Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

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Geotechnical Investigation

Kanata Lakes Golf and Country Club
7000 Campeau Drive
Ottawa, Ontario

Prepared For

Minto Communities Inc.
on behalf of ClubLink Corporation ULC

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1.0 Introduction

Paterson Group (Paterson) was commissioned by Minto Communities Inc. on behalf of Club Link Corporation ULC to conduct a geotechnical investigation for the proposed residential development to be located at 7000 Campeau Drive (Kanata Lakes Golf and Country Club), in the City of Ottawa, Ontario (refer to Figure 1 - Key Plan in Appendix 2 of this report).

The objective of the current investigation was to:

❏ determine the existing subsoil and groundwater information at this site by means of probe holes and boreholes.

❏ provide geotechnical recommendations for the design of the proposed development including construction considerations which may affect its design.

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

Investigating the presence or potential presence of contamination on the subject property was not part of the scope of work of the current investigation.

2.0 Proposed Development

It is expected that the proposed development will consist of residential dwellings, such as apartments, townhouses and detached units, as well as, associated local roadways and landscaped areas. Municipal services will also be constructed as part of the proposed development.

3.0 Method of Investigation

3.1 Field Investigation

The field program for the initial geotechnical field investigation was conducted between February 4, 2019 and March 10, 2019. During that time, approximately 190 probe holes and twenty (20) boreholes (BH1-19 to BH20-19) were extended to a maximum depth of 10 m below existing ground surface. The test holes were strategically placed in a manner to provide general coverage of the subject site taking into consideration of existing site features and underground utilities. In addition, a recent field investigation was conducted in March 6 to 10, 2020, in which a total of fourteen (14) boreholes (BH 1-20 to BH 13D-20) were extended to a maximum depth of 5.0 m below existing surface. Another earlier geotechnical field investigation was carried out on December 6 to 12, 2017. At that time a total of twenty-nine (29) boreholes (BH 1 to BH 29) were advanced to a maximum depth of 9.4 m below existing ground surface. In addition, relevant test holes completed by others within the south portion of the subject site during April 1998 have also been included in the current geotechnical report. The locations of the test holes are shown on Drawings PG4135-1 and 2 - Test Hole Location Plan included in Appendix 2.

The boreholes were advanced using a track-mounted auger drill rig while the probe holes were drilled using an air-track drill both operated by a two person crew. The field work was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer. The test hole procedures consisted of augering to the required depths at the selected locations and sampling the overburden.

Sampling and In Situ Testing

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

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 soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

Undrained shear strength testing using a vane apparatus was carried out at regular intervals of depth in cohesive soils.

The overburden thickness was also evaluated during the course of the investigations by dynamic cone penetration testing (DCPT) at several borehole locations. The DCPT consists of driving a steel rod, equipped with a 50 mm diameter cone at its tip, using a 63.5 kg hammer falling from a height of 760 mm. The number of blows required to drive the cone into the soil is recorded for each 300 mm increment.

Diamond drilling was carried out at six (6) borehole locations (BH 2-19, BH 3-19, BH 17-19, BH 18-19, BH 19-19 and BH 20-19) to confirm bedrock and assess the bedrock quality. A recovery value and a Rock Quality Designation (RQD) value were calculated for each drilled section of bedrock and are shown on the Soil Profile and Test Data sheets in Appendix 1. The recovery value is the ratio, in percentage, of the length of the bedrock sample recovered over the length of the drilled section. The RQD value is the ratio, in percentage, of the total length of intact rock pieces longer than 100 mm in one drilled section over the length of the drilled section. These values are indicative of the bedrock quality.

All soil samples were classified on site, placed in sealed plastic bags and were transported to our laboratory for visual inspection.

Groundwater

51 mm and 32 mm diameter PVC groundwater monitoring wells were installed in thirteen (13) of the twenty (20) boreholes completed during the initial geotechnical investigation conducted in February to March 2019, to permit monitoring of the groundwater levels subsequent to the completion of the drilling program. Monitoring wells should be decommissioned prior to the commencement of construction and during the excavation program for shallow monitoring wells.

Monitoring Well Installation

A groundwater monitoring well was installed in each borehole upon completion of the sampling program. Typical monitoring well construction details are described below:

❏ Slotted 51 or 32 mm diameter PVC screen at base of borehole for 3 m length.
❏ 51 or 32 mm diameter PVC riser pipe from top of the screen to ground surface.
❏ No. 3 silica sand backfill within annular space around screen.
❏ 300 mm thick bentonite hole plug directly above PVC slotted screen.
❏ Clean backfill from top of bentonite plug to ground surface.

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

Sample Storage

All samples will be stored in the laboratory for a period of one month after issuance of this report. They will then be discarded unless we are otherwise directed.

3.2 Field Survey

The borehole locations were determined by Paterson personnel to provide general coverage of the proposed development taking into consideration of proposed development and existing test holes completed as part of the previous geotechnical investigations. The location and ground surface elevation at each borehole location completed during the current investigation were provided by Stantec Geomatics Ltd.. It is understood that the elevations were referenced to a geodetic datum. The test hole locations and ground surface elevations at the test hole locations are presented on Drawings PG4135-1 and 2 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

The soil samples recovered from the subject site were visually examined in our laboratory to review the results of the field logging.

A total of ten (10) Atterberg Limits' tests were completed on selected soil sample within the silty clay deposit throughout the subject site. The results are presented under Subsection 4.2 and in Appendix 1.

In addition, four (4) soil samples were submitted for grain size distribution and hydrometer analysis. The results of our testing are presented in Subsection 4.2 and on Grain Size Distribution sheets in Appendix 1.

3.4 Analytical Testing

A total of three (3) soil samples were submitted for analytical testing to assess the potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. The samples were analyzed to determine its concentration of sulphate and chloride along with its resistivity and pH. The laboratory test results are provided in Appendix 1 and the results are discussed in Subsection 6.7.

4.0 Observations

4.1 Surface Conditions

The subject site is currently occupied by the existing Kanata Golf and Country Club. The surface consists of various landscaped areas associated with the golf course, along with occasional rock outcrops, mature trees and understand that there are two existing stormwater ponds. The ground surface is generally flat but undulates at several locations across the subject site. The site is generally bordered by existing residential dwellings to the west, north and east, and Campeau Drive to the south.

4.2 Subsurface Profile

Overburden

Generally, the subsurface profile encountered at the test hole locations consists of a topsoil layer and/or fill overlying a very stiff to firm silty clay deposit at depths up to 20 m below existing ground surface. Glacial till was generally found to be encountered below the above noted soils, which was observed to consist of a compact to dense silty clay/clayey silt with sand, gravel, cobbles and boulders.

Ten (10) silty clay samples were submitted for Atterberg Limits testing. The tested material was classified as Inorganic silts of High Plasticity (MH), Inorganic Clays of Low to Medium Plasticity (CL) to High Plasticity (CH). The results are summarized in Table 1 and further presented in Appendix 1.

In addition, four (4) sieve analyses were completed to classify selected soil samples according to the Unified Soil Classification System (USCS). The results are presented in Appendix 1.

Table 1 - Summary of Atterberg Limits Tests					
Sample	**Moisture Content %**	**Liquid Limit %**	**Plastic Limit %**	**Plasticity Index %**	**Classification**
BH 6-19	63.2	66	27	39	CH
BH 7-19	55.9	55	23	33	CH
BH 8-19	51.8	55	31	24	MH
BH 9-19	57.0	56	28	28	CH
BH 10-19	65.2	65	33	32	MH
BH 11-19	57.2	58	32	27	MH
BH 12-19	34.6	36	18	17	CL
BH 13-19	19.1	51	26	25	CH
BH 14-19	64.5	66	30	36	CH
BH 15-19	59.1	59	24	35	CH

Bedrock

Based on the recovery of the bedrock during the coring operations, field observations and available geological mapping, the local bedrock consists of Precambrian mafic and ultramafic intrusive rocks (diorite, gabbro) and migmatic rocks (paragneiss, granitic origin). The overburden thickness is anticipated to vary between 0 and 20 m.

The inferred bedrock contours have been presented on Drawings PG4135-5 and 6 - Bedrock Contour Plan interpolated based on limited test hole information and site observations.

4.3 Groundwater

A total of thirteen (13) groundwater monitoring wells were installed as part of our initial geotechnical investigation. Groundwater level measurements were recorded at the monitoring well locations and our observations are presented in Table 2.

Table 2 - Summary of Groundwater Level Readings

Test Hole Number	Ground Elevation (m)	Groundwater Levels (m)		Recording Date
		Depth	Elevation	
BH 2-19	105.20	2.38	102.82	April 29, 2019
BH 3-19	105.72	3.35	102.37	April 29, 2019
BH 8-19	98.21	1.21	97.00	April 29, 2019
BH 10-19	100.61	1.75	98.86	April 29, 2019
BH 11-19	94.64	0.15	94.49	April 30, 2019
BH 12-19	95.64	1.46	94.18	April 30, 2019
BH 13-19	102.84	1.38	101.46	April 29, 2019
BH 15-19	99.08	0.12	98.96	April, 29, 2019
BH 16-19	97.31	0.11	97.20	April 30, 2019
BH 17-19	97.15	0.10	97.05	April 29, 2019
BH 18-19	99.05	2.90	96.15	April 30, 2019
BH 19-19	96.57	0.39	96.18	April 30, 2019
BH 20-19	97.58	1.21	96.37	April 30, 2019

Notes - The location and ground surface elevation at each borehole location were provided by Stantec Geomatics. It is understood that the elevations were referenced to a geodetic datum. The test hole locations and ground surface elevations at the test hole locations are presented on Drawings PG4135-1 and 2 - Test Hole Location Plan in Appendix 2.

The groundwater levels were also measured on April 29 and 30, 2019 in the piezometers installed at BH 6-19, BH 7-19, BH 9-19 and BH 14-19. The measured groundwater levels are presented on the Soil Profile and Test Data sheets in Appendix 1.

It should be noted that surficial water from rain events can become trapped within the piezometers installed in low permeability soils. Therefore, as is typically noted at sites with low permeability soils, such as the current site, the recorded groundwater levels recorded within the piezometers are suspected to be elevated above water levels that will be observed during construction.

Long-term groundwater conditions can also be estimated based on the observed colour and consistency of the recovered soil samples. Based on these observations, it is estimated that long-term groundwater level can be expected between 2 to 3 m depth. Groundwater levels are subject to seasonal fluctuations and therefore could vary during time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is considered suitable for the proposed residential development. However, due to the presence of a silty clay layer, portions of the proposed development will be subjected to grade raise restrictions. Permissible grade raise recommendations are discussed in Subsection 5.3 and permissible grade raise areas are presented in Drawings PG4135-3 and 4 - Permissible Grade Raise Plan in Appendix 2.

It should be further noted that bedrock outcrops and shallow bedrock were observed across several portions of the subject site. It is expected that a bedrock blasting program is to be completed within these areas. As part of the blasting program, crushing of the blasted material is expected to be completed to enable reuse of the material on site. Construction recommendations for use of the crushed material and footing placement over blasted areas are provided in the following subsections.

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

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and deleterious fill, such as those containing organic materials, should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures.

Bedrock Removal

Based on the volume of bedrock encountered in the area, it is expected that line-drilling in conjunction with hoe-ramming or controlled blasting will be required to remove the bedrock. In areas of weathered bedrock and where only a small quantity of bedrock is to be removed, bedrock removal may be possible by hoe-ramming.

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

As a general guideline, peak particle velocity (measured at the structures) should not exceed 25 mm/s during the blasting program to reduce the risks of damage to the existing structures.

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

Excavation side slopes in sound bedrock can be completed with almost vertical side walls. A minimum 1 m horizontal bench should remain between the bottom of the overburden and the top of the bedrock surface to provide an area for potential sloughing or to provide a stable base for the overburden shoring system.

Critical Root Zone Considerations

If not done carefully, blasting near trees will have far-reaching consequences as the tree root-soil interfaces will likely be disturbed within the tree critical rooting zones (CRZ). It is these intimate interfaces which allow for the absorption of moisture and nutrients from the soil. In order to mitigate blasting-induced damage to tree roots, it is recommended that the following measures be taken:

❏ Prior to any blasting, the soil within any nearby trees' CRZ should be soaked with water to help increase the cohesiveness of the soil matrix.
❏ Prior to blasting, the bedrock must be pre-sheared to create a fissure between the CRZ to be protected and the blasting work. This is achieved by drilling closely spaced holes and using 'Primeaflex' as the explosive product. Pre-shearing will reduce the likelihood of fractures and reverberations traveling into the CRZ.
❏ During blasting, only dynamite should be used as the explosive product. Since dynamite is oxygen-balanced as well as waterproof, it will completely burn off, leaving only CO_2 as the by-product of the explosion. An incomplete burn will produce unburnt gases which are toxic to tree roots.

Vibration Considerations

Construction operations could be the cause of vibrations, and possibly sources of nuisance to the community. Therefore, means to reduce the vibration levels as much as possible should be incorporated in the construction operations to maintain a cooperative environment with the residents. Vibrations, whether caused by blasting operations or by construction operations could be the cause of the source of detrimental vibrations on the adjoining buildings and structures. Therefore, it is recommended that all vibrations be limited.

Two parameters determine the permissible vibrations: the maximum peak particle velocity and the frequency. For low frequency vibrations, the maximum allowable peak particle velocity is less than that for high frequency vibrations. As a guideline, the peak particle velocity should be less than 15 mm/s between frequencies of 4 to 12 Hz, and 50 mm/s above a frequency of 40 Hz (interpolate between 12 and 40 Hz). These guidelines are for current construction standards. Considering there are numerous sensitive buildings in close proximity to the subject site, consideration to lowering these guidelines is recommended. These guidelines are above perceptible human level and, in some cases, could be very disturbing to some people; a pre-construction survey is therefore recommended to minimize the risks of claims during or following the construction of the proposed development.

Fill Placement

It is expected that fill may be required for grading beneath the building areas and several fill options are available such as;

❏ Clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. The backfill material should be tested and approved prior to delivery to the site. The fill should be placed in maximum 300 mm thick lifts and compacted to 98% of the standard Proctor maximum dry density (SPMDD).

❏ Site crushed rock material, consisting of 150 mm minus well graded material which is adequately compacted to be placed below underside of footing. The 150 mm minus material should be topped with a minimum 300 mm thick layer of Granular A crushed stone material placed immediately below design footing level. The fill should be placed in maximum 300 mm thick lifts and compacted to 98% of the standard Proctor maximum dry density (SPMDD).

❏ For areas where greater than 2 m of fill is required below the design underside of footing elevations, site excavated blast rock can be used as fill to build up the bearing medium. The site excavated blast rock should be suitably fragmented to produce a well-graded material with a maximum particle size of 400 mm placed in maximum 600 mm loose lifts and compacted using a large smooth drum vibratory roller making several passes per lift and approved by the geotechnical consultant at the time of placement. Any blast rock greater than 400 mm in diameter should be segregated and hoe rammed into acceptable fragments. Where the fill is open-graded, a blinding layer of finer granular fill or a geotextile may be required to prevent adjacent finer materials from migrating into the voids, with associated loss of ground and settlements. The site excavated blast rock fill with maximum particle size of 400 mm should be capped with a minimum thickness of 600 mm of 150 mm minus well graded blast rock followed by a 200 mm thick layer of OPSS Granular A crushed stone material. The 150 mm minus well grade blast rock and OPSS Granular A crushed stone should be placed in maximum 300 mm thick lifts and compacted to 98% of the standard Proctor maximum dry density (SPMDD).

- ❑ Silty clay fill should consist of a relatively dry, unfrozen, workable brown silty clay, free of organic containing materials and approved by the geotechnical consultant at the time of construction. The workable silty clay fill should be placed in maximum 300 mm thick loose lifts and compacted by a sheepsfoot roller making several passes under dry, unfrozen conditions and periodically inspected and approved by the geotechnical consultant.

It is further recommended that the engineered clay fill be capped with a minimum of 300 mm of of Granular B Type II or Granular A crushed stone material and should be compacted to at least 98% of its standard Proctor maximum dry density (SPMDD). At the time of construction, proof roll the sub-excavated surface and capped with a minimum of 200 mm of OPSS Granular A crushed stone. The OPSS Granular A crushed stone should be placed in maximum 300 mm thick lifts and compacted to 98% of the standard Proctor maximum dry density (SPMDD).

If excavated rock is to be used as fill to build up the subgrade for roadways, it should be suitably fragmented to produce a well-graded material with a maximum particle size of 300 mm. Where the fill is open-graded, a blinding layer of finer granular fill or a geotextile may be required to prevent adjacent finer materials from migrating into the voids, with associated loss of ground and settlements.

Non-specified existing fill along with site-excavated soil can be placed as general landscaping fill where settlement of the ground surface is of minor concern. The existing fill materials should be spread in thin lifts and at a minimum compacted by the tracks of the spreading equipment to minimize voids. If the material is to be placed to increase the subgrade level for areas to be paved, the fill should be compacted in maximum 300 mm lifts and compacted to 95% of the SPMDD. Non-specified existing fill and site-excavated soils are not suitable for placement as backfill against foundation walls unless a composite drainage blanket connected to a perimeter drainage system is provided.

5.3 Foundation Design

Bearing Resistance Values

Footings for the proposed buildings can be designed using the bearing resistance values presented in Table 3. It should be noted that where foundations are placed over glacial till, engineered fill over bedrock or directly over bedrock, Part 9 of the current OBC 2012 standard should be used for design purposes. Also, where foundations are placed over a silty clay deposit, Part 4 of the current OBC 2012 standard should be used for design purposes. The area requiring permissible grade raise restrictions outlined in Drawings PG4135-3 and 4 - Permissible Grade Raise Areas in Appendix 2 should be used to delineate the houses where silty clay is anticipated below footing level.

Table 3 - Bearing Resistance Values

Bearing Surface	Bearing Resistance Value at SLS (kPa)	Factored Bearing Resistance Value at ULS (kPa)
Firm Silty Clay	60	125
Stiff Silty Clay	100	150
Compact Glacial Till	150	225
Clean, Bedrock	500	1000
Engineered Fill	150	250

Note: Strip footings, up to 3 m wide, and pad footings, up to 5 m wide, placed over a silty clay bearing surface can be designed using the abovenoted bearing resistance values.

The bearing resistance values are provided on the assumption that the footings will be placed on undisturbed soil bearing surfaces. An undisturbed soil bearing surface consists of one from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

A clean, surface-sounded bedrock bearing surface should be free of loose materials, and have no near surface seams, voids, fissures or open joints which can be detected from surface sounding with a rock hammer.

Footings placed on a soil bearing surface and designed using the bearing resistance values at SLS given above will be subjected to potential post construction total and differential settlements of 25 and 20 mm, respectively. Footings placed on a clean surface sounded bedrock bearing surface will be subjected to negligible post construction settlements

A geotechnical resistance factor of 0.5 was applied to the reported bearing resistance values at ULS.

Where a building is founded partly on bedrock and partly on soil, it is recommended to decrease the soil bearing resistance value by 25% for the footings placed on soil bearing media to reduce the potential long term total and differential settlements. Also, at the soil/bedrock and bedrock/soil transitions, it is recommended that the upper 0.5 m of the bedrock be removed for a minimum length of 2 m (on the bedrock side) and replaced with nominally compacted OPSS Granular A or Granular B Type II material. The width of the subexcavation should be at least the proposed footing width plus 0.5 m. Steel reinforcement, extending at least 3 m on both sides of the 2 m long transition, should be placed in the top part of the footings and foundation walls.

Bearing resistance values for footing design should be determined on a per lot basis at the time of construction.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to a sound bedrock bearing medium when a plane extending horizontally and vertically from the footing perimeter at a minimum of 1H:6V (or shallower) passing through sound bedrock or a material of the same or higher capacity as the bedrock, such as concrete.

Adequate lateral support is provided to a firm to stiff silty clay, compact glacial till or engineered fill above the groundwater table when a plane extending horizontally and vertically from the underside of the footing at a minimum of 1.5H:1V passing through in situ soil of the same or higher bearing capacity as the bearing medium soil.

Settlement and Permissible Grade Raise

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

The potential post construction total and differential settlements are dependent on the position of the long term groundwater level when buildings are situated over deposits of compressible silty clay. Efforts can be made to reduce the impacts of the proposed development on the long term groundwater level by placing clay dykes in the service trenches, reducing the sizes of paved areas, leaving green spaces to allow for groundwater recharge or limiting planting of trees to areas away from the buildings. However, it is not economically possible to control the groundwater level.

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

Based on the undrained shear strength values, our experience with Ottawa clays and consolidation testing results, permissible grade raise areas have been defined for the proposed development. The recommended permissible grade raise areas are presented in Drawings PG4135-3 and 4 - Permissible Grade Raise Plan in Appendix 2.

Where proposed grade raises exceed our permissible grade raise recommendations, several options could be considered for the foundation support of the proposed buildings:

Scenario A

Where the grade raise is close to, but below, the maximum permissible grade raise, consideration should be given to using more reinforcement in the design of the foundation (footings and walls) to reduce the risks of cracking in the concrete foundation. The use of control joints within the brick work between the garage and basement area should also be considered.

Scenario B

Where the grade raise cannot be accommodated with soil fill, the following options could be used alone or in combination.

Option 1 - Use of Lightweight Fill

Lightweight fill (LWF) can be used, consisting of EPS (expanded polystyrene) Type 19 or 22 blocks or other light weight materials which allow for raising the grade without adding a significant load to the underlying soils. However, these materials are expensive and, in the case of the EPS, are more difficult to use under the groundwater level, as they are buoyant, and must be protected against potential hydrocarbon spills. Use lightweight fill within the interior of the garage and porch areas to reduce the fill-related loads.

Option 2 - Preloading or Surcharging

It is possible to preload or surcharge the proposed site in localized areas provided sufficient time is available to achieve the desired settlements based on theoretical values from the settlement analysis. If this option is considered, a monitoring program using settlement plates will have to be implemented. This program will determine the amount of settlement in the preloaded or surcharged areas. Obviously, preloading to proposed finished grades will allow for consolidation of the underlying clays over a longer time period. Surcharging the site with additional fill above the proposed finished grade will add additional load to the underlying clays accelerating the consolidation process and allowing for accelerated settlements. Once the desired settlements are achieved, the site can be unloaded and the fill can be used elsewhere on site.

Once the required grade raises are established, the above options could be further discussed along with further recommendations on specific requirements.

5.4 Design for Earthquakes

It should be noted that where foundations are placed over glacial till, engineered fill over bedrock or directly over bedrock, Part 9 of the current OBC 2012 standard should be used for design purposes. Also, where foundations are placed over a silty clay, Part 4 of the current OBC 2012 standard should be used for design purposes. The area requiring permissible grade raise restrictions outlined in Drawings PG4135-3 and 4 - Permissible Grade Raise Plan in Appendix 2 should be used to delineate the houses where silty clay is anticipated below footing level.

The site class for seismic site response can be taken as **Class D** for footings placed over the silty clay deposit (where a permissible grade raise of 2.5 m or less is delineated in Drawings PG4135-3 and 4 - Permissible Grade Raise Areas).

5.5 Basement Slab

With the removal of all topsoil and deleterious materials within the footprint of the proposed buildings, such as those containing organic materials, the native soil or select fill approved by the geotechnical consultant will be considered to be an acceptable subgrade surface on which to commence backfilling for basement floor slab construction. The upper 150 mm of sub-slab fill should consist of 19 mm clear stone below the basement floor slab. All backfill material within the footprint of the proposed building should be placed in maximum 300 mm thick loose lifts and compacted to at least 98% of its SPMDD.

Where encountered, it is recommended that a minimum 300 mm thick layer (native soil plus crushed stone layer) be present between the floor slabs and the bedrock surface to reduce the risks of bending stresses in the concrete slab. The bending stress could lead to cracking of the concrete slabs. This requirement could be waived if the bedrock surface is relatively flat within the footprint of the building. This recommendation does not refer to potential concrete shrinkage cracking which should be controlled in the usual manner.

Any soft areas should be removed and backfilled with appropriate backfill material. OPSS Granular B Type II, with a maximum particle size of 50 mm, is recommended for backfilling below the floor slab.

5.6 Pavement Design

For car only parking areas, an Ontario Traffic Category A is applicable. For local roadways, an Ontario Traffic Category B should be used for design purposes. The subgrade material will consist of a silty clay, approved granular fill or bedrock surface. The proposed pavement structures are shown in Tables 4,5,and 6.

Table 4 - Recommended Pavement Structure - Car Only Parking Areas	
Thickness (mm)	**Material Description**
50	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill	

Table 5 - Recommended Pavement Structure - Local Roadways	
Thickness (mm)	**Material Description**
40	**Wear Course -** Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
450	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill	

Table 6 - Recommended Pavement Structure - Arterial Roadways and Local Road with Bus Traffic	
Thickness (mm)	**Material Description**
40	**Wear Course -** Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - Superpave 19.0 Asphaltic Concrete
50	**Binder Course** - Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
600	**SUBBASE** - OPSS Granular B Type II
	SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill

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

If a well-graded blast rock fill (minimum of 300 mm thickness) is used to build the subgrade for roadways as outlined in Section 5.2 and approved by the geotechnical consultant at the time of construction, the thickness of the subbase material identified in Tables 4, 5 and 6 can be reduced by 200 mm.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type I or II material. Weak subgrade conditions may be experienced over service trench fill materials. This may require the use of a geotextile, thicker subbase or other measures that can be recommended at the time of construction as part of the field observation program.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's SPMDD using suitable vibratory equipment.

Pavement Structure Drainage

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

In areas where silty clay is encountered at subgrade level, consideration should be given to installing subdrains during the pavement construction. These drains should be installed at each catch basin as per City of Ottawa standards and specifications. The subdrain inverts should be approximately 300 mm below subgrade level. The subgrade surface should be crowned to promote water flow to the drainage lines, and the subdrains should be provided with positive outlets to the storm sewer.

5.7 Stormwater Management Ponds

Based on DSEL Drawing No. D07-16-19-0026 04D and 10D dated April 2021 , four stormwater management ponds (SWMP) are currently proposed. The proposed SWMPs will consist of the following:

SWM Pond 1

❏ Pond bottom elevation . . . . 94.1 m
❏ Maximum water level. . . . . 97.0 m

SWM Pond 2

❏ Pond bottom elevation . . . . 94.0 m
❏ Maximum water level. . . . . 97.5 m

SWM Pond 3

- ❏ Pond bottom elevation . . . . 94.0 m
- ❏ Maximum water level. . . . . 96.0 m

SWM Pond 4

- ❏ Pond bottom elevation . . . . .94.7 m
- ❏ Maximum water level. . . . . 96.7 m

The construction of the proposed SWMPs is adequate from a geotechnical perspective. However, a significant volume of bedrock removal will be required based on the current design. The main issues to be addressed for the SWMP construction from a geotechnical perspective are summarized as follows:

- ❏ the groundwater infiltration rate within the excavation side slopes and along the bottom of the pond.

The proposed SWMP will be located in an area where managing the water infiltration rate during bedrock removal operations will be part of the construction program. Based on the test hole program carried out as part of our investigation, water infiltration rates within the overburden soil are expected to be moderate to low. The infiltration rate through bedrock is expected to be high.

Where bedrock is exposed within the excavation, a clay layer acting as an impermeable liner will be required. Additional bedrock removal will be required to accommodate the material thickness. To further reduce the potential infiltration rates the sidewalls of the SWMP, it is recommended that the final 150 to 300 mm of the bedrock removal be carried out using a rock grinder mounted to a hydraulic excavator. This method of bedrock grinding will provide a smoother surface to finalize the shape of the sidewall and will also lessen the potential for over breaks that typically occur with the use of high energy mechanical methods such as hoe-ramming.

Clay Liner

A minimum 0.6 m thick clay liner is recommended to be placed over the grinded bedrock surface to provide an impermeable layer over the bedrock. The clay material used for the liner should consist of brown, workable clay that can be placed and compacted using a sheepsfoot roller making several passes and approved in the field by Paterson. Alternatively, a geosynthetic clay liner can be used over the bedrock surface.

It is expected that the perched groundwater will be significantly reduced during the site redevelopment and after post-construction servicing. Groundwater hydrostatic pressure will need to be considered during the design of the SWMP.

Stability of Side Slopes

It is understood that the excavation side slopes for the proposed ponds will be approximately 3H:1V and that the 1:100 Year water level will be approximately 96 to 97.5 m. According to findings of the current investigation, the subgrade at the ponds locations will consist of stiff brown silty clay or bedrock bearing surface. Depending on the finish grade level, proposed side slopes, subsurface conditions, and 1:100 Year water elevation, two cross sections A-A and D-D, were assessed along Pond 1 and Pond 4 respectively. The locations of the selected cross sections are shown on Drawings PG4135-1 and 2 - Test Hole Location Plan. The cross sections were analysed for 1:100 Year water levels and for rapid drawdown under both static and seismic loading conditions.

The analysis of slope stability was carried out using SLIDE, a computer program that permits a two-dimensional slope stability analysis using several methods, including the Bishop's method, which is a widely used and accepted analysis method. The program calculates a factor of safety, which represents the ratio of the forces resisting failure to those favouring failure. Theoretically, a factor of safety of 1.0 represents a condition where the slope is stable. However, due to intrinsic limitations of the calculation methods and the variability of the subsoil and groundwater conditions, a factor of safety greater than one is usually required to ascertain than the risks of failure are acceptable. A minimum factor of safety of 1.5 is generally recommended for conditions where the failure of the slope would endanger permanent structures.

An analysis considering seismic loading was also completed. A horizontal acceleration of 0.16G was considered for the sections for the seismic loading condition. A factor of safety of 1.1 is considered to be satisfactory for stability analyses including seismic loading.

The groundwater table elevation is variable across the site. However, as a conservative measure, the slope stability analysis assumes the subsoil profile to be fully saturated. The subsoil conditions at the pond locations inferred based on the findings of the borehole located within the vicinity of the ponds and our general knowledge of the area's geology. The analysed sections were selected at locations where the side slopes are

The results of the stability analysis for 1:100 Year water level under static conditions at Sections A-A and D-D are presented on Figures 2 and 6, respectively attached to Appendix 2. Also, the results of the stability analysis during rapid draw-down under static conditions at Sections A-A and D-D are presented on Figures 4 and 8, respectively attached to Appendix 2. The results indicate that the factor of safety for the sections is greater than 1.5 for both sections.

The results of the stability analysis for 1:100 Year water level under seismic loading conditions at Sections A-A and D-D are presented on Figures 3 and 7, respectively attached to Appendix 2. Also, the results of the stability analysis during rapid draw-down under seismic loading conditions at Sections A-A and D-D are presented on Figures 5 and 9, respectively attached to Appendix 2. The results indicate that the factor of safety for the sections is greater than 1.1 for both sections.

Based on the results of the slope stability assessment completed by Paterson for the stormwater management ponds considering the 1:100 Year water level and the rapid drawdown events, the proposed side slopes for the ponds are considered acceptable from a geotechnical perspective, under both the static and seismic loading conditions..

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

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

Backfill against the exterior sides of the foundation walls should consist of free-draining non frost susceptible granular materials. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls, unless used in conjunction with a composite drainage system connected to the perimeter drainage system. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should be used for this purpose.

6.2 Protection of Footings Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effect of frost action. A minimum of 1.5 m thick soil cover (or equivalent) should be provided in this regard. For footings founded directly on sound bedrock where insufficient soil cover is available, the suggested insulation can be omitted.

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

6.3 Excavation Side Slopes

The side slopes of excavations in the soil and fill overburden materials should either be cut back at acceptable slopes or should be retained by shoring systems from the start of the excavation until the structure is backfilled. It is assumed that sufficient room will be available for the greater part of the excavation to be undertaken by open-cut methods (i.e. unsupported excavations).

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level. The subsoil at this site is considered to be mainly a Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept at least 4 to 6 m away from the excavation face depending on the excavation depth and soil consistency.

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

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by "cut and cover" methods and excavations will not be left open for extended periods of time.

6.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with City of Ottawa standards and specifications.

The pipe bedding for sewer and water pipes should consist of at least 150 mm of OPSS Granular A material over a stiff silty clay subgrade. However, the bedding thickness should be increased to 300 mm for areas over a bedrock or grey, firm silty clay subgrade. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of the SPMDD. The bedding material should extend at a minimum to the spring line of the pipe.

The cover material, which should consist of OPSS Granular A, should extend from the spring line of the pipe to a minimum of 300 mm above the obvert of the pipe. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of the SPMDD.

Based on the soil profile encountered, the subgrade for the services will be placed in both bedrock and in overburden soils. It is recommended that the subgrade medium be inspected in the field to determine how steeply the bedrock surface, where encountered, drops off. A transition treatment should be provided where the bedrock slopes at more than 3H:1V. At these locations, the bedrock should be excavated and extra bedding be placed to provide a 3H:1V (or flatter) transition from the bedrock subgrade towards the soil subgrade. This treatment reduces the propensity for bending stress to occur in the service pipes.

Generally, the dry brown silty clay could be placed above the cover material if the excavation and backfilling operations are completed in dry weather conditions. The wet silty clay materials could be difficult to place and compact, due to the high water content.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should consist of the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the SPMDD.

To reduce long-term lowering of the groundwater level, clay seals should be provided in the service trenches. The seals should be a minimum of 1.5 m long (in the trench direction) and should extend from trench wall to trench wall. Generally, the seals should extend from the frost line and fully penetrate the bedding, subbedding and cover material. The barriers should consist of relatively dry and compactable brown silty clay placed in maximum 225 mm thick loose layers and compacted to a minimum of 95% of the SPMDD. The clay seals should be placed at the site boundaries, roadway intersections and at a maximum distance of every 50 m in the service trenches.

6.5 Groundwater Control

Due to the relatively impervious nature of the silty clay materials, groundwater infiltration into the excavations should be low and controllable by open sumps. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations.

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

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

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

6.6 Winter Construction

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

The subsoil conditions at this site consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

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

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

6.7 Corrosion Potential and Sulphate

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

6.8 Landscaping Considerations

Tree Planting Setbacks

In general accordance with the City of Ottawa Tree Planting in Sensitive Marine Clay Soils (2017 Guidelines), Paterson completed a soils review of the site to determine applicable tree planting setbacks. Atterberg limits testing was completed for recovered silty clay samples at selected locations throughout the subject site. The results of our testing are presented in Table 1 in Subsection 4.2 and in Appendix 1.

The results of the shrinkage testing of BH 8-19 - SS4 resulted in a shrinkage limit of **17%** with a shrinkage ratio of **1.90**.

Based on the results of our review, two tree planting setback areas are present within the current phase of the proposed development. The two areas are detailed below and further outlined using Drawings PG4135-3 and 4- Permissible Grade Raise Plan presented in Appendix 2.

Area 1 - No Tree Planting Setbacks

Based on the subsoil profile at the test hole locations, bedrock and/or glacial till will be encountered at the future footing elevations at the locations identified on Drawings PG4135-3 and 4 - Permissible Grade Raise Plan where no permissible grade raise restrictions are provided. As a result, no tree planting restrictions are required for the aforementioned area.

Area 2 - Low/Medium Sensitivity Clay Soils

A low to medium sensitivity clay soil is present within the subject site. The following tree planting setbacks are recommended for areas identified on Drawings PG4135-3 and 4- Permissible Grade Raise Plan where permissible grade restrictions are provided. It should be noted that in areas where design finished grades and top of the silty clay layer is greater than 3.5 m, no tree planting setbacks will be required. This will be defined by the geotechnical consultant by a lot by lot basis upon review of the site grading plan.

Large trees (mature height over 14 m) can be planted within Area 2 provided a tree to foundation setback equal to the full mature height of the tree can be provided (e.g. in a park or other green space). Tree planting setback limits may be reduced to 4.5 m for small (mature tree height up to 7.5m) and medium size trees (mature tree height 7.5 m to 14 m) provided that the following conditions are met:

❏ The underside of footing (USF) is 2.1 m or greater below the lowest finished grade must be satisfied for footings within 10 m from the tree, as measured from the centre of the tree trunk and verified by means of the site Grading Plan.

❏ A small tree must be provided with a minimum of 25 m^3 of available soil volume while a medium tree must be provided with a minimum of 30 m^3 of available soil volume, as determined by the Landscape Architect. The developer is to ensure that the soil is generally un-compacted when backfilling in street tree planting locations.

❏ The tree species must be small (mature tree height up to 7.5 m) to medium size (mature tree height 7.5 m to 14 m) as confirmed by the Landscape Architect.

❏ The foundation walls are to be reinforced at least nominally (minimum of two upper and two lower 15M bars in the foundation wall).

❏ Grading surrounding the tree must promote drainage to the tree root zone (in such a manner as not to be detrimental to the tree), as noted on the subdivision Grading Plan.

Swimming Pools

The in-situ soils are considered to be acceptable for swimming pools. In areas where sensitive silty clay is observed, above ground swimming pools must be placed at least 3 m away from the residence foundation and neighbouring foundations. Otherwise, pool construction is considered routine, and can be constructed in accordance with the manufacturer's requirements.

Aboveground Hot Tubs

Additional grading around the hot tub should not exceed permissible grade raises. Otherwise, hot tub construction is considered routine, and can be constructed in accordance with the manufacturer's specifications.

Installation of Decks or Additions

Additional grading around a proposed deck or addition should not exceed permissible grade raises. Otherwise, standard construction practices are considered acceptable.

7.0 Recommendations

It is a requirement for the foundation design data provided herein to be applicable that the following material testing and observation program be performed by the geotechnical consultant.

- ❑ Review master grading plan from a geotechnical perspective, once available.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Sampling and testing of the concrete and fill materials used.
- ❑ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❑ Observation of all subgrades prior to backfilling.
- ❑ Field density tests to determine the level of compaction achieved.
- ❑ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued upon the completion of a satisfactory inspection program by the geotechnical consultant.

8.0 Statement of Limitations

The recommendations made in this report are in accordance with our present understanding of the project. We request that we be permitted to review the grading plan once available and our recommendations when the drawings and specifications are complete.

A geotechnical investigation of this nature is a limited sampling of a site. The recommendations are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around the test locations. The extent of the limited area depends on the soil, bedrock and groundwater conditions, as well the history of the site reflecting natural, construction, and other activities. Should any conditions at the site be encountered which differ from those at the test locations, we request notification immediately in order to permit reassessment of our recommendations.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Minto Communities Inc. 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.

LICENSED PROFESSIONAL ENGINEER
May 17, 2021
D. J. GILBERT
100116130
PROVINCE OF ONTARIO

Maha Saleh, Provisional P.Eng

David J. Gilbert, P.Eng.

Report Distribution:

- ❑ Minto Communities Inc.
- ❑ Paterson Group

APPENDIX 1

SOIL PROFILE & TEST DATA SHEETS

BOREHOLES BY OTHERS

SYMBOLS AND TERMS

ANALYTICAL TESTING RESULTS

ATTERBERG LIMITS' TESTING RESULTS

GRAIN SIZE DISTRIBUTION TESTING RESULTS

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG4135**

REMARKS

HOLE NO. **BH 1-19**

BORINGS BY CME 55 Power Auger

DATE February 27, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	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	105.47		
FILL: Brown silty sand with topsoil, some gravel, trace clay		AU	1						
1.07		SS	2	33	50+	1	104.47		
End of Borehole Pracical refusal to augering at 1.07m depth									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG4135**

REMARKS

HOLE NO. **BH 2-19**

BORINGS BY CME 55 Power Auger

DATE February 27, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	105.20
Asphaltic concrete 0.08							
FILL: Brown silty sand with gravel and crushed stone 0.91		AU	1				
						1	104.20
BEDROCK: Sound to very sound grey to red metaphorpic gneiss		RC	1	95	57		
						2	103.20
						3	102.20
		RC	2	98	90		
						4	101.20
		RC	3	100	97		
						5	100.20
		RC	4	94	88	6	99.20
6.40							
End of Borehole							

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

○ Water Content %

20 40 60 80

Monitoring Well Construction

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

REMARKS

BORINGS BY CME 55 Power Auger

DATE February 26, 2019

FILE NO. PG4135

HOLE NO. BH 3-19

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	105.72
Asphaltic concrete — 0.08		AU	1				
FILL: Brown silty sand with gravel and crushed stone — 1.42		SS	2	79	42	1	104.72
BEDROCK: Fractured to very sound, grey to red metamorphic gneiss — 6.83		RC	1	95	70	2	103.72
		RC	2	100	65	3	102.72
						4	101.72
		RC	3	100	100	5	100.72
		RC	4	100	84	6	99.72
End of Borehole							
(GWL @ 3.43m - March 22, 2019)							

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

○ Water Content %

20 40 60 80

Monitoring Well Construction

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4135

REMARKS

HOLE NO. BH 4-19

BORINGS BY CME 55 Power Auger **DATE** February 27, 2019

SOIL DESCRIPTION	Depth to base (m)	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	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	105.38		
Asphaltic concrete	0.08									
FILL: Brown silty sand, some crushed stone	0.20		AU	1						
FILL: Brown silty clay, trace topsoil	0.60		SS	2	50	50+				
GLACIAL TILL: Dense, brown silty sand with gravel	1.22						1	104.38		
End of Borehole										
Pracical refusal to augering at 1.22m depth										

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4135

REMARKS

HOLE NO. BH 5-19

BORINGS BY CME 55 Power Auger

DATE February 27, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	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	105.40		
Asphaltic concrete 0.10									
FILL: Brown silty sand with crushed stone and gravel 0.99		AU	1						
		SS	2	50	50+				
End of Borehole Pracical refusal to augering at 0.99m depth									

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

REMARKS

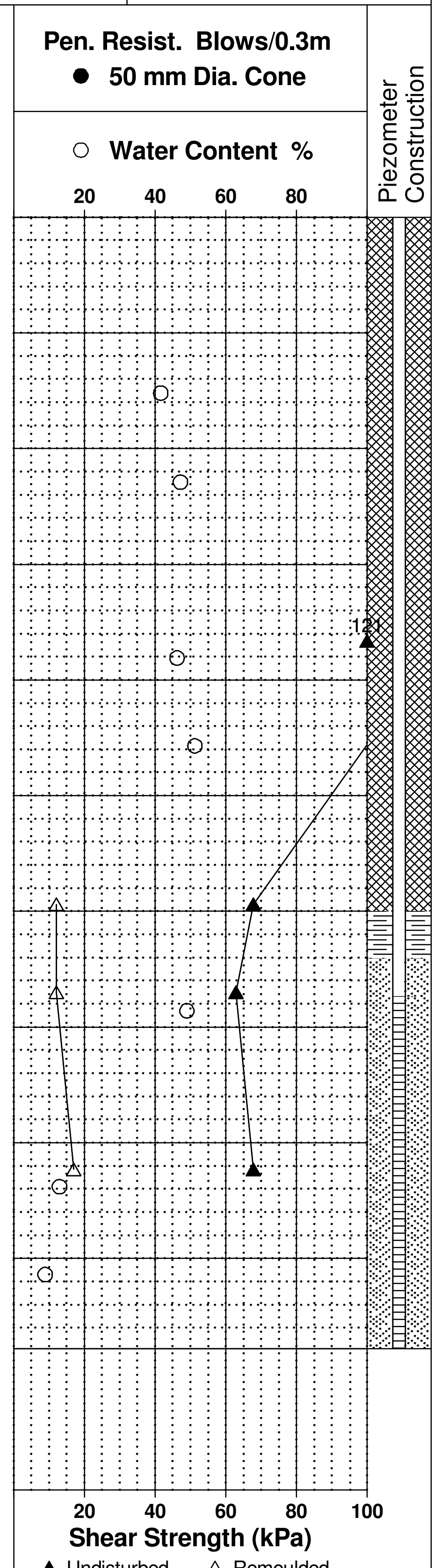
BORINGS BY CME 55 Power Auger

DATE February 26, 2019

FILE NO. PG4135

HOLE NO. BH 6-19

SOIL DESCRIPTION	STRATA PLOT	TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.38
Brown **SILTY CLAY** with topsoil 0.15		AU	1				
		AU	2				
						1	99.38
		SS	3	0	10		
		SS	4	67	9		
						2	98.38
		SS	5	100	7		
Very stiff to stiff, brown **SILTY CLAY**						3	97.38
						4	96.38
		SS	6	100	6		
- grey by 4.6m depth		SS	7	100	1		
						5	95.38
						6	94.38
						7	93.38
		SS	8	100	1		
8.38						8	92.38
GLACIAL TILL: Stiff, grey silty clay with sand, gravel and cobbles, occasional boulders - dense by 9.0m depth - clay content decreasing with depth		SS	9	29	18		
						9	91.38
9.78		SS	10	46	62		
End of Borehole							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4135

REMARKS

HOLE NO. BH 7-19

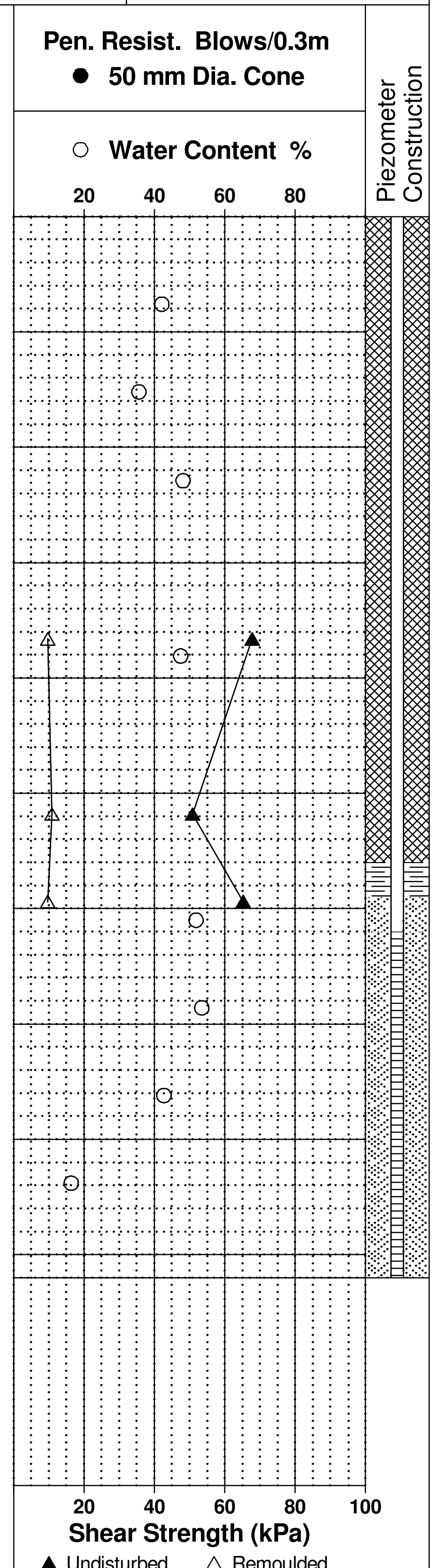
BORINGS BY CME 55 Power Auger **DATE** February 25, 2019

SOIL DESCRIPTION	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	98.48
TOPSOIL and ORGANICS 0.08	AU	1				
FILL: Brown silty clay with topsoil, organics, some sand and gravel 1.22	SS	2	58	6	1	97.48
Very stiff to stiff, brown **SILTY CLAY**	SS	3	75	6	2	96.48
	SS	4	96	4	3	95.48
- grey by 3.5m depth	SS	5	100	2	4	94.48
					5	93.48
	SS	6	100	2	6	92.48
	SS	7	100	1	7	91.48
- trace sand and gravel by 8.5m depth	SS	8	100	2	8	90.48
9.20	SS	9	100	5	9	89.48

End of Borehole

Practical refusal to augering at 9.20m depth

(GWL @



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

REMARKS

BORINGS BY CME 55 Power Auger

DATE February 25, 2019

FILE NO. PG4135

HOLE NO. BH 8-19

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.21
TOPSOIL 0.13		AU	1				
FILL: Brown silty clay with sand, some gravel 1.22		SS	2	54	11	1	97.21
Very stiff to stiff, brown **SILTY CLAY**		SS	3	79	8	2	96.21
		SS	4	100	4	3	95.21
- grey by 3.7m depth		SS	5	100	11	4	94.21
						5	93.21
						6	92.21
6.70		SS	6	100	W		
Grey **CLAYEY SILT,** trace sand and gravel 6.91		SS	7	100	50+		

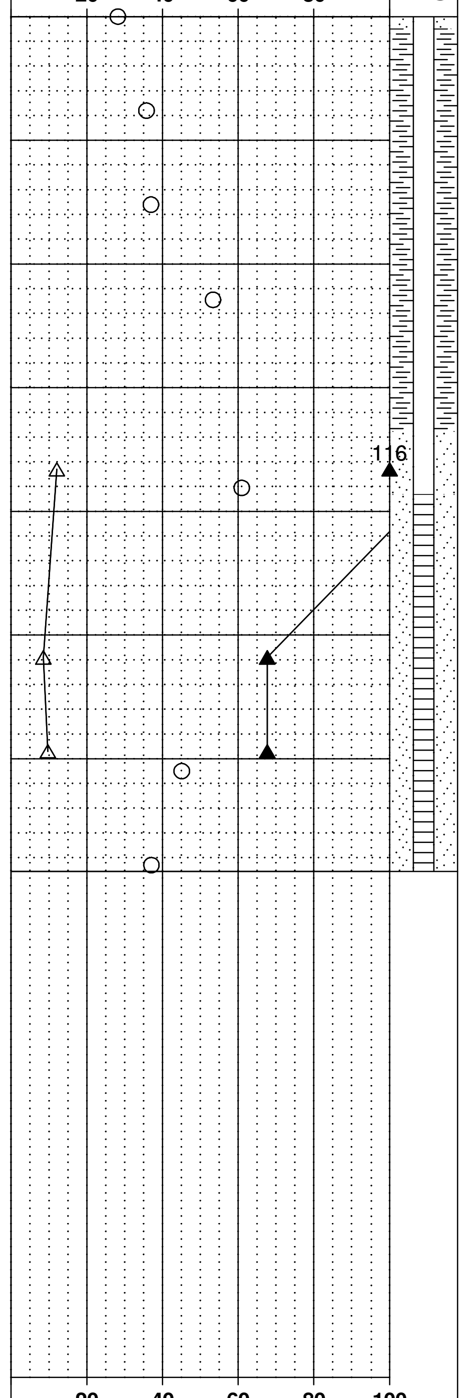
End of Borehole

Pracical refusal to augering at 6.91m depth

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
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

REMARKS

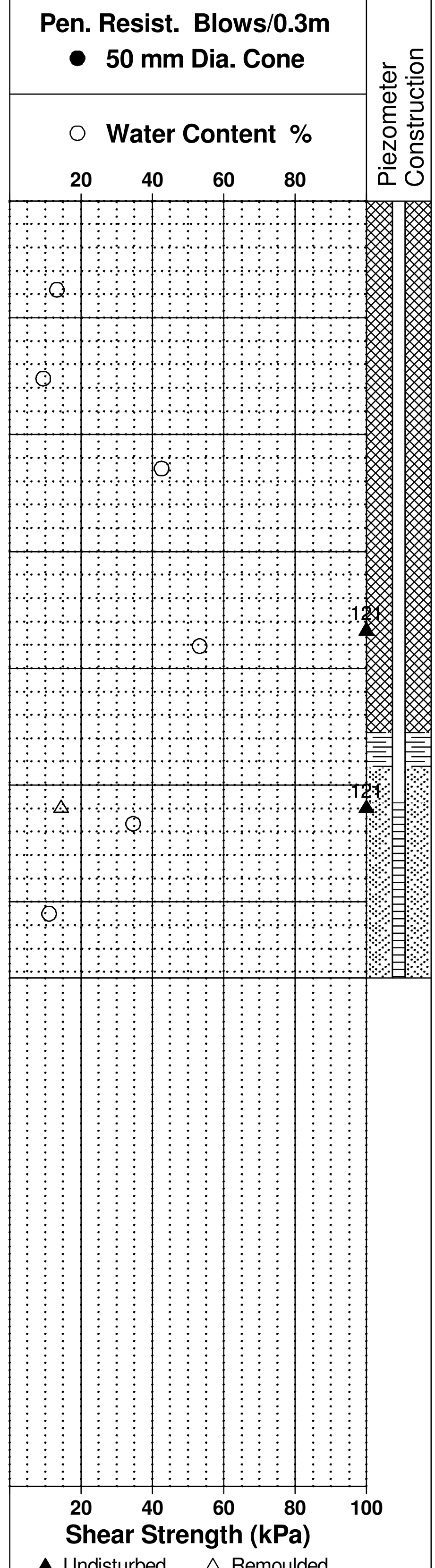
BORINGS BY CME 55 Power Auger

DATE February 27, 2019

FILE NO. PG4135

HOLE NO. BH 9-19

SOIL DESCRIPTION	Depth to base (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	102.21
Brown **SILTY CLAY** with topsoil & organics	0.10	AU	1				
FILL: Brown silty clay, trace topsoil	0.56	AU	2				
FILL: Brown silty sand with clay, gravel and cobbles, occasional boulders - grey by 1.4m depth	2.21	SS	3	71	19	1	101.21
		SS	4	58	28	2	100.21
Very stiff, brown **SILTY CLAY** - grey by 5.2m depth	5.61	SS	5	42	8	3	99.21
		SS	6	100	5	4	98.21
						5	97.21
GLACIAL TILL: Stiff, grey silty clay with sand, trace gravel and cobbles, occasional boulders	6.65	SS	7		23	6	96.21
		SS	8		7		
End of Borehole Pracical refusal to augering at 6.65m depth							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

REMARKS

BORINGS BY CME 55 Power Auger

DATE February 28, 2019

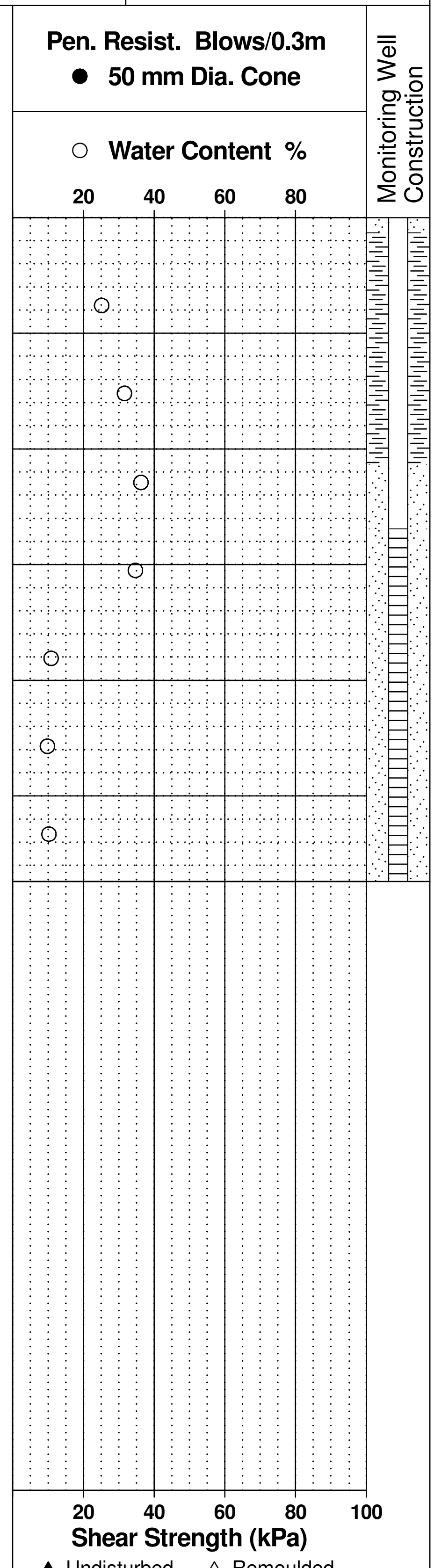
FILE NO. PG4135

HOLE NO. BH10-19

SOIL DESCRIPTION	Depth to base (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.61
TOPSOIL	0.10	AU	1				
FILL: Brown silty clay, trace sand, gravel and topsoil		AU	2				
	1.37	SS	3	42	6	1	99.61
FILL: Brown silty sand, some gravel, topsoil and organics	1.98	SS	4	54	14	2	98.61
Very stiff, brown **SILTY CLAY**		SS	5	75	12	3	97.61
	3.66	SS	6	83	10		
GLACIAL TILL: Compact to dense, brown silty clay with sand and gravel, occasional cobbles and boulders		SS	7	38	20	4	96.61
		SS	8	29	27	5	95.61
	5.74	SS	9	56	30		

End of Borehole

Pracical refusal to augering at 5.74m depth



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

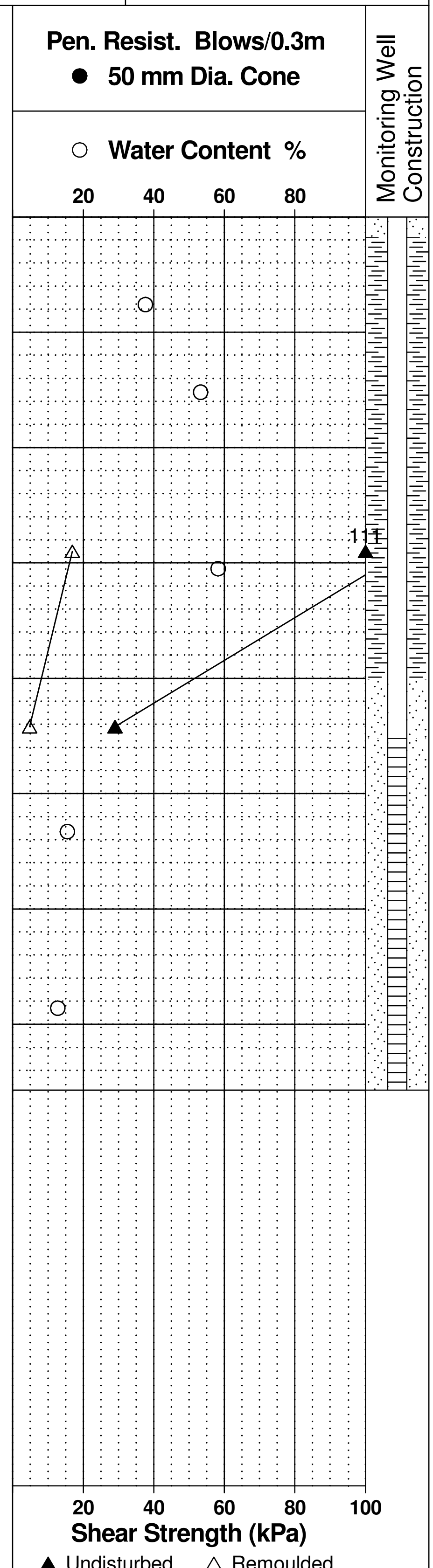
FILE NO. PG4135

REMARKS

HOLE NO. BH11-19

BORINGS BY CME 55 Power Auger **DATE** February 28, 2019

SOIL DESCRIPTION	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	94.64
FILL: Brown silty clay with topsoil, trace sand and organics	AU	1				
	AU	2				
0.56						
Very stiff to stiff, brown **SILTY CLAY**	SS	3	58	8	1	93.64
	SS	4	83	3	2	92.64
- grey by 3.0m depth					3	91.64
	SS	5	100	1		
- firm by 4.0m depth					4	90.64
4.42						
GLACIAL TILL: Grey silty clay/clayey silt, some sand, trace gravel, occasional cobbles and boulders					5	89.64
	SS	6	46	2	6	88.64
- sand and gravel increasing with depth	SS	7	0	9		
	SS	8	38	20	7	87.64
7.57						
End of Borehole						
Pracical refusal to augering at 7.57m depth						



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

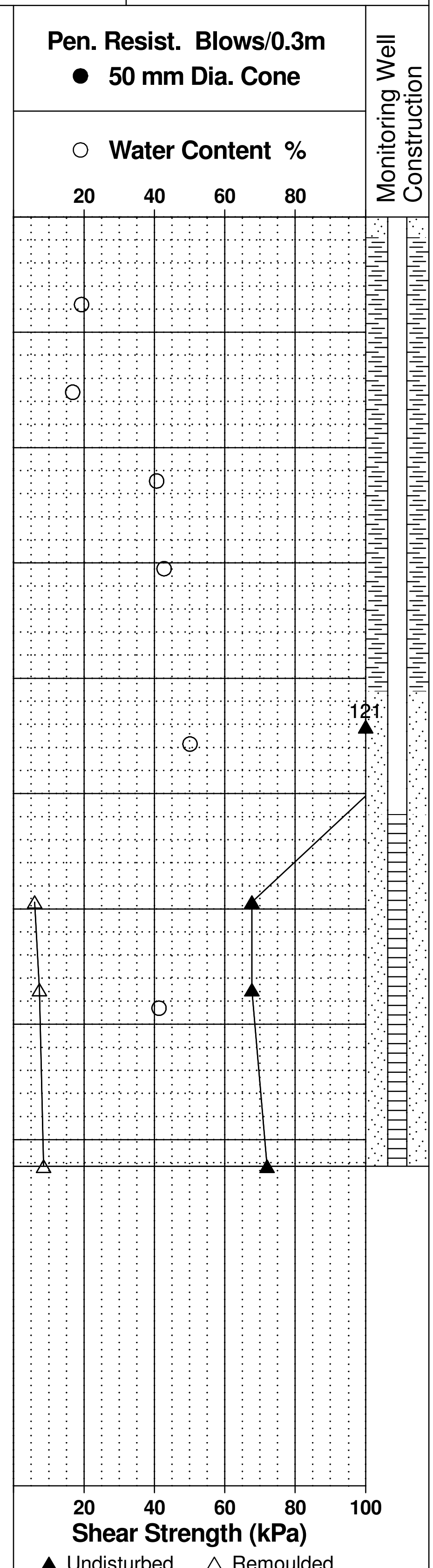
FILE NO. PG4135

REMARKS

HOLE NO. BH12-19

BORINGS BY CME 55 Power Auger **DATE** February 28, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	95.64
FILL: Brown silty clay with sand, trace gravel and topsoil		AU	1				
		AU	2				
		SS	3	33	21	1	94.64
1.22							
Very stiff to stiff, brown **SILTY CLAY** with sand - sand content decreasing with depth - grey by 5.3m depth		SS	4	46	7	2	93.64
		SS	5	96	10	3	92.64
		SS	6	100	7	4	91.64
		SS	7		2	5	90.64
						6	89.64
		SS	8	100	1	7	88.64
						8	87.64
8.23							
End of Borehole							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4135

REMARKS

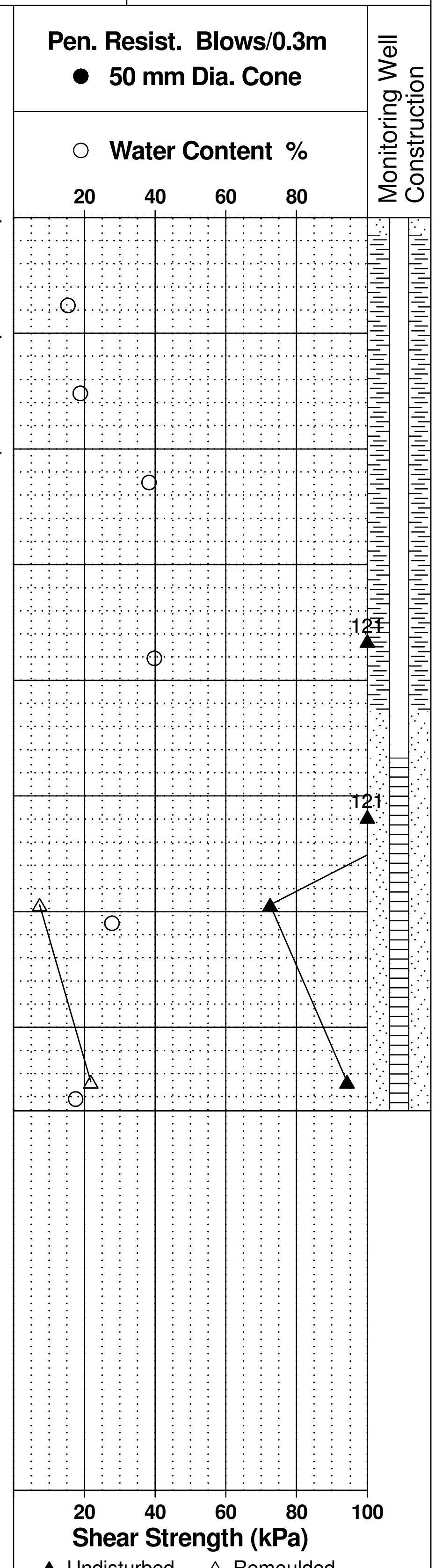
HOLE NO. BH13-19

BORINGS BY CME 55 Power Auger **DATE** March 7, 2019

SOIL DESCRIPTION	Depth (m)
GROUND SURFACE	
FILL: Brown silty sand with topsoil	0.18
FILL: Brown silty clay with sand and topsoil, trace organics	0.60
FILL: Brown silty sand - trace clay by 1.7m depth - some gravel and cobbles by 2.0m depth	2.29
Very stiff to stiff, brown **SILTY CLAY** - grey by 6.1m depth - trace sand and gravel by 7.6m depth	7.72
End of Borehole Pracical refusal to augering at 7.72m depth	

SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
AU	1		
AU	2		
SS	3	38	34
SS	4	50	50+
SS	5	79	8
SS	6	88	5
SS	7	100	1
SS	8	100	50+

DEPTH (m)	ELEV. (m)
0	102.84
1	101.84
2	100.84
3	99.84
4	98.84
5	97.84
6	96.84
7	95.84



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4135

REMARKS

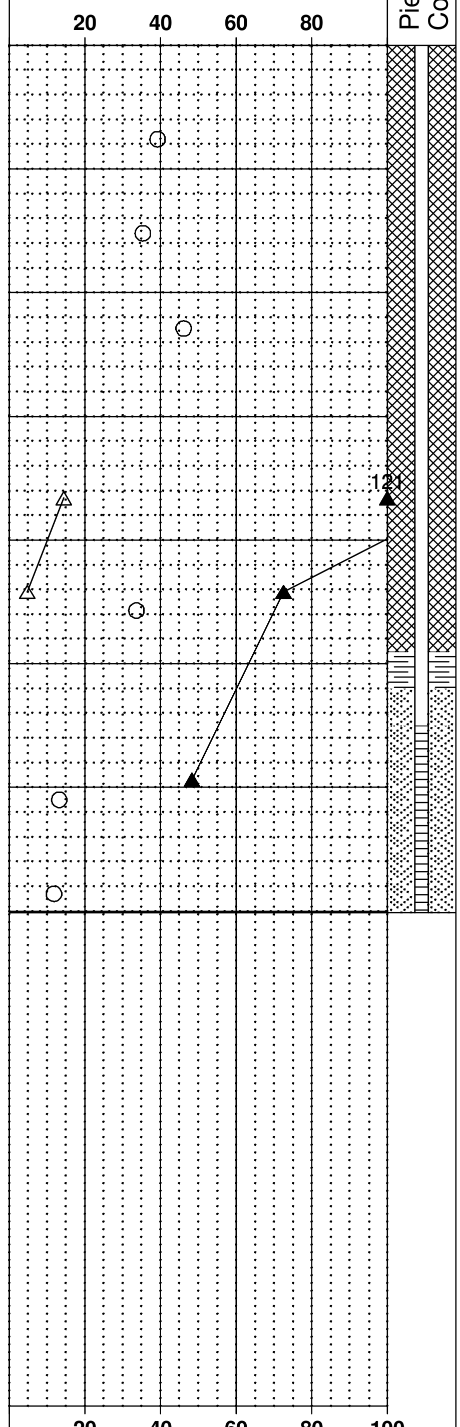
HOLE NO. BH14-19

BORINGS BY CME 55 Power Auger

DATE March 7, 2019

SOIL DESCRIPTION	Strata depth (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.90
FILL: Brown silty clay with topsoil & organics	0.20	AU	1				
FILL: Brown silty clay with sand, some topsoil, trace gravel	0.59	AU	2				
TOPSOIL	0.81	SS	3	88	11	1	99.90
Very stiff to stiff, brown **SILTY CLAY**		SS	4	92	6	2	98.90
		SS	5	100	4	3	97.90
- firm and grey by 4.6m depth						4	96.90
- some sand, trace gravel by 5.2m depth		SS	6	100	1	5	95.90
	6.10					6	94.90
GLACIAL TILL: Grey silty clay with sand and gravel, occ cobbles and boulders		SS	7	33	6		
	7.01	SS	8	100	50+	7	93.90
End of Borehole							
Practical refusal to augering at 7.01m depth							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %



Shear Strength (kPa)
▲ Undisturbed △ Remoulded

Piezometer Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

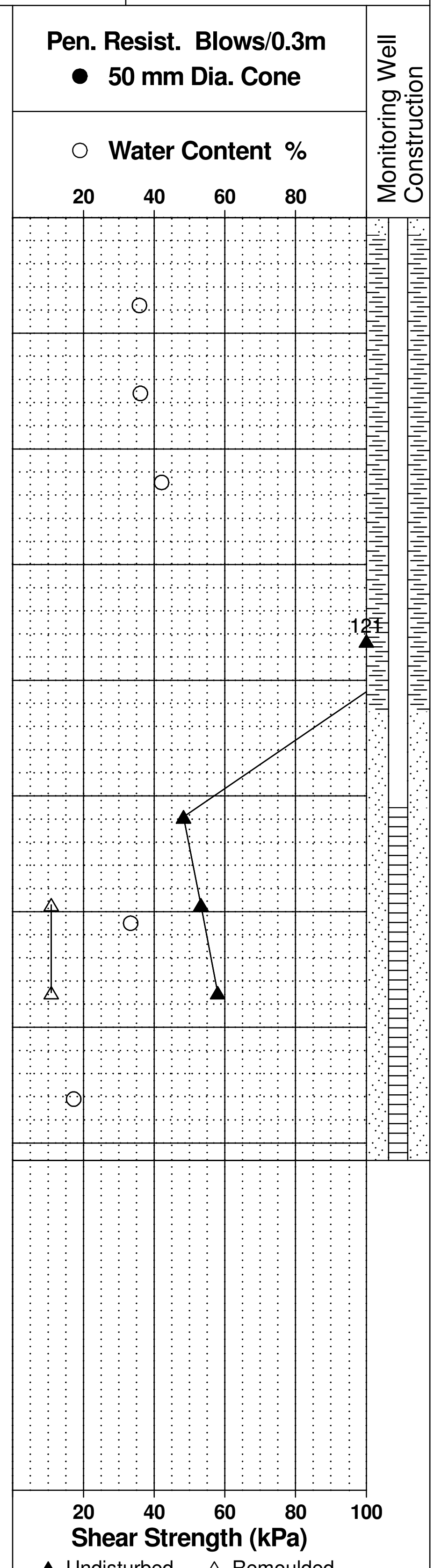
FILE NO. PG4135

REMARKS

HOLE NO. BH15-19

BORINGS BY CME 55 Power Auger **DATE** March 8, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.08
TOPSOIL and brown **SILTY CLAY**, some gravel 0.15		AU	1				
		AU	2				
		SS	3	54	13	1	98.08
		SS	4	100	9	2	97.08
		SS	5	100	4		
Very stiff, brown **SILTY CLAY**						3	96.08
						4	95.08
- firm to stiff and grey by 4.6m depth						5	94.08
						6	93.08
		SS	6	100	1		
- some sand and gravel by 7.6m depth						7	92.08
8.15		SS	7		16	8	91.08
End of Borehole							
Pracical refusal to augering at 8.15m depth							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

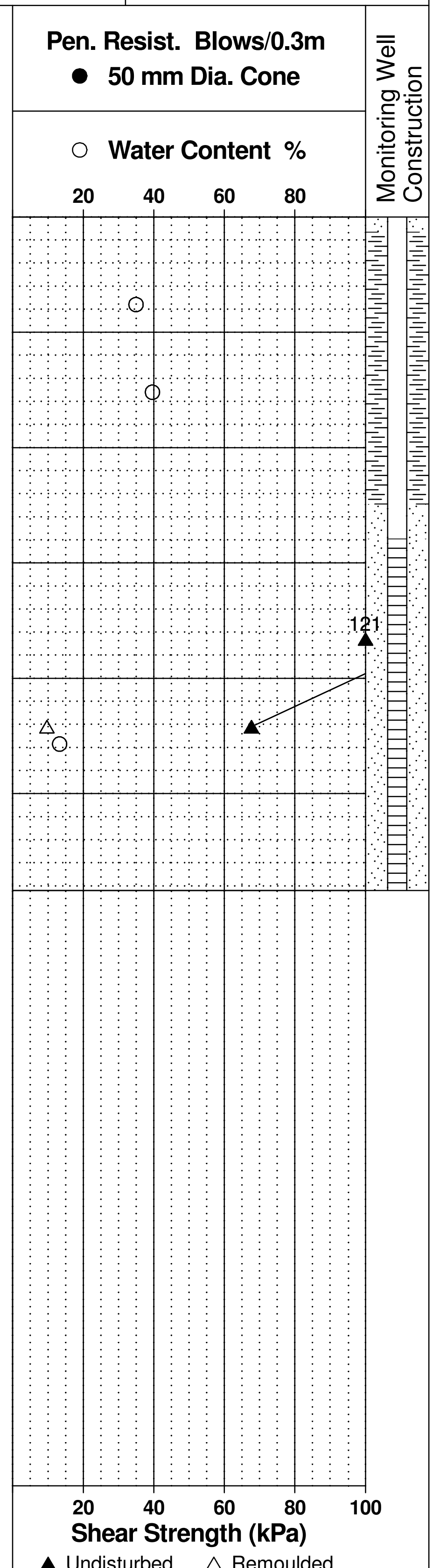
FILE NO. **PG4135**

REMARKS

HOLE NO. **BH16-19**

BORINGS BY CME 55 Power Auger **DATE** March 8, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.31
FILL: Brown silty clay, some topsoil, gravel and organics — 0.15		AU	1				
		AU	2				
FILL: Brown silty sand, some gravel — 1.22		SS	3	100	13	1	96.31
Very stiff to stiff, brown **SILTY CLAY** — 4.57		SS	4	100	8	2	95.31
						3	94.31
						4	93.31
GLACIAL TILL: Grey silty clay with sand and gravel, occasional cobbles and boulders — 5.84		SS	5	42	18	5	92.31
End of Borehole Pracical refusal to augering at 5.84m depth							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

REMARKS

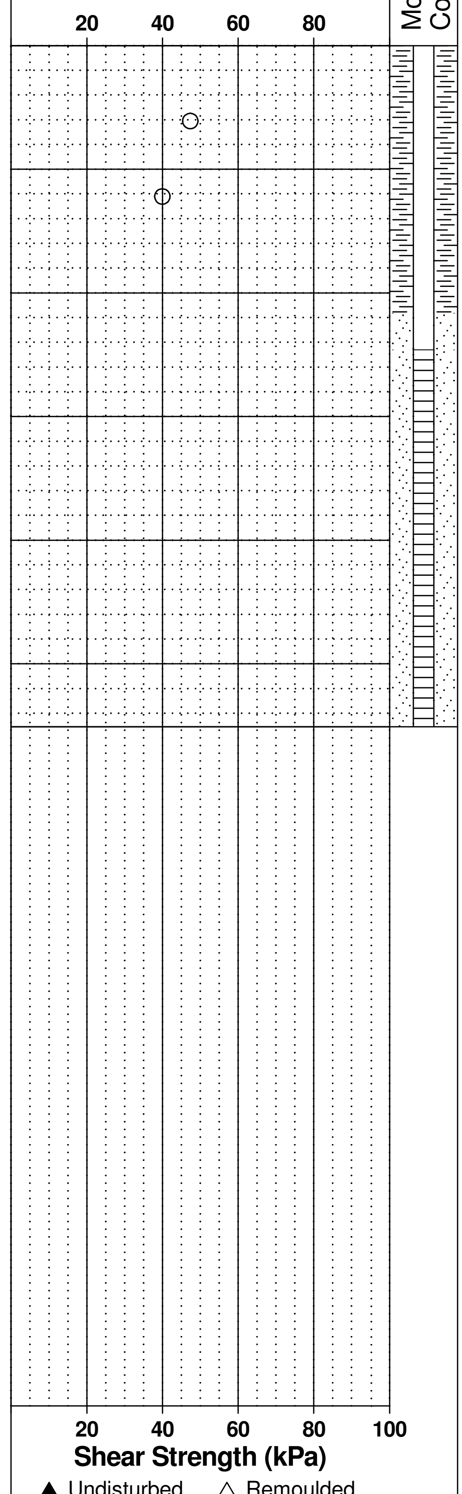
BORINGS BY CME 55 Power Auger

DATE March 13, 2019

FILE NO. PG4135

HOLE NO. BH17-19

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Monitoring Well Construction
GROUND SURFACE						0	97.15		
FILL: Brown silty clay with topsoil and organics		AU	1						
		AU	2						
		SS	3	75	9	1	96.15		
- some sand by 0.9m depth		SS	4	100	13				
1.75									
BEDROCK: Very sound, grey metamorphic gneiss		RC	1	100	100	2	95.15		
		RC	2	100	100	3	94.15		
						4	93.15		
		RC	3	100	100	5	92.15		
5.51									
End of Borehole									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

REMARKS

BORINGS BY CME 55 Power Auger

DATE March 12, 2019

FILE NO. PG4135

HOLE NO. BH18-19

SOIL DESCRIPTION	Depth to base (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.05
Asphaltic concrete	0.10	AU	1				
FILL: Brown silty sand with gravel and crushed stone	0.59	AU	2				
BEDROCK: Fractured to very sound, grey metamorphic gneiss - vertical seam from 2.5 to 3.0m depth	5.51	RC	1	100	79	1	98.05
		RC	2	100	95	2	97.05
		RC	3	100	58	3	96.05
						4	95.05
		RC	4	100	100	5	94.05
End of Borehole							

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

○ Water Content %

20 40 60 80

Monitoring Well Construction

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4135

REMARKS

HOLE NO. BH19-19

BORINGS BY CME 55 Power Auger

DATE March 12, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	96.57
TOPSOIL 0.15		AU	1				
FILL: Brown to grey silty clay, some sand and gravel, trace topsoil and organics		AU	2				
		SS	3	62	12	1	95.57
2.21		SS	4	12	20	2	94.57
Peat, topsoil and wood		SS	5	100	50+		
3.12		SS	6	67	50+	3	93.57
BEDROCK: Sound to very sound, grey to red metamorphic gneiss		RC	1	100	88	4	92.57
		RC	2	100	100	5	91.57
6.83		RC	3	100	98	6	90.57
End of Borehole							

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

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Lakes Golf & Country Club
Campeau Drive, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

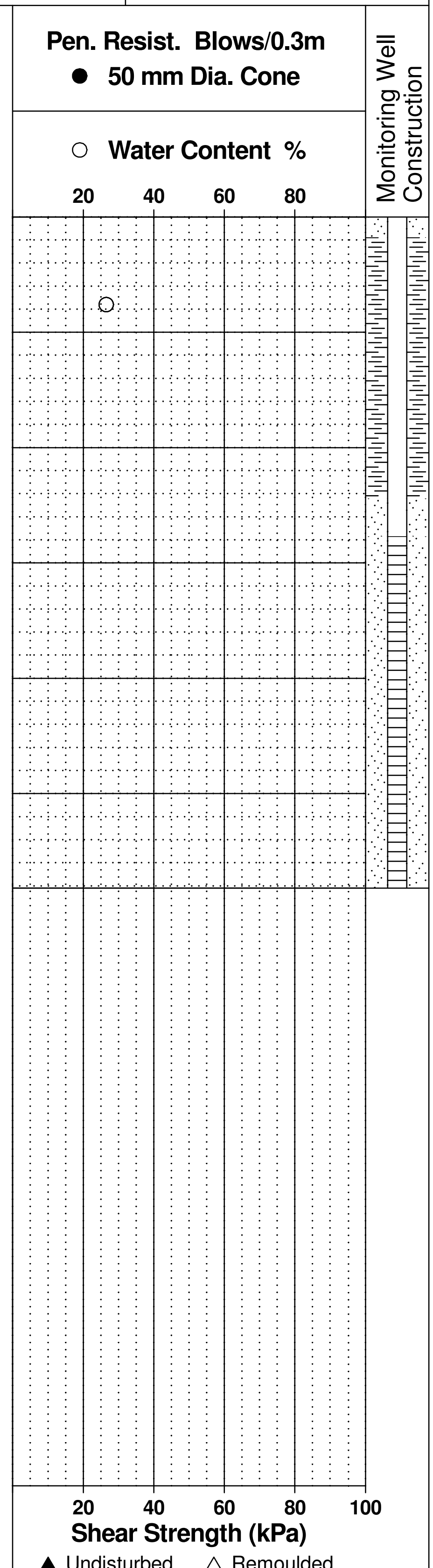
FILE NO. PG4135

REMARKS

HOLE NO. BH20-19

BORINGS BY CME 55 Power Auger **DATE** March 13, 2019

SOIL DESCRIPTION	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	97.58
FILL: Brown silty clay, some sand, gravel, topsoil and organics (to 0.46)	AU	1				
	AU	2				
Very stiff, brown **SILTY CLAY** - some gravel and trace sand by 0.9m depth (to 1.75)	SS	3	75	16	1	96.58
	SS	4	62	50+		
BEDROCK: Very sound, grey metamorphic gneiss (to 5.82)	RC	1	100	98	2	95.58
	RC	2	100	95	3	94.58
					4	93.58
	RC	3	100	96	5	92.58
End of Borehole						



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Golf and Country Club - 7000 Campeau Drive
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger

DATE December 12, 2017

FILE NO. PG4135

HOLE NO. BH 1

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	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			
TOPSOIL 0.30		AU	1						
FILL: Brown silty clay, some sand, trace gravel		SS	2	33	4	1			
1.60									
GLACIAL TILL: Brown silty sand, some gravel, trace clay and cobbles		SS	3	58	20	2			
2.49		SS	4	40	50+				
End of Borehole Practical refusal to augering at 2.49m depth (BH dry upon completion)									

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Golf and Country Club - 7000 Campeau Drive
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger

DATE December 11, 2017

FILE NO. PG4135

HOLE NO. BH 2

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	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			
TOPSOIL 0.15									
FILL: Brown silty clay, some sand		SS	1	83	11	1			
		SS	2	75	7	2			
2.29									
End of Borehole Practical refusal to augering at 2.29m depth (BH dry upon completion)									

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Golf and Country Club - 7000 Campeau Drive
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger **DATE** December 11, 2017

FILE NO. PG4135

HOLE NO. BH 3

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	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			
TOPSOIL 0.20									
GLACIAL TILL: Brown silty clay, some sand, trace gravel		SS	1	58	7	1			
		SS	2		2	2			∇
2.34									

End of Borehole

Practical refusal to augering at 2.34m depth

(GWL @ 2.0m depth based on field observations)

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Golf and Country Club - 7000 Campeau Drive
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger

DATE December 12, 2017

FILE NO. PG4135

HOLE NO. BH 4

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			
TOPSOIL 0.18		AU	1						
FILL: Brown silty sand, trace gravel, clay and cobbles 1.32		SS	2	71	50+	1			
End of Borehole Practical refusal to augering at 1.32m depth (BH dry upon completion)									

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Golf and Country Club - 7000 Campeau Drive
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REMARKS

BORINGS BY CME 55 Power Auger **DATE** December 12, 2017

FILE NO. PG4135

HOLE NO. BH 5

SOIL DESCRIPTION	Depth to base (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Monitoring Well Construction
GROUND SURFACE						0			
TOPSOIL	0.10								
FILL: Topsoil with organics, wood fragments, trace clay	1.22	AU	1						
		SS	2	46	3	1			
Brown **SILTY CLAY,** trace sand	2.44	SS	3	100	6	2			
GLACIAL TILL: Brown silty clay, trace sand, gravel, cobbles and boulders	4.57	SS	4	100	P			▲ 249	
		SS	5	100	1	3			
		SS	6	58	29	4			

End of Borehole

Practical refusal to augering at 4.57m depth

(BH dry upon completion)

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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REMARKS

BORINGS BY CME 55 Power Auger

DATE December 12, 2017

FILE NO. PG4135

HOLE NO. BH 6

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			
TOPSOIL 0.30									
GLACIAL TILL: Brown silty sand, gravel and cobbles 0.74									
End of Borehole Practical refusal to augering at 0.74m depth (BH dry upon completion)									

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

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REMARKS

BORINGS BY CME 55 Power Auger

DATE December 11, 2017

FILE NO. PG4135

HOLE NO. BH 7

SOIL DESCRIPTION	Depth to base (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE					
TOPSOIL	0.20				
Very stiff, brown **SILTY CLAY**	2.74	SS	1	83	9
		SS	2	100	6
GLACIAL TILL: Brown silty clay, some sand, gravel, cobbles and boulders	4.98	SS	3	100	6
		SS	4	100	4

End of Borehole

Practical refusal to augering at 4.98m depth

(BH dry upon completion)

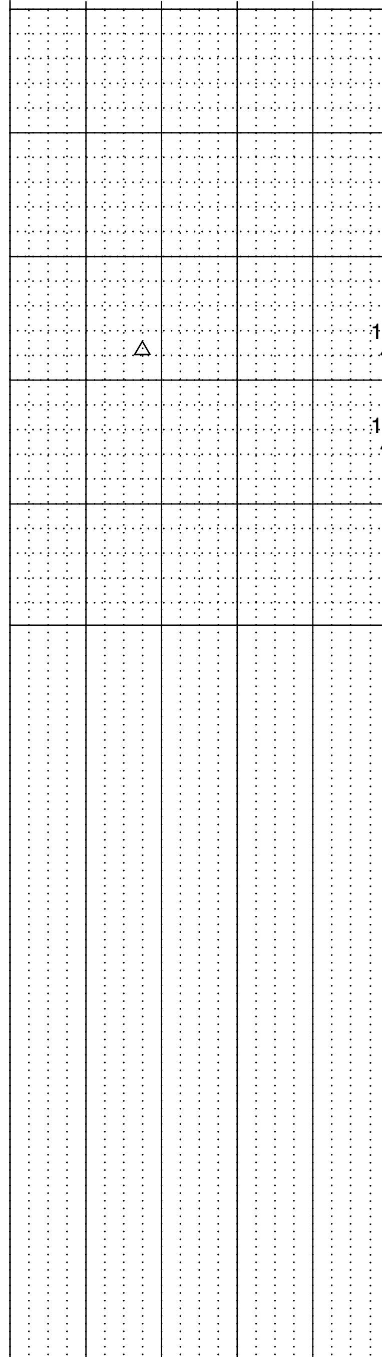
DEPTH (m): 0, 1, 2, 3, 4

ELEV. (m)

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

Monitoring Well Construction

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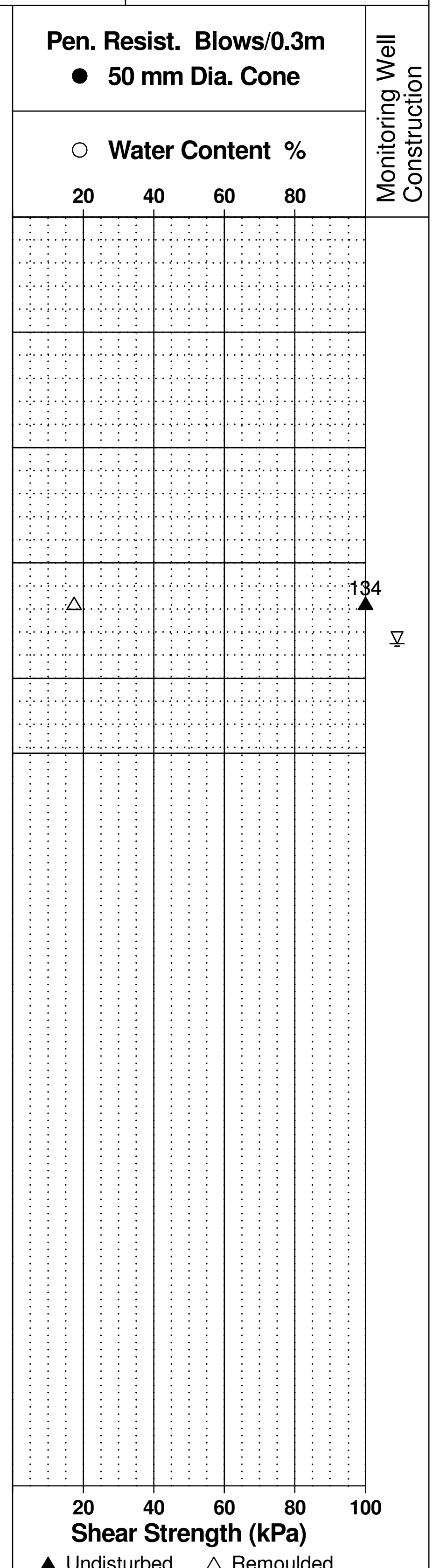
BORINGS BY CME 55 Power Auger

DATE December 12, 2017

FILE NO. PG4135

HOLE NO. BH 8

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL 0.18							
FILL: Brown silty sand with gravel, cobbles and boulders 0.91		AU	1				
Very stiff, brown **SILTY CLAY,** some sand		SS	2	42	10	1	
		SS	3	100	9	2	
		SS	4		4	3	
3.58							
GLACIAL TILL: Brown silty clay, some sand, trace gravel, cobbles, boulders		SS	5	100	P	4	
4.65		SS	6	100	50+		
End of Borehole							
Practical refusal to augering at 4.65m depth							
(GWL @ 3.7m depth based on field observations)							



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BORINGS BY CME 55 Power Auger **DATE** December 12, 2017

FILE NO. PG4135

HOLE NO. BH 9

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			
TOPSOIL 0.46		AU	1						
GLACIAL TILL: Brown silty clay, some sand and gravel 0.71									
End of Borehole Practical refusal to augering at 0.71m depth (BH dry upon completion)									

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

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BORINGS BY CME 55 Power Auger

DATE December 7, 2017

FILE NO. PG4135

HOLE NO. BH10

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Monitoring Well Construction
GROUND SURFACE						0			
TOPSOIL 0.18		AU	1						
GLACIAL TILL: Brown silty clay, some sand and gravel		SS	2	83	6	1			
		SS	3	58	8	2			
2.21									
End of Borehole Practical refusal to augering at 2.21m depth (BH dry upon completion)									

Water Content % axis: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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BORINGS BY CME 55 Power Auger

DATE December 7, 2017

FILE NO. PG4135

HOLE NO. BH11

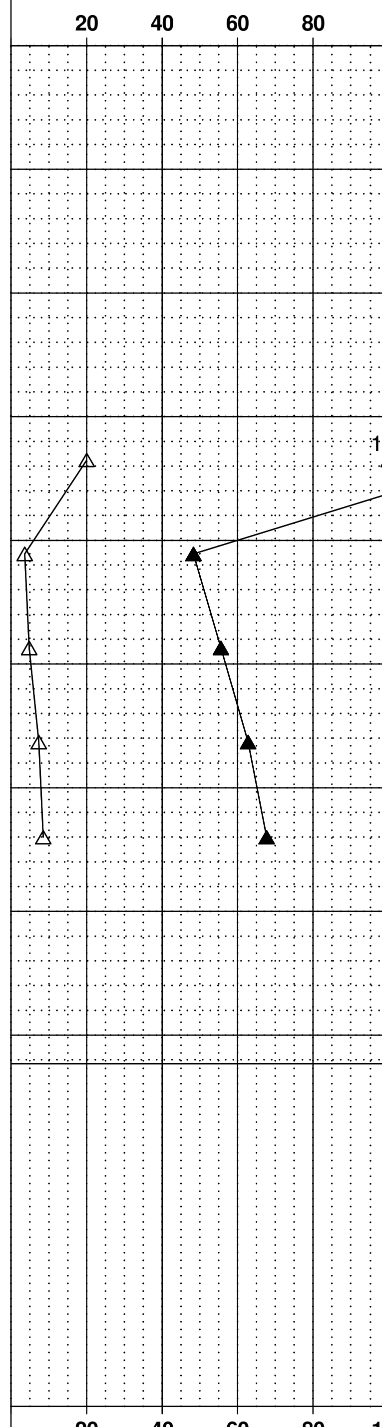
SOIL DESCRIPTION	Depth to base (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL	0.23	AU	1				
Very stiff to stiff, brown **SILTY CLAY,** trace to some sand, trace gravel		SS	2	71	12	1	
		SS	3	100	9	2	
		SS	4	100	6		
		SS	5	100	P	3	
		SS	6	100	P	4	
		SS	7	100	P	5	
		SS	8	100	P	6	
	6.63	SS	9	100	P		
GLACIAL TILL: Grey silty clay, some sand and gravel, trace cobbles						7	
	8.23	SS	10	42	2	8	

End of Borehole

(GWL @ 3.8m depth based on field observations)

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

○ Water Content %



Shear Strength (kPa)
▲ Undisturbed △ Remoulded

Monitoring Well Construction

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BORINGS BY CME 55 Power Auger

DATE December 7, 2017

FILE NO. PG4135

HOLE NO. BH12

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Monitoring Well Construction
GROUND SURFACE						0			
TOPSOIL 0.20									
GLACIAL TILL: Brown silty clay, some sand and gravel		SS	1	83	9	1			
		SS	2		50+				
1.98									
End of Borehole									
Practical refusal to augering at 1.98m depth									
(BH dry upon completion)									

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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BORINGS BY CME 55 Power Auger

DATE December 8, 2017

FILE NO. PG4135

HOLE NO. BH13

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	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			
TOPSOIL 0.36		AU	1						
GLACIAL TILL: Brown silty clay, some sand, gravel, cobbles and boulders		SS	2	46	17	1			
		SS	3	57	50+				
2.19						2			
End of Borehole Practical refusal to augering at 2.19m depth (BH dry upon completion)									

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

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BORINGS BY CME 55 Power Auger

DATE December 7, 2017

FILE NO. PG4135

HOLE NO. BH14

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Monitoring Well Construction
GROUND SURFACE						0			
TOPSOIL 0.20		AU	1						
GLACIAL TILL: Brown silty clay, some sand, gravel, cobbles and boulders 1.58		SS	2	50	14	1			
End of Borehole Practical refusal to augering at 1.58m depth (BH dry upon completion)									

Water Content % axis: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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BORINGS BY CME 55 Power Auger

DATE December 6, 2017

FILE NO. PG4135

HOLE NO. BH15

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Monitoring Well Construction
GROUND SURFACE						0			
TOPSOIL 0.15		AU	1						
FILL: Brown silty sand, some gravel and cobbles, trace clay		SS	2	21	25	1			
		SS	3	0	3	2			
		SS	4	42	3	3			
3.33		SS	5	100	50+				

End of Borehole

Practical refusal to augering at 3.33m depth

(GWL @ 2.2m depth based on field observations)

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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BORINGS BY CME 55 Power Auger

DATE December 11, 2017

FILE NO. PG4135

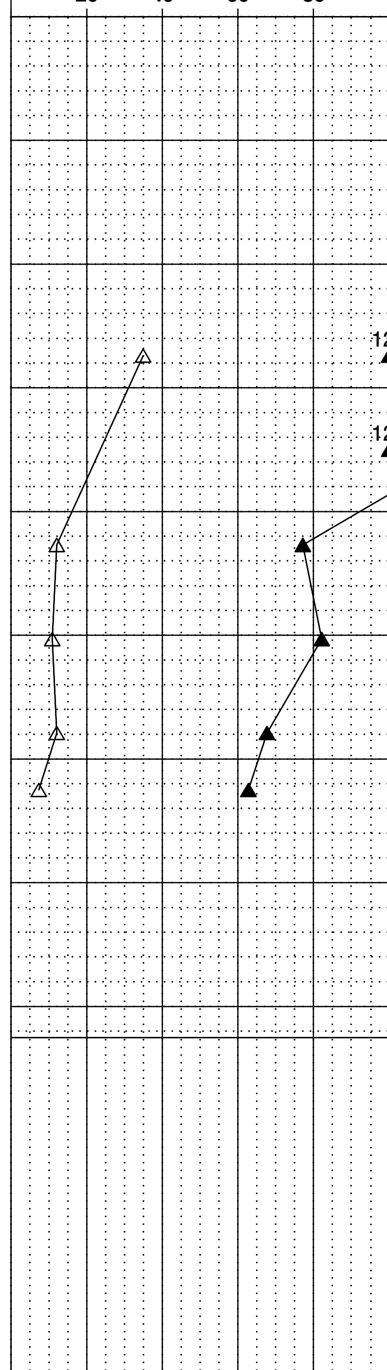
HOLE NO. BH16

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL 0.25							
		SS	1	100	6	1	
		SS	2	100	6	2	
Very stiff to stiff, brown **SILTY CLAY,** trace sand and gravel - grey by 3.5m depth						3, 4, 5, 6, 7, 8	
8.23							
Dynamic Cone Penetration Test commenced at 8.23m depth. 8.25			7 100				
End of Borehole Practical DCPT refusal at 8.25m depth (BH dry upon completion)							

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

Monitoring Well Construction

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DATE December 7, 2017

FILE NO. PG4135

HOLE NO. BH17

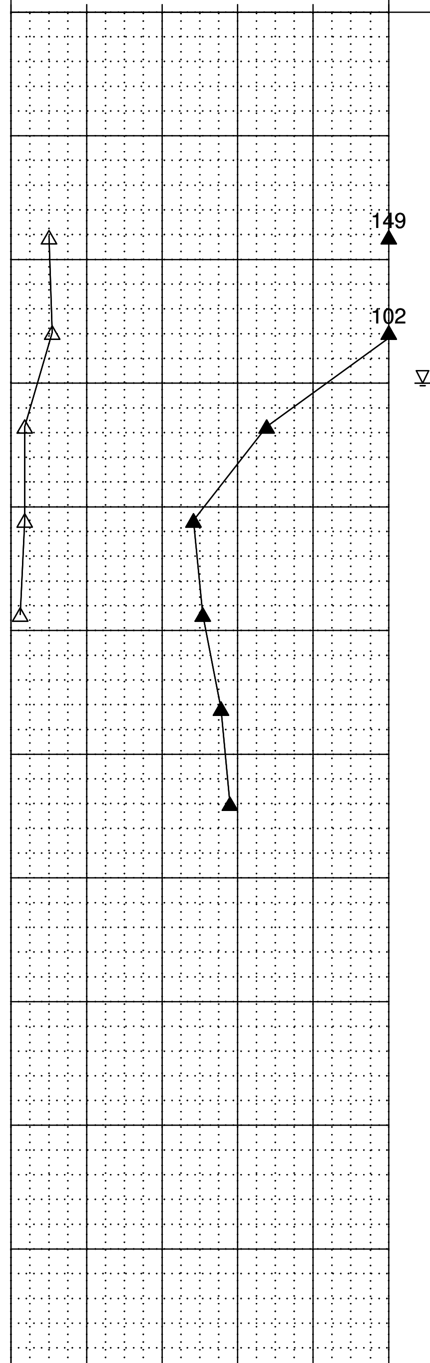
SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL 0.20		AU	1				
Very stiff to stiff, brown **SILTY CLAY,** trace sand - grey by 3.0m depth		SS	2	50	4	1	
		SS	3	58	P	2	
		SS	4	83	P	3	
		SS	5	92	P		
		SS	6	100	P	4	
		SS	7	100	P	5	
		SS	8	100	P	6	
6.70		SS	9	100	P		
Dynamic Cone Penetration Test commenced at 6.70m depth. Cone pushed to 11.4m depth.						7	
						8	
						9	
						10	
						11	

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

○ Water Content %

20 40 60 80

Monitoring Well Construction



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

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FILE NO. PG4135

HOLE NO. BH17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	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						11			
11.58									
End of Borehole Practical DCPT refusal at 11.58m depth (GWL @ 3.0m depth based on field observations)									

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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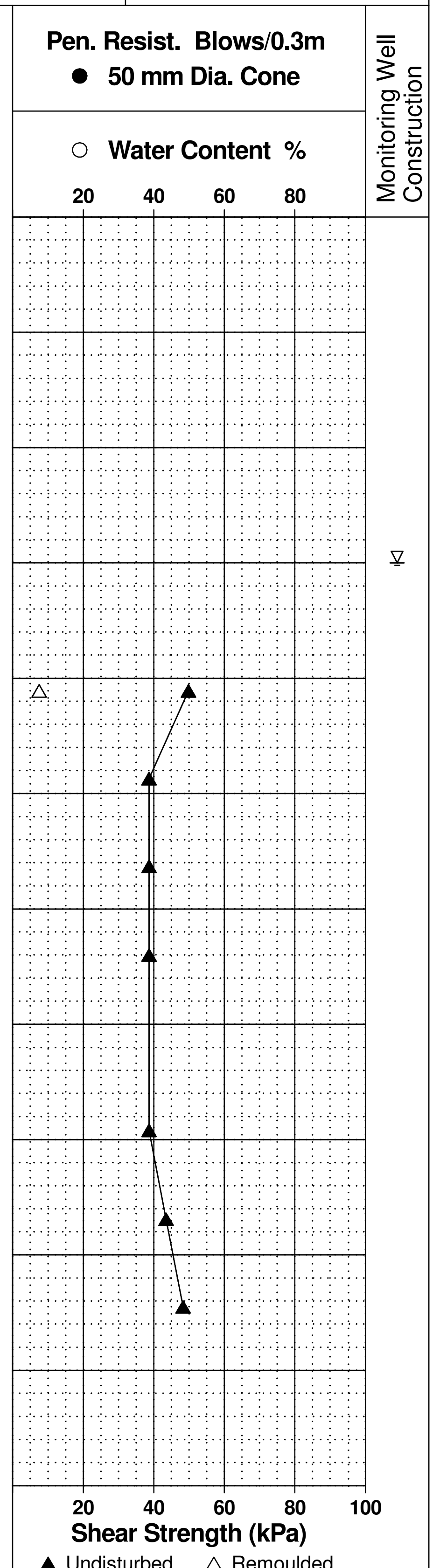
BORINGS BY CME 55 Power Auger **DATE** December 6, 2017

FILE NO. PG4135

HOLE NO. BH18

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL — 0.18		AU	1				
FILL: Brown silty clay, trace sand, gravel, cobbles — 1.45		SS	2	42	7	1	
TOPSOIL — 1.83		SS	3	83	13	2	
Firm, brown SILTY CLAY, trace sand and gravel - grey by 4.6m depth — 9.45		SS	4	83	8	3	
		SS	5	100	2	4	
		SS	6	83	P	5	
		SS	7	83	P	6	
		SS	8	100	P	7	
		SS	9	100	P	8	
		SS	10	100	P	9	
Dynamic Cone Penetration Test commenced at 9.45m depth, pushed to 14.2m depth.						10	
						11	



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DATE December 6, 2017

FILE NO. PG4135

HOLE NO. BH18

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						11			
						12			
						13			
						14			
14.27									
End of Borehole Practical DCPT refusal at 14.27m depth (GWL @ 3.0m depth based on field observations)									

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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BORINGS BY CME 55 Power Auger

DATE December 12, 2017

FILE NO. PG4135

HOLE NO. BH19

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Monitoring Well Construction
GROUND SURFACE						0			
TOPSOIL 0.28		AU	1						
FILL: Brown silty sand, some organics, trace gravel 1.45		SS	2	33	7	1			
GLACIAL TILL: Brown silty clay, some sand, with gravel, cobbles and boulders 2.95		SS	3	83	7	2			
		SS	4	54	29				▽

End of Borehole

Practical refusal to augering at 2.95m depth

(GWL @ 2.3m depth based on field observations)

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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BORINGS BY CME 55 Power Auger

DATE December 8, 2017

FILE NO. PG4135

HOLE NO. BH20

SOIL DESCRIPTION	Depth to base (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE					
TOPSOIL	0.25	AU	1		
Very stiff to stiff, brown **SILTY CLAY,** trace sand - grey by 3.0m depth	6.40	SS	2	50	4
			3	100	P
		SS	4	100	P
		SS	5	100	P
		SS	6	100	P
		SS	7	100	P

End of Borehole

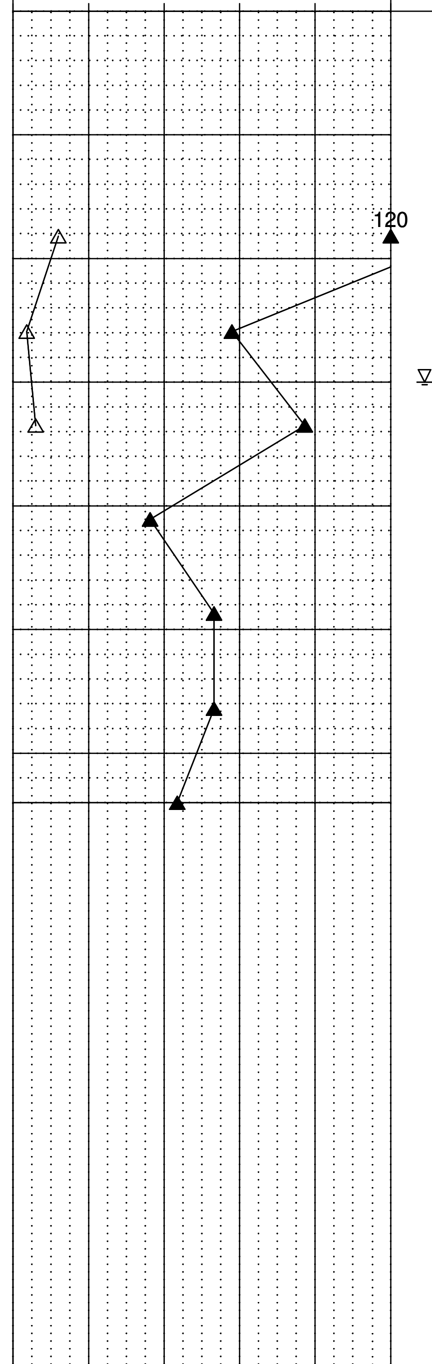
(GWL @ 3.0m depth based on field observations)

DEPTH (m): 0, 1, 2, 3, 4, 5, 6

ELEV. (m)

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

Monitoring Well Construction

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BORINGS BY CME 55 Power Auger

DATE December 6, 2017

FILE NO. PG4135

HOLE NO. BH21

SOIL DESCRIPTION	Depth to base (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL	0.20	AU	1				
Stiff, brown **SILTY CLAY,** trace sand		SS	2	100	9	1	
	2.03	SS	3	100	8	2	
GLACIAL TILL: Brown silty clay, some sand, with gravel, cobbles and boulders		SS	4	100	5		
	3.86	SS	5	54	5	3	

End of Borehole

Practical refusal to augering at 3.86m depth

(GWL @ 3.0m depth based on field observations)

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

○ Water Content %

20 40 60 80

Monitoring Well Construction

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

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BORINGS BY CME 55 Power Auger

DATE December 8, 2017

FILE NO. PG4135

HOLE NO. BH22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	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			
TOPSOIL 0.13									
FILL: Brown silty sand, some gravel, cobbles, trace clay 0.53		AU	1						
End of Borehole Practical refusal to augering at 0.53m depth (BH dry upon completion)									

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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BORINGS BY CME 55 Power Auger **DATE** December 12, 2017

FILE NO. PG4135

HOLE NO. BH23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Monitoring Well Construction
GROUND SURFACE						0			
TOPSOIL 0.33		AU	1						
Very stiff to stiff, brown **SILTY CLAY,** trace sand and gravel		SS	2	42	9	1			
		SS	3	100	5	2			
								139	
3.73		SS	4	100		3			
Compact, brown **SILTY SAND** 4.50		SS	5	50	10	4			
GLACIAL TILL: Compact, brown silty sand, some gravel, trace cobbles and boulders 5.18		SS	6	50	13	5			
End of Borehole (GWL @ 2.1m depth based on field observations)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Golf and Country Club - 7000 Campeau Drive
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger

DATE December 8, 2017

FILE NO. **PG4135**

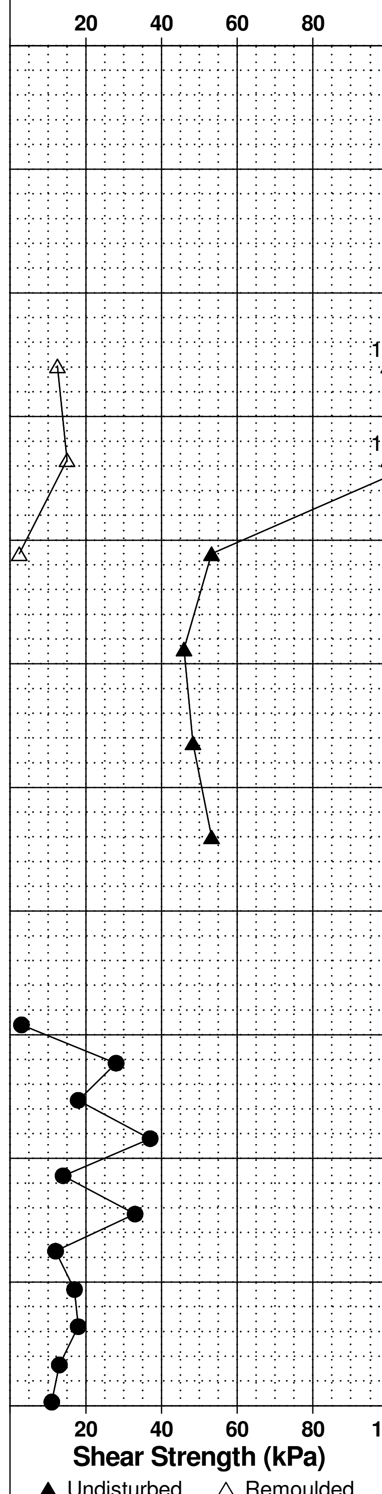
HOLE NO. **BH24**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOI 0.33		AU	1				
		SS	2	83	9	1	
		SS	3	92	4	2	
Very stiff to stiff, brown **SILTY CLAY,** some sand - firm to stiff and grey by 3.8m depth						3 4 5 6	
6.40							
Dynamic Cone Penetration Test commenced at 6.40m depth, pushed to 7.7m depth.						7 8 9 10 11	

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

○ Water Content %

Monitoring Well Construction



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Geotechnical Investigation
Kanata Golf and Country Club - 7000 Campeau Drive
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DATUM

REMARKS

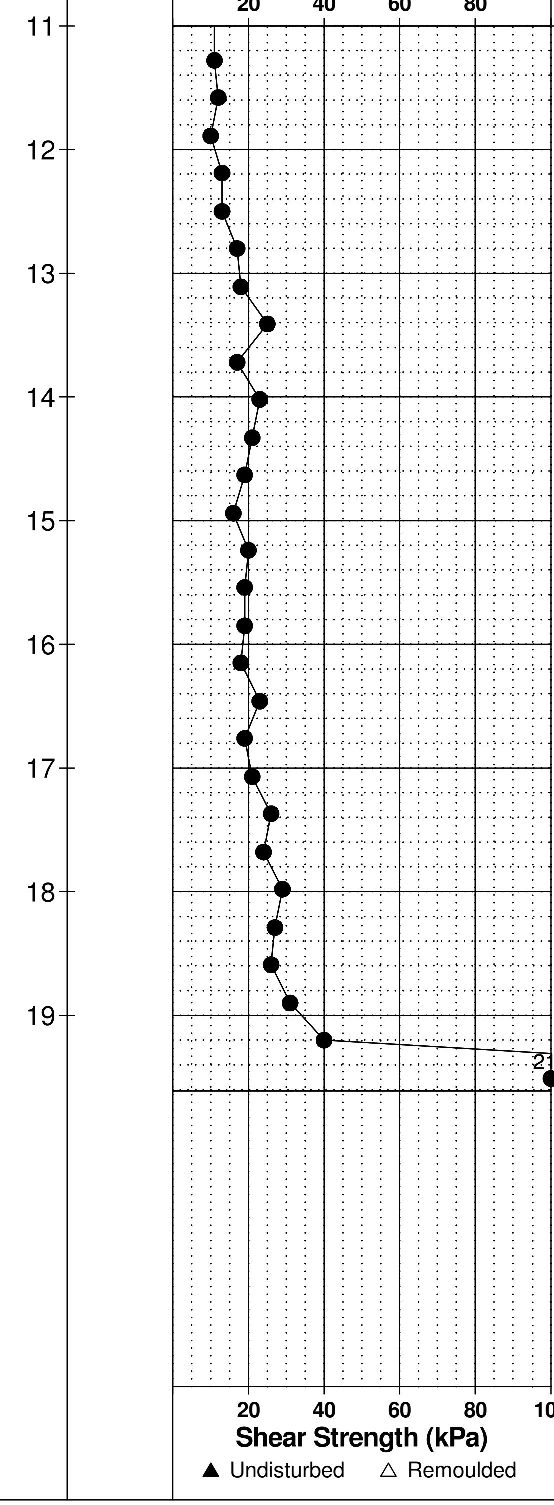
BORINGS BY CME 55 Power Auger

DATE December 8, 2017

FILE NO. PG4135

HOLE NO. BH24

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 %	Monitoring Well Construction
GROUND SURFACE									
						11 – 19			
19.61 End of Borehole									
(GWL @ 3.8m depth based on field observations)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Golf and Country Club - 7000 Campeau Drive
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger

DATE December 6, 2017

FILE NO. PG4135

HOLE NO. BH25

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	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			
TOPSOIL 0.23									
GLACIAL TILL: Brown silty sand, some clay, trace gravel, cobbles 0.61		AU	1						
End of Borehole Practical refusal to augering at 0.61m depth (BH dry upon completion)									

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

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Golf and Country Club - 7000 Campeau Drive
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger

DATE December 6, 2017

FILE NO. PG4135

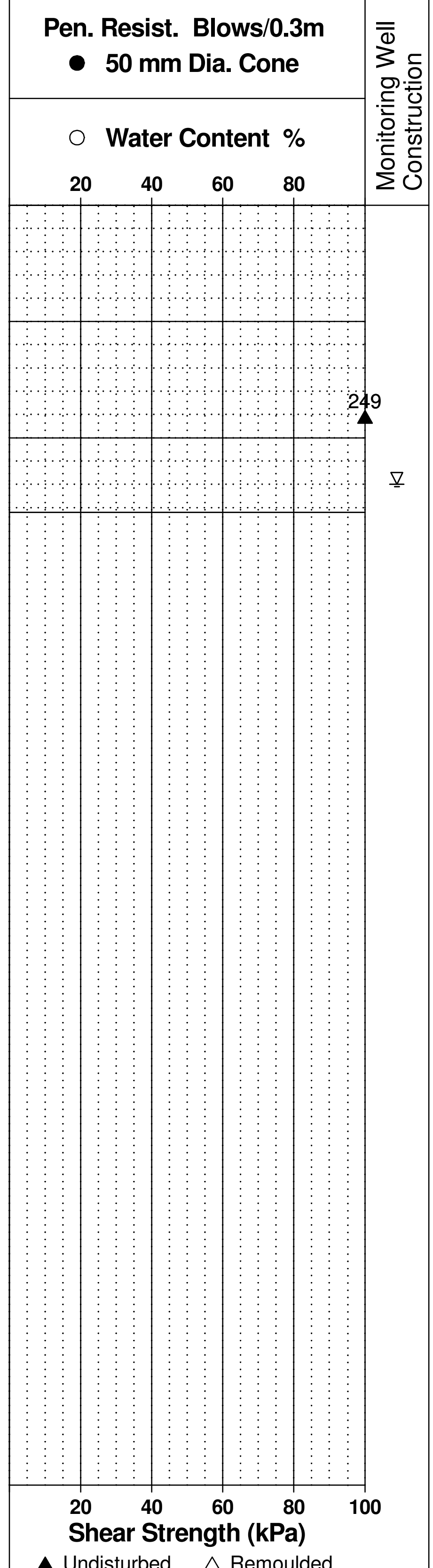
HOLE NO. BH26

SOIL DESCRIPTION	Depth to layer base (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL	0.20	AU	1				
FILL: Brown silty clay, some sand and gravel	0.36						
Hard, brown **SILTY CLAY,** trace sand		SS	2	67	5	1	
		SS	3	71	P	2	
	2.44	SS	4	30	50+		
GLACIAL TILL: Brown silty clay, some sand, gravel, trace cobbles and boudlers	2.64						

End of Borehole

Practical refusal to augering at 2.64m depth

(GWL @ 2.4m depth based on field observations)



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Golf and Country Club - 7000 Campeau Drive
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger

DATE December 6, 2017

FILE NO. PG4135

HOLE NO. BH27

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Monitoring Well Construction
GROUND SURFACE						0		20 40 60 80	
TOPSOIL 0.18		AU	1						
GLACIAL TILL: Brown silty clay, some sand, gravel, cobbles		SS	2	58	7	1			
1.52									▽
End of Borehole Practical refusal to augering at 1.52m depth (GWL @ 1.4m depth based on field observations)									

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Golf and Country Club - 7000 Campeau Drive
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger

DATE December 6, 2017

FILE NO. PG4135

HOLE NO. BH28

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	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			
TOPSOIL 0.30		AU	1						
GLACIAL TILL: Brown silty sand, some gravel, cobbles, boulders		SS	2	87	39	1			
1.96		SS	3	71	50+				
Weathered **BEDROCK**		SS	4	100	50+	2			
2.87									
End of Borehole									
Practical refusal to augering at 2.87m depth									
(BH dry upon completion)									

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Kanata Golf and Country Club - 7000 Campeau Drive
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger **DATE** December 8, 2017

FILE NO. PG4135

HOLE NO. BH29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	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			
TOPSOIL 0.25		AU	1						
FILL: Brown silty sand, some gravel, trace clay 1.30		SS	2	76	24	1			
End of Borehole									
Practical refusal to augering at 1.30m depth									
(BH dry upon completion)									

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

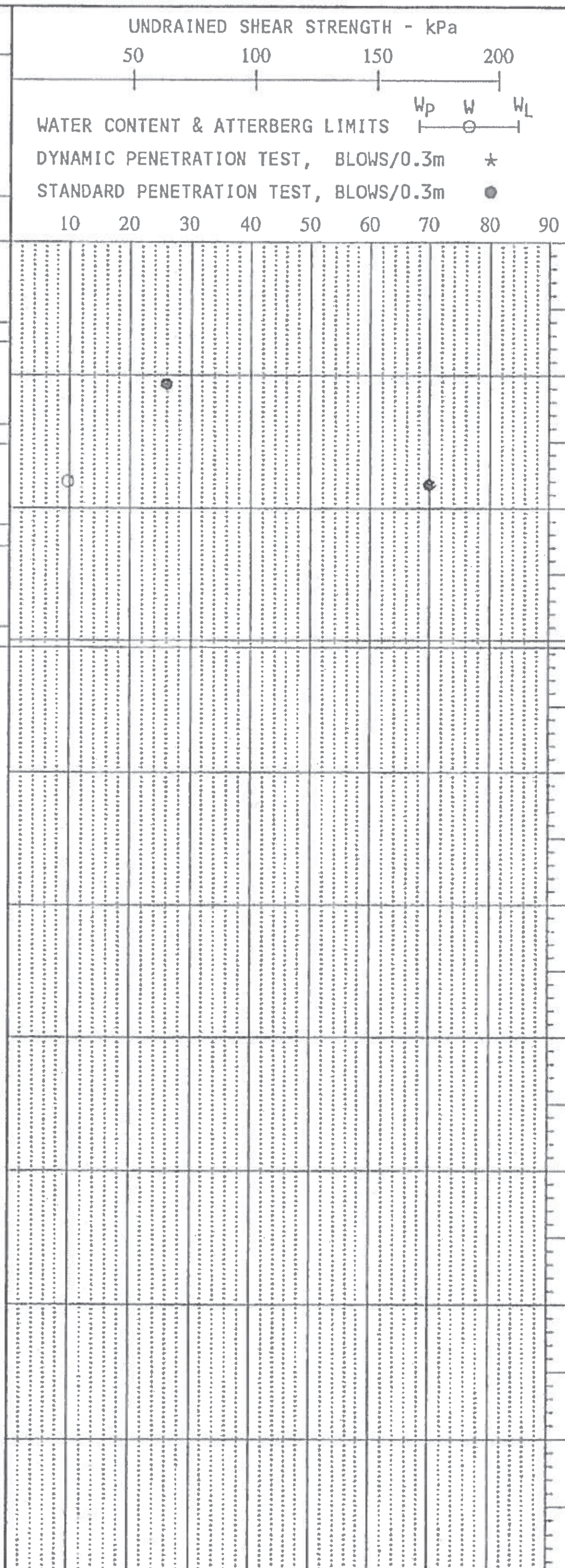
JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

CLIENT: Club Link Properties Ltd.
LOCATION: Kanata Lakes Golf Course, Campeau Drive, Kanata, ON
DATES: BORING 98-04-17 WATER LEVEL 98-04-17

BOREHOLE No. 98-1
PROJECT No. 11054
DATUM Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD
0	98.35							
	98.3	50 mm ASPHALT						
	98.0	Very dense, grey, sandy gravel: FILL			SS	1	160	ref
1		Brownish grey, sandy clayey silt (possible fill)		▽	SS	2	400	26
	96.9	Very dense, brown, silty sand, some gravel: TILL			SS	3	300	70
2					SS	4	210	ref
3	95.3	End of Borehole Auger Refusal on Inferred Bedrock ref = >50 blows for 150mm						
4								
5								
6								
7								
8								
9								
10								



▽ Inferred Groundwater Level
▼ Groundwater Level Measured in Standpipe
Proposed Pipe Invert

◘ Field Vane Test, kPa
□ Remoulded Vane Test, kPa
△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

CLIENT: Club Link Properties Ltd.
LOCATION: Kanata Lakes Golf Course, Campeau Drive, Kanata, ON
DATES: BORING 98-04-17
WATER LEVEL: -

BOREHOLE No. 98-2
PROJECT No. 11054
DATUM: Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD
0	100.95							
	100.9	60 mm ROOTMAT						
	100.6	Loose, dark brown, sand, some roots: FILL			SS	1	260	9
1	99.6	Dark brown and brownish grey, silty clay, trace sand, trace gravel: FILL			SS	2	250	16
		End of Borehole Auger Refusal on Inferred Bedrock						

UNDRAINED SHEAR STRENGTH - kPa: 50, 100, 150, 200
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80 90

Depth scale: 0 1 2 3 4 5 6 7 8 9 10

Inferred Groundwater Level
Groundwater Level Measured in Standpipe
Proposed Pipe Invert

Field Vane Test, kPa
Remoulded Vane Test, kPa
Pocket Penetrometer Test, kPa

JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

CLIENT Club Link Properties Ltd.
LOCATION Kanata Lakes Golf Course, Campeau Drive, Kanata, ON
DATES: BORING 98-04-17
WATER LEVEL -
BOREHOLE No. 98-3
PROJECT No. 11054
DATUM Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD
0	98.81	Paved Parking Area						
	98.7	50 mm ASPHALT			SS	1	160	ref
	98.5	Grey, sandy gravel, trace silt: FILL						
	98.2	Brown, sand and gravel: FILL						
		End of Borehole						
		Auger Refusal on Inferred Bedrock						
		ref = >50 blows for 150mm						

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

UNDRAINED SHEAR STRENGTH - kPa: 50, 100, 150, 200
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80 90

Inferred Groundwater Level
Groundwater Level Measured in Standpipe
Proposed Pipe Invert

Field Vane Test, kPa
Remoulded Vane Test, kPa
△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

CLIENT Club Link Properties Ltd.

LOCATION Kanata Lakes Golf Course, Campeau Drive, Kanata, ON

DATES: BORING 98-04-17

WATER LEVEL -

BOREHOLE No. 98-4

PROJECT No. 11054

DATUM Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	97.77	Granular Parking Area						
		Dark brown, sand and gravel: FILL			SS	1	300	53
	97.0	End of Borehole Auger Refusal on Inferred Bedrock						

UNDRAINED SHEAR STRENGTH - kPa: 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Inferred Groundwater Level

Groundwater Level Measured in Standpipe

Proposed Pipe Invert

Field Vane Test, kPa

Remoulded Vane Test, kPa

Pocket Penetrometer Test, kPa

JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

CLIENT: Club Link Properties Ltd.
BOREHOLE No.: 98-5
LOCATION: Kanata Lakes Golf Course, Campeau Drive, Kanata, ON
PROJECT No.: 11054
DATES: BORING: 98-04-17
WATER LEVEL: -
DATUM: Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY (mm)	SAMPLES: N-VALUE OR RQD
0	99.44							
	99.3	30 mm ROOTMAT			SS	1	330	ref
	98.9	Dark brown, sand, trace rootlets (organics): FILL						
		End of Borehole Auger Refusal on Inferred Bedrock ref = >50 blows for 150mm						

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

UNDRAINED SHEAR STRENGTH - kPa: 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS: W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m *

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

Inferred Groundwater Level

Groundwater Level Measured in Standpipe

Proposed Pipe Invert

□ F

□ R

△ P

JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

CLIENT: Club Link Properties Ltd.
BOREHOLE No.: 98-6

LOCATION: Kanata Lakes Golf Course, Campeau Drive, Kanata, ON
PROJECT No.: 11054

DATES: BORING: 98-04-17
WATER LEVEL: -
DATUM: Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD	STANDARD PENETRATION TEST, BLOWS/0.3m
0	99.78								
	99.7	30 mm ROOTMAT			SS	1	430	9	● ~9
	99.6	Loose, brown, sand: FILL							
	99.0	Grey and brownish grey, clayey silt, trace sand, trace organic matter: FILL							
		End of Borehole Auger Refusal on Inferred Bedrock							

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

UNDRAINED SHEAR STRENGTH - kPa: 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS: W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

◄ Proposed Pipe Invert

⊡ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

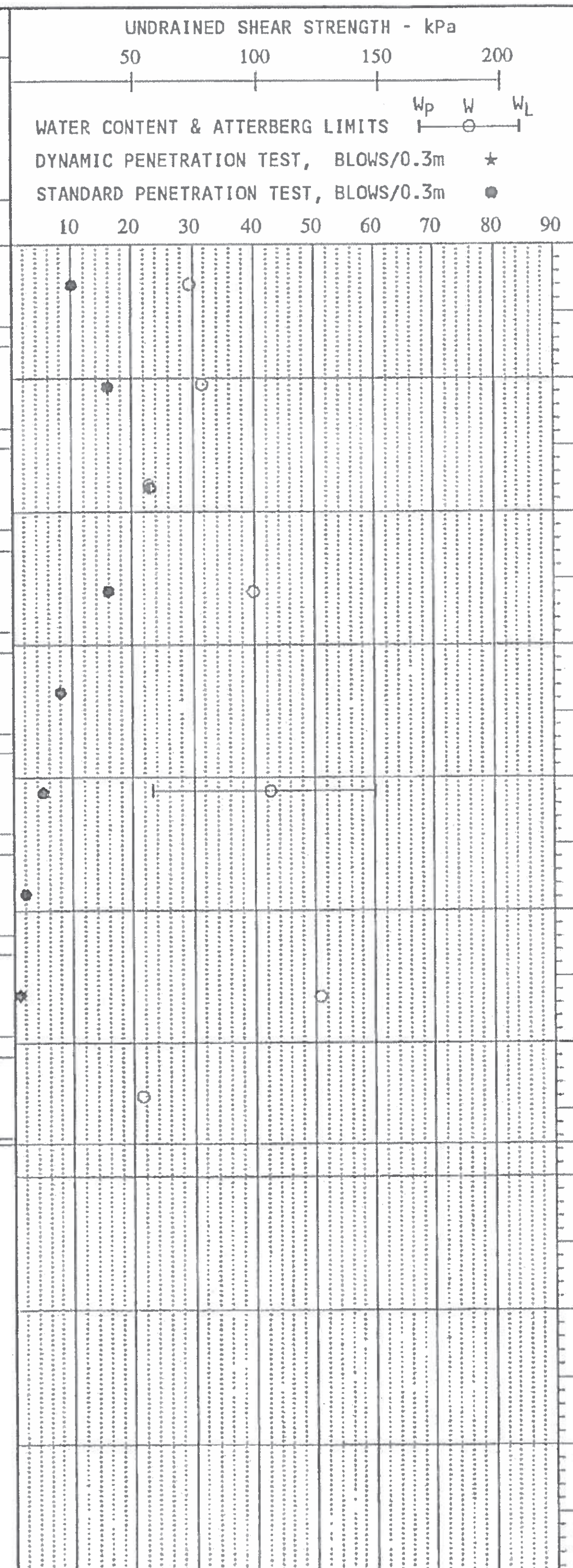
JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

CLIENT: Club Link Properties Ltd.
LOCATION: Kanata Lakes Golf Course, Campeau Drive, Kanata, ON
DATES: BORING 98-04-17 WATER LEVEL 98-04-17

BOREHOLE No. 98-7
PROJECT No. 11054
DATUM Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD
0	98.98					
	98.9	30 mm ROOTMAT	SS	1	400	10
	98.6	Dark brownish grey, sandy clayey silt: FILL				
	98.4	Grey, silty sand: FILL				
1		Dark brownish grey, silty clay, trace organics: FILL	SS	2	400	16
	97.5	Very stiff to stiff, brownish grey to grey, SILTY CLAY	SS	3	610	23
2			SS	4	610	16
3			SS	5	610	8
4			SS	6	610	5
	94.4	Firm to soft, grey, SILTY CLAY	SS	7	610	2
5			SS	8	610	1
6	92.9	Soft, grey, CLAYEY SILT, trace gravel	SS	9	360	ref
	92.2	End of Borehole				
7		Auger Refusal on Inferred Bedrock				
8		ref = >50 blows for 150mm				
9						
10						



Inferred Groundwater Level
Groundwater Level Measured in Standpipe
Proposed Pipe Invert

□ Field Vane Test, kPa
□ Remoulded Vane Test, kPa
△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

CLIENT: Club Link Properties Ltd.
LOCATION: Kanata Lakes Golf Course, Campeau Drive, Kanata, ON
DATES: BORING: 98-04-17
WATER LEVEL: -
BOREHOLE No.: 98-8
PROJECT No.: 11054
DATUM: Local

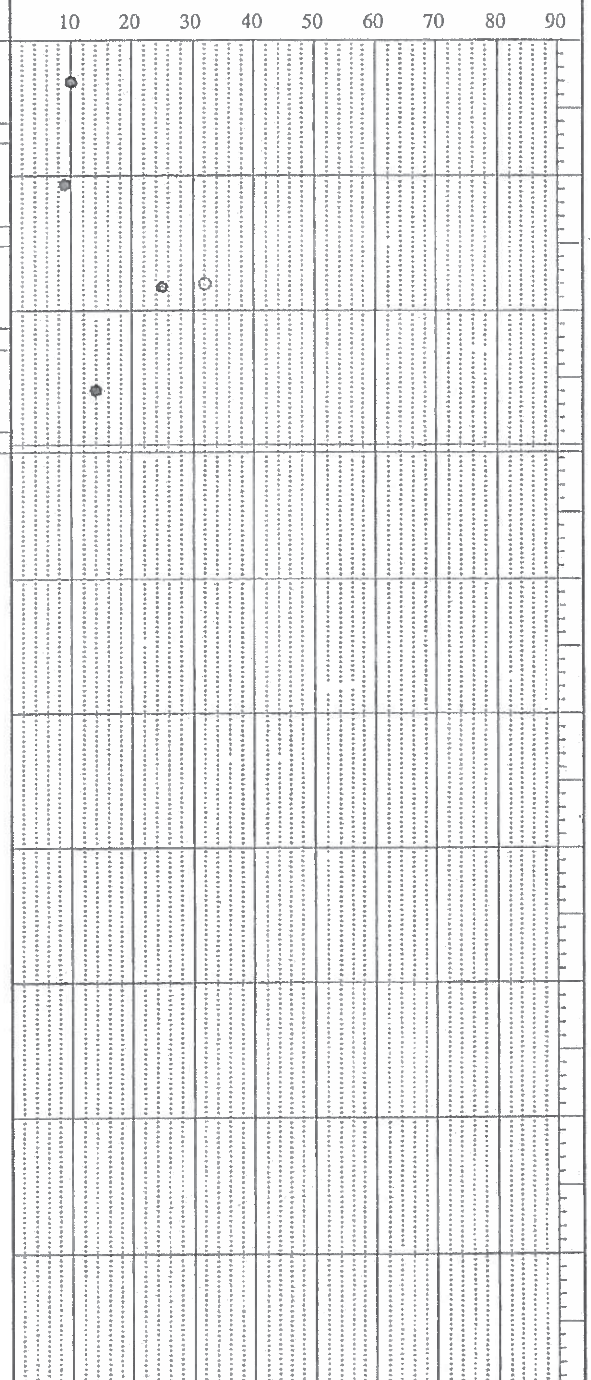
DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD
0	99.78					
	99.7	20 mm ROOTMAT	SS	1	60	10
	99.5	Dark brown to black and brownish grey, sandy silt and roots: FILL				
	99.3					
	99.2	Grey, clayey silt: FILL	SS	2	310	9
	98.4	Brownish grey, silty sand: FILL				
		Black sand and roots: FILL	SS	3	610	25
		Very stiff, brownish grey, SILTY CLAY, trace sand (possible fill)	SS	4	60	14
3	96.7	End of Borehole				
		Auger Refusal on Inferred Bedrock				

UNDRAINED SHEAR STRENGTH - kPa: 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●



Inferred Groundwater Level
Groundwater Level Measured in Standpipe
Proposed Pipe Invert

Field Vane Test, kPa
Remoulded Vane Test, kPa
Pocket Penetrometer Test, kPa

JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

CLIENT Club Link Properties Ltd.
LOCATION Kanata Lakes Golf Course, Campeau Drive, Kanata, ON
DATES: BORING 98-04-17
WATER LEVEL -

BOREHOLE No. 98-9
PROJECT No. 11054
DATUM Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD
0	101.74							
	101.6	50 mm ROOTMAT			SS	1	440	14
	101.0	Brown to dark brownish grey, sandy clayey silt, trace roots, trace gravel: FILL						
1		End of Borehole Auger Refusal on Inferred Bedrock						

UNDRAINED SHEAR STRENGTH - kPa: 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

Depth scale: 0 1 2 3 4 5 6 7 8 9 10

Inferred Groundwater Level
Groundwater Level Measured in Standpipe
Proposed Pipe Invert

Field Vane Test, kPa
Remoulded Vane Test, kPa
Pocket Penetrometer Test, kPa

JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

CLIENT Club Link Properties Ltd. BOREHOLE No. 98-10

LOCATION Kanata Lakes Golf Course, Campeau Drive, Kanata, ON PROJECT No. 11054

DATES: BORING 98-04-17 WATER LEVEL - DATUM Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD
0	103.59							
	103.5	50 mm ROOTMAT			SS	1	340	50
	102.8	Dark brown sand with roots intermixed with brownish grey silt and clay: FILL						
1		End of Borehole Auger Refusal on Inferred Bedrock						

UNDRAINED SHEAR STRENGTH - kPa: 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

Depth scale: 0, 1, 2, 3, 4, 5, 6

□ F

□ R

△ Po

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

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

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

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

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

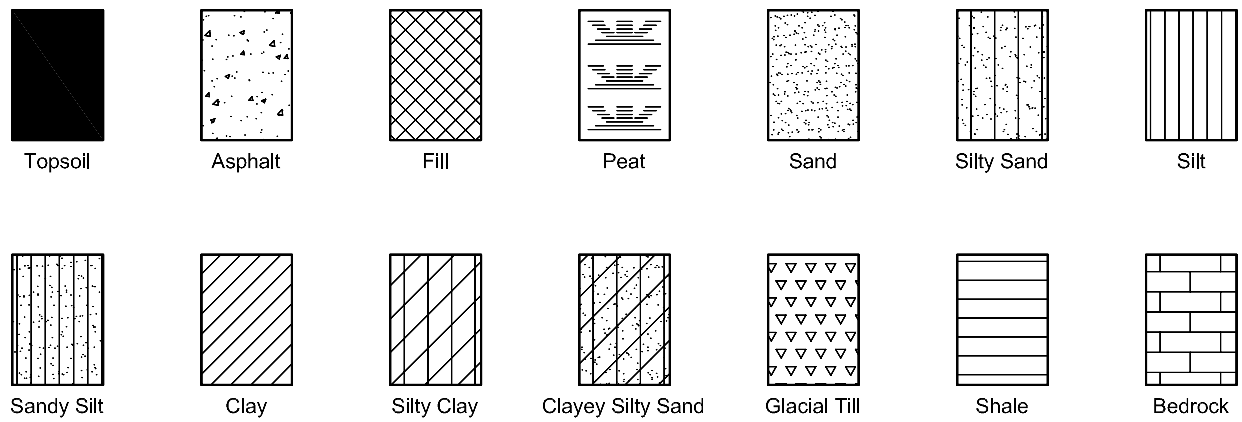
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

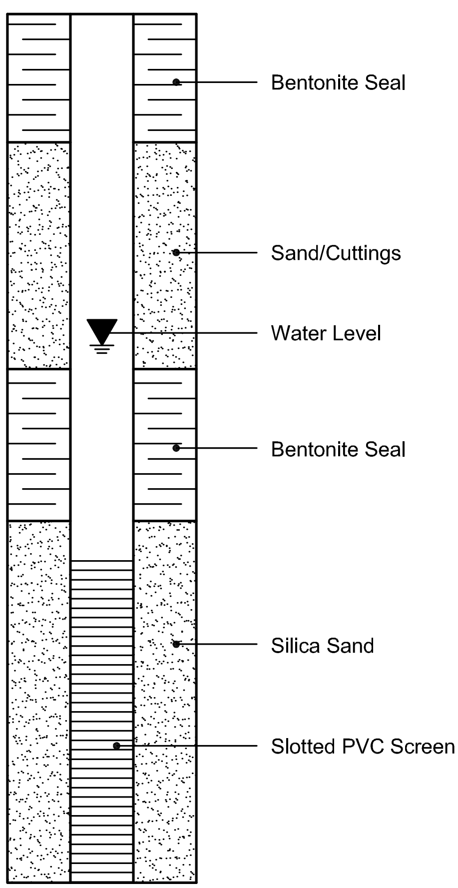
SYMBOLS AND TERMS (continued)

STRATA PLOT

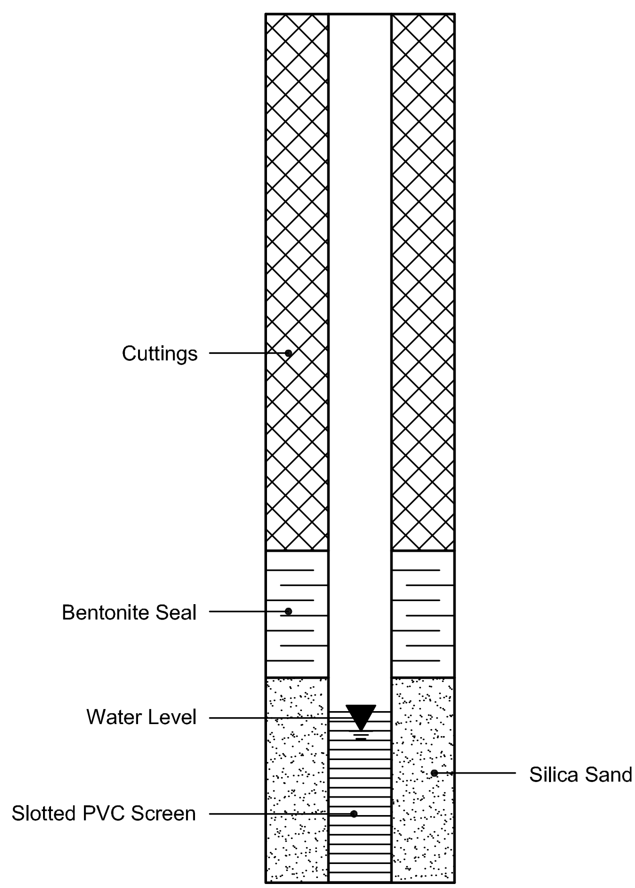


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



PARACEL LABORATORIES LTD.

Order #: 1751084

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23311

Report Date: 22-Dec-2017

Order Date: 18-Dec-2017

Project Description: PG4135

	Client ID:	BH17 SS3	-	-	-
	Sample Date:	07-Dec-17	-	-	-
	Sample ID:	1751084-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	68.5	-	-	-
General Inorganics					
pH	0.05 pH Units	7.68	-	-	-
Resistivity	0.10 Ohm.m	39.6	-	-	-
Anions					
Chloride	5 ug/g dry	66	-	-	-
Sulphate	5 ug/g dry	35	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

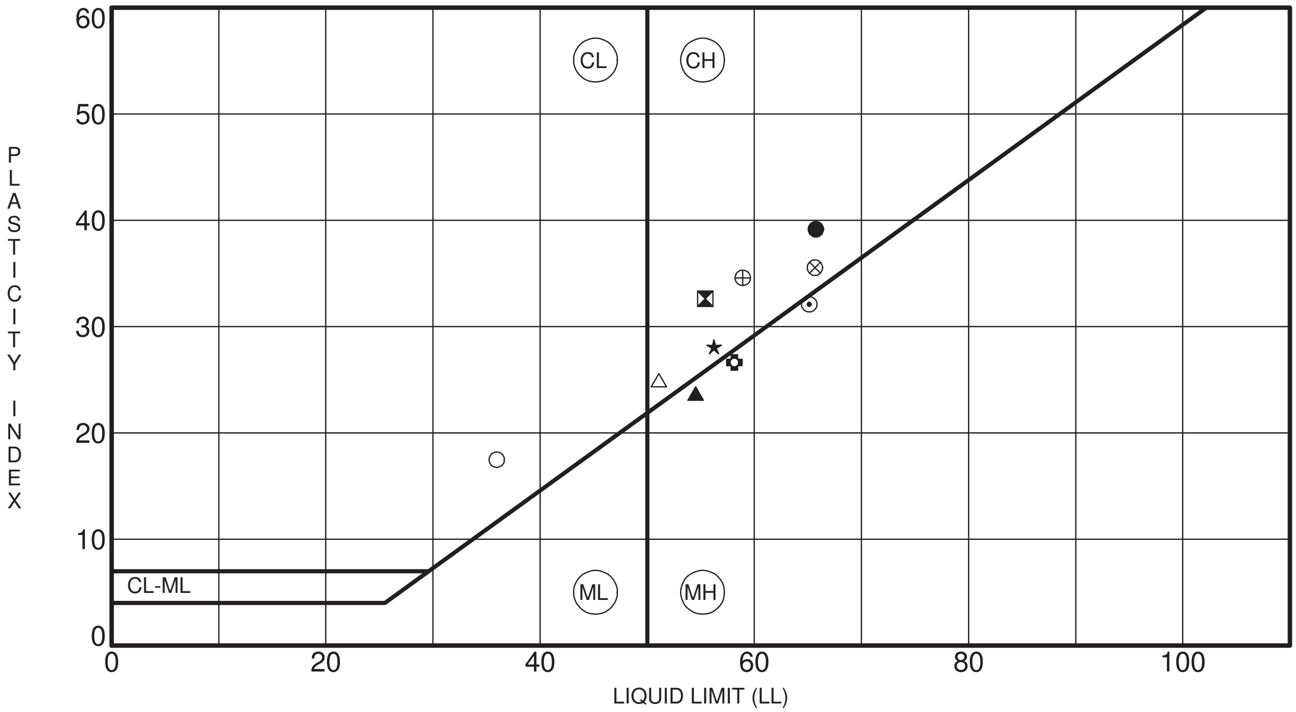
Client PO: 25823

Report Date: 18-Mar-2019

Order Date: 12-Mar-2019

Project Description: PG4135

	Client ID:	BH7-19-SS3	BH16-19-SS4	-	-
	Sample Date:	02/25/2019 09:00	03/08/2019 09:00	-	-
	Sample ID:	1911250-01	1911250-02	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	71.4	72.6	-	-
General Inorganics					
pH	0.05 pH Units	7.72	6.54	-	-
Resistivity	0.10 Ohm.m	44.9	96.8	-	-
Anions					
Chloride	5 ug/g dry	21	11	-	-
Sulphate	5 ug/g dry	55	12	-	-



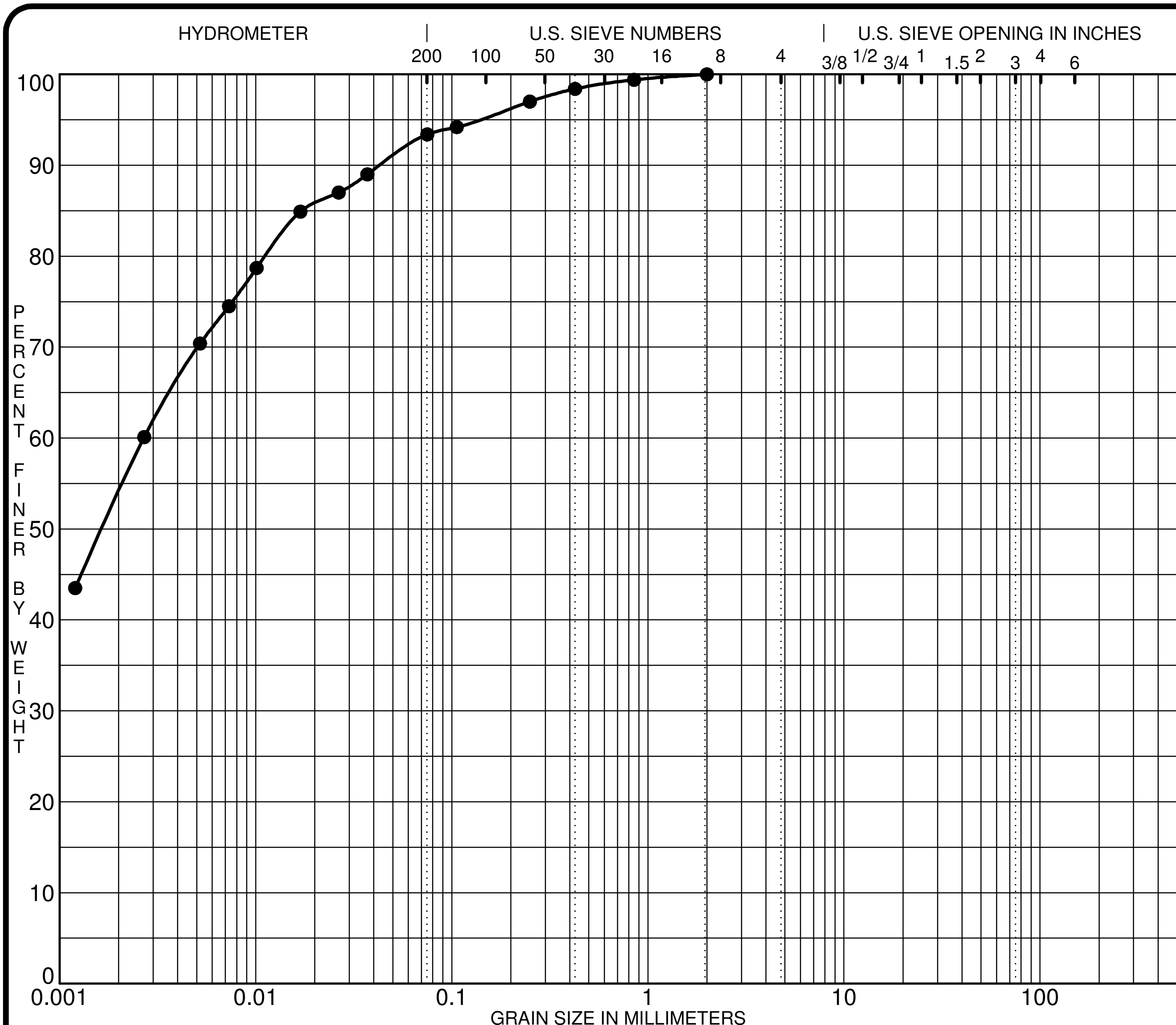
	Specimen Identification		LL	PL	PI	Fines	Classification
●	BH 6-19	SS 5	66	27	39		CH - Inorganic clays of high plasticity
⧗	BH 7-19	SS 3	55	23	33		CH - Inorganic clays of high plasticity
▲	BH 8-19	SS 3	55	31	24		MH - Inorganic silt of high plasticity
★	BH 9-19	SS 5	56	28	28		CH - Inorganic clays of high plasticity
⊙	BH10-19	SS 5	65	33	32		MH - Inorganic silt of high plasticity
✿	BH11-19	SS 3	58	32	27		MH - Inorganic silt of high plasticity
○	BH12-19	SS 4	36	18	17		CL - Inorganic clays of low plasticity
△	BH13-19	SS 5	51	26	25		CH - Inorganic clays of high plasticity
⊗	BH14-19	SS 3	66	30	36		CH - Inorganic clays of high plasticity
⊕	BH15-19	SS 4	59	24	35		CH - Inorganic clays of high plasticity

CLIENT	**Minto Communities Inc.**	FILE NO.	**PG4135**
PROJECT	**Geotechnical Investigation - Kanata Lakes Golf & Country Club**	DATE	**8 Mar 19**

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

ATTERBERG LIMITS' RESULTS



SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**BH 6-19**	**SS 4**	**CH - Inorganic clays of high plasticity**						

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH 6-19**	**SS 4**	**2.00**	**0.00**			**0.0**	**6.6**	**93.4**	

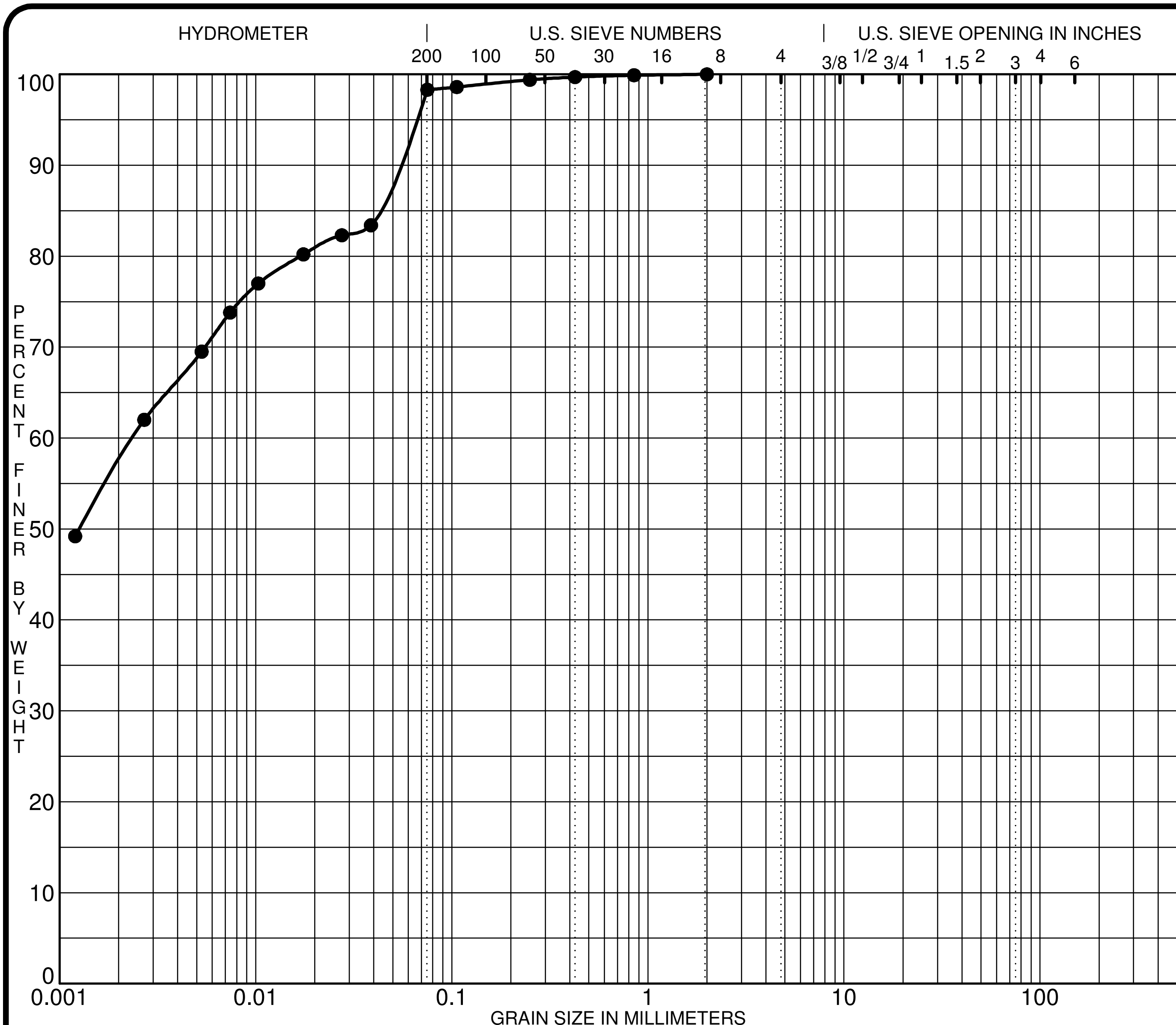
CLIENT **Minto Communities Inc.** FILE NO. **PG4135**

PROJECT **Geotechnical Investigation - Kanata Lakes Golf & Country Club** DATE **26 Feb 19**

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

GRAIN SIZE DISTRIBUTION



SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● BH11-19	SS 4	**MH - Inorganic silts of high plasticity**						

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● BH11-19	SS 4	**2.00**	**0.00**			**0.0**	**1.7**	**98.3**	

CLIENT **Minto Communities Inc.**

FILE NO. **PG4135**

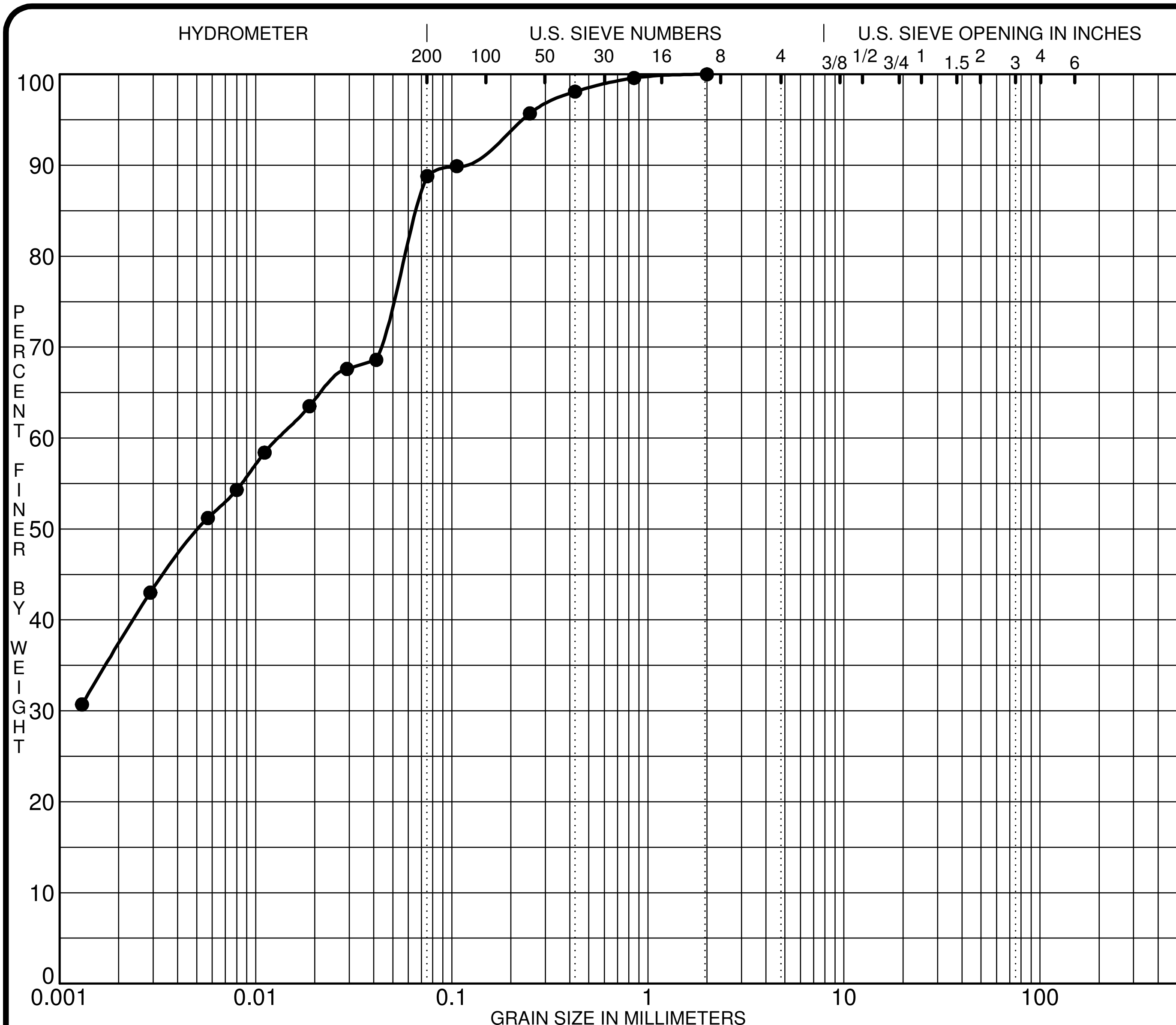
PROJECT **Geotechnical Investigation - Kanata Lakes Golf & Country Club**

DATE **28 Feb 19**

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

GRAIN SIZE DISTRIBUTION



SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**BH14-19**	**SS 5**	**CH - Inorganic clays of high plasticity**						

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH14-19**	**SS 5**	**2.00**	**0.01**			**0.0**	**11.2**	**88.8**	

CLIENT **Minto Communities Inc.**

FILE NO. **PG4135**

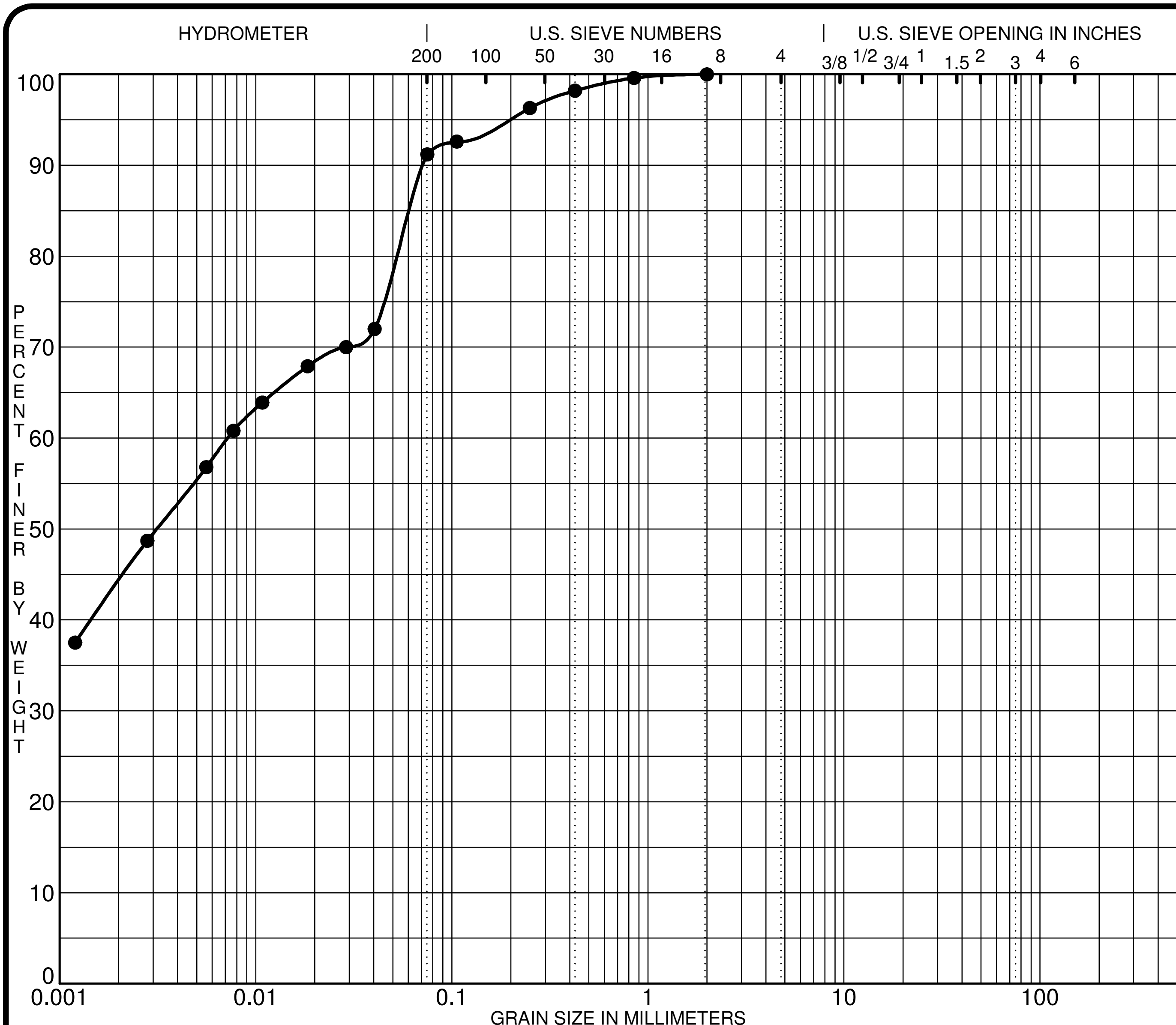
PROJECT **Geotechnical Investigation - Kanata Lakes Golf & Country Club**

DATE **7 Mar 19**

patersongroup **Consulting Engineers**

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

GRAIN SIZE DISTRIBUTION



SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	BH15-19	SS 4	CH - Inorganic clays of high plasticity		59	24	35		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	BH15-19	SS 4	2.00	0.01			0.0	8.8	91.2	

CLIENT **Minto Communities Inc.**
FILE NO. **PG4135**
PROJECT **Geotechnical Investigation - Kanata Lakes Golf & Country Club**
DATE **8 Mar 19**

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

GRAIN SIZE DISTRIBUTION

APPENDIX 2

FIGURE 1 - KEY PLAN

FIGURES 2 TO 9 - SECTIONS FOR SLOPE STABILITY ANALYSIS

DRAWINGS PG4135-1 AND 2 - TEST HOLE LOCATION PLAN

DRAWINGS PG4135-3 AND 4 - PERMISSIBLE GRADE RAISE AND TREE RESTRICTION PLAN

DRAWINGS PG4135-5 AND 6 - BEDROCK CONTOUR PLAN

DRAWING PG4135-8 AND 9- GROUNDWATER CONTOUR PLAN

FIGURE 1

KEY PLAN

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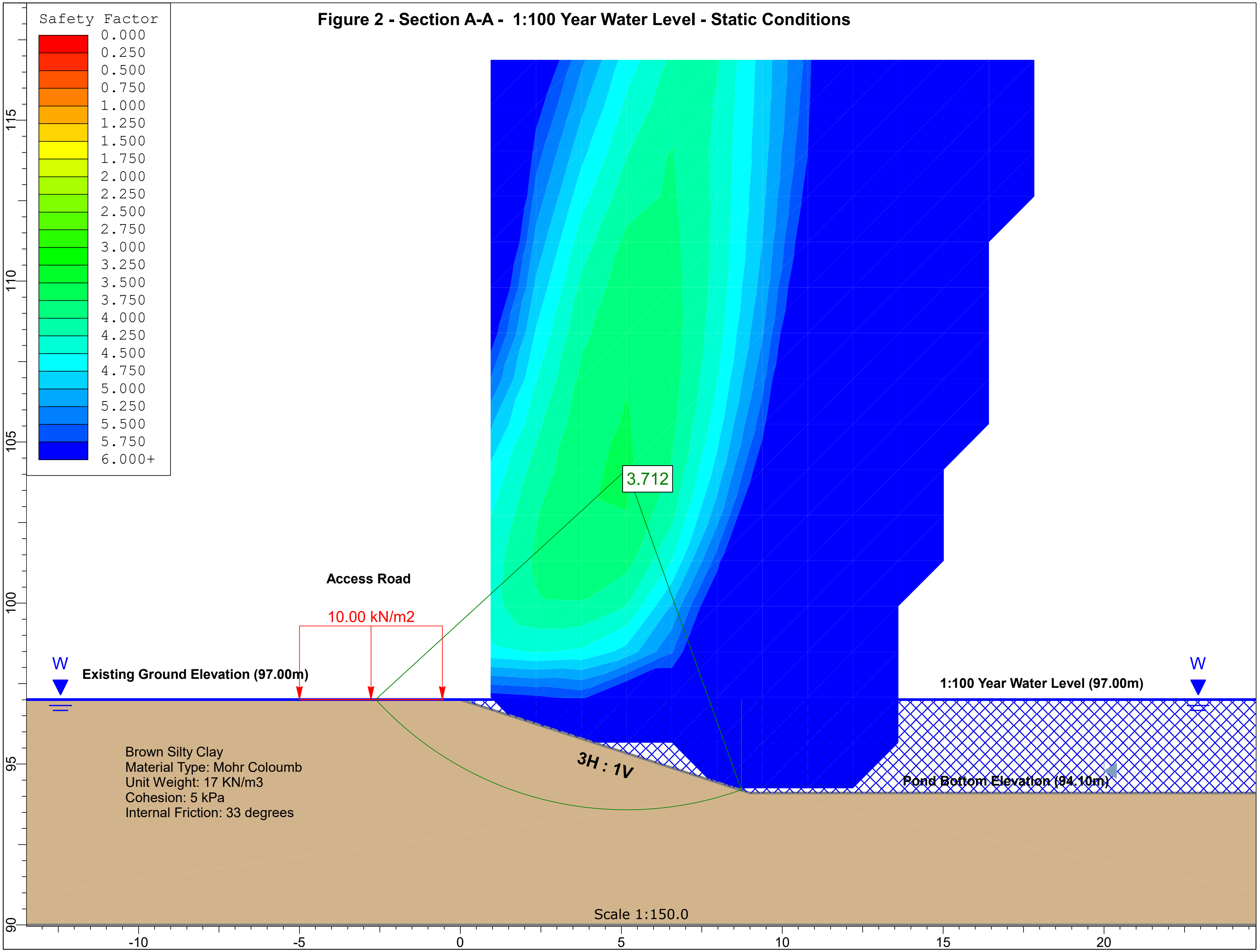


Figure 2 - Section A-A - 1:100 Year Water Level - Static Conditions
Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
3.712
Access Road
10.00 kN/m2
W
Existing Ground Elevation (97.00m)
1:100 Year Water Level (97.00m)
W
3H : 1V
Pond Bottom Elevation (94.10m)
Brown Silty Clay
Material Type: Mohr Coloumb
Unit Weight: 17 KN/m3
Cohesion: 5 kPa
Internal Friction: 33 degrees
Scale 1:150.0
115
110
105
100
95
90
-10
-5
0
5
10
15
20

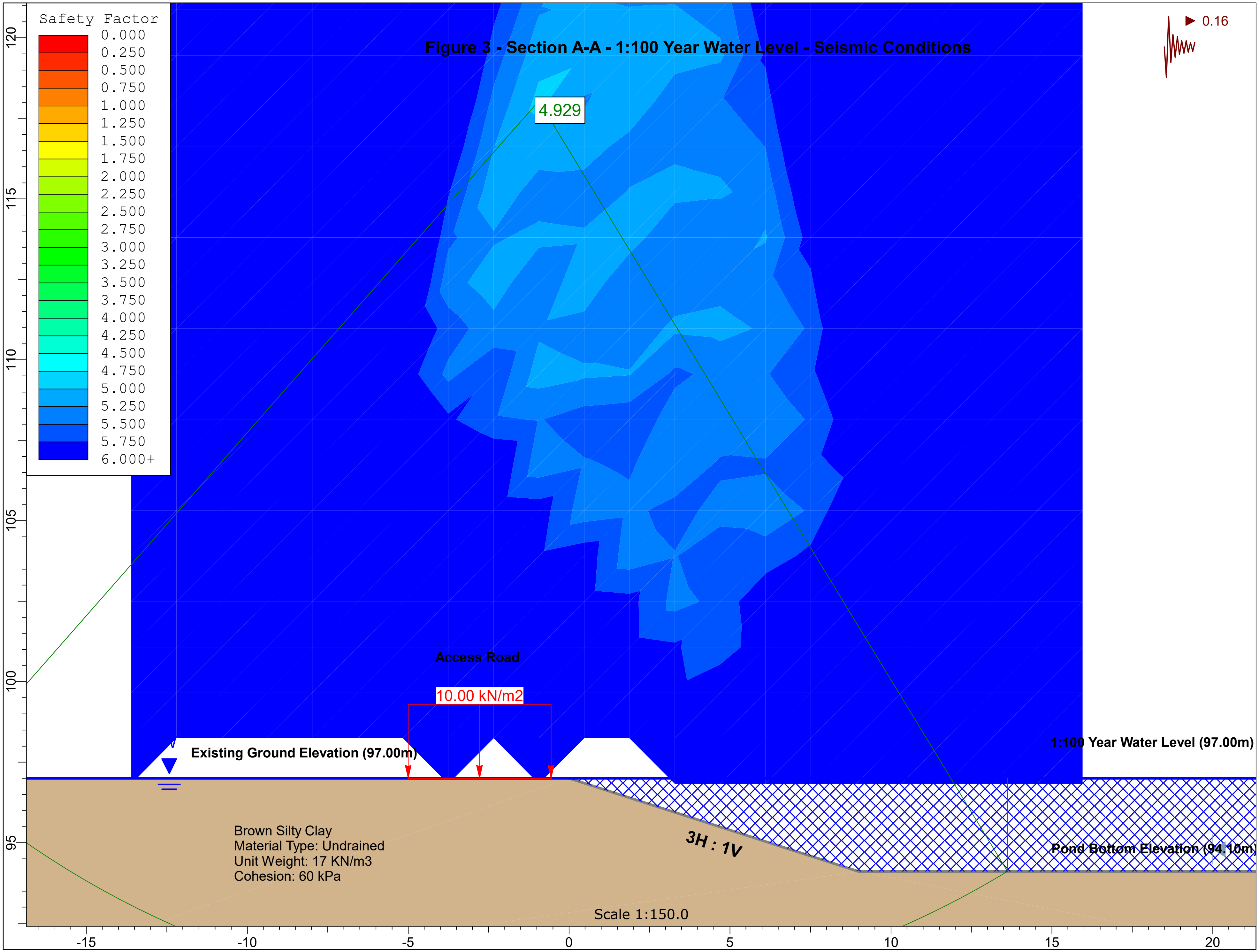


Figure 3 - Section A-A - 1:100 Year Water Level - Seismic Conditions
Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
0.16
4.929
Access Road
10.00 kN/m2
Existing Ground Elevation (97.00m)
1:100 Year Water Level (97.00m)
Brown Silty Clay
Material Type: Undrained
Unit Weight: 17 KN/m3
Cohesion: 60 kPa
3H : 1V
Pond Bottom Elevation (94.10m)
Scale 1:150.0
120
115
110
105
100
95
-15
-10
-5
0
5
10
15
20

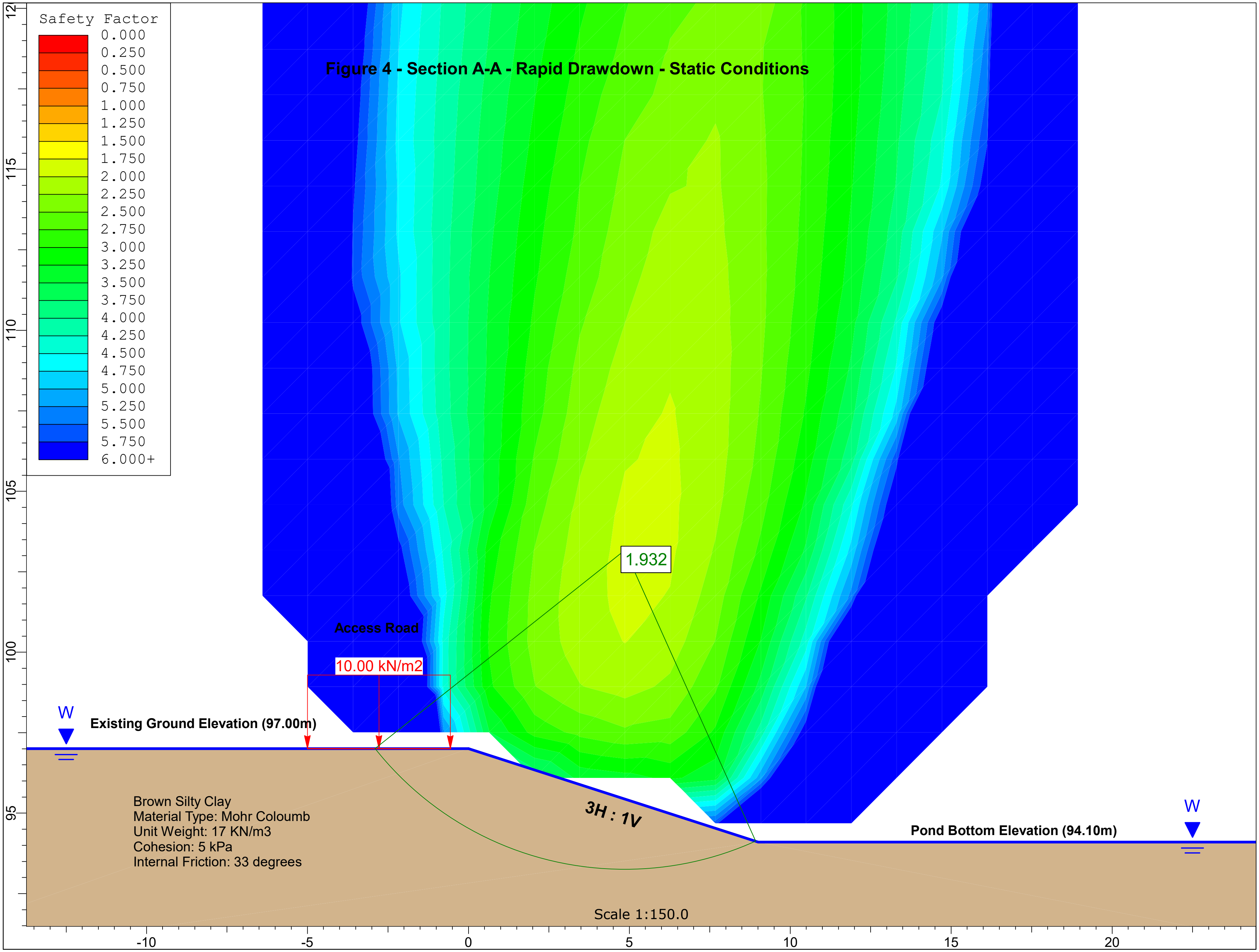


Figure 4 - Section A-A - Rapid Drawdown - Static Conditions
Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
1.932
Access Road
10.00 kN/m2
W
Existing Ground Elevation (97.00m)
Brown Silty Clay
Material Type: Mohr Coloumb
Unit Weight: 17 KN/m3
Cohesion: 5 kPa
Internal Friction: 33 degrees
3H : 1V
Pond Bottom Elevation (94.10m)
W
Scale 1:150.0
-10
-5
0
5
10
15
20
95
100
105
110
115

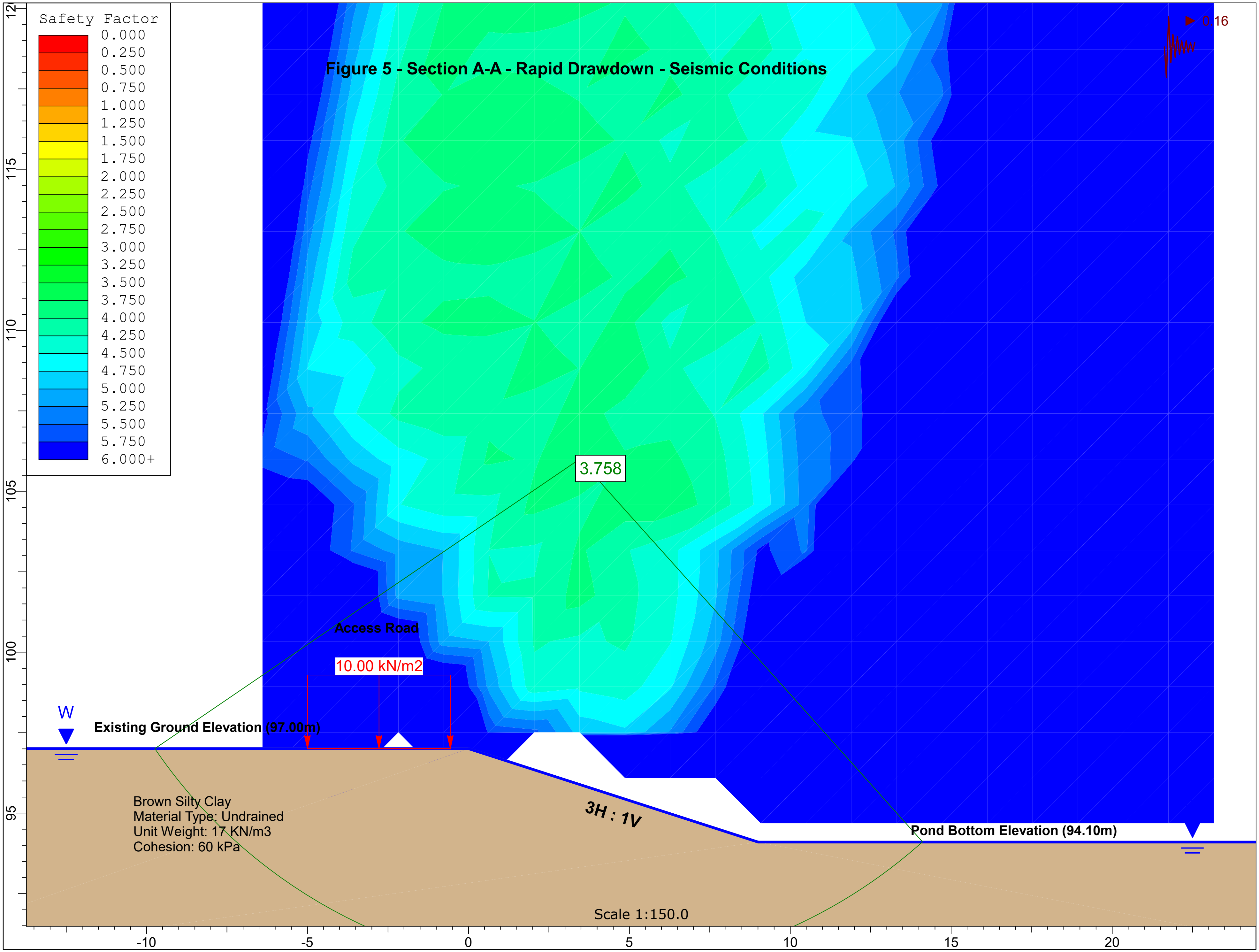


Figure 5 - Section A-A - Rapid Drawdown - Seismic Conditions
Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
0.16
3.758
Access Road
10.00 kN/m2
W
Existing Ground Elevation (97.00m)
Brown Silty Clay
Material Type: Undrained
Unit Weight: 17 KN/m3
Cohesion: 60 kPa
3H : 1V
Pond Bottom Elevation (94.10m)
Scale 1:150.0

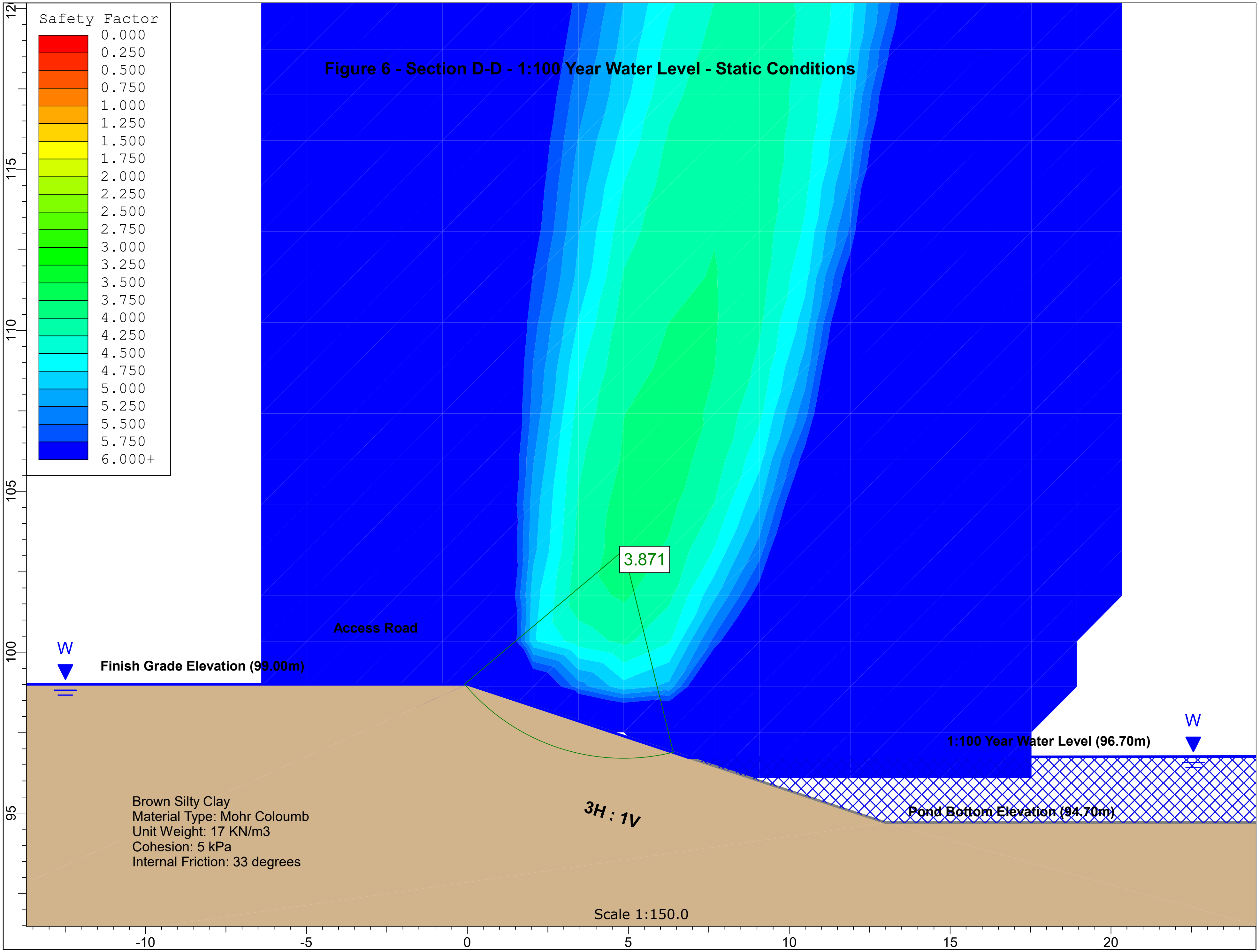
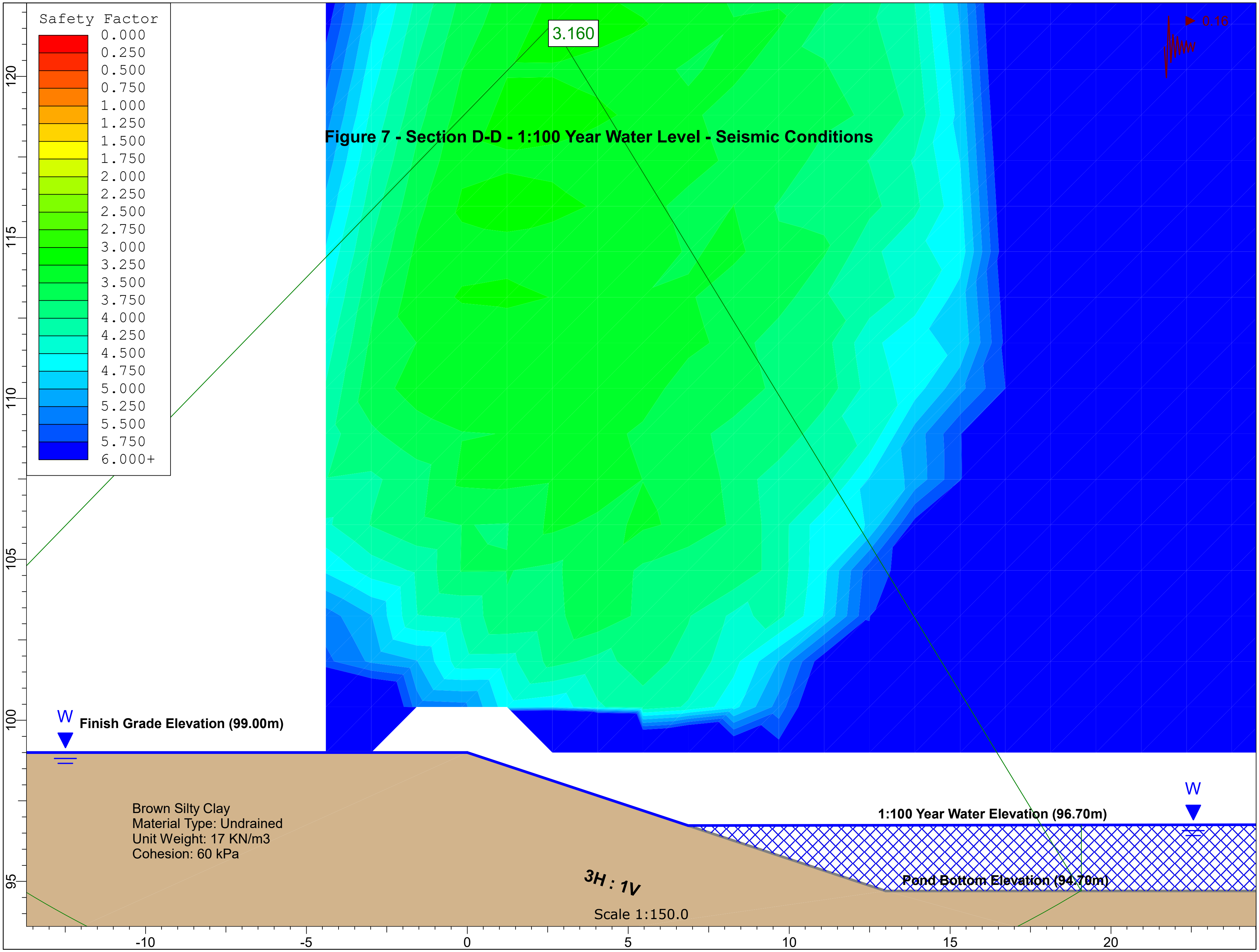
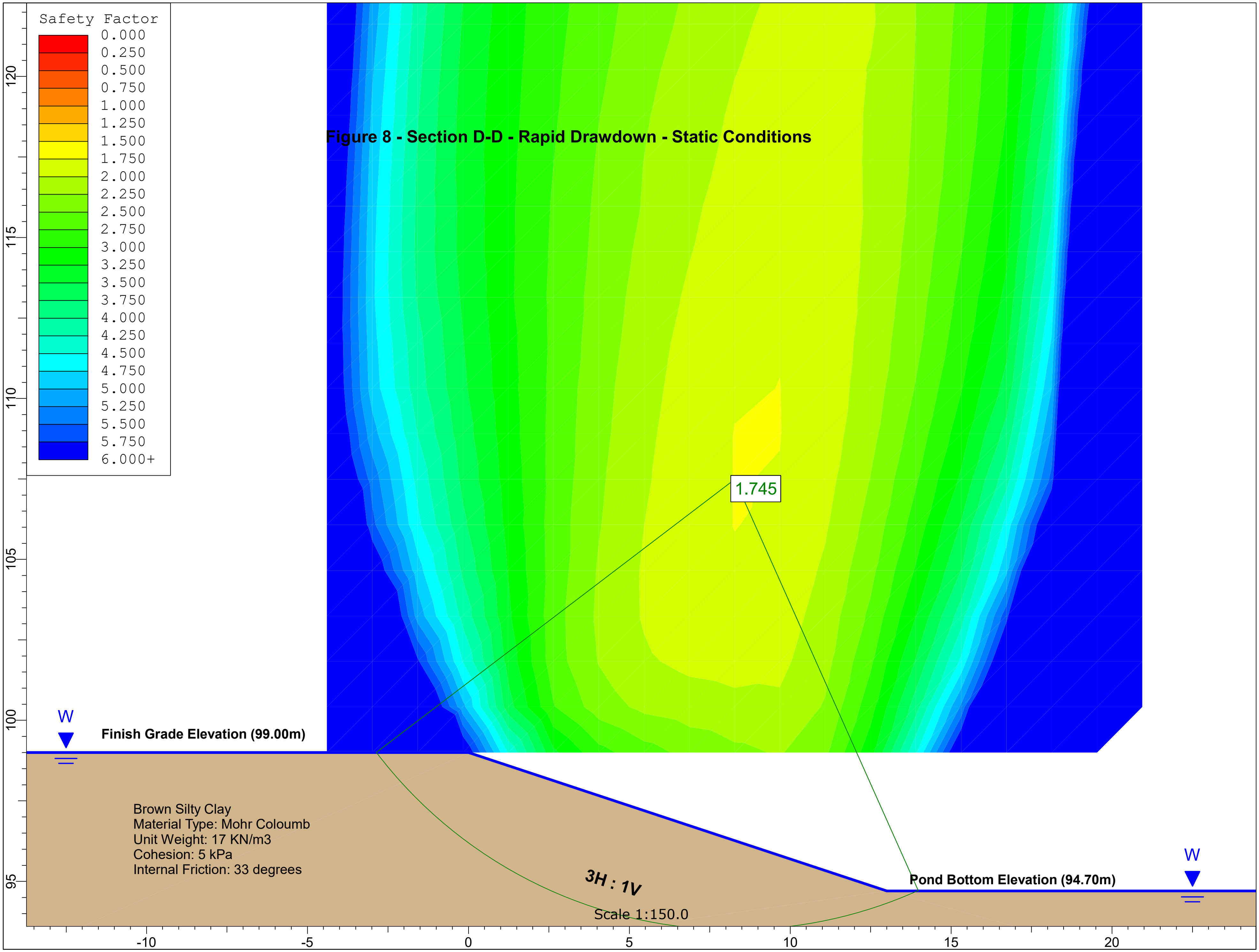
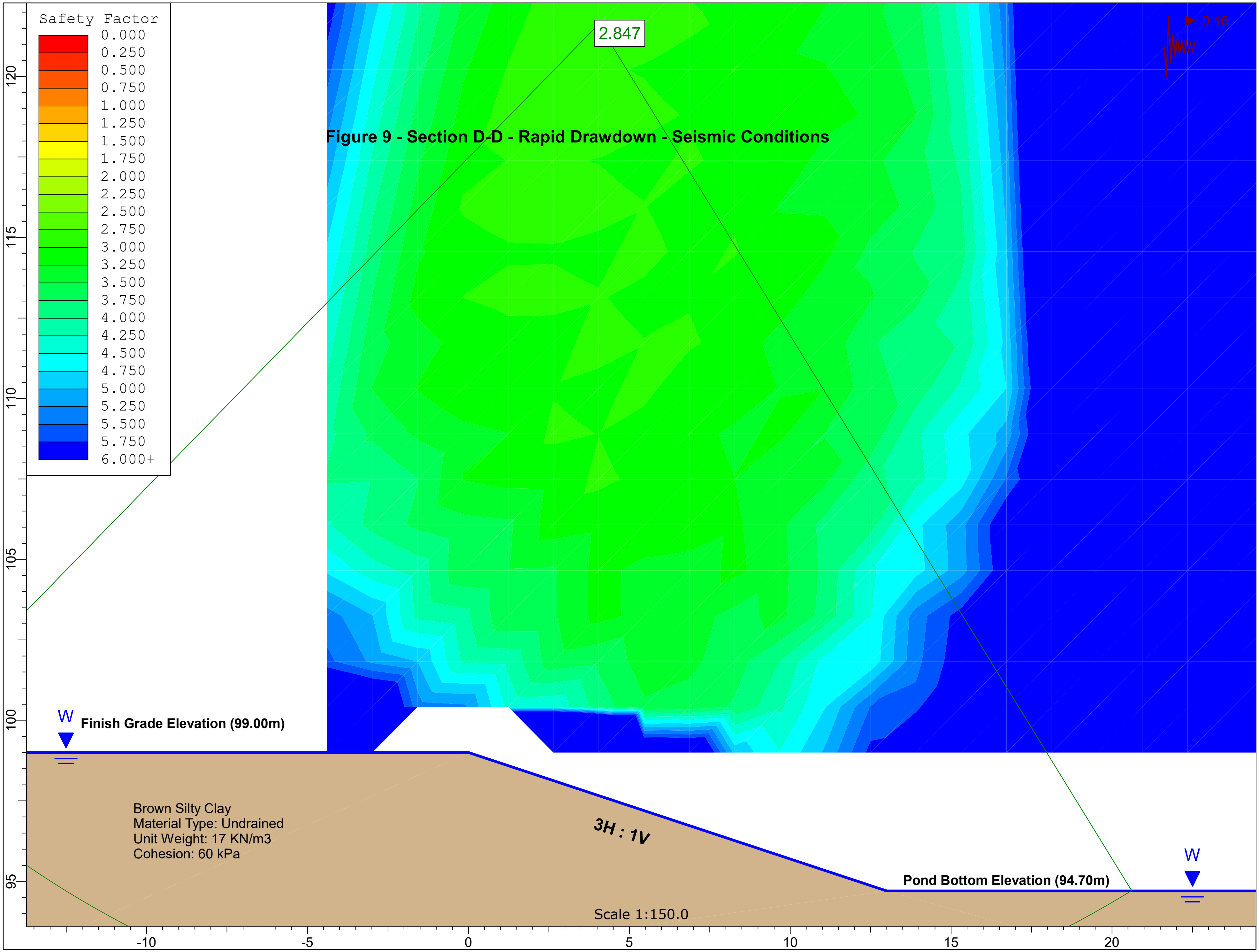


Figure 6 - Section D-D - 1:100 Year Water Level - Static Conditions
Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
3.871
Access Road
W
Finish Grade Elevation (99.00m)
W
1:100 Year Water Level (96.70m)
3H : 1V
Pond Bottom Elevation (94.70m)
Brown Silty Clay
Material Type: Mohr Coloumb
Unit Weight: 17 KN/m3
Cohesion: 5 kPa
Internal Friction: 33 degrees
Scale 1:150.0
120
115
110
105
100
95
-10
-5
0
5
10
15
20



Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
3.160
0.16
Figure 7 - Section D-D - 1:100 Year Water Level - Seismic Conditions
W
Finish Grade Elevation (99.00m)
W
1:100 Year Water Elevation (96.70m)
Brown Silty Clay
Material Type: Undrained
Unit Weight: 17 KN/m3
Cohesion: 60 kPa
3H : 1V
Pond Bottom Elevation (94.70m)
Scale 1:150.0
120
115
110
105
100
95
-10
-5
0
5
10
15
20


Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Figure 8 - Section D-D - Rapid Drawdown - Static Conditions
1.745
W
Finish Grade Elevation (99.00m)
Brown Silty Clay
Material Type: Mohr Coloumb
Unit Weight: 17 KN/m3
Cohesion: 5 kPa
Internal Friction: 33 degrees
3H : 1V
Scale 1:150.0
Pond Bottom Elevation (94.70m)
W
120
115
110
105
100
95
-10
-5
0
5
10
15
20


Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
2.847
0.16
Figure 9 - Section D-D - Rapid Drawdown - Seismic Conditions
W
Finish Grade Elevation (99.00m)
Brown Silty Clay
Material Type: Undrained
Unit Weight: 17 KN/m3
Cohesion: 60 kPa
3H : 1V
Pond Bottom Elevation (94.70m)
W
Scale 1:150.0
95
100
105
110
115
120
-10
-5
0
5
10
15
20

LEGEND:

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL LOCATION, CURRENT INVESTIGATION
- PROBEHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PG4135, JANUARY 2018
- BOREHOLE LOCATION BY OTHERS

105.20 GROUND SURFACE ELEVATION (m)

[104.29] BEDROCK SURFACE ELEVATION (m)

(104.40) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)

{88.83} ELEVATION AT BOTTOM OF TEST HOLE, REFUSAL NOT ENCOUNTERED (m)

D—D' SLOPE STABILITY CROSS SECTION

TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS (CURRENT INVESTIGATION) PROVIDED BY STANTEC GEOMATICS LIMITED.

SCALE: 1:2000

0 25 50 75 100 125 150m

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
5	REVISED TO LATEST BASE PLAN	03/22/2021	MS
4	REVISED TO LATEST BASE PLAN	05/15/2020	DJG
3	REVISED TO LATEST BASE PLAN	03/17/2020	RG
2	REVISED TO LATEST BASE PLAN	07/26/2019	SD
1	REVISED TO LATEST BASE PLAN + ADDED BOREHOLES AND PROBEHOLES DURING MARCH 2019	04/04/2019	RG

MINTO COMMUNITIES INC.

GEOTECHNICAL INVESTIGATION
KANATA GOLF AND COUNTRY CLUB
OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Stamp:

Scale:	1:2000
Drawn by:	MPG
Checked by:	RG
Approved by:	DJG
Date:	03/2019
Report No.:	PG4135
Drawing No.:	PG4135-1
Revision No.:	5

p:\autocad drawings\geotechnical\pg41xx\pg4135\pg4135-1 thlp (rev5) (mar 2021) draft plan.dwg

paterson group
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
5	REVISED TO LATEST BASE PLAN	03/22/2021	MS
4	REVISED TO LATEST BASE PLAN	05/15/2020	DJG
3	REVISED TO LATEST BASE PLAN - NEW BOREHOLE LOCATIONS AND ELEVATIONS ADDED	03/17/2020	RG
2	REVISED TO LATEST BASE PLAN	07/26/2019	SD
1	REVISED TO LATEST BASE PLAN + ADDED BOREHOLES AND PROBEHOLES DURING MARCH 2019	04/04/2019	RG

MINTO COMMUNITIES INC.

GEOTECHNICAL INVESTIGATION
KANATA GOLF AND COUNTRY CLUB
OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Stamp:

Scale:	1:2000
Drawn by:	MPG
Checked by:	RG
Approved by:	DJG
Date:	03/2019
Report No.:	PG4135
Drawing No.:	PG4135-2
Revision No.:	5

PERMISSIBLE GRADE RAISE / TREE PLANTING RESTRICTIONS

(pink)	UP TO 2.0m / AREA 2: TREE PLANTING RESTRICTIONS
(green)	UP TO 2.5m / AREA 2: TREE PLANTING RESTRICTIONS
(white)	NO GRADE RAISE RESTRICTIONS / AREA 1: NO TREE PLANTING RESTRICTIONS

LEGEND:

	BOREHOLE LOCATION, CURRENT INVESTIGATION
	BOREHOLE WITH MONITORING WELL LOCATION, CURRENT INVESTIGATION
	PROBEHOLE LOCATION, CURRENT INVESTIGATION
	BOREHOLE LOCATION, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PG4135, JANUARY 2018
	BOREHOLE LOCATION BY OTHERS
105.20	GROUND SURFACE ELEVATION (m)
[104.29]	BEDROCK SURFACE ELEVATION (m)
(104.40)	PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
{88.83}	ELEVATION AT BOTTOM OF TEST HOLE, REFUSAL NOT ENCOUNTERED (m)

TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS (CURRENT INVESTIGATION) PROVIDED BY STANTEC GEOMATICS LIMITED.

SCALE: 1:2000

0 25 50 75 100 125 150m

paterson group
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
5	REVISED TO LATEST BASE PLAN	03/22/2021	MS
4	REVISED TO LATEST BASE PLAN	05/15/2019	DJG
3	REVISED TO LATEST BASE PLAN	03/17/2019	RG
2	REVISED TO LATEST BASE PLAN	07/26/2019	SD
1	REVISED TO LATEST BASE PLAN - ADDED BOREHOLES AND PROBEHOLES DURING MARCH 2019	04/04/2019	SD

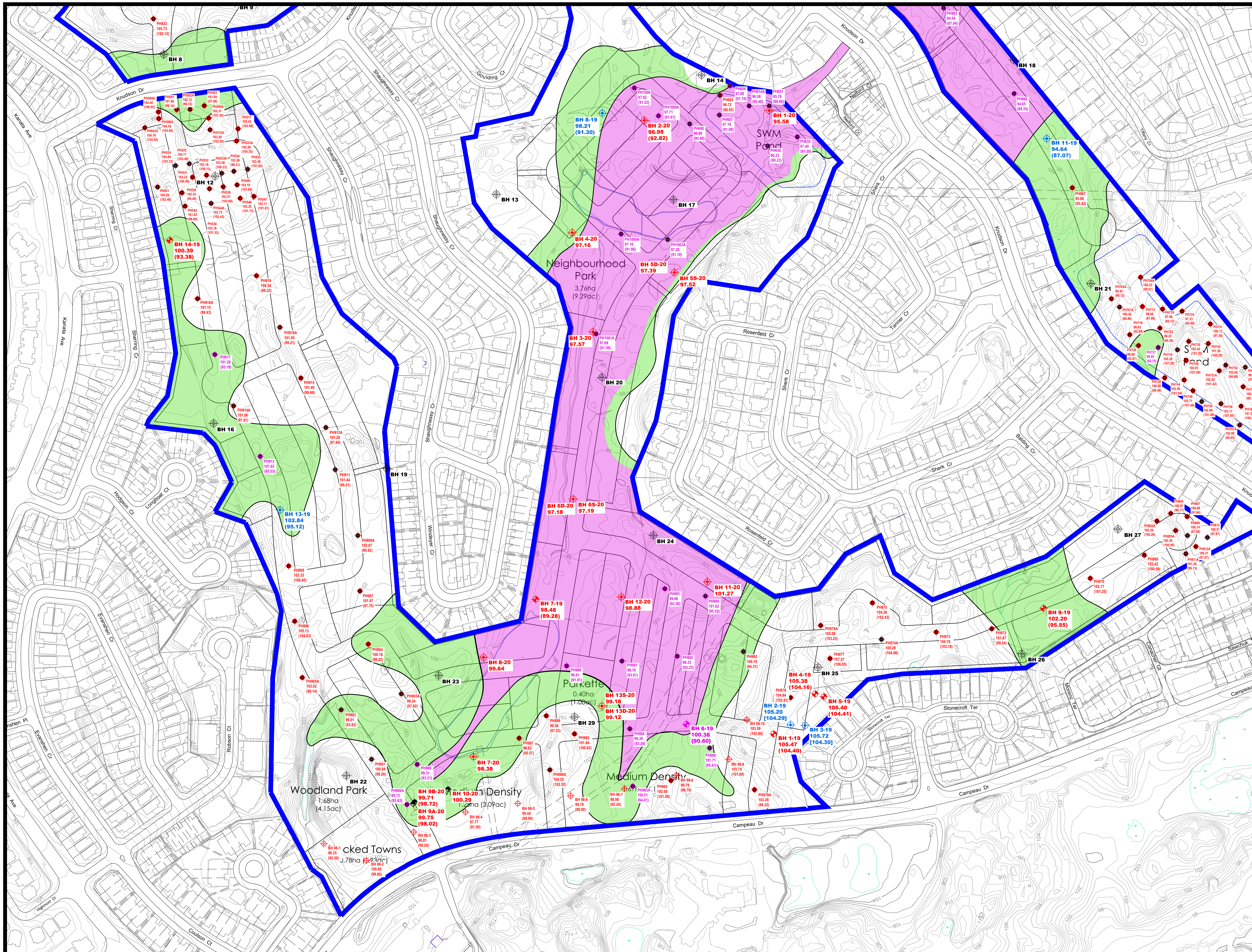
MINTO COMMUNITIES INC.

GEOTECHNICAL INVESTIGATION
KANATA GOLF AND COUNTRY CLUB
OTTAWA, ONTARIO

Title:
PERMISSIBLE GRADE RAISE PLAN AND TREE PLANTING RESTRICTION PLAN

Stamp:

Scale:	1:2000
Drawn by:	MPG
Checked by:	RG
Approved by:	DJG
Date:	03/2019
Report No.:	PG4135
Drawing No.:	PG4135-3
Revision No.:	5



PERMISSIBLE GRADE RAISE / TREE PLANTING RESTRICTIONS

- UP TO 2.0m / AREA 2: TREE PLANTING RESTRICTIONS
- UP TO 2.5m / AREA 2: TREE PLANTING RESTRICTIONS
- NO GRADE RAISE RESTRICTIONS / AREA 1: NO TREE PLANTING RESTRICTIONS

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION (DEEP WELL) (CURRENT INVESTIGATION)
- BOREHOLE WITH MONITORING WELL LOCATION (SHALLOW WELL) (CURRENT INVESTIGATION)
- BOREHOLE LOCATION (CURRENT INVESTIGATION)
- BOREHOLE LOCATION (APRIL, 2019)
- BOREHOLE WITH MONITORING WELL LOCATION (APRIL, 2019)
- PROBEHOLE LOCATION (APRIL, 2019)
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PG4135, JANUARY 2018
- BOREHOLE LOCATION BY OTHERS

105.20	GROUND SURFACE ELEVATION (m)
[104.29]	BEDROCK SURFACE ELEVATION (m)
(104.40)	PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
{88.83}	ELEVATION AT BOTTOM OF TEST HOLE, REFUSAL NOT ENCOUNTERED (m)

TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS (CURRENT INVESTIGATION) PROVIDED BY STANTEC GEOMATICS LIMITED.

SCALE: 1:2000

0 25 50 75 100 125 150m

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consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
5	REVISED TO LATEST BASE PLAN	03/22/2021	MS
4	REVISED TO LATEST BASE PLAN	05/15/2019	DJG
3	REVISED TO LATEST BASE PLAN - NEW BOREHOLES ADDED	03/17/2019	RG
2	REVISED TO LATEST BASE PLAN	07/26/2019	SD
1	REVISED TO LATEST BASE PLAN - ADDED BOREHOLES AND PROBEHOLES DURING MARCH 2019	04/04/2019	SD

MINTO COMMUNITIES INC.

GEOTECHNICAL INVESTIGATION
KANATA GOLF AND COUNTRY CLUB
OTTAWA, ONTARIO

Title:

PERMISSIBLE GRADE RAISE PLAN AND TREE PLANTING RESTRICTION PLAN

Stamp:

Scale: 1:2000	Report No.: PG4135
Drawn by: MPG	Drawing No.: PG4135-4
Checked by: RG	
Approved by: DJG	
Date: 03/2019	Revision No.: 5

p:\autocad drawings\geotechnical\pg41xx\pg4135\pg4135 permissible grade raise plan rev5(may 2020).dwg

LEGEND:

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL LOCATION, CURRENT INVESTIGATION
- PROBEHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PG4135, JANUARY 2018
- BOREHOLE LOCATION BY OTHERS
- 105.20 GROUND SURFACE ELEVATION (m)
- [104.29] BEDROCK SURFACE ELEVATION (m)
- (104.40) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
- (88.83) ELEVATION AT BOTTOM OF TEST HOLE, REFUSAL NOT ENCOUNTERED (m)
- 98 BEDROCK CONTOUR

TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS (CURRENT INVESTIGATION) PROVIDED BY STANTEC GEOMATICS LIMITED.

SCALE: 1:2000

0 25 50 75 100 125 150m

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NO.	REVISIONS	DATE	INITIAL
5	REVISED TO LATEST BASE PLAN	03/22/2021	MS
4	REVISED TO LATEST BASE PLAN	05/15/2019	DJG
3	REVISED TO LATEST BASE PLAN	03/17/2019	RG
2	REVISED TO LATEST BASE PLAN	07/26/2019	SD
1	REVISED TO LATEST BASE PLAN - ADDED BOREHOLES AND PROBEHOLES DURING MARCH 2019	04/04/2019	SD

MINTO COMMUNITIES INC.

GEOTECHNICAL INVESTIGATION
KANATA GOLF AND COUNTRY CLUB
OTTAWA, ONTARIO

Title:

BEDROCK CONTOUR PLAN

Stamp:

Scale:	1:2000
Drawn by:	MPG
Checked by:	RG
Approved by:	DJG
Date:	03/2019
Report No.:	PG4135
Drawing No.:	PG4135-5
Revision No.:	5

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NO.	REVISIONS	DATE	INITIAL
5	REVISED TO LATEST BASE PLAN	03/22/2021	MS
4	REVISED TO LATEST BASE PLAN	05/15/2019	DJG
3	REVISED TO LATEST BASE PLAN	03/17/2019	RG
2	REVISED TO LATEST BASE PLAN	07/26/2019	SD
1	REVISED TO LATEST BASE PLAN - ADDED BOREHOLES AND PROBEHOLES DURING MARCH 2019	04/04/2019	SD

MINTO COMMUNITIES INC.

GEOTECHNICAL INVESTIGATION
KANATA GOLF AND COUNTRY CLUB
OTTAWA, ONTARIO

Title:

BEDROCK CONTOUR PLAN

Stamp:

Scale:	1:2000
Drawn by:	MPG
Checked by:	RG
Approved by:	DJG
Date:	03/2019
Report No.:	PG4135
Drawing No.:	PG4135-6
Revision No.:	5

p:\autocad drawings\geotechnical\pg41xx\pg4135\pg4135-3 bedrock contour plan rev 1.dwg

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION (DEEP WELL) (CURRENT INVESTIGATION)
- BOREHOLE WITH MONITORING WELL LOCATION (SHALLOW WELL) (CURRENT INVESTIGATION)
- BOREHOLE LOCATION (CURRENT INVESTIGATION)
- BOREHOLE LOCATION (APRIL, 2019)
- BOREHOLE WITH MONITORING WELL LOCATION (APRIL, 2019)
- PROBEHOLE LOCATION (APRIL, 2019)
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PG4135, JANUARY 2018
- BOREHOLE LOCATION BY OTHERS

105.20 GROUND SURFACE ELEVATION (m)

[104.29] BEDROCK SURFACE ELEVATION (m)

(104.40) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)

(88.83) ELEVATION AT BOTTOM OF TEST HOLE, REFUSAL NOT ENCOUNTERED (m)

97.0 GROUNDWATER CONTOUR(m)

TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS (CURRENT INVESTIGATION) PROVIDED BY STANTEC GEOMATICS LIMITED.

SCALE: 1:2000

0 25 50 75 100 125 150m

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NO.	REVISIONS	DATE	INITIAL
1	UPDATED TO LATEST CONCEPTUAL PLAN	25/03/2021	MS

MINTO COMMUNITIES INC.

GEOTECHNICAL INVESTIGATION
KANATA GOLF AND COUNTRY CLUB
OTTAWA, ONTARIO

Title:

GROUNDWATER CONTOUR PLAN

Stamp:

Scale:	1:2000
Drawn by:	MPG
Checked by:	RG
Approved by:	DJG
Date:	04/2020
Report No.:	PG4135
Drawing No.:	PG4135-8
Revision No.:	1

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION (DEEP WELL) (CURRENT INVESTIGATION)
- BOREHOLE WITH MONITORING WELL LOCATION (SHALLOW WELL) (CURRENT INVESTIGATION)
- BOREHOLE LOCATION (CURRENT INVESTIGATION)
- BOREHOLE LOCATION (APRIL, 2019)
- BOREHOLE WITH MONITORING WELL LOCATION (APRIL, 2019)
- PROBEHOLE LOCATION (APRIL, 2019)
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PG4135, JANUARY 2018
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- 105.20 GROUND SURFACE ELEVATION (m)
- [104.29] BEDROCK SURFACE ELEVATION (m)
- (104.40) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
- (88.83) ELEVATION AT BOTTOM OF TEST HOLE, REFUSAL NOT ENCOUNTERED (m)
- 97.0 GROUNDWATER CONTOUR(m)

TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS (CURRENT INVESTIGATION) PROVIDED BY STANTEC GEOMATICS LIMITED.

SCALE: 1:2000

0 25 50 75 100 125 150m

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NO.	REVISIONS	DATE	INITIAL

MINTO COMMUNITIES INC.

GEOTECHNICAL INVESTIGATION
KANATA GOLF AND COUNTRY CLUB
OTTAWA, ONTARIO

Title:

GROUNDWATER CONTOUR PLAN

Stamp:	
Scale:	1:2000
Drawn by:	RCG
Checked by:	DP
Approved by:	DJG
Date:	11/2020
Report No.:	PG4135
Drawing No.:	PG4135-9
Revision No.:	0

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