Geotechnical Engineering

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Geotechnical Investigation

Proposed Residential Development
Drummond Lands
Borrisokane Road - Ottawa

Prepared For

Caivan Greenbank North Inc.

November 12, 2019

Report: PG5016-1

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Caivan Greenbank North Inc. to conduct a geotechnical investigation for the proposed residential development to be located within the former Drummond Aggregate Pit along Borrisokane Road, in the City of Ottawa (refer to Figure 1 - Key Plan presented in Appendix 2).

The objective of the investigation was to:

- ❏ determine the subsoil and groundwater conditions at this site by means of boreholes.
- ❏ provide geotechnical recommendations for the design of the proposed development based on the results of the test holes 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 our findings and includes geotechnical recommendations pertaining to the design and construction of the proposed development as understood at the time of this report.

Investigating the presence or potential presence of contamination on the proposed development was not part of the scope of work. Therefore, the present report does not address environmental issues.

2.0 Proposed Development

It is expected that the proposed residential development will consist of a single and townhouse style residential dwellings with basement or slab-on-grade construction, attached garages, associated driveways, local roadways and landscaping areas. It is further understood that the proposed development will be serviced by future municipal water, sanitary and storm services and a stormwater management pond within the northwest corner of the site.

3.0 Method of Investigation

3.1 Field Investigation

The field program for the current investigation was carried out between July 19, 22 and 23, 2019. At that time, a total of 7 boreholes were advanced to a maximum depth of 11.3 m below existing grade. The boreholes were placed in a manner to provide general coverage of the subject site taking into consideration site features, underground utilities. 31 test pits were excavated using a hydraulic shovel on July 25 and 26, 2019 and September 16 to 18, 2019. The location of the test holes are presented on Drawing PG5016-1 - Test Hole Location Plan included in Appendix 2.

The boreholes were completed using 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 the geotechnical division. The testing procedure consisted of augering to the required depths and at the selected test hole locations sampling and testing the overburden.

Sampling and In Situ Testing

Soil samples were collected from the boreholes using a 50 mm diameter split-spoon (SS) sampler or from the auger flights and grab samples were collected from the test pit excavation sidewalls. All soil samples were visually inspected and initially classified on site. The split-spoon samples were placed in sealed plastic bags on site. All samples were transported to our laboratory for examination and classification. The depths at which the split-spoon, auger and grab samples were recovered from the test holes are shown as SS, AU, and G, respectively, on the Soil Profile and Test Data sheets presented 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 was conducted in cohesive soils using a field vane apparatus.

The thickness of the overburden was evaluated by a dynamic cone penetration testing (DCPT) completed at BH 5. The DCPT consists of driving a steel drill rod, equipped with a 50 mm diameter cone at the tip, using a 63.5 kg hammer falling from a height of 760 mm. The number of blows required to drive the cone into the soil is recorded for each 300 mm increment.

The subsurface conditions observed at the test hole locations were recorded in detail in the field. Our findings are presented in the Soil Profile and Test Data sheets in Appendix 1.

Groundwater Monitoring

Flexibile PVC standpipes were installed in all borehole locations except for BH 8 to permit monitoring of the groundwater levels subsequent to the completion of the sampling program. The groundwater observations are discussed in Subsection 4.3 and presented in the Soil Profile and Test Data sheets presented in Appendix 1.

Sample Storage

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

3.2 Field Survey

The borehole locations were selected by Paterson taking into considerations site features. The test hole locations and ground surface elevations at the test hole locations completed during the current investigation were provided by JD Barnes Ltd. It is understood that the ground surface elevations are referenced to a geodetic datum. The test hole locations and ground surface elevations at the test hole locations are presented on Drawing PG5016-1 - 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.

4.0 Observations

4.1 Surface Conditions

The subject site was formerly being used as part of a sand extraction operation. Various fill piles, excavated areas, gravel roads, as well as scattered construction debris are located across the site. Also, the ground surface elevation across the majority of the site is well above the ground surface elevation of the adjacent properties.

The site is bordered to the north by a future development lands, to the south by undeveloped land, to the west by Borrisokane Road and to the east by a future residential development.

4.2 Subsurface Profile

Overburden

Generally, the subsurface profile encountered at the test hole locations consists of a fill layer overlying a deep deposit of brown silty sand and/or brown sand with varying amounts of gravel, cobbles and boulders. Stiff to very stiff brown to grey silty clay was encountered below the silty sand layer and/or fill layer at BH 5, BH 6, BH 8, TP 7, TP 14, TP 23 and TP 25. Practical refusal to DCPT was encountered at 11.6 m below existing ground surface at BH 5.

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

Bedrock

Based on available geological mapping, dolomite of the Oxford formation is present in this area with an overburden drift thickness ranging between 15 to 25 m.

4.3 Groundwater

The groundwater levels in the boreholes from the current geotechnical investigation were measured on July 24, 2019 and are presented in Table 1 below. A perched water level was noted within the west portion of the site at a higher elevation at the borehole locations where a clay deposit is present below a sand deposit.

Groundwater levels are subject to seasonal fluctuations and therefore could vary during time of construction.

Table 1 - Summary of Groundwater Level Readings

Borehole Number	Ground Elevation (m)	Groundwater Levels (m)		Recording Date
		Depth	Elevation	
BH 1	102.51	6.67	95.84	July 24, 2019
BH 2	101.22	5.65	95.57	July 24, 2019
BH 3	104.78	9.08	95.70	July 24, 2019
BH 4	104.52	6.69	97.83	July 24, 2019
BH 5	106.40	Dry	-	July 24, 2019
BH 6	103.89	3.80	100.09	July 24, 2019
BH 7	103.77	3.66	100.11	July 24, 2019
BH 8	100.95	5.08	95.87	July 24, 2019

5.0 Discussion

5.1 Geotechnical Assessment

It is anticipated that the majority of the proposed development area will undergo a ground improvement program, consisting of a dynamic compaction program, completed by a contractor specializing in those works. The dynamic compaction will be completed in areas where the existing fill extends below the design underside of footing elevation. The compaction program has been designed to ensure that a bearing resistance value at SLS of 100 kPa is provided at design underside of footing elevation upon successful completion of the program. There are areas within the site where native silty sand will be encountered at footing level and also areas where the existing fill is to be removed to a native soil and reinstated with an engineered fill. Alternatively, an engineered granular fill pad can be placed over a proof-rolled fill layer, which is reviewed and approved by Paterson personnel at the time of house construction.

Due to the groundwater level within the sand layer and high infiltration rate through the sand layer, it is expected that a significantly high groundwater in-flux will be observed for the installation of the deep sanitary sewer, where located below the groundwater table. Excavations below the water level in non-cohesive soils, such as the native silty sand, have the potential for basal heave if groundwater is not controlled during excavation work. A series of well points may be required to control groundwater in-flow for service trenches that extend below the water table. It is assumed that the excavations will be carried out within the confines of a fully braced steel trench box or other acceptable shoring systems designed by a qualified engineer to resist the design lateral earth pressures and potential basal heave issues. Alternatively, a micro-tunnelling or directional drilling installation technique could be considered for service installations completed below the water table.

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 and construction debris, should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures. The contractor should take appropriate precautions to avoid disturbing the subgrade and bearing surfaces from construction and worker traffic.

Fill Placement

In-filling operations are anticipated to be completed using approved existing fill and imported fill. The fill should be free of significant amounts of organics, deleterious materials and approved by Paterson at the source location prior to importing to the subject site. Approved fill should be placed in maximum 300 mm loose lifts and compacted by suitably sized compaction equipment making several passes under dry conditions and in above freezing temperatures. Paterson personnel should complete periodic inspections during the placement operations.

Outside of Dynamic Compaction Area - Future Building Footprints and Settlement Sensitive Structures

Consideration could be given to placing the proposed footings and floor slabs over the existing fill, free of deleterious materials and organics, provided the fill is approved by Paterson at the time of construction. The approved existing fill material should be proof-rolled using suitable compaction equipment under dry conditions, tested and approved by Paterson personnel. Also, a minimum 300 mm thick granular pad, consisting of a Granular A crushed stone, compacted to 98% of its SPMDD is recommended to be placed at footing level over the approved fill subgrade. Where the fill is deemed inadequate below the proposed footings, the fill should be sub-excavated below the design underside of footing and replaced with engineered fill, such as OPSS Granular A or Granular B Type II and compacted to a minimum 98% of the material's SPMDD. The fill should be extended a minimum 300 mm horizontally beyond the footing face in all directions at footing level and throughout the lateral support zone of the footing.

It is understood that consideration is being given to excavating on-site material and placing within areas of the site to be raised to achieve pregrade elevations for the proposed development. The native sand to silty sand anticipated to be encountered is considered suitable for fill purposes across the proposed development.

Future Right-of-Ways and Landscaped Areas

Where required, it is recommended that sand fill placement be completed in maximum 300 mm loose lifts, under dry and above freezing temperatures, and proof-rolled by a suitably sized bulldozer making several passes to provide adequate compaction below future right-of-ways and landscaped areas. The geotechnical consultant should periodically inspect the placement activities and confirm that adequate proof-rolling is being completed and fill lift thicknesses are acceptable.

Future Building Footprints and Settlement Sensitive Structures

The fill placement recommendations for the future ROWs could be applied to future building footprints provided that design underside of footing (USF) level is placed over a native sand bearing surface or an approved engineered fill pad. Consideration could be given to placement of sand fill below design USF level of the proposed building footprints. However, several items should be confirmed to allow building foundations to be placed over a sand fill subgrade. It is recommended that compacted sand fill depths below design USF level should be limited to no greater than 1.2 m without area specific review by the geotechnical consultant. It is expected that an engineered fill, such as Granular B Type II, or use of a biaxial geogrid layers will be required to achieve adequate compaction for soils placed at or below the groundwater table or deeper fill depths, where required. A more stringent compaction program should be in place for placement of sand fill below the design USF level. The sand fill should be placed in maximum 300 mm loose lifts and compacted to at least 98% of its SPMDD under dry and above freezing temperatures. Due to the sensitivity of the sand fill to disturbance, a minimum 300 mm thick granular pad, consisting of a Granular A crushed stone, compacted to 98% of its SPMDD is recommended to be placed at footing level over the sand fill subgrade.

5.3 Foundation Design

Bearing Resistance Values

Footings for the proposed buildings placed over the noted undisturbed, soil bearing surfaces can be designed using the bearing resistance values presented in Table 2.

Table 2 - Bearing Resistance Values

Bearing Surface	Bearing Resistance Value at SLS (kPa)	Factored Bearing Resistance Value at ULS (kPa)
Compact to Dense Silty Sand	100	175
Stiff Silty Clay	100	175
Dynamic Compaction improved soil	100	175
Approved Fill	100	175

Note: Strip footings, up to 3 m wide, and pad footings, up to 5 m wide, placed over a silty clay bearing surface can be designed using the above noted bearing resistance values.

The bearing resistance values are provided on the assumption that the footings will be placed on undisturbed soil or approved fill bearing surfaces. An undisturbed soil bearing surface consists of one 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.

Bearing resistance values for footing design should be determined on a per lot basis at the time of construction. If the subgrade medium is noted to be in a loose state of compactness, it is recommended to proof-roll the bearing medium under dry conditions and above freezing temperature. The subgrade should be inspected by a Paterson at the time of construction.

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 the in-situ bearing medium soils above the groundwater table when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in situ soil of the same or higher capacity as the bearing medium soil.

Permissible Grade Raise Restriction

Due to the presence of a silty clay layer, a permissible grade raise recommendation of 103.5 m (geodetic elevation) is required for the west portion of the site. Reference should be made to Drawing PG5016-1 - Test Hole Location Plan in Appendix 1 presenting the area containing silty clay which is effected by the permissible grade raise recommendations.

5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Site Class D** for the shallow foundations considered at this site. Based on the current information, including the level of groundwater table and compactness of the underlying sand layer, the soil underlying the subject site is 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 Basement Slab / Slab-on-Grade Construction

With the removal of all topsoil and deleterious fill, containing organic matter, within the footprints of the proposed buildings, undisturbed native soil surface or compacted fill approved by Paterson will be considered an acceptable subgrade on which to commence backfilling for floor slab construction. Any soft areas should be removed and backfilled with appropriate backfill material. OPSS Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab. It is recommended that the upper 200 mm of sub-slab fill for the basement slab to consist of 19 mm clear crushed stone. It is recommended that the upper 200 mm of sub-slab fill for slab-ob-grade construction to consist of OPSS Granular A crushed stone.

5.6 Pavement Structure

Car only parking areas, local and collector roadways are anticipated at this site. The proposed pavement structures are shown in Tables 3, 4 and 5.

Table 3 - Recommended Pavement Structure - Driveways

Thickness (mm)	Material Description
50	**Wear Course** - HL 3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either approved fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or approved fill **Note:** Minimum Performance Graded (PG) 58-34 asphalt cement should be used for driveways.	

Table 4 - Recommended Pavement Structure - Local Residential Roadways (no bus traffic)

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
400	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either approved fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or approved fill **Note:** Minimum Performance Graded (PG) 58-34 asphalt cement should be used for local roadways.	

Table 5 - Recommended Pavement Structure - Roadways with Bus Traffic	
Thickness mm	**Material Description**
40	**Wear Course -** Superpave 12.5 Asphaltic Concrete
50	**Upper Binder Course** - Superpave 19.0 Asphaltic Concrete
50	**Lower Binder Course** - Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
600	**SUBBASE** - OPSS Granular B Type II
	SUBGRADE - Either in situ soil or OPSS Granular B Type II material placed over in situ soil
Note: Minimum Performance Graded (PG) 64-34 asphalt cement should be used for roadways with bus traffic.	

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

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

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Foundation Drainage

A perimeter foundation drainage system is recommended for proposed structures. The system should consist of a 150 mm diameter, geotextile-wrapped, 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 or sump pit.

Foundation Backfill

Backfill against the exterior sides of the foundation walls should consist of free-draining, non frost susceptible granular materials. The site materials will be frost susceptible and, as such, are not recommended for re-use as backfill unless a composite drainage system (such as system Platon or Miradrain G100N) connected to a drainage system is provided.

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 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

Excavations will be through loose to compact silty sand, glacial till and/or silty clay. Above the groundwater level, for excavations to depths of approximately 3 m, the excavation side slopes should be stable in the short term at 1H:1V. Flatter slopes could be required for deeper excavations or for excavation below the groundwater level. Where such side slopes are not permissible or practical, temporary shoring should be used.

Based on observations at the test hole locations at the time of the field program and review of the recovered soil samples, the subsoil at this site is considered to be mainly a Type 2 or 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects. 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.

It is recommended that a dewatering program, such as a series of well points designed and installed by a licensed contractor specializing in dewatering, be completed for service installations completed below the groundwater level for areas in non-cohesive soils.

Excavated soil should not be stockpiled directly at the top of temporary excavations and heavy equipment should be kept away from the excavation sides. A minimum of 4 to 6 m setback should be considered from the excavation face depending on the excavation depth and soil consistency.

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.

Excavation Base Stability

The base of supported excavations can fail by three (3) general modes:

- ❏ Shear failure within the ground caused by inadequate resistance to loads imposed by grade difference inside and outside of the excavation,
- ❏ Piping from water seepage through granular soils, and
- ❏ Heave of layered soils due to water pressures confined by intervening low permeability soils.

Shear failure of excavation bases is typically rare in granular soils if adequate lateral support is provided. Inadequate dewatering can cause instability in excavations made through granular or layered soils. The potential for base heave in cohesive soils should be determined for stability of flexible retaining systems.

The factor of safety with respect to base heave, FS_b, is:

$$FS_b = N_b s_u / \sigma_z$$

where:

N_b - stability factor dependent upon the geometry of the excavation and given in Figure 1 on the following page.
s_u - undrained shear strength of the soil below the base level
σ_z - total overburden and surcharge pressures at the bottom of the excavation

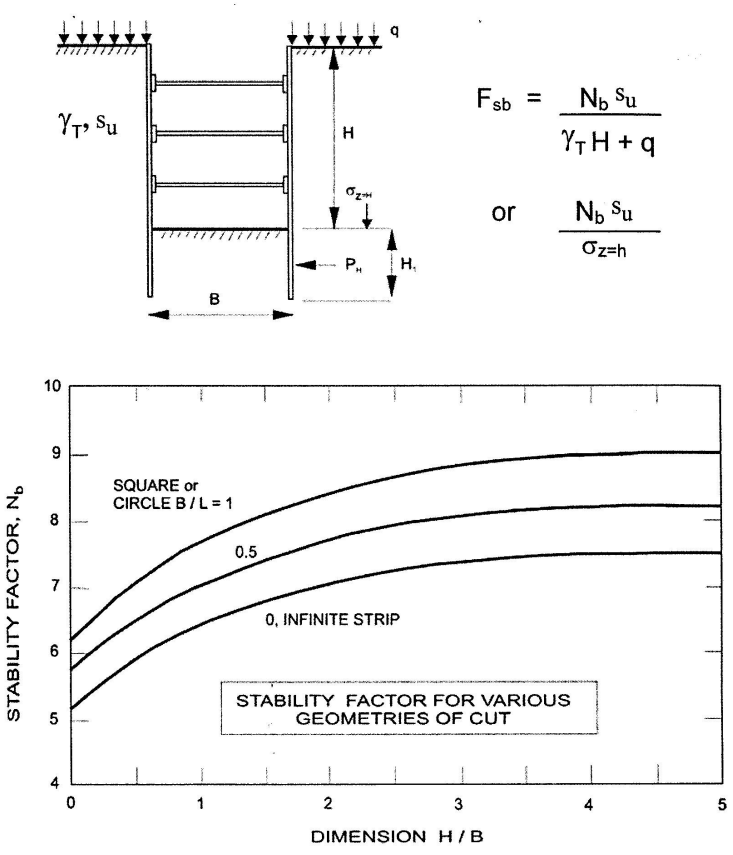

Figure 1 - Stability Factor for Various Geometries of Cut

In the case of soft to firm clays, a factor of safety of 2 is recommended for base stability.

6.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent Material Specifications and Standard Detail Drawings from the City of Ottawa.

It is expected that the invert level of the municipal services will be installed at or below the long term groundwater level within the compact silty sand to sandy silt deposit. As a result, it is recommended that a dewatering program should be implemented prior to construction to temporarily draw down the long term groundwater level during the construction phase. It is recommended that the dewatering program consisting of a series of well points be designed and installed by a licensed contractor specialized in dewatering.

The pipe bedding for sewer and water pipes placed on a relatively dry, undisturbed subgrade surface should consist of at least 150 mm of OPSS Granular A material. If the bedding is located within a layer of firm grey silty clay, 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 its SPMDD.

Generally, it should be possible to re-use the moist (not wet) brown silty clay and silty sand above the cover material if the excavation and filling operations are carried out in dry weather conditions. Wet silty clay and silty sand 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 material's SPMDD.

6.5 Groundwater Control

Due to the permeable silty sand to sandy silt deposit encountered within the shallow groundwater table within the subject site, it is anticipated that conventional pumping with open sumps will be difficult to control the groundwater influx through the sides of the temporary excavation. As a result, it is recommended that a dewatering specialist be consulted to review the most effective dewatering methods.

Permit to Take Water

A temporary Ministry of the Environment, Conservation and Parks (MECP) permit to take water (PTTW) is recommended 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 MECP.

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.

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 Landscaping Considerations

No tree planting setback from foundation restrictions are required for the subject site due to the absence of a silty clay deposit located within 2 m of the proposed design underside of footing elevation. There are also no building setback restrictions for swimming pools or exterior structures from a geotechnical perspective.

7.0 Recommendations

It is recommended that the following be completed once the master plan and site development are determined:

- ❑ Review detailed grading plan(s) from a geotechnical perspective.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❑ Observation of all subgrades prior to placing backfilling materials.
- ❑ Field density tests to ensure that the specified level of compaction has been 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 Paterson's recommendations could be issued upon request, following the completion of a satisfactory material testing and observation program by the geotechnical consultant.

8.0 Statement of Limitations

The recommendations made in this report are in accordance with Paterson's present understanding of the project. Paterson requests permission to review the grading plan once available. Paterson's recommendations should be reviewed when the drawings and specifications are complete.

The client should be aware that any information pertaining to soils and the test hole log are furnished as a matter of general information only. Test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests to be notified immediately in order to permit reassessment of the 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 Caivan Greenbank North Inc. 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:

- ❑ Caivan Greenbank North Inc. (3 copies)
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APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PG5016

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** 2019 July 22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	102.51
FILL: Brown silty fine sand, trace gravel		AU	1				
0.91		SS	2	8	22	1	101.51
FILL: Brown silt, some sand and gravel		SS	3	54	18	2	100.51
		SS	4	25	5		
3.20		SS	5	54	8	3	99.51
		SS	6	88	58	4	98.51
FILL: Brown silty clay, some sand		SS	7	62	8	5	97.51
- with gravel and trace cobbles, boulders by 5.5m depth		SS	8	50	5	6	96.51
		SS	9	46	8		
		SS	10	17	9	7	95.51
7.72		SS	11	50	7	8	94.51
Loose to compact, brown **SILTY SAND,** some gravel		SS	12	58	14		
9.10						9	93.51
Very dense, brown **SILTY SAND** with gravel, cobbles and boulders		SS	13		50+		
9.75							
End of Borehole							
(GWL @ 6.67m - July 24, 2019)							

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

Monitoring Well 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
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PG5016

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** 2019 July 22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	101.22
		AU	1				
		SS	2	62	12	1	100.22
FILL: Brown silty fine sand, trace gravel, cobbles and boulders		SS	3	38	5	2	99.22
		SS	4	46	5	3	98.22
		SS	5	38	9		
		SS	6	6	50+	4	97.22
4.62							
		SS	7	79	23	5	96.22
Compact, brown **SILTY FINE SAND** to **SAND,** some silt		SS	8	58	22		
6.00						6	95.22
Compact, brown **SILTY SAND** with gravel, cobbles and boulders		SS	9	67	24		
		SS	10	50	29	7	94.22
7.47							
End of Borehole							
(GWL @ 5.65m - July 24, 2019)							

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

20 40 60 80

Monitoring Well 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
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PG5016

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** 2019 July 19

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	104.78
		AU	1				
		SS	2	54	8	1	103.78
		SS	3	62	26	2	102.78
FILL: Brown silty sand, some gravel		SS	4	58	43		
		SS	5	4	29	3	101.78
		AU	6				
		SS	7	100	89	4	100.78
		SS	8	75	43	5	99.78
		SS	9	79	33		
6.10						6	98.78
FILL: Brown sand, some gravel		SS	10	75	55		
6.86						7	97.78
		SS	11	71	76		
FILL: Brow sand with gravel, trace cobbles and boulders		SS	12	54	65	8	96.78
		SS	13	62	52		
9.10						9	95.78
		SS	14	58	36		
Dense, brown **SILTY SAND** with gravel, cobbles and boulders		SS	15	46	25	10	94.78
		SS	16	54	44	11	93.78
11.28							
End of Borehole							
(GWL @ 9.08m - July 24, 2019)							

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

20 40 60 80

Monitoring Well 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
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

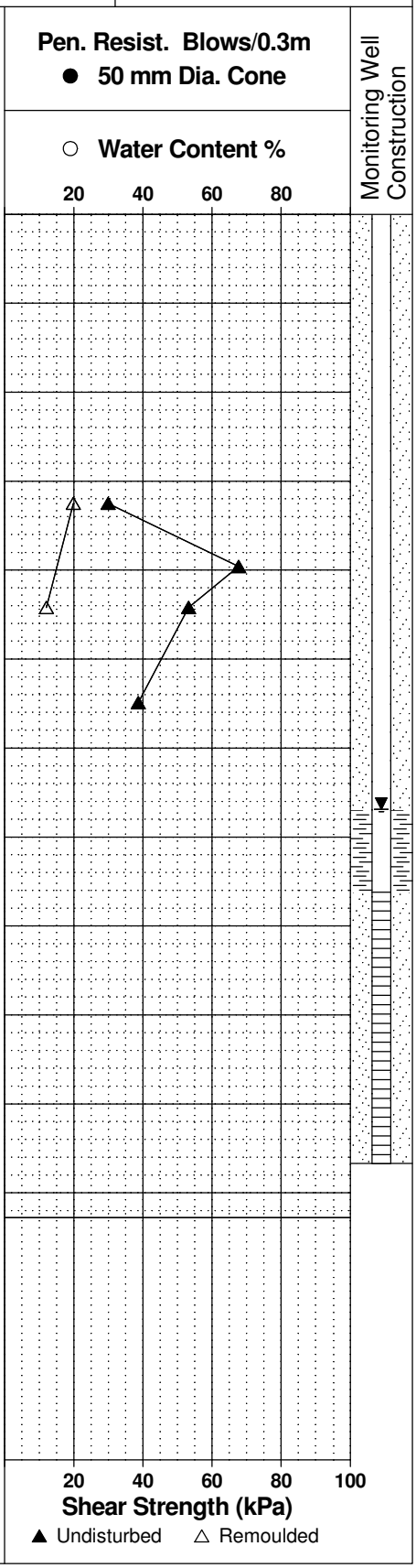
FILE NO. PG5016

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** 2019 July 19

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	104.52
FILL: Brown sand with silt and organics (0.46)		AU	1				
FILL: Grey silty sand with gravel		SS	2	38	8	1	103.52
(1.58)		SS	3	38	7	2	102.52
		SS	4	67	4	3	101.52
FILL: Grey silty clay/clayey silt with sand and gravel, trace brick						4	100.52
						5	99.52
		SS	5	71	7	6	98.52
- trace cobbles and boulders by 6.7m depth		SS	6	79	18	7	97.52
(8.23)		SS	7	33	25	8	96.52
		SS	8	46	14	9	95.52
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders		SS	7	62	16		
		SS	10	79	7	10	94.52
(11.28)		SS	11	67	9	11	93.52
End of Borehole							
(GWL @ 6.69m - July 24, 2019)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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Ottawa, Ontario

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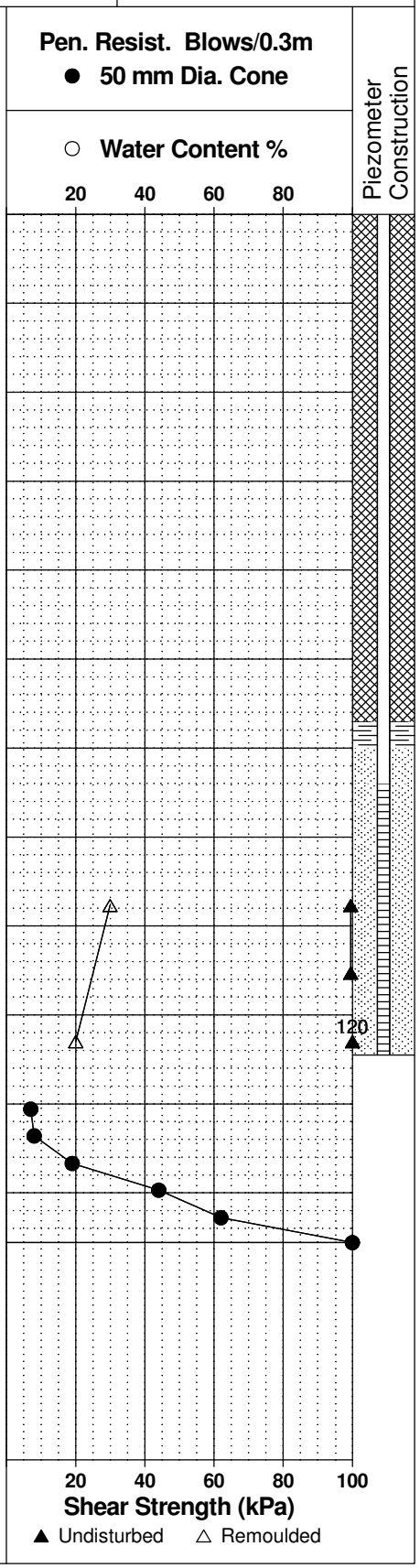
FILE NO. PG5016

REMARKS

HOLE NO. BH 5

BORINGS BY CME 55 Power Auger **DATE** 2019 July 22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	106.40
FILL: Brown to dark brown sand with gravel, some cobbles and boulders		AU	1				
		SS	2	58	14	1	105.40
		SS	3	8	7	2	104.40
2.30							
FILL: Dark grey silty clay, trace organics, sand and gravel		SS	4	54	7	3	103.40
		SS	5	83	9		
		SS	6	54	8	4	102.40
		SS	7	50	13	5	101.40
5.50		SS	8	100	50+		
FILL: Brown sand, some gravel, trace cobbles and boulders						6	100.40
6.60		SS	9	58	32		
		SS	10		3	7	99.40
Stiff to very stiff, grey **SILTY CLAY/CLAYEY SILT,** trace sand						8	98.40
9.45						9	97.40
Dynamic Cone Penetration Test commenced at 9.45m depth.						10	96.40
						11	95.40
11.56							
End of Borehole							
Practical DCPT refusal at 11.56m depth							
(BH dry - July 25, 2019)							



DATUM

REMARKS

CME 5

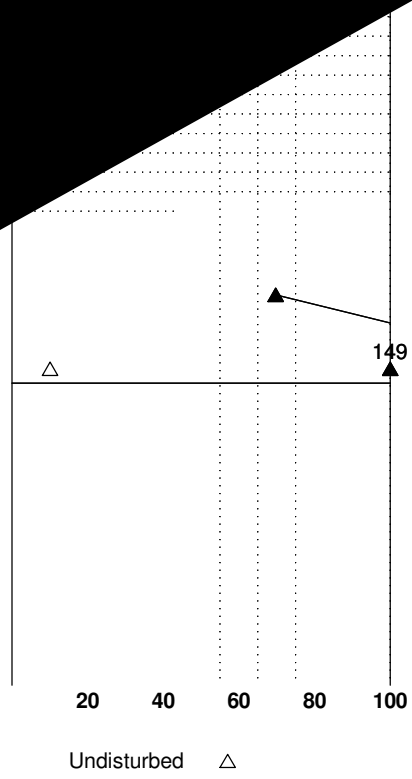
GROUND SUR

TOPSOIL

FILL: Brown s
and gravel

FILL: Brow
trace cobb

Compa
SAND



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SOIL PROFILE AND TEST DATA

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FILE NO. PG5016

REMARKS

HOLE NO. BH 7

BORINGS BY CME 55 Power Auger **DATE** 2019 July 23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.77
FILL: Brown silty sand and gravel		AU	1				
1.07		SS	2	0	9	1	102.77
		SS	3	62	13	2	101.77
		SS	4	62	14	3	100.77
Compact to dense, brown **SILTY SAND**		SS	5	54	22		
		SS	5	96	23	4	99.77
		SS	7	71	24	5	98.77
		SS	8	100	27	6	97.77
6.70		SS	9	100	38		
End of Borehole							
(GWL @ 3.66m - July 24, 2019)							

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

20 40 60 80

Monitoring Well Construction

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

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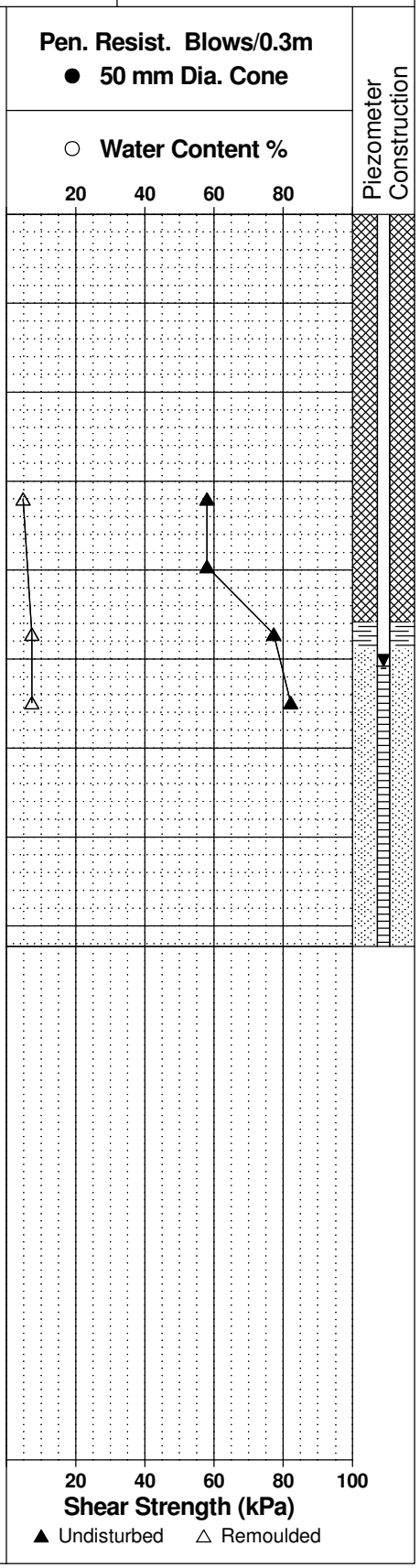
REMARKS

HOLE NO. BH 8

BORINGS BY CME 55 Power Auger **DATE** 2019 July 23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.95
		AU	1				
FILL: Brown sand, some gravel		SS	2	62	15	1	99.95
1.93		SS	3	100	3	2	98.95
Brown **SANDY SILT/SILT,** trace clay							
2.49		SS	4	100	2	3	97.95
Stiff, grey **SILTY CLAY/CLAYEY SILT,** trace sand						4	96.95
						5	95.95
6.10		SS	5	100	5	6	94.95
Loose to compact, brown **SILTY SAND**						7	93.95
8.23		SS	6	100	11	8	92.95
End of Borehole							
(GWL @ 5.08m - July 24, 2019)							



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SOIL PROFILE AND TEST DATA

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REMARKS

HOLE NO. TP 1

BORINGS BY Excavator **DATE** 2019 July 25

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	101.80		
FILL: Brown sand with gravel, cobbles and boulders, some brick pieces		G	1			1	100.80		
- grey by 1.2m depth		G	2			2	99.80		
		G	3			3	98.80		
		G	4			4	97.80		
						5	96.80		
6.00						6	95.80		
GLACIAL TILL: Grey-brown sand with gravel, cobbles and boulders		G	5						
6.60									
End of Test Pit									
(Groundwater infiltration at 6.0m depth)									

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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3713 Borrisokane Road
Ottawa, Ontario

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FILE NO. PG5016

REMARKS

HOLE NO. TP 2

BORINGS BY Excavator **DATE** 2019 July 25

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	102.15		
FILL: Brown silty sand with gravel, some clay, cobbles and boulders		G	1			1	101.15		
						2	100.15		
3.00		G	2			3	99.15		
FILL: Brown silty clay with sand and gravel, trace cobbles and boulders		G	3			4	98.15		
						5	97.15		
		G	4			6	96.15		
6.70									
End of Test Pit (Groundwater infiltration at 3.0m depth)									

Pen. Resist. / Water Content % scale: 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
3713 Borrisokane Road
Ottawa, Ontario

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REMARKS

HOLE NO. TP 3

BORINGS BY Excavator **DATE** 2019 July 25

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	101.63		
FILL: Brown silty sand with gravel, some clay, cobbles, boulders, brick and concrete pieces 0.50									
		G	1			1	100.63		
FILL: Brown silty clay with sand and gravel, some cobbles, boulders, brick and concrete pieces						2	99.63		
		G	2			3	98.63		
5.00						4	97.63		
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles, boulders						5	96.63		
5.60		G	3						
End of Test Pit									
(Groundwater infiltration at 5.3m 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

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FILE NO. PG5016

REMARKS

HOLE NO. TP 4

BORINGS BY Excavator **DATE** 2019 July 25

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	105.93		
FILL: Brown sand with gravel, cobbles, boulders, brick and plastic pieces		G	1						
0.50									
FILL: Dark brown silty sand with gravel, organics, brick and plastic pieces		G	2			1	104.93		
1.90									
FILL: Brown silty sand, some gravel and clay		G	3			2	103.93		
2.50									
		G	4			3	102.93		
FILL: Dark brown islty clay with sand and gravel, trace cobbles and boulders						4	101.93		
		G	5			5	100.93		
						6	99.93		
						7	98.93		
7.40									
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
3713 Borrisokane Road
Ottawa, Ontario

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FILE NO. PG5016

REMARKS

HOLE NO. TP 5

BORINGS BY Excavator **DATE** 2019 July 25

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	105.03		
FILL: Brown sand with gravel, some organics, cobbles, boulders and brick pieces		G	1			1	104.03		
1.10									
		G	2			2	103.03		
FILL: Dark brown silty sand, some gravel, trace cobbles and boulders						3	102.03		
4.50						4	101.03		
		G	3			5	100.03		
GLACIAL TILL: Brown sand with gravel, cobbles and boulders						6	99.03		
6.30		G	4						
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
3713 Borrisokane Road
Ottawa, Ontario

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FILE NO. PG5016

REMARKS

HOLE NO. TP 6

BORINGS BY Excavator **DATE** 2019 July 25

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	105.04		
FILL: Brown sand with gravel, cobbles and boulders		G	1						
0.70						1	104.04		
FILL: Brown silty sand, some clay, gravel, trace cobbles and boulders - steel pipe encountered at 1.0m depth		G	2			2	103.04		
						3	102.04		
4.20		G	3			4	101.04		
FILL: Brown clayey silty sand with gravel, some cobbles and boulders						5	100.04		
6.10						6	99.04		
FILL: Brown silty clay, some sand, gravel, cobbles and boulders		G	4						
6.70									
End of Test Pit (Groundwater infiltration at 6.1m depth)									

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
3713 Borrisokane Road
Ottawa, Ontario

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REMARKS

HOLE NO. TP 7

BORINGS BY Excavator **DATE** 2019 July 25

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	106.70		
FILL: Brown sand with gravel, cobbles and boulders		G	1			1	105.70		
2.00						2	104.70		
FILL: Brown silty clay with sand, gravel, cobbles and boulders		G	2			3	103.70		
		G	3			4	102.70		
						5	101.70		
						6	100.70		
6.50									
Brown **SILTY CLAY**		G	4						
6.90									
End of Test Pit									
(Groundwater infiltration at 5.8m depth)									

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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Ottawa, Ontario

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FILE NO. PG5016

REMARKS

HOLE NO. TP 8

BORINGS BY Excavator **DATE** 2019 July 26

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	106.58		
FILL: Brown sand with gravel, cobbles and boulders		G	1			1	105.58		
1.20									
FILL: Brown sand, some gravel and clay		G	2			2	104.58		
2.20									
FILL: Brown silty clay with sand, gravel, cobbles and boulders		G	3			3	103.58		
						4	102.58		
						5	101.58		
		G	4			6	100.58		
6.60									
End of Test Pit									
(Groundwater infiltration at 5.9m depth)									

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

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SOIL PROFILE AND TEST DATA

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FILE NO. PG5016

REMARKS

HOLE NO. TP 9

BORINGS BY Excavator **DATE** 2019 July 26

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	104.06		
FILL: Brown silty sand, some gravel, organics, trace cobbles, boulders, metal pieces		G	1			1	103.06		
1.40									
FILL: Brown silty clay with sand, gravel, some cobbles, boulders		G	2			2	102.06		
						3	101.06		
						4	100.06		
4.80									
Brown **SAND,** some gravel		G	3			5	99.06		
5.20									
End of Test Pit									
(Groundwater infiltration at 2.9m 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

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SOIL PROFILE AND TEST DATA

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FILE NO. PG5016

REMARKS

HOLE NO. TP10

BORINGS BY Excavator **DATE** 2019 July 26

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	106.58		
FILL: Brown sand with gravel, cobbles and boulders		G	1						
0.70						1	105.58		
FILL: Brown silty sand with gravel, trace cobbles and boulders		G	2			2	104.58		
3.30						3	103.58		
FILL: Brown silty clay, trace sand and gravel		G	3			4	102.58		
						5	101.58		
6.20						6	100.58		
FILL: Brown sand, some gravel, trace cobbles and boulders		G	4						
7.10						7	99.58		
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

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3713 Borrisokane Road
Ottawa, Ontario

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FILE NO. PG5016

REMARKS

HOLE NO. TP11

BORINGS BY Excavator **DATE** 2019 July 26

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	105.18		
FILL: Brown sand with gravel, trace cobbles and boulders		G	1						
0.60						1	104.18		
FILL: Brown sand with gravel		G	2			2	103.18		
						3	102.18		
4.40		G	3			4	101.18		
Brown **SAND,** some gravel						5	100.18		
						6	99.18		
6.30		G	4						
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

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FILE NO. PG5016

REMARKS

HOLE NO. TP12

BORINGS BY Excavator **DATE** 2019 July 26

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	103.85		
						1	102.85		
		G	1						
Brown **SAND** some gravel, trace to some cobbles and boulders						2	101.85		
						3	100.85		
						4	99.85		
		G	2						
5.00									
GLACIAL TILL: Brown clayey silt with sand and gravel 5.20		G	3			5	98.85		
End of Test Pit									
(Groundwater infiltration at 4.7m depth)									

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
3713 Borrisokane Road
Ottawa, Ontario

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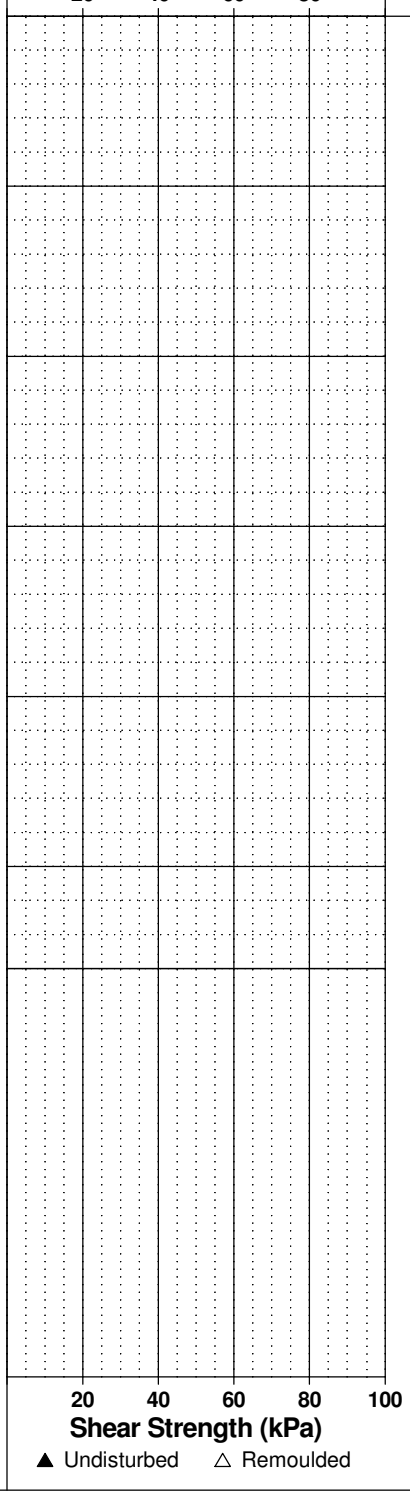
FILE NO. PG5016

REMARKS

HOLE NO. TP13

BORINGS BY Excavator **DATE** 2019 July 26

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	104.50		
FILL: Dark brown to brown sand with gravel, some cobbles and boulders		G	1			1	103.50		
		G	2			2	102.50		
		G	3			3	101.50		
4.80						4	100.50		
Brown **SAND,** trace gravel		G	4			5	99.50		
5.60									
End of Test Pit (Groundwater infiltration at 4.8m depth)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
3713 Borrisokane Road
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FILE NO. PG5016

REMARKS

HOLE NO. TP14

BORINGS BY Excavator **DATE** 2019 July 26

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	100.63		
FILL: Brown sand		G	1						
0.50									
FILL: Brown silty sand, some clay and gravel, trace cobbles and boulders		G	2			1	99.63		
1.60									
Brown **SAND,** trace gravel		G	3			2	98.63		
2.80									
Grey **SILTY CLAY**		G	4			3	97.63		
						4	96.63		
4.60									
End of Test Pit									
(Groundwater infiltration at 1.8m 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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
3713 Borrisokane Road
Ottawa, Ontario

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FILE NO. PG5016

REMARKS

HOLE NO. TP15

BORINGS BY Excavator **DATE** 2019 September 16

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	103.42		
FILL: Brown silty sand with gravel 0.23		G	1						
FILL: Grey silty clay with gravel		G	2			1	102.42		
						2	101.42		
						3	100.42		
4.09						4	99.42		
FILL: Brown sand with boulders		G	3			5	98.42		
						6	97.42		
7.14						7	96.42		
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

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FILE NO. PG5016

REMARKS

HOLE NO. TP16

BORINGS BY Excavator **DATE** 2019 September 16

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	105.71		
FILL: Brown silty sand with clay, gravel, cobbles and boulders		G	1			1	104.71		
						2	103.71		
						3	102.71		
						4	101.71		
5.26						5	100.71		
FILL: Grey silty sand with gravel, cobbles and boulders, some clay		G	2			6	99.71		
7.26						7	98.71		
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

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3713 Borrisokane Road
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FILE NO. PG5016

REMARKS

HOLE NO. TP17

BORINGS BY Excavator **DATE** 2019 September 16

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	101.66		
FILL: Brown silty sand with gravel, concrete, trace organics 0.46		G	1			1	100.66		
FILL: Brown silty sand with concrete		G	2			2	99.66		
3.30						3	98.66		
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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FILE NO. PG5016

REMARKS

HOLE NO. TP18

BORINGS BY Excavator **DATE** 2019 September 16

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	105.36		
FILL: Brown silty sand with gravel and cobbles		G	1			1	104.36		
1.24						2	103.36		
FILL: Brown silty sand with concrete, boulders, trace organics		G	2			3	102.36		
						4	101.36		
						5	100.36		
						6	99.36		
7.03						7	98.36		
End of Test Pit (TP dry upon completion)									

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

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SOIL PROFILE AND TEST DATA

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FILE NO. PG5016

REMARKS

HOLE NO. TP19

BORINGS BY Excavator **DATE** 2019 September 16

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	106.71		
FILL: Brown silty sand with gravel and cobbles		G	1			1	105.71		
1.36						2	104.71		
FILL: Brown silty sand with gravel, clay, trace organics		G	2			3	103.71		
						4	102.71		
						5	101.71		
6.83						6	100.71		
Brown **SILTY SAND**		G	3			7	99.71		
7.92									
End of Test Pit									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %; scale 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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FILE NO. PG5016

REMARKS

HOLE NO. TP20

BORINGS BY Excavator **DATE** 2019 September 16

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	107.02		
FILL: Brown silty sand with gravel, cobbles and boulders, trace organics		G	1			1	106.02		
1.65						2	105.02		
FILL: Brown silty sand with boulders						3	104.02		
						4	103.02		
5.33		G	2			5	102.02		
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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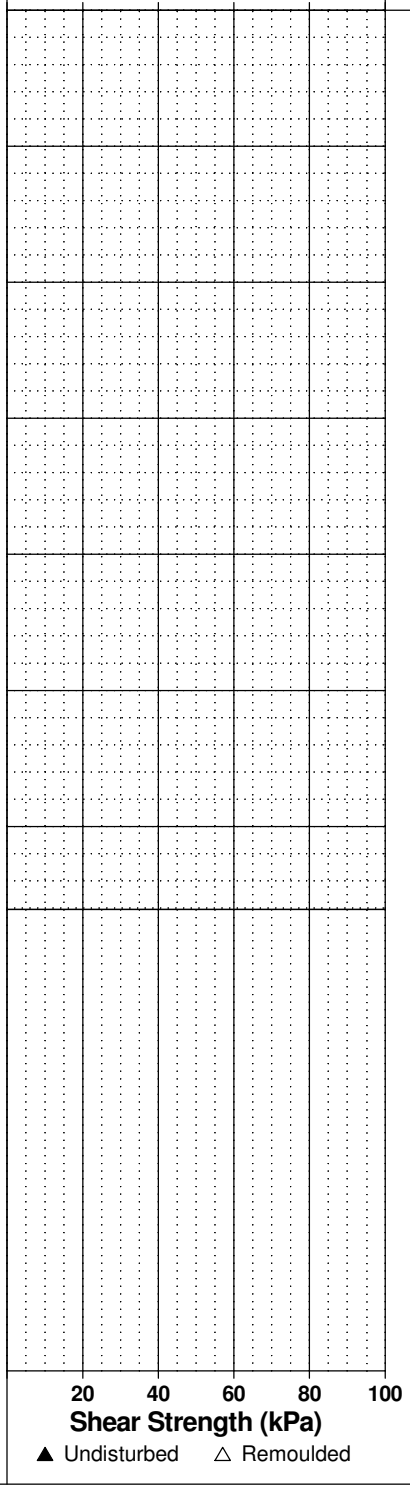
REMARKS

HOLE NO. TP21

BORINGS BY Excavator **DATE** 2019 September 17

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	106.39		
FILL: Brown silty sand with gravel, clay, trace organics and cobbles						1	105.39		
1.98		G	1			2	104.39		
FILL: Brown silty sand, trace cobbles and boulders						3	103.39		
						4	102.39		
						5	101.39		
		G	2			6	100.39		
6.61									
End of Test Pit									
(TP dry upon completion)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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FILE NO. PG5016

REMARKS

HOLE NO. TP22

BORINGS BY Excavator **DATE** 2019 September 17

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	106.64		
						1	105.64		
						2	104.64		
		G	1			3	103.64		
FILL: Brown sand, some clay, cobbles, brick and concrete						4	102.64		
						5	101.64		
		G	2			6	100.64		
						7	99.64		
						8	98.64		
8.25 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
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FILE NO. PG5016

REMARKS

HOLE NO. TP23

BORINGS BY Excavator **DATE** 2019 September 17

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	105.53		
FILL: Brown silty sand with clay, trace cobbles and boulders		G	1			1	104.53		
						2	103.53		
						3	102.53		
						4	101.53		
						5	100.53		
						6	99.53		
6.48									
Grey **SILTY CLAY**						7	98.53		▽
7.34		G	2						
End of Test Pit									
(GWL @ 7.0m depth based on field observations)									

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
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FILE NO. PG5016

REMARKS

HOLE NO. TP24

BORINGS BY Excavator **DATE** 2019 September 17

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	106.36		
						1	105.36		
						2	104.36		
						3	103.36		
FILL: Grey silty clay, trace cobbles and boulders		G	1						
		G	2			4	102.36		
						5	101.36		
						6	100.36		
						7	99.36		
						8	98.36		
8.48									
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

Geotechnical Investigation
3713 Borrisokane Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

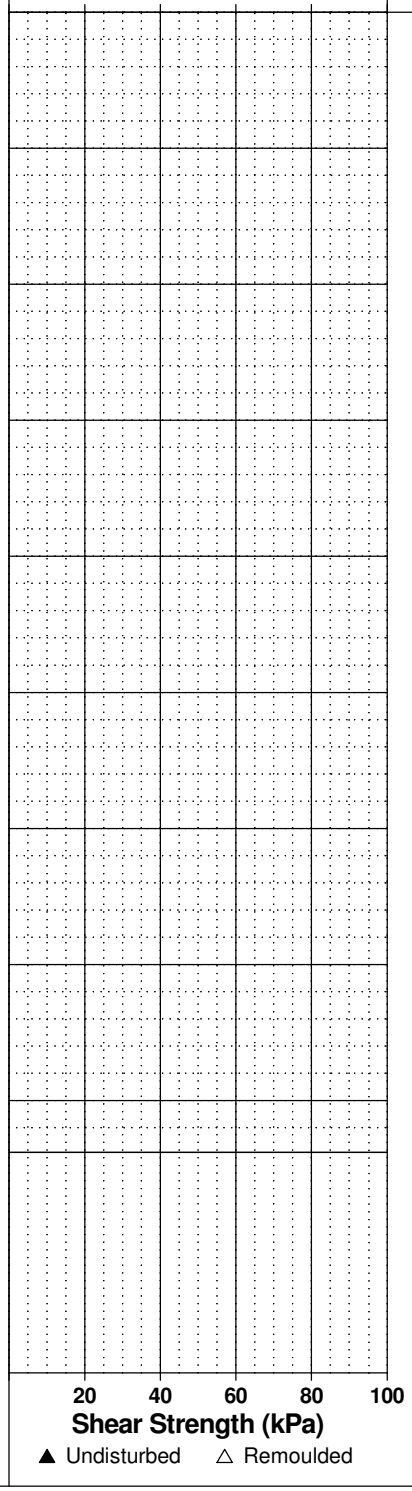
FILE NO. PG5016

REMARKS

HOLE NO. TP25

BORINGS BY Excavator **DATE** 2019 September 17

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	106.40		
FILL: Brown silty sand, trace organics, concrete and building mat		G	1			1	105.40		
3.81						2	104.40		
FILL: Brown silty sand with clay, cobbles and boulders		G	2			3	103.40		
						4	102.40		
						5	101.40		
						6	100.40		
						7	99.40		
8.18						8	98.40		
Stiff, grey **SILTY CLAY** 8.38		G	3						▽
End of Test Pit									
(GWL @ 8.2m depth based on field observations)									



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SOIL PROFILE AND TEST DATA

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FILE NO. PG5016

REMARKS

HOLE NO. TP26

BORINGS BY Excavator **DATE** 2019 September 18

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	105.54		
FILL: Brown silty sand with clay, trace organics and cobbles		G	1			1	104.54		
						2	103.54		
						3	102.54		
4.09						4	101.54		
FILL: Brown silty clay with concrete and boulders		G	2			5	100.54		
						6	99.54		
						7	98.54		
7.67									
End of Test Pit									
(TP dry upon completion)									

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

DATUM Ground surface elevations provided by J.D. Barnes Limited.

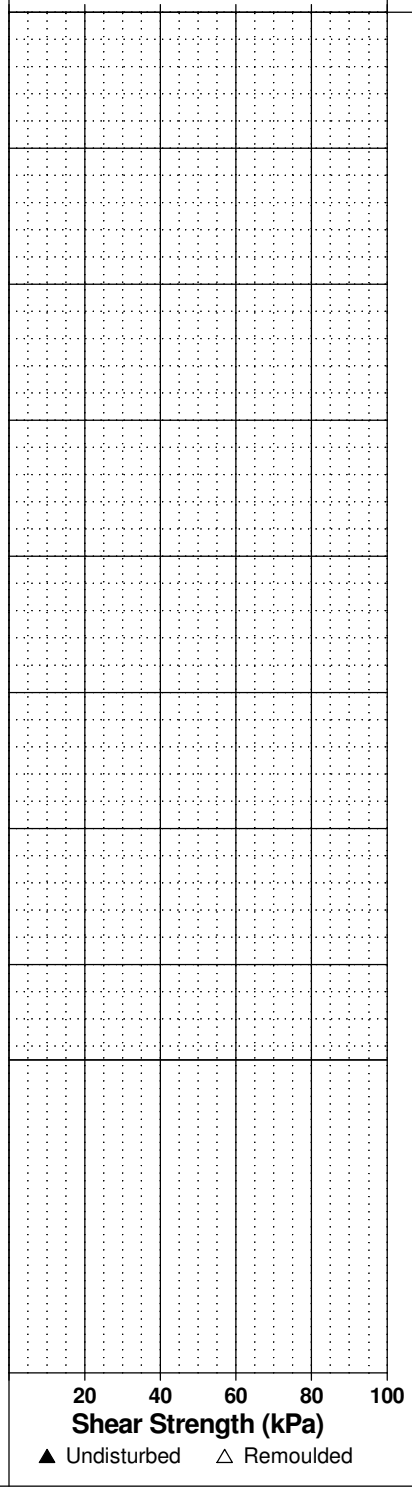
FILE NO. PG5016

REMARKS

HOLE NO. TP27

BORINGS BY Excavator **DATE** 2019 September 18

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	105.62		
						1	104.62		
						2	103.62		
						3	102.62		
FILL: Brown silty sand with clay, trace concrete, boulders and construction materials		G	1			4	101.62		
						5	100.62		
						6	99.62		
						7	98.62		
7.70		G	2						
End of Test Pit									
(TP dry upon completion)									



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SOIL PROFILE AND TEST DATA

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FILE NO. PG5016

REMARKS

HOLE NO. TP28

BORINGS BY Excavator **DATE** 2019 September 18

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	104.75		
						1	103.75		
		G	1			2	102.75		
FILL: Brown silty sand with gravel, clay, boulders, concrete and construction materials						3	101.75		
						4	100.75		
						5	99.75		
						6	98.75		
		G	2			7	97.75		
7.03									
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

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REMARKS

HOLE NO. TP29

BORINGS BY Excavator **DATE** 2019 September 18

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	104.41		
FILL: Brown silty sand with boulders, trace organics		G	1			1	103.41		
1.27									
Brown **SILTY SAND**		G	2			2	102.41		
2.13									
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

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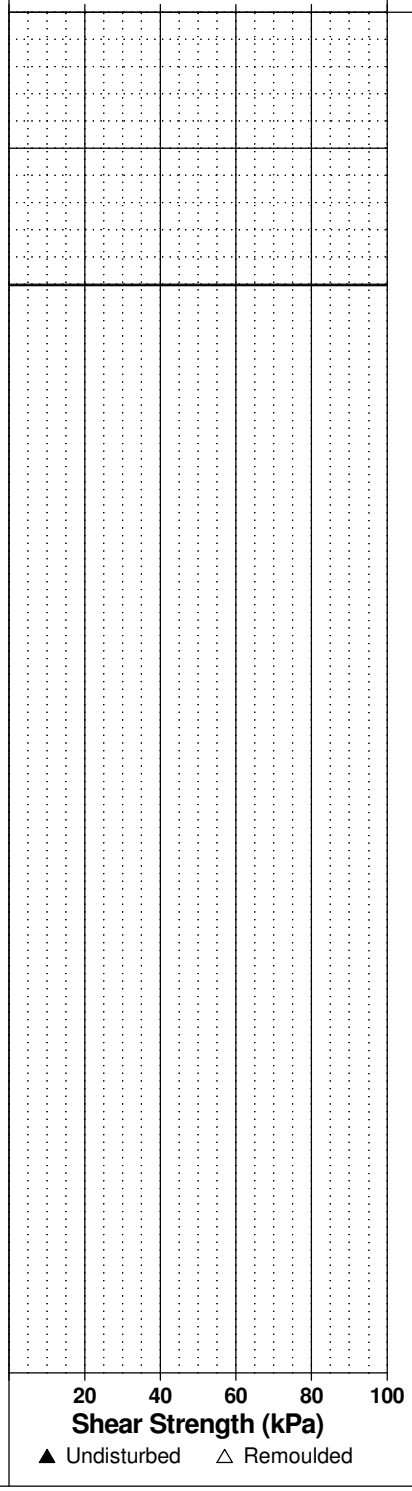
FILE NO. PG5016

REMARKS

HOLE NO. TP30

BORINGS BY Excavator **DATE** 2019 September 18

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	101.71		
FILL: Brown silty sand, some gravel		G	1						
0.97						1	100.71		
Brown **SILTY SAND**		G	2						
2.01						2	99.71		
End of Test Pit									
(TP dry upon completion)									



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SOIL PROFILE AND TEST DATA

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FILE NO. PG5016

REMARKS

HOLE NO. TP31

BORINGS BY Excavator **DATE** 2019 September 18

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	100.59		
FILL: Brown silty sand, trace organics and boulders		G	1						
1.04						1	99.59		
Brown **SILTY SAND**		G	2						
1.98									
End of Test Pit									
(TP dry upon completion)									

20 40 60 80

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

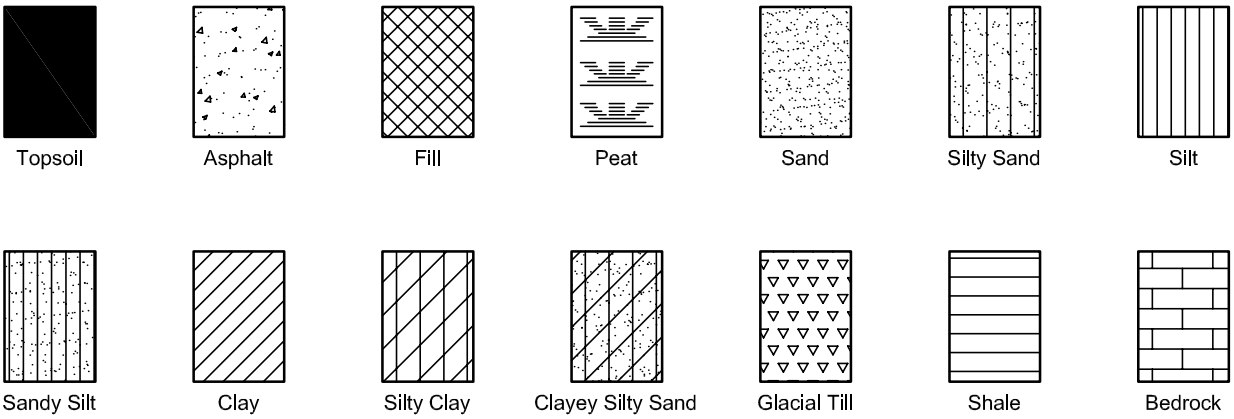
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

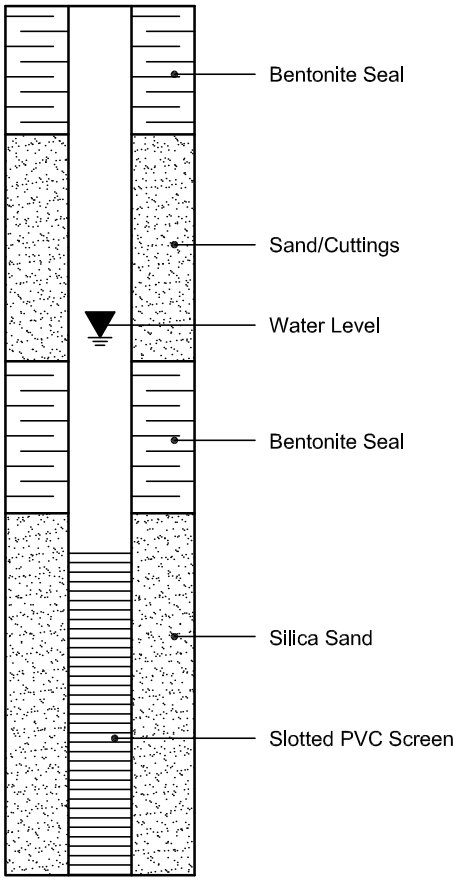
SYMBOLS AND TERMS (continued)

STRATA PLOT

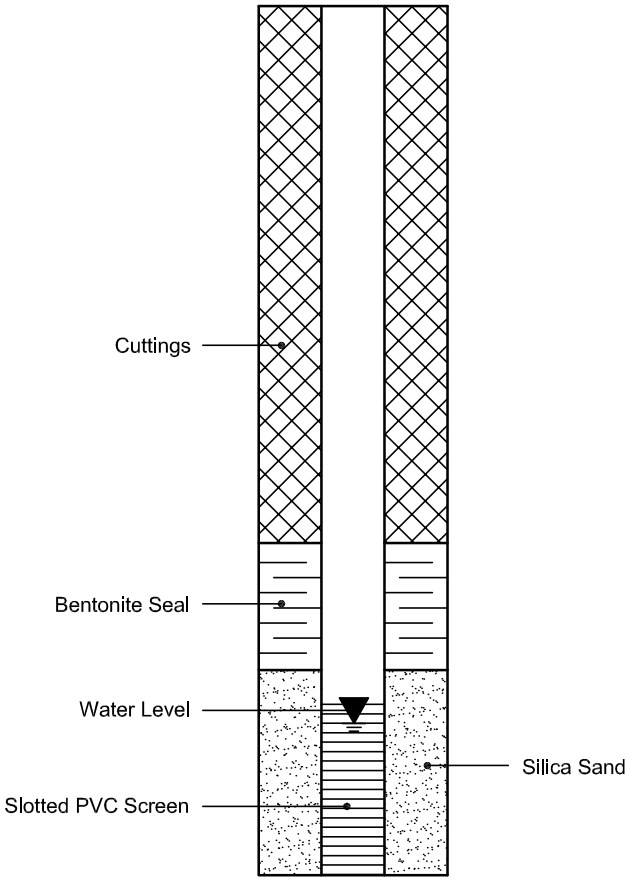


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



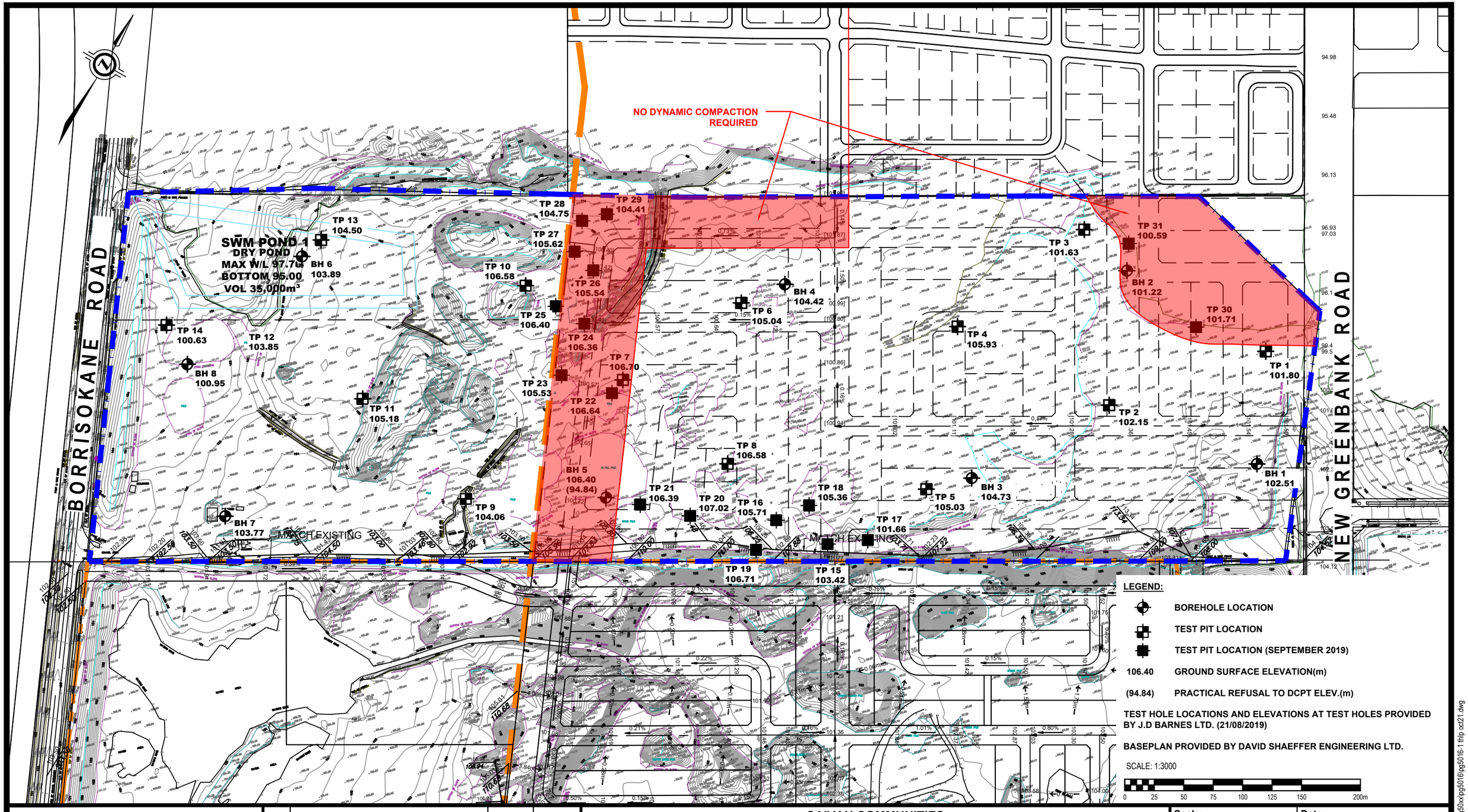
APPENDIX 2

FIGURE 1 - KEY PLAN

DRAWING PG5016-1 - TEST HOLE LOCATION PLAN

FIGURE 1

KEY PLAN



LEGEND:

- BOREHOLE LOCATION
- TEST PIT LOCATION
- TEST PIT LOCATION (SEPTEMBER 2019)
- 106.40 GROUND SURFACE ELEVATION(m)
- (94.84) PRACTICAL REFUSAL TO DCPT ELEV.(m)

TEST HOLE LOCATIONS AND ELEVATIONS AT TEST HOLES PROVIDED BY J.D BARNES LTD. (21/08/2019)

BASEPLAN PROVIDED BY DAVID SHAEFFER ENGINEERING LTD.

SCALE: 1:3000

0 25 50 75 100 125 150 200m

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NO.	REVISIONS	DATE	INITIAL
1	UPDATED TO INCLUDE SEPTEMBER 2019 TEST PITS	25/09/2019	DJG

CAIVAN COMMUNITIES

GEOTECHNICAL INVESTIGATION
BORRISOKANE ROAD - DRUMMONDS PIT

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:3000	Date: 08/2019
Drawn by: RCG	Report No.: PG5016-1
Checked by: DJG	**PG5016-1**
Approved by: DJG	Revision No.:

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