PATERSON GROUP

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Geotechnical Engineering
Environmental Engineering
Hydrogeology
Materials Testing
Building Science
Rural Development Design
Retaining Wall Design
Noise and Vibration Studies

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July 6, 2023
PG4366-LET.06

Broccolini Construction (Ontario) Inc.
500-16766 Transcanadienne
Kirkland, Quebec
H9H 4M7

Attention: **Guillaume Paquette**

Subject: **Geotechnical Investigation**
Proposed Parking Lot Expansion
5225 Boundary Road - Ottawa, Ontario

Dear Mr. Paquette

Further to your request, Paterson Group (Paterson) completed a geotechnical investigation for the proposed parking lot expansion to be located at the aforementioned site.

The objectives of the assessment were to:

- ❒ Determine the subgrade conditions by means of test pits.
- ❒ Provide pavement design and recommendations for the subject site.

The following report presents a summary of our findings and provides geotechnical recommendations pertaining to the proposed parking lot expansion. Investigating the presence or potential presence of contamination on the subject site was not part of the scope of work of the present investigation. Therefore, the present report does not address environmental issues.

Overall, it is understood the existing truck parking area located along the southern portion of the existing warehouse building will be expanded upon in the east and west directions. It is expected the western and eastern portions of the parking will consist of a fill- and cut-style earthworks program, respectively, as part of constructing the proposed parking lot areas.

1.0 Field Observations

Field Program

The field program for the investigation was conducted on June 21, 2023, and consisted of advancing 14 test pits, TP 1-23 to TP 14-23, to a maximum depth of 1.2 m below the existing ground surface. The test pits were reviewed in the field by Paterson personnel under the direction of a senior engineer from the geotechnical division. The test pit procedure consisted of excavating to the required depths at the selected locations and sampling the overburden. The depths at which the grab samples were recovered from the test pits are shown as G on the Soil Profile and Test Data sheets attached to the present report.

Paterson conducted previous geotechnical investigations in support of the existing warehouse development located throughout the remainder of the subject property and throughout the current subject site. The previous investigation took place between 2014 and 2018, and included a combination of boreholes and test pits. Pertinent test hole logs from those field programs are attached to the current report.

The test pits were placed in a manner to provide general coverage of the subject site, taking into consideration existing site features and underground services. The approximate location of the test holes are shown on Drawing PG4366-3 – Test Hole Location Plan attached to the present report.

Site Conditions

The subject site is currently undeveloped and consists of grass-covered areas which were landscaped as part of the development as part of constructing the existing warehouse structure and associated infrastructure.

The eastern parking lot expansion area is relatively flat and at grade with the existing truck-parking area. The western parking lot expansion area slopes gradually from east to west between geodetic elevations 77.0 to 76.0 m. The parking lot expansion areas are bordered to the north by a rip-rap lined channel, to the west landscaped areas, to the south by a swale and further by a raised paved access road and the to east by an existing communications tower.

Subsurface Conditions

Overburden

Generally, the soil profile at the test hole locations consists of fill underlain by either topsoil, or native overburden, extending to depths ranging from 0.5 to 1.0 m below the existing ground surface. The fill was generally observed to consist of brown silty sand or silty clay, with sand, gravel, occasional cobbles and variable amounts of organic and inorganic debris.

A layer of native, in-situ compact, brown silty sand to sandy silt was encountered underlying the topsoil and fill extending to approximate depths of 0.3 to 1.2 m below the existing ground surface. The silty sand layer was observed to be underlain by a very stiff to firm brown silty clay at TP 11-23, TP 13-23, and TP 14-23.

The subsurface conditions observed in the test holes are presented in detail on the Soil Profile and Data Sheets in Appendix 1. A summary of the fill thicknesses encountered at each test hole location within the subject site, are presented in Table 1:

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

Bedrock

Based on available geological mapping, the bedrock in the area consists of shale of the Carlsbad Formation, with a drift thickness of 25 to 50 m.

Groundwater

Groundwater was not observed within the depth of the test pits during the current geotechnical investigation. However, groundwater was encountered during previous investigations and the observations are presented in Table 1 below:

Table 1 – Summary of Groundwater Levels

Test Hole Number	Ground Surface Elevation (m)	Measured Groundwater Level / Groundwater Infiltration for Boreholes		Dated Recorded
		Depth (m)	Elevation (m)	
BH 1	77.92	1.23	76.69	December 27, 2017
TP 1	76.99	1.00	75.99	July 26, 2012
TP 2	77.31	1.40	75.91	
TP 2-14	77.50	1.47	76.03	July 15, 2014

Note: The ground surface elevation at each borehole location for the current investigation was surveyed using a handheld GPS referenced to a geodetic datum.

Based on our review, it is expected the long-term groundwater table may be located at a depth of **1.5 to 2.5 m** below the existing ground surface throughout the subject site. It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater level could vary at the time of construction.

2.0 Geotechnical Assessment

From a geotechnical perspective, the subject site is considered suitable for the proposed parking lot expansion. It is anticipated that the eastern and a portion of the western parking lot expansion areas will encounter native in-situ soil and previously placed fill at the subgrade level for the pavement structure as part of cut-program. Further, the western portion of the subject site will require fill to raise the ground surface up to subgrade level for the proposed pavement structure.

It is expected that site-generated fil prepared as detailed in this report and reviewed and approved at the time of preparation and placement by personnel may be used to raise the subgrade for pavement subgrade construction throughout the subject site. Proof-rolling of the subgrade is also recommended to be conducted across the soil subgrade areas throughout the subject site and prior to the placement of layers of crushed stone.

Due to the presence of a silty clay deposit, permissible grade restrictions are recommended for this site. However, since the eastern parking lot area will be generally reduced in elevation and the western section will be raised to match and be slightly lower than the existing parking area, grading restrictions are not considered applicable form a geotechnical perspective.

The above and other considerations are discussed in the following paragraphs.

2.2 Site Grading and Preparation

Stripping Depth

Topsoil and fill containing organic or deleterious materials, should be stripped from under any paved areas, pipe bedding, and other settlement sensitive structures. It is expected fill will be encountered at the subgrade level for the majority of the eastern and a portion of the western parking expansion areas. The fill layer, if encountered at subgrade, should be proof-rolled using a suitably sized vibratory sheepsfoot roller making several passes and reviewed and approved at the time of proof-rolling by Paterson personnel.

Fill Placement

From a geotechnical perspective, site-generated fill generated from sub-excavation works may be considered acceptable for re-use as subgrade material provided it is prepared as follows. The site-generated soil fill material should be free and segregated of topsoil organic debris (stumps, logs, peat and/or other organic debris), inorganic material (plastic, metal, PVC, etc.) and/or stones/cobbles larger than 200 mm in their longest dimension. Care will also need to be taken during storage, placement and compaction of the excavated fill soils to maintain them in an unfrozen state and at a moisture content which is suitable for compaction.

Soils intended for re-use which become frozen and/or which have excessive moisture contents will not be considered suitable for reuse at the subject site. Placement of this material during winter months increases the risk of placing frozen material which may result in future poor performing areas that will require future repair.

It is recommended that site-generated fill, reviewed and approved by Paterson at the time of preparation and placement, is placed in maximum 300 mm thick loose lifts, compacted to a minimum of 95% of the materials SPMDD and using a suitably sized vibratory sheepsfoot roller in the dry and above-freezing conditions.

Engineered fill placed for grading beneath access lanes and heavy truck parking areas should consist of clean, imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. This material should be tested and approved prior to delivery to the site. The fill should be placed in maximum 300 mm thick loose lifts and compacted using suitable compaction equipment for the lift thickness.

2.3 Pavement Design

Pavement Structure

It is expected heavy-duty vehicle parking areas and associated access lanes are required as part of the proposed parking lot addition. The recommended pavement structure is presented in Table 2.

Table 2 - Recommended Pavement Structure - Heavy Vehicle Parking Areas & Loading 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.	

Performance graded (PG) 58-34 asphaltic concrete is recommended for use on this project. The pavement granular materials should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's standard Proctor maximum dry density (SPMDD).

All subgrade surfaces should be proof rolled with a suitably sized vibratory sheepsfoot roller prior to the placement of the subbase stone layer. If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be sub-excavated and replaced with OPSS Granular A or Granular B Type II Material.

Pavement Joint Tie-In

Where the proposed pavement structure meets the existing asphalt surface, the following recommendations should be followed:

- A 300 mm wide section of existing asphalt roadways should be saw cut from the existing pavement edge to provide a sound surface to abut the proposed pavement structure.
- It is recommended to mill a 300 mm wide and 50 mm deep section of the existing asphalt at the saw cut edge.
- The proposed pavement structure subbase materials should be tapered no greater than 3H:1V to meet the existing subbase materials.
- Clean existing granular road subbase materials can be reused upon assessment by Paterson personnel at the time of excavation (construction) as to its suitability.
- All compaction efforts should be reviewed and approved by Paterson at the time of construction.

Exterior Concrete Dolly Pads

It is expected concrete dolly pads will be implemented throughout the proposed truck parking areas. The recommended rigid pavement structure is presented in Table 3.

Table 3 – Rigid Pavement Structure – Heavy-Duty Dolly Pads

Thickness (mm)	Material Description
Project Specification	**Exposure Class C2 – 32 MPa Concrete** (5 to 8% Air Entrainment)
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
100	**RIGID INSULATION** - HI-40 Rigid Insulation
SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil.	

It is recommended that exterior apron slabs consist of a Category C2 Exposure Class concrete with a minimum 28-day compressive strength of 32 MPa.

Rigid Pavement Structure – Frost Taper Recommendations

To improve the long-term performance of the concrete dolly pads and lessen the effects of frost penetration and differential movement between the rigid and flexible pavement structures, it is recommended to place a minimum 100 mm thick layer of insulation a extending a minimum of 2.4 m beyond all directions of the footprint of the concrete dolly pads. This layer should be placed on the subgrade layer throughout the area of the flexible pavement structure (i.e.- asphalt paved lanes).

Further, it is recommended to sub-excavate at least 300 mm below the subgrade level of the pavement structure along the outside edge of the rigid insulation to provide a suitable frost taper. The sub-excavated area should extend horizontally at least 600 mm beyond the exterior face of the rigid insulation layer. A minimum 3H:1V slope profile can be used to raise the sub-excavated area back to subgrade level. The frost taper area should be backfilled with a free draining, non-frost susceptible engineered fill, such as OPSS Granular A or OPSS Granular B Type II compacted to a minimum of 100% of the materials SPMDD.

Additional Considerations

It is recommended that all base and subbase granular layers be covered with asphalt or soil at the edges of the parking lot to prevent loss of granular material due to unconfined conditions along the edge of the parking area.

2.4 Winter Construction

The subsurface conditions at this site mostly 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. Precautions should be taken if winter construction is considered for this project.

Trench excavations should be constructed in a manner that will avoid the introduction of frozen materials into the trenches. Pavement construction is also difficult during winter. The subgrade consists of frost susceptible soils which will experience total and differential frost heaving as the work takes place. In addition, the introduction of frost, snow or ice into the pavement materials, which is difficult to avoid, could adversely affect the performance of the pavement structure. Additional information could be provided, if required.

3.0 Field Inspections During Construction

It is recommended that Paterson personnel complete periodic inspections during construction. The inspections are recommended to include and consist of the following:

- Stripping of topsoil and removal of deleterious material at subgrade.
- Preparation of site-generated fill for re-use for raising the subgrade level.
- Testing of imported and site-generated material for standard Proctor maximum density and gradation.
- Observation of compaction of each lift of material placed for subgrade and within the pavement structures.
- Observation of all subgrades prior to backfilling and follow-up field density tests to determine the level of compaction achieved.
- Observation of placement of rigid insulation.
- Sampling and testing of cementitious and 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 Paterson. All excess soil must be handled as per *Ontario Regulation 406/19: On-Site and Excess Soil Management*.

4.0 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 hole 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 the purposes other than those described herein or by person(s) other than Broccolini Construction (Ontario) Ltd., or their agents, is not authorized without review by Paterson for the applicability of our recommendations to the alternative use of the report.

We trust that the current submission meets your immediate requirements.

Best Regards,

Paterson Group Inc.

Drew Petahtegoose, B.Eng.

David J. Gilbert, P.Eng.

Attachments

- ❏ Soil Profile and Test Data Sheets
- ❏ Symbols and Terms
- ❏ Figure 1 - Key Plan
- ❏ Drawing PG4366-1 - Test Hole Location Plan

Report Distribution

- ❏ Broccolini Construction (Ontario) Ltd. (e-mail copy)
- ❏ Paterson Group (1 copy)

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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Parking Expansion - 5225 Boundary Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** June 21, 2023

FILE NO. PG4366

HOLE NO. TP 1-23

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	77.04		
FILL: Brown silty sand to sandy silt, trace organics, trace some gravel and crushed stone		G	1						
0.46									
TOPSOIL		G	2						
0.61									
Compact, light brown **SILTY SAND to SANDY SILT**		G	3			1	76.04		
1.21									
End of Test Pit									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Parking Expansion - 5225 Boundary Road
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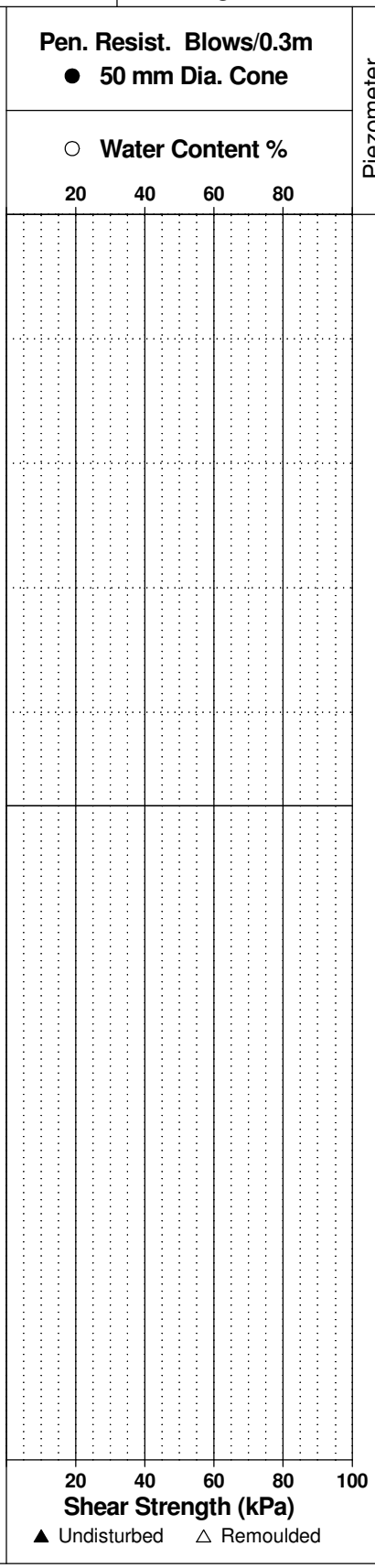
REMARKS

BORINGS BY Excavator **DATE** June 21, 2023

FILE NO. PG4366

HOLE NO. TP 2-23

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	76.90		
FILL: Dark brown silty clay, some gravel, crushed stone, trace to some shale and sand		G	1						
0.60									
Compact, light brown **SILTY SAND to SANDY SILT**		G	2						
0.95									
End of Test Pit (TP dry upon completion)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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REMARKS

BORINGS BY Excavator **DATE** June 21, 2023

FILE NO. PG4366

HOLE NO. TP 3-23

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	77.22		
FILL: Brown silty clay with gravel, crushed stone, trace to some topsoil, trace brick and plastic, occasional cobbles		G	1						
0.80									
Compact, brown **SILTY SAND to SANDY SILT**		G	2			1	76.22		
1.05									
End of Test Pit									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Parking Expansion - 5225 Boundary Road
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REMARKS

BORINGS BY Excavator **DATE** June 21, 2023

FILE NO. PG4366

HOLE NO. TP 4-23

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	77.35		
FILL: Brown silty sand with crushed stone and gravel, trace to some organics, brick		G	1						
0.46									
FILL: Brown silty sand, some topsoil, organics, occasional cobbles		G	2			1	76.35		
1.05									
Compact, brown **SILTY SAND to SANDY SILT**		G	3						
1.25									
End of Test Pit									
(TP dry upon completion)									

20 40 60 80

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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FILE NO. PG4366

HOLE NO. TP 5-23

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	77.10		
FILL: Brown silty sand with topsoil, some gravel, wood, organics		G	1						
0.70									
TOPSOIL		G	2						
0.80									
Compact, light brown **SILTY SAND to SANDY SILT**		G	3			1	76.10		
1.07									
End of Test Pit									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: 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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REMARKS

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FILE NO. PG4366

HOLE NO. TP 6-23

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	77.06		
FILL: Brown to dark brown silty sand with gravel and crushed stone, trace organics		G	1						
		G	2						
0.90									
Compact, brown **SILTY SAND to SANDY SILT**		G	3			1	76.06		
1.20									
End of Test Pit									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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REMARKS

BORINGS BY Excavator **DATE** June 21, 2023

FILE NO. PG4366

HOLE NO. TP 7-23

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	77.18		
FILL: Brown silty sand with gravel and crushed stone, trace to some organics		G	1						
0.82									
FILL: Dark brown silty sand with organics		G	2						
0.96						1	76.18		
Compact, light brown **SILTY SAND to SANDY SILT**		G	3						
1.20									
End of Test Pit									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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REMARKS

BORINGS BY Excavator **DATE** June 21, 2023

FILE NO. PG4366

HOLE NO. TP 8-23

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	77.20		
FILL: Brown silty sand with crushed stone and gravel, trace brick, organics		G	1						
0.80									
Compact, brown **SILTY SAND to SANDY SILT**		G	2						
1.00						1	76.20		
End of Test Pit									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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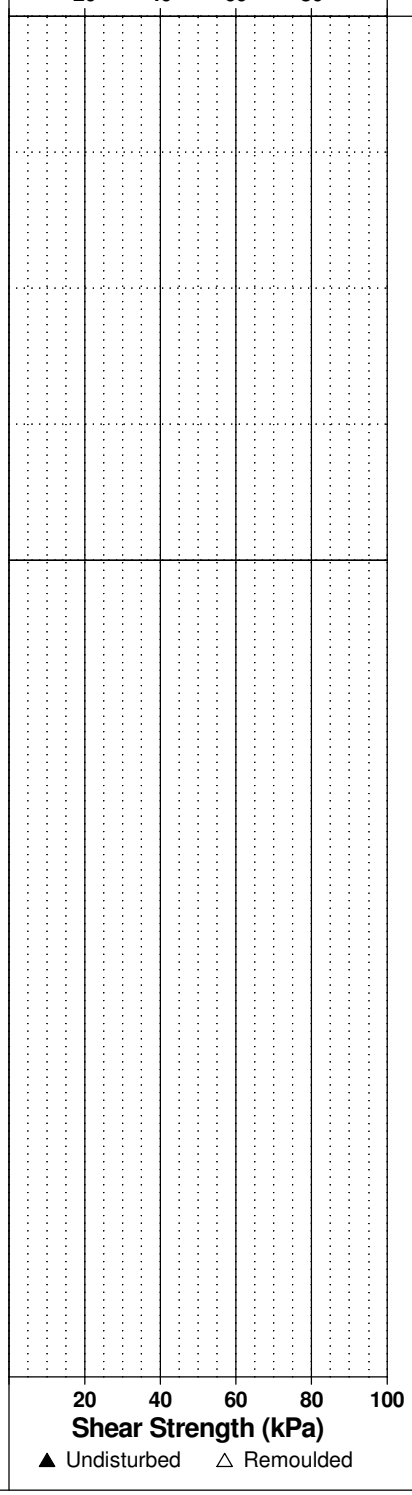
REMARKS

BORINGS BY Excavator **DATE** June 21, 2023

FILE NO. PG4366

HOLE NO. TP 9-23

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	76.89		
FILL: Dark brown silty sand, trace to some crushed stone, plastic and organics		G	1						
0.60									
Compact, light brown **SILTY SAND to SANDY SILT**		G	2						
0.80									
End of Test Pit									
(TP dry upon completion)									



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FILE NO. PG4366

HOLE NO. TP10-23

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	77.12		
FILL: Brown silty sand with gravel an crushed stone, trace to some organics, occasional cobbles		G	1						
		G	2						
0.95									
Compact, light brown **SILTY SAND to SANDY SILT**		G	3			1	76.12		
1.20									
End of Test Pit									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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FILE NO. PG4366

HOLE NO. TP11-23

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									
TOPSOIL 0.05						0	76.14		
Compact, brown **SILTY SAND to SANDY SILT** 0.30		G	1						
Very stiff to firm, brown **SILTY CLAY** 1.05		G	2			1	75.14		
End of Test Pit									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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REMARKS

BORINGS BY Excavator **DATE** June 21, 2023

FILE NO. PG4366

HOLE NO. TP12-23

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	76.65		
FILL: Brown silty sand with crushed stone, trace to some organics		G	1						
0.45									
Compact, light brown **SILTY SAND to SANDY SILT**		G	2			1	75.65		
1.10									
End of Test Pit (TP dry upon completion)									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Parking Expansion - 5225 Boundary Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** June 21, 2023

FILE NO. PG4366

HOLE NO. TP13-23

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	76.01		
TOPSOIL 0.07									
Compact, brown **SILTY SAND to SANDY SILT** 0.30		G	1						
Very stiff to firm, brown **SILTY CLAY**		G	2						
End of Test Pit 0.95									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Parking Expansion - 5225 Boundary Road
Ottawa, Ontario

DATUM Geodetic

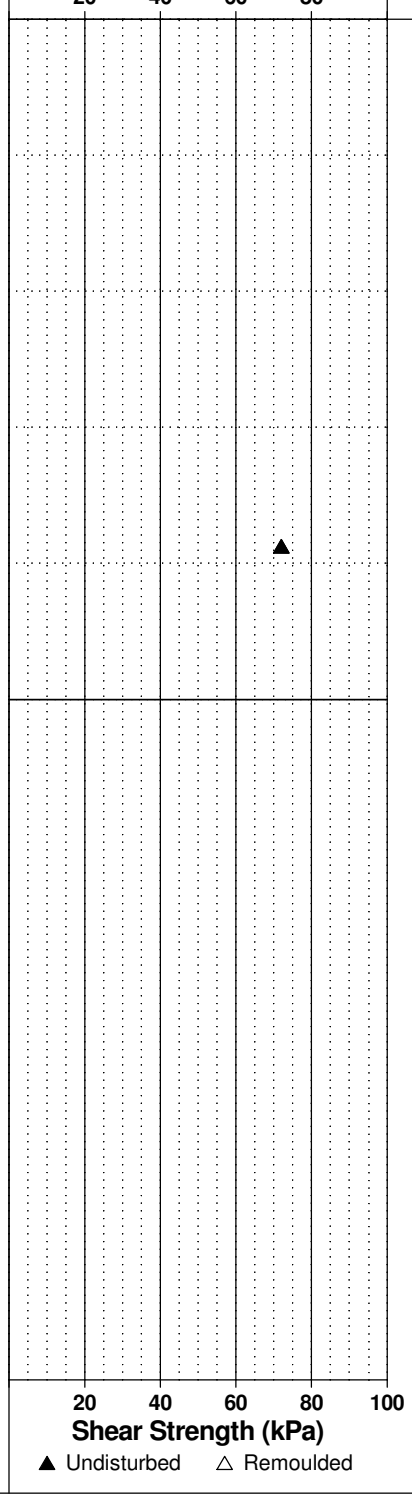
REMARKS

BORINGS BY Excavator **DATE** June 21, 2023

FILE NO. PG4366

HOLE NO. TP14-23

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	76.34		
TOPSOIL 0.12									
Compact, light brown **SILTY SAND to SANDY SILT**		G	1						
0.50									
Very stiff to firm, brown **SILTY CLAY**		G	2			1	75.34		
1.00									
End of Test Pit									
(TP dry upon completion)									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Boundary Road at Highway 417
Ottawa, Ontario

DATUM TBM - Culvert invert provided on plan. Geodetic elevation = 76.49m, provided by East Gateway Properties.

FILE NO. PG2721

REMARKS

HOLE NO. TP 1

BORINGS BY Hydraulic Shovel **DATE** June 26, 2012

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	76.99		
TOPSOIL 0.26		G	1						
Compact to loose, brown **SILTY SAND**		G	2			1	75.99		▽
1.80		G	3						
Firm, grey **SILTY CLAY**		G	4			2	74.99		
3.00						3	73.99		
End of Test Pit (GWL @ 1.0m depth based on field observations)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Boundary Road at Highway 417
Ottawa, Ontario

DATUM TBM - Culvert invert provided on plan. Geodetic elevation = 76.49m, provided by East Gateway Properties.

FILE NO. PG2721

REMARKS

HOLE NO. TP 2

BORINGS BY Hydraulic Shovel **DATE** June 26, 2012

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	77.31		
TOPSOIL 0.20									
Compact to loose, brown **SILTY SAND**		G	1			1	76.31		▽
		G	2						
2.10						2	75.31		
Firm, grey **SILTY CLAY**		G	3						
3.00						3	74.31		
End of Borehole									
(GWL @ 1.4m depth based on field observations)									

Water Content % scale: 20, 40, 60, 80

Shear Strength (kPa) scale: 20, 40, 60, 80, 100

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Industrial Park - 5341 Boundary Road
Ottawa, Ontario

DATUM Ground surface elevations were interpolated from topographic information provided by others and, as such, are approximate only.

REMARKS

FILE NO. PG3287

HOLE NO. TP 2-14

BORINGS BY Backhoe **DATE** July 15, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	77.50
FILL: Brown silty clay with sand, gravel, cobbles and boulders, trace crushed stone		G	1				
0.60							
		G	2			1	76.50
FILL: Brown silty sand with organics							
1.83						2	75.50
		G	3				
Firm, red-brown **SILTY CLAY**							
- red-grey by 2.7m depth						3	74.50
		G	4				
4.27						4	73.50
Grey **SILTY FINE SAND,** trace shells		G	5				
4.88						5	72.50
Soft, grey **SILTY CLAY**		G	6				
5.18							
End of Test Pit							
(GWL @ 1.47m-August 13, 2014)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Boundary Road at Highway 417
Ottawa, Ontario

DATUM Geodetic

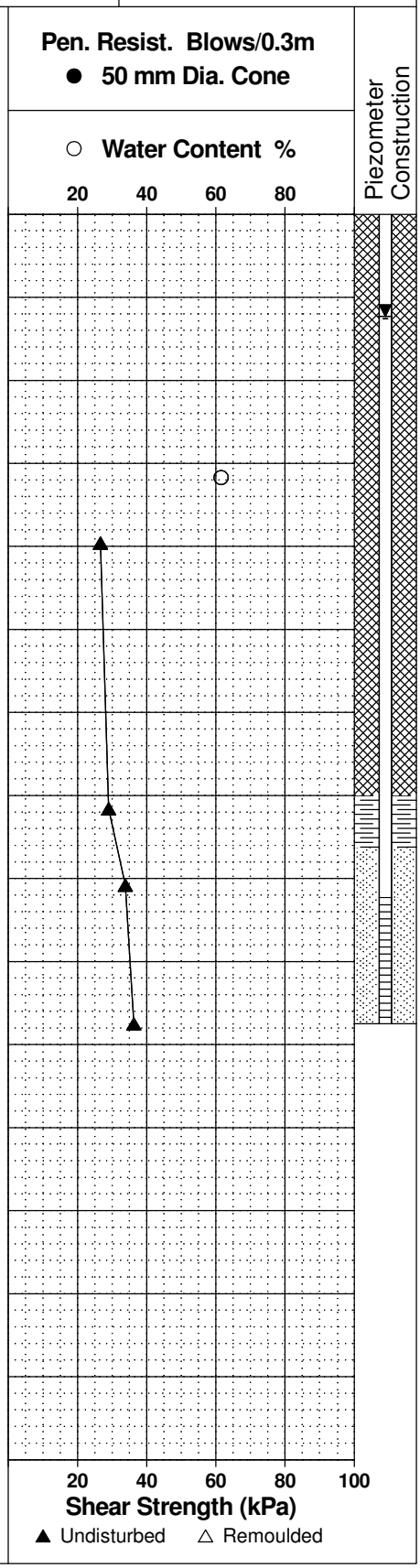
FILE NO. PG4366

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** December 27, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	77.92
FILL: Brown silty clay with sand, some gravel		SS	1	50	6	1	76.92
1.68		SS	2	67	7	2	75.92
Loose, brown **SILTY SAND**		SS	3	58	7	3	74.92
2.74		TW	4	90			
		TW	5	20		4	73.92
		SS	6	25	3		
		SS	7	0	1	5	72.92
		SS	8	100	0		
Firm, grey **SILTY CLAY**		TW	9	90		6	71.92
						7	70.92
						8	69.92
						9	68.92
9.75						10	67.92
Dynamic Cone Penetration Test commenced at 9.75m depth. Cone pushed to 17.4m depth.						11	66.92
						12	65.92
						13	64.92
						14	63.92
						15	62.92



Piezometer Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Boundary Road at Highway 417
Ottawa, Ontario

DATUM Geodetic

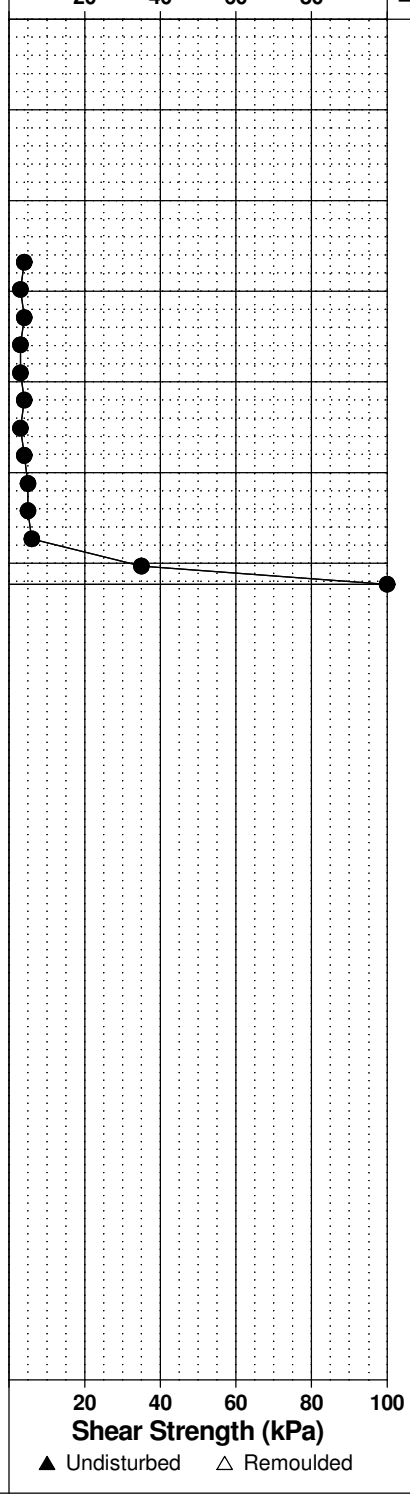
FILE NO. PG4366

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** December 27, 2017

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									
						15	62.92		
						16	61.92		
						17	60.92		
						18	59.92		
						19	58.92		
						20	57.92		
						21	56.92		
21.23									
End of Borehole Practical DCPT refusal at 21.23m depth (GWL @ 1.23m - Jan. 23, 2018)									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Boundary Road at Highway 417
Ottawa, Ontario

DATUM Geodetic

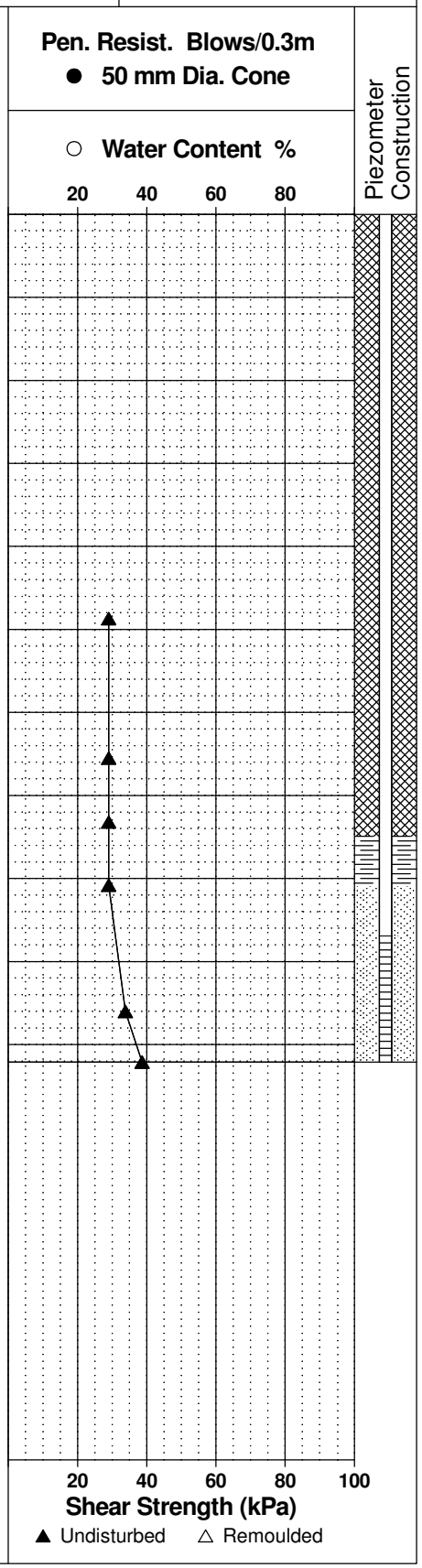
FILE NO. PG4366

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** December 27, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	77.02
150mm Topsoil over brown silty sand **FILL** 0.30							
Loose, brown **SAND,** some silt		SS	1	58	10	1	76.02
1.60		SS	2	100	4	2	75.02
Firm, brown to grey **SILTY CLAY**		TW	3	73		3	74.02
- grey sandy silt seam from 4.0 to 4.7m depth		SS	4	50	W	4	73.02
		SS	5			5	72.02
		TW	6	100		6	71.02
						7	70.02
						8	69.02
						9	68.02
10.21						10	67.02
End of Borehole							
(Piezometer not accessible - Jan. 23, 2018)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Boundary Road at Highway 417
Ottawa, Ontario

DATUM Geodetic

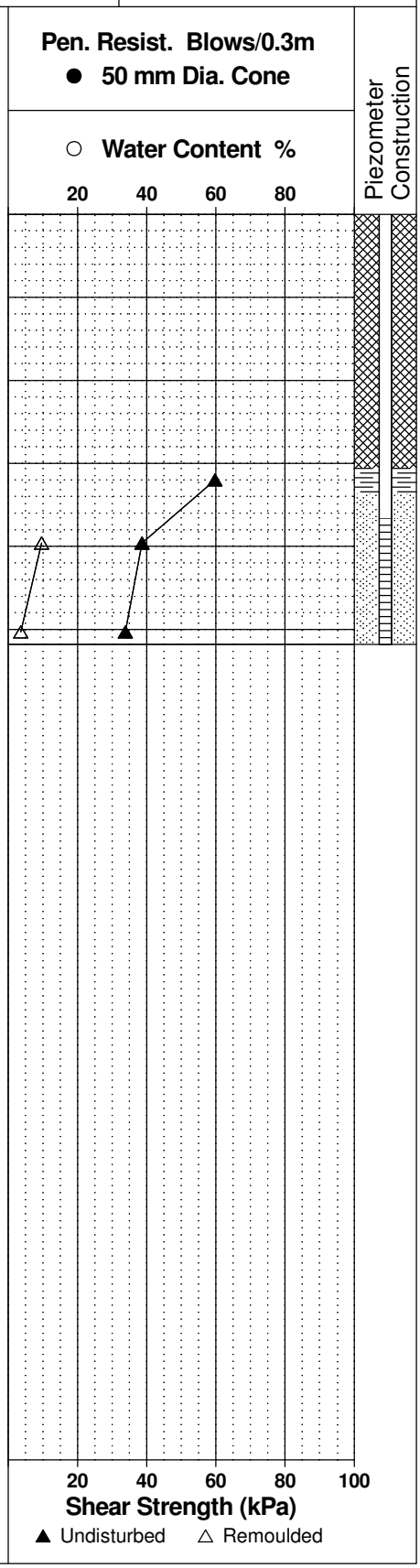
FILE NO. PG4366

REMARKS

HOLE NO. BH12

BORINGS BY CME 55 Power Auger **DATE** May 17, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	77.84
TOPSOIL 0.18		AU	1				
FILL: Crushed stone with silt and sand		SS	2	46	29	1	76.84
		SS	3	42	19	2	75.84
2.29		SS	4	67	9		
Stiff to firm, brown **SILTY CLAY**						3	74.84
						4	73.84
- grey by 4.9m depth							
5.18						5	72.84
End of Borehole							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Boundary Road at Highway 417
Ottawa, Ontario

DATUM Geodetic

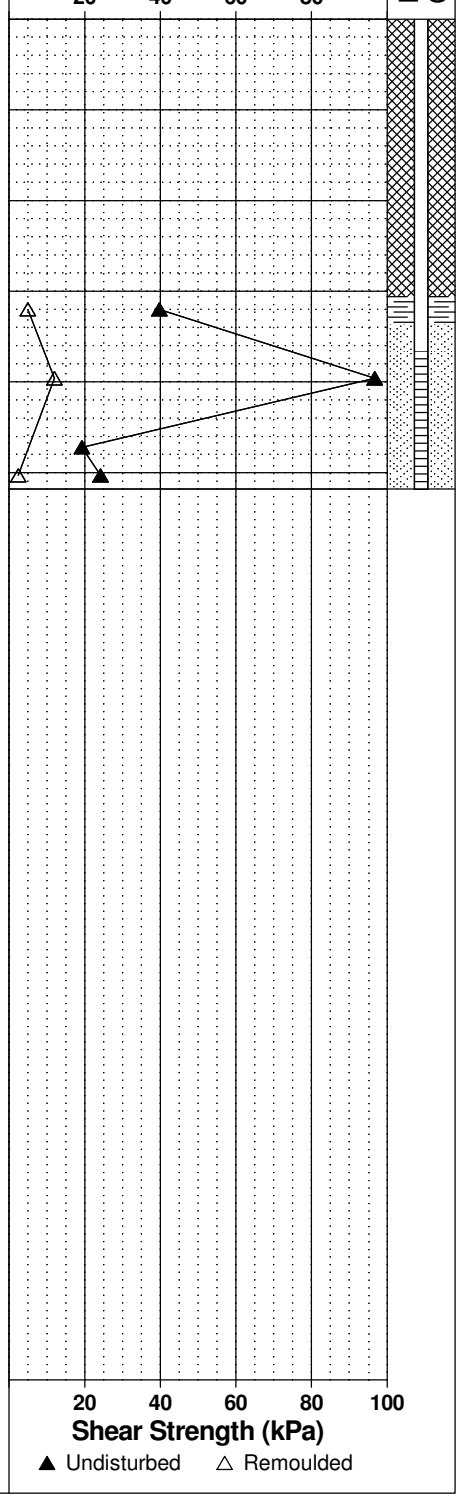
FILE NO. PG4366

REMARKS

HOLE NO. BH13

BORINGS BY CME 55 Power Auger **DATE** May 18, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	77.60
TOPSOIL 0.15		AU	1				
Compact, brown **SILTY SAND**		SS	2	71	11	1	76.60
		SS	3	67	11	2	75.60
2.29		SS	4	100	1	3	74.60
Firm to soft, brown to grey **SILTY CLAY**						4	73.60
5.18						5	72.60
End of Borehole							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Boundary Road at Highway 417
Ottawa, Ontario

DATUM Geodetic

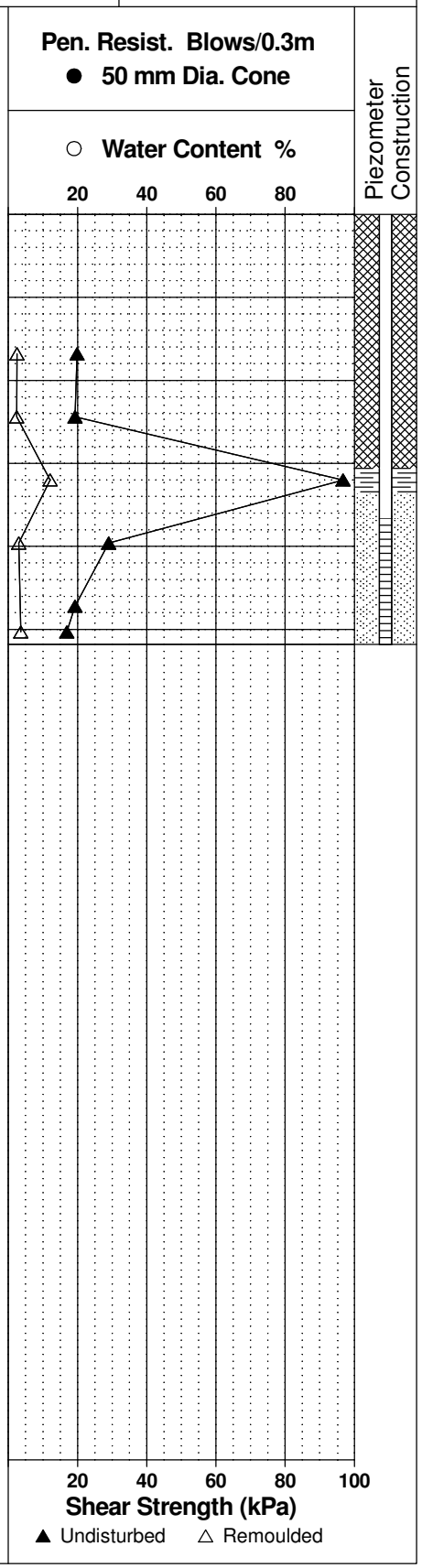
FILE NO. PG4366

REMARKS

HOLE NO. BH14

BORINGS BY CME 55 Power Auger **DATE** May 18, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.69
25mm Topsoil		AU	1				
Loose, brown **SILTY SAND**		SS	2	38	5	1	75.69
1.22							
Soft, brown **SILTY CLAY**						2	74.69
- stiff to firm and grey by 3.0m depth						3	73.69
- soft by 4.4m depth						4	72.69
5.18						5	71.69
End of Borehole							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Boundary Road at Highway 417
Ottawa, Ontario

DATUM Geodetic

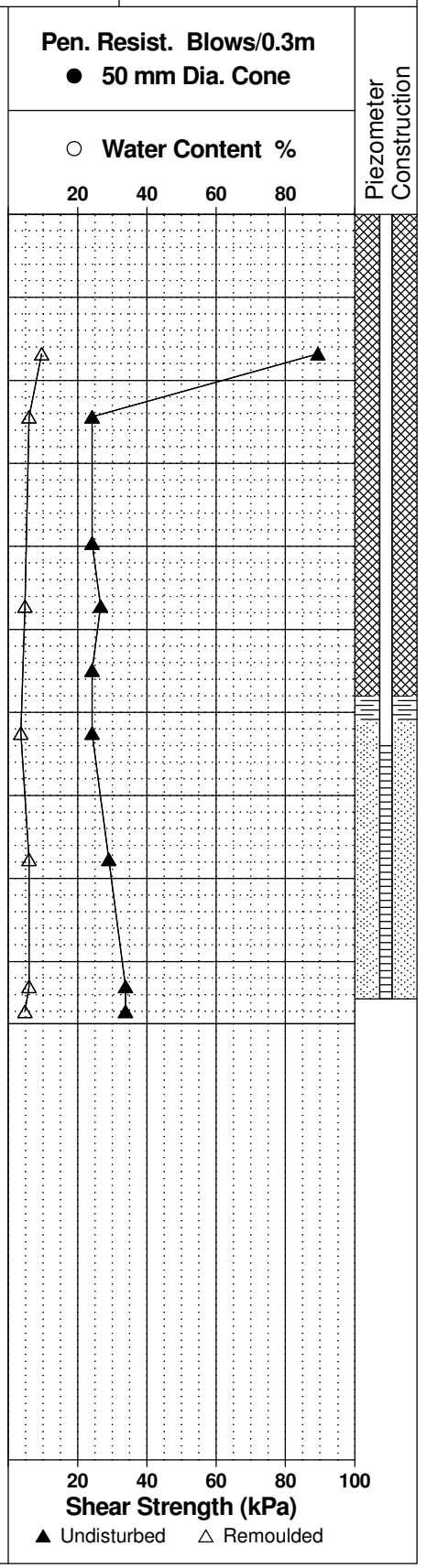
FILE NO. PG4366

REMARKS

HOLE NO. BH30

BORINGS BY CME 55 Power Auger **DATE** May 29, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.97
TOPSOIL 0.13		AU	1				
Loose, brown **SILTY SAND** 1.07		SS	2	58	5	1	75.97
						2	74.97
Stiff to soft, brown **SILTY CLAY**		TW	3	83		3	73.97
- soft to firm and grey by 3.0m depth						4	72.97
						5	71.97
						6	70.97
						7	69.97
						8	68.97
						9	67.97
9.75							
End of Borehole							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Boundary Road at Highway 417
Ottawa, Ontario

DATUM Geodetic

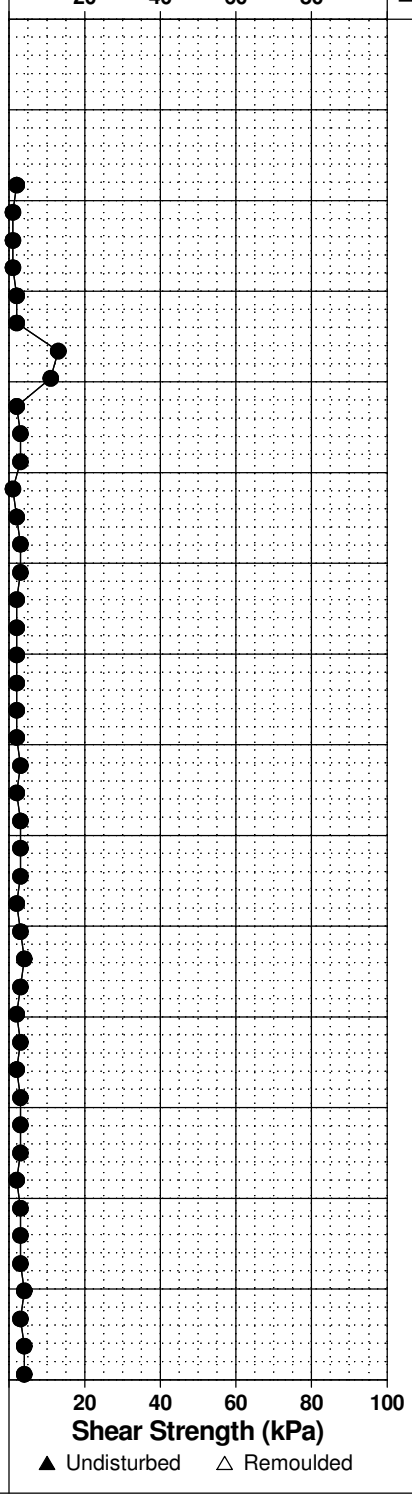
FILE NO. PG4366

REMARKS Ground surface is after stripping operations.

HOLE NO. BH34

BORINGS BY CME 55 Power Auger **DATE** July 9, 2018

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	76.95		
Drove cone through inferred soft to stiff **SILTY CLAY**						1	75.95		
						2	74.95		
						3	73.95		
						4	72.95		
						5	71.95		
						6	70.95		
						7	69.95		
						8	68.95		
						9	67.95		
						10	66.95		
						11	65.95		
						12	64.95		
						13	63.95		
						14	62.95		
						15	61.95		



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Boundary Road at Highway 417
Ottawa, Ontario

DATUM Geodetic

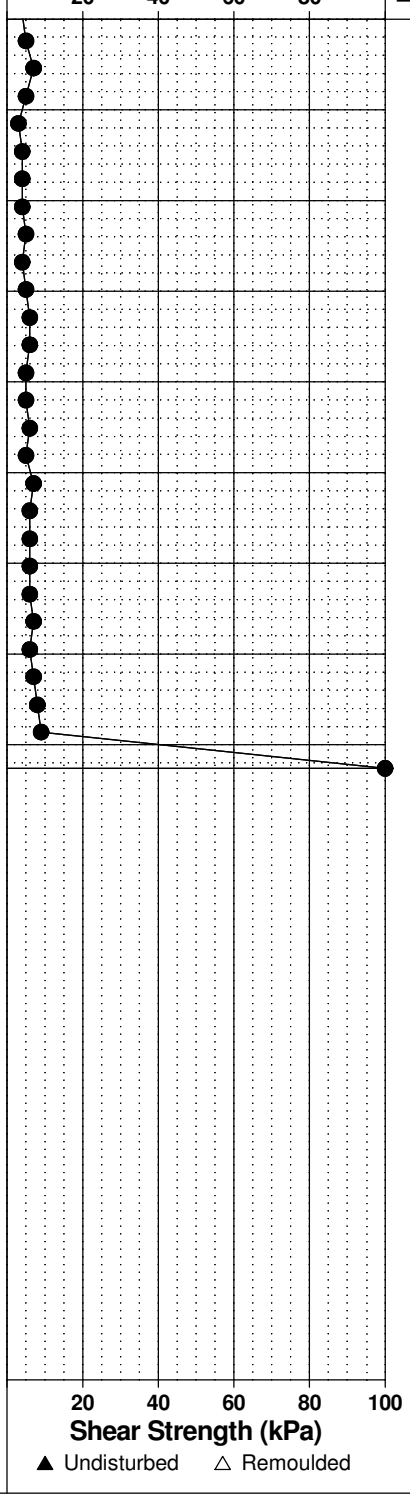
FILE NO. PG4366

REMARKS Ground surface is after stripping operations.

HOLE NO. BH34

BORINGS BY CME 55 Power Auger **DATE** July 9, 2018

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									
Drove cone through inferred firm to stiff **SILTY CLAY**						15	61.95		
						16	60.95		
						17	59.95		
						18	58.95		
						19	57.95		
						20	56.95		
						21	55.95		
						22	54.95		
23.26						23	53.95		
End of Borehole Practical DCPT refusal at 23.26m depth.									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Boundary Road at Highway 417
Ottawa, Ontario

DATUM Geodetic

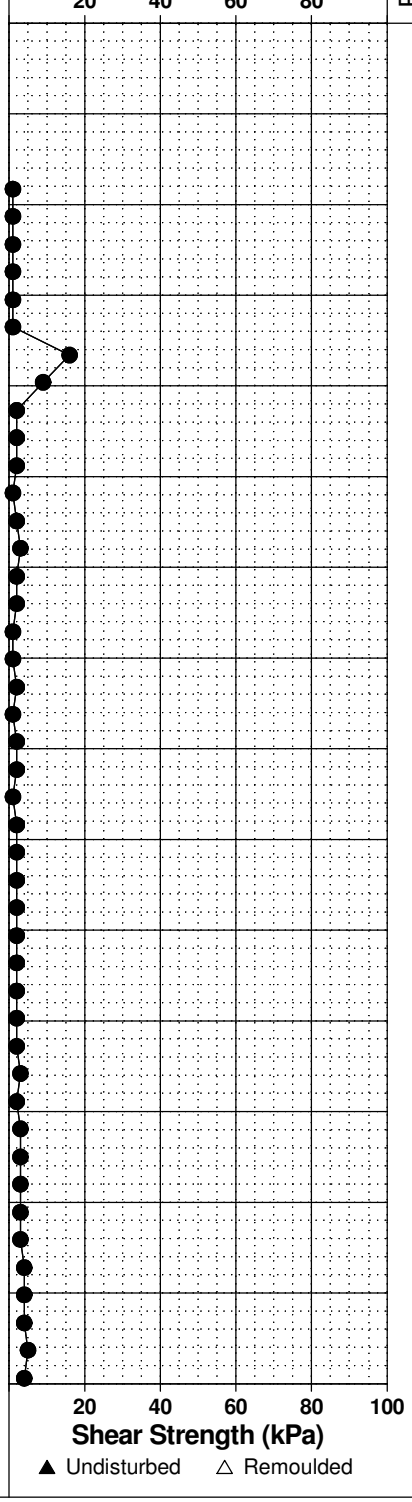
FILE NO. PG4366

REMARKS Ground surface is after stripping operations.

HOLE NO. BH35

BORINGS BY CME 55 Power Auger **DATE** July 9, 2018

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	76.60		
Drove cone through inferred soft to stiff **SILTY CLAY**						1	75.60		
						2	74.60		
						3	73.60		
						4	72.60		
						5	71.60		
						6	70.60		
						7	69.60		
						8	68.60		
						9	67.60		
						10	66.60		
						11	65.60		
						12	64.60		
						13	63.60		
						14	62.60		
						15	61.60		



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Boundary Road at Highway 417
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG4366

REMARKS Ground surface is after stripping operations.

HOLE NO. BH35

BORINGS BY CME 55 Power Auger **DATE** July 9, 2018

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						15	61.60		
						16	60.60		
						17	59.60		
						18	58.60		
Drove cone through inferred stiff to very stiff **SILTY CLAY**						19	57.60		
						20	56.60		
						21	55.60		
						22	54.60		
						23	53.60		
23.90						24	52.60		
Drove cone through inferred **GLACIAL TILL** and/or very stiff **SILTY CLAY** and/or fractured **SHALE** 25.09									
End of Borehole						25	51.60		
Practical DCPT refusal at 25.09m depth.									

Water Content % scale: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Boundary Road at Highway 417
Ottawa, Ontario

DATUM Geodetic

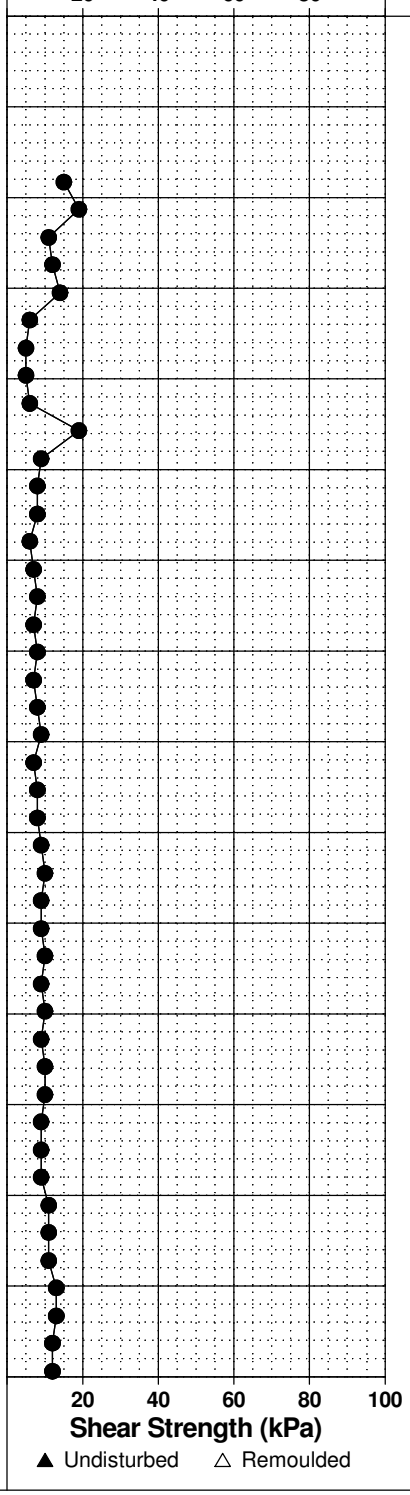
FILE NO. PG4366

REMARKS Ground surface is after stripping operations.

HOLE NO. BH42

BORINGS BY CME 55 Power Auger **DATE** July 10, 2018

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	78.02		
Drove cone through inferred soft to stiff **SILTY CLAY**						1	77.02		
						2	76.02		
						3	75.02		
						4	74.02		
						5	73.02		
						6	72.02		
						7	71.02		
						8	70.02		
						9	69.02		
						10	68.02		
						11	67.02		
						12	66.02		
						13	65.02		
						14	64.02		
						15	63.02		



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Boundary Road at Highway 417
Ottawa, Ontario

DATUM Geodetic

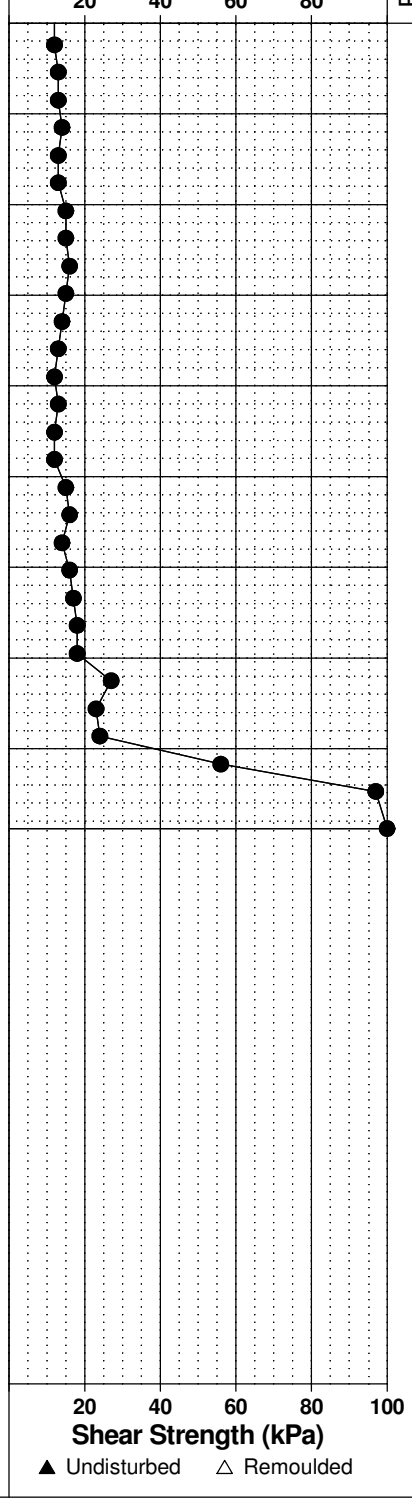
FILE NO. PG4366

REMARKS Ground surface is after stripping operations.

HOLE NO. BH42

BORINGS BY CME 55 Power Auger **DATE** July 10, 2018

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						15	63.02		
Drove cone through inferred stiff to very stiff **SILTY CLAY**						16	62.02		
						17	61.02		
						18	60.02		
						19	59.02		
						20	58.02		
						21	57.02		
						22	56.02		
22.20									
Drove cone through inferred **GLACIAL TILL** and/or very stiff **SILTY CLAY** and/or fractured **SHALE**						23	55.02		
23.88									
End of Borehole									
Practical DCPT refusal at 23.88m depth.									



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 relative strength of cohesionless soils is the compactness condition, 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. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	'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 shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

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, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

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 NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, 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, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC%	-	Natural water 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 at 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

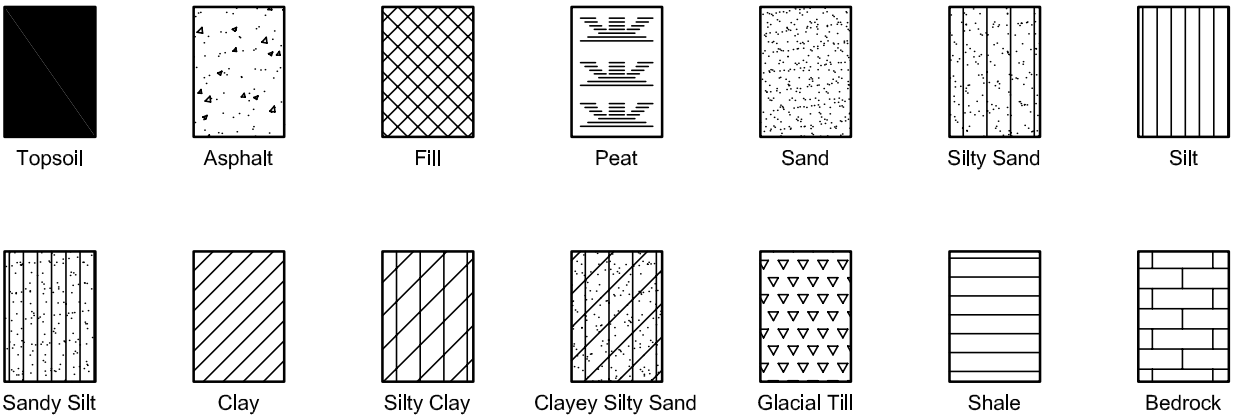
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void 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.

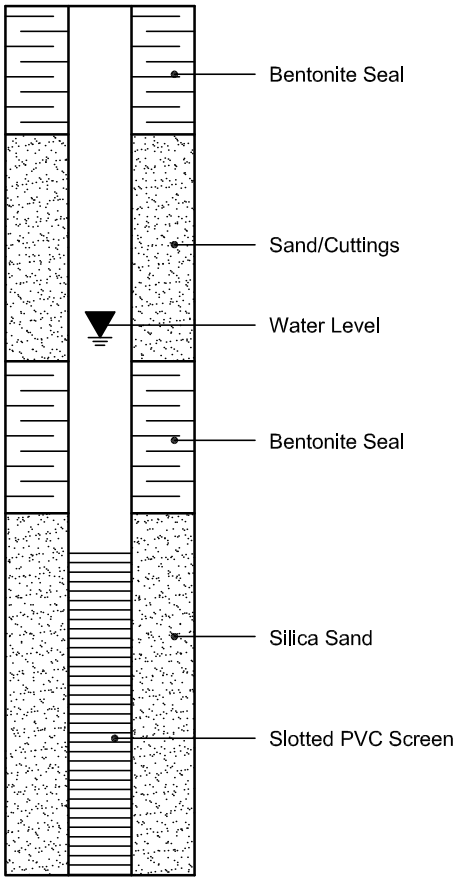
SYMBOLS AND TERMS (continued)

STRATA PLOT

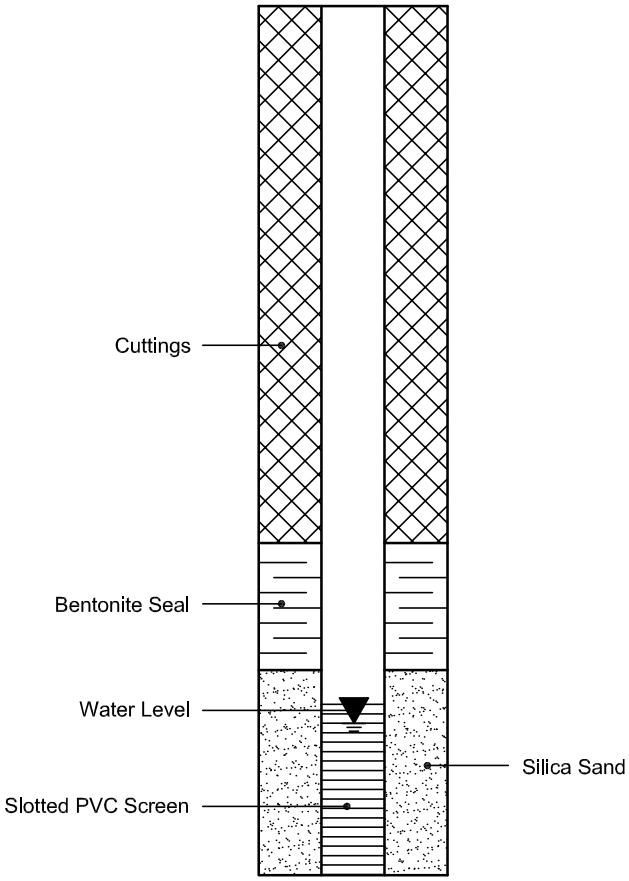


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



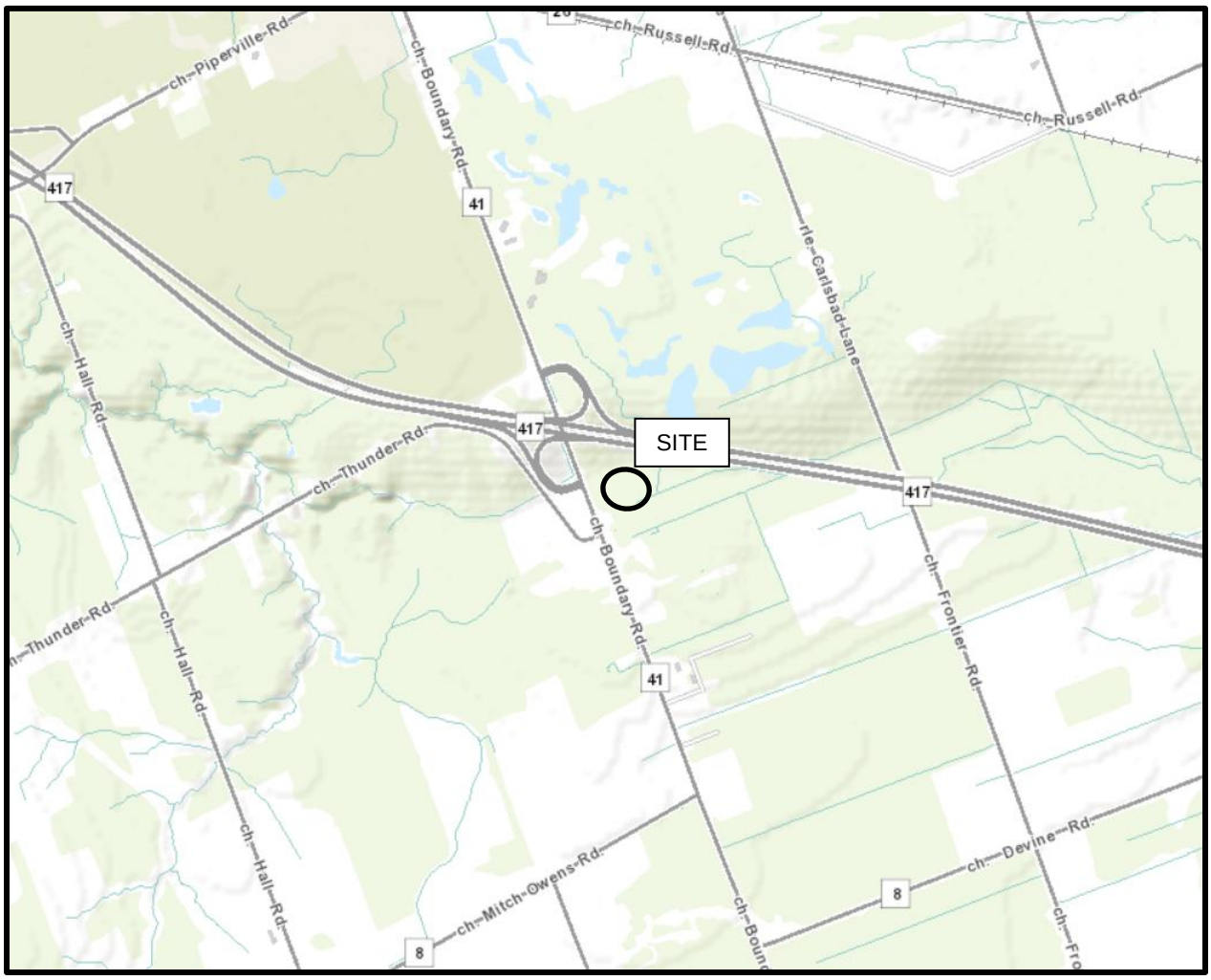
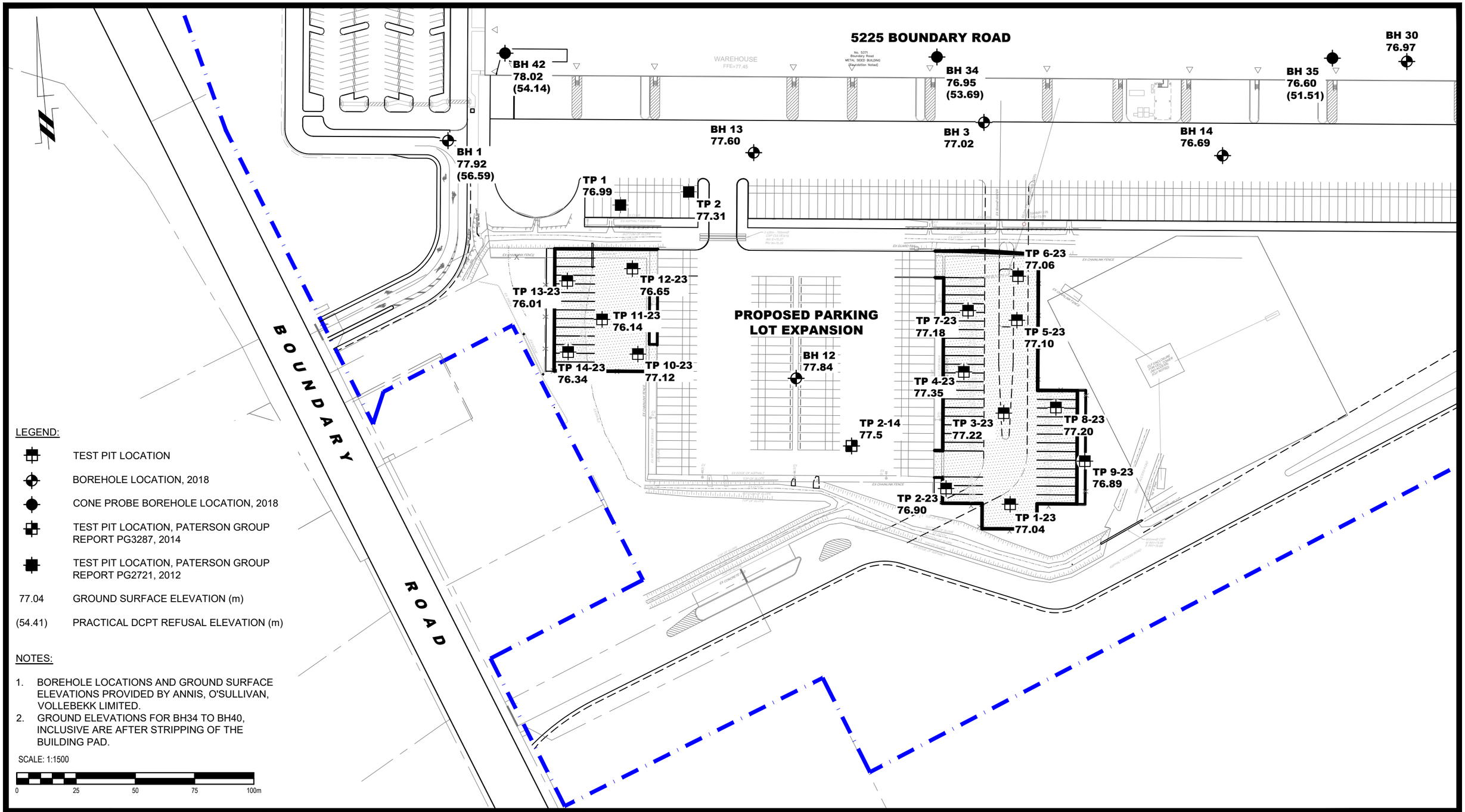


FIGURE 1

KEY PLAN

PATERSON GROUP



LEGEND:

- TEST PIT LOCATION
- BOREHOLE LOCATION, 2018
- CONE PROBE BOREHOLE LOCATION, 2018
- TEST PIT LOCATION, PATERSON GROUP REPORT PG3287, 2014
- TEST PIT LOCATION, PATERSON GROUP REPORT PG2721, 2012
- 77.04 GROUND SURFACE ELEVATION (m)
- (54.41) PRACTICAL DCPT REFUSAL ELEVATION (m)

NOTES:

1. BOREHOLE LOCATIONS AND GROUND SURFACE ELEVATIONS PROVIDED BY ANNIS, O'SULLIVAN, VOLLEBEKK LIMITED.
2. GROUND ELEVATIONS FOR BH34 TO BH40, INCLUSIVE ARE AFTER STRIPPING OF THE BUILDING PAD.

SCALE: 1:1500

0 25 50 75 100m

PATERSON GROUP
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NO.	REVISIONS	DATE	INITIAL

BROCCOLINI CONSTRUCTION (ONTARIO) LTD.

GEOTECHNICAL INVESTIGATION
PROPOSED PARKING LOT EXPANSION
5225 BOUNDARY ROAD
OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:1500	Date: 07/2023
Drawn by: GK	Report No.: PG4366-LET.01
Checked by: DP	Dwg. No.: PG4366-3
Approved by: DJG	Revision No.:

p:\autocad drawings\geotechnical\pg43xx\pg4366\pg4366-3 test hole location plan.dwg