FINAL

Geotechnical Investigation – Proposed Residential Development

25 Pickering Place, Ottawa, Ontario

Prepared for:

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1.0 INTRODUCTION AND SCOPE

Pinchin Ltd. (Pinchin) was retained by Colonnade BridgePort and Fiera Real Estate Core Fund LP. (Client) to conduct a Geotechnical Investigation and provide subsequent geotechnical design recommendations for the proposed residential development to be located at 25 Pickering Place, Ottawa, Ontario (Site). The Site location is shown on Figure 1.

Currently the Site is developed with multiple commercial/light industrial buildings. It is Pinchin's understanding that the Client intends to demolish the existing buildings and develop the Site with four Residential Apartment Buildings ranging from 20 to 30 stories in height, a Seniors Residence Building with a total of 12 stories in height, and a Hotel Building with a total of 9 stories in height. In addition, each proposed building will include 2 to 4 levels of underground parking. As such, for the purpose of developing a suitable scope of work, Pinchin has presumed that each building will possess two levels of underground parking. It is noted that should additional subsurface levels be added to the buildings; additional geotechnical investigation work may be required.

Pinchin's geotechnical comments and recommendations are based on the results of the Geotechnical Investigation and our understanding of the project scope.

The purpose of the Geotechnical Investigation was to delineate the subsurface conditions and soil engineering characteristics by advancing a total of seventeen (17) sampled boreholes (Boreholes BH1 to BH13 and BH17 to BH20), at the Site. The information gathered from the Geotechnical Investigation will allow Pinchin to provide geotechnical design recommendations for the proposed development. It is noted that the geotechnical field investigation was completed in conjunction with Pinchin's Phase II Environmental Site Assessment (ESA), and the information obtained from within the Phase II ESA boreholes (Boreholes MW14 to MW16) was also used in the development of this report.

Based on a desk top review and the results of the Geotechnical Investigation, the following geotechnical data and engineering design recommendations are provided herein:

- A detailed description of the soil, groundwater and bedrock conditions;
- Site preparation recommendations;
- Open cut excavations;
- Anticipated groundwater management;
- Site service trench design;
- Lateral earth pressure coefficients and unit densities;
- Foundation design recommendations including bedrock bearing resistances at Ultimate Limit States (ULS) and Serviceability Limit States (SLS) design;

- Potential total and differential settlements;
- Foundation frost protection and engineered fill specifications and installation;
- Seismic Site classification for seismic Site response;
- Concrete floor slab-on-grade support recommendations;
- Asphaltic concrete pavement structure design for parking areas and access roadways; and
- Potential construction concerns.

Abbreviations terminology and principle symbols commonly used throughout the report, borehole logs and appendices are enclosed in Appendix I.

2.0 SITE DESCTIPTION AND GEOLOGICAL SETTING

The Site is located on the south side of Tremblay Road, approximately 0.5 kilometres east of Riverside Drive in Ottawa, Ontario. The Site is currently developed with various commercial/light industrial buildings and asphalt surfaced parking areas and access roadways, with isolated areas of soft landscaping noted. The lands adjacent to the Site are developed with a mixture of single-family residential dwellings and multi-storey commercial office buildings.

Data obtained from the Ontario Geological Survey Maps, as published by the Ontario Ministry of Natural Resources, indicates that the Site is located on a fine textured glaciomarine deposit consisting of massive to well laminated silt and clay with minor sand and gravel. The underlying bedrock at this Site is of the Georgian Bay, Blue Mountain, and Billings Formations consisting of shale, limestone, dolostone, and siltstone (Ontario Geological Survey Map 1972, published 1978).

3.0 GEOTECHNICAL FIELD INVESTIGATION AND METHODOLOGY

Pinchin completed the field investigation at the Site from January 7 to 15, 2020 by advancing a total of seventeen (17) sampled boreholes (Boreholes BH1 to BH13 and BH17 to BH20) throughout the Site. The boreholes were advanced to sampled depths ranging from approximately 6.4 to 9.1 metres below existing ground surface (mbgs) where refusal was encountered on the underlying bedrock surface. As previously mentioned, the field investigation was completed in conjunction with Pinchin's Phase II ESA, and the information obtained from within the Phase II ESA boreholes (Boreholes MW14 to MW16) was also used in the development of this report. The approximate spatial locations of the boreholes advanced at the Site are shown on Figure 2.

The boreholes were advanced with the use of a Geoprobe 7822 DT direct push drill rig which was equipped with standard soil sampling equipment. Soil samples were collected at 0.76 m intervals using a 51 mm outside diameter (OD) split spoon barrel in conjunction with Standard Penetration Tests (SPT) “N” values (ASTM D1586). The SPT “N” values were used to assess the compactness condition of the non-cohesive soil.

Bedrock was proven in Boreholes BH7, BH8, and BH17 by core drilling with an NQ-size double tube diamond bit core barrel. The bedrock core specimens were measured in the field to determine the Rock Quality Designation (RQD) (ASTM 6032). The core samples were returned to our offices for further visual examination and testing.

Monitoring wells were installed within the Pinchin Phase II ESA boreholes to allow measurement of groundwater levels. The monitoring wells were constructed using flush-threaded 50 mm diameter Trilock pipe with 3.0-meter-long 10-slot well screens, delivered to the Site in pre-cleaned individually sealed plastic bags. The screen and riser pipes were not allowed to come into contact with the ground or drilling equipment prior to installation.

A completed well record was submitted to the property owner and the Ministry of the Environment, Conservation and Parks for Ontario (MECP) as per Ontario Regulation 903, as amended. A licensed well technician must properly decommission the monitoring wells prior to construction according to Regulation 903 of the Ontario Water Resources Act.

Groundwater observations and measurements were obtained from the open boreholes during and upon completion of drilling. Groundwater levels were measured in the monitoring wells on January 10, 2020. The groundwater observations and measurements recorded are included on the appended borehole logs.

The borehole locations and ground surface elevations were surveyed by Pinchin using a Stonex Model 900A Global Navigation Satellite System (GNSS) rover. The ground surface elevations are geodetic, based on GNSS and local base station telemetry with a precision static of less than 20 mm.

The field investigation was monitored by experienced Pinchin personnel. Pinchin logged the drilling operations and identified the soil samples as they were retrieved. The recovered soil samples were sealed into plastic bags and carefully transported to an independent and accredited materials testing laboratory for detailed analysis and testing. All soil samples were classified according to visual and index properties by the project engineer.

The field logging of the soil and groundwater conditions was performed to collect geotechnical engineering design information. The borehole logs include textural descriptions of the subsoil in accordance with a modified Unified Soil Classification System (USCS) and indicate the soil boundaries inferred from non-continuous sampling and observations made during the borehole advancement. These boundaries reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The modified USCS classification is explained in further detail in Appendix I. Details of the soil and groundwater conditions encountered within the boreholes are included on the Borehole Logs within Appendix II.

Select soil samples collected from the boreholes were submitted to a material testing laboratory to determine the grain size distribution of the soil. A copy of the laboratory analytical reports is included in Appendix III. In addition, the collected samples were compared against previous geotechnical information from the area, for consistency and calibration of results.

4.0 SUBSURFACE CONDITIONS

4.1 Borehole Soil Stratigraphy

In general, the soil stratigraphy at the Site consists of either surficial asphaltic concrete or organics overlying granular fill, natural silty soil, glacial till and bedrock to the maximum borehole refusal depth of approximately 9.1 mbgs. It is noted that the granular fill was encountered at the surface within Boreholes BH12 to MW15 and BH17. The appended borehole logs provide detailed soil descriptions and stratigraphies, results of SPT testing, details of monitoring well installations, and groundwater measurements.

Boreholes BH1 to BH11, BH16 and BH18 to BH20 were advanced through the existing pavement structure. The surficial asphalt and granular fill material (i.e. sand and gravel) was observed to be between 0.8 and 2.3 m thick. The fill generally consisted of brown sand and gravel/gravelly sand containing trace silt. The material was generally frozen to approximately 0.8 mbgs and damp to moist below 0.8 mbgs. The results of two particle size distribution analyses completed on samples of the fill indicate that the samples contain 39 to 40% gravel, 58 to 59% sand, and 1 to 3% silt.

The surficial organic material was encountered within Borehole BH6 and was measured to be approximately 75 mm thick. It is noted that the organic material was frozen at the time of the field investigation.

The natural silty material was encountered underlying the granular fill material in all boreholes. The silty soil generally ranged in soil matrix from brown silt containing some clay, trace sand, and trace gravel to brown silt and sand containing trace clay. The non-cohesive soil had a very loose to compact relative density based on SPT ‘N’ values of between 1 and 24 blows per 300 mm penetration of a split spoon sampler. The results of two particle size distribution analyses completed on samples of the silty soil indicate that the samples contain 0 to 2% gravel, 9 to 46% sand, 45 to 75% silt, and 9 to 14% clay. The natural moisture content of the samples tested ranged from 17.1 to 19.9%.

The glacial till material was observed underlying the natural silty soil in Boreholes BH3 to BH5, BH7 to BH12, and BH17 to BH20 and extended down to the underlying bedrock surface. The glacial till material generally ranged in soil matrix from grey gravelly sand containing some silt and some clay to brown silty sand containing some gravel and some clay. The non-cohesive material had a loose to dense relative density based on SPT 'N' values of between 0 and 48 blows per 300 mm penetration of a split spoon sampler. The results of two particle size distribution analyses completed on samples of the material indicate that the samples contain 11 to 25% gravel, 45 to 48% sand, 20 to 30% silt, and 10 to 11% clay. The natural moisture content of the samples tested ranged from 7.8 to 9.2%.

4.2 Bedrock

Bedrock was proved within Boreholes BH7, BH8 and BH17 by core drilling with an NQ-size double tube diamond bit core barrel. The bedrock cores recovered consisted of shale rock which was slightly weathered. The bedrock was black with grey and white banding, fine to medium grained, and contained few natural fractures with little to no oxidation. The bedrock at the fracture locations was mostly sharp and angular, which indicates minor water migration. Natural fractures were closely to moderately spaced and were generally found to occur in sets oriented at approximately 45 to 90º to the core axis. The rock core recovery ranged from 87 to 100%, with an average RQD of 57%. Based on the RQDs obtained, the bedrock is considered to be weathered and poor to fair quality. Photographs of the rock cores are provided in Appendix IV.

4.3 Groundwater Conditions

Groundwater observations and measurements were obtained in the open boreholes at the completion of drilling and are summarized on the appended borehole logs. Groundwater was observed between approximately 1.5 and 3.0 mbgs within the open boreholes at the completion of drilling. In addition, groundwater measurements were obtained from the groundwater monitoring wells installed within Boreholes MW14 to MW16 as part of Pinchin's Phase II ESA. Groundwater was measured on January 10, 2020 at approximately 2.0 mbgs.

Seasonal variations in the water table should be expected, with higher levels occurring during wet weather conditions in the spring and fall and lower levels occurring during dry weather conditions.

5.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

5.1 General Information

The recommendations presented in the following sections of this report are based on the information available regarding the proposed construction, the results obtained from the geotechnical investigation, and Pinchin's experience with similar projects. Since the investigation only represents a portion of the subsurface conditions, it is possible that conditions may be encountered during construction that are substantially different than those encountered during the investigation. If these situations are encountered, adjustments to the design may be necessary. A qualified geotechnical engineer should be on-Site during the foundation preparation to ensure the subsurface conditions are the same/similar to what was observed during the investigation.

Based on information provided by the Client, it is Pinchin's understanding that the proposed development is to consist of four residential apartment buildings ranging from 20 to 30 stories in height, a seniors residence building with a total of 12 stories in height, and a hotel building with a total of 9 stories in height. In addition, each proposed building will include a minimum of 2 levels of underground parking. At the time of this report the depths to the underside of the footings for the parking garages are unknown; as such, for the purpose of this report, Pinchin has assumed an approximate depth of 3.5 metres below the existing ground surface (mbgs) per level of underground parking.

Based on the proposed development consisting of multiple towers ranging from 9 to 30 stories in height, the natural subgrade soil is not considered capable of supporting the proposed building foundations systems. As such, Pinchin recommends that the foundations be extended down to the underlying bedrock surface at the Site.

5.2 Site Preparation

Prior to Site preparation activities commencing, the existing building structures will need to be demolished and removed from the Site, including all foundations and service pipes.

Preparation of the Site for the proposed development will consist of removing all surficial and overburden materials down to the underlying bedrock surface in the vicinity of the proposed building footprints. The existing inorganic natural soil may be left in place in the proposed parking and access roadway areas and can also be used to raise grades below soft landscaping areas.

Prior to placing any fill material at the Site, the bedrock and/or subgrade soil should be inspected by a qualified geotechnical engineer and loosened/soft pockets should be sub excavated and replaced with an engineered fill. All fill material is to be installed in maximum 200 mm thick loose lifts, compacted to 98% of its Standard Proctor Maximum Dry Density (SPMDD), within plus 2 to minus 4 of the optimum moisture contents.

A qualified geotechnical engineering technician should be on site to observe fill placement operations and perform field density tests at random locations throughout each lift, to indicate the specified compaction is being achieved.

5.3 Open Cut Excavations and Anticipated Groundwater Management

It is anticipated that the excavations for the building foundations will extend to a minimum depth of approximately 8.0 mbgs in order to accommodate the proposed levels of underground parking and up to 9.1 mbgs to bedrock for the foundation construction below the natural soil. As the depth to bedrock varies across the Site portions of the excavations will require that bedrock is removed to accommodate the underground levels.

Based on the subsurface information obtained from within the boreholes it is anticipated that the excavated material will consist of a combination of asphalt, granular fill, silty soil, glacial till, and bedrock. Groundwater was encountered between approximately 1.5 and 3.0 mbgs.

Where workers must enter trench excavations deeper than 1.2 m, the trench excavations should be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act (OHSA), Ontario Regulation 213/91, Construction Projects, July 1, 2011, Part III - Excavations, Section 226. Alternatively, the excavation walls may be supported by either closed shoring, bracing, or trench boxes complying with sections 235 to 239 and 241 under O. Reg. 231/91, s. 234(1). The shoring system may be designed as full cantilevers, or the lateral loads can be taken up to the installation of internal bracing of rakers or tie back soil anchors. The temporary shoring design must include appropriate factors of safety, and any possible surcharge loading must be considered.

The following parameters (un-factored) could be used in the shoring design against lateral loads: It should be noted that these earth pressure coefficients assume that the back of the wall is vertical; condition of the ground surface behind the wall is assumed to be flat:

Soil Layer	**Unit Weight (kN/m^3)**	**Angle of Internal Friction (°)**	**Active Earth Pressure Coefficient - K_a**	**Passive Earth Pressure Coefficient - K_p**	**At Rest Earth Pressure Coefficient - K_o**
Fill Material	20	30	0.33	3.0	0.5

Soil Layer	Unit Weight (kN/m^3)	Angle of Internal Friction (°)	Active Earth Pressure Coefficient - K_a	Passive Earth Pressure Coefficient - K_p	At Rest Earth Pressure Coefficient - K_o
Silty Soil & Glacial Till	19	28	0.36	2.76	0.53

Based on the OHSA, the natural soil would be classified as Type 2 soil and temporary excavations in these soils may be cut vertical in the bottom 1.2 m and must be sloped back at an inclination of 1 horizontal to 1 vertical (H to V) above this. Excavations extending below the groundwater table would be classified as a Type 4 soil and temporary excavations will have to be sloped back at 3 horizontal to 1 vertical from the base of the excavation.

The upper approximate 1.5 to 3.0 m of bedrock in this area is typically weathered and can usually be removed with mechanical equipment, such as a large excavator and hydraulic hammer (hoe ram) and where required, with line drilling on close centres. Often a hydraulic hammer can be utilized to create an initial opening for the excavator bucket to gain access of the layered rock. The bedrock is known to contain vertical joints and near horizontal bedding planes. Therefore, some vertical and horizontal over break of the bedrock should be expected.

Depending on the ability of the mechanical equipment to advance through the bedrock, drilling and blasting may be required. It is often difficult to blast “neat” lines using conventional drilling and blasting procedures, as such, problems with “over break” are common. This may affect quantities claimed by the contractor for rock excavations, as well as the potential for off-site disposal of the blasted rock, if necessary. Allowances should be made for over break conditions. Due consideration should also be given to controlled blasting procedures in order to prevent potential damage to the surrounding environment.

In addition, we recommend that a pre-blast survey of all neighbouring properties be undertaken prior to conducting drilling and blasting activities. The preconstruction survey will serve to protect the Client from claims unrelated to the construction activities in the development of this property.

Pinchin notes that, local contractors are familiar with excavating the local bedrock and have specialized knowledge and techniques for its removal. Depending on the block size and degree of weathering of the rock they may have a different approach than what is presented in the preceding paragraphs.

Construction slopes in intact bedrock should stand near vertical provided the “loose” rock is properly scaled off the face. Once the blasting is completed, if there are any permanent bedrock shear walls, they will have to be reviewed by a Rock Mechanics Specialist to determine if it is stable or if it needs reinforcing, such as rock bolting.

In addition to compliance with the OHSA, the excavation procedures must also be in compliance to any potential other regulatory authorities, such as federal and municipal safety standards.

Moderate groundwater inflow through the overburden soil and bedrock face is expected where the excavations extend less than 0.50 m below the groundwater table. It is believed that this groundwater inflow can be controlled using a gravity dewatering system with perimeter interceptor ditches and high capacity pumps. For excavations extending more than 0.5 m below the stabilized groundwater table, a dewatering system installed by a specialist dewatering contractor may be required to either lower the groundwater level prior to excavation, or to maintain the groundwater level during construction. The design of the dewatering system should be left to the contractor’s discretion, and the system should meet a performance specification to maintain and control the groundwater at least 0.50 m below the excavation base. A hydrogeological investigation will be required once the proposed development has been finalized in order to determine the quantity of water which will be removed from the Site.

Seasonal variations in the water table should be expected, with higher levels occurring during wet weather conditions in the spring and fall and lower levels occurring during dry weather conditions. If construction commences during wet periods (typically spring or fall), there is a greater potential that the groundwater elevation could be higher and/or perched groundwater may be present. Any potential precipitation of perched groundwater should be able to be controlled from pumping from filtered sumps and should be pumped away immediately (not allowed to pond).

Prior to commencing excavations, it is critical that all existing surface water and potential surface water is controlled and diverted away from the Site to prevent infiltration and subgrade softening. At no time should excavations be left open for a period of time that will expose them to precipitation and cause subgrade softening.

All collected water is to discharge a sufficient distance away from the excavation to prevent re-entry. Sediment control measures, such as a silt fence should be installed at the discharge point of the dewatering system. The utmost care should be taken to avoid any potential impacts on the environment.

It is the responsibility of the contractor to propose a suitable dewatering system based on the groundwater elevation at the time of construction. The method used should not adversely impact any nearby structures. A Permit to Take Water or a submission to the Environmental Activity and Sector Registry (EASR) would be required if the daily water takings exceed 50,000 L/day. It is the responsibility of the contractor to make this application if required. Depending on the groundwater at the time of the excavation works, a more involved dewatering system may be required

5.4 Site Servicing

5.4.1 Pipe Bedding and Cover Materials for Flexible and Rigid Pipes

The subgrade soil conditions beneath the Site services will comprise natural silty soil. No support problems are anticipated for flexible or rigid pipes founded on the natural silt. Service pipes require an adequate base to ensure proper pipe connection and positive flow is maintained post construction. As such, pipe bedding should be placed to be of uniform thickness and compactness. The pipe bedding and cover material should conform to OPSD 802.010 and 802.013 specifications for flexible pipes and to OPSD 802.031 to 802.033 with Class “B” bedding for rigid pipes.

The pipe bedding material should consist of a minimum thickness of 150 mm Granular “A” (OPSS 1010) below the pipe and extend up the sides to the spring line. However, the bedding thickness may have to be increased depending on the pipe diameter or if wet or weak subgrade conditions are encountered. The pipe cover material from the spring line should consist of a Granular “B” Type I (OPSS 1010) and should extend to a minimum of 300 mm above the top of the pipe. All granular fill material is to be placed in maximum 200 mm thick loose lifts compacted to a minimum of 98% SPMDD.

The bedding material, pipe and cover material should be installed as soon as practically possible after the excavation subgrade is exposed. The longer the excavated subgrade soil remains open to weather conditions and groundwater seepage, the greater the chance for construction problems to occur.

Where it is difficult to stabilize the subgrade due to groundwater or the material is higher than the optimum moisture content, a Granular “B” Type II material may be required. Alternatively, if constant groundwater infiltration becomes an issue, then an approximate 150 mm granular pad consisting of 19 mm clear stone gravel (OPSS 1004) wrapped in a non-woven geotextile (Terrafix 270R or equivalent) should be considered to maintain the integrity of the natural subgrade soils. The clear stone should contain a minimum of 50% crushed particles. Water collected within the stone should be controlled through sumps and filtered pumps.

5.4.2 Trench Backfill

Above the pipe cover material, the trench can be backfilled by re-using the excavated natural soil matching the materials exposed on the sides of the trenches. The soil should be placed to the underside of the granular subbase of the pavement structure and be compacted in maximum 300 mm thick lifts to 98% SPMDD within 4% of the optimum moisture content. This is recommended to provide soil compatibility and help minimize potential abrupt differential frost heave between surrounding natural materials similar in composition. The natural material must be free of organics or other deleterious material.

All stockpiled material should be protected from deleterious materials, additional moisture and be kept from freezing.

Quality control will be the utmost importance when selecting the material. The selection of the material should be done as early in the contract as possible to allow sufficient time for gradation and proctor testing on representative samples to ensure it meets the projects specifications.

Where the natural soil will be exposed, adequate compaction may prove difficult if the material becomes wet (i.e., above the optimum moisture content). Depending on the moisture content of the natural materials at the time of construction, they may either require moisture to be added or stockpiled and left to dry to achieve moisture content within plus 2% to minus 4% of optimum. The natural soil at this site is subject to moisture content increase during wet weather. As such, stockpiles should be protected to help minimize moisture absorption during wet weather.

Alternatively, an imported drier material of similar gradation as the soil (i.e., silt) may be mixed to decrease the overall moisture content and bring it to within plus 2% to minus 4% of optimum. Depending on weather conditions at the time of construction, an imported material may be required regardless to achieve adequate compaction. If the imported material is not the same/similar to the soil observed on the side walls of the excavation, then a horizontal transition between the materials should be sloped as per frost heave taper OPSD 205.60. Any natural material is to be placed in maximum 300 mm thick lifts compacted to 95% SPMDD within plus 2% to minus 4% optimum moisture content. Imported material should consist of a Granular “A”, Granular “B” Type I, or Select Subgrade Material (OPSS 1010). Heavy construction equipment and truck traffic should not cross any pipe until at least 1 m of compacted soil is placed above the top of the pipe.

Post compaction settlement of finer grained soil can be expected, even when placed to compaction specifications. As such, fill materials should be installed as far in advance as possible before finishing the roadway in order to mitigate post compaction settlements.

5.4.3 Frost Protection

The frost penetration depth in Ottawa, Ontario is estimated to extend to approximately 2.1 mbgs in open roadways cleared of snow. As such, it is recommended to place water services at a minimum depth of 300 mm below this elevation with the top of the pipe located at 2.4 mbgs or lower as dictated by municipal service requirements. If a minimum of 2.4 m of soil cover cannot be provided, then the pipe should be insulated with a rigid polystyrene insulation (DOW Styrofoam HI40, or equivalent) or a pre-insulated pipe be utilized.

The insulation design configuration may either consist of placing horizontal insulation to a specified design distance beyond the outside edge of the pipe or an inverted "U" surrounding the top and sides of the pipe. Any method chosen requires suitable design and installation in accordance with the manufacture's recommendations. To accommodate the placement of horizontal insulation a wider excavation trench may be required.

5.5 Foundation Design

5.5.1 Discussion

Bedrock was encountered within the boreholes at depths ranging from approximately 6.4 to 9.1 mbgs. The natural soil encountered at the Site is not considered suitable to support the proposed structures and the foundations should be founded on the bedrock.

5.5.2 Shallow Foundations Bearing on Bedrock

For conventional shallow strip and spread footings established directly on the weathered bedrock surface, a factored geotechnical bearing resistance of 1,500 kPa may be used at ULS. For conventional shallow strip and spread footings established on unweathered competent bedrock, a factored bearing resistance of 3,500 kPa at ULS may be used.

Prior to installing foundation formwork, the bedrock is to be reviewed by a geotechnical engineer. SLS does not apply to foundations bearing directly on bedrock, since the loads required for unacceptable settlements to occur would be much larger than the factored ULS and would be limited to the elastic compression of the bedrock and concrete.

The above bearing resistances assume the bedrock is cleaned of all overburden material and any loose rock pieces. In addition, it is assumed that the bedrock is free of soil filled seams. Therefore, the bedrock should be cleaned with air or water pressure exposing clean sound bedrock, and 1.5 m long probe holes should be advanced at selected locations to check for bedrock defects and soil filled seams. In the event soil filled seams are encountered, bedrock may need to be removed to the soil seam in order to achieve the recommended bearing resistances.

If construction proceeds during freezing weather conditions water should not be allowed to pool and freeze in bedrock depressions. All concrete should be installed and maintained above freezing temperatures as required by the concrete supplier.

The bedrock is to be relatively level with slopes not exceeding 10 degrees from the horizontal. Where the bedrock slope exceeds 10 degrees from the horizontal and does not exceed 25 degrees from the horizontal, shear dowels can be incorporated into the design to resist sliding. Where rock slopes are steeper, the bedrock is to be levelled and stepped as required. The change in vertical height will be a function of the rock quality at the proposed foundation location and will need to be determined at the time of construction.

As an alternative to levelling the bedrock, where the bedrock surface is irregular and jagged, it may be more practical to provide a level benching over these areas by pouring lean mix concrete (minimum 10 MPa) prior to constructing the foundations. This decision is made on Site, since each situation will depend on the Site-specific bedrock conditions.

5.5.3 Site Classification for Seismic Site Response & Soil Behaviour

The following information has been provided to assist the building designer from a geotechnical perspective only. These geotechnical seismic design parameters should be reviewed in detail by the structural engineer and be incorporated into the design as required.

The seismic Site classification has been based on the 2012 OBC. The parameters for determination of Site Classification for Seismic Site Response are set out in Table 4.1.8.4.A of the OBC. The site classification is based on the average shear wave velocity in the top 30 m of the site stratigraphy. If the average shear wave velocity is not known, the Site class can be estimated from energy corrected Standard Penetration Resistance (N60) and/or the average undrained shear strength of the soil in the top 30 m.

The boreholes advanced at this Site extended to a maximum sampled depth of approximately 9.1 mbgs where refusal was encountered on bedrock. SPT “N” values within the soil deposit ranged between 0 and 48 blows per 300 mm. As such, based on Table 4.1.8.4.A of the OBC, this Site has been classified as Class C. A Site Class C has an average shear wave velocity (Vs) of between 360 and 760 m/s. It is recommended that shear wave velocity soundings be completed at the Site once final design and depths of foundations are known as a higher Site Classification may be available for deeper foundations at the Site.

5.5.4 Foundation Transition Zones

Where strip footings are founded at different elevations, the bedrock is to have a maximum slope of 2 H to 1 V, with the concrete footing having a maximum rise of 600 mm and a minimum run of 600 mm between each step, as detailed in the 2012 Ontario Building Code (OBC). The lower footing should be installed first to mitigate the risk of undermining the upper footing.

Individual spread footings are to be spaced a minimum distance of one and a half times the largest footing width apart from each other to avoid stress bulb interaction between footings. This assumes the footings are at the same elevation.

Foundations may be placed at a higher elevation relative to one another provided that the slope between the outside face of the foundations are separated at a minimum slope of 2H: 1V with an imaginary line drawn from the underside of the foundations. The lower footing should be installed first to mitigate the risk of undermining the upper footing.

5.5.5 Estimated Settlement

All individual spread footings should be founded on bedrock, reviewed and approved by a licensed geotechnical engineer.

Foundations installed in accordance with the recommendations outlined in the preceding sections are not expected to exceed total settlements of 25 mm and differential settlements of 19 mm.

All foundations are to be designed and constructed to the minimum widths as detailed in the latest edition of the OBC.

5.5.6 Building Drainage

To assist in maintaining the building dry from surface water seepage, it is recommended that exterior grades around the buildings be sloped away at a 2% gradient or more, for a distance of at least 2.0 m. Roof drains should discharge a minimum of 1.5 m away from the structure to a drainage swale or appropriate storm drainage system.

5.5.7 Shallow Foundations Frost Protection & Foundation Backfill

In the Ottawa, Ontario area, exterior perimeter foundations for heated buildings require a minimum of 1.8 m of soil cover above the underside of the footing to provide soil cover for frost protection.

It is noted that for foundations established on well-draining bedrock (i.e. no ponding adjacent to the foundation), frost protection is not required. This decision is typically made on Site, since each situation will depend on Site specific bedrock conditions.

Where the foundations for heated buildings do not have the minimum 1.8 m of soil cover frost protection, they should be protected from frost with a combination of soil cover and rigid polystyrene insulation, such as Dow Styrofoam or equivalent product. If required, Pinchin can provide appropriate foundation frost protection recommendations as part of the design review.

To minimize potential frost movements from soil frost adhesion, the perimeter foundation backfill should consist of a free draining granular material, such as a Granular ‘B’ Type I (OPSS 1010) or an approved sand fill, extending a minimum lateral distance of 600 mm beyond the foundation. The backfill material used against the foundation must be placed so that the allowable lateral capacity is achieved. All granular material is to be placed in maximum 300 mm thick lifts compacted to a minimum of 100% SPMDD in hard landscaping areas and 95% SPMDD in soft landscaping areas. It is recommended that inspection and testing be carried out during construction to confirm backfill quality, thickness and to ensure compaction requirements are achieved.

5.6 Underground Parking Garage Design

At this time the final grades for the underside of the underground parking garage footings is unknown; however, it is understood that a minimum of two levels of underground parking will be constructed at the Site, extending to a depth of approximately 8 mbgs. Groundwater was encountered at depths ranging between approximately 1.5 and 3.0 mbgs.

As such, depending on the proposed final grades, the building will have to be designed to either resist hydrostatic uplift or to be provided with underfloor and foundation wall drainage systems connected to a suitable frost-free outlet.

The magnitude of the hydrostatic uplift may be calculated using the following formula:

$$P = \gamma \times d$$

Where:

P = hydrostatic uplift pressure acting on the base of the structure (kPa)

γ = unit weight of water (9.8 kN/m^3)

d = depth of base of structure below the design high water level (m)

The resistance of gross uplift of the structure can be increased by simply increasing the mass of the structure, incorporating oversize footings into the structure or by installing soil/rock anchors.

Alternatively, exterior perimeter foundation drains should be installed where subsurface walls are exposed to the interior. The foundation drains should consist of a minimum 150 mm diameter fabric wrapped perforated drainage tile surrounded by 19 mm diameter clear stone (OPSS 1004) with a minimum cover of 150 mm on top and sides and 50 mm below the drainage tile. Since the natural soil contains a significant amount of silt sized particles, the clear stone gravel should be wrapped in a non-woven geotextile (Terrafix 270R or equivalent). The water collected from the weeping tile should be directed away from the building to appropriate drainage areas; either through gravity flow or interior sump pump systems. All subsurface walls should be waterproofed.

If the proposed basement floor level is constructed close to or below the stabilized groundwater level, an underfloor drainage system should be installed beneath the slab, in addition to the installation of perimeter weeping tiles at the footing level. The floor slab sub drains should be constructed in a similar fashion to the foundation drains and be connected to a suitable frost-free outlet or sump.

If the building is constructed below the groundwater table and utilities sub drains and pumps are used to remove the groundwater from around the building footprint, there is the potential that a Permit to Take Water from the Ministry of the Environment, Conservation and Parks (MECP) will be required for the long term dewatering of the Site.

The walls must also be designed to resist lateral earth pressure. Depending on the design of the building the earth pressure computations must consider the groundwater level at the Site. For calculating the lateral earth pressure, the coefficient of at-rest earth pressure (K_0) may be assumed at 0.5 for non-cohesive sandy soil. The bulk unit weight of the retained backfill may be taken as 20 kN/m^3 for well compacted soil. An appropriate factor of safety should be applied.

5.6.1 Lower Level Parking Garage Concrete Slab-on-Grade

Prior to the installation of the engineered fill material, all organics and deleterious materials should be removed to the underlying bedrock surface. The underlying bedrock encountered within the boreholes is considered adequate for the support of a concrete slab-on-grade provided it is inspected and approved by an experienced geotechnical engineering consultant.

Based on the in-situ conditions, it is recommended to establish a concrete floor slab-on-grade on a minimum 200 mm thick layer of Granular ’A’ (OPSS 1010). The purpose of the Granular ’A’ is mainly to provide a level surfaced for the concrete formwork. Alternatively, consideration may also be given to using a 200 mm thick layer of uniformly compacted 19 mm clear stone. Any required up-fill should consist of a Granular ‘B’ Type I or Type II (OPSS 1010).

The installation of a vapour barrier may be required under the floor slab. If required, the vapour barrier should conform to the flooring manufacturer’s and designer’s requirements. Consideration may be given to carrying out moisture emission and/or relative humidity testing of the slab to determine the concrete condition prior to flooring installation. To minimize the potential for excess moisture in the floor slab, a concrete mixture with a low water-to-cement ratio (i.e. 0.5 to 0.55) should be used.

The following table provides the unfactored modulus of subgrade reaction values:

Material Type	**Modulus of Subgrade Reaction (kN/m^3)**
Granular A (OPSS 1010)	85,000
Granular “B” Type I (OPSS 1010)	75,000
Granular “B” Type II (OPSS 1010)	85,000

5.7 Asphaltic Concrete Pavement Structure Design for Parking Lot and Driveways

5.7.1 Discussion

Parking areas and access roadways will be constructed around the proposed buildings. The in-situ natural silty soil is considered a sufficient bearing material for an asphaltic concrete pavement structure provided all organics and deleterious materials are removed prior to installing the engineered fill material.

At this time Pinchin is unaware of the proposed final grades for the parking lot and access roadways. As such, provided the pavement structure overlies the in-situ silty soil, the following pavement structure is recommended.

5.7.2 Pavement Structure

The following table presents the minimum specifications for a flexible asphaltic concrete pavement structure:

Pavement Layer	**Compaction Requirements**	**Parking Areas**	**Driveways**
Surface Course Asphaltic Concrete HL-3 (OPSS 1150)	92% MRD as per OPSS 310	40 mm	40 mm
Binder Course Asphaltic Concrete HL-8 (OPSS 1150)	92 % MRD as per OPSS 310	50 mm	80 mm
Base Course: Granular “A” (OPSS 1010)	100% Standard Proctor Maximum Dry Density (ASTM-D698)	150 mm	150 mm
Subbase Course: Granular “B” Type I (OPSS 1010)	100% Standard Proctor Maximum Dry Density (ASTM D698)	300 mm	450 mm

Notes:

I. Prior to placing the pavement structure, the subgrade soil is to be proof rolled with a smooth drum roller without vibration to observe weak spots and the deflection of the soil; and

II. The recommended pavement structure may have to be adjusted according to the City of Ottawa standards. Also, if construction takes place during times of substantial precipitation and the subgrade soil becomes wet and disturbed, the granular thickness may have to be increased to compensate for the weaker subgrade soil. In addition, the granular fill material thickness may have to be temporarily increased to allow heavy construction equipment to access the Site, in order to avoid the subgrade from “pumping” up into the granular material.

Performance grade PG 58-28 asphaltic concrete should be specified for Marshall mixes.

5.7.3 Pavement Structure Subgrade Preparation and Granular up Fill

The proper placement of base and subbase fill materials becomes very important in addressing the proper load distribution to provide a durable pavement structure.

The pavement subgrade materials should be thoroughly proof rolled prior to placement of the Granular ‘B’ subbase course. If any unstable areas are noted, then the Granular ‘B’ thickness may need to be increased to support pavement construction traffic. This should be left as a field decision by a qualified geotechnical engineer at the time of construction, but it is recommended that additional Granular ‘B’ be carried as a provisional item under the construction contract.

Where fill material is required to increase the grade to the underside of the pavement structure it should consist of Granular ‘B’ Type I (OPSS 1010). The up-fill material is to be placed in maximum 300 mm thick lifts compacted to 98% SPMDD within 4% of the optimum moisture content.

Samples of both the Granular ‘A’ and Granular ‘B’ Type I aggregates should be tested for conformance to OPSS 1010 prior to utilization on Site and during construction. All stockpiled material should be protected from deleterious materials, additional moisture and be kept from freezing.

Post compaction settlement of fine-grained soil can be expected, even when placed to compaction specifications. As such, fill material should be installed as far in advance as possible before finishing the parking lot and access roadways for best grade integrity.

Where the subgrade material types differ below the underside of the pavement structure, the transition between the materials should be sloped as per frost heave taper OPSD 205.60.

5.7.4 Drainage

Control of surface water is a critical factor in achieving good pavement structure life. The pavement thickness designs are based on a drained pavement subgrade via sub-drains or ditches.

The silty soil has poor natural drainage and therefore it is recommended that pavement subdrains be installed in the lower areas and be connected to the catch basins.

The surface of the roadways should be free of depressions and be sloped at a minimum grade of 1% in order to drain to appropriate drainage areas. Subgrade soil should slope a minimum of 3% toward stormwater collection points. Positive slopes are very important for the proper performance of the drainage system. The granular base and subbase materials should extend horizontally to any potential ditches or swales.

In addition, routine maintenance of the drainage systems will assist with the longevity of the pavement structure. Ditches, culverts, sewers and catch basins should be regularly cleared of debris and vegetation.

6.0 SITE SUPERVISION & QUALITY CONTROL

It is recommended that all geotechnical aspects of the project be reviewed and confirmed under the appropriate geotechnical supervision, to routinely check such items. This includes but is not limited to inspection and confirmation of the bedrock surface and undisturbed natural subgrade material prior to subgrade preparation, pouring any foundations or footings, backfilling, or engineered fill installation to ensure that the actual conditions are not markedly different than what was observed at the borehole locations and geotechnical components are constructed as per Pinchin’s recommendations. Compaction quality control of engineered fill material (full-time monitoring) is recommended as standard practice, as well as regular sampling and testing of aggregates and concrete, to ensure that physical characteristics of materials for compliance during installation and satisfies all specifications presented within this report.

7.0 TERMS AND LIMITATIONS

This Geotechnical Investigation was performed for the exclusive use of Colonnade BridgePort and Fiera Real Estate Core Fund LP. (Client) in order to evaluate the subsurface conditions at 25 Pickering Place, Ottawa, Ontario. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practises in the field of geotechnical engineering for the Site. Classification and identification of soil, and geologic units have been based upon commonly accepted methods employed in professional geotechnical practice. No warranty or other conditions, expressed or implied, should be understood. Conclusions derived are specific to the immediate area of study and cannot be extrapolated extensively away from sample locations.

Performance of this Geotechnical Investigation to the standards established by Pinchin is intended to reduce, but not eliminate, uncertainty regarding the subgrade soil at the Site, and recognizes reasonable limits on time and cost.

Regardless how exhaustive a Geotechnical Investigation is performed, the investigation cannot identify all the subsurface conditions. Therefore, no warranty is expressed or implied that the entire Site is representative of the subsurface information obtained at the specific locations of our investigation. If during construction, subsurface conditions differ from then what was encountered within our test location and the additional subsurface information provided to us, Pinchin should be contacted to review our recommendations. This report does not alleviate the contractor, owner, or any other parties of their respective responsibilities.

This report has been prepared for the exclusive use of the Client and their authorized agents. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third parties. If additional parties require reliance on this report, written authorization from Pinchin will be required. Pinchin disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed. Furthermore, this report should not be construed as legal advice.

The liability of Pinchin or our officers, directors, shareholders or staff will be limited to the lesser of the fees paid or actual damages incurred by the Client. Pinchin will not be responsible for any consequential or indirect damages. Pinchin will only be liable for damages resulting from the negligence of Pinchin. Pinchin will not be liable for any losses or damage if the Client has failed, within a period of two years following the date upon which the claim is discovered (Claim Period), to commence legal proceedings against Pinchin to recover such losses or damage unless the laws of the jurisdiction which governs the Claim Period which is applicable to such claim provides that the applicable Claim Period is greater than two years and cannot be abridged by the contract between the Client and Pinchin, in which case the Claim Period shall be deemed to be extended by the shortest additional period which results in this provision being legally enforceable.

Pinchin makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and these interpretations may change over time. Please refer to Appendix IV, Report Limitations and Guidelines for Use, which pertains to this report.

Specific limitations related to the legal and financial and limitations to the scope of the current work are outlined in our proposal, the attached Methodology and the Authorization to Proceed, Limitation of Liability and Terms of Engagement which accompanied the proposal.

Information provided by Pinchin is intended for Client use only. Pinchin will not provide results or information to any party unless disclosure by Pinchin is required by law. Any use by a third party of reports or documents authored by Pinchin or any reliance by a third party on or decisions made by a third party based on the findings described in said documents, is the sole responsibility of such third parties. Pinchin accepts no responsibility for damages suffered by any third party as a result of decisions made or actions conducted. No other warranties are implied or expressed.

C:\Users\wtabaczuk\Desktop\Work References\Example Reports\267991.001 Geotechnical Investigation 25 Pickering Place Ottawa ON.docx

Template: Master Geotechnical Investigation Report – Ontario, GEO, April 18, 2019

FIGURES

PROJECT NAME:
GEOTECHNICAL INVESTIGATION

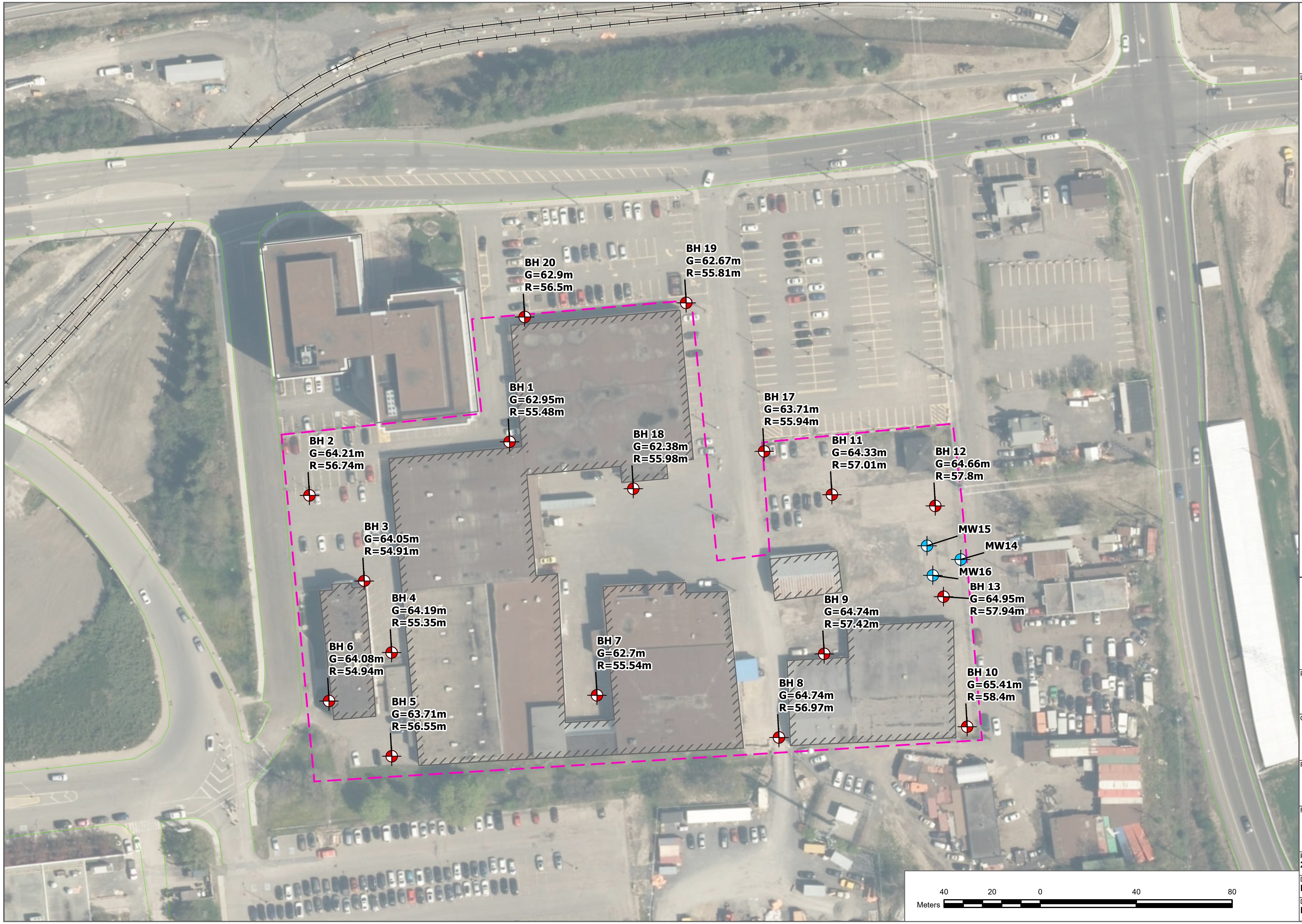
CLIENT NAME:
1. FIERA REAL ESTATE CORE FUND LP 2. COLONNADE BRIDGEPORT

PROJECT LOCATION:
25 PICKERING PLACE, OTTAWA, ONTARIO

FIGURE NAME:
KEY MAP

FIGURE NUMBER
1

PROJECT NUMBER:	SCALE:	DRAWN BY:	REVIEWED BY:	DATE:
267991.001	1:75,000	PKM	WT	FEBRUARY 2020



N

LEGEND

- ⊕ ENVIRONMENTAL BOREHOLE
- ⊕ GEOTECHNICAL BOREHOLE
- ┼ RAILROAD
- ─ ROAD
- ☐ EXISTING BUILING
- ⬚ SITE BOUNDARY
- ▨ SITE BUILDING

G - GROUND ELEVATION AT INVESTIGATION LOCATION (masl)

R - REFUSAL ELEVATION AT INVESTIGATION LOCATION (masl)

masl - METRES ABOVE SEA LEVEL

m - METRES

NOTES:
1) Proprietary information may not be reproduced or divulged without prior written consent of Pinchin Ltd.
2) Do not scale drawing
3) This drawing may have been reduced. All scale notations indicated are based on a 11"x17" format drawings.
4)Legend is color dependent. Non-colour copies may alter interpretation.
5) Coordinate system: WGS 1984 Web Mercator Auxiliary Sphere
6) Source: Pinchin Ltd.,

PINCHIN

PROJECT NAME
GEOTECHNICAL INVESTIGATION

CLIENT NAME
1. FIERA REAL ESTATE CORE FUND LP.
2. COLONNADE BRIDGEPORT

PROJECT LOCATION
25 PICKERING PLACE, OTTAWA, ONTARIO

FIGURE NAME
BOREHOLE LOCATION PLAN

PROJECT NUMBER: **267991.001**	SCALE **1:1,500**
DRAWN BY **PKM**	REVIEWED BY **WT**
DATE **FEBRUARY 2020**	FIGURE NUMBER **2**

APPENDIX I

Abbreviations, Terminology and Principle Symbols used in Report and Borehole Logs

ABBREVIATIONS, TERMINOLOGY & PRINCIPAL SYMBOLS USED

Sampling Method

AS	Auger Sample	**w**	Washed Sample
SS	Split Spoon Sample	**HQ**	Rock Core (63.5 mm diam.)
ST	Thin Walled Shelby Tube	**NQ**	Rock Core (47.5 mm diam.)
BS	Block Sample	**BQ**	Rock Core (36.5 mm diam.)

In-Situ Soil Testing

Standard Penetration Test (SPT), “N” value is the number of blows required to drive a 51 mm outside diameter spilt barrel sampler into the soil a distance of 300 mm with a 63.5 kg weight free falling a distance of 760 mm after an initial penetration of 150 mm has been achieved. The SPT, “N” value is a qualitative term used to interpret the compactness condition of cohesionless soils and is used only as a very approximation to estimate the consistency and undrained shear strength of cohesive soils.

Dynamic Cone Penetration Test (DCPT) is the number of blows required to drive a cone with a 60 degree apex attached to “A” size drill rods continuously into the soil for each 300 mm penetration with a 63.5 kg weight free falling a distance of 760 mm.

Cone Penetration Test (CPT) is an electronic cone point with a 10 cm2 base area with a 60 degree apex pushed through the soil at a penetration rate of 2 cm/s.

Field Vane Test (FVT) consists of a vane blade, a set of rods and torque measuring apparatus used to determine the undrained shear strength of cohesive soils.

Soil Descriptions

The soil descriptions and classifications are based on an expanded Unified Soil Classification System (USCS). The USCS classifies soils on the basis of engineering properties. The system divides soils into three major categories; coarse grained, fine grained and highly organic soils. The soil is then subdivided based on either gradation or plasticity characteristics. The classification excludes particles larger than 75 mm. To aid in quantifying material amounts by weight within the respective grain size fractions the following terms have been included to expand the USCS:

Soil Classification		Terminology	Proportion
Clay	< 0.002 mm		
Silt	0.002 to 0.06 mm	“trace”, trace sand, etc.	1 to 10%
Sand	0.075 to 4.75 mm	“some”, some sand, etc.	10 to 20%
Gravel	4.75 to 75 mm	Adjective, sandy, gravelly, etc.	20 to 35%
Cobbles	75 to 200 mm	And, and gravel, and silt, etc.	>35%
Boulders	>200 mm	Noun, Sand, Gravel, Silt, etc.	>35% and main fraction

Notes:

- Soil properties, such as strength, gradation, plasticity, structure, etcetera, dictate the soils engineering behaviour over grain size fractions; and
- With the exception of soil samples tested for grain size distribution or plasticity, all soil samples have been classified based on visual and tactile observations. The accuracy of visual and tactile observation is not sufficient to differentiate between changes in soil classification or precise grain size and is therefore an approximate description.

The following table outlines the qualitative terms used to describe the compactness condition of cohesionless soil:

Cohesionless Soil	
Compactness Condition	**SPT N-Index (blows per 300 mm)**
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	> 50

The following table outlines the qualitative terms used to describe the consistency of cohesive soils related to undrained shear strength and SPT, N-Index:

Cohesive Soil

Consistency	Undrained Shear Strength (kPa)	SPT N-Index (blows per 300 mm)
Very Soft	<12	<2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

Note: Utilizing the SPT, N-Index value to correlate the consistency and undrained shear strength of cohesive soils is only very approximate and needs to be used with caution.

Soil & Rock Physical Properties

General

W	Natural water content or moisture content within soil sample
γ	Unit weight
γ'	Effective unit weight
γ_d	Dry unit weight
γ_{sat}	Saturated unit weight
ρ	Density
ρ_s	Density of solid particles
ρ_w	Density of Water
ρ_d	Dry density
ρ_{sat}	Saturated density e Void ratio
n	Porosity
S_r	Degree of saturation
E_{50}	Strain at 50% maximum stress (cohesive soil)

Consistency

W_L	Liquid limit
W_P	Plastic Limit
I_P	Plasticity Index
W_S	Shrinkage Limit
I_L	Liquidity Index
I_C	Consistency Index
e_{max}	Void ratio in loosest state
e_{min}	Void ratio in densest state
I_D	Density Index (formerly relative density)

Shear Strength

C_u, S_u	Undrained shear strength parameter (total stress)
C'_d	Drained shear strength parameter (effective stress)
r	Remolded shear strength
τ_p	Peak residual shear strength
τ_r	Residual shear strength
ø’	Angle of interface friction, coefficient of friction = tan ø’

Consolidation (One Dimensional)

C_C	Compression index (normally consolidated range)
C_r	Recompression index (over consolidated range)
C_S	Swelling index
m_V	Coefficient of volume change
c_V	Coefficient of consolidation
T_V	Time factor (vertical direction)
U	Degree of consolidation
σ'_o	Overburden pressure
σ'_p	Preconsolidation pressure (most probable)
OCR	Overconsolidation ratio

Permeability

The following table outlines the terms used to describe the degree of permeability of soil and common soil types associated with the permeability rates**:**

Permeability (k cm/s)	**Degree of Permeability**	**Common Associated Soil Type**
$> 10^{-1}$	Very High	Clean gravel
10^{-1} to 10^{-3}	High	Clean sand, Clean sand and gravel
10^{-3} to 10^{-5}	Medium	Fine sand to silty sand
10^{-5} to 10^{-7}	Low	Silt and clayey silt (low plasticity)
$>10^{-7}$	Practically Impermeable	Silty clay (medium to high plasticity)

Rock Coring

Rock Quality Designation (RQD) is an indirect measure of the number of fractures within a rock mass, Deere et al. (1967). It is the sum of sound pieces of rock core equal to or greater than 100 mm recovered from the core run, divided by the total length of the core run, expressed as a percentage. If the core section is broken due to mechanical or handling, the pieces are fitted together and if 100 mm or greater included in the total sum**.**

RQD is calculated as follows:

$$\text{RQD (\%)} = \frac{\Sigma \text{ Length of core pieces} > 100 \text{ mm} \times 100}{\text{Total length of core run}}$$

The following is the Classification of Rock with Respect to RQD Value:

RQD Classification	**RQD Value (%)**
Very poor quality	**<25**
Poor quality	25 to 50
Fair quality	50 to 75
Good quality	75 to 90
Excellent quality	90 to 100

APPENDIX II

Pinchin's Borehole Logs

Log of Borehole: BH1

Project #: 267991.001 **Logged By:** WT

Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

Drill Date: January 7, 2020 **Project Manager:** WT

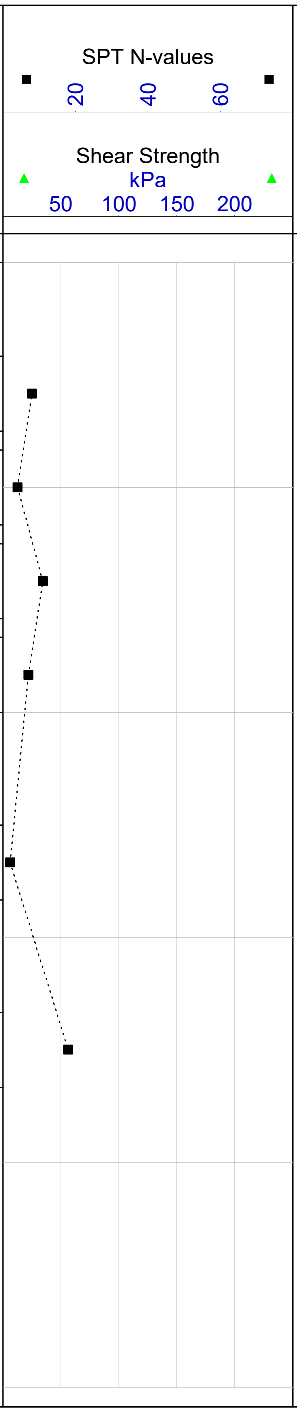
SUBSURFACE PROFILE

Description	Elevation (m)
Ground Surface	62.95
Asphalt ~ 75 mm	
Fill Brown sand and gravel, trace silt, frozen	62.19
Silt Brown silt, some clay, trace sand, trace gravel, loose, damp	61.12
Brown sand seam (~ 50 mm)	60.66
Trace clay, compact, moist to wet	59.90
Loose	58.38
Very loose	56.85
No clay, compact, wet	55.48
End of Borehole Borehole terminated at 7.47 mbgs due to auger refusal on probable bedrock Groundwater was observed approximately 2.1 mbgs at drilling completion.	

Monitoring Well Details: No Monitoring Well Installed

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values
AS	1	100	NA
SS	2	80	8
SS	3	80	4
SS	4	100	11
SS	5	100	7
SS	6	100	2
SS	7	100	18



Lab Analysis | Moisture (%) | Plasticity Index

Contractor: Strata Drilling Group

Drilling Method: Split Spoon / Hollow Stem Auger

Well Casing Size: NA

Grade Elevation: 62.95 masl

Top of Casing Elevation: NA

Sheet 1 of 1

Log of Borehole: BH2

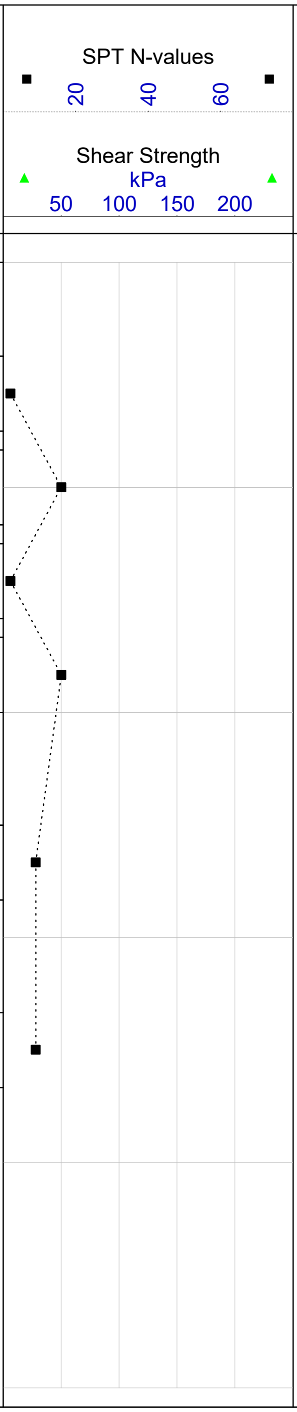
Project #: 267991.001
Logged By: WT
Project: Geotechnical Investigation
Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP
Location: 25 Pickering Place, Ottawa, Ontario
Drill Date: January 14, 2020
Project Manager: WT

SUBSURFACE PROFILE

Description	Elevation (m)	Monitoring Well Details
Ground Surface	64.21	No Monitoring Well Installed
Asphalt ~ 200 mm	64.01	
Fill Brown sand and gravel, trace silt, frozen	63.45	
Trace brick, very loose, damp	62.69	
Brown sand, trace silt, trace gravel, compact, damp	61.92	
Silt Brown silt, some clay, trace sand, trace gravel, very loose, wet	61.16	
Compact	59.64	
Grey, loose	56.74	
End of Borehole Borehole terminated at 7.47 mbgs due to auger refusal on probable bedrock Groundwater was observed approximately 2.1 mbgs at drilling completion.		

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values	Lab Analysis	Moisture (%)	Plasticity Index
AS	1	100	NA			
SS	2	80	2			
SS	3	80	16			
SS	4	100	2			
SS	5	100	16	Hyd.	19.9	
SS	6	100	9			
SS	7	100	9			



Contractor: Strata Drilling Group
Grade Elevation: 64.21 masl
Drilling Method: Split Spoon / Hollow Stem Auger
Top of Casing Elevation: NA
Well Casing Size: NA
Sheet: 1 of 1

Log of Borehole: BH3

Project #: 267991.001 **Logged By:** WT

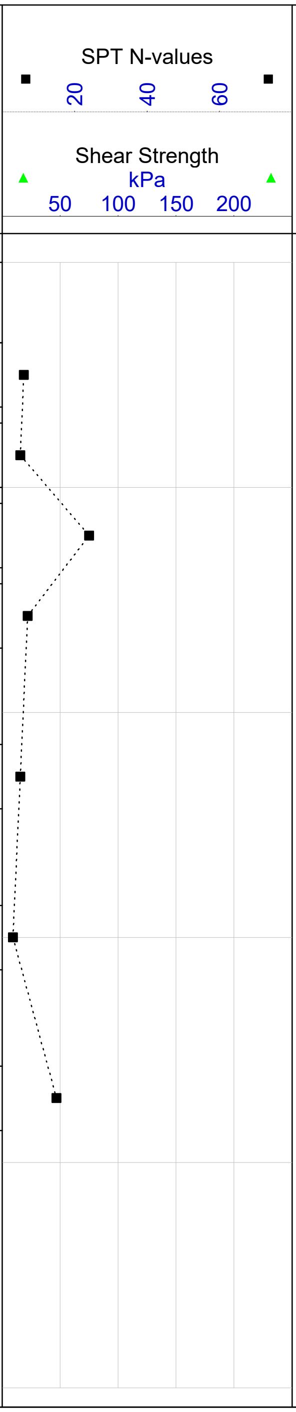
Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

Drill Date: January 14, 2020 **Project Manager:** WT

SUBSURFACE PROFILE				SAMPLE						
Depth (m)	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-values	Lab Analysis	Moisture (%)	Plasticity Index
	Ground Surface	64.05								
0	**Asphalt** ~ 125 mm		No Monitoring Well Installed	AS	1	100	NA	G.S.		
	Fill Brown sand and gravel, trace silt, frozen	63.29								
1				SS	2	100	6			
	Silt Grey silt, some clay, trace sand, trace gravel, loose, moist									
2		62.07		SS	3	100	5			
	Brown sand seam	61.76								
	Compact, wet			SS	4	100	24			
3	Loose	61.00		SS	5	100	7			
4										
5				SS	6	100	5			
6		57.95								
	GlacialTill Grey gravelly sand, some silt, some clay, very loose, wet			SS	7	100	3			
7										
	Compact	56.43								
8				SS	8	100	15			
9		54.91								
	End of Borehole Borehole terminated at 9.14 mbgs due to auger refusal on probable bedrock. Groundwater was observed approximately 2.1 mbgs at drilling completion.									
10										



Contractor: Strata Drilling Group **Grade Elevation:** 64.05 masl

Drilling Method: Split Spoon / Hollow Stem Auger **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH4

Project #: 267991.001 **Logged By:** WT

Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

Drill Date: January 14, 2020 **Project Manager:** WT

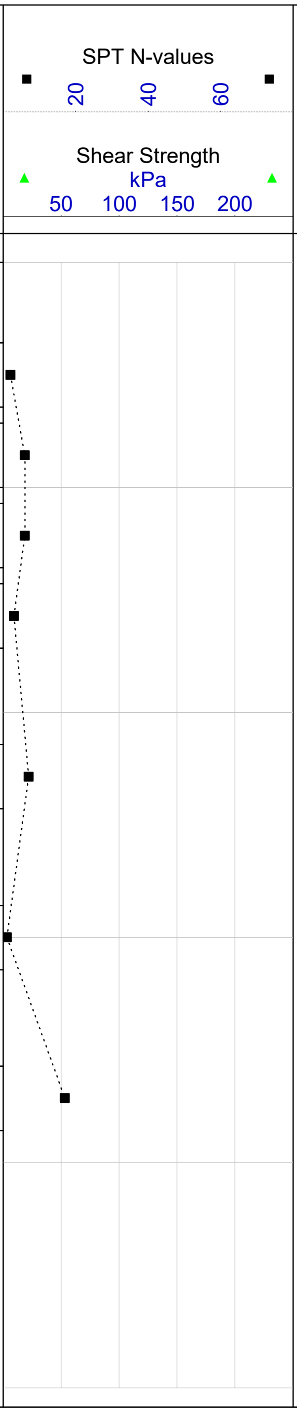
SUBSURFACE PROFILE

Description	Elevation (m)	Monitoring Well Details
Ground Surface	64.19	No Monitoring Well Installed
Asphalt ~ 100 mm		
Fill Brown sand and gravel, trace silt, frozen	63.43	
Brown silty sand, very loose, damp	62.67	
Silt Brown silt, some clay, trace sand, trace gravel, loose, damp		
Very loose, moist	61.14	
Loose	59.62	
Very loose	58.09	
GlacialTill Brown gravelly sand, some silt, some clay, compact, moist	56.57	
End of Borehole	55.35	

Borehole terminated at 8.84 mbgs due to auger refusal on probable bedrock. Groundwater was observed approximately 3.0 mbgs at drilling completion.

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values	Lab Analysis	Moisture (%)	Plasticity Index
AS	1	100	NA	G.S.		
SS	2	100	2			
SS	3	100	6			
SS	4	100	6			
SS	5	100	3			
SS	6	100	7			
SS	7	100	1			
SS	8	100	17	Hyd.	9.2	



Contractor: Strata Drilling Group **Grade Elevation:** 64.19 masl

Drilling Method: Split Spoon / Hollow Stem Auger **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH5

Project #: 267991.001 **Logged By:** WT

Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

Drill Date: January 14, 2020 **Project Manager:** WT

SUBSURFACE PROFILE

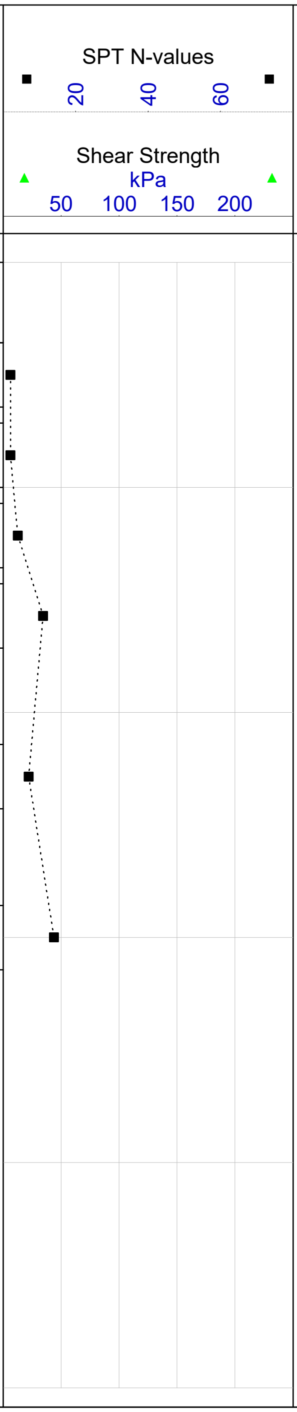
Description	Elevation (m)
Ground Surface	63.71
Asphalt ~ 75 mm	63.41
Fill Brown sand and gravel, trace silt, frozen	62.95
Brown silty sand and gravel, frozen	62.19
Silt Brown silt, some clay, trace sand, trace gravel, very loose, damp	61.42
trace organics	60.97
No organics, moist	60.66
Sand seam (~ 50 mm), trace clay	
Compact, wet	59.14
Some sand, no clay, loose	57.61
GlacialTill Grey gravelly sand, some silt, some clay, compact, wet	56.55
End of Borehole	

Borehole terminated at 7.16 mbgs due to auger refusal on probable bedrock.
Groundwater was observed approximately 3.0 mbgs at drilling completion.

Monitoring Well Details: No Monitoring Well Installed

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values	Lab Analysis	Moisture (%)	Plasticity Index
AS	1	100	NA			
SS	2	100	2			
SS	3	100	2			
SS	4	100	4			
SS	5	100	11			
SS	6	100	7			
SS	7	100	14			



Depth (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Contractor: Strata Drilling Group **Grade Elevation:** 63.71 masl

Drilling Method: Split Spoon / Hollow Stem Auger **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH6

Project #: 267991.001 **Logged By:** WT

Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

Drill Date: January 14, 2020 **Project Manager:** WT

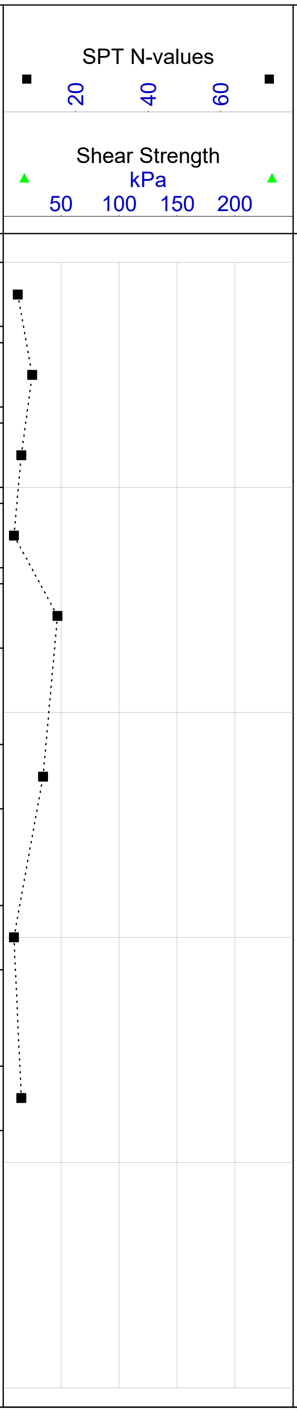
SUBSURFACE PROFILE

Description	Elevation (m)	Monitoring Well Details
Ground Surface	64.08	No Monitoring Well Installed
Organics ~ 75 mm	63.78	
Fill Brown silty sand, trace gravel, frozen	63.32	
Loose		
Some gravel		
Trace gravel, moist	62.56	
Silt Brown silt, some clay, trace sand, very loose, moist	61.79	
Some sand, no clay, compact, wet	61.03	
Grey	59.51	
Very loose	57.98	
Loose	56.46	
End of Borehole	54.94	

Borehole terminated at 9.14 mbgs due to auger refusal on probable bedrock. Groundwater was observed approximately 3.0 mbgs at drilling completion.

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values
SS	1	100	4
SS	2	100	8
SS	3	100	5
SS	4	100	3
SS	5	100	15
SS	6	100	11
SS	7	100	3
SS	8	100	5



Lab Analysis | Moisture (%) | Plasticity Index

Contractor: Strata Drilling Group **Grade Elevation:** 64.08 masl

Drilling Method: Split Spoon / Hollow Stem Auger **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH7

Project #: 267991.001 **Logged By:** WT

Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

Drill Date: January 9, 2020 **Project Manager:** WT

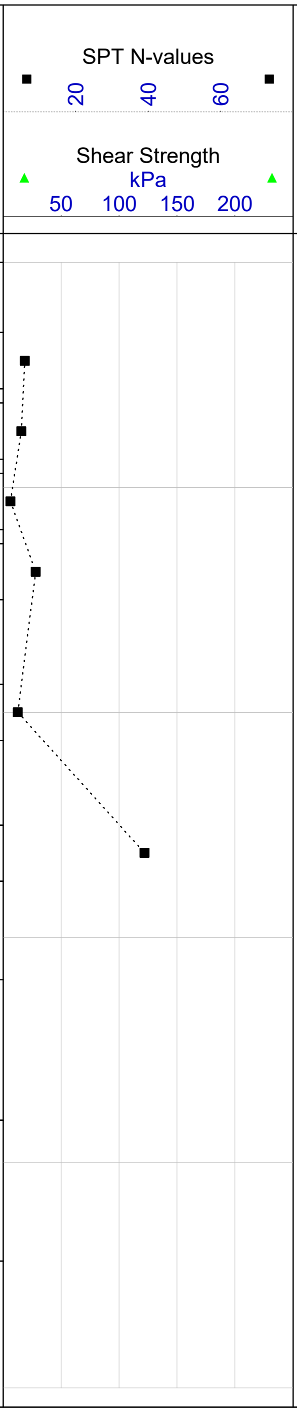
SUBSURFACE PROFILE

Description	Elevation (m)
Ground Surface	62.70
Asphalt ~ 25 mm	61.94
Fill Brown sand and gravel, trace silt, frozen Brown gravelly sand, frozen to damp	60.41
Silt Brown silt and sand, trace clay, compact, moist	59.65
Grey, trace sand, very loose to loose, wet	58.13
Very loose	56.60
GlacialTill Brown silty sand, some gravel, some clay, dense, wet	55.54
Bedrock Shale rock, slightly weathered, black with grey and white banding, fine to medium grained, few natural fractures with little to no oxidation. Poor to fair quality.	51.88
End of Borehole Borehole terminated at 10.82 mbgs. Groundwater was observed approximately 3.0 mbgs at drilling completion.	

Monitoring Well Details: No Monitoring Well Installed

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values	Lab Analysis / RQD	Moisture (%)	Plasticity Index
AS	1	100	NA			
SS	2	100	6			
SS	3	100	5			
SS	4	100	2			
SS	5	100	9			
SS	6	100	4			
SS	7	100	39			
RC	8	90	NA	48		
RC	9	100	NA	75		



Contractor: Strata Drilling Group **Grade Elevation:** 62.70 masl

Drilling Method: Split Spoon / Hollow Stem Auger **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH8

Project #: 267991.001 **Logged By:** WT

Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

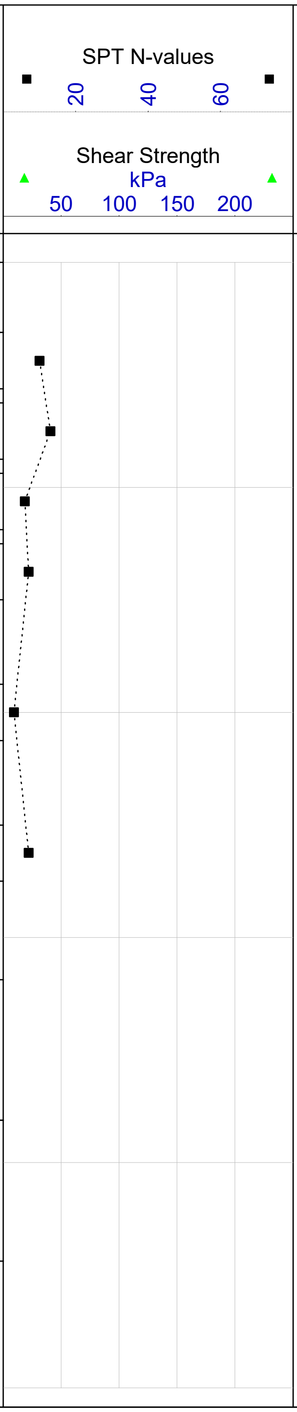
Drill Date: January 9, 2020 **Project Manager:** WT

SUBSURFACE PROFILE

Description	Elevation (m)	Monitoring Well Details
Ground Surface	64.74	No Monitoring Well Installed
Asphalt ~ 75 mm	63.98	
Fill Brown sand and gravel, trace silt, frozen Brown gravelly sand, frozen	63.22	
Silt Brown silt and sand, trace clay, compact, moist Trace to some silt, moist to wet Grey, trace gravel, loose, wet	62.45	
Very loose	60.17	
GlacialTill Brown silty sand, some gravel, some clay, loose, wet	58.34	
Bedrock Shale rock, slightly weathered, black with grey and white banding, fine to medium grained, few natural fractures with little to no oxidation. Poor to fair quality.	56.97	
End of Borehole Borehole terminated at 10.82 mbgs. Groundwater was observed approximately 2.1 mbgs at drilling completion.	53.92	

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values	Lab Analysis / RQD	Moisture (%)	Plasticity Index
AS	1	100	NA			
SS	2	100	10			
SS	3	100	13	Hyd.	17.1	
SS	4	100	6			
SS	5	100	7			
SS	6	100	3			
SS	7	100	7			
RC	8	100	NA	58		
RC	9	100	NA	72		



Contractor: Strata Drilling Group **Grade Elevation:** 64.74 masl

Drilling Method: Split Spoon / Hollow Stem Auger **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH9

Project #: 267991.001 **Logged By:** WT

Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

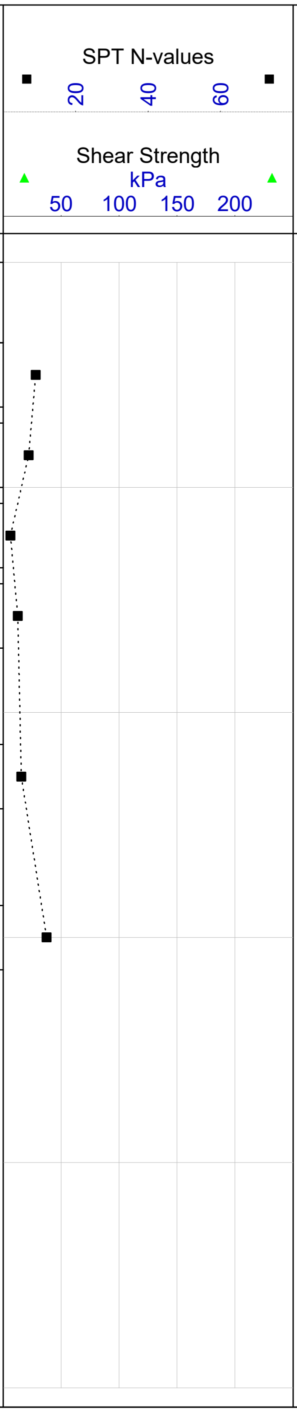
Drill Date: January 9, 2020 **Project Manager:** WT

SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details
0		Ground Surface	64.74	No Monitoring Well Installed
		Asphalt ~ 100 mm		
		Fill Brown sand and gravel, trace silt, frozen	63.90	
		Brown gravelly sand, frozen	63.22	
		Silt Brown silt and sand, trace clay, loose, moist	62.45	
		Moist to wet	61.92	
		Trace sand and gravel, wet	61.69	
		Grey	58.64	
		GlacialTill Brown silty sand, some gravel, some clay, compact, wet	57.42	
		End of Borehole Borehole terminated at 7.32 mbgs due to auger refusal on probable bedrock. Groundwater was observed approximately 2.1 mbgs at drilling completion.		

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values	Lab Analysis	Moisture (%)	Plasticity Index
AS	1	100	NA			
SS	2	100	9			
SS	3	100	7			
SS	4	100	2			
SS	5	100	4			
SS	6	100	5			
SS	7	100	12			



Contractor: Strata Drilling Group **Grade Elevation:** 64.74 masl

Drilling Method: Split Spoon / Hollow Stem Auger **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH10

Project #: 267991.001 **Logged By:** WT

Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

Drill Date: January 9, 2020 **Project Manager:** WT

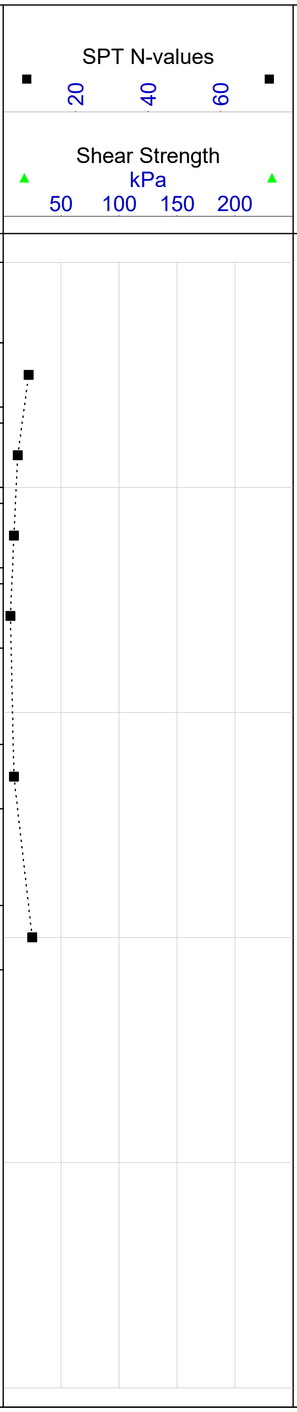
SUBSURFACE PROFILE

Depth (m)	Description	Elevation (m)	Monitoring Well Details
0	Ground Surface	65.41	No Monitoring Well Installed
0 – 0.76	**Asphalt** ~ 100 mm	64.65	
0.76 – 1.37	**Fill** Brown sand and gravel, trace silt, frozen	64.04	
	Brown gravelly sand, frozen to damp		
1.37 – 2.29	loose, moist	63.12	
2.29 – 3.05	**Silt** Brown silt and sand, trace clay, very loose moist to wet	62.36	
3.05 – 6.10	Grey, trace to some silt, wet	59.31	
6.10 – 7.01	**GlacialTill** Grey silty sand, some gravel, some clay, compact, wet	58.40	
	End of Borehole		

Borehole terminated at 7.01 mbgs due to auger refusal on probable bedrock. Groundwater was observed approximately 2.1 mbgs at drilling completion.

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values
AS	1	100	NA
SS	2	100	7
SS	3	100	4
SS	4	100	3
SS	5	100	2
SS	6	100	3
SS	7	100	8



Lab Analysis	Moisture (%)	Plasticity Index

Contractor: Strata Drilling Group

Grade Elevation: 65.41 masl

Drilling Method: Split Spoon / Hollow Stem Auger

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH11

Project #: 267991.001 **Logged By:** WT

Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

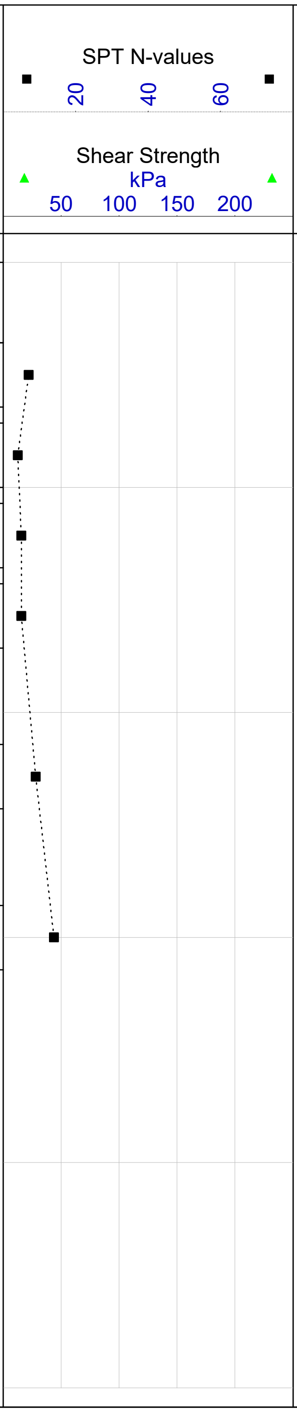
Drill Date: January 15, 2020 **Project Manager:** WT

SUBSURFACE PROFILE

Description	Elevation (m)	Monitoring Well Details
Ground Surface	64.33	No Monitoring Well Installed
Asphalt ~ 50 mm	63.57	
Fill Brown sand and gravel, trace silt, frozen	62.81	
Silt Brown silt and sand, trace clay, loose, damp	62.04	
Very loose, moist to wet		
Loose	58.23	
GlacialTill Brown silty sand, some gravel, some clay, compact, wet	57.01	
End of Borehole Borehole terminated at 7.32 mbgs due to auger refusal on pobable bedrock. Groundwater was observed approximately 2.1 mbgs at drilling completion.		

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values	Lab Analysis	Moisture (%)	Plasticity Index
AS	1	100	NA			
SS	2	100	7			
SS	3	100	4			
SS	4	100	5			
SS	5	100	5			
SS	6	100	9			
SS	7	100	14			



Contractor: Strata Drilling Group **GradeElevation:** 64.33 masl

Drilling Method: Split Spoon / Hollow Stem Auger **Top of CasingElevation:** NA

Well Casing Size: NA **Sheet** 1 of 1

PINCHIN

Log of Borehole: BH12

Project #: 267991.001 **Logged By:** WT

Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

Drill Date: January 15, 2020 **Project Manager:** WT

SUBSURFACE PROFILE

Description	Elevation (m)	Monitoring Well Details
Ground Surface	64.66	No Monitoring Well Installed
Fill Brown sand and gravel, trace silt, frozen	63.90	
Silt Brown silt and sand, trace clay, loose, moist	62.37	
some clay,wet,	61.46	
loose	60.85	
very loose	59.33	
loose	58.26	
GlacialTill Brown silty sand, some gravel, some clay, moist, compact	57.80	

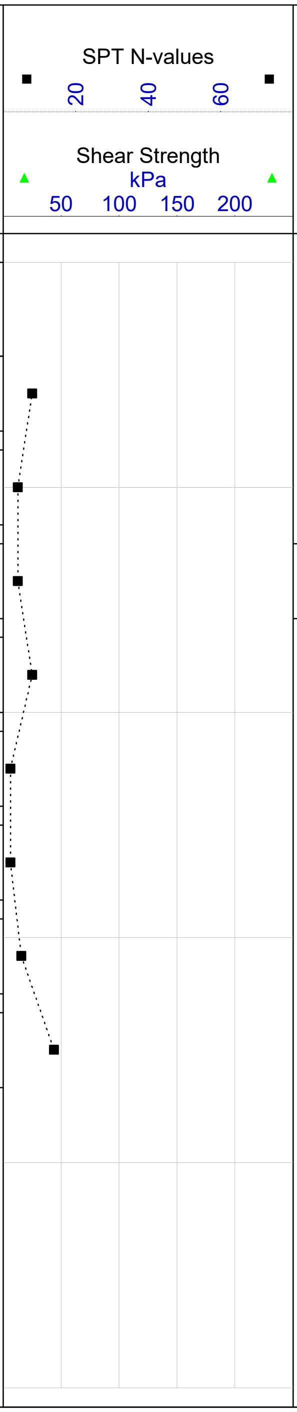
End of Borehole

Borehole terminated at 6.9 mbgs due to auger refusal on probable bedrock.
Groundwater was observed approximately 2.1 mbgs at drilling completion.

Depth (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values	Lab Analysis	Moisture (%)	Soil Vapour Concentration
AS	1	100	NA			0/0
SS	2	100	8			0/0
SS	3	80	4			0/0
SS	4	80	4	PHCs, VOCs, PAHs		0/0
SS	5	25	8			0/0
SS	6	100	2			0/0
SS	7	0	2			NA
SS	8	50	5			0/0
SS	9	100	14			0/0



Contractor: Strata Drilling Group **Grade Elevation:** 64.66 masl

Drilling Method: Split Spoon / Hollow Stem Auger **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH13

Project #: 267991.001 **Logged By:** WT

Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

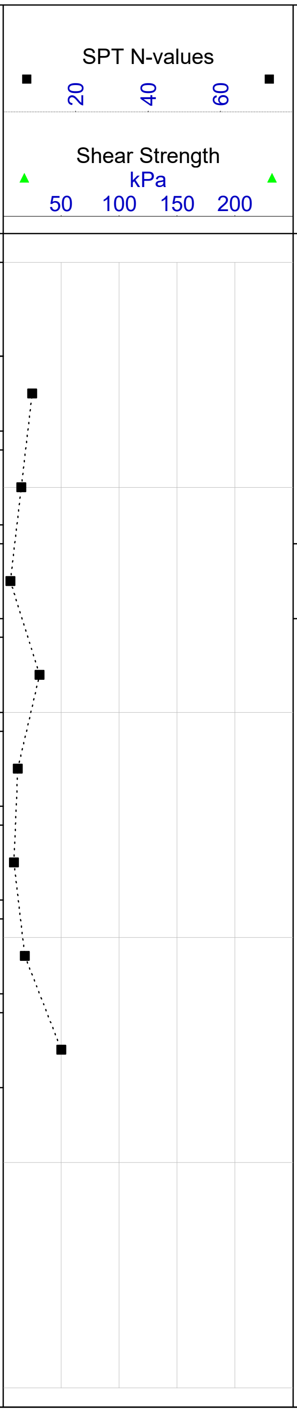
Drill Date: January 8, 2020 **Project Manager:** WT

SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details
		Ground Surface	64.95	
0	▨	**Fill** Brown sand and gravel, trace silt, frozen	64.19	No Monitoring Well Installed
1 2		**Silt** Brown silt and sand, trace clay, loose, moist	62.66	
3		some clay, very loose, wet	61.9	
		compact	61.14	
4 5 6		very loose to loose	58.85	
		compact	57.94	
7 8 9		End of Borehole Borehole terminated at 7.0 mbgs due to auger refusal on probable bedrock. Groundwater was observed approximately 2.1 mbgs at drilling completion.		

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values	Lab Analysis	Moisture (%)	Soil Vapour Concentration
AS	1	100	NA			0/0
SS	2	100	8			0/0
SS	3	100	5			0/0
SS	4	100	2	PHCs, VOCs, PAHs		0/0
SS	5	0	10			0/0
SS	6	10	4			0/0
SS	7	80	3			0/0
SS	8	80	6			0/0
SS	9	100	16			0/0



Contractor: Strata Drilling Group

Drilling Method: Split Spoon / Hollow Stem Auger

Well Casing Size: NA

Grade Elevation: 64.95 masl

Top of Casing Elevation: NA

Sheet: 1 of 1

Log of Borehole: MW-14

Project #: 267991.002 **Logged By:** MK

Project: Supplemental Phase II Environmental Site Assessment

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

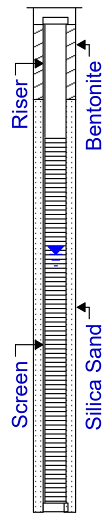
Location: 25 Pickering Place, Ottawa, Ontario

Drill Date: January 8, 2020

SUBSURFACE PROFILE | **SAMPLE**

Depth (m)
ft 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
m 0 1 2 3 4 5 6 7 8 9

Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-values	Dynamic Penetration Resistance ☐ ☐ 20 40 60 80	Shear Stress (kPa)	Sample ID	Soil Vapour Concentration* (ppm) CGI/PID	Laboratory Analysis
0		Ground Surface	0.00										
		Sand and Gravel Brown, damp.	0.00 -0.76		SS	1	100				SS1	0/0	
		Silty Clay Grey, damp, organic-like odour. Slight PHC-like odour from 1.52 to 3.05 mbgs. Very wet from 3.05 to 1.68 mbgs.	0.76 -4.57		SS	2	100				SS2	0/0	
					SS	3	100				SS3	0/10	PHCs, VOCs, PAHs, pH
						4					SS4	0/1	
					SS	5	100				SS5	0/0	
						6					SS6	0/0	
		End of Borehole	4.57	Water level measured at 2.01 mbgs on January 10, 2020.									



DTPL - Drier Than The Plastic Limit
WTPL - Wetter Than The Plastic Limit
RQD - Rock Quality Designation

Contractor: Strata Drilling Group Inc.

Drilling Method: Direct Push

Well Casing Size: 5.08 cm

Note:
* Soil vapour concentrations measured using a RKI Eagle 2 equipment with a combustible gas indicator (CGI) and a photoionization detector (PID).

Grade Elevation: NM

Top of Casing Elevation: NM

Sheet: 1 of 1

PINCHIN

Log of Borehole: MW-15

Project #: 267991.002 **Logged By:** MK

Project: Supplemental Phase II Environmental Site Assessment

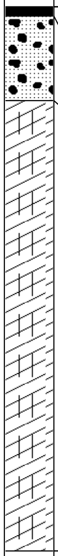
Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

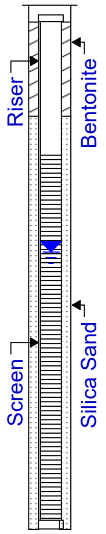
Location: 25 Pickering Place, Ottawa, Ontario

Drill Date: January 8, 2020

SUBSURFACE PROFILE

Depth (m)	Description	Elevation (m)
0	Ground Surface	0.00
0	**Asphalt**	0.00
	Sand and Gravel Brown, damp.	-0.76 0.76
1 – 4	**Silty Clay** Grey, damp, slight PHC-like odour. Wet from 1.52 to 2.13 mbgs. Very wet from 2.28 to 4.42 mbgs.	-4.42 4.42
	End of Borehole	





Water level measured at 2.01 mbgs on January 10, 2020.

DTPL - Drier Than The Plastic Limit
WTPL - Wetter Than The Plastic Limit
RQD - Rock Quality Designation

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values	Dynamic Penetration Resistance 20 40 60 80	Shear Stress (kPa)	Sample ID	Soil Vapour Concentration* (ppm) CGI/PID	Laboratory Analysis
SS	1	100				SS1	0/0	
	2					SS2	0/0.2	
SS	3	100				SS3	0/6	
	4					SS4	0/17	PHCs, VOCs, PAHs
SS	5	100				SS5	0/4	
	6					SS6	0/2	

Contractor: Strata Drilling Group Inc.

Drilling Method: Direct Push

Well Casing Size: 5.08 cm

Note:
* Soil vapour concentrations measured using a RKI Eagle 2 equipment with a combustible gas indicator (CGI) and a photoionization detector (PID).

Grade Elevation: NM

Top of Casing Elevation: NM

Sheet: 1 of 1

Log of Borehole: MW-16

Project #: 267991.002 **Logged By:** MK

Project: Supplemental Phase II Environmental Site Assessment

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

Drill Date: January 8, 2020

SUBSURFACE PROFILE

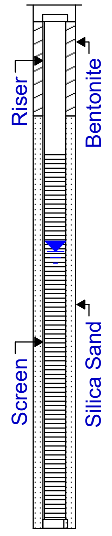
Depth (m)

ft: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

m: 0 1 2 3 4 5 6 7 8 9

Symbol	Description	Elevation (m)
	Ground Surface	0.00
■	**Asphalt**	0.00
⁘	**Sand and Gravel** Brown, damp.	-0.76 0.76
▨	**Silty Clay** Brown, damp, organic-like odour. Wet from1.52 to 3.05 mbgs. Grey, very wet from 3.05 to 4.57 mbgs.	-4.57 4.57
	End of Borehole	

Monitoring Well Details



Water level measured at 2.01 mbgs on January 10, 2020.

DTPL - Drier Than The Plastic Limit
WTPL - Wetter Than The Plastic Limit
RQD - Rock Quality Designation

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values	Dynamic Penetration Resistance 20 40 60 80	Shear Stress (kPa)	Sample ID	Soil Vapour Concentration* (ppm) CGI/PID	Laboratory Analysis
SS	1	100				SS1	0/0	
	2					SS2	0/0	
SS	3	100				SS3	0/0	
	4					SS4	0/0	PHCs, VOCs, PAHs
SS	5	100				SS5	0/0	
	6					SS6	0/0	

Contractor: Strata Drilling Group Inc.

Drilling Method: Direct Push

Well Casing Size: 5.08 cm

Note:
* Soil vapour concentrations measured using a RKI Eagle 2 equipment with a combustible gas indicator (CGI) and a photoionization detector (PID).

Grade Elevation: NM

Top of Casing Elevation: NM

Sheet: 1 of 1

Log of Borehole: BH17

Project #: 267991.001 **Logged By:** WT

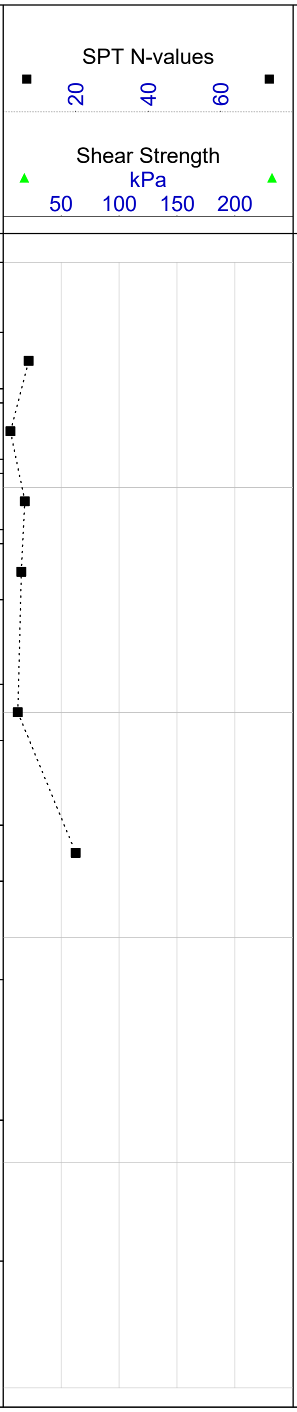
Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

Drill Date: January 15, 2020 **Project Manager:** WT

SUBSURFACE PROFILE					SAMPLE							
Depth (m)	Symbol	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-values	SPT N-values 20 40 60 / Shear Strength kPa 50 100 150 200	Lab Analysis	Moisture (%)	Plasticity Index
0		Ground Surface	63.71	No Monitoring Well Installed								
0–1		**Fill** Brown sand and gravel, trace silt, frozen	62.95		AS	1	100	NA				
1–2		**Silt** Brown silt and sand, trace clay, loose, moist	62.19		SS	2	100	7				
2		Very loose, wet	61.42		SS	3	100	2				
3–4		Grey, loose	59.14		SS SS	4 5	100 100	6 5				
5–6		**GlacialTill** Grey silty sand, some gravel, some clay, very loose, wet	57.61		SS	6	100	4				
6–7		Compact	55.94		SS	7	100	20		Hyd.	7.8	
8–10		**Bedrock** Shale rock, slightly weathered, black with grey and white banding, fine to medium grained, few natural fractures with little to no oxidation. Poor to fair quality.	52.89		RC RC	8 9	87 93	NA NA		30 62		
11–12		End of Borehole Borehole terminated at 10.8 mbgs. Groundwater was observed approximately 1.5 mbgs at drilling completion.										



Contractor: Strata Drilling Group **Grade Elevation:** 63.71 masl

Drilling Method: Split Spoon / Hollow Stem Auger **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH18

Project #: 267991.001 **Logged By:** WT

Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

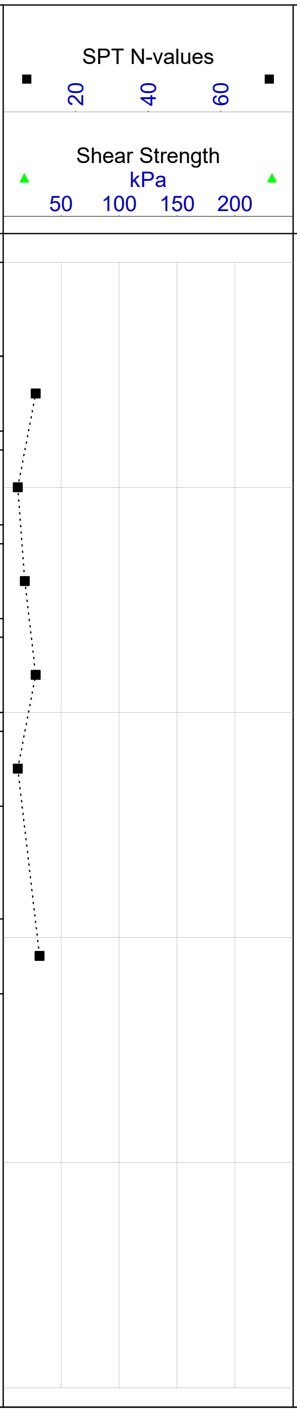
Drill Date: January 7, 2020 **Project Manager:** WT

SUBSURFACE PROFILE

Description	Elevation (m)	Monitoring Well Details
Ground Surface	62.38	No Monitoring Well Installed
Asphalt ~ 75 mm		
Fill Brown sand and gravel, trace silt, frozen	61.62	
Silt Brown silt and sand, trace clay, damp, very loose Grey some clay, loose, wet	60.86	
GlacialTill Brown silty sand, some gravel, some clay, very loose to compact, wet	58.57	
End of Borehole Borehole terminated at 6.4 mbgs due to auger refusal on probable bedrock. Groundwater was observed approximately 1.5 mbgs at drilling completion.	55.98	

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values	Lab Analysis	Moisture (%)	Plasticity Index
AS	1	100	NA			
SS	2	10	9			
SS	3	10	4			
SS	4	25	6			
SS	5	90	9			
SS	6	100	4			
SS	7	100	10			



Contractor: Strata Drilling Group **Grade Elevation:** 62.38 masl

Drilling Method: Split Spoon / Hollow Stem Auger **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

PINCHIN

Log of Borehole: BH19

Project #: 267991.001 **Logged By:** WT

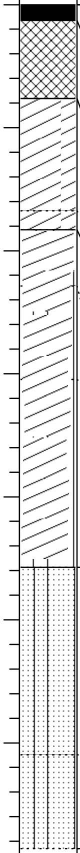
Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

Drill Date: January 7, 2020 **Project Manager:** WT

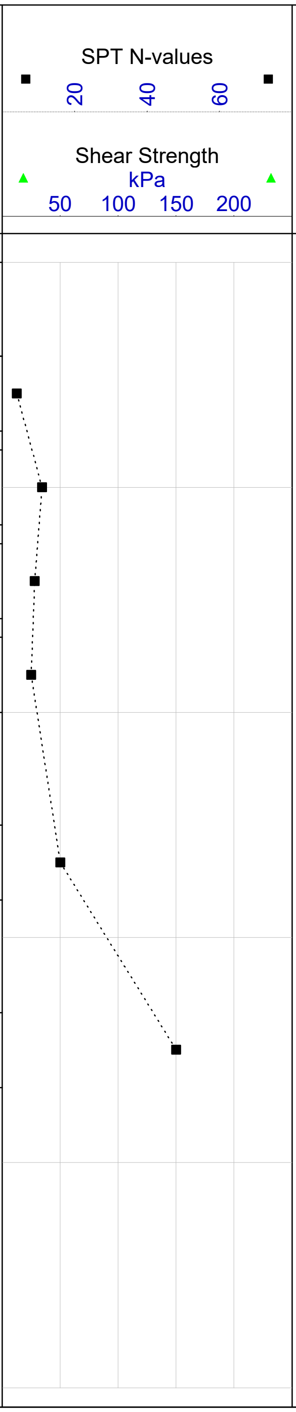
SUBSURFACE PROFILE



Depth (m)	Description	Elevation (m)	Monitoring Well Details
0	Ground Surface	62.67	No Monitoring Well Installed
	Asphalt ~ 125 mm		
	Fill Brown sand and gravel, trace silt, frozen	61.91	
1			
	Silt Brown silt and sand, trace clay, very loose to compact	60.99	
2	Brown sand seam	60.38	
	some sand, compact, moist	59.62	
3	wet		
4		58.10	
5	**GlacialTill** Brown silty sand, some gravel, some clay, compact, wet	56.57	
6	Dense	55.81	
7	End of Borehole Borehole terminated at 6.9 mbgs due to auger refusal on probable bedrock. Groundwater was observed approximately 2.1 mbgs at drilling completion.		
8			
9			

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values
AS	1	100	NA
SS	2	80	4
SS	3	80	11
SS	4	0	9
SS	5	90	8
SS	6	50	16
SS	7	80	48



Lab Analysis	Moisture (%)	Plasticity Index

Contractor: Strata Drilling Group

Grade Elevation: 62.67 masl

Drilling Method: Split Spoon / Hollow Stem Auger

Top of Casing Elevation: NA

Well Casing Size: NA

Sheet: 1 of 1

Log of Borehole: BH20

Project #: 267991.001 **Logged By:** WT

Project: Geotechnical Investigation

Client: Colonnade BridgePort & Fiera Real Estate Core Fund LP

Location: 25 Pickering Place, Ottawa, Ontario

Drill Date: January 7, 2020 **Project Manager:** WT

SUBSURFACE PROFILE

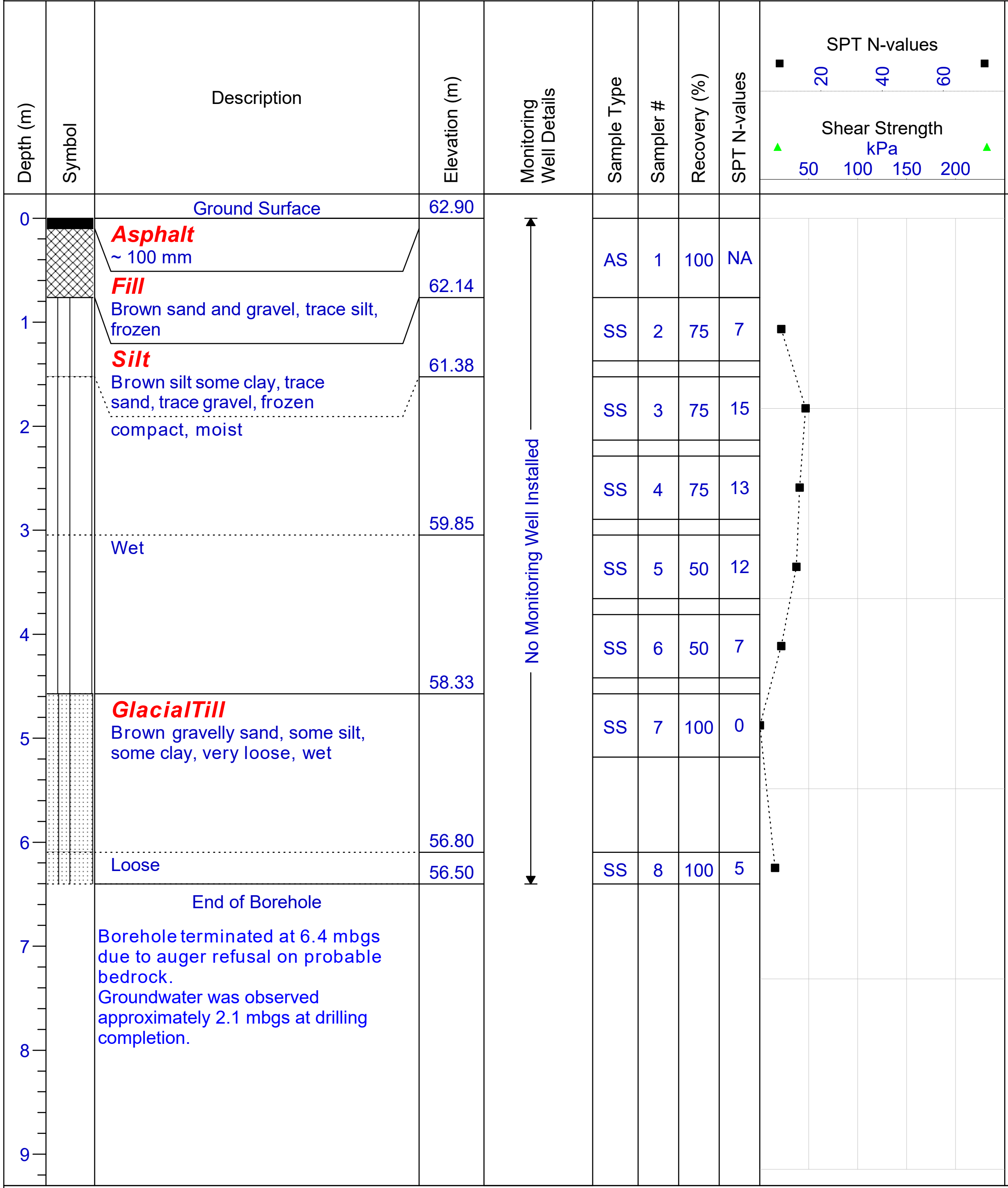
Description	Elevation (m)
Ground Surface	62.90
Asphalt ~ 100 mm	
Fill Brown sand and gravel, trace silt, frozen	62.14
Silt Brown silt some clay, trace sand, trace gravel, frozen	61.38
compact, moist	
Wet	59.85
GlacialTill Brown gravelly sand, some silt, some clay, very loose, wet	58.33
Loose	56.80
End of Borehole	56.50

Monitoring Well Details: No Monitoring Well Installed

Borehole terminated at 6.4 mbgs due to auger refusal on probable bedrock.
Groundwater was observed approximately 2.1 mbgs at drilling completion.

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-values	Lab Analysis	Moisture (%)	Plasticity Index
AS	1	100	NA			
SS	2	75	7			
SS	3	75	15			
SS	4	75	13			
SS	5	50	12			
SS	6	50	7			
SS	7	100	0			
SS	8	100	5			



Contractor: Strata Drilling Group **Grade Elevation:** 62.90 masl

Drilling Method: Split Spoon / Hollow Stem Auger **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

APPENDIX III

Laboratory Testing Reports for Soil Samples

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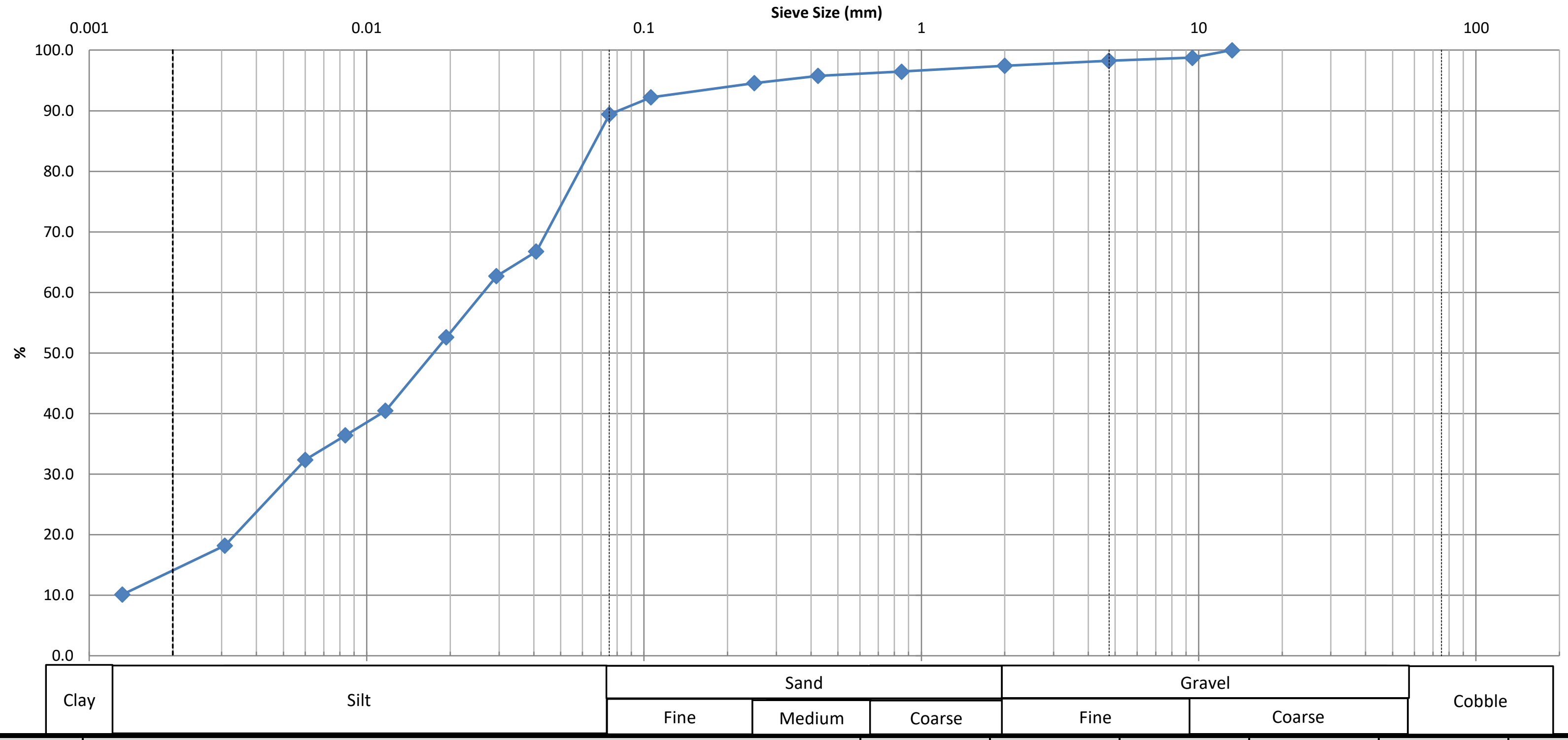
SIEVE ANALYSIS **LS-**
702

CLIENT:	Pinchin	DEPTH:	10.0 - 12.0'	FILE NO:	PM4184
CONTRACT NO.:		BH OR TP No.:	BH2	LAB NO:	14777
PROJECT:	267991.001			DATE RECEIVED:	20-Jan-20
				DATE TESTED:	22-Jan-20
DATE SAMPLED:	7-Jan-20			DATE REPORTED:	24-Jan-20
SAMPLED BY:	Client			TESTED BY:	D. Bertrand



Identification	**Soil Classification**					**MC(%)**	**LL**	**PL**	**PI**	**Cc**	**Cu**
						19.9					
	D100	D60	D30	D10	Gravel (%)		Sand (%)		Silt (%)		Clay (%)
					1.8		8.8		75.9		13.5

Comments:

REVIEWED BY:	**Curtis Beadow**	**Joe Fosyth, P. Eng.**

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HYDROMETER
LS-702 ASTM-422

CLIENT:	Pinchin	DEPTH:	10.0 - 12.0'	FILE NO.:	PM4184
PROJECT:	267991.001	BH OR TP No.:	BH2	DATE SAMPLED:	07-Jan-20
LAB No. :	14777	TESTED BY:	D. Bertrand	DATE RECEIVED:	20-Jan-20
SAMPLED BY:	Client	DATE REPT'D:	24-Jan-20	DATE TESTED:	22-Jan-20

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
194.2	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	47.63	TARE WEIGHT	50.00	ACTUAL WEIGHT
WEIGHT AFTER WASH BACK SIEVE	4.42	AIR DRY	150.00	100.00
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	145.25	95.25
		CORRECTED	0.953	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
63.0				
53.0				
37.5				
26.5				
19.0				
16.0				
13.2		**0.0**	0.0	**100.0**
9.5		**2.4**	1.2	**98.8**
4.75		**3.4**	1.8	**98.2**
2.0		**5.0**	2.6	**97.4**
Pan		**189.2**		
0.850		**0.49**	3.5	**96.5**
0.425		**0.85**	4.2	**95.8**
0.250		**1.47**	5.4	**94.6**
0.106		**2.66**	7.8	**92.2**
0.075		**4.11**	10.6	**89.4**
Pan		**4.42**		
SIEVE CHECK	0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	10:33	39.0	6.0	22.0	0.0409	68.5	**66.8**
2	10:34	37.0	6.0	22.0	0.0294	64.4	**62.7**
5	10:37	32.0	6.0	22.0	0.0194	54.0	**52.6**
15	10:47	26.0	6.0	22.0	0.0117	41.5	**40.5**
30	11:02	24.0	6.0	22.0	0.0084	37.4	**36.4**
60	11:32	22.0	6.0	22.0	0.0060	33.2	**32.4**
250	14:42	15.0	6.0	22.0	0.0031	18.7	**18.2**
1440	10:32	11.0	6.0	22.0	0.0013	10.4	**10.1**

Moisture Content = 19.9%

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

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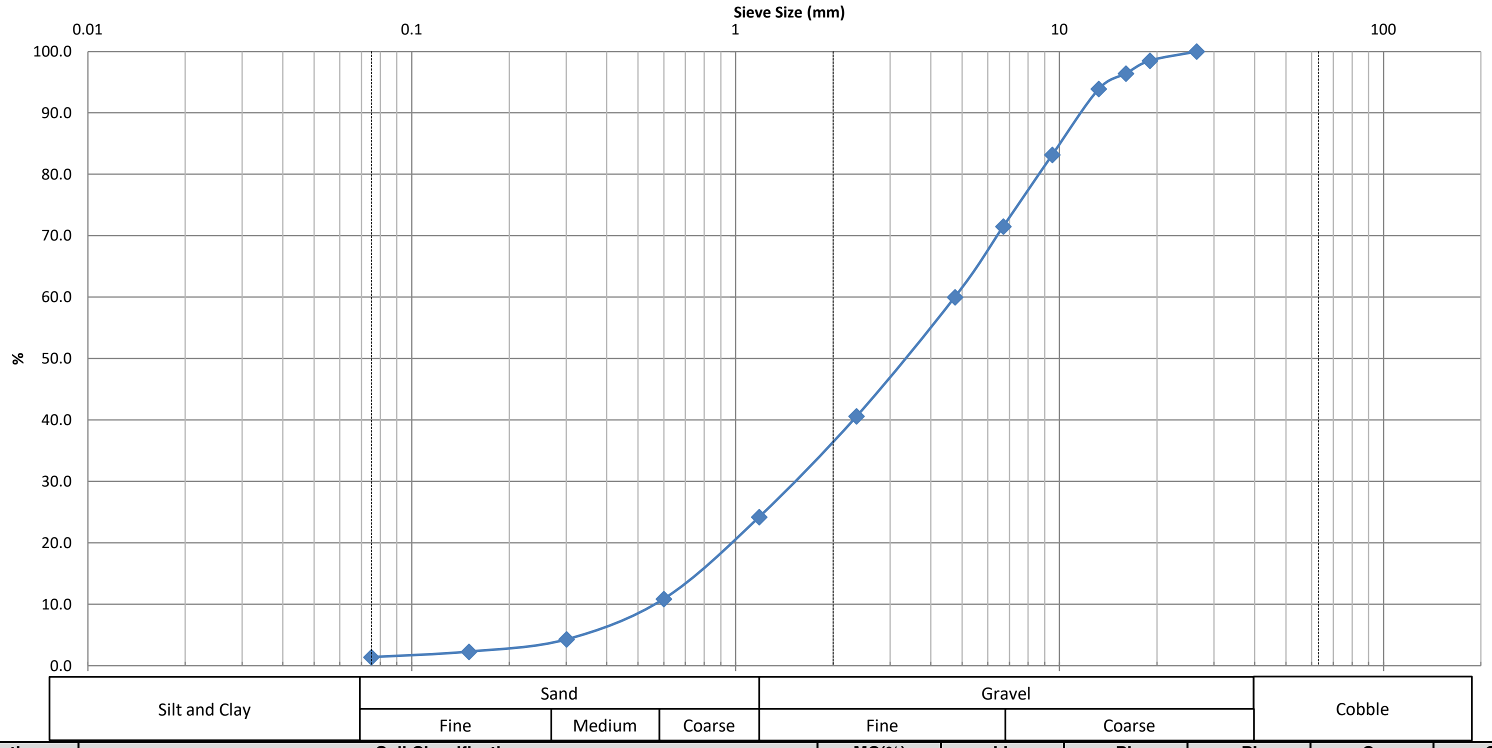
SIEVE ANALYSIS
ASTM C136

CLIENT:	Pinchin	DESCRIPTION:	Soil	FILE NO:	PM4184
CONTRACT NO.:	-	SPECIFICATION:	-	LAB NO:	14773
PROJECT:	267991.001	INTENDED USE:	-	DATE RECEIVED:	20-Jan-20
		PIT OR QUARRY:	-	DATE TESTED:	22-Jan-20
DATE SAMPLED:	20-Jan-20	SOURCE LOCATION:	BH3	DATE REPORTED:	23-Jan-20
SAMPLED BY:	Client	SAMPLE LOCATION:	0 - 1.5'	TESTED BY:	DB



Identification	Soil Classification	MC(%)	LL	PL	PI	Cc	Cu
						0.98	8.1

D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
26.5	4.6	1.6	0.57	40.0	58.6	1.4	

Comments: STRONG ASPHALT COATED PARTICLE PRESENCE

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

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SIEVE ANALYSIS
ASTM C136

CLIENT:	Pinchin	DESCRIPTION:	Soil	FILE NO.:	PM4184
CONTRACT NO.:	-	SPECIFICATION:	-	LAB NO.:	14773
PROJECT:	267991.001	INTENDED USE:	-	DATE REC'D:	20-Jan-20
		PIT OR QUARRY:	-	DATE TESTED:	22-Jan-20
DATE SAMPLED:	20-Jan-20	SOURCE LOCATION:	BH3	DATE REP'D:	23-Jan-20
SAMPLED BY:	Client	SAMPLE LOCATION:	0 - 1.5'	TESTED BY:	DB

WEIGHT BEFORE WASH	1942.6
WEIGHT AFTER WASH	1923.3

SIEVE SIZE (mm)	WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING	LOWER SPEC	UPPER SPEC	REMARK
150						
106						
75						
63						
53						
37.5						
26.5	**0.0**	0.0	**100.0**			
19	**29.7**	1.5	**98.5**			
16	**70.0**	3.6	**96.4**			
13.2	**118.6**	6.1	**93.9**			
9.5	**326.6**	16.8	**83.2**			
6.7	**553.1**	28.5	**71.5**			
4.75	**776.4**	40.0	**60.0**			
2.36	**1154.5**	59.4	**40.6**			
1.18	**1471.9**	75.8	**24.2**			
0.6	**1730.3**	89.1	**10.9**			
0.3	**1858.1**	95.7	**4.3**			
0.15	**1897.0**	97.7	**2.3**			
0.075	**1916.2**	98.6	**1.4**			
PAN	**1922.2**					
SIEVE CHECK FINE		0.06	0.3% max.			

OTHER TESTS	**RESULT**	**REFERENCE MATERIAL** **LAB NO.**	 **RESULT**
STRONG ASPHALT COATED PARTICLE PRESENCE			

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

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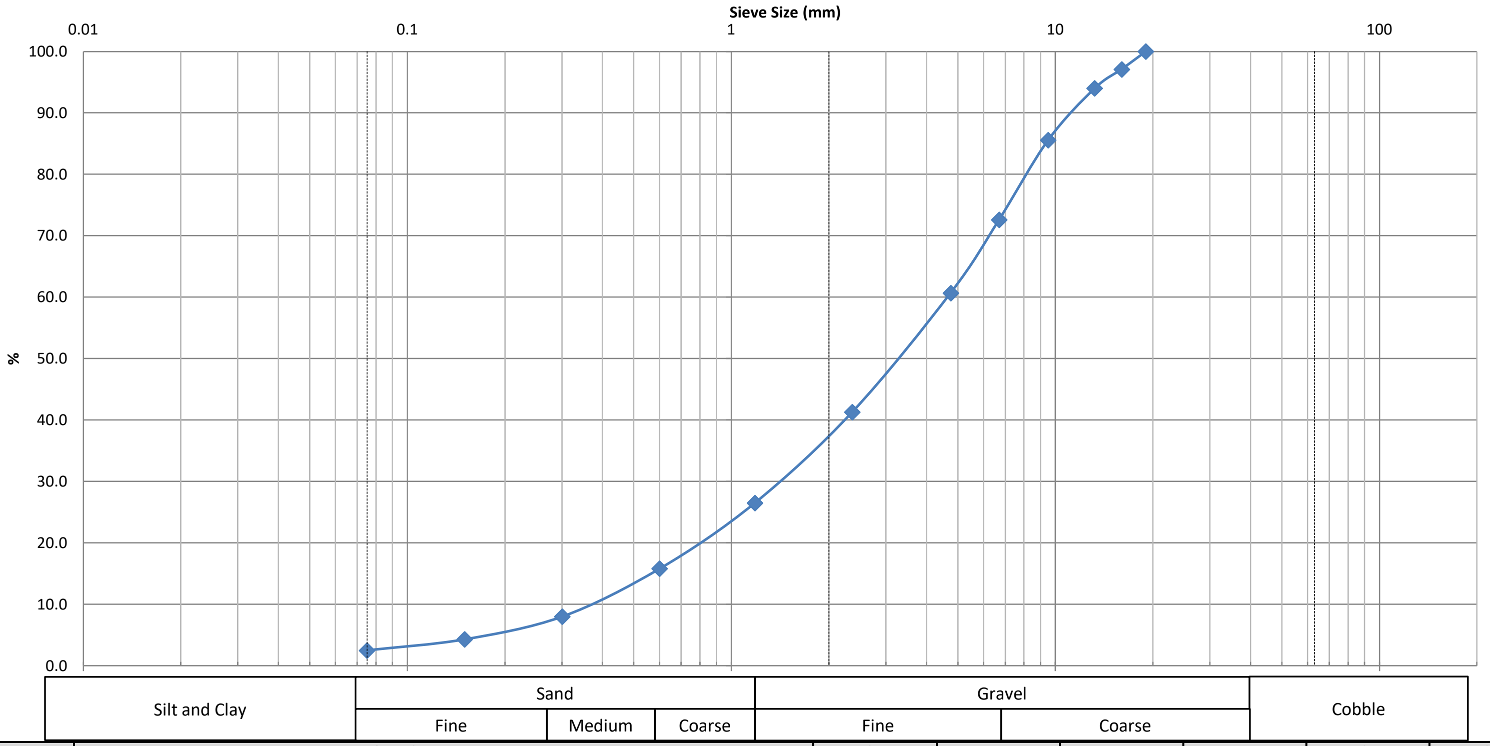
SIEVE ANALYSIS
ASTM C136

CLIENT:	Pinchin	DESCRIPTION:	Soil	FILE NO:	PM4184
CONTRACT NO.:	-	SPECIFICATION:	-	LAB NO:	14774
PROJECT:	267991.001	INTENDED USE:	-	DATE RECEIVED:	20-Jan-20
		PIT OR QUARRY:	-	DATE TESTED:	22-Jan-20
DATE SAMPLED:	20-Jan-20	SOURCE LOCATION:	BH4	DATE REPORTED:	23-Jan-20
SAMPLED BY:	Client	SAMPLE LOCATION:	0 - 1.5'	TESTED BY:	DB



Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
									1.02	9.6
	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)		Clay (%)	
	19	4.6	1.5	0.48	39.3	58.2	2.5			

Comments:	SOME ASPHALT COATED PARTICLE PRESENCE

REVIEWED BY:	**Curtis Beadow**	**Joe Fosyth, P. Eng.**

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SIEVE ANALYSIS
ASTM C136

CLIENT:	Pinchin	DESCRIPTION:	Soil	FILE NO.:	PM4184
CONTRACT NO.:	-	SPECIFICATION:	-	LAB NO.:	14774
PROJECT:	267991.001	INTENDED USE:	-	DATE REC'D:	20-Jan-20
		PIT OR QUARRY:	-	DATE TESTED:	22-Jan-20
DATE SAMPLED:	20-Jan-20	SOURCE LOCATION:	BH4	DATE REP'D:	23-Jan-20
SAMPLED BY:	Client	SAMPLE LOCATION:	0 - 1.5'	TESTED BY:	DB

WEIGHT BEFORE WASH	1403
WEIGHT AFTER WASH	1376.6

SIEVE SIZE (mm)	WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING	LOWER SPEC	UPPER SPEC	REMARK
150						
106						
75						
63						
53						
37.5						
26.5						
19	**0.0**	0.0	**100.0**			
16	**40.3**	2.9	**97.1**			
13.2	**84.0**	6.0	**94.0**			
9.5	**202.5**	14.4	**85.6**			
6.7	**383.8**	27.4	**72.6**			
4.75	**551.4**	39.3	**60.7**			
2.36	**823.4**	58.7	**41.3**			
1.18	**1031.7**	73.5	**26.5**			
0.6	**1181.3**	84.2	**15.8**			
0.3	**1290.4**	92.0	**8.0**			
0.15	**1342.1**	95.7	**4.3**			
0.075	**1367.8**	97.5	**2.5**			
PAN	**1375.4**					

SIEVE CHECK FINE	0.09	0.3% max.	**REFERENCE MATERIAL**

OTHER TESTS	**RESULT**	**LAB NO.**	**RESULT**
SOME ASPHALT COATED PARTICLE PRESENCE			

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

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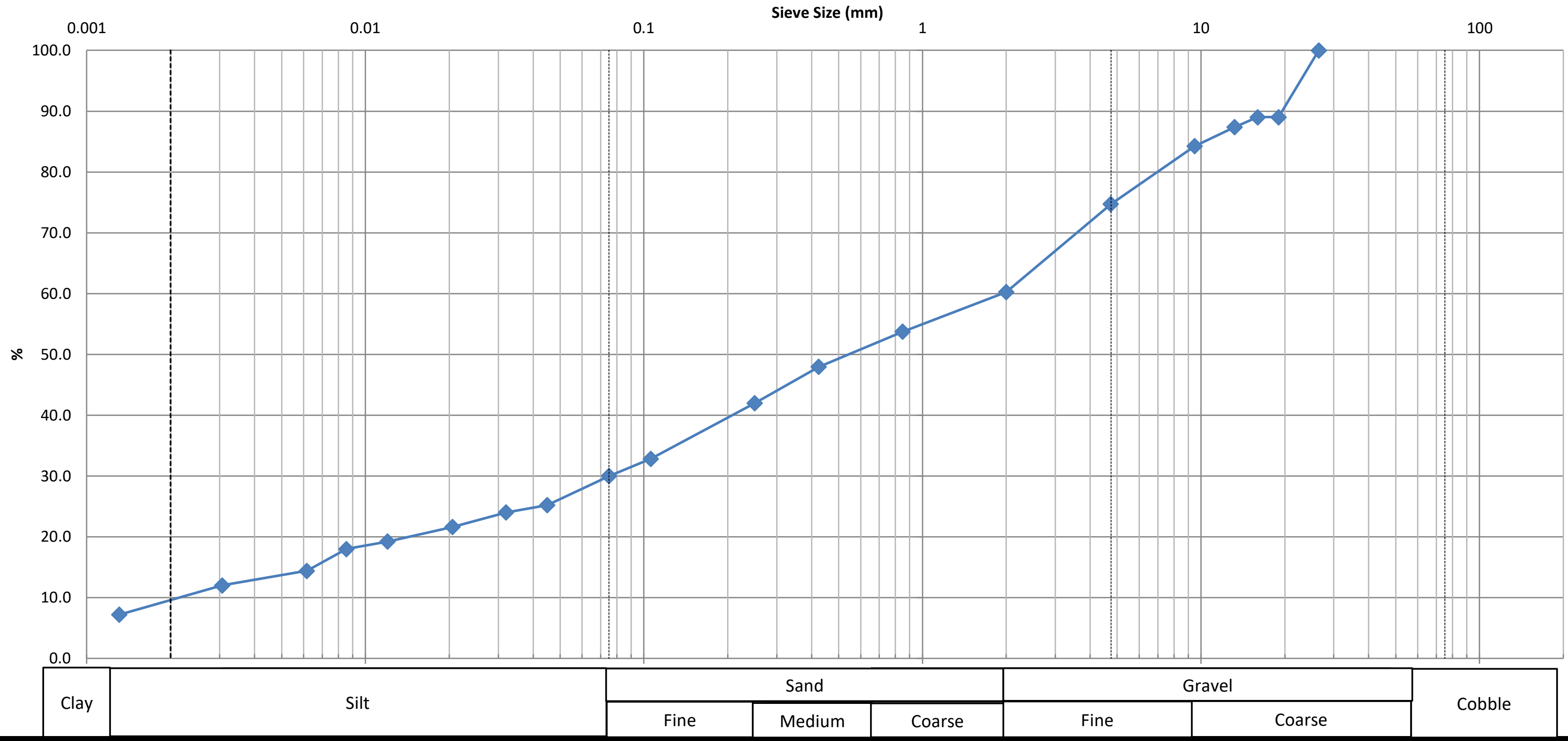
SIEVE ANALYSIS **LS-**
702

CLIENT:	Pinchin	DEPTH:	25.0 - 27.0'	FILE NO:	PM4184
CONTRACT NO.:		BH OR TP No.:	BH4	LAB NO:	14778
PROJECT:	267991.001			DATE RECEIVED:	20-Jan-20
				DATE TESTED:	22-Jan-20
DATE SAMPLED:	7-Jan-20			DATE REPORTED:	24-Jan-20
SAMPLED BY:	Client			TESTED BY:	D. Bertrand



Identification	**Soil Classification**	**MC(%)**	**LL**	**PL**	**PI**	**Cc**	**Cu**
		9.2					

	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
					25.3	44.7	20.0	10.0

Comments:

REVIEWED BY:	**Curtis Beadow**	**Joe Fosyth, P. Eng.**

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HYDROMETER
LS-702 ASTM-422

CLIENT:	Pinchin	DEPTH:	25.0 - 27.0'	FILE NO.:	PM4184
PROJECT:	267991.001	BH OR TP No.:	BH4	DATE SAMPLED:	07-Jan-20
LAB No. :	14778	TESTED BY:	D. Bertrand	DATE RECEIVED:	20-Jan-20
SAMPLED BY:	Client	DATE REPT'D:	24-Jan-20	DATE TESTED:	22-Jan-20

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
219.6	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	49.63	TARE WEIGHT	50.00	ACTUAL WEIGHT
WEIGHT AFTER WASH BACK SIEVE	25.38	AIR DRY	150.00	100.00
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	149.25	99.25
		CORRECTED	0.993	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
63.0			
53.0			
37.5			
26.5	**0**	0.0	**100.0**
19.0	**24.1**	11.0	**89.0**
16.0	**24.1**	11.0	**89.0**
13.2	**27.7**	12.6	**87.4**
9.5	**34.6**	15.8	**84.2**
4.75	**55.5**	25.3	**74.7**
2.0	**87.3**	39.8	**60.2**
Pan	**132.3**		
0.850	**5.39**	46.2	**53.8**
0.425	**10.19**	52.0	**48.0**
0.250	**15.16**	58.0	**42.0**
0.106	**22.75**	67.2	**32.8**
0.075	**25.10**	70.0	**30.0**
Pan	**25.38**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	10:45	27.0	6.0	22.0	0.0450	41.8	**25.2**
2	10:46	26.0	6.0	22.0	0.0320	39.9	**24.0**
5	10:49	24.0	6.0	22.0	0.0206	35.9	**21.6**
15	10:59	22.0	6.0	22.0	0.0120	31.9	**19.2**
30	11:14	21.0	6.0	22.0	0.0086	29.9	**18.0**
60	11:44	18.0	6.0	22.0	0.0062	23.9	**14.4**
250	14:54	16.0	6.0	22.0	0.0031	19.9	**12.0**
1440	10:44	12.0	6.0	22.0	0.0013	12.0	**7.2**

Moisture Content = 9.2%

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

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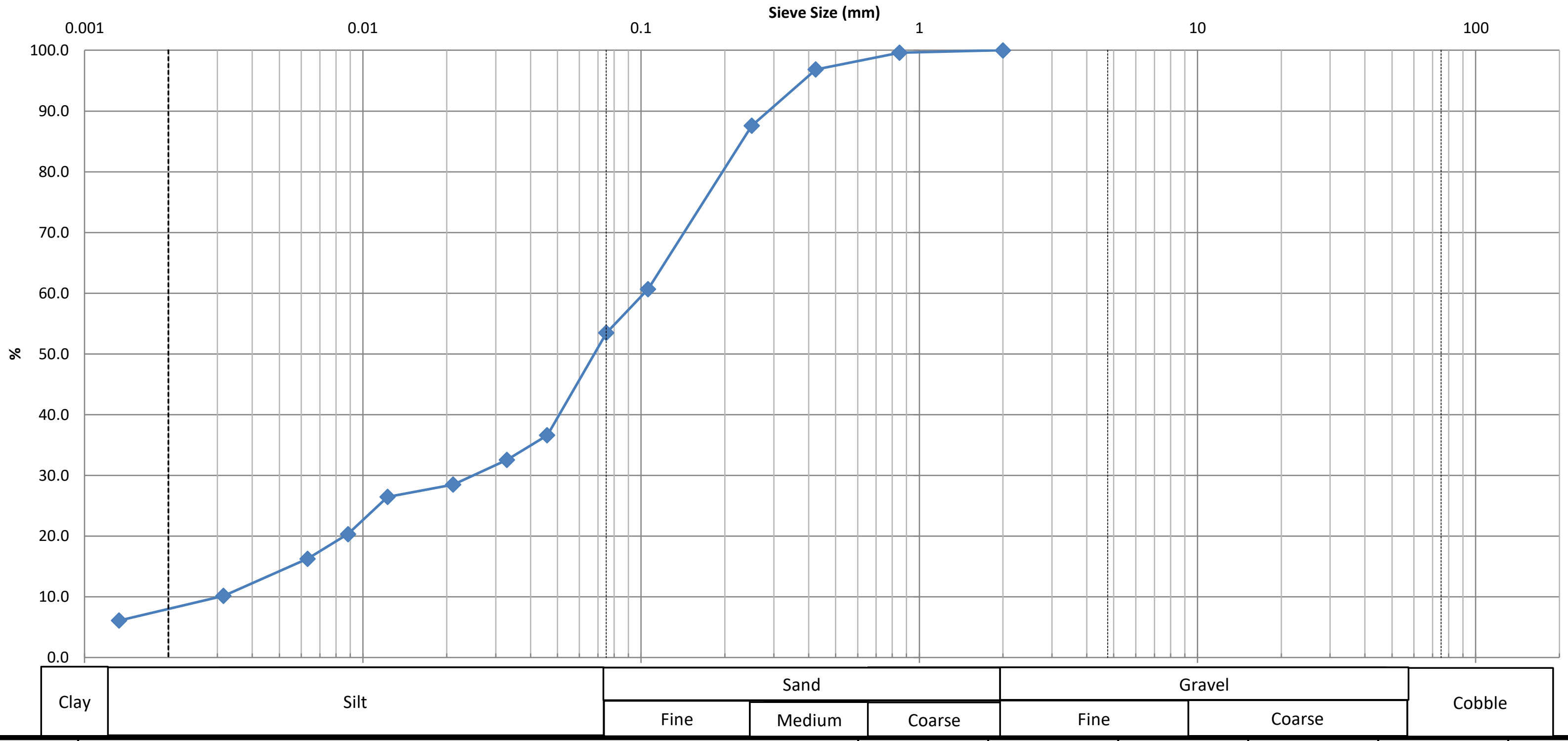
SIEVE ANALYSIS **LS-**
702

CLIENT:	Pinchin	DEPTH:	5.0 - 7.0'	FILE NO:	PM4184
CONTRACT NO.:		BH OR TP No.:	BH8	LAB NO:	14776
PROJECT:	267991.001			DATE RECEIVED:	20-Jan-20
				DATE TESTED:	22-Jan-20
DATE SAMPLED:	7-Jan-20			DATE REPORTED:	24-Jan-20
SAMPLED BY:	Client			TESTED BY:	D. Bertrand



Identification	**Soil Classification**	**MC(%)**	**LL**	**PL**	**PI**	**Cc**	**Cu**
		17.1					

D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
				0.0	46.5	45.0	8.5

Comments:

REVIEWED BY:	**Curtis Beadow**	**Joe Fosyth, P. Eng.**

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HYDROMETER
LS-702 ASTM-422

CLIENT:	Pinchin	DEPTH:	5.0 - 7.0'	FILE NO.:	PM4184
PROJECT:	267991.001	BH OR TP No.:	BH8	DATE SAMPLED:	07-Jan-20
LAB No. :	14776	TESTED BY:	D. Bertrand	DATE RECEIVED:	20-Jan-20
SAMPLED BY:	Client	DATE REPT'D:	24-Jan-20	DATE TESTED:	22-Jan-20

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
191	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	48.60	TARE WEIGHT	50.00	ACTUAL WEIGHT
WEIGHT AFTER WASH BACK SIEVE	24.26	AIR DRY	150.00	100.00
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	147.20	97.20
		CORRECTED	0.972	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
63.0			
53.0			
37.5			
26.5			
19.0			
16.0			
13.2			
9.5			
4.75			
2.0	**0.0**	0.0	**100.0**
Pan	**191**		
0.850	**0.19**	0.4	**99.6**
0.425	**1.57**	3.1	**96.9**
0.250	**6.21**	12.4	**87.6**
0.106	**19.65**	39.3	**60.7**
0.075	**23.26**	46.5	**53.5**
Pan	**24.26**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (^{o}C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	10:18	24.0	6.0	22.0	0.0460	36.6	**36.6**
2	10:19	22.0	6.0	22.0	0.0329	32.6	**32.6**
5	10:23	20.0	6.0	22.0	0.0211	28.5	**28.5**
15	10:32	19.0	6.0	22.0	0.0123	26.4	**26.4**
30	10:47	16.0	6.0	22.0	0.0088	20.3	**20.3**
60	11:17	14.0	6.0	22.0	0.0063	16.3	**16.3**
250	14:27	11.0	6.0	22.0	0.0032	10.2	**10.2**
1440	10:17	9.0	6.0	22.0	0.0013	6.1	**6.1**

Moisture Content = 17.1%

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

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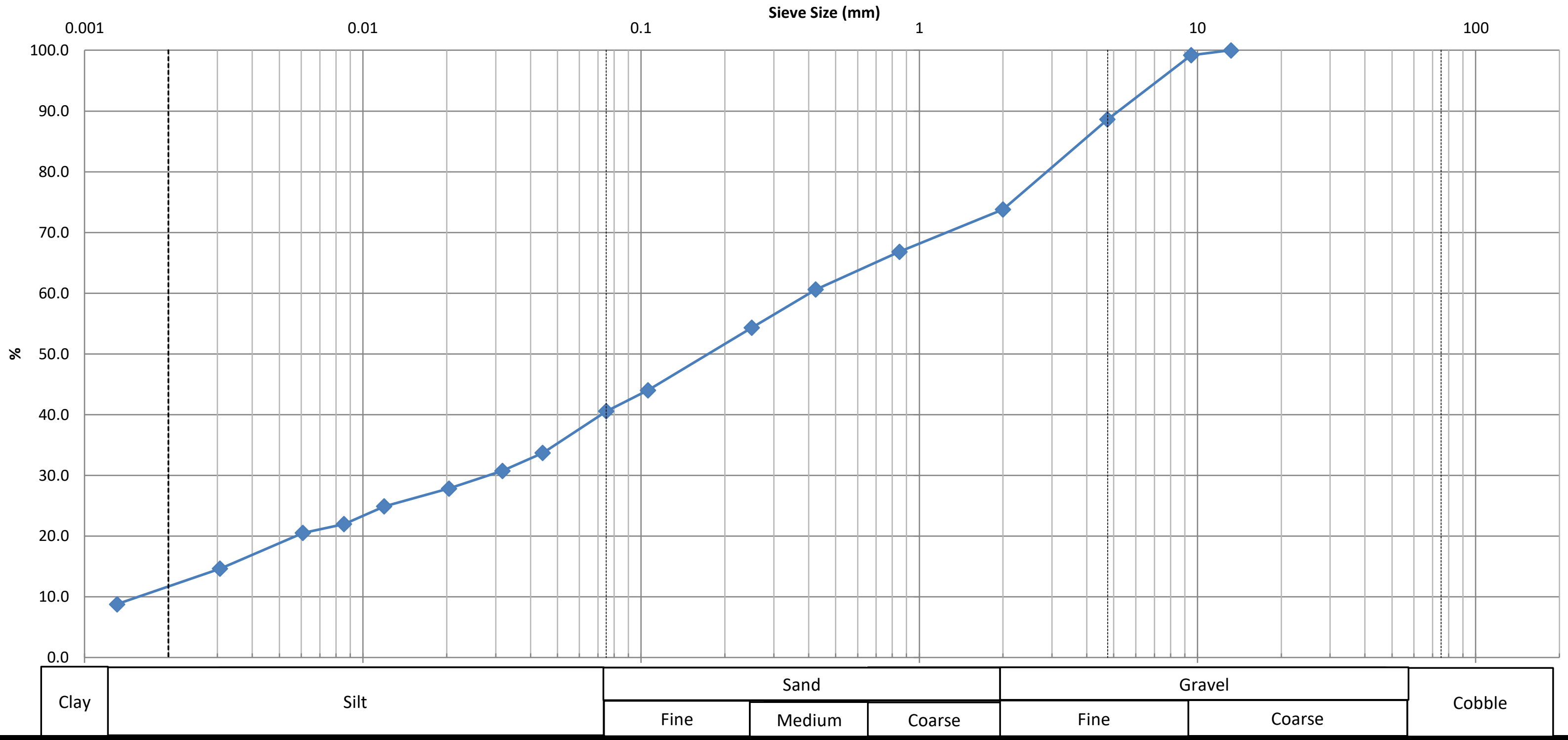
SIEVE ANALYSIS **LS-**
702

CLIENT:	Pinchin	DEPTH:	20.0 - 22.5'	FILE NO:	PM4184
CONTRACT NO.:		BH OR TP No.:	BH17	LAB NO:	14775
PROJECT:	267991.001			DATE RECEIVED:	20-Jan-20
				DATE TESTED:	22-Jan-20
DATE SAMPLED:	7-Jan-20			DATE REPORTED:	24-Jan-20
SAMPLED BY:	Client			TESTED BY:	D. Bertrand



Identification	**Soil Classification**	**MC(%)**	**LL**	**PL**	**PI**	**Cc**	**Cu**
		7.8					

	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
					11.4	48.0	29.6	11.0

Comments:

REVIEWED BY:	**Curtis Beadow**	**Joe Fosyth, P. Eng.**

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HYDROMETER
LS-702 ASTM-422

CLIENT:	Pinchin	DEPTH:	20.0 - 22.5'	FILE NO.:	PM4184
PROJECT:	267991.001	BH OR TP No.:	BH17	DATE SAMPLED:	07-Jan-20
LAB No. :	14775	TESTED BY:	D. Bertrand	DATE RECEIVED:	20-Jan-20
SAMPLED BY:	Client	DATE REPT'D:	24-Jan-20	DATE TESTED:	22-Jan-20

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
215.5	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	49.80	TARE WEIGHT	50.00	ACTUAL WEIGHT
WEIGHT AFTER WASH BACK SIEVE	22.78	AIR DRY	150.00	100.00
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	149.60	99.60
		CORRECTED	0.996	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
63.0			
53.0			
37.5			
26.5			
19.0			
16.0			
13.2	**0.0**	0.0	**100.0**
9.5	**1.7**	0.8	**99.2**
4.75	**24.5**	11.4	**88.6**
2.0	**56.5**	26.2	**73.8**
Pan	**159**		
0.850	**4.70**	33.2	**66.8**
0.425	**8.91**	39.4	**60.6**
0.250	**13.18**	45.7	**54.3**
0.106	**20.16**	56.0	**44.0**
0.075	**22.51**	59.4	**40.6**
Pan	**22.78**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	10:05	29.0	6.0	22.0	0.0443	45.7	**33.7**
2	10:06	27.0	6.0	22.0	0.0318	41.7	**30.8**
5	10:09	25.0	6.0	22.0	0.0204	37.7	**27.8**
15	10:19	23.0	6.0	22.0	0.0119	33.8	**24.9**
30	10:34	21.0	6.0	22.0	0.0086	29.8	**22.0**
60	11:04	20.0	6.0	22.0	0.0061	27.8	**20.5**
250	14:14	16.0	6.0	22.0	0.0031	19.9	**14.6**
1440	10:04	12.0	6.0	22.0	0.0013	11.9	**8.8**

Moisture Content = 7.8%

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

APPENDIX IV

Rock Core Photographs

Photo 1 – Rock Core BH7

Photo 2 – Rock Core BH8

Photo 3 – Rock Core BH17

APPENDIX V

Report Limitations and Guidelines for Use

REPORT LIMITATIONS & GUIDELINES FOR USE

This information has been provided to help manage risks with respect to the use of this report.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS

This report was prepared for the exclusive use of the Client and their authorized agents, subject to the conditions and limitations contained within the duly authorized work plan. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third parties. If additional parties require reliance on this report, written authorization from Pinchin will be required. Pinchin disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed. Furthermore, this report should not be construed as legal advice.

SUBSURFACE CONDITIONS CAN CHANGE

This geotechnical report is based on the existing conditions at the time the study was performed, and Pinchin's opinion of soil conditions are strictly based on soil samples collected at specific test hole locations. The findings and conclusions of Pinchin's reports may be affected by the passage of time, by manmade events such as construction on or adjacent to the Site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations.

LIMITATIONS TO PROFESSIONAL OPINIONS

Interpretations of subsurface conditions are based on field observations from test holes that were spaced to capture a 'representative' snap shot of subsurface conditions. Site exploration identifies subsurface conditions only at points of sampling. Pinchin reviews field and laboratory data and then applies professional judgment to formulate an opinion of subsurface conditions throughout the Site. Actual subsurface conditions may differ, between sampling locations, from those indicated in this report.

LIMITATIONS OF RECOMMENDATIONS

Subsurface soil conditions should be verified by a qualified geotechnical engineer during construction. Pinchin should be notified if any discrepancies to this report or unusual conditions are found during construction.

Sufficient monitoring, testing and consultation should be provided by Pinchin during construction and/or excavation activities, to confirm that the conditions encountered are consistent with those indicated by the test hole investigation, and to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated. In addition, monitoring, testing and consultation by Pinchin should be completed to evaluate whether or not earthwork activities are completed in accordance with our recommendations. Retaining Pinchin for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions. However, please be advised that any construction/excavation observations by Pinchin is over and above the mandate of this geotechnical evaluation and therefore, additional fees would apply.

MISINTERPRETATION OF GEOTECHNICAL ENGINEERING REPORT

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having Pinchin confer with appropriate members of the design team after submitting the report. Also retain Pinchin to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having Pinchin participate in pre-bid and preconstruction conferences, and by providing construction observation. Please be advised that retaining Pinchin to participation in any ‘other’ activities associated with this project is over and above the mandate of this geotechnical investigation and therefore, additional fees would apply.

CONTRACTORS RESPONSIBILITY FOR SITE SAFETY

This geotechnical report is not intended to direct the contractor's procedures, methods, schedule or management of the work Site. The contractor is solely responsible for job Site safety and for managing construction operations to minimize risks to on-Site personnel and to adjacent properties. It is ultimately the contractor’s responsibility that the Ontario Occupational Health and Safety Act is adhered to, and Site conditions satisfy all ‘other’ acts, regulations and/or legislation that may be mandated by federal, provincial and/or municipal authorities.

SUBSURFACE SOIL AND/OR GROUNDWATER CONTAMINATION

This report is geotechnical in nature and was not performed in accordance with any environmental guidelines. As such, any environmental comments are very preliminary in nature and based solely on field observations. Accordingly, the scope of services do not include any interpretations, recommendations, findings, or conclusions regarding the, assessment, prevention or abatement of contaminants, and no conclusions or inferences should be drawn regarding contamination, as they may relate to this project. The term "contamination" includes, but is not limited to, molds, fungi, spores, bacteria, viruses, PCBs, petroleum hydrocarbons, inorganics, pesticides/insecticides, volatile organic compounds, polycyclic aromatic hydrocarbons and/or any of their by-products.

Pinchin will not be responsible for any consequential or indirect damages. Pinchin will only be held liable for damages resulting from the negligence of Pinchin. Pinchin will not be liable for any losses or damage if the Client has failed, within a period of two years following the date upon which the claim is discovered within the meaning of the Limitations Act, 2002 (Ontario), to commence legal proceedings against Pinchin to recover such losses or damage.