Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

patersongroup

Geotechnical Investigation

Proposed Commercial Development
Phases 1 and 2
2025 Mer Bleue Road
Ottawa, Ontario

Prepared For

SmartReit

March 6, 2018

Report: PG0811-2 Revision 2

Paterson Group Inc.
Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
Canada K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

Table of Contents

Page

Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by SmartReit to conduct a geotechnical investigation for the current phase of the proposed commercial development to be located at the southeast corner of Innes Road and Mer Bleue Road, in the City of Ottawa, Ontario (refer to Figure 1 - Key Plan in Appendix 2).

The objectives of the current investigation were:

- ❑ to determine the subsurface soil and groundwater conditions by means of boreholes,
- ❑ to provide geotechnical recommendations pertaining to design of the proposed development including construction considerations which may affect the design.

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

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

2.0 Proposed Development

It is understood that the current phases (Phases 1 and 2) of the proposed development will consist of several commercial buildings of slab-on-grade construction along with associated car parking areas, access lanes and landscaped areas. It is further understood that the site will be municipally serviced.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the current geotechnical investigation was carried out between November 9 and 11, 2016. At that time, seven (7) boreholes were drilled to a maximum depth of 6.6 m and eleven (11) probeholes were drilled to a maximum depth of 7.6 m below existing ground surface. A previous investigation was conducted by this firm within the subject site during April 2006. The relevant test holes within the subject site from the current and previous investigations are presented on Drawing PG0811-1 - Test Hole Location Plan in Appendix 2. The test hole locations were determined in the field by Paterson personnel taking into consideration site features and underground services.

The test holes were completed with a track-mounted auger 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 from our geotechnical department. The test pits completed during the previous geotechnical investigation consisted of excavating to the required depths at the selected locations and sampling and testing the overburden.

Sampling and In Situ Testing

Soil samples were recovered from the auger flights or a 50 mm diameter split-spoon sampler. The soil from the auger flights and split-spoon samples were classified on site and placed in sealed plastic bags. All samples were transported to our laboratory. The depths at which the auger flight and , split-spoon samples were recovered from the boreholes are depicted as AU and SS, respectively, on the Soil Profile and Test Data sheets in Appendix 1.

The 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 conducted at regular intervals of depth in cohesive soils.

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.

Groundwater

Flexible PVC standpipes were installed in all boreholes to permit monitoring of the groundwater levels subsequent to the completion of the sampling program.

Sample Storage

All samples will be stored in the laboratory for a period of one month after issuance of this report. They will then be discarded unless we are otherwise directed.

3.2 Field Survey

The test hole locations were located in the field by Paterson personnel. The test hole locations and ground surface elevation at the test hole locations were provided by Stantec Geomatics. The ground surface elevations are understood to be referenced to a geodetic datum. The test hole locations and ground surface elevations of the test hole locations are presented on Drawing PG0811-1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

The soil samples recovered from the subject site were examined in our laboratory to review the results of the field logging. Two atterberg limit tests were completed on selected soil samples. The results are presented in Table 1 on the following page.

3.4 Analytical Testing

One soil sample from the subject site 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 analytical test results are presented in Appendix 1 and discussed in Subsection 6.7.

4.0 Observations

4.1 Surface Conditions

At the time of our field program, the subject site consisted of agricultural fields with some mature trees and a grassed area within the northwest corner of the site. It should be noted that two existing ditches were observed within the current phase of the proposed development. The subject site is relatively flat and slightly lower than Innes Road and Mer Bleue Road.

Several residential and agricultural buildings were formerly present within the northwest portion of the subject site. Three potable wells (one dug and two drilled) associated with the former buildings were observed during our 2006 inspection. It is recommended that the existing wells be decommissioned at the time of construction of the proposed development. The wells should be abandoned according to Ontario Regulation 903.

4.2 Subsurface Profile

Generally, the soil conditions encountered at the test hole locations consist of topsoil overlying very stiff to stiff brown silty clay crust layer and followed by a firm grey silty clay deposit. A thin layer of fill overtop of the silty clay crust was encountered at BH 1-16 and BH 5-16. Glacial till was encountered below the firm grey silty clay deposit at BH 1-16, BH 2-16, BH 3-16 and BH 5-16. Practical refusal to augering was encountered at depths ranging from 2 m to 7.6 m. 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. The results of the atterberg limit testing on selected silty clay samples are presented in Table 1 below.

Table 1
Summary of Atterberg Limits Tests

Samples	Depth (m)	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %
BH1-17 SS3	4.6	84.5	87	23	64
BH2-17 G1	1.5	43.0	77	23	54

Based on available geological mapping, the bedrock consists of interbedded limestone and dolomite of the Lindsay Formation and is expected to be encountered at depths ranging from 5 to 15 m.

4.3 Groundwater

Groundwater levels were noted at the test hole locations at the time of drilling and the results are summarized in Table 2. It is important to note that groundwater readings at the piezometers can be influenced by water perched within the borehole backfill material. Long-term groundwater conditions can also be estimated based on the observed colour, moisture levels and consistency of the recovered soil samples. Based on these observations, it is estimated that the long-term groundwater level can be expected between 2 to 3 m below existing ground surface. It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater levels could vary at the time of construction.

Table 2 - Measured Groundwater Levels

Test Hole Number	Ground Surface Elevation (m)	Water Level		Date
		Depth (m)	Elevation (m)	
Current Investigation				
BH 1-16	89.78	1.17	88.61	November 24, 2016
BH 2-16	88.54	1.50	87.04	November 24, 2016
BH 3-16	88.52	1.33	87.19	November 24, 2016
BH 4-16	88.38	0.97	87.41	November 24, 2016
BH 5-16	89.62	2.13	87.49	November 24, 2016
BH 6-16	89.32	Damaged	n/a	November 24, 2016
BH 7-16	88.73	Damaged	Surface	November 24, 2016
PH 6-16	88.59	Damaged	n/a	November 24, 2016
PH 7-16	89.48	2.01	87.47	November 24, 2016
Previous Investigation				
BH 1	89.41	Dry	n/a	April 12, 2006
BH 2	87.81	0.60	87.21	April 12, 2006
BH 3	89.00	0.45	88.55	April 12, 2006

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is considered adequate for the proposed commercial development. It is expected that the proposed buildings can be founded by conventional style shallow foundations placed on an undisturbed, stiff brown silty clay bearing surface.

Due to the presence of a silty clay deposit underlying the subject site, a permissible grade raise restriction will be required.

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. Sideslopes of the existing ditch should be shaped to provide maximum 500 mm high steps to improve the quality of the compaction work during the backfilling program.

Fill Placement

Fill placed for grading beneath the proposed buildings, unless otherwise specified, should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. The fill should be tested and approved prior to delivery to the site. The fill should be placed in lifts with a maximum loose lift thickness of 300 mm and compacted with suitable compaction equipment. Fill placed beneath the building areas 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 where settlement is a minor concern. These materials should be spread in maximum lift thickness of 300 mm and at a minimum compacted by the tracks of the spreading equipment to minimize voids. If these materials are to be placed to increase the subgrade level for areas to be paved, the backfill should be compacted in thin lifts to a minimum density of 95% of the SPMDD.

Non-specified existing fill and site-excavated soils are not suitable for placement as backfill against foundation walls, unless a geocomposite drainage membrane is installed, such as Miradrain G100N or Delta Drain 6000. Consideration should also be given to placing a non-frost susceptible, granular fill against the exterior side of the foundation walls to limit frost heave issues for sensitive areas, such as perimeter sidewalks or exterior entrance slabs.

Bedrock Removal

If bedrock removal is required, consideration should be given to hoe-ramming or controlled blasting. In areas of weathered bedrock and where only a small quantity of bedrock is to be removed, bedrock removal may be possible by hoe-ramming.

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

As a general guideline, peak particle velocities (measured at the structures) should not exceed 25 mm per second during the blasting program to reduce the risks of damage to the existing structures.

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

Vibration Considerations

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

5.3 Foundation Design

Conventional Shallow Foundations

Strip footings, up to 2 m wide, and pad footings, up to 5 m wide, founded on an undisturbed, stiff silty clay, glacial till or engineered fill bearing surface can be designed using the 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**.

Footings designed using the above-noted bearing resistance values will be subjected to potential post-construction total and differential settlements of 25 and 20 mm, respectively.

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.

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 silty clay above the groundwater table when a plane extending horizontally and vertically from the footing face at a minimum of 1.5H:1V, passing through in situ soil of the same or higher capacity as the bearing medium soil.

Settlement/Grade Raise

Consideration must 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.

Due to the silty clay underlying the subject site, a permissible grade raise of **2 m** is recommended for grading within 6 m of the building footprint. A permissible grade raise restriction of **2.5 m** is recommended for the parking areas and access lanes. It should be noted that the permissible grade raise values noted above are measured from the **original ground surface**, below any existing fill observed at select locations on site.

Generally, the potential long term settlement is evaluated based on the compressibility characteristics of the silty clay. The total and differential settlements will be dependent on characteristics of the proposed buildings. For design purposes, the total and differential settlements are estimated to be 25 and 20 mm, respectively. A post-development groundwater lowering of 0.5 m was assumed.

5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Class C** for footings placed over a silty clay bearing surface. The soils underlying the proposed shallow foundations are not susceptible to liquefaction. Reference should be made to the latest revision of the 2012 Ontario Building Code for a full discussion of the earthquake design requirements.

5.5 Slab on Grade Construction

The in situ soils, approved granular fill or lean concrete mudslab will be considered to be an acceptable subgrade on which to commence backfilling for floor slab construction.

The upper 200 mm of sub-slab backfill is recommended to consist of 19 mm clear crushed stone. All backfill material within the proposed building footprint should be placed in maximum 300 mm thick loose layers and compacted to a minimum of 98% of the SPMDD.

Any soft areas should be removed and backfilled with appropriate backfill material prior to placing any additional backfill. OPSS Granular A or Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab. All backfill material within the footprint of the proposed building should be placed in maximum 300 mm thick loose layers and compacted to a minimum of 98% of the SPMDD.

5.6 Pavement Structure

For design purposes, the pavement structures presented in the following tables could be used for the design of car only parking areas, heavy truck parking areas and access lanes.

Table 3 - 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
400	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either in situ soil, fill or OPSS Granular B Type I or II material placed over in situ soil	

Table 4 - Recommended Pavement Structure Heavy Truck Parking Areas and Access Lanes	
Thickness (mm)	**Material Description**
40	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course -** HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
450	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either in situ soil, fill or OPSS Granular B Type I or II material placed over in situ soil	

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

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

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 98% of the SPMDD using suitable vibratory equipment.

Pavement Structure Drainage

Satisfactory performance of the pavement structure is largely dependent on keeping the contact zone between the subgrade material and the base stone in a dry condition.

Failure to provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing the load bearing capacity.

Where silty clay is anticipated at subgrade level, consideration should be given to installing sub-drains at the catch basin locations during the pavement construction. The sub-drain inverts should be approximately 300 mm below subgrade level and extend 3 m along the curblines in both directions. The subgrade surface should be crowned to promote water flow to the drainage lines.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

It is recommended that a perimeter foundation drainage system be provided for the proposed structures. The system should consist of a 150 mm diameter perforated corrugated plastic pipe, surrounded on all sides by 150 mm of 10 mm clear crushed stone, placed at the footing level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

Backfill against the exterior sides of the foundation walls should consist of free-draining non frost susceptible granular materials. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls where frost heave sensitive structures, such as a concrete sidewalk, will be placed. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material may be used for this purpose. A composite drainage system, such as Delta Drain 6000, Miradrain G100 or equivalent, should be placed against the foundation wall to promote drainage toward the perimeter drainage pipe.

6.2 Protection Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effect of frost action. A minimum of 1.5 m thick soil cover (or equivalent) should be provided in this regard.

A minimum of 2.1 m thick soil cover (or equivalent) should be provided for other exterior unheated footings.

6.3 Excavation Side Slopes

The side slopes of excavations in the soil and fill overburden materials should be either 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 assumed 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. 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

The pipe bedding for sewer and water pipes should consist of at least 150 mm of OPSS Granular A crushed stone. Where the bedding is located within the firm grey silty clay or directly over the bedrock surface, the thickness of the bedding material should be increased to a minimum of 300 mm. 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 the 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 minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the SPMDD.

It is recommended that the subgrade medium be inspected in the field to determine how steeply the bedrock surface, where encountered, drops off. A transition treatment should be provided where the bedrock slopes at more than 3H:1V. At these locations, the bedrock should be excavated and extra bedding be placed to provide a 3H:1V (or flatter) transition from the bedrock subgrade towards the soil subgrade. This treatment reduces the propensity for bending stress to occur in the service pipes.

To reduce long-term lowering of the groundwater level at this site, clay seals should be provided in the service trenches where services are installed within 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. Generally, 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.

6.5 Groundwater Control

It is anticipated that groundwater infiltration into the excavations should be low and controllable using open sumps. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations. 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.

A temporary Ministry of the Environment and Climate Change (MOECC) permit to take water (PTTW) may be required for this project if more than 400,000 L/day of ground and/or surface water is to be pumped during the construction phase. A minimum 4 to 5 months should be allowed for completion of the PTTW application package and issuance of the permit by the MOECC.

For typical ground or surface water volumes, being pumped during the construction phase, between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. If a project qualifies for a PTTW based upon anticipated conditions, an EASR will not be allowed as a temporary dewatering measure while awaiting the MOECC review of the PTTW application.

6.6 Winter Construction

The subsurface conditions at this site mostly consist of frost susceptible materials. In 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.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the use of straw, propane heaters, 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.

The trench excavations should be constructed in a manner that will avoid the introduction of frozen materials into the trenches. As well, pavement construction is 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.

6.7 Corrosion Potential and Sulphate

The analytical test results are presented in Table 5 along with industry standards for the applicable threshold values. The results are indicative that Type 10 Portland cement can be used at the subject site.

Table 5 - Corrosion Potential

Parameter	Laboratory Results	Threshold	Commentary
	BH 2 - SS3		
Chloride	16 µg/g	Chloride content less than 400 mg/g	Negligible concern
pH	7.432	pH value less than 5.0	Neutral Soil
Resistivity	86 ohm.m	Resistivity greater than 1,500 ohm.cm	Low Corrosion Potential
Sulphate	35 µg/g	Sulphate value greater than 1 mg/g	Negligible Concern

6.8 Landscaping Considerations

Tree Planting Restrictions

The proposed development is located in a moderate sensitivity area with respect to tree plantings over a silty clay deposit. The following tree setbacks are recommended for varying types of trees to be planted across the subject site:

- ❏ Shrubs and trees (max. mature height of 3 m) of low water demand with shallow root systems can be planted within 4.5 m of the foundation.
- ❏ Low water demand trees with a maximum mature height of 8 m can be placed between 4.51 to 6 m from the foundation
- ❏ Low water demand trees with a maximum mature height of 12 m can be placed between 6.01 to 7.5 m from the foundation
- ❏ Typical street trees with low to moderate water demand should be placed greater than 7.5 m from the foundation

It is well documented in the literature, and is our experience, that fast-growing trees located near buildings founded on cohesive soils that shrink on drying can result in long-term differential settlements of the structures. Tree varieties that have the most pronounced effect on foundations are seen to consist of poplars, willows and some maples (i.e. Manitoba Maples) and, as such, they should not be considered in the landscaping design.

.

7.0 Recommendations

It is a requirement for the foundation design data provided herein to be applicable that a materials testing and observation services program including the following aspects be performed by the geotechnical consultant.

- ❑ Review the master grading plan from a geotechnical perspective, once available.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Sampling and testing of the concrete and granular 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 request, following the completion of a satisfactory materials testing and observation program by the geotechnical consultant.

8.0 Statement of Limitations

The recommendations made in this report are in accordance with our present understanding of the project. We request that we be permitted to review the grading plan once available. Also, our recommendations should be reviewed when the project drawings and specifications are complete.

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, we request that we be notified immediately in order to permit reassessment of our recommendations.

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 SmartReit or their agent(s) is not authorized without review by this firm for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Faisal I. Abou-Seido, P.Eng.

David J. Gilbert, P.Eng.

Report Distribution:

- ❑ SmartReit (3 copies)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ANALYTICAL TESTING RESULTS

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

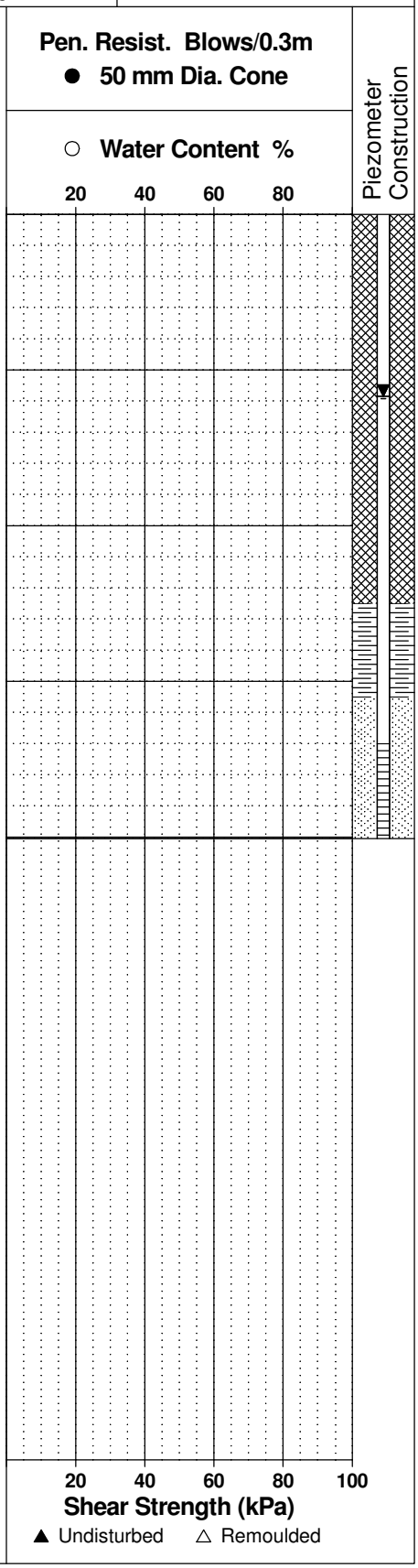
FILE NO. PG0811

REMARKS

HOLE NO. BH 1-16

BORINGS BY CME 55 Power Auger **DATE** November 9, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	89.78
TOPSOIL 0.20		AU	1				
FILL: Brown silty clay, trace sand and gravel 0.91		SS	2	54	13	1	88.78
		SS	3	17	39	2	87.78
GLACIAL TILL: Brown silty clay, trace sand, gravel, cobbles and boulders		SS	4	38	31	3	86.78
		SS	5	29	50+		
4.01		SS	6	50	50+	4	85.78
End of Borehole							
Practical refusal to augering at 4.01m depth							
(GWL @ 1.17m - Nov. 24, 2016)							



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

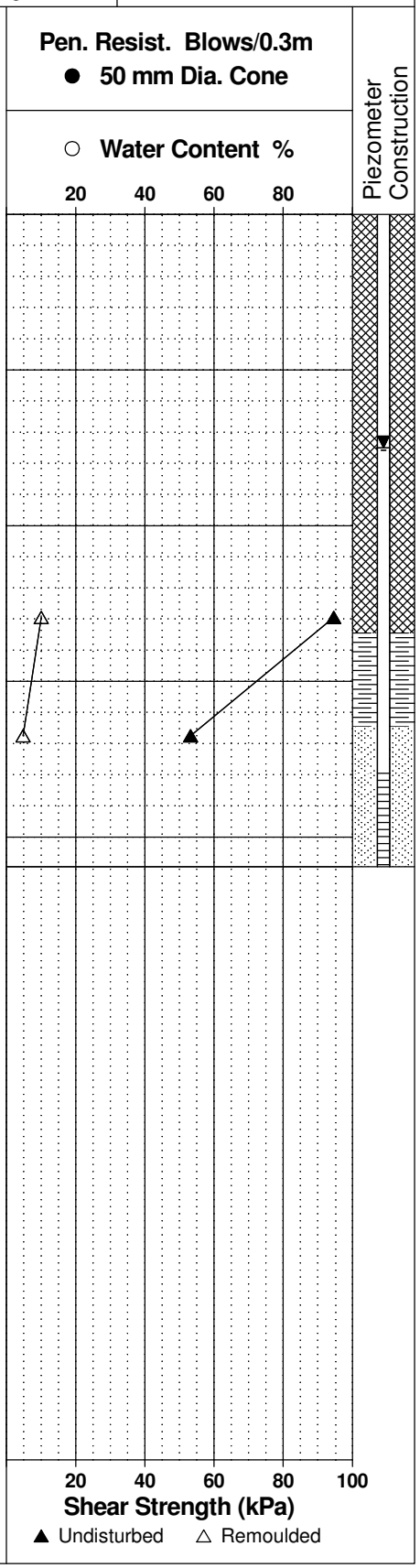
FILE NO. PG0811

REMARKS

HOLE NO. BH 2-16

BORINGS BY CME 55 Power Auger **DATE** November 10, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.54
TOPSOIL 0.35		AU	1				
		SS	2	100	9	1	87.54
Very stiff to stiff, brown **SILTY CLAY,** trace sand		SS	3	100	6	2	86.54
- grey by 3.0m depth						3	85.54
3.50							
GLACIAL TILL: Grey silty clay, trace sand, gravel, cobbles and boulders 4.19		SS	4	31	50+	4	84.54
End of Borehole							
Practical refusal to augering at 4.19m depth							
(GWL @ 1.50m - Nov. 24, 2016)							



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

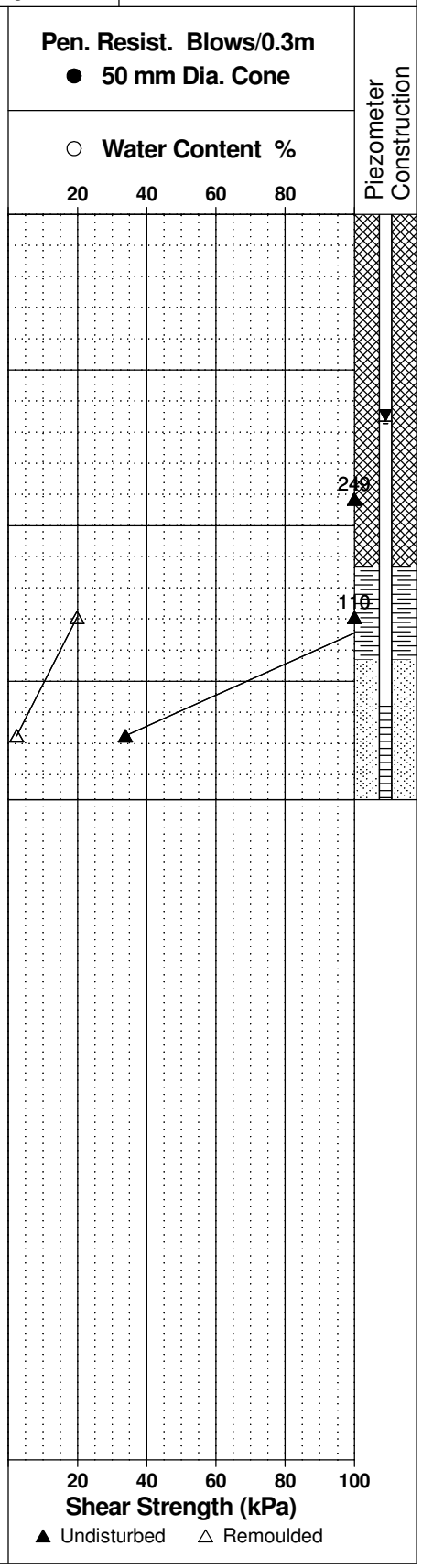
FILE NO. PG0811

REMARKS

HOLE NO. BH 3-16

BORINGS BY CME 55 Power Auger **DATE** November 10, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.52
TOPSOIL 0.35		AU	1				
		SS	2	100	13	1	87.52
Hard to very stiff, brown **SILTY CLAY,** trace sand						2	86.52
- stiff to firm and grey by 3.0m depth						3	85.52
3.50							
GLACIAL TILL: Grey silty clay, trace sand, gravel, cobbles and boulders 3.76							
End of Borehole							
Practical refusal to augering at 3.76m depth							
(GWL @ 1.33m - Nov. 24, 2016)							



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

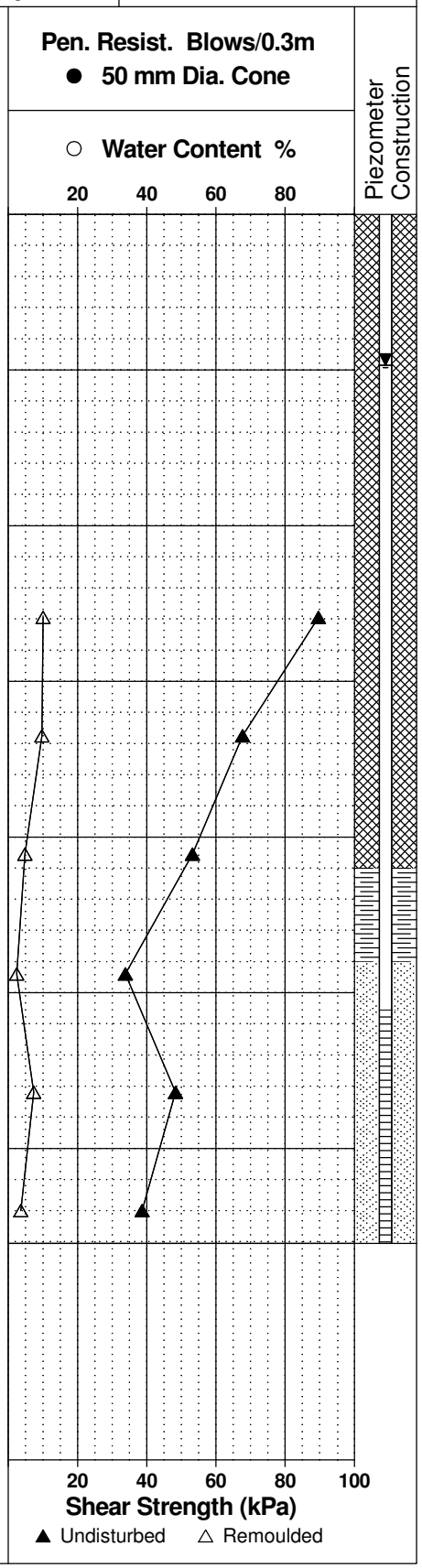
FILE NO. PG0811

REMARKS

HOLE NO. BH 4-16

BORINGS BY CME 55 Power Auger **DATE** November 10, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.38
TOPSOIL 0.30		AU	1				
		SS	2	100	10	1	87.38
		SS	3	100	8	2	86.38
Very stiff to stiff, brown **SILTY CLAY,** trace sand						3	85.38
						4	84.38
- firm and grey by 4.6m depth						5	83.38
						6	82.38
6.61 End of Borehole							
Practical refusal to augering at 6.61m depth							
(GWL @ 0.97m - Nov. 24, 2016)							



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. BH 5-16

BORINGS BY CME 55 Power Auger **DATE** November 9, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	89.62
TOPSOIL 0.18							
FILL: Brown silty clay, trace gravel		AU	1				
0.53							
Compact, brown **SILTY SAND,** trace clay						1	88.62
1.07		SS	2	67	15		
Very stiff, brown **SILTY CLAY**							
1.60		SS	3	100	50+		
GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders						2	87.62
		SS	4	83	23		
2.84							
End of Borehole							
Practical refusal to augering at 2.84m depth							
(GWL @ 2.13m - Nov. 24, 2016)							

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. BH 6-16

BORINGS BY CME 55 Power Auger **DATE** November 9, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	89.32
TOPSOIL 0.20		AU	1				
FILL: Brown silty clay, trace sand, gravel, cobbles and asphalt 0.89		SS	2	0	13	1	88.32
		SS	3	100	10	2	87.32
Very stiff to stiff, brown **SILTY CLAY,** trace sand		SS	4	100	7	3	86.32
		SS	5	100			
3.66 End of Borehole							
(BH dry - Nov. 24, 2016)							

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

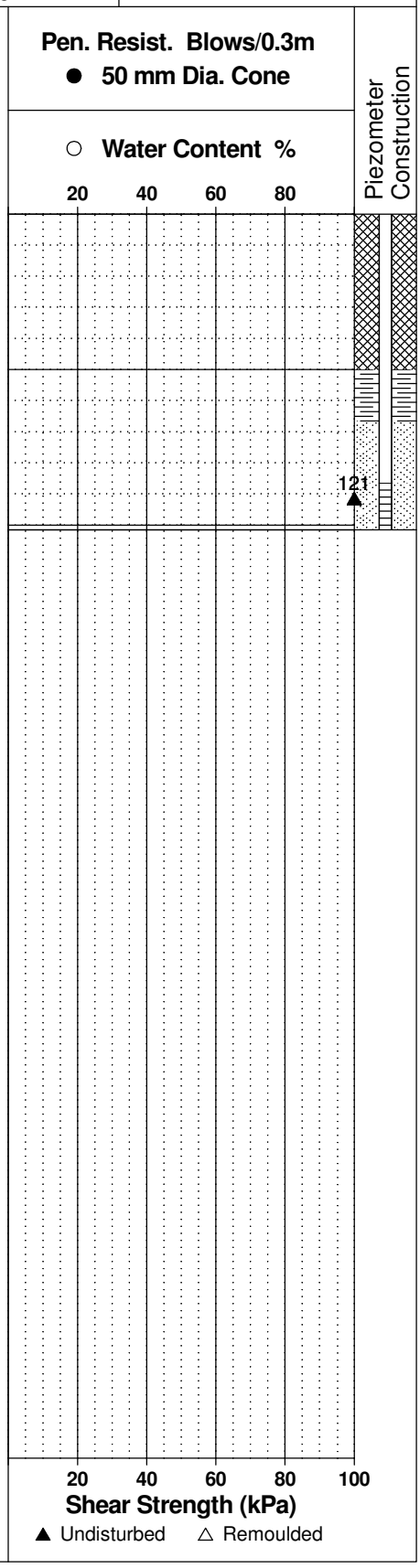
FILE NO. PG0811

REMARKS

HOLE NO. BH 7-16

BORINGS BY CME 55 Power Auger **DATE** November 9, 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL						0	88.75
0.30		AU	1				
Very stiff, brown **SILTY CLAY,** trace sand		SS	2	100	11	1	87.75
2.03						2	86.75
End of Borehole							
Practical refusal to augering at 2.03m depth							
(Piezometer damaged - Nov. 24, 2016)							



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. PH 1-16

BORINGS BY CME 55 Power Auger **DATE** November 10, 2016

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	89.19	20 40 60 80	
						1	88.19		
						2	87.19		
OVERBURDEN						3	86.19		
						4	85.19		
4.57									
End of Probehole									

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. PH 2-16

BORINGS BY CME 55 Power Auger **DATE** November 10, 2016

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	88.64	20 40 60 80	
OVERBURDEN						1	87.64		
						2	86.64		
						3	85.64		
3.28									
End of Probehole Practical refusal to augering at 3.28m depth								20 40 60 80 100 Shear Strength (kPa) ▲ Undisturbed △ Remoulded	

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. PH 3-16

BORINGS BY CME 55 Power Auger **DATE** November 11, 2016

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	88.96		
						1	87.96		
OVERBURDEN						2	86.96		
2.80									
End of Probehole									
Practical refusal to augering at 2.80m depth									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. PH 4-16

BORINGS BY CME 55 Power Auger **DATE** November 11, 2016

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	88.28		
						1	87.28		
OVERBURDEN						2	86.28		
						3	85.28		
						4	84.28		
End of Probehole						4.57			

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. PH 5-16

BORINGS BY CME 55 Power Auger **DATE** November 11, 2016

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	88.36	20 40 60 80	
						1	87.36		
OVERBURDEN						2	86.36		
						3	85.36		
						4	84.36		
4.57									
End of Probehole									

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. PH 6-16

BORINGS BY CME 55 Power Auger **DATE** November 10, 2016

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	88.59		
OVERBURDEN						1	87.59		
2.13						2	86.59		
End of Probehole Practical refusal to augering at 2.13m depth									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. PH 7-16

BORINGS BY CME 55 Power Auger **DATE** November 10, 2016

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	89.48		
						1	88.48		
						2	87.48		
OVERBURDEN						3	86.48		
						4	85.48		
4.72									
End of Probehole Practical refusal to augering at 4.72m depth (GWL @ 2.01m - Nov. 24, 2016)									

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

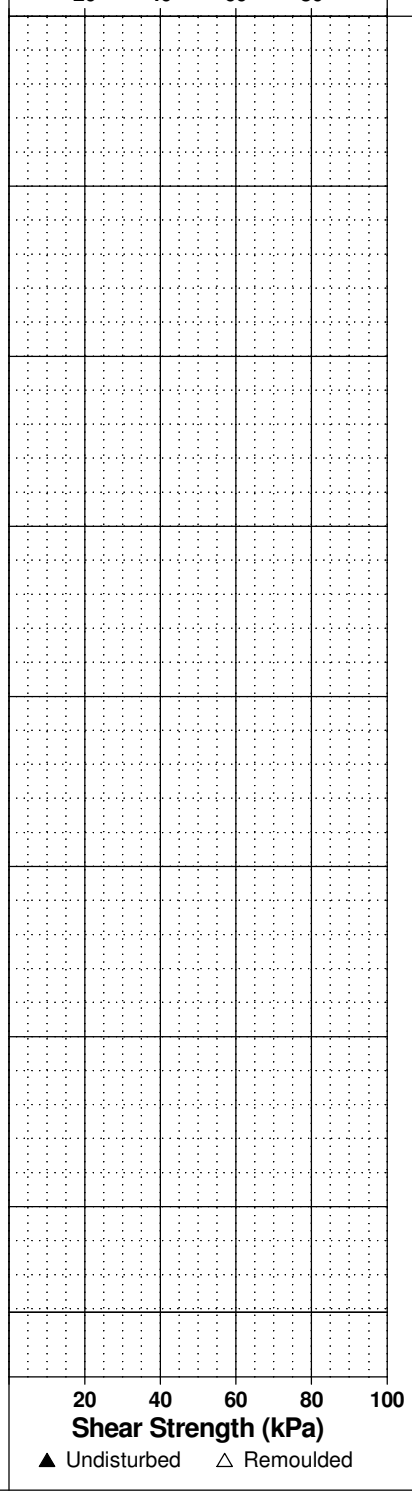
FILE NO. PG0811

REMARKS

HOLE NO. PH 8-16

BORINGS BY CME 55 Power Auger **DATE** November 10, 2016

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	88.53		
						1	87.53		
						2	86.53		
						3	85.53		
OVERBURDEN						4	84.53		
						5	83.53		
						6	82.53		
						7	81.53		
7.62 End of Probehole									



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. PH 9-16

BORINGS BY CME 55 Power Auger **DATE** November 10, 2016

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	88.23		
						1	87.23		
OVERBURDEN						2	86.23		
						3	85.23		
						4	84.23		
4.27									
End of Probehole									
Practical refusal to augering at 4.27m depth									

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. PH10-16

BORINGS BY CME 55 Power Auger **DATE** November 11, 2016

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	88.42		
						1	87.42		
OVERBURDEN						2	86.42		
						3	85.42		
3.58									
End of Probehole Practical refusal to augering at 3.58m depth									

Water Content % scale: 20 40 60 80

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

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. PH11-16

BORINGS BY CME 55 Power Auger **DATE** November 11, 2016

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	88.36	20 40 60 80	
OVERBURDEN						1	87.36		
						2	86.36		
						3	85.36		
3.15									
End of Probehole Practical refusal to augering at 3.15m depth								20 40 60 80 100 **Shear Strength (kPa)** ▲ Undisturbed △ Remoulded	

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. BH 1

BORINGS BY CME 75 Power Auger **DATE** 5 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	89.41
TOPSOIL 0.08							
FILL: Brown silty clay, some gravel 0.20							
Very stiff, brown **SILTY CLAY** 1.42		SS	1	50	17	1	88.41
GLACIAL TILL: Dense, brown silty sand with clay, gravel, cobbles and boulders 2.03		SS	2	44	50+	2	87.41
End of Borehole							
Practical refusal to augering @ 2.03m depth							
(BH dry-Apr. 12/06)							

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

FILE NO. PG0811

REMARKS

HOLE NO. BH 1-17

BORINGS BY CME 55 Power Auger **DATE** January 26, 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									
TOPSOIL 0.25						0	88.17		
		AU	1			1	87.17		
FILL: Brown silty clay, trace gravel		SS	2	8		2	86.17		
						3	85.17		
						4	84.17		
4.78 Stiff, grey **SILTY CLAY,** trace sand 5.18		SS	3	83	4	5	83.17		
End of Borehole									
(GWL @ 1.8m depth based on field observations)									

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

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

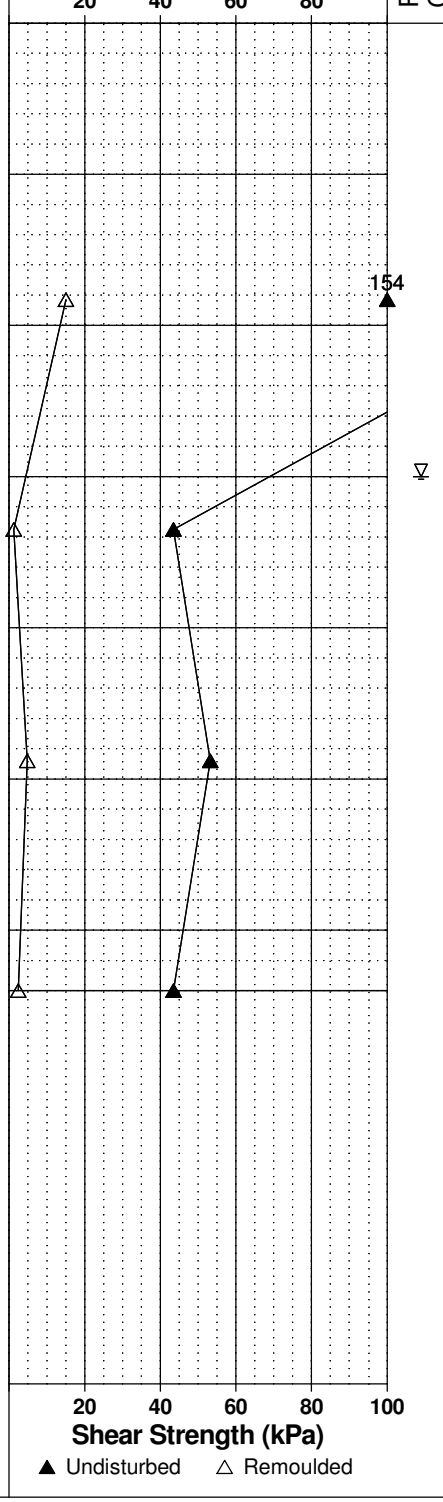
FILE NO. PG0811

REMARKS

HOLE NO. BH 2-17

BORINGS BY CME 55 Power Auger **DATE** January 25, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.35
TOPSOIL 0.28		AU	1			1	87.35
		SS	2	92	P	2	86.35
Very stiff to firm, brown **SILTY CLAY,** trace sand						3	85.35
- grey by 4.6m depth						4	84.35
						5	83.35
						6	82.35
6.40 End of Borehole							
(GWL @ 3.0m depth based on field observations)							



Piezometer Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

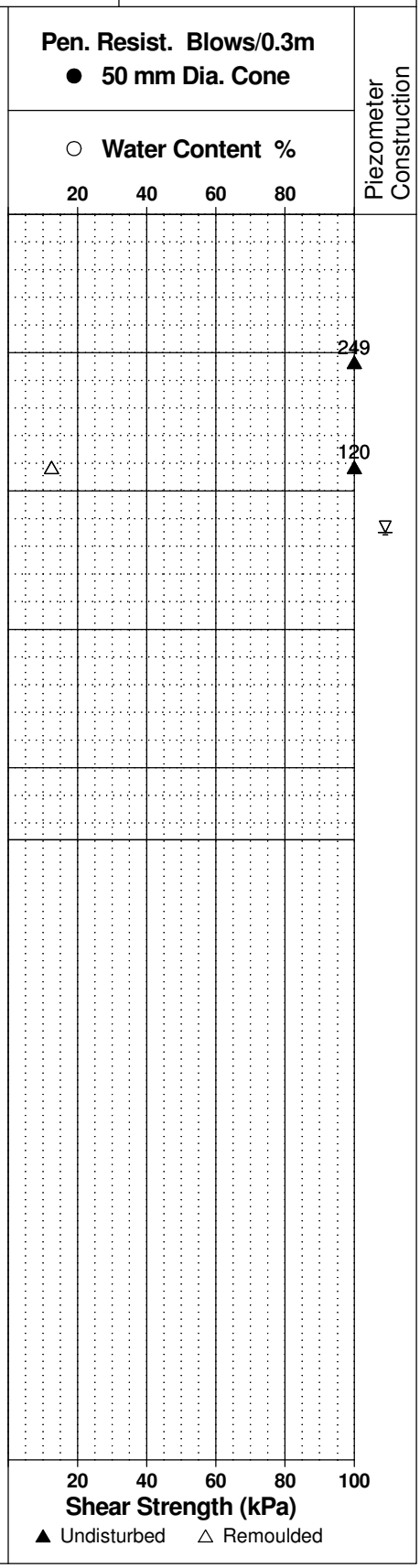
FILE NO. PG0811

REMARKS

HOLE NO. BH 3-17

BORINGS BY CME 55 Power Auger **DATE** January 25, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.60
TOPSOIL							
0.33							
Hard to very stiff, brown **SILTY CLAY,** trace sand						1	87.60
						2	86.60
3.05							
GLACIAL TILL: Grey silty sand with clay, gravel, cobbles and boulders		SS	1	100	11	3	85.60
4.52						4	84.60
End of Borehole							
Practical refusal to augering at 4.52m depth							
(GWL @ 2.3m depth based on field observations)							



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

FILE NO. PG0811

REMARKS

HOLE NO. BH 4-17

BORINGS BY CME 55 Power Auger **DATE** January 25, 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									
TOPSOIL 0.30						0	88.24		
Very stiff, brown **SILTY CLAY,** trace sand						1	87.24		
2.39						2	86.24		
End of Borehole Practical refusal to augering at 2.39m depth (BH dry upon completion)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %
20 40 60 80
164
20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

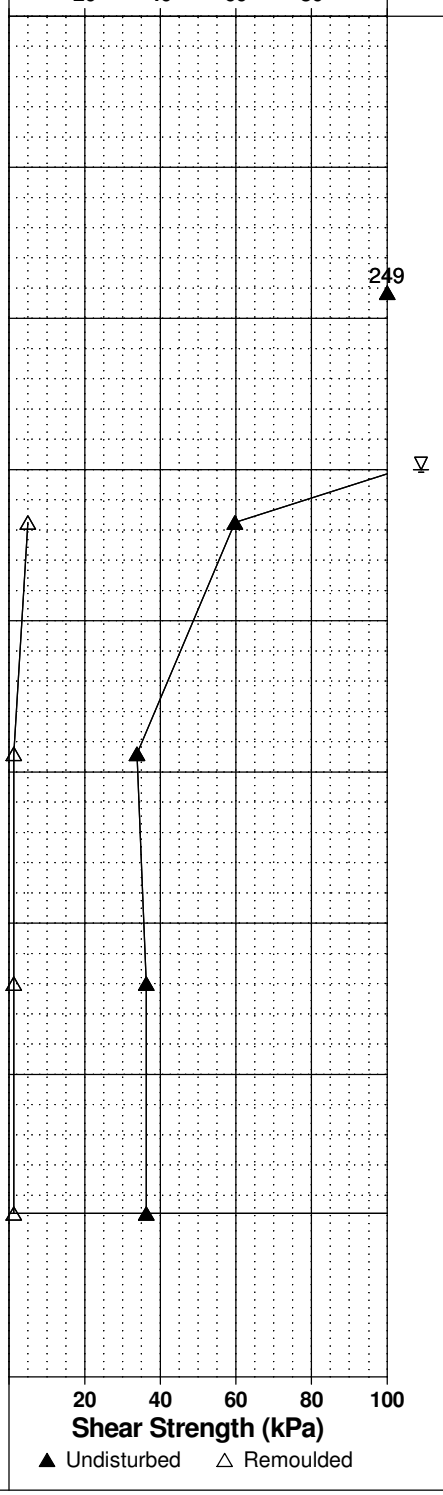
FILE NO. PG0811

REMARKS

HOLE NO. BH 5-17

BORINGS BY CME 55 Power Auger **DATE** January 25, 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									
TOPSOIL 0.27						0	88.11		
Hard to stiff, brown **SILTY CLAY,** trace sand						1	87.11		
						2	86.11		
						3	85.11		
- firm and grey by 4.6m depth						4	84.11		
						5	83.11		
						6	82.11		
						7	81.11		
7.92									
End of Borehole									
(GWL @ 3.0m depth based on field observations)									



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

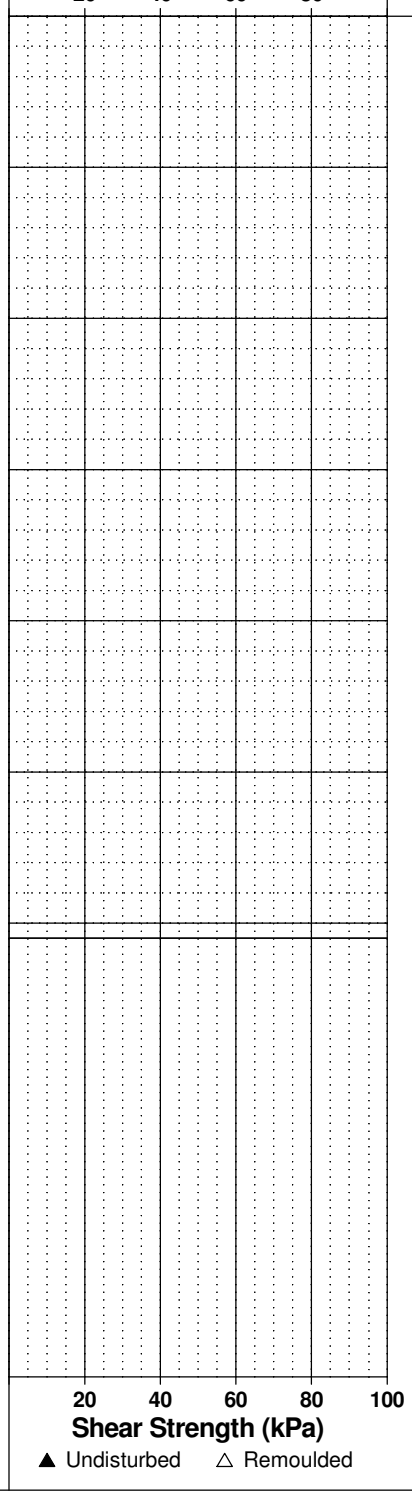
FILE NO. PG0811

REMARKS

HOLE NO. PH 1-17

BORINGS BY CME 55 Power Auger **DATE** January 26, 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						0	88.32		
						1	87.32		
						2	86.32		
OVERBURDEN						3	85.32		
						4	84.32		
						5	83.32		
6.10						6	82.32		
End of Probehole									



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

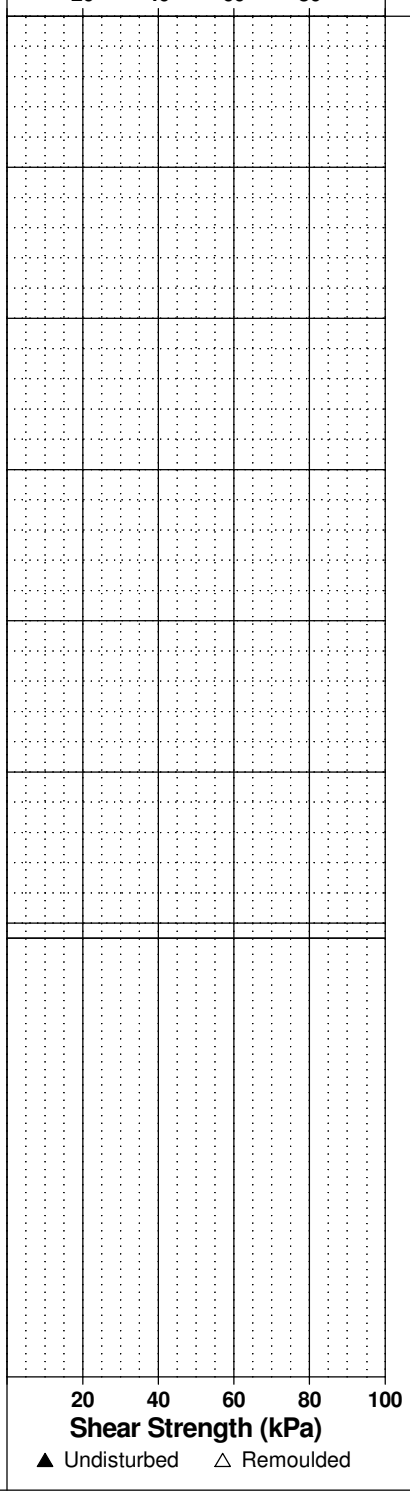
FILE NO. PG0811

REMARKS

HOLE NO. PH 2-17

BORINGS BY CME 55 Power Auger **DATE** January 26, 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						0	88.02		
						1	87.02		
						2	86.02		
OVERBURDEN						3	85.02		
						4	84.02		
						5	83.02		
6.10						6	82.02		
End of Probehole									



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

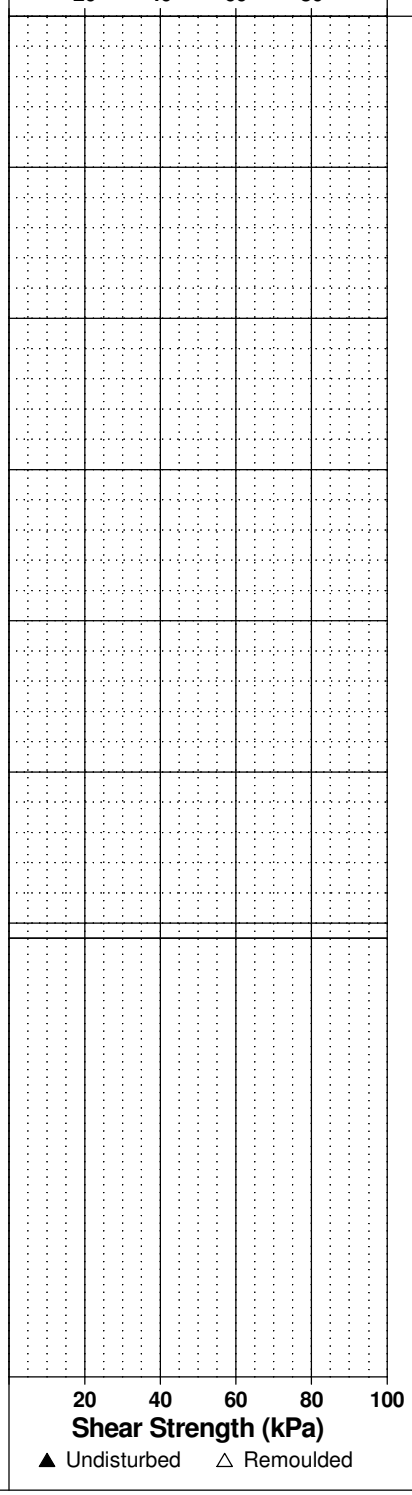
FILE NO. PG0811

REMARKS

HOLE NO. PH 3-17

BORINGS BY CME 55 Power Auger **DATE** January 25, 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						0	88.53		
						1	87.53		
						2	86.53		
OVERBURDEN						3	85.53		
						4	84.53		
						5	83.53		
6.10						6	82.53		
End of Probehole									



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

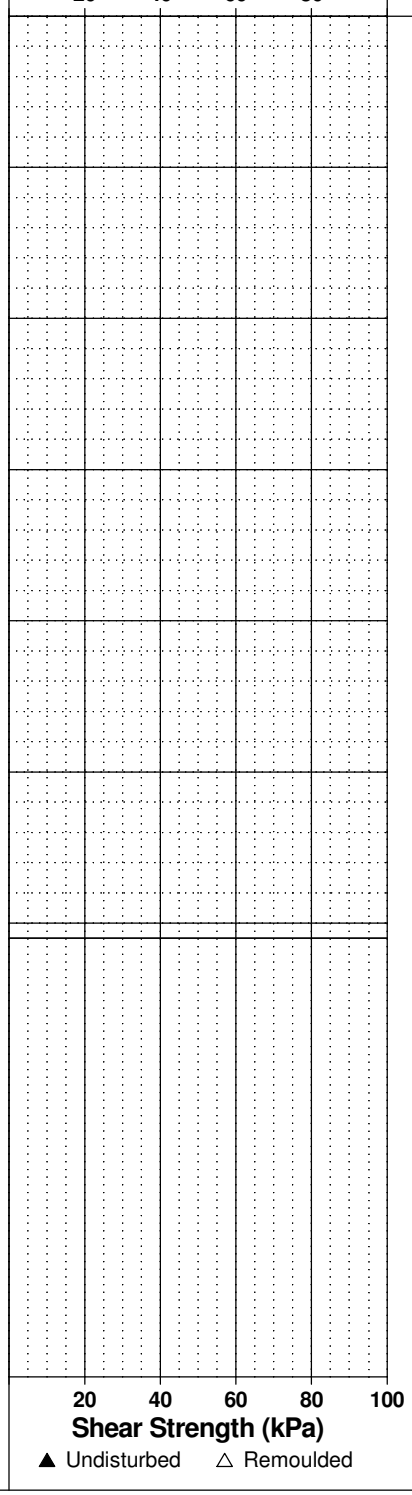
FILE NO. PG0811

REMARKS

HOLE NO. PH 4-17

BORINGS BY CME 55 Power Auger **DATE** January 25, 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						0	88.53		
						1	87.53		
						2	86.53		
OVERBURDEN						3	85.53		
						4	84.53		
						5	83.53		
6.10						6	82.53		
End of Probehole									



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

FILE NO. PG0811

REMARKS

HOLE NO. PH 5-17

BORINGS BY CME 55 Power Auger **DATE** January 25, 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						0	88.66	20 40 60 80	
OVERBURDEN						1	87.66		
1.75									
End of Probehole Practical refusal to augering at 1.75m depth									

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

FILE NO. PG0811

REMARKS

HOLE NO. PH 6-17

BORINGS BY CME 55 Power Auger **DATE** January 25, 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						0	88.52		
OVERBURDEN						1	87.52		
2.01						2	86.52		
End of Probehole									
Practical refusal to augering at 2.01m depth									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

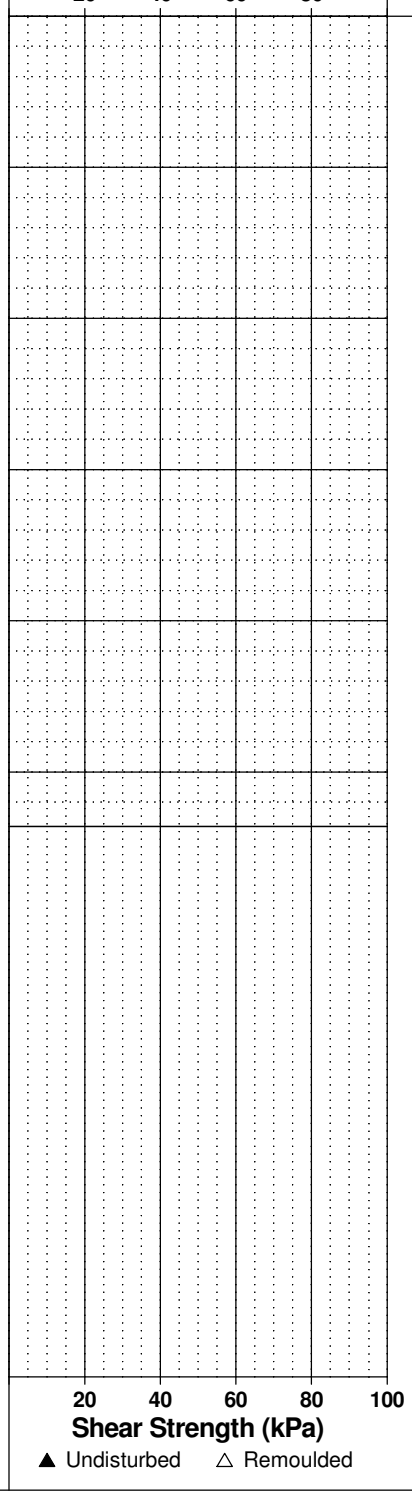
FILE NO. PG0811

REMARKS

HOLE NO. PH 7-17

BORINGS BY CME 55 Power Auger **DATE** January 25, 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						0	87.89		
						1	86.89		
						2	85.89		
OVERBURDEN						3	84.89		
						4	83.89		
						5	82.89		
5.36									
End of Probehole									
Practical refusal to augering at 5.36m depth									



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

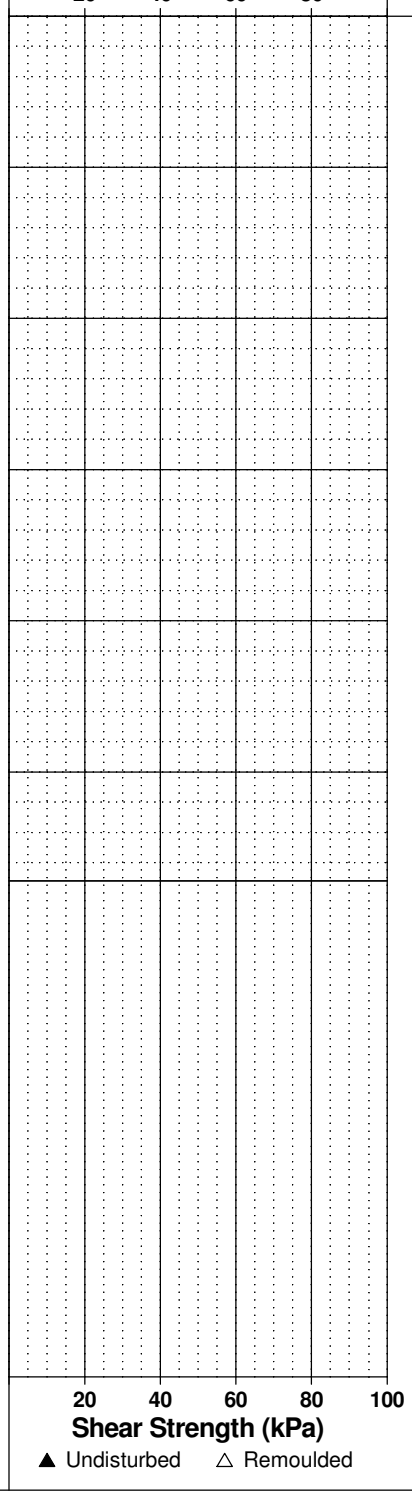
FILE NO. PG0811

REMARKS

HOLE NO. PH 8-17

BORINGS BY CME 55 Power Auger **DATE** January 25, 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						0	88.13		
						1	87.13		
						2	86.13		
OVERBURDEN						3	85.13		
						4	84.13		
						5	83.13		
5.72									
End of Probehole Practical refusal to augering at 5.72m depth									



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

FILE NO. PG0811

REMARKS

HOLE NO. PH 9-17

BORINGS BY CME 55 Power Auger **DATE** January 25, 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						0	87.72		
						1	86.72		
						2	85.72		
						3	84.72		
OVERBURDEN						4	83.72		
						5	82.72		
						6	81.72		
						7	80.72		
7.62									
End of Probehole									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %; 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

FILE NO. PG0811

REMARKS

HOLE NO. PH10-17

BORINGS BY CME 55 Power Auger **DATE** January 26, 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						0	87.95	20 40 60 80	
						1	86.95		
OVERBURDEN						2	85.95		
						3	84.95		
						4	83.95		
4.57									
End of Probehole									

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Innes at Mer Bleue Road
Ottawa, Ontario

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

FILE NO. PG0811

REMARKS

HOLE NO. PH11-17

BORINGS BY CME 55 Power Auger **DATE** January 26, 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						0	88.38	20 40 60 80	
						1	87.38		
OVERBURDEN						2	86.38		
						3	85.38		
						4	84.38		
4.57 End of Probehole								20 40 60 80 100 Shear Strength (kPa) ▲ Undisturbed △ Remoulded	

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP 1

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	89.57
TOPSOIL 0.15							
FILL: Dark brown silty clay, trace organic matter		G	1			1	88.57
1.10							
Very stiff to stiff, grey-brown **SILTY CLAY**		G	2			2	87.57
2.10							
GLACIAL TILL: Grey-brown sandy silt with gravel, cobbles and boulders		G	3				
2.40							
End of Borehole							
TP terminated on bedrock surface @ 2.40m depth							
(Open hole GWL @ 1.2m depth)							

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

Piezometer Construction

▽

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP 2

BORINGS BY Backhoe **DATE** 12 Apr 06

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	89.83		
FILL: Crushed gravel									
0.15									
		G	1						
Brown **SILTY SAND**						1	88.83		
		G	2						
- grey-brown by 1.3m depth									
		G	3			2	87.83		
2.10									
End of Test Pit									
TP terminated on bedrock surface @ 2.10m depth									
(Open hole GWL @ 1.3m depth)									

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

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP 3

BORINGS BY Backhoe **DATE** 12 Apr 06

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	89.34		
TOPSOIL 0.20									
Brown **SANDY SILT** 0.90						1	88.34		▽
Very stiff to stiff, grey-brown **SILTY CLAY** 2.90						2	87.34		
End of Test Pit TP terminated on bedrock surface @ 2.90m depth (Open hole GWL @ 1.4m depth)									

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

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP 4

BORINGS BY Backhoe **DATE** 12 Apr 06

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	89.54		
TOPSOIL 0.30									
GLACIAL TILL: Brown sandy silt with gravel, cobbles and boulders						1	88.54		
2.20						2	87.54		
End of Test Pit TP terminated on bedrock surface @ 2.20m depth (Open hole GWL @ 1.1m depth)									

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

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP 5

BORINGS BY Backhoe **DATE** 12 Apr 06

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	88.89		
TOPSOIL 0.20									
Stiff, brown **SILTY CLAY**		G	1			1	87.89		▽
1.40									
GLACIAL TILL: Brown clayey silt with sand, gravel, cobbles and boulders		G	2			2	86.89		
2.70									
End of Test Pit TP terminated on bedrock surface @ 2.70m depth (Open hole GWL @ 1.2m depth)									

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

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP 6

BORINGS BY Backhoe **DATE** 12 Apr 06

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	88.81		
TOPSOIL 0.20									
Grey-brown **SILTY CLAY**						1	87.81		
1.20									
GLACIAL TILL: Brown clayey silt with sand, gravel, cobbles and boulders						2	86.81		
2.00									
End of Test Pit									
TP terminated on bedrock surface @ 2.00m depth									
(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

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP 7

BORINGS BY Backhoe **DATE** 12 Apr 06

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	88.71		
TOPSOIL 0.20									
Very stiff to stiff, brown **SILTY CLAY**						1	87.71		
1.40									
GLACIAL TILL: Brown clayey silt with sand, gravel, cobbles and boulders						2	86.71		
2.20									
End of Test Pit TP terminated on bedrock surface @ 2.20m depth (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

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP 8

BORINGS BY Backhoe **DATE** 12 Apr 06

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	88.02		
TOPSOIL 0.25									
Very stiff to stiff, brown **SILTY CLAY**						1	87.02		
						2	86.02		
- grey by 3.0m depth		G	1			3	85.02		▽
3.40 End of Test Pit (Open hole GWL @ 3.0m depth)									

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

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP 9

BORINGS BY Backhoe **DATE** 12 Apr 06

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	88.12		
TOPSOIL 0.20									
Very stiff to stiff, grey-brown **SILTY CLAY**						1	87.12		
2.00						2	86.12		
GLACIAL TILL: Grey-brown clayey silt with sand, gravel, cobbles and boulders						3	85.12		▽
3.20 End of Test Pit (Open hole GWL @ 2.9m depth)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %; 20 40 60 80

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

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP10

BORINGS BY Backhoe **DATE** 12 Apr 06

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	89.08	20 40 60 80	
TOPSOIL									
0.60									
Very stiff to stiff, grey-brown **SILTY CLAY**						1	88.08		
						2	87.08		
						3	86.08		
3.30									
End of Test Pit TP terminated on Glacial Till @ 3.30 m depth (Open hole GWL @ 2.4m depth)									

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

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP11

BORINGS BY Backhoe **DATE** 12 Apr 06

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	88.57		
TOPSOIL									
0.30									
Very stiff to stiff, grey-brown **SILTY CLAY**						1	87.57		▽
- firm and grey by 2.5m depth						2	86.57		
						3	85.57		
3.50									
End of Test Pit									
(Open hole GWL @ 1.6m depth)									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP12

BORINGS BY Backhoe **DATE** 12 Apr 06

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	88.95		
TOPSOIL 0.20									
GLACIAL TILL: Brown silty clay with sand, gravel and boulders						1	87.95		▽
1.70									
End of Test Pit Bedrock @ 1.7m depth, east of test pit and 0.3m depth at west of test pit (Open hole GWL @ 1.6m depth)									

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

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP13

BORINGS BY Backhoe **DATE** 12 Apr 06

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	88.79	20 40 60 80	
TOPSOIL									
0.30									
Very stiff to stiff, brown to grey-brown **SILTY CLAY**						1	87.79		▽
						2	86.79		
						3	85.79		
3.60									
End of Test Pit (Open hole GWL @ 1.5m depth)									

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

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

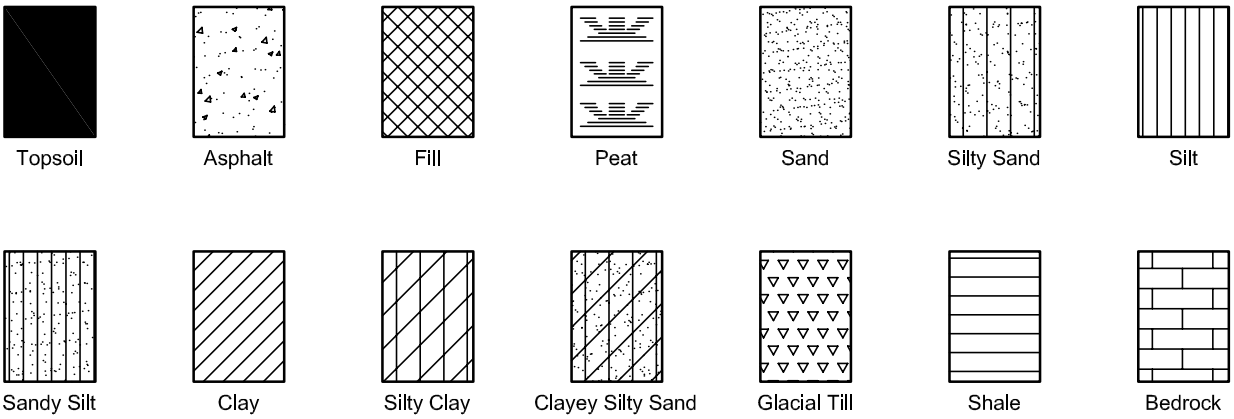
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

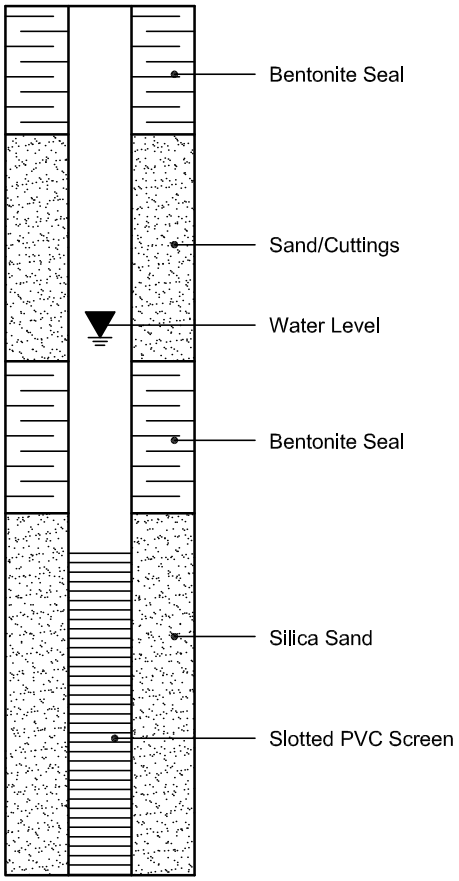
SYMBOLS AND TERMS (continued)

STRATA PLOT

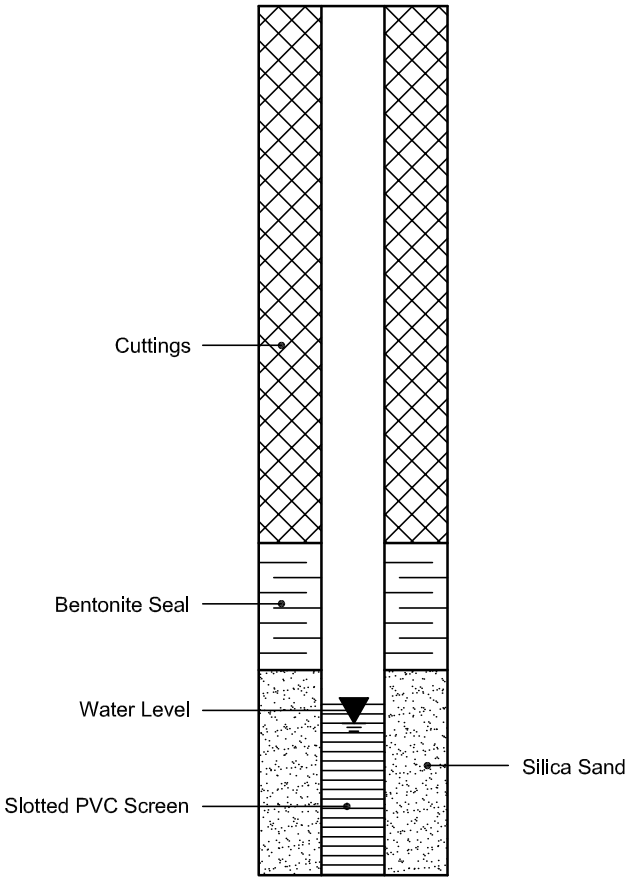


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 21264

Report Date: 17-Nov-2016
Order Date: 14-Nov-2016
Project Description: PG0811

	Client ID:	BH2-16 SS3	-	-	-
	Sample Date:	10-Nov-16	-	-	-
	Sample ID:	1647058-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	65.1	-	-	-
General Inorganics					
pH	0.05 pH Units	7.32	-	-	-
Resistivity	0.10 Ohm.m	86.0	-	-	-
Anions					
Chloride	5 ug/g dry	16	-	-	-
Sulphate	5 ug/g dry	41	-	-	-

APPENDIX 2

FIGURE 1 - KEY PLAN

DRAWING PG0811-1 - TEST HOLE LOCATION PLAN

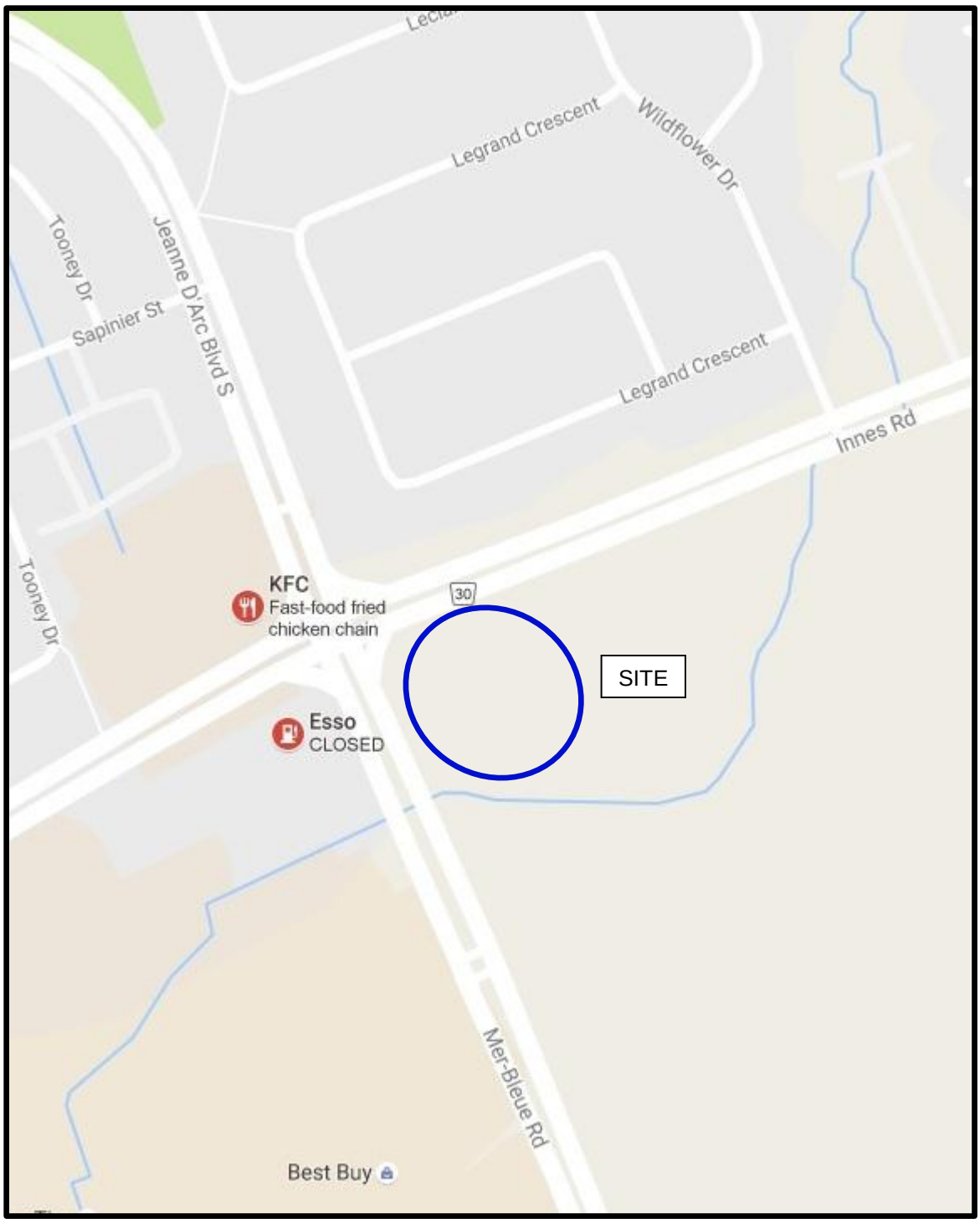
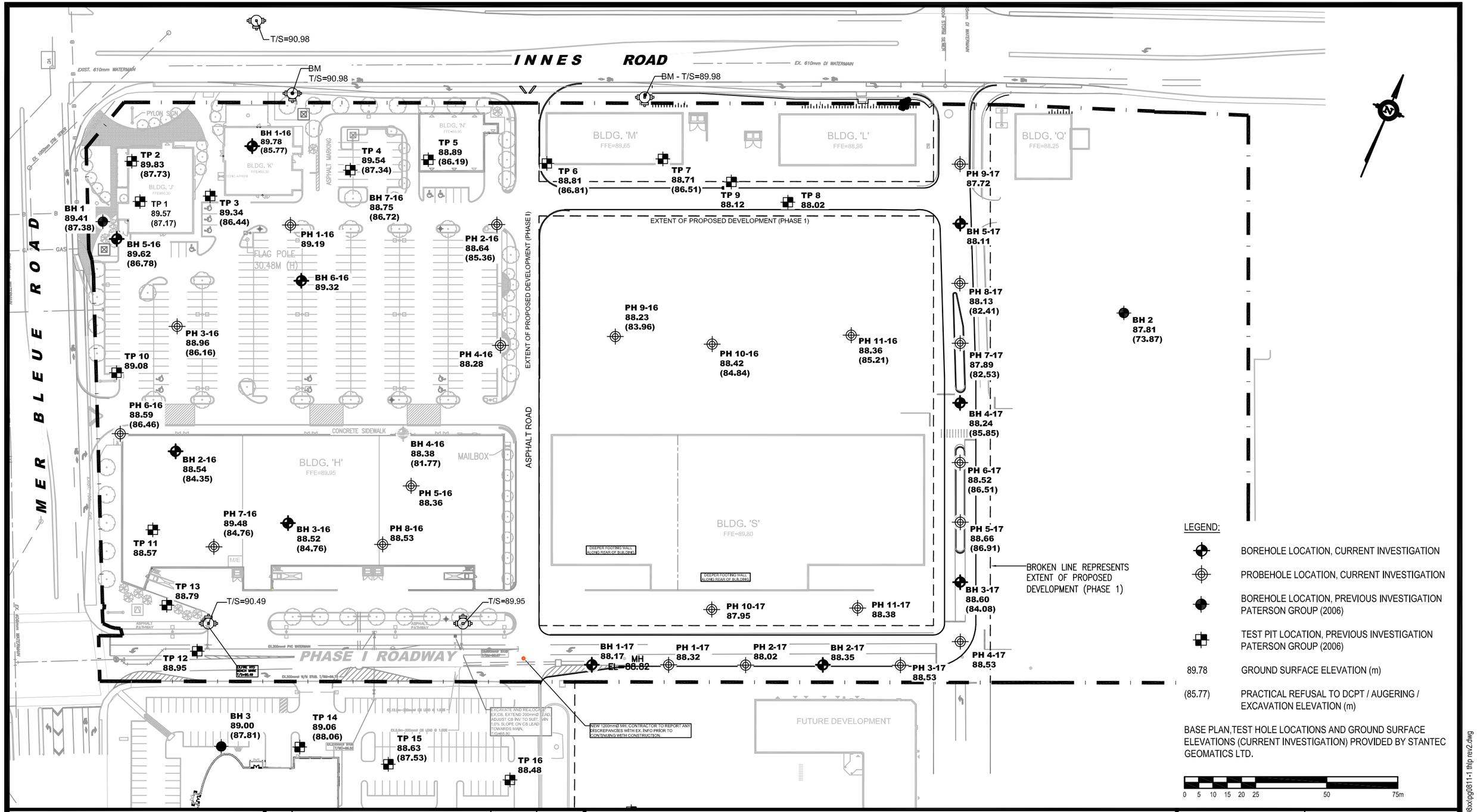


FIGURE 1

KEY PLAN



patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL
2	ADDITIONAL PROBEHOLES AND BOREHOLES ALONG SERVICE PIPES	01/02/2017	FA
1	BASE PLAN UPDATED, PROBEHOLES AND BOREHOLES ADDED	29/11/2016	FA

SMART REIT

PROPOSED COMMERCIAL DEVELOPMENT - PHASE 1 AND PHASE 2
MER BLEUE ROAD AND INNES ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:1250	Date: 11/2016
Drawn by: RCG	Report No.: PG0811
Checked by: FA	Dwg. No.: PG0811-1
Approved by: DJG	Revision No.: 2

p:\autocad drawings\geotechnical\pg08xx\pg0811-1 thlp rev2.dwg