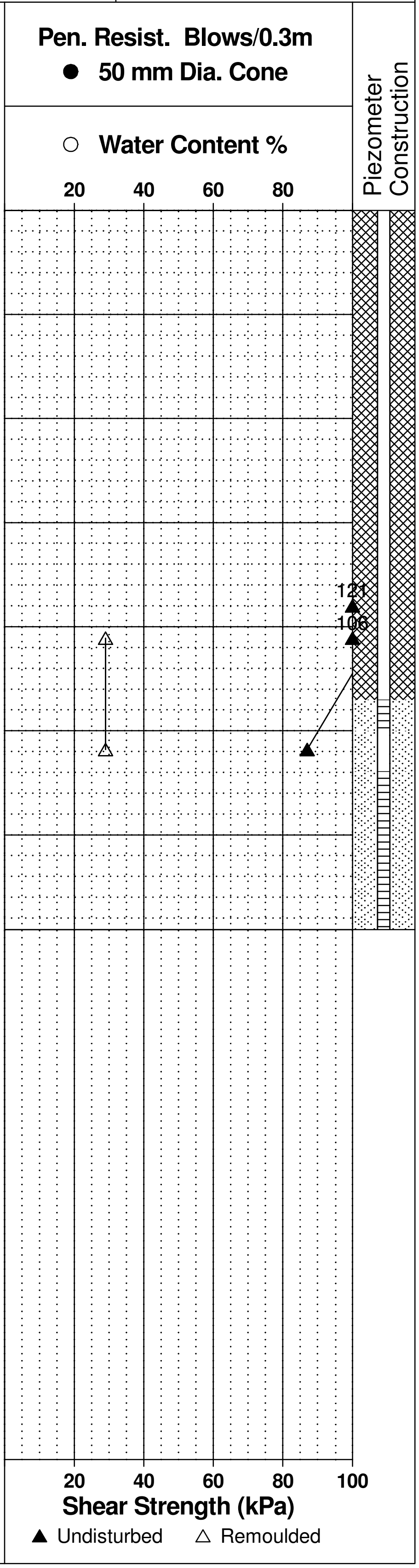
HOLE NO. BH 2

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	69.43
TOPSOIL 0.15						
Loose, brown **SILTY SAND**	AU	1				
1.01	SS	2	83	5	1	68.43
Very stiff to stiff, brown **SILTY CLAY**	SS	3	100	4	2	67.43
	SS	4	100	2	3	66.43
- grey by 3.8m depth	SS	5	100	2		
	SS	6	100	2	4	65.43
5.20					5	64.43
GLACIAL TILL: Grey silty clay with gravel, cobbles and boulders	SS	7	17	15	6	63.43
	SS	8	100	55		
6.91	SS	9	100	50+		

End of Borehole

Practical refusal to augering at 6.91m depth

(Piezometer inaccessible - Sept. 7, 2019)



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SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Proposed Commercial / Industrial Complex
4055 and 4120 Russell Road, Ottawa, Ontario

DATUM Ground surface elevations provided Annis, O'Sullivan, Vollebekk Ltd.

REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 August 28

FILE NO. PG4854

HOLE NO. BH 3

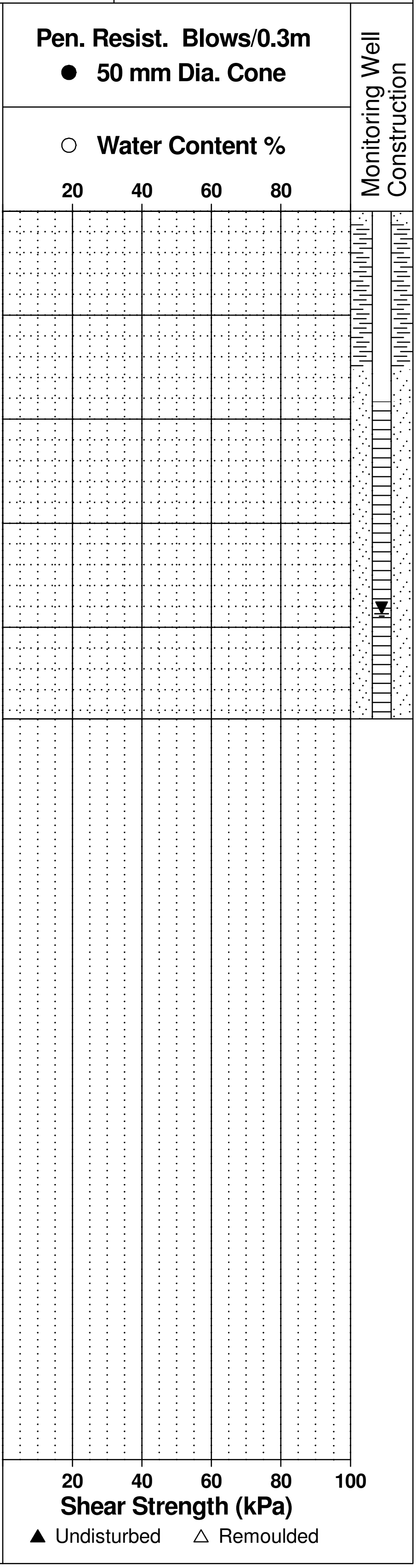
SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE				
Brown **SILTY SAND** with gravel 0.28	AU	1		
Loose, brown **SILTY SAND** 2.90	SS	2	50	8
	SS	3	58	10
	SS	4	54	2
GLACIAL TILL: Grey silty sand with gravel, cobbles, boulders, trace clay 4.88	SS	5	42	12
	SS	6	54	24
	SS	7	67	50+

DEPTH (m)	ELEV. (m)
0	71.57
1	70.57
2	69.57
3	68.57
4	67.57

End of Borehole

Practical refusal to augering at 4.88m depth

(GWL @ 3.87m - Sept. 18, 2019)



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Proposed Commercial / Industrial Complex
4055 and 4120 Russell Road, Ottawa, Ontario

DATUM Ground surface elevations provided Annis, O'Sullivan, Vollebekk Ltd.

REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 August 29

FILE NO. PG4854

HOLE NO. BH 4

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	67.49		
TOPSOIL 0.18		AU	1						
Loose to compact, brown **SILTY SAND**		SS	2	96	8	1	66.49		
2.13		SS	3	100	21	2	65.49		
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders		SS	4	83	17				
3.12		SS	5	100	50+	3	64.49		

End of Borehole

Practical refusal to augering at 3.12m depth

(Piezometer inadequate - Sept. 7, 2019)

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Proposed Commercial / Industrial Complex
4055 and 4120 Russell Road, Ottawa, Ontario

DATUM Ground surface elevations provided Annis, O'Sullivan, Vollebekk Ltd.

REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 August 29

FILE NO. PG4854

HOLE NO. BH 5

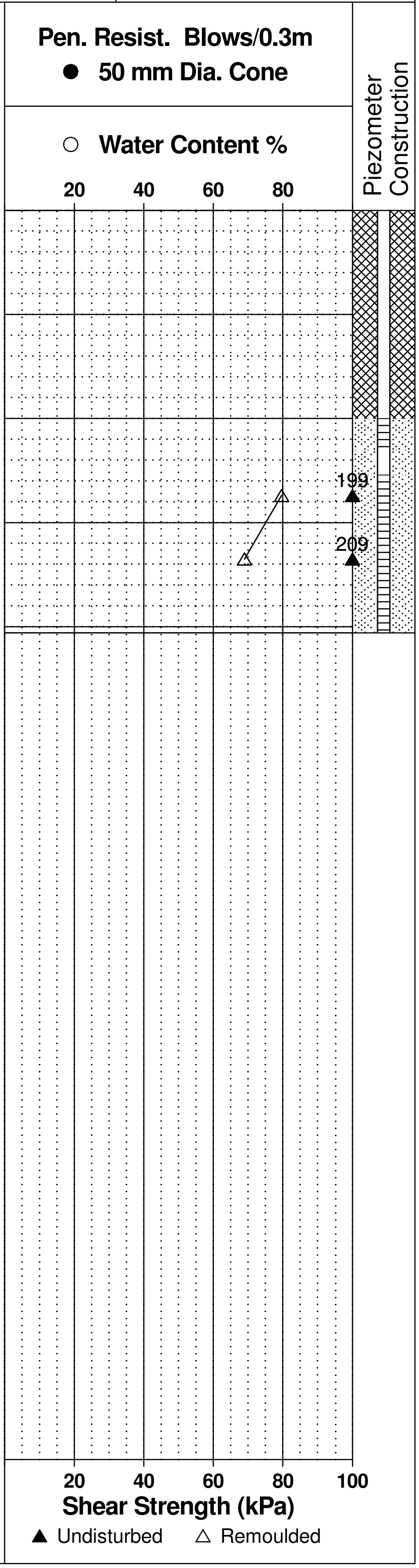
SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE				
TOPSOIL 0.13	AU	1		
Compact, brown **SILTY SAND** 1.37	SS	2	62	11
Very stiff to hard, brown **SILTY CLAY** 3.66	SS	3	100	7
GLACIAL TILL: Brown silty clay with gravel, some cobbles, boulders 4.06	SS	4	60	50+

DEPTH (m)	ELEV. (m)
0	68.91
1	67.91
2	66.91
3	65.91
4	64.91

End of Borehole

Practical refusal to augering at 4.06m depth

(Piezometer inaccessible - Sept. 7, 2019)



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Proposed Commercial / Industrial Complex
4055 and 4120 Russell Road, Ottawa, Ontario

DATUM Ground surface elevations provided Annis, O'Sullivan, Vollebekk Ltd.

REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 August 29

FILE NO. PG4854

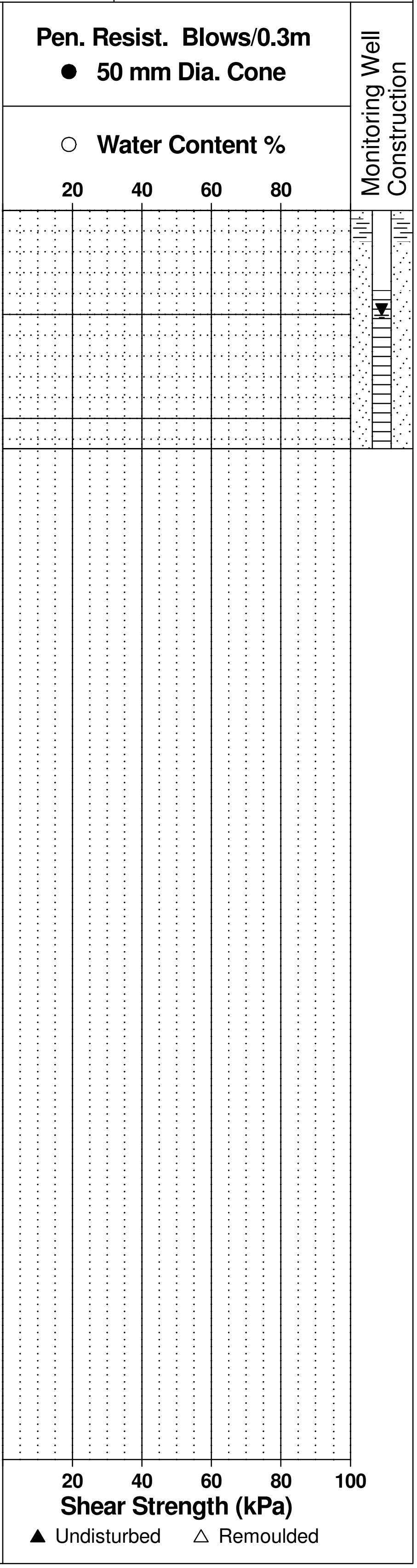
HOLE NO. BH 6

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	70.60
TOPSOIL 0.20		AU	1				
Compact, brown **SILTY SAND** 1.37		SS	2	75	10	1	69.60
Grey **SILTY CLAY** 2.13		SS	3	92	5	2	68.60
GLACIAL TILL: Grey silty sand with gravel, cobbles, boulders 2.29							

End of Borehole

Practical refusal to augering at 2.29m depth

(GWL @ 1.01m - Sept. 18, 2019)



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Proposed Commercial / Industrial Complex
4055 and 4120 Russell Road, Ottawa, Ontario

DATUM Ground surface elevations provided Annis, O'Sullivan, Vollebekk Ltd.

REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 August 29

FILE NO. PG4854

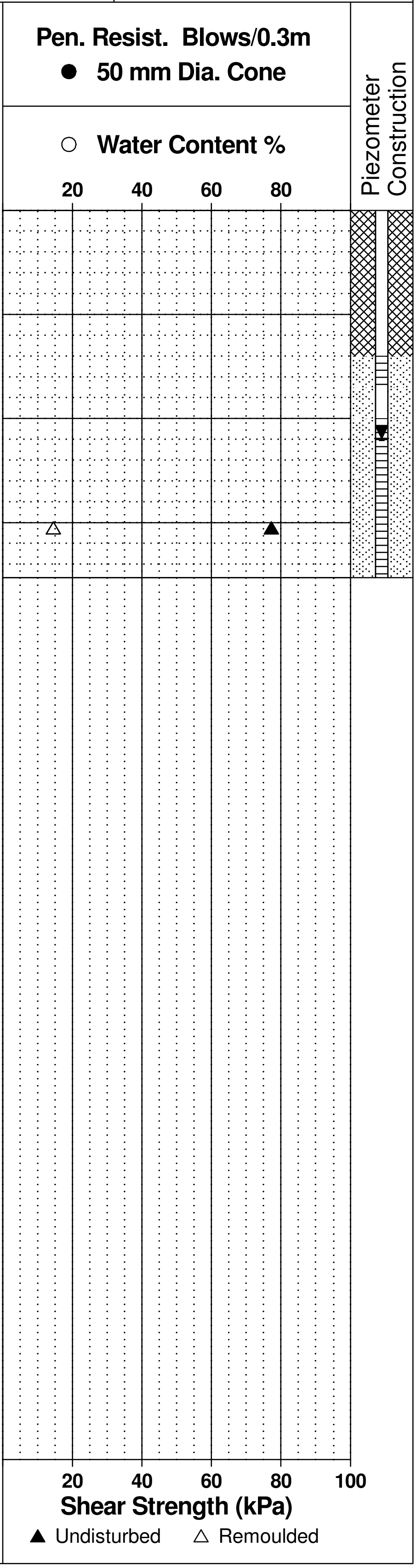
HOLE NO. BH 7

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	71.39
TOPSOIL 0.20	AU	1				
Loose, brown **SILTY SAND**	SS	2	67	6	1	70.39
	SS	3	79	8	2	69.39
2.29						
Stiff, grey **SILTY CLAY**	SS	4	96	1	3	68.39
3.53						

End of Borehole

Practical refusal to augering at 3.53m depth

(GWL @ 2.19m - Sept. 27, 2019)



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Proposed Commercial / Industrial Complex
4055 and 4120 Russell Road, Ottawa, Ontario

DATUM Ground surface elevations provided Annis, O'Sullivan, Vollebekk Ltd.

FILE NO. PG4854

REMARKS

HOLE NO. BH 8

BORINGS BY CME 55 Power Auger

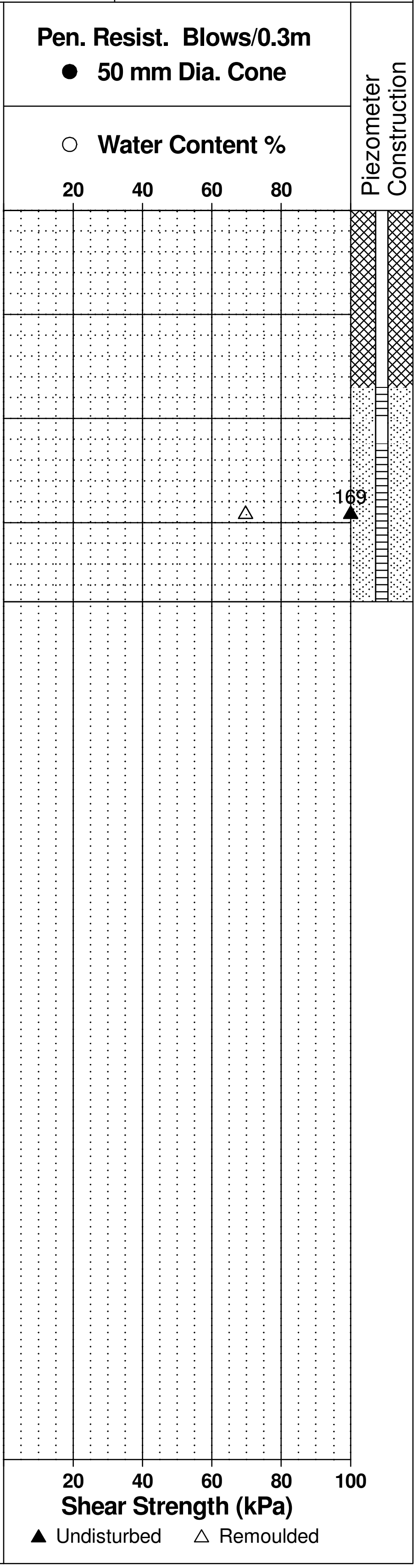
DATE 2019 August 29

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	68.59
TOPSOIL 0.23	AU	1				
Very stiff, brown **SILTY CLAY**	SS	2	75	8	1	67.59
- grey by 1.5m depth	SS	3	100	4	2	66.59
2.90					3	65.59
GLACIAL TILL: Grey silty clay, trace gravel, cobbles and boulders 3.76	SS	4	75	3		

End of Borehole

Practical refusal to augering at 3.76m depth

(Piezometer dry - Sept. 27, 2019)



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Proposed Commercial / Industrial Complex
4055 and 4120 Russell Road, Ottawa, Ontario

DATUM Ground surface elevations provided Annis, O'Sullivan, Vollebekk Ltd.

REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 August 29

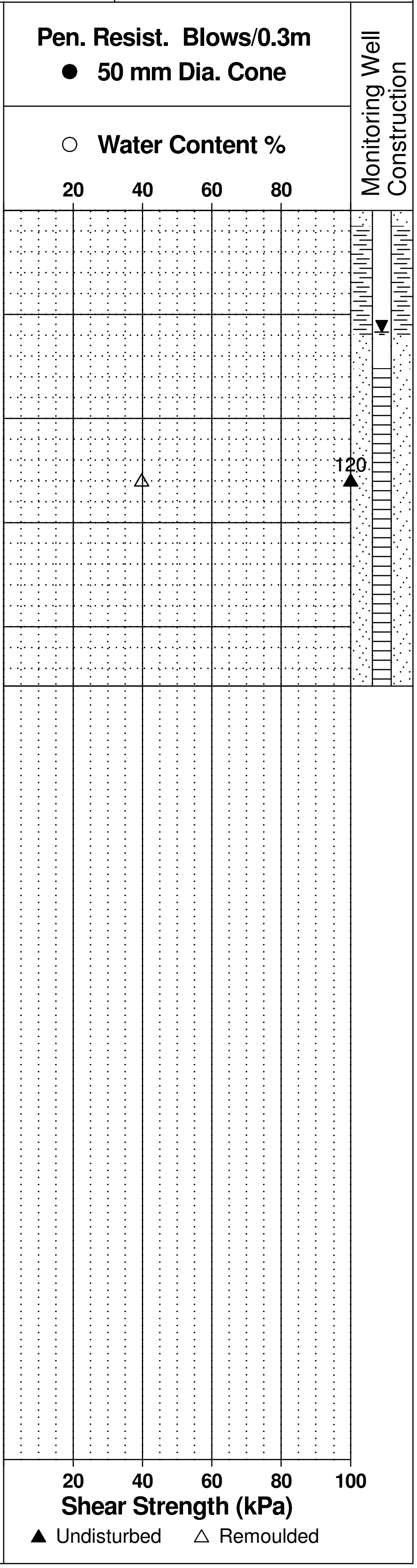
FILE NO. PG4854

HOLE NO. BH 9

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	70.95
TOPSOIL 0.25		AU	1				
Loose, brown **SILTY SAND**		SS	2	46	9	1	69.95
1.52							
Very stiff to stiff, grey **SILTY CLAY**		SS	3	75	3	2	68.95
		SS	4	100	1	3	67.95
		SS	5	100	1	4	66.95
		SS	6	100	1		
4.57							

End of Borehole

(GWL @ 1.17m - Sept. 18, 2019)



SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Proposed Commercial / Industrial Complex
4055 and 4120 Russell Road, Ottawa, Ontario

DATUM Ground surface elevations provided Annis, O'Sullivan, Vollebekk Ltd.

REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 August 29

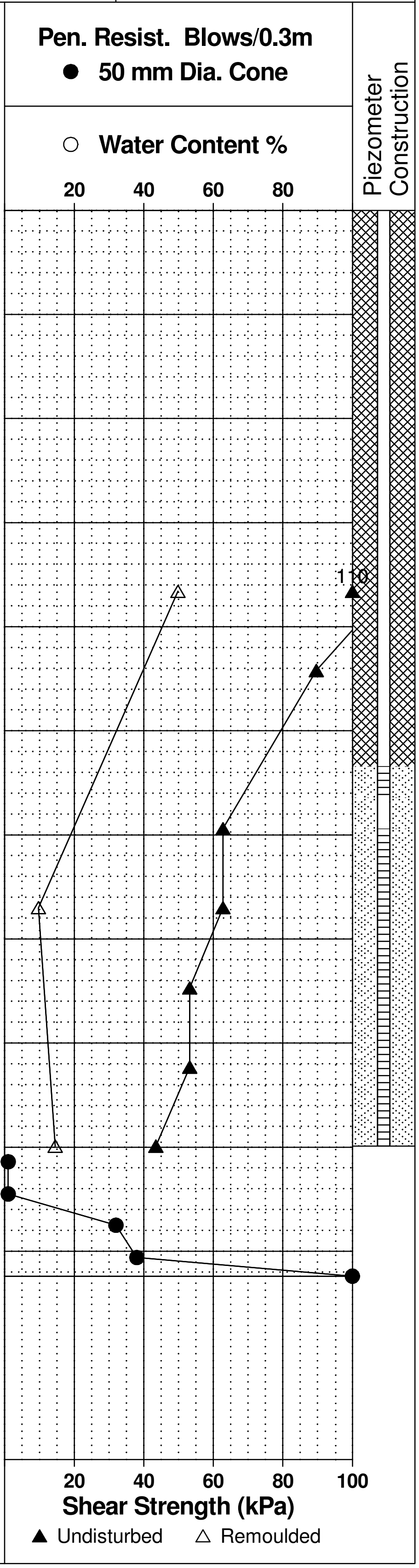
FILE NO. PG4854

HOLE NO. BH10

SOIL DESCRIPTION	
GROUND SURFACE	
TOPSOIL	0.15
Compact, brown **SILTY SAND**	1.52
Very stiff to stiff, grey **SILTY CLAY** - firm by 8.4m depth	8.99
Dynamic Cone Penetration Test commenced at 8.99m depth.	10.24
End of Borehole Practical DCPT refusal at 10.24m depth (Piezometer blocked - Sept. 27, 2019)	

SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
AU	1		
SS	2	54	10
SS	3	83	6
SS	4	100	2
SS	5	100	1

DEPTH (m)	ELEV. (m)
0	70.69
1	69.69
2	68.69
3	67.69
4	66.69
5	65.69
6	64.69
7	63.69
8	62.69
9	61.69
10	60.69



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Proposed Commercial / Industrial Complex
4055 and 4120 Russell Road, Ottawa, Ontario

DATUM Ground surface elevations provided Annis, O'Sullivan, Vollebekk Ltd.

REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 August 30

FILE NO. PG4854

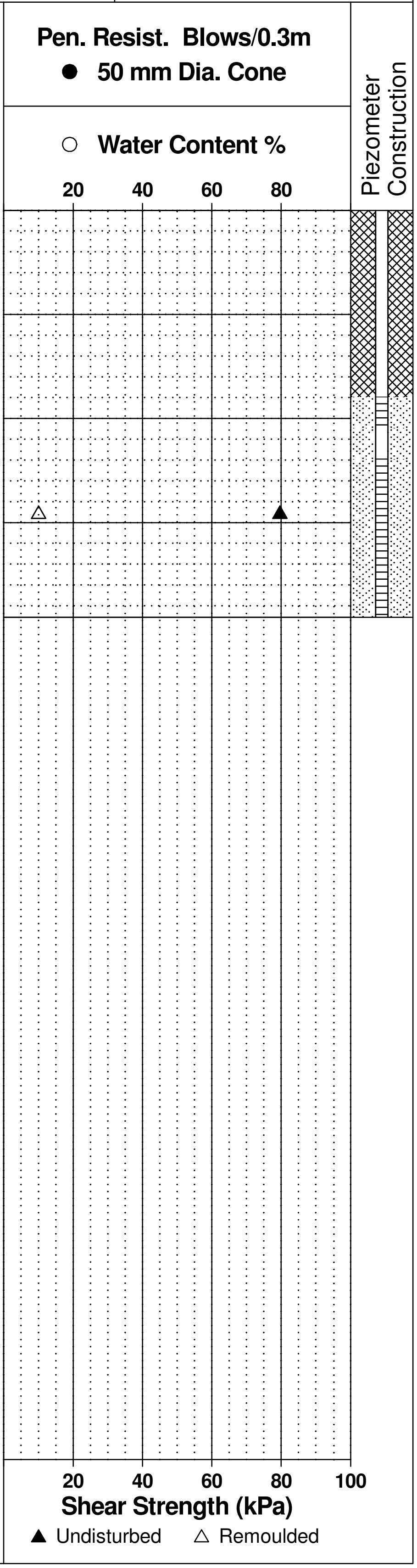
HOLE NO. BH11

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	66.78
TOPSOIL 0.15	AU	1				
Very stiff to stiff, brown **SILTY CLAY**	SS	2	88	8	1	65.78
- grey by 1.5m depth	SS	3	92	4	2	64.78
3.05					3	63.78
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles, boulders	SS	4	100	12		
3.91	SS	5	0	50+		

End of Borehole

Practical refusal to augering at 3.91m depth

(Piezometer blocked - Sept. 27, 2019)



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 x 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)

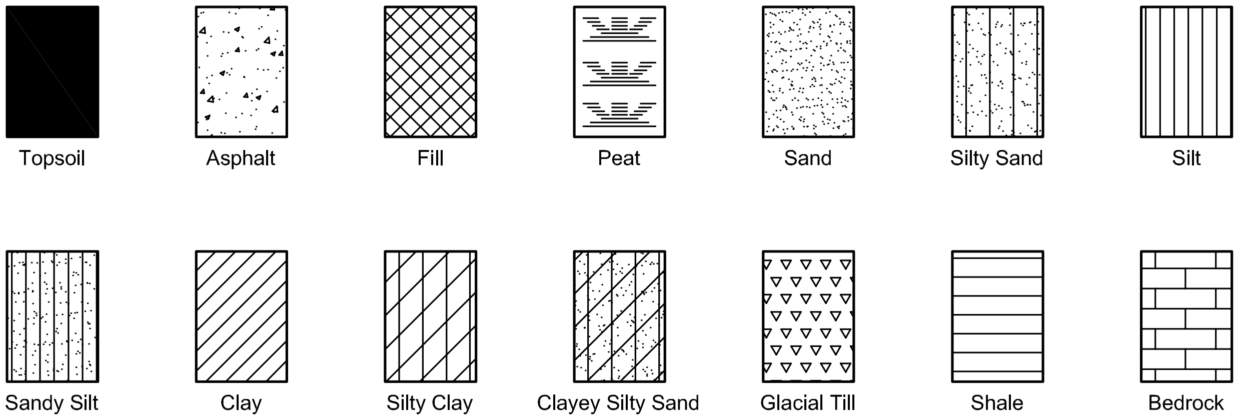
OC Ratio Overconsolidaton ratio = p'_c / p'_o
Void Ratio Initial sample void ratio = volume of voids / volume of solids
Wo - Initial water content (at start of consolidation test)

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.

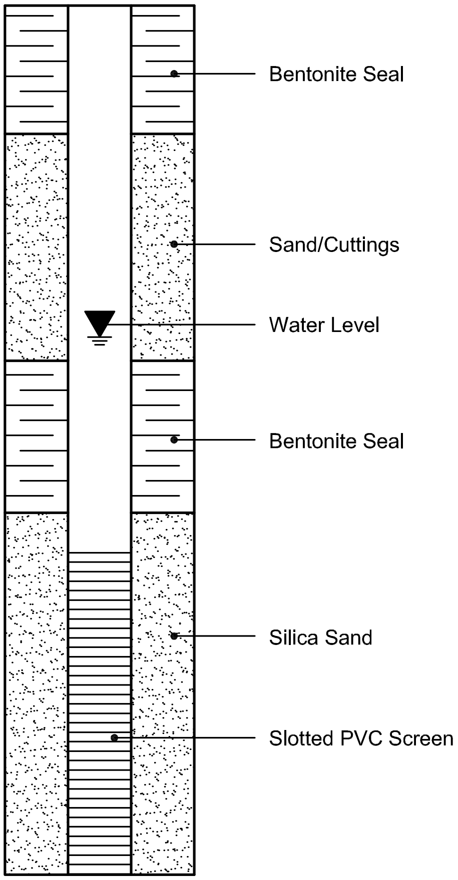
SYMBOLS AND TERMS (continued)

STRATA PLOT

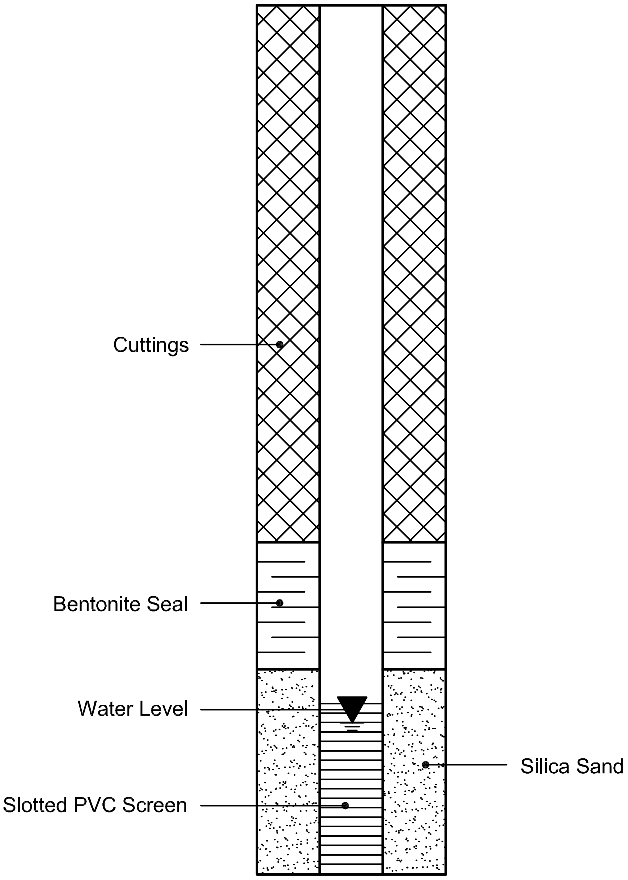


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27100

Report Date: 03-Oct-2019

Order Date: 30-Sep-2019

Project Description: PG4854

	Client ID:	BH2 5'-7'	BH3 5'-7'	-	-
	Sample Date:	27-Sep-19 11:00	27-Sep-19 11:00	-	-
	Sample ID:	1940105-01	1940105-02	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	74.8	77.0	-	-
General Inorganics					
pH	0.05 pH Units	6.72	6.79	-	-
Resistivity	0.10 Ohm.m	18.3	64.3	-	-
Anions					
Chloride	5 ug/g dry	199	14	-	-
Sulphate	5 ug/g dry	71	34	-	-

APPENDIX 2

FIGURE 1 - KEY PLAN

FIGURES 2 & 3 - SEISMIC SHEAR WAVE VELOCITY PROFILES

FIGURES 4 & 5 - SLOPE STABILITY ANALYSIS SECTIONS

DRAWINGS PG4854-7 - TEST HOLE LOCATION PLAN

DRAWING PG4854-8 - PERMISSIBLE GRADE RAISE PLAN

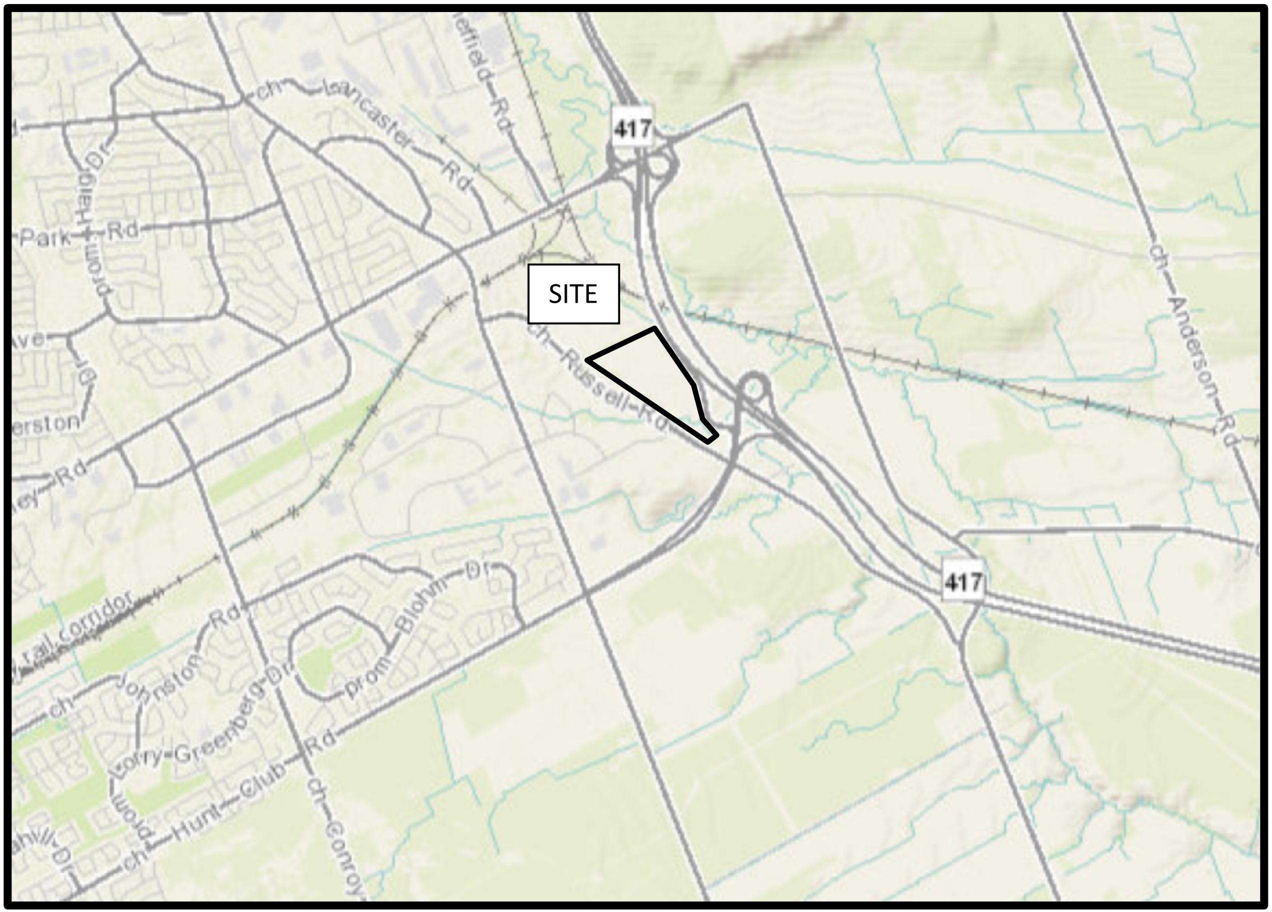


FIGURE 1

KEY PLAN

PATERSON
GROUP

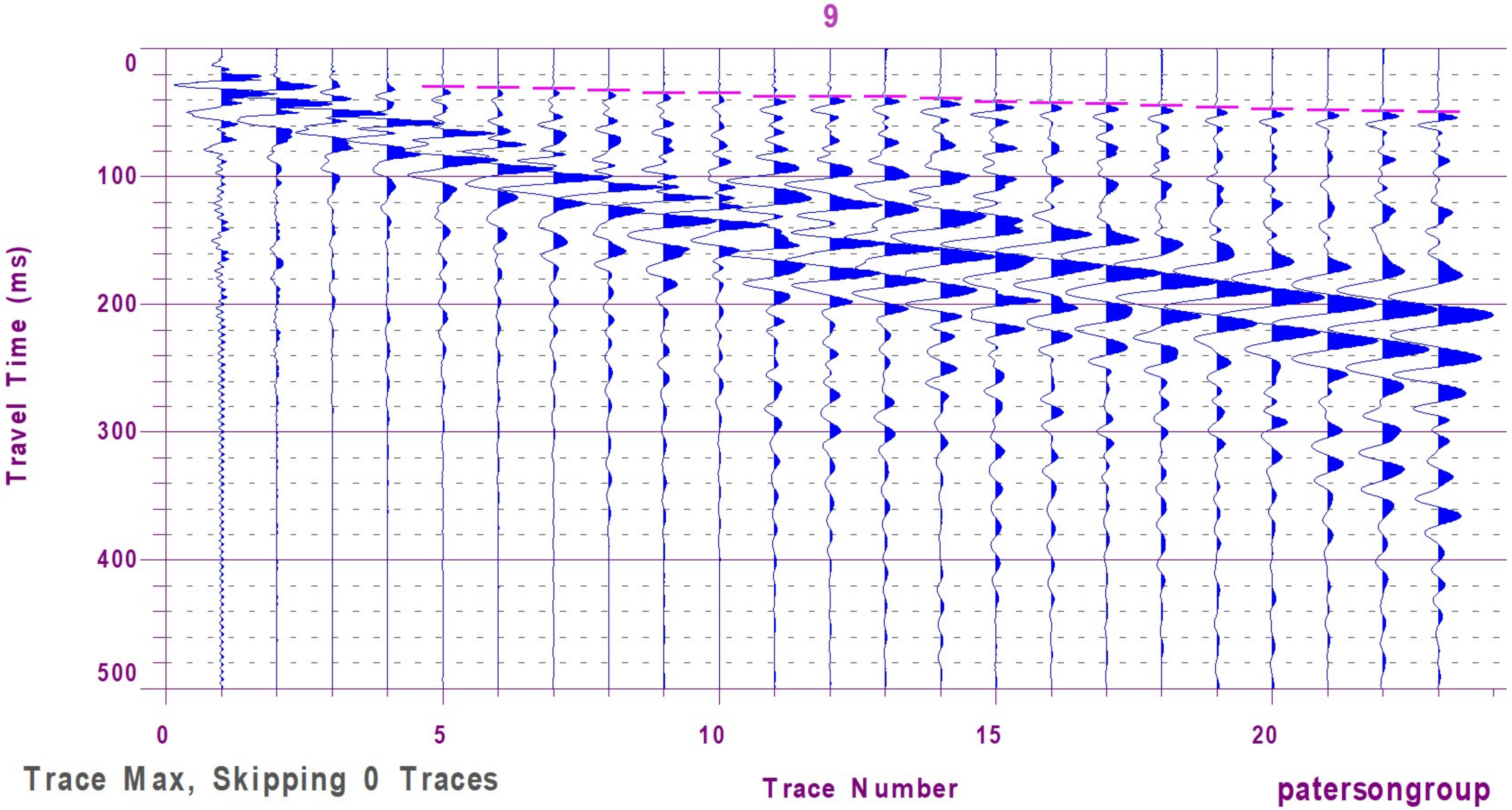


Figure 2 – Shear Wave Velocity Profile at Shot Location -2 m

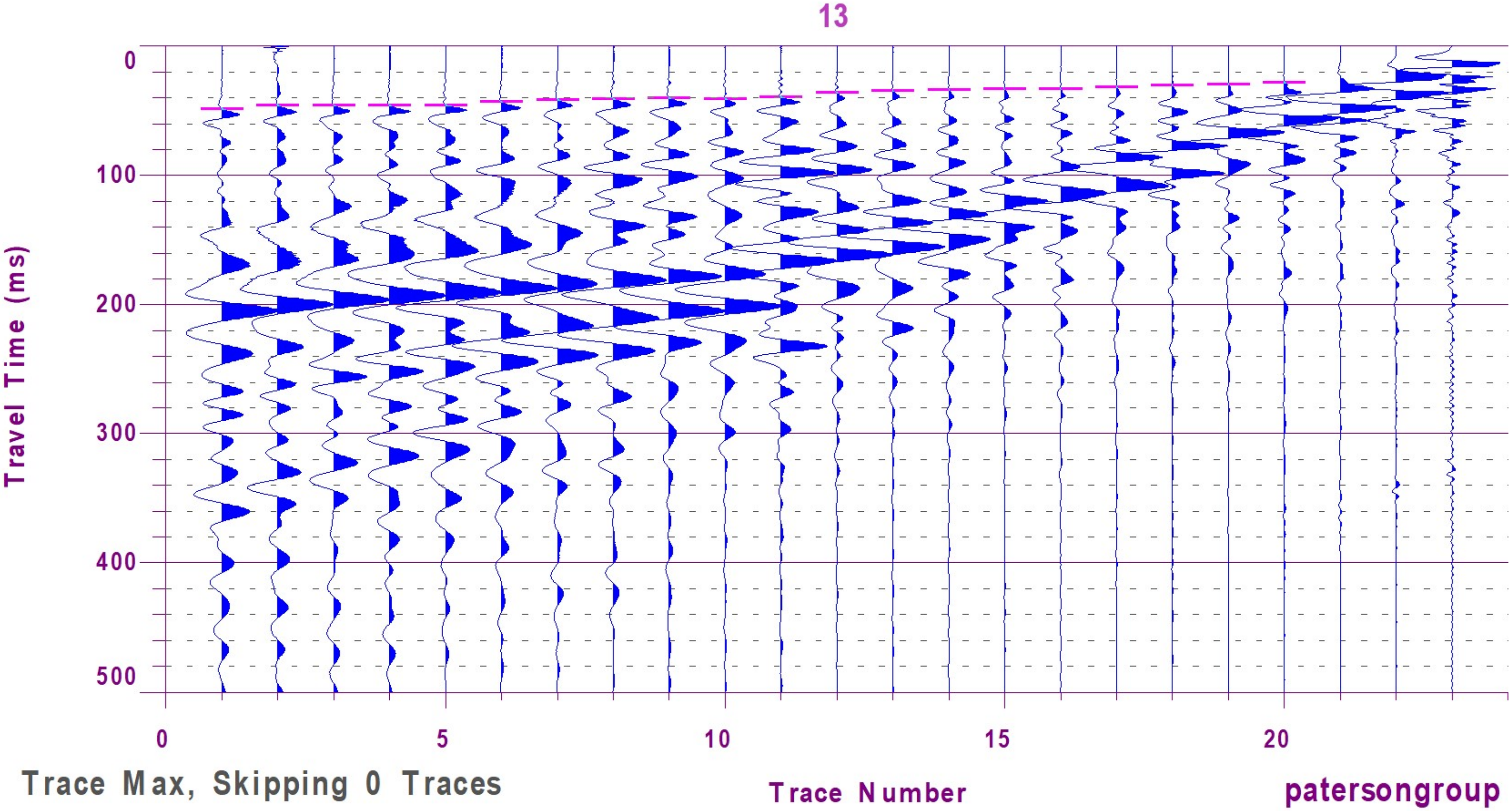
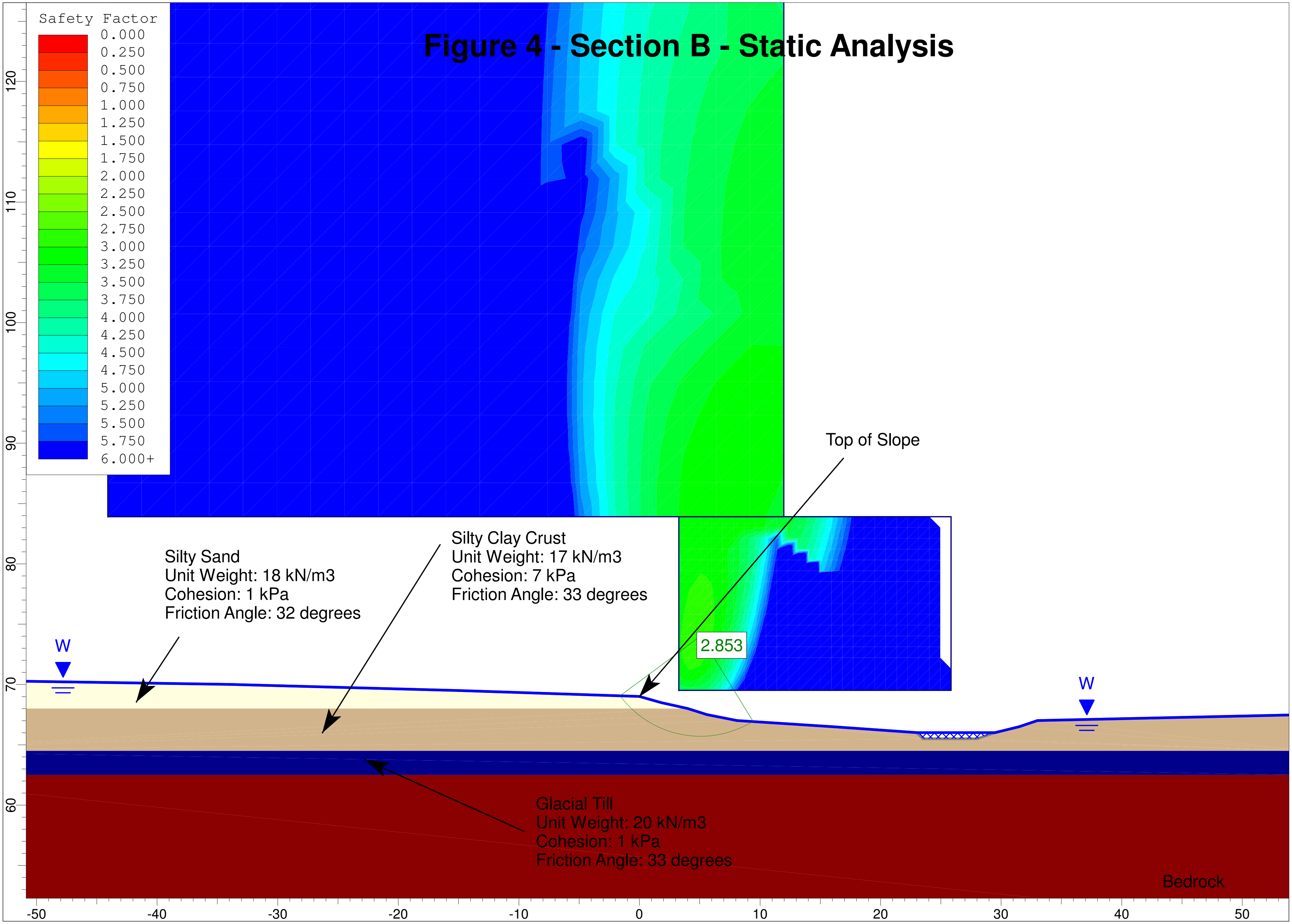


Figure 3 – Shear Wave Velocity Profile at Shot Location 48 m

Figure 4 - Section B - Static Analysis



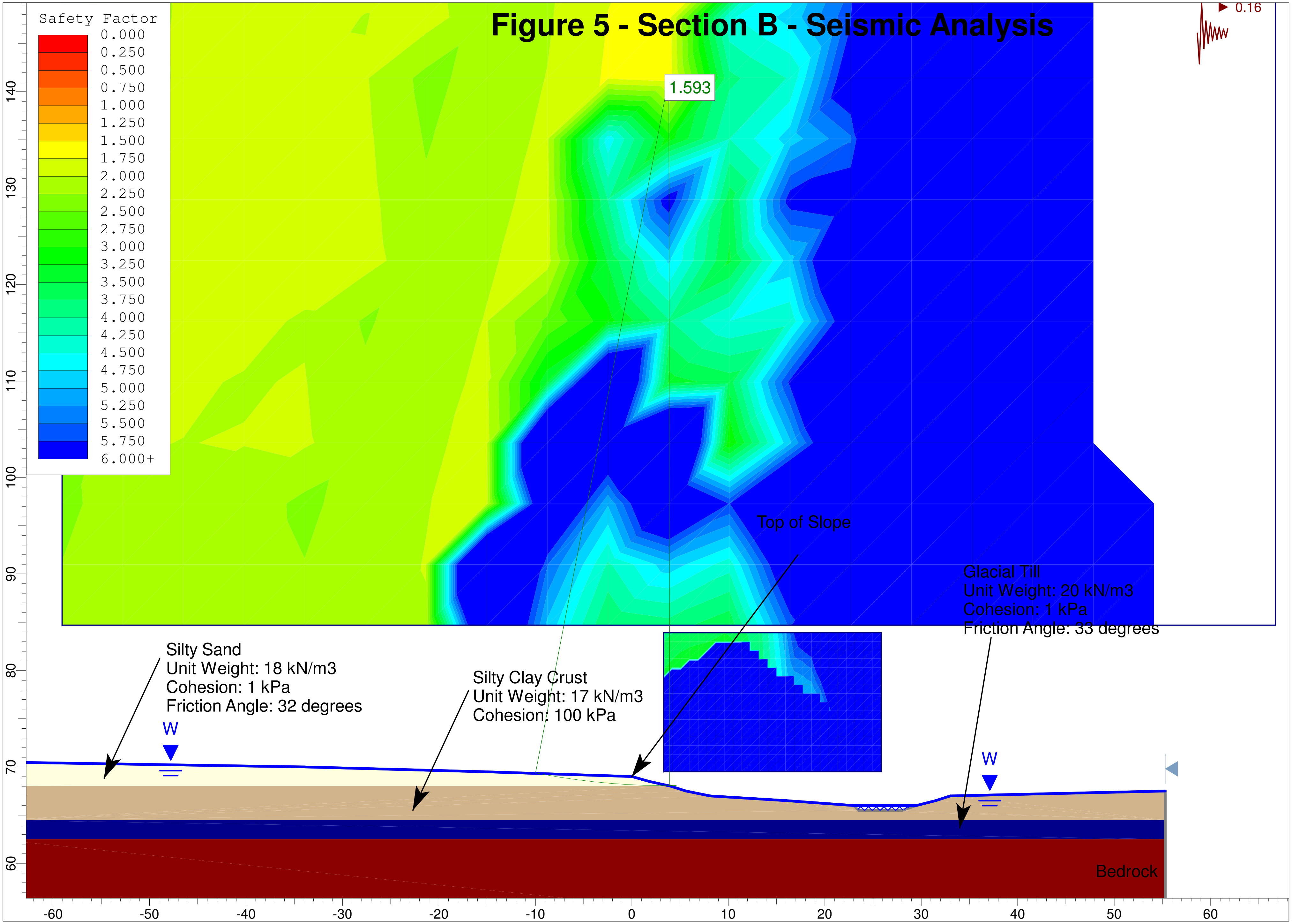
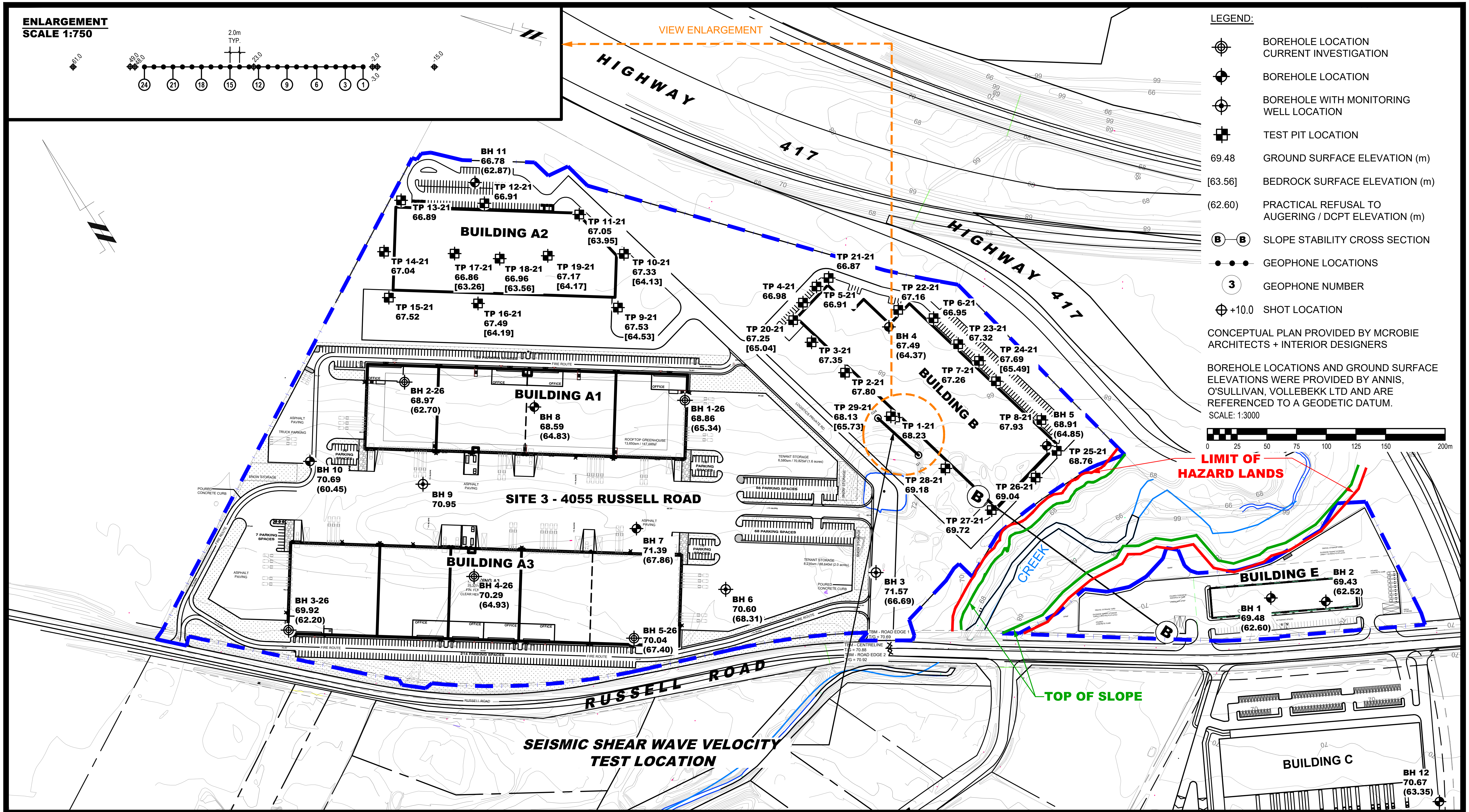


Figure 5 - Section B - Seismic Analysis



LEGEND:

⊕	BOREHOLE LOCATION CURRENT INVESTIGATION
⊕	BOREHOLE LOCATION
⊕	BOREHOLE WITH MONITORING WELL LOCATION
▨	TEST PIT LOCATION
69.48	GROUND SURFACE ELEVATION (m)
[63.56]	BEDROCK SURFACE ELEVATION (m)
(62.60)	PRACTICAL REFUSAL TO AUGERING / DCPT ELEVATION (m)
B—B	SLOPE STABILITY CROSS SECTION
● ● ●	GEOPHONE LOCATIONS
③	GEOPHONE NUMBER
⊕ +10.0	SHOT LOCATION

CONCEPTUAL PLAN PROVIDED BY MCROBIE ARCHITECTS + INTERIOR DESIGNERS

BOREHOLE LOCATIONS AND GROUND SURFACE ELEVATIONS WERE PROVIDED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD AND ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:3000

0 25 50 75 100 125 150 200m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7S9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL
3	ADDED 2026 BOREHOLE LOCATION BH 1-26 TO BH 5-26	26/01/2026	SD
2	UPDATED CONCEPTUAL PLAN	27/11/2025	SD
1	UPDATED WITH SEISMIC SHEAR WAVE VELOCITY LOCATION	20/12/2021	KP

AVENUE 31
GEOTECHNICAL INVESTIGATION - NATIONAL CAPITAL BUSINESS PARK
4055 RUSSELL ROAD
OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:3000
Date: 11/2021
Drawn by: YA
Report No.: PG4854-3
Checked by: KP
Dwg. No.: PG4854-7
Approved by: SD
Revision No.: 3

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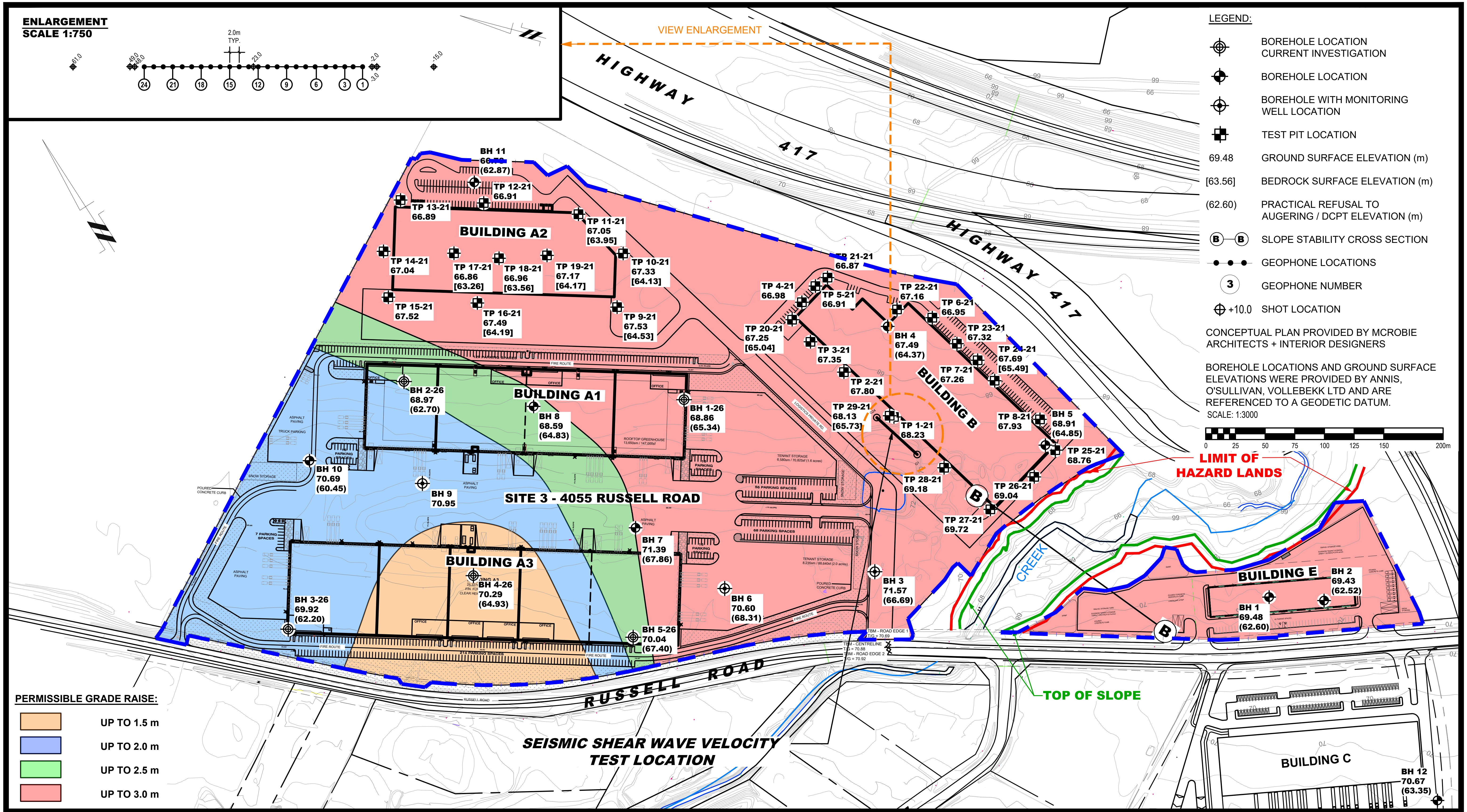

LEGEND:

⌖ BOREHOLE LOCATION CURRENT INVESTIGATION

⌖ BOREHOLE LOCATION

⌖ BOREHOLE WITH MONITORING WELL LOCATION

⊞ TEST PIT LOCATION

69.48	GROUND SURFACE ELEVATION (m)
[63.56]	BEDROCK SURFACE ELEVATION (m)
(62.60)	PRACTICAL REFUSAL TO AUGERING / DCPT ELEVATION (m)
B—B	SLOPE STABILITY CROSS SECTION
●—●—●	GEOPHONE LOCATIONS
3	GEOPHONE NUMBER
⌖ +10.0	SHOT LOCATION

CONCEPTUAL PLAN PROVIDED BY MCROBIE ARCHITECTS + INTERIOR DESIGNERS

BOREHOLE LOCATIONS AND GROUND SURFACE ELEVATIONS WERE PROVIDED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD AND ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:3000

PERMISSIBLE GRADE RAISE:

🟧	UP TO 1.5 m
🟦	UP TO 2.0 m
🟩	UP TO 2.5 m
🟥	UP TO 3.0 m

PATERSON GROUP

9 AURIGA DRIVE
OTTAWA, ON
K2E 7S9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL
3	ADDED 2026 BOREHOLE LOCATION BH 1-26 TO BH 5-26	26/01/2026	SD
2	UPDATED CONCEPTUAL PLAN	27/11/2025	SD
1	UPDATED WITH SEISMIC SHEAR WAVE VELOCITY LOCATION	20/12/2021	KP

AVENUE 31

GEOTECHNICAL INVESTIGATION - NATIONAL CAPITAL BUSINESS PARK
4055 RUSSELL ROAD

OTTAWA, ONTARIO

Title:

PERMISSIBLE GRADE RAISE PLAN

Scale: 1:3000

Date: 11/2021

Drawn by: YA

Report No.: PG4854-3

Checked by: KP

Dwg. No.: PG4854-8

Approved by: SD

Revision No.: 3

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