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Hydrogeology
Geological Engineering
Materials Testing
Building Science

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January 17, 2019
File: PG4746-LET.01

Regional Group
c/o Novatech Engineering
130 Slater Street
Ottawa, Ontario
K1P 6E2

Attention: **Ms. Melanie Riddell**

Subject: **Preliminary Geotechnical Investigation**
Proposed Development - Evoy Lands
Florence Street at Adelaide Street - Almonte, Ontario

Dear Madam,

Paterson Group (Paterson) was commissioned by Novatech Engineering (Novatech) to conduct a preliminary geotechnical investigation to evaluate the subsoil conditions and determine bedrock elevation at the aforementioned site.

1.0 Background Information

It is of our understanding that the Regional Group is planning on expanding the Mill Run development in the town of Almonte, across the adjacent Evoy Lands situated between Florence Street and Honneyborne Street. The development will consist of residential dwellings along associated landscaped areas and local roadways.

2.0 Field Program and Observations

The field program for the investigation was carried out on December 18, 2018. At that time, ten (10) test pits were excavated to a maximum depth of 1.6 m below existing ground surface at the Evoy Lands. The test hole locations were distributed in a manner to provide general coverage of the subject site where access was not hindered by dense vegetation and trees. The locations of the test holes are shown on Drawing PG4746-1 - Test Hole Location Plan included in attachment.

The test pits were completed by a hydraulic shovel at the selected locations across the sites. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer. The test hole procedures consisted of excavating to refusal depths at the selected locations and sampling the overburden.

Surface Conditions

The subject site consist of an undeveloped land with bush areas and mature trees. At the time of the field program the grounds were snow covered and surface water was frozen. Surface water was observed in the south corner of the property. The south-west corner of the land was covered with tall grass and bushes with areas of mature trees. The north and north-east corner of the land is treed. The topography of the subject property is fairly flat with a slightly lower portion in the south corner.

The property is bordered by Florence Street and a residential dwelling along the south-west property line, a storm water retention pond is situated at the north-east border of the site and undeveloped lands border the property on both south-east and north-west sides with a drainage ditch flowing north along the north-west property line.

Subsurface Conditions

Generally, the subsurface profile at the test pit locations within the south and west portion of the subject site consists of topsoil overlying a thin layer of brown silty sand or glacial till consisting of gravel and cobbles mixed with a clayey silt fine soil matrix over a shallow bedrock. At the test pit completed within the north and eastern portion of the site, a layer of marl was observed directly under the topsoil surface layer underlain by a layer of brown clayey silt over a dense grey layer of silty clay. Ground water was found to be on top of the grey silty clay layer in the northern section of the property. Reference should be made to the soil profile and test data sheets attached. The table below summarises the test pit findings.

The test pit locations were selected by Paterson and surveyed by Novatech. The locations are shown on Drawing PG4746-1 - Test Hole Location Plan in attachment.

Groundwater

Groundwater was encountered to be on top of the grey silty clay layer in the northern section of the property. Frozen surface water was observed on the south portion of the site. Test pits TP18-A, TP18-B and TP18-C were dry upon completion. It should be noted that groundwater levels are subject to seasonal fluctuations, therefore the groundwater levels could vary at the time of construction.

Table 1 - Evoy Lands Test Pit Subsurface Profile Summary					
	Subsurface soil layer				
	Topsoil	Marl	Till: Brown silty sand	Brown Clayey Silt	Grey Silty Clay
Test Pit Location	Underside of Layer Elevation (m)				
TP18-A	138.13		137.65		
TP18-B	138.3				
TP18-C	138.3		138.09		
TP18-D	137.67	137.57	137.07		136.93
TP18-E	137.96		137.37		
TP18-F	137.83	137.67		137.17	136.57
TP18-G	137.85	137.63		137.25	136.72
TP18-H	137.87	137.44		137.34	137.1
TP18-I	137.77	137.58			137.1
TP18-J	137.85	Traces		137.65	137.4

3.0 Geotechnical Assessment

Site Grading and Preparation

Stripping Depth

All topsoil and deleterious fill, such as those containing organic materials and marl, should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures.

Fill Placement

Fill used for grading beneath the building footprint, 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. It should be placed in lifts no greater than 300 mm thick and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the building area should be compacted to at least 98% of its standard Proctor maximum dry density (SPMDD).

Site-excavated soil can be used as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If these materials are to be used to build up the subgrade level for areas to be paved, they should be compacted in thin lifts to a minimum density of 95% of their respective SPMDD. Site-excavated soils are not suitable for use as backfill against foundation walls unless a composite drainage blanket connected to a perimeter drainage system is provided.

Bedrock Removal

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. Where significant quantities of bedrock are to be removed, it is expected that line-drilling in conjunction with hoe-ramming or controlled blasting will be required.

Foundation Design

Based on the Paterson's field observation the site is partly underlain by a layer of sensitive grey silty clay on the north and east portions. The following preliminary bearing resistance values can be used for footings up to 2 m width, placed on an undisturbed bearing surface:

Table 2 - Evoy Lands Preliminary Bearing Capacities

Bearing Medium	Bearing Resistance Value at SLS (kPa)	Factored Bearing Resistance Value at ULS (kPa)
Firm silty clay	65	125
Bedrock surface	500	1000
Lean concrete over bedrock	500	1000
Engineered fill over bedrock	150	225

An undisturbed soil bearing surface consists of a surface from which all topsoil, peat, marl 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.

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

Design for Earthquakes

The site class for seismic site response can be taken as **Class C**. If a higher seismic site class is required (Class A or B), a site specific shear wave velocity test may be completed to accurately determine the applicable seismic site classification for foundation design of the proposed building, as presented in Table 4.1.8.4.A of the Ontario Building Code (OBC) 2012.

Soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the Ontario Building Code 2012 for a full discussion of the earthquake design requirements.

4.0 Design and Construction Precautions

Protection of Footings 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 for footings supported on an undisturbed, compact silty sand to sand bearing surface. However, perimeter footings supported directly on clean, surface-sounded bedrock will only require 0.6 m of soil cover for frost protection.

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

Excavation Side Slopes

The side slopes of excavations in the overburden soils should be sloped back at acceptable slopes from the start of the excavation until the structure is backfilled. 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 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 Paterson 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.

Groundwater Control

It is anticipated that groundwater infiltration into the excavations should be 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, Conservation and Parks (MECP) 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 of 4 to 5 months should be allowed for completion of the PTTW application package and issuance of the permit by the MECP.

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 MECP review of the PTTW application.

The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium. dewatering measure while awaiting the MECP review of the PTTW application.

5.0 Recommendations

A supplemental investigation and a materials testing and observation services program is a requirement for the provided foundation design recommendations to be applicable. The following aspects of the program should be performed by Paterson:

- ❑ Supplemental investigation to provide sufficient soil coverage of inaccessible treed areas.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Sampling and testing of the concrete and fill materials used.
- ❑ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❑ Observation of all subgrades prior to backfilling.
- ❑ Field density tests to determine the level of compaction achieved.

A report confirming that the construction has been conducted in general accordance with Paterson's recommendations could be issued upon the completion of a satisfactory inspection program by the geotechnical consultant.

6.0 Statement of Limitations

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

The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only and 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 the test locations, Paterson requests immediate notification 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 Regional Group, or their agents, is not authorized without review by Paterson Group for the applicability of our recommendations to the altered use of the report.

We trust this report meets your present requirements.

Best Regards,

Paterson Group Inc.

Joey R. Villeneuve, M.A.Sc, EIT

David J. Gilbert, P.Eng

Attachments

- ❏ Soil Profile and Test Data Sheets
- ❏ Symbols and Terms
- ❏ Figure 1 - Key Plan
- ❏ Drawing PG4746-01 - Test Hole Location Plan

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Evoy Lands - Florence Street
Almonte, Ontario

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. PG4746

REMARKS

HOLE NO. TP18-A

BORINGS BY Excavator **DATE** December 18, 2019

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	138.38	20 40 60 80	
TOPSOIL									
0.25									
Brown **SILTY SAND**		G	1						
0.73									
End of Test Pit TP terminated on bedrock surface at 0.73m depth (TP dry upon completion)									

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Evoy Lands - Florence Street
Almonte, Ontario

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

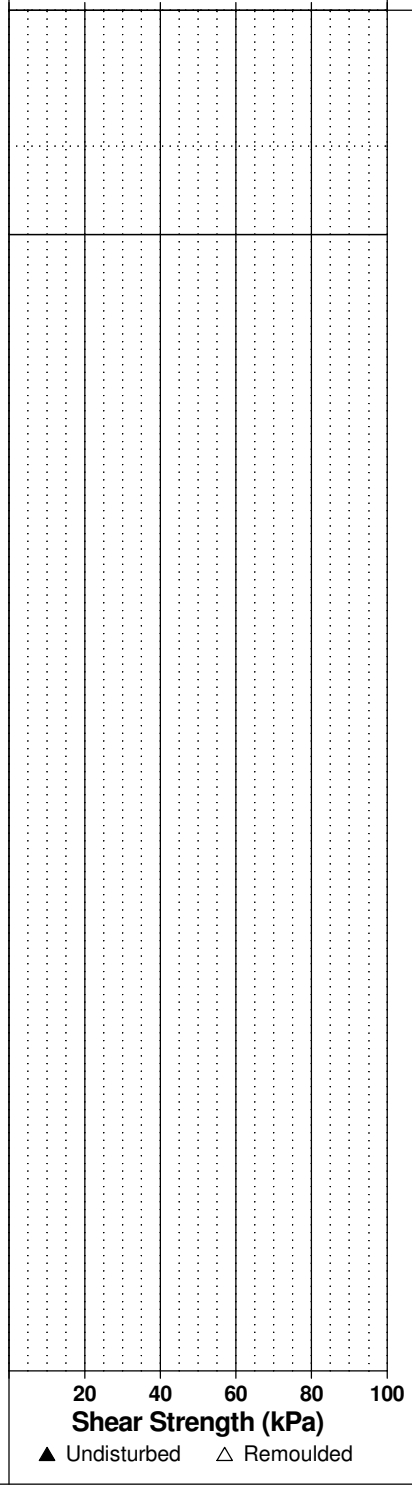
FILE NO. PG4746

REMARKS

HOLE NO. TP18-B

BORINGS BY Excavator **DATE** December 18, 2019

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	138.55		
TOPSOIL		G	1						
0.25									
Weathered **BEDROCK**									
0.33									
End of Test Pit									
TP terminated on bedrock surface at 0.33m depth									
(TP dry upon completion)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Evoy Lands - Florence Street
Almonte, Ontario

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. PG4746

REMARKS

HOLE NO. TP18-C

BORINGS BY Excavator **DATE** December 18, 2019

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	138.60	20 40 60 80	
TOPSOIL									
0.30									
GLACIAL TILL: Brown silty sand with gravel, cobbles, boulders		G	1						▽
0.51									
Weathered **BEDROCK** 0.52									
End of Test Pit									
TP terminated on bedrock surface at 0.52m depth									
(GWL @ 0.5m based on field observations)									

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Evoy Lands - Florence Street
Almonte, Ontario

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. PG4746

REMARKS

HOLE NO. TP18-D

BORINGS BY Excavator **DATE** December 18, 2019

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	138.17	20 40 60 80	
TOPSOIL									
0.50									
MARL									
0.60		G	1						
GLACIAL TILI: Brown silty sand with gravel, cobbles, boulders						1	137.17		▽
1.10									
GreY **SILTY CLAY** with sand		G	2						
1.24									
End of Test Pit									
TP terminated on bedrock surface at 1.24m depth									
(GWL @ 1.1m based on field observations)									

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Evoy Lands - Florence Street
Almonte, Ontario

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. PG4746

REMARKS

HOLE NO. TP18-E

BORINGS BY Excavator **DATE** December 18, 2019

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	138.26	20 40 60 80	
TOPSOIL									
0.30									
GLACIAL TILL: Brown silty sand with gravel, cobbles, boulders		G	1						
0.89									
End of Test Pit TP terminated on bedrock surface at 0.89m depth (TP dry upon completion)									

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Evoy Lands - Florence Street
Almonte, Ontario

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. PG4746

REMARKS

HOLE NO. TP18-F

BORINGS BY Excavator **DATE** December 18, 2019

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	138.27	20 40 60 80	
TOPSOIL									
0.44									
MARL									
0.60		G	1						
Brown **CLAYEY SILT**		G	2			1	137.27		▽
1.10									
Grey **SILTY CLAY**		G	3						
1.70									
End of Test Pit									
TP terminated on bedrock surface at 1.70m depth									
(GWL @ 1.1m based on field observations)									

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Evoy Lands - Florence Street
Almonte, Ontario

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. PG4746

REMARKS

HOLE NO. TP18-G

BORINGS BY Excavator **DATE** December 18, 2019

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	138.35		
TOPSOIL									
0.50									
MARL		G	1						
0.72									
Brown **CLAYEY SILT**		G	2			1	137.35		▽
1.10									
Grey **SILTY CLAY**		G	3						
1.63									
End of Test Pit TP terminated on bedrock surface at 1.63m depth (GWL @ 1.1m based on field observations)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Evoy Lands - Florence Street
Almonte, Ontario

DATUM Ground surface elevations provided by Novatech Engineering Consultants Ltd.

FILE NO. PG4746

REMARKS

HOLE NO. TP18-H

BORINGS BY Excavator **DATE** December 18, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	138.14
TOPSOIL							
0.27							
MARL		G	1				
0.70							
Brown **CLAYEY SILT**		G	2				
0.80							
Grey **SILTY CLAY**		G	3			1	137.14
1.04							
End of Test Pit							
TP terminated on bedrock surface at 1.04m depth							
(GWL @ 1.0m based on field observations)							

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

20 40 60 80

Piezometer Construction

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Evoy Lands - Florence Street
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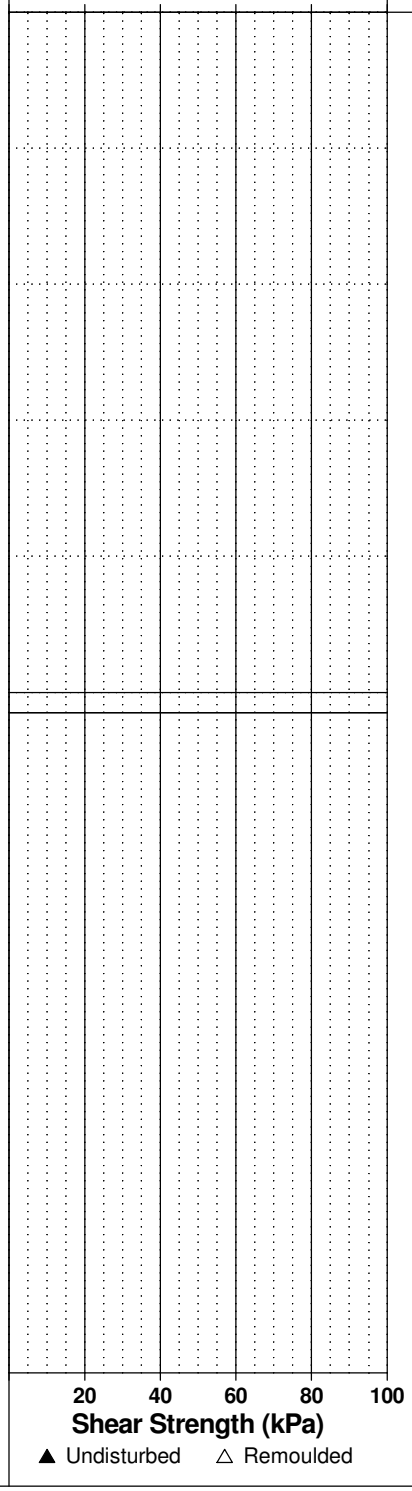
FILE NO. PG4746

REMARKS

HOLE NO. TP18-I

BORINGS BY Excavator **DATE** December 18, 2019

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	138.13		
TOPSOIL									
0.36									
MARL		G	1						
0.55									
Grey **SANDY CLAY**		G	2						▽
1.03						1	137.13		
End of Test Pit TP terminated on bedrock surface at 1.03m depth (GWL @ 0.9m based on field observations)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Evoy Lands - Florence Street
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FILE NO. PG4746

REMARKS

HOLE NO. TP18-J

BORINGS BY Excavator **DATE** December 18, 2019

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	138.15		
TOPSOIL									
0.30									
Brown **SILT** with clay, trace marl		G	1						
0.50									
Grey **SANDY CLAY**		G	2						
0.75									
Weathered **BEDROCK**									
0.81									
End of Test Pit									
TP terminated on bedrock surface at 0.81m depth									
(GWL @ 0.5m based on field observations)									

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

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

▲ 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 relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

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

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their "sensitivity". The sensitivity, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

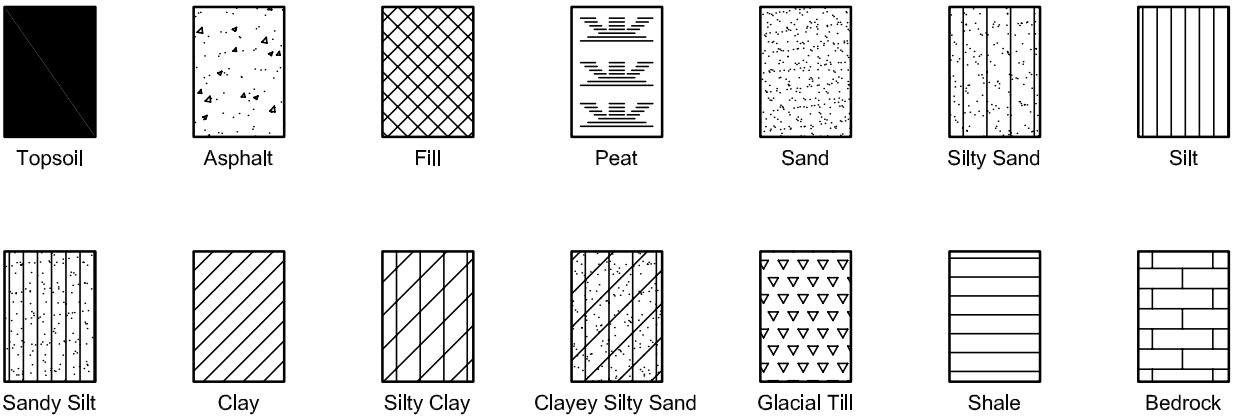
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

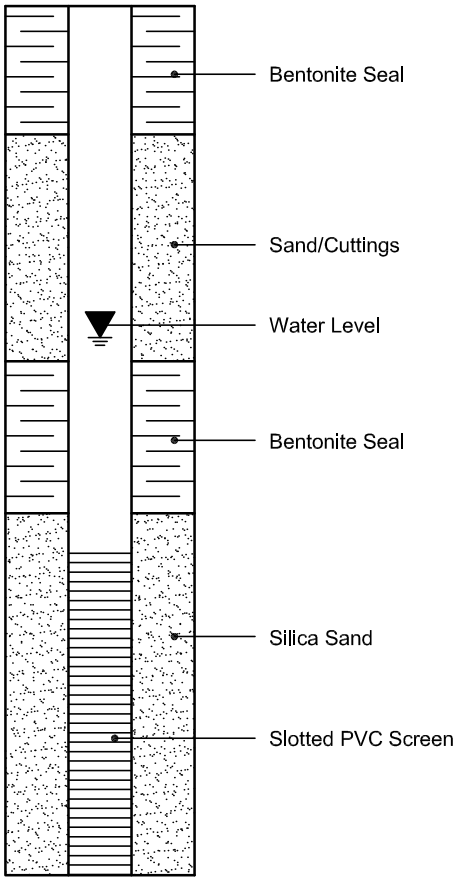
SYMBOLS AND TERMS (continued)

STRATA PLOT

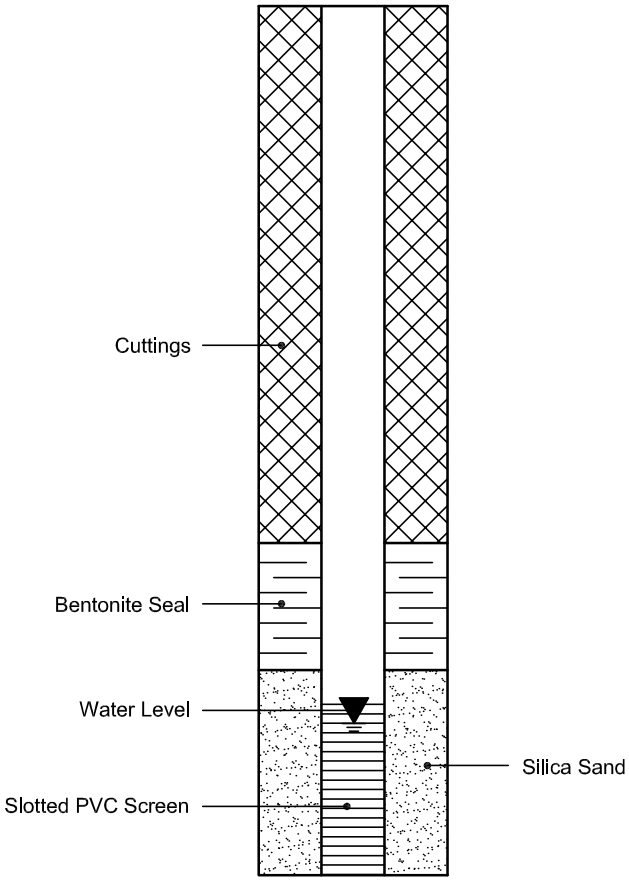


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



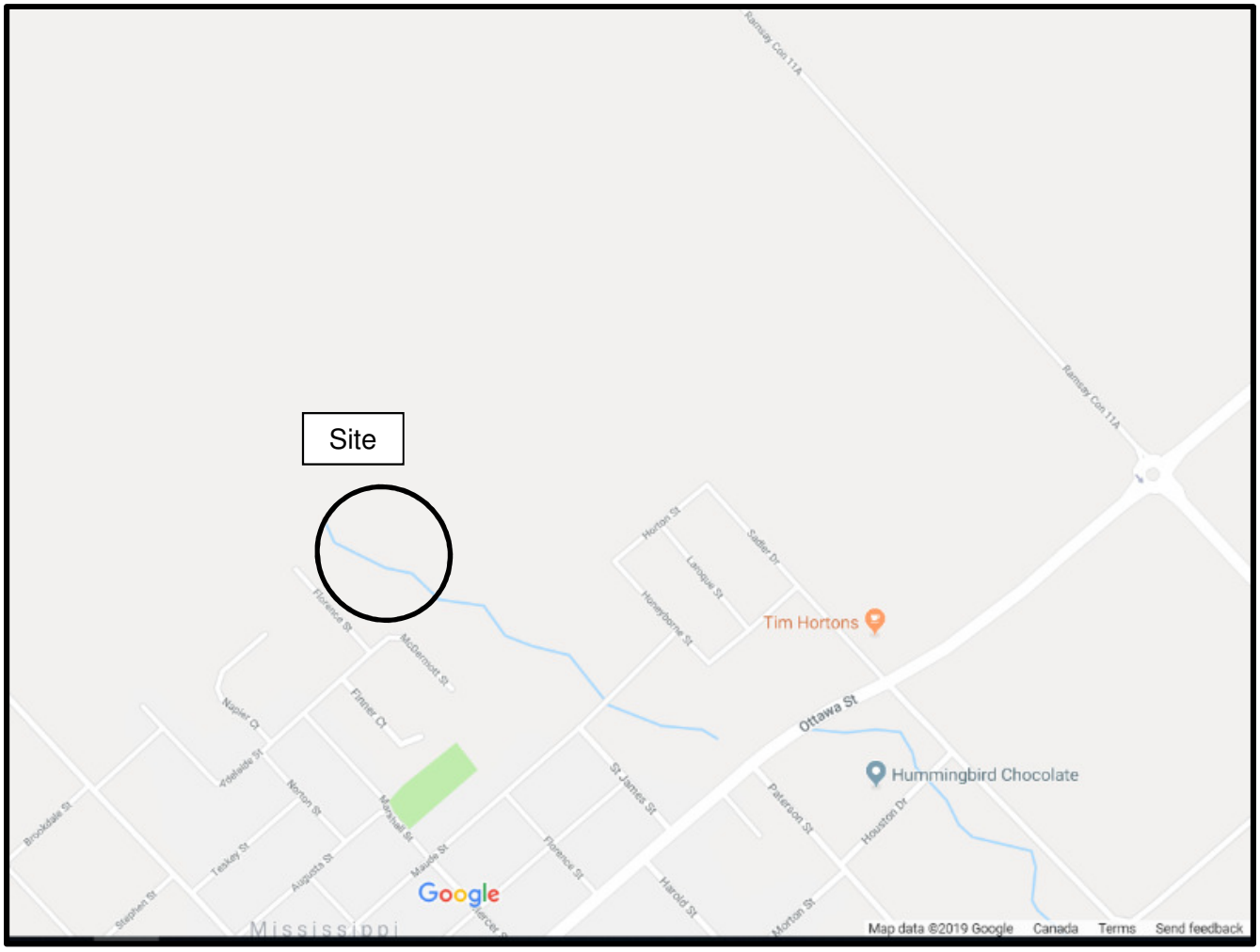
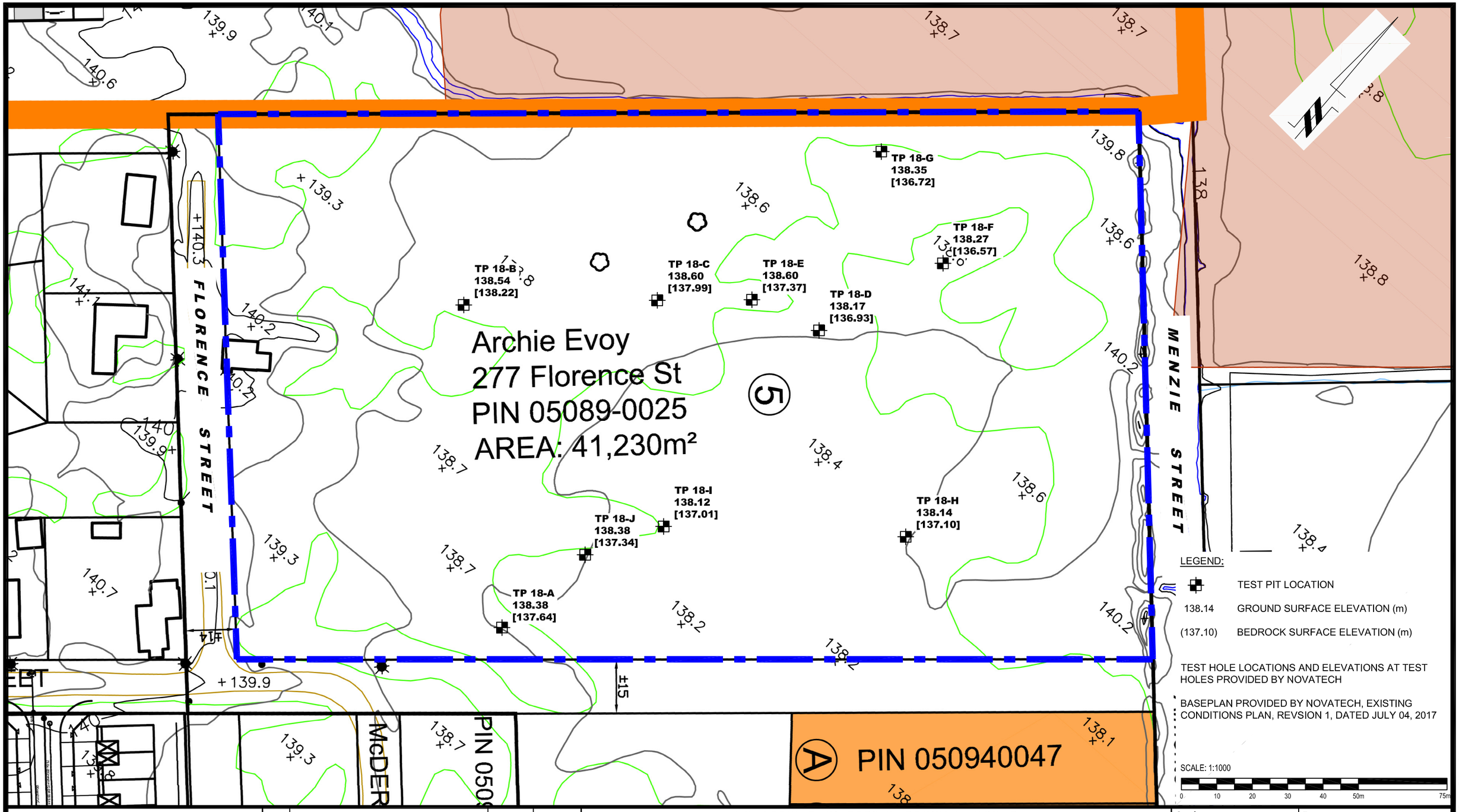


FIGURE 1

KEY PLAN



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NOVATECH ENGINEERING / REGIONAL GROUP

GEOTECHNICAL INVESTIGATION
EVOY LANDS - FLORENCE STREET

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:1000	Date: 01/2019
Drawn by: RCG	Report No.: PG4746-1
Checked by: JV	Dwg. No.: PG4746-1
Approved by: DJG	Revision No.: 0

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