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Preliminary Geotechnical Investigation

Halfmoon Point, Parts 1 to 6 of Lots G and H, Concession South of Prince Edward Bay South Marysburgh, Prince Edward County, Ontario

Project #

2104501

Prepared For

Port Royal Shores

June 10, 2021

June 10, 2021

Port Royal Shores
c/o Brayden Libawski
The Biglieri Group
20 Leslie Street, Suite 121
Toronto, ON M4M 3L4

Dear Brayden:

Re: Preliminary Geotechnical Investigation – Halfmoon Point, Parts 1 to 6 of Lots G and H, Concession South of Prince Edward Bay South Marysburgh, Prince Edward County, Ontario
Project #: 2104501

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

The report provides geotechnical site information from field investigation, laboratory testing, records reviews, and our interpretations/recommendations for your consideration. Based on the results of our study, the site is underlain by shallow bedrock located between 0.3 m and 0.9 m below existing grade. This bedrock is suitable for placement of foundations for the proposed low-rise recreational structures planned for the Halfmoon Point development.

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,

Palmer

Ted Pan, B.A. Sc., P.Eng.
Geotechnical Engineer

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1. Introduction

Palmer was retained by Port Royal Shores (the Client) to undertake a preliminary geotechnical investigation to support the proposed development at the Site, located at Halfmoon Point, in Prince Edward County, Ontario. It is understood that the proposed development consists of golf course with low-rise clubhouse building(s) and associated parking lot.

The objective of this geotechnical investigation was to determine the subsurface conditions at the location of the proposed development area by means of twenty-one (21) exploratory test pits (**Drawing 1**), and from the findings in the test pits make engineering recommendations for the following:

1. Foundations
2. Floor slab and permanent drainage
3. Excavations and backfilling
4. Earth pressure
5. Pipe trenching and bedding
6. Seismic considerations
7. Access road and pavements
8. Chemical Analysis

This geotechnical investigation is preliminary, based on limited number of test pits. 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 updates 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 test pits, borehole drilling or 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 for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report deals with geotechnical issues only. Environmental Site Assessment (ESA) and Hydrogeological Assessment for the subject property will be provided in separate Palmer reports.

This report has been prepared for the Client, The Biglieri Group Ltd. and their designers. Use of this report by third party without Palmer's consent is prohibited. The limitations of the report presented in this report form an integral part of the report and they must be considered in conjunction with this report.

2. Site and Regional Geology

The Site is located in a rural area, located at the intersection of County Road 13 and Babylon Road in Prince Edward County, Ontario. The study area is situated within the Prince Edward Peninsula physiographic region of Southern Ontario (Chapman and Putnam, 1984). The underlying geological material in this region is typically a plain or low plateau of limestone covered by shallow soils.

A review of available online surficial geology mapping indicated that the overburden materials of the site generally consist of shallow soils over Paleozoic Bedrock (Ontario Geological Survey, 2010). Bedrock geology mapping indicated that the Site is underlain by materials comprised of limestone and dolostone of Lindsay Formation (Ontario Geological Survey, 2011).

3. Field and Laboratory Work

The first phase of the field work for the preliminary geotechnical investigation was carried out on October 27, 2020 by excavation specialists subcontracted to Palmer, during which time thirteen (13) test pits (TP20-1, TP20-1A, TP20-2 to TP20-12) were advanced at the locations shown on the Test Pit Location Plan, **Drawing 1**. The test pits were excavated to refusal on bedrock at depths ranging from 0.4 to 0.9m below the existing ground surface.

These test pits were advanced with hydraulic backhoe excavator, where soil stratigraphy was recorded by observing the soil texture and changes of excavated materials which were retrieved from the test pits, and by observing the materials exposed within the test pits.

The second phase of the field work was carried out on May 25, 2021 by Palmer staff by means of manual digging, during which time eight (8) test pits (TP21-1 to TP21-8) were advanced at the locations shown on the **Drawing 1**. These test pits were dug to refusal on bedrock at depths ranging from 0.3 to 0.6m below the existing ground surface.

The field work for this investigation was carried out and/or supervised by Palmer engineering staff, who also logged the test pits (refer to **Appendix A**) and cared for the recovered samples. Groundwater condition observations were also made in the test pits during excavation.

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 two (2) months after the day of issuing draft report, after which time they will be discarded unless Palmer is advised otherwise in writing. In addition to visual examination in the laboratory, selected soil samples from geotechnical test pits were tested for moisture contents. Grain size analyses of five (5) selected soil samples and Sieve analyses of two (2) selected soil samples were conducted and the results are presented in **Appendix B**. Metal & Inorganic Chemical Analyses of four (4) selected soil samples were conducted and the results are presented in **Appendix C**.

The elevations of the excavated test pits are not available at the time of preparing the report. The test pit locations plotted on the Test Pit Location Plan (**Drawing 1)** were based on the measurement of site features and should be considered as approximate.

4. Subsurface Conditions

The subsurface conditions at each of the twenty-one (21) test pits were found to be substantially similar. General notes on sample description are presented in **Appendix A**. The subsurface conditions in the test pits are presented in the individual test pit logs (**Enclosures 1** to **21** inclusive, **Appendix A**). The subsurface conditions in the test pits are summarized in the following paragraphs.

4.1 Soil Conditions

Topsoil

A 50 to 220mm thick layer of surficial topsoil was encountered at all test pit locations. It should be noted that the thickness of the topsoil explored at the test pit locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

Disturbed Native Soils

A thin veneer of disturbed native soils (herein referred to as “fill”) consisting of gravelly silty clay, silty gravel, gravel, and cobbles and boulders, were encountered below the topsoil in all test pits and extended to depths ranging from about 0.3 to 0.9m below the existing ground surface. The in-situ moisture contents measured in the fill samples ranged from approximately 10% to 74%.

Grain size analyses were conducted on five (5) samples (TP20-1A/AS3, TP20-3/AS2, TP20-8/AS2, TP20-9/AS2, and TP20-12/AS2) from the silty gravel and gravel fill materials. The results are presented on individual test pit logs and in **Appendix B**, with the following fractions:

Gravel: 57 to 83%
Sand: 3 to 9%
Silt: 9 to 27%
Clay: 4 to 15%

Sieve analyses were conducted on two (2) samples (TP20-6/AS2 and TP20-11/AS2) from the gravel fill materials. The results are presented on individual test pit logs and in **Appendix B**, with the following fractions:

Gravel: 86 to 87%
Sand: 5 to 6%
Fines (silt and clay): 8%

Bedrock

All test pits are terminated upon encountering digging or excavation refusal on bedrock. The bedrock encountered at the site consists of typically moderately weathered to fresh, grey, medium strong to very strong limestone of the Lindsay Formation beneath the fill materials in all test pits from 0.3 to 0.9m below existing ground surface.

4.2 Groundwater Conditions

Groundwater condition observations were made in the test pits upon completion of excavation. Groundwater was measured at between 0.4 to 0.5m below the existing ground surface in test pit TP20-7 and TP20-8. All other test pits were dry upon completion. The water level in TP20-7 and TP20-8 is interpreted to represent a perched water table on the bedrock 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

It is understood that the proposed development plan will consist of gold course with low-rise buildings, parking lots, internal servicing and roadways within Parts 1 to 6 of Lots G and H, Concession South of Prince Edward Bay South Marysburgh, Prince Edward County, Ontario.

5.1 Proposed Building Foundation Design Considerations

Based on the test pit information, the proposed low-rise buildings can be supported by spread and strip footings founded on the bedrock at all locations for a factored geotechnical resistance of 1000 kPa at Ultimate Limit States (ULS). The Serviceability Limit States (SLS) condition will not govern for footings founded on the bedrock.

The excavated footing bases should be cleared of any loose, deleterious, or otherwise unsuitable materials. All footing bases must be inspected by qualified geotechnical engineering personnel prior to pouring concrete.

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

In the vicinity of the existing buried utilities, all footings must be lowered to undisturbed native soils or 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 by Palmer from the test pit information are for the preliminary planning stage only. The investigation and comments are necessarily on-going as new

information of the underground conditions becomes available. For example, more specific information is available with respect to conditions between test pits when foundation construction is underway. The interpretation between test pits and the recommendations of this report must therefore be checked through field inspections to validate the information for use during the design stage.

5.2 Floor Slab and Permanent Drainage

The existing disturbed native soils (i.e., fill materials) are considered not suitable for supporting the floor slab for the on-site structures. The floor slab can be supported on the bedrock or compacted backfill to raise the grade. The backfill required to raise the grade can consist of inorganic soil, placed in shallow lifts (200 mm) and compacted to 98% of Standard Proctor Maximum Dry Density (SPMDD).

A moisture barrier consisting of at least 200 mm of 19 mm clear crushed stone should be installed under the floor slab.

For the proposed buildings without basement, if the floor slab is more than about 300 mm higher than the exterior grade, then a perimeter drainage system is not considered to be necessary. If the floor is lower, then the perimeter drainage system shown on **Drawing 2** is recommended.

5.3 Excavations and Backfilling

According to the results of this investigation, the excavations are generally anticipated to be carried out in the disturbed native (fill materials) and minor excavation in weathered bedrock. This excavation can be carried out with heavy hydraulic backhoe.

It should be noted that the onsite fill materials consist of disturbed native containing gravel, cobbles and boulders. Possible large obstructions such as buried concrete pieces and existing foundations are also anticipated in the fill materials, particularly near the historical residential buildings. Provisions must be made in the excavation contract for the removal of possible boulders or obstructions in the fill materials.

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 would be classified as Type 3 Soils above the groundwater table and Type 4 Soils below the groundwater table.

It is anticipated that foundation excavations at the site will consist of temporary open cuts with side slopes not steeper than 1.5 horizontal to 1 vertical (1.5H:1V) above the groundwater table. However, depending on the construction procedures adopted by the contractor and weather conditions at the time of construction, some local flattening of the slopes might be required. Where side slopes of excavations are to be steepened, then a positive excavation support system should be considered.

Vertical cuts in any of the soil types should be supported with shoring and bracing to safeguard the stability of the sides of the trenches. All shoring designs should be in accordance with the 4th Edition of the Canadian Foundation Engineering Manual and must be reviewed by a professionally qualified geotechnical

engineer. 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 insulation or heated hoarding as frost will induce an additional load to the shored wall.

Excavation in Bedrock

The bedrock encountered at the site is characterized as medium strong to very strong limestone. The top weathered portion of the bedrock may be removed with a powerful excavator equipped with a rock bucket and rock teeth, assisted by hoe ramming. 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 removal of the underlying fresh and strong to very strong rock may be arduous and time consuming, and may require use of impact breakers and line-drilling. Blasting may be considered for excavation in the sound bedrock.

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.
- For the bedrock 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 existing disturbed native (fill) in the test pits containing organics is generally not suitable for re-use as backfill. Existing fill or imported soils free from topsoil and organics 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. The excavated weathered bedrock could be used as backfill provided they are pulverized to the sizes similar to Granular “A” or “B” and are blended with the backfill soils. Ripped or mechanically excavated bedrock may be too coarsely graded and open graded for reuse as compacted fill.

Under floor backfill should be compacted to at least 98 percent of Standard Proctor Maximum Dry Density (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 preferable that the on-site soils be re-used from approximately the position at which they are excavated so that frost response characteristics of the soils after construction remain essentially similar to presently existing.

It is expected that any seepage above the groundwater table can be removed by pumping from sumps in the excavation area. However, more significant seepage should be expected from the perched water table in the vicinity of test pit TP20-7 and TP20-8, once the excavations extend below the perched groundwater tables in the disturbed native materials at the site.

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 preliminary Hydrogeological Assessment by Palmer provides the assessment of the dewatering requirements for any excavations below the groundwater table.

5.4 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** prevents the build-up of any hydrostatic pressure behind the wall.

5.5 Pipe Support and Bedding

All topsoil, the disturbed native (fill), and other objectionable material must be removed from excavation base prior to placement of pipe bedding. The recommended minimum thickness of granular bedding below the invert of the pipes is 150 mm where the subgrade consists of competent native soils or bedrock.

Where the weak or otherwise unsuitable fill materials or native soils are present at the proposed pipe invert or trench invert elevation, the unsuitable fill materials should be sub-excavated and replaced using conventional Class "B" bedding. In this case, the recommended minimum thickness of granular bedding below the invert of the pipes is 300 mm.

The bedding material and its minimum thickness for the pipes should be in accordance with the current revision of OPSD (Ontario Provincial Standard Drawing) and applicable municipal standards.

To avoid the loss of soil fines from the subgrade, uniformly graded clear stone should not be used unless, below the granular bedding material, a suitable, approved filter fabric (geotextile) is placed. The geotextile should extend along the sides of the trench and should be wrapped all around the uniformly graded bedding material.

The compacted granular base and the cover material for the pipe should consist of OPSS 1010 Granular "A" type material. All granular materials should be placed in loose lifts of 150mm thickness and then compacted. The granular bedding and cover materials should be compacted to 100% of Standard Proctor Maximum Dry Density (SPMDD) at a placement water content within ±2% of the materials optimum. Care should be exercised when compacting the cover material on top of the pipes to avoid damaging them.

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 excavation 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 field investigation program included test pits excavated to depths up to 0.9 m below the existing ground surface. Based on the test pit information and our local experience, a Site Class C 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 Internal Road and Pavements

The recommended pavement structures provided in **Table 1** are based upon test pit information. The values may need to be adjusted based on the municipality/regional standards. Consequently, the recommended pavement structures should be considered for preliminary design 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 1: Recommended Pavement Structure Thickness

Pavement Layer	Compaction Requirements	Light Duty Pavement (Parking for Cars)	Heavy Duty Pavement (Access Road, Fire Routes, Parking for Delivery Trucks)
Asphaltic Concrete	97% Maximum Relative Density (MRD)	40 mm HL 3 40 mm HL 8	40 mm HL 3 70 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	200 mm	300 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 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. 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.

5.8 Chemical Analysis

Soil samples were collected by Palmer to assess the requirements for soil disposal/reuse. Palmer collected four (4) sets of soil samples for bulk chemical analysis on October 29, 2020. The samples were submitted under chain of custody to ALS Laboratories, a Canadian Association for Laboratory Accreditation Inc. (CALA) certified laboratory, for parameters listed in Ontario Regulation 153/04. Collected samples were analyzed for Metals and Inorganics (M&I) and compared against Regulation 153/04 Table 1 and Table 3 Site Condition Standards (SCS) for Residential/Parkland/Institutional/ Industrial/Commercial/Community (RPIICC) property uses.

Details of the samples tested are listed in **Table 2** below. The Certificate of Chemical Analysis (CoA) are provided in **Appendix C**.

Table 2: Summary of Soil Environmental Quality Tests

Sample ID	Soil Depth (mBGS)	Soil Type	Analytical Parameters
TP20-1 AS2	0.2 ~ 0.5	Disturbed Native (Fill)	M&I
TP20-4 AS2	0.3 ~ 0.5	Disturbed Native (Fill)	M&I
TP20-7 AS2	0.1 ~ 0.4	Disturbed Native (Fill)	M&I
TP20-10 AS1	0 ~ 0.2	Topsoil/ Disturbed Native (Fill)	M&I

Note: mBGS = meters below ground surface

In comparison with the Table 1 and Table 3 SCS for RPIICC properties, the results of the laboratory analyses on the four (4) soil samples indicated that the measured contaminant concentrations were below the Table 1 SCS, with the exception of soil samples TP20-4/AS2 and TP20-7/AS2. **Table 3** below summarizes the soil sample exceedances that were detected. These exceedances are interpreted to be related to background metals concentration in the thin veneer of disturbed native soils and not related the importation of contaminated soils. Additional testing during future site investigations is recommended.

Table 3: Exceedance Values in Analyzed Soil Samples

Sample ID	Parameter	Detected Contaminant Concentration	MECP Table 1 Standards Guideline Values	MECP Table 3 Standards (R/P/I) Guideline Values	MECP Table 3 Standards (I/C/C) Guideline Values
TP20-4 AS2	Arsenic (As)	22.9 ug/g	11 ug/g	18 ug/g	18 ug/g
TP20-7 AS2	Antimony (Sb)	4.3 ug/g	1 ug/g	1.3 ug/g	1.3 ug/g

Note: R/P/I = Residential, Parkland and Institutional Property Use

I/C/C = Industrial, Commercial and Community Property Use

Based on the results, the following disposal options may be considered: The soils excavated in the vicinity of Test Pit TP20-4 and TP20-7 cannot be reused onsite. This material should be disposed of off-site at a licensed landfill facility. Toxicity Characteristic Leachate Procedure (TCLP) analysis will be required to characterize the soils prior to disposal.

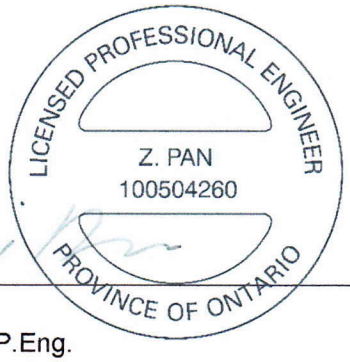
Based on the proposed development, the excavation of soil will likely be required during the early stages of construction. Prior to the excavation of soil and in support of the building permit application process, the suitability of reusing the soil at an off-site receiving site or temporary storage site must be assessed in accordance with Ontario Regulation 406/19. This will include the completion of an Assessment of Past Uses, Soil Characterization, Excess Soil Destination Report, Tracking, and Registry on the Environmental Site Registry.

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.

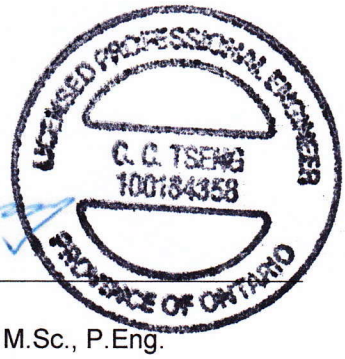
This report was prepared and reviewed by the undersigned:

Prepared By:



Ted Pan, B.A.Sc., P.Eng.
Geotechnical Engineer

Reviewed By:



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

7. References

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 borehole and test pit 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 boreholes and test pits may differ from those encountered at the borehole and test pit 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 borehole and test pit 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.

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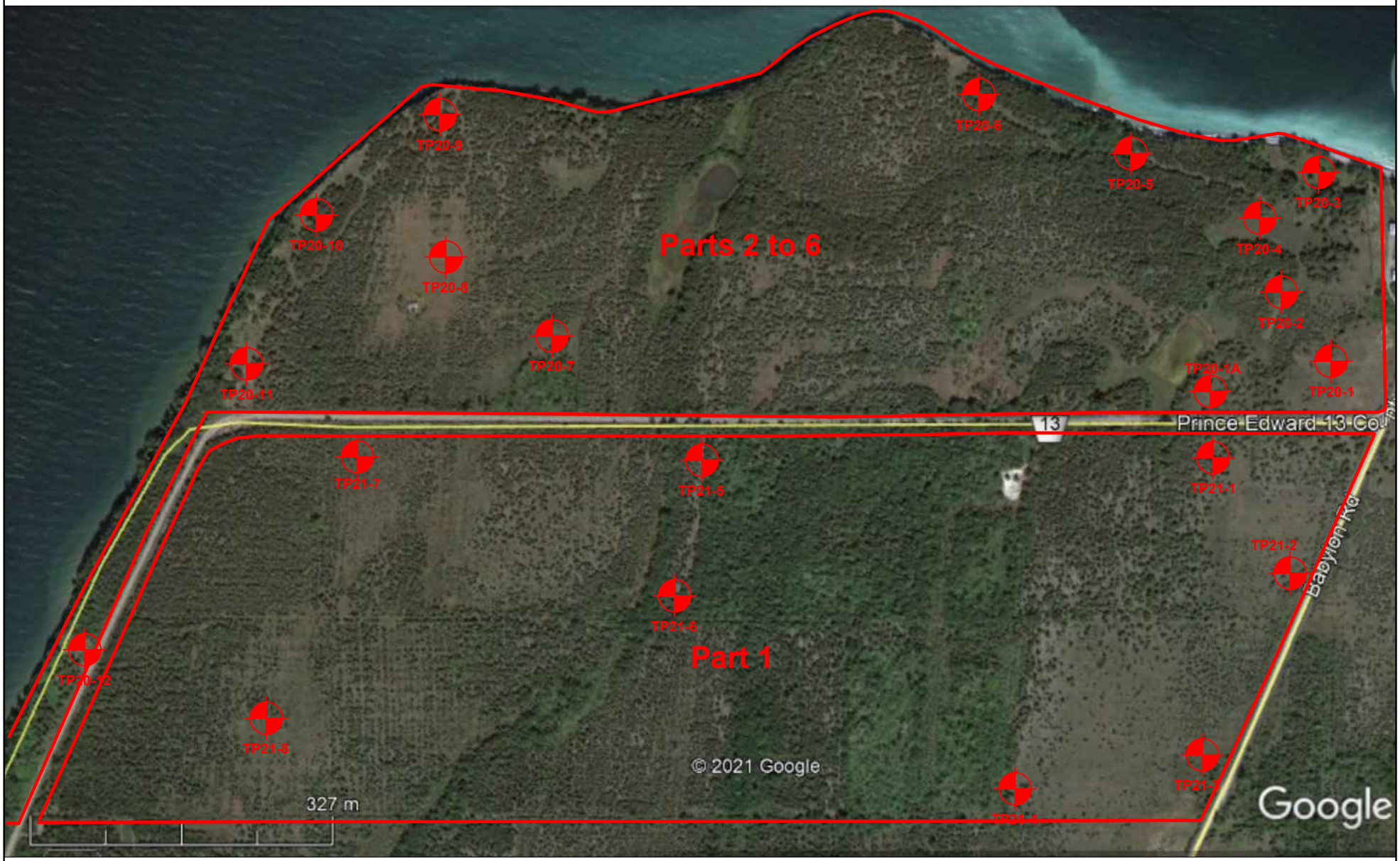
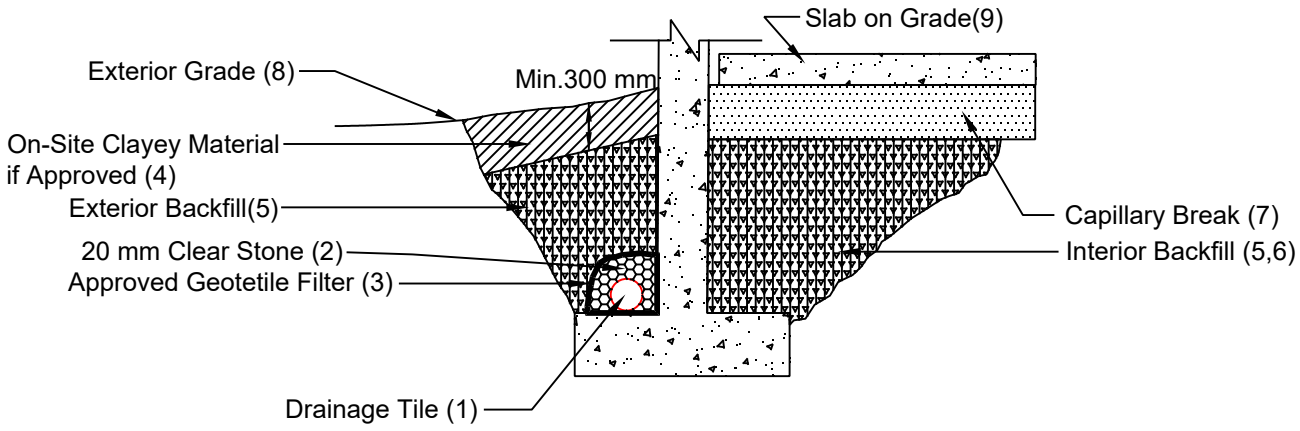
Drawings



LEGEND

Test Pit

Client:	**Greg Sorbara**		Project No.:	**2104501**	Drawing No.: **1**
Drawn:	**TO**	Approved: **DT**	Title:	**Test Pit Location Plan**	
Date:	**June, 2021**	Scale: **As Shown**	Project:	**Geotechnical Investigation** **Halfmoon Point Golf Course, Prince Edward County, Ontario**	
Original Size:	**Letter**	Rev: **TP**	Palmer™	74 Berkeley Street Toronto, Ontario M5A 2W7	



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. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved geotetile filter (Terrafix 270R or equivalent).
4. The on-site clayey material, if approved, can be used as backfill in the upper 300 mm.
5. The interior and exterior fill adjacent to foundation walls should be OPSS Granular 'B' Type I. Compact to at least 98% SPMDD.
6. Do not use heavy compaction equipment within 450 mm (18") of the wall. Do not fill or compact within 1.8 m (6') of the wall. Place fill on both sides simultaneously.
7. Capillary break to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors (consult with archtect).
8. Exterior grade to slope away from building at min. 2%.
9. Slab on grade should not be structurally connected to the wall or footing.
10. Review the geotechnical report for specific details.

DRAINAGE AND BACKFILL RECOMMENDATIONS
Slab on Grade Construction Without Underfloor Drainage
(not to scale)

Appendix A

Test Pit 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 Palmer 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		

0.002 0.006 0.02 0.06 0.2 0.6 2.0 6.0 20 60 200

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 Test Pits

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

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LOG OF BOREHOLE TP20-1

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara | Method: Backhoe Excavation

PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501

DATUM: N/A | Date: Oct-27-2020 | ENCL NO.: 1

BH LOCATION: See Test Pit Location Plan

(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, + FIELD VANE & Sensitivity, ● QUICK TRIAXIAL, × 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/m^3)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface											
0.0	**TOPSOIL:** 200 mm		1	AS					○			
0.2	**DISTURBED NATIVE (FILL):** gravel, trace clay, trace silt, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		2	AS					○			
0.5	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Excavation refusal

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

Palmer

LOG OF BOREHOLE TP20-1A

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara | Method: Backhoe Excavation

PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501

DATUM: N/A | Date: Oct-27-2020 | ENCL NO.: 2

BH LOCATION: See Test Pit Location Plan

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	BLOWS / 0.3 m "N"							GR SA SI CL
0.0	Ground Surface **TOPSOIL:** 160 mm		1	AS								
0.2	**DISTURBED NATIVE (FILL):**gravel, trace clay, trace silt, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		2	AS								
0.4	**DISTURBED NATIVE TILL (FILL):**silty gravel, some clay, trace sand, contain cobbles and boulders, brown, moist		3	AS								60 7 20 13
0.9	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Excavation refusal

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

Palmer

LOG OF BOREHOLE TP20-2

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara | Method: Backhoe Excavation

PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501

DATUM: N/A | Date: Oct-27-2020 | ENCL NO.: 3

BH LOCATION: See Test Pit Location Plan

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
	Ground Surface											
0.0	**TOPSOIL:** 200 mm		1	AS								
0.2	**DISTURBED NATIVE (FILL):** gravel, trace clay, trace silt, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		2	AS								
0.4	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Excavation refusal

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

Palmer

LOG OF BOREHOLE TP20-3

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara | Method: Backhoe Excavation

PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501

DATUM: N/A | Date: Oct-27-2020 | ENCL NO.: 4

BH LOCATION: See Test Pit Location Plan

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	BLOWS / 0.3 m "N"							
0.0	Ground Surface **TOPSOIL:** 180 mm		1	AS					○			GR SA SI CL
0.2	**DISTURBED NATIVE (FILL):** gravel, some clay, some silt, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		2	AS					○			65 5 15 15
0.6	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Excavation refusal

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara | Method: Backhoe Excavation

PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501

DATUM: N/A | Date: Oct-27-2020 | ENCL NO.: 5

BH LOCATION: See Test Pit Location Plan

(m) ELEV / DEPTH	SOIL PROFILE – DESCRIPTION (Ground Surface)	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100); SHEAR STRENGTH (kPa): O 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/m^3)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**TOPSOIL:** 280 mm		1	AS					o (approx. 23)			
0.3	**DISTURBED NATIVE (FILL):** gravel, trace clay, trace silt, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		2	AS					o (approx. 15)			
0.5	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Excavation refusal

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; O 8=3% Strain at Failure

Palmer

LOG OF BOREHOLE TP20-5

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara | Method: Backhoe Excavation

PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501

DATUM: N/A | Date: Oct-27-2020 | ENCL NO.: 6

BH LOCATION: See Test Pit Location Plan

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	BLOWS / 0.3 m "N"							GR SA SI CL
	Ground Surface											
0.0	**TOPSOIL:** 230 mm		1	AS						41.7		
0.2	**DISTURBED NATIVE (FILL):** gravel, trace clay, trace silt, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		2	AS					○			
0.4	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Excavation refusal

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

Palmer

LOG OF BOREHOLE TP20-6

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara | Method: Backhoe Excavation

PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501

DATUM: N/A | Date: Oct-27-2020 | ENCL NO.: 7

BH LOCATION: See Test Pit Location Plan

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
	Ground Surface											
0.0	**TOPSOIL:** 200 mm		1	AS					○			
0.2	**DISTURBED NATIVE (FILL):** gravel, trace clay, trace silt, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		2	AS					○			86 6 (8)
0.5	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Excavation refusal

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

Palmer™

LOG OF BOREHOLE TP20-7

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara

PROJECT LOCATION: Prince Edward County, ON

DATUM: N/A

BH LOCATION: See Test Pit Location Plan

Method: Backhoe Excavation

Diameter:

Date: Oct-27-2020

REF. NO.: 2104501

ENCL NO.: 8

SOIL PROFILE (m) ELEV DEPTH	DESCRIPTION (Ground Surface)	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m^3)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**TOPSOIL:** 130 mm		1	AS					88.4			
0.1	**DISTURBED NATIVE (FILL):** gravel, trace clay, trace silt, trace sand, contain cobbles and boulders, trace organics, trace rootlets, dark brown, moist		2	AS					48.6			
0.4	**DISTURBED NATIVE (FILL):** Cobbles and boulders, some clay, some silt, some gravel, trace sand, trace rootlets, brown, wet		3	AS								
0.8	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. Water was at 0.4m below ground surface (mBGS) upon completion of excavation.											Excavation refusal

Legend: 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.

SOIL-ROCK-OCT30-2019_PM_ROCK_HYDROG FORM_NEW LOGO.GLB
PALMER SOIL - 2018 1DIG 2104501 HALFMOON POINT 20210602.GPJ 21-6-2

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 TP20-8

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara | Method: Backhoe Excavation

PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501

DATUM: N/A | Date: Oct-27-2020 | ENCL NO.: 9

BH LOCATION: See Test Pit Location Plan

(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
Ground Surface												
0.0	**TOPSOIL:** 110 mm		1	AS					75			
0.1	**DISTURBED NATIVE (FILL):** silty gravel, trace clay, trace sand, contain cobbles and boulders, trace organics, trace rootlets, dark brown, moist		2	AS					73.6			57 9 27 7
0.4	**DISTURBED NATIVE (FILL):** Cobbles and boulders, some clay, some silt, some gravel, trace sand, trace limestone fragments, brown, wet		3	AS								
0.7	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. Water was at 0.5m below ground surface (mBGS) upon completion of drilling.											Excavation refusal

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

Palmer

LOG OF BOREHOLE TP20-9

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara | Method: Backhoe Excavation

PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501

DATUM: N/A | Date: Oct-27-2020 | ENCL NO.: 10

BH LOCATION: See Test Pit Location Plan

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	BLOWS / 0.3 m "N"							GR SA SI CL
	Ground Surface											
0.0	**TOPSOIL:** 220 mm		1	AS								
0.2	**DISTURBED NATIVE (FILL):** gravel, some silt, trace clay, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		2	AS								77 5 14 4
0.6	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Excavation refusal

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

Palmer™

LOG OF BOREHOLE TP20-10

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara | Method: Backhoe Excavation

PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501

DATUM: N/A | Date: Oct-27-2020 | ENCL NO.: 11

BH LOCATION: See Test Pit Location Plan

SOIL PROFILE: (m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: 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, + 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/m^3)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface											
0.0	**TOPSOIL:** 150 mm		1	AS								
0.2	**DISTURBED NATIVE (FILL):** gravel, trace clay, trace silt, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		2	AS								
0.4	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Excavation refusal

SOIL-ROCK-OCT30-2019_PM_ROCK_HYDROG FORM_NEW LOGO.GLB
PALMER SOIL - 2018 1DIG 2104501 HALFMOON POINT 20210602.GPJ 21-6-2

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3, \times^3$: Numbers refer to Sensitivity; ○ 8 =3% Strain at Failure

Palmer

LOG OF BOREHOLE TP20-11

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara | Method: Backhoe Excavation

PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501

DATUM: N/A | Date: Oct-27-2020 | ENCL NO.: 12

BH LOCATION: See Test Pit Location Plan

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	BLOWS / 0.3 m "N"							GR SA SI CL
0.0	Ground Surface **TOPSOIL:** 250 mm		1	AS						44.8		
0.3	**DISTURBED NATIVE (FILL):** gravel, trace clay, trace silt, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		2	AS								87 5 (8)
0.6	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Excavation refusal

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 TP20-12

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara

Method: Backhoe Excavation

PROJECT LOCATION: Prince Edward County, ON

Diameter:

REF. NO.: 2104501

DATUM: N/A

Date: Oct-27-2020

ENCL NO.: 13

BH LOCATION: See Test Pit Location Plan

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3 m "N"	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
	Ground Surface										
0.0	**TOPSOIL:** 220 mm		1	AS							
0.2	**DISTURBED NATIVE (FILL):** gravel, trace clay, trace silt, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		2	AS							83 3 9 5
0.5	**BEDROCK:** limestone, moderately weathered to fresh, grey		3	AS							
0.7	**END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.										Excavation refusal

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

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

Palmer

LOG OF BOREHOLE TP21-1

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara | Method: Manual Dig

PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501

DATUM: N/A | Date: May-25-2021 | ENCL NO.: 14

BH LOCATION: See Test Pit Location Plan

(m) ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100); SHEAR STRENGTH (kPa): O 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/m^3)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface											
0.0	**TOPSOIL:** 110 mm											
0.1	**DISTURBED NATIVE (FILL):**gravelly silty clay, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		1	AS								
0.3	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Dig refusal

SOIL-ROCK-OCT30-2019_PM_ROCK_HYDROG FORM_NEW LOGO.GLB PALMER SOIL 2018 LOG 2104501 - HALFMOON POINT 20210602.GPJ 21-6-2

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

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

Palmer

LOG OF BOREHOLE TP21-2

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara | Method: Manual Dig

PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501

DATUM: N/A | Date: May-25-2021 | ENCL NO.: 15

BH LOCATION: See Test Pit Location Plan

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / 0.3 m "N"	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
Ground Surface											
0.0	**TOPSOIL:** 160 mm										
0.2	**DISTURBED NATIVE (FILL):** gravelly silty clay, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		1	AS							
0.4	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.										Dig refusal

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

Palmer™

LOG OF BOREHOLE TP21-3

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara — Method: Manual Dig

PROJECT LOCATION: Prince Edward County, ON — Diameter: — REF. NO.: 2104501

DATUM: N/A — Date: May-25-2021 — ENCL NO.: 16

BH LOCATION: See Test Pit Location Plan

ELEV (m) / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	SAMPLE TYPE	"N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT (WATER CONTENT %)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m^3)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface											
0.0	**TOPSOIL:** 180 mm											
0.2	**DISTURBED NATIVE (FILL):** gravelly silty clay, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		1	AS								
0.4	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Dig refusal

Legend: SHEAR STRENGTH (kPa): ○ UNCONFINED; + FIELD VANE & Sensitivity; ● QUICK TRIAXIAL; × LAB VANE. Scales 20, 40, 60, 80, 100. Water content 10, 20, 30. W_P — W — W_L

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ^{8}=3% Strain at Failure

Palmer

LOG OF BOREHOLE TP21-4

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara

Method: Manual Dig

PROJECT LOCATION: Prince Edward County, ON

Diameter:

REF. NO.: 2104501

DATUM: N/A

Date: May-25-2021

ENCL NO.: 17

BH LOCATION: See Test Pit Location Plan

ELEV DEPTH (m)	SOIL PROFILE – DESCRIPTION (Ground Surface)	STRATA PLOT	SAMPLES 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, + 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/m^3)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**TOPSOIL:** 220 mm											
0.2	**DISTURBED NATIVE (FILL):**gravelly silty clay, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		1	AS								
0.4	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Dig refusal

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

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

Palmer™

LOG OF BOREHOLE TP21-5

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara | Method: Manual Dig

PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501

DATUM: N/A | Date: May-25-2021 | ENCL NO.: 18

BH LOCATION: See Test Pit Location Plan

SOIL PROFILE (m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	"N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	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/m^3)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface											
0.0	**TOPSOIL:** 130 mm											
0.1	**DISTURBED NATIVE (FILL):** gravelly silty clay, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		1	AS								
0.4	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Dig refusal

SOIL-ROCK-OCT30-2019_PM_ROCK_HYDROG FORM_NEW LOGO.GLB
PALMER SOIL - 2018 1DIG 2104501 HALFMOON POINT 20210602.GPJ 21-6-2

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 TP21-6

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course
CLIENT: Greg Sorbara | Method: Manual Dig
PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501
DATUM: N/A | Date: May-25-2021 | ENCL NO.: 19
BH LOCATION: See Test Pit Location Plan

(m) ELEV DEPTH	SOIL PROFILE – DESCRIPTION (Ground Surface)	STRATA PLOT	SAMPLES – NUMBER	SAMPLES – TYPE	"N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	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/m^3)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**TOPSOIL:** 50 mm											
0.1	**>DISTURBED NATIVE (FILL):**gravelly silty clay, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		1	AS								
0.3	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Dig refusal

SOIL-ROCK-OCT30-2019_PM_ROCK_HYDROG FORM_NEW LOGO.GLB
PALMER SOIL - 2018 1DIG 2104501 HALFMOON POINT 20210602.GPJ 21-6-2

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

GRAPH NOTES: $+^3, \times^3$: Numbers refer to Sensitivity; ○ ^{8}=3% Strain at Failure

Palmer™

LOG OF BOREHOLE TP21-7

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course
CLIENT: Greg Sorbara | Method: Manual Dig
PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501
DATUM: N/A | Date: May-25-2021 | ENCL NO.: 20
BH LOCATION: See Test Pit Location Plan

(m) ELEV DEPTH	SOIL PROFILE DESCRIPTION (Ground Surface)	STRATA PLOT	SAMPLES 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 + 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
0.0	**TOPSOIL:** 200 mm											
0.2	**DISTURBED NATIVE (FILL):** gravelly silty clay, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		1	AS								
0.6	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Dig refusal

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ 8=3% Strain at Failure

Palmer

LOG OF BOREHOLE TP21-8

PROJECT: Preliminary Geotechnical Investigation - Halfmoon Point Golf Course

CLIENT: Greg Sorbara | Method: Manual Dig

PROJECT LOCATION: Prince Edward County, ON | Diameter: | REF. NO.: 2104501

DATUM: N/A | Date: May-25-2021 | ENCL NO.: 21

BH LOCATION: See Test Pit Location Plan

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 (%) GR SA SI CL
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"							
	Ground Surface											
0.0	**TOPSOIL:** 200 mm											
0.2	**DISTURBED NATIVE (FILL):** gravelly silty clay, trace sand, contain cobbles and boulders, trace organics, trace rootlets, brown, moist		1	AS								
0.5	**GREY, MODERATELY WEATHERED TO FRESH LIMESTONE BEDROCK ENCOUNTERED** **END OF TEST PIT** 1. No groundwater accumulation upon completion of excavation.											Dig refusal

GROUNDWATER ELEVATIONS

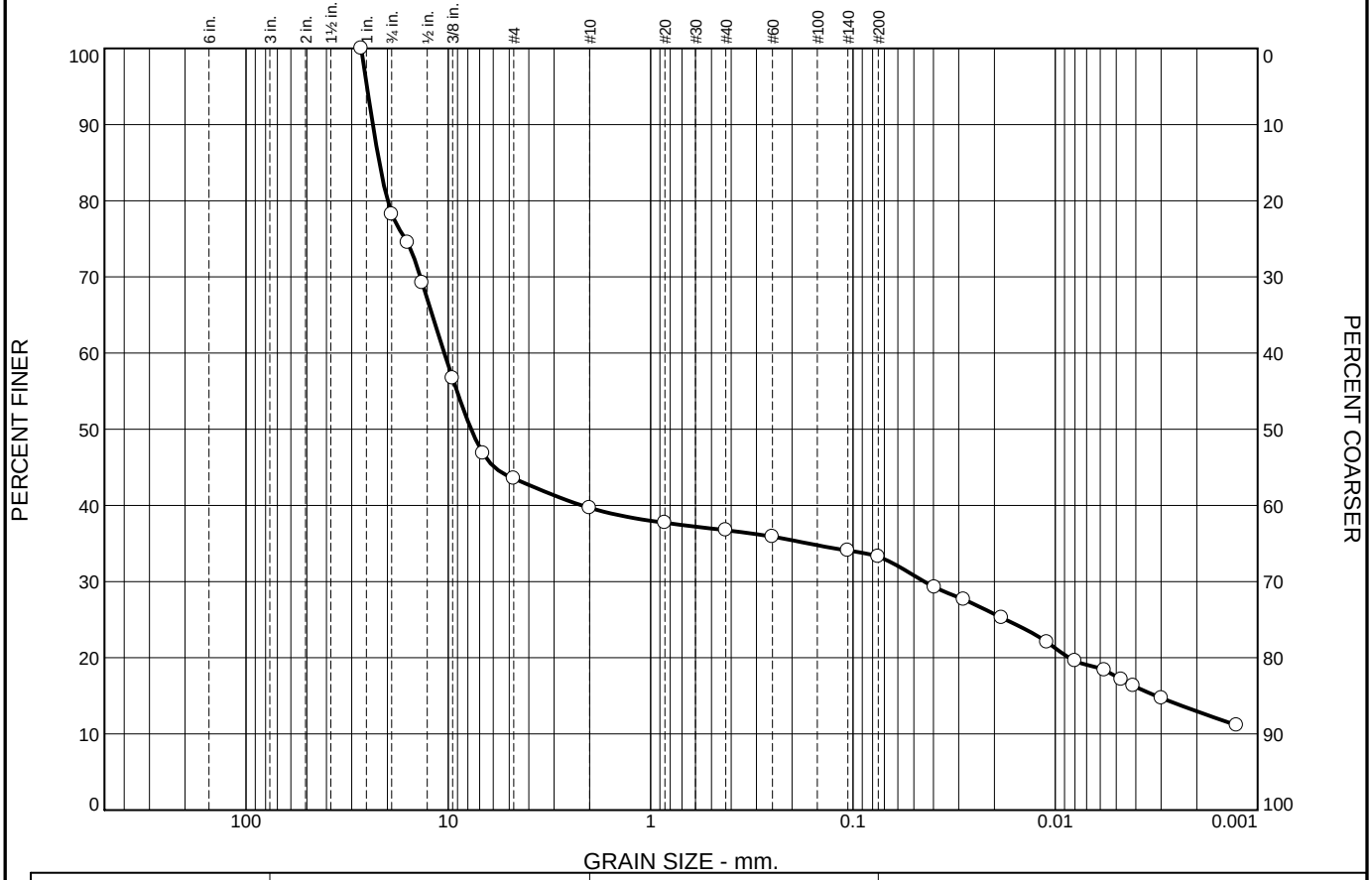
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

Appendix B

Geotechnical Soil Testing Results

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	60	3	4	20	13

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			21.9256	10.4579	7.7105	0.0445	0.0032			

Material Description	USCS	AASHTO
○ SILTY GRAVEL some clay trace sand		

Project No. CA19-009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)

Project: PECG Prj. No. 1904307 (Laboratory Testing)

○ **Sample Number:** TP20-1a, AS3

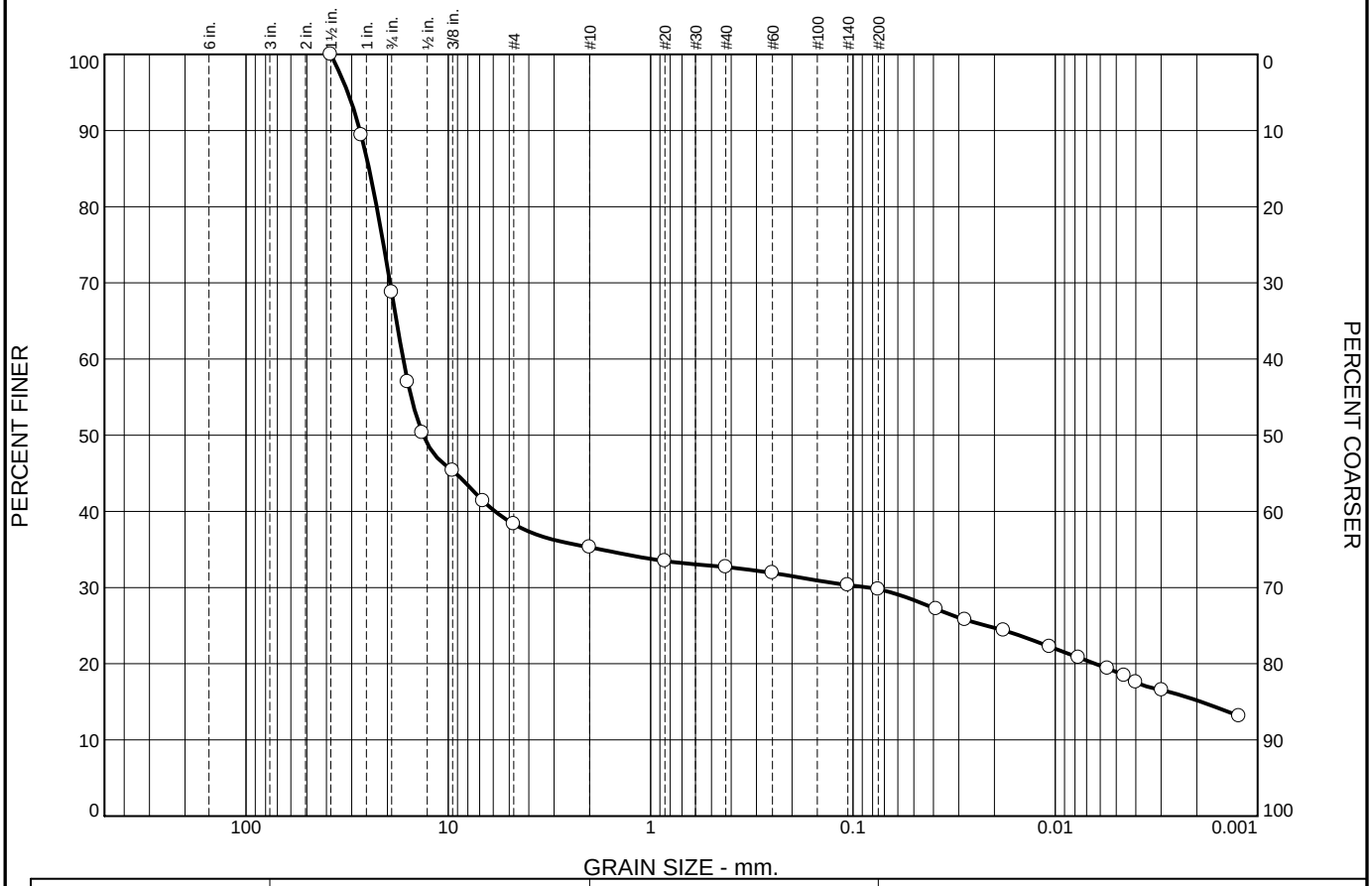
Remarks:

Terrapex

Figure 1

Tested By: DM/AM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	65	2	3	15	15

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			24.6382	16.7132	13.3072	0.0840	0.0019			

Material Description	USCS	AASHTO
○ GRAVEL some silt some clay trace sand		

Project No. CA19-009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)

Project: PECG Prj. No. 1904307 (Laboratory Testing)

○ **Sample Number:** TP20-3, AS2

Remarks:

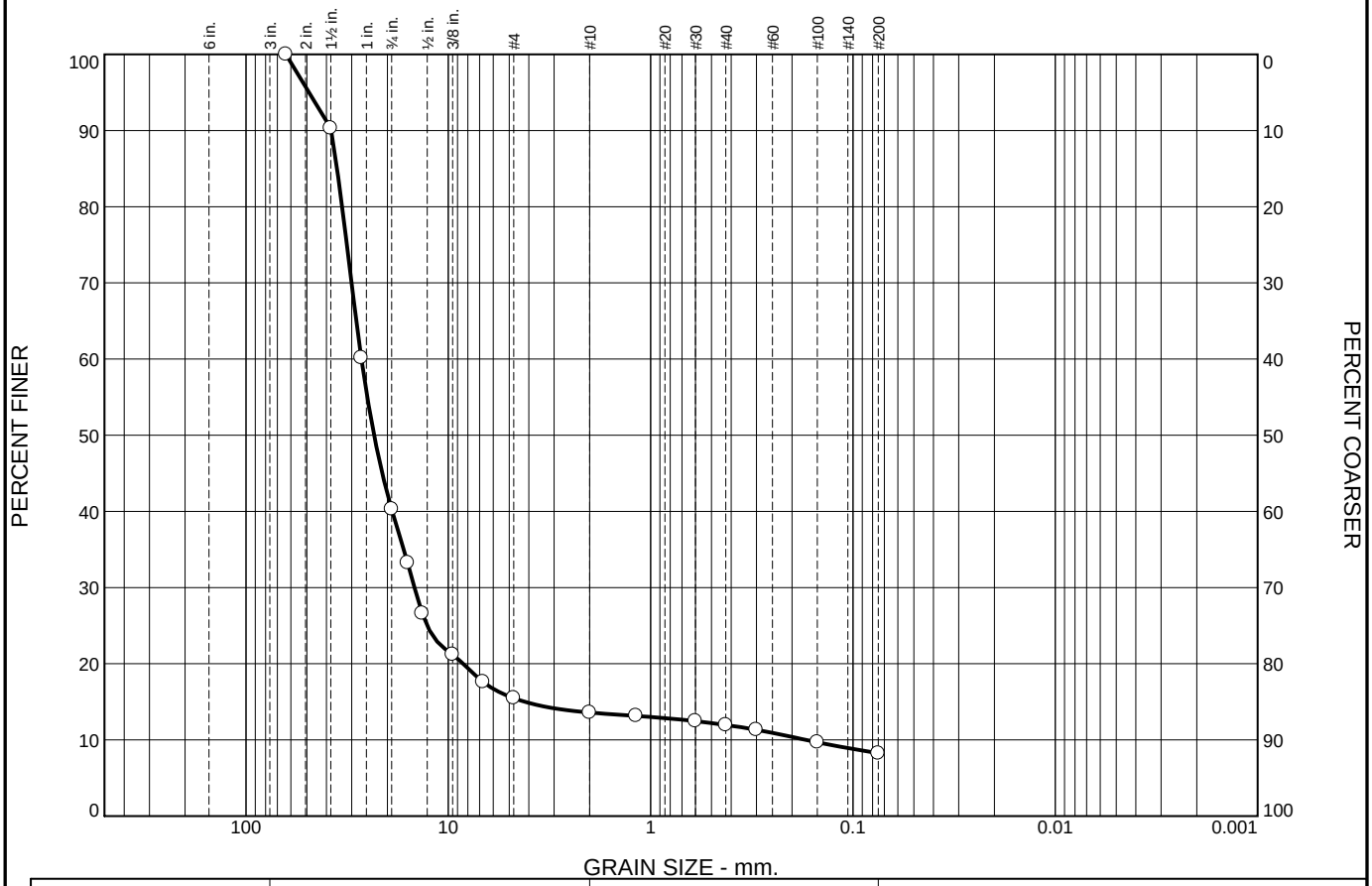
○Tested on 2/11/2020

Terrapex

Figure 2

Tested By: DM/AM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	86	2	4	8	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			35.4718	26.8700	23.2769	14.7024	4.1764	0.1707	47.13	157.41

Material Description	USCS	AASHTO
○ GRAVEL trace sand trace fines		

Project No. CA19-009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)

Project: PECG Prj. No. 1904307 (Laboratory Testing)

○ **Sample Number:** TP20-6, AS2

Remarks:

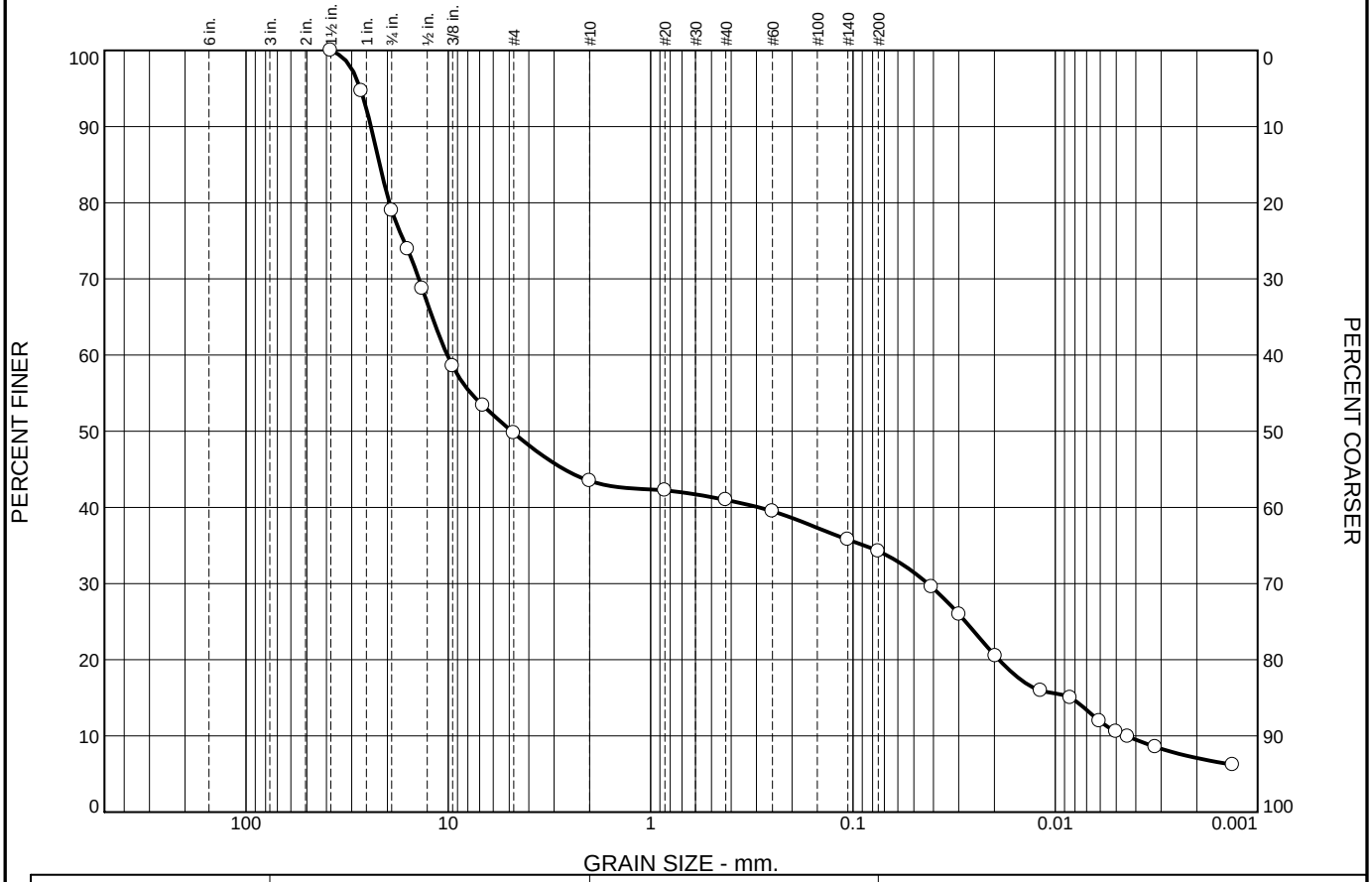
○Tested on 3/11/2020

Terrapex

Figure 3

Tested By: AM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	57	2	7	27	7

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			21.8260	10.1159	4.8600	0.0427	0.0084	0.0045	0.04	2267.81

Material Description	USCS	AASHTO
○ SILTY GRAVEL trace sand trace clay		

Project No. CA19-009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)

Project: PECG Prj. No. 1904307 (Laboratory Testing)

○ **Sample Number:** TP20-8, AS2

Remarks:

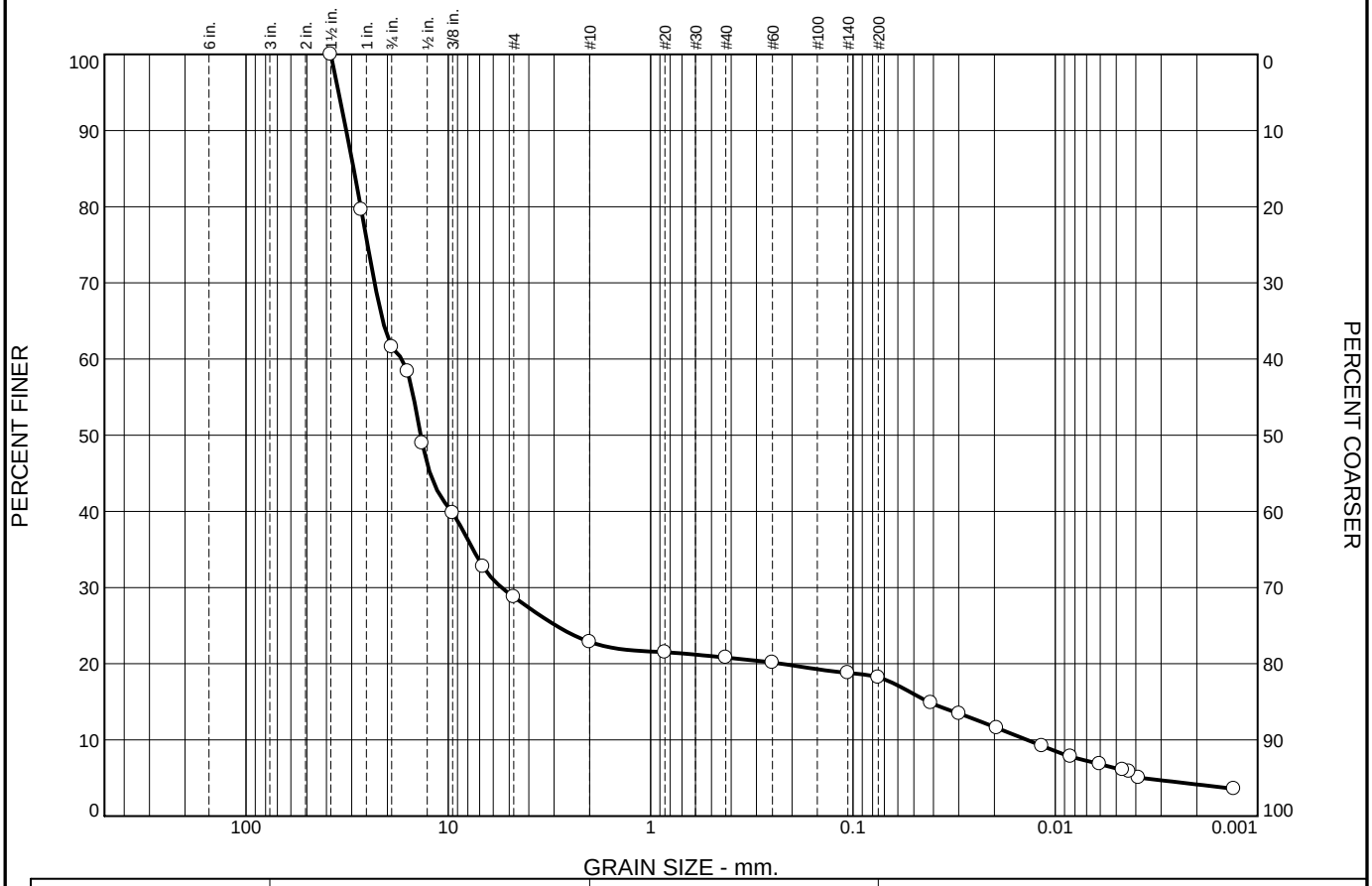
○Tested 2/11/2020

Terrapex

Figure 4

Tested By: DM/AM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	77	2	3	14	4

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			29.3591	16.9009	13.7076	5.4554	0.0422	0.0138	127.86	1227.12

Material Description	USCS	AASHTO
○ GRAVEL some silt trace sand trace clay		

Project No. CA19-009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)

Project: PECG Prj. No. 1904307 (Laboratory Testing)

○ **Sample Number:** TP20-9, AS2

Remarks:

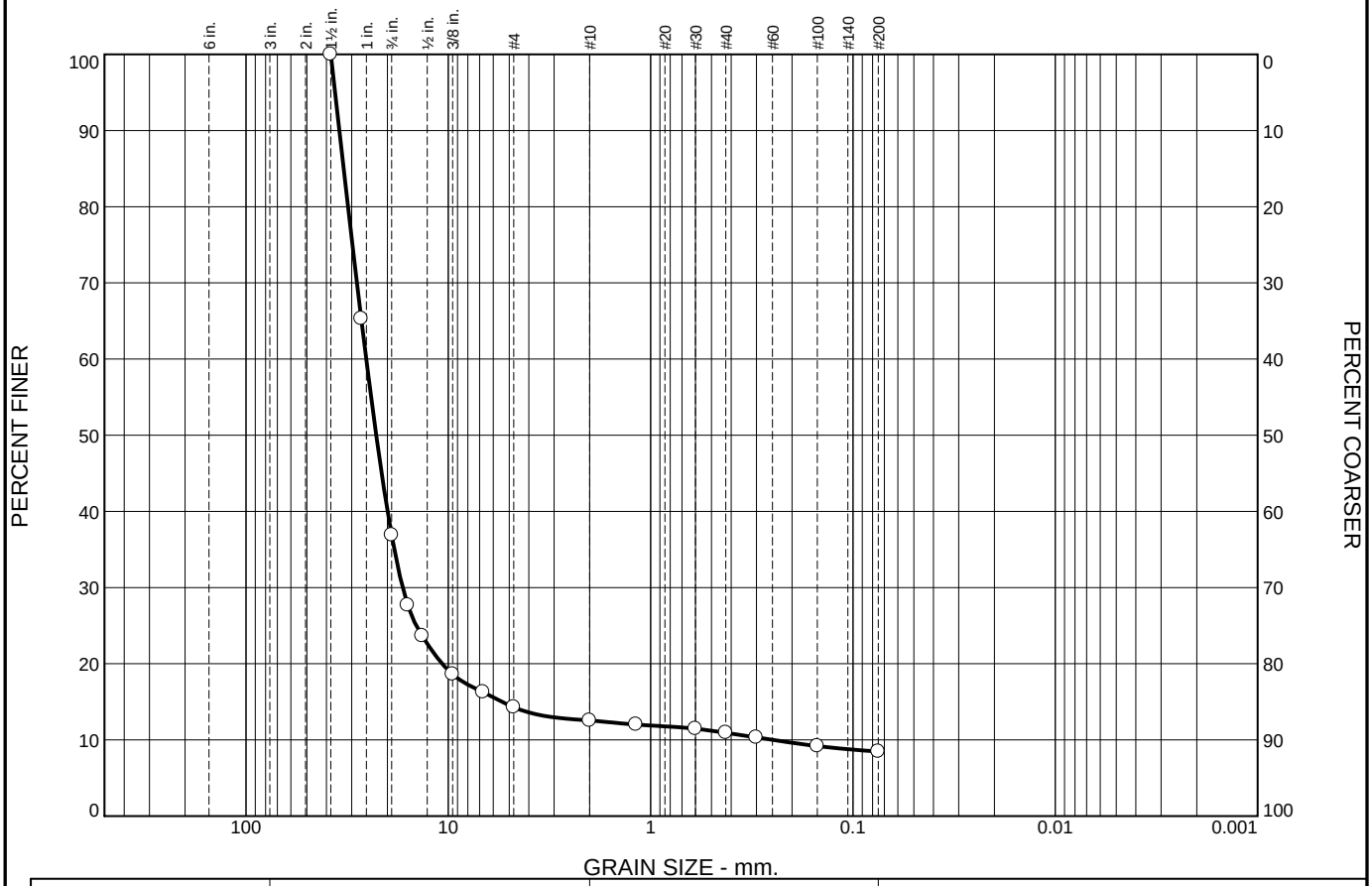
○Tested on 2/11/2020

Terrapex

Figure 5

Tested By: DM/AM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	87	2	3	8	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			32.8931	25.4445	22.7147	16.8139	5.4180	0.2486	44.69	102.35

Material Description	USCS	AASHTO
○ GRAVEL trace sand trace fines		

Project No. CA19-009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)
Project: PECG Prj. No. 1904307 (Laboratory Testing)

○ **Sample Number:** TP20-11, AS2

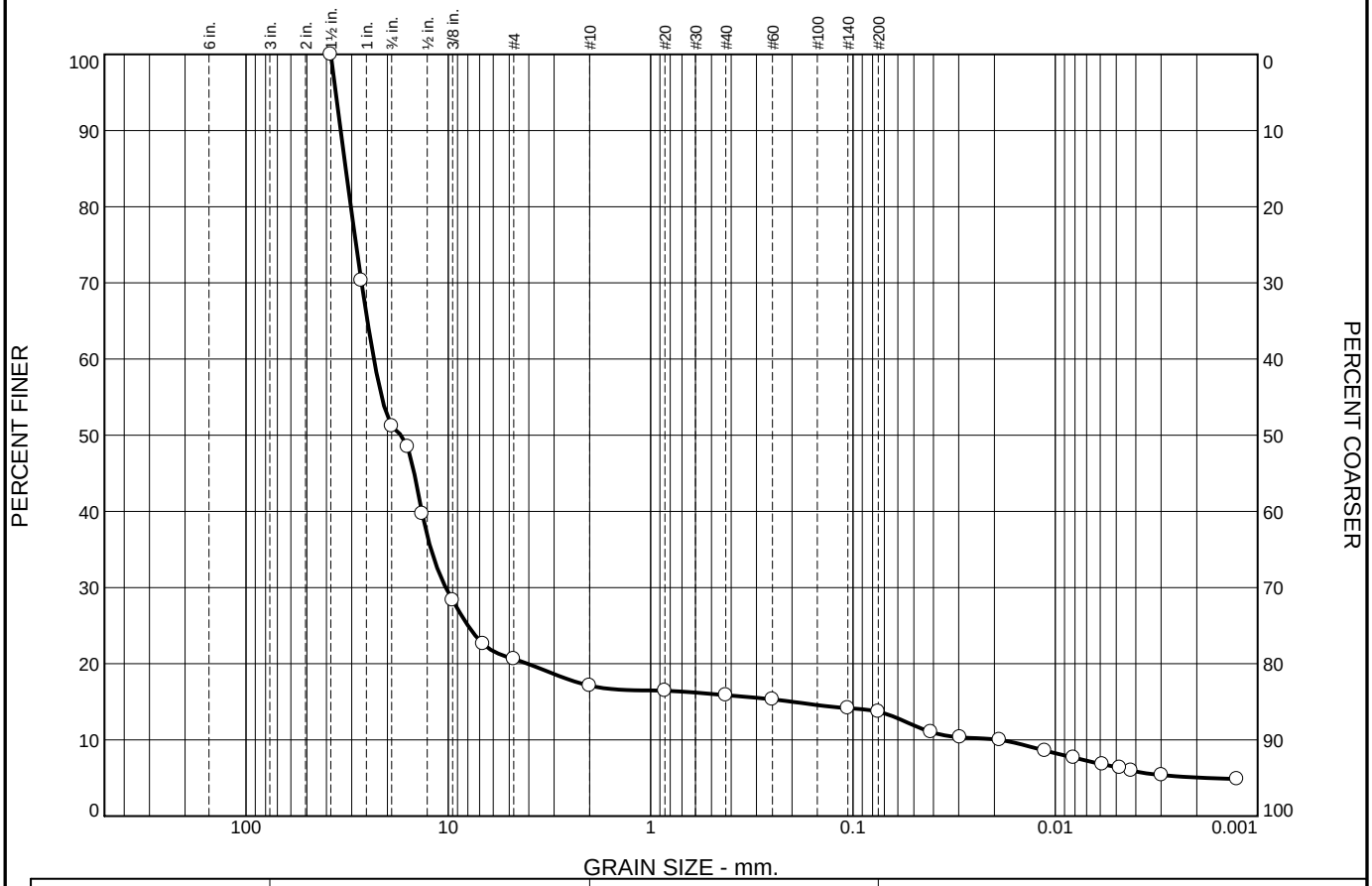
Remarks:

Terrapex

Figure 6

Tested By: AM

Particle Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	83	1	2	9	5

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			32.1333	23.3382	17.0730	10.2898	0.1986	0.0189	239.69	1233.03

Material Description	USCS	AASHTO
○ GRAVEL trace sand trace silt trace clay		

Project No. CA19-009 **Client:** Palmer Environmental Consulting Group Inc. (PECG)
Project: PECG Prj. No. 1904307 (Laboratory Testing)

○ **Sample Number:** TP20-12, AS2

Remarks:

Terrapex

Figure 7

Tested By: DM/AM

Appendix C

Certificate of Analysis

PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
ATTN: TED OU / TED PAN
74 Berkeley Street
Toronto ON M5V 1E3

Date Received: 29-OCT-20
Report Date: 05-NOV-20 12:53 (MT)
Version: FINAL

Client Phone: 647-795-8153

Certificate of Analysis

Lab Work Order #: L2523380

Project P.O. #: NOT SUBMITTED
Job Reference: 1904307
C of C Numbers: 17-797035
Legal Site Desc:

Jennifer Barkshire-Paterson
Account Manager

ANALYTICAL REPORT

SOIL - Ontario Regulation 153/04 - April 15, 2011 Standards

		ALS ID	L2523380-1	L2523380-2	L2523380-3	L2523380-4
		Sampled Date	29-OCT-20	29-OCT-20	29-OCT-20	29-OCT-20
		Sampled Time	-	-	-	-
		Sample ID	TP20-1 AS2	TP20-4 AS2	TP20-7 AS2	TP20-10 AS1
Grouping	Analyte	Unit				
Physical Tests	Conductivity	mS/cm	0.248	0.280	0.282	0.280
	% Moisture	%	26.6	26.8	37.2	28.9
	pH	pH units	7.34	7.41	7.37	7.22
Cyanides	Cyanide, Weak Acid Diss	ug/g	<0.050	<0.050	<0.050	<0.050
Saturated Paste Extractables	SAR	SAR	<0.10	0.29	0.38	<0.10
	Calcium (Ca)	mg/L	47.8	48.0	47.3	56.7
	Magnesium (Mg)	mg/L	0.59	0.74	0.75	0.87
	Sodium (Na)	mg/L	0.92	7.36	9.69	0.98
Metals	Antimony (Sb)	ug/g	<1.0	<1.0	4.3	<1.0
	Arsenic (As)	ug/g	10.0	22.9	6.8	7.7
	Barium (Ba)	ug/g	109	189	114	96.6
	Beryllium (Be)	ug/g	1.17	0.83	0.91	1.08
	Boron (B)	ug/g	7.3	6.3	8.6	5.8
	Boron (B), Hot Water Ext.	ug/g	0.21	0.25	0.36	0.32
	Cadmium (Cd)	ug/g	<0.50	<0.50	<0.50	0.51
	Chromium (Cr)	ug/g	27.5	21.2	21.7	24.6
	Cobalt (Co)	ug/g	5.8	5.8	3.8	5.3
	Copper (Cu)	ug/g	5.6	6.2	32.1	6.3
	Lead (Pb)	ug/g	18.1	15.3	31.4	19.9
	Mercury (Hg)	ug/g	0.0338	0.0375	0.0795	0.0314
	Molybdenum (Mo)	ug/g	<1.0	1.7	<1.0	<1.0
	Nickel (Ni)	ug/g	14.6	11.4	16.8	11.2
	Selenium (Se)	ug/g	<1.0	<1.0	<1.0	<1.0
	Silver (Ag)	ug/g	<0.20	<0.20	<0.20	<0.20

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

ANALYTICAL REPORT

SOIL - Ontario Regulation 153/04 - April 15, 2011 Standards

			ALS ID	L2523380-1	L2523380-2	L2523380-3	L2523380-4
			Sampled Date	29-OCT-20	29-OCT-20	29-OCT-20	29-OCT-20
			Sampled Time	-	-	-	-
			Sample ID	TP20-1 AS2	TP20-4 AS2	TP20-7 AS2	TP20-10 AS1
Grouping	Analyte	Unit					
Metals	Thallium (Tl)	ug/g		<0.50	<0.50	<0.50	<0.50
	Uranium (U)	ug/g		<1.0	<1.0	<1.0	<1.0
	Vanadium (V)	ug/g		29.3	28.5	25.3	27.5
	Zinc (Zn)	ug/g		47.0	36.5	52.4	43.9
Speciated Metals	Chromium, Hexavalent	ug/g		<0.20	<0.20	<0.20	<0.20

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

Summary of Guideline Exceedances: Ontario Regulation 153/04 - April 15, 2011 Standards

Guideline ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
T1-Soil-Agricultural or Other Property Use						
L2523380-2	TP20-4 AS2	Metals	Arsenic (As)	22.9	11	ug/g
L2523380-3	TP20-7 AS2	Metals	Antimony (Sb)	4.3	1	ug/g
T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use						
L2523380-2	TP20-4 AS2	Metals	Arsenic (As)	22.9	18	ug/g
L2523380-3	TP20-7 AS2	Metals	Antimony (Sb)	4.3	1.3	ug/g
T3-Soil-Ind/Com/Commu. Property Use (Coarse)						
L2523380-2	TP20-4 AS2	Metals	Arsenic (As)	22.9	18	ug/g
T3-Soil-Ind/Com/Commu. Property Use (Fine)						
L2523380-2	TP20-4 AS2	Metals	Arsenic (As)	22.9	18	ug/g
T3-Soil-Res/Park/Inst. Property Use (Fine)						
L2523380-2	TP20-4 AS2	Metals	Arsenic (As)	22.9	18	ug/g
T3-Soil-Res/Park/Inst. Property Use (Coarse)						
L2523380-2	TP20-4 AS2	Metals	Arsenic (As)	22.9	18	ug/g

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
B-HWS-R511-WT	Soil	Boron-HWE-O.Reg 153/04 (July 2011)	HW EXTR, EPA 6010B

A dried solid sample is extracted with calcium chloride, the sample undergoes a heating process. After cooling the sample is filtered and analyzed by ICP/OES.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-WAD-R511-WT	Soil	Cyanide (WAD)-O.Reg 153/04 (July 2011)	MOE 3015/APHA 4500CN I-WAD

The sample is extracted with a strong base for 16 hours, and then filtered. The filtrate is then distilled where the cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CR-CR6-IC-WT	Soil	Hexavalent Chromium in Soil	SW846 3060A/7199

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-WT	Soil	Conductivity (EC)	MOEE E3138

A representative subsample is tumbled with de-ionized (DI) water. The ratio of water to soil is 2:1 v/w. After tumbling the sample is then analyzed by a conductivity meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

HG-200.2-CVAA-WT	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-200.2-CCMS-WT	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020B (mod)

Soil/sediment is dried, disaggregated, and sieved (2 mm). For tests intended to support Ontario regulations, the <2mm fraction is ground to pass through a 0.355 mm sieve. Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H2S) may be excluded if lost during sampling, storage, or digestion.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

MOISTURE-WT	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)
PH-WT	Soil	pH	MOEE E3137A

A minimum 10g portion of the sample 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 and then analyzed using a pH meter and electrode.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).	
SAR-R511-WT	Soil	SAR-O.Reg 153/04 (July 2011)	SW846 6010C

A dried, disaggregated solid sample is extracted with deionized water, the aqueous extract is separated from the solid, acidified and then analyzed using a ICP/OES. The concentrations of Na, Ca and Mg are reported as per CALA requirements for calculated parameters. These individual parameters are not for comparison to any guideline.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

17-797035

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2523380 Report Date: 05-NOV-20

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3

Contact: TED OU / TED PAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
B-HWS-R511-WT	**Soil**							
Batch R5277798								
WG3438301-4 DUP		**L2523339-1**						
Boron (B), Hot Water Ext.		0.19	0.20		ug/g	3.7	30	04-NOV-20
WG3438301-2 IRM		**WT SAR4**						
Boron (B), Hot Water Ext.			98.8		%		70-130	04-NOV-20
WG3438301-3 LCS								
Boron (B), Hot Water Ext.			109.0		%		70-130	04-NOV-20
WG3438301-1 MB								
Boron (B), Hot Water Ext.			<0.10		ug/g		0.1	04-NOV-20
CN-WAD-R511-WT	**Soil**							
Batch R5280782								
WG3436673-3 DUP		**L2522803-3**						
Cyanide, Weak Acid Diss		<0.050	<0.050	RPD-NA	ug/g	N/A	35	03-NOV-20
WG3436673-2 LCS								
Cyanide, Weak Acid Diss			106.9		%		80-120	03-NOV-20
WG3436673-1 MB								
Cyanide, Weak Acid Diss			<0.050		ug/g		0.05	03-NOV-20
WG3436673-4 MS		**L2522803-3**						
Cyanide, Weak Acid Diss			97.0		%		70-130	03-NOV-20
CR-CR6-IC-WT	**Soil**							
Batch R5274583								
WG3436506-4 CRM		**WT-SQC012**						
Chromium, Hexavalent			101.3		%		70-130	02-NOV-20
WG3436506-3 DUP		**L2523385-1**						
Chromium, Hexavalent		0.32	<0.20	RPD-NA	ug/g	N/A	35	02-NOV-20
WG3436506-2 LCS								
Chromium, Hexavalent			96.6		%		80-120	02-NOV-20
WG3436506-1 MB								
Chromium, Hexavalent			<0.20		ug/g		0.2	02-NOV-20
EC-WT	**Soil**							
Batch R5277698								
WG3438304-4 DUP		**WG3438304-3**						
Conductivity		0.276	0.278		mS/cm	0.7	20	04-NOV-20
WG3438304-2 IRM		**WT SAR4**						
Conductivity			107.0		%		70-130	04-NOV-20
WG3438456-1 LCS								
Conductivity			100.0		%		90-110	04-NOV-20
WG3438304-1 MB								

Quality Control Report

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3
Contact: TED OU / TED PAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-WT	**Soil**							
Batch R5277698								
WG3438304-1 MB								
Conductivity			<0.0040		mS/cm		0.004	04-NOV-20
HG-200.2-CVAA-WT	**Soil**							
Batch R5277656								
WG3438284-2 CRM		**WT-SS-2**						
Mercury (Hg)			107.1		%		70-130	04-NOV-20
WG3438284-6 DUP		**WG3438284-5**						
Mercury (Hg)		0.0331	0.0338		ug/g	2.1	40	04-NOV-20
WG3438284-3 LCS								
Mercury (Hg)			114.0		%		80-120	04-NOV-20
WG3438284-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	04-NOV-20
MET-200.2-CCMS-WT	**Soil**							
Batch R5278496								
WG3438284-2 CRM		**WT-SS-2**						
Antimony (Sb)			88.7		%		70-130	04-NOV-20
Arsenic (As)			107.4		%		70-130	04-NOV-20
Barium (Ba)			111.8		%		70-130	04-NOV-20
Beryllium (Be)			100.8		%		70-130	04-NOV-20
Boron (B)			8.4		mg/kg		3.5-13.5	04-NOV-20
Cadmium (Cd)			102.1		%		70-130	04-NOV-20
Chromium (Cr)			104.7		%		70-130	04-NOV-20
Cobalt (Co)			102.0		%		70-130	04-NOV-20
Copper (Cu)			106.0		%		70-130	04-NOV-20
Lead (Pb)			100.8		%		70-130	04-NOV-20
Molybdenum (Mo)			103.4		%		70-130	04-NOV-20
Nickel (Ni)			104.0		%		70-130	04-NOV-20
Selenium (Se)			0.11		mg/kg		0-0.34	04-NOV-20
Silver (Ag)			117.7		%		70-130	04-NOV-20
Thallium (Tl)			0.067		mg/kg		0.029-0.129	04-NOV-20
Uranium (U)			84.4		%		70-130	04-NOV-20
Vanadium (V)			102.6		%		70-130	04-NOV-20
Zinc (Zn)			98.8		%		70-130	04-NOV-20
WG3438284-6 DUP		**WG3438284-5**						
Antimony (Sb)		0.18	0.16		ug/g	8.4	30	04-NOV-20

Quality Control Report

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3
Contact: TED OU / TED PAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R5278496								
WG3438284-6 DUP		**WG3438284-5**						
Arsenic (As)		4.09	3.55		ug/g	14	30	04-NOV-20
Barium (Ba)		50.4	43.4		ug/g	15	40	04-NOV-20
Beryllium (Be)		0.43	0.34		ug/g	22	30	04-NOV-20
Boron (B)		8.2	6.8		ug/g	17	30	04-NOV-20
Cadmium (Cd)		0.241	0.223		ug/g	7.8	30	04-NOV-20
Chromium (Cr)		15.4	13.7		ug/g	12	30	04-NOV-20
Cobalt (Co)		5.32	4.60		ug/g	15	30	04-NOV-20
Copper (Cu)		17.0	15.2		ug/g	11	30	04-NOV-20
Lead (Pb)		24.6	20.2		ug/g	20	40	04-NOV-20
Molybdenum (Mo)		0.42	0.42		ug/g	0.7	40	04-NOV-20
Nickel (Ni)		11.3	9.90		ug/g	14	30	04-NOV-20
Selenium (Se)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	04-NOV-20
Silver (Ag)		<0.10	<0.10	RPD-NA	ug/g	N/A	40	04-NOV-20
Thallium (Tl)		0.089	0.076		ug/g	15	30	04-NOV-20
Uranium (U)		0.507	0.416		ug/g	20	30	04-NOV-20
Vanadium (V)		28.0	24.4		ug/g	14	30	04-NOV-20
Zinc (Zn)		98.8	85.0		ug/g	15	30	04-NOV-20
WG3438284-4 LCS								
Antimony (Sb)			108.7		%		80-120	04-NOV-20
Arsenic (As)			108.9		%		80-120	04-NOV-20
Barium (Ba)			110.0		%		80-120	04-NOV-20
Beryllium (Be)			101.7		%		80-120	04-NOV-20
Boron (B)			98.9		%		80-120	04-NOV-20
Cadmium (Cd)			100.7		%		80-120	04-NOV-20
Chromium (Cr)			108.1		%		80-120	04-NOV-20
Cobalt (Co)			105.7		%		80-120	04-NOV-20
Copper (Cu)			105.1		%		80-120	04-NOV-20
Lead (Pb)			102.7		%		80-120	04-NOV-20
Molybdenum (Mo)			104.7		%		80-120	04-NOV-20
Nickel (Ni)			105.9		%		80-120	04-NOV-20
Selenium (Se)			104.4		%		80-120	04-NOV-20
Silver (Ag)			99.7		%		80-120	04-NOV-20
Thallium (Tl)			102.8		%		80-120	04-NOV-20

Quality Control Report

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3
Contact: TED OU / TED PAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R5278496								
WG3438284-4 LCS								
Uranium (U)			93.4		%		80-120	04-NOV-20
Vanadium (V)			111.2		%		80-120	04-NOV-20
Zinc (Zn)			101.1		%		80-120	04-NOV-20
WG3438284-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	04-NOV-20
Arsenic (As)			<0.10		mg/kg		0.1	04-NOV-20
Barium (Ba)			<0.50		mg/kg		0.5	04-NOV-20
Beryllium (Be)			<0.10		mg/kg		0.1	04-NOV-20
Boron (B)			<5.0		mg/kg		5	04-NOV-20
Cadmium (Cd)			<0.020		mg/kg		0.02	04-NOV-20
Chromium (Cr)			<0.50		mg/kg		0.5	04-NOV-20
Cobalt (Co)			<0.10		mg/kg		0.1	04-NOV-20
Copper (Cu)			<0.50		mg/kg		0.5	04-NOV-20
Lead (Pb)			<0.50		mg/kg		0.5	04-NOV-20
Molybdenum (Mo)			<0.10		mg/kg		0.1	04-NOV-20
Nickel (Ni)			<0.50		mg/kg		0.5	04-NOV-20
Selenium (Se)			<0.20		mg/kg		0.2	04-NOV-20
Silver (Ag)			<0.10		mg/kg		0.1	04-NOV-20
Thallium (Tl)			<0.050		mg/kg		0.05	04-NOV-20
Uranium (U)			<0.050		mg/kg		0.05	04-NOV-20
Vanadium (V)			<0.20		mg/kg		0.2	04-NOV-20
Zinc (Zn)			<2.0		mg/kg		2	04-NOV-20
MOISTURE-WT	**Soil**							
Batch R5272618								
WG3436491-3 DUP		**L2522803-2**						
% Moisture		11.3	11.8		%	3.9	20	01-NOV-20
WG3436491-2 LCS								
% Moisture			101.0		%		90-110	01-NOV-20
WG3436491-1 MB								
% Moisture			<0.25		%		0.25	01-NOV-20
PH-WT	**Soil**							
Batch R5272868								
WG3436437-1 DUP		**L2522803-1**						
pH		7.26	7.23	J	pH units	0.03	0.3	02-NOV-20
WG3436849-1 LCS								

Quality Control Report

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3
Contact: TED OU / TED PAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-WT	**Soil**							
Batch R5272868								
WG3436849-1 LCS								
pH			6.98		pH units		6.9-7.1	02-NOV-20
SAR-R511-WT	**Soil**							
Batch R5277800								
WG3438304-4 DUP		**WG3438304-3**						
Calcium (Ca)		11.7	11.1		mg/L	5.3	30	04-NOV-20
Sodium (Na)		18.8	19.1		mg/L	1.6	30	04-NOV-20
Magnesium (Mg)		10.8	10.3		mg/L	4.7	30	04-NOV-20
WG3438304-2 IRM		**WT SAR4**						
Calcium (Ca)			109.6		%		70-130	04-NOV-20
Sodium (Na)			91.0		%		70-130	04-NOV-20
Magnesium (Mg)			107.7		%		70-130	04-NOV-20
WG3438304-5 LCS								
Calcium (Ca)			113.3		%		80-120	04-NOV-20
Sodium (Na)			104.4		%		80-120	04-NOV-20
Magnesium (Mg)			108.2		%		80-120	04-NOV-20
WG3438304-1 MB								
Calcium (Ca)			<0.50		mg/L		0.5	04-NOV-20
Sodium (Na)			<0.50		mg/L		0.5	04-NOV-20
Magnesium (Mg)			<0.50		mg/L		0.5	04-NOV-20

Quality Control Report

Workorder: L2523380 Report Date: 05-NOV-20

Client: PALMER ENVIRONMENTAL CONSULTING GROUP INC. (Richmond Hill)
74 Berkeley Street
Toronto ON M5V 1E3
Contact: TED OU / TED PAN

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes 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 pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2523380-COFC

COC Number: 17 - 797035

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Palmer
Contact:	Ted Ou / Ted Pan
Phone:	647-280-6355
	Company address below will appear on the final report
Street:	74 Berkeley St
City/Province:	Toronto, ON
Postal Code:	M5A 2W7

Report Format / Distribution	
Select Report Format:	[X] PDF [X] EXCEL [ ] EDD (DIGITAL)
Quality Control (QC) Report with Report	[X] YES [ ] NO
[X] Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	[X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	ted.ou@peq.ca
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	Same as Report To	[ ] YES [ ] NO
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Company:		
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Invoice Distribution	
Select Invoice Distribution:	[X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	1904307
PO / AFE:	
LSD:	
ALS Lab Work Order # (lab use only):	L2523380

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)	
Regular [R]	[X] Standard TAT if received by 3 pm - business days - no surcharges apply
PRIORITY (Business Days): 4 day [P4-20%]	[ ]
3 day [P3-25%]	[ ]
2 day [P2-50%]	[ ]
EMERGENCY: 1 Business day [E - 100%]	[ ]
Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]	[ ]
Date and Time Required for all E&P TATs:	dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab 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: M & Z	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	TP20-1 AS2	29-10-20	AM	Soil	X		
	TP20-4 AS2	29-10-20	AM	Soil	X		
	TP20-7 AS2	29-10-20	AM	Soil	X		
	TP20-10 AS1	29-10-20	AM	Soil	X		

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? [ ] YES [ ] NO	O. Reg. 153 Table 1 & Table 3
Are samples for human consumption/ use? [ ] YES [ ] NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	[ ]	SIF Observations	Yes [ ]	No	[ ]
Ice Packs	[ ]	Ice Cubes [X]	Custody seal intact	Yes [ ]	No [ ]
Cooling Initiated	[ ]				

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
1.7				2.7			

SHIPMENT RELEASE (client use)		
Released by:	Date:	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by: Kuranpartab	Date: 10/29/2020	Time: 14:48

FINAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date: 29-10-20	Time: 17:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

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