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Geotechnical Investigation – 69 & 117 John Street, Mississauga, Ontario

Palmer Project #

2209001

Prepared For

13545130 Canada Inc.

January 17, 2022

January 17, 2022

Bashar Ghreiwati
Centracondos de la Montagne
Montreal, Quebec H3G 1Y7
c/o Scott Kruse
Weston Consulting

Re: Geotechnical Investigation – 69 & 117 John Street, Mississauga, Ontario
Project #: 2209001

Palmer is pleased to submit the attached report describing the results of our geotechnical investigation for the project at the subject site ("the Site") located in Mississauga, Ontario.

The report provides site information from our site investigation, laboratory testing, records reviews, and our interpretations/recommendations for your consideration.

Thank you for the opportunity to be of service on this project. We trust that this report will be satisfactory for your current needs. If you have any questions or require further information, please contact our office at your convenience. This report is subject to the Statement of Limitations provided at the end of this report.

Yours truly,

Draft

Alonzo Rowe, P.Eng.
Geotechnical Engineer

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1. Introduction

Palmer was retained by Centracondos de la Montagne (13545130 Canada Inc., the Client) to undertake a geotechnical investigation in support of the design of a proposed residential development consisting of three (3) towers that are 15, 25 and 25 stories in height. A six (6) story podium will be used to connect each tower. In total, 1,145 residential units are proposed with a total density of 4.0 FSI. Three (3) levels of underground parking will include a total of 1,117 parking spaces. A series of conceptual drawings have been provided and show an underground parking floor-to-floor height of 3.1 m. The lowest FFE of the proposed three (3) level underground structure is currently planned at about 11 m below ground surface. An additional 1 to 2 m below the third level FFE will be required to construct the foundations.

The objective of this geotechnical investigation was to determine the subsurface conditions in the area of the proposed development by means of sixteen (16) exploratory boreholes. From the findings in the boreholes, Palmer makes engineering recommendations for the project.

The report is provided on the basis of the terms of reference presented above, and on the assumption that the design will be in accordance with applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations of this office can be relied upon.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report deals with geotechnical issues only. An environmental assessment and a hydrogeological assessment for the Site are provided in separate Palmer reports.

This report has been prepared for 13545130 Canada Inc. and their designers. Use of this report by third party without Palmer's consent is prohibited. The limitations of the report presented within form an integral part of the document and they must be considered in conjunction with this report.

2. Site and Regional Geology

The study area is situated within the Iroquois Plain physiographic region of Southern Ontario (Chapman and Putnam, 1984). The topography in this region typically consists of a slightly sloping plain.

A review of available Ontario surficial geology mapping indicated that the overburden materials of the site comprised of tills with clay, silt, sand and gravel. Bedrock geology mapping indicated that the site is underlain by bedrock comprised of shale, limestone and dolostones of the Georgian Bay and Queenston Formations (Ontario Geological Survey, 2011).

3. Field and Laboratory Work

The field work for the geotechnical investigation was carried out on November 3 to 11, 2022 by drilling specialists subcontracted to Palmer, during which time sixteen (16) boreholes (BH22-1 to BH22-16) were advanced. The locations of boreholes are shown on the Borehole/Monitoring Well Location Plan, **Drawing 1**. The boreholes were drilled to depths ranging from 5.3 to 20.5 m below existing ground surface (Elev. 114.8 to 98.7).

The boreholes were advanced with a power auger drilling machine, where soil stratigraphy was recorded by observing the quality and changes of augered materials which were retrieved from the boreholes, and by sampling the soils at regular intervals of depth using a 50 mm O.D. split spoon sampler, in accordance with the Standard Penetration Test (SPT) method (ASTM D 1586). This sampling method recovers samples from the soil strata, and the number of blows required to drive the sampler 300 mm depth into the soil (SPT 'N' values) gives an indication of the compactness condition or consistency of the sampled soil material. The SPT 'N' values are indicated on the borehole logs (Refer to **Appendix A**). The field work for this investigation was supervised by Palmer engineering staff, who also logged the boreholes and cared for the recovered samples.

Boreholes BH22-11 to BH22-16 were advanced into bedrock below overburden. Upon encountering bedrock, a HW drill casing was sealed into bedrock and then the bedrock was sampled by diamond core drilling over lengths ranging from 3.4 to 8.6 m. The coring of rock was carried out with HQ size double tube wireline equipment, allowing recovery of 63 mm diameter rock cores. The Palmer engineering staff recorded and visually described the rock samples. For the rock cores, the Total Core Recovery (TCR), Solid Core Recovery (SCR), Rock Quality Designation (RQD) values and Fracture Indices (FI) were recorded in accordance with the conventions used by the International Society for Rock Mechanics (ISRM). Unconfined Compressive Strength (UCS) testing was conducted on six (6) selected rock core samples and the results are presented in **Appendix C.**

Eight (8) monitoring wells were installed in Boreholes BH22-1, BH22-2, BH22-3, BH22-7, BH22-8, BH22-9, BH22-11 and BH22-16 to determine stabilized groundwater levels. The remaining boreholes without monitoring wells installed were backfilled and sealed upon completion of drilling. The stabilized groundwater levels were measured on December 22, 2022. The monitoring wells installation details and the measured groundwater levels are summarized in **Table 2** and shown in the individual borehole logs.

All soil samples obtained during this investigation were brought to our laboratory for further examination. These soil samples will be stored for a period of three (3) months after the day of issuing the draft report, after which time they will be discarded unless Palmer is advised otherwise in writing. In addition to visual examination in the laboratory, all soil samples from geotechnical boreholes were tested for moisture contents. Grain size analyses of four (4) selected soil samples were conducted and the results are presented in **Appendix B**.

The approximate elevations at the as drilled borehole locations were surveyed using differential GPS unit. The elevations at the as-drilled borehole locations were not provided by a professional surveyor and should be considered as approximate. Contractors performing the work should confirm the elevations prior to construction. The locations plotted on **Drawing 1** were based on the survey and should be considered as approximate.

4. Subsurface Conditions

The borehole locations are shown on **Drawing 1**. General notes on soil sample description are presented on the "Explanation of Terms Used in the record of borehole" sheet in **Appendix A**. The subsurface conditions in the boreholes are presented in the individual borehole logs (**Enclosures 1** to **16** inclusive, **Appendix A**). The subsurface conditions in the boreholes are summarized in the following paragraphs.

4.1 Soil Conditions

Topsoil

About 100 mm of topsoil was encountered at the surface of Boreholes BH22-11 to BH22-16. It should be noted that the thickness of the topsoil encountered at the borehole locations may not be representative of the site and should not be relied upon to calculate the amount of topsoil at the site.

Fill Materials

Fill Materials consisting of sands with silt and gravel, or clayey silt were encountered below the topsoil or on the surface of all boreholes and extended to depths ranging from about 2.2 to 4.6 m below existing ground surface (Elev. 117.0 to 113.9). The standard penetration 'N' values ranging from 5 to greater than 50 blows per 300 mm penetration indicated a loose to very dense compactness condition and showed the presence of potential debris within the fill. The in-situ moisture contents measured in the fill materials ranged from approximately 4% to 32%.

Silt / Sandy Silt

Silt to sandy silt was encountered below the fill materials in BH22-4, BH22-6 and BH22-10, and below the silty sand in BH22-13. The silty to sandy silt extended to depths ranging from 3.1 to 5.7 m below existing ground surface (Elev. 114.6 to 113.0). The standard penetration 'N' values ranging from 4 to 16 indicated a loose to compact compactness condition. The natural moisture contents measured in the soil samples ranged from approximately 19% to 20%.

Sand / Silty Sand

Sand to silty sand was encountered below the fill materials in BH22-1, BH22-11, BH22-12, BH22-13, BH22-15, and BH22-16. Sand to silty sand was also encountered below the silt in BH22-4. The sand to silty sand extended to depths ranging from 3.8 to 5.7 m below existing ground surface (Elev. 114.4 to 113.0). The standard penetration 'N' values ranging from 10 to greater than 50 blows per 300 mm penetration indicated a compact to very dense compactness condition. The natural moisture contents measured in the soil samples ranged from approximately 8% to 21%.

Grain size analyses were conducted on two (2) samples (BH22-13/SS4 and BH22-16/SS6) from the silty sand deposits. The results are presented on individual borehole logs and in **Appendix B**, with the following range of fractions:

Gravel:	4% to 6%
Sand:	64% to 81%
Silt:	12% to 22%
Clay:	3% to 8%

Silty Clay

Silty clay was encountered below the fill materials in BH22-4 and BH22-7 and below the silt in BH22-6 and BH22-10. The silty clay extended to depths ranging from 3.8 to 6.2 m below existing ground surface (Elev. 113.8 to 112.5). BH22-10 was terminated in this unit. The standard penetration 'N' vales ranged from 4 to greater than 50 blows per 300 mm penetration indicated a soft to hard consistency. The natural moisture contents measured in the soil samples ranged from approximately 17% to 19%.

Clayey Silt (Till)

Clayey silt (till) was encountered below the fill in BH22-3, BH22-5 and BH22-9, below the sand in BH22-1, BH22-4, BH22-10, BH22-12 and BH22-15, below the silt in BH22-13 and below the clay in BH22-6, BH22-7 and BH22-14. The clayey silt (till) extended to depths of 5.3 to 7.7 m below existing ground surface (Elev. 114.4 to 110.4). BH22-1, BH22-3 to BH22-7 and BH22-9 were terminated in this deposit. In

BH22-13 to BH22-15, the clayey silt till contained fragments of shale and is considered as a shale complex. The standard penetration 'N' values ranged from 8 to greater than 50 blows per 300 mm penetration indicated a firm to hard consistency. The natural moisture contents ranged from 8% to 17%.

Grain size analyses were conducted on two (2) samples (BH22-4/SS6 and BH22-12/SS7) from the clayey silt (till) deposits. The results are presented on individual borehole logs and in **Appendix B**, with the following range of fractions:

Gravel:	17% to 19%
Sand:	15% to 21%
Silt:	47% to 48%
Clay:	12% to 21%

Sandy Silt (Till)

Locally, sandy silt (till) was encountered below the fill materials in BH22-2 extended to borehole termination at 5.3 m below existing ground surface respectively (Elev. 113.7). Standard penetration 'N' values ranged from 7 to 13 indicated a loose to compact compactness condition.

Shale and Limestone

Boreholes BH22-11 to BH22-16 had auger refusal upon reaching shale and limestone bedrock at depths of 7.1 to 7.7 m (elevation 110.4 to 111.6). Upon reaching auger refusal, BH22-11 to BH22-16 were further advanced by diamond rock coring using HQ size double-tube coring equipment. The rock core length ranged from 4.5 to 12.8 m to the maximum exploration depths of 15.2 to 20.5 m (elevation 105.5 to 98.7).

The bedrock was visually identified as grey shale and limestone from the Georgian Bay formation. Detailed rock core logs and log photographs can be found in **Appendix A.**

Total Core Recovery

Total Core Recovery (TCR) is the total cumulative length of all cores recovered in the core barrel expressed as a percentage of the length of the core run on a per run basis. The nature of double-barrel coring required the core to be assembled to align discontinuities prior to the measurement of TCR. The TCR of the rock cores ranged from 58 to 100%.

Rock Quality Designation

Rock Quality Designation (RQD) is the total cumulative length of intact core recovered expressed as a percentage of the length of the core run recorded on a per run basis. The cumulative length all intact rock

is all pieces which have a minimum length of 100 mm as measured along the centreline of the core, regardless of core diameter. The RQD values of the rock ranged from 0 to 83%.

Hard Layers

When recovering the core samples, the thickness of interbedded "hard" shaly limestone/limestone layers were measured and their aggregate expressed as a percentage of the actual length of core run (usually 1.5 m). "Hard layers" are defined herein as distinct stronger rock layers or lenses which have unconfined compressive strengths exceeding that of the bulk of rock mass. However, this is a subjective index based on visual examination and relatively basic index strength tests. The measured thicknesses of individual hard layers of the rock cores were typically less than 100 mm in the investigation. This rock formation, however, is known to contain very strong shaly limestone/limestone layers up to 1000 mm in thickness. Encountering such thick layers should be anticipated at the site. Percentage of hard layers ranged from 0% to 99% from the retrieved rock cores. The hard layers are mainly shaly limestone and/or limestone and may vary significantly in thickness over a short distance.

Fracture Index

The fracture index is a measure of the frequency of fracturing and bedding plane separations. It is expressed as the number of fractures per 0.3 m length of rock core run. Breaks which were obviously induced by drilling are excluded. A continuous vertical fracture, regardless of its length, is counted as one fracture. The recorded values ranged between 0 and greater than 25 in the investigation. It was observed that the planes of weaknesses along which the cores tended to break included planes of fissility and bedding, the contact surfaces between shale and limestone bands and some oblique and subvertical joints. The joints along the planes of fissility and bedding surfaces were generally smooth and clean, while those along the bedding surfaces were generally more open and were occasionally infilled with clay. The occasional oblique and subvertical faults were often stepped to irregular and the joint surfaces were often rough to very rough.

Weathering

In general, weathering in the bedrock was limited to the surfaces of major discontinuities. Deeper penetrating weathering has occurred in the zones very close to the bedrock surface, where the degree of weathering is described predominantly as highly to moderately weathered. Below this, the degree of weathering ranged from fresh to slightly weathered, except along surfaces of major discontinuities, where the degree of weathering ranged from slightly weathered to moderately weathered. The shaly limestone/limestone layers were generally fresh with only slight surficial weathering on joint surfaces in the zone close to bedrock surface.

Unconfined Compressive Strength

Unconfined Compressive Strength testing (UCS) was completed on selected samples. The laboratory test reports can be found in **Appendix C** and are summarized in **Table 1** below:

Table 1: UCS Testing Results

Borehole	Sample No.	Sample Depth Below Ground Surface (m)	Unconfined Compressive Strength (MPa)
BH22-11, SA3	1	10.2 to 10.3	18.9
BH22-12, SA2	2	10.0 to 10.2	18.0
BH22-13, SA5	3	15.1 to 15.2	46.1
BH22-14, SA3	4	9.9 to 10.1	128.7
BH22-15, SA5	5	13.9 to 14.0	137.5
BH22-16, SA6	6	15.8 to 16.0	31.0

4.2 Groundwater Conditions

Eight (8) monitoring wells (50 mm dia.) were installed to monitor stabilized groundwater levels. The stabilized groundwater levels were measured on December 22, 2022. The monitoring well installation details and the measured groundwater levels are summarized in **Table 2** and shown in the individual borehole logs.

Table 2: Monitoring Well Details and Water Levels

Monitoring Well ID	Screen Interval (mBGS)	Water Level Depth (mBGS)/ Water Level Elevation (m)
		December 22, 2022
BH22-1	1.6 ~ 4.6	3.2/115.9
BH22-2	1.6 ~ 4.6	3.1/116.0
BH22-3	1.6 ~ 4.6	4.3/115.4
BH22-7	3.1 ~ 6.1	3.8/115.2
BH22-8	1.6 ~ 4.6	2.7/115.3
BH22-9	3.1 ~ 6.1	4.1/115.3
BH22-11	9.1 ~ 12.1	3.0/114.7
BH22-16	16.6 ~ 18.1	6.2/114.0

Note: mBGS = meter below ground surface

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to weather events.

5. Discussion and Recommendations

5.1 Building Foundation Considerations

It is understood that the proposed subdivision development would consist of a 15-story and two 25-story buildings with three (3) levels of underground parking. The current conceptual plan considers an underground parking floor-to-floor height of 3.1 m. Consequently, the lowest FFE of the proposed three (3) level underground structure is currently planned at about 11 m below existing ground surface. An

additional 1 to 2 m below the third level FFE will be required to construct the footings with a resultant approximate founding depth in the range of 12.5 m.

Conventional shallow foundations including strip and spread footings are considered appropriate to support the proposed structure. Deep foundations are not recommended.

Based on the borehole information, the sound shale and limestone bedrock encountered are considered capable of a bearing capacity of 5,000 kPa factored net bearing resistance at Ultimate Limit State (ULS) as the settlement of bedrock is considered negligible.

5.1.1 Site Preparation for Foundations

Prior to the placement of any engineered / imported fill such as for access ramps, all existing fills and surficially softened native soils must be removed and the exposed surface proof rolled. Any soft spots revealed during proof rolling must be sub-excavated and re-engineered. Engineered fill consisting of approved inorganic material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. To reduce the risk of improperly placed engineered compacted fill, full-time supervision of the contractor is essential.

All footing bases must be inspected by qualified geotechnical personnel prior to pouring concrete. The excavated footing bases can be covered with 50 mm thick lean concrete slab immediately after inspection and cleaning in order to avoid disturbance of the founding soil due to water, construction activity and weathering / drying.

In the vicinity of the existing buried utilities, all footings must be lowered to undisturbed native soils/bedrock, or alternatively the services must be structurally bridged. Where it is necessary to place footings at different levels, the upper footing must be founded below an imaginary 10 horizontal to 7 vertical line drawn up from the base of the lower footing. The lower footing must be installed first to help minimize the risk of undermining the upper footing.

It should be noted that the recommended bearing resistances that have been calculated by Palmer from the limited borehole information are for preliminary design only. This information must be updated as additional information regarding subsurface conditions becomes available. For example, additional information with respect to subsurface conditions between boreholes will become available once excavation is underway. This additional information must be used to validate the interpretations and recommendations made in this report.

5.1.2 Frost protection

All foundations exposed to seasonal freezing conditions must have at least 1.2 m of soil cover for frost protection.

There is no official regulation governing the required soil cover for frost protection of footings below unheated basement floors. Certainly, it will not be greater than 1.2 m required for exterior footings. Unconfirmed experience suggests that shallower depths of soil cover of 0.9 m for interior column footings and 0.6 m for wall footings have been adequate in cases of 2 or more levels of basements. Adjacent to air shafts and entrance / exit doors, a footing depth of 1.2 m below floor level is required or alternatively insulation must be provided.

It is also emphasized that underfloor drainage and / or adequate free draining gravel base is required to minimize the risk of floor dampness which can lead to icing and adverse consequences.

5.2 Floor Slab and Permanent Drainage

With three levels of underground parking, the floor slab can be supported on the sound shale bedrock provided that all loose materials are removed. A moisture barrier consisting of at least 300 mm of 19 mm clear crushed stone should be installed under the floor slab.

Given that the structure may be located below the groundwater table and depending on the foundation design, as per the OBC one or a combination of the permanent perimeter and underfloor drainage systems as conceptually shown in **Drawings 2** to **5** is required. Where the exposed subgrade consists of cohesionless soils below the water table; all openings including the subgrade must be covered or wrapped with filter fabric, typically a Class II non-woven textile with filtration opening size of 50 µm to 100 µm to prevent migration of fines and clogging of drains. Above the filter fabric, a layer of concrete sand is recommended. It is imperative that both the filter fabric and concrete sand are placed on the subgrade.

Special care should be taken to ensure compaction around columns and adjacent to foundation walls. Unless the foundations are designed to account for the floor slab loads, the floor slabs should be structurally separated from the foundation walls and columns. Sawcut control joints should be provided at regular intervals and along column lines to minimize shrinkage cracking and to allow for differential settlement of the floor slabs.

Where the backfill against the exterior walls is to support settlement sensitive structures, such as concrete slabs, pavements or walkways, it should be uniformly compacted to at least 98% of SPMDD.

5.2.1 Elevator Pits

Elevator pits can be designed as water-tight structures. Water pressures on the pit walls and the slab should be taken into consideration by the design engineer.

A drainage system at the base level of the elevator pits may also be considered with the watertight structure to accommodate minor seepage.

5.3 Excavations and Backfill

Based on the proposed three levels of underground parking, it is anticipated that the excavations will continue to a depth of 12 to 13 m below the existing ground surface. Based on the results of this investigation, the excavations would extend into sound shale bedrock.

5.3.1 Excavation in Overburden

Excavations of overburden are expected to extend through the fill into the native clay along with the silt and sand tills and can be carried out with a heavy hydraulic backhoe. It should be noted that the (glacial) tills are non-sorted sediments and therefore may contain boulders. Possible large obstructions such as buried concrete pieces and existing foundations may also be encountered at the Site within the fill materials. Provisions must be made in the excavation contract for the removal of possible boulders in the till or obstructions in the fill material.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the fill materials, the firm to stiff cohesive soils, and the compact cohesionless soils would be classified as Type 3 above the groundwater table and Type 4 below the groundwater table. The very stiff to hard cohesive soils and dense cohesionless soils fall into the category of Type 2 Soils above the groundwater table and Type 3 to Type 4 Soils below the groundwater table.

Provided adequate groundwater control is achieved, it is anticipated that the majority of the foundation excavations at the Site could consist of temporary open cuts with side slopes of 1 horizontal to 1 vertical (1H: 1V) to the base of the excavation. However, depending on the construction procedures adopted by the contractor and weather conditions at the time of construction, some local flattening of the slopes may be required. Where side slopes of excavations are to be steepened, then a positive excavation support system should be considered.

The existing fill in the boreholes is generally not suitable for re-use as backfill. The native soils free from organics and other deleterious materials can be used as general construction backfill. Loose lifts of soil, which are to be compacted, should not exceed 200 mm. Depending on the time of construction and weather, some excavated material may be too wet to compact and will require aeration prior to its use.

Under floor fill should be compacted to at least 98% of SPMDD. The excavated soils are not considered to be free draining. Where free draining backfill is required, imported granular fill such as OPSS Granular "B" should be used. Imported granular fill, which can be compacted with handheld equipment, should be used in confined areas.

It should be noted that the excavated soils are subject to moisture content increase during wet weather which would make these materials too wet for adequate compaction. Stockpiles should be compacted at the surface or be covered with tarpaulins to minimize moisture uptake.

It is expected that any seepage above the groundwater table can be removed by pumping from sumps in the building development area. However, due to the high groundwater level encountered at the site, significant seepage should be expected once the excavations extend below the prevailing groundwater tables in the cohesionless silt and sand soils at the site. Depending upon the actual thickness and extent of these soils, the prevailing groundwater level at the time of construction, "active, advance" dewatering measure using well points/eductors will be required to maintain the stability of the base and side slopes of the excavations in these areas. These 'active dewatering' measures would have to be installed and then operated for a week or two in advance of excavation work progressing to these areas. A contractor specializing in dewatering should be retained to design the active dewatering systems.

It should be noted that if the construction dewatering system/sumps result in a water taking of more than 50,000 L/day but less than 400,000 L/day, a registration should be made in the Environmental Activity and Sector Registry (EASR). If a water taking is more than 400,000 L/day, a permit to take water (PTTW), issued by the MECP, will be required. A hydrogeological assessment by Palmer to determine dewatering requirements will be provided in a separate report.

Surface water should be directed away from the excavation area, to prevent ponding of water that could result in disturbance and weakening of the foundation subgrade.

5.3.2 Excavation in Bedrock

The bedrock can generally be excavated without blasting. Blasting should not be considered due to the surrounding roadways, railroad and buildings and the potential presence of the methane gas. It should be noted that the excavation of bedrock is expected to be very slow and laboured and will be a challenge for excavation equipment. Productivity of the excavation will be low. The top weaker portion of the bedrock can generally be removed with a powerful excavator equipped with a rock bucket and rock teeth, assisted by hoe ramming. The removal of the underlying fresh and stronger rock and especially the hard layers (i.e. limestone) or the bedrock with rock quality is "fair", "good" or "excellent" (i.e. RQD > 50%), however, may be arduous and time consuming, and may require use of impact breakers and line-

drilling. The relative ease/difficulty in excavation of bedrock will also depend on the size (width) and depth of the excavation.

It should be noted that “hard” layers in the shale bedrock should be expected as mentioned in this report. These “hard” layers encountered in the rock core samples were relatively thin. However, thicker hard layers have been reported to be as much as up to 1000 mm in the same bedrock formation. Should the thicker hard layers be encountered in the shale, it will pose significant difficulties on the rock excavation, especially when blasting is not allowed. It is recommended that Non-Standard Specifications Provisions (NSSPs) be included in the Contract Documents to warn the Contractor of these conditions.

The excavation into fresh, sound bedrock can be done using near-vertical sidewalls (10V:1H) provided that:

- All OHSA requirements regarding worker safety are met during the course of the work.
- The rock face is scaled of all loose and potentially spalling material (including slaked rock as the excavation faces dry out over time).
- For the bedrock is to be exposed for a long period of time, the surface should be fully covered with at least 60 mm of fibre-reinforced shotcrete or protective mesh.

The Georgian Bay Formation is known to contain pockets of combustible gas (methane). Appropriate care, mechanical forced venting and monitoring are essential in all confined bedrock excavation. In some areas of the GTA, this gas has been found to migrate up into the overlying soils.

5.4 Temporary Shoring

In consideration of the predominant silty/sandy soils encountered in all boreholes, a continuous cut-off caisson wall may be considered to reduce the groundwater seepage during the temporary dewatering stage. Depending on the foundation design and depth of adjacent buildings, continuous caisson walls should also be considered for the shoring system to support the adjacent buildings. Soldier pile and lagging shoring system may also be considered, however, the potential of the wet sand layer sloughing into the excavation must be addressed in the shoring system design. A caisson wall may also be required to support adjacent structures.

Depending on design requirements, the shoring walls may be braced using rakers, struts, corner braces or soil anchors.

The shoring system should be designed by a specialist shoring design engineer and must be in accordance with the 4th Edition of the Canadian Foundation Engineering Manual (CFEM). Soil parameters applicable to this design are provided in **Table** Table**3**.

Table 3. Recommended Geotechnical Parameters for Design

Soil Types[1]	Unit Weight (γ) (kN/m³)	Effective Angle of Internal Friction (φ') (deg)	Effective cohesion (c') (kPa)	Coefficient of Lateral Earth Pressure		
				At Rest	Active	Passive
Stiff Clayey Silt (till)	20.5	28	2.0	0.53	0.36	2.77
Very stiff Clayey Silt (till)	21	30	5.0	0.50	0.33	3.00
Hard Clayey Silt (Till)	21.5	32	10.0	0.60	0.31	3.25
Compact Silty Sand to Sandy Silt	21	30.0	0.0	0.50	0.33	3.00
Dense Silty Sand to Sandy Silt	21.5	32.0	0.0	0.55	0.31	3.25
Very Dense Silty Sand to Sandy Silt	22.5	37.0	0.0	0.80	0.25	4.03

Soldier piles should be installed in pre-augered holes to a pre-determined depth. Holes should be filled with concrete strength specified by the shoring engineer. No loss of ground should be permitted during augering for piles and contractor should be aware of potential for occasional obstructions and / or boulders within fill and native till materials. Temporary liners may be required to control water seepage and caving.

If shoring is to be carried out over the winter months or if the excavation is to be left open for any period during below zero temperature, shored walls must be protected against frost penetration by means of insulated or heated hoarding.

Soil anchor length(s) if applicable must meet requirements of the 4th Edition of Canadian Foundation Engineering Manual. The top anchor must not be placed lower than 3.0 meters below the top of level ground surface.

For post tensioned pressure grouted soil anchors installed into compact or very stiff soils, the allowable (SLS) bond stress between grout and soil can be assumed as 80 kPa. Suggested bond capacity will depend on the contractor's installation procedures who is responsible for design and confirmation of bond

capacity to be established through pull-out tests at each anchor level in accordance with CFEM (4th edition), testing to 200% of working load. Each installed anchor must be proof loaded to 1.33 times the design working load, in accordance with Post-Tensioning Institute (PTI) guidelines. Anchors should be double-corrosion protected (i.e. PTI Class I). Adhesion on the buried piles or behind the shoring system must be neglected when designing this shoring system.

Movement of the shoring system is inevitable. Vertical movement will result from the vertical load on the shoring system resulting from inclined tiebacks and inward horizontal movement results from earth and water pressures. The magnitude of movement can be controlled by sound construction practices. Horizontal movement should be in the range of 0.1% to 0.25% the height of the excavation.

To ensure vertical and horizontal deformations within acceptable ranges, a monitoring program must be completed. Vertical and horizontal targets on the shoring walls must be located and surveyed before excavation begins. Weekly readings during excavation should indicate movements within expected tolerances and if otherwise will necessitate improvements to the shoring system. Movement should be monitored throughout the construction period.

5.4.1 Preconstruction Condition Survey

It is recommended that a preconstruction survey of neighboring properties and any adjacent utilities and structures be completed prior to excavation and throughout the construction period.

Additionally, the types and condition of all adjacent structures and underground services should be reviewed by the structural and geotechnical engineer to determine potential underpinning requirements as conceptually identified in **Drawing 6**. Utility owners should be contacted to establish deformation limits.

5.5 Lateral Earth Pressures

The lateral earth pressures acting at any depth on foundation walls may be calculated from the following expression:

$$P_h = K (\gamma h + q)$$

where P_h = Lateral earth pressure acting at depth “h” (kPa)

K = Earth pressure coefficient, assumed to be 0.40 for vertical walls and horizontal backfill for permanent construction

γ = Unit weight of backfill, may assume a value of 21 kN/m^3

h = Depth below finished grade of the point of interest (m)

q = Equivalent value of surcharge on the ground surface (kPa)

The above expression assumes that the perimeter drainage system as shown on **Drawing 2 to 5** prevents the build-up of any hydrostatic pressure behind the wall. Otherwise, below the water table the submerged unit weight of the soil should be used and the full hydrostatic water pressure added. If the ground surface is not horizontal, the uneven portion can be treated as an equivalent surcharge load. For additional parameters, see **Table 3.**

To minimize potential for hydrostatic uplift, building design must ensure appropriate weight to resist such pressures. As per the above equation, hydrostatic uplift may be calculated by considering the depth below finished grade and multiplying by unit weight of water (9.8 kN/m3). Note that the permanent foundation structure should also be self-supporting and not reliant on mobilized friction / adhesion against backfill / native soil or the temporary shoring system.

5.6 Seismic Considerations

The 2012 Ontario Building Code (OBC 2012) came into effect on January 1, 2014 and contains updated seismic analysis and design methodology. The seismic site classification methodology outlined in the code is based on the subsurface conditions within the upper 30 m below existing grade.

The conservative site classification is based on physical borehole information obtained at depths of less than 30 m and based on general knowledge of the local geology and physiography. In this regard, Palmer's drilling program included boreholes drilled to depths up to 20.5 m below the existing ground surface. Based on the borehole information and our local experience, a Site Class B may be used for the building design.

Should optimization of the site class be recommended by the structural engineer, in situ geophysical testing or a deep borehole extending to 30 m may be considered.

5.7 Pavements

The recommended pavement structures provided in **Table 4** are based upon borehole information obtained in this investigation. The values may need to be adjusted based on the municipality/regional standards. Consequently, the recommended pavement structures should be considered for reference purposes only. A functional design life of eight to ten years has been used to establish the pavement recommendations. This represents the number of years to the first rehabilitation, assuming regular maintenance is carried out. If required, a more refined pavement structure design can be performed based on specific traffic data and design life requirements and will involve specific laboratory tests to determine frost susceptibility and strength characteristics of the subgrade soils, as well as specific data input from the client.

Table 4: Recommended Pavement Structure Thickness

Pavement Layer	Compaction Requirements	Light Duty Pavement (Parking for Cars)	Heavy Duty Pavement (Access Road, Fire Routes, occasional Delivery Trucks)
Asphaltic Concrete	92% Maximum Relative Density (MRD)	40 mm HL 3 50 mm HL 8	40 mm HL 3 80 mm HL 8
OPSS Granular "A" Base (or 20mm Crusher Run Limestone)	100% SPMDD*	150 mm	150 mm
OPSS Granular "B" (or 50mm Crusher Run Limestone)	100% SPMDD	250 mm	350 mm

* Denotes Standard Proctor Maximum Dry Density, ASTM-D698

The subgrade must be compacted to 98% SPMDD for at least the upper 500 mm unless accepted by Palmer.

The pavement design considers that construction will be carried out during the drier time of the year and that the subgrade is stable, as determined by proofrolling operations. If the subgrade should become excessively wet or rutted during construction activities, additional subbase material may be required. The need for additional subbase is best determined during construction.

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be sloped (preferably at a minimum grade of two percent) to provide effective surface drainage toward catch basins. The excavation around catch basins and manholes should be backfilled with free-draining granular material to minimize differential movements between the pavement and structures due to frost action. The manholes/catch basins should be provided with perforated stub drains to permit drainage of the backfill. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. Subdrains should be installed to intercept excess subsurface moisture and prevent subgrade softening. This is particularly important in heavy-duty pavement areas.

Additional comments on the construction of internal roadways and parking areas are as follows:

1) As part of the subgrade preparation, proposed area for internal roads and pavements should be stripped of topsoil and other obvious deleterious material. Fill required to raise the grades to design elevations should conform to backfill requirements outlined in previous sections of this report. The subgrade should be properly shaped, crowned then proof-rolled in the full-time presence of a representative of this office. Soft or spongy subgrade areas should be sub-excavated and properly replaced with suitable approved granular backfill compacted to 98% SPMDD.

2) The locations and extent of sub-drainage required within the roadways and other paved areas should be reviewed by a pavement engineer in conjunction with the proposed site grading. The subdrains should be properly filtered to prevent the loss of (and clogging by) soil fines. Assuming that satisfactory crossfalls in the order of two percent have been provided, subdrains extending from and between catch basins may be satisfactory. If shallower crossfalls are considered, a more extensive system of sub-drainage may be necessary and should be reviewed by a pavement engineer.

The most severe loading conditions on light-duty pavement areas and the subgrade may occur during construction. Consequently, special provisions such as restricted access lanes, half-loads during paving, etc., may be required, especially if construction is carried out during unfavourable weather.

5.8 Geotechnical Quality of Excavated Soils

Reference to the borehole logs suggests that the excavated materials with respect to their compaction characteristics can be divided into three groups:

- **Group 1** comprises the native clayey silt and silty clay and have moisture content very close to or above its optimum water content. This material will excavate in clods and would thus require a heavy pad footed compactor or hoe pack to break it down and adequately compact it. Given the water content of the clayey silt, it may not be possible to obtain a degree of compaction of this material much above 95% of SPMDD. This degree of compaction might be acceptable within landscaped areas above which pavements or infrastructure are not expected to be built in the future.

- **Group 2** soils comprise the cohesionless to low plasticity silt and sand. The compaction of these soils will require a very tight control of their moisture content during placement and compaction. At moisture contents more than 3% below the optimum, the soil will likely be dusty and “flour” like while at moisture contents ±1% higher than optimum, the soil will be “spongy” and will “pump”.

- **Group 3** soils consist of unsuitable materials because of their high moisture, organic inclusions, or deleterious inclusions, including all of the existing fill materials. These soils should be either

disposed off-site or should be used only in “soft” landscaping areas where they can be placed with nominal compaction, and where surface settlements are tolerable.

As a general requirement, all backfill material should be placed in 200 to 300 mm thick loose lifts and compacted to at least 96% of SPMDD, at a placement moisture content within ±2% of the optimum. Below existing/future roads, the backfill must be Granular “A” or “B” material, and the top 1.5m of subgrade backfill below the underside of the pavement structure should be compacted to 98% of SPMDD.

5.9 Concrete Exposed to Sulphate Attack

The sulphate (SO_4) resistance of the concrete in contact with the soil was evaluated by performing water-soluble sulphate tests on two (2) soil samples. The tested sample and the corresponding sulphate concentrations are summarized in **Table 5** below. The analytical data is provided as part of the Laboratory Certificate of Analysis in **Appendix D**.

Table 5: Summary of Sulphate Concentration Test

Sample ID	Soil Depth (mBGS)	Soil Type	Sulphate Concentration (%)
BH22-6 SS7	4.6 – 5.3	Clayey Silt Till	0.0165
BH22-12 SS6	4.6 – 5.3	Clayey Silt Till	0.0027
BH22-15 SS6	4.6 – 5.3	Silty Sand	0.0030

Note: mBGS = meters below ground surface

The category of severity of attack is “negligible” based on CSA Standard CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction. The final selection of the type of concrete should be made by the Engineer taking into account all aspects of design considerations.

6. Certification

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

This report was prepared and reviewed by the undersigned:

Prepared By: Draft

Alonzo Rowe, P.Eng.
Geotechnical Engineer

Reviewed By: Draft

Chi Cheng (Dennis) Tseng, M.Sc., P.Eng.
Principal Geotechnical Engineer

7. References

ASTM International. 2018. ASTM D1586 / D1586M-18, Standard test method for standard penetration test (SPT) and split-barrel sampling of soils.

Canadian Geotechnical Society. 2006. Canadian Foundation Engineering Manual, 4th Edition.

Chapman, L.J. and Putnam, D.F. 1984. Physiography of southern Ontario; Ontario Geological Survey

Ontario Geological Survey 2010. Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release— Data 128 – Revised.

Ontario Geological Survey 2011. 1:250 000 scale bedrock geology of Ontario; Ontario Geological Survey, Miscellaneous Release---Data 126-Revision 1.

General Comments and Limitations of Report

Palmer should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, Palmer will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes and test pits required to determine the localized underground conditions between boreholes and test pits affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole and test pit results, so that they may draw their own conclusions as to how the subsurface conditions may affect them. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to Palmer at the time of preparation. Unless otherwise agreed in writing by Palmer, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Palmer accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

Drawings

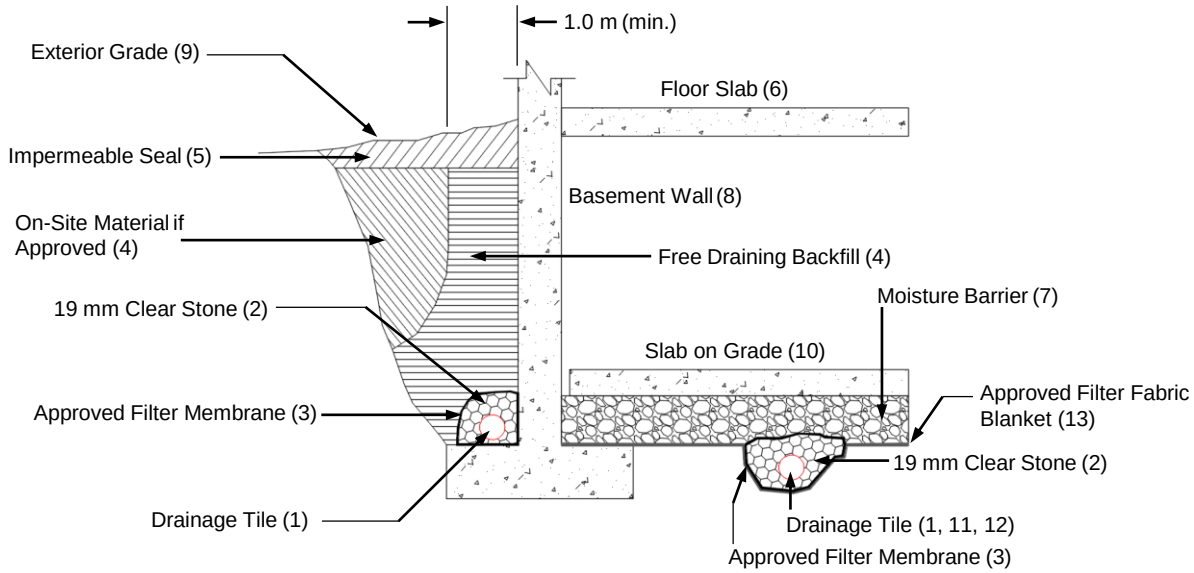
LEGEND

Borehole/Monitoring Well Location

Borehole Location

Client:	**13545130 Canada Inc.**			Project No.: **2209001**	Drawing No.: **1**
Drawn:	**IB**	Approved:	AR	Title:	**Borehole/Monitoring Well Location Plan**
Date:	**January, 2023**	Scale:	**As Shown**	Project:	**Geotechnical Investigation** **69 & 117 John Street, Mississauga, ON**
Original Size:	**Letter**	Rev:	**N/A**	Palmer™	74 Berkeley Street Toronto, Ontario M5A 2W7

Project: 2209001 Drawing No. 2



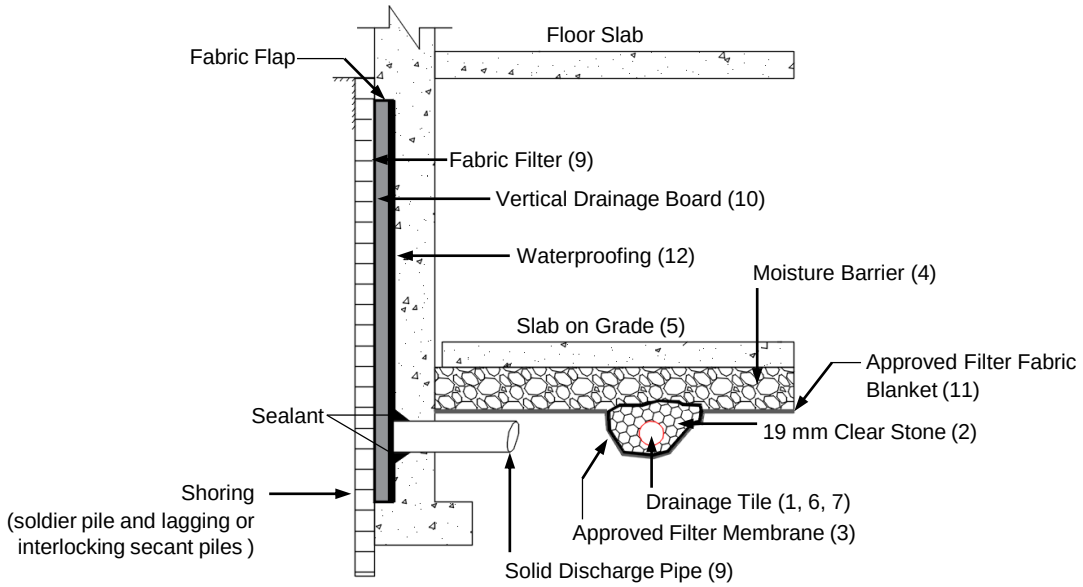
EXTERIOR FOOTING

Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
2. 19 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place 100 mm (4 inches) of stone below drain.
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Free Draining backfill - OPSS Granular B or equivalent compacted to the specified density. Do not use heavy compaction equipment within 450 mm (18") of the wall. Use hand-controlled light compaction equipment within 1.8 m (6') of wall. The minimum width of the Granular 'B' backfill must be 1.0 m.
5. Impermeable backfill seal - compacted clay, clayey silt or equivalent. If original soil is free-draining, seal may be omitted. Maximum thickness of seal to be 0.5 m.
6. Do not backfill until wall is supported by basement and floor slabs or adequate bracing.
7. Moisture barrier to be at least 200 mm (8") of compacted clear 19 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors (consult with architect).
8. Basement wall to be damp proofed / waterproofed.
9. Exterior grade to slope away from building at minimum 2%.
10. Slab on grade should not be structurally connected to the wall or footing.
11. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab.
12. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
13. The entire subgrade to be sealed with approved filter membrane (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
14. Do not connect the underfloor drains to perimeter drains.
15. Review the geotechnical report for specific details.

DRAINAGE AND BACKFILL RECOMMENDATIONS
Basement with Underfloor Drainage System
(not to scale)

Project: 2209001 Drawing No. 3



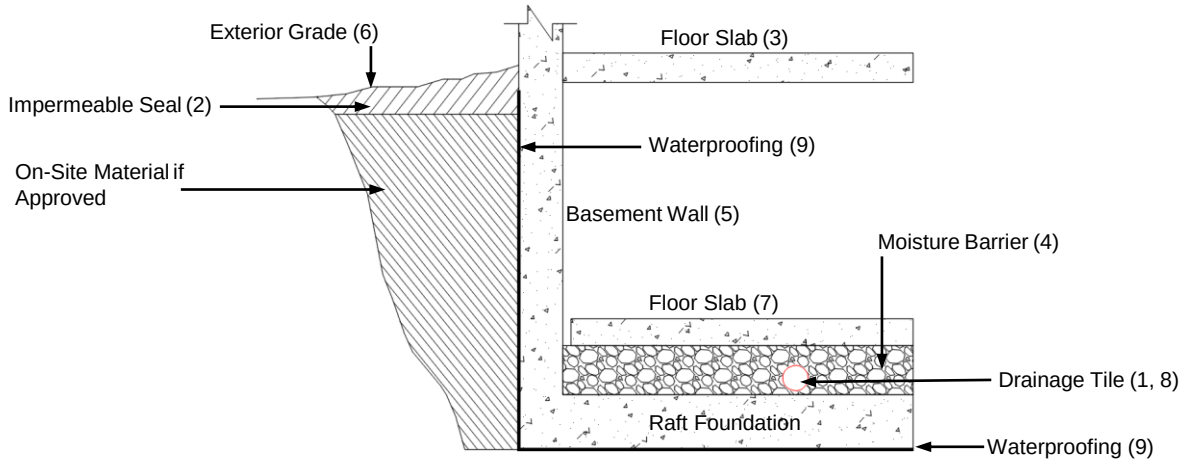
EXTERIOR FOOTING

Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet, spaced between the columns.
2. 19 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place 100 mm (4 inches) of stone below drain.
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Moisture barrier to be at least 200 mm (8") of compacted clear 19 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors (consult with architect).
5. Slab on grade should not be structurally connected to the wall or footing.
6. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab.
7. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
8. Do not connect the underfloor drains to perimeter drains.
9. Solid discharge pipe located at the middle of each bay between the soldier piles, approximate spacing 2.5 m, outletting into a solid pipe leading to a sump.
10. Vertical drainage board with filter cloth should be kept a minimum of 1.2 m below exterior finished grade.
11. The entire subgrade to be sealed with approved filter membrane (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
12. The basement walls should be waterproofed using bentonite or equivalent waterproofing system.
13. Review the geotechnical report for specific details. Final detail must be approved before system is considered acceptable.

DRAINAGE AND BACKFILL RECOMMENDATIONS
Shored Basement Wall with Underfloor Drainage System
(not to scale)

Project: 2209001 Drawing No. 4

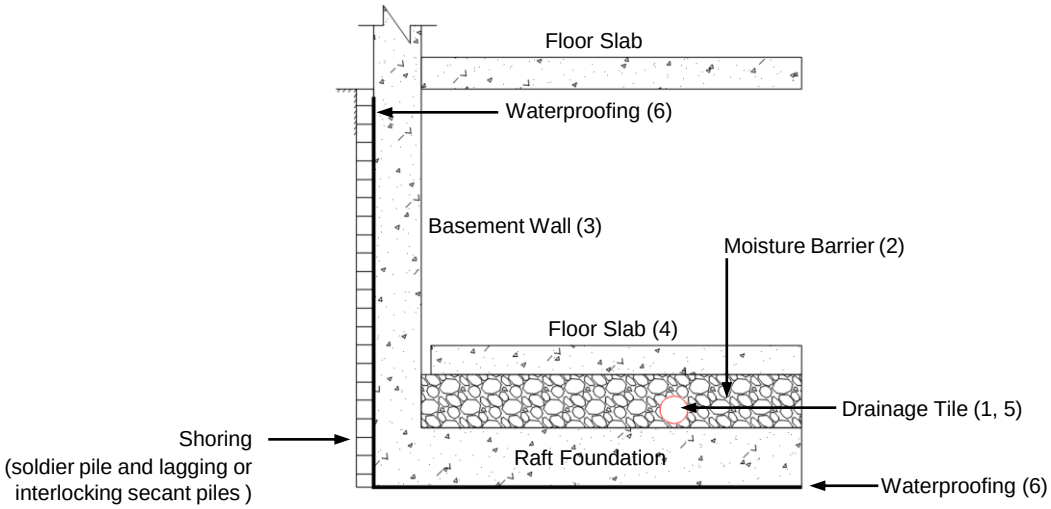


Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet. Invert to be a minimum of 150 mm (6") below underside of floor slab.
2. Impermeable backfill seal – compacted clay, clayey silt or equivalent. If original soil is free-draining, seal may be omitted.
3. Do not backfill until wall is supported by basement and floor slabs or adequate bracing.
4. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material.
5. Basement wall to be waterproofed and the wall has to be designed in consideration of the hydrostatic water pressure.
6. Exterior grade to slope away from building.
7. Slab on grade should not be structurally connected to the wall or footing.
8. Underfloor drain invert to be placed on raft foundation slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centres one way.
9. The waterproofing should be at least 1 m above the highest groundwater table. The waterproofing must be approved by engineer.

DRAINAGE AND BACKFILL RECOMMENDATIONS
Waterproofed Underground Parking Structure / Basement with Underfloor Drainage System
(raft foundation)
(not to scale)

Project: 2209001 Drawing No. 5



Notes

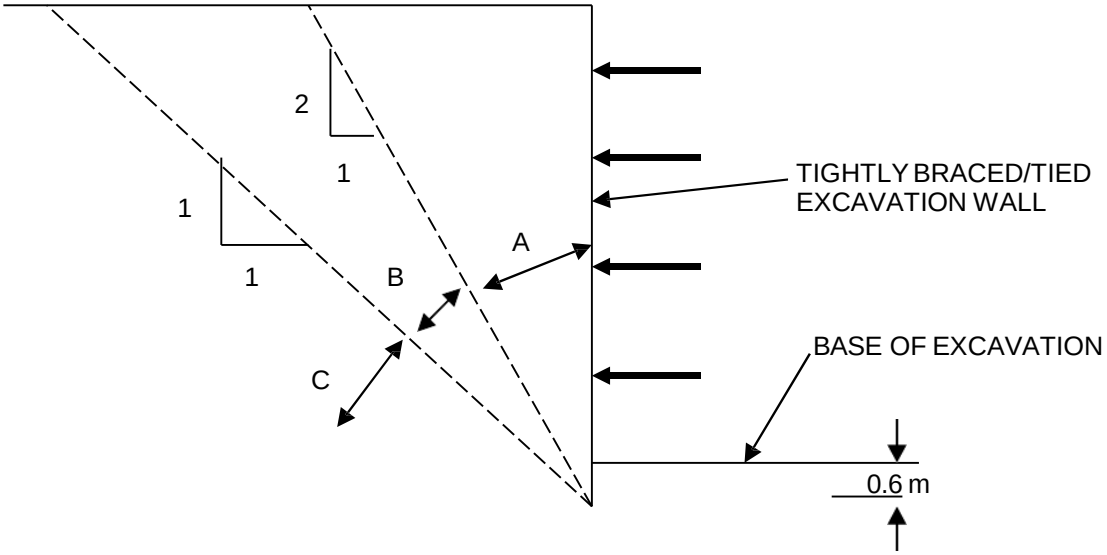
1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet. Invert to be a minimum of 150 mm (6") below underside of floor slab.
2. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material.
3. Basement wall to be waterproofed and the wall has to be designed in consideration of the hydrostatic water pressure.
4. Slab on grade should not be structurally connected to the wall or footing.
5. Underfloor drain invert to be placed on raft foundation slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centres one way.
6. The waterproofing should be at least 1 m above the highest groundwater table. The waterproofing must be approved by engineer.

DRAINAGE AND BACKFILL RECOMMENDATIONS
Shored Waterproofed Underground Parking Structure / Basement with Underfloor Drainage System
(raft foundation)
(not to scale)

Project: 2209001 Drawing No. 6

Guidelines for Underpinning in Soil and Excavation Support

Existing foundations located within Zone A normally require underpinning, especially for heavy structures. For some foundations in Zone A, it may be possible to eliminate underpinning and control foundation movement by tightly braced excavation walls, such as caisson walls.



Zone A: Foundations located within this zone normally require underpinning. Horizontal and vertical pressures on the excavation wall of non underpinned foundations must be considered.

Zone B: Foundations located within this zone do not normally underpinning. Horizontal and vertical pressures on the excavation wall of non underpinned foundations must be considered.

Zone C: Underpinning to structures is normally founded in this zone. Lateral pressure from underpinning is not normally considered.

(Reference: Figure 26.27 from Canadian Foundation Engineering Manual, 4th Edition)

Appendix A

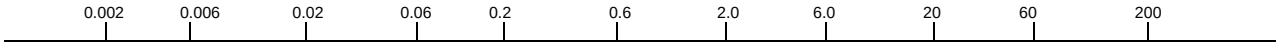
Borehole Logs

Notes On Sample Descriptions

1. All sample descriptions included in this report generally follow the Unified Soil Classification. Laboratory grain size analyses provided by PECG also follow the same system. Different classification systems may be used by others, such as the system by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Please note that, with the exception of those samples where a grain size analysis and/or Atterberg Limits testing have been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Explanation of Terms Used in the Record of Borehole

Sample Type

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Dimension type sample
FS	Foil sample
RC	Rock core
SC	Soil core
SS	Spoon sample
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

Penetration Resistance

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) required to drive a 50 mm (2 in) drive open sampler for a distance of 300 mm (12 in).

Dynamic Cone Penetration Resistance, N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) to drive uncased a 50 mm (2 in) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in).

Textural Classification of Soils

Classification	Particle Size
Boulders	>300 mm
Cobbles	75 mm-300 mm
Gravel (Gr)	4.75 mm-75 mm
Sand (Sa)	0.075 mm-4.75 mm
Silt (Si)	0.002 mm-0.075 mm
Clay (Cl)	<0.002 mm

Coarse Grain Soil Description (50% greater than 0.075 mm)

Terminology	Proportion
Trace	0-10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. sand and gravel)	>35%

Soil Description

a) Cohesive Soils

Consistency	Undrained Shear Strength (kPa)	SPT "N" Value
Very soft	<12	0-2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very stiff	100-200	15-30
Hard	>200	>30

b) Cohesionless Soils

Density Index (Relative Density)	SPT "N" Value
Very loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

Soil Tests

w	Water content
w_p	Plastic limit
w_l	Liquid limit
C	Consolidation (oedometer) test
CID	Consolidated isotropically drained triaxial test
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement
D_R	Relative density (specific gravity, Gs)
DS	Direct shear test
ENV	Environmental/ chemical analysis
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified proctor compaction test
SPC	Standard proctor compaction test
OC	Organic content test
V	Field vane (LV-laboratory vane test)
γ	Unit weight

Palmer

LOG OF BOREHOLE BH22-01

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826927.98 E 611489.09

Method: Hollow Stem Augers

Diameter: 200 mm

Date: Nov 3, 2022

REF. NO.: 2209001

ENCL NO.: 1

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
119.1	Ground Surface						
0.0	**FILL:** silty sand, trace clay, trace to some gravel, brown, moist, compact to very dense		1	SS	15		Concrete
	contains rootlets						Sand
	concrete block/slab encountered						
							Bentonite
1			2	SS	61/ initial 200mm		118
117.6							Sand
1.5	**FILL:** silty sand, trace clay, trace gravel, trace wood pieces, brown, wet, loose to compact		3	SS	8		
2							117
			4	SS	22		
3							
116.0							Screen
3.1	**FILL:** gravelly sand, trace clay, trace silt, brown, moist to wet, loose		5	SS	9		W. L. 115.9 m Dec 22, 2022
115.3	contains clayey silt layers						
3.8	**SILTY SAND:** trace silt, trace gravel, grey, moist to wet, compact		6	SS	11		115
4							
114.5							
4.6	**CLAYEY SILT TILL:** trace sand, trace gravel, grey, moist to wet, stiff		7	SS	11		Bentonite
5							114
113.8							
5.3	**END OF BOREHOLE**						

1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole.
2. Water Level Readings:

Date	W. L. Depth (mBGS)
Dec 22, 2022	3.2

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-02

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

Method: Hollow Stem Augers

PROJECT LOCATION: Mississauga, ON

Diameter: 200 mm

REF. NO.: 2209001

DATUM: Geodetic

Date: Nov 3, 2022 to Nov 4, 2021

ENCL NO.: 2

BH LOCATION: See Borehole Location Plan N 4826875.93 E 611443.05

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
119.0	Ground Surface											
0.0	**FILL:** gravelly sand, trace clay, trace silt, brown to grey, moist, compact		1	SS	16		Concrete / Sand					
118.2							Bentonite					
0.8	**FILL:** silty sand, some gravel, trace clay, brown, moist, compact to loose		2	SS	20		118 / Sand					
			3	SS	7		117					
116.7	encountered metal debris, borehole offset by 1.5m											
2.3	**FILL:** gravelly sand, trace clay, trace silt, grey, moist, compact to loose		4	SS	21		Screen					
			5	SS	10		W. L. 116.0 m Dec 22, 2022					
115.4												
3.6	**FILL:** clayey silt, trace sand, trace gravel, grey, moist, loose											
115.2												
3.8	**SANDY SILT TILL:** trace gravel, trace clay, grey, moist to wet, compact to loose		6	SS	13		115					
			7	SS	7		Bentonite 114					
113.7												
5.3	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) Dec 22, 2022 3.1											

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-03

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

Method: Hollow Stem Augers

PROJECT LOCATION: Mississauga, ON

Diameter: 200 mm

REF. NO.: 2209001

DATUM: Geodetic

Date: Nov 4, 2021

ENCL NO.: 3

BH LOCATION: See Borehole Location Plan N 4826813.65 E 611391.18

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
119.7	Ground Surface											
0.0	**FILL:** silty sand, trace clay, trace gravel, contains cobbles, brown, moist, loose		1	SS	6		Concrete					
							Sand					
							119					
			2	SS	7		Bentonite					
118.2							Sand					
1.5	**FILL:** gravelly sand, trace silt, contains cobbles, brown to grey, moist to wet, very loose		3	SS	3		118					
	wet below 2.6m		4	SS	2		117					
116.6							Screen					
3.1	**FILL:** silty sand, trace clay, grey, moist, compact		5	SS	11		116					
			6	SS	26		W. L. 115.4 m Dec 22, 2022					
115.1							115					
4.6	**CLAYEY SILT TILL:** trace sand, trace gravel, grey, wet, very stiff		7	SS	25		Bentonite					
114.4												
5.3	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) Dec 22, 2022 4.3											

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ε_f=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-04

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826909.39 E 611517.39

Method: Hollow Stem Augers

Diameter: 200 mm

Date: Nov 3, 2022

REF. NO.: 2209001

ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
117.7	Ground Surface						
0.0	**FILL:** silty sand, trace to some clay, trace gravel, contains silty clay pockets, contains cobbles, brown, moist, compact to loose contains rootlets		1	SS	13		117
1			2	SS	10		
116.2							
1.5	**FILL:** sand, some silty, trace clay, trace gravel, contains cobbles, brown, moist, compact		3	SS	22		116
2							
115.5							
2.3	**FILL:** clayey silt, trace sand, trace gravel, some organics, brown, wet, soft contains silty clay pocket		4	SS	4		115
115.0							
2.7	**SILT:** some clay, trace sand, brown, wet, very loose						
3							
114.7							
3.1	**SILTY SAND TILL:** trace clay, some gravel, brown, wet, loose		5	SS	10		114
113.9							
3.8	**CLAYEY SILT TILL:** some sand, trace gravel, contains cobbles, brown to grey, wet to moist, very stiff to hard		6	SS	18		
4							
5			7	SS	24		113
6							112
111.2			8	SS	67/ 275mm		
6.5	**END OF BOREHOLE**						

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED
● QUICK TRIAXIAL
+ FIELD VANE & Sensitivity
× LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
17	15	47	21

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-05

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826872.93 E 611478.93

Method: Hollow Stem Augers

Diameter: 200 mm

Date: Nov 3, 2022

REF. NO.: 2209001

ENCL NO.: 5

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION
118.0	Ground Surface						
0.0	**FILL:** sand, trace silt, some gravel, dark brown to brown, moist, compact		1	SS	17		
			2	SS	20		117
			3	SS	12		116
115.7	silty clay layers						
2.3	**FILL:** silt, some sand, trace clay, brown, moist to wet, very loose		4	SS	4		
114.9							115
3.1	**FILL:** sand, trace silt, brown, wet to moist, loose		5	SS	9		
113.9							114
4.1	**CLAYEY SILT TILL:** trace sand, trace gravel, brown to grey, moist, firm to hard		6	SS	8		
			7	SS	16		113
	grey below 6.1m						112
			8	SS	70		
111.1							
6.9	**END OF BOREHOLE**						

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ 3=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-06

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

Method: Solid Stem Augers

PROJECT LOCATION: Mississauga, ON

Diameter: 150 mm

REF. NO.: 2209001

DATUM: Geodetic

Date: Nov 3, 2022

ENCL NO.: 6

BH LOCATION: See Borehole Location Plan N 4826880.91 E 611535.11

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
117.4	Ground Surface						
0.0	**FILL:** sand, trace silt, some gravel, contains rootlets, brown, moist to wet, compact		1	SS	17		117
			2	SS	20		
	contains clayey silt pockets						116
			3	SS	12		
115.1							
2.3	**FILL:** clayey silt, trace sand, trace gravel, brown, moist, soft		4	SS	4		115
114.7							
2.7	**SILT:** some clay, trace sand, brown, wet, very loose						
114.4							
3.1	**SILTY CLAY:** trace to some sand, trace gravel, brown, moist, stiff		5	SS	9		114
113.6							
3.8	**CLAYEY SILT TILL:** trace sand, trace gravel, brown to grey, moist, firm to hard		6	SS	8		
	grey below 4.6m		7	SS	16		113
							112
			8	SS	70		
111.1							
6.4	**END OF BOREHOLE** 1. Water level was at 5.0mBGS upon completion of drilling. 2. Borehole was caved to 6.0mBGS upon completion of drilling.						

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-07

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826796.32 E 611439.19

Method: Hollow Stem Augers

Diameter: 200 mm

Date: Nov 4, 2022

REF. NO.: 2209001

ENCL NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
119.1	Ground Surface						
0.0	**FILL:** sand, some gravel, trace silt, contains clayey silt pocket, dark brown to brown, moist to wet, compact		1	SS	16		Concrete
							Sand
1			2	SS	12		118
117.5							
1.5	**FILL:** silt, some sand, trace clay, brown, wet, loose		3	SS	6		Bentonite
2							117
116.8							
2.3	**FILL:** sand, some silt, trace clay, brown, moist to wet, loose to compact		4	SS	9		
3	contains silt layer and organic pockets		5	SS	19		Sand
							116
4			6	SS	18	▽	W. L. 115.2 m Dec 22, 2022
114.5							
4.6	**SILTY CLAY:** some sand, trace gravel, brown, moist to wet, very stiff		7	SS	18		Screen
5							114
113.7							
5.3	**CLAYEY SILT TILL:** trace sand, trace gravel, contains shale fragments, grey, moist, hard						
6							113
112.7			8	SS	84/ initial 225mm		Bentonite
6.3	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) Dec 22, 2022 3.8						

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-08

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826809.63 E 611477.31

Method: Hollow Stem Augers

Diameter: 200 mm

Date: Nov 4, 2022

REF. NO.: 2209001

ENCL NO.: 8

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE & Sensitivity, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
117.9	Ground Surface										
0.0	Straight augered to 4.6m, no sample collected						Concrete Sand Bentonite 117 Sand 116 W. L. 115.3 m Dec 22, 2022 115 Screen 114				
113.4											
4.6	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring wells was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) Dec 22, 2022 2.7										

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-09

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

Method: Hollow Stem Augers

PROJECT LOCATION: Mississauga, ON

Diameter: 200 mm

REF. NO.: 2209001

DATUM: Geodetic

Date: Nov 4, 2022

ENCL NO.: 9

BH LOCATION: See Borehole Location Plan N 4826775.85 E 611404.33

SOIL PROFILE			SAMPLES											
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
119.4 Ground Surface												
0.0	**FILL:** sand, trace to some silt, trace to some gravel, contains cobbles, contains rootlets, dark brown to brown, moist to wet, compact		1	SS	13		Concrete Sand 119					
			2	SS	20		118					
			3	SS	23		Bentonite					
			4	SS	28		117 Sand					
	wet below 3.8m		5	SS	18		116					
114.8			6	SS	14		W. L. 115.3 m Dec 22, 2022 115					
4.6	**CLAYEY SILT TILL:** some sand, trace gravel, contains cobbles, brown to grey, moist, stiff to very stiff		7	SS	11		Screen					
							114					
	contains shale fragments, grey below 6.1m		8	SS	26		Bentonite 113					
112.8												
6.6	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) Dec 22, 2022 4.1											

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ $^{\varepsilon_f}$=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-10

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

Method: Hollow Stem Augers

PROJECT LOCATION: Mississauga, ON

Diameter: 200 mm

REF. NO.: 2209001

DATUM: Geodetic

Date: Nov 4, 2022

ENCL NO.: 10

BH LOCATION: See Borehole Location Plan N 4826815.3 E 611421.09

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m							GR SA SI CL
119.1	Ground Surface											
0.0	**FILL:** sand, some gravel, trace silt, contains rootlets, contains brick pieces, brown, moist to wet, compact		1	SS	16		119		○			
			2	SS	22		118		○			
			3	SS	30				○			
			4	SS	29		117		○			
	wet below 3.8m		5	SS	29		116		○			
114.7			6	SS	13							
4.4	**SILT:** trace clay, trace sand, contains sand layers, brown, wet, compact		7	SS	16		115			○		
114.1												
5.0	**SILTY CLAY:** some sand, trace gravel, contains shale fragments, grey, moist, very stiff to hard						114					
113.0			8	SS	50/ initial 50mm		113		○			
6.2	**END OF BOREHOLE**											

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

Palmer

LOG OF BOREHOLE BH22-11

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

Method: Hollow Stem Augers/Rock Coring

PROJECT LOCATION: Mississauga, ON

Diameter: 200 mm/96 mm

REF. NO.: 2209001

DATUM: Geodetic

Date: Nov 10, 2022 to Nov 11, 2022

ENCL NO.: 11

BH LOCATION: See Borehole Location Plan N 4826869.87 E 611504.27

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
117.7	Ground Surface				
117.6 / 0.1	**TOPSOIL:** 100mm	1	SS	17	Concrete
117.0 / 0.7	**FILL:** gravelly sand, some silt, trace clay, trace gravel, dark brown, moist, compact				Sand
1	**FILL:** sand to silty sand, some silt, trace clay, trace to some gravel, trace wood pieces, dark brown, moist, compact	2	SS	15	117
2		3	SS	11	116
115.5 / 2.2	**SILTY SAND:** some clay, trace gravel, contains clayey silt layer, contains silt layer, brown, moist to wet, compact	4	SS	14	115
3		5	SS	13	W. L. 114.7 m Dec 22, 2022
113.6 / 4.1	**CLAYEY SILT TILL:** trace sand, trace gravel, brown to grey, moist, very stiff				114
5		6	SS	20	Bentonite
6		7	SS	39	112
110.6 / 7.1	**SHALE:** highly weathered, grey, wet				111
109.9		8	SS	79/ initial / 200mm	110
8 7.8	**ROCK CORING STARTS, REFER TO ROCK CORE LOG**				109
9					Sand
10					108
11					Screen
12					106
105.4					Bentonite
12.3	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date / W. L. Depth (mBGS) Dec 22, 2022 / 3.0				

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%) — GR SA SI CL

GROUNDWATER ELEVATIONS

Measurement: 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ε_f=3% Strain at Failure

Palmer

LOG OF ROCK CORE BH22-11

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

LOCATION: Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826869.87 E 611504.27

Method: Hollow Stem Augers/Rock Coring

Diameter: 200 mm/96 mm

Date: Nov-10-2022 to Nov-11-2022

REF. NO.: 2209001

ENCL NO.: 11

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
109.9	Rock Surface															
7.8 / 109.1	**GEORGIAN BAY FORMATION:** highly weathered to moderately weathered, laminated to thinly bedded with fragmented layers, very weak to weak, grey **SHALE**		1	HQ	100	82	0	78	20 2 1 1 1	Soft Layer: 7.82m-8.03m Fracture: 8.13-8.15m (15°) Fragment Zone: 8.23m-8.28m	W4 - W3					
8.0 / 108.5	**GEORGIAN BAY FORMATION:** moderately to slightly weathered, laminated to thinly bedded with fragmented layers, weak to medium strong, grey **SHALE**		2	HQ	100	95	0	83	2 3 2 1 3	Soft Layer: 9.6m-9.63m Fragment Zone: 9.77m-9.79m, 10.11m-10.15m	W3 - W2				18.9	
10.7 / 105.4			3	HQ	100	100	0	60	2 5 4 3 3							
12.3	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) Dec 22, 2022 3.0															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered

θ = angle to the core axis

E = Modulus of Elasticity

*: UCS [Mpa]≈ 24 $I_{S(50)}$

Palmer

LOG OF BOREHOLE BH22-12

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826843.5 E 611504.4

Method: Hollow Stem Augers/Rock Coring

Diameter: 200 mm/96 mm

Date: Nov 10, 2022

REF. NO.: 2209001

ENCL NO.: 12

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
117.8	Ground Surface						
117.7 / 0.1	**TOPSOIL:** 100mm	1	SS	66		117	
117.1 / 0.7	**FILL:** gravelly sand, trace silt, contains cobbles, contains rootlets, grey, moist, very dense	2	SS	13			
	FILL: sand, some silt, trace clay, trace rootlets, contains cobbles, brown, moist, compact to very loose	3	SS	3		116	
115.6 / 2.2	**FILL:** silty sand, some clay, some gravel, contains cobbles, contains pottery pieces, brown, moist to wet, compact	4	SS	25		115	
114.8 / 3.0	wet below 2.7m	5	SS	11			
	SILTY SAND: trace clay, trace gravel, brown, wet, compact					114	
113.7 / 4.1	contains silt pockets	6	SS	18		113	
	CLAYEY SILT TILL: some sand, trace gravel, contains shale fragments, grey, moist, very stiff to hard					112	
110.7 / 7.2		7	SS	34		111	19 21 48 12
	SHALE: highly weathered, trace gravel, grey	8	SS	50/ initial 125mm		110	
110.1 / 7.8	**ROCK CORING STARTS, REFER TO ROCK CORE LOG**					109	
						108	
						107	
105.5 / 12.3	**END OF BOREHOLE** 1. Borehole was open upon completion of drilling.					106	

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

Palmer

LOG OF ROCK CORE BH22-12

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc | Method: Hollow Stem Augers/Rock Coring | REF. NO.: 2209001

LOCATION: Mississauga, ON | Diameter: 200 mm/96 mm | ENCL NO.: 12

DATUM: Geodetic | Date: Nov-10-2022

BH LOCATION: See Borehole Location Plan N 4826843.5 E 611504.4

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
110.2	Rock Surface															
7.9 / 110.2	**GEORGIAN BAY FORMATION:** moderately weathered to slightly weathered, laminated to thinly bedded, grey, weak **SHALE**		1	HQ	100	93	0	47	5 3 2 2 6	Fragmented Zone: 7.62m-7.67m, 8.84m-8.89m	W3-W2					
9.2 / 108.6	**GEORGIAN BAY FORMATION:** moderately weathered to slightly weathered, laminated to thinly bedded, grey, weak to medium strong **SHALE** (61~82%), slightly weathered, light grey, weak to medium strong **LIMESTONE** (18~39%)		2	HQ	100	100	39	62	4 1 4 3 1	Hard Layer: 9.82m-10.31m Fracture: 9.47m-9.50m (90°), 9.82m-9.93m (90°)					18	
10.7 / 107.1			3	HQ	100	96	18	66	5 1 2 1 4	Soft Layer: 10.84m-10.88m 10.85m ~ 10.88m Hard Layer: 11.46m-11.58m, 12.09m-12.24m Broken Zone: 12.07m-12.09m						
12.3 / 105.5	**END OF BOREHOLE** 1. Borehole was open on completion of drilling.															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered

θ = angle to the core axis

E = Modulus of Elasticity

*: UCS [Mpa]≈ 24 $I_{S(50)}$

Palmer

LOG OF BOREHOLE BH22-13

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826834.89 E 611436.88

Method: Hollow Stem Augers/Rock Coring

Diameter: 200 mm/96 mm

Date: Nov 8, 2022 to Nov 9, 2022

REF. NO.: 2209001

ENCL NO.: 13

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
118.7	Ground Surface						
118.6 / 0.1	**TOPSOIL:** 100mm						
	FILL: silty sand to sand, trace clay, trace gravel, contains cobbles and limestone pieces, brown, moist, compact to very dense		1	SS	13		118
			2	SS	65		
117.2 / 1.5	**FILL:** clayey silt, some sand to sandy, trace gravel, trace brick fragments, brown, moist to wet, very stiff		3	SS	29		117
116.4 / 2.3	wet below 2m		4	SS	12		116
	SILTY SAND: trace clay, trace gravel, contains cobbles, contains clayey silt pocket, brown, wet, compact		5	SS	14		115
114.5 / 4.2	**SANDY SILT:** some clay, grey, wet, loose		6	SS	8		114
113.0 / 5.7	**CLAYEY SILT TILL/SHALE COMPLEX:** trace sand, trace gravel, grey, moist, very dense		7	SS	50/ initial 125mm		113
111.0 / 7.7	**ROCK CORING STARTS, REFER TO ROCK CORE LOG**		8	SS	50/ initial 100mm		112
							111
							110
							109
							108
							107
							106
							105
							104
103.4 / 15.2	**END OF BOREHOLE** 1. Borehole was open upon completion of drilling.						

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
6	64	22	8

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; $\circ^{\varepsilon_f=3\%}$ Strain at Failure

Palmer

LOG OF ROCK CORE BH22-13

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc | Method: Hollow Stem Augers/Rock Coring | REF. NO.: 2209001

LOCATION: Mississauga, ON | Diameter: 200 mm/96 mm | ENCL NO.: 13

DATUM: Geodetic | Date: Nov-08-2022 to Nov-09-2022

BH LOCATION: See Borehole Location Plan N 4826834.89 E 611436.88

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
111.0	Rock Surface															
111.6	**GEORGIAN BAY FORMATION:** highly weathered to slightly weathered, laminated to thinly bedded, grey, weak to medium strong **SHALE**		1	HQ	100	75	0	25	25 25 2 3 2	Soft Layer: 10.84m-10.88m Hard Layer: 11.46m-11.58m, 12.09m-12.24m Broken Zone: 12.07m-12.09m	W4					
109.5																
9.2			2	HQ	100	97	0	67	3 3 2 2 5	Fragmented Zone: 10.72m-10.77m Fractures: 9.75m-9.83m (90°)	W3-W2					
108.0																
107.9																
10.8	**GEORGIAN BAY FORMATION:** highly weathered to moderately weathered, laminated to thinly bedded, grey, very weak to weak **SHALE** (80~95%), Moderately weathered, light grey, medium strong **LIMESTONE** (5~20%)		3	HQ	100	95	5	70	3 12 1 1 2 2	Hard Layer: 10.85m-10.92m Fragmented Zone: 10.77m-10.85m	W4-W3 W3					
106.4																
12.3																
105.9																
12.8	Lost core zone, residual soil/silt washed away during coring		4	HQ	98	95	20	23	5 10 5 3 2	Hard Layers: 12.42m-12.52m, 13.07m-13.21m, 13.68m-13.74m Soft Layer: 12.70m-12.78m Fractures: 12.34m-12.37m (90°), 12.53m (15°), 13.07m-13.21m (90°)	W6 W3-W2					
104.9										12.7m ~ 12.78m						
13.8	**GEORGIAN BAY FORMATION:** moderately weathered to slightly weathered, laminated to thinly bedded, grey, weak to medium strong **SHALE** (77~80%), Moderately to slightly weathered, light grey, medium strong to strong **LIMESTONE** (20~23%)		5	HQ	100	96	23	64	10 2 3 0 1	Hard Layers: 14.30m-14.38m, 14.99m-15.24m Fragmented Zone: 13.82m-13.87m Fractures: 13.87m-13.89m (90°), 13.94m-13.97m (90°), 15.06m (15°)	W2				46.1	
103.4																
15.2	**END OF BOREHOLE** 1. Borehole was open on completion of drilling.															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered

θ = angle to the core axis

E = Modulus of Elasticity

*: UCS [Mpa]≈ 24 $I_{S(50)}$

Palmer

LOG OF BOREHOLE BH22-14

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: City of Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826815.94 E 611464.25

Method: Hollow Stem Augers/Rock Coring

Diameter: 200 mm/96 mm

Date: Nov 9, 2022 to Nov 10, 2022

REF. NO.: 2209001

ENCL NO.: 14

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
118.1	Ground Surface						
118.0 / 0.1	**TOPSOIL:** 100mm		1	SS	14		
117.4 / 0.7	**FILL:** gravelly sand, some silt, contains cobbles, contains rootlets, contains concrete pieces, grey to brown, moist, compact		2	SS	16		117
	FILL: sand, some silt, trace to some gravel, contains cobbles, brown, moist, compact		3	SS	12		
115.9 / 2.2	**FILL:** silty sand, trace gravel, some clay, contains cobbles, brown to grey, moist to wet, loose to very loose		4	SS	4		116
			5	SS	3		115
114.0 / 4.1	**SILTY CLAY TO CLAYEY SILT:** some sand to sandy, trace gravel, trace rootlets, grey, moist to wet, soft		6	SS	4		114
112.4 / 5.6	**CLAYEY SILT TILL/SHALE COMPLEX:** trace sand, trace gravel, grey, moist, very hard		7	SS	69/ initial 250mm		113
110.4 / 7.7	**ROCK CORING STARTS, REFER TO ROCK CORE LOG**		8	SS	50/ initial 75mm		112
							111
							110
							109
							108
							107
							106
							105
							104
102.8 / 15.2	**END OF BOREHOLE** 1. Borehole was open upon completion of drilling.						103

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

Palmer

LOG OF ROCK CORE BH22-14

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

LOCATION: Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826815.94 E 611464.25

Method: Hollow Stem Augers/Rock Coring

Diameter: 200 mm/96 mm

Date: Nov-09-2022 to Nov-10-2022

REF. NO.: 2209001

ENCL NO.: 14

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
110.4	Rock Surface															
110.4	**GEORGIAN BAY FORMATION:** highly weathered to moderately weathered, laminated to thinly bedded, grey, weak **SHALE** (0~4%), slightly weathered, light grey, strong to very strong **LIMESTONE** (96%~100%)		1	HQ	100	72	98	16	16 22 7 3 4	Hard Layer: 14.30m-14.38m, 14.99m-15.24m Fragmented Zone: 13.82m - 13.87m Fractures: 13.87m-13.89m (90°), 13.94m-13.97m (90°), 15.06m (15°)	W4-W3 W2					
108.9	Lost core zone, residual soil/silt washed away during coring		2	HQ	58	20	0	0	18 25 14 25 25	Lost Zone: 9.42m-9.75m, 10.36m-10.67m Fragmented Zones: 9.14m-9.19m, 9.32m-9.42m, 9.87m-9.94m, 10.01m-10.36m	W4-W3				128.7	
107.4	**GEORGIAN BAY FORMATION:** moderately to slightly weathered, laminated to thinly bedded, grey, medium strong **SHALE** (70~75%), Slightly weathered, light grey, strong to very strong **LIMESTONE** (25~30%)		3	HQ	96	94	26	32	10 5 1 5 3	Lost Zone: 10.67m-10.73m Hard Layer: 11.40m-11.73m, 12.04m-12.10m Fragmented Zone: 10.77m-10.80m	W3-W2					
105.9			4	HQ	100	80	0	48	7 19 5 5 0	Fractures: 12.55m-12.57m (90°), 13.13m-13.17m (90°) Fragmented Zone: 12.34m-12.40m, 12.37m-12.42m, 12.55m-12.60m, 12.65m-12.80m	W4-W3					
104.4	**GEORGIAN BAY FORMATION: LIMESTONE/SHALE:** slightly weathered, laminated to thinly bedded, grey, weak to medium strong **SHALE**		5	HQ	100	95	0	83	0 0 9 0 0	Fragmented Zone: 14.48m-14.55m	W3-W2					
102.8	**END OF BOREHOLE** 1. Borehole was open upon completion of drilling.															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered

θ = angle to the core axis

E = Modulus of Elasticity

*: UCS [Mpa]≈ 24 $I_{S(50)}$

Palmer

LOG OF BOREHOLE BH22-15

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826788.27 E 611428.09

Method: Hollow Stem Augers/Rock Coring

Diameter: 200 mm/96 mm

Date: Nov 7, 2022 to Nov 8, 2022

REF. NO.: 2209001

ENCL NO.: 15

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m
119.3 / 0.0	Ground Surface			
119.2 / 0.1	**TOPSOIL:** 100mm			
	FILL: gravelly sand, trace clay, trace silt, contains cobbles, dark brown to brown, moist, compact to loose	1	SS	16
		2	SS	6
117.0 / 2.3		3	SS	5
	SILTY SAND: some clay, trace gravel, contains cobbles, contains clayey silt layer, contains shale fragments, brown to grey, moist to wet, compact to very dense	4	SS	13
		5	SS	20
		6	SS	21
		7	SS	94/ initial 250mm
112.3 / 7.0	**CLAYEY SILT TILL/SHALE COMPLEX:** trace sand, trace gravel, grey, moist to wet, very hard			
111.6 / 7.7	**ROCK CORING STARTS, REFER TO ROCK CORE LOG**	8	SS	50/ initial 100mm
103.5 / 15.8	**END OF BOREHOLE** 1. 1. Borehole was open upon completion of drilling.			

GROUND WATER CONDITIONS

ELEVATION: 119, 118, 117, 116, 115, 114, 113, 112, 111, 110, 109, 108, 107, 106, 105, 104

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

$+^3$, $\times^3$: Numbers refer to Sensitivity

ε_f=3% Strain at Failure

Palmer

LOG OF ROCK CORE BH22-15

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc | Method: Hollow Stem Augers/Rock Coring | REF. NO.: 2209001

LOCATION: Mississauga, ON | Diameter: 200 mm/96 mm | ENCL NO.: 15

DATUM: Geodetic | Date: Nov-07-2022 to Nov-08-2022

BH LOCATION: See Borehole Location Plan N 4826788.27 E 611428.09

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
111.7	Rock Surface															
111.7 / 7.6	**GEORGIAN BAY FORMATION:** moderately weathered to slightly weathered, laminated to thinly bedded, light grey to grey, weak to medium strong **SHALE** (93~100%). thinly laminated to medium bedded with slightly weathered to fresh, light grey to grey, medium strong to strong **LIMESTONE** (0~7%)		1	HQ	100	61	7	22	>25 >25 12 8 4	Fracture: 8.64m-8.69m (90°), 8.81m-8.84m (15°) Fragment Zone: 7.62m-7.86m, 7.98m-8.05m, 8.2m-8.28m	W3					
110.1 / 9.1			2	HQ	100	85	0	13	8 17 8 5 5	Fragment Zone: 9.45m-9.6m						
108.6 / 10.7			3	HQ	83	72	0	25	8 11 >25 8 3	Soft Layer: 11.19m-11.51m Fracture: 10.95m-10.96m (15°) Fragment Zone: 10.81m-10.86m, 11.58m - 11.63m						
107.1 / 12.2	**GEORGIAN BAY FORMATION:** slightly weathered, laminated to thinly bedded, light grey to grey, medium strong to strong **SHALE** (68~100%). thinly laminated to medium bedded with slightly weathered to fresh, light grey to grey, medium strong to strong **LIMESTONE** (0~32%)		4	HQ	85	62	17	28	3 2 5 20 >25	Soft Layer: 13.21m-13.72m Fracture: 12.83m-12.85m (90°)	W3-W2					
105.6 / 13.7			5	HQ	100	78	32	17	16 6 6 3 4	Soft Layer: 14.12m-14.15m Fragment Zone: 13.72m-13.86m					137.5	
104.0 / 15.2			6	HQ	100	81	0	43	13 0	Fracture: 15.51m (15°) Fragment Zone: 15.24m-15.32m						
103.5 / 15.8	**END OF BOREHOLE** 1. Borehole was open upon completion of drilling.															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered

θ = angle to the core axis

E = Modulus of Elasticity

*: UCS [Mpa]≈ 24 $I_{S(50)}$

Palmer

LOG OF BOREHOLE BH22-16

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826769.25 E 611440.73

Method: Hollow Stem Augers/Rock Coring

Diameter: 200 mm/96 mm

Date: Nov 7, 2022 to Nov 8, 2022

REF. NO.: 2209001

ENCL NO.: 16

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
119.2 / 0.0	Ground Surface						
119.0 / 0.1	**TOPSOIL:** 100mm						Concrete
	FILL: silty sand, trace clay, trace gravel, contains cobbles, dark rown to brown, moist to wet, compact to very dense		1	SS	16		Sand
			2	SS	18		118
			3	SS	13		117
	contains clayey silt pockets		4	SS	6		
			5	SS	54		116
	contains limestones and cobble fragments						
115.1 / 4.1	**SILTY SAND:** trace clay, contains silt layer, contains shale fragments, grey, wet to moist, compact to very dense						115
			6	SS	18		114
			7	SS	67/ 225mm	▽	W. L. 113.0 m Dec 22, 2022
							112
111.5 / 7.7	**ROCK CORING STARTS, REFER TO ROCK CORE LOG**		8	SS	50/ initial 100mm		111 Bentonite
							110
							109
							108
							107
							106
							105
							104
							103
							Sand

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
- ○ UNCONFINED
- ● QUICK TRIAXIAL
- + FIELD VANE & Sensitivity
- × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)	GR	SA	SI	CL
	4	81	12	3

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

LOG OF BOREHOLE BH22-16

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

PROJECT LOCATION: Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826769.25 E 611440.73

Method: Hollow Stem Augers/Rock Coring

Diameter: 200 mm/96 mm

Date: Nov 7, 2022 to Nov 8, 2022

REF. NO.: 2209001

ENCL NO.: 16

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued										
	ROCK CORING STARTS, REFER TO ROCK CORE LOG(Continued)						102 Screen				
18							101				
19							100 Bentonite				
20							99				
98.7											
20.5	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) Dec 22, 2022 6.2										

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

Palmer

LOG OF ROCK CORE BH22-16

PROJECT: Geotechnical Investigation - 69 & 117 John St

CLIENT: 13545130 Canada Inc

LOCATION: Mississauga, ON

DATUM: Geodetic

BH LOCATION: See Borehole Location Plan N 4826769.25 E 611440.73

Method: Hollow Stem Augers/Rock Coring

Diameter: 200 mm/96 mm

Date: Nov-07-2022 to Nov-08-2022

REF. NO.: 2209001

ENCL NO.: 16

(m) ELEV / DEPTH	ROCK DESCRIPTION	GROUND WATER CONDITIONS	CORE SAMPLE NUMBER	CORE SAMPLE SIZE	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	HARD LAYER (%)	RQD (%)	FRACTURE INDEX (per 0.3 m)	DISCONTINUITIES	Weathering Index	HYDRAULIC CONDUCTIVITY (cm/sec)	POINT LOAD TEST UCS AXIAL (MPa)*	POINT LOAD TEST UCS DIAMETRAL (MPa)*	UNIAXIAL COMPRESSION (MPa)	DENSITY (g/cm^3) E (GPa)
111.5	Rock Surface															
111.3 / 0.2	**GEORGIAN BAY FORMATION:** moderately weathered, laminated to thinly bedded with fragment layers, weak, reddish brown to grey **SHALE**		1	HQ	100	43	0	0	>25 >25 22 9 12	Fracture: 8.17m-8.23m (90°), 8.66m-8.7m (75°), 9.02m - 9.07m (90°) Fragment Zone: 7.7m-8.15m, 8.31m-8.41m, 8.48m-8.56m	W3					
110.0																
9.2	**GEORGIAN BAY FORMATION:** slightly weathered, laminated to thinly bedded with fragment layers, grey, weak to medium strong **SHALE** (94~100%), slightly weathered, thinly to medium bedded, light grey to grey, medium strong to strong **LIMESTONE** (0~6%)		2	HQ	100	93	0	0	17 9 5 7 9	Fracture: 10.13m-10.16m (15°), 10.67m-10.69m (90°) Fragment Zone: 9.22m-9.32m						
108.4																
10.8			3	HQ	100	100	0	0	6 7 7 6 5	Fracture: 11.35m-11.4m (90°), 11.71m-1.81m (90°)						
106.9																
12.3			4	HQ	100	98	0	20	6 5 9 7 3	Fragment Zone: 13.08m-13.1m						
105.4																
13.8			5	HQ	100	60	0	0	19 >25 >25 15 8	Soft Layer: 14.15m-14.63m Fracture: 14.9m-14.92m (90°) Fragment Zone: 14.63m-14.78m	W2					
103.8																
15.4			6	HQ	100	100	0	9	5 1 18 2 2						31	
102.5																
16.7			7	HQ	100	90	6	38	3 3 2 16 5	Hard Layer: 17.02m-17.11m Fracture: 18.15m - 18.23m (90°) Fragment Zone: 17.75m-17.91m						
100.9																
18.3			8	HQ	100	100	N/A	41	2 2 3 6 4	Fracture: 19.18m-19.2m (45°)						
99.5																
19.8			9	HQ	100	100	N/A	72	3 1							
98.7																
20.5	**END OF BOREHOLE** 1. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 2. Water Level Readings: Date W. L. Depth (mBGS) Dec 22, 2022 6.2															

Weathering Index: W1-Fresh, W2-Slightly weathered, W3-Moderately weathered, W4-Highly weathered, W5-Completely weathered

θ = angle to the core axis

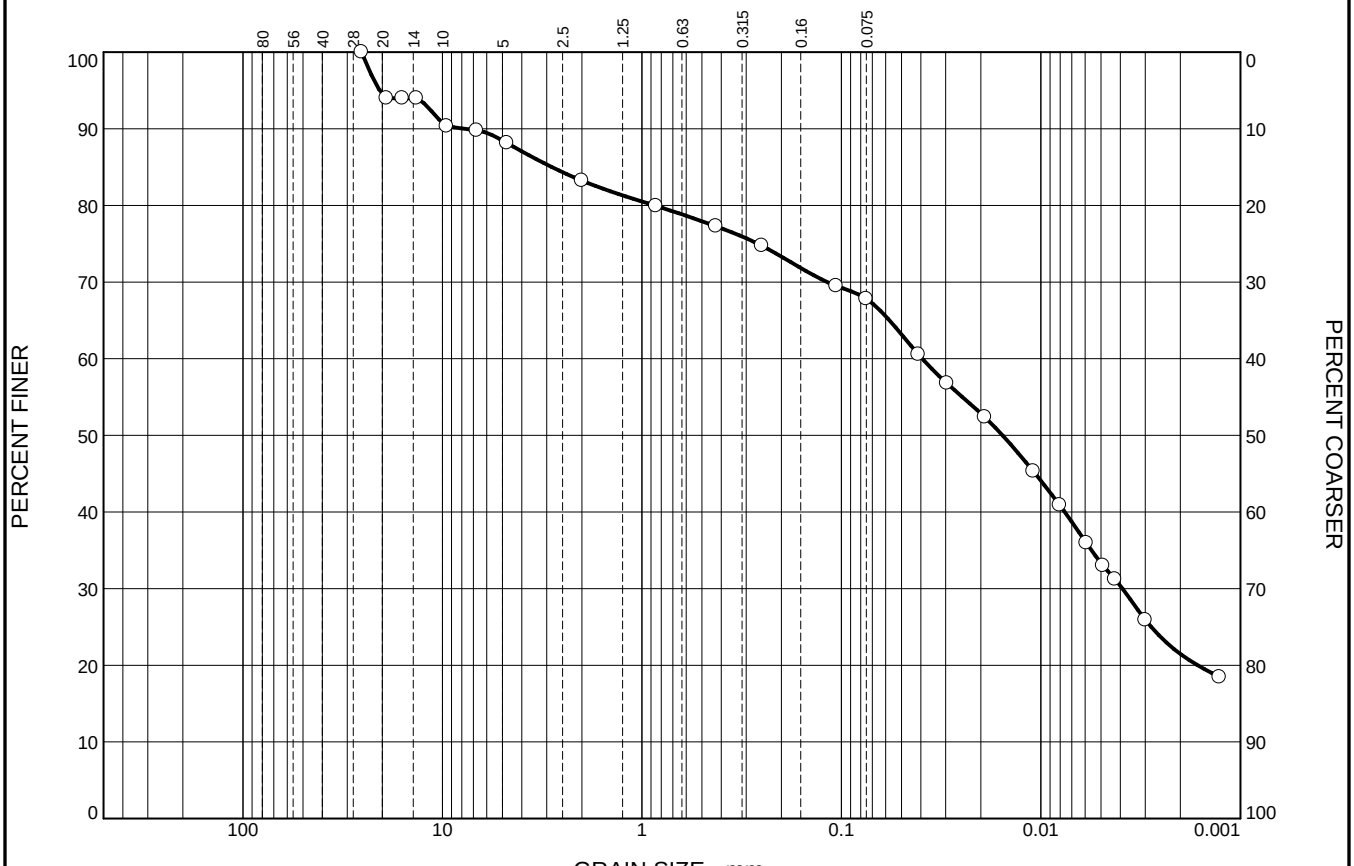
E = Modulus of Elasticity

*: UCS [Mpa]≈ 24 $I_{S(50)}$

Appendix B

Geotechnical Laboratory Tesing Results

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	17	6	9	47	21

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○			2.8234	0.0393	0.0156	0.0039				

Material Description	USCS	AASHTO
○ CLAYEY SILT some gravel some sand		

Project No. CA19009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)

Project: PECG PRJ# 2209001

○ **Sample Number:** BH 22-4, SS6

Terrapex

Toronto, Ontario

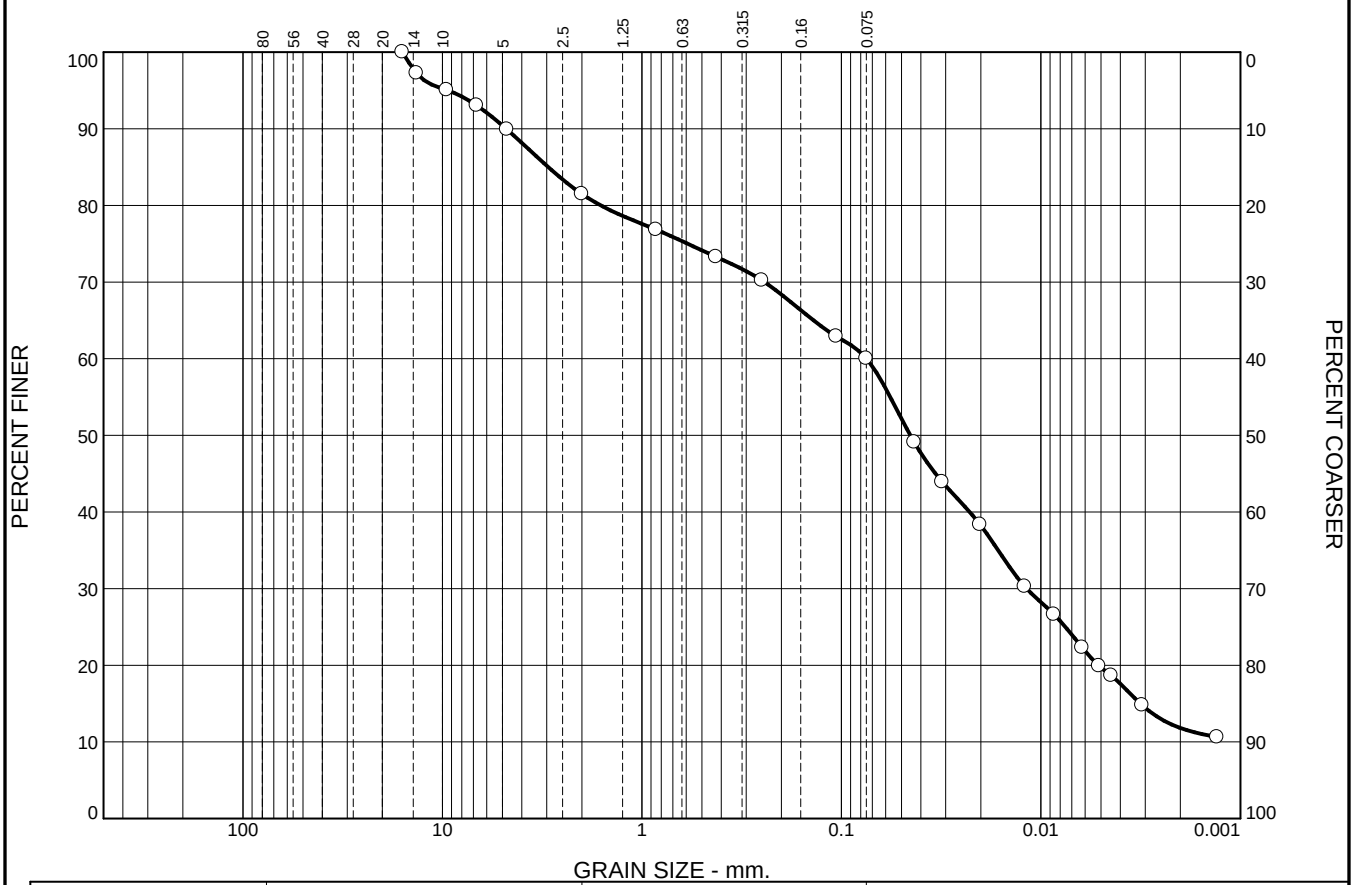
Remarks:

○HYDROMETER DETAILS: Spec. Grav. 2.75(assumed);Vb= 53cm^3; L2=13.8cm; L1=10.7cm; hs=0.16cm/Div; A=30.2cm^2; Mass of Disp. Agent=40g/1 Test Date: Nov.29 2022

Figure 1

Tested By: AM/CM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	19	8	13	48	12

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○			2.9460	0.0749	0.0451	0.0118	0.0032			

Material Description	USCS	AASHTO
○ SANDY SILT some gravel some clay		

Project No. CA19009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)

Project: PECG PRJ# 2209001

○ **Sample Number:** BH 22-12, SS7

Terrapex

Toronto, Ontario

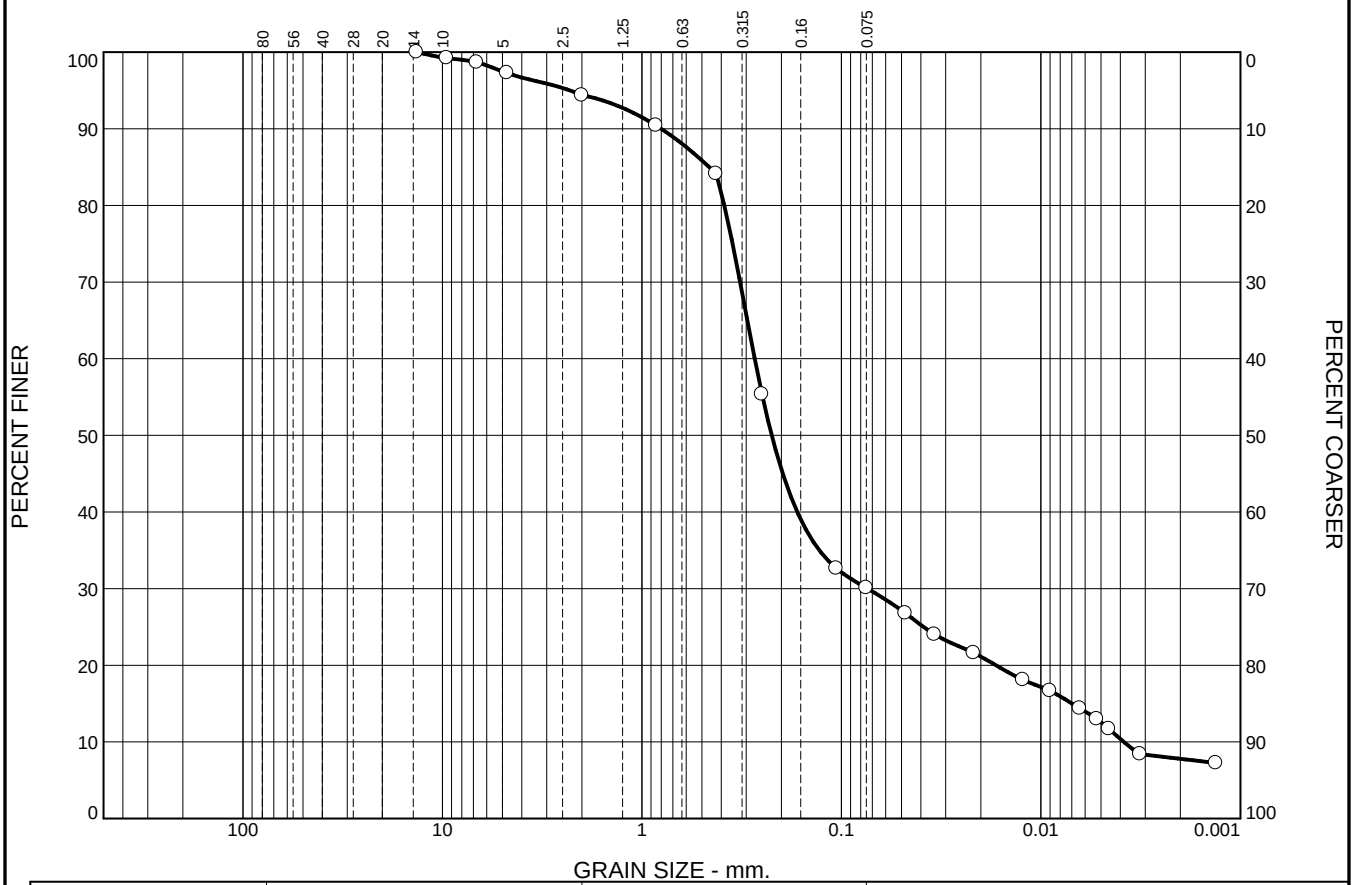
Remarks:

○HYDROMETER DETAILS: Spec. Grav. 2.75(assumed);Vb= 53cm^3; L2=13.8cm; L1=10.7cm; hs=0.16cm/Div; A=30.2cm^2; Mass of Disp. Agent=40g/1 Test Date: Nov.30 2022

Figure 2

Tested By: AM/CM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	6	10	54	22	8

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.4597	0.2720	0.2234	0.0740	0.0070	0.0038	5.24	70.79

Material Description	USCS	AASHTO
○ SILTY SAND trace clay trace gravel		

Project No. CA19009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)

Project: PECG PRJ# 2209001

○ **Sample Number:** BH 22-13, SS5

Terrapex

Toronto, Ontario

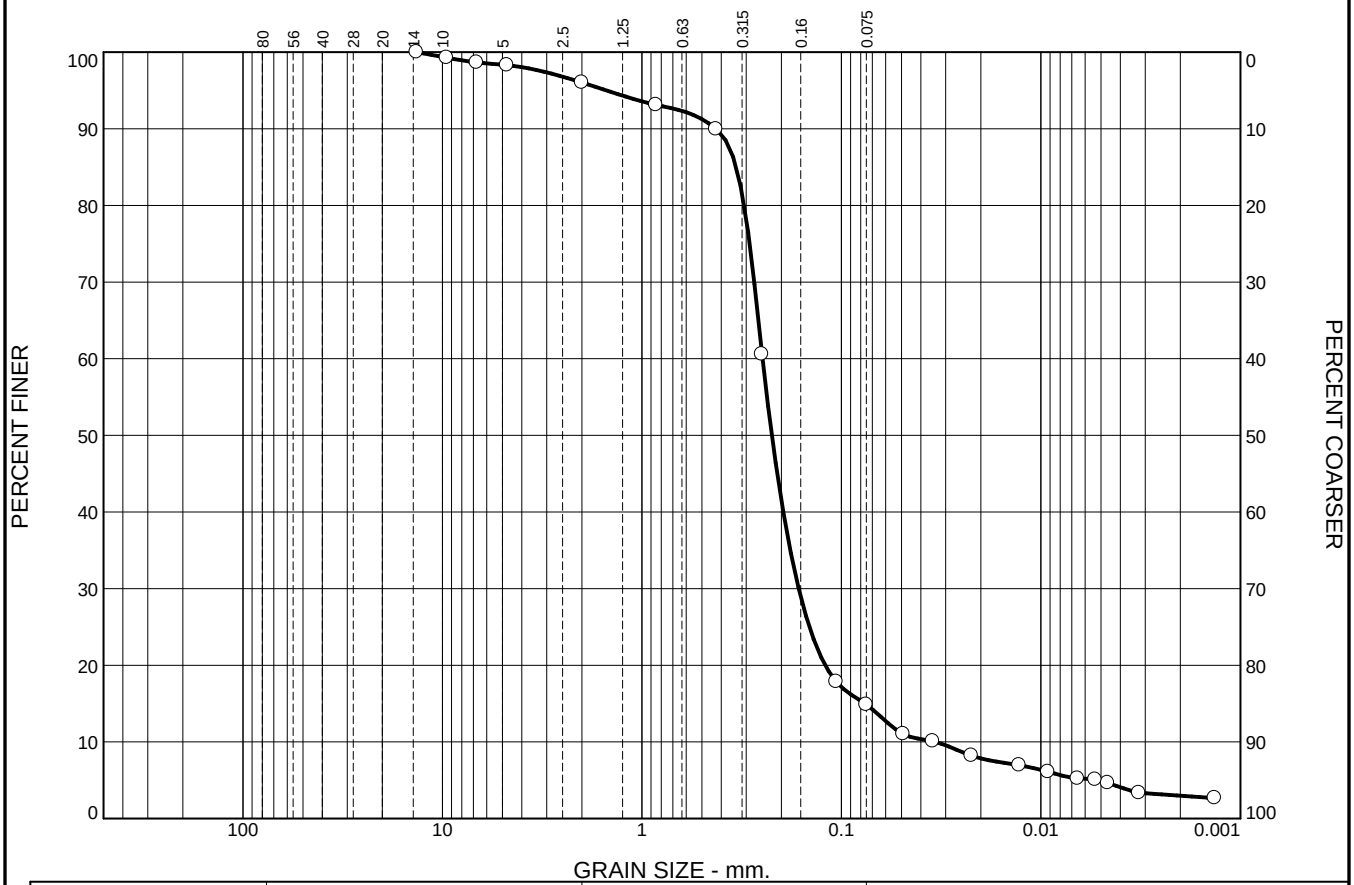
Remarks:

○HYDROMETER DETAILS: Spec. Grav. 2.75(assumed);Vb= 53cm^3; L2=13.8cm; L1=10.7cm; hs=0.16cm/Div; A=30.2cm^2; Mass of Disp. Agent=40g/1 Test Date: Nov.30 2022

Figure 3

Tested By: AM/CM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	4	6	75	12	3

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.3368	0.2485	0.2231	0.1637	0.0762	0.0338	3.19	7.36

Material Description	USCS	AASHTO
○ SAND some silt trace gravel trace clay		

Project No. CA19009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)

Project: PECG PRJ# 2209001

○ **Sample Number:** BH 22-16, SS6

Terrapex

Toronto, Ontario

Remarks:

○HYDROMETER DETAILS: Spec. Grav. 2.75(assumed);Vb= 53cm^3; L2=13.8cm; L1=10.7cm; hs=0.16cm/Div; A=30.2cm^2; Mass of Disp. Agent=24g/1 Test Date: Nov.29 2022

Figure 4

Tested By: CM

Appendix C

Rock Laboratory Testing Results

Geomechanica Inc.
Unit 14 – 1240 Speers Rd.
Oakville Ontario
Canada L6L 2X4

December 5, 2022

Mr. Alonzo Rowe
Palmer Environmental Consulting Group Inc.
74 Berkeley Street
Toronto, Ontario
Canada M5A 2W7

Re: UCS, Testing
(Palmer Project No. 2209001)

Dear Mr. Rowe:

On November 21st, 2022, a series of six (6) HQ-sized core samples were received by Geomechanica Inc. via drop-off by Palmer Personnel. These samples were identified as being from Palmer project 2209001. From these samples, six (6) Uniaxial Compressive Strength (UCS) tests were completed.

Details regarding the steps of specimen preparation and testing along with the test results are presented in the accompanying laboratory report and summary spreadsheets.

Sincerely,

Bryan Tatone Ph.D., P. Eng.

Geomechanica Inc.
Tel: (647) 478-9767
Email: bryan.tatone@geomechanica.com

GEOMECHANICA

Rock Laboratory Testing Results

A report submitted to:

Alonzo Rowe
Palmer
74 Berkeley Street
Toronto, Ontario
Canada, M5A 2W7

Prepared by:

Bryan Tatone, PhD, PEng

Omid Mahabadi, PhD, PEng
Geomechanica Inc.
#14-1240 Speers Rd.
Oakville ON
L6L 2X4 Canada
Tel: +1-647-478-9767
lab@geomechanica.com

December 5, 2022
Project number: 2209001

Abstract

This document summarizes the results of rock laboratory testing, including 6 Unaxial Compressive Strength (UCS) tests. The UCS values along with photographs of specimens before and after testing are presented herein.

In this document:

1 Uniaxial Compressive Strength Tests

1.1 Overview

This section summarizes the results of uniaxial compressive strength (UCS) testing. The testing was performed in Geomechanica's rock testing laboratory using a 150 ton (1.3 MN) Forney loading frame equipped with pressure-compensated control valve to maintain an axial displacement rate of approximately 0.15 mm/min (Figure 1). The preparation and testing procedure for each specimen included the following:

1. Unwrapping the core sample, inspecting it for damage, and re-wrapping it in electrical tape to minimize exposure to moisture during subsequent specimen preparation.
2. Diamond cutting the core sample to obtain a cylindrical specimen with an appropriate length (length:diameter = 2:1) and nearly parallel end faces.
3. Diamond grinding of the specimen to obtain flat (within ± 0.025 mm) and parallel end faces (within $0.25°$).
4. Placing the specimen into the loading frame, applying a 1 kN axial load, and removing the electrical tape.
5. Axially loading the specimen to rupture while continuously recording axial force and axial deformation to determine the peak strength (UCS).

Figure 1: Forney loading frame setup for UCS testing.

Using a precision V-block mounted on the magnetic chuck of the surface grinder, test specimens met the end flatness, end parallelism, and perpendicularity criteria set out in ASTM D4543-19. The side straightness

criteria, as checked with a feeler gauge, and the minimum length:diameter criteria were met for all specimens unless noted otherwise in Table 1. Testing of the specimens followed ASTM D7012-14 Method C.

1.2 Results

The results of UCS testing are summarized in Table 1. Additional specimen details and measurements are provided in the summary spreadsheet that accompanies this report.

Table 1: Summary of Uniaxial Compression test results.

Sample	Depth (ft' in")	Bulk density ρ (g/cm^3)	UCS (MPa)	Lithology	Failure description
BH22-11	33'4.5" - 33'11"	2.620	18.9	Shale	1, 2
BH22-12	32'9" - 33'3.5"	2.600	18.0	Shale	1, 2
BH22-13	49'6" - 50'0"	2.571	46.1	Limestone and Shale	3, 2
BH22-14	32'5" - 33'0"	2.645	128.7	Limestone	1
BH22-15	45'5.5" - 45'11"	2.655	137.5	Limestone	4, 5
BH22-16	51'9" - 52'4.5"	2.641	31.0	Shale and Limestone	4

[1] Inclined shear fracture and axial splitting failure
[2] Specimen emitted pore water upon loading
[3] Axial splitting failure
[4] Inclined shear failure
[5] Length:Diameter ratio less than 2

1.3 Specimen photographs

Photographs of the specimens before and after testing are presented in the Appendix of this report.

Appendices

Specimen sheets

- BH22-11
- BH22-12
- BH22-13
- BH22-14
- BH22-15
- BH22-16

GEOMECHANICA

Uniaxial Compression Test

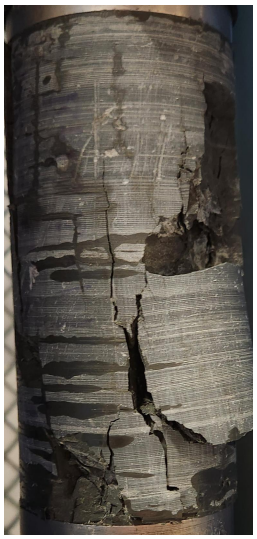
Client	Palmer	**Project**	2209001
Sample	BH22-11	**Depth**	33’4.5” - 33’11”

Specimen parameters	
Diameter (mm) [a]	63.03
Length (mm) [a]	129.98
Bulk density ρ (g/cm^3)	2.620
UCS (MPa)	18.9
Lithology	Shale
Failure description [b]	1, 2

[a] Additional specimen measurement/details provided in accompanying summary spreadsheet.
[b] Failure description: [1] Inclined shear fracture and axial splitting failure; [2] Specimen emitted pore water upon loading;

Prior to testing

After testing



Remarks: Loading rate: 0.15 mm/min.

Performed by	MB/MB	**Date**	2022-11-28

GEOMECHANICA

Uniaxial Compression Test

Client	Palmer	**Project**	2209001
Sample	BH22-12	**Depth**	32’9” - 33’3.5”

Specimen parameters	
Diameter (mm) [a]	63.09
Length (mm) [a]	129.86
Bulk density ρ (g/cm^3)	2.600
UCS (MPa)	18.0
Lithology	Shale
Failure description [b]	1, 2

[a] Additional specimen measurement/details provided in accompanying summary spreadsheet.
[b] Failure description: [1] Inclined shear fracture and axial splitting failure; [2] Specimen emitted pore water upon loading;

Prior to testing

After testing

Remarks: Loading rate: 0.15 mm/min.

Performed by	MB/MB	**Date**	2022-11-28

GEOMECHANICA

Uniaxial Compression Test

Client	Palmer	**Project**	2209001
Sample	BH22-13	**Depth**	49’6” - 50’0”

Specimen parameters	
Diameter (mm) [a]	63.08
Length (mm) [a]	130.59
Bulk density ρ (g/cm^3)	2.571
UCS (MPa)	46.1
Lithology	Limestone and Shale
Failure description [b]	3, 2

[a] Additional specimen measurement/details provided in accompanying summary spreadsheet.
[b] Failure description: [3] Axial splitting failure; [2] Specimen emitted pore water upon loading;

Prior to testing

After testing

Remarks: Loading rate: 0.15 mm/min.

Performed by	MB/MB	**Date**	2022-11-28

GEOMECHANICA

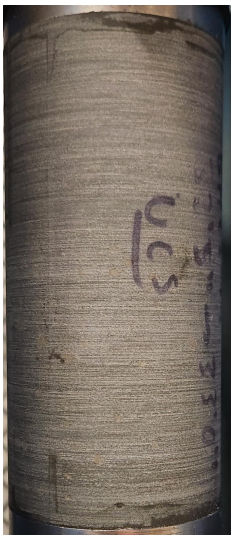
Uniaxial Compression Test

Client	Palmer	**Project**	2209001
Sample	BH22-14	**Depth**	32’5” - 33’0”

Specimen parameters	
Diameter (mm) [a]	63.26
Length (mm) [a]	130.33
Bulk density ρ (g/cm^3)	2.645
UCS (MPa)	128.7
Lithology	Limestone
Failure description [b]	1

[a] Additional specimen measurement/details provided in accompanying summary spreadsheet.
[b] Failure description: [1] Inclined shear fracture and axial splitting failure;

Prior to testing



After testing

Remarks: Loading rate: 0.15 mm/min.

Performed by	MB/MB	**Date**	2022-11-28

Uniaxial Compression Test

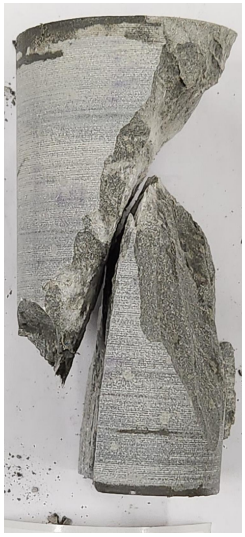
Client	Palmer	**Project**	2209001
Sample	BH22-15	**Depth**	45’5.5” - 45’11”

Specimen parameters	
Diameter (mm) [a]	63.15
Length (mm) [a]	121.26
Bulk density ρ (g/cm^3)	2.655
UCS (MPa)	137.5
Lithology	Limestone
Failure description [b]	4, 5

[a] Additional specimen measurement/details provided in accompanying summary spreadsheet.
[b] Failure description: [4] Inclined shear failure; [5] Length:Diameter ratio less than 2;

Prior to testing

After testing



Remarks: Loading rate: 0.15 mm/min.

Performed by	MB/MB	**Date**	2022-11-28

GEOMECHANICA

Uniaxial Compression Test

Client	Palmer	**Project**	2209001
Sample	BH22-16	**Depth**	51’9” - 52’4.5”

Specimen parameters	
Diameter (mm) [a]	62.88
Length (mm) [a]	130.29
Bulk density ρ (g/cm^3)	2.641
UCS (MPa)	31.0
Lithology	Shale and Limestone
Failure description [b]	4

[a] Additional specimen measurement/details provided in accompanying summary spreadsheet.
[b] Failure description: [4] Inclined shear failure;

Prior to testing

After testing

Remarks: Loading rate: 0.15 mm/min.

Performed by	MB/MB	**Date**	2022-11-28

Appendix D

Sulphate Laboratory Testing Results

CERTIFICATE OF ANALYSIS

Work Order	: **WT2222466**	Page	: 1 of 2
Client	: **Palmer Environmental Consulting Group Inc.**	Laboratory	: Waterloo - Environmental
Contact	: Iqbal Budwal	Account Manager	: Andrew Martin
Address	: 74 Berkeley Street Toronto ON Canada M5V 1E3	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: ----	Telephone	: +1 519 886 6910
Project	: 2209001	Date Samples Received	: 21-Nov-2022 13:10
PO	: ----	Date Analysis Commenced	: 22-Nov-2022
C-O-C number	: 20-1005993	Issue Date	: 29-Nov-2022 17:01
Sampler	: CLIENT		
Site	: ----		
Quote number	: (Q88296) PALMER 2022 STANDING OFFER		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Inorganics, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
µg/g	micrograms per gram
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical Results

Sub-Matrix: **Soil** (Matrix: **Soil/Solid**)					*Client sample ID*	**BH22-6, SS7**	**BH22-12, SS6**	**BH22-15, SS6**	**----**	**----**
					Client sampling date / time	21-Nov-2022 11:30	21-Nov-2022 11:30	21-Nov-2022 11:30	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*		**WT2222466-001**	**WT2222466-002**	**WT2222466-003**	**--------**	**--------**
						Result	Result	Result	----	----
Physical Tests										
pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units		7.80	7.90	7.88	----	----
Leachable Anions & Nutrients										
sulfate, soluble ion content	14808-79-8	E236.SO4	20	µg/g		165	27	30	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Canada Ltd.

right solutions.
right partner.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2222466**	Page	: 1 of 5
Client	: **Palmer Environmental Consulting Group Inc.**	Laboratory	: Waterloo - Environmental
Contact	: Iqbal Budwal	Account Manager	: Andrew Martin
Address	: 74 Berkeley Street Toronto ON Canada M5V 1E3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: ----	Telephone	: +1 519 886 6910
Project	: 2209001	Date Samples Received	: 21-Nov-2022 13:10
PO	: ----	Issue Date	: 29-Nov-2022 17:01
C-O-C number	: 20-1005993		
Sampler	: CLIENT		
Site	: ----		
Quote number	: (Q88296) PALMER 2022 STANDING OFFER		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
Glass soil jar/Teflon lined cap										
BH22-12, SS6	E236.SO4	21-Nov-2022	28-Nov-2022	30 days	7 days	✓	28-Nov-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
Glass soil jar/Teflon lined cap										
BH22-15, SS6	E236.SO4	21-Nov-2022	28-Nov-2022	30 days	7 days	✓	28-Nov-2022	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
Glass soil jar/Teflon lined cap										
BH22-6, SS7	E236.SO4	21-Nov-2022	28-Nov-2022	30 days	7 days	✓	28-Nov-2022	28 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
BH22-12, SS6	E108A	21-Nov-2022	22-Nov-2022	----	----		24-Nov-2022	30 days	3 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
BH22-15, SS6	E108A	21-Nov-2022	22-Nov-2022	----	----		23-Nov-2022	30 days	3 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap										
BH22-6, SS7	E108A	21-Nov-2022	22-Nov-2022	----	----		24-Nov-2022	30 days	3 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	753197	2	30	6.6	5.0	✓
Water Extractable Sulfate by IC	E236.SO4	753360	1	3	33.3	5.0	✓
Laboratory Control Samples (LCS)							
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	753197	2	30	6.6	5.0	✓
Water Extractable Sulfate by IC	E236.SO4	753360	2	3	66.6	10.0	✓
Method Blanks (MB)							
Water Extractable Sulfate by IC	E236.SO4	753360	1	3	33.3	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C) and is carried out in accordance with procedures described in the Analytical Protocol (prescriptive method). A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling, or decanting and then analyzed using a pH meter and electrode.
Water Extractable Sulfate by IC	E236.SO4 Waterloo - Environmental	Soil/Solid	EPA 300.1	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection using a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Anions are measured in the fluid that is observed in the upper layer.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil : 0.01CaCl2 - As Received for pH	EP108A Waterloo - Environmental	Soil/Solid	MOEE E3137A	A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling or decanting and then analyzed using a pH meter and electrode.
Anions Leach 1:10 Soil:Water (Dry)	EP236 Waterloo - Environmental	Soil/Solid	EPA 300.1	5 grams of dried soil is mixed with 50 grams of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.

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QUALITY CONTROL REPORT

Work Order	: **WT2222466**	Page	: 1 of 3
Client	: Palmer Environmental Consulting Group Inc.	Laboratory	: Waterloo - Environmental
Contact	: Iqbal Budwal	Account Manager	: Andrew Martin
Address	: 74 Berkeley Street Toronto ON Canada M5V 1E3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: +1 519 886 6910
Project	: 2209001	Date Samples Received	: 21-Nov-2022 13:10
PO	: ----	Date Analysis Commenced	: 22-Nov-2022
C-O-C number	: 20-1005993	Issue Date	: 29-Nov-2022 17:01
Sampler	: CLIENT ----		
Site	: ----		
Quote number	: (Q88296) PALMER 2022 STANDING OFFER		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 753197)											
WT2222426-021	Anonymous	pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units	6.98	6.93	0.719%	5%	----
Physical Tests (QC Lot: 753675)											
WT2222440-001	Anonymous	pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units	7.16	7.22	0.834%	5%	----
Leachable Anions & Nutrients (QC Lot: 753360)											
WT2222466-001	BH22-6, SS7	sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	165 µg/g	159	3.51%	30%	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Leachable Anions & Nutrients (QCLot: 753360)						
sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	<20	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 753197)									
pH (1:2 soil:CaCl2-aq)	----	E108A	----	pH units	7 pH units	101	98.0	102	----
Physical Tests (QCLot: 753675)									
pH (1:2 soil:CaCl2-aq)	----	E108A	----	pH units	7 pH units	100	98.0	102	----
Leachable Anions & Nutrients (QCLot: 753360)									
sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	5000 mg/kg	99.4	70.0	130	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Leachable Anions & Nutrients (QCLot: 753360)									
	RM	sulfate, soluble ion content	14808-79-8	E236.SO4	217 mg/kg	106	60.0	140	----

Chain of Custody (COC) / Analytical Request Form

COC Number: 20 - 1005993

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Page of

Environmental Division
Waterloo
Work Order Reference
WT2222466

Telephone : +1 519 886 6910

Report To	Contact and company name below will appear on the final report
Company:	Palmer (PEC6)
Contact:	Iqbal Budwal
Phone:	519-573-7161
Company address below will appear on the final report	
Street:	74 Berkeley St
City/Province:	Toronto / Ontario
Postal Code:	M5A 2W7
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Reports / Recipients

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Merge QC/QCI Reports with COA ☐ YES ☐ NO ☐ N/A
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: iqbal.budwal@pecg.ca
Email 2: alonzo.rowe@pecg.ca
Email 3:

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax:
Email 2:

Turnaround Time (TAT) Requested

☑ Routine [R] if received by 3pm M-F - no surcharges apply
☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge min
☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge mi
☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge mi
☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge mir
☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. may apply to rush requests on weekends, statutory holidays and n

Date and Time Required for all E&P TATs:

For all tests with rush TATs requested, ple

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#:
Job #:	2209001	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (ALS use only):	WT2222466	ALS Contact:	Sampler:

Analysis

Indicate Filtered (F), Preserved (P) or Filtered

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	pH	Sulphate	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRE	SUSPECTED HAZARD (see notes)
	BH22-6, SS7	21-Nov-22	11:30am	Soil	2					
	BH22-12, SS6	"	"	Soil	2					
	BH22-15, SS6	"	"	Soil	2					

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO
Are samples for human consumption/ use? ☐ YES ☐ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☑ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED
Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO
Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
0.4	2.3

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date: Nov 21, 2022	Time: 12pm	Received by:	Date: 11/21/2022	Time: 12pm	Received by:	Date: 11/21/2022	Time: 15:10

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

ALS 2020 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

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