Geotechnical Engineering

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Geotechnical Investigation

Proposed Commercial Building
3735 St. Joseph Boulevard
Ottawa, Ontario

Prepared For

Blueprint Builds

August 10, 2018

Report PG3215-1 Revision 1

Table of Contents

Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Blueprint Builds to conduct a geotechnical investigation for the proposed commercial building to be located at 3735 St. Joseph Boulevard in the City of Ottawa, Ontario (refer to Figure 1 - Key Plan in Appendix 2 of this report).

The objectives of the investigation were to:

- Determine the subsoil and groundwater conditions at this site by means of boreholes.

- Provide geotechnical recommendations for the design of the proposed development including construction considerations which may affect the design.

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

2.0 Proposed Project

Based on the provided conceptual site plan, it is understood that the proposed development will consist of a single-storey commercial structure with a walk-out basement. Associated at-grade parking areas, access lanes, and landscaped areas are also proposed as part of the development.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the investigation was carried out on April 14, 2014. At that time, three (3) boreholes were advanced to a maximum 26.5 m depth. Additionally, nine (9) test pits were excavated within the subject site as part of a fill delineation program completed by Paterson in 2014. The test hole locations were distributed in a manner to provide general coverage of the proposed development. Previous investigations, consisting of 4 boreholes and 24 test pits, were completed by others in 2008 and 2010. The location of the test holes are shown on Drawing PG3215-1 - Test Hole Location Plan included in Appendix 2. It should be noted that the test pit logs from the 2010 investigation were not provided in the reports reviewed by Paterson.

The boreholes were completed with a truck-mounted auger drill rig operated by a two-person crew. All fieldwork was conducted under the full-time supervision of our personnel under the direction of a senior engineer. The test hole procedure consisted of augering to the required depths at the selected locations, and sampling and testing the overburden.

Sampling and In Situ Testing

Soil samples were recovered using a 50 mm diameter split-spoon sampler or the auger flights and were initially classified on site. The depths at which the split spoon and auger samples were recovered from the boreholes are shown as SS and AU, respectively, on the Soil Profile & Test Data sheets in Appendix 1.

In conjunction with the recovery of the split spoon samples, the Standard Penetration Test (SPT) was conducted. The SPT results are recorded as “N” values on the Soil Profile & 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 tests were completed in cohesive soils with a shear vane apparatus.

The overburden thickness was evaluated by a dynamic cone penetration test (DCPT) at borehole BH 1. 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 in the test holes were recorded in detail in the field. The soil profiles are logged on the Soil Profile and Test Data sheets in Appendix 1 of this report.

Groundwater

Flexible polyethylene standpipes were installed at the borehole locations to monitor the groundwater level subsequent to the completion of the sampling program.

3.2 Field Survey

The test hole locations were determined in the field by Paterson personnel with consideration of existing site features. It should be noted that the ground surface elevations are referenced to a temporary benchmark (TBM), consisting of the top of spindle of a fire hydrant located in front of the subject site along the north side of St. Joseph Boulevard. A geodetic elevation of 63.50 m was provided for the TBM. The location and ground surface elevations at the borehole locations are presented on Drawing PG3215-1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

Soil samples were recovered from the boreholes and visually examined in our laboratory to review the field logs. Moisture content testing was completed for the recovered soil samples. The results are presented on the Soil Profile and Test Data sheets in Appendix 1.

3.4 Analytical Testing

One (1) soil sample was submitted to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. The sample was analyzed to determine the concentration of sulphate and chloride, the resistivity and the pH of the sample. The results are discussed in Subsection 6.7 and provided in Appendix 1.

4.0 Observations

4.1 Surface Conditions

The subject site is generally vacant and is bordered by commercial properties to the north, east, and west, and by St-Joseph Boulevard to the south. The ground surface across the subject site was noted to be grass covered with several mature trees within the northeast portion of the site. The ground surface across the site is below the grade of St. Joseph Boulevard and was observed to be slightly undulating, sloping downward gradually to the north.

4.2 Subsurface Profile

The subsurface profile at the test hole locations was generally observed to consist of topsoil or fill at the ground surface. The topsoil had a thickness of 0.15 to 0.3 m, while the fill was observed to extend to approximate depths ranging from 0.6 to 3 m. The fill layer was noted to consist of a silty clay with gravel, roots and wood chips or a mixture of concrete, brick, sand and gravel. Refusal of the excavator was encountered within the fill in the current test pits TP 1, TP 2, and TP 9 at approximate depths of 1.6, 1.1, and 1.3 m, respectively, on suspected concrete slabs. Auger and/or excavator refusal was also encountered in the fill within the previous boreholes and test pits BH 1, BH 4, TP 1, TP 2, TP 3a completed by others at approximate depths ranging from 0.8 to 2.3 m.

A silty clay deposit was encountered underlying the topsoil and/or fill. The silty clay deposit was noted to have a very stiff to stiff consistency based on the undrained shear strength testing completed at the borehole locations. Practical refusal to the DCPT was encountered at borehole BH 1 at a depth of 26.5 m below the existing ground surface.

Based on available geological mapping, the bedrock in this area consists of limestone and dolomite of the Gull River formation. The overburden drift thickness is estimated to be between 15 and 25 m depth.

4.3 Groundwater

The measured groundwater levels are summarized below in Table 1 and presented on the Soil Profile and Test Data sheets in Appendix 1. It is important to note that groundwater level readings could be influenced by surface water infiltrating the backfilled borehole, which can lead to higher water levels than noted during the investigation. However, the long-term groundwater level can also be estimated based on moisture levels and colour of the recovered soil samples. Based on these observations at the borehole locations, the long-term groundwater level is expected at a 2.5 to 3 m depth.

Table 1 - Summary of Groundwater Level Readings

Test Hole Number	Ground Surface Elevation (m)	Groundwater Depth (m)	Groundwater Elevation (m)	Date
BH 1	61.31	1.05	60.26	April 25, 2014
BH 2	61.70	0.40	61.30	April 25, 2014
BH 3	61.66	Ground Surface	61.66	April 25, 2014

Note: The ground surface at the test hole locations was referenced to a temporary benchmark (TBM) consisting of the top spindle of the fire hydrant located on the north side of St. Joseph Boulevard with a geodetic elevation of 64.28 m.

Groundwater is subject to seasonal fluctuations and therefore, groundwater could vary at the time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is considered satisfactory for the proposed development. It is expected that the proposed building can be founded by conventional style shallow foundations. It is recommended that footings for the proposed building be placed over an undisturbed, very stiff to stiff silty clay bearing surface. Engineered fill may be required where existing fill is located below proposed footing level.

Due to the presence of a silty clay layer, the proposed development will be subjected to grade raise restrictions, which are discussed in Subsection 5.3. If higher than permissible grade raises are required, preloading with or without a surcharge, lightweight fill and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction total and differential settlements.

The above and other considerations are further discussed in the following sections.

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and fill, such as those containing organic or deleterious materials, should be stripped from under any buildings and other settlement sensitive structures. It is anticipated that the existing fill within the proposed building footprint, free of deleterious material and significant amounts of organics, can be left in place outside of lateral support zones for the footings. However, it is recommended that the existing fill layer be proof-rolled several times and approved by the geotechnical consultant at the time of construction. Any poor performing areas noted during the proof-rolling operation should be removed and replaced with an approved fill.

Fill Placement

Fill used for grading beneath the proposed buildings, should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. This material should be tested and approved prior to delivery to the site. The fill should be placed in lifts no greater than 225 mm thick and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the building and paved areas 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. This material should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If this material is to be used to build up the subgrade level for areas to be paved, it should be compacted in thin lifts to a minimum density of 95% of its SPMDD. Non-specified existing fill and site-excavated soils are not suitable for use as backfill against foundation walls unless used in conjunction with a composite drainage membrane.

5.3 Foundation Design

Bearing Resistance Values

Strip footings, up to 3 m wide, and pad footings, up to 5 m wide, placed on an undisturbed, very stiff to stiff silty clay bearing surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **250 kPa**.

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

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

Footings founded over a compacted engineered fill layer, as detailed in Subsection 5.2, placed over an undisturbed, very stiff to stiff silty clay bearing surface can be designed using the bearing resistance values noted above.

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 soil subgrade 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.

Permissible Grade Raise Restriction

A permissible grade raise restriction has been determined for the subject site based on the undrained shear strength values completed within the silty clay deposit. Based on the testing results, a permissible grade raise restriction of **1.5 m** above existing ground surface is recommended for the subject site.

To reduce potential long term liabilities, consideration should be given to accounting for a larger groundwater lowering and to providing means to reduce long term groundwater lowering (e.g. clay dykes, restriction on planting around the stores, etc). It should be noted that building over silty clay deposits increases the likelihood of building movements and therefore of cracking. The use of steel reinforcement in foundations placed at key structural locations will tend to reduce foundation cracking as compared to unreinforced foundations.

5.4 Design for Earthquakes

The site class for seismic site response is a **Class D** for the foundations considered. The soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the Ontario Building Code for a full discussion of the earthquake design requirements.

5.5 Basement Slab Construction

With the removal of all topsoil and fill, containing significant amounts of organic or deleterious materials, within the footprint of the proposed building, the native soil or approved fill surface will be considered to be an acceptable subgrade surface 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 is recommended for backfilling below the floor slab. It is recommended that the upper 200 mm of sub-slab fill consist of 19 mm clear crushed stone for the basement floor slab. The upper 200 mm of sub-slab fill should consist of a Granular A crushed stone for slab-on-grade construction.

In consideration of the groundwater conditions encountered at the time of the construction, a sub-slab drainage system, consisting of lines of perforated drainage pipe sub-drains connected to a positive outlet, should be provided in the clear stone under the basement floor.

5.6 Basement Wall

There are several combinations of backfill materials and retained soils that could be applicable for the basement walls of the subject structure. However, the conditions can be well-represented by assuming the retained soil consists of a material with an angle of internal friction of 30 degrees and a bulk (drained) unit weight of 20 kN/m^3.

However, undrained conditions are anticipated (i.e. below the groundwater level). Therefore, the applicable effective (undrained) unit weight of the retained soil can be taken as 13 kN/m^3, where applicable. A hydrostatic pressure should be added to the total static earth pressure when using the effective unit weight.

Lateral Earth Pressures

The static horizontal earth pressure (p_o) can be calculated using a triangular earth pressure distribution equal to $K_o \cdot \gamma \cdot H$ where:

K_o = at-rest earth pressure coefficient of the applicable retained soil, 0.5
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)

An additional pressure having a magnitude equal to $K_o \cdot q$ and acting on the entire height of the wall should be added to the above diagram for any surcharge loading, q (kPa), that may be placed at ground surface adjacent to the wall. The surcharge pressure will only be applicable for static analyses and should not be used in conjunction with the seismic loading case.

Actual earth pressures could be higher than the “at-rest” case if care is not exercised during the compaction of the backfill materials to maintain a minimum separation of 0.3 m from the walls with the compaction equipment.

Seismic Earth Pressures

The total seismic force (P_{AE}) includes both the earth force component (P_o) and the seismic component (ΔP_{AE}). The seismic earth force (ΔP_{AE}) can be calculated using $0.375 \cdot a_c \cdot \gamma \cdot H^2/g$ where:

a_c = $(1.45-a_{max}/g)a_{max}$
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)
g = gravity, 9.81 m/s^2

The peak ground acceleration, (a_{max}), for the Ottawa area is 0.32g according to OBC 2012. Note that the vertical seismic coefficient is assumed to be zero.

The earth force component (P_o) under seismic conditions can be calculated using $P_o = 0.5\ K_o\ \gamma\ H^2$, where $K_o = 0.5$ for the soil conditions noted above.

The total earth force (P_{AE}) is considered to act at a height, h (m), from the base of the wall, where:

$h = \{P_o \cdot (H/3) + \Delta P_{AE} \cdot (0.6 \cdot H)\}/P_{AE}$

The earth forces calculated are unfactored. For the ULS case, the earth loads should be factored as live loads, as per OBC 2012.

5.7 Pavement Structure

Car only parking and heavy truck parking areas, and access lanes are anticipated at this site. The proposed pavement structures are presented in Tables 2 and 3.

Table 2 - Recommended Pavement Structure - Car Only Parking Areas

Thickness (mm)	Material Description
50	Wear Course - HL-3 or Superpave 12.5 Asphaltic Concrete
150	BASE - OPSS Granular A Crushed Stone
400	SUBBASE - OPSS Granular B Type II
	SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or approved existing fill.

Table 3 - Recommended Pavement Structure
Access Lanes and Heavy Truck Parking Areas

Thickness (mm)	Material Description
40	Wear Course - HL-3 or Superpave 12.5 Asphaltic Concrete
50	Binder Course - HL-8 or Superpave 19.0 Asphaltic Concrete
150	BASE - OPSS Granular A Crushed Stone
450	SUBBASE - OPSS Granular B Type II
	SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or approved existing fill.

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

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

Pavement Structure Drainage

Satisfactory performance of the pavement structure is largely dependent on keeping the contact zone between the subgrade material and the base stone in a dry condition. Failure to provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing its load carrying capacity.

Due to the impervious nature of the subgrade materials consideration should be given to installing subdrains during the pavement construction. These drains should be installed at each catch basin, be at least 3 m long and should extend in four orthogonal directions or longitudinally when placed along a curb. The subdrain inverts should be approximately 300 mm below subgrade level. The subgrade surface should be shaped to promote water flow to the drainage lines.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

It is recommended that a perimeter foundation drainage system be provided for the proposed structure. The system should consist of a 100 mm to 150 mm diameter perforated corrugated plastic pipe, surrounded on all sides by 150 mm of 10 mm clear crushed stone, placed at the footing level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer or sump pit.

As noted above, a sub-slab drainage is also recommended to control water infiltration. For preliminary design purposes, we recommend that 100 or 150 mm perforated pipes be placed at approximate 6 m centres. The spacing of the sub-slab drainage system should be confirmed at the time of completing the excavation when water infiltration can be better assessed.

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 Miradrain G100N or Delta Drain 6000, connected to the perimeter foundation drainage system. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should otherwise be used for this purpose.

6.2 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.

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

6.3 Excavation Side Slopes

The side slopes of excavations in the soil and fill overburden materials should either be excavated to acceptable slopes or should be retained by shoring systems from the beginning of the excavation until the structure is backfilled. It is assumed that sufficient room will be available for the greater part of the excavation to be constructed by open-

cut methods (i.e. unsupported excavations).

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be excavated at 1H:1V or flatter. The flatter slope is recommended for excavation below groundwater level. The subsurface soils are considered to be a Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should maintain a safe distance from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

A trench box is recommended to protect personnel working in trenches with steep or vertical sides. Services are expected to be installed by “cut and cover” methods and excavations will not be left open for extended periods of time.

6.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent Material Specifications & Standard Detail Drawings from the Department of Public Works and Services, Infrastructure Services Branch of the City of Ottawa.

At least 150 mm of OPSS Granular A should be used for pipe bedding for sewer and water pipes. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to at least 300 mm above the obvert of the pipe should consist of OPSS Granular A or Granular B Type II with a maximum size of 25 mm. The bedding and cover materials should be placed in maximum 225 mm thick lifts compacted to 95% of the material’s SPMDD.

It should generally be possible to re-use the site materials above the cover material if the operations are carried out in dry weather conditions.

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) and above the cover material should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 225 mm thick loose lifts and compacted to a minimum of 95% of the material standard Proctor maximum dry density.

To reduce long-term lowering of the groundwater level at this site, clay seals should be provided in the service trenches. The seals should be at least 1.5 m long and should extend from trench wall to trench wall. Generally, the seals should extend from the frost line and fully penetrate the bedding, subbedding and cover material. The barriers should consist of relatively dry and compactable brown silty clay placed in maximum 225 mm thick loose layers and compacted to a minimum of 95% of the material's SPMDD. The clay seals should be placed at the site boundaries and at strategic locations at no more than 60 m intervals in the service trenches.

6.5 Groundwater Control

It is anticipated that groundwater infiltration into the excavations should be low and controllable using open sumps. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

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

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

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project.

The subsoil 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.

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.

The trench excavations should be carried out in a manner to avoid the introduction of frozen materials, snow or ice into the trenches.

Precaution must be taken where excavations are carried in proximity of existing structures which may be adversely affected due to the freezing conditions.

6.7 Corrosion Potential and Sulphate

The analytical testing results are presented in Table 4 along with industry standards for the applicable threshold values. These results are indicative that Type 10 Portland cement (Type GU, or normal cement) would be appropriate for this site.

Table 4 - Corrosion Potential

Parameter	Laboratory Results	Threshold	Commentary
	BH3 SS4		
Chloride	244 µg/g	Chloride content less than 400 mg/g	Negligible concern
pH	7.24	pH value less than 5.0	Neutral Soil
Resistivity	17.9 ohm.m	Resistivity greater than 1,500 ohm.cm	Moderate Corrosion Potential
Sulphate	48 µg/g	Sulphate value greater than 1 mg/g	Negligible Concern

6.8 Landscaping Considerations

The silty clay deposit encountered at the site was very stiff to stiff and is considered to be low to medium sensitivity clay and should not be considered a sensitive marine clay. Based on the above discussion, shrubs and other small plantings are permitted within 4.5 m of the perimeter foundations walls. Trees may be placed at distances greater than 4.5 m from the foundation walls.

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

7.0 Recommendations

A materials testing and observation services program is a requirement for the provided foundation design data to be applicable. The following aspects of the program should be performed by the geotechnical consultant:

- ❑ Review detailed grading plan(s) from a geotechnical perspective.
- ❑ 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.
- ❑ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued, upon request, following the completion of a satisfactory materials testing and observation program by the geotechnical consultant.

8.0 Statement of Limitations

The recommendations provided in this report are in accordance with our present understanding of the project. We request permission to review the grading plan once available. We also request permission to review our recommendations when the drawings and specifications are completed.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, we request immediate notification to permit reassessment of our recommendations.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Blueprint Builds or their agents is not authorized without review by Paterson for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Scott S. Dennis, P.Eng.

David J. Gilbert, P.Eng.

Report Distribution:

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- ❏ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

BOREHOLE AND TEST PIT LOGS BY OTHERS

ANALYTICAL TESTING RESULTS

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 3735 St. Joseph Blvd.
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant, north side of St. Joseph Boulevard, in front of subject site. Geodetic elevation of 63.50m was provided for the TBM.

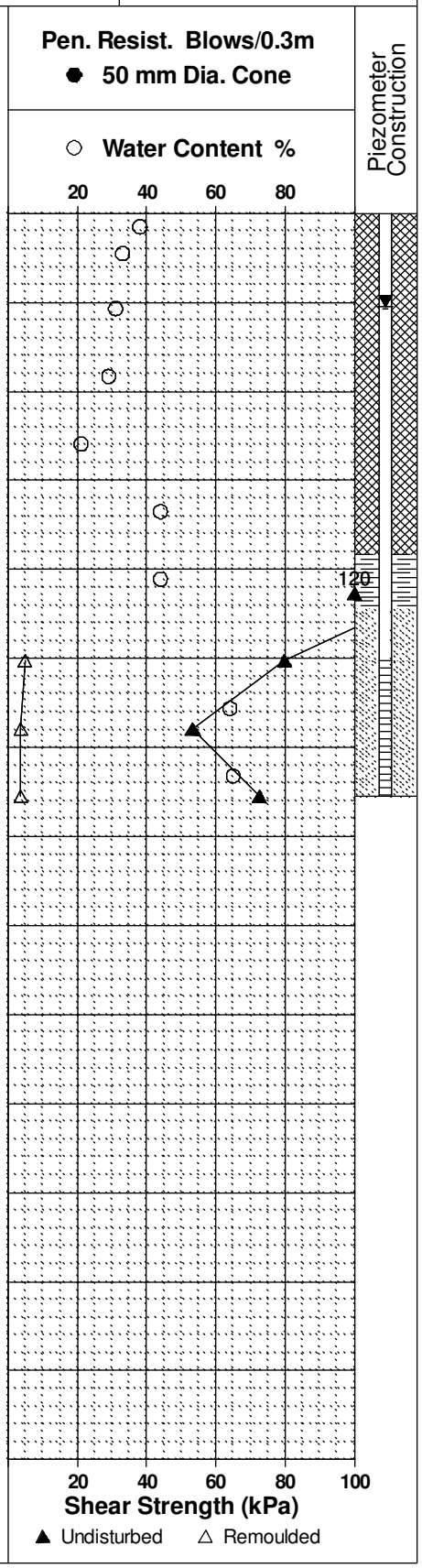
FILE NO. PG3215

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** April 14, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	61.31
		AU	1				
		AU	2				
FILL: Brown silty clay with sand, gravel, roots and wood chips		SS	3	33	5	1	60.31
		SS	4	21	7	2	59.31
		SS	5	12	14		
2.97						3	58.31
Very stiff to stiff, brown **SILTY CLAY**		SS	6	100	15	4	57.31
- grey-brown by 5.2m depth						5	56.31
- grey by 5.9m depth						6	55.31
6.55							
Dynamic Cone Penetration Test commenced at 6.55m depth. Cone pushed to 23.5m depth.						7	54.31
						8	53.31
						9	52.31
						10	51.31
						11	50.31
						12	49.31
						13	48.31
						14	47.31



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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 3735 St. Joseph Blvd.
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant, north side of St. Joseph Boulevard, in front of subject site. Geodetic elevation of 63.50m was provided for the TBM.

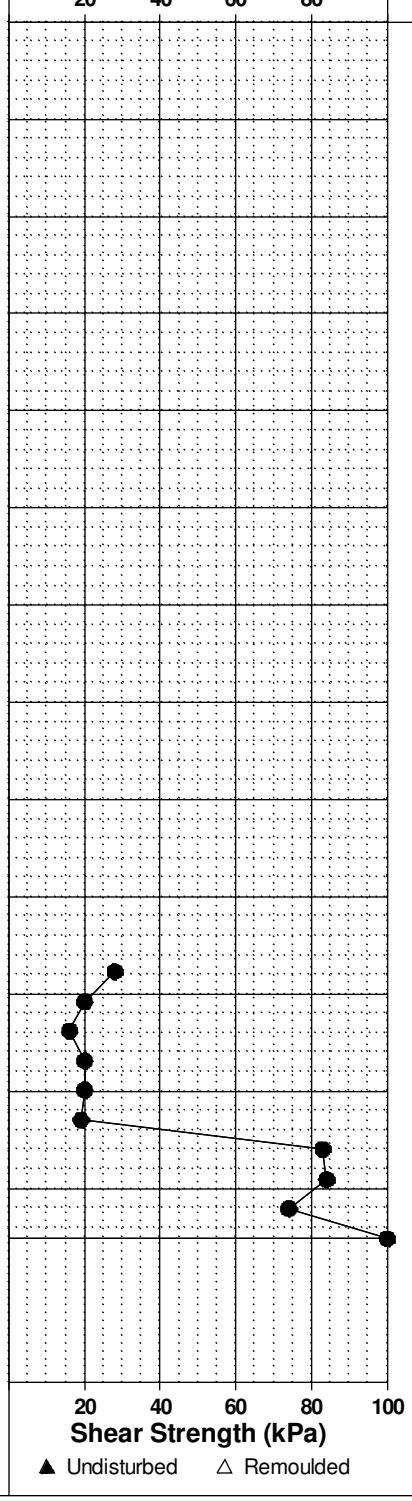
FILE NO. PG3215

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** April 14, 2014

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									
						14	47.31		
						15	46.31		
						16	45.31		
						17	44.31		
						18	43.31		
						19	42.31		
						20	41.31		
						21	40.31		
						22	39.31		
						23	38.31		
						24	37.31		
						25	36.31		
						26	35.31		
26.52									
End of Borehole Practical DCPT refusal at 26.52m depth (GWL @ 1.05m-April 25, 2014)									



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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 3735 St. Joseph Blvd.
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant, north side of St. Joseph Boulevard, in front of subject site. Geodetic elevation of 63.50m was provided for the TBM.

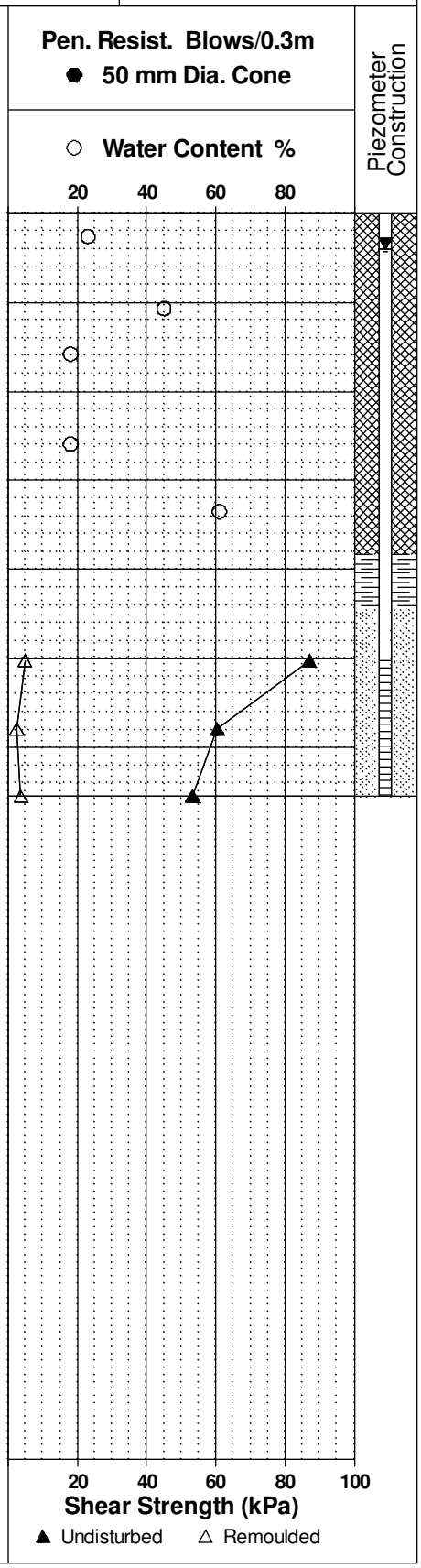
FILE NO. PG3215

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** April 14, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	61.70
FILL: Brown silty clay with roots 0.30		AU	1				
		SS	2	8	6	1	60.70
FILL: Mixture of brick, concrete with sand and gravel		SS	3	80	50+		
		SS	4	4	14	2	59.70
2.97							
		SS	5	100	6	3	58.70
		SS	6	100	4	4	57.70
Stiff, brown **SILTY CLAY**						5	56.70
						6	55.70
6.55							
End of Borehole							
(GWL @ 0.40m-April 25, 2014)							



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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 3735 St. Joseph Blvd.
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant, north side of St. Joseph Boulevard, in front of subject site. Geodetic elevation of 63.50m was provided for the TBM.

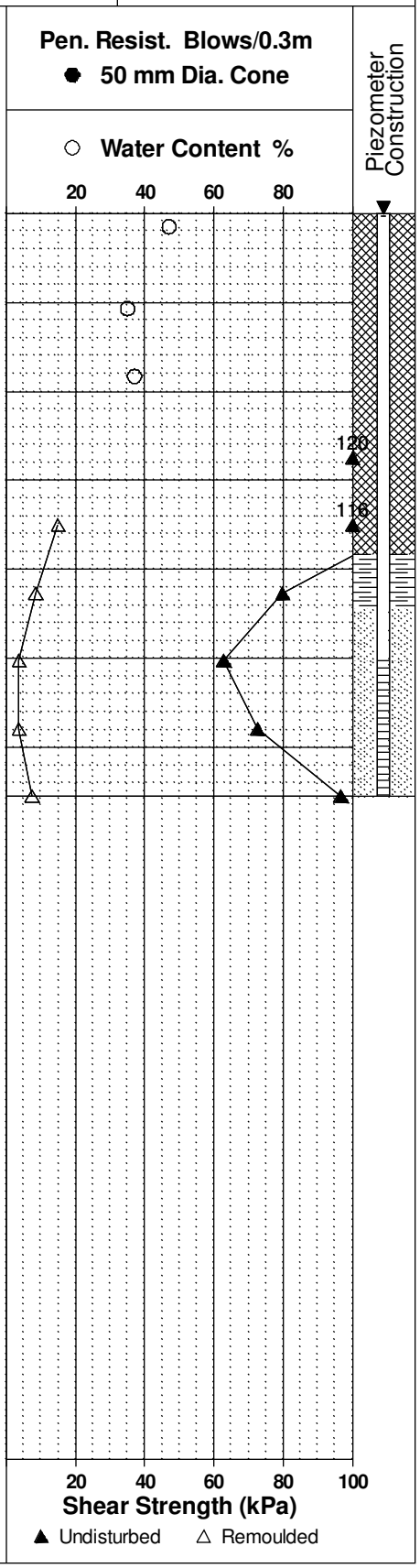
FILE NO. PG3215

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** April 14, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	61.66
TOPSOIL 0.30		AU	1				
		SS	2	83	9	1	60.66
		SS	3		13	2	59.66
Very stiff to stiff, brown **SILTY CLAY**						3	58.66
						4	57.66
						5	56.66
6.55						6	55.66
End of Borehole							
(GWL @ ground surface - April 25, 2014)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Limited Fill Assessment Program
3735 St. Joseph Boulevard
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north side of St. Joseph Blvd., in front of subject site. Geodetic elevation = 63.50m.

FILE NO. PE3204

REMARKS

HOLE NO. TP 1

BORINGS BY Backhoe **DATE** January 14, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	62.12		
FILL: Brown silty clay with sand and construction debris		G	1						
						1	61.12		
		G	2						
						1.60			
End of Test Pit TP terminated on suspected concrete slab at 1.60m depth									

Photo Ionization Detector: ○ Lower Explosive Limit % — 20 40 60 80

100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Limited Fill Assessment Program
3735 St. Joseph Boulevard
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north side of St. Joseph Blvd., in front of subject site. Geodetic elevation = 63.50m.

FILE NO. PE3204

REMARKS

HOLE NO. TP 2

BORINGS BY Backhoe **DATE** January 14, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	62.30		
FILL: Brown silty clay with sand and construction debris		G	1					△	
						1	61.30		
1.10									
End of Test Pit TP terminated on suspected concrete slab at 1.10m depth									

Photo Ionization Detector scale: 20, 40, 60, 80

RKI Eagle Rdg. (ppm): 100, 200, 300, 400, 500

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Limited Fill Assessment Program
3735 St. Joseph Boulevard
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north side of St. Joseph Blvd., in front of subject site. Geodetic elevation = 63.50m.

FILE NO. PE3204

REMARKS

HOLE NO. TP 3

BORINGS BY Backhoe **DATE** January 14, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	62.11		
Brown **SILTY CLAY,** trace sand		G	1						
0.80									
End of Test Pit									

Photo Ionization Detector: ○ Lower Explosive Limit % — 20, 40, 60, 80

RKI Eagle Rdg. (ppm): 100, 200, 300, 400, 500

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Limited Fill Assessment Program
3735 St. Joseph Boulevard
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north side of St. Joseph Blvd., in front of subject site. Geodetic elevation = 63.50m.

FILE NO. PE3204

REMARKS

HOLE NO. TP 4

BORINGS BY Backhoe **DATE** January 14, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	61.19		
FILL: Brown silty clay, trace gravel and wood		G	1						
0.60									
TOPSOIL		G	2						
0.80									
						1	60.19		
Grey **SILTY CLAY**		G	3						
1.90									
End of Test Pit									

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm); ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Limited Fill Assessment Program
3735 St. Joseph Boulevard
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north side of St. Joseph Blvd., in front of subject site. Geodetic elevation = 63.50m.

FILE NO. PE3204

REMARKS

HOLE NO. TP 5

BORINGS BY Backhoe **DATE** January 14, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	61.66		
FILL: Brown silty sand with clay and construction debris		G	1						
		G	2			1	60.66		
						1.60			
Grey **SILTY CLAY**		G	3						
						1.90			
End of Test Pit									

Photo Ionization Detector: ○ Lower Explosive Limit % — 20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Limited Fill Assessment Program
3735 St. Joseph Boulevard
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north side of St. Joseph Blvd., in front of subject site. Geodetic elevation = 63.50m.

FILE NO. PE3204

REMARKS

HOLE NO. TP 6

BORINGS BY Backhoe **DATE** January 14, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	62.22		
TOPSOIL									
0.30									
Brown **SILTY CLAY,** trace sand		G	1						
1.05						1	61.22		
End of Test Pit									

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ Lower Explosive Limit %
20 40 60 80
100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Limited Fill Assessment Program
3735 St. Joseph Boulevard
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north side of St. Joseph Blvd., in front of subject site. Geodetic elevation = 63.50m.

FILE NO. PE3204

REMARKS

HOLE NO. TP 7

BORINGS BY Backhoe **DATE** January 14, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	62.29		
FILL: Brown silty sand with gravel and construction debris		G	1						
0.40									
		G	2						
Brown **SILTY CLAY,** trace sand						1	61.29		
1.50									
End of Test Pit									

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ Lower Explosive Limit %
20 40 60 80
100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Limited Fill Assessment Program
3735 St. Joseph Boulevard
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north side of St. Joseph Blvd., in front of subject site. Geodetic elevation = 63.50m.

FILE NO. PE3204

REMARKS

HOLE NO. TP 8

BORINGS BY Backhoe **DATE** January 14, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	62.50		
TOPSOIL 0.15									
Brown **SILTY CLAY,** trace sand		G	1			1	61.50		
1.20 End of Test Pit									

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ Lower Explosive Limit %
20 40 60 80
100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Limited Fill Assessment Program
3735 St. Joseph Boulevard
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north side of St. Joseph Blvd., in front of subject site. Geodetic elevation = 63.50m.

FILE NO. PE3204

REMARKS

HOLE NO. TP 9

BORINGS BY Backhoe **DATE** January 14, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	62.00		
FILL: Brown silty sand with construction debris		G	1						
		G	2			1	61.00		
						1.30			
End of Test Pit TP terminated on suspected concrete slab at 1.30m depth									

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ Lower Explosive Limit %
20 40 60 80
100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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

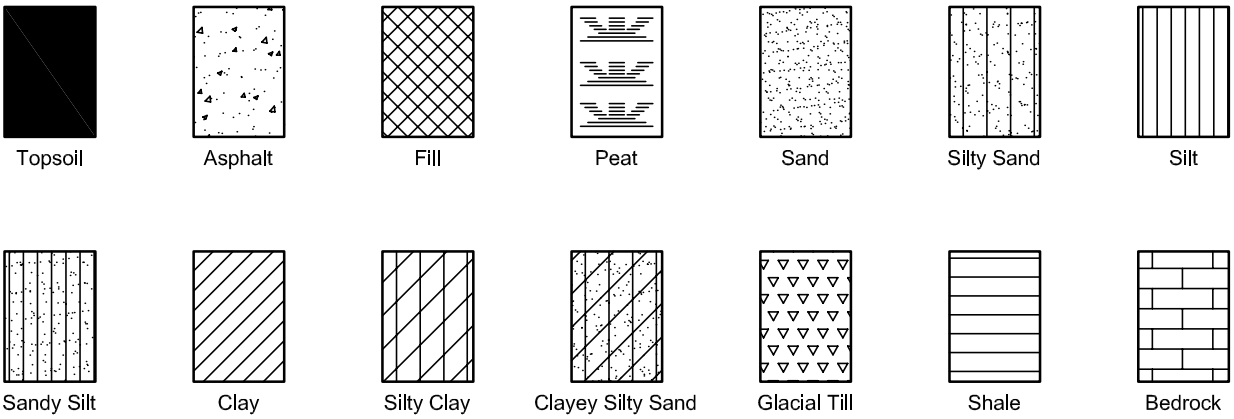
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

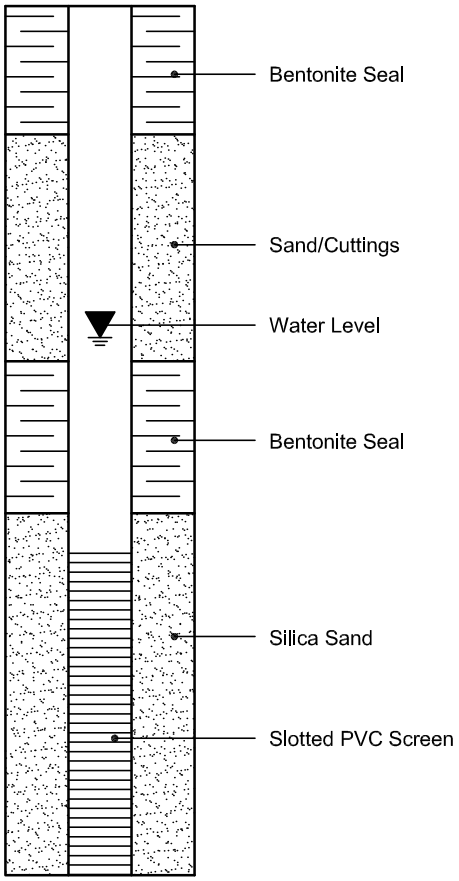
SYMBOLS AND TERMS (continued)

STRATA PLOT

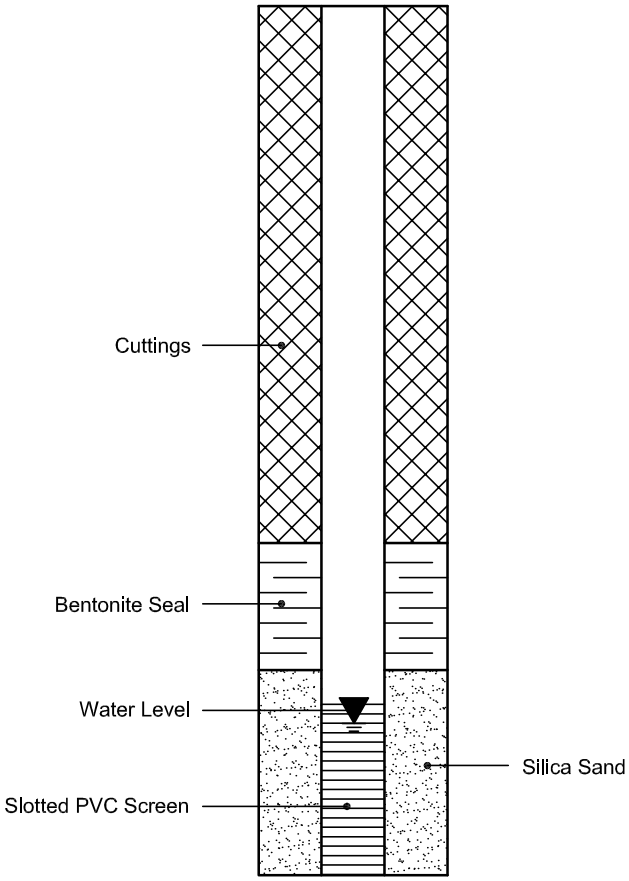


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Log of Borehole 1

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph Boulevard, Ottawa, Ontario

Figure No. 2

Feuille. 1 of 1

Date Drilled: 'November 11, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	▮▯	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢○
Dynamic Cone Test	——	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth 0	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		FILL Silty clay, rootlets in upper levels, occasional rock and concrete fragments, reworked, brown, moist (loose)	61 60.2		9 ○ 50/75 mm ○	×		
		Auger Refusal @ 0.8 m depth on concrete slab						
		Notes -Moved borehole 2 m south met refusal @ 0.75 m depth -Moved borehole 5 m west met refusal @ 1.1 m depth						

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Borehole backfilled upon completion of drilling
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	Dry	1.7

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHLOGS-1.GPJ TROW OTTAWA.GDT 4/12/08

Log of Borehole 2

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph Boulevard, Ottawa, Ontario

Figure No. 3

Feuille. 1 of 1

Date Drilled: 'November 11, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢—○
Dynamic Cone Test	——	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		FILL Silty clay, organics and topsoily in upper levels, reworked, oxidized in lower levels, brown, moist (loose)	61.1	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
				1	7			
			59.4	2	7 192			
		SILTY CLAY Brown to grey, moist (hard to stiff)	59.4	2				
				2	13 216			
				3	9 216			18.2
				4	8 120			17.9
				5	4			
				5	77 s=5			
				6	4			
			53.9	7	58 s=5			
		Borehole Terminated @ 7.2 m depth						

LOG OF BOREHOLE BHLOGS-1.GPJ TROW OTTAWA.GDT 4/12/08

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. A 19 mm slotted pipe was installed in the borehole upon completion of drilling
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	3.0	6.7
1 day	3.0	-
7 days	1.4	-
23 days	1.7	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole 3

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph Boulevard, Ottawa, Ontario

Figure No. 4

Feuille. 1 of 2

Date Drilled: 'November 11, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample ⊠
Auger Sample ◨
SPT (N) Value ○
Dynamic Cone Test —
Shelby Tube ■
Shear Strength by Vane Test + S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits —○—
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth
		FILL Silty clay, topsoil, stone fragments in lower levels, reworked, grey/brown, moist (loose)	61.9	0
			60.8	1
		SILTY CLAY Some topsoil, rootlets in upper levels, oxidized, brown to grey, moist (hard to stiff)	60.5	
				2
				3
				4
				5
				6
		INFERRED SILTY CLAY **Performed Nilcon vane tests from 6.4 to 19.6 m depth**	55.5	
				7
				8
				9
				10

Standard Penetration Test N Value
20 40 60 80
Shear Strength kPa
50 100 150 200

Combustible Vapour Reading (ppm)
250 500 750
Natural Moisture Content % Atterberg Limits (% Dry Weight)
20 40 60

SAMPLES

Natural Unit Wt. kN/m³

7 11 216 7 216 6 144 4 2 91 76 s=5 78 s=16 99 89 89 s=15

20.0

Continued Next Page

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. A 19 mm slotted pipe was installed in the borehole upon completion of drilling
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	3.8	6.1
1 day	4.4	-
7 days	0.9	-
23 days	1.1	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHLOGS-1.GPJ TROW OTTAWA.GDT 4/12/08

Log of Borehole 3

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Figure No. 4

Feuille. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth
		INFERRED SILTY CLAY **Performed Nilcon vane tests from 6.4 to 19.6 m depth** *(continued)*	51.4	
			42.3	
		Borehole Terminated @ 19.6 m depth		

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES

Natural Unit Wt. kN/m³

Depth 11 12 13 14 15 16 17 18 19

89
s=15
98
98
109
s=9
104
111
121
106
135
140

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. A 19 mm slotted pipe was installed in the borehole upon completion of drilling
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	3.8	6.1
1 day	4.4	-
7 days	0.9	-
23 days	1.1	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHLOGS~1.GPJ TROW.OTTAWA.GDT 4/12/08

Log of Borehole 4

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph Boulevard, Ottawa, Ontario

Figure No. 5

Feuille. 1 of 1

Date Drilled: 'November 11, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢○
Dynamic Cone Test	———	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
					20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
		FILL Silty clay to silty sand, topsoil, occasional rootlets, brown, moist (loose)	61.6	0				
			60.8					
		TOPSOIL	60.7					
		SILTY CLAY Oxidized, brown to grey, moist (hard to stiff)	60.3	1	9 ○	×		
				2	14 ○ 216 ▲	×		18.6
				3	6 ○ 144 ▲	×		17.0
				4				
				5	3 ○ 120 ▲	×		
				6	77 + s=5			
					2 ○	×		
			54.4	7	57 + s=5			
		Borehole Terminated @ 7.2 m depth						
		Note -First borehole drilled @ 2.5 m north met refusal @ 0.76 m depth						

LOG OF BOREHOLE BHLOGS-1.GPJ TROW OTTAWA.GDT 4/12/08

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. A 19 mm slotted pipe was installed in the borehole upon completion of drilling
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
completion	3.0	6.1
1 day	2.9	-
7 days	1.1	-
23 days	1.3	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

Log of Test Pit 1

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 6

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢—○
Dynamic Cone Test	——	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth
		FILL	61.1	0
		Silty clay, asphalt, rail track ties, concrete blocks, steel pipes, burnt wood, some organics, occasional voids, brown to brown/grey, moist		
		-Water @ 1.1 m depth over possible slab concrete		1
			59.1	2
		SILTY CLAY Organics, grey, moist	58.8	
		Backhoe Bucket Refusal @ 2.3 m depth		

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES

Natural Unit Wt. kN/m³

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	1.5	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TPLOGS-1.GPJ TROW OTTAWA.GDT 26/11/08

Log of Test Pit 2

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 7

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢○
Dynamic Cone Test	———	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		FILL Wood, concrete blocks, steel pipes, concrete and stone rubbles, blue 45 gallon steel drums, glass, plastic over 0.15 m thick x 1.4 m x1.5 m concrete slab over 0.3 m thick oragincs mixed with gravel	61.3	0				
			59.5	1		×		
		SILTY CLAY Brown, moist	59.2	2				
		Backhoe Bucket Refusal @ 2.1 m depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	1.5	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TPLOGS-1.GPJ TROW.OTTAWA.GDT 26/11/08

Log of Test Pit 3

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 8

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢○
Dynamic Cone Test	———	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		FILL Silty clay, reworked brown/grey, moist	61.1	0	20 40 60 80 50 100 150 200	250 500 750 20 40 60		
				1		×		
		TOPSOPIL Occasional red brick	59.6					
		-Water @ 1.8 m along old foundation block wall/footing	59.3	2		×		
		SILTY CLAY Brown, moist	59.0					
		Test Pit @ 2.1 m depth						

LOG OF BOREHOLE TPLOGS-1.GPJ TROW OTTAWA.GDT 26/11/08

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	1.8	-

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Test Pit 3a

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 9

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢○
Dynamic Cone Test	———	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		FILL Silty clay, concrete and wood rubbles, wet	61.2	0 1	20 40 60 80 50 100 150 200	250 500 750 20 40 60		
		-Concrete slab @ 1.5 m depth Backhoe Bucket Refusal @ 1.6	59.6					

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	Dry	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TPLOGS-1.GPJ TROW OTTAWA.GDT 26/11/08

Log of Test Pit 3b

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 10

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢—○
Dynamic Cone Test	——	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		FILL Silty clay, reworked brown/grey, moist	60.7	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
				1		×		
			59.2					
		TOPSOPIL	58.9					
		SILTY CLAY Brown, dry	58.6	2				
		Test Pit Terminated @ 2.1 m depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	Dry	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TPLOGS-1.GPJ TROW OTTAWA.GDT 26/11/08

Log of Test Pit 3c

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 11

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢○
Dynamic Cone Test	———	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa (20 40 60 80 / 50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		FILL Silty clay, reworked brown/grey, moist	61.1	0				
			59.6	1		×		
		TOPSOPIL	59.3					
		SILTY CLAY Brown, dry	59.0	2				
		Test Pit Terminated @ 2.1 m depth						

LOG OF BOREHOLE TPLOGS-1.GPJ TROW OTTAWA.GDT 26/11/08

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	Dry	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

Log of Test Pit 4

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 12

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa (20 40 60 80 / 50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		FILL Silty clay, silty sand, steel pipes, wood barn parts, wires, concrete blocks, 0.15 x0.15 m wood ties, rubber tires, concrete block foundation wall	61.6	0				
		-Concrete slab @ 1.7 m depth	59.6	1		×		
		SILTY CLAY Brown, moist	59.3	2				
		Test Pit Terminated @ 2.3 m depth						

LOG OF BOREHOLE TPLOGS-1.GPJ TROW OTTAWA.GDT 4/12/08

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS		
Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	1.8	-

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Test Pit 4a

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 13

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample ⊠
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth
		FILL Silty clay, rubber tires, truck steel dumper, garbage bags, wood, steel pipes, light brown/grey, moist	61.2	0
		-Concrete slab @ 1.4 m depth	59.7	1
		TOPSOIL Silty clay, organics, dark brown	59.2	
		SILTY CLAY Brown, moist	58.9	2
		Test Pit Terminated @ 2.3 m depth		

Standard Penetration Test N Value: 20 40 60 80
Shear Strength kPa: 50 100 150 200
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60
SAMPLES
Natural Unit Wt. kN/m³

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	1.8	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TPLOGS-1.GPJ TROW OTTAWA.GDT 26/11/08

Log of Test Pit 4b

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 14

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample ⊠
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth
		FILL	61.4	0
		Silty clay, rubber tires, truck steel dumper, garbage bags, wood, steel pipes, light brown to dark brown, moist		
		-Concrete slab @ 1.4 m depth	59.9	1
		TOPSOIL		
		Silty clay, organics, dark brown	59.4	
		SILTY CLAY		2
		Brown, moist	59.1	
		Test Pit Terminated @ 2.3 m depth		

Standard Penetration Test N Value: 20 40 60 80
Shear Strength kPa: 50 100 150 200
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60
SAMPLES
Natural Unit Wt. kN/m³

LOG OF BOREHOLE TPLOGS-1.GPJ TROW.OTTAWA.GDT 26/11/08

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	1.8	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

Log of Test Pit 5

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 15

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢○
Dynamic Cone Test	———	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth 0	Standard Penetration Test N Value 20 40 60 80 / Shear Strength kPa 50 100 150 200	Combustible Vapour Reading (ppm) 250 500 750 / Natural Moisture Content % Atterberg Limits (% Dry Weight) 20 40 60	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL	62.1					
		Silty clay, plant fibres, swampy odour, black, moist	61.8					
		SILTY CLAY Brown, moist	61.2					
		Test Pit Terminated @ 0.9 m depth						

LOG OF BOREHOLE TPLOGS-1.GPJ TROW.OTTAWA.GDT 26/11/08

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	Dry	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

Log of Test Pit 6

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 16

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢—○
Dynamic Cone Test	——	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth
		TOPSOIL	61.6	0
		Silty clay, plant fibres, swampy odour, black, moist	61.3	
		SILTY CLAY Brown, moist	60.7	
		Test Pit Terminated @ 0.9 m depth		

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES

Natural Unit Wt. kN/m³

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	Dry	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TPLOGS-1.GPJ TROW.OTTAWA.GDT 26/11/08

Log of Test Pit 7

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 17

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢○
Dynamic Cone Test	———	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth 0	Standard Penetration Test N Value 20 40 60 80 / Shear Strength kPa 50 100 150 200	Combustible Vapour Reading (ppm) 250 500 750 / Natural Moisture Content % Atterberg Limits (% Dry Weight) 20 40 60	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL	61.9					
		Silty clay, plant fibres, swampy odour, black, moist	61.6					
		SILTY CLAY Brown, moist	61.0					
		Test Pit Terminated @ 0.9 m depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	Dry	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TPLOGS-1.GPJ TROW.OTTAWA.GDT 26/11/08

Log of Test Pit 8

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 18

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test —
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa (20 40 60 80 / 50 100 150 200)	Combustible Vapour Reading (ppm) 250 500 750 / Natural Moisture Content % Atterberg Limits (% Dry Weight) 20 40 60	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL	62	0				
		Silty clay, plant fibres, swampy odour, black, moist	61.7					
		SILTY CLAY Brown, moist	61.1					
		Test Pit Terminated @ 0.9 m depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	Dry	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TPLOGS-1.GPJ TROW OTTAWA.GDT 26/11/08

Log of Test Pit 9

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 19

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢—○
Dynamic Cone Test	——	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa (20 40 60 80 / 50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		FILL Silty clay, brown/grey, moist	62	0				
		TOPSOIL	61.1					
		Old water line	60.8	1				
		SILTY CLAY Brown, dry	60.5					
		Test Pit Terminated @ 1.5 m depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	Dry	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TPLOGS-1.GPJ TROW OTTAWA.GDT 26/11/08

Log of Test Pit 10

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 20

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢○
Dynamic Cone Test	———	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		FILL Silty clay, brown/grey, moist	61.3	0	20 40 60 80 50 100 150 200	250 500 750 20 40 60		
			59.9	1		×		
		TOPSOIL 0.15 x 15 m wood within topsoil zone	59.7					
		SILTY CLAY Brown, dry	59.4					
		Test Pit Terminated @ 1.9 m depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	Dry	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TPLOGS-1.GPJ TROW OTTAWA.GDT 26/11/08

Log of Test Pit 11

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 21

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢—○
Dynamic Cone Test	——	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa (20 40 60 80 / 50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		FILL Silty clay, brown/grey, moist	60.8	0				
			59.6	1				
		TOPSOIL	59.4					
		SILTY CLAY Brown, dry	59.1					
		Test Pit Terminated @ 1.7 m depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	Dry	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TPLOGS~1.GPJ TROW OTTAWA.GDT 26/11/08

Log of Test Pit 12

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 22

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test —
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits ⊢○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		FILL Silty clay, brown/grey, moist	60.7	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
		TOPSOIL concrete and red brick	59.5	1				
		SILTY CLAY Brown, dry	59.0					
		Test Pit Terminated @ 2.3 m depth	58.4	2				

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	Dry	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TPLOGS-1.GPJ TROW OTTAWA.GDT 26/11/08

Log of Test Pit 13

Trow

Project No: OTGE00019796A

Project: Geotechnical Investigation-Proposed Commercial Development

Location: 3735 Saint Joseph, Ottawa, Ontario

Figure No. 23

Feuille. 1 of 1

Date Drilled: 'November 14, 2008

Drill Type:

Datum: Geodetic

Logged by: _____ Checked by: _____

Split Spoon Sample	⊠	Combustible Vapour Reading	□
Auger Sample	◧	Natural Moisture Content	×
SPT (N) Value	○	Atterberg Limits	⊢○
Dynamic Cone Test	———	Undrained Triaxial at % Strain at Failure	⊕
Shelby Tube	■	Shear Strength by Penetrometer Test	▲
Shear Strength by Vane Test	+ S		

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic m	Depth 0	Standard Penetration Test N Value 20 40 60 80 / Shear Strength 50 100 150 200 kPa	Combustible Vapour Reading (ppm) 250 500 750 / Natural Moisture Content % Atterberg Limits (% Dry Weight) 20 40 60	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL	61.8					
		Silty clay, plant fibres, swampy odour, black, moist	61.5					
		SILTY CLAY Brown, moist	60.9					
		Test Pit Terminated @ 0.9 m depth						

NOTES:
1. Borehole/Test Pit data requires Interpretation by Trow before use by others
2. Test Pit backfilled upon completion of excavtion
3. Field work supervised by a Trow representative
4. See Notes on Sample Descriptions
5. This Figure is to read with Trow Associates Inc. report OTGE00019796A

WATER LEVEL RECORDS

Elapsed Time	Water Level (m)	Hole Open To (m)
Completion	Dry	-

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TPLOGS-1.GPJ TROW OTTAWA.GDT 26/11/08

Certificate of Analysis

Report Date: 22-Apr-2014
Order Date:15-Apr-2014

Client: **Paterson Group Consulting Engineers**
Client PO: 15228

Project Description: PG3215

	Client ID:	BH3-SS4	-	-	-
	Sample Date:	14-Apr-14	-	-	-
	Sample ID:	1416129-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	73.2	-	-	-
General Inorganics					
pH	0.05 pH Units	7.24	-	-	-
Resistivity	0.10 Ohm.m	17.9	-	-	-
Anions					
Chloride	5 ug/g dry	244	-	-	-
Sulphate	5 ug/g dry	48	-	-	-

APPENDIX 2

FIGURE 1 - KEY PLAN

DRAWING PG3215-1 - TEST HOLE LOCATION PLAN

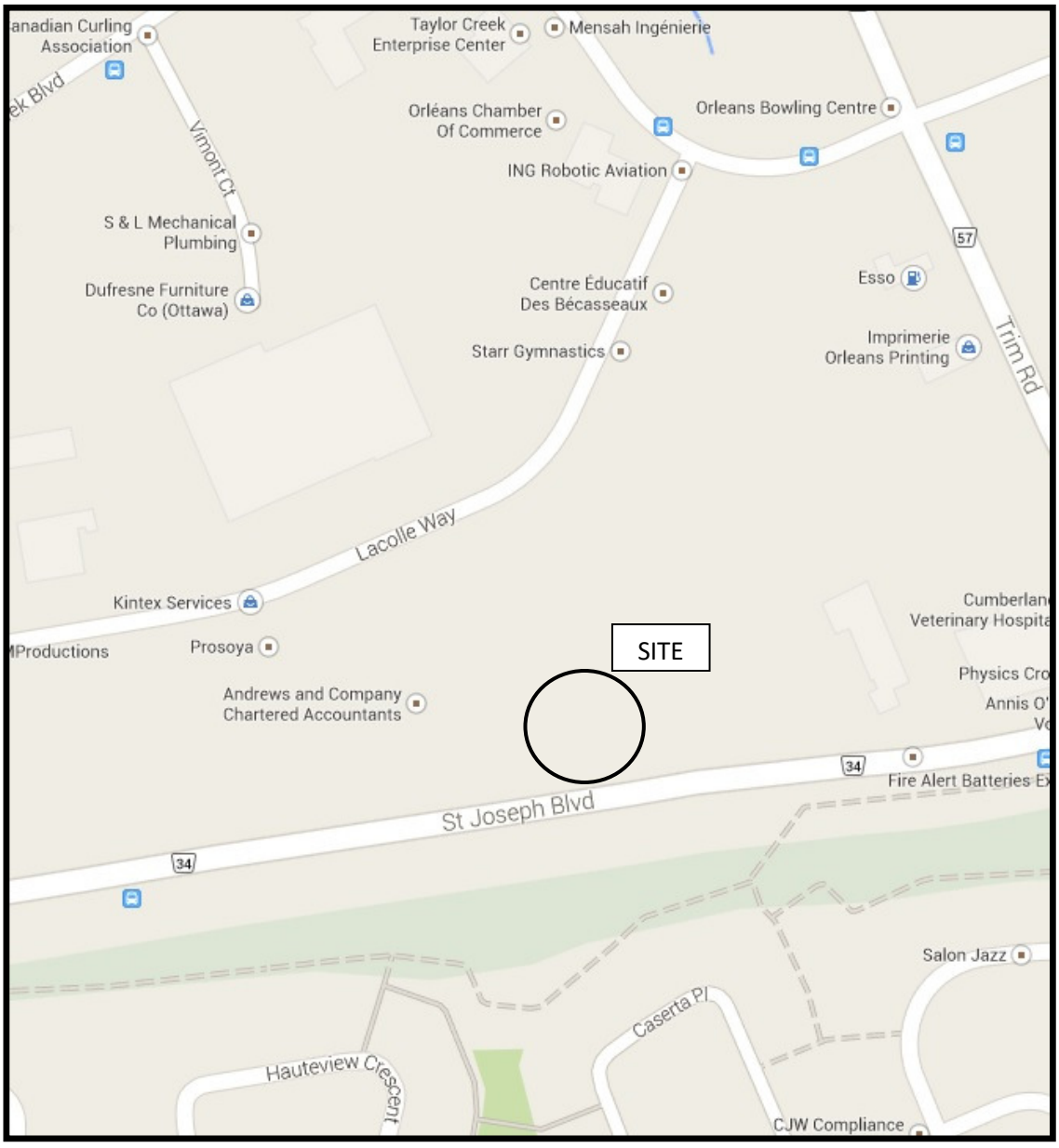
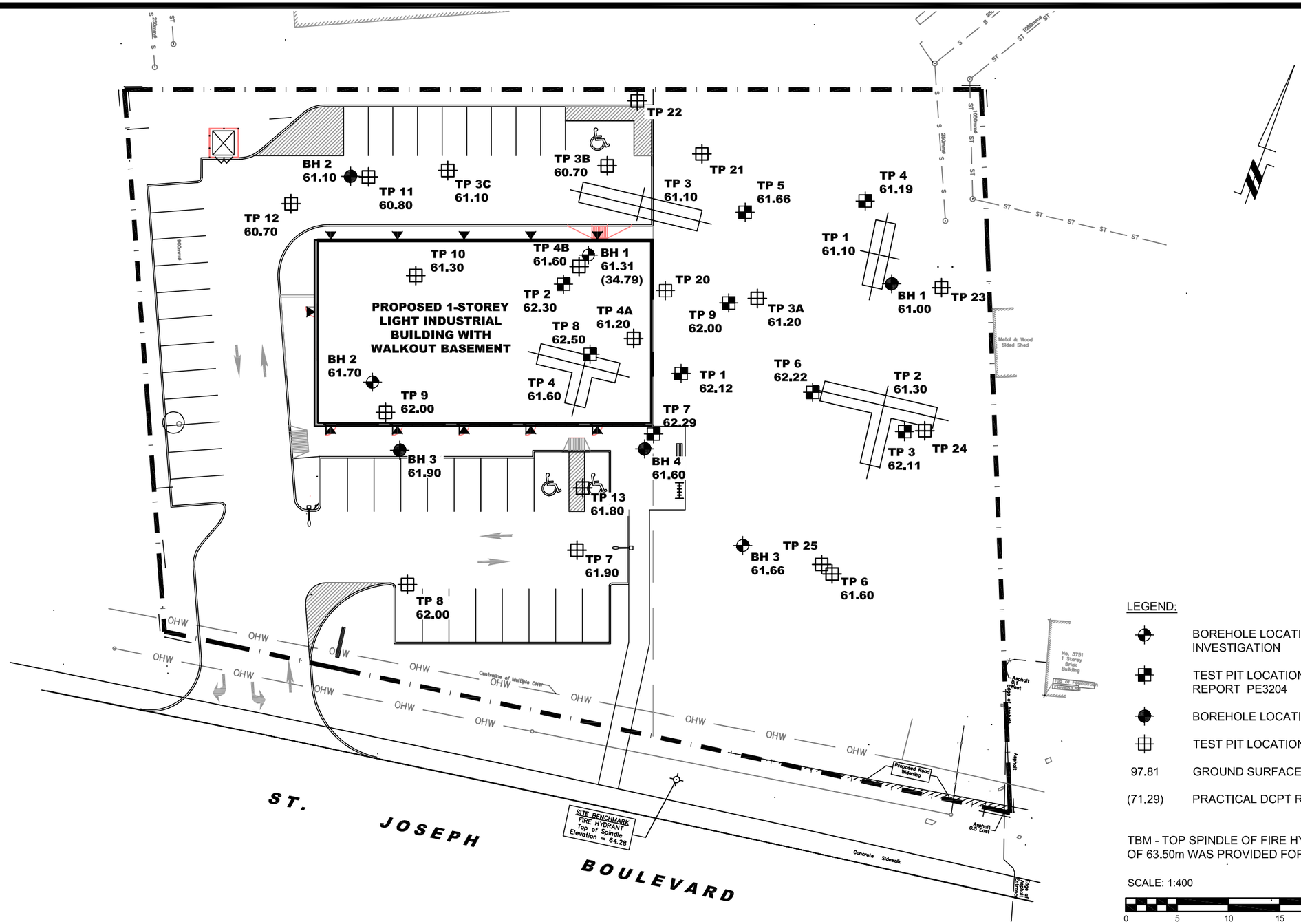


FIGURE 1

KEY PLAN



LEGEND:

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- TEST PIT LOCATION, PATERSON GROUP REPORT PE3204
- BOREHOLE LOCATION BY OTHERS
- TEST PIT LOCATION BY OTHERS
- 97.81 GROUND SURFACE ELEVATION (m)
- (71.29) PRACTICAL DCPT REFUSAL ELEVATION (m)

TBM - TOP SPINDLE OF FIRE HYDRANT. GEODETIC ELEVATION OF 63.50m WAS PROVIDED FOR THE TBM.

SCALE: 1:400

0 5 10 15 20 25m

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
1	UPDATED CONCEPT PLAN	07/08/2018	RG

BLUEPRINT BUILDS

GEOTECHNICAL INVESTIGATION
PROP. COMMERCIAL DEVELOPMENT - 3735 ST. JOSEPH BLVD.
OTTAWA, ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:400	Date: 04/2014
Drawn by: RCG	Report No.: PG3215
Checked by: SD	Dwg. No.: PG3215-1
Approved by: DJG	Revision No.: 1