PATERSON GROUP

Geotechnical Investigation

Proposed Development

5360 Bank Street
Ottawa, Ontario

Greely Sand & Gravel Inc.

Report PG7831-1 Revision 2 dated October 14, 2026

Table of Contents

PAGE

1.0 Introduction 1
2.0 Proposed Development 1
3.0 Method of Investigation 2
3.1 Field Investigation 2
3.2 Field Survey 3
3.3 Laboratory Review 3
3.4 Analytical Testing 3
4.0 Observations 4
4.1 Surface Conditions 4
4.2 Subsurface Profile 4
4.3 Groundwater 5
5.0 Discussion 6
5.1 Geotechnical Assessment 6
5.2 Site Grading and Preparation 6
5.3 Foundation Design 7
5.4 Design for Earthquakes 8
5.5 Slab-on-Grade Construction 8
5.6 Pavement Design 9
6.0 Design and Construction Precautions 10
6.1 Foundation Drainage and Backfill 10
6.2 Protection of Footings Against Frost Action 10
6.3 Excavation Side Slopes 10
6.4 Pipe Bedding and Backfill 11
6.5 Groundwater Control 12
6.6 Winter Construction 12
6.7 Corrosion Potential and Sulphate 13
6.8 Slope Stability Assessment 13
6.9 Stormwater Management Pond 15
7.0 Recommendations 16
8.0 Statement of Limitations 17

Appendices

Appendix 1 Soil Profile and Test Data Sheets
Symbols and Terms
Record of Borehole Sheets by Others
Analytical Testing Results

Appendix 2 Figure 1 – Key Plan
Figures 2A To 5B – Sections for Slope Stability Analysis
Figure 6 – Recommended Remedial Work
Drawing PG7831-1 – Test Hole Location Plan

1.0 Introduction

Paterson Group (Paterson) was commissioned by Greely Sand & Gravel Inc. to conduct a geotechnical investigation for the proposed development to be located at 5360 Bank Street in the City of Ottawa, Ontario (refer to Figure 1 – Key Plan in Appendix 2 of this report for the general site location).

The objectives of the geotechnical investigation were to:

- ❑ Determine the subsoil and groundwater conditions at this site by means of boreholes.
- ❑ Provide geotechnical recommendations for the design of the proposed development, including construction considerations which may affect the design.

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

2.0 Proposed Development

Based on the available drawings, it is understood that the proposed development will consist of the construction of a stormwater management pond (SWMP) with associated swales to be located within the southern portion of the site. Associated access lanes, parking areas, and landscaped areas are anticipated to surround the proposed development.

It is further anticipated that the development will be municipally serviced.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the current geotechnical investigation was carried out on March 17, 2026. At that time, 5 boreholes (BH 1-26 through BH 5-26) were advanced to a maximum depth of 6.4 m below the existing grade. A previous investigation was conducted at the site by others in 2023, consisting of a total of 7 boreholes (MW23-01 to MW23-07) advanced to a maximum depth of 6.9 m below existing grade at the aforementioned site.

The boreholes were placed in a manner to provide general coverage of the subject site, taking into consideration site features and underground utilities. The locations of the boreholes are shown on Drawing PG7831-1 – Test Hole Location Plan included in Appendix 2.

The boreholes were advanced using a CME-55 low-clearance auger drill rig operated by a two-person crew. The drilling procedure consisted of augering to the required depths at the selected locations, and sampling and testing the overburden. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer.

Sampling and In Situ Testing

Soil samples were collected from the boreholes using two different techniques, namely, sampled directly from the auger flights (AU) or collected using a 50 mm diameter split-spoon (SS) sampler. All samples were visually inspected and initially classified on-site, and subsequently placed in sealed plastic bags. All samples were transported to our laboratory for further examination and classification. The depths at which the auger and split spoon were recovered from the boreholes are shown as AU and SS, respectively, on the Soil Profile and Test Data sheets presented in Appendix 1.

A Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split spoon samples. The SPT results are recorded as "N" values on the Soil Profile and Test Data sheets. The "N" value is the number of blows required to drive the split spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

The subsurface conditions observed in the boreholes were recorded in detail in the field. The soil profiles are presented on the Soil Profile and Test Data sheets in Appendix 1 of this report.

Groundwater

All boreholes were fitted with 51 mm diameter PVC groundwater monitoring wells. Typical monitoring well construction details are described below:

- ❑ 1.5 m of slotted 51 mm diameter PVC screen at the base of the boreholes.
- ❑ 51 mm diameter PVC riser pipe from the top of the screen to the ground surface.
- ❑ No. 3 silica sand backfill within the annular space around the screen.
- ❑ 300 mm thick bentonite hole plug directly above the PVC slotted screen.
- ❑ Clean backfill from top of bentonite plug to the ground surface.

The groundwater observations are discussed in Section 4.3.

3.2 Field Survey

The borehole locations and ground surface elevation at each borehole location were surveyed by Paterson using a high-precision handheld GPS and referenced to a geodetic datum. The locations of the boreholes and ground surface elevation at each borehole location are presented on Drawing PG7831-1 – Test Hole Location Plan in Appendix 2.

3.3 Laboratory Review

Soil samples were recovered from the subject site and visually examined in our laboratory to review the results of the field logging. The laboratory testing results are further discussed in Section 4.2 and are also presented in Appendix 1.

All samples of the current investigation will be stored in the laboratory for a period of 1 month after issuance of this report. They will then be discarded unless we are otherwise directed.

3.4 Analytical Testing

One soil sample was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. The sample was submitted to determine the concentration of sulphate and chloride, the resistivity, and the pH of the sample. The results are presented in Appendix 1 and are discussed further in Section 6.7.

4.0 Observations

4.1 Surface Conditions

The site is currently occupied by a commercial/industrial facility. The property includes a main building with an associated garage, repair shop, and office space. Ancillary features include covered storage domes used for salt and aggregate materials, as well as areas for material storage, equipment staging, and contractor yard operations.

The site is bordered to the east by Bank Street and to the north, south, and west by a mix of residential, commercial, and industrial lands. The property includes a watercourse and existing ponds located within the western portion of the site.

The ground surface across the site generally slopes from the central portion toward the west and south, in the direction of the adjacent ponds and watercourse.

4.2 Subsurface Profile

Overburden

Generally, the subsurface profile encountered at the borehole locations consists of topsoil or fill underlain by a silty sand deposit followed by glacial till. The fill material was generally observed to consist of brown silty sand with gravel, trace organics, cobbles, and clay, extending to depths of approximately 0.7 to 2.2 m below the existing ground surface. A loose to compact, brown silty sand, trace clay, and gravel deposit was generally encountered underlying the fill at depths ranging from 0.7 to 5.2 m below the existing ground surface.

A glacial till deposit was encountered underlying the silty sand and was generally observed to consist of very dense, brown silty sand with gravel, cobbles and boulders.

Practical refusal to augering was encountered at a depth of about 3.7 m below the existing ground surface at borehole BH 5-26. Refusal was not encountered in the remaining boreholes at depths of up to 6.4 m below the existing ground surface.

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

Bedrock

Based on available geological mapping, the site is located in an area where the bedrock consists of dolomite of the Oxford Formation with an overburden drift thickness ranging from approximately 3 to 10 m.

4.3 Groundwater

Groundwater conditions at the subject site are currently being monitored as part of an on-going groundwater monitoring program. As such, discrete groundwater level readings obtained during the field investigation are not presented herein. A summary memorandum will be issued upon completion of the monitoring program.

Groundwater levels are also subject to seasonal fluctuations and may vary at the time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed development. For any new structures, it is recommended that they be founded on conventional spread footings bearing on an undisturbed, compact to dense silty sand or glacial till bearing surface.

Where fill or loose silty sand is encountered at the underside of the footing (USF), it should be sub-excavated to the surface of the undisturbed, compact to dense silty sand or glacial till and replaced with engineered fill or lean concrete up to the proposed founding elevation. The lateral limits of the engineered fill or lean concrete placement should be in accordance with our lateral support recommendations provided herein.

A slope stability assessment has been conducted in order to determine the Limit of Hazard Lands setbacks from the existing pond.

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

5.2 Site Grading and Preparation

Stripping Depth and Subgrade Preparation

Topsoil, asphalt or fill, such as those containing organic materials, should be stripped from under the building footprints and other settlement-sensitive structures, prior to placing the fill.

However, it is anticipated that the existing fill can remain in place below the proposed building, outside of the lateral support zones of the footings, provided that the existing fill subgrade is proof rolled several times under dry conditions and above freezing temperatures. The proof rolling should consist of several passes of a vibratory drum roller, which is done under the supervision of Paterson. Any poor-performing areas noted during the proof rolling operation should be removed and replaced with an approved fill.

Where silty sand is encountered at the slab-on-grade subgrade and/or underside of the footing (USF) elevation and is observed to be in a loose state of compactness, it should also be proof-compacted with several passes of a vibratory plate compactor or drum roller.

Existing foundation walls and other construction debris, if encountered, should be entirely removed from within the proposed structure perimeter. Under paved areas, existing construction remnants, such as foundation walls, should be excavated to a minimum depth of 1 m below the final grade.

Fill Placement

Fill placed 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. The imported fill material should be tested and approved prior to delivery. The fill should be placed in maximum 300 mm thick loose lifts and compacted by suitable compaction equipment. Fill placed beneath proposed building and paved areas should be compacted to a minimum 98% of the 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 this material is to be used to build up the subgrade level for areas to be paved, it should be compacted in thin lifts to at least 95% of the material's SPMDD.

Fill used for grading beneath the base and subbase layers of paved areas should consist, unless otherwise specified, of clean imported granular fill, such as OPSS Granular A, Granular B Type II or select subgrade 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 paved areas should be compacted to at least 95% of its SPMDD.

5.3 Foundation Design

Conventional Spread Footings

Conventional spread footings placed on an undisturbed, compact to dense glacial till or silty sand bearing surfaces can be designed using a bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **225 kPa**. A geotechnical resistance factor of 0.5 was applied to the above-noted bearing resistance value at ULS.

An undisturbed soil bearing surface consists of a surface from which 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.

Footings bearing on the undisturbed, compact to dense glacial till or silty sand and designed using the above-noted bearing resistance value at SLS will be subjected to potential post-construction total and differential settlement of 25 and 20 mm, respectively.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to a soil bearing medium when a plane extending down and out from the bottom edge of the footing or raft at a minimum of 1.5H:1V, passes only through in situ soil or engineered fill of the same or higher capacity as the soil.

5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Class X_D**. If a higher seismic site class is required for the proposed development, then a site-specific shear wave velocity test may be completed to accurately determine the applicable seismic site classification for foundation design, as defined in the Ontario Building Code (OBC) 2024.

Soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest version of the OBC 2024 for a full discussion of the earthquake design requirements.

5.5 Slab-on-Grade Construction

With the removal of all topsoil and fill, containing significant amounts of deleterious or organic materials, the existing fill, silty sand, or glacial till subgrade approved by the geotechnical consultant at the time of excavation will be considered an acceptable subgrade surface on which to commence backfilling for slab-on-grade construction. A vibratory drum roller should complete several passes over the subgrade surface as a proof-rolling program. Any poor performing areas should be removed and reinstated with an engineered fill, such as OPSS Granular B Type II.

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

5.6 Pavement Design

The pavement structures presented in the following tables are recommended for the design of car-only parking, heavy truck parking and loading areas and access lanes.

Table 1 – Recommended Pavement Structure – Car Only Parking Areas	
Thickness (mm)	**Material Description**
50	**Wear Course** – HL-3 or Superpave 12.5 Asphalt Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
SUBGRADE – Either existing fill, in-situ soil, or OPSS Granular B Type I or II material placed over in-situ soil or fill.	

Table 2 – Recommended Pavement Structure – Access Lanes, Loading Areas and Heavy Truck Parking	
Thickness (mm)	**Material Description**
40	**Wear Course** - Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
450	**SUBBASE** - OPSS Granular B Type II
SUBGRADE – Either existing fill, in-situ soil, or OPSS Granular B Type I or II material placed over in-situ soil or fill.	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project. If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material. The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 99% of the material's SPMDD using suitable vibratory equipment.

Where the proposed asphalt surface meets existing asphalt, the following joint transition detail should be employed:

- A 300 mm wide section of the existing asphalt should be saw cut from the existing pavement edge to provide a sound surface to abut the proposed pavement structure.
- It is recommended to mill a 300 mm wide and 40 mm deep section of the existing asphalt at the saw cut edge.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

A perimeter foundation drainage system is recommended for any new buildings constructed at this site with below-grade space. Where utilized, the system should consist of a 150 mm diameter perforated and corrugated plastic pipe which is surrounded on all sides by 150 mm of 19 mm clear crushed stone, and 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, such as clean sand or OPSS Granular B Type I granular material, should otherwise be used for this purpose.

Backfill material below sidewalks and walkway subgrade areas throughout the subject site, including along the building, should be provided with a minimum 300 mm thick layer of OPSS Granular A or OPSS Granular B Type II crushed stone. This material should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 98% of the material's SPMDD.

6.2 Protection of Footings Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effects of frost action. Generally, a minimum of 1.5 m thick soil cover, or an equivalent combination of soil cover and foundation insulation, should be provided in this regard.

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

6.3 Excavation Side Slopes

The side slopes of excavations in the overburden material 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 expected that sufficient room will be available for the greater part of the excavation to be undertaken by open-cut methods (i.e. unsupported excavations).

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be excavated at 1H:1V or shallower. The shallower slope is required for excavation below groundwater level. The subsurface soils are considered to be 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.

A trench box is recommended to protect personnel working in trenches with steep or vertical sides. Services are expected to be installed by “cut and cover” methods and excavations should not remain open for extended periods of time.

6.4 Pipe Bedding and Backfill

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

A minimum of 150 mm of OPSS Granular A should be placed for bedding for sewer or water pipes when placed on a soil subgrade. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to a minimum of 300 mm above the obvert of the pipe, should consist of OPSS Granular A or Granular B Type II with a maximum size of 25 mm. The bedding layer should be increased to a minimum thickness of 300 mm where the subgrade consists of grey silty clay. The bedding and cover materials should be placed in maximum 300 mm thick lifts compacted to 95% of the material’s standard Proctor maximum dry density.

It should generally be possible to re-use the site-generated fill, silty sand, and glacial till materials (moist, not wet) above the cover material if excavation and filling operations are carried out in dry and non-freezing weather conditions. The wet silty sand should be given a sufficient drying period to decrease its moisture content to an acceptable level to make compaction possible prior to being reused.

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) and above the cover material should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 225 mm thick loose lifts and compacted to a minimum of 95% of the material standard Proctor maximum dry density.

6.5 Groundwater Control

It is anticipated that groundwater infiltration into the excavations should be moderate and controllable using open sumps. 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.

Under the current regulations enacted by the Ministry of Environment, Conservation and Parks (MECP), any dewatering in excess of 50,000 L/day requires a registration on the Environmental Activity and Sector Registry (EASR), provided that dewatering is related to construction. If the dewatering is not related to construction, a Permit to Take Water obtained from the MECP will be required.

In the event that an EASR is required to facilitate dewatering of the proposed development, a minimum of 3 to 4 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. Should a Permit to Take Water be required, a minimum of five to six months should be allotted for completion of the permit, due to the minimum review period imposed by the MECP.

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project. The subsoil conditions at this site mostly 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, 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 activities are to be carried out during freezing conditions. Additional information could be provided, if required.

6.7 Corrosion Potential and Sulphate

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

6.8 Slope Stability Assessment

As noted above, the subject site slopes downward from the central portion toward the west and south, in the direction of the adjacent ponds and watercourse, with an approximate elevation change of 4 to 5 m across the site. Accordingly, slope stability analyses were carried out under the proposed site conditions.

The slope stability analysis of the proposed site conditions was carried out using SLIDE2, a computer program that permits a two-dimensional slope stability analysis using several widely accepted limit equilibrium methods, such as Bishop's Method. The program calculates a factor of safety, which represents the ratio of the forces resisting failure to those favoring failure. Theoretically, a factor of safety of 1.0 represents a condition where the slope is stable. However, due to intrinsic limitations of the calculation methods and the variability of the subsoil and groundwater conditions, a factor of safety greater than 1.0 is usually required to ascertain that the risks of failure are acceptable. Minimum factors of safety of 1.5 and 1.1 are generally recommended under static and seismic conditions, respectively, where the failure of the slope would endanger permanent structures.

Subsoil conditions at the cross-section were inferred based on the completed boreholes at the subject site and our knowledge of the area. The soil parameters used for the analysis are shown in Figures 2A to 5B in Appendix 2.

Static and Seismic Loading Analysis

The results for the analysis of the proposed slopes (Section A-A', B-B', and C-C') are shown in Figures 2A to 5B attached to this memorandum. For Section B-B', the slope stability analyses indicate that the estimated factors of safety under the proposed conditions are below the minimum recommended values of 1.5 and 1.1 for static and seismic conditions, respectively, indicating unstable slope conditions. For Sections A-A and C-C, the slope stability analyses indicate that the estimated factors of safety under the proposed conditions are greater than 1.5 and 1.1 for static and seismic conditions, respectively, indicating stable slope conditions.

It is important to note that due to the nature of the cohesionless soils (silty sand), groundwater infiltration through the slope may cause several washouts over the long run. In addition, precipitation events along with snowmelt events in early spring seasons will also contribute to eroding the slope face by surface water runoff. Therefore, additional analyses were conducted with suggested remedial work to ensure that a factor of safety of 1.5 and 1.1 for static and seismic conditions, respectively, is achieved. The following represents the analyses conducted for the proposed condition of the slope and the suggested remedial work for Section B-B' (Figures 4A and 4B) under static and seismic conditions.

Figures 3A and 3B illustrate the slope under proposed conditions without the installation of erosion control measures. The analyzed slopes were estimated to have factors of safety of 1.14 under static conditions, which are below the minimum required factor of safety of 1.5 for stable slope conditions. Under seismic conditions, the estimated factors of safety are 0.785, which are below the minimum recommended factor of safety of 1.1 for seismic conditions.

Figures 4A and 4B illustrate a proposed slope reinforcement system consisting of compacted granular material extending from approximately 1.0 m at the toe of the slope to approximately 0.5 m near the top of the slope. Reference should be made to Figure 6 – Recommended Remedial Work in Appendix 2. Followed by the placement of a woven geotextile liner such as Terrafix 200W or an approved equivalent. The geotextile liner should be pinned to the ground with steel pins embedded a minimum of 450 mm below the slope surface. Alternatively, the geotextile liner can also be anchored with any recommended anchorage system by the geotextile supplier, pending Paterson's review and approval. The geotextile liners along the slope face should be overlapped by a minimum 300 mm and anchored with pins spaced at max 1.5 m along the overlapped areas. Following the placement of the geotextile liner, a granular material, such as OPSS Granular B Type II, compacted to a minimum of 95% of the material's Standard Proctor Maximum Dry Density (SPMDD), should be installed. With the proposed reinforcement system, the slopes were estimated to achieve improved factors of safety of 1.655 under static conditions and 1.174 under seismic conditions.

As a second layer of protection, hydroseeding can be installed over the slope face to establish vegetations. It is important to note that the remedial program will provide erosion control measures where implemented. However, areas not included in the remedial work may be susceptible to natural surficial erosion caused by rain events or surface water runoff.

Toe Erosion and Access Allowances

Based on the soil profiles encountered at the borehole locations, a dense to very dense silty sand is anticipated to be subject to erosion activity. The John Boyce Municipal Drain did not appear to be affected by active erosion at the time of our site visit. Based on the anticipated soils, a toe erosion allowance of 2 m should be applied. Please note that if the remedial work is implemented on any portion of the slope, the toe erosion setback may be fully removed from the Limit of Hazard Lands setback provided on the attached plan.

Further, an access allowance of 6 m is required from the top of slope or geotechnical setback (where applicable).

Limit of Hazard Lands

Based on the above, a setback taken from the top of the current slope has been provided based on the above-noted observations and analysis. Reference should be made to Drawing PG7831-1 – Test Hole Location Plan for the proposed Limit of Hazard Lands setback for development considerations at the subject site. The existing vegetation on the slope faces should not be removed as it contributes to the stability of the slope and reduces erosion.

6.9 Stormwater Management Pond

It is understood that the proposed stormwater management pond (SWMP) will be located within the subject site. Based on the test holes completed within the footprint of the SWMP, it is anticipated that the proposed structure will be founded on a silty sand and/or glacial till bearing surface.

Given the anticipated silty sand and/or glacial till at the bottom and lower sides of the SWMP, a liner is recommended. The pond liner may consist of one of the following:

- A 500 mm thick layer of workable, brown silty clay which is compacted with several passes of a sheepsfoot roller, and placed directly over the bedrock.

- 150 mm thick layer of 19 mm clear crushed stone placed over the bedrock subgrade, followed by a scrim-reinforced geosynthetic clay liner (such as the Bentofix Thermal Lock SRNWL Series Geosynthetic Clay Liner, or approved equivalent) which is capped with a 300 mm thick layer of OPSS Granular A material.

7.0 Recommendations

It is recommended that the following be carried out by Paterson once details of the proposed development are available:

- ❑ Review detailed Grading and Servicing Plans from a geotechnical perspective.
- ❑ Review of detailed plans pertaining to excavation.

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

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

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

All excess soils must be handled in accordance with *Ontario Regulation 406/19: On-Site and Excess Soil Management.*

8.0 Statement of Limitations

The recommendations provided in this report are in accordance with our present understanding of the project. We request permission to review our recommendations when the drawings and specifications are available.

A geotechnical investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, we request immediate notification to permit reassessment of our recommendations.

The recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work. The latter should evaluate the factual information provided in this report and determine its suitability and completeness for their intended construction schedule and methods. Additional testing may be required for their purposes.

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 Greely Sand & Gravel Inc. or their agents is not authorized without review by Paterson for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.



Yashar Ziaeimehr, M.A.Sc., P.Eng. Faisal I. Abou-Seido, P.Eng.

Report Distribution:

- ❑ Greely Sand & Gravel Inc. (email copy)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

RECORD OF BOREHOLE SHEETS BY OTHERS

ANALYTICAL TESTING RESULTS

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

5360 Bank Street, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 377088.44 **NORTHING:** 5016470.60 **ELEVATION:** 109.08

PROJECT: Proposed Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 17, 2026

FILE NO. : PG7831

HOLE NO. : BH 1-26

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									109
FILL: Brown silty sand with gravel, trace organics, cobbles and clay		1	AU 1						
			SS 2	58	20-14-16-13 30				108
		2	SS 3	58	6-7-10-8 17				
2.21m [106.87m]									107
Compact to loose, brown **SILTY SAND** trace clay			SS 4	75	3-5-5-5 10				
		3	SS 5	67	3-4-3-6 7				106
		4	SS 6	58	4-7-7-8 14				105
		5	SS 7	83	3-4-5-6 9				104
5.26m [103.82m]									
GLACIAL TILL: Very dense, brown silty fine sand with gravel, cobbles and boulders		6	SS 8	64	23-24-48-50 72/0.1				103
6.43m [102.65m]			SS 9	92	15-28-50-/ 78/0.03				
End of Borehole		7							102
		8							

DISCLAIMER: THE DATA PRESENTED IN THIS SHEET IS THE PROPERTY OF PATERSON GROUP AND THE CLIENT FOR WHOM IT WAS PRODUCED. THIS SHEET SHOULD BE READ IN CONJUNCTION WITH ITS CORRESPONDING REPORT. PATERSON GROUP IS NOT RESPONSIBLE FOR THE UNAUTHORIZED USE OF THIS DATA.

P:/AutoCAD Drawings/Test Hole Data Files/PG78xx/PG7831/data.sqlite 2026-03-31, 08:45 Paterson_Template AE

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

5360 Bank Street, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 377171.43 **NORTHING:** 5016452.47 **ELEVATION:** 109.72

PROJECT: Proposed Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 17, 2026

FILE NO. : PG7831

HOLE NO. : BH 2-26

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
FILL: Brown silty sand with gravel			AU 1						109
0.69m [109.03m]									
Compact to very dense, brown **SILTY SAND**		1	SS 2	67	5-4-6-8 10				108
			SS 3	71	5-32-50-/ 82/0.05				
1.98m [107.74m]		2							
GLACIAL TILL: Very dense, brown silty fine sand with gravel, cobbles and boulders			SS 4	100	40-50-/-/ 50/None				107
		3	SS 5	36	50-/-/-/ 50/None				
			SS 6	61	21-50-/-/ 50/0.1				106
		4	SS 7	95	50-/-/-/ 50/0.08				105
		5	SS 8	66	20-50-/-/ 50/0.08				104
		6	SS 9	76	30-50-/-/ 50/0.05				103
6.30m [103.42m]									
End of Borehole		7							102
		8							

DISCLAIMER: THE DATA PRESENTED IN THIS SHEET IS THE PROPERTY OF PATERSON GROUP AND THE CLIENT FOR WHOM IT WAS PRODUCED. THIS SHEET SHOULD BE READ IN CONJUNCTION WITH ITS CORRESPONDING REPORT. PATERSON GROUP IS NOT RESPONSIBLE FOR THE UNAUTHORIZED USE OF THIS DATA.

P:/AutoCAD Drawings/Test Hole Data Files/PG78xx/PG7831/data.sqlite 2026-03-31, 08:45 Paterson_Template AE

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

5360 Bank Street, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 377272.25 **NORTHING:** 5016441.87 **ELEVATION:** 108.16

PROJECT: Proposed Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 17, 2026

FILE NO. : PG7831

HOLE NO. : BH 3-26

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									108
FILL: Brown silty sand with gravel, trace organics			AU 1						
		1	SS 2	50	3-3-2-2 5				107
1.45m [106.71m]									
GLACIAL TILL: Very dense, brown silty fine sand with gravel, cobbles and boulders			SS 3	95	50-/-/-/ 50/0.08				
		2							106
			SS 4	91	28-50-/-/ 50/0.13				
		3	SS 5	85	35-50-/-/ 50/0.03				105
4.19m [103.97m]			SS 6	73	26-50-/-/ 50/0.13				
		4							104
End of Borehole									
		5							103
		6							102
		7							101
		8							

DISCLAIMER: THE DATA PRESENTED IN THIS SHEET IS THE PROPERTY OF PATERSON GROUP AND THE CLIENT FOR WHOM IT WAS PRODUCED. THIS SHEET SHOULD BE READ IN CONJUNCTION WITH ITS CORRESPONDING REPORT. PATERSON GROUP IS NOT RESPONSIBLE FOR THE UNAUTHORIZED USE OF THIS DATA.

P:/AutoCAD Drawings/Test Hole Data Files/PG78xx/PG7831/data.sqlite 2026-03-31, 08:45 Paterson_Template AE

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

5360 Bank Street, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 377281.20 **NORTHING:** 5016436.81 **ELEVATION:** 107.99

PROJECT: Proposed Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 17, 2026

FILE NO. : PG7831

HOLE NO. : BH 4-26

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
FILL: Brown silty sand with gravel, trace organics			AU 1						
		1	SS 2	29	7-8-8-6 16				107
1.45m [106.54m]			SS 3	63	50-/-/-/ 50/0.08				
GLACIAL TILL: Very dense, brown silty sand with gravel and cobbles		2							106
			SS 4	65	6-6-29-50 35/0.1				
		3	SS 5	66	15-50-/-/ 50/0.08				105
3.81m [104.18m]			SS 6		50-/-/-/ 50/0				
End of Borehole		4							104
		5							103
		6							102
		7							101
		8							100

DISCLAIMER: THE DATA PRESENTED IN THIS SHEET IS THE PROPERTY OF PATERSON GROUP AND THE CLIENT FOR WHOM IT WAS PRODUCED. THIS SHEET SHOULD BE READ IN CONJUNCTION WITH ITS CORRESPONDING REPORT. PATERSON GROUP IS NOT RESPONSIBLE FOR THE UNAUTHORIZED USE OF THIS DATA.

P:/AutoCAD Drawings/Test Hole Data Files/PG78xx/PG7831/data.sqlite 2026-03-31, 08:45 Paterson_Template AE

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

5360 Bank Street, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 377386.92 **NORTHING:** 5016556.63 **ELEVATION:** 107.37

PROJECT: Proposed Development **FILE NO. :** **PG7831**

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: Datum: NAD1983 (Canada) Geoid: HT2-2010 **DATE:** March 17, 2026 **HOLE NO. :** **BH 5-26**

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL: trace organics									
0.10m [107.27m]									
Loose to compact, brown **SILTY SAND**, trace gravel									
0.69m [106.68m]									
GLACIAL TILL: Very dense, brown silty fine sand with gravel, cobbles and boulders		1	AU 1						107
			SS 2	83	9-25-21-25 46				
			SS 3	635	20-34-33-30 67				106
		2							
			SS 4	54	6-50-/-/ 50/0.13				105
		3	SS 5	51	50-/-/-/ 50/0.1				
3.66m [103.71m]									104
End of Borehole		4							
Practical refusal to augering at 3.66 m depth									103
		5							
									102
		6							
									101
		7							
									100
		8							

DISCLAIMER: THE DATA PRESENTED IN THIS SHEET IS THE PROPERTY OF PATERSON GROUP AND THE CLIENT FOR WHOM IT WAS PRODUCED. THIS SHEET SHOULD BE READ IN CONJUNCTION WITH ITS CORRESPONDING REPORT. PATERSON GROUP IS NOT RESPONSIBLE FOR THE UNAUTHORIZED USE OF THIS DATA.

P:/AutoCAD Drawings/Test Hole Data Files/PG78xx/PG7831/data.sqlite 2026-03-31, 08:45 Paterson_Template AE

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

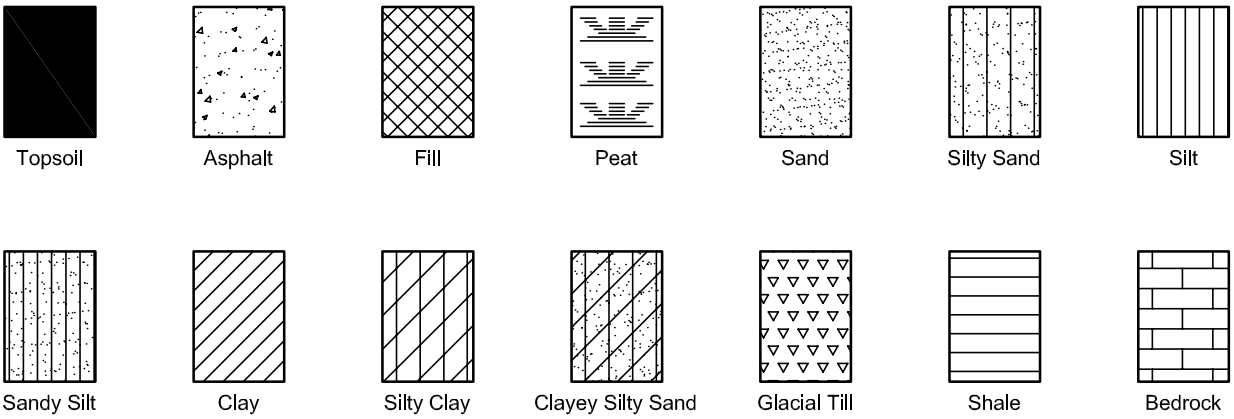
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

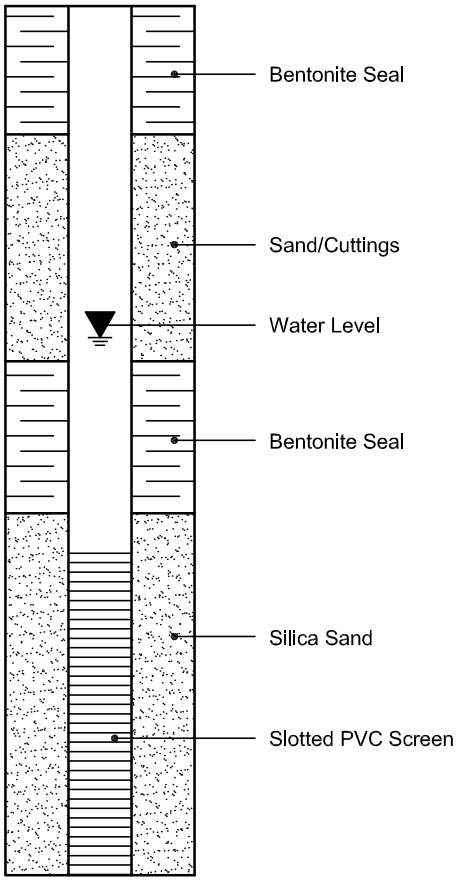
SYMBOLS AND TERMS (continued)

STRATA PLOT

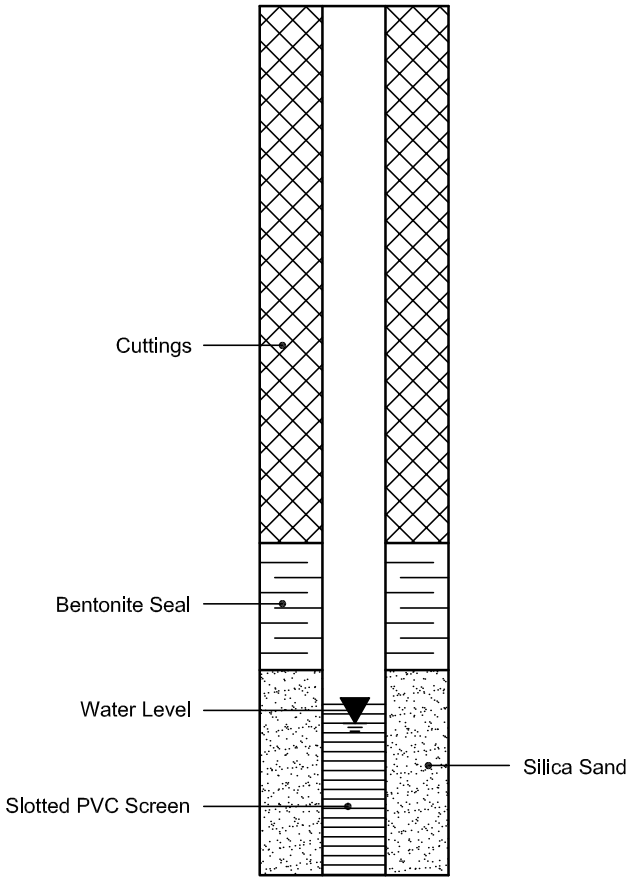


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



RECORD OF BOREHOLE 23-01

CLIENT: PERCY PYPER (1997) LTD.
PROJECT: 5360 Bank Street Phase Two ESA
JOB#: 100227.101
LOCATION: Salt Domes

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 21 2023

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	SAMPLE DATA: TYPE	SAMPLE DATA: RECOVERY (mm)	SAMPLE DATA: BLOWS/0.3m	SAMPLE DATA: LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface											
0	Direct Push	Brown gravelly sand with trace silt			SA1	CS			M&I, BTEX, PHCs F1-F4		None		
					SA2	CS			M&I, BTEX, PHCs F1-F4		None		
1					NR								
					SA3	CS					None		
2					SA4	CS					None		
					NR								
3					SA5	CS					None		
					SA6	CS					None		
		End of Borehole Refusal		3.96									

GEMTEC
Consulting Engineers and Scientists

LOGGED: CZ
CHECKED: EW

ENV - BOREHOLE LOG 100227101_GINT_BOREHOLE LOGS.GPJ GEMTEC 2018.GDT 8/31/23

RECORD OF BOREHOLE 23-02

CLIENT: PERCY PYPER (1997) LTD.
PROJECT: 5360 Bank Street Phase Two ESA
JOB#: 100227.101
LOCATION: Cold Patch Pile

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 21 2023

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	SAMPLE DATA: TYPE	SAMPLE DATA: RECOVERY (mm)	SAMPLE DATA: BLOWS/0.3m	SAMPLE DATA: LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface											
0	Direct Push	Dark brown silty sand, trace clay (top soil)			SA1	CS			M&I, BTEX, PHCs F1-F4		None		
1					NR								
2		Orangey brown silty sand (beach sand)		1.83	SA2	CS			M&I, BTEX, PHCs F1-F4		None		
3					NR								
					SA3	CS					None		
		End of Borehole Refusal		3.96									

GEMTEC
Consulting Engineers and Scientists

LOGGED: CZ
CHECKED: EW

ENV - BOREHOLE LOG 100227101_GINT_BOREHOLE LOGS.GPJ GEMTEC 2018.GDT 8/31/23

RECORD OF BOREHOLE 23-03 (MW)

CLIENT: PERCY PYPER (1997) LTD.
PROJECT: 5360 Bank Street Phase Two ESA
JOB#: 100227.101
LOCATION: Tanks Outside CACE

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 21 2023

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface		108.84									
0	Auger	Light brown medium sand		0.03	NR								
		Dark brown silty sand, trace clay			SA1	CS				HEX: 115, IBI: 2	None		
1					NR								
					SA2	CS			BTEX, PHCs F1-F4	HEX: 160, IBI: 2	None		
		Crushed/ pulverized rock		107.01 1.83									
2				106.71	SA3	CS				HEX: 0, IBI: 1	None		
		Grey brown sand with gravel		2.13									
					NR								
3	Direct Push												
				105.49	SA4	CS					None		
		Crushed/ pulverized rock		3.35									
				105.18									
		Wet, brown grey medium sand with trace clay		3.66	SA5	CS				HEX: 0, IBI: 0	None		
4					NR								
													50mm diameter PVC well screen
5					SA6	CS			BTEX, PHCs F1-F4	HEX: 950, IBI: 2	None		
				103.51									
		Crushed rock		5.33									
				103.35									
		Brown sandy gravel with some silt		5.49	SA7	CS				HEX: 0, IBI: 2	None		
6					NR								
				102.74									
		End of Borehole Intersected Water Table		6.10									

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEVATION (m)
Aug. 23/23	3.86 ▽	104.94
Aug. 25/23	3.86 ▼	104.94

GEMTEC
Consulting Engineers and Scientists

LOGGED: CZ
CHECKED: EW

ENV - BOREHOLE LOG 100227101_GINT_BOREHOLE LOGS.GPJ GEMTEC 2018.GDT 8/31/23

RECORD OF BOREHOLE 23-04 (MW)

CLIENT: PERCY PYPER (1997) LTD.
PROJECT: 5360 Bank Street Phase Two ESA
JOB#: 100227.101
LOCATION: Side of Building

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 21 2023

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface		109.77									
0	Direct Push	Brown sandy gravel (Fill)			NR								
		Grey brown sand and gravel		0.30	SA1	CS			BTEX, PHCs F1-F4	HEX: 55, IBI: 0	None		
					SA2	CS				HEX: 10, IBI: 0	None		
1					NR								
2					SA3	CS				HEX: 15, IBI: 0	None		
					SA4	CS				HEX: 0, IBI: 0	None		
3					SA5	CS				HEX: 0, IBI: 0	None		
4		Grey sand and gravel, some silt		3.96 / 105.19	SA6	CS				HEX: 0, IBI: 1	None		
		Brown sand and silt with gravel		4.58 / 104.81	SA7	CS			BTEX, PHCs F1-F4	HEX: 290, IBI: 1	None		38 mm diameter PVC well screen
5		Grey sand and wilt with crushed rock		4.96	SA8	CS				HEX: 0, IBI: 0	None		
6				103.67									
		Grey clayey silt, wet		6.10 / 102.91	SA9	CS				HEX: 55, IBI: 0	None		
		End of Borehole Intersected Water Table		6.86									

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEVATION (m)
Aug. 23/23	3.24 ▽	106.45
Aug. 25/23	3.65 ▼	106.03

GEMTEC
Consulting Engineers and Scientists

LOGGED: CZ
CHECKED: EW

ENV - BOREHOLE LOG 100227101_GINT_BOREHOLE LOGS.GPJ GEMTEC 2018.GDT 8/31/23

RECORD OF BOREHOLE 23-05 (MW)

CLIENT: PERCY PYPER (1997) LTD.
PROJECT: 5360 Bank Street Phase Two ESA
JOB#: 100227.101
LOCATION: Beside Diesel Tank

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 21 2023

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface		110.60									
0	Auger	Greyish brown silty sand with crushed rock and gravel (Fill)			NR								
					SA1	CS			BTEX, PHCs F1-F4	HEX: 0, IBI: 0	None		
1					NR								
					SA2	CS				HEX: 0, IBI: 0	None		
2				108.47									
		Grey sandy silt, trace clay		2.13	SA3	CS				HEX: 0, IBI: 0	None		
					NR								
3	Direct Push			107.55									
		Grey brown silty sand and gravel, trace clay		3.05	SA4	CS				HEX: 0, IBI: 0	None		
					SA5	CS				HEX: 0, IBI: 0	None		38 mm diameter PVC well screen
4				106.33									
		Grey brown clayey silt with sand, wet to 5.64 mbgs		4.27	NR								
					SA6	CS			BTEX, PHCs F1-F4	HEX: 310, IBI: 1	None		
5					SA7	CS				HEX: 0, IBI: 0	None		
					NR								
6				104.50									
		End of borehole Intersection of Water Table Caved to 5.94 mbgs		6.10									

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEVATION (m)
Aug. 23/23	3.51 ▽	106.85
Aug. 25/23	3.70 ▼	106.66

GEMTEC
Consulting Engineers and Scientists

LOGGED: CZ
CHECKED: EW

RECORD OF BOREHOLE 23-06 (MW)

CLIENT: PERCY PYPER (1997) LTD.
PROJECT: 5360 Bank Street Phase Two ESA
JOB#: 100227.101
LOCATION: Beside Sea Cans

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 22 2023

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface		110.29									
0	Auger	Dark brown silty sand, trace clay (Topsoil)			NR								
					SA1	CS			BTEX, PHCs F1-F4	HEX: 0, IBI: 0	None		
1					NR								
					SA2	CS				HEX: 0, IBI: 0	None		
2				108.31									
		Grey brown sand, trace silt (Beach sand)		1.98									
					NR								
3	Direct Push				SA3	CS				HEX: 0, IBI: 2	None		
				106.48									
		Wet, brown silty sand. Organic debris at 3.2 mbgs.		3.81									
4					SA4	CS				HEX: 0, IBI: 0	None		50 mm diameter PVC well screen
					SA5	CS				HEX: 0, IBI: 0	None		
5													
					SA6	CS			BTEX, PHCs F1-F4	HEX: 15, IBI: 1	None		
6				104.20									
		End of Borehole Intersection of Water Table		6.10									

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEVATION (m)
Aug. 23/23	3.92 ▽	106.22
Aug. 25/23	3.95 ▼	106.20

GEMTEC
Consulting Engineers and Scientists

LOGGED: CZ
CHECKED: EW

ENV - BOREHOLE LOG 100227101_GINT_BOREHOLE LOGS.GPJ GEMTEC 2018.GDT 8/31/23

RECORD OF BOREHOLE 23-07 (MW)

CLIENT: PERCY PYPER (1997) LTD.
PROJECT: 5360 Bank Street Phase Two ESA
JOB#: 100227.101
LOCATION: Asphalt Front of Building

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 22 2023

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	TYPE	RECOVERY (mm)	BLOWS/0.3m	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm)	ODOUR	TPH (mg/kg)	MONITORING WELL INSTALLATION AND NOTES
		Ground Surface		110.20									
0	Auger	Asphalt			NR								
		Light brown silty sand, trace gravel and rock			SA1	CS			BTEX, PHCs F1-F4	HEX: 0, IBL: 0	None		
1					NR								
					SA2	CS			BTEX, PHCs F1-F4	HEX: 0, IBL: 0	None		
2	Direct Push				SA3	CS				HEX: 0, IBL: 0	None		
3					SA4	CS				HEX: 0, IBL: 0	None		
4					SA5	CS				HEX: 0, IBL: 0	None		38 mm diameter PVC well screen
		End of Borehole Auger Refusal at 3.96 mbgs, Core Refusal at 4.57 mbgs		105.63 4.57									

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEVATION (m)
Aug. 23/23	3.40 ▽	106.71
Aug. 23/23	3.43 ▼	106.68

GEMTEC
Consulting Engineers and Scientists

LOGGED: CZ
CHECKED: EW

ENV - BOREHOLE LOG 100227101_GINT_BOREHOLE LOGS.GPJ GEMTEC 2018.GDT 8/31/23

Certificate of Analysis

Report Date: 20-Mar-2026

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 18-Mar-2026

Client PO: 65370

Project Description: PG7831

	Client ID:	BH2-26 SS4	-	-	-		
	Sample Date:	18-Mar-26 09:00	-	-	-	-	-
	Sample ID:	2612332-01	-	-	-		
	Matrix:	Soil	-	-	-		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	94.8	-	-	-	-	-
General Inorganics							
pH	0.05 pH Units	8.02	-	-	-	-	-
Resistivity	0.1 Ohm.m	54.1	-	-	-	-	-
Anions							
Chloride	10 ug/g	26	-	-	-	-	-
Sulphate	10 ug/g	17	-	-	-	-	-

APPENDIX 2

FIGURE 1 – KEY PLAN

FIGURES 2A TO 5B – SECTIONS FOR SLOPE STABILITY ANALYSIS

FIGURE 6 – RECOMMENDED REMEDIAL WORK

DRAWING PG7831-1 – TEST HOLE LOCATION PLAN

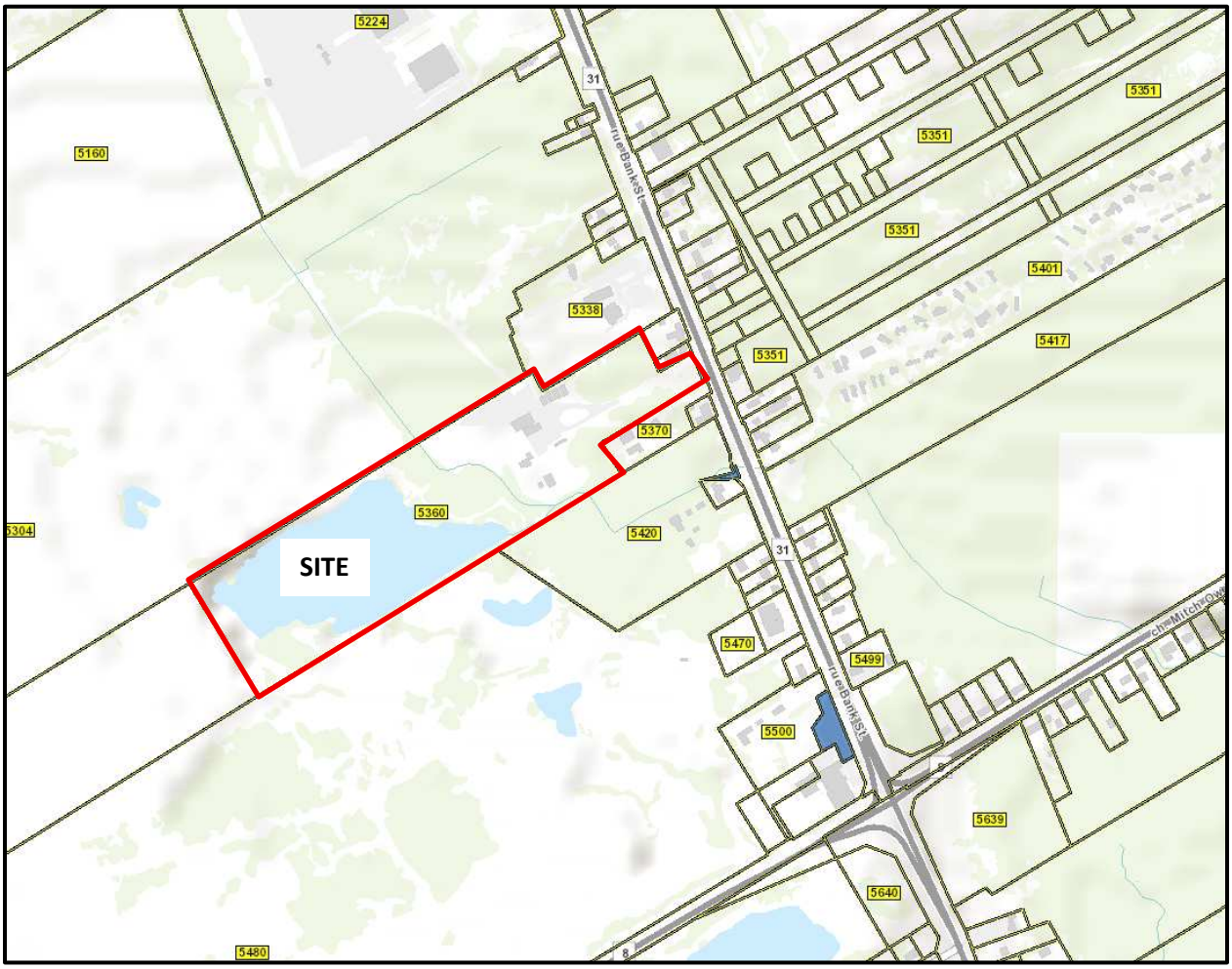
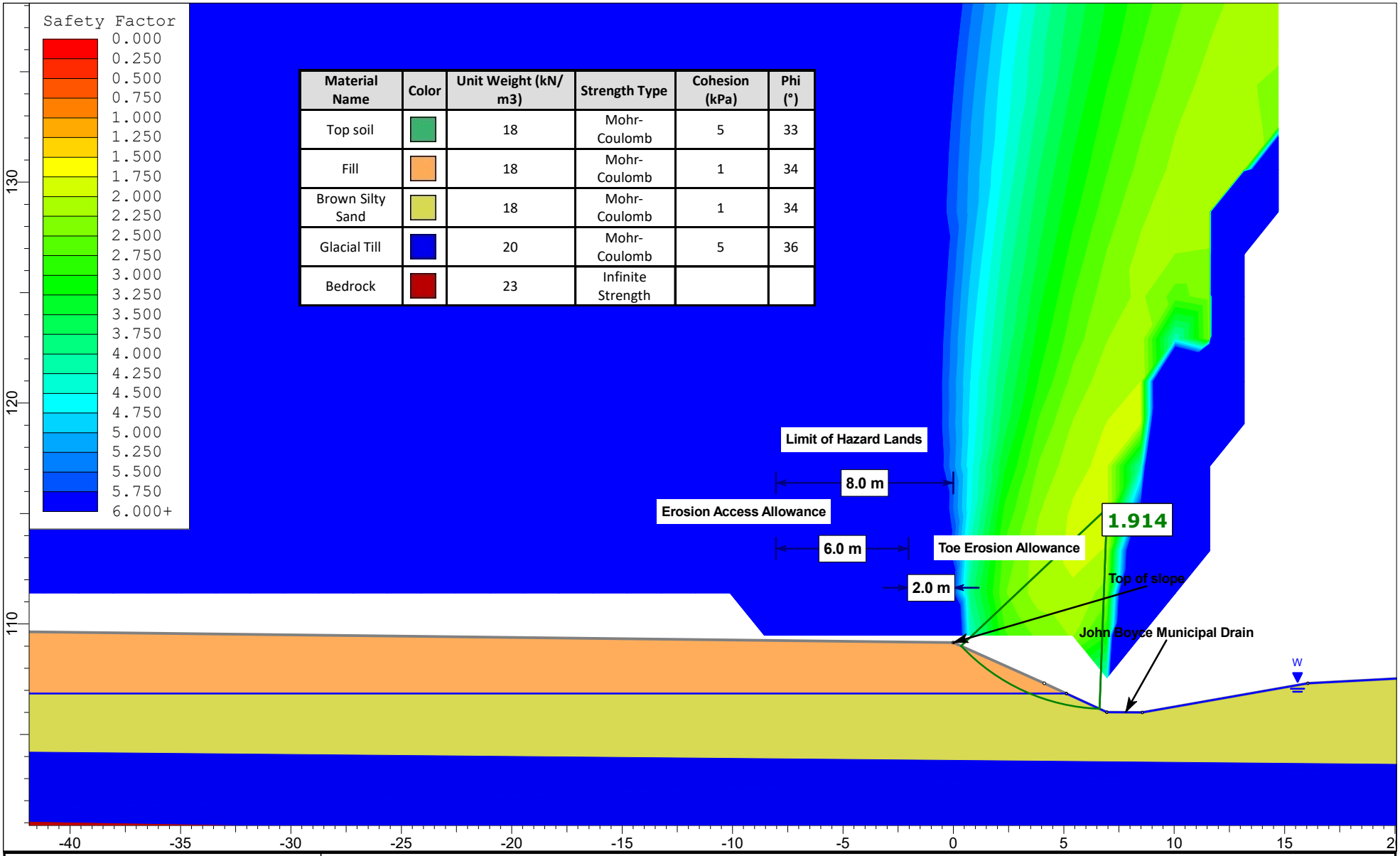


FIGURE 1

KEY PLAN

PATERSON GROUP



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)
Top soil		18	Mohr-Coulomb	5	33
Fill		18	Mohr-Coulomb	1	34
Brown Silty Sand		18	Mohr-Coulomb	1	34
Glacial Till		20	Mohr-Coulomb	5	36
Bedrock		23	Infinite Strength		

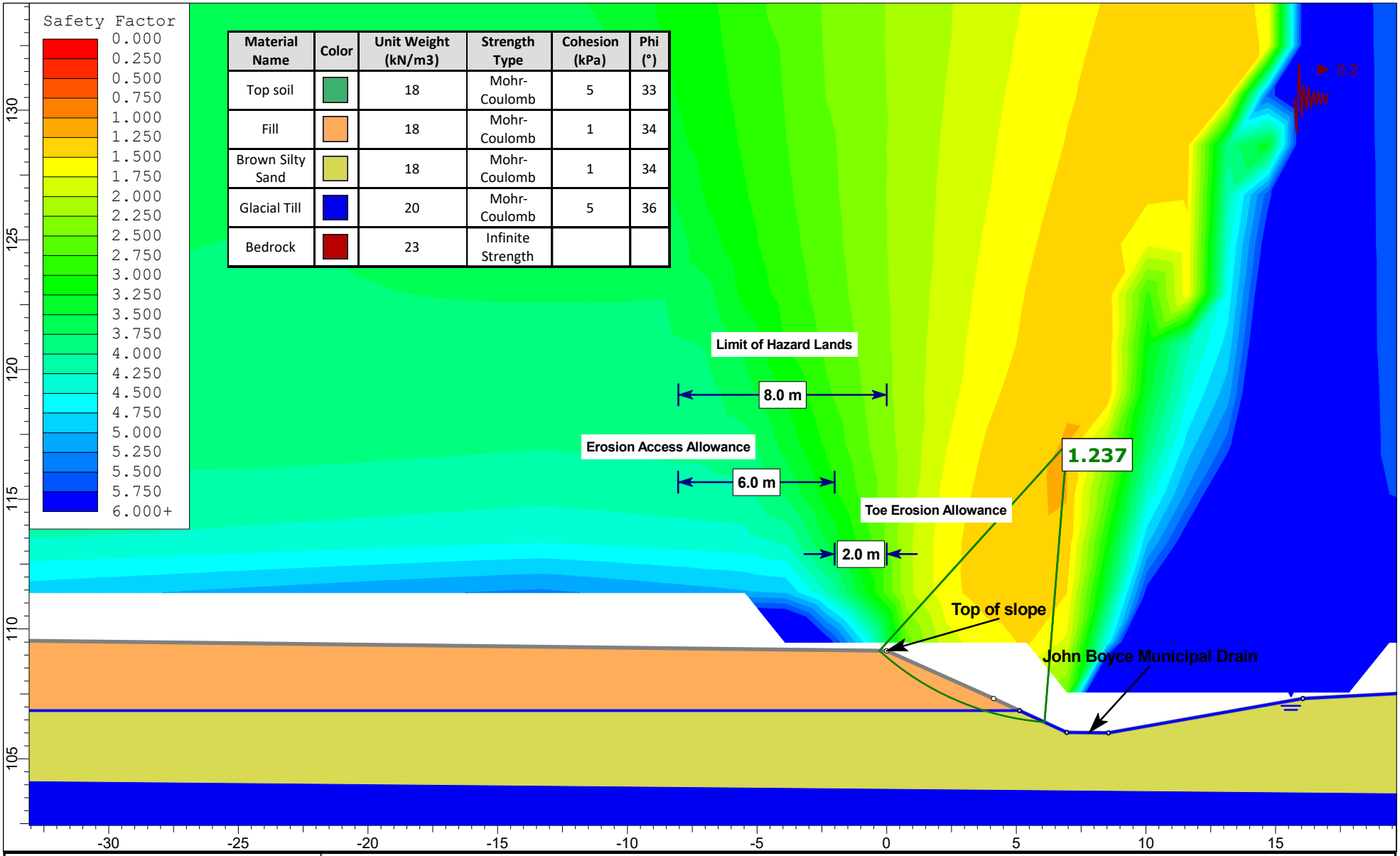
PATERSON GROUP

SLIDEINTERPRET 9.036

Project No.: **PG7831 - Greely Sand & Gravel Inc. - 5360 Bank Street, Ottawa**

Drawing No.: **Figure 2A - Proposed Condition - Static Loading - Section A-A'**

Prepared By:	Approved By:	*Date:*
ZA	FS	2026-07-06



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)
Top soil		18	Mohr-Coulomb	5	33
Fill		18	Mohr-Coulomb	1	34
Brown Silty Sand		18	Mohr-Coulomb	1	34
Glacial Till		20	Mohr-Coulomb	5	36
Bedrock		23	Infinite Strength		

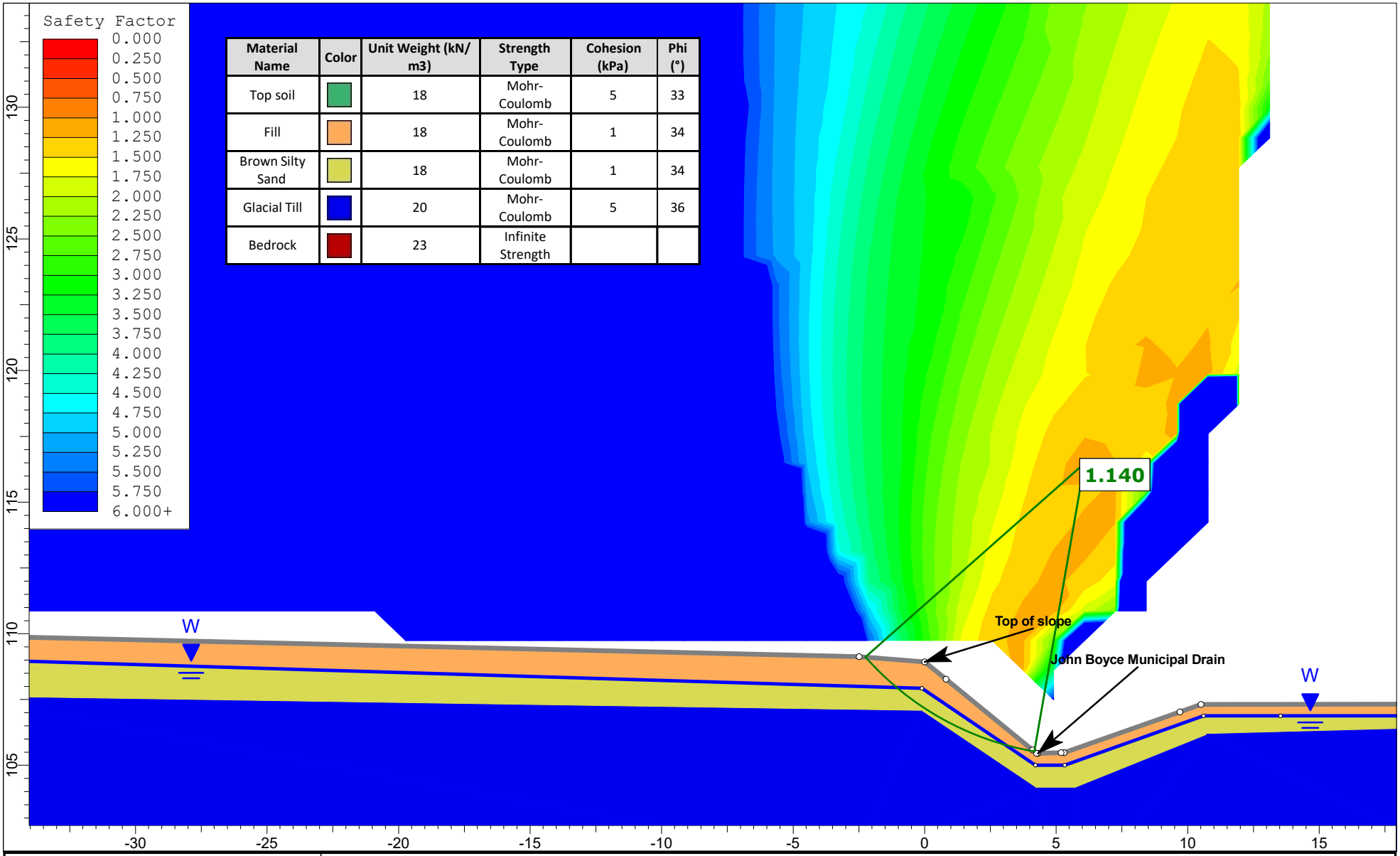
PATERSON GROUP

SLIDEINTERPRET 9.036

Project No.: **PG7831 - Greely Sand & Gravel Inc. - 5360 Bank Street, Ottawa**

Drawing No.: **Figure 2B - Proposed Condition - Seismic Loading - Section A-A'**

Prepared By:	Approved By:	*Date:*
ZA	FS	2026-07-06



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)
Top soil		18	Mohr-Coulomb	5	33
Fill		18	Mohr-Coulomb	1	34
Brown Silty Sand		18	Mohr-Coulomb	1	34
Glacial Till		20	Mohr-Coulomb	5	36
Bedrock		23	Infinite Strength		

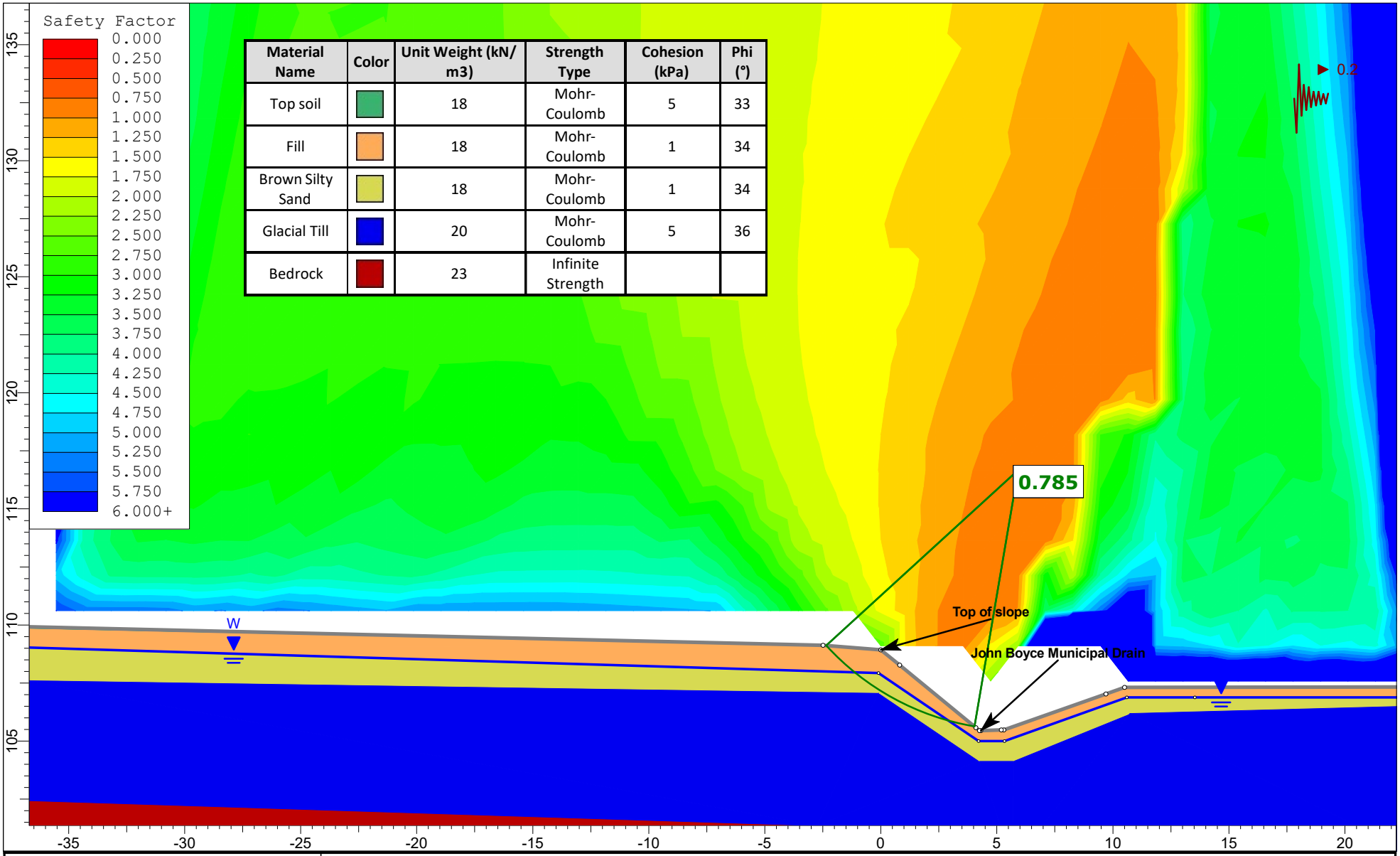
PATERSON GROUP

SLIDEINTERPRET 9.036

Project No.: **PG7831 - Greely Sand & Gravel Inc. - 5360 Bank Street, Ottawa**

Drawing No.: **Figure 3A - Proposed Condition - Static Loading - Section B-B'**

Prepared By:	Approved By:	*Date:*
ZA	FS	2026-07-06



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)
Top soil		18	Mohr-Coulomb	5	33
Fill		18	Mohr-Coulomb	1	34
Brown Silty Sand		18	Mohr-Coulomb	1	34
Glacial Till		20	Mohr-Coulomb	5	36
Bedrock		23	Infinite Strength		

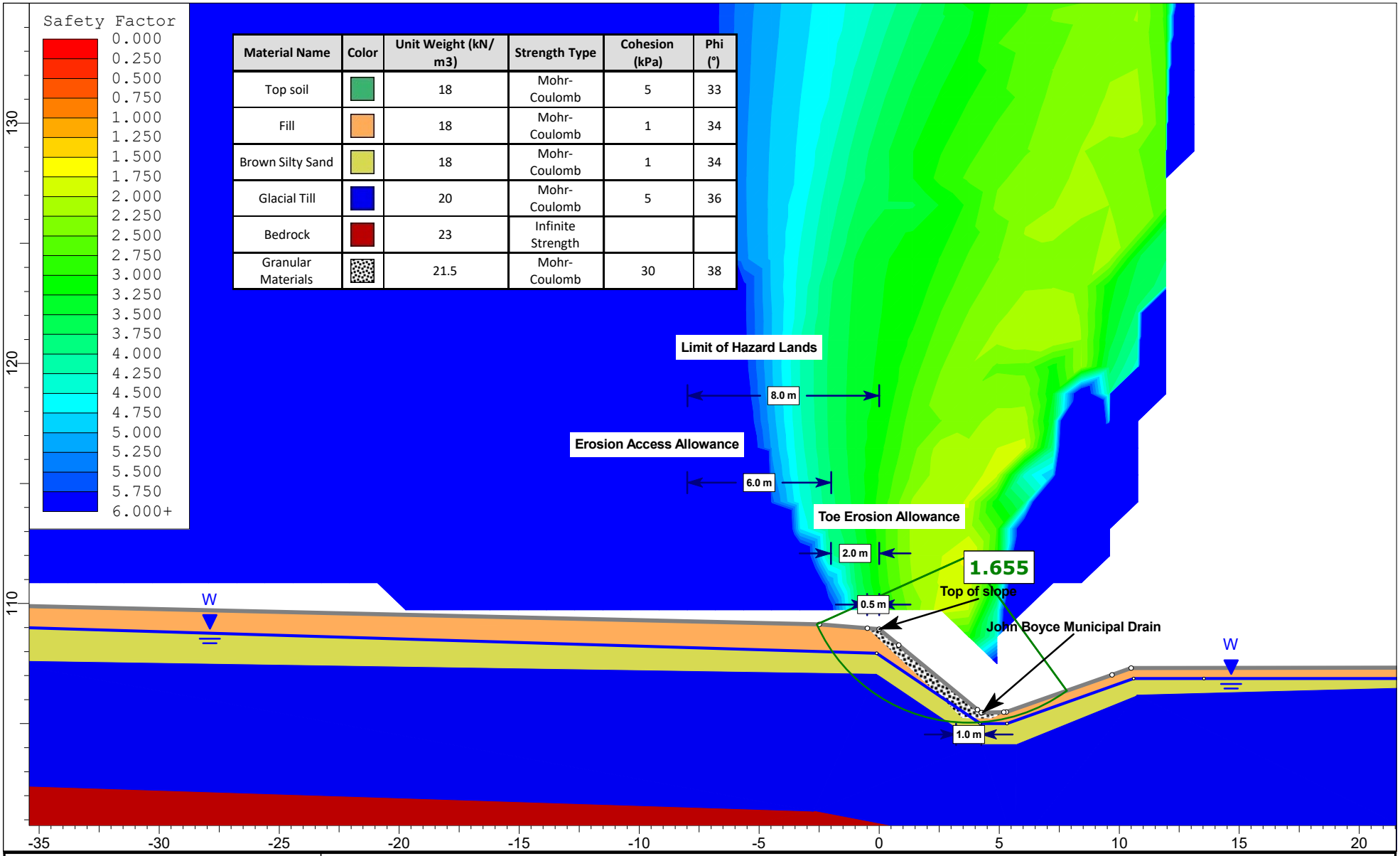
PATERSON GROUP

SLIDEINTERPRET 9.036

Project No.: **PG7831 - Greely Sand & Gravel Inc. - 5360 Bank Street, Ottawa**

Drawing No.: **Figure 3B - Proposed Condition - Seismic Loading - Section B-B'**

Prepared By:	Approved By:	*Date:*
ZA	FS	2026-07-06



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)
Top soil		18	Mohr-Coulomb	5	33
Fill		18	Mohr-Coulomb	1	34
Brown Silty Sand		18	Mohr-Coulomb	1	34
Glacial Till		20	Mohr-Coulomb	5	36
Bedrock		23	Infinite Strength		
Granular Materials		21.5	Mohr-Coulomb	30	38

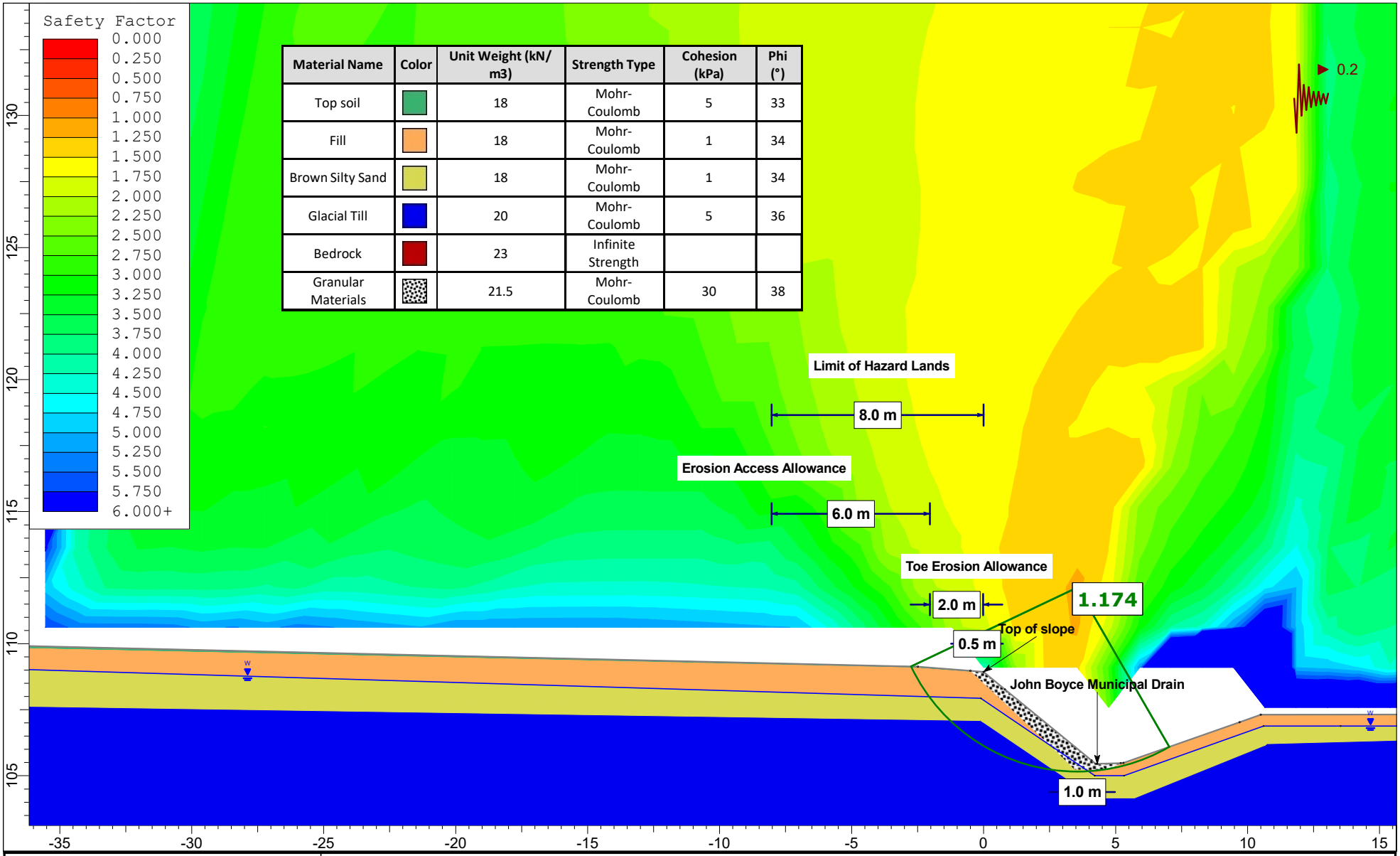
PATERSON GROUP

SLIDEINTERPRET 9.036

Project No.: **PG7831 - Greely Sand & Gravel Inc. - 5360 Bank Street, Ottawa**

Drawing No.: **Figure 4A - Proposed Condition - Static Loading - Granular Material at Slope Face - Section B-B'**

Prepared By:	Approved By:	*Date:*
ZA	FS	2026-07-06

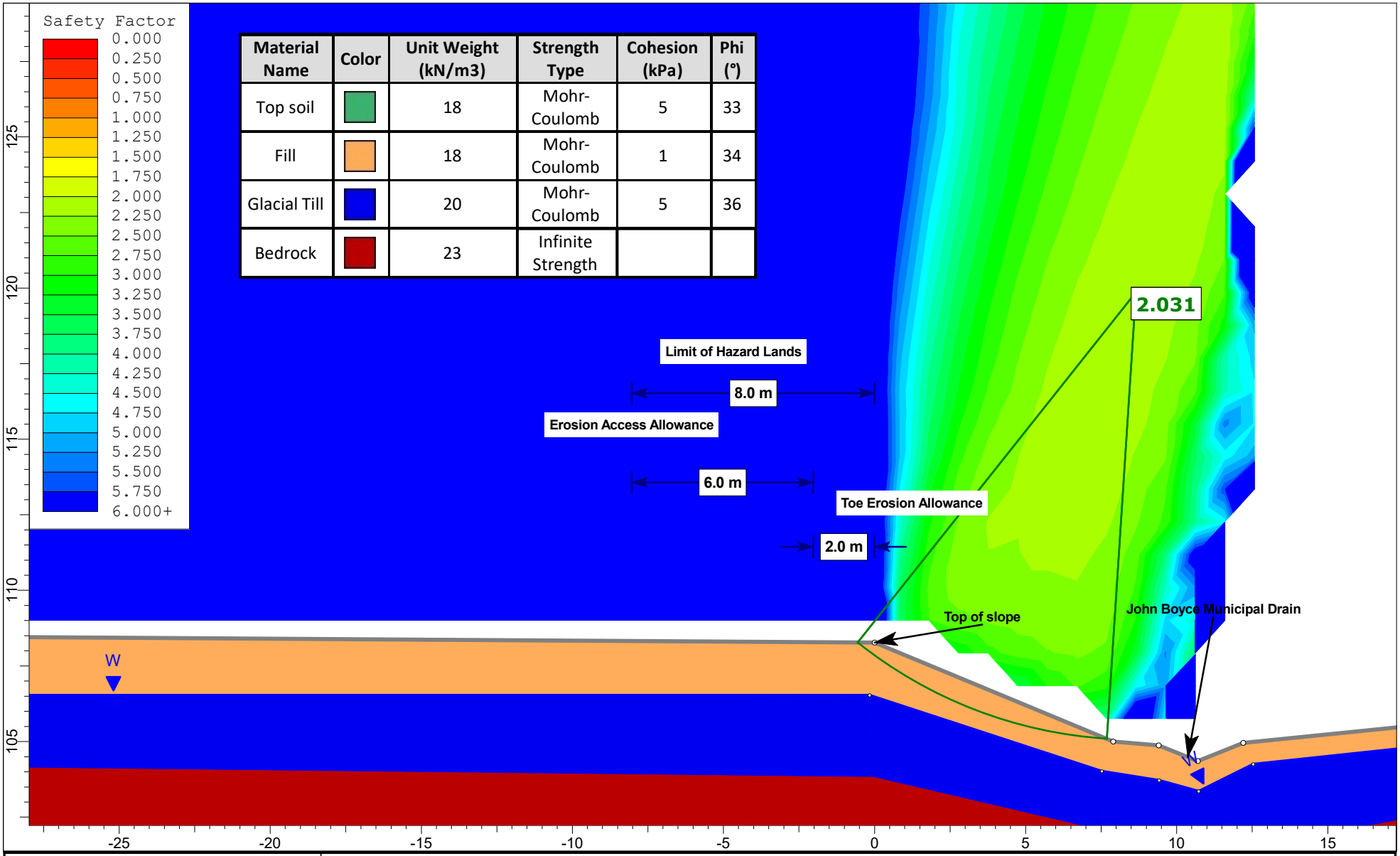


PATERSON GROUP

SLIDEINTERPRET 9.036

Project No.:	**PG7831 - Greely Sand & Gravel Inc. - 5360 Bank Street, Ottawa**
Drawing No.:	**Figure 4B - Proposed Condition - Seismic Loading - Granular Material at Slope Face - Section B-B'**

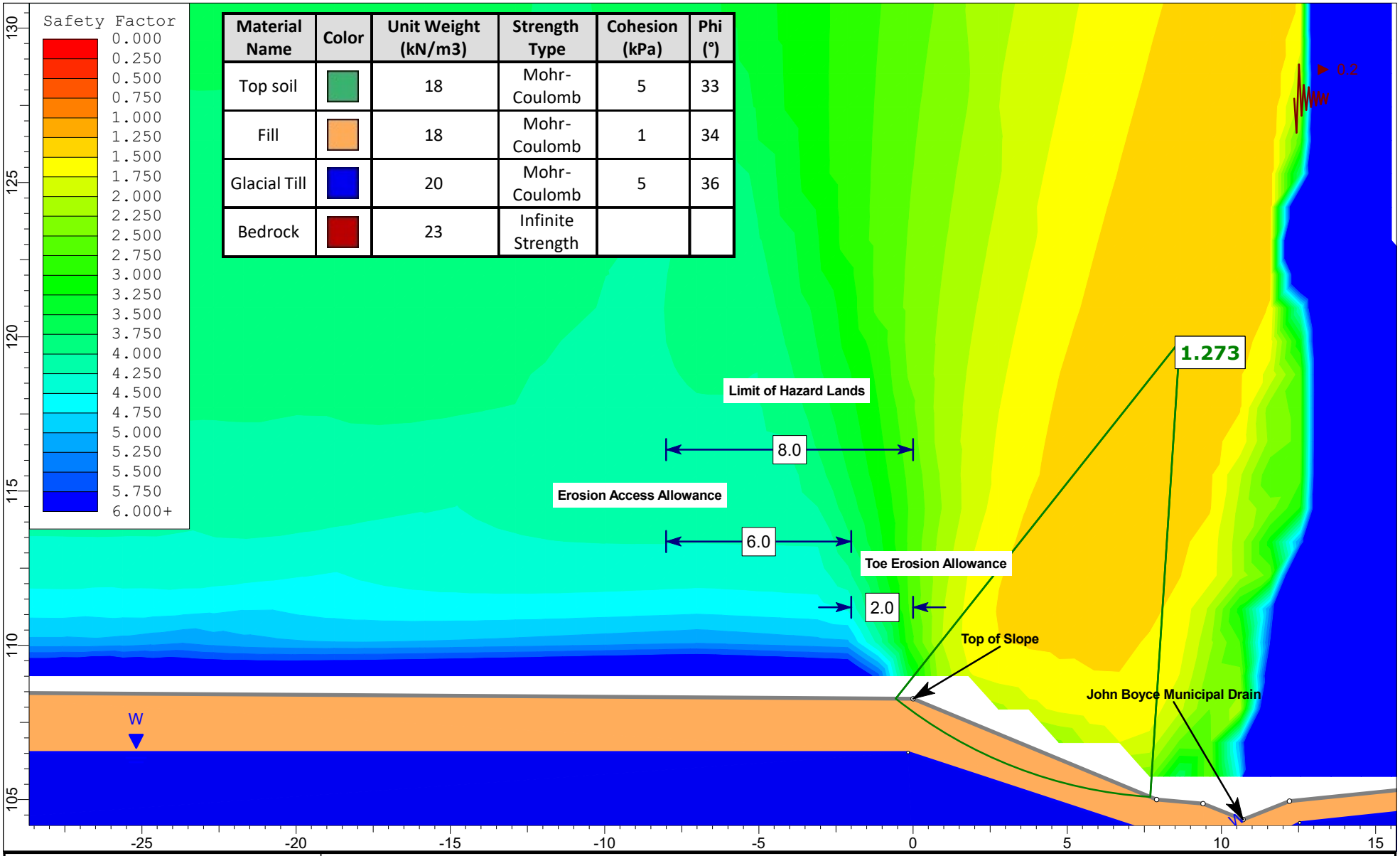
Prepared By:	Approved By:	*Date:*
ZA	FS	2026-07-06



PATERSON GROUP

SLIDEINTERPRET 9.036

Project No.:	**PG7831 - Greely Sand & Gravel Inc. - 5360 Bank Street, Ottawa**		
Drawing No.:	**Figure 5A - Proposed Condition - Static Loading - Section C-C'**		
Prepared By: ZA	Approved By: FS	*Date:* 2026-07-06	



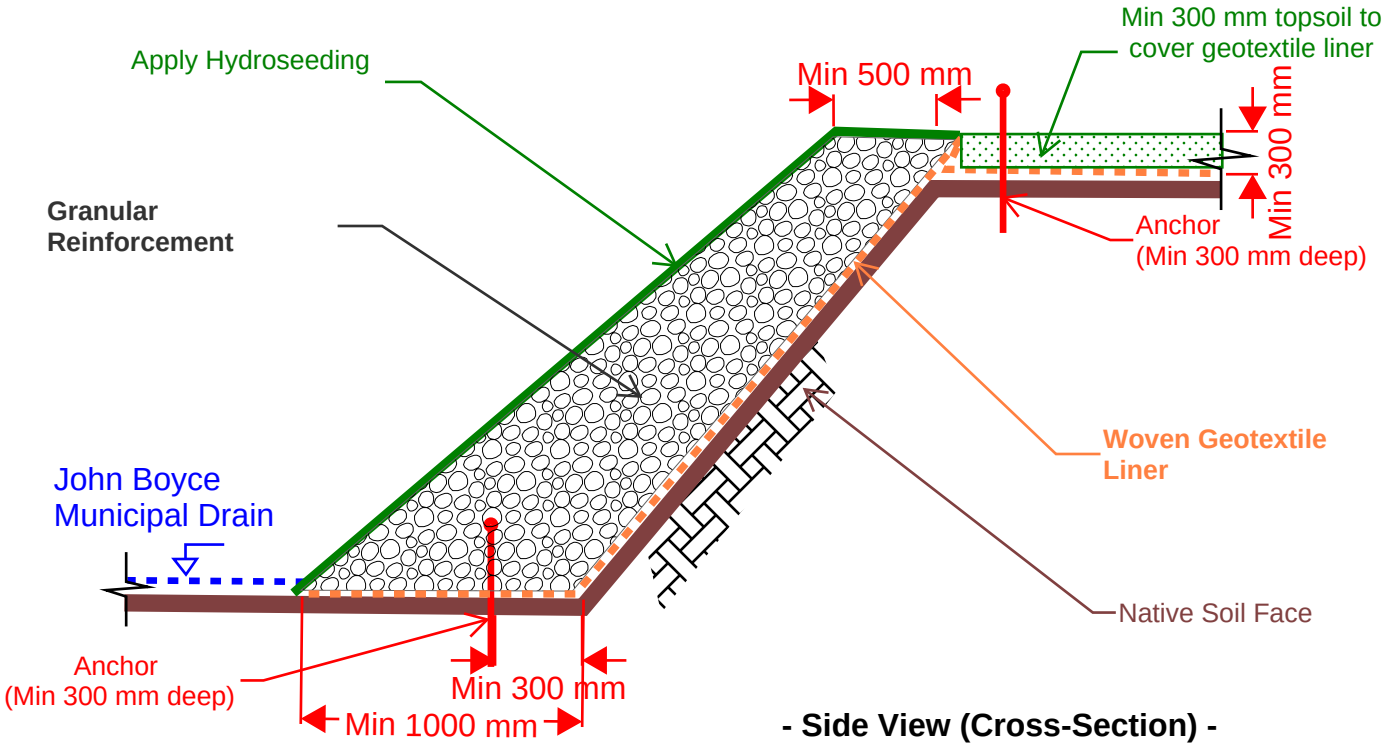
PATERSON GROUP

SLIDEINTERPRET 9.036

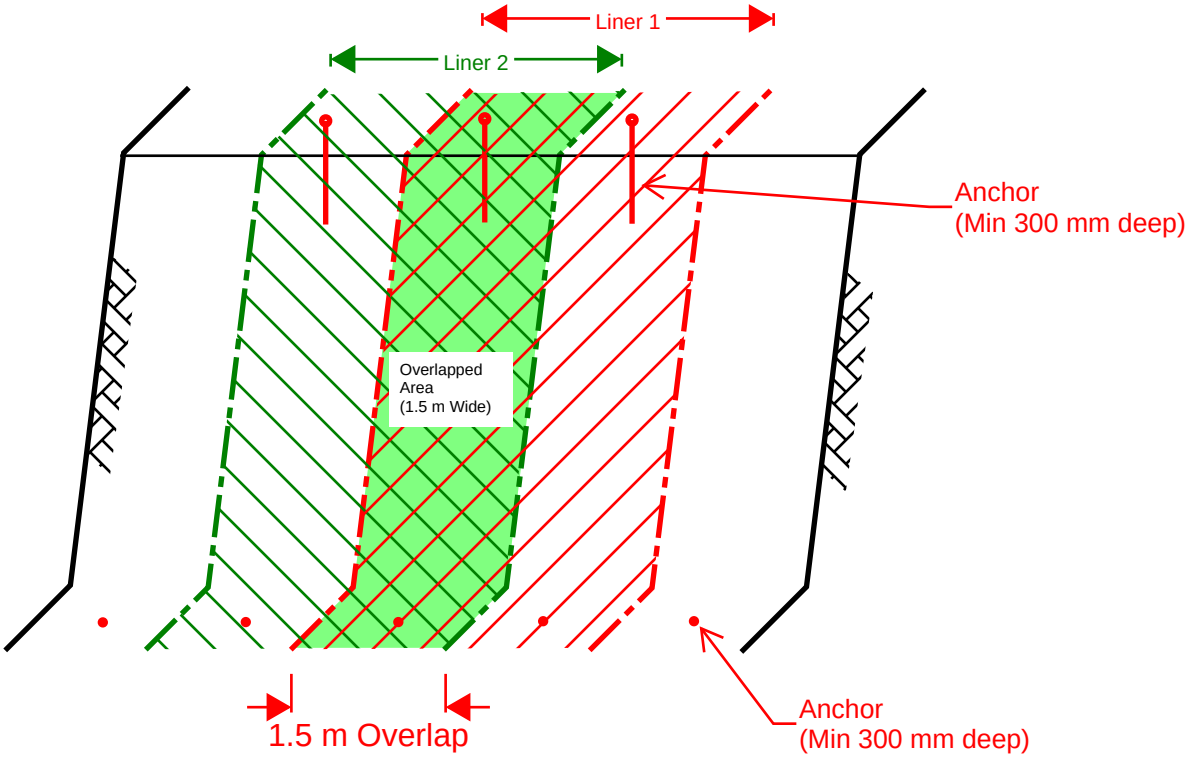
Project No.:	**PG7831 - Greely Sand & Gravel Inc. - 5360 Bank Street, Ottawa**		
Drawing No.:	**Figure 5B - Proposed Condition - Seismic Loading - Section C-C'**		
Prepared By: ZA	Approved By: FS	*Date:* 2026-07-06	

PATERSON GROUP	Geotechnical Investigation	Job No.: PG7831
	Proposed Development	Date: July 9, 2026
	5360 Bank Street – Ottawa, Ontario	Dwn: ZAM
	Drawing is not to scale	Page: 1 of 1

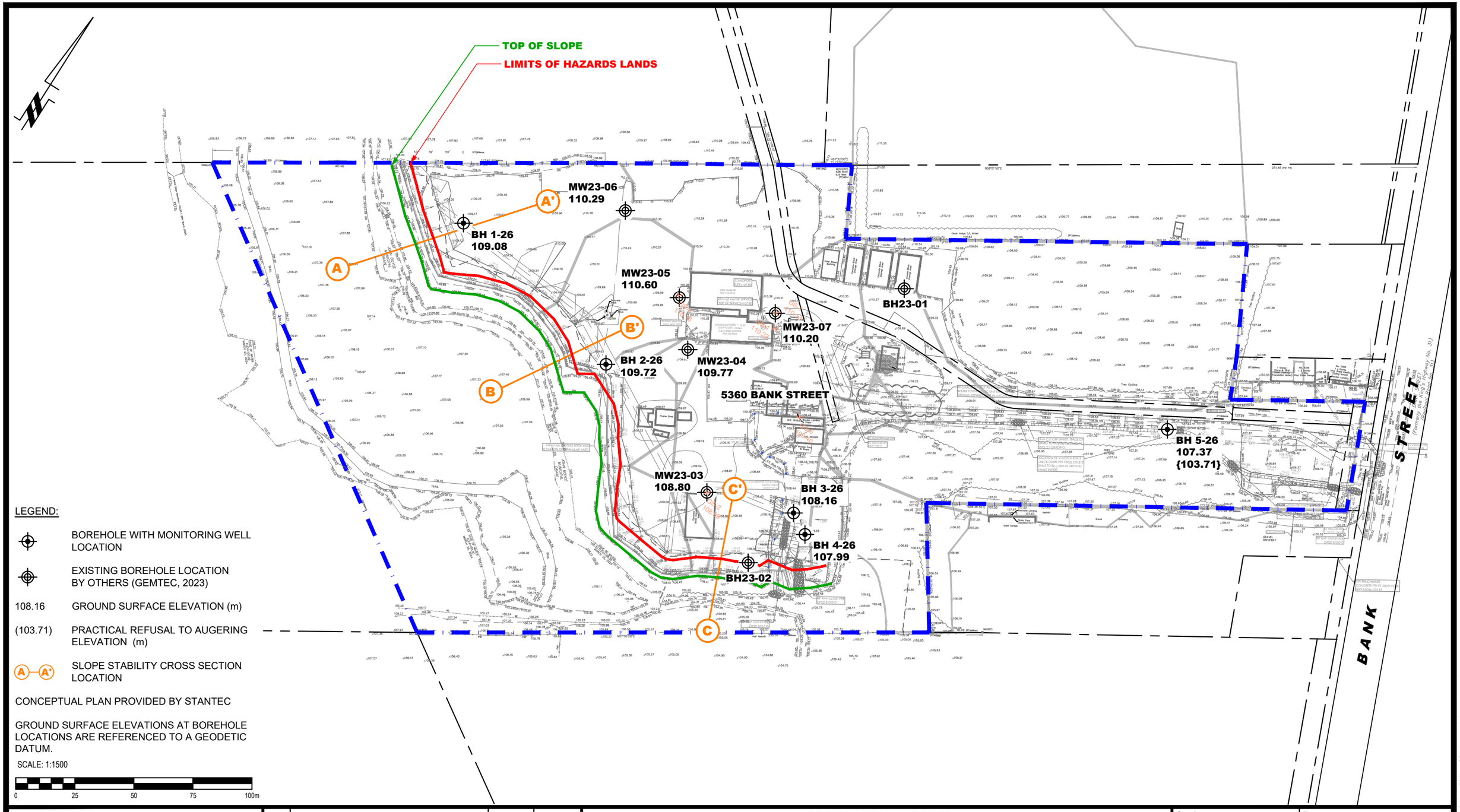
Figure 6 – Recommended Remedial Work



- Side View (Cross-Section) -



- Profile View of Slope Face -



LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- EXISTING BOREHOLE LOCATION BY OTHERS (GEMTEC, 2023)
- 108.16 GROUND SURFACE ELEVATION (m)
- (103.71) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
- A—A' SLOPE STABILITY CROSS SECTION LOCATION

CONCEPTUAL PLAN PROVIDED BY STANTEC

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

SCALE: 1:1500

0 25 50 75 100m

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

NO.	REVISIONS	DATE	INITIAL

GREELY SAND & GRAVEL
GEOTECHNICAL INVESTIGATION
PROPOSED DEVELOPMENT
5360 BANK STREET
OTTAWA, ONTARIO

Title: TEST HOLE LOPCATION PLAN

Scale: 1:1500	Date: 03/2026
Drawn by: GK	Report No.: PG7831-1
Checked by: ZA	Dwg. No.: PG7831-1
Approved by: SD	Revision No.:

p:\autocad drawings\geotechnical\pg78xx\pg7831\pg7831-1 test hole location plan.dwg

11x17