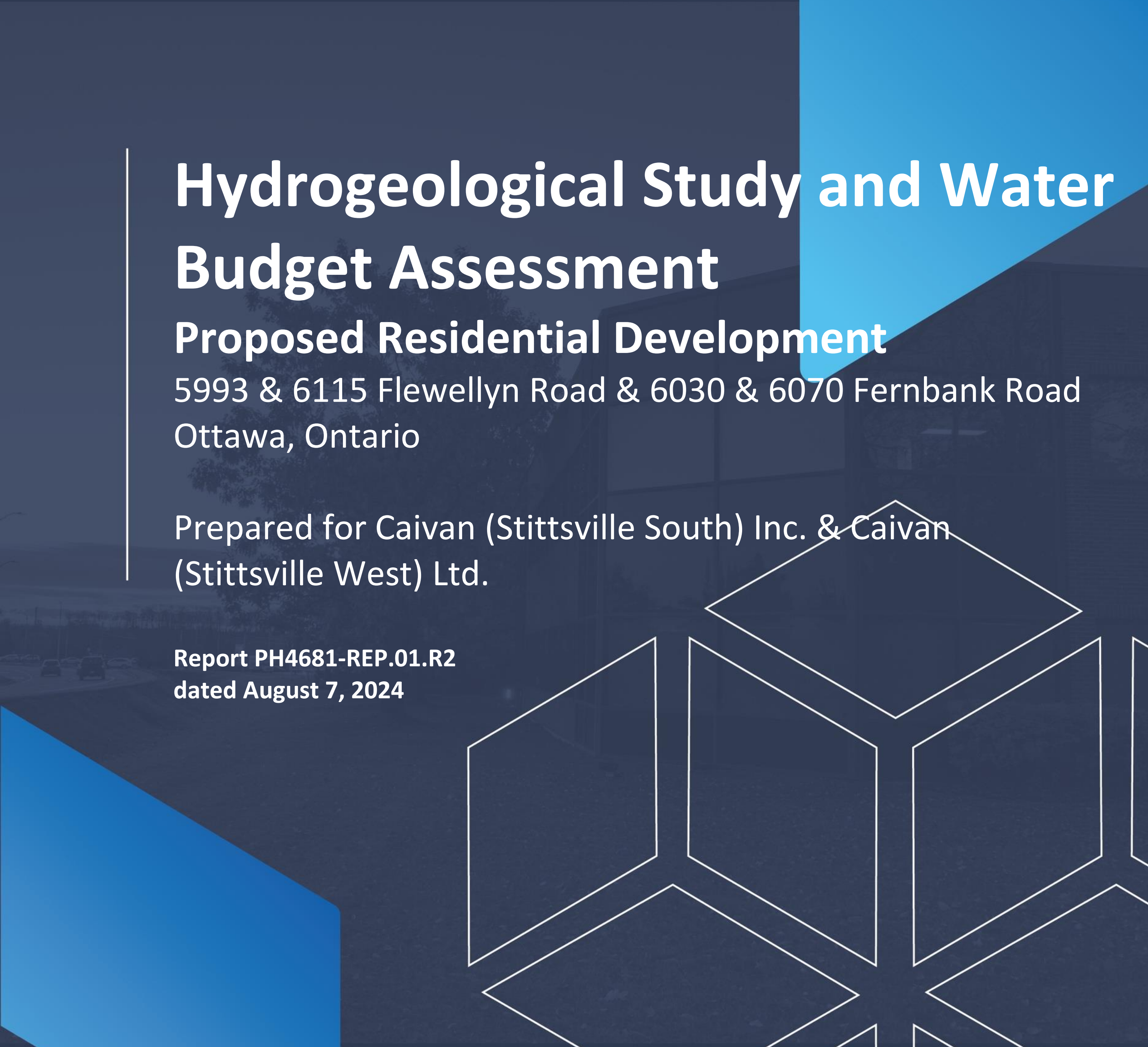
Hydrogeological Study and Water Budget Assessment

Proposed Residential Development

5993 & 6115 Flewellyn Road & 6030 & 6070 Fernbank Road
Ottawa, Ontario

Prepared for Caivan (Stittsville South) Inc. & Caivan (Stittsville West) Ltd.

Report PH4681-REP.01.R2
dated August 7, 2024



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EXECUTIVE SUMMARY

Assessment

Further to the request and authorization of Caivan Communities Inc., Paterson Group (Paterson) completed a Hydrogeological Study for 5993, 6030 & 6115 Flewellyn Road & 6070 Fernbank Road in the City of Ottawa, Ontario as per the agreed upon scope of work. The purpose of this study is to:

- ☐ Characterize the hydrogeological setting of the subject site. Consideration was given to bedrock and surficial geology, aquifer systems, groundwater levels, hydraulic properties and catchment characteristics.

- ☐ Complete pre-development water budget analyses to determine the hydrogeological function of the subject site, to identify infiltration potential and to identify opportunities for Low Impact Development (LID) measures or the use of best management practices (BMP).

This report incorporates the findings of geotechnical and hydrogeological investigations by Paterson as well as investigations by others.

The subject site consists of a mixture of agricultural lands, meadows, and forested areas. The location of the subject site is shown on PH4681-1 - Site Plan appended to this report.

Overburden soils identified during the geotechnical investigation by Paterson were generally consistent with the available mapping. Overburden thickness varied from approximately 0.8 to 6.1 m across the subject site, with greater depths of overburden materials typically present at the eastern portion of the site. Soils generally consisted of topsoil overlying silty sand to sandy silt layers underlain by a glacial till deposit comprised of a compact to dense, brown to grey silty sand to sandy silt with gravel, cobbles and boulders, dependent on location across the site. A thin layer of stiff brown silty clay was observed underlying the topsoil and/or interlayered within the sandy silt deposit at select test holes within the eastern portion of the subject site.

Bedrock was encountered at depths between 0.3 and 6.0 m bgs and cored to a maximum depth of 10.2 m bgs at select borehole locations as part of the geotechnical investigation. Based on available mapping, bedrock in the area is expected to consist of limestone, dolostone, shale and sandstone of the Gull River Formation.

Field saturated hydraulic conductivity values for the native silty sand to sandy silt, silty clay, and glacial till deposit throughout the site ranged from $\leq 8.1 \times 10^{-9}$ to 6.4×10^{-6} m/sec.

It is our interpretation that the majority of surface water will infiltrate the sandy silt, silty sand and glacial till layer before being intercepted by the underlying bedrock unit where it will either recharge the underlying bedrock aquifer or flow laterally down-gradient as perched water (interflow). Therefore, the volume of recharge occurring within the site boundaries is expected to be low to moderate dependant on location across the site.

With regards to discharge zones, neither the topographical or geological conditions are suitable for discharge to be occurring on a large scale at the subject site.

The pre-development water budget analysis conducted for the study area determined that an estimated 149,490 m^3/year of surplus water currently infiltrates the surface soils and either recharges local bedrock aquifer systems or travels laterally as interflow at the bedrock interface. The remaining estimated 114,952 m^3/year of surplus leaves the site as runoff, draining towards adjacent man-made drainage ditches and local drains.

There are several water wells within 500 m of the site as depicted on drawing PH4681-2 - MECP Water Well Location Plan appended to this report. However, after reviewing the water well records of the surrounding water supply wells, it was noted that the majority of the wells are screened within the bedrock aquifer at depths below the proposed servicing depths at the subject site, providing sufficient vertical separation between the wells and potential development activities.

A review of the MECP's Brownfield Environmental Site Registry did not identify any environmental concerns in the immediate vicinity of the study area. Based on observations of Paterson staff during field work, no groundwater contamination was identified with respect to the site.

Recommendations

A brief summary of the recommendations of the hydrogeological study is provided as follows:

- ☐ Prior to and during site development, it is recommended that construction best management practices with respect to fuels and chemical handling, spill prevention, and erosion and sediment control be followed.

- ☐ It is recommended that adherence to the City of Ottawa Salt Management Plan - Appendix A (October, 2011) is enforced to ensure that chloride levels in stormwater runoff are as low as possible.

- ☐ Should potential dewatering volumes during construction activities be anticipated to exceed 50,000 L/day, it is recommended that either an EASR or PTTW (dependent on pumping requirements) be obtained prior to construction commencing at the site.

- ☐ This report has been completed as per the agreed-upon scope of work for this project. It is recommended that the sufficiency of these conclusions be re-evaluated at the detail design phase and that any data gaps be addressed accordingly.

1.0 INTRODUCTION

1.1 Background

Paterson Group (Paterson) was retained by Caivan (Stittsville South) Inc. & Caivan (Stittsville West) Ltd. to complete a hydrogeological study and water budget assessment for the proposed residential development to be located at 5993 and 6115 Flewellyn Road and 6030 and 6070 Fernbank Road (hereinafter referred to as the “subject site”). The location of the subject site is shown on PH4681-1 - Site Plan appended to this report. This report incorporates the findings of Paterson Report PG5570-2 Revision 4 dated August 7, 2024, as well as a recent hydrogeological field investigation also completed by Paterson.

1.2 Scope of Work

Paterson has completed this report in accordance with the scope prepared by Paterson. As per the agreed upon scope, the purpose of this study was to:

- ☐ Characterize the hydrogeological setting of the subject site. Consideration was given to bedrock and surficial geology, aquifer systems, groundwater levels, hydraulic properties and catchment characteristics.

Additionally, as per the scope, the study was to include the following:

- ☐ Pre-development water budget analyses to determine the hydrogeological function of the subject site, to identify infiltration potential and to identify opportunities for Low Impact Development (LID) measures or the use of best management practices (BMP).

2.0 PREVIOUS REPORTS

In addition to a review of the general literature summarized in the following sections and in the ‘References’ section of this report (MECP water well mapping, available geological and physiographic mapping), Paterson reviewed the following site-specific reports:

- ☐ The Jock River – Reach Two Subwatershed – Phase 1 Report (Marshall Macklin Monaghan Limited and WESA, (2009)
- ☐ Paterson Hydrogeological Existing Conditions Report PH4625-REP-01.R2 - Flewellyn Road 5993 & 6115 Flewellyn Road & 6030 & 6070 Fernbank Road – (August 7, 2024)
- ☐ Paterson Geotechnical Report PG5570-2 Revision 4 – 5993 & 6115 Flewellyn Road & 6030 & 6070 Fernbank Road – (August 7, 2024)
- ☐ Paterson Geotechnical Report PG2802-1 – Maguire Lands – Hartsmere Drive (November 2012) – As part of D07-16-13-0033.
- ☐ Paterson Geotechnical Report PG2853-1 – Proposed Residential Development – Stittsville Main Street (January 2013) - As part of D07-16-13-0033.
- ☐ Paterson Geotechnical Report PG2983-1 – Faulkner Lands – Fernbank Road at Main Street (July 2013) - As part of D07-16-13-0033.
- ☐ Houle Chevrier Engineering – Technical Memorandum - Hydrogeological Study – (D007-16-13-0033) – Area 6, Stittsville South (April 2015) – As part of D07-16-13-0033.
- ☐ Houle Chevrier Engineering – Report on Private Well Monitoring Program Stittsville South Residential Development and Stormwater Management Pond – (November 2015) – As part of D07-16-15-0008.
- ☐ J.F. Sabourin and Associates Inc. – Stittsville Lands (5993, 6070 & 6115 Flewellyn Road): Pre-Development Hydraulic and Hydrologic Study” – (November 2022)

3.0 METHOD OF INVESTIGATION

3.1 Records Review

A review of available physiographic, geological, and hydrogeological data was completed as a part of this assessment. However, the literature review and previous reports did not provide site-specific data regarding overburden and bedrock aquifers, recharge and discharge conditions or flow contributions to the nearby water features. Further detail is provided in the following sections.

3.2 Field Program

The geotechnical field programs were developed to assess geology, groundwater conditions, and hydraulic gradients in the overburden at the subject site. The test holes were advanced to various depths across the site to assess hydrogeological and geotechnical conditions at the approximate depth of the proposed construction activities. A supplemental hydrogeological field program was carried out within the subject site to determine the infiltration potential of the soils.

Geotechnical field investigations completed by Paterson have been carried out at the subject site between November 20, 2020, and September 30, 2022. During this time, a total of 45 boreholes, 1 hand auger hole and 18 test pits were advanced to a maximum depth of 10.2, 0.7 and 3.4 m below ground surface (bgs), respectively. The test holes were distributed in a manner to provide general coverage of the proposed development. Each of the boreholes were instrumented with either groundwater monitoring wells or flexible standpipe piezometers. The test hole locations are shown on Drawing PG5570-1 - Test Hole Location Plan located in Appendix 1.

The test pits were completed using a hydraulic shovel and backfilled with the excavated soil upon completion. The boreholes were advanced using a track-mounted drill rig. All fieldwork was conducted under full-time supervision of Paterson personnel.

Soil samples were recovered from the sidewalls of the test pits. All soil samples were visually inspected and classified on site. The soil samples were placed in sealed plastic bags and transported to our laboratory for further examination and classification. The depths at which the soil samples were recovered from the test pits are shown as G on the Soil Profile and Test Data sheets presented in Appendix 1.

Soil samples were obtained from the boreholes by means of split spoon sampling and the sampling of shallow soils directly from auger flights. Split-spoon samples were taken at approximate 0.76 m intervals. The depth at which split-spoon and auger flight samples were obtained from the test holes are shown as "**SS**" and "**AU**" respectively on the Soil Profile and Test Data sheets, appended to this report.

All samples were classified on site, placed in sealed plastic bags and were transported to our laboratory for further review and testing. Transportation of the samples was completed in accordance with ASTM D4220-95 (2007) - Standard Practice for Preserving and Transporting Soils.

The Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split-spoon samples. The SPT results are recorded as "N" values on the Soil Profile and Test Data sheets. The "N" value is the number of blows required to drive the split-spoon sampler 300 mm into the ground after an initial penetration of 150 mm using a 63.5 kg hammer falling from a height of 760 mm. This test was done in accordance with ASTM D1586-11 - Standard Method for Penetration Test and Split-Barrel Sampling of Soils.

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

Infiltration Testing

In conjunction with a supplemental geotechnical investigation, Paterson completed site specific infiltration testing in September 2022 using a Pask Permeameter in order to identify the infiltration potential of the underlying soils on site.

A total of 24 constant head Pask (Constant Head Well) Permeameter tests were conducted at 12 test pit locations. The testing locations were distributed in a manner to provide general coverage of the site. Tests were completed at an approximate depth of 0.3 to 0.6 m bgs. Preparation and testing of this investigation are in accordance with the Canadian Standards Association (CSA) B65-12 - Annex E. The field saturated hydraulic conductivity (Kfs) and estimated infiltration values at each test pit location are presented in Table 1 of this report.

Field saturated hydraulic conductivity values were determined using Engineering Technologies Canada (ETC) Ltd. reference tables provided in the most recent ETC Pask Permeameter User Guide. The field saturated hydraulic conductivity values were used to estimate the infiltration rates based on the approximate relationship between infiltration rate and hydraulic conductivity, as described in the 2010 Low

Impact Development Stormwater Management Planning and Design Guide prepared by the CVC and the TRCA.

Table 1 - Summary of Field Saturated Hydraulic Conductivity Values and Estimated Infiltration Rates

Test Completed Adjacent to Borehole ID	Infiltration Testing Elevation (m asl)	Material	K_{fs} (m/s)*	Unfactored Infiltration Rate (mm/hr)**
BH1-21	103.90	Brown Silty Sand	2.10 x 10^{-6}	56
	103.63	Brown Silty Sand	1.90 x 10^{-6}	56
BH2-21	106.95	Brown Silty Sand	6.40 x 10^{-6}	76
	106.65	Brown Silty Sand	5.30 x 10^{-7}	39
BH7-21	106.74	Brown Silty Sand	1.10 x 10^{-6}	47
	106.44	Brown Silty Sand	1.60 x 10^{-6}	52
BH11-21	104.68	Brown Silty Sand	2.70 x 10^{-6}	60
	104.38	Brown Silty Sand	1.60 x 10^{-6}	52
BH15-21	102.70	Brown Silty Sand to Sandy Silt	2.10 x 10^{-7}	31
	102.48	Brown Silty Clay w/ Sand	≤ 8.1 x 10^{-9}	≤ 13
BH17-21	106.74	Brown Silty Sand to Sandy Silt	5.90 x 10^{-6}	74
	106.44	Brown Silty Sand to Sandy Silt	4.10 x 10^{-6}	67
BH22-21	102.58	Brown Silty Sand	1.10 x 10^{-6}	47
	102.28	Brown Silty Sand	1.60 x 10^{-6}	52
BH23-21	102.33	Brown Silty Clay w/ Sand	5.30 x 10^{-7}	39
	101.70	Brown Silty Clay w/ Sand	≤ 8.1 x 10^{-9}	≤ 13
BH26-21	102.74	Brown Silty Clay w/ Sand	1.10 x 10^{-7}	26
	102.44	Brown Silty Clay w/ Sand	1.10 x 10^{7}	26
BH29-21	101.87	Brown Silty Sand to Sandy Silt	5.30 x 10^{-7}	39
	101.57	Brown Silty Sand to Sandy Silt	2.70 x 10^{-7}	33
BH31-21	103.19	Brown Silty Sand to Sandy Silt	1.10 x 10^{-6}	47
	102.89	Brown Silty Sand to Sandy Silt	1.35 x 10^{-7}	27
BH37-21	103.21	Brown Silty Sand to Sandy Silt	5.30 x 10^{-6}	72
	102.91	Brown Silty Sand to Sandy Silt	5.90 x 10^{-6}	74

*Field saturated hydraulic conductivity

**The infiltration rates do not include a safety correction factor. For design purposes, a minimum safety correction factor of 2.5 will be required.

Based on Paterson's hydrogeological investigation, the field saturated hydraulic conductivity values and infiltration rates measured in the test holes are consistent with similar material Paterson has encountered on other sites as well as published values for the materials identified on-site. Field saturated hydraulic conductivity values for the native silty sand to sandy silt, silty clay, and glacial till deposit throughout the site ranged from $\leq 8.1 \times 10^{-9}$ to 6.4×10^{-6} m/sec, with an estimated infiltration rate between <13 to 76 mm/hr. Prior to implementation for design purposes in the stormwater management strategy, a minimum safety correction factor of 2.5 will need to be applied to the above rates. The rate to be applied will be dependent on soil properties at a given location across the site.

3.3 Laboratory Testing

All soil samples were retained for laboratory review following the field portion of the subsurface investigation. The soils were classified in general accordance with ASTM D2488-09a, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Based on the soil descriptions across the subject site during the geotechnical investigations, these samples are considered to be sufficiently representative of the site.

3.4 Groundwater Monitoring Well/Piezometer Installation

Groundwater monitoring wells or flexible polyethylene standpipes were installed in all boreholes to permit the monitoring of groundwater levels subsequent to the completion of the geotechnical field programs.

3.5 Groundwater Level Measurement

Following the geotechnical field programs mentioned above which included the installation of monitoring wells and piezometers across the subject site, groundwater levels were measured at the groundwater monitoring well and piezometer installations using an electronic water level meter. Water levels were measured relative to the ground surface elevation at each location and are noted on the Soil Profile and Test Data sheets, appended to this report. In addition to the manual groundwater measurements, select wells were outfitted with data loggers to record long-term fluctuations in groundwater elevations. Long-term groundwater monitoring data can be found in Paterson Report PG5570-2 Revision 4 - Geotechnical Investigation - 5993, 6070 & 6115 Flewellyn Road - dated August 7, 2024.

3.6 Surveying

The test hole locations and ground surface elevations at each test pit location completed by Paterson were surveyed using a GPS unit with respect to a geodetic datum. The locations and ground surface elevations for each test hole are presented on Drawing PG5570-1- Test Hole Location Plan,
located in Appendix 1.

3.7 Water Budget

The site-specific water budget analyses conducted at the subject site employed the method derived by Thornthwaite and Mather (1957). This method utilizes soil water holding capacity along with the mean monthly air temperature and precipitation values to estimate the actual evapotranspiration (AET) at a specific location over the same time period (referred to as the water balance of the site). By subtracting the average annual AET from the average annual precipitation, it was possible to determine the average annual water surplus available for either infiltration or runoff. The water holding capacities used in the water balance calculations at the subject site were obtained from the MOE Stormwater Management Planning and Design Manual (2003). The water balance information was then provided by Environment Canada's Engineering Climate Services division. The water balance information is presented in Appendix 2 of this report.

The average annual water surplus obtained from the water balance calculations were separated into infiltration and runoff using the approach taken from the MOE Stormwater Management Planning and Design Manual (2003). This method multiplies the sum of three factors (topography, soil type and land cover) by the annual water surplus to provide an estimated annual infiltration potential. The topography factor was derived from mapping provided by the City of Ottawa and the geodetic surveys completed by Paterson as part of the geotechnical investigations completed at the subject site. The soil factor was based on the average composition of the overburden materials found at the subject site during the Paterson geotechnical field investigations. The vegetation factor was based on site reconnaissance and aerial photography. Both the water balance and water budget calculations are discussed in greater detail within Section 5.0 of this report.

4.0 REVIEW AND EVALUATION

4.1 Physical Setting

The subject site is located west of Shea Road and north of Flewellyn Road. The subject site consists of multiple property parcels; 5993 and 6115 Flewellyn Road and 6030 and 6070 Fernbank Road. The location of the subject site is shown on PH4681-1 - Site Plan appended to this report.

The study area currently consists of a mixture of agricultural lands, meadows, and forested areas. The property is bordered to the north by existing and under construction and residential developments, to west by residential dwellings, to the south by Flewellyn Road and further by forested and agricultural lands and to the east by Shae road and further by agricultural lands. A SWMP and a hydro corridor transects the middle of the subject site in a northeast to southwest orientation.

The subject site is located within the Flowing Creek subwatershed.

Site topography consists of approximately 4 to 7 m of elevation variability across the subject site. The subject site generally slopes from northwest to southeast with greater topographic relief within the western portion of the site. The subject site is at grade with adjacent properties and roadways.

4.2 Geology

Surficial Geology

Overburden mapping provided by the Ontario Geological Survey was reviewed as a part of this assessment. Available mapping indicates that overburden soils throughout the subject site consist primarily of fine grained glaciomarine deposits to the east and coarse grained glaciomarine deposits to the west. A small portion identified to consist of glacial till located to the north. Overburden soils mapping is shown on Drawing PH4681-3 - Surficial Geology Plan.

Overburden soils identified during the geotechnical investigation by Paterson were generally consistent with the available mapping. Overburden thickness varied from approximately 0.3 to 6.1 m across the subject site, with greater depths of overburden materials typically present within the eastern portion of the subject site. Soils generally consisted of topsoil overlying silty sand to sandy silt layers underlain by a glacial till deposit comprised of a compact to dense, brown to grey silty sand to sandy silt with gravel, cobbles and boulders, dependent on the location across the subject site. A layer of loose to compact brown silty sand to sandy silt was observed underlying the topsoil across the subject site, extending to approximate depths ranging from 0.3 to 4.7 m bgs. A thin layer of stiff brown silty clay was observed underlying the topsoil and/or interlayered within the sandy silt deposit at select test hole locations and extended to a maximum depth of 3.2 m bgs. The above noted layers were underlain by a glacial till deposit consisting of compact to dense brown/grey silty sand to sandy silt with gravel, cobbles and boulders, extending to a maximum depth of 6.1 m bgs.

Specific details are provided on the Soil Profile and Test Data Sheets attached within Appendix 1 of this report.

Bedrock Geology

Bedrock was encountered between 0.8 and 6.0 m bgs and cored to maximum depth of 10.2 m bgs at select borehole locations. Bedrock depths are shown on Drawing PG5570-2 - Bedrock Contour Plan. The bedrock was observed to consist of limestone interbedded with dolostone, generally being excellent in quality.

Bedrock mapping provided by the Ontario Geologic Survey was reviewed as a part of this assessment. Available mapping indicates that bedrock at the subject site consists of limestone, dolostone, shale and sandstone of the Gull River Formation. Bedrock geology mapping is shown on Drawing PH4681-4 - Bedrock Geology Mapping.

Karst Features

The term ‘karst’ refers to a geologic formation characterized by the dissolution of carbonate bedrock, such as limestone. Based on a review of available mapping, a small area within the western portion of the subject site is inferred to contain karst, while the remainder of the site falls within an area that can potentially contain karst. It should be noted that no evidence of karstification was observed at the time of the field investigations completed at the subject site. However, if future investigations identify karst within the subject site, best management practices should be implemented to reduce/mitigate the potential impacts related to developing on a karstic landscape.

4.3 Hydrogeological Setting

Existing Aquifer Systems

Aquifer systems may be defined as geological media, either overburden soils or fractured bedrock, which permit the movement of groundwater under hydraulic gradients. In general, aquifer systems may be present in overburden soils or bedrock. Although groundwater has been observed within overburden soils at the subject site, the typical overburden materials found at the site do not allow for the development of significant water supply wells. Water supply wells in the vicinity are instead likely found in bedrock aquifers.

Bedrock aquifer mapping, provided by Natural Resources Canada Urban Geology of the National Capital Region mapping, was reviewed as a part of this assessment. Using this tool, the water supply aquifer system has been identified in the vicinity of the study area as the Gull River Formation aquifer system.

Groundwater Levels

Groundwater levels were observed to range from 0.6 to 2.8 m bgs in the piezometers and 0.0 to 3.7 m bgs in the groundwater monitoring wells installed at the borehole locations. Based on a review of the water well records, groundwater is also present in the bedrock at greater depths.

A long-term groundwater monitoring program was completed extending from October 2022 to May 2023. Specific information is available in Paterson Report PH4625-REP.01.R2 dated August 7, 2024 and Paterson Report PG5570-2 Revision 4 dated August 7, 2024.

Horizontal Hydraulic Gradients

Due to the nature of the water levels obtained from field work conducted at the subject site (groundwater monitoring wells and piezometers), the absolute direction of horizontal hydraulic gradients in the vicinity of the subject site was not determined. However, using the available data, it was possible to approximate the horizontal hydraulic gradients in the bedrock and overburden material given that the horizontal hydraulic gradient between any 2 points is the slope of the hydraulic head between those points:

$$i_h=h_2-h_1/L$$

Where: i = horizontal gradient
h = water level (m bgs)
L = horizontal distance between test hole locations

Using the above noted formula, the horizontal hydraulic gradients were observed to be in an approximate east orientation with a magnitude of approximately 0.006 in the overburden material and approximately 0.001 to 0.026 in the bedrock material. Local groundwater flow in the overburden and bedrock is expected to flow be towards the Faulkner Drain and regional groundwater flow in the overburden and bedrock is expected to be towards the Jock River.

Vertical Hydraulic Gradients

Using the available water level data from the monitoring wells installed on the subject site, the approximate vertical hydraulic gradient of the aquifer was approximated by dividing the difference in hydraulic head by the vertical distance between the midpoints of the 2 well screens.

$$i_v=(h_2-h_1)/(z_2-z_1)$$

Where: i =vertical hydraulic gradient
h =water level (m bgs)
z =depth of midpoint of well screen (m bgs)

Due to the limited number of nested wells throughout the subject site, only a limited number of vertical hydraulic gradients were calculated. Using the above noted formula, vertical hydraulic gradients were calculated within two nested well installations across the study area. BH 1-22 and BH 1A-22 had vertical upward gradient of approximately 0.011 to 0.015 while BH 3-22 and BH 3A-22 had a vertical downward gradient of 0.004 to 0.035. It is anticipated that the vertical gradient observed in the southwest portion of the site is due to the higher topography to the west of the subject site providing additional head where groundwater may daylight in areas such as the man-made excavation observed in the southwest portion of the site. The eastern portion of the site is showing a slight downward gradient which is indicative of the overburden providing minor recharge to the underlying bedrock aquifer.

Hydraulic Conductivity

Hydraulic conductivity testing (slug testing) was also completed by Paterson as part of the field investigation. The test data was analyzed as per the method set out by Hvorslev (1951). The results of the testing yielded hydraulic conductivity values ranging between 4.2×10^{-6} m/sec to 2.2×10^{-5} m/sec at the monitoring well locations screened in the sandy silt, silty sand and glacial till. Hydraulic conductivity results from slug tests conducted at wells screened in the limestone bedrock are dependent on the quality of the bedrock and ranged from 4.3×10^{-7} to 1.6×10^{-4} m/sec.

The hydraulic conductivity range given above for glacial till is wide in order to account for fluctuations in the majority composition of the matrix and accessory materials at a given location.

Groundwater Recharge and Discharge

In general, groundwater will follow the path of least resistance from areas of higher hydraulic head to areas of lower hydraulic head. While upward and downward hydraulic gradients may be indicative of areas of discharge and recharge respectively, other factors must be considered.

It is our interpretation that the majority of surface water will infiltrate the sandy silt, silty sand and glacial till layer before being intercepted by the underlying bedrock unit where it will either recharge the underlying bedrock aquifer or flow laterally down-gradient as perched water (interflow). Therefore, the volume of recharge occurring within the site boundaries is expected to be low to moderate dependant on location across the site.

With regards to discharge zones, neither the topographical or geological conditions are suitable for discharge to be occurring on a large scale at the subject site. Further discussion regarding groundwater recharge/discharge is included under separate cover.

5.0 SITE SPECIFIC WATER BUDGET ASSESSMENT

The site-specific water budget assessment (SSWB) was conducted to determine the hydrogeological function of the subject site, to identify infiltration potential and to identify opportunities for Low Impact Development (LID) measures. The study area currently consists of a mixture of a mixture of agricultural lands, meadows, and forested areas. The pre-development terrain compositions are illustrated on Drawings PH4681-6 - Pre-Development Terrain Composition Plan appended to this report.

5.1 Calculations

Thornthwaite and Mather Water Balance Calculations

When falling precipitation intercepts the ground, three possible outcomes arise. The water can either evaporate/transpire back into the atmosphere (evapotranspiration), infiltrate into the surface soils (infiltration) or leave the area as runoff.

As mentioned earlier in this report, the method employed by Thornthwaite and Mather (1957) was used along with modelling software to determine the partitioning of water throughout various portions of the hydrologic cycle. Inputs into the modelling program included monthly temperature, precipitation, water holding capacities and site latitude. Using the long-term averages of these variables, it was possible to calculate annual potential and actual evapotranspiration, change in soil moisture storage and the water surplus.

The formula employed by Thornthwaite and Mather is as follows:

$$S = R + I = P - ET$$

Where:
S = surplus (mm/year)
R = annual runoff (mm/year)
I = annual infiltration (mm/year)
P = annual precipitation (mm/year)
ET = annual evapotranspiration (mm/year).

Soils within the study area generally consisted of topsoil overlying fill material and/or silty clay, dependent on location across the site. Therefore, the above noted calculations were carried out for the soil moisture holding capacities of each material found on site.

Based on the location of the site within the Ottawa area, climatic data was obtained from the climate station located at the McDonald-Cartier International Airport covering the period of January 1939 to December 2018. The information was provided by Environment Canada's Engineering Climate Services Unit and is presented in Appendix 2 of the report.

Table 2, below, displays the soil types present within the study area and their associated water holding capacities (WHC) as well as the actual evapotranspiration (AET) and surplus data. For the purposes of this study, AET values were used as they account for accumulated soil moisture deficit. This deficit represents the volume of water retained within the available pore spaces of the soil and is subtracted from the potential evapotranspiration (PET) value to more accurately calculate the water surplus. The monthly/annual water balance and water budget data is presented in Appendix 2 of the report.

A WHC value was not assigned for the impervious surfaces designated within the existing SWMP. However, modeling conducted by JFSA provided an evapotranspiration and runoff value for the SWMP. Based on their modeling, 26% of precipitation will evaporate and the remaining 74% will result in runoff. Due to the design characteristics of the SWMP, it is assumed that all water surplus will result in runoff.

Table 2: Site Specific Water Surplus Information

Soil Type	Water Holding Capacity (mm)	Actual Evapotranspiration (mm/year)	Surplus Water (mm/year)
Impervious Surfaces (SWMP)*	N/A	235	669
Fine Sandy Loam (urban lawn/shallow rooted crops)	75	524	380
Fine Sandy Loam (pasture and shrubs)	150	572	330
Fine Sandy Loam (mature forest)	300	604	298

Table reproduced using WHC values from MOE (2003) - Stormwater Management Planning and Design Manual and modelling data from Environment Canada.
*Based on JFSA modeling for impervious surfaces. 26% of precipitation will evaporate and the remaining 74% will result in runoff.

Infiltration Factors

In order to break down the surplus water values for the various materials into infiltration and runoff, various factors must be considered. The MOE Stormwater

Management Planning and Design Manual (2003) lists three main factors that contribute to surface water infiltration rates.

The first factor is topography, which is broken down further into three sections: flat and average slope, rolling land and hilly land. Flat and average slope provides the greatest potential for infiltration and has the largest factor applied to it (0.3), while the other two have progressively lower factors (rolling land is 0.2 and hilly land is 0.1).

The second factor is soil, which is also broken down further into three sections: tight impervious clay, medium combinations of clay and loam and open sandy loam. Open sandy loam provides the greatest potential for infiltration (factor of 0.4) while the other two have progressively lower potential for infiltration to occur (factors for medium combinations of clay and loam is 0.2 and tight impervious clay is 0.1).

The final factor the MOE manual uses to partition infiltration from runoff is land cover. It is broken down into two sections: open fields/cultivated lands and woodlands. Woodlands have greater infiltration potential and a factor of 0.2. Open fields and cultivated lands have lower potential and with a factor of 0.1. A summary of the MOE manual's descriptors and their associated infiltration factors is shown below in Table 3.

Table 3: MOE (2003) Infiltration Factors

Description of Area/Development Site	**Value of Infiltration Factor**
Topography	
Flat and average slope (<0.6 m/km)	0.30
Rolling land (slope of 2.8-3.8 m/km)	0.20
Hilly land (slope of 28-47 m/km)	0.10
Soil	
Tight impervious clay	0.10
Medium combinations of clay and loam	0.20
Open sandy loam	0.40
Cover	
Open fields/cultivated lands	0.10
Woodlands	0.20

Table reproduced from MOE (2003) - Stormwater Management Planning and Design Manual.

The topography of the study area consists of a mixture of rolling land (generally 2 to 4 m/km throughout the subject site) and hilly land (generally 28 to 47 m/km throughout the subject site). Therefore, a pre-development topography infiltration factor of 0.15 was given for the materials analysed on this property.

As previously discussed, soils within the study area generally consisted of topsoil overlying silty sand to sandy silt layers underlain by a glacial till deposit. Therefore, a pre-development soil infiltration factor of 0.3 was given for the materials analysed on this property.

The subject site generally consists of agricultural lands and meadows with select areas with mature forests to the western portion of the site. A pre-development vegetation infiltration factor of 0.1 was therefore used for the majority of the site with the exception of the tree covered area which was given a vegetation infiltration factor of 0.2.

The pre-development infiltration factors for all materials considered are included in the water budget calculations provided in Table 7 included in Appendix 2 of this report.

5.2 Pre and Post-Construction Water Budget

The pre-development water budget analysis conducted for the study area determined that an estimated 149,489.85 m^3/year of surplus water currently infiltrates the surface soils and either recharges local bedrock aquifer systems or travels laterally as interflow at the glacial till material/bedrock interface. The remaining estimated 114,951.85 m^3/year of surplus leaves the site as runoff, draining towards Faulkner Drain.

At the time of report preparation, details regarding post-development land-usage was not available. Therefore, a post-development water budget analysis was not conducted at this time.

Details of pre-development water budget analyses are presented in Table 7 included in Appendix 2 of this report.

6.0 ASSESSMENT AND RECOMMENDTIONS

Existing Wells

A search of the Ontario Water Well Records database indicates there are several water wells within 500 m of the site as depicted on drawing PH4681-2 - MECP Water Well Location Plan appended to this report. However, after reviewing the water well records of the surrounding water supply wells, it was noted that the majority of the wells are screened within the bedrock aquifer at depths below the proposed servicing depths at the subject site, providing sufficient vertical separation between the wells and potential development activities.

Based on the results of assessments done under separate cover, it was determined that a radius of influence of approximately 5 to 50 m will develop as a steady state condition, extending from the edge of the housing and servicing excavations associated with the proposed development. As such, it was determined that all surrounding water supply wells are located outside the theoretical radius of influence associated with the proposed development. Additionally, the surrounding water supply wells are screened within the bedrock aquifer system, well below the anticipated maximum depth of housing and servicing excavations. Furthermore, excavations related to the proposed development are anticipated to be short-term in duration. Therefore, impacts to surrounding water supply wells are not expected as a result of construction activities associated with the proposed development.

Sources of Contamination

No concerns were identified with respect to sources of groundwater contamination at the time of completion of this study.

Prior to and during site development, it is recommended that construction best management practices with respect to fuels and chemical handling, spill prevention, and erosion and sediment control be followed. This will minimize the potential for the introduction of contaminants to the soil, surface water, or groundwater at the subject site.

With respect to stormwater runoff quality, it is recommended that best management practices with respect to operational standards be maintained for any stormwater management facilities constructed for the proposed development. It is also recommended that adherence to the City of Ottawa Salt Management Plan - Appendix A (October, 2011) included in Appendix 3 is enforced to ensure that chloride levels in stormwater runoff are as low as possible.

Services

It is our understanding that the subject site will be developed with municipal sewer and water services. General recommendations regarding site servicing are provided under separate cover in our geotechnical investigation report. Specific hydrogeological and geotechnical recommendations will be provided during the detail design phase. Although specific details regarding site servicing are not currently available, it is our expectation that site servicing depths will be in the range of 2 to 5 m bgs.

Permit To Take Water

For any water taking of greater than 50,000 L/day, either an Environmental Activity and Sector Registration (EASR) or a Permit to Take Water (PTTW) is required from the MECP, dependent on dewatering requirements. At the subject site, an EASR or PTTW may be required for construction dewatering or works below the water table. The requirement for either will be determined during the detail design phase. The information contained in this report may be used as supporting documentation for an EASR or PTTW application for the subject site. Depending on the nature of the proposed water taking, an additional hydrogeological investigation may be required.

Infiltration Potential and Low Impact Development (LID) Considerations

As previously discussed, soils within the study area generally consisted of topsoil overlying silty sand to sandy silt layers underlain by a glacial till deposit. With regards to infiltration rates for the soils found on-site, site-specific testing varied from <13 to 76 mm/hr for the sandy silt to silty sand and the glacial till deposits. A minimum safety correction factor of 2.5 will need to be applied to the estimated infiltration rates noted above prior to consideration in the stormwater management design. It is also recommended that the proposed invert elevation of potential infiltration systems be constructed at least 1 m above the seasonally high groundwater level and sound bedrock surface to promote infiltration.

As noted above, a post-development water budget analysis was not completed at the subject site due to the lack of available information regarding post-development land usage. However, given that pre-development site conditions allow for approximately 149,490 m^3/year of water infiltration, it will likely be necessary to incorporate various stormwater management measures into the design of the development. Due to the presence of shallow bedrock, shallow water table elevation and high RQD values identified during coring activities, opportunities for infiltration-based LID measures may be limited. As an alternative, consideration should be given to incorporating other forms of LID measures (i.e. amended topsoil) in conjunction with site best management practices (BMP's) to maintain the existing hydrologic function of the site.

8.0 CLOSURE

The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only, and test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Caivan (Stittsville South) Inc. & Caivan (Stittsville West) Ltd., or their agent(s) is not authorized without review by Paterson Group for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Michael Laflamme, P.Geo.

PROFESSIONAL GEOSCIENTIST
Aug. 7, 2024
MICHAEL LAFLAMME
PRACTISING MEMBER
3017
ONTARIO

Oliver Blume, P.Geo.

9.0 REFERENCES

Chapman, L.J., and Putnam, D. F. “The Physiography of Southern Ontario, Third Edition”. Ontario Ministry of Natural Resources, 1984.

Freeze, R.A., and Cherry, J.A. “Groundwater”. Prentice-Hall, Inc., 1979.

Natural Resources Canada. “Urban Geology of the National Capital Region”, mapping released 1994.

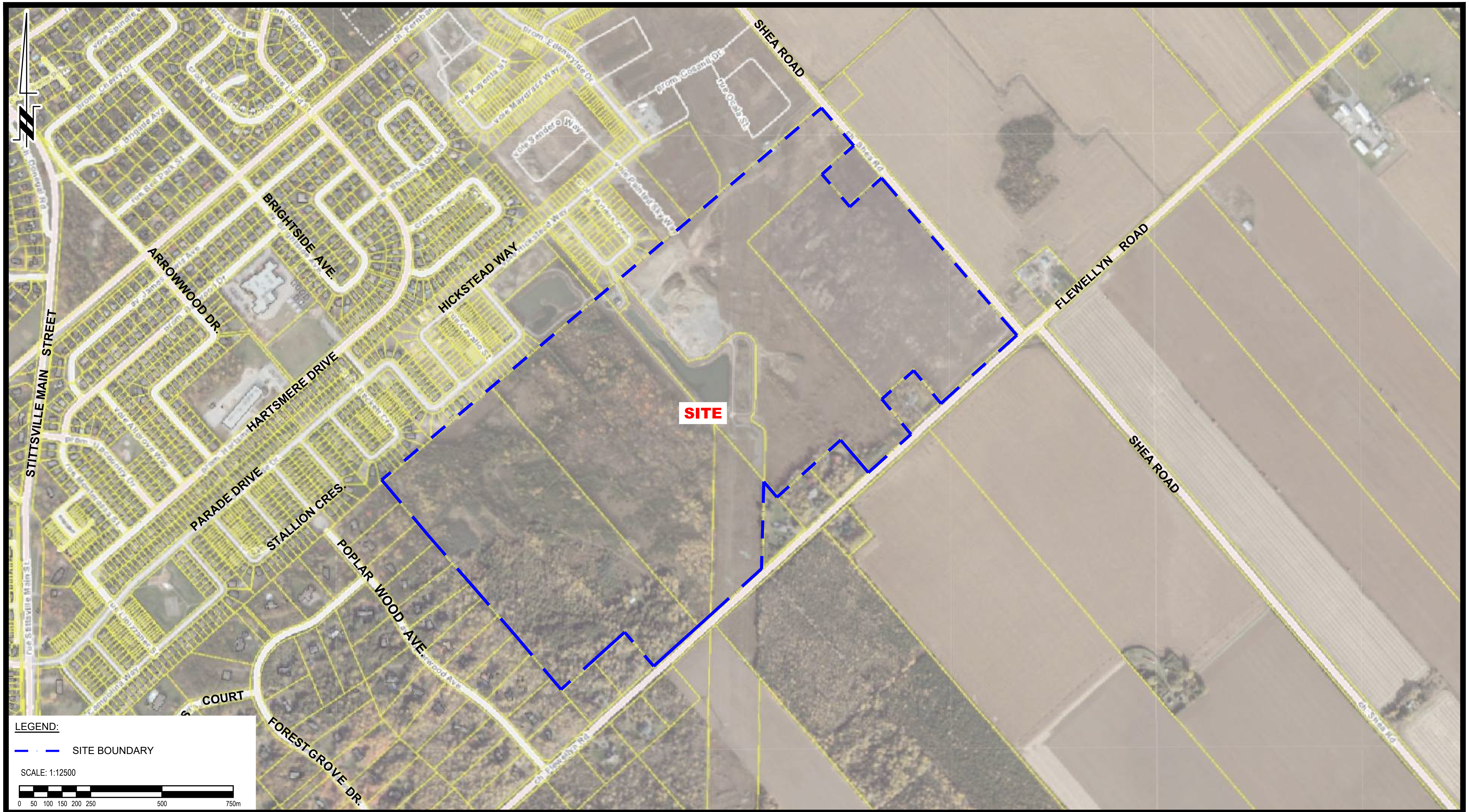
Ontario Ministry of Northern Development and Mines “Geology of Ontario, Ontario Geological Survey Special Volume 4”, Queen's Printer for Ontario, 1992.

Ontario Ministry of the Environment. “Technical Terms of Reference for Groundwater Studies” (excerpts), Queen’s Printer for Ontario, 2001.

Ontario Ministry of the Environment. "Stormwater Management Planning and Design Manual", Queen's Printer for Ontario, March, 2003.

City of Ottawa - Public Works and Services Department - Surface Operations Branch. "Material Applications Policy, Revision 3.2 - Salt Management Plan - Appendix A", October 31, 2011.

FIGURES



1	REVISED SITE BOUNDARY	04/07/2024	OB
NO.	REVISIONS	DATE	INITIAL

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OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

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HYDROGEOLOGICAL STUDY AND WATER BUDGET ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
OTTAWA, 5993 & 6115 FLEWELLYN ROAD & 6030 & 6070 FERNBANK ROAD ONTARIO

Title:

SITE PLAN

Scale: 1:7500
Date: 12/2022
Drawn by: JM
Report No.: PH4681-REP.01
Checked by: OB
Dwg. No.: **PH4681-1**
Approved by: ML
Revision No.: 1

11x17

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PROPOSED RESIDENTIAL DEVELOPMENT
OTTAWA, 5993 & 6115 FLEWELLYN ROAD & 6030 & 6070 FERNBANK ROAD ONTARIO

Title:

MECP WATER WELL LOCATION PLAN

Scale: 1:12500
Drawn by: JM
Checked by: OB
Approved by: ML

Date: 12/2022
Report No.: PH4681-REP.01
Dwg. No.: PH4681-2
Revision No.: 1

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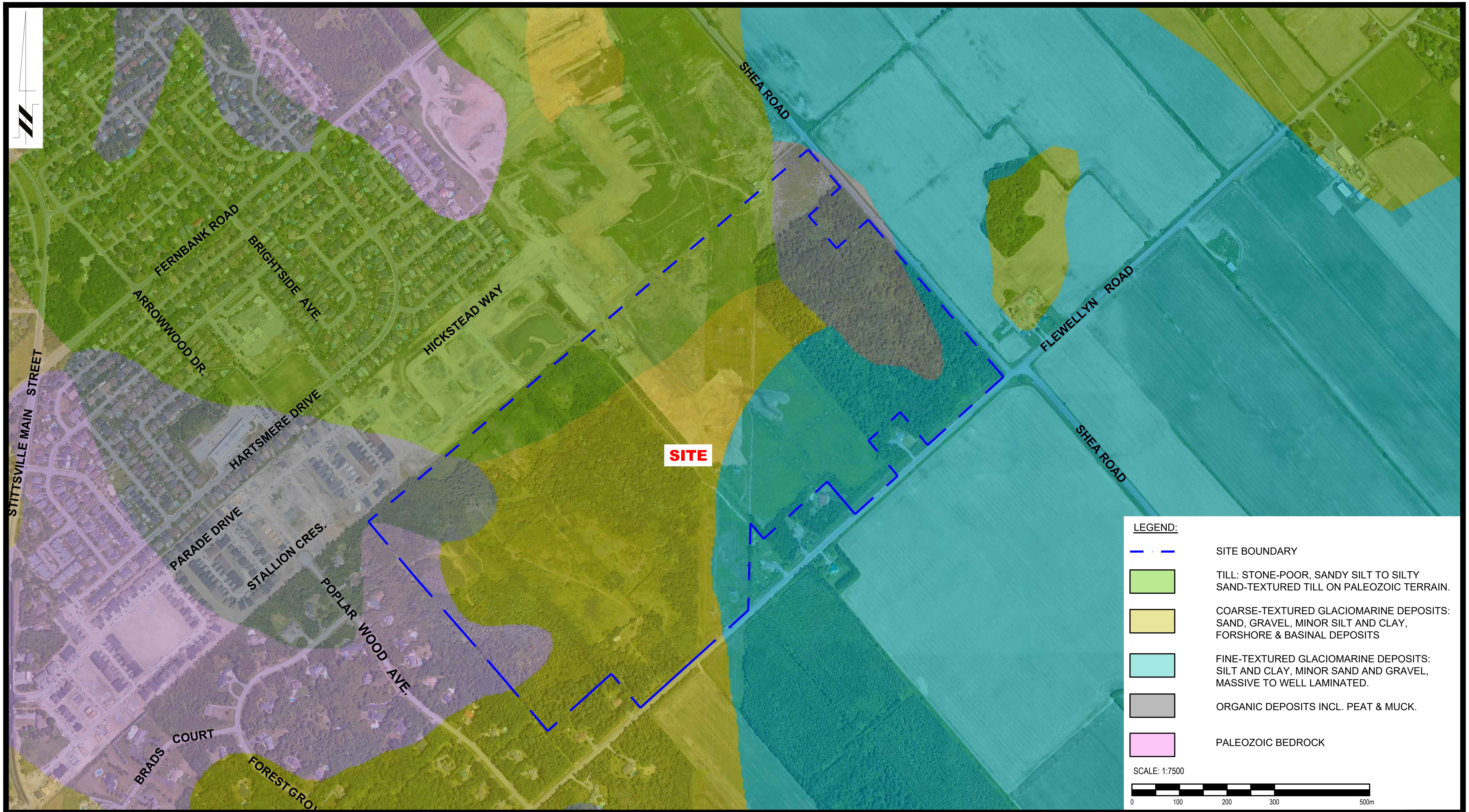

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PROPOSED RESIDENTIAL DEVELOPMENT
OTTAWA, 5993 & 6115 FLEWELLYN ROAD & 6030 & 6070 FERNBANK ROAD ONTARIO

Title:

SURFICIAL GEOLOGY PLAN

Scale: 1:7500

Date: 12/2022

Drawn by: JM

Report No.: PH4681-REP.01

Checked by: OB

Dwg. No.: **PH4681-3**

Approved by: ML

Revision No.: 1

11x17

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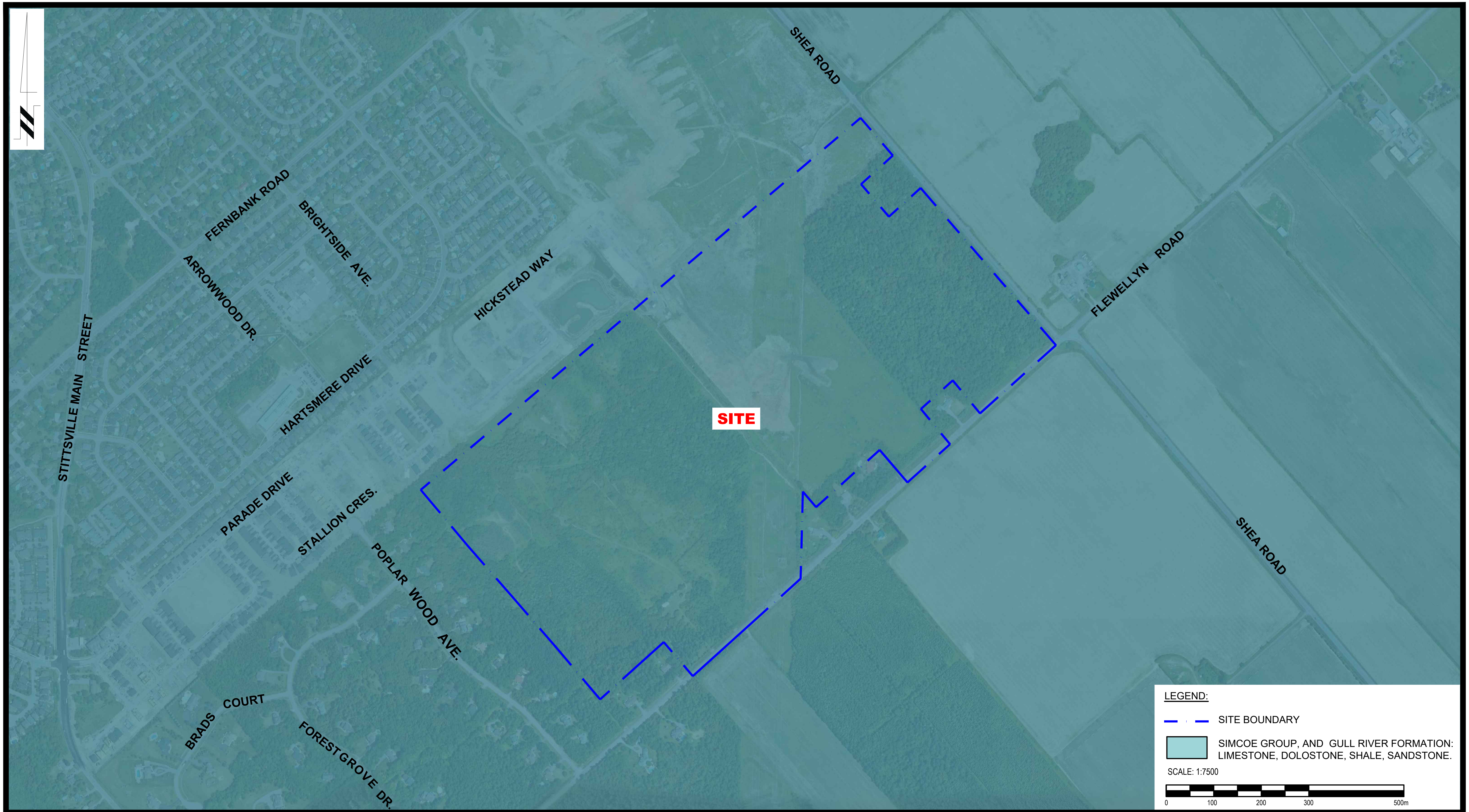

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PROPOSED RESIDENTIAL DEVELOPMENT
OTTAWA, 5993 & 6115 FLEWELLYN ROAD & 6030 & 6070 FERNBANK ROAD ONTARIO

Title:

BEDROCK GEOLOGY PLAN

Scale: 1:7500
Date: 12/2022
Drawn by: JM
Report No.: PH4681-REP.01
Checked by: OB
Dwg. No.: **PH4681-4**
Approved by: ML
Revision No.: 1

11x17

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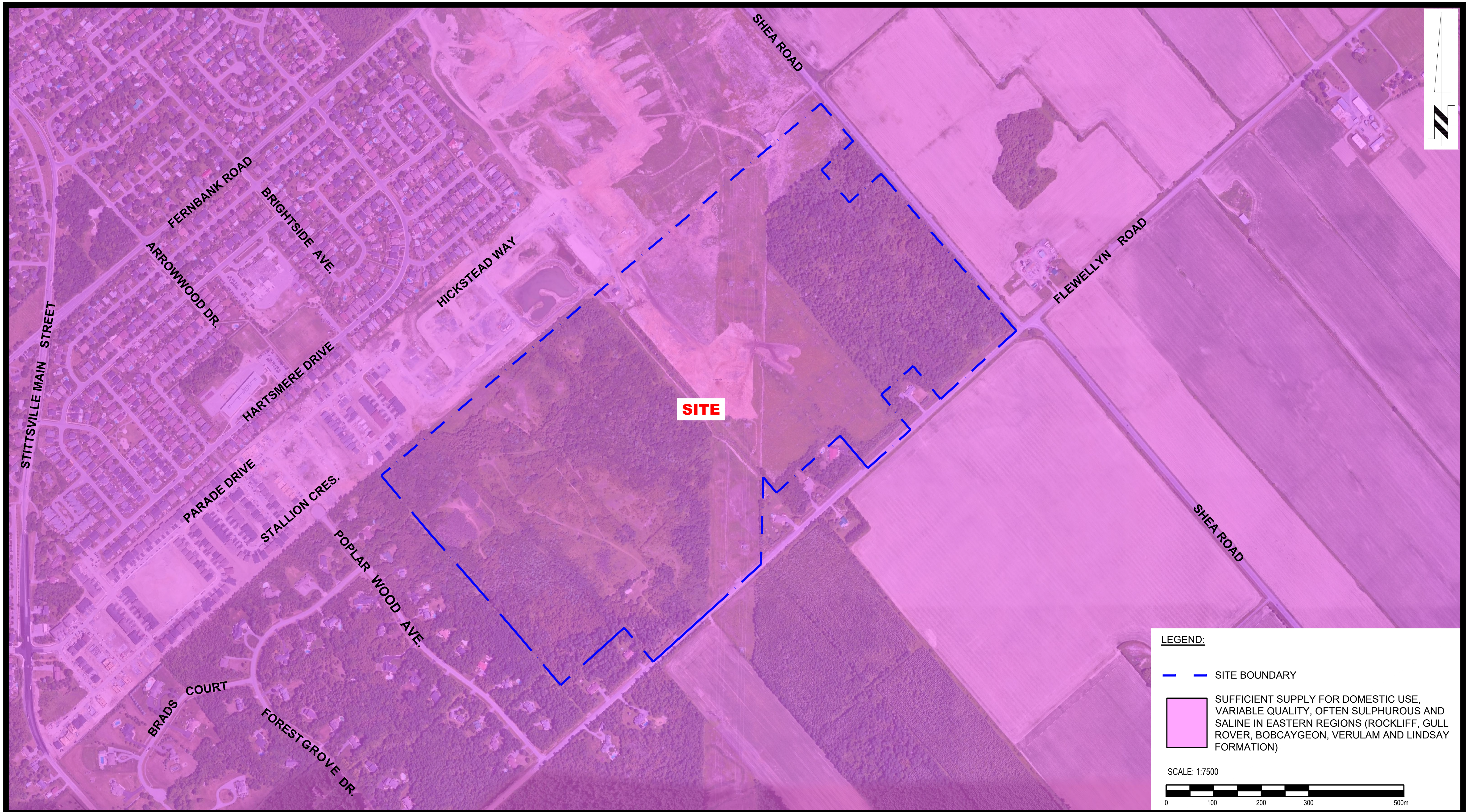

LEGEND:

- SITE BOUNDARY
- ▨ SUFFICIENT SUPPLY FOR DOMESTIC USE, VARIABLE QUALITY, OFTEN SULPHUROUS AND SALINE IN EASTERN REGIONS (ROCKLIFF, GULL ROVER, BOBCAYGEON, VERULAM AND LINDSAY FORMATION)

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PROPOSED RESIDENTIAL DEVELOPMENT
OTTAWA, 5993 & 6115 FLEWELLYN ROAD & 6030 & 6070 FERNBANK ROAD ONTARIO

Title:

BEDROCK AQUIFER PLAN

Scale: 1:7500
Date: 12/2022
Drawn by: JM
Report No.: PH4681-REP.01
Checked by: OB
Dwg. No.: PH4681-5
Approved by: ML
Revision No.: 1

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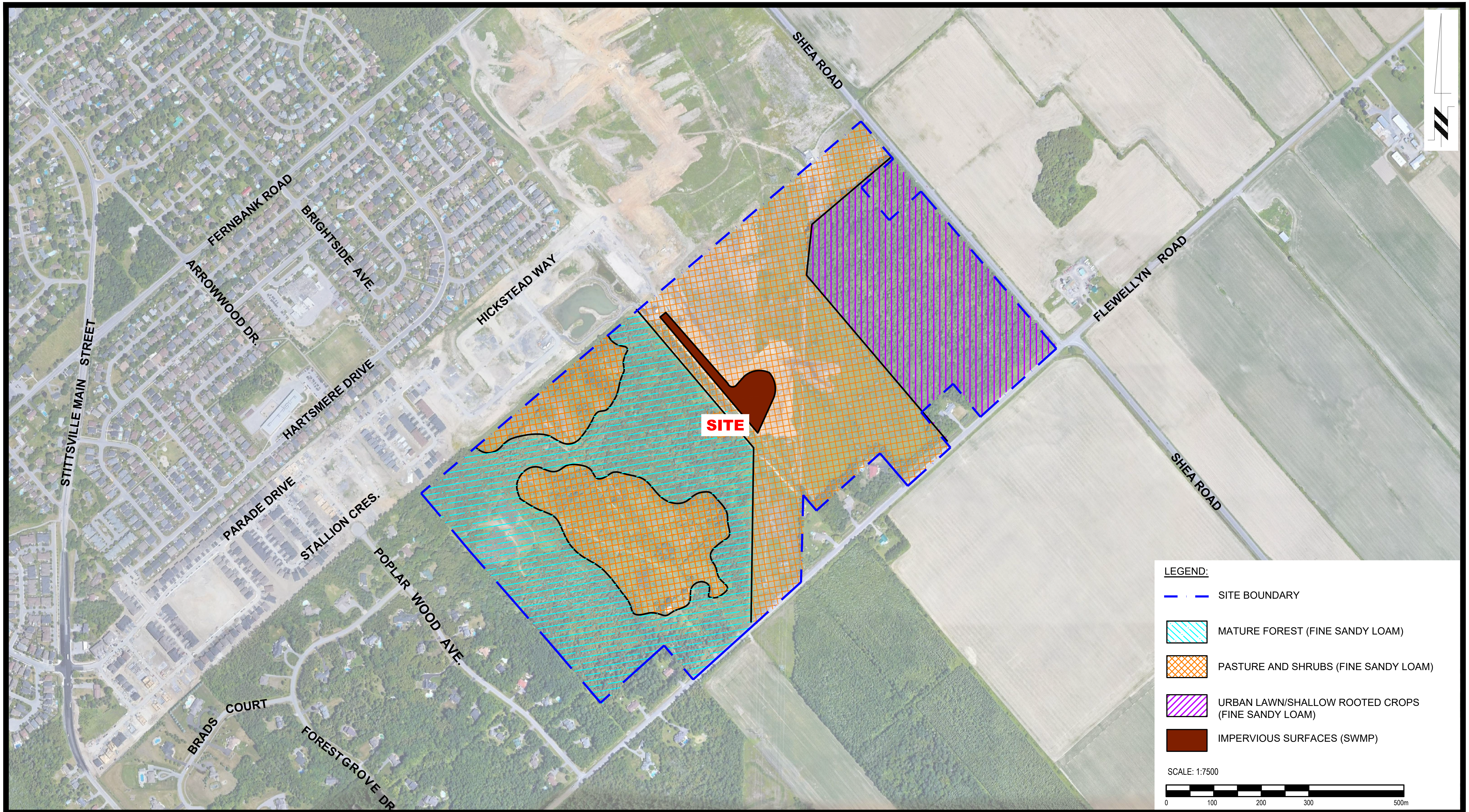

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PROPOSED RESIDENTIAL DEVELOPMENT
OTTAWA, 5993 & 6115 FLEWELLYN ROAD & 6030 & 6070 FERNBANK ROAD ONTARIO

Title:

PRE-DEVELOPMENT TERRAIN COMPOSITION PLAN

Scale: 1:7500
Drawn by: JM
Checked by: OB
Approved by: ML
Date: 12/2022
Report No.: PH4681-REP.01
Dwg. No.: PH4681-6
Revision No.: 1

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APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

DRAWING PG5570-1 - TEST HOLE LOCATION PLAN

DRAWING PG5570-2 - BEDROCK CONTOUR PLAN

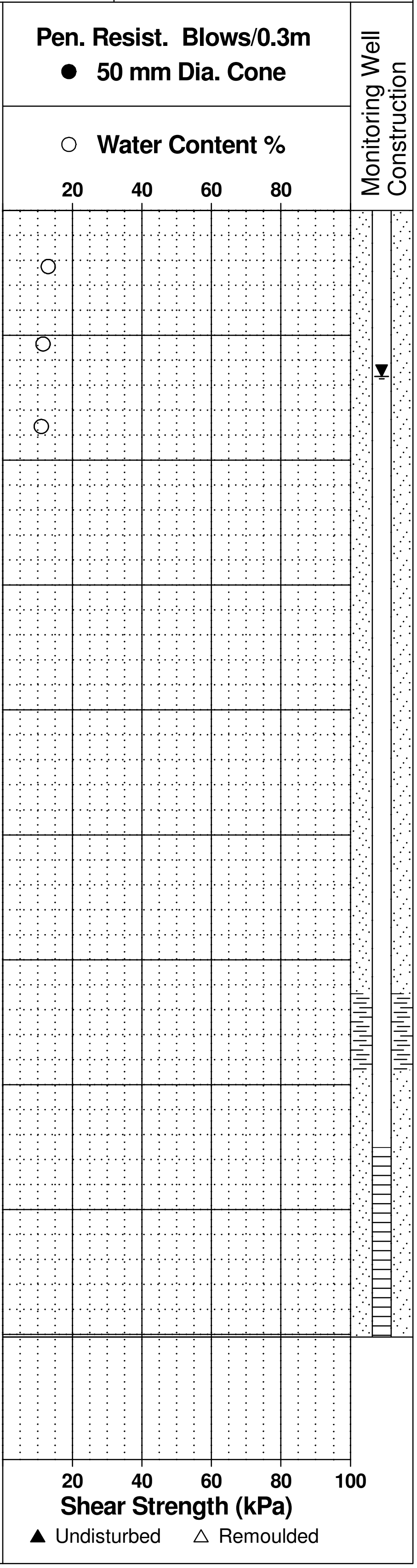
patersongroup Consulting Engineers
9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5993, 6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic
REMARKS
BORINGS BY CME-55 Low Clearance Drill
DATE September 28, 2022
FILE NO. **PG5570**
HOLE NO. **BH 1-22**

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	107.31
TOPSOIL 0.30						
Loose to compact, brown **SILTY SAND,** trace gravel 0.60	AU	1				
GLACIAL TILL: Compact to dense, brown silty sand to sandy silt with gravel, cobbles and boulders	SS	2	45	17	1	106.31
	SS	3	14	65	2	105.31
2.34						
BEDROCK: Excellent quality, grey limestone interbedded with dolostone	RC	1	100	89	3	104.31
	RC	2	100	100	4	103.31
	RC	3	100	100	5	102.31
					6	101.31
	RC	4	98	98	7	100.31
	RC	5	100	100	8	99.31
9.02					9	98.31
End of Borehole						
(GWL @ 1.33m - Oct. 11, 2022)						

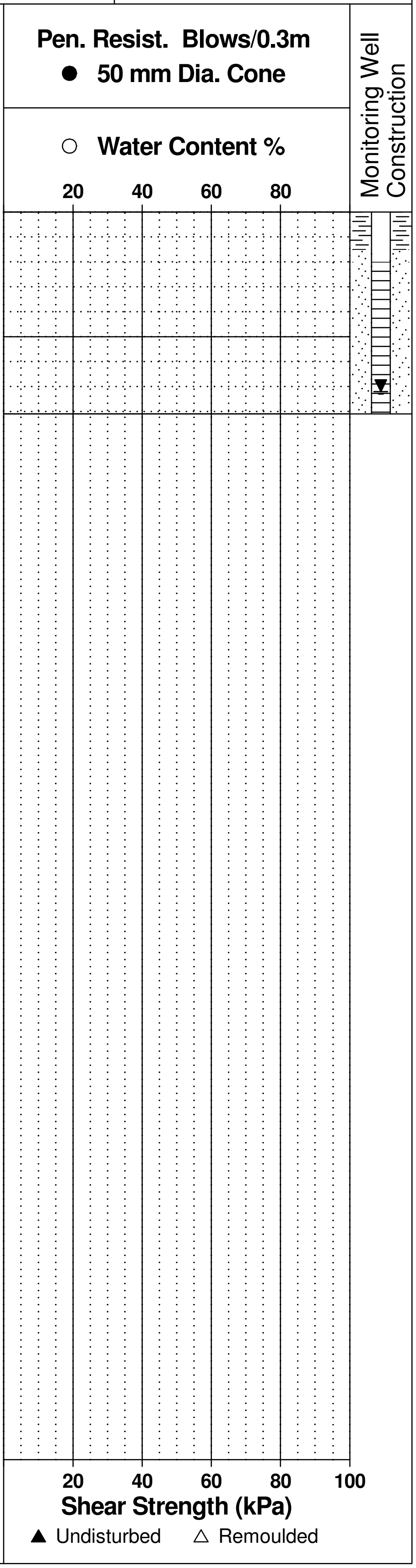


SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5993, 6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic
REMARKS
BORINGS BY CME-55 Low Clearance Drill **DATE** September 28, 2022
FILE NO. PG5570
HOLE NO. BH 1A-22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	107.31
OVERBURDEN						1	106.31
1.62							
End of Borehole Practical refusal to augering at 1.62m depth (GWL @ 1.44m - Oct. 11, 2022)							



SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5993, 6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill

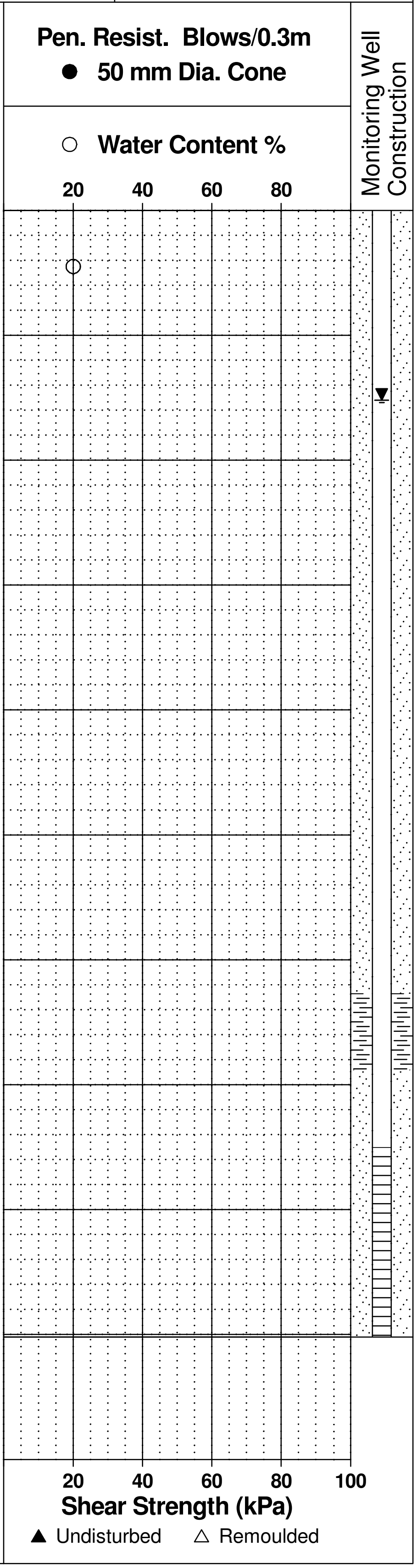
DATE September 28, 2022

FILE NO. **PG5570**

HOLE NO. **BH 2-22**

SOIL DESCRIPTION	Depth of change (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE					
TOPSOIL	0.30				
Compact, brown **SILTY SAND to SANDY SILT,** trace clay and gravel	0.76	AU	1		
BEDROCK: Good to excellent quality, grey limestone interbedded with dolostone		RC	1	100	77
		RC	2	100	97
		RC	3	100	100
		RC	4	100	100
		RC	5	100	97
		RC	6	100	100
	9.02				
End of Borehole (GWL @ 1.52m - Oct. 11, 2022)					

DEPTH (m)	ELEV. (m)
0	103.58
1	102.58
2	101.58
3	100.58
4	99.58
5	98.58
6	97.58
7	96.58
8	95.58
9	94.58



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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5993, 6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill

DATE September 29, 2022

FILE NO. **PG5570**

HOLE NO. **BH 3-22**

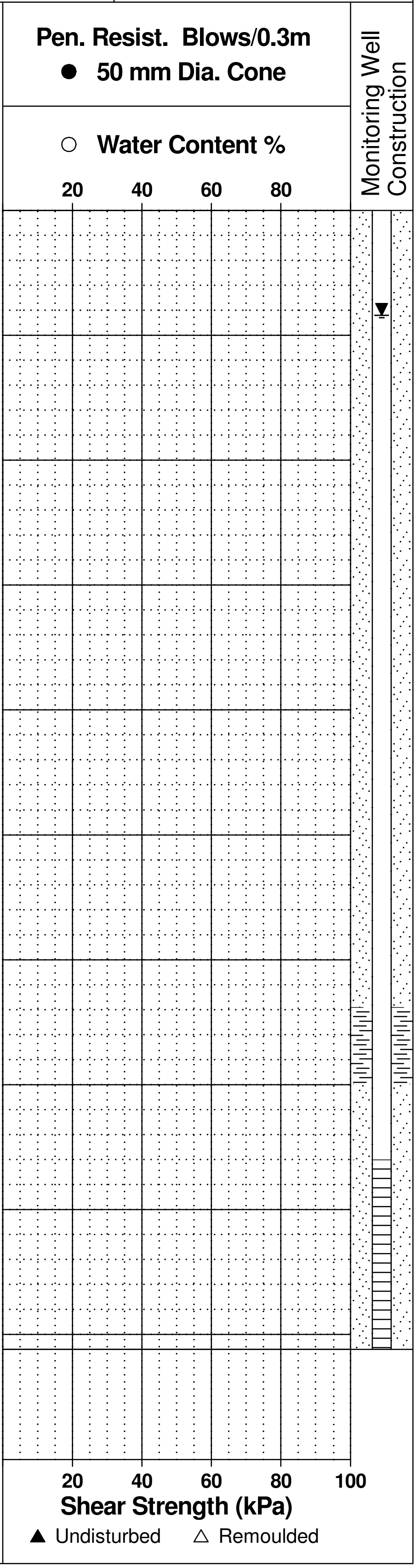
SOIL DESCRIPTION	Depth (m)
GROUND SURFACE	
TOPSOIL	0.28
Compact, brown **SILTY SAND to SANDY SILT**	2.21
GLACIAL TILL: Grey silty sand to sandy silt with gravel, cobbles and boulders, trace clay	3.43
BEDROCK: Excellent quality, grey limestone interbedded with doloston	9.12

End of Borehole

(GWL @ 0.84m - Oct. 11, 2022)

SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
AU	1		
SS	2	58	19
SS	3	58	17
SS	4	67	3
SS	5	67	50+
RC	1	100	96
RC	2	100	98
RC	3	100	100
RC	4	100	100

DEPTH (m)	ELEV. (m)
0	102.25
1	101.25
2	100.25
3	99.25
4	98.25
5	97.25
6	96.25
7	95.25
8	94.25
9	93.25



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5993, 6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

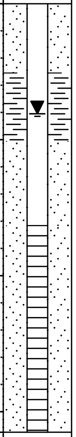
BORINGS BY CME-55 Low Clearance Drill

DATE September 29, 2022

FILE NO. **PG5570**

HOLE NO. **BH 3A-22**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % (20 40 60 80)	Monitoring Well Construction
GROUND SURFACE						0	102.25		
TOPSOIL 0.28									
Compact, brown **SILTY SAND to SANDY SILT** 2.20		AU	1			1 2	101.25 100.25		
GLACIAL TILL: Grey silty sand to sandy silt with gravel, cobbles and boulders, trace clay 3.15						3	99.25		
End of Borehole Practical refusal to augering at 3.15m depth. (GWL @ 0.81m - Oct. 11, 2022)									



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

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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5993, 6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

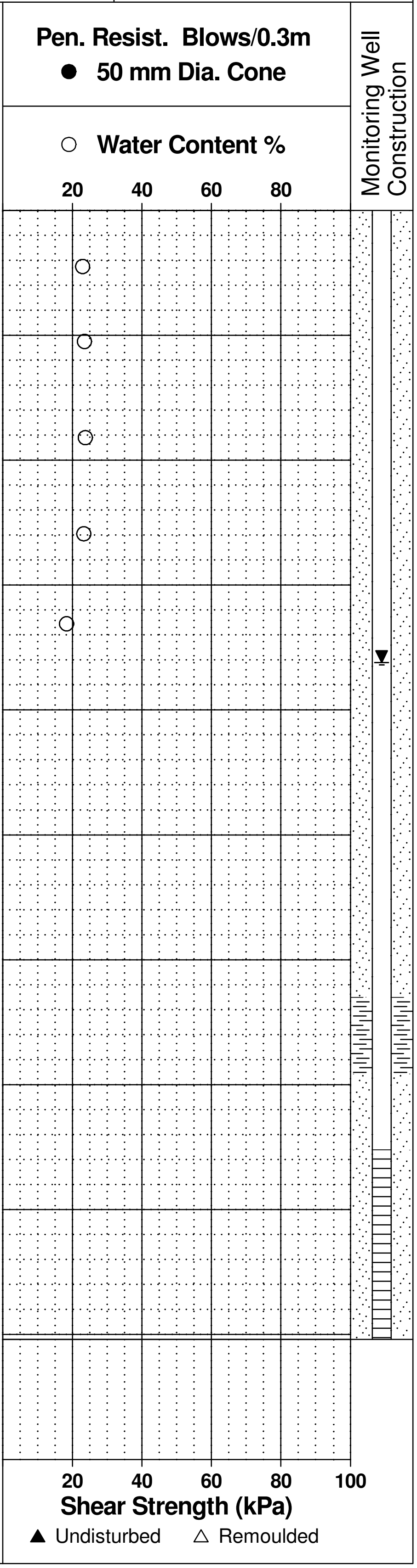
BORINGS BY CME-55 Low Clearance Drill

DATE September 29, 2022

FILE NO. PG5570

HOLE NO. BH 4-22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	105.71
TOPSOIL 0.28		AU	1				
Compact, brown **SILTY SAND to SANDY SILT**		SS	2	75	22	1	104.71
		SS	3	75	21		
2.21						2	103.71
GLACIAL TILL: Compact to dense, brown silty sand with gravel, cobbles and boulders, trace clay		SS	4	67	17		
- grey by 3.0m depth		SS	5	57	45	3	102.71
3.61							
		RC	1	100	84	4	101.71
		RC	2	100	98	5	100.71
BEDROCK: Good to excellent quality, grey limestone interbedded with dolostone						6	99.71
		RC	3	100	100	7	98.71
		RC	4	100	100	8	97.71
9.04						9	96.71
End of Borehole (GWL @ 3.62m - Oct. 11, 2022)							



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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5993, 6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill

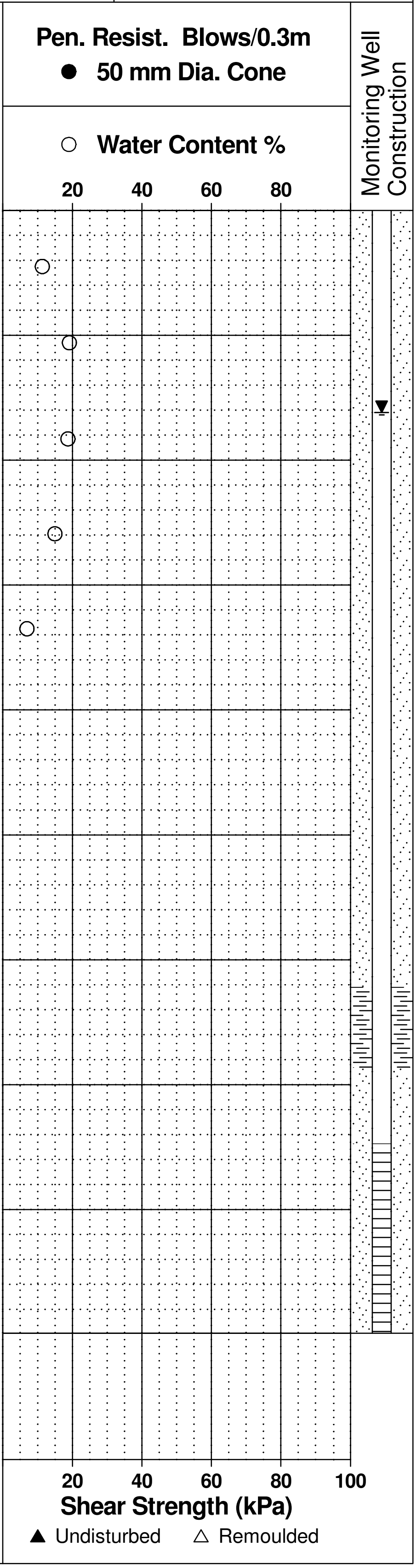
DATE September 30, 2022

FILE NO. **PG5570**

HOLE NO. **BH 5-22**

SOIL DESCRIPTION	Strata depth (m)	TYPE	NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE					
TOPSOIL	0.28				
Compact, brown **SILTY SAND to SANDY SILT**		AU	1		
		SS	2	79	21
	1.96	SS	3	71	29
GLACIAL TILL: Compact to dense, brown silty sand to sandy silt, trace gravel	2.29	SS	4	100	50+
BEDROCK: Excellent quality, grey limestone interbedded with dolostone		RC	1	100	100
		RC	2	100	100
		RC	3	100	100
		RC	4	100	100
	8.99	RC	5	100	100
End of Borehole					
(GWL @ 1.62m - Oct. 11, 2022)					

DEPTH (m)	ELEV. (m)
0	105.70
1	104.70
2	103.70
3	102.70
4	101.70
5	100.70
6	99.70
7	98.70
8	97.70



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5993, 6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Hand Auger

DATE September 28, 2022

FILE NO. PG5570

HOLE NO. HA 1-22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Monitoring Well Construction
GROUND SURFACE						0	106.78		
TOPSOIL 0.30									
Brown **SILTY SAND,** trace gravel 0.69									▼
End of Hand Auger Hole									
(GWL @ 0.31m - Oct. 11, 2022)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

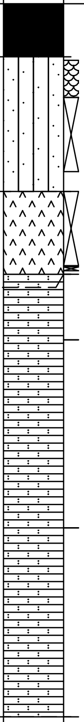
DATE December 14, 2021

FILE NO. PG5570

HOLE NO. BH 1-21

SOIL DESCRIPTION	TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	104.29
TOPSOIL 0.43						
Very loose, brown **SILTY SAND**	AU	1				
- some clay by 0.6m depth	SS	2	8	1	1	103.29
1.52						
GLACIAL TILL: Compact, brown silty sand with gravel, cobbles and boulders, trace clay	SS	3	25	23		
2.19	SS	4	100	50+	2	102.29
BEDROCK: Fair to excellent quality, grey limestone interbedded with dolostone	RC	1	100	57		
					3	101.29
	RC	2	100	68		
- 20mm thick mud seam at 3.4m depth					4	100.29
- 12mm thick mud at 3.7m depth	RC	3	100	98	5	99.29
5.77						
End of Borehole (GWL @ 1.22m - Jan. 11, 2022)						

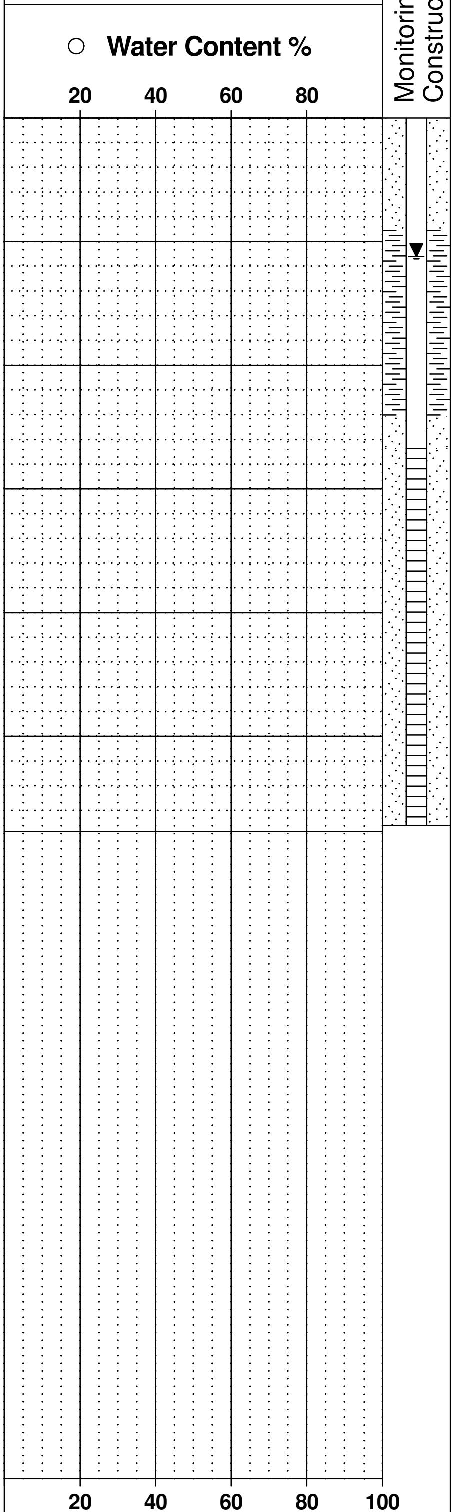
STRATA PLOT



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

○ Water Content %

Monitoring Well Construction



Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

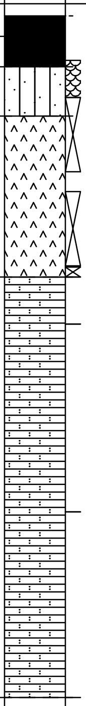
BORINGS BY Track-Mount Power Auger

DATE December 14, 2021

FILE NO. PG5570

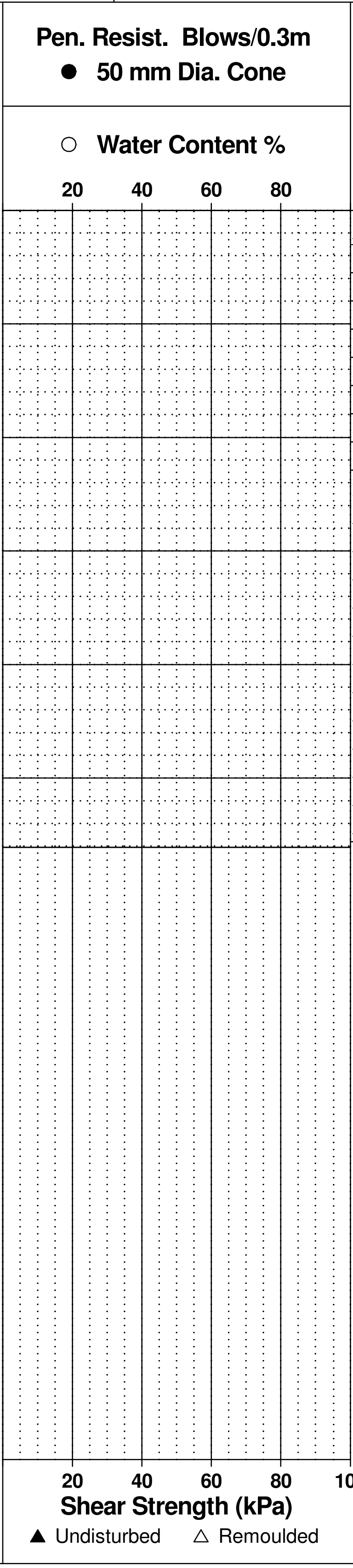
HOLE NO. BH 2-21

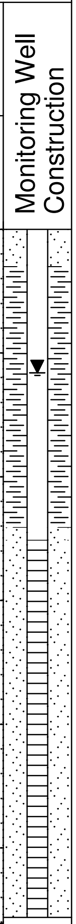
SOIL DESCRIPTION	Depth to base (m)
GROUND SURFACE	
Mulch	0.10
TOPSOIL	0.51
Compact, brown **SILTY SAND**	0.91
GLACIAL TILL: Compact to dense, brown silty sand with gravel, cobbles and boulders	2.21
BEDROCK: Good to excellent quality, grey limestone - 12mm thick mud seam at 4.1m depth	5.61
End of Borehole (GWL @ 0.82m - Jan. 11, 2022)	



SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
AU	1		
SS	2	75	12
SS	3	75	50
SS	4	0	50+
RC	1	100	80
RC	2	100	100
RC	3	100	95

DEPTH (m)	ELEV. (m)
0	107.19
1	106.19
2	105.19
3	104.19
4	103.19
5	102.19





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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 15, 2021

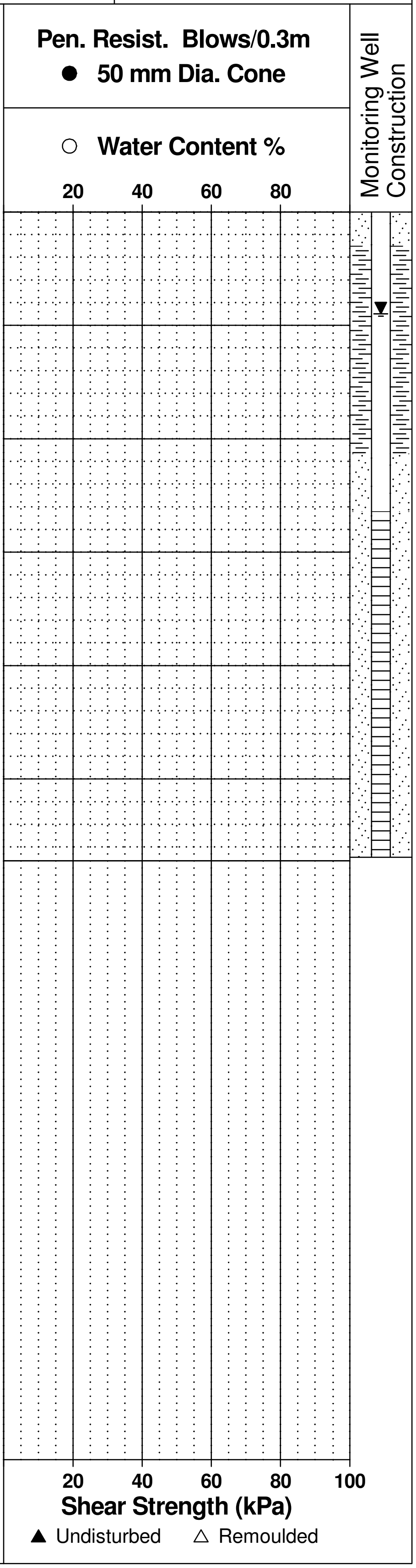
FILE NO. **PG5570**

HOLE NO. **BH 3-21**

SOIL DESCRIPTION	
GROUND SURFACE	
Mulch	0.08
TOPSOIL	0.43
Loose, brown **SILTY SAND**	0.63
Loose to compact, brown **SILTY SAND to SANDY SILT**	1.55
BEDROCK: Good to excellent, grey limestone interbedded with dolostone - 30mm thick mud seam at 4.3m depth	5.72
End of Borehole (GWL @ 0.89m - Jan. 11, 2022)	

SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
AU	1		
SS	2	50	10
SS	3	0	50+
RC	1	100	100
RC	2	100	72
RC	3	100	100

DEPTH (m)	ELEV. (m)
0	108.41
1	107.41
2	106.41
3	105.41
4	104.41
5	103.41



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

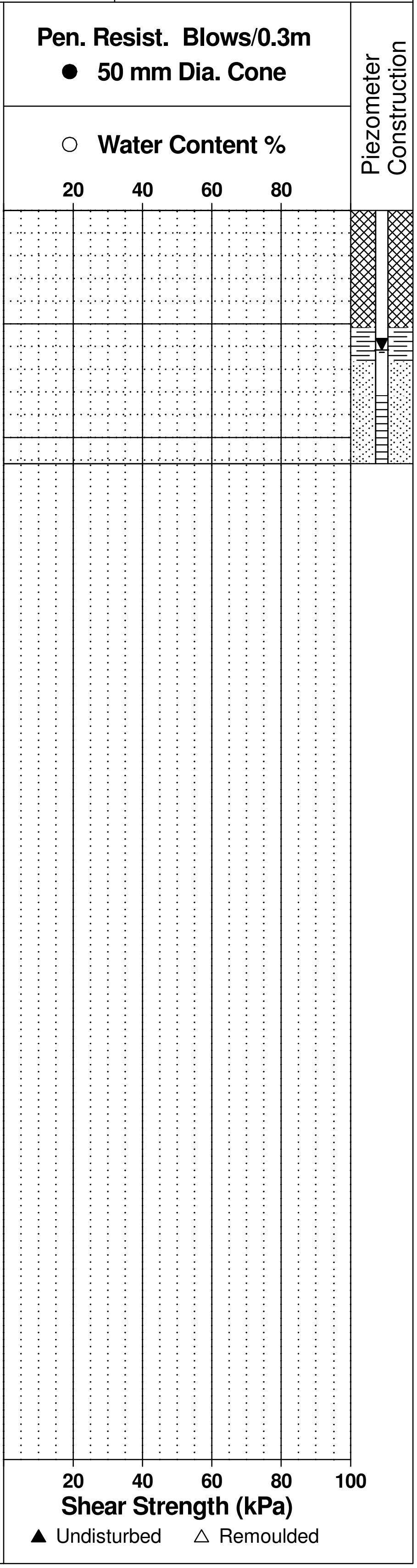
BORINGS BY Track-Mount Power Auger

DATE December 15, 2021

FILE NO. PG5570

HOLE NO. BH 4-21

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	108.95
Mulch 0.10						
TOPSOIL 0.30	AU	1				
Compact, brown **SILTY SAND,** trace shells 0.60						
	SS	2	50	12	1	107.95
GLACIAL TILL: Compact, brown silty sand with gravel, cobbles and boulders	SS	3	42	21		
2.23					2	106.95
End of Borehole Practical refusal to augering at 2.23m depth (GWL @ 1.23m - Jan. 11, 2022)						



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SOIL PROFILE AND TEST DATA

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Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 15, 2021

FILE NO. PG5570

HOLE NO. BH 5-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	108.38
TOPSOIL 0.36		AU	1				
Loose, brown **SILTY SAND** 1.22		SS	2		4	1	107.38
GLACIAL TILL: Dense, grey silty sand with gravel, cobbles and boulders 1.62		SS	3	0	50+		
End of Borehole Practical refusal to augering at 1.62m depth (BH dry - January 11, 2022)							

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

○ Water Content %

20 40 60 80

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

Piezometer Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

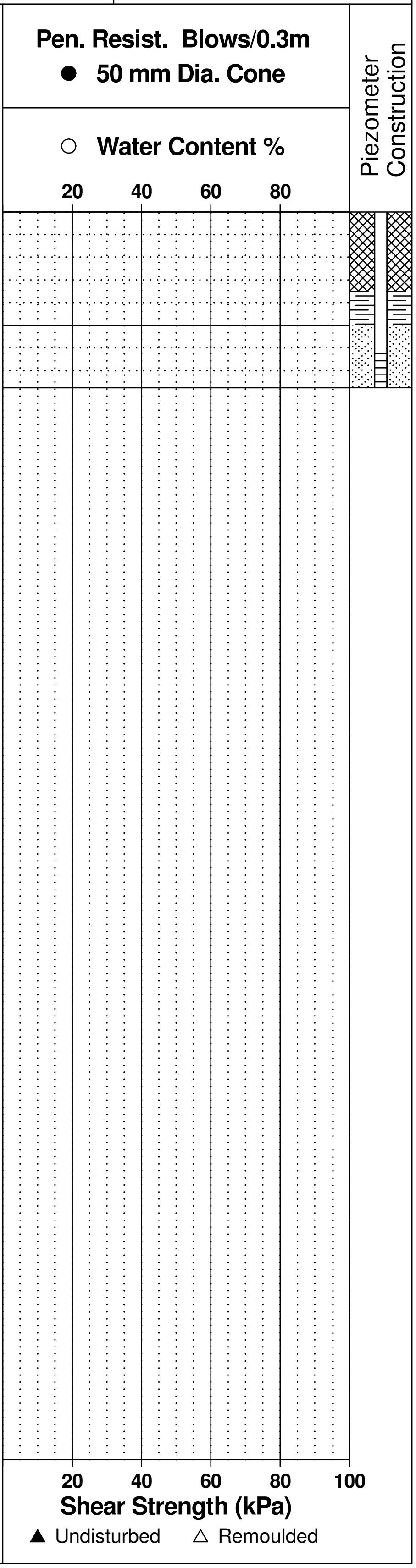
BORINGS BY Track-Mount Power Auger

DATE December 15, 2021

FILE NO. PG5570

HOLE NO. BH 6-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	106.32
TOPSOIL 0.41							
Loose, brown **SILTY SAND,** trace clay 0.60		AU	1				
GLACIAL TILL: Compact to dense, brown silty sand with gravel, cobbles and boulders 1.55		SS	2	83	17	1	105.32
End of Borehole Practical refusal to augering at 1.55m depth (BH dry - January 11, 2022)							



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SOIL PROFILE AND TEST DATA

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Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 15, 2021

FILE NO. **PG5570**

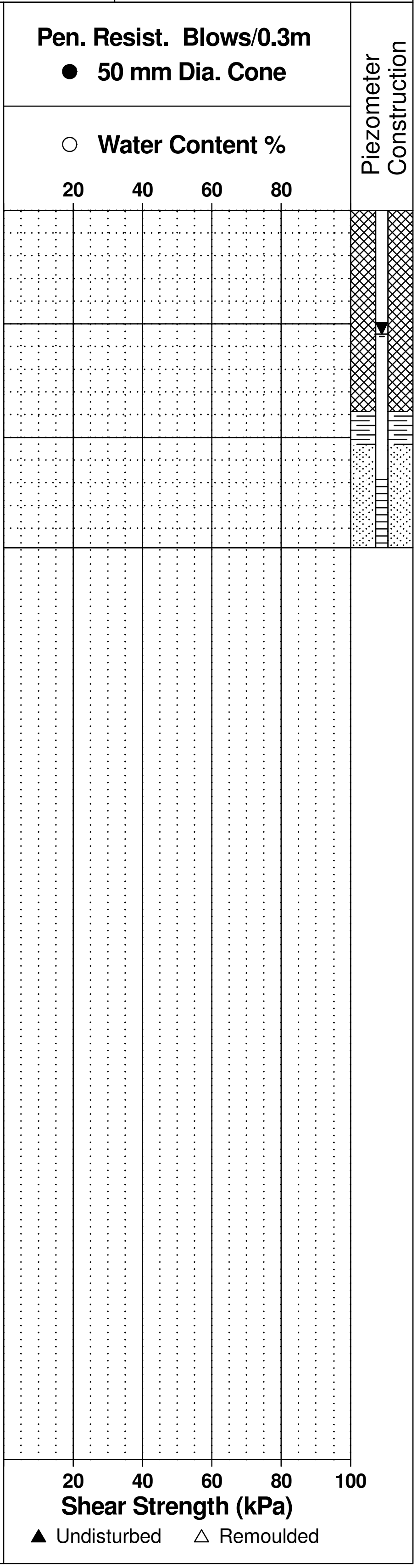
HOLE NO. **BH 7-21**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)
GROUND SURFACE		TYPE	NUMBER	% RECOVERY	N VALUE or RQD		
Mulch 0.10		AU	1			0	107.04
TOPSOIL 0.41							
Loose, brown **SILTY SAND** 0.60							
GLACIAL TILL: Compact to dense, brown silty sand with gravel, cobbles and boulders		SS	2	100	19	1	106.04
		SS	3	67	44	2	105.04
2.97		SS	4		52		

End of Borehole

Practical refusal to augering at 2.97m depth

(GWL @ 1.09m - Jan. 11, 2022)



SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger **DATE** December 15, 2021

FILE NO. PG5570

HOLE NO. BH 8-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	105.91		
Mulch 0.05		AU	1						
TOPSOIL 0.38									
Loose, brown **SILTY SAND** 0.60									
GLACIAL TILL: Compact to dense, brown silty sand with gravel, cobbles and boulders		SS	2	67	20	1	104.91		
1.60		SS	3	0	50+				
End of Borehole Practical refusal to augering at 1.60m depth (BH dry - January 11, 2022)									

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 15, 2021

FILE NO. PG5570

HOLE NO. BH 9-21

SOIL DESCRIPTION		SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	104.62
TOPSOIL	0.36						
Loose, brown **SILTY SAND,** trace clay	0.69	AU	1				
GLACIAL TILL: Compact to dense, brown silty sand with gravel, cobbles and boulders	1.22	SS	2		50+	1	103.62

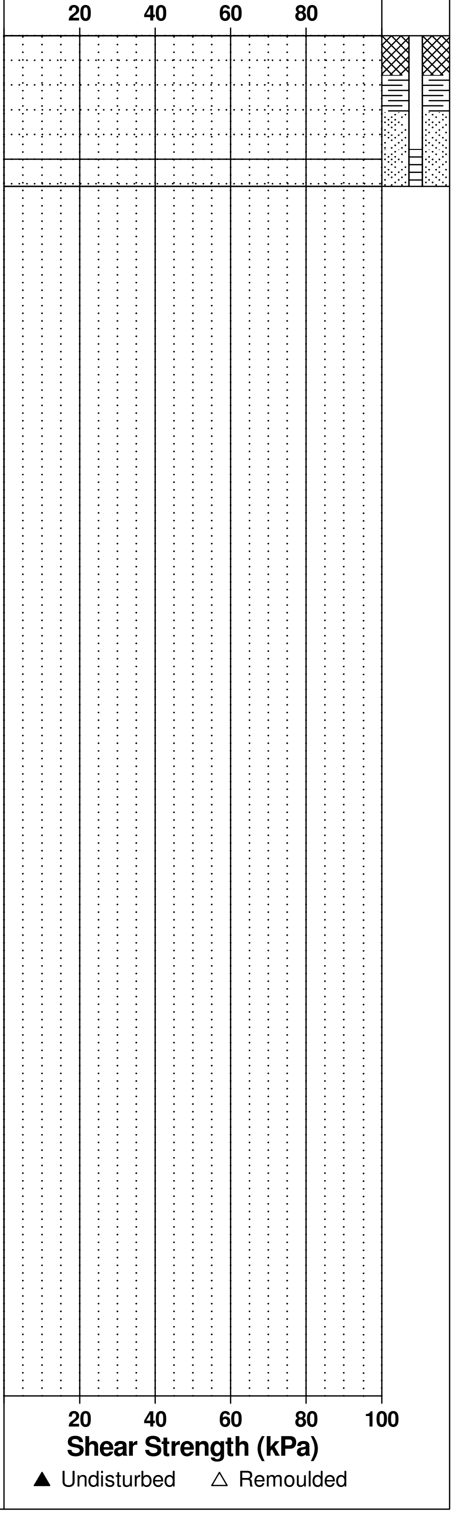
End of Borehole

Practical refusal to augering at 1.22m depth

(Piezometer damaged - Jan. 11, 2022)

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

○ Water Content %



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 15, 2021

FILE NO. **PG5570**

HOLE NO. **BH10-21**

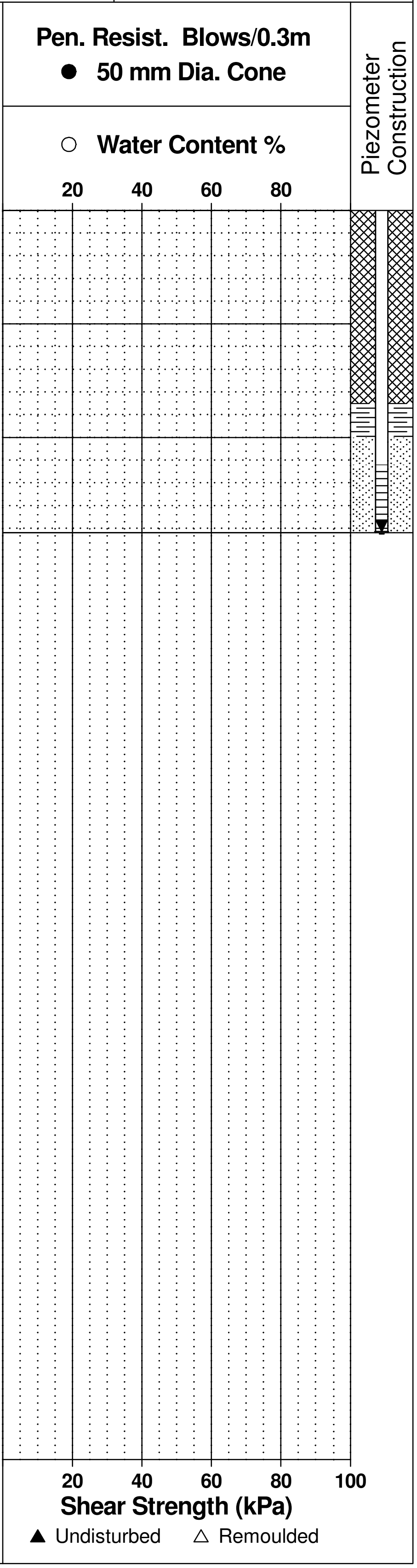
SOIL DESCRIPTION	Depth of base (m)	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE					
TOPSOIL	0.36				
Compact, brown **SILTY SAND**	2.74	AU	1		
		SS	2	67	23
		SS	3	67	16
		SS	4	64	25
GLACIAL TILL: Compact to dense, grey silty sand with gravel, cobbles and boulders	2.84				

End of Borehole

Practical refusal to augering at 2.84m depth

(GWL @ 2.83m - Jan. 11, 2022)

DEPTH (m)	ELEV. (m)
0	105.70
1	104.70
2	103.70



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 16, 2021

FILE NO. PG5570

HOLE NO. BH11-21

SOIL DESCRIPTION	Depth to base (m)
GROUND SURFACE	
TOPSOIL	0.33
Compact, brown **SILTY SAND**	0.66
Compact, brown **SILTY SAND to SANDY SILT**	1.12
GLACIAL TILL: Compact to dense, brown silty sand with gravel, cobbles and boulders	2.54

End of Borehole

Practical refusal to augering at 2.54m depth

(GWL @ 1.32m - Jan. 11, 2022)

SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
AU	1		
SS	2	67	24
SS	3	67	32
SS	4	80	50+

DEPTH (m)	ELEV. (m)
0	104.98
1	103.98
2	102.98

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

○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 16, 2021

FILE NO. PG5570

HOLE NO. BH12-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE		TYPE	NUMBER	% RECOVERY	N VALUE or RQD				
TOPSOIL 0.36						0	104.05		
Compact, brown **SILTY SAND** 0.69		AU	1						
Compact, brown **SILTY SAND to SANDY SILT** 1.45		SS	2	67	13	1	103.05		
GLACIAL TILL: Dense, brown silty sand with gravel, cobbles and boulders 2.26		SS	3	17	36	2	102.05		▼
End of Borehole Practical refusal to augering at 2.26m depth (GWL @ 1.58m - Jan. 11, 2022)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 16, 2021

FILE NO. **PG5570**

HOLE NO. **BH13-21**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	103.54		
TOPSOIL 0.36		AU	1						
Loose, brown **SILTY SAND to SANDY SILT**		SS	2	25	6	1	102.54		
1.60		SS	3	0	50+				
End of Borehole Practical refusal to augering at 1.60m depth (GWL @ 1.44m - Jan. 11, 2022)									

Water Content % axis: 20 40 60 80

Shear Strength (kPa) axis: 20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 16, 2021

FILE NO. **PG5570**

HOLE NO. **BH14-21**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.28
TOPSOIL 0.36							
Loose, brown **SILTY SAND** 0.69		AU	1				
Loose, brown **SILTY SAND to SANDY SILT** 1.45		SS	2	67	6	1	102.28
GLACIAL TILL: Loose to dense, brown silty sand with clay, gravel, cobbles and boulders 2.34		SS	3	25	7	2	101.28
End of Borehole Practical refusal to augering at 2.34m depth (GWL @ 1.37m - Jan. 11, 2022)		SS	4	0	50+		

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

○ Water Content %

20 40 60 80

Piezometer Construction

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 16, 2021

FILE NO. PG5570

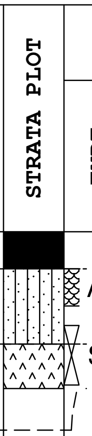
HOLE NO. BH15-21

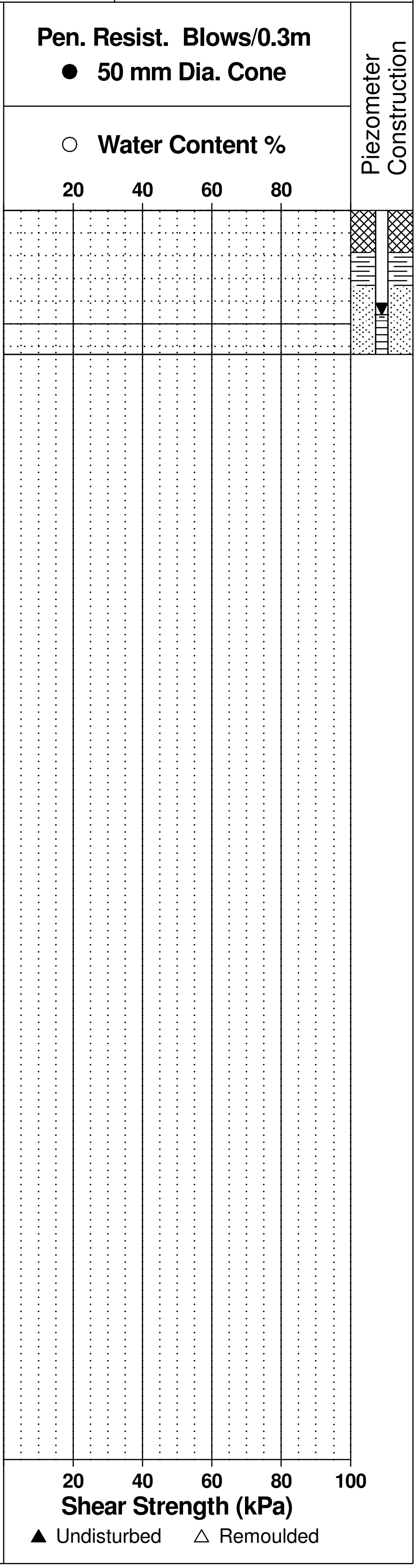
SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	103.08
TOPSOIL 0.30						
Compact, brown **SILTY SAND to SANDY SILT** 0.91	AU	1				
GLACIAL TILL: Compact, brown silty sand with gravel, cobbles and boulders 1.27	SS	2	63	19	1	102.08

End of Borehole

Practical refusal to augering at 1.27m depth

(GWL @ 0.92m - Jan. 11, 2022)





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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

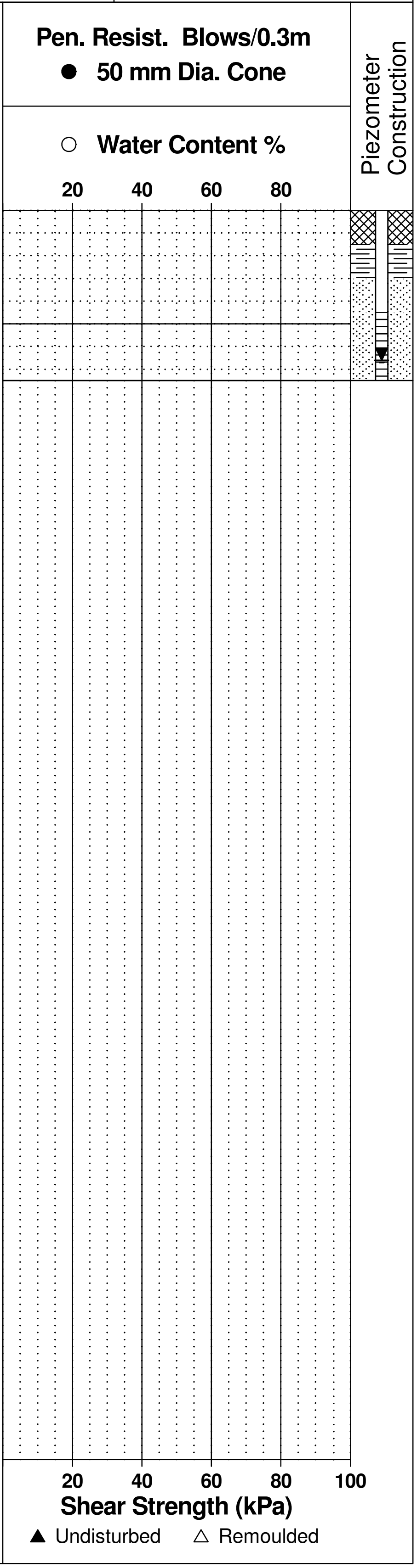
BORINGS BY Track-Mount Power Auger

DATE December 16, 2021

FILE NO. **PG5570**

HOLE NO. **BH16-21**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	104.19
TOPSOIL 0.25							
Compact, brown **SILTY SAND,** trace gravel 0.69		AU	1				
GLACIAL TILL: Compact, brown silty sand with gravel, cobbles and boulders 1.50		SS	2		22	1	103.19
End of Borehole Practical refusal to augering at 1.50m depth (GWL @ 1.32m - Jan. 11, 2022)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 16, 2021

FILE NO. PG5570

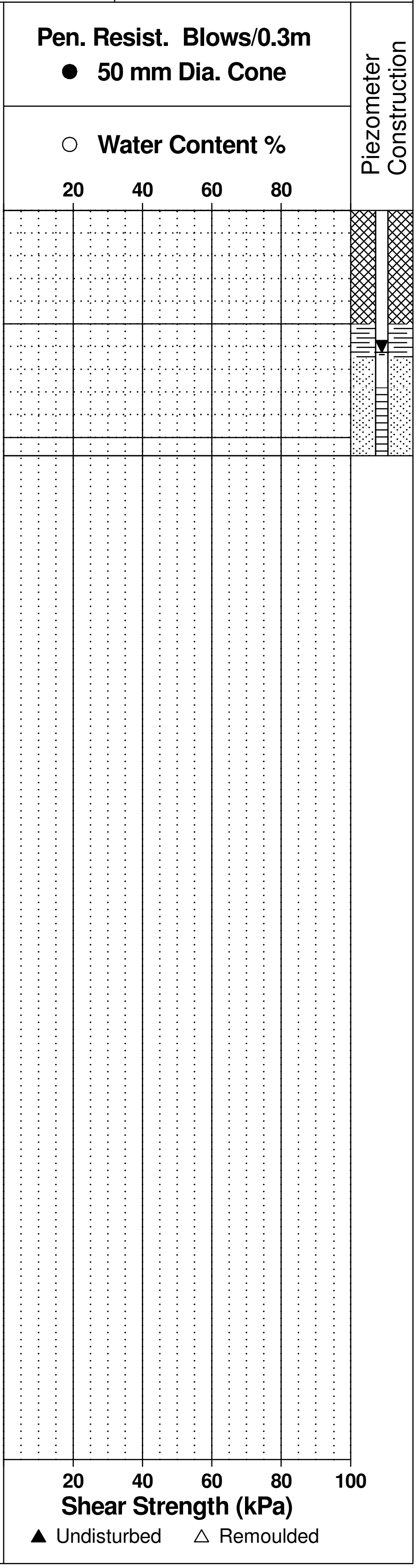
HOLE NO. BH17-21

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	104.42
TOPSOIL 0.28	AU	1				
Loose, brown **SILTY SAND to SANDY SILT**	SS	2	75	5	1	103.42
1.98	SS	3	91	11	2	102.42
GLACIAL TILL: Compact, brown silty sand with gravel, cobbles and boulders 2.16						

End of Borehole

Practical refusal to augering at 2.16m depth

(GWL @ 1.25m - Jan. 11, 2022)



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SOIL PROFILE AND TEST DATA

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Prop. Residential Development - 6115 Flewellyn Road
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DATUM Geodetic

REMARKS

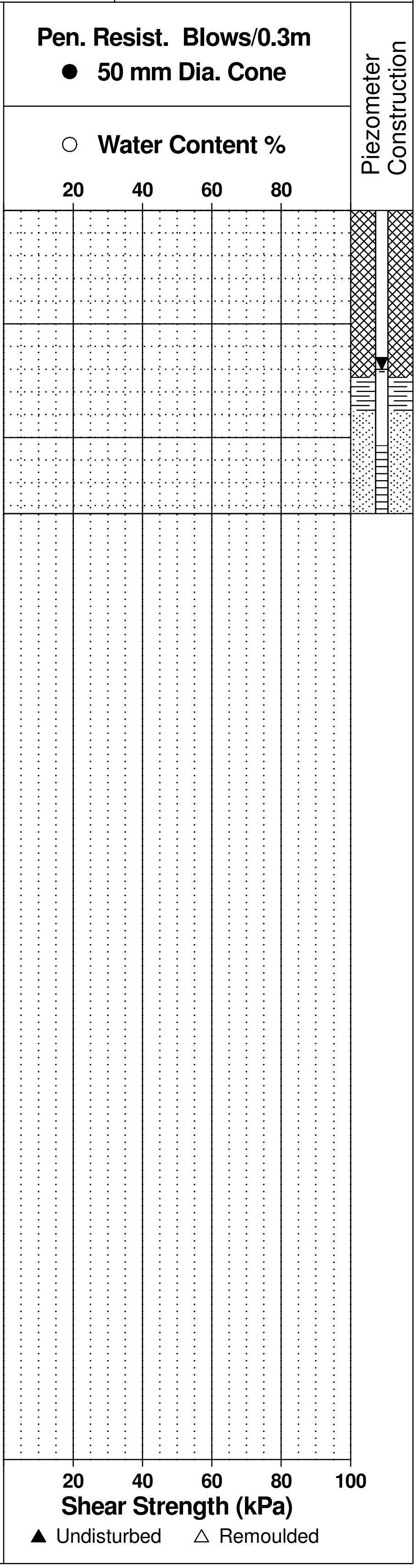
BORINGS BY Track-Mount Power Auger

DATE December 16, 2021

FILE NO. PG5570

HOLE NO. BH18-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	105.06
TOPSOIL 0.30							
Compact, brown **SILTY SAND to SANDY SILT**		AU	1				
		SS	2	75	10	1	104.06
		SS	3	100	19	2	103.06
- grey by 2.0m depth 2.67		SS	4		50+		
End of Borehole Practical refusal to augering at 2.67m depth (GWL @ 1.40m - Jan. 11, 2022)							



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Prop. Residential Development - 6115 Flewellyn Road
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DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 16, 2021

FILE NO. **PG5570**

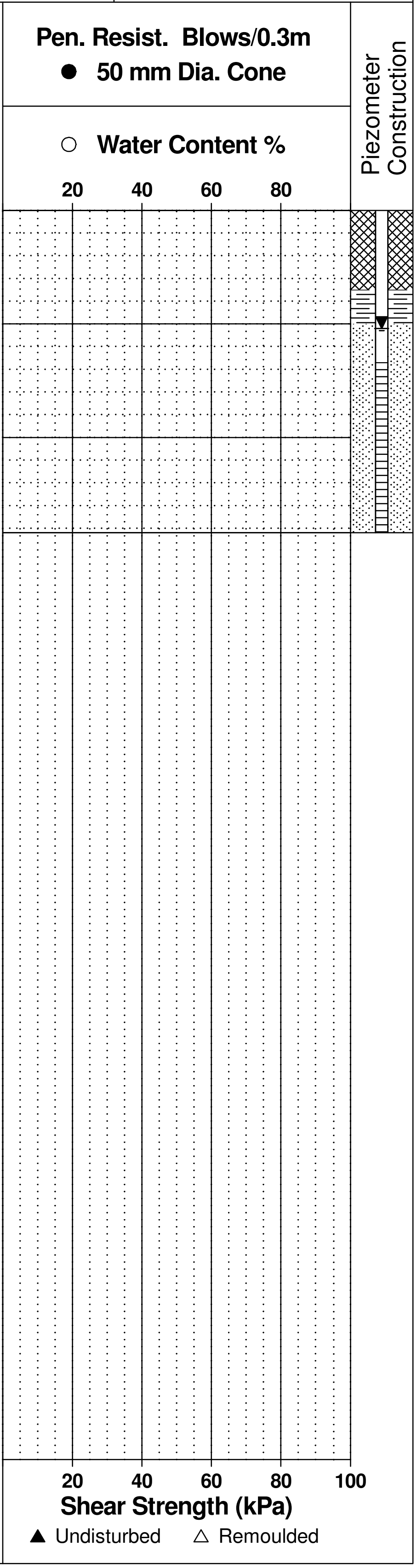
HOLE NO. **BH19-21**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	101.85
TOPSOIL 0.20							
		AU	1				
Compact, brown **SILTY SAND to SANDY SILT** 1.73		SS	2	50	12	1	100.85
		SS	3	75	8	2	99.85
Loose, brown **SILTY SAND,** some clay 2.59							
GLACIAL TILL: Compact, grey silty sand with gravel, cobbles and boulders 2.84		SS	4	100	12		

End of Borehole

Practical refusal to augering at 2.84m depth

(GWL @ 1.04m - Jan. 11, 2022)



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Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 17, 2021

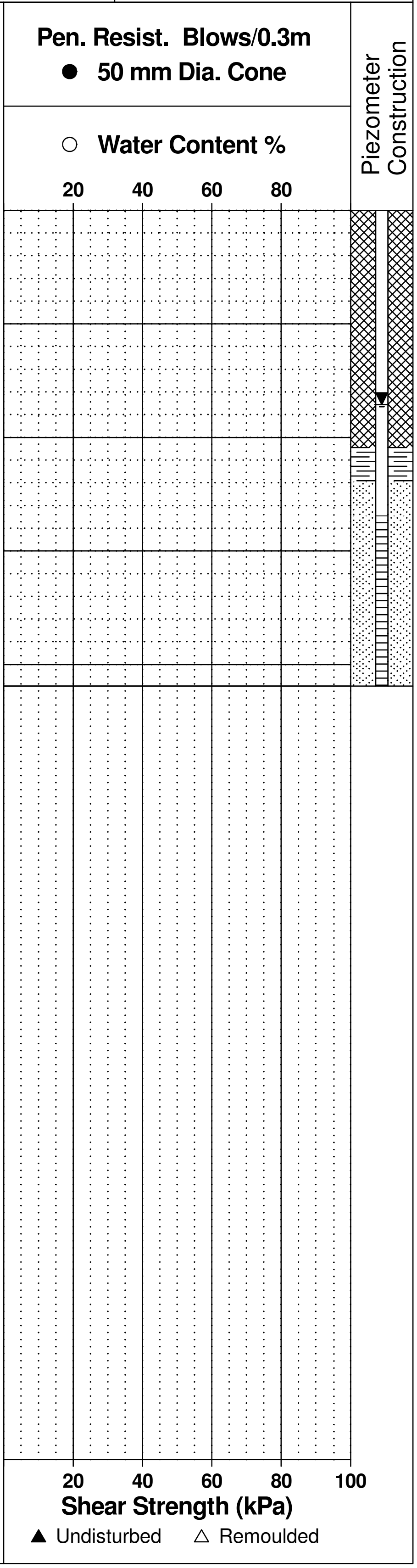
FILE NO. **PG5570**

HOLE NO. **BH20-21**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	102.25
TOPSOIL 0.23							
		AU	1				
Compact to loose, brown **SILTY SAND to SANDY SILT**		SS	2	58	11	1	101.25
		SS	3	42	7		
2.44						2	100.25
Interlayered grey **SANDY SILT** and grey **SILTY CLAY**		SS	4	75	3		
3.20						3	99.25
GLACIAL TILL: Compact, grey silty sand with gravel, cobbles and boulders		SS	5	67	23		
4.19		SS	6		50+	4	98.25
End of Borehole							

Practical refusal to augering at 4.19m depth

(GWL @ 1.71m - Jan. 11, 2022)



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REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 17, 2021

FILE NO. **PG5570**

HOLE NO. **BH21-21**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	102.92
TOPSOIL 0.25							
Loose, brown **SILTY SAND to SANDY SILT** 1.07		AU	1				
		SS	2	42	36	1	101.92
GLACIAL TILL: Dense, brown silty sand with gravel, cobbles and boulders 2.23		SS	3	50	71	2	100.92

End of Borehole

Practical refusal to augering at 2.23m depth

(Piezometer damaged - Jan. 11, 2022)

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

○ Water Content %

20 40 60 80

Piezometer Construction

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

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REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 20, 2021

FILE NO. PG5570

HOLE NO. BH22-21

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	102.98
TOPSOIL 0.20						
Loose, brown **SILTY SAND,** trace gravel 0.69	AU	1				
GLACIAL TILL: Compact to dense, brown silty sand with gravel, cobbles and boulders	SS	2	100	22	1	101.98
	SS	3	92	29	2	100.98
	SS	4	83	46		
3.48	SS	5	50	50+	3	99.98
End of Borehole Practical refusal to augering at 3.48m depth.						

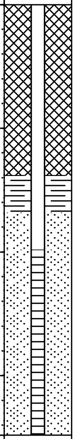
Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

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

Piezometer Construction



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REMARKS

BORINGS BY Track-Mount Power Auger

DATE January 10, 2022

FILE NO. **PG5570**

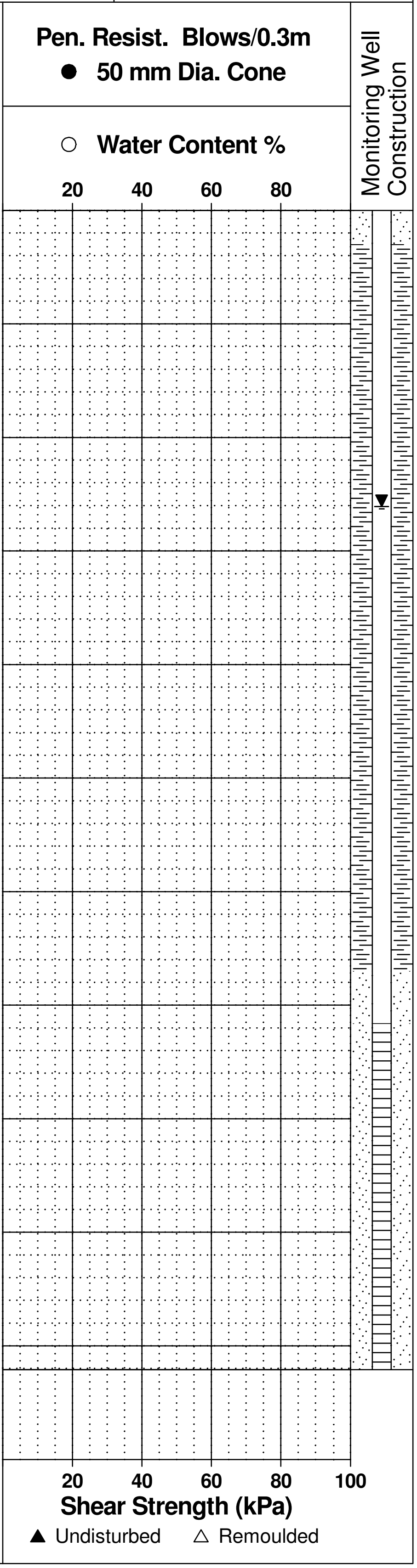
HOLE NO. **BH22A-21**

SOIL DESCRIPTION	Depth to base (m)
GROUND SURFACE	
TOPSOIL	0.20
Loose, brown **SILTY SAND,** trace gravel	0.69
GLACIAL TILL: Compact to dense, brown silty sand with gravel, cobbles and boulders	5.97
BEDROCK: Excellent quality, grey dolostone interbedded with grey limestone	10.21
End of Borehole	

(GWL @ 2.49m - Jan. 11, 2022)

TYPE	NUMBER	% RECOVERY	N VALUE or RQD
AU	1		
SS	2	100	22
SS	3	92	29
SS	4	83	46
SS	5	50	50+
RC	1	77	
RC	2	14	
RC	3	100	94
RC	4	100	100
RC	5	100	100

DEPTH (m)	ELEV. (m)
0	102.98
1	101.98
2	100.98
3	99.98
4	98.98
5	97.98
6	96.98
7	95.98
8	94.98
9	93.98
10	92.98



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REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 20, 2021

FILE NO. PG5570

HOLE NO. BH23-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content % 20 40 60 80	Piezometer Construction
GROUND SURFACE						0	102.38		
TOPSOIL 0.28									
Stiff, brown **SILTY CLAY,** some sand		AU	1						
1.12		SS	2	25	32	1	101.38		
GLACIAL TILL: Dense, brown silty sand with gravel, cobbles and boulders, trace clay 1.83		SS	3	55					
End of Borehole Practical refusal to augering at 1.83m depth (Piezometer damaged - Jan. 11, 2022)									

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

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REMARKS

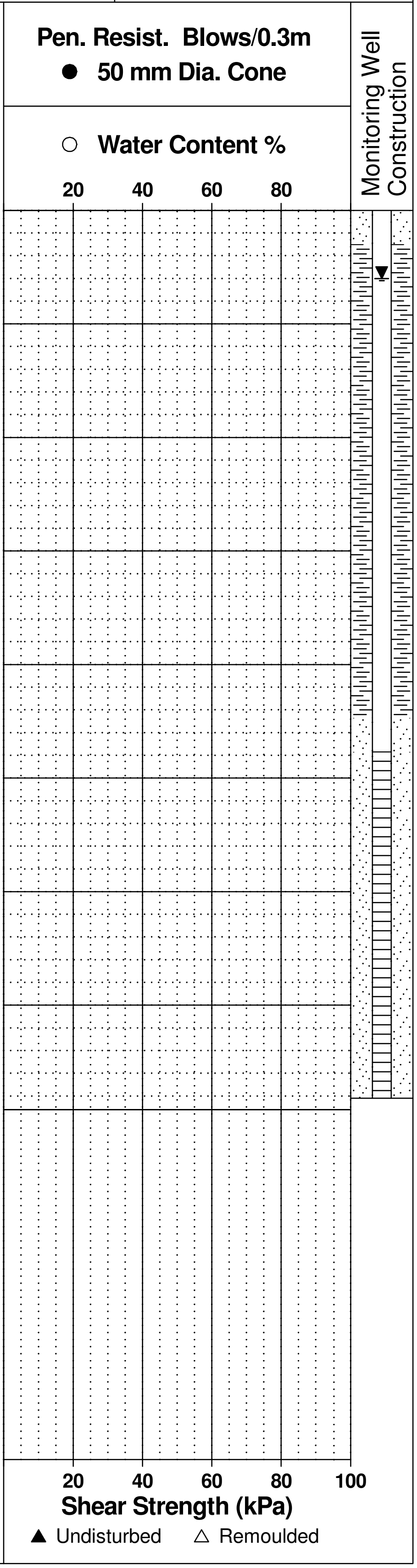
BORINGS BY Track-Mount Power Auger

DATE December 20, 2021

FILE NO. PG5570

HOLE NO. BH24-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.07
TOPSOIL 0.30		AU	1				
Loose to dense, brown **SILTY SAND to SANDY SILT**		SS	2	58	8	1	102.07
1.83		SS	3	75	32		
						2	101.07
GLACIAL TILL: Dense, brown silty sand with gravel, cobbles and boulders		SS	4	50	50+		
		RC	1	100			
						3	100.07
- boulders cored from 2.46 to 4.42m depth		RC	2	19			
4.42						4	99.07
BEDROCK: Good to excellent quality, grey limestone interbedded with dolostone		RC	3	100	81	5	98.07
						6	97.07
- 15mm thick mud seam at 5.25m depth		RC	4	100	100	7	96.07
7.92		RC	5	100	100		
End of Borehole							
(GWL @ 0.67m - Jan. 11, 2022)							



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REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 21, 2021

FILE NO. PG5570

HOLE NO. BH25-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	102.73
TOPSOIL 0.25							
Loose, brown **SILTY SAND,** trace clay and gravel		AU	1				
1.17		SS	2	71	50+	1	101.73
End of Borehole Practical refusal to augering at 1.17m depth (GWL @ 0.71m - Jan. 11, 2022)							

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

○ Water Content %

20 40 60 80

Piezometer Construction

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

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REMARKS
BORINGS BY Track-Mount Power Auger
DATE December 21, 2021
FILE NO. PG5570
HOLE NO. BH26-21

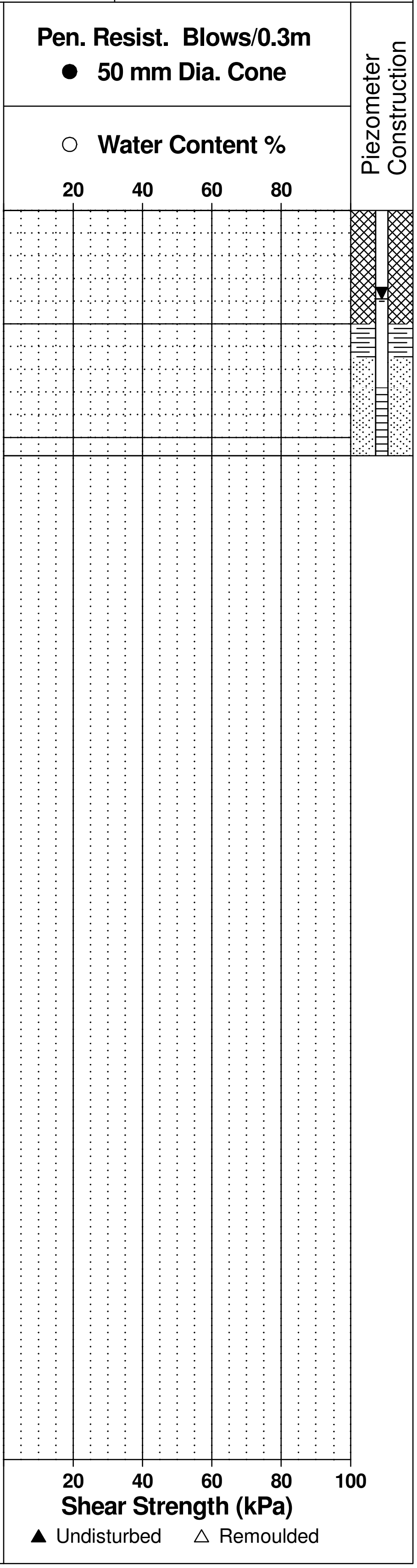
SOIL DESCRIPTION	Depth to base (m)
GROUND SURFACE	
TOPSOIL	0.25
Stiff, brown **SILTY CLAY,** some sand	0.69
GLACIAL TILL: Dense, brown silty sand with gravel, cobbles and boulders, trace clay	2.16
End of Borehole	

Practical refusal to augering at 2.16m depth

(GWL @ 0.78m - Jan. 11, 2022)

SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
AU	1		
SS	2	40	50+
SS	3	61	33

DEPTH (m)	ELEV. (m)
0	103.04
1	102.04
2	101.04



SOIL PROFILE AND TEST DATA

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REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 21, 2021

FILE NO. **PG5570**

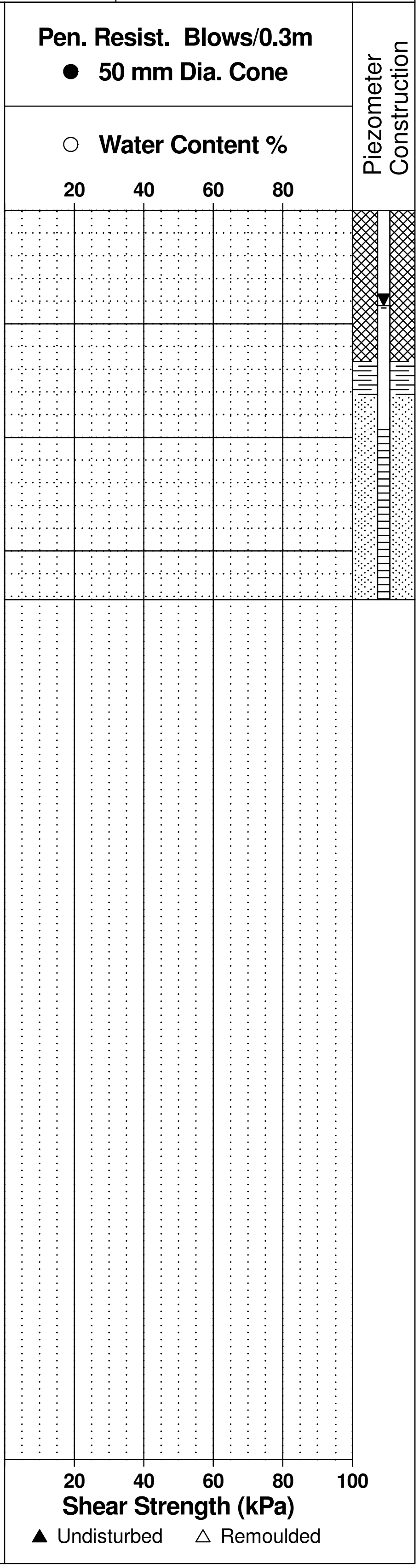
HOLE NO. **BH27-21**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	102.71
TOPSOIL 0.28							
Compact to loose, brown **SILTY SAND to SANDY SILT,** trace clay		AU	1				
		SS	2	67	19	1	101.71
		SS	3	83	21	2	100.71
- grey by 2.4m depth		SS	4	50	9		
3.12						3	99.71
GLACIAL TILL: Very loose, grey silty sand with gravel, cobbles and boulders 3.43		SS	5	86	3		

End of Borehole

Practical refusal to augering at 3.43m depth

(GWL @ 0.84m - Jan. 11, 2022)



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REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 21, 2021

FILE NO. **PG5570**

HOLE NO. **BH28-21**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	101.85
TOPSOIL 0.30							
		AU	1				
Loose, brown **SILTY SAND to SANDY SILT,** trace clay		SS	2	42	7	1	100.85
2.21		SS	3	58	8	2	99.85
Interbedded layers of grey **SILTY SAND** and grey **SILTY CLAY** 2.97		SS	4	100	2		
						3	98.85
GLACIAL TILL: Very loose, grey silty sand with clay, gravel and cobbles		SS	5	100	3		
3.89		SS	6		50+		

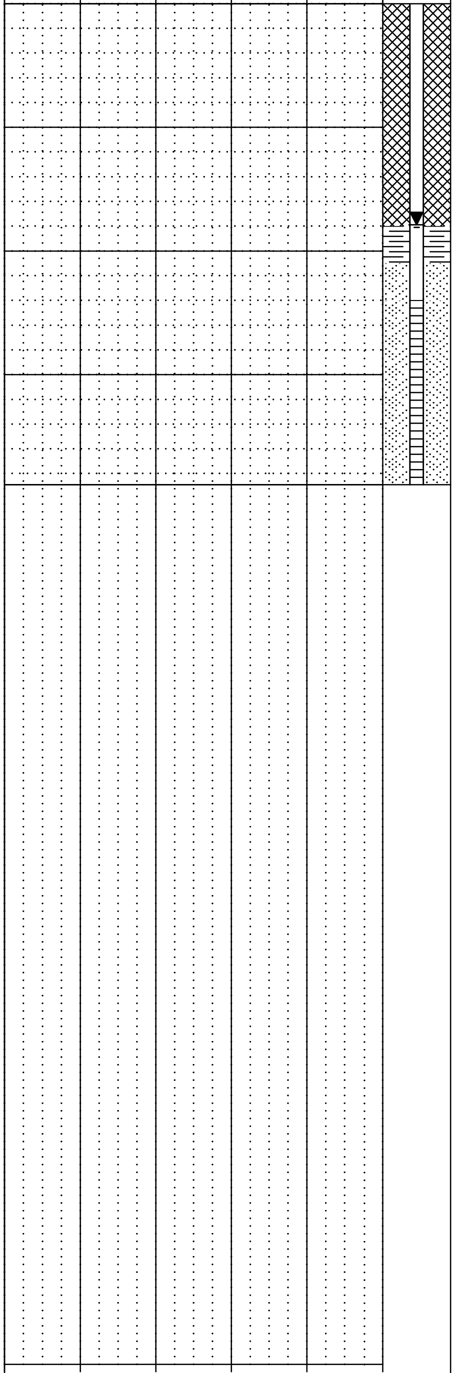
End of Borehole

Practical refusal to augering at 3.89m depth

(GWL @ 1.79m - Jan. 11, 2022)

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

○ Water Content %



Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 21, 2021

FILE NO. PG5570

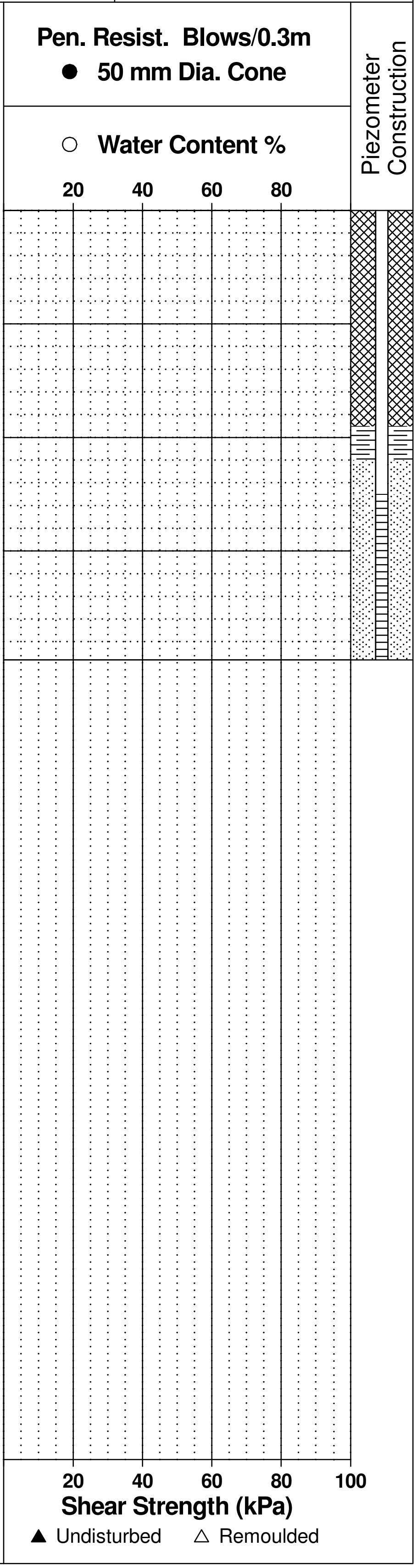
HOLE NO. BH29-21

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	102.31
TOPSOIL 0.28						
	AU	1				
	SS	2	50	9	1	101.31
Loose to very loose, brown **SILTY SAND to SANDY SILT,** trace clay	SS	3	67	8	2	100.31
- grey by 1.9m depth	SS	4	67	4	3	99.31
- intermittent layers of grey silty clay by 3.0m depth	SS	5	58	2		
3.96	SS	6	67			

End of Borehole

Practical refusal to augering at 3.96m depth

(Piezometer damaged - Jan. 11, 2022)



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BORINGS BY Track-Mount Power Auger

DATE December 21, 2021

FILE NO. PG5570

HOLE NO. BH30-21

SOIL DESCRIPTION

GROUND SURFACE

SOIL DESCRIPTION	Depth to base (m)
TOPSOIL	0.25
Compact to very loose, brown **SILTY SAND to SANDY SILT,** trace clay - grey by 2.0m depth	3.45
GLACIAL TILL: Very loose to compact, grey silty sand with gravel, cobbles and boulders, trace clay	4.82

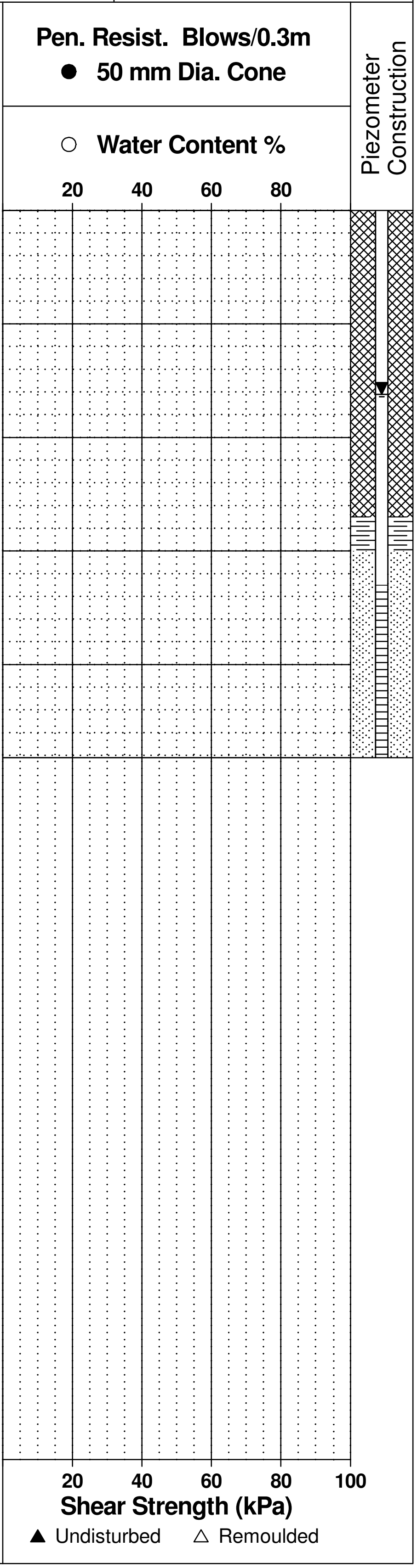
End of Borehole

Practical refusal to augering at 4.82m depth

(GWL @ 1.62m - Jan. 11, 2022)

SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
AU	1		
SS	2	50	12
SS	3	33	10
SS	4	92	1
SS	5	83	2
SS	6	33	24
SS	7	50	50+

DEPTH (m)	ELEV. (m)
0	102.44
1	101.44
2	100.44
3	99.44
4	98.44



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REMARKS

BORINGS BY Track-Mount Power Auger

DATE December 21, 2021

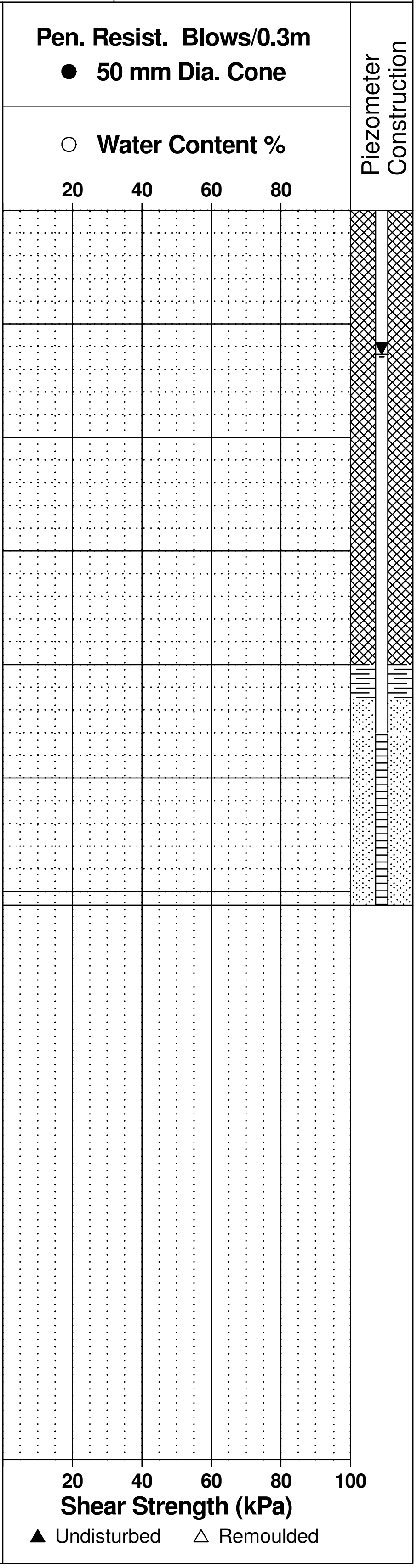
FILE NO. PG5570

HOLE NO. BH31-21

SOIL DESCRIPTION	Depth to base of stratum (m)
GROUND SURFACE	
TOPSOIL	0.36
Compact to loose, brown **SILTY SAND to SANDY SILT,** trace clay - grey by 3.2m depth	4.72
GLACIAL TILL: Dense, grey silty sand with gravel, cobbles and boulders	6.12
End of Borehole Practical refusal to augering at 6.12m depth (GWL @ 1.27m - Jan. 11, 2022)	

SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
AU	1		
SS	2	50	14
SS	3	50	22
SS	4	42	9
SS	5	58	5
SS	6	42	12
SS	7	58	37
SS	8		58
SS	9	0	50+

DEPTH (m)	ELEV. (m)
0	103.43
1	102.43
2	101.43
3	100.43
4	99.43
5	98.43
6	97.43



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BORINGS BY Track-Mount Power Auger

DATE December 21, 2021

FILE NO. PG5570

HOLE NO. BH32-21

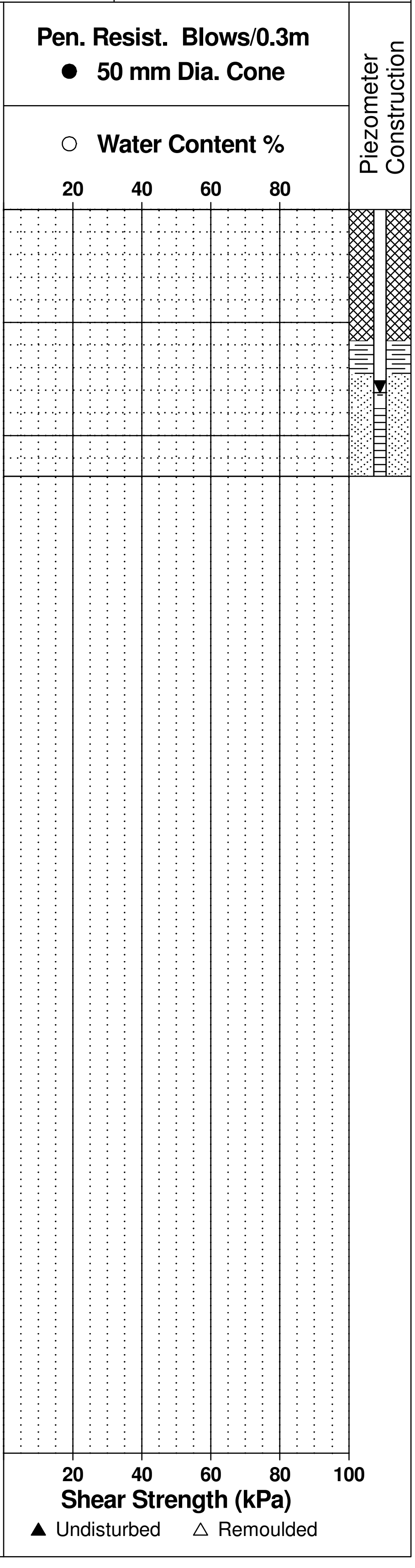
SOIL DESCRIPTION	Depth of boundary (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE					
TOPSOIL	0.15	AU	1		
Compact to dense, brown **SILTY SAND to SANDY SILT**		SS	2	67	39
- grey 1.4m depth	2.21	SS	3	67	26
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders	2.36	SS	4	50	50+

End of Borehole

Practical refusal to augering at 2.36m depth

(GWL @ 1.62m - Jan. 11, 2022)

DEPTH (m)	ELEV. (m)
0	103.74
1	102.74
2	101.74



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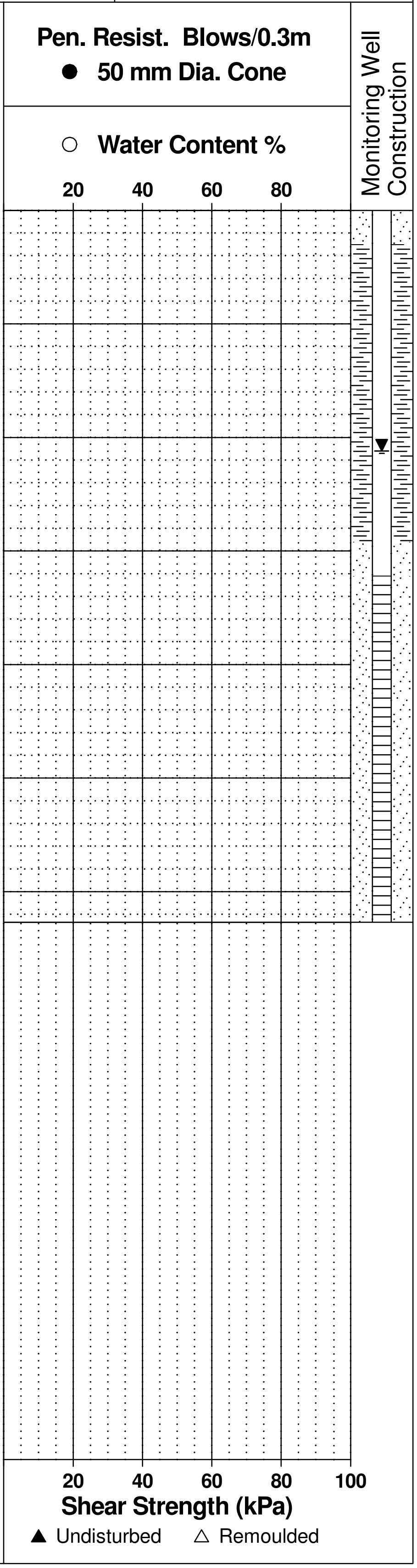
BORINGS BY Track-Mount Power Auger

DATE December 22, 2021

FILE NO. **PG5570**

HOLE NO. **BH33-21**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	104.70
Compact, brown **SILTY SAND,** trace clay and organics		AU	1				
		SS	2	50	13	1	103.70
1.45							
GLACIAL TILL: Compact, brown silty sand with gravel, cobbles and boulders		SS	3	8	11		
		RC	1	30		2	102.70
2.74							
BEDROCK: Good to excellent quality, grey limestone						3	101.70
		RC	2	100	73		
						4	100.70
- 25mm thick mud seam at 3.7m depth		RC	3	95	85	5	99.70
- 30mm thick mud seam at 3.8m depth		RC	4	100	100	6	98.70
6.27							
End of Borehole							
(GWL @ 1.84m - Jan. 11, 2022)							



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BORINGS BY Track-Mount Power Auger

DATE December 22, 2021

FILE NO. PG5570

HOLE NO. BH34-21

SOIL DESCRIPTION	Depth to base (m)
GROUND SURFACE	
TOPSOIL	0.25
Compact to loose, brown **SILTY SAND to SANDY SILT**	2.21
GLACIAL TILL: Very loose to loose, grey silty sand with gravel, cobbles and boulders, trace clay	5.21
BEDROCK: Excellent quality, grey limestone interbedded with dolostone	6.61
End of Borehole	

SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
SS	5	17	8
AU	1		
SS	2	42	10
SS	3	25	9
SS	4	17	2
RC	1	31	
RC	2	100	100
RC	3	100	100

DEPTH (m)	ELEV. (m)
0	102.65
1	101.65
2	100.65
3	99.65
4	98.65
5	97.65
6	96.65

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

○ **Water Content %**

20 40 60 80

Piezometer Construction

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE January 7, 2022

FILE NO. PG5570

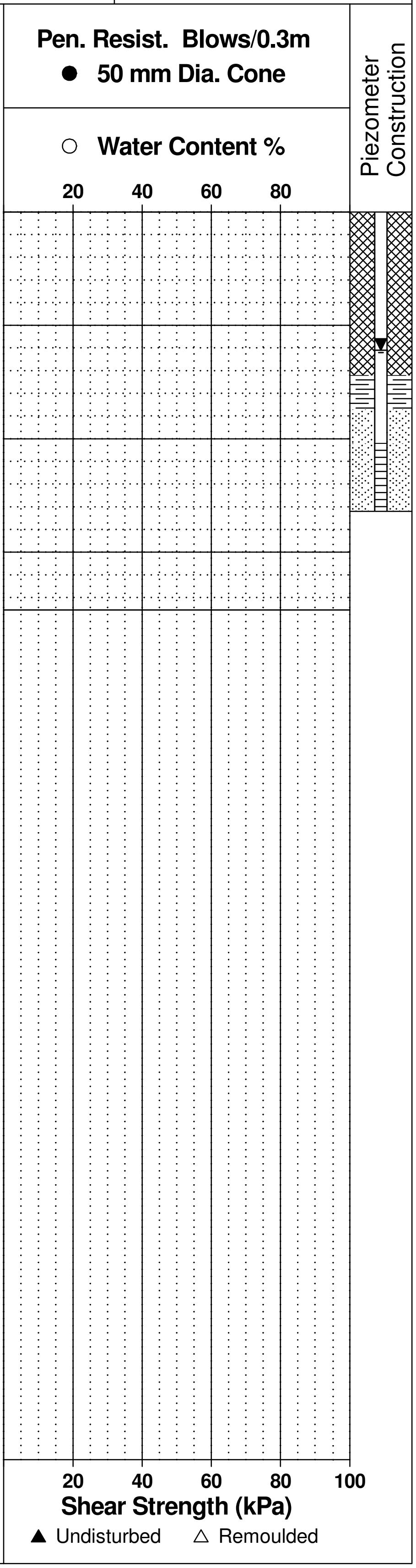
HOLE NO. BH35-21

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	105.03
TOPSOIL 0.28						
	AU	1				
Loose to compact, brown **SILTY SAND to SANDY SILT**	SS	2	50	7	1	104.03
1.68						
	SS	3	50	25	2	103.03
GLACIAL TILL: Compact to very dense, grey silty sand with gravel, cobbles and boulders	SS	4	25	56	3	102.03
	SS	5	67	50+		
3.51						

End of Borehole

Practical refusal to augering at 3.51m depth.

(GWL @ 1.22m - Jan. 11, 2022)



SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE January 7, 2022

FILE NO. **PG5570**

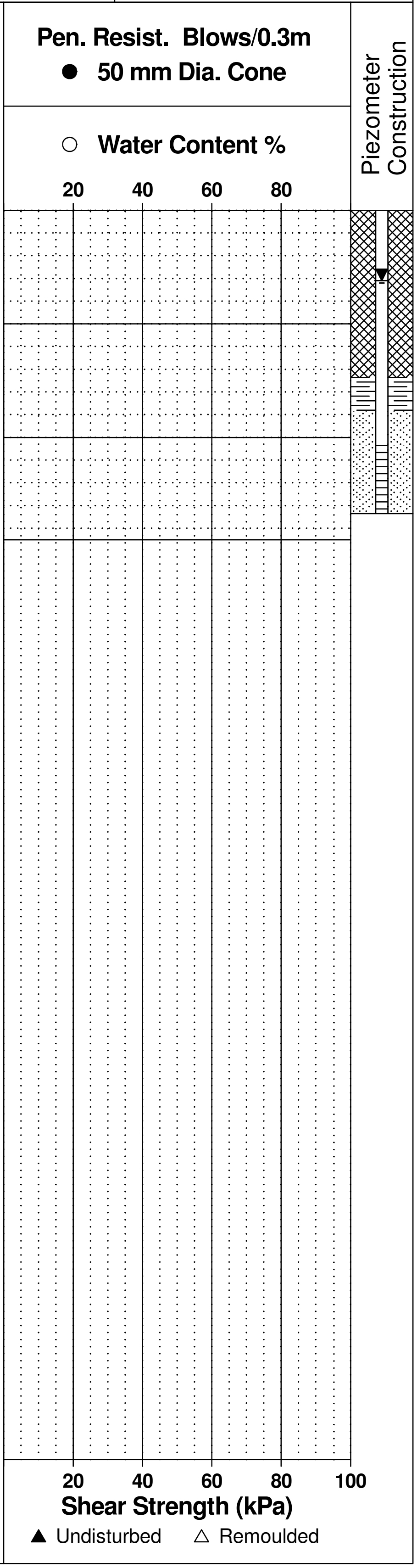
HOLE NO. **BH36-21**

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	102.79
TOPSOIL 0.30						
Compact, brown **SILTY SAND to SANDY SILT**	AU	1				
	SS	2	42	15	1	101.79
1.45						
GLACIAL TILL: Very dense to compact, brown silty sand with gravel, cobbles and boulders	SS	3	60	50+		
					2	100.79
	SS	4	8	15		
2.90						

End of Borehole

Practical refusal to augering at 2.90m depth.

(GWL @ 0.62m - Jan. 11, 2022)



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Track-Mount Power Auger

DATE January 7, 2022

FILE NO. PG5570

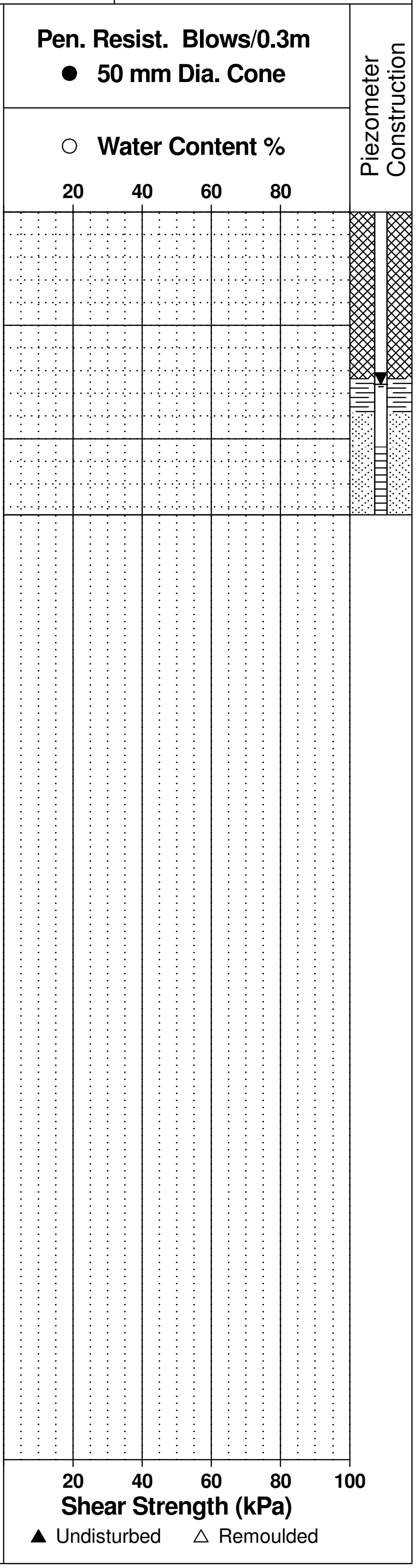
HOLE NO. BH37-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.54
TOPSOIL 0.36		AU	1				
Compact to dense, brown **SILTY SAND to SANDY SILT**		SS	2	42	22	1	102.54
		SS	3	58	34		
2.21						2	101.54
GLACIAL TILL: Very dense, grey silty sand with gravel, cobbles and boulders 2.67		SS	4	50	50+		

End of Borehole

Practical refusal to augering at 2.67m depth.

(GWL @ 1.52m - Jan. 11, 2022)



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

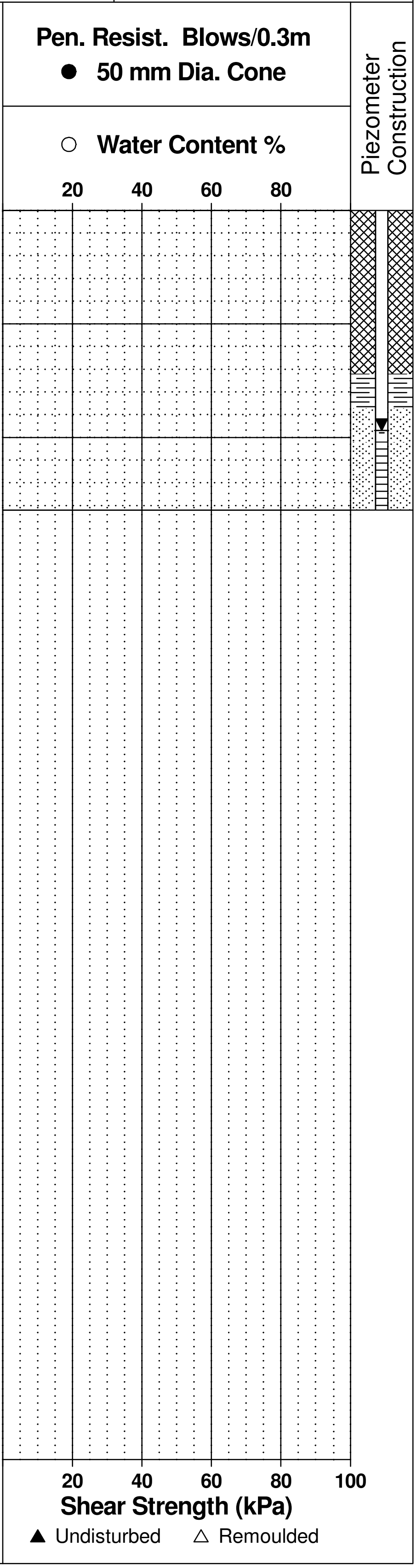
BORINGS BY Track-Mount Power Auger

DATE January 7, 2022

FILE NO. **PG5570**

HOLE NO. **BH38-21**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD		
GROUND SURFACE						0	103.62
FILL: Crushed stone and gravel 0.15							
		AU	1				
Dense to compact, brown **SILTY SAND to SANDY SILT**		SS	2		32	1	102.62
		SS	3		24		
- grey by 2.0m depth						2	101.62
		SS	4	100	50+		
2.64							
End of Borehole Practical refusal to augering at 2.64m depth. (GWL @ 1.94m - Jan. 11, 2022)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5570

REMARKS

HOLE NO. TP 1

BORINGS BY CME-55 Low Clearance Drill

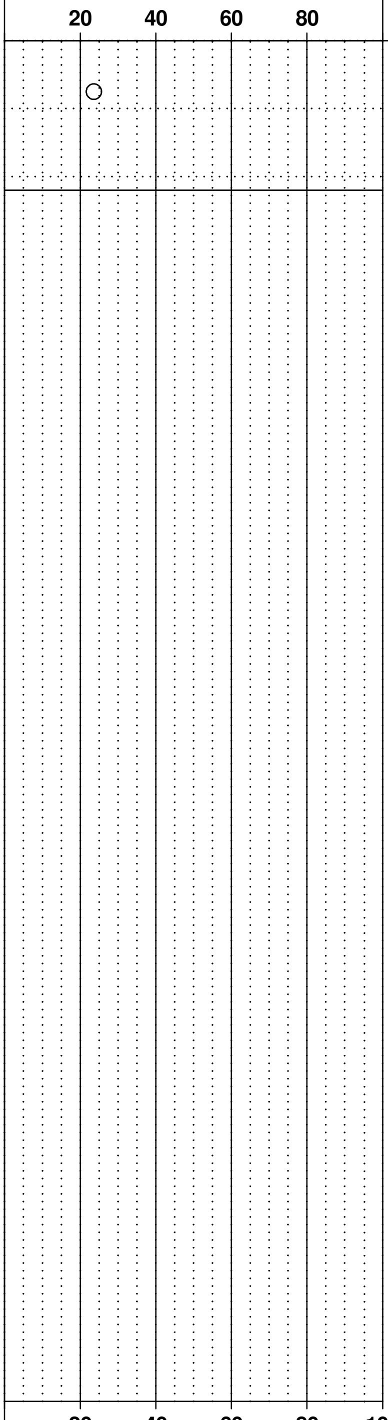
DATE November 20, 2020

SOIL DESCRIPTION	Strata depth (m)	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	105.94
TOPSOIL	0.15	G	1				
GLACIAL TILL: Brown silty sand with gravel and some clay	0.25	G	2				
BEDROCK Weathered interbedded limestone	0.44	G	3				

End of Test Pit

Practical refusal to excavation at 0.44m depth

(TP dry upon completion)



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. **PG5570**

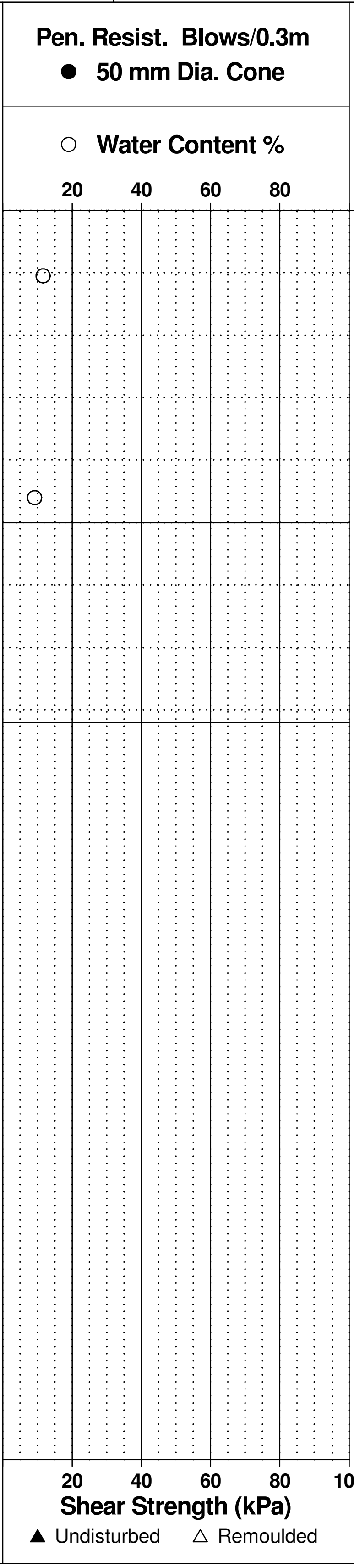
REMARKS

HOLE NO. **TP 2**

BORINGS BY CME-55 Low Clearance Drill

DATE November 20, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	105.06
TOPSOIL 0.21		G	1				
Brown **SILTY SAND,** trace gravel 0.92		G	2				
						1	104.06
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders 1.64		G	3				
End of Test Pit TP terminated on inferred bedrock surface at 1.64m depth (TP dry upon completion)							



Piezometer Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

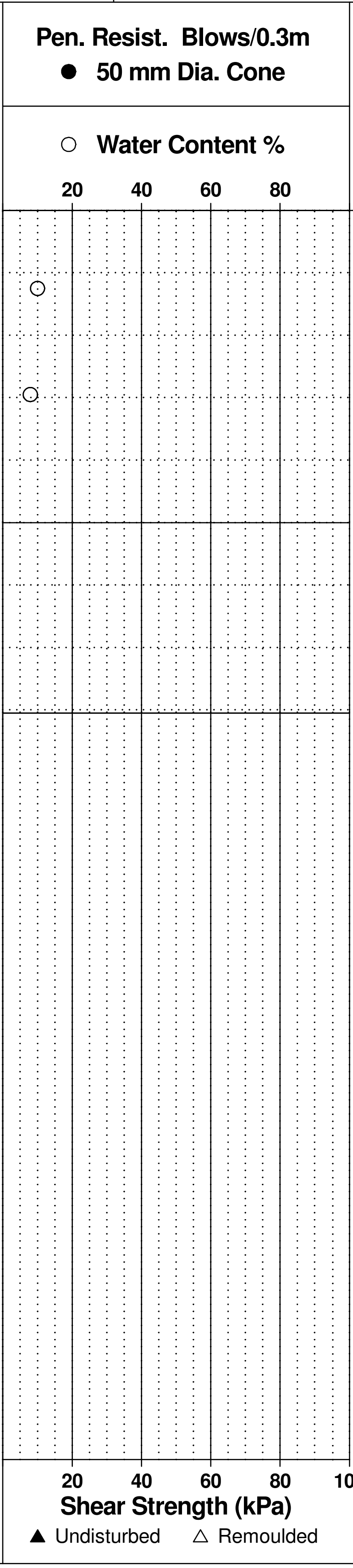
BORINGS BY CME-55 Low Clearance Drill

DATE November 20, 2020

FILE NO. PG5570

HOLE NO. TP 3

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Piezometer Construction
GROUND SURFACE						0	102.10	
TOPSOIL 0.25		G	1					
Brown **SILTY SAND,** trace sea shells 0.59		G	2					
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders 1.61		G	3			1	101.10	
End of Test Pit TP terminated on inferred bedrock surface at 1.61m depth (TP dry upon completion)								



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5570

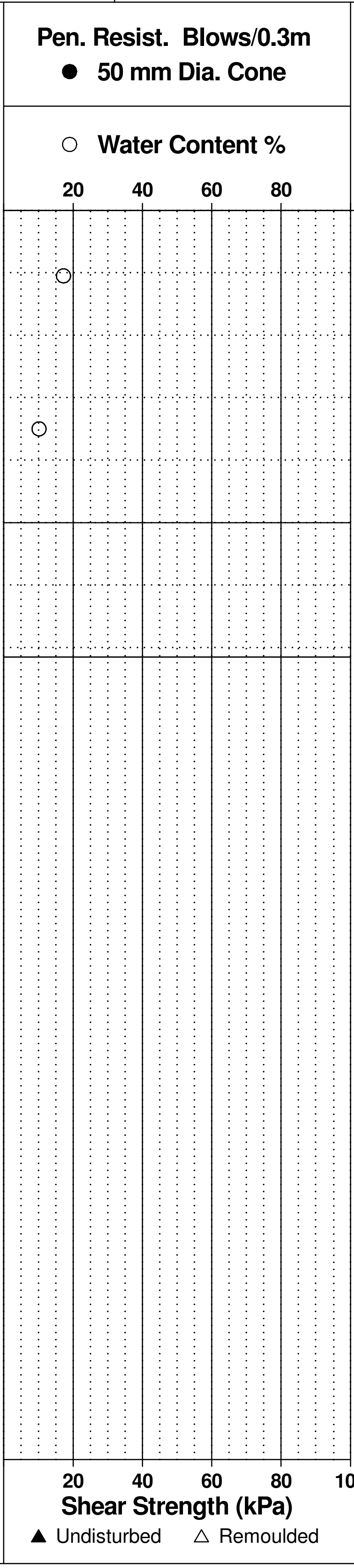
REMARKS

HOLE NO. TP 4

BORINGS BY CME-55 Low Clearance Drill

DATE November 20, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Piezometer Construction
GROUND SURFACE						0	108.49	
TOPSOIL 0.21	■	G	1					
Brown **SILTY SAND,** trace gravel, cobble and organics 0.70		G	2					
GLACIAL TILL: Brown silty sand, some gravel, cobble, boulder, trace clay 1.43		G	3			1	107.49	
End of Test Pit Test Pit terminated on bedrock surface at 1.43m depth (TP dry upon completion)								



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill

DATE November 20, 2020

FILE NO. PG5570

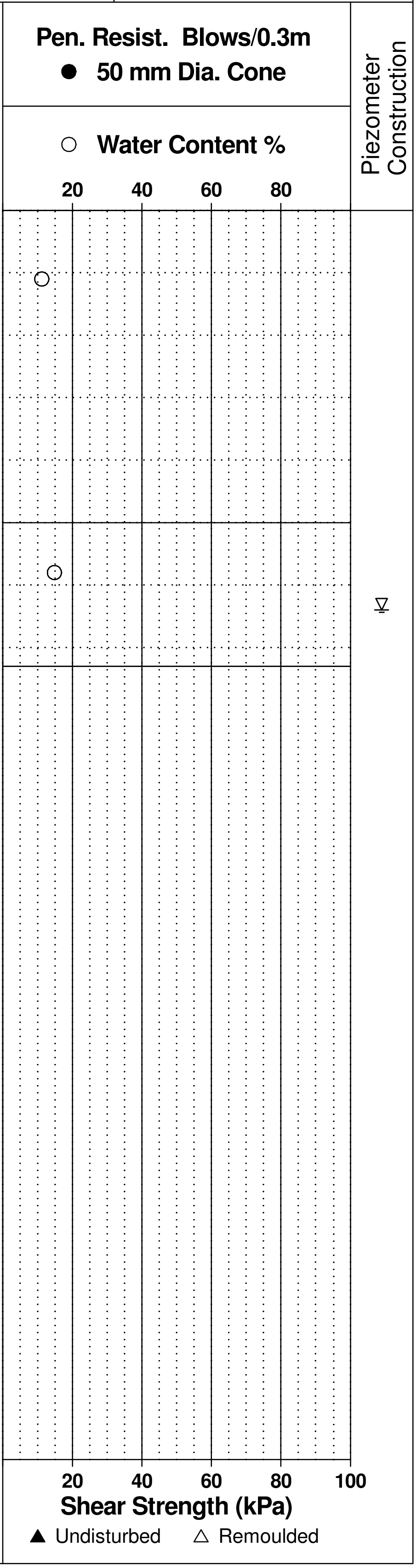
HOLE NO. TP 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	108.36
TOPSOIL 0.22		G	1				
Brown **SILTY SAND** 1.16		G	2			1	107.36
GLACIAL TILL: Brown silty sand, some gravel, cobble, and boulder 1.46		G	3				

End of Test Pit

TP terminated on inferred bedrock surface at 1.46m depth

(Groundwater infiltration at 1.28m - Nov 20, 2020)



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SOIL PROFILE AND TEST DATA

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DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill

DATE November 20, 2020

FILE NO. PG5570

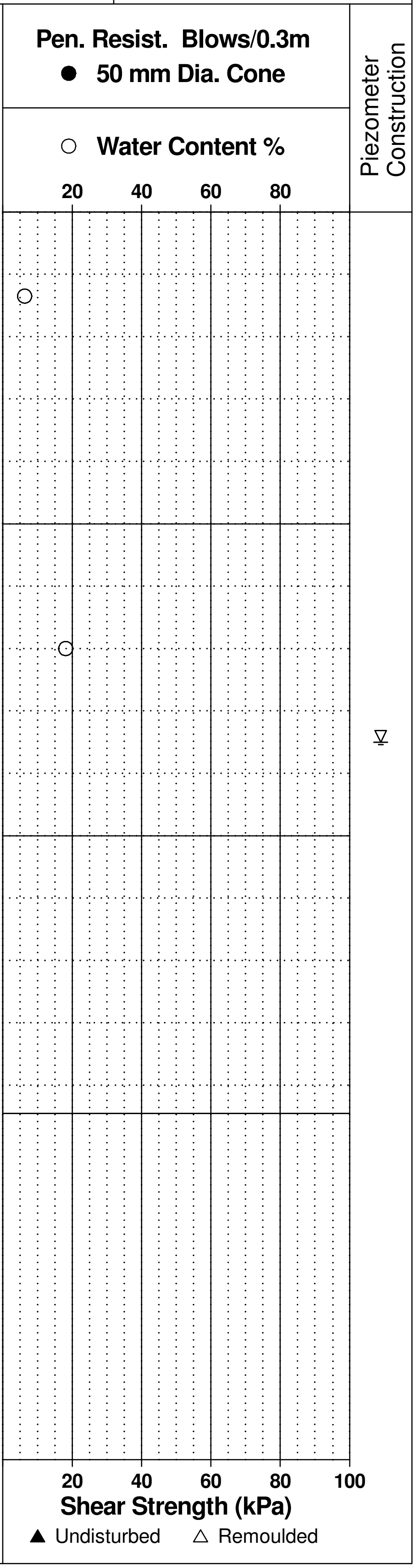
HOLE NO. TP 6

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	107.91
TOPSOIL 0.27	G	1				
Brown **SILTY SAND,** trace cobble, boulders and seashells 1.70	G G	2 3			1	106.91
BEDROCK: Weathered interbedded limestone 2.89	G	4			2	105.91

End of Test Pit

TP terminated on inferred bedrock surface at 2.89m depth

(Groundwater infiltration at 1.70m - Nov 20, 2020)



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SOIL PROFILE AND TEST DATA

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Ottawa, Ontario

DATUM Geodetic

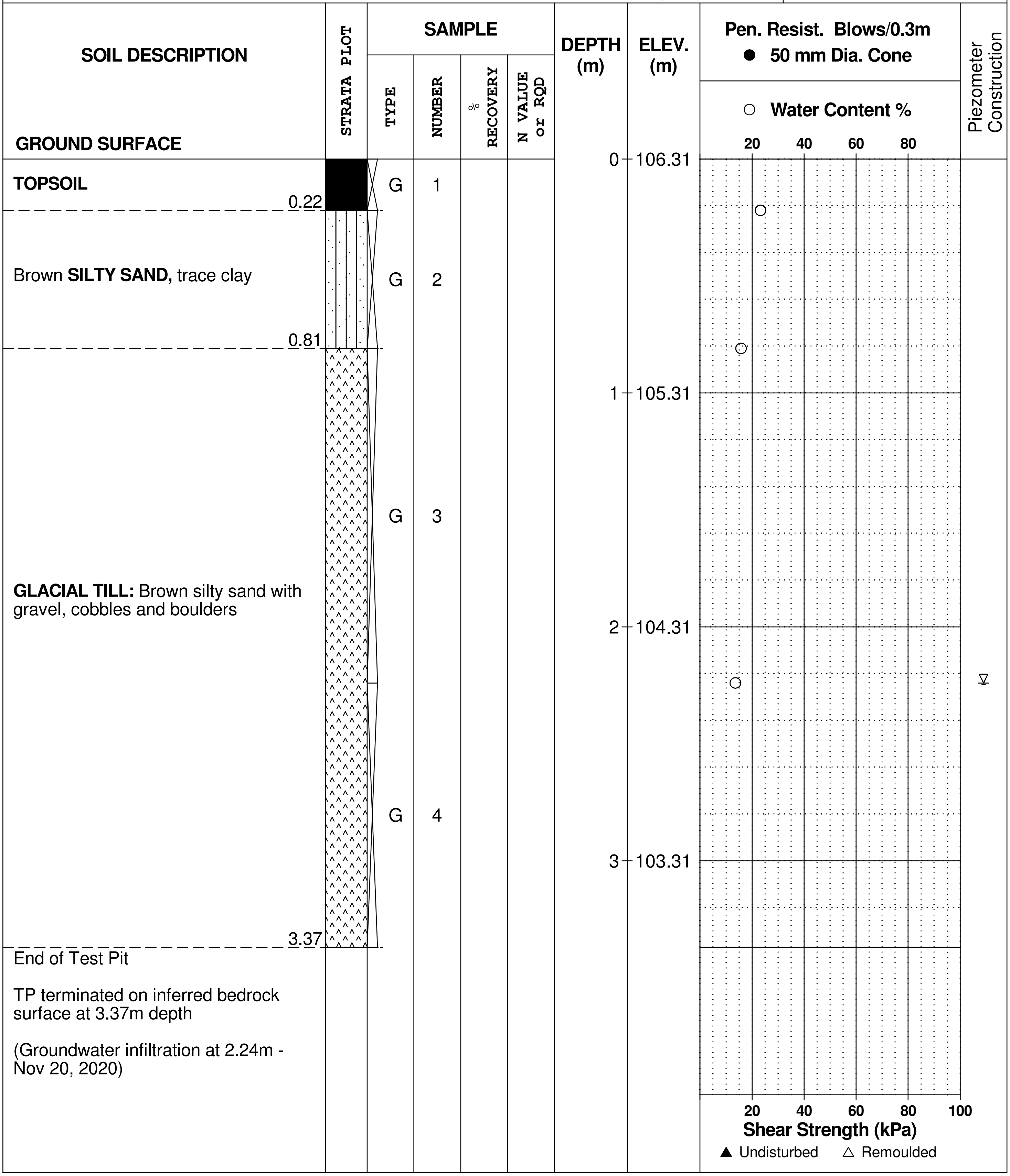
REMARKS

BORINGS BY CME-55 Low Clearance Drill

DATE November 20, 2020

FILE NO. PG5570

HOLE NO. TP 7



SOIL DESCRIPTION		TYPE	NUMBER
GROUND SURFACE			
TOPSOIL	0.22	G	1
Brown **SILTY SAND,** trace clay	0.81	G	2
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders	3.37	G G	3 4

End of Test Pit

TP terminated on inferred bedrock surface at 3.37m depth

(Groundwater infiltration at 2.24m - Nov 20, 2020)

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SOIL PROFILE AND TEST DATA

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FILE NO. PG5570

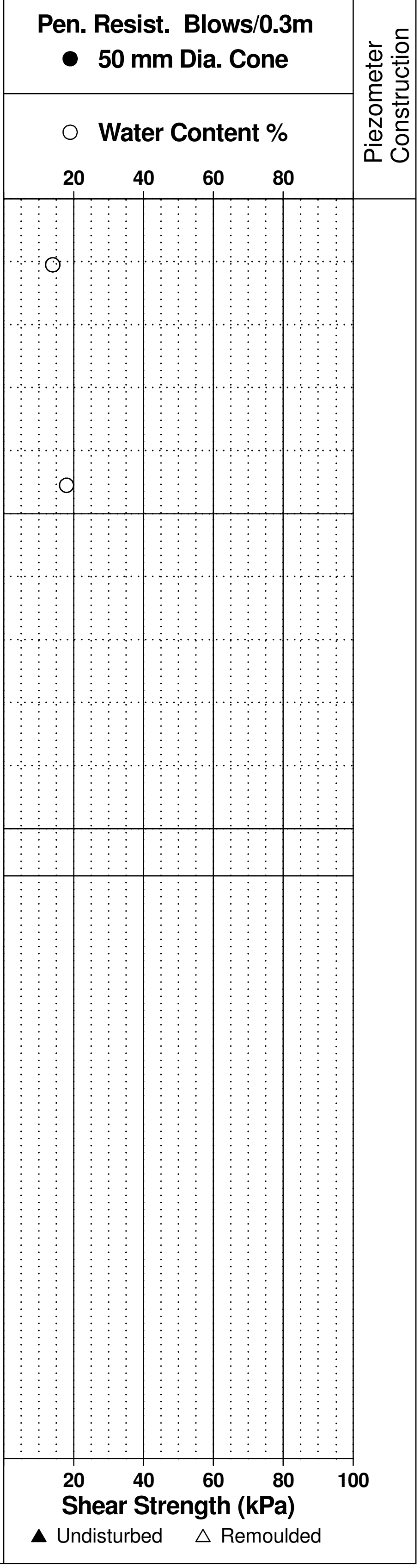
REMARKS

HOLE NO. TP 8

BORINGS BY CME-55 Low Clearance Drill

DATE November 20, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	105.48
TOPSOIL		G	1				
0.21							
		G	2				
						1	104.48
Brown **SILTY SAND,** trace clay and organics - increasing in silt content with depth							
		G	3				
						2	103.48
2.15							
End of Test Pit TP terminated on inferred bedrock surface at 2.15m depth (TP dry upon completion)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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Ottawa, Ontario

DATUM Geodetic

REMARKS

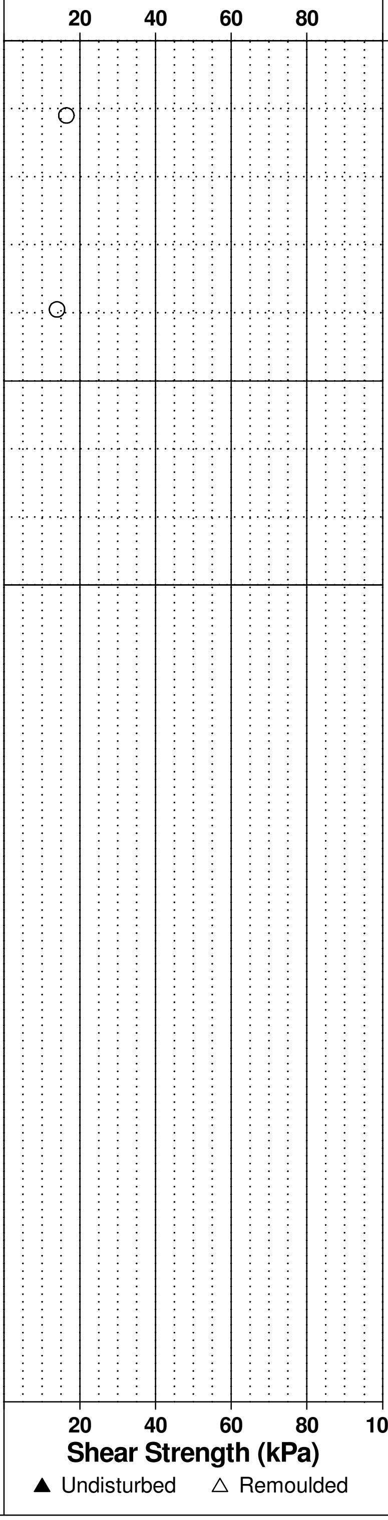
BORINGS BY CME-55 Low Clearance Drill

DATE November 20, 2020

FILE NO. PG5570

HOLE NO. TP 9

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	104.47
TOPSOIL 0.22		G	1				
Brown **SILTY SAND,** trace organics 0.79		G	2				
GLACIAL TILL: Brown silty sand trace gravel, cobbles, and boulders 1.60		G	3			1	103.47
End of Test Pit TP terminated on inferred bedrock surface at 1.60m depth (TP dry upon completion)							



Piezometer Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5570

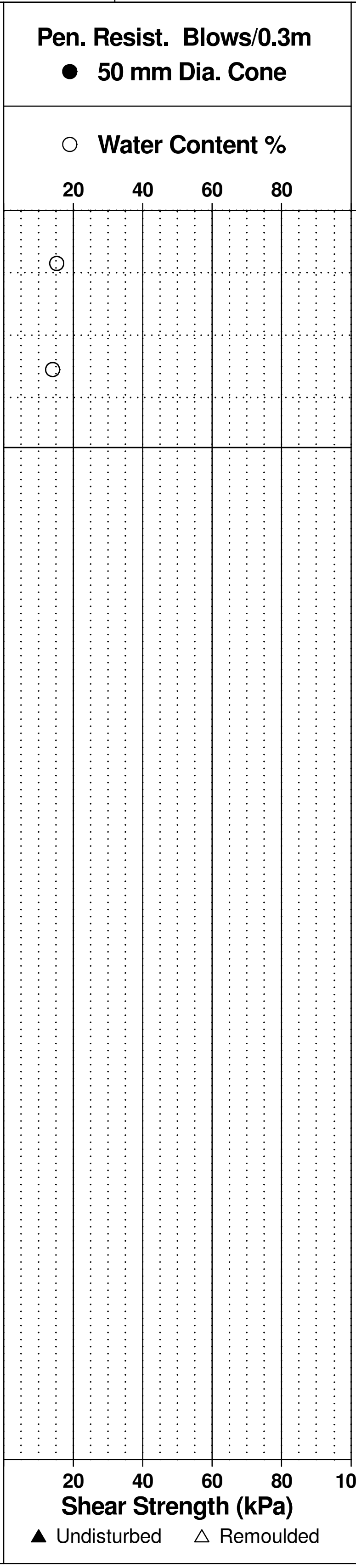
REMARKS

HOLE NO. TP 10

BORINGS BY CME-55 Low Clearance Drill

DATE December 10, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Piezometer Construction
GROUND SURFACE						0	103.62	
TOPSOIL 0.17		G	1					
Brown **SILTY SAND,** trace gravel and cobbles 0.51		G	2					⊻
GLACIAL TILL: Brown silty sand, with gravel, trace cobble and boulders 0.76		G	3					
End of Test Pit TP terminated on inferred bedrock surface at 0.76m depth (Groundwater infiltration at 0.51m - Dec 10, 2020)								



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SOIL PROFILE AND TEST DATA

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DATUM Geodetic

REMARKS

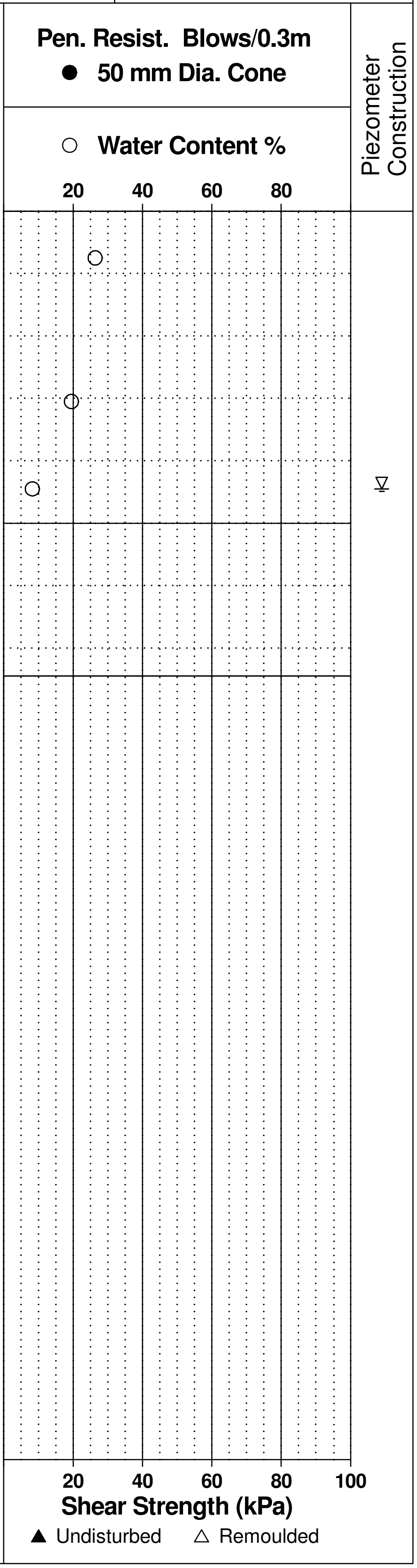
BORINGS BY CME-55 Low Clearance Drill

DATE December 10, 2020

FILE NO. PG5570

HOLE NO. TP 11

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.01
TOPSOIL 0.15		G	1				
Brown **SILTY SAND,** trace gravel 0.89		G	2				
		G	3				
GLACIAL TILL: Brown silty sand, with gravel, cobbles, and boulders 1.49		G	1			1	102.01
End of Test Pit TP terminated on inferred bedrock surface at 1.49m depth (Groundwater infiltration at 0.89m - Dec 10, 2020)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

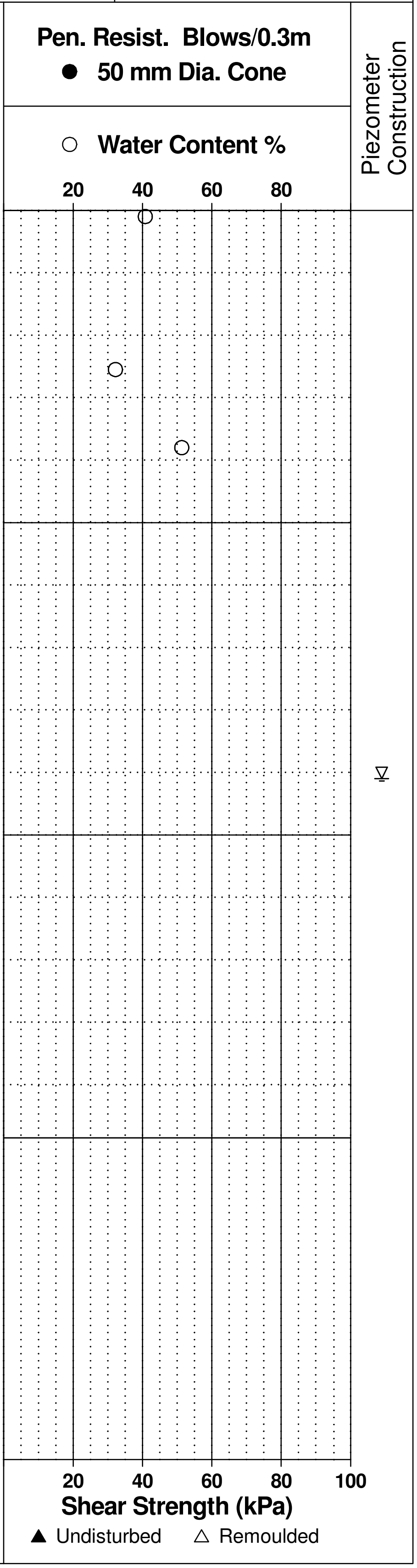
BORINGS BY CME-55 Low Clearance Drill

DATE December 10, 2020

FILE NO. PG5570

HOLE NO. TP 12

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	103.21
TOPSOIL 0.02	G	1				
Brown **SILTY SAND,** trace gravel 0.51	G	2				
Organic silt with **PEAT** fibers 0.76	G	3				
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders 2.97	G	4			1	102.21
					2	101.21
End of Test Pit TP terminated on inferred bedrock surface at 2.97m depth (Groundwater infiltration at 1.82m - Dec 10, 2020)						



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

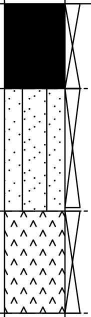
BORINGS BY CME-55 Low Clearance Drill

DATE December 10, 2020

FILE NO. PG5570

HOLE NO. TP 13

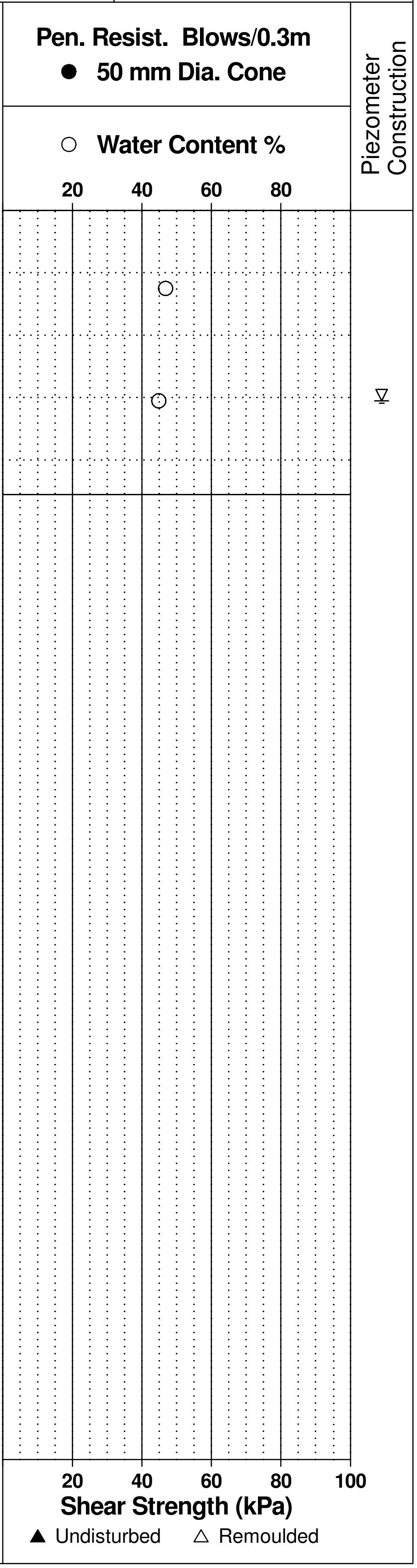
SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	104.30
TOPSOIL (to 0.25)	G	1				
Brown **SILTY SAND,** trace organics (to 0.61)	G	2				
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders (to 0.91)	G	3				



End of Test Pit

TP terminated on inferred bedrock surface at 0.91m depth

(Groundwater infiltration at 0.61m - Dec 10, 2020)



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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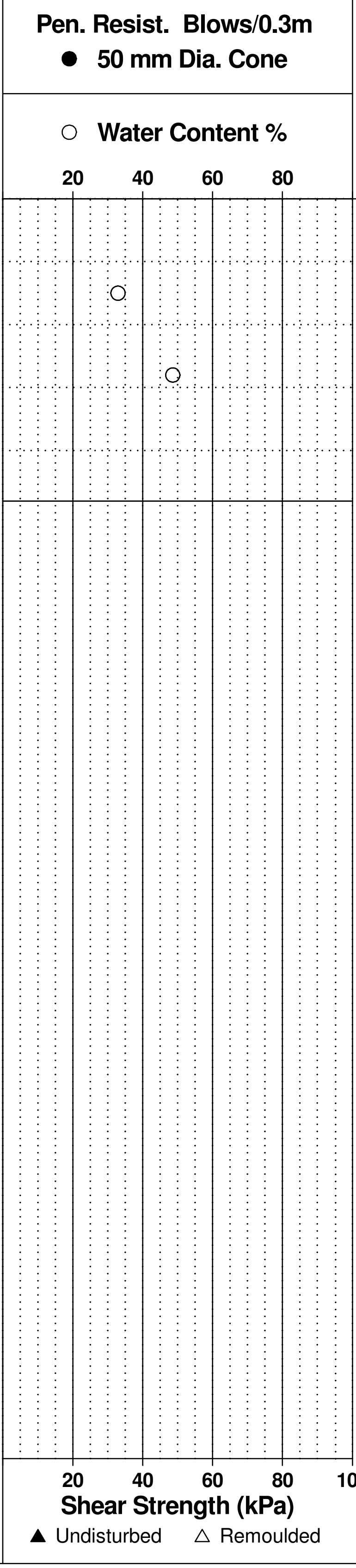
Ottawa, Ontario

DATUM Geodetic
REMARKS
BORINGS BY CME-55 Low Clearance Drill
DATE December 10, 2020
FILE NO. PG5570
HOLE NO. TP 14

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	105.60
TOPSOIL 0.30			1				
Brown **SILTY SAND** 0.56			2				
GLACIAL TILL: Brown silty sand with gravel, cobbles, and boulders. 0.97			3				
End of Test Pit Practical refusal to excavation at 0.94m depth (TP dry upon completion)							



Piezometer Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6070 and 6115 Flewellyn Road
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DATUM Geodetic

FILE NO. **PG5570**

REMARKS

HOLE NO. **TP 15**

BORINGS BY CME-55 Low Clearance Drill

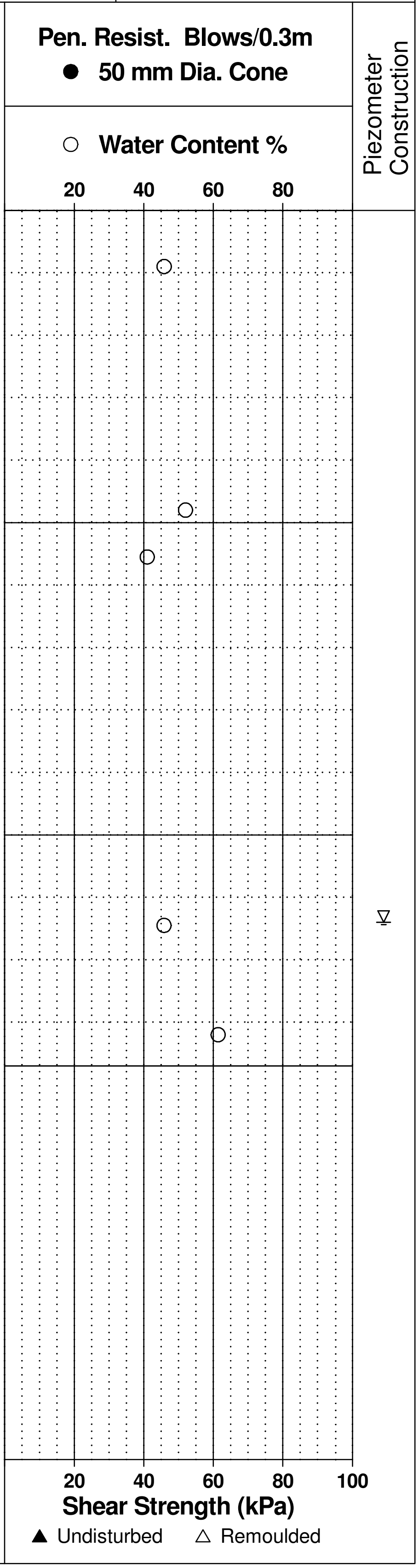
DATE December 10, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	106.80
TOPSOIL 0.18		G	1				
Brown **SILTY SAND**		G	2				
		G	3			1	105.80
		G	4				
						2	104.80
2.64		G	5				
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders 2.74		G	6				

End of Test Pit

TP terminated on inferred bedrock surface at 2.74m depth

(Groundwater infiltration at 2.28m - Dec 10, 2020)



SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5570

REMARKS

HOLE NO. TP 16

BORINGS BY CME-55 Low Clearance Drill

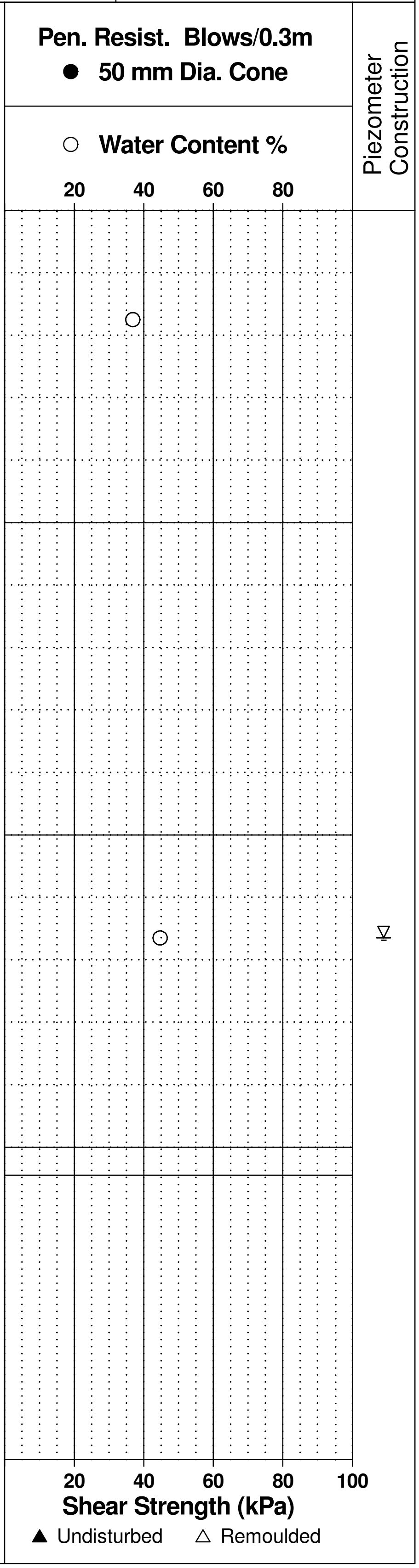
DATE December 10, 2020

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	104.62
TOPSOIL	G	1				
0.35						
Brown **SILTY SAND,** trace gravel	G	2			1	103.62
					2	102.62
2.34						
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders.	G	3			3	101.62
3.09						

End of Test Pit

TP terminated on inferred bedrock surface at 3.09m depth

(Groundwater infiltration at 2.33m - Dec 10, 2020)



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SOIL PROFILE AND TEST DATA

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REMARKS

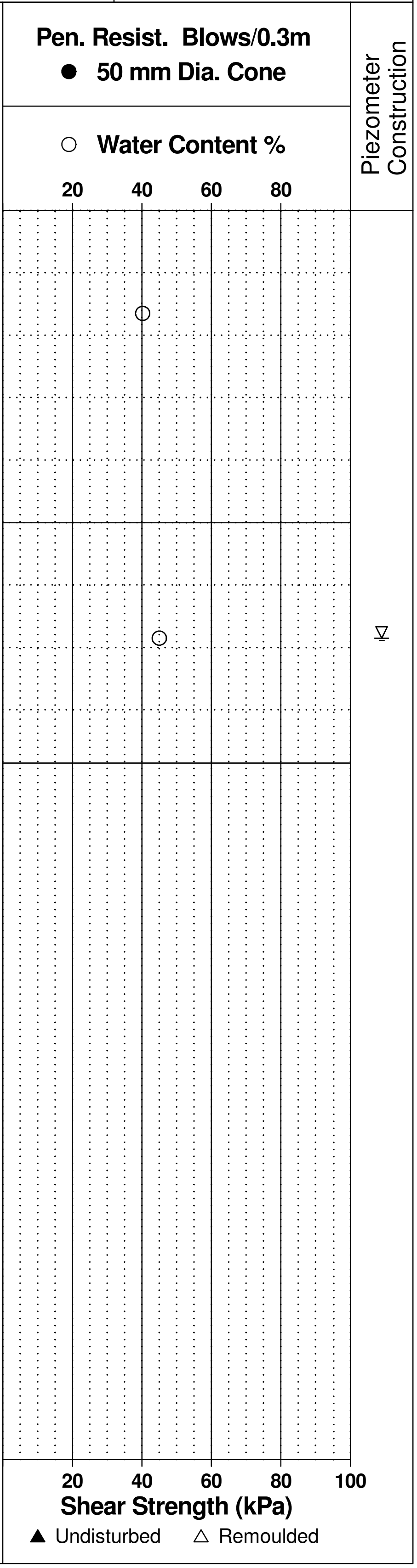
BORINGS BY CME-55 Low Clearance Drill

DATE December 10, 2020

FILE NO. PG5570

HOLE NO. TP 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.90
TOPSOIL		G	1				
0.33							
Brown **SILTY SAND,** trace gravel		G	2			1	102.90
1.37							
GLACIAL TILL: Brown silty sand, with gravel cobbles and boulders		G	3				
1.78							
End of Test Pit TP terminated on inferred bedrock surface at 1.78m depth (Groundwater infiltration at 1.37m - Dec 10, 2020)							



patersongroup Consulting Engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
6070 and 6115 Flewellyn Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

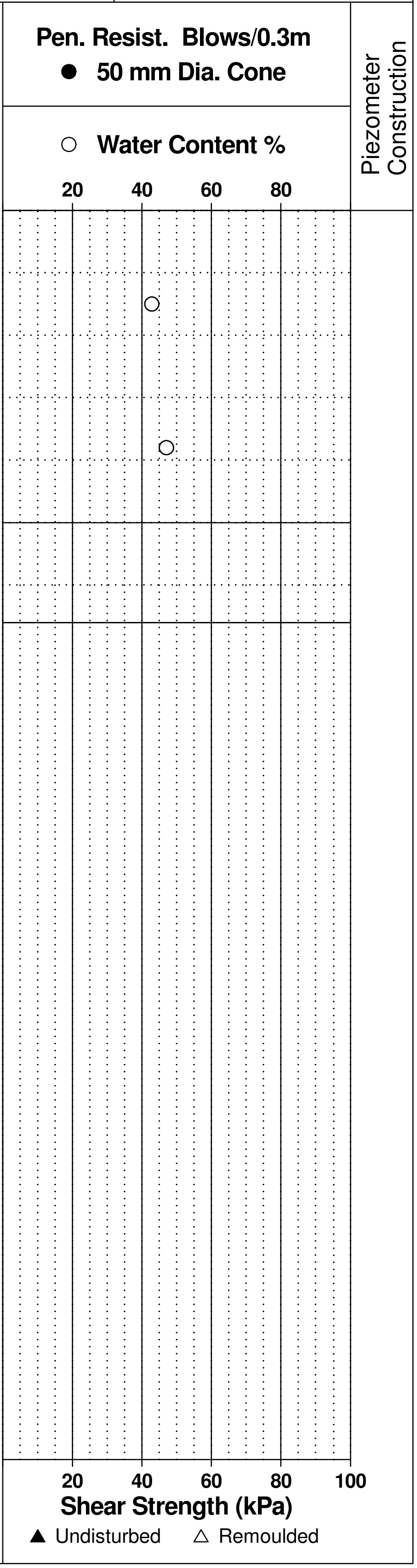
BORINGS BY CME-55 Low Clearance Drill

DATE December 10, 2020

FILE NO. PG5570

HOLE NO. TP 18

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	103.42
TOPSOIL	G	1				
0.30						
Brown **SILTY SAND,** some gravel	G	2				
	G	3			1	102.42
1.32						
End of Test Pit TP terminated on inferred bedrock surface at 1.32m depth (TP dry upon completion)						



SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC% - Natural water content or water content of sample, %
LL - Liquid Limit, % (water content above which soil behaves as a liquid)
PL - Plastic Limit, % (water content above which soil behaves plastically)
PI - Plasticity Index, % (difference between LL and PL)

Dxx - Grain size at which xx% of the soil, by weight, is of finer grain sizes
These grain size descriptions are not used below 0.075 mm grain size
D10 - Grain size at which 10% of the soil is finer (effective grain size)
D60 - Grain size at which 60% of the soil is finer

Cc - Concavity coefficient = $(D30)^2 / (D10 \times D60)$
Cu - Uniformity coefficient = D60 / D10

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

CONSOLIDATION TEST

p'_o - Present effective overburden pressure at sample depth
p'_c - Preconsolidation pressure of (maximum past pressure on) sample
Ccr - Recompression index (in effect at pressures below p'_c)
Cc - Compression index (in effect at pressures above p'_c)

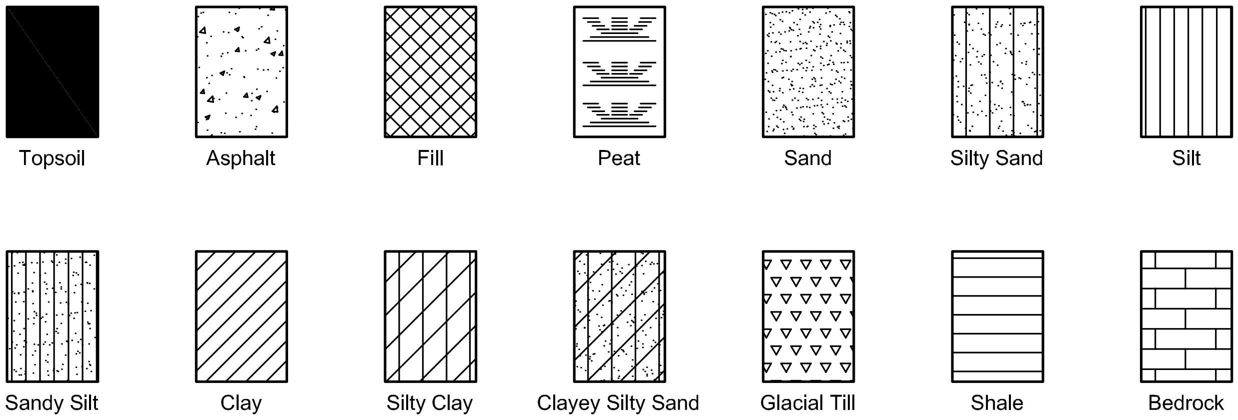
OC Ratio Overconsolidaton ratio = p'_c / p'_o
Void Ratio Initial sample void ratio = volume of voids / volume of solids
Wo - Initial water content (at start of consolidation test)

PERMEABILITY TEST

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

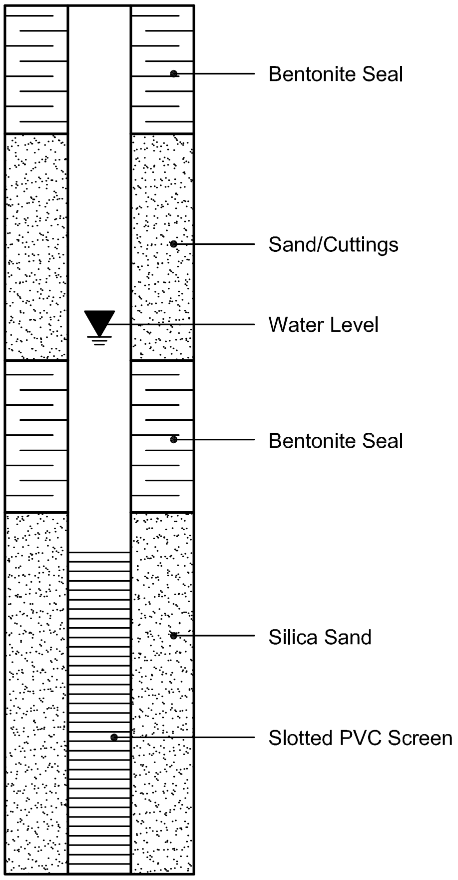
SYMBOLS AND TERMS (continued)

STRATA PLOT

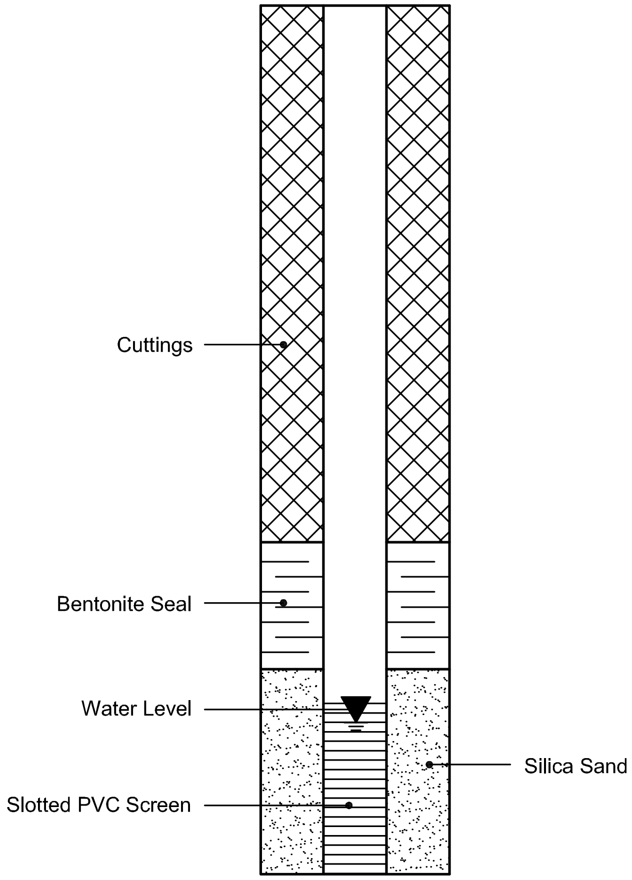


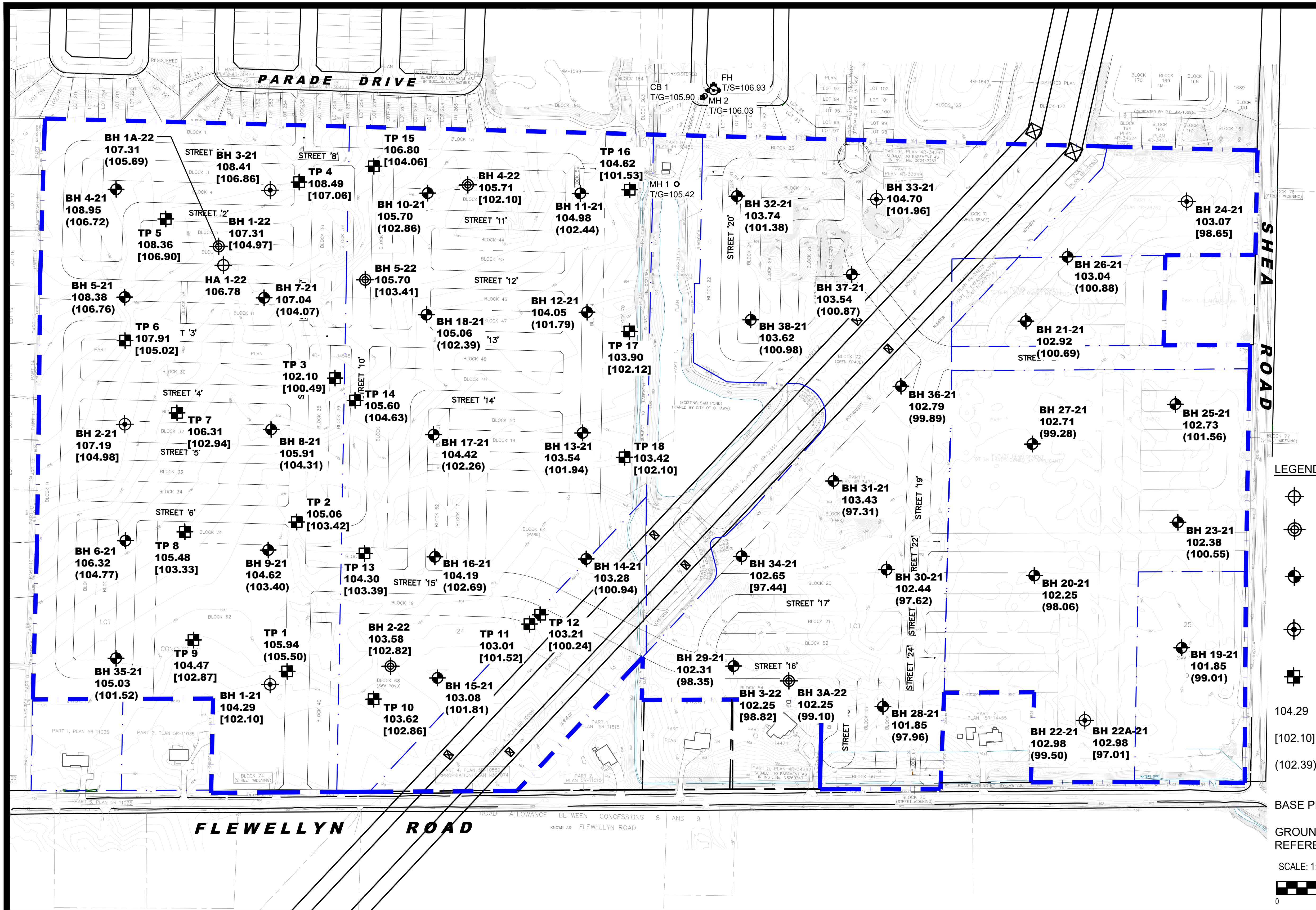
MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION





LEGEND:

⌖	HAND AUGER LOCATION (CURRENT INVESTIGATION)
◎	BOREHOLE WITH MONITORING WELL LOCATION (CURRENT INVESTIGATION)
◕	BOREHOLE WITH PIEZOMETER LOCATION (PATERSON GROUP REPORT; PG5570-2, JAN 20, 2022)
⊙	BOREHOLE WITH MONITORING WELL LOCATION (PATERSON GROUP REPORT; PG5570-2, JAN 20, 2022)
▚	TEST PIT LOCATION\ (PATERSON GROUP REPORT; PG5570-1, JAN 3, 2021)
104.29	GROUND SURFACE ELEVATION (m)
[102.10]	BEDROCK SURFACE ELEVATION (m)
(102.39)	PRACTICAL REFUSAL TO AUGERING / EXCAVATION ELEVATION (m)

BASE PLAN PREPARED BY J.D. BARNES LIMITED.

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

SCALE: 1:4000

0 50 100 150 200 250m

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PATERSON GROUP

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

NO.	REVISIONS	DATE	INITIAL
6	UPDATED TO NEW CONCEPTUAL PLAN	03/07/2024	KP
5	UPDATED TO NEW CONCEPTUAL PLAN	28/08/2023	KP
4	UPDATED CLIENT'S NAME AND SITE ADDRESS	12/06/2023	KP
3	UPDATED SITE BOUNDARY	13/02/2023	KP
2	BH 1-22 - BH 5-22 & HA1-22 ADDED TO PLAN	10/03/2022	KP

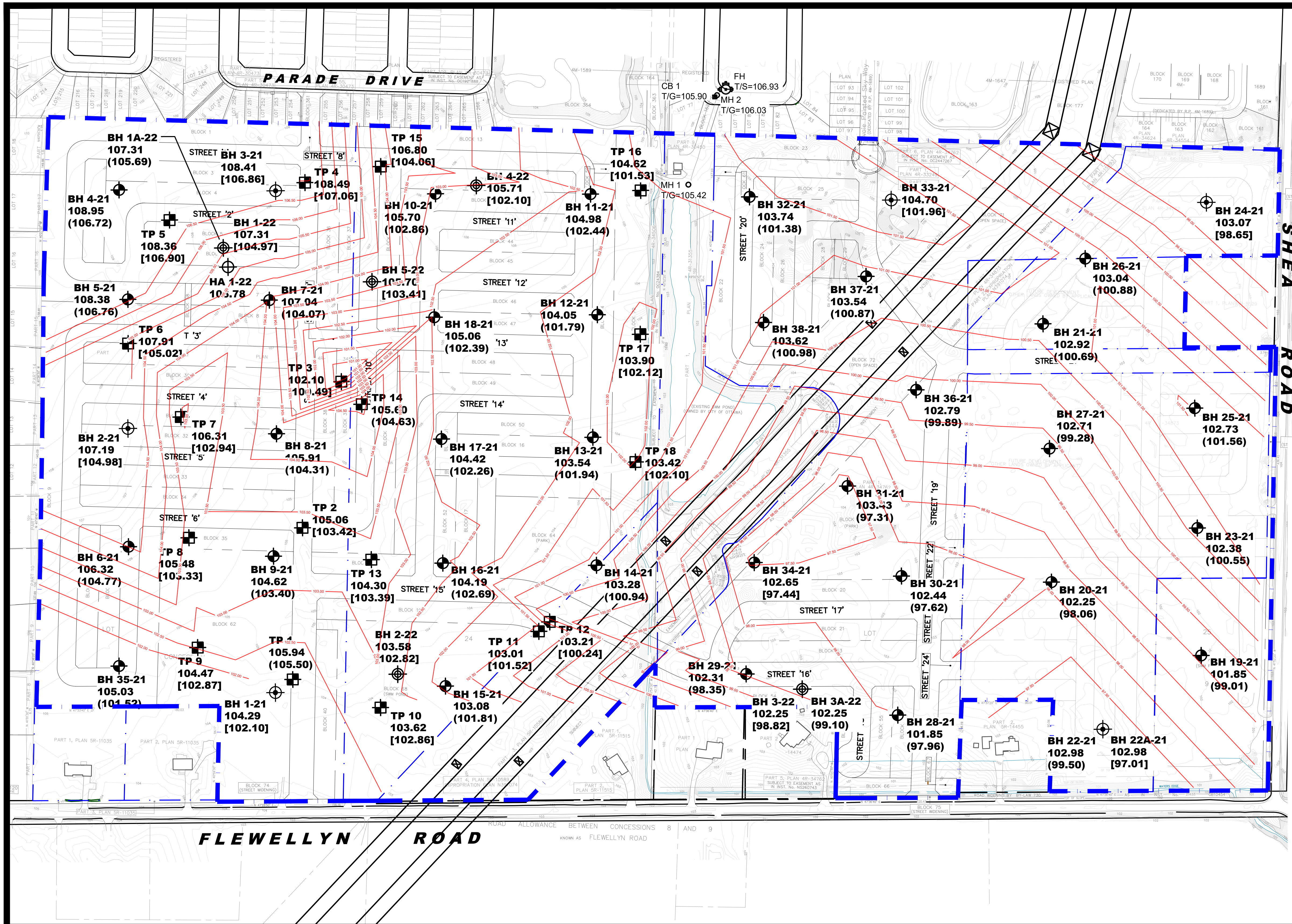
CAIVAN (STITTSVILLE SOUTH) INC. & CAIVAN (STITTSVILLE WEST) LTD.
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
OTTAWA, 5993 & 6115 FLEWELLYN ROAD & 6030 & 6070 FERNBANK ROAD ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:4000
Date: 01/2022
Drawn by: YA
Report No.: PG5570-2, REVISION 4
Checked by: KP
Dwg. No.: PG5570-1
Approved by: DJG
Revision No.: 6

11x17



LEGEND:

⌖	HAND AUGER LOCATION (CURRENT INVESTIGATION)
⊕	BOREHOLE WITH MONITORING WELL LOCATION (CURRENT INVESTIGATION)
⊕	BOREHOLE WITH PIEZOMETER LOCATION (PATERSON GROUP REPORT; PG5570-2, JAN 20, 2022)
⊕	BOREHOLE WITH MONITORING WELL LOCATION (PATERSON GROUP REPORT; PG5570-2, JAN 20, 2022)
⊞	TEST PIT LOCATION\ (PATERSON GROUP REPORT; PG5570-1, JAN 3, 2021)
97.50 ——	BEDROCK CONTOUR (m)
104.29	GROUND SURFACE ELEVATION (m)
[102.10]	BEDROCK SURFACE ELEVATION (m)
(102.39)	PRACTICAL REFUSAL TO AUGERING / EXCAVATION ELEVATION (m)

BASE PLAN PREPARED BY J.D. BARNES LIMITED.

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

SCALE: 1:4000

0 50 100 150 200 250m

p:\autocad drawings\geotechnical\pg55xx\pg5570\pg5570-1 thlp (rev.06) r.dwg

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9 AURIGA DRIVE
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NO.	REVISIONS	DATE	INITIAL
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4	UPDATED CLIENT'S NAME AND SITE ADDRESS	12/06/2023	KP
3	UPDATED SITE BOUNDARY	13/02/2023	KP
2	BH 1-22 - BH 5-22 & HA1-22 ADDED TO PLAN	10/03/2022	KP

CAIVAN (STITTSVILLE SOUTH) INC. & CAIVAN (STITTSVILLE WEST) LTD.
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
OTTAWA, 5993 & 6115 FLEWELLYN ROAD & 6030 & 6070 FERNBANK ROAD ONTARIO

Title:

BEDROCK CONTOUR PLAN

Scale: 1:4000
Date: 01/2022
Drawn by: YA
Report No.: PG5570-2, REVISION 4
Checked by: KP
Dwg. No.: PG5570-2
Approved by: DJG
Revision No.: 6

11x17

APPENDIX 2

TABLE 4 - MONTHLY WATER BALANCE FOR SOIL WITH 75 mm WATER HOLDING CAPACITY AT THE OTTAWA INTERNATIONAL AIRPORT

TABLE 5 - MONTHLY WATER BALANCE FOR SOIL WITH 150 mm WATER HOLDING CAPACITY AT THE OTTAWA INTERNATIONAL AIRPORT

TABLE 6 - MONTHLY WATER BALANCE FOR SOIL WITH 300 mm WATER HOLDING CAPACITY AT THE OTTAWA INTERNATIONAL AIRPORT

TABLE 7 - PRE-DEVELOPMENT ANNUAL WATER BUDGET FOR FOR 5993 & 6115 FLEWELLYN ROAD & 6030 & 6070 FERNBANK ROAD

Table 4- Monthly Water Balance for Soil With 75 mm Water Holding Capacity the Ottawa International Airport				
Month	**Temperature (°C)**	**Total Precipitation (mm)**	**Actual Evapotranspiration (mm)**	**Water Surplus (mm)**
January	-10.6	62	0	25
February	-9.0	56	1	27
March	-2.8	65	5	102
April	5.7	73	31	111
May	13.1	76	80	14
June	18.3	85	107	5
July	20.9	89	104	3
August	19.6	84	84	1
September	14.8	82	65	4
October	8.3	76	36	14
November	1.3	77	10	38
December	-7.0	80	1	36
Annual	**6**	**904**	**524**	**380**

Table 5 - Monthly Water Balance for Soil With 150 mm Water Holding Capacity at the Ottawa International Airport				
Month	**Temperature (°C)**	**Total Precipitation (mm)**	**Actual Evapotranspiration (mm)**	**Water Surplus (mm)**
January	-10.6	62	0	21
February	-9.0	56	1	24
March	-2.8	65	5	98
April	5.7	73	31	110
May	13.1	76	81	14
June	18.3	85	116	5
July	20.9	89	126	3
August	19.6	84	98	1
September	14.8	82	67	2
October	8.3	76	36	7
November	1.3	77	10	21
December	-7.0	80	1	24
Annual	**6**	**904**	**572**	**330**

Table 6 - Monthly Water Balance for Soil With 300 mm Water Holding Capacity at the Ottawa International Airport				
Month	**Temperature (°C)**	**Total Precipitation (mm)**	**Actual Evapotranspiration (mm)**	**Water Surplus (mm)**
January	-10.6	62	0	17
February	-9.0	56	1	21
March	-2.8	65	5	90
April	5.7	73	31	106
May	13.1	76	81	14
June	18.3	85	116	5
July	20.9	89	135	3
August	19.6	84	114	1
September	14.8	82	73	2
October	8.3	76	37	6
November	1.3	77	10	16
December	-7.0	80	1	17
Annual	**6**	**904**	**604**	**298**

Table 7 - Pre-Development Annual Water Budget Calculations - 5993 & 6115 Flewellyn Road & 6030 & 6070 Fernbank Road

Geologic Unit	Area (m^2)	Water Surplus (mm)	Topography Factor	Soil Factor	Vegetation Factor	Infiltration Factor	Runoff Factor	Total Infiltration (mm/year)	Total Infiltration (L/year)	Total Runoff (mm/year)	Total Runoff (L/year)
Fine Sandy Loam (Urban Lawn/Shallow Rooted Crops)	152,160	380	0.15	0.3	0.1	0.55	0.45	209	31,801,527.78	171	26,019,431.82
Fine Sandy Loam (Pasture and Shrubs)	375,238	330	0.15	0.3	0.1	0.55	0.45	181.5	68,105,691.56	148.5	55,722,838.55
Fine Sandy Loam (Mature Forest)	255,976	298	0.15	0.3	0.2	0.65	0.35	193.7	49,582,630.62	104.3	26,698,339.56
Impervious Surfaces (SWMP)	9,733	669*	0	0	0	0	1	0	0	669	6,511,243.20
Totals	**793,108**								**149,489,849.95**		**114,951,853.13**

*Based on JFSA modeling for impervious surfaces. 26% of precipitation will evaporate and the remaining 74% will result in runoff.

APPENDIX 3

CITY OF OTTAWA - SALT MANAGEMENT PLAN - APPENDIX A - OCTOBER 31, 2011

City of Ottawa

Public Works and Services Department
Surface Operations Branch

Salt Management Plan

Appendix A

MATERIAL APPLICATION POLICY

CONTENT

The Surface Operations Branch District Managers, Area Managers and Zone Supervisors have been consulted through the development of this document.

REVISION INFO

Rev	Date	By	Description
3.1	Jan 10 2007		
3.2	Oct 31 2011	D Vander Wal	• Removed 50/50 mix per Dan O'Keefe. • Removed specific references to Sodium and Calcium Chloride as new product for 2011 is a Multi-Chloride Brine. Changed liquid application rate from 46 (6%) to 39L/tonne (5%). • Removed Dry and Wet salt rates for pavement temperatures below -18C. • Updated Epoke rates to match Appendix B and added wet rates to obtain 20% reduction when pre-wetting. • Removed separate rate table for Hwy 174 Epoke spreaders since the resulting lane-km rates are the same as other bare pavement.

COUNCIL APPROVED MAINTENANCE QUALITY STANDARDS

For snow clearing, resources are to be deployed and snow clearing completed as defined in the Table below. If the depth of snow accumulation is less than the minimum for deployment, then resources may be deployed subject to road conditions resulting from previous snow accumulations or from forecasted weather conditions.

For treating icy roads, resources are to be deployed as soon as practicable after becoming aware of the icy conditions. Icy roads are to be treated within the times defined in the Table below after becoming aware of the icy conditions.

MAINTENANCE QUALITY STANDARD
SNOW AND ICE CONTROL ON ROADS

Road Maintenance Class		**Road Type**	**Minimum Depth of Snow Accumulation for Deployment of Resources** *(Depth as per MMSMH)*	**Time to Clear Snow Accumulation From the End of Snow Accumulation or Time to Treat Icy Conditions** *(Time as per MMSMH)*	**Treatment Standard**		
					Bare Pavement	**Centre Bare**	**Snow Packed**
1	A	High Priority Roads	As accumulation begins *(2.5-8 cm depending on class)*	2 h *(3-4 h)*	√		
	B				√		
2	A	Most Arterials		3 h *(3-6 h)*	√		
	B				√		
3	A	Most Major Collectors		4 h *(8-12 h)*	√		
	B				√		
4	A	Most Minor Collectors	5 cm *(8 cm)*	6 h *(12-16 h)*	√		
	B					√	
	C						√
5	A, C	Residential Roads and Lanes	7 cm *(10 cm)*	10 h *(16-24 h)*			√
	B		10 cm *(not defined)*	16 h *(not defined)*			√

Note - MMSMH refers to Ontario Regulation 239/02, Minimum Maintenance Standards for Municipal Highways shown for comparison purposes.

- **Bare Pavement:** requires that snow and ice be controlled, cleared and/or prevented for the full traveled road pavement width, including flush medians of 2 m width or less, paved shoulders and/or adjacent cycling lanes. It does not include parking lanes.
- **Centre-Bare:** requires that snow and ice be controlled, cleared and/or prevented in a strip down the middle of the road pavement width for a minimum width of 2.5 m on each side of centre-line.
- **Snow-Packed:** requires that snow and ice be cleared and that ruts and/or potholes that may cause poor vehicle control be leveled off. Abrasive or deicing materials are applied at intersections, hills and sharp curves.

LIQUID CHEMICALS

Application Rates and Reductions

USE OF LIQUID CHEMICALS

Chemical	Use	Application Ratio	Chemical Concentration	Application Rate	Dry Salt Reduction
CaCl, MgCl, or Multi-Chloride	Pre-Wetting	5% by weight	Varies (28%-35%)	39L / t	20%[1]
CaCl, MgCl, or Multi-Chloride	Straight Liquid Application	N/A	Varies	60 to 100L/ lane-km	-

[1] The Epoke controller does not support setting a separate reduction percentage – the rate will only be reduced by the set liquid application ratio (5%).

Pre-Wetted Salt

- Pre-wetting salt is a recommended practice to enhance the performance of the road salt.
- When salt is pre-wet, the brine solution is formed quicker than dry salt and more material is retained on the road surface. It is the brine solution that prevents or breaks the bond between the road surface and snow/ice.
- The enhanced performance of the salt as well as the retention of salt on the road surface facilitates achieving a bare road more quickly and maintains bare pavement longer. As a result, a reduction in salt application rates can achieve the same effectiveness as dry salt application at traditional rates.

Practical temperature ranges for Pre-Wetted Salt (WET SALT)

- Sodium Chloride Brine ($NaCl$):
  - From 0 to –9ºC (0 to -12ºC as per pre-wetting practices in urban areas)
- Calcium Chloride ($CaCl_2$), Magnesium Chloride ($MgCl$), and Multi-Chloride Brines with a minimum eutectic temperature of -30°C:
  - From 0 to –15ºC (0 to -18ºC as per pre-wetting practices in urban areas)

Direct Liquid Applications (DLA)

- Anti-icing by Direct Liquid Application is a recommended practice to treat frost and black ice conditions in the shoulder seasons at pavement temperatures between 0 and –10ºC.
- Liquid should be applied to treat forecasted conditions at the following rates:

Winter Event	Litres / LaneKm	mL / m^2 (at 3m width)
Frost	60	20
Light Snow	60 to 80	25
Moderate to Heavy Snow, Freezing Rain	80 to 100	30

- DLA should be applied:
  - As close to the beginning of the winter event as possible
  - When the air and pavement temperatures are both below +5°C currently and forecasted to remain below +5°C within the next 12 hours.
  - When the air and pavement temperatures are a minimum of 10°C above the eutectic temperature of the DLA liquid and forecasted to do so for the next 24 hours.
- DLA should NOT be applied:

  - When the relative humidity is below 60% and the air and pavement temperatures are between 0°C and +5°C.
  - More than once in a three-day period unless a Winter Event (frost, snow, freezing rain or rain) has removed the product from the pavement. Note that DLA liquid can remain on the pavement up to several days after the initial application.

GENERAL INFORMATION

When the Pavement Temperature is below –18ºC

- Below –18ºC, the salt melting action is close to none.
- Below –18ºC, the use of salt shall be discontinued and replaced by an abrasive.
- Multiple factors can affect the performance of de-icing chemicals and abrasives below pavement temperature of –18ºC. Under such conditions, supervisors shall select the most appropriate material based on the current and expected traffic volume, current and forecasted weather and road conditions.

Abrasives

- Accepted abrasives are Sand and Grit
- Straight abrasive does contain salt to prevent the stockpile from freezing. The goal is to minimize the amount of salt mixed with the abrasives. The objective is to use an engineered abrasive of 5% salt / 95% sand or grit by volume. The following interim abrasive ratios are accepted (where the engineered ratio cannot be achieved due to equipment and material storage constraints)
  - 10% salt / 90% sand or grit by volume

Rush Hours and Forecasted Conditions

- Supervisors are responsible for making timely material application calls based on forecasted conditions and expected traffic peak hours.

Freezing Rain

- When Freezing Rain occurs, abrasive materials (sand or grit) will be applied on snow packed roads on a continuous basis (to the full Road Width).
- Snow Packed Roads – where available, graders with ice blades shall drag the roads to aid traction.

MATERIAL APPLICATION POLICY

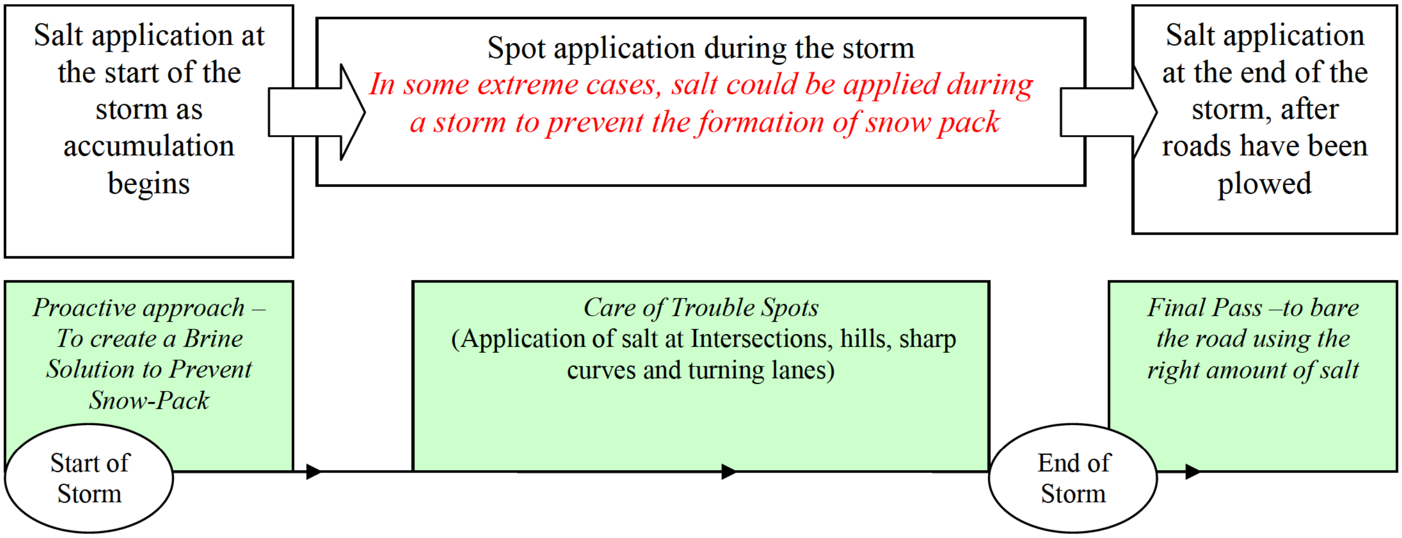
BARE PAVEMENT

Pavement Temperature °C	**Material**	**Frost and Black Ice** *Kg/2-lane km*	**Light Snow <1cm/hr** *Kg/2-lane km*	**Heavy Snow >1cm/hr** *Kg/2-lane km*	**Freezing Rain** *Kg/2-lane km*
0 to –5°C	DRY SALT	70	100	140	230
	WET SALT	55	80	110	185
-5 to –10°C	DRY SALT	85	140	180	230
	WET SALT	70	110	145	185
-10 to –18°C	DRY SALT	85	180	230	230
	WET SALT	70	145	185	185
< -18°C*	ABRASIVE	350	350	350	-

* Refer to the General Information Section for additional information when the Pavement Temperature is below –18°C. When forecasted warming conditions are expected, dry/wet rates of 180/145, and 230/185 may provide some baring-off benefit.

* Note: Use wet rates where pre-wetting capable spreaders and liquid supply is available.

Timing of Application – BARE PAVEMENT ROADS



Salt application at the start of the storm as accumulation begins

Spot application during the storm

In some extreme cases, salt could be applied during a storm to prevent the formation of snow pack

Salt application at the end of the storm, after roads have been plowed

Proactive approach – To create a Brine Solution to Prevent Snow-Pack

Care of Trouble Spots

(Application of salt at Intersections, hills, sharp curves and turning lanes)

Final Pass –to bare the road using the right amount of salt

Start of the Storm

Salt shall be spread just at the beginning of the icy precipitation.

End of Storm

Salt shall not be spread once bare pavement is achieved and when no further precipitation is forecasted.

MATERIAL APPLICATION POLICY

BARE PAVEMENT (EPOKE SPREADERS)

Pavement Temperature °C	Material	Frost and Black Ice		Light Snow <1cm/hr		Heavy Snow >1cm/hr		Freezing Rain	
		g/m2	*Width*	*g/m2*	*Width*	*g/m2*	*Width*	*g/m2*	*Width*
0 to –5°C	DRY Salt (WET Salt)*	70kg/2ln-km		100kg/2ln-km		140kg/2ln-km		230kg/2ln-km	
		35 (30)	2m	50 (43)	2m	70 (60)	2m	115 (98)	2m
		23 (20)	3m	35 (30)	3m	45 (38)	3m	77 (65)	3m
		17 (14)	4m	23 (20)	4m	35 (30)	4m	58 (49)	4m
		17 (14)	5m	20 (17)	5m	28 (24)	5m	45 (38)	5m
-5 to –10°C	DRY Salt (WET Salt)*	85kg/2ln-km		140kg/2ln-km		180kg/2ln-km		230kg/2ln-km	
		45 (38)	2m	70 (60)	2m	90 (77)	2m	115 (98)	2m
		28 (24)	3m	45 (38)	3m	58 (49)	3m	77 (65)	3m
		20 (17)	4m	35 (30)	4m	45 (38)	4m	58 (49)	4m
		17 (14)	5m	28 (24)	5m	35 (30)	5m	45 (38)	5m
-10 to –18°C	DRY Salt (WET Salt)*	85kg/2ln-km		180kg/2ln-km		230kg/2ln-km		230kg/2ln-km	
		45 (38)	2m	90 (77)	2m	115 (98)	2m	115 (98)	2m
		28 (24)	3m	58 (49)	3m	77 (65)	3m	77 (65)	3m
		20 (17)	4m	45 (38)	4m	58 (49)	4m	58 (49)	4m
		17 (14)	5m	35 (30)	5m	45 (38)	5m	45 (38)	5m
< -18°C†	ABRASIVE	350kg/2ln-km		350kg/2ln-km		350kg/2ln-km		-	
		175	2m	175	2m	175	2m	-	-
		115	3m	115	3m	115	3m		
		88	4m	88	4m	88	4m		
		70	5m	70	5m	70	5m		

* When the pre-wetting system is engaged, the dry material output is reduced. The Epoke controller does not support setting a separate reduction percentage – the rate is only reduced by the set liquid application ratio (5%). Material 2 was therefore configured with rates reduced by 15%.

* Use wet rates where pre-wetting capable spreaders and liquid supply is available.

† Refer to the General Information Section for additional information when the Pavement Temperature is below –18°C. When forecasted warming conditions are expected, dry/wet rates of 180/145, and 230/185 may provide some baring-off benefit.

Notes

There are 2 variables affecting the material output on an Epoke salt spreader:

-Material Application Rate in **g/m^2** AND Application Width in **m**.

Examples:

1- For a rate of 100kg/2ln-km, the Epoke Setup would be 25g/m^2 at a Width of 4m. **OR** a rate of 50g/m^2 at a Width of 2m.

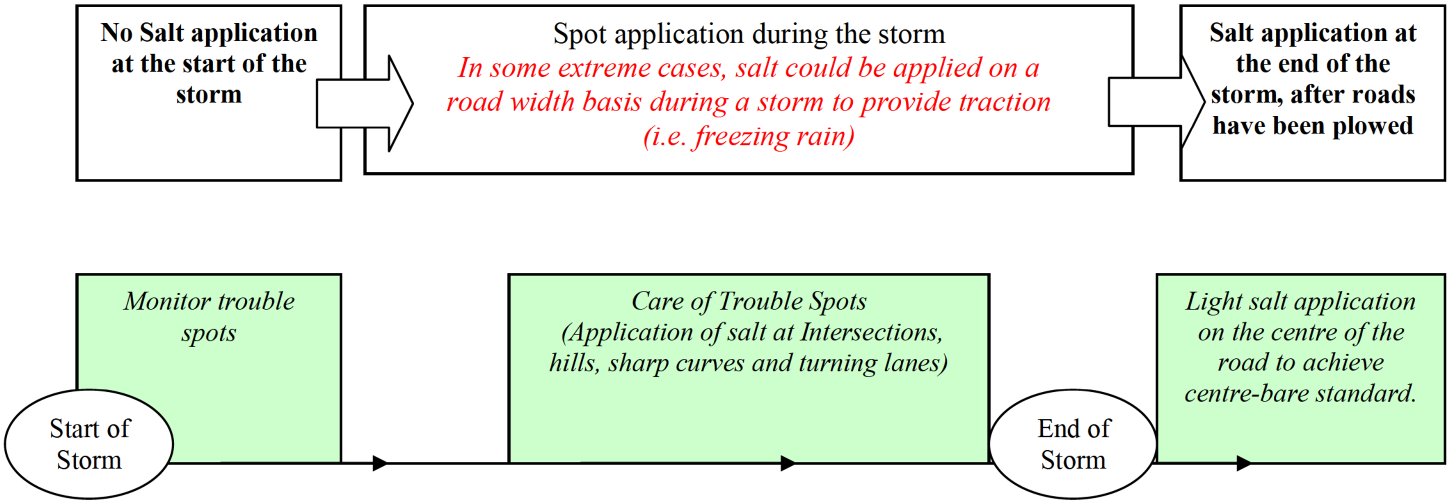
2- For a rate of 170kg/2ln-km, the Epoke Setup would be 42g/m^2 at a Width of 4m. **OR** a rate of 57g/m^2 at a Width of 3m.

MATERIAL APPLICATION POLICY
CENTRE-BARE PAVEMENT

Pavement Temperature °C	**Material**	**Frost and Black Ice** *Kg/2-lane km*	**Snow** *Kg/2-lane km*	**Freezing Rain** *Kg/2-lane km*
0 to –5°C	DRY SALT	70	100	230
	WET SALT	55	80	185
-5 to –18°C	DRY SALT	85	140	230
	WET SALT	70	110	185
< -18°C	ABRASIVE	350	350	-

Note: Use wet rates where pre-wetting capable spreaders and liquid supply is available.

Timing of Application – CENTRE-BARE PAVEMENT ROADS



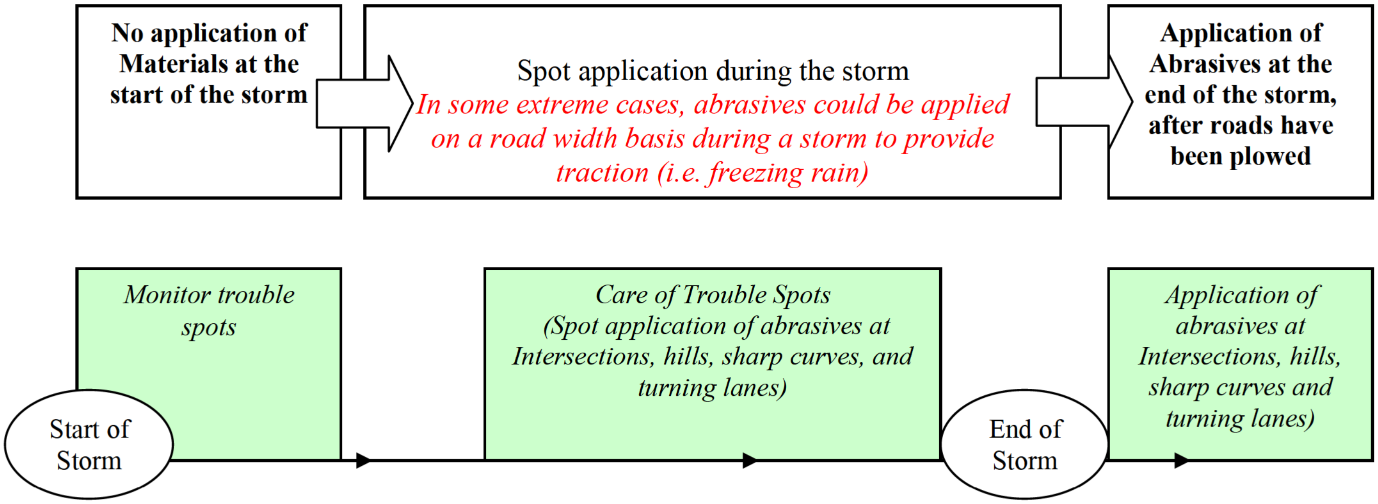
Start of the Storm
No Salt application at the start of the storm. Monitor trouble spots.

End of Storm
Salt shall not be spread once centre-bare pavement is achieved and when no further precipitation is forecasted.

MATERIAL APPLICATION POLICY
(Intersections, Hills and Sharp Curves)
SNOW PACKED

Pavement Temperature °C	**Material**	**Frost and Black Ice** *Kg/2-lane km*	**Snow** *Kg/2-lane km*	**Freezing Rain** *Kg/2-lane km*
0 to –30°C and below	ABRASIVE	350	350	500

Timing of Application – SNOW PACKED ROADS



No application of Materials at the start of the storm

Spot application during the storm
In some extreme cases, abrasives could be applied on a road width basis during a storm to provide traction (i.e. freezing rain)

Application of Abrasives at the end of the storm, after roads have been plowed

Monitor trouble spots

Care of Trouble Spots (Spot application of abrasives at Intersections, hills, sharp curves, and turning lanes)

Application of abrasives at Intersections, hills, sharp curves and turning lanes)

Start of the Storm
No application of abrasives at the start of the storm. Monitor trouble spots.

End of Storm
Abrasives shall not be spread once traction is provided.

BLASTING POLICY

The On-Board Electronic Controller's Blast function is an important tool for roadway de-icing operations. It allows operational staff to timely increase the amount of spread material at trouble locations such as steep hills and sharp curves. Although the blast function is indispensable, it should be used with care as it its liberal use can lead to significant increases in salt consumption and environmental impacts.

- Supervisory staff shall work toward minimizing the amount of salt being spread using the Blast function to achieve the required maintenance quality standard.
- Many variables come into play during a winter weather event. As such, the call to allow the use of the Blast Function during a winter event is left to the judgment of the supervisory staff, as the first priority is the safety of the traveling public.

The Blast function shall only be used at the following locations:

- Steep Hills
- Elevated Curves
- Intersections (within 30m of the stop line on the approach side only)
- Shade areas
- Right and Left Turning Lanes
- Bus Bays
- Railways (within 30m of the railway crossing on the approach side only)
- Bridge Decks

  Caution: when blasting salt on a bridge deck. Rock salt needs heat to dissolve. Spreading salt on a bridge deck could lower its surface temperature to a point where the brine solution will refreeze.

Application:

- The Blast function shall only be used under severe winter conditions
- The Blast function shall not be used during light winter weather events such as light snow, frost, etc.
- The blast function shall not be used while clearing the roads (stripping) at the end of a storm.

On-Board Electronic Controller's Blast function

- The Epoke controllers will blast at the highest material calibration setting.
- The CS-230 controller will blast to its maximum hydraulic power (which can be adjusted if too high)
- The CS-440 controller can be calibrated at a defined Blast rate for each material.
  - The Blast Rate for Salt is to be set at 300kg/2 lane-km
  - The Blast Rate for Abrasive is to be set at 500kg/2 lane-km. Note: Suburban/Rural District has a requirement to Blast Abrasives on gravel roads at a rate of 700kg/2 lane-km. To achieve this rate, the spreaders need to be calibrated using two gate settings. The District will provide, every fall, a list of spreaders requiring this specific calibration.