Geotechnical Engineering

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Geotechnical Investigation

Proposed Residential Development
Richmond Subdivision
Ottawa Street, Richmond, Ontario

Prepared For

Mattamy Homes

December 18, 2018

Report: PG4683-1

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Mattamy Homes (Mattamy) to complete a geotechnical investigation for the proposed residential development - Richmond Subdivision to be located along Ottawa Street, 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 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 Proposed Development

Based on current plans, it is understood that the proposed development will consist of a series of residential dwellings with the associated driveways, local roadways, landscaped areas and parking areas. A community park and a school building are also proposed as part of the subject development. The proposed development is also understood to be municipally serviced.

2.0 Method of Investigation

3.1 Field Investigation

The field program for the current investigation was conducted on October 31, 2018. At that time, a total of 8 test pits were advanced to a maximum depth of 3 m or excavation refusal. Previous geotechnical field investigations were completed by others in 2007. During that time, a total of 39 test holes consisting of a combination of test pits and borehole were extended to a maximum depth of 4.5 m. The results of the previous investigations completed by others are discussed in the present report. The locations of the test holes are shown on Drawing PG4683-1 - Test Hole Location Plan included in Appendix 2.

The test pits were completed using a rubber-tired 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 from the test pit locations were recovered from the test pit sidewalls at selected intervals. All soil samples were initially classified on site and placed in sealed plastic bags and transported to our laboratory. The depths at which the grab samples were recovered from the test pits are shown as, G on the Soil Profile and Test Data sheets presented in Appendix 1.

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.

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

3.2 Field Survey

The borehole locations were determined by Paterson personnel taking into consideration the presence of underground and aboveground services. The location and ground surface elevation at each borehole location were provided by Annis O'Sullivan Vollebekk (AOV). It is understood that the elevations were referenced to a geodetic datum. The test hole locations and ground surface elevations at the test hole locations are presented on Drawing PG4683-1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

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

A total of 5 atterberg limit tests were completed on selected soil samples. The results are presented under Subsection 4.2. In addition, 3 soil samples were submitted for grain size distribution analysis. The results of our testing are presented in Subsection 4.2 and on Grain Size Distribution sheets in Appendix 1.

It should be noted that a cone penetration testing (CPT) and grain size distribution and hydrometer analysis completed by others are also attached in Appendix 1.

4.0 Observations

4.1 Surface Conditions

Generally, the subject site consists of agricultural lands and lands formerly used for agricultural purposes. The ground surface across the subject site slopes down towards the north with a difference in elevation up to 8 m. Ottawa Street cuts the site within the central portion while Jock River borders the site along the south property line with an average slope of 8H:1V. Tree lines were observed around the perimeter of the site.

The site is bordered to the east by a residential development, to the south by the Jock River, to the north and west by agricultural lands.

4.2 Subsurface Profile

Overburden Profile

South and Central Portion

Generally, the subsurface profile encountered at the test hole locations within the south and central portions of the site mainly consists of topsoil overlying a compact to dense sandy silt deposit. Glacial till was encountered below the above noted layers consisting of sandy silt with gravel and varying amounts of cobbles and boulders. Shallow bedrock was encountered in the majority of the test pits within the south portion below a cultivated organic zone/topsoil and/or sandy silt deposit.

North Portion

Generally, the subsurface profile at the test hole locations within the north portion of the site consists of topsoil overlying a stiff brown silty clay to clayey silt deposit. The silty clay layer is underlain by a layer of compact to dense sandy silt. Glacial till was encountered below the above noted layers consisting of compact to dense brown sandy silt mixed with varying amounts of gravel, cobbles and boulders. Bedrock was encountered below a number of the test pit locations within the north portion of the site.

Atterberg Limit Tests

Atterberg limit testing of 5 samples was completed. The Plasticity Index of the underlying silty clay was measured to range from 8 to 31. The results of the atterberg limit testing on select silty clay samples are presented in Appendix 1.

Grain Size Distribution Tests

Three (3) sieve analyses were completed for the current investigation by this firm and 5 in the previous investigation by others to classify selected soil samples according to the Unified Soil Classification System (USCS). The results are presented in Appendix 1.

Bedrock

Based on available geological mapping, the bedrock in this area mostly consists of Dolomite of the Oxford formation with an overburden drift thickness of 1 to 10 m depth.

4.3 Groundwater

Based on the groundwater observations within the open holes and groundwater measurements completed by others, groundwater was encountered between 2 to 3 m below existing grade. Long-term groundwater conditions can also be estimated based on the observed colour and consistency of the recovered soil samples. Based on these observations, it is estimated that long-term groundwater level can be expected between 3 to 4 m depth. Groundwater levels are subject to seasonal fluctuations and therefore could vary during time of construction. The groundwater conditions observed at the test pits were recorded in detail in the field. Our groundwater observations are presented in the Soil Profile and Test Data sheets in Appendix 1.

5.0 Discussion

5.1 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 silty clay layer within the north portion of the site, residential buildings should be designed in accordance with Part 4 of the current Ontario Building Code (OBC). Also, due to the silty clay deposit within the north portion of the site, the proposed development will be subjected to grade raise restrictions.

Permissible grade raise recommendations have been designed for the north portion of the subject site. The recommended permissible grade raise areas are presented in Drawing PG4683-2 - 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.

Due to the presence of the Jock River bordering the south portion of the site, a slope stability analysis has been completed to identify the appropriate limit of hazard lands setback as per the Ottawa Guidelines .

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

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

5.2 Site Grading and Preparation

Stripping Depth

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

Due to the relatively shallow depth of the bedrock surface within the south portion of the site and the anticipated founding level for the proposed buildings, bedrock removal may be required.

Bedrock Removal

Bedrock removal can be accomplished by hoe ramming where only a small quantity of the bedrock needs to be removed. Sound bedrock may be removed by line drilling and controlled blasting and/or hoe ramming.

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

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

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

Excavation side slopes in sound bedrock can be excavated almost vertical side walls. A minimum 1 m horizontal ledge, should remain between the overburden excavation and the bedrock surface. The ledge will provide an area to allow for potential sloughing or a stable base for the overburden shoring system.

Vibration Considerations

Construction operations are the cause of vibrations, and possibly, sources of nuisance to the community. Therefore, means to reduce the vibration levels as much as possible should be incorporated in the construction operations to maintain, as much as possible, a cooperative environment with the residents.

The following construction equipments could be the source of vibrations: hoe ram, compactor, dozer, crane, truck traffic, etc. Vibrations, whether caused by blasting operations or by construction operations, could be the source of detrimental vibrations on the nearby buildings and structures. Therefore, all vibrations are recommended to be limited.

Two parameters are used to determine the permissible vibrations, namely, the maximum peak particle velocity and the frequency. For low frequency vibrations, the maximum allowable peak particle velocity is less than that for high frequency vibrations. As a guideline, the peak particle velocity should be less than 15 mm/s between frequencies of 4 to 12 Hz, and 50 mm/s above a frequency of 40 Hz (interpolate between 12 and 40 Hz). The guidelines are for current construction standards. Considering that these guidelines are above perceptible human level and, in some cases, could be very disturbing to some people, a pre-construction survey is recommended be completed to minimize the risks of claims during or following the construction of the proposed building.

Fill Placement

Fill used for grading beneath the building areas should consist, unless otherwise specified, of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II material. This material should be tested and approved prior to delivery to the site. The fill should be placed in lifts no greater than 300 mm thick and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the buildings should be compacted to at least 98% of its standard Proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil can be used as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If excavated stiff brown silty clay, free of organics and deleterious materials, is to be used to build up the subgrade level for areas to be paved, the silty clay, under dry conditions, should be compacted in thin lifts to a minimum density of 95% of their respective SPMDD. Non-specified existing fill and site-excavated soils are not suitable for use as backfill against foundation walls unless a composite drainage blanket connected to a perimeter drainage system is provided.

5.3 Foundation Design

Bearing Resistance Values

Conventional style shallow footings for 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)**
Undisturbed, Compact Sandy Silt	80	150
Undisturbed, Stiff Silty Clay/Clayey Silt	125	180
Undisturbed, Compact Glacial Till	150	250
Clean, Surface Sounded Bedrock	-	500
Note: Pad footings, up to 3 m wide, and strip footings, up to 2 m wide, can be designed using the above noted bearing resistance values placed over an undisturbed, 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 the abovenoted soils 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

Based on the undrained shear strength testing results, consolidation testing and experience with the local silty clay deposit. **The recommended permissible grade raise areas for buildings within the north portion of the site is 2 m above existing grade and are defined in Drawing PG4683-2 - Permissible Grade Raise Plan in Appendix 2.**

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

Scenario A

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

Scenario B

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

Option 1 - Use of Lightweight Fill

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

Option 2 - Preloading or Surcharging

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

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

5.4 Design for Earthquakes

For the south portion, 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.

For the north portion of the site, the bedrock depths do not exceed 5 m below existing grade. Assuming a conservative shear wave velocity of 200 m/s for all overburden, and a conservative shear wave velocity of 1,500 m/s for the bedrock, the average shear wave velocity pf the upper 30 m profile , Vs30, is estimated to be well above **360 m/s** throughout the north portion of the site. Therefore, the site class for seismic site response can be taken as **Class C** for the foundations within the north portion of the 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.

5.5 Basement Slab

With the removal of all topsoil and fill, containing deleterious or organic materials, the native soil will be considered to be an acceptable subgrade surface on which to commence backfilling for basement floor slab or slab on grade construction. Any soft areas should be removed and backfilled with appropriate backfill material. OPSS Granular A or Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab.

It is recommended that the upper 200 mm of sub-floor fill for basement slab construction consist of 19 mm clear crushed stone. All backfill materials within the footprint of the proposed buildings should be placed in maximum 300 mm thick loose layers and compacted to at least 98% of its SPMDD.

5.6 Pavement Structure

For design purposes, the pavement structure presented in the following tables is recommended for the design of the proposed pavement structures.

Table 2 - Recommended Pavement Structure - Car Only Parking Areas/Driveways

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 in situ soils or OPSS Granular B Type I or II material placed over in situ soil - Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.	

Table 3 - Recommended Pavement Structure - Local Roadways

Thickness (mm)	Material Description
40	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course -** HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
400	**SUBBASE** - OPSS Granular B Type II
- SUBGRADE - Either in situ soils or OPSS Granular B Type I or II material placed over in situ soil - Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.	

Table 4 - Recommended Pavement Structure - Arterial Roadways with Bus Traffic	
Thickness (mm)	**Material Description**
40	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Upper Binder Course -** HL-8 or Superpave 19.0 Asphaltic Concrete
50	**Lower Binder Course -** HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
550	**SUBBASE** - OPSS Granular B Type II
- SUBGRADE - Either in situ soils or OPSS Granular B Type I or II material placed over in situ soil - Minimum Performance Graded (PG) 64-34 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 (North Portion)

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.

Due to the low permeability of the subgrade materials consideration should be given to installing subdrains during the pavement construction as per City of Ottawa standards. The subdrain inverts should be approximately 300 mm below subgrade level. The subgrade surface should be crowned to promote water flow to the drainage lines.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

It is recommended that a perimeter foundation drainage system be provided for the proposed structures. The system should consist of a 150 mm diameter perforated corrugated plastic pipe, surrounded on all sides by 150 mm of 10 mm clear crushed stone, placed at the footing level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

Backfill against the exterior sides of the foundation walls should consist of free-draining non frost susceptible granular materials. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls, unless used in conjunction with a composite drainage system, such as Delta Drain 6000 or an approved equivalent. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should otherwise be used for this purpose.

6.2 Protection of Footings Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effect of frost action. A minimum of 1.5 m thick soil cover (or equivalent) should be provided in this regard.

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

6.3 Excavation Side Slopes

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

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

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

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

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

Excavation Base Stability

The base of supported excavations can fail by three (3) general modes:

- ❏ Shear failure within the ground caused by inadequate resistance to loads imposed by grade difference inside and outside of the excavation,
- ❏ Piping from water seepage through granular soils, and
- ❏ Heave of layered soils due to water pressures confined by intervening low permeability soils.

Shear failure of excavation bases is typically rare in granular soils if adequate lateral support is provided. Inadequate dewatering can cause instability in excavations made through granular or layered soils. The potential for base heave in cohesive soils should be determined for stability of flexible retaining systems.

The factor of safety with respect to base heave, FS_b, is:

$$FS_b = N_b s_u / \sigma_z$$

where:

N_b - stability factor dependent upon the geometry of the excavation and given in Figure 1 on the following page.
s_u - undrained shear strength of the soil below the base level
σ_z - total overburden and surcharge pressures at the bottom of the excavation

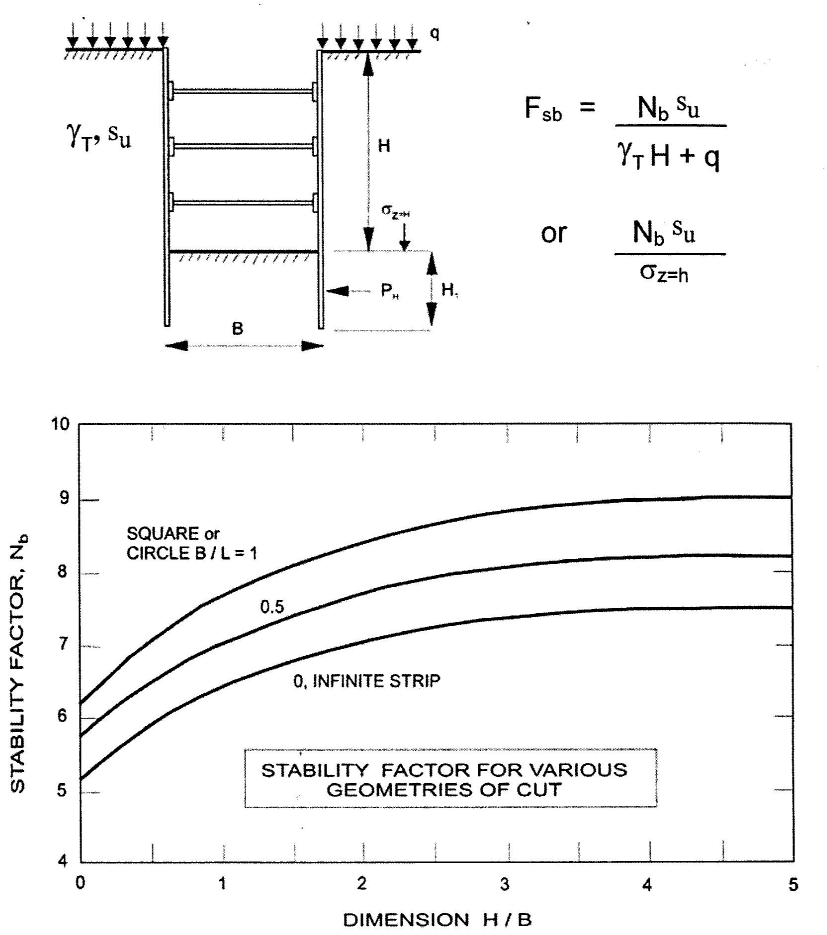

Figure 1 - Stability Factor for Various Geometries of Cut

In the case of soft to firm clays, a factor of safety of 2 is recommended for base stability.

6.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent Material Specifications & Standard Detail Drawings from the Department of Public Works and Services, Infrastructure Services Branch of the City of Ottawa.

At least 150 mm of OPSS Granular A should be used for bedding for sewer and water pipes when placed on soil subgrade. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to at least 300 mm above the obvert of the pipe should consist of OPSS Granular A (concrete or PSM PVC pipes) or sand (concrete pipe). The bedding and cover materials should be placed in maximum 225 mm thick lifts compacted to a minimum of 95% of the material's SPMDD.

Generally, it should be possible to re-use the moist, not wet, silty clay above the cover material if the excavation and filling operations are carried out in dry weather conditions. The wet silty clay should be given a sufficient drying period to decrease its moisture content to an acceptable level to make compaction possible prior to being re-used.

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

To reduce long-term lowering of the groundwater level at the north side of site, clay seals should be provided in the service trenches. The seals should be at least 1.5 m long and should extend from trench wall to trench wall. Generally, the seals should extend from the frost line and fully penetrate the bedding, subbedding and cover material. The barriers should consist of relatively dry and compactable brown silty clay placed in maximum 225 mm thick loose layers and compacted to a minimum of 95% of the material's SPMDD. The clay seals should be placed at the site boundaries and at strategic locations at no more than 60 m intervals in the service trenches.

6.5 Groundwater Control

Although, permeable sandy silt deposit covers the majority of the site, the groundwater level was estimated between 3 to 4 m depth. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations. 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..

Permit to Take Water

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

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

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

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project. The subsoil conditions at this site consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

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

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

6.7 Landscaping Considerations

Tree Planting Restrictions

In accordance with the City of Ottawa Tree Planting in Sensitive Marine Clay Soils (2017 Guidelines), Paterson completed a soils review of the site to determine applicable tree planting setbacks. Atterberg limits testing was completed for recovered silty clay samples at selected locations within the north portion of the subject site. Sieve analysis testing was also completed on selected soil samples. The abovenoted soil samples were recovered from elevations below the anticipated design underside of footing elevation and 3.5 m depth below anticipated finished grade. The results of our testing are presented in Appendix 1.

Based on the results of our review, the two tree planting setback areas are present within the proposed development. The two areas are detailed below and have been outlined in Drawing PG4683-3 - Tree Planting Setback Recommendations presented in Appendix 2.

Area 1 - Silty Sand to Sandy Silt Areas

No tree planting setback from foundation restrictions are required for the subject site due to the absence of a silty clay deposit within the future location of the proposed residential development (west portion of site).

Area 2 - Low to Medium Sensitivity Area

A low to medium sensitivity clay soil was encountered between anticipated underside of footing elevations and 3.5 m below preliminary finished grade as per City Guidelines at the areas outlined in Drawing PG4683-3 - Tree Planting Setback Recommendations in Appendix 2. Based on our Atterberg Limits test results, the modified plasticity limit does not exceed 40% in these areas. The following tree planting setbacks are recommended for the low to medium sensitivity area. Large trees (mature height over 14 m) can be planted within these areas provided a tree to foundation setback equal to the full mature height of the tree can be provided (e.g. in a park or other green space). Tree planting setback limits may be reduced to 4.5 m for small (mature tree height up to 7.5m) and medium size trees (mature tree height 7.5 m to 14 m) provided that the conditions noted below are met.

Aboveground Swimming Pools, Hot Tubs, Decks and Additions

The in-situ soils are considered to be acceptable for in-ground swimming pools. Above ground swimming pools must be placed at least 5 m away from the residence foundation and neighbouring foundations within the north portion of the site. Otherwise, pool construction is considered routine, and can be constructed in accordance with the manufacturer`s requirements.

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

Additional grading around proposed deck or addition should not exceed permissible grade raises along the north portion of the site. Otherwise, standard construction practices are considered acceptable.

6.8 Slope Stability Analysis

Slope Conditions

Based on our field observations and available topographic mapping, the subject slopes in the vicinity of the watercourse at the southeast end of the site are stable with no signs of active erosion and are sloped at 8H:1V slope or less. Test pits in close proximity to the existing slopes were analyzed to determine the subsurface soil conditions for our analysis.

Slope Stability Analysis

The slope stability analysis was modeled in SLIDE, a computer program which permits a two-dimensional slope stability analysis calculating several methods including the Bishop's method, which is a widely accepted slope analysis method. The program calculates a factor of safety, which represents the ratio of the forces resisting failure to forces 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 the variability of the subsurface soil and groundwater conditions, a factor of safety greater than 1.0 is generally required for the failure risk to be considered acceptable. A minimum factor of safety of 1.5 is generally recommended for conditions where the slope failure would comprise permanent structures. An analysis considering seismic loading was also completed. A horizontal acceleration of 0.16 g was considered for the sections for the seismic loading condition. A factor of safety of 1.1 is considered to be satisfactory for stability analyses including seismic loading.

Three (3) slope cross-sections (Sections A, B, C) were studied as the worst case scenarios. The cross section locations are presented on Drawing PG4683-1 - Test Hole Location Plan in Appendix 2. It should be noted that details of the slope height and slope angle at the cross-section locations are presented in Figures 2A through 4B in Appendix 2 from the topographic data identified on Drawing PG4683-1 - Test Hole Location Plan in Appendix 2.

Stable Slope Allowance

The static analysis results for slope sections A, B, and are presented in Figures 2A, 3A,and 4A, respectively, provided in Appendix 2. The factor of safety for the slopes was greater than 1.5 for the slope sections analysed.

The results of the analyses with seismic loading are shown in Figures 2B, 3B, and 4B presented in Appendix 2. The results indicate that the factor of safety for the sections are greater than 1.1. Based on these results, the slopes are considered to be stable under seismic loading.

As the slopes were determined to be stable under static and seismic conditions for the sections analyzed, a stable slope allowance is not required.

Toe Erosion and Erosion Access Allowance

The slopes were generally observed to be vegetated with trees and brush. Further, flow from the creek in the watercourse at the base of the slopes was observed to be minimal, with no signs of significant active erosion observed at the toe of the slopes. Nonetheless, a conservative toe erosion allowance of 5 m was utilized.

A 6 m erosion access allowance is recommended to be applied from the top of stable slope for the slopes to allow for future maintenance of the slope.

Limit of Hazard Lands

Limit of hazard lands are not required for this site as the combined setback of the toe erosion and erosion access allowances do not extend beyond the limits of the flood zone. Therefore, the proposed limit of development is not limited by the slope stability.

It is recommended that the existing vegetation and mature trees not be removed from the slope faces as the presence of the vegetation reduces surficial erosion activities. If the existing vegetation needs to be removed along the slope faces, it is recommended that a 100 to 150 mm of topsoil mixed with a hardy seed or an erosional control blanket be placed across the exposed slope face.

7.0 Recommendations

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

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

A report confirming that these works have been conducted in general accordance with our recommendations could be issued, upon request, following the completion of a satisfactory materials testing and observation program by the geotechnical consultant.

8.0 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 Mattamy Homes 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:

- ❑ Mattamy Homes (3 copies)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

BOREHOLES BY OTHERS

ATTERBERG LIMITS' TESTING RESULTS

GRAIN SIZE DISTRIBUTION TESTING RESULTS

GRAIN SIZE DISTRIBUTION TESTING AND HYDROMETER TESTING RESULTS - BY OTHERS

CPT TESTING RESULTS BY OTHERS

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Ottawa Street
Ottawa, Ontario

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

FILE NO. PG4683

REMARKS

HOLE NO. TP 1-18

BORINGS BY Backhoe **DATE** 31 October 2018

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	94.76		
TOPSOIL with organics, some silty clay		G	1						
0.30									
Brown **SILTY CLAY to CLAYEY SILT,** some sand		G	2						
0.70									
		G	3			1	93.76		
		G	4						
		G	5						
Compact, brown **SANDY SILT**		G	6			2	92.76		
2.80									
GLACIAL TILL: Compact to dense, brown sandy silt, trace gravel, occasional cobbles, boulders		G	7			3	91.76		
3.00									
End of Test Pit									
(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

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Ottawa Street
Ottawa, Ontario

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

FILE NO. PG4683

REMARKS

HOLE NO. TP 2-18

BORINGS BY Backhoe **DATE** 31 October 2018

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 with organics, some silty clay		G	1			0	94.53		
0.20									
Very stiff, brown **SILTY CLAY**		G	2						
0.60									
Very stiff, light brown **CLAYEY SILT to SANDY SILT**		G	3			1	93.53		
1.00									
		G	4						
		G	5						
Compact, brown **SANDY SILT**									
- trace gravel to 1.5m depth		G	6						
		G	7			2	92.53		
2.50		G	8						
End fo Test Pit									
(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

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Ottawa Street
Ottawa, Ontario

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

FILE NO. PG4683

REMARKS

HOLE NO. TP 3-18

BORINGS BY Backhoe **DATE** 31 October 2018

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	94.22		
TOPSOIL with organics, some silty clay		G	1						
0.20									
		G	2						
Very stiff, brown **SILTY CLAY**		G	3			1	93.22		
1.20		G	4						
		G	5						
		G	6						
Compact, brown **SANDY SILT**						2	92.22		
		G	7						
		G	8						
2.70									
End of Test Pit									
(TP dry upon completion)									

Pen. Resist. Blows/0.3m: 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 - Ottawa Street
Ottawa, Ontario

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

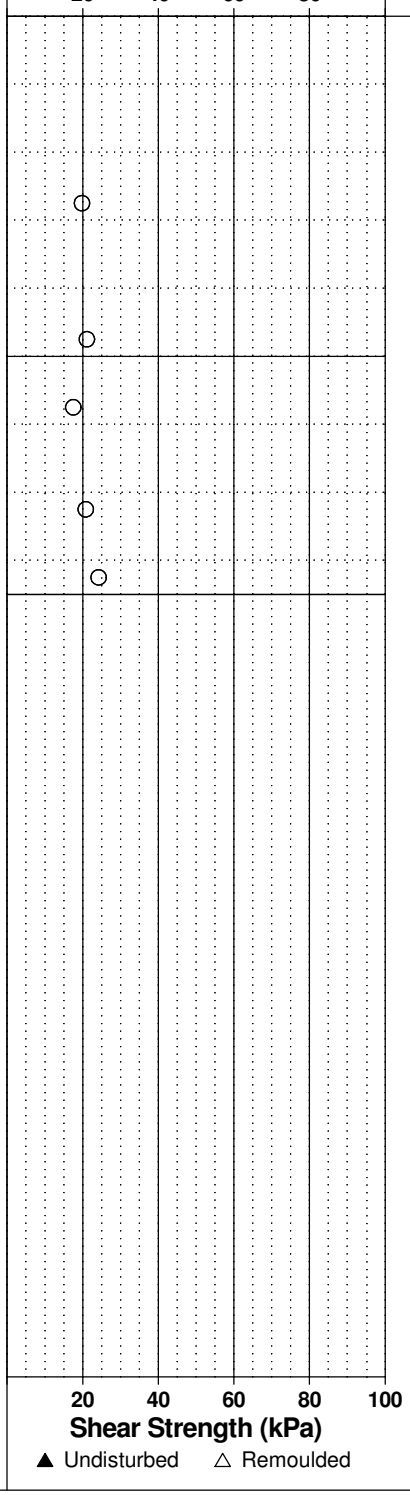
FILE NO. PG4683

REMARKS

HOLE NO. TP 4-18

BORINGS BY Backhoe **DATE** 31 October 2018

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	95.01		
TOPSOIL with organics, some silty clay		G	1						
0.30									
Compact, brown **SANDY SILT,** trace clay		G	2						
- trace gravel to 0.8m depth		G	3			1	94.01		
		G	4						
1.40									
Compact, brown **SILTY SAND**		G	5						
1.70		G	6						
End of Test Pit									
Practical refusal to excavation on inferred bedrock surface at 1.70m depth									
(TP dry upon completion)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Ottawa Street
Ottawa, Ontario

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

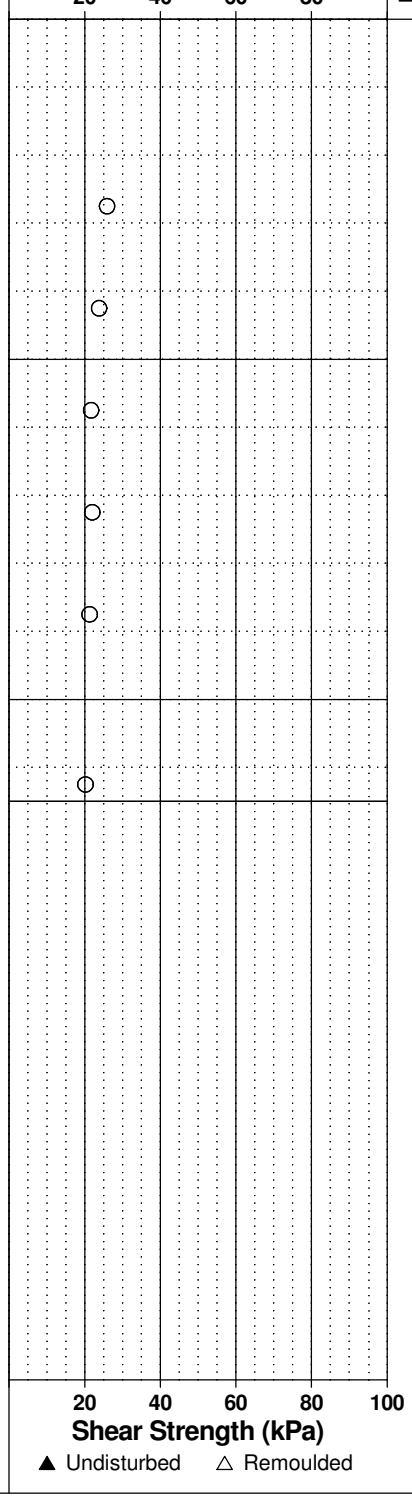
FILE NO. PG4683

REMARKS

HOLE NO. TP 5-18

BORINGS BY Backhoe **DATE** 31 October 2018

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 with organics, trace silty clay		G	1			0	94.70		
0.25									
Compact, brown **SANDY SILT to CLAYEY SILT**		G	2						
0.60		G	3						
		G	4			1	93.70		
Compact, brown **SANDY SILT**		G	5						
- trace gravel from 1.3 to 1.6m depth		G	6						
						2	92.70		
2.30		G	7						
End of Test Pit									
(TP dry upon completion)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Ottawa Street
Ottawa, Ontario

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

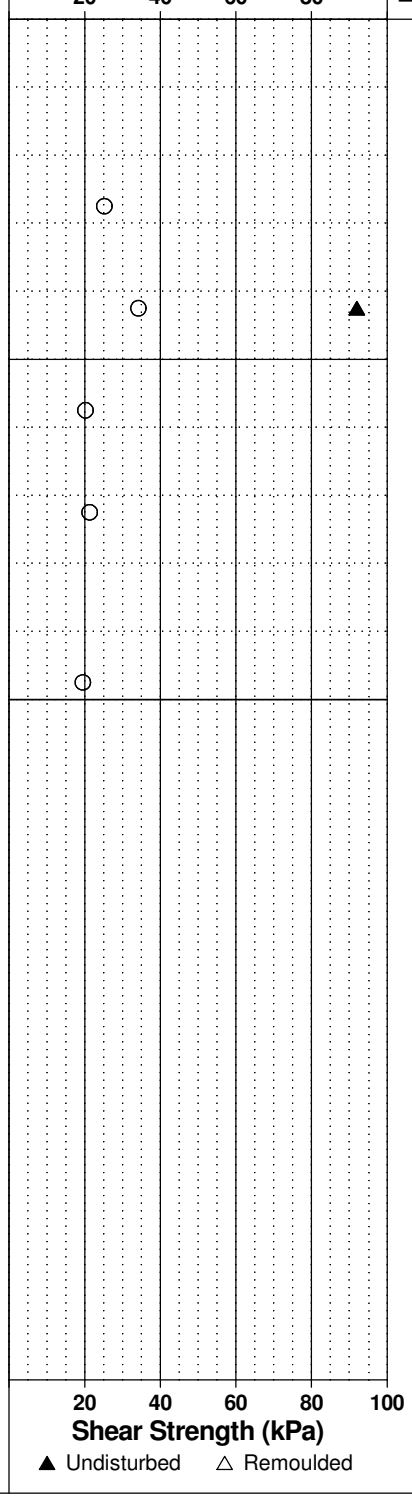
FILE NO. PG4683

REMARKS

HOLE NO. TP 6-18

BORINGS BY Backhoe **DATE** 31 October 2018

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 with organics, trace silty clay		G	1			0	94.58		
0.30									
Very stiff, brown **SILTY CLAY,** trace sand		G	2						
0.90		G	3			1	93.58		
		G	4						
Compact, brown **SANDY SILT**		G	5						
2.00		G	6			2	92.58		
End of Test Pit									
(TP dry upon completion)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Ottawa Street
Ottawa, Ontario

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

FILE NO. PG4683

REMARKS

HOLE NO. TP 7-18

BORINGS BY Backhoe **DATE** 31 October 2018

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									
TOSPOIL with organics, trace silty clay		G	1			0	95.17		
0.25									
Compact, brown **SANDY SILT,** trace clay		G	2						
- clay content decreasing with depth									
0.60									
		G	3						
		G	4			1	94.17		
Compact, brown **SANDY SILT**		G	5						
2.00		G	6			2	93.17		
End of Test Pit									
(TP dry upon completion)									

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

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Ottawa Street
Ottawa, Ontario

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

FILE NO. PG4683

REMARKS

HOLE NO. TP 8-18

BORINGS BY Backhoe **DATE** 31 October 2018

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	94.80		
TOPSOIL with organics, trace silty sand		G	1						
0.30									
Compact, brown **SANDY SILT,** trace clay		G	2						
- clay content decreasing with depth)									
0.70									
		G	3			1	93.80		
		G	4						
Compact, brown **SANDY SILT**		G	5						
		G	6						
2.00		G	7			2	92.80		
End of Test Pit									
(TP dry upon completion)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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

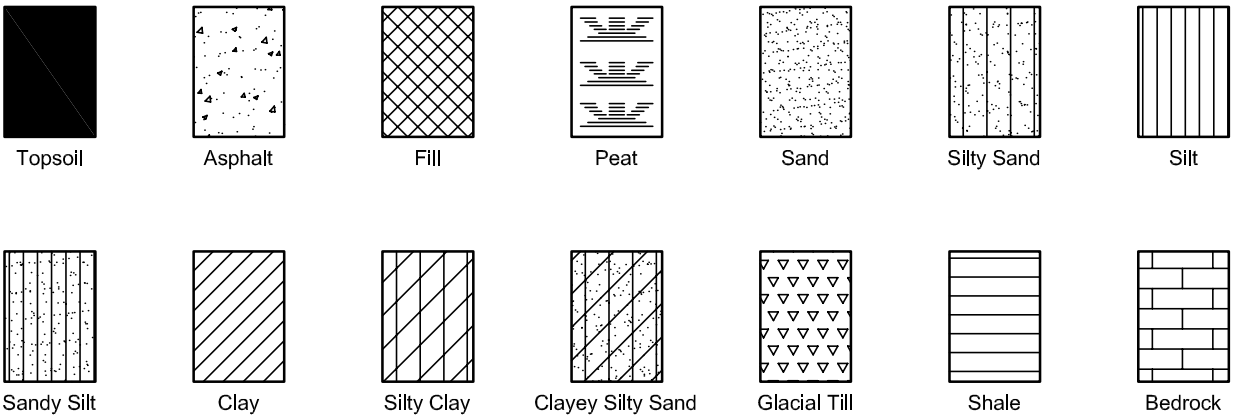
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

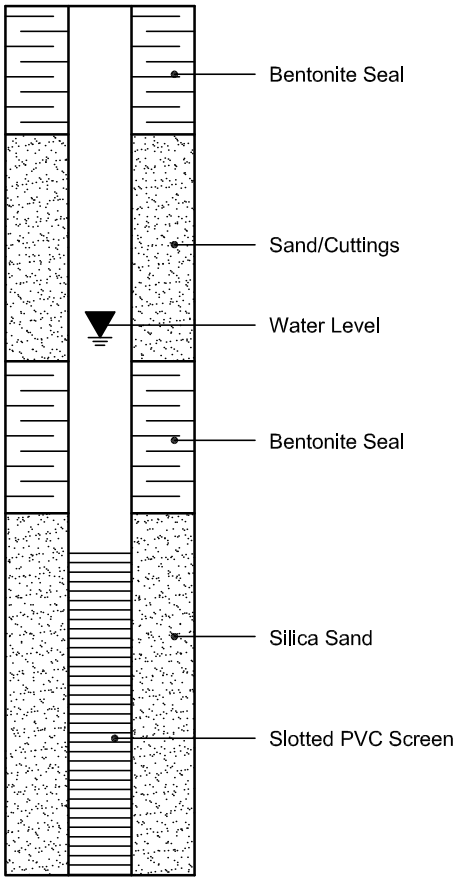
SYMBOLS AND TERMS (continued)

STRATA PLOT

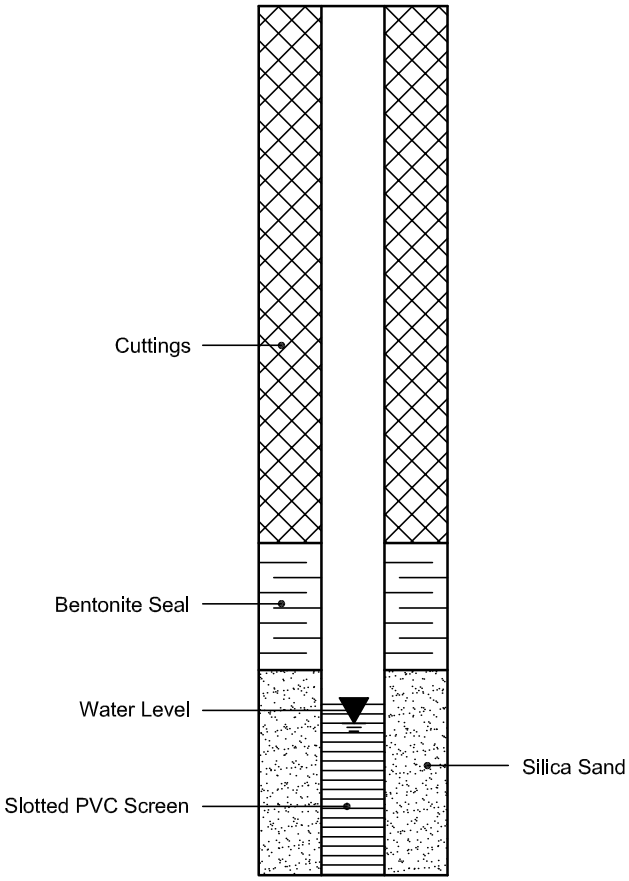


MONITORING WELL AND PIEZOMETER CONSTRUCTION

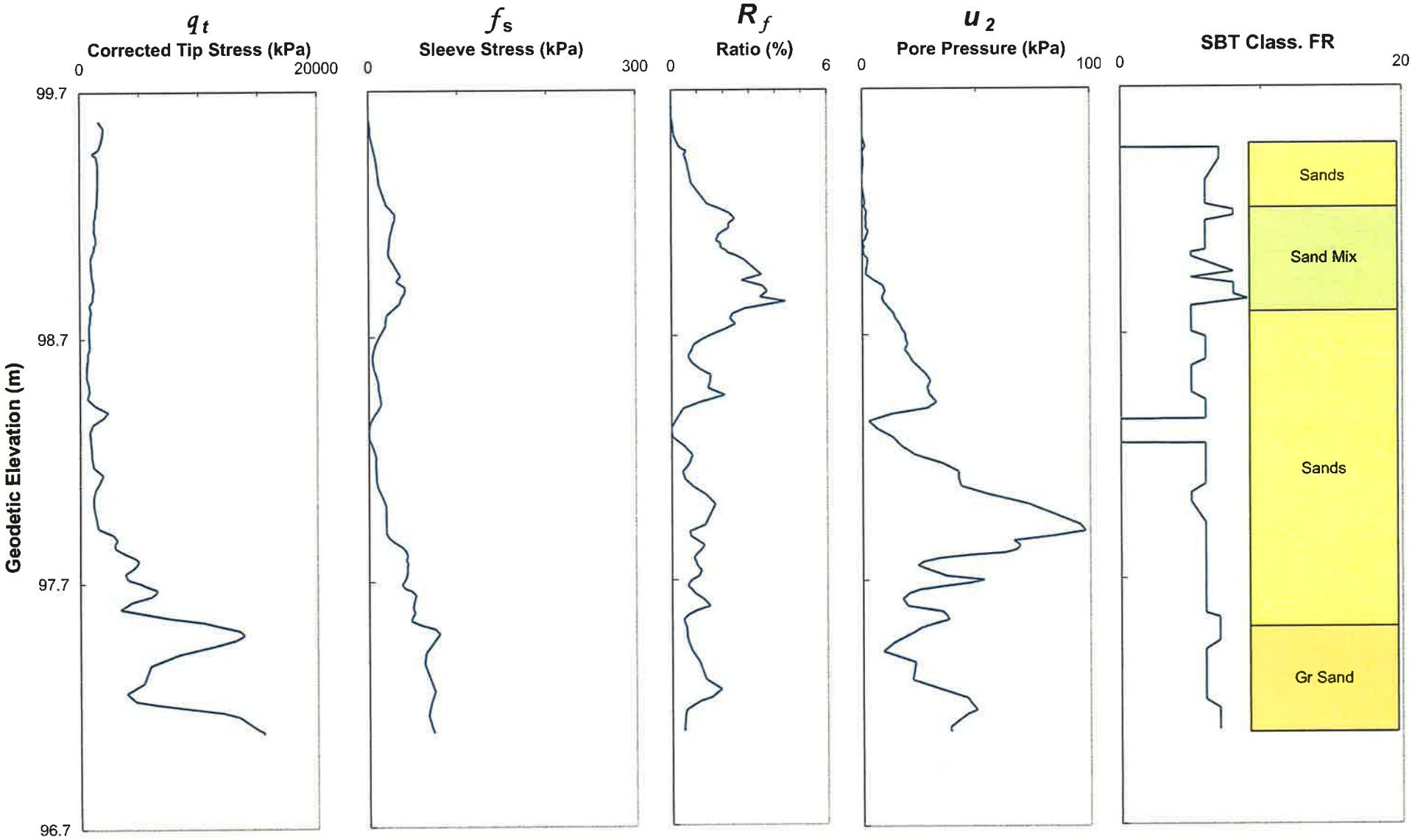
MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Jacques Whitford	Elevation: 99.64 m SCPTu Start Elevation: 99.64 m Groundwater Elevation: 98.19 m	Test Date: June 15, 2007 Project No. 1026929	CPT 07-35
	Client: Mattamy Homes Project: Proposed Residential Subdivision, Richmond, ON		



Class FR: Friction Ratio Classification (Robertson, 1990)

Jacques Whitford

TEST PIT RECORD

TP07-33

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 15, 2007 WATER LEVEL

BOREHOLE No. TP07-33

PROJECT No. 1026929

DATUM Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
	99.45							
0	99.3	150 mm TOPSOIL			BS	1		
		Stiff, brown lean CLAY (CL)						
					BS	2		
1								
	98.0				BS	3		
		Dense, brown SANDY SILT (ML)						
2					BS	4		
					BS	5		
3	96.2							
		Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	6		
	95.4				BS	7		
4		End of Borehole						
		Refusal on Inferred Bedrock						
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-34

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 15, 2007 WATER LEVEL

BOREHOLE No. TP07-34

PROJECT No. 1026929

DATUM Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	RECOVERY (mm)	N-VALUE OR RQD
0	99.56							
	99.3	250 mm TOPSOIL			BS	1		
		Stiff, brown lean CLAY (CL)			BS	2		
1				▽	BS	3		
2	97.6	Dense, brown to grey SANDY SILT (ML)			BS	4		
					BS	5		
3	96.3				BS	6		
	96.0	Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	7		
4		End of Borehole Refusal on Inferred Bedrock						
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-36

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 15, 2007 WATER LEVEL

BOREHOLE No. TP07-36

PROJECT No. 1026929

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	**100.16**							
	100.0	200 mm TOPSOIL			BS	1		
		Stiff, brown lean CLAY (CL)						
					BS	2		
1	99.1							
		Dense, brown SANDY SILT (ML)		▽	BS	3		
2					BS	4		
	97.3				BS	5		
3		End of Borehole Refusal on Inferred Bedrock						
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

MONITORING WELL RECORD

MW07-37

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL June 20, 2007

BOREHOLE No. MW07-37

PROJECT No. 1026929

DATUM Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD
0	99.62							
	99.5	75 mm TOPSOIL						
		Firm, greyish brown lean CLAY (CL)		▼	SS	1	150	6
1					SS	2	300	6
	98.4	Compact to dense, greyish brown SANDY SILT (ML)		▽				
2					SS	3	350	37
					SS	4	320	27
3	96.4							
	96.2	Compact to dense, grey SANDY SILT (ML)			SS	5	280	50/ 75 mm
4		End of Borehole						
		Auger Refusal on Inferred Bedrock						
5		Monitoring Well Installed						
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd _____

△ Pocket Penetrometer Test, kPa Date _____

JWL-OLD 1026929.GPJ SMART.GDT 07/06/22

Jacques Whitford

TEST PIT RECORD

TP07-38

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 15, 2007 WATER LEVEL

BOREHOLE No. TP07-38

PROJECT No. 1026929

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	99.75							
	99.6	200 mm TOPSOIL			BS	1		
		Stiff, brown lean CLAY (CL)			BS	2		
1					BS	3		
	98.2							
		Dense, brown SANDY SILT (ML)			BS	4		
2					BS	5		
3					BS	6		
	96.4							
		Dense, brown sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	7		
4	95.8							
		End of Borehole						
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Jacques Whitford

TEST PIT RECORD

TP07-39

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 15, 2007 WATER LEVEL

BOREHOLE No. TP07-39

PROJECT No. 1026929

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	99.83							
	99.6	220 mm TOPSOIL			BS	1		
		Stiff, brown lean CLAY (CL)			BS	2		
1					BS	3		
	98.1			▽				
		Dense, brown SANDY SILT (ML)			BS	4		
2					BS	5		
	96.9				BS	6		
3		End of Borehole Refusal on Inferred Bedrock						
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

App'd

Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

MONITORING WELL RECORD

MW07-40

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 15, 2007 WATER LEVEL

BOREHOLE No. MW07-40

PROJECT No. 1026929

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	100.26							
	100.1	150 mm TOPSOIL						
		Compact to dense, brownish grey SANDY SILT (ML)		▽	SS	1	320	7
1					SS	2	420	17
	98.3				SS	3	300	50/ 50 mm
2		End of Borehole						
		Auger Refusal on Inferred Bedrock						
3		Monitoring Well Installed						
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/22

Jacques Whitford

TEST PIT RECORD

TP07-41

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 15, 2007 WATER LEVEL

BOREHOLE No. TP07-41

PROJECT No. 1026929

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	99.77							
	99.6	200 mm TOPSOIL						
		Compact to dense, grey and brown SANDY SILT (ML)		▽	BS	1		
1					BS	2		
	98.0				BS	3		
2	97.6	Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	4		
		End of Borehole Refusal on Inferred Bedrock						
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-42

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL

BOREHOLE No. TP07-42

PROJECT No. 1026929

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	100.05							
	99.8	200 mm TOPSOIL						
		Compact to dense, brown to grey SANDY SILT (ML)		▽	BS	1		
1					BS	2		
2	98.0							
		Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	3		
					BS	4		
3	96.7				BS	5		
		End of Borehole Refusal on Inferred Bedrock						
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-43

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL

BOREHOLE No. TP07-43

PROJECT No. 1026929

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	**100.16**							
	100.0	200 mm TOPSOIL			BS	1		
		Compact to dense, brown to grey SANDY SILT (ML)		▽	BS	2		
1					BS	3		
2					BS	4		
	97.5							
		Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	5		
3	97.0				BS	6		
		End of Borehole						
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-44

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 15, 2007 WATER LEVEL

BOREHOLE No. TP07-44

PROJECT No. 1026929

DATUM Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	RECOVERY (mm)	N-VALUE OR RQD
0	**100.41**							
	100.2	200 mm TOPSOIL						
		Compact to dense, brown to grey SANDY SILT (ML)		▽	BS	1		
					BS	2		
1					BS	3		
	98.8							
		Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	4		
2	98.1				BS	5		
		End of Borehole						
		Refusal on Inferred Bedrock						
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-45

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 15, 2007 WATER LEVEL June 20, 2007

BOREHOLE No. TP07-45

PROJECT No. 1026929

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	100.19							
	100.0	200 mm TOPSOIL						
		Compact to dense, brown to grey SANDY SILT (ML)		▽	BS	1		
1					BS	2		
				▼	BS	3		
	98.3							
2		Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	4		
	97.3							
3		End of Borehole						
		Refusal on Inferred Bedrock						
		Standpipe Installed						
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-46

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL

BOREHOLE No. TP07-46

PROJECT No. 1026929

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	100.16							
	99.9	300 mm TOPSOIL						
		Compact to dense, brown to grey SANDY SILT (ML)		▽	BS	1		
					BS	2		
1					BS	3		
2					BS	4		
3					BS	5		
	96.8							
		Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	6		
4	96.2				BS	7		
		End of Borehole						
		Refusal on Inferred Bedrock						
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-47

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL June 20, 2007

BOREHOLE No. TP07-47

PROJECT No. 1026929

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	100.24							
	100.0	200 mm TOPSOIL			BS	1		
		Stiff, brown lean CLAY (CL)						
	99.6				BS	2		
1		Compact to dense, brown and grey SANDY SILT (ML)			BS	3		
					BS	4		
2					BS	5		
					BS	6		
3	97.0							
		Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	7		
4					BS	8		
	95.7				BS	9		
		End of Borehole						
5		Standpipe Installed						
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-48

CLIENT Mattamy Homes — BOREHOLE No. TP07-48

LOCATION Proposed Subdivision, Richmond, ON — PROJECT No. 1026929

DATES: BORING June 15, 2007 — WATER LEVEL — DATUM Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**100.51**							
	100.4	150 mm TOPSOIL						
		Compact to dense, brown and grey SANDY SILT (ML)		▽	BS	1		
					BS	2		
1					BS	3		
					BS	4		
2					BS	5		
	98.0							
		Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	6		
3								
	96.9				BS	7		
		End of Borehole						
		Refusal on Inferred Bedrock						
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Jacques Whitford

TEST PIT RECORD

TP07-49

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL

BOREHOLE No. TP07-49

PROJECT No. 1026929

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	**100.67**							
	100.4	230 mm TOPSOIL						
		Compact to dense, brown and grey SANDY SILT (ML)			BS	1		
1					BS	2		
	98.7				BS	3		
2		End of Borehole Refusal on Inferred Bedrock						
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-50

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL

BOREHOLE No. TP07-50

PROJECT No. 1026929

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	100.42							
		300 mm TOPSOIL			BS	1		
	100.1	Compact to dense, brown and grey SANDY SILT (ML)		▽	BS	2		
					BS	3		
1					BS	4		
					BS	5		
2								
					BS	6		
3					BS	7		
	96.9							
	96.6	Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	8		
4		End of Borehole Refusal on Inferred Bedrock						
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Jacques Whitford

TEST PIT RECORD

TP07-51

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL

BOREHOLE No. TP07-51

PROJECT No. 1026929

DATUM Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	RECOVERY (mm)	N-VALUE OR RQD
0	**100.34**							
	100.0	300 mm TOPSOIL						
		Compact to dense, brown and grey SANDY SILT (ML)		▽	BS	1		
1					BS	2		
					BS	3		
2					BS	4		
	97.5							
		Dense, grey SANDY SILT			BS	5		
3					BS	6		
	96.3				BS	7		
4		End of Borehole						
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-52

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL

BOREHOLE No. TP07-52

PROJECT No. 1026929

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	100.59							
	100.3	280 mm TOPSOIL			BS	1		
		Compact to dense, brown and grey SANDY SILT (ML)		▽	BS	2		
1					BS	3		
2					BS	4		
	98.1							
		Dense, grey SANDY SILT			BS	5		
3	97.4							
		Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	6		
4					BS	7		
	96.1				BS	8		
		End of Borehole						
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Jacques Whitford

TEST PIT RECORD

TP07-53

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 15, 2007 WATER LEVEL

BOREHOLE No. TP07-53

PROJECT No. 1026929

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	**100.94**							
	100.7	200 mm TOPSOIL			BS	1		
		Firm, brown lean CLAY (CL)						
1					BS	2		
	99.4							
		Compact to dense, brown and grey SANDY SILT (ML)		▽	BS	3		
2					BS	4		
	98.5							
		Dense, grey sandy silt, trace gravel, occasional cobbles and boulders: TILL (ML)			BS	5		
3								
	97.4				BS	6		
		End of Borehole						
		Refusal on Inferred Boulders						
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

App'd

Date

Jacques Whitford

TEST PIT RECORD

TP07-54

CLIENT Mattamy Homes — BOREHOLE No. TP07-54

LOCATION Proposed Subdivision, Richmond, ON — PROJECT No. 1026929

DATES: BORING June 15, 2007 — WATER LEVEL — DATUM Local

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	101.37							
	101.2	200 mm TOPSOIL			BS	1		
		Compact to dense, brown and grey SANDY SILT (ML)			BS	2		
1					BS	3		
				▽	BS	4		
2					BS	5		
	98.4							
3		Dense, grey SANDY SILT (ML)			BS	6		
4					BS	7		
	96.9							
		End of Borehole						
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Jacques Whitford

TEST PIT RECORD

TP07-55

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL

BOREHOLE No. TP07-55

PROJECT No. 1026929

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	101.07							
	100.9	180 mm TOPSOIL			BS	1		
		Compact to dense, brown and grey SANDY SILT (ML)			BS	2		
					BS	3		
1				▽	BS	4		
	99.1							
2		Dense, grey SANDY SILT (ML)			BS	5		
	98.3							
3		Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	6		
					BS	7		
4	97.0							
		End of Borehole						
		Refusal on Inferred Bedrock						
		Standpipe Installed						
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-56

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL

BOREHOLE No. TP07-56

PROJECT No. 1026929

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	**101.21**							
	101.0	200 mm TOPSOIL			BS	1		
		Compact to dense, brown and grey SANDY SILT (ML)		▽	BS	2		
1					BS	3		
2	99.2							
		Dense, grey SANDY SILT (ML)			BS	4		
3	98.0				BS	5		
		Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	6		
	97.6	End of Borehole						
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Jacques Whitford

TEST PIT RECORD

TP07-57

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 15, 2007 WATER LEVEL

BOREHOLE No. TP07-57

PROJECT No. 1026929

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	102.95							
	102.7	200 mm TOPSOIL			BS	1		
		End of Borehole Refusal on Inferred Bedrock						
1								
2								
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-58

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 15, 2007 WATER LEVEL

BOREHOLE No. TP07-58

PROJECT No. 1026929

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	**101.39**							
	101.2	200 mm TOPSOIL			BS	1		
	100.9	Compact to dense, brown and grey SILTY SAND (SM)			BS	2		
	100.5	Dense, grey sandy silt, trace gravel: TILL (ML)			BS	3		
1		End of Borehole Refusal on Inferred Bedrock						
2								
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-59

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL

BOREHOLE No. TP07-59

PROJECT No. 1026929

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	101.13							
	100.9	200 mm TOPSOIL			BS	1		
		Compact to dense, brown						
	100.6	SANDY SILT (ML)			BS	2		
		End of Borehole						
		Refusal on Inferred Bedrock						
1								
2								
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Jacques Whitford

TEST PIT RECORD

TP07-60

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL

BOREHOLE No. TP07-60

PROJECT No. 1026929

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	**101.36**							
	101.2	200 mm TOPSOIL			BS	1		
		Compact to dense, brown and grey SANDY SILT (ML)			BS	2		
	100.5				BS	3		
1		Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	4		
	99.5				BS	5		
2		End of Borehole Refusal on Inferred Bedrock						
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Jacques Whitford

TEST PIT RECORD

TP07-61

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 15, 2007 WATER LEVEL

BOREHOLE No. TP07-61

PROJECT No. 1026929

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	102.15							
	101.9	230 mm TOPSOIL			BS	1		
	101.8	Compact to dense, brown SILTY SAND (SM)			BS	2		
	101.5	Fractured Bedrock						
		End of Borehole						
1		Refusal on Inferred Bedrock						
2								
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-62

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 15, 2007 WATER LEVEL

BOREHOLE No. TP07-62

PROJECT No. 1026929

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	101.68							
	101.4	200 mm TOPSOIL			BS	1		
	101.2	Compact to dense, brown and grey SANDY SILT (ML)			BS	2		
	101.0	Dense, brown sandy silt, trace gravel, occasional cobbles: TILL (ML)			BS	3		
1		End of Borehole Refusal on Inferred Bedrock						
2								
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Jacques Whitford

TEST PIT RECORD

TP07-63

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL

BOREHOLE No. TP07-63

PROJECT No. 1026929

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	**101.44**							
	101.2	200 mm TOPSOIL			BS	1		
	101.0	Compact to dense, brown SANDY SILT (ML)			BS	2		
		End of Borehole						
		Refusal on Inferred Bedrock						
1								
2								
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

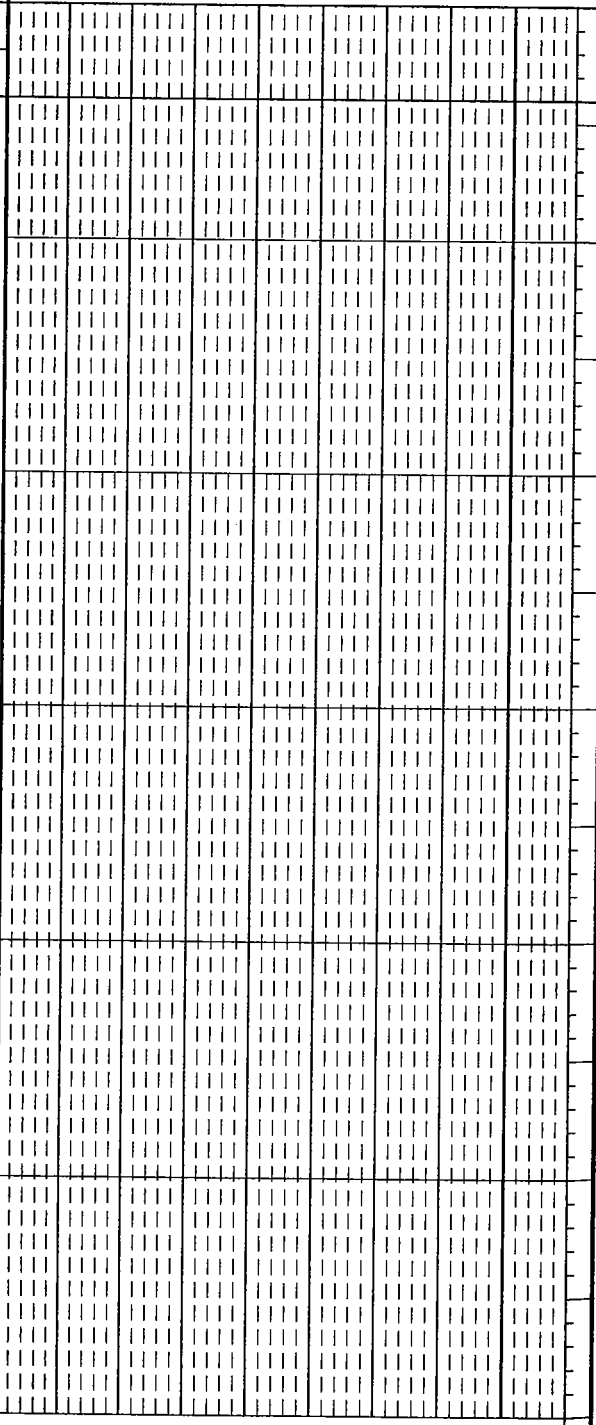
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90



▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Jacques Whitford

TEST PIT RECORD

TP07-64

CLIENT Mattamy Homes
LOCATION Proposed Subdivision, Richmond, ON
DATES: BORING June 14, 2007 WATER LEVEL

BOREHOLE No. TP07-64
PROJECT No. 1026929
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	**101.32**							
	101.1	230 mm TOPSOIL			BS	1		
		Compact to dense, brown SILTY SAND (SM)			BS	2		
1	100.2			▽				
		Dense, grey SILTY SAND (SM)			BS	3		
					BS	4		
2	98.9							
		Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (SM)			BS	5		
					BS	6		
3	97.8							
		End of Borehole						
		Refusal on Inferred Bedrock						
4								
5								
6								

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

▽ Inferred Groundwater Level
▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa
□ Remoulded Vane Test, kPa App'd
△ Pocket Penetrometer Test, kPa Date

Jacques Whitford

TEST PIT RECORD

TP07-65

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 15, 2007 WATER LEVEL

BOREHOLE No. TP07-65

PROJECT No. 1026929

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	**100.15**							
	99.9	250 mm TOPSOIL			BS	1		
		Compact to dense, brown SILTY SAND (SM)			BS	2		
	99.3	Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (SM)		▽	BS	3		
1					BS	4		
2					BS	5		
	97.2	End of Borehole Refusal on Inferred Bedrock or Boulders						
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-66

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL June 20, 2007

BOREHOLE No. TP07-66

PROJECT No. 1026929

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	100.48							
	100.4	100 mm TOPSOIL			BS	1		
		Compact to dense, brown to grey SILTY SAND (SM)			BS	2		
1				▽	BS	3		
	98.9				BS	4		
		Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (SM)						
2					BS	5		
3					BS	6		
	97.0							
		End of Borehole						
		Refusal on Inferred Boulders						
4		Standpipe Installed						
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-67

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL

BOREHOLE No. TP07-67

PROJECT No. 1026929

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	**101.50**							
	101.3	200 mm TOPSOIL			BS	1		
		Compact, brown SILTY SAND (SM)		▽				
					BS	2		
1					BS	3		
	100.2							
	99.9	Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (SM)			BS	4		
		End of Borehole						
2		Refusal on Inferred Bedrock						
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/21

Jacques Whitford

TEST PIT RECORD

TP07-68

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 20, 2007 WATER LEVEL

BOREHOLE No. TP07-68

PROJECT No. 1026929

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		130 mm TOPSOIL			BS	1		
		Compact, brown SILTY SAND (SM)			BS	2		
		Compact to dense, brown and grey SANDY SILT (ML)			BS	3		
1					BS	4		
		End of Hand Auger Hole Hand Auger Refusal						
2								
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Jacques Whitford

TEST PIT RECORD

TP07-69

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 20, 2007 WATER LEVEL

BOREHOLE No. TP07-69

PROJECT No. 1026929

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		150 mm TOPSOIL			BS	1		
		Compact, brown silty sand, trace gravel, occasional cobbles: TILL			BS	2		
1		End of Hand Auger Hole Hand Auger Refusal						
2								
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Jacques Whitford

TEST PIT RECORD

TP07-70

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 20, 2007 WATER LEVEL

BOREHOLE No. TP07-70

PROJECT No. 1026929

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		30 mm TOPSOIL Compact, brown SILTY SAND (SM)						
1		End of Hand Auger Hole Hand Auger Refusal						
2								
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

Jacques Whitford

TEST PIT RECORD

TP07-71

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL

BOREHOLE No. TP07-71

PROJECT No. 1026929

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	102.71							
	102.5	230 mm TOPSOIL			BS	1		
		Fractured Bedrock						
	102.1	End of Borehole						
1		Refusal on Inferred Bedrock						
2								
3								
4								
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa App'd

△ Pocket Penetrometer Test, kPa Date

JWL-OLD 1026929.GPJ SMART.GDT 07/06/22

Jacques Whitford

TEST PIT RECORD

TP07-72

CLIENT Mattamy Homes

LOCATION Proposed Subdivision, Richmond, ON

DATES: BORING June 14, 2007 WATER LEVEL June 20, 2007

BOREHOLE No. TP07-72

PROJECT No. 1026929

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	102.44							
	102.2	200 mm TOPSOIL			BS	1		
		Dense, grey sandy silt, trace gravel, occasional cobbles: TILL (SM)			BS	2		
1				▽				
				▼	BS	3		
2					BS	4		
3					BS	5		
	98.9							
4		End of Borehole Refusal on Inferred Bedrock Standpipe Installed						
5								
6								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

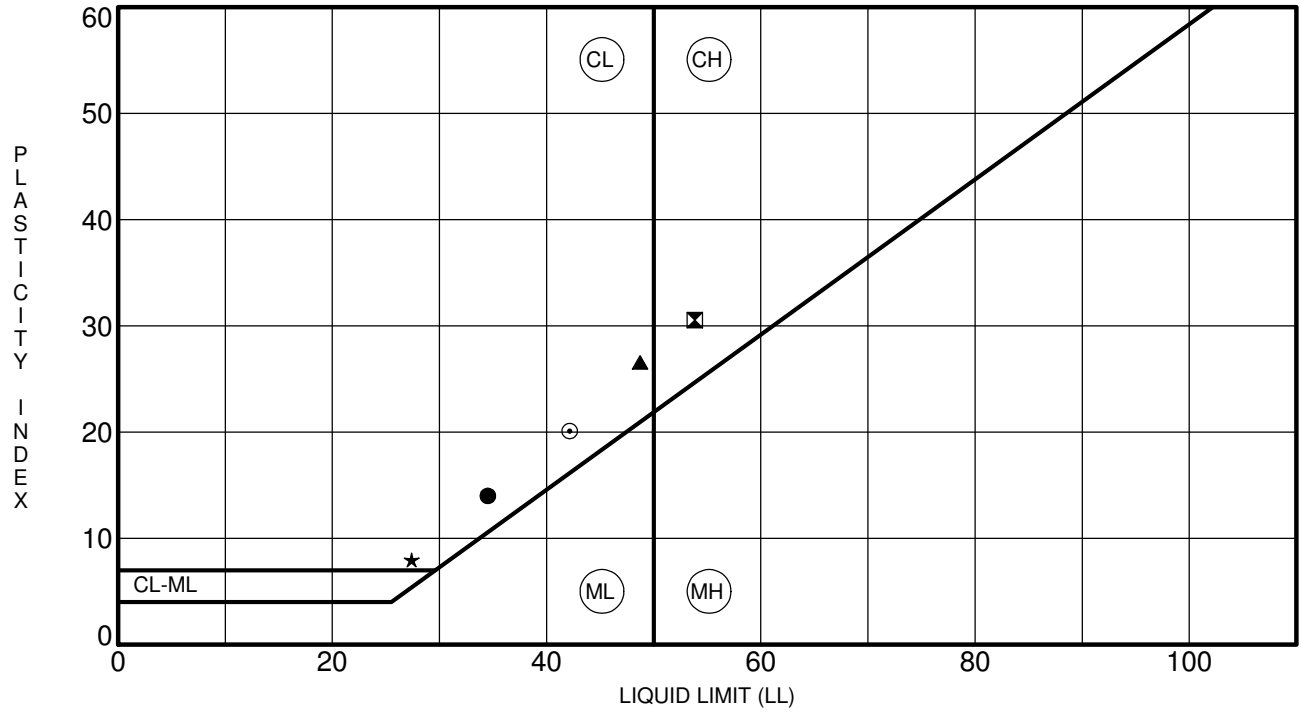
■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

App'd

Date

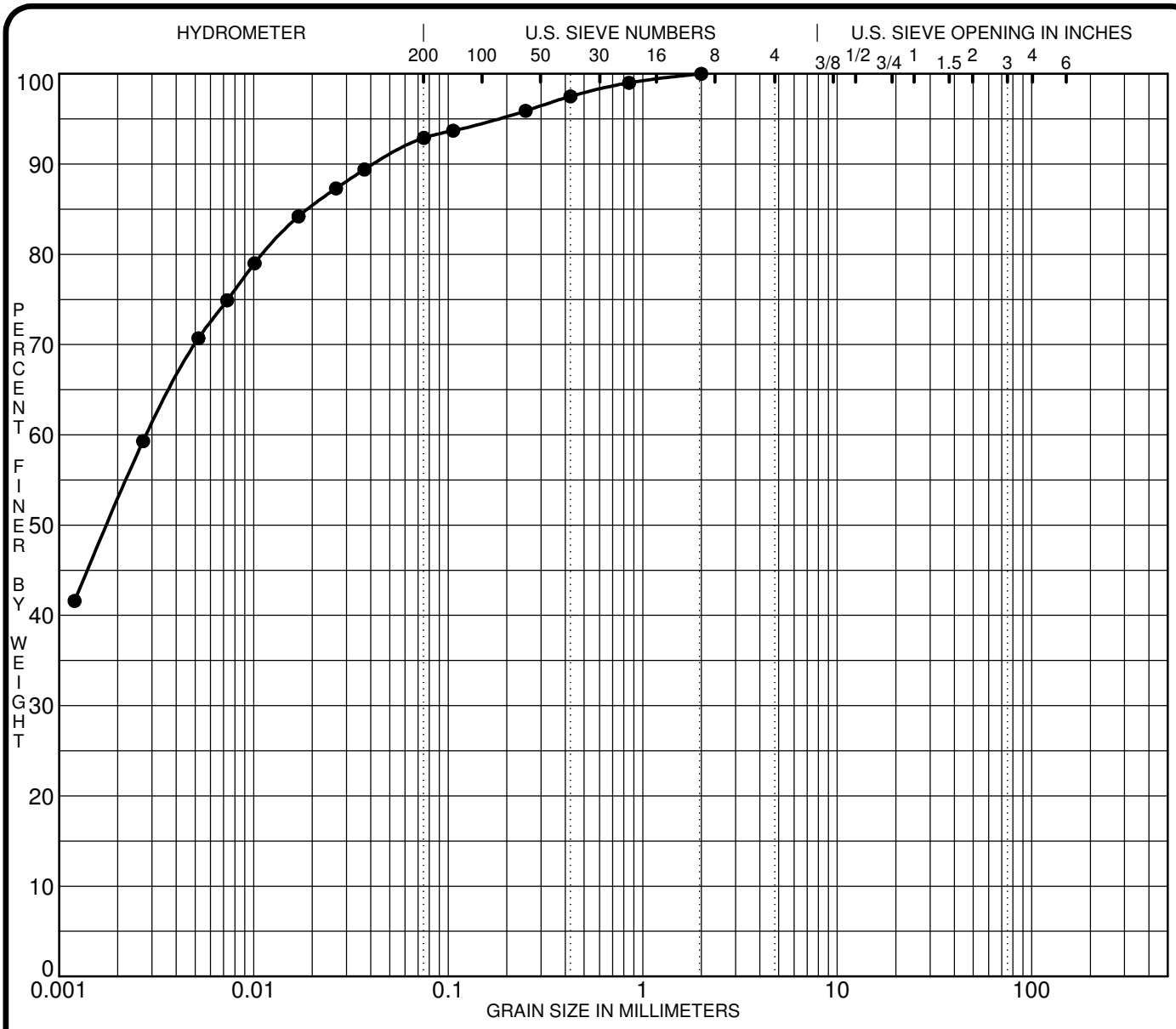


Specimen Identification			LL	PL	PI	Fines	Classification
●	**TP 1-18**	**G 2**	**35**	**21**	**14**		**CL - Inorganic clays of low plasticity**
⊠	**TP 2-18**	**G 2**	**54**	**23**	**31**		**CH - Inorganic clays of high plasticity**
▲	**TP 3-18**	**G 3**	**49**	**22**	**27**		**CL - Inorganic clays of low plasticity**
★	**TP 5-18**	**G 2**	**27**	**19**	**8**		**CL - Inorganic clays of low plasticity**
⊙	**TP 6-18**	**G 3**	**42**	**22**	**20**		**CL - Inorganic clays of low plasticity**

CLIENT	**Mattamy Homes**	FILE NO.	**PG4683**
PROJECT	**Geotechnical Investigation - Prop. Residential Development - Ottawa Street**	DATE	**31 Oct 18**

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

ATTERBERG LIMITS' RESULTS



SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
● **TP 3-18 G 2**	**CL - Inorganic clays of low plasticity**	**38**					

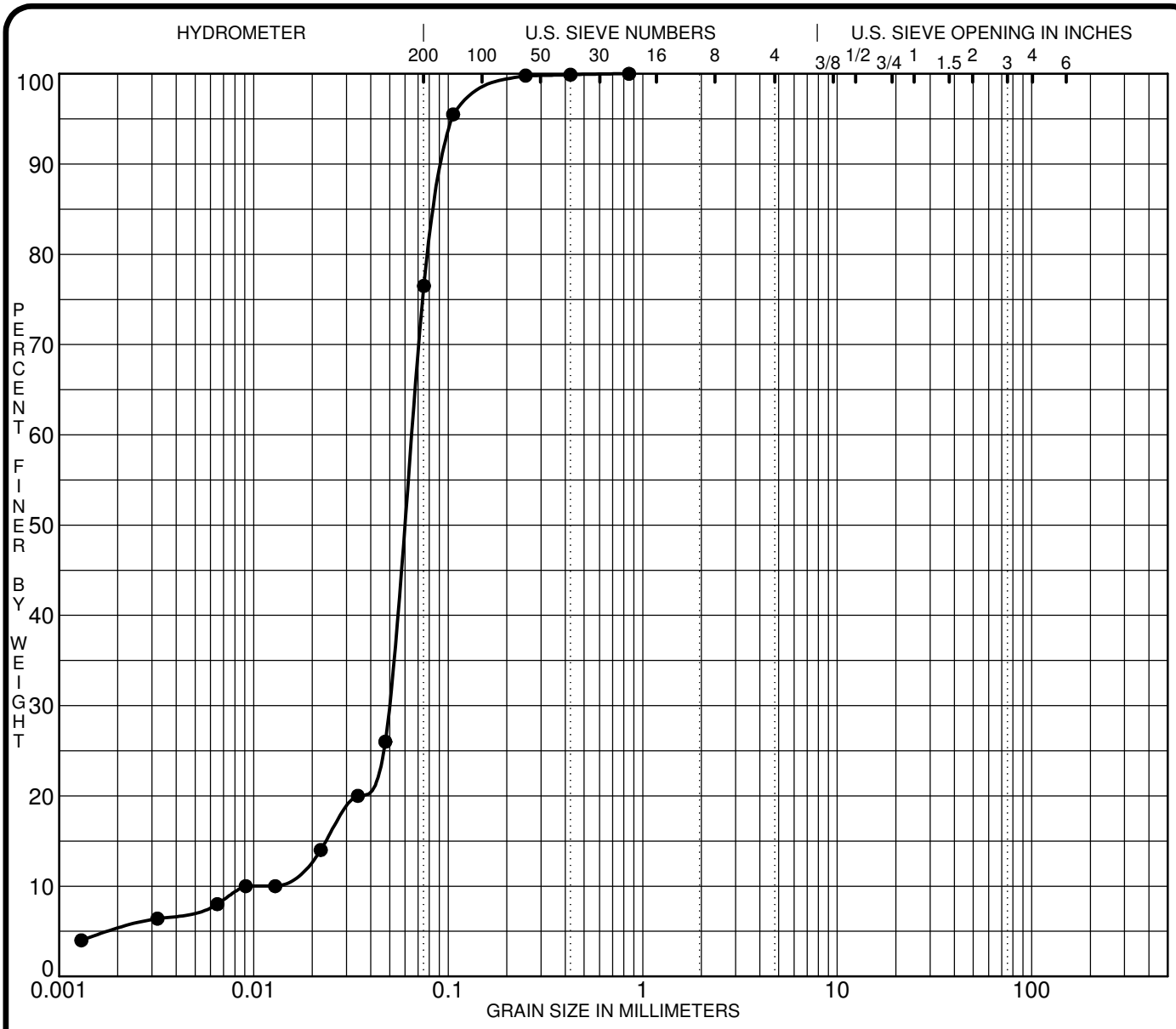
Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **TP 3-18 G 2**	**2.00**	**0.00**			**0.0**	**7.1**	**92.9**	

CLIENT **Mattamy Homes** FILE NO. **PG4683**

PROJECT **Geotechnical Investigation - Prop. Residential Development - Ottawa Street** DATE **31 Oct 18**

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

GRAIN SIZE DISTRIBUTION



SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● **TP 4-18**	**G 3**	**ML - Inorganic silt, some sand**	**21**				**4.13**	**7.1**

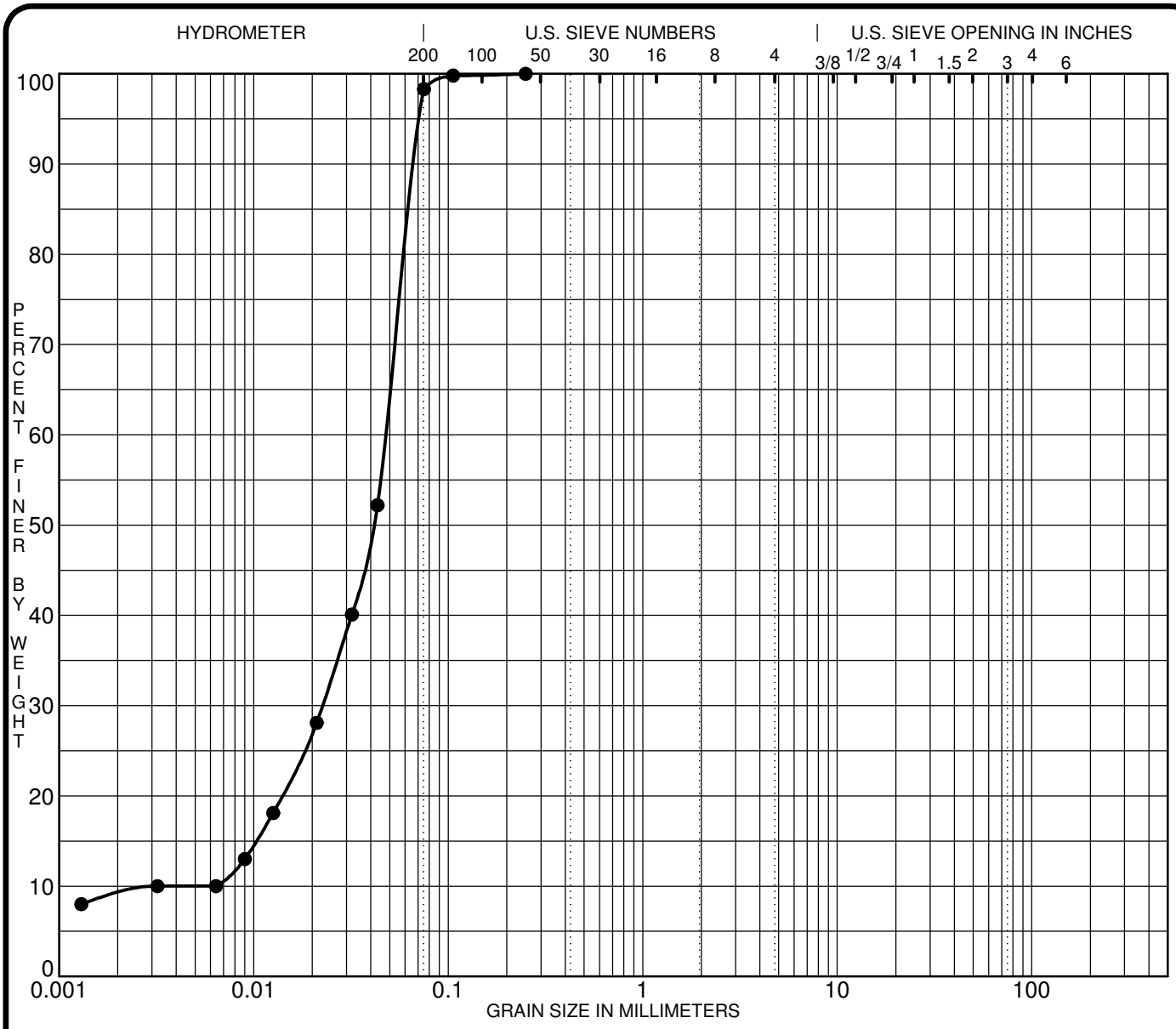
Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **TP 4-18**	**G 3**	**0.85**	**0.06**	**0.049**	**0.0091**	**0.0**	**23.5**	**76.5**	

CLIENT **Mattamy Homes** FILE NO. **PG4683**

PROJECT **Geotechnical Investigation - Prop. Residential Development - Ottawa Street** DATE **31 Oct 18**

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

GRAIN SIZE DISTRIBUTION



SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● **TP 8-18**	**G 3**	**ML - Inorganic silt, trace clay**	**23**				**3.34**	**14.8**

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **TP 8-18**	**G 3**	**0.25**	**0.05**	**0.023**	**0.0032**	**0.0**	**1.7**	**98.3**	

CLIENT **Mattamy Homes** FILE NO. **PG4683**

PROJECT **Geotechnical Investigation - Prop. Residential Development - Ottawa Street** DATE **31 Oct 18**

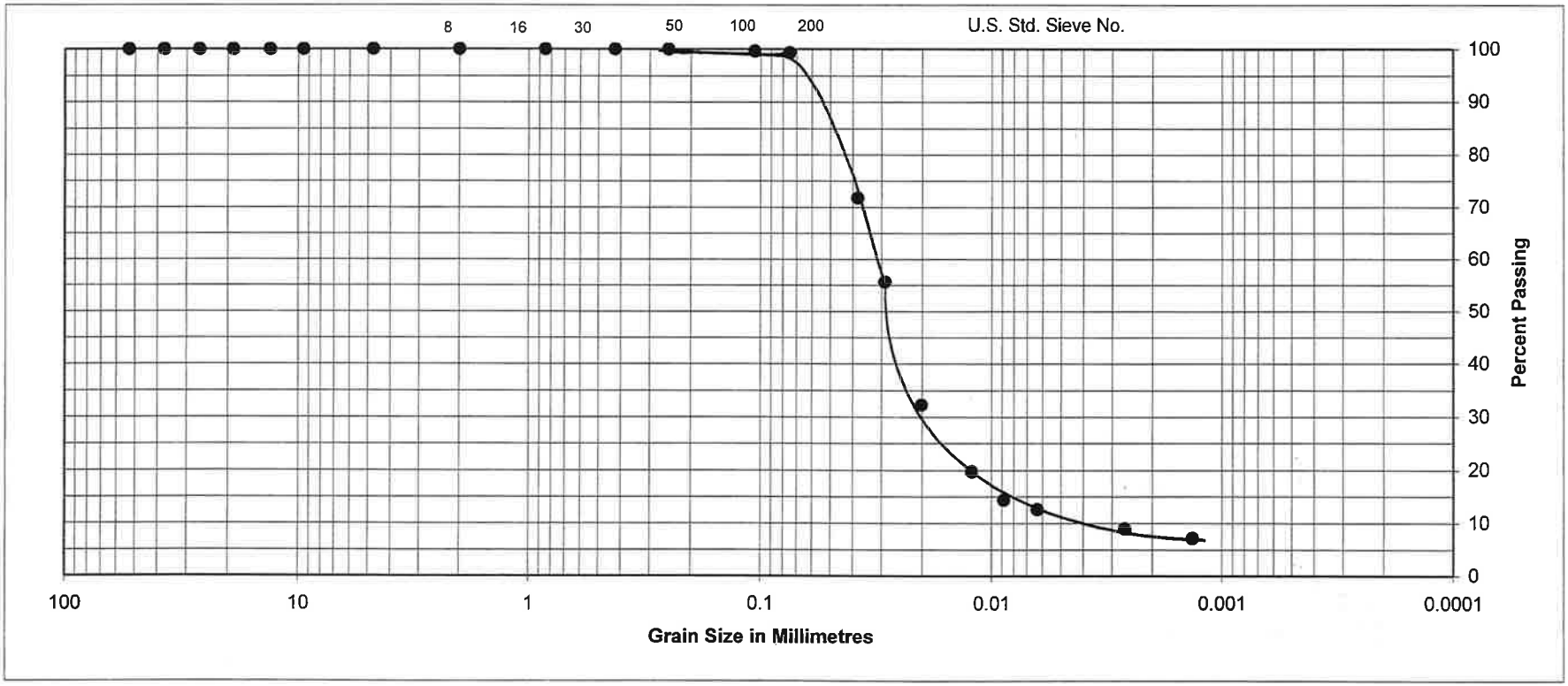
patersongroup Consulting Engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

GRAIN SIZE DISTRIBUTION

2781 Lancaster Rd. Tel: 613 738-0708
Ottawa, Ontario K1B 1A7 Fax: 613 738-0721

Hydrometer Analysis

Client:	**Mattamy Homes**	Project No.:	**1026929**
Project:	**Mattamy Homes, Rickmond**	Test Method:	**LS702**
Material Type:		Sample No.:	**N/A**
Source:	**BH07-37, SS-3**	Date Sampled:	**14-Jun-07**
Sampled From:	**5' to 7'**	Tested By:	**Blaine Miller**
Sampled By:	**Jeff Forrester**	Date Tested:	**21-Jun-07**



Remarks:

Reviewed By: Brian Pound
Date: June 22/2007

2781 Lancaster Rd.
Ottawa ON, K1B 1A7

Wash Sieve Analysis

Client :	**Mattamy Homes**	Project No. :	**1026929**
Project :	**Mattamy Homes, Richmond**	Test Method :	**LS 602 (ASTM C136)**
Material Type :	**Soils / Aggregate:**		
Proposed Use :	**Fill / Granulars:**	Sample No. :	**N/A**
Supplier :	**N/A**		
Source :	**TP-66**		
Sampled From :	**SS-4**		
Sampled By :	**Jeff Forrester**	Date Sampled :	**14-Jun-07**
Tested By :	**Eric Naylor**	Date Tested :	**20-Jun-07**

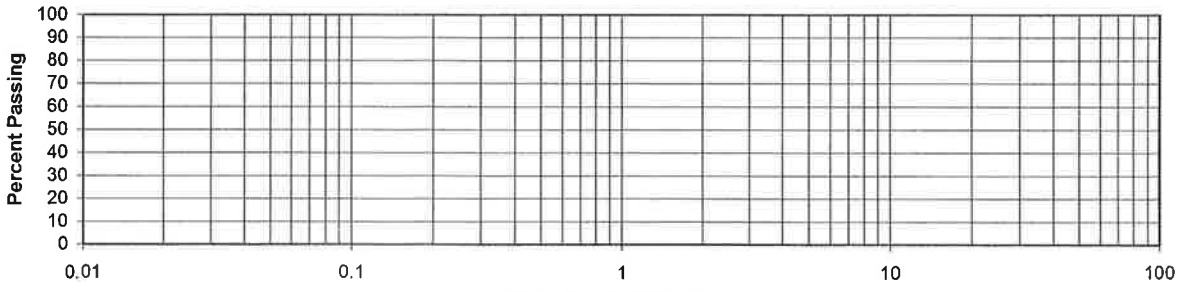
Wash Test Data

Sample Weight Before Sieve :		Sample Weight Before Wash :	**2163.8**	
Sample Weight Aftter Sieve :		Sample Weight After Wash :	**1424.5**	**Corrected**
% Loss In Sieve :		% Passing No.200	**34.2**	**N/A**

Sieve Analysis

Sieve No.	Size of Opening		Wt. Retained	Cum Wt. Retained	% Passing	Specifications	
	Inches	mm	grams	grams		Min	Max
	3	**76.2**					
	2	**53.0**					
	1	**26.5**					
	3/4	**19.0**					
	5/8	**16.0**					
	1/2	**13.2**					
	3/8	**9.5**					
+4	**0.187**	**4.75**		**392.4**	**81.9**		
		- 4.75		**1424.3**			
8	**0.0937**	**2.36**					
16	**0.0469**	**1.18**					
30	**0.234**	**0.600**					
50	**0.0117**	**0.300**					
100	**0.0059**	**0.150**					
200	**0.0029**	**0.075**					
		Pan					

Classification of sample : % Gravel : **18.1** % Sand : **47.7** % Silt and Clay : **34.2**



Remarks :

Laboratory Supervisor : Brian Reid **Date:** June 21/2007

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2781 Lancaster Rd.
Ottawa ON, K1B 1A7

Wash Sieve Analysis

Client :	**Mattamy Homes**	Project No. :	**1026929**
Project :	**Mattamy Homes, Richmond**	Test Method :	**LS 602 (ASTM C136)**
Material Type :	**Soils / Aggregate:**		
Proposed Use :	**Fill / Granulars:**	Sample No. :	**N/A**
Supplier :	**N/A**		
Source :	**TP-48**		
Sampled From :	**BS-3**		
Sampled By :	**Jeff Forrester**	Date Sampled :	**14-Jun-07**
Tested By :	**Eric Naylor**	Date Tested :	**21-Jun-07**

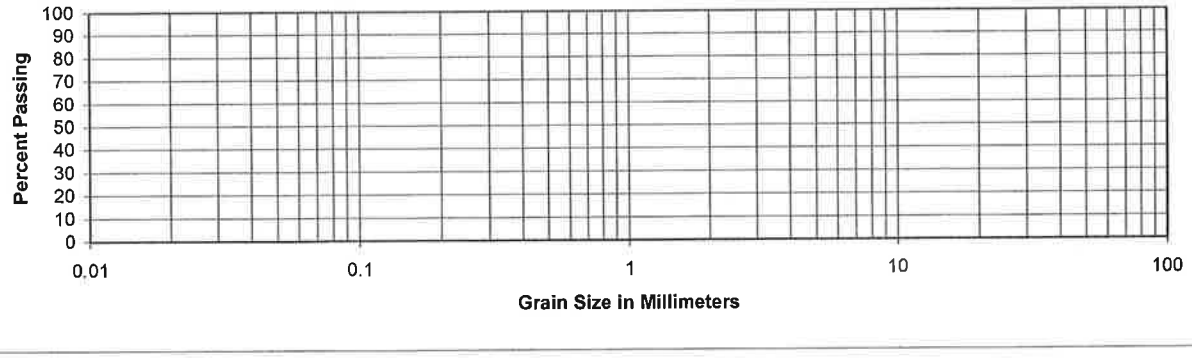
Wash Test Data

Sample Weight Before Sieve :		Sample Weight Before Wash :	**254.2**	
Sample Weight Aftter Sieve :		Sample Weight After Wash :	**8.3**	**Corrected**
% Loss In Sieve :		% Passing No.200	**96.7**	**N/A**

Sieve Analysis

Sieve No.	Size of Opening		Wt. Retained	Cum Wt. Retained	% Passing	Specifications	
	Inches	mm	grams	grams		Min	Max
	3	**76.2**					
	2	**53.0**					
	1	**26.5**					
	3/4	**19.0**					
	5/8	**16.0**					
	1/2	**13.2**					
	3/8	**9.5**					
+4	**0.187**	**4.75**		**1.6**	**99.4**		
		- 4.75		**6.7**			
8	**0.0937**	**2.36**					
16	**0.0469**	**1.18**					
30	**0.234**	**0.600**					
50	**0.0117**	**0.300**					
100	**0.0059**	**0.150**					
200	**0.0029**	**0.075**					
		Pan					

Classification of sample : % Gravel : **0.6** % Sand : **2.6** % Silt and Clay : **96.7**



Remarks :

Laboratory Supervisor : Brian Rivard **Date:** June 22/2007

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Ottawa ON, K1B 1A7

Wash Sieve Analysis

Client :	**Mattamy Homes**	Project No. :	**1026929**
Project :	**Mattamy Homes, Richmond**	Test Method :	**LS 602 (ASTM C136)**
Material Type :	**Soils / Aggregate:**		
Proposed Use :	**Fill / Granulars:**	Sample No. :	**N/A**
Supplier :	**N/A**		
Source :	**TP-48**		
Sampled From :	**BS-7**		
Sampled By :	**Jeff Forrester**	Date Sampled :	**14-Jun-07**
Tested By :	**Eric Naylor**	Date Tested :	**20-Jun-07**

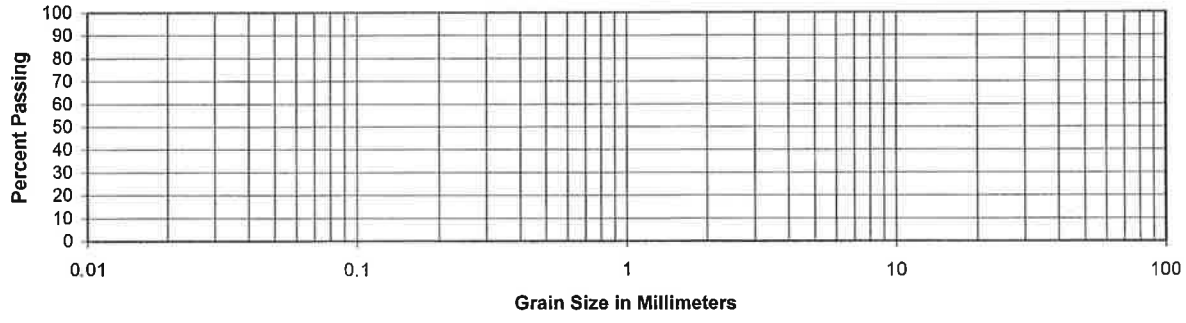
Wash Test Data

Sample Weight Before Sieve :		Sample Weight Before Wash :	385	
Sample Weight Aftter Sieve :		Sample Weight After Wash :	232	Corrected
% Loss In Sieve :		% Passing No.200	39.7	N/A

Sieve Analysis

Sieve No.	Size of Opening		Wt. Retained	Cum Wt. Retained	% Passing	Specifications	
	Inches	mm	grams	grams		Min	Max
	3	76.2					
	2	53.0					
	1	26.5					
	3/4	19.0					
	5/8	16.0					
	1/2	13.2					
	3/8	9.5					
+4	0.187	4.75		44.7	88.4		
		- 4.75		231.9			
8	0.0937	2.36					
16	0.0469	1.18					
30	0.234	0.600					
50	0.0117	0.300					
100	0.0059	0.150					
200	0.0029	0.075					
		Pan					

Classification of sample : % Gravel : **11.6** % Sand : **48.6** % Silt and Clay : **39.7**



Remarks :

Laboratory Supervisor : Brian Rennett **Date:** June 21/2007

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2781 Lancaster Rd.
Ottawa ON, K1B 1A7

Wash Sieve Analysis

Client :	**Mattamy Homes**	Project No. :	**1026929**
Project :	**Mattamy Homes, Richmond**	Test Method :	**LS 602 (ASTM C136)**
Material Type :	**Soils / Aggregate:**		
Proposed Use :	**Fill / Granulars:**	Sample No. :	**N/A**
Supplier :	**N/A**		
Source :	**TP-54**		
Sampled From :	**BS-3**		
Sampled By :	**Jeff Forrester**	Date Sampled :	**14-Jun-07**
Tested By :	**Eric Naylor**	Date Tested :	**21-Jun-07**

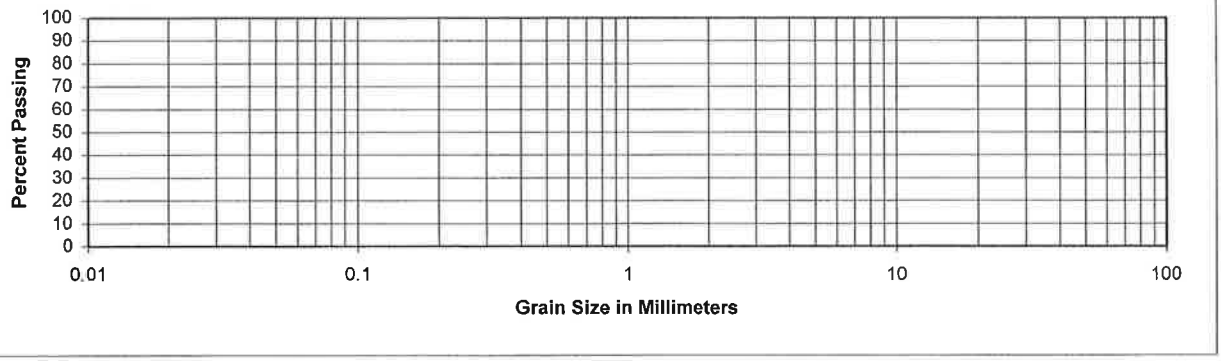
Wash Test Data

Sample Weight Before Sieve :		Sample Weight Before Wash :	**259.3**	
Sample Weight Aftter Sieve :		Sample Weight After Wash :	**9.5**	**Corrected**
% Loss In Sieve :		% Passing No.200	**96.3**	**N/A**

Sieve Analysis

Sieve No.	Size of Opening		Wt. Retained	Cum Wt. Retained	% Passing	Specifications	
	Inches	mm	grams	grams		Min	Max
	3	**76.2**					
	2	**53.0**					
	1	**26.5**					
	3/4	**19.0**					
	5/8	**16.0**					
	1/2	**13.2**					
	3/8	**9.5**					
+4	**0.187**	**4.75**		**0.0**	**100.0**		
		- 4.75					
8	**0.0937**	**2.36**					
16	**0.0469**	**1.18**					
30	**0.234**	**0.600**					
50	**0.0117**	**0.300**					
100	**0.0059**	**0.150**					
200	**0.0029**	**0.075**					
		Pan					

Classification of sample : | % Gravel : **0.0** | % Sand : **3.7** | % Silt and Clay : **96.3**



Remarks :

Laboratory Supervisor : Brian Rennie **Date:** June 22/2007

APPENDIX 2

FIGURE 1 - KEY PLAN

FIGURE 2A TO 4B - SLOPE STABILITY ANALYSIS SECTIONS

DRAWING PG4683-1 - TEST HOLE LOCATION PLAN

DRAWING PG4683-2 - PERMISSIBLE GRADE RAISE PLAN

DRAWING PG4683-3 - TREE PLANTING SETBACK RECOMMENDATIONS

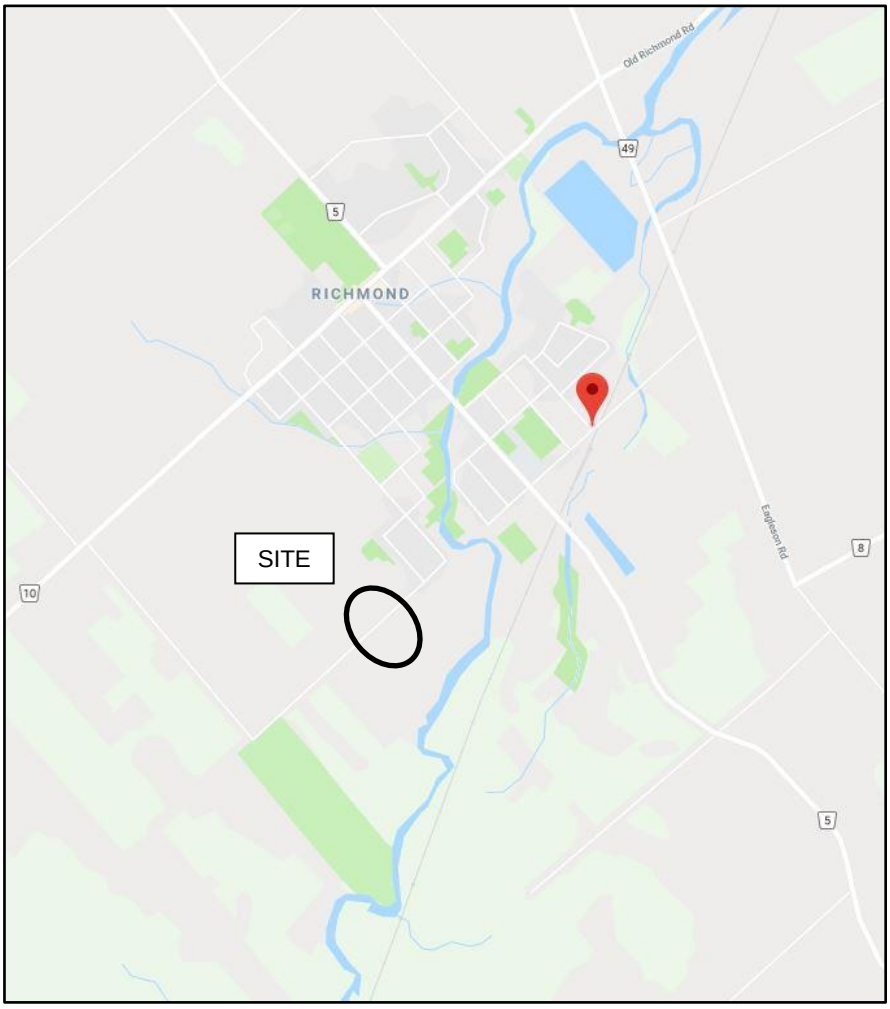
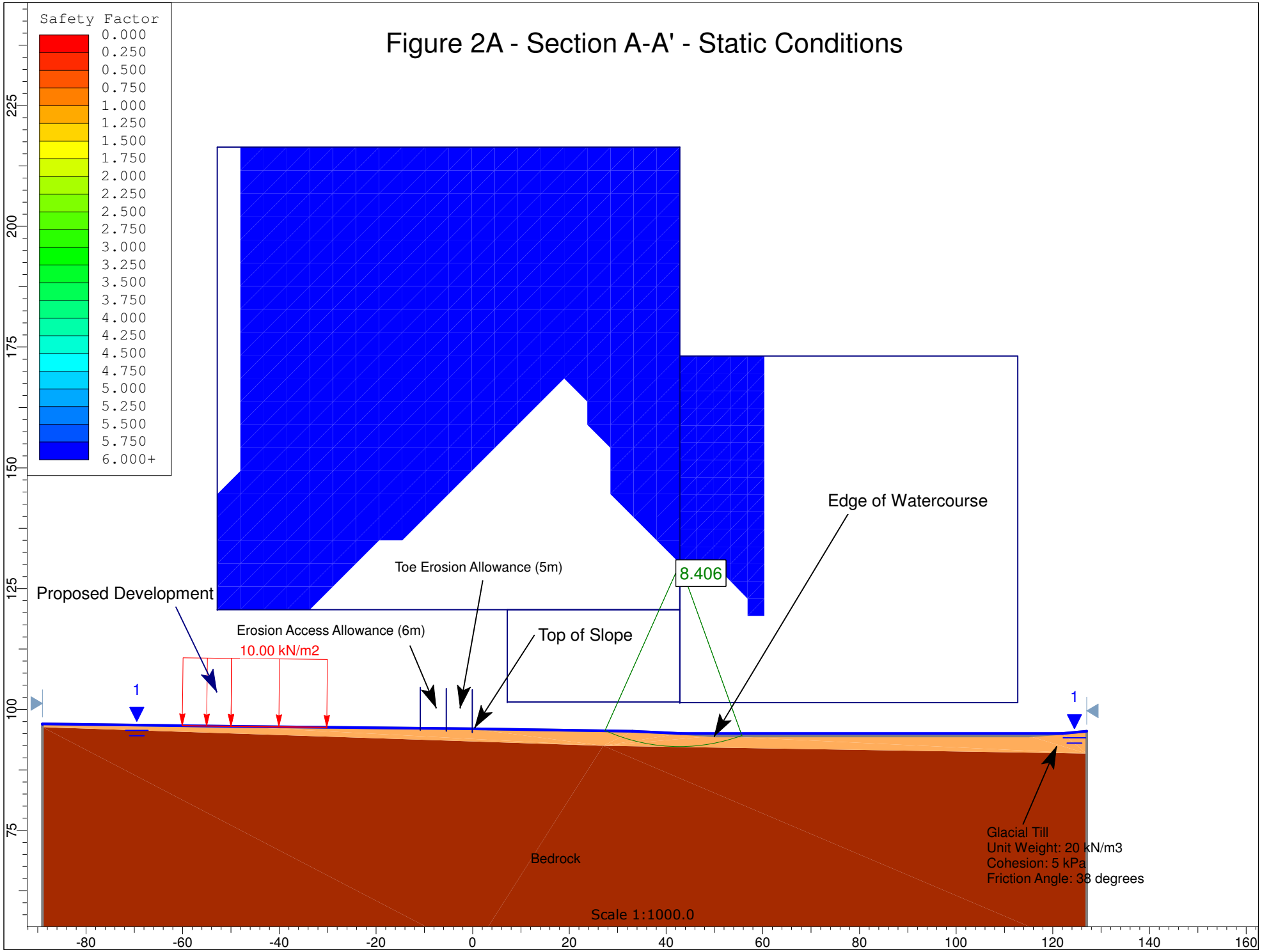


FIGURE 1

KEY PLAN

Figure 2A - Section A-A' - Static Conditions



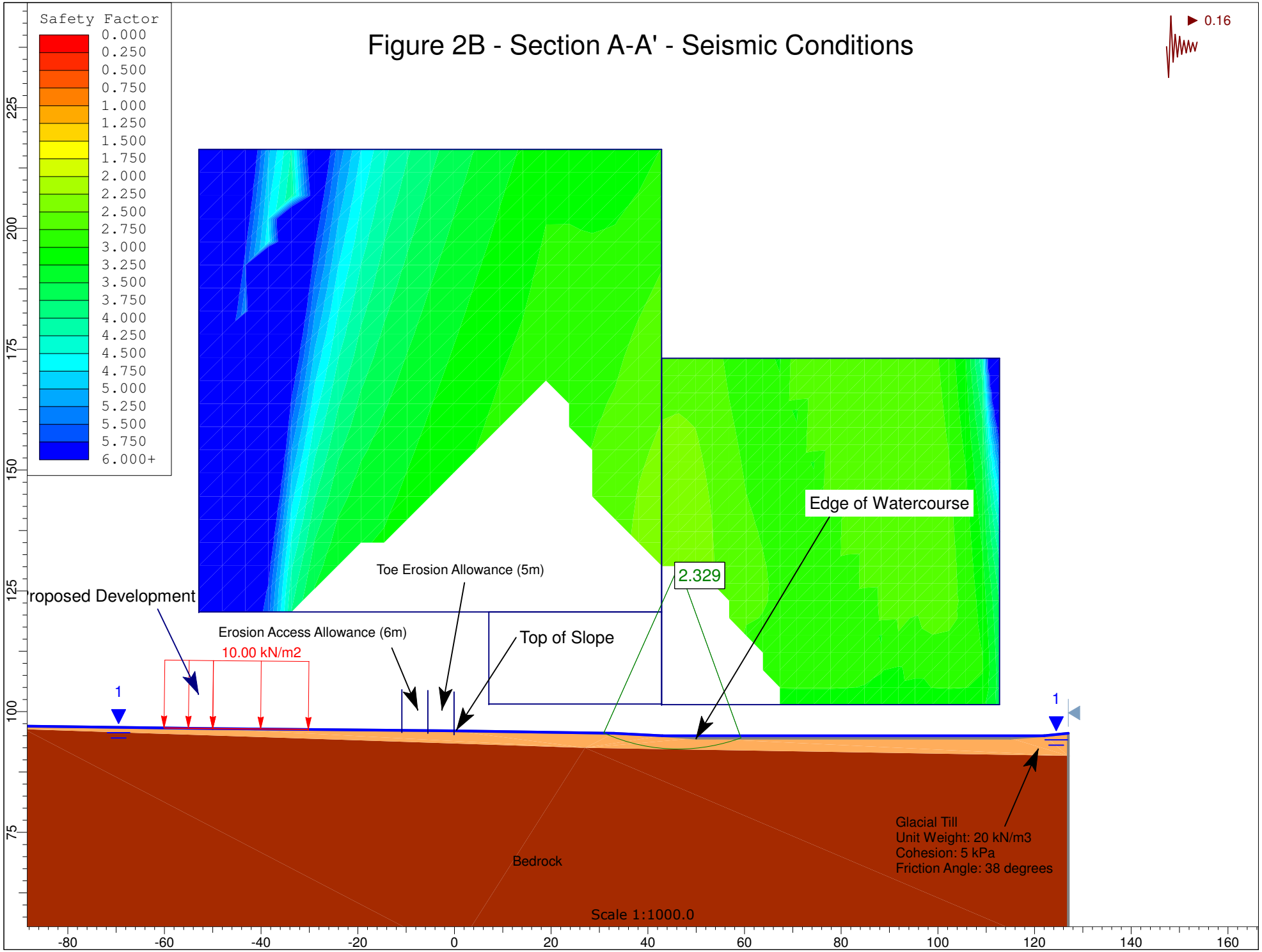
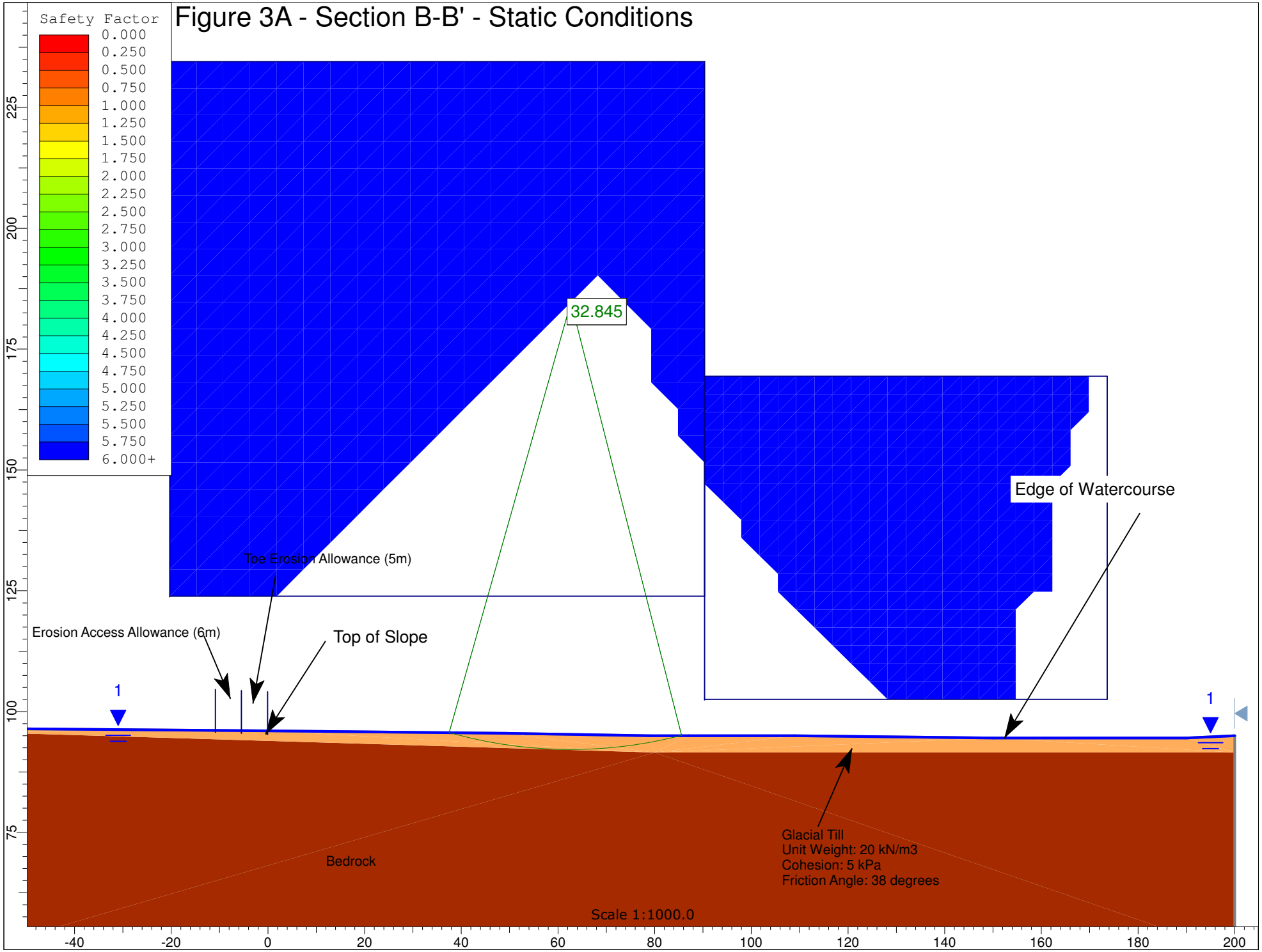


Figure 2B - Section A-A' - Seismic Conditions
Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
0.16
Edge of Watercourse
2.329
Toe Erosion Allowance (5m)
roposed Development
Erosion Access Allowance (6m)
10.00 kN/m2
Top of Slope
1
1
Glacial Till
Unit Weight: 20 kN/m3
Cohesion: 5 kPa
Friction Angle: 38 degrees
Bedrock
Scale 1:1000.0
225
200
175
150
125
100
75
-80
-60
-40
-20
0
20
40
60
80
100
120
140
160

Figure 3A - Section B-B' - Static Conditions



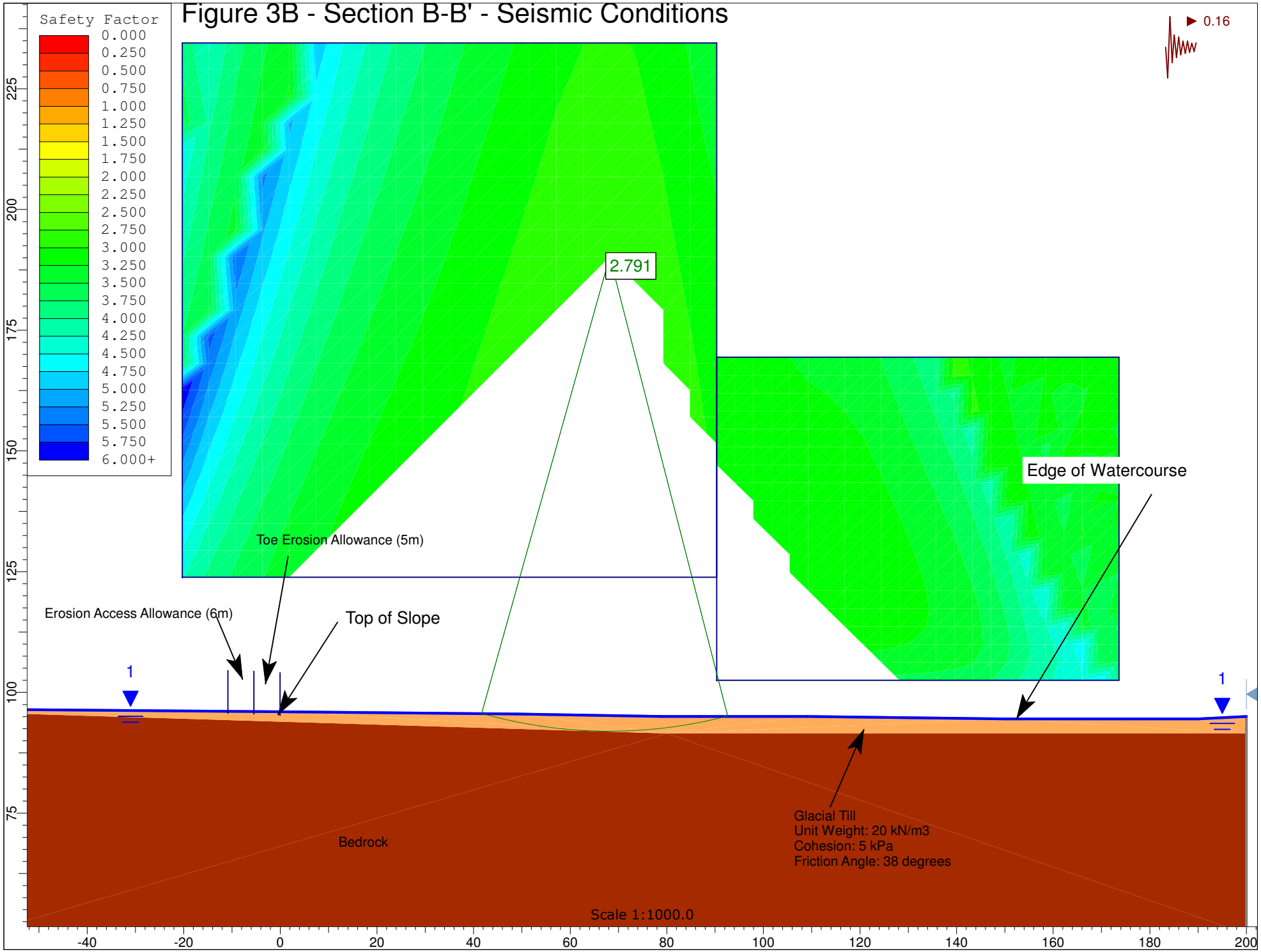
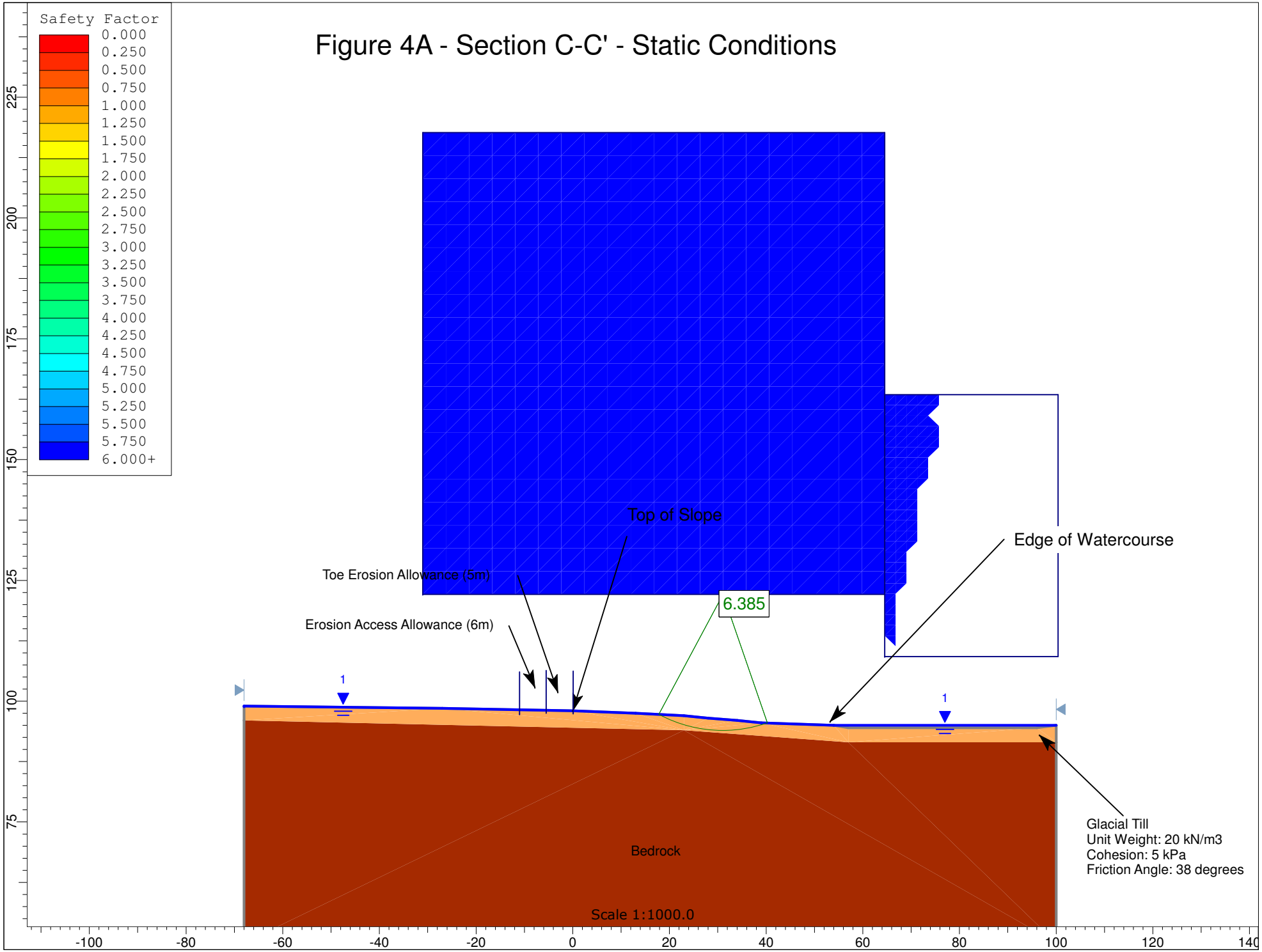


Figure 3B - Section B-B' - Seismic Conditions
Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
0.16
2.791
Edge of Watercourse
Toe Erosion Allowance (5m)
Erosion Access Allowance (6m)
Top of Slope
1
1
Glacial Till
Unit Weight: 20 kN/m3
Cohesion: 5 kPa
Friction Angle: 38 degrees
Bedrock
Scale 1:1000.0
225
200
175
150
125
100
75
-40
-20
0
20
40
60
80
100
120
140
160
180
200

Figure 4A - Section C-C' - Static Conditions



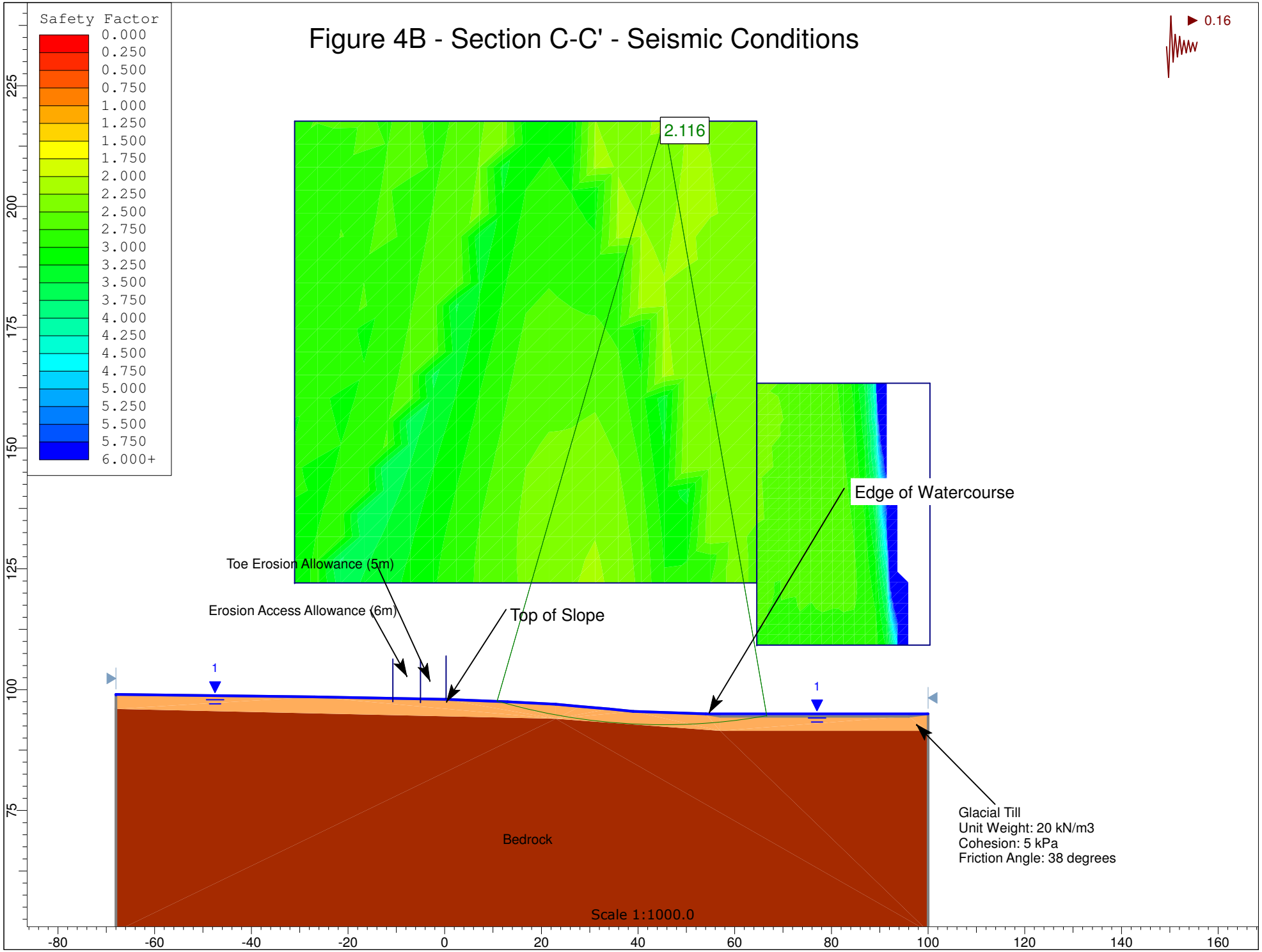
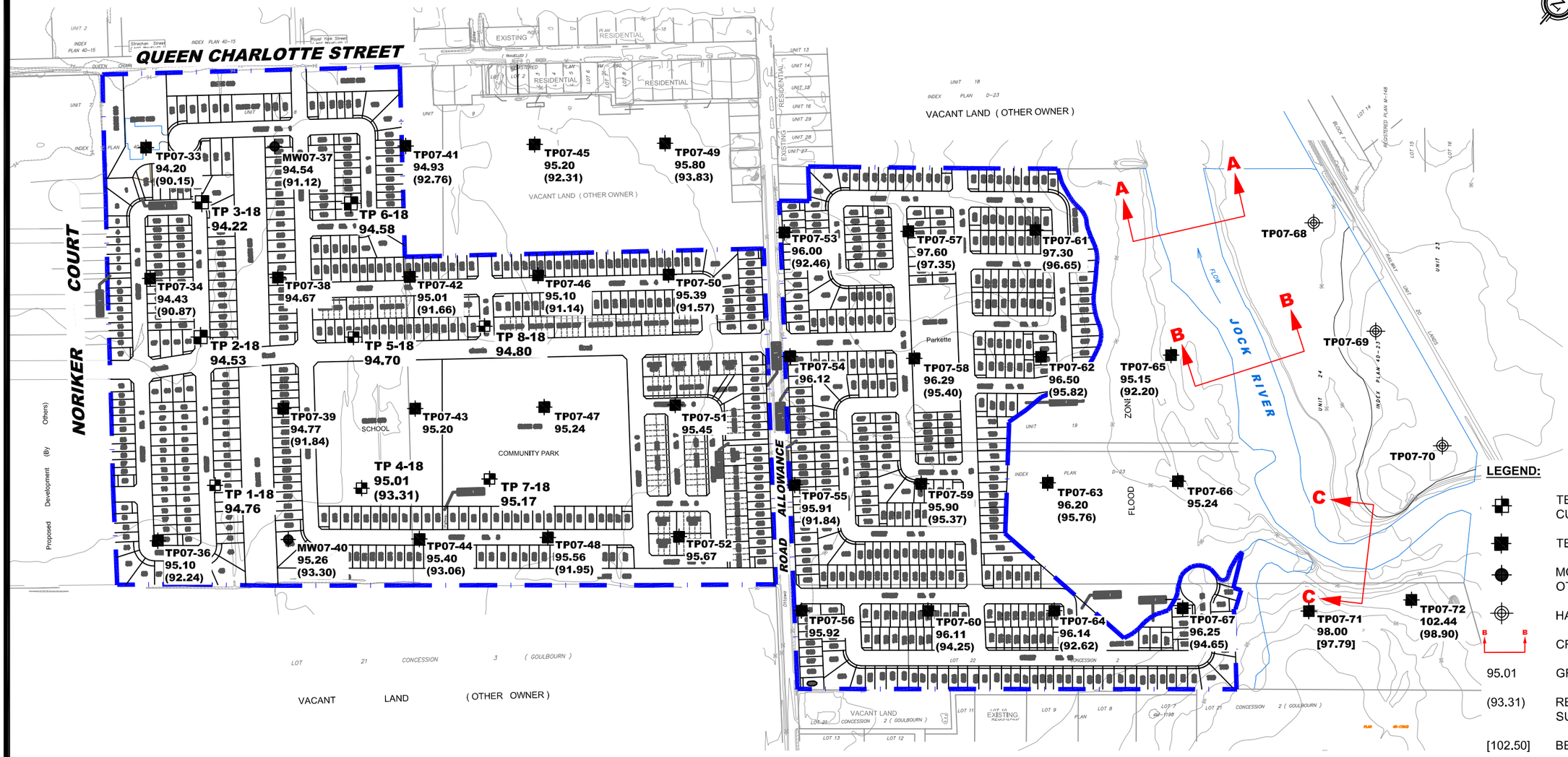


Figure 4B - Section C-C' - Seismic Conditions
Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
0.16
2.116
Edge of Watercourse
Toe Erosion Allowance (5m)
Erosion Access Allowance (6m)
Top of Slope
1
1
Bedrock
Glacial Till
Unit Weight: 20 kN/m3
Cohesion: 5 kPa
Friction Angle: 38 degrees
Scale 1:1000.0
225
200
175
150
125
100
75
-80
-60
-40
-20
0
20
40
60
80
100
120
140
160



LEGEND:

- TEST PIT LOCATION, CURRENT INVETIGATION
- TEST PIT LOCATION BY OTHERS
- MONITORING WELL LOCATION BY OTHERS
- HAND AUGER HOLE
- CROSS-SECTION LOCATION
- 95.01 GROUND SURFACE ELEV. (m)
- (93.31) REFUSAL ON INFERRED BEDROCK SURFACE ELEV. (m)
- [102.50] BEDROCK SURFACE ELEV. (m)

BASE PLAN, TEST HOLE LOCATIONS AND ELEVATIONS AT TEST HOLES PROVIDED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

SCALE: 1:5000

0 50 100 150 200 250 300m

NOTES:

1. GROUND SURFACE ELEVATION FOR THE TEST PITS COMPLETED BY OTHERS WERE PROVIDED USING AN ASSUMED ELEVATIONS FOR THE TEMPORARY BENCHMARK. ASSUMING THAT THE GROUND SURFACE HAS NOT BEEN MODIFIED SINCE THE TEST PITS WERE COMPLETED, PATERSON INTERPOLATED THE GROUND SURFACE ELEVATIONS AT THESE TEST PITS BASED ON THE MOST RECENT TOPOGRAPHIC SURVEY PROVIDED BY MATTAMY HOMES COMPLETED BY LATE 2018.

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NO.	REVISIONS	DATE	INITIAL
0			

MATTAMY HOMES

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT - OTTAWA STREET - RICHMOND
OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:5000	Date: 11/2018
Drawn by: RCG	Report No.: PG4683-1
Checked by: RG	Dwg. No.: PG4683-1
Approved by: DJG	Revision No.: 0

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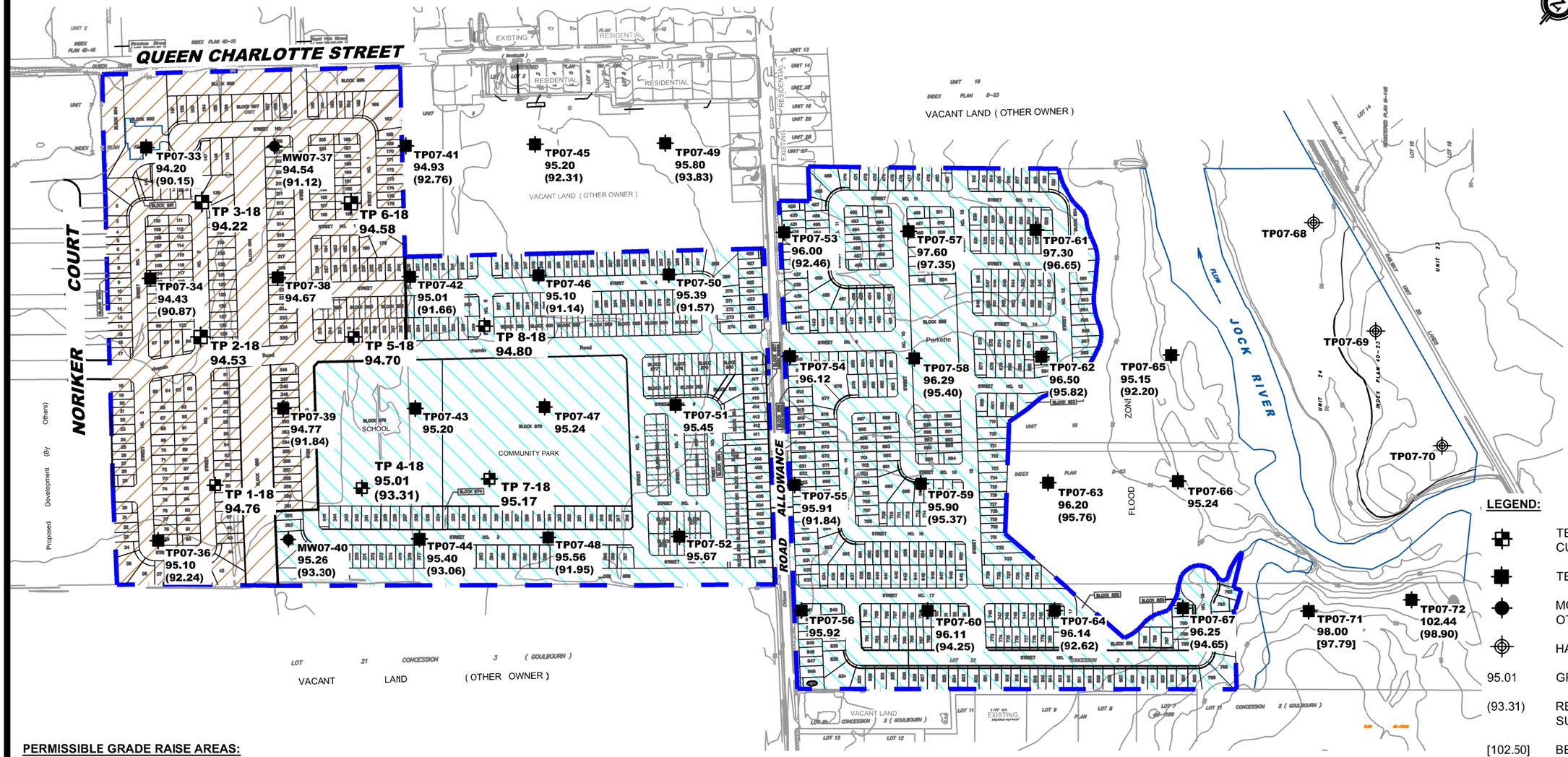

PERMISSIBLE GRADE RAISE AREAS:

NO PERMISSIBLE GRADE RAISE REQUIRED

UP TO 2.0m PERMISSIBLE GRADE RAISE ABOVE EXISTING GROUND SURFACE

LEGEND:

- TEST PIT LOCATION, CURRENT INVETIGATION
- TEST PIT LOCATION BY OTHERS
- MONITORING WELL LOCATION BY OTHERS
- HAND AUGER HOLE
- 95.01 GROUND SURFACE ELEV. (m)
- (93.31) REFUSAL ON INFERRED BEDROCK SURFACE ELEV. (m)
- [102.50] BEDROCK SURFACE ELEV. (m)

BASE PLAN, TEST HOLE LOCATIONS AND ELEVATIONS AT TEST HOLES PROVIDED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

SCALE: 1:5000

0 50 100 150 200 250 300m

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GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT - OTTAWA STREET - RICHMOND
OTTAWA, ONTARIO

Title:

PERMISSIBLE GRADE RAISE

Scale: 1:5000	Date: 11/2018
Drawn by: RCG	Report No.: PG4683-1
Checked by: RG	Dwg. No.: PG4683-2
Approved by: DJG	Revision No.: 0

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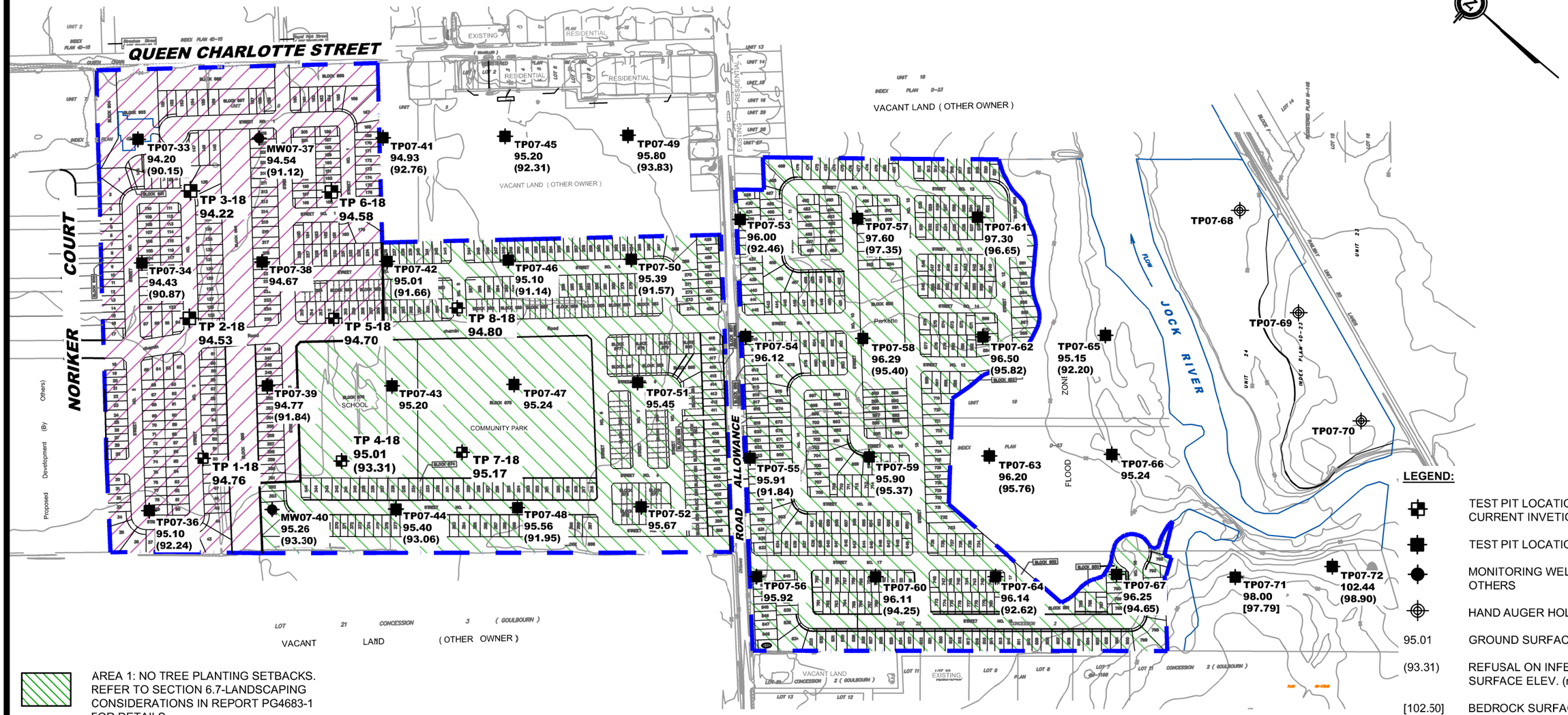

AREA 1: NO TREE PLANTING SETBACKS.
REFER TO SECTION 6.7-LANDSCAPING CONSIDERATIONS IN REPORT PG4683-1 FOR DETAILS

AREA 2: LOW TO MEDIUM SENSITIVITY CLAY SOILS.
REFER TO SECTION 6.7 - LANDSCAPING CONSIDERATIONS IN REPORT PG4683-1 FOR DETAILS

LEGEND:

- TEST PIT LOCATION, CURRENT INVETIGATION
- TEST PIT LOCATION BY OTHERS
- MONITORING WELL LOCATION BY OTHERS
- HAND AUGER HOLE
- 95.01 GROUND SURFACE ELEV. (m)
- (93.31) REFUSAL ON INFERRED BEDROCK SURFACE ELEV. (m)
- [102.50] BEDROCK SURFACE ELEV. (m)

BASE PLAN, TEST HOLE LOCATIONS AND ELEVATIONS AT TEST HOLES PROVIDED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

SCALE: 1:5000

0 50 100 150 200 250 300m

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GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT - OTTAWA STREET - RICHMOND
OTTAWA, ONTARIO

Title:

TREE SETBACK RECOMMENDATIONS

Scale: 1:5000	Date: 11/2018
Drawn by: RCG	Report No.: PG4683-1
Checked by: RG	Dwg. No.: PG4683-3
Approved by: DJG	Revision No.: 0

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