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Hydrogeology
Geological Engineering
Materials Testing
Building Science

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June 14, 2019
PG4923-LET.01

Krista Construction Ltd.
1292 Humber Place
Ottawa, Ontario
K1B 3W3

Attention: **Mr. Geoffrey Lauzon**

Subject: **Geotechnical Investigation**
Proposed Building Addition
St-Laurent Academy
641 Sladen Avenue - Ottawa

Dear Sir,

Paterson Group (Paterson) was commissioned by Krista Construction Ltd. to conduct a geotechnical investigation for the proposed building addition to the existing school building located at 641 Sladen Avenue, in the City of Ottawa, Ontario (refer to Figure 1 - Key Plan attached to the current report).

It is understood that the proposed building addition will consist of a one storey slab-on-grade structure located at the east side of the existing school building. The building expansion will include constructing a second floor over an existing one-storey portion of the existing building. Removal and reinstatement is anticipated for the existing utility conduits located within the proposed building footprint.

1.0 Field Investigation

The field work for the current investigation was carried out on May 9, 2019. At that time, two (2) boreholes were advanced to a maximum depth of 3.0 m. A previous investigation was carried out by Paterson on September 3, 2010 and consisting of two boreholes advanced to a maximum depth of 2.13 m below existing grade.

Rock samples were recovered from BH2 during the previous investigation using a core barrel and diamond drilling techniques. The bedrock samples were classified on site, placed in hard cardboard core boxes and transported to Paterson's laboratory. The depths at which rock core samples were recovered from the borehole is presented as RC on the Soil Profile and Test Data sheets attached to this report.

All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer. The boreholes drilled using a track-mounted geoprobe operated by a two person crew. The test hole procedure consisted of drilling to the required depths at the selected locations and sampling and testing the overburden. The borehole locations are presented on Drawing PG4923-1 - Test Hole Location Plan attached to the current report.

The location and ground surface elevation at the borehole locations were surveyed in the field by Paterson personnel. Ground surface elevations at the test hole locations were referenced to a temporary benchmark (TBM), consisting of the top spindle of the fire hydrant located on the west side of Sladen Avenue across from the subject site. An assumed elevation of 100.00 m was assigned to the TBM. The TBM, borehole locations and ground surface elevations are presented in Drawing PG4923-1 - Test Hole Location Plan attached to the present letter report.

2.0 Field Observations

Surface Conditions

The subject site is currently occupied by St-Laurent Academy with an associated asphalt covered recreation area along the south and east portions of the property. The site is bordered to the north by a commercial plaza, to the east by a commercial development, to the west by an associated asphalt parking area and Sladen Avenue and to the south by Forbes Park. The site is relatively flat and at grade with the adjacent streets and neighbouring properties.

Subsurface Conditions

The subsurface profile encountered at the borehole locations consists of a pavement structure underlain by a compact brown silty sand overlying a clayey silt. Glacial till was encountered below the above noted layers followed by weathered shale bedrock.

Reference should be made to the Soil Profile and Test Data sheets attached to the present letter for specific details of the soil profile encountered at the test pit locations.

Bedrock

Based on available geological mapping, the local bedrock consists of shale of the Rockliffe formation with an anticipated overburden thickness of 2 to 5 m depth.

Groundwater

Groundwater levels were recorded in the open test holes at the time of the investigation and are presented on the attached Soil Profile and Test Data Sheets. Based on the groundwater level observations, the long-term groundwater table is anticipated to be between 2 to 3 m depth. It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater levels could vary at the time of construction.

3.0 Geotechnical Discussion

Geotechnical Assessment

From a geotechnical perspective, the subject site is considered acceptable for the proposed building addition It is expected that the addition will be founded on shallow footings placed on a stiff clayey silt, dense glacial till or shale bedrock bearing surface.

Expansive shale of the Billings formation is present at shallow depths. Precautions should be taken during construction to reduce the risks associated with the risks of exposing the expansive shale during excavation.

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

Stripping Depth

Asphaltic concrete, topsoil and deleterious fill, such as those containing organic materials, should be stripped from under any building and other settlement sensitive structures. It is anticipated that the existing fill, free of significant amounts of deleterious material and organics, can be left in place below the proposed building footprint outside of lateral support zones for the footings. However, it is recommended that the slab subgrade surface be proof-rolled **under dry conditions and above freezing temperatures** by an adequately sized roller making several passes to achieve optimum compaction levels. The compaction program should be reviewed and approved by Paterson at the time of construction. In soft or poor performing areas, the existing fill should be removed and replaced with an approved engineered fill.

Fill Placement

Fill used for grading beneath the building footprints, 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).

Non-specified existing fill along with 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.

Foundation Design

Footings founded on an undisturbed, stiff clayey silt surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **100 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **150 kPa**.

Footings founded on an undisturbed, dense glacial till bearing surface can be designed using a bearing resistance value at SLS of **150 kPa** and a factored bearing resistance value at ULS of **225 kPa**.

An undisturbed soil bearing surface consists of a surface from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

Footings designed using the bearing resistance values at SLS provided will be subjected to potential post construction total and differential settlements of 25 and 20 mm, respectively. A geotechnical resistance factor of 0.5 was applied to the reported bearing resistance values at ULS.

Footings placed on a clean, surface sounded shale bedrock surface can be designed using a factored bearing resistance value at ultimate limit states (ULS) of **750 kPa**, incorporating a geotechnical resistance factor of 0.5, and a bearing resistance value at serviceability limit states (SLS) of **500 kPa**.

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.

Footings bearing on an acceptable bedrock bearing surface and designed using the bearing resistance values provided herein will be subjected to negligible potential post-construction total and differential settlements.

As a general procedure, it is recommended that those footings for the proposed addition that are located adjacent to the existing structure, be founded at the same level as the existing footings. This accomplishes three objectives. First, the behavior of the two structures at their connection will be similar due to the similar bearing medium. Second, there will be minimal stress added to the existing structure from the new structure.

Third, the bearing of the new structure will likely not be influenced by any backfill material associated with the existing structure.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to a soil bearing medium 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 or engineered fill of the same or higher capacity as the soil.

Adequate lateral support is provided to sound bedrock bearing medium when a plane extending horizontally and vertically from the underside of the footing at a minimum of 1H:6V passing through sound bedrock or a material of the same or higher capacity as the bedrock, such as concrete. A weathered bedrock bearing medium should be provided with a lateral support zone of 1H:1V.

Design for Earthquakes

The site class for seismic site response can be taken as **Class C** for the foundations considered for the subject site. A higher seismic site class such as Class A or B may be applicable. However, the higher site class would have to be confirmed by site specific shear wave velocity testing. The soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest version of the Ontario Building Code (OBC) 2012 for a full discussion of the earthquake design requirements

Slab-On-Grade Construction

With the removal of all asphalt, topsoil and deleterious fill, such as those containing significant amounts of organic materials within the footprint of the proposed building addition, the existing fill approved by the geotechnical consultant at the time of construction will be considered an acceptable subgrade. It is recommended that the existing fill be proof-rolled with a suitably sized roller making several passes under dry conditions and above freezing temperatures prior to fill placement and approved by the geotechnical consultant. Any poor performing areas should be removed and replaced with OPSS Granular A or Granular B Type II.

It is recommended that the upper 300 mm of sub-slab fill consist of OPSS Granular A crushed stone. All backfill material within the footprint of the proposed building and slab on grade should be placed in maximum 300 mm thick loose layers and compacted to at least 98% of the SPMDD.

4.0 Design and Construction Precautions

Foundation Drainage and Backfill

It is recommended that a perimeter foundation drainage system be provided for the proposed building addition and connected to the existing system. The system should consist of 150 mm diameter, geotextile-wrapped, perforated, corrugated, plastic pipes surrounded on all sides by 150 mm of 19 mm clear crushed stone placed at the footing level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer

Backfill against the exterior sides of the foundation walls should consist of free-draining non frost susceptible granular materials. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls, unless used in conjunction with a drainage geocomposite, such as Delta Drain 6000 or Miradrain G100N, connected to the perimeter foundation drainage system.

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

Excavation Side Slopes

The side slopes of excavations in the soil and fill overburden materials should be either cut back to acceptable slopes or should be retained by shoring systems 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 low and controllable using open sumps. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of the shallow excavation. 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.

For typical ground or surface water volumes being pumped during the construction phase, typically 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, and EASR will not be allowed as a temporary dewatering measure while awaiting the MECP review of the PTTW application. It is anticipated that an EASR will be sufficient for this site.

Winter Construction

Precautions must be taken if winter construction is considered for this project. The subsurface soil conditions at this site consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the use of straw, propane heaters and tarpaulins or other suitable means. In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

Trench excavations and pavement construction are also difficult activities to complete during freezing conditions without introducing frost in the subgrade or in the excavation walls and bottoms. Precautions should be taken if such activities are to be carried out during freezing conditions.

Corrosion Potential and Sulphate

The results of analytical testing show that the sulphate content is less than 0.1%. This result is indicative that Type 10 Portland cement (normal cement) would be appropriate for this site. The chloride content and the pH of the sample indicate that they are not significant factors in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity is indicative of a very low to slightly aggressive corrosive environment.

Protection of Potential Expansive Bedrock

It is anticipated that expansive shale may be encountered at the subject site. A potential for heaving and rapid deterioration of the shale bedrock could occur if exposed to air. To reduce the long term deterioration of the shale, exposure of the bedrock surface to oxygen should be kept as low as possible. The bedrock surface within the proposed building footprint should be protected from excessive dewatering and exposure to ambient air. To accomplish this a 50 mm thick concrete mud slab should be placed on the exposed bedrock surface within a 48 hour period of being exposed. A 15 MPa sulphate resistant lean concrete may be used. As an alternative to the mud slab, keeping the shale surface covered with granular backfill is also acceptable.

Any excavated sidewalls of the exposed bedrock should be sprayed with a bituminous emulsion to protect the bedrock from exposure to air and dewatering.

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:

- Review grading plans for proposed development to review the geotechnical recommendations.

- 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 Krista Construction Ltd., 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.

Nathan F. S. Christie, P.Eng.

LICENSED PROFESSIONAL ENGINEER
June 14-2019
F. I. ABOU-SEIDO
100156744
PROVINCE OF ONTARIO

Faisal I. Abou-Seido, P.Eng.

Attachments

☐ Soil Profile and Test Data Sheets
☐ Symbols and Terms
☐ Analytical Testing Results
☐ Figure 1 - Key Plan
☐ Drawing PG4923-1 - Test Hole Location Plan

Report Distribution

☐ Krista Construction Ltd. (1 digital copy)
☐ Paterson Group (1 copy)

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Building Addition - 641 Sladen Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located along the west side of Sladen Avenue. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY Geoprobe

DATE 2019 May 9

FILE NO. PG4923

HOLE NO. BH 1-19

SOIL DESCRIPTION	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	99.44
Asphaltic concrete 0.06						
FILL: Crushed stone, trace sand 0.15						
FILL: Brown silty sand, trace gravel 0.60	SS	1	67	8		
Loose, brown **SILTY SAND** 1.22	SS	2	88	7	1	98.44
Stiff, brown **CLAYEY SILT** 1.83	SS	3	75	13		
GLACIAL TILL: Very dense, brown clayey silt with sand and gravel 2.13	SS	4	91	54	2	97.44
Weathered black shale **BEDROCK** 2.41						

End of Borehole

Practical refusal to augering at 2.41m depth.

(Piezometer blocked at 1.13m depth - June 6, 2019)

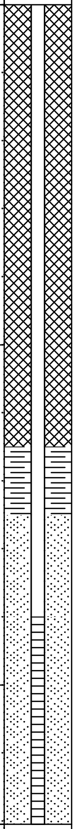
Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**

★ **Soil Sensitivity (St)**

20 40 60 80

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

Piezometer Construction



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Building Addition - 641 Sladen Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located along the west side of Sladen Avenue. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY Geoprobe

DATE 2019 May 9

FILE NO. PG4923

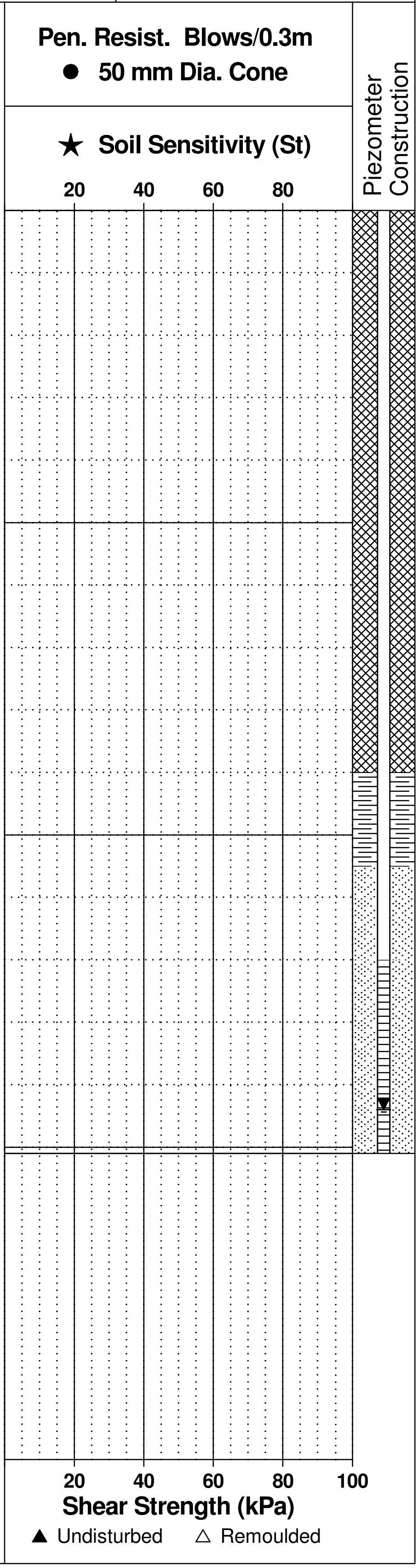
HOLE NO. BH 2-19

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.78
Asphaltic concrete	0.06						
FILL: Crushed stone, some sand	0.20						
FILL: Brown silty sand	0.60	SS	1	83	8		
Loose, brown **SILTY SAND,** trace clay	1.22	SS	2	79	4	1	98.78
GLACIAL TILL: Loose to dense, brown clayey silt with sand and gravel	2.95	SS SS SS	3 4 5	88 79 100	8 21 49	2	97.78
Weathered black shale **BEDROCK**	3.02					3	96.78

End of Borehole

Practical refusal to augering at 3.02m depth

(GWL @ 2.88m - June 6, 2019)



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

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
641 Sladen Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant, corner of Malartic Avenue and Sladen Avenue. Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 55 Power Auger

DATE 1 September 2010

FILE NO. PG2222

HOLE NO. BH 2

SOIL DESCRIPTION	
GROUND SURFACE	
FILL: Dark brown mixture of silt, sand and organics	0.60
FILL: Brown, mixture of silt, sand and possible trace of slag	1.07
Compact, brown **SILTY SAND** with shale fragments	2.03
BEDROCK: Black shale	5.74
End of Borehole (GWL @ 2.18m-Sept. 7/10)	

SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
AU	1		
SS	2	88	11
SS	3	88	14
RC	1	95	0
RC	2	78	11

DEPTH (m)	ELEV. (m)
0	99.69
1	98.69
2	97.69
3	96.69
4	95.69
5	94.69

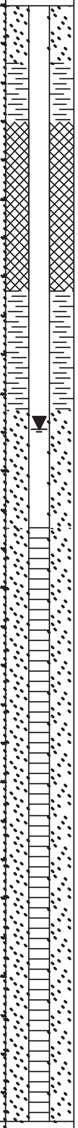
Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**

○ **Water Content %**

20 40 60 80

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

Piezometer Construction



patersongroup Consulting Engineers

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

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
641 Sladen Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant, corner of Malartic Avenue and Sladen Avenue. Assumed elevation = 100.00m.

REMARKS

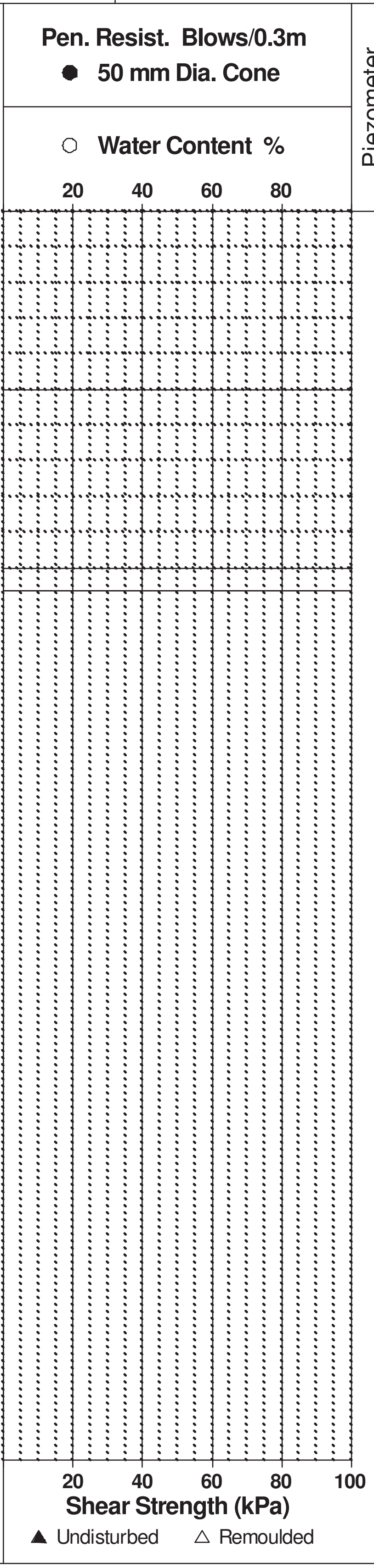
BORINGS BY CME 55 Power Auger

DATE 1 September 2010

FILE NO. PG2222

HOLE NO. BH 4

SOIL DESCRIPTION		SAMPLE				DEPTH (m)	ELEV. (m)	Piezometer Construction
	STRATA PLOT	TYPE	NUMBER	% RECOVERY	N VALUE or RQD			
GROUND SURFACE								
Asphaltic concrete 0.05						0	99.50	
FILL: Crushed stone with silty sand 0.84		AU	1					
Loose, brown **SILTY SAND** 1.50		SS	2		7	1	98.50	
GLACIAL TILL: Dense, grey silty sand with gravel, occasional cobbles 2.08		SS	3		49	2	97.50	
BEDROCK: Black shale 2.13								
End of Borehole								



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)

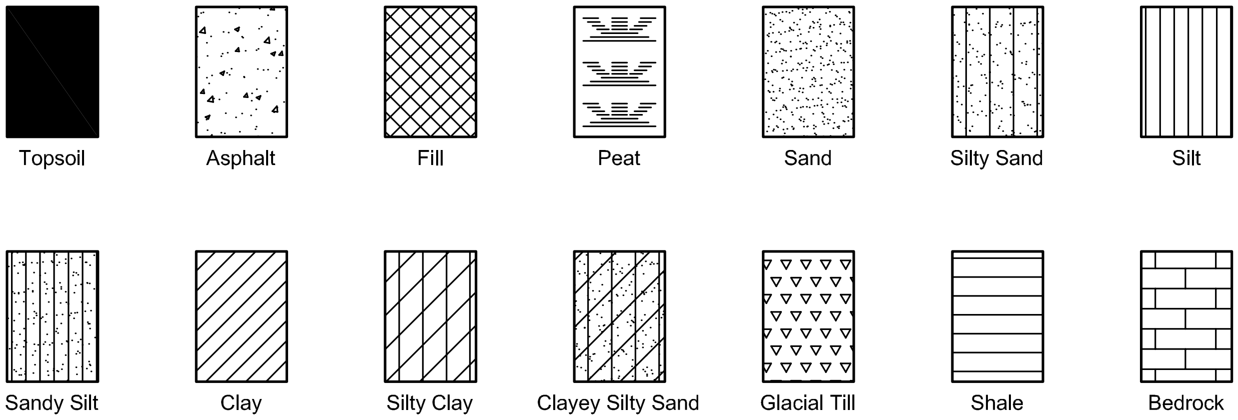
OC Ratio Overconsolidaton ratio = p'_c / p'_o
Void Ratio Initial sample void ratio = volume of voids / volume of solids
Wo - Initial water content (at start of consolidation test)

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.

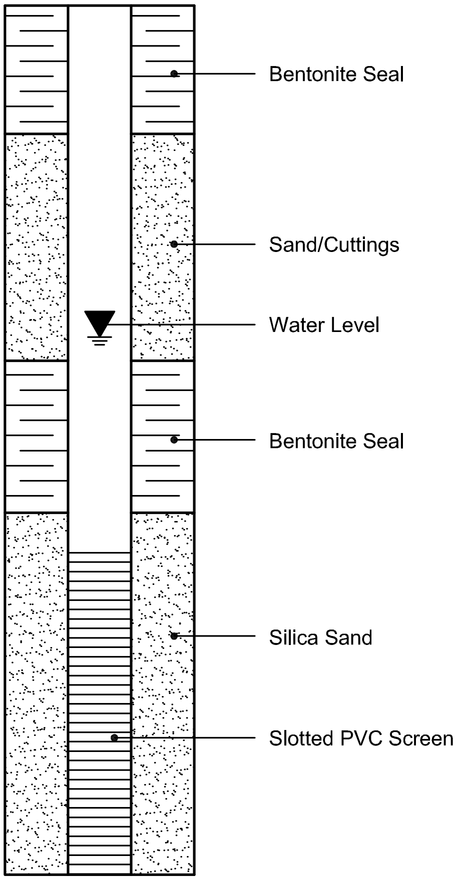
SYMBOLS AND TERMS (continued)

STRATA PLOT

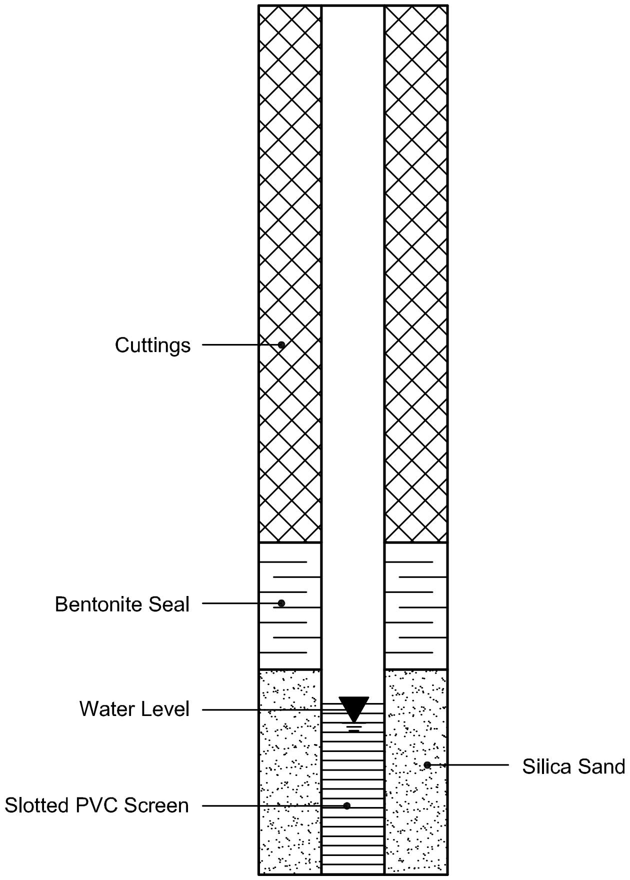


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



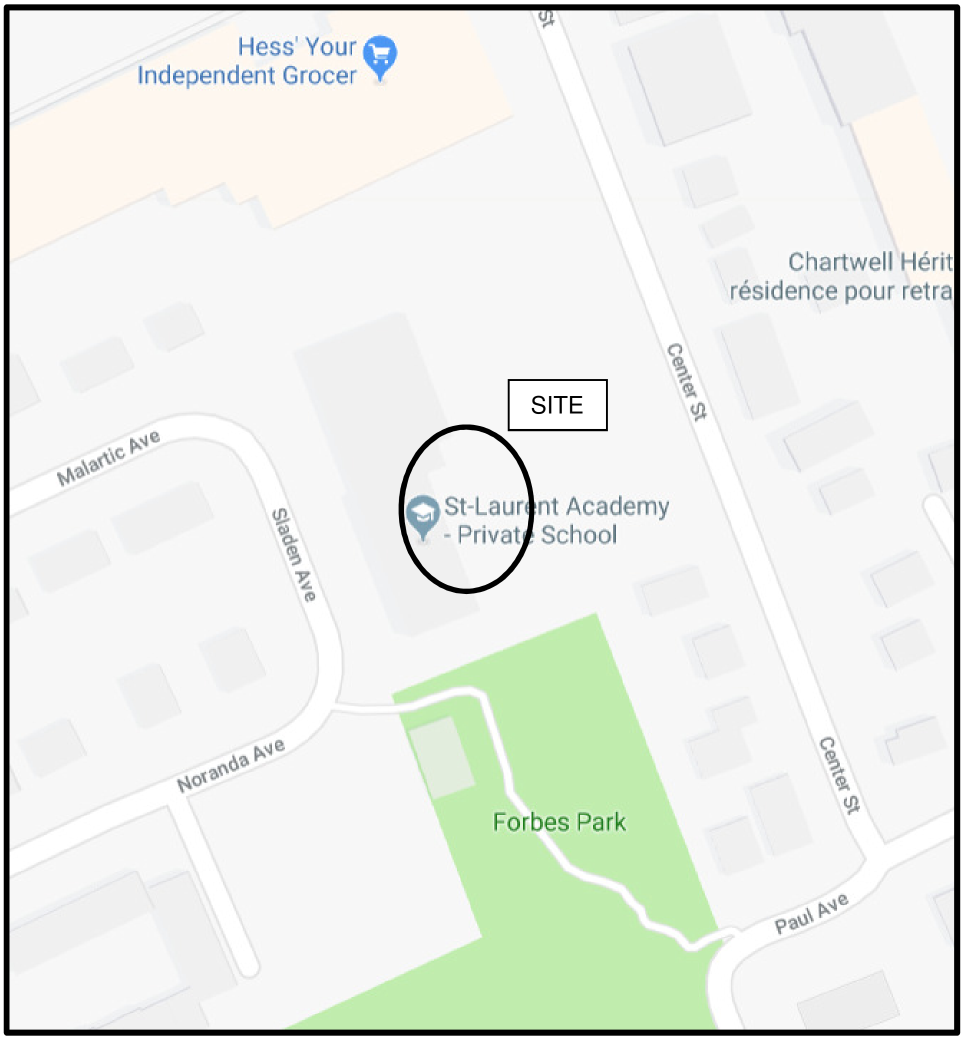


FIGURE 1

KEY PLAN

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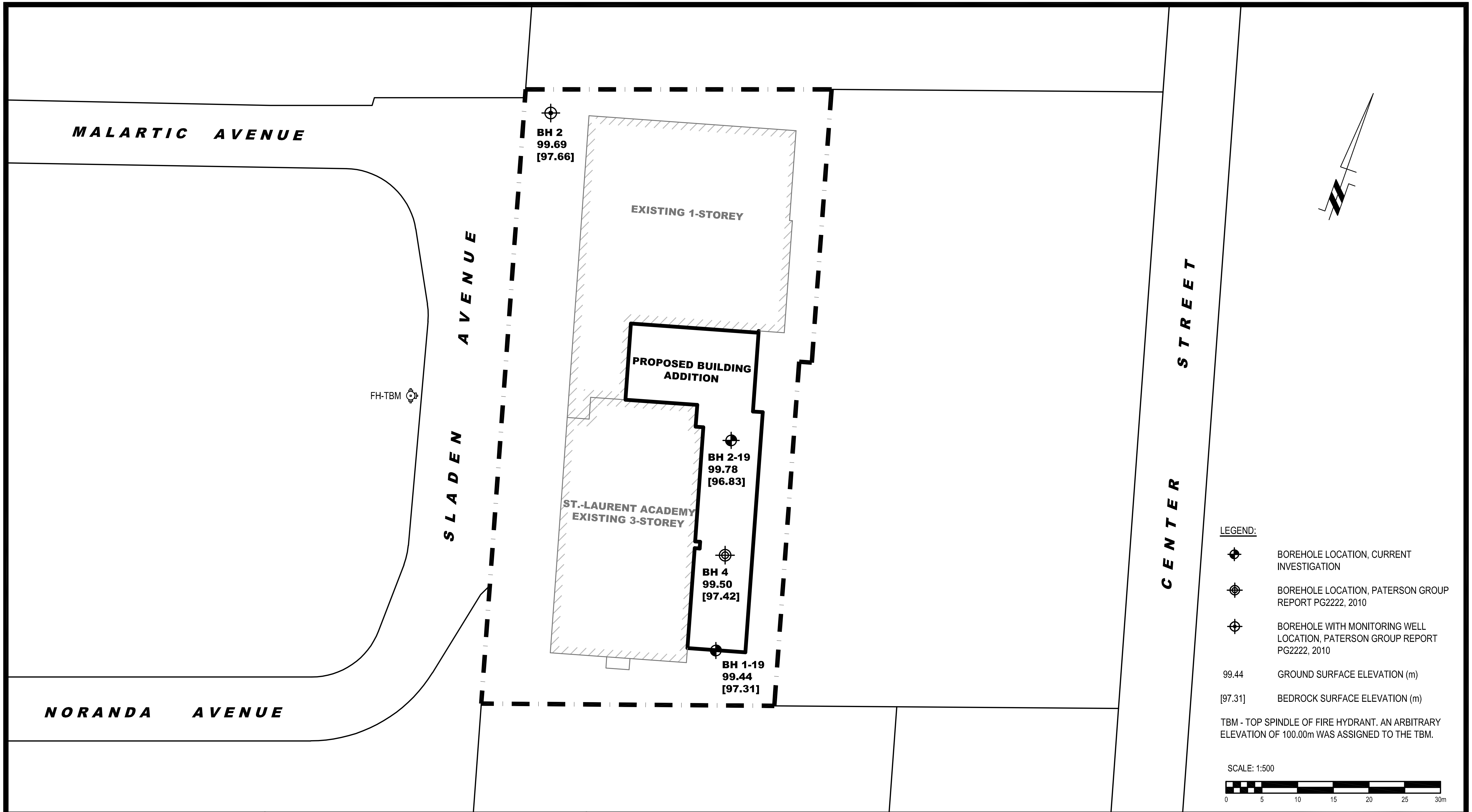

LEGEND:

⌖	BOREHOLE LOCATION, CURRENT INVESTIGATION
⌖	BOREHOLE LOCATION, PATERSON GROUP REPORT PG2222, 2010
⌖	BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT PG2222, 2010
99.44	GROUND SURFACE ELEVATION (m)
[97.31]	BEDROCK SURFACE ELEVATION (m)

TBM - TOP SPINDLE OF FIRE HYDRANT. AN ARBITRARY ELEVATION OF 100.00m WAS ASSIGNED TO THE TBM.

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NO.	REVISIONS	DATE	INITIAL
0			

KRISTA CONSTRUCTION LTD.

GEOTECHNICAL INVESTIGATION
PROPOSED BUILDING ADDITION - 641 SLADEN AVENUE

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:500

Date: 05/2019

Drawn by: MPG

Report No.: PG4923-LET.01

Checked by: DP

Approved by: DJG

PG4923-1

Revision No.:

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