

GEOTECHNICAL ENGINEERING REPORT

1875 Steeles Avenue West Toronto, Ontario

PREPARED FOR:

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ATTENTION:

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Grounded Engineering Inc.

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1 Introduction

Tenblock has retained Grounded Engineering Inc. ("Grounded") to provide geotechnical engineering design advice for their proposed development at 1875 Steeles Avenue West, in Toronto, Ontario.

The proposed project includes demolishing the existing structure and three buildings 12 to 37-stories in height connected by a 5 to 6-storey podium. The development is underlain with two underground parking levels set at a lowest (P2) Finished Floor Elevation (FFE) of 181.5± m. The southern end of the property is occupied by a park dedication.

There is an existing slope on the east side of the property. A slope stability and erosion risk assessment report has been completed under a separate cover (File No 19-019, Revision 1, dated May 8, 2020).

Revision 1 of this report includes the following changes:

- Additional borehole information,
- Updated spread footing foundation recommendations, and
- Alternative foundation options including raft foundations and end bearing caissons.

Grounded has been provided with the following reports and drawings to assist in our geotechnical scope of work:

 Quadrangle Architects Limited, "1875 Steeles Avenue West, Toronto, ON", Project No. 21016, dated November 16, 2021

Grounded's subsurface investigation of the site to date includes a total of thirteen (13) boreholes. Six (6) boreholes (Boreholes 101 to 106) were advanced from December 16th, 2019 to February 6th, 2020. Additional investigation including seven (7) new boreholes (Boreholes 201 to 207) and extending five (5) existing boreholes deeper (Boreholes 101A to 103A, 105A, 106A). The additional investigation was completed between November 2nd to 10th and December 14th to 16th 2020.

Based on the borehole findings, geotechnical engineering advice for the proposed development is provided for foundations, seismic site classification, earth pressure design, slab on grade design, and basement drainage. Construction considerations including excavation, groundwater control, and geostructural engineering design advice are also provided.

Grounded Engineering must conduct the on-site evaluation of founding subgrade as foundation and slab construction proceeds. This is a vital and essential part of the geotechnical engineering function and must not be grouped together with other "third-party inspection services". Grounded will not accept responsibility for foundation performance if Grounded is not retained to carry out all the foundation evaluations during construction.



2 Ground Conditions

The borehole results are detailed on the attached borehole logs. Our assessment of the relevant stratigraphic units is intended to highlight the strata as they relate to geotechnical engineering. The ground conditions reported here will vary between and beyond the borehole locations.

The stratigraphic boundary lines shown on the borehole logs are assessed from non-continuous samples supplemented by drilling observations. These stratigraphic boundary lines represent transitions between soil types and should be regarded as approximate and gradual. They are not exact points of stratigraphic change.

Elevations are measured relative to geodetic datum (CGVD28:PRE78). The horizontal coordinates are provided relative to the Universal Transverse Mercator (UTM) geographic coordinate system.

Asphalt and granular thicknesses reported here are observed in individual borehole locations through the top of the open borehole. Thicknesses may vary between and beyond the boreholes.

2.1 Soil Stratigraphy

The following soil stratigraphy summary is based on the borehole results and the geotechnical laboratory testing.

A cross-section showing stratigraphy and engineering units is appended.

A summary of the relevant stratigraphic units is provided as follows. The summary elevations are provided for general guidance only. Details are provided on the borehole logs and in the following subsections. In general, four main stratigraphic units were encountered on site as follows:

- earth fill, overlying
- 2. an "upper glacial till" encountered at 0.8 to 3 m depth, overlying
- 3. "sands" encountered in all boreholes at variable depths, overlying
- 4. a hard "lower glacial till" encountered in three boreholes at Elev. 172.8 to 170.8± m.

There is ground water within the sands unit at elevations varying from approximate Elev. $180.3\pm$ m in the west to $179.0\pm$ m in the east. The West Don River just east of the site has a water level of about Elev. 179 to $178.5\pm$ m.

2.1.1 Surficial and Earth Fill

Borehole 101 encountered approximately 600 mm of topsoil. Boreholes 102 to 106 and 201 to 204 encountered a pavement structure consisting of 60 to 100 mm of asphalt and 75 to 200 mm of aggregate. Boreholes 205 to 207 encountered 100 mm of concrete.

Underlying the surficial materials, Boreholes 101 to 106 and 201 to 204 observed a layer of earth fill that extends to depths of 0.8 to 3.0 metres below grade (Elev. 184.1 to 187.2 metres). The earth fill varies in composition but generally consists of sandy silt to gravelly sand with trace to



some clay. Deleterious and organic materials encountered in the boreholes include asphalt, rootlets, and wood. The colour ranges from brown, dark brown, grey, and dark grey. The earth fill is moist.

Due to inconsistent placement and the inherent heterogeneity of earth fill materials, the relative density of the earth fill varies but is on average loose to compact.

2.1.2 Upper Glacial Till

A glacial till was encountered underlying the earth fill at a depth of 0.8 to 3.0 metres below grade (Elev. 184.1 to 187.2 metres). The upper glacial till comprises sandy silt, trace clay to clayey, and with trace gravel. In Borehole 106, the glacial till transitions to a clayey silt with some sand and trace gravel and extends much lower than other boreholes.

The extent of the upper glacial till is variable, as summarized in the table below. In general, the upper till extends to Elev. 183.4 m at the northwest corner of the site (Borehole 103) to Elev. 174.1 m at the southeast corner of the site (Borehole 106).

Table 2.1 - Extent of Upper Glacial Till

Table 2.1 Extent of Opper	Giaciai Tili		
Borehole	Borehole Elevation (m)	Depth/Elevation of top of Upper Glacial Till (m)	Depth/Elevation of bottom of Upper Glacial Till (m)
101	187.1	3.0 / 184.1	6.1 / 181.0
102	187.7	1.5 / 186.2	6.1 / 181.6
103	188	0.8 / 187.2	4.6 / 183.4
104	187.8	0.8 / 187.0	9.1 / 178.7
105	187.9	1.5 / 186.4	7.6 / 180.3
106	187.8	3.0 / 184.8	13.7 / 174.1
201	187.7	1.5 / 186.2	4.8 / 182.9
202	188.1	1.5 / 186.6	6.4 / 182.0
203	187.7	1.5 / 186.2	9.1 / 178.6
204	187.8	3.0 / 184.8	12.2 / 175.6
205	184.5	0.1 / 184.4	6.1 / 178.4
206	184.5	0.9 / 183.6	2.3 / 182.2*
207	184.5	0.9 / 183.6	2.4 / 182.1*

^{*}Borehole was terminated in this unit

The upper glacial till is moist and ranges in colour from brown, brown with mottled orange, grey with orange, and grey. The Standard Penetration Test (SPT) results (N-Values) indicate an on



average dense relative density. The upper till is on average dense, with average SPT N-Values of 38 blows per 300 mm of penetration ("bpf").

2.1.3 **Sands**

A sands unit was encountered at variable depths, ranging from Elev. 183.4 m at the northwest corner of the site (Borehole 103) to Elev. 174.1 m at the southeast corner of the site (Borehole 106). The sands unit extends to Elev. 169.4 to 174.3 m. Boreholes 206 and 207 were terminated in this unit.

The sands unit generally comprises a silty sand to a sand with some silt. The sand is generally brown, and moist transitioning to wet at depth ranging from 6.1 to 9.1 m.

The SPT N-Values in the sands unit SPT N-Values ranges from 22 to greater than 50 bpf and is on average dense to very dense.

2.1.4 Lower Glacial Till

Underlying the sands unit a lower glacial till was encountered at a depth of 13.0 to 18.5 m (Elev. 169.4 to 174.3 m) and extends past the vertical depth of the investigation (Elev. 165.8 m). The lower glacial till generally comprises sandy silt to silty sand, with trace to some clay and trace gravel. This unit is generally grey and wet, with an average SPT N-Value of 53 bpf. The lower glacial till is on average, very dense.

2.2 Groundwater

On completion of drilling, the boreholes were filled with drill fluid (from mud rotary drilling) and measuring the unstabilized groundwater level after drilling was not practical. Monitoring wells were installed in each of the boreholes, and stabilized groundwater levels were measured in each of the monitoring wells one week after the completion of drilling.

The groundwater observations are shown on the Borehole Logs and are summarized as follows.

Table 2.2 - Summary of Groundwater Observations

Borehole	Depth of	Chusta Causanad	Water Level in Well, Depth/Elev. (m)				
No. Strata Screened		Highest Level	Date	Most Recent Level	Date		
101	15.2	Sands	6.8 / 180.3	Mar 20, 2020	7.4 / 179.7	Mar 17, 2021	
101A	19.8	Lower Till	10.2 / 177.0	Jan 6, 2021	10.3 / 176.9	Mar 17, 2021	
102	15.2	Sands	7.8 / 179.9	Mar 11, 2020	8.2 / 179.5	Mar 17, 2021	
102A	No monitoring well installed.						
103	15.2	Sands	8.4 / 179.6	Mar 25, 2020	8.8 / 179.2	Mar 17, 2021	
103A	19.8	Lower Till	9.9 / 178.1	Mar 17, 2021	9.9 / 178.1	Mar 17, 2021	



Borehole	Depth of		1	Vater Level in We	ell, Depth/Elev. (m)	
No.	well (m)	Strata Screened	Highest Level	Date	Most Recent Level	Date	
104	19.8	Sands and Lower Till	8.7 / 179.1	Mar 11, 2020	9.0 / 178.8	Mar 17, 2021	
105	15.2	Sands	8.9 / 179.0	Mar 11, 2020	9.3 / 178.6	Mar 17, 2021	
105A	21.3	Lower Till	9.3 / 178.7	Mar 17, 2021	9.3 / 178.7	Mar 17, 2021	
106	15.2	Upper Till and Sands	9.2 / 178.6	Mar 11, 2020	9.6 / 178.2	Mar 17, 2021	
106A	No monitorin	g well installed.	g well installed.				
201	16.8	Sands and Lower Till	8.2 / 179.5	Dec 11, 2020	8.3 / 179.4	Mar 17, 2021	
202	21.3	Lower Till	9.7 / 178.4	Mar 17, 2021	9.7 / 178.4	Mar 17, 2021	
203	19.8	Lower Till	9.1 / 178.6	Mar 17, 2021	9.1 / 178.6	Mar 17, 2021	
204	19.8	Lower Till	10.7 / 177.1	Mar 17, 2021	10.7 / 177.1	Mar 17, 2021	
205	7.6	Upper Till and Sands	4.8 / 179.7	Mar 17, 2021	4.8 / 179.7	Mar 17, 2021	
206	2.1	Upper Till	Dry	Mar 17, 2021	Dry	Mar 17, 2021	
207	2.1	Upper Till	Dry	Mar 17, 2021	Dry	Mar 17, 2021	

Groundwater levels fluctuate with time depending on the amount of precipitation and surface runoff.

Groundwater in the sands deposit ranges from Elev. 180.3 m in the southwest corner of the site to Elev. 179.0 m in the northeast corner of the site. The sands unit is generally wet and will yield free-flowing water when penetrated. Groundwater in the lower glacial till ranges from Elev. 178.7 to 177.0 m.

A pump test was also conducted on site, which indicated free-flowing groundwater. Grounded has prepared a hydrogeological report for this site (File No. 19-019).

2.3 Pressuremeter Testing

In situ pressuremeter testing (PMT) was conducted by Grounded Engineering using an N-size Texam Pressuremeter. Our equipment is lab calibrated before every project, and field calibrated on each day of field testing. The raw data is corrected for membrane stiffness and system volume loss to obtain a corrected plot of probe pressure versus change in probe volume, from which we obtain a pressuremeter modulus. Calibrations and data correction are in accordance with ASTM D4719. The field test data are appended.

The PMT modulus is converted to an equivalent Young's modulus using the following simplified relationship:

 $E_{PMT} / \alpha = E$



 E_{PMT} = Pressuremeter Modulus (MPa) α = Menard Factor (unitless)

E = Young's Modulus (MPa)

E_{ur} = Young's Modulus, unload-reload (MPa)

There are many ways to derive alpha. We use a first principle derivation which assumes the soil behaves according to the general orthotropic elastic equations. This is checked against the Menard table and the Pressiorama chart.

The detailed pressuremeter test results are appended, and the estimated Young's Modulus results are also shown on the attached Borehole Logs and Subsurface Profile. The test results are summarized as follows:

Table 2.3 - Summary of Pressuremeter Test Results

Borehole	Depth of Test (m)	Elevation of Test (m)	E (MPa)	E _{ur} (MPa)	Engineering Unit
201	14.3	173.4	102	1040	Sands
203	11.3	176.4	111	909	Sands
203	14.3	173.4	81	563	Sands
203	17.4	170.3	83	525	Sands
205	11.3	173.2	86	826	Sands
205	12.8	171.7	80	488	Sands

2.4 Corrosivity and Sulphate Attack

Three (3) soil samples were submitted for corrosivity testing parameters (pH, Resistivity, Electrical Conductivity, Redox Potential, Sulphate, Sulphide and Chloride). The Certificate of Analyses is appended.

The soil samples were analysed for soluble sulphate concentration and compared to the Canadian Standard CAN3/CSA A23.1-M94 Table 3, *Additional Requirements for Concrete Subjected to Sulphate Attack*. The results are summarized as follows:

Table 2.4 - Summary of Soluble Sulphates

Parameter	BH102 SS5	BH103 SS3	BH106 SS2
Soluble Sulphate (SO ₄) in soil sample	39 μg/g < 0.1 %	44 μg/g < 0.1 %	69 μg/g < 0.1 %
Class of Exposure	Negligible	Negligible	Negligible



Corrosivity parameters are also used for assessing soil corrosivity applicable to cast iron alloys, according to the 10-point soil evaluation procedure described in the American Water Work Association (AWWA) C-105 standard. The results are summarized as follows:

Table 2.5 - Summary of AWWA C-105 Standard Evaluation

	AWWA C-105 Standard – Assigned Points					
	BH102 SS5		BH103 SS3		BH106 SS2	
Parameter	Result	Points	Result	Points	Result	Points
Resistivity (ohm.cm)	2230	0	711	8	1140	5
рН	8.19	0	8.48	0	8.05	0
Redox Potential (mV)	310	0	277	0	251	0
Sulfides (%)	<0.02	0	<0.02	0	<0.02	0
Moisture (%)	7.1	0	11.3	1	13.7	2
Corrosion protection recommended?	No		No		No	
Resistivity less than 2000 ohm.cm?	No)	YE	S	YE	S

The analytical results only provide an indication of the potential for corrosion. All three samples scored less than 10 points and corrosion protective measures are therefore not recommended for cast iron alloys. A more recent study by the AWWA has suggested that soil with a resistivity of less than about 2000 ohm.cm should be considered aggressive. Therefore, samples from BH103 SS3 and BH106 SS2 **should be considered aggressive**.

3 Geotechnical Engineering Recommendations

Based on the factual data summarized above, we are providing the following geotechnical engineering design recommendations. Contractors must review the factual data while bidding or scoping services for this project and must provide their own opinion as to means, methods, and schedule.

This report assumes that the design features relevant to the geotechnical analyses will be in accordance with applicable codes, standards, and guidelines of practice. If there are any changes to the site development features, or there is any additional information relevant to the interpretations made of the subsurface information with respect to the geotechnical analyses or other recommendations, then Grounded should be retained to review the implications of these changes with respect to the contents of this report.



3.1 Foundation Design Parameters

The proposed project includes demolishing the existing structure and three buildings 12 to 37-stories in height connected by a 5 to 6-storey podium. The development is underlain with two underground parking levels set at a lowest (P2) Finished Floor Elevation (FFE) of 181.5± m. The southern end of the property is occupied by a park dedication. Multiple foundation options may provide adequate support for the proposed development including:

- Spread footing foundations,
- Raft foundations, or
- End bearing caissons.

The geotechnical engineering recommendations for each of these options are outlined below.

3.1.1 Spread Footings

The underside of the P2 foundations will bear around Elev. 180.5 ±m on either wet sands or glacial till within 1.2 m of the groundwater table (Elev. 180.3 m in the west and Elev. 179.0 ±m in the east). The wet sands were encountered at varying elevations across the site, as summarized in the table below.

Table 3.1 -Top of wet sands encountered in each borehole

Borehole	Borehole Elevation (m)	Depth of top of Wet Sands (m)	Elevation of top of Wet Sands (m)
101	187.1	6.1	181.0
102	187.7	6.1	181.6
103	188.0	4.6	183.4
104	187.8	9.1	178.7
105	187.9	7.9	180.3
106	187.8	13.7	174.1
201	187.7	4.8	182.9
202	188.1	6.4	182.0
203	187.7	9.1	178.6
204	187.8	12.2	175.6
205	184.5	6.1	178.4
206	184.5	Sands unit n	not encountered
207	184.5	Sands unit n	not encountered



In general, the top of the wet sands unit ranges from Elev. 183.4 m at the west corner of the site (BH 103) to Elev. 174.1 m at the east corner of the site (BH 106).

Conventional spread footings with a size approximately 3 m by 3 m made to bear on dense undisturbed soils (the upper glacial till or the sands) at or below Elev. 180.5 ±m may be designed using a maximum factored geotechnical resistance at ULS of 950 kPa. The net geotechnical reaction at SLS is 800 kPa, for an estimated total settlement of 25 mm.

Conventional spread footings with a size approximately 4 m by 4 m made to bear on dense undisturbed soils (the upper glacial till or the sands) at or below Elev. 180.5 ±m may be designed using a maximum factored geotechnical resistance at ULS of 1,150 kPa. The net geotechnical reaction at SLS is 750 kPa, for an estimated total settlement of 25 mm.

The SLS criteria provides a settlement at the given load, which for practical purposes is linear, non-recoverable, and occurs in proportion to the applied load and footing size. Differential settlement is related to column spacing, loading, and the size of each foundation.

Excavations for typical footings will be nominally 1.0± m below FFE, to as much as 3± m below FFE for the elevator core. Therefore,

- Foundation excavations will be above to just into the wet sands unit,
- Elevator core excavations will extend below the water table in the wet sands,
- Where the wet sands are penetrated they will yield free-flowing water, risking basal instability.

Where any foundation excavations are within 1.2 m of the water table (at Elev. 180.3 m in the west and Elev. 179.0 ±m in the east), the groundwater table must be lowered to at least 1.2 m below the lowest excavation elevation prior to excavation. Where the wet sands are not dewatered prior to excavation, particularly at the west half of the site, the native soils may become disturbed by basal heave or the ingress of groundwater and the recommendations for bearing capacity will not be valid.

Footings stepped from one elevation to another should be offset at a slope not steeper than 7 vertical to 10 horizontal.

The lowest levels of unheated underground parking structures two or more levels deep are, although unheated, still warmer than typical outdoor winter temperatures in the Greater Toronto Area. Interior foundations (or pile caps) with 900 mm of frost cover perform adequately, as do perimeter foundations with 600 mm of frost cover. Where foundations are next to ventilation shafts or are exposed to typical outdoor temperatures, 1.2 m of earth cover (or equivalent insulation) is required for frost protection.

The founding subgrade must be cleaned of all unacceptable materials and approved by Grounded prior to pouring concrete for the footings. Such unacceptable materials may include disturbed or caved soils, ponded water, or similar as indicated by Grounded during founding subgrade

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inspection. During the winter, adequate temporary frost protection for the footing bases and concrete must be provided if construction proceeds during freezing weather conditions.

3.1.2 Raft Foundation

The spread footing capacities provided above may not be sufficient for the support of a 37-storey tower. A raft foundation can also be considered for the support of structural loads, with waterproofed foundation walls designed to withstand hydrostatic forces (lateral and uplift). A 19 \times 43 m raft underlying the 37-storey tower is considered in the discussion below.

Assuming a P2 FFE of 181.5± m, a raft would be founded at around Elev. 179.5± m, on undisturbed (dewatered) dense to very dense native upper glacial till or sands.

The preliminary raft design parameters are provided assuming a *uniform load* at the base of the raft. In reality, raft loads are non-uniform; they will be highest around the core and will decrease away from the core. Consequently, detailed raft design is an iterative process between the structural and geotechnical engineers. The preliminary parameters below are provided as the initial step in determining raft feasibility (a structural task).

Bulk excavation to underside of raft elevation (Elev. 179.5 m) will induce a reduction in effective stress of 170 kPa, which is the unload stress. Utilizing preliminary soil stiffness parameters obtained from PMT in situ testing, analysis of a *uniformly* loaded raft foundation shows that a uniform total SLS bearing pressure of 170 kPa (which is recompression) applied at the base of the raft will generate around 4 mm of settlement. Each additional increase of 110 kPa (which is now virgin loading) generates an additional 25 mm of settlement. For 25 mm of total settlement, the total uniform SLS bearing pressure is 270 kPa. Thus, a total (gross) *uniform* geotechnical reaction at SLS of 380 kPa will generate 50 mm of settlement.

The modulus of subgrade reaction for design of a raft slab is a function of the size of the raft, the applied load, and whether loading is within the recompression range or the virgin range. On the basis of our preliminary stiffness parameters and the assumption of uniform raft loading, the preliminary modulus of subgrade reaction appropriate for 19x43 m raft design at this site is about 4,600 kPa/m.

Settlement analysis can likely be improved by modelling the real non-uniform loading at the base of the raft. Detailed raft design is an iterative process between the structural and geotechnical engineers. Once a draft structural design is completed by the structural engineer, the resulting non-uniform raft pressure distribution is provided to us (typically as a contour plot). Grounded will then use finite element modelling to determine the real settlement more accurately at each point under the raft. The detailed settlement distribution and MSRs under the raft are then sent back to the structural engineer, and the structural design is modified as necessary.

The maximum factored geotechnical resistance of this 19x43 m raft foundation at ULS is 4,000 kPa for design purposes.

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Should raft slab design be considered beyond this conceptual level, recommendations and discussion pertaining to differential settlement between the podium and tower must be provided by Grounded. This may involve detailed construction sequencing or the use of delay strips.

A raft underside of footing elevation at Elev. 179.5± m will be below the groundwater table in the west portion of the site, and 0.5 m above the groundwater table in the east part of the site. Therefore, it will be necessary to positively dewater the site to a minimum 1.2 m below proposed the founding elevation prior to excavation to preserve the in situ integrity of the native soils. If the subsurface is not dewatered prior to excavation, the native soils will become disturbed by the ingress of groundwater and the above recommendations for bearing capacity will not be valid. The site should not be excavated below an elevation of 1 m above the groundwater table without positive dewatering in place, to preserve the native soils in their undisturbed state.

During construction, the subgrade at founding elevation should be cut neat, inspected, and immediately protected by a mud slab (comprising lean concrete) to provide a working surface. The raft slab is then constructed on top of the mud slab. Prior to pouring the mud mat and raft foundation, the foundation subgrade must be cleaned of all deleterious materials such as softened, disturbed or caved materials, or standing water. If construction proceeds during freezing weather conditions, adequate temporary frost protection for the raft foundation base and concrete must be provided. The raft subgrade must not be proof-rolled as this activity would weaken these soils.

As the raft slab is to be fully waterproofed, the structure must be designed to resist uplift and lateral hydrostatic pressure on foundation walls. During construction, it will be necessary to consider the potential uplift pressure on the underside of a raft foundation due to hydrostatic forces. Positive dewatering operations during construction must begin prior to excavation and must continue until such time as the structural dead load exceeds the potential uplift forces (with suitable partial factors (LRFD) included in this assessment). Design groundwater table elevations in Towers A, B, and C of 180.3, 179.0, and 179.5 m, respectively, are to be used.

Differential settlement is related to real non-uniform raft load distribution and must be assessed as part of the detailed design process. Differential settlement may become an issue if two different foundation types (conventional spread footings and deep foundations) are used to support structures with different column loads (e.g. towers and adjacent podiums) on a shared underground parking structure. Likewise, differential settlement issues may become apparent if different foundation types are designed using two different SLS criteria. Net geotechnical reactions at SLS have been provided for both foundations systems, which will occur as load is applied and is linear and non-recoverable. The tolerance for differential settlement is related to the structural design and is specified by the structural engineer as a function of column spacing. To avoid this issue, Grounded may be consulted regarding adjustment of the construction schedule such that podium and towers experience similar post-construction settlement. If the scheduling approach is not preferred, the alternative would be to construct the entire structure simultaneously floor-by-floor and to leave a delay strip between the structures supported on different foundation types. Once the buildings are completed, the delay strip is then closed.



3.1.3 End Bearing Caissons

If spread footing and / or raft capacities provided above are not sufficient to carry the proposed tower column loads, caissons may be designed.

Caissons may also be considered as an option for the support of the proposed towers. Caissons acting in end bearing, made to bear on the undisturbed very dense lower glacial till at Elev. 169.5± m, may be designed using a maximum factored geotechnical resistance at ULS of 1,800 kPa in end bearing. The net allowable geotechnical reaction at SLS is 1,200 kPa in end bearing, for an estimated total settlement of 25 mm or less.

The soils at this site are cohesionless, permeable and sufficiently wet such that augered holes made into these soils will be unstable. It will also be necessary to control the bases of any augered holes below the groundwater table, to protect them against basal disturbance caused by the ingress of groundwater and to prevent loss of ground.

To avoid additional settlement of caissons caused by group effect, caissons should be separated from other caissons by at least 2.5 times the largest caisson diameter. If this situation is unavoidable from a structural engineering perspective, we can calculate the expected settlement for existing caissons in this situation on request.

Caisson foundations at different elevations must be designed such that the higher caissons are set below a line drawn up at 10 horizontal to 7 vertical from the closest edge of the lower caisson.

Unheated and ventilated underground parking two or more levels deep are warmer than typical outdoor temperatures in the Greater Toronto Area. Frost protection for interior foundations (or pile caps) with 900 mm of cover perform adequately, as do perimeter foundations with 600 mm of cover. Where foundations are next to ventilation shafts or are exposed to typical outdoor temperatures, earth cover of 1.2 m or equivalent insulation is required for frost protection.

The following construction methodology must be utilized for the caissons:

- All caisson excavations are to be inspected on a full-time basis by Grounded per the OBC.
- Caissons designed to bear on lower glacial till below Elev. 169.5± m as confirmed by Grounded through observation of the drilling and auger cuttings at each location.
- Auger, cleanout bucket, or one-eyed bucket cleaning of the hole base is to then take place in each caisson hole, and visually inspected as well as base probing by Grounded to ensure that auger cleaning has been carried out as thoroughly as practically possible.
- Place 30 MPa (min.) concrete to a minimum depth of 600 mm in the base of the hole (volume to be determined based on caisson diameter) to be stirred with the auger without advancing the auger any further for about 5-10 minutes.
- The auger spun concrete is then removed and wasted, leaving no more than 100 mm depth of concrete at the base of the caisson.
- Tremie placement of concrete is required wherever the drill holes have more than 150 mm of water in the base or are full of polymer or other drilling fluids.



Complete construction of the caisson to cut off elevation.

Grounded should be retained to review the specification for contractor quality control. Based on the selected construction method for caissons at the site, Grounded recommends sonic caliper, crosshole logging, or another similar test be carried out on every caisson prior to the placement of concrete.

3.2 Earthquake Design Parameters

The Ontario Building Code stipulates the methodology for earthquake design analysis, as set out in Subsection 4.1.8.7. The determination of the type of analysis is predicated on the importance of the structure, the spectral response acceleration, and the site classification.

The parameters for determination of Site Classification for Seismic Site Response are set out in Table 4.1.8.4A of the Ontario Building Code. The classification is based on the determination of the average shear wave velocity in the top 30 metres of the site stratigraphy, where shear wave velocity (v_s) measurements have been taken. Alternatively, the classification is estimated from the rational analysis of undrained shear strength (s_u) or penetration resistance (N-values) according to the OBC and National Building Code of Canada.

Below the nominal founding elevations (for spread footings or grade beams) of 180.5± metres, the boreholes observe dense to very dense sands and glacial till. Based on this information, the site designation for seismic analysis is **Class D**, per Table 4.1.8.4.A of the Ontario Building Code. Tables 4.1.8.4.B and 4.1.8.4.C. of the same code provide the applicable acceleration- and velocity-based site coefficients.

We have estimated the site designation based on quantitative analysis of penetration resistance (N-values) with assumed N-values for the soil stratigraphy beyond the investigation depth. If an improved seismic site class provides economic benefit to the project, consideration should be given to conducting a site-specific Multichannel Analysis of Surface Waves (MASW) to determine the average shear wave velocity in the top 30 meters of the site stratigraphy. MASW testing may result in an improved seismic site designation (to a Class C) which may help reduce the cost implication for the structure.

3.3 Earth Pressure Design Parameters

At this site, the design parameters for structures subject to unbalanced earth pressures such as basement walls and retaining walls are shown in the table below.



Stratigraphic Unit	γ	φ	Ka	K _o	K _p
Compact Granular Fill Granular 'B' (OPSS.MUNI 1010)	21	32	0.31	0.47	3.25
Existing Earth Fill	19	29	0.35	0.52	2.88
Upper Glacial Till	21	34	0.28	0.44	3.54
Sands	21	36	0.26	0.41	3.85
Lower Glacial Till	21	34	0.28	0.44	3.54

γ = soil bulk unit weight (kN/m³)
 φ = internal friction angle (degrees)
 K_a = active earth pressure coefficient (Rankine, dimensionless)
 K_o = at-rest earth pressure coefficient (Rankine, dimensionless)
 K_P = passive earth pressure coefficient (Rankine, dimensionless)

height of groundwater (m) above depth h

These earth pressure parameters assume that grade is horizontal behind the retaining structure. If retained grade is inclined, these parameters do not apply and must be re-evaluated.

The following equation can be used to calculate the unbalanced earth pressure imposed on walls:

$$P = K[\gamma(h - h_w) + \gamma' h_w + q] + \gamma_w h_w$$

$$P = \text{horizontal pressure (kPa) at depth h} \qquad \gamma = \text{soil bulk unit weight (kN/m³)}$$

$$h = \text{the depth at which P is calculated (m)} \qquad \gamma' = \text{submerged soil unit weight (} \gamma - 9.8 \text{ kN/m³})$$

$$K = \text{earth pressure coefficient} \qquad q = \text{total surcharge load (kPa)}$$

If the wall backfill is drained such that hydrostatic pressures on the wall are effectively eliminated, this equation simplifies to:

$$P = K[\gamma h + q]$$

Where walls are made directly against shoring, prefabricated composite drainage panel covering the blind side of the wall is used to provide drainage. Water from the composite drainage panel is collected and discharged through the basement wall in solid ports directly to the sumps. This is discussed in Section 3.5.

Where the structure extends below the groundwater table at Elev. 180.3± to 179.0±, the walls should be designed to withstand horizontal hydrostatic pressure.

The possible effects of frost on retaining earth structures must be considered. In frost-susceptible soils, pressures induced by freezing pore water are basically irresistible. Insulation typically addresses this issue. Alternatively, non-frost-susceptible backfill may be specified.

Foundation resistance to sliding is proportional to the friction between the soil subgrade and the base of the footing. The factored geotechnical resistance to friction (\mathbf{R}_f) at ULS provided in the following equation:

$$R_f = \Phi N \tan \varphi$$



 R_f = frictional resistance (kN)

Φ = reduction factor per Canadian Foundation Engineering Manual (CFEM) Ed. 4 (0.8)

N = normal load at base of footing (kN) φ = internal friction angle (see table above)

3.4 Slab on Grade Design Parameters

The slab-on-grade parameters provided here apply to a conventional slab on grade and drained basement approach only. If a fully waterproofed raft foundation approach is adopted (with no permanent drainage system), design parameters are provided in Section 3.1.2.

At the proposed lowest P2 elevation, the slab on grade will be made above the groundwater table on a subgrade consisting of dense to very dense glacial till or sand around Elev. 181.5 \pm m. The modulus of subgrade reaction for slab-on-grade design supported by undisturbed native soils is 40,000 kPa/m.

The slab on grade must be provided with a drainage layer and capillary moisture break, which is achieved by forming the slab on a minimum 300 mm thick layer of 19 mm clear stone (OPSS.MUNI 1004) vibrated to a dense state.

Since the slab-on-grade is made on native sands or sandy till, the drainage layer must be separated from the sands using a non-woven geotextile (with an apparent opening size of less than 0.250 mm and a tear resistance of more than 200 N) with a minimum 600 mm overlap. The clear stone drainage layer is then placed over the geotextile. Without this filtering layer, fines from the underlying sand subgrade will enter the drainage layer potentially resulting in loss of ground, loss of slab support, and clogging of the subfloor drainage system.

The subgrade must be inspected under the supervision of Grounded for obvious loose or disturbed soils or where there is deleterious materials or moisture. These areas can either be recompacted in place and retested, or replaced with Granular B in lifts 150 mm thick or less, and compacted to a minimum of 98% SPMDD.

3.5 Long-Term Groundwater and Seepage Control

To limit seepage to the extent practicable, exterior grades adjacent to foundation walls should be sloped at a minimum 2 percent gradient away from the wall for 1.2 m minimum.

The requirement for a permanent basement drainage system depends on whether a fully waterproofed approach is adopted for this site. Grounded's Hydrogeological Report (File No. 19-019) provides estimates of long-term seepage to a drained basement under a variety of scenarios, which will assist in determining the preferred approach.

For a conventional drained basement approach, perimeter and subfloor drainage systems are required for the underground structure. Subfloor drainage collects and removes the seepage that infiltrates under the floor. Perimeter drainage collects and removes seepage that infiltrates at the foundation walls.



Subfloor drainage pipes are to be spaced at an average 3 m (measured on-centres). If subdrain elevation conflicts with top of footing elevation, footings should be lowered as necessary.

The walls of the substructure are to be fully drained to eliminate hydrostatic pressure. Where drained basement walls are made directly against shoring, prefabricated composite drainage panel covering the blind side of the wall is used to provide drainage. Seepage from the composite drainage panel is collected and discharged through the basement wall in solid ports directly to the sumps. A layer of waterproofing placed between the drain core product and the basement wall should be considered to protect interior finishes from moisture. Typical basement drainage details are appended.

The perimeter and subfloor drainage systems are critical structural elements since they eliminate hydrostatic pressure from acting on the basement walls and floor slab. The sumps that ensure the performance of these systems must have a duplexed pump arrangement providing 100% redundancy, and they must be on emergency power. The sumps should be sized by the mechanical engineer to adequately accommodate the estimated volume of water seepage.

4 Considerations for Construction

4.1 Excavations

Excavations must be carried out in accordance with the *Occupational Health and Safety Act – Regulation 213/91 – Construction Projects (Part III - Excavations, Section 222 through 242).* These regulations designate four (4) broad classifications of soils to stipulate appropriate measures for excavation safety. For practical purposes:

- The earth fill is a Type 3 soil
- The glacial till is a Type 2 soil
- The wet sands are Type 4 soils, or Type 3 soils if dewatered

In accordance with the regulation's requirements, the soil must be suitably sloped and/or braced where workers must enter a trench or excavation deeper than 1.2 m. Safe excavation slopes (of no more than 3 m in height) by soil type are stipulated as follows:

Table 4.1 – Safe excavation slopes (of no more than 3 m in height) by soil type

Soil Type	Base of Slope	Steepest Slope Inclination
1	within 1.2 metres of bottom of trench	1 horizontal to 1 vertical
2	within 1.2 metres of bottom of trench	1 horizontal to 1 vertical
3	from bottom of trench	1 horizontal to 1 vertical
4	from bottom of trench	3 horizontal to 1 vertical

Minimum support system requirements for steeper excavations are stipulated in Sections 235 through 238 and 241 of the Act and Regulations and include provisions for timbering, shoring and



moveable trench boxes. Any excavation slopes greater than 3 m in height should be checked by Grounded for global stability issues.

Larger obstructions (e.g. buried concrete debris, other obstructions) not directly observed in the boreholes are likely present in the earth fill. Similarly, larger inclusions (e.g. cobbles and boulders) may be encountered in the native soils. The size and distribution of these obstructions cannot be predicted with boreholes, as the split spoon sampler is not large enough to capture particles of this size. Provision must be made in excavation contracts to allocate risks associated with the time spent and equipment utilized to remove or penetrate such obstructions when encountered.

4.2 Short-Term Groundwater Control

Considerations pertaining to groundwater discharge quantities and quality are discussed in Grounded's hydrogeological report for the site, under separate cover.

For design purposes, the stabilized groundwater table is approximately at Elev. 180.3± m in the west and Elev. 179.0± m in the east. The groundwater is in the wet flowing sands. The lowest (P2) FFE is approximately at Elev. 181.5 m, which is 1.2 m above the highest prevailing groundwater table measurement. Therefore, bulk excavation and foundation excavations will extend down within 1.2 m of the groundwater table.

Positive dewatering prior to excavation to lower the groundwater table will be required to facilitate construction as well as to maintain the integrity of the subgrade for foundation and slab-on-grade support. Dewatering will take some time to accomplish prior to the start of excavation. The water level must be kept at least 1.2 m below the lowest excavation elevation during construction. Failure to dewater prior to excavation will result in unrecoverable disturbance of the subgrade, which will render advice provided for undisturbed subgrade conditions inapplicable.

It is recommended that a professional dewatering contractor be consulted to review the subsurface conditions and to design a site-specific dewatering system. It is the dewatering contractor's responsibility to assess the factual data and to provide recommendations on dewatering system requirements.

The City of Toronto will require Discharge Agreements in the short and long-terms, if any water is to be discharged to the storm or sanitary sewers.

4.3 Earth-Retention Shoring Systems

The site is immediately bounded by Steeles Avenue West the north, a slope to the east, and neighbouring property to the south and west. No excavation shall extend below the foundations of existing adjacent structures without adequate alternative support being provided. Underpinning guidelines are appended.

File No. 19-019 Rev. 1



4.3.1 Lateral Earth Pressure Distribution

If the shoring is supported with a single level of earth anchor or bracing, a triangular earth pressure distribution like that used for the basement wall design is appropriate.

Where multiple rows of lateral supports are used to support the shoring walls, research has shown that a distributed pressure diagram more realistically approximates the earth pressure on a shoring system of this type, when restrained by pre-tensioned anchors. A multi-level supported shoring system can be designed based on an earth pressure distribution with a maximum pressure defined by:

$$P = 0.65 K[\gamma H + q] + \gamma_w h_w$$

P = maximum horizontal pressure (kPa)

K = earth pressure coefficient (see Section 3.3)

H = total depth of the excavation (m)

h_w = height of groundwater (m) above the base of excavation

 γ = soil bulk unit weight (kN/m3)

q = total surcharge loading (kPa)

Where shoring walls are drained to effectively eliminate hydrostatic pressure on the shoring system (e.g. pile and lagging walls), h_w is equal to zero.

4.3.2 Soldier Pile Toe Embedment

Soldier pile toes will be made in dense to very dense glacial till or wet sands. Soldier pile toes resist horizontal movement due to the passive earth pressure acting on the toe below the base of excavation.

The subgrade soils at this site are cohesionless, wet, and permeable. Augered holes for piles made into these soils will be prone to caving and blowback. Temporarily cased holes are required to prevent borehole caving during installations in drilled holes. To prevent groundwater issues (groundwater inflow, caving and blowback into the drill holes, disturbance to placed concrete, etc.) during drilling and installation, construction methods such as utilizing temporary liners, preadvancing liners deeper than the augured holes, mud/slurry/polymer drilling techniques, or other methods as deemed necessary by the shoring contractor are required.

4.3.3 Lateral Bracing Elements

The shoring system at this site will require lateral bracing. If feasible, the shoring system should be supported by pre-stressed soil anchors (tiebacks) extending into the subgrade of the adjacent properties. To limit the movement of the shoring system as much as is practically possible, tiebacks are installed and stressed as excavation proceeds. The use of tiebacks through adjacent properties requires the consent (through encroachment agreements) of the adjacent property owners.



It is expected that post-grouted anchors can be made such that an anchor will safely carry up to 70 kN/m of adhered anchor length (at a nominal borehole diameter of 150 mm).

At least one prototype anchor per tieback level must be performance-tested to 200% of the design load to demonstrate the anchor capacity and validate design assumptions. Given the potential variability in soil conditions or installation quality, all production anchors must also be prooftested to 133% of the design load.

The dense to very dense till and sands below the proposed FFE is suitable for the placement of raker foundations. Raker footings established on dense to very dense soils at an inclination of 45 degrees can be designed for a maximum factored geotechnical resistance at ULS of 400 kPa.

4.4 Site Work

To better protect wet undisturbed subgrade, excavations exposing wet soils must be cut neat, inspected, and then immediately protected with a skim coat of concrete (i.e. a mud mat). Wet sands are susceptible to degradation and disturbance due to even mild site work, frost, weather, or a combination thereof.

The effects of work on site can greatly impact soil integrity. Care must be taken to prevent this damage. Site work carried out during periods of inclement weather may result in the subgrade becoming disturbed, unless a granular working mat is placed to preserve the subgrade soils in their undisturbed condition. Subgrade preparation activities should not be conducted in wet weather and the project must be scheduled accordingly.

If site work causes disturbance to the subgrade, removal of the disturbed soils and the use of granular fill material for site restoration or underfloor fill will be required at additional cost to the project.

It is construction activity itself that often imparts the most severe loading conditions on the subgrade. Special provisions such as end dumping and forward spreading of earth and aggregate fills, restricted construction lanes, and half-loads during placement of the granular base and other work may be required, especially if construction is carried out during unfavourable weather.

Adequate temporary frost protection for the founding subgrade must be provided if construction proceeds in freezing weather conditions. The subgrade at this site is susceptible to frost damage. Depending on the project context, consideration should be given to frost effects (heaving, softening, etc.) on exposed subgrade surfaces.

4.5 Engineering Review

By issuing this report, Grounded Engineering has assumed the role of Geotechnical Engineer of Record for this site. Grounded should be retained to review the structural engineering drawings prior to issue or construction to ensure that the recommendations in this report have been appropriately implemented.

File No. 19-019 Rev. 1



All foundation installations must be reviewed in the field by Grounded, the Geotechnical Engineer of Record, as they are constructed. The on-site review of the condition of the founding subgrade as the foundations are constructed is as much a part of the geotechnical engineering design function as the design itself; it is also required by Section 4.2.2.2 of the Ontario Building Code. If Grounded is not retained to carry out foundation engineering field review during construction, then Grounded accepts no responsibility for the performance or non-performance of the foundations, even if they are constructed in general conformance with the engineering design advice contained in this report.

The long-term performance of a slab on grade is highly dependent upon the subgrade support and drainage conditions. Strict procedures must be maintained during construction to maintain the integrity of the subgrade to the extent possible. The design advice in this report is based on an assessment of the subgrade support capabilities as indicated by the boreholes. These conditions may vary across the site depending on the final design grades and therefore, the preparation of the subgrade and the compaction of all fill should be monitored by Grounded at the time of construction to confirm material quality, thickness, and to ensure adequate compaction.

A visual pre-construction survey of adjacent lands and buildings is recommended to be completed prior to the start of any construction. This documents the baseline condition and can prevent unwarranted damage claims. Any shoring system, regardless of the execution and design, has the potential for movement. Small changes in stress or soil volume can cause cracking in adjacent buildings.

5 Limitations and Restrictions

Grounded should be retained to review the structural engineering drawings prior to issue or construction to ensure that the recommendations in this report have been appropriately implemented.

5.1 Investigation Procedures

The geotechnical engineering analysis and advice provided are based on the factual borehole information observed and recorded by Grounded. The investigation methodology and engineering analysis methods used to carry out this scope of work are consistent with conventional standard practice by Grounded as well as other geotechnical consultants, working under similar conditions and constraints (time, financial and physical).

Borehole drilling services were provided to Grounded by a specialist professional contractor. The drilling was observed and recorded by Grounded's field supervisor on a full-time basis. Drilling was conducted using conventional drilling rigs equipped with mud-rotary drilling methods. As drilling proceeded, groundwater observations were made in the boreholes. Based on examination of recovered borehole samples, our field supervisor made a record of borehole and drilling



observations. The field samples were secured in air-tight clean jars and bags and taken to the Grounded soil laboratory where they were each logged and reviewed by the geotechnical engineering team and the senior reviewer.

The Split-Barrel Method technique (ASTM D1586) was used to obtain the soils samples. The sampling was conducted at conventional intervals and not continuously. As such, stratigraphic interpolation between samples is required and stratigraphic boundary lines do not represent exact depths of geological change. They should be taken as gradual transition zones between soil or rock types.

A carefully conducted, fully comprehensive investigation and sampling scope of work carried out under the most stringent level of oversight may still fail to detect certain ground conditions. As such, users of this report must be aware of the risks inherent in using engineered field investigations to observe and record subsurface conditions. As a necessary requirement of working with discrete test locations, Grounded has assumed that the conditions between test locations are the same as the test locations themselves, for the purposes of providing geotechnical engineering advice.

It is not possible to design a field investigation with enough test locations that would provide complete subsurface information, nor is it possible to provide geotechnical engineering advice that completely identifies or quantifies every element that could affect construction, scheduling, or tendering. Contractors undertaking work based on this report (in whole or in part) must make their own determination of how they may be affected by the subsurface conditions, based on their own analysis of the factual information provided and based on their own means and methods. Contractors using this report must be aware of the risks implicit in using factual information at discrete test locations to infer subsurface conditions across the site and are directed to conduct their own investigations as needed.

5.2 Site and Scope Changes

Natural occurrences, the passage of time, local construction, and other human activity all have the potential to directly or indirectly alter the subsurface conditions at or near the project site. Contractual obligations related to groundwater or stormwater control, disturbed soils, frost protection, etc. must be considered with attention and care as they relate this potential site alteration.

The geotechnical engineering advice provided in this report is based on the factual observations made from the site investigations as reported. It is intended for use by the owner and their retained design team. If there are changes to the features of the development or to the scope, the interpreted subsurface information, geotechnical engineering design parameters, advice, and discussion on construction considerations may not be relevant or complete for the project. Grounded should be retained to review the implications of such changes with respect to the contents of this report.



5.3 Report Use

The authorized users of this report are Tenblock and their design team, for whom this report has been prepared. Grounded Engineering Inc. maintains the copyright and ownership of this document. Reproduction of this report in any format or medium requires explicit prior authorization from Grounded Engineering Inc.

The City of Toronto may also make use of and rely upon this report, subject to the limitations as stated.

6 Closure

If the design team has any questions regarding the discussion and advice provided, please do not hesitate to have them contact our office. We trust that this report meets your requirements at present.

For and on behalf of our team,

GROUNDED ENGINEERING

Jory/Hunte/, B.Sc.(Eng.), EIT

Geotechnical and Environmental Group

Jason Crowder, Ph.D., P.Eng.

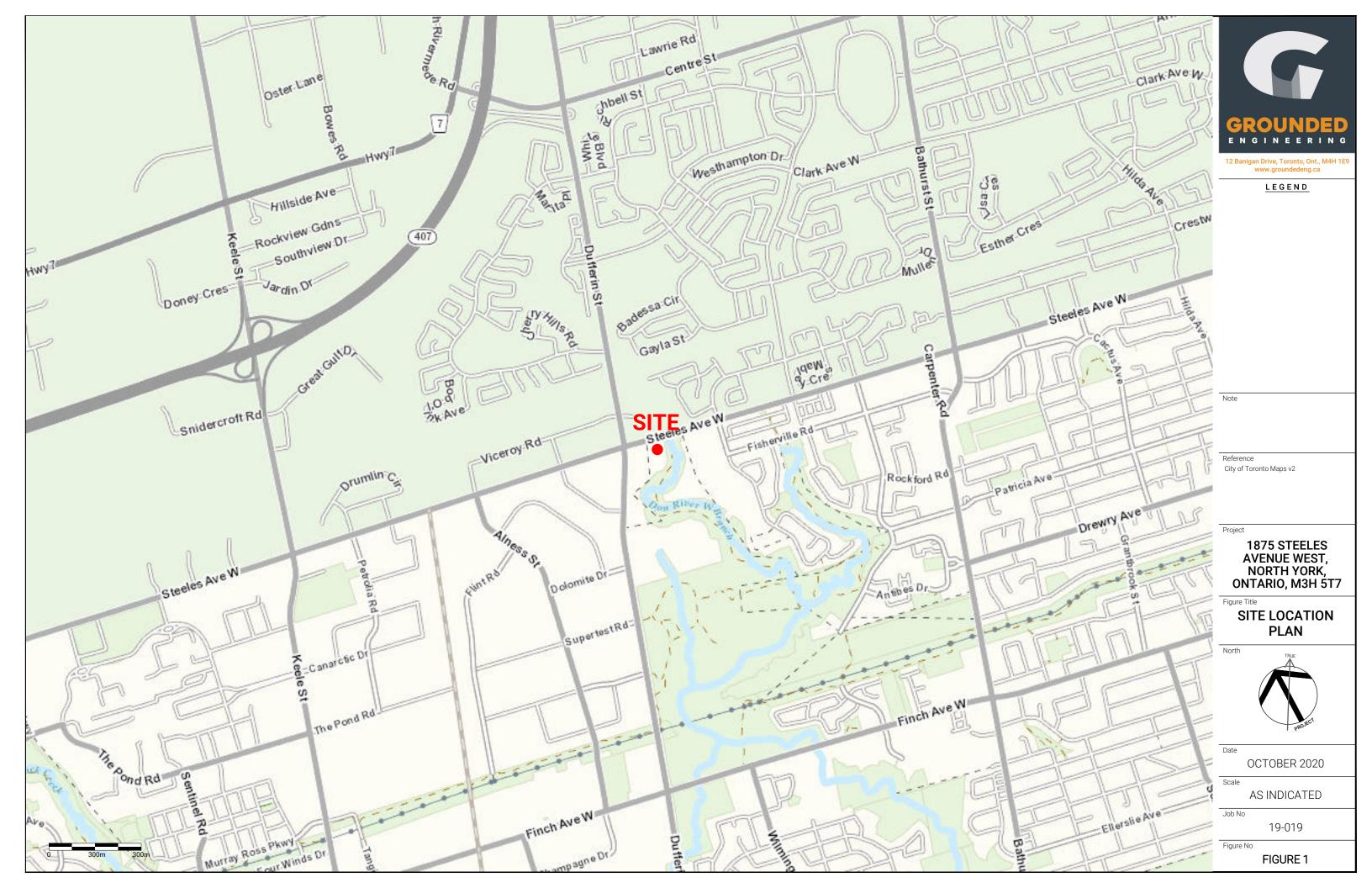
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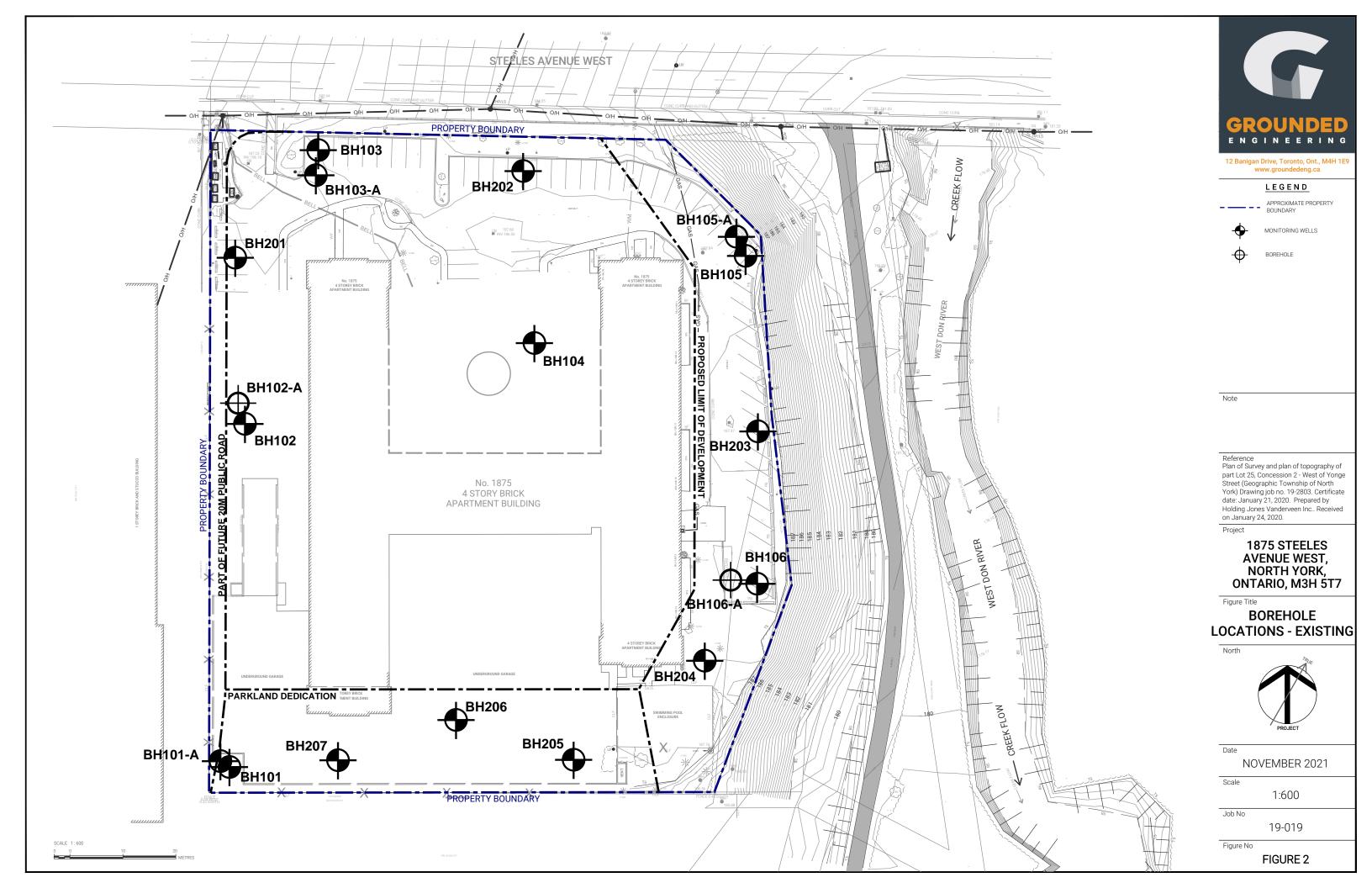
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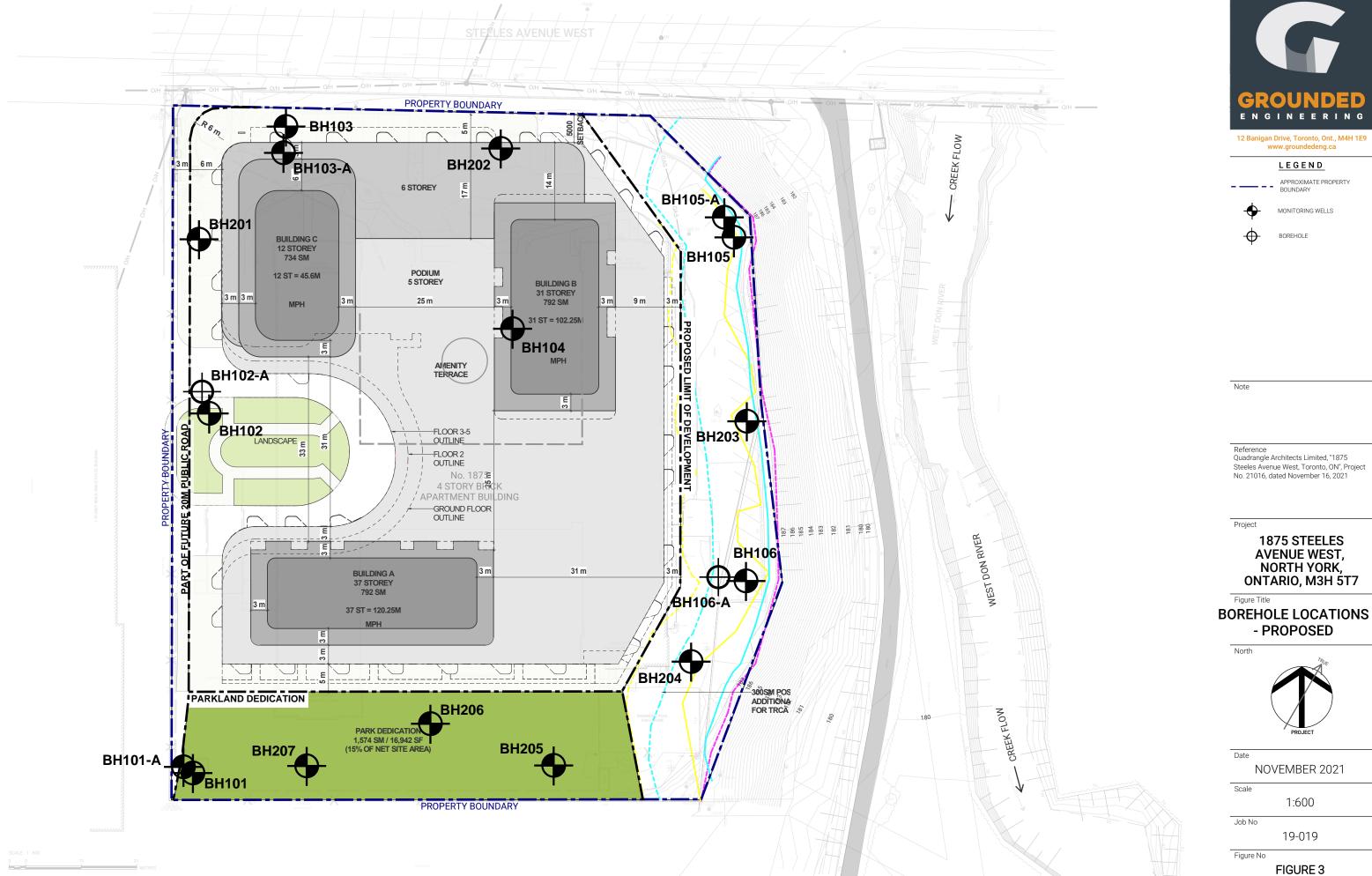
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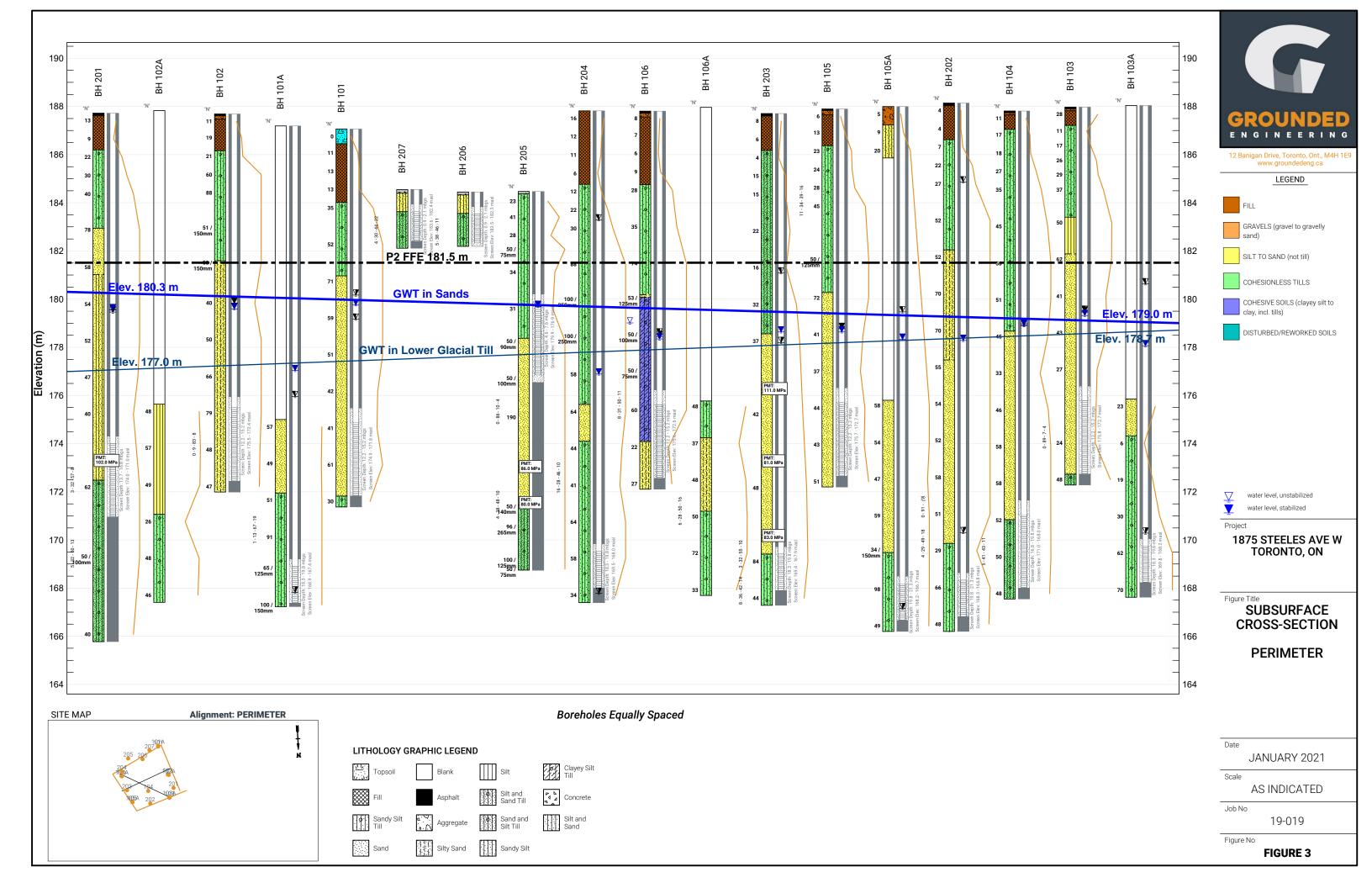












APPENDIX



APPENDIX A





SAMPLING/TESTING METHODS

SS: split spoon sample

AS: auger sample

GS: grab sample

FV: shear vane

DP: direct push

PMT: pressuremeter test

ST: shelby tube CORE: soil coring RUN: rock coring

SYMBOLS & ABBREVIATIONS

MC: moisture content

LL: liquid limit

PL: plastic limit

PI: plasticity index

y: soil unit weight (bulk)

G_s: specific gravity

S_{II}: undrained shear strength

∪ unstabilized water level

1st water level measurement

2nd water level measurement most recent

water level measurement

ENVIRONMENTAL SAMPLES

M&I: metals and inorganic parameters

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl VOC: volatile organic compound PHC: petroleum hydrocarbon

BTEX: benzene, toluene, ethylbenzene and xylene

PPM: parts per million

FIELD MOISTURE (based on tactile inspection)

MOIST: inferred pore water, not observable (i.e. grey, cool, etc.)

WET: visible pore water

DRY: no observable pore water

COMPOSITION Term % by weight trace silt <10 some silt 10 - 20 silt**y** 20 - 35sand **and** silt

COHESIONLESS				
Relative Density	N-Value			
Very Loose	<4			
Loose	4 - 10			
Compact	10 - 30			
Dense	30 - 50			
Very Dense	>50			

N-Value	Su (kPa)
<2	<12
2 - 4	12 - 25
4 - 8	25 - 50
8 - 15	50 - 100
15 - 30	100 - 200
>30	>200
	<2 2 - 4 4 - 8 8 - 15 15 - 30

ASTM STANDARDS

ASTM D1586 Standard Penetration Test (SPT)

>35

Driving a 51 mm O.D. split-barrel sampler ("split spoon") into soil with a 63.5 kg weight free falling 760 mm. The blows required to drive the split spoon 300 mm ("bpf") after an initial penetration of 150 mm is referred to as the N-Value.

ASTM D3441 Cone Penetration Test (CPT)

Pushing an internal still rod with a outer hollow rod ("sleeve") tipped with a cone with an apex angle of 60° and a cross-sectional area of 1000 mm² into soil. The resistance is measured in the sleeve and at the tip to determine the skin friction and the tip resistance.

ASTM D2573 Field Vane Test (FVT)

Pushing a four blade vane into soil and rotating it from the surface to determine the torque required to shear a cylindrical surface with the vane. The torque is converted to the shear strength of the soil using a limit equilibrium analysis.

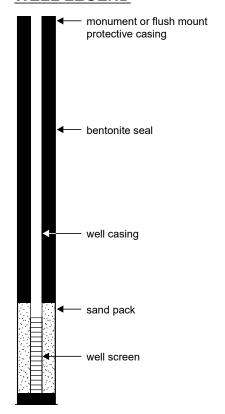
ASTM D1587 Shelby Tubes (ST)

Pushing a thin-walled metal tube into the in-situ soil at the bottom of a borehole, removing the tube and sealing the ends to prevent soil movement or changes in moisture content for the purposes of extracting a relatively undisturbed sample.

ASTM D4719 Pressuremeter Test (PMT)

Place an inflatable cylindrical probe into a pre-drilled hole and expanding it while measuring the change in volume and pressure in the probe. It is inflated under either equal pressure increments or equal volume increments. This provides the stress-strain response of the soil.

WELL LEGEND



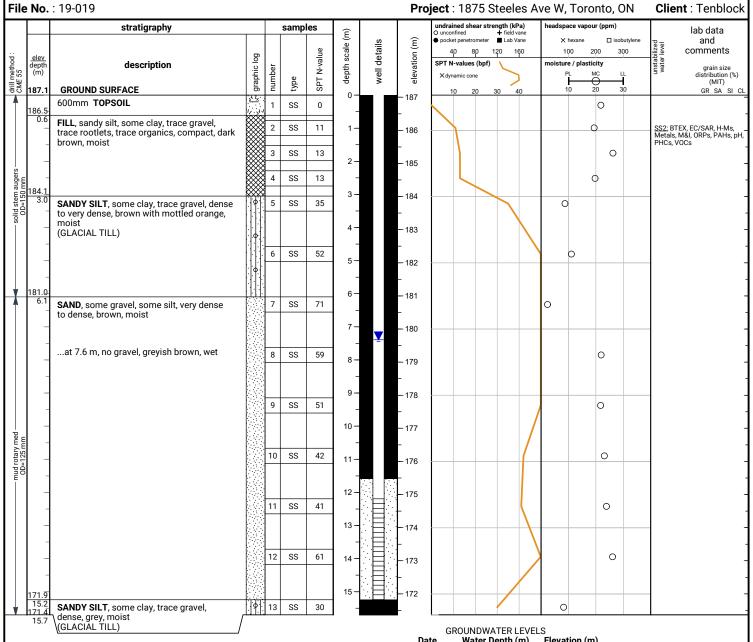


Date Started: Feb 6, 2020

Position: E: 623266, N: 4849289 (UTM 17T)

Elev. Datum: Geodetic

BOREHOLE LOG 101



END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.

50 mm dia. monitoring well installed. No. 10 screen

Date	Water Depth (m)	Elevation (m
Feb 10, 2020	7.9	179.2
Feb 18, 2020	6.9	180.2
Feb 25, 2020	6.9	180.2
Mar 11, 2020	6.9	180.2
Mar 25, 2020	6.8	180.3
Dec 11, 2020	7.4	179.8
Mar 17, 2021	7.4	179.7

Mar 17, 2021



Date Started: Nov 11, 2020

BOREHOLE LOG 101A Position: E: 623267, N: 4849288 (UTM 17T) Elev. Datum: Geodetic File No.: 19-019 Project: 1875 Steeles Ave W, Toronto, ON Client: Tenblock stratigraphy undrained shear strength (kPa)
O unconfined + field vane samples headspace vapour (ppm) lab data $\widehat{\Xi}$ pocket penetrometer Lab Vane ☐ isobutylene Ξ details depth scale 80 120 100 200 comments SPT N-value drill method: CME 55 elevation SPT N-values (bpf) moisture / plasticity description grain size distribution (%) (MIT) number X dynamic cone type **GROUND SURFACE** GR SA SI CL 40 Straight drilled to 12.2 m. See the borehole log for Borehole 101 for upper stratigraphy. 187 - 186 - 185 3 -- 184 - 183 5 -- 181 - 180 8 -- 179 - 178 10 -11-- 176 SAND, some silt, very dense to dense, SS 57 0 13 -2 SS 49 14 -× φ - 173 15-SILT, some clay, some sand, trace gravel, 3 51 SS \times 0 very dense, grey, moist (GLACIAL TILL) 16 -- 171 17 4 SS 91 1 13 67 19 - 170 18 - 169 φ 65/ SS 25mn 168 ..at 19.8 m, trace clay, wet 100 / 150mm **GROUNDWATER LEVELS END OF BOREHOLE** <u>Date</u> Nov 16, 2020 Water Depth (m) 10.3 Elevation (m) 176.9 Nov 18, 2020 18.4 168.8 Borehole was filled with drill water upon Dec 11, 2020 Dec 15, 2020 Jan 6, 2021 174.1 175.6 13.1 completion of drilling. 11.6 10.2 50 mm dia. monitoring well installed. Mar 17, 2021 10.3



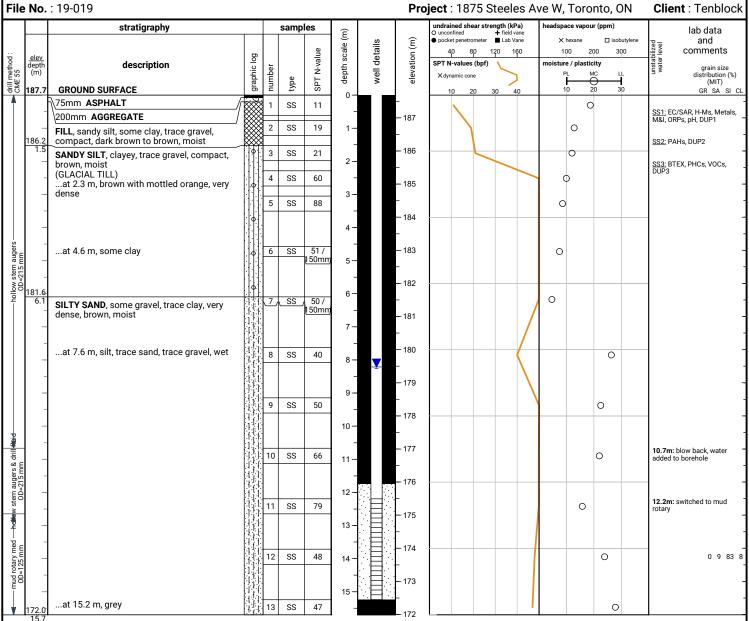
Date Started: Dec 17, 2019

Position: E: 623248, N: 4849353 (UTM 17T)

Elev. Datum: Geodetic

BOREHOLE LOG 102

Client: Tenblock Project: 1875 Steeles Ave W, Toronto, ON



END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.

50 mm dia. monitoring well installed. No. 10 screen

GROUNDWATER LEVELS				
<u>Date</u>	Water Depth (m)	Elevation (m)		
Feb 10, 2020	7.9	179.8		
Feb 18, 2020	7.9	179.8		
Feb 25, 2020	7.9	179.8		
Mar 11, 2020	7.8	179.9		
Mar 25, 2020	8.1	179.6		
Dec 11, 2020	8.1	179.6		
Jan 6, 2021	8.1	179.6		
Mar 17, 2021	8.2	179.5		



Date Started : Nov 12, 2020

Position: E: 623246, N: 4849354 (UTM 17T)

Elev. Datum : Geodetic

BOREHOLE LOG 102A

le	No.	: 19-019							Pro	ject : 1875		Ave W, 7	Foronto, (NC	Client : Tenblo
		stratigraphy			samp	les	Ē			undrained shear st	trength (kPa)	headspac	e vapour (ppm)		lab data
rruck-mounted rig	elev	deceriation	_{Sol}			SPT N-value	depth scale (m)	well details	elevation (m)	pocket penetromete 40 80 SPT N-values (bpf	r ■ Lab Vane 120 160	X he		butylene 100	and comments
K-1110	elev depth (m)	description	graphic log	number	a u	ž	epth	le (levat	X dynamic cone	<i>'</i>	PL		ų.	
1100	187.8	GROUND SURFACE	gra	п	type	SP	0-	>	Φ	10 20	30 40	10	MC I	1 30	(MIT) ` GR SA SI
	_	Straight drilled to 12.2 m. See the borehole log for Borehole 102 for upper stratigraphy.					-		-						
۰ _	_	log for borefiole 102 for upper stratigraphy.					1 –		- 187						
5 mn	_						l .		-						
)D=21							2-		- 186						
0D=215 mm							l		-						
							3 -		- 185						
									-						3.0m: switched to mud rotary
							4-		- 184						-
							-		-						
							5 –		– 183						
							_		-						
							6-		- 182						
							"		-						
							7-		– 181						
							'		-						
							8-		- 180						-
							0-		-						
							9 -		- 179						
							9-		-						
							10 -		– 178						-
							10		-						
							11-		– 177						
шш							''-		-						
=135।							12-		– 176						-
ÖD	175.6 12.2	SILT, trace sand, trace clay, dense to very	НΠ	1	SS	48	12-		-				0		
		dense, grey, wet		Ľ	33	40	13 –		- 175						
							13-		-						
		at 13.7 m, brown			00	57	14		- 174						-
				2	SS	5/	14 -		-				0		
							15		- 173						
		at 15.2 m, grey				40	15 -		-						
		.5 ,		3	SS	49	16-		- 172				0		
							16-		-						
	171.0 16.8	CANDY SILT come play trace group!	1 0	+			17		– 171						
		SANDY SILT, some clay, trace gravel, compact to dense, grey, wet		4	SS	26	17 –		-			9			
		(GLACIAL TILL)		1					– 170						
		at 18.3 m, wet, sand seams		1			18 –		-						
		at 10.5 m, wet, Saliu SeamS		5	SS	48			- 169)		
	_			!			19 –		_						
	-			L			_		 168						
		at 19.8 m, no sand seams, moist				1	20 -			1		, ,	0	1	

END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.



Date Started : Feb 5, 2020

Position: E: 623247, N: 4849404 (UTM 17T)

Elev. Datum : Geodetic

BOREHOLE LOG 103

File No.: 19-019 Project: 1875 Steeles Ave W, Toronto, ON Client: Tenblock

		stratigraphy		samp	les				undrained shear strength (kPa) O unconfined + field vane	headspace vapour (ppm)	lab data
						depth scale (m)	<u>0</u>	Ê	O unconfined → field vane → pocket penetrometer Lab Vane	X hexane ☐ isobutylene	l i l
	Ι.		.		e	Sale	well details	elevation (m)	40 80 120 160	100 200 300	mat team grain size distribution (%)
hod	depth	description $\frac{\delta}{\delta}$	[]		·va	h s	 8	atio	SPT N-values (bpf)	moisture / plasticity	vate grain size
met 55	(m)		l a	a)	<u>Ż</u>	ept	le le	lev3	X dynamic cone	PL MC LL	
drii	elev depth (m)	description ground surface	number	type	SPT N-value	0-	>	o o	10 20 30 40	10 20 30	(MIT) CR SA SI CL
A		75mm ASPHALT	X 1	SS	28] "-				0	
	187.2 0. <u>8</u>	75mm AGGREGATE	X			-		_			1
	0.0	FILL, gravelly sand, trace silt, trace asphalt,	2	SS	11	1-		 187		0	SS2: BTEX, EC/SAR, H-Ms, Metals, M&I, ORPs, PAHs, pH,
ers -	-	compact, brown, moist	3	SS	17	-		-		0	PHCs, VOCs
ang	-	SANDY SILT, trace clay, trace gravel, compact to dense, brown, moist	4	SS	26	2-		 186		0	
sterr =150	-	(GLACIAL TILL)		33	20	-		_			1
solid stem augers	_	at 2.0 m, brown with mottled orange	5	SS	29	3-		 185		0	
Ĭ		[:[-]	6	SS	37	1		_			
						1		404			
ΙŢ	-	[:[]				4 -		 184			1
X	183.4 4.6	SILT, trace clay, trace sand, very dense,	1 7	SS	50	-		_			1
	-	brown, moist	H		- 00	5-		- 183			1
	-					-		-			-
	181.9	L	Ш			6-		- 182			4
	6.1	SAND, some silt, trace clay, very dense to	8	SS	62] _		_		0	
		dense, brown, wet				7-		 181	/		
								101	/		
		at 7.6 m, silt and sand	9	SS	41	1		_	/		1
	_			+	· · ·	. 8-		 180			1 1
	-					-	· V	-			1
	-					9 -	-	 179			-
l ed c	-	at 9.1 m, trace silt, orange	10	SS	43			-		0	-
T Y	_					10 -		– 178			4
mud rotary med						_		_]
J H		at 10.7 m, compact, grey with orange	11	l SS	27	1,,		- 177			
						11-		177			
	-					-		Г			1
	-		_			12 -		- 176			1 1
	-		12	2 SS		-	l∷⊟∷	<u> </u> -			-
	-					13 -	目:	- 175			-
	_					-	I. ⊟∵	-			_
	l _	at 13.7 m, grey	13	3 SS	24	14 -		— 174			0 89 7 4
			\vdash			'¯].	L			
						l '	1.	170			1
	172.8					15 -		- 173			1
V	15.2 172.3	SILT AND SAND, trace clay, trace gravel, dense, grey, wet	14	\$ SS	48] -		ŀ		0	
1	15.7	(GLACIAL TILL)							GROUNDWATER LEVEL	9	
1		<u>'</u>						_	GROUNDWATER LEVEL	.5	

END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.

50 mm dia. monitoring well installed. No. 10 screen

GR	OUNDWATER LEVE	LS
<u>Date</u>	Water Depth (m)	Elevation (m)
Feb 10, 2020	8.5	179.5
Feb 18, 2020	8.6	179.4
Feb 25, 2020	8.6	179.4
Mar 11, 2020	8.4	179.6
Mar 25, 2020	8.4	179.6
Dec 11, 2020	8.7	179.3
Mar 17, 2021	8.8	179.2



Date Started: Nov 6, 2020

Position: E: 623247, N: 4849403 (UTM 17T)

Elev. Datum: Geodetic

BOREHOLE LOG 103A

File No.: 19-019 Project: 1875 Steeles Ave W, Toronto, ON Client: Tenblock undrained shear strength (kPa)
O unconfined + field vane stratigraphy samples headspace vapour (ppm) lab data $\widehat{\Xi}$ pocket penetrometer Lab Vane ☐ isobutylene Ξ details scale 80 120 100 200 comments SPT N-value drill method: CME 55 elevation SPT N-values (bpf) moisture / plasticity description depth grain size distribution (%) (MIT) number X dynamic cone type 188.0 **GROUND SURFACE** GR SA SI CL 40 0 188 Straight drilled to 12.2 m. See the borehole log for Borehole 103 for upper stratigraphy. - 187 **-** 186 3 -- 185 - 184 5 -- 183 - 182 - 181 8 -- 180 - 179 10 -- 178 11 -**-** 176 SAND, some silt, trace clay, compact, SS 23 0 brown, wet 13 -- 175 SANDY SILT, clayey, trace gravel, firm, grey, 2 6 14 -0 (GLACIAL TILL) 15 -- 173 ...at 15.2 m, very stiff 3 19 SS 0 $\mathbf{m} \times$ 16 -...at 16.8 m, some clay, dense to very dense 17 4 - 171 SS 30 0 18 - 170 ...at 18.3 m, coarse wet sand seams 5 SS 62 d - 169 ...at 19.8 m, no sand seams, moist 20 168 6 SS 70 **GROUNDWATER LEVELS END OF BOREHOLE** Water Depth (m) 7.5 17.8 <u>Date</u> Elevation (m) Nov 16, 2020 Nov 18, 2020 180.6 170.2 Borehole was filled with drill water upon completion of drilling. 10.0

50 mm dia. monitoring well installed. No. 10 screen

Dec 15, 2020 10.3 177.7 Jan 6, 2021 Mar 17, 2021 10.0 178.0 178.1

Page 1 of 1 Tech: GM | PM: JH | Rev: MD



Date Started: Feb 3, 2020

Position: E: 623293, N: 4849387 (UTM 17T)

BOREHOLE LOG 104

Elev. Datum: Geodetic File No.: 19-019 Client: Tenblock Project: 1875 Steeles Ave W, Toronto, ON stratigraphy samples undrained shear strength (kPa)
unconfined + field vane headspace vapour (ppm) lab data $\widehat{\Xi}$ pocket penetrometer Lab Vane ☐ isobutylene Ξ details scale 80 120 100 200 comments SPT N-value elevation SPT N-values (bpf) moisture / plasticity description graphic l number grain size distribution (%) (MIT) depth X dynamic cone type 187.8 **GROUND SURFACE** GR SA SI CI 0 75mm **ASPHALT** 1 11 SS 0 75mm **AGGREGATE** 187.0 - 187 3.0 17 FILL, sandy silt, some clay, trace gravel, compact, brown with dark brown, moist 2 SS 0 SS2: BTEX, EC/SAR, H-Ms, Metals, M&I, ORPs, PAHs, pH, PHCs, VOCs SANDY SILT, some clay, trace gravel, compact to dense, brown, moist 3 SS 18 0 - 186 (GLACIAL TILL) 4 SS 27 0 ...at 2.3 m, brown with orange - 185 3 -5 SS 35 0 solid stem a ...at 4.6 m, grey with orange 6 SS 45 0 - 183 5 — 6 – 0 ...at 6.1 m, very dense, brown 7A 50 ...at 6.4 m, grey - 181 8 SS 51 - 180 0 8 -9 -45 SAND, some silt, dense to very dense, 9 SS 0 brown, wet - 178 10 -- 177 10 SS 33 0 11-- 176 11 SS 46 0 - 175 13 -- 174 0 ...at 13.7 m, silty 58 14 -0 ...at 13.9 m, sandy silt glacial till seam - 173 15 -13 SS 58 0 171 0 52 0 SAND AND SILT, some clay, trace gravel, dense to very dense, brown and grey, wet (GLACIAL TILL) 18 ...at 18.3 m, silty sand, with wet sand seams, 15 50 5 41 43 11 SS ю grey 169 ...at 19.8 m, sandy silt 20 SS 48 GROUNDWATER LEVELS

Water Depth (m) Elevation (m)
20 9.0 178.8 **END OF BOREHOLE** Date Feb 10, 2020 Borehole was filled with drill water upon Feb 18, 2020 8.9 178.9 Feb 25, 2020 Mar 11, 2020 completion of drilling. 8.8 179.0 179.1 8.7 Mar 25, 2020 50 mm dia. monitoring well installed. 8.8 Nov 18, 2020 178.7 No. 10 screen Dec 11, 2020 178.9 8.9

Jan 6, 2021 8.9 178.9



Date Started: Dec 19, 2019

Position: E: 623330, N: 4849410 (UTM 17T)

Elev. Datum: Geodetic

BOREHOLE LOG 105

File No.: 19-019 Project: 1875 Steeles Ave W, Toronto, ON Client: Tenblock undrained shear strength (kPa)
O unconfined + field vane headspace vapour (ppm) stratigraphy samples lab data

						e e	depth scale (m	ails	elevation (m)	pocket penetrometer Lab Vane 40 80 120 160	X hexane	□ isobutylene 00 300	and □ and □ comments
thod	elev depth (m) 187.9	description	graphic log	 -		SPT N-value	th sc	well details	atior	SPT N-values (bpf)	moisture / plastic	eity	- <u>e</u> -
II me	(m)		aphi	number	type	N F	deb	we	elev	X dynamic cone	PL M	1C LL 20 30	grain size distribution (%) (MIT)
₽Ş	187.9	GROUND SURFACE	5	=			0-			10 20 30 40		20 30	GR SA SI CL
Ιĵ		60mm ASPHALT		1	SS	6	_		_		0		<u>SS1:</u> M&I
		165mm AGGREGATE	\bowtie	2	SS	13	1-		 187				1 4
	186. <u>4</u> 1.5	FILL, sandy silt, some gravel, trace clay, loose, grey and dark brown, moistat 0.8 m, trace gravel, brown, compact	\bigotimes	3	SS	23	<u> </u>		-				SS2: BTEX, EC/SAR, H-Ms, Metals, ORPs, PAHs, pH, PHCs, VOCs
	-	SAND AND SILT, some clay, some gravel,		1			2-		 186				
solid stem augers	-	compact, brown, moist (GLACIAL TILL)		4	SS	24	3-		- 185		0		1
sten D=15				. 5	SS	28			_		0		
solid	1 1	.00					1 1		- 184				
	l T	at 3.8 m, dense		6	SS	45	4 -		- 104		0-	-	11 34 39 16
				•			-		_				-
	-			.]			5 —		 183				-
	-			:			-		-				1
V							6-		- 182				
1		at 6.1 m, sandy silt		7	SS	50 / 125mm			-		0		-
				-			7-		 181				_
	100 0						'-		_				
	180.3 7.6	SAND, some silt, dense to very dense,		8	SS	72	1 1		 180			0	
	l	brown, wet		-	- 00		8 –		- 160				
	-						-		_	/			-
	-						9 –	<u>_</u>	- 179	/			1
	-			9A 9B	SS	41	_	<u>-</u>	_			0	-
	▎╶╽						10 -		- 178				-
E E									_				_
mud rotary small	1 1			10	SS	37	١ ا		– 177			0	
d rot	lī			H		-	11 –						
I E	1 1						-	(1)					
	-			_			12 -		176				1
	-			11	SS	44	-		1		0		-
	-						13 -		175				-
							4		}				-
	▎▕			12	SS	43	14		174			0	4
]					 	'	目	1			_	
	1								173				
				_			15 —		1/3				
₩.	172.2			13	SS	51] -					D	
I	15.7										_		

END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.

50 mm dia. monitoring well installed. No. 10 screen

GF	ROUNDWATER LEVE	LS
te	Water Depth (m)	Elevation (m)
, 2020	9.2	178.7
2020	9.2	178 7

GR

Date

Feb 10, 2020
Feb 18, 2020
Feb 25, 2020
Mar 11, 2020
Mar 25, 2020
Nov 18, 2020
Dec 11, 2020
Mar 17, 2021 178.8 179.0 178.8 9.2 8.9 9.1 9.3 9.2 9.3 178.6 178.7 178.6



Date Started: Nov 3, 2020

Position: E: 623329, N: 4849410 (UTM 17T)

BOREHOLE LOG 105A

Elev. Datum: Geodetic File No.: 19-019 Project: 1875 Steeles Ave W, Toronto, ON Client: Tenblock stratigraphy samples undrained shear strength (kPa)
O unconfined + field vane headspace vapour (ppm) lab data $\widehat{\Xi}$ pocket penetrometer Lab Vane ☐ isobutylene Ξ details scale 80 120 100 200 comments SPT N-value elevation SPT N-values (bpf) moisture / plasticity description number depth grain size distribution (%) (MIT) X dynamic cone type 188.0 **GROUND SURFACE** GR SA SI CI 0 760mm AGGREGATE 1 5 SS SS1: Metals, (CrVI Only) 3.0 - 187 SANDY SILT, trace clay, trace gravel, loose, 2 9 SS 0 brown with mottled orange, moist (GLACIAL TILL) SS2: Metals, (CrVI Only) 3 SS 20 ...at 1.5 m, compact 0 출 등 185.9 2.1 SS3: Metals, (CrVI Only) Straight drilled from 2.1 m to 12.2 m. See the borehole log for Borehole 105 for upper stratigraphy. - 185 3 -- 184 - 183 5 -- 182 - 181 **-** 180 8 -10 -- 178 - 177 11 -4 58 0 SAND, some silt, trace clay, very dense to SS dense, brown, wet - 175 13 -5 SS 54 14 -- 173 15 -6 SS 47 0 16 --172 ...at 16.8 m, grey 7 SS 59 17 -0 - 170 18 -34 / 0 SS 8 18.5 50mn SANDY SILT, some clay, trace gravel, dense to very dense, grey, moist (GLACIAL TILL) -168 9 SS 98 20 21 167 SS **END OF BOREHOLE GROUNDWATER LEVELS** Elevation (m) <u>Date</u> Water Depth (m) 8.6

Borehole was filled with drill water upon completion of drilling.

50 mm dia. monitoring well installed. No. 10 screen

Nov 16, 2020 Nov 18, 2020 179.4 167.1 20.9 Dec 11, 2020 Dec 15, 2020 9.9 9.7 178.1 178.3 178.7 Jan 6, 2021 93 Mar 17, 2021 9.3 178.7



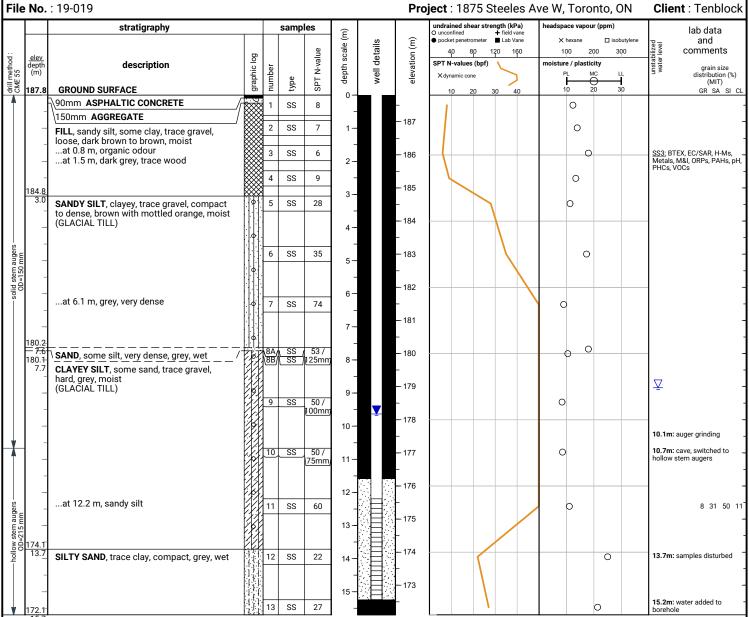
Date Started: Dec 16, 2019

Position: E: 623351, N: 4849351 (UTM 17T)

Elev. Datum : Geodetic

BOREHOLE LOG 106

Project: 1875 Steeles Ave W, Toronto, ON Client: Tenblock



END OF BOREHOLE

Unstabilized water level measured at 8.8 m below ground surface; caved to 15.7 m below ground surface upon completion of

50 mm dia. monitoring well installed. No. 10 screen

GR	OUNDWATER LEVE	LS
<u>Date</u>	Water Depth (m)	Elevation (m)
Jan 3, 2020	9.3	178.5
Jan 31, 2020	9.4	178.4
Feb 18, 2020	9.5	178.3
Feb 25, 2020	9.5	178.3
Mar 11, 2020	9.2	178.6
Mar 25, 2020	9.5	178.3
Nov 18, 2020	9.3	178.5
Dec 11, 2020	9.6	178.3
Jan 6, 2021	9.5	178.3
Mar 17, 2021	9.6	178.2



Date Started: Nov 2, 2020

Position: E: 623350, N: 4849352 (UTM 17T)

Elev. Datum : Geodetic

BOREHOLE LOG 106A

File No.: 19-019 Project: 1875 Steeles Ave W, Toronto, ON Client: Tenblock

		stratigraphy		sam	oles	(undrained shear st O unconfined	rength (kPa)	headspace vapo	our (ppm)		lab data
						depth scale (m)	<u>s</u> (E	pocket penetrometer	Tield vane Lab Vane	× hexane	☐ isobutylene	R =	and
	elev		g		<u>e</u>	cale	etai	40 80	120 160	100	200 300	bilize r leve	comments
2 2 2	depth	description	9	ē	-\-\-	ş	well details elevation (m)	SPT N-values (bpf)		moisture / plas	-	unstabilized water level	grain size distribution (%)
II me	elev depth (m)		graphic log	number	SPT N-value	ф	we ele	X dynamic cone		PL ———	MC LL 20 30	3 -	distribution (%) (MIT)
투	188.0	GROUND SURFACE	g	로 호	S	0 -		10 20	30 40	10	20 30	<u> </u>	GR SA SI CL
1	_	Straight drilled to 12.2 m. See the borehole log for Borehole 106 for upper stratigraphy.					L						
jers.		log for boreliole 100 for apper stratigraphy.					- 187						
mm						1-	- 107						
-hollow stem augers- 0D=215 mm	-					1 1	T T						
Mo OD	-					2-	- 186					1	
- hc	-					1 4	-						
V	_					3 -	- 185						
A							L						
							101						
	_					4 -	- 184					1	
	-					-	-						
	_					5 —	- 183						
	-						-						
	_					6-	- 182					4	
							1.04						
	_					7-	- 181						
	-					1 1	F						
	_					8 –	- 180					-	
	-					-	-						
	_					9	- 179						
							L						
						40	- 178						
						10 —	176						
	-					1							
₽ 	-					11 -	- 177						
otary 35 m	-					-	-						
ud re	175.8° 12.2					12 -	- 176					-	
1	12.2	SANDY SILT some clay trace gravel grey	φ.	1 SS	48					x o			
		i Chito i Cie, Some Ciay, mace graver, grey	11.14				—		_ /L	P			
		wet sand seams, hard, grey, moist				12	175		/'				
	-	wet sand seams, hard, grey, moist (GLACIAL TILL)				13 –	175						
	- 174.3 13.7	wet sand seams, hard, grey, moist (GLACIAL TILL)	0			-	-						
	- 174.3 13.7	wet sand seams, hard, grey, moist (GLACIAL TILL)	0	2 SS	37	13 -	- 175 - - 174			x 0	0		
	- 174.3 13.7 -	wet sand seams, hard, grey, moist (GLACIAL TILL)	0		37	-	-				0		
	- 174.3 13.7 - -	wet sand seams, hard, grey, moist (GLACIAL TILL)	0		37	-	-				0		
	- 174.3 13. <u>7</u> - -	wet sand seams, hard, grey, moist (GLACIAL TILL) SILTY SAND, trace clay, dense, grey, wet		2 SS		- 14 - -	- 174 -				0		
	174.3 13.7 - -	wet sand seams, hard, grey, moist (GLACIAL TILL) SILTY SAND, trace clay, dense, grey, wet		2 SS		14 — - 15 —	- - 174 - - 173				0		
	- 174.3 13.7 - - -	wet sand seams, hard, grey, moist (GLACIAL TILL) SILTY SAND, trace clay, dense, grey, wet		2 SS		- 14 - -	- 174 -				0		
	- - - - 171 2	wet sand seams, hard, grey, moist (GLACIAL TILL) SILTY SAND, trace clay, dense, grey, wet		2 SS 3 SS	48	14 — 15 — 16 —	- - 174 - - 173 - - 172			x	0	-	
	-	wet sand seams, hard, grey, moist (GLACIAL TILL) SILTY SAND, trace clay, dense, grey, wet		2 SS		14 — - 15 —	- - 174 - - 173				0	_	6 28 50 16
	- - - - 171 2	wet sand seams, hard, grey, moist (GLACIAL TILL) SILTY SAND, trace clay, dense, grey, wet		2 SS 3 SS	48	14 — 15 — 16 —	- - 174 - - 173 - - 172			x	0	-	6 28 50 16
	- - - - 171 2	wet sand seams, hard, grey, moist (GLACIAL TILL) SILTY SAND, trace clay, dense, grey, wet SANDY SILT, some clay, trace gravel, dense to very dense, grey, moist (GLACIAL TILL)		2 SS 3 SS	48	14 — 15 — 16 —	- - 174 - - 173 - - 172			x	0	-	6 28 50 16
	- - - - 171 2	wet sand seams, hard, grey, moist (GLACIAL TILL) SILTY SAND, trace clay, dense, grey, wet SANDY SILT, some clay, trace gravel, dense to very dense, grey, moist (GLACIAL TILL)	Φ	2 SS 3 SS 4 SS	48	14 — 15 — 16 — 17 —	- -174 - -173 - -172 - -171			x	0	-	6 28 50 16
	- - - - 171 2	wet sand seams, hard, grey, moist (GLACIAL TILL) SILTY SAND, trace clay, dense, grey, wet SANDY SILT, some clay, trace gravel, dense to very dense, grey, moist (GLACIAL TILL)		2 SS 3 SS	48	- 14 - - 15 - - 16 - - 17 - - 18 -	- -174 - -173 - -172 - -171 - -170			» × • ОН	0		6 28 50 16
	- - - - 171 2	wet sand seams, hard, grey, moist (GLACIAL TILL) SILTY SAND, trace clay, dense, grey, wet SANDY SILT, some clay, trace gravel, dense to very dense, grey, moist (GLACIAL TILL)	Φ	2 SS 3 SS 4 SS	48	14 — 15 — 16 — 17 —	- -174 - -173 - -172 - -171			» × • ОН	0		6 28 50 16
	- - - - 171 2	wet sand seams, hard, grey, moist (GLACIAL TILL) SILTY SAND, trace clay, dense, grey, wet SANDY SILT, some clay, trace gravel, dense to very dense, grey, moist (GLACIAL TILL)	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2 SS 3 SS 4 SS	48	- 14 - - 15 - - 16 - - 17 - - 18 -	- -174 - -173 - -172 - -171 - -170			» × • ОН	0	-	6 28 50 16

END OF BOREHOLE

Borehole was filled with drill water upon completion of drilling.



Date Started: Nov 10, 2020

Position: E: 623237, N: 4849383 (UTM 17T)

Elev. Datum: Geodetic

BOREHOLE LOG 201

File No.: 19-019 Client: Tenblock Project: 1875 Steeles Ave W, Toronto, ON undrained shear strength (kPa)
unconfined + field vane stratigraphy samples headspace vapour (ppm) lab data $\widehat{\Xi}$ pocket penetrometer Lab Vane ☐ isobutylene Ξ details scale 40 80 120 100 200 comments SPT N-value drill method: elevation SPT N-values (bpf) moisture / plasticity description number grain size depth distribution (%) (MIT) X dynamic cone type 187.7 **GROUND SURFACE** GR SA SI CI 0 100mm ASPHALT 1 13 SS 0 FILL, silt and sand, some clay, trace gravel, trace organics, compact to loose, dark 2 9 SS 0 SS2: EC/SAR, H-Ms, Metals, M&I, ORPs, pH brown to brown, moist ...at 0.8 m, trace rootlets - 186 22 3 SS O SANDY SILT, trace clay, trace gravel, SS3: BTEX, PHCs compact to dense, brown with mottled orange, moist (GLACIAL TILL) 4 30 SS 0 - 185 3 -5 SS 40 φ SS5: EC/SAR, H-Ms, Metals, M&I, ORPs, pH, DUP4 - 184 182.9 4.<u>8</u> 0 ...at 4.6 m, greyish brown, very dense 6A 6B - 183 SS 78 0 5 — SAND, trace silt, very dense, light brown, dry - 182 6 – 7 58 SS O 181.0 6.7 SS7: BTEX, PHCs, DUP5 - 181 SILTY SAND, trace clay, very dense to dense, brown, wet - 180 8 SS 54 $\mathbf{d} \times$ 0 8 -V - 179 9 -9 SS 52 0 10 -10 SS 47 h 11-- 176 ...at 12.2 m, grey 11 SS 40 0 13 174 PMT@173.4 m: 102 MPa РМТ - 173 15 SANDY SILT, trace clay, trace gravel, very 12 62 SS 0 3 32 57 8 dense, grey, moist (GLACIAL TILL) 172 16 171 17.4m: PMT conducted, disturbed test result to 2 PMT 18.3m 18 -50 / 13 SS фн ...at 18.3 m, some clay 5 32 50 13 - 169 - 168 20 -20.4m: PMT attempted, equipment failure to 21.3m - 167 3 РМТ 21 -SS 40 166 GROUNDWATER LEVELS END OF BOREHOLE <u>Date</u> Water Depth (m) Elevation (m) Nov 16, 2020 179.5 179.4 8.3 Borehole was filled with drill water upon Nov 18, 2020 Dec 11, 2020 Dec 15, 2020 8.2 179.5 179.5 completion of drilling. 50 mm dia. monitoring well installed. Jan 6, 2021 8.2 179.5 Mar 17, 2021 No. 10 screen 8.3 179.4



Date Started: Nov 4, 2020

Position: E: 623290, N: 4849415 (UTM 17T)

Elev. Datum: Geodetic

BOREHOLE LOG 202

File No.: 19-019 Project: 1875 Steeles Ave W, Toronto, ON Client: Tenblock stratigraphy samples undrained shear strength (kPa)
unconfined + field vane headspace vapour (ppm) lab data $\widehat{\Xi}$ pocket penetrometer Lab Vane ☐ isobutylene Ξ details scale 80 120 100 200 comments SPT N-value drill method: CME 55 elevation SPT N-values (bpf) moisture / plasticity description graphic I number grain size depth distribution (%) (MIT) X dynamic cone type 188.1 **GROUND SURFACE** 20 GR SA SI CI 0 188 100mm ASPHALT 1 4 0 SS FILL, sand and silt, trace clay, trace gravel, loose, dark brown, moist 2 4 SS 0 SS2: EC/SAR, H-Ms, Metals, M&I, ORPs, pH ...at 0.8 m, wet 186.6 1.5 **SANDY SILT**, trace clay, trace gravel, loose to compact, brown with mottled orange, 7 3 SS 0 SS3: BTEX, PHCs - 186 moist to wet 4 22 (GLACIAL TILL) SS ...at 2.3 m, some clay 3 -- 185 5 SS 27 SS5: EC/SAR, H-Ms, Metals, M&I, ORPs, pH, DUP2 - 184 ...at 4.6 m, very dense 6 SS 52 0 5 -- 183 182.0 6.1 6 – - 182 SILTY SAND, trace clay, trace gravel, very 7 52 SS 0 SS7: BTEX, PHCs dense, brown, wet - 181 ...at 7.6 m, moist 8 SS 70 0 8 -- 180 9 – - 179 ...at 9.1 m, wet 9 SS 70 0 Ţ 10 -- 178 10.7 SAND, trace silt, trace clay, very dense, 10 SS 55 0 11 brown with orange, wet - 176 11 SS 54 0 13 -- 175 ...at 13.7 m, grey 12 SS 52 14 -C - 174 15 -- 173 ...at 15.2 m, silt seams 13 58 SS 0 16 -17 14 SS 51 0 0 91 (9)_ - 171 18 - 170 18.3 SANDY SILT, some clay, trace gravel, SS 29 4 29 49 18compact, grey, wet (GLACIAL TILL) ...at 19.8 m, dense to very dense 20 SS 16 66 168 21 167 SS 48 0 GROUNDWATER LEVELS **END OF BOREHOLE** <u>Date</u> Water Depth (m) Elevation (m) Nov 16, 2020 3.3 17.9 184.8 170.2 Borehole was filled with drill water upon Nov 18, 2020 Dec 11, 2020 Dec 15, 2020 174.9 13.2 completion of drilling. 50 mm dia. monitoring well installed. Jan 6, 2021 9.9 178.2 Mar 17, 2021 No. 10 screen 9.7 178.4



Date Started: Nov 9, 2020

Position: E: 623340, N: 4849383 (UTM 17T)

Elev. Datum: Geodetic

BOREHOLE LOG 203

File No.: 19-019 Client: Tenblock Project: 1875 Steeles Ave W, Toronto, ON undrained shear strength (kPa) stratigraphy samples headspace vapour (ppm) lab data $\widehat{\Xi}$ pocket penetrometer Lab Vane ☐ isobutylene Ξ details scale 40 80 120 100 200 comments SPT N-value drill method: CME 55 elevation SPT N-values (bpf) moisture / plasticity description number grain size depth distribution (%) (MIT) X dynamic cone type 187.7 **GROUND SURFACE** GR SA SI CI 0 75mm ASPHALT 1 8 SS 0 FILL, sandy silt, trace clay, trace gravel, trace organics, loose, dark brown to 2 6 SS 0 SS2: EC/SAR, H-Ms, Metals, M&I, ORPs, pH brownish orange, moist 186.2 1.5 ...at 0.8 m, moist to wet - 186 4 3 SS 0 SILT AND SAND, trace clay, trace gravel, SS3: BTEX, PHCs loose, brown with mottled orange, moist (GLACIAL TILL) 4 15 SS h - 185 ...at 2.3 m, sandy silt, compact, grey with 3 mottled orange 5 SS 15 0 SS5: EC/SAR, H-Ms, Metals, M&I, ORPs, pH -1836 SS 22 0 5 — - 182 6 – ...at 6.1 m, clayey, grey, wet, very stiff 7 SS 16 h SS7: BTEX, PHCs, DUP3 - 181 -- 180 ...at 7.6 m, sand and silt, trace clay, dense 8 SS 32 0 8 -- 179 Ţ 9 -SAND, some silt, trace clay, dense, grey, 9 SS 37 O wet - 178 10 -- 177 11-PMT@176.4 m: 111 MPa 1 РМТ - 176 ...at 12.2 m, silty 10 SS 42 0 - 175 13 -- 174 PMT@173.4 m: 81 MPa 2 PMT — 173 15 -11 48 SS 0 16 -- 171 17 PMT@170.3 m: 83 MPa - 170 3 PMT 18 SILT AND SAND, some clay, trace gravel, very dense to dense, grey, moist 18.3 12 84 3 32 55 10_ SS 0 - 169 (GLACIAL TILL) 168 20 SS 44 φ 8 36 42 14 **GROUNDWATER LEVELS END OF BOREHOLE Date** Water Depth (m) Elevation (m) Nov 16, 2020 Nov 18, 2020 181.0 178.2 6.7 Borehole was filled with drill water upon 9.6 completion of drilling. Dec 15, 2020 9.1 178.6 50 mm dia. monitoring well installed. Jan 6, 2021 Mar 17, 2021 9.1 178.6 178.6 No. 10 screen



Date Started: Nov 5, 2020

Position: E: 623350, N: 4849341 (UTM 17T)

Elev. Datum: Geodetic

BOREHOLE LOG 204

File No.: 19-019 Client: Tenblock Project: 1875 Steeles Ave W, Toronto, ON stratigraphy samples undrained shear strength (kPa)
unconfined + field vane headspace vapour (ppm) lab data $\widehat{\Xi}$ pocket penetrometer Lab Vane ☐ isobutylene Ξ details scale 80 120 100 200 comments SPT N-value elevation SPT N-values (bpf) moisture / plasticity description number grain size depth distribution (%) (MIT) X dynamic cone **GROUND SURFACE** GR SA SI CI 0 FILL, silty sand, some clay, trace gravel, trace rootlets, compact, dark brown to 1 16 φ SS brown, moist 2 12 SS 0 SS2: EC/SAR, H-Ms, Metals, M&I, ORPs, pH ...at 1.5 m, brown with orange 3 11 SS **-** 186 SS3: BTEX, PHCs ...at 2.3 m, moist to wet 4 6 0 SS - 185 184.<u>8</u> 3.0 3 -SANDY SILT, trace clay, trace gravel, compact to dense, brown with mottled 5 SS 12 0 - 184 orange, moist to wet (GLACIAL TILL) 6 22 0 SS6: EC/SAR, H-Ms, Metals, M&I, ORPs, pH ...at 3.8 m, brown with grey, some clay ...at 4.6 m, greyish brown with mottled -- 183 7 SS 30 0 orange 5 -6 – ...at 6.1 m, grey, very dense 8 SS 88 0 SS8: BTEX. PHCs - 181 9 SS - 180 8 – 250mr 9 -100 / 10 SS 250mr - 178 10 -- 177 11 SS 58 0 11 -- 176 SAND, some silt, trace clay, trace gravel, 12 SS 64 0 very dense, grey, wet - 175 13 -- 174 SANDY SILT, some gravel, some clay, 13 44 14 ф× ЮН dense to very dense, grey, moist (GLACIAL TILL) 15 -...at 15.2 m, wet sand seams 14 41 SS OH 16 28 46 10 16 -- 171 17 15 SS 64 0 18 16 SS 58 þ - 169 168 20 SS 34 0 **GROUNDWATER LEVELS END OF BOREHOLE Date** Water Depth (m) Elevation (m) Nov 16, 2020 Nov 18, 2020 4.6 19.1 183.2 168.7 Borehole was filled with drill water upon 12.8 completion of drilling. Dec 15, 2020 12.3 175.5 50 mm dia. monitoring well installed. Jan 6, 2021 Mar 17, 2021 11.0 176.8

Page 1 of 1

No. 10 screen

Tech: GM | PM: JH | Rev: MD



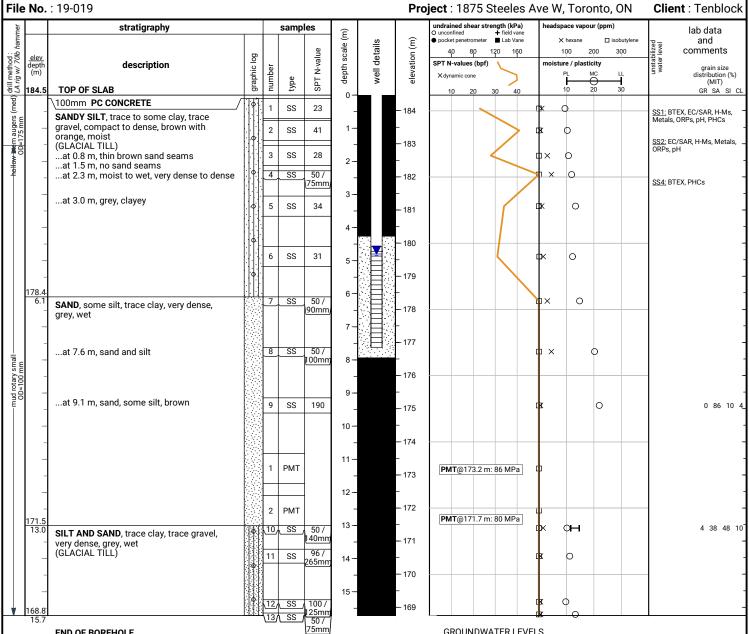
Date Started: Dec 14, 2020

Position: E: 623334, N: 4849313 (UTM 17T)

Elev. Datum: Geodetic

BOREHOLE LOG 205

Client: Tenblock Project: 1875 Steeles Ave W, Toronto, ON headspace vapour (ppm)



END OF BOREHOLE Wash boring refusal

Borehole was filled with drill water upon completion of drilling.

50 mm dia. monitoring well installed. No. 10 screen

GROUNDWATER LEVELS <u>Date</u> Dec 18, 2020 Water Depth (m) Elevation (m) 182.9 1.6 Jan 6, 2021 4.8 179.7 Mar 17, 2021 179.7

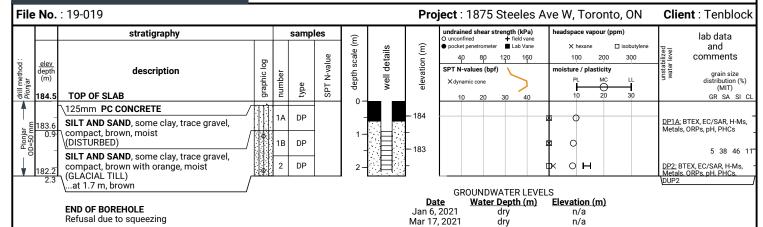


Date Started: Dec 16, 2020

Position: E: 623303, N: 4849316 (UTM 17T)

Elev. Datum: Geodetic

BOREHOLE LOG 206



Dry and open upon completion of drilling.

38 mm dia. monitoring well installed.

file: 19-019 1875 steeles ave w v2.gpj

Page 1 of 1 Tech: DK | PM: JH | Rev: MD



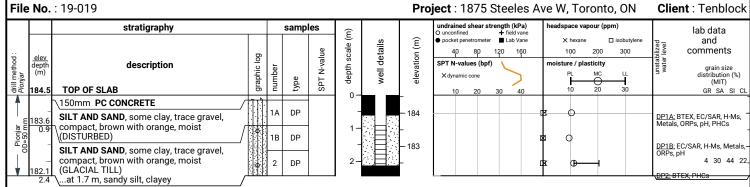
Date Started: Dec 16, 2020

Position: E: 623286, N: 4849297 (UTM 17T)

Elev. Datum: Geodetic

BOREHOLE LOG 207

Elev. Datum : Geodetic



END OF BOREHOLE

Refusal due to squeezing

GROUNDWATER LEVELS

Date Water Depth (m) Elevation (m)

Jan 6, 2021 dry n/a

Mar 17, 2021 dry n/a

Dry and open upon completion of drilling.

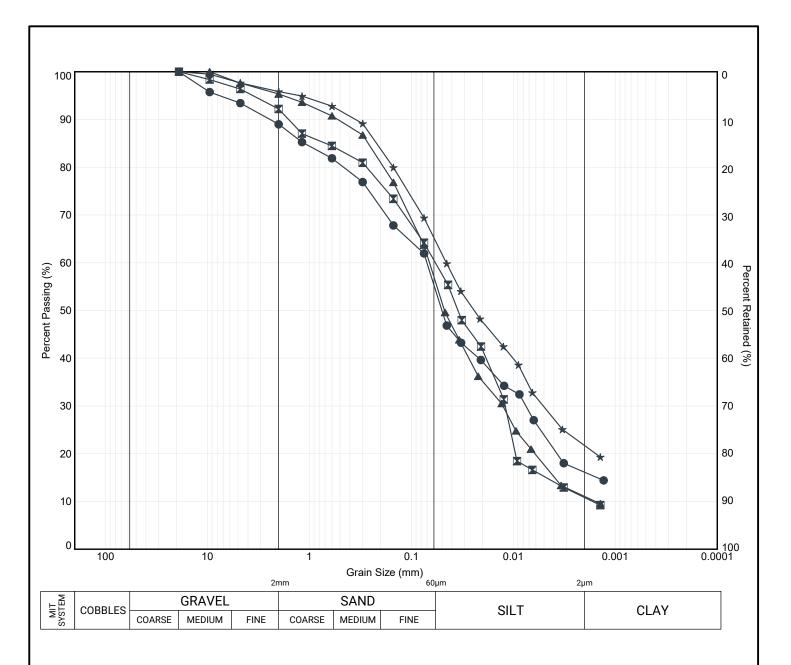
38 mm dia. monitoring well installed.

file: 19-019 1875 steeles ave w v2.gpj

 Page 1 of 1
 Tech : DK | PM : JH | Rev : MD

APPENDIX B





MIT SYSTEM

	Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	
•	105	SS6	4.0	183.9	11	34	39	16	
	106	SS11	12.4	175.4	8	31	50	11	
A	206	DP2	2.0	182.5	5	38	46	11	
*	207	DP2	2.1	182.5	4	30	44	22	

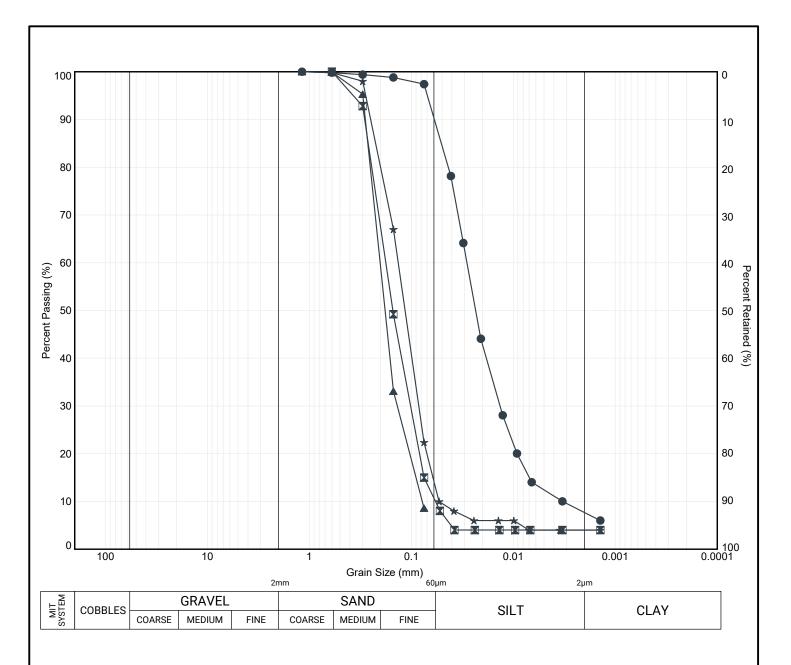


Title:

GRAIN SIZE DISTRIBUTION UPPER GLACIAL TILL

File No.:

19-019



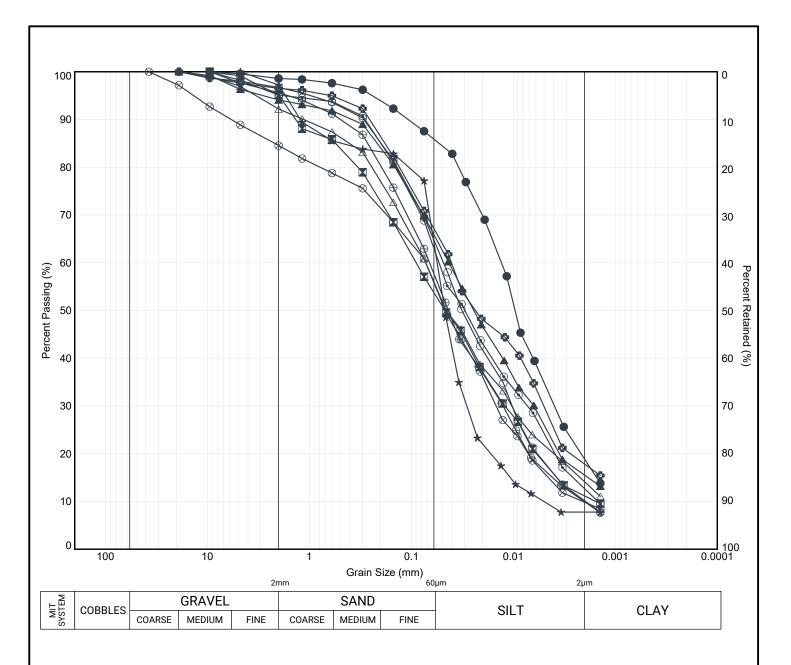
MIT SYSTEM

	Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)		
•	102	SS12	13.9	173.7	0	9	83	8		
×	103	SS13	13.9	174.0	0	89	7	4		
A	202	SS14	17.1	171.1	0	91			(9)	
*	205	SS9	9.4	175.1	0	86	10	4		



Title: GRAIN SIZE DISTRIBUTION SAND

File No.: 19-019



MIT SYSTEM

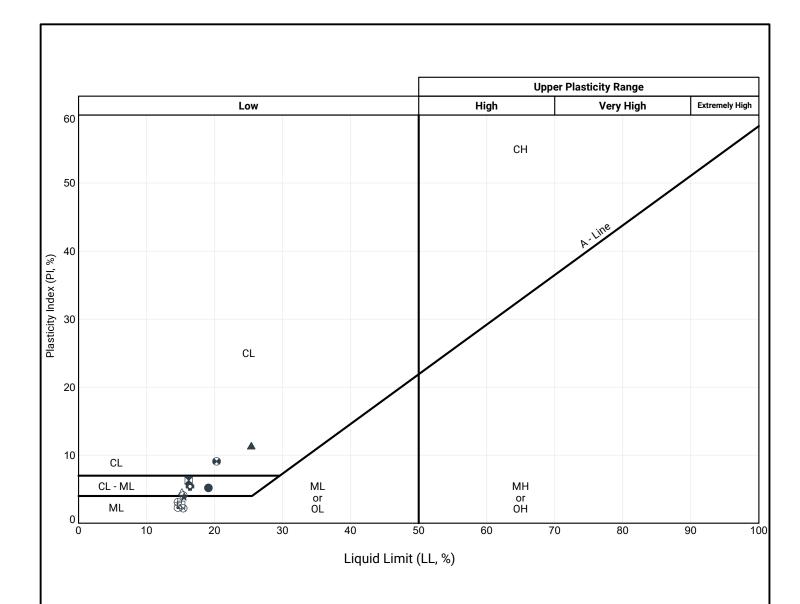
	Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	
•	101A	SS4	17.1	170.1	1	13	67	19	
×	104	SS15	18.5	169.3	5	41	43	11	
A	106A	SS4	17.0	171.0	6	28	50	16	
*	201	SS12	15.5	172.2	3	32	57	8	
•	201	SS13	18.4	169.3	5	32	50	13	
٥	202	SS15	18.6	169.6	4	29	49	18	
0	203	SS12	18.6	169.1	3	32	55	10	
Δ	203	SS13	20.1	167.6	8	36	42	14	
\otimes	204	SS14	15.5	172.3	16	28	46	10	
\oplus	205	SS10	13.1	171.4	4	38	48	10	



Title:

GRAIN SIZE DISTRIBUTION LOWER GLACIAL TILL

File No.: 19-019



	Borehole	Sample	Depth (m)	Elev. (m)	LL (%)	PL (%)	PI (%)
•	101A	SS4	17.1	170.1	19	14	5
×	104	SS15	18.5	169.3	16	10	6
A	105	SS6	4.0	183.9	25	14	11
*	106A	SS4	17.0	171.0	16	12	4
•	201	SS13	18.4	169.3	15	12	3
۰	202	SS15	18.6	169.6	16	11	5
0	203	SS12	18.6	169.1	15	11	4
Δ	204	SS13	14.0	173.8	15	11	4
\otimes	204	SS14	15.5	172.3	15	13	2
\oplus	205	SS10	13.1	171.4	15	12	3
	206	DP2	2.0	182.5	15	12	3
•	207	DP2	2.1	182.5	20	11	9



Title:

ATTERBERG LIMITS CHART

File No.: 19-019

APPENDIX C





Project name: Borehole name: Test date: (dd/mm/yyyy)

Test number:

19-019 | 1875 Steeles BH201 47ft

BH 201 10/11/2020

steeles 47 bh 201_001_2020-11-10 1117

Probe Designation N Probe (76 mm OD)

Drilling Method: Mud Rotary Drilling
Test depth: 14.3 m
Test Elev: 173.4 m
Poisson's ratio: 0.33
Probe initial volume: 1478 cm³

Raw Rea	adings	Co	rrected Readin	gs
essure	Volume	Pressure	Volume	DR/R ₀
kPa	cm³	kPa	cm³	%
18	41.5	160	41.1	1.38
6	83.0	143	82.8	2.76
14	121.7	148	121.3	4.02
16	161.9	146	161.5	5.32
24	202.8	151	202.3	6.62
40	242.0	164	241.1	7.85
82	281.5	204	279.6	9.05
211	324.2	331	319.3	10.27
420	361.1	539	351.3	11.25
766	401.0	883	383.3	12.22
1084	440.4	1200	415.3	13.18
1365	480.7	1480	449.1	14.18
1604	522.2	1718	485.7	15.26
1423	521.0	1537	488.0	15.33
1238	518.4	1352	489.7	15.38
1044	513.8	1158	489.7	15.38
1221	516.1	1335	487.8	15.33
1442	520.4	1556	486.9	15.30
1583	525.6	1697	489.4	15.37
1706	541.1	1819	502.9	15.77
1894	581.5	2006	540.2	16.85
2050	622.6	2161	578.7	17.96
2210	661.8	2320	615.1	19.00
2329 2448	702.0 742.0	2438 2557	653.3 691.1	20.08 21.14
2554	781.2	2662	728.7	22.19
2651	823.5	2759	770.3	23.33
2734	861.0	2841	807.2	24.34
	<u> </u>			

Interpreted Test Results Epmt: 51,211 kPa Ep-ur 520,082 kPa 102 MPa Ey: Ey-ur: 1040 MPa PI: 3,938 kPa Ep / Pl: 132.1 1,200 kPa Ру: Poh (est.): 149 kPa K₀ (est): 0.60

Time before recording readings: 15 sec.

Method for estimating PI : 1/V vs P as per ASTM D4719

3000 -	Pressuremeter Test - Corrected Curve
2500 -	
2000 -	
Pressure (kPa)	
1000 -	
500 -	
0 -	0 10 20 30 dR/R0 (%)

TEXAM COMPANION V.3.4.25



Project name: 19-019 | 1875 Steeles, BH203 37ft Borehole name: 203

Test date: (dd/mm/yyyy) 09/11/2020

Test number: steeles 37 bh203_001_2020-11-9 1135

N Probe (76 mm OD) **Probe Designation**

Drilling Method: Mud Rotary Drilling Test depth: 11.3 m Test Elev: 176.4 m Poisson's ratio: 0.33 Probe initial volume: 1409 cm³

Raw Readings		Co	Corrected Readings		
ressure	Volume	Pressure	Volume	DR/R ₀	
kPa	cm³	kPa	cm³	%	
18	81.5	106	81.1	2.84	
23	123.1	107	122.6	4.26	
29	162.2	111	161.6	5.58	
40	204.6	119	203.7	6.99	
56	242.9	133	241.7	8.24	
53	243.9	130	242.7	8.27	
82	283.9	157	282.1	9.56	
158	323.5	231	320.0	10.78	
370	360.0	441	351.8	11.79	
770	401.3	840	384.2	12.82	
1120	440.7	1189	415.9	13.81	
1385	480.7	1453	450.0	14.87	
1575	521.9	1642	487.5	16.02	
1333	520.6	1400	491.1	16.13	
1123	518.8	1190	493.9	16.22	
926	513.0	993	492.5	16.17	
1143	515.2	1210	489.9	16.09	
1301	517.6	1368	488.7	16.06	
1494	522.8	1561	489.7	16.09	
1716	561.3	1783	524.8	17.16	
1820	601.5	1886	563.5	18.32	
1924	640.8	1989	601.2	19.45	
2006	682.6	2071	641.7	20.65	
2087	722.0	2152	679.9	21.76	
2152	761.4	2216	718.3	22.88	
2230	800.9	2293	756.5	23.98	
2292	842.9	2354	797.6	25.15	
2341	881.7	2403	835.6	26.22	
2011	301.7	2100	000.0	20.22	
		 			

Time before recording readings :

 $\label{eq:Method for estimating Pl:} \end{substitute} \begin{substitute} \begin{substit$

15 sec.

1/V vs P as per ASTM D4719

Pressuremeter Test - Corrected Curve 3000 2500 2000 Pressure (kPa) 0051 0051 1000 500 0 0 10 20 30 dR/R0 (%)

Interpreted Test Results				
Epmt:	55,626 kPa			
Ep-ur	454,278 kPa			
Ey:	111 MPa			
Ey-ur:	909 MPa			
Pl: Ep / Pl: Py:	3,038 kPa 149.5 1,189 kPa			
Poh (est.) : K ₀ (est):	100 kPa 0.47			

TEXAM COMPANION V.3.4.25



Project name: Borehole name: Test date: (dd/mm/yyyy)

Time before recording readings :

 $\label{eq:Method for estimating Pl:} \end{substitute} \begin{substitute} \begin{substit$

15 sec.

Test number:

19-019 | 1875 Steeles BH203 47

BH203 09/11/2020

steeles 47 bh203_001_2020-11-9 1305

Probe Designation N Probe (76 mm OD)

Drilling Method: Mud Rotary Drilling
Test depth: 14.3 m
Test Elev: 173.4 m
Poisson's ratio: 0.33
Probe initial volume: 1409 cm³

Raw Readings		dings Corrected Readings		
Pressure	Volume	Pressure	Volume	DR/R ₀
kPa	cm³	kPa	cm³	%
26	42.8	149	42.2	1.49
31	81.0	148	80.3	2.81
36	121.8	150	121.0	4.21
42	160.4	154	159.5	5.51
54	201.7	163	200.5	6.88
73	243.5	180	241.9	8.25
105	281.3	210	279.0	9.46
197	326.4	300	322.0	10.84
333	360.2	434	352.8	11.82
528	402.1	628	390.4	13.01
740	441.9	839	425.5	14.11
934	480.8	1032	460.1	15.18
1115	521.7	1212	497.0	16.31
817	517.5	914	499.3	16.38
617	510.6	714	496.9	16.31
409	498.5	506	489.4	16.08
605	504.8	702	491.4	16.14
786	511.0	883	493.6	16.21
1056	527.5	1153	504.1	16.53
1364	580.9	1460	550.6	17.94
1505	620.6	1600	587.3	19.03
1614	660.0	1708	625.1	20.16
1701	700.3	1795	664.1	21.30
1799	740.8	1893	703.1	22.44
1882	780.8	1975	741.8	23.56
1941	821.3	2033	781.5	24.69
İ				

Interpreted To	est Results
Epmt:	26,606 kPa
Ep-ur	185,904 kPa
Ey:	81 MPa
Ey-ur:	563 MPa
Pl: Ep / Pl: Py:	2,843 kPa 65.4 839 kPa
Poh (est.) : K ₀ (est):	149 kPa 0.60

1/V vs P as per ASTM D4719

TEXAM COMPANION V.3.4.25



Project name: Borehole name: Test date: (dd/mm/yyyy)

Test number:

19-019 | 1875 Steeles BH203 57ft

BH203

09/11/2020

steeles 57_001_2020-11-9 1430

Probe Designation N Probe (76 mm OD)

Drilling Method: Mud Rotary Drilling
Test depth: 17.4 m
Test Elev: 170.3 m
Poisson's ratio: 0.33
Probe initial volume: 1478 cm³

7	gs	rrected Readin	Co	Raw Readings	
1	DR/R ₀	Volume	Pressure	Volume	Pressure
	%	cm³	kPa	cm³	kPa
	3.13	93.9	233	95.0	67
	4.06	122.5	197	123.1	34
	5.65	171.7	212	172.6	53
1	6.60	201.4	235	202.7	78
	7.82	240.1	290	242.3	136
	8.95	276.4	412	280.7	260
٦◂	10.09	313.5	633	321.4	483
	11.14	347.5	891	359.8	743
	11.78	368.9	1063	384.0	915
٦◂	12.77	401.7	1323	421.1	1177
	13.85	437.8	1586	461.6	1441
	14.93	474.2	1818	501.8	1674
	14.95	474.9	1464	496.7	1320
	14.90	473.5	1181	490.6	1036
Ī∢	14.72	467.4	886	479.6	741
	14.75	468.1	1139	484.5	994
1	14.85	471.7	1471	493.6	1326
Ī∢	15.00	476.6	1704	502.3	1560
1	15.23	484.7	1847	512.8	1703
1	15.34	488.4	1901	517.4	1757
	15.98	510.3	2022	541.3	1879
	17.08	548.1	2224	582.5	2082
1	18.11	583.9	2392	621.3	2251
	19.18	621.5	2552	661.7	2412
1	20.26	659.8	2693	702.2	2554
	21.37	699.4	2821	742.8	2682
1	22.45	738.2	2935	782.4	2797
1	23.54	777.8	3045	822.8	2907
1	24.57	815.8	3149	861.5	3012
1					
1					
1					
1					
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3500 -	Pressuremeter Test - Corrected Curve
3000 -	
2500 -	
(KPa) -	
Pressure (KPa)	
1000 -	
500 -	
0 -	0 10 20 30 dR/R0 (%)

Interpreted To	est Results
Epmt:	38,195 kPa
Ep-ur	242,616 kPa
Ey:	83 MPa
Ey-ur:	525 MPa
Pl: Ep / Pl: Py:	4,114 kPa 59.0 1,323 kPa
Poh (est.) : K ₀ (est):	197 kPa 0.69

Time before recording readings : 15 sec.

Method for estimating PI: 1/V vs P as per ASTM D4719

TEXAM COMPANION V.3.4.25



Project name:
Borehole name:
Test date: (dd/mm/yyyy)

19-019 | 1875 Steeles BH205 37ft

BH205

16/12/2020

Test number: 19-019 BH205 37_001_2020-12-16 1340

Probe Designation N Probe (76 mm OD)

Drilling Method: Mud Rotary Drilling
Test depth: 11.3 m
Test Elev: 173.2 m
Poisson's ratio: 0.33
Probe initial volume: 1402 cm³

	Corrected Readings			Raw Readings	
٦	DR/R ₀	Volume	Pressure	Volume	Pressure
	%	cm³	kPa	cm³	kPa
1	1.48	41.8	133	42.8	33
1	2.89	82.1	131	83.2	37
1	4.28	122.5	131	123.7	40
1	5.57	160.7	132	162.0	44
1	6.86	199.1	132	200.6	48
1	8.27	241.7	133	243.2	52
	9.57	281.2	138	283.0	60
1	10.87	321.5	147	323.7	71
1	12.13	361.0	153	363.3	78
1	13.33	398.9	184	402.2	111
1	14.59	439.0	220	443.5	148
1	15.76	476.9	308	484.0	237
٦.	16.77	509.8	505	522.8	435
1	17.76	542.5	819	565.0	750
1	18.69	573.3	1064	603.1	996
1	19.66	605.6	1315	643.0	1247
٦.	20.64	638.8	1567	683.8	1500
1	21.71	675.0	1865	724.6	1799
1	22.84	713.7	2102	766.6	2037
1	23.84	748.4	2301	804.2	2236
1	24.96	787.4	2519	846.3	2455
1	25.95	822.2	2703	883.3	2639
1	27.14	864.6	2900	927.6	2836
1	28.11	899.1	3068	963.9	3005
1	29.14	936.4	3214	1002.9	3151
٦	29.15	936.7	2691	997.7	2628
1	29.03	932.6	2098	985.5	2035
٦.	28.87	926.7	1668	973.7	1605
1	28.92	928.4	2183	982.5	2120
1	29.04	932.8	2647	993.3	2584
٦.	29.22	939.2	3083	1004.1	3020
1	30.22	975.9	3376	1044.2	3313
٦	31.32	1016.0	3527	1086.1	3464
1	32.32	1052.9	3634	1124.2	3571
1	33.36	1091.8	3771	1164.5	3708
	34.37	1129.9	3870	1203.7	3807
1	35.45	1170.8	3969	1245.6	3906
1	36.42	1207.6	4075	1283.5	4012
1	37.51	1249.3	4154	1326.0	4091
1	38.45	1285.7	4252	1363.2	4189
7	39.47	1325.7	4326	1403.8	4263
1	40.44	1363.5	4393	1442.1	4330
4					
1					
1					

Interpreted To	est Results
Epmt:	43,278 kPa
Ep-ur	417,123 kPa
Ey:	86 MPa
Ey-ur:	826 MPa
Pl: Ep / Pl: Py:	5,372 kPa 77.6 1,567 kPa
Poh (est.) : K ₀ (est):	130 kPa 0.70

TEXAM COMPANION V.3.4.25

Time before recording readings :

15 sec.

1/V vs P as per ASTM D4719

Method for estimating PI :



Project name: 19-019 | 1875 Steeles BH205 42ft Borehole name: BH205

Test date: (dd/mm/yyyy) 17/12/2020

Test number: 19-019 BH205 42_2020-12-17 918

Probe Designation N Probe (76 mm OD)

Drilling Method: Mud Rotary Drilling
Test depth: 12.8 m
Test Elev: 171.7 m
Poisson's ratio: 0.33
Probe initial volume: 1434 cm³

Raw Readings		Co	rrected Readin	gs
Pressure	Volume	Pressure	Volume	DR/R ₀
kPa	cm³	kPa	cm³	%
39	41.8	154	41.4	1.43
43	83.6	152	83.1	2.86
48	123.8	154	123.3	4.21
53	165.0	155	164.5	5.58
57	204.4	156	203.9	6.87
63	246.7	159	246.1	8.24
70	285.2	163	284.5	9.47
80	326.0	171	325.2	10.76
90	364.7	180	363.8	11.97
105	403.9	193	402.8	13.18
128	445.9	215	444.6	14.46
175	485.6	261	483.9	15.65
257	524.6	342	522.0	16.79
550	563.1	634	557.6	17.85
828	602.2	911	593.8	18.92
1124	645.8	1207	634.4	20.10
1329	683.7	1411	670.2	21.14
1548	723.3	1629	707.7	22.21
1740	764.1	1820	746.7	23.32
1911	804.4	1991	785.4	24.41
1612	801.0	1692	784.8	24.39
1351	795.4	1431	781.8	24.39
1071	795.4	1151	775.8	24.30
1342	793.3	1422	773.8	24.14
1584	801.9	1664	779.7	24.23
1861	816.7	1941	788.2	24.42
		2143	_	25.42
2064	842.2		821.8	_
2245	883.3	2324	861.4	26.52
2404 2557	925.0 966.1	2483	902.0 941.9	27.63 28.72
		2635		
2677	1002.0	2755	977.0	29.66
2839	1040.6	2917	1014.3	30.66
2974	1080.8	3052	1053.5	31.71
3111	1120.3	3189	1091.9	32.72
3248	1164.3	3326	1134.7	33.84
3354	1203.4	3432	1173.0	34.83
3442	1243.6	3520	1212.5	35.85
3529	1285.9	3607	1254.1	36.91
3598	1326.3	3676	1294.1	37.93
3659	1364.9	3737	1332.3	38.89
3726	1402.4	3804	1369.3	39.82
3788	1444.7	3866	1411.2	40.86

Interpreted Test Results Epmt: 40,254 kPa Ep-ur 246,571 kPa 80 MPa Ey: Ey-ur: 488 MPa PI: 4,491 kPa Ep / Pl: 54.9 1,207 kPa Ру: Poh (est.): 145 kPa K₀ (est): 0.71

Time before recording readings: 15 sec.

Method for estimating PI: 1/V vs P as per ASTM D4719

4500 -	Pressuremeter Test - Corrected Curve
4000 -	
3500 -	
3000 -	
(k Pa)	
Pressure (kPa) - 0005	
1500 -	
1000 -	
500 -	
0 -	0 10 20 30 40 50 dR/R0 (%)

TEXAM COMPANION V.3.4.25

APPENDIX D









CA14362-FEB20 R1

19-019-101 1875 Steeles Ave W

Prepared for

Grounded Engineering Inc.



First Page

CLIENT DETAIL	S	LABORATORY DETAIL	LS
Client	Grounded Engineering Inc.	Project Specialist	Jill Campbell, B.Sc.,GISAS
		Laboratory	SGS Canada Inc.
Address	12 Banigan Drive	Address	185 Concession St., Lakefield ON, K0L 2H0
	Toronto, Ontario		
	M4H1E9. Canada		
Contact	Jory Hunter	Telephone	2165
Telephone	613-539-0347	Facsimile	705-652-6365
Facsimile		Email	jill.campbell@sgs.com
Email	jhunter@groundedeng.ca	SGS Reference	CA14362-FEB20
Project	19-019-101 1875 Steeles Ave W	Received	02/11/2020
Order Number		Approved	02/18/2020
Samples	Soil (3)	Report Number	CA14362-FEB20 R1
		Date Reported	02/18/2020

COMMENTS

Temperature of Sample upon Receipt: 5 degrees C

Cooling Agent Present:Yes Custody Seal Present:Yes

Chain of Custody Number:012627

Corrosivity Index is based on the American Water Works Corrosivity Scale according to AWWA C-105. An index greater than 10 indicates the soil matrix may be corrosive to cast iron alloys.

SIGNATORIES

Jill Campbell, B.Sc.,GISAS

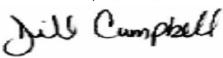






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QC Summary	6-7
Legend	8
Annexes	9



CA14362-FEB20 R1

Client: Grounded Engineering Inc.

Project: 19-019-101 1875 Steeles Ave W

Project Manager: Jory Hunter **Samplers:** Jory Hunter

PACKAGE: - Corrosivity Index (S	SOIL)		Sample Number	5	6	7
			Sample Name	BH102 SS5	BH103 SS3	BH106 SS2
			Sample Matrix	Soil	Soil	Soil
			Sample Date	10/02/2020	10/02/2020	10/02/2020
Parameter	Units	RL		Result	Result	Result
Corrosivity Index						
Corrosivity Index	none	1		3	11	11
Soil Redox Potential	mV	-		310	277	251
Sulphide	%	0.02		< 0.02	< 0.02	< 0.02
рН	pH Units	0.05		8.19	8.48	8.05
Resistivity (calculated)	ohms.cm	-9999		2230	711	1140
PACKAGE: - General Chemistry	(SOIL)		Sample Number Sample Name Sample Matrix Sample Date	5 BH102 SS5 Soil 10/02/2020	6 BH103 SS3 Soil 10/02/2020	7 BH106 SS2 Soil 10/02/2020
Parameter	Units	RL		Result	Result	Result
General Chemistry						
Conductivity	uS/cm	2		449	1410	875
PACKAGE: - Metals and Inorgan	nics (SOIL)		Sample Number	5	6	7
			Sample Name	BH102 SS5	BH103 SS3	BH106 SS2
			Sample Matrix Sample Date	Soil 10/02/2020	Soil 10/02/2020	Soil 10/02/2020
Parameter	Units	RL	Cample Date	Result	Result	Result
Metals and Inorganics	Offits	r.L		Nosuit	Nesuit	Nosuit
				7.4	44.2	42.7
Moisture Content	%	0.1		7.1	11.3	13.7 69
Sulphate	μg/g	0.4		39	44	99



CA14362-FEB20 R1

Client: Grounded Engineering Inc.

Project: 19-019-101 1875 Steeles Ave W

Project Manager: Jory Hunter

Samplers: Jory Hunter

PACKAGE: - Other (ORP) (SOIL)			Sample Number	5	6	7
			Sample Name	BH102 SS5	BH103 SS3	BH106 SS2
			Sample Matrix	Soil	Soil	Soil
			Sample Date	10/02/2020	10/02/2020	10/02/2020
Parameter	Units	RL		Result	Result	Result
Other (ORP)						
Chloride	μg/g	0.4		380	660	220



QC SUMMARY

Anions by IC

Method: EPA300/MA300-lons1.3 | Internal ref.: ME-CA-[ENV]IC-LAK-AN-001

Parameter	QC batch	Units	RL	Method	Dup	licate	LC	S/Spike Blank		M	latrix Spike / Re	f.
	Reference			Blank	RPD	AC	Spike	Recove	ry Limits %)	Spike Recovery		ry Limits %)
						(%)	Recovery (%)	Low	High	(%)	Low	High
Chloride	DIO0195-FEB20	μg/g	0.4	<0.4	9	20	97	80	120	NV	75	125
Sulphate	DIO0195-FEB20	μg/g	0.4	<0.4	3	20	92	80	120	94	75	125

Carbon/Sulphur

Method: ASTM E1915-07A | Internal ref.: ME-CA-[ENV]ARD-LAK-AN-020

Parameter	QC batch	Units	RL	Method	Duj	plicate	LC	S/Spike Blank		M	atrix Spike / Ref	:
	Reference			Blank	RPD	AC	Spike		ery Limits %)	Spike Recovery	Recover	-
						(%)	Recovery (%)	Low	High	(%)	Low	High
Sulphide	ECS0016-FEB20	%	0.02	< 0.02	ND	20	108	80	120			

Conductivity

Method: SM 2510 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch	Units	RL	Method	Dup	olicate	LC	S/Spike Blank		M	atrix Spike / Ref	
	Reference			Blank	RPD	AC	Spike		ery Limits %)	Spike Recovery	Recove	-
						(%)	Recovery (%)	Low	High	(%)	Low	High
Conductivity	EWL0213-FEB20	uS/cm	2	0.002	0	10	100	90	110	NA		

20200218

QC SUMMARY

На

Method: SM 4500 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-001

Parameter	QC batch	Units	RL	Method	Dup	olicate	LC	S/Spike Blank		м	atrix Spike / Ref	
	Reference			Blank	RPD	AC	Spike		ery Limits %)	Spike Recovery	Recove	ry Limits %)
						(%)	Recovery (%)	Low	High	(%)	Low	High
pH	EWL0213-FEB20	pH Units	0.05	NA	0		101			NA		

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL. **Matrix Spike Qualifier**: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

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LEGEND

FOOTNOTES

NSS Insufficient sample for analysis.

RL Reporting Limit.

- † Reporting limit raised.
- ↓ Reporting limit lowered.
- NA The sample was not analysed for this analyte
- ND Non Detect

Samples analysed as received. Solid samples expressed on a dry weight basis. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated. This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

This report must not be reproduced, except in full. This report supersedes all previous versions.

-- End of Analytical Report --

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Request for Laboratory Services and CHAIN OF CUSTODY

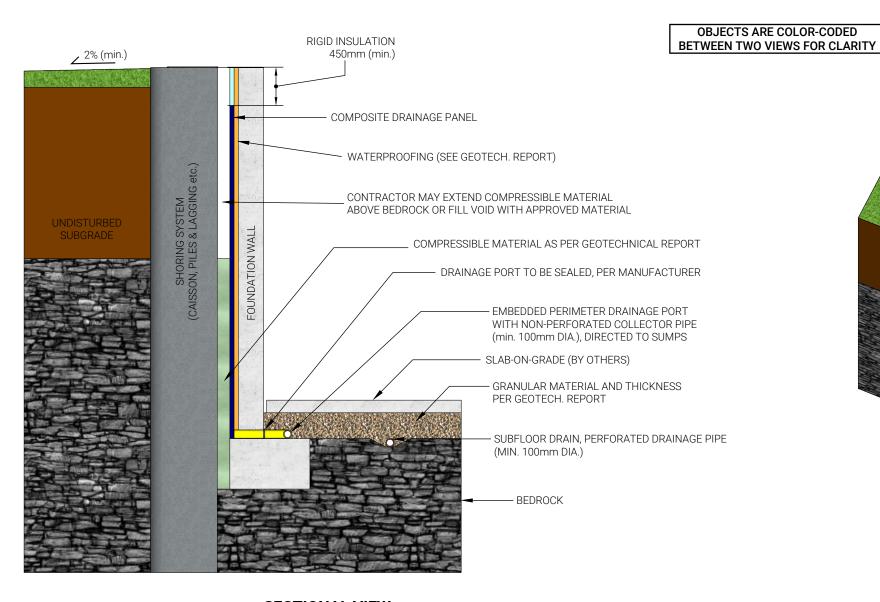
Environment, Health & Safety - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment

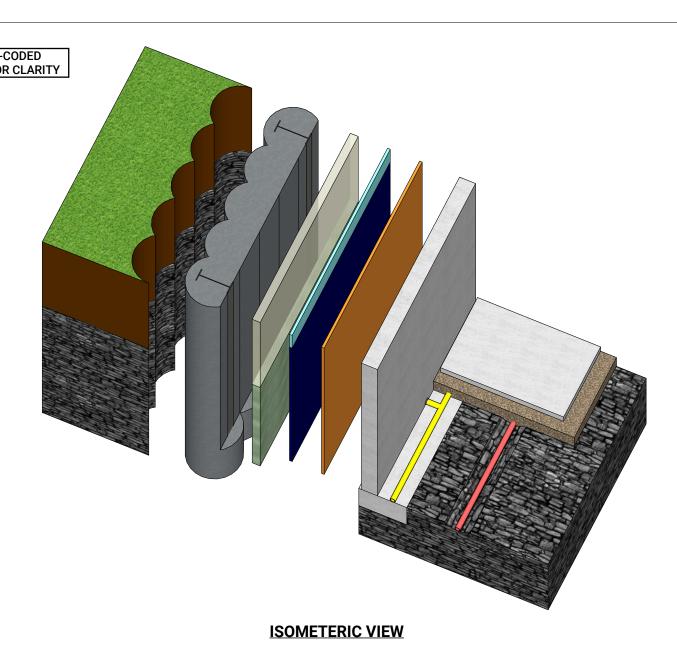
No: 012627

Note: Submission of samples to SGS is acknowledgement that you have been provided direction on sample pollection handling and transportation of samples to SGS is acknowledgement that you have been provided direction on sample pollection handling and transportation of samples to SGS is acknowledgement that you have been provided direction on sample pollection handling and transportation of samples to SGS is acknowledgement that you have been provided direction on sample pollection handling and transportation of samples to SGS is acknowledgement that you have been provided direction on sample pollection handling and transportation of samples to SGS is acknowledgement that you have been provided direction on sample pollection handling and transportation of samples to SGS is acknowledgement that you have been provided direction on sample pollection of samples to SGS is acknowledgement that you have been provided direction on sample pollection of samples to SGS is acknowledgement that you have been provided direction on sample pollection of samples to SGS is acknowledgement that you have been provided direction on sample pollection of samples to SGS is acknowledgement that you have been provided direction on sample pollection of samples to SGS is acknowledgement that you have been provided direction of samples to SGS is acknowledgement that you have been provided direction of samples to SGS is acknowledgement that you have been provided direction of samples to SGS is acknowledgement that you have been provided direction of samples to SGS is acknowledgement that you have been provided direction of samples to SGS is acknowledgement that you have been provided direction of samples to SGS is acknowledgement that you have been provided direction of samples to SGS is acknowledgement that you have been provided to sample that you have b	gnatures may appear on this r its General Conditions of S	etion of work. Si	ion for comple issued by the	authorizat locument i	onsidered st. This d	SGS is co	amples to	ssion of s	2) Submi onal cost.	no additi	rtation or iresses for	nd transpo	handling a	le collection nail to an un	rection on samp av be sent by er	n provided d 3) Results m	you have bee documents). {	edgement that (e.g. shipping	S is acknowl ative format	ubmission of samples to SG the contract, or in an altern	019	Revision #: 1.2 Date of Issue: (
Yellow & White Copy - SGS	Y (wybbyr	O (mm	1 / 20	02/1	0	Date					7	1	+	1	77	Signature			5	からも	(NAME)	Relinquished by
Pink Copy - Client	(mm/dd/yy)		0,20	02,1	1000	Date:						4	37	1	M	Signature:			7	u Hunter	Sampled By (NAME): TOX	Sampled
												7	_		1					Instructions	Observations/Comments/Special Instructions	Observat
																						12
																						11
														15-8								10
																						9
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				X											501)	-	3:36	10/20	62	2	BHIDL SS.	w
				×											Soil	-	3:30	10/20	2	8	3H103SS3	2
				×											8:1	-	3:30	10/20	6	Ğī	BH 102 SS	7
	Sewer Use: Specify pkg: Water Charact General			compswit	Pesticides Organochlorine or spec	VOCs all incl BTEX	F1-F4 only	F1-F4 + BTEX	PCBs Total	SVOCs all incl PAHs, ABNs, CPs	ICP Metals on Sb,As,Ba,Be,B,Cd,Cr,Co, Se,Ag,TI,U,V,Zn	Full Metals S ICP metals plus B(HWS-s	Metals & Inor incl CrVI, CN,Hg pH,(B(H (CI, Na-water)	Field Filtered (S MATRIX	# OF BOTTLES	TIME	DATE SAMPLED S	D/ SAM	IDENTIFICATION	SAMPLE IDENT	
COMMENTS:	Ext				ify othe				Aı		Cu,Pb,I	oil only	gan WS),EG	Y/N			0	S UNO	☐ YES	E CONDITION (RSC)	RECORD OF SITE	
	zation Pkg ended Specify Control of tests				ır				oclor 🗌		Ao,Ni,		ics ;,SAR-soil)		Sanitary Storm Municipality:		3 Day min T/ MMER Other:	47/558 (5	Reg 3	k Soil Texture: Coarse er	le 1	Table 1 Table 2 Table 3 Table 3
		(please specify)	Other		Pest	VOC	С	PHC	PCB	SVOC	10	 80	×		Sewer By-Law:	Se		Other Regulations:	Other R		Regulation 153/04:	Regula
				NALYSIS REQUESTED	DUE	REC	YSIS	1000000	Þ									S	REGULATIONS	JREG		(
MUST BE SUBMITTED	NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY	MPLES FOR H	WATER SA SGS DRINI	WITH	ING (PC	DRINK	NOTE					Date:	Specify Due Date	Spec					(Ca) Email:	nundedeno ici	1 hunter@amuntedera	Email:
		3 Days ☐ 4 Days TO SUBMISSION	RUSH TAT (Additional Charges May Apply): 1 Day 1 2 Days 1 3 Days 1 4 Days PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION	☐ 2 Days ☐ ATIVE PRIOR	ITATIV	1 Day	S REP	ITH SO	LITY W	EASIB	nal Cha RUSH F	Addition	RUSH TAT (Additional Charges May Apply): PLEASE CONFIRM RUSH FEASIBILITY WITH	PLE					Phone:	559-0347	610-	Phone: Fax:
holidays & weekends). jins next business day	TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends: TAT begins next business day	ed in business ved after 6pm c	T's are quot nples receiv	TA Sa						ays)	Regular TAT (5-7days)	gular TA	₩ Re						Address	Ec	CI	dinary
		RED	TURNAROUND TIME (TAT) REQUIRED	ME (TA	IT DNL	NAROL	TUR												Contact:	かして	JJ.	Address: 17
Avelu	75 Steeles	St≪ :all/no	P.O. #: Site Location/ID:	(O TI						101	-610-	3-6	Quotation #:_ Project #: /	Quot		ition)	ort Informa	(same as Report Information)	Company:	ingineering	company Sypunded Engineering	Compa
															٥	RMATIO	INVOICE INFORMATION	INV		RMATION	REPORT INFORMATION	
LAB LIMS #: CA-14362-Feb20	AB LIMS #: CA-1					16	SType	178	Yes A		Cooling Agent Present: Yes ATTEMPERATURE Upon Receipt (°C)_	Cooling / Tempera			Yes No	Present: Intact:	Custody Seal Present: Custody Seal Intact:	0.0	8	20 (mm/dd/yy) 0 (hr:min)	Date: 20/1/ d Time: 17 : 0	Received Date: Received Time:
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Page of	F							72-0361	x: 519-6	-8060 Fa	877-848	foll Free:	72-4500	one: 519-6	- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361	ondon, ON	ium Court, L	657 Consor	- London		-	

APPENDIX E







SECTIONAL VIEW

SUBFLOOR DRAINAGE SYSTEM

- 1. THE SUBFLOOR DRAINS SHOULD BE SET IN PARALLEL ROWS, IN ONE DIRECTION, AND SPACED AS PER THE GEOTECHNICAL REPORT.
- 2. THE INVERT OF THE PIPES SHOULD BE A MINIMUM OF 300mm BELOW THE UNDERSIDE OF THE SLAB-ON-GRADE.
- 3. A CAPILLARY MOISTURE BARRIER (I.E. DRAINAGE LAYER) CONSISTING OF A MINIMUM 200 mm LAYER OF CLEAR STONE (OPSS MUNI 1004) COMPACTED TO A DENSE STATE (OR AS PER THE GEOTECHNICAL REPORT). WHERE VEHICULAR TRAFFIC IS REQUIRED, THE UPPER 50 mm OF THE CAPILLARY MOISTURE BARRIER MAY BE REPLACED WITH GRANULAR A (OPSS MUNI 1010) COMPACTED TO A MINIMUM 98% SPMDD.

PERIMETER DRAINAGE SYSTEM

- 1. FOR A DISTANCE OF 1.2m FROM THE BUILDING, THE GROUND SURFACE SHOULD HAVE A MINIMUM 2% GRADE.
- 2. PREFABRICATED COMPOSITE DRAINAGE PANEL (CONTINUOUS COVER, AS PER MANUFACTURER'S REQUIREMENTS) IS RECOMMENDED BETWEEN THE BASEMENT WALL AND RIGID SHORING WALL. THE DRAINAGE PANEL MAY CONSIST OF MIRADRAIN 6000 OR AN APPROVED EQUIVALENT.
- PERIMETER DRAINAGE IS TO BE COLLECTED IN NON-PERFORATED PIPES AND CONVEYED DIRECTLY TO THE BUILDING SUMPS.
- 4. PERIMETER DRAINAGE PORTS SHOULD BE SPACED A MAXIMUM 3m ON-CENTRE. EACH PORT SHOULD HAVE A MINIMUM CROSS-SECTIONAL AREA OF 1500 mm2.

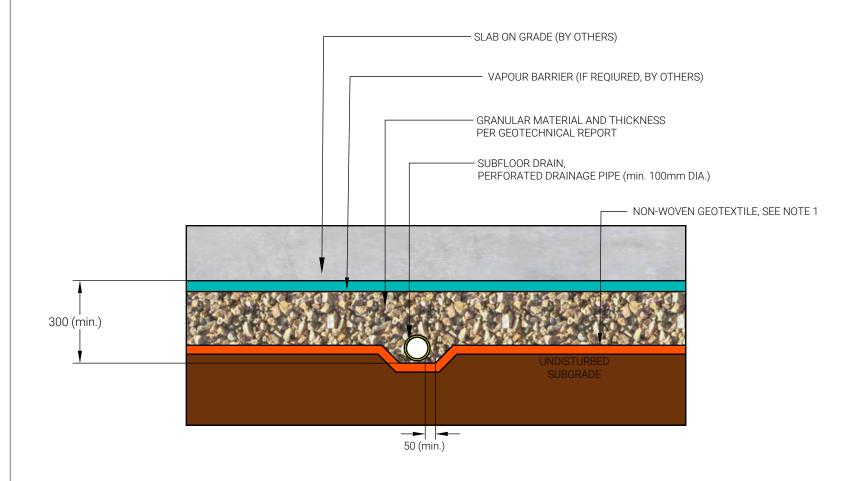
GENERAL NOTES

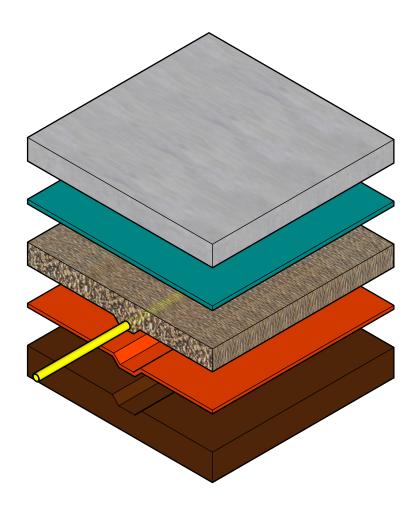
- THERE SHOULD BE NO STRUCTURAL CONNECTION BETWEEN THE SLAB-ON-GRADE AND THE FOUNDATION WALL OR FOOTING.
- 2. THERE SHOULD BE NO CONNECTION BETWEEN THE SUBFLOOR AND PERIMETER DRAINAGE SYSTEMS.
- 3. THIS IS ONLY A TYPICAL BASEMENT DRAINAGE DETAIL. THE GEOTECHNICAL REPORT SHOULD BE CONSULTED FOR SITE SPECIFIC RECOMMENDATIONS.
- 4. THE FINAL BASEMENT DRAINAGE DESIGN SHOULD BE REVIEWED BY THE GEOTECHNICAL ENGINEER TO CONFIRM THE DESIGN IS ACCEPTABLE.



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OBJECTS ARE COLOR-CODED
BETWEEN TWO VIEWS FOR CLARITY





SECTIONAL VIEW ISOMETRIC VIEW

NOTES

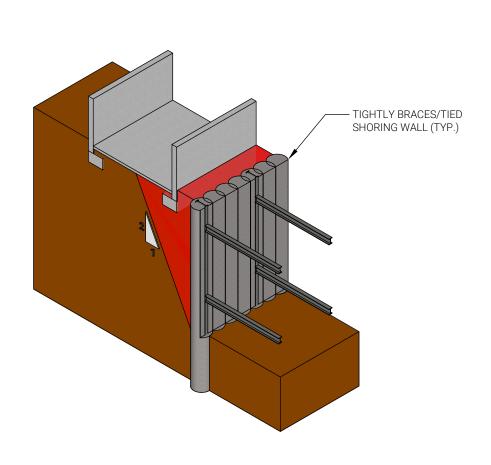
- 1. WHEN THE SUBGRADE CONSISTS OF COHESIONLESS SOIL, IT MUST BE SEPARATED FROM THE SUBFLOOR DRAINAGE LAYER USING A NON-WOVEN GEOTEXTILE (WITH AN APPARENT OPENING SIZE OF < 0.250mm AND A TEAR RESISTANCE OF > 200 N).
- 2. TYPICAL SCHEMATIC ONLY. MUST BE READ IN CONJUNCTION WITH GEOTECHNICAL REPORT.

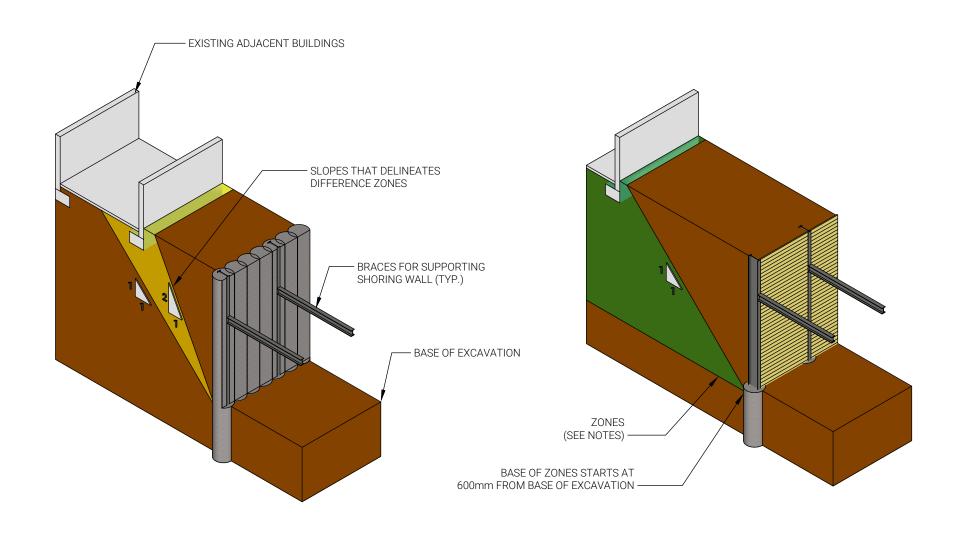


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APPENDIX F







ZONE A (RED)

FOUNDATIONS WITHIN THIS ZONE OFTEN REQUIRE UNDERPINNING OR SHORING SYSTEM. HORIZONTAL AND VERTICAL PRESSURES ON EXCAVATION WALL OF NON-UNDERPINNED FOUNDATION MUST BE CONSIDERED

ZONE B (YELLOW)

FOUNDATIONS WITHIN THIS ZONE OFTEN DO NOT REQUIRE UNDERPINNING BUT MAY REQUIRE SHORING SYSTEM.
HORIZONTAL AND VERTICAL PRESSURES ON EXCAVATION WALL OF NON-UNDERPINNED FOUNDATION MUST BE CONSIDERED

ZONE C (GREEN)

FOUNDATIONS WITHIN THIS ZONE USUALLY DO NOT REQUIRE UNDERPINNING OR SHORING SYSTEM

NOTES

1. USER'S GUIDE - NBC 2005 STRUCTURAL COMMENTARIES (PART 4 OF DIVISION B) - COMMENTARY K.

