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Geotechnical - Existing Conditions Report

East Urban Community Mixed Use CDP
Mer Bleue Road
Ottawa - Ontario

Prepared For

Richcraft Group of Companies

July 7, 2019

Report: PG3130-2 Revision 2

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Richcraft Group of Companies (Richcraft) to complete an existing conditions report from a geotechnical perspective for the proposed East Urban Community (EUC) development to be located along Mer Bleue Road, in the City of Ottawa (refer to Figure 1 - Key Plan presented in Appendix 2).

The objective of the study is:

- ❑ to determine the subsurface soil and groundwater conditions based on available subsoil information and supplemental borehole investigation.

- ❑ to provide preliminary geotechnical recommendations for the design of the proposed development including construction considerations which may affect the design.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. Investigating the presence or potential presence of contamination on the proposed development was not part of the scope of work. Therefore, the present report does not address environmental issues.

2.0 Background Information

Field Investigation

The subject site is located to the north of Renaud Road and to the south of Innes Road. Mer Bleue Road runs in a north-south direction through the east portion of the site and the existing Hydro corridor runs in roughly an east-west direction through the south portion of the site.

The current field program was completed on September 12 and 15, 2014. The historical geotechnical field investigations were completed by Paterson between March 2002 and February 2012. During that time, a total of fifty-four (54) test holes, consisting of boreholes, test pits and hand auger holes, were extended to a maximum depth of 22 m. Previous geotechnical investigations were also completed by others within the area of the subject site. The results of the previous investigations by others are discussed in the present report.

The locations of the test holes are shown on Drawing PG3130-6 - Test Hole Location Plan included in Appendix 2.

The boreholes were completed using a track-mounted auger drill rig operated by a two person crew. The test pits were completed using a rubber tire backhoe. All fieldwork was conducted under the full-time supervision of personnel from our geotechnical division under the direction of a senior engineer. The testing procedure consisted of augering to the required depths and at the selected locations sampling the overburden.

Sampling and In Situ Testing

Soil samples were collected from the boreholes using a 50 mm diameter split-spoon (SS) sampler, using 73 mm diameter thin walled (TW) Shelby tubes in conjunction with a piston sampler, or from the auger flights.

Soil samples were recovered along the sidewalls of the test pits by hand during excavation.

All soil samples were visually inspected and initially classified on site. The split-spoon samples were placed in sealed plastic bags and the Shelby tubes were sealed at both ends on site. All samples were transported to the our laboratory for examination and classification. The depths at which the split-spoon, Shelby tube, auger and grab samples were recovered from the test holes are shown as SS, TW, AU and G, 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 was carried out at regular depth intervals in cohesive soils. Undrained shear strength testing in test pits was completed using a handheld, portable vane apparatus (field inspection vane tester Roctest Model H-60).

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

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

The subsurface conditions observed at the borehole and test pits were recorded in detail in the field. The soil profiles are presented on the Soil Profile and Test Data sheets and Borehole Logs by Others in Appendix 1.

Groundwater

Flexible standpipes were installed in all boreholes to monitor the groundwater levels subsequent to the completion of the sampling program. Groundwater infiltration levels were noted at the time of excavation at the test pit locations.

Laboratory Testing

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

Ten (10) Shelby tube samples were submitted for unidimensional consolidation during the previous geotechnical investigations. The results of the consolidation and Atterberg testing are presented on the Consolidation Test sheets presented in Appendix 1 and are further discussed in Sections 4.

3.0 Existing Conditions

3.1 Surface Conditions

Currently, the subject site, consists of agricultural lands and lands formerly used for agricultural purposes. The site and regional topography is relatively flat and approximately at grade with neighboring properties and adjacent roadways.

3.2 Subsurface Profile

Overburden Profile

Generally, the subsurface profile encountered at the test hole locations varies between shallow bedrock and a deep silty clay deposit across the subject site. Shallow bedrock was encountered below a cultivated organic zone/topsoil followed by a silty sand, and/or clayey silt layer within the north portion of the site. The remainder of the subject site was underlain by a sensitive silty clay deposit. Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for specific details of the soil profiles encountered at each test hole location.

Based on available geological mapping, the bedrock in this area mostly consists of interbedded limestone and dolomite of the Gull River formation with an overburden drift thickness of 0 to 30 m depth.

Groundwater

Generally, the groundwater levels recovered from the piezometers installed at the borehole locations varied between 0.2 and 6.3 m below existing ground surface. It is important to note that groundwater readings at piezometers can be influenced by surface water perched within the borehole backfill material. 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 groundwater can be expected between 1.5 to 2.5 m depth. Groundwater levels are subject to seasonal fluctuations and therefore could vary during time of construction.

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

4.0 Geotechnical Assessment

An existing slope stability analysis report was completed by others for Reaches 7 and 12 of the Stormwater Management Pond Block. The report also defines the limit of hazard lands limits along the west portion of the SWMP. Reference should be made to the attached report in Appendix 3.

4.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is adequate for the proposed development. Bedrock removal may require line drilling and blasting or hoe ramming depending on the depth of bedrock removal required. Due to the presence of the sensitive silty clay layer, residential buildings should be design in accordance with Part 4 of the current Ontario Building Code (OBC). Also, due to the sensitive silty clay deposit, the proposed development will be subjected to grade raise restrictions.

Preliminary permissible grade raise recommendations have been designed based on the existing soils information. The recommended permissible grade raise areas are presented in Drawing PG3130-7 - Permissible Grade Raise Plan in Appendix 2. If higher than permissible grade raises are required, preloading with or without a surcharge, lightweight fill and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction total and differential settlements.

Municipal services are anticipated within the subject site and will be completed mostly through OHSA Type 2 and 3 soils.

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

4.2 Foundation Design

Bearing Resistance Values

For preliminary design purposes, a conventional style shallow footing for commercial or residential buildings can be designed using the bearing resistance values presented in Table 1. A geotechnical resistance factor of 0.5 was applied to the bearing resistance values at ULS.

Table 1 - Bearing Resistance Values		
Bearing Surface	**Bearing Resistance Value at SLS (kPa)**	**Factored Bearing Resistance Value at ULS (kPa)**
Compact Sandy Silt	60	125
Firm Clayey Silt/Silty Clay	60	125
Stiff Silty Clay/Clayey Silt	100	150
Glacial Till	150	225
Bedrock	500	1000
Note: Footings, up to 3 m wide, can be designed using the above noted bearing resistance values placed over a silty clay bearing surface.		

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.

The bearing resistance values at SLS for shallow footing bearing on compact sandy silt, firm to stiff clayey silt/silty and/or glacial till will be subjected to potential post-construction total and differential settlements of 25 and 15 mm, respectively.

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 bearing on an acceptable bedrock bearing surface and designed using the bearing resistance values provided herein will be subjected to negligible potential post-construction total and differential settlements.

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.

Settlement/Grade Raise

Ten (10) consolidation tests were conducted within the immediate area of the subject site. The results of the consolidation tests from the previous investigations are presented in Tables 2, 3 and 4 and in Appendix 1.

The value for p'_c is the preconsolidation pressure and p'_o is the effective overburden pressure of the test sample. The difference between these values is the available preconsolidation. The increase in stress on the soil due to the cumulative effects of the fill surcharge, the footing pressures, the slab loadings and the lowering of the groundwater should not exceed the available preconsolidation if unacceptable settlements are to be avoided.

The values for C_{cr} and C_c are the recompression and compression indices, respectively. These soil parameters are a measure of the compressibility due to stress increases below and above the preconsolidation pressures. The higher values for the C_c, as compared to the C_{cr}, illustrate the increased settlement potential above, as compared to below, the preconsolidation pressure.

Table 2 - Summary of Consolidation Test Results (Paterson Investigation PG2392)

Borehole	Sample	Depth	p'_c	p'_o	C_{cr}	C_c	Q
BH 7	TW 2	4.36	90	53	0.016	1.643	A
BH 9	TW 3	4.33	106	53	0.021	4.008	A
BH 11	TW 4	4.32	85	53	0.027	2.735	P

* - Q - Quality assessment of sample - G: Good A: Acceptable P: Likely disturbed

Table 3 - Summary of Consolidation Test Results (Paterson Investigation PG0861)

Borehole	Sample	Depth	p'_c	p'_o	C_{cr}	C_c	Q
BH 9-08	TW 2	4.8	126	55	0.026	3.260	A
BH 12-08	TW 4	9.4	109	68	0.031	3.080	A
BH 13-08	TW 2	3.42	142	43	0.025	1.334	A
BH 15-08	TW 2	4.91	87	50	0.029	1.890	A
BH 19-08	TW 3	4.9	99	43	0.025	3.100	A

* - Q - Quality assessment of sample - G: Good A: Acceptable P: Likely disturbed

Table 4 - Summary of Consolidation Test Results (Paterson Investigation G8533)

Borehole	Sample	Depth	p'_c	p'_o	C_{cr}	C_c	Q
BH 3	TW 5	6.53	103	64	0.043	2.967	A
BH 3	TW 7	9.6	175	82	0.028	3.046	A

* - Q - Quality assessment of sample - G: Good A: Acceptable P: Likely disturbed

The values of p'_c, p'_o, C_{cr} and C_c are determined using standard engineering testing procedures and are estimates only. Natural variations within the soil deposit will affect the results. The p'_o parameter is directly influenced by the groundwater level. Groundwater levels were measured during the site investigation. Groundwater levels vary seasonally which has an impact on the available preconsolidation. Lowering the groundwater level increases the p'_o and therefore reduces the available preconsolidation. Unacceptable settlements could be induced by a significant lowering of the groundwater level. The p'_o values for the consolidation tests during the investigation are based on the long term groundwater level being at 0.5 m below the existing groundwater table. The groundwater level is based on the colour and undrained shear strength profile of the silty clay.

The total and differential settlements will be dependent on characteristics of the proposed buildings. For design purposes, the total and differential settlements are estimated to be 25 and 20 mm, respectively. A post-development groundwater lowering of 0.5 m was assumed.

The potential post construction total and differential settlements are dependent on the position of the long term groundwater level when building 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.

The recommended permissible grade raise areas for buildings are defined in Drawing PG3130-7 - 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.

4.3 Design for Earthquakes

The site class for seismic site response can be taken as **Class C** for the foundations bearing on a compact to dense glacial till and/or bedrock within the north portion of the subject site. A higher site class, such as Class A or B, is applicable for footings bearing on the bedrock surface. However, a site specific seismic shear wave test will be required to confirm the Class A or B seismic site classification.

Based on existing subsoils information, a seismic site response **Class D or E** is applicable for design of the proposed buildings bearing over a stiff to firm silty clay deposit throughout the remainder of the site. The specific site classification is dependent on the bedrock depth, which should be more accurately delineated as part of a future geotechnical investigation program for the subject site.

Soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the 2012 Ontario Building Code for a full discussion of the earthquake design requirements.

4.4 Groundwater Control

Due to the relatively impervious nature of the silty clay/clayey silt materials, it is anticipated that groundwater infiltration into the excavations should be low and controllable using open sumps. A perched groundwater condition may be encountered within the sandy silt deposit, where encountered, which may produce significant temporary groundwater infiltration levels. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations.

A temporary MOE permit to take water (PTTW) will be required for this project if more than 50,000 L/day are to be pumped during the construction phase. At least 4 to 5 months should be allowed for completion of the application and issuance of the permit by the MOE.

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.

4.5 Stormwater Management Facility

It is understood that a stormwater management facility is planned for the subject site. However, details or the SWMF have not been designed yet. From a geotechnical perspective, the construction of the proposed SWMF is possible. The main areas of concern will be:

- ❏ The groundwater infiltration rate within the excavation side slopes and along the bottom of the pond
- ❏ The permeability of the subsoil materials
- ❏ The stability of the excavation side slopes

From a geotechnical perspective, the construction of the proposed SWMF is possible and its long term performance will depend on the stability of its excavation side slopes. From a geotechnical perspective, sidewalls shaped to a 3H:1V slope are considered to be stable in the long term and are adequate for SWMF construction at the subject site.

5.0 Recommendations

This existing conditions report provides preliminary design information. A detailed geotechnical investigation will be required once the proposed design is finalized. It is recommended that the following be carried out once the design plans and site development are determined:

- ❑ Carry out a detailed geotechnical investigation for the final detailed design which will include boreholes at strategic locations to recover undisturbed soil samples of the sensitive underlying silty clay deposit for consolidation testing.
- ❑ Review detailed grading plan(s) from a geotechnical perspective.
- ❑ Review detailed foundation plan(s) from a geotechnical perspective.
- ❑ A MOE Permit to Take Water (PTTW) will be required for the subject site and should be applied for well in advance of building construction (4 to 5 months).

6.0 Statement Of Limitations

The recommendations made in this report are in accordance with Paterson's present understanding of the project. Paterson requests permission to review the grading plan once available. Paterson's recommendations should be reviewed when the drawings and specifications are complete.

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

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests to be notified immediately in order to permit reassessment of the 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 Richcraft Group of Companies or their agent(s) is not authorized without review by this firm for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Faisal I. Abou-Seido, P.Eng. David J. Gilbert, P.Eng.

Report Distribution:

- ❑ Richcraft Group of Companies (3 copies)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

BOREHOLES BY OTHERS

SYMBOLS AND TERMS

CONSOLIDATION TEST RESULTS

ATTERBERG LIMITS' TESTING RESULTS

APPENDIX 2

FIGURE 1 - KEY PLAN

DRAWING PG3130-6 - TEST HOLE LOCATION PLAN

DRAWING PG3130-7 - PERMISSIBLE GRADE RAISE PLAN

APPENDIX 3

SLOPE STABILITY ANALYSIS REPORT - BY OTHERS

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

BOREHOLES BY OTHERS

SYMBOLS AND TERMS

CONSOLIDATION TEST RESULTS

ATTERBERG LIMITS' TESTING RESULTS

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
East Urban Community - Navan Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Annis, O'Sullivan, Vollebekk Limited.

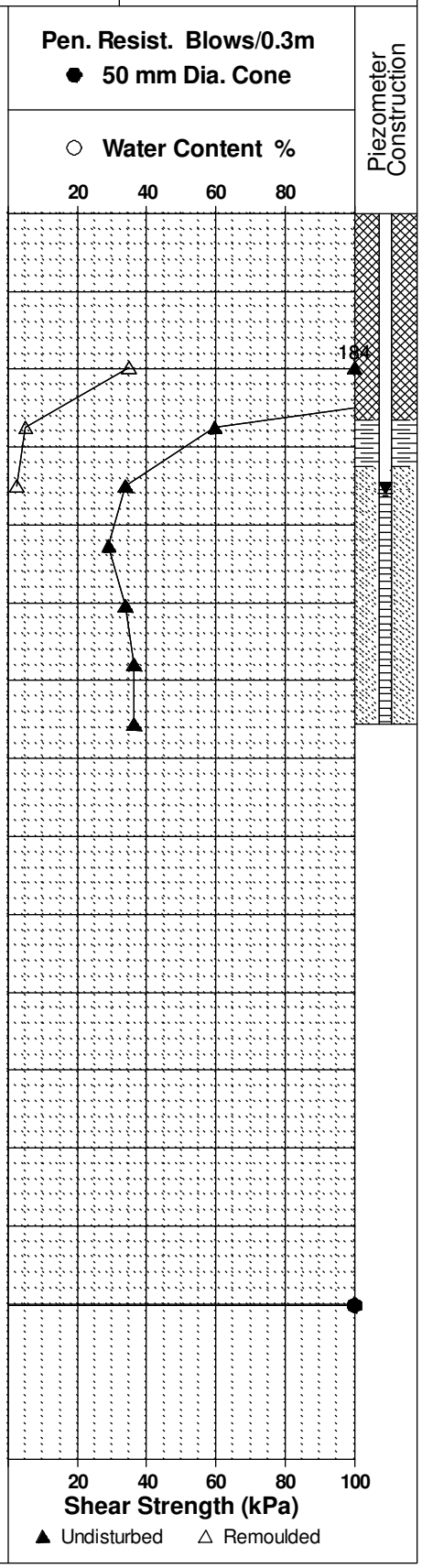
FILE NO. PG3130

REMARKS

HOLE NO. BH 1-14

BORINGS BY CME 55 Power Auger **DATE** September 12, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.68
TOPSOIL 0.28		AU	1				
		SS	2	83	9	1	86.68
Very stiff to stiff, brown **SILTY CLAY**						2	85.68
- firm and grey by 2.9m depth						3	84.68
						4	83.68
						5	82.68
						6	81.68
6.55							
Dynamic Cone Penetration Test commenced at 6.55m depth. Cone pushed to 14.0m depth.						7	80.68
						8	79.68
						9	78.68
						10	77.68
						11	76.68
						12	75.68
						13	74.68
14.02						14	73.68
End of Borehole							
Practical DCPT refusal at 14.02m depth.							
(GWL @ 3.60m-Sept. 24, 2014)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
East Urban Community - Navan Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Annis, O'Sullivan, Vollebekk Limited.

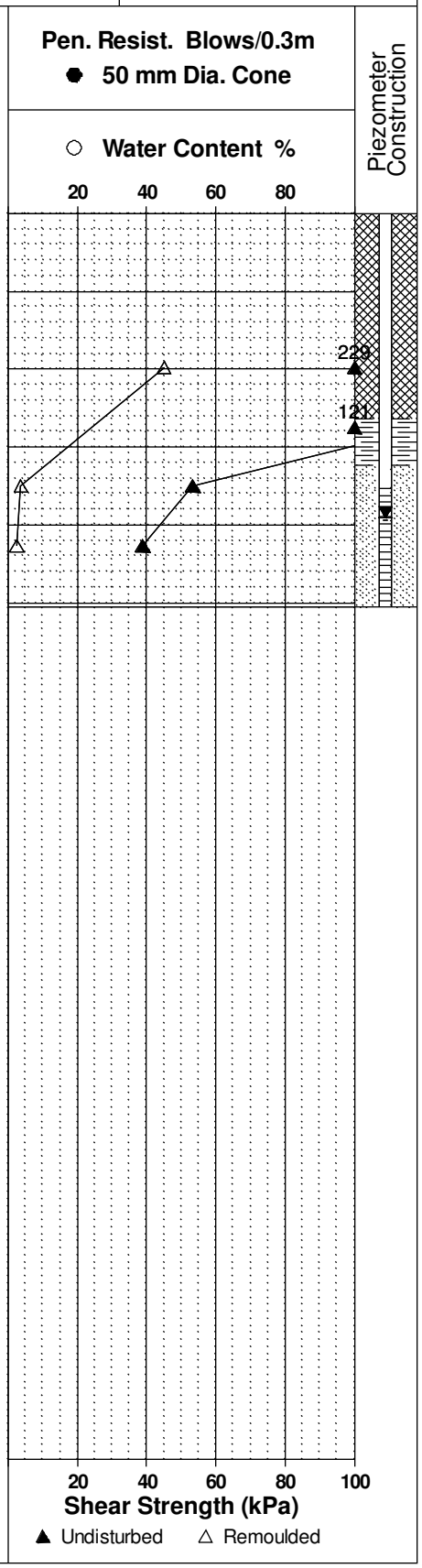
FILE NO. PG3130

REMARKS

HOLE NO. BH 2-14

BORINGS BY CME 55 Power Auger **DATE** September 12, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.13
TOPSOIL 0.33		AU	1				
		SS	2	83	12	1	87.13
Hard to very stiff, brown **SILTY CLAY**						2	86.13
- stiff to firm and grey by 2.9m depth						3	85.13
4.42						4	84.13
GLACIAL TILL: Grey-brown silty clay with sand, gravel, cobbles, boulders 5.05		SS	3		50+	5	83.13
End of Borehole							
Practical refusal to augering at 5.05m depth							
(GWL @ 3.91m-Sept. 24, 2014)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
East Urban Community - Navan Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Annis, O'Sullivan, Vollebekk Limited.

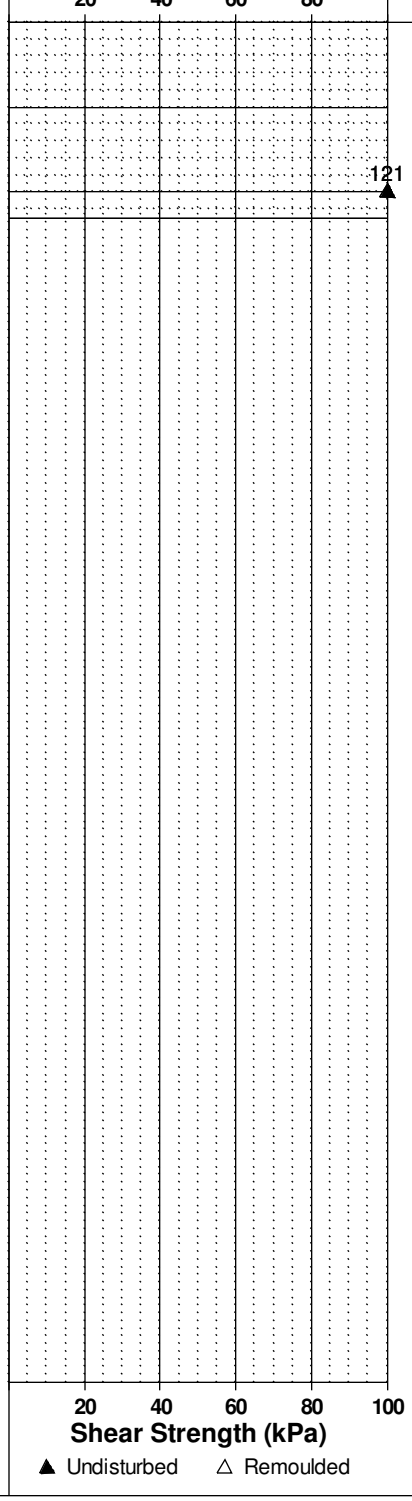
FILE NO. PG3130

REMARKS

HOLE NO. BH 3-14

BORINGS BY CME 55 Power Auger **DATE** September 12, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL 0.28		AU	1			0	88.74		
Very stiff, brown **SILTY CLAY**		SS	2		11	1	87.74		
2.13						2	86.74		
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles and boulders 2.31		SS	3	0	50+				
End of Borehole									
Practical refusal to augering at 2.31m depth									
(BH dry upon completion)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
East Urban Community - Navan Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Annis, O'Sullivan, Vollebekk Limited.

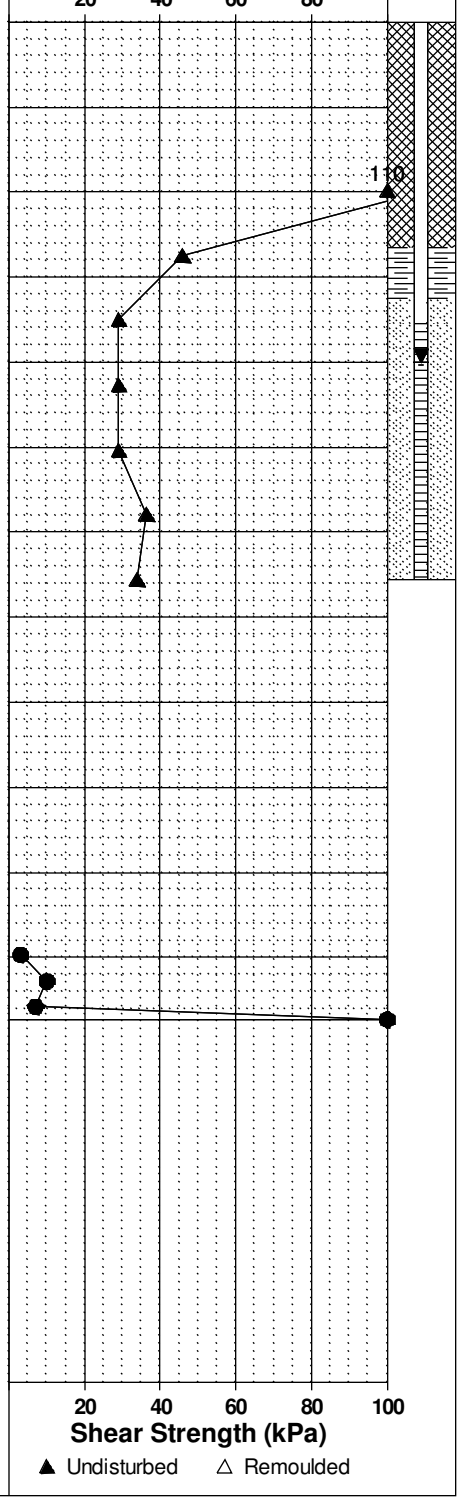
FILE NO. PG3130

REMARKS

HOLE NO. BH 4-14

BORINGS BY CME 55 Power Auger **DATE** September 12, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.15
TOPSOIL 0.28							
		SS	1	83	6	1	87.15
Very stiff to stiff, brown **SILTY CLAY**						2	86.15
						3	85.15
- firm and grey by 2.9m depth						4	84.15
						5	83.15
						6	82.15
6.55							
Dynamic Cone Penetration Test commenced at 6.55m depth. Cone pushed to 10.7m depth.						7	81.15
						8	80.15
						9	79.15
						10	78.15
						11	77.15
11.73							
End of Borehole							
Practical DCPT refusal at 11.73m depth							
(GWL @ 4.00m-Sept. 24, 2014)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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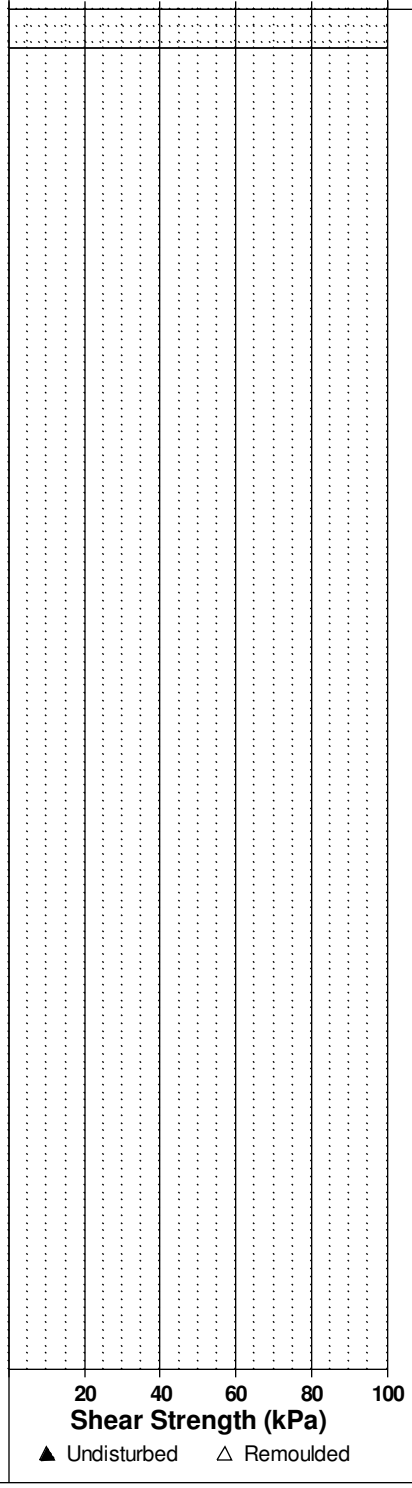
FILE NO. PG3130

REMARKS

HOLE NO. BH 5-14

BORINGS BY CME 55 Power Auger **DATE** September 15, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	90.54		
TOPSOIL 0.13									
GLACIAL TILL: Brown silty clay with sand, gravel and cobbles 0.46									
End of Borehole									
Practical refusal to augering at 0.46m depth									
(BH dry upon completion)									



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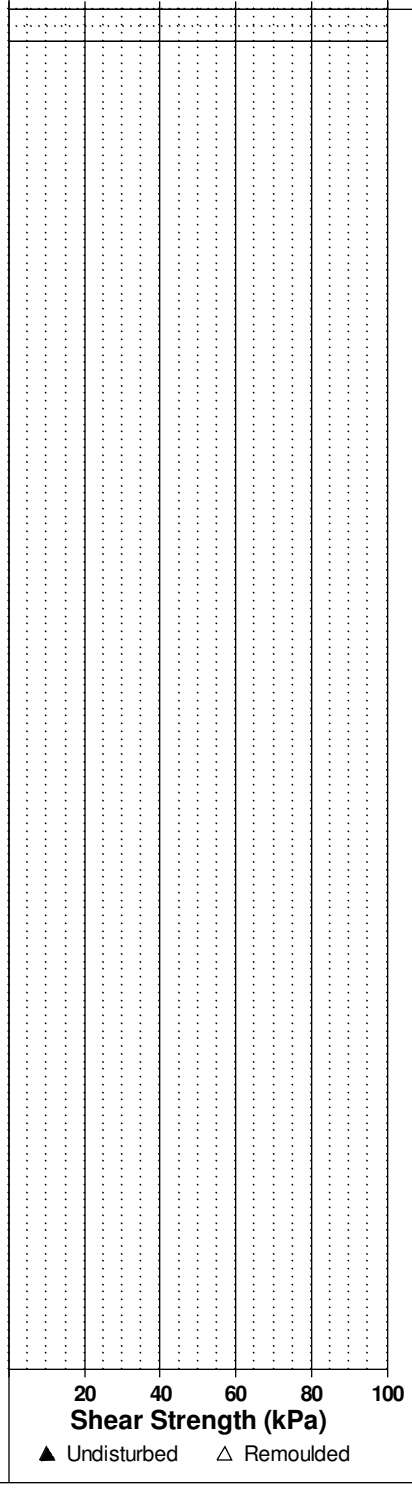
HOLE NO. BH 6-14

BORINGS BY CME 55 Power Auger **DATE** September 15, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	89.34		
TOPSOIL 0.20		AU	1						
Brown **SILTY CLAY,** trace sand 0.38									
End of Borehole									
Practical refusal to augering at 0.38m depth									
(BH dry upon completion)									



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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
East Urban Community - Navan Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Annis, O'Sullivan, Vollebekk Limited.

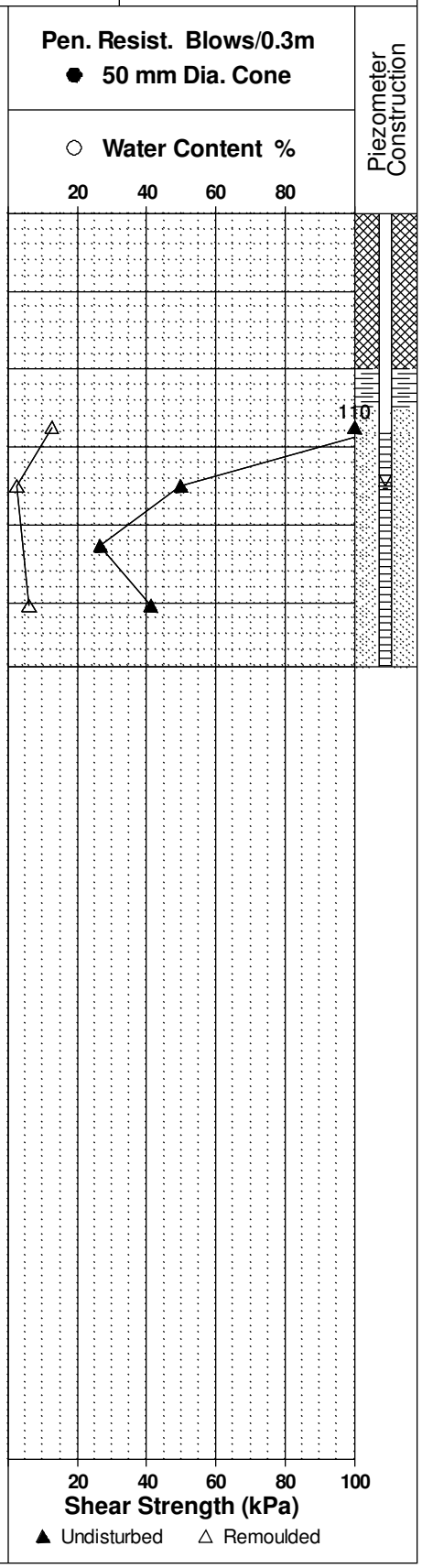
FILE NO. PG3130

REMARKS

HOLE NO. BH 7-14

BORINGS BY CME 55 Power Auger **DATE** September 15, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.99
TOPSOIL 0.23		AU	1				
		SS	2	100		1	86.99
		SS	3	100	5	2	85.99
Very stiff to stiff, brown **SILTY CLAY**							
- firm and grey by 2.9m depth						3	84.99
						4	83.99
5.18						5	82.99
GLACIAL TILL: Grey-brown silty clay with sand, gravel, cobbles and boulders 5.82		SS	4	100	12		
End of Borehole							
Practical refusal to augering at 5.82m depth							
(GWL @ 3.5m depth based on field observations)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
East Urban Community - Navan Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Annis, O'Sullivan, Vollebekk Limited.

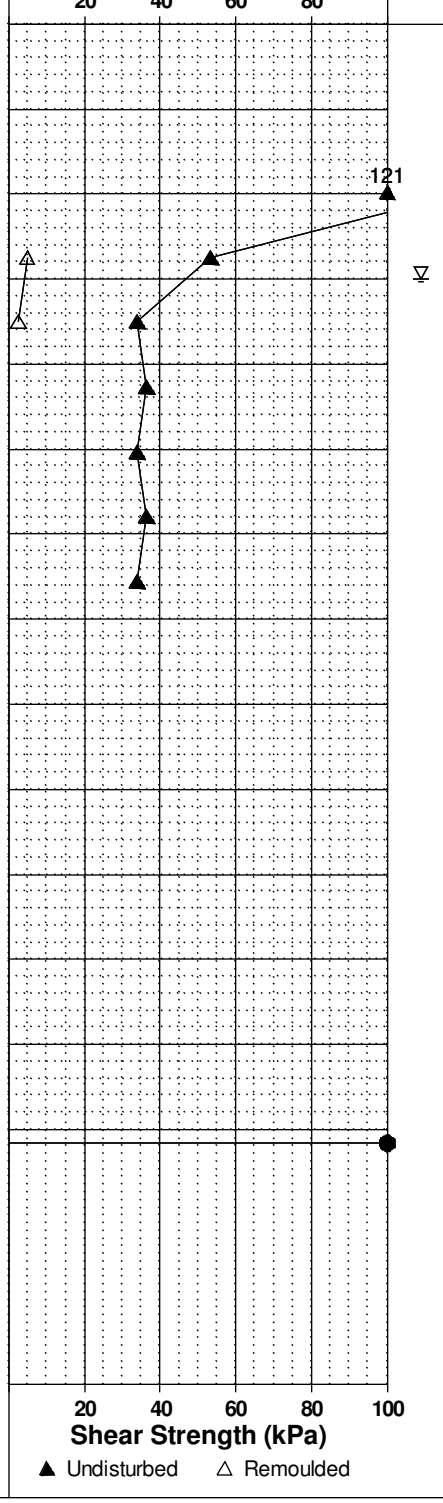
FILE NO. PG3130

REMARKS

HOLE NO. BH 8-14

BORINGS BY CME 55 Power Auger **DATE** September 15, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.46
TOPSOIL 0.25		AU	1				
		SS	2	100	3	1	86.46
						2	85.46
Very stiff to stiff, brown **SILTY CLAY**						3	84.46
- firm and grey by 2.9m depth						4	83.46
						5	82.46
						6	81.46
6.55							
Dynamic Cone Penetration Test commenced at 6.55m depth. Cone pushed to 13.1m depth.						7	80.46
						8	79.46
						9	78.46
						10	77.46
						11	76.46
						12	75.46
						13	74.46
13.16							
End of Borehole							
Practical DCPT refusal at 13.16m depth							
(GWL @ 3.0m depth based on field observations)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
East Urban Community - Navan Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Annis, O'Sullivan, Vollebekk Limited.

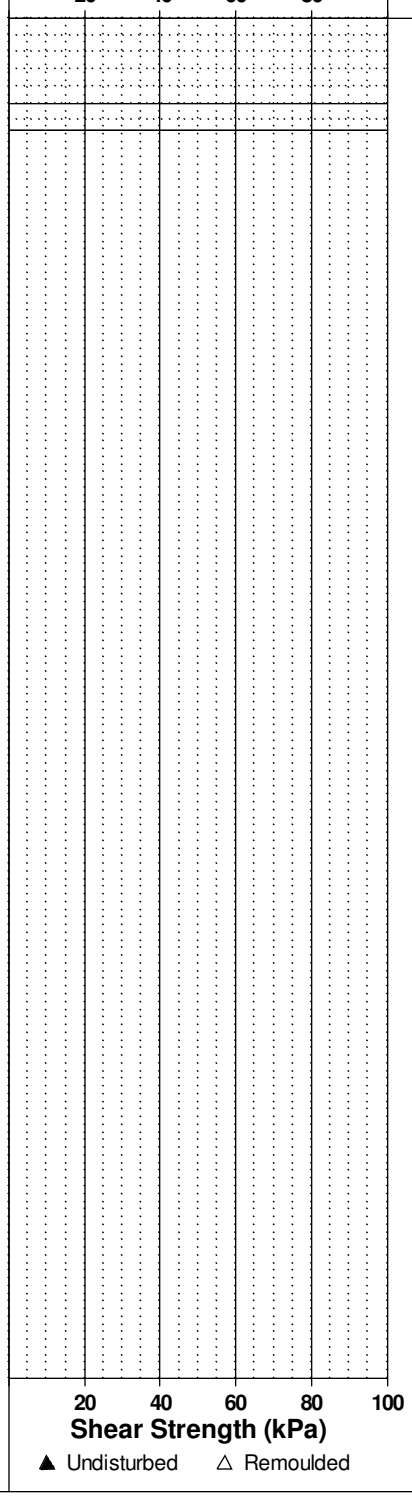
FILE NO. PG3130

REMARKS

HOLE NO. BH 9-14

BORINGS BY CME 55 Power Auger **DATE** September 15, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL 0.20		AU	1			0	89.97		
Very stiff, brown **SILTY CLAY** 1.32		SS	2		14	1	88.97		
End of Borehole									
Practical refusal to augering at 1.32m depth									
(BH dry upon completion)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
East Urban Community - Navan Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Annis, O'Sullivan, Vollebekk Limited.

FILE NO. PG3130

REMARKS

HOLE NO. BH10-14

BORINGS BY CME 55 Power Auger **DATE** September 15, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.44		
TOPSOIL 0.28		AU	1						
		SS	2	83	9	1	87.44		
		SS	3	83	5	2	86.44		
Very stiff to stiff, brown **SILTY CLAY**						3	85.44		
- firm and grey by 3.7m depth						4	84.44		▽
						5	83.44		
						6	82.44		
7.14						7	81.44		
End of Borehole Practical refusal to augering at 7.14m depth (GWL @ 4.0m depth based on field observations)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development-Trails Edge Phase 2
Ottawa, Ontario

DATUM Ground surface provided by Annis, O'Sullivan, Vollebekk Limited.

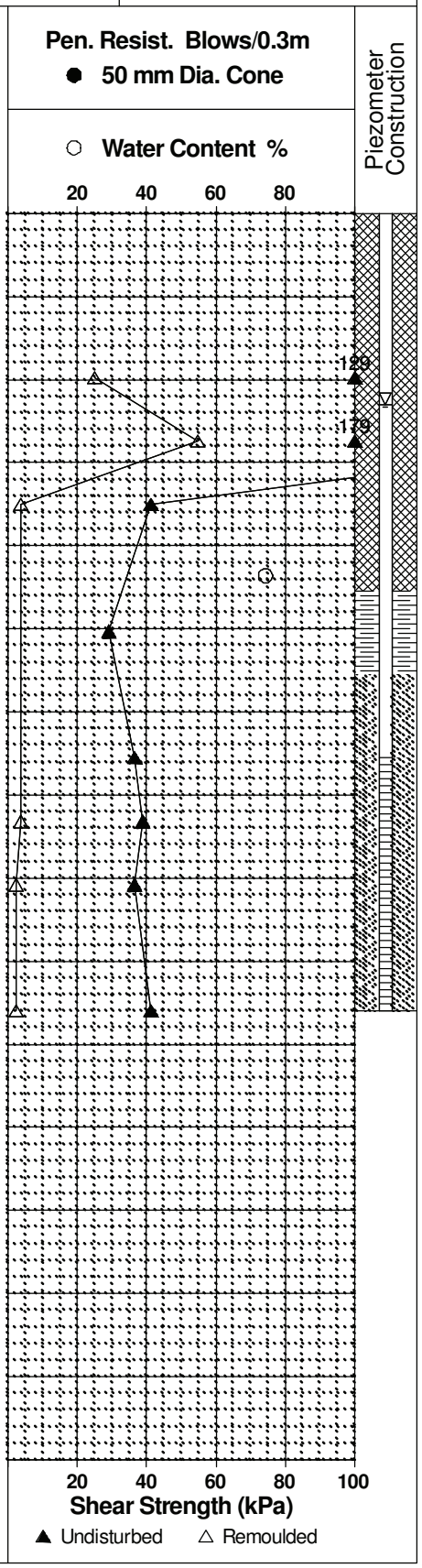
FILE NO. PG2392

REMARKS

HOLE NO. BH 7

BORINGS BY CME 55 Power Auger **DATE** 17 August 2011

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.15
TOPSOIL 0.20							
Loose, brown **SILTY SAND** 0.30		SS	1	67	7	1	86.15
Very stiff to stiff, brown **SILTY CLAY**						2	85.15
3.30						3	84.15
		TW	2	100		4	83.15
		TW	3	100		5	82.15
Firm, grey **SILTY CLAY**						6	81.15
						7	80.15
						8	79.15
		TW	4	100		9	78.15
9.60							
Dynamic Cone Penetration Test commenced @ 9.60m depth. Cone pushed to 23.5m depth.						10	77.15
						11	76.15
						12	75.15
						13	74.15
						14	73.15
						15	72.15



Piezometer Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development-Trails Edge Phase 2
Ottawa, Ontario

DATUM Ground surface provided by Annis, O'Sullivan, Vollebekk Limited.

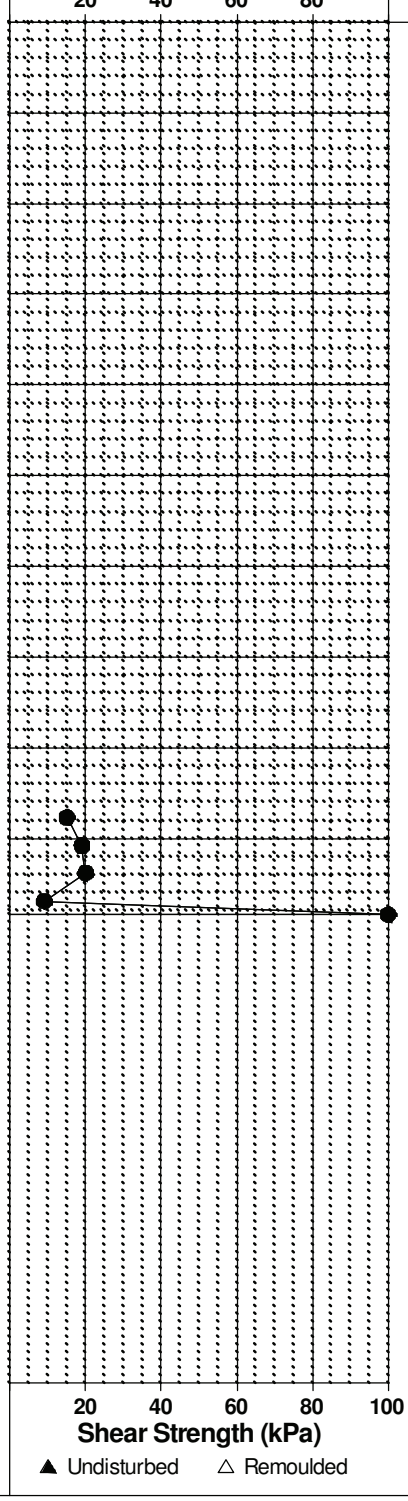
FILE NO. PG2392

REMARKS

HOLE NO. BH 7

BORINGS BY CME 55 Power Auger **DATE** 17 August 2011

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
						15	72.15		
						16	71.15		
						17	70.15		
						18	69.15		
						19	68.15		
						20	67.15		
						21	66.15		
						22	65.15		
						23	64.15		
						24	63.15		
24.84									
End of Borehole Practical cone refusal @ 24.84m depth (GWL @ 2.3m depth based on field observations)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development-Trails Edge Phase 2
Ottawa, Ontario

DATUM Ground surface provided by Annis, O'Sullivan, Vollebekk Limited.

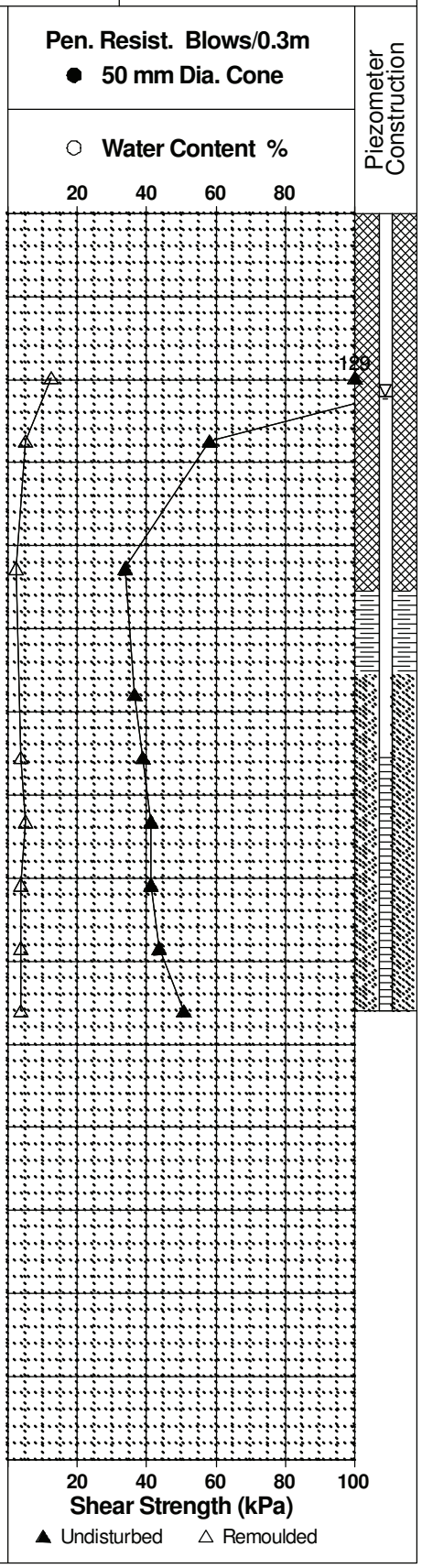
FILE NO. PG2392

REMARKS

HOLE NO. BH 8

BORINGS BY CME 55 Power Auger **DATE** 9 February 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	86.93
TOPSOIL 0.25		AU	1				
		SS	2		8	1	85.93
Very stiff to stiff, brown **SILTY CLAY**						2	84.93
2.90						3	83.93
		TW	3	83		4	82.93
		TW	4	100		5	81.93
Firm, grey **SILTY CLAY**						6	80.93
						7	79.93
						8	78.93
						9	77.93
9.60							
Dynamic Cone Penetration Test commenced @ 9.60m depth. Cone pushed to 19.8m depth.						10	76.93
						11	75.93
						12	74.93
						13	73.93
						14	72.93
						15	71.93



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development-Trails Edge Phase 2
Ottawa, Ontario

DATUM Ground surface provided by Annis, O'Sullivan, Vollebekk Limited.

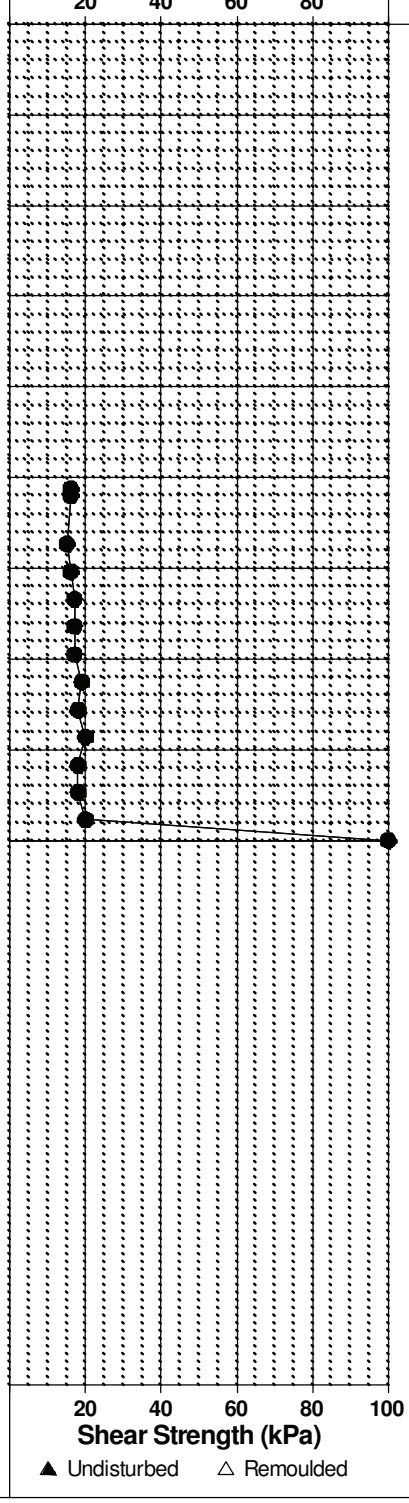
FILE NO. PG2392

REMARKS

HOLE NO. BH 8

BORINGS BY CME 55 Power Auger **DATE** 9 February 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						15	71.93		
						16	70.93		
						17	69.93		
						18	68.93		
						19	67.93		
						20	66.93		
						21	65.93		
						22	64.93		
						23	63.93		
24.00						24	62.93		
End of Borehole Practical DCPT refusal @ 24.00m depth. (GWL @ 2.2m depth based on field observations)									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development-Trails Edge Phase 2
Ottawa, Ontario

DATUM Ground surface provided by Annis, O'Sullivan, Vollebekk Limited.

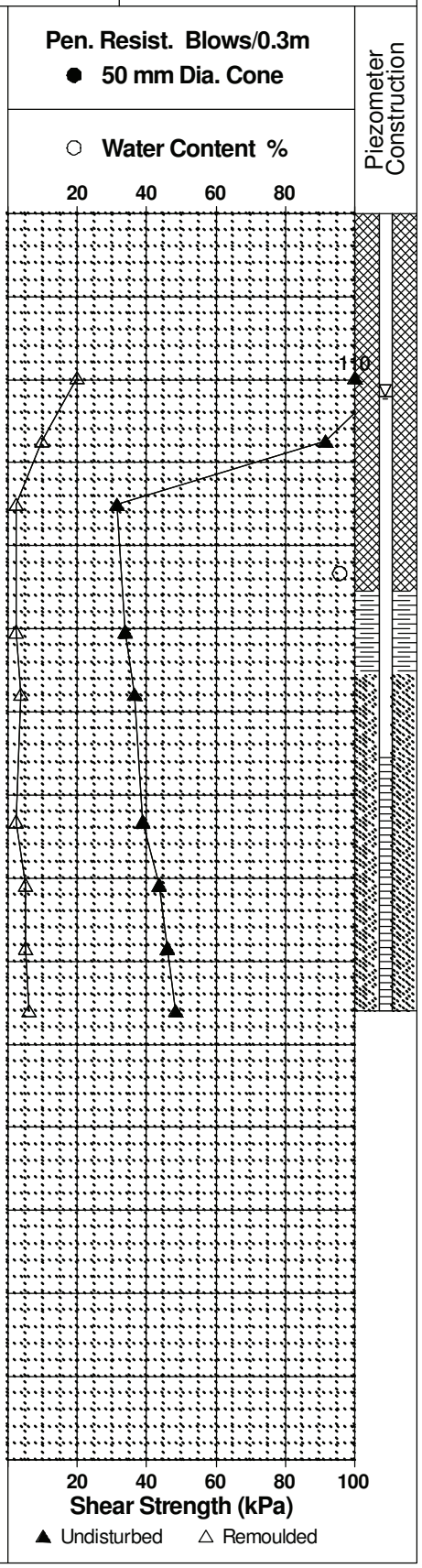
FILE NO. PG2392

REMARKS

HOLE NO. BH 9

BORINGS BY CME 55 Power Auger **DATE** 10 February 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	86.96
TOPSOIL 0.23		AU	1				
		SS	2	100	8	1	85.96
Very stiff to stiff, brown **SILTY CLAY**						2	84.96
2.90						3	83.96
		TW	3	100		4	82.96
Firm, grey **SILTY CLAY**						5	81.96
		TW	4	100		6	80.96
						7	79.96
						8	78.96
9.60						9	77.96
Dynamic Cone Penetration Test commenced at 9.60m depth. Cone pushed to 19.8m depth.						10	76.96
						11	75.96
						12	74.96
						13	73.96
						14	72.96
						15	71.96



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development-Trails Edge Phase 2
Ottawa, Ontario

DATUM Ground surface provided by Annis, O'Sullivan, Vollebekk Limited.

FILE NO. PG2392

REMARKS

HOLE NO. BH 9

BORINGS BY CME 55 Power Auger **DATE** 10 February 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						15	71.96		
						16	70.96		
						17	69.96		
						18	68.96		
						19	67.96		
						20	66.96		
						21	65.96		
						22	64.96		
						23	63.96		
						24	62.96		
						25	61.96		
26.16						26	60.96		
End of Borehole Practical DCPT refusal @ 26.16m depth. (GWL @ 2.2m depth based on field observations)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development-Trails Edge Phase 2
Ottawa, Ontario

DATUM Ground surface provided by Annis, O'Sullivan, Vollebekk Limited.

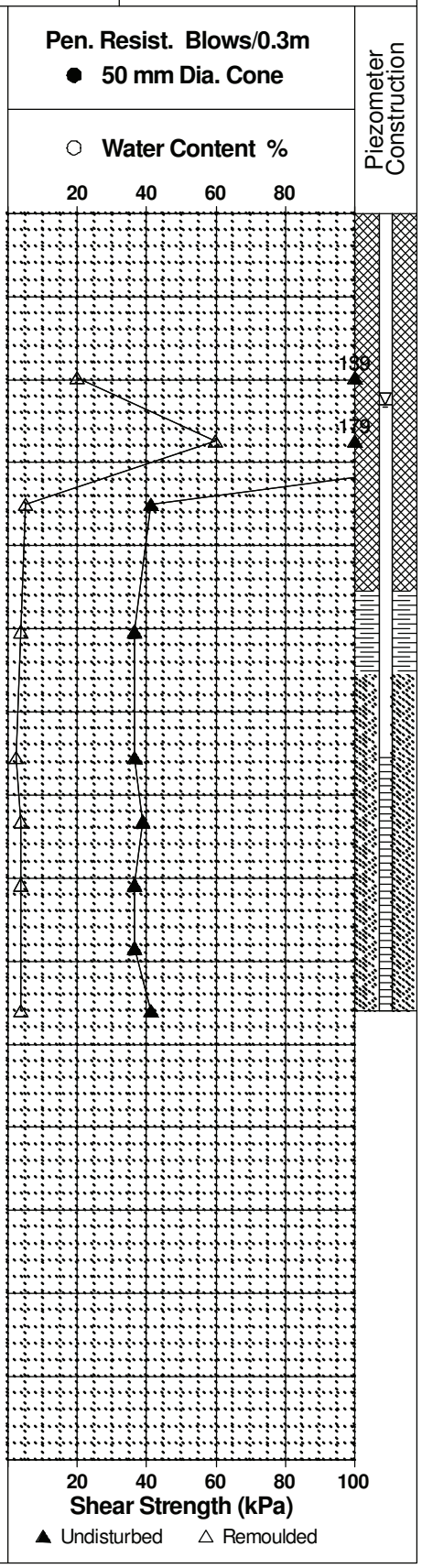
FILE NO. PG2392

REMARKS

HOLE NO. BH10

BORINGS BY CME 55 Power Auger **DATE** 17 August 2011

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	86.97
TOPSOIL 0.20		AU	1				
Brown **SILTY CLAY** with sand, trace gravel 0.69		SS	2	92	7	1	85.97
Very stiff to stiff, brown **SILTY CLAY**						2	84.97
3.30						3	83.97
		TW	2			4	82.97
		TW	3			5	81.97
Firm, grey **SILTY CLAY**						6	80.97
						7	79.97
						8	78.97
						9	77.97
9.60							
Dynamic Cone Penetration Test commenced @ 25.27m depth. Cone pushed to 22.7m depth.						10	76.97
						11	75.97
						12	74.97
						13	73.97
						14	72.97
						15	71.97



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development-Trails Edge Phase 2
Ottawa, Ontario

DATUM Ground surface provided by Annis, O'Sullivan, Vollebekk Limited.

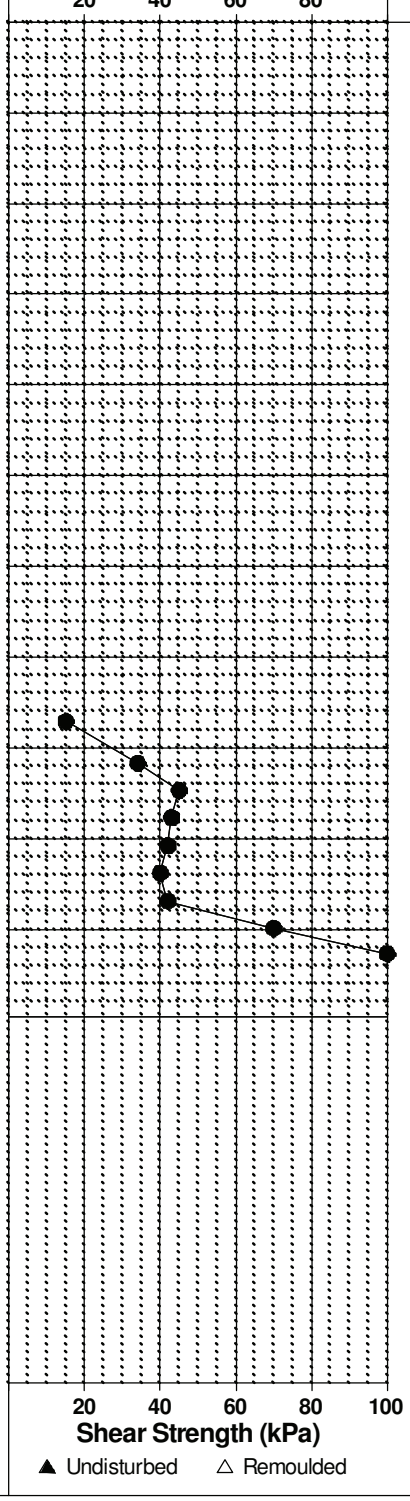
FILE NO. PG2392

REMARKS

HOLE NO. BH10

BORINGS BY CME 55 Power Auger **DATE** 17 August 2011

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
						15	71.97		
						16	70.97		
						17	69.97		
						18	68.97		
						19	67.97		
						20	66.97		
						21	65.97		
						22	64.97		
						23	63.97		
						24	62.97		
						25	61.97		
25.27									
End of Borehole Practical cone refusal @ 25.27m depth (GWL @ 2.3m depth based on field observations)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development-Trails Edge Phase 2
Ottawa, Ontario

DATUM Ground surface provided by Annis, O'Sullivan, Vollebekk Limited.

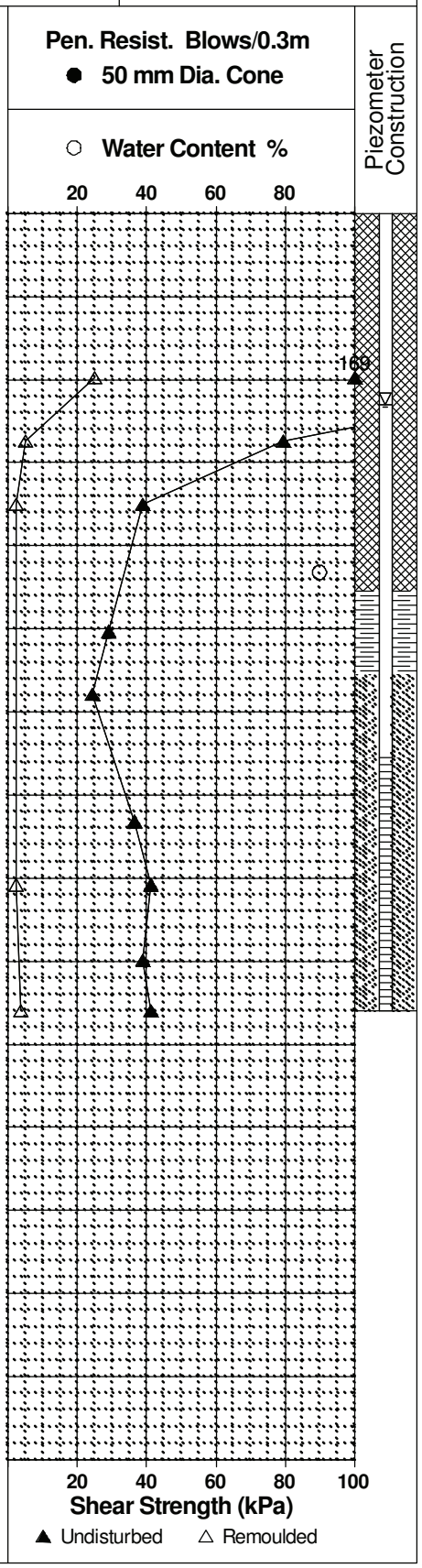
FILE NO. PG2392

REMARKS

HOLE NO. BH11

BORINGS BY CME 55 Power Auger **DATE** 9 February 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.17
TOPSOIL 0.25		AU	1				
		AU	2				
Very stiff to stiff, brown **SILTY CLAY**		SS	3	83	12	1	86.17
2.90						2	85.17
						3	84.17
		TW	4	100		4	83.17
						5	82.17
Firm, grey **SILTY CLAY**						6	81.17
		TW	5	100		7	80.17
						8	79.17
						9	78.17
9.60						10	77.17
Dynamic Cone Penetration Test commenced @ 9.60m depth. Cone pushed to 20.4m depth.						11	76.17
						12	75.17
						13	74.17
						14	73.17
						15	72.17



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development-Trails Edge Phase 2
Ottawa, Ontario

DATUM Ground surface provided by Annis, O'Sullivan, Vollebekk Limited.

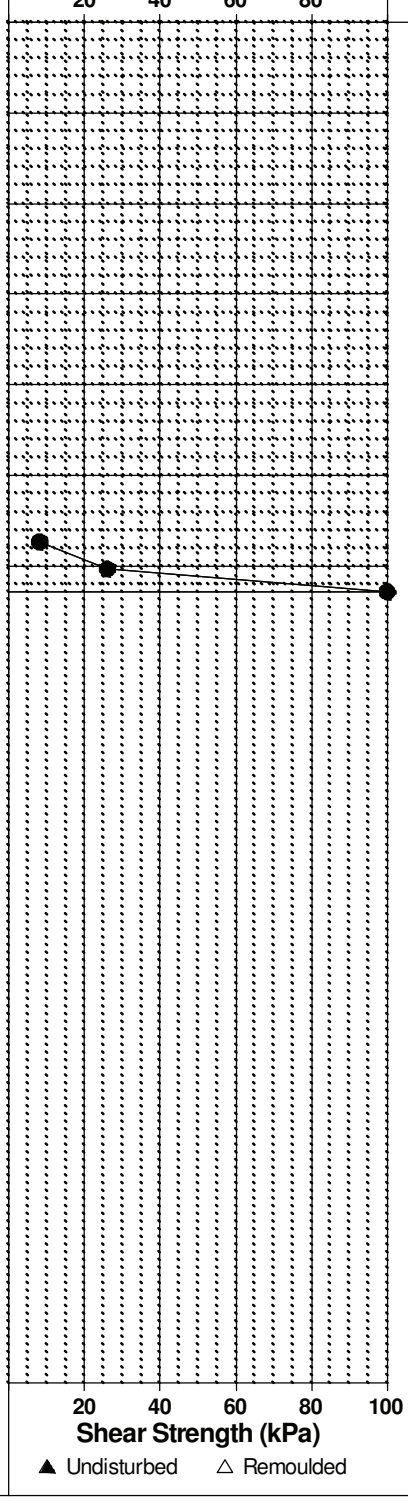
FILE NO. PG2392

REMARKS

HOLE NO. BH11

BORINGS BY CME 55 Power Auger **DATE** 9 February 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						15	72.17		
						16	71.17		
						17	70.17		
						18	69.17		
						19	68.17		
						20	67.17		
						21	66.17		
21.28									
End of Borehole Practical DCPT refusal @ 21.28m depth. (GWL @ 2.3m depth based on field observations)									



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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

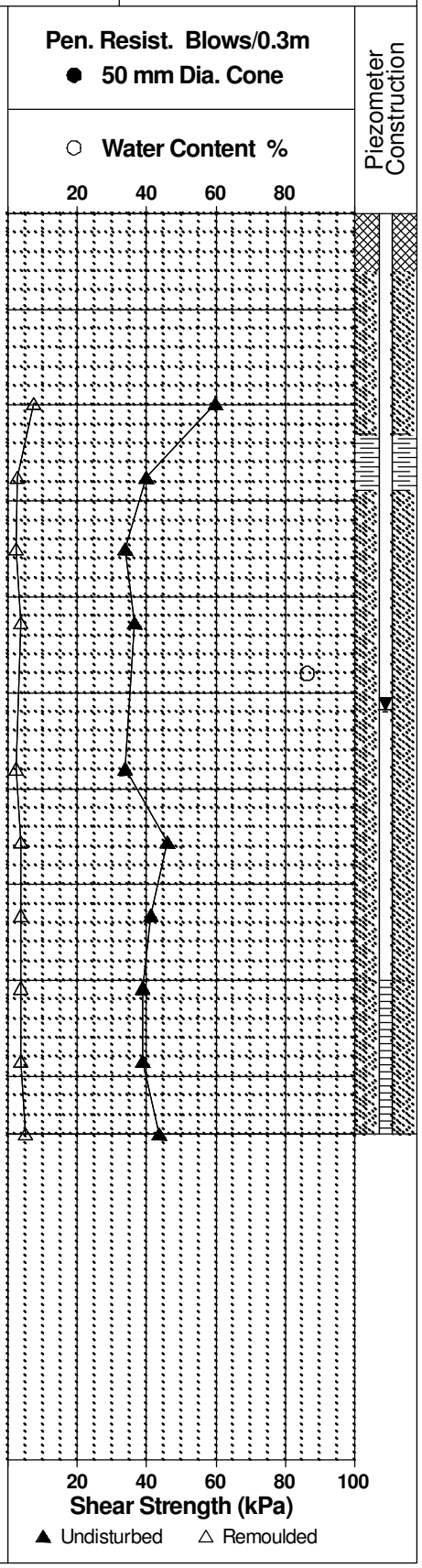
FILE NO. PG0861

REMARKS

HOLE NO. BH 9-08

BORINGS BY CME 55 Power Auger **DATE** 7 August 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	86.92
TOPSOIL 0.40							
Loose, light brown **SILTY SAND** 0.75		SS	1	67	7	1	85.92
Very stiff to stiff, brown **SILTY CLAY**						2	84.92
						3	83.92
- firm and grey by 2.7m depth						4	82.92
		TW	2	100		5	81.92
						6	80.92
						7	79.92
						8	78.92
						9	77.92
9.60							
End of Borehole							
(GWL @ 5.17m-Aug. 28/08)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

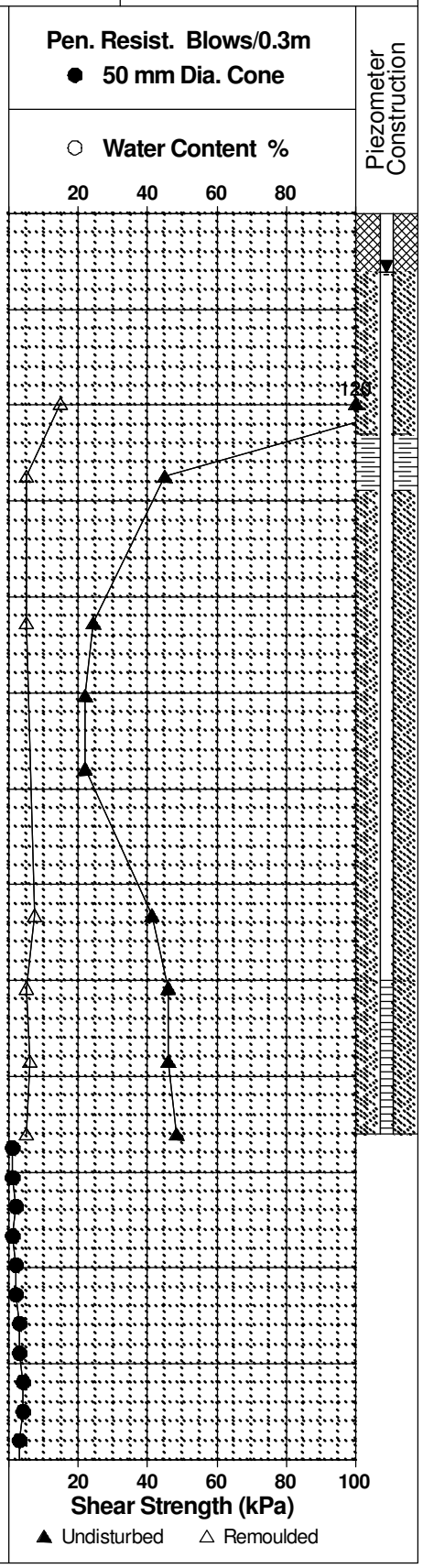
FILE NO. PG0861

REMARKS

HOLE NO. BH11-08

BORINGS BY CME 55 Power Auger **DATE** 7 August 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.14
TOPSOIL 0.20							
		SS	1		9	1	86.14
Very stiff to stiff, brown **SILTY CLAY**						2	85.14
- firm and grey by 2.9m depth		TW	2	88		3	84.14
						4	83.14
						5	82.14
		TW	3	100		6	81.14
						7	80.14
						8	79.14
						9	78.14
9.60							
Dynamic Cone Penetration Test commenced @ 9.60m depth						10	77.14
Inferred **SILTY CLAY**						11	76.14
						12	75.14
						13	74.14



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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

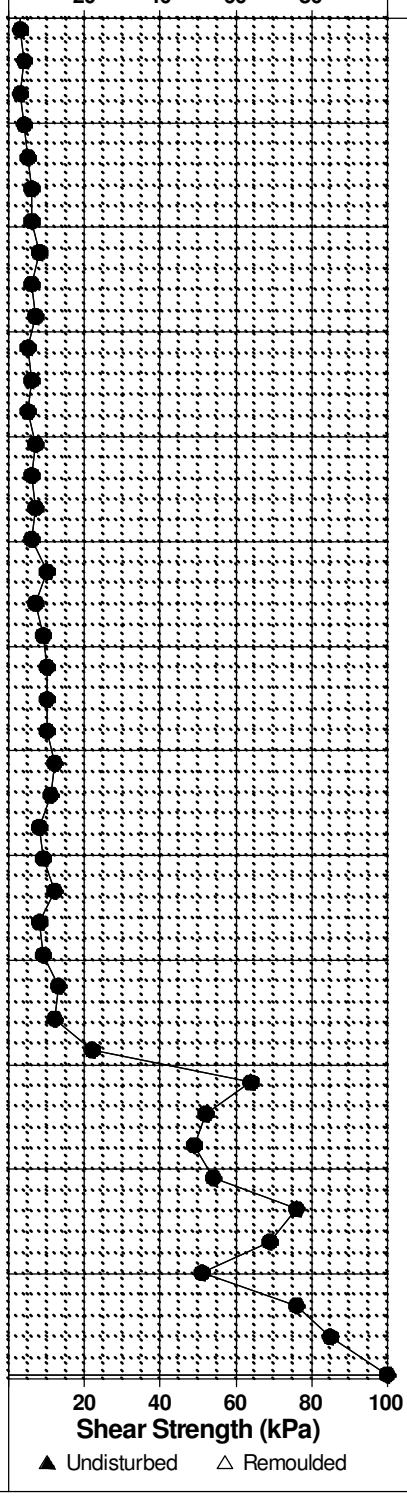
FILE NO. PG0861

REMARKS

HOLE NO. BH11-08

BORINGS BY CME 55 Power Auger **DATE** 7 August 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						13	74.14		
						14	73.14		
						15	72.14		
Inferred **SILTY CLAY**						16	71.14		
						17	70.14		
						18	69.14		
						19	68.14		
						20	67.14		
						21	66.14		
						22	65.14		
Inferred **SILTY CLAY**						23	64.14		
22.90									
Inferred **GLACIAL TILL**						24	63.14		
						25	62.14		
25.96									



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

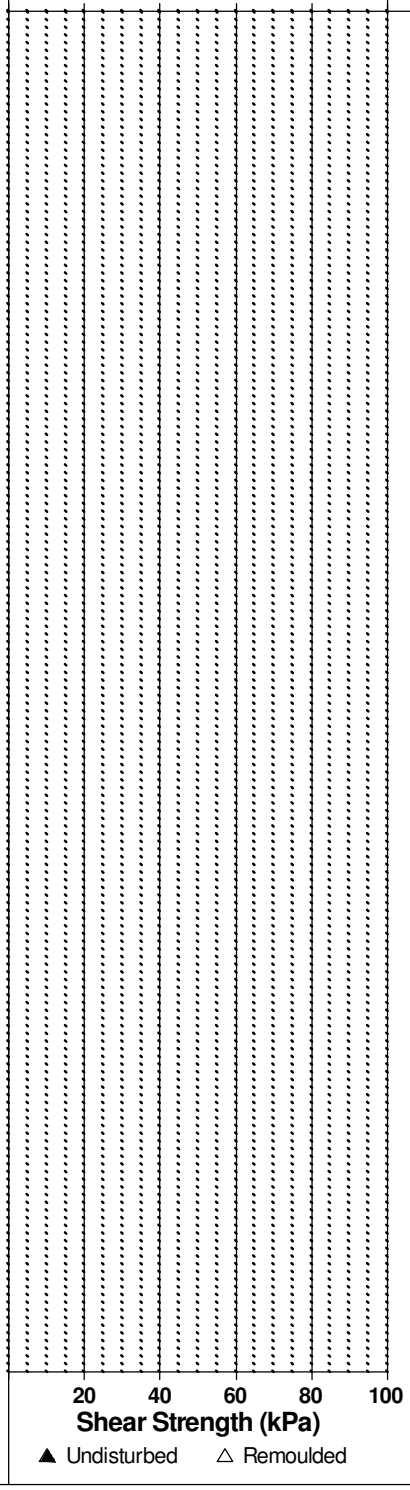
FILE NO. PG0861

REMARKS

HOLE NO. BH11-08

BORINGS BY CME 55 Power Auger **DATE** 7 August 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
End of Borehole Practical DCPT refusal @ 25.96m depth (GWL @ 0.61m-Aug. 28/08)									



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

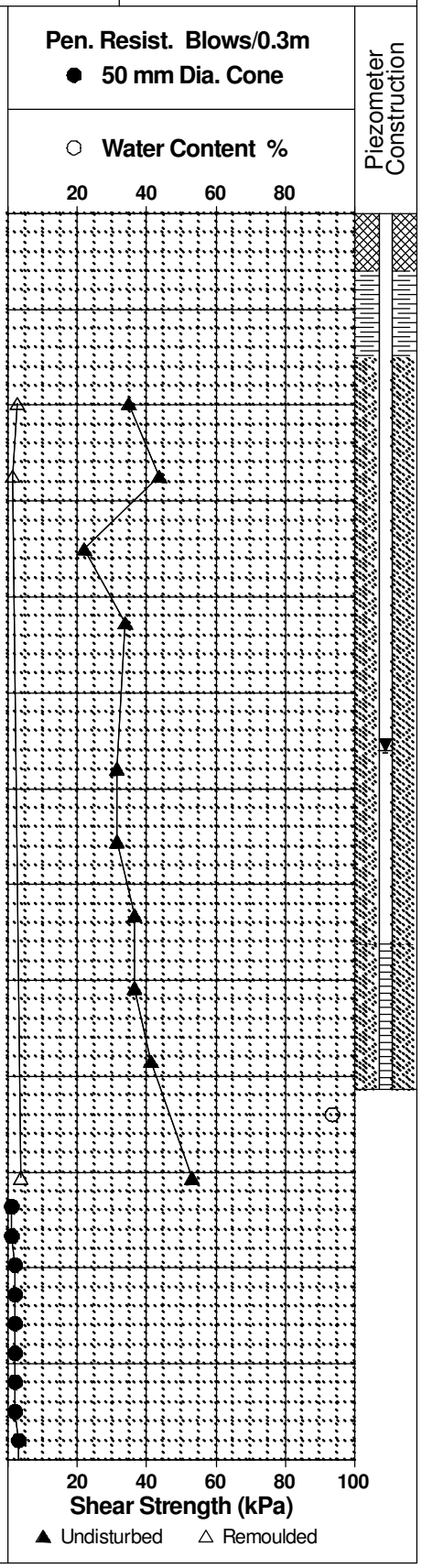
FILE NO. PG0861

REMARKS

HOLE NO. BH12-08

BORINGS BY CME 75 Power Auger **DATE** 16 October 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.62
TOPSOIL 0.20		AU	1				
Stiff to firm, brown **SILTY CLAY**		SS	2	58	5	1	86.62
- grey by 1.3m depth						2	85.62
						3	84.62
						4	83.62
		TW	3	100		5	82.62
						6	81.62
						7	80.62
						8	79.62
						9	78.62
		TW	4			10	77.62
10.06							
Dynamic Cone Penetration Test commenced @ 10.06m depth						11	76.62
Inferred **SILTY CLAY**						12	75.62
						13	74.62



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

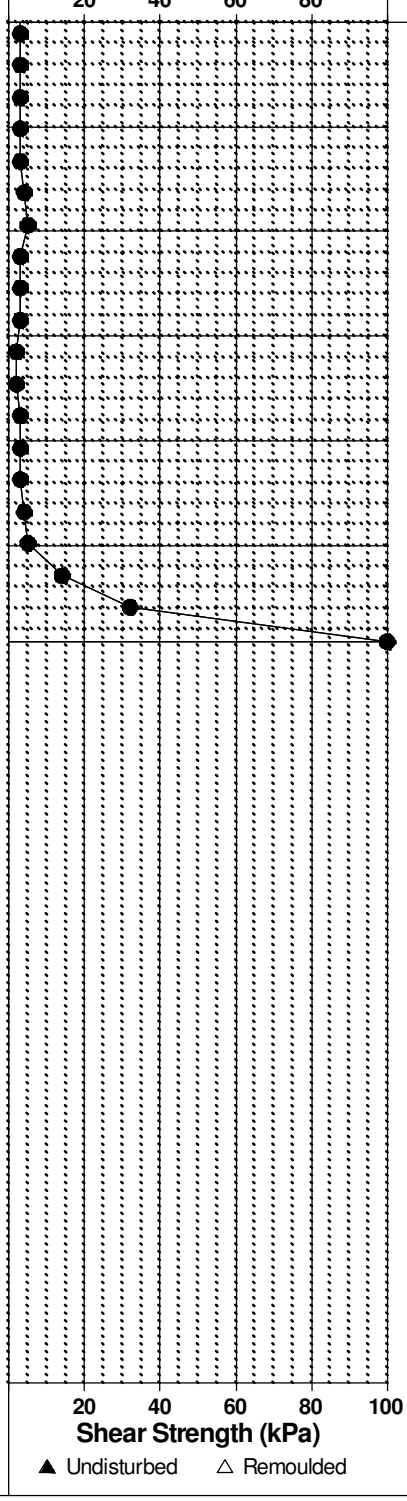
FILE NO. PG0861

REMARKS

HOLE NO. BH12-08

BORINGS BY CME 75 Power Auger **DATE** 16 October 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
Inferred **SILTY CLAY**						13	74.62		
						14	73.62		
						15	72.62		
						16	71.62		
						17	70.62		
18.00						18	69.62		
Inferred **GLACIAL TILL**									
18.92									
End of Borehole									
Practical DCPT refusal @ 18.92m depth									
(GWL @ 5.60m-Oct. 23/08)									



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

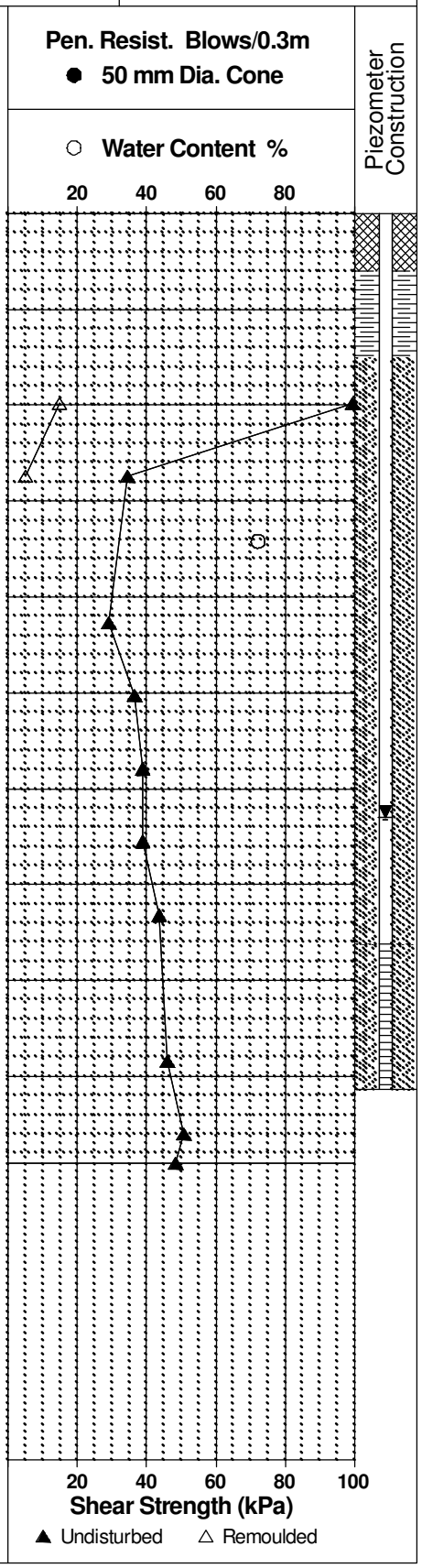
FILE NO. PG0861

REMARKS

HOLE NO. BH13-08

BORINGS BY CME 75 Power Auger **DATE** 16 October 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.38
TOPSOIL 0.20							
		SS	1			1	86.38
Stiff to firm, brown **SILTY CLAY**						2	85.38
- grey by 2.5m depth		TW	2	88		3	84.38
						4	83.38
						5	82.38
		SS	3	100		6	81.38
						7	80.38
		TW	4	100		8	79.38
						9	78.38
		SS	5	100			
9.91							
End of Borehole							
(GWL @ 6.30m-Oct. 23/08)							



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

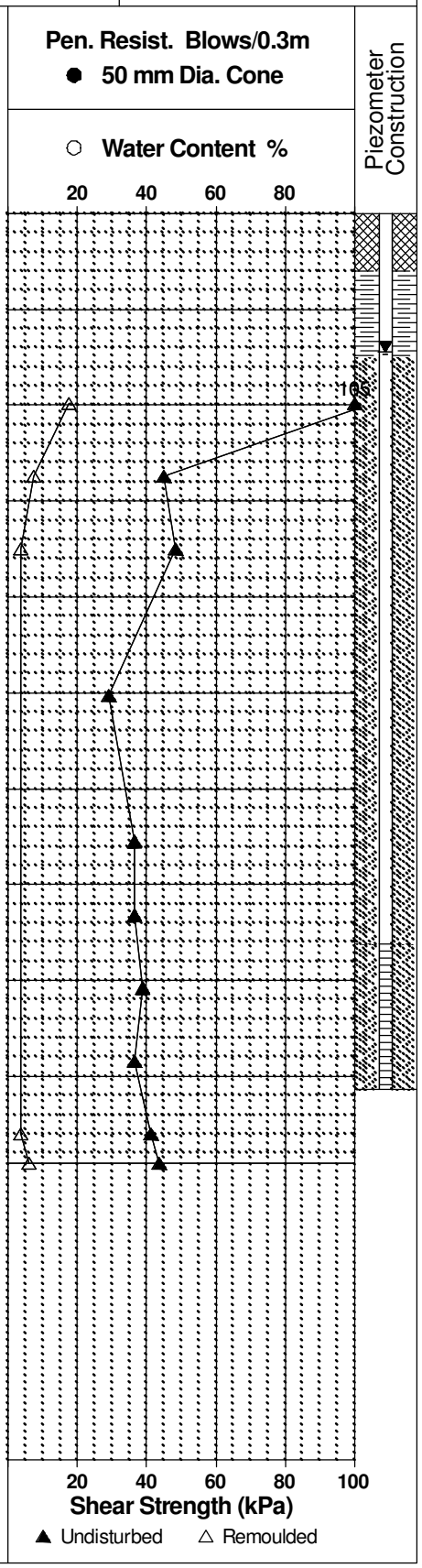
FILE NO. PG0861

REMARKS

HOLE NO. BH14-08

BORINGS BY CME 75 Power Auger **DATE** 15 October 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.03
TOPSOIL 0.20		AU	1				
		SS	2	75	9	1	86.03
Very stiff to stiff, brown **SILTY CLAY**						2	85.03
- firm and grey by 2.0m depth						3	84.03
		TW	3	100		4	83.03
						5	82.03
		TW	4	100		6	81.03
						7	80.03
						8	79.03
						9	78.03
9.91 End of Borehole							
(GWL @ 1.45m-Oct. 23/08)							



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

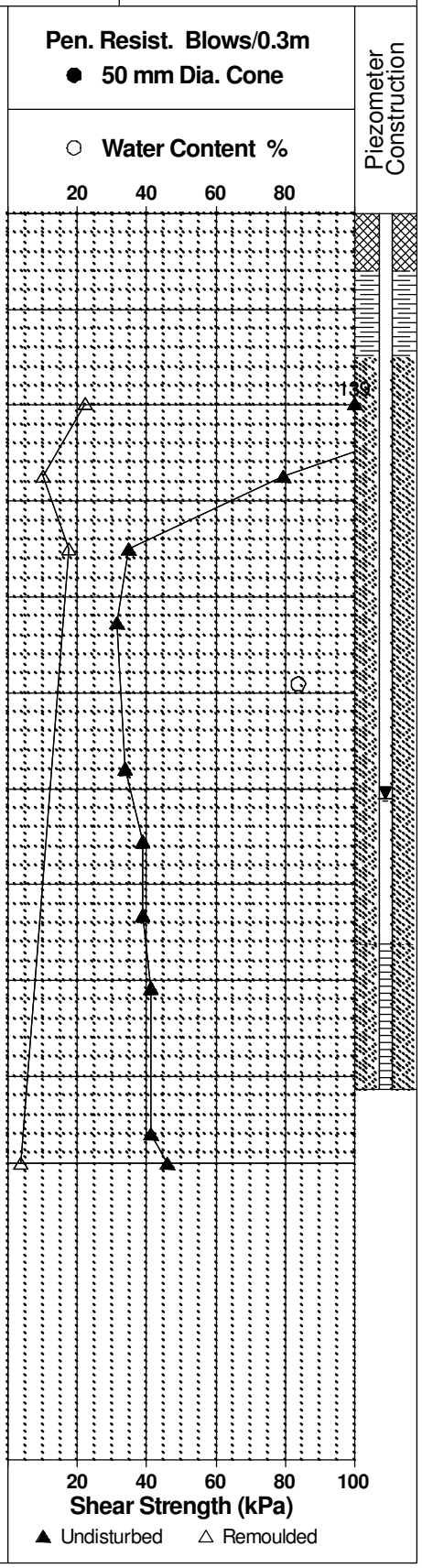
FILE NO. PG0861

REMARKS

HOLE NO. BH15-08

BORINGS BY CME 75 Power Auger **DATE** 16 October 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.24
TOPSOIL 0.20							
		SS	1	67	11	1	86.24
Very stiff to stiff, brown **SILTY CLAY**						2	85.24
						3	84.24
- stiff to firm and grey by 2.5m depth						4	83.24
		TW	2	100		5	82.24
						6	81.24
						7	80.24
		SS	3	100		8	79.24
		AU	5				
		TW	4	100		9	78.24
9.91							
End of Borehole							
(GWL @ 6.10m-Oct. 23/08)							



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. BH 3

BORINGS BY CME 75 Power Auger **DATE** 5 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	89.00
TOPSOIL 0.23							
Very stiff, brown **SILTY CLAY** 0.76							
GLACIAL TILL: Dense, brown silty sand with clay, gravel, cobbles and boulders 1.19		SS	1	67	50+	1	88.00
End of Borehole							
Practical refusal to augering @ 1.19m depth							
(GWL @ 0.45m-Apr. 12/06)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Piezometer Construction

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

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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. BH 4

BORINGS BY CME 75 Power Auger **DATE** 5 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.38
TOPSOIL 0.23							
Very stiff to stiff, brown **SILTY CLAY**		SS	1	62	12	1	87.38
		SS	2	100	8	2	86.38
- stiff to firm and grey by 2.6m depth		SS	3	100	1	3	85.38
		SS	4	100	1	4	84.38
4.72							
End of Borehole							
(GWL @ 0.40m-Apr. 12/06)							

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

20 40 60 80

Piezometer Construction

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

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

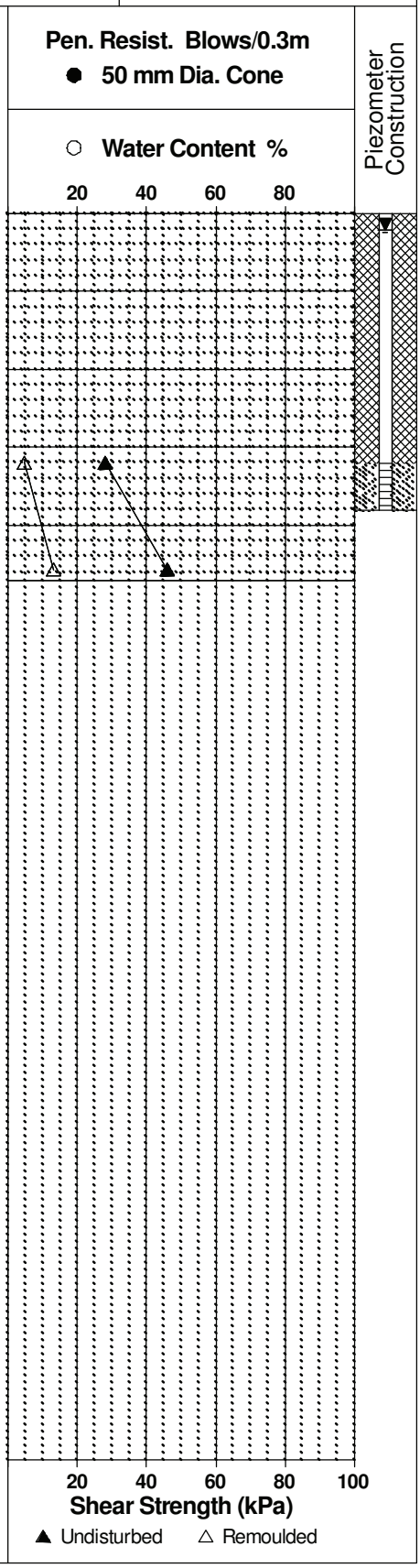
FILE NO. PG0811

REMARKS

HOLE NO. BH 5

BORINGS BY CME 75 Power Auger **DATE** 5 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.46
TOPSOIL 0.10							
Brown **CLAYEY SILT**, trace sand 0.60		SS	1	75	12	1	87.46
		SS	2	83	7	2	86.46
Stiff, brown **SILTY CLAY**		SS	3	100	4	3	85.46
- firm and grey by 2.9m depth		SS	4	100	1	4	84.46
4.72							
End of Borehole							
(GWL @ 0.21m-Apr. 12/06)							



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. BH 6

BORINGS BY CME 75 Power Auger **DATE** 5 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL 0.25						0	89.47		
Brown **SILTY CLAY**, trace sand 0.76		AU	1						
End of Borehole									
Practical refusal to augering @ 0.76m depth									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

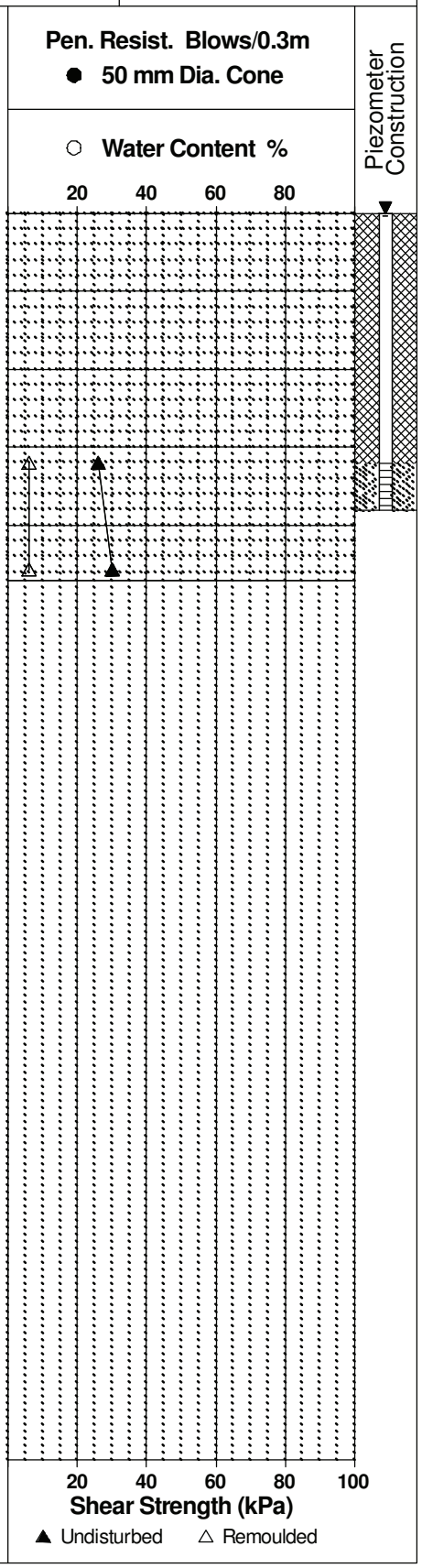
FILE NO. PG0811

REMARKS

HOLE NO. BH 7

BORINGS BY CME 75 Power Auger **DATE** 5 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.20
TOPSOIL 0.23							
Very stiff to stiff, red-brown **SILTY CLAY**, trace sand		SS	1	75	9	1	87.20
		SS	2	100	4	2	86.20
- firm and brown by 2.1m depth		SS	3	100	3		
- grey by 2.7m depth						3	85.20
		SS	4	100	1	4	84.20
4.72							
End of Borehole							
(GWL @ ground surface - April 12/06)							



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

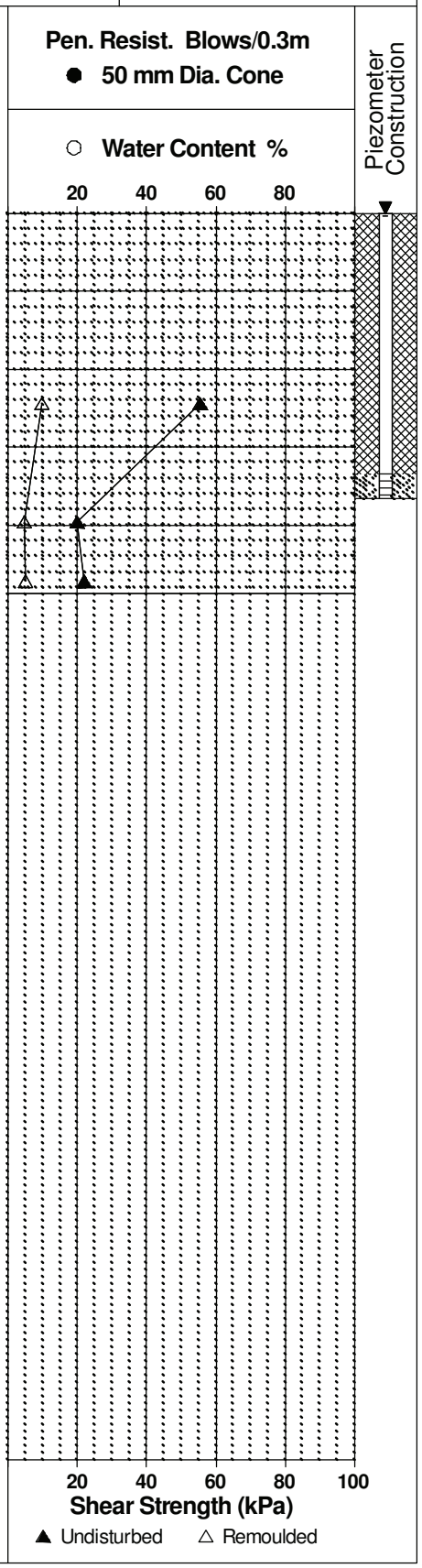
FILE NO. PG0811

REMARKS

HOLE NO. BH 8

BORINGS BY CME 75 Power Auger **DATE** 5 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.28
TOPSOIL 0.19							
Very stiff to stiff, brown to red-brown **SILTY CLAY**		SS	1	50	11	1	87.28
		SS	2	75	7	2	86.28
- firm to soft and grey by 2.6m depth		SS	3	100	1	3	85.28
						4	84.28
4.88							
End of Borehole							
(GWL @ ground surface - April 12/06)							



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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Subdivision, 4th Line Road
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

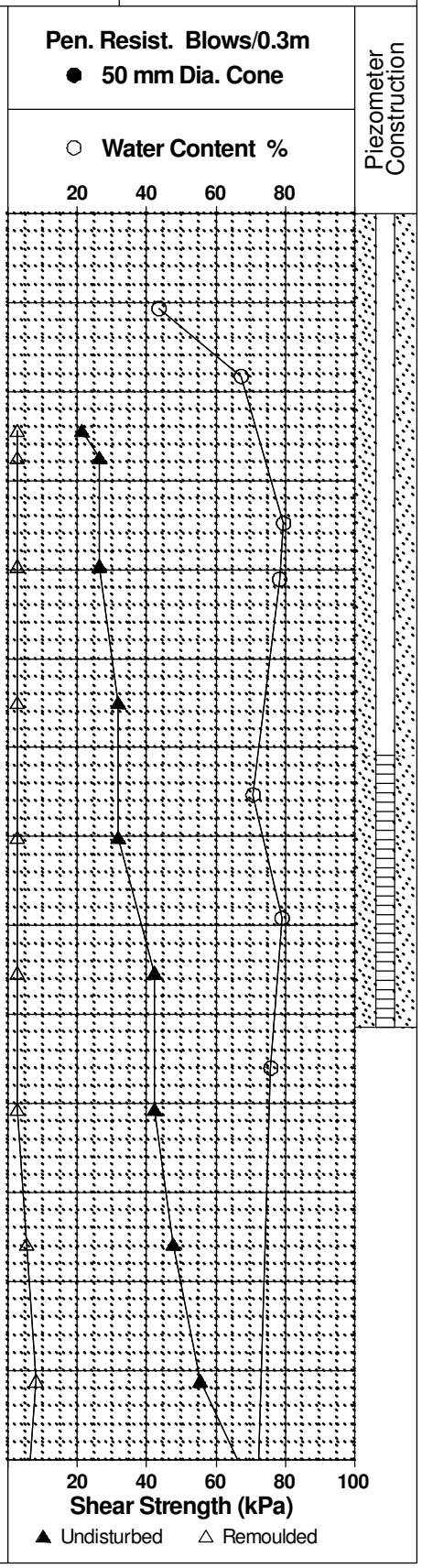
FILE NO. G8533

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** 12 Mar 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.50
TOPSOIL 0.15							
Stiff to very stiff, grey-brown **SILTY CLAY**		SS	1	62	5	1	86.50
		SS	2	58	3	2	85.50
- firm by 2.4m depth							
- grey by 3.0m depth		TW	3			3	84.50
		SS	4	100	1	4	83.50
		TW	5			5	82.50
		SS	6	100	1	6	81.50
		TW	7			7	80.50
		SS	8	100	1	8	79.50
		SS	9	100	1	9	78.50
						10	77.50
						11	76.50
						12	75.50
						13	74.50
14.00						14	73.50



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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Subdivision, 4th Line Road
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

FILE NO. G8533

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** 12 Mar 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
Stiff, grey **SILTY CLAY**		SS	10	100	1	14	73.50		
		TW	11			15	72.50		
						16	71.50		
						17	70.50		
						18	69.50		
						19	68.50		
						20	67.50		
20.73									
GLACIAL TILL: Dense, grey silty sand and gravel						21	66.50		
21.56		SS	12		50+				
End of Borehole									
(Standpipe damaged - March 26/02)									

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

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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Subdivision, 4th Line Road
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

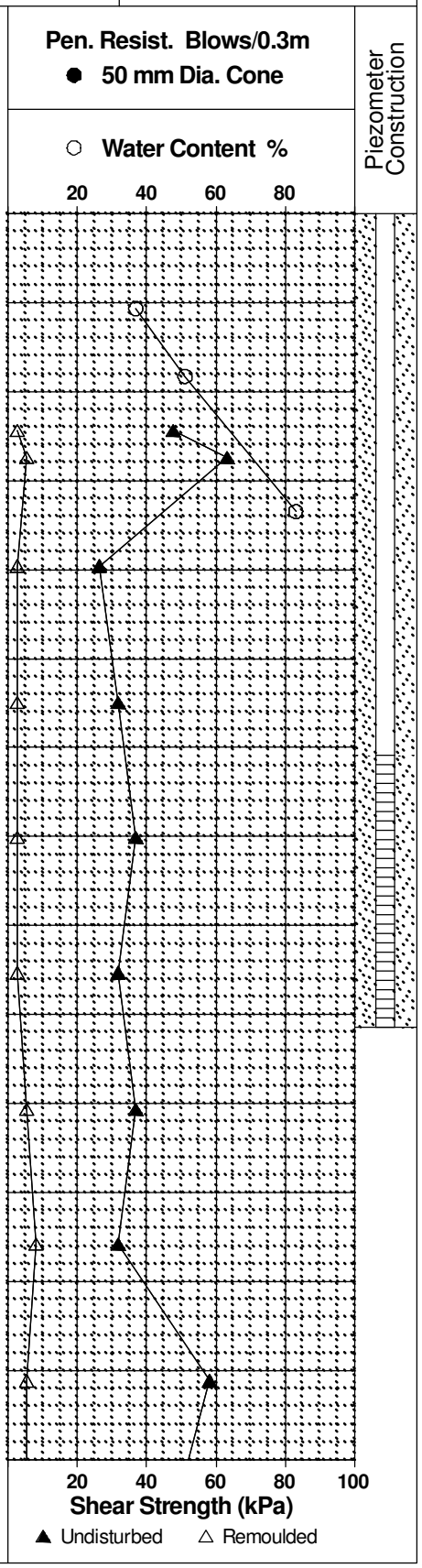
FILE NO. G8533

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** 12 Mar 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.40
TOPSOIL 0.15							
Very stiff to stiff, brown-grey **SILTY CLAY**		SS	1	50	9	1	86.40
		SS	2	67	6	2	85.40
- firm and grey by 3.0m depth		SS	3	100	1	3	84.40
		SS	4	100	1	4	83.40
		SS	5	100	1	5	82.40
		SS	6	100	1	6	81.40
		SS	7	100	1	7	80.40
		SS	8	100	1	8	79.40
		SS	9	100	1	9	78.40
						10	77.40
						11	76.40
						12	75.40
						13	74.40
14.00						14	73.40



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Subdivision, 4th Line Road
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

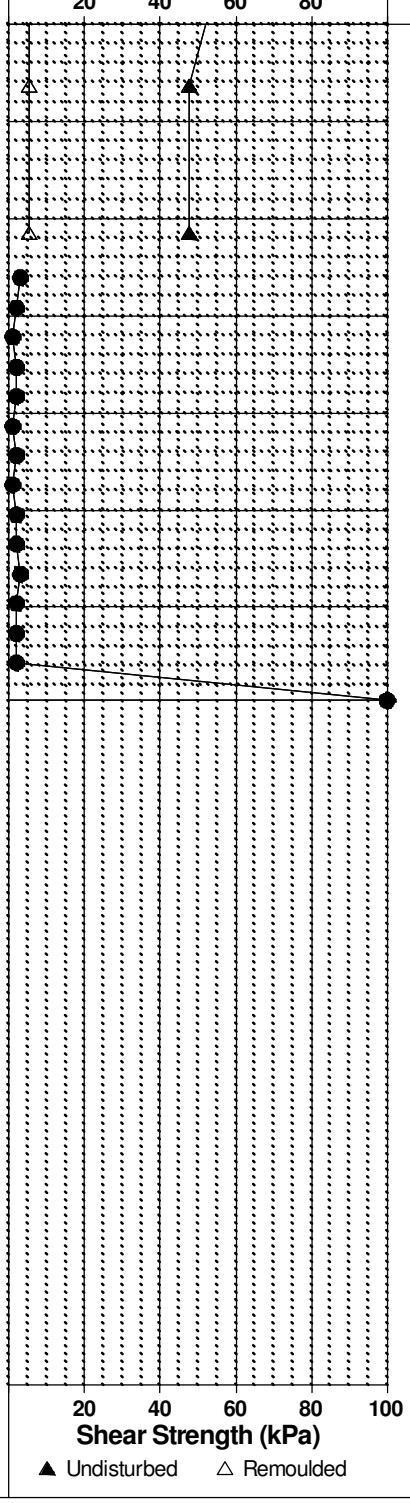
FILE NO. G8533

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** 12 Mar 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Firm to stiff, grey **SILTY CLAY**		SS	10	100	1	14	73.40
		SS	11	100	1	15	72.40
						16	71.40
16.46							
Dynamic Cone Penetration test commenced @ 16.46m depth						17	70.40
						18	69.40
						19	68.40
						20	67.40
20.96							
End of Borehole Cone refusal @ 20.96m depth (Standpipe damaged - March 26/02)							



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Subdivision, 4th Line Road
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

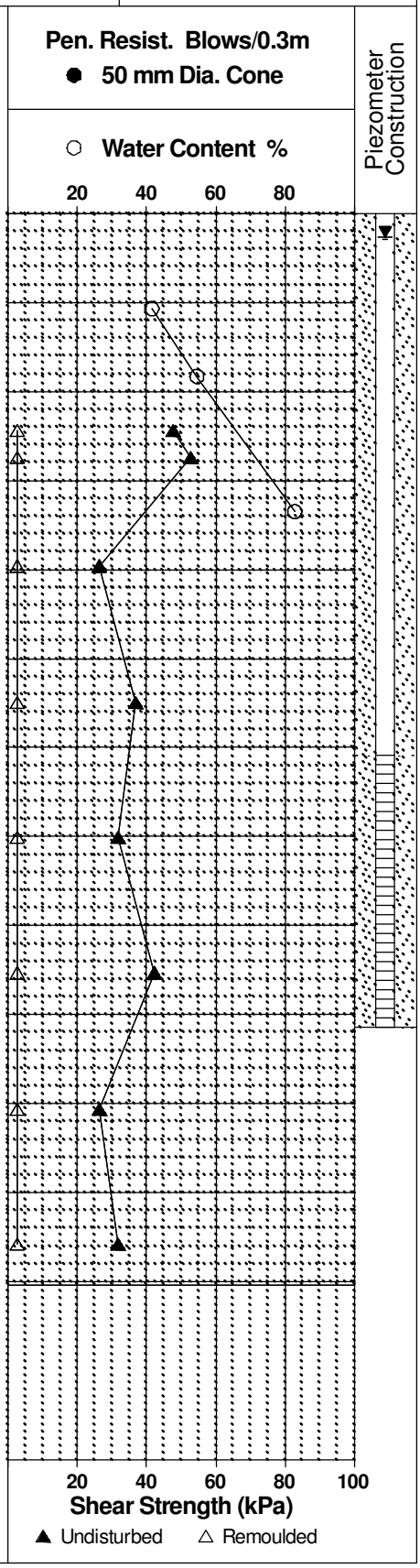
FILE NO. G8533

REMARKS

HOLE NO. BH 5

BORINGS BY CME 55 Power Auger **DATE** 13 Mar 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.70
TOPSOIL 0.18							
Stiff to very stiff, brown-grey **SILTY CLAY**		SS	1	75	7	1	86.70
- firm to stiff by 1.5m depth		SS	2	79	2	2	85.70
- firm and grey by 3.0m depth		SS	3	100	1	3	84.70
		SS	4	100	1	4	83.70
		TW	5			5	82.70
		SS	6	100	1	6	81.70
		SS	7	100	1	7	80.70
		SS	8	100	1	8	79.70
						9	78.70
						10	77.70
						11	76.70
12.04						12	75.70
End of Borehole							
Practical refusal to augering @ 12.04m depth							
(GWL @ 0.27m-March 26/02)							



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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Subdivision, 4th Line Road
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

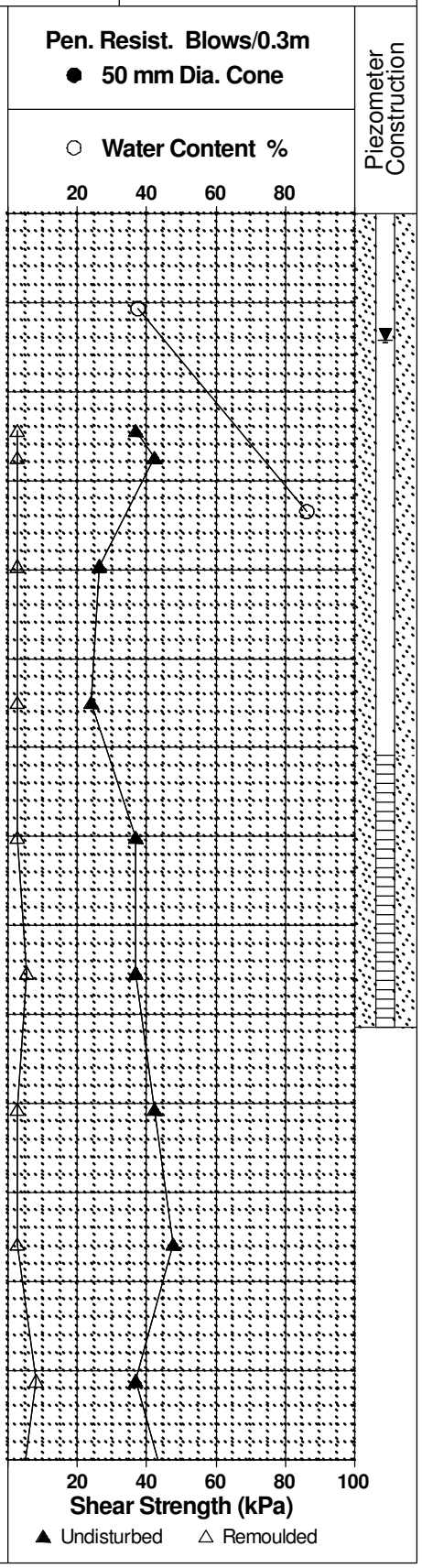
FILE NO. G8533

REMARKS

HOLE NO. BH 6

BORINGS BY CME 55 Power Auger **DATE** 13 Mar 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.30
TOPSOIL 0.15							
Stiff to very stiff, brown-grey **SILTY CLAY**		SS	1	67	11	1	86.30
- firm by 1.5m depth		SS	2	79	2	2	85.30
- grey by 3.0m depth		SS	3	29	1	3	84.30
		TW	4			4	83.30
		SS	5	100	1	5	82.30
		SS	6	100	1	6	81.30
		SS	7	100	1	7	80.30
		SS	8	100	1	8	79.30
		SS	9	100	1	9	78.30
						10	77.30
						11	76.30
						12	75.30
						13	74.30
14.00						14	73.30



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Subdivision, 4th Line Road
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

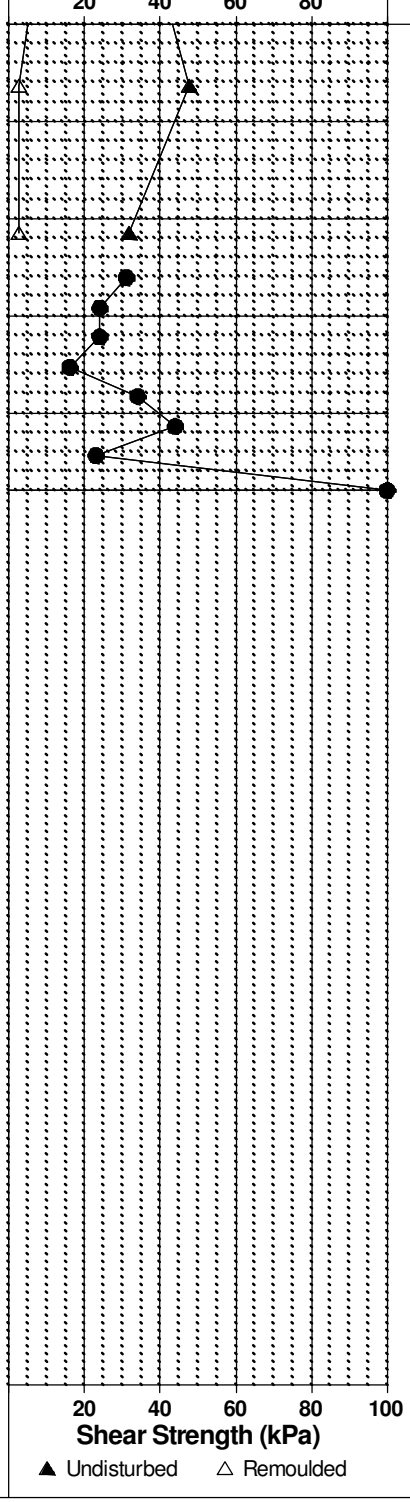
FILE NO. G8533

REMARKS

HOLE NO. BH 6

BORINGS BY CME 55 Power Auger **DATE** 13 Mar 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Firm, grey **SILTY CLAY**		SS	10	100	1	14	73.30
		SS	11	100	1	15	72.30
						16	71.30
16.46						17	70.30
Dynamic Cone Penetration test commenced @ 16.46m depth						18	69.30
18.80							
End of Borehole Cone refusal @ 18.80m depth (GWL @ 1.42m-March 26/02)							



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Subdivision, 4th Line Road
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

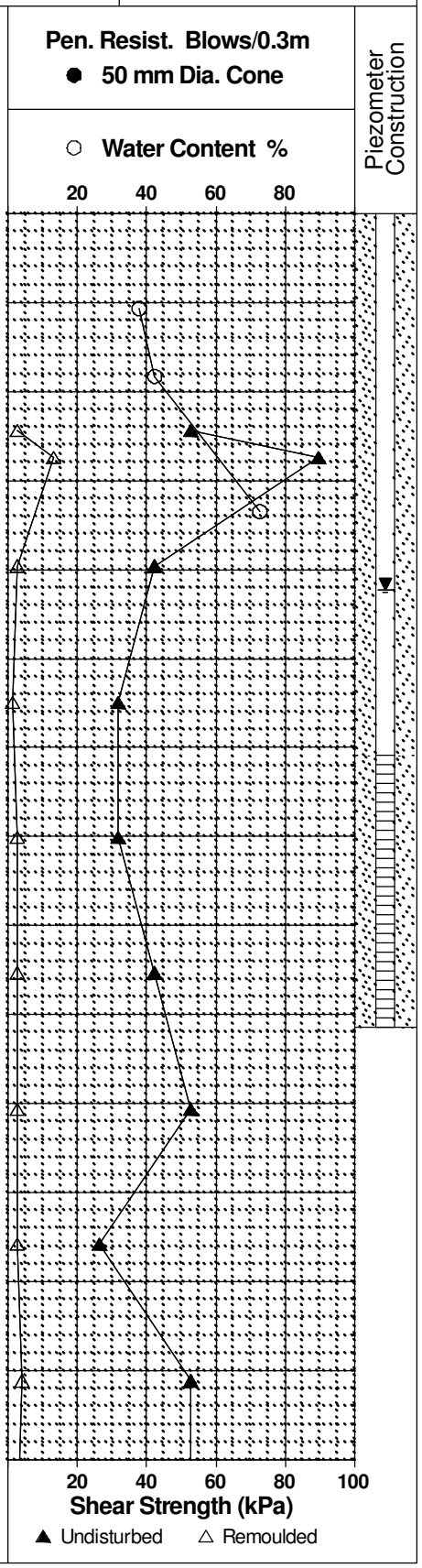
FILE NO. G8533

REMARKS

HOLE NO. BH 7

BORINGS BY CME 55 Power Auger **DATE** 14 Mar 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	86.80
TOPSOIL 0.18							
Very stiff to stiff, brown-grey **SILTY CLAY**		SS	1	58	10	1	85.80
		SS	2	67	7	2	84.80
- firm and grey by 3.0m depth		SS	3	71	2	3	83.80
		SS	4	100	1	4	82.80
		SS	5	100	1	5	81.80
		SS	6	100	1	6	80.80
		SS	7	100	1	7	79.80
- stiff to firm by 10.0m depth		SS	8	100	1	8	78.80
		SS	9	100	1	9	77.80
						10	76.80
						11	75.80
						12	74.80
						13	73.80
14.00						14	72.80



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Subdivision, 4th Line Road
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

FILE NO. G8533

REMARKS

HOLE NO. BH 7

BORINGS BY CME 55 Power Auger **DATE** 14 Mar 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
Stiff, grey **SILTY CLAY**		SS	10	100	1	14	72.80		
		SS	11	100	1	15	71.80		
						16	70.80		
16.46						17	69.80		
Dynamic Cone Penetration test commenced @ 16.46m depth						18	68.80		
						19	67.80		
19.30									
End of Borehole Cone refusal @ 19.30m depth (GWL @ 4.23m-March 26/02)									

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

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

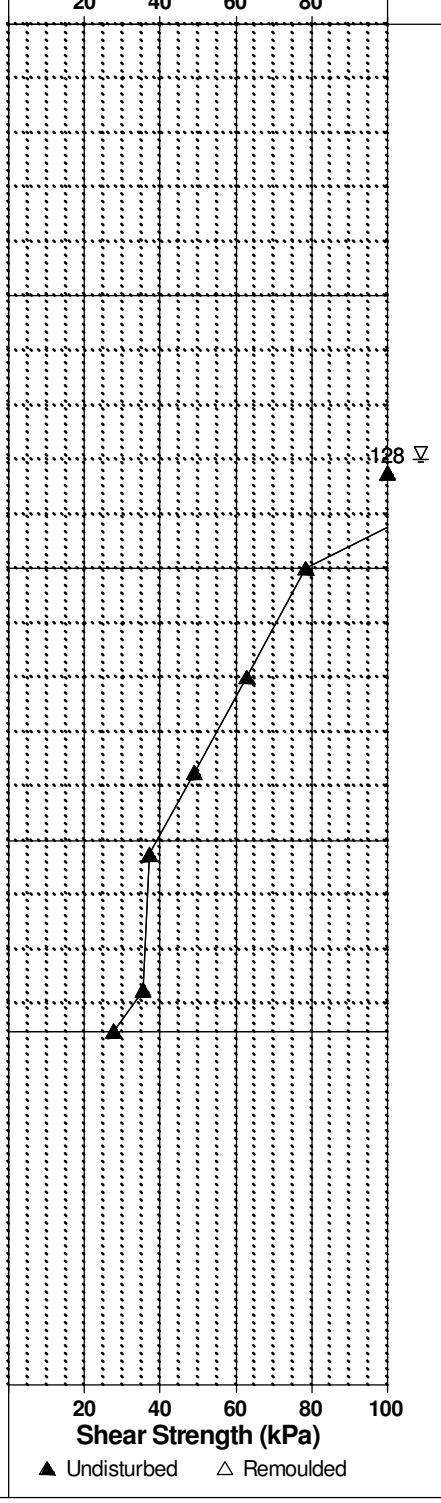
FILE NO. PG0861

REMARKS

HOLE NO. TP 9-08

BORINGS BY Hydraulic Shovel **DATE** 28 August 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	86.92		
TOPSOIL 0.15									
Loose, light brown **SILTY SAND** 0.75						1	85.92		
Very stiff to stiff, brown **SILTY CLAY**						2	84.92		
- firm and grey by 2.7m depth						3	83.92		
3.70									
End of Test Pit									
(GWL @ 1.6m-Aug. 28/08)									



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. TP11-08

BORINGS BY Hydraulic Shovel **DATE** 28 August 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL 0.20						0	87.14		
Very stiff to stiff, brown **SILTY CLAY**						1	86.14	128 128 128 128	
						2	85.14		
- stiff to firm and grey by 2.9m depth						3	84.14		
3.70 End of Test Pit (GWL @ 1.0m-Aug. 28/08)									

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

Water Content % axis: 20 40 60 80

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

▲ Undisturbed △ Remoulded

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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. TP16-08

BORINGS BY Hydraulic Shovel **DATE** 28 August 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	86.81		
TOPSOIL 0.20									
Very stiff to stiff, brown **SILTY CLAY**						1	85.81	128 128	▽
- firm and grey by 2.3m depth						2	84.81		
						3	83.81		
3.85 End of Test Pit (GWL @ 1.1m-Aug. 28/08)									

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

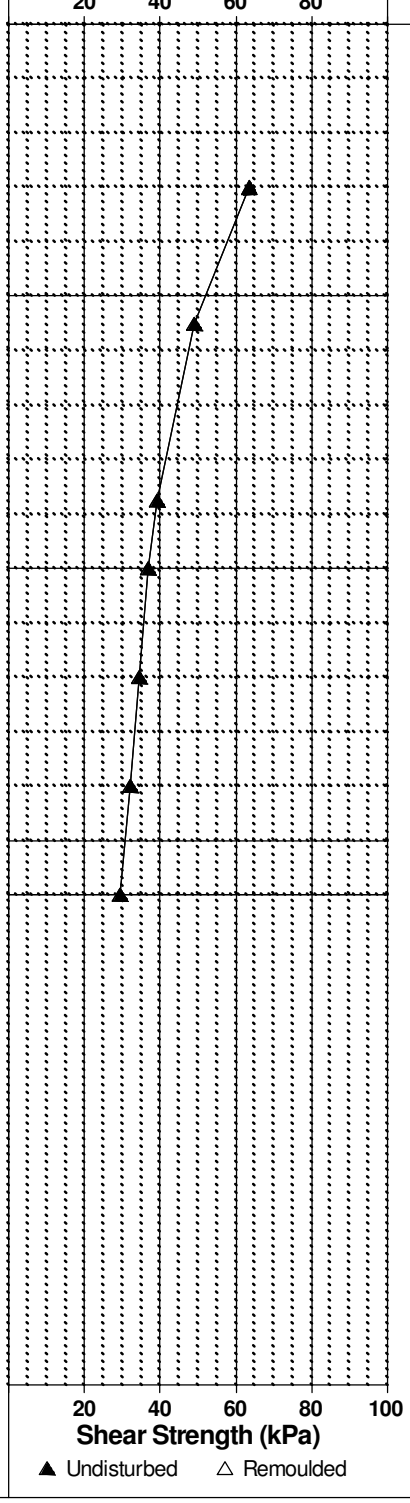
FILE NO. PG0861

REMARKS

HOLE NO. TP17-08

BORINGS BY Backhoe **DATE** 24 October 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL 0.15						0	87.62		
Stiff to firm, brown **SILTY CLAY**						1	86.62		
- firm and grey by 1.3m depth						2	85.62		
3.20						3	84.62		
End of Test Pit									
(TP dry upon completion)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. TP18-08

BORINGS BY Backhoe **DATE** 24 October 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	87.38		
TOPSOIL 0.15									
Stiff, brown **SILTY CLAY**						1	86.38		▽
- firm and grey by 2.5m depth						2	85.38		
3.10						3	84.38		
End of Test Pit (Groundwater infiltration @ 1.5m depth)									

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

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. TP19-08

BORINGS BY Backhoe **DATE** 24 October 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	87.03		
TOPSOIL 0.15									
Stiff, brown **SILTY CLAY**						1	86.03		▽
- stiff to firm and grey by 2.3m depth						2	85.03		
						3	84.03		
3.35 End of Test Pit									
(Groundwater infiltration @ 1.6m depth)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %; 20 40 60 80

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

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

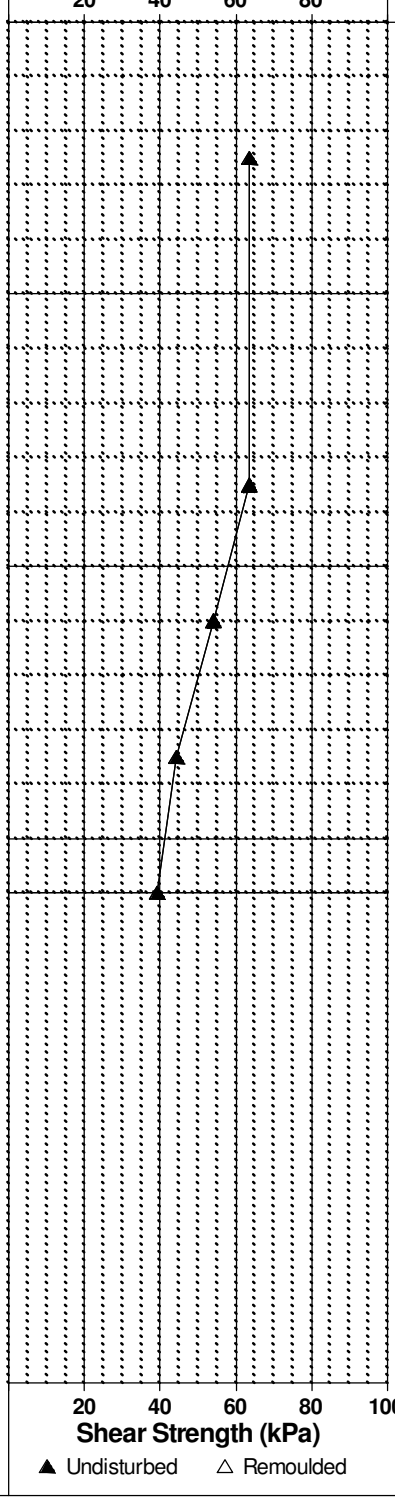
FILE NO. PG0861

REMARKS

HOLE NO. TP20-08

BORINGS BY Backhoe **DATE** 24 October 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	87.24		
TOPSOIL 0.30									
Stiff, brown **SILTY CLAY**						1	86.24		
						2	85.24		
- firm and grey by 2.5m depth						3	84.24		▽
3.20 End of Test Pit (Groundwater infiltration @ 3.0m depth)									



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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP14

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	89.06		
TOPSOIL 0.30									
Stiff, brown **SILTY CLAY**									
1.00						1	88.06		
End of Test Pit TP terminated on bedrock surface @ 1.00m depth (TP dry upon completion)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %
20 40 60 80

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

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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP15

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL 0.15						0	88.63		
Very stiff, grey-brown **SILTY CLAY**		G	1						
1.10						1	87.63		▽
End of Test Pit TP terminated on bedrock surface @ 1.10m depth (Open hole GWL @ 1.0m depth)									

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

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP16

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.48	20 40 60 80	
TOPSOIL 0.15									
Very stiff to stiff, grey-brown **SILTY CLAY**						1	87.48		▽
						2	86.48		
3.10						3	85.48		
End of Test Pit (Open hole GWL @ 1.8m depth)								20 40 60 80 100 **Shear Strength (kPa)** ▲ Undisturbed △ Remoulded	

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP17

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.47	20 40 60 80	
TOPSOIL									
0.30									
Stiff, grey-brown **SILTY CLAY**						1	87.47		▽
						2	86.47		
						3	85.47		
3.20									
End of Test Pit (Open hole GWL @ 1.0m depth)								20 40 60 80 100 **Shear Strength (kPa)** ▲ Undisturbed △ Remoulded	

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP18

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	89.14		
TOPSOIL 0.30									
Stiff, brown to grey-brown **SILTY CLAY**						1	88.14		
1.10									
End of Test Pit TP terminated on bedrock surface @ 1.10m depth (Open hole GWL @ 1.1m depth)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %
20 40 60 80

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

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP19

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	89.26		
TOPSOIL									
0.30									
Brown **SILTY CLAY**									
0.60									
End of Test Pit									
TP terminated on bedrock surface @ 0.60m depth									

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

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP20

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.94		
TOPSOIL 0.30									
Stiff, brown **SILTY CLAY**									
1.00						1	87.94		
End of Test Pit TP terminated on bedrock surface @ 1.00m depth (TP 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

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP21

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.53		
TOPSOIL 0.30									
Stiff, grey-brown **SILTY CLAY**						1	87.53		
1.70									
End of Test Pit TP terminated on bedrock surface @ 1.70m depth (TP 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

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP22

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.78		
TOPSOIL 0.30									
Stiff, grey-brown **SILTY CLAY**						1	87.78		
1.40									
End of Test Pit TP terminated on bedrock surface @ 1.40m depth (TP dry upon completion)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP23

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.49	20 40 60 80	
TOPSOIL									
0.30									
Stiff, brown to grey-brown **SILTY CLAY**						1	87.49		
						2	86.49		▽
						3	85.49		
3.30									
End of Test Pit (Open hole GWL @ 2.0m depth)									

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

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP24

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.71	20 40 60 80	
TOPSOIL									
0.30									
Stiff, grey-brown **SILTY CLAY**						1	87.71		▽
						2	86.71		
						3	85.71		
3.30									
End of Test Pit (Open hole GWL @ 1.4m depth)								20 40 60 80 100 **Shear Strength (kPa)** ▲ Undisturbed △ Remoulded	

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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP25

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.82		
TOPSOIL									
0.40									
Stiff, grey-brown **SILTY CLAY**						1	87.82		▽
						2	86.82		
2.40									
End of Test Pit TP terminated on bedrock surface @ 2.40m depth (Open hole GWL @ 1.6m depth)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %
20 40 60 80

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

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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

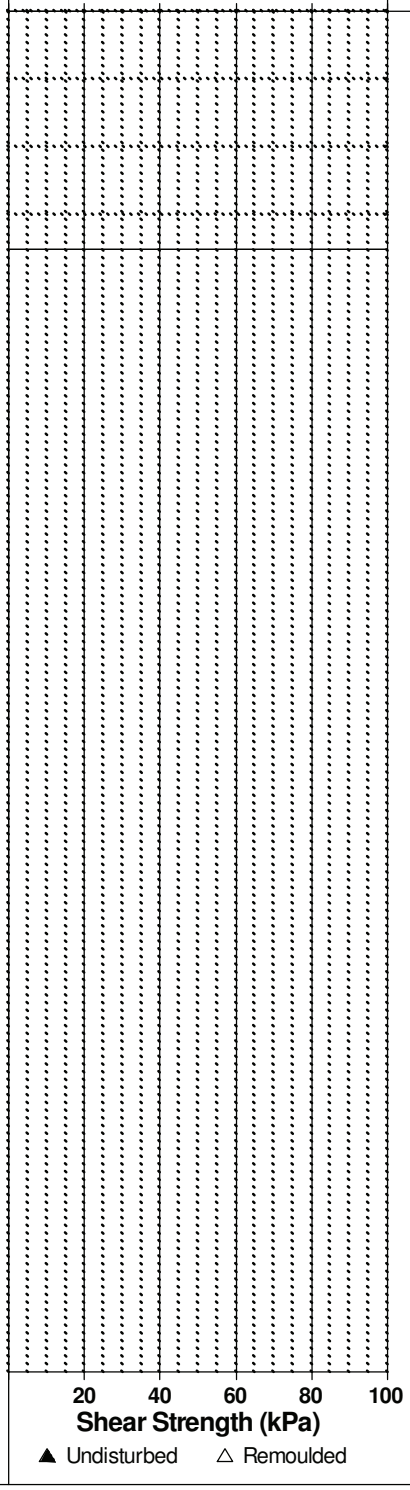
FILE NO. PG0811

REMARKS

HOLE NO. TP26

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	89.48		
TOPSOIL									
0.30									
Stiff, brown **SILTY CLAY**									
0.70									
End of Test Pit									
TP terminated on bedrock surface @ 0.70m depth									
(TP dry upon completion)									



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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP27

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.54		
TOPSOIL									
0.30									
Stiff, grey-brown **SILTY CLAY**						1	87.54		▽
						2	86.54		
2.30									
End of Test Pit TP terminated on bedrock surface @ 2.30m depth (Open hole GWL @ 1.2m depth)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %
20 40 60 80

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

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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP28

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.15	20 40 60 80	
TOPSOIL									
0.30									
Stiff, grey-brown **SILTY CLAY**						1	87.15		
						2	86.15		
2.40									
End of Test Pit TP terminated on bedrock surface @ 2.40m depth (Open hole GWL @ 1.3m depth)									

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

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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP29

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.12		
TOPSOIL									
0.30									
Stiff, grey-brown **SILTY CLAY**		G	1			1	87.12		
- grey by 1.8m depth						2	86.12		
						3	85.12		
3.20									
End of Test Pit									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP30

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	89.09		
TOPSOIL 0.20									
Stiff, brown **SILTY CLAY**						1	88.09		
1.10									
End of Test Pit TP terminated on bedrock surface @ 1.10m depth (TP 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

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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP31

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.63		
TOPSOIL									
0.30									
Stiff, grey-brown **SILTY CLAY**						1	87.63		
						2	86.63		
2.50									
End of Test Pit TP terminated on bedrock surface @ 2.50m depth (TP dry upon completion)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP32

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	89.18		
TOPSOIL 0.30									
Stiff, brown **SILTY CLAY** 0.80									
End of Test Pit TP terminated on bedrock surface @ 0.80m depth (TP dry upon completion)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP33

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.99		
TOPSOIL 0.30									
Stiff, grey-brown **SILTY CLAY**						1	87.99		
- some boulders by 1.2m depth 1.40									
End of Test Pit TP terminated on bedrock surface @ 1.40m depth (TP 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

patersongroup

Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
Pharand Lands - Innes Road at Mer Bleeu Road
Ottawa, Ontario

DATUM Geodetic, as provided by Stantec Consulting Ltd.

FILE NO. PG0811

REMARKS

HOLE NO. TP34

BORINGS BY Backhoe **DATE** 12 Apr 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.49	20 40 60 80	
TOPSOIL									
0.30									
Stiff, grey-brown **SILTY CLAY**						1	87.49		
						2	86.49		
2.30									
End of Test Pit TP terminated on bedrock surface @ 2.30m depth (TP dry upon completion)									

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

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development-Renaud Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Hand Auger **DATE** 11 May 2009

FILE NO. PG1605

HOLE NO. HA 3-09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0		20 40 60 80	
TOPSOIL									
0.25									
Very stiff, brown **SILTY CLAY**						1		128	
1.60								128	
End of Hand Auger Hole								20 40 60 80 100 **Shear Strength (kPa)** ▲ Undisturbed △ Remoulded	

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development-Renaud Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Hand Auger **DATE** 11 May 2009

FILE NO. PG1605

HOLE NO. HA 4-09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0		20 40 60 80	
TOPSOIL									
0.25									
Brown **SILTY** fine **SAND**									
0.35									
Very stiff, brown **SILTY CLAY**						1		128	
								128	
1.56									
End of Hand Auger Hole									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development-Renaud Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Hand Auger **DATE** 11 May 2009

FILE NO. PG1605

HOLE NO. HA 5-09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0		20 40 60 80	
TOPSOIL									
0.30									
Very stiff, brown **SILTY CLAY**						1		128	
								128	
1.60									
End of Hand Auger Hole								20 40 60 80 100 **Shear Strength (kPa)** ▲ Undisturbed △ Remoulded	

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development-Renaud Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Hand Auger **DATE** 11 May 2009

FILE NO. PG1605

HOLE NO. HA 6-09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0		20 40 60 80	
TOPSOIL									
0.30									
Brown **SILTY CLAY** with sand									
0.50									
Very stiff, brown **SILTY CLAY**						1		128	
								128	
1.60									
End of Hand Auger Hole									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

PROJECT: 05-1120-163

RECORD OF BOREHOLE: 05-1

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: Oct. 26, 2005

DATUM:

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE									
0	Power Auger 203mm Diam. (Hollow Stem)	TOPSOIL		0.00							
		Stiff grey brown SILTY CLAY, slight black organic mottling (Weathered Crust)		0.28	1	SS	6				
1											
					2	SS	8				
2		Loose brown SILTY SAND, some gravel, trace clay, occasional boulder (GLACIAL TILL)		2.29	3	SS	>100				
		End of Borehole Sampler Refusal		2.72							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: R.I.
CHECKED: M.I.C.

BOREHOLE: 05-1120-163.GPJ GLDR_CAN.GDT 12/5/05

PROJECT: 05-1120-163

RECORD OF BOREHOLE: 05-2

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: Oct. 26, 2005

DATUM:

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT Wp — W — Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE									
0	Power Auger 200mm Diam. (Hollow Stem)	TOPSOIL		0.00							
		Stiff grey brown and red brown SILTY CLAY, slight black organic mottling (Weathered Crust)		0.20	1	50 DO	10				
1											
					2	50 DO	7				
2		Compact brown SILTY SAND, some gravel, trace clay (GLACIAL TILL)		2.13	3	50 DO	>100				
		End of Borehole Sampler Refusal		2.36							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: R.I.
CHECKED: M.I.C.

BOREHOLE: 05-1120-163.GPJ GLDR_CAN.GDT 12/5/05

PROJECT: 05-1120-163

RECORD OF BOREHOLE: 05-3

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: Oct. 21, 2005

DATUM:

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE											
0	Power Auger 200mm Diam. (Hollow Stem)	TOPSOIL		0.00									
		Very stiff to stiff with depth grey brown and red brown SILTY CLAY (Weathered Crust)		0.22	1	SS DO	10						
1					2	SS DO	6						Native Backfill
2					3	SS DO	2						
3		Firm grey SILTY CLAY		3.20	4	SS DO	WH						Bentonite Seal
4													Silica Sand
5					5	SS DO	1						Standpipe
		Probably Glacial Till		5.03									
		End of Borehole Auger Refusal		5.33									Water level at 0.39m depth below ground surface on Nov. 8, 2005
6													
7													
8													
9													
10													

BOREHOLE 05-1120-163.GPJ GLDR_CAN.GDT 12/5/05

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: P.A.H.
CHECKED: M.J.C.

PROJECT: 05-1120-163

RECORD OF BOREHOLE: 05-4

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: Oct. 26, 2005

DATUM:

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-4} 10^{-5} 10^{-6} 10^{-7})	WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE											
0	Power Auger 200mm Diam. (Hollow Stem)	TOPSOIL		0.00									
		Stiff grey brown and red brown SILTY CLAY, slight organic mottling (Weathered Crust)		0.30	1	SS DO	9						
1													
					2	SS DO	7						
2													
					3	SS DO	2						
3													
4		Soft to firm grey SILTY CLAY		4.47									
5													
6					4	SS DO	WH						
7		End of Borehole		7.32									
8													
9													
10													

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: R.I.

CHECKED: M.I.C.

BOREHOLE 05-1120-163.GPJ GLDR_CAN.GDT 12/5/05

PROJECT: 05-1120-163

RECORD OF BOREHOLE: 05-5

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: Oct. 27, 2005

DATUM:

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT (Wp W Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE									
		TOPSOIL		0.00							Silica Sand
		Firm to stiff grey brown SILTY CLAY (Weathered Crust)		0.08							
1	Power Auger 200mm Diam. (Hollow Stem)				1	SS	10				
2					2	SS	4				Native Backfill
3					3	SS	WH				
		Firm grey SILTY CLAY		3.05							
4											
											Bentonite Seal
5											Silica Sand
											Standpipe
6											Water level in standpipe at 2.0m depth below ground surface on Nov. 8, 2005
		End of Borehole		6.71							
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: H.E.C.

CHECKED: M.J.C.

BOREHOLE 05-1120-163.GPJ GLDR_CAN.GDT 12/5/05

JACQUES WHITFORD LIMITED

BOREHOLE RECORD

CLIENT McNeely Engineering Consultants Ltd.
LOCATION Orleans South Feedermain, Orleans, Ontario
DATES: BORING 95-05-15 WATER LEVEL 95-05-19

BOREHOLE No. 95-1
PROJECT No. 10629
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	98.37							
		Compact, brown and grey, SANDY SILT, trace clay						
1	97.3				SS	1	560	13
		Very stiff to stiff, greyish-brown, SILTY CLAY			SS	2	610	7
2					SS	3	610	4
3	95.3				SS	4	610	4
		Firm to stiff, grey, SILTY CLAY						
6				▽	SS	5	610	2
9					SS	6	610	2
	88.6							
10		End of Borehole Standpipe installed						
11								

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

▽ Proposed Pipe Invert

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

JACQUES WHITFORD LIMITED

BOREHOLE RECORD

CLIENT McNeely Engineering Consultants Ltd. BOREHOLE No. 95-2

LOCATION Orleans South Feedermain, Orleans, Ontario PROJECT No. 10629

DATES: BORING 95-05-15 WATER LEVEL 95-05-19 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	99.60	Stiff to very stiff, greyish-brown, SILTY CLAY						
1					SS	1	560	9
2					SS	2	610	2
3	96.6	Firm to stiff, grey, SILTY CLAY						
4					SS	3	610	1
5								
6					SS	4	610	2
7	92.9	End of Borehole Standpipe installed						
8								
9								
10								
11								

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

30

▽ Proposed Pipe Invert

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JACQUES WHITFORD LIMITED

BOREHOLE RECORD

CLIENT McNeely Engineering Consultants Ltd. BOREHOLE No. 95-3

LOCATION Orleans South Feedermain, Orleans, Ontario PROJECT No. 10629

DATES: BORING 95-05-15 WATER LEVEL 95-05-19 DATUM Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD
0	99.54	Firm to very stiff, greyish-brown, SILTY CLAY		▽				
1					SS	1	610	12
2	97.2							
					SS	2	610	2
3								
4					SS	3	610	2
5		Firm, grey, SILTY CLAY						
6					SS	4	610	1
	92.8							
7		End of Borehole Standpipe installed						
8								
9								
10								
11								

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

▽ Proposed Pipe Invert

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JACQUES WHITFORD LIMITED

BOREHOLE RECORD

CLIENT McNeely Engineering Consultants Ltd.
BOREHOLE No. 95-4
LOCATION Orleans South Feedermain, Orleans, Ontario
PROJECT No. 10629
DATES: BORING 95-05-15
WATER LEVEL 95-05-19
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	99.69	Stiff to very stiff, grey-brown, SILTY CLAY						
1					SS	1	610	17
2					SS	2	610	3
3	96.6	Firm, grey, SILTY CLAY						
4					SS	3	610	2
5								
6					SS	4	610	1
7	93.0	End of Borehole Standpipe installed						
8								
9								
10								
11								

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

Proposed Pipe Invert

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

JACQUES WHITFORD LIMITED

BOREHOLE RECORD

CLIENT McNeely Engineering Consultants Ltd.
LOCATION Orleans South Feedermain, Orleans, Ontario
DATES: BORING 95-05-16 WATER LEVEL 95-05-19

BOREHOLE No. 95-5
PROJECT No. 10629
DATUM Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES N-VALUE OR RQD
	99.91	Loose, gravel fill at surface					mm	
0		Stiff to very stiff, grey-brown, SILTY CLAY						
1					SS	1	500	10
2								
					SS	2	530	4
3	96.9							
4		Firm, grey, SILTY CLAY			SS	3	610	1
5								
6	93.2				SS	4	610	1
7		End of Borehole Standpipe installed						
8								
9								
10								
11								

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

Proposed Pipe Invert

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

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

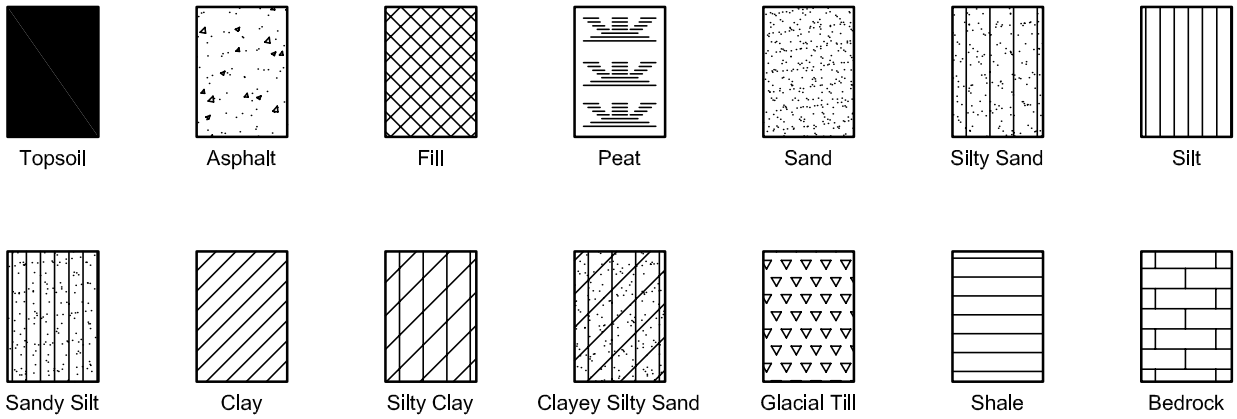
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

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

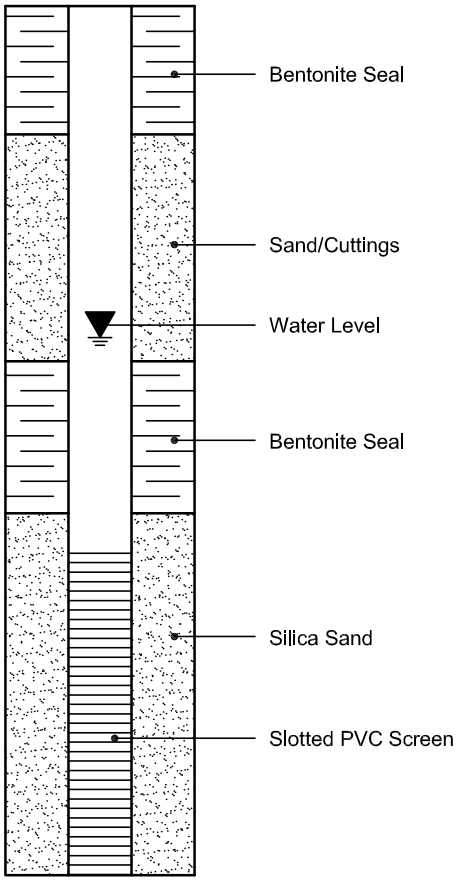
SYMBOLS AND TERMS (continued)

STRATA PLOT

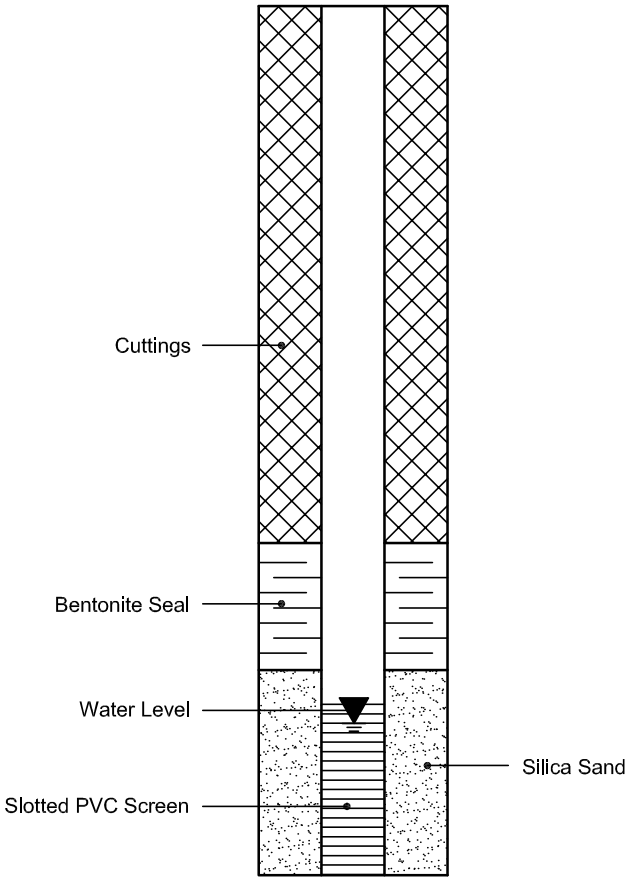


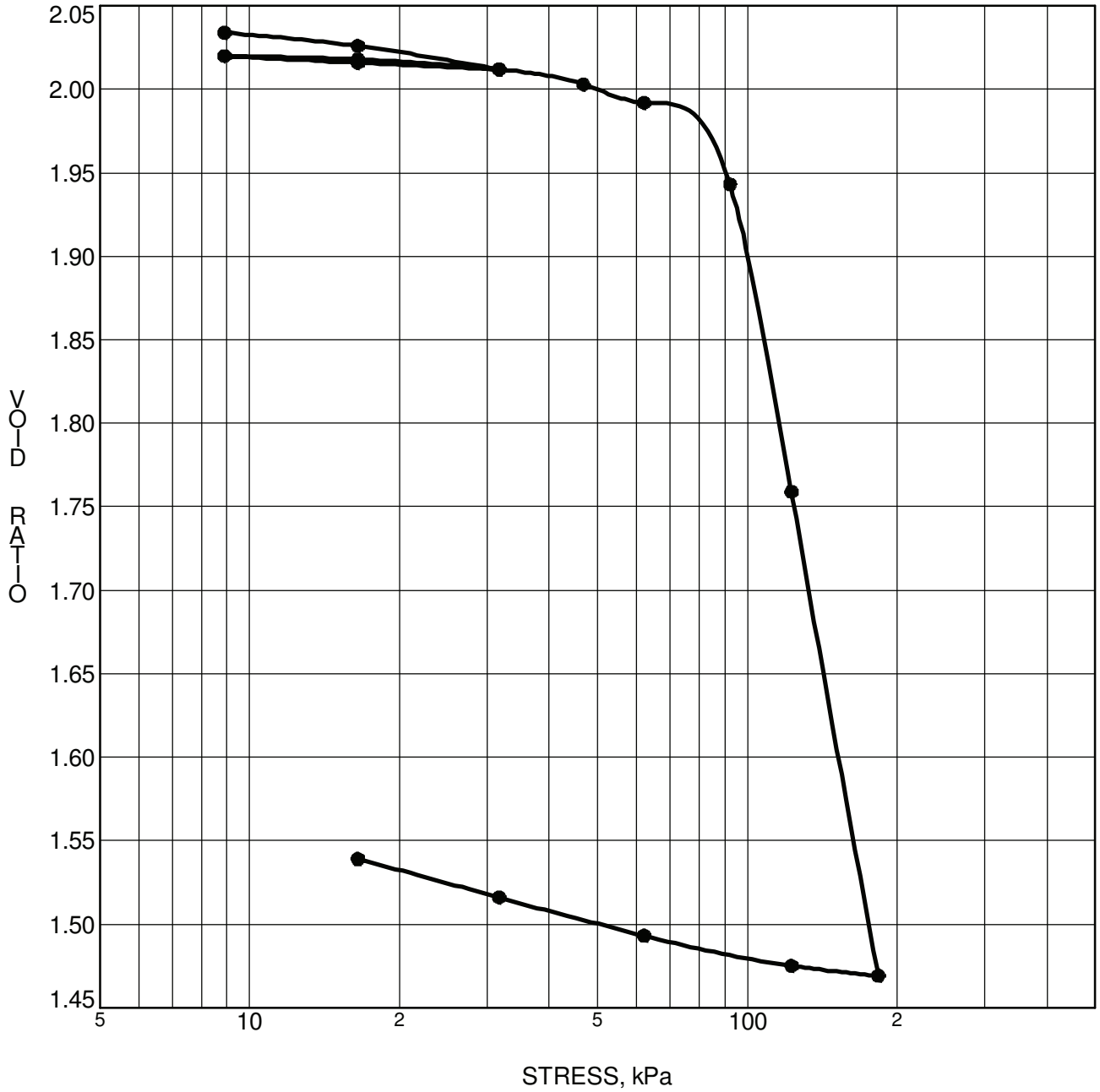
MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



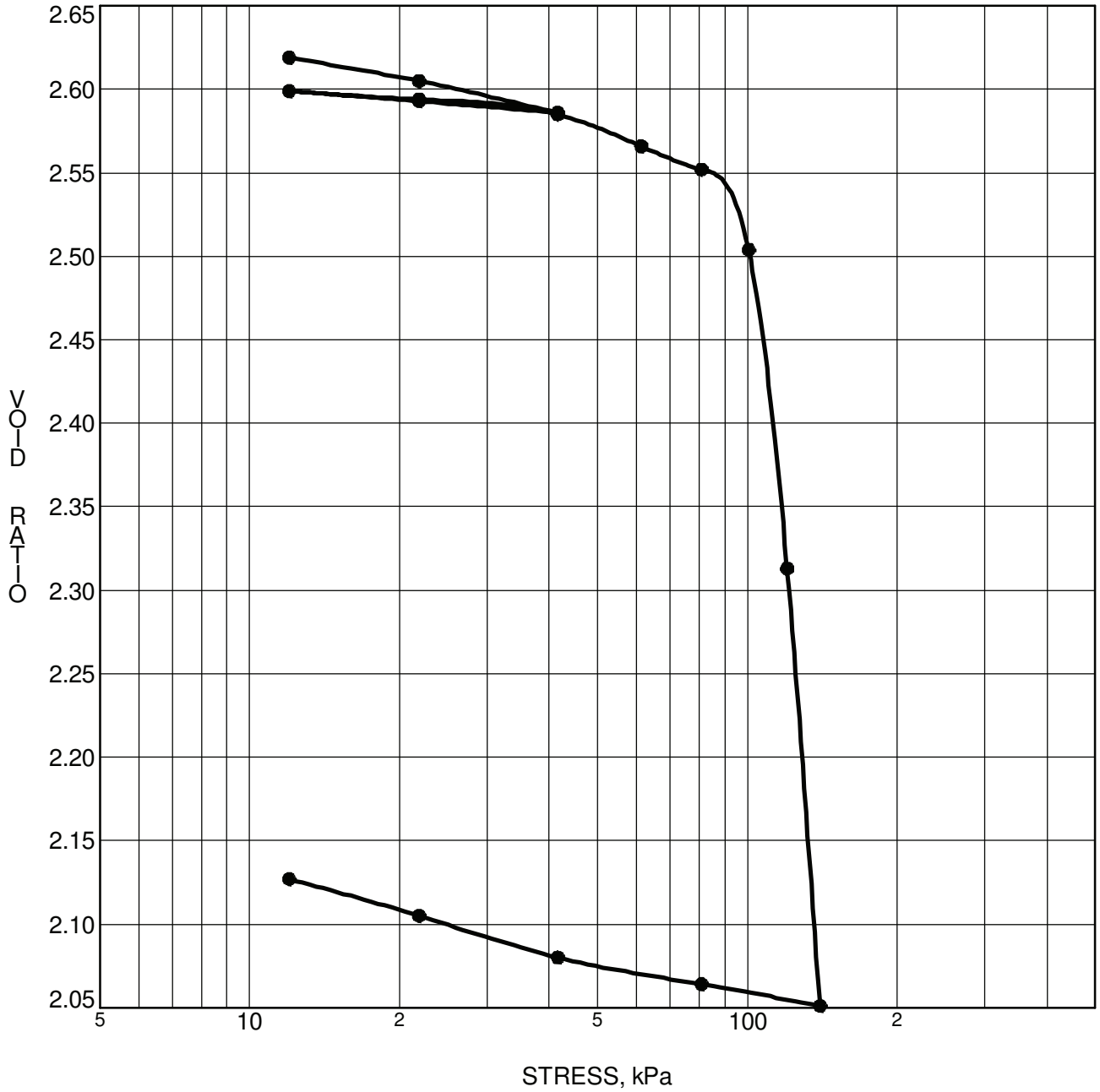


CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH 7**	p'_o	**53** kPa	Ccr	**0.016**
Sample No.	**TW 2**	p'_c	**90** kPa	Cc	**1.643**
Sample Depth	**4.36** m	OC Ratio	**1.7**	Wo	**74.3** %
Sample Elev.	**82.79** m	Void Ratio	**2.043**	Unit Wt.	**15.7** kN/m ^{3}

CLIENT	**Minto Communities Inc.**	FILE NO.	**PG2392**
PROJECT	**Geotechnical Investigation - Prop. Residential Development-Trails Edge Phase 2**	DATE	**08/23/2011**

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

CONSOLIDATION TEST

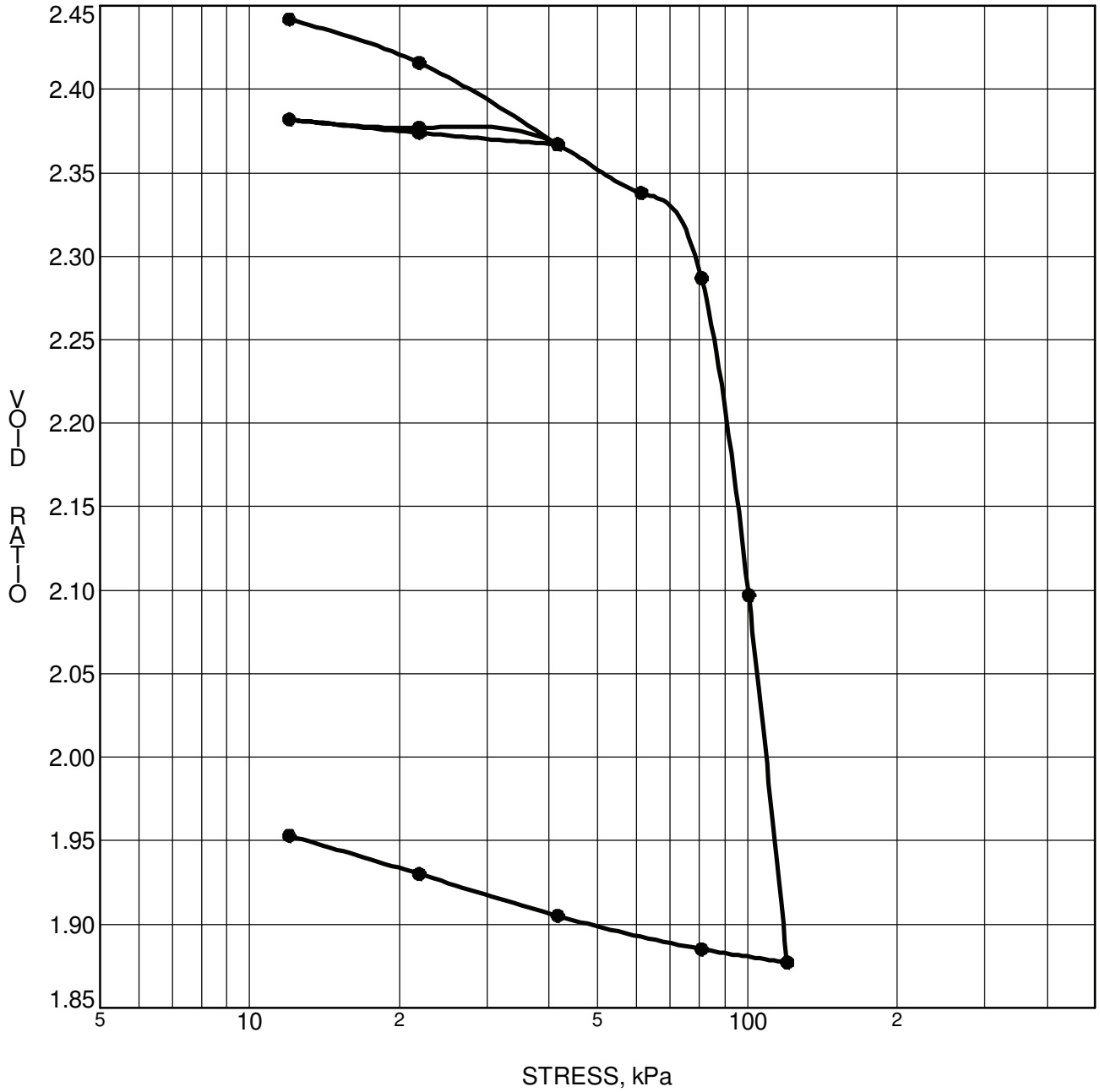


CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH 9**	p'_o	**53** kPa	Ccr	**0.021**
Sample No.	**TW 3**	p'_c	**106** kPa	Cc	**4.008**
Sample Depth	**4.33** m	OC Ratio	**2.0**	Wo	**95.8** %
Sample Elev.	**82.63** m	Void Ratio	**2.634**	Unit Wt.	**15.0** kN/m ^{3}

CLIENT	**Minto Communities Inc.**	FILE NO.	**PG2392**
PROJECT	**Geotechnical Investigation - Prop. Residential Development-Trails Edge Phase 2**	DATE	**02/19/2012**

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

CONSOLIDATION TEST

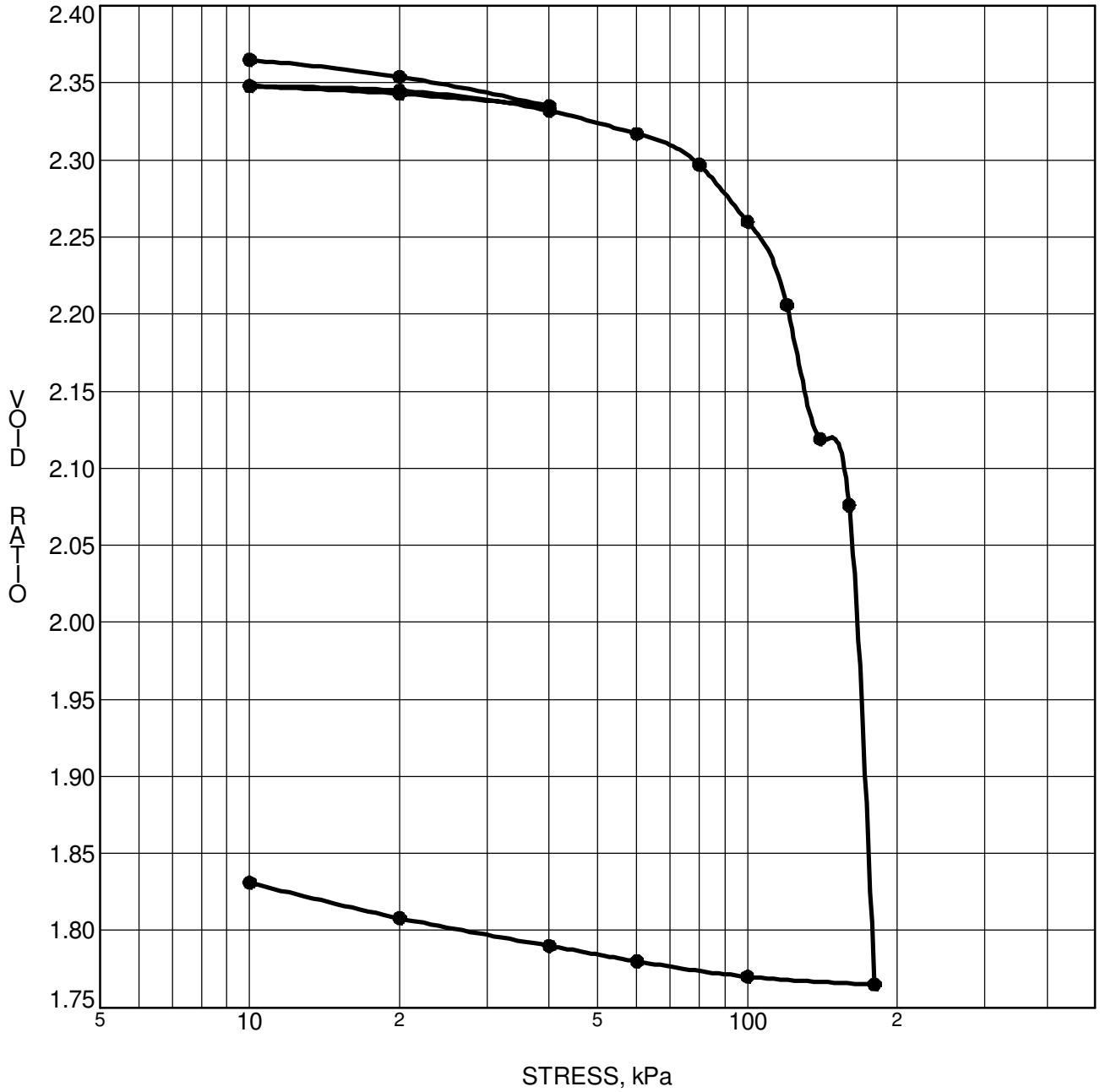


CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH11**	p'_o	**53** kPa	Ccr	**0.027**
Sample No.	**TW 4**	p'_c	**85** kPa	Cc	**2.735**
Sample Depth	**4.32** m	OC Ratio	**1.6**	Wo	**89.9** %
Sample Elev.	**82.85** m	Void Ratio	**2.472**	Unit Wt.	**15.1** kN/m ^{3}

CLIENT	**Minto Communities Inc.**	FILE NO.	**PG2392**
PROJECT	**Geotechnical Investigation - Prop. Residential Development-Trails Edge Phase 2**	DATE	**02/17/2012**

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

CONSOLIDATION TEST



CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH 9-08**	p'_o	**55** kPa	Ccr	**0.026**
Sample No.	**TW 2**	p'_c	**126** kPa	Cc	**3.260**
Sample Depth	**4.80** m	OC Ratio	**2.3**	Wo	**86.4** %
Sample Elev.	**82.12** m	Void Ratio	**2.376**	Unit Wt.	**16.2** kN/m ^{3}

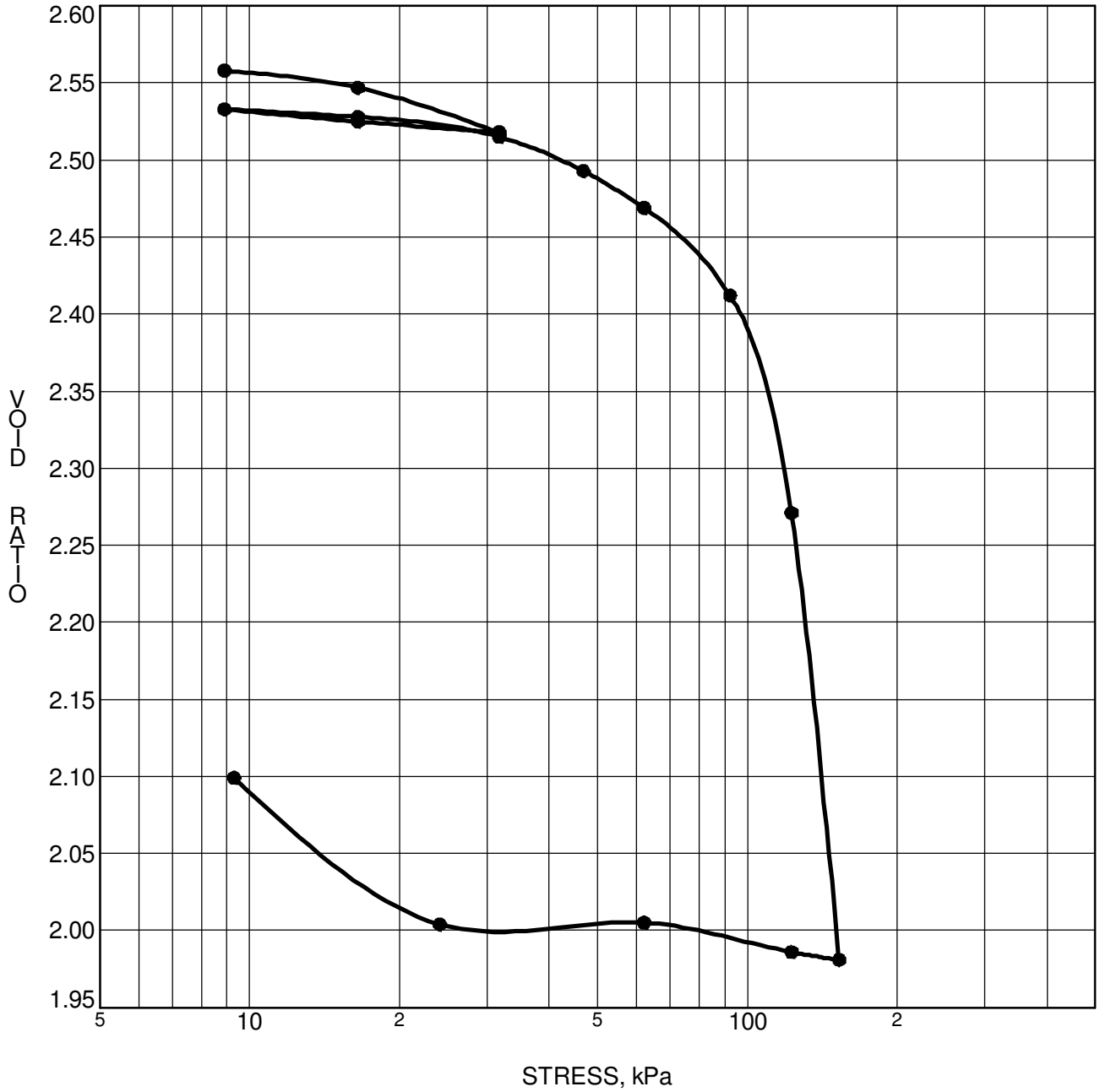
CLIENT **Richcraft Homes** FILE NO. **PG0861**

PROJECT **Geotechnical Investigation - Residential Development - Eden Park East Portion** DATE **08/12/08**

patersongroup Consulting Engineers

28 Concouse Gate, Unit 1, Ottawa, Ontario K2E 7T7

CONSOLIDATION TEST



CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH12-08**	p'_o	**68** kPa	Ccr	**0.031**
Sample No.	**TW 4**	p'_c	**109** kPa	Cc	**3.080**
Sample Depth	**9.40** m	OC Ratio	**1.6**	Wo	**93.6** %
Sample Elev.	**78.22** m	Void Ratio	**2.575**	Unit Wt.	**16.0** kN/m ^{3}

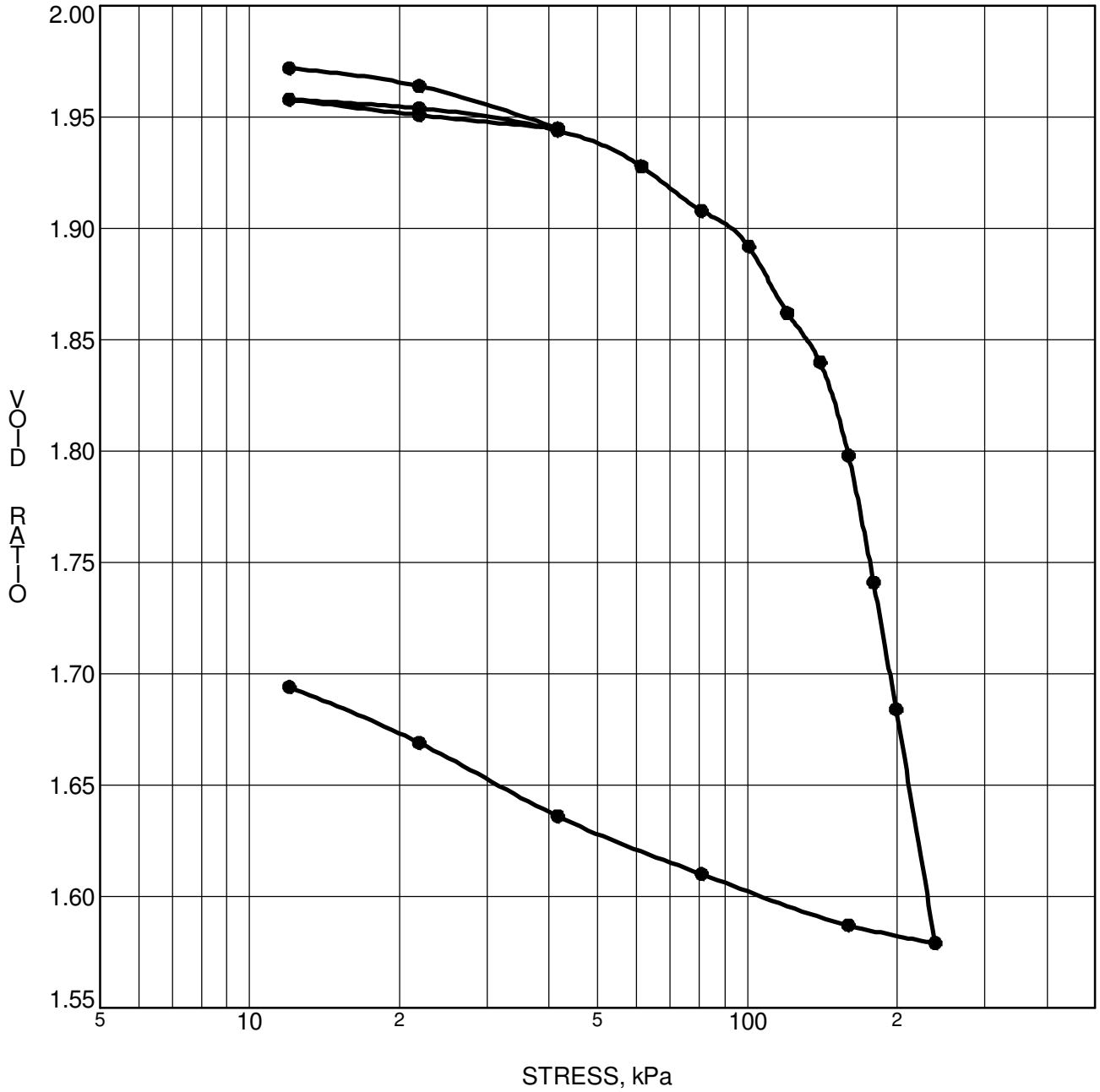
CLIENT **Richcraft Homes** FILE NO. **PG0861**

PROJECT **Geotechnical Investigation - Residential Development - Eden Park East Portion** DATE **10/27/08**

patersongroup Consulting Engineers

28 Concouse Gate, Unit 1, Ottawa, Ontario K2E 7T7

CONSOLIDATION TEST



CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH13-08**	p'_o	**43** kPa	Ccr	**0.025**
Sample No.	**TW 2**	p'_c	**142** kPa	Cc	**1.334**
Sample Depth	**3.42** m	OC Ratio	**3.3**	Wo	**72.2** %
Sample Elev.	**83.96** m	Void Ratio	**1.985**	Unit Wt.	**16.5** kN/m ^{3}

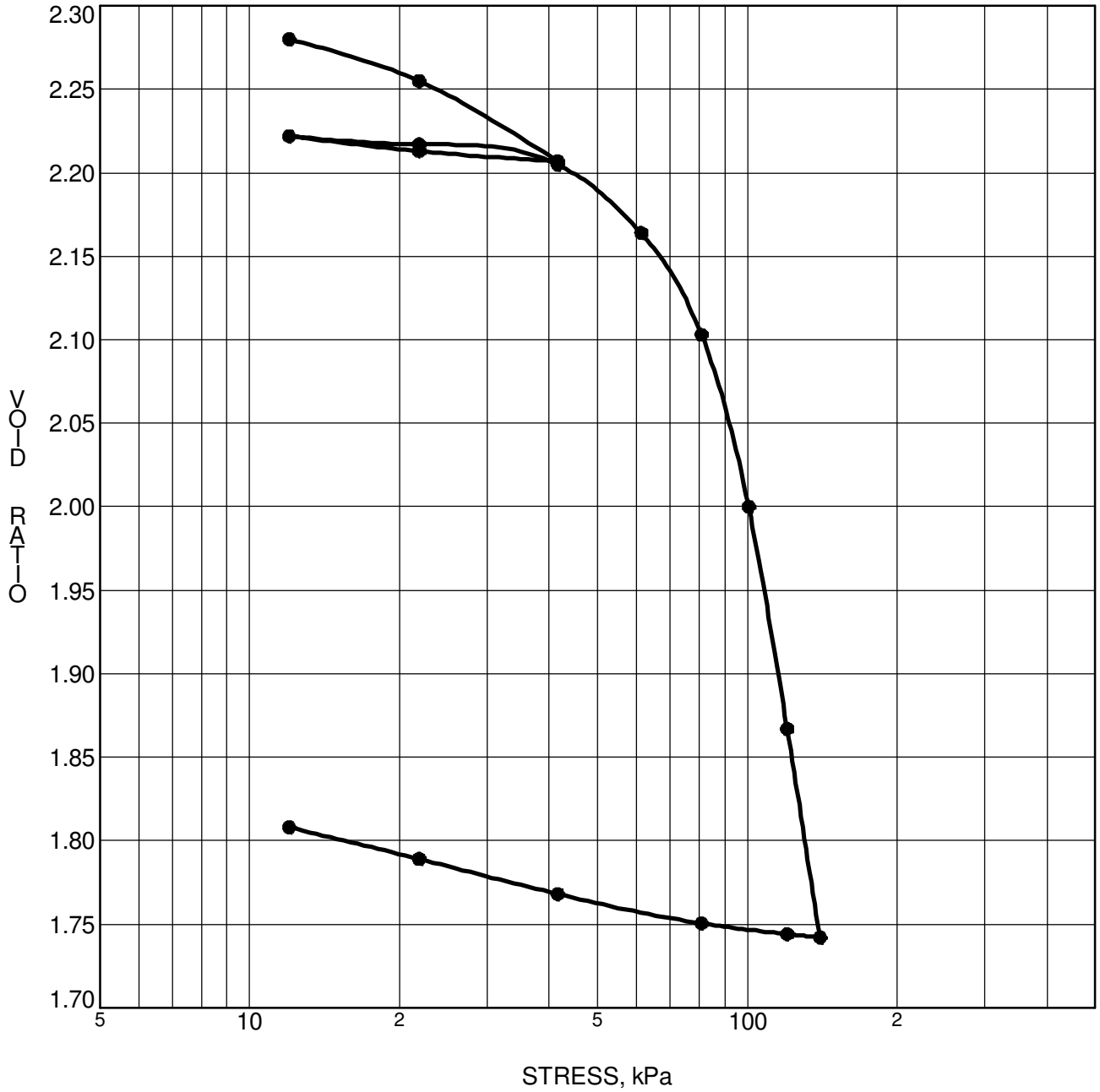
CLIENT **Richcraft Homes** FILE NO. **PG0861**

PROJECT **Geotechnical Investigation - Residential Development - Eden Park East Portion** DATE **10/28/08**

patersongroup Consulting Engineers

28 Concouse Gate, Unit 1, Ottawa, Ontario K2E 7T7

CONSOLIDATION TEST

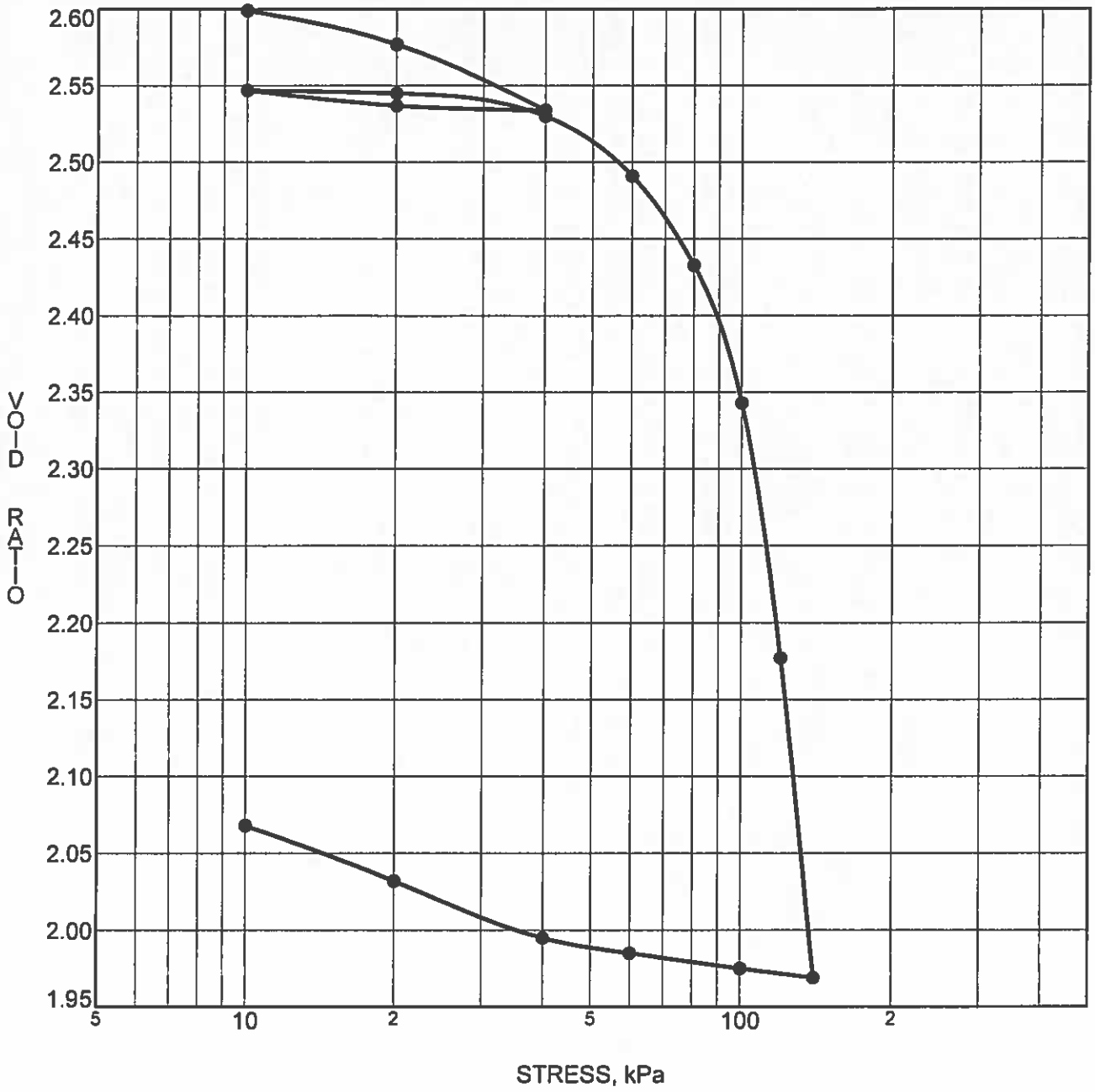


CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH15-08**	p'_o	**50** kPa	Ccr	**0.029**
Sample No.	**TW 2**	p'_c	**87** kPa	Cc	**1.890**
Sample Depth	**4.91** m	OC Ratio	**1.7**	Wo	**83.8** %
Sample Elev.	**82.33** m	Void Ratio	**2.303**	Unit Wt.	**16.0** kN/m ^{3}

CLIENT	**Richcraft Homes**	FILE NO.	**PG0861**
PROJECT	**Geotechnical Investigation - Residential Development - Eden Park East Portion**	DATE	**10/27/08**

patersongroup Consulting Engineers
28 Concouse Gate, Unit 1, Ottawa, Ontario K2E 7T7

CONSOLIDATION TEST



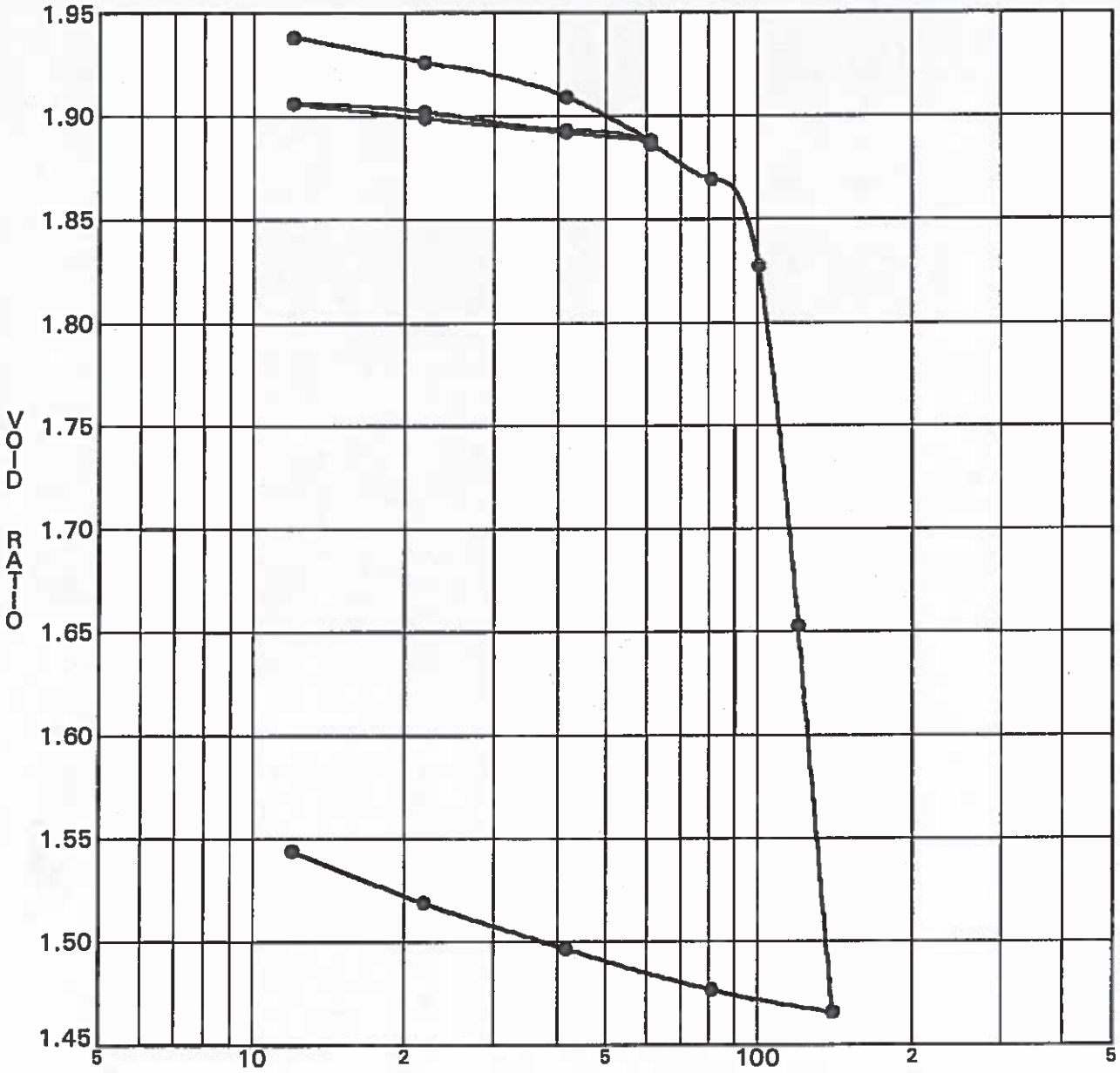
CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	BH19-08	p'_o	43 kPa	Ccr	0.025
Sample No.	TW 3	p'_c	99 kPa	Cc	3.100
Sample Depth	4.9 m	OC Ratio	2.3	Wo	95.1 %
Sample Elev.	81.9 m	Void Ratio	2.615	Unit Wt.	16.0 kN/m^3

CLIENT **Richcraft Homes** FILE NO. **PG0861**

PROJECT **Geotechnical Investigation - Residential Development - Eden Park East Portion** DATE **10/21/08**

patersongroup Consulting Engineers
28 Concouse Gate, Unit 1, Ottawa, Ontario K2E 7T7

CONSOLIDATION TEST

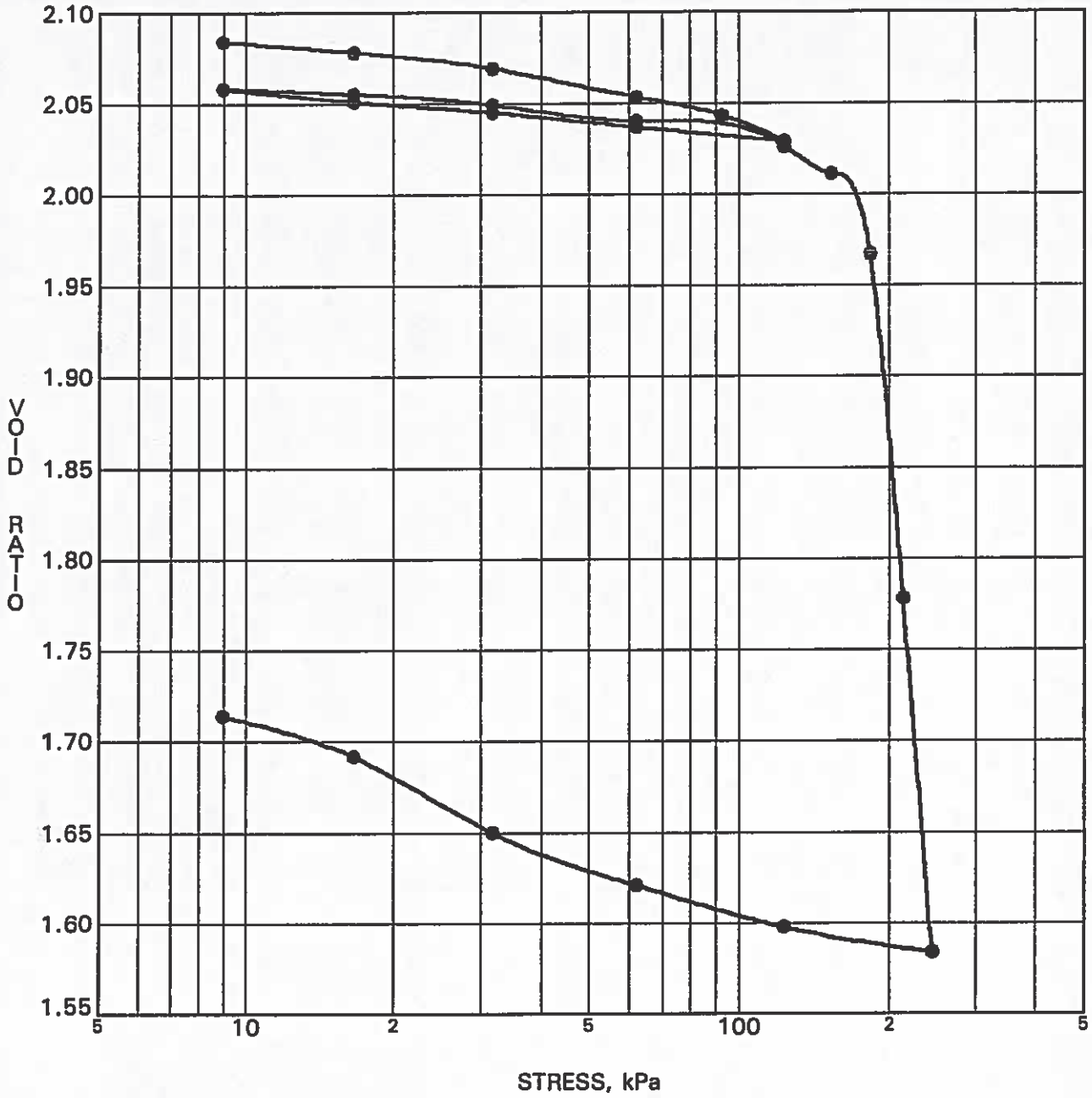


CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	BH 3	p'_o	64 kPa	Ccr	0.043
Sample No.	TW 5	p'_c	103 kPa	Cc	2.967
Sample Depth	6.53 m	OC Ratio	1.6	Wo	70.8 %
Sample Elev.	80.97 m	Void Ratio	1.951	Unit Wt.	14.9 kN/m^3

CLIENT	Richcraft Homes	FILE NO.	G8533
PROJECT	Geotechnical Investigation - Proposed Residential Subdivision, 4th Line Road	DATE	20/03/02

CONSOLIDATION TEST

JOHN D. PATERSON & ASSOCIATES LTD.
Unit 1, 28 Concourse Gate, Nepean, Ontario K2E 7T7

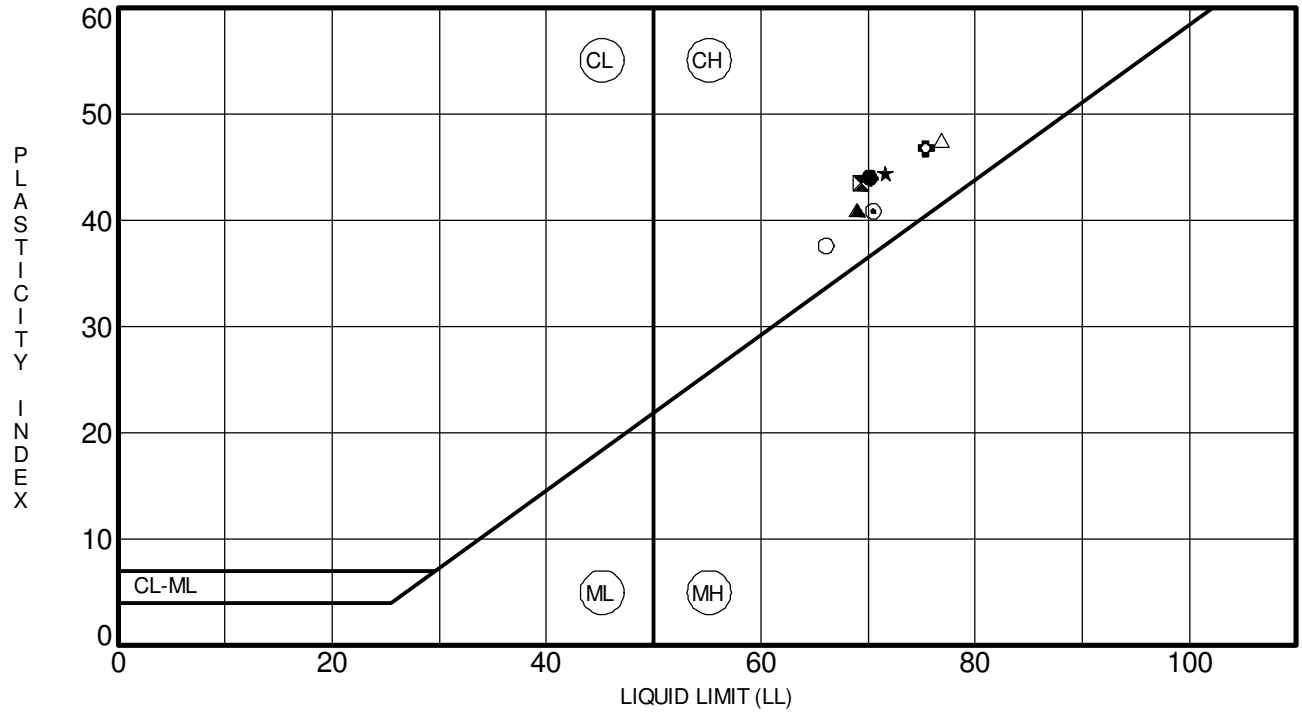


CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	BH 3	p'_o	82 kPa	Ccr	0.028
Sample No.	TW 7	p'_c	175 kPa	Cc	3.046
Sample Depth	9.60 m	OC Ratio	2.1	Wo	75.9 %
Sample Elev.	77.90 m	Void Ratio	2.084	Unit Wt.	15.4 kN/m^3

CLIENT	Richcraft Homes	FILE NO.	G8533
PROJECT	Geotechnical Investigation - Proposed Residential Subdivision, 4th Line Road	DATE	20/03/02

CONSOLIDATION TEST

JOHN D. PATERSON & ASSOCIATES LTD.
Unit 1, 28 Concourse Gate, Nepean, Ontario K2E 7T7



	Specimen Identification	LL	PL	PI	Fines	Classification
●	**BH 1-08**	**70**	**26**	**44**		**CH - Clay with high plasticity (TW 5)**
⊠	**BH 3-08**	**69**	**26**	**44**		**CH - Clay with high plasticity (TW 3)**
▲	**BH 5-08**	**69**	**28**	**41**		**CH - Clay with high plasticity (TW 5)**
★	**BH 6-08**	**72**	**27**	**44**		**CH - Clay with high plasticity (TW 3)**
⊙	**BH 9-08**	**70**	**30**	**41**		**CH - Clay with high plasticity (TW 2)**
✿	**BH10-08**	**75**	**29**	**47**		**CH - Clay with high plasticity (TW 3)**
○	**BH15-08**	**66**	**28**	**38**		**CH-Inorganic Clays of High Plasticity (TW2)**
△	**BH17-08**	**77**	**29**	**48**		**CH-Inorganic Clays of High Plasticity (TW3)**

CLIENT **Richcraft Homes** FILE NO. **PG0861**

PROJECT **Geotechnical Investigation - Residential Development - Eden Park East Portion** DATE **15 Oct 08**

patersongroup Consulting Engineers

28 Concouse Gate, Unit 1, Ottawa, Ontario K2E 7T7

ATTERBERG LIMITS' RESULTS

APPENDIX 2

FIGURE 1 - KEY PLAN

DRAWING PG3130-6 - TEST HOLE LOCATION PLAN

DRAWING PG3130-7 - PERMISSIBLE GRADE RAISE PLAN

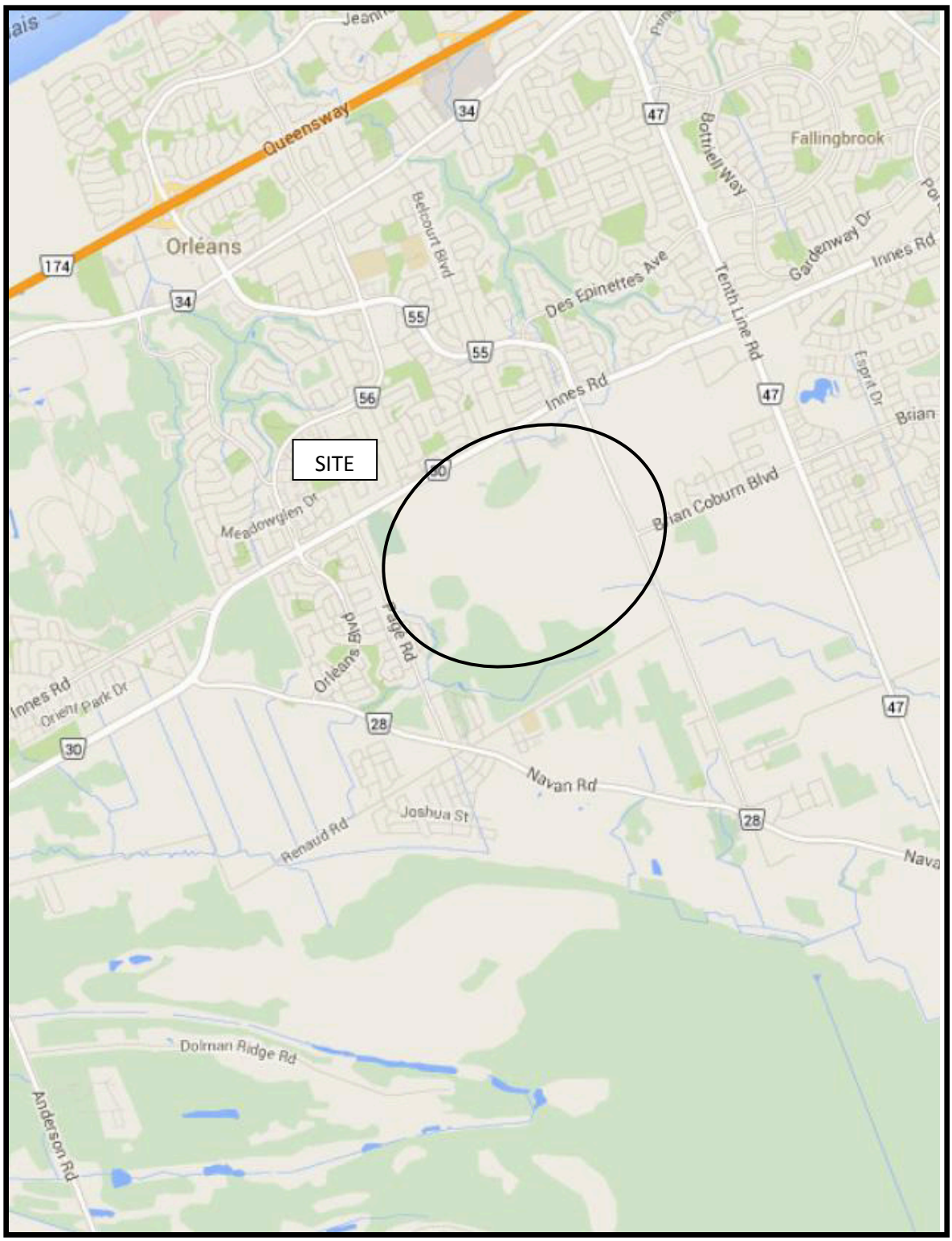


FIGURE 1

KEY PLAN

LEGEND:

◈	BOREHOLE LOCATION, CURRENT INVESTIGATION
⊕	BOREHOLE LOCATION, PATERSON GROUP REPORT PG2392
⊕	HAND AUGER HOLE LOCATION, PATERSON GROUP REPORT PG1605
◈	BOREHOLE LOCATION, PATERSON GROUP REPORT PG0861
▪	TEST PIT LOCATION, PATERSON GROUP REPORT PG0861
⊕	BOREHOLE LOCATION, PATERSON GROUP REPORT G8533
◆	BOREHOLE LOCATION, PATERSON GROUP REPORT PG0811
■	TEST PIT LOCATION, PATERSON GROUP REPORT PG0811
▪	TEST PIT LOCATION, PATERSON GROUP REPORT PG0861
◈	BOREHOLE LOCATION BY OTHERS
86.93	GROUND SURFACE ELEVATION (m)
(62.93)	PRACTICAL REFUSAL TO AUGERING / DCPT ELEVATION (m)

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

PROPOSED MIXED USE COMMUNITY
EXISTING CONDITIONS REPORT
1000 BANK STREET
OTTAWA, ONTARIO

GEOTECHNICAL INVESTIGATION
EAST URBAN COMMUNITY - MIXED USE DEVELOPMENT

Title:

TEST HOLE LOCATION PLAN

Stamp:

Drawn by: MPG	Report No.: PG3130-2
Checked by: CDS	Drawing No.: PG3130-6
Scale: 1:4000	
Date: 09/2014	

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PERMISSIBLE GRADE RAISE:

SHALLOW OVERBURDEN WITH BEDROCK RANGING FROM 1m TO 5m BELOW GRADE (<2m GRADE RAISE RESTRICTION)

SILTY CLAY DEP[OSIT WITH BEDROCK RANGING FROM 5m TO 25m BELOW GRADE (0.5 TO 1.5m GRADE RAISE RESTRICTION)

LEGEND:

◈	BOREHOLE LOCATION, CURRENT INVESTIGATION
⊕	BOREHOLE LOCATION, PATERSON GROUP REPORT PG2392
⊕	HAND AUGER HOLE LOCATION, PATERSON GROUP REPORT PG1605
◈	BOREHOLE LOCATION, PATERSON GROUP REPORT PG0861
■	TEST PIT LOCATION, PATERSON GROUP REPORT PG0861
⊕	BOREHOLE LOCATION, PATERSON GROUP REPORT G8533
●	BOREHOLE LOCATION, PATERSON GROUP REPORT PG0811
■	TEST PIT LOCATION, PATERSON GROUP REPORT PG0811
■	TEST PIT LOCATION, PATERSON GROUP REPORT PG0861
◈	BOREHOLE LOCATION BY OTHERS
86.93	GROUND SURFACE ELEVATION (m)
(62.93)	PRACTICAL REFUSAL TO AUGERING / DCPT ELEVATION (m)

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

NO.	REVISIONS	DATE	INITIAL

RICHCRAFT GROUP OF COMPANIES

EXISTING CONDITIONS REPORT
EAST URBAN COMMUNITY MIXED-USE DEVELOPMENT
OTTAWA, ONTARIO

PERMISSIBLE GRADE RAISE PLAN

Drawn by: MPG	Report No.: PG3130-2
Checked by: CDS	Drawing No.: PG3130-7
Scale: 1:4000	
Date: 10/2014	

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APPENDIX 3

SLOPE STABILITY ANALYSIS REPORT - BY OTHERS

REPORT

Slope Stability Assessment
Reaches 7 and 12
Storm Water Management Pond Block
3490 Innes Road Development
Ottawa, Ontario

Submitted to:

Innes Road Development Corporation
204-223 Colonnade Road South
Ottawa, Ontario
K2E 7K3

Submitted by:

Golder Associates Ltd.
1931 Robertson Road Ottawa, Ontario, K2H 5B7 Canada

+1 613 592 9600

1660030-03

June 2018

Distribution List

1 e-copy - Innes Road Development Corporation

1 e-copy - Golder

Table of Contents

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Innes Road Development Corporation to carry out a slope stability assessment for Reaches 7 and 12 that run through the proposed Storm Water Management Pond Block to be located south of the proposed residential development at 3490 Innes Road in Ottawa, Ontario.

The purpose of this assessment was to evaluate the stability of the existing slopes along the ravine and to establish the Limit of Hazard Lands (i.e., set-back) for the proposed Storm Water Management Pond (SWMP). It is understood that the design for the SWMP has not yet been undertaken and will be completed at a later date; the assumptions made in this report and for the stability analysis are based on a conceptual plan provided by David Schaeffer Engineering Limited (DSEL), dated May 24, 2018.

The reader is referred to the “Important Information and Limitations of This Report” which follows the text but forms an integral part of this document.

2.0 DESCRIPTION OF PROJECT AND SITE

Plans are being prepared for a residential and commercial development to be located at 3490 Innes Road in Ottawa, Ontario (see Site Plan, Figure 1).

The following is understood about the project and site:

- The property is roughly rectangular in shape with a maximum width and length of approximately 320 and 950 metres, respectively (i.e., about 30 hectares in area).
- The site has a gently sloping topography, with ground surface elevations decreasing from north to south in the range of about 91.0 to 86.5 metres.
- The site primarily consists of undeveloped vacant and/or agricultural land, with the exception of the northernmost portion of the site along Innes Road, which is occupied by a driving range and a parking area for school buses.
- The northern portion of the property is proposed to be developed with commercial buildings. The southern portion is proposed to be developed as a residential subdivision.
- The southwest boundary of the property is marked by a ravine which flows along the edge of the site in an approximately 2 to 4 metre deep valley. The stability of the ravine slopes needs to be evaluated so that the extent of potential Hazard Lands (which are generally un-developable) can be identified.

Golder Associates (Golder) has carried out two previous subsurface investigations on this site; one included a total of 25 boreholes drilled in 2016, and the other included 5 boreholes drilled in 2005. A third investigation carried out by Golder, near this site for the Cumberland Transitway was also referenced to supplement the site information. The results of these three previous investigations are provided in the following reports:

- Report to City of Ottawa Planning and Growth Management Department titled “*Preliminary Geotechnical Investigation, Proposed Orleans Business Park, Ottawa, Ontario”* dated December 2005 (Report No. 05-1120-163).
- Report to Innes Road Development Corporation titled “*Geotechnical Investigation, Commercial and Residential Development, 3490 Innes Road, Ottawa, Ontario*” dated December 2016 (Report No. 1660030).

- Report to Stantec Consulting Ltd. titled "*Geotechnical Investigation Pavements and Services, Cumberland Transitway: West of Innes Road to East of Tenth Line Road, Ottawa, Ontario*" dated January 2013 (Report No. 09-1121-0049).

Based on published geological mapping and previous investigations carried out on this and nearby sites, the subsurface conditions on this site are indicated to vary significantly from north to south. To the north at Innes Road, the subsurface conditions consist of fill and glacial till overlying shallow limestone bedrock (less than about 2 metres deep). To the south, the bedrock is deeper (25 to 50 metres) and the glacial till is overlain by a thick deposit of sensitive silty clay. In general, the sensitive silty clay thickens to the south and west. At the location of the ravine, the subsurface conditions consist of a thick deposit of silty clay. The underlying bedrock is indicated to consist of limestone of the Bobcaygeon and Lindsay Formations.

3.0 SITE RECONNAISSANCE

A reconnaissance of the site was carried out on May 17 and 29, 2018. The purpose of the site reconnaissance was to view the site conditions along the ravines (at the southwest portion of the property), to measure the slope geometry, and to observe the state of erosion at the toes of the slopes, in the area of the proposed Storm Water Management Pond Block at Reaches 7 and 12. A total of seven slope cross sections (labelled AA to FF) were surveyed at locations along the ravine. The approximate locations of the surveyed slope cross sections along with the crest of slopes are shown on the Site Plan (Figure 1). The survey was carried out using a hand-held GPS unit, and the slope angles and heights were measured with a hand clinometer.

4.0 SUBSURFACE CONDITIONS

Information on the subsurface conditions near the ravines discussed herein are provided on the Records of Borehole for boreholes 16-19 and 09-Q24 from the previous investigations and which are provided in Appendix A.

At the borehole locations, a thin surficial deposit of native silty sand exists below the topsoil. The silty sand is about 0.3 metres in thickness and extends to depths of 0.5 and 0.6 metres below the existing ground surface.

The silty sand layer is underlain by a thick deposit of sensitive silty clay. The upper portion of the silty clay deposit has been weathered to a very stiff to stiff grey brown crust that extends to about 3.1 metres depth. Below the weathered zone, the silty clay is grey in colour and is indicated to be firm in consistency, with measured undrained shear strength values ranging from about 30 to 42 kilopascals. The silty clay was not fully penetrated in these boreholes, but was proven to extend to at least 8.8 metres depth.

Based on published geological mapping and previous investigations, the depth of the bedrock surface at this location is indicated to range between about 25 and 50 metres. The bedrock is expected to be overlain by a layer of glacial till.

The groundwater level in the monitoring well at the location of borehole 16-19 was measured to be at about 3.4 metres depth on November 23, 2016. The groundwater level in borehole 09-Q24, immediately after drilling in the open hole, was measured to be at 7.0 metres depth. Groundwater levels are expected to fluctuate seasonally, and higher groundwater levels are expected during wet periods of the year, such as spring.

5.0 DISCUSSION

5.1 General

This section of the report provides an assessment of the stability of the existing slope geometries and the corresponding extent of Hazard Lands.

The reader is referred to the “Important Information and Limitations of This Report” which follows the text but forms an integral part of this document.

5.2 Slope Stability Assessment

This assessment includes the evaluation of the stability of the existing slopes along the critical sections of Reaches 7 and 12 of the ravine to establish a horizontal limit of developable land (i.e., Limit of Hazard Lands associated with the slopes), based on the geometry of the slopes at both surveyed locations.

5.2.1 Results of Slope Mapping

As discussed in Section 3.0, mapping of the slopes along Reaches 7 and 12 were carried out using a hand-held GPS unit and a hand clinometer. The measured cross section geometries are provided on Figures 2 to 8. Figures 2, 3, 4, 7, and 8 show the cross-sections surveyed along Reach 7 and Figures 5 and 6 show the cross-sections surveyed along Reach 12. These cross-sections were selected as the most representative of the critical slopes along these reaches (i.e., highest and deepest) based on visual observation during the site reconnaissance.

In general, the slopes of the ravine are about 2.5 to 4.0 metres in height along Reach 7 and 1.5 to 2.0 metres in height along Reach 12, and have an inclination of about 30 to 90 degrees and about 35 to 45 degrees from the horizontal for Reach 7 and Reach 12, respectively.

At the time of the site visits on May 17 and 29, 2018, evidence of active erosion was observed at the toes of the slopes, particularly in the areas at Cross Sections A-A, C-C, F-F and G-G.

5.2.2 Analysis

Limit equilibrium slope stability analyses were carried out to assess the stability of the existing slopes. For this assessment, one cross section for each Reach was selected for detailed analysis, based on the highest slope and steepest inclination, along the bank of the ravine.

In general, slope failures occur when the forces (or rotational moments) generated by the weight of the soil in a slope and external loads exceed the shear strength of the soil. The six main parameters involved in the engineering analysis of the stability of a slope are:

1) The geometry of the slope.

2) The subsurface stratigraphy within the slope (i.e., the composition of the various soil layers within the slope and their depth, thickness, and orientation).

3) The groundwater conditions (the groundwater levels and the hydraulic gradient/flow conditions).

4) The strength parameters for the soils.

5) The unit weights (i.e., densities) of the soils within the slope.

6) External loads on the slope, such as from foundations of structures, filling above the slope, or earthquakes.

For this site, the geometries of the slopes were based on the slope mapping, as described previously.

The subsurface stratigraphy used in the analysis was based on borehole 16-19 and borehole 09-Q24, which were put down from previous investigations. The stratigraphy in the analysis was modelled as a layer of stiff weathered crust over firm silty clay. The thin layer of sand observed at borehole 16-19 was not considered to have a material effect on the analysis results and was therefore neglected for this analysis.

Static and seismic slope stability analyses were carried out with the commercially available SLOPE/W software (produced by Geo-Studio 2007), using the soil parameters given in the following table.

Material	Static Drained Parameters		Seismic Undrained Shear Strength (kPa)	Unit Weight (kN/m^3)
	Effective Angle of Internal Friction (degrees)	Effective Cohesion (kPa)		
Weathered Silty Clay Crust	35	5	50	17.5
Grey Silty Clay	29.6	7.4	35	15.5

The groundwater conditions within the slopes for static conditions were conservatively assumed to be at the ground surface (i.e., fully saturated slopes), which is a condition that may occur during periods with prolonged precipitation (e.g., spring).

The stability of the slopes was evaluated for:

- Drained (i.e., long-term, static) conditions, for which effective stress soil parameters were used.
- Seismic conditions (i.e., the dynamic loading conditions during an earthquake), for which undrained shear strength parameters were used. A horizontal seismic coefficient of 0.19 was used for the analyses. This value is based on the peak horizontal ground acceleration for Ottawa specified in the 2012 Ontario Building Code (with half that value being used, per standard practice).

The stability of the slopes was evaluated using limit equilibrium methods and the SLOPE/W software. The Morgenstern-Price method was used to compute the factor of safety. The factor of safety is defined as the ratio of the magnitude of the forces/moments tending to resist failure to the magnitude of the forces/moments tending to cause failure. Theoretically, a slope with a factor of safety of less than 1.0 will fail and one with a factor of safety of 1.0 or greater will stand. However, because the modeling is not exact and natural variations exist for all of the parameters affecting slope stability, a factor of safety of 1.5 is used to define a stable slope (for static loading conditions), and/or to define the ‘safe’ set-back distance from an unstable slope.

For seismic loading conditions, a factor of safety of 1.1 is typically used.

5.2.3 Results

The result of the stability analyses carried out for drained (i.e., static) conditions indicates that the factor of safety against global instability of the existing slopes are 1.2 and 1.4 (i.e., less than 1.5) for Reach 7 and 12, respectively, and the slopes are therefore considered unstable from a geotechnical perspective. The factor of safety against instability under *seismic* loading was determined to be greater than 1.1 for both Reach 7 and Reach 12 and therefore the slope is considered to have an adequate factor of safety during a seismic event. The results of the static analyses are provided on Figures 9 to 12.

Hazard Lands associated with unstable slopes, as defined by Ministry of Natural Resources (MNR) guidelines and provincial planning policies, are unsuitable for development with either publicly owned infrastructure or private development. In accordance with the MNR guidelines, the set-back distance from the crest of an unstable slope to the Limit of Hazard Lands should include three components, as appropriate, namely:

1) A “Stable Slope Allowance”, which is determined as the limit beyond which there is an acceptable factor of safety (i.e., greater than about 1.5 for static) against the table land being impacted by a slope failure.

2) An “Erosion Allowance”, to account for future movement of the slope toe, in the table land direction, as a result of erosion along the slope toe/creek bank. The magnitude of the Erosion Allowance depends upon the type of soil being eroded at the slope toe, the severity of the erosion, and the water course characteristics.

3) An “Erosion Access Allowance” of 6 metres, to allow a corridor by which equipment could travel to access and repair a future slope failure. This Erosion Access Allowance is included in the determination of the Limit of Hazard Lands wherever the development could restrict future slope access.

Stable Slope Allowance

For this site, the results of the stability analysis indicate that the factor of safety against global instability of the existing slope under static conditions is lower than 1.5, and that for seismic conditions is greater than 1.1. The slopes are therefore considered unstable for static loading conditions. This being the case, a Stable Slope Allowance of 6 metres and 2 meters is required to achieve a factor of safety of 1.5 for Reach 7 and Reach 12, respectively.

Any filling of the table land area could negatively impact on the stability of the adjacent ravine slope and increase the required set-back. If any filling is considered inside the Limit of Hazard Lands, the stability of the slopes must be reassessed.

Erosion Allowance

An Erosion Allowance needs to be applied wherever there is active erosion, or the potential for active erosion based on the flow velocities. Based on the observations of the current erosion conditions, it is considered that the magnitude of the *Erosion Allowance* for this site, based on the MNR guidelines, would be 5 metres for Reach 7 and 1 metre for Reach 12 (no active erosion was observed along Reach 12 at the time of the site reconnaissance).

However, if erosion protection were to be installed along the ravine bank, then, at least for those specific sections of bank and slope where erosion protection were installed, an *Erosion Allowance* need not be included in the determination of the Limit of Hazard Lands.

Detailed guidelines on the nature of the erosion protection are not provided in this report. However, conceptually, the erosion protection could consist of rip-rap, placed on a maximum 2 horizontal to 1 vertical front slope up to the 100 year flood level, and underlain by a non-woven geotextile. Further guidelines on erosion protection options can be provided, if required.

If erosion protection is to be considered, other studies and regulatory approvals could be required, such as with respect to environmental impacts, fish habitat, and alterations to the waterway. The feasibility of obtaining these approvals has not been evaluated.

Erosion Access Allowance

The Erosion Access Allowance included in the MNR procedures for determining the Limit of Hazard Lands is intended to provide a corridor of sufficient width across the table land that equipment could access the site of a future slope failure to undertake a repair. The width of the Erosion Access Allowance is typically 6 metres. The MNR documents do not provide guidance on those situations where the Erosion Access Allowance need, or not need, be applied. However, as a general guideline, the Erosion Access Allowance should be included wherever the development plans would preclude equipment access to the slope. For example, it should be included where buildings or fences will be constructed right up to the Limit of Hazard Lands. However, it probably need not be included in the Limit of Hazard Lands associated with the construction of the SWMP, provided that an unobstructed corridor for equipment access is provided at the top of the SWMP side slopes.

Limit of Hazard Land Summary

The following table provides a summary of the various “set-back” components which are applicable for determining the total set-back for this site.

Location	Stable Slope Allowance (metres)	Erosion Allowance (metres)	Access Allowance (metres)	Total Set-Back (metres)
Reach 7	6	5(1)	0(2)	11
Reach 12	2	1(1)	0(2)	3

Notes:
(1) Assumes that erosion protection will not be provided. This allowance can be reduced to 0 metres if erosion protection is provided.

(2) Assumes that access to the slope is unrestricted. If the access is restricted 6 metres access allowance will be required.

For areas where the set-back distances cannot be maintained along Reach 7, erosion protection such as riprap, gabion baskets, erosion control blankets etc. may be provided so that the Erosion Allowance can be reduced to 0 metres, thus decreasing the total set-back to 6 metres (assuming that unobstructed access is also provided).

The 11 metre and 3 metre set-back lines for Reach 7 and Reach 12, respectively are shown on Figure 1.

6.0 ADDITIONAL CONSIDERATIONS

The assessment provided in this report is based on there being no filling on the table land area adjacent to the slope. These guidelines will therefore need to be confirmed once the site grading has been designed.

7.0 CLOSURE

We trust this report contains sufficient information for your present requirements. If you have any questions concerning this report, or if we can be of further service to you on this project, please contact the undersigned.

Golder Associates Ltd.

Chaitanya Raj Goyal
Geotechnical Scientist

William Cavers, P.Eng.
Associate, Senior Geotechnical Engineer

CRG/WC/mvrd
\\golder.gds\gal\ottawa\active\2016\3 proj\1660030 caivan 3490 innes road\3 - geotechnical\analysis\phase 6000 - 24 05 2018 slope stability, by bb and crg\report\report rev 1\1660030-6000-003-r-rev1-slope stability assessment-june 2018.docx

IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client, **Innes Road Development Corporation.** The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder cannot be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then the client may authorize the use of this report for such purpose by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process, provided this report is not noted to be a draft or preliminary report, and is specifically relevant to the project for which the application is being made. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client cannot rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder cannot be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT (cont'd)

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. **The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report.** The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

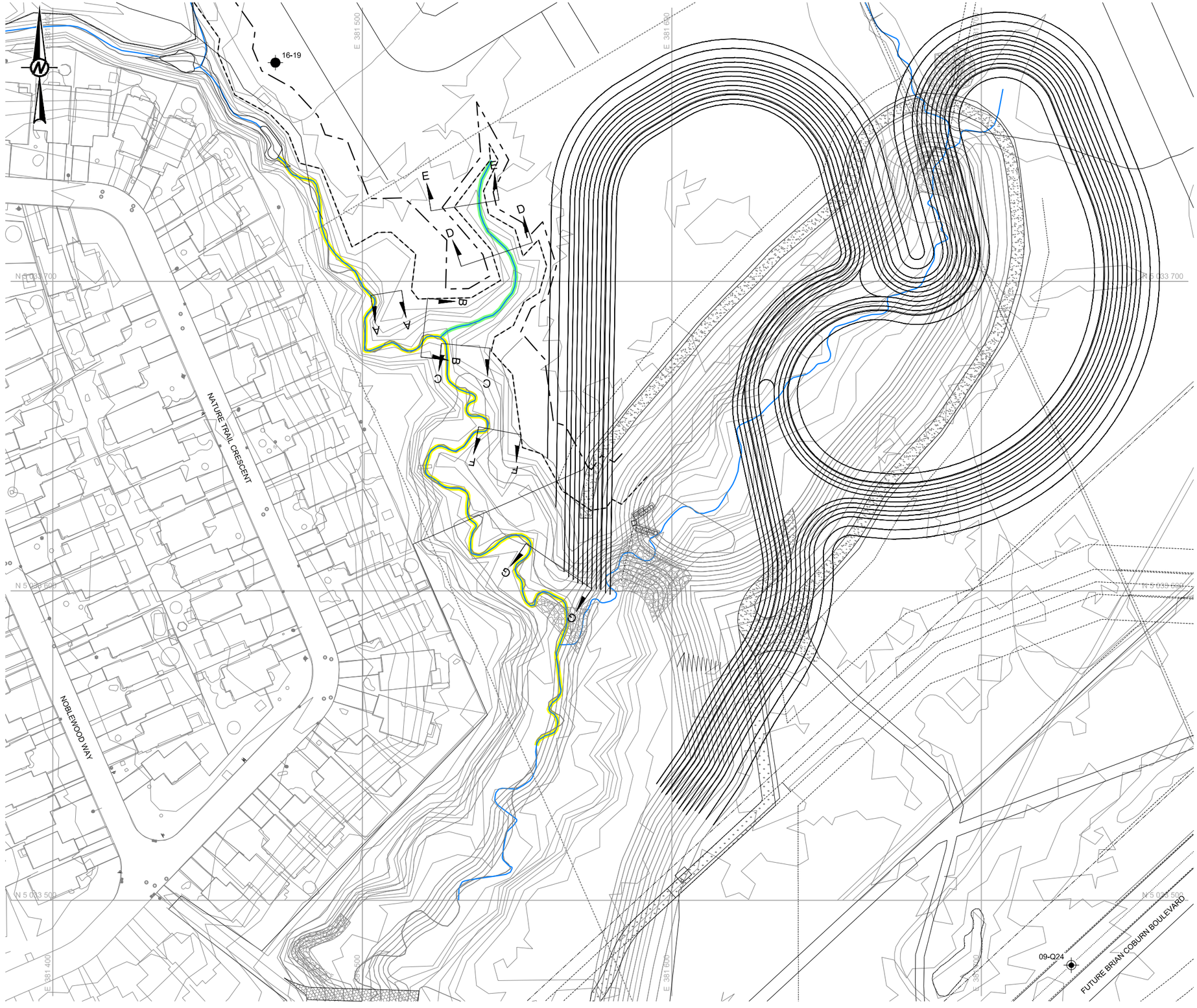
Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



KEY MAP

SCALE 1:50,000

LEGEND

- APPROXIMATE BOREHOLE LOCATION, PREVIOUS INVESTIGATION BY GOLDER ASSOCIATES LTD., TECHNICAL MEMORANDUM NO. 1660030-3000 (DEC. 16, 2016)
- APPROXIMATE BOREHOLE LOCATION, PREVIOUS INVESTIGATION BY GOLDER ASSOCIATES LTD., REPORT NO. 09-1121-0049-4000-9/10 (JAN. 2013)
- A — CROSS-SECTION LOCATION
- REACH 7
- REACH 12
- LIMIT OF HAZARD LANDS BASED ON TOP OF CREEK SLOPE (EROSION, STABLE SLOPE, AND ACCESS ALLOWANCE)
- TOP OF SLOPE

REFERENCE(S)

1. BASE PLAN SUPPLIED BY DSEL ON MAY 24, 2018, FILE NO. 2018-05-11_733_Base_Coord.dwg
2. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28

0 25 50
1:1,250 METRES

CLIENT
CAIVAN DEVELOPMENT CORPORATION

PROJECT
SLOPE STABILITY ASSESSMENT
3490 INNES ROAD, OTTAWA, ONTARIO

TITLE
SITE PLAN

CONSULTANT
GOLDER

YYYY-MM-DD	2018-06-07
DESIGNED	----
PREPARED	JM
REVIEWED	CRG
APPROVED	WC

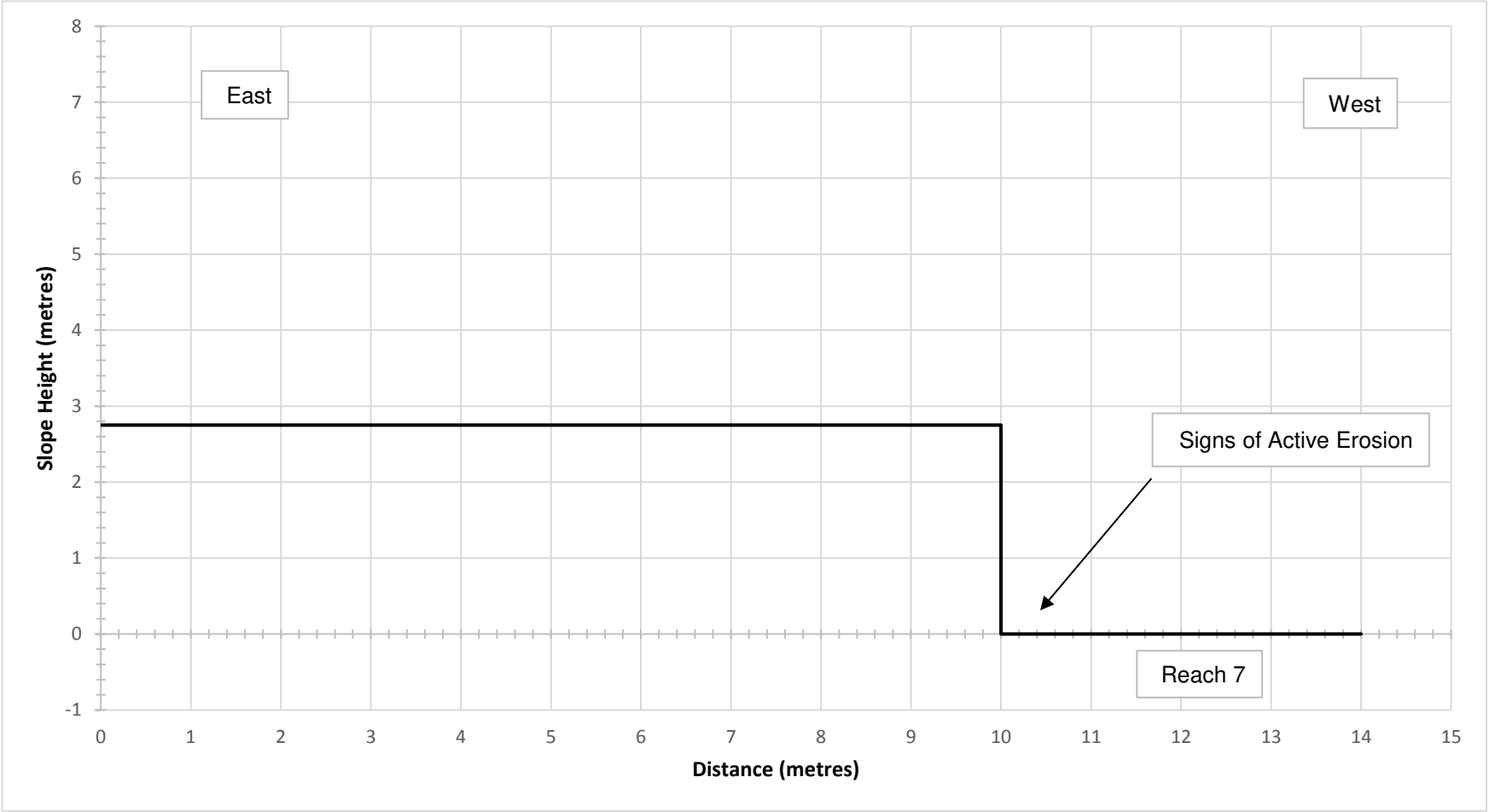
PROJECT NO.	PHASE	REV.	FIGURE
1660030	6000	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25 mm 0

Path: \\golder.gds\gal\ottawa\Active\Spatial_IM\Caivan\3490_Innes_Rd99_PROJ\1660030_Caivan_GeoEnviron40_PROD\Phase6000_Geotech\Investigation\ | File Name: 1660030-6000-BG-0001.dwg | Last Edited By: jmcconnell Date: 2018-06-07 Time:1:33:29 PM | Printed By: jmcconnell Date: 2018-06-07 Time:1:34:12 PM

A-A



GOLDER

SLOPE CROSS SECTION

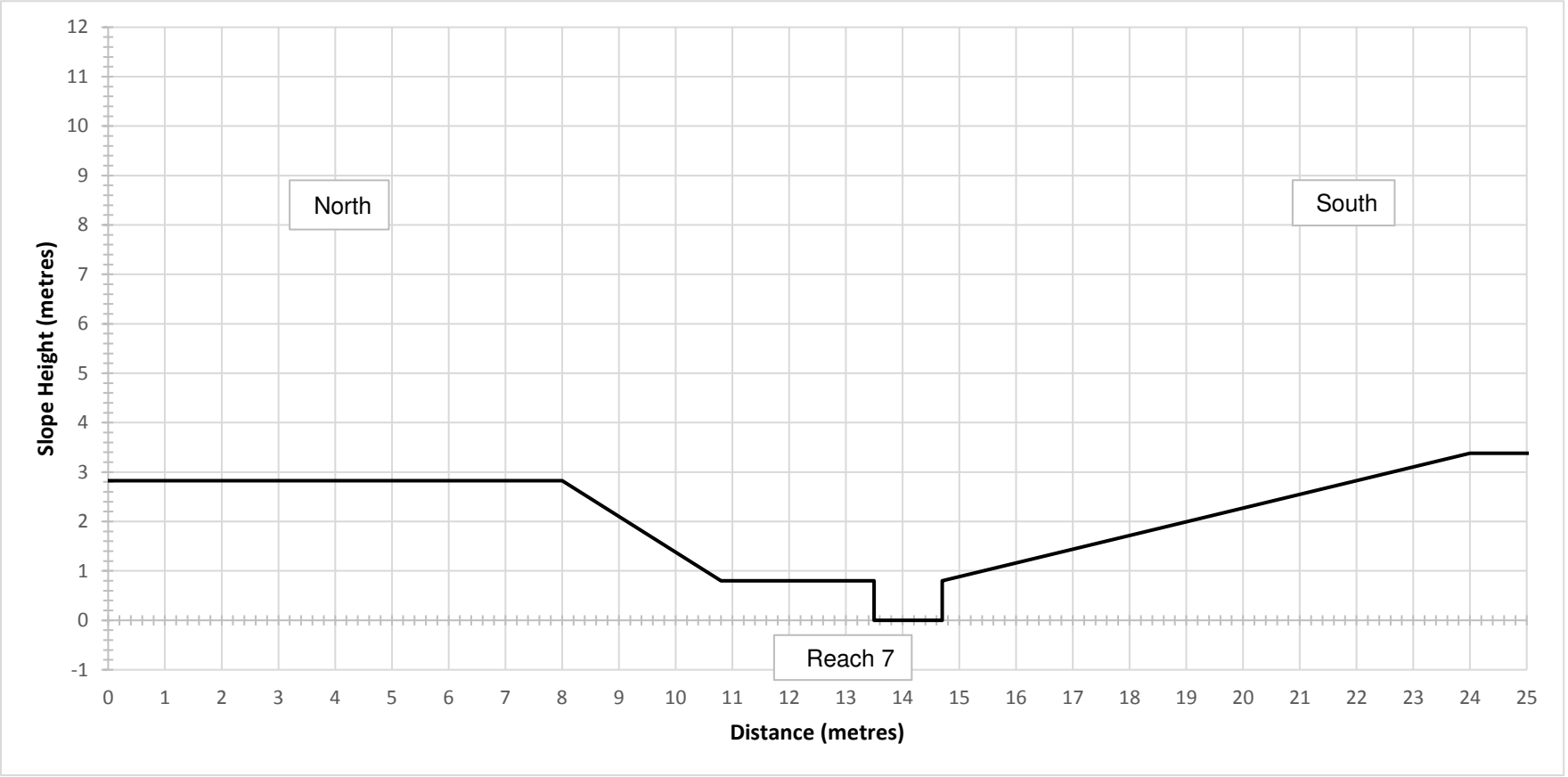
PROPOSED STORM WATER MANAGEMENT POND BLOCK

3490 INNES ROAD, OTTAWA

Project No.	1660030-6000
Drawn:	BB
Date:	24/05/2018
Checked:	CRG
Review:	KSL

FIGURE 2

B-B



GOLDER

SLOPE CROSS SECTION

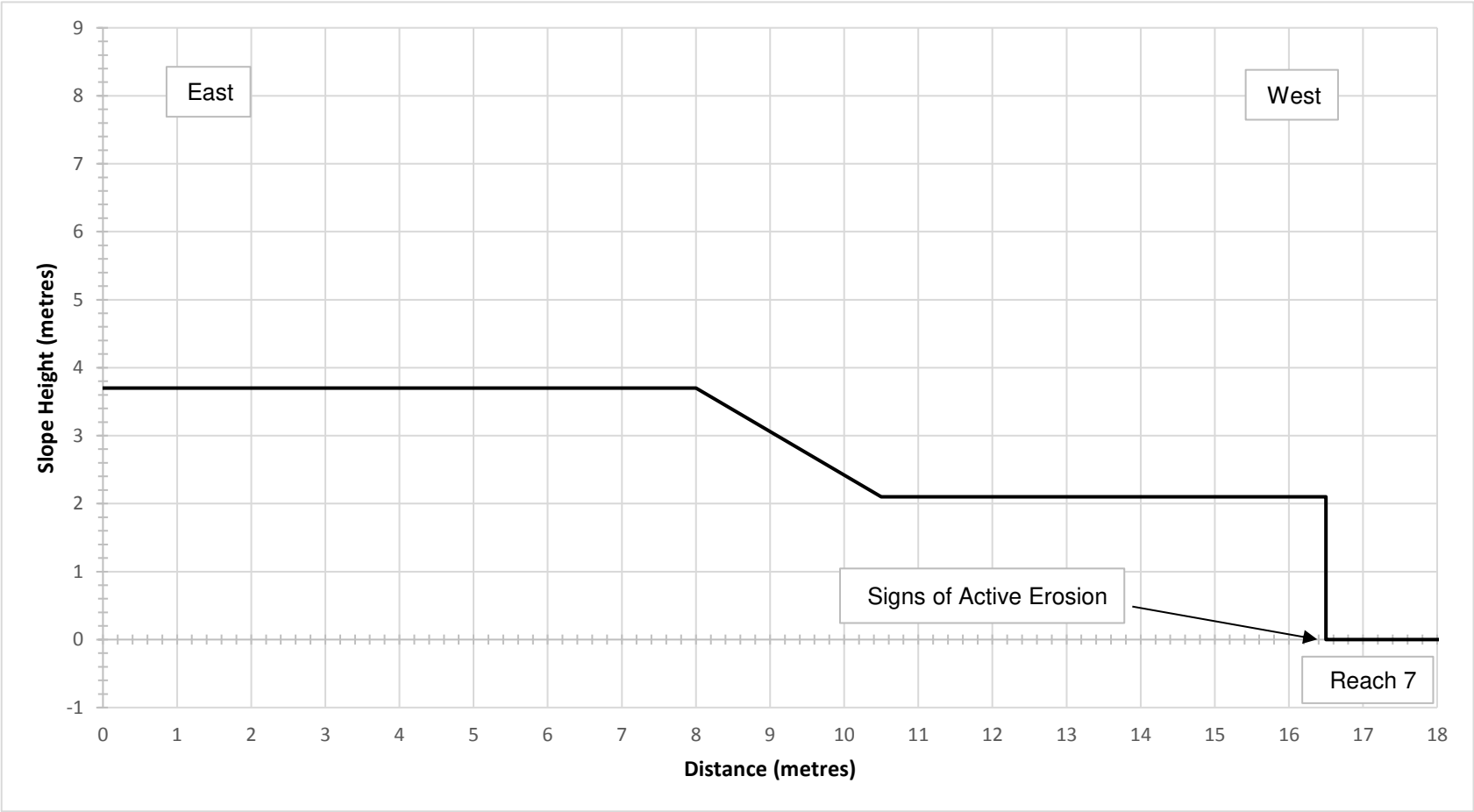
PROPOSED STORM WATER MANAGEMENT POND BLOCK

3490 INNES ROAD, OTTAWA

Project No.	1660030-6000
Drawn:	BB
Date:	24/05/2018
Checked:	CRG
Review:	KSL

FIGURE 3

C-C



GOLDER

SLOPE CROSS SECTION

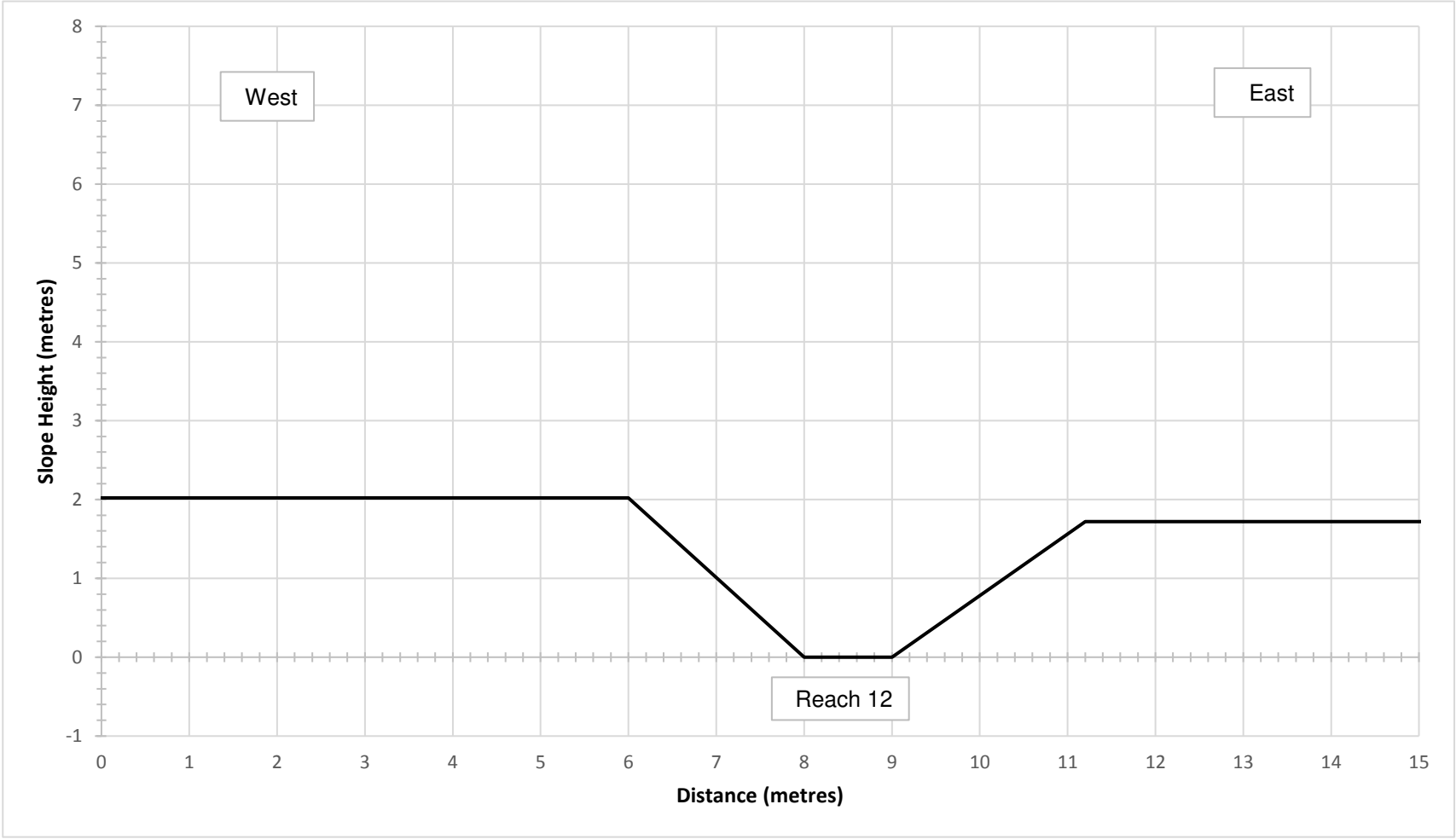
PROPOSED STORM WATER MANAGEMENT POND BLOCK

3490 INNES ROAD, OTTAWA

Project No.	1660030-6000
Drawn:	BB
Date:	24/05/2018
Checked:	CRG
Review:	KSL

FIGURE 4

D-D



GOLDER

SLOPE CROSS SECTION

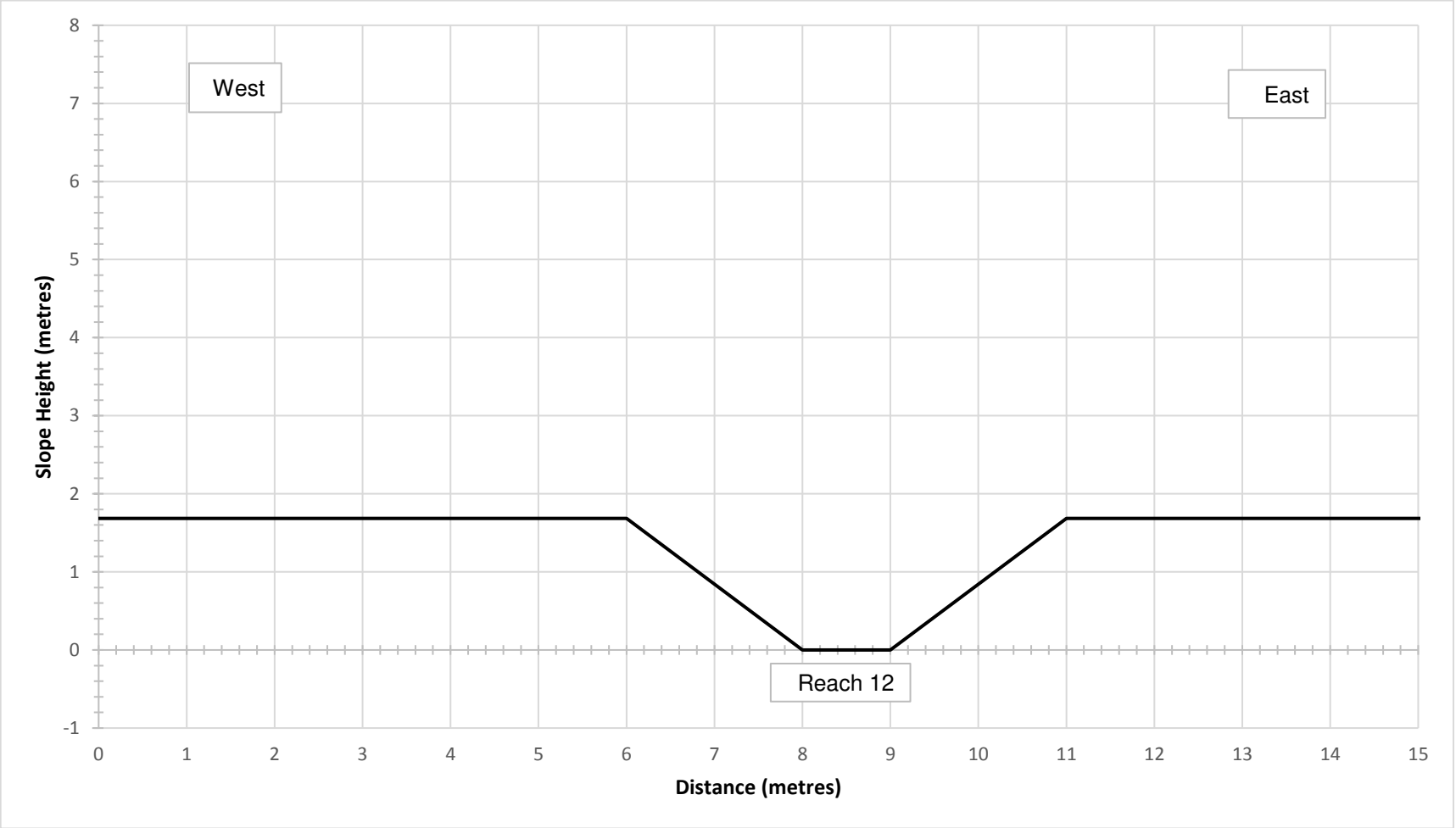
PROPOSED STORM WATER MANAGEMENT POND BLOCK

3490 INNES ROAD, OTTAWA

Project No.	1660030-6000
Drawn:	BB
Date:	24/05/2018
Checked:	CRG
Review:	KSL

FIGURE 5

E-E



GOLDER

SLOPE CROSS SECTION

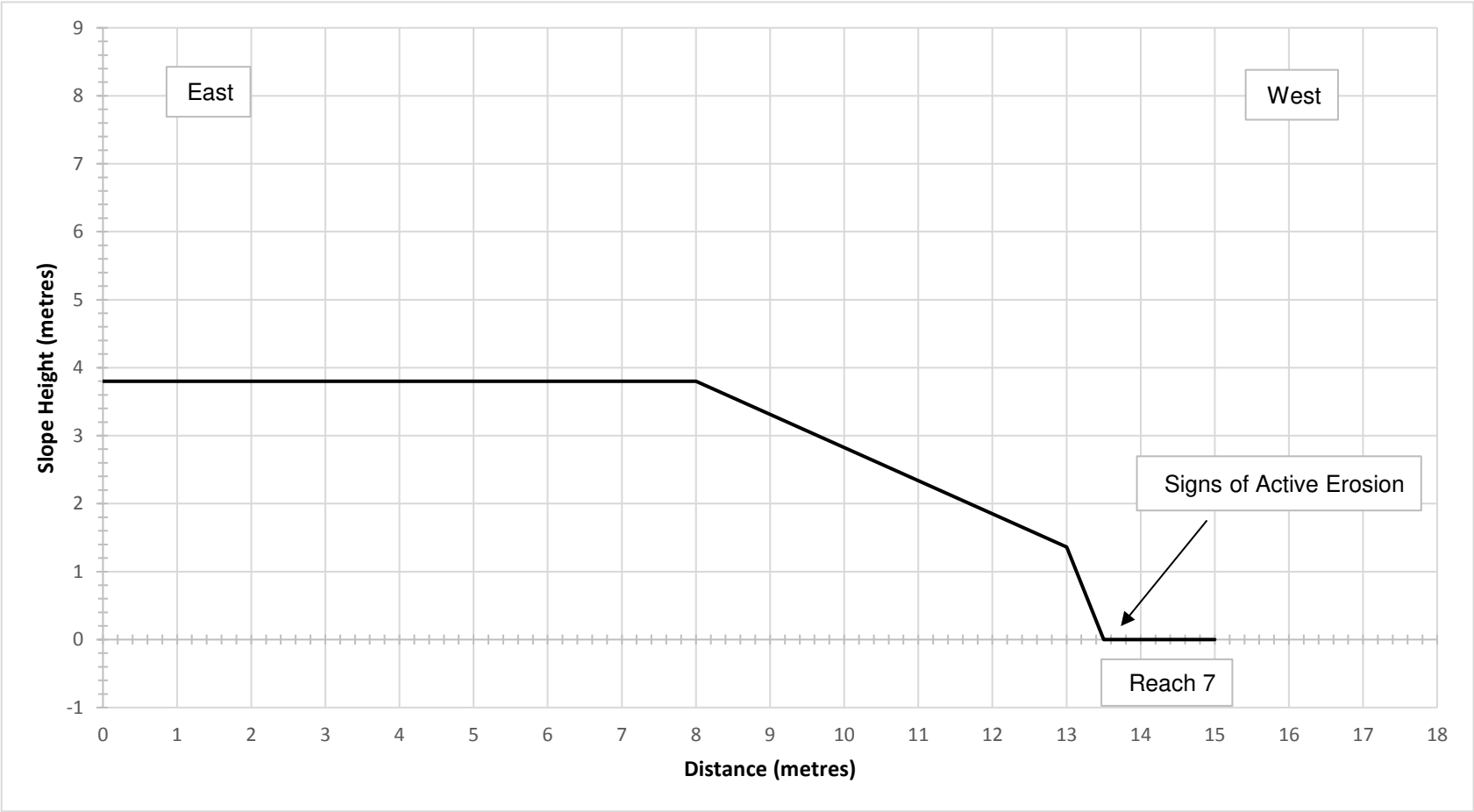
PROPOSED STORM WATER MANAGEMENT POND BLOCK

3490 INNES ROAD, OTTAWA

Project No.	1660030-6000
Drawn:	BB
Date:	24/05/2018
Checked:	CRG
Review:	KSL

FIGURE 6

F-F



GOLDER

SLOPE CROSS SECTION

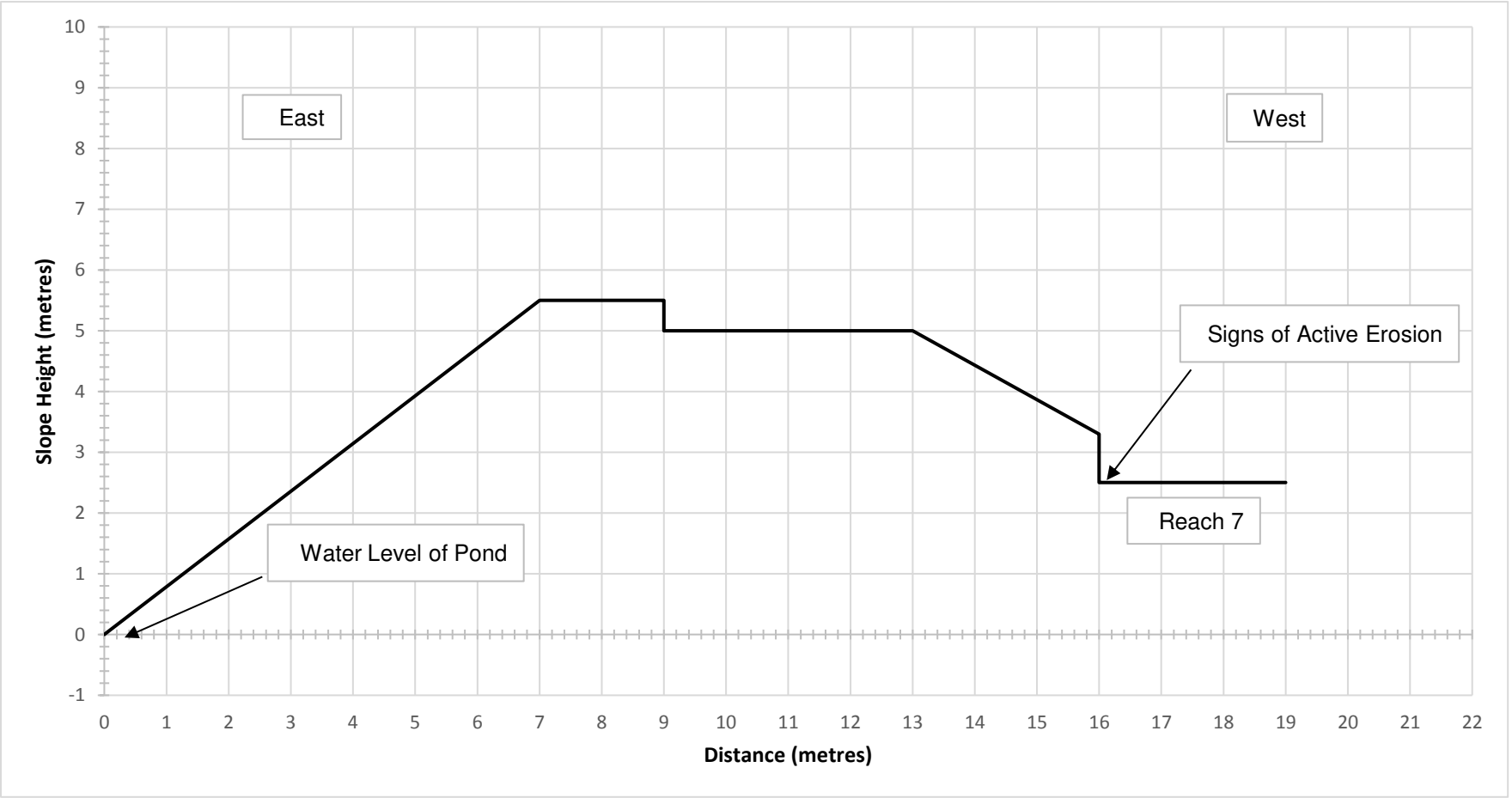
PROPOSED STORM WATER MANAGEMENT POND BLOCK

3490 INNES ROAD, OTTAWA

Project No.	1660030-6000
Drawn:	CRG
Date:	24/05/2018
Checked:	KSL
Review:	WC

FIGURE 7

G-G



GOLDER

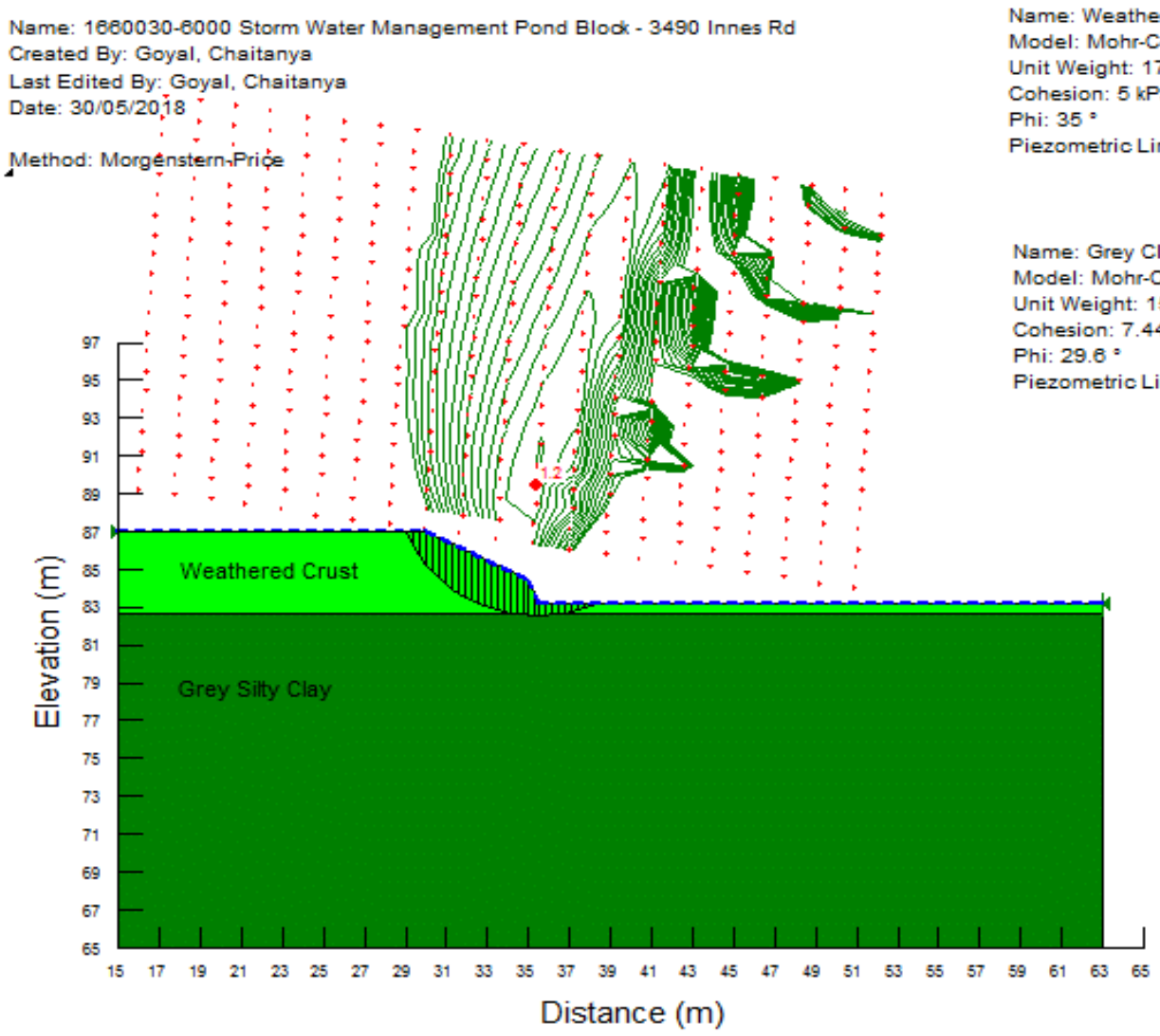
SLOPE CROSS SECTION

PROPOSED STORM WATER MANAGEMENT POND BLOCK

3490 INNES ROAD, OTTAWA

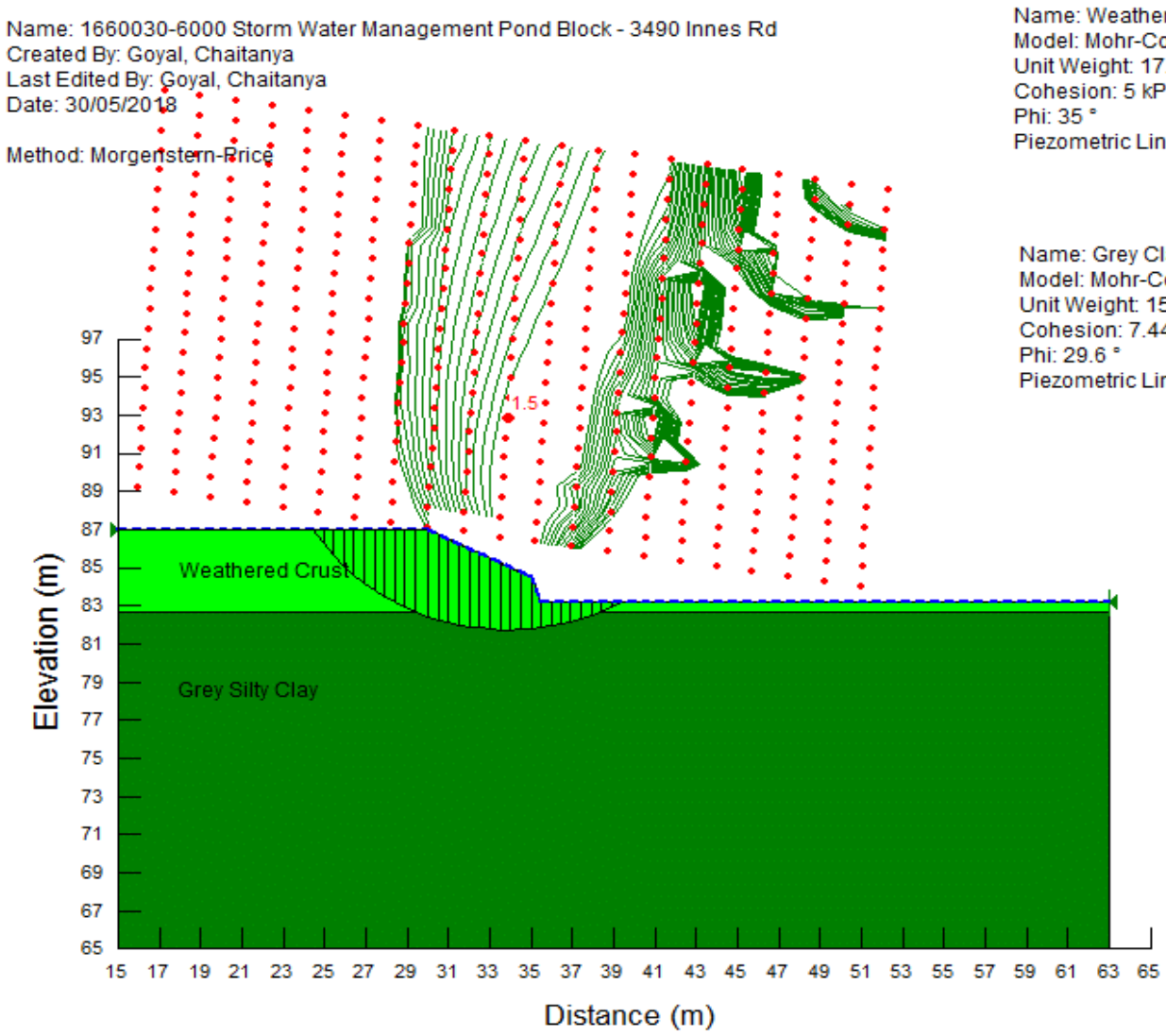
Project No.	1660030-6000
Drawn:	CRG
Date:	24/05/2018
Checked:	KSL
Review:	WC

FIGURE 8



GOLDER	**STATIC SLOPE ASSESSMENT - REACH 7 (SECTION F-F)** **PROPOSED STORM WATER MANAGEMENT POND BLOCK** **3490 INNES ROAD, OTTAWA**	Project No. 1660030-6000 Drawn: CRG Date: 30/05/2018 Checked: BB Review: KSL

FIGURE 9



GOLDER

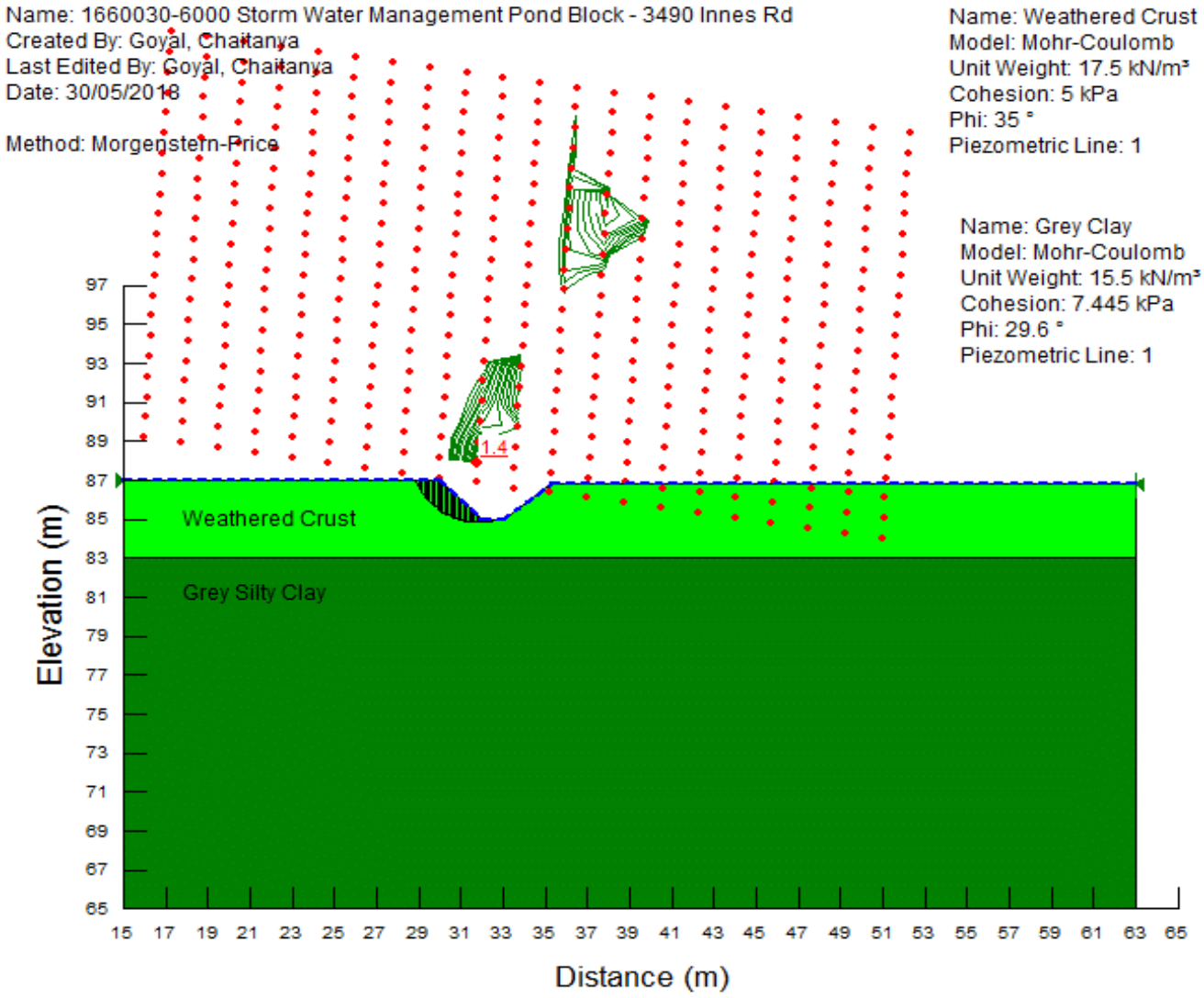
STATIC SLOPE ASSESSMENT - REACH 7 (SECTION F-F)

PROPOSED STORM WATER MANAGEMENT POND BLOCK

3490 INNES ROAD, OTTAWA

Project No.	1660030-6000
Drawn:	CRG
Date:	30/05/2018
Checked:	BB
Review:	KSL

FIGURE 10



GOLDER

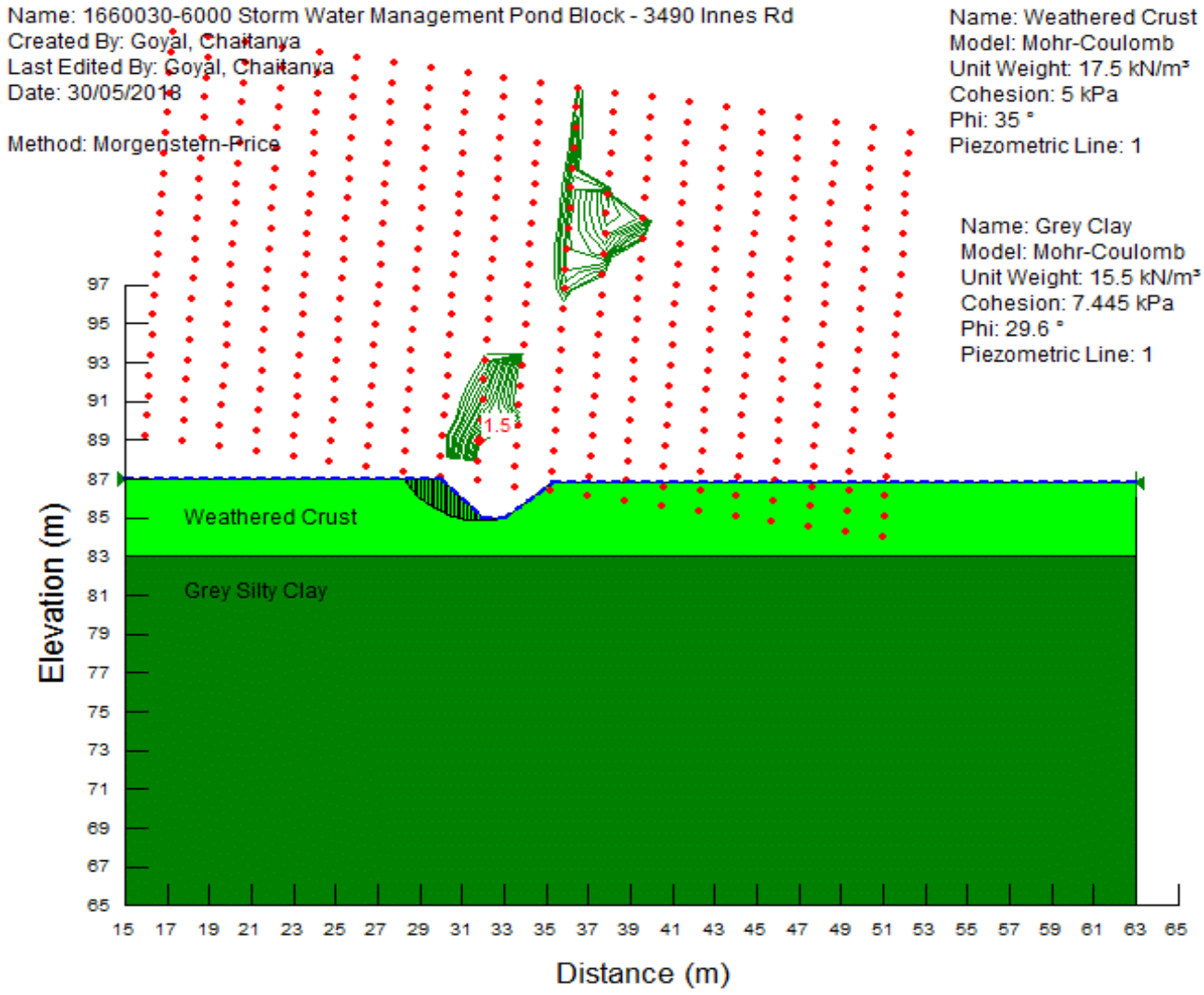
STATIC SLOPE ASSESSMENT - REACH 12 (SECTION D-D)

PROPOSED STORM WATER MANAGEMENT POND BLOCK

3490 INNES ROAD, OTTAWA

Project No.	1660030-6000
Drawn:	CRG
Date:	30/05/2018
Checked:	BB
Review:	KSL

FIGURE 11



GOLDER

STATIC SLOPE ASSESSMENT - REACH 12 (SECTION D-D)

PROPOSED STORM WATER MANAGEMENT POND BLOCK

3490 INNES ROAD, OTTAWA

Project No.	1660030-6000
Drawn:	CRG
Date:	30/05/2018
Checked:	BB
Review:	KSL

FIGURE 12

APPENDIX A

Record of Borehole 16-19 and 09-Q24 from Previous Investigations by Golder Associates

PROJECT: 1660030

RECORD OF BOREHOLE: 16-19

SHEET 1 OF 1

LOCATION: N 5033770.7 ;E 381471.9

BORING DATE: November 8, 2016

DATUM: CGVD28

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diam. (Hollow Stem)	GROUND SURFACE		86.62							
		TOPSOIL - (ML) sandy SILT; brown		0.00							
		(SM) SILTY SAND, fine; brown; non-cohesive, moist, loose		0.13	1	SS	5				
				86.16							
		(CI/CH) SILTY CLAY to CLAY, trace sand; grey brown (WEATHERED CRUST); cohesive, w>PL, very stiff to stiff		0.46							
1					2	SS	9				
					3	SS	7				
2											Cuttings
					4	SS	3				
3				83.57							
		(CI/CH) SILTY CLAY to CLAY; grey; cohesive, w>PL, firm		3.05	5	SS	WH				
4								⊕ +			
								⊕ +			
5								⊕ +			Bentonite Seal
								⊕ +			Silica Sand
					6	TP	PH				19 mm PVC Slot Screen
6											
								⊕ +			
7								⊕ +			Cuttings
								⊕ +			
								⊕ +			
8					7	SS	WR				W.L. in Screen at Elev. 83.23 m on Nov. 23, 2016
								⊕ +			
		End of Borehole		77.78 8.84				⊕ +			
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: DWM

CHECKED: WAM

MIS-BHS 001 1660030-GEOTECH.GPJ GAL-MIS.GDT 12/16/16 JEM

PROJECT: 09-1121-0049-4000

RECORD OF BOREHOLE: 09-Q24

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: Feb. 18, 2010

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		86.02									
		Black sandy silt with organic matter (TOPSOIL)		0.00 / 85.72									
		Brown fine SAND, trace silt		0.30 / 85.41	1	GRAB	-						
1		Stiff grey brown SILTY CLAY (Weathered Crust)		0.61									
					2	50 DO	5						
2													
					3	50 DO	WH						
3				82.97									
		Firm grey SILTY CLAY		3.05	4	50 DO	PM						
4	Power Auger 200 mm Diam. (Hollow Stem)							⊕	+				
								⊕	+				
					5	50 DO	PM						
5								⊕	+				
6								⊕	+				
7													▽
					6	50 DO	PM						
8								⊕	+				
		End of Borehole		77.18 / 8.84				⊕	+				W.L. in open hole at 7.01m depth below ground surface upon completion of drilling
9													
10													
11													
12													
13													
14													
15													

DEPTH SCALE
1 : 75

Golder Associates

LOGGED: D.G.

CHECKED: K.S.L.

MIS-BHS 001 0911210049-3000.GPJ GAL-MIS.GDT 01/11/13 JM

golder.com