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Geotechnical Engineering
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Noise and Vibration Studies

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October 9, 2024
PG6557-LET.01 Revision 1

Myers Automotive Group
1200 Baseline Road
Ottawa, Ontario
K2C 0A6

Attention: **David Johnston**

Subject: **Preliminary Geotechnical Investigation**
Proposed Commercial Development
2175 Prince of Wales Drive – Ottawa, Ontario

Dear David Johnston,

Further to your request, Paterson Group (Paterson) completed a preliminary geotechnical investigation at the aforementioned site. The current letter report presents the results of the geotechnical investigation and provides preliminary foundation design information and construction recommendations from a geotechnical perspective.

Paterson understands that the proposed development will consist of two commercial low-rise buildings of slab-on-grade constructions. It is also understood that associated asphaltic parking areas, access lanes and hardscaped areas are also anticipated as part of the proposed development. It is expected that the proposed buildings will be municipally serviced.

1.0 Field Observations

Field Investigation

The field program for the investigation was conducted on May 11, 2017. At that time, a total of ten (10) test pits were excavated to a maximum depth 3.0 m below the existing ground surface. Previous investigations were completed by Paterson between November 2002 and May 2003 and consisted of advancing five (5) boreholes and four (4) hand augered test pits to maximum depths of 16.7 and 7.9 m below ground surface, respectively.

A previous historical geotechnical investigation for the subject site was also completed on December 30, 1983, and consisted of advancing three (3) boreholes to a maximum depth of 12.2 m below ground surface. The test hole locations were distributed in a manner to provide general coverage of the subject site and taking into consideration underground utilities and site features. The approximate locations of all test holes are shown on Drawing PG6557-1 - Test Hole Location Plan attached to the present letter report.

The test pit procedure consisted of excavating using a rubber-tired backhoe at the selected locations and sampling the overburden. The boreholes of the previous investigation were drilled using a portable drill rig operated by a two-person crew. The drilling procedure consisted of augering to the required depths at the selected depths and sampling the overburden. All fieldwork was reviewed in the field by Paterson personnel under the direction of a senior engineer from the geotechnical division.

Surface Conditions

The subject site is undeveloped and generally covered with grass. The subject site is bordered by a treed ravine around a tributary to the Rideau River to the north, the Rideau River to the east, Waterbend Lane followed by residential dwellings to the south and Prince of Wales Drive to the west. The ground surface slopes gradually downward to the east towards Rideau River. Paterson has conducted several rounds of field reconnaissance along the Rideau River as part of the slope stability assessment portion of this report and is detailed further in that section.

Subsurface Soil Profile

The subsurface profile encountered at the test hole locations consisted of a thin layer of topsoil underlain by interbedded layers of silty sand, sandy silt and silty clay. A predominancy of sand was observed to occur along the watercourse while an increase in clay content was encountered towards the central portion of the subject site and at a greater distance from the river and its tributary.

The interbedded layers of silty sand to silty clay were observed to consist of compact silty sand or very stiff to stiff silty clay with varying amounts of clay, silty and/or sand, respectively. Trace amounts of gravel, cobbles or boulders were also observed occasionally throughout the subject site. The interbedded layers were observed to be brown and weathered up to depths ranging between 2.7 and 8.8 m below ground elevation. Details of the soil profile at each test hole location are presented on the Soil Profile and Test Data sheets appended to this letter report.

Bedrock

Based on available geological mapping, the bedrock surface in this area is encountered at depths varying between 15 to 25 m and consists of dolomite of the Oxford formation.

Groundwater

Groundwater infiltration levels were observed within the open test pit locations. The groundwater infiltration levels are presented in the Soil Profile and Test Data sheets attached. Long-term groundwater levels can also be estimated based on the observed colour, moisture content and consistency of the recovered soil samples. Based on our observations, the long-term groundwater level is located approximately **4 to 6 m** below existing ground surface. It should be noted that groundwater levels are subject to fluctuations, therefore, the groundwater levels could vary at the time of construction.

2.0 Geotechnical Discussion and Construction Precautions

Geotechnical Assessment

From a geotechnical perspective, the subject site is considered suitable for the proposed development. It is expected that the proposed commercial buildings will consist of slab-on-grade construction and be supported by conventional spread footing foundations placed on an undisturbed compact silty sand or stiff silty clay bearing surface.

Due to the presence of the silty clay deposit, a permissible grade raise restriction is required for the subject site.

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

Site Grading and Preparation

Topsoil and any deleterious fill, containing organics and/or construction debris, should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures. Care should be taken not to disturb adequate bearing surfaces during site preparation activities.

Fill Placement

Engineered fill used for grading beneath the proposed building, where required, should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. This material should be tested and approved prior to delivery to the site.

The fill should be placed in a maximum 300 mm thick loose lifts and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the building should be compacted to at least 98% of the material's Standard Proctor Maximum Dry Density (SPMDD).

Site-excavated soil can be used as general landscaping fill where settlement of the ground surface is of minor concern. The soil should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids and approved by Paterson personnel. If the soil is to be used to build up the subgrade level for areas to be paved, it should be compacted in thin lifts to a minimum 95% of its SPMDD. The material should be placed under dry conditions and above freezing temperatures.

Non-specified existing fill and site-excavated soils are not suitable for use as backfill against foundation walls unless used in conjunction with a composite drainage membrane.

Foundation Design

Strip footings, up to 3 m wide, and pad footings, up to 6 m wide, founded on an undisturbed stiff silty clay bearing surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **225 kPa** incorporating a geotechnical resistance factor of 0.5 at ULS.

Footings placed on an undisturbed, compact silty sand bearing surface can be designed using a bearing resistance value at SLS of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **225 kPa**.

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 value at SLS will be subjected to potential post-construction total and differential settlements of 25 and 20 mm, respectively.

Permissible Grade Raise Restrictions

Due to the presence of the underlying silty clay layer, a permissible grade raise restriction of **2.0 m** is recommended in the immediate area of settlement sensitive structures. A post-development groundwater lowering of 0.5 m was considered in our permissible grade raise restriction calculations. If higher than permissible grade raises are required, preloading with or without a surcharge, lightweight fill and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction total and differential settlements.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels.

Above the groundwater level, adequate lateral support is provided to a stiff silty clay or compact silty sand bearing medium when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in situ soil of the same or higher capacity as the bearing medium soil.

Design For Earthquakes

The site class for seismic site response can be taken as **Class D** for the foundations considered at this site as per Table 4.1.8.4.A of the Ontario Building Code (OBC) 2012. The soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the Ontario Building Code for a full discussion of the earthquake design requirements.

Slab-On-Grade Construction

With the removal of all topsoil and deleterious materials within the footprint of the proposed buildings, the native soil surface, approved by Paterson personnel at the time of construction, will be considered an acceptable subgrade on which to commence backfilling for floor slab construction.

The upper 200 mm of sub-slab fill is recommended to consist of OPSS Granular A crushed stone. All backfill material within the footprints of the proposed buildings should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 98% of its SPMDD.

Any soft areas should be removed and backfilled with OPSS Granular B Type II, with a maximum particle size of 50 mm and compacted to 98% of the material’s SPMDD.

Pavement Structure

If required, the pavement structure for car only parking, access lanes and heavy truck parking is presented in Table 1 and Table 2 below.

Table 1 - Recommended Pavement Structure - Driveways and Car Only Parking

Thickness (mm)	Material Description
50	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either approved fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill.	

Table 2 - Recommended Pavement Structure - Access Lane and Heavy Truck Parking Areas

Thickness (mm)	Material Description
40	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - HL-8 or Superpave 19 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
400	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either approved fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill.	

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

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type I or II material. The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's SPMDD using suitable vibratory equipment.

Pavement Structure Drainage

Satisfactory performance of the pavement structure is largely dependent on keeping the contact zone between the subgrade material and the base stone in a dry condition. Failure to provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing its load carrying capacity. Where silty clay is anticipated at subgrade level, consideration should be given to installing subdrains during the pavement construction. These drains should extend in four orthogonal directions or longitudinally when placed along a curb. The clear crushed stone surrounding the drainage lines or the pipe, should be wrapped with suitable filter cloth. The subdrain inverts should be approximately 300 mm below subgrade level. The subgrade surface should be shaped to promote water flow to the drainage lines. Discharge of the subdrains should be directed by gravity to storm sewers or deeper drainage ditches.

Foundation Drainage

Since the buildings will consist of a slab-on-grade construction, a perimeter foundation drainage system is considered optional throughout the landscaped portions of the proposed building footprints. In areas where hardscaping or pavement structures will abut the building footprints, it is recommended to implement a foundation drainage system. The system should consist of a minimum 100 to 150 mm diameter perforated corrugated plastic pipe wrapped in a geosock and surrounded on all sides by 150 mm of minimum 10 mm clear crushed stone. The clear stone should be wrapped in a non-woven geotextile. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

The pipe should be placed at the footing level around the exterior perimeter of the structure if the backfill between the founding depth and will consist of crushed stone fill or site-generated soil backfill in conjunction with a composite foundation drainage board, such as CCW MiraDRAIN 2000 or Delta-Teraxx. Alternatively, the perimeter drainage pipe may be placed up to 1 m below proposed finished grade and against the building footprint upon approved soil backfill to ensure adequate drainage of the granular fill layer is provided from precipitation events and/or spring meltwater. In this configuration, provided the backfill overlying the pipe consists of crushed stone fill associated with the pavement structure, a composite foundation drainage board will not be required in these areas.

Foundation Backfill

Backfill against the exterior sides of the foundation walls should consist of free-draining, non-frost susceptible imported crushed stone or clean sand fill. Alternatively, consideration may be given to placing site-generated soil fill as backfill against the foundation walls provided the material is compacted in 300 mm thick loose lifts and provided the foundation wall is covered with a composite foundation drainage board layer and associated perimeter drainage pipe with a gravity outlet. If the building's perimeter drainage pipe is located at footing level, a composite foundation drainage board should be placed against the foundation walls to ensure satisfactory drainage of the backfill layer to the perimeter drainage pipe.

All fill placed as foundation backfill should be placed in maximum 300 mm thick loose lifts, compacted using suitable compaction equipment (suitably sized smooth-drum roller for crushed stone fill, sheepsfoot roller for soil fill) and tested for compaction efforts at the time of construction by Paterson personnel.

Protection of Footings Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effect of frost action. A minimum of 1.5 m thick soil cover should be provided for adequate frost protection of heated structures, or an equivalent combination of soil cover and foundation insulation.

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

Excavation Side Slopes

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

Unsupported Excavations

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

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides. Slopes in excess of 3 m in height should be periodically inspected by Paterson field personnel in order to detect if the slopes are exhibiting signs of distress.

Excavation side slopes around the building excavation should be protected from erosion by surface water and rainfall events by the use of secured tarpaulins spanning the length of the side slopes, or other means of erosion protection along their footprint. Efforts should also be made to maintain dry surfaces at the bottom of the excavation footprints and along the bottom of side slopes. Additional measures may be recommended at the time of construction by the geotechnical consultant.

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

Winter Construction

If winter construction is considered for this project, precautions should be provided for frost protection. The subsurface soil conditions mainly consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

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

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

Corrosion Potential and Sulphate

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

3.0 Geotechnical Slope Stability Analysis

Paterson Group (Paterson) completed a field review of the existing slope conditions on October 8, 2024 to supplement previous reviews undertaken in 2017 and in 2010 and as previously discussed in our report PG1887-LET.01 Revision 3 dated February 28, 2017.

The supplemental slope stability analysis was completed to review the existing slopes bordering the north and east boundaries of the aforementioned site to determine if there were any significant changes to the existing slopes that would subsequently result in a change in the limit of hazard lands based on our on-site observations. As noted in our referenced report, PG1887-LET.01, Revision 3, dated February 28, 2017, the limit of hazard lands for the subject site extends along the west side of the Rideau River and along the south side of the ravine containing a tributary watercourse to the Rideau River.

The subject site remains undeveloped and has an approximate area of 3.23 hectares. The majority of the subject site is grass covered and slopes gradually downward to the east towards the Rideau River. The subject site is bordered by a ravine to the north, the Rideau River to the east, Waterbend Lane followed by single family residential dwellings to the south and Prince of Wales Drive to the west. A sparse topographic survey was completed by Paterson to provide spot grade elevations across the subject site and three (3) slope cross section were completed as part of our slope stability analysis. One slope cross section was completed for the area that has undergone a remedial slope repair after toe erosional activities subsequently resulted in a slip failure.

Existing Slope Conditions and Subsoil Information

The south valley corridor wall of the drainage ravine along the north property boundary was noted to be vegetated with small brush and signs of active erosion occurring at several isolated locations within the watercourse/creek channel. A 2 to 3 m wide watercourse with water depths varying between 0.2 to 0.3 m in depth was noted to meander through the bottom of the valley corridor.

Along the east property boundary, the west valley corridor wall of the Rideau River is undergoing some active erosion with some subsequent undercutting of the toe of the slope. It is expected that historical erosional activities have resulted in a relatively steep slope along the subject section of the Rideau River. At the present time, the majority of banks are vegetated with brush and mature trees. It should be noted that a slope remedial program was initiated near the southeast corner of the subject site during the Summer 2003 and consisted of modifying the existing slope and reinstating with blast rock. Reference should be made to Section C present in Figure 5 and Figure 6 which is located on our attached drawing, PG6557-1 – Test Hole Location Plan.

The subsurface soil profile used for the slope stability analysis was based on the existing test hole information and available geological mapping in the immediate area of the subject site. Generally, the soil profile at the test hole locations placed within the subject site, consists of a thin layer of topsoil overlying a sandy silt to silty sand layer followed by a 1 to 3 m thick, very stiff brown silty clay deposit. The silty clay layer was found to be underlain by a sandy silty to silty sand deposit extending beyond a depth of 12 m below existing ground surface. Based on nearby borehole locations, glacial till was encountered at 18 to 20 m followed by bedrock at 25 to 30 m below ground surface.

Based on available geological mapping, the bedrock surface in this area is encountered at depths varying between 15 to 25 m and consists of dolostone of the Oxford Formation.

Slope Stability Analysis

The slope stability analysis was completed using the topographic survey, as well as a subsequent slope condition review by Paterson field personnel on October 8, 2024. Two (2) cross-sections (Section A and Section B) were studied as worst-case-scenarios. Due to the proximity of the former slope failure located near the southeast corner of the site, a third cross-section (Section C) was analyzed as part of the slope stability analysis. The cross-section locations are presented on Drawing, PG6557-1 – Test Hole Location Plan attached to the present report.

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

Subsoil conditions at the cross-sections were inferred based on the findings of nearby test holes and general knowledge of the area's geology.

The results of the existing slope conditions under static loading at Section A, Section B, and Section C are shown in Figure 1, Figure 3 and Figure 5, respectively, attached to the present report. The overall slope stability factors of safety for the subject sections were found to be less than 1.5, except for Section C. The stable slope allowance from top of slope required for slope with minimum factor of safety of 1.5 is identified for each profile in the attached figures.

Seismic Loading

An analysis considering seismic loading was also completed as part of the slope stability analysis. A horizontal seismic loading acceleration, K_h, of 0.16g was considered for the analyzed sections. A factor of safety of 1.1 is considered to be satisfactory for stability analysis including seismic loading.

The results of the analysis including seismic loading are shown in Figure 2, Figure 4 and Figure 6 for the slope sections. Where the minimum factor of safety is less than 1.1, the stable sloe allowance from top of slope required for the slope section is identified in the attached figured.

Limit of Hazard Lands

The limit of hazard lands including stable slope allowance taken from the top of slope. The limit of hazard lands also includes toe erosion and a 6 m erosion access allowance for the subject site. The associated Limit of Hazard Lands and location of our cross-sections studied as part of our slope stability analysis are depicted on Drawing PG6557-1 – Test Hole Location Plan attached to the present report.

The toe erosion allowance for the slopes were based on the nature of the soils and observed current erosional activities and the width and location of the current watercourses. Signs of active erosion were noted in areas where the existing watercourse has meandered in close proximity to the toe of the corridor wall of the tributary watercourse located to the north of the subject site. It is considered that a toe erosion allowance of 5 m is appropriate for the tributary watercourse to the Rideau River.

Some erosional activities were noted along the toe of the subject valley corridor wall of the Rideau River. As a result, it is considered that a toe erosion allowance of 8 m is appropriate for the subject slope along the Rideau River.

In summary, the Limit of Hazard Lands is formed of a combination of setbacks considering the stable slope allowance (varies between 9.5 and 11.6 m), toe erosion allowance (considered as 6 to 8 m) and an erosion access allowance (considered as 6 m). The Limit of Hazard Lands is based on the results of our analysis which were undertaken in accordance with the City of Ottawa's *Slope Stability Guidelines for Development Application in the City of Ottawa*.

The existing vegetation on the slope face should not be removed as it contributes to the overall stability of the slope and reduces erosion. If the existing vegetation needs to be removed, it is recommended that 100 to 150 mm of topsoil mixed with a hardy grass seed and an erosion control blanket be placed across the exposed slope face.

3.0 Recommendations

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

☐ A full geotechnical investigation should be completed once conceptual details of the proposed development are available.

☐ Review of the grading and servicing plans from a geotechnical perspective.

☐ Sampling and testing of the concrete and fill materials used.

☐ Observation of all bearing surfaces prior to the placement of concrete.

☐ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.

☐ Observation of the placement of the foundation insulation, if applicable.

☐ Observation of all subgrades prior to backfilling.

☐ Field density tests to determine the level of compaction achieved.

☐ Sampling and testing of bituminous concrete including mix design reviews.

A report confirming that the construction has been conducted in general accordance with Paterson's recommendations could be issued upon the completion of a satisfactory inspection program by the Paterson consultant.

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

4.0 Statement of Limitations

The recommendations provided in the report are in accordance with Paterson's present understanding of the project. Paterson requests permission to review the recommendations when the drawings and specifications are completed.

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

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from the test locations, Paterson requests immediate notification 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 Myers Automotive Group or their agents, is not authorized without review by Paterson Group Inc. for the applicability of our recommendations to the altered use of the report.

We trust that the current submission meets your immediate requirements.

Best Regards,

Paterson Group Inc.

Drew Petahtegoose, P.Eng.

LICENSED PROFESSIONAL ENGINEER
October 9, 2024
D. J. PETAHTEGOOSE
100568013
PROVINCE OF ONTARIO

David J. Gilbert, P.Eng.

Attachments

- ☐ Soil Profile and Test Data Sheets
- ☐ Symbols and Terms
- ☐ Figures 1 to Figure 6 – Slope Stability Analysis
- ☐ Drawing PG6557-1 - Test Hole Location Plan

Report Distribution

- ☐ Myers Automotive Group (e-mail copy)
- ☐ Paterson Group (1 copy)

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

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
2175 Prince of Wales Drive
Ottawa, Ontario

DATUM

REMARKS Co-ordinates: 45.331482N, 75.700920W

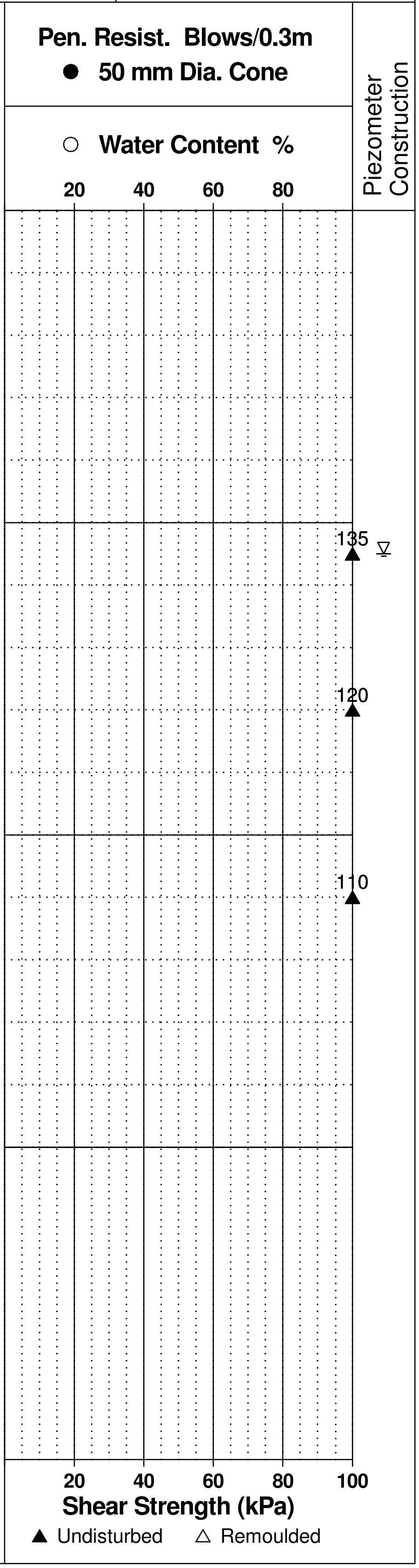
BORINGS BY Rubber Tired Backhoe

DATE May 11, 2017

FILE NO. PG4120

HOLE NO. TP 1-17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
Dark brown **TOPSOIL** with rootlets 0.24		G	1				
Compact, brown **SILTY SAND**, trace clay 0.70		G	2				
Very stiff, brown **SILTY CLAY**, trace sand - boulder noted at 1.0m depth 2.70		G	3			1 2	
Stiff, grey **SILTY CLAY** with sand seams 3.00		G	4			3	
End of Test Pit (Open hole GWL @ 1.1m depth) -rootlets extend to 0.5 m							



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
2175 Prince of Wales Drive
Ottawa, Ontario

DATUM

REMARKS Co-ordinates: 45.331791N, 75.700262W

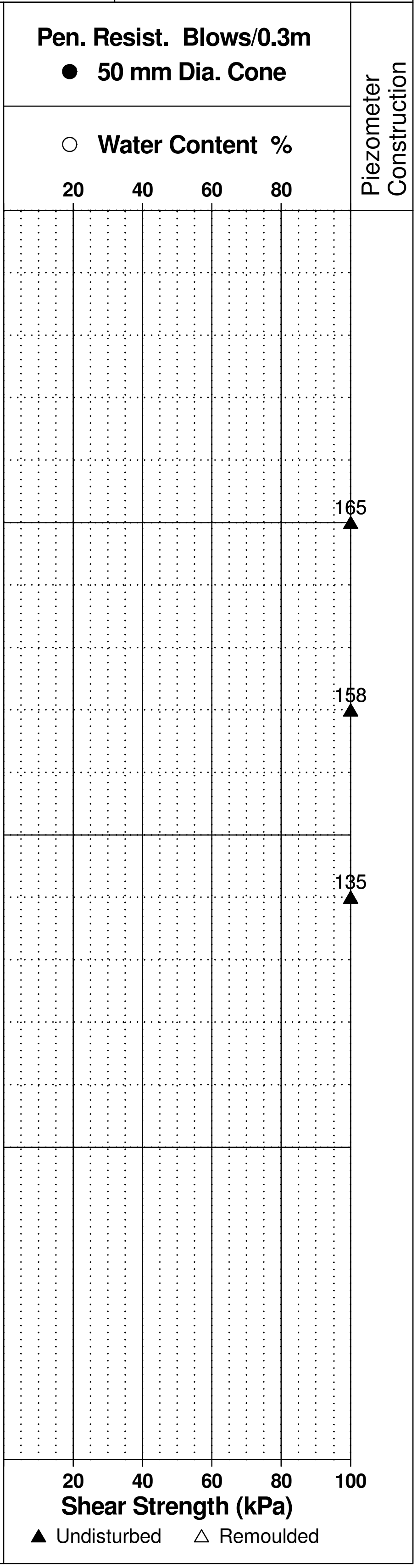
BORINGS BY Rubber Tired Backhoe

DATE May 11, 2017

FILE NO. PG4120

HOLE NO. TP 2-17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD		
GROUND SURFACE						0	
Brown **TOPSOIL**, trace roots	■	G	1				
0.27							
Very stiff, brown **SANDY CLAY** with silt, trace cobbles	▨	G	2				
0.70							
Very stiff to stiff, brown **SILTY CLAY**, trace sand	▨					1	
						2	
		G	3				
3.00		G	4			3	
End of Test Pit							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
2175 Prince of Wales Drive
Ottawa, Ontario

DATUM

REMARKS Co-ordinates: 45.332297N, 75.699537W

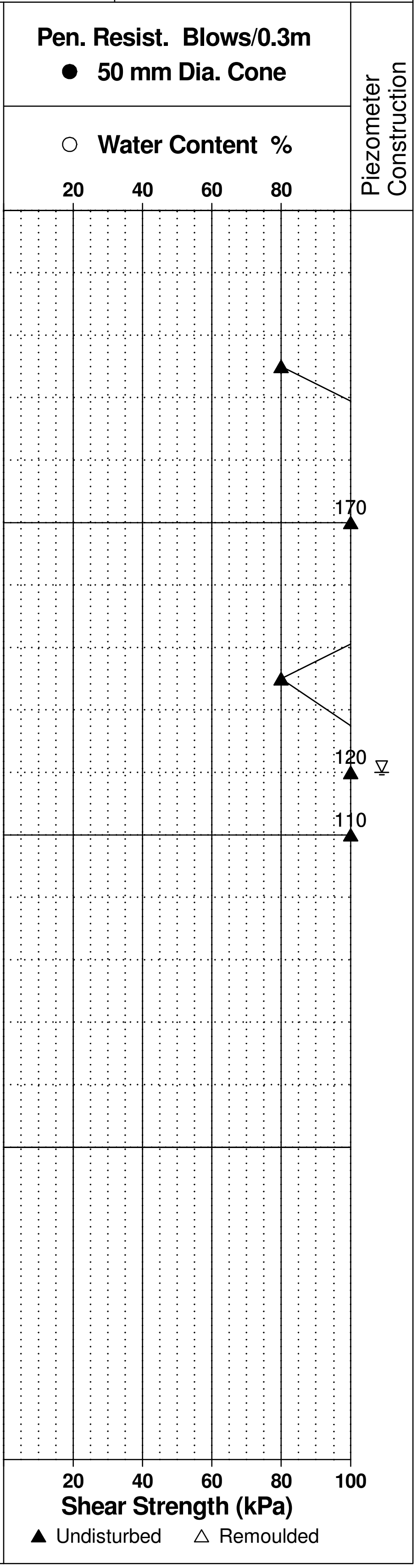
BORINGS BY Rubber Tired Backhoe

DATE May 11, 2017

FILE NO. PG4120

HOLE NO. TP 3-17

SOIL DESCRIPTION GROUND SURFACE	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Brown **TOPSOIL** with organics 0.27	■	G	1			0	
Stiff, brown **SILTY CLAY** 0.90	▨	G	2				
Very stiff to stiff, brown **SILTY CLAY** with silty sand seams 3.00	▨	G G	3 4			1 2 3	
End of Test Pit (Open hole GWL @ 1.8m depth)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
2175 Prince of Wales Drive
Ottawa, Ontario

DATUM

REMARKS Co-ordinates: 45.332538N, 75.698942W

BORINGS BY Rubber Tired Backhoe

DATE May 11, 2017

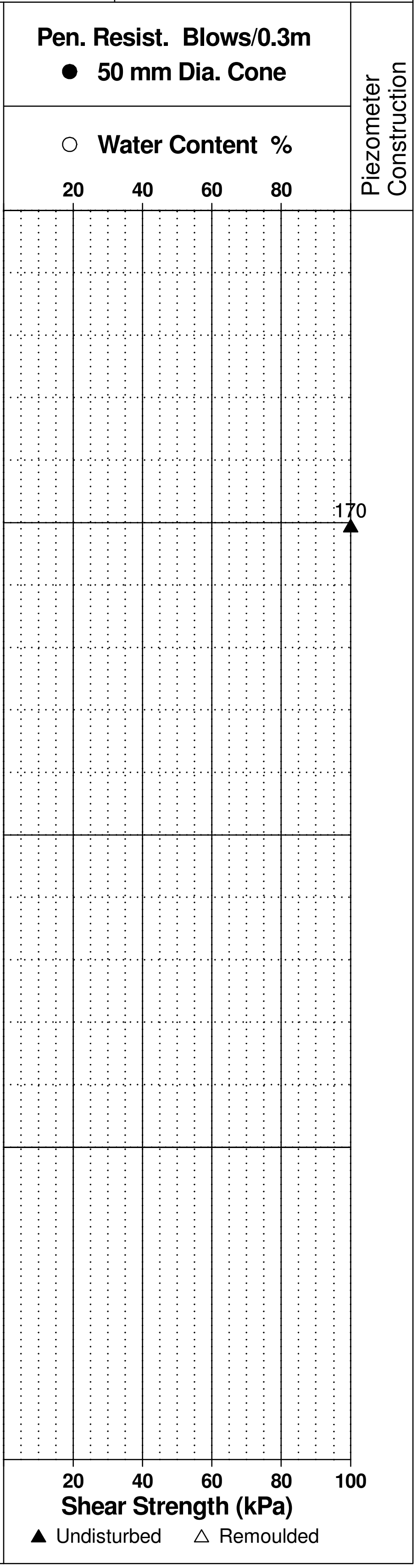
FILE NO. PG4120

HOLE NO. TP 4-17

SOIL DESCRIPTION	Depth to base (m)	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE					
Brown **TOPSOIL** with rootlets	0.20	G	1		
Dense, brown **SILTY SAND**, some clay	0.50	G	2		
Very stiff, brown **SILTY CLAY** with sand seams	1.40	G	3		
Compact, brown **SILTY SAND**	3.00	G G	4 5		
End of Test Pit (TP dry upon completion)					

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

ELEV. (m)



SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
2175 Prince of Wales Drive
Ottawa, Ontario

DATUM

REMARKS Co-ordinates: 45.332822N, 75.699174W

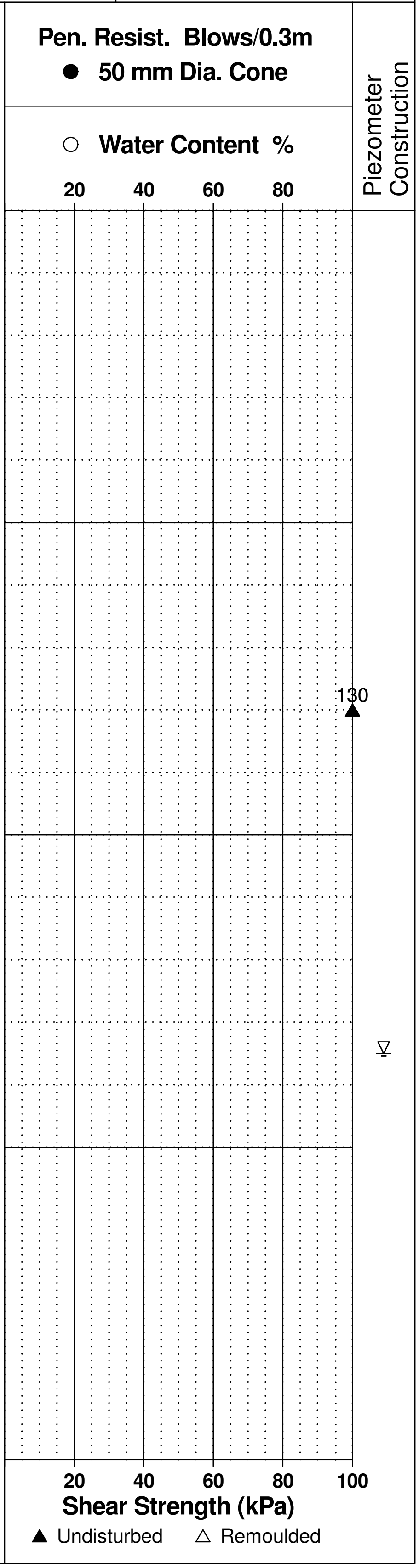
BORINGS BY Rubber Tired Backhoe

DATE May 11, 2017

FILE NO. PG4120

HOLE NO. TP 5-17

SOIL DESCRIPTION	Layer bottom (m)	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	
Brown **TOPSOIL** with rootlets	0.25		G	1				
Compact to dense, brown **SILTY SAND**, some clay, trace cobbles	0.90		G	2				
Compact, brown **SILTY SAND**, trace gravel and boulders	1.40		G	3			1	
Very stiff, brown **SILTY CLAY** with sand, trace cobbles	2.20		G	4			2	
Compact, brown **SILTY SAND**, some clay	3.00		G	5			3	
End of Test Pit (Open hole GWL @ 2.7m depth)								



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SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
2175 Prince of Wales Drive
Ottawa, Ontario

DATUM

REMARKS Co-ordinates: 45.332822N, 75.699635W

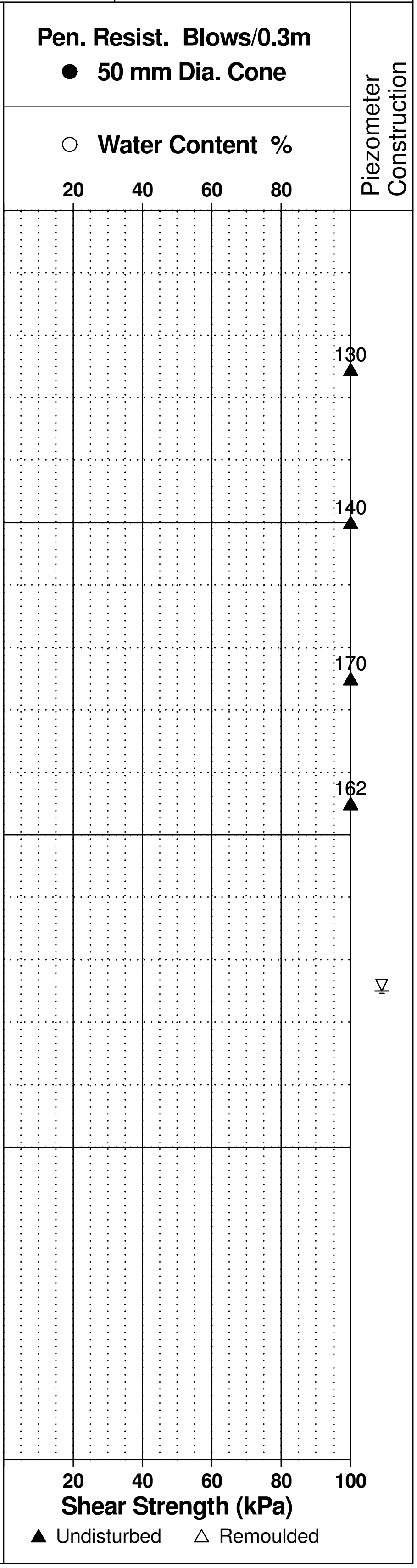
BORINGS BY Rubber Tired Backhoe

DATE May 11, 2017

FILE NO. PG4120

HOLE NO. TP 6-17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
Brown **TOPSOIL** with rootlets 0.30	■	G	1				
Very stiff, brown **SILTY CLAY**, some sand seams, trace cobbles	▨	G	2				
1.20	▨					1	
Very stiff to stiff, brown **SILTY CLAY**	▨	G	3			2	
- sand seams at 2.5m depth	▨	G	4				
3.00	▨					3	
End of Test Pit (Open hole GWL @ 2.5m depth)							



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SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
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Ottawa, Ontario

DATUM

REMARKS Co-ordinates: 45.332959N, 75.700424W

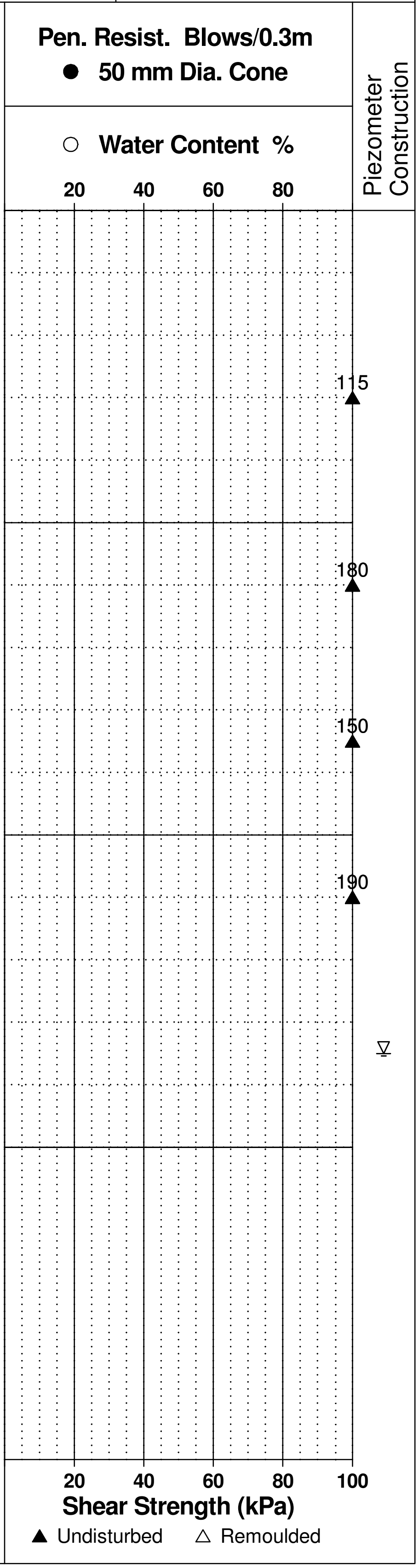
BORINGS BY Rubber Tired Backhoe

DATE May 11, 2017

FILE NO. PG4120

HOLE NO. TP 7-17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
Brown **TOPSOIL** 0.20	■	G	1				
Compact, brown **SILTY SAND**, some clay, trace gravel 0.60		G	2				
Very stiff, brown **SILTY CLAY**, some sand seams 3.00	▨	G G	3 4			1 2 3	
End of Test Pit (Open hole GWL @ 2.7m depth)							



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SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
2175 Prince of Wales Drive
Ottawa, Ontario

DATUM

REMARKS Co-ordinates: 45.332538N, 75.700326W

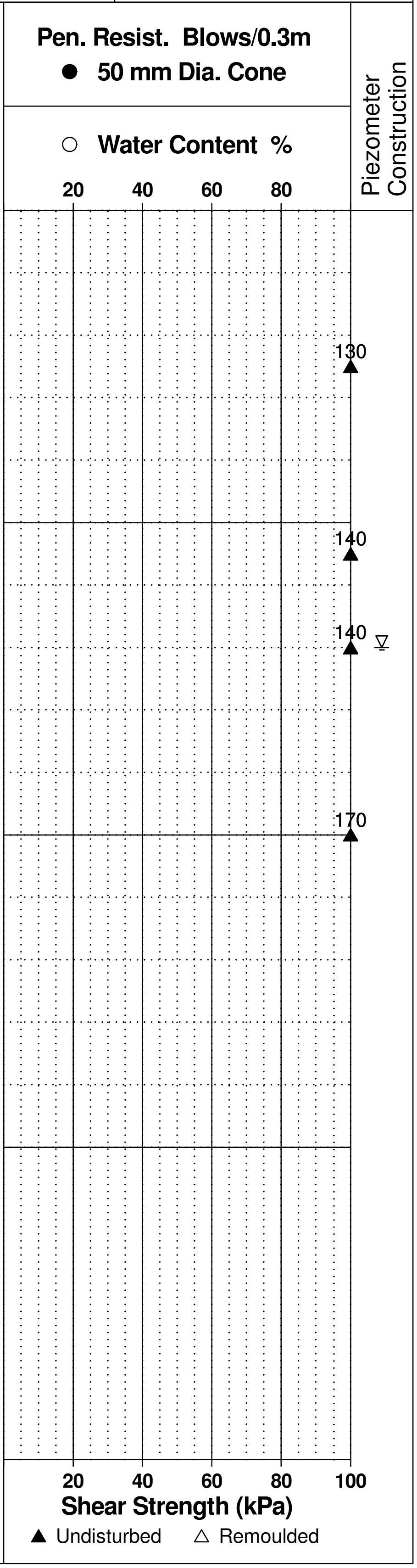
BORINGS BY Rubber Tired Backhoe

DATE May 11, 2017

FILE NO. PG4120

HOLE NO. TP 8-17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
Brown **TOPSOIL** 0.25		G	1				
Very stiff, brown **SILTY CLAY**, trace sand and gravel 1.10		G	2			1	
Very stiff to stiff, brown **SILTY CLAY**, trace silty sand seams 3.00		G	3			2 3	
End of Test Pit (Open hole GWL @ 2 m depth)							



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SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
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DATUM

REMARKS Co-ordinates: 45.332153N, 75.700467W

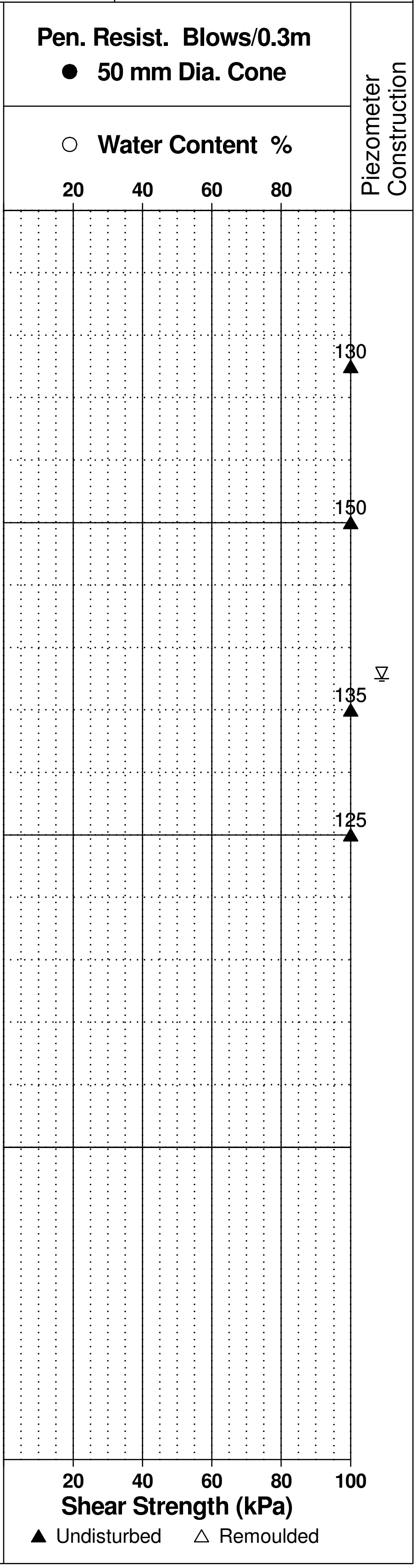
BORINGS BY Rubber Tired Backhoe

DATE May 11, 2017

FILE NO. PG4120

HOLE NO. TP 9-17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)
GROUND SURFACE		TYPE	NUMBER	% RECOVERY	N VALUE or RQD		
Brown **TOPSOIL**		G	1			0	
0.25							
Very stiff, brown **SILTY CLAY**, trace sand						1	
		G	2			2	
3.00						3	
End of Test Pit (Open hole GWL @ 1.5 m depth)							



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SOIL PROFILE AND TEST DATA

Preliminary Geotechnical Investigation
2175 Prince of Wales Drive
Ottawa, Ontario

DATUM

REMARKS Co-ordinates: 45.332488N, 75.699615W

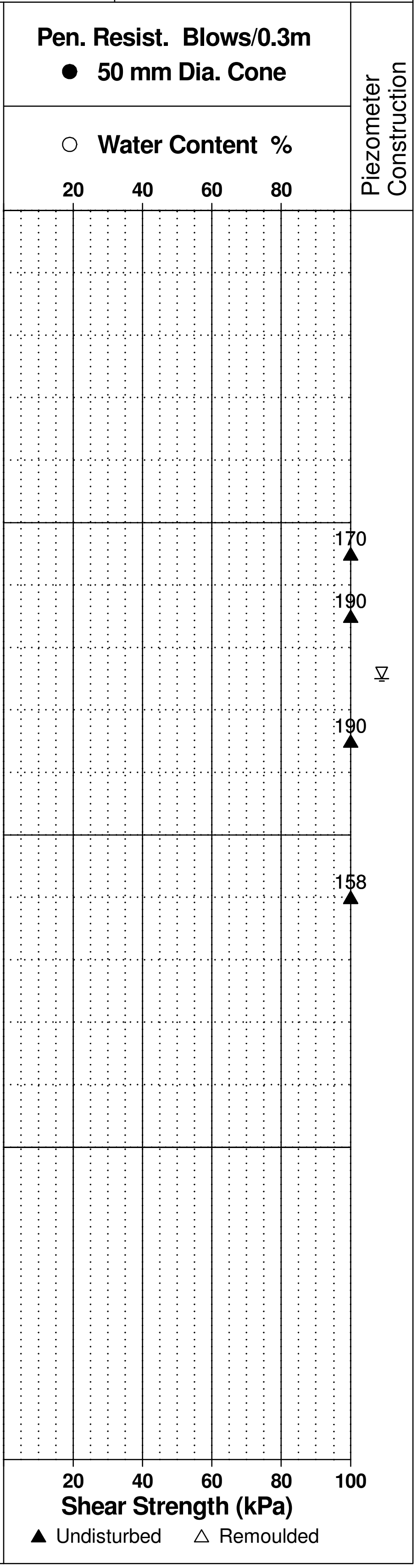
BORINGS BY Rubber Tired Backhoe

DATE May 11, 2017

FILE NO. PG4120

HOLE NO. TP10-17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
Black **TOPSOIL** with rootlets 0.32	■	G	1				
Very stiff, brown **SILTY CLAY** with sand, trace cobbles 1.00	▨	G	2			1	
Very stiff, brown **SILTY CLAY**, some sand seams 3.00	▨	G	3			2 3	
End of Test Pit (Open hole GWL @ 1.5 m depth)							



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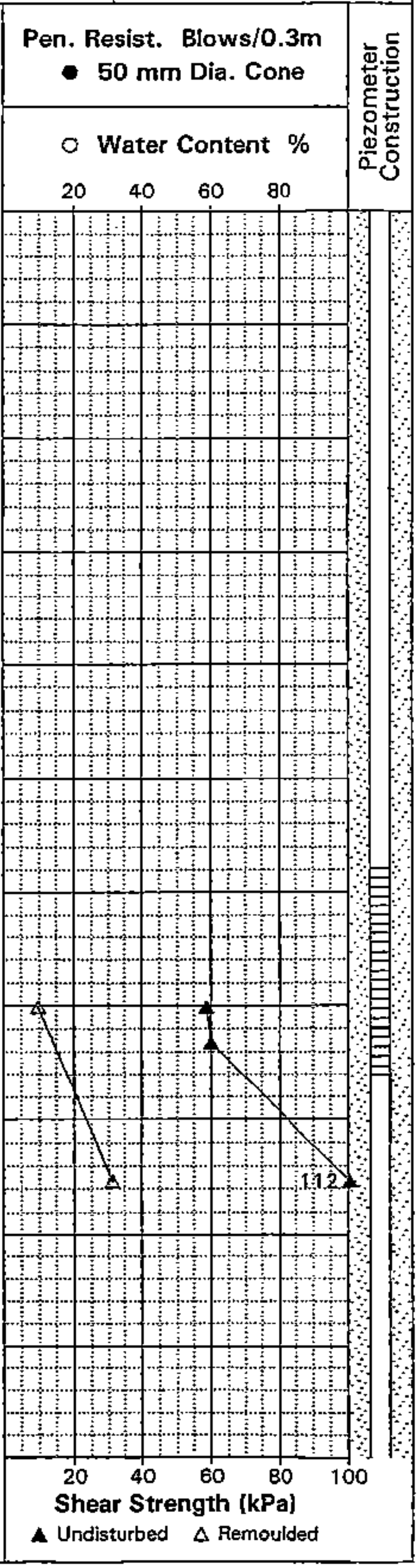
SOIL PROFILE & TEST DATA

Riverbank Failure Assessment
Waterbend Lane
Ottawa, Ontario

DATUM Geodetic, as provided by Cumming Cockburn Limited.
FILE NO. **G8824**
REMARKS
HOLE NO. **BH 1**
BORINGS BY CME 55 Power Auger
DATE 12 DEC 02

SOIL DESCRIPTION	Depth	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE					
75mm Topsoil over brown fine to coarse SAND and GRAVEL	0.18				
Brown SILTY CLAY interbedded with SILTY fine SAND		SS	1	67	10
		SS	2	83	11
	2.66	SS	3	100	9
Brown SILTY CLAY with occasional 25mm thick fine sand seams		SS	4	100	7
	4.34	SS	5	100	6
Brown SILTY fine to medium SAND with occasional 25 to 50mm thick layers of brown silty clay		SS	6	67	11
	6.02	SS	7	100	7
Grey SILTY fine SAND with clay, trace white shells	6.58	SS	8	100	1
Grey SILTY CLAY to CLAYEY SILT		SS	9	100	3
	9.50	SS	10	79	40

DEPTH (m)	ELEV. (m)
0	86.02
1	85.02
2	84.02
3	83.02
4	82.02
5	81.02
6	80.02
7	79.02
8	78.02
9	77.02
10	76.02
11	75.02



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SOIL PROFILE & TEST DATA

Riverbank Failure Assessment
Waterbend Lane
Ottawa, Ontario

DATUM Geodetic, as provided by Cumming Cockburn Limited.

REMARKS

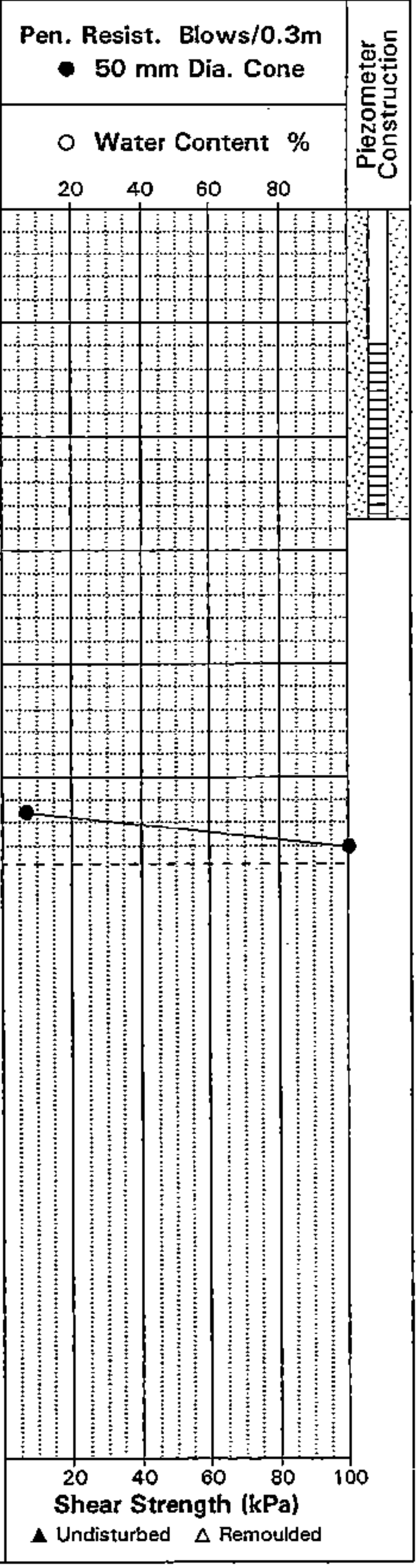
BORINGS BY CME 55 Power Auger

DATE 12 DEC 02

FILE NO. G8824

HOLE NO. BH 1

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Brown SILTY fine to medium SAND 380mm thick sandy silt layer @ 12.7m depth		SS	11	100	46	11	75.02
						12	74.02
		SS	12	54	7	13	73.02
		SS	13	83	9	14	72.02
						15	71.02
- gravel sizes by 15.5m depth		SS	14	100	47		
- start of DCPT @ 16.3m depth						16	70.02
16.76							
End of Borehole Refusal to DCPT at 16.8m depth (BH dry @ 12.8m on Dec. 16/02)							



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SOIL PROFILE & TEST DATA

Riverbank Failure Assessment
Waterbend Lane
Ottawa, Ontario

DATUM Geodetic, as provided by Cumming Cockburn Limited.

REMARKS

BORINGS BY Portable Drill

DATE 21 MAR 03

FILE NO. G8824

HOLE NO. BH 2-03

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	74.93
Brown SILTY fine SAND 0.30	G	1				
Brown SILTY CLAY, some sand 1.20	SS	2	71	2		
	SS	3	58	13	1	73.93
Compact, brown SILTY fine SAND - 25mm thick silty clay seam at 2.12m depth - 50mm thick grey silt, trace clay @ 2.46m depth 2.74	SS	4	100	11	2	72.93
	SS	5	62	14		
Compact, grey SILTY fine SAND - 10mm thick silty clay seam by 4.2m depth 4.57	SS	6	100	12	3	71.93
	SS	7	100	12		
	SS	8	100	13	4	70.93
End of Borehole (Open hole GWL @ 0.2m depth)						

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

○ Water Content %
20 40 60 80

Piezometer Construction
∇

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

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SOIL PROFILE & TEST DATA

Riverbank Failure Assessment
Waterbend Lane
Ottawa, Ontario

DATUM Geodetic, as provided by Cumming Cockburn Limited.

REMARKS

BORINGS BY Portable Drill

DATE 21 MAR 03

FILE NO. G8824

HOLE NO. BH 3-03

SOIL DESCRIPTION		TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	74.89
Brown **SILTY** fine to medium **SAND**	0.15	G	1				
Loose, grey **SILTY** fine **SAND** with thin grey silty clay layers		SS	2	67	4		
		SS	3	100	5	1	73.89
	2.13	SS	4	100	5	2	72.89
Loose to compact, grey to grey-brown **SILTY** fine to coarse **SAND**		SS	5	100	11		
		SS	6	100	8	3	71.89
		SS	7	100	13		
	4.57	SS	8	92	22	4	70.89

End of Test Pit

(Open hole GWL @ 0.3m depth)

STRATA PLOT

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

○ Water Content %
20 40 60 80

Piezometer Construction

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

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SOIL PROFILE & TEST DATA

Riverbank Failure Assessment
Waterbend Lane
Ottawa, Ontario

DATUM Geodetic, as provided by Cumming Cockburn Limited.

REMARKS

BORINGS BY CME 55 Power Auger

DATE 16 MAY 03

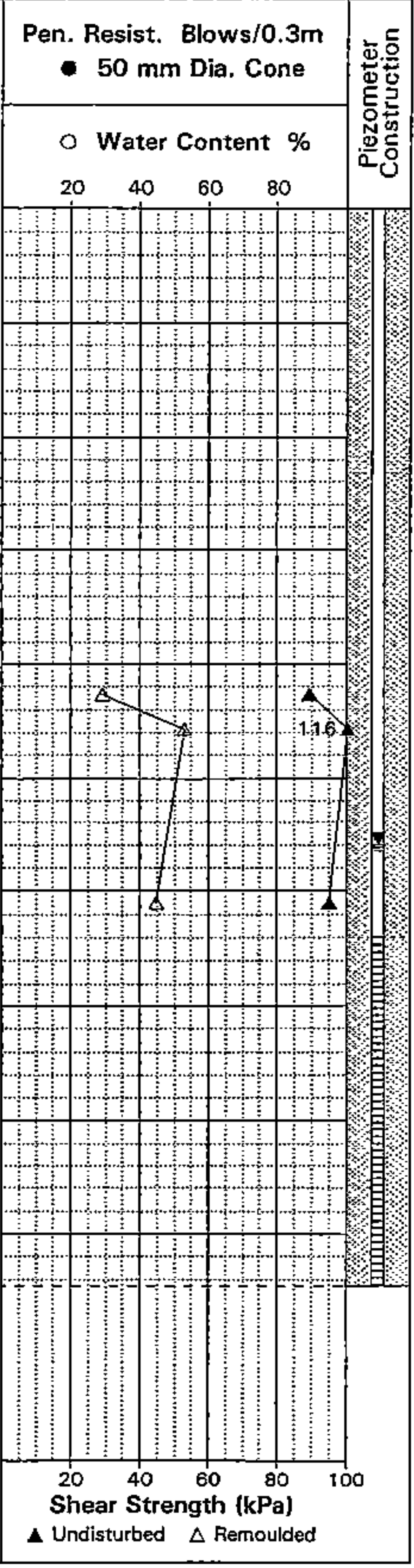
FILE NO. **G8824**

HOLE NO. **BH 4-03**

SOIL DESCRIPTION	Depth to base (m)
GROUND SURFACE	
TOPSOIL	0.38
Stiff, brown SILTY CLAY	0.56
Very loose to loose, brown **SILTY** fine to coarse **SAND** - brown-grey and trace clay by 2.6m depth	3.20
Very stiff, brown-grey **SILTY CLAY** - with silt and sandy silt seams by 9.4m depth	7.60
Compact, brown SILTY fine to coarse SAND - grey by 8.8m depth	9.45
End of Borehole (GWL @ 5.60m-May 22/03)	

SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
SS	1	42	2
SS	2	75	3
SS	3	71	3
SS	4	83	5
SS	5	67	4
SS	6	100	2
SS	7	83	P
SS	8	100	3
SS	9	100	2
SS	10	100	P
SS	11		8
SS	12	100	21
SS	13	67	22
SS	14	100	11
SS	15	100	30

DEPTH (m)	ELEV. (m)
0	81.82
1	80.82
2	79.82
3	78.82
4	77.82
5	76.82
6	75.82
7	74.82
8	73.82
9	72.82



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SOIL PROFILE & TEST DATA

Riverbank Failure Assessment
Waterbend Lane
Ottawa, Ontario

DATUM Geodetic, estimated.

REMARKS

BORINGS BY Portable Drill

DATE 8 MAY 03

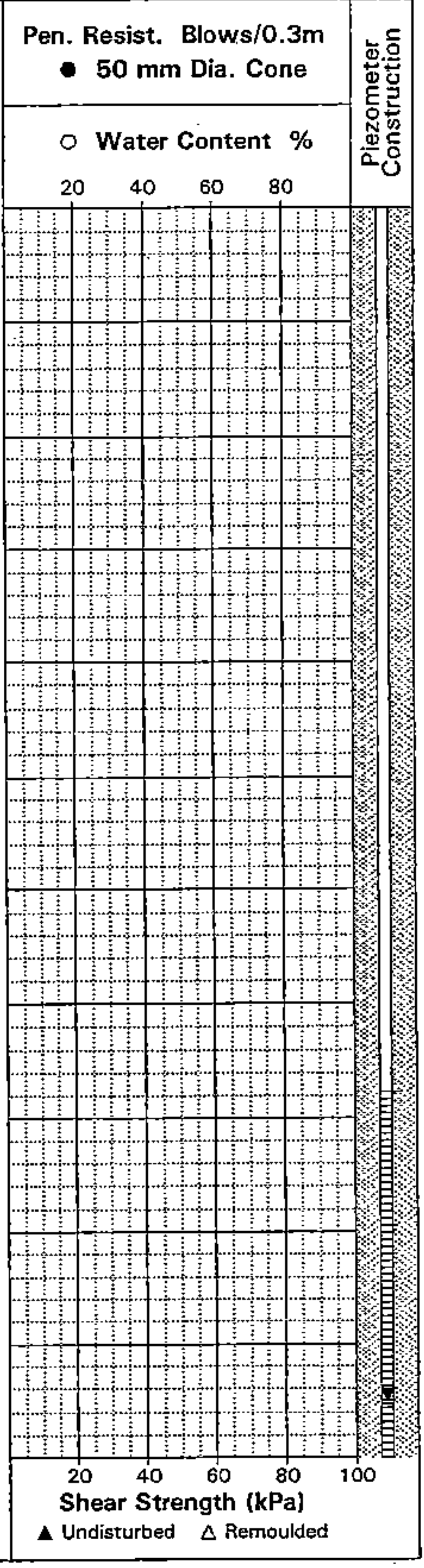
FILE NO. **G8824**

HOLE NO. **BH 5-03**

SOIL DESCRIPTION	Depth to base (m)
GROUND SURFACE	
TOPSOIL	0.44
Very loose to loose, brown **SILTY** fine to medium **SAND**	1.47
Very stiff, brown-grey **SILTY CLAY** - occasional silty sand layers by 2.7m depth - grey by 3.1m depth	5.00
Very loose to loose, brown-grey SILTY SAND, trace clay - 0.3m thick silty clay at 6.1m depth	8.80
Firm to stiff, grey SILTY CLAY, trace sand	

TYPE	NUMBER	% RECOVERY	N VALUE or RQD
SS	1	48	3
SS	2		3
SS	3		6
SS	4		10
SS	5	62	14
SS	6	88	10
SS	7	58	7
SS	8	71	10
SS	9	75	7
SS	10	96	8
SS	11	54	4
SS	12	100	3
SS	13	100	2
SS	14	100	2
SS	15		P
SS	16	100	3
SS	17	100	6

DEPTH (m)	ELEV. (m)
0	85.66
1	84.66
2	83.66
3	82.66
4	81.66
5	80.66
6	79.66
7	78.66
8	77.66
9	76.66
10	75.66
11	74.66



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SOIL PROFILE & TEST DATA

Riverbank Failure Assessment
Waterbend Lane
Ottawa, Ontario

DATUM Geodetic, estimated.

REMARKS

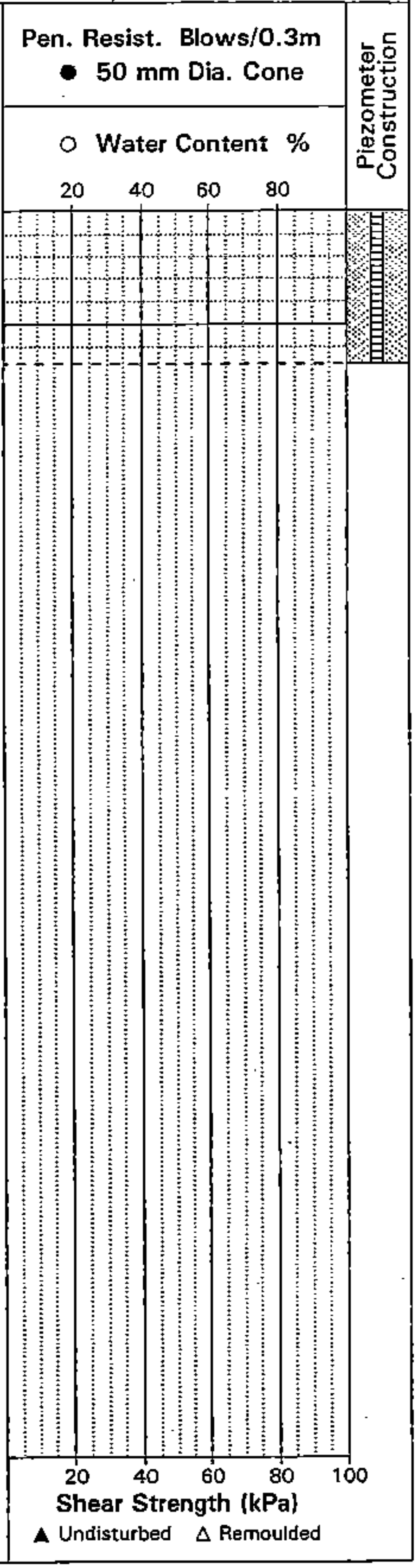
BORINGS BY Portable Drill

DATE 8 MAY 03

FILE NO. **G8824**

HOLE NO. **BH 5-03**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
						11	74.66
Firm to stiff, grey SILTY CLAY, trace sand		SS	18	100	3		
		SS	19	100	10		
						12	73.66
12.34							
End of Borehole (GWL @ 10.5m-May 22/03)							



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SOIL PROFILE & TEST DATA

Riverbank Failure Assessment
Waterbend Lane
Ottawa, Ontario

DATUM Geodetic, as provided by Cumming Cockburn Limited.

FILE NO. **G8824**

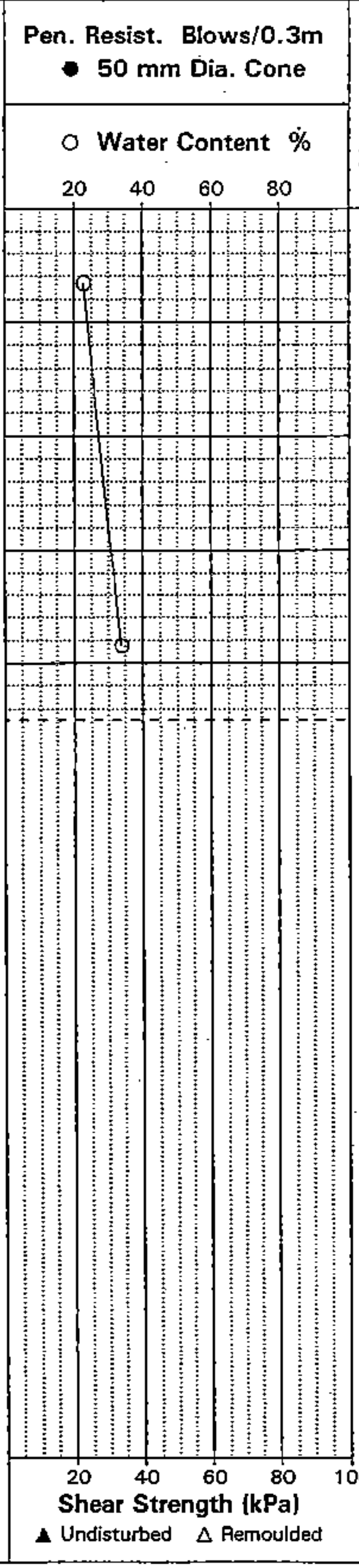
REMARKS

HOLE NO. **HA 1**

BORINGS BY Hand Auger

DATE 28 NOV 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Piezometer Construction
GROUND SURFACE						0	81.82	
TOPSOIL 0.18								
Loose to compact, brown **SILTY** fine to medium **SAND**		G G	1 2					
						1	80.82	
- silty fine to medium sand with brown silty clay seams by 0.6m depth		G G	3 4					
						2	79.82	
- brown-red silty fine to medium sand by 1.6m depth - brown to light brown by 2.5m depth		G	5					
						3	78.82	
- brown-grey by 3.4m depth 3.80		G	6					
Stiff, grey SILTY **CLAY/CLAYEY SILT** 4.50		G	7			4	77.82	
End of Hand Auger Hole								



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SOIL PROFILE & TEST DATA

Riverbank Failure Assessment
Waterbend Lane
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DATUM Geodetic, as provided by Cumming Cockburn Limited.

FILE NO. **G8824**

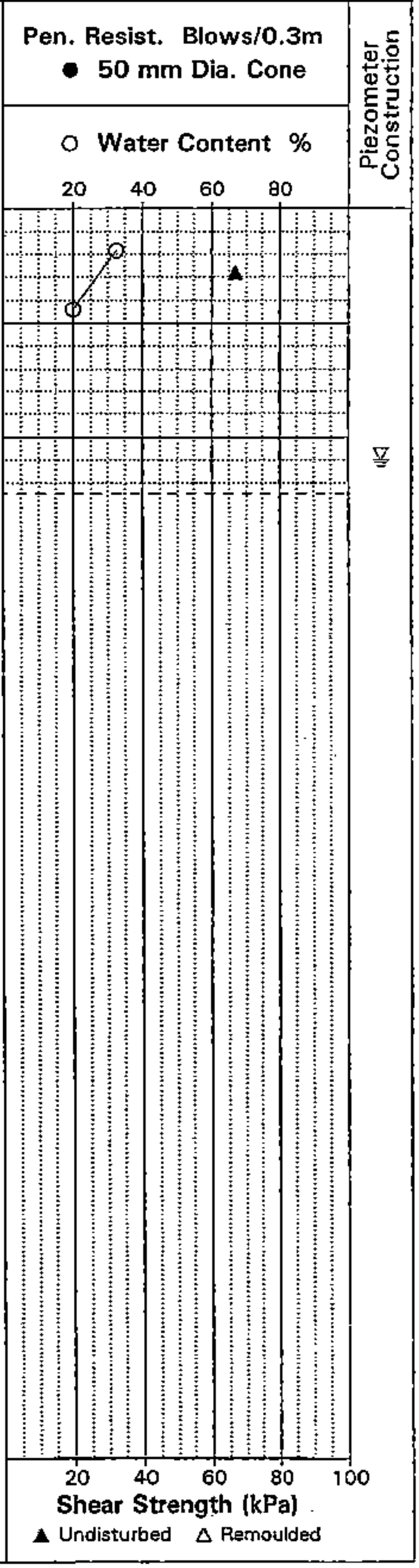
REMARKS

HOLE NO. **HA 2**

BORINGS BY Hand Auger

DATE 28 NOV 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	74.93
SILTY fine **SAND** 0.05							
Stiff, grey **SILTY CLAY**, trace sand 0.70		G	8				
Compact, grey **SANDY SILT**, trace clay		G	9			1	73.93
		G	10			2	72.93
2.49							
End of Hand Auger Hole (Open hole GWL @ 2.2m depth)							



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SOIL PROFILE & TEST DATA

Riverbank Failure Assessment
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DATUM Geodetic, estimated.

REMARKS

BORINGS BY Hand Auger

DATE 28 NOV 02

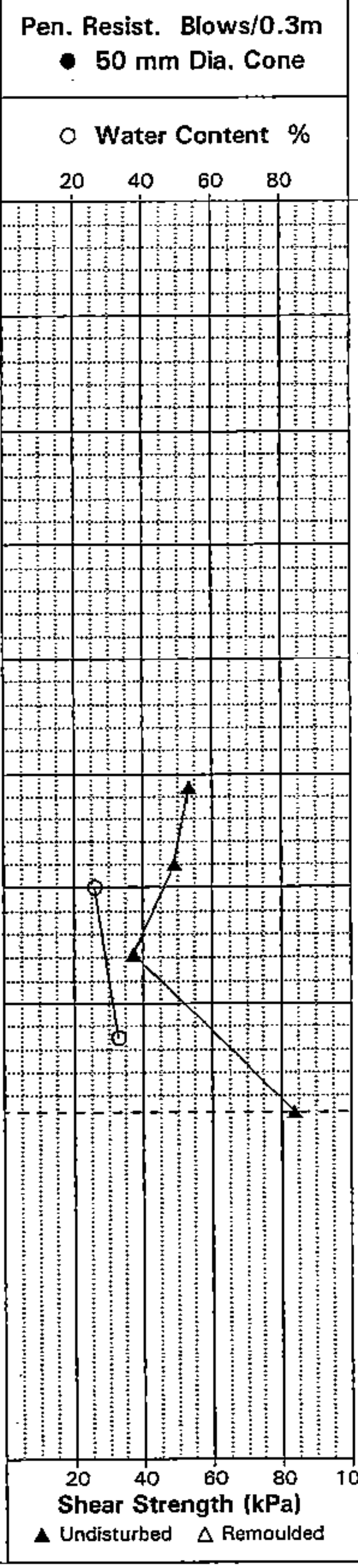
FILE NO. G8824

HOLE NO. HA 3

SOIL DESCRIPTION	Depth (m)
GROUND SURFACE	
TOPSOIL	0.25
Hard, brown SILTY CLAY	0.56
Loose to compact, brown SILTY fine to coarse SAND with frequent silty clay seams - brown-grey silty fine to medium sand with silt by 4.4m depth - brown silty fine sand by 5.0m depth	5.10
Stiff to firm, brown-grey SANDY SILTY CLAY, trace sand - stiff and grey by 7.2m depth	7.94
End of Hand Auger Hole	

SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
G	11		
G	12		
G	13		
G	14		
G	15		
G	16		

DEPTH (m)	ELEV. (m)
0	84.70
1	83.70
2	82.70
3	81.70
4	80.70
5	79.70
6	78.70
7	77.70



Piezometer Construction

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SOIL PROFILE & TEST DATA

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DATUM Geodetic, as provided by Cumming Cockburn Limited.

REMARKS

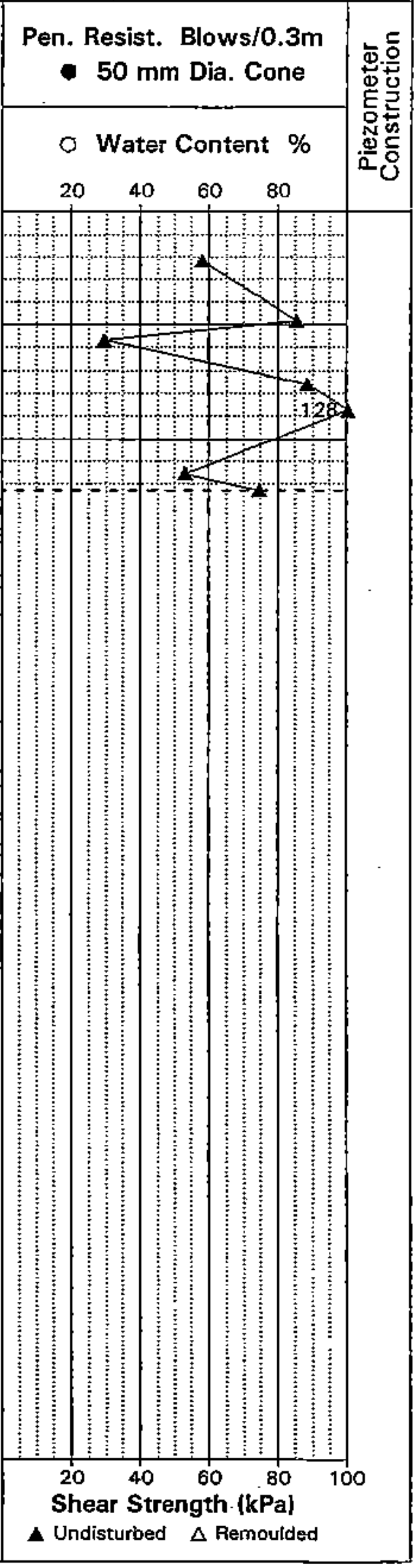
BORINGS BY Hand Auger

DATE 29 NOV 02

FILE NO. G8824

HOLE NO. HA 4

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD		
GROUND SURFACE							
SILTY fine SAND 0.08						0	74.89
Stiff, grey SILTY CLAY, trace sand		G	17				
		G	18			1	73.89
- very stiff by 1.7m depth - clayey silt by 1.8m depth		G	19			2	72.89
- stiff by 2.3m depth 2.46							
End of Hand Auger Hole							



SOIL PROFILE AND TEST DATA

Proposed Residential Subdivision
South 1/2 Lot 26, Concession "A", R.F.
Nepean, Ontario

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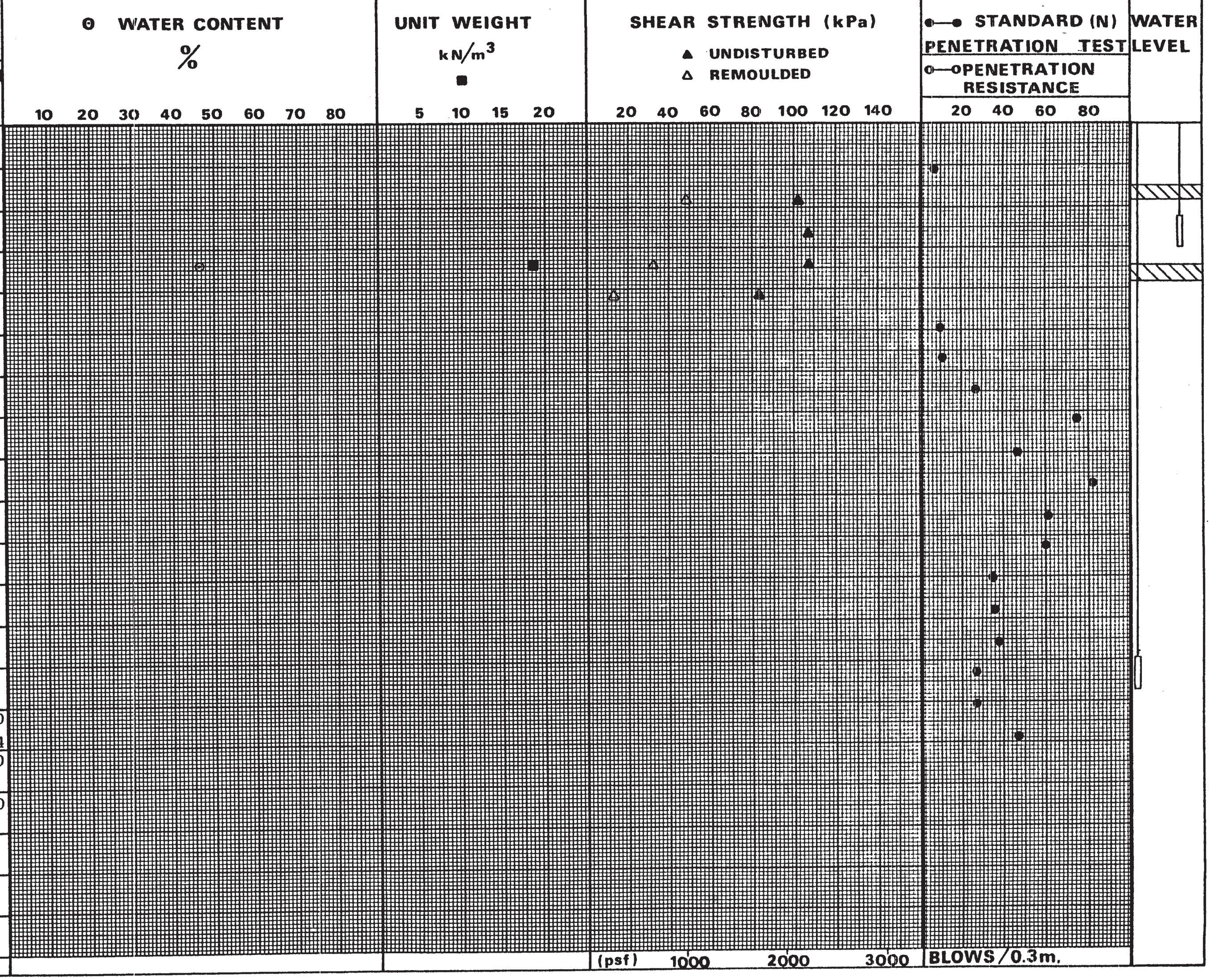
Soil Investigations
Inspection & Testing Services
Damage Claims

Offices & Laboratory
1479 Laperriere Ave.
Ottawa, Canada K1Z 7S8
Telephone (613) 728-3505

SHEET NO. 1 OF 3
HOLE NO. BH 1
GROUND SURFACE 86.04
BOTTOM HOLE 73.84
BEDROCK
GROUNDWATER DRY

DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	ELEV. / DEPTH
Ground Surface			86.04
250 mm TOPSOIL over a compact grey interbedded FINE SAND and SANDY SILT 0.8	G	1	0.00
	SS	2	0.80
Very stiff to stiff fissured olive grey SILTY CLAY with pinkish grey banding containing fine sand seams	TW	3	
	TW	4	1.60
	TW	5	2.40
3.6	TW	6	3.20
Compact brown SILTY FINE SAND containing clayey silt seams approximately 5 mm thick	SS	7	82.04 4.00
	SS	8	
5.5	SS	9	4.80
Very dense grey SANDY SILT containing silty fine sand seams	SS	10	5.60
6.7	SS	11	6.40
Dense pale grey FINE SAND with some hairlike black banding. Becoming coarser with depth.	SS	12	
	SS	13	7.20 78.04
	SS	14	8.00
	SS	15	8.80
	SS	16	
	SS	17	9.60
	SS	18	10.40
	SS	19	11.20 74.04
12.2	SS	20	12.00
Borehole terminated in sand			12.80



SOIL PROFILE AND TEST DATA

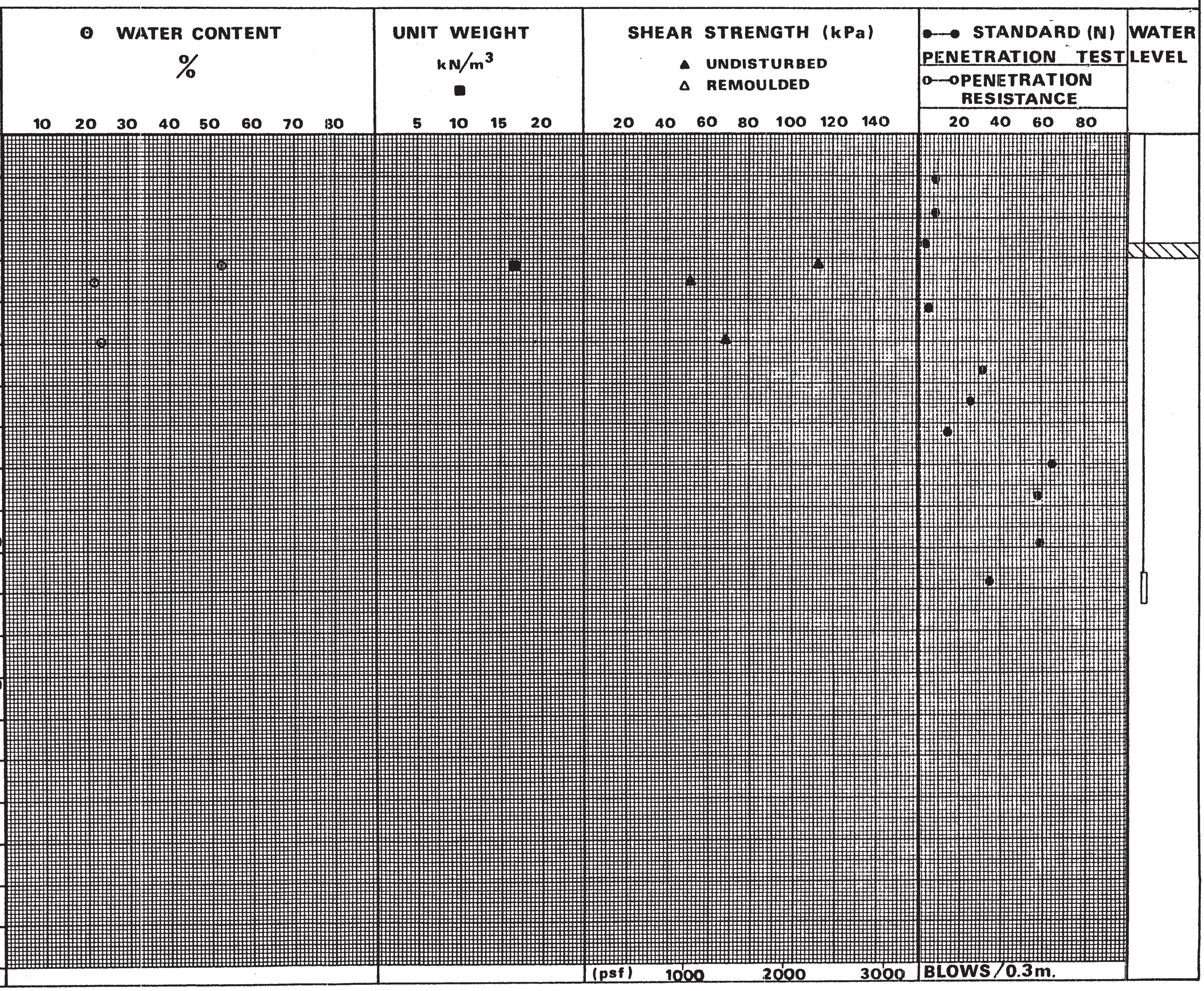
Proposed Residential Subdivision
South 1/2 Lot 26, Concession "A", R.F.
Nepean, Ontario

JOHN D. PATERSON & ASSOCIATES LTD.
Consulting Engineers & Geologists
Soil Investigations
Inspection & Testing Services
Damage Claims

Offices & Laboratory
1479 Laperriere Ave.
Ottawa, Canada K1Z 7S8
Telephone (613) 728-3505

SHEET NO. 2 OF 3
HOLE NO. BH 2
GROUND SURFACE 80.59 BOTTOM HOLE 71.59
BEDROCK ______ GROUNDWATER DRY

DESCRIPTION	LEGEND	SAMPLE TYPE	SAMPLE NUMBER	ELEV. DEPTH
Ground Surface				80.59
300 mm TOPSOIL over a loose brown SANDY SILT interbedded with layers of clayey silt and fine sand.		G	21	0.00
		SS	22	0.80
		SS	23	1.60
2.2		SS	24	
Stiff fissured olive grey SILTY CLAY 2.9		SS	25	2.40
		SS	26	3.20
Compact grey FINE SANDY SILT with a trace of clay		TW	27	76.59 4.00
		SS	28	4.80
		SS	29	
6.1		SS	30	5.60
Dense light brown to grey SILTY FINE SAND		SS	31	6.40
		SS	32	7.20
		SS	33	72.59
				8.00
9.0		SS	34	
Borehole terminated in silty fine sand				8.80
				9.60
				10.40



SOIL PROFILE AND TEST DATA

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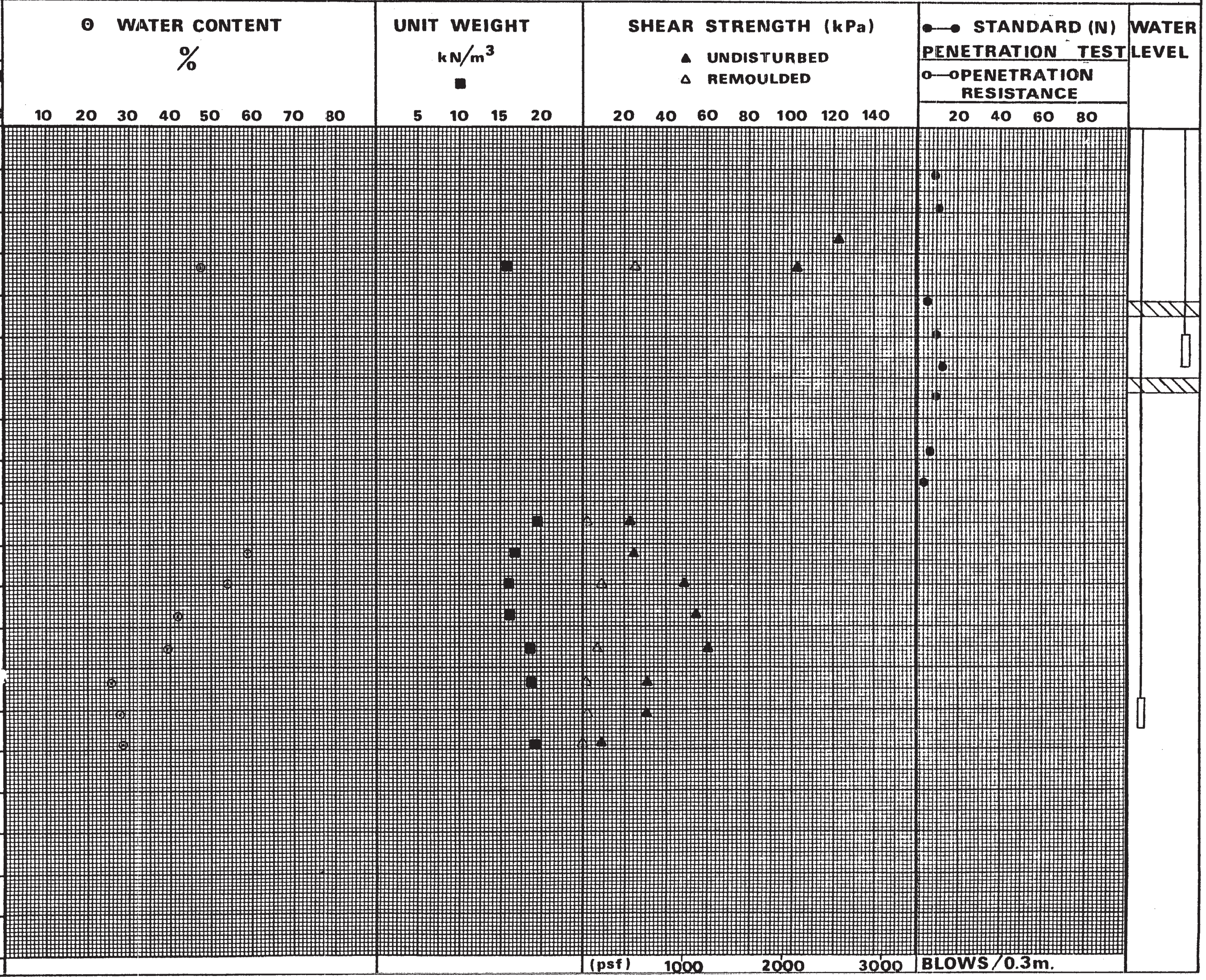
SHEET NO. 3 OF 3
HOLE NO. BH 3
GROUND SURFACE 85.53 BOTTOM HOLE 73.33
BEDROCK ______ GROUNDWATER DRY

DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	ELEV. DEPTH
Ground Surface			85.53
250 mm TOPSOIL over a loose brown SANDY SILT interbedded with clayey silt & sand	G	35	0.00
0.8	SS	36	0.80
Stiff olive grey fissured SILTY CLAY containing brown fine sand seams at 50 mm ± intervals	SS	37	1.60
	TW	38	
	TW	39	2.40
3.3	SS	40	3.20
			81.53
	SS	41	4.00
	SS	42	
	SS	43	4.80
			5.60
Compact brown SILTY FINE SAND containing clayey silt seams	SS	44	
	SS	45	6.40
	TW	46	7.20
7.9			77.53
	TW	47	8.00
Firm to stiff grey fissured SILTY CLAY with occasional fine sand lenses and containing fine sand seams	TW	48	8.80
	TW	49	
9.8	TW	50	9.60
STRATIFIED SILT: grey compact layers of silty sand, sandy silt and stiff silty clay	TW	51	10.40
	TW	52	11.20
12.2	TW	53	73.53
			12.00
Borehole terminated in silt			



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.

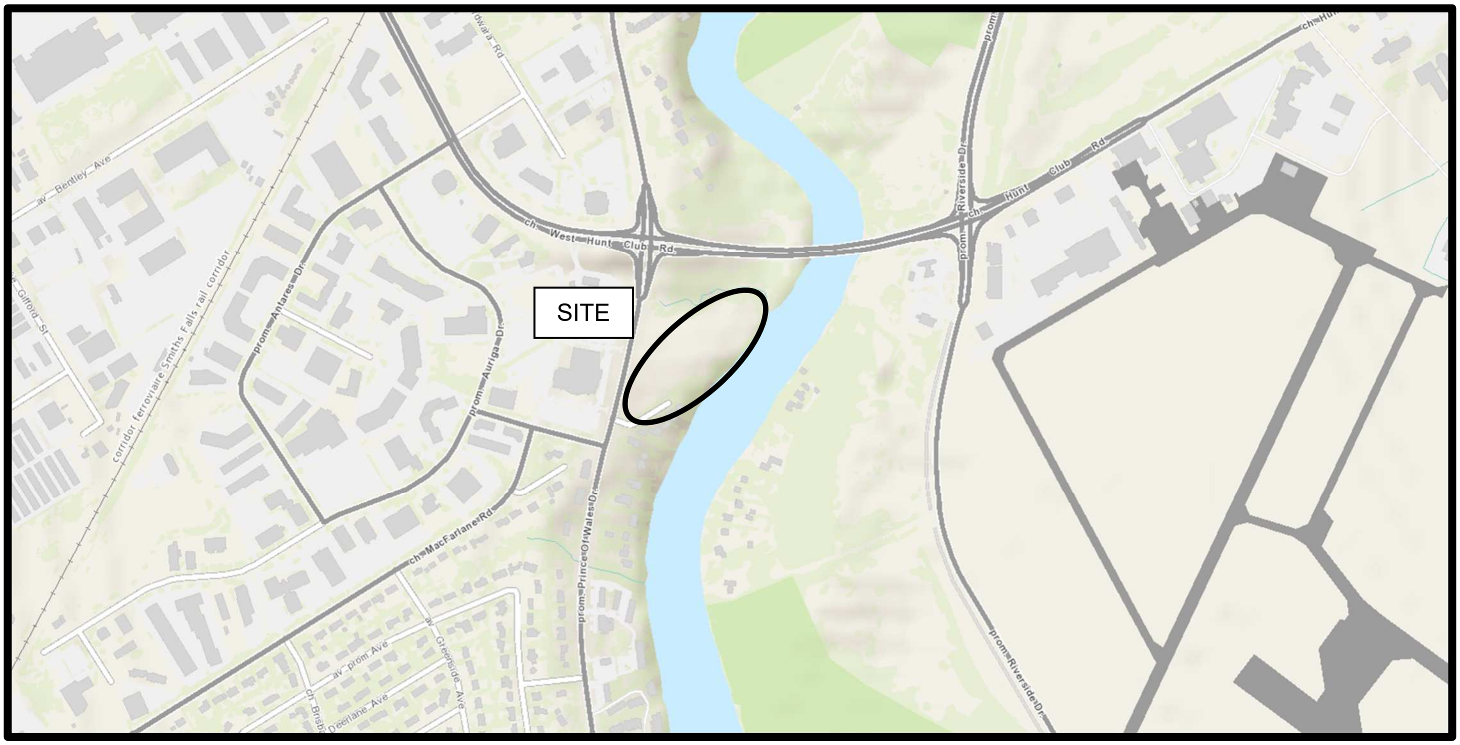


FIGURE 1

KEY PLAN

PATERSON
GROUP

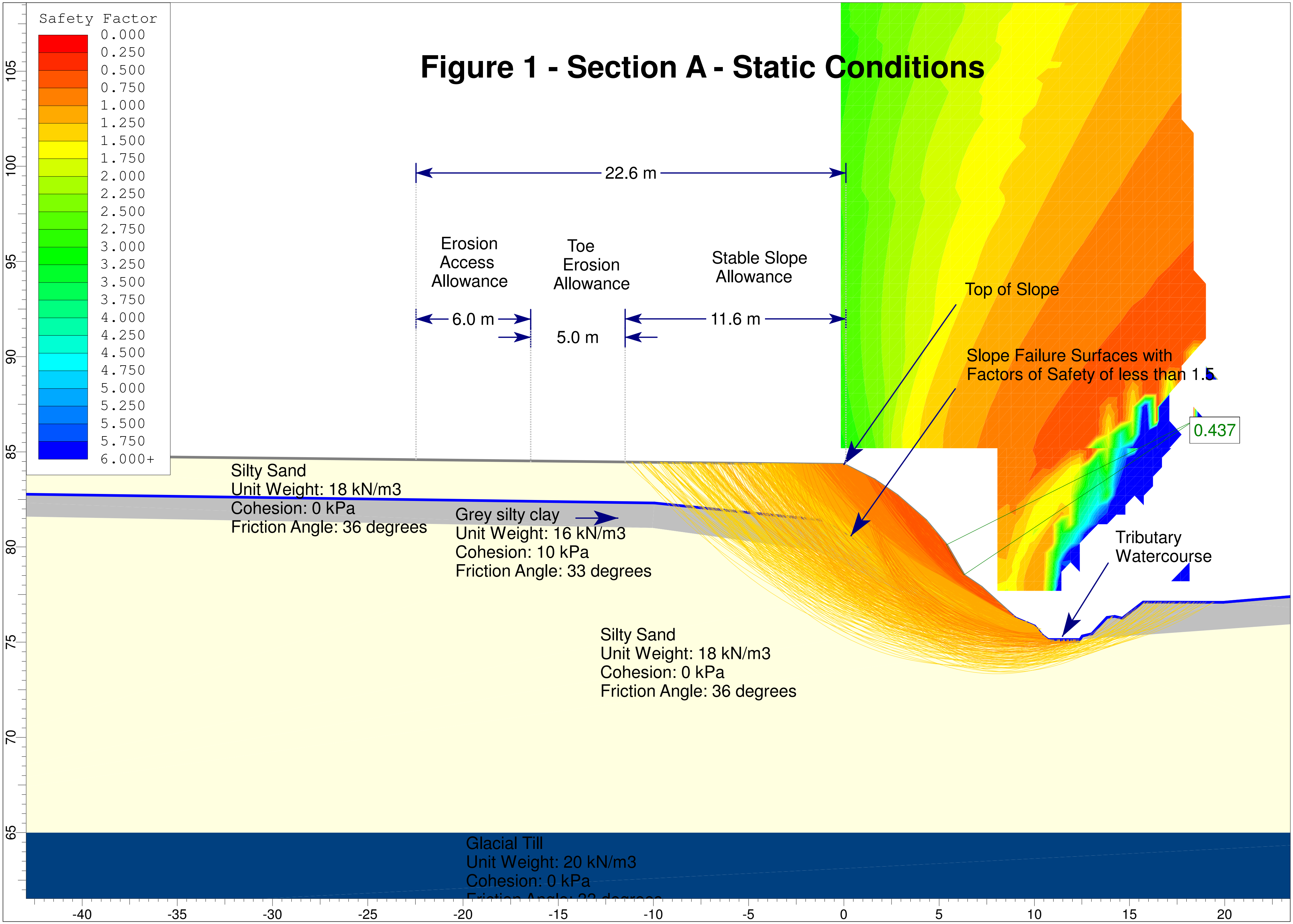


Figure 1 - Section A - Static Conditions

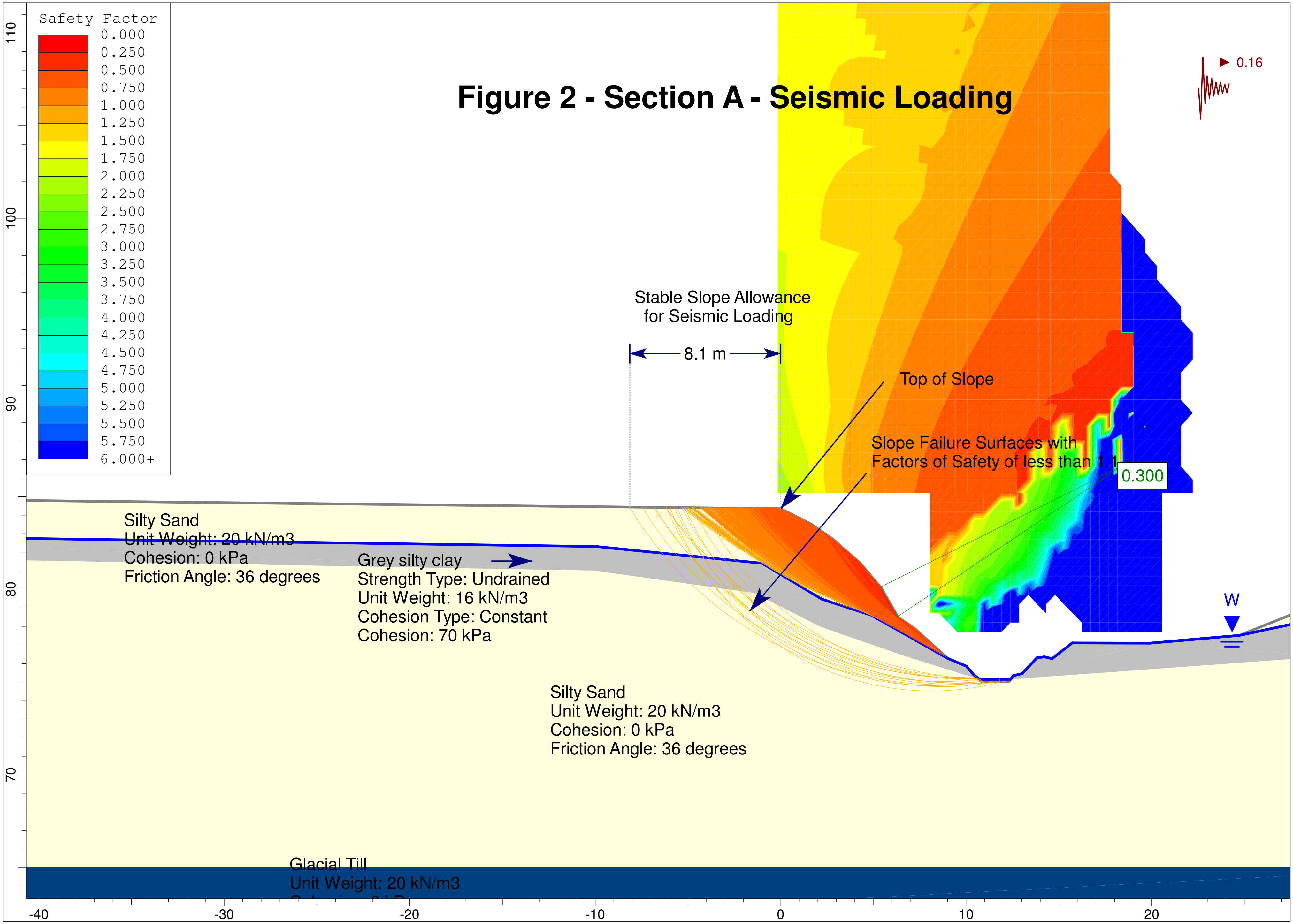


Figure 2 - Section A - Seismic Loading

Figure 3 - Section B - Static Conditions

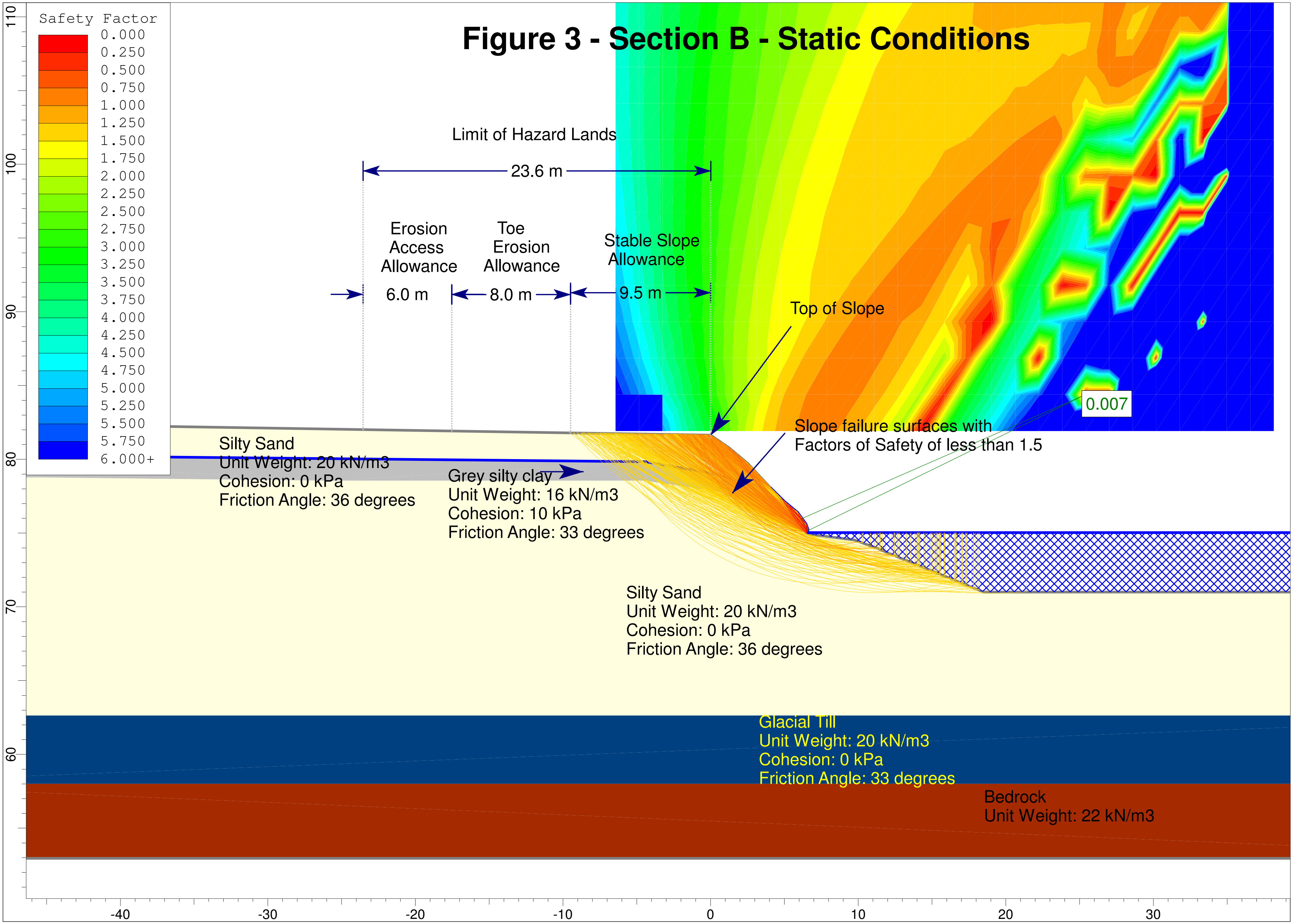


Figure 4 - Section B - Seismic Loading

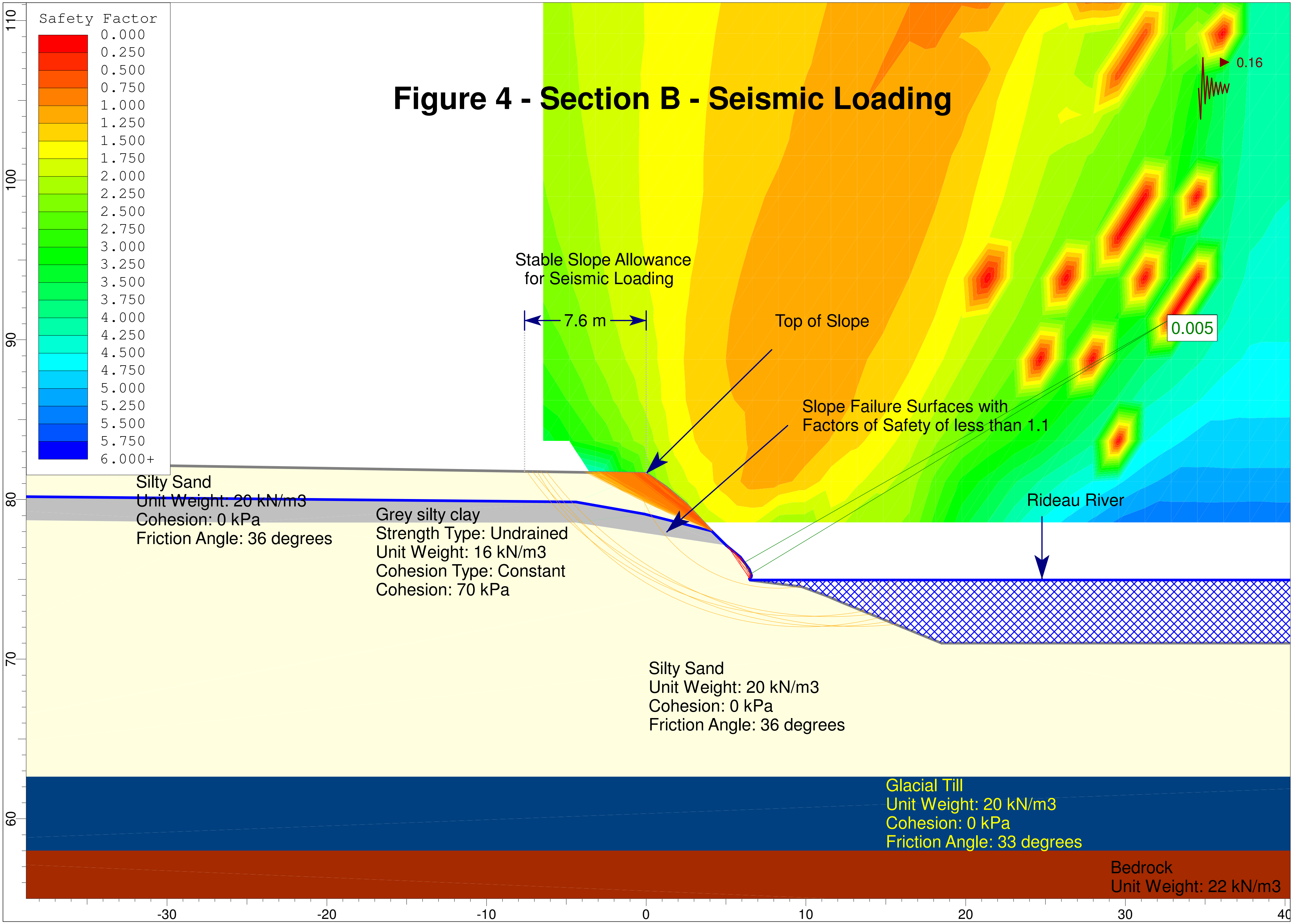
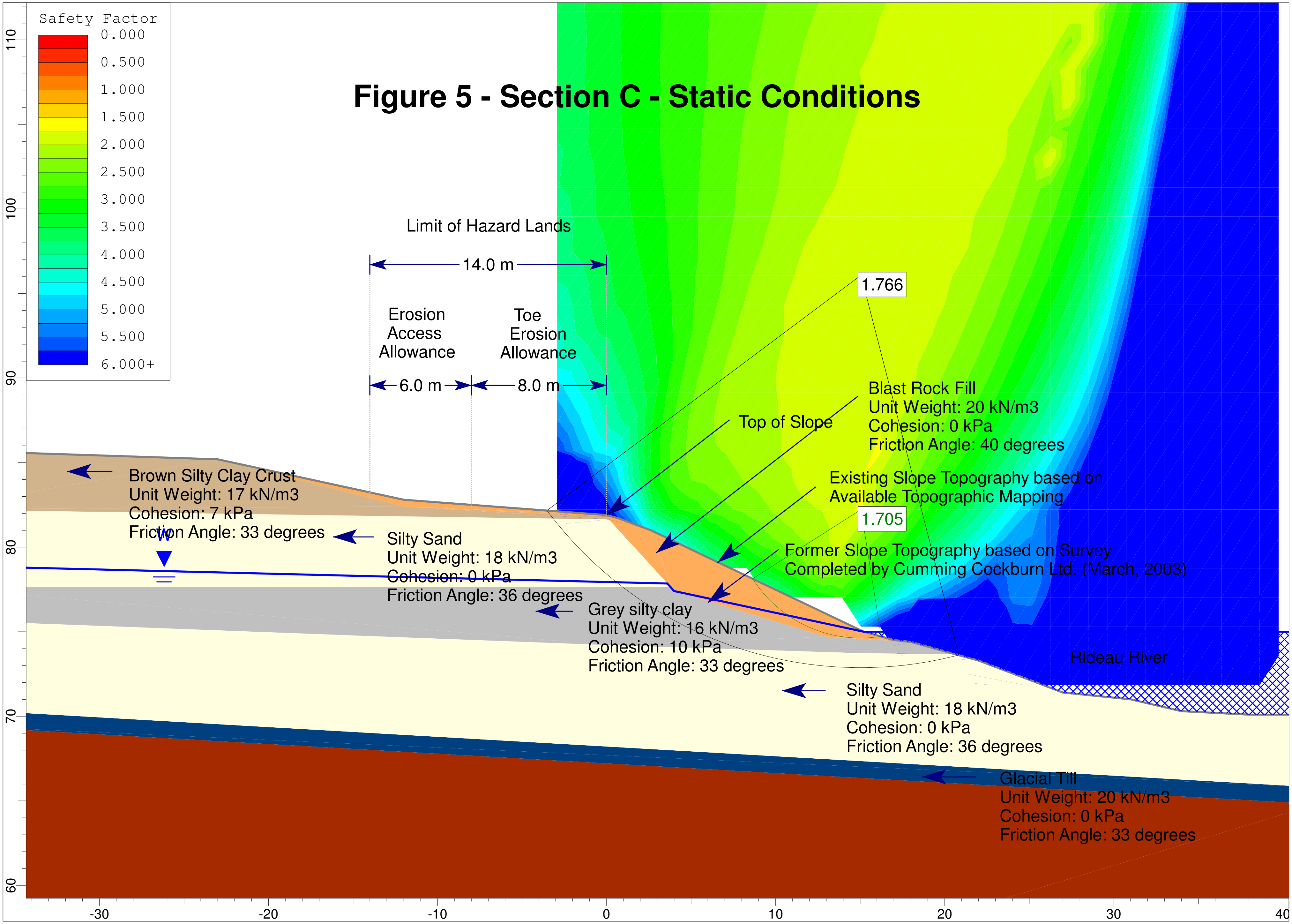


Figure 5 - Section C - Static Conditions



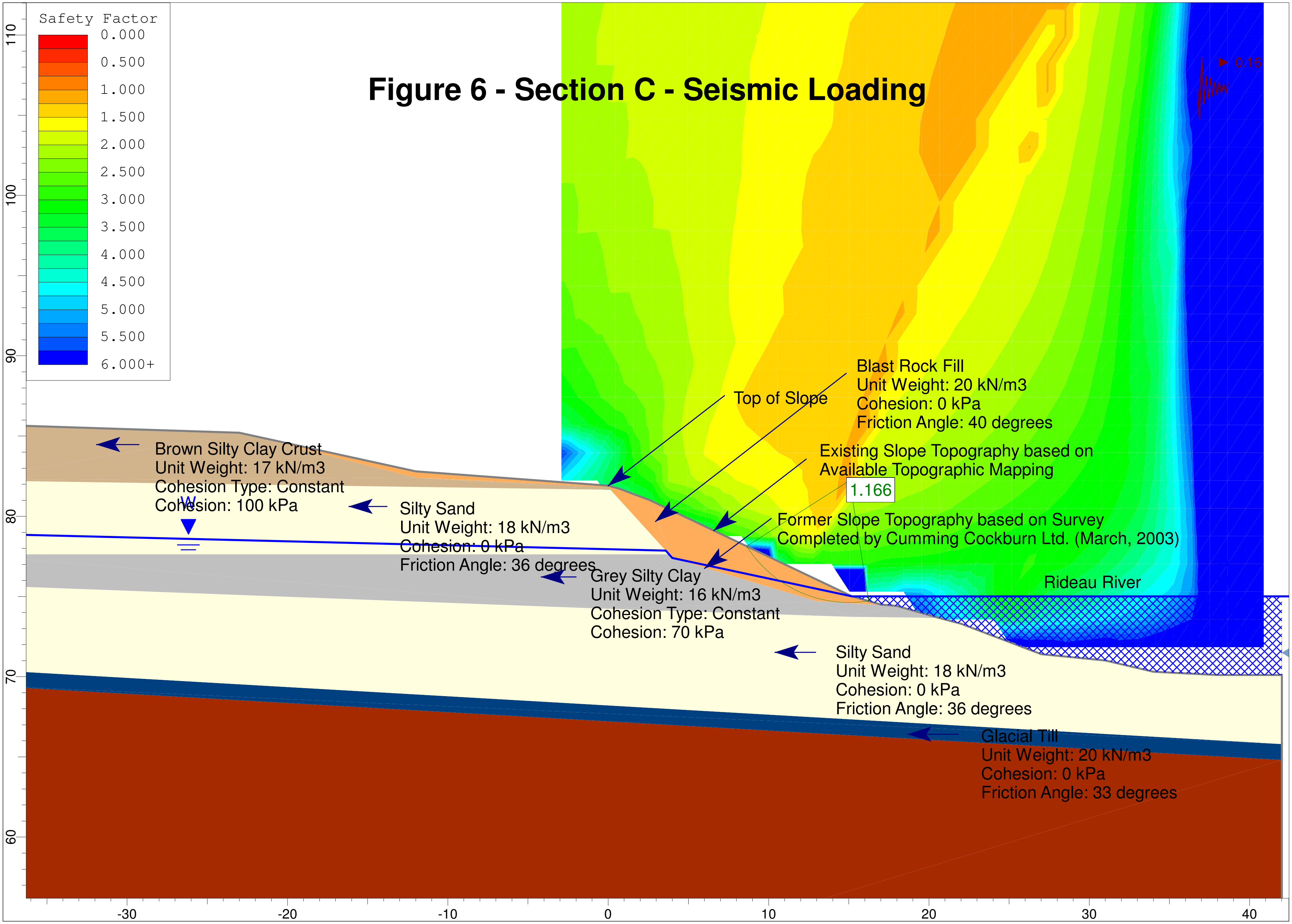
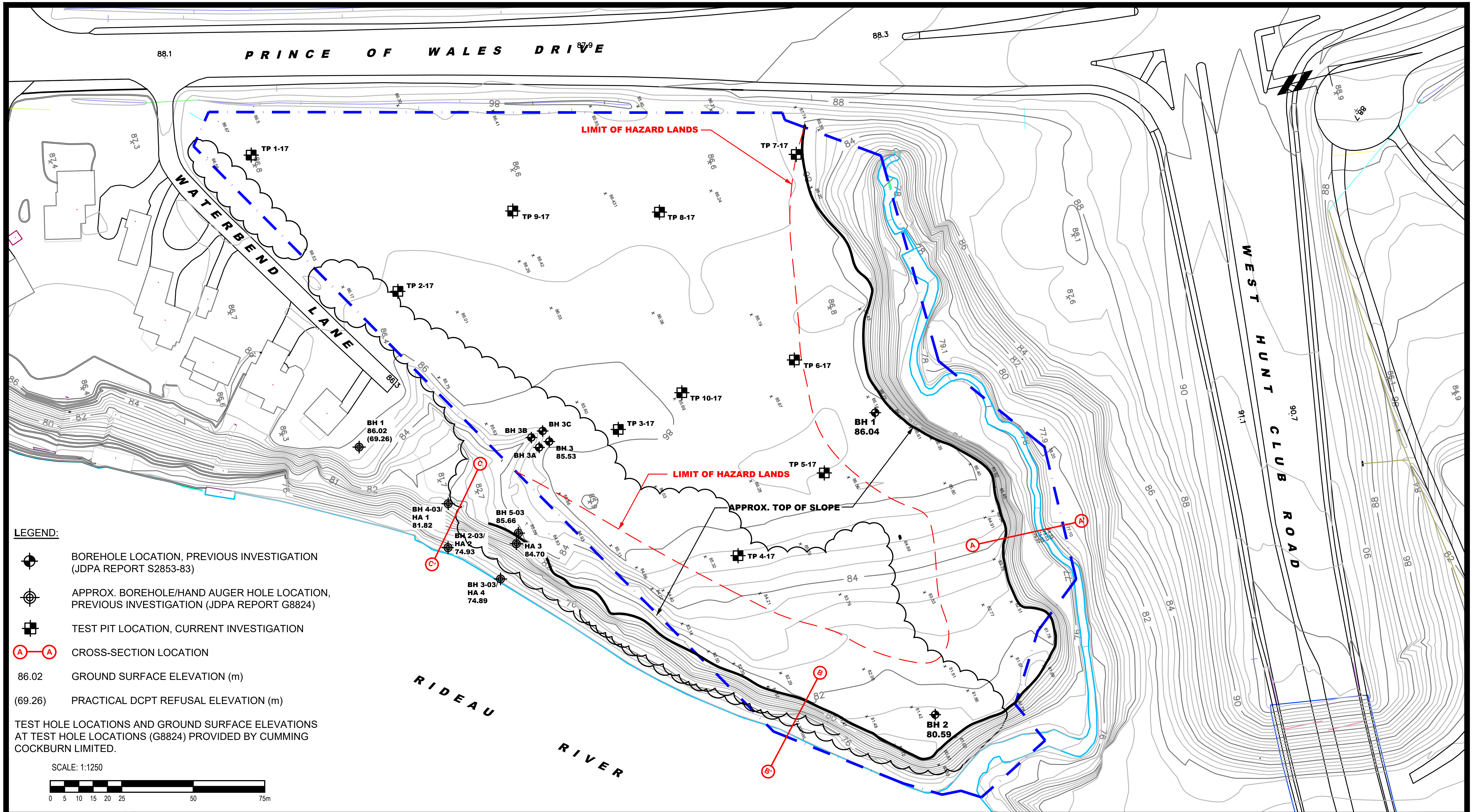


Figure 6 - Section C - Seismic Loading



LEGEND:

⊕	BOREHOLE LOCATION, PREVIOUS INVESTIGATION (JDPA REPORT S2853-83)
⊕	APPROX. BOREHOLE/HAND AUGER HOLE LOCATION, PREVIOUS INVESTIGATION (JDPA REPORT G8824)
▣	TEST PIT LOCATION, CURRENT INVESTIGATION
Ⓐ—Ⓐ	CROSS-SECTION LOCATION
86.02	GROUND SURFACE ELEVATION (m)
(69.26)	PRACTICAL DCPT REFUSAL ELEVATION (m)

TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS AT TEST HOLE LOCATIONS (G8824) PROVIDED BY CUMMING COCKBURN LIMITED.

SCALE: 1:1250

0 5 10 15 20 25 50 75m

PATERSON GROUP

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

NO.	REVISIONS	DATE	INITIAL

MYERS AUTOMOTIVE GROUP

PRELIMINARY GEOTECHNICAL INVESTIGATION
2175 PRINCE OF WALES DRIVE

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:1250

Date: 06/2024

Drawn by: NFRV

Report No.: PG6557-1

Checked by: FC

Dwg. No.: PG6557-1

Approved by: DP

Revision No.:

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