PATERSON GROUP

Geotechnical Investigation

Proposed Development

1101 Baxter Road
Ottawa, Ontario

Prepared for Regional Group

Report PG7639-1 dated September 26, 2025

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1.0 Introduction

Paterson Group (Paterson) was commissioned by Regional Group to conduct a geotechnical investigation for the proposed development to be located at 1101 Baxter Road within the City of Ottawa, Ontario (refer to Figure 1 - Key Plan in Appendix 2 of this report for the general site location).

The objectives of the geotechnical investigation were to:

- ❒ Determine the existing subsoil and groundwater information at this site by means of boreholes.
- ❒ Provide geotechnical recommendations for the design of the proposed development, including construction considerations which may affect its design.

This 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 Development

Based on available drawings, it is understood that the proposed development will consist of 4 high-rise structures (Buildings A through D) and 2 mid-rise structures (Buildings E and F). It is understood that the proposed buildings will have 2 or 3 levels of underground parking.

It is further understood that the proposed development will include asphalt-paved access lanes and landscaped areas. It is also anticipated that the subject site will be municipally serviced.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the current investigation was carried out on August 25th and 26th, 2025, and consisted of 5 boreholes (BH 1-25 through BH 5-25) advanced to a maximum depth of 13.5 m below the existing ground surface. The borehole locations were distributed in a manner to provide general coverage of the subject site. A previous field program conducted in January 2017 by Paterson included 7 boreholes (BH 1 through BH 7) at the subject site, which were advanced to a maximum depth of 5.5 m below the existing ground surface.

A total of 5 boreholes (BS-1 through BS-5) were also completed by others in October 2018, extending to a maximum depth of 10.7 m.

These borehole locations were distributed in a manner to provide general coverage of the subject site. The approximate locations of the boreholes are shown on Drawing PG7639-1 - Test Hole Location Plan and included in Appendix 2.

The boreholes were advanced using a track-mounted auger drill rig operated by a two-person crew. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer. The drilling procedure consisted of augering and rock coring to the required depths at the selected locations, and sampling and testing the overburden.

Sampling and In Situ Testing

Soil samples were collected from the boreholes using two different techniques, namely, sampled directly from the auger flights (AU) or collected using a 50 mm diameter split-spoon (SS) sampler. Rock cores (RC) were obtained using 47.6 mm inside diameter coring equipment.

All samples were visually inspected and initially classified on site. The auger and split-spoon samples were placed in sealed plastic bags, and rock cores were placed in cardboard boxes. All samples were transported to our laboratory for further examination and classification. The depths at which the auger, split spoon and rock core samples were recovered from the boreholes are shown as AU, SS and RC, respectively, on the Soil Profile and Test Data sheets presented in Appendix 1.

A Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split spoon samples. The SPT results are recorded as "N" values on the Soil Profile and Test Data sheets. The "N" value is the number of blows required to drive the split spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

A recovery value and a Rock Quality Designation (RQD) value were calculated for each drilled section (core run) of bedrock and are shown on the borehole logs. The recovery value is the ratio, in percentage, of the length of the bedrock sample recovered over the length of the drilled section (core run). The RQD value is the ratio, in percentage, of the total length of intact rock pieces longer than 100 mm in one core run over the length of the core run. These values are indicative of the quality of the bedrock.

The subsurface conditions observed in the test holes were recorded in detail in the field. The soil profiles are presented on the Soil Profile and Test Data sheets in Appendix 1.

Groundwater

Boreholes BH 1-25 through BH 3-25 from the most recent geotechnical investigation were fitted with 51 mm diameter PVC groundwater monitoring wells. The groundwater level readings were obtained after a suitable stabilization period subsequent to the completion of the field investigation.

The groundwater observations are discussed in Section 4.3 and presented in the Soil Profile and Test Data sheets presented in Appendix 1.

Typical monitoring well construction details are described below:

- 1.5 m or less, as needed, depending on the soil profile, of slotted 51 mm diameter PVC screen at specified intervals within the borehole column.
- 51 mm diameter PVC riser pipe from the top of the screen to the ground surface.
- No. 3 silica sand backfill within the annular space around the screen.
- 300 mm thick bentonite hole plug directly above PVC slotted screen.
- Clean backfill from the top of the bentonite plug to the ground surface.

Refer to the Soil Profile and Test Data sheets in Appendix 1 for specific well construction details.

3.2 Field Survey

The recent borehole locations (BH 1-25 through BH 5-25), and ground surface elevations at these borehole locations, were surveyed by Paterson using a GPS unit with respect to a geodetic datum. The previous boreholes (BH 1 through BH 7) were surveyed with respect to a temporary benchmark (TBM) consisting of the top spindle of the fire hydrant located at the entrance to 1101 Baxter Road, which was assigned an assumed elevation of 100.00 m.

The boreholes by others are also referenced to a geodetic datum.

The locations of the boreholes are presented on Drawing PG7639-1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

Soil samples were recovered from the subject site and visually examined in our laboratory to review the results of the field logging. A total of 2 sieve analyses, including hydrometer tests, were completed on selected soil samples. Moisture content testing was completed on all recovered soil samples. The results of the testing are presented in Section 4.2 and are provided in Appendix 1.

3.4 Analytical Testing

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

4.0 Observations

4.1 Surface Conditions

The subject site is currently occupied by an existing commercial building surrounded by asphalt-paved roadways and parking areas with landscaped margins. The site is bordered by Baxter Road and further by the Queensway Highway 417 to the north, commercial buildings to the east and west, and residential dwellings and further by Iris Street to the south.

The existing ground surface across the subject site is relatively level at an approximate geodetic elevation of 74 m, and the site is at-grade with Baxter Road.

4.2 Subsurface Profile

Overburden

Generally, the subsurface profile across the site consists of an approximate 0.05 to 0.07 m layer of asphalt, which is underlain by fill followed by silty sand, alternating layers of silty sand/silty clay, and a glacial till deposit. The fill material was generally observed to consist of silty sand to silty clay with gravel and crushed stone, and extended to approximate depths ranging from 0.4 to 3 m below the existing ground surface.

A brown silty sand deposit was encountered underlying the fill. The silty sand material was additionally observed to transition to grey at approximate depths of 1.2 to 3 m below the ground surface. A silty clay to clayey silt deposit with silty sand seams was encountered beneath the silty sand material extending to depths of about 6 to 11 m below the existing ground surface.

A glacial till deposit was encountered underlying the silty clay to clayey silt, and was generally observed to consist of silty clay to clayey silt with varying amounts of sand, gravel, cobbles and boulders.

Bedrock

Auger refusal was encountered at approximate depths ranging from 9.7 to 12 m below the existing ground surface. Bedrock was cored in boreholes BH 1-25 to BH 3-25, where it was observed to consist of grey limestone. Based on the RQDs of the recovered rock core, the bedrock was poor to excellent in quality, generally improving with depth.

Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for specific details of the subsurface profiles encountered at the borehole locations.

Grain Size Distribution and Hydrometer Testing

Hydrometer tests were completed on selected silty clay samples recovered from boreholes BH 1-25 and BH 2-25. The results are summarized in Table 1 and presented on the Sieve Analysis Results sheet in Appendix 1.

Table 1 – Grain Size Distribution Results

Sample	Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH 1-25-SS7	4.5	0.0	38.8	57.2	4.0
BH 2-25-SS11	7.6	0.0	55.7	36.3	8.0

Note: The ground surface elevation at each borehole location was surveyed using a handheld GPS using a geodetic datum.

4.3 Groundwater

The groundwater level readings in the monitoring wells and standpipe piezometers are provided below in Table 2, and on the Soil Profile and Test Data sheets in Appendix 1.

Table 2 – Summary of Groundwater Level Readings

Borehole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Date Recorded
		Depth (m)	Elevation (m)	
Previous Investigations				
BH 1*	-	2.29	-	February 6, 2017
BH 2*	-	3.19	-	February 6, 2017
BH 6*	-	3.57	-	February 6, 2017
BH 7*	-	4.03	-	February 6, 2017
Current Investigation				
BH 1-25*	74.04	3.60	70.98	September 18, 2025
BH 2-25*	74.06	5.02	69.04	September 18, 2025
BH 3-25*	74.64	Blocked	-	September 18, 2025

Note: The ground surface elevation at each borehole location was surveyed by Paterson and was referenced to a geodetic datum.
* Denotes a monitoring well

It should be noted that the groundwater level readings in the monitoring wells can be influenced by surface water becoming trapped in the backfill materials. Long-term groundwater levels can also be estimated based on the observed colour and consistency of the recovered soil samples. Based on these observations, the long-term groundwater table can be expected at approximate depths of 3 to 5 m below the existing ground surface.

However, it should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater level could vary at the time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed development. The recommended foundation support for the proposed buildings will depend on the number of underground parking levels:

- For 2 or fewer underground parking levels, foundation support should consist of end-bearing piles advanced to bedrock,

- For 3 or more underground parking levels, foundation support should consist of conventional spread footings bearing on clean, surface sounded bedrock.

Bedrock removal may be required to complete the excavation of the underground parking levels, dependent on their depth. Foundations and other debris from demolished structures may also be present at this site, and the need for their removal should be anticipated by the contractor.

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.

Existing foundation walls and other construction debris should be entirely removed from within the building perimeter and within the lateral support zones of the foundations. Under paved areas, existing construction remnants, such as foundation walls, should be excavated to a minimum of 1 m below final grade.

Bedrock Removal

Should it be required, bedrock removal can be accomplished by hoe ramming where the bedrock is weathered and/or where only a small quantity of the bedrock needs to be removed. Sound bedrock may be removed by line drilling and controlled blasting in conjunction with hoe ramming.

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

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

Vibration Considerations

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

The following construction equipment could be the source of vibrations: hoe ram, compactor, dozer, crane, truck traffic, etc. Vibrations, whether caused by blasting operations or by construction operations, could be the source of detrimental vibrations on the nearby buildings and structures. Therefore, all vibrations are recommended to be limited.

Two parameters are used to determine the permissible vibrations, namely, the maximum peak particle velocity and the frequency. For low frequency vibrations, the maximum allowable peak particle velocity is less than that for high frequency vibrations. As a guideline, the peak particle velocity should be less than 15 mm/s between frequencies of 4 to 12 Hz, and 50 mm/s above a frequency of 40 Hz (interpolate between 12 and 40 Hz). The guidelines are for current construction standards. Considering that these guidelines are above perceptible human level and, in some cases, could be very disturbing to some people, a pre-construction survey is recommended to be completed to minimize the risks of claims during or following the construction of the proposed building.

Compacted Granular Fill Working Platform (Pile Foundation)

Where the proposed buildings will be supported on a driven pile foundation that requires the use of heavy equipment (i.e. pile driving crane), it is conventional practice to install a compacted granular fill layer, at a convenient elevation, to allow the equipment to access the site without getting stuck and causing significant disturbance.

A typical working platform could consist of 0.6 m of OPSS Granular B, Type II material placed and compacted to a minimum of 98% of its standard Proctor maximum dry density (SPMDD) in lifts not exceeding 300 mm in thickness.

Once the piles have been driven and cut off, the working platform can be re-graded, and soil tracked in, or soil pumping up from the pile installation locations, can be bladed off and the surface can be topped up, if necessary, and re-compacted to act as the substrate for further fill placement for the basement slabs.

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 300 mm thick and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the buildings and paved areas should be compacted to at least 98% of the material's 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 at least 95% of the material's SPMDD.

Lean Concrete Placement

Where foundation support for the proposed buildings consists of conventional spread footings bearing on clean, surface sounded bedrock, and where rock overbreak occurs at the underside of footing (USF) elevation, lean concrete (minimum **17 MPa** compressive strength at 28 days) can be used to re-instate the subgrade from the bedrock surface to the USF elevation. Typically, the excavation side walls will be used as the form to support the concrete. The lean concrete placement should be at least 150 mm wider than all sides of the footing (strip and pad footings) at the base of the excavation. The additional width of the concrete poured will suffice in providing a direct transfer of the footing load to the underlying bedrock.

5.3 Foundation Design

Conventional Spread Footings bearing on Bedrock

Footings placed on clean, surface sounded bedrock, or on lean concrete which is placed directly over the clean, surface sounded bedrock, can be designed using a factored bearing resistance value at serviceability limit states (SLS) and ultimate limit states (ULS) of **3,000 kPa**, incorporating a geotechnical resistance factor of 0.5.

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. The bedrock sounding should be carried out by the geotechnical consultant.

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.

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 sound bedrock bearing medium when a plane extending down and out from the bottom edge of the footing at a minimum of 1H:6V (or flatter) passes only through sound bedrock or a material of the same or higher capacity as the bedrock, such as concrete. A weathered bedrock or soil bearing medium will require a lateral support zone of 1H:1V (or flatter).

Pile Foundation

Where the founding depth of the proposed building(s) is significantly above the bedrock surface, it is recommend that foundation support consist of piles driven to refusal in the bedrock. For deep foundations, concrete-filled steel pipe piles are generally utilized in the Ottawa area. Applicable pile resistance values at ultimate limit states (ULS) are given in Table 3 on the next page. Note that these are all geotechnical axial resistance values.

The geotechnical pile resistance values were estimated using the Hiley dynamic formula.

Table 3 - Pile Foundation Design Data		
Pile Outside Diameter (mm)	**Pile Wall Thickness (mm)**	**Geotechnical Axial Resistance Factored at ULS (kN)**
245	9	1,000
245	11	1,250
245	13	1,500

The minimum centre-to-centre pile spacing is 2.5 times the pile diameter. The closer the piles are spaced, however, the more potential that the driving of subsequent piles in a group could have influence on piles in the group that have already been driven. These effects, primarily consisting of uplift of previously driven piles, are checked as part of the field review of the pile driving operations.

Re-striking of all piles at least once will also be required after at least 48 hours have elapsed since initial driving.

Prior to the commencement of production pile driving, a limited number of indicator piles should be installed across the site. It is recommended that each indicator pile be dynamically load tested to evaluate pile stresses, hammer efficiency, pile load transfer, and end-of-driving criteria for end-bearing in the bedrock.

Downdrag loads would also need to be considered if grade raises are proposed as part of the site development. More details regarding downdrag can be provided upon request.

Permissible Grade Raise Restrictions

Consideration must be given to potential settlements which could occur due to the presence of the silty clay/clayey silt deposit and the combined loads from the proposed buildings, any groundwater lowering effects, and grade raise fill. The foundation loads to be considered for the settlement case are the continuously applied loads which consist of the unfactored dead loads and the portion of the unfactored live load that is considered to be continuously applied. A minimum value of 50% of the live load is often recommended by Paterson.

A permissible grade raise restriction of **1.2 m** is recommended for finished grading at the site. A post-development groundwater lowering of 0.5 m was considered in our permissible grade raise restriction calculations.

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.

5.4 Design for Earthquakes

The preliminary site class for seismic site response can be taken as **Class X_D**, although this can be finalized once the project design becomes more advanced. A site-specific shear wave velocity test is recommended to accurately determine the applicable seismic site classification for the foundation design of the proposed development, as presented in Table 4.1.8.4.A of the Ontario Building Code (OBC) 2024.

The proposed buildings supported on end-bearing piles extending to bedrock or footings bearing directly on clean, surface sounded bedrock will not be subject to liquefaction.

5.5 Basement Floor Slab

With the removal of all topsoil and fill, containing significant amounts of deleterious or organic materials, the native soil or bedrock subgrade will be considered an acceptable subgrade surface on which to commence backfilling for basement slab construction.

It is anticipated that the basement area for the proposed development will be mostly parking, and the recommended pavement structures noted in Section 5.8 will be applicable. However, if storage or other uses of the lower level will involve the construction of a concrete floor slab, the upper 200 mm of sub-slab fill is recommended to consist of 19 mm clear crushed stone.

In consideration of the groundwater conditions encountered during the geotechnical investigation, an underslab drainage system, consisting of lines of perforated drainage pipe subdrains connected to a positive outlet, should be provided in the clear crushed stone layer under the lowest level floor slabs. This is discussed further in Section 6.1.

5.6 Basement Wall

There are several combinations of retained soils that could be applicable for the basement walls of the proposed buildings. 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 drained unit weight of 20 kN/m^3.

Two distinct conditions, static and seismic, must be reviewed for design calculations. The parameters for design calculations for the two conditions are presented below.

Lateral Earth Pressures

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

K_o = at-rest earth pressure coefficient of the applicable retained material (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 this site is 0.359g for a Site Class X_D according to the OBC 2024. 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 2024.

5.7 Rock Anchor Design

Where required for foundation uplift resistance, rock anchors could be used. The geotechnical design of grouted rock anchors in bedded sedimentary bedrock is based upon two possible failure modes.

The anchor can fail either by shear failure along the grout/rock interface or by pullout of a 60 to 90 degree cone of rock with the apex of the cone near the middle of the bonded length of the anchor. Both modes of failure have to be examined, as described in the following section. A third failure mode of shear failure along the grout/steel interface should be reviewed by the structural engineer to ensure all typical failure modes have been reviewed.

Anchors can be of the “passive” or the “prestressed/post-tensioned” type, depending on whether the anchor tendon is provided with prestress load or not prior to being put into service.

Regardless of whether an anchor is of the passive or the prestressed type, it is recommended that the anchor be provided with a bonded length, or fixed anchor length, at the base of the anchor, which will provide the anchor capacity, as well as an unbonded length, or free anchor length, between the rock surface and the start of the bonded length.

As the depth at which the apex of the shear failure cone develops is midway along the bonded length, a fully bonded anchor would tend to have a shallower cone, and therefore less geotechnical resistance, than one where the bonded length was just the bottom part of the overall anchor.

Grout to Rock Bond

The Canadian Foundation Engineering Manual recommends a maximum allowable grout to rock bond stress (for sound rock) of 1/30 of the unconfined compressive strength (UCS) of either the grout or rock (but less than 1.3 MPa) for an anchor of minimum length (depth) of 3 m.

Generally, the UCS of limestone ranges between about 60 and 90 MPa, which is stronger than most routine grouts. A factored at ULS tensile grout to rock bond resistance value of **1.0 MPa**, incorporating a resistance factor of 0.4, can be used. A minimum grout strength of 40 MPa is recommended.

Rock Cone Uplift

Based on the bedrock quality observed in the boreholes, and assuming that the bond zone will be in competent bedrock located 1 m below the bedrock surface, a Rock Mass Rating (RMR) of 65 was assigned to the bedrock, and Hoek and Brown parameters (m and s) were taken as 0.575 and 0.00293, respectively.

Recommended Rock Anchor Lengths

Parameters used to calculate rock anchor lengths are provided in Table 4 below:

Table 4 - Parameters Used in Rock Anchor Review	
Grout to Rock Bond Strength - Factored at ULS	1.0 MPa
Compressive Strength - Grout	40 MPa
Rock Mass Rating (RMR) - Good quality Limestone Hoek and Brown parameters	62 m=0.575 and s=0.00293
Unconfined compressive strength - Limestone	50 MPa
Unit weight - Submerged Bedrock	15.2 kN/m^3
Apex angle of failure cone	60°
Apex of failure cone	mid-point of fixed anchor length

From a geotechnical perspective, the fixed anchor length will depend on the diameter of the drill holes. Recommended anchor lengths for a 75- and 125-mm diameter holes are provided in Table 5 below:

Table 5 - Recommended Rock Anchor Lengths - Grouted Rock Anchor				
Diameter of Drill Hole (mm)	Anchor Lengths (m)			Factored Tensile Resistance (kN)
	Bonded Length	Unbonded Length	Total Length	
75	2.0	0.8	2.8	450
	2.6	1.0	3.6	600
	3.2	1.2	4.4	750
125	4.5	2.0	6.5	1000
	1.6	0.6	2.2	600
	2.0	1.0	3.0	750
	2.6	1.4	4.0	1000

Other Considerations

The anchor drill holes should be a maximum of 1.5 to 2 times the rock anchor diameter, inspected by Paterson personnel and should be flushed clean prior to grouting. A tremie tube is recommended to place grout from the bottom of the anchor hole. Compressive strength testing is recommended to be completed for the rock anchor grout. A set of grout cubes should be tested for each day that grout is prepared.

The geotechnical capacity of each rock anchor should be proof tested at the time of construction and reviewed at the time of testing by Paterson field personnel. More information on proof testing can be provided upon request.

5.8 Pavement Structure

Lowest Underground Parking Level

For design purposes, it is recommended that the rigid pavement structure for the lowest underground parking level consist of Category C2, 32 MPa concrete at 28 days with air entrainment of 5 to 8%. The recommended rigid pavement structure is further presented in Table 6 on the next page.

Table 6 – Recommended Rigid Pavement Structure – Lower Parking Level	
Thickness (mm)	**Material Description**
150	**Exposure Class C2 – 32 MPa Concrete** (5 to 8% Air Entrainment)
300	**BASE –** OPSS Granular A Crushed Stone
SUBGRADE – Existing imported fill, or OPSS Granular B Type I or II material placed over bedrock.	

To control cracking due to shrinking of the concrete floor slab, it is recommended that strategically located saw cuts be used to create control joints within the concrete floor slab of the lower underground parking level. The control joints are generally recommended to be located at the center of the column lines and spaced at approximately 24 to 36 times the slab thickness (for example, a 0.15 m thick slab should have control joints spaced between 3.6 and 5.4 m).

The joints should be cut between 25 and 30% of the thickness of the concrete floor slab and completed as early as 4 hour after the concrete has been poured during warm temperatures and up to 12 hours during cooler temperatures.

Pavement Structure on Podium Deck

The pavement structures presented in Tables 7 and 8 should be used for car only parking areas, at grade access lanes, and heavy loading parking areas over the top of the podium structure, where present as part of the proposed development:

Table 7 – Recommended Pavement Structure - Car Only Parking Areas Over Podium Deck	
Thickness (mm)	**Material Description**
50	**Wear Course** – HL-3 or Superpave 12.5 Asphaltic Concrete
200	**BASE** - OPSS Granular A Crushed Stone
See below*	**Thermal Break** - Rigid Insulation (See Following Paragraph)**
n/a	**Waterproofing Membrane and IKO Protection Board**
SUBGRADE – Reinforced concrete podium deck *If specified by others, not required from a geotechnical perspective	

Table 8 - Recommended Pavement Structure – Access Lanes, Fire Truck Lane, Ramp, and Heavy Loading Areas Over Podium Deck	
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
300	**BASE** - OPSS Granular A Crushed Stone
See below*	**Thermal Break** - Rigid Insulation (See Following Paragraph)
n/a	**Waterproofing Membrane and IKO Protection Board**
SUBGRADE – Reinforced concrete podium deck *If specified by others, not required from a geotechnical perspective	

Pavement Structure on Overburden Soils

The flexible pavement structure presented in Table 9 should be used for access lanes and heavy loading areas located on the overburden soils.

Table 9 – Recommended Pavement Structure – Access Lanes and Heavy Loading Area	
Thickness (mm)	**Material Description**
40	**Wear Course –** Superpave 12.5 Asphaltic Concrete
50	**Binder Course –**Superpave 19.0 Asphaltic Concrete
150	**BASE –** OPSS Granular A Crushed Stone
300	**SUBBASE –** OPSS Granular B Type II
SUBGRADE – OPSS Granular B Type I or II material placed over in situ soil or engineered fill.	

Other Considerations

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 99% of the SPMDD using suitable vibratory equipment.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Foundation Drainage & Waterproofing

It is recommended that the proposed building's foundation walls be blind-poured against a composite drainage board which is fastened to the temporary shoring system.

It is also recommended that 100 mm diameter sleeves at 3 m centres be cast at the foundation wall/footing interface to allow for the infiltration of water from the composite drainage board to flow to an interior perimeter drainage pipe. The perimeter drainage pipe should direct water to sump pit(s) within the lower basement area.

Requirements for waterproofing of the foundation walls should be reviewed once the project design becomes more advanced. Elevators and any other pits located below the underslab drainage system should be waterproofed.

Underslab Drainage

Underslab drainage will be required to control water infiltration below the underground parking levels. For preliminary design purposes, we recommend that 100 mm perforated pipes be placed at approximately 6 m centers. The spacing of the underslab drainage system should be confirmed at the time of completing the excavation, when water infiltration can be better assessed.

Foundation Backfill

Where sufficient space is available for conventional backfilling, the backfill material against the exterior sides of the foundation walls should consist of free-draining, non-frost-susceptible granular materials. The site materials will be frost susceptible and, as such, are not recommended for re-use as backfill unless a composite drainage system (such as Delta Drain 6000) connected to a drainage system is provided.

6.2 Protection of Footings Against Frost Action

Perimeter footings of heated structures are recommended to be protected against the deleterious effects of frost action. A minimum of 1.5 m of soil cover, or an

equivalent combination of soil cover and foundation insulation, should be provided in this regard.

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

However, the foundations are generally not expected to require protection against frost action due to the founding depth. Unheated structures such as the access ramp may require insulation for protection against the deleterious effects of frost action.

6.3 Excavation Side Slopes

The side slopes of excavations in the overburden materials should either be cut back at acceptable slopes or should be retained by shoring systems from the start of the excavation until the structure is backfilled.

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 shallower. The shallower slope is required 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 be kept away from the excavation sides. Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

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 should not remain open for extended periods of time.

Temporary Shoring

Due to the depth of excavation and the proximity of the proposed development to the property boundaries, temporary shoring may be required to support the overburden soils of the adjacent properties. The design and approval of the shoring system, where required, will be the responsibility of the shoring contractor and the

shoring designer, who is a licensed professional engineer and is hired by the shoring contractor. It is the responsibility of the shoring contractor to ensure that the temporary shoring is in compliance with safety requirements, designed to avoid any damage to adjacent structures and includes dewatering control measures.

In the event that subsurface conditions differ from the approved design during the actual installation, it is the responsibility of the shoring contractor to commission the required experts to re-assess the design and implement the required changes.

The designer should also take into account the impact of a significant precipitation event and designate design measures to ensure that precipitation will not negatively impact the shoring system or soils supported by the system. Any changes to the approved shoring design system should be reported immediately to the owner's structural designer prior to implementation.

The temporary shoring system may consist of a soldier pile and lagging system. Any additional loading due to street traffic, construction equipment, adjacent structures and facilities, etc., should be added to the earth pressures provided in Table 10. The earth pressures acting on the shoring system may be calculated using the parameters below

Table 10 – Soil Parameters for Shoring System Design

Parameters	Values
Active Earth Pressure Coefficient (K_a)	0.33
Passive Earth Pressure Coefficient (K_p)	3
At-rest Earth Pressure Coefficient (K_o)	0.5
Total Unit Weight (γ), kN/m^3	210
Submerged Unit Weight (γ'), kN/m^3	13

The active earth pressure should be calculated where wall movements are permissible while the at-rest pressure should be calculated if no movement is permissible. The dry unit weight should be calculated above the groundwater level while the effective unit weight should be calculated below the groundwater level.

The hydrostatic groundwater pressure should be included to the earth pressure distribution wherever the effective unit weight is calculated for earth pressures. If the groundwater level is lowered, the dry unit weight for the soil should be calculated full weight, with no hydrostatic groundwater pressure component.

For design purposes, the minimum factor of safety of 1.5 should be calculated.

6.4 Pipe Bedding and Backfill

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

A minimum of 150 mm of OPSS Granular A should be placed for bedding for sewer or water pipes when placed on a soil subgrade. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to a minimum of 300 mm above the obvert of the pipe, should consist of OPSS Granular A (concrete or PSM PVC pipes) or sand (concrete pipe). The bedding and cover materials should be placed in maximum 225 mm thick lifts and compacted to 98% of the SPMDD. It should generally be possible to re-use 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 98% of the material's SPMDD. All cobbles larger than 200 mm in their longest direction should be segregated from re-use as trench backfill.

6.5 Groundwater Control

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

Dewatering Permit

Under the current regulations enacted by the Ministry of Environment, Conservation and Parks (MECP), any dewatering in excess of 50,000 L/day requires a registration on the Environmental Activity and Sector Registry (EASR), so long as that dewatering is related to construction. If the dewatering is not related to construction, a Permit to Take Water obtained from the MECP will be required. In the event that an EASR is required to facilitate dewatering of the proposed development, a minimum of 3 to 4 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. Should a Permit to Take Water be required, a minimum of five to six months should be allotted for completion of the permit, due to the minimum review period imposed by the MECP.

The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project. The subsoil 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 using 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 the founding level.

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

6.7 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 moderate to very aggressive corrosive environment.

7.0 Recommendations

Once the project design becomes more developed, the drawings should be sent to Paterson for review and to determine if this report needs to be revised.

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

- ❑ Review of the geotechnical aspects of the excavation contractor's shoring design, prior to construction.
- ❒ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❒ Observation of all bearing surfaces prior to the placement of concrete.
- ❒ Sampling and testing of the concrete and fill materials used.
- ❒ Observation of all subgrades prior to backfilling materials.
- ❒ 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 the completion of a satisfactory inspection program by the geotechnical consultant.

All excess soils must be handled as per *Ontario Regulation 406/19: On-Site and Excess Soil Management*.

8.0 Statement of Limitations

The recommendations provided are in accordance with the present understanding of the project. Paterson requests permission to review the 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, Paterson requests immediate notification to permit reassessment of our recommendations.

The recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work. The latter should evaluate the factual information provided in this report and determine the suitability and completeness for their intended construction schedule and methods. Additional testing may be required for their purposes.

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

Paterson Group Inc.

Otillia McLaughlin, B.Eng.

Scott S. Dennis, P.Eng.

Report Distribution:

- ❑ Regional Group (1 digital copy)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

RECORD OF BOREHOLE SHEETS BY OTHERS

SIEVE ANALYSIS RESULTS

ANALYTICAL TESTING RESULTS

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

1101 Baxter Road, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 361008.85 **NORTHING:** 5023811.94 **ELEVATION:** 74.04

PROJECT: Proposed Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: **DATE:** August 25, 2025

FILE NO. : PG7639

HOLE NO. : BH 1-25

SAMPLE DESCRIPTION	DEPTH (m)	TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	ELEVATION (m)
GROUND SURFACE						74
ASPHALT 0.06m [73.98m]						
FILL: Gravel and crushed stone 0.41m [73.63m]		AU 1			4	
Compact, brown **SILTY SAND**	1	SS 2	42	4-6-5-3 11	7	73
- Silt content increased by 1.52 m depth	2	SS 3	50	3-2-2-1 4		72
- Grey by 2.21 m depth		SS 4	42	0-0-0-0 0	23	
2.79m [71.25m]					34	
Firm, grey **SILTY CLAY**	3	SS 5	100	P	43	71
3.35m [70.69m]						
Grey **SILTY CLAY** to **CLAYEY SILT** 3.73m [70.31m]					30	
Very loose to loose, grey **SILTY SAND** to **SANDY SILT**	4	SS 6	25	P	21	70
- Compact by 5.03 m depth	5	SS 7	42	1-2-2-6 4	18	69
- 25 mm gravel seam at 5.64 m depth		SS 8	33	5-4-7-5 11	19	
5.87m [68.17m]					14	
Firm to stiff, grey **SILTY CLAY**, some grave	6					68
6.30m [67.74m]		SS 9	87	4-5-4-3 9	13	
GLACIAL TILL: Stiff to very stiff, grey clayey silt, trace gravel, with cobbles and boulders	7	SS 10	25	2-4-3-3 7	19	67
	8	SS 11	17	2-4-4-10 8	12	66
		SS 12		6-5-6-6 11	21	
9.07m [64.97m]	9					65
GLACIAL TILL: Hard, grey clayey silt, with gravel, cobbles and boulders		SS 13	75	14-26-40-50 66	10	
- Rock fragments below 9.45 m depth	10	SS 14				
9.83m [64.21m]						

Legend: ■ PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80; △ REMOULDED SHEAR STRENGTH (kPa); ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80; PL (%) WATER CONTENT (%) LL (%) 20 40 60 80

MONITORING WELL CONSTRUCTION: 3.60 m 2025-09-18; 121

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

1101 Baxter Road, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 361008.85 **NORTHING:** 5023811.94 **ELEVATION:** 74.04

PROJECT: Proposed Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: **DATE:** August 25, 2025

FILE NO. : PG7639

HOLE NO. : BH 1-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
9.85m [64.21m]									
GLACIAL TILL: Dense, grey silty sand, with gravel, cobbles and boulders		10	SS 15	54	24-20-21-25	15			64
10.36m [63.68m]			SS 14	0	41				
BOULDER 10.85m [63.19m]					50-/-/-/ 50/0.03				
BEDROCK: Good quality, grey limestone - Vertical fragment from 11.00 m to 11.51 m depth		11	RC 1	73	RQD 86			11.13m	63
		12	RC 2	100	RQD 87				62
12.65m [61.39m]								12.65m	
End of Borehole		13							61
(GWL at 3.60 m depth - September 18, 2025)		14							60
		15							59
		16							58
		17							57
		18							56
		19							55
		20							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

1101 Baxter Road, Ottawa, Ontario

PATERSON GROUP

COORD. SYS.: MTM ZONE 9 **EASTING:** 361119.62 **NORTHING:** 5023970.08 **ELEVATION:** 74.06

PROJECT: Proposed Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: **DATE:** August 25, 2025

FILE NO. : PG7639

HOLE NO. : BH 2-25

SAMPLE DESCRIPTION (GROUND SURFACE)	DEPTH (m)	TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	ELEVATION (m)
ASPHALT 0.05m [74.01m]		AU 1			16	74
FILL: Brown silty clay, some gravel, sand and crushed stone 0.69m [73.37m]						
Very loose to loose, brown silty sand	1	SS 2	8	1-1-2-4 3	9	73
	2	SS 3	42	3-5-3-6 8	17	72
		SS 4	0	5-10-9-5 19		
2.97m [71.09m]	3					71
Loose, brown **SILTY SAND** to **SANDY SILT**		SS 5	79	2-3-5-4 8	32	
3.73m [70.33m]						
Firm, grey **SILTY CLAY** to **CLAYEY SILT** 3.96m [70.10m]	4	SS 6	67	1-4-6-2 10		70
Compact, grey **SILTY SAND** to **SANDY SILT** 4.50m [69.56m]						
Firm, grey **SILTY CLAY** to **CLAYEY SILT** 4.88m [69.18m]	5	SS 7	92	1-1-1-1 2	40 28	69
Very loose, grey **SILTY SAND** to **SANDY SILT**, trace clay 5.64m [68.42m]		SS 8	92	2-2-2-3 4	26 32	
Stiff to very stiff, grey **SILTY CLAY** to **CLAYEY SILT**	6	SS 9	83	0-0-2-2 2	25	68
	7	SS 10	100	P	30	67
7.54m [66.52m]						
Very loose, grey **SILTY SAND** to **SANDY SILT**	8	SS 11	92	1-1-1-3 2	24	66
8.31m [65.75m]						
Stiff, grey **CLAYEY SILT**, trace sand	9	SS 12	83	1-1-3-1 4	22	65
9.45m [64.61m]						
GLACIAL TILL: Very stiff, grey **CLAYEY SILT**, with gravel, cobbles and boulders	10	SS 13	54	3-2-28-50 30	12	
		RC 1	86	RQD 33		

SAMPLE

■ PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80

△ REMOULDED SHEAR STRENGTH (kPa)

▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80

PL (%) WATER CONTENT (%) LL (%) 20 40 60 80

MONITORING WELL CONSTRUCTION

5.02 m 2025-09-18

121

7.42m

8.94m

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

1101 Baxter Road, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 361119.62 **NORTHING:** 5023970.08 **ELEVATION:** 74.06

PROJECT: Proposed Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: **DATE:** August 25, 2025

FILE NO. : PG7639

HOLE NO. : BH 2-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) △ / UNDRAINED SHEAR STRENGTH (kPa) ▲ 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
- Rock fragments below 9.60 m depth (9.65m [64.41m])		10	RC 1						64
BEDROCK: Poor to good quality, grey limestone		11	RC 2	100	RQD 97				63
(11.99m [62.07m])		12							62
End of Borehole									
(GWL at 5.02 m depth - September 18, 2025)		13							61
		14							60
		15							59
		16							58
		17							57
		18							56
		19							55
		20							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

1101 Baxter Road, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 361037.40 **NORTHING:** 5023925.02 **ELEVATION:** 74.65

PROJECT: Proposed Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: **DATE:** August 26, 2025

FILE NO. : PG7639

HOLE NO. : BH 3-25

SAMPLE DESCRIPTION (GROUND SURFACE)	DEPTH (m)	TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	ELEVATION (m)
TOPSOIL and organics (0.10m [74.55m])		AU 1			4	
Loose to compact, brown **SILTY SAND**, trace organics	1	SS 2	33	3-4-2-3 6	9	74
	2	SS 3	58	7-13-18-26 31	12	73
		SS 4	50	8-11-16-19 27	11	72
- Grey by 3.05 m depth	3	SS 5	67	8-15-8-14 23	17	71
(4.50m [70.15m])	4	SS 3	33	10-11-5-5 16	20	
Very stiff, grey **SILTY CLAY** to **CLAYEY SILT**		SS 7	100	1-1-1-1 2	30	70
	5	SS 8	83	P	33	69
- Sand content increasing with depth (6.78m [67.87m])	6	SS 9	100	P	25	68
Compact, grey **SILTY SAND**, trace clay	7	SS 10	83	8-12-16-15 28	18	
- Silt content increasing with depth (8.31m [66.34m])	8	SS 11	75	2-7-7-3 14	21	67
Very stiff, grey **CLAYEY SILT** to **SILTY CLAY**, trace gravel and sand	9	SS 12	71	4-3-3-7 6	21	66
	10	SS 13	62	1-5-3-3 8	24	65
		SS 14				

Legend: ■ PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80; △ REMOULDED SHEAR STRENGTH (kPa); ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80; PL (%) WATER CONTENT (%) LL (%) 20 40 60 80

Monitoring well construction: 5.00m, 6.53m

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

1101 Baxter Road, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 361037.40 **NORTHING:** 5023925.02 **ELEVATION:** 74.65

PROJECT: Proposed Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: **DATE:** August 26, 2025

FILE NO. : PG7639

HOLE NO. : BH 3-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) △ / UNDRAINED SHEAR STRENGTH (kPa) ▲ 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
		10	SS 14	54	2-3-2-1 5	26			64
10.97m [63.68m]									
GLACIAL TILL: Dense, grey **CLAYEY SILT** to **SILTY CLAY**, with gravel, cobbles, boulders and sand - Sand content increasing with depth		11	SS 15	50	4-2-2-4 4	10			
			SS 16	100	1-2-6-50 8	11			63
11.99m [62.66m]		12							
BEDROCK: Excellent quality, grey limestone			RC 1	100	RQD 95				62
		13							
13.51m [61.14m]									
End of Borehole									61
		14							
									60
		15							
									59
		16							
									58
		17							
									57
		18							
									56
		19							
									55
		20							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

1101 Baxter Road, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 361108.67 **NORTHING:** 5023988.16 **ELEVATION:** 73.64

PROJECT: Proposed Development

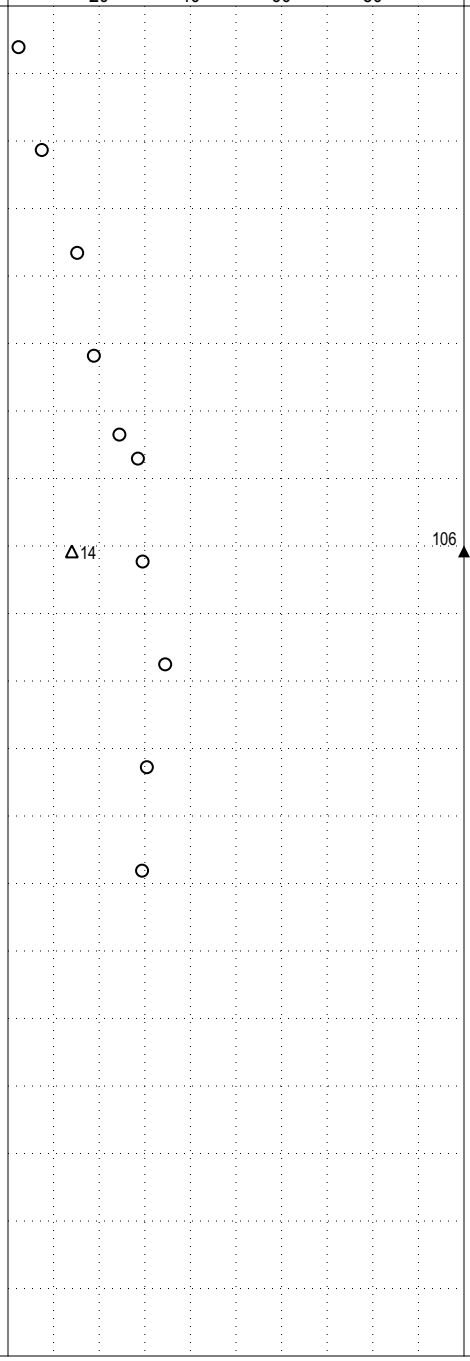
ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: **DATE:** August 26, 2025

FILE NO. : PG7639

HOLE NO. : BH 4-25

SAMPLE DESCRIPTION (GROUND SURFACE)	STRATA PLOT	DEPTH (m)	TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	ELEVATION (m)
ASPHALT 0.08m [73.56m]							
FILL: Brown silty sand, with gravel 0.51m [73.12m]							
Loose to compact, brown **SILTY SAND**		1	AU 1			2	73
			SS 2	50	2-4-4-4 8	7	
		2	SS 3	50	2-4-4-6 8	15	72
			SS 4	67	4-6-8-9 14	19	71
- Grey by 2.97 m depth		3					
3.28m [70.36m]			SS 5	75	2-8-5-3 13	24 28	
Very stiff, grey **SILTY CLAY** to **CLAYEY SILT**							70
- Silt content increasing with depth		4	SS 6	83	P	30	
4.50m [69.14m]							
Loose, grey **SILTY SAND** to **SANDY SILT**, trace clay							69
		5	SS 7	75	1-2-3-2 5	34	
5.26m [68.38m]							
Stiff, grey **SILTY CLAY** to **CLAYEY SILT**, trace sand							
- Sand seam from 5.64 m to 5.79 m depth		6	SS 8	100	1-1-1-1 2	30	68
			SS 9	100	1-1-1-1 2	29	67
6.71m [66.93m]							
End of Borehole		7					66
		8					65
		9					64
		10					



PIEZOMETER CONSTRUCTION

DISCLAIMER: THE DATA PRESENTED IN THIS SHEET IS THE PROPERTY OF PATERSON GROUP AND THE CLIENT FOR WHOM IT WAS PRODUCED. THIS SHEET SHOULD BE READ IN CONJUNCTION WITH ITS CORRESPONDING REPORT. PATERSON GROUP IS NOT RESPONSIBLE FOR THE UNAUTHORIZED USE OF THIS DATA.

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

1101 Baxter Road, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 360999.73 **NORTHING:** 5023800.59 **ELEVATION:** 74.11

PROJECT: Proposed Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: **DATE:** August 26, 2025

FILE NO. : PG7639

HOLE NO. : BH 5-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) △ / UNDRAINED SHEAR STRENGTH (kPa) ▲ 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									74
ASPHALT 0.06m [74.05m]			AU 1			2			
FILL: Compact, brown silty sand, with gravel 0.46m [73.65m]									
Loose to compact, brown **SILTY SAND** to **SANDY SILT** - Grey by 1.27 m depth		1	SS 2	33	6-5-4-4 9	21			73
		2	SS 3	50	2-3-4-4 7	21			72
			SS 4	50	2-4-6-6 10	23			
		3	SS 5	58	2-5-5-4 10	23			71
3.73m [70.38m]									
Very stiff, grey **SILTY CLAY**, with gravel and sand 4.50m [69.61m]		4	SS 6	25	2-8-11-8 19	9			70
Loose to compact, grey **SILTY SAND** to **SANDY SILT**		5	SS 7	67	2-3-5-3 8	25			69
			SS 8	4	7-10-8-10 18	20			
		6							68
6.71m [67.40m]			SS 9	58	5-8-8-7 16	9			
End of Borehole		7							67
		8							66
		9							65
		10							

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patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment
1101 Baxter Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located between entrances for 1101 Baxter Road. Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 55 Power Auger **DATE** January 31, 2017

FILE NO. PE3956

HOLE NO. BH 1

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.31
Asphaltic concrete 0.08							
FILL: Crushed stone 0.23							
FILL: Brown sand		SS	1	67	11	1	98.31
1.83		SS	2	75	16	2	97.31
		SS	3	67	15	3	96.31
Compact, brown **SILTY SAND,** trace clay		SS	4	67	12	4	95.31
- grey by 3.7m depth		SS	5	75	10	5	94.31
		SS	6	67	14	6	93.31
		SS	7	75	15		
6.10							
End of Borehole							
(GWL @ 2.29m - Feb. 6, 2017)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment
1101 Baxter Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located between entrances for 1101 Baxter Road. Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 55 Power Auger **DATE** January 31, 2017

FILE NO. PE3956

HOLE NO. BH 2

SOIL DESCRIPTION	Depth (m)	Elev. (m)	Sample Type	Number	% Recovery	N Value or RQD
GROUND SURFACE	0	100.10				
Asphaltic concrete	0.08					
FILL: Crushed stone	0.30					
FILL: Brown sand		1 / 99.10	SS	1	58	7
		2 / 98.10	SS	2	67	8
	2.69		SS	3	92	8
Loose to very loose, brown **SILTY SAND,** trace clay		3 / 97.10	SS	4	100	2
		4 / 96.10	SS	5	83	4
- grey by 4.4m depth			SS	6	67	W
	5.18	5 / 95.10				
End of Borehole						
(GWL @ 3.19m - Feb. 6, 2017)						

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.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment
1101 Baxter Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located between entrances for 1101 Baxter Road. Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 55 Power Auger **DATE** January 31, 2017

FILE NO. PE3956

HOLE NO. BH 3

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector ● Volatile Organic Rdg. (ppm) ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.08									
FILL: Crushed stone 0.25									
FILL: Brown sand		SS	1	67	11	1	98.86		
		SS	2	58	3	2	97.86		
		SS	3	67	4				
2.97									
Very loose, brown **SILTY SAND**		SS	4	67	2	3	96.86		
- grey by 4.4m depth		SS	5	75	1	4	95.86		
		SS	6	50	W	5	94.86		
5.18									
End of Borehole									

Lower Explosive Limit % scale: 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

Phase I - II Environmental Site Assessment
1101 Baxter Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located between entrances for 1101 Baxter Road. Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 55 Power Auger **DATE** January 31, 2017

FILE NO. PE3956

HOLE NO. BH 4

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.08									
FILL: Crushed stone 0.30									
FILL: Brown sand		SS	1	58	6	1	98.21		
		SS	2	75	7	2	97.21		
2.13									
Very loose, brown **SILTY SAND,** trace clay		SS	3	100	3	3	96.21		
		SS	4	67	1	4	95.21		
- grey by 4.4m depth		SS	5	75	1	5	94.21		
		SS	6	100	W				
5.18									
End of Borehole									

Lower Explosive Limit % scale: 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

Phase I - II Environmental Site Assessment
1101 Baxter Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located between entrances for 1101 Baxter Road. Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 55 Power Auger **DATE** January 31, 2017

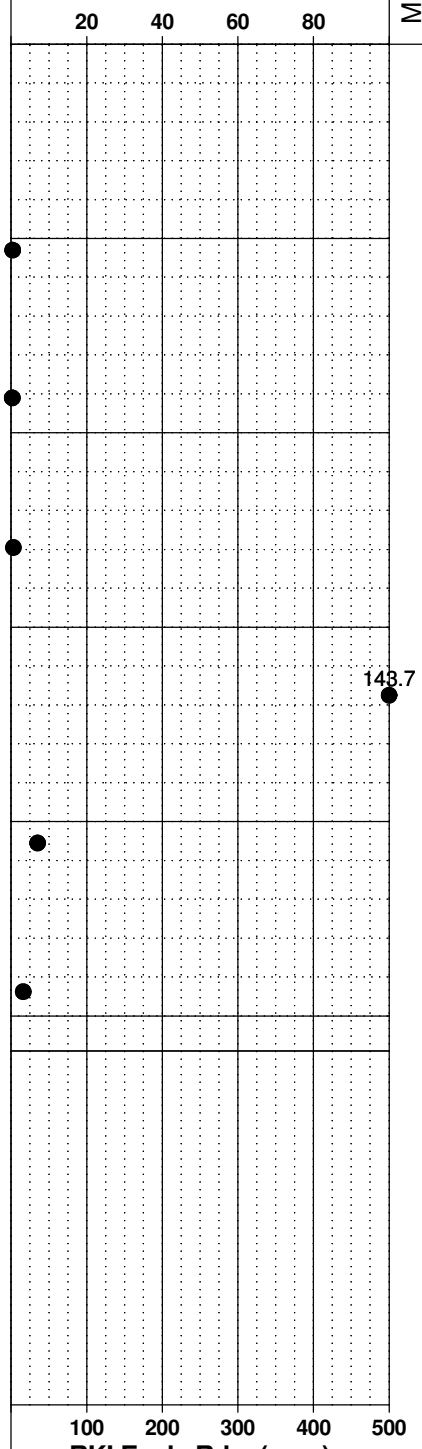
FILE NO. PE3956

HOLE NO. BH 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.92
Asphaltic concrete 0.08							
FILL; Crushed stone 0.30							
		SS	1	67	35	1	98.92
FILL: Brown sand		SS	2	58	16	2	97.92
		SS	3	58	11	3	96.92
		SS	4	58	4		
3.66							
		SS	5	25	5	4	95.92
Loose, grey **SAND,** trace silt							
		SS	6	50	5	5	94.92
5.18							
End of Borehole							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**



▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment
1101 Baxter Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located between entrances for 1101 Baxter Road. Assumed elevation = 100.00m.

REMARKS

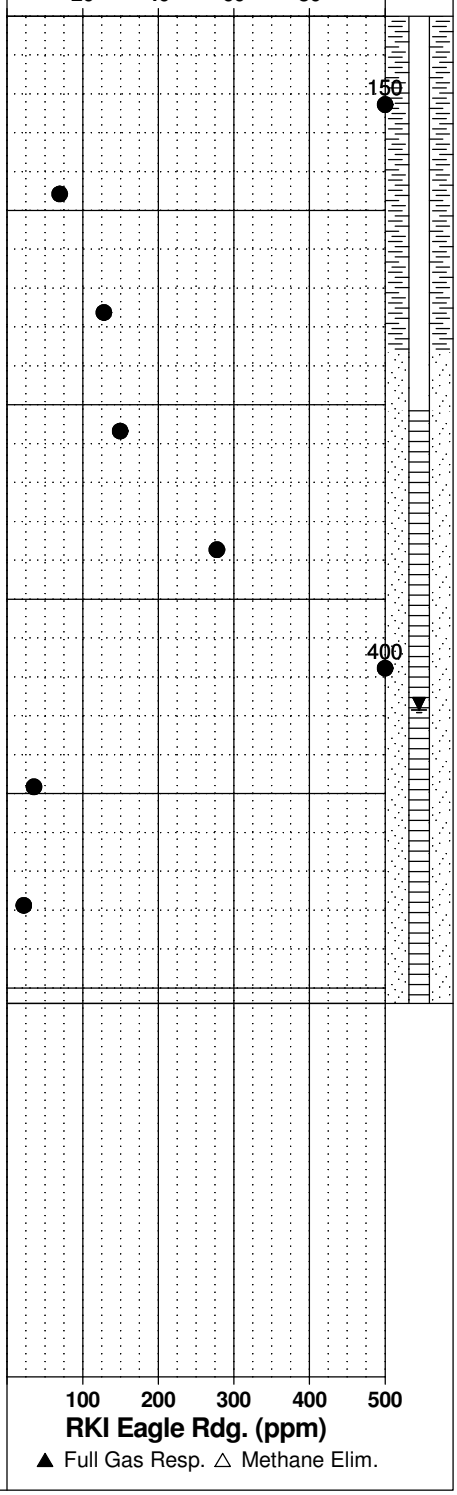
BORINGS BY Portable Drill **DATE** February 13, 2017

FILE NO. PE3956

HOLE NO. BH 6

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.25
Concrete floor 0.28							
FILL: Crushed stone, some silty sand, trace styrofoam		SS	1	83			
		SS	2	38		1	99.25
1.37							
Brown **SILTY SAND,** trace gravel		SS	3	75			
- trace clay by 2.4m depth		SS	4	75		2	98.25
		SS	5	38		3	97.25
3.56		SS	6	75			
Grey **CLAYEY SILT,** trace sand and gravel 4.27		SS	7	71		4	96.25
Grey **SILTY SAND** 5.08		SS	8	75		5	95.25
End of Borehole							
(GWL @ 3.57m - Feb. 6, 2017)							

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



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase I - II Environmental Site Assessment
1101 Baxter Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located between entrances for 1101 Baxter Road. Assumed elevation = 100.00m.

REMARKS

BORINGS BY Portable Drill **DATE** February 13, 2017

FILE NO. PE3956

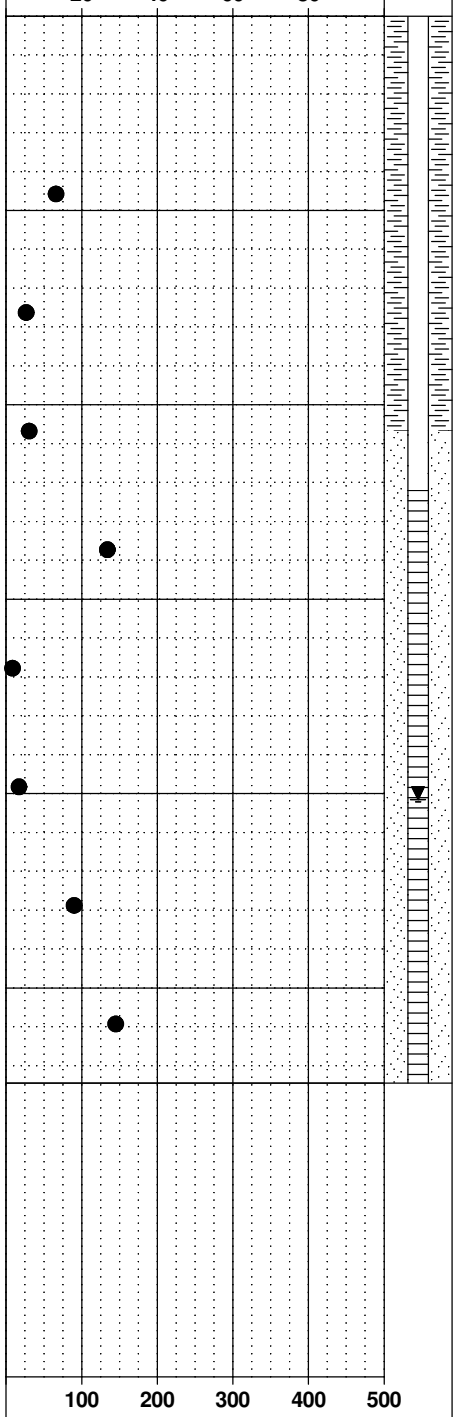
HOLE NO. BH 7

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.29
Reinforced concrete slab (0.51)							
FILL: Brown silty sand, trace concrete and gravel (1.22)		SS	1	71		1	99.29
Brown **FINE SAND,** with silt, some gravel		SS	2	58		2	98.29
		SS	3	83			
		SS	4	33		3	97.29
		SS	5	100			
Grey **SILTY SAND,** some gravel, trace clay (3.66)		SS	6	25		4	96.29
		SS	7	100		5	95.29
		SS	8	100			
End of Borehole (5.49)							
(GWL @ 4.03m - Feb. 6, 2017)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**



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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

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

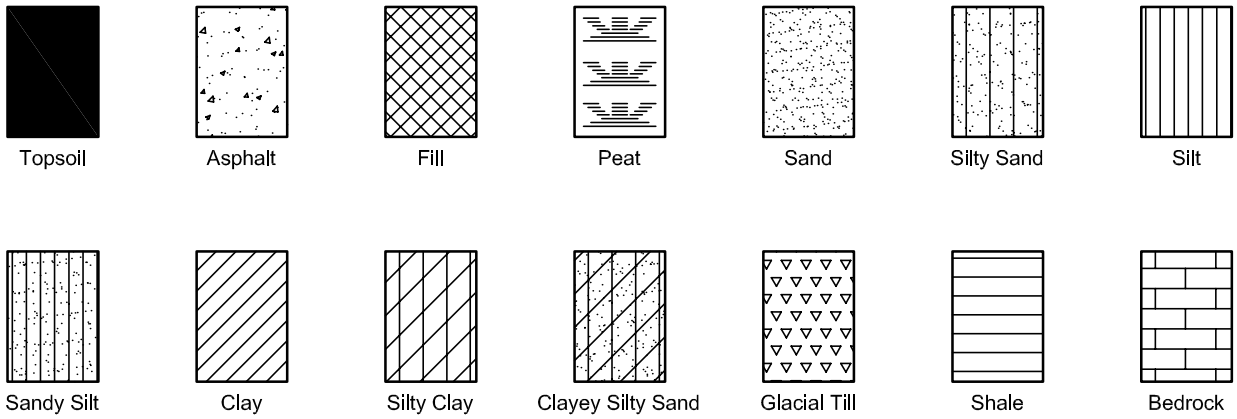
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

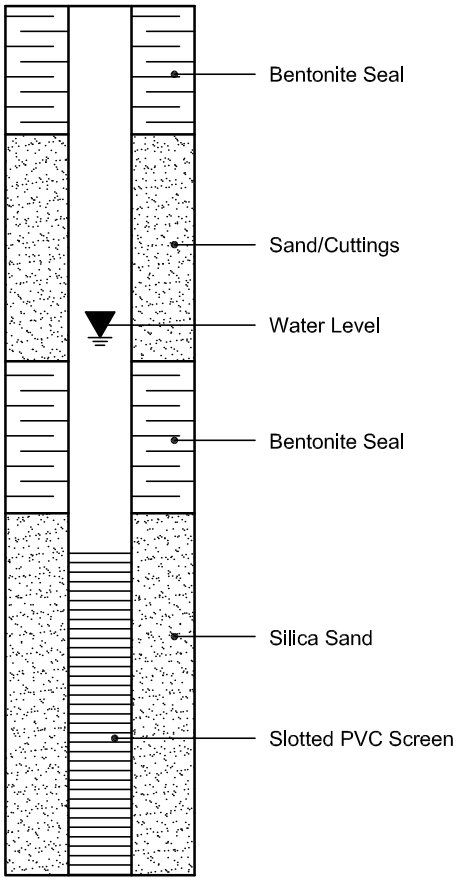
SYMBOLS AND TERMS (continued)

STRATA PLOT

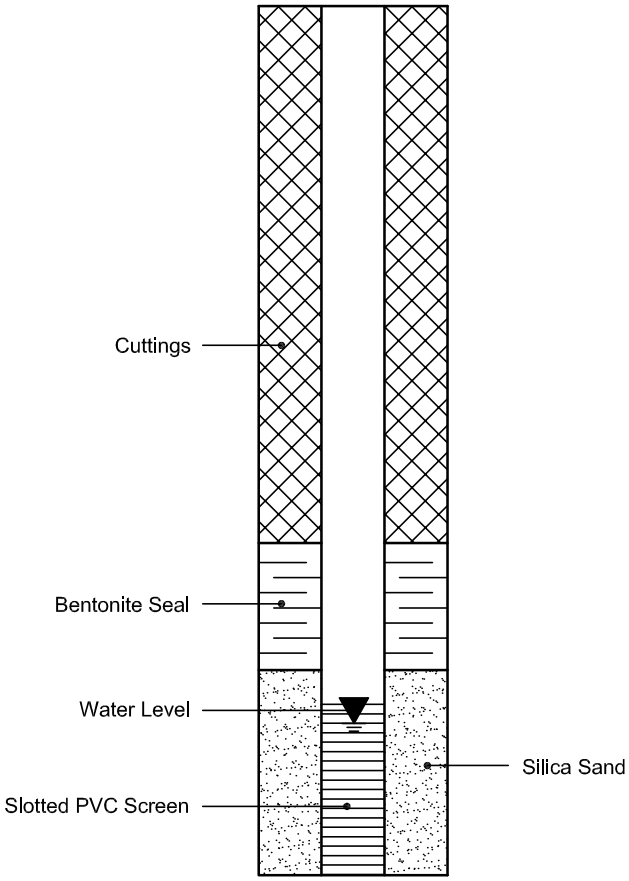


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Morrison Hershfield
2440 Don Reid Drive
Ottawa, ON K1H 1E1
Telephone: 613-739-2910

RECORD OF BOREHOLE BS-1 (ENVIRONMENTAL)

CLIENT Regional Group
PROJECT NAME 1101 Baxter Road Limited Phase II ESA
PROJECT NUMBER 180564700
PROJECT LOCATION 1101 Baxter Road, Ottawa, ON
DATE STARTED 10/15/18 **COMPLETED** 10/15/18
MTM Zone9 361020.12m E 5023750.97m N **ELEVATION**
DRILLING CONTRACTOR Strata Drilling Group
GROUNDWATER LEVELS:
METHOD Direct Push - DT35 Dual Tube Sampling System
STATIC WATER LEVEL 2.21 m below ground surface
LOGGED BY MD **CHECKED BY** CG
MEASUREMENT DATE 10/17/2018
DRILLING SUPERVISED BY: MORRISON HERSHFIELD

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER	Headspace Organic Vapour Concentrations ▲ IBL (ppm) 500 1000 1500 2000	Headspace Combustible Vapour Concentrations ✠ HEX (ppm) 2500 5000 7500 / ◕ HEX (%LEL) 25 50 75	ANALYSES
0.2	ASPHALTIC CONCRETE				
0.3	FILL - (SP) SAND; light brown; moist				
	(ML) SANDY SILT, trace gravel; brownish grey; moist to wet	SA1	1	0	
1		SA2	0	0	
2		SA3	0	0	
2.4	(SM/ML) SILTY SAND to SANDY SILT, trace gravel; grey; wet	SA4	0	0	
3		SA5	0	0	
4		SA6	1	0	
5		SA7	1	0	
6		SA8	1	0	
7		SA9	0	0	
8		SA10	1	0	PHC, VOC
8.2	(SM) SILTY SAND, some gravel, trace clay (GLACIAL TILL); grey; wet	SA11	0	120	
9		SA12	0	10	
10					

WELL DIAGRAM: Flush Mount Casing; Bentonite Seal; Silica Sand #1; 50mm Diam. PVC #10 Slot Screen; Silica Sand #1; Cave

(Continued Next Page)

ENVIRONMENTAL BH PLOTS BAXTER ROAD PROJECT FILE.GPJ GINT STD CANADA LAB.GDT 10/22/18

Morrison Hershfield
2440 Don Reid Drive
Ottawa, ON K1H 1E1
Telephone: 613-739-2910

RECORD OF BOREHOLE BS-1 (ENVIRONMENTAL)

CLIENT Regional Group
PROJECT NAME 1101 Baxter Road Limited Phase II ESA
PROJECT NUMBER 180564700
PROJECT LOCATION 1101 Baxter Road, Ottawa, ON

DEPTH (m)	GRAPHIC LOG	SOIL DESCRIPTION	SAMPLE NUMBER	Headspace Organic Vapour Concentrations ▲ IBL (ppm) 500 1000 1500 2000	Headspace Combustible Vapour Concentrations ✠ HEX (ppm) 2500 5000 7500 ◐ HEX (%LEL) 25 50 75	ANALYSES	WELL DIAGRAM
10		(SM) SILTY SAND, some gravel, trace clay (GLACIAL TILL); grey; wet *(continued)*	SA13	0	0		
		10.7 End of Borehole at 10.7m.					

*Density of material increased around 6.0m. Drillers had difficulty advancing outer casing and switched from a dual tube sampling system to a macro-core sampling system.

**Soil from sample SA11 was submit for VOC and benzo(a)pyrene TCLP analysis.

Morrison Hershfield
2440 Don Reid Drive
Ottawa, ON K1H 1E1
Telephone: 613-739-2910

RECORD OF BOREHOLE BS-2 (ENVIRONMENTAL)

CLIENT Regional Group
PROJECT NAME 1101 Baxter Road Limited Phase II ESA
PROJECT NUMBER 180564700
PROJECT LOCATION 1101 Baxter Road, Ottawa, ON
DATE STARTED 10/15/18 **COMPLETED** 10/15/18
MTM Zone9 361068.82m E 5023834.77m N **ELEVATION**
DRILLING CONTRACTOR Strata Drilling Group
GROUNDWATER LEVELS:
METHOD Direct Push - DT35 Dual Tube Sampling System
STATIC WATER LEVEL ---
LOGGED BY MD **CHECKED BY** CG
MEASUREMENT DATE
DRILLING SUPERVISED BY: MORRISON HERSHFIELD

DEPTH (m)	GRAPHIC LOG	SOIL DESCRIPTION	SAMPLE NUMBER	Headspace Organic Vapour Concentrations ▲ IBL (ppm) 500 1000 1500 2000	Headspace Combustible Vapour Concentrations ✠ HEX (ppm) 2500 5000 7500 / ◕ HEX (%LEL) 25 50 75	ANALYSES	WELL DIAGRAM
0		0.1 ASPHALTIC CONCRETE					
		0.3 FILL - (GP) SANDY GRAVEL; greyish brown; moist					
		FILL - (SP) SAND, some silt; light brown; moist	SA1	0	0		
1							
2			SA2	0	0		
			SA3	0	0	PHC, VOC	
3		2.9					
		3.1 FILL - (SP) SAND; black staining from decaying organic matter					
		FILL - 1 m long piece of decaying wood in liner and clogging cutting shoe					
4		4.0					
		(SM/ML) SILTY SAND to SANDY SILT, trace clay; grey; wet	SA4	0	0		
5			SA5	0	0		
6			SA6	0	10		
7			SA7	0	0		
		7.6					

End of Borehole at 7.6 m.

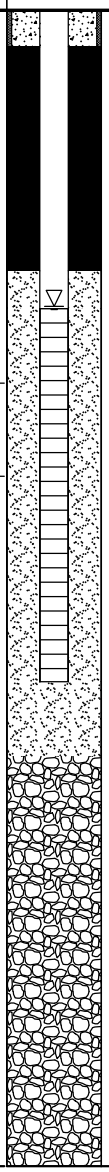
Morrison Hershfield
2440 Don Reid Drive
Ottawa, ON K1H 1E1
Telephone: 613-739-2910

RECORD OF BOREHOLE BS-3 (ENVIRONMENTAL)

CLIENT Regional Group
PROJECT NAME 1101 Baxter Road Limited Phase II ESA
PROJECT NUMBER 180564700
PROJECT LOCATION 1101 Baxter Road, Ottawa, ON
DATE STARTED 10/15/18 **COMPLETED** 10/15/18
MTM Zone9 361160.25m E 5023917.43m N **ELEVATION**
DRILLING CONTRACTOR Strata Drilling Group
GROUNDWATER LEVELS:
METHOD Direct Push - DT35 Dual Tube Sampling System
STATIC WATER LEVEL 2.42 m below ground surface
LOGGED BY MD **CHECKED BY** CG
MEASUREMENT DATE 10/17/2018
DRILLING SUPERVISED BY: MORRISON HERSHFIELD

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER	Headspace Organic Vapour Concentrations ▲ IBL (ppm)	Headspace Combustible Vapour Concentrations ✖ HEX (ppm)	◔ HEX (%LEL)	ANALYSES
0			500 1000 1500 2000	2500 5000 7500	25 50 75	
0.2	ASPHALTIC CONCRETE					
	FILL - (GP) SANDY GRAVEL, some silt; angular; greyish brown; moist	SA1	5	320		
0.8	FILL - (SP) SAND, trace gravel; light brown; moist	SA2	3	0		
1.5	(SM) SILTY SAND; brown; moist	SA3	3	0		
2.3	(SM/ML) SILTY SAND to SANDY SILT; grey; wet	SA4	4	0		
		SA5	1	0		Metals, PHC, VOC
	*Soil from sample SA4 was submit for metals, inorganics and benzo(a)pyrene TCLP analysis.	SA6	0	0		
		SA7	1	0		
		SA8	4	0		
		SA9	0	0		
		SA10	0	0		
		SA11	4	0		
9.1	(SM) SILTY SAND, trace gravel, trace clay (GLACIAL TILL); grey; wet	SA12	3	0		
9.5	End of Borehole at 9.45 m due to bedrock.					

WELL DIAGRAM



ENVIRONMENTAL BH PLOTS BAXTER ROAD PROJECT FILE.GPJ GINT STD CANADA LAB.GDT 10/22/18

Morrison Hershfield
2440 Don Reid Drive
Ottawa, ON K1H 1E1
Telephone: 613-739-2910

RECORD OF BOREHOLE BS-4 (ENVIRONMENTAL)

CLIENT Regional Group
PROJECT NAME 1101 Baxter Road Limited Phase II ESA
PROJECT NUMBER 180564700
PROJECT LOCATION 1101 Baxter Road, Ottawa, ON
DATE STARTED 10/19/18 **COMPLETED** 10/19/18
MTM Zone9 361080.23m E 5023876.72m N **ELEVATION**
DRILLING CONTRACTOR Strata Drilling Group
GROUNDWATER LEVELS:
METHOD Direct Push - Macro Core Sampling System
STATIC WATER LEVEL ---
LOGGED BY MD **CHECKED BY** CG
MEASUREMENT DATE
DRILLING SUPERVISED BY: MORRISON HERSHFIELD

DEPTH (m)	GRAPHIC LOG	SOIL DESCRIPTION	SAMPLE NUMBER	Headspace Organic Vapour Concentrations ▲ IBL (ppm) 500 1000 1500 2000	Headspace Combustible Vapour Concentrations ✖ HEX (ppm) 2500 5000 7500 / ◔ HEX (%LEL) 25 50 75	ANALYSES	WELL DIAGRAM
0		REINFORCED CONCRETE					
0.5		FILL - (SP) SAND, trace gravel, trace silt; brown; moist	SA1	19	0		
1			SA2	26	0		
2			SA3	28	0		
2.5		(SM) SILTY SAND, trace clay; brown to dark brown; moist	SA4	38	0	Metals	
3			SA5	22	0		
3.8		(SM) SILTY SAND, trace clay; brownish grey to grey; wet	SA6	43	0	PHC, VOC, PAH	
4			SA7	38	0		
5			SA8	15	0		
5.8			SA9	11	0		
6		(ML) SILT, some clay; grey; wet					
6.1		End of Borehole at 6.1 m.					

ENVIRONMENTAL BH PLOTS BAXTER ROAD PROJECT FILE.GPJ GINT STD CANADA LAB.GDT 10/22/18

Morrison Hershfield
2440 Don Reid Drive
Ottawa, ON K1H 1E1
Telephone: 613-739-2910

RECORD OF BOREHOLE BS-5 (ENVIRONMENTAL)

CLIENT Regional Group
PROJECT NAME 1101 Baxter Road Limited Phase II ESA
PROJECT NUMBER 180564700
PROJECT LOCATION 1101 Baxter Road, Ottawa, ON
DATE STARTED 10/19/18 **COMPLETED** 10/19/18
MTM Zone9 361147.95m E 5023870.2m N **ELEVATION**
DRILLING CONTRACTOR Strata Drilling Group
GROUNDWATER LEVELS:
METHOD Direct Push - Macro Core Sampling System
STATIC WATER LEVEL ---
LOGGED BY MD **CHECKED BY** CG
MEASUREMENT DATE
DRILLING SUPERVISED BY: MORRISON HERSHFIELD

DEPTH (m)	GRAPHIC LOG	SOIL DESCRIPTION	SAMPLE NUMBER	Headspace Organic Vapour Concentrations ▲ IBL (ppm) 500 1000 1500 2000	Headspace Combustible Vapour Concentrations ✖ HEX (ppm) 2500 5000 7500 ◔ HEX (%LEL) 25 50 75	ANALYSES	WELL DIAGRAM
0							
		0.3 REINFORCED CONCRETE					
		0.6 FILL - (GP) SANDY GRAVEL, some silt; angular to subangular; light grey; moist	SA1	167	0		
		0.8 FILL - (SW) GRAVELLY SAND, trace silt; brown; moist					
1		FILL - (SM) SILTY SAND; light brown; moist	SA2	223	0		
			SA3	25	0		
2			SA4	49	0		
		2.7 FILL - (SM) SILTY SAND; dark grey; moist to wet; hydrocarbon odour; dark staining	SA5	308	530		
3			SA6	1144	3600	Metals, PAH, PHC, VOC	
		3.5 3.7 FILL - (MH) CLAYEY SILT; grey; w>PL; hydrocarbon odour; dark staining					
4		(SM) SILTY SAND; grey; wet; slight hydrocarbon odour	SA7	170	95		
			SA8	100	115		
5			SA9	177	165		
6		6.1	SA10	42	80	PHC, VOC	
		(ML) CLAYEY SILT; grey; wet; slight to trace hydrocarbon odour	SA11	27	0		
7			SA12	9	0		
		7.3					

End of Borehole at 7.3 m.

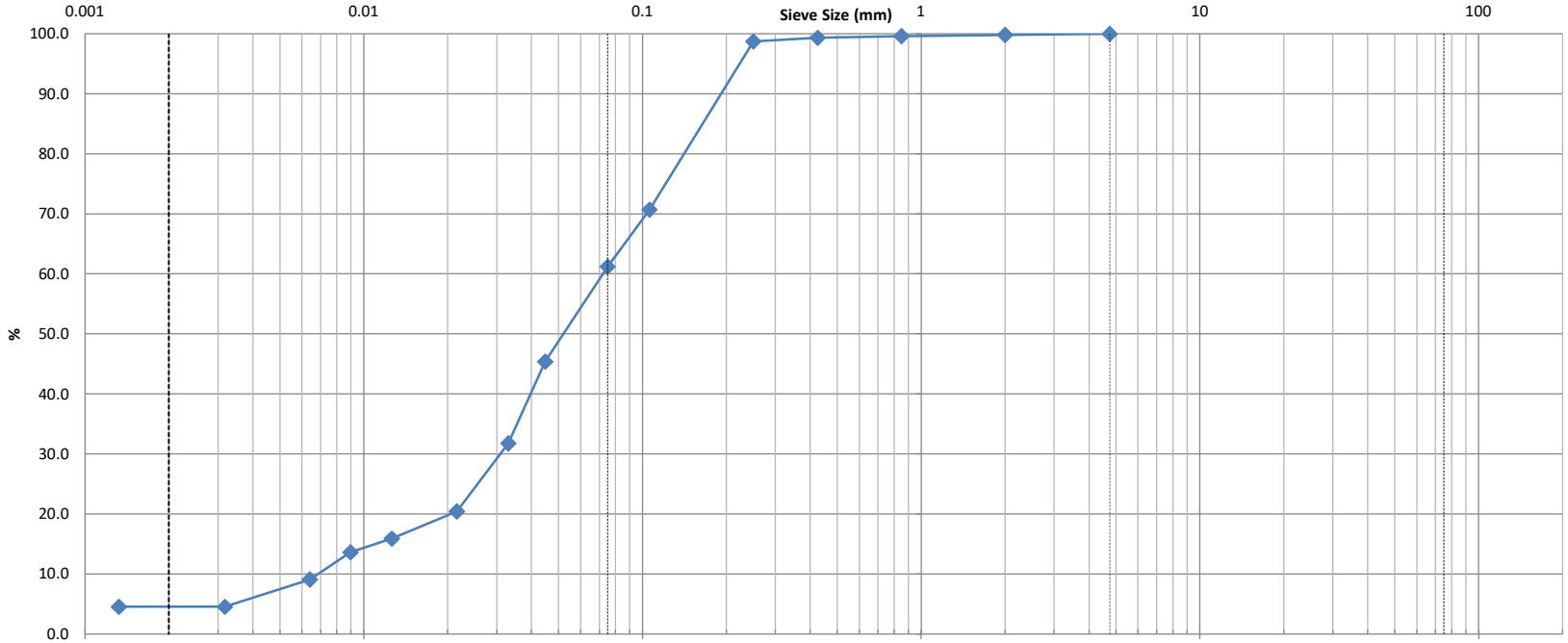
*A blind duplicate of sample SA10 was submitted to the lab under the ID SA21 for analysis of PHC and VOCs.

ENVIRONMENTAL BH PLOTS BAXTER ROAD PROJECT FILE.GPJ GINT STD CANADA LAB.GDT 10/22/18

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Regional Group	DEPTH:	15'-17'	FILE NO:	PG7639
CONTRACT NO.:		BH OR TP No.:	BH1-25	LAB NO:	62467
PROJECT:	1101 Baxter Rd.			DATE RECEIVED:	2-Sep-25
				DATE TESTED:	2-Sep-25
DATE SAMPLED:	25-Aug-25			DATE REPORTED:	9-Sep-25
SAMPLED BY:	A.A			TESTED BY:	C.M



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification	MC(%)	LL	PL	PI	Cc	Cu
		19.6%					

D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
				0.0	38.8	57.2	4.0

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	Regional Group	DEPTH:	15'-17'	FILE NO.:	PG7639
PROJECT:	1101 Baxter Rd.	BH OR TP No.:	BH1-25	DATE SAMPLED:	25-Aug-25
LAB No. :	62467	TESTED BY:	C.M	DATE RECEIVED:	02-Sep-25
SAMPLED BY:	A.A	DATE REPT'D:	09-Sep-25	DATE TESTED:	02-Sep-25

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
180.7	2.700

INITIAL WEIGHT	50.08	**HYGROSCOPIC MOISTURE**		
WEIGHT CORRECTED	43.51	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	22.05	AIR DRY	208.00	208.00
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	180.70	180.70
		CORRECTED	0.869	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5				
19				
13.2				
9.5				
4.75		**0.0**	0.0	**100.0**
2.0		**0.32**	0.2	**99.8**
Pan		**180.38**		
0.850		**0.09**	0.4	**99.6**
0.425		**0.24**	0.7	**99.3**
0.250		**0.55**	1.3	**98.7**
0.106		**14.60**	29.3	**70.7**
0.075		**19.37**	38.8	**61.2**
Pan		**22.05**		
SIEVE CHECK	0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	7:07	26.0	6.0	23.0	0.0448	45.5	**45.4**
2	7:08	20.0	6.0	23.0	0.0330	31.8	**31.8**
5	7:11	15.0	6.0	23.0	0.0215	20.5	**20.4**
15	7:21	13.0	6.0	23.0	0.0126	15.9	**15.9**
30	7:36	12.0	6.0	23.0	0.0090	13.6	**13.6**
60	8:06	10.0	6.0	23.0	0.0064	9.1	**9.1**
250	11:16	8.0	6.0	23.0	0.0032	4.5	**4.5**
1440	7:06	8.0	6.0	23.0	0.0013	4.5	**4.5**

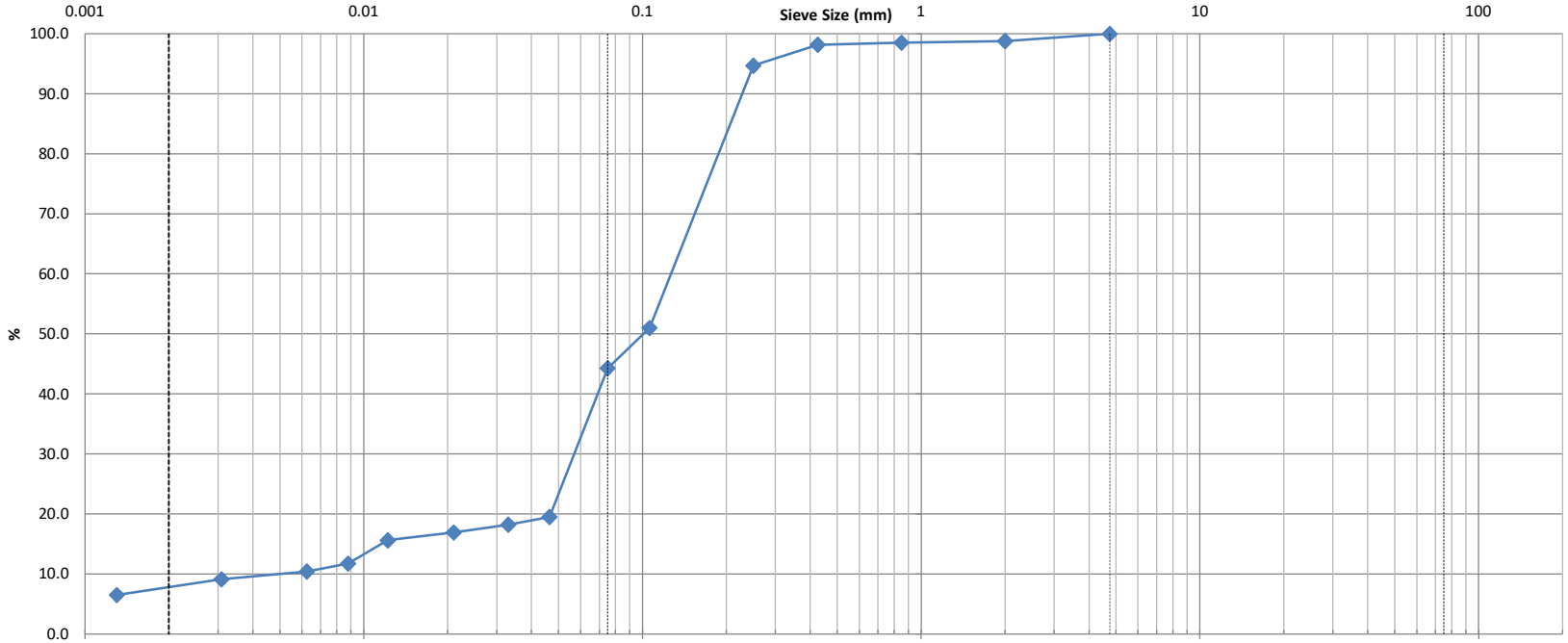
Moisture = 19.6%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Regional Group	DEPTH:	25'-27'	FILE NO:	PG7639
CONTRACT NO.:		BH OR TP No.:	BH2-25	LAB NO:	62468
PROJECT:	1101 Baxter Rd.			DATE RECEIVED:	2-Sep-25
				DATE TESTED:	2-Sep-25
DATE SAMPLED:	25-Aug-25			DATE REPORTED:	9-Sep-25
SAMPLED BY:	A.A			TESTED BY:	C.M



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification	MC(%)	LL	PL	PI	Cc	Cu
		24.8%					

D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
				0.0	55.7	36.3	8.0

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	Regional Group	DEPTH:	25'-27'	FILE NO.:	PG7639
PROJECT:	1101 Baxter Rd.	BH OR TP No.:	BH2-25	DATE SAMPLED:	25-Aug-25
LAB No. :	62468	TESTED BY:	C.M	DATE RECEIVED:	02-Sep-25
SAMPLED BY:	A.A	DATE REPT'D:	09-Sep-25	DATE TESTED:	02-Sep-25

09-Sep

SAMPLE MASS	SPECIFIC GRAVITY
247.5	2.700

INITIAL WEIGHT	50.07	**HYGROSCOPIC MOISTURE**		
WEIGHT CORRECTED	75.11	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	28.55	AIR DRY	165.00	165.00
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	247.50	247.50
		CORRECTED	1.500	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5				
19				
13.2				
9.5				
4.75		**0.0**	0.0	**100.0**
2.0		**2.99**	1.2	**98.8**
Pan		**244.50**		
0.850		**0.13**	1.5	**98.5**
0.425		**0.31**	1.8	**98.2**
0.250		**2.07**	5.3	**94.7**
0.106		**24.23**	49.0	**51.0**
0.075		**27.63**	55.7	**44.3**
Pan		**28.55**		
SIEVE CHECK	0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	7:10	21.0	6.0	23.0	0.0464	19.7	**19.5**
2	7:11	20.0	6.0	23.0	0.0330	18.4	**18.2**
5	7:14	19.0	6.0	23.0	0.0210	17.1	**16.9**
15	7:24	18.0	6.0	23.0	0.0122	15.8	**15.6**
30	7:39	15.0	6.0	23.0	0.0088	11.8	**11.7**
60	8:09	14.0	6.0	23.0	0.0063	10.5	**10.4**
250	11:19	13.0	6.0	23.0	0.0031	9.2	**9.1**
1440	7:09	11.0	6.0	23.0	0.0013	6.6	**6.5**

Moisture = 24.8%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PARACEL LABORATORIES LTD.

Order #: 2539168

Certificate of Analysis

Report Date: 25-Sep-2025

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 23-Sep-2025

Client PO:

Project Description: PG7639

	Client ID:	BH4-25/SS7/15' to 17'	-	-	-		
	Sample Date:	26-Aug-25 12:00	-	-	-	-	-
	Sample ID:	2539168-01	-	-	-		
	Matrix:	Soil	-	-	-		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	78.6	-	-	-	-	-
General Inorganics							
pH	0.05 pH Units	7.98	-	-	-	-	-
Resistivity	0.1 Ohm.m	25.6	-	-	-	-	-
Anions							
Chloride	5 ug/g	148	-	-	-	-	-
Sulphate	5 ug/g	70	-	-	-	-	-

APPENDIX 2

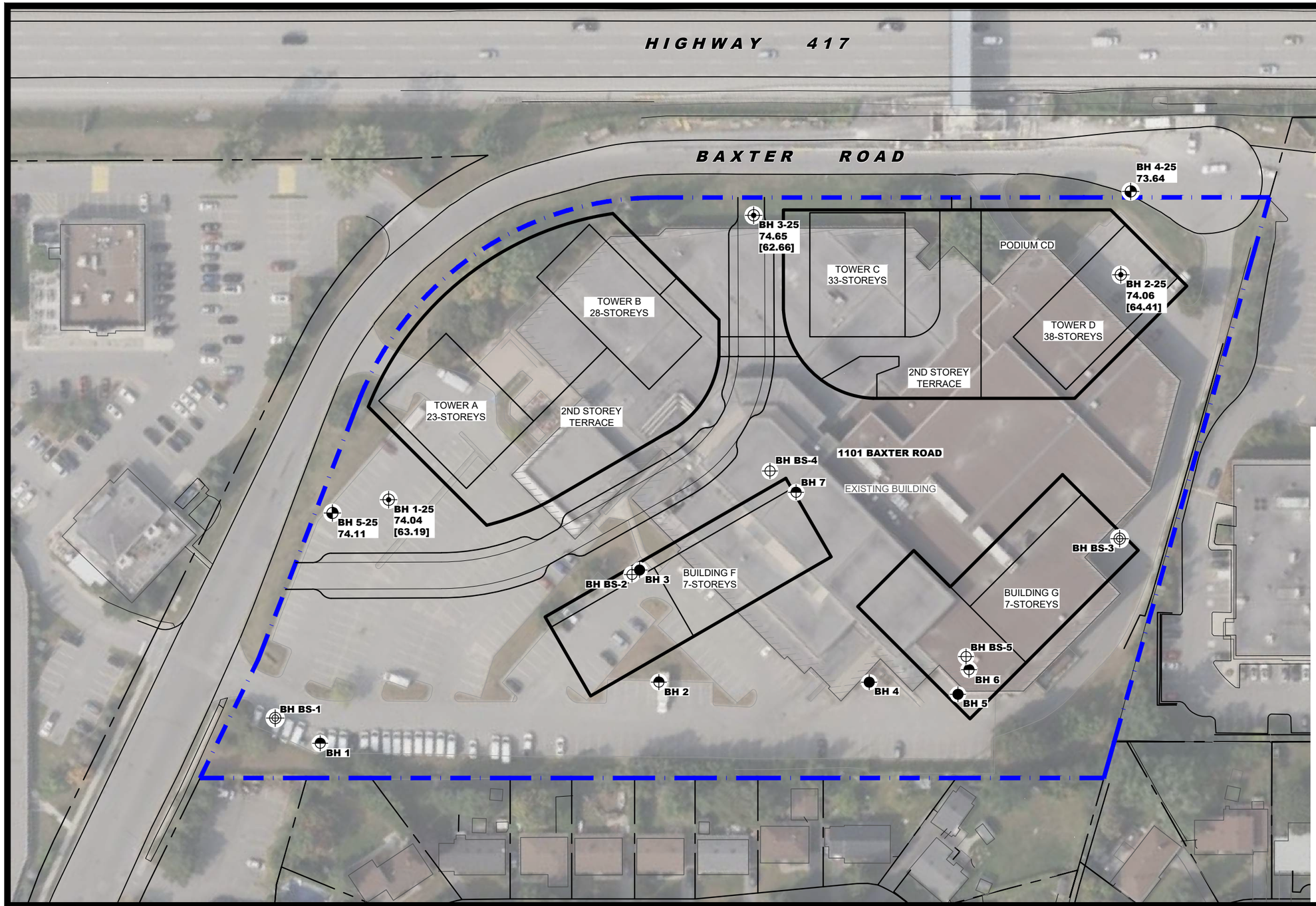
FIGURE 1 - KEY PLAN

DRAWING PG7639-1 – TEST HOLE LOCATION PLAN

FIGURE 1

KEY PLAN

PATERSON GROUP



LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION (BY PATERSON GROUP, JANUARY, 2017)
- BOREHOLE WITH MONITORING WELL LOCATION (BY PATERSON GROUP, JANUARY, 2017)
- BOREHOLE LOCATION (BY MORRISON HERSHFIELD, OCTOBER, 2018)
- BOREHOLE WITH MONITORING WELL LOCATION (BY MORRISON HERSHFIELD, OCTOBER, 2018)

74.11 GROUND SURFACE ELEVATION (m)

[64.41] BEDROCK SURFACE ELEVATION (m)

CONCEPTUAL PLAN PREPARED BY NEUF ARCHITECTES

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:1000

0 10 20 30 40 50m 75m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

REGIONAL GROUP
GEOTECHNICAL INVESTIGATION
PROPOSED DEVELOPMENT
1101 BAXTER ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:1000	Date: 09/2025
Drawn by: ZS	Report No.: PG7639-1
Checked by: OM	Dwg. No.: PG7639-1
Approved by: SD	Revision No.:

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11x17