Appendix J GEOTECHNICAL REPORT

GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

Geotechnical Investigation

Living Arts Drive Extension

From Rathburn Road West to Centre View Drive

Mississauga, Ontario

Prepared For:

Stantec Consulting Limited

GeoPro Project No.: 17-1798G

Report Date: November 20, 2017

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GeoPro CONSULTING LIMITED

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1 INTRODUCTION

GeoPro Consulting Limited (GeoPro) was retained by Stantec Consulting Limited (the Client) to conduct a geotechnical investigation for the proposed extension of Living Arts Drive from Rathburn Road West to Centre View Drive (approximate 200 m), in the City of Mississauga, Ontario.

The purpose of this geotechnical investigation was to obtain information on the existing subsurface conditions by means of a limited number of boreholes, in-situ tests and laboratory tests of soil samples to provide required geotechnical design information. Based on GeoPro's interpretation of the obtained data, geotechnical comments and recommendations related to the project designs are provided.

This report is prepared with the condition that the design will be in accordance with all applicable standards and codes, regulations of authorities having jurisdiction, and good engineering practice. Furthermore, the recommendations and opinions in this report are applicable only to the proposed project as described above. On-going liaison and communication with GeoPro during the design stage and construction phase of the project is strongly recommended to confirm that the recommendations in this report are applicable and/or correctly interpreted and implemented. Also, any queries concerning the geotechnical aspects of the proposed project shall be directed to GeoPro for further elaboration and/or clarification.

This report is provided on the basis of the terms of reference presented in our approved proposal prepared based on our understanding of the project. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations of this report can be relied upon.

This report deals with geotechnical issues only. The geo-environmental (chemical) aspects of the subsurface conditions, including the consequences of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources were not investigated and were beyond the scope of this assignment. However, limited chemical testing was carried out on selected soil samples for excess soil disposal purposes.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. Laboratory testing, for most part, follows ASTM or CSA Standards or modifications of these standards that have become standard practice in Ontario.

This report has been prepared for the Client only. Third party use of this report without GeoPro's consent is prohibited. The limitations to the report presented above form an integral part of the report and they must be considered in conjunction with this report.

2 SITE AND PROJECT DESCRIPTION

This geotechnical investigation is used for the Class EA study. It is understood that the proposed Living Arts Drive Extension will intersect Rathburn Road West and Centre View Drive, in Mississauga, Ontario. This section of the road is classified as a Minor Collector, with a designated right-of-way (R.O.W.) of 26 meters.

3 FIELD AND LABORATORY WORK

Field work for the geotechnical investigation was carried out on October 6, 2017, during which time nine (9) boreholes (Boreholes BH1 to BH9) were advanced to depths ranging from about 1.7 m to 5.0 m below the existing ground surface. The borehole locations are shown on Borehole Location Plan, Drawing 1.

The boreholes were advanced using truck-mounted continuous flight auger equipment supplied by a drilling specialist subcontracted to GeoPro. Soil samples were recovered at regular intervals of depth using a 50 mm O.D. split-spoon sampler driven into the soil in accordance with the Standard Penetration Test (SPT) procedure described in ASTM D1586 - 11 Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils.

Groundwater condition observations were made in the boreholes during drilling and upon completion of drilling. The boreholes were backfilled and sealed upon completion of drilling. For the purpose of measuring static groundwater levels in the study area, Boreholes BH7 and BH9 were completed with one 51 mm diameter monitoring well.

All soil samples obtained during this investigation were brought to our laboratory for further examination. These soil samples will be stored for a period of three (3) months after the day of issuing draft report, after which time they will be discarded unless we are advised otherwise in writing. Geotechnical classification testing (including water content, grain size distribution and Atterberg Limits, when applicable) were carried out on selected soil samples. The laboratory test results are shown in Figures 1 and 2.

The elevations at the as-drilled borehole locations were not available at the time of preparing the report. The borehole locations plotted on the Borehole Location Plan, Drawing 1 were based on the measurement of the site features and should be considered to be approximate.

4 PAVEMENT AND SUBSURFACE CONDITIONS

4.1 Existing Pavement Condition

In general, the existing pavement on Living Arts Drive and access road was observed to be in fair condition. The most significant distresses are frequent slight to moderate longitudinal and transverse cracking (partially sealed), slight to moderate alligator cracking, and slight to moderate edge cracking.

The existing pavement on Rathburn Road West at the intersection of Living Arts Drive was observed to be in fair condition. The most significant distresses are slight to moderate longitudinal and transverse cracking.

The existing pavement on Centre View Drive at the proposed intersection of Living Arts Drive Extension was observed to be in fair condition. The most significant distresses are slight to moderate longitudinal and transverse cracking and slight cut patching.

The existing roadways were designed and constructed to an urban cross-section (curb and catchbasins). The overall surface drainage within the project limits is generally considered to be good.

4.2 Subsurface Conditions

The borehole/corehole locations are shown on Drawing 1. Notes on sample descriptions are presented in Enclosure 1A. Explanations of terms used in the boreholes logs are presented in Enclosure 1B. The subsurface conditions in the boreholes (Boreholes BH1 to BH9) are presented in the individual borehole logs (Enclosures 2 to 10 inclusive). Detailed descriptions of the major soil strata encountered in the boreholes drilled at the site are provided as follows.

Existing Pavement Structure

A flexible pavement structure was observed in the existing roadways on Rathburn Road West, Centre View Drive and Living Arts Drive. The range and average thickness of pavement structure is summarized in the following table:

Section	Pavement Structure (mm)		
	Asphalt Concrete Range (Average)	Granular Base/Subbase Range (Average)	Total Thickness
Rathburn Road West (BH1 to BH3)	150 - 160 (155)	580 - 610 (595)	740 - 760 (755)
Centre View Drive (BH4 to BH6)	150 - 200 (180)	530 - 570 (545)	720 - 740 (725)
Existing Access Road/Future Extension of Living Arts Drive (BH7 to BH9)	110 - 150 (130)	430 - 515 (485)	540 - 660 (615)

Fill Materials

Fill materials consisting of gravelly sand, (organic) clayey silt, and sandy silt were encountered below the granular base/subbase materials in Boreholes BH4 to BH9, and extended to depths ranging from about 0.8 m to 3.2 m below the existing ground surface. For cohesive fill materials, SPT N values ranging from 5 to 19 blows per 300 mm penetration indicated a firm to very stiff

consistency. For cohesionless fill materials, SPT N value of 17 blows per 300 mm penetration indicated a compact compactness. The in-situ moisture content measured in the soil samples ranged from approximately 4% to 21%.

Clayey Silt

Clayey silt deposit was encountered below the fill materials in Boreholes BH5, BH6 and BH9, and extended to depths ranging from about 1.4 m to 2.9 m below the existing ground surface. SPT N values ranging from 18 to 23 blows per 300 mm penetration indicated a very stiff consistency. The natural moisture content measured in the soil samples ranged from approximately 13% to 17%.

Clayey Silt Till

Clayey silt till deposit was encountered below the granular base/subbase martials, fill materials, and clayey silt in all boreholes except for Borehole BH9, and extended to depths ranging from about 1.5 m to 4.0 m below the existing ground surface. Boreholes BH1 and BH2 were terminated in this deposit. SPT N values ranging from 16 to greater than 100 blows per 300 mm penetration indicated a very stiff to hard consistency. The natural moisture content measured in this soil samples ranged from approximately 8% to 14%.

Clayey Silt (Till)/Shale Complex

Clayey silt (till)/shale complex deposit was encountered below the clayey silt (till) in Boreholes BH4 to BH9, and extended to depths ranging from about 1.9 m to 5.0 m below the existing ground surface. Boreholes BH4 to BH7 and BH9 were terminated in this deposit. SPT N values ranging from 37 to greater than 100 blows per 300 mm penetration indicated a hard consistency. The natural moisture content measured in the soil samples ranged from approximately 7% to 20%.

The “clayey silt (till)/shale complexes” exists as a transitional deposit between the bedrock and the overlying clayey silt (till). This deposit has characteristics of both the clayey silt (till) and shale/limestone/siltstone bedrock. The deposit is very difficult to auger through due to the fragmented shale/siltstone/limestone content and the hardness condition. The bedrock slabs found within the soil may be quite large (over 1 m in length/thickness).

Probable Weathered Shale

As best could be practically determined, shale presumed to coincide with the bedrock surface was encountered in Boreholes BH3 and BH8 below the clayey silt till and clayey silt till/shale complex deposits at the depths ranging from about 2.3 m to 3.2 m below the existing ground surface. Exploration of the bedrock was not carried out as part of this assignment, however based on samples recovered from the penetration testing, the bedrock beneath the site appeared to consist of weathered shale interbedded with limestone/siltstone.

4.3 Groundwater Conditions

Groundwater condition observations made in the boreholes during and immediately upon completion of drilling are shown in the borehole logs and are also summarized in the following table. All the boreholes were open and dry upon completion of drilling except for Borehole BH4.

BH No.	BH Depth (m)	Depth of Water Encountered during Drilling (mBGS)	Cave-in Depth upon Completion of Drilling (mBGS)	Water Level upon Completion of Drilling (mBGS)
BH4	4.7	4.6	Open	4.2

Note: mBGS = meters below ground surface

Two (2) monitoring wells (51 mm O.D.) were installed to monitor groundwater levels. The monitoring well construction details and measured groundwater levels are shown in the following table.

Monitoring Well ID	Screen Interval (mBGS)	Water Level (mBGS) Date of Monitoring	
		October 13, 2017	October 18, 2017
BH7	1.0 - 1.9	1.17	1.15
BH9	1.5 - 3.0	Dry	Dry

Notes: mBGS = meters below ground surface;
1.0 - 1.9: monitoring well screen depth from 1.0 to 1.9 mBGS.

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

5 LABORATORY TESTING RESULTS

In the laboratory, each soil sample was examined as to its visual and textural characteristics by the project engineer. Moisture content determinations were carried out on all subsoil samples. Sieve analyses were completed on four samples of the recovered granular base/subbase materials, and the results were compared to OPSS.MUNI 1010 Granular A and Granular B Type I specifications. The gradation distribution curves for these samples are presented in Figure 1, and a summary of the results is provided in the following table.

Sample	OPSS.MUNI 1010 Granular A	OPSS.MUNI 1010 Granular B Type I
BH2 AS1A	Does not meet requirements due to excessive percentages passing most sieves	Does not meet requirements due to excessive fines (24.8% passing 0.075 mm sieve)

BH5 AS1A	Does not meet requirements due to excessive percentages passing 0.15 mm and 0.075 mm sieves	Does not meet requirements due to excessive fines (12.6% passing 0.075 mm sieve)
BH7 AS1A	Does not meet requirements due to excessive percentages passing most sieves	Does not meet requirements due to excessive fines (16.3% passing 0.075 mm sieve)
BH9 AS1A	Does not meet requirements due to excessive percentages passing most sieves	Does not meet requirements due to excessive fines (26.4% passing 0.075 mm sieve)

Grain size analyses of three subgrade samples confirmed the visual descriptions of the subgrade soils. In addition, the soil was examined and compared to frost susceptibility characteristics in accordance with the MTO Pavement Design and Rehabilitation Manual. The summarized results are provided in the following table, and the grain size distribution curves of these samples are presented in Figure 2.

Soil Sample	Description	Susceptibility of Frost Heaving
BH3 SS2	Clayey Silt Till	Moderate
BH7 SS3	Clayey Silt Till/Shale Complex	Moderate
BH9 SS4	Clayey Silt/Shale Complex	Moderate

6 DISCUSSION AND RECOMMENDATIONS

This report contains the findings of GeoPro's geotechnical investigation, together with geotechnical engineering recommendations and comments. These recommendations and comments are based on factual information and are intended only for use by the design engineers. The number of boreholes may not be sufficient to determine all factors that may affect construction methods and costs. Subsurface conditions between and beyond the boreholes may differ from those encountered at the borehole locations, and conditions may become apparent during construction that could not be detected or anticipated at the time of the site investigation. The anticipated construction conditions are also discussed, but only to the extent that they may influence design decisions. The construction methods discussed, however, express GeoPro's opinion only and are not intended to direct contractors on how to carry out construction. Contractors should also be aware that the data and interpretation presented in this report may not be sufficient to assess all factors that may have an effect on construction.

The design drawings of the project were not available when this report was prepared. Once the design drawings and detailed site plan are available, this report will be reviewed by GeoPro, and further recommendations will be provided as needed.

6.1 Pavement Structure Designs

6.1.1 Traffic Data Analysis

It is understood that Living Arts Drive is classified as a Minor Collector, and Living Arts Drive will intersect Rathburn Road West and Centre View Drive, which are both classified as Major Collector Roads. The traffic volumes for the roadways are estimated using back calculation method based on the traffic data provided by the Client in an e-mail dated October 10, 2017; the compound growth rates are also calculated based on the forecasting traffic data provided.

The traffic data was interpreted by GeoPro to estimate the number of Equivalent Single Axle Loads (ESALs) for pavement design purposes. Traffic loading repetitions were determined for the 20-year pavement design life period that is considered typical for municipal pavements of this type. On this basis, the ESAL applications during the design period were calculated in accordance with the Appendix D of MTO MI-183 Adaption and Verification of AASHTO Pavement Design Guide for Ontario Conditions. The traffic data and estimated ESALs are presented in the following table:

Parameters	AADT (2021)	AADT (2031)	AADT (2041)	Percentage of Heavy Vehicle	Estimated Design ESALs (million)
Living Arts Drive Extension	8,000	10,500	24,000	6.0	2.23
Intersection of Living Arts Drive Extension/Rathburn Road West	23,000	25,500	28,500	4.0	2.34
Proposed Intersection of Living Arts Drive Extension/Centre View Drive	27,500	32,000	36,500	5.0	3.64

6.1.2 Pavement Design

The subgrade soils along the length of subject roadway section generally consisted of native clayey silt (till) and clayey silt (till)/shale complex based on GeoPro's borehole information. The resilient modulus of subgrade has been assumed to be 25 MPa. The pavement designs were developed based on the '1993 AASHTO Guide for Design of Pavement Structures and MTO MI-183 Adaption and Verification of AASHTO Pavement Design Guide for Ontario Conditions'. The pavement design parameters are summarized in the following table:

Design Parameters	Values
Design Life	20 Years
Initial Serviceability Index	4.4
Terminal Serviceability Index	2.2
Reliability Level, %	85
Overall Standard Deviation	0.45
Design Subgrade Resilient Modulus, MPa	25

Layer Coefficient of Hot Mix Asphalt	0.42
Layer Coefficient of Granular Base Course	0.14
Layer Coefficient of Granular Subbase Course	0.12

The minimum Structural Number required for the new pavement on Living Arts Drive Extension is about 116; the minimum Structural Number required for the intersection of Rathburn Road West and Living Arts Drive is about 117; the minimum Structural Number required for the intersection of Centre View Drive and Living Arts Drive is about 124.

6.1.3 Pavement Design Recommendations

6.1.3.1 Living Arts Drive Extension

Option 1: Road Reconstruction and Widening

Based on the expected traffic on this road section and the type and strength of subgrade soil, for the road section that needs to be reconstructed and the proposed widening area, the recommended pavement structure for Living Arts Drive Extension is provided in the following table:

Material		Thickness of Pavement (mm)
Hot-Mix Asphalt (OPSS 1150)	HL 3 Surface Course	40
	HL 8 Binder Course	100 (2 lifts)
Granular Materials (OPSS.MUNI 1010)	Granular A Base (19 mm Crusher Run Limestone)	200
	Granular B Type II Subbase	325
Prepared and Approved Subgrade		

The construction procedure should be as follows:

- Existing Lanes: excavate the existing asphalt concrete, granular base/subbase and subgrade materials to the depth required to accommodate the new pavement structure (about 665 mm below the proposed pavement surface);
- Widening Lanes: completely remove the existing topsoil and any other obviously deleterious materials; Excavate subgrade to the depth required to accommodate the new pavement structure (about 665 mm below the proposed pavement surface);
- The exposed subgrade surface should be graded and compacted to 98 percent of Standard Proctor Maximum Dry Density (SPMDD);
- The prepared subgrade should be carefully proofrolled using a heavily loaded truck in conjunction with the inspection by the geotechnical engineer from GeoPro; any soft/loose

or wet areas or other obviously deleterious materials must be excavated and properly replaced with material similar to the existing subgrade soils or other granular soils approved by the geotechnical engineer;

- All backfill materials should be placed in uniform loose lifts not exceeding 200 mm thickness and compacted to at least 98 percent of SPMDD. The finished subgrade should be provided with a grade of 3 percent towards the positive drainages;
- Place a minimum of 325 mm OPSS.MUNI Granular B Type II subbase course in loose lifts not exceeding 200 mm thickness, compact to 98 percent of SPMDD;
- Place 200 mm of OPSS.MUNI Granular A (19 mm Crusher Run Limestone) base course and compact to 98 percent of SPMDD; and
- Place 140 mm of hot-mix asphalt (100 mm lift of OPSS 1150 HL 8 binder course in two lifts and one 40 mm lift of OPSS 1150 HL 3 surface course). The surface of the completed pavement should be provided with a grade of 2 percent.

The constructed pavement Structural Number for Living Arts Drive Extension is 126, which is greater than the Design Structural Numbers (116). As such, the pavement will be structurally adequate for the expected traffic loads over the 20-year design period with required regular maintenance.

Option 2: Full-Depth Reclamation (Pulverization) with HMA Overlay for Existing Lanes)

At the section where the existing pavement grade is allowed to raise slightly, a full-depth reclamation (pulverization) with hot-mix asphalt overlay may be considered to rehabilitate the existing lanes. The full-depth reclamation pavement structure is shown in the following table:

Material	Structural Layer Coefficient (αi)	Drainage Coefficient (mi)	Thickness of Pavement (mm)
Hot-Mix Asphalt (OPSS 1150)	0.42	1.0	140 HL 3 (40) HL 8 (100)
Pulverized Materials	0.12	1.0	200
Remaining Granular Base/Subbase	0.09	1.0	385
Total Thickness			**725**

The construction procedure may be considered as follows:

- Mill and remove 30 mm existing asphalt concrete and dispose off-site;
- Pulverize the existing asphalt concrete and underlying granular base/subbase materials to a depth of 200 mm; grade and compact to 100 percent of SPMDD;

- The exposed pulverized base should be carefully proofrolled using a heavily loaded truck in conjunction with the inspection by the geotechnical engineer from GeoPro; any soft, segregated or wet spots shall be repaired in accordance with the instructions provided in the section **"**Full-Depth Base Repairs"; and
- Place 140 mm thickness of hot-mix asphalt (100 mm of OPSS 1150 HL8 binder course placed in two lifts and one lift of 40 mm of OPSS 1150 HL 3 surface course), produced and placed in accordance with OPSS 310. The surface of the completed pavement should be provided with a grade of 2 percent.

Adoption of this pavement rehabilitation option will result in a grade raise of about 110 mm. The grade increase will impact the intersection roads and side entrances, which should be considered by the design engineer.

The rehabilitated pavement Structural Number is 117, which is greater than the Design Structural Number (116). As such, the pavement will be structurally adequate for the expected traffic loads over the 20-year design period with required regular maintenance.

Further to full-depth reclamation rehabilitation to the existing lanes as discussed above, the recommended pavement structure for widening area is shown in the following table:

Material		**Thickness of Pavement (mm)**
Hot-Mix Asphalt (OPSS 1150)	HL 3 Surface Course	40
	HL 8 Binder Course	100 (2 lifts)
Granular Material (OPSS.MUNI 1010)	Granular A Base (19 mm Crusher Run Limestone)	200
	Granular B Type II Subbase	385 *
Prepared and Approved Subgrade		

* Minimum thickness of subbase; the subbase thickness should match the existing subbase depth of the adjacent pavement structure to be rehabilitated.

The constructed pavement Structural Number is 133, which is greater than the Design Structural Number (116). As such, the pavements are structurally adequate for the expected traffic loads in the 20-year design period.

6.1.3.2 Rathburn Road West and Centre View Drive at Intersection of Living Arts Drive

This section of the report provides recommendations for the restoration of the pavement structure at the both intersections of Rathburn Road West and Centre View Drive, where required. Disturbed/damaged pavement, resulting from the road connection operations, should be restored in kind to match the existing pavement structure. Based on the expected traffic and the results of this investigation, the general pavement restoration design is recommended in the following table:

Material		Thickness of Pavement (mm)	
		Ruthburn Road West	**Centre View Drive**
Hot-Mix Asphalt (OPSS 1150)	HL 1 Surface Course	40	40
	HDBC Binder Course	120 (2 lifts)	140 (2 lifts)
Granular Material (OPSS.MUNI 1010)	Granular A Base (19 mm Crusher Run Limestone)	200	200
	Granular B Type II Subbase	400	350
Prepared and Approved Subgrade			

Note: In consideration of the existing pavement thickness is structurally adequate for the current and anticipated future traffic, the designed thicknesses should match the existing depths of the adjacent pavement structure.

The construction procedure should be as follows:

- Excavate the existing asphalt concrete, granular base/subbase and subgrade materials to the depth required to accommodate the new pavement structure (about 760 mm (Rathburn Road West) and 730 mm (Centre View Drive) below the proposed pavement surface);
- The exposed subgrade surface should be graded and compacted to 98 percent of SPMDD;
- The prepared subgrade should be carefully proofrolled using a heavily loaded truck in conjunction with the inspection by the geotechnical engineer from GeoPro; any soft/loose or wet areas or other obviously deleterious materials must be excavated and properly replaced with material similar to the existing subgrade soils or other granular soils approved by the geotechnical engineer;
- All backfill materials should be placed in uniform loose lifts not exceeding 200 mm thickness and compacted to at least 98 percent of SPMDD. The finished subgrade should be provided with a grade of 3 percent towards the positive drainages;
- Place a minimum of 400 mm (Rathburn Road West) and 350 mm (Centre View Drive) OPSS.MUNI Granular B Type II subbase course in loose lifts not exceeding 200 mm thickness, compact to 98 percent of SPMDD;
- Place 200 mm of OPSS.MUNI Granular A (19 mm Crusher Run Limestone) base course and compact to 98 percent of SPMDD;
- Rathburn Road West: place 160 mm of hot-mix asphalt (120 mm of OPSS 1150 HDBC binder course in two lifts and one 40 mm lift of OPSS 1150 HL 1 surface course). The surface of the completed pavement should be provided with a grade of 2 percent; and

- Centre View Drive: place 180 mm of hot-mix asphalt (140 mm of OPSS 1150 HDBC binder course in two lifts and one 40 mm lift of OPSS 1150 HL 1 surface course). The surface of the completed pavement should be provided with a grade of 2 percent.

The constructed pavement Structural Number at the intersection of Rathburn Road West and Living Arts Drive is about 143, which is greater than the Design Structural Numbers (117). The constructed pavement Structural Number at the intersection of Centre View Drive and Living Arts Drive is about 146, which is greater than the Design Structural Numbers (124). As such, the pavement will be structurally adequate for the expected traffic loads over the 20-year design period with required regular maintenance.

6.1.4 Drainage Improvements

Control of surface water is an important factor in achieving a good pavement service life. Therefore, we recommend that provisions be made to drain the new pavement subgrade and its granular layers. It is understood that the proposed road is anticipated to consist of typical urban section (concrete curb/gutter and catchbasins). To provide positive drainage across the pavement platform, the surface of pavement should be sloped at a grade of 2 percent and the pavement subgrade should be sloped at a grade of 3 percent towards the subdrains. Subdrains should be designed and constructed in accordance with City of Mississauga Standard Specifications Section 02712 and Standard Drawing No. 2220.040 “Subdrains”, and the subdrain pipe should be connected to a positive outlet.

6.1.5 General Pavement Recommendations

6.1.5.1 Pavement Materials

The following hot-mix asphalt mix types should be selected:

- HL 3 and HL 1 Surface Course; and
- HL8 and HDBC Binder Course

These hot mix asphalt mixes should be designed and produced in conformance with OPSS 1150 requirements.

Granular A and Granular B Type II material should be used as base course and subbase course, respectively. Both Granular A and Granular B Type II material should meet OPSS.MUNI 1010 specifications.

6.1.5.2 Asphalt Cement Grade

Performance graded asphalt cement PGAC 64-28 conforming to OPSS.MUNI 1101 requirements is recommended for the HMA binder and surface courses.

6.1.5.3 Tack Coat

A tack coat (SS1) should be applied to all construction joints prior to placing hot-mix asphalt to create an adhesive bond. Prior to placing hot-mix asphalt, SS1 tack coat must also be applied to all existing surfaces and between all new lifts in accordance with OPSS 308 requirements.

6.1.5.4 Compaction

All granular base and subbase materials should be placed in uniform lifts not exceeding 200 mm loose thickness and compacted to 98 percent of the material SPMDD at ±2 percent of the materials Optimum Moisture Content (OMC) in accordance with the City of Mississauga Specifications Section 02512. Hot-mix asphalt should be placed and compacted in accordance with OPSS 310 specifications.

6.1.5.5 Pavement Tapers

At the limits of construction, appropriate tapering of the pavement thickness to match the existing pavement structure should be implemented in accordance with OPSS and the applicable local municipality specifications.

6.1.5.6 Subgrade Preparation

All topsoil, organics, soft/loose and otherwise disturbed soils should be stripped from the subgrade area. The exposed subgrade consisting of fine grained sandy/silty soils will be disturbed by construction traffic when wet; especially if site work is carried out during periods of wet weather. Under inclement weather conditions, an adequate granular working surface may be required to facilitate construction traffic as well as to minimize subgrade disturbance and to protect its integrity.

Immediately prior to placing the granular subbase, the exposed subgrade should be compacted and then proofrolled with a heavy rubber tired vehicle (such as a loaded gravel truck) in conjunction with inspection by a geotechnical engineer from GeoPro. The subgrade should be inspected for signs of rutting or displacement. Areas displaying signs of rutting or displacement should be recompacted and retested, or the material should be subexcavated and replaced with well-compacted clean fill materials approved by the geotechnical engineer from GeoPro.

6.1.5.7 Reuse and Disposal of Existing Pavement Materials

It should be noted that gradation analyses of the selected samples of the existing granular base/subbase materials do not meet the OPSS.MUNI 1010 granular A and B Type I gradation specifications with excessive content of fines. Therefore, the existing granular materials could not be reused as subbase/base materials, however, they can be reused as subgrade material to replace soft, wet or otherwise disturbed areas identified during proofrolling.

The existing asphalt concrete may be salvaged and utilized as Recycled Asphalt Pavement (RAP) in the production of the new hot mix asphalt in accordance with the requirements of the contract or the relevant OPS specifications.

6.1.5.8 Maintenance

Routine maintenance should be considered to extend the life of the pavement. Systematic routine preventative maintenance is strongly recommended for all newly constructed pavements. Crack routing and sealing will generally be required within 2 to 3 years after pavement construction. As the pavement ages, it will also be necessary to patch areas of medium to high severity distresses, such as potholes and ravelling.

6.2 Proposed Storm Water Servicing Pipes

6.2.1 Conventional (Open Cut) Installation of the Proposed Servicing Pipes

The invert depths of the proposed storm water servicing pipes are not available at the time of preparing the report. We have assumed that the majority of the servicing pipes installations would require excavations between about 2 m and 3 m below the existing ground surface. According to the results of this investigation, the soils at the proposed founding depths are generally anticipated to be in the fill materials, clayey silt (till), clayey silt (till)/shale complex or probable weathered shale. The native soils are considered to be suitable for supporting the pipes, provided the integrity of the base of the trench can be maintained during construction. The suitability of the existing fill materials to support the pipes, if encountered at the base of the trenches, should be further assessed during construction. This assessment will require inspection during construction by qualified geotechnical personnel from GeoPro to determine the suitability of the fill materials for supporting the pipes.

It should be noted that some difficulties may be encountered in excavating the till and clayey silt (till)/shale complex deposits and probable weathered shale at some locations. In addition, the tills are inferred containing cobbles and boulders. Once the actual service invert depths are finalized, the following comments and recommendations should be reviewed and revised as necessary.

6.2.2 Trenching Excavation and Temporary Groundwater Control

Based on the results of this investigation, excavations (assumed up to 2 m to 3 m below the existing ground surface) for the site servicing are anticipated to be curried out through fills, clayey silt (till), clayey silt (till)/shale complex, and probable weathered shale. The site servicing pipes are anticipated to be generally above, below or at the groundwater tables measured at the borehole locations.

Groundwater control during excavations within the tills and native cohesive clayey silt deposits can be handled, as required, by pumping from properly constructed and filtered sumps located within the excavations. Perched groundwater may be expected in the fill materials above the groundwater tables at various depths which can be handled, as required, by pumping from properly constructed and filtered sumps located within the excavations. However, more significant groundwater seepage might be expected from any cohesionless silty/sandy layers/zones within the tills as well as in the shale bedrock, especially at the interface of overburden and shale bedrock. Depending upon the actual thickness and extent of the silty/sandy deposits/layers, the finalized design pipe invert depths and the prevailing groundwater tables at the time of construction, some form of positive (pro-active) groundwater control or depressurization might be required to maintain the stability of the base and side slopes of the trench excavations, in addition to pumping from sumps. The groundwater level should be lowered to at least 1 m below the excavation base prior to excavating for the site services.

It should be noted that any construction dewatering or water taking in Ontario is governed by Ontario Regulation 387/04 - Water Taking and Transfer, made under the Ontario Water Resources Act (OWRA), and/or Ontario Regulation 63/16 – Registrations under Part II.2 of the Act – Water Taking, made under Environmental Protection Act. Based on these regulations, water taking of more than 400,000 L/day is subject to a Permit to Take Water (PTTW), while water taking of 50,000 L/day to 400,000 L/day is to be registered through the Environmental Activity and Sector Registry (EASR).

Where excavations are conducted by conventional temporary open cuts, side slopes should not be steeper than 1.5 horizontal to 1 vertical (1.5H:1V). However, depending upon the construction procedures adopted by the contractor, actual groundwater seepage conditions, the success of the contractor's groundwater control methods and weather conditions at the time of construction, some flattening and/or blanketing of the slopes may be required, especially in fill materials or where localized seepage is encountered. Care should be taken to direct surface runoff away from the open excavations and all excavations should be carried out in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects. According to OHSA, the native very stiff to hard clayey silt (till) and clayey silt (till)/shale complex deposits would be classified as Type 2 to Type 1 soils above groundwater table and Type 3 below groundwater table; the fill materials , or silty/sandy soils, if encountered, would be classified as Type 3 soils above groundwater table and Type 4 below groundwater table and unless supported by shoring or other approved retaining method, the excavations will require minimum side slopes of 3H:1V. In addition, care must be taken during excavation to ensure that adequate support is provided for any existing structures and underground services located adjacent to the excavations.

The excavated material should be placed well back from the edge of the excavation and stockpiling of materials adjacent to the excavation should be prohibited, to minimize surcharge loading near the excavation crest.

6.2.3 Temporary Shoring and Trench Boxes

It is understood that for the majority of the service installations, the extent of the excavations will have to be minimized to allow for traffic to continue using a reduced portion of the existing roadway. Where side slopes of excavations are steepened to limit the extent of the excavation, some form of trench support system such as a trench box system will be required. The trench support system shall be designed by a professional engineer. The earth pressure on the multiple braced shoring system may be evaluated by using the pressure distribution diagram shown on Drawing 2. It must be emphasized that a trench liner box provides protection for construction personnel but does not provide any lateral support for the adjacent excavation walls, underground services or existing structures. In the case of trench box excavation work, the tolerance for disturbance of any structure founded above a 1 horizontal to 1 vertical line projected up from the base of the excavation should be assessed prior to construction. If adjacent structures and/or utilities or existing pavement structure open for traffic are susceptible to damage from construction induced settlement, then excavation support using sheet piles or a strutted soldier pile and lagging wall must be considered. It is therefore, imperative that any underground services or existing structures adjacent to the excavations be accurately located prior to construction and adequate support provided where required. Steepened excavations should be left open for as short a duration as possible and completely backfilled at the end of each working day. Care must be taken during excavation near any underground structures located within or adjacent to the excavation. The owner of the structures/utilities should also be contacted prior to excavating near their easement to confirm that the proposed excavation meets their requirements.

While the use of trench boxes is an effective and economical trench-support method, its use can cause increased loss of ground relative to properly braced shoring, especially when working close to granular base courses below existing pavements or along existing utility trenches backfilled with granular materials. Trench boxes also reduce the contractor's ability to compact backfill materials placed between the trench wall and the outer trench box shell, thereby increasing the likelihood of post-construction settlements along the trench walls. When trench boxes are used along existing roadways, settlements frequently occur along the trench wall, which may manifest months after completion of backfilling. In such cases, following backfilling of the trench, road reconstruction should include a provision for saw-cutting the asphalt at least 1 m back from the trench walls, recompacting the upper trench backfill, and then repaving. Where permissible under the OHSA and where its use is considered to be a safe alternative for shoring and bracing, contractors may elect to utilize trench boxes for temporary trench wall support for trenches less than 6 m deep in Type 2 and 3 soils. Where trench depths exceed 6 m (or at any trench depth in Type 4 soil), engineered support systems designed by a qualified professional engineer are required under the OHSA.

Further to the above and in consideration of the fill materials, some loss of ground should be expected for the sections of nearly vertical excavation where a trench box will be used. It is anticipated that in the cohesionless soils, the unsupported soils on the trench sides will relax, filling the void between the trench walls and trench box. This may lead to loss of ground below the pavement and potentially undermine and reduce the stability of the pavement structure adjacent to the open traffic lanes. In order to minimize this effect, the gap between the trench walls and trench box should be minimized during the excavation and trench box installation.

6.2.4 Pipe Support and Bedding

The bedding for the service pipes should be compatible with the type and class of pipe, the surrounding subsoil and anticipated loading conditions and should be designed in accordance with the standards of the local municipality or Ontario Provincial Standard Specifications (OPSS). Where granular bedding is deemed to be acceptable, it should consist of at least 150 mm of TS 1010 Granular A or 19 mm crusher run limestone material. The thickness of the bedding may, however, have to be increased (i.e. 300 mm to 450 mm) depending on the pipe diameter or in accordance with local standards or if wet or weak subgrade conditions are encountered, especially when the soils at the trench base level consists of wet sandy/silty deposits. From springline to 300 mm above obvert of the pipe, sand cover could be used. All bedding and cover material should be placed in 150 mm loose lifts and uniformly compacted to at least 100 percent of the material's Standard Proctor Maximum Dry Density (SPMDD).

To avoid the loss of soil fines from the subgrade, clear stone bedding material should not be used in any case for pipe bedding or to stabilize the bases.

6.2.5 Trench Backfill

Based on visual and tactile examination and the measured natural water contents of the soil samples, the majority of the existing fill materials, native clayey silt above groundwater tables and the glacial tills are anticipated to be generally at or near their estimated optimum water contents for compaction. However, the existing fill materials and native silty/sandy soils below the prevailing groundwater tables are anticipated to be generally wet of their estimated optimum water contents for compaction, which should require some aeration prior to reuse as backfill materials. Some of the existing fill materials containing excessive organic matter shall be wasted or used at the landscape area.

The excavated materials at suitable water contents may be reused as trench backfill provided they are free of significant amounts of topsoil, organics or other deleterious material, and are placed and compacted as outlined below. It should also be noted that due to the predominantly fine-grained, silty/clayey nature of the majority of the existing fill and native soils, some difficulty would be expected in achieving adequate compaction, especially during wet weather.

The backfill should be placed in maximum 300 mm loose lifts at or near (±2%) their optimum moisture content and each lift should be compacted to at least 95% SPMDD. Unsuitable materials such as organic soils, boulders, cobbles, frozen soils, etc. should not be used for backfilling. In pavement areas, the upper 1.2 m zone of the trench backfill should be a non-frost susceptible material that is free of fines and compacted to at least 98% SPMDD.

It should be noted that if the soils for trench backfilling were placed and compacted at wet of their optimum water content (>2%), pumping and rolling conditions may be encountered, which would require mitigative measures in order to construct roads and utilities. This might include significant extra thicknesses of granular base, base reinforcement using geogrids or importing of better quality common fill.

Alternatively, if placement water contents at the time of construction are too high, or if there is a shortage of suitable in-situ material, then an approved imported sandy material which meets the requirements for OPSS Select Subgrade Material ("SSM") could be used. It should be placed in loose lift thicknesses as indicated above and uniformly compacted to at least 95% SPMDD.

Normal post-construction settlement of the compacted trench backfill should be anticipated, with the majority of such settlement taking place within about 6 months following the completion of trench backfilling operations. This settlement may be compensated for, where necessary, by placing additional granular material prior to asphalt paving. Alternatively, if the asphalt binder course is placed shortly following the completion of trench backfilling operations in these areas, any settlement that may be reflected by subsidence of the surface of the binder asphalt should be compensated for by placing an additional thickness of binder asphalt or by padding.

6 SOIL ENVIRONMENTAL ANALYTICAL RESULTS

6.1 Soil Sample Submission

In order to provide information on the chemical quality of the subsurface soils, selected soil samples were submitted to AGAT Laboratories in Mississauga, Ontario ("AGAT") for chemical analyses. Descriptions of the selected soil samples and analytical parameters are presented in the following table:

Sample ID	Soil Depth (mBGS)	Primary Soil	Analytical Parameters
BH2 SS2	0.8 – 1.4	Clayey Silt Till	SAR and PHCs
BH4 SS3	1.5 – 2.0	Organic Clayey Silt Fill	SAR and PHCs
BH5 SS2	0.8 – 1.2	Clayey Silt Fill	SAR and PHCs
BH7 SS2	0.8 – 0.9	Sandy Silt Fill	Metals and Inorganics, PAHs, and PHCs/BTEX

Sample ID	Soil Depth (mBGS)	Primary Soil	Analytical Parameters
BH8 SS2	0.8 –0.9	Sandy Silt Fill	Metals and Inorganics, PAHs, and PHCs/BTEX
BH9 SS2&SS3	0.8 – 1.2	Sandy Silt Fill; Clayey Silt	Metals and Inorganics, PAHs, and HCs/BTEX

Notes: SAR = Sodium Absorption Ratio
PAHs = Polycyclic Aromatic Hydrocarbons
PHCs = Petroleum Hydrocarbon Fractions F1 to F4
BTEX = Benzene, Toluene, Ethylbenzene and Xylene Mixture

In addition, a composite sample from recovered spoon soil samples from each of boreholes (Boreholes BH1 to BH9) was tested for Toxicity Characteristic Leaching Procedure (TCLP) to characterize soil quality for landfill disposal purposes.

It should be noted that at the time of the sampling, no obvious visual or olfactory evidence of environmental impact (i.e. staining or odours) was observed in the retrieved soil samples or at the sampling locations.

6.2 Soil Analytical Results

A total of six (6) soil samples were analysed for the parameters of PHCs/BTEX, PAHs, metals and inorganics (EC/SAR), under Ontario Regulation 153/04 ("O. Reg. 153/04") as amended. A copy of the soil analytical results is provided in the Laboratory Certificates of Analysis, attached to Appendix B.

The soil analytical results were compared with the Ontario Ministry of the Environment and Climate Change ("MOECC") "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", April 2011, Table 1: Full Depth Background Site Condition Standards for Residential/Parkland/Institutional/Industrial/Commercial/Community Property Uses ("2011 MOECC Table 1 Standards"); Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition ("2011 MOECC Table 2 Standards"), and Table 3: Full Depth Generic Site Condition Standards in a non-potable Ground Water Condition ("2011 MOECC Table 3 Standards").

Based on the comparison, exceedances of MOECC Table 1, Table 2 or Table 3 standards were noted for SAR and/or EC in all tested soil samples. The exceedance values detected in the soil samples are summarized in the following table:

Soil Sample ID	Parameter	Detected Value / Unit	MOECC Table 1 Standards Guideline Value	MOECC Table 2 and 3 Standards (R/P/I) Guideline Value	MOECC Table 2 and 3 Standards (I/C/C) Guideline Value
BH2 SS2	SAR	26.5	**2.4**	**5**	**12**
BH4 SS3	SAR	8.20	**2.4**	**5**	12
BH5 SS2	SAR	12.5	**2.4**	**5**	**12**
BH7 SS2	EC	1.57 mS/cm	**0.57**	**0.7**	**1.4**

Soil Sample ID	Parameter	Detected Value / Unit	MOECC Table 1 Standards Guideline Value	MOECC Table 2 and 3 Standards (R/P/I) Guideline Value	MOECC Table 2 and 3 Standards (I/C/C) Guideline Value
	SAR	7.13	**2.4**	**5**	12
BH8 SS2	EC	0.975 mS/cm	**0.57**	**0.7**	1.4
	SAR	7.14	**2.4**	**5**	12
BH9 SS2&SS3	EC	0.599 mS/cm	**0.57**	0.7	1.4
	SAR	4.57	**2.4**	5	12

Note: R/P/I = Residential, Parkland and Institutional Property Use
I/C/C = Industrial, Commercial and Community Property Use
0.57 = standard value exceeded by the analytical result

One (1) composite soil sample was tested in accordance with Ontario Regulation 347 as amended. The TCLP results were compared with Ontario Regulation 347, as amended, Schedule 4 criteria (Leachate Quality Criteria). Based on the analytical results, there were no exceedances of Schedule 4 Leachate Quality criteria for metals and inorganics, VOCs, and benzo(a)pyrene. In addition, the sample was tested to be non-flammable. Therefore, the composite sample tested would be considered as a non-hazardous waste for disposal purposes.

A copy of the soil analytical results is provided in the Laboratory Certificates of Analysis, attached in Appendix B.

6.3 Discussion of Analytical Results

Based on the analytical results, no exceedances were found for PHCs/BTEX, PAHs, and metals in the tested soil samples; however, exceedances of the MOECC Table 1, Table 2 or Table 3 Standards were noted for EC and/or SAR in all tested soil samples. It should be noted that the samples selected for analysis were taken from the boreholes located on the roadways. The elevated EC and SAR values in the tested soil samples may likely be attributed to the application of de-icing salt on the road.

Based on the results of soil sample analysis, GeoPro would recommend the following disposal options:

1) The soils generated at the Site at the same tested sample depth from Borehole BH9 can be re-used for the on-site development, provided that the soils will not be in contact with groundwater, or re-used at a receiving site which is not considered as an environmentally sensitive site and would accept the soil as per the test results;

2) The soils generated at the Site at the same tested sample depth from Boreholes BH2, BH4, BH5, BH7 and BH8 may be disposed at facilities which are suitable to accept salt-impacted excess soil (i.e., certain former aggregate sites, mines, etc.), and would accept the soils based on the analytical results; and

3) The soils generated at the Site could be disposed at a licenced landfill facility as non-hazardous solid wastes.

It should be noted that the results of the chemical analysis refer only to the soil samples analyzed, which were obtained from specific sampling locations and sampling depths, and that the soil chemistry may vary between and beyond the location and depth of the samples taken. Therefore, soil materials to be used on site or transported to other sites must be inspected during excavation for indication of variance in composition or any chemical/environmental constraints. If conditions indicate significant variations, further chemical analyses should be carried out.

Please note that the level of testing outlined herein is meant to provide a broad indication of soil quality based on the limited soil samples tested. The analytical results contained in this report should not be considered a warranty with respect to the soil quality or the use of the soil for any specific purpose. Furthermore, it must be noted that our scope of work was only limited to the review of the analytical results of the limited number of samples. The scope of work did not include any environmental evaluation or assessment of the subject site (such as a Phase One or Phase Two Environmental Site Assessment).

Sites accepting fill may have requirements relating to its aesthetic or engineering properties in addition to its chemical quality. Some receiving sites may have specific chemical testing protocols, which may require additional tests to meet the requirements. The requirements for accepting the fill at an off-site location must be confirmed in advance. GeoPro would be pleased to assist once the receiving sites are determined and the requirements of the receiving sites are available.

7 MONITORING AND TESTING

The geotechnical aspects of the final design drawings and specifications should be reviewed by this office prior to tendering and construction, to confirm that the intent of this report has been met. During construction, full-time engineered fill monitoring and sufficient foundation inspections, subgrade inspections, in-situ density tests and materials testing should be carried out to confirm that the conditions exposed are consistent with those encountered in the boreholes, and to monitor conformance to the pertinent project specification.

8 CLOSURE

We appreciate the opportunity to be of service to you and trust that this report provides sufficient geotechnical engineering information to facilitate the detailed design of this project. We look forward to providing you with continuing service during the construction stage. Please do not hesitate to contact our office should you wish to discuss, in further detail, any aspects of this project.

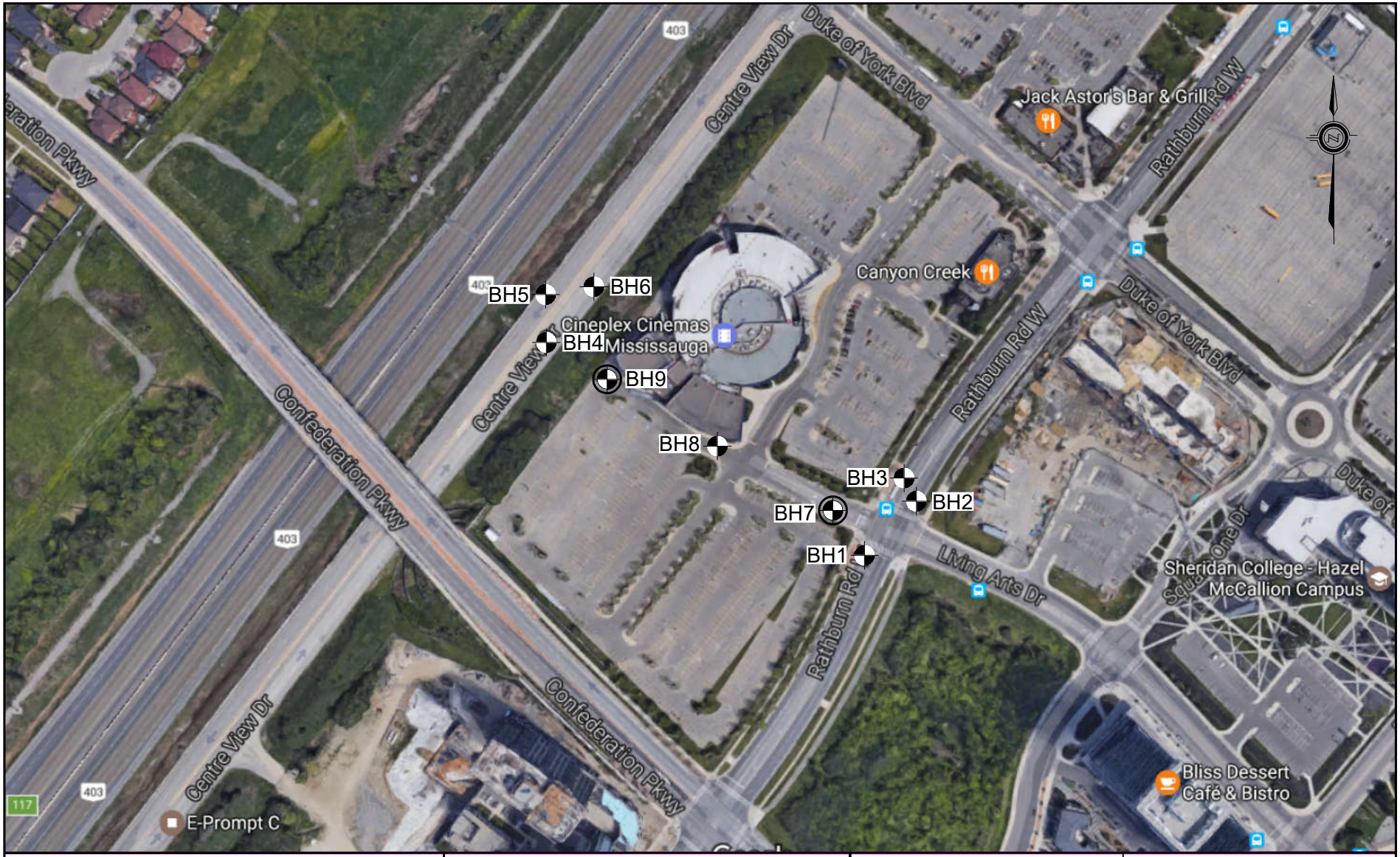
Yours very truly,

GEOPRO CONSULTING LIMITED

Jessica Yao, P.Eng.
Senior Geotechnical Engineer

David B. Liu, P.Eng., Principal

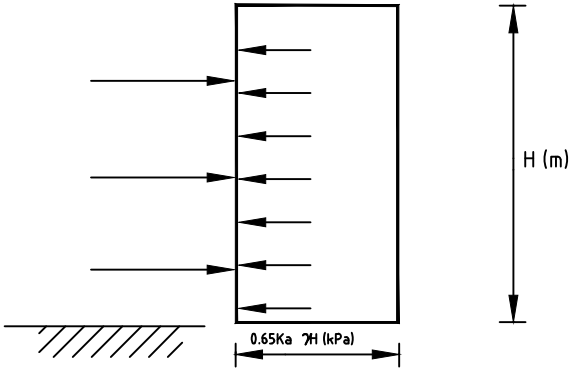
DRAWINGS



Legend:

- Borehole Location
- Monitoring Well Location

Client:	Stantec Consulting Limited			Project No.: 17-1798G	Drawing No.: 1
Drawn:	SD	Approved:	DL	Title:	Borehole Location Plan
Date:	October 2017	Scale:	N.T.S.	Project:	Geotechnical Investigation for Class EA Study Living Arts Drive Extension, Mississauga, Ontario
Original Size:	Letter	Rev:	JY		GeoPro Consulting Limited

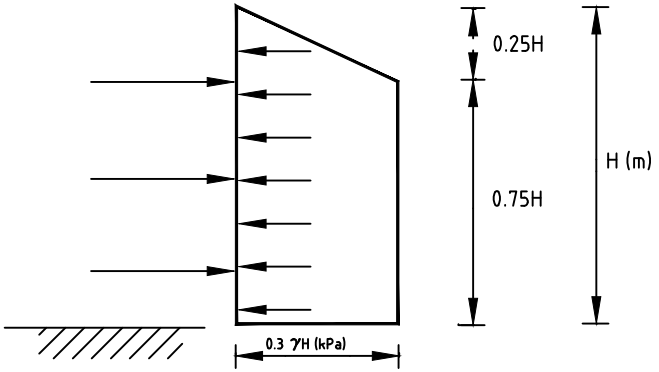


γ = unit weight of soil = 21.0 kN/m ^{3}

γ' = submerged unit weight of soil (i.e. below ground water level)= 11.2 kN/m ^{3}

Ka = 0.3

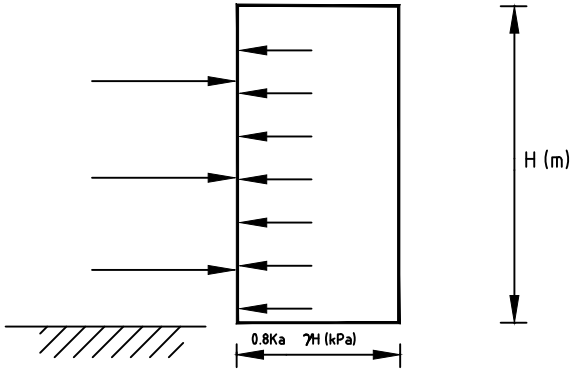
IN COMPACT TO VERY DENSE NON-COHESIVE SOILS (SANDS AND SILTS)



γ = unit weight of soil = 21.5 kN/m ^{3}

γ' = submerged unit weight of soil (i.e. below ground water level)= 11.7 kN/m ^{3}

IN COHESIVE CLAYS OR CLAYEY SOILS

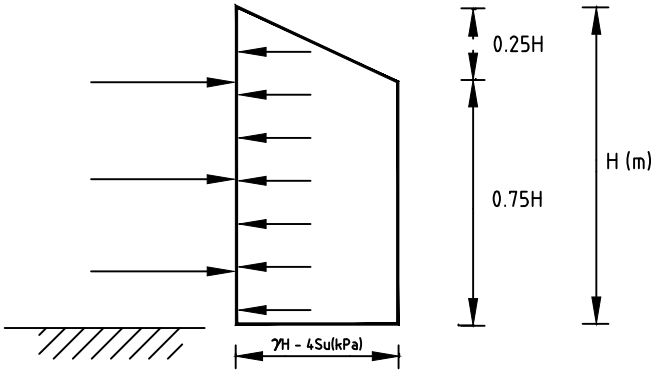


γ = unit weight of soil = 19.0 kN/m ^{3}

γ' = submerged unit weight of soil (i.e. below ground water level)= 9.2 kN/m ^{3}

Ka = 0.36

IN LOOSE OR DISTURBED NON-COHESIVE SOILS (SANDS AND SILTS)



γ = unit weight of soil = 19.0 kN/m^3

γ' = submerged unit weight of soil (i.e. below ground water level)= 9.2 kN/m^3

Su = 10 KPa

IN VERY SOFT TO FIRM COHESIVE CLAYS OR CLAYEY SOILS

Notes:
1. Check system for partial excavation condition.
2. If the free water level is above the base of the excavation, the hydrostatic pressure must be added to the above pressure distribution.
3. If surcharge loadings are present near the excavation, these must be included in the lateral pressure calculation.

Client:	**Stantec Consulting Limited**			Project No.: **17-1798GH**	Drawing No.: **2**
Drawn:	**EW**	Approved:	**JY**	Title:	**Earth Pressure Distribution on Braced Excavations**
Date:	**October, 2017**	Scale:	**N.T.S**	Project:	**Geotechnical Investigation** **Living Arts Drive Extension, Mississauga, Ontario**
Original Size:	**Letter**	Rev:	**JY**		GeoPro Consulting Limited

S:\Projects_Standard Report Drawings\EARTH PRESSURE DISTRIBUTION ON BRACED EXCAVATIONS-Aug-2012.dwg

ENCLOSURES

Enclosure 1A: Notes on Sample Descriptions

1. Each soil stratum is described according to the *Modified Unified Soil Classification System*. The compactness condition of cohesionless soils (SPT) and the consistency of cohesive soils (undrained shear strength) are defined according to Canadian Foundation Engineering Manual, 4th Edition. Different soil classification systems may be used by others. Please note that a description of the soil stratums is based on visual and tactile examination of the samples augmented with field and laboratory test results, such as a grain size analysis and/or Atterberg Limits testing. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

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.

Enclosure 1B: Explanation of Terms Used in the Record of Boreholes

Sample Type

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Dimension type sample
FS	Foil sample
NR	No recovery
RC	Rock core
SC	Soil core
SS	Spoon sample
SH	Shelby tube 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).

PM – Samples advanced by manual pressure
WR – Samples advanced by weight of sampler and rod
WH – Samples advanced by static weight of hammer

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).

Piezo-Cone Penetration Test (CPT):

An electronic cone penetrometer with a 60 degree conical tip and a projected end area of 10 cm² pushed through ground at a penetration rate of 2 cm/s. Measurement of tip resistance (Q_t), porewater pressure (PWP) and friction along a sleeve are recorded electronically at 25 mm penetration intervals.

Textural Classification of Soils (ASTM D2487)

Classification	Particle Size
Boulders	> 300 mm
Cobbles	75 mm - 300 mm
Gravel	4.75 mm - 75 mm
Sand	0.075 mm – 4.75 mm
Silt	0.002 mm-0.075 mm
Clay	<0.002 mm(*)

(*) Canadian Foundation Engineering Manual (4th Edition)

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

(*) Hierarchy of Shear Strength prediction

1. Lab triaxial test
2. Field vane shear test
3. Lab. vane shear test
4. SPT "N" value
5. Pocket penetrometer

b) Cohesionless Soils

Compactness Condition (Formerly 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
U	Unconsolidated Undrained Triaxial Test
V	Field vane (LV-laboratory vane test)
γ	Unit weight

LOG OF BOREHOLE BH1

PROJECT: Geotechnical Investigation for Class EA Study

CLIENT: Stantec Consulting Limited

PROJECT LOCATION: Living Arts Drive Extension, City of Mississauga, ON

DATUM: N/A

BH LOCATION: See Borehole Location Plan

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer

FIELD ENGINEER: CS

SAMPLE REVIEW: TY

CHECKED: JY

DIAMETER: 155 mm

DATE: 2017-10-06

REF. NO.: 17-1798G

ENCL. NO.: 2

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS/0.3m	GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST / SHEAR STRENGTH (kPa)	WATER CONTENT (%)	UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**ASPHALT CONCRETE:** (150 mm)										
0.2	**GRANULAR BASE:** (300 mm)		1A	AS							
0.5	**GRANULAR SUBBASE:** (310 mm)		1B	AS							
0.8	**CLAYEY SILT TILL:** some sand, trace gravel, containing shale fragments, containing rock fragments, containing cobbles and boulders, brown, moist, very stiff to hard		2	SS	16						
1	--- containing limestone fragments		3	SS	69 / 180 mm			> >100			
1.9	**END OF BOREHOLE DUE TO AUGER REFUSAL** Note: 1) Borehole was open and dry upon completion of drilling.										

DYNAMIC PENETRATION TEST: ○ SPT, ≳ Cone, blows/0.3m; 20, 40, 60, 80

SHEAR STRENGTH (kPa): ● Unconfined, ✕ Field Vane & Sensitivity, ▲ Quick Triaxial, ⊠ Penetrometer, + Lab Vane; 20, 40, 60, 80

Plastic Limit, Natural Moisture Content, Liquid Limit; w_P, w, w_L

WATER CONTENT (%): 10, 20, 30, 40

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

LOG OF BOREHOLE BH2

PROJECT: Geotechnical Investigation for Class EA Study

CLIENT: Stantec Consulting Limited

PROJECT LOCATION: Living Arts Drive Extension, City of Mississauga, ON

DATUM: N/A

BH LOCATION: See Borehole Location Plan

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer | DIAMETER: 155 mm

FIELD ENGINEER: GH | DATE: 2017-10-06

SAMPLE REVIEW: TY | REF. NO.: 17-1798G

CHECKED: JY | ENCL. NO.: 3

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS/0.3m	GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST: SHEAR STRENGTH (kPa) / WATER CONTENT (%)	UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
0.0	**ASPHALT CONCRETE:** (160 mm)									
0.2	**GRANULAR BASE/SUBBASE:** (580 mm)		1A	AS						GR 28 SA 47 SI 25 CL
0.7	**CLAYEY SILT TLL:** some sand, trace gravel, containing shale fragments, containing rock fragments, containing cobbles and boulders, greenish brown, moist, hard		1B / 2	AS / SS	32					
	--- containing limestone fragments --- auger grinding		3	SS	50 / 50 mm					
1.7	**END OF BOREHOLE DUE TO AUGER REFUSAL** Note: 1) Borehole was open and dry upon completion of drilling.									

DYNAMIC PENETRATION TEST: ○ SPT, ≳ Cone, blows/0.3m; 20 40 60 80

SHEAR STRENGTH (kPa): ● Unconfined, ✕ Field Vane & Sensitivity, ▲ Quick Triaxial, ⊠ Penetrometer, + Lab Vane; 20 40 60 80

WATER CONTENT (%): Plastic Limit (w_P), Natural Moisture Content (w), Liquid Limit (w_L); 10 20 30 40

> >100

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

LOG OF BOREHOLE BH3

PROJECT: Geotechnical Investigation for Class EA Study

CLIENT: Stantec Consulting Limited

PROJECT LOCATION: Living Arts Drive Extension, City of Mississauga, ON

DATUM: N/A

BH LOCATION: See Borehole Location Plan

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer | DIAMETER: 155 mm

FIELD ENGINEER: CS | DATE: 2017-10-06

SAMPLE REVIEW: TY | REF. NO.: 17-1798G

CHECKED: JY | ENCL. NO.: 4

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m	GROUND WATER ELEVATION	DYNAMIC PENETRATION TEST (SPT / Cone, blows/0.3m)	SHEAR STRENGTH (kPa)	WATER CONTENT (%) Plastic Limit / Natural Moisture Content / Liquid Limit	UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**ASPHALT CONCRETE:** (160 mm)									
0.2	**GRANULAR BASE:** (290 mm)	1A	AS							
0.5	**GRANULAR SUBBASE:** (310 mm)	1B	AS							
0.8	**CLAYEY SILT TILL:** some sand, trace to some gravel, containing shale fragments, containing rock fragments, containing cobbles and boulders, brown, moist, very stiff to hard	2	SS	17						10 18 46 26
	--- containing limestone fragments --- auger grinding	3	SS	50 / 100 mm						
		4	SS	66 / 205 mm						
		5	SS	50 / 25 mm						
3.2	**PROBABLE WEATHERED SHALE:** containing limestone fragments, grey, moist, very dense	6	AS							
3.4	**END OF BOREHOLE DUE TO AUGER REFUSAL** Note: 1) Borehole was open and dry upon completion of drilling.									

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

LOG OF BOREHOLE BH4

PROJECT: Geotechnical Investigation for Class EA Study
CLIENT: Stantec Consulting Limited
PROJECT LOCATION: Living Arts Drive Extension, City of Mississauga, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

DRILLING DATA
METHOD: Continuous Flight Auger - Auto Hammer
FIELD ENGINEER: CS
SAMPLE REVIEW: TY
CHECKED: JY
DIAMETER: 155 mm
DATE: 2017-10-06
REF. NO.: 17-1798G
ENCL. NO.: 5

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m
0.0	**ASPHALT CONCRETE:** (200 mm)			
0.2	**GRANULAR BASE:** (120 mm)	1A	AS	
0.3	**GRANULAR SUBBASE:** (420 mm)	1B	AS	
0.7	**FILL:** gravelly sand, trace silt, containing asphalt pieces, brown, moist, compact	1C	AS	
1		2	SS	17
1.4	**FILL:** organic clayey silt, trace to some sand, trace gravel, trace rootlets, containing shale fragments, dark grey, moist, firm			
2		3	SS	7
2.1	**FILL:** clayey silt, trace to some sand, trace gravel, trace rootlets, brown and grey mottled, moist, stiff to very stiff			
3		4	SS	10
		5A	SS	
3.2	**CLAYEY SILT TILL:** some sand, trace gravel, containing shale fragments, containing rock fragments, containing cobbles and boulders, brown and grey mottled, moist, very stiff	5B	SS	19
4				
4.0	**CLAYEY SILT/SHALE COMPLEX:** some sand, trace gravel, containing shale fragments, containing rock fragments, brownish grey, wet, hard			
		6	SS	50 / 150 mm
4.7	**END OF BOREHOLE DUE TO AUGER REFUSAL**			

Notes:
1) Water encountered at a depth of 4.6 m below ground surface (mBGS) during drilling.
2) Water was at a depth of 4.2 mBGS upon completion of drilling.
3) Borehole was open upon completion of drilling.

DYNAMIC PENETRATION TEST: ○ SPT, ≳ Cone, blows/0.3m; 20, 40, 60, 80
SHEAR STRENGTH (kPa): ● Unconfined, ✕ Field Vane & Sensitivity, ▲ Quick Triaxial, ⊠ Penetrometer, + Lab Vane; 20, 40, 60, 80
Plastic Limit, Natural Moisture Content, Liquid Limit
w_P, w, w_L
WATER CONTENT (%): 10, 20, 30, 40
UNIT WT (kN/m³)
REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

> >100

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

LOG OF BOREHOLE BH5

PROJECT: Geotechnical Investigation for Class EA Study

CLIENT: Stantec Consulting Limited

PROJECT LOCATION: Living Arts Drive Extension, City of Mississauga, ON

DATUM: N/A

BH LOCATION: See Borehole Location Plan

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer | DIAMETER: 155 mm

FIELD ENGINEER: CS | DATE: 2017-10-06

SAMPLE REVIEW: TY | REF. NO.: 17-1798G

CHECKED: JY | ENCL. NO.: 6

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m
0.0	**ASPHALT CONCRETE:** (190 mm)			
0.2	**GRANULAR BASE/SUBBASE:** (530 mm)	1A	AS	
0.7	**FILL:** clayey silt, some sand, trace gravel, trace to some organics, containing shale fragments, grey to brown, moist, firm to stiff	1B	AS	
1		2	SS	9
2		3	SS	7
2.1	**CLAYEY SILT:** some sand, trace gravel, containing shale fragments, brown and grey mottled, moist, very stiff	4	SS	18
2.9	**CLAYEY SILT TILL:** some sand, trace gravel, containing shale fragments, containing rock fragments, containing cobbles and boulders, brown, moist, very stiff	5	SS	27
4				
4.0	**CLAYEY SILT/SHALE COMPLEX:** some sand, trace gravel, containing shale fragments, containing rock fragments, containing cobbles and boulders, brown, moist, hard	6	SS	50 / 75 mm
4.7	**END OF BOREHOLE DUE TO AUGER REFUSAL** Note: 1) Borehole was open and dry upon completion of drilling.			

DYNAMIC PENETRATION TEST: ○ SPT, ≳ Cone, blows/0.3m (20, 40, 60, 80)

SHEAR STRENGTH (kPa): ● Unconfined, ✕ Field Vane & Sensitivity, ▲ Quick Triaxial, ⊠ Penetrometer, + Lab Vane (20, 40, 60, 80)

Natural Moisture Content: Plastic Limit (w_P), w, Liquid Limit (w_L)

WATER CONTENT (%): 10, 20, 30, 40

> >100

UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
55	32	13	

GROUNDWATER ELEVATIONS

Measurement: 1st, 2nd, 3rd, 4th

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

LOG OF BOREHOLE BH6

PROJECT: Geotechnical Investigation for Class EA Study

CLIENT: Stantec Consulting Limited

PROJECT LOCATION: Living Arts Drive Extension, City of Mississauga, ON

DATUM: N/A

BH LOCATION: See Borehole Location Plan

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer

FIELD ENGINEER: CS

SAMPLE REVIEW: TY

CHECKED: JY

DIAMETER: 155 mm

DATE: 2017-10-06

REF. NO.: 17-1798G

ENCL. NO.: 7

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m
0.0	**ASPHALT CONCRETE:** (150 mm)			
0.2	**GRANULAR BASE:** (160 mm)	1A	AS	
0.3	**GRANULAR SUBBASE:** (410 mm)	1B	AS	
0.7	**FILL:** clayey silt, some sand, trace gravel, trace to some organics, trace rootlets, containing shale fragments, dark grey, moist, firm to stiff	1C	AS	
		2	SS	8
		3	SS	5
2.1	**CLAYEY SILT:** some sand, trace gravel, containing shale fragments, brown and grey mottled, moist, very stiff	4	SS	20
2.9	**CLAYEY SILT TILL:** some sand, trace gravel, containing shale fragments, containing rock fragments, containing cobbles and boulders, brown, moist, very stiff	5	SS	28
4.0	**CLAYEY SILT TILL/SHALE COMPLEX:** some sand, trace gravel, containing shale fragments, containing rock fragments, containing cobbles and boulders, brown, moist, hard	6	SS	61
5.0	**END OF BOREHOLE DUE TO AUGER REFUSAL** Note: 1) Borehole was open and dry upon completion of drilling.			

GROUND WATER ELEVATION

DYNAMIC PENETRATION TEST
○ SPT ≳ Cone blows/0.3m
20 40 60 80

SHEAR STRENGTH (kPa)
● Unconfined ✕ Field Vane & Sensitivity
▲ Quick Triaxial ⊠ Penetrometer + Lab Vane
20 40 60 80

Plastic Limit w_P | Natural Moisture Content w | Liquid Limit w_L

WATER CONTENT (%)
10 20 30 40

UNIT WT (kN/m³)

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

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

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

LOG OF BOREHOLE BH7

PROJECT: Geotechnical Investigation for Class EA Study

CLIENT: Stantec Consulting Limited

PROJECT LOCATION: Living Arts Drive Extension, City of Mississauga, ON

DATUM: N/A

BH LOCATION: See Borehole Location Plan

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer | DIAMETER: 155 mm

FIELD ENGINEER: GH | DATE: 2017-10-06

SAMPLE REVIEW: DX | REF. NO.: 17-1798G

CHECKED: JY | ENCL. NO.: 8

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**ASPHALT CONCRETE:** (110 mm)					
0.1	**GRANULAR BASE/SUBBASE:** (430 mm)	1A	AS			36 48 16
0.5	**FILL:** sandy silt, some clay, trace gravel, layers of clayey silt, containing shale fragments, brown, moist	1B	AS			
		2A	SS			
0.9	**CLAYEY SILT TILL:** some sand, trace gravel, containing shale fragments, containing cobbles and boulders, brown, moist, very stiff	2B	SS	21		
1.5	**CLAYEY SILT TILL/SHALE COMPLEX:** some sand, trace gravel, containing shale fragments, containing rock fragments, containing cobbles and boulders,	3	SS	72 / 230 mm		14 17 43 26
1.9	brown, moist, hard --- auger grinding					

END OF BOREHOLE DUE TO AUGER REFUSAL

Notes:
1) Borehole was open and dry upon completion of drilling.
2) 51 mm dia. monitoring well was installed in borehole upon completion of drilling.

Water Level Readings (mBGS)

Date	W. L. Depth
Oct. 13, 2017	1.17 m
Oct. 18, 2017	1.15 m

Concrete

Bentonite

1.2 mBGL Oct 13

Sand

Screen

DYNAMIC PENETRATION TEST: ○ SPT, ≈ Cone, blows/0.3m; 20 40 60 80

SHEAR STRENGTH (kPa): ● Unconfined ✕ Field Vane & Sensitivity ▲ Quick Triaxial ⊠ Penetrometer + Lab Vane; 20 40 60 80

Plastic Limit w_P | Natural Moisture Content w | Liquid Limit w_L

WATER CONTENT (%): 10 20 30 40

UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

LOG OF BOREHOLE BH8

PROJECT: Geotechnical Investigation for Class EA Study

CLIENT: Stantec Consulting Limited

PROJECT LOCATION: Living Arts Drive Extension, City of Mississauga, ON

DATUM: N/A

BH LOCATION: See Borehole Location Plan

DRILLING DATA

METHOD: Continuous Flight Auger - Auto Hammer | DIAMETER: 155 mm

FIELD ENGINEER: GH | DATE: 2017-10-06

SAMPLE REVIEW: DX | REF. NO.: 17-1798G

CHECKED: JY | ENCL. NO.: 9

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	"N" BLOWS/0.3m	GROUND WATER ELEVATION	DYNAMIC PENETRATION TEST (○ SPT, ≳ Cone, blows/0.3m) / SHEAR STRENGTH (kPa) (● Unconfined, ▲ Quick Triaxial, ✕ Field Vane & Sensitivity, ⊠ Penetrometer, + Lab Vane)	Plastic Limit w_P / Natural Moisture Content w / Liquid Limit w_L — WATER CONTENT (%)	UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**ASPHALT CONCRETE:** (150 mm)									
0.2	**GRANULAR BASE/SUBBASE:** (510 mm)		1A	AS						
0.7	**FILL:** sandy silt, some clay, trace gravel, trace organics, containing shale fragments, containing wood fragments, brown, moist		1B	AS						
			2A	SS						
0.9	**CLAYEY SILT TILL:** some sand to sandy, trace gravel, containing shale fragments, containing rock fragments, containing cobbles and boulders, brown, moist, hard		2B	SS	57					
1.5	**CLAYEY SILT TILL/SHALE COMPLEX:** some sand to sandy, trace gravel, containing shale fragments, containing rock fragments, containing cobbles and boulders, brown, moist, hard		3	SS	43					
2.3	**PROBABLE WEATHERED SHALE:** containing rock fragments, brown to grey --- auger grinding		4	SS	50 / 100 mm		> >100			
			5	SS	50 / 50 mm		> >100			
3.1	**END OF BOREHOLE** Note: 1) Borehole was open and dry upon completion of drilling.									

GROUNDWATER ELEVATIONS

Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

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

LOG OF BOREHOLE BH9

PROJECT: Geotechnical Investigation for Class EA Study
CLIENT: Stantec Consulting Limited
PROJECT LOCATION: Living Arts Drive Extension, City of Mississauga, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

DRILLING DATA
METHOD: Continuous Flight Auger - Auto Hammer
FIELD ENGINEER: GH
SAMPLE REVIEW: DX
CHECKED: JY
DIAMETER: 155 mm
DATE: 2017-10-06
REF. NO.: 17-1798G
ENCL. NO.: 10

ELEV / DEPTH (m)	DESCRIPTION	NUMBER	TYPE	"N" BLOWS/0.3m	ELEVATION	UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**ASPHALT CONCRETE:** (125 mm)						
0.1	**GRANULAR BASE/SUBBASE:** (515 mm)	1A	AS				25 49 26
0.6	**FILL:** sandy silt, trace to some clay, trace gravel, brown, moist	1B	AS				
		2A	SS				
0.9	**CLAYEY SILT:** some sand to sandy, trace gravel, layers of sandy silt, containing shale fragments, brown, moist, very stiff	2B	SS	23			
1.4	**CLAYEY SILT/SHALE COMPLEX:** some sand, trace gravel, layers of sandy silt, containing shale fragments, containing rock fragments, brown, moist, hard	3	SS	37			
		4	SS	60			6 16 46 32
		5	SS	50 / 75 mm			
3.3	**END OF BOREHOLE**						

Notes:
1) Borehole was open and dry upon completion of drilling.
2) 51 mm dia. monitoring well was installed in borehole upon completion of drilling.

Water Level Readings (mBGS)
Date W. L. Depth
Oct. 13, 2017 Dry
Oct. 18, 2017 Dry

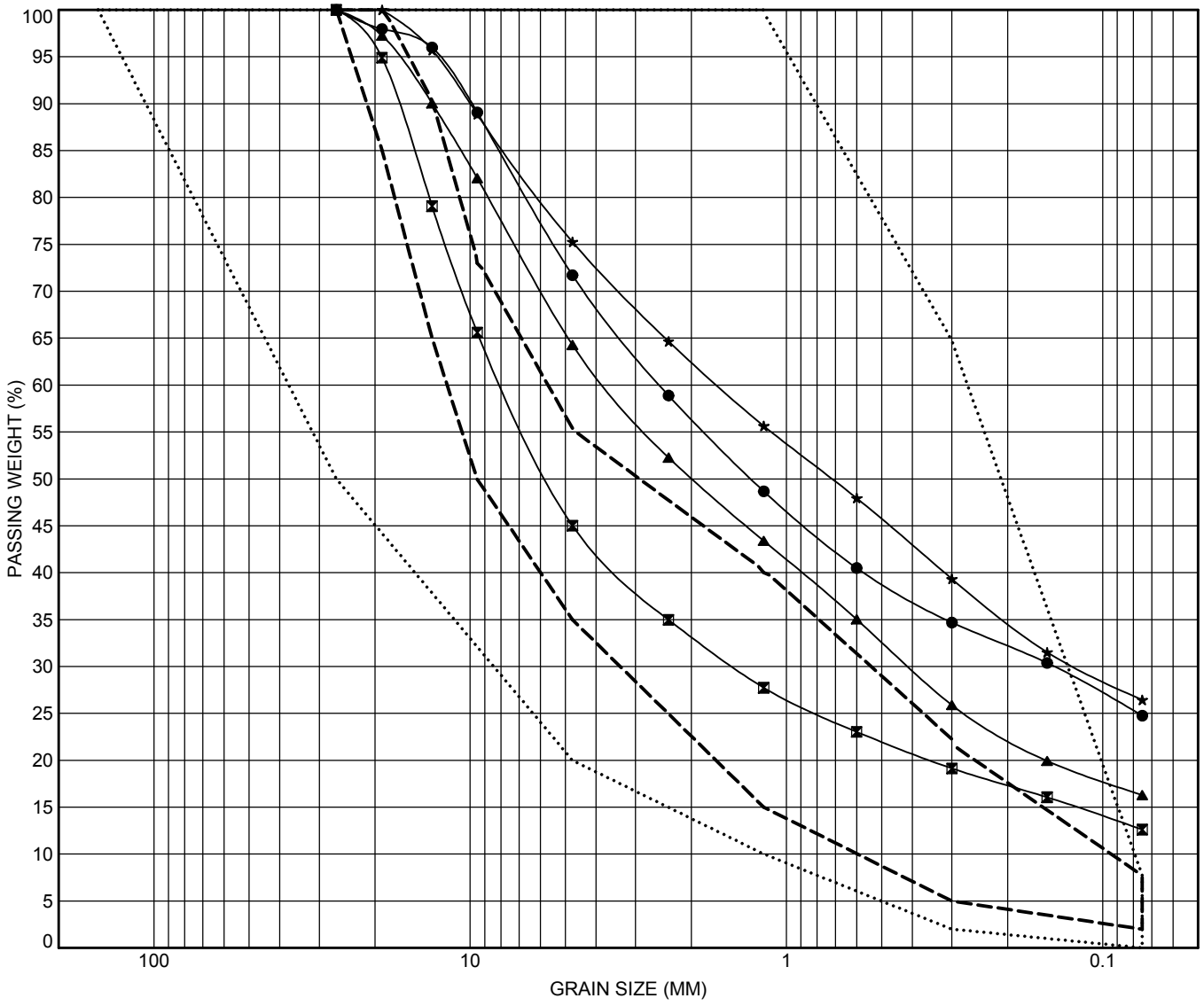
Concrete
Bentonite
Sand
Screen
Natural pack

DYNAMIC PENETRATION TEST
○ SPT ≳ Cone blows/0.3m
SHEAR STRENGTH (kPa)
● Unconfined ✕ Field Vane & Sensitivity
▲ Quick Triaxial ⊠ Penetrometer + Lab Vane
Natural Moisture Content
Plastic Limit w_P — w — Liquid Limit w_L
WATER CONTENT (%)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

FIGURES



COBBLES	GRAVEL		SAND			FINES
	coarse	fine	coarse	medium	fine	

OPSS1010 GRANULAR A

OPSS1010 GRANULAR B TYPE I

Specimen Identification				D100	D60	D30	D10	%Gravel	%Sand	%Fines
●	BH2	AS1A	0.16	26.5	2.509	0.143		28.3	47.0	24.8
⊠	BH5	AS1A	0.19	26.5	7.867	1.467		55.0	32.4	12.6
▲	BH7	AS1A	0.11	26.5	3.703	0.41		35.7	48.0	16.3
★	BH9	AS1A	0.13	19	1.649	0.122		24.7	48.8	26.4

GeoPro CONSULTING LIMITED

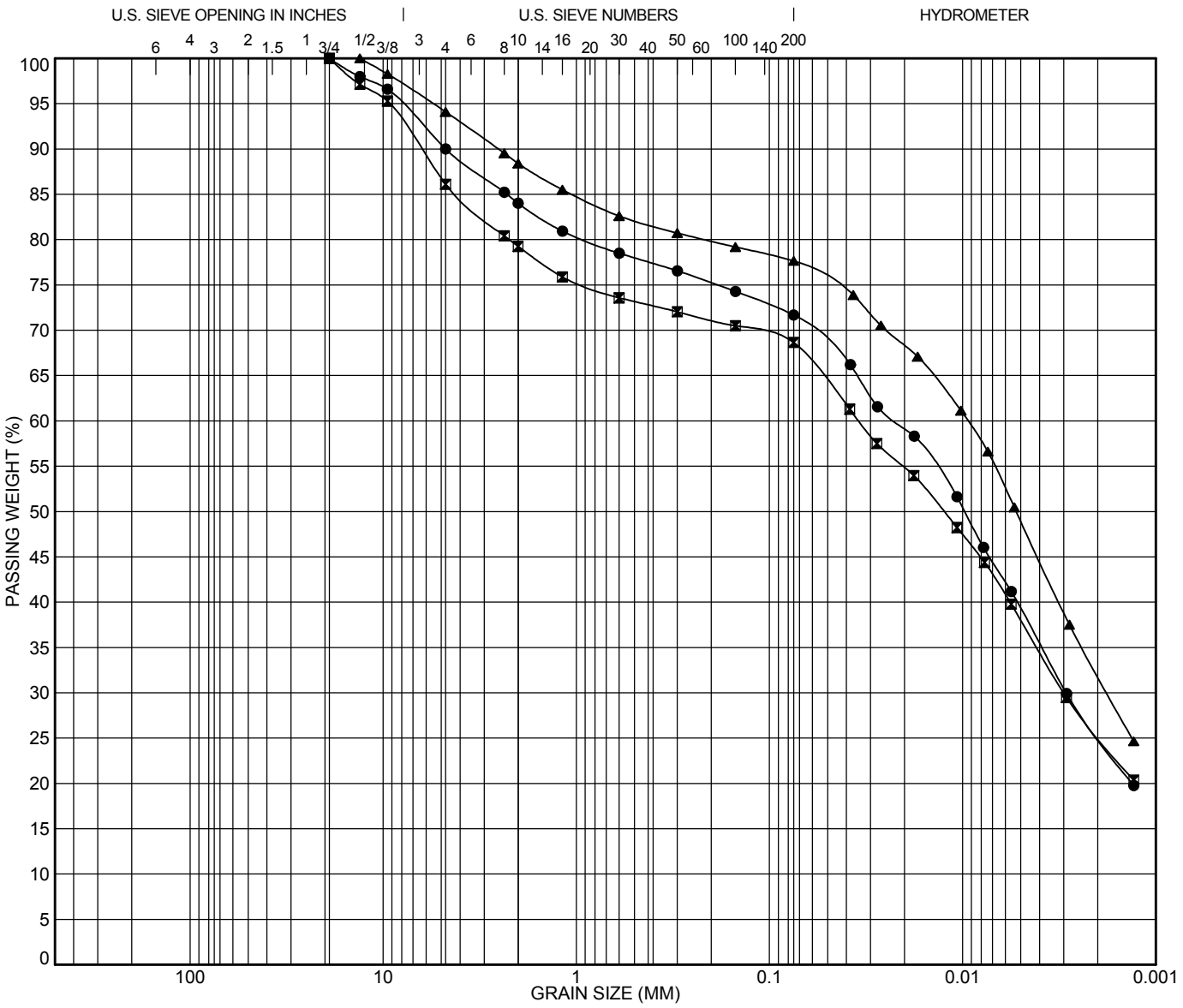
Unit 57, 40 Vogell Road, Richmond Hill, Ontario L4B 3N6
Tel: 905-237-8336 Fax: 905-248-3699
office@geoproconsulting.ca www.geoproconsulting.ca

GRAIN SIZE DISTRIBUTION

PROJECT: Geotechnical Investigation for Proposed Class EA Study

LOCATION: Living Arts Drive Extension, City of Mississauga, ON

PROJECT NO.: 17-1798GH	SAMPLED ON: 2017-10-06
FIGURE NO.: 1	TESTED ON:



COBBLES	GRAVEL		SAND			SILT	CLAY
	coarse	fine	coarse	medium	fine		

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
● BH3	SS2	0.76						
⊠ BH7	SS3	1.52						
▲ BH9	SS4	2.29						

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **BH3**	**SS2**	**0.76**	**19**	**0.022**	**0.003**		**10.0**	**18.3**	**46.5**	**25.2**
⊠ **BH7**	**SS3**	**1.52**	**19**	**0.034**	**0.003**		**13.9**	**17.4**	**43.4**	**25.3**
▲ **BH9**	**SS4**	**2.29**	**13.2**	**0.009**	**0.002**		**5.9**	**16.4**	**45.8**	**31.9**

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GRAIN SIZE DISTRIBUTION

PROJECT: Geotechnical Investigation for Proposed Class EA Study

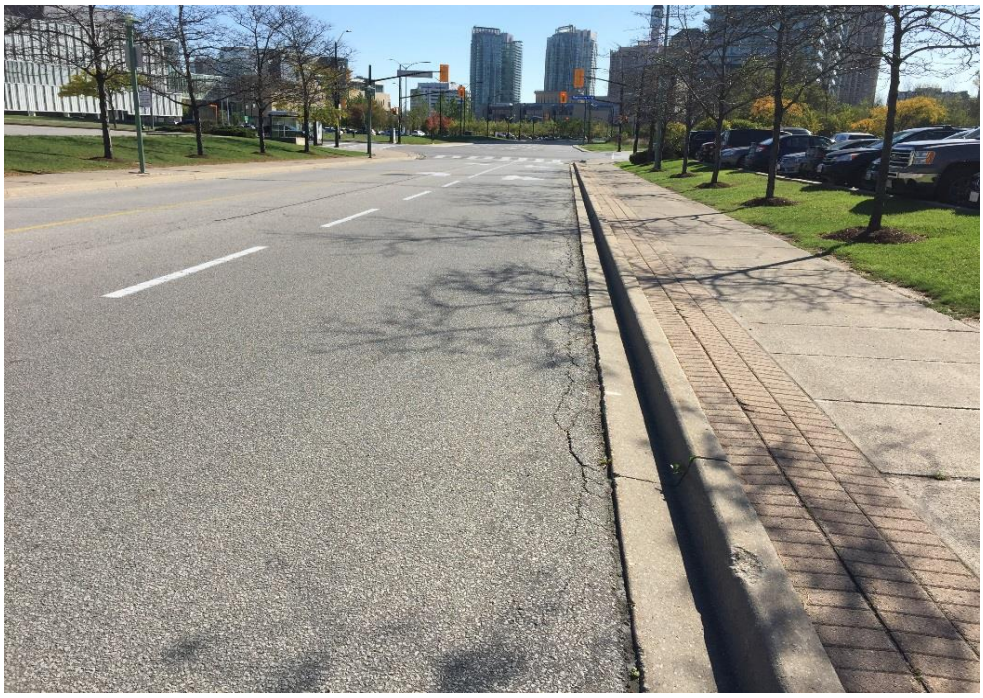
LOCATION: Living Arts Drive Extension, City of Mississauga, ON

PROJECT NO.: 17-1798GH | SAMPLED ON: 2017-10-06

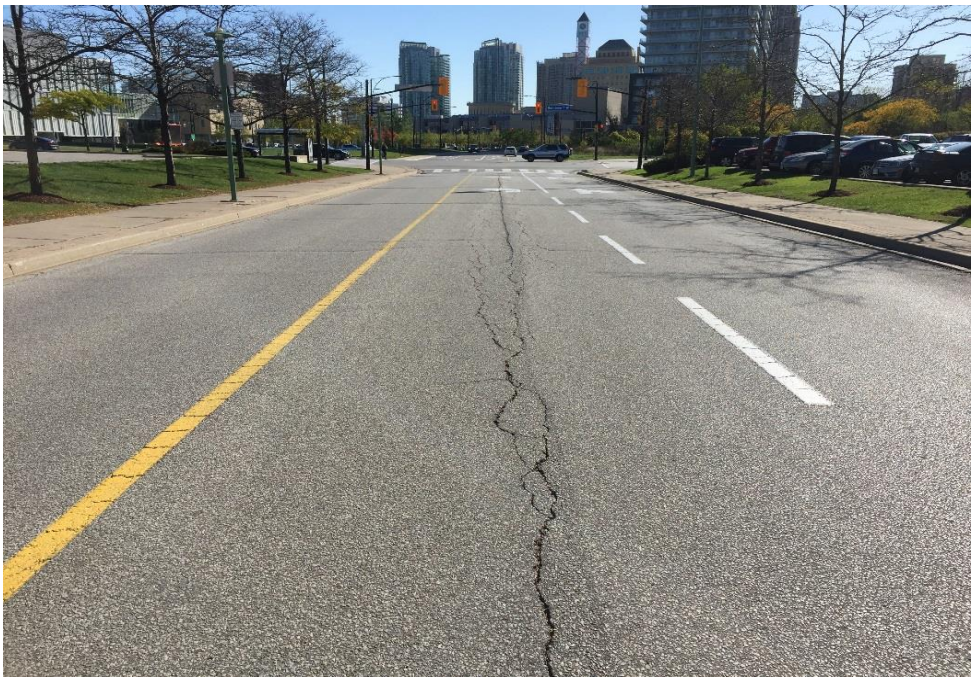
FIGURE NO.: 2 | TESTED ON:

APPENDIX A

Photograph 1 – Existing Access Road/future Extension of Living Arts Drive, westbound lane, at the intersection of Rathburn Road West, looking west, showing moderate construction joint cracking, moderate longitudinal and transverse cracking. Catch basin was in fair condition with slight alligator and random cracking around it.



Photograph 2 – Existing Access Road/future Extension of Living Arts Drive, eastbound lane, about 50 m west of Rathburn Road West, looking east, showing moderate edge cracking and slight longitudinal and transverse cracking.



Photograph 3 – Existing Access Road/future Extension of Living Arts Drive, eastbound lane, about 50 m west of Rathburn Road West, looking east, showing moderate longitudinal cracking associated with slight to moderate alligator cracking and slight to moderate transverse cracking.

Photograph 4 – Existing Access Road/future Extension of Living Arts Drive, eastbound lane, about 45 m west of Rathburn Road West, looking west, showing moderate edge cracking associated with alligator cracking, slight to moderate longitudinal and transverse cracking (partially sealed).

Photograph 5 – Existing Access Road/future Extension of Living Arts Drive, south of the theater, about 140 m west of Rathburn Road West, looking north, showing moderate longitudinal and transverse cracking associated with slight to moderate alligator cracking and.

Photograph 6 – Existing Access Road/future Extension of Living Arts Drive, about 160 m west of Rathburn Road West, looking east, showing moderate longitudinal and transverse cracking associated with alligator cracking.

Photograph 7 – Rathburn Road West, at the intersection of Living Arts Drive, looking south, showing slight to moderate longitudinal and transverse cracking.

Photograph 8 – Centre View Drive, eastbound lane, at the proposed intersection with Living Arts Drive, showing slight edge cracking, slight longitudinal and transverse cracking (partially sealed) and slight cut patching. Catch basin was in fair condition.

APPENDIX B

AGAT Laboratories

5835 COOPERS AVENUE
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TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: GEOPRO CONSULTING LTD
UNIT 57, 40 VOGELL ROAD
RICHMOND HILL, ON L4B3N6
(905) 237-8336

ATTENTION TO: Bujing Guan

PROJECT: 17-1798-GH

AGAT WORK ORDER: 17T273763

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist

DATE REPORTED: Oct 26, 2017

PAGES (INCLUDING COVER): 8

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

5835 COOPERS AVENUE
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CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 17T273763

PROJECT: 17-1798-GH

CLIENT NAME: GEOPRO CONSULTING LTD

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - ORPs (Soil)

DATE RECEIVED: 2017-10-19

DATE REPORTED: 2017-10-26

				SAMPLE DESCRIPTION:	BH2 SS2	BH4 SS3	BH5 SS2
				SAMPLE TYPE:	Soil	Soil	Soil
				DATE SAMPLED:	2017-10-06	2017-10-06	2017-10-06
Parameter	Unit	G / S	RDL		8833239	8833246	8833247
Sodium Adsorption Ratio	NA	2.4	NA		26.5	8.20	12.5

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8833239-8833247 SAR was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil).

Certified By: Amanjot Bhela

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 17T273763

PROJECT: 17-1798-GH

CLIENT NAME: GEOPRO CONSULTING LTD

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2017-10-19

DATE REPORTED: 2017-10-26

		SAMPLE DESCRIPTION:		BH2 SS2	BH4 SS3	BH5 SS2
		SAMPLE TYPE:		Soil	Soil	Soil
		DATE SAMPLED:		2017-10-06	2017-10-06	2017-10-06
Parameter	Unit	G / S	RDL	8833239	8833246	8833247
Benzene	µg/g	0.02	0.02	<0.02	<0.02	<0.02
Toluene	µg/g	0.2	0.08	<0.08	<0.08	<0.08
Ethylbenzene	µg/g	0.05	0.05	<0.05	<0.05	<0.05
Xylene Mixture	µg/g	0.05	0.05	<0.05	<0.05	<0.05
F1 (C6 to C10)	µg/g	25	5	<5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g	25	5	<5	<5	<5
F2 (C10 to C16)	µg/g	10	10	<10	<10	<10
F3 (C16 to C34)	µg/g	240	50	<50	<50	<50
F4 (C34 to C50)	µg/g	120	50	<50	<50	<50
Gravimetric Heavy Hydrocarbons	µg/g	120	50	NA	NA	NA
Moisture Content	%		0.1	18.7	20.6	17.3
Surrogate	Unit	Acceptable Limits				
Terphenyl	%	60-140		83	91	100

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8833239-8833247 Results are based on sample dry weight.
The C6-C10 fraction is calculated using Toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Certified By: N Popnikolof

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Guideline Violation

AGAT WORK ORDER: 17T273763

PROJECT: 17-1798-GH

CLIENT NAME: GEOPRO CONSULTING LTD

ATTENTION TO: Bujing Guan

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
8833239	BH2 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - ORPs (Soil)	Sodium Adsorption Ratio	NA	2.4	26.5
8833246	BH4 SS3	ON T1 S RPI/ICC	O. Reg. 153(511) - ORPs (Soil)	Sodium Adsorption Ratio	NA	2.4	8.20
8833247	BH5 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - ORPs (Soil)	Sodium Adsorption Ratio	NA	2.4	12.5

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Quality Assurance

CLIENT NAME: GEOPRO CONSULTING LTD

AGAT WORK ORDER: 17T273763

PROJECT: 17-1798-GH

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Oct 26, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - ORPs (Soil)															
Sodium Adsorption Ratio	8833239	8833239	26.5	26.8	1.1%	NA	NA								

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Amanjot Bhela

AGAT Laboratories

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Quality Assurance

CLIENT NAME: GEOPRO CONSULTING LTD

AGAT WORK ORDER: 17T273763

PROJECT: 17-1798-GH

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Oct 26, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PHCs F1 - F4 (Soil)															
Benzene	8831598		< 0.02	< 0.02	NA	< 0.02	75%	60%	130%	101%	60%	130%	115%	60%	130%
Toluene	8831598		< 0.08	< 0.08	NA	< 0.08	83%	60%	130%	99%	60%	130%	111%	60%	130%
Ethylbenzene	8831598		< 0.05	< 0.05	NA	< 0.05	94%	60%	130%	99%	60%	130%	115%	60%	130%
Xylene Mixture	8831598		< 0.05	< 0.05	NA	< 0.05	92%	60%	130%	100%	60%	130%	112%	60%	130%
F1 (C6 to C10)	8831598		< 5	< 5	NA	< 5	73%	60%	130%	90%	85%	115%	72%	70%	130%
F2 (C10 to C16)	8841055		< 10	< 10	NA	< 10	104%	60%	130%	91%	80%	120%	73%	70%	130%
F3 (C16 to C34)	8841055		< 50	< 50	NA	< 50	110%	60%	130%	98%	80%	120%	73%	70%	130%
F4 (C34 to C50)	8841055		< 50	< 50	NA	< 50	93%	60%	130%	104%	80%	120%	96%	70%	130%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: N Popnikolof

AGAT Laboratories

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Method Summary

CLIENT NAME: GEOPRO CONSULTING LTD

AGAT WORK ORDER: 17T273763

PROJECT: 17-1798-GH

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
Trace Organics Analysis			
Benzene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Toluene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Ethylbenzene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Xylene Mixture	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
F1 (C6 to C10)	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
F2 (C10 to C16)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
F3 (C16 to C34)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
F4 (C34 to C50)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009		GC/FID

AGAT Laboratories

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Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 17T273763

Cooler Quantity: 1 on ice

Arrival Temperatures: 4.3 4.5 4.2 3.5 3.2 3

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: Geo Pro Consulting
Contact: Bujing Guan, Jessica Tao
Address: Unit 57, 40 Voyager Rd. Richmond Hill, ON.
Phone: 905-237-8336 Fax:
Reports to be sent to:
1. Email: bguan@geoproconsulting.ca
2. Email: jessica@geoproconsulting.ca

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 1 (Indicate One)
☐ Ind/Com
☑ Res/Park
☐ Agriculture
Soil Texture (Check One)
☑ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region (Indicate One)
☐ MISA

☑ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Is this submission for a Record of Site Condition? ☐ Yes ☑ No

Report Guideline on Certificate of Analysis ☑ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: 17-1798 GH
Site Location: Mississauga, ON.
Sampled By: Chris
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company: As above
Contact:
Address:
Email:

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Y/N)	O. Reg 153: Metals and Inorganics	All Metals ☐ 153 Metals (excl. Hydrides)	Hydride Metals ☐ 153 Metals (Incl. Hydrides)	ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use
BH2 SS2	Oct. 6, 2017	AM	2	Soil	—					✓					✓						
BH4 SS3	Oct. 6, 2017	AM	2	Soil	—					✓					✓						
BH5 SS2	Oct. 6, 2017	PM	2	Soil	—					✓					✓						

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
[illegible]	Oct 18, 17		[illegible]	2017/10/19	11:55
[illegible]	2017/10/19	3:30			

Page 1 of 1

N°: T 059365

AGAT Laboratories

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CLIENT NAME: GEOPRO CONSULTING LTD
40 VOGELL ROAD UNIT 25-27
RICHMOND HILL, ON L4B3N6
(905) 237-8336

ATTENTION TO: Bujing Guan

PROJECT: 17-1798GHE

AGAT WORK ORDER: 17T270428

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist

DATE REPORTED: Oct 19, 2017

PAGES (INCLUDING COVER): 10

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 17T270428

PROJECT: 17-1798GHE

CLIENT NAME: GEOPRO CONSULTING LTD

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-10-11

DATE REPORTED: 2017-10-19

					SAMPLE DESCRIPTION:	BH7 SS2	BH8 SS2	BH9 SS2+SS3
					SAMPLE TYPE:	Soil	Soil	Soil
					DATE SAMPLED:	2017-10-06	2017-10-06	2017-10-06
Parameter	Unit	G / S: A	G / S: B	RDL		8806821	8806822	8806826
Antimony	µg/g	1.3	40	0.8		<0.8[<A]	<0.8[<A]	<0.8[<A]
Arsenic	µg/g	18	18	1		8[<A]	7[<A]	9[<A]
Barium	µg/g	220	670	2		40[<A]	60[<A]	56[<A]
Beryllium	µg/g	2.5	8	0.5		1.1[<A]	1.1[<A]	1.2[<A]
Boron	µg/g	36	120	5		14[<A]	14[<A]	13[<A]
Boron (Hot Water Soluble)	µg/g	NA	2	0.10		0.30[<B]	0.20[<B]	0.16[<B]
Cadmium	µg/g	1.2	1.9	0.5		<0.5[<A]	<0.5[<A]	<0.5[<A]
Chromium	µg/g	70	160	2		26[<A]	25[<A]	26[<A]
Cobalt	µg/g	21	80	0.5		15.8[<A]	15.3[<A]	15.6[<A]
Copper	µg/g	92	230	1		57[<A]	59[<A]	53[<A]
Lead	µg/g	120	120	1		6[<A]	6[<A]	9[<A]
Molybdenum	µg/g	2	40	0.5		<0.5[<A]	<0.5[<A]	<0.5[<A]
Nickel	µg/g	82	270	1		31[<A]	30[<A]	31[<A]
Selenium	µg/g	1.5	5.5	0.4		<0.4[<A]	<0.4[<A]	<0.4[<A]
Silver	µg/g	0.5	40	0.2		<0.2[<A]	<0.2[<A]	<0.2[<A]
Thallium	µg/g	1	3.3	0.4		<0.4[<A]	<0.4[<A]	<0.4[<A]
Uranium	µg/g	2.5	33	0.5		1.2[<A]	0.8[<A]	0.7[<A]
Vanadium	µg/g	86	86	1		31[<A]	30[<A]	34[<A]
Zinc	µg/g	290	340	5		76[<A]	71[<A]	72[<A]
Chromium VI	µg/g	0.66	8	0.2		<0.2[<A]	<0.2[<A]	<0.2[<A]
Cyanide	µg/g	0.051	0.051	0.040		<0.040[<A]	<0.040[<A]	<0.040[<A]
Mercury	µg/g	0.27	3.9	0.10		<0.10[<A]	<0.10[<A]	<0.10[<A]
Electrical Conductivity	mS/cm	0.57	1.4	0.005		1.57[>B]	0.975[A-B]	0.599[A-B]
Sodium Adsorption Ratio	NA	2.4	12	NA		7.13[A-B]	7.14[A-B]	4.57[A-B]
pH, 2:1 CaCl2 Extraction	pH Units			NA		7.76	7.68	7.61

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use, B Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8806821-8806826 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By: Amanjot Bhela

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 17T270428

PROJECT: 17-1798GHE

CLIENT NAME: GEOPRO CONSULTING LTD

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - PAHs (Soil)

DATE RECEIVED: 2017-10-11

DATE REPORTED: 2017-10-19

					SAMPLE DESCRIPTION:	BH7 SS2	BH8 SS2	BH9 SS2+SS3
					SAMPLE TYPE:	Soil	Soil	Soil
					DATE SAMPLED:	2017-10-06	2017-10-06	2017-10-06
Parameter	Unit	G / S: A	G / S: B	RDL		8806821	8806822	8806826
Naphthalene	µg/g	0.09	9.6	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Acenaphthylene	µg/g	0.093	0.15	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Acenaphthene	µg/g	0.072	21	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Fluorene	µg/g	0.12	62	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Phenanthrene	µg/g	0.69	12	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Anthracene	µg/g	0.16	0.67	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Fluoranthene	µg/g	0.56	9.6	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Pyrene	µg/g	1	96	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Benz(a)anthracene	µg/g	0.36	0.96	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Chrysene	µg/g	2.8	9.6	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Benzo(b)fluoranthene	µg/g	0.47	0.96	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Benzo(k)fluoranthene	µg/g	0.48	0.96	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Benzo(a)pyrene	µg/g	0.3	0.3	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Indeno(1,2,3-cd)pyrene	µg/g	0.23	0.76	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Dibenz(a,h)anthracene	µg/g	0.1	0.1	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Benzo(g,h,i)perylene	µg/g	0.68	9.6	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
2-and 1-methyl Naphthalene	µg/g	0.59	30	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Surrogate	Unit		Acceptable Limits					
Chrysene-d12	%		50-140			78	75	73

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use, B Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8806821-8806826 Results are based on the dry weight of the soil.
Note: The result for Benzo(b)Fluoranthene is the total of the Benzo(b)&(j)Fluoranthene isomers because the isomers co-elute on the GC column.

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 17T270428

PROJECT: 17-1798GHE

CLIENT NAME: GEOPRO CONSULTING LTD

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - PHCs F1 - F4 (with PAHs) (Soil)

DATE RECEIVED: 2017-10-11

DATE REPORTED: 2017-10-19

					SAMPLE DESCRIPTION:	BH7 SS2	BH8 SS2	BH9 SS2+SS3
					SAMPLE TYPE:	Soil	Soil	Soil
					DATE SAMPLED:	2017-10-06	2017-10-06	2017-10-06
Parameter	Unit	G / S: A	G / S: B	RDL		8806821	8806822	8806826
Benzene	µg/g	0.02	0.32	0.02		<0.02[<A]	<0.02[<A]	<0.02[<A]
Toluene	µg/g	0.2	6.4	0.08		<0.08[<A]	<0.08[<A]	<0.08[<A]
Ethylbenzene	µg/g	0.05	1.1	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Xylene Mixture	µg/g	0.05	26	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
F1 (C6 to C10)	µg/g	25	55	5		<5[<A]	<5[<A]	<5[<A]
F1 (C6 to C10) minus BTEX	µg/g	25	55	5		<5[<A]	<5[<A]	<5[<A]
F2 (C10 to C16)	µg/g	10	230	10		<10[<A]	<10[<A]	<10[<A]
F2 (C10 to C16) minus Naphthalene	µg/g			10		<10	<10	<10
F3 (C16 to C34)	µg/g	240	1700	50		<50[<A]	<50[<A]	<50[<A]
F3 (C16 to C34) minus PAHs	µg/g			50		<50	<50	<50
F4 (C34 to C50)	µg/g	120	3300	50		<50[<A]	<50[<A]	<50[<A]
Gravimetric Heavy Hydrocarbons	µg/g	120	3300	50		NA[<A]	NA[<A]	NA[<A]
Moisture Content	%			0.1		18.0	12.0	13.0
Surrogate	Unit	Acceptable Limits						
Terphenyl	%	60-140				97	102	85

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use, B Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8806821-8806826 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX and PAH contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.

Certified By: N Popnikolof

AGAT Laboratories

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Guideline Violation

AGAT WORK ORDER: 17T270428

PROJECT: 17-1798GHE

CLIENT NAME: GEOPRO CONSULTING LTD

ATTENTION TO: Bujing Guan

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
8806821	BH7 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	0.57	1.57
8806821	BH7 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	NA	2.4	7.13
8806821	BH7 SS2	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	1.4	1.57
8806822	BH8 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	0.57	0.975
8806822	BH8 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	NA	2.4	7.14
8806826	BH9 SS2+SS3	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	0.57	0.599
8806826	BH9 SS2+SS3	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	NA	2.4	4.57

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Quality Assurance

CLIENT NAME: GEOPRO CONSULTING LTD

AGAT WORK ORDER: 17T270428

PROJECT: 17-1798GHE

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Oct 19, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	8804995		<0.8	<0.8	NA	< 0.8	106%	70%	130%	103%	80%	120%	83%	70%	130%
Arsenic	8804995		5	5	0.0%	< 1	97%	70%	130%	97%	80%	120%	106%	70%	130%
Barium	8804995		78	76	2.6%	< 2	95%	70%	130%	95%	80%	120%	90%	70%	130%
Beryllium	8804995		0.8	0.8	NA	< 0.5	82%	70%	130%	94%	80%	120%	110%	70%	130%
Boron	8804995		6	7	NA	< 5	92%	70%	130%	93%	80%	120%	82%	70%	130%
Boron (Hot Water Soluble)	8813885		0.11	0.10	NA	< 0.10	99%	60%	140%	102%	70%	130%	101%	60%	140%
Cadmium	8804995		<0.5	<0.5	NA	< 0.5	94%	70%	130%	93%	80%	120%	98%	70%	130%
Chromium	8804995		21	20	4.9%	< 2	81%	70%	130%	103%	80%	120%	101%	70%	130%
Cobalt	8804995		10.1	10.0	1.0%	< 0.5	85%	70%	130%	92%	80%	120%	97%	70%	130%
Copper	8804995		26	25	3.9%	< 1	86%	70%	130%	99%	80%	120%	90%	70%	130%
Lead	8804995		14	13	7.4%	< 1	94%	70%	130%	94%	80%	120%	95%	70%	130%
Molybdenum	8804995		<0.5	<0.5	NA	< 0.5	87%	70%	130%	95%	80%	120%	98%	70%	130%
Nickel	8804995		22	21	4.7%	< 1	88%	70%	130%	93%	80%	120%	96%	70%	130%
Selenium	8804995		<0.4	<0.4	NA	< 0.4	80%	70%	130%	94%	80%	120%	99%	70%	130%
Silver	8804995		<0.2	<0.2	NA	< 0.2	74%	70%	130%	85%	80%	120%	81%	70%	130%
Thallium	8804995		<0.4	<0.4	NA	< 0.4	83%	70%	130%	90%	80%	120%	93%	70%	130%
Uranium	8804995		0.6	0.6	NA	< 0.5	84%	70%	130%	93%	80%	120%	100%	70%	130%
Vanadium	8804995		29	28	3.5%	< 1	86%	70%	130%	92%	80%	120%	93%	70%	130%
Zinc	8804995		61	60	1.7%	< 5	95%	70%	130%	100%	80%	120%	109%	70%	130%
Chromium VI	8807614		<0.2	<0.2	NA	< 0.2	97%	70%	130%	99%	80%	120%	99%	70%	130%
Cyanide	8806821	8806821	<0.040	<0.040	NA	< 0.040	98%	70%	130%	99%	80%	120%	107%	70%	130%
Mercury	8804995		<0.10	<0.10	NA	< 0.10	88%	70%	130%	89%	80%	120%	96%	70%	130%
Electrical Conductivity	8808760		0.093	0.094	1.1%	< 0.005	97%	90%	110%	NA			NA		
Sodium Adsorption Ratio	8808760		0.592	0.586	1.0%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	8807895		8.40	8.32	1.0%	NA	101%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Amanjot Bhela

AGAT Laboratories

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Quality Assurance

CLIENT NAME: GEOPRO CONSULTING LTD

AGAT WORK ORDER: 17T270428

PROJECT: 17-1798GHE

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Oct 19, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PHCs F1 - F4 (with PAHs) (Soil)															
Benzene	8802662		< 0.02	< 0.02	NA	< 0.02	72%	60%	130%	83%	60%	130%	107%	60%	130%
Toluene	8802662		< 0.08	< 0.08	NA	< 0.08	76%	60%	130%	74%	60%	130%	101%	60%	130%
Ethylbenzene	8802662		< 0.05	< 0.05	NA	< 0.05	75%	60%	130%	71%	60%	130%	96%	60%	130%
Xylene Mixture	8802662		< 0.05	< 0.05	NA	< 0.05	73%	60%	130%	72%	60%	130%	92%	60%	130%
F1 (C6 to C10)	8802662		< 5	< 5	NA	< 5	70%	60%	130%	86%	85%	115%	77%	70%	130%
F2 (C10 to C16)	8808212		< 10	< 10	NA	< 10	105%	60%	130%	85%	80%	120%	72%	70%	130%
F3 (C16 to C34)	8808212		< 50	< 50	NA	< 50	108%	60%	130%	88%	80%	120%	75%	70%	130%
F4 (C34 to C50)	8808212		< 50	< 50	NA	< 50	90%	60%	130%	87%	80%	120%	118%	70%	130%
O. Reg. 153(511) - PAHs (Soil)															
Naphthalene	8808305		< 0.05	< 0.05	NA	< 0.05	113%	50%	140%	96%	50%	140%	60%	50%	140%
Acenaphthylene	8808305		< 0.05	< 0.05	NA	< 0.05	106%	50%	140%	82%	50%	140%	79%	50%	140%
Acenaphthene	8808305		< 0.05	< 0.05	NA	< 0.05	105%	50%	140%	82%	50%	140%	62%	50%	140%
Fluorene	8808305		< 0.05	< 0.05	NA	< 0.05	95%	50%	140%	72%	50%	140%	80%	50%	140%
Phenanthrene	8808305		< 0.05	< 0.05	NA	< 0.05	79%	50%	140%	65%	50%	140%	62%	50%	140%
Anthracene	8808305		< 0.05	< 0.05	NA	< 0.05	97%	50%	140%	82%	50%	140%	65%	50%	140%
Fluoranthene	8808305		< 0.05	< 0.05	NA	< 0.05	82%	50%	140%	63%	50%	140%	63%	50%	140%
Pyrene	8808305		< 0.05	< 0.05	NA	< 0.05	81%	50%	140%	63%	50%	140%	63%	50%	140%
Benz(a)anthracene	8808305		< 0.05	< 0.05	NA	< 0.05	69%	50%	140%	75%	50%	140%	67%	50%	140%
Chrysene	8808305		< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	69%	50%	140%	62%	50%	140%
Benzo(b)fluoranthene	8808305		< 0.05	< 0.05	NA	< 0.05	101%	50%	140%	114%	50%	140%	72%	50%	140%
Benzo(k)fluoranthene	8808305		< 0.05	< 0.05	NA	< 0.05	108%	50%	140%	104%	50%	140%	88%	50%	140%
Benzo(a)pyrene	8808305		< 0.05	< 0.05	NA	< 0.05	115%	50%	140%	105%	50%	140%	68%	50%	140%
Indeno(1,2,3-cd)pyrene	8808305		< 0.05	< 0.05	NA	< 0.05	121%	50%	140%	82%	50%	140%	68%	50%	140%
Dibenz(a,h)anthracene	8808305		< 0.05	< 0.05	NA	< 0.05	117%	50%	140%	90%	50%	140%	69%	50%	140%
Benzo(g,h,i)perylene	8808305		< 0.05	< 0.05	NA	< 0.05	113%	50%	140%	88%	50%	140%	66%	50%	140%
2-and 1-methyl Naphthalene	8808305		< 0.05	< 0.05	NA	< 0.05	122%	50%	140%	97%	50%	140%	64%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

AGAT Laboratories

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Method Summary

CLIENT NAME: GEOPRO CONSULTING LTD

AGAT WORK ORDER: 17T270428

PROJECT: 17-1798GHE

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

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Method Summary

CLIENT NAME: GEOPRO CONSULTING LTD

AGAT WORK ORDER: 17T270428

PROJECT: 17-1798GHE

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Naphthalene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Acenaphthylene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Acenaphthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Fluorene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Phenanthrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Anthracene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Fluoranthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Pyrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benz(a)anthracene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Chrysene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(b)fluoranthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(k)fluoranthene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(a)pyrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Indeno(1,2,3-cd)pyrene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Dibenz(a,h)anthracene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzo(g,h,i)perylene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
2-and 1-methyl Naphthalene	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Chrysene-d12	ORG-91-5106	EPA SW846 3541 & 8270	GC/MS
Benzene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Toluene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Ethylbenzene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Xylene Mixture	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
F1 (C6 to C10)	VOL-91-5009	CCME Tier 1 Method	GC / FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	CCME Tier 1 Method	GC / FID
F2 (C10 to C16)	VOL-91-5009	CCME Tier 1 Method	GC / FID
F2 (C10 to C16) minus Naphthalene	VOL-91-5009	CCME Tier 1 Method	GC / FID
F3 (C16 to C34)	VOL-91-5009	CCME Tier 1 Method	GC / FID
F3 (C16 to C34) minus PAHs	VOL-91-5009	CCME Tier 1 Method	GC / FID
F4 (C34 to C50)	VOL-91-5009	CCME Tier 1 Method	GC / FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009		GC/FID

AGAT Laboratories

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Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 17T270428

Cooler Quantity:

Arrival Temperatures: 6.8 | 7.9 | 6.2

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: Geo Pro Consulting Ltd.
Contact: Bujing Guan.
Address: 40 Vogel Road, Unit 17, Richmond Hill, Ontario
Phone: 905-237-8336 Fax: 905-268-3689
Reports to be sent to:
1. Email: bguan@geoproconsulting.ca
2. Email: willsun@geoproconsulting.ca

Regulatory Requirements:

☐ No Regulatory Requirement
(Please check all applicable boxes)

☑ Regulation 153/04
Table I II (Indicate One)
☑ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture (Check One)
☑ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Is this submission for a Record of Site Condition? ☐ Yes ☑ No

Report Guideline on Certificate of Analysis ☑ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: 17-1798 GHE
Site Location: Living ARTS Drive, Mississauga.
Sampled By: George Hao.
AGAT Quote #: Geopro PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact:
Address:
Email:

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Y/N)	O. Reg 153: Metals and Inorganics	O. Reg 153: All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides)	O. Reg 153: ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr6+ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☑ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use
BH7 SS2	2017/10/06		4	Soil			✓						✓	✓		✓			
BH8 SS2	2017/10/06		4	Soil			✓						✓	✓		✓			
BH9 SS2+SS3	2017/10/06		4	Soil			✓						✓	✓		✓			

Samples Relinquished By (Print Name and Sign):	Date: 2017/10/11	Time:	Samples Received By (Print Name and Sign):	Date: 17/10/11	Time: 12:05
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:
Samples Relinquished By (Print Name and Sign):	Date: 17/10/11	Time: 3:40	Samples Received By (Print Name and Sign):	Date:	Time:

Page 1 of 1

N°: T 059116

Document ID: DIV-TR-151-014

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AGAT Laboratories

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TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: GEOPRO CONSULTING LTD
40 VOGELL ROAD UNIT 25-27
RICHMOND HILL, ON L4B3N6
(905) 237-8336

ATTENTION TO: Bujing Guan

PROJECT: 17-1798GHE

AGAT WORK ORDER: 17T270430

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

DATE REPORTED: Oct 20, 2017

PAGES (INCLUDING COVER): 9

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 17T270430

PROJECT: 17-1798GHE

CLIENT NAME: GEOPRO CONSULTING LTD

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

Ignitability in Soil

DATE RECEIVED: 2017-10-11

DATE REPORTED: 2017-10-20

			SAMPLE DESCRIPTION:		Composite
			SAMPLE TYPE:		Soil
			DATE SAMPLED:		2017-10-06
Parameter	Unit	G / S		RDL	8806753
Ignitability					N

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

8806753 N = Non-Flammable Solid
Wet soil sample with pebbles.

Certified By: Amanjot Bhela

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 17T270430

PROJECT: 17-1798GHE

CLIENT NAME: GEOPRO CONSULTING LTD

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

O. Reg. 558 Metals and Inorganics

DATE RECEIVED: 2017-10-11

DATE REPORTED: 2017-10-20

		SAMPLE DESCRIPTION:		Composite
		SAMPLE TYPE:		Soil
		DATE SAMPLED:		2017-10-06
Parameter	Unit	G / S	RDL	8806753
Arsenic Leachate	mg/L	2.5	0.010	<0.010
Barium Leachate	mg/L	100	0.100	0.619
Boron Leachate	mg/L	500	0.050	0.091
Cadmium Leachate	mg/L	0.5	0.010	<0.010
Chromium Leachate	mg/L	5	0.010	<0.010
Lead Leachate	mg/L	5	0.010	<0.010
Mercury Leachate	mg/L	0.1	0.01	<0.01
Selenium Leachate	mg/L	1	0.010	<0.010
Silver Leachate	mg/L	5	0.010	<0.010
Uranium Leachate	mg/L	10	0.050	<0.050
Fluoride Leachate	mg/L	150	0.05	0.29
Cyanide Leachate	mg/L	20	0.05	<0.05
(Nitrate + Nitrite) as N Leachate	mg/L	1000	0.70	<0.70

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By: Amanjot Bhela

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Certificate of Analysis

AGAT WORK ORDER: 17T270430

PROJECT: 17-1798GHE

CLIENT NAME: GEOPRO CONSULTING LTD

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

O. Reg. 558 - Benzo(a) pyrene

DATE RECEIVED: 2017-10-11

DATE REPORTED: 2017-10-20

				SAMPLE DESCRIPTION:	Composite
				SAMPLE TYPE:	Soil
				DATE SAMPLED:	2017-10-06
Parameter	Unit	G / S	RDL	8806753	
Benzo(a)pyrene	mg/L	0.001	0.001	<0.001	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8806753 The sample was leached according to Regulation 558 protocol. Analysis was performed on the leachate.

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 17T270430

PROJECT: 17-1798GHE

CLIENT NAME: GEOPRO CONSULTING LTD

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

O. Reg. 558 - VOCs

DATE RECEIVED: 2017-10-11

DATE REPORTED: 2017-10-20

		SAMPLE DESCRIPTION:		Composite
		SAMPLE TYPE:		Soil
		DATE SAMPLED:		2017-10-06
Parameter	Unit	G / S	RDL	8806753
Vinyl Chloride	mg/L	0.2	0.030	<0.030
1,1 Dichloroethene	mg/L	1.4	0.020	<0.020
Dichloromethane	mg/L	5.0	0.030	<0.030
Methyl Ethyl Ketone	mg/L	200	0.090	<0.090
Chloroform	mg/L	10.0	0.020	<0.020
1,2-Dichloroethane	mg/L	0.5	0.020	<0.020
Carbon Tetrachloride	mg/L	0.5	0.020	<0.020
Benzene	mg/L	0.5	0.020	<0.020
Trichloroethene	mg/L	5.0	0.020	<0.020
Tetrachloroethene	mg/L	3.0	0.050	<0.050
Chlorobenzene	mg/L	8.0	0.010	<0.010
1,2-Dichlorobenzene	mg/L	20.0	0.010	<0.010
1,4-Dichlorobenzene	mg/L	0.5	0.010	<0.010
Surrogate	Unit	Acceptable Limits		
Toluene-d8	% Recovery	60-130		99

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8806753 Sample was prepared using Regulation 558 protocol and a zero headspace extractor.

Certified By:

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Quality Assurance

CLIENT NAME: GEOPRO CONSULTING LTD

AGAT WORK ORDER: 17T270430

PROJECT: 17-1798GHE

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Oct 20, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 558 Metals and Inorganics															
Arsenic Leachate	8806893		<0.010	<0.010	NA	< 0.010	105%	90%	110%	108%	80%	120%	111%	70%	130%
Barium Leachate	8806893		0.398	0.398	NA	< 0.100	108%	90%	110%	108%	80%	120%	112%	70%	130%
Boron Leachate	8806893		<0.050	<0.050	NA	< 0.050	107%	90%	110%	101%	80%	120%	84%	70%	130%
Cadmium Leachate	8806893		<0.010	<0.010	NA	< 0.010	109%	90%	110%	107%	80%	120%	112%	70%	130%
Chromium Leachate	8806893		<0.010	<0.010	NA	< 0.010	100%	90%	110%	114%	80%	120%	114%	70%	130%
Lead Leachate	8806893		<0.010	<0.010	NA	< 0.010	99%	90%	110%	100%	80%	120%	94%	70%	130%
Mercury Leachate	8806893		<0.01	<0.01	NA	< 0.01	107%	90%	110%	92%	80%	120%	90%	70%	130%
Selenium Leachate	8806893		<0.010	<0.010	NA	< 0.010	103%	90%	110%	97%	80%	120%	97%	70%	130%
Silver Leachate	8806893		<0.010	<0.010	NA	< 0.010	110%	90%	110%	107%	80%	120%	101%	70%	130%
Uranium Leachate	8806893		<0.050	<0.050	NA	< 0.050	101%	90%	110%	106%	80%	120%	106%	70%	130%
Fluoride Leachate	8806893		0.29	0.29	0.0%	< 0.05	100%	90%	110%	103%	90%	110%	94%	70%	130%
Cyanide Leachate	8806893		<0.05	<0.05	NA	< 0.05	98%	90%	110%	99%	90%	110%	108%	70%	130%
(Nitrate + Nitrite) as N Leachate	8806893		<0.70	<0.70	NA	< 0.70	96%	80%	120%	95%	80%	120%	89%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Amanjot Bhela

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Quality Assurance

CLIENT NAME: GEOPRO CONSULTING LTD

AGAT WORK ORDER: 17T270430

PROJECT: 17-1798GHE

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Oct 20, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 558 - VOCs															
Vinyl Chloride	8806753	8806753	< 0.030	< 0.030	NA	< 0.030	101%	60%	140%	79%	60%	140%	NA	60%	140%
1,1 Dichloroethene	8806753	8806753	< 0.020	< 0.020	NA	< 0.020	99%	70%	130%	72%	70%	130%	NA	60%	140%
Dichloromethane	8806753	8806753	< 0.030	< 0.030	NA	< 0.030	113%	70%	130%	100%	70%	130%	NA	60%	140%
Methyl Ethyl Ketone	8806753	8806753	< 0.090	< 0.090	NA	< 0.090	96%	70%	130%	82%	70%	130%	NA	60%	140%
Chloroform	8806753	8806753	< 0.020	< 0.020	NA	< 0.020	116%	70%	130%	96%	70%	130%	NA	60%	140%
1,2-Dichloroethane	8806753	8806753	< 0.020	< 0.020	NA	< 0.020	102%	70%	130%	102%	70%	130%	NA	60%	140%
Carbon Tetrachloride	8806753	8806753	< 0.020	< 0.020	NA	< 0.020	72%	70%	130%	78%	70%	130%	NA	60%	140%
Benzene	8806753	8806753	< 0.020	< 0.020	NA	< 0.020	81%	70%	130%	82%	70%	130%	NA	60%	140%
Trichloroethene	8806753	8806753	< 0.020	< 0.020	NA	< 0.020	76%	70%	130%	100%	70%	130%	NA	60%	140%
Tetrachloroethene	8806753	8806753	< 0.050	< 0.050	NA	< 0.050	72%	70%	130%	89%	70%	130%	NA	60%	140%
Chlorobenzene	8806753	8806753	< 0.010	< 0.010	NA	< 0.010	98%	70%	130%	100%	70%	130%	NA	60%	140%
1,2-Dichlorobenzene	8806753	8806753	< 0.010	< 0.010	NA	< 0.010	102%	70%	130%	102%	70%	130%	NA	60%	140%
1,4-Dichlorobenzene	8806753	8806753	< 0.010	< 0.010	NA	< 0.010	116%	70%	130%	109%	70%	130%	NA	60%	140%
O. Reg. 558 - Benzo(a) pyrene															
Benzo(a)pyrene		TW	< 0.001	< 0.001	NA	< 0.001	110%	70%	130%	108%	70%	130%	NA	70%	130%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

AGAT Laboratories

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Method Summary

CLIENT NAME: GEOPRO CONSULTING LTD

AGAT WORK ORDER: 17T270430

PROJECT: 17-1798GHE

ATTENTION TO: Bujing Guan

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Ignitability		EPA SW-846 1030	BURN MOLD
Arsenic Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Barium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Boron Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Cadmium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Chromium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Lead Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Mercury Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Selenium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Silver Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Uranium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Fluoride Leachate	INOR-93-6018	EPA SW-846-1311 & SM4500-F- C	ION SELECTIVE ELECTRODE
Cyanide Leachate	INOR-93-6052	EPA SW-846-1311 & MOE 3015 & SM 4500 CN- I	TECHNICON AUTO ANALYZER
(Nitrate + Nitrite) as N Leachate	INOR-93-6053	EPA SW 846-1311 & SM 4500 - NO3- I	LACHAT FIA
Trace Organics Analysis			
Benzo(a)pyrene	ORG-91-5114	EPA SW846 3540 & 8270	GC/MS
Vinyl Chloride	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,1 Dichloroethene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Dichloromethane	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Chloroform	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Benzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Trichloroethene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Tetrachloroethene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Chlorobenzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Toluene-d8	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS

AGAT Laboratories

1 1 5

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webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 17T270430

Cooler Quantity:

Arrival Temperatures: 7.9 | 7.1 | 6.8 / 5.9 | 6.1 | 6.3

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes:

Report Information:

Company: Geo Pro Consulting Ltd.
Contact: Buying Guan
Address: 40 Vogell. Unit 5-7. Richmond Hill Ontario
Phone: 905-237-8336 Fax: 905-248-3689
Reports to be sent to:
1. Email: bguan@geoproconsulting.ca
2. Email: willsun@geoproconsulting.ca

Regulatory Requirements:

(Please check all applicable boxes)

☐ No Regulatory Requirement

☐ Regulation 153/04
Table ____ (Indicate One)
☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Sewer Use
☐ Sanitary ☐ Storm
Region ____ (Indicate One)
☐ MISA

☑ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
____ (Indicate One)

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
TAT is exclusive of weekends and statutory holidays

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: 17-1798 GHE
Site Location: Living Arts Drive, Mississauga
Sampled By: George Hao.
AGAT Quote #: Geopro PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a Record of Site Condition? ☐ Yes ☑ No

Report Guideline on Certificate of Analysis ☑ Yes ☐ No

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company: Geo Pro Consulting Ltd.
Contact: Buying Guan
Address: 40 Vogell Road. Unit 7 Richmond Hill
Email: bguan@geoproconsulting.ca

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y/N	O. Reg 153: Metals and Inorganics (☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides))	ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides (TCLP: ☐ M&I ☑ VOCs ☐ ABNs ☑ B/P ☐ PCBs)	Same as liability
composite	20171006		4	Soil													

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page 1 of 1

N°: T 059110

Document ID: DW-78-111-014

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Date Issued: February 22, 2017

LIMITATIONS TO THE REPORT

This report is intended solely for the Client named. The report is prepared based on the work has been undertaken in accordance with normally accepted geotechnical engineering practices in Ontario.

The comments and recommendations given in this report are based on information determined at the limited number of the test hole and test pit locations. The boundaries between the various strata as shown on the borehole logs are based on non-continuous sampling and represent an inferred transition between the various strata and their lateral continuation rather than a precise plane of geological change. Subsurface and groundwater conditions between and beyond the test holes and test pits may differ significantly from those encountered at the test hole and test pit locations. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole and test pit locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The report reflects our best judgment based on the information available to GeoPro Consulting Limited at the time of preparation. Unless otherwise agreed in writing by GeoPro Consulting Limited, it shall not be used to express or imply warranty as to any other purposes. No portion of this report shall be used as a separate entity, it is written to be read in its entirety. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated.

The design recommendations given in this report are applicable only to the project designed and constructed completely in accordance with the details stated in this report. Otherwise, our responsibility is limited to interpreting the subsurface information at the borehole or test pit locations.

Should any comments and recommendations provided in this report be made on any construction related issues, they are intended only for the guidance of the designers. The number of test holes and test pits may not be sufficient to determine all the factors that may affect construction activities, methods and costs. Such as, the thickness of surficial topsoil or fill layers may vary significantly and unpredictably; the amount of the cobbles and boulders may vary significantly than what described in the report; unexpected water bearing zones/layers with various thickness and extent may be encountered in the fill and native soils. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and make their own conclusions as to how the subsurface conditions may affect their work and determine the proper construction methods.

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. GeoPro Consulting Limited 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.