GOLDER

REPORT

PAVEMENT/GEOTECHNICAL AND ENVIRONMENTAL INVESTIGATION AND PRELIMINARY DESIGN REPORT

Airport Road from Braydon Boulevard/Stonecrest Drive to Countryside Drive
City of Brampton

Submitted to:

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1.0 INTRODUCTION

The Region of Peel (Region) intends to widen Airport Road (Regional Road 7) to six lanes and rehabilitate the existing lanes from 300 m south of Braydon Boulevard/Stonecrest Drive to 300 m north of Countryside Drive in the City of Brampton, a distance of approximately 2.2 km. The Region has retained by HDR Inc. (HDR) as the Design Consultant and HDR in turn has retained Golder Associates Ltd. (Golder) to carry out the geotechnical/pavement investigation for the preliminary design as part of a Schedule 'C' Class Environmental Assessment. HDR has also retained Golder to carry out the chemical analysis and excess soil characterization of the subsurface soils throughout the project limits. Refer to Figure 1 – Key Plan, for the site location.

The terms of reference and scope of work for the investigation and design services were outlined in the Request for Proposal (RFP) 2017-079P, issued by the Region dated January 17, 2017, Addenda 1 to 2, and Golder's proposal to HDR dated February 8, 2017.

This report should be read in conjunction with the "Important Information and Limitations of this Report" attached at the end of the report. The reader's attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report.

The factual data, interpretations and recommendations contained in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. If the project is modified in concept, location or elevation, or if the project is not initiated within two years of the date of the report, Golder should be given an opportunity to confirm that the recommendations are still valid.

2.0 PROJECT UNDERSTANDING

The existing road consists of four through lanes with additional left and right turn lanes near intersections. The proposed improvements include widening to accommodate six through lanes and a centre median of varying widths. The purpose of the investigation was to evaluate the existing pavement structure and the subgrade and drainage conditions along Airport Road and provide pavement design recommendations for the proposed widening, as well as the rehabilitation of the existing lanes.

3.0 WORK PROGRAM

The pavement/environmental scope of work along Airport Road consisted of the following:

1) Visual pavement condition survey of Airport Road to evaluate the existing condition of the pavement, in accordance with the Ontario Ministry of Transportation (MTO)'s Manual for Condition Rating of Flexible Pavements, SP-024;

2) Marking/staking all proposed borehole locations and arranging clearance of underground utilities at the proposed borehole locations;

3) Advancing boreholes to a depth of about 1.5 m at selected locations along the existing main lanes, proposed widening areas on both sides and at various intersecting sideroads;

4) Laboratory testing of selected representative samples of the granular base, subbase and subgrade soils to assess the material characteristics including grain size distribution, Atterberg Limits and water content;

5) Pavement analysis and design recommendations included in a Pavement Design Report; and

6) Interpretation and comparison of the environmental analytical results to the soil quality standards set out in "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act" (April 2011), and Ontario Regulation 347.

4.0 INVESTIGATION PROCEDURE

The field work for this project was carried out in October and November 2019, at which time 42 boreholes were advanced to a depth of approximately 1.5 m. Of the 42 boreholes drilled to 1.5 m depth, 19 were drilled through the lanes of the roadway, 16 boreholes were drilled on the proposed widening areas to the east and west of Airport Road, and 7 through various intersecting sideroads. Two (2) other boreholes were advanced to depths of 6.6 m and 8.1 m to obtain geotechnical information for the design of the foundation for a culvert. The locations of all boreholes are shown on the Borehole Location Plan (see Figure 2, attached). The boreholes were drilled using solid stem augers advanced by truck mounted drill rigs supplied and operated by specialist drilling contractors, subcontracted to Golder. The groundwater conditions were noted in the open boreholes during drilling. The soil samples obtained during the site investigation were brought to our Whitby laboratory where further examination and classification testing (i.e. water contents, grain size distributions and Atterberg Limits) were carried out on selected samples.

The field work for this investigation was monitored on a full-time basis by members of Golder's engineering and technical staff, who logged the boreholes and cared for the recovered samples. The boreholes were advanced to identify and measure the individual pavement layers (hot-mix asphalt (HMA), granular base/subbase, etc.), assess the type of subgrade soils and groundwater conditions, and obtain material samples for laboratory testing.

It should be noted that the boundaries between the strata have been inferred from drilling observations and non-continuous samples. They generally represent a transition from one soil type to another and should not be inferred to represent an exact plane of geological change. Furthermore, conditions will vary between and beyond the boreholes.

The information obtained from the boreholes and the results of laboratory testing carried out on selected samples are presented on the Record of Borehole Sheets in Appendix B.

5.0 SOIL AND PAVEMENT DATA

The following sections present the existing pavement condition based on the visual condition survey, pavement structure and subgrade soil conditions encountered in the boreholes, and the results of the laboratory testing carried out on selected samples of the granular base, subbase and subgrade soils.

5.1 Pavement Performance (Existing Condition)

In October of 2019, Golder carried out a visual pavement condition inspection of Airport Road between Braydon Boulevard/Stonecrest Drive and Countryside Drive.

The pavement on Airport Road is generally in fair condition with localized areas in poor condition. Some of the transverse and longitudinal cracks have been sealed with rubberized asphalt, and the sealant is generally performing well. The majority of this section of Airport Road has an urban cross-section (curb and gutter system), with catch basins for drainage. The following types, severities and densities of surface distresses were observed:

- Extensive, moderate to severe transverse cracking;
- Frequent slight to moderate longitudinal wheel path cracking;
- Intermittent, slight alligator cracking;

- Extensive slight to severe opening of longitudinal construction joints;
- Intermittent slight to moderate map cracking;
- Frequent slight to moderate pavement edge cracking;
- Intermittent, very slight rutting; and
- Few severe potholes.

The Pavement Condition Rating (PCR) assigned to this section of Airport Road is 62.

Photos 1 to 4 in Appendix A show examples of the condition of the pavement on Airport Road between Braydon Boulevard/Stonecrest Drive to Countryside Drive.

5.2 Pavement Structure

In all 19 boreholes drilled through the lanes, a layer of granular base is present immediately under the HMA but the granular base layer was underlain by a granular subbase layer in only 10 of the 19 boreholes. The remainder of the boreholes had granular base only. The existing pavement structures encountered in the boreholes drilled along Airport Road are summarized in Table 1.

Table 1: Summary of Existing Pavement Structure on Airport Road

Section	Pavement Component	Pavement Thickness on Mainlanes	
		Range (mm)	60th Percentile Value (mm)
Airport Road	HMA	150 – 290	200
	Granular Base	130 – 1340	650 (Combined)
	Granular Subbase	0 – 880	
	[1]Total Pavement Thickness	690 - 1520	850

[1]The average total pavement thickness is 1100 mm.

Gradation testing was carried out on 5 of the granular base samples. The results indicated that 1 of the samples tested satisfied the current OPSS.PROV 1010 gradation requirements for Granular A. In most cases, the samples were too fine or too coarse on some or most of the sieve sizes, as shown on Figure C1 in Appendix C. The water content of the granular base samples ranged from 2 to 9 percent.

Granular subbase was encountered in about 50 percent of the boreholes. Gradation testing was carried out on three (3) granular subbase samples. None of the subbase samples satisfied the current OPSS.PROV 1010 gradation requirements for Granular B, Type I, generally due to excessive material passing the 75 µm sieve, as shown on Figure C2 in Appendix C. The water content of the granular subbase samples tested ranged from 4 to 10 percent.

5.3 Subgrade Soils

The predominant subgrade soil type encountered in the boreholes is clayey silt/silty clay with varying amounts of sand and gravel. Laboratory testing was carried out on selected samples of the subgrade materials. The subgrade soils were generally in a moist condition. The in-situ water contents of the silty clay/clayey silt subgrade materials

generally ranged from about 11 to 19 percent, and the moisture content of the silt and sand fill materials ranged from 7 to 9 percent. The results of particle size distribution testing carried out on the subgrade soil samples are shown on Figures C3 to C5, in Appendix C.

Atterberg limits of the subgrade material showed that the silty clay/clayey silt was of low plasticity (CL). The results of the Atterberg testing are shown on Figures C6 and C7, in Appendix C. Fill materials consisting of sand with varying amounts of silt, silty clay/clayey silt and an isolated area of silt were encountered in the boreholes advanced in the proposed widening areas east and west of Airport Road underlying the topsoil and underlying the granular materials. Fill materials were also encountered under the pavement structure on Airport Road in some of the boreholes.

5.3.1 Frost Susceptibility

The frost susceptibility of the subgrade soils has been assessed using the Ministry of Transportation of Ontario's ("MTO") guidelines, which are based on the percentage of silt particles coarser than 5 µm, as outlined in Table 2.

Table 2: MTO Frost Susceptibility Guidelines

Grain Size (75 – 5 µm)	Susceptibility to Frost Heaving
0 – 40 %	Low
40 – 55 %	Moderate
55 – 100 %	High

The subgrade soils tested generally had low susceptibility to frost heave, with the exception of one sample from BH 18-39 advanced in the proposed widening area which has high susceptibility to frost heave; the highly frost susceptible soil was encountered between 0.69 m and 1.45 m below ground surface.

5.4 Groundwater

The pavement boreholes advanced to a depth of 1.5 m were dry upon completion of drilling. It is expected that the groundwater levels will fluctuate, being higher during wet periods (i.e. spring thaw) and lower during the drier, summer periods.

Groundwater was encountered in one (1) of the two (2) deep boreholes drilled for the culvert investigation. The water level is recorded on the Record of Boreholes in Appendix B. A standpipe piezometer was installed in BH18-F2 to monitor the groundwater level at the site. The groundwater level measurements in the monitoring well was measured to be 3.2 m below the existing ground surface on January 7th, 2020, about 6 weeks after completion of drilling. It should be noted that these observations reflect the groundwater conditions encountered in the monitoring well during the time of the field investigation (January 2020) and some seasonal fluctuations should be anticipated.

6.0 PAVEMENT DESIGN AND ANALYSIS

This section of the report provides engineering information for the geotechnical/pavement design aspects of the project, based on our interpretation of the data obtained during this investigation, and our understanding of the project requirements. The information in this portion of the report is provided for the guidance of the design engineers. Where comments are made on construction, they are provided only in order to highlight aspects of construction which could affect the design of the project. Contractors bidding on or undertaking any work at the site

should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction and make their own interpretation of the factual data as it affects their proposed construction techniques, schedule, equipment capabilities, costs, sequencing and the like.

6.1 Traffic Data and Road Classification

The traffic data for Airport Road provided by HDR in an email dated January 27, 2020 is summarized in Table 3.

Table 3: Traffic Data for Airport Road

Parameters	Values
Road Classification	Major Arterial
AADT (2011)[1] Four Lanes	20,000
AADT (2021)[1] Four Lanes (existing)	30,500
AADT (2031)[1] Six Lanes (with improvements)	42,000
% Commercial Vehicles[1]	8%
Annual Traffic Growth Rate	3.25%

[1]Information used for estimating ESALs is based on data provided by HDR in email dated January 27, 2020.

6.2 AASHTO Design Analysis

The designs for the rehabilitation and widening of the pavements within the project limits have been developed using the “1993 AASHTO Guide for the Design of Pavement Structures”. Traffic load calculation has been carried out in accordance with MTO’s “Procedures for Estimating Traffic Loads for Pavement Design, 1995”. AASHTO pavement design parameters have been selected from MTO’s Materials Information Report, MI-183 “Adaptation and Verification of AASHTO Pavement Design Parameters for Ontario Conditions”, dated March 19, 2008 (MI-183).

Based on the AADT data, this section of Airport Road is considered to be a Major Arterial Road. The estimation of the Equivalent Single Axle Loads (ESALs) has been carried out over a design period of 20 years using the traffic data as well as the breakdown for commercial traffic listed in MI-183. The estimated ESALs over a 20-year design life are 14,500,000.

We understand that the Region’s minimum standard design used for widening of Urban Arterial Roads is as follows:

- 50 mm HL-1
- 100 mm HL-8 (HS)/HDBC
- 150 mm Granular A
- Minimum 450 mm Granular B

Or, match existing adjacent pavement structure.

Minimum pavement thickness = 750 mm

Structural Number (SN) = 125 mm

The results of the borehole investigation and laboratory testing were used to develop the pavement designs and the rehabilitation strategies.

The resilient modulus of the subgrade soil was estimated based the results of laboratory classification testing of the subgrade soils and the in-situ water content of the soils encountered in the boreholes. Although variable fill materials were encountered in some of the boreholes, native subgrade soil within the project limits is mainly clayey silt/silty clay with sand. Based on Table 8-6 of MI-183 “Adaptation and Verification of the AASHTO Pavement Design for Ontario Conditions” dated March 19, 2008, the recommended resilient modulus values for silty clay/clayey silt ranges between 15 MPa and 35 MPa. For the design analysis, resilient moduli of 30 MPa and 25 MPa were selected for the rehabilitation and widening designs, respectively. A higher value was used for the soil under the existing lanes, as the subgrade soil has been in place for several years with repeated traffic loading, and thus has a lower moisture content and higher strength when compared to the same soil type in the widening areas.

6.2.1 Design Parameters

The 1993 AASHTO Guide for Design of Pavement Structures (AASHTO) was used to design the pavement rehabilitation and widening of Airport Road. In accordance with MI-183, the design parameters used for the pavement design analysis are summarized in Table 4.

Table 4: Pavement Design Parameters

Parameters	Selected Values
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level (%)	90
Overall Standard Deviation	0.47
Roadbed Soil Resilient Modulus	30 MPa (Rehabilitation areas) 25 MPa (Widening areas)

6.2.2 Structural Numbers

The structural and drainage coefficients selected for the existing and new pavement materials are listed in Table 5.

Table 5: Structural and Drainage Coefficients

Material	Structural Coefficient	Drainage Coefficient
Existing HMA	0.28	1.0
Existing Granular Base	0.12	0.8
Existing Granular Subbase	0.08	0.8
New HMA	0.42	1.0
New Granular 'A' Base	0.14	1.0
New Granular 'B Type I' Subbase	0.09	1.0

The existing and required Structural Numbers (SN), as well as the calculated structural deficiency based on the analysis, are listed in Table 6 below.

Table 6: Structural Numbers

Section	[1]Existing SN (mm)	Required SN (mm)	Structural Deficiency (mm)
Existing Lanes	118	152	34
Widening	-	160	160

[1]The existing SN is based on the 60th percentile value

6.3 Alternative Pavement Designs Considered

Based on the design analysis and communications with HDR, two pavement design alternatives were developed for the rehabilitation/reconstruction of Airport Road and both are presented below. We understand that a grade raise is not permitted for the existing lanes. As such, to address the large structural deficiency the options include partial and full depth reconstruction. Option 1 involves removing the existing HMA full depth and a portion of the underlying granular materials, placing new granular base and new HMA, and; Option 2 consists of full depth reconstruction. Each option will have a specific widening design to accompany the rehabilitation design.

It should be noted, the proposed granular base thickness in the rehabilitation/ reconstruction options is greater than that of typical pavement designs because the existing granular base materials are of poor quality. Adding additional new Granular 'A' base material will provide for a good quality base for the HMA in terms of strength and drainage.

6.3.1 Option 1 – Full Depth HMA and Partial Depth Granular Removal and Replacement with New Granular Base and HMA

This option consists of removing the HMA full depth and some of the underlying granular materials, placing new Granular 'A' base and paving with new HMA.

Remove the existing HMA and granular materials to 490 mm below existing grade and place the following:

- 50 mm SP 12.5 FC1, Surface Course

- 70 mm SP 19.0, Upper Binder Course
- 70 mm SP 19.0, Lower Binder Course
- 300 mm new Granular ‘A’ Base placed in lifts not exceeding 150 mm, compacted to 100% of the material’s Standard Proctor Maximum Dry Density (SPMDD).

6.3.2 Option 1 – Widening Design

The accompanying widening design for Option 1 is as follows:

Excavate the widening area beyond the existing edge of pavement to a minimum depth of 1100 mm below the proposed finished pavement grade, and place the following:

- 50 mm SP 12.5 FC1, Surface Course
- 70 mm SP 19.0, Upper Binder Course
- 70 mm SP 19.0, Lower Binder Course
- 300 mm new Granular ‘A’ Base compacted to 100% of the material’s SPMDD
- 610 mm new Granular ‘B’ Type I Subbase in lifts not exceeding 300 mm and compacted to 100% of the material’s SPMDD.

The average existing total pavement structure thickness encountered in the existing lanes is approximately 1100 mm. As such, to mitigate differential performance between the existing and new lanes and to ensure sufficient lateral drainage the Granular A base thickness has been increased to 300 mm and the Granular B subbase thickness has been increased to 610 mm.

6.3.3 Option 2 – Full Depth Reconstruction

The full depth reconstruction option will be the same for the existing pavement as well as the widening and is as follows:

Remove the existing HMA, granular materials and subgrade soils under the existing pavement and the topsoil and underlying subgrade soils from the widening areas to 1100 mm below proposed finished grade, and place the following:

- 50 mm SP 12.5 FC1, Surface Course
- 60 mm SP 19.0, Upper Binder Course
- 70 mm SP 19.0, Lower Binder Course
- 200 mm new Granular ‘A’ Base compacted to 100% of the material’s SPMDD; and
- 720 mm new Granular ‘B Type I’ Subbase in lifts not exceeding 300 mm and compacted to 100% of the material’s SPMDD.

6.4 Life Cycle Cost Analysis

A 50 year Life Cycle Cost Analysis (LCCA) was carried out for the two pavement rehabilitation/reconstruction options considered including the accompanying widening designs, in accordance with MTO's "*Guidelines for the Use of Life Cycle Cost Analysis on MTO Freeways*" dated March 17, 2003. The initial construction costs and the life cycle costs were calculated based on unit costs provided by HDR in an email dated February 6, 2020. A five percent (5%) discount rate was assumed in the LCCA.

The details of the proposed rehabilitation strategies and the associated initial construction and life cycle costs are provided in Tables E-1 to E-3 (Appendix E) and are summarized in Table 7. The initial construction costs include the cost of the rehabilitation and widening for each option.

Table 7: Alternative Pavement Design Analysis

Design & Analysis Parameters	Option 1	Option 2
	Remove HMA full depth and portion of underlying granulars, place new granular base and HMA	Full Depth Reconstruction
Milling/Excavation (mm)	490	1100
New HMA (mm)	190	180
Existing HMA (mm)	-	-
Existing Granular Base (mm)	360	-
New Granular Base (mm)	300	200
New Granular Subbase (mm)	-	720
Structural Number (mm)	157	169
Grade Raise (mm)	None	None
Initial Construction Cost of Rehabilitation and Widening per lane per km ($)*	870,000	991,000
Initial Construction Cost Ranking	1	2

Design & Analysis Parameters	Option 1 Remove HMA full depth and portion of underlying granulars, place new granular base and HMA	Option 2 Full Depth Reconstruction
50 Years Life Cycle Cost per lane per km ($)	998,000	1,119,000
Life Cycle Cost Rating	**1**	**2**

Note: The cost of staging has not been included for any of the options.

Table 8 presents the pros and cons of each alternative based on initial and life cycle costs, ease of construction, etc.

Table 8: Pros and Cons for Pavement Design Alternatives

	Option 1 Remove HMA full depth and portion of underlying granulars, place new granular base and HMA	Option 2 Full Depth Reconstruction
Pros	➢ Reuses existing materials; ➢ Disruption to public will be less as compared to Option 2; ➢ Construction and staging duration will be less as compared to Option 2; and ➢ Life cycle cost is lower as compared to Option 2.	➢ Opportunity to address poor performing subgrade areas; ➢ Removal of aged granular subbase materials; ➢ Existing and widened sections will have very similar pavement performance; and ➢ Entirely new pavement structure.
Cons	➢ Will not address poor performing subgrade areas.	➢ More inconvenience to public as compared to Option 1; ➢ The excavation depth is the greatest; ➢ Highest initial construction costs; ➢ Highest life cycle cost; and ➢ Slowest operation.

Based on the Life Cycle Cost Analysis and the pros and cons of the options, Option 1 – Remove HMA full depth and the underlying granular materials to a depth of 490 mm, place 300 mm of new granular base and 190 mm new HMA, is the recommended strategy.

7.0 PREFERRED PAVEMENT DESIGNS

7.1 Rehabilitation of Existing Lanes

The recommended pavement rehabilitation strategy for Airport Road from Braydon Boulevard/Stonecrest Drive to Countryside Drive for a distance of approximately 2.2 km is:

Remove the existing HMA and granular materials to 490 mm below existing grade and place the following:

- 50 mm SP 12.5 FC1, Surface Course
- 70 mm SP 19.0, Upper Binder Course
- 70 mm SP 19.0, Lower Binder Course
- 300 mm new Granular 'A' Base placed in lifts not exceeding 150 mm, compacted to 100% of the material's Standard Proctor Maximum Dry Density (SPMDD).

7.2 Pavement Widening Recommendations

The recommended pavement design for the widening of the roadway is presented below.

Excavate the widening area beyond the existing edge of pavement to a minimum depth of 1100 mm below the proposed finished pavement grade, and place the following:

- 50 mm SP 12.5 FC1, Surface Course
- 70 mm SP 19.0, Upper Binder Course
- 70 mm SP 19.0, Lower Binder Course
- 300 mm new Granular 'A' Base compacted to 100% of the material's SPMDD
- 610 mm new Granular 'B' Type I Subbase in lifts not exceeding 300 mm and compacted to 100% of the material's SPMDD.

The prepared subgrade should be proof rolled, inspected and approved by a Geotechnical representative before placement of the granular subbase materials. In order to provide adequate lateral drainage for the existing pavements, the bottom of the granular subbase thickness in the widening areas should match or exceed the bottom of the granular base/subbase in the adjacent existing pavement which terminates at varying depths.

As noted in Section 5.3.1, a layer of highly frost susceptible silt was encountered in BH 18-39, between 0.69 and 1.45 m below ground surface. This borehole was drilled through the grassed area west of airport road, approximately at Station 12+850. As such, between Sta. 12+800 and 12+900, the area of the widening in the southbound direction should be subexcavated to a depth of 1.4 m below proposed finished grade, proofrolled to check for soft spots and backfilled with 300 mm of non-frost susceptible silty clay/clayey silt approved for use as earth fill and compacted to 98% of the material's SPMDD prior to placing the granular subbase. To prevent creating a bathtub under the pavement in this area, avoid granular materials as the fill.

8.0 TIE-INS AT SIDEROADS

To tie in the widening into the sideroads, mill 50 mm on the intersecting sideroad beyond the project limits for a minimum length of 0.5 m, and key in the 50 mm SP 12.5 FC1 surface course.

9.0 TOPSOIL

Topsoil encountered in the boreholes ranged in thickness from 50 mm to 100 mm. For estimating purposes, an average topsoil thickness of 80 mm can be used.

10.0 DRAINAGE

In areas where an urban cross section is proposed, a proper drainage system should be installed along the new EP immediately below the proposed subgrade elevation. The drainage system should consist of a 150 mm diameter perforated pipe, placed inside a 300 mm by 300 mm trench and surrounded by clear stone. The trench should be lined with a suitable geotextile prior to placing the clear stone. At the top of the trench, the geotextile should overlap a minimum of 300 mm. The geotextile should conform to OPSS 1860, Class II and be non-woven with a F.O.S. in the range of 75 to 150 micron. The subdrain invert should be approximately 250 mm below the bottom of the granular base.

The bottom of the granular subbase layer in the widened areas should match or exceed the bottom of the granular base/subbase layer of the existing adjacent lane or shoulder, to facilitate lateral drainage. The granular subbase thickness in the widening areas will have to be increased if highly frost susceptible soils, soft/wet soils, or organics are encountered. As such, the exposed subgrade soils in the widening areas should be inspected by a qualified geotechnical engineer before placing the granular materials.

11.0 FROST PENETRATION DEPTH

A frost penetration depth of 1.4 m can be assumed for design purposes.

12.0 ASPHALT CEMENT

It is recommended that PG 64-28 asphalt cement be used in all the HMA layers on this project. The asphalt cement quality should satisfy the Region's technical specifications.

13.0 TRAFFIC CATEGORY

The Superpave asphalt mix designs should be designed for Category D, based on the 20-year Design ESALs of 14,500,000.

14.0 TACK COAT

It is recommended that tack coat be applied between all new lifts of HMA. Tack coat should conform to the requirements of Ontario Provincial Standard Specification OPSS.PROV 308 (April 2012) and SSP 308F02 (February 2017).

15.0 COMPACTION

The granular materials (granular base and subbase; existing and new) should be compacted to 100 percent of the material's SPMDD. The SP 12.5 FC1 surface course asphalt should be compacted to a minimum of 92.0 percent of the material's Maximum Relative Density (MRD) while the SP 19 binder course mix should be compacted to a minimum of 91% of the MRD. Joint compaction for both SP 12.5 FC1 and SP 19 mixes should be a minimum of 90%.

16.0 INSPECTION AND TESTING

During construction, 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 specifications. Asphalt testing should be carried out in a CCIL certified laboratory.

17.0 EXCESS SOIL CHARACTERIZATION

17.1 Approach

Golder has completed limited soil characterization to provide a preliminary indication of potential reuse and/or disposal options for excess fill and native material that would be generated during the proposed rehabilitation and widening of Airport Road from Braydon Boulevard/Stonecrest Drive to Countryside Drive. As previously noted, 44 boreholes (BH18-1 to BH18-40, 44, 45, BH18F-1 and BH18F-2) were advanced between October 29, 2019 and December 6, 2019 to a maximum depth of 6.6 m below ground surface ("bgs"). Borehole locations are provided on Figure 1.

Eight soil samples (BH18-3 SA2, BH18-9 SA2, BH18-14 SA1, BH18-27 SA2, BH18-32 SA3, BH18-38 SA1, BH18-45 SA2 and BH18F-2 SA2) were selected for analysis based on the presence of staining, odour and/or debris (if any), or in the absence of obvious impact, to provide general coverage across the project area. At the selected locations, samples were placed in pre-cleaned laboratory-supplied sample containers for potential chemical analysis. Samples for analysis of metals, inorganics, volatile organic compounds ("VOCs"), polycyclic aromatic hydrocarbons ("PAHs"), petroleum hydrocarbons ("PHCs") and polychlorinated biphenyls ("PCBs") were taken from soil fill materials near the surface, up to a maximum depth of 1.5 m bgs.

The following soil samples were submitted to ALS Environmental. ("ALS") for analysis of the parameters listed below:

Table 9: Environmental Samples Submitted for Analysis

Sample ID	Sample Type	Sample Depth (m bgs)	Soil Type	Analysis
BH18-3 SA2	Discrete	1.1 – 1.5	Fil – (CL) SILTY CLAY	Metals and inorganics, VOCs, PAHs, PHCs, and PCBs
BH18-9 SA2		0.2 – 1.5	Fil – (SP/CL) CLAYEY SILT with Sand	
BH18-14 SA1		0.2 – 1.2	Granular Base – (SP) gravelly SAND	
BH18-27 SA2		0.5 – 1.5	Fill – (SP/CL) SILTY CLAY with SAND	
BH18-32 SA3		1.1 – 1.5	Fill – (CL) SILTY CLAY	
BH18-38 SA1		0.5 – 0.7	Granular Base – (SP) gravelly SAND	
BH18-45 SA2		0.8 – 1.5	(CL) SILTY CLAY	

Sample ID	Sample Type	Sample Depth (m bgs)	Soil Type	Analysis
BH18F-2 SA2		0.8 – 1.2	Fil – (CL) SILTY CLAY	

17.2 Analytical Results

The analytical data were compared to the Ministry of Environment, Conservation and Parks ("MECP") generic site condition standards in the "*Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*", dated April 15, 2011. For evaluation purposes, Golder compared the results to both the Table 1 site condition standards (background) for residential, parkland, institutional, industrial, commercial, and community property uses ("Table 1 Standards") and the Table 3 (Full Depth Generic Site Condition Standards in a Non-Potable Groundwater Condition) site condition standards for residential/parkland/institutional land use, with coarse-grained soils ("Table 3 Standards"). A summary of the soil analytical results is provided on the Laboratory Certificate of Analysis in Appendix F.

Aside from a slight "rotten egg" odour noted in BH18-9 SA2, no other odours, staining, discolouration, debris or free product was observed in the soil samples recovered from any of the other advanced boreholes. Based on the results of the analyses the following parameters were identified at concentrations exceeding the Table 1 and 3 Standards:

Table 10: Table 1 and Table 3 Exceedances

Sample ID	Parameters Exceeding the Table 1 Site Condition Standards	Parameters Exceeding the Table 3 Site Condition Standards
BH18-3 SA2	Electrical Conductivity ("EC"), Sodium Adsorption Ratio ("SAR"), PHC F3, and PHC F4	EC, SAR, and PHC F3
BH18-9 SA2	EC, SAR	EC, SAR
BH18-14 SA1	EC, SAR, and PHC F4	EC
BH18-27 SA2	EC, SAR	EC
BH18-32 SA3,	EC, SAR	EC, SAR
BH18-38 SA1	EC, SAR, PHC F3, and PHC F4	EC, SAR, and PHC F3
BH18-45 SA2	EC, SAR	EC
BH18F-2 SA2	EC, SAR	None

17.3 Discussion of Findings

As noted above, the analytical results have been compared to the Table 1 and Table 3 generic site condition standards issued for use in conjunction with O.Reg. 153/04, *Records of Site Condition*. It is important to note that these standards are not directly applicable in law to excess fill from construction projects except in some limited

circumstances (e.g., where the owner intends to obtain a Record of Site Condition in accordance with O.Reg. 153/04). However, they nonetheless have commonly been used in the industry to date as a reference to assess the general environmental quality of excess soil, and its potential suitability for re-use.

On December 4, 2019, MECP released O.Reg. 406/19, *On-Site and Excess Soil Management*, which imposes new requirements on both generators and receivers of excess soil, outlines a defined process for assessing excess soil, and provides new standards for the assessment of excess soil quality (some of which are equivalent to the Reg 153/04 Table 1 Standards). The implementation dates for various sections of O.Reg. 406/19 are staggered over the next five years; the first provisions (including the excess soil standards) come into effect on July 1, 2020. Please note that the assessment provided herein was not intended to comply with O.Reg. 406/19; should excess soil management be anticipated to occur later than July 1, 2020, these findings should be re-evaluated int that context. Additional site assessment and/or sampling and analysis activities may be required.

The reported concentrations of EC and SAR in all eight samples submitted for analysis were above their respective Table 1 Standards. Reported concentrations of SAR in four samples and EC in seven samples (of the eight analyzed) also exceeded their respective Table 3 Standards. In Golder's opinion, these exceedances are most likely associated with the application of de-icing salts which are commonly used in roadways.

The reported concentrations of PHC F3 in two samples and PHC F4 in three samples exceeded their respective Table 1 Standards. Two of those samples also exceeded the Table 3 Standard for PHC F3.

If excess soil is required to be removed from the project site, soils which are demonstrated to satisfy the Table 1 Standards are typically acceptable to most receiving sites for re-use as fill material, subject to the following:

- There is no evidence of potential environmental impact, including staining, discoloration or odours that are potentially associated with petroleum hydrocarbons, or other contaminants;
- The excess soil is free of wastes, including putrescible materials (e.g., organic materials, wood), coated concrete, cement fines, rebar, plastics, scrap metal, asphalt, shingles, rubbish, glass, and garbage;
- The excess fill is geotechnically suitable and approved for use as backfill material by a geotechnical engineer; and,
- The prospective receiver has reviewed the available documentation concerning excess soil quality and has provided written confirmation of acceptance.

We note that the majority if not all of the excess soil potentially generated from this project is likely to contain elevated levels of EC and/or SAR. Soil which meets the Table 1 Standards for all contaminants of concern except EC and SAR may be acceptable (subject to the conditions listed above) to some receiving sites, particularly other infrastructure projects or other sites where de-icing activities have and will continue to occur. We further note that the forthcoming O.Reg. 406/19 contains provisions to facilitate the re-use of salt-impacted soils at sites receiving soil fill (once the regulation is implemented), subject to some limitations.

We note that excess soil containing exceedances of the Table 1 Standards for PHCs are not likely to be accepted for re-use as fill at other receiving sites, and is likely to require disposal at a licensed waste management facility as described above. At present, the source and distribution of the PHC impacts identified at borehole locations BH18-3, BH18-14, and BH18-38 is unknown; the Client may wish to consider undertaking additional sampling and analysis in these areas to gain a better understanding of the nature of the impacts and the quantity of soil that may be affected.

Alternatively, excess soil may be removed from the Site to a waste disposal facility in accordance with Part V of the Environmental Protection Act. It is advisable to review a potential receiving site's acceptable protocol to determine what documentation must be submitted to facilitate the acceptance of soil. If material is to be disposed of off-Site, Golder recommends obtaining and submitting a sample for toxicity characteristic leachate procedure ("TCLP"), with the analytical data compared to the Leachate Quality Criteria listed in Schedule 4 of O.Reg. 347 ("Schedule 4 Criteria").

If excess soil materials generated during construction vary in composition from the samples tested by Golder, additional testing is recommended to determine their suitability for disposal/reuse. Note that the excess soil reuse options as discussed herein are limited to the environmental quality of the soil, and as noted above, should be re-evaluated for any soil management activities occurring after July 1, 2020.

18.0 CLOSURE

We trust that this report provides sufficient pavement engineering information to proceed with the design of this project. If you have any questions regarding the contents of this report or require additional information, please do not hesitate to contact this office.

Signature Page

Golder Associates Ltd.

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IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder cannot be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

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The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Ground Water Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) 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 are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

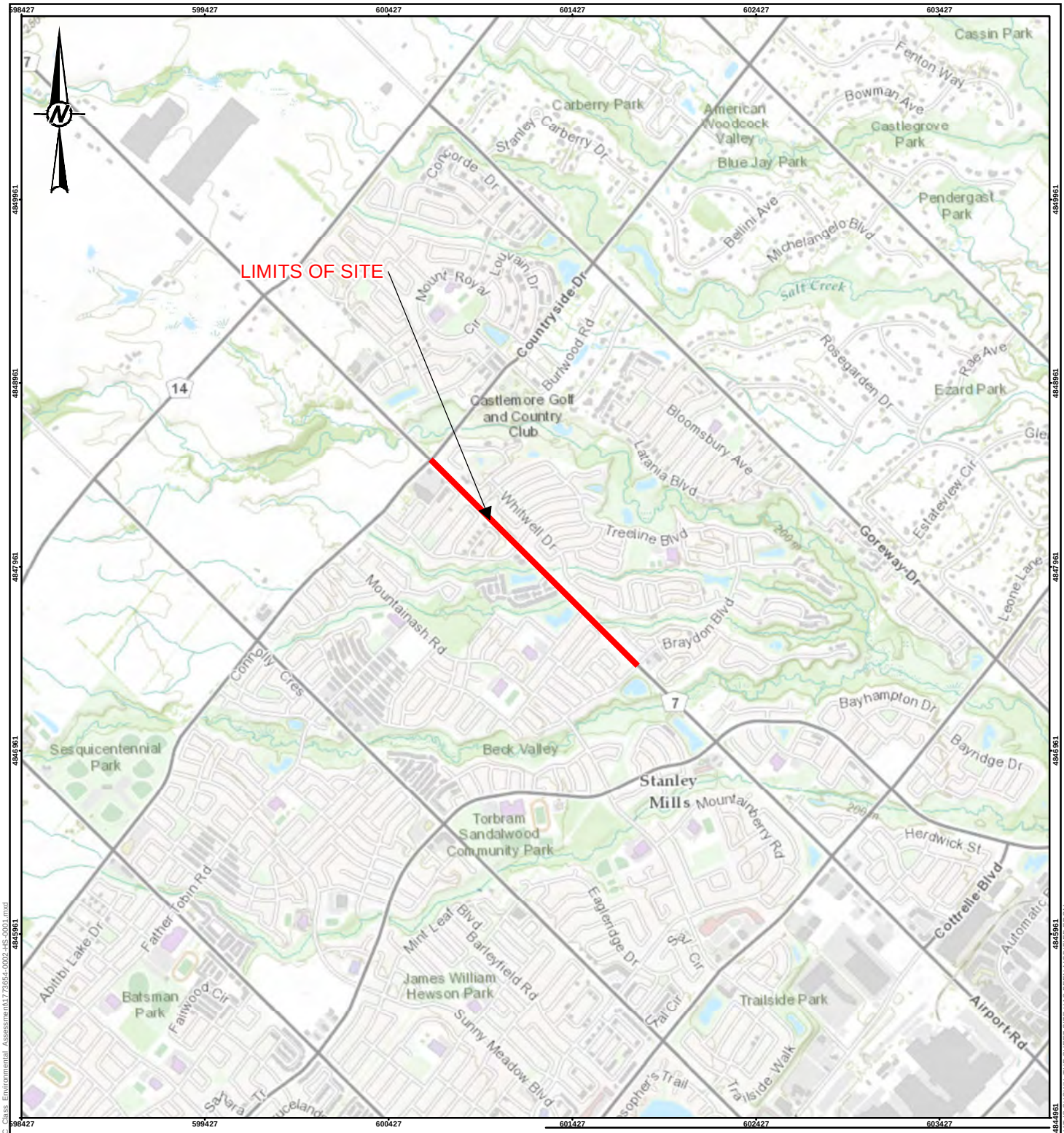
Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

FIGURES



0 750 1,500

1:30,000 METRES

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2019
SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2019
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
HDR CORPORATION

PROJECT
SCHEDULE 'C' CLASS ENVIRONMENTAL ASSESSMENT
AIRPORT ROAD FROM BRAYDON BOULEVARD TO COUNTRYSIDE DRIVE
CITY OF BRAMPTON, ONTARIO

TITLE
KEY PLAN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-01-21
DESIGNED	
PREPARED	MK
REVIEWED	KK
APPROVED	ACB

PROJECT NO.	CONTROL	REV.	FIGURE
1773654	0002	A	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM:
25mm
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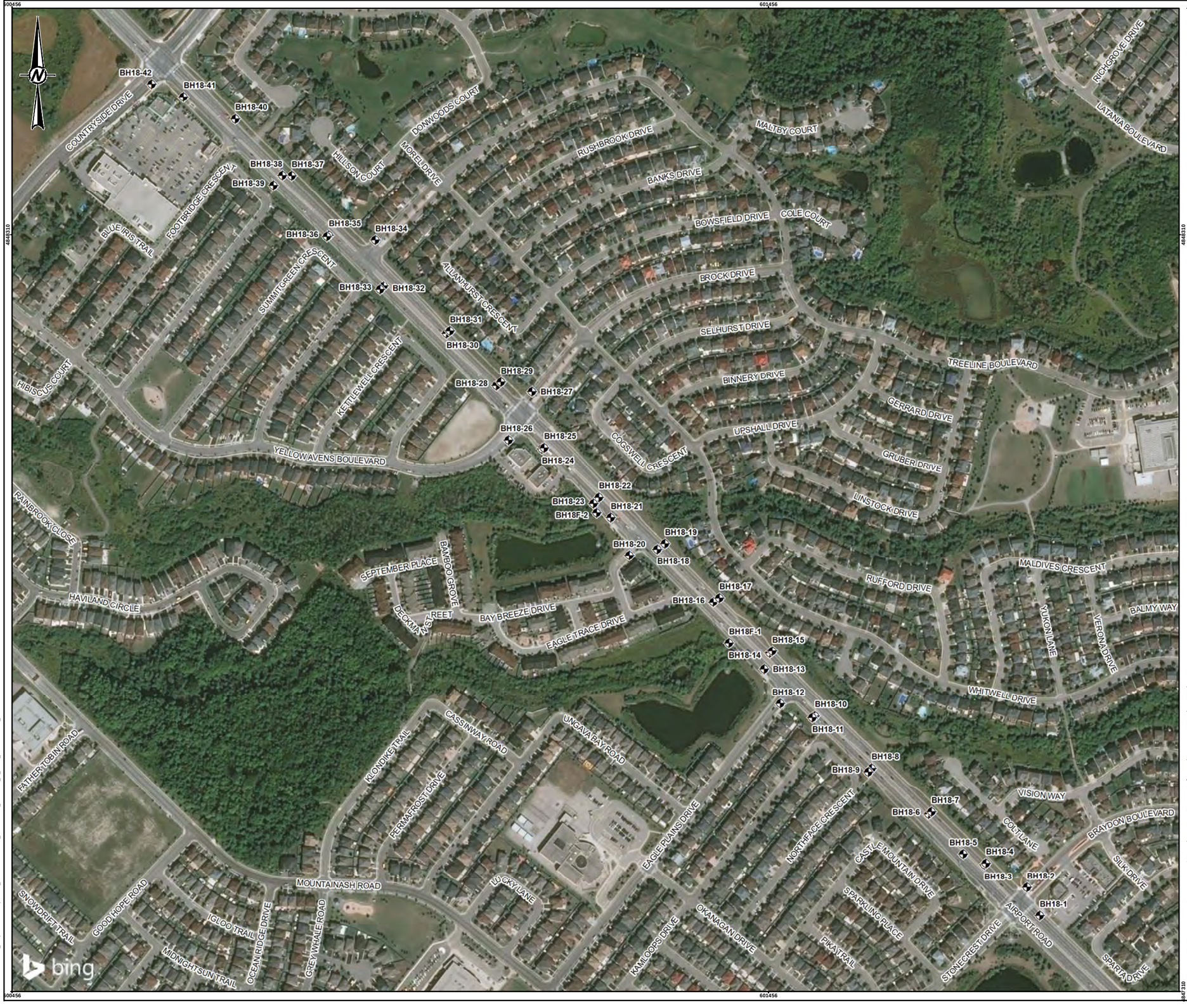

LEGEND

- BOREHOLE LOCATION

0 400

1:5,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2019
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PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT

HDR CORPORATION

PROJECT

SCHEDULE 'C' CLASS ENVIRONMENTAL ASSESSMENT
AIRPORT ROAD FROM BRAYDON BOULEVARD TO COUNTRYSIDE DRIVE
CITY OF BRAMPTON, ONTARIO

TITLE

BOREHOLE LOCATION PLAN

CONSULTANT

GOLDER

YYYY-MM-DD	2020-11-10
DESIGNED	
PREPARED	MK
REVIEWED	KK
APPROVED	ACB

PROJECT NO.	CONTROL	REV.	FIGURE
1773654	0002		**2**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm 0

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APPENDIX A

Pavement Condition Survey

SITE PHOTOGRAPHS

Airport Road – Eastbound/Westbound Lanes
Brampton, ON

FIGURE A1

Photo 1 – Severe Transverse Cracking near Airport Road and Brock Drive Intersection

Photo 2 – Slight to Moderate Map Cracking on Airport Road

Project No.	1773654		Inputted by:	TS
Photo Taken:	June/October 2019	**Golder Associates Ltd.**	Checked by:	KK

SITE PHOTOGRAPHS

Airport Road – Eastbound/Westbound Lanes
Brampton, ON

FIGURE 1B

Photo 3 – Slight to Moderate Pavement Edge Cracking on Airport Road

Photo 4 – Severe Pothole and Very Slight Rutting on Airport Road

Project No.	1773654		Inputted by:	TS
Photo Taken:	June/October, 2019	**Golder Associates Ltd.**	Checked by:	KK

APPENDIX B

Record of Borehole Logs

PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-1

SHEET 1 OF 1

LOCATION: Airport Road Northbound Right Turning Lane, See Borehole Location Plan

BORING DATE: November 1, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		211.23									
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~250 mm)		0.00 / 210.98									
		GRANULAR FILL - Sand with Silt; trace gravel; brown; non-cohesive, moist		0.25 / 210.32	1	AS							
1		GRANULAR FILL - Sand with Silt, some gravel; brown; non-cohesive, moist		0.91 / 209.71	2	AS							
		END OF BOREHOLE		1.52									
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-2

SHEET 1 OF 1

LOCATION: Braydon Boulevard Westbound Lane, See Borehole Location Plan

BORING DATE: October 30, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		211.28				SHEAR STRENGTH Cu, kPa: nat V. + Q - ●, rem V. ⊕ U - ○ (20 40 60 80)	WATER CONTENT PERCENT: Wp, W, Wl (10 20 30 40)		
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~200 mm)		0.00 / 211.08							
		GRANULAR FILL - Sand with Silt; some gravel subgrade; brown; cohesive, w~PL		0.20 / 210.21	1	AS			W		
1		GRANULAR FILL - Sand with Silt; some gravel subgrade; brown; cohesive, w~PL		1.07 / 209.76	2	AS			W		
		END OF BOREHOLE		1.52							
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DEPTH SCALE
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GOLDER

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CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-3

SHEET 1 OF 1

LOCATION: Airport Road Northbound Lane 2, See Borehole Location Plan

BORING DATE: October 29, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		212.06									
0	AMS Powerprobe 9120, 100 mm Solid Stem	ASPHALT (~200 mm)		0.00 / 211.86									
		GRANULAR BASE - Sand with Gravel; some fines; brown; non-cohesive, moist		0.20 / 210.99	1	AS					○	M	
1		FILL - (CL) Silty Clay, some sand, some gravel; brown; cohesive, w~PL		1.07 / 210.54	2	AS							
		END OF BOREHOLE		1.52									
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DEPTH SCALE

1 : 50

GOLDER

LOGGED: LK

CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-4

SHEET 1 OF 1

LOCATION: Airport Road Northbound Boulevard, See Borehole Location Plan

BORING DATE: October 29, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		212.58									
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~100 mm)		0.00									
		GRANULAR FILL - Gravelly Sand, some fines; brown; non-cohesive, moist		0.10	1	AS							
		FILL - (CL) Silty Clay, some sand; brown; cohesive, w~PL		0.20									
1					2	AS							
				211.06									
		END OF BOREHOLE		1.52									
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-5

SHEET 1 OF 1

LOCATION: Airport Road Southbound Left Turning Lane, See Borehole Location Plan

BORING DATE: November 8, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		212.33									
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~220 mm)		0.00 / 212.11									
		GRANULAR BASE - Sand and Gravel, trace fines; brown; non-cohesive, moist		0.22 / 211.69	1	AS					○	M	
1		GRANULAR SUBBASE - Gravelly Sand; brown; non-cohesive, moist		0.64 / 210.86	2	AS							
		(CL) Silty Clay, with sand, trace gravel; brown; cohesive, w<PL		1.52	3	AS					○	MH	
		END OF BOREHOLE											
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DEPTH SCALE

1 : 50

GOLDER

LOGGED: LK

CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-6

SHEET 1 OF 1

LOCATION: Airport Road Northbound Lane 1, See Borehole Location Plan

BORING DATE: November 1, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		211.58									
0	AMS Powerprobe 9120, 100 mm Solid Stem	ASPHALT (~180 mm)		0.00 / 211.40									
		GRANULAR BASE - Sand and Gravel; brown; non-cohesive, moist		0.18	1	AS							
1				210.06									
		END OF BOREHOLE		1.52									
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10													

DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

LOCATION: Airport Road Northbound Boulevard, See Borehole Location Plan

RECORD OF BOREHOLE: BH18-7

BORING DATE: October 29, 2019

SHEET 1 OF 1

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		211.73							
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~200 mm)		0.00 / 211.53							
		GRANULAR FILL - Gravelly Sand, brown; non-cohesive, moist		0.20	1	AS					
1				210.21							
		END OF BOREHOLE		1.52							
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DEPTH SCALE

1 : 50

GOLDER

LOGGED: LK

CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-8

SHEET 1 OF 1

LOCATION: Airport Road Southbound Lane 1, See Borehole Location Plan

BORING DATE: October 29, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		211.78									
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~200 mm)		0.00 / 211.58									
		GRANULAR BASE - Sand with Silt; some gravel; brown; non-cohesive, moist		0.20	1	AS					○		
1				210.26									
		END OF BOREHOLE		1.52									
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-9

SHEET 1 OF 1

LOCATION: Airport Road Southbound boulevard, See Borehole Location Plan

BORING DATE: October 29, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		212.65									
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~60 mm)		0.00									
		GRANULAR FILL - Gravelly Sand, brown; non-cohesive, moist		0.06	1	AS							
		FILL - (SP/CL) Clayey Silt with Sand; some gravel, brown; slight organic odour; cohesive, w~PL		0.22	2	AS					W	MH	
1				211.13									
		END OF BOREHOLE		1.52									
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-10

SHEET 1 OF 1

LOCATION: Airport Road Southbound Lane 2, See Borehole Location Plan

BORING DATE: October 29, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		212.14									
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~250 mm)		0.00 / 211.89									
		GRANULAR BASE - Gravelly Sand, some fines; brown; non-cohesive, moist		0.25 / 211.38	1	AS							
1		FILL - (CL) Silty Clay, some sand; some gravel; brown; cohesive, w~PL		0.76 / 210.62	2	AS							
		END OF BOREHOLE		1.52									
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-11

SHEET 1 OF 1

LOCATION: Airport Road Southbound Boulevard, See Borehole Location Plan

BORING DATE: October 29, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		212.36									
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~60 mm)		0.00									
		GRANULAR FILL - Gravelly Sand, brown; non-cohesive, moist		0.06	1	AS							
		FILL - (CL) Silty Clay, some sand, some gravel subgrade; brown; cohesive, w~PL		0.22	2	AS							
1		(CL) Silty Clay, some sand; brown; cohesive, w~PL		211.14 1.22	3	AS							
		END OF BOREHOLE		210.84 1.52									
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-12

SHEET 1 OF 1

LOCATION: Eagle Plains Drive Eastbound Lane 1, See Borehole Location Plan

BORING DATE: October 30, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		211.86							
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~150 mm)		0.00							
		GRANULAR FILL - Sand, trace gravel; some fines; brown; non-cohesive, moist		0.15	1	AS					
		FILL - (CL) Clayey Silt with Sand; some gravel; brown; cohesive; w~PL		0.30	2	AS			○	MH	
1				210.34							
		END OF BOREHOLE		1.52							
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-13

SHEET 1 OF 1

LOCATION: Airport Road Southbound Right Turning Lane, See Borehole Location Plan

BORING DATE: October 30, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		212.39									
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~250 mm)		0.00 / 212.14									
		GRANULAR BASE - Gravelly Sand; brown; non-cohesive, moist		0.25 / 211.63	1	AS							
1		FILL - (CL) Silty Clay Subgrade, some sand; brown; cohesive, w~PL		0.76 / 210.87	2	AS							
		END OF BOREHOLE		1.52									
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-14

SHEET 1 OF 1

LOCATION: Airport Road Northbound Lane 2, See Borehole Location Plan

BORING DATE: October 29, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		211.72									
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~150 mm)		0.00									
		GRANULAR BASE - Sand; some gravel, some fines; brown; non-cohesive, moist		0.15	1	AS							
1				210.50									
		(CL) Silty Clay, some sand; brown; cohesive, w~PL		1.22	2	AS							
				210.20									
		END OF BOREHOLE		1.52									
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DEPTH SCALE

1 : 50

GOLDER

LOGGED: LK

CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-15

SHEET 1 OF 1

LOCATION: Airport Road Northbound Boulevard, See Borehole Location Plan

BORING DATE: October 29, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		212.52									
0	AMS Powerprobe 9120 100 mm Solid Stem	TOPSOIL (~100 mm)		0.00	1	AS							
		GRANULAR FILL - Gravelly Sand, brown; non-cohesive, moist		0.10	2	AS							
1				211.45									
		Auger refusal on a suspected boulder		1.07									
		END OF BOREHOLE											
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-16

SHEET 1 OF 1

LOCATION: Airport Road Northbound Lane 1, See Borehole Location Plan

BORING DATE: October 29, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		213.21									
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~200 mm)		0.00 / 213.01									
		GRANULAR BASE - Gravel with Sand, trace fines; brown; non-cohesive, moist		0.20 / 212.14	1	AS				○		M	
1		GRANULAR SUBBASE - Sand with Gravel, some fines; brown; non-cohesive, moist		1.07 / 211.69	2	AS				○		M	
		END OF BOREHOLE		1.52									
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-17

SHEET 1 OF 1

LOCATION: Airport Road Northbound Boulevard Sidewalk, See Borehole Location Plan

BORING DATE: November 11, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		213.30									
0	AMS Powerprobe 9120, 100 mm Solid Stem	CONCRETE (~110 mm)		0.00									
		FILL - (CL) Silty Clay, with sand; brown; cohesive, w~PL		0.11	1	AS							
1				212.08									
		(CL) Silty Clay, brown; cohesive, w~PL		1.22	2	AS							
				211.78									
		END OF BOREHOLE		1.52									
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-18

SHEET 1 OF 1

LOCATION: Airport Road Northbound Left Turning Lane, See Borehole Location Plan

BORING DATE: October 30, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		215.40									
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~230 mm)		0.00 / 215.17									
		GRANULAR BASE, Sand with Silt, some gravel; brown; non-cohesive, moist		0.23 / 214.94	1	AS							
		GRANULAR FILL- Sand and Silt, trace gravel; brown; non-cohesive, moist		0.46 / 214.33	2	AS							
1		(CL) Silty Clay, some sand; brown; cohesive, w~PL		1.07 / 213.88	3	AS							
		END OF BOREHOLE		1.52									
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-19

SHEET 1 OF 1

LOCATION: Airport Road Northbound Boulevard Sidewalk, See Borehole Location Plan

BORING DATE: November 11, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		215.21							
0	AMS Powerprobe 9120 100 mm Solid Stem	CONCRETE (~170 mm)		0.00							
		FILL - Silty Clay, with sand, some gravel; brown; cohesive		0.17	1	AS					
				214.52							
1		(CL) Silty Clay, some sand; brown; cohesive, w~PL		0.69	2	AS					
				213.69							
		END OF BOREHOLE		1.52							
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DEPTH SCALE

1 : 50

GOLDER

LOGGED: LK

CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-20

SHEET 1 OF 1

LOCATION: Camrose Street Eastbound Lane, See Borehole Location Plan

BORING DATE: October 29, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		215.20									
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~200 mm)		0.00 / 215.00									
		GRANULAR BASE - Gravelly Sand, light brown; non-cohesive, moist		0.20 / 214.44	1	AS							
1		(CL) Silty Clay with Sand, trace gravel; cohesive, w<PL		0.76 / 213.68	2	AS					W	MH	
		END OF BOREHOLE		1.52									
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-21

SHEET 1 OF 1

LOCATION: Airport Road Southbound Right Turning Lane, See Borehole Location Plan

BORING DATE: November 8, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		215.57									
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~190 mm)		0.00 / 215.38									
		GRANULAR BASE - Sand and Gravel, brown; non-cohesive, moist		0.19 / 214.88	1	AS							
1		FILL - (CL) Silty Clay, with sand, some gravel; brown; cohesive, w~PL		0.69 / 214.05	2	AS							
		END OF BOREHOLE		1.52									
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-22

SHEET 1 OF 1

LOCATION: Airport Road Southbound Lane 1, See Borehole Location Plan

BORING DATE: November 8, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		215.89							
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~240 mm)		0.00 / 215.65							
		GRANULAR BASE - Sand and Gravel, brown; non-cohesive, moist		0.24 / 215.20	1	AS					
1		GRANULAR SUBBASE - Sand, some gravel; brown; non-cohesive, moist		0.69 / 214.37	2	AS					
		END OF BOREHOLE		1.52							
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

GTA-BHS 001 S:\CLIENTS\HDR_CORPORATION\BRAMPTON\02_DATA\GINT\1773654.GPJ GAL-MIS.GDT 20-2-10 NP

PROJECT: 1773654 (1000)

LOCATION: Airport Road Southbound Boulevard, See Borehole Location Plan

RECORD OF BOREHOLE: BH18-23

BORING DATE: November 8, 2019

SHEET 1 OF 1

DATUM:

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		216.21									
0	AMS Powerprobe 9120 100 mm Solid Stem	TOPSOIL (~70 mm)		0.00									
		FILL - (CL) Silty Clay, some sand, some gravel; brown; cohesive, w~PL		0.07	1	AS							
1				214.94									
		(CL) Silty Clay, trace sand, trace gravel; brown; cohesive, w~PL		1.27	2	AS							
		END OF BOREHOLE		214.69 1.52									
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DEPTH SCALE

1 : 50

GOLDER

LOGGED: LK

CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-24

SHEET 1 OF 1

LOCATION: Airport Road Southbound Right Turning Lane, See Borehole Location Plan

BORING DATE: November 8, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp ○ W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		217.13							
0	MARL M5T 100 mm Solid Stem	ASPHALT (~180 mm)		0.00 / 216.95							
		GRANULAR BASE - Sand with Gravel, brown; trace reclaimed asphalt products; non-cohesive, moist		0.18 / 216.75	1	AS					
		GRANULAR SUBBASE - Sand and Gravel; brown; non-cohesive, moist		0.38	2	AS			○		
1		FILL - (CL) Silty Clay, some sand, some gravel; brown; cohesive, w<PL		215.96 / 1.17 / 215.61	3	AS					
		END OF BOREHOLE		1.52							
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-25

SHEET 1 OF 1

LOCATION: Airport Road Southbound Lane 2, See Borehole Location Plan

BORING DATE: November 8, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		217.29									
0	MARL M5T 100 mm Solid Stem	ASPHALT (~200 mm)		0.00 / 217.09									
		GRANULAR BASE - Sand and Gravel; brown; non-cohesive, moist		0.20	1	AS							
				216.45									
1		FILL - (CL) Silty Clay, some sand, some gravel; brown; cohesive, w~PL		0.84	2	AS							
				215.77									
		END OF BOREHOLE		1.52									
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-26

SHEET 1 OF 1

LOCATION: Yellow Avens Boulevard Eastbound Lane, See Borehole Location Plan

BORING DATE: November 1, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		217.60							
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~200 mm)		0.00 / 217.40							
		GRANULAR BASE - Sand with Gravel, light brown; non-cohesive, moist		0.20 / 216.76	1	AS					
1		FILL - (CL) Silty Clay, some sand, trace gravel; brown; cohesive, w<PL		0.84 / 216.08	2	AS					
		END OF BOREHOLE		1.52							
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DEPTH SCALE

1 : 50

GOLDER

LOGGED: LK

CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-27

SHEET 1 OF 1

LOCATION: Brock Drive Westbound Lane 1, See Borehole Location Plan

BORING DATE: October 10, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		217.70							
0	AMS Powerprobe 9120, 100 mm Solid Stem	ASPHALT (~200 mm)		0.00 / 217.50							
		GRANULAR BASE - Sand with Gravel, beige; non-cohesive, moist		0.20 / 217.09	1	AS					
1		FILL - (CL) Silty Clay, some sand, some gravel; brown; cohesive, moist		0.61 / 216.18	2	AS					
		END OF BOREHOLE		1.52							
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DEPTH SCALE

1 : 50

GOLDER

LOGGED: LK

CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-28

SHEET 1 OF 1

LOCATION: Airport Road Northbound Lane 1, See Borehole Location Plan

BORING DATE: December 6, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		218.04							
0	CME 75 Truck 100 mm Solid Stem	ASPHALT (~200 mm)		0.00 / 217.84							
		GRANULAR BASE - Sand and Gravel, brown; non-cohesive, moist		0.20 / 217.23	1	AS					
1		FILL - (CL) Silty Clay, some sand, trace gravel; brownish grey, cohesive, w<PL		0.81 / 216.52	2	AS					
		END OF BOREHOLE		1.52							
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-29

SHEET 1 OF 1

LOCATION: Airport Road Northbound Boulevard, See Borehole Location Plan

BORING DATE: December 6, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		219.21									
0	CME 75 Truck, 100 mm Solid Stem	TOPSOIL (~70 mm)		0.00	1	AS							
		FILL - (CL) Silty Clay, some sand, trace gravel; brown; cohesive, w<PL		0.07	2	AS							
1		(CL) Silty Clay, trace sand, trace gravel; brown; oxidation staining; cohesive, w<PL		218.50 0.71	3	AS							
		END OF BOREHOLE		217.69 1.52									
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DEPTH SCALE

1 : 50

GOLDER

LOGGED: LK

CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-30

SHEET 1 OF 1

LOCATION: Airport Road Northbound Lane 2, See Borehole Location Plan

BORING DATE: December 6, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		219.85							
0	CME 75 Truck, 100 mm Solid Stem	ASPHALT (~250 mm)		0.00 / 219.60							
		GRANULAR BASE - Gravelly Sand, some fines; brown; non-cohesive,moist		0.25	1	AS			○	M	
		GRANULAR SUBBASE - Gravelly Sand, some fines; brown; non-cohesive, moist		0.41 / 219.09	2	AS			○	M	
1		FILL - (CL) Silty Clay, some sand, some gravel; brown; cohesive, w~PL		0.76 / 218.33	3	AS					
		END OF BOREHOLE		1.52							
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-31

SHEET 1 OF 1

LOCATION: Airport Road Northbound Boulevard, See Borehole Location Plan

BORING DATE: December 6, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		220.09									
0	CME 75 Truck, 100 mm Solid Stem	TOPSOIL (~70 mm)		0.00									
		FILL - (CL) Silty Clay, trace sand, trace gravel; brown; cohesive, w~PL		0.07 / 219.66	1	AS							
1		(CL) Silty Clay, trace sand, trace gravel; brown to brownish grey; cohesive, w~PL		0.43	2	AS							
					3	AS							
				218.57									
		END OF BOREHOLE		1.52									
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DEPTH SCALE

1 : 50

GOLDER

LOGGED: LK

CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-32

SHEET 1 OF 1

LOCATION: Airport Road Southbound Lane 1, See Borehole Location Plan

BORING DATE: December 6, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		221.11							
0	CME 75 Truck 100 mm Solid Stem	ASPHALT (~280 mm)		0.00 / 220.83							
		GRANULAR BASE - Sand and Gravel; trace reclaimed asphalt; brown; non-cohesive, moist		0.28	1	AS					
		GRANULAR SUBBASE - Sand and Gravel; brown; non-cohesive, moist		0.41 / 220.04	2	AS					
1		FILL - (CL) Silty Clay, some sand, trace gravel; brown; cohesive, w~PL		1.07 / 219.59	3	AS					
		END OF BOREHOLE		1.52							
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-33

SHEET 1 OF 1

LOCATION: Airport Road Southbound Boulevard, See Borehole Location Plan

BORING DATE: December 6, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		221.42									
0	CME 75 Truck, 100 mm Solid Stem	ASPHALT (~50 mm)		0.00									
		GRANULAR FILL - Sand and Gravel; brown; non-cohesive, moist		0.05	1	AS							
1					2	AS							
		FILL - (CL) Silty Clay, trace sand, trace gravel; brown; cohesive, w~PL		220.18 1.24	3	AS							
		END OF BOREHOLE		219.90 1.52									
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DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-34

SHEET 1 OF 1

LOCATION: Treeline Bouvelard Westbound Lane, See Borehole Location Plan

BORING DATE: November 11, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		220.90									
0	AMS Powerprobe 9120 100 mm Solid Stem	ASPHALT (~140 mm)		0.00									
		GRANULAR BASE - Gravelly Sand, light brown; non-cohesive, moist		0.14	1	AS					○		
				220.29									
		FILL - (CL) Silty Clay, some sand, some gravel; brown; cohesive, w~PL		0.61	2	AS							
1				219.99									
		(CL) Silty Clay, some sand; brown; cohesive, w~PL		0.91	3	AS							
				219.38									
		END OF BOREHOLE		1.52									
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DEPTH SCALE

1 : 50

GOLDER

LOGGED: LK

CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-35

SHEET 1 OF 1

LOCATION: Airport Road Southbound Lane 2, See Borehole Location Plan

BORING DATE: December 6, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		222.11									
0	CME 75 Truck, 100 mm Solid Stem	ASPHALT (~230 mm)		0.00 / 221.88									
		GRANULAR BASE - Gravel and Sand; brown; non-cohesive, moist		0.23 / 221.68	1	AS						M	
		GRANULAR SUBBASE - Gravel and Sand; some fines; brown; non-cohesive, moist		0.43 / 221.04	2	AS						M	
1		(CL) Silty Clay, trace sand, trace gravel; grey; cohesive, w~PL		1.07 / 220.59	3	AS							
		END OF BOREHOLE		1.52									
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DEPTH SCALE

1 : 50

GOLDER

LOGGED: LK

CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-36

SHEET 1 OF 1

LOCATION: Airport Road Southbound Bouvelard, See Borehole Location Plan

BORING DATE: December 6, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp ⊖W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		222.17							
0	CME 75 Truck, 100 mm Solid Stem	ASPHALT (~130 mm)		0.00							
		GRANULAR BASE - Sand and Gravel; brown; non-cohesive, moist		0.13	1	AS					
		GRANULAR SUBBASE - Sand and Gravel; brown; non-cohesive, moist		0.25	2	AS					
1				221.13							
		FILL - (CL) Silty Clay, trace sand, trace gravel; brown; cohesive, w~PL		1.04 / 220.90	3	AS					
		(CL) Silty Clay, trace sand, trace gravel; brown; cohesive, w~PL		1.27 / 220.65	4	AS					
		END OF BOREHOLE		1.52							
2											
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

GTA-BHS 001 S:\CLIENTS\HDR_CORPORATION\BRAMPTON\02_DATA\GINT\1773654.GPJ GAL-MIS.GDT 20-2-10 NP

PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-37

SHEET 1 OF 1

LOCATION: Airport Road Northbound Bouvelard, See Borehole Location Plan

BORING DATE: November 8, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		223.55							
0	MARL M5T 100 mm Solid Stem	TOPSOIL (~90 mm)		0.00							
		FILL - (CL) Silty Clay, some sand, brown; cohesive, w~PL, firm		0.09	1	AS	6				
				222.85							
1		(CL) Silty Clay, some sand, brown; cohesive, w~PL, firm		0.70	2	AS	6				
					3	AS	10				
2				221.42							
		END OF BOREHOLE		2.13							
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: LK

CHECKED: KK

GTA-BHS 001 S:\CLIENTS\HDR_CORPORATION\BRAMPTON\02_DATA\GINT\1773654.GPJ GAL-MIS.GDT 20-2-10 NP

PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-38

SHEET 1 OF 1

LOCATION: Airport Road Northbound Lane 1, See Borehole Location Plan

BORING DATE: November 8, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		223.45									
0	MARL M5T 100 mm Solid Stem	ASPHALT (~230 mm)		0.00 / 223.22									
		GRANULAR BASE - Gravelly Sand, brown; non-cohesive, moist		0.23 / 222.97	1	AS							
		GRANULAR SUBBASE - Sand and Gravel; brown; trace reclaimed asphalt; non-cohesive, moist		0.48 / 222.76	2	AS							
				0.69 / 222.54	3	AS							
1		FILL - (CL/SP) Silty Clay and Sand, some gravel; brown; cohesive, w<PL		0.91									
		(CL) Silty Clay, some to trace sand, some to trace gravel; brown to brownish grey; cohesive, w~PL			4	AS							
					5	AS							
2				221.32									
		END OF BOREHOLE		2.13									
3													
4													
5													
6													
7													
8													
9													
10													

DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

GTA-BHS 001 S:\CLIENTS\HDR_CORPORATION\BRAMPTON\02_DATA\GINT\1773654.GPJ GAL-MIS.GDT 20-2-10 NP

PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-39

SHEET 1 OF 1

LOCATION: Airport Road Southbound Bouvelard, See Borehole Location Plan

BORING DATE: November 8, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		223.54									
0	MARL M5T 100 mm Solid Stem	TOPSOIL (~50 mm)		0.00									
		FILL - (CL) Silty Clay, some sand, brown; cohesive, w<PL, stiff		0.05	1	AS	10						
		(CL) Silty Clay, some sand; brown; cohesive, w<PL, stiff		0.20	2	AS	21						
		(ML) Silt, some sand, brown; non-cohesive, moist, very stiff		222.85 0.69	3	AS	28				○	MH	
2		(CL) Silty Clay, trace sand; brown; cohesive, w<PL, very stiff		222.09 1.45	4	AS							
		END OF BOREHOLE		221.41 2.13									

DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

GTA-BHS 001 S:\CLIENTS\HDR_CORPORATION\BRAMPTON\02_DATA\GINT\1773654.GPJ GAL-MIS.GDT 20-2-10 NP

PROJECT: 1773654 (1000)

LOCATION: Airport Road Northbound Bouvelard, See Borehole Location Plan

RECORD OF BOREHOLE: BH18-40

BORING DATE: December 6, 2019

SHEET 1 OF 1

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		224.79									
0	CME 75 Truck, 100 mm Solid Stem	TOPSOIL (~70 mm)		0.00	1	AS							
		FILL - (CL) Silty Clay, trace sand, trace gravel; brown; cohesive, w~PL		0.07	2	AS							
				223.88	3	AS							
1		(CL) Silty Clay, trace sand, trace gravel; brown; cohesive, w<PL		0.91									
				223.57									
		END OF BOREHOLE		1.22									
2													
3													
4													
5													
6													
7													
8													
9													
10													

DEPTH SCALE

1 : 50

GOLDER

LOGGED: LK

CHECKED: KK

GTA-BHS 001 S:\CLIENTS\HDR_CORPORATION\BRAMPTON\02_DATA\GINT\1773654.GPJ GAL-MIS.GDT 20-2-10 NP

PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-41

SHEET 1 OF 1

LOCATION: Airport Road Southbound Bouvelard, See Borehole Location Plan

BORING DATE: November 8, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		224.93									
0	MARL M5T 100 mm Solid Stem	TOPSOIL (~50 mm)		0.00	1	AS	7						
		FILL - (CL) Silty Clay, some sand; brown; cohesive, w~PL, firm		0.05	2	AS	8						
				224.24									
1		(CL) Silty Clay, some sand; brown; cohesive, w~PL, stiff		0.69	3	AS	18						
2				222.80									
		END OF BOREHOLE		2.13									
3													
4													
5													
6													
7													
8													
9													
10													

DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

GTA-BHS 001 S:\CLIENTS\HDR_CORPORATION\BRAMPTON\02_DATA\GINT\1773654.GPJ GAL-MIS.GDT 20-2-10 NP

PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18-42

SHEET 1 OF 1

LOCATION: Countryside Drive Eastbound Right Turning Lane, See Borehole Location Plan

BORING DATE: November 11, 2019

DATUM:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE									
0	AMS Powerprobe 9120 70 mm Solid Stem	ASPHALT (~180 mm)		0.00							
		GRANULAR BASE - Sand and Gravel; brown; non-cohesive, moist		0.18	1	AS					
1		(CL) Silty Clay, trace sand, trace gravel; brown; cohesive, w<PL		0.76	2	AS					
		END OF BOREHOLE		1.52							
2											
3											
4											
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

GOLDER

LOGGED: LK
CHECKED: KK

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PROJECT: 1773654 (1000)

RECORD OF BOREHOLE: BH18F-1

SHEET 1 OF 1

LOCATION: SEE BOREHOLE LOCATION PLAN

BORING DATE: November 22, 2019

DATUM:

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○; 20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE									
0	MINIMOLE 102 mm SOLID STEM AUGER	TOPSOIL (51mm thick)		0.00 / 0.05							
		FILL - (CL) SILTY CLAY, some sand, some gravel; brown, rootlets; cohesive, w~PL, firm			1	SS	5				
1					2	SS	7				
		FILL - (OH) clayey ORGANIC SILT, some sand; dark brown; cohesive, w>PL, very stiff		1.37							
2					3	SS	17				
		(CL/ML) SILTY CLAY to CLAYEY SILT, some sand some gravel; brown, oxidation stains (TILL); cohesive, w<PL, hard		2.13	4	SS	15				
3					5	SS	31				
4		(CL) SILTY CLAY, trace sand, some gravel; grey (TILL); cohesive, w<PL, very stiff		4.04							
					6	SS	20				
5											
6					7	SS	19				
		END OF BOREHOLE		6.55							
7		NOTE:									
		1. Borehole was dry upon completion of drilling.									
8											
9											
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED:

CHECKED:

GTA-BHS 001 S:\CLIENTS\HDR_CORPORATION\BRAMPTON\02_DATA\GINT\1773654.GPJ GAL-MIS.GDT 20-1-23 NP

PROJECT: 1773654 (1000)

LOCATION: SEE BOREHOLE LOCATION PLAN

RECORD OF BOREHOLE: BH18F-2

SHEET 1 OF 1

BORING DATE: November 22, 2019

DATUM:

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE									
0	MINIMOLE 102 mm SOLID STEM AUGER	TOPSOIL (64mm thick)		0.00 / 0.06							
		FILL - (CL) SILTY CLAY, some sand, some gravel; brown; cohesive, w~PL, soft to firm -Rootlets found between the depths of 0 m and 0.61 m			1	SS	4				
1					2	SS	6				
					3	SS	8				
2											Bentonite
		(CL/ML) SILTY CLAY to CLAYEY SILT, some sand, some gravel; brown (TILL); cohesive, w<PL, very stiff		2.13	4	SS	25				
3					5	SS	31				January 7, 2020
4		(CL) SILTY CLAY, trace to some sand, trace gravel; grey; cohesive, w~PL to w>PL, very stiff to stiff		4.04							Sand
					6	SS	20				
5											
6											Sand and Screen
					7	SS	15				
7											
					8	SS	13				
8		END OF BOREHOLE		8.08							
9		NOTES: 1. Borehole was dry upon completion of drilling. 2. Groundwater level measured in monitoring well as follows: Date 07-Jan-20 Depth (m) 3.17 Elevation (m)									
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED:

CHECKED:

GTA-BHS 001 S:\CLIENTS\HDR_CORPORATION\BRAMPTON\02_DATA\GINT\1773654.GPJ GAL-MIS.GDT 20-1-23 NP

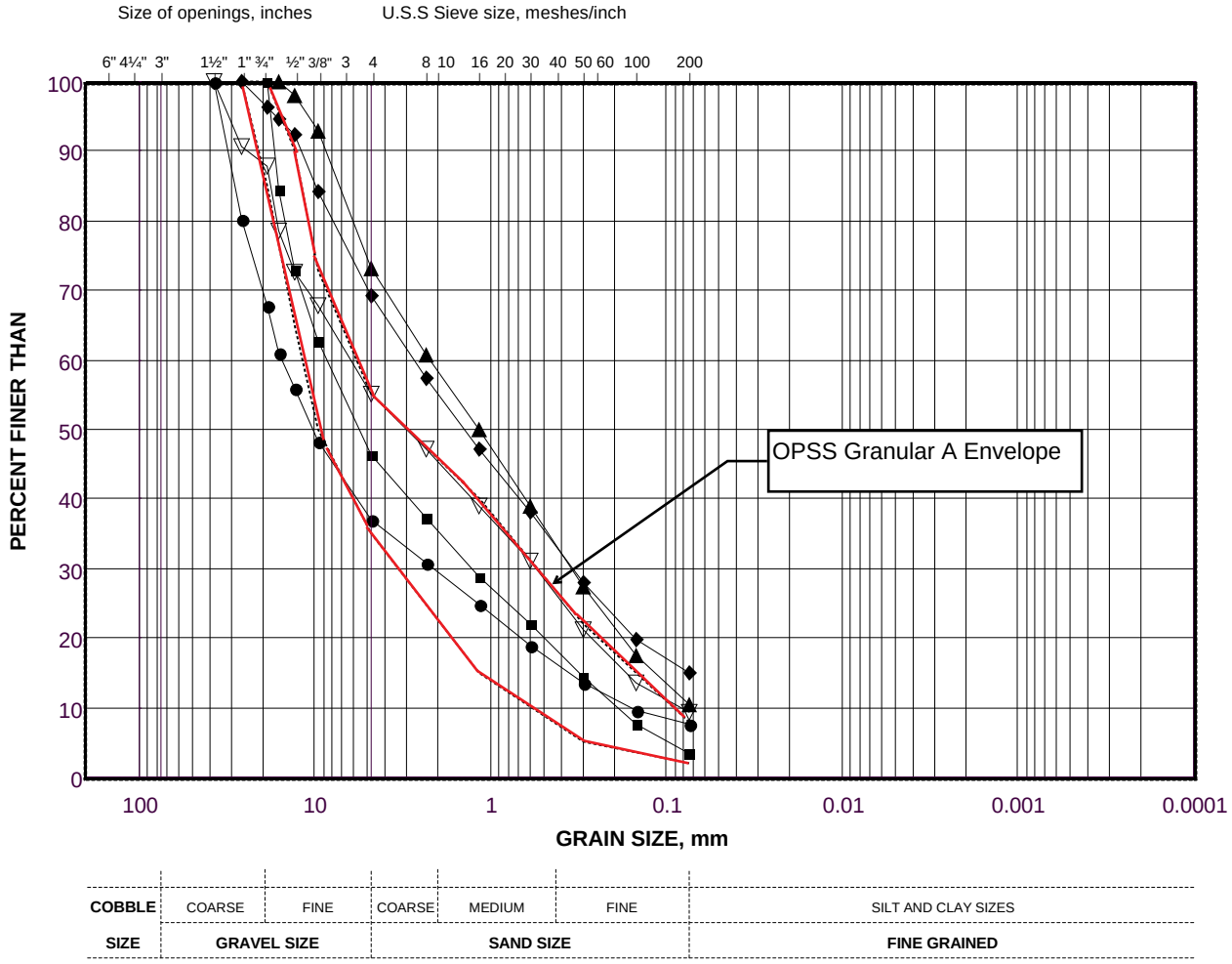
APPENDIX C

Laboratory Testing Results

GRAIN SIZE DISTRIBUTION

Typical Granular Base Materials

FIGURE C1



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH (mm)
●	BH 18-16	1	230 - 530
■	BH 18-35	1	310 - 430
◆	BH 18-30	1	260 - 410
▲	BH 18-3	1	230 - 560
▽	BH 18-5	1	220 - 500

Project Number: 1773654 (1000)

Checked By: _____

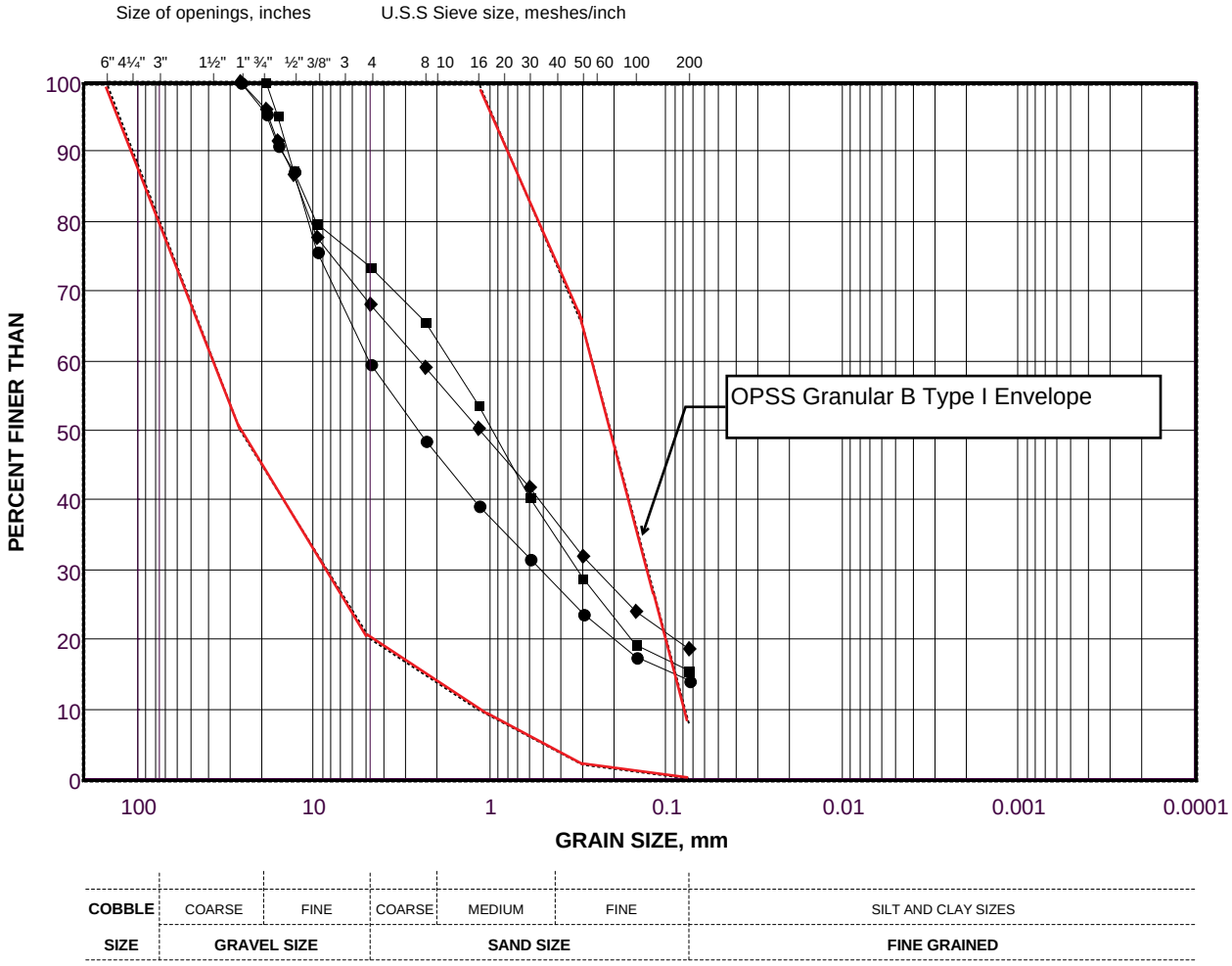
Golder Associates

Date: 05-Feb-20

GRAIN SIZE DISTRIBUTION

Typical Granular Subbase Materials

FIGURE C2



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH (mm)
●	BH 18-35	2	490 - 760
■	BH 18-16	2	1,070 - 1,370
◆	BH 18-30	2	460 - 660

Project Number: 1773654 (1000)

Checked By: _____

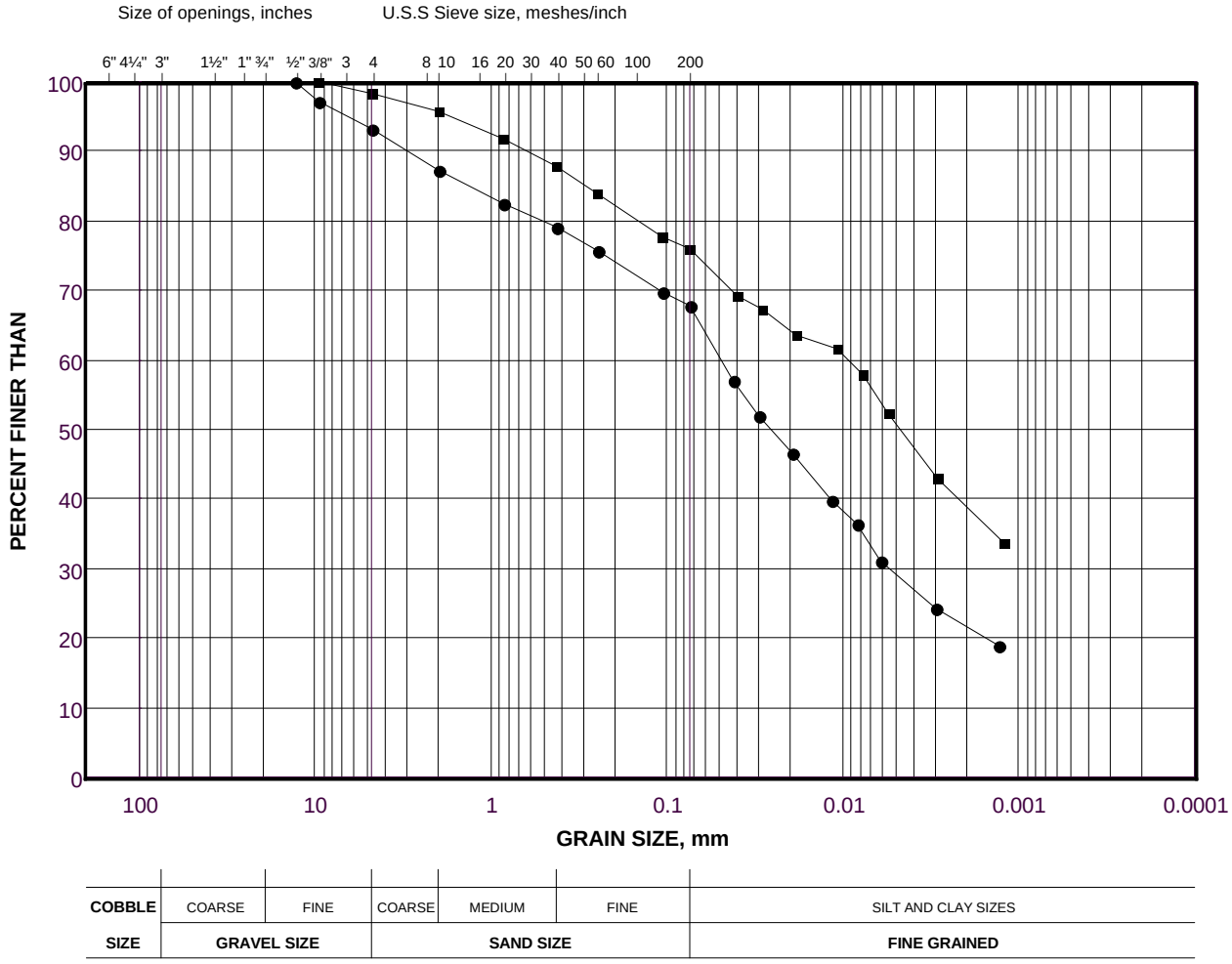
Golder Associates

Date: 05-Feb-20

GRAIN SIZE DISTRIBUTION

Silty Clay with Sand Subgrade

FIGURE C3



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH (mm)
●	BH 18-20	2	980 - 1,300
■	BH 18-5	3	1,480 - 1,520

Project Number: 1773654 (1000)

Checked By: _____

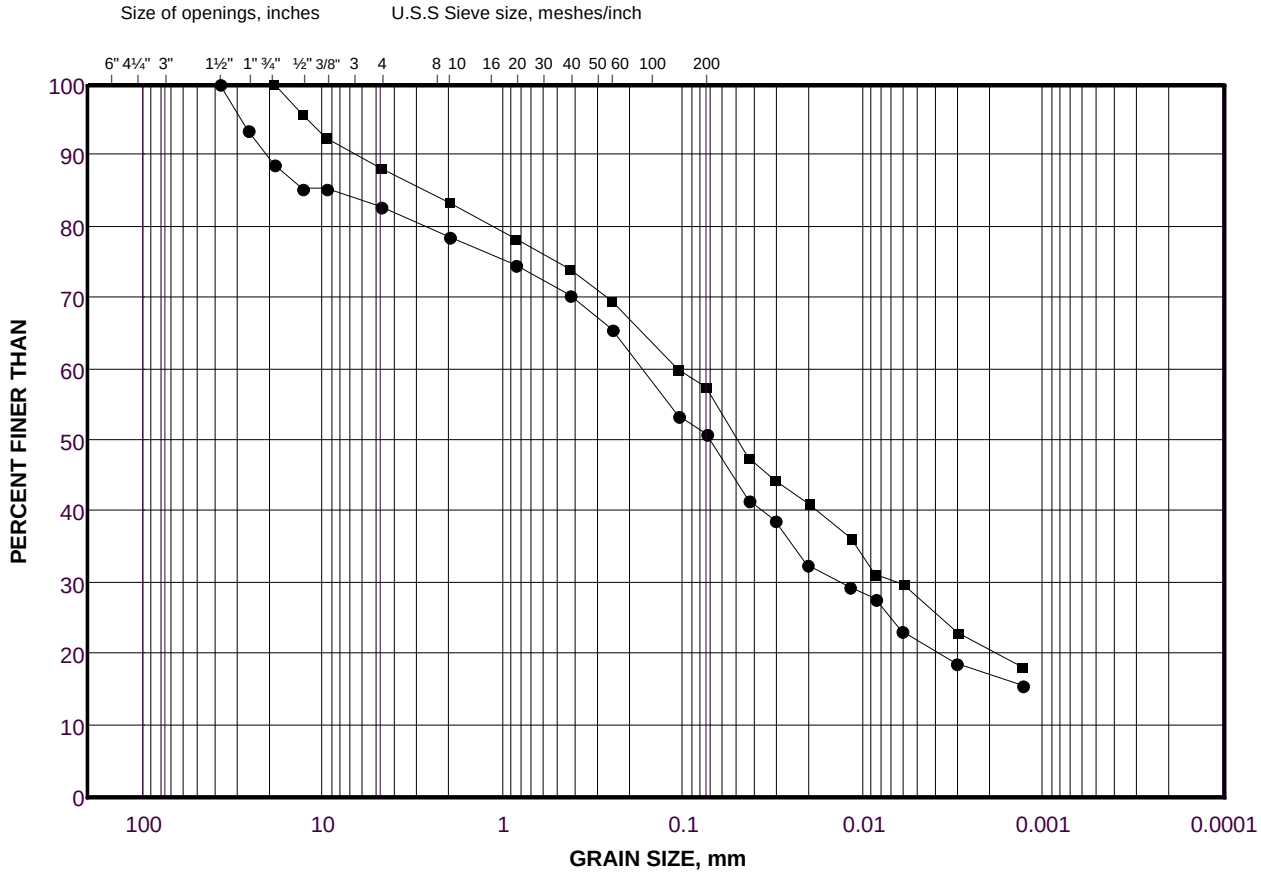
Golder Associates

Date: 06-Feb-20

GRAIN SIZE DISTRIBUTION

Clayey Silt with Sand some Gravel Subgrade

FIGURE C4



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH (mm)
●	BH 18-12	2	360 - 660
■	BH 18-9	2	300 - 600

Project Number: 1773654 (1000)

Checked By: _____

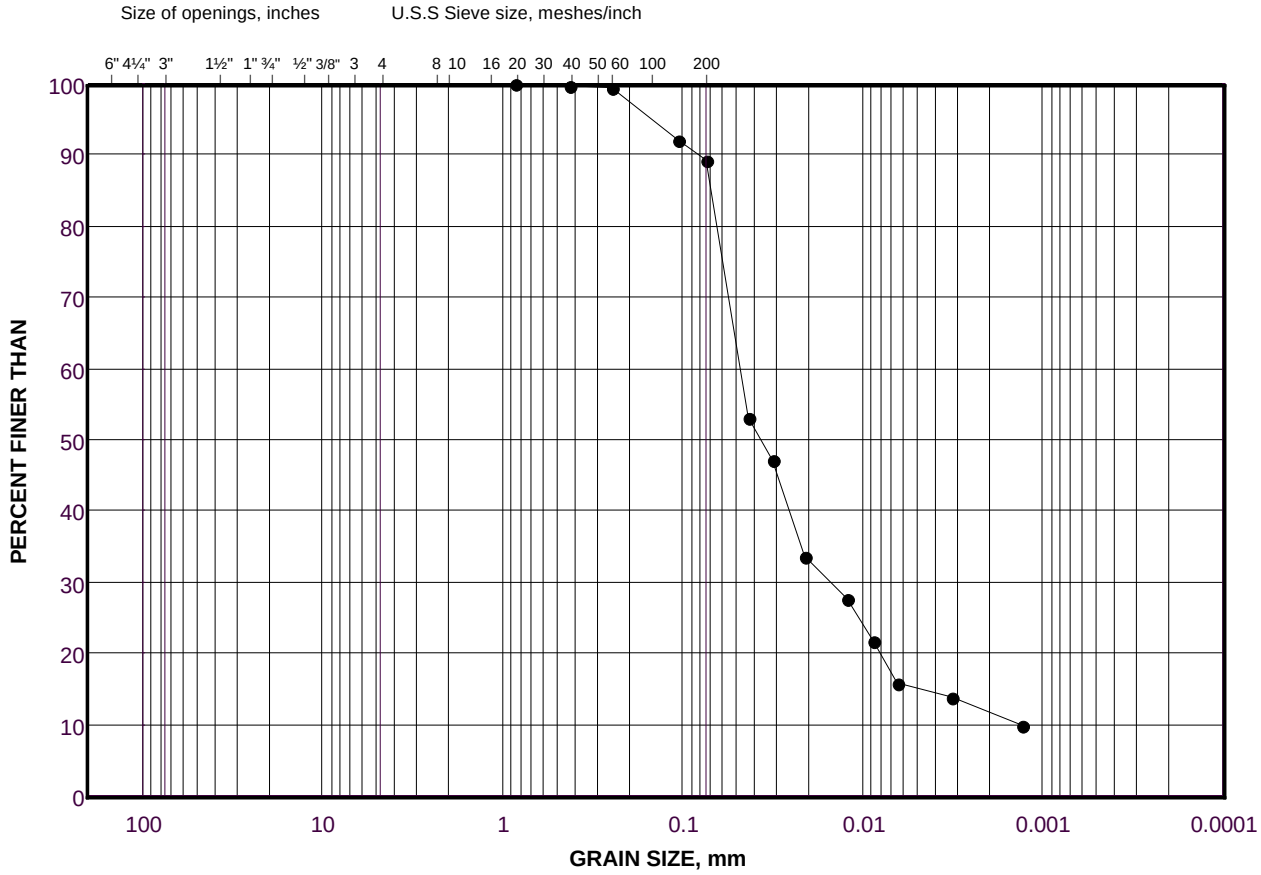
Golder Associates

Date: 05-Feb-20

GRAIN SIZE DISTRIBUTION

Silt some Clay some Sand Subgrade

FIGURE C5



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH (mm)
●	BH 18-39	3	710 -1010

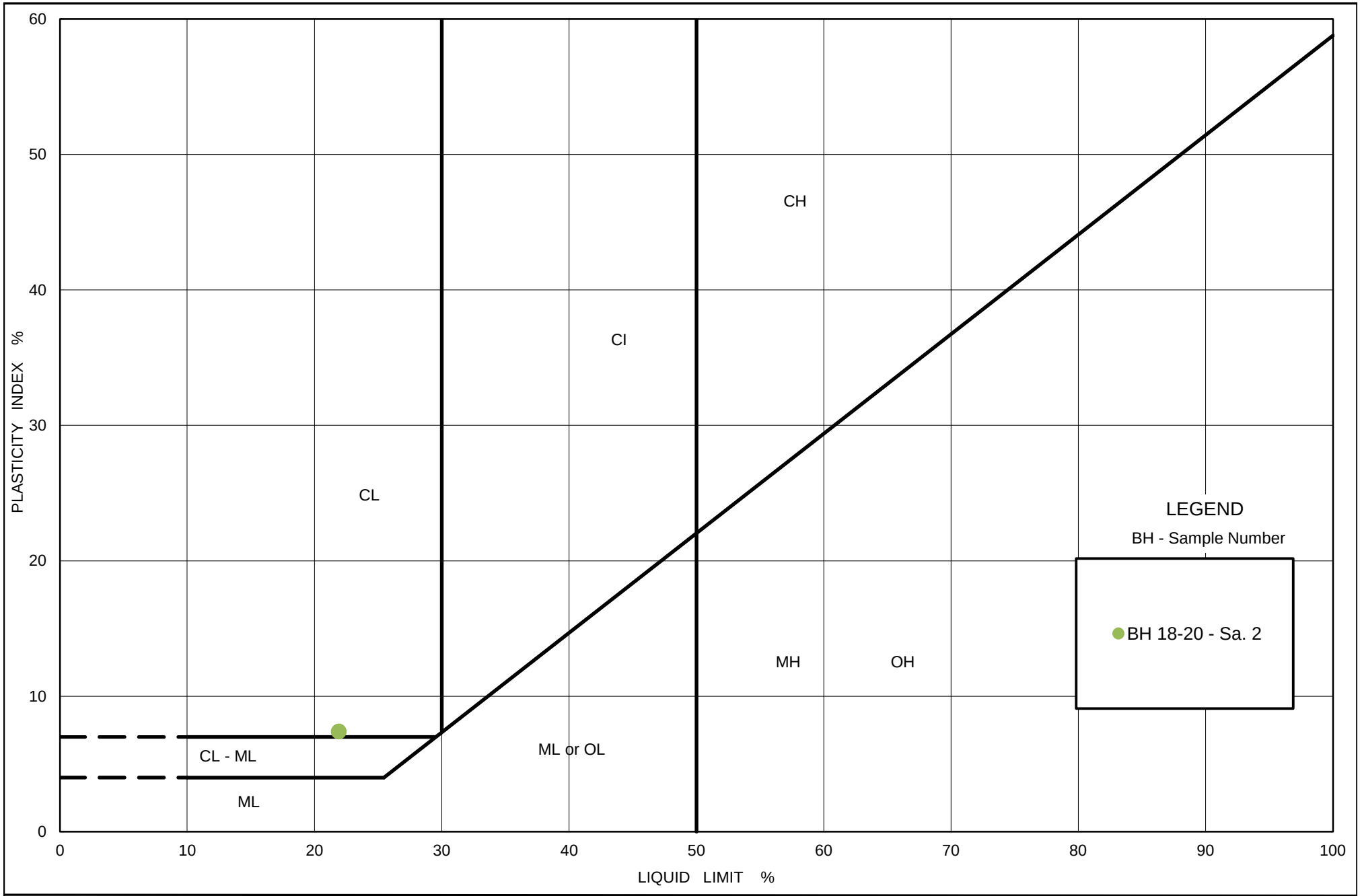
Project Number: 1773654 (1000)

Checked By: _____

Golder Associates

Date: 03-Feb-20

LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ASTM D4318)



GOLDER

PLASTICITY CHART

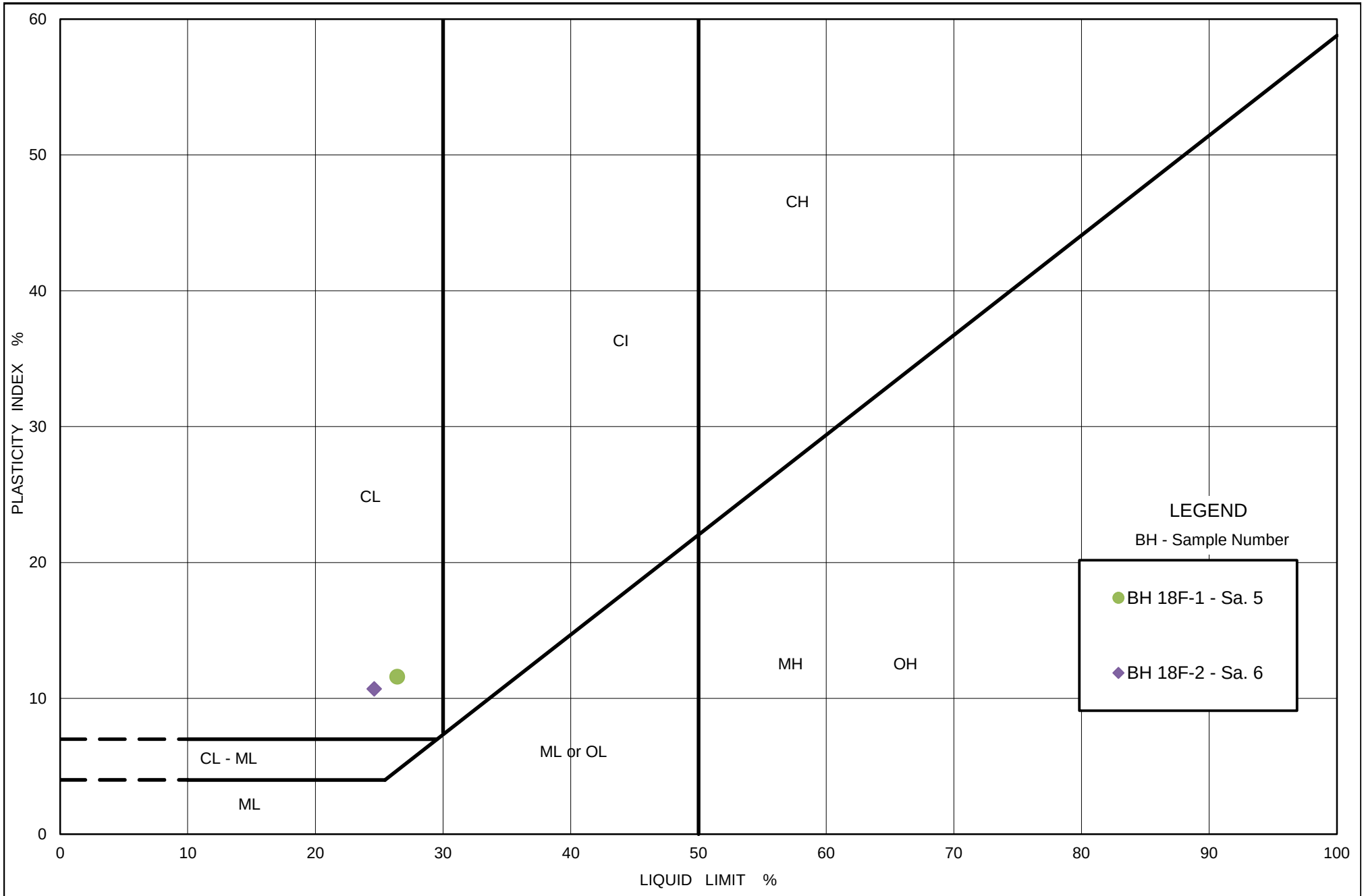
(CL) SILTY CLAY

Figure No.: C6

Project No.: 1773654 - 1000

Checked By:

LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ASTM D4318)



GOLDER

PLASTICITY CHART

(CL) SILTY CLAY

Figure No.: C7

Project No.: 1773654 - 1000

Checked By:

APPENDIX D

AASHTO Designs

Table D1
EQUIVALENT SINGLE AXLE LOAD CALCULATION

Region of Peel
Airport Road From Braydon Blvd/Stonecrest Drive to Countryside Drive
20-Year ESAL calculation

1) Traffic Analysis

Traffic Data Year		2021		2031	2041
Design Year		**2021**			
Traffic Analysis Period			10	10	
Average Annual Daily Traffic (AADT)		30,500		42,000	57,830
Average Rate of Increase in Traffic (%)			3.25	3.25	
Truck Fraction of Total Traffic (%)		8		8	8
Average Rate of Increase in Truck Fraction (%)			0.00	0.00	
Number of Lanes in One Direction		3		3	3
Directional Factor		0.5		0.5	0.5
Lane Distribution Factor		0.7		0.6	0.6
Daily Truck Volume		**854**		**1,008**	**1,388**

2) Daily ESALs Analysis

Road Classification		***Urban Minor Arterial***		
Traffic Analysis Base Year		2021	2031	2041
Breakdown of Truck Proportions (%)	Class 1	65		
	Class 2	5		
	Class 3	20		
	Class 4	10		
Daily Truck Volumes for 4 Classes	Class 1	1,467	1,702	1,903
	Class 2	43	50	69
	Class 3	171	202	278
	Class 4	85	101	139
Truck Factors for 4 Classes of Truck	Class 1	0.5		
	Class 2	2.3		
	Class 3	1.6		
	Class 4	5.5		
Weighted Average Truck Factor			**1.310**	
Daily ESALs per Truck Class	Class 1	734	851	952
	Class 2	98	116	160
	Class 3	273	323	444
	Class 4	470	554	763
Total Daily ESALs in Design Lane		**1,575**	**1,844**	**2,319**

3) Total ESALs for Base Year

Base Year	2021	2031	2041
Number of Days of Truck Traffic	365	365	365
Total ESALs for Base Year	**574,762**	**673,016**	**846,286**

4) Cumulative ESALs for the Design Period

Design Period (Years)	**20**	
Span of Design Periods	2021 to 2031	2031 to 2041
Average Rate of Increase in Truck Volume (%)	1.67	3.25
Years of Design Periods	10	10
Growth Factor	11.60	11.60
ESALs for the Design Periods	6,666,000	7,805,000
Cumulative ESALs for the Design Period	**14,470,524**	

Note: The ESAL calculations are baesd on the guidelines "Procedures for Estimating Traffic Loads for Pavement Design" by Jerry Hajek, 1995, and on MTO's "Adaptation and Verification of AASHTO Pavement Design Guide for Ontario Conditions", March 19, 2008.

Table D2
PAVEMENT DESIGN AND ANALYSIS - FLEXIBLE STRUCTURAL DESIGN MODULE

Airport Road - Rehabilitation Option 1
Removal of HMA and underlying Granular to a depth of 390 mm and placement of 200 mm new Granular A and 190 mm HMA
Design Life - 20 years

Flexible Structural Design

80-kN ESALs Over Initial Performance Period	14,500,000
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level (%)	90
Overall Standard Deviation	0.47
Roadbed Soil Resilient Modulus	30,000 kPa
Stage Construction	1.0
Calculated Design Structural Number	151

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di) (mm)	Required Thickness (mm)	Calculated SN (mm)
1	New Hot Mix Asphalt	0.42	1.00	190	190	80
2	New Granular A Base	0.14	1.00	300	300	42
3	Existing Granular Base	0.12	0.80	360	360	35
Total	-	-	-	850	850	157

Layered Thickness Design

Thickness precision

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Actual Spec Thickness (Di) (mm)	Actual Min Thickness (Di) (mm)	Elastic Modulus (kPa)	Calculated Thickness (mm)	Calculated SN (mm)
1	New Hot Mix Asphalt	0.42	1.00		-	2,750,000	177	74
2	New Granular A Base	0.14	1.00		-	250,000	67	9
3	Existing Granular Base	0.12	0.80		-	180,000	705	68
Total	-	-	-	-	-	-	949	151

-

Table D3
PAVEMENT DESIGN AND ANALYSIS - FLEXIBLE STRUCTURAL DESIGN MODULE

Airport Road - Rehabilitation Option 2
Full Depth Reconstruction to 1100 mm
Design life - 20 years

Flexible Structural Design

80-kN ESALs Over Initial Performance Period	14,500,000
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level (%)	90
Overall Standard Deviation	0.47
Roadbed Soil Resilient Modulus	30,000 kPa
Stage Construction	1.0
Calculated Design Structural Number	151

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di) (mm)	Required Thickness (mm)	Calculated SN (mm)
1	New Hot Mix Asphalt	0.42	1.00	180	180	76
2	New Granular A Base	0.14	1.00	200	200	28
3	New Granular B,Type I	0.09	1.00	720	720	65
Total	-	-	-	1100	1100	169

Layered Thickness Design

Thickness precision

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Actual Spec Thickness (Di) (mm)	Actual Min Thickness (Di) (mm)	Elastic Modulus (kPa)	Calculated Thickness (mm)	Calculated SN (mm)
1	New Hot Mix Asphalt	0.42	1.00	180	-	2,750,000	180	76
2	New Granular A Base	0.14	1.00	-	-	250,000	150	21
3	New Granular B,Type I	0.09	1.00		-	120,000	608	55
Total	-	-	-	-	-	-	938	152

-

Table D4
PAVEMENT DESIGN AND ANALYSIS - FLEXIBLE STRUCTURAL DESIGN MODULE

Airport Road
Widening Design for Option 1
Design life - 20 years

Flexible Structural Design

80-kN ESALs Over Initial Performance Period	14,500,000
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level (%)	90
Overall Standard Deviation	0.47
Roadbed Soil Resilient Modulus	25,000 kPa
Stage Construction	1.0
Calculated Design Structural Number	160

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di) (mm)	Required Thickness (mm)	Calculated SN (mm)
1	New Hot Mix Asphalt	0.42	1.00	190	190	80
2	New Granular A Base	0.14	1.00	300	300	42
3	New Granular B,Type I	0.09	1.00	610	610	55
Total	-	-	-	1100	1100	177

Layered Thickness Design

Thickness precision

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Actual Spec Thickness (Di) (mm)	Actual Min Thickness (Di) (mm)	Elastic Modulus (kPa)	Calculated Thickness (mm)	Calculated SN (mm)
1	New Hot Mix Asphalt	0.42	1.00	190	-	2,750,000	190	80
2	New Granular A Base	0.14	1.00	-	-	250,000	141	20
3	New Granular B,Type I	0.09	1.00		-	110,000	669	60
Total	-	-	-	-	-	-	1000	160

-

Table D5
PAVEMENT DESIGN AND ANALYSIS - FLEXIBLE STRUCTURAL DESIGN MODULE

Airport Road
Widening Design for Option 2
Design life - 20 years

Flexible Structural Design

80-kN ESALs Over Initial Performance Period	14,500,000
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliability Level (%)	90
Overall Standard Deviation	0.47
Roadbed Soil Resilient Modulus	25,000 kPa
Stage Construction	1.0
Calculated Design Structural Number	160

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di) (mm)	Required Thickness (mm)	Calculated SN (mm)
1	New Hot Mix Asphalt	0.42	1.00	180	180	76
2	New Granular A Base	0.14	1.00	200	200	28
3	New Granular B,Type I	0.09	1.00	720	720	65
Total	-	-	-	1100	1100	169

Layered Thickness Design

Thickness precision -

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Actual Spec Thickness (Di) (mm)	Actual Min Thickness (Di) (mm)	Elastic Modulus (kPa)	Calculated Thickness (mm)	Calculated SN (mm)
1	New Hot Mix Asphalt	0.42	1.00	180	-	2,750,000	180	76
2	New Granular A Base	0.14	1.00	-	-	250,000	171	24
3	New Granular B,Type I	0.09	1.00		-	110,000	669	60
Total	-	-	-	-	-	-	1020	160

APPENDIX E

Life Cycle Cost Analysis

Table E-1
LIFE CYCLE ANALYSIS FOR 50 YEARS
(per lane per kilometer)
AIRPORT ROAD
From Braydon Boulevard/Stonecrest Drive to Countryside Drive, City of Brampton, Region of Peel

SUMMARY OF LIFE CYCLE COST ANALYSIS - REHABILITATION OF EXISTING LANES AND WIDENING

OPTIONS	DESCRIPTION	INITIAL COST	LCC	COST RANKING
OPTION 1	Rehabilitation: Remove HMA and granulars to 490 mm, place 190 mm HMA over 300 mm Granular A; Widening: 190 mm HMA over 300 mm Granular A over 610 mm Granular B Type I	$870,434	$998,251	1
OPTION 2	Full Depth Reconstruction - 180 mm HMA over 200 mm Granular A over 720 Granular B Type I; Widening: 180 mm HMA over 200 mm Granular A over 720 mm Granular B Type I	$991,202	$1,118,649	2

OPTION 1 Rehabilitation: Remove HMA and granulars to 490 mm, place 190 mm HMA over 300 mm Granular A; Widening: 190 mm HMA over 300 mm Granular A over 610 mm Granular B Type I

Structure	Thickness (mm)	Item		Quantity	Unit	Price	Cost
Excavation	**490**	490 mm	Excavation	1,838	m3	$15.00	$27,563
New Hot Mix Asphalt	**190**	50 mm	SP 12.5 FC1	473	t	$130.30	$61,567
		70 mm	SP 19.0	643	t	$105.00	$67,528
		70 mm	SP 19.0	643	t	$105.00	$67,528
New Granular A	**300**	300 mm	Granular A	2700	t	$45.00	$121,500
Tack Coat		2 lifts	Tack Coat	7,500	sq.m	$0.50	$3,750
Widening Design							
Excavation	**1100**	1100 mm	Excavation	4,125	m3	$15.00	$61,875
New Hot Mix Asphalt	**190**	50 mm	SP 12.5 FC1	473	t	$130.30	$61,567
		70 mm	SP 19.0	643	t	$105.00	$67,528
		70 mm	SP 19.0	643	t	$105.00	$67,528
New Granular A	**300**	300 mm	Granular A	2700	t	$45.00	$121,500
New Granular B, Type I	**610**	610 mm	Granular B Type I	5490	t	$25.00	$137,250
Tack Coat		2 lifts	Tack Coat	7,500	sq.m	$0.50	$3,750
						Total	**$870,434**

OPTION 2 Full Depth Reconstruction - 180 mm HMA over 200 mm Granular A over 720 Granular B Type I; Widening: 180 mm HMA over 200 mm Granular A over 720 mm Granular B Type I

Structure	Thickness (mm)	Item		Quantity	Unit	Price	Cost
Excavation	**1100**	1100 mm	Excavation	4,125	m3	$15.00	$61,875
New Hot Mix Asphalt	**180**	50 mm	SP 12.5 FC1	473	t	$130.30	$61,567
		60 mm	SP 19.0	551	t	$105.00	$57,881
		70 mm	SP 19.0	643	t	$105.00	$67,528
New Granular A	**200**	200 mm	Granular A	1800	t	$45.00	$81,000
New Granular B, Type I	**720**	720 mm	Granular B Type I	6480	t	$25.00	$162,000
Tack Coat		2 lifts	Tack Coat	7,500	sq.m	$0.50	$3,750
Widening Design							
Excavation	**1100**	1100 mm	Excavation	4,125	m3	$15.00	$61,875
New Hot Mix Asphalt	**180**	50 mm	SP 12.5 FC1	473	t	$130.30	$61,567
		60 mm	SP 19.0	551	t	$105.00	$57,881
		70 mm	SP 19.0	643	t	$105.00	$67,528
New Granular A	**200**	200 mm	Granular A	1800	t	$45.00	$81,000
New Granular B, Type I	**720**	720 mm	Granular B Type I	6480	t	$25.00	$162,000
Tack Coat		2 lifts	Tack Coat	7,500	sq.m	$0.50	$3,750
						Total	**$991,202**

Designed: KK
Checked:

Table E-2

50 YEARS LIFE CYCLE COST ANALYSIS

(Per Lane per kilometer)

AIRPORT ROAD

From Braydon Boulevard/Stonecrest Drive to Countryside Drive, City of Brampton, Region of Peel

OPTION 2 - Rehabilitation: Remove HMA and granulars to 490 mm, place 190 mm HMA over 300 mm Granular A; Widening: 190 mm HMA over 300 mm Granular A over 610 mm Granular B Type I

Scheduled Maint/Rehab Year	Maintenance/Rehabilitation Treatment	Quantities	Pay Item Price ($)	Cost	Yearly Total Cost	Discount (5%)	Present Worth Maint/Rehab $
0	**Initial Construction Cost**			$870,434	**$870,434**	1.00	**$870,434**
3							
	Rout and Seal cracks	60 m	$14.00	$840	$840	0.86	$726
7	Rout and Seal cracks	100 m	$14.00	$1,400	$3,275	0.71	$2,327
	Mill 40 mm and 40 mm Patch	188 sq.m	$10.00	$1,875			
12	Rout and Seal cracks	150 m	$14.00	$2,100	$9,600	0.56	$5,346
	Mill 40 mm and 40 mm Patch	750 sq.m	$10.00	$7,500			
16							
	Mill 100 mm asphalt pavement	3,750 sq.m	$4.50	$16,875	**$130,426**	0.46	**$59,750**
	Resurface SP 12.5 FC2 - 50 mm	473 t	$130.30	$61,567			
	Resurface SP 19.0 - 50 mm	459 t	$105.00	$48,234			
	Tack Coat - 2 layers	7,500 sq.m	$0.50	$3,750			
19	Rout and Seal cracks	70 m	$14.00	$980	$980	0.40	$388
	Mill 40 mm and 40 mm Patch	413 sq.m	$10.00	$4,125			
28							
	Mill 100 mm asphalt pavement	3,750 sq.m	$4.50	$16,875	**$130,426**	0.26	**$33,271**
	Resurface SP 12.5 FC2 - 50 mm	473 t	$130.30	$61,567			
	Resurface SP 19.0 - 50 mm	459 t	$105.00	$48,234			
	Tack Coat - 2 layers	7,500 sq.m	$0.50	$3,750			
31	Rout and Seal cracks	70 m	$14.00	$980	$980	0.22	$216
35	Rout and Seal cracks	230 m	$14.00	$3,220	$7,345	0.18	$1,332
	Mill 40 mm and 40 mm Patch	413 sq.m	$10.00	$4,125			
39							
	Mill 100 mm asphalt pavement	3,750 sq.m	$4.50	$16,875	**$130,426**	0.15	**$19,453**
	Resurface SP 12.5 FC2 - 50 mm	473 t	$130.30	$61,567			
	Resurface SP 19.0 - 50 mm	459 t	$105.00	$48,234			
	Tack Coat - 2 layers	7,500 sq.m	$0.50	$3,750			
42	Rout and Seal cracks	70 m	$14.00	$980	$980	0.13	$126
45	Rout and Seal cracks	230 m	$14.00	$3,220	$7,345	0.11	$817
	Mill 40 mm and 40 mm Patch	413 sq.m	$10.00	$4,125			
49							
	Mill 100 mm asphalt pavement	3,750 sq.m	$4.50	$16,875	**$130,426**	0.09	**$11,942**
	Resurface SP 12.5 FC2 - 50 mm	473 t	$130.30	$61,567			
	Resurface SP 19.0 - 50 mm	459 t	$105.00	$48,234			
	Tack Coat - 2 layers	7,500 sq.m	$0.50	$3,750			
50	**Salvage Value**			-$115,934	-$115,934	0.09	**-$10,110**
					TOTAL		**$998,251**

Calculated: KK

Reviewed: _____

Table E-3

50 YEARS LIFE CYCLE COST ANALYSIS

(Per Lane per kilometer)

AIRPORT ROAD

From Braydon Boulevard/Stonecrest Drive to Countryside Drive, City of Brampton, Region of Peel

OPTION 3 - Full Depth Reconstruction - 180 mm HMA over 200 mm Granular A over 720 Granular B Type I; Widening: 180 mm HMA over 200 mm Granular A over 720 mm Granular B Type I

Scheduled Maint/Rehab Year	Maintenance/Rehabilitation Treatment	Quantities	Pay Item Price ($)	Cost	Yearly Total Cost	Discount (5%)	Present Worth Maint/Rehab $
0	**Initial Construction Cost**			$991,202	**$991,202**	1.00	**$991,202**
3							
	Rout and Seal cracks	60 m	$14.00	$840	$840	0.86	$726
7	Rout and Seal cracks	100 m	$14.00	$1,400	$3,275	0.71	$2,327
	Mill 40 mm and 40 mm Patch	188 sq.m	$10.00	$1,875			
12	Rout and Seal cracks	150 m	$14.00	$2,100	$9,600	0.56	$5,346
	Mill 40 mm and 40 mm Patch	750 sq.m	$10.00	$7,500			
16	**Mill 100 mm asphalt pavement**	3,750 sq.m	$4.50	$16,875	**$130,426**	0.46	**$59,750**
	Resurface SP 12.5 FC2 - 50 mm	473 t	$130.30	$61,567			
	Resurface SP 19.0 - 50 mm	459 t	$105.00	$48,234			
	Tack Coat - 2 layers	7,500 sq.m	$0.50	$3,750			
19	Rout and Seal cracks	60 m	$14.00	$840	$840	0.40	$332
	Mill 40 mm and 40 mm Patch	375 sq.m	$10.00	$3,750			
28	**Mill 100 mm asphalt pavement**	3,750 sq.m	$4.50	$16,875	**$130,426**	0.26	**$33,271**
	Resurface SP 12.5 FC2 - 50 mm	473 t	$130.30	$61,567			
	Resurface SP 19.0 - 50 mm	459 t	$105.00	$48,234			
	Tack Coat - 2 layers	7,500 sq.m	$0.50	$3,750			
31	Rout and Seal cracks	60 m	$14.00	$840	$840	0.22	$185
35	Rout and Seal cracks	220 m	$14.00	$3,080	$6,830	0.18	$1,238
	Mill 40 mm and 40 mm Patch	375 sq.m	$10.00	$3,750			
39	**Mill 100 mm asphalt pavement**	3,750 sq.m	$4.50	$16,875	**$130,426**	0.15	**$19,453**
	Resurface SP 12.5 FC2 - 50 mm	473 t	$130.30	$61,567			
	Resurface SP 19.0 - 50 mm	459 t	$105.00	$48,234			
	Tack Coat - 2 layers	7,500 sq.m	$0.50	$3,750			
42	Rout and Seal cracks	60 m	$14.00	$840	$840	0.13	$108
45	Rout and Seal cracks	220 m	$14.00	$3,080	$6,830	0.11	$760
	Mill 40 mm and 40 mm Patch	375 sq.m	$10.00	$3,750			
49	**Mill 100 mm asphalt pavement**	3,750 sq.m	$4.50	$16,875	**$130,426**	0.09	**$11,942**
	Resurface SP 12.5 FC2 - 50 mm	473 t	$130.30	$61,567			
	Resurface SP 19.0 - 50 mm	459 t	$105.00	$48,234			
	Tack Coat - 2 layers	7,500 sq.m	$0.50	$3,750			
50	**Salvage Value**			-$115,934	-$115,934	0.09	**-$10,110**
					TOTAL		**$1,118,649**

Calculated: KK

Reviewed: _____

APPENDIX F

Certificate of Analysis

GOLDER ASSOCIATES LTD. (Markham)
ATTN: Alexander Dziedzic
215 Shields Court
Unit #1
Markham ON L3R 8V2

Date Received: 09-DEC-19
Report Date: 16-DEC-19 12:07 (MT)
Version: FINAL

Client Phone: 905-475-5591

Certificate of Analysis

Lab Work Order #: L2393672

Project P.O. #: NOT SUBMITTED
Job Reference: 1773654
C of C Numbers:
Legal Site Desc:

Amanda Overholster
Account Manager

ANALYTICAL REPORT

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Regulation 153/04 - April 15, 2011 Standards - T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use						
L2393672-1	BH18-32 SA3	Physical Tests	Conductivity	1.37	0.57	mS/cm
		Saturated Paste Extractables	SAR	29.3	2.4	SAR

ANALYTICAL REPORT

Physical Tests - SOIL

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2393672-1 Sample Date: 06-DEC-19 Sample ID: BH18-32 SA3
Conductivity	mS/cm	0.57	-	1.37
% Moisture	%	-	-	14.0
pH	pH units	-	-	7.98

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

ANALYTICAL REPORT

Cyanides - SOIL

		Lab ID	L2393672-1
		Sample Date	06-DEC-19
		Sample ID	BH18-32 SA3
Analyte	Unit	Guide Limits #1	#2	
Cyanide, Weak Acid Diss	ug/g	0.051	-	<0.050

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

ANALYTICAL REPORT

Saturated Paste Extractables - SOIL

			Lab ID	L2393672-1
			Sample Date	06-DEC-19
			Sample ID	BH18-32 SA3
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
SAR	SAR	2.4	-	29.3
Calcium (Ca)	mg/L	-	-	6.02
Magnesium (Mg)	mg/L	-	-	0.92
Sodium (Na)	mg/L	-	-	292

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

ANALYTICAL REPORT

Metals - SOIL

			Lab ID	L2393672-1
			Sample Date	06-DEC-19
			Sample ID	BH18-32 SA3
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Antimony (Sb)	ug/g	1.3	-	<1.0
Arsenic (As)	ug/g	18	-	4.4
Barium (Ba)	ug/g	220	-	105
Beryllium (Be)	ug/g	2.5	-	0.63
Boron (B)	ug/g	36	-	10.6
Boron (B), Hot Water Ext.	ug/g	36	-	0.13
Cadmium (Cd)	ug/g	1.2	-	<0.50
Chromium (Cr)	ug/g	70	-	20.7
Cobalt (Co)	ug/g	21	-	10.6
Copper (Cu)	ug/g	92	-	22.1
Lead (Pb)	ug/g	120	-	8.0
Mercury (Hg)	ug/g	0.27	-	0.0135
Molybdenum (Mo)	ug/g	2	-	<1.0
Nickel (Ni)	ug/g	82	-	22.6
Selenium (Se)	ug/g	1.5	-	<1.0
Silver (Ag)	ug/g	0.5	-	<0.20
Thallium (Tl)	ug/g	1	-	<0.50
Uranium (U)	ug/g	2.5	-	<1.0
Vanadium (V)	ug/g	86	-	36.3
Zinc (Zn)	ug/g	290	-	45.2

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

ANALYTICAL REPORT

Speciated Metals - SOIL

			Lab ID	L2393672-1
			Sample Date	06-DEC-19
			Sample ID	BH18-32 SA3
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Chromium, Hexavalent	ug/g	0.66	-	<0.20

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

ANALYTICAL REPORT

Volatile Organic Compounds - SOIL

			Lab ID	L2393672-1
			Sample Date	06-DEC-19
			Sample ID	BH18-32 SA3
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Acetone	ug/g	0.5	-	<0.50
Benzene	ug/g	0.02	-	<0.0068
Bromodichloromethane	ug/g	0.05	-	<0.050
Bromoform	ug/g	0.05	-	<0.050
Bromomethane	ug/g	0.05	-	<0.050
Carbon tetrachloride	ug/g	0.05	-	<0.050
Chlorobenzene	ug/g	0.05	-	<0.050
Dibromochloromethane	ug/g	0.05	-	<0.050
Chloroform	ug/g	0.05	-	<0.050
1,2-Dibromoethane	ug/g	0.05	-	<0.050
1,2-Dichlorobenzene	ug/g	0.05	-	<0.050
1,3-Dichlorobenzene	ug/g	0.05	-	<0.050
1,4-Dichlorobenzene	ug/g	0.05	-	<0.050
Dichlorodifluoromethane	ug/g	0.05	-	<0.050
1,1-Dichloroethane	ug/g	0.05	-	<0.050
1,2-Dichloroethane	ug/g	0.05	-	<0.050
1,1-Dichloroethylene	ug/g	0.05	-	<0.050
cis-1,2-Dichloroethylene	ug/g	0.05	-	<0.050
trans-1,2-Dichloroethylene	ug/g	0.05	-	<0.050
Methylene Chloride	ug/g	0.05	-	<0.050
1,2-Dichloropropane	ug/g	0.05	-	<0.050
cis-1,3-Dichloropropene	ug/g	-	-	<0.030
trans-1,3-Dichloropropene	ug/g	-	-	<0.030
1,3-Dichloropropene (cis & trans)	ug/g	0.05	-	<0.042
Ethylbenzene	ug/g	0.05	-	<0.018
n-Hexane	ug/g	0.05	-	<0.050
Methyl Ethyl Ketone	ug/g	0.5	-	<0.50
Methyl Isobutyl Ketone	ug/g	0.5	-	<0.50
MTBE	ug/g	0.05	-	<0.050
Styrene	ug/g	0.05	-	<0.050

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

ANALYTICAL REPORT

Volatile Organic Compounds - SOIL

			Lab ID	L2393672-1
			Sample Date	06-DEC-19
			Sample ID	BH18-32 SA3
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
1,1,1,2-Tetrachloroethane	ug/g	0.05	-	<0.050
1,1,2,2-Tetrachloroethane	ug/g	0.05	-	<0.050
Tetrachloroethylene	ug/g	0.05	-	<0.050
Toluene	ug/g	0.2	-	<0.080
1,1,1-Trichloroethane	ug/g	0.05	-	<0.050
1,1,2-Trichloroethane	ug/g	0.05	-	<0.050
Trichloroethylene	ug/g	0.05	-	<0.010
Trichlorofluoromethane	ug/g	0.25	-	<0.050
Vinyl chloride	ug/g	0.02	-	<0.020
o-Xylene	ug/g	-	-	<0.020
m+p-Xylenes	ug/g	-	-	<0.030
Xylenes (Total)	ug/g	0.05	-	<0.050
Surrogate: 4-Bromofluorobenzene	%	-	-	82.0
Surrogate: 1,4-Difluorobenzene	%	-	-	94.7

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

ANALYTICAL REPORT

Hydrocarbons - SOIL

			Lab ID	L2393672-1
			Sample Date	06-DEC-19
			Sample ID	BH18-32 SA3
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
F1 (C6-C10)	ug/g	25	-	<5.0
F1-BTEX	ug/g	25	-	<5.0
F2 (C10-C16)	ug/g	10	-	<10
F2-Naphth	ug/g	-	-	<10
F3 (C16-C34)	ug/g	240	-	<50
F3-PAH	ug/g	-	-	<50
F4 (C34-C50)	ug/g	120	-	94
Total Hydrocarbons (C6-C50)	ug/g	-	-	94
Chrom. to baseline at nC50		-	-	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-	103.0
Surrogate: 3,4-Dichlorotoluene	%	-	-	84.7

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

Polycyclic Aromatic Hydrocarbons - SOIL

			Lab ID	L2393672-1
			Sample Date	06-DEC-19
			Sample ID	BH18-32 SA3
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Acenaphthene	ug/g	0.072	-	<0.050
Acenaphthylene	ug/g	0.093	-	<0.050
Anthracene	ug/g	0.16	-	<0.050
Benzo(a)anthracene	ug/g	0.36	-	<0.050
Benzo(a)pyrene	ug/g	0.3	-	<0.050
Benzo(b)fluoranthene	ug/g	0.47	-	<0.050
Benzo(g,h,i)perylene	ug/g	0.68	-	<0.050
Benzo(k)fluoranthene	ug/g	0.48	-	<0.050
Chrysene	ug/g	2.8	-	<0.050
Dibenzo(ah)anthracene	ug/g	0.1	-	<0.050
Fluoranthene	ug/g	0.56	-	<0.050
Fluorene	ug/g	0.12	-	<0.050
Indeno(1,2,3-cd)pyrene	ug/g	0.23	-	<0.050
1+2-Methylnaphthalenes	ug/g	0.59	-	<0.042
1-Methylnaphthalene	ug/g	0.59	-	<0.030
2-Methylnaphthalene	ug/g	0.59	-	<0.030
Naphthalene	ug/g	0.09	-	<0.013
Phenanthrene	ug/g	0.69	-	<0.046
Pyrene	ug/g	1	-	<0.050
Surrogate: 2-Fluorobiphenyl	%	-	-	85.7
Surrogate: p-Terphenyl d14	%	-	-	79.1

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

ANALYTICAL REPORT

Polychlorinated Biphenyls - SOIL

			Lab ID	L2393672-1
			Sample Date	06-DEC-19
			Sample ID	BH18-32 SA3
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Aroclor 1242	ug/g	-	-	<0.010
Aroclor 1248	ug/g	-	-	<0.010
Aroclor 1254	ug/g	-	-	<0.010
Aroclor 1260	ug/g	-	-	<0.010
Total PCBs	ug/g	0.3	-	<0.020
Surrogate: d14-Terphenyl	%	-	-	86.5

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

Reference Information

Methods Listed (if applicable):

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

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

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

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

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

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

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

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

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

EC-WT	Soil	Conductivity (EC)	MOEE E3138

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

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

F1-F4-511-CALC-WT	Soil	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-S

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

Hydrocarbon results are expressed on a dry weight basis.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
F1-HS-511-WT	Soil	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by extracting a soil or sediment sample as received with methanol, then analyzing by headspace-GC/FID.

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

F2-F4-511-WT	Soil	F2-F4-O.Reg 153/04 (July 2011)	CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from soil with 1:1 hexane:acetone using a rotary extractor. Extracts are treated with silica gel to remove polar organic interferences. F2, F3, & F4 are analyzed by GC-FID. F4G-sg is analyzed gravimetrically.

Notes:
1. F2 (C10-C16): Sum of all hydrocarbons that elute between nC10 and nC16.
2. F3 (C16-C34): Sum of all hydrocarbons that elute between nC16 and nC34.
3. F4 (C34-C50): Sum of all hydrocarbons that elute between nC34 and nC50.
4. F4G: Gravimetric Heavy Hydrocarbons
5. F4G-sg: Gravimetric Heavy Hydrocarbons (F4G) after silica gel treatment.
6. Where both F4 (C34-C50) and F4G-sg are reported for a sample, the larger of the two values is used for comparison against the relevant CCME guideline for F4.
7. F4G-sg cannot be added to the C6 to C50 hydrocarbon results to obtain an estimate of total extractable hydrocarbons.
8. This method is validated for use.
9. Data from analysis of validation and quality control samples is available upon request.
10. Reported results are expressed as milligrams per dry kilogram, unless otherwise indicated.

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

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

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

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

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

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

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

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

METHYLNAPS-CALC-WT	Soil	ABN-Calculated Parameters	SW846 8270
MOISTURE-WT	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)
PAH-511-WT	Soil	PAH-O.Reg 153/04 (July 2011)	SW846 3510/8270

A representative sub-sample of soil is fortified with deuterium-labelled surrogates and a mechanical shaking techniqueis used to extract the sample with a mixture of methanol and toluene. The extracts are concentrated and analyzed by GC/MS. Results for benzo(b) fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.

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

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
PCB-511-WT	Soil	PCB-O.Reg 153/04 (July 2011)	SW846 3510/8082

An aliquot of a solid sample is extracted with a solvent, extract is cleaned up and analyzed on the GC/MS.

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

PH-WT	Soil	pH	MOEE E3137A

A minimum 10g portion of the sample is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil and then analyzed using a pH meter and electrode.

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

SAR-R511-WT	Soil	SAR-O.Reg 153/04 (July 2011)	SW846 6010C

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

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

VOC-1,3-DCP-CALC-WT	Soil	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Soil	VOC-O.Reg 153/04 (July 2011)	SW846 8260 (511)

Soil and sediment samples are extracted in methanol and analyzed by headspace-GC/MS.

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

XYLENES-SUM-CALC-WT	Soil	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

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

Chain of Custody Numbers:

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

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

Reference Information

GLOSSARY OF REPORT TERMS

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

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

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

Quality Control Report

Workorder: L2393672 Report Date: 16-DEC-19

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Alexander Dziedzic

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
B-HWS-R511-WT	**Soil**							
Batch R4939934								
WG3238687-4 DUP		**L2393075-2**						
Boron (B), Hot Water Ext.		0.26	0.31		ug/g	17	30	10-DEC-19
WG3238687-2 IRM		**WT SAR3**						
Boron (B), Hot Water Ext.			106.6		%		70-130	10-DEC-19
WG3238687-3 LCS								
Boron (B), Hot Water Ext.			105.0		%		70-130	10-DEC-19
WG3238687-1 MB								
Boron (B), Hot Water Ext.			<0.10		ug/g		0.1	10-DEC-19
CN-WAD-R511-WT	**Soil**							
Batch R4940538								
WG3238296-3 DUP		**L2393123-1**						
Cyanide, Weak Acid Diss		<0.050	<0.050	RPD-NA	ug/g	N/A	35	10-DEC-19
WG3238296-2 LCS								
Cyanide, Weak Acid Diss			98.4		%		80-120	10-DEC-19
WG3238296-1 MB								
Cyanide, Weak Acid Diss			<0.050		ug/g		0.05	10-DEC-19
WG3238296-4 MS		**L2393123-1**						
Cyanide, Weak Acid Diss			103.9		%		70-130	10-DEC-19
CR-CR6-IC-WT	**Soil**							
Batch R4939891								
WG3238419-4 CRM		**WT-SQC012**						
Chromium, Hexavalent			88.3		%		70-130	10-DEC-19
WG3238419-3 DUP		**L2393796-1**						
Chromium, Hexavalent		0.32	0.29		ug/g	9.6	35	10-DEC-19
WG3238419-2 LCS								
Chromium, Hexavalent			97.0		%		80-120	10-DEC-19
WG3238419-1 MB								
Chromium, Hexavalent			<0.20		ug/g		0.2	10-DEC-19
EC-WT	**Soil**							
Batch R4940134								
WG3238695-4 DUP		**WG3238695-3**						
Conductivity		0.892	0.892		mS/cm	0.0	20	10-DEC-19
WG3238695-2 IRM		**WT SAR3**						
Conductivity			101.4		%		70-130	10-DEC-19
WG3238859-1 LCS								
Conductivity			101.3		%		90-110	10-DEC-19
WG3238695-1 MB								

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Alexander Dziedzic

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-WT	**Soil**							
Batch R4940134								
WG3238695-1 MB								
Conductivity			<0.0040		mS/cm		0.004	10-DEC-19
F1-HS-511-WT	**Soil**							
Batch R4941366								
WG3238564-4 DUP		**WG3238564-3**						
F1 (C6-C10)		<5.0	<5.0	RPD-NA	ug/g	N/A	30	12-DEC-19
WG3238564-2 LCS								
F1 (C6-C10)			101.0		%		80-120	11-DEC-19
WG3238564-1 MB								
F1 (C6-C10)			<5.0		ug/g		5	12-DEC-19
Surrogate: 3,4-Dichlorotoluene			87.2		%		60-140	12-DEC-19
WG3238564-6 MS		**L2393712-3**						
F1 (C6-C10)			91.8		%		60-140	12-DEC-19
F2-F4-511-WT	**Soil**							
Batch R4941544								
WG3238689-3 DUP		**WG3238689-5**						
F2 (C10-C16)		<10	<10	RPD-NA	ug/g	N/A	30	11-DEC-19
F3 (C16-C34)		<50	<50	RPD-NA	ug/g	N/A	30	11-DEC-19
F4 (C34-C50)		<50	<50	RPD-NA	ug/g	N/A	30	11-DEC-19
WG3238689-2 LCS								
F2 (C10-C16)			111.7		%		80-120	11-DEC-19
F3 (C16-C34)			107.9		%		80-120	11-DEC-19
F4 (C34-C50)			103.5		%		80-120	11-DEC-19
WG3238689-1 MB								
F2 (C10-C16)			<10		ug/g		10	11-DEC-19
F3 (C16-C34)			<50		ug/g		50	11-DEC-19
F4 (C34-C50)			<50		ug/g		50	11-DEC-19
Surrogate: 2-Bromobenzotrifluoride			94.9		%		60-140	11-DEC-19
WG3238689-4 MS		**WG3238689-5**						
F2 (C10-C16)			106.7		%		60-140	11-DEC-19
F3 (C16-C34)			103.2		%		60-140	11-DEC-19
F4 (C34-C50)			102.3		%		60-140	11-DEC-19
HG-200.2-CVAA-WT	**Soil**							

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Alexander Dziedzic

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-200.2-CVAA-WT	**Soil**							
Batch R4939898								
WG3238670-2 CRM		**WT-CANMET-TILL2**						
Mercury (Hg)			121.6		%		70-130	10-DEC-19
WG3238670-6 DUP		**WG3238670-5**						
Mercury (Hg)		0.0112	0.0107		ug/g	5.2	40	10-DEC-19
WG3238670-3 LCS								
Mercury (Hg)			113.5		%		80-120	10-DEC-19
WG3238670-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	10-DEC-19
MET-200.2-CCMS-WT	**Soil**							
Batch R4940011								
WG3238670-2 CRM		**WT-CANMET-TILL2**						
Antimony (Sb)			113.3		%		70-130	10-DEC-19
Arsenic (As)			105.6		%		70-130	10-DEC-19
Barium (Ba)			104.2		%		70-130	10-DEC-19
Beryllium (Be)			100.1		%		70-130	10-DEC-19
Boron (B)			3.7		mg/kg		0-8.6	10-DEC-19
Cadmium (Cd)			100.6		%		70-130	10-DEC-19
Chromium (Cr)			104.3		%		70-130	10-DEC-19
Cobalt (Co)			103.4		%		70-130	10-DEC-19
Copper (Cu)			102.7		%		70-130	10-DEC-19
Lead (Pb)			107.4		%		70-130	10-DEC-19
Molybdenum (Mo)			104.2		%		70-130	10-DEC-19
Nickel (Ni)			104.1		%		70-130	10-DEC-19
Selenium (Se)			0.38		mg/kg		0.15-0.55	10-DEC-19
Silver (Ag)			0.28		mg/kg		0.16-0.36	10-DEC-19
Thallium (Tl)			105.4		%		70-130	10-DEC-19
Uranium (U)			105.1		%		70-130	10-DEC-19
Vanadium (V)			106.0		%		70-130	10-DEC-19
Zinc (Zn)			99.2		%		70-130	10-DEC-19
WG3238670-6 DUP		**WG3238670-5**						
Antimony (Sb)		<0.10	<0.10	RPD-NA	ug/g	N/A	30	10-DEC-19
Arsenic (As)		1.61	1.41		ug/g	13	30	10-DEC-19
Barium (Ba)		18.3	15.2		ug/g	18	40	10-DEC-19
Beryllium (Be)		0.16	0.12		ug/g	28	30	10-DEC-19
Boron (B)		<5.0	<5.0	RPD-NA	ug/g	N/A	30	10-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Alexander Dziedzic

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4940011								
WG3238670-6 DUP		**WG3238670-5**						
Cadmium (Cd)		0.129	0.108		ug/g	18	30	10-DEC-19
Chromium (Cr)		6.27	5.22		ug/g	18	30	10-DEC-19
Cobalt (Co)		1.91	1.58		ug/g	19	30	10-DEC-19
Copper (Cu)		4.78	3.98		ug/g	18	30	10-DEC-19
Lead (Pb)		22.1	16.6		ug/g	29	40	10-DEC-19
Molybdenum (Mo)		0.25	0.20		ug/g	22	40	10-DEC-19
Nickel (Ni)		3.88	3.13		ug/g	22	30	10-DEC-19
Selenium (Se)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	10-DEC-19
Silver (Ag)		<0.10	<0.10	RPD-NA	ug/g	N/A	40	10-DEC-19
Thallium (Tl)		<0.050	<0.050	RPD-NA	ug/g	N/A	30	10-DEC-19
Uranium (U)		0.408	0.386		ug/g	5.6	30	10-DEC-19
Vanadium (V)		13.1	12.0		ug/g	8.2	30	10-DEC-19
Zinc (Zn)		46.6	40.8		ug/g	13	30	10-DEC-19
WG3238670-4 LCS								
Antimony (Sb)			104.1		%		80-120	10-DEC-19
Arsenic (As)			95.2		%		80-120	10-DEC-19
Barium (Ba)			96.4		%		80-120	10-DEC-19
Beryllium (Be)			92.6		%		80-120	10-DEC-19
Boron (B)			92.3		%		80-120	10-DEC-19
Cadmium (Cd)			94.9		%		80-120	10-DEC-19
Chromium (Cr)			94.2		%		80-120	10-DEC-19
Cobalt (Co)			94.6		%		80-120	10-DEC-19
Copper (Cu)			91.6		%		80-120	10-DEC-19
Lead (Pb)			97.8		%		80-120	10-DEC-19
Molybdenum (Mo)			100.1		%		80-120	10-DEC-19
Nickel (Ni)			93.3		%		80-120	10-DEC-19
Selenium (Se)			90.0		%		80-120	10-DEC-19
Silver (Ag)			97.7		%		80-120	10-DEC-19
Thallium (Tl)			98.1		%		80-120	10-DEC-19
Uranium (U)			96.4		%		80-120	10-DEC-19
Vanadium (V)			98.7		%		80-120	10-DEC-19
Zinc (Zn)			89.7		%		80-120	10-DEC-19
WG3238670-1 MB								
							0.1	

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Alexander Dziedzic

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4940011								
WG3238670-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	10-DEC-19
Arsenic (As)			<0.10		mg/kg		0.1	10-DEC-19
Barium (Ba)			<0.50		mg/kg		0.5	10-DEC-19
Beryllium (Be)			<0.10		mg/kg		0.1	10-DEC-19
Boron (B)			<5.0		mg/kg		5	10-DEC-19
Cadmium (Cd)			<0.020		mg/kg		0.02	10-DEC-19
Chromium (Cr)			<0.50		mg/kg		0.5	10-DEC-19
Cobalt (Co)			<0.10		mg/kg		0.1	10-DEC-19
Copper (Cu)			<0.50		mg/kg		0.5	10-DEC-19
Lead (Pb)			<0.50		mg/kg		0.5	10-DEC-19
Molybdenum (Mo)			<0.10		mg/kg		0.1	10-DEC-19
Nickel (Ni)			<0.50		mg/kg		0.5	10-DEC-19
Selenium (Se)			<0.20		mg/kg		0.2	10-DEC-19
Silver (Ag)			<0.10		mg/kg		0.1	10-DEC-19
Thallium (Tl)			<0.050		mg/kg		0.05	10-DEC-19
Uranium (U)			<0.050		mg/kg		0.05	10-DEC-19
Vanadium (V)			<0.20		mg/kg		0.2	10-DEC-19
Zinc (Zn)			<2.0		mg/kg		2	10-DEC-19
MOISTURE-WT	**Soil**							
Batch R4939256								
WG3238668-3 DUP		**L2393701-8**						
% Moisture		9.77	9.09		%	7.2	20	10-DEC-19
WG3238668-2 LCS								
% Moisture			100.8		%		90-110	10-DEC-19
WG3238668-1 MB								
% Moisture			<0.25		%		0.25	10-DEC-19
PAH-511-WT	**Soil**							
Batch R4940822								
WG3238619-3 DUP		**WG3238619-5**						
1-Methylnaphthalene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	11-DEC-19
2-Methylnaphthalene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	11-DEC-19
Acenaphthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	11-DEC-19
Acenaphthylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	11-DEC-19
Anthracene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	11-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Alexander Dziedzic

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT	**Soil**							
Batch R4940822								
WG3238619-3 DUP		**WG3238619-5**						
Benzo(a)anthracene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	11-DEC-19
Benzo(a)pyrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	11-DEC-19
Benzo(b)fluoranthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	11-DEC-19
Benzo(g,h,i)perylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	11-DEC-19
Benzo(k)fluoranthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	11-DEC-19
Chrysene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	11-DEC-19
Dibenzo(ah)anthracene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	11-DEC-19
Fluoranthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	11-DEC-19
Fluorene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	11-DEC-19
Indeno(1,2,3-cd)pyrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	11-DEC-19
Naphthalene		<0.013	<0.013	RPD-NA	ug/g	N/A	40	11-DEC-19
Phenanthrene		<0.046	<0.046	RPD-NA	ug/g	N/A	40	11-DEC-19
Pyrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	11-DEC-19
WG3238619-2 LCS								
1-Methylnaphthalene			90.1		%		50-140	11-DEC-19
2-Methylnaphthalene			84.8		%		50-140	11-DEC-19
Acenaphthene			91.7		%		50-140	11-DEC-19
Acenaphthylene			94.2		%		50-140	11-DEC-19
Anthracene			90.0		%		50-140	11-DEC-19
Benzo(a)anthracene			91.9		%		50-140	11-DEC-19
Benzo(a)pyrene			88.5		%		50-140	11-DEC-19
Benzo(b)fluoranthene			85.0		%		50-140	11-DEC-19
Benzo(g,h,i)perylene			89.6		%		50-140	11-DEC-19
Benzo(k)fluoranthene			91.7		%		50-140	11-DEC-19
Chrysene			100.5		%		50-140	11-DEC-19
Dibenzo(ah)anthracene			91.0		%		50-140	11-DEC-19
Fluoranthene			89.3		%		50-140	11-DEC-19
Fluorene			90.1		%		50-140	11-DEC-19
Indeno(1,2,3-cd)pyrene			91.1		%		50-140	11-DEC-19
Naphthalene			87.6		%		50-140	11-DEC-19
Phenanthrene			89.6		%		50-140	11-DEC-19
Pyrene			89.2		%		50-140	11-DEC-19
WG3238619-1 MB								
							0.03	

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Alexander Dziedzic

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT	**Soil**							
Batch R4940822								
WG3238619-1 MB								
1-Methylnaphthalene			<0.030		ug/g		0.03	11-DEC-19
2-Methylnaphthalene			<0.030		ug/g		0.03	11-DEC-19
Acenaphthene			<0.050		ug/g		0.05	11-DEC-19
Acenaphthylene			<0.050		ug/g		0.05	11-DEC-19
Anthracene			<0.050		ug/g		0.05	11-DEC-19
Benzo(a)anthracene			<0.050		ug/g		0.05	11-DEC-19
Benzo(a)pyrene			<0.050		ug/g		0.05	11-DEC-19
Benzo(b)fluoranthene			<0.050		ug/g		0.05	11-DEC-19
Benzo(g,h,i)perylene			<0.050		ug/g		0.05	11-DEC-19
Benzo(k)fluoranthene			<0.050		ug/g		0.05	11-DEC-19
Chrysene			<0.050		ug/g		0.05	11-DEC-19
Dibenzo(ah)anthracene			<0.050		ug/g		0.05	11-DEC-19
Fluoranthene			<0.050		ug/g		0.05	11-DEC-19
Fluorene			<0.050		ug/g		0.05	11-DEC-19
Indeno(1,2,3-cd)pyrene			<0.050		ug/g		0.05	11-DEC-19
Naphthalene			<0.013		ug/g		0.013	11-DEC-19
Phenanthrene			<0.046		ug/g		0.046	11-DEC-19
Pyrene			<0.050		ug/g		0.05	11-DEC-19
Surrogate: 2-Fluorobiphenyl			87.7		%		50-140	11-DEC-19
Surrogate: p-Terphenyl d14			78.6		%		50-140	11-DEC-19
WG3238619-4 MS		**WG3238619-5**						
1-Methylnaphthalene			91.5		%		50-140	11-DEC-19
2-Methylnaphthalene			86.4		%		50-140	11-DEC-19
Acenaphthene			93.6		%		50-140	11-DEC-19
Acenaphthylene			95.7		%		50-140	11-DEC-19
Anthracene			90.6		%		50-140	11-DEC-19
Benzo(a)anthracene			94.5		%		50-140	11-DEC-19
Benzo(a)pyrene			90.4		%		50-140	11-DEC-19
Benzo(b)fluoranthene			95.5		%		50-140	11-DEC-19
Benzo(g,h,i)perylene			90.7		%		50-140	11-DEC-19
Benzo(k)fluoranthene			84.7		%		50-140	11-DEC-19
Chrysene			102.3		%		50-140	11-DEC-19
Dibenzo(ah)anthracene			91.8		%		50-140	11-DEC-19
Fluoranthene			92.7		%		50-140	11-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Alexander Dziedzic

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT	**Soil**							
Batch R4940822								
WG3238619-4 MS		**WG3238619-5**						
Fluorene			92.2		%		50-140	11-DEC-19
Indeno(1,2,3-cd)pyrene			92.7		%		50-140	11-DEC-19
Naphthalene			88.5		%		50-140	11-DEC-19
Phenanthrene			91.6		%		50-140	11-DEC-19
Pyrene			92.3		%		50-140	11-DEC-19
PCB-511-WT	**Soil**							
Batch R4940747								
WG3238619-3 DUP		**WG3238619-5**						
Aroclor 1242		<0.010	<0.010	RPD-NA	ug/g	N/A	40	11-DEC-19
Aroclor 1248		<0.010	<0.010	RPD-NA	ug/g	N/A	40	11-DEC-19
Aroclor 1254		<0.010	<0.010	RPD-NA	ug/g	N/A	40	11-DEC-19
Aroclor 1260		<0.010	<0.010	RPD-NA	ug/g	N/A	40	11-DEC-19
WG3238619-2 LCS								
Aroclor 1242			99.3		%		60-140	11-DEC-19
Aroclor 1248			87.8		%		60-140	11-DEC-19
Aroclor 1254			102.9		%		60-140	11-DEC-19
Aroclor 1260			109.7		%		60-140	11-DEC-19
WG3238619-1 MB								
Aroclor 1242			<0.010		ug/g		0.01	11-DEC-19
Aroclor 1248			<0.010		ug/g		0.01	11-DEC-19
Aroclor 1254			<0.010		ug/g		0.01	11-DEC-19
Aroclor 1260			<0.010		ug/g		0.01	11-DEC-19
Surrogate: d14-Terphenyl			86.1		%		60-140	11-DEC-19
WG3238619-4 MS		**WG3238619-5**						
Aroclor 1242			100.4		%		60-140	11-DEC-19
Aroclor 1254			104.5		%		60-140	11-DEC-19
Aroclor 1260			115.7		%		60-140	11-DEC-19
PH-WT	**Soil**							
Batch R4940120								
WG3238700-1 DUP		**L2393672-1**						
pH		7.98	7.93	J	pH units	0.05	0.3	10-DEC-19
WG3238852-1 LCS								
pH			6.96		pH units		6.9-7.1	10-DEC-19
SAR-R511-WT	**Soil**							

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Alexander Dziedzic

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SAR-R511-WT	**Soil**							
Batch R4939892								
WG3238695-4 DUP		**WG3238695-3**						
Calcium (Ca)		0.80	0.89		mg/L	11	30	10-DEC-19
Sodium (Na)		183	188		mg/L	2.7	30	10-DEC-19
Magnesium (Mg)		0.80	0.59	J	mg/L	0.21	1	10-DEC-19
WG3238695-2 IRM		**WT SAR3**						
Calcium (Ca)			109.8		%		70-130	10-DEC-19
Sodium (Na)			107.1		%		70-130	10-DEC-19
Magnesium (Mg)			109.4		%		70-130	10-DEC-19
WG3238695-5 LCS								
Calcium (Ca)			102.7		%		80-120	10-DEC-19
Sodium (Na)			101.0		%		80-120	10-DEC-19
Magnesium (Mg)			100.8		%		80-120	10-DEC-19
WG3238695-1 MB								
Calcium (Ca)			<0.50		mg/L		0.5	10-DEC-19
Sodium (Na)			<0.50		mg/L		0.5	10-DEC-19
Magnesium (Mg)			<0.50		mg/L		0.5	10-DEC-19
VOC-511-HS-WT	**Soil**							
Batch R4941366								
WG3238564-4 DUP		**WG3238564-3**						
1,1,1,2-Tetrachloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
1,1,2,2-Tetrachloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
1,1,1-Trichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
1,1,2-Trichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
1,1-Dichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
1,1-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
1,2-Dibromoethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
1,2-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
1,2-Dichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
1,2-Dichloropropane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
1,3-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
1,4-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
Acetone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	12-DEC-19
Benzene		<0.0068	<0.0068	RPD-NA	ug/g	N/A	40	12-DEC-19
Bromodichloromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
Bromoform		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Alexander Dziedzic

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4941366								
WG3238564-4 DUP		**WG3238564-3**						
Bromomethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
Carbon tetrachloride		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
Chlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
Chloroform		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
cis-1,2-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
cis-1,3-Dichloropropene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	12-DEC-19
Dibromochloromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
Dichlorodifluoromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
Ethylbenzene		<0.018	<0.018	RPD-NA	ug/g	N/A	40	12-DEC-19
n-Hexane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
Methylene Chloride		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
MTBE		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
m+p-Xylenes		<0.030	<0.030	RPD-NA	ug/g	N/A	40	12-DEC-19
Methyl Ethyl Ketone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	12-DEC-19
Methyl Isobutyl Ketone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	12-DEC-19
o-Xylene		<0.020	<0.020	RPD-NA	ug/g	N/A	40	12-DEC-19
Styrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
Tetrachloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
Toluene		<0.080	<0.080	RPD-NA	ug/g	N/A	40	12-DEC-19
trans-1,2-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
trans-1,3-Dichloropropene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	12-DEC-19
Trichloroethylene		<0.010	<0.010	RPD-NA	ug/g	N/A	40	12-DEC-19
Trichlorofluoromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-DEC-19
Vinyl chloride		<0.020	<0.020	RPD-NA	ug/g	N/A	40	12-DEC-19
WG3238564-2 LCS								
1,1,1,2-Tetrachloroethane			86.0		%		60-130	11-DEC-19
1,1,2,2-Tetrachloroethane			84.3		%		60-130	11-DEC-19
1,1,1-Trichloroethane			93.5		%		60-130	11-DEC-19
1,1,2-Trichloroethane			87.2		%		60-130	11-DEC-19
1,1-Dichloroethane			91.3		%		60-130	11-DEC-19
1,1-Dichloroethylene			91.8		%		60-130	11-DEC-19
1,2-Dibromoethane			86.8		%		70-130	11-DEC-19
1,2-Dichlorobenzene			85.2		%		70-130	11-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Alexander Dziedzic

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4941366								
WG3238564-2 LCS								
1,2-Dichloroethane			88.4		%		60-130	11-DEC-19
1,2-Dichloropropane			90.5		%		70-130	11-DEC-19
1,3-Dichlorobenzene			90.3		%		70-130	11-DEC-19
1,4-Dichlorobenzene			89.5		%		70-130	11-DEC-19
Acetone			92.4		%		60-140	11-DEC-19
Benzene			95.0		%		70-130	11-DEC-19
Bromodichloromethane			87.4		%		50-140	11-DEC-19
Bromoform			87.5		%		70-130	11-DEC-19
Bromomethane			80.4		%		50-140	11-DEC-19
Carbon tetrachloride			94.6		%		70-130	11-DEC-19
Chlorobenzene			85.6		%		70-130	11-DEC-19
Chloroform			87.9		%		70-130	11-DEC-19
cis-1,2-Dichloroethylene			91.7		%		70-130	11-DEC-19
cis-1,3-Dichloropropene			89.8		%		70-130	11-DEC-19
Dibromochloromethane			87.0		%		60-130	11-DEC-19
Dichlorodifluoromethane			63.0		%		50-140	11-DEC-19
Ethylbenzene			91.9		%		70-130	11-DEC-19
n-Hexane			85.5		%		70-130	11-DEC-19
Methylene Chloride			82.8		%		70-130	11-DEC-19
MTBE			94.2		%		70-130	11-DEC-19
m+p-Xylenes			91.7		%		70-130	11-DEC-19
Methyl Ethyl Ketone			89.4		%		60-140	11-DEC-19
Methyl Isobutyl Ketone			87.1		%		60-140	11-DEC-19
o-Xylene			90.3		%		70-130	11-DEC-19
Styrene			89.3		%		70-130	11-DEC-19
Tetrachloroethylene			93.0		%		60-130	11-DEC-19
Toluene			93.3		%		70-130	11-DEC-19
trans-1,2-Dichloroethylene			90.7		%		60-130	11-DEC-19
trans-1,3-Dichloropropene			90.7		%		70-130	11-DEC-19
Trichloroethylene			91.6		%		60-130	11-DEC-19
Trichlorofluoromethane			90.2		%		50-140	11-DEC-19
Vinyl chloride			94.6		%		60-140	11-DEC-19
WG3238564-1 MB								
1,1,1,2-Tetrachloroethane			<0.050		ug/g		0.05	12-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Alexander Dziedzic

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4941366								
WG3238564-1 MB								
1,1,2,2-Tetrachloroethane			<0.050		ug/g		0.05	12-DEC-19
1,1,1-Trichloroethane			<0.050		ug/g		0.05	12-DEC-19
1,1,2-Trichloroethane			<0.050		ug/g		0.05	12-DEC-19
1,1-Dichloroethane			<0.050		ug/g		0.05	12-DEC-19
1,1-Dichloroethylene			<0.050		ug/g		0.05	12-DEC-19
1,2-Dibromoethane			<0.050		ug/g		0.05	12-DEC-19
1,2-Dichlorobenzene			<0.050		ug/g		0.05	12-DEC-19
1,2-Dichloroethane			<0.050		ug/g		0.05	12-DEC-19
1,2-Dichloropropane			<0.050		ug/g		0.05	12-DEC-19
1,3-Dichlorobenzene			<0.050		ug/g		0.05	12-DEC-19
1,4-Dichlorobenzene			<0.050		ug/g		0.05	12-DEC-19
Acetone			<0.50		ug/g		0.5	12-DEC-19
Benzene			<0.0068		ug/g		0.0068	12-DEC-19
Bromodichloromethane			<0.050		ug/g		0.05	12-DEC-19
Bromoform			<0.050		ug/g		0.05	12-DEC-19
Bromomethane			<0.050		ug/g		0.05	12-DEC-19
Carbon tetrachloride			<0.050		ug/g		0.05	12-DEC-19
Chlorobenzene			<0.050		ug/g		0.05	12-DEC-19
Chloroform			<0.050		ug/g		0.05	12-DEC-19
cis-1,2-Dichloroethylene			<0.050		ug/g		0.05	12-DEC-19
cis-1,3-Dichloropropene			<0.030		ug/g		0.03	12-DEC-19
Dibromochloromethane			<0.050		ug/g		0.05	12-DEC-19
Dichlorodifluoromethane			<0.050		ug/g		0.05	12-DEC-19
Ethylbenzene			<0.018		ug/g		0.018	12-DEC-19
n-Hexane			<0.050		ug/g		0.05	12-DEC-19
Methylene Chloride			<0.050		ug/g		0.05	12-DEC-19
MTBE			<0.050		ug/g		0.05	12-DEC-19
m+p-Xylenes			<0.030		ug/g		0.03	12-DEC-19
Methyl Ethyl Ketone			<0.50		ug/g		0.5	12-DEC-19
Methyl Isobutyl Ketone			<0.50		ug/g		0.5	12-DEC-19
o-Xylene			<0.020		ug/g		0.02	12-DEC-19
Styrene			<0.050		ug/g		0.05	12-DEC-19
Tetrachloroethylene			<0.050		ug/g		0.05	12-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Alexander Dziedzic

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4941366								
WG3238564-1 MB								
Toluene			<0.080		ug/g		0.08	12-DEC-19
trans-1,2-Dichloroethylene			<0.050		ug/g		0.05	12-DEC-19
trans-1,3-Dichloropropene			<0.030		ug/g		0.03	12-DEC-19
Trichloroethylene			<0.010		ug/g		0.01	12-DEC-19
Trichlorofluoromethane			<0.050		ug/g		0.05	12-DEC-19
Vinyl chloride			<0.020		ug/g		0.02	12-DEC-19
Surrogate: 1,4-Difluorobenzene			107.8		%		50-140	12-DEC-19
Surrogate: 4-Bromofluorobenzene			91.5		%		50-140	12-DEC-19
WG3238564-5 MS		**L2393672-1**						
1,1,1,2-Tetrachloroethane			87.6		%		50-140	12-DEC-19
1,1,2,2-Tetrachloroethane			95.0		%		50-140	12-DEC-19
1,1,1-Trichloroethane			91.7		%		50-140	12-DEC-19
1,1,2-Trichloroethane			95.6		%		50-140	12-DEC-19
1,1-Dichloroethane			93.0		%		50-140	12-DEC-19
1,1-Dichloroethylene			88.6		%		50-140	12-DEC-19
1,2-Dibromoethane			97.4		%		50-140	12-DEC-19
1,2-Dichlorobenzene			83.8		%		50-140	12-DEC-19
1,2-Dichloroethane			96.6		%		50-140	12-DEC-19
1,2-Dichloropropane			93.5		%		50-140	12-DEC-19
1,3-Dichlorobenzene			86.5		%		50-140	12-DEC-19
1,4-Dichlorobenzene			86.4		%		50-140	12-DEC-19
Acetone			110.8		%		50-140	12-DEC-19
Benzene			95.9		%		50-140	12-DEC-19
Bromodichloromethane			92.1		%		50-140	12-DEC-19
Bromoform			97.9		%		50-140	12-DEC-19
Bromomethane			81.9		%		50-140	12-DEC-19
Carbon tetrachloride			91.8		%		50-140	12-DEC-19
Chlorobenzene			85.8		%		50-140	12-DEC-19
Chloroform			89.9		%		50-140	12-DEC-19
cis-1,2-Dichloroethylene			94.6		%		50-140	12-DEC-19
cis-1,3-Dichloropropene			93.5		%		50-140	12-DEC-19
Dibromochloromethane			93.8		%		50-140	12-DEC-19
Dichlorodifluoromethane			58.4		%		50-140	12-DEC-19
Ethylbenzene			88.8		%		50-140	12-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Alexander Dziedzic

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4941366								
WG3238564-5 MS		**L2393672-1**						
n-Hexane			81.8		%		50-140	12-DEC-19
Methylene Chloride			88.1		%		50-140	12-DEC-19
MTBE			94.5		%		50-140	12-DEC-19
m+p-Xylenes			88.5		%		50-140	12-DEC-19
Methyl Ethyl Ketone			102.7		%		50-140	12-DEC-19
Methyl Isobutyl Ketone			102.2		%		50-140	12-DEC-19
o-Xylene			88.3		%		50-140	12-DEC-19
Styrene			88.5		%		50-140	12-DEC-19
Tetrachloroethylene			88.0		%		50-140	12-DEC-19
Toluene			91.5		%		50-140	12-DEC-19
trans-1,2-Dichloroethylene			88.9		%		50-140	12-DEC-19
trans-1,3-Dichloropropene			96.0		%		50-140	12-DEC-19
Trichloroethylene			89.3		%		50-140	12-DEC-19
Trichlorofluoromethane			86.7		%		50-140	12-DEC-19
Vinyl chloride			91.2		%		50-140	12-DEC-19

Quality Control Report

Workorder: L2393672 Report Date: 16-DEC-19

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Alexander Dziedzic

Legend:

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

Sample Parameter Qualifier Definitions:

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

Hold Time Exceedances:

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

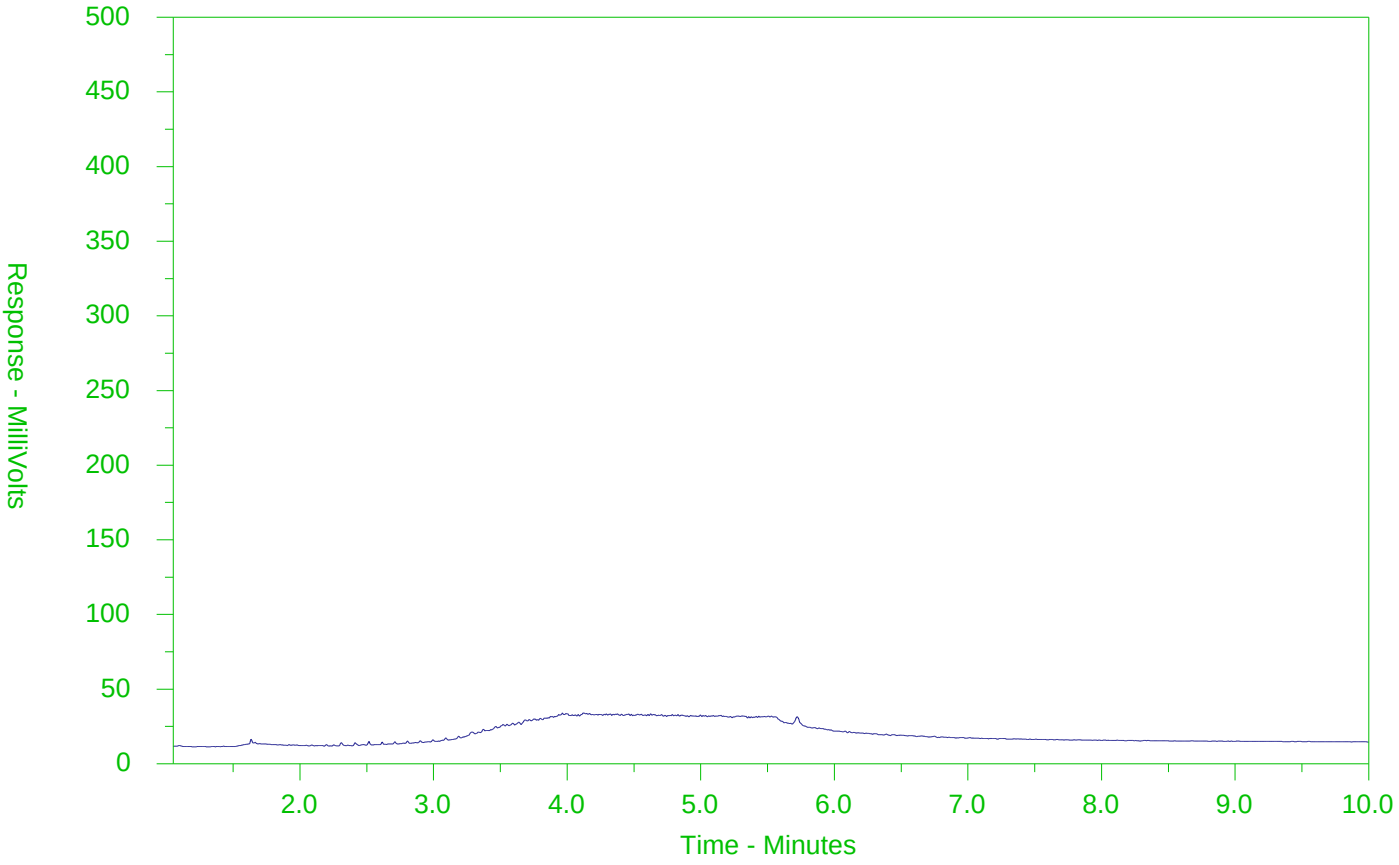
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where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

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2393672-1
Client Sample ID: BH18-32 SA3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2393672-COFC

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Golder
Contact:	Alexander Dziedzic
Phone:	647 309 7597
	Company address below will appear on the final report
Street:	#1, 215 Shields Court
City/Province:	Markham Ontario
Postal Code:	L3R 8V2
Invoice To	Same as Report To ☐ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax lawrence_kwak@golder.com
Email 2
Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax alexander_dziedzic@golder.com
Email 2 leanh_huynh@golder.com

Project Information

ALS Account # / Quote #:
Job #: 1773654
PO / AFE:
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only): L2393672

ALS Contact: Amanda Sampler:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

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

Analysis Request

NUMBER OF CONTAINERS

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

SAMPLES ON HOLD

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Metals and Inorganics	VOCs	F2-F4	PAHs	PCBs	SUSPECTED HAZARD (see Special Instructions)
	BH18-32 SA3	6-Dec-19	12:00	Soil	R	R	R	R	R	4

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

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human consumption/ use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Ontario Regulation 153/04 - April 15, 2011 Standards
Table 1 (Residential, Parkland, Institutional, etc)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				3.7			

SHIPMENT RELEASE (client use)

Released by: Alexander Dziedzic | 2019-12-09 | Time:

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: | Date: | Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by: | Date: Dec 9/19 | Time: 14:15

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

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

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

GOLDER ASSOCIATES LTD. (Markham)
ATTN: Lawrence Kwak
215 Shields Court. Unit 1
Markham ON L3R 8V2

Date Received: 14-NOV-19
Report Date: 22-NOV-19 10:29 (MT)
Version: FINAL

Client Phone: 905-475-5591

Certificate of Analysis

Lab Work Order #: L2382620

Project P.O. #: NOT SUBMITTED
Job Reference: 1773654
C of C Numbers:
Legal Site Desc:

Amanda Overholster
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2382620-1 BH18-38 SA1 Sampled By: CLIENT on 08-NOV-19 @ 11:30 Matrix: SOIL							
Physical Tests							
Conductivity	1.72		0.0040	mS/cm		19-NOV-19	R4915875
% Moisture	3.49		0.25	%	15-NOV-19	15-NOV-19	R4908867
pH	8.15		0.10	pH units		15-NOV-19	R4909968
Cyanides							
Cyanide, Weak Acid Diss	<0.050		0.050	ug/g	14-NOV-19	18-NOV-19	R4915172
Saturated Paste Extractables							
SAR	88.5	SAR:M	0.10	SAR		19-NOV-19	R4916178
Calcium (Ca)	0.98		0.50	mg/L		19-NOV-19	R4916178
Magnesium (Mg)	<0.50		0.50	mg/L		19-NOV-19	R4916178
Sodium (Na)	318		0.50	mg/L		19-NOV-19	R4916178
Metals							
Antimony (Sb)	<1.0		1.0	ug/g	18-NOV-19	19-NOV-19	R4916114
Arsenic (As)	3.8		1.0	ug/g	18-NOV-19	19-NOV-19	R4916114
Barium (Ba)	59.6		1.0	ug/g	18-NOV-19	19-NOV-19	R4916114
Beryllium (Be)	<0.50		0.50	ug/g	18-NOV-19	19-NOV-19	R4916114
Boron (B)	<5.0		5.0	ug/g	18-NOV-19	19-NOV-19	R4916114
Boron (B), Hot Water Ext.	0.11		0.10	ug/g	18-NOV-19	18-NOV-19	R4914490
Cadmium (Cd)	<0.50		0.50	ug/g	18-NOV-19	19-NOV-19	R4916114
Chromium (Cr)	10.6		1.0	ug/g	18-NOV-19	19-NOV-19	R4916114
Cobalt (Co)	5.0		1.0	ug/g	18-NOV-19	19-NOV-19	R4916114
Copper (Cu)	24.5		1.0	ug/g	18-NOV-19	19-NOV-19	R4916114
Lead (Pb)	42.0		1.0	ug/g	18-NOV-19	19-NOV-19	R4916114
Mercury (Hg)	0.0086		0.0050	ug/g	18-NOV-19	19-NOV-19	R4915831
Molybdenum (Mo)	<1.0		1.0	ug/g	18-NOV-19	19-NOV-19	R4916114
Nickel (Ni)	9.9		1.0	ug/g	18-NOV-19	19-NOV-19	R4916114
Selenium (Se)	<1.0		1.0	ug/g	18-NOV-19	19-NOV-19	R4916114
Silver (Ag)	<0.20		0.20	ug/g	18-NOV-19	19-NOV-19	R4916114
Thallium (Tl)	<0.50		0.50	ug/g	18-NOV-19	19-NOV-19	R4916114
Uranium (U)	<1.0		1.0	ug/g	18-NOV-19	19-NOV-19	R4916114
Vanadium (V)	23.0		1.0	ug/g	18-NOV-19	19-NOV-19	R4916114
Zinc (Zn)	56.9		5.0	ug/g	18-NOV-19	19-NOV-19	R4916114
Speciated Metals							
Chromium, Hexavalent	<0.20		0.20	ug/g	15-NOV-19	18-NOV-19	R4915603
Volatile Organic Compounds							
Acetone	<0.50		0.50	ug/g	18-NOV-19	20-NOV-19	R4916835
Benzene	<0.0068		0.0068	ug/g	18-NOV-19	20-NOV-19	R4916835
Bromodichloromethane	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
Bromoform	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
Bromomethane	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
Carbon tetrachloride	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
Chlorobenzene	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
Dibromochloromethane	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2382620-1 BH18-38 SA1 Sampled By: CLIENT on 08-NOV-19 @ 11:30 Matrix: SOIL							
Volatile Organic Compounds							
Chloroform	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
1,2-Dibromoethane	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
1,2-Dichlorobenzene	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
1,3-Dichlorobenzene	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
1,4-Dichlorobenzene	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
Dichlorodifluoromethane	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
1,1-Dichloroethane	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
1,2-Dichloroethane	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
1,1-Dichloroethylene	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
cis-1,2-Dichloroethylene	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
trans-1,2-Dichloroethylene	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
Methylene Chloride	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
1,2-Dichloropropane	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
cis-1,3-Dichloropropene	<0.030		0.030	ug/g	18-NOV-19	20-NOV-19	R4916835
trans-1,3-Dichloropropene	<0.030		0.030	ug/g	18-NOV-19	20-NOV-19	R4916835
1,3-Dichloropropene (cis & trans)	<0.042		0.042	ug/g		20-NOV-19	
Ethylbenzene	<0.018		0.018	ug/g	18-NOV-19	20-NOV-19	R4916835
n-Hexane	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
Methyl Ethyl Ketone	<0.50		0.50	ug/g	18-NOV-19	20-NOV-19	R4916835
Methyl Isobutyl Ketone	<0.50		0.50	ug/g	18-NOV-19	20-NOV-19	R4916835
MTBE	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
Styrene	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
1,1,1,2-Tetrachloroethane	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
1,1,2,2-Tetrachloroethane	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
Tetrachloroethylene	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
Toluene	<0.080		0.080	ug/g	18-NOV-19	20-NOV-19	R4916835
1,1,1-Trichloroethane	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
1,1,2-Trichloroethane	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
Trichloroethylene	<0.010		0.010	ug/g	18-NOV-19	20-NOV-19	R4916835
Trichlorofluoromethane	<0.050		0.050	ug/g	18-NOV-19	20-NOV-19	R4916835
Vinyl chloride	<0.020		0.020	ug/g	18-NOV-19	20-NOV-19	R4916835
o-Xylene	<0.020		0.020	ug/g	18-NOV-19	20-NOV-19	R4916835
m+p-Xylenes	<0.030		0.030	ug/g	18-NOV-19	20-NOV-19	R4916835
Xylenes (Total)	<0.050		0.050	ug/g		20-NOV-19	
Surrogate: 4-Bromofluorobenzene	87.4		50-140	%	18-NOV-19	20-NOV-19	R4916835
Surrogate: 1,4-Difluorobenzene	107.8		50-140	%	18-NOV-19	20-NOV-19	R4916835
Hydrocarbons							
F1 (C6-C10)	<5.0		5.0	ug/g	18-NOV-19	20-NOV-19	R4916835
F1-BTEX	<5.0		5.0	ug/g		21-NOV-19	
F2 (C10-C16)	<50	DLM	50	ug/g	15-NOV-19	20-NOV-19	R4919565
F2-Naphth	<50		50	ug/g		21-NOV-19	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2382620-1 BH18-38 SA1 Sampled By: CLIENT on 08-NOV-19 @ 11:30 Matrix: SOIL							
Hydrocarbons							
F3 (C16-C34)	980	DLM	250	ug/g	15-NOV-19	20-NOV-19	R4919565
F3-PAH	970		250	ug/g		21-NOV-19	
F4 (C34-C50)	2790	DLM	250	ug/g	15-NOV-19	20-NOV-19	R4919565
F4G-SG (GHH-Silica)	6860		250	ug/g	19-NOV-19	19-NOV-19	R4919882
Total Hydrocarbons (C6-C50)	3760		360	ug/g		21-NOV-19	
Chrom. to baseline at nC50	NO				15-NOV-19	20-NOV-19	R4919565
Surrogate: 2-Bromobenzotrifluoride	75.0		60-140	%	15-NOV-19	20-NOV-19	R4919565
Surrogate: 3,4-Dichlorotoluene	81.7		60-140	%	18-NOV-19	20-NOV-19	R4916835
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	<0.050		0.050	ug/g	15-NOV-19	18-NOV-19	R4915392
Acenaphthylene	<0.050		0.050	ug/g	15-NOV-19	18-NOV-19	R4915392
Anthracene	<0.050		0.050	ug/g	15-NOV-19	18-NOV-19	R4915392
Benzo(a)anthracene	<0.050		0.050	ug/g	15-NOV-19	18-NOV-19	R4915392
Benzo(a)pyrene	<0.050		0.050	ug/g	15-NOV-19	18-NOV-19	R4915392
Benzo(b)fluoranthene	0.056		0.050	ug/g	15-NOV-19	18-NOV-19	R4915392
Benzo(g,h,i)perylene	0.102		0.050	ug/g	15-NOV-19	18-NOV-19	R4915392
Benzo(k)fluoranthene	<0.050		0.050	ug/g	15-NOV-19	18-NOV-19	R4915392
Chrysene	<0.050		0.050	ug/g	15-NOV-19	18-NOV-19	R4915392
Dibenzo(ah)anthracene	<0.050		0.050	ug/g	15-NOV-19	18-NOV-19	R4915392
Fluoranthene	<0.050		0.050	ug/g	15-NOV-19	18-NOV-19	R4915392
Fluorene	<0.050		0.050	ug/g	15-NOV-19	18-NOV-19	R4915392
Indeno(1,2,3-cd)pyrene	<0.050		0.050	ug/g	15-NOV-19	18-NOV-19	R4915392
1+2-Methylnaphthalenes	<0.042		0.042	ug/g		18-NOV-19	
1-Methylnaphthalene	<0.030		0.030	ug/g	15-NOV-19	18-NOV-19	R4915392
2-Methylnaphthalene	<0.030		0.030	ug/g	15-NOV-19	18-NOV-19	R4915392
Naphthalene	<0.013		0.013	ug/g	15-NOV-19	18-NOV-19	R4915392
Phenanthrene	<0.046		0.046	ug/g	15-NOV-19	18-NOV-19	R4915392
Pyrene	<0.050		0.050	ug/g	15-NOV-19	18-NOV-19	R4915392
Surrogate: 2-Fluorobiphenyl	86.3		50-140	%	15-NOV-19	18-NOV-19	R4915392
Surrogate: p-Terphenyl d14	76.2		50-140	%	15-NOV-19	18-NOV-19	R4915392
Polychlorinated Biphenyls							
Aroclor 1242	<0.010		0.010	ug/g	18-NOV-19	18-NOV-19	R4914861
Aroclor 1248	<0.010		0.010	ug/g	18-NOV-19	18-NOV-19	R4914861
Aroclor 1254	<0.010		0.010	ug/g	18-NOV-19	18-NOV-19	R4914861
Aroclor 1260	<0.010		0.010	ug/g	18-NOV-19	18-NOV-19	R4914861
Total PCBs	<0.020		0.020	ug/g	18-NOV-19	18-NOV-19	R4914861
Surrogate: d14-Terphenyl	81.9		60-140	%	18-NOV-19	18-NOV-19	R4914861

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
SAR:M	Reported SAR represents a maximum value. Actual SAR may be lower if both Ca and Mg were detectable.

Test Method References:

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

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

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

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

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

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

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

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

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

EC-WT	Soil	Conductivity (EC)	MOEE E3138

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

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

F1-F4-511-CALC-WT	Soil	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-S

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

Hydrocarbon results are expressed on a dry weight basis.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Soil	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by extracting a soil or sediment sample as received with methanol, then analyzing by headspace-GC/FID.

Reference Information

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

F2-F4-511-WT Soil F2-F4-O.Reg 153/04 (July 2011) CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from soil with 1:1 hexane:acetone using a rotary extractor. Extracts are treated with silica gel to remove polar organic interferences. F2, F3, & F4 are analyzed by GC-FID. F4G-sg is analyzed gravimetrically.

Notes:
1. F2 (C10-C16): Sum of all hydrocarbons that elute between nC10 and nC16.
2. F3 (C16-C34): Sum of all hydrocarbons that elute between nC16 and nC34.
3. F4 (C34-C50): Sum of all hydrocarbons that elute between nC34 and nC50.
4. F4G: Gravimetric Heavy Hydrocarbons
5. F4G-sg: Gravimetric Heavy Hydrocarbons (F4G) after silica gel treatment.
6. Where both F4 (C34-C50) and F4G-sg are reported for a sample, the larger of the two values is used for comparison against the relevant CCME guideline for F4.
7. F4G-sg cannot be added to the C6 to C50 hydrocarbon results to obtain an estimate of total extractable hydrocarbons.
8. This method is validated for use.
9. Data from analysis of validation and quality control samples is available upon request.
10. Reported results are expressed as milligrams per dry kilogram, unless otherwise indicated.

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

F4G-ADD-511-WT Soil F4G SG-O.Reg 153/04 (July 2011) MOE DECPH-E3398/CCME TIER 1

F4G, gravimetric analysis, is determined if the chromatogram does not return to baseline at or before C50. A soil sample is extracted with a solvent mix, the solvent is evaporated and the weight of the residue is determined.

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

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

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

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

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

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

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

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

METHYLNAPS-CALC-WT Soil ABN-Calculated Parameters SW846 8270

MOISTURE-WT Soil % Moisture CCME PHC in Soil - Tier 1 (mod)

PAH-511-WT Soil PAH-O.Reg 153/04 (July 2011) SW846 3510/8270

A representative sub-sample of soil is fortified with deuterium-labelled surrogates and a mechanical shaking techniqueis used to extract the sample with a mixture of methanol and toluene. The extracts are concentrated and analyzed by GC/MS. Results for benzo(b) fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.

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

PCB-511-WT Soil PCB-O.Reg 153/04 (July 2011) SW846 3510/8082

An aliquot of a solid sample is extracted with a solvent, extract is cleaned up and analyzed on the GC/MS.

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

Reference Information

PH-WT	Soil	pH	MOEE E3137A

A minimum 10g portion of the sample is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil and then analyzed using a pH meter and electrode.

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

SAR-R511-WT	Soil	SAR-O.Reg 153/04 (July 2011)	SW846 6010C

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

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

VOC-1,3-DCP-CALC-WT	Soil	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Soil	VOC-O.Reg 153/04 (July 2011)	SW846 8260 (511)

Soil and sediment samples are extracted in methanol and analyzed by headspace-GC/MS.

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

XYLENES-SUM-CALC-WT	Soil	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

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

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

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

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

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

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

Quality Control Report

Workorder: L2382620 Report Date: 22-NOV-19

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
B-HWS-R511-WT	**Soil**							
Batch R4914490								
WG3220926-4 DUP		**L2382302-3**						
Boron (B), Hot Water Ext.		0.20	0.20		ug/g	3.4	30	18-NOV-19
WG3220926-2 IRM		**WT SAR3**						
Boron (B), Hot Water Ext.			102.6		%		70-130	18-NOV-19
WG3220926-3 LCS								
Boron (B), Hot Water Ext.			99.1		%		70-130	18-NOV-19
WG3220926-1 MB								
Boron (B), Hot Water Ext.			<0.10		ug/g		0.1	18-NOV-19
CN-WAD-R511-WT	**Soil**							
Batch R4915172								
WG3219230-3 DUP		**L2382620-1**						
Cyanide, Weak Acid Diss		<0.050	<0.050	RPD-NA	ug/g	N/A	35	18-NOV-19
WG3219230-2 LCS								
Cyanide, Weak Acid Diss			97.6		%		80-120	15-NOV-19
WG3219230-1 MB								
Cyanide, Weak Acid Diss			<0.050		ug/g		0.05	18-NOV-19
WG3219230-4 MS		**L2382620-1**						
Cyanide, Weak Acid Diss			79.2		%		70-130	18-NOV-19
CR-CR6-IC-WT	**Soil**							
Batch R4915603								
WG3219249-4 CRM		**WT-SQC012**						
Chromium, Hexavalent			84.7		%		70-130	18-NOV-19
WG3219249-3 DUP		**L2382280-1**						
Chromium, Hexavalent		<0.20	<0.20	RPD-NA	ug/g	N/A	35	18-NOV-19
WG3219249-2 LCS								
Chromium, Hexavalent			97.8		%		80-120	18-NOV-19
WG3219249-1 MB								
Chromium, Hexavalent			<0.20		ug/g		0.2	18-NOV-19
EC-WT	**Soil**							
Batch R4915875								
WG3221131-4 DUP		**WG3221131-3**						
Conductivity		0.463	0.449		mS/cm	3.1	20	19-NOV-19
WG3221131-2 IRM		**WT SAR3**						
Conductivity			100.0		%		70-130	19-NOV-19
WG3222211-1 LCS								
Conductivity			101.9		%		90-110	19-NOV-19
WG3221131-1 MB								

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-WT	**Soil**							
Batch R4915875								
WG3221131-1 MB								
Conductivity			<0.0040		mS/cm		0.004	19-NOV-19
F1-HS-511-WT	**Soil**							
Batch R4916835								
WG3221627-4 DUP		**WG3221627-3**						
F1 (C6-C10)		<5.0	<5.0	RPD-NA	ug/g	N/A	30	20-NOV-19
WG3221627-2 LCS								
F1 (C6-C10)			112.2		%		80-120	20-NOV-19
WG3221627-1 MB								
F1 (C6-C10)			<5.0		ug/g		5	20-NOV-19
Surrogate: 3,4-Dichlorotoluene			107.7		%		60-140	20-NOV-19
WG3221627-6 MS		**L2382750-10**						
F1 (C6-C10)			108.6		%		60-140	20-NOV-19
F2-F4-511-WT	**Soil**							
Batch R4919565								
WG3219917-3 DUP		**WG3219917-5**						
F2 (C10-C16)		<10	<10	RPD-NA	ug/g	N/A	30	20-NOV-19
F3 (C16-C34)		<50	<50	RPD-NA	ug/g	N/A	30	20-NOV-19
F4 (C34-C50)		<50	<50	RPD-NA	ug/g	N/A	30	20-NOV-19
WG3219917-2 LCS								
F2 (C10-C16)			90.4		%		80-120	20-NOV-19
F3 (C16-C34)			89.0		%		80-120	20-NOV-19
F4 (C34-C50)			89.2		%		80-120	20-NOV-19
WG3219917-1 MB								
F2 (C10-C16)			<10		ug/g		10	20-NOV-19
F3 (C16-C34)			<50		ug/g		50	20-NOV-19
F4 (C34-C50)			<50		ug/g		50	20-NOV-19
Surrogate: 2-Bromobenzotrifluoride			83.2		%		60-140	20-NOV-19
WG3219917-4 MS		**WG3219917-5**						
F2 (C10-C16)			90.8		%		60-140	20-NOV-19
F3 (C16-C34)			86.4		%		60-140	20-NOV-19
F4 (C34-C50)			87.3		%		60-140	20-NOV-19
F4G-ADD-511-WT	**Soil**							

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F4G-ADD-511-WT	**Soil**							
Batch R4919882								
WG3225082-2 LCS								
F4G-SG (GHH-Silica)			64.3		%		60-140	19-NOV-19
WG3225082-1 MB								
F4G-SG (GHH-Silica)			<250		ug/g		250	19-NOV-19
HG-200.2-CVAA-WT	**Soil**							
Batch R4915831								
WG3221660-2 CRM		**WT-CANMET-TILL2**						
Mercury (Hg)			110.6		%		70-130	19-NOV-19
WG3221660-6 DUP		**WG3221660-5**						
Mercury (Hg)		0.0420	0.0431		ug/g	2.6	40	19-NOV-19
WG3221660-3 LCS								
Mercury (Hg)			102.5		%		80-120	19-NOV-19
WG3221660-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	19-NOV-19
MET-200.2-CCMS-WT	**Soil**							
Batch R4916114								
WG3221660-2 CRM		**WT-CANMET-TILL2**						
Antimony (Sb)			108.5		%		70-130	19-NOV-19
Arsenic (As)			98.6		%		70-130	19-NOV-19
Barium (Ba)			97.9		%		70-130	19-NOV-19
Beryllium (Be)			93.7		%		70-130	19-NOV-19
Boron (B)			3.1		mg/kg		0-8.6	19-NOV-19
Cadmium (Cd)			94.0		%		70-130	19-NOV-19
Chromium (Cr)			97.5		%		70-130	19-NOV-19
Cobalt (Co)			97.5		%		70-130	19-NOV-19
Copper (Cu)			98.3		%		70-130	19-NOV-19
Lead (Pb)			96.8		%		70-130	19-NOV-19
Molybdenum (Mo)			99.6		%		70-130	19-NOV-19
Nickel (Ni)			98.9		%		70-130	19-NOV-19
Selenium (Se)			0.34		mg/kg		0.15-0.55	19-NOV-19
Silver (Ag)			0.25		mg/kg		0.16-0.36	19-NOV-19
Thallium (Tl)			95.1		%		70-130	19-NOV-19
Uranium (U)			93.4		%		70-130	19-NOV-19
Vanadium (V)			97.8		%		70-130	19-NOV-19
Zinc (Zn)			95.1		%		70-130	19-NOV-19
WG3221660-6 DUP		**WG3221660-5**						

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4916114								
WG3221660-6 DUP		**WG3221660-5**						
Antimony (Sb)		0.40	0.37		ug/g	6.2	30	19-NOV-19
Arsenic (As)		6.16	6.41		ug/g	3.9	30	19-NOV-19
Barium (Ba)		78.3	81.1		ug/g	3.5	40	19-NOV-19
Beryllium (Be)		0.78	0.82		ug/g	4.8	30	19-NOV-19
Boron (B)		9.5	10.0		ug/g	4.7	30	19-NOV-19
Cadmium (Cd)		0.170	0.184		ug/g	7.8	30	19-NOV-19
Chromium (Cr)		26.3	26.9		ug/g	2.3	30	19-NOV-19
Cobalt (Co)		12.5	12.8		ug/g	2.4	30	19-NOV-19
Copper (Cu)		34.5	35.4		ug/g	2.3	30	19-NOV-19
Lead (Pb)		17.3	17.8		ug/g	2.7	40	19-NOV-19
Molybdenum (Mo)		0.49	0.49		ug/g	1.4	40	19-NOV-19
Nickel (Ni)		29.0	29.9		ug/g	3.1	30	19-NOV-19
Selenium (Se)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	19-NOV-19
Silver (Ag)		<0.10	<0.10	RPD-NA	ug/g	N/A	40	19-NOV-19
Thallium (Tl)		0.168	0.177		ug/g	5.2	30	19-NOV-19
Uranium (U)		0.484	0.493		ug/g	1.9	30	19-NOV-19
Vanadium (V)		36.2	37.6		ug/g	3.7	30	19-NOV-19
Zinc (Zn)		87.8	92.5		ug/g	5.2	30	19-NOV-19
WG3221660-4 LCS								
Antimony (Sb)			98.9		%		80-120	19-NOV-19
Arsenic (As)			93.5		%		80-120	19-NOV-19
Barium (Ba)			96.3		%		80-120	19-NOV-19
Beryllium (Be)			89.3		%		80-120	19-NOV-19
Boron (B)			85.1		%		80-120	19-NOV-19
Cadmium (Cd)			90.0		%		80-120	19-NOV-19
Chromium (Cr)			92.8		%		80-120	19-NOV-19
Cobalt (Co)			91.8		%		80-120	19-NOV-19
Copper (Cu)			90.6		%		80-120	19-NOV-19
Lead (Pb)			90.9		%		80-120	19-NOV-19
Molybdenum (Mo)			96.0		%		80-120	19-NOV-19
Nickel (Ni)			90.9		%		80-120	19-NOV-19
Selenium (Se)			93.0		%		80-120	19-NOV-19
Silver (Ag)			94.3		%		80-120	19-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4916114								
WG3221660-4 LCS								
Thallium (Tl)			90.6		%		80-120	19-NOV-19
Uranium (U)			89.7		%		80-120	19-NOV-19
Vanadium (V)			95.3		%		80-120	19-NOV-19
Zinc (Zn)			90.0		%		80-120	19-NOV-19
WG3221660-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	19-NOV-19
Arsenic (As)			<0.10		mg/kg		0.1	19-NOV-19
Barium (Ba)			<0.50		mg/kg		0.5	19-NOV-19
Beryllium (Be)			<0.10		mg/kg		0.1	19-NOV-19
Boron (B)			<5.0		mg/kg		5	19-NOV-19
Cadmium (Cd)			<0.020		mg/kg		0.02	19-NOV-19
Chromium (Cr)			<0.50		mg/kg		0.5	19-NOV-19
Cobalt (Co)			<0.10		mg/kg		0.1	19-NOV-19
Copper (Cu)			<0.50		mg/kg		0.5	19-NOV-19
Lead (Pb)			<0.50		mg/kg		0.5	19-NOV-19
Molybdenum (Mo)			<0.10		mg/kg		0.1	19-NOV-19
Nickel (Ni)			<0.50		mg/kg		0.5	19-NOV-19
Selenium (Se)			<0.20		mg/kg		0.2	19-NOV-19
Silver (Ag)			<0.10		mg/kg		0.1	19-NOV-19
Thallium (Tl)			<0.050		mg/kg		0.05	19-NOV-19
Uranium (U)			<0.050		mg/kg		0.05	19-NOV-19
Vanadium (V)			<0.20		mg/kg		0.2	19-NOV-19
Zinc (Zn)			<2.0		mg/kg		2	19-NOV-19
MOISTURE-WT	**Soil**							
Batch R4908867								
WG3219271-3 DUP		**L2382616-2**						
% Moisture		5.79	6.56		%	13	20	15-NOV-19
WG3219271-2 LCS								
% Moisture			100.1		%		90-110	15-NOV-19
WG3219271-1 MB								
% Moisture			<0.25		%		0.25	15-NOV-19
PAH-511-WT	**Soil**							

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT	**Soil**							
Batch R4915392								
WG3219247-3 DUP		**WG3219247-5**						
1-Methylnaphthalene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	18-NOV-19
2-Methylnaphthalene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	18-NOV-19
Acenaphthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	18-NOV-19
Acenaphthylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	18-NOV-19
Anthracene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	18-NOV-19
Benzo(a)anthracene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	18-NOV-19
Benzo(a)pyrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	18-NOV-19
Benzo(b)fluoranthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	18-NOV-19
Benzo(g,h,i)perylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	18-NOV-19
Benzo(k)fluoranthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	18-NOV-19
Chrysene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	18-NOV-19
Dibenzo(ah)anthracene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	18-NOV-19
Fluoranthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	18-NOV-19
Fluorene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	18-NOV-19
Indeno(1,2,3-cd)pyrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	18-NOV-19
Naphthalene		<0.013	<0.013	RPD-NA	ug/g	N/A	40	18-NOV-19
Phenanthrene		<0.046	<0.046	RPD-NA	ug/g	N/A	40	18-NOV-19
Pyrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	18-NOV-19
WG3219247-2 LCS								
1-Methylnaphthalene			91.7		%		50-140	18-NOV-19
2-Methylnaphthalene			86.5		%		50-140	18-NOV-19
Acenaphthene			91.1		%		50-140	18-NOV-19
Acenaphthylene			89.5		%		50-140	18-NOV-19
Anthracene			88.5		%		50-140	18-NOV-19
Benzo(a)anthracene			86.4		%		50-140	18-NOV-19
Benzo(a)pyrene			90.0		%		50-140	18-NOV-19
Benzo(b)fluoranthene			83.3		%		50-140	18-NOV-19
Benzo(g,h,i)perylene			86.7		%		50-140	18-NOV-19
Benzo(k)fluoranthene			99.6		%		50-140	18-NOV-19
Chrysene			108.9		%		50-140	18-NOV-19
Dibenzo(ah)anthracene			90.6		%		50-140	18-NOV-19
Fluoranthene			89.0		%		50-140	18-NOV-19
Fluorene			86.8		%		50-140	18-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT	**Soil**							
Batch R4915392								
WG3219247-2 LCS								
Indeno(1,2,3-cd)pyrene			82.1		%		50-140	18-NOV-19
Naphthalene			91.1		%		50-140	18-NOV-19
Phenanthrene			89.8		%		50-140	18-NOV-19
Pyrene			89.0		%		50-140	18-NOV-19
WG3219247-1 MB								
1-Methylnaphthalene			<0.030		ug/g		0.03	18-NOV-19
2-Methylnaphthalene			<0.030		ug/g		0.03	18-NOV-19
Acenaphthene			<0.050		ug/g		0.05	18-NOV-19
Acenaphthylene			<0.050		ug/g		0.05	18-NOV-19
Anthracene			<0.050		ug/g		0.05	18-NOV-19
Benzo(a)anthracene			<0.050		ug/g		0.05	18-NOV-19
Benzo(a)pyrene			<0.050		ug/g		0.05	18-NOV-19
Benzo(b)fluoranthene			<0.050		ug/g		0.05	18-NOV-19
Benzo(g,h,i)perylene			<0.050		ug/g		0.05	18-NOV-19
Benzo(k)fluoranthene			<0.050		ug/g		0.05	18-NOV-19
Chrysene			<0.050		ug/g		0.05	18-NOV-19
Dibenzo(ah)anthracene			<0.050		ug/g		0.05	18-NOV-19
Fluoranthene			<0.050		ug/g		0.05	18-NOV-19
Fluorene			<0.050		ug/g		0.05	18-NOV-19
Indeno(1,2,3-cd)pyrene			<0.050		ug/g		0.05	18-NOV-19
Naphthalene			<0.013		ug/g		0.013	18-NOV-19
Phenanthrene			<0.046		ug/g		0.046	18-NOV-19
Pyrene			<0.050		ug/g		0.05	18-NOV-19
Surrogate: 2-Fluorobiphenyl			86.8		%		50-140	18-NOV-19
Surrogate: p-Terphenyl d14			75.2		%		50-140	18-NOV-19
WG3219247-4 MS		**WG3219247-5**						
1-Methylnaphthalene			91.4		%		50-140	18-NOV-19
2-Methylnaphthalene			85.9		%		50-140	18-NOV-19
Acenaphthene			90.6		%		50-140	18-NOV-19
Acenaphthylene			88.9		%		50-140	18-NOV-19
Anthracene			88.6		%		50-140	18-NOV-19
Benzo(a)anthracene			83.6		%		50-140	18-NOV-19
Benzo(a)pyrene			88.7		%		50-140	18-NOV-19
Benzo(b)fluoranthene			83.7		%		50-140	18-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT	**Soil**							
Batch R4915392								
WG3219247-4 MS		**WG3219247-5**						
Benzo(g,h,i)perylene			82.8		%		50-140	18-NOV-19
Benzo(k)fluoranthene			98.1		%		50-140	18-NOV-19
Chrysene			109.6		%		50-140	18-NOV-19
Dibenzo(ah)anthracene			85.6		%		50-140	18-NOV-19
Fluoranthene			88.1		%		50-140	18-NOV-19
Fluorene			86.1		%		50-140	18-NOV-19
Indeno(1,2,3-cd)pyrene			81.1		%		50-140	18-NOV-19
Naphthalene			90.8		%		50-140	18-NOV-19
Phenanthrene			89.7		%		50-140	18-NOV-19
Pyrene			87.7		%		50-140	18-NOV-19
PCB-511-WT	**Soil**							
Batch R4914861								
WG3219247-3 DUP		**WG3219247-5**						
Aroclor 1242		<0.010	<0.010	RPD-NA	ug/g	N/A	40	18-NOV-19
Aroclor 1248		<0.010	<0.010	RPD-NA	ug/g	N/A	40	18-NOV-19
Aroclor 1254		<0.010	<0.010	RPD-NA	ug/g	N/A	40	18-NOV-19
Aroclor 1260		<0.010	<0.010	RPD-NA	ug/g	N/A	40	18-NOV-19
WG3219247-2 LCS								
Aroclor 1242			98.3		%		60-140	18-NOV-19
Aroclor 1248			93.9		%		60-140	18-NOV-19
Aroclor 1254			96.3		%		60-140	18-NOV-19
Aroclor 1260			106.0		%		60-140	18-NOV-19
WG3219247-1 MB								
Aroclor 1242			<0.010		ug/g		0.01	18-NOV-19
Aroclor 1248			<0.010		ug/g		0.01	18-NOV-19
Aroclor 1254			<0.010		ug/g		0.01	18-NOV-19
Aroclor 1260			<0.010		ug/g		0.01	18-NOV-19
Surrogate: d14-Terphenyl			67.7		%		60-140	18-NOV-19
WG3219247-4 MS		**WG3219247-5**						
Aroclor 1242			98.8		%		60-140	18-NOV-19
Aroclor 1254			96.0		%		60-140	18-NOV-19
Aroclor 1260			103.1		%		60-140	18-NOV-19
PH-WT	**Soil**							

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-WT	**Soil**							
Batch R4909968								
WG3219256-1 DUP		**L2382633-2**						
pH		7.89	7.89	J	pH units	0.00	0.3	15-NOV-19
WG3219503-1 LCS								
pH			7.00		pH units		6.9-7.1	15-NOV-19
SAR-R511-WT	**Soil**							
Batch R4916178								
WG3221131-4 DUP		**WG3221131-3**						
Calcium (Ca)		27.6	26.6		mg/L	3.7	30	19-NOV-19
Sodium (Na)		21.0	20.5		mg/L	2.4	30	19-NOV-19
Magnesium (Mg)		18.6	18.0		mg/L	3.3	30	19-NOV-19
WG3221131-2 IRM		**WT SAR3**						
Calcium (Ca)			115.3		%		70-130	19-NOV-19
Sodium (Na)			99.3		%		70-130	19-NOV-19
Magnesium (Mg)			119.4		%		70-130	19-NOV-19
WG3221131-5 LCS								
Calcium (Ca)			102.7		%		70-130	19-NOV-19
Sodium (Na)			98.6		%		70-130	19-NOV-19
Magnesium (Mg)			100.8		%		70-130	19-NOV-19
WG3221131-1 MB								
Calcium (Ca)			<0.50		mg/L		0.5	19-NOV-19
Sodium (Na)			<0.50		mg/L		0.5	19-NOV-19
Magnesium (Mg)			<0.50		mg/L		0.5	19-NOV-19
VOC-511-HS-WT	**Soil**							
Batch R4916835								
WG3221627-4 DUP		**WG3221627-3**						
1,1,1,2-Tetrachloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
1,1,2,2-Tetrachloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
1,1,1-Trichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
1,1,2-Trichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
1,1-Dichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
1,1-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
1,2-Dibromoethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
1,2-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
1,2-Dichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
1,2-Dichloropropane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4916835								
WG3221627-4 DUP		**WG3221627-3**						
1,3-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
1,4-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
Acetone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	20-NOV-19
Benzene		<0.0068	<0.0068	RPD-NA	ug/g	N/A	40	20-NOV-19
Bromodichloromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
Bromoform		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
Bromomethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
Carbon tetrachloride		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
Chlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
Chloroform		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
cis-1,2-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
cis-1,3-Dichloropropene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	20-NOV-19
Dibromochloromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
Dichlorodifluoromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
Ethylbenzene		<0.018	<0.018	RPD-NA	ug/g	N/A	40	20-NOV-19
n-Hexane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
Methylene Chloride		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
MTBE		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
m+p-Xylenes		<0.030	<0.030	RPD-NA	ug/g	N/A	40	20-NOV-19
Methyl Ethyl Ketone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	20-NOV-19
Methyl Isobutyl Ketone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	20-NOV-19
o-Xylene		<0.020	<0.020	RPD-NA	ug/g	N/A	40	20-NOV-19
Styrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
Tetrachloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
Toluene		<0.080	<0.080	RPD-NA	ug/g	N/A	40	20-NOV-19
trans-1,2-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
trans-1,3-Dichloropropene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	20-NOV-19
Trichloroethylene		<0.010	<0.010	RPD-NA	ug/g	N/A	40	20-NOV-19
Trichlorofluoromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	20-NOV-19
Vinyl chloride		<0.020	<0.020	RPD-NA	ug/g	N/A	40	20-NOV-19
WG3221627-2 LCS								
1,1,1,2-Tetrachloroethane			97.2		%		60-130	20-NOV-19
1,1,2,2-Tetrachloroethane			113.6		%		60-130	20-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4916835								
WG3221627-2 LCS								
1,1,1-Trichloroethane			94.9		%		60-130	20-NOV-19
1,1,2-Trichloroethane			104.4		%		60-130	20-NOV-19
1,1-Dichloroethane			102.8		%		60-130	20-NOV-19
1,1-Dichloroethylene			92.9		%		60-130	20-NOV-19
1,2-Dibromoethane			103.5		%		70-130	20-NOV-19
1,2-Dichlorobenzene			111.3		%		70-130	20-NOV-19
1,2-Dichloroethane			101.3		%		60-130	20-NOV-19
1,2-Dichloropropane			102.7		%		70-130	20-NOV-19
1,3-Dichlorobenzene			109.7		%		70-130	20-NOV-19
1,4-Dichlorobenzene			112.3		%		70-130	20-NOV-19
Acetone			113.6		%		60-140	20-NOV-19
Benzene			104.3		%		70-130	20-NOV-19
Bromodichloromethane			98.8		%		50-140	20-NOV-19
Bromoform			102.4		%		70-130	20-NOV-19
Bromomethane			90.6		%		50-140	20-NOV-19
Carbon tetrachloride			94.7		%		70-130	20-NOV-19
Chlorobenzene			102.7		%		70-130	20-NOV-19
Chloroform			101.2		%		70-130	20-NOV-19
cis-1,2-Dichloroethylene			99.0		%		70-130	20-NOV-19
cis-1,3-Dichloropropene			104.9		%		70-130	20-NOV-19
Dibromochloromethane			98.5		%		60-130	20-NOV-19
Dichlorodifluoromethane			57.6		%		50-140	20-NOV-19
Ethylbenzene			98.7		%		70-130	20-NOV-19
n-Hexane			90.2		%		70-130	20-NOV-19
Methylene Chloride			103.1		%		70-130	20-NOV-19
MTBE			88.5		%		70-130	20-NOV-19
m+p-Xylenes			98.9		%		70-130	20-NOV-19
Methyl Ethyl Ketone			107.7		%		60-140	20-NOV-19
Methyl Isobutyl Ketone			101.9		%		60-140	20-NOV-19
o-Xylene			96.7		%		70-130	20-NOV-19
Styrene			93.3		%		70-130	20-NOV-19
Tetrachloroethylene			102.7		%		60-130	20-NOV-19
Toluene			102.3		%		70-130	20-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4916835								
WG3221627-2 LCS								
trans-1,2-Dichloroethylene			100.3		%		60-130	20-NOV-19
trans-1,3-Dichloropropene			106.6		%		70-130	20-NOV-19
Trichloroethylene			97.6		%		60-130	20-NOV-19
Trichlorofluoromethane			89.6		%		50-140	20-NOV-19
Vinyl chloride			97.6		%		60-140	20-NOV-19
WG3221627-1 MB								
1,1,1,2-Tetrachloroethane			<0.050		ug/g		0.05	20-NOV-19
1,1,2,2-Tetrachloroethane			<0.050		ug/g		0.05	20-NOV-19
1,1,1-Trichloroethane			<0.050		ug/g		0.05	20-NOV-19
1,1,2-Trichloroethane			<0.050		ug/g		0.05	20-NOV-19
1,1-Dichloroethane			<0.050		ug/g		0.05	20-NOV-19
1,1-Dichloroethylene			<0.050		ug/g		0.05	20-NOV-19
1,2-Dibromoethane			<0.050		ug/g		0.05	20-NOV-19
1,2-Dichlorobenzene			<0.050		ug/g		0.05	20-NOV-19
1,2-Dichloroethane			<0.050		ug/g		0.05	20-NOV-19
1,2-Dichloropropane			<0.050		ug/g		0.05	20-NOV-19
1,3-Dichlorobenzene			<0.050		ug/g		0.05	20-NOV-19
1,4-Dichlorobenzene			<0.050		ug/g		0.05	20-NOV-19
Acetone			<0.50		ug/g		0.5	20-NOV-19
Benzene			<0.0068		ug/g		0.0068	20-NOV-19
Bromodichloromethane			<0.050		ug/g		0.05	20-NOV-19
Bromoform			<0.050		ug/g		0.05	20-NOV-19
Bromomethane			<0.050		ug/g		0.05	20-NOV-19
Carbon tetrachloride			<0.050		ug/g		0.05	20-NOV-19
Chlorobenzene			<0.050		ug/g		0.05	20-NOV-19
Chloroform			<0.050		ug/g		0.05	20-NOV-19
cis-1,2-Dichloroethylene			<0.050		ug/g		0.05	20-NOV-19
cis-1,3-Dichloropropene			<0.030		ug/g		0.03	20-NOV-19
Dibromochloromethane			<0.050		ug/g		0.05	20-NOV-19
Dichlorodifluoromethane			<0.050		ug/g		0.05	20-NOV-19
Ethylbenzene			<0.018		ug/g		0.018	20-NOV-19
n-Hexane			<0.050		ug/g		0.05	20-NOV-19
Methylene Chloride			<0.050		ug/g		0.05	20-NOV-19
MTBE			<0.050		ug/g		0.05	20-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4916835								
WG3221627-1 MB								
m+p-Xylenes			<0.030		ug/g		0.03	20-NOV-19
Methyl Ethyl Ketone			<0.50		ug/g		0.5	20-NOV-19
Methyl Isobutyl Ketone			<0.50		ug/g		0.5	20-NOV-19
o-Xylene			<0.020		ug/g		0.02	20-NOV-19
Styrene			<0.050		ug/g		0.05	20-NOV-19
Tetrachloroethylene			<0.050		ug/g		0.05	20-NOV-19
Toluene			<0.080		ug/g		0.08	20-NOV-19
trans-1,2-Dichloroethylene			<0.050		ug/g		0.05	20-NOV-19
trans-1,3-Dichloropropene			<0.030		ug/g		0.03	20-NOV-19
Trichloroethylene			<0.010		ug/g		0.01	20-NOV-19
Trichlorofluoromethane			<0.050		ug/g		0.05	20-NOV-19
Vinyl chloride			<0.020		ug/g		0.02	20-NOV-19
Surrogate: 1,4-Difluorobenzene			109.8		%		50-140	20-NOV-19
Surrogate: 4-Bromofluorobenzene			90.7		%		50-140	20-NOV-19
WG3221627-5 MS		**L2382750-7**						
1,1,1,2-Tetrachloroethane			106.7		%		50-140	20-NOV-19
1,1,2,2-Tetrachloroethane			115.5		%		50-140	20-NOV-19
1,1,1-Trichloroethane			107.4		%		50-140	20-NOV-19
1,1,2-Trichloroethane			109.6		%		50-140	20-NOV-19
1,1-Dichloroethane			112.5		%		50-140	20-NOV-19
1,1-Dichloroethylene			105.1		%		50-140	20-NOV-19
1,2-Dibromoethane			107.1		%		50-140	20-NOV-19
1,2-Dichlorobenzene			121.2		%		50-140	20-NOV-19
1,2-Dichloroethane			105.2		%		50-140	20-NOV-19
1,2-Dichloropropane			110.3		%		50-140	20-NOV-19
1,3-Dichlorobenzene			120.2		%		50-140	20-NOV-19
1,4-Dichlorobenzene			121.7		%		50-140	20-NOV-19
Acetone			119.2		%		50-140	20-NOV-19
Benzene			115.0		%		50-140	20-NOV-19
Bromodichloromethane			105.9		%		50-140	20-NOV-19
Bromoform			106.1		%		50-140	20-NOV-19
Bromomethane			97.5		%		50-140	20-NOV-19
Carbon tetrachloride			107.8		%		50-140	20-NOV-19
Chlorobenzene			112.5		%		50-140	20-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4916835								
WG3221627-5 MS		**L2382750-7**						
Chloroform			110.8		%		50-140	20-NOV-19
cis-1,2-Dichloroethylene			107.8		%		50-140	20-NOV-19
cis-1,3-Dichloropropene			104.2		%		50-140	20-NOV-19
Dibromochloromethane			104.8		%		50-140	20-NOV-19
Dichlorodifluoromethane			71.8		%		50-140	20-NOV-19
Ethylbenzene			110.1		%		50-140	20-NOV-19
n-Hexane			104.7		%		50-140	20-NOV-19
Methylene Chloride			110.7		%		50-140	20-NOV-19
MTBE			95.7		%		50-140	20-NOV-19
m+p-Xylenes			109.8		%		50-140	20-NOV-19
Methyl Ethyl Ketone			102.3		%		50-140	20-NOV-19
Methyl Isobutyl Ketone			97.2		%		50-140	20-NOV-19
o-Xylene			107.1		%		50-140	20-NOV-19
Styrene			101.1		%		50-140	20-NOV-19
Tetrachloroethylene			113.8		%		50-140	20-NOV-19
Toluene			115.5		%		50-140	20-NOV-19
trans-1,2-Dichloroethylene			109.0		%		50-140	20-NOV-19
trans-1,3-Dichloropropene			103.6		%		50-140	20-NOV-19
Trichloroethylene			107.9		%		50-140	20-NOV-19
Trichlorofluoromethane			104.0		%		50-140	20-NOV-19
Vinyl chloride			111.0		%		50-140	20-NOV-19

Quality Control Report

Workorder: L2382620 Report Date: 22-NOV-19

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Legend:

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

Sample Parameter Qualifier Definitions:

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

Hold Time Exceedances:

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

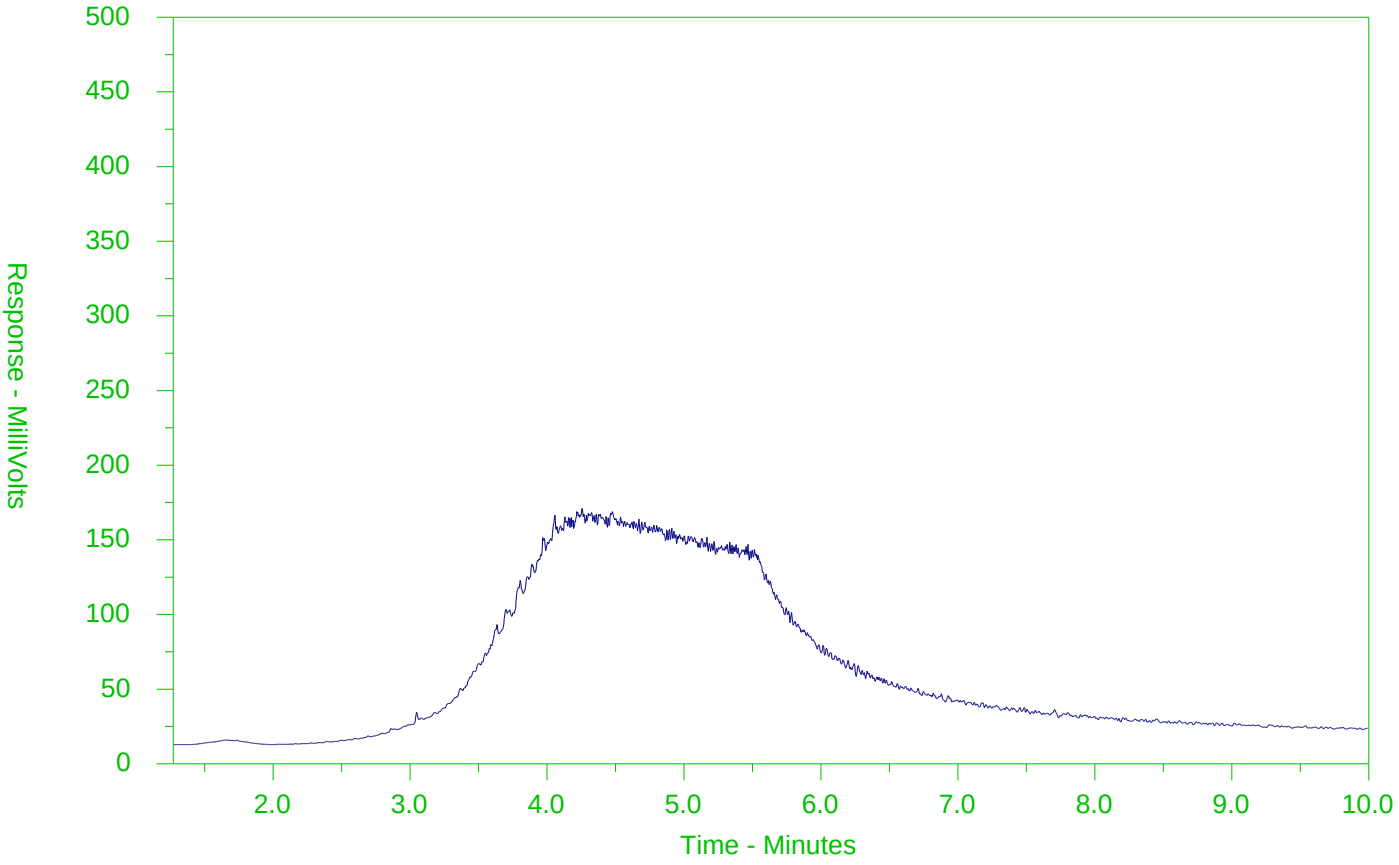
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where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

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2382620-1
Client Sample ID: BH18-38 SA1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2382620-COFC

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Golder
Contact:	Lawrence Kwak
Phone:	903 391 2846
	Company address below will appear on the final report
Street:	
City/Province:	
Postal Code:	
Invoice To	Same as Report To ☐ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax lawrence_kwak@golder.com
Email 2
Email 3

Invoice Distribution

Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax lawrence_kwak@golder.com
Email 2 leanh_huynh@golder.com

Project Information

ALS Account # / Quote #:
Job #: 1773654
PO / AFE:
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only): L2382620RD

ALS Contact: Sampler:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

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

Analysis Request

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Metals and Inorganics	VOCs	F2-F4	PAHs	PCBs	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	BH18-38 SA1	08-Nov-19	11:30	Soil		R	R	R	R	R		4

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

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

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human consumption/ use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Ontario Regulation 153/04 - April 15, 2011 Standards

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				7,8			

SHIPMENT RELEASE (client use)

Released by: Lawrence Kwak | 2019-11-14 | Time: 13:11

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: | Date: | Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by: | Date: 19/11/19 | Time: 18:45

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

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

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

golder.com

GOLDER ASSOCIATES LTD. (Markham)
ATTN: Lawrence Kwak
215 Shields Court
Unit #1
Markham ON L3R 8V2

Date Received: 07-NOV-19
Report Date: 14-NOV-19 15:41 (MT)
Version: FINAL

Client Phone: 905-475-5591

Certificate of Analysis

Lab Work Order #: L2379182

Project P.O. #: NOT SUBMITTED
Job Reference: 1773654
C of C Numbers:
Legal Site Desc:

Amanda Overholster
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379182-1 BH18-45 SA2 Sampled By: CLIENT on 01-NOV-19 @ 11:30 Matrix: SOIL							
Physical Tests							
Conductivity	1.39		0.0040	mS/cm		11-NOV-19	R4904460
% Moisture	20.4		0.25	%	07-NOV-19	08-NOV-19	R4902765
pH	7.61		0.10	pH units		12-NOV-19	R4905105
Cyanides							
Cyanide, Weak Acid Diss	<0.050		0.050	ug/g	08-NOV-19	11-NOV-19	R4904405
Saturated Paste Extractables							
SAR	3.11		0.10	SAR		11-NOV-19	R4904390
Calcium (Ca)	114		0.50	mg/L		11-NOV-19	R4904390
Magnesium (Mg)	8.66		0.50	mg/L		11-NOV-19	R4904390
Sodium (Na)	128		0.50	mg/L		11-NOV-19	R4904390
Metals							
Antimony (Sb)	<1.0		1.0	ug/g	10-NOV-19	11-NOV-19	R4904561
Arsenic (As)	5.6		1.0	ug/g	10-NOV-19	11-NOV-19	R4904561
Barium (Ba)	78.9		1.0	ug/g	10-NOV-19	11-NOV-19	R4904561
Beryllium (Be)	0.88		0.50	ug/g	10-NOV-19	11-NOV-19	R4904561
Boron (B)	8.8		5.0	ug/g	10-NOV-19	11-NOV-19	R4904561
Boron (B), Hot Water Ext.	0.10		0.10	ug/g	10-NOV-19	11-NOV-19	R4904389
Cadmium (Cd)	<0.50		0.50	ug/g	10-NOV-19	11-NOV-19	R4904561
Chromium (Cr)	27.2		1.0	ug/g	10-NOV-19	11-NOV-19	R4904561
Cobalt (Co)	13.4		1.0	ug/g	10-NOV-19	11-NOV-19	R4904561
Copper (Cu)	32.2		1.0	ug/g	10-NOV-19	11-NOV-19	R4904561
Lead (Pb)	10.6		1.0	ug/g	10-NOV-19	11-NOV-19	R4904561
Mercury (Hg)	0.0221		0.0050	ug/g	10-NOV-19	11-NOV-19	R4904320
Molybdenum (Mo)	<1.0		1.0	ug/g	10-NOV-19	11-NOV-19	R4904561
Nickel (Ni)	29.2		1.0	ug/g	10-NOV-19	11-NOV-19	R4904561
Selenium (Se)	<1.0		1.0	ug/g	10-NOV-19	11-NOV-19	R4904561
Silver (Ag)	<0.20		0.20	ug/g	10-NOV-19	11-NOV-19	R4904561
Thallium (Tl)	<0.50		0.50	ug/g	10-NOV-19	11-NOV-19	R4904561
Uranium (U)	<1.0		1.0	ug/g	10-NOV-19	11-NOV-19	R4904561
Vanadium (V)	38.2		1.0	ug/g	10-NOV-19	11-NOV-19	R4904561
Zinc (Zn)	68.1		5.0	ug/g	10-NOV-19	11-NOV-19	R4904561
Speciated Metals							
Chromium, Hexavalent	0.20		0.20	ug/g	10-NOV-19	12-NOV-19	R4905428
Volatile Organic Compounds							
Acetone	<0.50		0.50	ug/g	11-NOV-19	14-NOV-19	R4905480
Benzene	<0.0068		0.0068	ug/g	11-NOV-19	14-NOV-19	R4905480
Bromodichloromethane	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
Bromoform	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
Bromomethane	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
Carbon tetrachloride	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
Chlorobenzene	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
Dibromochloromethane	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379182-1 BH18-45 SA2 Sampled By: CLIENT on 01-NOV-19 @ 11:30 Matrix: SOIL							
Volatile Organic Compounds							
Chloroform	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
1,2-Dibromoethane	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
1,2-Dichlorobenzene	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
1,3-Dichlorobenzene	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
1,4-Dichlorobenzene	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
Dichlorodifluoromethane	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
1,1-Dichloroethane	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
1,2-Dichloroethane	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
1,1-Dichloroethylene	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
cis-1,2-Dichloroethylene	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
trans-1,2-Dichloroethylene	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
Methylene Chloride	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
1,2-Dichloropropane	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
cis-1,3-Dichloropropene	<0.030		0.030	ug/g	11-NOV-19	14-NOV-19	R4905480
trans-1,3-Dichloropropene	<0.030		0.030	ug/g	11-NOV-19	14-NOV-19	R4905480
1,3-Dichloropropene (cis & trans)	<0.042		0.042	ug/g		14-NOV-19	
Ethylbenzene	<0.018		0.018	ug/g	11-NOV-19	14-NOV-19	R4905480
n-Hexane	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
Methyl Ethyl Ketone	<0.50		0.50	ug/g	11-NOV-19	14-NOV-19	R4905480
Methyl Isobutyl Ketone	<0.50		0.50	ug/g	11-NOV-19	14-NOV-19	R4905480
MTBE	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
Styrene	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
1,1,1,2-Tetrachloroethane	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
1,1,2,2-Tetrachloroethane	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
Tetrachloroethylene	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
Toluene	<0.080		0.080	ug/g	11-NOV-19	14-NOV-19	R4905480
1,1,1-Trichloroethane	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
1,1,2-Trichloroethane	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
Trichloroethylene	<0.010		0.010	ug/g	11-NOV-19	14-NOV-19	R4905480
Trichlorofluoromethane	<0.050		0.050	ug/g	11-NOV-19	14-NOV-19	R4905480
Vinyl chloride	<0.020		0.020	ug/g	11-NOV-19	14-NOV-19	R4905480
o-Xylene	<0.020		0.020	ug/g	11-NOV-19	14-NOV-19	R4905480
m+p-Xylenes	<0.030		0.030	ug/g	11-NOV-19	14-NOV-19	R4905480
Xylenes (Total)	<0.050		0.050	ug/g		14-NOV-19	
Surrogate: 4-Bromofluorobenzene	87.1		50-140	%	11-NOV-19	14-NOV-19	R4905480
Surrogate: 1,4-Difluorobenzene	101.0		50-140	%	11-NOV-19	14-NOV-19	R4905480
Hydrocarbons							
F1 (C6-C10)	<5.0		5.0	ug/g	11-NOV-19	14-NOV-19	R4905480
F1-BTEX	<5.0		5.0	ug/g		14-NOV-19	
F2 (C10-C16)	<10		10	ug/g	08-NOV-19	14-NOV-19	R4905960
F2-Naphth	<10		10	ug/g		14-NOV-19	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2379182-1 BH18-45 SA2 Sampled By: CLIENT on 01-NOV-19 @ 11:30 Matrix: SOIL							
Hydrocarbons							
F3 (C16-C34)	<50		50	ug/g	08-NOV-19	14-NOV-19	R4905960
F3-PAH	<50		50	ug/g		14-NOV-19	
F4 (C34-C50)	<50		50	ug/g	08-NOV-19	14-NOV-19	R4905960
Total Hydrocarbons (C6-C50)	<72		72	ug/g		14-NOV-19	
Chrom. to baseline at nC50	YES				08-NOV-19	14-NOV-19	R4905960
Surrogate: 2-Bromobenzotrifluoride	91.5		60-140	%	08-NOV-19	14-NOV-19	R4905960
Surrogate: 3,4-Dichlorotoluene	91.9		60-140	%	11-NOV-19	14-NOV-19	R4905480
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	<0.050		0.050	ug/g	08-NOV-19	12-NOV-19	R4904724
Acenaphthylene	<0.050		0.050	ug/g	08-NOV-19	12-NOV-19	R4904724
Anthracene	<0.050		0.050	ug/g	08-NOV-19	12-NOV-19	R4904724
Benzo(a)anthracene	<0.050		0.050	ug/g	08-NOV-19	12-NOV-19	R4904724
Benzo(a)pyrene	<0.050		0.050	ug/g	08-NOV-19	12-NOV-19	R4904724
Benzo(b)fluoranthene	<0.050		0.050	ug/g	08-NOV-19	12-NOV-19	R4904724
Benzo(g,h,i)perylene	<0.050		0.050	ug/g	08-NOV-19	12-NOV-19	R4904724
Benzo(k)fluoranthene	<0.050		0.050	ug/g	08-NOV-19	12-NOV-19	R4904724
Chrysene	<0.050		0.050	ug/g	08-NOV-19	12-NOV-19	R4904724
Dibenzo(ah)anthracene	<0.050		0.050	ug/g	08-NOV-19	12-NOV-19	R4904724
Fluoranthene	<0.050		0.050	ug/g	08-NOV-19	12-NOV-19	R4904724
Fluorene	<0.050		0.050	ug/g	08-NOV-19	12-NOV-19	R4904724
Indeno(1,2,3-cd)pyrene	<0.050		0.050	ug/g	08-NOV-19	12-NOV-19	R4904724
1+2-Methylnaphthalenes	<0.042		0.042	ug/g		12-NOV-19	
1-Methylnaphthalene	<0.030		0.030	ug/g	08-NOV-19	12-NOV-19	R4904724
2-Methylnaphthalene	<0.030		0.030	ug/g	08-NOV-19	12-NOV-19	R4904724
Naphthalene	<0.013		0.013	ug/g	08-NOV-19	12-NOV-19	R4904724
Phenanthrene	<0.046		0.046	ug/g	08-NOV-19	12-NOV-19	R4904724
Pyrene	<0.050		0.050	ug/g	08-NOV-19	12-NOV-19	R4904724
Surrogate: 2-Fluorobiphenyl	91.2		50-140	%	08-NOV-19	12-NOV-19	R4904724
Surrogate: p-Terphenyl d14	81.9		50-140	%	08-NOV-19	12-NOV-19	R4904724
Polychlorinated Biphenyls							
Aroclor 1242	<0.010		0.010	ug/g	12-NOV-19	12-NOV-19	R4904996
Aroclor 1248	<0.010		0.010	ug/g	12-NOV-19	12-NOV-19	R4904996
Aroclor 1254	<0.010		0.010	ug/g	12-NOV-19	12-NOV-19	R4904996
Aroclor 1260	<0.010		0.010	ug/g	12-NOV-19	12-NOV-19	R4904996
Total PCBs	<0.020		0.020	ug/g	12-NOV-19	12-NOV-19	R4904996
Surrogate: d14-Terphenyl	91.4		60-140	%	12-NOV-19	12-NOV-19	R4904996

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

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

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

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

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

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

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

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

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

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

EC-WT	Soil	Conductivity (EC)	MOEE E3138

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

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

F1-F4-511-CALC-WT	Soil	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-S

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

Hydrocarbon results are expressed on a dry weight basis.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Soil	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by extracting a soil or sediment sample as received with methanol, then analyzing by headspace-GC/FID.

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

F2-F4-511-WT	Soil	F2-F4-O.Reg 153/04 (July 2011)	CCME Tier 1

Reference Information

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from soil with 1:1 hexane:acetone using a rotary extractor. Extracts are treated with silica gel to remove polar organic interferences. F2, F3, & F4 are analyzed by GC-FID. F4G-sg is analyzed gravimetrically.

Notes:
1. F2 (C10-C16): Sum of all hydrocarbons that elute between nC10 and nC16.
2. F3 (C16-C34): Sum of all hydrocarbons that elute between nC16 and nC34.
3. F4 (C34-C50): Sum of all hydrocarbons that elute between nC34 and nC50.
4. F4G: Gravimetric Heavy Hydrocarbons
5. F4G-sg: Gravimetric Heavy Hydrocarbons (F4G) after silica gel treatment.
6. Where both F4 (C34-C50) and F4G-sg are reported for a sample, the larger of the two values is used for comparison against the relevant CCME guideline for F4.
7. F4G-sg cannot be added to the C6 to C50 hydrocarbon results to obtain an estimate of total extractable hydrocarbons.
8. This method is validated for use.
9. Data from analysis of validation and quality control samples is available upon request.
10. Reported results are expressed as milligrams per dry kilogram, unless otherwise indicated.

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

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

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

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

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

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

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

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

METHYLNAPS-CALC-WT	Soil	ABN-Calculated Parameters	SW846 8270
MOISTURE-WT	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)
PAH-511-WT	Soil	PAH-O.Reg 153/04 (July 2011)	SW846 3510/8270

A representative sub-sample of soil is fortified with deuterium-labelled surrogates and a mechanical shaking techniqueis used to extract the sample with a mixture of methanol and toluene. The extracts are concentrated and analyzed by GC/MS. Results for benzo(b) fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.

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

PCB-511-WT	Soil	PCB-O.Reg 153/04 (July 2011)	SW846 3510/8082

An aliquot of a solid sample is extracted with a solvent, extract is cleaned up and analyzed on the GC/MS.

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

PH-WT	Soil	pH	MOEE E3137A

A minimum 10g portion of the sample is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil and then analyzed using a pH meter and electrode.

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

SAR-R511-WT	Soil	SAR-O.Reg 153/04 (July 2011)	SW846 6010C

A dried, disaggregated solid sample is extracted with deionized water, the aqueous extract is separated from the solid, acidified and then analyzed using a ICP/OES. The concentrations of Na, Ca and Mg are reported as per CALA requirements for calculated parameters. These individual parameters are

Reference Information

not for comparison to any guideline.

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

VOC-1,3-DCP-CALC-WT	Soil	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Soil	VOC-O.Reg 153/04 (July 2011)	SW846 8260 (511)

Soil and sediment samples are extracted in methanol and analyzed by headspace-GC/MS.

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

XYLENES-SUM-CALC-WT	Soil	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

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

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

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

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

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

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

Quality Control Report

Workorder: L2379182 Report Date: 14-NOV-19

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
B-HWS-R511-WT	**Soil**							
Batch R4904389								
WG3215731-4 DUP		**L2379084-3**						
Boron (B), Hot Water Ext.		<0.10	<0.10	RPD-NA	ug/g	N/A	30	11-NOV-19
WG3215731-2 IRM		**WT SAR3**						
Boron (B), Hot Water Ext.			96.6		%		70-130	11-NOV-19
WG3215731-3 LCS								
Boron (B), Hot Water Ext.			101.0		%		70-130	11-NOV-19
WG3215731-1 MB								
Boron (B), Hot Water Ext.			<0.10		ug/g		0.1	11-NOV-19
CN-WAD-R511-WT	**Soil**							
Batch R4904405								
WG3214631-3 DUP		**L2379363-6**						
Cyanide, Weak Acid Diss		<0.050	<0.050	RPD-NA	ug/g	N/A	35	11-NOV-19
WG3214631-2 LCS								
Cyanide, Weak Acid Diss			90.7		%		80-120	11-NOV-19
WG3214631-1 MB								
Cyanide, Weak Acid Diss			<0.050		ug/g		0.05	11-NOV-19
WG3214631-4 MS		**L2379363-6**						
Cyanide, Weak Acid Diss			91.5		%		70-130	11-NOV-19
CR-CR6-IC-WT	**Soil**							
Batch R4905428								
WG3215719-4 CRM		**WT-SQC012**						
Chromium, Hexavalent			86.9		%		70-130	12-NOV-19
WG3215719-3 DUP		**L2379084-14**						
Chromium, Hexavalent		<0.20	<0.20	RPD-NA	ug/g	N/A	35	12-NOV-19
WG3215719-2 LCS								
Chromium, Hexavalent			96.8		%		80-120	12-NOV-19
WG3215719-1 MB								
Chromium, Hexavalent			<0.20		ug/g		0.2	12-NOV-19
EC-WT	**Soil**							
Batch R4904460								
WG3215744-4 DUP		**WG3215744-3**						
Conductivity		0.126	0.123		mS/cm	1.9	20	11-NOV-19
WG3215744-2 IRM		**WT SAR3**						
Conductivity			90.0		%		70-130	11-NOV-19
WG3215951-1 LCS								
Conductivity			102.7		%		90-110	11-NOV-19
WG3215744-1 MB								

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-WT	**Soil**							
Batch R4904460								
WG3215744-1 MB								
Conductivity			<0.0040		mS/cm		0.004	11-NOV-19
F1-HS-511-WT	**Soil**							
Batch R4905480								
WG3215958-4 DUP		**WG3215958-3**						
F1 (C6-C10)		<5.0	<5.0	RPD-NA	ug/g	N/A	30	13-NOV-19
WG3215958-2 LCS								
F1 (C6-C10)			118.2		%		80-120	13-NOV-19
WG3215958-1 MB								
F1 (C6-C10)			<5.0		ug/g		5	13-NOV-19
Surrogate: 3,4-Dichlorotoluene			110.6		%		60-140	13-NOV-19
WG3215958-6 MS		**L2375414-2**						
F1 (C6-C10)			96.7		%		60-140	13-NOV-19
F2-F4-511-WT	**Soil**							
Batch R4905960								
WG3214482-3 DUP		**WG3214482-5**						
F2 (C10-C16)		<10	<10	RPD-NA	ug/g	N/A	30	13-NOV-19
F3 (C16-C34)		<50	<50	RPD-NA	ug/g	N/A	30	13-NOV-19
F4 (C34-C50)		<50	<50	RPD-NA	ug/g	N/A	30	13-NOV-19
WG3214482-2 LCS								
F2 (C10-C16)			115.2		%		80-120	13-NOV-19
F3 (C16-C34)			113.0		%		80-120	13-NOV-19
F4 (C34-C50)			115.9		%		80-120	13-NOV-19
WG3214482-1 MB								
F2 (C10-C16)			<10		ug/g		10	13-NOV-19
F3 (C16-C34)			<50		ug/g		50	13-NOV-19
F4 (C34-C50)			<50		ug/g		50	13-NOV-19
Surrogate: 2-Bromobenzotrifluoride			74.3		%		60-140	13-NOV-19
WG3214482-4 MS		**WG3214482-5**						
F2 (C10-C16)			106.3		%		60-140	13-NOV-19
F3 (C16-C34)			108.2		%		60-140	13-NOV-19
F4 (C34-C50)			112.8		%		60-140	13-NOV-19
HG-200.2-CVAA-WT	**Soil**							

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-200.2-CVAA-WT	**Soil**							
Batch R4904320								
WG3215729-2 CRM		**WT-CANMET-TILL2**						
Mercury (Hg)			107.1		%		70-130	11-NOV-19
WG3215729-6 DUP		**WG3215729-5**						
Mercury (Hg)		0.0221	0.0215		ug/g	2.7	40	11-NOV-19
WG3215729-3 LCS								
Mercury (Hg)			104.5		%		80-120	11-NOV-19
WG3215729-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	11-NOV-19
MET-200.2-CCMS-WT	**Soil**							
Batch R4904561								
WG3215729-2 CRM		**WT-CANMET-TILL2**						
Antimony (Sb)			90.2		%		70-130	11-NOV-19
Arsenic (As)			96.3		%		70-130	11-NOV-19
Barium (Ba)			104.3		%		70-130	11-NOV-19
Beryllium (Be)			85.6		%		70-130	11-NOV-19
Boron (B)			3.1		mg/kg		0-8.6	11-NOV-19
Cadmium (Cd)			87.0		%		70-130	11-NOV-19
Chromium (Cr)			96.0		%		70-130	11-NOV-19
Cobalt (Co)			95.0		%		70-130	11-NOV-19
Copper (Cu)			94.7		%		70-130	11-NOV-19
Lead (Pb)			90.1		%		70-130	11-NOV-19
Molybdenum (Mo)			93.4		%		70-130	11-NOV-19
Nickel (Ni)			95.1		%		70-130	11-NOV-19
Selenium (Se)			0.38		mg/kg		0.15-0.55	11-NOV-19
Silver (Ag)			0.25		mg/kg		0.16-0.36	11-NOV-19
Thallium (Tl)			90.6		%		70-130	11-NOV-19
Uranium (U)			84.7		%		70-130	11-NOV-19
Vanadium (V)			96.9		%		70-130	11-NOV-19
Zinc (Zn)			90.8		%		70-130	11-NOV-19
WG3215729-6 DUP		**WG3215729-5**						
Antimony (Sb)		0.12	0.12		ug/g	1.6	30	11-NOV-19
Arsenic (As)		5.58	5.38		ug/g	3.6	30	11-NOV-19
Barium (Ba)		78.9	75.0		ug/g	5.1	40	11-NOV-19
Beryllium (Be)		0.88	0.84		ug/g	4.1	30	11-NOV-19
Boron (B)		8.8	8.2		ug/g	6.6	30	11-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4904561								
WG3215729-6 DUP		**WG3215729-5**						
Cadmium (Cd)		0.103	0.098		ug/g	5.0	30	11-NOV-19
Chromium (Cr)		27.2	25.8		ug/g	5.3	30	11-NOV-19
Cobalt (Co)		13.4	12.5		ug/g	6.3	30	11-NOV-19
Copper (Cu)		32.2	30.4		ug/g	5.7	30	11-NOV-19
Lead (Pb)		10.6	9.98		ug/g	5.8	40	11-NOV-19
Molybdenum (Mo)		0.30	0.26		ug/g	16	40	11-NOV-19
Nickel (Ni)		29.2	27.5		ug/g	6.0	30	11-NOV-19
Selenium (Se)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	11-NOV-19
Silver (Ag)		<0.10	<0.10	RPD-NA	ug/g	N/A	40	11-NOV-19
Thallium (Tl)		0.126	0.115		ug/g	8.6	30	11-NOV-19
Uranium (U)		0.435	0.400		ug/g	8.3	30	11-NOV-19
Vanadium (V)		38.2	36.3		ug/g	5.1	30	11-NOV-19
Zinc (Zn)		68.1	63.7		ug/g	6.8	30	11-NOV-19
WG3215729-4 LCS								
Antimony (Sb)			106.3		%		80-120	11-NOV-19
Arsenic (As)			98.3		%		80-120	11-NOV-19
Barium (Ba)			99.7		%		80-120	11-NOV-19
Beryllium (Be)			88.9		%		80-120	11-NOV-19
Boron (B)			83.6		%		80-120	11-NOV-19
Cadmium (Cd)			94.6		%		80-120	11-NOV-19
Chromium (Cr)			98.7		%		80-120	11-NOV-19
Cobalt (Co)			96.3		%		80-120	11-NOV-19
Copper (Cu)			93.8		%		80-120	11-NOV-19
Lead (Pb)			92.4		%		80-120	11-NOV-19
Molybdenum (Mo)			99.0		%		80-120	11-NOV-19
Nickel (Ni)			94.4		%		80-120	11-NOV-19
Selenium (Se)			97.3		%		80-120	11-NOV-19
Silver (Ag)			98.3		%		80-120	11-NOV-19
Thallium (Tl)			96.9		%		80-120	11-NOV-19
Uranium (U)			86.4		%		80-120	11-NOV-19
Vanadium (V)			99.7		%		80-120	11-NOV-19
Zinc (Zn)			91.1		%		80-120	11-NOV-19
WG3215729-1 MB								
							0.1	

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4904561								
WG3215729-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	11-NOV-19
Arsenic (As)			<0.10		mg/kg		0.1	11-NOV-19
Barium (Ba)			<0.50		mg/kg		0.5	11-NOV-19
Beryllium (Be)			<0.10		mg/kg		0.1	11-NOV-19
Boron (B)			<5.0		mg/kg		5	11-NOV-19
Cadmium (Cd)			<0.020		mg/kg		0.02	11-NOV-19
Chromium (Cr)			<0.50		mg/kg		0.5	11-NOV-19
Cobalt (Co)			<0.10		mg/kg		0.1	11-NOV-19
Copper (Cu)			<0.50		mg/kg		0.5	11-NOV-19
Lead (Pb)			<0.50		mg/kg		0.5	11-NOV-19
Molybdenum (Mo)			<0.10		mg/kg		0.1	11-NOV-19
Nickel (Ni)			<0.50		mg/kg		0.5	11-NOV-19
Selenium (Se)			<0.20		mg/kg		0.2	11-NOV-19
Silver (Ag)			<0.10		mg/kg		0.1	11-NOV-19
Thallium (Tl)			<0.050		mg/kg		0.05	11-NOV-19
Uranium (U)			<0.050		mg/kg		0.05	11-NOV-19
Vanadium (V)			<0.20		mg/kg		0.2	11-NOV-19
Zinc (Zn)			<2.0		mg/kg		2	11-NOV-19
MOISTURE-WT	**Soil**							
Batch R4902765								
WG3213574-3 DUP		**L2379029-5**						
% Moisture		10.9	11.0		%	0.4	20	08-NOV-19
WG3213574-2 LCS								
% Moisture			100.7		%		90-110	08-NOV-19
WG3213574-1 MB								
% Moisture			<0.25		%		0.25	08-NOV-19
PAH-511-WT	**Soil**							
Batch R4904724								
WG3213907-3 DUP		**WG3213907-5**						
1-Methylnaphthalene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	12-NOV-19
2-Methylnaphthalene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	12-NOV-19
Acenaphthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-NOV-19
Acenaphthylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-NOV-19
Anthracene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT	**Soil**							
Batch R4904724								
WG3213907-3 DUP		**WG3213907-5**						
Benzo(a)anthracene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-NOV-19
Benzo(a)pyrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-NOV-19
Benzo(b)fluoranthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-NOV-19
Benzo(g,h,i)perylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-NOV-19
Benzo(k)fluoranthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-NOV-19
Chrysene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-NOV-19
Dibenzo(ah)anthracene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-NOV-19
Fluoranthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-NOV-19
Fluorene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-NOV-19
Indeno(1,2,3-cd)pyrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-NOV-19
Naphthalene		<0.013	<0.013	RPD-NA	ug/g	N/A	40	12-NOV-19
Phenanthrene		<0.046	<0.046	RPD-NA	ug/g	N/A	40	12-NOV-19
Pyrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	12-NOV-19
WG3213907-2 LCS								
1-Methylnaphthalene			87.2		%		50-140	12-NOV-19
2-Methylnaphthalene			83.2		%		50-140	12-NOV-19
Acenaphthene			93.2		%		50-140	12-NOV-19
Acenaphthylene			93.8		%		50-140	12-NOV-19
Anthracene			92.0		%		50-140	12-NOV-19
Benzo(a)anthracene			95.2		%		50-140	12-NOV-19
Benzo(a)pyrene			90.3		%		50-140	12-NOV-19
Benzo(b)fluoranthene			78.6		%		50-140	12-NOV-19
Benzo(g,h,i)perylene			90.2		%		50-140	12-NOV-19
Benzo(k)fluoranthene			102.4		%		50-140	12-NOV-19
Chrysene			103.3		%		50-140	12-NOV-19
Dibenzo(ah)anthracene			92.3		%		50-140	12-NOV-19
Fluoranthene			88.7		%		50-140	12-NOV-19
Fluorene			91.3		%		50-140	12-NOV-19
Indeno(1,2,3-cd)pyrene			90.6		%		50-140	12-NOV-19
Naphthalene			85.7		%		50-140	12-NOV-19
Phenanthrene			91.3		%		50-140	12-NOV-19
Pyrene			89.0		%		50-140	12-NOV-19
WG3213907-1 MB								
							0.03	

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT	**Soil**							
Batch R4904724								
WG3213907-1 MB								
1-Methylnaphthalene			<0.030		ug/g		0.03	12-NOV-19
2-Methylnaphthalene			<0.030		ug/g		0.03	12-NOV-19
Acenaphthene			<0.050		ug/g		0.05	12-NOV-19
Acenaphthylene			<0.050		ug/g		0.05	12-NOV-19
Anthracene			<0.050		ug/g		0.05	12-NOV-19
Benzo(a)anthracene			<0.050		ug/g		0.05	12-NOV-19
Benzo(a)pyrene			<0.050		ug/g		0.05	12-NOV-19
Benzo(b)fluoranthene			<0.050		ug/g		0.05	12-NOV-19
Benzo(g,h,i)perylene			<0.050		ug/g		0.05	12-NOV-19
Benzo(k)fluoranthene			<0.050		ug/g		0.05	12-NOV-19
Chrysene			<0.050		ug/g		0.05	12-NOV-19
Dibenzo(ah)anthracene			<0.050		ug/g		0.05	12-NOV-19
Fluoranthene			<0.050		ug/g		0.05	12-NOV-19
Fluorene			<0.050		ug/g		0.05	12-NOV-19
Indeno(1,2,3-cd)pyrene			<0.050		ug/g		0.05	12-NOV-19
Naphthalene			<0.013		ug/g		0.013	12-NOV-19
Phenanthrene			<0.046		ug/g		0.046	12-NOV-19
Pyrene			<0.050		ug/g		0.05	12-NOV-19
Surrogate: 2-Fluorobiphenyl			92.8		%		50-140	12-NOV-19
Surrogate: p-Terphenyl d14			78.4		%		50-140	12-NOV-19
WG3213907-4 MS		**WG3213907-5**						
1-Methylnaphthalene			82.1		%		50-140	12-NOV-19
2-Methylnaphthalene			78.3		%		50-140	12-NOV-19
Acenaphthene			87.9		%		50-140	12-NOV-19
Acenaphthylene			86.6		%		50-140	12-NOV-19
Anthracene			84.9		%		50-140	12-NOV-19
Benzo(a)anthracene			88.7		%		50-140	12-NOV-19
Benzo(a)pyrene			87.3		%		50-140	12-NOV-19
Benzo(b)fluoranthene			74.4		%		50-140	12-NOV-19
Benzo(g,h,i)perylene			85.1		%		50-140	12-NOV-19
Benzo(k)fluoranthene			99.2		%		50-140	12-NOV-19
Chrysene			98.3		%		50-140	12-NOV-19
Dibenzo(ah)anthracene			88.2		%		50-140	12-NOV-19
Fluoranthene			83.7		%		50-140	12-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT	**Soil**							
Batch R4904724								
WG3213907-4 MS		**WG3213907-5**						
Fluorene			85.7		%		50-140	12-NOV-19
Indeno(1,2,3-cd)pyrene			86.6		%		50-140	12-NOV-19
Naphthalene			80.7		%		50-140	12-NOV-19
Phenanthrene			86.0		%		50-140	12-NOV-19
Pyrene			84.8		%		50-140	12-NOV-19
PCB-511-WT	**Soil**							
Batch R4904996								
WG3213907-3 DUP		**WG3213907-5**						
Aroclor 1242		<0.010	<0.010	RPD-NA	ug/g	N/A	40	12-NOV-19
Aroclor 1248		<0.010	<0.010	RPD-NA	ug/g	N/A	40	12-NOV-19
Aroclor 1254		<0.010	<0.010	RPD-NA	ug/g	N/A	40	12-NOV-19
Aroclor 1260		<0.010	<0.010	RPD-NA	ug/g	N/A	40	12-NOV-19
WG3213907-2 LCS								
Aroclor 1242			87.7		%		60-140	12-NOV-19
Aroclor 1248			91.6		%		60-140	12-NOV-19
Aroclor 1254			92.4		%		60-140	12-NOV-19
Aroclor 1260			102.0		%		60-140	12-NOV-19
WG3213907-1 MB								
Aroclor 1242			<0.010		ug/g		0.01	12-NOV-19
Aroclor 1248			<0.010		ug/g		0.01	12-NOV-19
Aroclor 1254			<0.010		ug/g		0.01	12-NOV-19
Aroclor 1260			<0.010		ug/g		0.01	12-NOV-19
Surrogate: d14-Terphenyl			95.4		%		60-140	12-NOV-19
WG3213907-4 MS		**WG3213907-5**						
Aroclor 1242			85.8		%		60-140	12-NOV-19
Aroclor 1254			91.2		%		60-140	12-NOV-19
Aroclor 1260			96.4		%		60-140	12-NOV-19
PH-WT	**Soil**							
Batch R4905105								
WG3214463-1 DUP		**L2379343-1**						
pH		7.23	7.25	J	pH units	0.02	0.3	12-NOV-19
WG3216311-1 LCS								
pH			6.98		pH units		6.9-7.1	12-NOV-19
SAR-R511-WT	**Soil**							

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SAR-R511-WT	**Soil**							
Batch R4904390								
WG3215744-4 DUP		**WG3215744-3**						
Calcium (Ca)		7.58	7.56		mg/L	0.3	30	11-NOV-19
Sodium (Na)		2.35	2.37		mg/L	0.8	30	11-NOV-19
Magnesium (Mg)		1.21	1.18		mg/L	2.5	30	11-NOV-19
WG3215744-2 IRM		**WT SAR3**						
Calcium (Ca)			74.7		%		70-130	11-NOV-19
Sodium (Na)			93.9		%		70-130	11-NOV-19
Magnesium (Mg)			83.9		%		70-130	11-NOV-19
WG3215744-5 LCS								
Calcium (Ca)			109.7		%		70-130	11-NOV-19
Sodium (Na)			107.0		%		70-130	11-NOV-19
Magnesium (Mg)			108.2		%		70-130	11-NOV-19
WG3215744-1 MB								
Calcium (Ca)			<0.50		mg/L		0.5	11-NOV-19
Sodium (Na)			<0.50		mg/L		0.5	11-NOV-19
Magnesium (Mg)			<0.50		mg/L		0.5	11-NOV-19
VOC-511-HS-WT	**Soil**							
Batch R4905480								
WG3215958-4 DUP		**WG3215958-3**						
1,1,1,2-Tetrachloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
1,1,2,2-Tetrachloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
1,1,1-Trichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
1,1,2-Trichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
1,1-Dichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
1,1-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
1,2-Dibromoethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
1,2-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
1,2-Dichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
1,2-Dichloropropane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
1,3-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
1,4-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
Acetone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	13-NOV-19
Benzene		<0.0068	<0.0068	RPD-NA	ug/g	N/A	40	13-NOV-19
Bromodichloromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
Bromoform		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4905480								
WG3215958-4 DUP		**WG3215958-3**						
Bromomethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
Carbon tetrachloride		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
Chlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
Chloroform		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
cis-1,2-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
cis-1,3-Dichloropropene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	13-NOV-19
Dibromochloromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
Dichlorodifluoromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
Ethylbenzene		<0.018	<0.018	RPD-NA	ug/g	N/A	40	13-NOV-19
n-Hexane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
Methylene Chloride		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
MTBE		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
m+p-Xylenes		<0.030	<0.030	RPD-NA	ug/g	N/A	40	13-NOV-19
Methyl Ethyl Ketone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	13-NOV-19
Methyl Isobutyl Ketone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	13-NOV-19
o-Xylene		<0.020	<0.020	RPD-NA	ug/g	N/A	40	13-NOV-19
Styrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
Tetrachloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
Toluene		<0.080	<0.080	RPD-NA	ug/g	N/A	40	13-NOV-19
trans-1,2-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
trans-1,3-Dichloropropene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	13-NOV-19
Trichloroethylene		<0.010	<0.010	RPD-NA	ug/g	N/A	40	13-NOV-19
Trichlorofluoromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	13-NOV-19
Vinyl chloride		<0.020	<0.020	RPD-NA	ug/g	N/A	40	13-NOV-19
WG3215958-2 LCS								
1,1,1,2-Tetrachloroethane			97.9		%		60-130	13-NOV-19
1,1,2,2-Tetrachloroethane			106.0		%		60-130	13-NOV-19
1,1,1-Trichloroethane			97.0		%		60-130	13-NOV-19
1,1,2-Trichloroethane			100.3		%		60-130	13-NOV-19
1,1-Dichloroethane			101.1		%		60-130	13-NOV-19
1,1-Dichloroethylene			93.7		%		60-130	13-NOV-19
1,2-Dibromoethane			99.3		%		70-130	13-NOV-19
1,2-Dichlorobenzene			110.3		%		70-130	13-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4905480								
WG3215958-2 LCS								
1,2-Dichloroethane			96.6		%		60-130	13-NOV-19
1,2-Dichloropropane			99.3		%		70-130	13-NOV-19
1,3-Dichlorobenzene			111.0		%		70-130	13-NOV-19
1,4-Dichlorobenzene			112.1		%		70-130	13-NOV-19
Acetone			103.8		%		60-140	13-NOV-19
Benzene			102.0		%		70-130	13-NOV-19
Bromodichloromethane			96.8		%		50-140	13-NOV-19
Bromoform			100.1		%		70-130	13-NOV-19
Bromomethane			88.8		%		50-140	13-NOV-19
Carbon tetrachloride			97.5		%		70-130	13-NOV-19
Chlorobenzene			102.2		%		70-130	13-NOV-19
Chloroform			99.8		%		70-130	13-NOV-19
cis-1,2-Dichloroethylene			97.0		%		70-130	13-NOV-19
cis-1,3-Dichloropropene			101.2		%		70-130	13-NOV-19
Dibromochloromethane			97.4		%		60-130	13-NOV-19
Dichlorodifluoromethane			63.1		%		50-140	13-NOV-19
Ethylbenzene			101.0		%		70-130	13-NOV-19
n-Hexane			90.9		%		70-130	13-NOV-19
Methylene Chloride			99.7		%		70-130	13-NOV-19
MTBE			87.5		%		70-130	13-NOV-19
m+p-Xylenes			100.4		%		70-130	13-NOV-19
Methyl Ethyl Ketone			95.6		%		60-140	13-NOV-19
Methyl Isobutyl Ketone			94.2		%		60-140	13-NOV-19
o-Xylene			98.7		%		70-130	13-NOV-19
Styrene			94.7		%		70-130	13-NOV-19
Tetrachloroethylene			105.6		%		60-130	13-NOV-19
Toluene			103.1		%		70-130	13-NOV-19
trans-1,2-Dichloroethylene			100.7		%		60-130	13-NOV-19
trans-1,3-Dichloropropene			102.8		%		70-130	13-NOV-19
Trichloroethylene			98.8		%		60-130	13-NOV-19
Trichlorofluoromethane			93.0		%		50-140	13-NOV-19
Vinyl chloride			99.0		%		60-140	13-NOV-19
WG3215958-1 MB								
1,1,1,2-Tetrachloroethane			<0.050		ug/g		0.05	13-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4905480								
WG3215958-1 MB								
1,1,2,2-Tetrachloroethane			<0.050		ug/g		0.05	13-NOV-19
1,1,1-Trichloroethane			<0.050		ug/g		0.05	13-NOV-19
1,1,2-Trichloroethane			<0.050		ug/g		0.05	13-NOV-19
1,1-Dichloroethane			<0.050		ug/g		0.05	13-NOV-19
1,1-Dichloroethylene			<0.050		ug/g		0.05	13-NOV-19
1,2-Dibromoethane			<0.050		ug/g		0.05	13-NOV-19
1,2-Dichlorobenzene			<0.050		ug/g		0.05	13-NOV-19
1,2-Dichloroethane			<0.050		ug/g		0.05	13-NOV-19
1,2-Dichloropropane			<0.050		ug/g		0.05	13-NOV-19
1,3-Dichlorobenzene			<0.050		ug/g		0.05	13-NOV-19
1,4-Dichlorobenzene			<0.050		ug/g		0.05	13-NOV-19
Acetone			<0.50		ug/g		0.5	13-NOV-19
Benzene			<0.0068		ug/g		0.0068	13-NOV-19
Bromodichloromethane			<0.050		ug/g		0.05	13-NOV-19
Bromoform			<0.050		ug/g		0.05	13-NOV-19
Bromomethane			<0.050		ug/g		0.05	13-NOV-19
Carbon tetrachloride			<0.050		ug/g		0.05	13-NOV-19
Chlorobenzene			<0.050		ug/g		0.05	13-NOV-19
Chloroform			<0.050		ug/g		0.05	13-NOV-19
cis-1,2-Dichloroethylene			<0.050		ug/g		0.05	13-NOV-19
cis-1,3-Dichloropropene			<0.030		ug/g		0.03	13-NOV-19
Dibromochloromethane			<0.050		ug/g		0.05	13-NOV-19
Dichlorodifluoromethane			<0.050		ug/g		0.05	13-NOV-19
Ethylbenzene			<0.018		ug/g		0.018	13-NOV-19
n-Hexane			<0.050		ug/g		0.05	13-NOV-19
Methylene Chloride			<0.050		ug/g		0.05	13-NOV-19
MTBE			<0.050		ug/g		0.05	13-NOV-19
m+p-Xylenes			<0.030		ug/g		0.03	13-NOV-19
Methyl Ethyl Ketone			<0.50		ug/g		0.5	13-NOV-19
Methyl Isobutyl Ketone			<0.50		ug/g		0.5	13-NOV-19
o-Xylene			<0.020		ug/g		0.02	13-NOV-19
Styrene			<0.050		ug/g		0.05	13-NOV-19
Tetrachloroethylene			<0.050		ug/g		0.05	13-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4905480								
WG3215958-1 MB								
Toluene			<0.080		ug/g		0.08	13-NOV-19
trans-1,2-Dichloroethylene			<0.050		ug/g		0.05	13-NOV-19
trans-1,3-Dichloropropene			<0.030		ug/g		0.03	13-NOV-19
Trichloroethylene			<0.010		ug/g		0.01	13-NOV-19
Trichlorofluoromethane			<0.050		ug/g		0.05	13-NOV-19
Vinyl chloride			<0.020		ug/g		0.02	13-NOV-19
Surrogate: 1,4-Difluorobenzene			113.6		%		50-140	13-NOV-19
Surrogate: 4-Bromofluorobenzene			98.2		%		50-140	13-NOV-19
WG3215958-5 MS		**L2375414-1**						
1,1,1,2-Tetrachloroethane			96.0		%		50-140	13-NOV-19
1,1,2,2-Tetrachloroethane			100.6		%		50-140	13-NOV-19
1,1,1-Trichloroethane			95.7		%		50-140	13-NOV-19
1,1,2-Trichloroethane			96.5		%		50-140	13-NOV-19
1,1-Dichloroethane			98.6		%		50-140	13-NOV-19
1,1-Dichloroethylene			92.5		%		50-140	13-NOV-19
1,2-Dibromoethane			95.3		%		50-140	13-NOV-19
1,2-Dichlorobenzene			109.6		%		50-140	13-NOV-19
1,2-Dichloroethane			92.0		%		50-140	13-NOV-19
1,2-Dichloropropane			95.9		%		50-140	13-NOV-19
1,3-Dichlorobenzene			110.8		%		50-140	13-NOV-19
1,4-Dichlorobenzene			112.0		%		50-140	13-NOV-19
Acetone			99.1		%		50-140	13-NOV-19
Benzene			100.3		%		50-140	13-NOV-19
Bromodichloromethane			93.5		%		50-140	13-NOV-19
Bromoform			95.8		%		50-140	13-NOV-19
Bromomethane			86.3		%		50-140	13-NOV-19
Carbon tetrachloride			96.8		%		50-140	13-NOV-19
Chlorobenzene			100.8		%		50-140	13-NOV-19
Chloroform			97.7		%		50-140	13-NOV-19
cis-1,2-Dichloroethylene			94.9		%		50-140	13-NOV-19
cis-1,3-Dichloropropene			96.5		%		50-140	13-NOV-19
Dibromochloromethane			94.9		%		50-140	13-NOV-19
Dichlorodifluoromethane			61.6		%		50-140	13-NOV-19
Ethylbenzene			100.4		%		50-140	13-NOV-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4905480								
WG3215958-5 MS		**L2375414-1**						
n-Hexane			91.0		%		50-140	13-NOV-19
Methylene Chloride			96.4		%		50-140	13-NOV-19
MTBE			86.0		%		50-140	13-NOV-19
m+p-Xylenes			99.5		%		50-140	13-NOV-19
Methyl Ethyl Ketone			87.0		%		50-140	13-NOV-19
Methyl Isobutyl Ketone			86.4		%		50-140	13-NOV-19
o-Xylene			97.5		%		50-140	13-NOV-19
Styrene			92.6		%		50-140	13-NOV-19
Tetrachloroethylene			106.0		%		50-140	13-NOV-19
Toluene			102.7		%		50-140	13-NOV-19
trans-1,2-Dichloroethylene			98.8		%		50-140	13-NOV-19
trans-1,3-Dichloropropene			97.8		%		50-140	13-NOV-19
Trichloroethylene			97.9		%		50-140	13-NOV-19
Trichlorofluoromethane			91.5		%		50-140	13-NOV-19
Vinyl chloride			97.2		%		50-140	13-NOV-19

Quality Control Report

Workorder: L2379182 Report Date: 14-NOV-19

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court Unit #1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Legend:

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

Sample Parameter Qualifier Definitions:

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

Hold Time Exceedances:

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

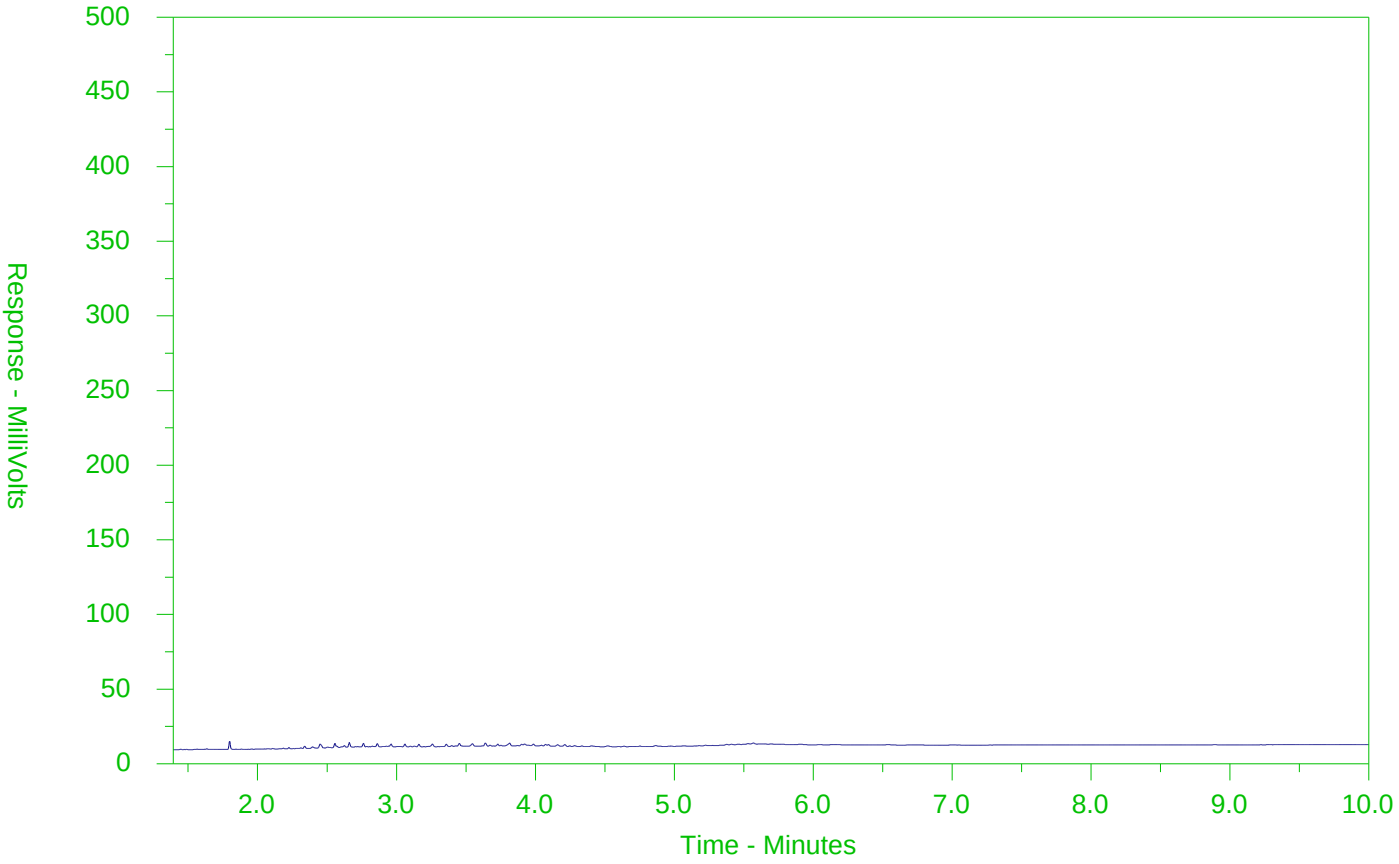
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where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

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2379182-1
Client Sample ID: BH18-45 SA2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2379182-COFC

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Golder
Contact:	Lawrence Kwak
Phone:	903 391 2846
	Company address below will appear on the final report
Street:	
City/Province:	
Postal Code:	
Invoice To	Same as Report To ☐ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	lawrence_kwak@golder.com
Email 2	
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	lawrence_kwak@golder.com
Email 2	leanh_huynh@golder.com

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	1773654	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):	L2379182	**ALS Contact:**	**Sampler:**

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

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

Analysis Request

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Metals and Inorganics	VOCs	F2-F4	PAHs	PCBs	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	BH18-45 SA2	01-Nov-19	11:30	Soil		R	R	R	R	R			4

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	Ontario Regulation 153/04 - April 15, 2011 Standards
Are samples for human consumption/ use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				4.5			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Lawrence Kwak	2019-11-07	Time: 9:40	Received by:	Date:	Time:	Received by:	Date: Nov 7/19	Time: 14:15

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

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

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

GOLDER ASSOCIATES LTD. (Markham)
ATTN: Lawrence Kwak
215 Shields Court. Unit 1
Markham ON L3R 8V2

Date Received: 28-NOV-19
Report Date: 05-DEC-19 11:49 (MT)
Version: FINAL

Client Phone: 905-475-5591

Certificate of Analysis

Lab Work Order #: L2389478

Project P.O. #: NOT SUBMITTED
Job Reference: 1773654
C of C Numbers:
Legal Site Desc:

Amanda Overholster
Account Manager

ANALYTICAL REPORT

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Regulation 153/04 - April 15, 2011 Standards - T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use						
L2389478-1	BH18F-2 SA2	Saturated Paste Extractables	SAR	4.79	2.4	SAR

ANALYTICAL REPORT

Physical Tests - SOIL

			Lab ID	L2389478-1
			Sample Date	22-NOV-19
			Sample ID	BH18F-2 SA2
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Conductivity	mS/cm	0.57	-	0.355
% Moisture	%	-	-	12.1
pH	pH units	-	-	7.55

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

ANALYTICAL REPORT

Cyanides - SOIL

		Guide Limits		Lab ID	Sample Date	Sample ID
Analyte	Unit	#1	#2			
Cyanide, Weak Acid Diss	ug/g	0.051	-	L2389478-1	22-NOV-19	BH18F-2 SA2
				<0.050		

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

ANALYTICAL REPORT

Saturated Paste Extractables - SOIL

			Lab ID	L2389478-1
			Sample Date	22-NOV-19
			Sample ID	BH18F-2 SA2
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
SAR	SAR	2.4	-	4.79
Calcium (Ca)	mg/L	-	-	7.33
Magnesium (Mg)	mg/L	-	-	1.22
Sodium (Na)	mg/L	-	-	53.2

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

ANALYTICAL REPORT

Metals - SOIL

			Lab ID	L2389478-1
			Sample Date	22-NOV-19
			Sample ID	BH18F-2 SA2
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Antimony (Sb)	ug/g	1.3	-	<1.0
Arsenic (As)	ug/g	18	-	4.4
Barium (Ba)	ug/g	220	-	70.1
Beryllium (Be)	ug/g	2.5	-	0.65
Boron (B)	ug/g	36	-	9.9
Boron (B), Hot Water Ext.	ug/g	36	-	0.17
Cadmium (Cd)	ug/g	1.2	-	<0.50
Chromium (Cr)	ug/g	70	-	26.0
Cobalt (Co)	ug/g	21	-	9.8
Copper (Cu)	ug/g	92	-	23.3
Lead (Pb)	ug/g	120	-	8.8
Mercury (Hg)	ug/g	0.27	-	0.0201
Molybdenum (Mo)	ug/g	2	-	<1.0
Nickel (Ni)	ug/g	82	-	21.4
Selenium (Se)	ug/g	1.5	-	<1.0
Silver (Ag)	ug/g	0.5	-	<0.20
Thallium (Tl)	ug/g	1	-	<0.50
Uranium (U)	ug/g	2.5	-	<1.0
Vanadium (V)	ug/g	86	-	30.6
Zinc (Zn)	ug/g	290	-	48.6

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

ANALYTICAL REPORT

Speciated Metals - SOIL

			Lab ID	L2389478-1
			Sample Date	22-NOV-19
			Sample ID	BH18F-2 SA2
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Chromium, Hexavalent	ug/g	0.66	-	0.37

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

ANALYTICAL REPORT

Volatile Organic Compounds - SOIL

			Lab ID	L2389478-1
			Sample Date	22-NOV-19
			Sample ID	BH18F-2 SA2
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Acetone	ug/g	0.5	-	<0.50
Benzene	ug/g	0.02	-	<0.0068
Bromodichloromethane	ug/g	0.05	-	<0.050
Bromoform	ug/g	0.05	-	<0.050
Bromomethane	ug/g	0.05	-	<0.050
Carbon tetrachloride	ug/g	0.05	-	<0.050
Chlorobenzene	ug/g	0.05	-	<0.050
Dibromochloromethane	ug/g	0.05	-	<0.050
Chloroform	ug/g	0.05	-	<0.050
1,2-Dibromoethane	ug/g	0.05	-	<0.050
1,2-Dichlorobenzene	ug/g	0.05	-	<0.050
1,3-Dichlorobenzene	ug/g	0.05	-	<0.050
1,4-Dichlorobenzene	ug/g	0.05	-	<0.050
Dichlorodifluoromethane	ug/g	0.05	-	<0.050
1,1-Dichloroethane	ug/g	0.05	-	<0.050
1,2-Dichloroethane	ug/g	0.05	-	<0.050
1,1-Dichloroethylene	ug/g	0.05	-	<0.050
cis-1,2-Dichloroethylene	ug/g	0.05	-	<0.050
trans-1,2-Dichloroethylene	ug/g	0.05	-	<0.050
Methylene Chloride	ug/g	0.05	-	<0.050
1,2-Dichloropropane	ug/g	0.05	-	<0.050
cis-1,3-Dichloropropene	ug/g	-	-	<0.030
trans-1,3-Dichloropropene	ug/g	-	-	<0.030
1,3-Dichloropropene (cis & trans)	ug/g	0.05	-	<0.042
Ethylbenzene	ug/g	0.05	-	<0.018
n-Hexane	ug/g	0.05	-	<0.050
Methyl Ethyl Ketone	ug/g	0.5	-	<0.50
Methyl Isobutyl Ketone	ug/g	0.5	-	<0.50
MTBE	ug/g	0.05	-	<0.050
Styrene	ug/g	0.05	-	<0.050

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

ANALYTICAL REPORT

Volatile Organic Compounds - SOIL

			Lab ID	L2389478-1
			Sample Date	22-NOV-19
			Sample ID	BH18F-2 SA2
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
1,1,1,2-Tetrachloroethane	ug/g	0.05	-	<0.050
1,1,2,2-Tetrachloroethane	ug/g	0.05	-	<0.050
Tetrachloroethylene	ug/g	0.05	-	<0.050
Toluene	ug/g	0.2	-	<0.080
1,1,1-Trichloroethane	ug/g	0.05	-	<0.050
1,1,2-Trichloroethane	ug/g	0.05	-	<0.050
Trichloroethylene	ug/g	0.05	-	<0.010
Trichlorofluoromethane	ug/g	0.25	-	<0.050
Vinyl chloride	ug/g	0.02	-	<0.020
o-Xylene	ug/g	-	-	<0.020
m+p-Xylenes	ug/g	-	-	<0.030
Xylenes (Total)	ug/g	0.05	-	<0.050
Surrogate: 4-Bromofluorobenzene	%	-	-	79.3
Surrogate: 1,4-Difluorobenzene	%	-	-	97.0

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

ANALYTICAL REPORT

Hydrocarbons - SOIL

			Lab ID	L2389478-1
			Sample Date	22-NOV-19
			Sample ID	BH18F-2 SA2
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
F1 (C6-C10)	ug/g	25	-	<5.0
F1-BTEX	ug/g	25	-	<5.0
F2 (C10-C16)	ug/g	10	-	<10
F2-Naphth	ug/g	-	-	<10
F3 (C16-C34)	ug/g	240	-	<50
F3-PAH	ug/g	-	-	<50
F4 (C34-C50)	ug/g	120	-	<50
Total Hydrocarbons (C6-C50)	ug/g	-	-	<72
Chrom. to baseline at nC50		-	-	YES
Surrogate: 2-Bromobenzotrifluoride	%	-	-	68.5
Surrogate: 3,4-Dichlorotoluene	%	-	-	80.3

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - SOIL

			Lab ID	L2389478-1
			Sample Date	22-NOV-19
			Sample ID	BH18F-2 SA2
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Acenaphthene	ug/g	0.072	-	<0.050
Acenaphthylene	ug/g	0.093	-	<0.050
Anthracene	ug/g	0.16	-	<0.050
Benzo(a)anthracene	ug/g	0.36	-	<0.050
Benzo(a)pyrene	ug/g	0.3	-	<0.050
Benzo(b)fluoranthene	ug/g	0.47	-	<0.050
Benzo(g,h,i)perylene	ug/g	0.68	-	<0.050
Benzo(k)fluoranthene	ug/g	0.48	-	<0.050
Chrysene	ug/g	2.8	-	<0.050
Dibenzo(ah)anthracene	ug/g	0.1	-	<0.050
Fluoranthene	ug/g	0.56	-	<0.050
Fluorene	ug/g	0.12	-	<0.050
Indeno(1,2,3-cd)pyrene	ug/g	0.23	-	<0.050
1+2-Methylnaphthalenes	ug/g	0.59	-	<0.042
1-Methylnaphthalene	ug/g	0.59	-	<0.030
2-Methylnaphthalene	ug/g	0.59	-	<0.030
Naphthalene	ug/g	0.09	-	<0.013
Phenanthrene	ug/g	0.69	-	<0.046
Pyrene	ug/g	1	-	<0.050
Surrogate: 2-Fluorobiphenyl	%	-	-	85.4
Surrogate: p-Terphenyl d14	%	-	-	83.0

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

ANALYTICAL REPORT

Polychlorinated Biphenyls - SOIL

			Lab ID	L2389478-1
			Sample Date	22-NOV-19
			Sample ID	BH18F-2 SA2
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Aroclor 1242	ug/g	-	-	<0.010
Aroclor 1248	ug/g	-	-	<0.010
Aroclor 1254	ug/g	-	-	<0.010
Aroclor 1260	ug/g	-	-	<0.010
Total PCBs	ug/g	0.3	-	<0.020
Surrogate: d14-Terphenyl	%	-	-	92.8

Guide Limit #1: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

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

Reference Information

Methods Listed (if applicable):

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

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

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

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

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

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

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

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

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

EC-WT	Soil	Conductivity (EC)	MOEE E3138

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

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

F1-F4-511-CALC-WT	Soil	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-S

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

Hydrocarbon results are expressed on a dry weight basis.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
F1-HS-511-WT	Soil	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS

Fraction F1 is determined by extracting a soil or sediment sample as received with methanol, then analyzing by headspace-GC/FID.

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

F2-F4-511-WT	Soil	F2-F4-O.Reg 153/04 (July 2011)	CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from soil with 1:1 hexane:acetone using a rotary extractor. Extracts are treated with silica gel to remove polar organic interferences. F2, F3, & F4 are analyzed by GC-FID. F4G-sg is analyzed gravimetrically.

Notes:
1. F2 (C10-C16): Sum of all hydrocarbons that elute between nC10 and nC16.
2. F3 (C16-C34): Sum of all hydrocarbons that elute between nC16 and nC34.
3. F4 (C34-C50): Sum of all hydrocarbons that elute between nC34 and nC50.
4. F4G: Gravimetric Heavy Hydrocarbons
5. F4G-sg: Gravimetric Heavy Hydrocarbons (F4G) after silica gel treatment.
6. Where both F4 (C34-C50) and F4G-sg are reported for a sample, the larger of the two values is used for comparison against the relevant CCME guideline for F4.
7. F4G-sg cannot be added to the C6 to C50 hydrocarbon results to obtain an estimate of total extractable hydrocarbons.
8. This method is validated for use.
9. Data from analysis of validation and quality control samples is available upon request.
10. Reported results are expressed as milligrams per dry kilogram, unless otherwise indicated.

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

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

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

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

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

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

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

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

METHYLNAPS-CALC-WT	Soil	ABN-Calculated Parameters	SW846 8270
MOISTURE-WT	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)
PAH-511-WT	Soil	PAH-O.Reg 153/04 (July 2011)	SW846 3510/8270

A representative sub-sample of soil is fortified with deuterium-labelled surrogates and a mechanical shaking techniqueis used to extract the sample with a mixture of methanol and toluene. The extracts are concentrated and analyzed by GC/MS. Results for benzo(b) fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.

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

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
PCB-511-WT	Soil	PCB-O.Reg 153/04 (July 2011)	SW846 3510/8082

An aliquot of a solid sample is extracted with a solvent, extract is cleaned up and analyzed on the GC/MS.

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

PH-WT	Soil	pH	MOEE E3137A

A minimum 10g portion of the sample is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil and then analyzed using a pH meter and electrode.

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

SAR-R511-WT	Soil	SAR-O.Reg 153/04 (July 2011)	SW846 6010C

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

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

VOC-1,3-DCP-CALC-WT	Soil	Regulation 153 VOCs	SW8260B/SW8270C
VOC-511-HS-WT	Soil	VOC-O.Reg 153/04 (July 2011)	SW846 8260 (511)

Soil and sediment samples are extracted in methanol and analyzed by headspace-GC/MS.

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

XYLENES-SUM-CALC-WT	Soil	Sum of Xylene Isomer Concentrations	CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

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

Chain of Custody Numbers:

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

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

Reference Information

GLOSSARY OF REPORT TERMS

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

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

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

Quality Control Report

Workorder: L2389478 Report Date: 05-DEC-19

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
B-HWS-R511-WT	**Soil**							
Batch R4929724								
WG3232683-4 DUP		**L2389407-3**						
Boron (B), Hot Water Ext.		0.15	0.15		ug/g	3.7	30	02-DEC-19
WG3232683-2 IRM		**WT SAR3**						
Boron (B), Hot Water Ext.			101.8		%		70-130	02-DEC-19
WG3232683-3 LCS								
Boron (B), Hot Water Ext.			104.0		%		70-130	02-DEC-19
WG3232683-1 MB								
Boron (B), Hot Water Ext.			<0.10		ug/g		0.1	02-DEC-19
CN-WAD-R511-WT	**Soil**							
Batch R4930489								
WG3231259-3 DUP		**L2389132-5**						
Cyanide, Weak Acid Diss		<0.050	<0.050	RPD-NA	ug/g	N/A	35	02-DEC-19
WG3231259-2 LCS								
Cyanide, Weak Acid Diss			94.7		%		80-120	02-DEC-19
WG3231259-1 MB								
Cyanide, Weak Acid Diss			<0.050		ug/g		0.05	02-DEC-19
WG3231259-4 MS		**L2389132-5**						
Cyanide, Weak Acid Diss			100.7		%		70-130	02-DEC-19
CR-CR6-IC-WT	**Soil**							
Batch R4930308								
WG3231320-4 CRM		**WT-SQC012**						
Chromium, Hexavalent			96.7		%		70-130	02-DEC-19
WG3231320-3 DUP		**L2389115-2**						
Chromium, Hexavalent		0.46	0.27	J	ug/g	0.19	0.4	02-DEC-19
WG3231320-2 LCS								
Chromium, Hexavalent			104.3		%		80-120	02-DEC-19
WG3231320-1 MB								
Chromium, Hexavalent			<0.20		ug/g		0.2	02-DEC-19
EC-WT	**Soil**							
Batch R4931326								
WG3233396-4 DUP		**WG3233396-3**						
Conductivity		1.29	1.25		mS/cm	3.5	20	03-DEC-19
WG3233396-2 IRM		**WT SAR3**						
Conductivity			98.6		%		70-130	03-DEC-19
WG3233765-1 LCS								
Conductivity			101.9		%		90-110	03-DEC-19
WG3233396-1 MB								

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-WT	**Soil**							
Batch R4931326								
WG3233396-1 MB								
Conductivity			<0.0040		mS/cm		0.004	03-DEC-19
F1-HS-511-WT	**Soil**							
Batch R4930652								
WG3232664-4 DUP		**WG3232664-3**						
F1 (C6-C10)		<5.0	<5.0	RPD-NA	ug/g	N/A	30	03-DEC-19
WG3232664-2 LCS								
F1 (C6-C10)			104.5		%		80-120	03-DEC-19
WG3232664-1 MB								
F1 (C6-C10)			<5.0		ug/g		5	03-DEC-19
Surrogate: 3,4-Dichlorotoluene			98.6		%		60-140	03-DEC-19
WG3232664-6 MS		**L2389407-2**						
F1 (C6-C10)			103.6		%		60-140	03-DEC-19
F2-F4-511-WT	**Soil**							
Batch R4930145								
WG3231693-3 DUP		**WG3231693-5**						
F2 (C10-C16)		<10	<10	RPD-NA	ug/g	N/A	30	02-DEC-19
F3 (C16-C34)		<50	<50	RPD-NA	ug/g	N/A	30	02-DEC-19
F4 (C34-C50)		<50	<50	RPD-NA	ug/g	N/A	30	02-DEC-19
WG3231693-2 LCS								
F2 (C10-C16)			107.2		%		80-120	02-DEC-19
F3 (C16-C34)			108.1		%		80-120	02-DEC-19
F4 (C34-C50)			109.0		%		80-120	02-DEC-19
WG3231693-1 MB								
F2 (C10-C16)			<10		ug/g		10	02-DEC-19
F3 (C16-C34)			<50		ug/g		50	02-DEC-19
F4 (C34-C50)			<50		ug/g		50	02-DEC-19
Surrogate: 2-Bromobenzotrifluoride			92.2		%		60-140	02-DEC-19
WG3231693-4 MS		**WG3231693-5**						
F2 (C10-C16)			105.2		%		60-140	02-DEC-19
F3 (C16-C34)			106.2		%		60-140	02-DEC-19
F4 (C34-C50)			107.4		%		60-140	02-DEC-19
HG-200.2-CVAA-WT	**Soil**							

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-200.2-CVAA-WT	**Soil**							
Batch R4929796								
WG3232671-2 CRM		**WT-CANMET-TILL2**						
Mercury (Hg)			117.0		%		70-130	02-DEC-19
WG3232671-6 DUP		**WG3232671-5**						
Mercury (Hg)		0.0201	0.0195		ug/g	3.0	40	02-DEC-19
WG3232671-3 LCS								
Mercury (Hg)			111.0		%		80-120	02-DEC-19
WG3232671-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	02-DEC-19
MET-200.2-CCMS-WT	**Soil**							
Batch R4929994								
WG3232671-2 CRM		**WT-CANMET-TILL2**						
Antimony (Sb)			86.7		%		70-130	02-DEC-19
Arsenic (As)			96.7		%		70-130	02-DEC-19
Barium (Ba)			91.6		%		70-130	02-DEC-19
Beryllium (Be)			93.8		%		70-130	02-DEC-19
Boron (B)			3.2		mg/kg		0-8.6	02-DEC-19
Cadmium (Cd)			92.5		%		70-130	02-DEC-19
Chromium (Cr)			96.6		%		70-130	02-DEC-19
Cobalt (Co)			95.6		%		70-130	02-DEC-19
Copper (Cu)			95.9		%		70-130	02-DEC-19
Lead (Pb)			91.3		%		70-130	02-DEC-19
Molybdenum (Mo)			96.8		%		70-130	02-DEC-19
Nickel (Ni)			96.2		%		70-130	02-DEC-19
Selenium (Se)			0.36		mg/kg		0.15-0.55	02-DEC-19
Silver (Ag)			0.25		mg/kg		0.16-0.36	02-DEC-19
Thallium (Tl)			91.8		%		70-130	02-DEC-19
Uranium (U)			80.9		%		70-130	02-DEC-19
Vanadium (V)			96.3		%		70-130	02-DEC-19
Zinc (Zn)			91.2		%		70-130	02-DEC-19
WG3232671-6 DUP		**WG3232671-5**						
Antimony (Sb)		<0.10	<0.10	RPD-NA	ug/g	N/A	30	02-DEC-19
Arsenic (As)		4.38	4.44		ug/g	1.5	30	02-DEC-19
Barium (Ba)		70.1	70.4		ug/g	0.5	40	02-DEC-19
Beryllium (Be)		0.65	0.62		ug/g	4.2	30	02-DEC-19
Boron (B)		9.9	9.2		ug/g	7.9	30	02-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4929994								
WG3232671-6 DUP		**WG3232671-5**						
Cadmium (Cd)		0.095	0.091		ug/g	3.6	30	02-DEC-19
Chromium (Cr)		26.0	26.4		ug/g	1.4	30	02-DEC-19
Cobalt (Co)		9.76	10.1		ug/g	3.2	30	02-DEC-19
Copper (Cu)		23.3	24.3		ug/g	4.1	30	02-DEC-19
Lead (Pb)		8.76	9.33		ug/g	6.3	40	02-DEC-19
Molybdenum (Mo)		0.37	0.36		ug/g	4.3	40	02-DEC-19
Nickel (Ni)		21.4	22.0		ug/g	3.1	30	02-DEC-19
Selenium (Se)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	02-DEC-19
Silver (Ag)		<0.10	<0.10	RPD-NA	ug/g	N/A	40	02-DEC-19
Thallium (Tl)		0.132	0.129		ug/g	1.9	30	02-DEC-19
Uranium (U)		0.431	0.445		ug/g	3.1	30	02-DEC-19
Vanadium (V)		30.6	31.0		ug/g	1.2	30	02-DEC-19
Zinc (Zn)		48.6	49.1		ug/g	1.1	30	02-DEC-19
WG3232671-4 LCS								
Antimony (Sb)			105.2		%		80-120	02-DEC-19
Arsenic (As)			93.4		%		80-120	02-DEC-19
Barium (Ba)			94.9		%		80-120	02-DEC-19
Beryllium (Be)			96.3		%		80-120	02-DEC-19
Boron (B)			92.3		%		80-120	02-DEC-19
Cadmium (Cd)			90.8		%		80-120	02-DEC-19
Chromium (Cr)			95.0		%		80-120	02-DEC-19
Cobalt (Co)			94.0		%		80-120	02-DEC-19
Copper (Cu)			94.0		%		80-120	02-DEC-19
Lead (Pb)			93.8		%		80-120	02-DEC-19
Molybdenum (Mo)			98.8		%		80-120	02-DEC-19
Nickel (Ni)			94.0		%		80-120	02-DEC-19
Selenium (Se)			96.1		%		80-120	02-DEC-19
Silver (Ag)			94.5		%		80-120	02-DEC-19
Thallium (Tl)			96.3		%		80-120	02-DEC-19
Uranium (U)			84.0		%		80-120	02-DEC-19
Vanadium (V)			97.5		%		80-120	02-DEC-19
Zinc (Zn)			88.5		%		80-120	02-DEC-19
WG3232671-1 MB								
							0.1	

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT	**Soil**							
Batch R4929994								
WG3232671-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	02-DEC-19
Arsenic (As)			<0.10		mg/kg		0.1	02-DEC-19
Barium (Ba)			<0.50		mg/kg		0.5	02-DEC-19
Beryllium (Be)			<0.10		mg/kg		0.1	02-DEC-19
Boron (B)			<5.0		mg/kg		5	02-DEC-19
Cadmium (Cd)			<0.020		mg/kg		0.02	02-DEC-19
Chromium (Cr)			<0.50		mg/kg		0.5	02-DEC-19
Cobalt (Co)			<0.10		mg/kg		0.1	02-DEC-19
Copper (Cu)			<0.50		mg/kg		0.5	02-DEC-19
Lead (Pb)			<0.50		mg/kg		0.5	02-DEC-19
Molybdenum (Mo)			<0.10		mg/kg		0.1	02-DEC-19
Nickel (Ni)			<0.50		mg/kg		0.5	02-DEC-19
Selenium (Se)			<0.20		mg/kg		0.2	02-DEC-19
Silver (Ag)			<0.10		mg/kg		0.1	02-DEC-19
Thallium (Tl)			<0.050		mg/kg		0.05	02-DEC-19
Uranium (U)			<0.050		mg/kg		0.05	02-DEC-19
Vanadium (V)			<0.20		mg/kg		0.2	02-DEC-19
Zinc (Zn)			<2.0		mg/kg		2	02-DEC-19
MOISTURE-WT	**Soil**							
Batch R4928247								
WG3231216-3 DUP		**L2389473-3**						
% Moisture		14.6	15.4		%	5.0	20	29-NOV-19
WG3231216-2 LCS								
% Moisture			100.7		%		90-110	29-NOV-19
WG3231216-1 MB								
% Moisture			<0.25		%		0.25	29-NOV-19
PAH-511-WT	**Soil**							
Batch R4932906								
WG3231775-8 DUP		**WG3231775-10**						
1-Methylnaphthalene		0.068	0.072		ug/g	5.0	40	04-DEC-19
2-Methylnaphthalene		0.132	0.147		ug/g	11	40	04-DEC-19
Acenaphthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	04-DEC-19
Acenaphthylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	04-DEC-19
Anthracene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	04-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT	**Soil**							
Batch R4932906								
WG3231775-8 DUP		**WG3231775-10**						
Benzo(a)anthracene		0.149	0.071	J	ug/g	0.078	0.1	04-DEC-19
Benzo(a)pyrene		0.166	0.092	J	ug/g	0.074	0.1	04-DEC-19
Benzo(b)fluoranthene		0.227	0.121	DUP-H,J	ug/g	0.106	0.1	04-DEC-19
Benzo(g,h,i)perylene		0.177	0.124		ug/g	35	40	04-DEC-19
Benzo(k)fluoranthene		0.068	<0.050	RPD-NA	ug/g	N/A	40	04-DEC-19
Chrysene		0.190	0.099	J	ug/g	0.090	0.1	04-DEC-19
Dibenzo(ah)anthracene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	04-DEC-19
Fluoranthene		0.343	0.155	DUP-H,J	ug/g	0.188	0.1	04-DEC-19
Fluorene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	04-DEC-19
Indeno(1,2,3-cd)pyrene		0.133	0.091		ug/g	38	40	04-DEC-19
Naphthalene		0.048	0.060		ug/g	22	40	04-DEC-19
Phenanthrene		0.253	0.121	DUP-H,J	ug/g	0.132	0.092	04-DEC-19
Pyrene		0.313	0.158	DUP-H,J	ug/g	0.155	0.1	04-DEC-19
WG3231775-7 LCS								
1-Methylnaphthalene			88.0		%		50-140	04-DEC-19
2-Methylnaphthalene			83.9		%		50-140	04-DEC-19
Acenaphthene			95.6		%		50-140	04-DEC-19
Acenaphthylene			96.8		%		50-140	04-DEC-19
Anthracene			90.1		%		50-140	04-DEC-19
Benzo(a)anthracene			88.0		%		50-140	04-DEC-19
Benzo(a)pyrene			86.6		%		50-140	04-DEC-19
Benzo(b)fluoranthene			87.7		%		50-140	04-DEC-19
Benzo(g,h,i)perylene			93.7		%		50-140	04-DEC-19
Benzo(k)fluoranthene			93.4		%		50-140	04-DEC-19
Chrysene			102.1		%		50-140	04-DEC-19
Dibenzo(ah)anthracene			91.0		%		50-140	04-DEC-19
Fluoranthene			90.8		%		50-140	04-DEC-19
Fluorene			93.7		%		50-140	04-DEC-19
Indeno(1,2,3-cd)pyrene			82.8		%		50-140	04-DEC-19
Naphthalene			88.1		%		50-140	04-DEC-19
Phenanthrene			90.9		%		50-140	04-DEC-19
Pyrene			90.6		%		50-140	04-DEC-19
WG3231775-6 MB								
							0.03	

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT	**Soil**							
Batch R4932906								
WG3231775-6 MB								
1-Methylnaphthalene			<0.030		ug/g		0.03	04-DEC-19
2-Methylnaphthalene			<0.030		ug/g		0.03	04-DEC-19
Acenaphthene			<0.050		ug/g		0.05	04-DEC-19
Acenaphthylene			<0.050		ug/g		0.05	04-DEC-19
Anthracene			<0.050		ug/g		0.05	04-DEC-19
Benzo(a)anthracene			<0.050		ug/g		0.05	04-DEC-19
Benzo(a)pyrene			<0.050		ug/g		0.05	04-DEC-19
Benzo(b)fluoranthene			<0.050		ug/g		0.05	04-DEC-19
Benzo(g,h,i)perylene			<0.050		ug/g		0.05	04-DEC-19
Benzo(k)fluoranthene			<0.050		ug/g		0.05	04-DEC-19
Chrysene			<0.050		ug/g		0.05	04-DEC-19
Dibenzo(ah)anthracene			<0.050		ug/g		0.05	04-DEC-19
Fluoranthene			<0.050		ug/g		0.05	04-DEC-19
Fluorene			<0.050		ug/g		0.05	04-DEC-19
Indeno(1,2,3-cd)pyrene			<0.050		ug/g		0.05	04-DEC-19
Naphthalene			<0.013		ug/g		0.013	04-DEC-19
Phenanthrene			<0.046		ug/g		0.046	04-DEC-19
Pyrene			<0.050		ug/g		0.05	04-DEC-19
Surrogate: 2-Fluorobiphenyl			80.6		%		50-140	04-DEC-19
Surrogate: p-Terphenyl d14			72.3		%		50-140	04-DEC-19
WG3231775-9 MS		**WG3231775-10**						
1-Methylnaphthalene			92.0		%		50-140	04-DEC-19
2-Methylnaphthalene			88.8		%		50-140	04-DEC-19
Acenaphthene			100.8		%		50-140	04-DEC-19
Acenaphthylene			100.9		%		50-140	04-DEC-19
Anthracene			94.8		%		50-140	04-DEC-19
Benzo(a)anthracene			93.9		%		50-140	04-DEC-19
Benzo(a)pyrene			84.6		%		50-140	04-DEC-19
Benzo(b)fluoranthene			81.7		%		50-140	04-DEC-19
Benzo(g,h,i)perylene			91.5		%		50-140	04-DEC-19
Benzo(k)fluoranthene			92.5		%		50-140	04-DEC-19
Chrysene			100.1		%		50-140	04-DEC-19
Dibenzo(ah)anthracene			96.0		%		50-140	04-DEC-19
Fluoranthene			85.2		%		50-140	04-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT	**Soil**							
Batch R4932906								
WG3231775-9 MS		**WG3231775-10**						
Fluorene			101.1		%		50-140	04-DEC-19
Indeno(1,2,3-cd)pyrene			87.2		%		50-140	04-DEC-19
Naphthalene			91.0		%		50-140	04-DEC-19
Phenanthrene			88.3		%		50-140	04-DEC-19
Pyrene			89.0		%		50-140	04-DEC-19
PCB-511-WT	**Soil**							
Batch R4930666								
WG3231775-8 DUP		**WG3231775-10**						
Aroclor 1242		<0.010	<0.013	RPD-NA	ug/g	N/A	40	03-DEC-19
Aroclor 1248		<0.010	<0.010	RPD-NA	ug/g	N/A	40	03-DEC-19
Aroclor 1254		<0.010	<0.010	RPD-NA	ug/g	N/A	40	03-DEC-19
Aroclor 1260		0.190	0.182		ug/g	4.4	40	03-DEC-19
WG3231775-7 LCS								
Aroclor 1242			88.8		%		60-140	03-DEC-19
Aroclor 1248			93.6		%		60-140	03-DEC-19
Aroclor 1254			89.6		%		60-140	03-DEC-19
Aroclor 1260			82.5		%		60-140	03-DEC-19
WG3231775-6 MB								
Aroclor 1242			<0.010		ug/g		0.01	03-DEC-19
Aroclor 1248			<0.010		ug/g		0.01	03-DEC-19
Aroclor 1254			<0.010		ug/g		0.01	03-DEC-19
Aroclor 1260			<0.010		ug/g		0.01	03-DEC-19
Surrogate: d14-Terphenyl			84.3		%		60-140	03-DEC-19
WG3231775-9 MS		**WG3231775-10**						
Aroclor 1242			95.5		%		60-140	03-DEC-19
Aroclor 1254			98.8		%		60-140	03-DEC-19
Aroclor 1260			71.8		%		60-140	03-DEC-19
PH-WT	**Soil**							
Batch R4928865								
WG3231267-1 DUP		**L2389465-1**						
pH		8.23	8.41	J	pH units	0.18	0.3	29-NOV-19
WG3231421-1 LCS								
pH			6.96		pH units		6.9-7.1	29-NOV-19
SAR-R511-WT	**Soil**							

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SAR-R511-WT	**Soil**							
Batch R4931747								
WG3233396-4 DUP		**WG3233396-3**						
Calcium (Ca)		32.7	34.3		mg/L	4.8	30	03-DEC-19
Sodium (Na)		194	200		mg/L	3.0	30	03-DEC-19
Magnesium (Mg)		4.60	4.80		mg/L	4.3	30	03-DEC-19
WG3233396-2 IRM		**WT SAR3**						
Calcium (Ca)			112.6		%		70-130	03-DEC-19
Sodium (Na)			101.7		%		70-130	03-DEC-19
Magnesium (Mg)			112.8		%		70-130	03-DEC-19
WG3233396-5 LCS								
Calcium (Ca)			104.7		%		80-120	03-DEC-19
Sodium (Na)			102.6		%		80-120	03-DEC-19
Magnesium (Mg)			103.2		%		80-120	03-DEC-19
WG3233396-1 MB								
Calcium (Ca)			<0.50		mg/L		0.5	03-DEC-19
Sodium (Na)			<0.50		mg/L		0.5	03-DEC-19
Magnesium (Mg)			<0.50		mg/L		0.5	03-DEC-19
VOC-511-HS-WT	**Soil**							
Batch R4930652								
WG3232664-4 DUP		**WG3232664-3**						
1,1,1,2-Tetrachloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
1,1,2,2-Tetrachloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
1,1,1-Trichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
1,1,2-Trichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
1,1-Dichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
1,1-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
1,2-Dibromoethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
1,2-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
1,2-Dichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
1,2-Dichloropropane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
1,3-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
1,4-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
Acetone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	03-DEC-19
Benzene		<0.0068	<0.0068	RPD-NA	ug/g	N/A	40	03-DEC-19
Bromodichloromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
Bromoform		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4930652								
WG3232664-4 DUP		**WG3232664-3**						
Bromomethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
Carbon tetrachloride		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
Chlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
Chloroform		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
cis-1,2-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
cis-1,3-Dichloropropene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	03-DEC-19
Dibromochloromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
Dichlorodifluoromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
Ethylbenzene		<0.018	<0.018	RPD-NA	ug/g	N/A	40	03-DEC-19
n-Hexane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
Methylene Chloride		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
MTBE		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
m+p-Xylenes		<0.030	<0.030	RPD-NA	ug/g	N/A	40	03-DEC-19
Methyl Ethyl Ketone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	03-DEC-19
Methyl Isobutyl Ketone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	03-DEC-19
o-Xylene		<0.020	<0.020	RPD-NA	ug/g	N/A	40	03-DEC-19
Styrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
Tetrachloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
Toluene		<0.080	<0.080	RPD-NA	ug/g	N/A	40	03-DEC-19
trans-1,2-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
trans-1,3-Dichloropropene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	03-DEC-19
Trichloroethylene		<0.010	<0.010	RPD-NA	ug/g	N/A	40	03-DEC-19
Trichlorofluoromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	03-DEC-19
Vinyl chloride		<0.020	<0.020	RPD-NA	ug/g	N/A	40	03-DEC-19
WG3232664-2 LCS								
1,1,1,2-Tetrachloroethane			97.4		%		60-130	03-DEC-19
1,1,2,2-Tetrachloroethane			103.5		%		60-130	03-DEC-19
1,1,1-Trichloroethane			94.8		%		60-130	03-DEC-19
1,1,2-Trichloroethane			100.5		%		60-130	03-DEC-19
1,1-Dichloroethane			96.9		%		60-130	03-DEC-19
1,1-Dichloroethylene			93.1		%		60-130	03-DEC-19
1,2-Dibromoethane			100.1		%		70-130	03-DEC-19
1,2-Dichlorobenzene			97.0		%		70-130	03-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4930652								
WG3232664-2 LCS								
1,2-Dichloroethane			102.7		%		60-130	03-DEC-19
1,2-Dichloropropane			103.0		%		70-130	03-DEC-19
1,3-Dichlorobenzene			97.6		%		70-130	03-DEC-19
1,4-Dichlorobenzene			99.1		%		70-130	03-DEC-19
Acetone			113.0		%		60-140	03-DEC-19
Benzene			99.5		%		70-130	03-DEC-19
Bromodichloromethane			101.5		%		50-140	03-DEC-19
Bromoform			101.2		%		70-130	03-DEC-19
Bromomethane			90.3		%		50-140	03-DEC-19
Carbon tetrachloride			94.7		%		70-130	03-DEC-19
Chlorobenzene			95.2		%		70-130	03-DEC-19
Chloroform			97.1		%		70-130	03-DEC-19
cis-1,2-Dichloroethylene			95.4		%		70-130	03-DEC-19
cis-1,3-Dichloropropene			106.4		%		70-130	03-DEC-19
Dibromochloromethane			98.5		%		60-130	03-DEC-19
Dichlorodifluoromethane			80.9		%		50-140	03-DEC-19
Ethylbenzene			95.3		%		70-130	03-DEC-19
n-Hexane			89.1		%		70-130	03-DEC-19
Methylene Chloride			97.0		%		70-130	03-DEC-19
MTBE			99.6		%		70-130	03-DEC-19
m+p-Xylenes			97.3		%		70-130	03-DEC-19
Methyl Ethyl Ketone			110.2		%		60-140	03-DEC-19
Methyl Isobutyl Ketone			107.7		%		60-140	03-DEC-19
o-Xylene			95.5		%		70-130	03-DEC-19
Styrene			103.6		%		70-130	03-DEC-19
Tetrachloroethylene			95.4		%		60-130	03-DEC-19
Toluene			93.8		%		70-130	03-DEC-19
trans-1,2-Dichloroethylene			98.2		%		60-130	03-DEC-19
trans-1,3-Dichloropropene			105.1		%		70-130	03-DEC-19
Trichloroethylene			95.7		%		60-130	03-DEC-19
Trichlorofluoromethane			92.6		%		50-140	03-DEC-19
Vinyl chloride			105.0		%		60-140	03-DEC-19
WG3232664-1 MB								
1,1,1,2-Tetrachloroethane			<0.050		ug/g		0.05	03-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4930652								
WG3232664-1 MB								
1,1,2,2-Tetrachloroethane			<0.050		ug/g		0.05	03-DEC-19
1,1,1-Trichloroethane			<0.050		ug/g		0.05	03-DEC-19
1,1,2-Trichloroethane			<0.050		ug/g		0.05	03-DEC-19
1,1-Dichloroethane			<0.050		ug/g		0.05	03-DEC-19
1,1-Dichloroethylene			<0.050		ug/g		0.05	03-DEC-19
1,2-Dibromoethane			<0.050		ug/g		0.05	03-DEC-19
1,2-Dichlorobenzene			<0.050		ug/g		0.05	03-DEC-19
1,2-Dichloroethane			<0.050		ug/g		0.05	03-DEC-19
1,2-Dichloropropane			<0.050		ug/g		0.05	03-DEC-19
1,3-Dichlorobenzene			<0.050		ug/g		0.05	03-DEC-19
1,4-Dichlorobenzene			<0.050		ug/g		0.05	03-DEC-19
Acetone			<0.50		ug/g		0.5	03-DEC-19
Benzene			<0.0068		ug/g		0.0068	03-DEC-19
Bromodichloromethane			<0.050		ug/g		0.05	03-DEC-19
Bromoform			<0.050		ug/g		0.05	03-DEC-19
Bromomethane			<0.050		ug/g		0.05	03-DEC-19
Carbon tetrachloride			<0.050		ug/g		0.05	03-DEC-19
Chlorobenzene			<0.050		ug/g		0.05	03-DEC-19
Chloroform			<0.050		ug/g		0.05	03-DEC-19
cis-1,2-Dichloroethylene			<0.050		ug/g		0.05	03-DEC-19
cis-1,3-Dichloropropene			<0.030		ug/g		0.03	03-DEC-19
Dibromochloromethane			<0.050		ug/g		0.05	03-DEC-19
Dichlorodifluoromethane			<0.050		ug/g		0.05	03-DEC-19
Ethylbenzene			<0.018		ug/g		0.018	03-DEC-19
n-Hexane			<0.050		ug/g		0.05	03-DEC-19
Methylene Chloride			<0.050		ug/g		0.05	03-DEC-19
MTBE			<0.050		ug/g		0.05	03-DEC-19
m+p-Xylenes			<0.030		ug/g		0.03	03-DEC-19
Methyl Ethyl Ketone			<0.50		ug/g		0.5	03-DEC-19
Methyl Isobutyl Ketone			<0.50		ug/g		0.5	03-DEC-19
o-Xylene			<0.020		ug/g		0.02	03-DEC-19
Styrene			<0.050		ug/g		0.05	03-DEC-19
Tetrachloroethylene			<0.050		ug/g		0.05	03-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4930652								
WG3232664-1 MB								
Toluene			<0.080		ug/g		0.08	03-DEC-19
trans-1,2-Dichloroethylene			<0.050		ug/g		0.05	03-DEC-19
trans-1,3-Dichloropropene			<0.030		ug/g		0.03	03-DEC-19
Trichloroethylene			<0.010		ug/g		0.01	03-DEC-19
Trichlorofluoromethane			<0.050		ug/g		0.05	03-DEC-19
Vinyl chloride			<0.020		ug/g		0.02	03-DEC-19
Surrogate: 1,4-Difluorobenzene			101.9		%		50-140	03-DEC-19
Surrogate: 4-Bromofluorobenzene			86.6		%		50-140	03-DEC-19
WG3232664-5 MS		**L2389407-1**						
1,1,1,2-Tetrachloroethane			101.4		%		50-140	03-DEC-19
1,1,2,2-Tetrachloroethane			112.6		%		50-140	03-DEC-19
1,1,1-Trichloroethane			96.6		%		50-140	03-DEC-19
1,1,2-Trichloroethane			106.7		%		50-140	03-DEC-19
1,1-Dichloroethane			99.9		%		50-140	03-DEC-19
1,1-Dichloroethylene			93.4		%		50-140	03-DEC-19
1,2-Dibromoethane			107.5		%		50-140	03-DEC-19
1,2-Dichlorobenzene			99.98		%		50-140	03-DEC-19
1,2-Dichloroethane			109.2		%		50-140	03-DEC-19
1,2-Dichloropropane			107.2		%		50-140	03-DEC-19
1,3-Dichlorobenzene			98.3		%		50-140	03-DEC-19
1,4-Dichlorobenzene			99.98		%		50-140	03-DEC-19
Acetone			130.0		%		50-140	03-DEC-19
Benzene			102.4		%		50-140	03-DEC-19
Bromodichloromethane			106.5		%		50-140	03-DEC-19
Bromoform			109.6		%		50-140	03-DEC-19
Bromomethane			88.1		%		50-140	03-DEC-19
Carbon tetrachloride			96.4		%		50-140	03-DEC-19
Chlorobenzene			97.3		%		50-140	03-DEC-19
Chloroform			100.7		%		50-140	03-DEC-19
cis-1,2-Dichloroethylene			98.0		%		50-140	03-DEC-19
cis-1,3-Dichloropropene			104.3		%		50-140	03-DEC-19
Dibromochloromethane			104.0		%		50-140	03-DEC-19
Dichlorodifluoromethane			69.8		%		50-140	03-DEC-19
Ethylbenzene			95.3		%		50-140	03-DEC-19

Quality Control Report

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	**Soil**							
Batch R4930652								
WG3232664-5 MS		**L2389407-1**						
n-Hexane			87.3		%		50-140	03-DEC-19
Methylene Chloride			100.4		%		50-140	03-DEC-19
MTBE			103.1		%		50-140	03-DEC-19
m+p-Xylenes			97.3		%		50-140	03-DEC-19
Methyl Ethyl Ketone			114.3		%		50-140	03-DEC-19
Methyl Isobutyl Ketone			119.1		%		50-140	03-DEC-19
o-Xylene			96.4		%		50-140	03-DEC-19
Styrene			105.2		%		50-140	03-DEC-19
Tetrachloroethylene			94.4		%		50-140	03-DEC-19
Toluene			94.4		%		50-140	03-DEC-19
trans-1,2-Dichloroethylene			98.1		%		50-140	03-DEC-19
trans-1,3-Dichloropropene			101.3		%		50-140	03-DEC-19
Trichloroethylene			96.0		%		50-140	03-DEC-19
Trichlorofluoromethane			91.8		%		50-140	03-DEC-19
Vinyl chloride			101.9		%		50-140	03-DEC-19

Quality Control Report

Workorder: L2389478 Report Date: 05-DEC-19

Client: GOLDER ASSOCIATES LTD. (Markham)
215 Shields Court. Unit 1
Markham ON L3R 8V2
Contact: Lawrence Kwak

Legend:

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

Sample Parameter Qualifier Definitions:

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

Hold Time Exceedances:

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

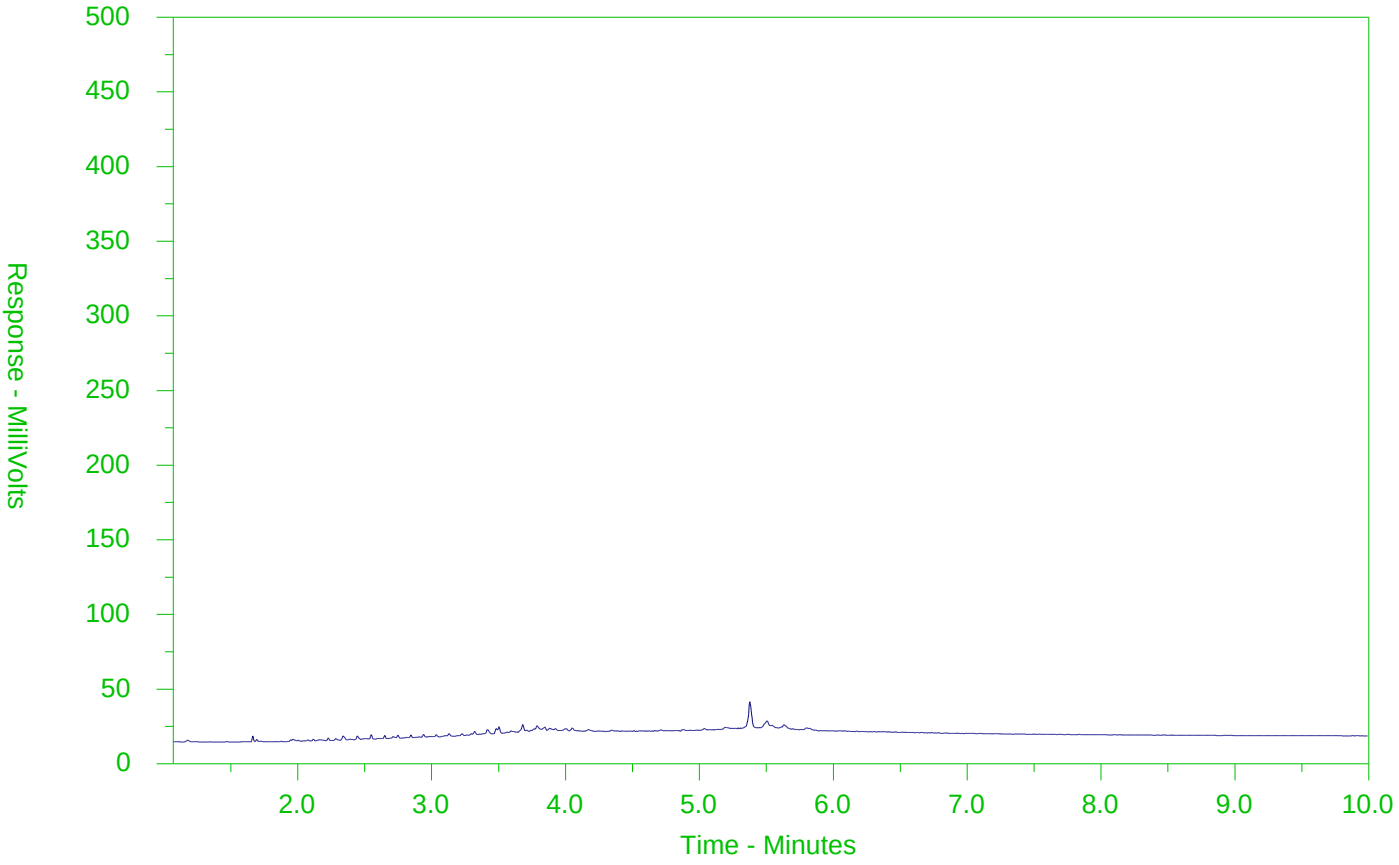
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where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

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2389478-1
Client Sample ID: BH18F-2 SA2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
←Diesel/Jet Fuels→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2389478-COFC

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Golder
Contact:	Lawrence Kwak
Phone:	903 391 2846
	Company address below will appear on the final report
Street:	
City/Province:	
Postal Code:	

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	lawrence_kwak@golder.com
Email 2	
Email 3	

Invoice To		
	Same as Report To	☐ YES ☐ NO
	Copy of Invoice with Report	☐ YES ☐ NO
Company:		
Contact:		

Invoice Distribution	
Select Invoice Distribution:	☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	lawrence_kwak@golder.com
Email 2	leanh_huynh@golder.com

Project Information	
ALS Account # / Quote #:	
Job #:	1773654
PO / AFE:	
LSD:	

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

ALS Lab Work Order # (lab use only): L2389478PD

ALS Contact: Sampler:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Metals and Inorganics	VOCs	F2-F4	PAHs	PCBs	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	BH18F-2 SA2	22-Nov-19	11:30	Soil		R	R	R	R	R		4

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)
- 4 day [P4-20%] ☐
- 3 day [P3-25%] ☐
- 2 day [P2-50%] ☐

EMERGENCY
- 1 Business day [E - 100%] ☐
- Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

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

Analysis Request

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

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

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human consumption/ use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Ontario Regulation 153/04 - April 15, 2011 Standards, Table 1

Residential / Parkland / ...

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No	☐
Ice Packs	☑ Ice Cubes ☐	Custody seal intact	Yes ☐	No	☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C					FINAL COOLER TEMPERATURES °C				
					2.9				

SHIPMENT RELEASE (client use)

Released by: Lawrence Kwak | 2019-11-28 | Time: 14:00

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: | Date: | Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by: | Date: 14-28-19 | Time: 1846

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

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

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

golder.com