Geotechnical Investigation

Proposed Multi-Storey Building

294-300 Tremblay Road
Ottawa, Ontario

Prepared for TC United Development Corporation
c/o ZW Project Management

Report PG5407-1 Revision 4 dated August 31, 2023

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 Testing..3
3.4 Analytical Testing 4
4.0 Observations 5
4.1 Surface Conditions 5
4.2 Subsurface Profile 5
4.3 Groundwater...5
5.0 Discussion 7
5.1 Geotechnical Assessment..7
5.2 Site Grading and Preparation..7
5.3 Foundation Design 8
5.4 Design for Earthquakes..9
5.5 Basement Slab Construction..9
5.6 Basement Wall 10
5.7 Pavement Structure..11
6.0 Design and Construction Precautions.............................13
6.1 Foundation Drainage and Backfill 13
6.2 Protection of Footings Against Frost Action 15
6.3 Excavation Side Slopes..16
6.4 Pipe Bedding and Backfill...18
6.5 Groundwater Control 19
6.6 Winter Construction 20
6.7 Corrosion Potential and Sulphate...21
7.0 Recommendations 22
8.0 Statement of Limitations 23

Appendices

Appendix 1	Soil Profile and Test Data Sheets Symbols and Terms Analytical Testing Results
Appendix 2	Figure 1 - Key Plan Drawing PG5407-1 – Test Hole Location Plan
Appendix 3	Relevant Memorandums

1.0 Introduction

Paterson Group (Paterson) was commissioned by ZW Project Management on behalf of TC United Development to conduct a geotechnical investigation for the proposed multi-storey building to be located at the intersection between Tremblay Road and Belfast Road, in the City of Ottawa, Ontario (refer to Figure 1 – Key Plan presented in Appendix 2 of this report).

The objectives of the 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.

The following 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.

Investigating the presence or potential presence of contamination on the subject property was not part of the scope of work of this present investigation. A report addressing environmental issues for the subject site was prepared under separate cover.

2.0 Proposed Development

Based on our current drawings, it is understood that the proposed project will consist of a mixed-use multi-storey building with one (1) underground level. It is further understood that the existing buildings have been demolished as part of the proposed redevelopment at the subject site. Associated access lanes, and landscaped areas are further anticipated. It is expected that the proposed building will be municipally serviced.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the geotechnical investigation was carried out on July 7, 2020 and consisted of advancing three (3) boreholes (BH 1 to BH 3) to a maximum depth of 6.7 m below existing ground surface. The borehole locations were determined in the field by Paterson personnel taking into consideration site features and underground services. The locations of the boreholes are shown on Drawing PG5407-1 - Test Hole Location Plan included in Appendix 2.

The boreholes were advanced using a truck-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. The test hole procedures consisted of advancing the boreholes to the required depths at the selected locations and sampling the overburden.

Sampling and In Situ Testing

Soil samples were collected from the boreholes using three different techniques, namely, sampled directly from the auger flights (AU) or collected using a 50 mm diameter split-spoon (SS) sampler. All soil samples were visually inspected and initially classified on site. The auger and split-spoon samples were placed in sealed plastic bags and transported to our laboratory for further examination and classification. 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 presented in Appendix 1.

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

Overburden thickness was evaluated by dynamic cone penetration testing (DCPT) at BH 1. The DCPT consists of driving a steel drill rod, equipped with a 50 mm diameter cone at the tip, using a 63.5 kg hammer falling from a height of 760 mm. The number of blows required to drive the cone into the soil is recorded for each 300 mm increment. Due to the low resistance exerted by the silty clay in some boreholes, the cone was pushed using the hydraulic head of the drill rig until resistance to penetration was encountered. The hammer was then used to further advance the cone to practical refusal.

The subsurface conditions observed in the test holes 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

Groundwater monitoring wells were installed in BH 1 and BH 3, and flexible standpipe was installed in BH 2 to permit monitoring of the groundwater levels subsequent to the completion of the sampling program.

Sample Storage

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

3.2 Field Survey

The test holes were located and surveyed in the field by Paterson personnel. The locations and ground surface elevations were determined using a handheld GPS incorporating a geodetic datum. The borehole locations and ground surface elevation at each borehole location are presented on Drawing PG5407-1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

Soil samples were recovered from the boreholes and visually examined in our laboratory to review the field logs.

3.4 Analytical Testing

One (1) 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 Subsection 6.7.

4.0 Observations

4.1 Surface Conditions

The subject site is currently occupied by one single family home and one commercial building, the remainder of the site is occupied by parking lots, grass covered areas and mature trees. The existing ground surface across the site is relatively flat and at grade with the surrounding roadways and neighbouring properties.

The site is bordered to the north by Tremblay Road, to the east by Belfast Road, to the west by Avenue L and to the south by an asphalt covered parking area.

4.2 Subsurface Profile

Overburden

Generally, the subsurface profile encountered at the borehole locations consists of asphaltic concrete underlain by fill consisting of brown silty clay with trace silt and gravel. The fill is underlain by very stiff clayey silt overlying loose to compact brown sandy silty. Glacial till was encountered below the above noted layer consisting of compact grey sandy silt with gravel, cobbles and boulders. Practical refusal to the DCPT was encountered at a depth of 7.3 m below existing grade at BH 1.

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

Bedrock

Based on available geological mapping, the bedrock in this area consists of gray shale of the Carlsbad Formation with an overburden drift thickness of 7 to 10 m depth.

4.3 Groundwater

Groundwater levels were measured at the monitoring wells in the borehole locations of the current investigation on July 16, 2020. The measured groundwater levels in the piezometers at the borehole locations are presented in Table 1. The long-term groundwater level can also be estimated based on the recovered soil samples' moisture levels and consistency. Based on these observations, the long-term groundwater table is anticipated to be at a **3 to 4 m** depth.

Table 1 - Summary of Groundwater Levels

Borehole Number	Measured Groundwater Level		Recording Date
	Depth (m)	Elevation (m)	
Groundwater Levels Based on Current Investigation (Report PG5407)			
BH 1	4.08	61.84	July 16, 2020
BH 2	4.15	61.81	July 16, 2020
BH 3	3.41	62.29	July 16, 2020

It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater level could vary at the time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is satisfactory for the proposed multi-storey building. It is recommended that the proposed building be founded over conventional shallow foundation placed on an undisturbed, stiff clayey silt, compact sandy silt, and/or compact glacial till bearing surface.

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

5.2 Site Grading and Preparation

Stripping Depth

Topsoil, asphalt, and deleterious fill, such as material containing high content of organic materials or construction remnants, should be stripped from under the proposed building footprint and other settlement sensitive structures.

Fill Placement

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

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

Existing Fill Treatment

Based on the proposed building, a basement level is proposed which will result in the removal of the majority of the existing fill if not the entire fill layer. However, if portions of the existing fill is to remain in place outside the footprint of the proposed footings, it is recommended that the existing fill be proof-rolled under dry conditions and above freezing temperatures using suitable vibratory compaction equipment, making several passes and approved by Paterson personnel. Any poor performing areas should be sub excavated and replaced with OPSS Granular material as specified above.

5.3 Foundation Design

Bearing Resistance Values

Using continuously applied loads, footings placed over stiff clayey silt, compact sandy silt, compact glacial till bearing surfaces can be designed using the following bearing resistance values at serviceability limit states (SLS) and factored resistance values as ultimate limit states (ULS) incorporating a geotechnical factor of 0.5, presented in Table 2 below.

Table 2 - Bearing Resistance Values

Undisturbed Bearing Surface	Bearing Resistance Value at SLS (kPa)	Factored Bearing Resistance Value at ULS (kPa)
Stiff Clayey Silt	125	225
Compact Sandy Silt	125	225
Compact Glacial Till	150	225
Engineered Fill	100	150

If the sandy silt subgrade is observed to be in a loose state of compactness, the material should be proof rolled using suitable vibratory equipment making several passes under dry conditions and above freezing temperatures and approved by Paterson at the time of construction.

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.

Modulus of Subgrade

For spread footings placed on the compact grey sandy silt subgrade, the modulus of subgrade reaction can be taken as **10 MPa/m** for a contact pressure of **125 kPa**.

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 glacial till above the groundwater table when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in situ soil of the same or higher capacity as the bearing medium soil.

5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Class C** for the foundations bearing on an undisturbed, compact glacial till. Soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the 2012 Ontario Building Code for a full discussion of the earthquake design requirements.

5.5 Basement Slab Construction

With the removal of all topsoil and deleterious material, containing organic matter, within the footprint of the proposed building, the approved existing fill of native material as discussed in Subsection 5.3 will be considered to be an acceptable subgrade surface on which to commence backfilling for floor slab construction.

It is recommended that the upper 200 mm of sub-slab fill consists of 19 mm clear crushed stone. All backfill material within the footprint of the proposed building should be placed in maximum 300 mm thick loose layers and compacted to the minimum 98% of its SPMDD.

5.6 Basement Wall

There are several combinations of backfill materials and retained soils that could be applicable for the basement walls of the subject structure. However, the conditions can be well-represented by assuming the retained soil consists of a material with an angle of internal friction of 30 degrees and a bulk (drained) unit weight of 20 kN/m^3. The applicable effective (undrained) unit weight of the retained soil can be taken as 13 kN/m^3, where applicable. A hydrostatic pressure should be added to the total static earth pressure when using the effective unit weight.

Lateral Earth Pressures

The static horizontal earth pressure (p_o) can be calculated using a triangular earth pressure distribution equal to $K_o \cdot \gamma \cdot H$ where:

K_o = at-rest earth pressure coefficient of the applicable retained soil, 0.5
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)

An additional pressure having a magnitude equal to $K_o \cdot q$ and acting on the entire height of the wall should be added to the above diagram for any surcharge loading, q (kPa), that may be placed at ground surface adjacent to the wall. The surcharge pressure will only be applicable for static analyses and should not be used in conjunction with the seismic loading case.

Actual earth pressures could be higher than the “at-rest” case if care is not exercised during the compaction of the backfill materials to maintain a minimum separation of 0.3 m from the walls with the compaction equipment.

Seismic Earth Pressures

The total seismic force (P_{AE}) includes both the earth force component (P_o) and the seismic component (ΔP_{AE}). The seismic earth force (ΔP_{AE}) can be calculated using $0.375 \cdot a_c \cdot \gamma \cdot H^2/g$ where:

a_c = $(1.45 - a_{max}/g)a_{max}$
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)
g = gravity, 9.81 m/s^2

The peak ground acceleration, (a_{max}), for the Ottawa area is 0.32g according to OBC 2012. Note that the vertical seismic coefficient is assumed to be zero.

The earth force component (P_o) under seismic conditions can be calculated using $P_o = 0.5\ K_o\ \gamma\ H^2$, where $K_o = 0.5$ for the soil conditions noted above.

The total earth force (P_{AE}) is considered to act at a height, h (m), from the base of the wall, where:

$$h = \{P_o \cdot (H/3) + \Delta P_{AE} \cdot (0.6 \cdot H)\}/P_{AE}$$

The earth forces calculated are unfactored. For the ULS case, the earth loads should be factored as live loads, as per OBC 2012.

5.7 Pavement Structure

Where required at the subject site, the recommended pavement structures for car only parking areas and access lanes are shown in Tables 3 and 4.

Table 3 - Recommended Pavement Structure - Car Only Parking Areas and Driveways

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

Table 4 - Recommended Pavement Structure - Access Lanes and Heavy Truck Parking/Loading Areas

Thickness (mm)	Material Description
40	**Wear Course** - HL3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - HL8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
450	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill.	

Where a podium deck is located below the pavement structures, including parking areas and access lanes, can be designed using the pavement structure shown on Table 5 below.

Table 5 - Recommended Pavement Structure – Access Lanes and Heavy Truck Parking Areas

Thickness (mm)	Material Description
50	**Wear Course** - Superpave 12.5 Asphaltic Concrete
300	**BASE** - OPSS Granular A Crushed Stone
SUBGRADE - To consist of concrete podium deck including waterproofing and insulation.	

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

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's SPMDD using suitable vibratory equipment.

Native Subgrades

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. Weak subgrade conditions may be experienced over service trench fill materials. This may require the use of a geotextile, such as Terratrack 200 or equivalent, thicker subbase or other measures that can be recommended at the time of construction as part of the field observation program.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Foundation Drainage and Waterproofing System

It is recommended that a perimeter foundation drainage system be provided for the proposed structure. It is expected that the foundation wall will be cast as a blind-sided pour and/or double-sided pour against a shoring system. It is recommended that the groundwater drainage system consist of the following:

- ❑ A waterproofing membrane should be placed against the shoring system between underside of footings and 1 m above the groundwater elevation. A 150 MIL granular bentonite surfacing laminated to 20 MIL thick HDPE membrane should be installed in horizontal lifts to the manufacturer's specifications in a single fashion with the HDPE side facing applicator to an adequately prepared substrate surface. the waterproofing membrane can be terminated 1 m above the ground water table (approx. elevation of GWT is at 62.5 m). Furthermore, it is required that the waterproofing membrane should be extended at least 600 mm horizontally below underside of footings. It should be noted that termination elevation should be confirmed by Paterson once the excavation is completed.

- ❑ It is recommended that a composite foundation drainage membrane, such as 6000 series membrane by DeltaDrain, G100N by MiraDrain, or equivalent and approved other, be placed over the waterproofing membrane to divert water captured by the building foundation drainage system to the appropriate sump pump system. The composite foundation drainage membrane should extend from finished grade to the underside of footing level with the geotextile layer facing away from the foundation wall in a single fashion.

- ❑ It is highly recommended that the drainage boards be installed with a minimum horizontal and vertical overlap of 150 mm between the sheets (not the filter cloth) to minimize the joints between the sheets. The top 150 mm flap of each lower horizontal lift of the drainage board should be secured behind the bottom end lap of the overlying horizontal course of the drainage board to allow for proper shingling between lifts. This will mitigate the potential for water to drain behind the HDPE face of the drainage board and onto the concrete wall surface.

- 150 mm diameter sleeves placed should be cast in the foundation wall at the footing interface to allow the infiltration of water to flow to an interior drainage pipe. Further, the drainage sleeves should be mechanically connected to the exterior or interior perimeter drainage pipe and the underfloor drainage system. The perimeter and underfloor drainage pipes should direct water to the storm sump pit(s) within the lower basement area by gravity. It is recommended that an 'X' shaped incision through the composite foundation drainage board be cut to connect the sleeve. The sleeves should be fastened and secured into place at the footing/wall interface prior to casting concrete for the foundation wall. The incision in the drainage board should be sealed with 3M tape around the sleeve. Further, the waterproofing membrane should be sealed around the sleeve.

- All joints between drainage board sheets (i.e., overlaps) should be sealed using 3M Tape, or equivalent other product approved by Paterson. Further, all protrusions through the waterproofing and drainage board layers liner, such as fasteners or damage by materials such as concrete, should be sealed using 3M Tape or equivalent other products approved by Paterson to mitigate the potential for water to drain behind the HDPE face of the drainage board.

Underfloor Drainage

The underfloor drainage pipe shall consist of a 150 mm diameter perforated corrugated pipe spaced at approximately 6m and surrounded by well-graded granular fill having a maximum size of 100mm. The underfloor drainage system must have a positive gravity connection towards the building sump pit which is anticipated to be placed within the west area of the underground floor.

The exterior perimeter drainage shall consist of a 150 mm diameter perforated corrugated pipe wrapped in a geosock and surrounded by 150 mm of 19 mm clear crushed stone. The perimeter drainage pipe must have a positive gravity connection towards the underfloor drainage system and building sump pit. 150mm diameter drainage sleeves shall be cast in the foundation wall to connect the perimeter drainage pipe to the interior underfloor drainage system and building sump pit. The spacing of the underfloor drainage system should be confirmed by Paterson once the foundation layout and sump system location has been finalized.

Elevator Pit Waterproofing

To accommodate the elevator shaft within the lower level of the proposed structure, it is expected that the associated concrete base slab will be extended below the basement floor slab.

It is expected that the elevator shaft may extend below the invert level of the underfloor drainage system and will thus be theoretically designed under submerged conditions. As a result, the following elevator shaft waterproofing options should be considered:

Once the concrete slab and elevator pit sidewalls are poured in place, it is recommended that a waterproofing membrane, such as Colphene Torch'n Stick (or approved other) should be applied to the exterior of the elevator pit sidewalls and horizontally over the elevator slab in accordance with the manufacturer's specifications. A continuous PVC waterstop such as Southern waterstop 14RCB or equivalent should be installed within the concrete raft slab below the elevator pit sidewalls. An outlet for any trapped water should be installed through the elevator pit wall and connected to the elevator sump pump.

A protection board should be placed over the waterproofing membrane to protect the waterproofing membrane from damage during backfilling operations. It is recommended to backfill the elevator pit excavation with lean concrete to limit water contact with the elevator walls.

Foundation Backfill

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

6.2 Protection of Footings Against Frost Action

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

Exterior unheated footings, such as those for isolated exterior piers, are more prone to deleterious movement associated with frost action than the exterior walls of the heated 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

Unsupported Side Slopes

The side slopes of excavations in the soil and fill overburden materials should be either cut back at acceptable slopes or should be retained by shoring systems from the start of the excavation until the structure is backfilled. It is assumed that sufficient room will be available for the greater part of the 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 cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level. The subsurface soils at this site 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.

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

Temporary Shoring

If a temporary shoring system is considered, the design and implementation of these temporary systems will be the responsibility of the excavation contractor and their design team. Inspections and approval of the temporary system will also be the responsibility of the designer. Geotechnical information provided below is to assist the designer in completing a suitable and safe shoring system. The designer should take into account the potential for a fully saturated condition following a significant precipitation event. Any changes to the approved shoring design system should be reported immediately to the owner’s representative prior to implementation.

Temporary shoring may be required to complete the required excavations where insufficient room is available for open cut methods. The shoring requirements will depend on the depth of the excavation, the proximity of the adjacent buildings and underground structures, and the elevation of the adjacent building foundations and underground services. Additional information can be provided when the above details are known.

For design purposes, the temporary system may consist of soldier pile and lagging system or interlocking steel sheet piling. Any additional loading due to street traffic, construction equipment, adjacent structures and facilities, etc., should be added to the earth pressures described below. These systems can be cantilevered, anchored or braced.

The earth pressures acting on the shoring system may be calculated using the following parameters provided in Table 6.

Table 6 - Soil Parameters for Shoring System Design

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
Total Unit Weight (γ), kN/m^3	20
Submerged Unit Weight (γ), kN/m^3	13

Generally, it is expected that the shoring systems will be provided with tie-back rock anchors to ensure their stability. It is further recommended that the toe of the shoring be adequately supported to resist toe failure.

The geotechnical design of grouted rock anchors in sedimentary bedrock is based upon two possible failure modes. The anchor can fail either by shear failure along the grout/rock interface or by pull-out of a 60 to 90 degree cone of rock with the apex of the cone near the middle of the bonded length of the anchor.

The anchor derives its capacity from the bonded portion, or fixed anchor length, at the base of the anchor. An unbonded portion, or free anchor length, is also usually provided between the rock surface and the start of the bonded length. A factored tensile grout to rock bond resistance value at ULS of **1.0 MPa**, incorporating a resistance factor of 0.3, can be used. A minimum grout strength of 40 MPa is recommended.

The design of the rock anchors for temporary shoring can be based on the values provided in Table 7. From a geotechnical perspective, the fixed anchor length will depend on the diameter of the drill holes.

Table 7 - Recommended Rock Anchor Lengths - Grouted Rock Anchor

Diameter of Drill Hole (mm)	Anchor Lengths (m)			Factored Tensile Resistance (kN)
	Bonded Length	Unbonded Length	Total Length	
75	4	1.2	5.2	250
	5.6	1.7	7.3	500
	7.9	2.4	10.3	1000
125	3.9	1.1	5	250
	5.3	1.6	6.9	500
	7.2	2.2	9.4	1000

It is recommended that the anchor drill hole diameter be within 1.5 to 2 times the rock anchor tendon diameter and the anchor drill holes be inspected by geotechnical personnel and should be flushed clean prior to grouting. The use of a grout tube to place grout from the bottom up in the anchor holes is further recommended.

The geotechnical capacity of each rock anchor should be proof tested at the time of construction. More information on testing can be provided upon request. Compressive strength testing is recommended to be completed for the rock anchor grout. A set of grout cubes should be tested for each day grout is prepared.

6.4 Pipe Bedding and Backfill

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

A minimum of 150 mm of OPSS Granular A should be placed for bedding for sewer or water pipes when placed on soil subgrade. If the bedding is placed on bedrock, the thickness of the bedding should be increased to 300 mm for sewer pipes. The bedding should extend to the spring line of the pipe. The material should be placed in a maximum 300 mm thick loose lifts and compacted to a minimum of 95% of its SPMDD.

The cover material, which should consist of OPSS Granular A, should extend from the spring line of the pipe to at least 300 mm above the obvert of the pipe. The material should be placed in a maximum 300 mm thick loose lifts and compacted to a minimum of 95% of its 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 a maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD.

6.5 Groundwater Control

Groundwater Control for Building Construction

Based on our observations, it is anticipated that groundwater infiltration into the excavations should be low to moderate 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.

Permit to Take Water

It is anticipated that groundwater infiltration into the excavations should be low to moderate and controllable using open sumps. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of the shallow excavation. 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 of 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, typically 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.

Long-term Groundwater Control

Our recommendations for the proposed building's long-term groundwater control are presented in Subsection 6.1. Any groundwater encountered along the building's perimeter or sub-slab drainage system will be directed to the proposed building's sump pit. It is expected that groundwater flow will be low (i.e.- less than 25,000 L/day) with peak periods noted after rain events. It is anticipated that the groundwater flow will be controllable using conventional open sumps.

Impacts on Neighbouring Structures

It is understood that one (1) underground level is included for the proposed building. Based on the existing groundwater level and low permeability of the native soils, the extent of any significant groundwater lowering will take place within a limited range of the proposed building. Based on the proximity of neighbouring buildings and minimal zone impacted by the groundwater lowering, the proposed development will not negatively impact the neighbouring structures. It should be noted that no issues are expected with respect to groundwater lowering that would cause long term damage to adjacent structures surrounding the proposed building.

6.6 Winter Construction

The subsoil conditions at this site mostly 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. Precautions should be taken if winter construction is considered for this project.

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.

The trench excavations should be carried out in a manner that will avoid the introduction of frozen materials into the trenches. As well, pavement construction is difficult during winter. The subgrade consists of frost susceptible soils which will experience total and differential frost heaving as the work takes place. In addition, the introduction of frost, snow or ice into the pavement materials, which is difficult to avoid, could adversely affect the performance of the pavement structure. 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%. The results are indicative that Type 10 Portland Cement would be appropriate for this site. The chloride content and the pH of the sample indicate that they are not significant factors in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity in indicative of a moderate to slightly aggressive corrosive environment.

7.0 Recommendations

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

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

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

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 completed.

A geotechnical investigation of this nature 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 TC United Development or their agents is not authorized without review by Paterson Group for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Yashar Ziaeimehr

Maha K. Saleh, P.Eng.

Report Distribution:

- ❑ TC United Development (e-mail copy)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ANALYTICAL TESTING RESULTS

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Multi-Storey Building - 294-300 Tremblay Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill

DATE July 7, 2020

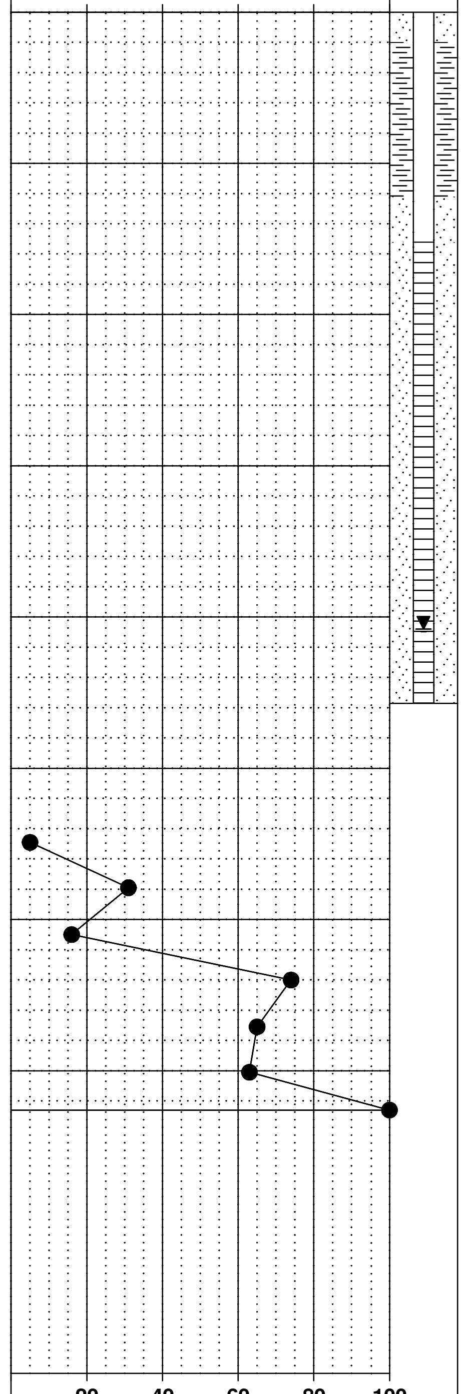
FILE NO. PG5407

HOLE NO. BH 1

SOIL DESCRIPTION	Strata depth (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	65.92
Asphaltic concrete	0.08						
FILL: Brown silty clay, trace sand, gravel and wood	0.51	AU	1				
FILL: Brown silty clay to clayey silt, trace sand - trace gravel by 1.5m depth	2.29	SS	2	54	8	1	64.92
		SS	3	67	7	2	63.92
Stiff, brown **CLAYEY SILT**	2.90	SS	4	71	11		
Compact, grey **SANDY SILT**	3.66	SS	5	58	11	3	62.92
GLACIAL TILL: Grey sandy silt with gravel, cobbles and boulders	5.18	SS	6	46	6	4	61.92
		SS	7	42	2	5	60.92
Dynamic Cone Penetration Test commenced at 5.18m depth. Inferred **GLACIAL TILL**	7.26					6	59.92
						7	58.92
End of Borehole Practical DCPT refusal at 7.26m depth (GWL @ 4.08m - July 16, 2020)							

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

○ Water Content %



Shear Strength (kPa)

▲ Undisturbed △ Remoulded

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Multi-Storey Building - 294-300 Tremblay Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5407

REMARKS

HOLE NO. BH 2

BORINGS BY CME-55 Low Clearance Drill

DATE July 7, 2020

SOIL DESCRIPTION	Depth to base (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE					
Asphaltic concrete	0.10				
FILL: Brown silty sand with gravel	0.56	AU	1		
FILL: Brown silty clay, trace sand	2.13	SS	2	33	6
		SS	3	79	7
Stiff, brown **CLAYEY SILT,** trace sand	3.05	SS	4	58	13
Loose to very loose, brown **SANDY SILT** - grey by 3.8m depth	4.42	SS	5	50	10
		SS	6	75	10
GLACIAL TILL: Compact, grey sandy silt with gravel, cobbles and boulders	6.70	SS	7	62	10
		SS	8	58	10
		SS	9	33	19
End of Borehole					

(GWL @ 4.15m - July 16, 2020)

DEPTH (m)	ELEV. (m)
0	65.96
1	64.96
2	63.96
3	62.96
4	61.96
5	60.96
6	59.96

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

○ Water Content %

20 40 60 80

Monitoring Well Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Multi-Storey Building - 294-300 Tremblay Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill

DATE July 7, 2020

FILE NO. PG5407

HOLE NO. BH 3

SOIL DESCRIPTION	Strata boundary depth (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	65.70
Asphaltic concrete	0.10						
FILL: Brown silty clay, trace sand and gravel		AU	1				
		SS	2	29	6	1	64.70
	2.29	SS	3	38	8	2	63.70
Stiff, brown **CLAYEY SILT**		SS	4	62	4	3	62.70
	3.63	SS	5	54	14		
Loose, grey **SANDY SILT**		SS	6		6	4	61.70
	5.33	SS	7	50	7	5	60.70
GLACIAL TILL: Compact, grey sandy silt with gravel, cobbles and boulders		SS	6	75	17	6	59.70
	6.70	SS	7	22	22		
End of Borehole							
(GWL @ 3.41m - July 16, 2020)							

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

Monitoring Well Construction

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

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

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 = $(D30)^2 / (D10 \times D60)$
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

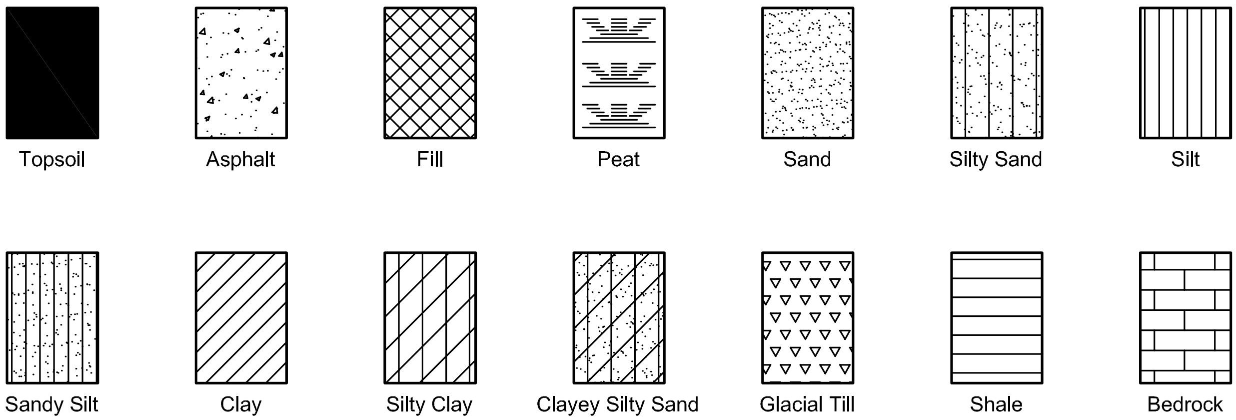
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

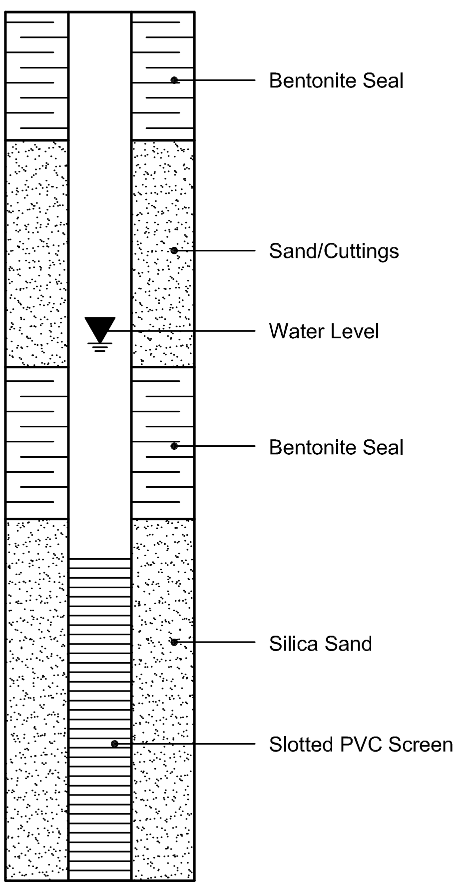
SYMBOLS AND TERMS (continued)

STRATA PLOT

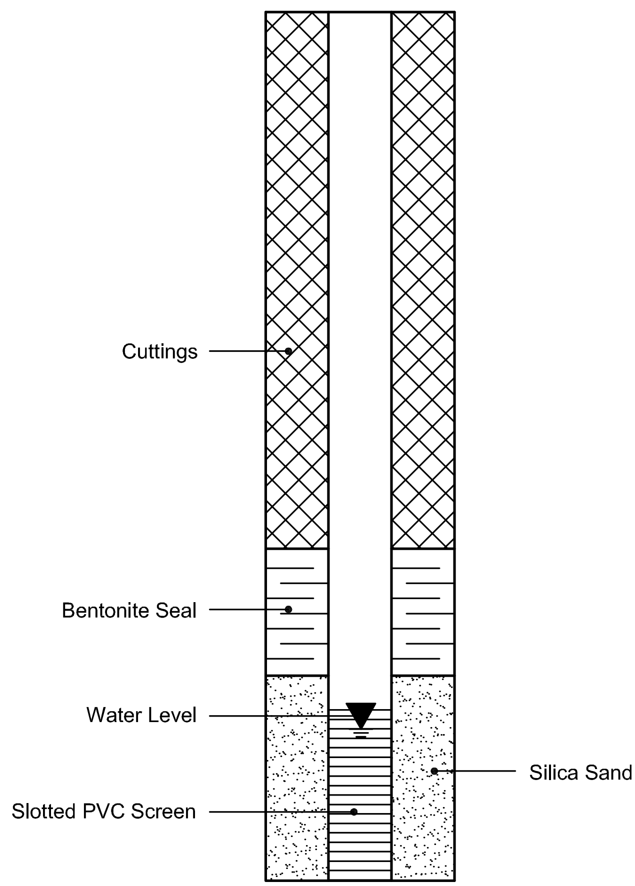


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 30335

Report Date: 14-Jul-2020

Order Date: 8-Jul-2020

Project Description: PG5407

	Client ID:	BH3-SS3	-	-	-
	Sample Date:	07-Jul-20 12:30	-	-	-
	Sample ID:	2028330-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	76.1	-	-	-
General Inorganics					
pH	0.05 pH Units	7.58	-	-	-
Resistivity	0.10 Ohm.m	12.9	-	-	-
Anions					
Chloride	5 ug/g dry	311	-	-	-
Sulphate	5 ug/g dry	66	-	-	-

APPENDIX 2

FIGURE 1 - KEY PLAN

DRAWING PG5407-1 – TEST HOLE LOCATION PLAN

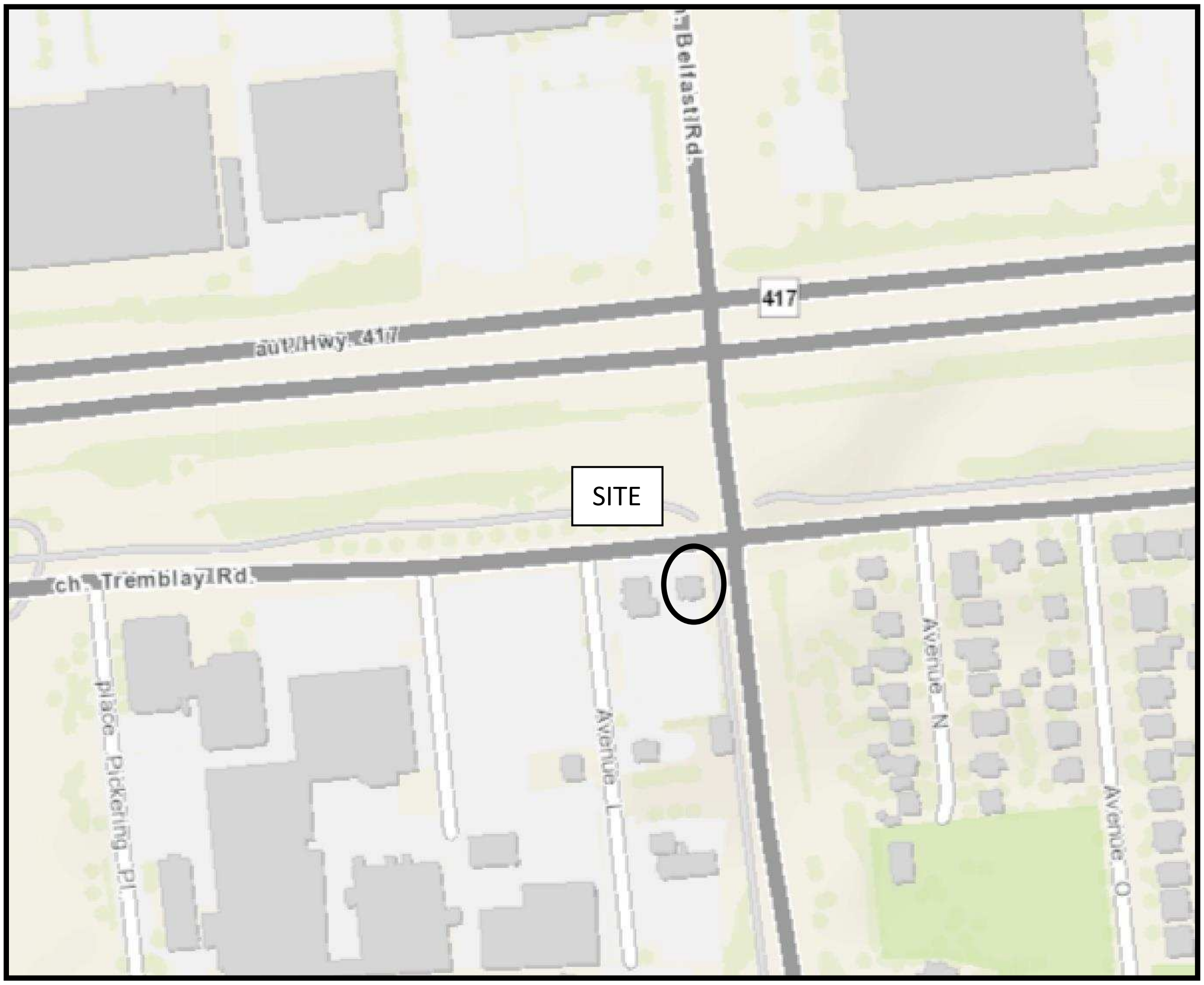
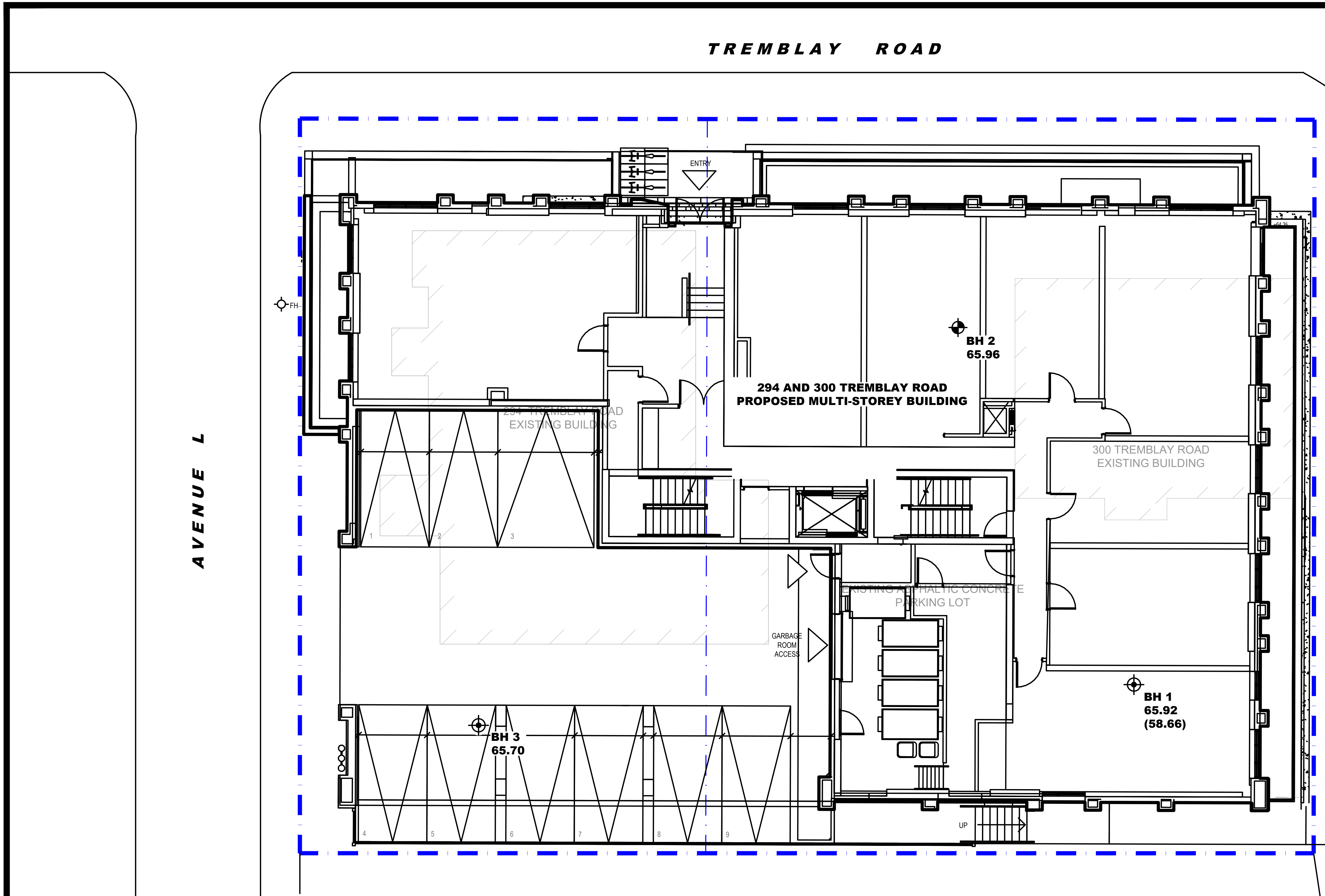


FIGURE 1

KEY PLAN

PATERSON GROUP



LEGEND:

BOREHOLE LOCATION

BOREHOLE WITH MONITORING WELL LOCATION

65.92 GROUND SURFACE ELEVATION (m)

(58.66) PRACTICAL DCPT REFUSAL ELEVATION (m)

CONCEPTUAL PLAN PROVIDED BY FOTENN PLANNING AND DESIGN

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

SCALE: 1:150

0 1 2 3 4 5 10m

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

NO.	REVISIONS	DATE	INITIAL
1.	ADDED CONCEPTUAL PLAN	20/07/2023	YZ

TC UNITED DEVELOPMENT CORP.

GEOTECHNICAL INVESTIGATION
PROPOSED MULTI-STOREY BUILDING - 294 AND 300 TREMBLAY ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:150	Date: 07/2020
Drawn by: YA	Report No.: PG5407-1
Checked by: YT	Dwg. No.: PG5407-1
Approved by: FA	Revision No.: 1

p:\autocad drawings\geotechnical\pg54xx\pg5407\pg5407-1-test hole location plan (rev.01).dwg

APPENDIX 3

RELEVANT MEMORANDUMS

memorandum

re: **Geotechnical Recommendations – Foundation Drainage System Design and Construction Recommendations**
Proposed Multi-Storey Building
300 Tremblay Road – Ottawa, Ontario

to: TC United Development Corporation – **Mr. Francis Marquez** – f.marquez@tcudevcorp.com

to: Project1 Studio Inc. – **Mr. Ryan Koolwine –** koolwine@projet1studio.ca

date: August 31, 2023

file: PG5407-MEMO.03 Revision 1

Further to your request and authorization, Paterson Group (Paterson) prepared the current memorandum to provide geotechnical recommendations regarding the foundation drainage system design for the proposed building. The following memorandum should be read in conjunction with Paterson Group Geotechnical Report PG5407-1 Revision 4, dated August 31, 2023, and the following drawings prepared by others for the proposed building:

- Structural Drawings - 300 Tremblay – Level 00/Foundation Plan – Project No. 21-0070 – Sheet No. S100 – Re-issued for tender Revision 6, dated August 11, 2023 – Prepared by Cleland Jardin Engineering Ltd.
- Architectural Drawings - 300 Tremblay – Building Sections – Project No. 2008 – Re-issued for tender - Revision 9, dated August 4, 2023 – Prepared by Project1 Studio Inc.

1.0 Background

It is understood the proposed development will consist of a seven-storey residential building with two below-grade levels, Level 00 and Basement Level. Based on the results of the above-noted geotechnical investigation, the subsurface profile at the subject site generally consists of fill overlaying a 0.6 to 1.3 m thick deposit of clayey silt which further overlays a 1.8 to 1.7 m thick deposit of sandy silt. A deposit of glacial till was encountered below the sandy silt. Practical refusal to DCPT was encountered at a depth of 7.3 m below existing ground surface at one borehole location.

The footings for the subject building are expected to be founded upon a clayey silt, sandy silt, or glacial till bearing surface. Further, the long-term groundwater table is anticipated to be at a depth of approximately 3 to 4 m below the existing ground surface, which is above the founding level of the basement. The groundwater level is subject to seasonal fluctuations and should be confirmed during construction.

2.0 Geotechnical Assessment and Recommendations

It is our understanding that the exterior perimeter concrete foundation walls at the location of window wells as well as some portions of the foundation walls along the intersection of Basement Level and Level 00 will be poured in a blind-sided fashion against the shoring system. Refer to Figure 1 – Foundation Drainage System – Blind-Side Pour, for specific details of the foundation drainage recommendations, attached to the current memorandum.

Furthermore, it is expected that some portions of the exterior perimeter concrete foundation walls will be poured in a double-sided or blind-sided fashion. Reference should be made to Figure 2 – Foundation Drainage System – Double-Sided Pour.

To manage and control groundwater infiltration to the building's storm sump pump over the long term, the following foundation drainage system is recommended to be installed within the subject site from a geotechnical perspective.

2.1 Foundation Drainage System

❒ A waterproofing membrane is required for the proposed building for the areas excavated below the groundwater table. A 150 MIL granular bentonite surfacing laminated to 20 MIL thick HDPE membrane should be installed in horizontal lifts to the manufacturer's specifications in a shingle fashion with the HDPE side facing applicator to an adequately prepared substrate surface. The waterproofing membrane can be terminated 1 m above the ground water table (approx. elevation of GWT is at 62.5 m, but it should be confirmed at construction stage). Furthermore, it is required that the waterproofing membrane should be extended at least 600 mm horizontally below underside of footings. It should be noted that termination elevation should be confirmed by Paterson once the excavation is completed.

❒ It is recommended that a composite foundation drainage membrane, such as 6000 series membrane by DeltaDrain, G100N by MiraDrain, or equivalent and approved other, be placed over the waterproofing membrane to divert water captured by the building foundation drainage system to the appropriate sump pump system. The composite foundation drainage membrane should extend from finished grade to the underside of footing level with the geotextile layer facing away from the foundation wall in a shingle fashion.

- It is highly recommended that the drainage boards be installed with a minimum horizontal and vertical overlap of 150 mm between the sheets (not the filter cloth) to minimize the joints between the sheets. The top 150 mm flap of each lower horizontal lift of the drainage board should be secured behind the bottom end lap of the overlying horizontal course of the drainage board to allow for proper shingling between lifts. This will mitigate the potential for water to drain behind the HDPE face of the drainage board and onto the concrete wall surface.

- 150 mm diameter sleeves placed, as specified in Figure 4 – Underfloor Drainage System, should be cast in the foundation wall at the footing interface to allow the infiltration of water to flow to an interior drainage pipe. Further, the drainage sleeves should be mechanically connected to the exterior or interior perimeter drainage pipe and the underfloor drainage system. The perimeter and underfloor drainage pipes should direct water to the storm sump pit(s) within the lower basement area by gravity. It is recommended that an 'X' shaped incision through the composite foundation drainage board be cut to connect the sleeve. The sleeves should be fastened and secured into place at the footing/wall interface prior to casting concrete for the foundation wall. The incision in the drainage board should be sealed with 3M tape around the sleeve. Further, the waterproofing membrane should be sealed around the sleeve.

- All joints between drainage board sheets (i.e., overlaps) should be sealed using 3M Tape, or equivalent other product approved by Paterson. Further, all protrusions through the waterproofing and drainage board layers liner, such as fasteners or damage by materials such as concrete, should be sealed using 3M Tape or equivalent other products approved by Paterson to mitigate the potential for water to drain behind the HDPE face of the drainage board.

2.1.1 Transition from Blind Side to Double Sided Formwork

Based on our review, the construction of the perimeter foundation walls along the temporary shoring system is anticipated to transition from a blind-sided pour into a conventional double-sided pour along the same side, at several locations of the excavation. The integrity of the drainage system should be maintained across this transition zone as per the following methodology:

- It is critical that the composite foundation drainage board and waterproofing membrane is extended in a suitable manner through this transition zone to maintain the long-term performance of the foundation drainage system. The composite foundation drainage board and waterproofing membrane should be temporarily extended over the shoring face prior to construction of the double-sided portion of the foundation walla minimum of 0.6 m beyond the transition point. The 0.6m temporary overhang of the drainage board should be folded over the drainage board coming from the other side (double sided pour) at the transition point, once the wall has been constructed. A minimum overlap of 0.3m will be required between the adjacent drainage boards. The waterproofing membrane should then be wrapped over the drainage board and be provided with a minimum 0.3m of overlap as well.

The above-noted recommendations are further illustrated in Figure 3 – Foundation Drainage System Transition from Blind-Side to Double-Sided Formwork, attached to the current memorandum.

Further, all the above-noted recommendations should be verified and approved at the time of construction/installation/placement by Paterson personnel.

2.2 Perimeter and Underfloor Drainage System

The underfloor drainage pipe shall consist of a 150 mm diameter perforated corrugated pipe spaced at approximately 6m and surrounded by well-graded granular fill having a maximum size of 100mm. The underfloor drainage system must have a positive gravity connection towards the building sump pit which is anticipated to be placed within the west area of the underground floor.

The exterior perimeter drainage shall consist of a 150 mm diameter perforated corrugated pipe wrapped in a geosock and surrounded by 150 mm of 19 mm clear crushed stone. The perimeter drainage pipe must have a positive gravity connection towards the underfloor drainage system and building sump pit. 150mm diameter drainage sleeves shall be cast in the foundation wall to connect the perimeter drainage pipe to the interior underfloor drainage system and building sump pit.

The perimeter and underfloor drainage pipes shall be placed throughout the building footprint as per Figure 4 - Perimeter and Underfloor Drainage Pipe Layout. The figure also shows the invert level of the underfloor drainage at several locations to assist the contractor in providing positive drainage toward the building sump pit.

Furthermore, a 150 mm diameter perforated corrugated pipe should be used at three (3) different locations, as presented in Figure 4, to connect interior /perimeter pipes from Level 00 to the perimeter pipe at the basement level of the proposed building.

It is required that the contractor conduct an as-built survey once the installation of the perimeter and underfloor drainage system is completed to ensure gravity drainage is provided towards the storm sewer and the building's sump pit. The drainage pipes should not be backfilled until as-builts are reviewed and approved by Paterson. Placement of the perimeter and underfloor drainage pipe must be periodically inspected by Paterson personnel.

2.3 Elevator Pit Waterproofing System

To accommodate the elevator shaft within the lower level of the proposed structure, it is expected that the associated concrete base slab will be extended below the basement floor slab. It is expected that the elevator shaft may extend below the invert level of the underfloor drainage system and will thus be theoretically designed under submerged conditions. As a result, the following elevator shaft waterproofing options should be considered:

Waterproofing System for Elevator

Once the concrete slab and elevator pit sidewalls are poured in place, it is recommended that a waterproofing membrane, such as Colphene Torch'n Stick (or approved other) should be applied to the exterior of the elevator pit sidewalls and horizontally over the elevator slab in accordance with the manufacturer's specifications. A continuous PVC waterstop such as Southern waterstop 14RCB or equivalent should be installed within the concrete raft slab below the elevator pit sidewalls. An outlet for any trapped water should be installed through the elevator pit wall and connected to the elevator sump pump.

A protection board should be placed over the waterproofing membrane to protect the waterproofing membrane from damage during backfilling operations. It is recommended to backfill the elevator pit excavation with lean concrete to limit water contact with the elevator walls. Reference should be made to Figure 3 - Elevator Waterproofing Detail, for specific details of the elevator waterproofing attached to the current memorandum.

3.0 Additional Considerations and Field Inspections

For areas around the window wells where a layer of rigid insulation is required to be placed on the exterior portion of the building's foundation wall, it is recommended to install this layer over the geotextile face of the composite foundation drainage board which would be underlain by the concrete foundation wall. It is recommended Paterson review the suitability of proposed rigid insulation products for use at the window wells prior to construction.

PVC waterstops are recommended to be installed in fresh concrete or attached to the reinforcement and formwork prior to the placement of concrete. The installation of waterstops should be reviewed and documented by Paterson personnel at the time of installation. It is important to note that bentonite waterstops are not recommended to be installed, specifically along the walls of the elevator pits due to issues related to the increased risk of failure of properly expanding during pouring of the concrete walls.

A termination bar for the composite foundation drainage board should be installed at the top of the layer along the perimeter of the building's foundation walls and in accordance with the manufacturer's specifications and where considered applicable.

To ensure an adequate incorporation of these recommendations in the building's design, it is recommended that Paterson reviews any updated architectural, structural, and mechanical drawings that may incorporate these recommendations prior to being released for tender to contractors.

Periodic Inspections

It is recommended that Paterson personnel carry out routine inspections of the implementation of the following items at the time of construction:

- ❑ Installation of the foundation drainage system which includes the following components:
  - Waterproofing membrane,
  - Composite foundation drainage board,
  - Foundation/footing interface drainage sleeves,
- ❑ Installation of the exterior perimeter and underfloor drainage system.
- ❑ Waterproofing of all elevator shafts including the following components
  - Installation of waterstops,
  - Installation of waterproofing products,
  - Sealing of all pipe protrusions.
  - Installation of foundation wall insulation (where considered).

We trust that this information is satisfactory for your immediate requirements.

Best Regards,

Paterson Group Inc.

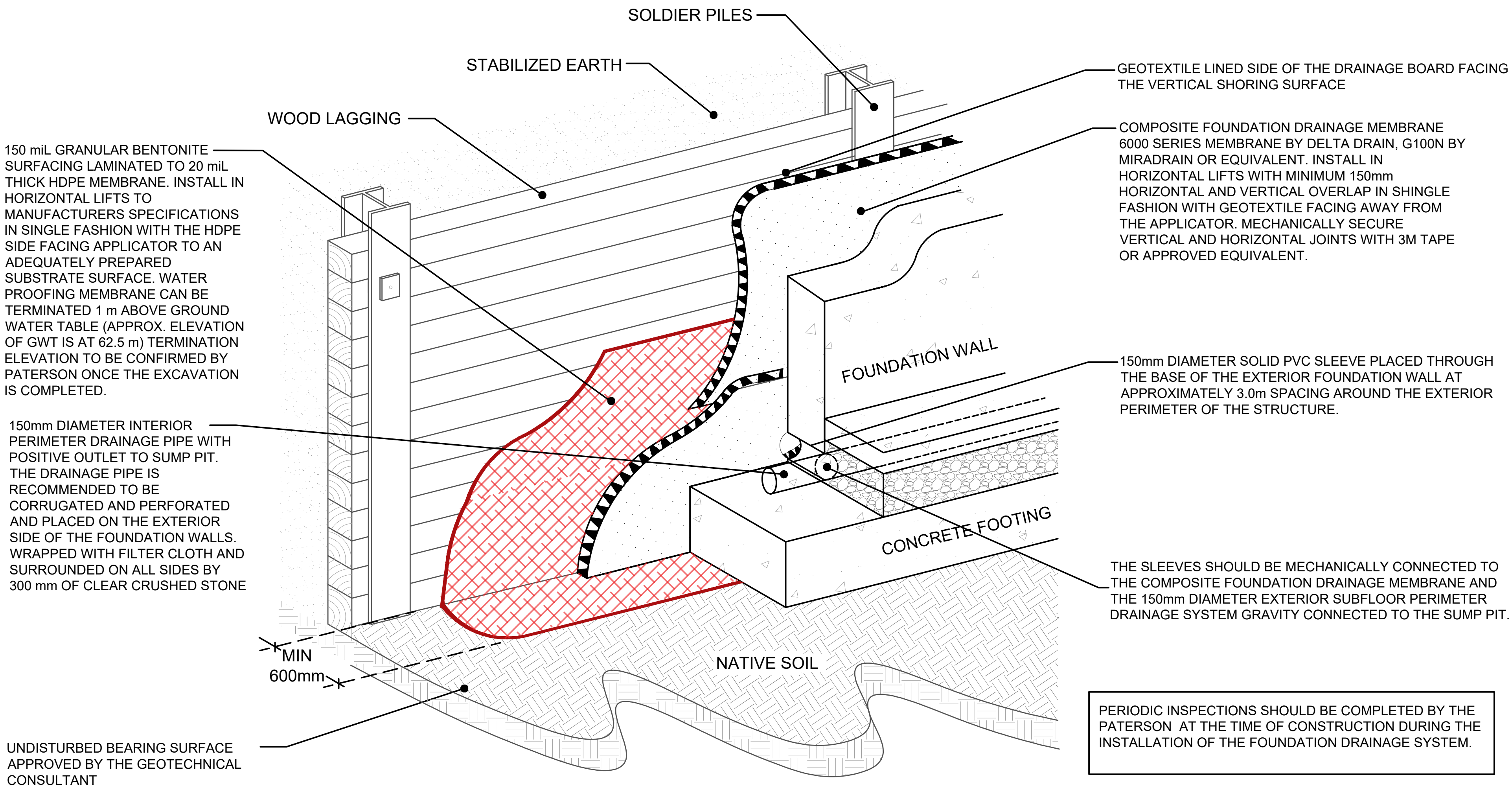
LICENSED PROFESSIONAL ENGINEER
August 31, 2023
M. SALEH
100507739
PROVINCE OF ONTARIO

Yashar Ziaeimehr

Maha K. Saleh, P.Eng.

Attachments:

- ❒ Figure 1 – Foundation Drainage System – Blind-Side Pour
- ❒ Figure 2 – Foundation Drainage System – Double-Sided Pour
- ❒ Figure 3 – Foundation Drainage System – Blind-Side to Double-Sided Transition
- ❒ Figure 4 – Perimeter and Underfloor Drainage Plan
- ❒ Figure 5 – Elevator Waterproofing Detail
- ❒ Figure 6 – Drainage and Waterproofing at the Location of the Window Wells



PERIODIC INSPECTIONS SHOULD BE COMPLETED BY THE PATERSON AT THE TIME OF CONSTRUCTION DURING THE INSTALLATION OF THE FOUNDATION DRAINAGE SYSTEM.

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

TC UNITED

PROPOSED MULTI-STOREY BUILDING

300 TREMBLAY ROAD

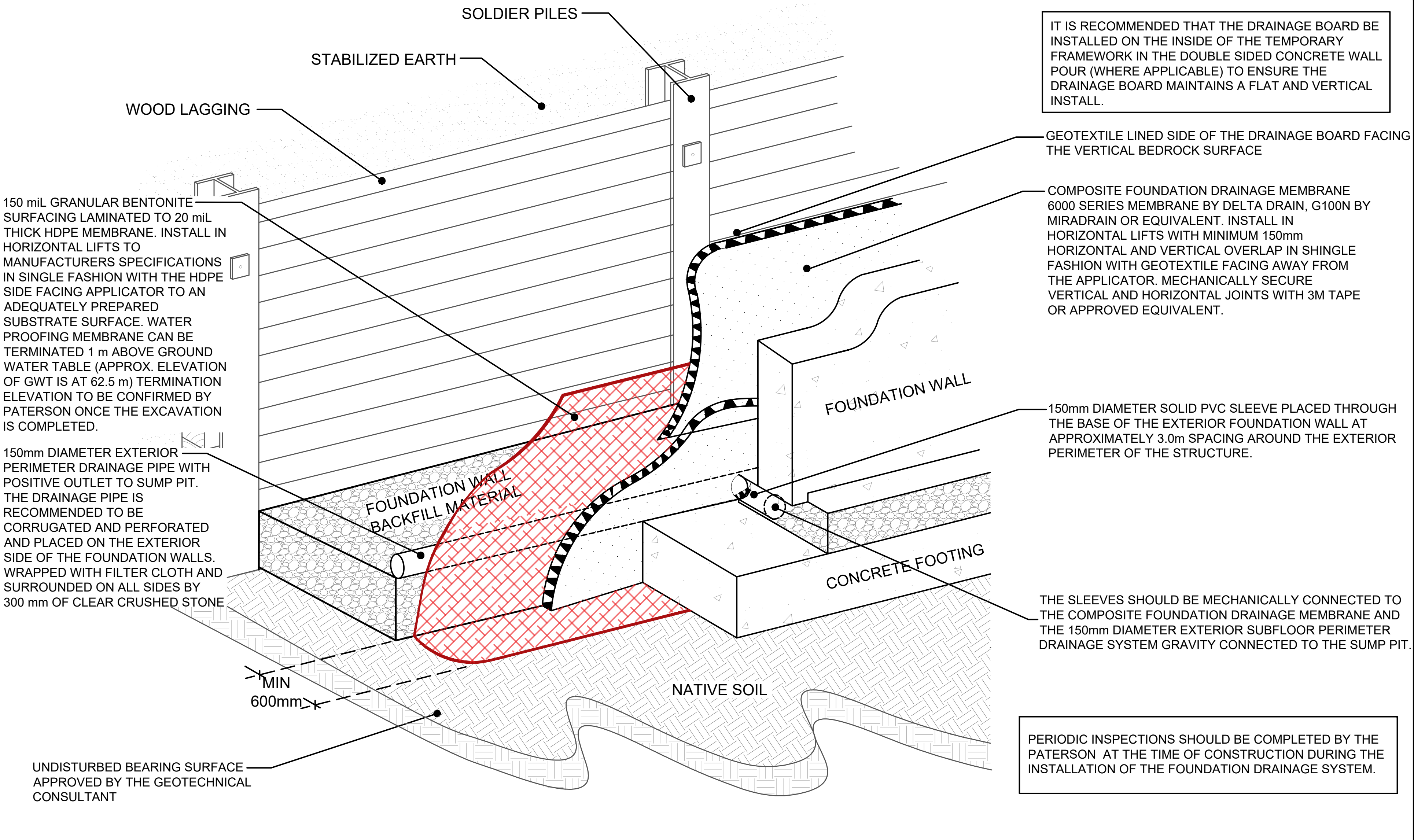
OTTAWA, ONTARIO

Title:

FOUNDATION DRAINAGE SYSTEM - BLIND SIDE POUR

Scale: N.T.S.	Date: 08/2023
Drawn by: YA	Report No.: PG5407-MEMO.03
Checked by: MS	Drawing No.: FIGURE 1
Approved by: FA	Revision No.: 1

p:\autocad drawings\geotechnical\pg54xx\pg5407\pg5407 figure 1- foundation drainage system.dwg



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

TC UNITED

PROPOSED MULTI-STOREY BUILDING

300 TREMBLAY ROAD

OTTAWA, ONTARIO

Title:

FOUNDATION DRAINAGE SYSTEM - DOUBLE SIDE POUR

Scale: N.T.S.	Date: 08/2023
Drawn by: YA	Report No.: PG5407-MEMO.03
Checked by: MS	Drawing No.: FIGURE 2
Approved by: FA	Revision No.: 1

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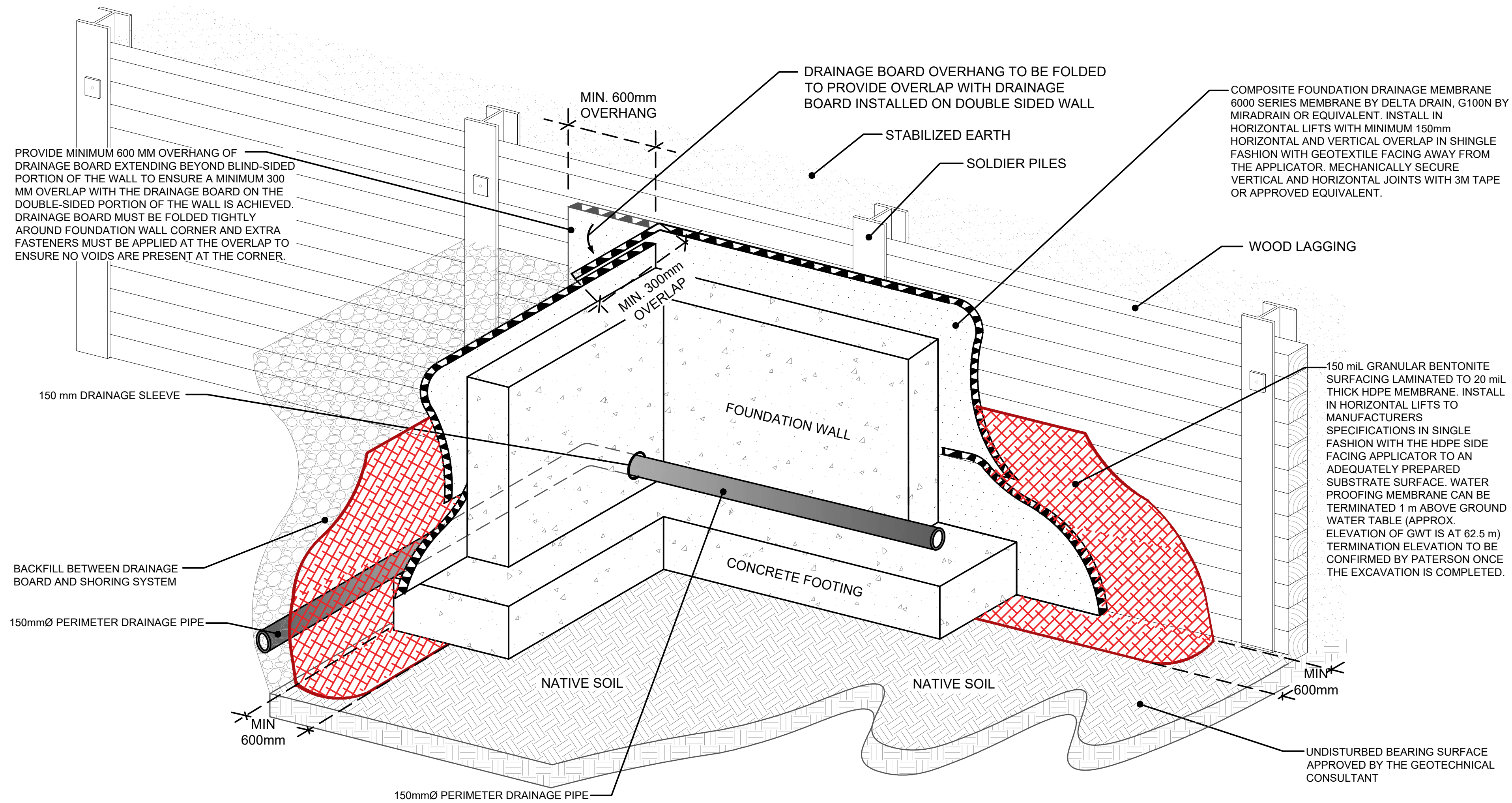


PATERSON GROUP

TC UNITED

PROPOSED MULTI-STOREY BUILDING

300 TREMBLAY ROAD

OTTAWA, ONTARIO

Title:

FOUNDATION DRAINAGE SYSTEM
BLIND SIDE TO DOUBLE BLIND SIDE TRANSITION

Scale: N.T.S.	Date: 08/2023
Drawn by: NFRV	Report No.: PG5407-MEMO.03
Checked by: MS	Drawing No.: FIGURE 3
Approved by: FA	Revision No.: 1

p:\autocad drawings\geotechnical\pg54xx\pg5407\pg5407 blindeside transition detail.dwg

A 150 mm diameter perforated corrugated pipe along the perimeter of the interior or exterior side of window wells

A 150 mm diameter perforated corrugated pipe along the perimeter of the exterior or interior side of the foundation wall at basement level

A 150 mm diameter perforated corrugated pipe along the perimeter of the exterior side of the foundation wall at Level 00

A 150 mm diameter perforated corrugated pipe to connect interior/perimeter pipes to the perimeter pipe at basement level

150 mm diameter drainage sleeves cast in the foundation wall at the top of the footing. Mechanical connection from exterior perimeter to interior underfloor drainage pipe

A 150 mm diameter interior underfloor drainage corrugated perforated pipe provided with gravity drainage to the storm sump pit

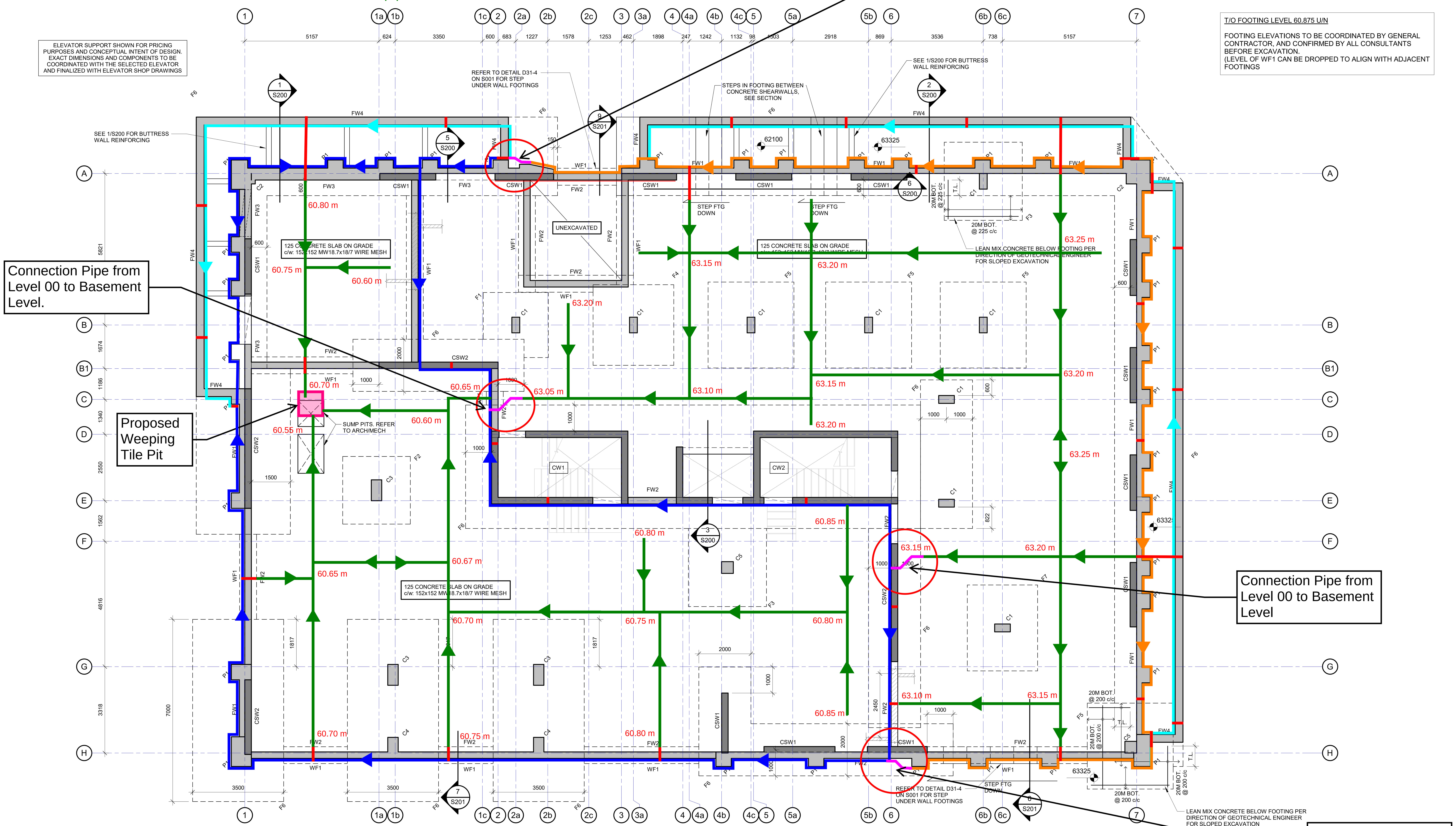
Direction of the sloped underfloor drainage pipe towards the building sump pit

FOUNDATION WALL SCHEDULE		
MARK	WALL THICKNESS (mm)	REINFORCING
FW1	207	15M @ 400 H & V E.F. (U/N ON PLAN OR SECTIONS)
FW2	250	20M @ 300 V.E.F. / 15M @ 400 H.E.F. (U/N ON PLAN OR SECTIONS)
FW3	250	15M @ 300 V.E.F. / 15M @ 400 H.E.F. (U/N ON PLAN OR SECTIONS)
FW4	300	SEE DRAWING S200

NOTES:

1. SEE SECTIONS FOR ADDITIONAL INFORMATION

FOOTING SCHEDULE		
MARK	SIZE (LxWxD)	REINFORCING
F1	2500x2500x550 DP	11-20M B.E.W.
F2	2600x2600x650 DP	13-20M B.E.W.
F3	3000x3000x600 DP	14-20M B.E.W. U/N
F4	3100x3100x650 DP	16-20M B.E.W.
F5	3300 x 3300 x 650 DP.	18-20M B.E.W. U/N
F6	600 DP (SEE PLAN FOR DIMENSIONS)	25M @ 250 T&B E.W. U/N
F7	3300 x 2700 x 600 DP.	14-20M BLL LONG 12-20M BUL SHORT
WF1	650 x 300 DP	4-15M BOT. CONT.



LEVEL 00 / FOUNDATION PLAN

SCALE: 1 : 75

Figure 4 - Perimeter and Underfloor Drainage Plan
Paterson Group Memo PG5407-MEMO.03 Revision 1 dated August 31, 2023

No.	DATE	REVISIONS	BY
6	23 08 11	RE-ISSUED FOR TENDER	SH/JB
5	23 07 05	ISSUED FOR TENDER	SH/JB
4	23 06 23	ISSUED FOR COORDINATION	SH/JB
3	23/06/02	RE-ISSUED FOR PERMIT	SH/JB
2	21/12/06	RE-ISSUED FOR PERMIT	SH/JB
1	21/11/01	ISSUED FOR PERMIT	SH/JB

PROJECT NORTH

N

STAMP

CLELAND JARDINE ENGINEERING LTD
200-580 TERRY FOX DR, KANATA, ON K2L 4B9 (613) 591-1533

PROJECT

300 TREMBLAY

300 TREMBLAY RD.
OTTAWA, ON

DRAWING

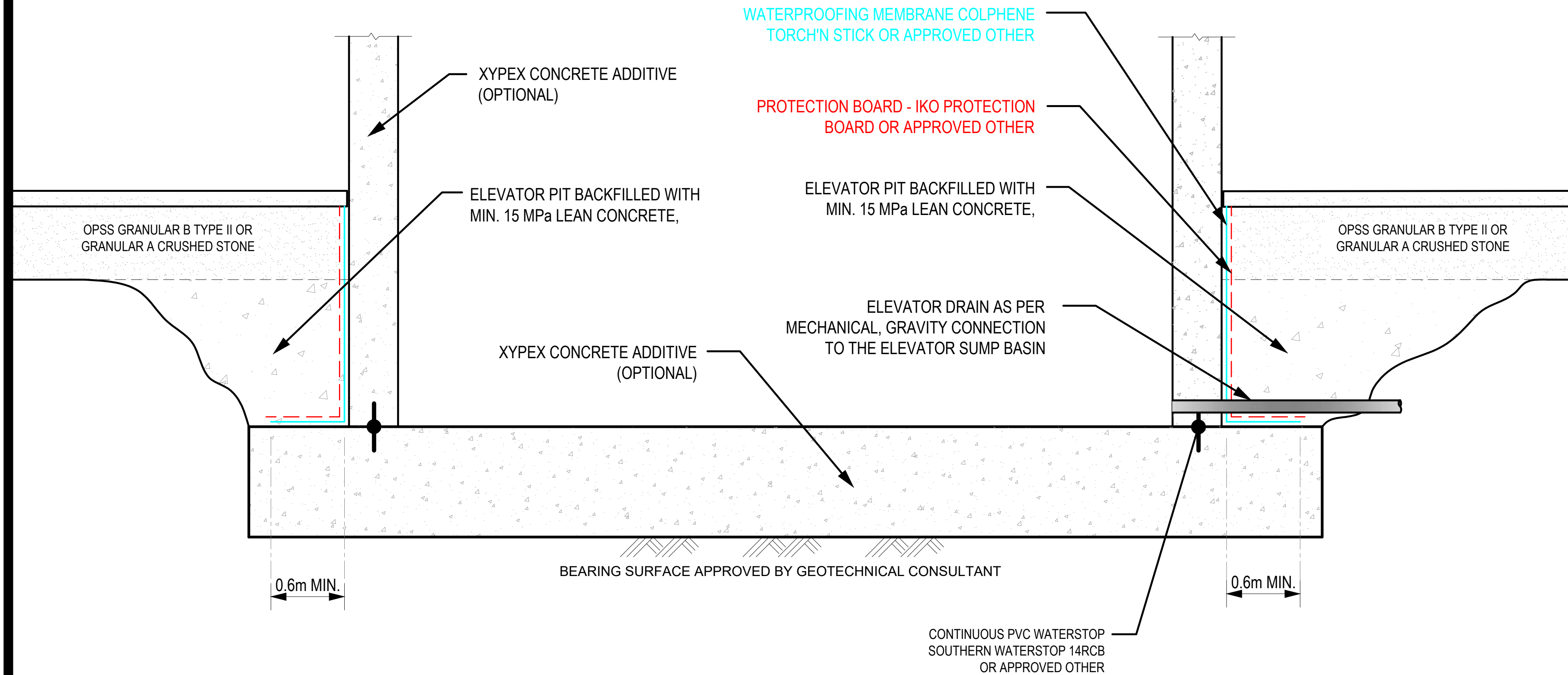
LEVEL 00 / FOUNDATION PLAN

DRAWN:	S.H./J.B.
DESIGNED:	Y.S.
APPROVED:	B.A.
DATE:	APR. 2023
SCALE:	As indicated
PROJECT No:	21-0070

DRAWING No.

S100

2023-08-11 11:57:19 AM



NOTES:

1. IT IS RECOMMENDED THAT PERIODIC INSPECTIONS BE COMPLETED BY THE GEOTECHNICAL CONSULTANT AT THE TIME OF CONSTRUCTION DURING THE INSTALLATION OF THE ELEVATOR WATERPROOFING MEMBRANE(S).

PATERSON GROUP

TC UNITED

PROPOSED MULTI-STOREY BUILDING

300 TREMBLAY ROAD

OTTAWA, ONTARIO

Title:

WATERPROOFING SYSTEM FOR ELEVATOR

Scale: N.T.S.	Date: 08/2023
Drawn by: NFRV	Report No.: PG5407-MEMO.03
Checked by: MS	Drawing No.: FIGURE 5
Approved by: FAS	Revision No.: 1

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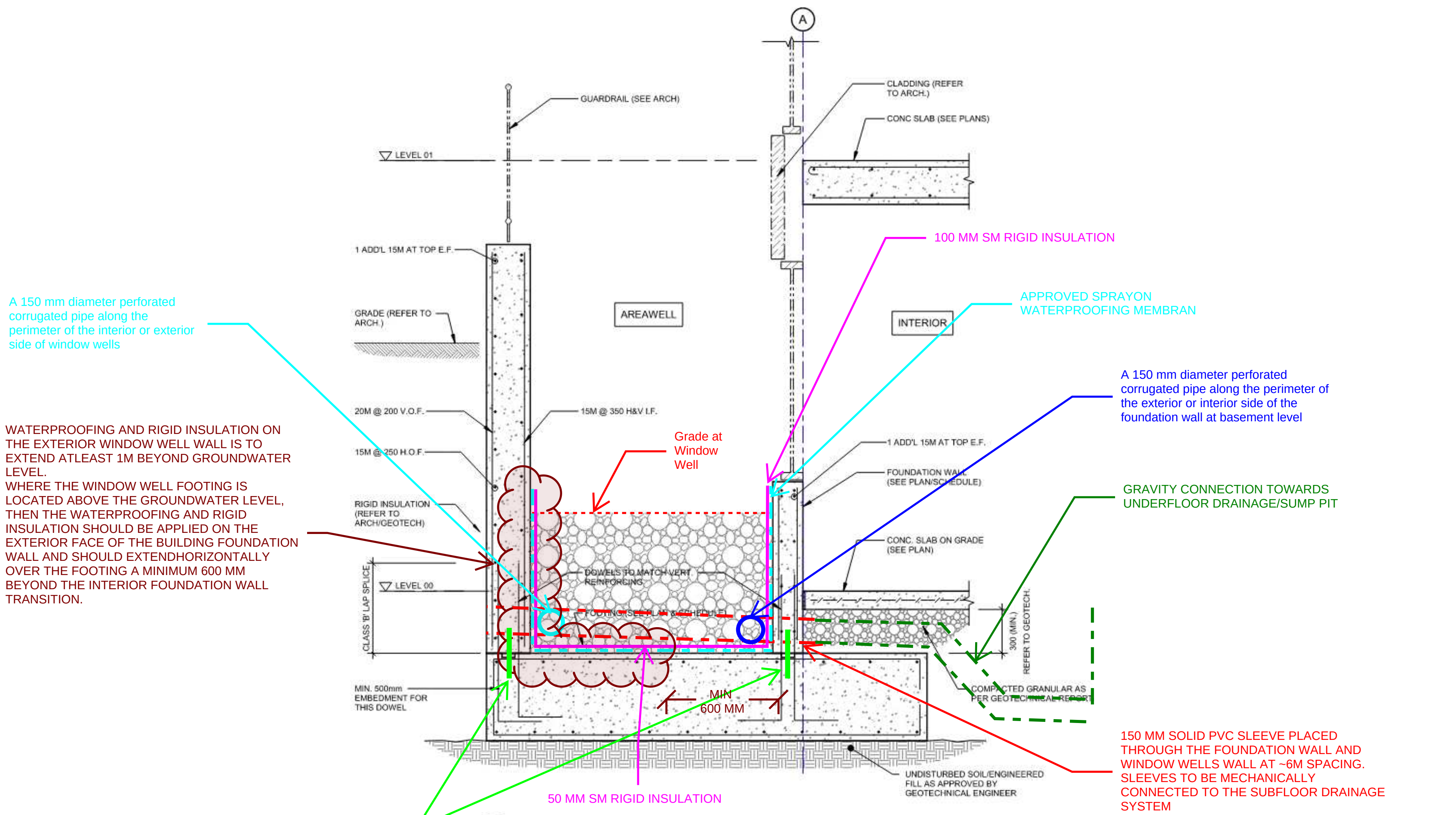


2 / S200 SECTION AREAWELL ALONG GRID 'A', BETWEEN GRIDS 3a-7

1 : 20

PATERSON GROUP	TC UNITED PROPOSED MULTI-STOREY BUILDING 300 TREMBLAY ROAD OTTAWA, ONTARIO	Scale: N.T.S.	Date: 08/2023
		Drawn by: NFRV	Report No.: PG5407-MEMO.03
	Title: DARINAGE AND WATERPROOFING AT THE LOCATION OF WINDOW WELLS - CROSS SECTION	Checked by: MS	Drawing No.: FIGURE 6
		Approved by: FAS	Revision No.:

p:\autocad drawings\geotechnical\pg54xx\pg5407\pg5407-fig 03- waterproofing systems for elevator.dwg memorandum

re: **Geotechnical Recommendation**
Proposed Multi-Storey Building
294-300 Tremblay Road – Ottawa, Ontario

to: Project1 Studio Inc. – **Mr. Ryan Koolwine –** koolwine@projet1studio.ca
to: Project1 Studio Inc. – **Mr. Garfield Seaton –** seaton@project1studio.ca
to: TC United Development Corporation – **Mr. Francis Marquez** – f.marquez@tcudevcorp.com
date: January 17, 2023
file: PG5407-MEMO.04

Further to your request and authorization, Paterson Group (Paterson) prepared the current memorandum to provide geotechnical recommendations regarding the fill material over the electrical room and concrete pad in the garbage area for the proposed multi-storey building at the subject site. The following memorandum has been prepared based on the information provided by the client via email.

1.0 Background

It is understood the proposed development will consist of a seven-storey residential building with one partial basement level which is proposed to house the mechanical and electrical rooms.

Regarding the information provided by the client via email, it is understood that the electrical room located in the basement will be extended below the concrete pad of the garbage area, and the total fall of the step in the concrete slab related to the electrical room is 350 mm. Due to the installation of a 50 mm rigid insulation and construction of a sloped concrete slab, the available thickness for backfilling granular material and construction of the concrete pad in the garbage area is reduced to 250 mm in this location. Furthermore, it is understood that the concrete pad will be constructed for the garbage containers on the top of the electrical room and the granular material mentioned above.

2.0 Geotechnical Review and Recommendations

Sub-slab Fill Material

Based on our review, the available thickness for the fill material over the above noted underground electrical room is sufficient for backfilling from a geotechnical perspective. It should be noted that the sub-slab fill should consist of Granular A crushed stone and should be placed in a maximum of 200 to 300 mm thick loose lifts and compacted to a minimum of 98% of the material's SPMDD using suitable compaction equipment. To be assured that no voids would form when the concrete slab was placed, all materials should be inspected and tested by Paterson during and after compaction.

In addition, the rigid insulation to be used below the granular material should be HI40 or equivalent material. Furthermore, SM rigid insulation should be acceptable only along the vertical placement along the foundation wall.

Reference should be made to Figure 1, attached to the current memorandum, in which the cross section of the proposed electrical room in the basement is presented.

Slab-on-Grade Construction

The following should be considered for slab-on-grade structures, such as the portion of the garage area concrete pad to be founded on native or fill subgrade.

With the removal of all topsoil, the native soil or approved fill 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. Provision should be made for proof-rolling the fill subgrade using suitably-sized heavy vibratory compaction equipment prior to placing any sub-slab fill. 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 sub-slab fill consist of OPSS Granular A crushed stone. All backfill material required to raise grade within the footprint of settlement sensitive structures should be placed in a maximum of 200 to 300 mm thick loose layers and compacted to at least 98% of its SPMDD.

We trust that the current submission meets your requirements.

Best Regards,

Paterson Group Inc.

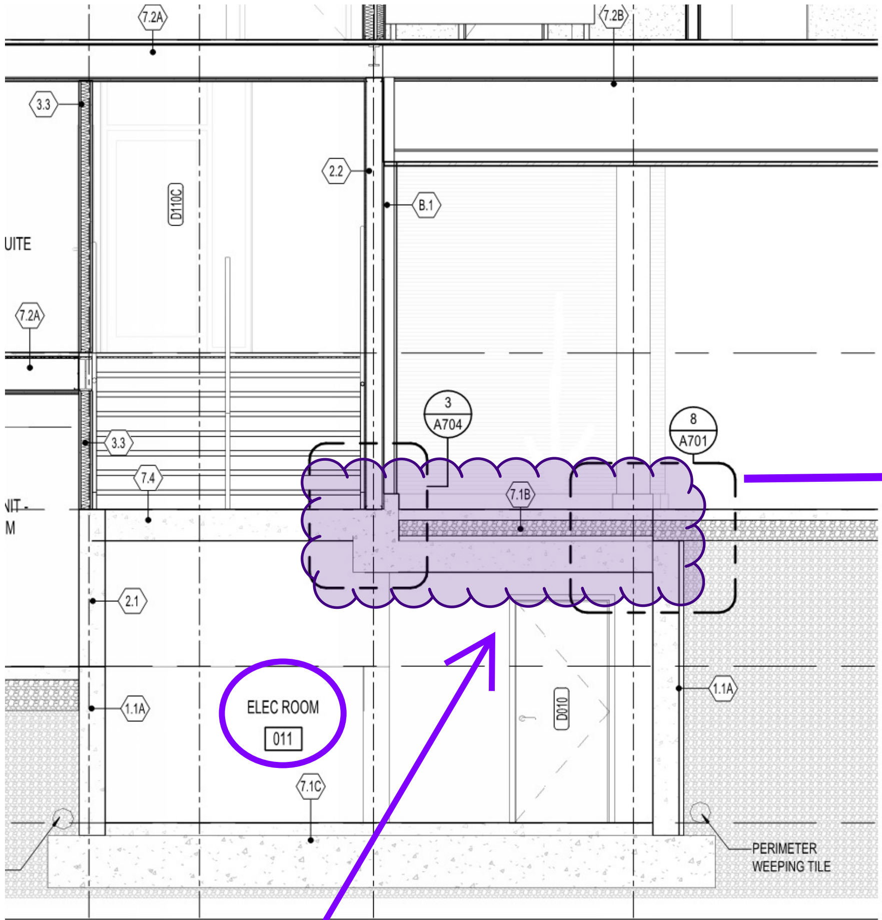
LICENSED PROFESSIONAL ENGINEER
Jan. 17, 2023
F. I. ABOU-SEIDO
100156744
PROVINCE OF ONTARIO

Nicole Patey, B.Eng.

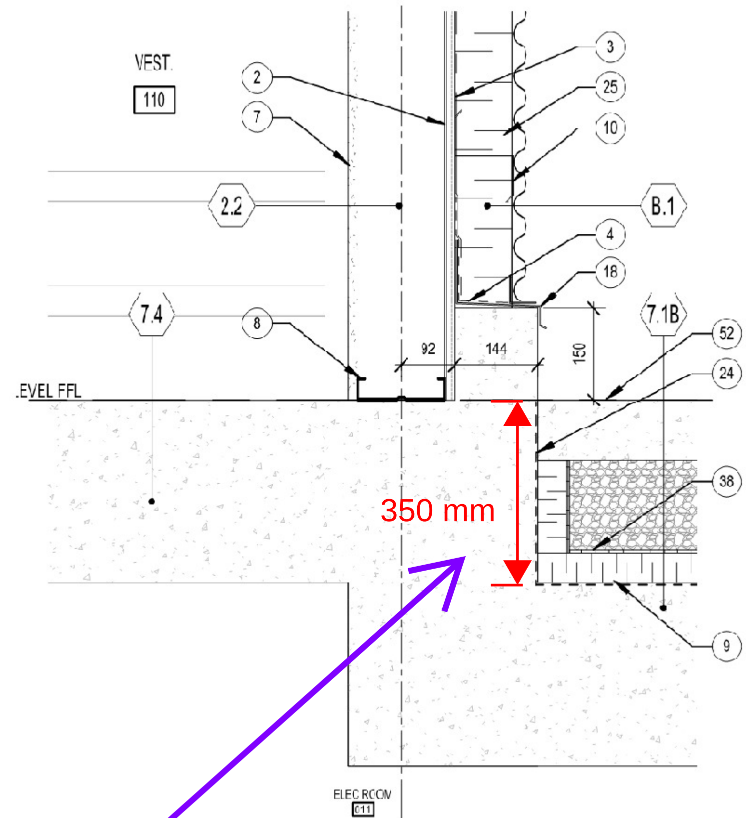
Faisal I. Abou-Seido, P.Eng.

Attachments:

- Figure 1 - Cross Section of The Proposed Electrical Room in The Basement



The electrical room located in the basement will be extended below a concrete slab



Thickness is approximately 350 mm. Due to the installation of a 50 mm rigid insulation and the slope of the concrete slab, the available thickness is reduced to 250 mm for granular fill material and the concrete pad.

Figure 1 - Cross Section of The Proposed Electrical Room in The Basement

PATERSON GROUP

memorandum

re: **Geotechnical Review and Recommendations – Proposed Excavation for Placement of Pad Footings**
Proposed Multi-Storey Building
294-300 Tremblay Road, Ottawa, Ontario

to: Cleland Jardine Engineering Ltd. – **Mr. Yudi Sun** – ysun@clelandjardine.com

to: FOTENN – **Mr. Nico Church** – church@fotenn.com

date: August 22, 2023

file: PG5407-MEMO.05

Further to your request and authorization, Paterson Group (Paterson) prepared the current memorandum to provide our geotechnical review and recommendations related to the proposed excavation for the placement of isolated pad footings for the proposed multi-storey building to be located at the aforementioned site. The following memorandum should be read in conjunction with Paterson Group Report PG5407-1 Revision 3 dated August 10, 2023.

In preparation of this memorandum, Paterson reviewed the following structural drawing prepared by Cleland Jardine Engineering Ltd. for the aforementioned development:

- Level 00/Foundation Plan - Project No. 21-0070 - Drawing S100 - 300 Tremblay - Revision 6 dated August 11, 2023.

Background Information

It is understood that the proposed development will consist of a seven-storey residential building with one basement level constructed over a conventional shallow foundation.

Based on discussion with the structural engineer and our review of the above noted drawing, it is understood that two pad footings located at the north-east and two pad footings located south-east corners of the building will be located within close proximity and at different elevations. Due to the varying founding elevations of the proposed pad footings and the limited space available between the footings for excavation, Paterson reviewed the above-mentioned drawing to provide our geotechnical recommendations for the completion of the excavation for the installation of the subject pad footings.

Reference should be made to Figure 1, attached to this memorandum, where the subject pad footings and locations of the cross sections discussed in the following section are illustrated.

Geotechnical Review and Recommendations

Based on the locations and foundation elevations of the proposed pad footings, the following recommendations may be considered for the completion of excavations required for the construction of the subject pad footings at the aforementioned site.

Section 1

Option 1:

Based on the above noted drawing, it is understood that the F6 spread footing located on the east side of the building will be founded at an elevation of 62.73 m. In addition, the adjacent F7 pad footing located at Grid Line F-G/6c will be founded at an elevation of 60.28 m. The horizontal distance between the two footings is approximately 2.98 m.

It is recommended that a minimum ledge of 300 mm extending beyond the face of the footings be provided on the top and bottom of the excavation slope for protection of the lateral support zone of the higher footing and to provide space for the placement of concrete formwork. The slope should be cut back at a maximum of 1H:1V.

Option 2:

In this option, a 300 mm ledge has been provided only for the top of excavation slope. The excavation will be considered acceptable from a geotechnical perspective, however, there will be less space available at the bottom of the excavation for the placement of formwork for the pad footing. Based on the horizontal distance between spread footing F6 and pad footing F7, the proposed slope should be flatter than the 1H:1V slope (i.e., 1.1H:1V).

Reference should be made to Figure 2 – Section 1 – Options 1&2 attached to this memorandum.

Section 2

Option 1:

Based on the above noted drawings, it is understood that the F5 pad footing located at approximately Grid Line H/7 will be founded at an elevation of 62.68 m. In addition, the adjacent F7 pad footing Grid Line F-G/6c will be founded at an elevation of 60.28 m. The horizontal distance between the two footings is approximately 2.20 m.

It is recommended that the F5 footing be founded upon a vertical lean concrete infilled trench (minimum 17 MPa 28-day compressive strength) extending to an elevation of 61.88 m. The lean concrete should be extended horizontally a minimum of 150 mm beyond each edge of the footing on all sides. Doing so will transfer the load of the footing to a lower elevation. Therefore, this approach will provide appropriate room to excavate a 1H:1V slope between these two footings.

It is recommended that a minimum horizontal ledge of 300 mm extending beyond the face of the footings be provided on the top and bottom of the excavation slope for protection of the lateral support zone of the higher footing and to provide space for the placement of concrete formwork. The slope should be cut back at a maximum of 1H:1V.

Option 2:

In this option, a 300 mm ledge has been provided only for the top of the excavation slope. The excavation will be considered acceptable from a geotechnical perspective, however, there will be less space available at the bottom of the excavation for the placement of formwork for the pad footing. In this case, the depth of the proposed lean concrete infilled trench will be reduced from Option 1. It is recommended that the F5 footing be founded upon a lean concrete infilled trench extending to an elevation of 62.18 m. The lean concrete should be extended horizontally a minimum of 150 mm beyond the edge of the footing on all sides. Doing so will transfer the load of the footing to a lower elevation.

Reference should be made to Figure 3 – Section 2 – Options 1&2 attached to this memorandum.

Section 3

Option 1:

Based on the above noted drawings, it is understood that the F3 pad footing located approximately at Grid Line A/6b will be founded at an elevation of 62.73 m. In addition, the adjacent pad footing F5 located at approximately Grid Line B/6b will be founded at an elevation of 60.23 m. The horizontal distance between these two footings is approximately 2.37 m.

It is recommended that the F3 footing be founded upon a vertical lean concrete infilled trench (minimum 17 MPa 28-day compressive strength) extending to an elevation of 62.00 m. The lean concrete should be extended horizontally a minimum of 150 mm beyond the edge of the footing on all sides. Doing so will transfer the load of the footing to a lower elevation. Therefore, this approach will provide appropriate room to excavate a 1H:1V slope between these two footings.

It is recommended that a minimum ledge of 300 mm extending beyond the face of the footings be provided on the top and bottom of the excavation slope for protection of the lateral support zone of the higher footing and to provide space for the placement of concrete formwork. The slope should be cut back at a maximum of 1H:1V.

Option 2:

In this option, a 300 mm ledge has been provided only for the top of the excavation slope. The excavation will be considered acceptable from a geotechnical perspective, however, there will be less space available at the bottom of the excavation for the placement of formwork for the pad footing. In this case, the depth of the proposed lean concrete infilled trench will be reduced from Option 1. It is recommended that the F3 footing be founded upon a lean concrete infilled trench extending to an elevation of 62.30 m. The lean concrete should be extended horizontally a minimum of 150 mm beyond the edge of the footing on all sides. Doing so will transfer the load of the footing to a lower elevation.

Reference should be made to Figure 4 – Section 3 – Options 1&2 attached to this memorandum.

We trust that this information satisfies your requirements.

Best Regards,

Paterson Group Inc.

LICENSED PROFESSIONAL ENGINEER
August 22, 2023
F. I. ABOU-SEIDO
100156744
PROVINCE OF ONTARIO

Nicole R.L. Patey, B.Eng.

Faisal I. Abou-Seido, P.Eng.

Attachment:

- Figure 1 – Location of Sections 1, 2, and 3
- Figure 2 – Section 1 - Options 1&2
- Figure 3 – Section 2 - Options 1&2
- Figure 4 – Section 3 - Options 1&2

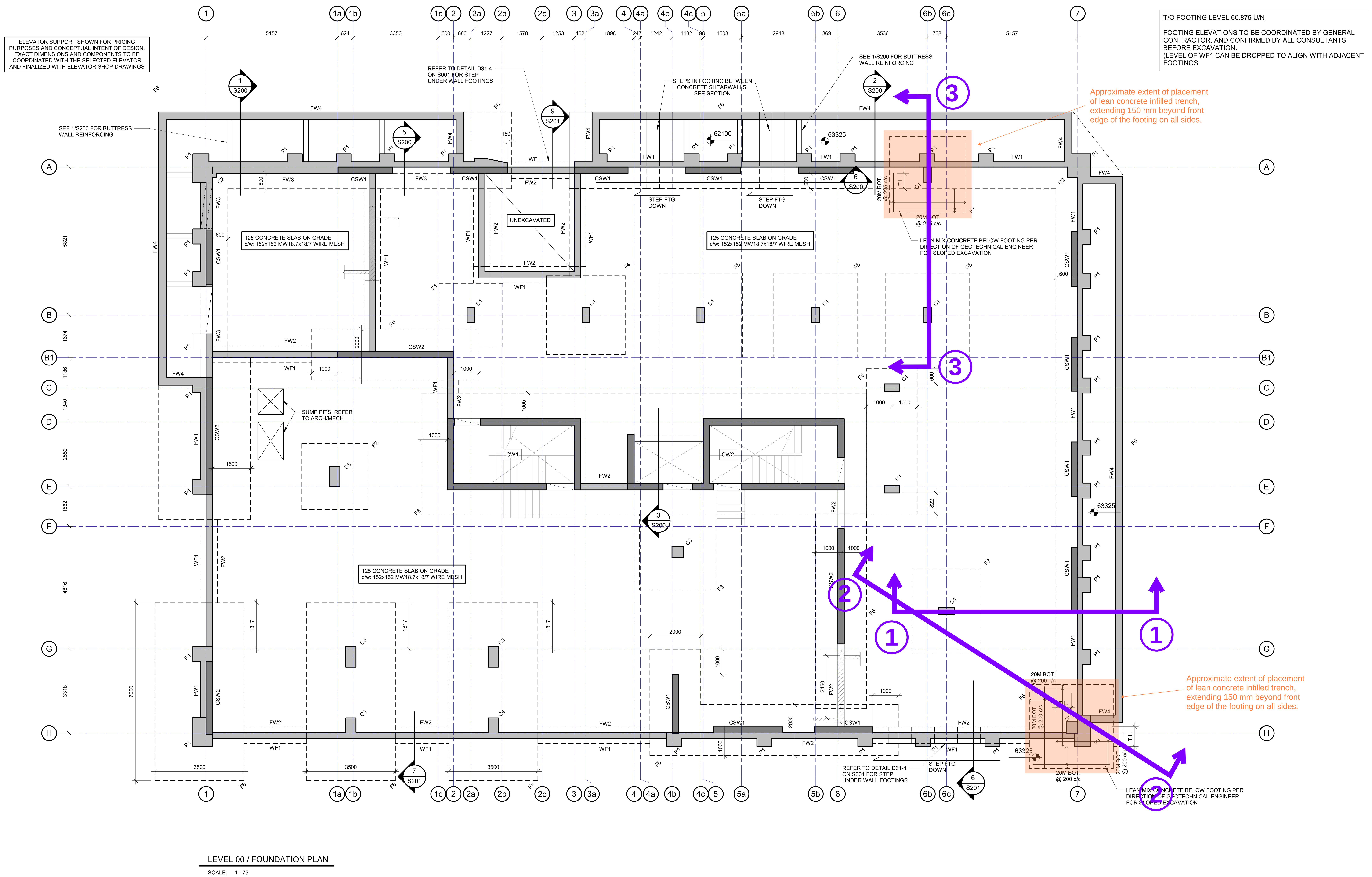
Figure 1 - Location of Sections 1, 2, and 3
Paterson Group Memorandum PG5407-Memo.05- dated August 16, 2023

FOUNDATION WALL SCHEDULE		
MARK	WALL THICKNESS (mm)	REINFORCING
FW1	207	15M @ 400 H & V E.F. (U/N ON PLAN OR SECTIONS)
FW2	250	20M @ 300 V.E.F. / 15M @ 400 H.E.F. (U/N ON PLAN OR SECTIONS)
FW3	250	15M @ 300 V.E.F. / 15M @ 400 H.E.F. (U/N ON PLAN OR SECTIONS)
FW4	300	SEE DRAWING S200

NOTES:

1. SEE SECTIONS FOR ADDITIONAL INFORMATION

FOOTING SCHEDULE		
MARK	SIZE (LxWxD)	REINFORCING
F1	2500x2500x550 DP	11-20M B.E.W.
F2	2600x2600x650 DP	13-20M B.E.W.
F3	3000x3000x600 DP	14-20M B.E.W. U/N
F4	3100x3100x650 DP	16-20M B.E.W.
F5	3300 x 3300 x 650 DP.	18-20M B.E.W. U/N
F6	600 DP (SEE PLAN FOR DIMENSIONS)	25M @ 250 T&B E.W. U/N
F7	3300 x 2700 x 600 DP.	14-20M BLL LONG 12-20M BUL SHORT
WF1	650 x 300 DP	4-15M BOT. CONT.



LEVEL 00 / FOUNDATION PLAN
SCALE: 1 : 75

No.	DATE	REVISIONS	BY
6	23 08 11	RE-ISSUED FOR TENDER	SH/JB
5	23 07 05	ISSUED FOR TENDER	SH/JB
4	23 06 23	ISSUED FOR COORDINATION	SH/JB
3	23/06/02	RE-ISSUED FOR PERMIT	SH/JB
2	21/12/06	RE-ISSUED FOR PERMIT	SH/JB
1	21/11/01	ISSUED FOR PERMIT	SH/JB

PROJECT NORTH

N

STAMP

CLELAND JARDINE ENGINEERING LTD

PROJECT
300 TREMBLAY
300 TREMBLAY RD.
OTTAWA, ON

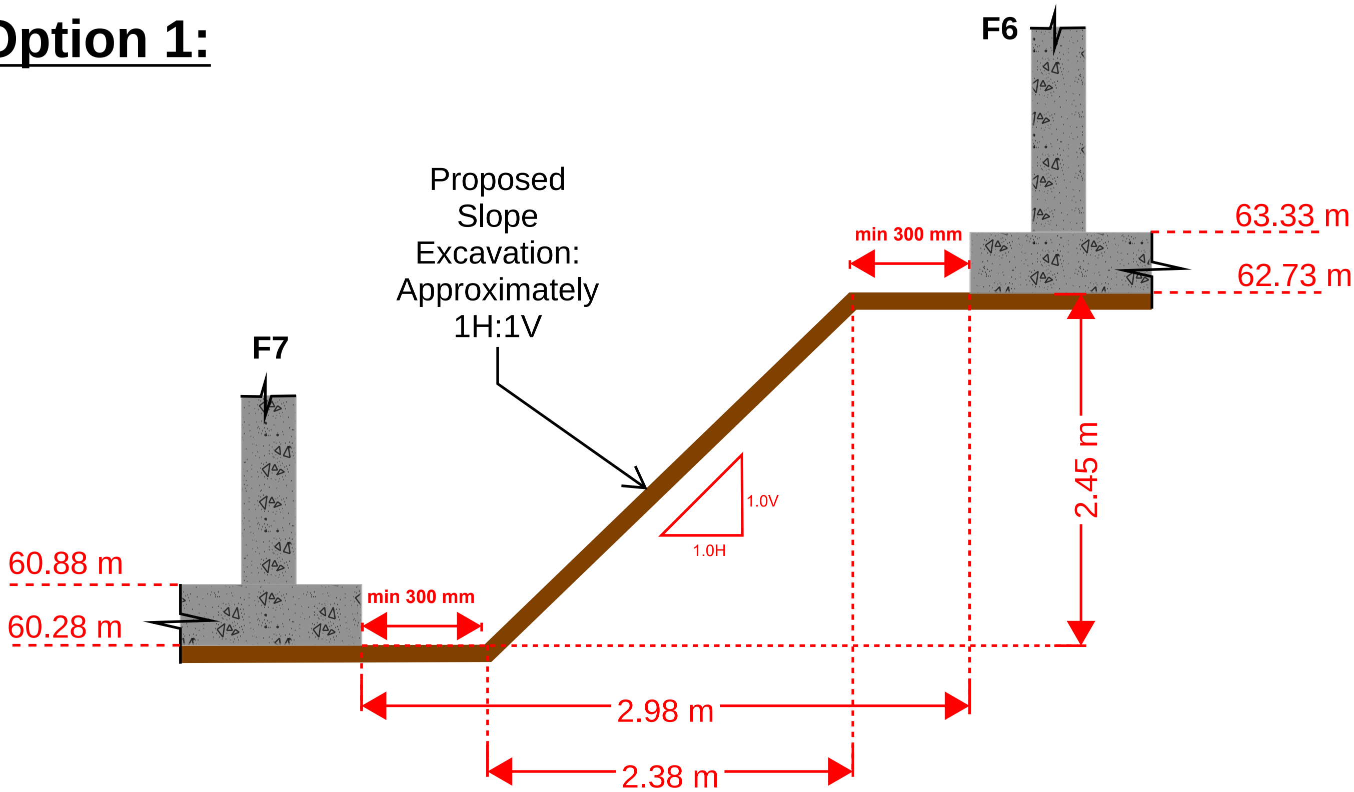
DRAWING
LEVEL 00 / FOUNDATION PLAN

DRAWN:	S.H./J.B.	DRAWING No.
DESIGNED:	Y.S.	
APPROVED:	B.A.	
DATE:	APR. 2023	S100
SCALE:	As indicated	
PROJECT No:	21-0070	

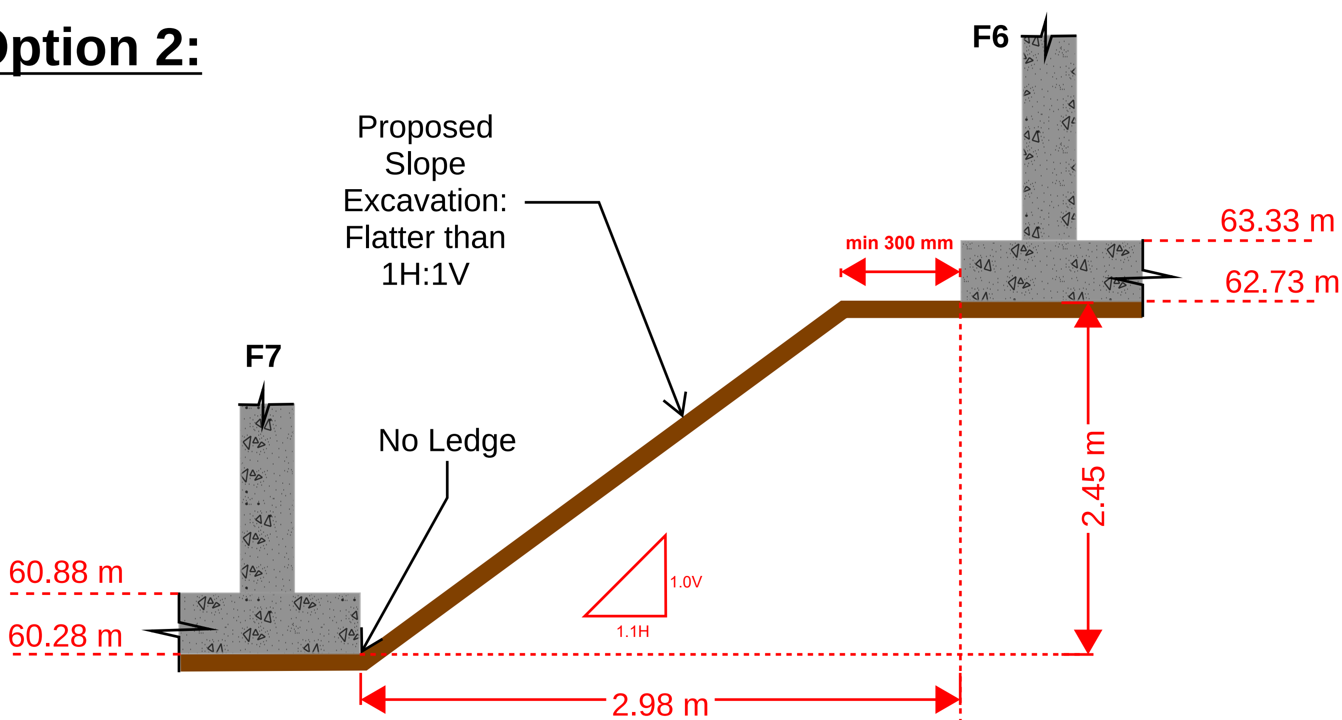
2023-08-11 11:57:19 AM

PATERSON GROUP	Geotechnical Excavation Review	Job No.: PG5407
	300 Tremblay, Ottawa, ON	Date: August 16, 2023
	Figure 2 - Section 1 - Options 1&2	Dwn: YZ
	Drawing is not to scale	Page: 1 of 1

Option 1:

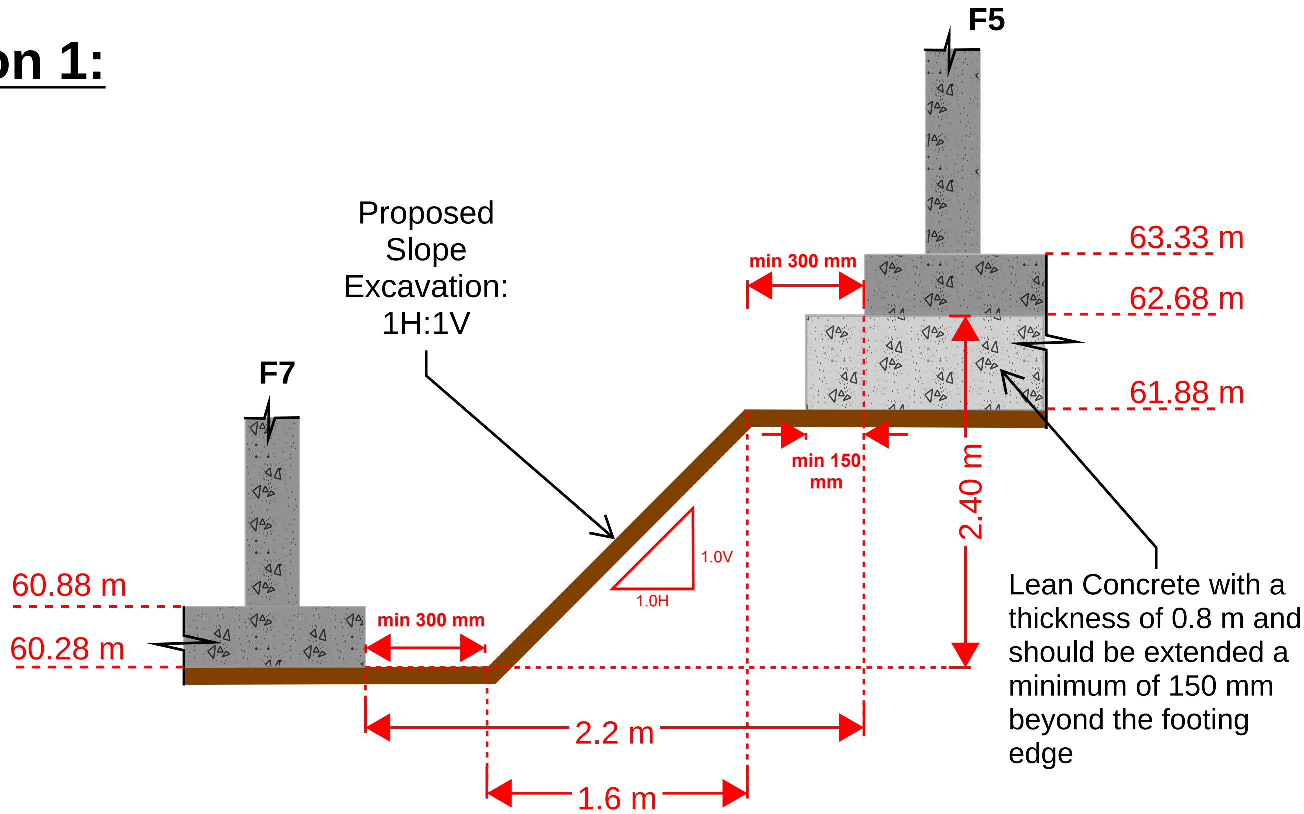


Option 2:

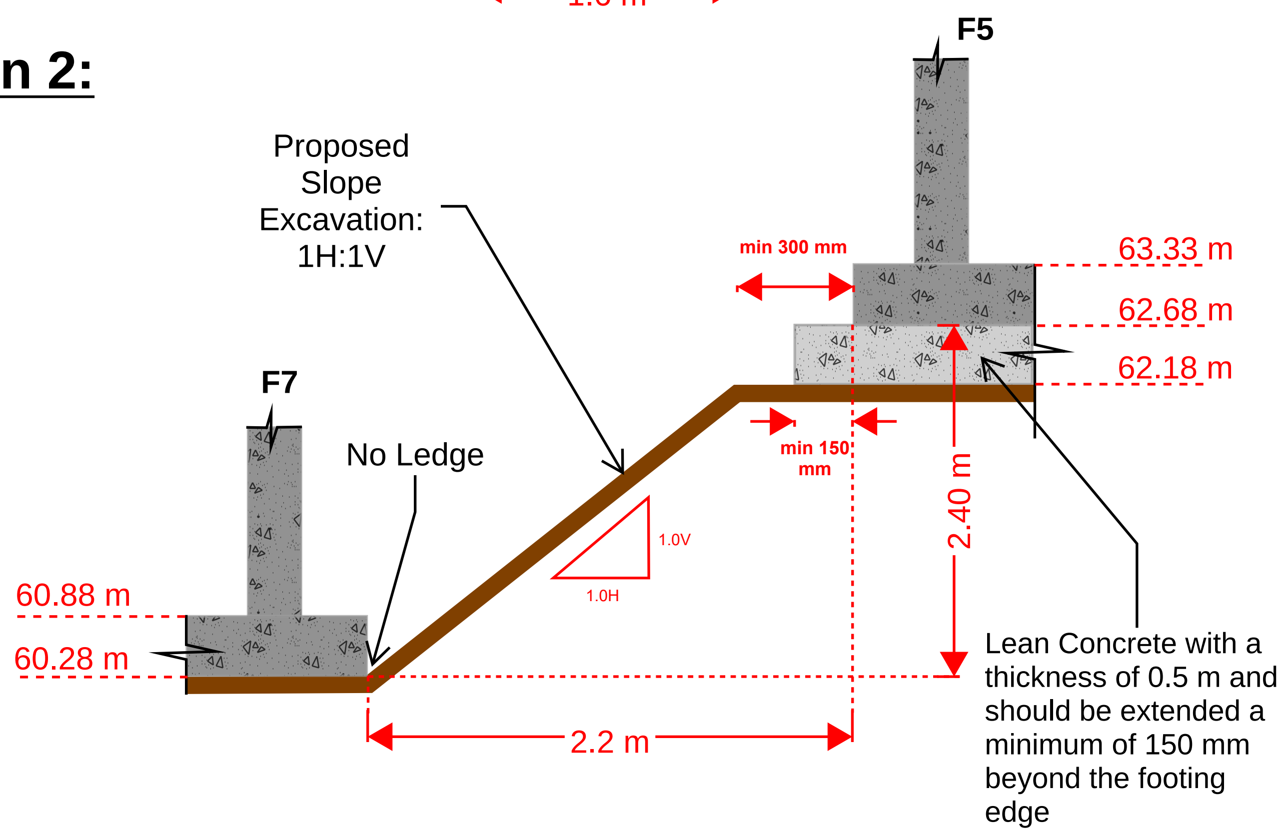


PATERSON GROUP	Geotechnical Excavation Review	Job No.: PG5407
	300 Tremblay, Ottawa, ON	Date: August 16, 2023
	Figure 3 - Section 2 - Options 1&2	Dwn: YZ
	Drawing is not to scale	Page: 1 of 1

Option 1:

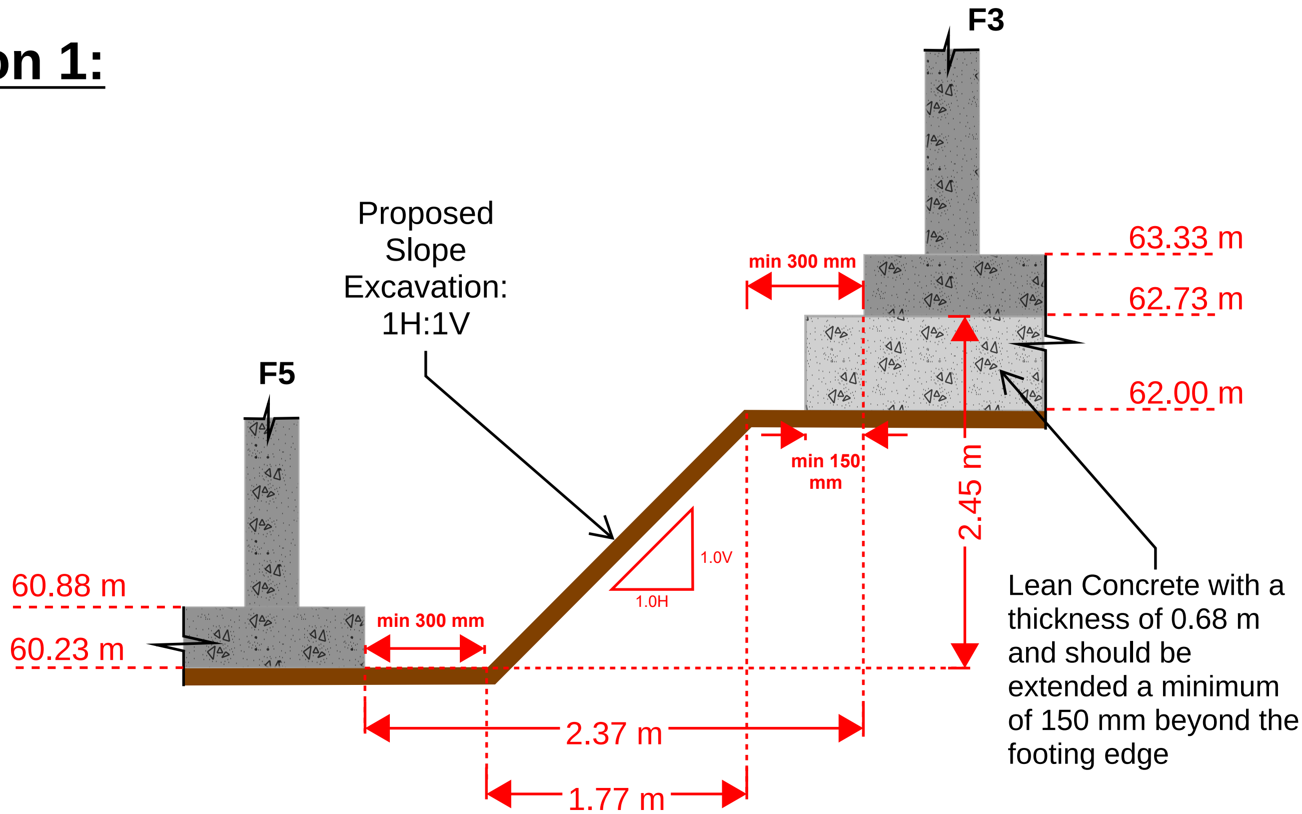


Option 2:



PATERSON GROUP	Geotechnical Excavation Review	Job No.: PG5407
	300 Tremblay, Ottawa, ON	Date: August 16, 2023
	Figure 4 - Section 3 - Options 1&2	Dwn: YZ
	Drawing is not to scale	Page: 1 of 1

Option 1:



Option 2: