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November 25, 2019
PG3780-LET.01 Revision 3

TC United Group
800 Industrial Avenue, Suite 9
Ottawa, Ontario
K1G 4B8

Attention: **Mr. Billy Triantafilos**

Subject: **Geotechnical Investigation**
Proposed Residential Building
244 Rideau Place - Ottawa

Dear Sir,

Paterson Group (Paterson) was commissioned by TC United Group to conduct a geotechnical investigation for the proposed residential building to be located at 244 Rideau Place in the City of Ottawa, Ontario. The proposed project is understood to consist of a three storey building with one basement level and at grade parking area, an access lane and landscaped/amenity areas.

1.0 Field Investigation

The fieldwork for the current investigation was conducted on March 7, 2016, and consisted of a test pit excavated by a rubber tired backhoe. The test pit was advanced to a maximum of 2.5 m depth. The test pit sidewalls were reviewed in the field by Paterson personnel once excavated, under the direction of a senior engineer from the geotechnical division. The field procedure consisted of reviewing the test pit sidewalls, sampling and testing the overburden at selected locations.

A supplemental investigation was conducted on June 5, 2019 to conduct field testing of the underlying silty clay to ensure the soils can withstand the proposed retaining wall system. The field program consisted of advancing 2 boreholes to a maximum depth of 6.7 m below existing ground surface. The boreholes were completed using a track-mounted auger drill rig operated by a two person crew. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer from the geotechnical division. The testing procedure consisted of augering to the required depths and at the selected locations sampling the overburden. The approximate test hole locations aew presented on Drawing PG3780-1 - Test Hole Location Plan attached to the end of the current letter report.

Sampling and In Situ Testing

Soil samples were recovered from the auger flights, and using a 50 mm diameter split-spoon sampler. The split-spoon samples were placed in sealed plastic bags and were transported to our laboratory. The depths at which the auger and split-spoon samples were recovered from the boreholes are shown as AU and SS, respectively, on the Soil Profile and Test Data sheets, attached.

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.

Undrained shear strength testing was carried out in cohesive soils using a field vane apparatus.

2.0 Field Observations

The subject site is currently undeveloped with several mature trees. The ground surface across the subject site is generally at grade with Rideau Place along the east and gradually slopes up towards the west portion of the site with an elevation difference of approximately 7 m. A dry laid stone retaining wall varying between 1.5 to 0.5 m in height was observed along the north property boundary. The subject site is bordered to the southeast and south by existing residential properties. Besserer Park borders the subject site to the north and Rideau Place to the east.

Generally, the subsurface profile encountered at the test hole locations consists of topsoil with rootlets and gravel overlying stiff to very stiff silty clay deposit. A fill layer consisting of silty sand with gravel was encountered along the slope face, underlying the topsoil layer and varying in thickness between 1.5 to 1.8 and 2.6 m. All test holes were terminated within a silty clay layer. Refer to the Soil Profile and Test Data sheet attached for specific details of the soil profile encountered at the test pit location.

Based on available geological mapping, the bedrock consists of interbedded limestone and shale from the Verulam formation. Bedrock is expected to range between 15 and 25 m depth.

Based on the field observations and the results of the borehole investigation, the long-term groundwater level is expected at an approximate elevation of 59 m. Groundwater levels are subject to seasonal fluctuations and therefore, the groundwater levels could vary at the time of construction.

3.0 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed residential building. The proposed low-rise residential building is expected to be constructed over conventional shallow foundations placed on an undisturbed, stiff silty clay bearing surface.

Due to the silty clay layer, the proposed development will be subjected to permissible grade raise restrictions to minimize settlement of the proposed building and surrounding buildings and infrastructure. The permissible grade raise recommendations are presented in Drawing PG3780-2 - Permissible Grade Raise Plan, attached to the end of this letter report.

It is understood that a 6 to 7 m high retaining wall is proposed along the northwest, west and southwest portion of the subject site adjacent to the proposed rear yard amenity space. A design completed by an engineer specializing in these works is required for the proposed retaining wall, where greater than 1 m in height. Due to the anticipated height of the retaining wall and the proximity of the neighbouring property along the north property line, shoring of the entire north side of the site will be required prior to constructing the retaining walls and the proposed building.

Site Grading and Preparation

Topsoil, asphalt, and fill, containing deleterious or organic materials, should be stripped from under any building, paved areas, pipe bedding and other settlement sensitive structures. Care should be provided to not disturb adequate bearing soils at subgrade level during site preparation activities.

Engineered fill placed for grading beneath the proposed building footprint, unless otherwise specified, should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. The fill should be tested and approved prior to delivery to the site. The fill should be placed in maximum lift thickness of 300 mm and compacted with suitable compaction equipment. Fill placed beneath the building should be compacted to a minimum of 98% of the standard Proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil could be placed as general landscaping fill where surface settlement is of minor concern. The existing materials should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If the existing materials are to be placed to increase the subgrade level for areas to be paved, the non-specified existing fill should be compacted in 300 mm lifts and compacted to a minimum density of 95% of the respective SPMDD.

Foundation Design

Footings placed on an approved engineered fill or an undisturbed, stiff silty clay bearing surface, can be designed using a bearing resistance value at SLS of **150 kPa** and a factored bearing resistance value at ULS of **225 kPa**. A geotechnical resistance factor of 0.5 was applied to the bearing resistance value at ULS.

An undisturbed soil bearing surface consists of one from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, have been removed prior to the placement of concrete for footings. The bearing resistance value at SLS given for footings will be subjected to potential post construction total and differential settlements 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 horizontally and vertically from the footing perimeter at a minimum of 1.5H:1V, passing through in situ soil or engineered fill of equal or higher capacity as the soil.

Permissible Grade Raise Recommendations

The permissible grade recommendations are presented on Drawing PG3780-2 - Permissible Grade Raise Areas Plan attached to this letter report. It should be noted that the upper 2 - 3 m of the slope subsurface profile consists of imported fill. Based on our review of the history of the subject area, the silty clay has been pre-loaded with the fill layer for the past 40 - 50 years which in turns consolidated the underlying silty clay. Therefore, where the fill is found to be thicker then 2.5 m above original ground surface elevation, a higher permissible grade raise elevation was provided. A post-development groundwater lowering of 0.5 m was considered in the permissible grade raise restriction calculations.

Design for Earthquakes

The site class for seismic site response can be taken as **Class D** for foundations constructed at the subject site. Refer to the latest revision of the 2012 Ontario Building Code for a full discussion of the earthquake design requirements.

Slab on Grade Construction

With the removal of all topsoil, and fill, containing significant amounts of organic or deleterious materials, within the footprint of the proposed buildings, the native soil or approved fill surface will be considered to be an acceptable subgrade surface on which to commence backfilling for floor slab construction. Any soft areas should be removed and backfilled with appropriate backfill material. OPSS Granular B Type II is recommended for backfilling below the floor slab.

It is recommended that the upper 200 mm of sub-slab fill consist of 19 mm clear crushed stone for the basement floor slab. If a slab-on-grade is to be constructed, the upper 200 mm of sub-slab fill should consist of a Granular A crushed stone.

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.

Pavement Structure

For design purposes, the pavement structure presented in the following tables could be used for the design of car only parking 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 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soils or OPSS Granular B Type I or II material placed over in situ soil or fill	

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

Thickness (mm)	Material Description
40	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
400	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soils 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 backfilled 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 98% of the SPMDD.

4.0 Slope Stability Analysis

A slope stability analysis was completed by Paterson for the subject slope. Two slope sections were assessed within the most critical portions of the existing and proposed conditions within the subject site. The location of both cross-sections are presented on Drawing PG3780-1 - Test Hole Location Plan.

The analysis of the stability of the slope was carried out using SLIDE, a computer program which permits a two-dimensional slope stability analysis using several methods including the Bishop’s method, which is a widely used and accepted analysis method. The program calculates a factor of safety, which represents the ratio of the forces resisting failure to those favouring failure. Theoretically, a factor of safety of 1.0 represents a condition where the slope is stable. However, due to intrinsic limitations of the calculation methods and the variability of the subsoil and groundwater conditions, a factor of safety greater than one is usually required to ascertain the risks of failure are acceptable. A minimum factor of safety of 1.5 is generally recommended for conditions where the failure of the slope would endanger permanent structures. Under seismic loading, a minimum factor of safety of 1.1 is considered to be satisfactory.

The sections were analysed taking into account a groundwater level at ground surface. Subsoil conditions at the cross-sections were inferred based on the findings at nearby test hole location and general knowledge of the area’s geology.

Static Conditions Analysis

The results of the slope stability analysis for the existing and proposed conditions at Section A running west to east and at Section B running North to South are shown in Figures 2, 5 and 7, respectively, and are attached to the present letter. The results of the slope stability analysis indicate that both sections have a slope stability factor of safety greater than 1.5. It is anticipated that the north foundation wall of the proposed building will be designed to support the elevated neighbouring site. Also, the south property line will include a retaining wall supporting the subject site due to the difference in finished grade with respect to the south property. Therefore, no slope will be present to analyse once the north foundation wall is built against the north property line.

Seismic Loading Analysis

An analysis considering seismic loading was also completed. A horizontal seismic acceleration, K_h, of 0.16G was considered for the analysed sections. The results of the analysis including seismic loading are shown in Figures 3 and 6 for the slope sections. The slope stability factors of safety for the subject sections were found to be greater than 1.1 for both sections.

5.0 Proposed Retaining Walls

Overview

A segmental retaining wall was designed the south and west portions of the subject site. Due to the height of the existing slopes along the west and northwest, the retaining walls will be constructed using oversized blocks to accommodate the proposed wall height..

Bearing Resistance Values

Due to the size of the proposed retaining wall across the north and west borderlines of the subject site and the soils encountered during our field program, the silty clay bearing surface was not accepted to withstand the proposed loads. Therefore, a reinforced bedding layer was designed to distribute the load across the subgrade level and provide a higher bearing capacity to support the retaining wall.

The bedding layer will vary in thickness based on the height of the retaining wall at each location. Where the wall is higher than 3.7 m, the granular bedding layer will be wrapped with a biaxial geogrid liner such as Terrafix TBX 3500 or equivalent. Both ends of the geogrid liner will overlap by a minimum of 1 m below the base blocks of the retaining wall. The bedding layer should extend horizontally a minimum 1 m in front of the retaining wall base block, where the height is a minimum 5 m. Also, the bedding layer should extend a minimum 500 mm in front of the wall where the wall height is between 3.7 and 5 m. No reinforced bedding will be required when the wall height is less than 3.7 in height.

This system will provide a minimum bearing capacity of **275 kPa (SLS)** which provide sufficient support for the retaining wall system. It should be noted that the subgrade must be inspected and approved by Paterson at the time of construction prior to placing the bedding and the base block of the retaining wall.

Global Stability Analysis

The global stability of the retaining walls have been checked as part of our slope stability summarized in Section A for the proposed conditions. The internal and exterior failure modes of the retaining wall sections have been checked with similar factors of safety provided in the slope stability analysis. The retaining walls have an adequate factor of safety in excess of the required 1.5 for static conditions and 1.1 for seismic loading conditions. Therefore, the proposed retaining walls are considered acceptable from a geotechnical perspective.

Excavation

Due to the close proximity of the northwest retaining wall to the northern property, the extent of excavation is expected to encroach into the neighbouring property. It is suggested that the entire north property line be supported by a shoring system designed by a professional engineer specializing in these works. The shoring system will prevent extending the excavation beyond the north property line.

Lateral Support

Based on our review of the retaining wall rough grading, no issues regarding installing the wall are expected provided that the lateral support zone of each wall is protected. It should be noted that the proposed building is recommended to be excavated and footings be placed prior to the construction of the retaining wall directly adjacent to the building. If the silty clay subgrade below and within the lateral support zone of the retaining wall is disturbed as part of the construction of the building, the silty clay should be sub-excavated and replaced with engineered fill, inspected and approved by Paterson at the time of construction.

The bearing medium under the retaining wall structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Above the groundwater level, adequate lateral support is provided to stiff silty clay, or engineered fill when a plane extending down and out from the bottom edge of the retaining wall granular bedding layer at a minimum of 1.5H:1V passes only through in situ soil or engineered fill.

Construction Monitoring

Geotechnical field inspection must be completed at the time of excavation, prior to placing the granular bedding layer, to assess the bearing medium under the proposed wall. A bearing resistance value at serviceability limit states, or allowable bearing pressure, of **150 kPa**, and/or a factored bearing resistance value at ULS of **225 kPa**, is required in order for the reinforced bedding to provide sufficient bearing capacity for the retaining wall system. The bearing medium at the subgrade level for the retaining wall should consist of an undisturbed, very stiff silty clay.

An undisturbed soil bearing surface consists of a surface 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.

It is also recommended that the Paterson conduct field reviews of the subgrade for the base of the wall, and testing or visual observations of the compaction methods for the base and backfill during retaining wall construction.

6.0 Design and Construction Precautions

Foundation Drainage and Backfill

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

Backfill against the exterior sides of the foundation walls should consist of free-draining non frost susceptible granular materials. The greater part of the site excavated materials will be frost susceptible and are not recommended for placement as backfill against the foundation walls, unless placed in conjunction with a drainage geocomposite, such as Miradrain G100N or Delta Drain 6000. The drainage geocomposite should be connected to the perimeter foundation drainage system. Otherwise, imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should be placed for foundation backfill.

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.

Exterior unheated footings, such as 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.

Excavation Side Slopes

The excavation side slopes in overburden materials should either be excavated to acceptable slopes or be retained by shoring systems from the beginning of the excavation until the structure is backfilled.

Unsupported Side Slopes

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 soil is 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 maintain safe working distance 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.

Temporary Shoring

The design and approval of the temporary shoring system will be the responsibility of the shoring contractor and the shoring designer who is a licensed professional engineer and is hired by the shoring contractor. It is the responsibility of the shoring contractor to ensure that the temporary shoring system is in compliance with safety requirements, designed to avoid any damage to adjacent structures and include dewatering control measures. In the event that subsurface conditions differ from the approved design during the actual installation, it is the responsibility of the shoring contractor to commission the required experts to re-assess the design and implement the required changes. Furthermore, the design of the temporary shoring system should take into consideration a full hydrostatic condition which can occur during significant precipitation events.

The temporary shoring system could consist of steel sheet piles or a soldier pile and lagging system. Any additional loading due to street traffic, construction equipment, adjacent structures and facilities, etc., should be included to the earth pressures described below. This system could be cantilevered, anchored or braced. The shoring system is also recommended to be adequately supported to resist toe failure.

The earth pressures acting on the temporary shoring system may be calculated with the following parameters.

Table 3 - Soil Parameters

Parameters	Values
Active Earth Pressure Coefficient (K_a)	0.33
Passive Earth Pressure Coefficient (K_p)	3
At-Rest Earth Pressure Coefficient (K_o)	0.5
Dry Unit Weight (γ), kN/m^3	20
Effective Unit Weight (γ), kN/m^3	13

The active earth pressure should be calculated where wall movements are permissible while the at-rest pressure should be calculated if no movement is permissible. The dry unit weight should be calculated above the groundwater level while the effective unit weight should be calculated below the groundwater level.

The hydrostatic groundwater pressure should be included to the earth pressure distribution wherever the effective unit weight is calculated for earth pressures. If the groundwater level is lowered, the dry unit weight for the soil should be calculated full weight, with no hydrostatic groundwater pressure component.

For design purposes, a minimum factor of safety of 1.5 should be calculated.

Groundwater Control

It is anticipated that groundwater infiltration into the excavations should be moderate to low through the sides of the excavation and controllable using open sumps. 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.

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.

Adverse Effects of Dewatering on Adjacent Properties

Based on the expected foundation level of the residential building and the depth of the groundwater level, temporary excavation during construction will have no effects on neighboring structures. Any minor dewatering will be temporary during the construction period and will be considered relatively negligible for the neighbouring buildings. Therefore, adverse effects to the surrounding buildings or properties are not expected due to the proposed development.

Pipe Bedding and Backfill

A minimum of 150 mm of OPSS Granular A should be placed 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 a minimum of 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 300 mm thick lifts compacted to a minimum of 95% of the SPMDD.

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 SPMDD.

Winter Construction

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

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

The trench excavations should be completed in a manner to avoid the introduction of frozen materials, snow or ice into the trenches. Where excavations are constructed in proximity of existing structures precaution to adversely affecting the existing structure due to the freezing conditions should be provided.

7.0 Recommendations

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

☐ Review detailed grading plan(s) from a geotechnical perspective.

☐ 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 the construction have been conducted in general accordance with Paterson's recommendations could be issued upon the completion of a satisfactory inspection program by the geotechnical consultant.

6.0 Statement of Limitations

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

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from the test locations, Paterson requests immediate notification to permit reassessment of the recommendations.

The recommendations provided should only be used by the design professionals associated with this project. The recommendations are not intended for contractors bidding on or constructing the project. The latter should evaluate the factual information provided in the report. The contractor should also determine the suitability and completeness for the intended construction schedule and methods. Additional testing may be required for the contractors purpose.

The present report applies only to the project described in the report. The use of the report for purposes other than those described above or by person(s) other than TC United Group or their agents is not authorized without review by Paterson.

Best Regards,

Paterson Group Inc.

LICENSED PROFESSIONAL ENGINEER
Nov 25, 2019
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Joey R. Villeneuve, M.A.Sc., P.Eng.

Faisal I. Abou-Seido, P.Eng.

Attachments

- ☐ Soil Profile and Test Data sheets
- ☐ Figure 1 - Key Plan
- ☐ Figures 2-7 - Sections for Slope Stability Analysis
- ☐ Drawing PG3780-1 - Test Hole Location Plan
- ☐ Drawing PG3780-2 - Permissible Grade Raise Restriction Areas
- ☐ Drawing PG3780-3 - Stone Strong Retaining Wall Design

Report Distribution

- ☐ TC United Group
- ☐ Paterson Group

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Building - 244 Rideau Place
Ottawa, Ontario

DATUM TBM - Top of grate of manhole cover located in front of subject site, along Fountain Place. Geodetic elevation = 62.70m.

REMARKS

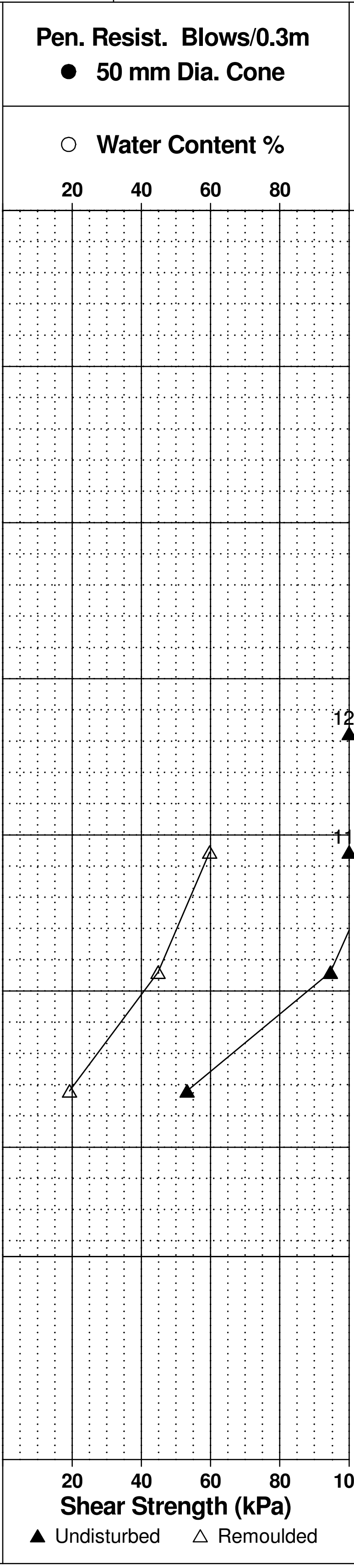
BORINGS BY CME 55 Power Auger

DATE 2019 June 5

FILE NO. PG3780

HOLE NO. BH 1

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Piezometer Construction
GROUND SURFACE						0	65.06	
TOPSOIL 0.25		SS	1	54	17			
FILL: Brown silty sand with gravel						1	64.06	
1.83		SS	2	42	16			
						2	63.06	
		SS	3	79	12			
Very stiff to stiff, brown **SILTY CLAY**						3	62.06	
- grey by 3.7m depth								
						4	61.06	
						5	60.06	
						6	59.06	
6.70		SS	4	96	19			
End of Borehole (BH dry upon completion)								



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Building - 244 Rideau Place
Ottawa, Ontario

DATUM TBM - Top of grate of manhole cover located in front of subject site, along Fountain Place. Geodetic elevation = 62.70m.

REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 June 5

FILE NO. PG3780

HOLE NO. BH 2

SOIL DESCRIPTION	Depth to base (m)
GROUND SURFACE	
TOPSOIL	0.08
FILL: Brown silty sand with gravel	2.59
Stiff, grey **SILTY CLAY**	4.72
End of Borehole (GWL @ 3.0m depth based on field observations)	

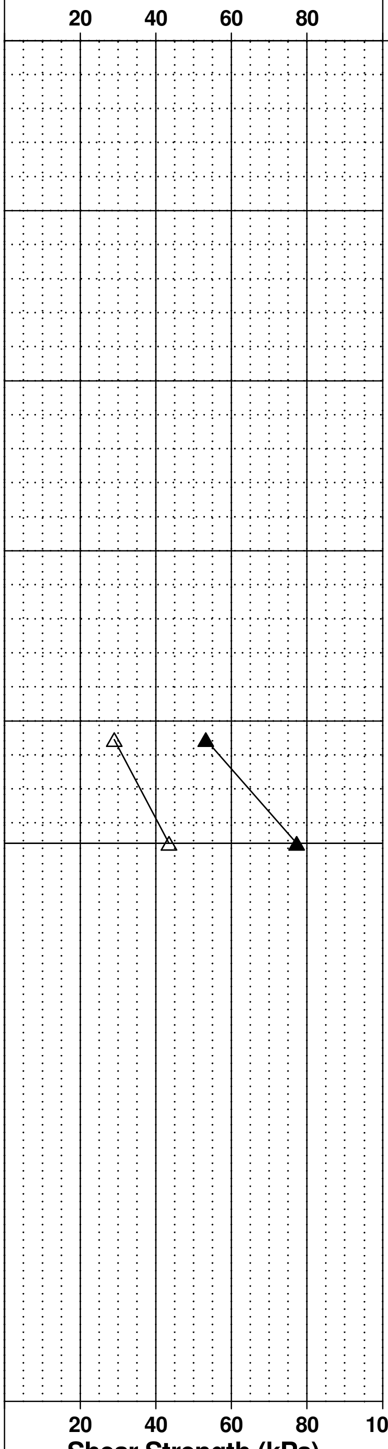
SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
AU	1		
SS	2	33	50+
SS	3	25	24
SS	4	0	44
SS	5	100	9

DEPTH (m)	ELEV. (m)
0	63.74
1	62.74
2	61.74
3	60.74
4	59.74

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

○ Water Content %

Piezometer Construction



Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Building - 244 Rideau Place
Ottawa, Ontario

DATUM TBM - Top of grate of manhole cover located in front of subject site, along Fountain Place. Geodetic elevation = 62.70m.

REMARKS

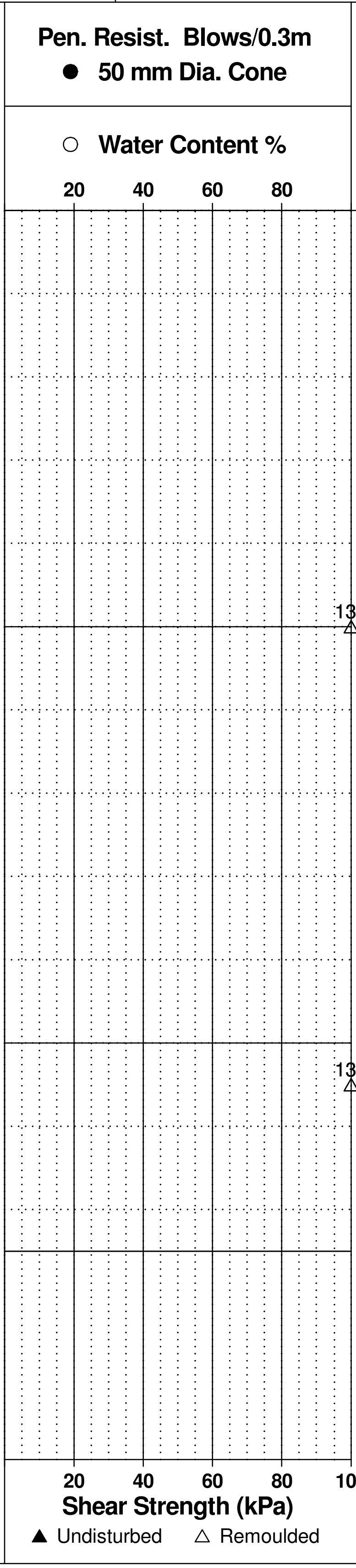
BORINGS BY Backhoe

DATE 2016 March 7

FILE NO. PG3780

HOLE NO. TP 1

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Piezometer Construction
GROUND SURFACE						0	62.62	
TOPSOIL	■	G	1					
0.30								
Brown **SILTY SAND** with clay, rootlets and gravel								
0.45								
Very stiff, brown **SILTY CLAY** with tree roots in upper 1.0m	▨	G	2			1	61.62	
	▨	G	3			2	60.62	
2.50								
End of Test Pit (TP dry upon completion)								



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 relative strength of cohesionless soils is the compactness condition, 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. An SPT N value of “P” denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	‘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 shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

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, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity: $S_t < 2$
Medium Sensitivity: $2 < S_t < 4$
Sensitive: $4 < S_t < 8$
Extra Sensitive: $8 < S_t < 16$
Quick Clay: $S_t > 16$

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 NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, 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, generally recovered using a piston sampler
G - "Grab" sample from test pit or surface materials
AU - Auger sample or bulk sample
WS - Wash sample
RC - Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC% - Natural water 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 at which xx% of the soil, by weight, is of finer grain sizes
These grain size descriptions are not used below 0.075 mm grain size

D10 - Grain size at which 10% of the soil is finer (effective grain size)

D60 - Grain size at which 60% of the soil is finer

Cc - Concavity coefficient = $(D30)^2 / (D10 \times D60)$

Cu - Uniformity coefficient = $D60 / D10$

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

CONSOLIDATION TEST

p'_o - Present effective overburden pressure at sample depth

p'_c - Preconsolidation pressure of (maximum past pressure on) sample

Ccr - Recompression index (in effect at pressures below p'_c)

Cc - Compression index (in effect at pressures above p'_c)

OC Ratio Overconsolidaton ratio = p'_c / p'_o

Void Ratio Initial sample void ratio = volume of voids / volume of solids

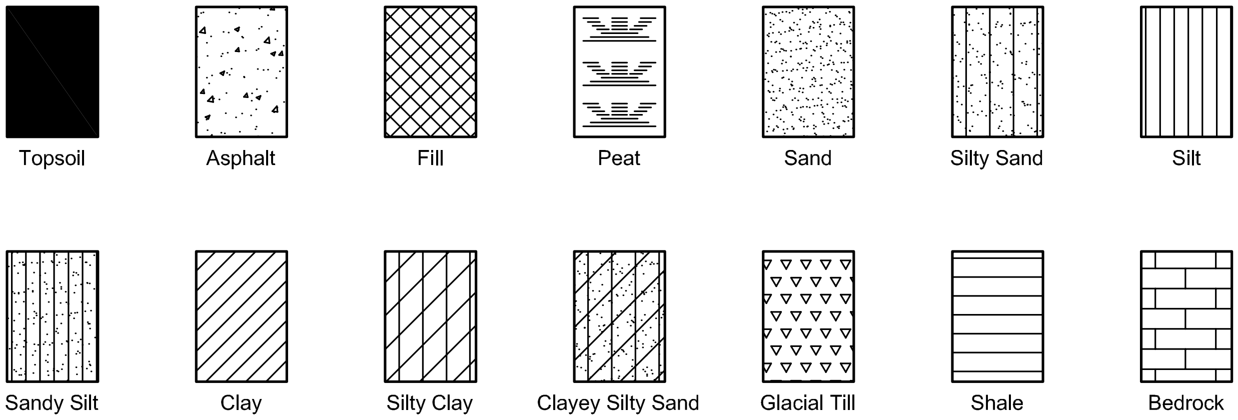
Wo - Initial water content (at start of consolidation test)

PERMEABILITY TEST

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

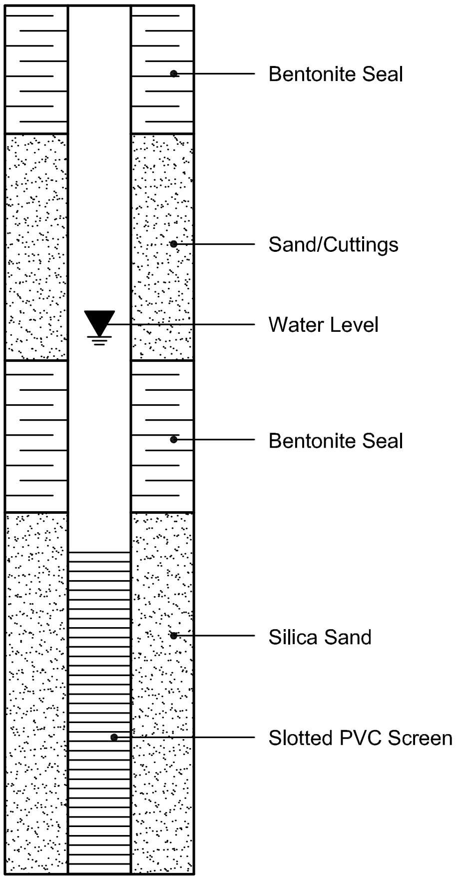
SYMBOLS AND TERMS (continued)

STRATA PLOT

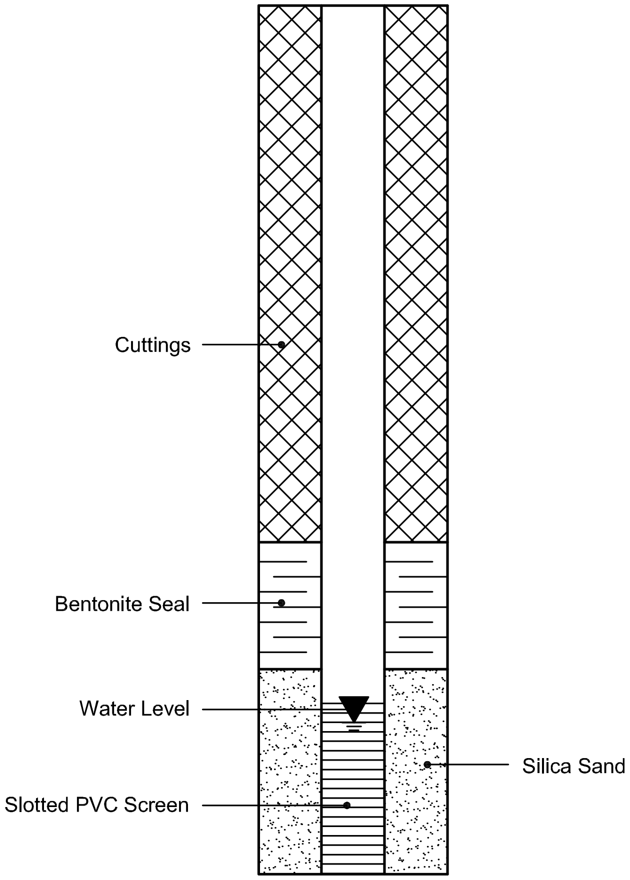


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



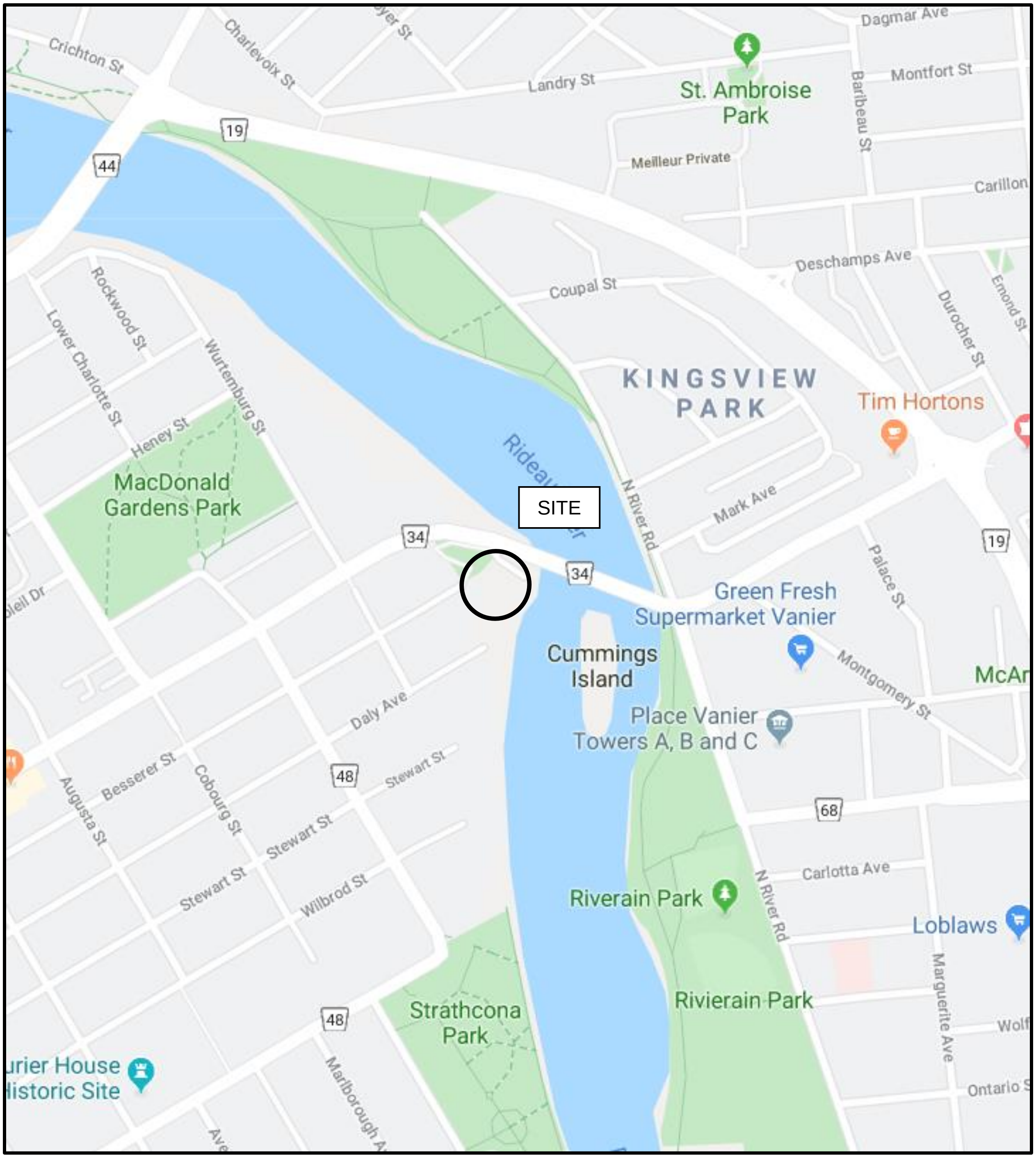


FIGURE 1

KEY PLAN

patersongroup

Figure 2 - Section A - Existing Conditions - Static Loading

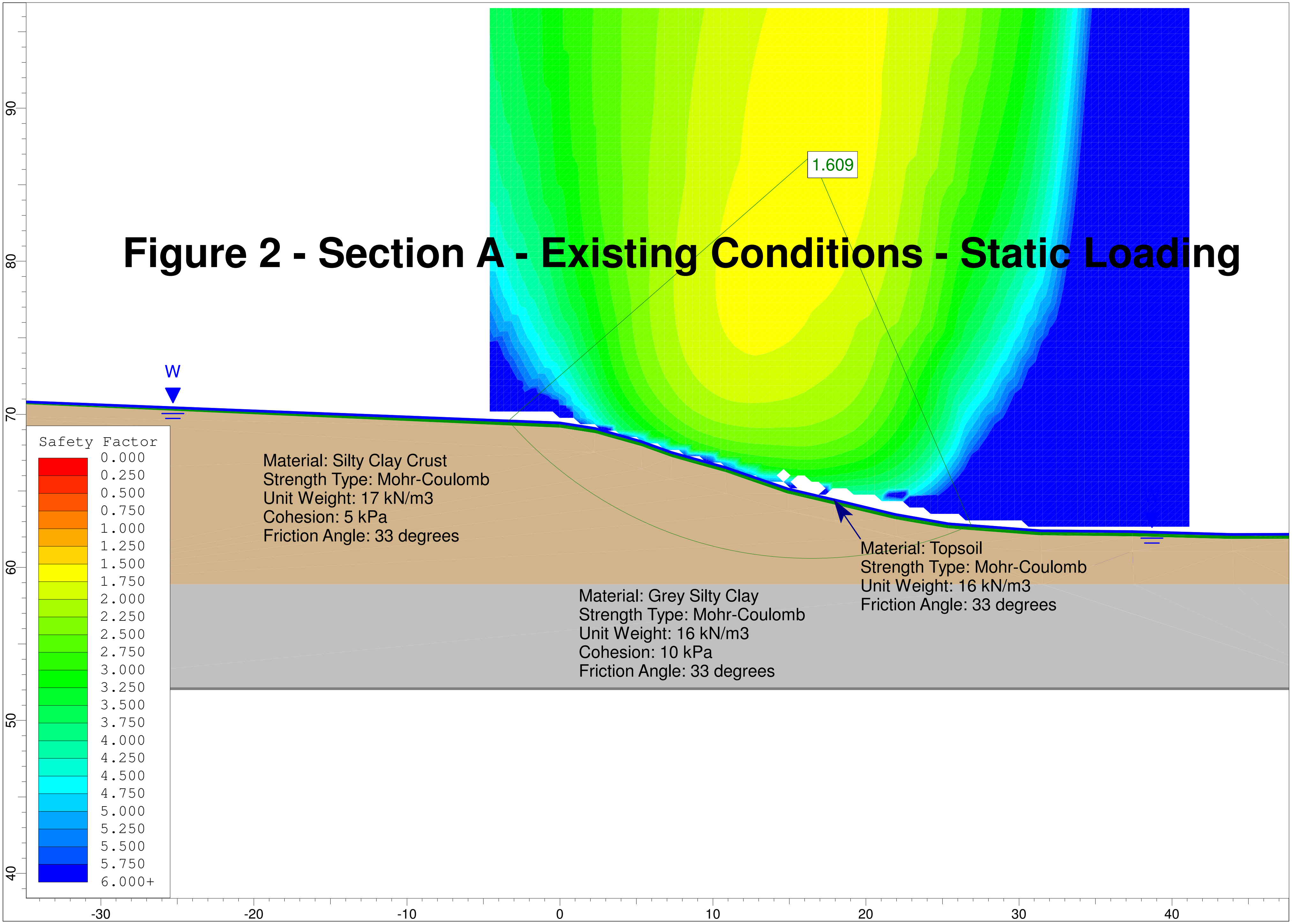


Figure 3 - Section A - Existing Conditons - Seismic Loading

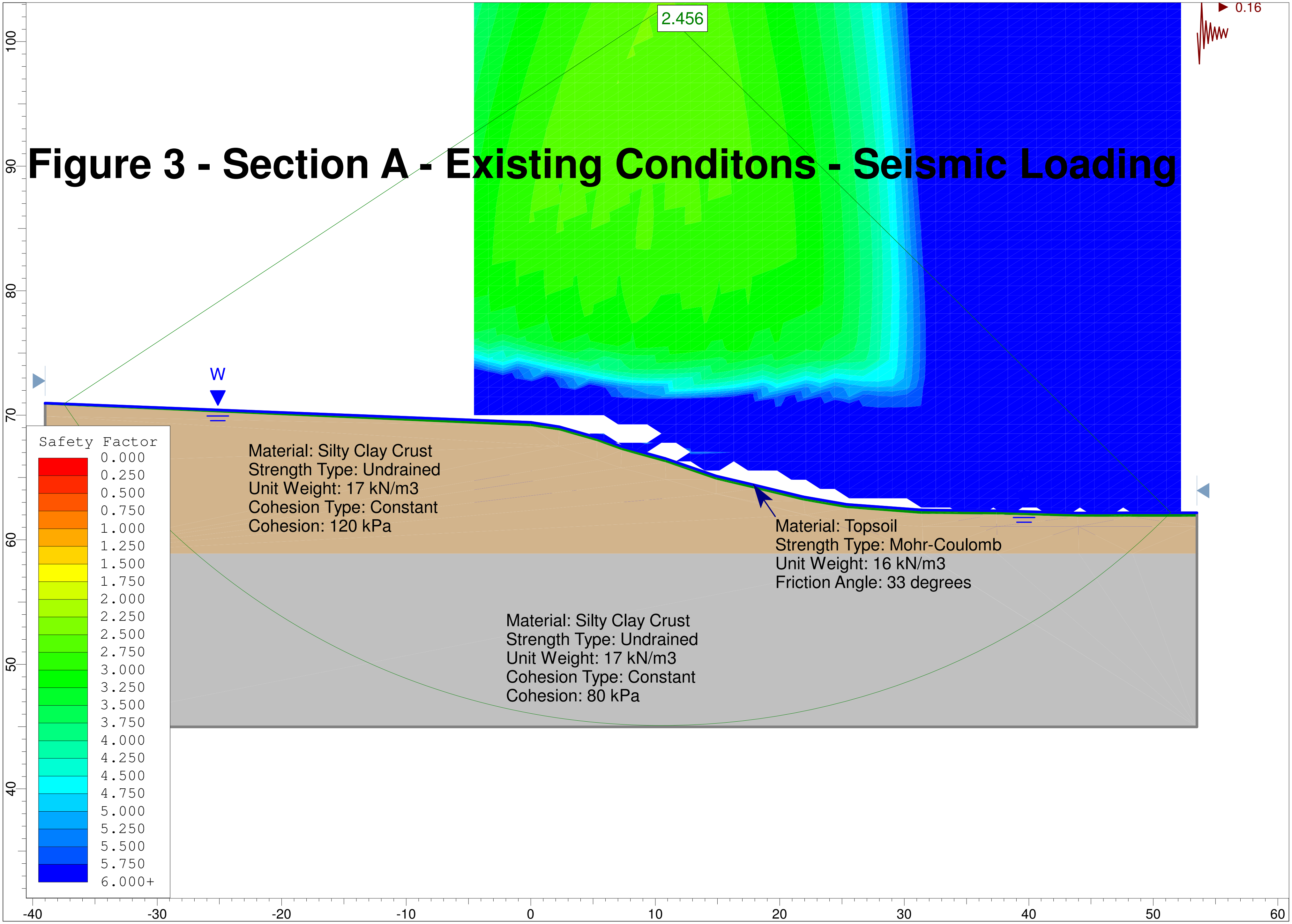
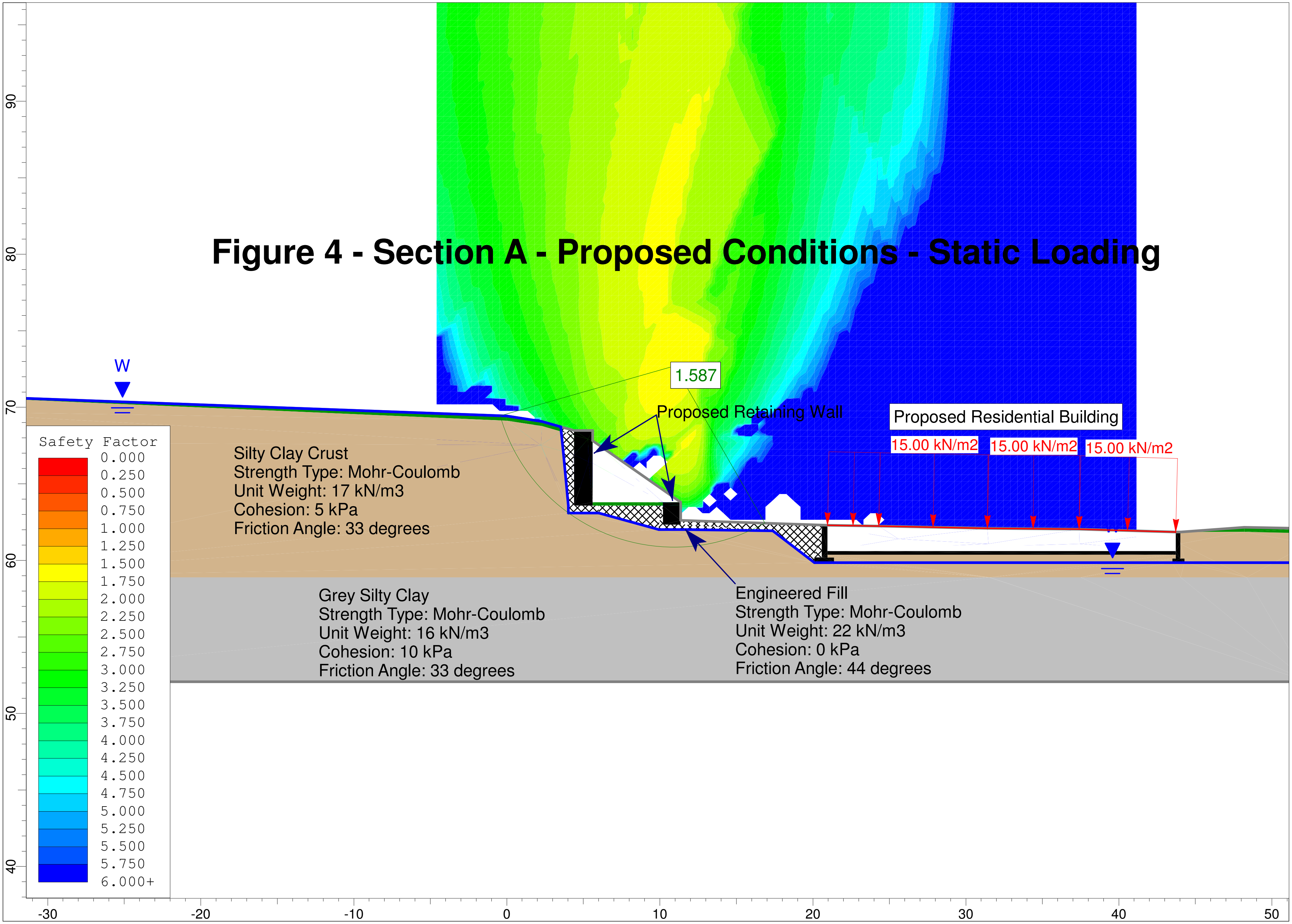


Figure 4 - Section A - Proposed Conditions - Static Loading



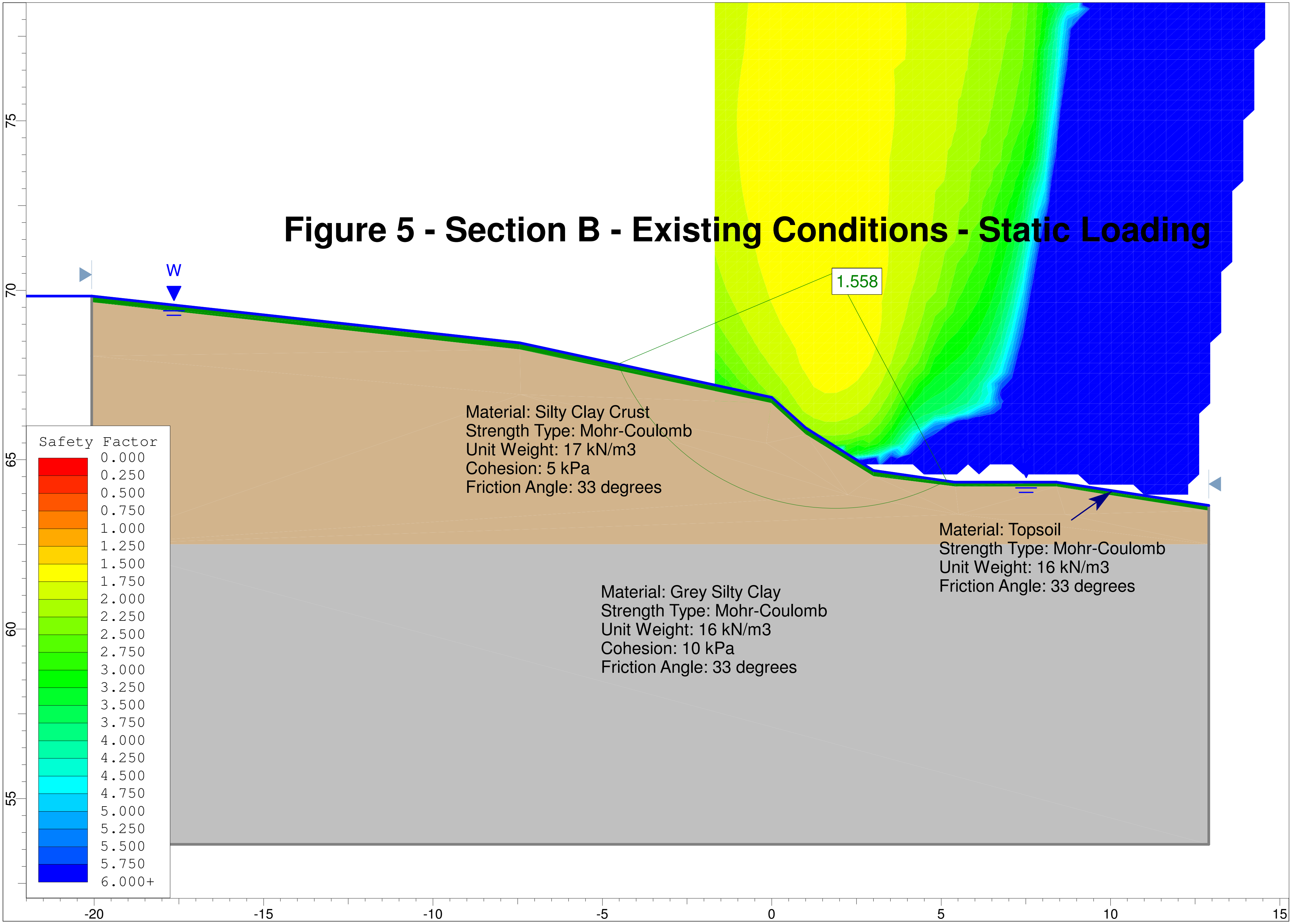
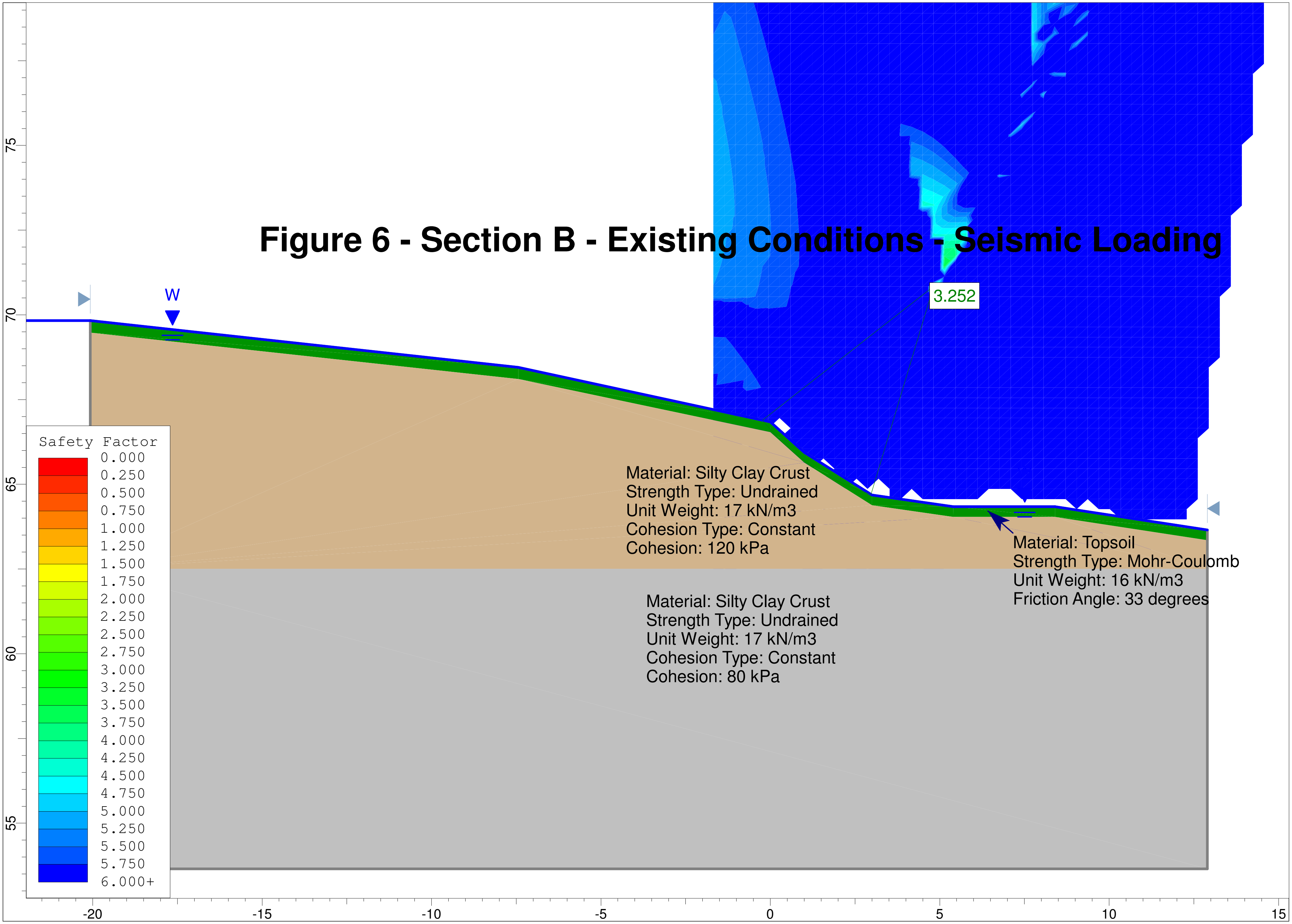


Figure 5 - Section B - Existing Conditions - Static Loading

Figure 6 - Section B - Existing Conditions - Seismic Loading



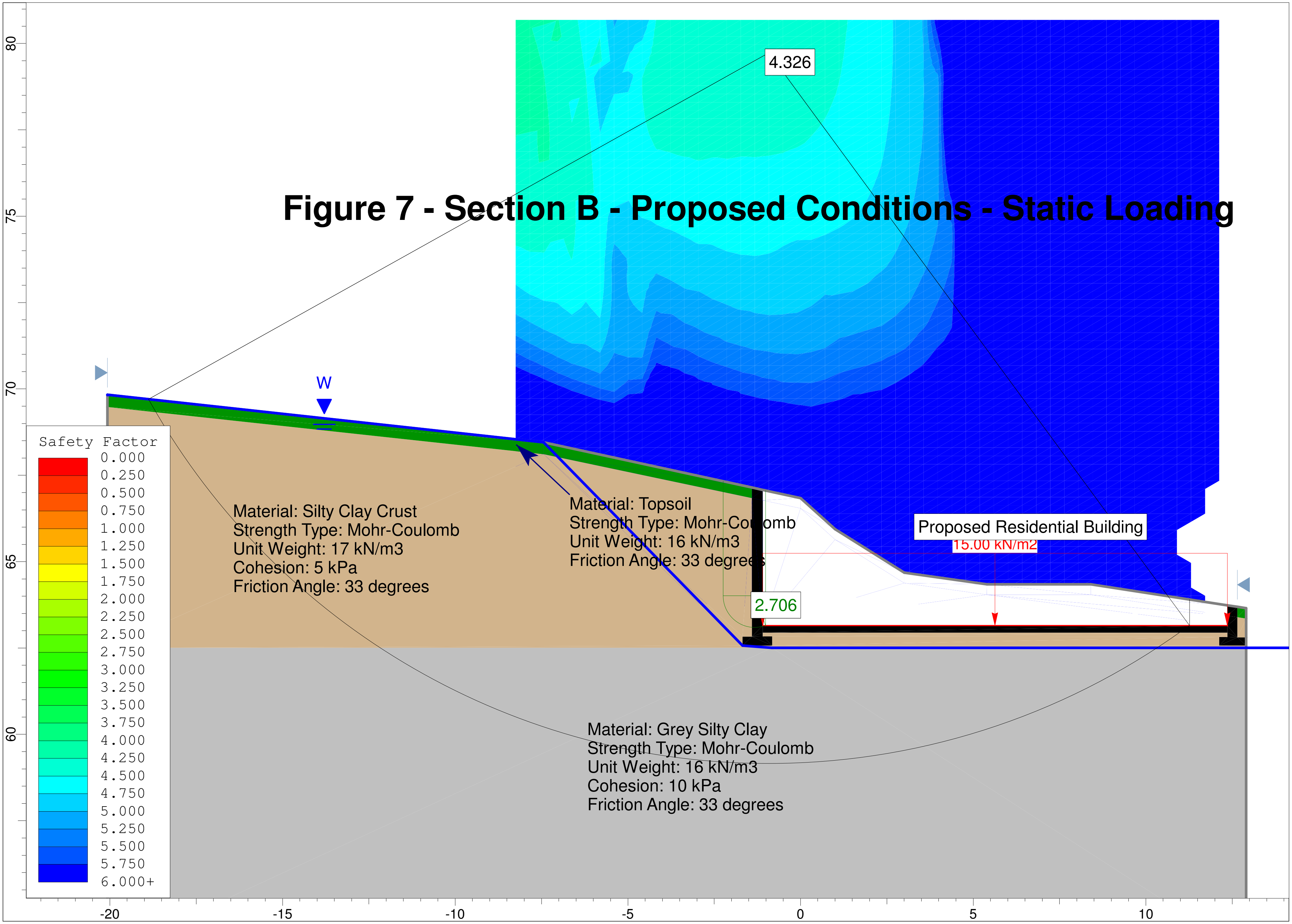
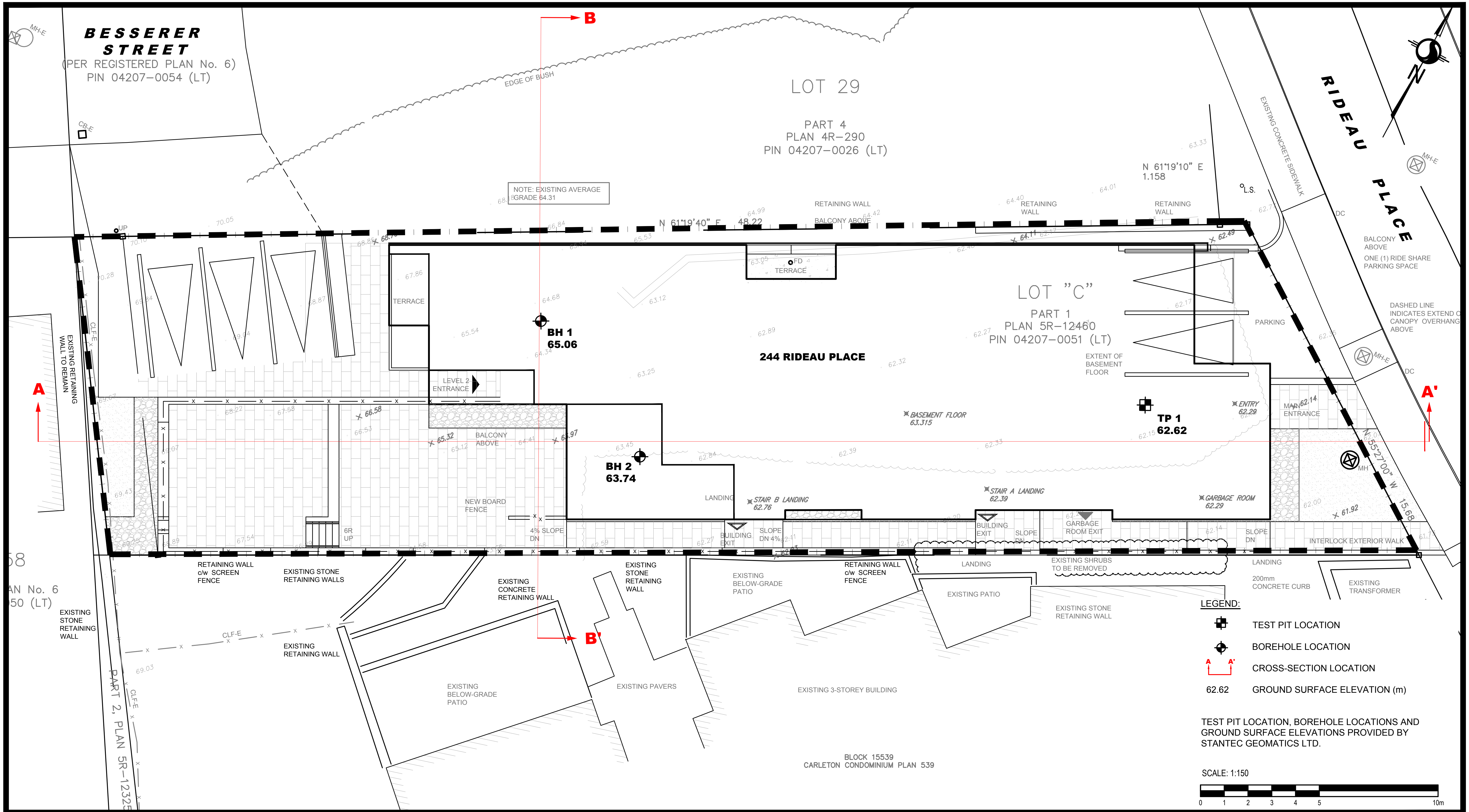


Figure 7 - Section B - Proposed Conditions - Static Loading



TEST PIT LOCATION, BOREHOLE LOCATIONS AND GROUND SURFACE ELEVATIONS PROVIDED BY STANTEC GEOMATICS LTD.

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consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
1	NEW BOREHOLES AND GROUND SURFACE ELEVATIONS ADDED	11/19/19	JV

TC UNITED GROUP
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL BUILDING- 244 RIDEAU PLACE
OTTAWA, ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:150	Date: 11/2019
Drawn by: rcg	Report No.: PG3780-1
Checked by: JV	Dwg. No.: PG3780-1
Approved by: FA	Revision No.: 1

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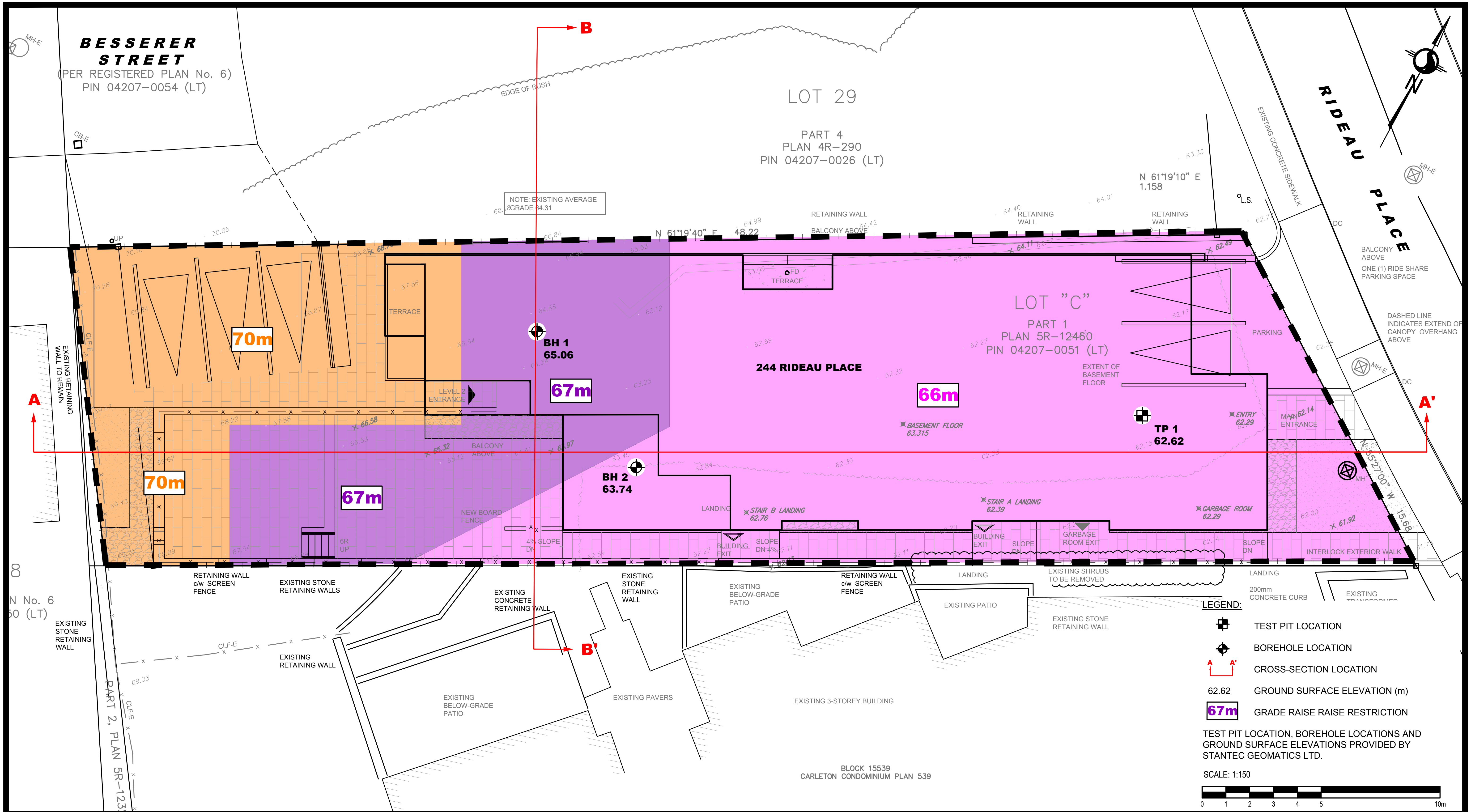

LEGEND:

⊞	TEST PIT LOCATION
⊕	BOREHOLE LOCATION
A A'	CROSS-SECTION LOCATION
62.62	GROUND SURFACE ELEVATION (m)
67m	GRADE RAISE RAISE RESTRICTION

TEST PIT LOCATION, BOREHOLE LOCATIONS AND GROUND SURFACE ELEVATIONS PROVIDED BY STANTEC GEOMATICS LTD.

SCALE: 1:150

0 1 2 3 4 5 10m

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Ottawa, Ontario K2E 7J5
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NO.	REVISIONS	DATE	INITIAL

TC UNITED GROUP
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL BUILDING- 244 RIDEAU PLACE
OTTAWA, ONTARIO

Title:

PERMISSIBLE GRADE RAISE PLAN

Scale: 1:150
Date: 11/2019
Drawn by: rcg
Report No.: PG3780-1
Checked by: JV
Dwg. No.: PG3780-2
Approved by: FA
Revision No.: 1

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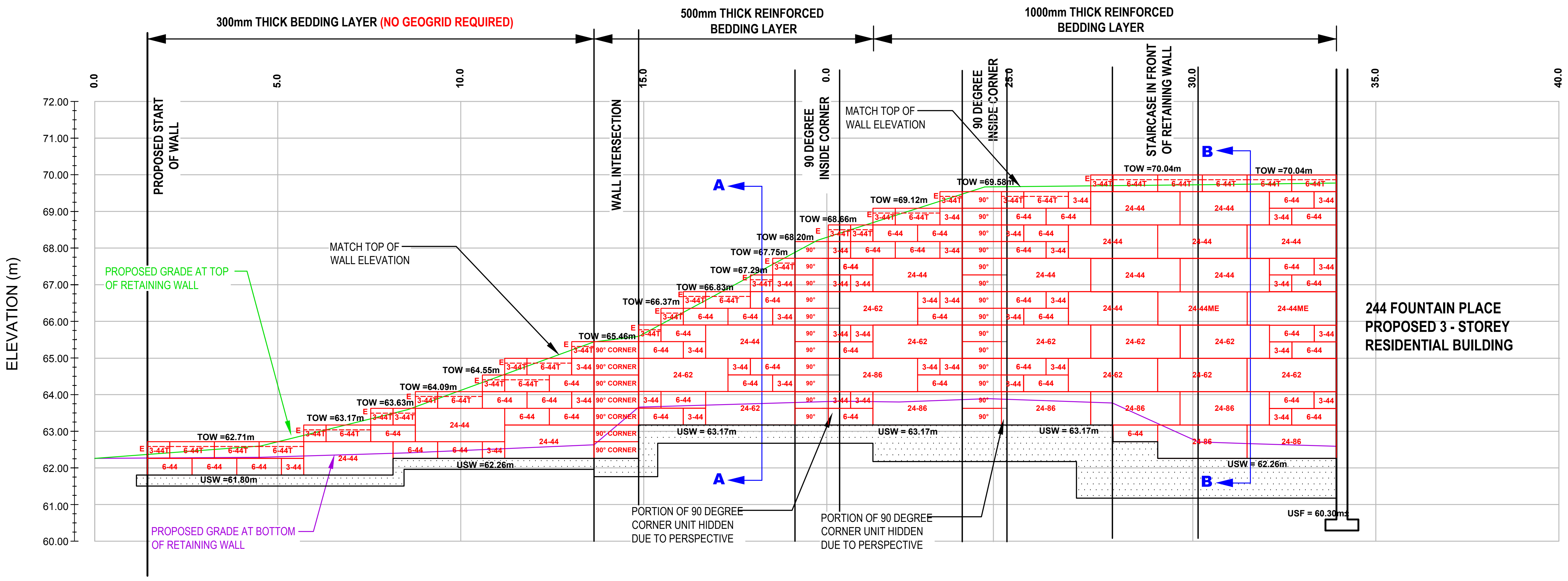
PROFILE VIEW (WALL SS1)

SCALE 1:100

I S S U E D   F O R   C O N S T R U C T I O N



BLOCK COUNT (SS1)

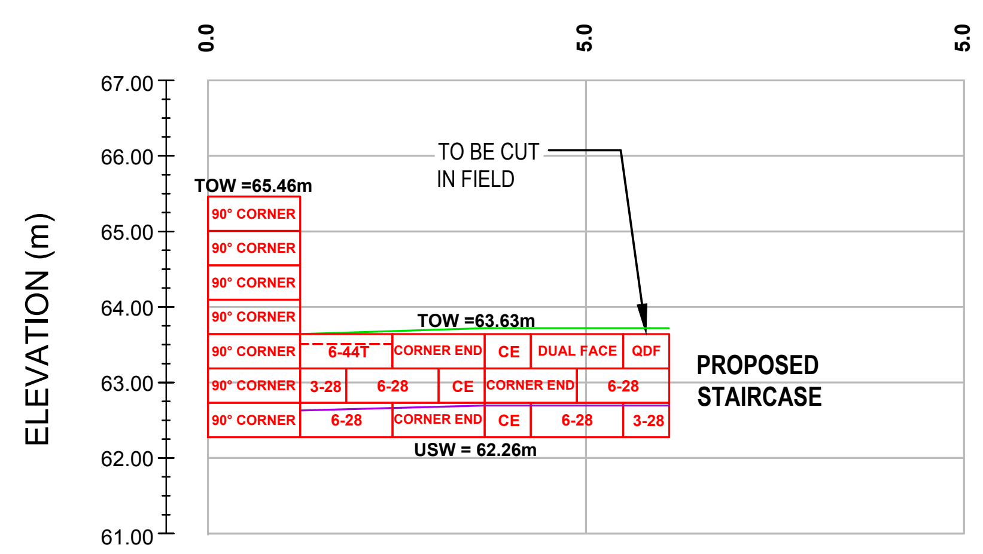
3-44 BLOCK -	39 UNITS
3-44 TOP BLOCK -	19 UNITS (16 END UNITS)
6-44 TOP BLOCK -	15 UNITS
6-44 BLOCK -	47 UNITS
24-44 BLOCK -	14 UNITS
24-44 MASS EX -	2 UNITS
24-62 BLOCK -	10 UNITS
24-86 BLOCK -	7 UNITS
90 DEG CORNER -	32 UNITS

BLOCK COUNT (SS2)

3-28 BLOCK -	2 UNITS
DUAL FACE UNITS -	1 FULL UNIT
6-28 TOP BLOCK -	1 UNITS
6-28 BLOCK -	4 UNITS
CORNER END UNIT -	3 UNITS

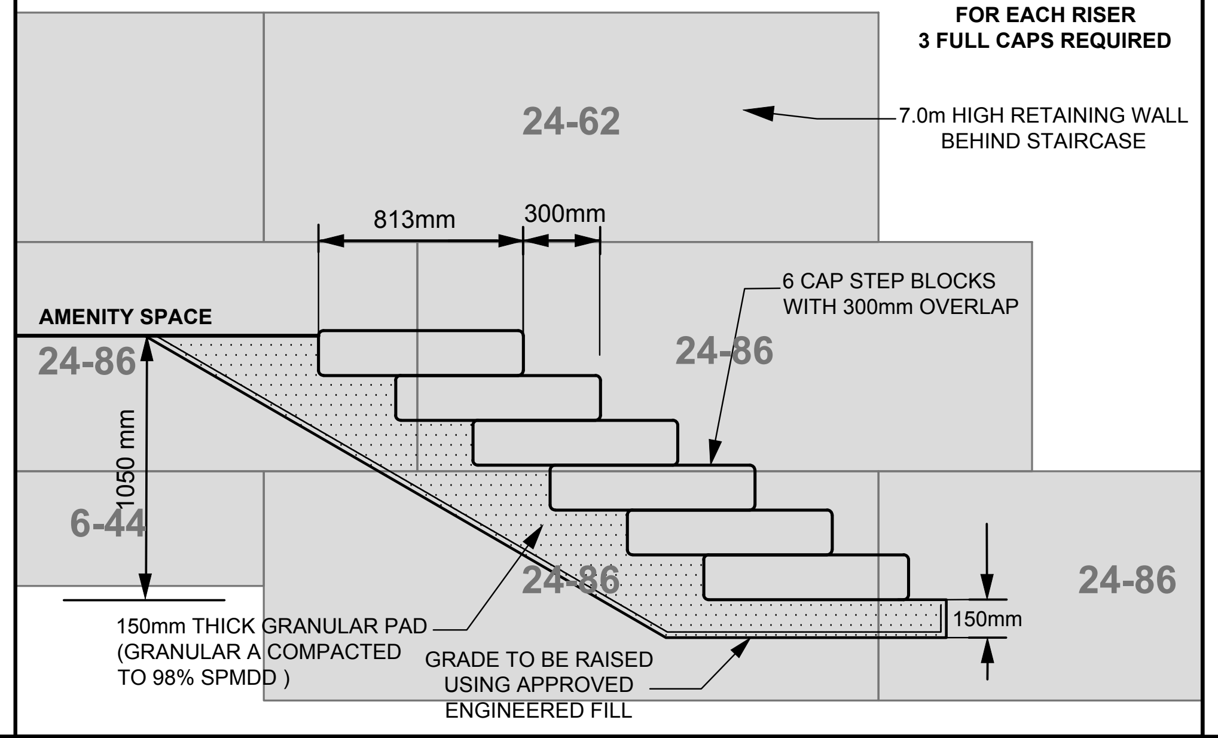
PROFILE VIEW (WALL SS2)

SCALE 1:100



CROSS SECTION C-C

SCALE 1:30



NOTES:

1. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR UTILITY CLEARANCE AND CONSTRUCTION SITE SAFETY. MCON PRODUCTS INC. AND PATERSON GROUP SHALL NOT BE RESPONSIBLE FOR MEANS OR METHODS OF CONSTRUCTION OR FOR SAFETY OF WORKERS OR OF THE PUBLIC.
2. THIS DESIGN IS BASED ON THE FOLLOWING SOIL PROPERTIES:

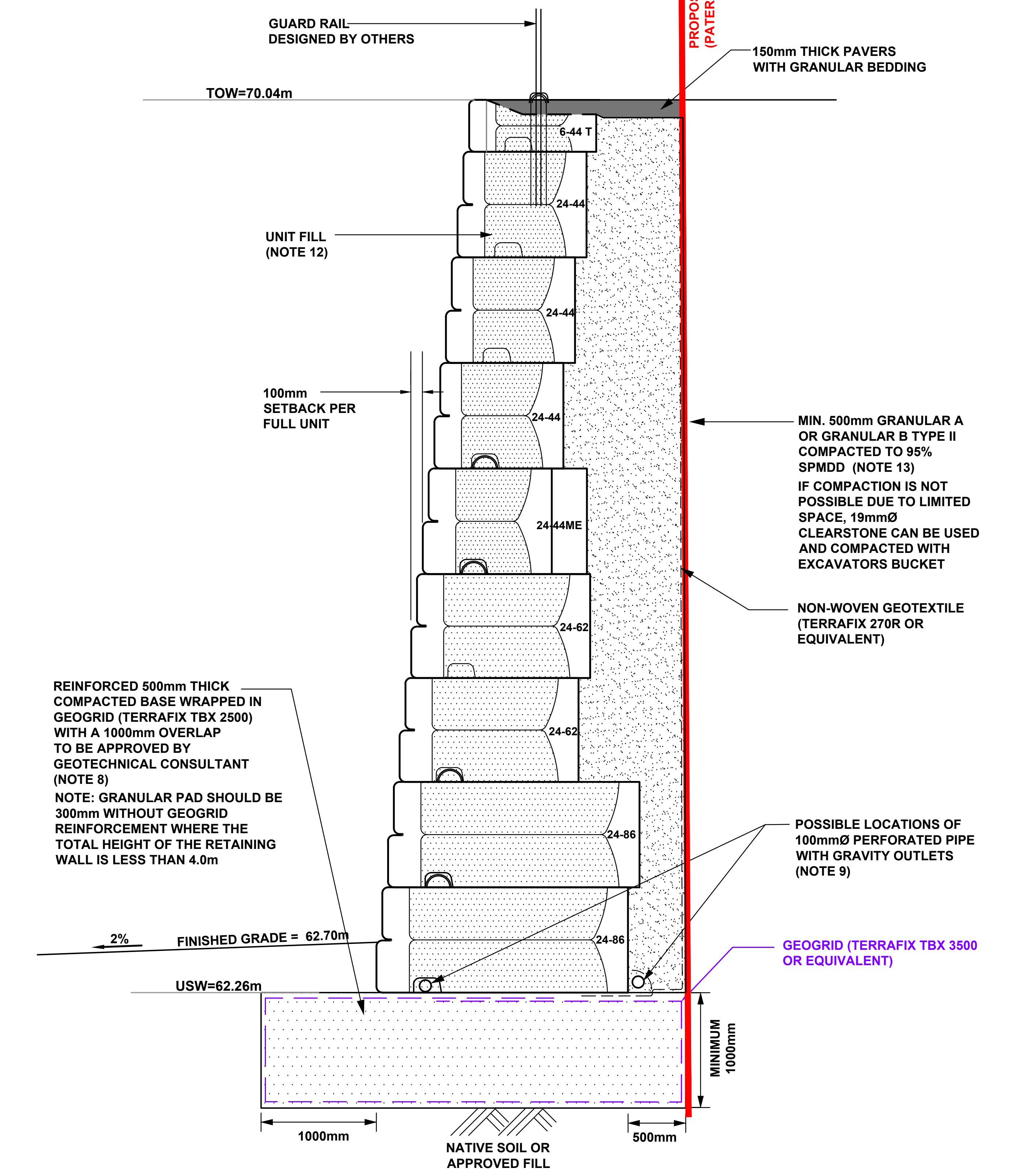
PROPERTY	RETAINED FILL	FOUNDATION MEDIUM
FRICTION ANGLE - PHI	33	33
UNIT WEIGHT -	21 KN/m3	18 KN/m3
COHESION - C	0	5 kPa
SOIL TYPE	GRANULAR B TYPE II & NATIVE FILL	STIFF SILTY CLAY

MATERIAL PROPERTIES ARE BASED ON SITE EVALUATION BY THE PATERSON GROUP, SEISMIC LOADING WAS EVALUATED ACCORDING TO THE ONTARIO BUILDING CODE 2012 WITH A PEAK GROUND ACCELERATION VALUE OF 0.32. NO SURCHARGE LOAD IS APPLICABLE FOR THIS WALL

3. THE WALL BASE DESIGN ASSUMES A BEARING RESISTANCE AT SLS OF 150 kPa. THE SITE GEOTECHNICAL ENGINEER SHOULD OBSERVE THE BEARING CONDITIONS AND ADJUST THE THICKNESS OF THE GRANULAR BASE OR RECOMMEND CONCRETE BEDDING TO ACCOMMODATE THE SITE CONDITIONS, IF NECESSARY.
4. THE DESIGN IS FOR STABILITY OF THE PRECAST MODULAR RETAINING WALL SYSTEM ONLY, SITE STABILITY (GLOBAL STABILITY), IS THE RESPONSIBILITY OF THE SITE GEOTECHNICAL ENGINEER, WALL GEOMETRY AND GRADE ELEVATIONS ABOVE AND BELOW THE WALL SHOULD CONFORM WITH THE GRADING PLAN PROVIDED HERE IN IF ACTUAL SITE GRADES VARY SIGNIFICANTLY FROM THOSE SHOWN OR IF THE BACK SLOPE DOES NOT CONFORM, INSTALLATION SHALL NOT PROCEED UNTIL THE ALL DESIGN IS VERIFIED OR MODIFIED IN THE APPLICABLE AREA.
5. THE RETAINING WALL DESIGN WAS BASED ON OUR UNDERSTANDING AND REVIEW OF THE PROPOSED SOLDER PILE AND LAGGING SHORING SYSTEM TO BE PLACED BEHIND THE RETAINING WALL ADJACENT TO THE PROPOSED BUILDING. THE SHORING SYSTEM (PERMANENT) SHOULD BE DESIGNED TO HANDLE THE LOAD APPLIED BY THE PROPOSED PARKING AREA, OTHERWISE, THE RETAINING WALL WILL REQUIRE LIGHT WEIGHT FILL TO BE PLACED WITHIN THE BACKFILL TO REDUCE THE SURCHARGE LOAD ON THE RETAINING WALL AND ENSURE ITS STABILITY.
6. HORIZONTAL LAYOUT DIMENSIONS ARE MEASURED ALONG THE FACE OF THE WALL, CORRESPONDING TO A HORIZONTAL REFERENCE ESTABLISHED BY PATERSON GROUP BASED ON DRAWINGS BY STANTEC, PROJECT NO. 160401234, 800 INDUSTRIAL AVENUE, 244 FOUNTAIN PLACE - GRADING PLAN REV. 4.
7. PRECAST UNITS SHALL BE STONE STRONG RETAINING WALL UNITS MANUFACTURED UNDER LICENSE FROM STONE STRONG SYSTEMS. UNITS SHALL HAVE A MOLDED GRANITE FACE. THE BLOCKS MAY BE STAINED IN PLACE TO ACHIEVE THE DESIRED COLOR.
8. THE WALL BASE SHALL CONSIST OF A MINIMUM OF 300 TO 1000mm OF OPSS GRANULAR A OR GRANULAR B TYPE II. THE BASE SHALL BE COMPACTED AS TO PROVIDE A LEVEL AND HARD SURFACE ON WHICH TO PLACE THE FIRST COURSE OF UNITS. GRANULAR BASE MATERIAL SHALL BE COMPACTED TO A MINIMUM 98% OF STANDARD PROCTOR MAXIMUM DRY DENSITY (SPMDD). WHERE THE WALL HEIGHT EXCEEDS 3.7m, A REINFORCED GRANULAR PAD WRAPPED IN GEOGRID (TERRAFIX TBX 3500 OR EQUIV.) WITH A 1.0m OVERLAP WILL BE REQUIRED. THE BASE SHALL BE SMOOTHED TO ENSURE COMPLETE CONTACT OF RETAINING WALL UNIT WITH BASE. SURFACE OF GRANULAR BASE MAY BE DRESSED WITH FINER AGGREGATE TO AID LEVELING. ENSURE GRADATION OF DRESSING MATERIAL IS SUCH AS TO PRECLUDE LOSS OF FINES INTO BASE. THE THICKNESS OF DRESSING LAYER SHOULD NOT EXCEED 3 TIMES THE MAXIMUM PARTICLE SIZE USED. THE CONTRACTOR MAY SUBSTITUTE CONCRETE WITH A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 20 MPa AND AIR ENTRAINMENT FOR THE GRANULAR BASE MATERIAL.
9. INSTALL 100 MM DIAMETER PERFORATED PIPE DRAIN UNDER LOWER COURSE OF WALL (OR ALTERNATIVELY BEHIND HEEL OF WALL). PROVIDE CLEAR STONE SURROUNDING THE DRAIN TO PROTECT PIPE FROM CLOGGING AND DAMAGE. PROVIDE OUTLETS THROUGH WALL BASE LAYER AT LOW AREAS, NO FURTHER APART THAN 15m CENTRES.
10. WALL IS DESIGNED FOR A MINIMUM OF 200 mm TOE EMBEDMENT WITH A MINIMUM HORIZONTAL LEDGE OF 300mm BEYOND THE FACE AND REAR OF BASE BLOCK. WHERE GRANULAR BEDDING WILL NOT BE SUFFICIENT, THE USE OF CONCRETE BEDDING MAY BE REQUIRED. EXTRA PRECAUTIONS MUST BE TAKEN TO PROVIDE TOE EMBEDMENT IN AREAS WHERE BASE OF WALL STEPS.
11. THE RETAINING WALL IS A BATTERED WALL. ALIGNMENT OF THE BOTTOM WALL UNIT COURSE SHOULD BE PLANNED TO CONSIDER THAT A NOMINAL 100 mm AUTOMATIC SETBACK WILL OCCUR WITH EACH 0.91 m HIGH UNIT, AS SUCH, THE LOWEST WALL BASE WITHIN A CONTINUOUS SECTION SHOULD BE WITHIN WALL CORRIDOR, INCLUDING REQUIREMENT FOR BASE EXTENT IN FRONT OF WALL. SIMILARLY, THE FACE OF THE HIGHEST WALL (T/W LEVEL) WITHIN THE SECTION SHOULD ALSO BE AT LEAST WITHIN 0.5 m WITHIN THE WALL CORRIDOR (OR AS REQUIRED BY OWNER).
12. UNIT FILL SHALL BE A CLEAN, COARSE GRANULAR MATERIAL. UNIT FILL SHALL BE 19mmØ CLEAR STONE MEETING THE SATISFACTION OF THE GEOTECHNICAL ENGINEER. UNIT FILL SHALL FILL CAVITIES WITHIN AND BETWEEN THE UNITS AND MAY EXTEND BEHIND THE FACING UNITS FOR THE CONTRACTOR'S CONVENIENCE.
13. BACKFILL MATERIAL SHALL BE APPROVED BY THE SITE GEOTECHNICAL ENGINEER PRIOR TO USE AND SHOULD CONSIST OF OPSS GRANULAR B TYPE II BUFFER OF 1000mm(AS SHOWN) WIDTH. ALL FILL WITHIN A 1H:1V ZONE UP AND BACK FROM THE HEEL SHOULD ALSO BE COMPACTED. BACKFILL SHALL BE PLACED IN MAXIMUM 300 mm LOOSE LIFTS AND COMPACTED TO A MINIMUM OF 95% OF THE MATERIAL'S SPMDD. MOISTURE CONTENT SHOULD BE CONTROLLED AND MAINTAINED WITHIN -3 TO +4 PERCENT OF OPTIMUM.
14. ENSURE EACH COURSE IS COMPLETELY FILLED AND BACKFILL IS PLACED TO THE SAME LEVEL PRIOR TO PROCEEDING TO THE NEXT COURSE. ENSURE ADJACENT UNITS ARE IN CONTACT SO THAT UNIT FILL MAY NOT ESCAPE THROUGH THE JOINT BETWEEN UNITS. GAPS GREATER THAN 6 mm BETWEEN UNITS (AT THE FACE) SHALL NOT BE ALLOWED. AT THE INTERSECTIONS WITH STRUCTURES, CUT UNITS TO OBTAIN A NEAT FIT. PULL BLOCK UNITS FORWARD TO ENGAGE THE ALIGNMENT LOOPS ON THE UNIT BELOW BEFORE INFILLING IN ALL CASES.
15. MAINTAIN TEMPORARY GRADES TO DIVERT SURFACE WATER AWAY FROM THE RETAINING WALL EXCAVATION. SLOPE FINAL BACKFILL TO PROVIDE POSITIVE DRAINAGE AND TO ELIMINATE PONDING. WHERE APPLICABLE, THE UPPER COURSE FOR THE RETAINING WALL CONSISTS OF DUAL FACE (DF) BLOCKS WHICH ALLOW FOR THE GRADE BEHIND THE TOP OF THE WALL TO VARY, WHILE PRESENTING A FINISHED REAR WALL FACE.
16. IF WINTER CONSTRUCTION IS CONSIDERED, HEAT MUST BE MAINTAINED WHEN THE BASE IS EXPOSED. THE WALL BASE MUST BE COVERED WITH INSULATION TARPS TO MAINTAIN HEAT AND PROTECT THE BASE FROM POTENTIAL FROST HEAVE. ONCE THE BASE IS BACKFILLED, THE TOP OF WALL MUST BE COVERED WITH INSULATION TARPS OVERNIGHT UNIT THE WALL CONSTRUCTION IS COMPLETED.
17. THE GEOTECHNICAL CONSULTANT SHOULD BE NOTIFIED AT THE BEGINNING OF THE WALL CONSTRUCTION TO COMPLETE PERIODIC INSPECTIONS AND PROVIDE GEOTECHNICAL RECOMMENDATIONS AS THE WALL CONSTRUCTION PROGRESSES.
18. DURING THE CONSTRUCTION OF THE RETAINING WALL, THE CONTRACTOR MUST ENSURE THAT A SAFE SLOPE IS PROVIDED BEHIND THE RETAINING WALL. PATERSON GROUP SHOULD COMPLETE PERIODIC INSPECTIONS TO ENSURE A PROPER SLOPE IS PROVIDED AS PER THE SITE GEOTECHNICAL RECOMMENDATIONS.
19. ANY INADEQUATE PERFORMING SUBGRADE SHOULD BE SUB-EXCAVATED AND REPLACED WITH OPSS GRANULAR B TYPE II, COMPACTED TO 98% OF THE MATERIALS SPMDD.
20. ANY CUTTING OF BLOCKS TO SUIT SITE CONDITIONS OR WALL DESIGN WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. REMOVAL/CUTTING OF LIFTING LOOPS ON THE FINAL ROW OF BLOCKS WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.

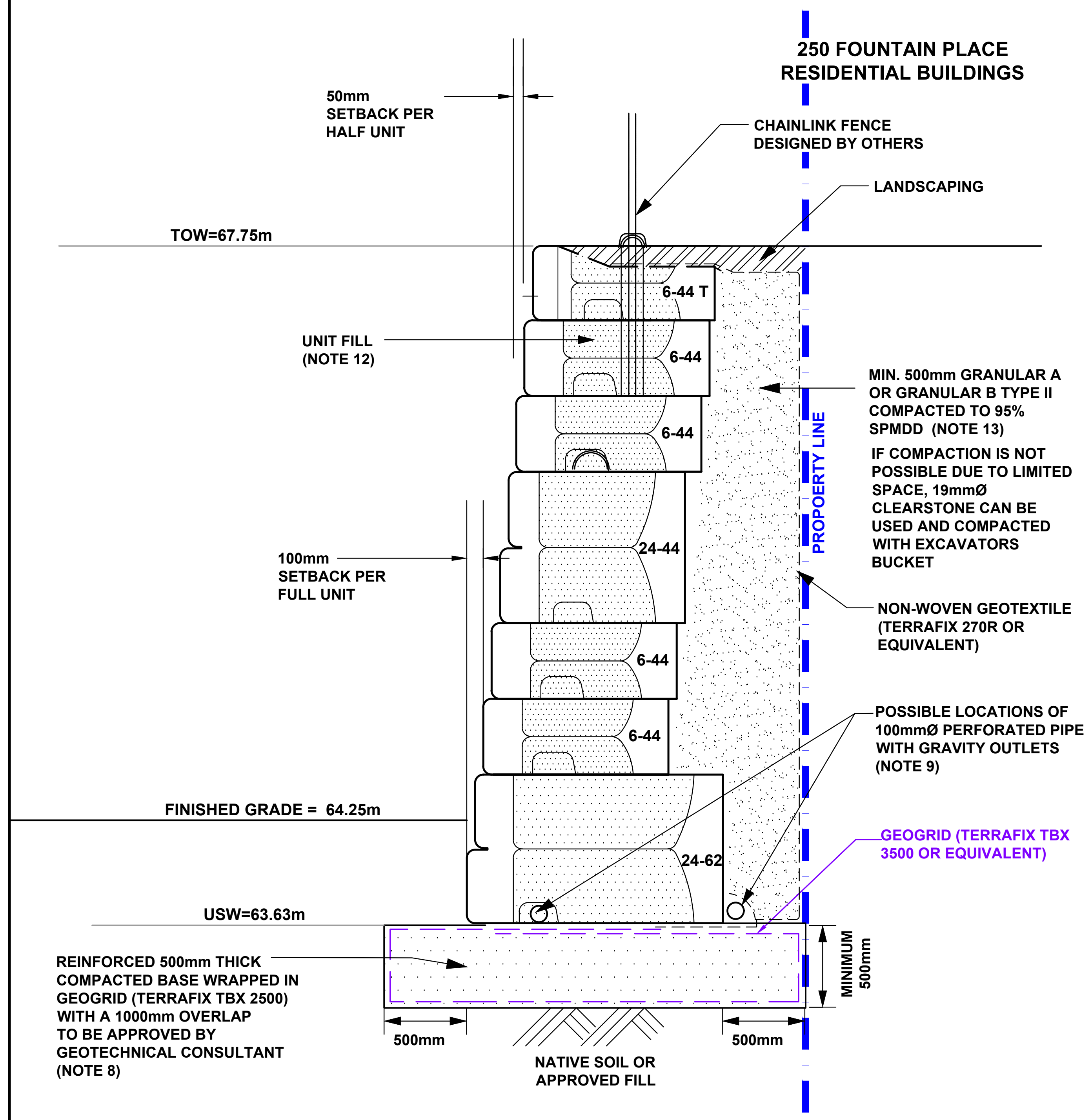
CROSS SECTION B-B

SCALE 1:40



CROSS SECTION A-A

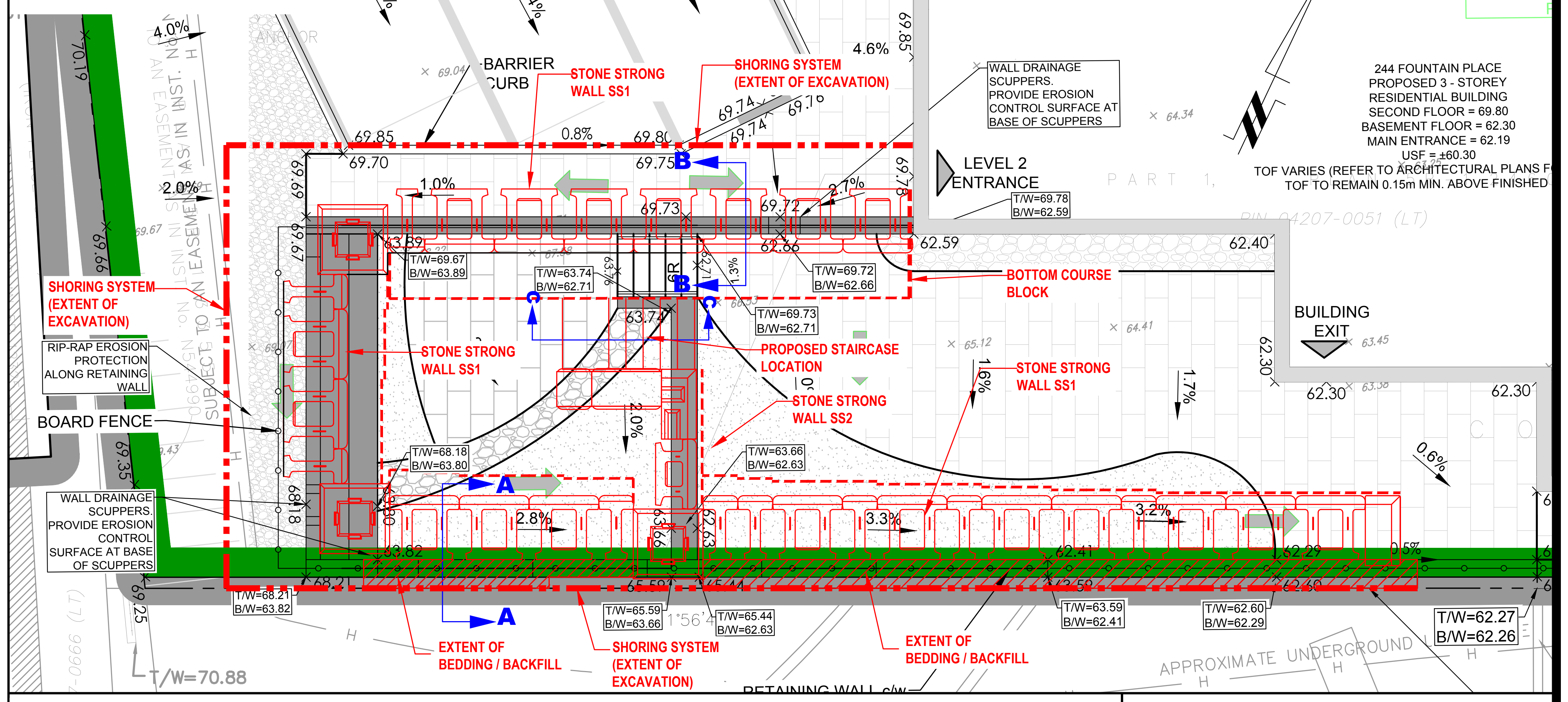
SCALE 1:30



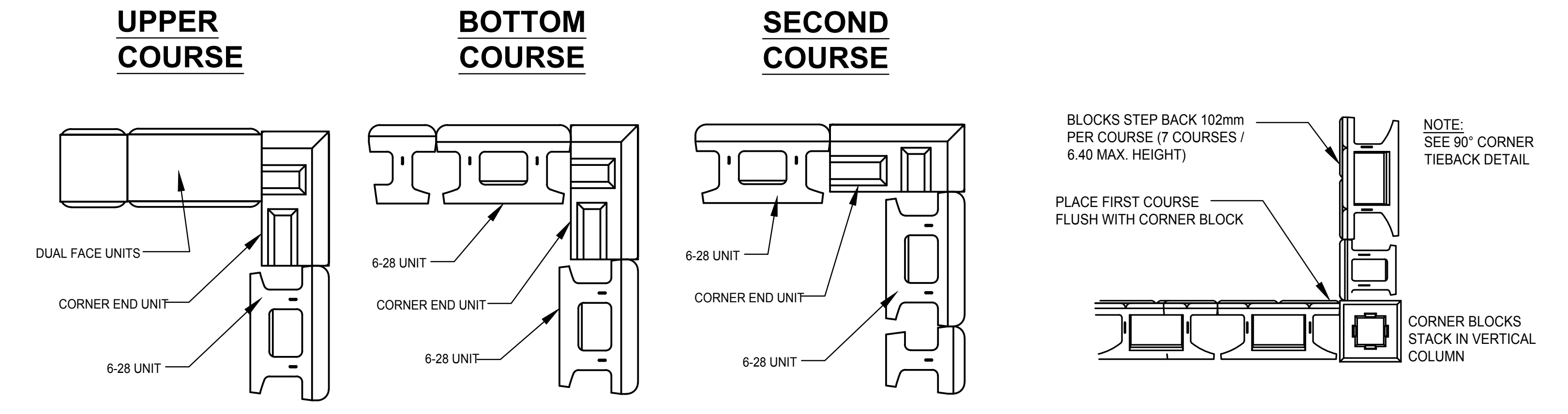
NOTE: GRANULAR PAD SHOULD BE 300mm WITHOUT GEOGRID REINFORCEMENT WHERE THE TOTAL HEIGHT OF THE RETAINING WALL IS LESS THAN 4.0m

GRADING PLAN

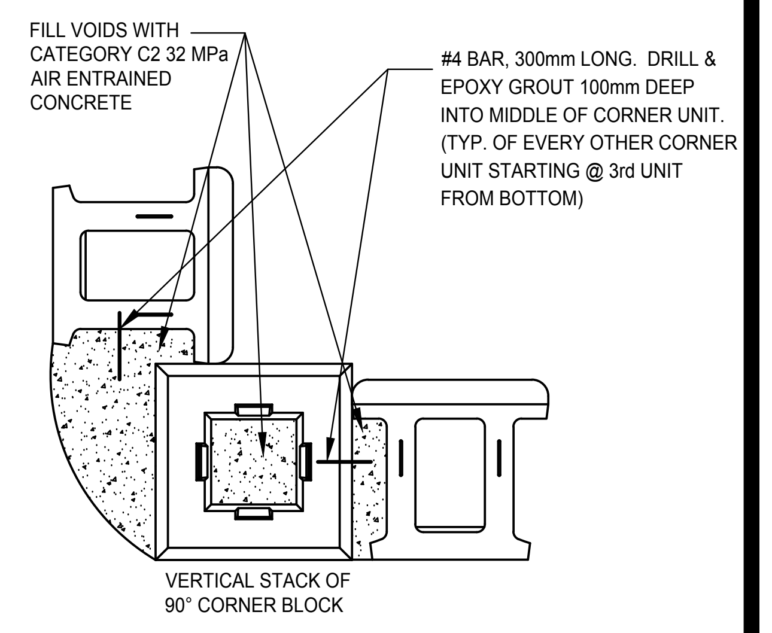
SCALE 1:75



90° CORNER DETAILS



90° TIEBACK



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Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL
1	REVISED WALL BASED ON GEOTECHNICAL REPORT INFORMATION	21/11/2019	FA

T.C UNITED GROUP

PROPOSED MULTI-STOREY RESIDENTIAL BUILDING
244 FOUNTAIN PLACE
OTTAWA, ONTARIO

Title:
STONE STRONG RETAINING WALL DESIGN

Stamp:

GEOTECHNICAL / STRUCTURAL PERSPECTIVE
21/11/2019
D. J. GILBERT
100116130

GEOTECHNICAL PERSPECTIVE
21/11/2019
F. I. ABOU-SEIDO
100156744

Scale: AS SHOWN
Drawn by: RCG
Checked by: FA
Approved by: FA
Date: 10/2019
Report No.: PG3780
Drawing No.: PG3780-3
Revision No.: 1

p:\autocad drawings\geotechnical\pg37xx\pg3780\pg3780-3(final) new stone strong retaining wall.dwg