Brampton Transit BUS MAINTENANCE & STORAGE FACILITY

Appendix I

Geotechnical Investigation

March 18, 2021



Prepared by









INFRASTRUCTURE

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Geotechnical Investigation For Proposed Johnston Transit Facility (Transit Bus Garage)

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December 04, 2019

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This report consists of 238 pages including appendices and may not be reproduced in whole or in part without the permission of Legal entity.

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SNCL has, in preparing the geotechnical parameters and recommendations, followed accepted methodology and procedures, and exercised due care consistent with the intended level of accuracy, using its professional judgment and reasonable care, and is thus of the opinion that there is a high probability that actual site geotechnical conditions will fall within the predicted range. However, no warranty should be implied as to the accuracy of estimates. Unless expressly stated otherwise, assumptions, data, and information supplied by, or gathered from other sources (including the Client, other consultants, testing laboratories and equipment suppliers, etc.) upon which *SNCL*'s opinions as set out herein are based, have not been verified by *SNCL*; *SNCL* makes no representation as to their accuracy and disclaims all liability with respect thereto.

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1 Introduction

SNC-Lavalin Inc. (SNCL), was retained by the City of Brampton to conduct a geotechnical investigation for a proposed bus transit facility, namely Johnston Transit Facility, to be constructed at 10192 Highway 50, Brampton, Ontario, as shown in Figure 1 of Appendix A.

The site is located at south of Cadetta Road, west of Highway 50 in Brampton, Ontario, with an unconfined creek (i.e. Rainbow Creek) and TRCA floodplain in the northwest quadrant of the site. The site is approximately 45.5 acres (43 acres for Parcel A and 1.5 acres for the Parcel B) and is predominantly gently rolling farmland. The eastern portion of this site consists of a City of Brampton Satellite yard and laydown area, which has been re-graded with asphaltic concrete gravel, but is generally flat with some stockpiles and berms. Based on information provided by the Client, it is understood that the City already owns the northeast portion of the Parcel A, approximately 19 acres in size and plans to purchase rest of the land of Parcel A and Parcel B.

The purpose of this geotechnical investigation was to obtain information on the subsurface conditions at the site by means of advancing a limited number of boreholes, in-situ tests and laboratory tests of select soil samples. Based on SNCL's interpretation of the obtained field information, recommendations are provided on the geotechnical aspects of the project.

It is understood that the proposed bus facility will consist of a slab-on-grade building without basement, approximately 55,742 m² (600,000 sq.ft) in size, with associated parking for light and heavy duty vehicles. No drawings or further details (such as final floor grading) about the proposed facility were available at the time of preparation of this report.

The geotechnical investigation was carried out in conjunction with Phase I and Phase II Environmental Site Assessments, and their findings are presented under separate cover.

The field work for this investigation was carried out on business days between June 3rd and 21st, 2019 for Parcel A and then October 15th and 16th, 2019 for Parcel B. It consisted of drilling seventyseven (77) boreholes in the footprint of the proposed transit facility and associated structures. Seventy-three (73) boreholes, namely BH01 to BH73 were drilled for for Parcel A and four (04) boreholes, namely BH74 to BH77, for Parcel B. The boreholes were advanced under the full-time supervision of experienced geotechnical personnel from SNCL.

A previous geotechnical report, titled "Preliminary Geotechnical Investigation Proposed Williams Parkway Satellite Yard, 10192 Highway 50, Brampton, Onatrio" prepared by Trow Associates Inc, dated November 2008 was reviewed for this project site.

The field investigation on Parcel A was completed in accordance with SNCL's approved proposal (Ref. No. 634196-14002, dated April 01, 2019). Additional investigation for Parcel B was completed in accordance with SNCL's approved proposal (Ref. No. 643196_14004, dated September 12, 2019)

This report contains the findings of SNCL's geotechnical investigation, together with recommendations and comments. These recommendations and comments are based on factual information and are intended only for the use of the design engineers. The recommendations and

opinions in this report are applicable only to the proposed project as described in this Section. The Report Limitations is an integral part of this report.

2 Method of Investigation

2.1 Fieldwork

The fieldwork for the geotechnical investigation was performed between June 3rd and 21st, 2019 (Parcel A: BH01 to BH73) and on October 15th and 16th, 2019 (Parcel B: BH73 to BH77), consisted of advancing a total of seventy-seven (77) boreholes. SNCL conducted a survey for borehole elevations and coordinates, where borehole location UTM coordinates and geodetic above mean sea level (MASL) elevations were taken by Trimble RX 5800 high precision unit. It should be noted that the ground surface elevations and coordinates at the borehole locations are approximate and should not be used for design and construction purposes.

The summary of borehole identification, depths, elevations and coordinates is presented in the following Table:

Borehole ID	Borehole Depth (mbgs*)	Approximate Ground Elevation (MASL)	Borehole Easting (UTM Zone 17)	Borehole Northing (UTM Zone 17)
BH01	5.2	210.06	606423.57	4852185.92
BH02	9.8	210.12	606377.19	4852223.96
BH03	6.7	208.90	606450.93	4852124.65
BH04	9.5	209.27	606427.73	4852143.69
BH05	3.7	209.82	606381.35	4852181.74
BH06	9.6	208.59	606478.28	4852063.42
BH07	9.8	208.46	606455.09	4852082.45
BH08	9.8	209.24	606431.9	4852101.46
BH09	8.2	209.69	606385.52	4852139.52
BH10	3.2	210.64	606339.12	4852177.58
BH11	2.9	210.59	606315.93	4852196.60
BH12	6.4	208.84	606436.06	4852059.24
BH13	9.6	209.48	606389.68	4852097.30
BH14	9.8	209.94	606366.48	4852116.32
BH15	4.4	210.59	606343.29	4852135.36
BH16	3.5	208.06	606509.82	4851959.94
BH17	9.7	208.31	606486.62	4851978.98
BH18	9.8	208.95	606440.23	4852017.03
BH19	9.8	209.24	606417.04	4852036.05
BH20	9.2	209.52	606393.84	4852055.08
BH21	3.7	209.88	606370.65	4852074.10
BH22	6.7	210.23	606347.46	4852093.13

Table 1: Summary of Borehole Depths, Elevations, and Coordinates

Borehole ID	Borehole Depth	Approximate Ground	Borehole Easting	Borehole Northing
	(mbgs*)	Elevation (MASL)	(UTM Zone 17)	(UTM Zone 17)
BH23	3.5	210.26	606301.07	4852131.2
BH24	3.7	208.18	606490.79	4851936.75
BH25	9.6	208.65	606444.40	4851974.81
BH26	9.7	209.42	606398.01	4852012.85
BH27	9.8	209.68	606374.81	4852031.88
BH28	9.5	209.90	606351.62	4852050.92
BH29	3.6	209.98	606305.24	4852088.98
BH30	6.2	208.46	606448.57	4851932.58
BH31	9.8	209.60	606402.18	4851970.64
BH32	3.7	209.61	606378.98	4851989.67
BH33	7.3	209.83	606355.80	4852008.70
BH34	9.7	209.82	606309.40	4852046.74
BH35	9.8	209.24	606263.02	4852084.80
BH36	6.7	209.51	606359.95	4851966.48
BH37	3.7	208.68	606267.18	4852042.59
BH38	9.4	208.65	606410.51	4851886.19
BH39	9.8	209.06	606364.12	4851924.26
BH40	6.7	209.04	606317.73	4851962.30
BH41	9.3	207.62	606271.34	4852000.36
BH42	3.7	207.92	606224.96	4852038.41
BH43	3.1	208.67	606414.67	4851843.97
BH44	8.2	208.87	606368.28	4851882.04
BH45	6.7	208.18	606275.51	4851958.14
BH46	3.7	207.61	606229.13	4851996.19
BH47	5.9	208.76	606372.46	4851839.81
BH48	9.2	208.72	606326.06	4851877.86
BH49	9.5	208.27	606279.68	4851915.92
BH50	9.3	207.60	606233.29	4851953.98
BH51	6.7	208.99	606376.62	4851797.58
BH52	3.7	208.13	606283.85	4851873.71
BH53	3.7	207.78	606237.46	4851911.75
BH54	5.9	208.37	606334.41	4851793.41
BH55	9.8	207.96	606288.01	4851831.47

Borehole ID	Borehole Depth	Approximate Ground	Borehole Easting	Borehole Northing
	(mbgs*)	Elevation (MASL)	(UTM Zone 17)	(UTM Zone 17)
BH56	3.7	207.62	606241.63	4851869.53
BH57	6.7	208.10	606292.18	4851789.25
BH58	6.7	207.48	606245.80	4851827.32
BH59	9.8	208.25	606296.34	4851747.04
BH60	9.6	207.80	606249.96	4851785.10
BH61	9.8	207.29	606226.77	4851804.11
BH62	5.9	207.95	606300.51	4851704.81
BH63	3.7	207.86	606277.31	4851723.83
BH64	3.7	207.91	606254.12	4851742.86
BH65	3.7	207.86	606258.29	4851700.64
BH66	6.5	207.48	606235.10	4851719.67
BH67	3.7	207.43	606211.90	4851738.70
BH68	3.7	207.06	606188.70	4851757.73
BH69	6.7	207.75	606262.45	4851658.43
BH70	8.1	207.58	606239.26	4851677.44
BH71	3.7	207.24	606216.07	4851696.48
BH72	5.0	208.98	606362.00	4851769.60
BH73	6.1	208.83	606359.90	4851771.20
BH74	5.9	207.93	606484.17	4851890.91
BH75	4.3	208.09	606531.45	4851945.29
BH76	6.7	208.01	606505.43	4851930.42
BH77	6.7	207.89	606528.74	4851913.36

* mbgs = metres below ground surface

The Site Location Plan (Figure 1) and Borehole Location Plan (Figure 2) are presented in Appendix A of this report.

The boreholes were advanced using 150 and 200 mm hollow-stem continuous-flight augers with a track mounted drill rig and a 100 mm solid-stem geo-probe under the full-time supervision of experienced geotechnical personnel from SNCL. Details of hole diameters, augers and rig types are provided in the individual Borehole logs in Appendix B.

Soil samples were generally taken at 0.76 m intervals from the ground surface to 3.1 mbgs and at 1.5 m intervals thereafter to termination depths while performing the Standard Penetration Test (SPT) in accordance with ASTM D1586. This consisted of freely dropping a 63.5 kg (140 lbs.) hammer for a vertical distance of 0.76 m (30 inches) to drive a 51 mm (2 inches) outer diameter (O.D.) split-barrel (split spoon) sampler into the ground. The number of blows of the hammer required to drive the sampler into the relatively undisturbed ground by a vertical distance of

0.30 m (12 inches) was recorded as the SPT 'N' value of the soil which indicated the consistency of cohesive soils or the relative density of non-cohesive soils. Select environmental boreholes were sampled continuously. Vane shear testing and advancement of thin-walled intact samples / Shelby tube were not possible due to the nature of the till deposit (refusal).

Groundwater observations were made in the boreholes upon completion of drilling. Freestanding water was encountered in twenty-two (22) boreholes identified as BH02 to BH04, BH06 to BH09, BH15 to BH17, BH21, BH24, to BH28, BH30 to BH32, BH44, BH51 and BH77 upon completion of drilling. It should be noted that there was not sufficient time available for the groundwater to stabilize inside the open boreholes. Twelve (12) monitoring wells were installed in boreholes BH02/MW02, BH03/MW03, BH22/MW22, BH30/MW30, BH33/MW33, BH35/MW35, BH50/MW50, BH51/MW51 BH60/BH60, BH70/MW70, BH74/MW74, and BH75/MW75 to enable us to measure a stabilized groundwater reading.

Upon completion of drilling, the soil samples were transported to our soil laboratory in our Vaughan office for further examination and laboratory testing.

3 Subsoil Conditions

Based on the soil conditions encountered in the boreholes, the soil profile consists of topsoil/ loose overburden asphalt underlain by earth fill material. The fill materials were underlain by native soil deposits (sandy silty clay, sandy silt to silty sand, sand). The stratigraphic units and groundwater conditions are discussed in the following sections. More details are provided in the Record of Boreholes (Appendix B).

The following summary is to assist the designers of the project with an understanding of the anticipated soil conditions across the site. However, it should be noted that the soil and groundwater conditions may vary between and beyond the borehole locations.

3.1 Ground Cover

The boreholes identified as BH01 to BH05, BH08 to BH11, BH15, BH18 to BH22, BH26 to BH28, and BH 31 to BH33 were advanced through an approximately 0.3 to 1.2 m thick layer of loose overburden asphaltic concrete. The remained boreholes encountered approximately 100 mm to 200 mm thick layer of topsoil at the ground surface. It should be noted that loose asphalt and topsoil thicknesses may vary between and beyond borehole locations.

3.2 Fill Materials

3.2.1 Silty Clay Fill

A fill layer consisting predominantly of silty clay with trace to some sand and trace rootlets was encountered immediately beneath the ground cover in all boreholes, except in BH20 and BH30 to BH33. The depths of this layer extended to 2.3 mbgs. The recovered samples were generally described to be in moist to very moist condition. Moisture content measurements obtained on the extracted samples were found to be approximately 5 to 25 % by weight.

SPT 'N' Values for this stratum varied between 4 and 45 blows per 300 mm, indicating very soft to hard state.

3.3 Native Strata

3.3.1 Sandy Silty Clay to Sandy Clayey Silt Till

A heterogenious stratum of native soil consisting predominantly of sandy silty clay with trace to some gravel was encountered below the fill layer in most of the boreholes at various depths ranging from 0.6 to 2.3 mbgs. Trace broken cobbles were encounted randomly at various depths in this layer.

The recovered samples of the sandy silty clay soils were generally described to be in a moist to wet condition. Moisture content measurements obtained on the extracted samples were found to be between 8% and 26% by weight indicating moist to wet state.

SPT 'N' Values for this stratum varied between 11 blows per 300 mm and 50 blows per 50 mm, indicating a stiff to hard state.

Liquid Limits, Plastic Limits and Plasticity Indices were from 18 % to 37 %11 % to 18 %, and 7 % to 19 % respectively.

3.3.2 Sandy Silt to Silt Till

A stratum of native soil consisting predominantly of sandy silt to silt with trace to some clay and trace gravel was encountered between the depths of 2.3 to 9.8 mbgs in various boreholes.

The recovered samples soils were generally described to be in a moist to wet condition. Moisture content measurements obtained on the extracted samples were found to be between 8% and 20% by weight indicating moist to wet state.

SPT 'N' Values for this stratum varied between 12 blows per 300 mm and 50 blows per 50 mm, indicating a compact to very dense relative density.

3.3.3 Silty Sand to Sand Till

A stratum of native soil consisting predominantly of silty sand to sand trace to some clay and trace gravel was encountered between the depths of 3.6 to 9.1 mbgs in various boreholes. The soils were more gravelly approximately between 4.0 to 6.1 mbgs in boreholes BH25, BH27, BH30 and BH34. Some clayey cores were present approximately at 6 to 7 mbgs.

The recovered samples were generally described to be in a moist to very moist condition. Moisture content measurements obtained on the extracted samples were found to be between 9% and 19%.

SPT 'N' Values for this stratum varied between 11 blows per 300 mm and 50 blows per 50 mm, indicating a compact to very dense relative density.

4 Laboratory Testing

Visual soil classifications made in the field were verified by peer review in the lab. Moisture content determinations were completed on all recovered samples.

Grain size analysis (sieve and hydrometer) was performed on eighteen (18) select samples. The results of these tests are summarized in Table 2 and are also presented in Appendix C of the report.

Sample ID	Sample Depth (mbgs)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH01 / SS05	3.1 – 3.7	4	33	48	15
BH08 / SS07A	6.1 – 6.5	0	38	59	3
BH12 / SS06	4.6 - 5.0	11	29	45	15
BH18 / SS08	6.1 – 6.7	2	13	63	22
BH21 / SS01	0.8 – 1.4	9	26	47	18
BH30 / SS02	0.8 - 1.4	2	28	49	21
BH34 / SS05	3.1 – 3.7	5	32	48	15
BH46 / SS05	3.1 – 3.7	3	13	76	8
BH48 / SS04	2.3 – 2.9	5	24	49	22
BH49 / SS03	1.5 – 2.1	4	26	49	21
BH51 / SS08	5.3 – 5.9	23	26	37	14
BH59 / SS07	6.1 – 6.7	5	28	49	18
BH61 / SS02	0.8 – 1.4	3	23	50	24
BH71 / SS03	1.5 – 2.1	7	27	47	19
BH76 / SS02	0.8 - 1.4	1	12	40	47
BH77 / SS02	0.8 - 1.4	3	33		64
BH77 / SS03	1.5 – 2.1	1	28	51	20
BH77 / SS06	4.5 – 5.1	3	43		54

Table 2: Grain-Size Laboratory Testing Results

Atterberg Limits tests were conducted on eleven (11) select samples. The results of these tests are presented in Table 3 and also presented in Appendix C of the report.

Table 3: Atterberg Limits Results	Table 3:	Atterberg	Limits	Results
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Sample ID	Sample	Liquid	Plastic	Plasticity	Soil Classification
	Depth	Limit (%)	Limit (%)	Index (%)	
	(mgbs)				
BH12 / SS06	4.6 - 5.0	18	11	7	Low Plasticity Inorganic Clay (CL)
BH18 / SS08	6.1 – 6.7	23	14	9	Low Plasticity Inorganic Clay (CL)
BH21 / SS01	0.8 – 1.4	20	12	8	Low Plasticity Inorganic Clay (CL)
BH30 / SS02	0.8 – 1.4	23	14	9	Low Plasticity Inorganic Clay (CL)
BH34 / SS05	3.1 – 3.7	20	12	8	Low Plasticity Inorganic Clay (CL)
BH46 / SS05	3.1 – 3.7	-	-	-	Non-plastic
BH49 / SS03	1.5 – 2.1	23	13	10	Low Plasticity Inorganic Clay (CL)
BH61 / SS02	0.8 – 1.4	25	13	12	Low Plasticity Inorganic Clay (CL)
BH71 / SS03	1.5 – 2.1	22	12	10	Low Plasticity Inorganic Clay (CL)
BH76 / SS02	0.8 – 1.4	37	18	19	Low Plasticity Inorganic Clay (CL)
BH77 / SS03	1.5 – 2.1	25	15	10	Low Plasticity Inorganic Clay (CL)

4.1 Chemical Attack Potential

Twenty (20) samples of native soil, identified as in table 10, were submitted to an external analytical laboratory (ALS Laboratories) to assess the potential for the attack to buried concrete and ductile iron. Laboratory results and certificates are attached in Appendix D of this report.

A summary of the test results is presented in the following table:

			Parameters					
Sample ID	Depth (m bgs)	Resistivity (ohm.cm)	pН	Redox Potential (mv)	Moisture (%)	Sulphides ⁽²⁾ (%)	Total Points	Corrosivity Potential
BH14/SS02	0.8 – 1.4	4720	7.65	198	15.7	<0.20	3	No
BH16/SS02	0.8 – 1.4	7320	7.81	211	13.0	<0.02	3	No
BH34/SS02	0.8 – 1.4	8600	7.74	208	11.6	<0.02	3	No
BH37/SS02	0.8 – 1.4	6320	7.85	245	10.7	<0.02	3	No
BH39/SS02	0.8 – 1.4	5050	7.75	232	14.2	<0.02	3	No
BH41/SS02	0.8 – 1.4	5190	7.76	205	16.4	<0.02	3	No
BH45/SS02	0.8 – 1.4	4810	7.70	220	16.2	<0.02	3	No
BH48/SS02	0.8 – 1.4	5600	7.47	246	18.1	<0.02	3	No
BH49/SS02	0.8 – 1.4	4880	7.77	193	18.1	<0.02	3	No
BH53/SS02	0.8 – 1.4	4550	7.78	244	10.9	<0.02	3	No
BH57/SS02	0.8 – 1.4	3760	7.76	209	17.3	<0.02	3	No
BH59/SS02	0.8 – 1.4	4670	7.81	197	16.0	<0.02	3	No
BH60/SS02	0.8 – 1.4	4420	7.50	224	19.9	<0.02	3	No
BH61/SS02	0.8 – 1.4	4950	7.76	209	14.6	<0.02	3	No
BH64/SS02	0.8 – 1.4	2770	7.92	210	15.6	<0.02	4	No
BH66/SS02	0.8 – 1.4	4570	7.75	209	16.8	<0.02	3	No
BH67/SS02	0.8 – 1.4	5640	7.86	202	10.7	<0.02	3	No
BH69/SS02	0.8 – 1.4	3310	7.55	241	16.0	<0.02	3	No
BH76/SS02	0.8 – 1.4	5230	7.55	260	17.8	<0.02	3	No
BH77/SS03	1.5 – 2.1	4520	7.52	269	11.7	<0.02	3	No

Table 4: Buried Metal Attack Parameters

Note:

(1) Soil test evaluation carried out using AWWA C105/A21.5-05. A score of ten points or more indicates the soil is corrosive to ductile iron. Additional protection would be recommended if the score is 10 or greater.

(2) It was assumed that samples with a laboratory result less than the reported detection limit (RDL) for sulphides would be considered a trace condition (score of 2) and results greater than the RDL would be considered positive (score of 3.5).

The following Table of refereeing from CSA A23.1-04/A23.2-04 'Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Procedure for Concrete' divides the degree of exposure of concrete structures to sulphate attack into the following classes:

Table 5: Sulphate Exposure Classes

Degree of Exposure (Class)	Water Soluble Sulphate (SO ₄) in Soil Samples (%)
Very Severe (S-1)	> 0.20
Severe (S-2)	0.20 – 2.0
Moderate (S-3)	0.10 - 0.20

The laboratory results indicated that the sulphate content of samples identified are in the S-3 class, indicating a low potential for sulphate attack on concrete to be placed below the ground surface. Based on these results, standard Portland cement should be suitable for use on this project.

5 Groundwater Conditions

Groundwater observations were made in the boreholes as drilling proceeded and upon completion of drilling. Freestanding water was encountered upon completion of drilling in twenty-one (21) boreholes identified as BH02 to BH04, BH06 to BH09, BH15 to BH17, BH21, BH24, to BH28, BH30 to BH32, BH44, and BH51. Twelve (12) 51 mm outside diameter (O.D). monitoring wells were installed in BH02/MW02, BH03/MW03, BH22/MW22, BH30/MW30, BH33/MW33, BH35/MW35, BH50/MW51, BH51/MW51, BH60/MW60, BH70/MW70, BH74/MW74, and BH75/MW75. A summary of groundwater and cave-in recordings is presented in Table 4. It should be noted that there was not sufficient time available for the groundwater to stabilize inside the open boreholes.

Borehole ID	Drilling Completion date	Groundwater Level Upon Completion of Drilling (mbgs)	Groundwater Level on June 24, 2019 (mbgs)	Groundwater Level on October 21, 2019 (mbgs)	Cave-in Level Upon Completion of Drilling (mbgs)
BH01	June 21, 2019	dry	n/a	n/a	1.5
BH02/MW02	June 10, 2019	5.6	3.4	4.4	9.1
BH03/MW02	June 10, 2019	4.6	2.1	3.1	5.9
BH04	June 3, 2019	9.1	n/a	n/a	4.6
BH05	June 3, 2019	dry	n/a	n/a	2.6
BH06	June 3, 2019	9.5	n/a	n/a	3.1
BH07	June 6, 2019	5.2	n/a	n/a	8.5
BH08	June 7, 2019	5.5	n/a	n/a	6.7
BH09	June 7, 2019	4.9	n/a	n/a	n/a
BH10	June 21, 2019	dry	n/a	n/a	2.4
BH12	June 6, 2019	dry	n/a	n/a	5.5
BH13	June 6, 2019	dry	n/a	n/a	8.5
BH14	June 5, 2019	dry	n/a	n/a	9.1
BH15	June 5, 2019	1.4	n/a	n/a	n/a
BH16	June 4, 2019	2.6	n/a	n/a	n/a
BH17	June 17, 2019	6.0	n/a	n/a	n/a
BH19	June 13, 2019	dry	n/a	n/a	8.8
BH20	June 13, 2019	dry	n/a	n/a	7.7
BH21	June 5, 2019	3.1	n/a	n/a	n/a
BH22/MW22	June 12, 2019	dry	0.1	0.8	n/a
BH24	June 4, 2019	3.0	n/a	n/a	n/a

Table 6: Groundwater and Cave-in Conditions

BH25	June 17, 2019	2.6	n/a	n/a	n/a
BH26	June 14, 2019	3.4	n/a	n/a	8.8
BH27	June 14, 2019	7.6	n/a	n/a	n/a
BH28	June 18, 2019	1.8	n/a	n/a	7.0
BH30/MW30	June 11, 2019	5.2	2.0	3.2	6.1
BH31	June 17, 2019	3.4	n/a	n/a	7.9
BH32	June 4, 2019	0.6	n/a	n/a	n/a
BH33/MW33	June 12, 2019	dry	2.3	0.9	n/a
BH34	June 5, 2019	dry	n/a	n/a	8.8
BH35/MW35	June 12, 2019	dry	0.95	2.4	n/a
BH36	June 19, 2019	dry	n/a	n/a	6.1
BH38	June 4, 2019	dry	n/a	n/a	3.4
BH39	June 17, 2019	dry	n/a	n/a	7.9
BH40	June 19, 2019	dry	n/a	n/a	6.1
BH41	June 5, 2019	dry	n/a	n/a	8.5
BH44	June 19, 2019	7.2	n/a	n/a	n/a
BH45	June 20, 2019	dry	n/a	n/a	6.1
BH48	June 17, 2019	dry	n/a	n/a	8.2
BH49	June 4, 2019	dry	n/a	n/a	8.2
BH50/MW50	June 20, 2019	dry	0.8 ¹	n/a	n/a
BH51/MW51	June 11, 2019	4.7	6.1	2.2	n/a
BH55	June 18, 2019	dry	n/a	n/a	7.9
BH58	June 19, 2019	dry	n/a	n/a	6.1
BH59	June 4, 2019	dry	n/a	n/a	7.9
BH60/MW60	June 18, 2019	dry	1.5 ¹	n/a	7.5
BH61	June 4, 2019	dry	n/a	n/a	8.2
BH69	June 21, 2019	dry	n/a	n/a	6.1
BH70/MW70	June 11, 2019	n/a	1.23	2.3	n/a
BH74/MW74	October 16, 2019	dry	n/a	2.6	5.6
BH75/MW75	October 16, 2019	dry	n/a	3.4	5.6
BH76	October 15, 2019	3.1	n/a	n/a	5.5
BH77	October 15, 2019	3.1	n/a	n/a	1.2

Note:

1- Date measured: 02 July 2019.

The groundwater at the site would fluctuate seasonally and can be expected to be somewhat higher in response to major weather events. No long-term groundwater monitoring provisions were made in this geotechnical investigation program.

6 Engineering Discussion and Assessment

Based on communication with the Client and a site visit to an existing transit facility located at 130 Sandalwood Parkway West in Brampton, Ontario, it is our understanding that the proposed development will consist of transit service and storage facility with a two-storey office building. The facility also contains above-grade bus parking bay and stormwater management pond. Seventy-three (73) boreholes were advanced in Parcel A and four (4) boreholes were advanced in Parcel B (See Appendix A for locations). Further details such as structural drawings, anticipated loading, Finished Floor Elevations (FFE), etc. were not available at the time of preparation of this report.

Freestanding groundwater was encountered in twenty-one (21) boreholes in the site upon completion of drilling. A detailed hydrogeological study was beyond the scope of work for this geotechnical investigation and will be provided in a separate cover. However, based on groundwater observations, excavations for shallow foundations may be anticipated to encounter groundwater during construction.

Based on above comments and the borehole information, and assuming them to be representative of the subsoil conditions across the site, following comments and recommendations are offered.

6.1 Site Preparation and Grading

Based on the conditions encountered in the boreholes as summarized in Section 3.0, the parking lot footprint area of the site primarily consists of ground cover of topsoil and asphaltic concrete gravel underlain by fill materials extending to depths ranging between 0.6 and 1.5 m bgs, with the exception of BH03 where fill was encountered to a depth of 2.3 m bgs. The fill consisted of clayey earth fill (ie. disturbed native from farming activities) and asphaltic concrete gravel in the eastern portion of the site (ie. existing City of Brampton laydown facility). In general, the existing earth fill was found to contain intermixed organics immediately below ground surface and decreasing with depth.

Prior to any construction, the existing ground surface cover and earthern berms are to be removed from the area of the proposed development. The asphaltic concrete gravel is not suitable for site grading or foundation purposes and should be removed entirely from the footprint of the building. Any organics, deleterious materials, asphaltic concrete and unsuitable fill exposed have to be removed from the area of the proposed building and parking lot. All subgrade surfaces which will support the footings and evaluation of suitable fill materials are to be examined by qualified geotechnical personnel.

The native and clayey fill soils encountered at the Site are generally suitable for reuse as backfill, provided it is free of organic and deleterious material and is within the optimum moisture content. Prior to any fill placement, the material needs to be inspected and approved by SNCL's qualified geotechnical engineer. Further comments regarding the use of backfill are discussed in Section 6.4. However, re-use of removed topsoil should be limited to landscaping areas (as applicable).

6.2 Building Foundations

The following section provides recommendations for geotechnical design of foundations for the proposed building based on the subsurface conditions encountered at the Site:

6.2.1 Conventional Spread Footings

The existing fill layers that overlay the proposed building footprintare unsuitable to support building foundations. Footings may be placed on the native strata at depths ranging approximately 1.2 m to 2.3 m, using a geotechnical bearing resistance of 200 kPa for a Serviceability Limit States (SLS) and 300 kPa for a factored Ultimate Limit State (ULS) design (assuming a 3 m by 3 m footing). It should be noted that the SLS bearing resistances is for total and differential settlements up to 25 mm and 20 mm respectively. The minimum founding depth at each of the borehole locations is provided in the Table below.

Borehole	Approximate Depth (mbgs)	Approximate Elevation (MASL)
BH03	2.3	206.6
BH04	1.5	207.7
BH06	1.5	207.1
BH07	1.5	206.9
BH08	1.5	207.7
BH09	1.2	208.5
BH12	1.5	207.3
BH13	1.2	208.3
BH14	1.2	208.7
BH17	1.2	207.1
BH18	1.5	207.4
BH19	1.5	207.7
BH20	1.2	208.3
BH21	1.2	208.7
BH22	1.5	208.7
BH25	1.2	207.5
BH26	1.2	208.2
BH27	1.5	208.5
BH28	1.2	208.7
BH30	1.5	207.3
BH31	1.5	208.1
BH32	1.2	208.4
BH33	1.2	208.6
BH34	1.5	208.3
BH36	1.2	208.3
BH38	1.2	207.5
BH39	1.2	207.9
BH40	1.5	207.5
BH41	1.2	206.4
BH47	1.2	207.6
BH48	1.5	207.2
BH49	2.0	206.3
BH50	1.5	206.1
BH52	1.2	206.9
BH54	1.2	207.2
BH55	1.2	206.8

Table 7: Maximum Footing Depth / Elevation

BH57	1.2	206.9
BH58	1.5	206.3
BH59	2.0	206.3
BH60	1.5	206.3
BH61	1.5	205.8

Conventional spread footings must be founded at least 0.2 metres into the native stratum for the geotechnical bearing resistance values provided. A permanent soil cover of a minimum of 1.2 m or its thermal equivalent in insulation is required for frost protection of all foundations. Higher geotechnical bearing resistances would be available at a greater depth, if required.

It is recommended that our office is allowed to review the structural drawings.

The exposed footing subgrades are to be inspected, evaluated and approved by SNCL's qualified geotechnical engineer or their designate.

Excavation for sump pits, utility trenches, footings, or similar should not intersect a zone which would extend downward and an angle of 10 horizontal to 7 vertical from the outside underside of existing or proposed footings.

6.3 Dewatering

As mentioned in Section 5, at the time of this investigation the groundwater table at the site (near Rainbow Creek for example) was at a shallow depths in some boreholes (e.g. BH35 approximately at 208.30 MASL). Based on the relatively shallow static groundwater elevation which was observed during this investigation, active dewatering may be required for excavations on this project in areas where groundwater cannot be controlled through the use of gravity fed sumps and pumps.

Any form of dewatering must consider possible settlements that may be caused on the adjacent areas, including the possible adverse effects on the existing and nearby structures, roads, underground services etc. It should also consider the large body of water present (e.g. the stream) as well as the relatively high permeability of the soils encountered in the boreholes.

As previously noted, a hydrogeological assessment has been prepared under separate cover. Nevertheless, the following general guidance is provided for designers of a dewatering system for this Site:

- Standby pumping capacity should be provided, in addition to an adequate primary capacity;
- Effective filters must be utilized in order to prevent migration of soil fines and ground loss;
- Pumped water must be discharged such that it will not interfere with excavations;
- Groundwater must be maintained at least 0.5 m below the base of any open excavations, including any progressively rising backfill during its placement in order to prevent 'pumping' of the base due to construction traffic/compaction efforts;
- Adequate monitoring of groundwater levels must be carried out this may involve installation of further monitoring wells prior to construction; and

• On completion of construction activities, dewatering systems should be gradually shut down to prevent the creation of transient critical exit gradient conditions, which may result in migration of fines.

It should be noted that if pumping volumes for construction dewatering are less than 400,000L per day, a Permit to Take Water (PTTW) from the Ontario Ministry of the Environment (MOE) is not required. However, registration under the Environmental Activity and Sector Registry (EASR) from the MOE will be required.

6.4 Backfill Considerations

Backfilling, if required can be accomplished by reusing the excavated soils or similar fill material provided the moisture content is maintained within 2 percent of optimum and the fill is free of topsoil, organics and any deleterious material. The fill placed in excavated foundations should be in thin lifts not exceeding 200 mm thick and compacted to not less than 98 percent of its Standard Proctor Maximum Dry Density (SPMDD) up to 500 mm below pavement structure or hardscaped areas.

In general, the on-site excavated clayey soils including silty clay and clayey fills, will be excavated in cohesive blocks and will be difficult to handle and compact, requiring the use of heavy compactors for proper compaction. For use as backfill, the cohesive blocks will have to be pulverized and placed in thin layers, provided their moisture contents are at or near the optimum moisture content. Unless the clayey soils are properly reduced in sized and compacted in sufficiently thin lifts, post-construction settlements could occur.

Backfill placed in the upper 500 mm below pavement structure or hardscaped areas should be compacted to 98 % to 100% of that material's SPMDD.

For any fill operation to be considered Engineered Fill, the following criteria must be satisfied:

- Engineered Fill should consist of uniform, homogeneous material. The fill material should also be free of organics, deleterious materials (i.e. building debris such as bricks, metal etc.). Materials meeting Ontario Provincial Standard Specification, such as Select Subgrade material, and/or OPSS Granular B Type I or II specifications or of better quality would be considered a suitable Engineered Fill material;
- Prior to the placement of Engineered Fill, it must be evaluated for suitability in the Geotechnical Laboratory. Samples should be provided to the Geotechnical Engineer and submitted for Standard Proctor, grain size analysis and moisture content determination;
- Engineered Fill must be compactable, and of a suitable moisture content such that it is within +/- 2.0% of its optimum moisture content, as determined through laboratory testing, and compacted to not less than 100% of the materials' Standard Proctor Maximum Dry Density (SPMDD), and placed and compacted in separate lifts up to 250mm in thickness or as otherwise noted;
- Engineered Fill must be placed under the continuous supervision of a Geotechnical Engineer or their designate;

- Field density tests must be taken under the supervision of the Geotechnical Engineer on each lift of Engineered Fill. Any Engineered Fill which is tested and found to be out of specification shall be either removed, reworked or retested;
- Material to be used as Engineered Fill must be environmentally acceptable, subject to confirmatory testing; and
- Engineered Fill placed underneath foundations must extend laterally a minimum of 0.6 D, but not less than 0.9 m from the outside edge of the footings, where D is the depth of Engineered Fill placed.

6.4.1 Engineered Fill Foundations

Engineered fill could be considered for supporting foundations or if grade raise is required. Due to the gentle slope at the site, if existing grades are required to be raised for general site grading, and to avoid stepping down footings, it is understood that proposed foundations for this building may be placed on engineered fill. If this is desired, the following procedure should be implemented.

- The existing fill material within the proposed building area should be removed to an appropriate depth that leaves up to 0.5 m of existing fill in place;
- A series of test pits within the building footprint should be excavated through the existing fill layer on a 20 m grid pattern to the top of the underlying native soils in order to visually assess the fill quality, measure the thickness of the fill layer left in place (not exceeding 0.5 m), and to assess the condition of the underlying native subgrade;
- The exposed subgrade should be inspected, evaluated and approved by a geotechnical engineer or designate. The exposed fill surface shoud be compacted to a minimum of 100 percent SPMDD and a proof roll inspection is to be carried out using heavy construction equipment to identify any soft areas that should be subexcavated and replaced with compacted engineered fill;
- Provided the fill quality, layer thickness, and compaction of the existing fill layer is determined to be acceptable and the underlying native soils are found suitable to support engineered fill then subsequent fill layers can be placed to raise Site grades; and
- If appropriate compaction is not achieved or if the existing fill or native soils are deemed unacceptable, additional measures such as subexcavation will be required. These measures should be determined at the time of construction.

Provided the Engineered fill is used underneath the footings as noted above, a geotechnical bearing resistance of 150 kPa for a Serviceability Limit States (SLS) and 225 kPa for a factored Ultimate Limit State (ULS) design quoted can be used for foundations placed within the engineered fill area (for a 3 m by 3 m foundation at 1.2 m embedment).

The selected backfill materials should reasonably match the existing soil profile within the zone of frost penetration (1.2 m below finished grades). Alternatively, if imported backfill (including

granular material) are used, excavations should be provided with frost tapers – designers should refer to applicable OPSD for taper requirements.

6.5 Slab-on-Grade

In order to have a floor slab with minimum maintenance, we recommend that all objectionable materials (i.e. organic, wet, soft etc.) and fill soils are removed and the exposed subgrade should be inspected, evaluated and approved and thoroughly proof rolled. The engineered fill can consist of inorganic soil, placed in shallow lifts and compacted to not less than 100 percent of Standard Proctor Maximum Dry Density (SPMDD).

It should be possible for some fill to remain in place, subject to a field examination at the time of construction by SNCL's qualified geotechnical engineer. The slab-on-grade areas should be proof rolled. Underneath slabs, a minimum 200mm thick base layer consisting of Ontario Provincial Standard Specifications (OPSS) Granular A should be placed and compacted to 100% of its SPMDD. It is also recommended that the final lift of material beneath the slab consist of 150mm of clear stone material in order to provide a capillary break as well as for fine grading purposes.

The modulus of subgrade reaction appropriate for slab design would depend on the condition of the subgrade and the extent of sub-excavation required. If all unsuitable materials are removed beneath the proposed slab-on-grade and replaced with well-compacted Engineered Fill, then a modulus of subgrade reaction of 27,000 kN/m²/m to 32,500 kN/m²/m (100 to 120 pci) can be used for design purposes. Once the size of the slab is confirmed, SNCL needs to be notified and the modulus of subgrade reaction may need to be modified.

6.6 Drainage

Perimeter drainage is not considered necessary for a structure with no basement and a floor slab set a minimum of 0.3 m above finished exterior grades. Appendix 7 presents typical sections of perimeter drains in accordance to the latest edition of the Canadian Foundation Engineering Manual. The drainage system should discharge to a protected and frost-resistant sump. The uppermost backfill should be impermeable soil.

It is generally recommended that all slabs-on-grade which are located at or near exterior grades be located a minimum of 300 mm above the final exterior grade, and that the ground surface around the perimeter of the buildings slope downward and away from the building walls.

Dampproofing should be applied to exterior foundation walls in order to prevent moisture infiltration from the backfill materials. Waterproofing membranes could be considered as an additional precaution.

6.7 Seismic Site Classification

Buildings foundations are required to be structurally designed to resist a minimum earthquake force, as defined in the National Building Code of Canada, 2015 (NBCC).

In accordance with Section 4.1.8.4 of NBCC, the site classification for seismic site response was verified by measurement of the in-situ shear wave velocity by geophysical techniques. Geophysics GPR conducted multi-channel analysis of shear waves (MASW) at the project site at

two locations, as shown in Appendix E. Based on the analysis, the average shear wave velocity for the top 30 m at the site was 571 m/s and therefore, a seismic site classification of 'C' can be considered at this project site.

6.8 Excavation and Temporary Shoring

6.8.1 Open Cut

The OHSA regulations require that if workmen must enter an excavation deeper than 1.2 m, the excavation must be suitably sloped and/or braced in accordance with the OHSA requirements. OHSA specifies the maximum slope of the excavations for four broad soil types as summarized in the following table:

Soil Type	Base of Slope	Maximum Slope Inclination
Туре 1	Within 1.2 metre of bottom	1 horizontal to 1 vertical
Туре 2	Within 1.2 metre of bottom of trench	1 horizontal to 1 vertical
Туре 3	From bottom of excavation	1 horizontal to 1 vertical
Туре 4	From bottom of excavation	3 horizontal to 1 vertical

Table 8: Maximum Slope of Excavation for Soil Type

The fill at the Site above the groundwater can be classified as Type 3 soils. The Native clayey soils can be classified as Type 1 (hard) to 3 (firm to stiff) soils. The cohesionless soils encountered at depth at this site can be classified as Type 1 (very dense) to type 3 (compact) soils. If affected by groundwater or surface water seepage, the fill and native soils must be considered as Type 4 soils. The highest number of soil type identified in an excavation must govern the excavation slopes from top to bottom of the excavation.

If the above-recommended excavation side slopes cannot be maintained due to lack of space (i.e. due to building addition) or any other reason, the excavation sides must be supported by an engineered shoring system. The shoring system should be designed in accordance with relevant codes, standards, and regulations such as the latest version of the Canadian Engineering Foundation Manual and the OHSA Regulations for Construction Projects.

For all temporary construction excavation slopes, the stability of the cut slopes will have to be frequently monitored by the geotechnical engineer. If the temporary construction excavation slopes are subject to erosion (e.g., due to rainfall, high groundwater flow, etc.), slope stabilization measures (e.g., covering the slope/trench faces with plastic sheets, excavating flatter slope, etc.) will have to be implemented.

Stockpiles of excavated materials should be kept at least 3 m from the edge of the excavation to prevent slope instability, subject to confirmation by the geotechnical engineer. Care should also be taken to avoid overloading of any underground services/structures by stockpiles.

No major excavation difficulties are foreseen in the existing overburden soils within the depths drilled for this investigation, but allowance should be made for the possible presence of boulders

and cobbles that may be found within the soil strata, so the use of appropriate equipment is recommended.

Temporary support for underground utilities (e.g. gas, water, cable, sewer, and telephone) and any existing footings/structures which may be exposed during the excavation may be required. Approval should be obtained from relevant authorities and utilities companies regarding excavation works around such services/footings.

6.8.2 Temporary Shoring and Lateral Earth Pressures

No basement is anticipated in proposed building area, however, service pits are anticipated. Any permanent walls or temporary shoring systems must be designed by a qualified engineer in order to resist unbalanced lateral earth pressures.

If required, shoring systems such as trench boxes could be employed for the site, if insufficient space is available to properly backslope excavation sidewalls. The temporary shoring system should be designed and provided in accordance with the latest version of the Canadian Foundation Engineering Manual, 4th Edition, and Ontario Health and Safety Regulations.

For design purposes, the following table presents geotechnical parameters related to lateral earth pressures can be considered:

Soil Type	Bulk Unit Weight, γ (kN/m³)	Angle of Internal Friction (Φ)	Coefficient of Lateral Earth Pressure		
			Ka	Ko	Kp
Silty to Clayey Fill	19	27	0.38	0.55	2.66
Native Silty Clayey Till Soils (stiff)	18.5	29	0.35	0.52	2.88
Native Silty Clayey Till Soils (very stiff to hard)	21	30	0.34	0.5	3.0
Native Cohesionless Tills (compact)	21	30	0.34	0.5	3.0
Native Cohesionless Tills (Dense)	21.5	32	0.31	0.47	3.25
Native Cohesionless Tills (Very Dense)	22	34	0.28	0.44	3.54
Compacted Granular 'B' Type II / "A"	21.5	35	0.27	0.43	3.70

Table 9: Lateral Earth Pressure Parameters

Note: the above values were calculated considering a level surface behind the wall

Horizontal earth pressures can be calculated based on the following equation:

 $\mathsf{P}=\mathsf{K}\left[\gamma(\mathsf{h}\text{-}\mathsf{h}_{\mathsf{w}})+\gamma`\mathsf{h}_{\mathsf{w}}+q\right]+\gamma_{\mathsf{w}}.\mathsf{h}_{\mathsf{w}}$

where:

P = the horizontal pressure at depth, h (m)

K = the earth pressure coefficient,

 γ = the bulk unit weight of soil, (kN/m3)

 γ ' = the submerged unit weight of soil, (kN/m3)

 γ_w = the unit weight of water, (kN/m3)

 h_w = the depth below the groundwater level (m)

q = the complete surcharge loading (kPa)

Where elevated groundwater level is not anticipated to be present or that a perimeter drainage system is used to eliminate hydrostatic pressures on the soil retaining structure, the above noted expression will be simplified as follows:

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

This equation assumes a drainage system which eliminates hydrostatic pressures would be present shoring system. It should be noted that shoring systems should be restrained and not allow lateral yielding, therefore the at-rest earth pressure coefficient should be used for their design. Surcharge loads related to compaction equipment should be taken into considerations for all designs.

6.9 Site Services

The boreholes showed that in their undisturbed state, the native soil will generally provide adequate support for utilities and allow the use of normal Class 'B' Type bedding (i.e. compacted granular bedding material - as per applicable OSPD standards e.g. OPSD 802.032). The recommended minimum thickness of granular bedding below proposed utilities is 150 mm. The thickness of the bedding may, however, have to be increased depending on the pipe diameter, as per specifications, or if wet or weak subgrade conditions are encountered. The Class 'B' Type bedding may need to be wrapped by a geotextile (e.g., Terrafix 270R or equivalent), as directed by the geotechnical engineer. HL6 clear stone wrapped in geo-textile and/or high performance bedding (HBP) can be considered as alternative bedding if wet or unsuitable conditions are present at the subgrade.

In any event, after installing the pipe on the bedding, the compacted bedding material must surround the pipe and extend above the top of the pipe as set by the applicable standards, but not less than 300 mm, to avoid damage to the pipe during backfilling. Backfill immediately overlying the bedding must be compacted carefully using a suitable compactor to avoid damage to the pipe.

6.10 Noise Walls

Based on information provided by the client, it is our undersanding that noise barrier walls are proposed to be located along the southern boundary of the site. It is anticipated that the noise barrier wall foundations will be supported by caissons, and that lateral resistance of the soil will govern the design. The resistance to lateral loading in front of a vertical caisson can be estimated

using the subgrade reaction theory, where the coefficient of horizontal subgrade reaction Ks (kN/m3) is described in detail below.

Lateral resistance of pile / caissons foundation can be derived from:

where:

P = is the soil reaction in load per unit length of the pile (kN/m);

K = is the horizontal spring constant (kN/m^2) ;

y = is the pile defection (m).

The horizontal subgrade modulus ks is defined as:

$$P/D = -k_s y$$

where:

D = is the width of the pile / caisson (m);

 k_s = is the horizontal soil modulus (kN/m³).

Lateral resistance design of pile foundations for soil-caisson interaction may be calculated using values for the coefficient of horizontal subgrade reaction ($k_s - kN/m^3$) as follows:

 $k_s = n_h z / D$ [Terzaghi (1955), non-cohesive soils]

 $k_s = 67 C_u / D$ [Davidson (1970), cohesive soils]

where

n_h = horizontal modulus of subgrade reaction (kN/m³)

z = depth of embedment of pile (m)

 C_u = undrained shear strength (kPa)

The following Table presents the recommended soil parameters.

Borehole ID	Applicable Elevation (MASL)	Soil Type	Bulk Unit Weight, γ (MN/m ³) ¹	Angle of Internal Friction (Φ)	Recommended n _h value (MN/m ³)	Recommended Undrained Shear Strength (kPa)	Groundwater Elevation (MASL)	
BH17	207.1 – 205.3	Native Silty Clay Till	21.0	30	-	150	202.2	
	205.3 – 202.2	Sandy Silt Till	22	34	18.0	-		
	202.2 – 198.6	Sand Till	22.5	34	11.0	-		
BH62	206.8 - 206.4	Native Silty Clay Till	21.0	30	-	120	n/a	
	206.4 - 202.0	Sandy Silt Till	22	34	18.0	-		
BH69	206.8 – 201.0	Native Silty Clay Till	21.0	30	-	120	n/a	
BH72	207.8 – 204.0	Native Silty Clay Till	21.0	30	-	200	n/a	

Table 10: Recommended Soil Parameters

Notes: 1) use buoyant unit weights below groundwater

As noted above, the contribution of lateral resistance of the soil within the frost depth (i.e. 1.2 m below the final grade) should not be included in calculations, except for the weight of soil. Research shows however that the restraint provided at the ground surface level plays a significant role in the performance of laterally loaded structures, and therefore, the placement of well compacted, competent material at and near ground surface immediately around the augered caisson is recommended.

Based on the borehole information as shown in the stratigraphic cross sections, the installation of caissons is anticipated to be carried out typically within cohesive and cohesionless deposits. Depending on the final depth of the proposed foundations, groundwater may be encountered during the installation of the caissons. During construction, caissons will require the use of temporary steel casings (liners) to support the granular soils below groundwater and to reduce the risk of caving. Temporary steel casings will also enable the bases to be properly cleaned of any disturbed soils and enable inspection and approval of the base by the geotechnical engineer, where necessary. The casing would then be carefully withdrawn as the concrete is poured, keeping a sufficient head of concrete in the casing to prevent 'necking'. Alternatively, installation by tremie methods can be used for concreteing caissons below groundwater. The clayey silt and silty clay deposits can be expected to be self-supporting and should not yield significant amounts of water in the short term, in caisson holes, even below the groundwater table. However, water bearing layers may cause instability problems during the installation of the caissons. Where these layers are rather thin and the soil is relatively fine grained, it may be possible to effect the construction by pouring the concrete rapidly upon the completion of the excavation of the caisson hole. In other cases however, the sandy layers may cause excessive groundwater seepage in unlined caisson holes and will necessitate special precautions by the contractor.

The use of extensive dewatering techniques to lower the groundwater table during the construction is unlikely to be economically viable due to limited construction efforts required. Within the cohesionless till and/or sandy layers below the groundwater table, the soil is susceptible to disturbance due to the unbalanced hydrostatic head and seepage, and may become unstable, especially with increased depth of excavation below the groundwater table. The contractor should maintain the stability of the soil at the sides and the bases of the holes for concrete foundations at all times, from the commencement of excavation to the completion of pouring the concrete. In view of the above, we recommend that the following special provisions be included in the contract documents:

- The contractor shall install concrete foundations in earth for the foundations. At various foundation locations, strata may consist of fill, silty sand to sandy silt, clayey silt to sandy till deposits. Groundwater is likely to be encountered above the base of the excavations at some locations.
- At various locations, soil deposits may consist of basically granular (i.e. non-cohesive) soils such as silty sand to sandy silt and sandy till. In such cases where the soil is susceptible to conditions of unbalanced hydrostatic head and seepage forces, "boiling" or a quick condition may occur and the soil may become unstable.
- The contractor shall maintain the stability of the soil along the side and base of the holes for the concrete caissons at all times, from the commencement of construction to the placement of concrete.
- Dewatering may be required to maintain a sufficiently dry condition for proper placement of the concrete.

We recommend that the contractor also be advised that the presence of cobbles and boulders can be expected, especially within the till deposits, which can cause problems during the installation of the caissons, such as increasing the time for drilling, employment of special equipment, etc., as well as possible dewatering requirements.

6.11 Pavement Design Selection and Recommendations

Based on the findings of the boreholes and visual condition of the project site to fit the proposed new bus terminal/garage and access road (heavy-duty traffic) and car parking areas (light duty traffic), new construction is recommended. The following table shows the summary of major reasons for pavement design selection. The pavement designs include a light duty section for passenger vehicle parking areas, and a heavy duty section for bus terminal and access roads (ie. trucks / buses).

Table 11: Asphalt Pavement Design

Route	Recommended Option	Reason
Bus Terminal/Garage and Access Road (Heavy Duty)	Rigid Pavement	Mitigate potential for pavement rutting and distortion due to frequent stop, move and turning movements of buses More Durable Less maintenance and longer design period Eliminate transition from flexible to rigid along the bus garage/access road
Car Parking Lot (Light Duty)	Flexible Pavement	Less expensive in terms of initial investment and maintenance Absence of heavy trucks or buses Easy and fast for rehabilitation and maintenance

Based on above table, Rigid Pavement Option is recommended for Bus Terminal and Access Road; Flexible Pavement is recommended for the car parking lot.

6.11.1 Rigid Pavement: Heavy Duty Parking Area (Bus Terminal and Access Road)

The recommended minimum required pavement structure for the Bus Terminal and Access Road is as follows:

- Excavate/remove the existing topsoil and underlying material in order to accommodate 730 mm (Granular A) or 630 mm (OGDL) pavement structure below the proposed final grade of the proposed parking area;
- Perform subgrade preparation with 3% crossfall toward drainage outlets (catch basins, storm sewers, or ditch);
- Place and compact 300 mm Granular B Type II to minimum 100% of Standard Proctor Maximum Dry Density (SPMDD);
- Place and compact 200 mm Granular A or 100 mm OGDL (Open Graded Drainage Layer), with 2% crossfall toward drainage outlets to minimum 100% SPMDD;
- Place 230 mm JPCP (Jointed Plain Concrete Pavement) in slabs not exceeding 4.5m in joint spacing, with 32mm dowel bars at slab joints (all directions) with 300mm dowel spacing.

6.11.2 Flexible Pavement: Light Duty Parking Lot (Car Parking)

- Excavate/remove the existing topsoil and underlying material in order to accommodate 540 mm pavement structure below the proposed final grade of the proposed parking area;
- Perform subgrade preparation with 3% crossfall toward drainage outlets (catch basins, storm sewers, or ditch);

- Place and compact 300 mm Granular B Type II to minimum 100% of Standard Proctor Maximum Dry Density (SPMDD);
- Place and compact 150 mm of Granular A with 2% crossfall toward drainage outlets to minimum 100% SPMDD;
- Pave 50 mm of HL8 binder course;
- Place SS-1 Tack Coat; and
- Pave 40 mm of HL3 surface course.

Design Considerations:

- 1. It should be noted that the above pavement designs are based on assumed traffic. If more accurate or reliable data are available, the pavement design should be accurate.
- 2. The permanent ground water level should be at least 1.5 m below the proposed finished grade by providing positive drainage system (e.g. subdrains, storm sewer, etc.) to prevent frost heave. To promote effective surface drainage, the finished pavement surface must be free of depressions and sloped at a minimum grade of two percent towards a positive outlet for runoff. Surface water should not be allowed to pond at the outside edges of any pavement areas.
- 3. All objectionable materials and surficially softened fill soils are removed and the exposed subgrade base is thoroughly proof rolled. The pavement thicknesses recommended above considers that construction will be carried out during a dry seasonal period and that the subgrade soils are competent. If the subgrade becomes excessively wet or rutted during construction activities, sub-excavation and replacement with additional depth of granular sub-base material may be required. The disturbance of the subgrade material during site preparation, stripping, proofrolling and granular fills must be avoided. If the granular pavement fill is placed on disturbed, undulating soils, water can be trapped and collect in the depression which could lead to differential frost heave and thus damage the asphaltic concrete surface.

6.11.3 Pavement Construction Material

Pavement construction material for new parking areas are summarized as follows:

Flexible Pavement

- 1. The minimum grade of asphalt cement for this project should be PG 58-28, however, consideration may be given to a high-grade increase to PG 64-28 for the heavy duty parking areas.
- 2. New asphalt will be paved and compacted to minimum 92% of Maximum Relative Density (MRD)
- 3. Tack coat should be applied to the top of binder course, as per OPSS PROV 308 and City of Brampton Specification.

4. Civil designers and contractors should refer to and follow all applicable OPSS (Such as OPSS 310, 1010, 1150) and local region/city standards regarding material specifications and construction procedures for new pavement construction.

Rigid Pavement

- 1. The concrete should satisfy the requirements of CAN/CSA A23.1-04 Class C-2 concrete with a minimum compressive strength of 32 MPa and a minimum flexural strength of 5.0 MPa. The PCC concrete should meet the requirements of local region/city specification.
- 2. Dowel bars shall be plain round bars of grade 300 or better according to CSA G40.219 and shall be epoxy coated according to OPSS 1442.
- 3. For concrete base specification, Dowel detail, Joint details, Concrete joint layout and Joint spacing, please refer to OPSS 350, OPSD 552.051, 552.010, 551.031 and 551.010, respectively.
- 4. Wire shall be according to ATSM A 82M. Wire sizes shall be according to American Steel Wire Gauge.
- 5. Standard subdrain should be installed as per OPSS and OPSD

7 Closure

The recommendations provided in this report are based on subsoil data obtained at the sounding locations. Experience indicates that the subsoil and groundwater conditions can vary significantly between and beyond the sounding locations. For this reason, the recommendations given in this report are subject to a field verification of the subsoil conditions at the time of construction.

Should any site condition encountered differ from those at the tested locations or any changes in the project, we request that SNCL be notified immediately in order to permit reassessment of the recommendations.

8 General Conditions and Limitations

A. Use of the Report

- A.1 The work performed in this report was carried out in accordance with the terms and conditions made part of our proposal and/or contract pursuant to which the report was issued. The conclusions presented in the report are based solely upon the scope of services, governed by the time and budgetary considerations to which this work is subject.
- A.2 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 twelve months of the date of the report, SNCL should be given an opportunity to confirm that the recommendations are still valid.
- A.3 The comments given in this report are intended only for the guidance of the design engineer. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual test hole data, as to how subsurface conditions may affect their work.
- A.4 The reader should be advised that geotechnical opinions, presented in this report, are subject to inherent uncertainties due to sampling limitations.
- A.5 The report must be read as a whole, as sections taken out of context may be misleading. Drafts and working copies of study reports and other deliverables, whether or not marked "draft" and/or "for discussion purposes", do not necessarily reflect SNCL's final opinion following consideration of all matters which are the subject of the study giving rise thereto; they are issued for comment and information purposes only, and are subject to change. The reader should not rely on such documents for any purpose.

B. Follow-up

- B.1 All details of the design and proposed construction may not be known at the time of submission of *SNCL*'s report. It is recommended that *SNCL* be retained during the final design stage to review the design drawings and specifications related to foundations, earthworks, retaining systems and drainage, to determine that they are consistent with the intent of *SNCL*'s report.
- B.2 Retention of *SNCL* during construction is recommended to confirm and document that the subsurface conditions throughout the site do not materially differ from those given in *SNCL*'s report and to confirm and document that construction activities did not adversely affect the design intent of *SNCL*'s recommendations.

C. Soil and Rock Conditions

C.1 Soils and/or rock descriptions in this report are based on commonly accepted methods of classification and identification employed in professional geotechnical practice. Classification and identification of soil and rock involves judgment and

SNCL does not guarantee descriptions as exact, but infers accuracy only to the extent that is common in current geotechnical practice.

C.2 The soils and rock conditions described in this report are those observed at the time of the study. Unless otherwise noted, those conditions form the basis of the recommendations in the report. The condition of the soil and rock may be significantly altered by construction activities (traffic, excavation, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting or drying. Unless otherwise indicated the soil and rock must be protected from these changes or disturbances during construction.

D. Logs of Test Holes and Subsurface Interpretations

- D.1 The test hole logs indicate the approximate subsurface stratigraphy and conditions only at the locations of the test holes. Soil and rock formations are variable to a greater or lesser extent. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. The precision with which subsurface stratigraphy and conditions are indicated depends on the method of boring, the frequency of sampling, the method of sampling and the uniformity of subsurface stratigraphy and conditions.
- D.2 Subsurface stratigraphy and conditions between test holes are inferred and may vary significantly from stratigraphy and conditions encountered at the test holes.
- D.3 Groundwater elevations and conditions described in this report refer only to those observed at the place and time of observation noted in the report. These elevations and conditions may vary seasonally or as a consequence of construction activities on the site or adjacent sites.

E. Changed Conditions

E.1 Where conditions encountered at the site differ significantly from those described or anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of the use or reliance by the client on this report that *SNCL* is notified of the changes and provided with an opportunity to review the recommendations of this report. Recognition of changed soil and rock conditions requires experience and it is recommended that an experienced geotechnical engineer be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

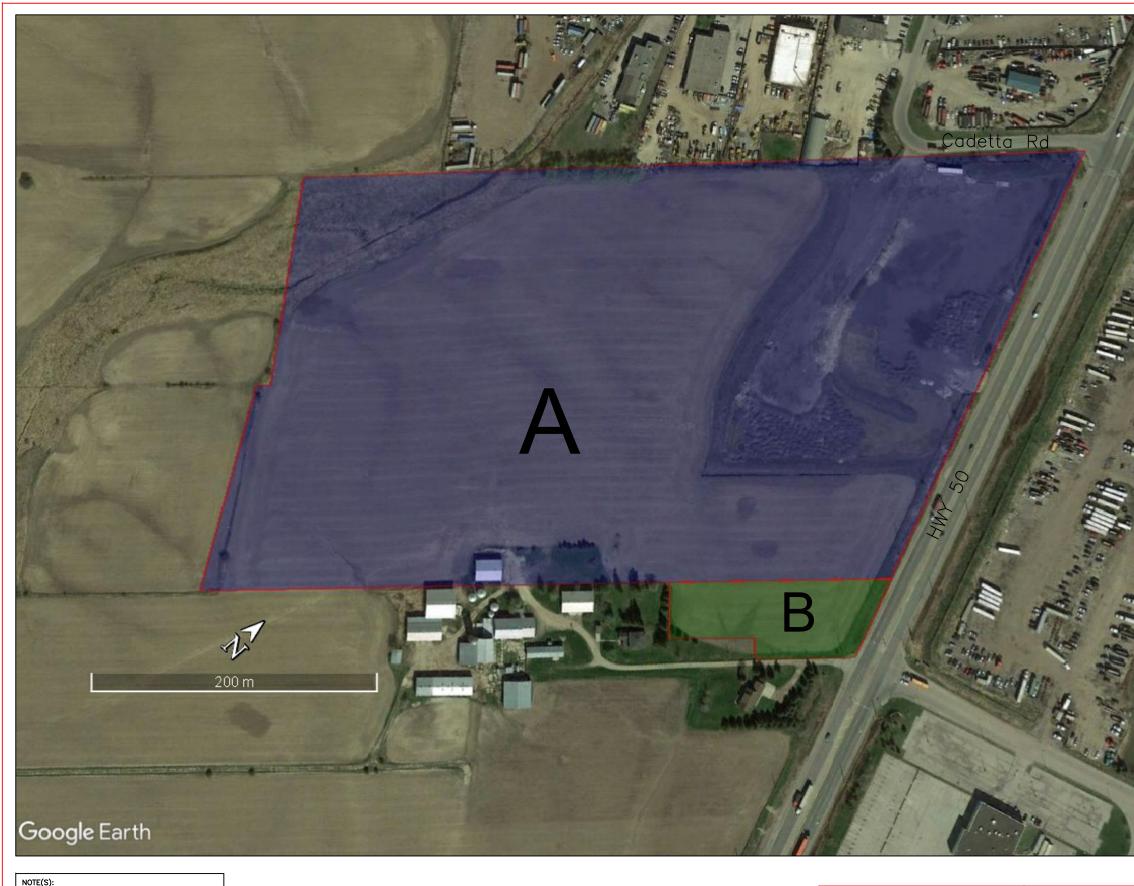
F. Drainage

F.1 Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage can have serious consequences. *SNCL* can take no responsibility for the effects of drainage unless *SNCL* is specifically involved in the detailed design and follow-up site services during construction of the system.

END OF DOCUMENT

Appendix A

Site and Borehole Location Plan (2 pages)

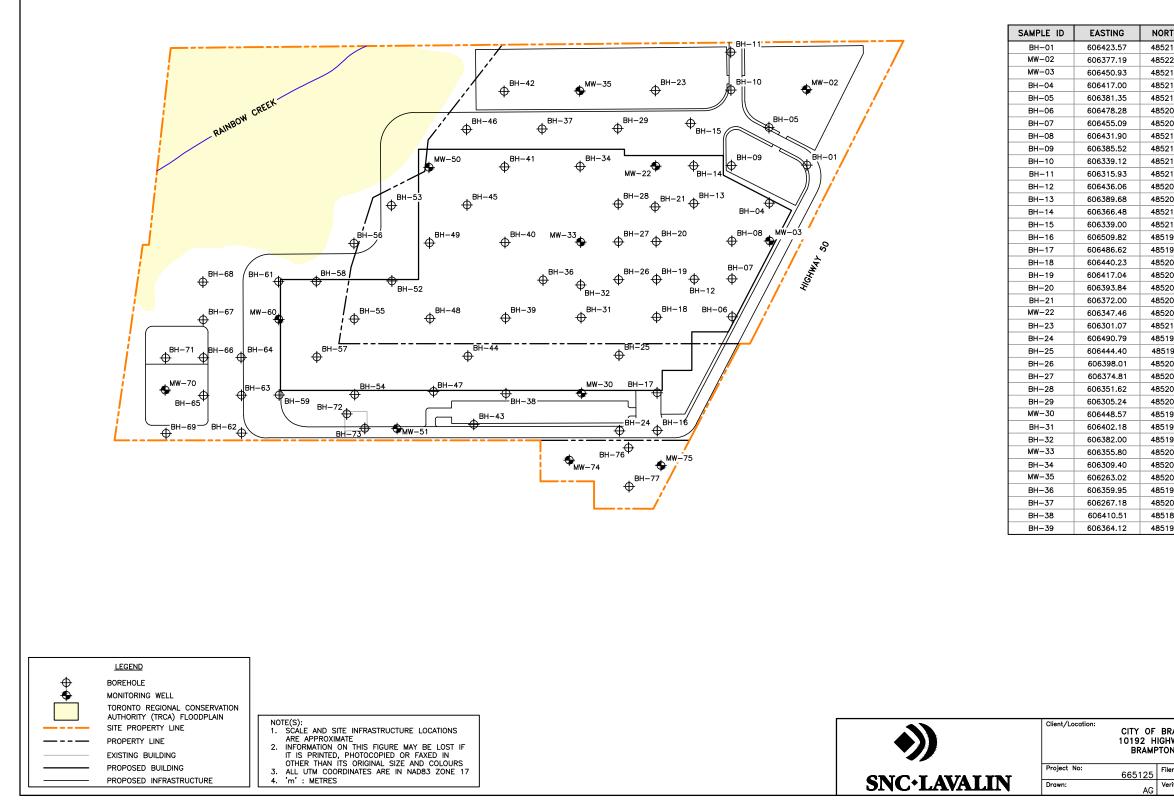


1 110	
1.	SCALE AND SITE INFRASTRUCTURE LOCATIONS
	ARE APPROXIMATE
2.	INFORMATION ON THIS FIGURE MAY BE LOST IF
	IT IS PRINTED, PHOTOCOPIED OR FAXED IN
	OTHER THAN ITS ORIGINAL SIZE AND COLOURS

OTHER THAN TIS ORIGINAL SIZE AND COLOURS
 PARCELS (A, B, C AND D) ARE REFERENCED FROM RFP DOCUMENTS. ANY FUTURE CHANGES IN SHOULD BE ACCOMMODATED IF NECESSARY.



DF BRAMPTON Highway 50, Mpton, on	Title: SITE PLAN
5 ^{Filename:}	Date: DEC 2019 Dwg No:
M Verified: AY	Project Manager: AY FIGURE 1



RTHING	SAMPLE ID	EASTING	NORTHING	1
52185.92	BH-40	606317.73	4851962.30	
52223.96	BH-41	606271.34	4852000.36	-
52124.65	BH-42	606224.96	4852038.41	-
52146.00	BH-43	606413.00	4851851.00	-
52181.74	BH-44	606368.28	4851882.04	-
52063.42	BH-45	606275.51	4851958.14	
52082.45	BH-46	606229.13	4851996.19	
52101.46	BH-47	606372.46	4851843.00	
52139.52	BH-48	606326.06	4851877.86	
52177.58	BH-49	606279.68	4851915.92	
52196.60	MW-50	606233.29	4851953.98	
52059.24	MW-51	606376.62	4851802.00	
52097.30	BH-52	606283.85	4851873.71	-
52116.32	BH-53	606237.46	4851911.75	
52136.00	BH-54	606334.41	4851793.41	
51959.94	BH-55	606288.01	4851831.47	
51978.98	BH-56	606241.63	4851869.53]
52017.03	BH-57	606292.18	4851789.25]
52036.05	BH-58	606245.80	4851827.32	
52055.08	BH-59	606296.34	4851747.04]
52072.00	MW-60	606249.96	4851785.10	
52093.13	BH-61	606226.77	4851804.11]
52131.20	BH-62	606300.51	4851704.81	
51936.75	BH-63	606277.31	4851723.83	- -
51974.81	BH-64	606254.12	4851742.86	- -
52012.85	BH-65	606258.29	4851700.64	
52031.88	BH-66	606235.10	4851719.67	
52050.92	BH-67	606211.90	4851738.70	, jo
52088.98	BH-68	606188.70	4851757.73	
51932.58	BH-69	606262.45	4851658.43	
51970.64	MW-70	606239.26	4851677.44	
51987.00	BH-71	606216.07	4851696.48	
52008.70	BH-72	606359.90	4851769.60	
52046.74	BH-73	606362.00	4851771.20	, j
52084.80	MW-74	606484.17	4851890.91	
51966.48	MW-75	606531.45	4851945.30	
52042.59	BH-76	606505.43	4851930.42	
51886.19	BH-77	606528.74	4851913.36	
51924.26				ļ
				000 WELL LOCATIONS Dwg No: FIGURE 2
		_	SCALE 1:3,	,000
		0	60	120m
BRAMPTON GHWAY 50, TON, ON		Title:		WELL LOCATIONS
Filename:	001F01_665125	Date:	CTOBER 2019	Dwg No:
Verified:	RM	Project Manager:	AY	FIGURE 2
	KM	I	AT	PAGE FORMAT: 11x17

Appendix B

Record of Borehole Logs (78 pages)

SNC-Lavalin Inc. NOTES TO RECORD OF BOREHOLES

DRILLING DATA			LABORATORY DATA	4	
Method: SolSt Auguring HolSt Auguring WB	- - -	Solid Stem Auguring Hollow Stem Auguring Washed Boring	WP W WL Y UNDR STRNG or C _u	- - - -	Plastic Limit (%) Water Content (%) Liquid Limit (%) Natural Unit Weight (kN/m ³) Undrained Shear Strength (kPa) Field Vane: St-sensitivity
SAMPLES TYPE: SS AS TW TP WS BS RC PH PM		Split Spoon Auger Sample Thin wall Open Thin wall Piston Washed Sample Block Sample Rock Core Sample Advanced Hydraulically Sample Advanced Manually	PP UC UU CU CD TOV	- - - -	Pocket Penetrometer Unconfined Compression Unconsolidated Undrained at Overburden Pressure Consolidated Undrained Consolidated Drained Total Organic Vapors

StandardThe Standard Penetration Test (SPT) 'N'-values are the number of blows required to cause a standard 51 millimeters o.d. split barrelPenetrationsampler to penetrate 0.3 meter into undisturbed ground in a borehole when driven by a hammer with a mass of 63.5 kilograms fallingTest,freely a distance of a 0.76 meter. For penetrations of less than 0.3 meter, N-values are indicated as the number of blows for the'N'- Values:penetration achieved (e.g. 50/25: 50 blows for 25 centimeters penetration).

Dynamic ConeContinuous penetration of a conical steel point (51 millimeters o.d. 60° cone angle) driven by 475 J impact energy on a size drill rods. ThePenetrationresistance to cone penetration is measured as the number of blows for each 0.3 meter advance of the conical point into the undisturbedTest:ground.

Soils are described by their composition and consistency or relative density

CONSISTENCY: Cohesive soils are described on the basis of their undrained shear strength (C_u) or 'N'-values as follows:

C _u (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	>200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD
N (blows/0.3 meter)	0 - 2	2 - 4	4 - 8	8 - 15	15 - 30	>30

RELATIVE DENSITY: Cohesionless soils are described on the basis of relative density as indicated by 'N'-values as follows:

N (blows/0.3 meters)	0 - 4	4 - 10	10 - 30	30 - 50	>50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

Rocks are described by their composition and structural features and/or strength

RECOVERY: Sum of all recovered rock core pieces from a coring run expressed as a percent of the total length of the coring run.

ROCK QUALITY

DESIGNATION (RQD):Sum of those intact core pieces, 100 millimeters in length expressed as a percent of the length of the coring run. Classification of a rock based on the RQD value as follows:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

JOINTING AND BEDDING:

SPACING	50 millimeters	50 - 300 millimeters	0.3 - 1.0 meter	1.0 - 3.0 meter	>3.0 meters
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

R	ECORD	OF BOREHOLE	lo.	<u>BH</u>	<u>01</u>									BRAMPTON
Pro	ject Number:	665125						Drilling	g Location:	As per borel	nole location plan		L	ogged by: MF
Clie	ent:	City of Brampton						Drilling	g Method:	150 mm Ho	llow Stem Augering		C	Compiled by: <u>NT</u>
	ject Name:	Geotechnical Investigation- J	ohnsto	n Tran	sit Fac	ility			g Machine:	Track Mount				Reviewed by: MT
Loc	ation:	10192 Hwy 50, Brampton, ON						Date S	Started:	Jun 21, 201	9 Date Completed: Jun:	21, 2019	9 R	Revision No.: 0
	LITH		SC	IL SA	MPLI	NG				TESTING	Kinse pH Values	NO		FING: 606423.57 HING: 4852185.92
Lithology Plot	Local Ground	DESCRIPTION Surface Elevation: 210.06 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould 	ion Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould tear Strength (kPa) 60 80	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Passing 75 um (%) Mosture Content (%) Mosture Content (%) Mosture 40 60 80	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
		ourden asphalt ~1.20 m.	SS	01	67	21	-	-			o ⁵			
	FILL	208. 1.2		02	75	39		209 —	0		o ⁵			
	Brown, stiff, <u>gravel</u> , mois NATIVE TIL Brown, verv	silty CLAY, trace sand, traces. t. 1.5 L stiff. sandy silty CLAY, trace	SS	03	75	19	- 2	208	0		o ¹⁵			
		vel, some oxidation, moist _{207.8} pact, sandy SILT, some clay23 , moist.		04	100	19		-	0		o ¹¹			
Ĩþ	GR: 4%; SA	: 33%; SI: 48%; & CL: 15%	ss	05	100	18	- 3	207 —	0		o ¹¹			
	dense		ss	06	100	35	- - - - - -	206 —	0		o ¹¹			
0 0 0	compact End of bore	204. hole. 5.2	SS	07	100	12	- 5	205 -	0		o ¹³			
	at 1.52 r water u complet hollow s 4. GR., SA Sand, S	e was found to be caved-in nbgs with no freestanding pon completion. ble was measured upon on of drilling inside the tem auger. ., SI. & CL. denote Gravel, it & Clay respectively.												
SNC 401 Vau	AVALIN Hanlan Rd ghan, Ontario L4 905-851-0090	- Borehole details	as prese Geotechr	nted, do hical Eng	not const	titute a th	norough ole infor	understa mation sh	nding of all pote	ntial conditions pr	Iling Cave in depth record	issistance		of drilling: <u>1.52 m</u> . Scale: 1 : 63 Page: 1 of 1

ect Number: nt:	665125 City of Brampton							g Location: g Method:		ehole location plan lollow Stem Augering			Logged by: <u>MF</u> Compiled by: NT
	Phase II Environmental Site A	ssess	ment				-	g Machine:	Track Mou				Reviewed by: MT
	10192 Hwy 50, Brampton, ON							Started:		19 Date Completed:	Jun 10, 2019		Revision No.: 0
		SO		MPLI	NG		-	FIELD.	TESTING			-	TING: 606377.19
			0,						ion Testing	★ Rinse pH Values 2 4 6 8 10			HING: 4852223.96
	DESCRIPTION Surface Elevation: 210.12 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould * Undrained She 20 40	 DCPT Nilcon Vane Intact Remould ear Strength (kPa 60 80 	 Lower Explosive Limit (* Passing 75 um (%) Moisture Content (%)		Unit Weight (KN/m3)	COMMENTS
Loose crush ~460 mm. FILL	ed stone / asphalt pieces 209.7 0.5	SS	01	75		-	210 -			o ²²			Top of Riser Elevatio 211.00 m; Height of Riser =0.90 Sample submitted for
	silty CLAY, trace to some ravel, moist.	SS	02	84	4		209 -	0		o			laboratory analysis: BH02-01 PP = 1.0 kg/ sq-cm Sample submitted for laboratory analysis: BH02-02
NATIVE TILI Brown, very gravel, wet.	208.6 1.5 stiff, sandy silty CLAY, trace	SS	03	100	19	- 2	208 -	0		o ¹⁶			PP = 3.5 kg/ sq-cm
becomes oxi	dized, hard	SS	04	100	62	Ē	-		0	o ¹¹			PP = 1.5 kg/ sq-cm
trace broken	cobble pieces	SS	05	100	58	- 3	207 -		0	°8			PP = 1.5 kg/ sq-cm
						4	206 -						
		SS	06	33	39	5	205 -	0		°9			
		SS	07	100	61		204 —		0	o ¹²			Sample submitted for laboratory analysis: BH02-07
	202.5					- 7 - 7 	203 -						
Grey, compa trace gravel,	ct, SAND to silty SAND, 7.6 wet.	SS	08	100	22	8	202 -	0		o ¹²			
very dense		SS	09	100	94		201 –		C	o o ¹⁰			PP = 3.0 kg/ sq-cm
End of boreh	200.4 ole. 9.8					-					· · · · ·		1
at 9.14 m at 5.64 m 2. Water tal completion stem aug 21, 2019	was found to be caved-in hbgs with freestanding water hbgl upon completion. ble was measured upon on of drilling inside the hollow ler on June 24 and October ket penetrometer.												
) • LAVALIN	∑ ⊑ Groundw ▼ Groundw									Cave in depth re	corded on co	mpletio	n of drilling: <u>9.14 m</u> .

R	ECORD	OF BOREHOLE N	lo.	BH	03/1	NW	<u>03</u>								🗱 BRAMPTON
Pro	ject Number:	665125						Drillin	g Locat	ion:	As per borel	nole location plan			Logged by: MF
Clie		City of Brampton						_	g Metho			llow Stem Augering			Compiled by: NT
	ject Name:	Phase II Environmental Site		ment					g Machi		Track Mount		40.004		Reviewed by: MT
Loc	ation:	10192 Hwy 50, Brampton, ON						_ Date :	Started:			9 Date Completed: Jun	10, 201	-	Revision No.: 0
	LITH		SC	DIL SA	AMPLI	NG						LAB TESTING * Rinse pH Values	N		STING: 606450.93 THING: 4852124.65
Lithology Plot		DESCRIPTION Surface Elevation: 208.90 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO\ ∆ Inta ▲ Ren	/ane* ct nould ned She	on Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	2 4 6 8 10 12 Soil Vapour Reading A parts per million (ppm) 100 200 300 400 Lower Explosive Limit (LEL) # Passing 75 um (%) Moisture Content (%) Moisture Content (%) We Mwsup Atterberg Limits % 20 40 60 80 We	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	
	Loose crush 460 mm.	ned stone / asphalt pieces~ 208.4	ss	01	75		-								Top of Riser Elevation = 209.81 m; Height of Riser= 0.92 m
	FILL Brown to lig trace gravel	0.5 ht brown, stiff, silty CLAY,		02	84	8		208 -	0		· · · · · · · · · · · · · · · · · · ·				PP = 2.0 kg/ sq-cm Sample submitted for laboratory analysis: BH03-01 PP = 3.0 kg/ sq-cm Sample submitted for laboratory analysis:
		idized, some sand. 206.6		03	100	9	- 2	207 –							BH03-02 PP = 4.0 kg/ sq-cm
	NATIVE TIL Brown, hard CLAY, trace moist.	L 2.3 to very stiff, sandy silty sand, trace gravel, oxidized,	ss	04	100	40		206 -		0			Y		PP = 3.0 kg/ sq-cm PP = 4.5 kg/ sq-cm
	fine sand at	bottom. 205.3	ss	05	75	26	-			С					FF - 4.5 kg/ sq-cm
	Brown to bro trace gravel	ownish grey, compact, SAND,6 , silty clay seams, moist.		06	75	24	- - - - - - - -	205 –)					
	becomes ve	ery dense.	SS	07	0	50/ 50 mm	- - - - - - - - - - - -	204 -							Sample submitted for laboratory analysis: BH03-07
o 77 0	becomes co	ompact, wet.	SS	08	75	28		203 -		0					
0			ss	09	33	17	-		0				1 S 1		
	End of bore	202.2 hole. 6.7	2				-		-						Auger refusal.
	at 5.94 r at 4.57 r 2. Water t complet stem au 21, 2019	e was found to be caved-in mbgs with freestanding water mbgs upon completion. able was measured upon ion of drilling inside the hollow ger on June 24 and October 3. cket penetrometer.													
	»	$\frac{\nabla}{\overline{z}}$ Ground										Cave in depth record	led on co	ompletion	n of drilling: <u>5.94 m</u> .
401 Vau	C•LAVALIN Hanlan Rd ghan, Ontario L4 905-851-0090	4L 3T1 T Ground Borehole details from a qualified commisioned an	as prese	nted, do	not cons	titute a th	noroual	understa	anding of a	all poter	13 m. ntial conditions pre conjunction with th	esent and requires interpretative a he geotechnical report for which i	assistance it was)	Scale: 1 : 63 Page: 1 of 1

ient:	City of Brampton						Drilling	g Method:	150 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
oject Name:	Geotechnical Investigation- Je	ohnsto	n Tran	sit Fac	ility		Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
ocation:	10192 Hwy 50, Brampton, ON						Date S	Started:	Jun 3, 2019	_ Date Completed: Jun	3, 2019	_ F	Revision No.: 0
LITH		SO	IL SA	MPLI	NG				TESTING	LAB TESTING Rinse pH Values	N		TING: 606427.73 HING: 4852143.69
	DESCRIPTION Surface Elevation: 209.27 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	 Intact Remould Particular Strength (kPa) 	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 * Dessing 75 um (%) Molisture Content (%) Wp Atterberg Limits W 20 40 60 80	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
Loose overt	ourden asphalt~ 760 mm. 208.5	ss	01	67	18		209 -	0		°		22.53	
FILL Brown, firm, trace sand,	0.8 , silty CLAY, trace gravel, oxidized, rootlets, moist.	SS	02	75	6	- - 	208 -	0		₀ 24			PP = 3.5 Kg / sq.cm
NATIVE TIL Brown, very gravel, oxidi	stiff, sandy silty CLAY, trace	SS	03	100	32	- 2	-	0		o ¹⁶		21.37	
Brown, very clay, trace g	v dense, sandy SILT, trace 2.3 gravel, oxidized, moist.	SS	04	100	55		207 -		0	o ¹¹		22.63	PP = 4.5 Kg / sq.cm
- - - - - - - - -		ss	05	100	76	3	206 -		0	° ⁸			
	204.7					- 4	205 -						
	lense, SILT, trace clay, trace ^{4.6} n cobble pieces, moist.	SS	06	100	58	- 5	204 —		O	° ⁹			
Grey, dense broken cobb	203.2 9, gravelly SAND, trace silt, 6.1 ble pieces, moist.	SS	07	75	45	- - - - - - - - -	203 —	C)	o ¹²			
		ss	08	75	26	- 7 	202 -	0		o ¹²			
compact						- 8	201 -						
gravel, mois	100.1	SS	09	108	16/ 230 mm	- - - -	200 -			o ¹⁰	Ţ	23.73	PP = 3.5 Kg / sq. cm
at 4.57 r at 9.14 r 2. Water ta the hollo complet	e was found to be caved in mbgs with freestanding water mbgs upon completion. able was measured inside bw stem auger upon												
•))	$\sum_{i=1}^{n}$ Groundv	l vater de	pth on	comple	tion of	l drilling	g: <u>9.14</u>	<u> </u>		Cave in depth record	l ed on co	l mpletior	l n of drilling: <u>4.57 m</u> .

		OF BOREHOLE	No.	BH	05									BRAMPTON
	ject Number:	-						- '	g Location:		hole location plan			logged by: RM
	ent:	City of Brampton	labrata					-	g Method:		bllow Stem Augering			Compiled by: <u>NT</u>
	ject Name: ation:	Geotechnical Investigation- 10192 Hwy 50, Brampton, Ol		n Trar	ISIL Fac	anty		-	g Machine: Started:	Track Mount	9 Date Completed: Jun	21 2010		Reviewed by: <u>MT</u> Revision No.: 0
							-					1	-	
Γ	LIIH			JIL SA	AMPLI	NG		-		tion Testing	★ Rinse pH Values	NO		TING: 606381.35 HING: 4852181.74
LIUIUUUU FIUL		DESCRIPTION Surface Elevation: 209.82 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould 	DCPT Nilcon Vane* Intact Remould ear Strength (kPa)	2 4 6 8 10 12 Soil Vapour Reading A parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Passing 75 um (%) Moisture Content (%) * Atterberg Limits Wp_B Atterberg Limits W_L * W_L	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	FILI	ourden asphalt ~460 mm. 209 0.	5	01	51	9		-	0		° ¹⁰ ° ¹⁶			
	Brown, firm gravel, mois NATIVE TIL Brown, very	, silty CLAY, trace sand, trace st. L stiff to hard, sandy silty	.1	02	100	24		209 -	0		o ¹²			
V V V V	CLAY, trace	e to some gravel, moist.	SS	03	100	25	- 2	208 -	0		o ¹⁴			PP = 3.5 kg/ sq-cm
1111	becomes ha	ard	SS	04	100	47	Ē	207 -		0	o ¹¹			PP = 3.5 kg/ sq-cm
		206	.2	05	100	55	- 3			0	°10			
	at 2.59 u water up 2. Water ta complet hollow s	e was found to be caved-in mbgs with no freestanding oon completion. able was measured upon ion of drilling inside the item auger. icket penetrometer.												
)) C·LAVALIN	$\frac{\nabla}{z}$ No free	estanding	groun	dwater i	neasure	 ed in o	pen bor	ehole upon co	ompletion of dri	lling Cave in depth record	ed on co	mpletion	of drilling: <u>2.59 m</u> .
1 u	Hanlan Rd ghan, Ontario L 905-851-0090	4L 3T1 Borehole deta from a qualifie commisioned	d Geotech	nical Eng	ineer. Als	io, boreh	ole info	rmation sl	nding of all pote nould be read in	ential conditions pro	esent and requires interpretative a he geotechnical report for which i	issistance t was		Scale: 1 :

oject Number:	000120							g Location:		nole location plan			.ogged by: MF
ent:	City of Brampton						_ Drillin	g Method:	150 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
oject Name:	Geotechnical Investigation- J	ohnsto	n Tran	sit Fac	ility		Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
cation:	10192 Hwy 50, Brampton, ON						_ Date \$	Started:	Jun 3, 2019	_ Date Completed: Jun :	3, 2019	_ F	Revision No.: 0
LITH	OLOGY PROFILE	SC	IL SA	MPLI	NG			FIELD	TESTING		Z		TING: 606478.28
Local Ground	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	ear Strength (kPa)	Kinse pH Values 2 4 6 8 10 12 Soil Vapour Reading Δ parts per million (ppm) 100 200 300 400 Lower Explosive Limit (LEL) w Pasing 75 um (%) O Moisture Content (%) Atterberg Limits Wv 0 40 60 80	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4852063.42
Topsoil ~15 FILL		ss	01	59	4	E				₀ 25		18.80	
Brown, firm gravel, trac NATIVE TII				59	4		208 -						PP = 1.5 Kg / sq.cm
Brown, firm CLAY, trace	to very stiff, sandy silty e gravel, moist.	ss	02	100	12		-	0		o ¹⁹		21.12	PP = 3.0 Kg / sq.cm
		ss	03	51	17	- 2	207 -	0		o ¹⁵		20.76	PP = 1.5 Kg / sq.cm
Brown, den some clay,	se to very dense, sandy SIL 7,3 trace gravel, oxidized, moist.		04	100	59		206 —		0	o ¹⁰		22.78	PP = 3.5 Kg / sq.cm
		SS	05	100	39	- 3 - 3 	205 –	0		° ⁹		22.76	PP = 4.5 Kg / sq.cm
clay, trace s	204.0 se to very dense, SAND, trace6 silt, wet. A: 81%; SI: & CL: 18%	SS	06	100	36	- 5	204	0		o ¹⁷			
becomes ve	ery fine.	SS	07	100	51	- 6	202 -		0	o ¹⁷			
							201 -			4			
		SS	08	100	45	- 8	-	c)	0 ¹⁵			
						- 9	200 -						
	dense, SILT, trace to some 9.1 clay, trace gravel, wet. hole. 9.6	SS	09	100	100	-	- 199 -		(⊳ ° ¹⁰		23.23	PP = 4.5 Kg / Sq.cm
 Borehol at 3.05 at 9.14 Water to the holl completion 	le was found to be caved in mbgl with freestanding water mbgl upon completion. able was measured inside ow stem auger upon tion. cket Penetrometer.												
》	$\frac{\nabla}{2}$ Ground	vater de	pth on	comple	tion of	 drilling	g: <u>9.55</u>	<u>i m</u>		Cave in depth recorded	ed on co	mpletion	of drilling: <u>3.05 m</u> .

R	ECORD OF I	BOREHOLE	No.	BH	07									BRAMPTON
Pro	oject Number: 665125	5						_ Drilling	g Location:	As per borel	nole location plan		L	ogged by: MF
Clie	ent: City of	Brampton						_ Drilling	g Method:	150 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
Pro	ject Name: Geoted	chnical Investigation-	Johnsto	on Tran	nsit Fac	cility		Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
Loc	cation: 10192	Hwy 50, Brampton, ON	I					Date S	Started:	Jun 6, 2019	Date Completed: Jun	6, 2019	_ F	Revision No.: 0
	LITHOLOGY	Y PROFILE	SC	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING * Rinse pH Values	Z		TING: 606455.09
Lithology Plot		RIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould * Undrained Sh 	 Intact Remould ear Strength (kPa) 	2 4 6 8 10 12 Soil Vapour Reading A parts per million (ppm) 100 200 300 400 Lower Explosive Limit (LEL) * Passing 75 um (%) 0 Moisture Content (%) W	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4852082.45
	Local Ground Surface Topsoil ~200 mm.	Elevation: 208.46 m 208.		0	~	S			20 40	60 80	20 40 60 80	<u> </u>		PP = 4.5 kg/ sq-cm
עועי	FILL Brown, firm, silty CL rootlets, moist. NATIVE TILL	0.2 AY, trace sand, 207. 0.8	7	01	75	9		208 -	0		° ²⁰			PP = 3.5 kg/ sq-cm
		AY, trace sand, trace	SS	02	100	13		207 -	0		o ¹³			11 – 0.0 kg/ 94-011
0	Grey, compact,, sar some clay, oxidized		SS	03	100	25	- - - - 2		0		o 10			PP = 3.0 kg/ sq-cm
	becomes very dens	е	SS	04	100	61		206 -		0	° ⁸			
0 0			SS	05	100	50		205 —		0	o ¹⁴			
	Brown, dense, SAND, trace silt, some						4	204 —						
	Brown, dense, SAN oxidation, wet.	D, trace silt, some 4.6	ss	06	75	38	- 5	203 —	0		0 ¹⁷	∑ Ţ		
			SS	07	75	30	6	-	0		o ¹⁷			
				07	/5	30	- 7	202	Ŭ		v			
<u>}</u>		dense, sandy SILT, 7.6	3					201 -			18			
0	trace gravel, trace g	iravel, wet.	SS	08	100	44		200 -)	o ¹⁸			
0							- - - - - - - -							
	End of borehole.	198. 9.8		09	84	77		199 —		0	o ¹¹			
	 Notes: Borehole was for at 8.53 mbgs wi at 5.18 mbgs up Water table was completion of d hollow stem aug PP = pocket per 	th freestanding water oon completion. s measured upon Irilling inside the ger.												
1000000)) C·LAVALIN	$\frac{\nabla}{\Xi}$ Ground	lwater de	epth on	comple	tion of	drilling	g: <u>5.18</u>	<u>m</u>	<u>.</u>	Cave in depth record	ed on co	mpletion	of drilling: <u>8.53 m</u> .
401 Vau	Hanlan Rd Ighan, Ontario L4L 3T1 905-851-0090	Borehole detail from a qualified commisioned a	I Geotechi	nical Eng	ineer. Als	so, boreh	ole info	rmation sl	nding of all pote lould be read in	ntial conditions pro	esent and requires interpretative a he geotechnical report for which i	assistance t was		Scale: 1 : 63

R	ECORD	OF BOREH		lo.	BH	<u>08</u>									BRAMPTON
Pro	ject Number:	665125							Drilling	g Location:	As per borel	nole location plan		L	ogged by: MF
Clie	ent:	City of Brampton							_ Drilling	g Method:	150 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
	ject Name:	Geotechnical Inves		hnsto	n Tran	sit Fac	ility		-	g Machine:	Track Mount				Reviewed by: MT
Loc	cation:	10192 Hwy 50, Brar							_ Date S	Started:		_ Date Completed: Jun	7, 2019	- F	Revision No.: 0
	LITHO	OLOGY PROFILE		SO	IL SA	MPLI	NG				TESTING	Kinse pH Values	N		TING: 606431.9 HING: 4852101.46
Lithology Plot	Local Ground	DESCRIPTION Surface Elevation: 20 Jurden asphalt~ 360		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 O SPT MTO Vane △ Intact ▲ Remould 	 ◇ Intact ◆ Remould hear Strength (kPa) 	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	FILL	silty CLAY, trace sa	208.9 0.4	SS	01	59	17		209 -	0		° ⁷			
	gravel, mois		.,	SS	02	75	8	- - - - -	208 -	0		° ²⁸			PP = 3.5 kg/ sq-cm
		stiff to hard, sandy s to some gravel, oxid		SS	03	100	17	- 2		0		_o 20			PP = 4.0 kg/ sq-cm
	moist to wet.			SS	04	100	25		207 —	0		° ¹⁶			PP = 4.5 kg/ sq-cm
	becomes ha	ırd		SS	05	100	54		206 -		0	° ⁹			PP = 3.0 kg/ sq-cm
							70/ 280	4	205 -			12			PP = 4.0 kg/ sq-cm
				SS	06	100	mm	5	204 —			o ¹³	Σ		
	trace clay, w	act to dense, sandy \$ /et. : 1%; SI: 48%; & CL		SS	07	84	29	6	203 -	0		°20			
				SS	08	75	34		202 -	0		0 ²⁰			
								- 8	201 -						
0	trace to som	ne gravel		SS	09	75	24	9	200 —	0		° ⁹			
<u>.:rb</u>	End of boreh	hole.	199.5 9.8					-							
	at 6.71 n at 5.49 n 2. Water ta completi hollow st 3. PP = poo 4. GR., SA	e was found to be ca nbgs with freestandin hbgs upon completic ble was measured u on of drilling inside t tem auger. cket penetrometer. ., SI. & CL. denote G ilt & Clay respectively	ng water on. ipon he Gravel,												
)) C·LAVALIN		$\frac{\nabla}{\overline{\underline{z}}}$ Groundw	ater de	pth on	comple	tion of	drilling	g: <u>5.49</u>	m		Cave in depth record	ed on co	mpletion	of drilling: <u>6.71 m</u> .
Vau	Hanlan Rd ghan, Ontario L4 905-851-0090	∔L3I1 [fn	orehole details a om a qualified G ommisioned and	Seotechn	ical Engi	ineer. Als	o, boreh	ole info	rmation sl	nding of all pot nould be read in	tential conditions pro n conjunction with t	esent and requires interpretative a he geotechnical report for which it	ssistance was		Scale: 1 : 63 Page: 1 of 1

ect Number: nt:	City of Brampton						-	g Location: g Method:		hole location plan			Logged by: <u>MF</u> Compiled by: NT
ect Name:	Geotechnical Investigation- Jo	ohnsto	n Tran	sit Fac	ility		-	g Machine:	Track Moun				Reviewed by: MT
ation:	10192 Hwy 50, Brampton, ON	Jinioto	ii ii dii	on ruc	, inty		-	Started:		Date Completed: Jun	7, 2019		Revision No.: 0
LITH	OLOGY PROFILE	SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING		FAS	TING: 606385.52
	DESCRIPTION	e Type	Sample Number	ery (%)	Value	(m)	TION (m)	O SPT MTO Vane* △ Intact	ion Testing ● DCPT Nilcon Vane* ◇ Intact	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 400 ↓ Deterion 75 um (k)	INSTRUMENTATION INSTALLATION		HING: 4852139.52
	I Surface Elevation: 209.69 m	Sample Type	Sample	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION	Remould * Undrained She 20 40	 Remould ear Strength (kPa) 60 80 	▲ Lower Explosive Limit (LEL) * Passing 75 um (%) Moisture Content (%) <u>Atterberg Limits</u> W _P 20 40 60 80	INSTRU	Unit V (KN	
FILL	burden asphalt~ 300 mm. 209.4 0.3 / stiff, silty CLAY, trace gravel, 208.9	SS	01	59	25		209 -	0					PP = 3.0 kg/ sq-cm
NATIVE TII Brown, stiff		SS	02	100	14	- - - - -	200	0		o ¹⁶			PP = 4.0 kg/ sq-cm
becomes hat trace broke	ard n cobble pieces	SS	03	25	33	- 2	208 -	0		o ¹¹			PP = 4.0 kg/ sq-cm
		SS	04	100	32		207 -	0		0 ¹⁵			PP = 2.5 kg/ sq-cm
		SS	05	100	45	3		c)	o ¹³			PP = 4.0 kg/ sq-cm
						- 4	206 -						
becomes ve	ery stiff,	SS	06	84	24		205 -	0		o ¹¹	∑ Ţ		PP = 2.5 kg/ sq-cm
						- 6	204 -						
becomes h	ard	SS	07	84	72		203 -		0	o ¹⁰			PP = 3.0 kg/ sq-cm
	act, SAND, wet. 7.6					- 7	202 -						
Grey, comp	201.5	SS	08	84	26	- 8		0		o ¹²			
freestar upon co 2 Water t													Borehole could not be advanced below 8.23 m due to fall of a 1.52 m auger inside the hole.
hollow s	stem auger. ocket penetrometer.												
) ·LAVALIN	$\frac{\sum}{\overline{z}}$ Groundw	/ater de	pth on	comple	tion of o	drilling	g: <u>4.88</u>	<u>]</u> 3 m			<u> </u>		

R	ECORD	OF BOREHOLE N	lo.	<u>BH</u>	<u>10</u>								Ś	\rm BRAN	PTON
Pro	oject Number:	665125						Drilling	g Location:	As per borel	nole location plan		L	ogged by:	RM
Clie	ent:	City of Brampton						Drilling	g Method:	150 mm Ho	llow Stem Augering		(Compiled by:	NT
Pro	oject Name:	Geotechnical Investigation- Jo	ohnsto	n Tran	sit Fac	ility		Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by:	МТ
Loc	cation:	10192 Hwy 50, Brampton, ON						Date S	Started:	Jun 21, 201	9 Date Completed: Jun :	21, 2019	<u>)</u> F	Revision No.:	0
	LITH		SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING Rinse pH Values	z		TING: 606339.	
Lithology Plot	Local Ground	DESCRIPTION Surface Elevation: 210.64 m Jurden asphalt ~410 mm.	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould 	ear Strength (kPa)	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4852177 COMME	
	FILL	210.2 0.4 silty CLAY, trace sand, tra 2e 9.9	SS	01	84	43		210 —	с		0 ²⁵				
	\gravel, mois NATIVE TIL	st. 0.ø	SS	02	79	15	- - - - - -		0		0 ¹⁸				
	Brown, com	pact, sandy SILT, trace to 1.5 trace gravel, moist	SS	03	100	25	- - - - - - 2	209 —	0	· · · · · · · · · · · · · · · · · · ·	o ¹²			PP = 2.75 kg/ s	q-cm
	becomes ve	ery dense	SS	04	100	50/ 100 mm		208 -			° ⁹			PP = 3.5 kg/ sq	-cm
<u> </u>	End of bore	207.5 hole. 3.2	SS	05	100	50/ 100 mm	3				8			PP = 3.5 kg/ sq	-cm
	at 2.44 r water u 2. Water ta complet hollow s	e was found to be caved in mbgs with no freestanding pon completion. able was measured upon ion of drilling inside the tem auger. cket penetrometer.													
)) C·LAVALIN	$\frac{\nabla}{\Xi}$ No freest	tanding	ground	dwater i	neasure	ed in o	pen bore	I ehole upon co	mpletion of dril	lling	ed on co	mpletion	l ı of drilling: <u>2.</u>	<u>44 m</u> .
au	Hanlan Rd Ighan, Ontario L4 905-851-0090	4L 3T1 Borehole details from a qualified 0 commisioned and	Geotechr	nical Engi	ineer. Als	o, boreh	ole infor	mation sh	nding of all pote lould be read in	ntial conditions pre conjunction with th	esent and requires interpretative a he geotechnical report for which it	ssistance was			ale: 1 : 6

	oject Number: <u>665125</u>						-	g Location:		tole location					р т
	ient: <u>City of Brampton</u> oject Name: Geotechnical Investigation- Jo	hneto	n Tran	eit Fac	lity		-	g Method: g Machine:	GeoProbe	lid Stem Aug	jers			Compiled by: <u>N</u>	
	cation: 10192 Hwy 50, Brampton, ON	ministo	ii iiai	ISIL Fat	Jiity		-	Started:	Jun 5, 2019	Date Com	oleted: Jun	5. 2019		Revision No.: 0	<u>.</u>
_	LITHOLOGY PROFILE	SO	IL SA	MPLI	NG		-		TESTING				-	TING: 606315.93	
									ion Testing	★ Rinse pH Va 2 4 6	alues 8 10 12	TION		HING: 4852196.6	
· · · · (6-····	DESCRIPTION Local Ground Surface Elevation: 210.59 m Loose overburden asphalt~ 460 mm.	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 △ Intact ▲ Remould 	DCPT Nilcon Vane* Intact Remould ear Strength (kPa) 60 80	 Soil Vapor parts per mi 100 200 ▲ Lower Explo * Passing 75 ○ Moisture Cont Mitterbe Wp. 20 40 	usive Limit (LEL)	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMEN	TS
	210.1					-									
	FILL 0.5 Brown, silty CLAY, trace sand, very 209.8 Monist						210 -								
	NATIVE TILL Brown, very stiff, sandy silty CLAY, some oxidation, moist	SS	02	100	23		-	0		o ¹⁴					
		SS	03	100	27	- 2	209 —	0		°15					
1 1 1 1 1	becomes hard broken cobble pieces. 207.7	SS	04	100	44		208 -	C)	₀ 12				Borehole could no	ot
	End of borehole. 2.9 Notes:													advance due to te issue of drill rig.	echni
	 Borehole was found to be open and no freestanding water upon completion. 														
	≫) ∑ No freest	anding		dwater	neasur		non hor		mpletion of dri	ling					

Page: 1 of 1

ent:	City of Brampton						Drilling	g Method:	150 mm Ho	bllow Stem Augering		(Compiled by: NT
ject Name:	Geotechnical Investigation- Jo	ohnsto	n Tran	sit Fac	ility		Drilling	g Machine:	Track Mount	ted Drill		I	Reviewed by: MT
ation:	10192 Hwy 50, Brampton, ON						Date S	Started:	Jun 6, 2019	Date Completed: Jun	6, 2019	_ 1	Revision No.: 0
LITH		SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING Rinse pH Values	Z		TING: 606436.06 HING: 4852059.24
	DESCRIPTION Surface Elevation: 208.84 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould 	ion Testing DCPT Nilcon Vane* Intact Remould ear Strength (kPa) 60 80	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) # Passing 75 um (%) Moisture Content (%) Moisture Content (%) Wp Atterberg Limits 40 60 80 W_L	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
Topsoil ~20 FILL	0.2	SS	01	59	5		-	0		o ¹⁷			PP = 3.0 kg/ sq-cm
gravel, oxid	L 0.8						208 —						PP = 4.5 kg/ sq-cm
Brown, stiff, gravel, oxid	sandy silty CLAY, some ized, moist.	SS	02	100	13	1 - - -	-	0		o ¹⁸			
becomes ha	ard	SS	03	67	51	- - - - - 2	207 —		0	° ⁸			
		ST	04	33									
trace broke	n cobble pieces	ss	05	100	58	- 3 3 	206 —		0	്			PP = 4.5 kg/ sq-cm
						- 4	205 —						
GR: 11%; S	A: 29%; SI: 48%; & CL: 41%	SS	06	49	39	- - - - - - - - 5	204 —	0		å.			PP = 4.0 kg/ sq-cm
	200.7						203 -						
Grey, very of End of bore	202.7 Iense, SAND, moist. 202.5 hole. 6.4	SS	07	244	61				0	o ¹⁷			Auger refusal
at 5.49 r water up 2. Water ta complet hollow s 3. PP = po 4. GR., SA	e was found to caved in mbgs with no freestanding boon completion. able was measured upon ion of drilling inside the tem auger. cket penetrometer. x, SI. & CL. denote Gravel, ilt & Clay respectively.												
))	$\frac{\nabla}{\Xi}$ No frees	tanding	ground	dwater r	neasur	ed in o	pen bore	ehole upon co	mpletion of dri	Iling Cave in depth record	ed on co	mpletior	n of drilling: <u>5.49 m</u> .

R	ECORD	OF BORE	HOLE N	lo.	<u>BH</u>	<u>13</u>									BRAMPTON
Pro	ject Number:	665125							_ Drilling	Location:	As per borel	hole location plan		L	ogged by: MF
Clie	ent:	City of Brampton	1						_ Drilling	Method:	150 mm Ho	bllow Stem Augering		(Compiled by: NT
Pro	ject Name:	Geotechnical Inv	estigation- Jo	hnsto	n Tran	sit Fac	ility		_ Drilling	Machine:	Track Mount	ted Drill		F	Reviewed by: MT
Loc	ation:	10192 Hwy 50, Bi	rampton, ON						_ Date S	started:	Jun 6, 2019	Date Completed: Jun	6, 2019	- F	Revision No.: 0
	LITH	OLOGY PROFIL	.E	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING * Rinse pH Values	N		TING: 606389.68
Lithology Plot		DESCRIPTION Surface Elevation:	209.48 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould 	on Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould tar Strength (kPa) 60 80	$\label{eq:constraints} \begin{array}{c} 2 4 6 8 10 12 \\ \hline Soil \ Vapour \ Reading \\ \Delta parts per \ milion \ (ppm) \\ 100 200 300 400 \\ \hline \text{ Lowesr Explosive Limit \ (LEL) } \\ \# \ Partial \ 75 \ m, \ \% \\ \hline W_{\text{P}} \begin{array}{c} 20 40 60 80 \end{array} \\ \hline W_{\text{L}} \begin{array}{c} W_{\text{P}} \\ 20 40 60 80 \end{array} \\ \end{array}$	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4852097.3
	 Topsoil ~10 FILL 	0 mm.	209.4 0.1	SS	01	75	9	_	-	0		o ¹¹			
KK)	Brown, stiff, gravel, rootl NATIVE TIL		st. 208.7 0.8					-	209 —	9					PP = 3.5 kg/ sq-cm PP = 4.0 kg/ sq-cm
	Brown, very CLAY, trace moist.	stiff to hard, sand gravel, some oxic	y silty lation,	SS	02	84	20	1 - -	208 —	0		o ¹²			
				SS	03	100	25	2	-	0		o ¹¹			PP = 4.5 kg/ sq-cm
	becomes ha	ard		SS	04	100	31		207 —	0		°12			PP = 4.5 kg/ sq-cm
				SS	05	100	41	- 3	206 —	0		° ⁹			PP = 3.0 kg/ sq-cm
	Grey, dense some grave	a, SAND, trace silt, I, moist.	204.9 trace to 4.6	SS	06	33	45	4 	205	c)	o ¹⁶			
	Grey, hard, gravel, mois	sandy silty CLAY, t.		SS	07	100	37		203 —	0		o ¹³			PP = 3.5 kg/ sq-cm
	becomes ve	ery stiff		SS	08	100	25	- - - - - - 8 - - - - - - - - - - - - -	202 -	0		o ¹⁵			PP = 3.5 kg/ sq-cm
	Grey, very d trace gravel End of bore	-	e SILT, 200.3 9.1 199.9 9.6	SS	09	100	50/ 150 mm	9	200 —			o ¹⁰			
	Notes: 1. Boreholi at 8.53 r water up 2. Water ta complet hollow s	e was found to cav mbgs with no frees oon completion. able was measured ion of drilling inside tem auger. cket penetrometer	ved in tanding d upon e the												
1000000)) C·LAVALIN		$\frac{\nabla}{\Xi}$ No freest	anding	ground	lwater n	neasure	d in c	open bore	hole upon co	mpletion of dri	Iling Cave in depth record	ed on co	mpletion	of drilling: <u>8.53 m</u> .
Vau	Hanlan Rd ghan, Ontario L₄ 905-851-0090	4L 3T1	Borehole details from a qualified C commisioned and	Geotechn	ical Engi	ineer. Als	o, boreho	ole info	rmation sh	nding of all poter ould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which it	ssistance was		Scale: 1 : 63 Page: 1 of 1

R	ECORD	OF BOREI		lo.	<u>BH</u>	<u>14</u>									\rm BRAMPTON
Pro	ject Number:	665125							_ Drilling	g Location:	As per borel	nole location plan		I	_ogged by: MF
Clie	ent:	City of Brampton							_ Drilling	g Method:	150 mm Ho	llow Stem Augering		(Compiled by: NT
Pro	ject Name:	Geotechnical Inve	estigation- Jo	hnsto	n Tran	sit Fac	ility		_ Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
Loc	ation:	10192 Hwy 50, Br	ampton, ON						Date S	Started:	Jun 5, 2019	Date Completed: Jun	5, 2019	_ F	Revision No.: 0
	LITH	OLOGY PROFIL	E	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	z		TING: 606366.48
Lithology Plot		DESCRIPTION Surface Elevation:	209.94 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	ion Testing DCPT Nilcon Vane* Intact Remould ear Strength (kPa) 60 80		INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4852116.32
	Topsoil ~10 FILL	0 mm.	209, 8 0.1	SS	01	75	4		-			₀ 18			
·n v		·	sand, 209.2 0.8		01	10	-		-			5			PP = 3.0 kg/ sq-cm PP = 3.5 kg/ sq-cm
	Brown, very	e gravel, moist.		SS	02	100	16		209 -	0		o ¹⁸			
				SS	03	33	37	- 2	208 —	0		0 ¹⁸			PP = 2.5 kg/ sq-cm
	becomes gr	eyish brown		SS	04	84	43		-	C C		o ¹¹			PP = 3.0 kg/ sq-cm
	Brown, dense, sandy SILT, some clay, some gravel, some oxidation, moist.			SS	05	100	41	- 3	207 —	0		° ⁹			PP = 3.5 kg/ sq-cm
	becomes cc	ompact		SS	06	84	21	- 4	206	0		o ¹¹			PP = 4.0 kg/ sq-cm
	becomes gr	еу		SS	07	84	30	6	204	0		o ¹¹			PP = 4.5 kg/ sq-cm
	becomes de	ense to very dense		SS	08	92	45	- 8	202 -	с)	o ¹⁰			PP = 4.5 kg/ sq-cm
								- 9 - 1	201 -		~	o ¹¹			PP = 4.0 kg/ sq-cm
	at 9.14 r water up 2. Water ta complet hollow s	hole. e was found to cave mbgs with no freest oon completion. able was measured ion of drilling inside tem auger. iocket penetrometer.	upon the	SS	09	92	54				0	0			
100000)) C·LAVALIN		$\frac{\nabla}{\overline{z}}$ No freest	anding	ground	lwater r	neasur	ed in c	pen bor	ehole upon co	mpletion of dri	lling Cave in depth record	ed on co	mpletion	n of drilling: <u>9.14 m</u> .
401 Vau	Hanlan Rd ghan, Ontario L4 905-851-0090	4L 3 I 1	Borehole details from a qualified C commisioned and	Geotechn	ical Engi	neer. Als	o, boreh	ole info	rmation sl	nding of all pote lould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which it	assistance t was		Scale: 1 : 63 Page: 1 of 1

Pro Clie	ECORD oject Number: ent: oject Name:	OF BORE					ility		Drillin	g Location: g Method: g Machine:		hole location plan blid Stem Augers		L	ogged by: <u>SP</u> compiled by: <u>NT</u> Reviewed by: <u>MT</u>
	cation:	10192 Hwy 50, Br							-	Started:		Date Completed: Jun	5, 2019		Revision No.: 0
	LITH	OLOGY PROFIL	E	SO	DIL SA	MPLI	NG				TESTING	LAB TESTING Rinse pH Values	N		FING: 606343.29 HING: 4852135.36
Lithology Plot	Local Ground	DESCRIPTION	210.59 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 O SPT MTO Vane* △ Intact ▲ Remould 	tion Testing DCPT Nilcon Vane* Intact Remould rear Strength (kPa) 60 80	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Passing 75 um (%) • • ● Moisture Content (%) • • • • •	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	FILL Brown. silty	CLAY, trace sand,	210.1 0.5 very 209.8 0.8	SS	01	100	14		210 -	0		o ¹⁷			
	becomes v oxidized co	st to very moist. ery stiff to hard pres.		SS	02	100	28	- - - - 2	209 -	0		o ¹³	Ţ		
	broken cob	ble pieces.		SS	03	100	55		208 -		0	o ¹¹			
						100	52		207 -		0	o ¹⁶			
	End of bore	End of borehole. 200			05	100	57	- 4			0	o ¹⁰			
	freestar	le was found open v iding water at 1.40 ompletion.	with mbgs												
)) C·LAVALIN		$\stackrel{[]}{=}$ Groundw	ater de	pth on	comple	tion of	drilling	j: <u>1.4</u>	<u>m</u>		·			
Vau	Hanlan Rd Ighan, Ontario L 905-851-0090	4L 3T1	Borehole details from a qualified of commisioned and	Seotechn	nical Eng	ineer. Als	io, boreh	ole info	rmation s	nding of all pote hould be read in	ential conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which i	issistance t was		Scale: 1 : 63 Page: 1 of 1

Pro	oject Number:		E N	0.	BH	<u>16</u>			-	g Location:		nole location plan		L	BRAMPTON
	ent:	City of Brampton			_				-	g Method:		lid Stem Augers			Compiled by: <u>NT</u>
	oject Name:	Geotechnical Investigati		hnsto	n Tran	isit Fac	cility		-	g Machine:	GeoProbe	Data Completedu Jun	4 2040		Reviewed by: MT
LUG	cation:	10192 Hwy 50, Bramptor						1		Started:	· · ·	_ Date Completed: Jun	4, 2019	- ' 	Revision No.: 0
				SO	IL SA	MPLI	NG					LAB TESTING ★ Rinse pH Values 2 4 6 8 10 12	NO		TING: 606509.82 HING: 4851959.94
Lithology Plot		DESCRIPTION Surface Elevation: 208.06	m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 O SPT MTO Vane* △ Intact ▲ Remould 	tion Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	Topsoil ~ 15 FILL Brown, firm,	silty CLAY, trace sand,	207. <u>9</u> 0.2	SS	01	33	5		-	0		°30		18.93	PP = 1.25 Kg / sq.cm PP = 2.0 Kg / sq.cm
		anics, oxidized, moist. L sandy silty CLAY, trace broken cobble pieces,	207.3 0.8	SS	02	100	8		207 -	0		_o 20		20.81	
	hard some broke	n cobble pieces, very moi: 	st. _20 <u>5.8</u>	SS	03	51	40	- 2	206 -	0		₀ 18		23.02	
0	Light grey, v clay, trace g cobble piece	rery dense, sandy SILT, tr. ravel, oxidized, broken es, moist.	acê.3	SS	04	100	75		005		0	°12 °9	Ā	23.48	
) p	204.6 SS 05 91 10 End of borehole. 3.5								205 -			_o 19		22.07	
	Notes: 1. Boreholi freestan upon co 2. Water ta the holic complet 3. PP= Por	e was found to be open wi ding water at 2.60 mbgs mpletion. bible was measured inside w stem auger upon ion. cket Penetrometer.													
SN 401	State St	Borehole	e details a	as prese	nted, do	not cons	titute a th	orough	understa	nding of all pote	ntial conditions pr	esent and requires interpretative a	assistance		Scale: 1 : 63
	905-851-0090	commisi	ioned and	the acc	ompanyi	ing'Notes	to Record	rd of Bo	preholes'.	noulu de read in	conjunction with t	he geotechnical report for which it	u was		Page: 1 of 1

ject Name: Geotechnical Investigation-Johnston Transit Facility Drilling Machine: Track Mounted Drill Reviewed by: MT iation: 10192 Hwy 50, Brampton, ON Soil SAMPLING File D TESTING LAB TESTING East redit Jun 17, 2019 Date Completed: Jun 17, 2019 Reviewed by: MT LITHOLOGY PROFILE Soil SAMPLING File D TESTING LAB TESTING East redit Jun 17, 2019 Date Completed: Jun 17, 2019 Revision No.: 0 DESCRIPTION at a file of the provide the pr	oject Number: ent:	City of Brampton						_ `	g Location:		nole location plan			Logged by: <u>SP</u> Compiled by: NT
Image: delete delete delete del la construcción del construcción del la construcción del la construcción dela			hnsto	n Tran	sit Far	ility		_	-					
DESCRIPTION B <th< th=""><th>cation:</th><th>_</th><th>inioto</th><th>ii ii dii</th><th>on rue</th><th>Jiity</th><th></th><th></th><th>-</th><th>-</th><th></th><th>17, 2019</th><th></th><th></th></th<>	cation:	_	inioto	ii ii dii	on rue	Jiity			-	-		17, 2019		
DESCRIPTION 8 8 6 9 <th< th=""><th>LITHO</th><th>DLOGY PROFILE</th><th>SC</th><th>IL SA</th><th>MPLI</th><th>NG</th><th></th><th>_</th><th>FIELD</th><th>TESTING</th><th>LAB TESTING</th><th></th><th>FAS</th><th>TING: 606486 62</th></th<>	LITHO	DLOGY PROFILE	SC	IL SA	MPLI	NG		_	FIELD	TESTING	LAB TESTING		FAS	TING: 606486 62
Topological 200 mm. 201			Sample Type	sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)		 SPT MTO Vane* △ Intact ▲ Remould * Undrained Sh 	DCPT Nilcon Vane* Intact Remould ear Strength (kPa)	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 Lower Explosive Limit (LEL)	NSTRUMENTATION NSTALLATION	NORT	HING: 4851978.98
Note: Note: <th< td=""><td>Topsoil~200 FILL</td><td>mm. 208.1 0.2</td><td></td><td></td><td></td><td></td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td>PP = 1.5 kg/gg gm</td></th<>	Topsoil~200 FILL	mm. 208.1 0.2					-							PP = 1.5 kg/gg gm
gravel, broken cobble pieces, oxidized sears, molst. Si Ga	rootlets, moi	st. 207.5 0.8		02	75	16	- - - - - -				_21			
hard $\frac{8}{100}$ $\frac{10}{100}$ $\frac{30}{100}$ $\frac{30}{10}$ $\frac{30}{100}$ $\frac{30}{10}$ $\frac{30}{100}$ $\frac{30}{10}$ $\frac{30}{100}$ $\frac{30}{10}$ $\frac{30}{100}$ $\frac{30}{10}$					15			207 -						FF = 3.75 kg/ sq-cm
hard <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td>- 2</td><td>206 -</td><td>0</td><td></td><td></td><td></td><td></td><td></td></th<>							- 2	206 -	0					
Crey, very dense, sandy Sill, some class, moist SS 06 33 90775 205 Tace gravel, broken cobble pieces, moist SS 06 100 72 205 0 011 1 SS 06 100 72 5 0 011 <	hard	205.0	55	04	100			_00			0			due to presence of
$ \begin{array}{ c c c c c c } \hline \begin{tabular}{ c c c c c } \hline \begin{tabular}{ c c c c c c } \hline \begin{tabular}{ c c c c c c } \hline \begin{tabular}{ c c c c c c c } \hline \begin{tabular}{ c c c c c c c } \hline \begin{tabular}{ c c c c c c c } \hline \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	trace gravel,	ense, sandy SILT, some cla§.1	SS	05	33		- 3 	205 -			o ¹⁴			
$\begin{array}{c c c c c c c c c c c c c c c c c c c $							- 4	204 –						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $			SS	06	100	72	- 5			0	o ¹¹			
Grey, dense, SAND, trace silt, trace 6.1 gravel, wet. gravel, wet. gravely SS 07 100 32 200 - SS 08 100 32 -8 SS 09 100 80 - 199 - SS 09 100 80 - 199 - 199 - SS 09 100 80 - 199 - 190 -								203 –						
Image: Signature Image: Signature <td< td=""><td>gravel, wet.</td><td></td><td>SS</td><td>07</td><td>100</td><td>32</td><td>-</td><td>202 —</td><td>0</td><td></td><td>o¹³</td><td>=</td><td></td><td></td></td<>	gravel, wet.		SS	07	100	32	-	202 —	0		o ¹³	=		
Image: Signature Image: Signature <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>7</td> <td>201 -</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							7	201 -						
SS 09 100 80 199 0 o ¹⁰ 198.6 SS 09 100 80 199 0 o ¹⁰ End of borehole. 9.7 9 0 0 0 0 1. Borehole was found to be open with freestanding water at 6.0 mbgs upon completion. 0 0 0 0 2. Water table was measured upon completion. 0 0 0 0 0			SS	08	100	32	- 8		0		o ¹⁴			
SS 09 100 80 199 0 o ¹⁰ End of borehole. 9.7 9.7 0 0 0 Notes: 1. 9.7 0 0 0 1. Borehole was found to be open with freestanding water at 6.0 mbgs upon completion. 0 0 0 2. Water table was measured upon completion. 0 0 0 0								200 -						
End of borehole. 9.7 Notes: 1. Borehole was found to be open with freestanding water at 6.0 mbgs upon completion. 2. Water table was measured upon completion of drilling inside the hollow stem auger.		108.6	SS	09	100	80	9	199 -		0	o ¹⁰			
	Notes: 1. Borehole freestand completi 2. Water ta completi hollow st	ole. 9.7 was found to be open with ting water at 6.0 mbgs upon on. ble was measured upon on of drilling inside the em auger.					-							
Groundwater depth on completion of drilling: <u>6.0 m</u>	•													

ject Number:	OF BOREHOLE N 665125	10.		10			Drillin	g Location:	As per borel	nole location plan			BRAMPTC
ent:	City of Brampton						_	g Method:		llow Stem Augering			Compiled by: NT
ject Name:	Phase II Environmental Site A	Assess	ment				_	g Machine:	Track Mount				Reviewed by: MT
cation:	10192 Hwy 50, Brampton, ON						_	Started:	-	9 Date Completed: Jun	11, 2019		Revision No.: 0
LITHO		SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	z	EAS	TING: 606440.23
	DESCRIPTION Surface Elevation: 208.95 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	on Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4852017.03
	ned stone / asphalt pieces~ 208.5	SS	01	84		-							PP = 2.5 kg/ sq-cm
	silty CLAY, trace gravel, some oxidation, moist.	SS	02	62	7		208 —	0					PP = 3.0 kg/ sq-cm Sample submitted for laboratory analysis:
	207.4					Ē							BH18-02
NATIVE TILI Brown, very to some grav	stiff, sandy silty CLAY, trace	ss	03	54	25	- 2	207 -	0					PP = 2.5 kg/ sq-cm
becomes ha	ard	SS	04	67	90		-		0				PP = 4.5 kg/ sq-cm
trace broken	n cobbles	ss	05	100	65	3	206 -		0				
wet sand po	ockets	ss	06	92	40	- - - - - - - -	205 -	0					PP = 4.5 kg/ sq-cm
		ss	07	100	30	- - - - - - - - -	204 -	0					PP = 4.0 kg/ sq-cm
GR: 2%; SA	v: 13%; SI: 63%; & CL: 22%						203 -						PP = 3.5 kg/ sq-cm
		SS	08	100	31	- - - - - - 7	202 -	0		H			
	lense, silty SAND, trace clay7.6												
trace gravel gravel pocke	moist to wet ets.	SS	09	100	59	- 8	201 –		0				
						- - - - - - 9	200 -						
some clay End of boreh	199.2 hole. 9.8	SS	10	100	49				0				
at 9.14 n water up 2. Water ta completii hollow st 3. PP = poo 4. GR., SA	e was found to caved in mbgs with no freestanding bon completion. able was measured upon ion of drilling inside the tem auger. cket penetrometer. ., SI. & CL. denote Gravel, ilt & Clay respectively.												
))	$\stackrel{\sum}{=}$ No frees	I tanding	ground	lwater r	neasur	ed in c	pen bor	l ehole upon co	mpletion of dri	lling.	1	1	1

R	ECORD	OF BORE	HOLE N	lo.	BH	<u>19</u>									BRAMPTON
Pro	ject Number:	665125							Drilling	g Location:	As per borel	nole location plan		L	ogged by: MF
Clie	ent:	City of Brampton	1						Drilling	g Method:	150 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
Pro	ject Name:	Geotechnical Inv	estigation- Jo	ohnsto	n Tran	sit Fac	ility		_ Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
Loc	ation:	10192 Hwy 50, B	rampton, ON						Date S	Started:	Jun 13, 201	9 Date Completed: Jun	13, 2019	<u>)</u> F	Revision No.: 0
	LITH	OLOGY PROFIL	.E	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING * Rinse pH Values	N		TING: 606417.04
Lithology Plot	Local Ground	DESCRIPTION Surface Elevation:	209 24 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	ion Testing DCPT Nilcon Vane* A Intact Remould ear Strength (kPa) 60 80	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4852036.05
		ourden asphalt~ 76	60 mm.	SS	01	67		-	209 -			° ⁹			
	FILL Brown, firm, moist.	, silty CLAY, trace	208.5 0.8 gravel, 207.7	SS	02	100	7		208 —	0		₀ 26			PP = 2.5 kg/ sq-cm
	NATIVE TIL Brown, very CLAY, trace moist.	L stiff to hard, sand to some gravel, o	1.5 y silty	ss	03	100	23	- - - - - - - 2	207 —	0		o ¹⁰			PP = 4.0 kg/ sq-cm
			206.2	SS	04	84	39			0		° ₁₅			PP = 4.0 kg/ sq-cm
0		se to very dense, s some gravel parting		SS	05	100	47		206 -		C	° ⁹			PP = 3.0 kg/ sq-cm
	becomes gr	ey, some cobble p	articles	SS	06	60	50/ 125 mm	- 4 	205 -			о ⁹			
	becomes co some clay c			SS	07	33	17		203 -	0		o ¹³			PP = 3.5 kg/ sq-cm
		act, SAND, wet. dense, sandy SILT st.	<u>201.6</u> 7.6 <u>201.2</u> , trace 8.1	SS	08	67	22	- - - - - - - - - - - - - - - - - - -	201 —	0		o12 o13			
				SS	09	84	66	- - - 9 - -	200 -		0	° ⁹			
<u>¥</u>	at a dep freestan 2. Water ta complet hollow s	hole. e was found to be th of 8.84 mbgs w iding water upon c able was measured ion of drilling insid- tem auger. icket penetrometer	ith no ompletion. d upon e the					-							PP = 4.0 kg/ sq-cm
SNO)) C·LAVALIN		$\frac{\nabla}{\Xi}$ No freest	tanding	ground	dwater r	neasur	ed in o	pen bor	ehole upon co	mpletion of dri	Iling III Cave in depth record	ed on co	mpletion	n of drilling: <u>8.84 m</u> .
Vau	Hanlan Rd ghan, Ontario L4 905-851-0090	4L 3T1	Borehole details from a qualified 0 commisioned and	Geotechn	nical Engi	ineer. Als	o, boreh	ole info	rmation sl	nding of all pote nould be read in	ntial conditions pro conjunction with the	esent and requires interpretative a he geotechnical report for which it	ssistance was		Scale: 1 : 63 Page: 1 of 1

oject Number: ent:	City of Brampton						- •	g Location: g Method:		hole location plan			Logged by: <u>MF</u> Compiled by: NT
piect Name:	Geotechnical Investigation- J	ohnsto	n Tran	sit Fac	ility			g Machine:	Track Mount				Reviewed by: MT
cation:	10192 Hwy 50, Brampton, ON	onnoto	ii iiui	on ruc	,iiity			Started:		9 Date Completed: Jun	13, 2019		Revision No.: 0
	OLOGY PROFILE	sc	IL SA	MPLI	NG		-	FIELD .	TESTING	LAB TESTING		- EA9	TING: 606393.84
	DESCRIPTION						(m) M	Penetrat O SPT	ion Testing DCPT	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 400	INSTRUMENTATION INSTALLATION	NORT	HING: 4852055.08
Local Ground	Surface Elevation: 209.52 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION	MTO Vane* △ Intact ▲ Remould * Undrained Sha 20 40	Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	▲ Lower Explosive Limit (LEL) * Passing 75 um (%) O Moisture Content (%) Atterberg Limits W _P 0 40 60 80	INSTRUME INSTALLA	Unit Weight (KN/m3)	COMMENTS
Loose over	burden asphalt~ 760 mm.	SS	01	51			209 —			o ⁶			
	208.8 L 0.8 to hard, sandy silty CLAY, ne gravel, some oxidation,		02	84	14	- - - - - -	-	0		o ¹⁹			PP = 4.5 kg/ sq-cm
moist.		ss	03	100	15	- - - - - - 2	208 -	0		o ¹⁵			PP = 4.0 kg/ sq-cm
becomes h	ard	ss	04	33	30		207 —	0		o ¹⁴			PP = 4.0 kg/ sq-cm
		ss	05	100	54	3	206 —		0	° ⁹			PP = 3.5 kg/ sq-cm
						- - - - - - - - - - - - - - - - - - -	205 —			°9			
becomes g	reyish brown, very stiff.	SS	06	100	22	5	204 -	0		o			PP = 4.0 kg/ sq-cm
becomes h	ard.	ss	07	100	37		203 —	0		o ¹²			PP = 4.0 kg/ sq-cm
clay cores							202 —						
		ss	08	100	37	8	201 -	0		o ¹⁰			
	200.3	SS	09	100	50/ 75	9							
at a dep freestar 2. Water to complet hollow s	thole. 9.2 be was found to be caved in oth of 7.70 mbgs with no nding water upon completion. able was measured upon tion of drilling inside the stem auger. ocket penetrometer.				mm								
•))	$\frac{\sum}{z}$ No frees	tanding	ground	dwater r	neasure	ed in o	pen bor	hole upon co	mpletion of dri	I	led on co	mpletior	I n of drilling: <u>7.70 m</u> .

	ECORD OF		OLE N	lo.	BH	<u>21</u>			Deillie					<i></i>			\rm BRAI	
Clie	oject Number: <u>6651</u>	of Brampton								g Location: g Method:	_	<u>s per boreh</u> 00 mm Sol		•			ogged by: Compiled by:	<u>SP</u>
		technical Invest	igation- Jo	hnsto	n Tran	sit Fac	ility			g Machine:		eoProbe					Reviewed by:	
Loc	cation: 1019	2 Hwy 50, Bran	npton, ON						Date	Started:	J	un 5, 2019	Date	Completed: Jun	5, 2019	_ F	Revision No.:	0
	LITHOLO	GY PROFILE		SO	IL SA	MPLI	NG			FIELD	TE	STING		B TESTING	z		TING: 606370	
Lithology Plot	DES	CRIPTION	9 88 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane △ Intact ▲ Remould 	● * N ◇ hear S	Testing DCPT Ilcon Vane* Intact Remould Strength (kPa) 50 80	2 4 Soil V parts 100 ▲ Lower * Pas	pH Values 6 10 12 /apour Reading per million (ppm) 200 300 400 Explosive Limit (LEL) sing 75 um (%) re Content (%) terberg Limits etcherg Limits 40 60 80 80 60 80	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 485207	
	Loose overburder							Ē										
	FILL Brown silts CLA	(trace cond we	209.4 0.5 209.1															
	Brown, silty CLAY moist. NATIVE TILL Brown, stiff to har	d, sandy silty C	0.8 	SS	01	75	16	- - - - - -	209 -	0			13 •••					
	trace gravel, som GR: 9%; SA: 26%	e oxidation, moi 5; SI: 47%; & CL	st .: 18%	SS	02	100	25	- - - - - -	208 -	0			o ¹⁴					
	broken cobble pie	eces.		SS	02	100	79		-			0	<mark>0</mark> 10					
¢/{	Brown, dense, sil some gravel, wet.		<u>207.0</u> clay, 2.9			400	40		207 -				°8 °11		₽			
10	End of borehole.		206.2 3.7	SS	04	100	43	-			о —		0					
	upon complet 2. GR., SA., SI.	water at 3.05 mb ion. & CL. denote G	ogs ravel,															
	Sand, Silt & C	Clay respectively	Υ.															
)) C·LAVALIN		$\frac{\nabla}{2}$ Groundw	ater de	pth on	comple	tion of o	ı drilling): <u>3.05</u>	<u>m</u>			-	<u> </u>	1	1	L	
Tel: 905-851-0090 commisioned and the accompanying Notes to Record of Boreholes'.											Scale: 1 : 63 ige: 1 of 1							

		REHOLE N	lo.	BH	22/	MW:	<u>22</u>	Drillin			hale location plan			BRAMPTON
Clie	ject Number: <u>665125</u> ent: City of Brar	nnton							g Location: g Method:		hole location plan			Logged by: <u>MF</u> Compiled by: NT
		vironmental Site A	Assess	ment				_	g Machine:	Track Moun				Reviewed by: MT
		50, Brampton, ON						_	Started:		9 Date Completed: Jun	12, 201		Revision No.: 0
	LITHOLOGY PR	OFILE	sc	NL SA	MPLI	NG	1	-	FIELD	TESTING			- FAS	TING: 606347.46
										tion Testing	★ Rinse pH Values 2 4 6 8 10 12	NOIT		HING: 4852093.13
Lithology Plot	DESCRIPT		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane ³ △ Intact ▲ Remould * Undrained SI 20 40	DCPT Nilcon Vane* Intact Remould hear Strength (kPa) 60 80	Soil Vapour Reading a parts per million (ppm) 100 200 300 40 ▲ Lower Explosive Limit (LEL) * Passing 75 un (%) Moisture Content (%) W _p Atterberg Limits W _p 40 60 80 W _L	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	Loose crushed stone / as ~760 mm.		SS	01	67			210 -						Top of Riser Elevation = 211.08 m; Height of Riser= 0.86 m
	NATIVE TILL Brown, stiff, sandy silty C some gravel, oxidized, m		SS	02	75	11	- - - - - -	209 —	0			-		PP = 3.5 kg/ sq-cm
	becomes hard		SS	03	100	31	- 2	-	0					Sample submitted for laboratory analysis: BH22-03
	trace broken cobbles		ss	04	67	75		208 -		0				PP = 4.5 kg/ sq-cm
			ss	05	100	60	- 	207 -		0				PP = 4.5 kg/ sq-cm
	oxidized cores		SS	06	100	44	- - - - - - -	206 —		C				PP = 4.5 kg/ sq-cm
	becomes grey, gravelly s	and pockets.	ss	07	84	72				0				PP = 4.5 kg/ sq-cm
	becomes very stiff.		SS	08	100	29		205 -	0					Sample submitted for laboratory analysis: BH22-08
		203.5	SS	09	100	27		204 -	0					
<u>a er.</u>	End of borehole.	6.7					t							
	 Notes: Borehole was found i with no freestanding completion. Water table was mea completion of drilling stem auger on June 21, 2019. PP = pocket penetro. 	water upon Isured upon inside the hollow 24 and October												
-	»	au No frees	l tanding	ground	dwater i	measur	ed in c	open bor	ehole upon c	ompletion of dri	l Iling.	I		1
	C·LAVALIN	¥ Groundv								.76m.				
Vau	Hanlan Rd ghan, Ontario L4L 3T1 905-851-0090	Borehole details	as prese	nted. do	not cons	titute a t	horoual	h understa	nding of all pot	ential conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which i	assistance t was		Scale: 1 : 63 Page: 1 of 1

R	ECORD	OF BOREHOLE I	No.	BH	23									BRAMPTON
Pro	ject Number:	665125						Drillin	g Location:	As per bore	hole location plan		L	ogged by: SP
Clie	ent:	City of Brampton						Drilling	g Method:	100 mm So	lid Stem Augers		(Compiled by: <u>NT</u>
Pro	ject Name:	Geotechnical Investigation- J	ohnsto	n Tran	isit Fac	ility		Drilling	g Machine:	GeoProbe			F	Reviewed by: MT
Loo	cation:	10192 Hwy 50, Brampton, ON						Date S	Started:	Jun 3, 2019	_ Date Completed: Jun	3, 2019	_ F	Revision No.: 0
	LITHO	DLOGY PROFILE	SC	DIL SA	MPLI	NG				TESTING	Kinse pH Values	z		TING: 606301.07 HING: 4852131.2
Lithology Plot	Local Ground	DESCRIPTION Surface Elevation: 210.26 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	ion Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 ▲ Dever Explosive Limit (LEL) * * Moisture Content (%) ● Moisture Content (%) * Atterberg Limits W_L	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
'nУ	∖moist.	0.2 CLAY, trace sand, very 209.	ss	01	75	10		210 -	0		o ¹⁸		22.04	PP = 2.5 Kg / sq.cm
	NATIVE TIL Grey, compa CLAY, trace	L act to very dense, sandy silty gravel, oxidized, moist.	SS	02	100	26	- 1 	209 -	0		o ¹¹		22.31	
	broken cobb	le pieces.	SS	03	100	27	- 2	-	0		o ¹³		21.62	
	SS 04 100 73 0 0 0 22.25													
206.8 SS 05 100 207 - 0 ⁸ 21.58														
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$														
SNO)) C•LAVALIN Hanlan Rd	_								ompletion of dri				
Vau	ghan, Ontario L4 905-851-0090	L 3T1 Borehole details from a qualified commisioned a	Geotechr	nical Eng	ineer. Als	o, boreh	ole info	rmation sl	nding of all pote nould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which i	issistance t was		Scale: 1 : 63 Page: 1 of 1

R	ECORD	OF BOREHOLE N	lo.	BH	24								Ş	BRAMPTON
Pro	ject Number:	665125						Drilling	g Location:	As per borel	hole location plan		I	ogged by: SP
Clie	ent:	City of Brampton						Drilling	g Method:	100 mm So	lid Stem Augers		(Compiled by: NT
	ject Name:	Geotechnical Investigation- Jo	ohnsto	n Tran	isit Fac	ility		-	g Machine:	GeoProbe				Reviewed by: MT
Loc	cation:	10192 Hwy 50, Brampton, ON						_ Date S	Started:		_ Date Completed: <u>Jun</u>	4, 2019	_ '	Revision No.: 0
	LITH		SC	IL SA	MPLI	NG		-		TESTING	* Rinse pH Values	S		TING: 606490.79 HING: 4851936.75
Lithology Plot	Local Ground	DESCRIPTION Surface Elevation: 208.18 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould 	ion Testing ● DCPT Nilcon Vane* ◇ Intact ● Remould ear Strength (kPa) 60 80	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Pasing 75 um (%) W _P Wetter berg Limits W _P W ₂ W ₂ W ₄ W ₄ W ₄	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	Topsoil ~ 15 FILL Brown, firm,	0.2 silty CLAY, trace sand,	SS	01	75	5	-	208 -	0		o ^{.c}		19.23	PP = 1.25 Kg / sq.cm PP = 1.5 Kg / sq.cm
	NATIVE TIL	stiff, sandy silty CLAY, trace	SS	02	100	16	- 1	207 —	0		o ¹³		22.38	
trace to some broken cobble pieces. SS 03 100 27 2 206											°8		23.14	
		205.1	SS	04	100			-			o ¹⁰	_ ⊻	23.12	
	some clay, t	race gravel, wet. 204.5	SS	05	100	95	-	205 -		0	o ¹²	_	21.92	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $														
SNO)) C•LAVALIN Hanlan Rd	∑_ Groundw								ntial conditions	pront and possizes intervented	acciatera		
Vau	ghan, Ontario L4 905-851-0090	4L 3T1 Borenoie details from a qualified of commisioned an	Geotechn	ical Eng	ineer. Als	o, boreh	ole info	rmation sl	ould be read in	conjunction with t	esent and requires interpretative he geotechnical report for which	it was		Scale: 1 : 63 Page: 1 of 1

R	ECORD	OF BOREI		lo.	BH	25									🛃 BRAMP	TON
	ect Number:								Drilling	g Location:	As per borel	hole location plan		L	ogged by: SP	
Clie	nt:	City of Brampton							Drilling	g Method:	150 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>	
Proj	ect Name:	Geotechnical Inve	estigation- Jo	ohnsto	n Tran	sit Fac	ility		Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT	
Loc	ation:	<u>10192 Hwy 50, Br</u>	ampton, ON						_ Date S	Started:	Jun 17, 201	9 Date Completed: Jun	17, 2019	<u>)</u> F	Revision No.: 0	
	LITH	OLOGY PROFIL	E	SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	z		TING: 606444.4	
Lithology Plot		DESCRIPTION Surface Elevation:	208.65 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	ion Testing DCPT Nilcon Vane* Intact Remould ear Strength (kPa) 60 80	★ relinse privalities 2 4 6 8 10 12 Soil Vapour Reading Δ parts per million (ppm) 100 200 300 400 ★ Davies Limit (LEL) * Passing 75 um (%) O Moisture Content (%) Atterberg Limits Wp 20 40 60 80	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4851974.81	6
	Topsoil ~20 FILL	0 mm.	208.5 0.2	SS	01	46	13	L		0		021			PP = 1.5 kg/ sq-cm	
KH.	Brown, stiff, gravel, mois NATIVE TIL	L	and, trace 207.9 0.8			40			208 -			o ¹⁵			PP = 1.5 kg/ sq-cm	
		stiff to hard, sandy to some gravel, so noist.		SS	02	75	28		-	0		o ²¹				
				SS	03	0	70	- 2	207 —		0	o ¹²				
	broken cobb	ole pieces.		SS	04	12	100/ 250 mm		206 -			° ⁸	Ţ		Higher N value prob due to presence of cobbles.	ably
				ss	05	100	87	- 3	205 —		0	₀ 2			Higher N value prob due to presence of cobbles.	ably
000000000000000000000000000000000000000	Grey, very d gravelly SAt	tense, sandy GRAV ND, trace silt, mois	\overline{VEL} to $\frac{204.1}{4.6}$ t.	SS	06	100	50/ 125 mm	- 4	203			o ¹³				
	dense			SS	07	70	38	6	203	0		o ¹⁴				
0 0 0 0 0 0	compact			SS	08	51	11	- 8	201	0		o ¹⁹				
) 0	Grey, very d	lense, silty SAND,	wet. <u>199.5</u> 199.1 <u>199.1</u> 9.6	ss	09	100	86/ 280 mm	9 9 	-			0 ¹⁸ 0 ¹⁸				
	Notes: 1. Borehold freestan 2.56 mb 2. Water ta completi hollow s 3. PP = po	e was found to ope ding water at a dep gs upon completion able was measured ion of drilling inside tem auger. icket penetrometer.	en with oth of n. upon e the													
2202-220))		$\stackrel{\nabla}{=}$ Groundv	vater de	pth on	comple	tion of	drilling	g: <u>2.56</u>	m						
401 Vaug	• LAVALIN Hanlan Rd ghan, Ontario L4 905-851-0090	4L 3T1	Borehole details from a qualified commisioned an	Geotechn	ical Engi	neer. Als	o, boreh	ole info	rmation sl	nding of all pote nould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which it	ssistance was		Scale: Page: 1	

oject Number:							-	g Location:		hole location plan			.ogged by: MF
ent:	City of Brampton						-	g Method:		ollow Stem Augering			Compiled by: <u>NT</u>
oject Name:	Geotechnical Investigation-Jo	ohnsto	n Tran	sit Fa	cility			g Machine:	Track Moun				Reviewed by: MT
cation:	10192 Hwy 50, Brampton, ON						Dates	Started:		9 Date Completed: Jun	14, 2019	<u> </u>	Revision No.: 0
LITHO		SC	OIL SA	MPLI	NG				TESTING	* Rinse pH Values	NO		TING: 606398.01 HING: 4852012.85
Local Ground	DESCRIPTION Surface Elevation: 209.42 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	 Intact Remould ear Strength (kPa) 	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Passing 75 um (%) Moisture Content (%) Weight (%) Wp 4 6 80 WL	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
Loose overb	ourden asphalt~ 460 mm. 209.0	SS	01	67			209 —			0 ²⁴			
FILL Brown, firm,	0.5 silty CLAY, trace gravel, 208.7	1					203			o ¹¹			PP = 1.5 kg/ sq-cm
	0.8 L stiff, sandy silty CLAY, trace id, trace to some gravel,	SS	02	100	17	- - 1 -	208 -	0		o ¹⁶			PP = 4.0 kg/ sq-cm
oxidized, mo		SS	03	100	26	- 2	-	0		o ¹³			PP = 4.5 kg/ sq-cm
Brown, dens trace clay, s	ze to very dense, sandy SIL 72.3 ome gravel, oxidized, moist.	ss	04	100	36		207 -	0		o ¹⁰			PP = 4.5 kg/ sq-cm
		SS	05	100	70/ 250 mm	3	206 -			° ⁹	∑ ⊒		PP = 4.0 kg/ sq-cm
becomes sil	ty SAND	SS	06	84	52	- 4	205		0	o ⁷			
		SS	07	75	34	6	203 -	0					PP = 4.0 kg/ sq-cm
						- 7 - 7 	202 —						
		ss	08	67	73	- 8	-		0				PP = 3.5 kg/ sq-cm
						- 9	201 -						
sandy grave	l pockets	SS	09	73	51		200 -		0				
End of borel Notes:	199.7 hole. 9.7					-	-						
 Borehole at 8.79 r at 3.35 r Water ta completi hollow si 	e was found to be caved in mbgs with freestanding water mbgs upon completion. whe was measured upon ion of drilling inside the tem auger. cket penetrometer.												
)) • LAVALIN	$\frac{\nabla}{=}$ Groundv	vater de	pth on	comple	tion of o	drilling): <u>3.35</u>	m		Cave in depth record	ed on co	mpletion	of drilling: <u>8.79 m</u> .

ject Number:	665125							g Location:	As per borer	ole location plan		L	.ogged by: MF
ent:	City of Brampton						Drillin	g Method:	150 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
ject Name:	Geotechnical Investigation- Jo	hnsto	n Tran	sit Fac	ility		Drillin	g Machine:	Track Mount	ed Drill		F	Reviewed by: MT
ation:	10192 Hwy 50, Brampton, ON						Date \$	Started:	Jun 14, 2019	Date Completed: Jun	14, 2019	<u>)</u> F	Revision No.: 0
LITHO		SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING Rinse pH Values	N		TING: 606374.81
Local Ground	DESCRIPTION Surface Elevation: 209.68 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	ion Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	A thise privates 0 12 2 4 6 10 12 Soil Vapour Reading 10 12 10 12 parts per million (ppm) 100 200 300 400 Lower Explosive Limit (LEL) × Passing 75 um (%) Moisture Content (%) Wp Wp	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
Loose overb	ourden asphalt~ 760 mm.	SS	01	51		-							
	208.9 L 0.8 to very stiff, sandy silty CLAY, he sand, trace to some gravel,	SS	02	75	11	- - - - - - - - - -	209 -	0					PP = 4.0 kg/ sq-cm
oxidized, mc	oist.	SS	03	67	20	- - - - - -	208 -	0					PP = 4.5 kg/ sq-cm
becomes ha	ırd	SS	04	33	45		207 -	(þ				PP = 4.5 kg/ sq-cm
		SS	05	100	52	3	206 -		0				PP = 4.5 kg/ sq-cm
becomes bro	ownish grey, stiff.	SS	06	67	12	- 4	205 –	0					
Grey, compa	act, sandy GRAVEL, wet. 6.6	SS	07	84	10	- 6	204 – 203 –	0					PP = 4.0 kg/ sq-cm
Grey, compa	act, SAND, trace gravel, wet7.6	SS	08	100	16	- 8	202 -	0			Ē		PP = 3.5 kg/ sq-cm
	202.4						201 –						
Grey, hard, o some gravel End of boreh Notes:	199.9	SS	09	75	77	-	200 -		0				
 Borehole freestand upon cor Water ta completi hollow st 	e was found to be open with ding water at 7.62 mbgl mpletion. ible was measured upon ion of drilling inside the tem auger. cket penetrometer.												
)) C·LAVALIN	$\frac{\nabla}{\overline{z}}$ Groundw	ater de	pth on	comple	tion of o	 drilling	g: <u>7.62</u>	<u> </u>					

RI	ECORD	OF BORE	HOLE N	lo.	<u>BH</u>	<u>28</u>									BRAMPTON
Proj	ect Number:	665125							Drilling	g Location:	As per bore	hole location plan		L	ogged by: MF
Clie	nt:	City of Bramptor	1						_ Drilling	g Method:	150 mm Ho	ollow Stem Augering		0	Compiled by: <u>NT</u>
Proj	ect Name:	Geotechnical Inv	estigation- Jo	hnsto	n Tran	sit Fac	ility		Drilling	g Machine:	Track Moun	ted Drill		F	Reviewed by: MT
Loc	ation:	10192 Hwy 50, B	rampton, ON						Date S	Started:	Jun 14, 201	9 Date Completed: Jun	14, 2019	<u>)</u> F	Revision No.: 0
	LITH	OLOGY PROFIL	.E	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	z	EAS	TING: 606351.62
Lithology Plot		DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould		★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 400 400 ▲ Lower Explosive Limit (LEL) ★ Passing 75 un (%) Moisture Content (%) Wp ▲ Atterberg Limits Wp 40 60 80 W	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4852050.92
Lith		Surface Elevation:		San	San	Rec	SPI	B		* Undrained Sh 20 40	ear Strength (kPa) 60 80	W _P 20 40 60 80	NS NS NS	5	
	Loose over	ourden asphalt~ 76		SS	01	33			-						
	NATIVE TIL Brown, stiff trace to som	L to hard, sandy silt ne gravel, oxidized	209.1 0.8 y CLAY, l, moist.	SS	02	84	17	- 1 	209 -	0					PP = 4.5 kg/ sq-cm
				SS	03	67	55	- 2	208 -		0		Ā		
				SS	04	100	44		207 —	C)				PP = 4.0 kg/ sq-cm
0	Brown, very SAND, trace cobble piece	dense, sandy SIL e clay, trace grave es, moist	\overline{T} to silty 3.1 I, trace	SS	05	100	63	3			0				PP = 4.0 kg/ sq-cm
> 0								4	206 -						
0 0 0	becomes gr	ey, compact		SS	06	100	25	- 5	205 -	0					
0	dense			SS	07	84	36	- 6	204 -	0					
								- - - - - - 7	203 -						PP = 4.0 kg/ sq-cm
	broken cobb	ble pieces, compa	ct	SS	08	84	25	- 8	202 -	0					PP = 4.0 kg/ sq-cm
	becomes ve	ery dense		ss	09	116	50/ 150	- 9	201 —						
1.11.	End of bore	hole.	200.4 9.5	33	09	011	mm	-							PP = 4.0 kg/ sq-cm
	Notes: 1. Borehole at 7.01 r at 1.83 r 2. Water ta complet hollow s	e was found to be nbgs with freestar nbgs upon comple able was measure ion of drilling insid tem auger. cket penetrometer	nding water etion. d upon e the												
2))		$\overline{2}$ Groundw	ater de	pth on	comple	tion of	l	q: <u>1.83</u>	m		Cave in depth record	ed on co	mpletion	of drilling: <u>7.01 m</u> .
	LAVALIN		_ 0.00100		2.1.011				, <u>1.05</u>						<u></u>
Vaug	Hanlan Rd ghan, Ontario L₄ 905-851-0090	4L 3T1	Borehole details from a qualified 0 commisioned and	Geotechn	ical Engi	ineer. Als	o, boreh	ole info	rmation sl	nding of all pote nould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a the geotechnical report for which it	issistance t was		Scale: 1 : 63 Page: 1 of 1

	ECORD	OF BOREHOLE N	lo.	BH	<u>29</u>			Drillin	g Location:	As nor hora	hole location plan			BRAMPTON
Clie		City of Brampton						-	g Method:		lid Stem Augers			Compiled by: NT
	ject Name:	Geotechnical Investigation- Jo	ohnsto	on Tran	nsit Fac	ility			g Machine:	GeoProbe				Reviewed by: MT
	ation:	10192 Hwy 50, Brampton, ON						-	Started:		_ Date Completed: Jun	3, 2019		Revision No.: 0
	LITH	OLOGY PROFILE	sc	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING		FAS	TING: 606305.24
										ion Testing	★ Rinse pH Values 2 4 6 8 10 12	TION		HING: 4852088.98
Lithology Plot		DESCRIPTION Surface Elevation: 209.98 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 △ Intact ▲ Remould 	 DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80 	Soil Vapour Reading a parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Passing 75 un (%) O Moisture Content (%) W _p <u>Atterberg Limits</u> W _p <u>4 therberg Limits</u> W _p <u>4 therberg Limits</u>	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
		50 mm. 209.8 0.2 wn, firm, silty CLAY, trace iics, rootlets, moist. 209.2	00	01	51	6		-	0		o ²⁷		21.06	PP = 3.5 Kg / sq.cm
	NATIVE TI Grevish bro	200.2		02	100	15	- - - - - -	209 -	0		o ¹²		21.06	
	trace broke	n cobble pieces.	SS	03	100	26	- 2	208 -	0		o ¹²		22.66	
			SS	04	100	32		-	0		o ¹¹		22.93	
		206.4	ss	05	100	90		207 -		0	o ¹⁰		22.39	
	with no upon co 2. Water t the holl comple	e was found to be open freestanding water mpletion. able was measured inside bw stem auger upon												
)) C·LAVALIN	$\frac{\nabla}{\Xi}$ No frees	tanding	ground	dwater ı	neasure	ed in o	pen bor	ehole upon co	ompletion of dri	l lling.	<u> </u>	<u>.</u>	1
401	Hanlan Rd ghan, Ontario I	4L 3T1 Borehole details from a qualified commisioned an	Geotechr	nical Eng	ineer. Als	o. boreh	ole info	rmation s	nding of all pote rould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which i	assistance t was	•	Scale: 1 : 63

es'. iying r

RI	ECORD	OF BOREH	OLE N	lo.	BH	30/	MW3	<u>30</u>						🥮 BRAMPTON
Pro	ject Number:	665125							Drilling	g Location:	As per borel	hole location plan		Logged by: MF
Clie	ent:	City of Brampton							Drilling	g Method:	150 mm Ho	bllow Stem Augering		Compiled by: NT
Pro	ject Name:	Phase II Environme	ntal Site A	ssess	ment				Drilling	g Machine:	Track Mount	ted Drill		Reviewed by: MT
Loc	ation:	10192 Hwy 50, Bram	npton, ON						Date	Started:	Jun 11, 201	9 Date Completed: Jun	11, 2019	Revision No.: 0
	LITH	OLOGY PROFILE		SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING		STING: 606448.57 THING: 4851932.58
Lithology Plot		DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	EVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	ion Testing DCPT Nilcon Vane* Intact Remould ear Strength (kPa)	2 4 6 8 10 12 Soil Vapour Reading A parts per million (ppm) 100 200 300 400 Lower Explosive Limits (KLEL) ★ Parsing 75 un (%) (%) Winsture Content (%) W Atterberg Limits W W W W	INSTRUMENTATION INSTALLATION Unit Weight 20 KNima	
	Local Ground Topsoil ~20	Surface Elevation: 20 0 mm.	8.46 m 208.3	ű	ů	Ř	N N			20 40	60 80	[₩] °° ² 0 40 60 80 [₩]	zz A A	Top of Riser Elevation =
ИХ	FILL Brown, firm, moist. NATIVE TIL	silty CLAY, trace gra	0.2 vel, 207.7 0.8	SS	01	84	5		208 -	0				209.36 m; Height of Riser=0.88 m Sample submitted for laboratory analysis: BH30-01
	Brown, stiff, some grave	sandy silty CLAY, tra l, some oxidation, mo .: 28%; SI: 49%; & CL	ice to ist.	SS	02	100	12		207 -	0		₽-●		PP = 1.5 kg/ sq-cm PP = 2.0 kg/ sq-cm Sample submitted for laboratory analysis: BH30-02
	becomes ha	ard		SS	03	100	33	2	-	0				PP = 3.5 kg/ sq-cm
				SS	04	133	50		206 -		0			PP = 4.5 kg/ sq-cm
				SS	05	100	44	- 3 	205 -	С)			PP = 3.5 kg/ sq-cm
				SS	06	100	40	4		0				PP = 4.0 kg/ sq-cm
	becomes br	ownish grey, very stiff	f.	SS	07	100	28	- 5	204 -	0				PP = 3.5 kg/ sq-cm
000	Brown, very SAND, wet.	dense, gravelly SAN	D to 5.3	SS	08	100	50/ 125 mm		203 -					Sample submitted for
			202.3	SS	09	94	50/ 75 mm	6	8					laboratory analysis: BH30-08
	at 6.10 r water at	e was found to caved nbgs with freestandin 5.18 mbgs upon com	g pletion.											
	complet stem au 21, 201 3. PP = po 4. GR., SA	le was measured upo ion of drilling inside th ger on June 24 and C 9. cket penetrometer. , SI. & CL. denote Gi ilt & Clay respectively	ne hollow October ravel,											
	»		$\overline{\mathbb{Y}}$ Groundw	/ater de	pth on	comple	tion of a	l drillina	ı: <u>5.18</u>	<u> </u>		Cave in depth record	ed on completi	on of drilling: <u>6.1 m</u> .
	·LAVALIN		_ Groundw								<u>16 m</u> .			
Vaug	Hanlan Rd ghan, Ontario L₄ 905-851-0090	1L3I1 [fro	mehole details m a qualified C mmisioned and	Geotechn	ical Eng	ineer. Als	o. boreh	ole info	rmation s	nding of all poter nould be read in o	ntial conditions pro conjunction with t	esent and requires interpretative a he geotechnical report for which it	ssistance was	Scale: 1 : 63 Page: 1 of 1

R	ECORD	OF BORE	HOLE N	lo.	<u>BH</u>	<u>31</u>									🗱 BRAMPTON
Pro	ject Number:	665125							_ Drilling	g Location:	As per borel	nole location plan		L	ogged by: MF
Clie	ent:	City of Brampton							_ Drilling	g Method:	150 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
Pro	ject Name:	Geotechnical Inv	estigation- Jo	ohnsto	n Tran	sit Fac	ility		Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
Loc	cation:	10192 Hwy 50, Br	rampton, ON						_ Date S	Started:	Jun 17, 2019	9 Date Completed: Jun	17, 2019	<u>9</u> F	Revision No.: 0
	LITH	OLOGY PROFIL	E	SO	IL SA	MPLI	NG				TESTING	LAB TESTING * Rinse pH Values	NO		TING: 606402.18 HING: 4851970.64
Lithology Plot		DESCRIPTION Surface Elevation:		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	 Intact Remould ear Strength (kPa) 	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Passing 75 um (%) Moisture Content (%) Wp A Hower Support Wp 4 6 80	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	Loose overb	ourden asphalt~ 76	30 mm.	SS	01	67		-	-			° ⁸			
	NATIVE TIL Brown, stiff trace gravel	to very stiff, sandy	208.8 0.8 silty CLAY,	SS	02	59	9	- - - - - - - 1	209 -	0		o ¹⁸			PP = 4.5 kg/ sq-cm
		kidized, trace sand.		SS	03	100	17		208 -	0		0 ¹²			PP = 3.5 kg/ sq-cm
		e, sandy SILT, trac ne gravel, some ox		SS	04	100	31	- 2 - - - -	207 —	0		o ¹⁰			PP = 4.5 kg/ sq-cm
		n cobble pieces. d	ense	ss	05	41	42	- 3		C		o ¹¹	∑ =		PP = 4.5 kg/ sq-cm
	compact			SS	06	84	20	- 4	206 -	0		°9			
	broken cobb	ole pieces, wet.		SS	07	8	36	6	204	0		o ¹³			PP = 3.5 kg/ sq-cm
	Grey, comp	act, SAND, wet.	<u>202.0</u> 7.6	ss	08	16	16	- - - - - - 8	202 -	0		o ¹⁴			
								- - - - - - - - - - - - - 9	201 -						
			199.8	SS	09	84	28		200 -	0		o ¹⁰			
	at 7.92 r at 3.35 r 2. Water ta complet hollow s	hole. e was found to be mbgl with freestand mbgl upon complet able was measured ble was measured ion of drilling insid tem auger. icket penetrometer	9.8 caved in ding water tion. J upon le the												
10000			$\frac{\nabla}{\underline{-}}$ Groundw	ı /ater de	pth on	comple	tion of o	drilling	g: <u>3.35</u>	<u>i</u> m		Cave in depth record	ed on co	mpletion) of drilling: <u>7.92 m</u> .
401 Vau	C•LAVALIN Hanlan Rd ghan, Ontario L4 905-851-0090	4L 3T1	Borehole details from a qualified of commisioned and	Geotechn	ical Engi	ineer. Als	o, boreh	ole info	rmation s	nding of all pote nould be read in	ntial conditions pre conjunction with th	esent and requires interpretative a he geotechnical report for which it	ssistance was		Scale: 1 : 63 Page: 1 of 1

	ECORD	OF BOREHOL	LE No).	BH	<u>32</u>			Drillin	g Location:	As per borel	nole location plan			Degged by: SP
Clie	ent:	City of Brampton							Drilling	g Method:	100 mm So	lid Stem Augers		C	ompiled by: <u>NT</u>
Pro	ject Name:	Geotechnical Investiga	tion- Joh	nstor	n Tran	isit Fac	ility		Drilling	g Machine:	GeoProbe				eviewed by: <u>MT</u>
Loc	cation:	10192 Hwy 50, Brampto	on, ON						Date	Started:	Jun 4, 2019	_ Date Completed: Jun	4, 2019	_ R	evision No.: 0
	LITH			SO	IL SA	MPLI	NG				TESTING	LAB TESTING * Rinse pH Values	N		ING: 606378.98 IING: 4851989.67
Lithology Plot	Local Ground	DESCRIPTION Surface Elevation: 209.61 burden asphalt~ 760 mm.		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 O SPT MTO Vane* △ Intact ▲ Remould 	tion Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 Lower Explosive Limits Passing 75 um (%) 0 Moisture Content (%) Might Address Content (%) Atterberg Limits Wight Address Content (%) Wight Address Content (%)	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
		·	208.9						209 -				Ā		
	NATIVE TIL Light brown moist.	L , stiff, silty CLAY, trace sa	0.8 and, 208.1	SS	01	75	14	- - 1 - -	-	0		o ¹⁶		21.67	
		stiff, sandy silty CLAY, tr ble pieces, oxidized, mois	race1.5	SS	02	100	25	- 2	208 -	0		o ¹³		22.52	
hard SS 03 79 65 207 0 0 ¹¹ 22.76 22.76 23.29															
SS 04 100 57 206.0 0 ¹¹ 23.29															
											Image: section of the sectio				
	*))	⊻ c	Groundwat	er de	pth on	comple	tion of o	drilling	: <u>0.6</u>	<u>m</u>					
SNO 401 Vau	C•LAVALIN Hanlan Rd ghan, Ontario L 905-851-0090	4L 3T1 Boreho	le details as	preser	nted, do ical Eng	not cons ineer. Als	titute a th	orough	understa mation s	nding of all pote hould be read in	ntial conditions pro conjunction with the	esent and requires interpretative a he geotechnical report for which i	assistance t was		Scale: 1 : 63 Page: 1 of 1

	ECORD OF BOREHOI	LE No.	BH	133/1	MW:	<u>33</u>	_ Drillin	Location:	As per borel	nole location plan			BRAMPTON
Clie	ent: City of Brampton						_ Drilling	g Method:	200 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
Proj	ject Name: Phase II Environmenta	I Site Asses	sment				Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
Loca	ation: 10192 Hwy 50, Brampto	on, ON					_ Date \$	Started:	Jun 12, 201	9 Date Completed: Jun	19, 2019	9 F	Revision No.: 0
	LITHOLOGY PROFILE	S		AMPLI	NG			FIELD	TESTING		z		TING: 606355.8
Lithology Plot	DESCRIPTION	ample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould 		★ Rinse pH Values 2 4 6 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 44 10 12 Lower Explosive Limit (LEL) x Passing 75 um (%) 0 Moisture Content (%) wp 20 40 60 80 WL	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4852008.7
	Loose overbourden asphalt~ 760 mr	SS	01	52		-							Top of Riser Elevation = 210.77 m; Height of Riser =0.92 m
	NATIVE TILL Light brown, very stiff, sandy silty CL some silt, moist.	209.2 0.6 AY, SS	02	64	15	- - - - - - - -	209 -	0			Y		Sample submitted for laboratory analysis: BH33-02
		ss	03	100	17		-	0					Sample submitted for
	hard	ss	04	100	37	- - 2 -	208 -	0					laboratory analysis: BH33-03
		ss	05	100	30		207 -	0					
	very stiff	ss	06	85	20		-	0					
	becomes hard	ss	07	100	58	4	206 -		0				Sample submitted for laboratory analysis: BH33-07
		ss	08	72	61		205 -		0				
	some sand pockets	ss	09	31	36	- 5 - - -	-	0					
		ss	10	100	33	- - - - - -	204 -	0					
	trace to some sand.	ss	11	100	32		203 —	0			· · · · ·		
	End of borehole.	202.5 7.3	12	100	58	- 7 - -	-		0		· · · · ·		
	 Borehole was found to be open with no freestanding water upon completion. Water table was measured upon completion of drilling inside the h stem auger on June 24 and Octo 21, 2019. 												
									ompletion of dri	lling.	[
401 l Vaug	Hanlan Rd Boreho	Groundwater of the details as pre qualified Geotec sioned and the a	sented. do	o not cons	titute a t	horoual	n understa	nding of all pote	89 m. ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which it	ssistance was		Scale: 1 : 63 Page: 1 of 1

R	ECORD	OF BORE	HOLE N	lo.	<u>BH</u>	<u>34</u>									\rm BRAMPTON
Pro	ject Number:	665125							Drilling	g Location:	As per borel	hole location plan		L	ogged by: MF
Clie	ent:	City of Brampton							Drilling	g Method:	150 mm Ho	llow Stem Augering		(Compiled by: NT
Pro	ject Name:	Geotechnical Inv	estigation- Jo	ohnsto	n Tran	sit Fac	ility		Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
Loc	ation:	10192 Hwy 50, Br	ampton, ON						Date S	Started:	Jun 5, 2019	Date Completed: Jun	5, 2019	_ F	Revision No.: 0
	LITH	OLOGY PROFIL	E	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	z	EAS	TING: 606309.4
Lithology Plot		DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	(m) H.	ELEVATION (m)	Penetrat ○ SPT MTO Vane* △ Intact ▲ Remould	ion Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading parts per milion (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Passing 75 um (%) O Moisture Content (%)	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4852046.74
Lithol	Local Ground	Surface Elevation:	209.82 m	Samp	Samp	Reco	SPT '	DEPTH	ELEV	* Undrained Sh 20 40	ear Strength (kPa) 60 80	O Moisture Content (%) Atterberg Limits W _P 20 40 60 80	INST INST	Ω (K	
	Topsoil~ 18 FILL	0 mm. , silty CLAY, trace ç	209. <u>6</u> 0.2 gravel,	SS	01	67	5	-	-	0		o ²³			
	NATIVE TIL	L sandy silty CLAY,	209.1 0.8 trace to	SS	02	84	10	- - - 1 -	209 -	0		o ¹³			PP = 1.5 kg/ sq-cm
				ss	03	100	14	- 2	208 -	0		o ¹⁵			PP = 1.5 kg/ sq-cm
	becomes ha some oxidat			ss	04	100	32		207 —	0		o ¹¹			PP = 4.0 kg/ sq-cm
	GR: 5%; SA	A: 32%; SI: 38%; &	CL: 15%	SS	05	100	34	3	201	0		1 9			PP = 2.0 kg/ sq-cm
								- 4	206 -						
0 () 0 ()		lense, sandy GRA ay, trace broken co st.		SS	06	56	68/ 200 mm	- 5	205 -			o ¹³			
о о (<u>203.7</u> sand. 6.1					- 6	204 —						
	Grey, nard, some grave	clayey SILT, some I, moist.	sano, o.i	SS	07	0	18		203 —	0					
									-						PP = 4.0 kg/ sq-cm
				SS	08	84	58	8	202 —		0	o ¹⁶			
								- - 9	201 -						PP = 4.0 kg/ sq-cm
	End of bore	hole.	<u>200.1</u> 9.7	SS	09	100	42		-	0		o ¹²			
	at 8.84 r water up 2. Water ta complet hollow s 3. PP = po 4. GR., SA	e was found to cav mbgs with no frees bon completion. able was measured ion of drilling inside tem auger. cket penetrometer. ., SI. & CL. denote ilt & Clay respectiv	tanding I upon e the g Gravel,												
))		$\stackrel{\nabla}{=}$ No freest	tanding	ground	lwater r	neasure	ed in o	pen bor	ehole upon co	mpletion of dri	lling Cave in depth record	ed on co	mpletion	of drilling: <u>8.84 m</u> .
100000	·LAVALIN														
Vau	Hanlan Rd ghan, Ontario L4 905-851-0090	4L 3T1	Borehole details from a qualified 0 commisioned and	Geotechn	ical Engi	ineer. Als	o, boreho	ole info	rmation sl	nding of all pote hould be read in	ntial conditions pro	esent and requires interpretative a he geotechnical report for which it	ssistance was		Scale: 1 : 63 Page: 1 of 1

R	ECORD OF BOR	EHOLE N	lo.	BH	35/N	NW:	<u>35</u>							BRAMPTON
Pro	ject Number: 665125							Drillin	g Location:	As per borel	hole location plan		L	ogged by: MF
Clie	ent: City of Bramp	ton						Drillin	g Method:	150 mm Ho	bllow Stem Augering		(Compiled by: <u>NT</u>
Pro	ject Name: Phase II Envir	onmental Site A	ssess	ment				Drillin	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
Loc	ation: <u>10192 Hwy 50</u>	Brampton, ON						_ Date \$	Started:	Jun 12, 201	9 Date Completed: Jun	12, 2019	<u>)</u> F	Revision No.: 0
	LITHOLOGY PRO	FILE	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	z		TING: 606263.02
Lithology Plot	DESCRIPTIO		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	ion Testing DCPT Nilcon Vane* Intact Remould ear Strength (kPa) 60 80	$\begin{array}{c} \begin{array}{c} 2 & 4 & 6 \\ 2 & 4 & 6 \\ \end{array} \begin{array}{c} 10 & 12 \\ \hline \text{Soil Vapour Reading} \\ \text{parts per million (ppm)} \\ 100 & 200 & 300 & 400 \\ \hline \text{Lower Explosive Limit (LEL)} \\ & \text{* Passing 75 un (%)} \\ \hline \text{Obsture Content (%)} \\ & W_p \\ \hline \begin{array}{c} Multiple of the set of th$	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4852084.8
1	_Topsoil ~150 mm. FILL Brown, soft, silty CLAY, trac	209. <u>1</u> 0.2	ss	01	67	3		209 -						Top of Riser Elevation = 210.09m; Height of Riser= 0.90 m PP = 0.5 kg/ sq-cm
	moist. NATIVE TILL Brown, stiff to very stiff, san trace gravel, some oxidation		SS	02	100	10			0					PP = 3.0 kg/ sq-cm
	trace gravel, some oxidation	n, moist.	SS	03	100	27		208 –	0					Sample submitted for laboratory analysis:
					100	21	- 2	207 -						BH35-03 PP = 4.0 kg/ sq-cm
	becomes hard		SS	04	100	32			0					PP = 4.5 kg/ sq-cm
			SS	05	100	38		206 -	0					PP = 3.0 kg/ sq-cm
			SS	06	0	31	4	205 -	0					
	becomes brownish grey, sti	ff.	SS	07	100	14	- - - - - 5	204 -	0					Sample submitted for laboratory analysis: BH35-07
	becomes very stiff.		SS	08	0	20		204	0					
			ss	09	67	20		203 -	0					PP = 3.5 kg/ sq-cm
	Grey, very dense, silty SAN	<u>201.6</u> D, trace clay7.6	SS	10	67	50/ 150		202 –						
	broken cobble pieces, mois						8	201 –						
) (- - - - -	200 -						
	End of borehole. Notes:	199.5 9.8	SS	11	100	58	<u> </u>			0				PP = 4.5 kg/ sq-cm
	 Borehole was found to l with no freestanding wa completion. Water table was measu completion of drilling ins hollow stem auger on J and October 21, 2019. 	iter upon ired upon side the												
	*	$\frac{\sum}{\overline{\underline{z}}}$ No frees	tanding	ground	dwater r	neasur	 ed in c	open bor	ehole upon co	mpletion of dri	lling.			
	C·LAVALIN		vater de	pth obs	served o	on <u>21/</u>	10/201	19 at a de	epth of: <u>2.</u>	<u>39 m</u> .				
Vau	Hanlan Rd ghan, Ontario L4L 3T1 905-851-0090	Borehole details from a qualified (commisioned and	Geotechn	ical Engi	ineer Als	o horeh	ole info	rmation s	nding of all pote hould be read in	ntial conditions pro	esent and requires interpretative he geotechnical report for which	assistance it was		Scale: 1 : 63 Page: 1 of 1

R	ECORD	OF BOREHOLE N	lo.	<u>BH</u>	<u>36</u>									🗱 BRAMPTON
Pro	ject Number:	665125						Drilling	g Location:	As per borel	hole location plan		L	ogged by: MF
Clie	ent:	City of Brampton						_ Drilling	g Method:	150 mm Ho	bllow Stem Augering		(Compiled by: <u>NT</u>
Pro	ject Name:	Geotechnical Investigation- Jo	ohnsto	n Tran	isit Fac	ility		_ Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
Loc	cation:	10192 Hwy 50, Brampton, ON						Date S	Started:	Jun 19, 201	9 Date Completed: Jun	19, 2019	<u>)</u> F	Revision No.: 0
	LITH		SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING * Rinse pH Values	Z		TING: 606359.95
Lithology Plot	Local Ground	DESCRIPTION Surface Elevation: 209.51 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	 Intact Remould ear Strength (kPa) 		INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4851966.48
_	Topsoil~ 18						-				o ¹⁸			
עועי	FILL Brown, firm trace sand, NATIVE TIL	silty CLAY, trace gravel, moist. 208.8	SS	01	67	5		209 -	0		0.0			PP = 2.0 kg/ sq-cm
	Brown, very	stiff, sandy silty CLAY, trace vel, some oxidation, moist.	SS	02	4	19	- - - -	-	0		o ¹⁷			
			SS	03	100	17	- - - - - - 2	208	0		o ¹¹			PP = 4.5 kg/ sq-cm
		206.5	SS	04	100	24		207 —	0		o ¹¹			PP = 4.5 kg/ sq-cm
0	Brown, den trace clay, d	se, sandy SILT, some gravel3.1 xidized, moist.	SS	05	100	42		206 —	0		°0			PP = 4.5 kg/ sq-cm
0,0,0,0	becomes gr	ey, compact	SS	06	100	22	- 4	205	0		°8			
0	End of bore	202.8 hole. 6.7	SS	07	51	25	6	203 -	0		o ¹⁰			PP = 4.0 kg/ sq-cm
	Notes: 1. Borehol at 6.10 water up 2. Water ta complet hollow s	e was found to caved in mbgs with no freestanding oon completion. able was measured upon ion of drilling inside the tem auger. cket penetrometer.												
))	$\frac{\nabla}{\Xi}$ No freest	anding	ground	dwater i	neasur	ed in o	pen bor	ehole upon co	mpletion of dri	Iling	ed on co	mpletion	l n of drilling: <u>6.10 m</u> .
	C·LAVALIN													
Vau	Hanlan Rd ghan, Ontario L 905-851-0090	4L 3T1 Borehole details from a qualified of commisioned and	Geotechn	ical Eng	ineer. Als	io, boreh	ole info	rmation sl	nding of all pote nould be read in	ntial conditions pro conjunction with th	esent and requires interpretative a he geotechnical report for which it	issistance t was		Scale: 1 : 63 Page: 1 of 1

roject Number:	OF BOREHOLE N 665125	0.		<u>57</u>			Drillin	g Location:	As per borel	nole location plan			ogged by: <u>SP</u>
ent:	City of Brampton						Drillin	g Method:	100 mm So	lid Stem Augers		(Compiled by: NT
oject Name:	Geotechnical Investigation- Jo	hnsto	n Tran	sit Fac	ility		Drillin	g Machine:	GeoProbe			F	Reviewed by: MT
cation:	10192 Hwy 50, Brampton, ON						Date	Started:	Jun 3, 2019	_ Date Completed: Jun	3, 2019	_ F	Revision No.: 0
LITHO	OLOGY PROFILE	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING		EAS	FING: 606267.18
Local Ground	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	Intact	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 Lower Explosive Limit (LEL) * Passing 75 um (%) Moisture Content (%) Atterberg Limits W.●	INSTRUMENTATION INSTALLATION		COMMENTS
Local Ground Topsoil ~ 15 FILL	Surface Elevation: 208.68 m 50 mm. 208.5 0.2							20 40	60 80	W _P 20 40 60 80 W _L	ZZ	⊃ 20.02	
Dark grey, fi rootlets, orga NATIVE TIL	irm, silty CLAY, trace sand, anics, very moist. 207.9 L 0.8	SS	01	41	6		208 -	0					PP = 4.0 Kg / sq.cm
trace gravel,	to very stiff, sandy silty CLAY, , oxidized, moist.	SS	02	100	22			0		o ¹⁷		21.08	
Brown, very clay, some g moist.	dense, sandy SILT, trace 1.5 gravel, broken cobble pieces, 206.4	SS	03	100	50	- 2	207 -		0	o ¹⁴		21.70	
	ense, SILT, trace to some 2.3 clay, trace gravel, moist.	SS	04	100	76		206 -		0	°8		20.87	
	205.0	SS	05	100	52	- 3			0	° ⁸		23.55	
End of boreh Notes:	hole. 3.7												
the hollo completi	ible was measured inside ow stem auger upon ion. cket Penetrometer.												
)) C•LAVALIN Hanlan Rd	Borehole details	as prese	nted, do	not const	titute a th	norough	understa	nding of all pote	ompletion of dri	lling. esent and requires interpretative he geotechnical report for which	assistance		Scale: 1

R	ECORD	OF BOREHOLE	No.	BH	<u>138</u>									BRAMPTON
Pro	ject Number:	665125						_ Drillin	g Location:	As per bore	hole location plan		L	.ogged by: MF
Clie	ent:	City of Brampton						_ Drillin	g Method:	150 mm Ho	bllow Stem Augering		(Compiled by: <u>NT</u>
	ject Name:	Geotechnical Investigation		ton Tra	nsit Fa	cility		_	g Machine:	Track Moun				Reviewed by: MT
Loc	ation:	10192 Hwy 50, Brampton,	ON					_ Date :	Started:		_ Date Completed: Jun	4, 2019	- F	Revision No.: 0
	LITH	OLOGY PROFILE	8	OIL S	AMPL	ING		_		TESTING	LAB TESTING Rinse pH Values	N		TING: 606410.51 HING: 4851886.19
Lithology Plot	Local Ground	DESCRIPTION Surface Elevation: 208.65 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 O SPT MTO Vane* △ Intact ▲ Remould 	 Intact Remould Particular Strength (kPa) 	2 4 6 8 10 12 Soil Vapour Reading A parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) # Passing 75 um (%) Moisture Content (%) Atterberg Limits Wr 20 40 60 80 Wr	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	Top Soil ~ 1 FILL		08.5				-				₀ 19		20.95	
ИX	Brown, firm		0.2 SS 07.9 0.8		100	6		208 -	0					PP = 2.0 Kg / sq.cm
		stiff, sandy silty CLAY, trac	e ss	02	100	21			0		o ¹⁵		22.55	PP = 2.5 Kg / sq.cm
	broken cobl	ble pieces.	ss	03	100	21	- - - - 2	207 -	0		o ¹¹		20.89	PP = 2.5 Kg / sq.cm
	hard	-	05.6	04	100	41		206 -	0		°10		22.07	PP = 4.5 Kg / sq. cm
0	Brown, very clay, trace o	dense, sandy SILT, trace gravel, oxidized, moist.	3.1 SS	05	100	52		205 -		0	° ⁹		21.25	
		2, SILT, trace to some sand, , broken cobble pieces,	04.1 4.6 SS	06	92	48	- 4	204 -		5	o ⁹		21.70	
			SS	07	100	42	6	203 - 202 -	0		o ¹¹		20.89	
	Grey, very o	lense, SAND, trace silt, moi	0 <u>1.3</u> St.3 SS	08	100	50 / 100mm		201 -			o ¹⁸			
	Grev verv		99.5		100	50 /		200 -			o ¹³		23.75	
	gravel, mois End of bore Notes:	st. hole.	913 SS 993	09	100	100mm								
	at 3.35 at 6.10 2. Water ta the hollo complet	e was found to be caved in mbgs with freestanding wate mbgs upon completion. able was measured inside ow stem auger upon ion. cket Penetrometer.	r											
))	∑ No f	reestandi	ng grour	ndwater	measur	ed in c	open bor	ehole upon co	mpletion of dri	Iling Cave in depth record	ed on co	mpletion	of drilling: <u>3.35 m</u> .
SNO	C·LAVALIN													
Vau	Hanlan Rd ghan, Ontario L 905-851-0090	4L 3T1 Borehole d from a qual commision	ified Geoteo	hnical En	gineer. Al	so, boreh	ole info	ormation s	nding of all pote hould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which it	issistance t was		Scale: 1 : 63 Page: 1 of 1

	City of Brampton City of Brampton Geotechnical Investigation- Jo 10192 Hwy 50, Brampton, ON	hnsto	n Tran	sit Fac	ility		_ Drillin	g Method: g Machine: Started:	Track Mount	Illow Stem Augering ted Drill 9 Date Completed: Jun	17 2010	F	Compiled by: <u>NT</u> Reviewed by: <u>MT</u> Revision No.: 0
		SO		MPLI	NG				TESTING		17,201	-	
	DESCRIPTION		Sample Number			(m)	(m) MOI	Penetra ○ SPT MTO Vane* △ Intact	ion Testing ● DCPT Nilcon Vane* ◇ Intact		INSTRUMENTATION		TING: 606364.12 HING: 4851924.26 COMMENTS
Lo	ocal Ground Surface Elevation: 209.06 m	Sample Type	Sample	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION	 Remould * Undrained Sh 20 40 	 Remould ear Strength (kPa) 60 80 	* Passing 75 um (%) O Moisture Content (%) Atterberg Limits Wp 20 40 60 80	INSTRU	Unit V (KN/	
I	Fopsoil~ 100 mm. 209 A FILL 3 Brown, soft, silty CLAY, trace gravel, noist. 208.3	SS	01	67	4		-	0		_o 20			PP = 2.0 kg/ sq-cm
E t	VATIVE TILL 0.8 Brown, stiff to hard, sandy silty CLAY, race to some gravel, some oxidation, noist. 207.5	SS	02	84	14		208 -	0		o ¹⁶			PP = 4.5 kg/ sq-cm
	Brown to grey, compact, sandy SILT, 1.5 some gravel, trace clay, moist.	SS	03	100	21	- - - - - - 2	207 -	0		o ¹⁴			PP = 4.5 kg/ sq-cm
ł	becomes dense	SS	04	51	35			0		o ¹¹			PP = 4.0 kg/ sq-cm
		SS	05	100	35		206 -	0		° ⁹			
						4	205 -						
ł	becomes very dense	SS	06	84	54	- - - - - - - -	204 -		0	o ⁶			
ł	pecomes dense	SS	07	67	30	6	203 -	0		o ¹¹			PP = 3.5 kg/ sq-cm
							202 -						
ł	pecomes very dense	SS	08	12	98/ 250 mm		201 -			o ¹²			
	Grey, very stiff, clayey SILT, some sand 9.1					- - - - - - 9	200 -						
5	some broken cobble pieces, moist. 199.3	SS	09	0	29	-		0					
	End of borehole. 9.8 Notes:												
2	 Borehole was found to caved in at 7.92 mbgs with no freestanding water upon completion. Water table was measured upon completion of drilling inside the hollow stem auger. PP = pocket penetrometer. 												
•)	$\sum_{i=1}^{n}$ No freest	anding	ground	dwater r	neasur	ed in c	open bor	ehole upon co	mpletion of dri	Iling Cave in depth record	ded on co	mpletior	n of drilling: <u>7.92 m</u> .

R	ECORD	OF BOREHOLE	No.	BH	<u>40</u>									👬 BRAMPTON
Pro	ject Number:	665125						_ Drillin	g Location:	As per bore	hole location plan		L	ogged by: MF
Clie	ent:	City of Brampton						Drillin	g Method:	250 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
	ject Name:	Geotechnical Investigation-		n Tran	isit Fac	cility		-	g Machine:	Track Moun				Reviewed by: MT
Loc	ation:	10192 Hwy 50, Brampton, Of						_ Date \$	Started:		9 Date Completed: Jun	19, 2019	<u>)</u> F	Revision No.: 0
	LITH		sc	DIL SA	MPLI	NG				TESTING	* Rinse pH Values	NO		TING: 606317.73 HING: 4851962.3
Lithology Plot		DESCRIPTION Surface Elevation: 209.04 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	 Intact Remould ear Strength (kPa) 	2 4 6 8 10 12 Soil Vapour Reading A parts per million (ppm) 100 200 300 400 Lower Explosive Limit (LEL) * Passing 75 um (%) Moisture Content (%) Moisture Content (%) Wp. Wp. 40 60 80 Wc	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	Top soil ~15 FILL	0.	.9 2 SS	01	67	4	È	_	0		o ²⁴			
6H	moist. NATIVE TIL										13			PP = 2.0 kg/ sq-cm
		to stiff, sandy silty CLAY, , oxidized,moist.	SS	02	100	8		208 –	0		o ¹³			PP = 2.5 kg/ sq-cm
			SS	03	100	15	- 2	207 -	0		o ¹²			PP = 4.0 kg/ sq-cm
	becomes ha	ırd	ss	04	100	43			C)	°15			PP = 4.5 kg/ sq-cm
			ss	05	100	58		206 -		0	് ⁸			
							4	205 -						
	becomes ve	ery stiff	SS	06	100	25	- - - - - - - - - -	204 -	0		° ⁹			
	some clay c	ores						203 -						
		202		07	100	21	-		0		o ¹¹			PP = 2.5 kg/ sq-cm
	End of bore Notes:	hole. 6.	7											
	at 6.10 r 2. Water ta complet hollow s	e was found to be caved in nbgs upon completion, ible was measured upon ion of drilling inside the tem auger. cket penetrometer.												
))	∑ No free	standing	ground	dwater	measur	l ed in o	pen bor	l ehole upon co	ompletion of dri	Iling Cave in depth record	l ed on co	mpletion	of drilling: <u>6.10 m</u> .
401 Vau	C•LAVALIN Hanlan Rd ghan, Ontario L 905-851-0090	4L 3T1 Borehole detai from a qualifie commisioned	d Geotechi	nical Eng	ineer. Als	so, boreh	ole info	rmation s	nding of all pote nould be read in	ential conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which it	issistance t was		Scale: 1 : 63 Page: 1 of 1

RECORD	OF BOREHOLE N	lo.	<u>BH</u>	<u>41</u>									\rm BRAMPTO
roject Number:	665125						_ Drillin	g Location:	As per borel	hole location plan		l	ogged by: MF
ient:	City of Brampton						_ Drilling	g Method:	150 mm Ho	bllow Stem Augering		(Compiled by: NT
oject Name:	Geotechnical Investigation- J	ohnsto	n Tran	sit Fac	ility		Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
cation:	10192 Hwy 50, Brampton, ON						_ Date \$	Started:	Jun 5, 2019	_ Date Completed: _Jun	5, 2019	_ F	Revision No.: 0
LITH	OLOGY PROFILE	SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	z		TING: 606271.34
Local Ground	DESCRIPTION Surface Elevation: 207.62 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	ion Testing • DCPT Nilcon Vane* • Intact • Remould ear Strength (kPa) 60 80		INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4852000.36
Topsoil~ 15 FILL			01	75	5	-		0		0 ²⁵			PP = 2.5 kg/ sq-cm
trace sand, NATIVE TIL Brown, stiff	moist. 206.9 L 0.8 to hard, sandy silty CLAY,	SS	02	84	16	- - - - 1	207 -	0		o ¹³			PP = 4.0 kg/ sq-cm
trace grave	l, oxidized, moist.						206 -			12			PP = 3.0 kg/ sq-cm
		SS	03	100	17	2	-	0		o ¹²			
	204.6	ss	04	100	35		205 -	0		o ¹²			PP = 4.5 kg/ sq-cm
	ownish grey, dense very 3.1 dy SILT, some gravel, moist.	SS	05	100	66	- 3	204 -		0	°,9			PP = 4.5 kg/ sq-cm
becomes co	ompact	SS	06	100	22	- 5	203 —	0		o ¹¹			
cobble piec	es.	SS	07	16	29	- 6	202	0		o ¹⁶			
becomes ve	ery dense	SS	08	100	50/ 75 mm	- 7	200 -			o ¹¹			
becomes si	³ 198.3	SS	09	96	50/ 125	- 9	199 -			o ¹²			
Notes: 1. Borehol at 8.53 water u 2. Water ta complet hollow s	e was found to caved in mbgs with no freestanding pon completion. able was measured upon ion of drilling inside the stem auger. wcket penetrometer.												
	Borehole details	as prese	nted, do	not cons	titute a th	orough	n understa	nding of all pote	ntial conditions pro	Iling Cave in depth record	issistance		of drilling: <u>8.53 m</u> . Scale: 1 :

		OF BOREH	OLE N	lo.	BH	<u>42</u>								Ş	BRAMPTON
	ject Number:									g Location:		nole location plan			.ogged by: <u>SP</u>
	ent: ject Name:	City of Brampton Geotechnical Inves	tigation la	hnoto	n Tron	oit Eas				g Method: g Machine:	-	lid Stem Augers			Compiled by: <u>NT</u>
	ation:	10192 Hwy 50, Bran		misto	li irdi	ISIL Fac	inty			Started:	GeoProbe	Date Completed: Jun	3. 2019		Revision No.: 0
200		OLOGY PROFILE		50		MPLI	NG				TESTING	LAB TESTING	1	-	
		OLOGI PROFILE		30	ni 34		NG				tion Testing	LAB TESTING * Rinse pH Values 2 4 6 8 10 12	NO		TING: 606224.96 HING: 4852038.41
Lithology Plot		DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	DCPT Nilcon Vane* Intact Remould ear Strength (kPa)	Soil Vapour Reading △ parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Passing 75 um (%) ○ Moisture Content (%) Atterberg Limits Wp 20 40 60 80 WL	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	SILT, trace	stiff, silty CLAY to clay sand, organics, rootle		SS	01	100	8		-	0		0 ³⁰		19.76	PP = 3.5 Kg / sq.cm
	NATIVE TIL Brown, stiff trace gravel	L to very stiff, sandy sil , oxidized, moist.	0.8	SS	02	100	11		207 -	0		o ¹³		22.57	PP = 4.0 Kg / sq.cm
				SS	03	100	22	- 2	206 -	0		o ¹¹		22.06	
W	becomes ha			SS	04	100	77		-		0	° ⁹		22.59	
	broken cobl becomes gr	ble pieces. ey, sand pocket.		SS	05	100	79		205 -		0	° ⁹		21.49	
<u>*1</u> /	End of bore Notes:	hole.	<u>204.3</u> 3.7					<u> </u>							
	with no upon co 2. Water ta the hollo complet	e was found to be op freestanding water mpletion. able was measured ir w stem auger upon ion. cket Penetrometer.													
)) C·LAVALIN		$\frac{\nabla}{=}$ No freest	anding	ground	dwater r	neasure	ed in o	pen bor	ehole upon co	ompletion of dri	lling.			
Vau	Hanlan Rd ghan, Ontario L 905-851-0090	4L3I1 [fro	orehole details om a qualified C ommisioned and	Seotechn	ical Eng	ineer. Als	o, boreh	ole info	rmation sl	nding of all pote nould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which i	assistance t was		Scale: 1 : 63 Page: 1 of 1

R	ECORD	OF BOREHOLE N	lo.	BH	<u>43</u>									BRAMPTON
Pro	ject Number:	665125						Drilling	g Location:	As per borel	hole location plan		I	ogged by: SP
Clie	ent:	City of Brampton						Drilling	g Method:	100 mm So	lid Stem Augers		(Compiled by: <u>NT</u>
Pro	ject Name:	Geotechnical Investigation- Jo	hnsto	n Tran	sit Fac	ility		Drilling	g Machine:	GeoProbe			F	Reviewed by: MT
Loc	ation:	10192 Hwy 50, Brampton, ON						Date S	Started:	Jun 4, 2019	Date Completed: Jun	4, 2019	_ F	Revision No.: 0
	LITH		SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING * Rinse pH Values	z		TING: 606414.67
Lithology Plot	Local Ground	DESCRIPTION Surface Elevation: 208.67 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould 	ion Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80		INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4851843.97
	Topsoil ~ 15 FILL Brown, firm,	0.2 silty CLAY, trace sand, trace	SS	01	84	6	-	-	0		o ²³		19.34	PP = 2.0 Kg / sq.cm
	NATIVE TIL Brown, very	nics, rootlets, oxidized, moist _{7.9} L 0.8 stiff to hard, sandy silty gravel, oxidized, moist.	SS	02	100	25	- - - - - - -	208 -	0		o ¹³		23.01	PP = 2.0 Kg / sq.cm
	trace broker	n cobble pieces.	SS	03	100	28	2	207 —	0		o ¹²		23.00	
			SS	04	100 5	0/76mr	- - +	206 -			° ⁹		23.48	
	End of bore	205.5 hole. 3.1	SS	05	-63 5	0/76mr	_ 3		·····		o ⁴			
	Notes: 1. Borehol with no i upon co 2. Water ta the holic complet 3. PP= Por	e was found to be open irreestanding water mpletion. ible was measured inside w stem auger upon ior. cket Penetrometer.												
SNO)) C·LAVALIN	⊻ No frees	anding	ground	lwater n	neasure	ed in o	pen bor	ehole upon co	mpletion of dri	lling.			
Vau	Hanlan Rd ghan, Ontario L4 905-851-0090	4L 3T1 Borehole details from a qualified of commisioned and	Geotechn	ical Engi	ineer. Als	o, boreh	ole info	rmation sl	nding of all pote would be read in	ntial conditions pr conjunction with t	esent and requires interpretative a the geotechnical report for which i	ssistance was		Scale: 1 : 63 Page: 1 of 1

	OF BOREHOLE N	lo.	<u>BH</u>	<u>44</u>			Deillie	- 1 4	A				BRAMPTO
Project Number: Client:	City of Brampton							g Location: g Method:		hole location plan			.ogged by: <u>MF</u> Compiled by: NT
Project Name:	Geotechnical Investigation- Jo	hneto	n Tran	eit Eac	lity		_	g Machine:	Track Mount	Ilow Stem Augering			Reviewed by: MT
Location:	10192 Hwy 50, Brampton, ON	misio	n Iran	ISIL Fac	inty			Started:		9 Date Completed: Jun	19, 2019		Revision No.: 0
	OLOGY PROFILE	SO	II SA	MPLI	NG		-		TESTING			-	
							(m		tion Testing DCPT	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 400	ITATION ON	NORTI	TING: 606368.28 HING: 4851882.04
H ology F	DESCRIPTION Surface Elevation: 208.87 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION	MTO Vane* △ Intact ▲ Remould * Undrained Sh 20 40	 Intact Remould ear Strength (kPa) 	Lower Explosive Limit (LEL) * Passing 75 um (%) Moisture Content (%) Moisture Content (%) Wp	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
Top soil.	208.7 0.2 silty CLAY, trace gravel, 208.3	SS	01	51	10	-		0		° ²⁵			PP = 1.5 kg/ sq-cm
moist. NATIVE TIL Brown, very gravel, oxidi	0.6	SS	02	100	27	- - - - - - - -	208 -	0		o ¹²			PP = 3.75 kg/ sq-cm
		SS	03	100	26		207 -	0		o ²²			
	I, sandy silty CLAY, trace 2.3 e oxidized seams, very	SS	04	100	57		206 -		0	° ₁₃			
i moist.		SS	05	100	64	3			0	o ¹¹			
						- 4	205 -						
becomes we	et, trace broken cobble pieces	SS	06	75	54	- - - - - 5 -	204 -		0	o ²²			
becomes m		SS	07	20	50/ 100 mm	- 6	203 –			0 ¹⁴			
sand pocket	n cobbles					7	202 -						
sand pocket	ts.	ss	08	88	78		201 -		0	o ¹²	Ţ		
End of borel Notes:	200.7 hole. 8.2					- 8							
2. Water ta completi hollow s	whole was open and free- ter noted at 7.15 mbgs able was measured upon ion of drilling inside the tem auger. cket penetrometer.												
♦) NC·LAVALIN	ੁ 프 Groundw	/ater de	pth on	comple	tion of (drilling	j: <u>7.1</u> §	<u>5 m</u>					
11 Hanlan Rd aughan, Ontario L4 sl: 905-851-0090	4L 3T1 Borehole details from a qualified (commisioned an	Geotechn	ical Eng	ineer. Als	o, boreh	ole info	rmation s	nding of all pote hould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which i	issistance t was		Scale: 1 : Page: 1 of

RECORD	OF BOREHOLE N	o .	<u>BH</u>	<u>45</u>									Z BRAMPTON
Project Number:							-	g Location:		hole location plan			ogged by: MF
Client:	City of Brampton							g Method:		ollow Stem Augering			Compiled by: <u>NT</u>
roject Name:	Geotechnical Investigation- Jo	hnsto	n Tran	sit Fac	ility			g Machine:	Track Moun		20. 2040		Reviewed by: MT
ocation:	10192 Hwy 50, Brampton, ON							Started:		9 Date Completed: Jun	20, 2018	<u> </u>	Revision No.: 0
		SO	IL SA	MPLI	NG	-				LAB TESTING * Rinse pH Values	NO		TING: 606275.51 HING: 4851958.14
	DESCRIPTION Surface Elevation: 208.18 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	ion Testing DCPT Nilcon Vane* Intact Remould ear Strength (kPa) 60 80	2 4 6 8 10 12 Soil Vapour Reading A parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Passing 75 um (%) Moisture Content (%) Moisture Content (%) Wp. ▲ Miterberg Limits Wp. 40 60 80 WL	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
Topsoil ~15 FILL	0.2	SS	01	67	4	Ē	208 -			o ²¹			DD = 1.5 kg/sg sm
sand, moist	207.4						-			o ¹⁴			PP = 1.5 kg/ sq-cm PP = 3.5 kg/ sq-cm
trace sand, oxydation, n Become ver	trace to some gravel, some noist.	SS	02	84	11		207 -	0					PP = 4.5 kg/ sq-cm
Rroup borg		SS	03	100	23	- - 2	206 -	0		o ¹¹			PP = 4.5 kg/ sq-cm
trace to son	I, sandy SILT, some clay, 2.3 ne gravel, moist, oxidized.	SS	04	100	32		-	0		് ⁸			FF - 4.3 kg/ sq-cill
		SS	05	109	51		205 —		0	° ⁸			
	203.6					- - 4 -	204 -						
	stiff, clayey SILT, some sandf.6 he gravel, moist.	SS	06	25	12	5	203 -	0		o ¹¹			PP = 3.0 kg/ sq-cm
trace clay, c	-	SS	07	67	32	6	202 -	0		° ⁹			
End of bore	hole. 6.7					F							
2. Water ta complet hollow s	e was found to be open upon completion. able was measured upon ion of drilling inside the tem auger. cket penetrometer.												
•)) IC · LAVALIN	$\frac{\sum}{z}$ No freest	anding	ground	lwater r	neasur	l ed in o	pen bor	l ehole upon co	mpletion of dri	Iling Cave in depth record	l ed on co	l mpletion	of drilling: <u>6.10 m</u> .
1 Hanlan Rd ughan, Ontario L4 I: 905-851-0090	4L 3T1 Borehole details from a qualified (commisioned and	Seotechn	ical Engi	ineer. Als	o, boreh	ole info	rmation sl	nding of all pote nould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which i	issistance t was		Scale: 1 : 6 Page: 1 of

R	ECORD	OF BOREHOLE N	lo.	BH	<u>46</u>								Ş	BRAMPTON
Pro	ject Number:	665125						Drilling	g Location:	As per bore	hole location plan		L	ogged by: SP
Clie	ent:	City of Brampton						Drilling	g Method:	100 mm So	lid Stem Augers		(Compiled by: NT
Pro	ject Name:	Geotechnical Investigation- Jo	ohnsto	n Tran	isit Fac	ility		Drilling	g Machine:	GeoProbe			F	Reviewed by: MT
Loc	cation:	10192 Hwy 50, Brampton, ON						Date S	Started:	Jun 3, 2019	Date Completed: Jun	3, 2019	_ F	Revision No.: 0
	LITH	OLOGY PROFILE	SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	7	EAS	TING: 606229.13
Lithology Plot		DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	♦ Intact♦ Remould	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Passing 75 un (%) ○ Moisture Content (%) Atterberg Limits W.■	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4851996.19 COMMENTS
Lift	Local Ground Topsoil ~ 15	Surface Elevation: 207.61 m		Sar	Rec	SP	DE		* Undrained Sh 20 40	ear Strength (kPa) 60 80	W _P 20 340 60 80	N N N	5	
	organics, ro	0 mm. 207.5 0.2 ilty CLAY, trace sand, otlets, moist. 206.8	SS	01	92	10		207 -	0		0 ²⁵		20.30	PP = 4.0 Kg / sq.cm
	NATIVE TIL Brown, com gravel, oxid	pact, sandy silty CLAY, trace	SS	02	100	17	- - 1 -	-	0		o ¹²		22.00	
			SS	03	100	25	- - - 2	206 -	0		o ¹¹		21.35	
	very dense		SS	04	100	55		205 -		0	° 9		22.60	
	gravel, brok	, SILT, some sand, trace 3.1 en cobble pieces, oxidized,	SS	05	100	68	- - - -	-		0	_12 _9		21.07 23.65	No Plasticity
	moist. GR: 3%; SA End of bore Notes:	<u>.: 13%; SI: 76%; & CL: 8% ^{203.9}</u> hole. 3.7						204 -			°°		20.00	
	with no supon co 2. Water ta the holic complet 3. PP= Po 4. GR., SA Sand, S	cket Penetrometer. ., SI. & CL. denote Gravel, ilt & Clay respectively.												
		$\sum_{i=1}^{n}$ No freest	anding	ground	dwater r	neasure	ed in o	pen bor	ehole upon co	mpletion of dri	lling.			
401 Vau	C • LAVALIN Hanlan Rd Ighan, Ontario L4 905-851-0090	4L 3T1 Borehole details from a qualified (commisioned and	Geotechr	nical Eng	ineer. Als	o, boreh	ole infoi	rmation sl	nding of all pote nould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which i	ssistance was		Scale: 1 : 63

R	ECORD	OF BOREHOLI	E No.	BH	47								Ş	BRAMPTON
Pro	ject Number:	665125						_ Drillin	g Location:	As per borel	hole location plan		L	.ogged by: MF
Clie	ent:	City of Brampton						_ Drillin	g Method:	150 mm Ho	ollow Stem Augering		0	Compiled by: <u>NT</u>
Pro	ject Name:	Geotechnical Investigatio	n- Johnst	on Trar	nsit Fac	cility		Drillin	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
Loc	cation:	10192 Hwy 50, Brampton,	ON					_ Date S	Started:	Jun 18, 201	9 Date Completed: Jun	19, 2019	9 F	Revision No.: 0
	LITH	OLOGY PROFILE	S		AMPLI	NG			FIELD	TESTING	LAB TESTING	z		TING: 606372.46
Lithology Plot		DESCRIPTION Surface Elevation: 208.76 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	on Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80		INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4851839.81
	Top soil~ 20 FILL		208.6 0.2 SS	01	67	10	-	-	0		o ¹⁸			PP = 1.71kg/ sq-cm
	moist. NATIVE TIL	L stiff, sandy silty CLAY, son	208.0 0.8	02	100	27		208 —	0		015			
		n cobble pieces.	ss	03	100	27		207 -	0		_o 16			
	Brown, very	dense, sandy SILT, some	206.5				- 2 	-			o ¹¹			
	ciay, trace g	ravel, moist	SS	04	100	51	- - - 3	206 -		0	0''			
0	trace broker	n cobble pieces	SS	05	100	56		205 —		0	° ⁹			
0	becomes lig	ht grey.	ss	06	100	46	- 4)	o ¹⁰			
0							- - - - - - -	204 -						
	Final of hours		SS 202.8	07	100	51	-	203 -		0	° ⁹			
	End of borel Notes:	nole.	5.9											
		e was found to be dry and completion.												
	completion hollow s	ble was measured upon on of drilling inside the tem auger. cket penetrometer.												
		1												
))		freestandin	g groun	dwater	measur	ed in o	pen bor	ehole upon co	mpletion of dri	lling.			
	C•LAVALIN Hanlan Rd		lataile ···	onted d	not	414			nding of all suc		econt and receive interview	a alata		
Vau	ighan, Ontario L4 905-851-0090	4L 3T1 Borenole c from a qua commision	letails as pres lified Geotech ned and the ac	ented, do inical Eng company	jineer. Als ing'Notes	so, boreh so, to Reco	iole info rd of Bo	rmation sl rreholes'.	noung of all pote nould be read in	conjunction with t	esent and requires interpretative a he geotechnical report for which i	issistance t was		Scale: 1 : 63

RECORD	OF BOREHOLE N	lo.	BH	<u>48</u>									\rm BRAMPTON
Project Number:	665125						_ Drilling	g Location:	As per borel	nole location plan		L	ogged by: MF
Client:	City of Brampton						_ Drillin	g Method:	150 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
Project Name:	Geotechnical Investigation- Jo	ohnsto	n Tran	isit Fac	ility		Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
_ocation:	10192 Hwy 50, Brampton, ON						_ Date S	Started:	Jun 17, 201	9 Date Completed: Jun	17, 2019	<u>)</u> F	Revision No.: 0
LITHO	OLOGY PROFILE	SO	IL SA	MPLI	NG		_		TESTING	LAB TESTING Rinse pH Values	Z		TING: 606326.06 HING: 4851877.86
1 ypolon	DESCRIPTION Surface Elevation: 208.72 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould 	ion Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 Lower Explosive Limit (LEL) * Passing 75 um (%) Moisture Content (%) Atterberg Limits WP We 20 40 60 80	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
Topsoil ~100 FILL Brown firm	0 mm. 208,6 9.1 silty CLAY, trace sand, trace	SS	01	75		-	-			o ²⁰			
gravel, mois	t. 208.0	SS	02	84	10	- - - - - - -	208 -	0		o ²⁶			PP = 3.0 kg/ sq-cm
gravel, oxidi							-						PP = 4.0 kg/ ag am
become ver	y stiff, some sand pockets	SS	03	100	22	- 2	207 -	0		0 ¹¹			PP = 4.0 kg/ sq-cm
GR: 5%; SA	: 24%; SI: 49%; & CL: 22%	SS	04	100	30		206 —	0		o ¹¹			PP = 4.5 kg/ sq-cm
	dense, silty SAND, trace 205.7 3.1 ravel, oxidized cores, moist.	SS	05	67	54	3			0	° ⁸			PP = 4.0 kg/ sq-cm
dense		SS	06	8	42	- 4	205	0		o ¹⁷			
		SS	07	92	45	6	203 -	C)	o ¹⁰			No sample recovery
> very dense		_\$\$_		0 \$:0/50mr	8	201 -						
	199.6			400-	0/400	- 9	-			_9			
End of borel Notes: 1. Borehole at 8.23 r water re 2. Water ta completi hollow si 3. PP = po 4. GR., SA	ense, sand, trace silt, moist995 hole. 9.2 e was found to caved in hbgs with no freestanding ported upon completion. ble was measured upon ion of drilling inside the tem auger. cket penetrometer. ., SI. & CL. denote Gravel, ilt & Clay respectively.	_ 33	09	1005	0/100m	nti							
•))	$\frac{\sum}{=}$ No frees	tanding	ground	dwater r	neasure	ed in c	open bor	ehole upon co	mpletion of dri	lling Cave in depth record	ed on co	mpletion	n of drilling: <u>8.23 m</u> .
NC · LAVALIN													
1 Hanlan Rd ughan, Ontario L4 l: 905-851-0090		Geotechn	ical Engi	ineer. Als	o, boreh	ole info	rmation sl			esent and requires interpretative a he geotechnical report for which it			Scale: 1 : Page: 1 of

ient:	Number:	City of Brampton							_	g Location: g Method:		nole location plan			logged by: <u>MF</u> Compiled by: NT
	Name:	Geotechnical Investigatio	n- Joh	nstor	n Tran	sit Fac	cility		_	g Machine:	Track Mount				Reviewed by: MT
ocatio		10192 Hwy 50, Brampton,								Started:	-	Date Completed: Jun	4, 2019		Revision No.: 0
	LITHO			SO		MPLI	NG			FIELD	TESTING	LAB TESTING	Ι_	EAS	TING: 606279.68
					er				(E)	Penetra	tion Testing	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading	ATION	NORTI	HING: 4851915.92
Lo		DESCRIPTION Surface Elevation: 208.27 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (r	MTO Vane* △ Intact ▲ Remould	Nilcon Vane* ◇ Intact ◆ Remould hear Strength (kPa)	Soil Vapour Reading △ parts per million (ppm) 100 20 300 400 ▲ Lower Explosive Limit (LEL) × Passing 75 un (%) O Moisture Content (%) ▲ Atterberg Limits Wp 20 40 60 80	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
F		silty CLAY, trace gravel,		SS	01	67	6	-	208 -	0		_o 26		18.71	PP = 2.0 Kg / sq.cm
N B	ATIVE TILI	L stiff, sandy silty CLAY, trac	07.5 0.8 e	SS	02	100	13		207 -	0		° ²²		20.73	PP = 2.5 Kg / sq.cm
G	iR: 4%; SA:	: 26%; SI: 49%; & CL: 21%		SS	03	100	13	- - - - - - - - 2		0		o ¹⁵		20.57	PP = 4.0 Kg / sq.cm
				SS	04	100	23		206 -	0		0 ¹²		21.79	PP = 4.0 Kg / sq.cm
		dense, sandy SILT, some clay, oxydized, moist.		SS	05	100	54		205 —		0	° ⁹		23.71	PP = 4.5 Kg / sq.cm
								- - - - -	204 -						
	ace clay, m	ense, SILT, trace gravel,	4.6	SS	06	100	50	- - - - - - - -	203 -		0	o ¹⁰		26.23	
								- 6							
				SS	07	84	63		202 -		0	°8		23.26	
							50 /	- 7 - 7 	201 –			o ¹²		23.04	
				SS	08	100	150 mm	8	200 -			0			
g		ense, silty SAND, trace	99.1 9.1 98.7 9.5	SS	09	95	82 / 230 mm	- - - - - - -	199 —			° ⁹		23.37	
E N	nd of boreh otes: . Borehole	nole. e was found to be caved in nbgs with no freestanding	<u> </u>												
2	water up Water ta the hollor completion PP= Pool GR., SA.	on completion. ble was measured inside w stem auger upon													
•))	AVALIN		reestar	nding	ground	lwater i	measur	ed in c	open bor	ehole upon c	ompletion of dri	lling Cave in depth record	led on co	mpletion	of drilling: <u>8.23 m</u> .

Pro	oject Number: 60		E No.	B	H50/	/MW	/50		g Location:		nole location plan		L	BRAMPTON
		ity of Brampton eotechnical Investigation	lohnst	on Tra	ncit Ea	cility		-	g Method:	250 mm Ho	Ilow Stem Augering			Compiled by: <u>NT</u>
		0192 Hwy 50, Brampton,		on Ira	IISIL Fa	cinty		-	g Machine: Started:	-	9 Date Completed: Jun:	21, 2019		Reviewed by: <u>MT</u> Revision No.: 0
		OGY PROFILE			AMPL	NG	1			TESTING	LAB TESTING	 		
										tion Testing	K inse pH Values 2 4 6 8 10 12	NOI		TING: 606233.29 HING: 4851953.98
Lithology Plot	Local Ground Su	ESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould * Undrained Sh 20 40 	 Intact Remould ear Strength (kPa) 	$\label{eq:solution} \begin{array}{ c c c c c c } \hline Soil Vapour Reading \\ \hline Soil Vapour Reading \\ 100 200 300 400 \\ \hline Lower Explosive Limit (LEL) \\ \# Passing 75 um (%) \\ O Moisture Content (%) \\ \hline W_p \hline Atterberg Limits \\ W_p \hline 40 & 60 & 80 \\ \hline \end{array}$	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	Topsoil ~170 n FILL Brown, firm, sil moist.	ty CLAY, trace gravel,	07.4 0.2 SS	01	67			207 -			o ³¹			
	NATIVE TILL Brown, firm to	very stiff, sandy silty some gravel, moist.	06.8 0.8 SS	02	75	8	- - 1 -	-	0		o ²¹	-		PP = 1.5 kg/ sq-cm
	becomes oxyd	ized.	SS	03	16	25	- - - - - - 2	206 -	0		₀ 23			PP = 1.5 kg/ sq-cm
			SS	04	92	26		205 -	0		°10			PP = 4.5 kg/ sq-cm
			SS	05	84	17	3	204 —	0		o ¹⁰			PP = 4.5 kg/ sq-cm
	becomes grey.		SS 01.5	06	92	18	5	203 -	0		o ¹¹			PP = 3.5 kg/ sq-cm
	Grey, very den SAND, some g	se, silty SAND to gravel ravel, some silt, moist.		07	92	60	- - - - - - - - - - - - - - - - - - -	201 -		0	o ¹³			
			SS	08	100 5	50/125m	- - - - - - - 8 -	200 -			°9			
0		1	98.3 <u>SS</u>	09	1005	50/125m	- - - - - - - - - - - - - - - - - - -	199 —			° ₉			
<u></u>	at 6.10 mb at 5.18 mb 2. Water table	e. vas found to caved in gs with freestanding wate gs upon completion. e was measured upon of drilling inside the hold	9.3 :r											
	•))	⊻ No f	reestandin	g grour	dwater	measure	l ed in o	pen bor	l ehole upon co	ompletion of dri	Iling Cave in depth record	l ed on co	l mpletion	of drilling: <u>7.75 m</u> .
	C·LAVALIN	-	indwater o							<u>80 m</u> .				<u></u>
Vau	Hanlan Rd ghan, Ontario L4L 3 905-851-0090	Borehole de BT1 from a qual	tails as pres	sented, do	o not cons	stitute a th	norough	understa	nding of all pote	ntial conditions proceeding of the proceeding of the processing of the processing of the proceeding of the proceeding of the processing of	esent and requires interpretative a he geotechnical report for which it	issistance t was		Scale: 1 : 63 Page: 1 of 1

	ECORD	OF BOREHOLE N 665125	lo.	BH	51/	MW.	<u>51</u>	Drillin	g Location:	As per borel	hole location plan			BRAMPTON
Clie	nt:	City of Brampton						Drilling	g Method:	150 mm Ho	bllow Stem Augering		(Compiled by: <u>NT</u>
Pro	ject Name:	Phase II Environmental Site	Assess	ment				Drilling	g Machine:	Track Mount	ted Drill		I	Reviewed by: MT
Loc	ation:	10192 Hwy 50, Brampton, ON						Date S	Started:	Jun 11, 201	9 Date Completed: Jun	11, 2019	<u>9</u> I	Revision No.: 0
	LITH		SC	DIL SA	MPLI	NG				TESTING	LAB TESTING ★ Rinse pH Values 2 4 6 8 10 12	TION		TING: 606376.62 HING: 4851797.58
Lithology Plot	Local Ground	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould * Undrained Sh 20 40 	 Intact Remould ear Strength (kPa) 	$ \begin{array}{r} Soil Vapour Reading \\ \ \ \ \ \ \ \ \ \ \ \ \ $		Unit Weight (KN/m3)	COMMENTS
	FILL Brown, firm	50 mm. 208.8 0.2 , silty CLAY, trace gravel, ne sand, rootlets, moist.	ss	01	84	7			0					209.94 m; Height of Riser= 1.00 m PP = 2.0 Kg / sq.cm
		207.5		02	100	7		208 -	0					Sample submitted for laboratory analysis: BH51-02 PP = 2.5 Kg / sq.cm
		L 1.5 stiff, sandy silty CLAY, trace wel, trace sand, oxidised,	SS	03	100	17	- 2	207 —	0			Y		PP = 4.0 Kg / sq.cm
				04	100	17		206 -	0					
0 - 0 - 7		se to very dense, sandy SILT3.1 , trace to some sand, oist.	SS	05	100	30 50 /		-	0					PP = 4.5 Kg / sq. cm
	some grave	1	SS	06	100	125 mm	- - - -	205 -						PP = 4.5 Kg / sq. cm
0 ~ 0	Some grave		ss	07	33	48	5	204 -		0				Sample submitted for
0	GR: 23%; S	A: 26%; SI: 37%; & CL: 14%	SS	08	25	26		203 —	0					laboratory analysis: BH51-08 PP = 4.5 Kg / sq. cm
	End of bore	202.3 hole. 6.7	SS	09	100	38			0					-
	3.05 mb 4.72 mb 2.Water tab complet stem au 21, 201 2. PP= Po 4. GR., SA	e was found to be caved in at ogs with freestanding water at gs upon completion. le was measured upon ion of drilling inside the hollow ger on June 24 and October 9. cket Penetrometer. ., SI. & CL. denote Gravel, ilt & Clay respectively.												
)) :-LAVALIN	∑ = Groundv ▼ Groundv							l 2.m epth of: <u>2.17r</u>	n.	<u>1 · · · · · ·</u>	1	1	1
401 Vaug	Hanlan Rd ghan, Ontario L 905-851-0090	Borehole details	as prese	nted, do	not cons	titute a ti	norouah	understa	nding of all pote	ential conditions pro	esent and requires interpretative a he geotechnical report for which it	issistance t was		Scale: 1 : 63 Page: 1 of 1

		OF BOREHOLE N	lo.	BH	<u>52</u>									BRAMPTON
	oject Number:							-	g Location:		hole location plan			_ogged by: <u>MF</u>
	ent:	City of Brampton						-	g Method:		ollow Stem Augering			Compiled by: <u>NT</u>
	oject Name:	Phase II Environmental Site		ment				-	g Machine:	Track Mount				Reviewed by: MT
Lo	cation:	10192 Hwy 50, Brampton, ON						_ Date S	Started:	Jun 12, 201	9 Date Completed: Jun	12, 2019	<u>)</u>	Revision No.: 0
	LITH	OLOGY PROFILE	SC		MPLI	NG				TESTING	LAB TESTING * Rinse pH Values 2 4 6 8 10 12	TION		TING: 606283.85 HING: 4851873.71
Lithology Plot		DESCRIPTION Surface Elevation: 208.13 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 △ Intact ▲ Remould 	ear Strength (kPa)	$ \begin{array}{c} Soil Vapour Reading \\ \hline Soil Vapour Reading \\ parts per million (ppm) \\ 100 200 300 400 \\ \hline Lower Explosive Limit (LEL) \\ * Passing 75 um (%) \\ O Moisture Content (%) \\ W_p \hline Atterberg Limits \\ W_p \hline 40 60 80 \\ \hline \end{array} $	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	Topsoil ~ 15 FILL Brown, firm, gravel, orga	50 mm. 208.0 0.2 silty CLAY, trace sand, trace nics, rootlets, oxidized, mo	SS	01	59	5		208 -	0					PP = 2.0 Kg / sq.cm
	NATIVE TIL Brown, very gravel, oxid	stiff, sandy silty CLAY, trace	SS	02	67	17	1- 	207 -	0					PP = 4.5 Kg / sq.cm
			ss	03	100	22	2	206 —	0					Sample submitted for laboratory analysis: BH52-03 PP = 4.0 Kg / sq.cm
	broken cobb	ole pieces.	ss	04	100	23		-	0					PP = 4.5 Kg / sq. cm
	End of bore	204.5 hole. 3.7	SS	05	100	28		205 -	0					
	at 3.05 r at 9.14 r 2. Water ta the holic complet	e was found to be caved in nbgs with freestanding water nbgs upon completion. ible was measured inside w stem auger upon ion. cket Penetrometer.												
	≫) C∙LAVALIN	$\frac{\sum}{z}$ No frees	tanding	ground	dwater i	measure	ed in o	pen bor	ehole upon co	ompletion of dri	lling.	I		I
Vau	Hanlan Rd Ighan, Ontario L4 905-851-0090	4L 3T1 Borehole details from a qualified commisioned ar	Geotechr	nical Eng	ineer. Als	io, boreh	ole info	rmation sl	nding of all pote hould be read in	ential conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which i	issistance t was		Scale: 1 : 63

R	ECORD	OF BOREH		lo.	BH	<u>53</u>									BRAMPTON
Pro	ject Number:	665125							Drilling	g Location:	As per borel	nole location plan		L	ogged by: SP
Clie	ent:	City of Brampton							Drilling	g Method:	100 mm So	lid Stem Augers		0	Compiled by: <u>NT</u>
Pro	ject Name:	Geotechnical Inve	stigation- Jo	hnsto	n Tran	sit Fac	ility		Drilling	g Machine:	GeoProbe			F	Reviewed by: MT
Loc	cation:	10192 Hwy 50, Bra	mpton, ON						Date S	Started:	Jun 3, 2019	_ Date Completed: Jun	3, 2019	_ F	Revision No.: 0
	LITH	OLOGY PROFILE		SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING Rinse pH Values	Z		TING: 606237.46
Lithology Plot		DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould 	tion Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould tear Strength (kPa) 60 80		INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4851911.75
	Topsoil ~ 15 FILL Brown, firm,	silty CLAY, trace sa	207.6 0.2 and,	SS	01	75	7		-	0		o ²⁶		19.04	PP = 1.0 Kg / sq.cm PP = 2.0 Kg / sq.cm
	organics, ro NATIVE TIL Brown, very CLAY, trace	otlets, moist. L stiff to hard, sandy gravel, oxidized, m	207.0 0.8 silty oist.	SS	02	100	10		207 -	0		o ¹³		208.92	<u></u>
				SS	03	100	30	- 2	206 —	0		o ¹²		22.78	
	trace broker	n cobble pieces.		SS	04	105	37		205 -	0		o ¹¹		22.80	
	becomes lig		<u>204.1</u> 3.7	SS	05	100	37		-	0		° ⁹		23.42	
	with no f upon co 2. Water ta the holic complet 3. PP= Por	e was found to be op freestanding water mpletion. able was measured i w stem auger upon ion. cket Penetrometer.	inside												
SNO)) C·LAVALIN		$\frac{\nabla}{=}$ No freest	anding	ground	dwater r	neasure	ed in o	pen bor	ehole upon co	ompletion of dri	ling.			
Vau	Hanlan Rd ghan, Ontario L4 905-851-0090	1L3I1 If	Borehole details a rom a qualified G commisioned and	Geotechn	ical Engi	ineer. Als	o, boreh	ole info	rmation sl	nding of all pote hould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which i	assistance t was		Scale: 1 : 63 Page: 1 of 1

R	ECORD	OF BORE		lo.	<u>BH</u>	<u>54</u>									🗱 BRAMPTON
Pro	ject Number:	665125							Drilling	g Location:	As per borel	nole location plan		L	_ogged by: SP
Clie	ent:	City of Brampton							Drilling	g Method:	150 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
Pro	ject Name:	Geotechnical Inve	estigation- Jo	hnsto	n Tran	sit Fac	ility		Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
Loc	ation:	10192 Hwy 50, Bra	ampton, ON						Date S	Started:	Jun 18, 201	9 Date Completed: Jun	19, 2019	<u>)</u> F	Revision No.: 0
	LITH		E	SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	z		TING: 606334.41
Lithology Plot	Local Ground	DESCRIPTION	208.37 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	ion Testing • DCPT Nilcon Vane* • Intact • Remould ear Strength (kPa) 60 80	Kinse pH Values 2 4 6 8 10 12 Soil Vapour Reading ∆ parts per million (ppm) 100 200 300 400 Lower Explosive Limit (LEL) x Passing 75 um (%) Moisture Content (%) Xterberg Limits Wvp20 40 60 80	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4851793.41
	Topsoil ~20 FILI		208.2	SS	01	75	11	-	208 -	0		_o 21			PP = 2.5 kg/ sq-cm
	NATIVE TIL	it. L stiff, sandy silty CL	0.6	SS	02	100	21	- - - - - - - - 1	-	0		o ¹⁴			PP = NP kg/ sq-cm
	Oxidized se								207 -						
			206.1	SS	03	33	18	- 2	-	0		o ¹⁷			
0	Brown, dens trace gravel	se, sandy SILT, son , moist		SS	04	100	37		206 —	0		o ¹¹			
	oxidized cor	e		SS	05	100	37		205 —	0		o ¹⁰			
		ey, very dense						- 4	204 -			10			
0	broken cobb	ble pieces		SS	06	100	57	5	-		0	o ¹⁰			
			202.4	SS	07	100	58		203 —		0	° ⁹			
	2. Water ta complet hollow s	noie. e was found open a mpletion. ible was measured ion of drilling inside tem auger. cket penetrometer.	upon the												
2000000)		$\stackrel{[]}{=}_{=}$ No freest	tanding	l groun	dwater	measu	red in	open bo	rehole upon	completion of c	Irilling.			
401 Vau	C•LAVALIN Hanlan Rd ghan, Ontario L4 905-851-0090	4L 3T1	Borehole details a from a qualified o commisioned and	as prese Geotechn I the acc	nted, do lical Engi ompanyi	not cons ineer. Als ng'Notes	titute a th o, boreh to Reco	norough ole infoi rd of Bo	understa mation sl reholes'.	nding of all pote nould be read in	ntial conditions pro conjunction with th	esent and requires interpretative a he geotechnical report for which it	issistance t was		Scale: 1 : 63 Page: 1 of 1

R	ECORD	OF BORE	HOLE N	lo.	<u>BH</u>	<u>55</u>								Ś	BRAMPTON
Pro	ject Number:	665125							Drilling	g Location:	As per borel	nole location plan		L	_ogged by: MF
Clie	ent:	City of Brampton							Drilling	g Method:	250 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
Pro	ject Name:	Geotechnical Inv	estigation- Jo	hnsto	n Tran	sit Fac	ility		Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
Loc	cation:	10192 Hwy 50, Br	ampton, ON						Date S	Started:	Jun 18, 201	9 Date Completed: Jun	18, 2019	<u>)</u> F	Revision No.: 0
	LITH	OLOGY PROFIL	E	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING Rinse pH Values	Z		TING: 606288.01
Lithology Plot		DESCRIPTION Surface Elevation:	207.96 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	ion Testing ● DCPT Nilcon Vane* ◇ Intact ● Remould ear Strength (kPa) 60 80	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 Lower Explosive Limit (LEL) * Passing 75 um (%) 0 Moisture Content (%) Afterberg Limits Wp20 40 60 80	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4851831.47
	Top soil~ 10 FILL	00 mm.	207.9 0.1					_	-						
		CLAY, trace sand,	very 207.2 0.8	SS	01	41	5	-	-	0		o ²¹			PP = 3.0 kg/ sq-cm
	Brown, stiff	to very stiff, sandy , some oxidation, n	silty CLAY,	SS	02	100	14	- 1 -	207 —	0		o ¹³			
				SS	03	100	15	- - - 2	206 -	0		o ¹¹			PP = 4.0 kg/ sq-cm
				SS	04	100	23		205 —	0		o ¹¹			PP = 4.5 kg/ sq-cm
				SS	05	100	36	3	205	0		° 9			PP = 4.5 kg/ sq-cm
			203.4					4	204						
	Grey, comp moist.	act, sandy SILT, so	ome grave l ,6	SS	06	100	13	- - - - - - -	203	0		°8			PP = 4.5 kg/ sq-cm
01	Grey, compa gravel, mois	act, silty SAND, tra st.	<u>201.9</u> ice to som fe 1	SS	07	92	26	6	202	0		o ¹²			PP = 2.5 kg/ sq-cm
								- - - - - -	201 —						
	very dense			SS	08	67	71	- 8	200 -		0	o ¹²			PP = 3.5 kg/ sq-cm
								- - - - - 9	199 —						PP = 4.0 kg/ sq-cm
	compact End of bore	hole	<u>198.2</u> 9.8	SS	09	75	22	- - - -	-	0		o ¹⁰			
	Notes: 1. Borehold at 7.92 r water up 2. Water ta complet hollow s	e was found to be on mbgs with no frees bon completion. able was measured ion of drilling inside tem auger. cket penetrometer.	caved in tanding I upon e the												
2000000)) C·LAVALIN		$\frac{\nabla}{2}$ No freest	anding	ground	lwater r	neasure	ed in o	pen bore	ehole upon co	ompletion of dri	Iling Cave in depth record	ed on co	mpletion	n of drilling: <u>7.92 m</u> .
401 Vau	Hanlan Rd ghan, Ontario L4 905-851-0090	4L 3T1	Borehole details from a qualified C commisioned and	Geotechn	ical Engi	ineer. Als	o, boreh	ole info	rmation sh	nding of all pote nould be read in	ntial conditions pro	esent and requires interpretative a he geotechnical report for which it	issistance t was		Scale: 1 : 63 Page: 1 of 1

Pro	ECORD OF BOREHOLE oject Number: 665125 ent: City of Brampton	lo.	BH	<u>56</u>			-	g Location: g Method:		hole location plan		L	BRAMPTON Logged by: <u>SP</u> Compiled by: <u>NT</u>
	oject Name: <u>Geotechnical Investigation- J</u> cation: <u>10192 Hwy 50, Brampton, ON</u>		n Tran	isit Fac	ility		-	g Machine: Started:	<u>GeoProbe</u> _Jun 3, 2019	_ Date Completed: Jun :	3, 2019		Reviewed by: MT Revision No.: 0
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG				TESTING	LAB TESTING * Rinse pH Values 2 4 6 8 10 12	NOI		TING: 606241.63 HING: 4851869.53
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 O SPT MTO Vane* △ Intact ▲ Remould 	■ DCPT Nilcon Vane*	Soil Vapour Reading △ parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Passing 75 um (%) Moisture Content (%) Wp44terberg Limits 00 201 244 60 80	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	Topsoil ~ 150 mm. 207.5 FILL 0.2 Brown, compact, SAND and GRAVEL, trace silt, moist.	SS	01	84	10		207 -	0		0 ²⁴ 0 ¹²		18.84	PP = 0.75 Kg / sq.cm
	NATIVE TILL 0.8 Brown, stiff to very stiff, sandy silty CLAY, trace to some sand, trace gravel, oxidized, moist.		02	100	14			0		o ¹³		22.71	PP = 4.5 Kg / sq.cm
		ss	03	100	21	- - - - - - 2	206 -	0		o ¹²		22.54	
	hard trace broken cobble pieces.	ss	04	105	38		205 -	0		°12		22.99	
	204.0 End of borehole. 3.7	ss	05	100	34	- 3	204 -	0		o ¹⁰		21.82	
	 Borehole was found to be open with no freestanding water upon completion. Water table was measured inside the hollow stem auger upon completion. PP= Pocket Penetrometer. 												
	-	tanding	ground	dwater r	neasure	ed in c	open bor	ehole upon co	mpletion of dri	lling.			
21	C·LAVALIN I Hanlan Rd Ighan, Ontario L4L 3T1	as prese Geotechr	nical Eng	ineer. Als	o, boreh	norough ole info	rmation s	nding of all pote hould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which it	ssistance was		Scale: 1

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oject Number: ient:	City of Brampton						Drillin	g Method:		hole location plan			logged by: <u>MF</u> Compiled by: NT
oject Name:	Geotechnical Investigation- Jo	hnsto	n Tran	sit Far	ility		-	g Machine:	Track Moun				Reviewed by: MT
cation:	10192 Hwy 50, Brampton, ON	7111310	ii iiaii	Sitrac	mty		-	Started:	-	9 Date Completed: Jun	18. 2019		Revision No.: 0
	OLOGY PROFILE	80		MPLI		1			TESTING		1	-	
		30							ion Testing	★ Rinse pH Values 2 4 6 8 10 12	ION		TING: 606292.18 HING: 4851789.25
Local Ground	DESCRIPTION Surface Elevation: 208.10 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	DCPT Nilcon Vane* Intact Remould ear Strength (kPa)	$\begin{array}{c} \hline & \hline $	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
Top soil ~ 1 FILL		00	04	400		-	208 -			o ²⁴			
Brown, firm	, silty CLAY, trace gravel, rootlets moist. 207.3	SS	01	100	4		-			0			PP = 4.5 kg/ sq-cm
Brown, very	v stiff, sandy silty CLAY, trace avel, some oxidation, moist.	SS	02	100	16	- 1 - -	207 -	0		o ¹⁷			
stiff		SS	03	100	14	2	206 -	0		o ¹³			PP = 3.5 kg/ sq-cm
oxidized co very stiff	res	SS	04	100	26			0		o ¹¹			PP = 4.0 kg/ sq-cm
becomes gi	reyish brown	SS	05	100	15		205 -	0		o ¹¹			
						- 4	204 -						PP = 3.0 kg/ sq-cm
	rey, very dense, sandy SILT, 4.6 some cobbles pieces, moist.	SS	06	92	43	- - - - - - 5	203 -	С		o ¹¹			
becomes si	Ity sand	SS	07	92	59	6	202 –		0	o ¹¹			
End of bore	201.4 hole. 6.7					-							
Notes:													
dry upo 2. Water ta complet hollow s	e was open and n completion. able was measured ion of drilling inside the stem auger. ccket penetrometer.												
))	$\stackrel{\nabla}{=}$ No frees	landina	arour	wator -	noaeur	 od in o	non bor	hole upon co	mpletion of dri		I		<u> </u>
)) -LAVALIN		anumg	ground	awater i	neasur	eu III O	יאיי	enoie upon co	impleation of dri				

R	ECORD	OF BOREHOLE N	lo.	<u>BH</u>	<u>58</u>									BRAMPTON
Pro	ject Number:	665125						Drilling	Location:	As per borel	hole location plan		L	ogged by: MF
Clie	ent:	City of Brampton						Drilling	g Method:	250 mm Ho	bllow Stem Augering		(Compiled by: <u>NT</u>
Pro	ject Name:	Geotechnical Investigation- Jo	ohnsto	n Tran	sit Fac	ility		Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
Loc	cation:	10192 Hwy 50, Brampton, ON						Date S	Started:	Jun 19, 201	9 Date Completed: Jun	19, 2019	<u>)</u> F	Revision No.: 0
	LITH		SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING * Rinse pH Values	Z		TING: 606245.8
Lithology Plot	Local Ground	DESCRIPTION Surface Elevation: 207.48 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould 	 Intact Remould Particular Strength (kPa) 		INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4851827.32
1	_Top soil ~ 1								20 40					
KH)	trace sand, NATIVE TIL	, silty CLAY, trace gravel, moist. 206.7 L 0.8	SS	01	59	4		207 -	0					PP = 3.5 kg/ sq-cm
	Brown, stiff some grave	sandy silty CLAY, trace to I, oxidized, moist.	SS	02	100	10	1 	206 -	0		o ¹³			PP = 4.5 kg/ sg-cm
			SS	03	100	17	- 2	-	0		o ¹⁰			
			SS	04	100	26		205 —	0		o ¹¹			PP = 4.5 kg/ sq-cm
			SS	05	100	44		204 -	C)	0 ¹²			PP = 4.5 kg/ sq-cm
R X O							4	203 -						
	becomes gi	ey and sandy	SS	06	33	58	- - - - - 5			0	o ⁷			
		201.4					6	202						
0	clay at the t	rey, SILT, some sand, some6.1 ip, moist. 200.8	SS	07	70	17		201 -	0		o ¹⁴			
	End of bore Notes:	hole. 6.7												
	 Borehol and dry Water ta complet hollow s 	e was open upon completion. able was measured upon ion of drilling inside the tem auger. cket penetrometer.												
		$\frac{\sum}{=}$ No freest	anding	ground	dwater r	neasure	l ed in o	pen bor	l ehole upon co	mpletion of dri	Iling Cave in depth record	ed on co	mpletion	n of drilling: <u>6.10 m</u> .
401 Vau	C • LAVALIN Hanlan Rd ghan, Ontario L 905-851-0090	4L 3T1 Borehole details from a qualified (commisioned and	as prese Seotechn d the acc	nted, do ical Engi ompanyi	not const ineer. Als ng'Notes	titute a th o, boreh to Recor	norough ole infoi rd of Bo	understa rmation sh reholes'.	nding of all pote would be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which it	issistance t was		Scale: 1 : 63 Page: 1 of 1

RECORD	OF BOREHO	LEN	0.	<u>BH</u>	<u>59</u>			Drilling	a Location:	As per bore	nole location plan			BRAMPTO
lient:	City of Brampton								g Method:		llow Stem Augering			Compiled by: NT
roject Name:	Geotechnical Investig	ation- Jo	hnsto	n Tran	sit Fac	ility			g Machine:	Track Mount				Reviewed by: MT
ocation:	10192 Hwy 50, Brampt								Started:		_ Date Completed: Jun	4, 2019		Revision No.: 0
LITH	OLOGY PROFILE		SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING		EAS	TING: 606296.34
								(L)		ion Testing DCPT	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading	ITATION ON	NORTH	HING: 4851747.04
Local Ground	DESCRIPTION Surface Elevation: 208.2	25 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION	MTO Vane* △ Intact ▲ Remould * Undrained Sha 20 40	Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	$\label{eq:production} \begin{array}{c} \Delta parts per million (ppm)^{9} \\ 100 200 300 400 \\ \hline \ \ \ \ \ \ \ \ \ \ \ \ \$	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	50 mm. , silty CLAY, trace grave rootlets moist.		SS	01	67	6		208 -	0		_o 23		19.59	PP = 2.5 Kg / sq.cm
NATIVE TIL Brown, firm		207.5 0.8 \Y,	SS	02	75	9	- - 	207	0		₀ 23		20.36	PP = 3.0 Kg / sq.cm
			SS	03	100	10		-	0		°25 °25		21.52	PP = 2.5 Kg / sq.cm
			SS	04	100	25	- 2 - - -	206 -	0		o ¹³		22.18	
								205 -			o ¹²		22.91	
			SS	05	100	34		-	0		0			PP = 4.5 Kg / sq. cm
	dense, sandy SILT, sor	203.7					- 4 - - -	204 -			0			
	gravel, oxidized, moist.	110 4.0	SS	06	100	40	5	203 —	0		o ⁹ o ¹⁰		21.41	PP = 4.0 Kg / sq. cm
GR: 5%; SA	4: 28%; SI: 49%; & CL: 1	18%	SS	07	100	15	6	202 -	0		o ¹²		22.37	PP = 3.0 Kg / sq. cm
			SS	08	100	66	- - - - - - - - - - - - - - - - - - -	201 -		0	o ⁸		21.39	PP = 4.5 Kg / sq. cm
							- - - - - - 9							
End of bore	hole.	198.5 9.8	SS	09	75	51		199		0	o ¹⁰		22.97	
at 7.92 f water up 2. Water ta the hold complet 2. PP= Po 4. GR., SA	e was found to be caved mbgs and no freestandir con completion. able was measured insic ow stem auger upon ion. cket Penetrometer. ., SI. & CL. denote Grav illt & Clay respectively.	ng Je												
◆) C·LAVALIN	∑ Ţ	No freest	anding	ground	lwater r	neasur	ed in o	pen bor	ehole upon co	ompletion of dril	ling Cave in depth record	ed on co	mpletion	of drilling: <u>7.92 m</u> .
Hanlan Rd ughan, Ontario L 905-851-0090	4L 3T1 from a	ole details a a qualified G iisioned and	eotechn	ical Engi	neer. Als	o, boreh	ole info	mation sl	nding of all pote nould be read in	ntial conditions pre conjunction with th	esent and requires interpretative a ne geotechnical report for which it	issistance twas		Scale: 1 : Page: 1 o

	ECORD	OF BORE		No.	Bŀ	160 /	MW	60	_ Drillin	g Location:	As per borel	nole location plan			BRAMPTON
Clie	ent:	City of Brampton	1						Drilling	g Method:	250 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
Pro	ject Name:	Geotechnical Inv	estigation- Jo	hnsto	n Tran	sit Fac	ility		Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
Loc	cation:	10192 Hwy 50, B	rampton, ON						Date S	Started:	Jun 18, 201	9 Date Completed: Jun	18, 2019	<u>)</u> F	Revision No.: 0
	LITH	OLOGY PROFIL	.E	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	7	EAS	TING: 606249.96
Lithology Plot		DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	♦ Intact♦ Remould	Kinse pH Values 2 4 6 8 10 12 Soil Vapour Reading Δ parts per million (ppm) 100 200 300 400 Lower Explosive Limit (LEL) × Passing 75 um (%) Moisture Content (%) Attractional content of the second s	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4851785.1
Li j	Local Ground Topsoil ~20	Surface Elevation:	207.80 m 207.6	Sar	Sar	Rec	SP	DEI		20 40	ear Strength (kPa) 60 80	Wp Atterberg Limits Wp 20 40 60 80		>	
	FILL Brown, firm trace sand,	, silty CLAY, trace noist.	0.2 gravel, 207.0	SS	01	51	4	-	-	0		o ²⁴	<u></u>		PP = 3.5 kg/ sq-cm
	NATIVE TIL Brown, stiff, some grave	L sandy silty CLAY, l, oxidized, moist.	0.8 trace to	SS	02	59	12	1 1	207 —	0		o ²¹			PP = 3.5 kg/ sq-cm
				SS	03	100	14	- 2	206 -	0		0 ¹²	⊻ =		PP = 3.0 kg/ sq-cm
<u>6/</u>	Grey, comp some grave	act, SILT to sandy I, moist.	<u>205.5</u> SILT, 2.3	SS	04	133	22		205 —	0		°15			PP = 4.5 kg/ sq-cm
				SS	05	100	22	3	200	0		° ⁸			PP = 4.5 kg/ sq-cm
0								- - - - 4	204 -						
0	becomes ve	ery dense		_\$\$ _		100 \$	i0/50mr	- - - - - - - - - - - - -	203 —			0 ²⁶			PP = 3.5 kg/ sq-cm
				SS	07	78 7	2/300m	- - 6 - n	202 -			o ¹¹			PP = 2.5 kg/ sq-cm
0,70								- 7	201 -						
				-\$\$		0	50/ 50mm	- 8	200 —						No recovery
0									199 -						
0	becomes si		198.2	SS	09	67	83/ 300mm	9	-			0 ¹⁷			
	End of bore	hole.	9.6												
	at 7.47 water w 2. Water ta complet	e was found to cay mbgs no with frees as recorded upon able was measurec ion of drilling insic tem auger.	standing completion. d upon												
ı															
)) C+LAVALIN		$\frac{\nabla}{2}$ No freest $\frac{\nabla}{2}$ Groundw								ompletion of dri	lling Cave in depth record	ed on co	mpletion	n of drilling: <u>7.47 m</u> .
Vau	Hanlan Rd ghan, Ontario L 905-851-0090	4L 3T1	Borehole details a from a qualified G commisioned and	Geotechn	ical Eng	ineer. Als	o, boreho	ole info	rmation sl	nding of all pote nould be read in	ential conditions pro- conjunction with the	esent and requires interpretative a he geotechnical report for which it	ssistance was		Scale: 1 : 63 Page: 1 of 1

oject Numł ent: oject Name	er: <u>665125</u> <u>City of Brampto</u> e: <u>Geotechnical In</u>	on nvestigation- Jo	ohnsto	n Tran	isit Fac	cility		_ Drillin	g Location: g Method: g Machine:		hole location plan bllow Stem Augering ted Drill		(Logged by: MF Compiled by: NT Reviewed by: MT
cation:	<u>10192 Hwy 50,</u>							_ Date \$	Started:		_ Date Completed: Jun	4, 2019	_ F	Revision No.: 0
L	ITHOLOGY PROF	ILE	SO	IL SA	MPLI	NG		_		TESTING	LAB TESTING * Rinse pH Values	N		TING: 606226.77 HING: 4851804.11
Local Gr	DESCRIPTIO		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	ion Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Passing 75 um (%) Moisture Content (%) Atterberg Limits Wp-20 40 60 80 L	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
Top So FILL	l ~150 mm.	207.1 0.2	SS	01	67	7		207 -	0		o ²⁴		20.03	
trace sa	firm, silty CLAY, trac ind, rootlets, moist.	206.5												PP = 2.0 Kg / sq.cm
trace gr	TILL stiff to very stiff, sand avel, oxidized, moist ; SA: 23%; SI: 50%;		SS	02	100	8	- 1 1	206 -	0		∎-18		22.30	PP = 2.5 Kg / sq.cm
			SS	03	100	21	2		0		o ¹²		22.40	PP = 4.0 Kg / sq.cm
			SS	04	84	25		205 –	0		o ¹¹		22.79	PP = 4.0 Kg / sq. cm
			SS	05	100	21	- 3	204 -	0		₀ ¹⁰ ₀ ¹²		22.83	PP = 2.0 Kg / sq.cm
							4	203 -						
	ense to very dense,						-						21 70	
some g	ravel, trace clay, oxio	dized, moist.	SS	06	100	33	5	202 -	0		° ⁹		21.78	
			ss	07	100	50/75	6				0 ¹²			
become	is wet.					mm		201 -						
							- 7	200 -						
brokon	cobble pieces.		SS	08	100	50 / 125		200			12			
DIOKEII	cobble pieces.					mm	- 8				o ¹² o ¹²			
								1 99 -						
							- 9							
			SS	09	100	52		198 -		0	o ¹¹		24.69	PP = 4.5 Kg / sq. cm
End of I Notes:	oorehole.	197.5 9.8					-							
1. Bor at 8 wat 2. Wat	chole was found to b .23 mbgs and no free er upon completion. er table was measur	estanding red inside												
com 3. PP= 4. GR.	hollow stem auger u pletion. Pocket Penetromet , SA., SI. & CL. deno d, Silt & Clay respec	er. ote Gravel,												
))		⊻ No freest	anding	ground	dwater i	measure	ed in c	pen bor	l ehole upon co	mpletion of dri	Iling Cave in depth record	l led on co	 mpletion	n of drilling: <u>8.23 m</u> .
·LAVALI	N	-							-					

R	ECORD	OF BOREHOLE N	lo.	<u>BH</u>	<u>62</u>								Ś	BRAMPTON
Pro	ject Number:	665125						Drilling	g Location:	As per bore	hole location plan		L	ogged by: MF
Clie	ent:	City of Brampton						Drilling	g Method:	150 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
Pro	ject Name:	Geotechnical Investigation- Je	ohnsto	n Tran	sit Fac	ility		Drilling	g Machine:	Track Moun	ted Drill		F	Reviewed by: MT
Loc	ation:	10192 Hwy 50, Brampton, ON						Date S	Started:	Jun 18, 201	9 Date Completed: Jun	18, 2019	<u>)</u> F	Revision No.: 0
	LITH	OLOGY PROFILE	SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	z	EAS	TING: 606300.51
Lithology Plot		DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	on Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa)	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 40	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4851704.81
Lith	Local Ground → Topsoil~ 10	Surface Elevation: 207.95 m		Saı	Re	SP	H		20 40	60 80	W _P 20 40 60 80	<u>N</u> N	>	
	FILL Brown, firm, moist.	0.1 silty CLAY, trace gravel, 207.2	SS	01	100	9		-	0		0 ²⁶			
		L 0.8 stiff, sandy silty CLAY, trace vel, some oxidation, moist 206.4	SS	02	100	16		207 -	0		o ¹³			PP = 3.5 kg/ sq-cm
0	Brown, com trace gravel	pact, sandy SILT, some clay[.5 , moist	SS	03	100	22	- - - - - 2	206 -	0		o ¹³			PP = 3.5 kg/ sq-cm
	becomes ve	ry dense	SS	04	100	51		-		0	°15			PP = 4.0 kg/ sq-cm
0	becomes de	ense	SS	05	100	43		205	0		o ¹¹			PP = 4.0 kg/ sq-cm
							- - 4 4	204 —						
0 '	Becomes gr	ey.	ss	06	100	50	- - - - - 5	203 -		0	o ¹⁰			PP = 2.5 kg/ sq-cm
0	trace broker	202.0	SS	07	100	42		-	0		° ⁸			
	upon co 2. Water ta complet hollow s	hole. 5.9 e was found open and dry mpletion. ble was measured upon on of drilling inside the tem auger. cket penetrometer.												PP =3.0 kg/ sq-cm
1000000))	∑ ⊒ No frees	tanding	ground	dwater r	neasur	ed in o	pen bor	ehole upon co	mpletion of dri	lling.	_	_	
401 Vau	C∙LAVALIN Hanlan Rd ghan, Ontario L₄ 905-851-0090	IL 3T1 Borehole details from a qualified commisioned an	as prese Geotechn d the acc	nted, do iical Engi ompanyi	not cons ineer. Als ng'Notes	titute a th o, boreh to Reco	norough ole info rd of Bo	n understa rmation sl preholes'.	nding of all pote nould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which it	ssistance was		Scale: 1 : 63 Page: 1 of 1

	ECORD OF BOREHOLE N	lo.	BH	63			Drillin	g Location:	As ner hore	nole location plan			BRAMPTON
	ent: City of Brampton						-	g Method:		lid Stem Augers			Compiled by: NT
Pro	oject Name: Geotechnical Investigation-Jo	ohnsto	n Trar	nsit Fac	ility		Drilling	g Machine:	GeoProbe			F	Reviewed by: MT
Loc	cation: 10192 Hwy 50, Brampton, ON						_ Date S	Started:	Jun 4, 2019	_ Date Completed: Jun	4, 2019	_ F	Revision No.: 0
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	7	EAS	TING: 606277.31
ot		a)	lber	()	е		(m)	Penetrat O SPT	ion Testing	★ Rinse pH Values 2 4 6 8 10 12 2 Soil Vapour Reading Δ parts per million (ppm) 100 200 300 400	UTATION ION	<u> </u>	HING: 4851723.83
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 207.86 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION	 △ Intact ▲ Remould 	Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	100 200 300 400 ▲ Lower Explosive Limit (LEL) * Passing 75 um (%) O Moisture Content (%) Atterberg Limits W _P 20 240 60 80	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	Topsoil ~ 150 mm. 207.7 FILL 0.2 Brown, firm, silty CLAY, trace sand, trace gravel, rootlets, moist. 207.1	SS	01	92	6			0		0 ⁻⁵		19.15	PP = 1.5 Kg / sq.cm
	NATIVE TILL 0.8 Brown, stiff to very stiff, sandy silty CLAY, trace gravel, broken cobble pieces, moist.		02	100	14	- - - - - -	207 -	0		o ¹¹		17.52	PP = 3.0 Kg / sq.cm
		SS	03	100	18	- - - - - - 2	206 -	0		o ¹²		17.20	
	becomes hard	ss	04	100	39			0		°15		17.16	
	201.0	ss	05	100	43		205 —	С		o ¹⁰		17.05	
<u>.</u>	End of borehole. 3.7 Notes:												
	 Borehole was found to be open with no freestanding water upon completion. Water table was measured inside the hollow stem auger upon completion. PP= Pocket Penetrometer. 												
	No frees C · LAVALIN	tanding	groun	dwater ı	neasure	ed in c	pen bor	ehole upon co	mpletion of dri	l lling.	1	1	
/au	Hanlan Rd Borehole details ighan, Ontario L4L 3T1 from a qualified 905-851-0090 commissioned an	Geotechr	nical Eng	ineer. Als	o, boreh	ole info	ormation sh	nding of all pote nould be read in	ntial conditions pr conjunction with t	esent and requires interpretative he geotechnical report for which	assistance it was	9	Scale: 1 : 63

	ECORD	OF BOREHOL	E No	. [BH	<u>64</u>			Drilling	g Location:	As per bore	hole location plan			BRAMPTON
Clie	,	City of Brampton							-	g Method:		lid Stem Augers			Compiled by: NT
	ject Name:	Geotechnical Investigation	on- John	ston	Tran	sit Fac	ility		-	g Machine:	GeoProbe				Reviewed by: MT
Loc	ation:	10192 Hwy 50, Brampton	, ON						_ Date S	Started:	Jun 4, 2019	Date Completed: Jun	4, 2019	_ 1	Revision No.: 0
	LITH	OLOGY PROFILE		SOI	L SA	MPLI	NG				TESTING	LAB TESTING ★ Rinse pH Values	NO		TING: 606254.12 HING: 4851742.86
Lithology Plot	Local Ground	DESCRIPTION Surface Elevation: 207.91 n	n G	sample iype	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	tion Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limits (LEL) * Passing 75 um (%) Moisture Content (%) Wp ▲ Cover Explosive Limits Wp We WL	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	Topsoil ~ 1 FILL Brown, firm	50 mm. , silty CLAY, trace sand, tra	207.8 0.2 sce	s	01	84	7	-	-	0		°23		18.48	PP = 1.25 Kg / sq.cm PP = 4.25 Kg / sq.cm
	gravel, root NATIVE TII Brown, stiff some sand		207.2 0.8 S	s	02	100	13	- - - - -	207 -	0		0 ¹⁵		18.80	
			s	s	03	100	16		206 -	0		° ¹⁴		17.73	
	becomes g	eyish brown.	s	s	04	100	50 / 75 mm	- 2	200			o ¹¹		17.15	
									205 —					47.00	
	trace broke End of bore		204.3 3.7	s	05	100	35	-	-	0		o ¹²		17.26	-
	with no upon co 2. Water to the hollo complet	e was found to be open freestanding water mpletion. able was measured inside bw stem auger upon ion. cket Penetrometer.													
)) C·LAVALIN	∑ No	freestand	ding g	jround	lwater r	neasure	ed in c	open bor	ehole upon co	ompletion of dri	lling.			
Vau	Hanlan Rd ghan, Ontario L 905-851-0090	4L3I1 from a qua	details as p alified Geot oned and the	echnic	al Engi	ineer. Als	o, boreh	ole info	rmation sl	nding of all pote rould be read in	ntial conditions pr conjunction with t	esent and requires interpretative he geotechnical report for which	assistance t was		Scale: 1 : 63 Page: 1 of 1

Pro	ECORD OF BOREHOLE N ject Number: <u>665125</u> ent: <u>City of Brampton</u>	No.	BH	<u>65</u>			_	g Location: g Method:	As per borel	hole location	•		L	ogged by: SP Compiled by: NT
	ject Name: <u>Geotechnical Investigation- J</u>		n Trar	nsit Fac	ility			g Machine:	GeoProbe	Data Oarr				Reviewed by: MT
LOC	LITHOLOGY PROFILE	-	DIL SA	MPLI	NG			Started:	TESTING	-	pleted: <u>Jun</u>			Revision No.: 0
y Plot	DESCRIPTION		Sample Number			(E	(m) NOI	Penetrat O SPT	ion Testing ● DCPT Nilcon Vane* ◇ Intact		alues 8 10 12 ur Reading illion (ppm) 300 400 psive Limit (LEL)	INSTRUMENTATION INSTALLATION		COMMENTS
Lithology Plot	Local Ground Surface Elevation: 207.86 m	Sample Type	Sample	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION	 Remould * Undrained Sh 20 40 	ear Strength (kPa)	* Passing 75 O Moisture Cont Atterbe W _P 20 28	rg Limits	INSTRU	Unit V (KN/	
	Topsoil ~ 150 mm. 207.3 FILL 0.2 Brown, firm, silty CLAY, trace sand, trace gravel, rootlets, moist. 207.3	SS	01	84	7			0		o ¹³			18.94	PP = 1.25 Kg / sq.cm
	NATIVE TILL 0.8 Brown, very stiff, sandy silty CLAY, trace gravel, broken cobble pieces, moist.		02	33	18		207 -	0		₀ 23			18.20	
		SS	03	100	22	- 2	206 -	0		o ¹¹			17.38	
	becomes hard	SS	04	100	42		205 —	С		o ¹¹			17.07	
	204.2 End of borehole. 3.7	ss	05	100	35			0		°11			17.20	
	Notes: 1. Borehole was found to be open with no freestanding water upon completion. 2. Water table was measured inside the hollow stem auger upon completion. 3. PP= Pocket Penetrometer. 4. A state of the s													
	No frees	tanding	groun	dwater ı	neasur	ed in c	open bor	ehole upon co	ompletion of dri	lling.				
Vau	Hanlan Rd ghan, Ontario L4L 3T1 905-851-0090 Borehole details from a qualified commissioned au	Geotechr	nical Eng	ineer. Als	so, boreh	ole info	rmation s	nding of all pote hould be read in	ntial conditions pr conjunction with t	esent and require he geotechnical r	es interpretative a report for which it	ssistance was		Scale: 1 : 63 Page: 1 of 1

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RECORD	OF BOREHOLE N	lo.	<u>BH</u>	<u>66</u>									🐉 BRAMPTON
Project Number:								g Location:		hole location plan			_ogged by: <u>MF</u>
Client:	City of Brampton		. .	- 14 5			-	g Method:		bllow Stem Augering			Compiled by: <u>NT</u>
Project Name: Location:	Geotechnical Investigation- Jo 10192 Hwy 50, Brampton, ON	onnsto	n Iran	ISIT Fac	anty		- '	g Machine: Started:	Track Mount	9 Date Completed: Jun	19. 2019		Reviewed by: <u>MT</u> Revision No.: 0
	OLOGY PROFILE	so	SA	MPLI	NG				TESTING	LAB TESTING			
		50							ion Testing	★ Rinse pH Values 2 4 6 8 10 12	TION		TING: 606235.1 HING: 4851719.67
tord A 6000 Local Ground	DESCRIPTION Surface Elevation: 207.48 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould * Undrained She 20 40 	● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	$\label{eq:solution} \begin{array}{ c c c c c } \hline Soil Vapour Reading \\ \hline Soil Vapour Reading \\ \hline Soil Vapour Reading \\ \hline 100 200 300 400 \\ \hline Lower Explosive Limit (LEL) \\ \hline \# Passing 75 um (%) \\ \hline Moisture Content (%) \\ \hline W_p \hline Atterberg Limits \\ \hline W_p \hline 40 60 80 \\ \hline \end{array}$	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
Topsoil~ 10 FILL		SS	01	33	5	-		0		o ²⁴			
moist.	silty CLAY, trace gravel, 206.7						207 -						PP = 2.5 kg/ sq-cm
	L 0.8 sandy silty CLAY, trace to I, some oxidation, moist,	SS	02	67	10	- - - - -	206 —	0		o ¹⁷			PP = 4.0 kg/ sq-cm
		SS	03	100	22	- 2	200	0		o ¹¹			PP = 3.0 kg/ sq-cm
Brown, com	pact, sandy SILT, some clay , moist	SS	04	84	25		205 —	0		o ¹¹			PP = 4.5 kg/ sq-cm
0		SS	05	75	24	3	204 -	0		o ¹¹			PP = 4.5 kg/ sq-cm
Becomes gr	rey, dense	SS	06	84	35	- 4	203 —	0		° ⁹			
						- 6	202 —						
very dense	y moist, some clay201.0	SS	07	12 7	6/279m	n -	201 -			o ¹⁶			
2. Water ta complet	hole. 6.5 e was found open and dry ompletion. able was measured upon ion of drilling inside the tem auger.												
•))	${\displaystyle \sqsubseteq}$ No frees	anding	ground	dwater i	neasure	ed in c	pen bor	ehole upon co	mpletion of dri	lling.			
NC·LAVALIN		9	5-2.1							5			
01 Hanlan Rd ′aughan, Ontario L4 el: 905-851-0090	4L 3T1 Borehole details from a qualified 0 commisioned and	Seotechn	ical Engi	ineer. Als	o, boreh	ole info	rmation sl	nding of all pote nould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which it	issistance t was		Scale: 1 : 6 Page: 1 of

Pro Clie	ECORD OF BOREHOLE N oject Number: 665125 ent: City of Brampton oject Name: Geotechnical Investigation-Jule				sility		Drilling	g Location: g Method: g Machine:		nole location plan lid Stem Augers		L	BRAMPTON ogged by: SP Compiled by: NT Reviewed by: MT
	cation: 10192 Hwy 50, Brampton, ON							Started:		_ Date Completed: Jun 4	4, 2019		Revision No.: 0
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG		<u> </u>	FIELD	TESTING	LAB TESTING Rinse pH Values	z		TING: 606211.9 HING: 4851738.7
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	tion Testing ● DCPT Nilcon Vane* ◇ Intact ● Remould ear Strength (kPa) 60 80	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 Lower Explosive Limit (LEL) * Passing 75 um (%) Moisture Content (%) Multiple Content (%) Atterberg Limits 20 Multiple 60 80	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	Topsoil ~ 150 mm.207.3FILL0.2Brown, firm, silty CLAY, trace sand, tracegravel, rootlets, moist.206.7	SS	01	67	5		207 -	0		o ²⁸		20.06	PP = 1.25 Kg / sq.cm
	NATIVE TILL 0.8 Brown, very stiff, sandy silty CLAY, trace gravel, oxidized, moist.	SS	02	100	15		-	0		o ¹²		17.48	PP = 2.5 Kg / sq.cm
		ss	03	100	23	- - - - - - - 2	206	0		o ¹²		17.50	
	hard	ss	04	100	32		205 -	0		o ¹¹		17.22	
	very stiff broken cobble pieces. 203.8 End of borehole. 3.7	ss	05	100	23	- 3	204 -	0		o ¹²		17.25	
	 Notes: Borehole was found to be open with no freestanding water upon completion. Water table was measured inside the hollow stem auger upon completion. PP= Pocket Penetrometer. 												
		tanding	ground	dwater i	neasure	ed in o	pen bor	ehole upon co	ompletion of dril	lling.			
401	C • LAVALIN Hanlan Rd Ighan, Ontario L4L 3T1	as prese	nted, do	not cons	titute a th	horough	understa	nding of all pote	ntial conditions pre	esent and requires interpretative a he geotechnical report for which it	ssistance		Scale: 1 : 63

401 Hanlan Rd
Vaughan, Ontario L4L 3T
Tel: 905-851-0090

	ECORD (OF BOREHOL	E No.	BH	<u>168</u>			Drilling	g Location:	As per borel	nole location plan			BRAMPTON
Clie	ent:	City of Brampton						Drilling	g Method:	100 mm So	lid Stem Augers		(Compiled by: NT
Pro	ject Name:	Geotechnical Investigat	ion- Johns	ton Tra	nsit Fa	cility		Drilling	g Machine:	GeoProbe			F	Reviewed by: MT
Loc	cation:	10192 Hwy 50, Brampto	n, ON					Date S	Started:	Jun 4, 2019	Date Completed: Jun	4, 2019	_ F	Revision No.: 0
	LITHO		5	SOIL S	AMPLI	NG				TESTING	LAB TESTING * Rinse pH Values 2 4 6 8 10 12	NOI		TING: 606188.7 HING: 4851757.73
Lithology Plot	Local Ground S	DESCRIPTION	B Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould 	● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa)	$\label{eq:starting} \begin{array}{c} \text{Soil Vapour Reading} \\ \text{A parts per million (ppm)} \\ 100 200 300 400 \\ \text{A Lower Explosive Limit (LEL)} \\ * \text{Passing 75 um (%)} \\ \text{O Moisture Content (%)} \\ \text{Weisture Content (%)} \\ \text{Moisture Content (%)} \\ \text{Solution Content (%)} \\ \text{Solution Content (%)} \\ \text{Moisture Content (%)} \\ Moi$	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	Topsoil ~ 150 FILL Brown, firm, s	ilty CLAY, trace sand, tr		6 01	84	6	-		0		0 0 ¹⁶		19.15	PP = 1.5 Kg / sq.cm
	gravel, rootlet NATIVE TILL Brown, very s gravel, oxidize	tiff, sandy silty CLAY, tra	206.3 0.8 ace SS	6 02	100	15		206 -	0		° ⁹		17.25	PP = 2.5 Kg / sq.cm
			SS	6 03	100	17	- - - - - - - 2	205 —	0		o ¹²		17.09	
	hard		204.0	6 04	100	32		-	0		o ¹¹		17.04	
	Grey, compac clay, moist. End of boreho	t, SILT, trace sand, trac	203.4	6 05	100	15		204	0		o ¹¹		17.05	
	with no fre upon com 2. Water tab the hollow completio 3. PP= Pock	le was measured inside r stem auger upon n. et Penetrometer.												
SNO 401)) C•LAVALIN Hanlan Rd	Borehol								ompletion of dri	lling.	Issistance	1	
Vau Tel:	ghan, Ontario L4L 905-851-0090	3T1 from a q	ualified Geote	chnical En	gineer. Als	so, boreh	ole info	rmation sl	nould be read in	conjunction with the	he geotechnical report for which it	was		Scale: 1 : 63 Page: 1 of 1

oiect Numb	ber: 665125			<u>69</u>			Drilling	Location:	As nor hore	hole location plan			BRAMPTO
ient:	City of Brampton							g Method:		blow Stem Augering			Compiled by: NT
oject Name		ohnsto	n Tran	sit Fac	ility		- •	g Machine:	Track Mount				Reviewed by: MT
ocation:	10192 Hwy 50, Brampton, ON							Started:		9 Date Completed: Jun :	21, 2019		Revision No.: 0
L	THOLOGY PROFILE	SC	IL SA	MPLI	NG			FIELD	ESTING	LAB TESTING		FAS	TING: 606262.45
									on Testing	★ Rinse pH Values 2 4 6 8 10 12	LION		HING: 4851658.43
Local Gro	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 △ Intact ▲ Remould 	● DCPT Nilcon Vane* ◇ Intact ◆ Remould ar Strength (kPa) 60 80	Soil Vapour Reading △ parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Pasing 75 un (%) O Moisture Content (%) Wrp20 40 60 80	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	ound Surface Elevation: 207.75 m ~ 200 mm. 207.3 0.2 0.2	5					-		00 80	0 ²¹	_ = =		
	firm, silty CLAY, trace gravel, 207.0		01	84	6		207 —	0					PP = 1.5 kg/ sq-cm PP = 3.5 kg/ sq-cm
Brown, to some	very stiff, sandy silty CLAY, trace e sand, trace to some gravel, xidation, moist to very moist, 206.3	ss	02	100	14	- 1 - -	-	0		o ¹³			
Brown, gravel, t	very stiff, sandy silty CLAY, tracel.5 trace oxidation, moist	SS	03	100	16	- 2	206 -	0		o ¹³			PP = 4.0 kg/ sq-cm
		SS	04	100	24		205 —	0		o ¹¹			PP = 4.5 kg/ sq-cm
Become clay sea	es brown grey. ams	ss	05	100	14		203	0		o ¹¹			PP = 4.0 kg/ sq-cm
						- 4	204 -						
		ss	06	100	17		203	0		₀ 27			PP = 4.0 kg/ sq-cm
							202 —						
Grey, de gravel, i	ense, sandy SILT, trace 6.1 moist. 201.0	SS	07	75	37	6		0		o ¹¹			
End of t Notes:	oorehole. 6.7												
to b with vate 2. Wat com hollo	ehole was found e caved in 6.10 mbgs out freestanding er upon completion. er table was measured upon upletion of drilling inside the ow stem auger. = pocket penetrometer.												
≫) C•LAVALI	-	standing	ground	lwater r	neasur	ed in o	pen bore	ehole upon co	mpletion of dri	I Iling Cave in depth record	ed on co	mpletior	l n of drilling: <u>6.10 m</u> .
Hanlan Rd		s as prese	nted, do	not const	titute a tl	norough	understa	nding of all pote	ntial conditions pr	esent and requires interpretative a he geotechnical report for which it	ssistance		Scale: 1 :

R	ECORD	OF BOREHOLE	No.	BH	70/	MW:	<u>70</u>						🧼 BR	AMPTON
	ject Number:							-	g Location:		nole location plan		_ Logged b	
Clie		City of Brampton						-	g Method:		llow Stem Augering		_ Compiled	
	ject Name:	Phase II Environmental Site		sment				-	g Machine:	Track Mount			_ Reviewed	
Loc	cation:	10192 Hwy 50, Brampton, ON	_					_ Date s	Started:		9 Date Completed: Jun	<u>11, 2019</u>	Revision	NO.: <u>U</u>
	LITHO		sc	DIL SA	AMPLI	NG				TESTING	Kinse pH Values		ASTING: 60 RTHING: 48	
Lithology Plot	Local Ground	DESCRIPTION Surface Elevation: 207.58 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	ion Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	2 4 6 8 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Passing 75 um (%) Moisture Content (%) Wp 41terberg Limits 40 60 80	INSTRUMENTATION INSTALLATION Unit Weight	(KN/m3)	MMENTS
		50 mm. 207 0.2 silty CLAY, trace gravel, rootlets, moist. 206		01	100	5		207 -	0				208.47 n Height o Sample	tiser Elevation = n; of Riser= 0.94 m submitted for ry analysis:
	NATIVE TIL Brown, stiff t	200		02	16	12			0				BH70-01	i Kg / sq.cm
			SS	03	100	19	- 2	206 -	0				PP = 4.0) Kg / sq.cm
			ss	04	100	25		205 —	0			Y 	PP = 4.5	i Kg / sq. cm
		act, SILT, trace to some clays. , trace sand, moist.		05	100	14			0				PP = 3.0) Kg / sq.cm
			SS	06	100	14	- - - - - 4	204 -	0				PP = 3.0) Kg / sq.cm
	Grey, compa grael, trace of	203 act, SILT to silty SAND, trace. clay, moist		07	8	20		203 —	0					
			SS	08	8	29		202 —	0					
	very dense		SS	09	80	50 / 100 mm		-						
							- - - - - 7 - - - -	201 -						
	End of bore	199 nole. 8.		10	0	86 / 280 mm	- - - 8	200 -						
	with no f 4.42 mb 2.Water tabl completi stem au 21, 201	e was found to be open reestanding water at gs upon completion. e was measured upon on of drilling inside the hollow ger on June 24 and October 9. cket Penetrometer.												
))	∑ □ No free	standing	g grour	ndwater	measu	red in	open bo	rehole upon	completion of				
	C·LAVALIN	drilling	. Ground	dwater	depth o	bserve	d on	21/10/20	19 at a depth	of: <u>2.33 m</u> .				
Vau	Hanlan Rd ghan, Ontario L4 905-851-0090	Borehole detai from a qualifier commisioned a	I Geotechi	nical Eng	jineer. Als	io, boreh	ole info	rmation s	nding of all pote nould be read in	ntial conditions pre conjunction with th	esent and requires interpretative he geotechnical report for which i	assistance t was		Scale: 1 : 63 Page: 1 of 1

	oject Number:	OF BOREHOLE N 665125 City of Brampton	lo.	BH	71				g Location: g Method:		nole location plan		L	ogged by: <u>SP</u>
	oject Name:	Geotechnical Investigation- Jo	ohnsto	n Tran	nsit Fac	ility		-	g Machine:	GeoProbe				Reviewed by: MT
	cation:	10192 Hwy 50, Brampton, ON							Started:	Jun 4, 2019	Date Completed: Jun	4, 2019		Revision No.: 0
	LITHO		SC	DIL SA	MPLI	NG				TESTING	LAB TESTING * Rinse pH Values 2 4 6 8 10 12	NO		TING: 606216.07 HING: 4851696.48
Lithology Plot		DESCRIPTION Surface Elevation: 207.24 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 SPT MTO Vane* △ Intact ▲ Remould 	■ DCPT Nilcon Vane* ↓ Intact Remould ear Strength (kPa)	$\begin{array}{c c} \hline & \hline $	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	Topsoil ~ 15 FILL Brown, firm,	0.2 silty CLAY, trace sand, trace	SS	01	67	4		207 -	0		0		20.08	PP = 1.75 Kg / sq.cm PP = 2.5 Kg / sq.cm
		stiff, sandy silty CLAY, trace	SS	02	100	17		206 —	0		o ¹²		18.98	
	GR: 7%; SA trace broker	: 27%; SI: 47%; & CL: 19% n cobble pieces.	SS	03	100	26	- 2		0		⊫ 15		17.17	
	becomes ha	ırd	SS	04	100	36		205	0		o ¹¹		17.20	
	End of borel	203.6 nole 3.7	SS	05	100	36	- 3	204 -	0		o ¹¹		17.09	
	 with no f upon col 2. Water ta the hollo completi 3. PP= Pool 4. GR., SA 	e was found to be open reestanding water mpletion. ible was measured inside w stem auger upon on. cket Penetrometer. ., SI. & CL. denote Gravel, it & Clay respectively.								And </th <th></th> <th></th> <th></th> <th></th>				
	•))	$\frac{\nabla}{\Xi}$ No frees	tanding	ground	dwater i	measure	ed in o	pen bor	ehole upon co	ompletion of dri	lling.			
401 Vau	C • LAVALIN Hanlan Rd Ighan, Ontario L4 905-851-0090	Borehole details from a qualified (commisioned an	Geotechn	nical Eng	ineer. Als	o, boreh	ole info	rmation sl	nding of all pote nould be read in	ntial conditions pro	esent and requires interpretative a he geotechnical report for which i	assistance t was		Scale: 1 : 63

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Page: 1 of 1

ject Number:	OF BOREHOLE I			<u> </u>			Drilling	g Location:	As per bore	nole location plan		I	ogged by: AB
ent:	City of Brampton						Drilling	g Method:	200 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
oject Name:	Phase II Environmental Site	Assess	sment				Drilling	g Machine:	Track Mount	ed Drill		F	Reviewed by: MT
cation:	10192 Hwy 50, Brampton, ON						Date \$	Started:	Jun 20, 2019	Date Completed: Jun 2	20, 2019	<u>)</u> F	Revision No.: 0
LITH		SC	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	z	EAS	TING: 606359.9
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	ion Testing ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa)	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) ★ Passing 75 um (%) O Moisture Content (%) _Atterberg Limits	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4851769.6 COMMENTS
Local Ground	Surface Elevation: 208.98 m 0 mm. 208.7		Sa	Re	R	8		20 40	60 80	W _P Atterberg Limits W ₂ 0 40 60 80	ΞΞ		
FILL Brown, com NATIVE TIL	pact, gravelly SAND, moist ₂₀₈ .	SS 1	01	66	28		-	0					Sample submitted for laboratory analysis: BH72-01
	, stiff, sandy silty CLAY, thin	SS	02	82	9	- - - - -	208 -	0					Sample submitted for laboratory analysis: BH72-02
		ss	03	100	20			0					Sample submitted for laboratory analysis: BH72-03
becomes ha	ard	ss	04	100	33	- 2 - - -	207 -	0					ВП72-03
		SS	05	66	49	- 3	206 -		0				
		SS SS	06	100 0	48 50/ 125		-		0				
Grev dense	204. to very dense, sandy SILT, 4.3	7	07	0	mm	- - - - -	205 —						
trace clay, n	noist.	SS	08	100	49 50/ 125		204 -		0				
End of bore	hole. 5.0						201						
with no t complet 2. Water ta complet	e was found to be open freestanding water upon ion. ble was measured upon ion of drilling inside the tem auger.												
》		tandin-		wator	moseur		non ho-		ompletion of dril	ling			
)) C·LAVALIN		sanuing	y ground	awateri	neasure	eu 111 O	heii nou	enole upon co	πιριεαστι στ απι	y.			

RECORD	OF BOREHOLE N 665125	lo.	<u>BH</u>	<u>73</u>			Drillin	g Location:	As per bore	hole location plan			BRAMPTO
lient:	City of Brampton						-	g Method:		blow Stem Augering			Compiled by: NT
roject Name:	Phase II Environmental Site A	ssess	ment				-	g Machine:	Track Moun				Reviewed by: MT
ocation:	10192 Hwy 50, Brampton, ON						-	Started:		9 Date Completed: Jun:	20, 2019		Revision No.: 0
LITH	OLOGY PROFILE	so	SA	MPLI	NG		-	FIELD.	TESTING		1	-	TING: 000202
							Ē		ion Testing	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 400		NORT	TING: 606362 HING: 4851771.2
Local Ground	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (MTO Vane* △ Intact ▲ Remould * Undrained Sha 20 40	 Intact Remould ear Strength (kPa) 	 Lower Explosive Limit (LEL) * Passing 75 um (%) Moisture Content (%) 	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
Topsoil~ 10 FILI		ss	01	100	30			20 40	00 80	20 40 00 00			
NATIVE TIL	pact, gravelly SAND, moist _{208.2} L 0.6 , stiff, silty CLAY, some sand,	ss	02	82	11		208 -	0					Sample submitted for
trace gravel	, moist207.6 , very stiff to hard, silty sandyl.2 e gravel, moist.					1 	-						laboratory analysis: BH73-02
		SS	03	100	25	- 2	207 -	0					
becomes ha	41 U	SS	04	100	35		-	0					
		SS	05	66	40	- 3	206 -	0					
		SS	06	100	48				0				Sample submitted for
		SS	07	100	50	4	205 -		0				laboratory analysis: BH73-07
		SS	08	70	50/ 125 mm		204 -						
		SS	09	100	52	5			0				
	202.7	SS	10	100	63		203 -		0				
End of bore Notes:	hole. 6.1												-
with not complet 2. Water ta complet	e was found to be open freestanding water upon ion. able was measured upon ion of drilling inside the tem auger.												
•))	$\frac{\sum}{=}$ No frees	tanding	ground	dwater r	neasuro	ed in o	pen bor	ehole upon co	ompletion of dri	l Illing.	1	1	1
C • LAVALIN Hanlan Rd Jghan, Ontario L4 905-851-0090	4L 3T1 Borehole details from a qualified (commisioned an	Geotechn	ical Engi	ineer. Als	o, boreh	ole info	rmation s	nding of all pote nould be read in	ntial conditions pr conjunction with t	resent and requires interpretative a the geotechnical report for which it	assistance t was		Scale: 1 :

RI	ECORD	OF BOREI	HOLE N	lo.	<u>BH</u>	74/N	/ W	<u>74</u>						Ø	BRAMPTON
Proj	ject Number:	665125							Drilling	g Location:	As per borel	hole location plan		L	ogged by: JP
Clie	nt:	City of Brampton							Drilling	g Method:	200 mm Ho	llow Stem Augering		(Compiled by: <u>NT</u>
Proj	ject Name:	Geotechnical Inve	estigation-Jo	hnstor	n Trans	sit Fac	ility		Drilling	g Machine:	Track Mount	ted Drill		F	Reviewed by: MT
Loc	ation:	Brampton							_ Date S	Started:	Oct 16, 2019	9 Date Completed: Oct	16, 2019	<u> </u>	Revision No.: 0
	LITH	OLOGY PROFIL	E	SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING * Rinse pH Values	N		TING: 606484.167
Lithology Plot	Local Ground	DESCRIPTION	207.93 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	OCPT Nilcon Vane*	$ \begin{array}{c} 2 4 6 0 12 \\ \hline Soil V 2pour Reading \\ \hline parts per million (ppm) \\ 100 200 300 400 \\ \hline Lower Explosive Limit (LEL) \\ * Passing 75 um (%) \\ \hline Moisture Content (%) \\ \hline Musture Content (%) \\ \hline W_{P} \\ \hline 20 40 60 80 \end{array} $	INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	HING: 4851890.911
	Topsoil ~ 20 FILL		207.7	SS	01	100	12	E	-	0		₀ 18			Top of Riser = 208.82 m Height of Riser = 0.89 m
	Light brown clay, moist.	, loose, silty SAND	, some 207.2		01	100	13		-			0			Sample submitted for laboratory analysis : BH74-01
	NATIVE TIL Light brown trace gravel	, hard, sandy silty (SS	02	100	31		207 -	0		o ¹¹			Sample submitted for laboratory analysis : BH74-02
				SS	03	100	38	- 2	206 -	0					
				SS	04	100	55		205 —		0				
				SS	05	100	70	- 3	203 -		0				Some grey clay mottling.
		ht brownish grey, v trace clay, moist to		SS	06	100	70	1 - - - - - -	204 -		0	o ¹¹			Sample submitted for laboratory analysis : BH74-06
		n brown, very dens d gravel, wet.	<u>203.4</u> e, SAND,4.6	SS	07	8	60		203 -		0				
	becomes co	ompact.	202.0	SS	08	51	16		-	0					Borehole cave in at 5.64
• . • . •	End of Bore Notes:	hole.	<u>202.0</u> 5.9					-	-202 -						mbgl due to wet soil.
		e was found to be on the one of t													
	upon co the hollo	ble was measured mpletion of drilling w stem auger and 21,2019.	inside												
	2		$\frac{\nabla}{\overline{\underline{z}}}$ No freest	tanding	ground	lwater r	neasur	ed in o	pen bor	ehole upon co	mpletion of dri	lling.			
SNC	·LAVALIN		Groundw								<u>59 m</u> .				
Vaug	Hanlan Rd ghan, Ontario L₄ 905-851-0090	4L 3T1	Borehole details from a qualified C commisioned and	as prese Geotechn d the acc	nted, do iical Engi companyi	not cons ineer. Als ng'Notes	titute a th o, boreh to Reco	norough ole info rd of Bo	understa rmation sl preholes'.	nding of all pote hould be read in	ntial conditions pro	esent and requires interpretative a he geotechnical report for which i	assistance t was		Scale: 1 : 63 Page: 1 of 1

Pro	ject Number:		E No.	BH	75/	MW	<u>75</u>	_	g Location:		hole location plan		I	BRAMPTON
Clie Pro	ject Name:	City of Brampton Geotechnical Investigation	n-Johnsto	n Tran	sit Fac	ility		-	g Method: g Machine:	Track Mount	bllow Stem Augering ted Drill			Compiled by: <u>NT</u> Reviewed by: <u>MT</u>
Loo	ation:	Brampton						_ Date \$	Started:		9 Date Completed: Oct	16, 2019	_ F	Revision No.: 0
	LITH		sc		AMPLI	NG		-		TESTING	LAB TESTING * Rinse pH Values 2 4 6 8 10 12	NOI		TING: 606531.454 HING: 4851945.297
Lithology Plot	Local Ground	DESCRIPTION Surface Elevation: 208.09 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	 O SPT MTO Vane* △ Intact ▲ Remould 	● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa)		INSTRUMENTATION INSTALLATION	Unit Weight (KN/m3)	COMMENTS
	FILL Light brown gravel, mois			01	100	16	-		0		0 ¹⁹			Top of Riser = 208.95 m Height of Riser = 0.86 m. Sample submitted for laboratory
	NATIVE ST Light brown gravel, trace		0.8 0.8 SS	02	100	18		207 -	0		o ¹⁸			analysis : BH75-01 Sample submitted for laboratory analysis : BH75-02
			SS	03	100	33	- - - - - - 2	206 -	0					
	NATIVE TIL Light brown sandy silty		2.3 2.3 SS	04	100	89 / 255 mm								Some grey clay mottling.
) (SS	05	74	72	- 3 - - -	205 —		0				
	sand, moist	ish grey, silty CLAY, some	203.8	06	100	50 / 125 mm	- - 4 -	204 -		· · · · · · · · · · · · · · · · · · ·	o ¹¹			Sample submitted for laboratory analysis : BH76-06 Auger to 4.27 and refusal
	and no 2. Water ta upon co the hole	e was found to be open reestanding water. able was measured mpletion of drilling inside ow stem auger and on 21,2019.	4.3							Note				at 4.27 mbgs.
)) C·LAVALIN	_	reestanding undwater de							ompletion of dri 41 m.	l lling.	1	<u> </u>	1
401 Vau	Hanlan Rd ghan, Ontario L 905-851-0090	4L 3T1 From a qual	etails as prese	ented, do nical Eng	not cons ineer. Als	titute a ti so, boreh	horough ole info	understa	nding of all pote	ntial conditions pr	esent and requires interpretative he geotechnical report for which	assistance it was		Scale: 1 : 63

Page:	1	of	1
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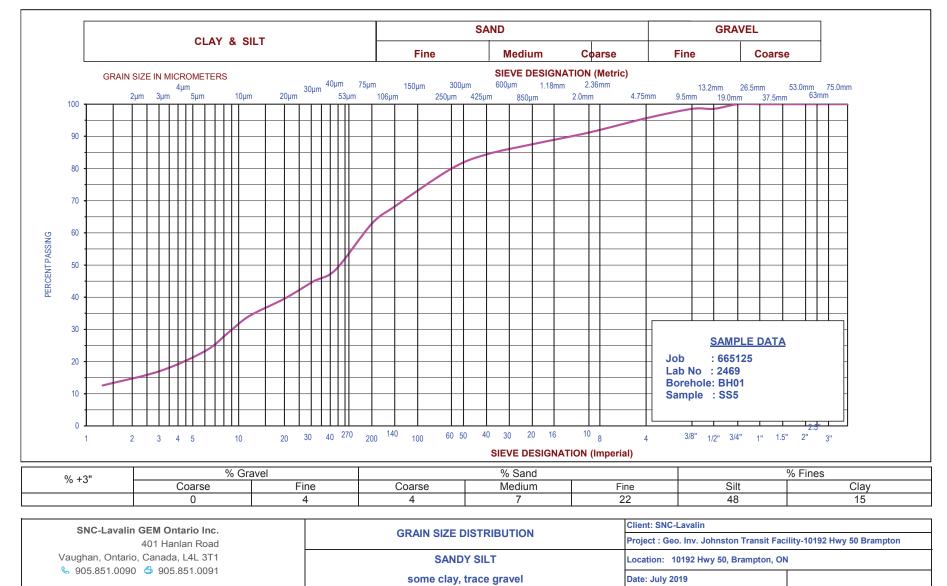
Project Number: <u>665125</u>										g Location:		hole location plan	Logged by: MF	
	ent:	City of Brampton								g Method:		lid Stem Augers	Compiled by: MF	
Project Name: <u>Geotechnical Investigation</u> . Location: <u>10192 Hwy 50</u>		igation-Jol	nnstor	Trans	sit Faci	ility			g Machine: Started:	Track Moun	ted Drill 9 Date Completed: Oct	15 2010	Reviewed by: MT	
													15, 2018	
Lithology Plot	LITH	DLOGY PROFILE		Sample Type	Sample Number	Kecovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)		Intact	LAB TESTING ★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit (LEL) * Passing 75 um (%) ○ Moisture Content (%)	INSTRUMENTATION INSTALLATION	EASTING: 606505.43 NORTHING: 4851930.42 COMMENTS
Lithold	Local Ground	Surface Elevation: 208	3.01 m	Samp	Samp	Recov	SPT '	DEPT	ELEV		ear Strength (kPa)	$ \begin{array}{c} & \text{Moisture Content (\%)} \\ & \text{Moisture Content (\%)} \\ & \text{Atterberg Limits} \\ W_{p} \\ \hline \begin{array}{c} & \\ & \\ & \\ & \\ & \\ & \\ & \\ & \\ & \\ & $	INSTF INST/	
	Topsoil ~ 15 FILL Brown, stiff trace gravel	0 mm , silty CLAY, some sa , rootlets, moist.	207.9 0.2 Ind, 207.4	SS	01	75	11	-	-	0		o ²²		
	trace gravel	L CLAY, trace to some , oxidized, moist. : 12%;SI: 40% ; CL: 4		SS	02	100	24	- - - - - -	207 — - - -	0		<u>a16</u> ●		
				SS	03	100	23	- - - - - - -	- - - 206 —	0		o ¹⁴		Wet Unit Weight= 1958.92 kg/m^3.
ľ		dense, silty SAND, tr. d, trace gravel, moist.		SS	04	100	88	- - - -	-		0			
	Brown, very trace to som	dense, sandy silty CL ae gravel, oxidized, mo	<u>205.0</u> AY, 3.1 bist.	SS	05	16	50	- 3 - - - -	205 -		0	o ¹¹	Ē	Wet Unit Weight= 1786.63 kg/m^3.
								- - - 4 - -	204					
	Brown, very trace silt, m	dense, SAND, trace g bist.	<u>203.4</u> gravel,4.6	SS	06	100	66		- - - 203 —		0	_o 20 o ¹⁸		
								- - -	- - - - - - - - - - - - - 					
	becomes fir	e.	201.3	SS	07	51	50	- 6 - - - -	202		0	o ¹⁰ o ¹⁷		
•1	End of Bore	hole.	6.7											
	and free 3.05 mb 2. Borehol mbgs u 3. GR, SA	e was found to be ope standing water was at gs upon completion. e was found to cave ir pon completion. SI, CL denotes Grave ilt and Clay, respective	t n 1.07m el,											
1			Groundw	ater de	pth on	comple	tion of	drilling): <u>3.05</u>	m		Cave in depth record	ed on co	mpletion of drilling: <u>5.5 m</u> .
	C·LAVALIN													

R	ECORD	OF BORE	HOLE N	lo.	<u>BH</u>	77								<i> B</i> RA	MPTON
Pro	ject Number:	665125							Drilling	g Location:	As per borel	hole location plan		Logged by:	MF
Cli	ent:	City of Brampton	1						Drilling	g Method:	150 mm So	lid Stem Augers		MF	
Pro	ject Name:	Geotechnical Inv	estigation-Jol	hnstor	n Trans	sit Fac	ility		Drilling	g Machine:	Track Mount	ted Drill		Reviewed by:	MT
Lo	cation:	10192 Hwy 50							Date	Started:	Oct 15, 2019	9 Date Completed: Oct 1	15, 2019	Revision No.:	0
	LITH	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING * Rinse pH Values	Z	EASTING: 60652			
Lithology Plot		DESCRIPTION Surface Elevation:	207.89 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	O SPT MTO Vane* △ Intact ▲ Remould	 Intact Remould ear Strength (kPa) 	A Write privatives 2 4 6 10 12 Soil Vapour Reading parts per million (ppm) 100 200 300 400 A Lower Explosive Limit (LEL) x Passing 75 um (%) Moisture Control (%) Wp Attendent (%) Wp 4.4 Centerd (%) 4.0 6.0 80 Wite	INSTRUMENTATION INSTALLATION	COMMEN	
	trace gravel NATIVE TIL Brown, very gravel, trace	f, silty CLAY, trace , rootlets, moist.	207.3 0.6 LAY, trace	SS	01	75	12	- - - - - - - - - - - - - - - - - - -	207 -	0		_o 20 _o 11		Wet Unit Weight= 19	57.23 kg/m^3.
	GR: 1%; SA	x: 28%; SI: 51% ; C	CL: 20%	SS	03	100	40	 - - - - - - - -	206 -	0		<u>ा</u> 3		Wet Unit Weight= 183	32 03 ka/m^3
				SS	04	100	90		205 -		0	o ¹⁰	∏ Ţ	wet Unit weight- 16.	52.03 kg/IIF3.
		r dense, silty SANE trace gravel, wet.	<u>204.7</u> D, trace to 3.2	SS	05	100	73	-	-		0	o ¹⁸ o ¹²	=		
								- - 4 - -	204 —						
	GR: 3%; SA	\: 43%; SI: & CL: 5	4%	SS	06	100	88	- - - - - - 5 -	203 -		Ο	o ²⁴ o ²⁵			
								- - - - - - - 6	202 -			20			
	5 1 (5		201.2	SS	07	100	51	- - - -	- - - -		0	0 ²⁰ 0 ¹⁸			
	and free 3.05 mb 2. Borehol 1.22 ml 3. GR, SA	e was found to be estanding water wa igs upon completic e was found to cav ogs upon completi SI, & CL denote C It and Clay, respec	is at on. ve in up to on. Gravel,												
)) C·LAVALIN		$\frac{\nabla}{\overline{z}}$ Groundw	vater de	pth on	comple	tion of	drilling	: <u>3.05</u>	<u>i m</u>		Cave in depth record	ed on co	mpletion of drilling:	<u>1.22 m</u> .
Vau	Hanlan Rd ghan, Ontario L 905-851-0090	4L 3T1	Borehole details a from a qualified of commissioned and	Geotechn	ical Engi	ineer. Als	o, boreh	ole infor	mation sl	nding of all pote nould be read in	ntial conditions pr conjunction with t	esent and requires interpretative a he geotechnical report for which it	ssistance was		Scale: 1 : 42 age: 1 of 1

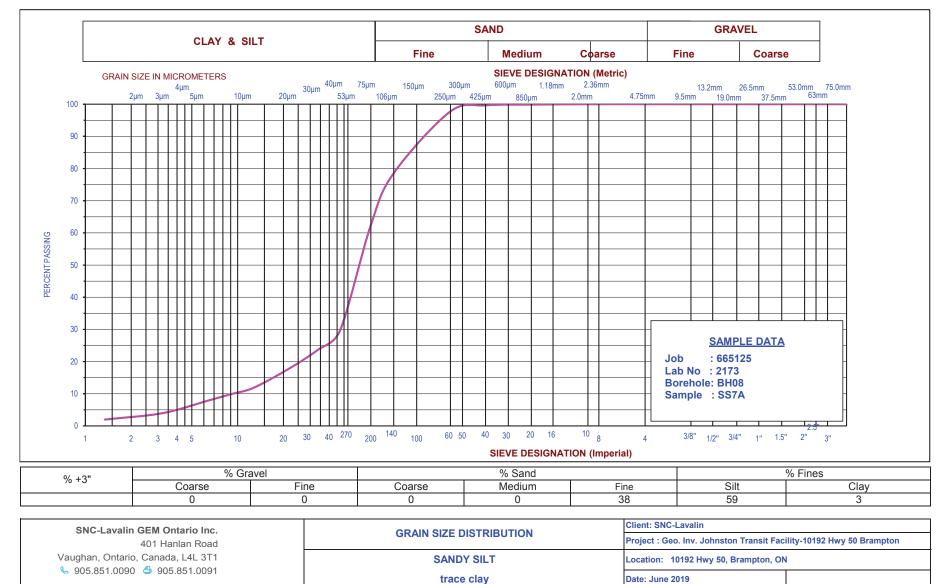
Appendix C

Laboratory Testing Results (21 pages)

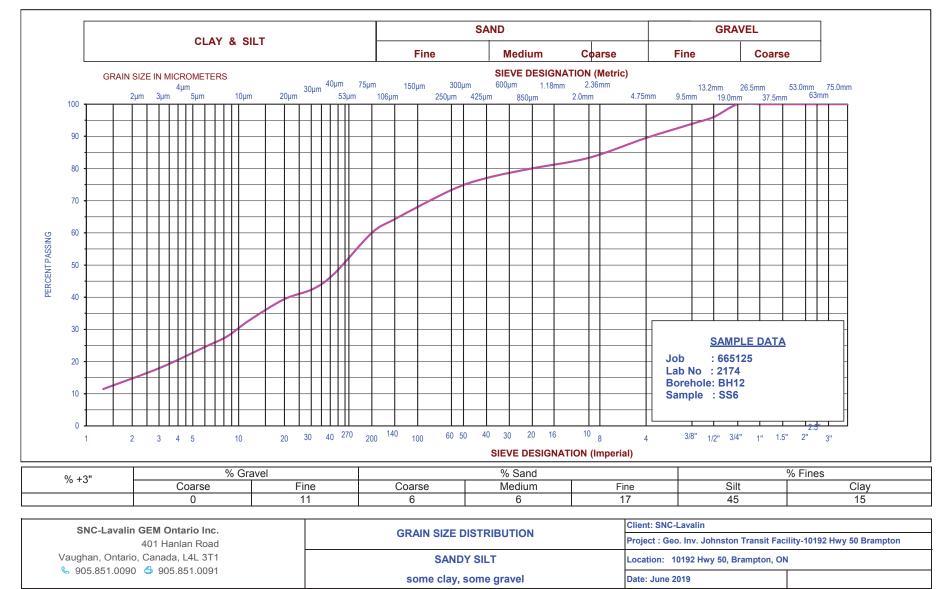




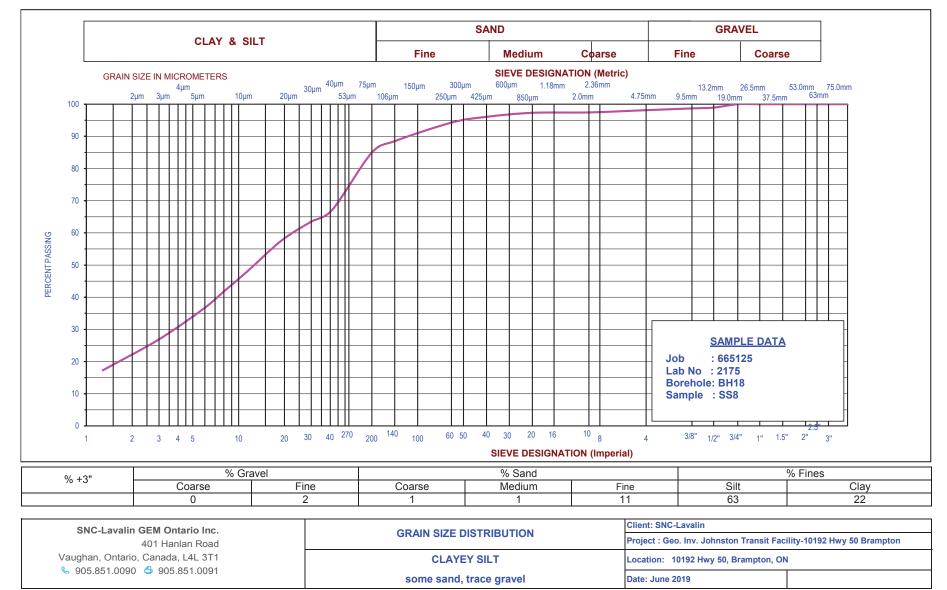




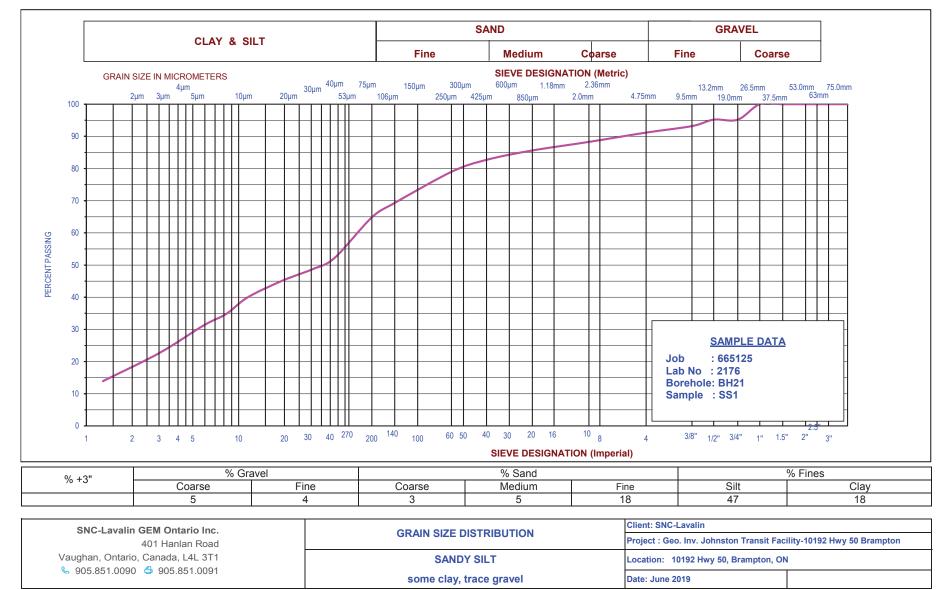




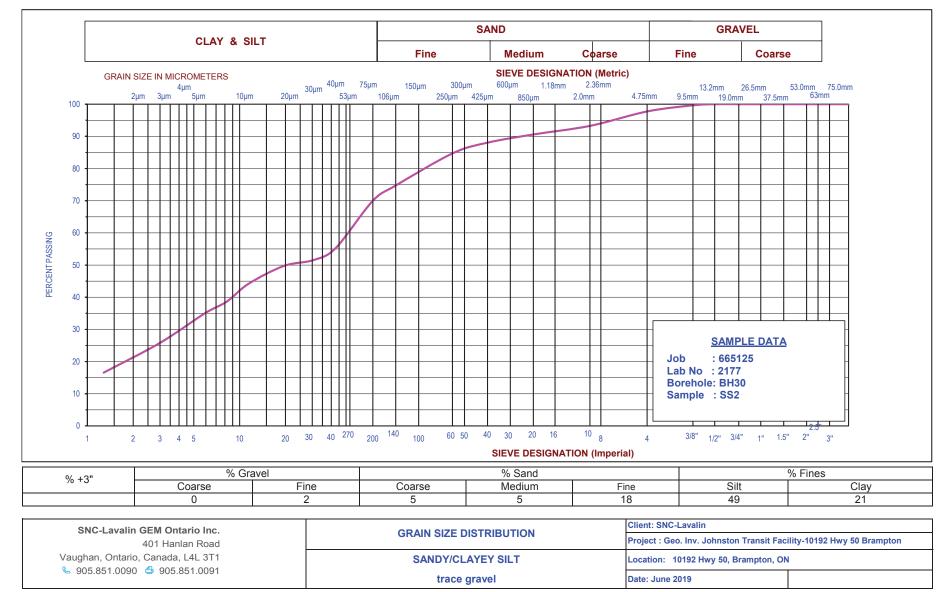




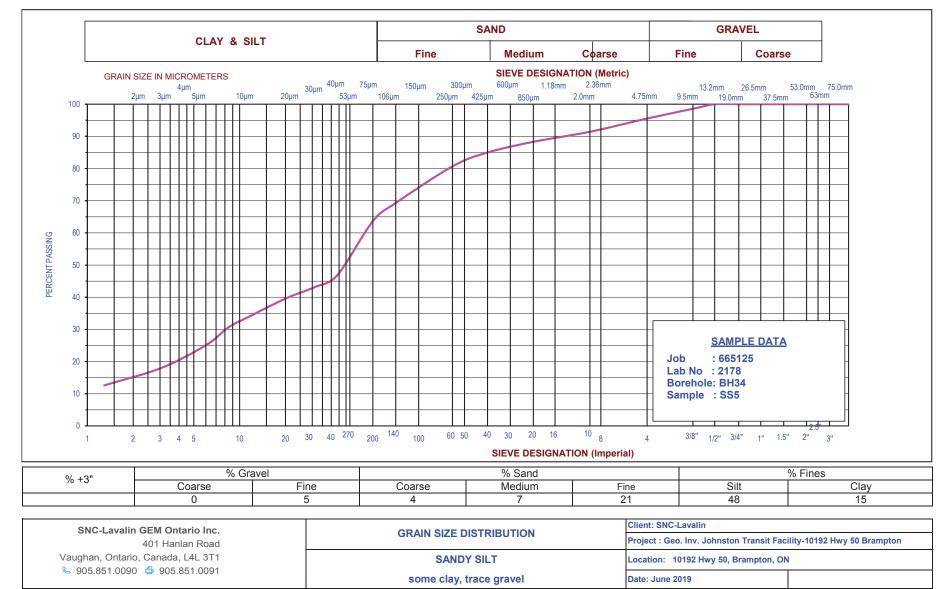




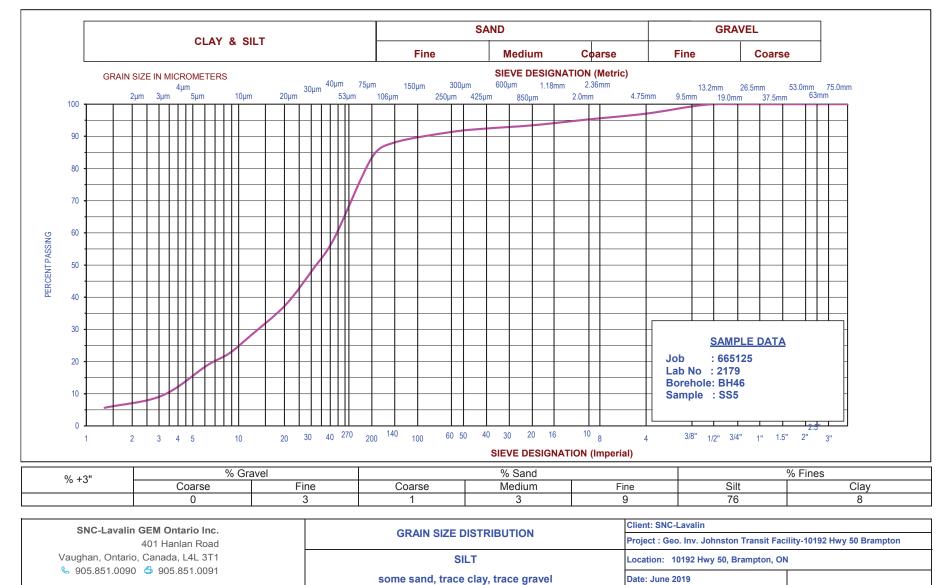




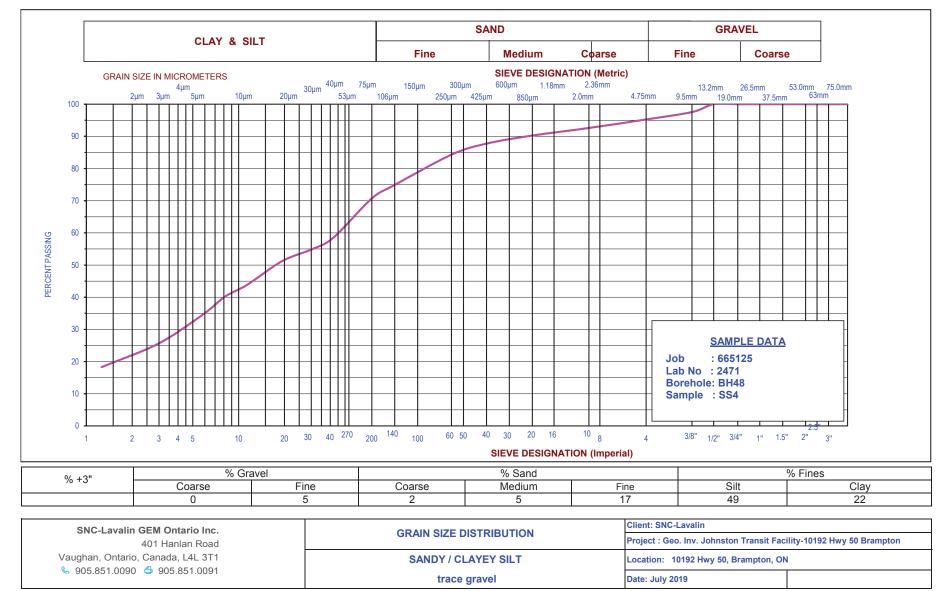




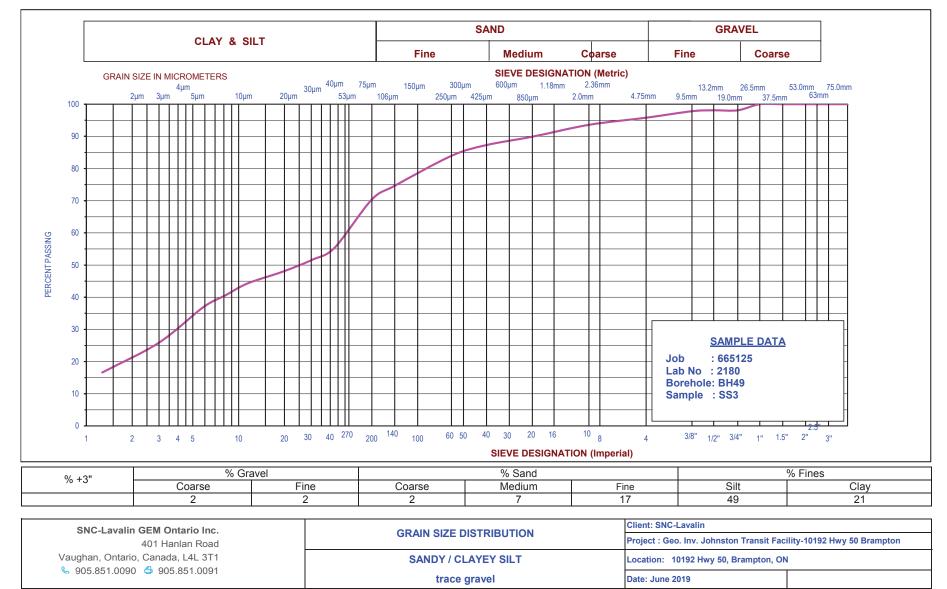




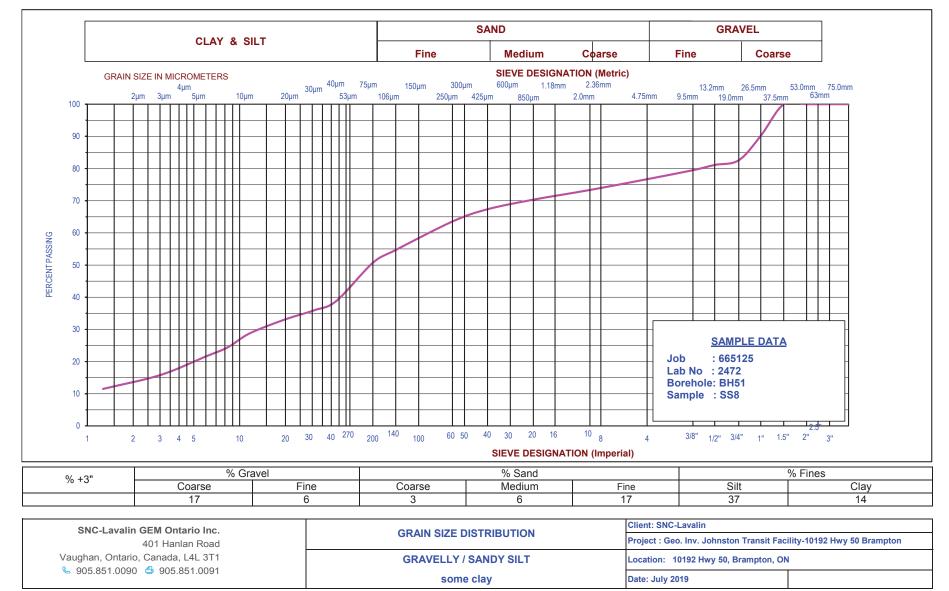




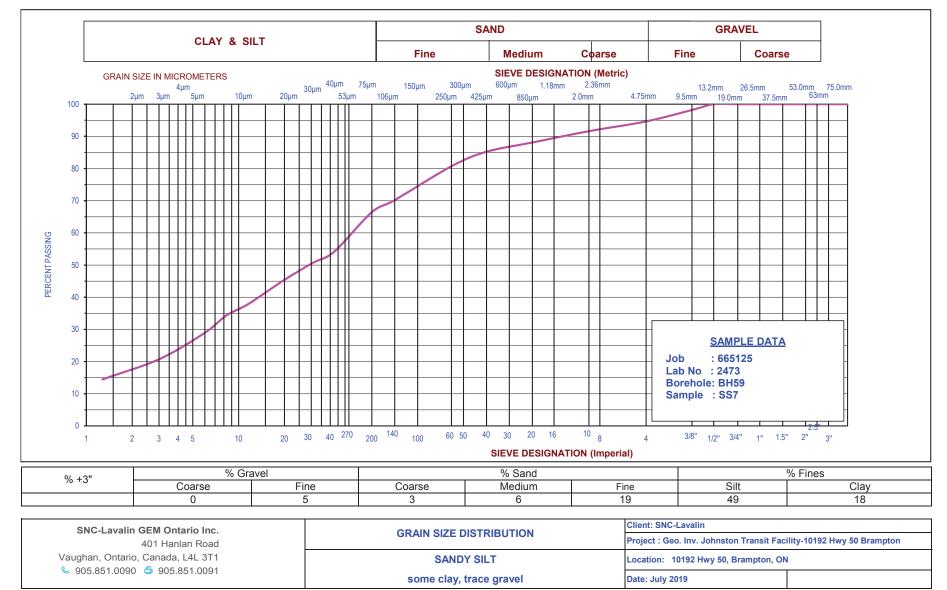




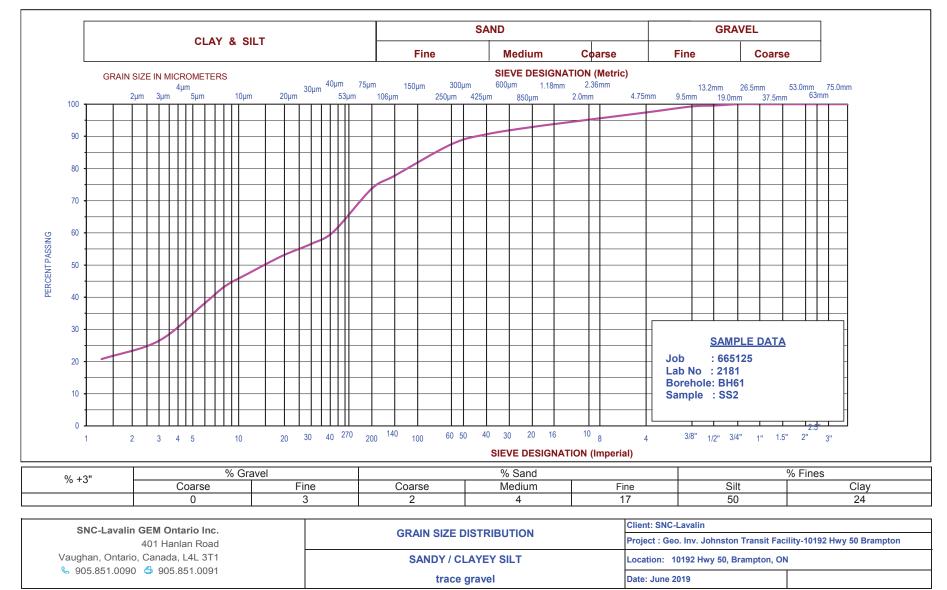




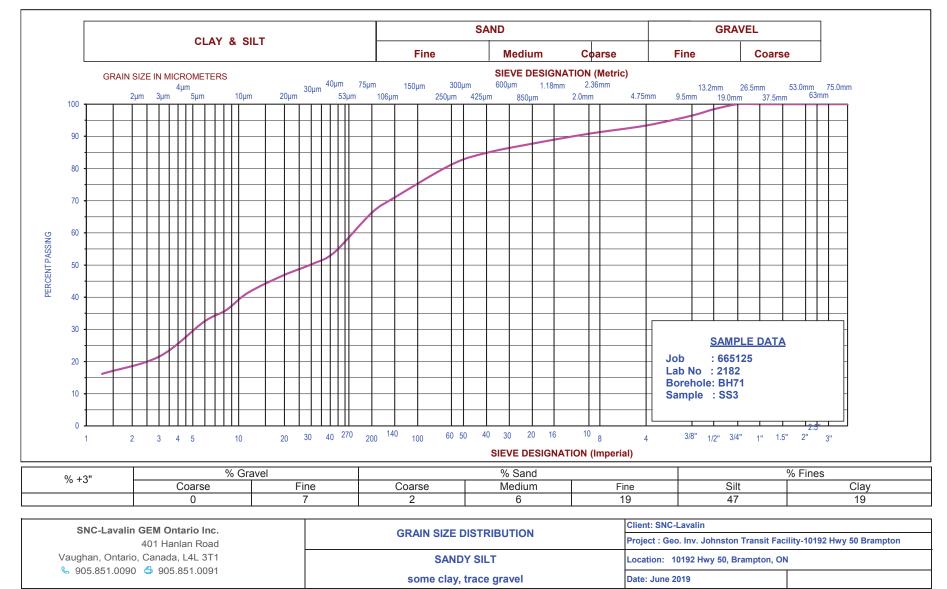




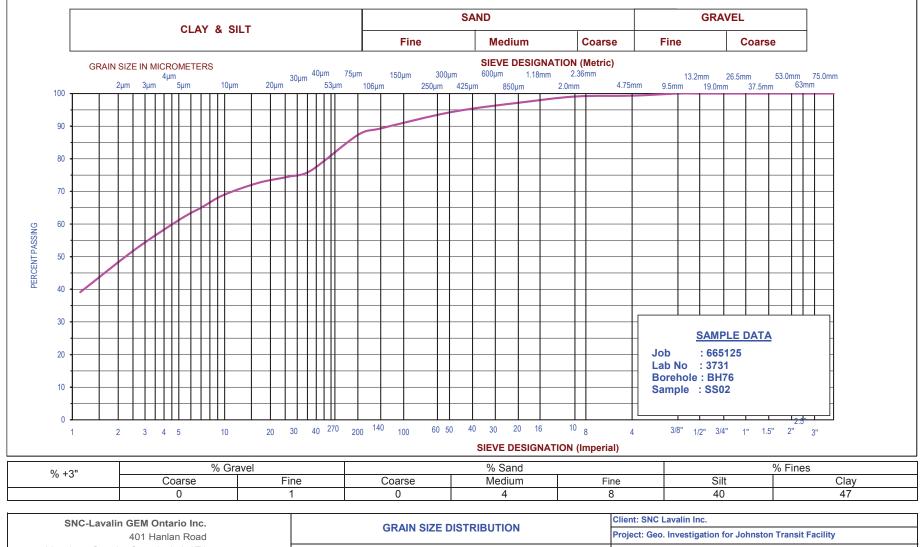












Vaughan, Ontario, Canada, L4L 3T1 Sec. 851.0090 4 905.851.0091

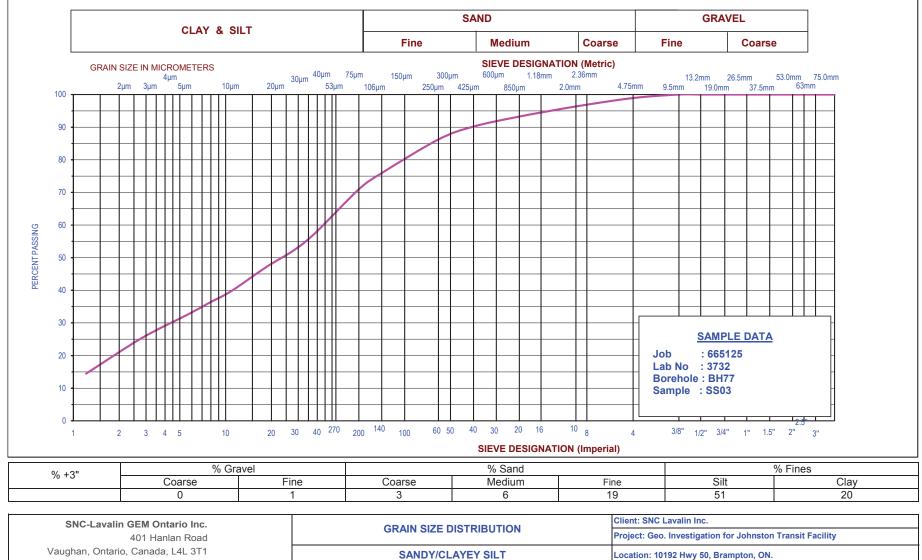
GRAIN	SIZE	DIST	RIB	JTION
	SILT	& CL	AY.	

some sand, trace gravel

Location:10192 Hwy 50, Brampton, ON.

Date: October 2019





Section 2019 € 100 €

trace gravel

Date: October 2019



SNC-Lavalin GEM Ontario Inc.

401 Hanlan Road

Vaughan, Ontario, Canada, L4L 3T1 & 905.851.0090 *4* 905.851.0091

Grain Size Analysis Test Report

SAMPLE DATA	1								Γ	Contr			Analysis	6	
Material:	Soil								ŀ	Sieve			nt Pass		
Date Sampled:	Oct 24, 20	10								Sizes (mm)			Specific		
ime Sampled:	001 24, 20	19	ł	150.0		100		100							
Sample Type:	Borehole		ŀ	106.0		100		-							
Sample Location:	ŀ	75.0		100		-									
ot:	BH77, SS(Sublot:	53.0		100		-								
Source:	Insitu						ŀ	37.5		100					
Sampled By:	Mahdi Tav	akouli	ŀ	26.5		100		-							
		anoun							ŀ	22.4		100		-	
AB DATA									ŀ	19.0		100		-	
ab No.: 3	3734 Date Tested: Oct 25, 2019											100		-	
Specification: ,	,											100		-	
-									₋, ŀ	9.5		99.3		-	
PARTICLE ANALYS	SIS Sample	Specification	WASH	PASS 0	.075mm		<u></u>] ŀ	6.7				-			
TEST		TEST	Sample Specs				4.75	-	96.8 -		-				
Percent Crushed:		<u> </u>		Wash Pass 0.075 mm:						2.36	_	94.3			
% Asphalt Coated:		<u> </u>	FINENES	FINENESS MODULUS 0.76							_	90.8			
% Flat and Elongated									ŀ	0.600	_	87.2		-	
Comments:									ŀ	0.300	_	82		-	
									ŀ	0.150)	73.9		-	
									ŀ	0.075	5	64.1	0 -	100	
	Sample:		Specs:						*	Indicate	es Out o	of Specif	ication		
100									T						
90															
80									-						
70						_			_						
0.0															
						_		+	-	+					
· _						+		+	+						
50						_									
50				_				+	+						
40							-	+ +				1	1		
50										_					
40															
50 40 30 20															
50 40 30															

knowledge of SNCL. The testing services reported herein have been performed by a SNCL technician to recognized industry standards, unless otherwise noted. No other warranty is made. This data does not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, SNCL will provide it upon written request.

Project Manager: Mavara Turab





SNC-Lavalin GEM Ontario Inc.

401 Hanlan Road

Grain Size Analysis Test Report

Project Location: SAMPLE DATA	1									Cor		<u>No.:</u> No.:		nalysis	5		
Material:	Soil									Sie				nt Pass			
Date Sampled:	Oct 24, 2	0010								Siz (m		Samp		Specific			
Time Sampled:	UCI 24, 2	2019			150		100			100							
Sample Type:	Borehole	`	100		100												
Sample Location:	BH77, S		75		100												
	DH(1 , 3)	Sublot:	53		100												
Source:	Insitu	••••••		•	ation					37		100					
Sampled By:	Mahdi Ta	avakouli								26		100					
ampieu by.		avakuuli								20		100					
AB DATA										19		100					
_ab No.: 3	3733		Date T	ested:	16		100										
Specification			2440		13		98.3										
Specification: ,										9.		97.					
PARTICLE ANALYS	SIS		WA	SH PASS	6 0.075mi	n		9. 6.		97.3	,						
TEST	on	TES	ST	Sa	Sample Specs					97		-					
Percent Crushed:			Was	h Pass 0.	075 mm:					4.							
% Asphalt Coated:			FINE	FINENESS MODULUS 0.38							36 18	96.7 96.4		-			
% Flat and Elongated																	
Comments:										0.6		96.3					
oonnients.										0.3		95.7					
										0.1		82.4			-		
	Sampl	e:	Spece	s: _						0.0		53.7 out of Sp			100		
100									_				00011				1
90									+								1
50																	1'
80									_								2
70																	3
60									_								
									_								4
50																	5
,									_	\vdash	_						
40																	6
30																	7
									+	\vdash							•
; 20																	8
, .									+						$ \square $		9
10																	
									-								10

knowledge of SNCL. The testing services reported herein have been performed by a SNCL technician to recognized industry standards, unless otherwise noted. No other warranty is made. This data does not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, SNCL will provide it upon written request.

Project Manager: Mavara Turab





SNC-Lavalin GEM Ontario Inc. 401 Hanlan Road Vaughan, Ontario, Canada, L4L 3T1 905.851.0090 4 905.851.0091

PLASTICITY CHART 665125 Job # 5 Project Client: Technician : UC SNC Lavalin Geotechnical Investigation for Johnston Transit Facility Project Supervisor KL 10192 HWY 50, Brampton, ON. _ocation Date 20/7/2019 **TEST RESULTS** Classification LL% PL% ΡΙ W% Remarks Specimen # Sample # Depth Fines CL-ML/CL Lab # 2174 BH12 SS06 18 11 7 8 CL Lab # 2175 BH18 SS08 23 14 9 BH21 SS01 20 CL Lab # 2176 12 8 13 BH30 SS02 23 14 CL Lab # 2177 9 BH34 SS05 20 12 8 10 CL Lab # 2178 BH12 SS06 BH18 SS08 × BH30 SS02 BH34 SS05 60 50 W =50 CH or OH 40 A' Line PI = 0.73(LL-20) PLASTICITY INDEX, PI 00 00 CL or OL MH or OH 10 89 8 9 CL-ML ML or O 0 0 10 20 30 40 60 70 80 90 100 50 LIQUID LIMIT, LL



SNC-Lavalin GEM Ontario Inc. 401 Hanlan Road Vaughan, Ontario, Canada, L4L 3T1 905.851.0090 4 905.851.0091

PLASTICITY CHART Job # 665125 5 Project Client: Technician : UC SNC Lavalin Geotechnical Investigation for Johnston Transit Facility Project Supervisor KL 10192 HWY 50, Brampton, ON. _ocation Date 20/7/2019 **TEST RESULTS** Classification LL% PL% ΡΙ W% Remarks Specimen # Sample # Depth Fines Lab # 2179 BH46 SS05 9 No Plasticity 23 Lab # 2180 BH49 SS03 13 10 15 CL BH61 SS02 25 CL Lab # 2181 13 12 18 BH71 SS03 22 12 10 15 CL Lab # 2182 BH46 SS05 BH49 SS03 × BH71 SS03 ٠ 60 50 W =50 CH or OH 40 A' Line PI = 0.73(LL-20) PLASTICITY INDEX, PI 00 00 CL or OL MH or OH **1**2 10 🗶 10 10 CL-ML ML or Ol 0 0 10 20 30 40 50 60 70 80 90 100

LIQUID LIMIT, LL



SNC-Lavalin GEM Ontario Inc. 401 Hanlan Road Vaughan, Ontario, Canada, L4L 3T1 905.851.0090 4 905.851.0091

PLASTICITY CHART 665125 Job # Project Client: Technician : UC SNC Lavalin Inc. Geotechnical Investigation for Johnston Transit Facility Project Supervisor KL 10192 HWY 50, Brampton, ON. _ocation Date 30/10/2019 **TEST RESULTS** LL% Classification Depth PL% ΡΙ W% Remarks Specimen # Sample # Fines Lab # 3731 **BH76** SS02 37 18 19 16 CL SS03 25 CL Lab # 3732 BH77 15 10 13 ◆BH76 SS02 BH77 SS03 60 50 W₁=50 CH or OH 40 A' Line PI = 0.73(LL-20) PLASTICITY INDEX, PI CL or OL 19 ۵ MH or OH 10 10 CL-ML ML or OI 0 0 10 20 30 40 50 60 70 80 90 100 LIQUID LIMIT, LL

Appendix D

Analytical Laboratory Results (85 pages)



SNC-Lavalin GEM Ontario Inc. (Vaughan) ATTN: Brendan Weaver 401 Hanlan Road Vaughan ON L4L 3T1 Date Received:04-JUN-19Report Date:11-JUN-19 12:02 (MT)Version:FINAL

Client Phone: 905-851-0090

Certificate of Analysis

Lab Work Order #: L2285075

Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED 665125 17-732945

Mathy Mahadeva Account Manager

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L2285075 CONT'D.... Job Reference: 665125 PAGE 2 of 8 11-JUN-19 12:02 (MT)

Summary of Guideline Exceedances

Guideline										
ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit				
Ontorio Boo	Ontaria Pagulation 153/04 - Anril 15, 2011 Standards - T1-Sail-Pas/Park/Inst/Ind/Com/Commu Property Use									

Ontario Regulation 153/04 - April 15, 2011 Standards - T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

(No parameter exceedances)



L2285075 CONT'D.... Job Reference: 665125 PAGE 3 of 8 11-JUN-19 12:02 (MT)

Physical Tests - SOIL

		l	_ab ID	L2285075-1	L2285075-2
	9	Sample	e Date	03-JUN-19	03-JUN-19
		Sam	ple ID	BH37-SS02	BH53-SS02
Analyte	Unit	Guide #1	Limits #2		
Conductivity	mS/cm	0.57		0.450	
,		0.57	-	0.158	0.220
% Moisture	%	-	-	10.7	10.9
рН	pH units	-	-	7.85	7.78
Redox Potential	mV	-	-	245	244
Resistivity	ohm*cm	-	-	6320	4550

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



L2285075 CONT'D.... Job Reference: 665125 PAGE 4 of 8 11-JUN-19 12:02 (MT)

Leachable Anions & Nutrients - SOIL

		Sampl	Lab ID e Date ple ID	L2285075-1 03-JUN-19 BH37-SS02	L2285075-2 03-JUN-19 BH53-SS02
Analyte	Unit	Guide #1	Limits #2		
Chloride	ug/g	-	-	5.3	7.1

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



L2285075 CONT'D.... Job Reference: 665125 PAGE 5 of 8 11-JUN-19 12:02 (MT)

Anions and Nutrients - SOIL

		Sampl	Lab ID e Date ple ID	L2285075-1 03-JUN-19 BH37-SS02	L2285075-2 03-JUN-19 BH53-SS02
Analyte	Unit	Guide #1	Limits #2		
Sulphate	mg/kg	-	-	75	74

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



L2285075 CONT'D.... Job Reference: 665125 PAGE 6 of 8 11-JUN-19 12:02 (MT)

Inorganic Parameters - SOIL

		Sampl	Lab ID le Date nple ID	L2285075-1 03-JUN-19 BH37-SS02	L2285075-2 03-JUN-19 BH53-SS02
Analyte	Unit	Guide #1	Limits #2		
Acid Volatile Sulphides	mg/kg	-	-	<0.20	<0.20

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

Reference Information

М	ethods Listed (if applicabl	lo);			11-JUN-19 12:02 (MT)
	LS Test Code	Matrix	Test Description	Method Reference**	
	CL-R511-WT	Soil	Chloride-O.Reg 153/04 (July 2011)	EPA 300.0	
	5 grams of dried soil is mi	xed with 10 gra	ms of distilled water for a minimum of 30	0 minutes. The extract is filtered and analyzed by ion chromatography.	
	Analysis conducted in acc	cordance with th	ne Protocol for Analytical Methods Used	in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (Jul	y 1, 2011).
	EC-WT	Soil	Conductivity (EC)	MOEE E3138	
	A representative subsamp	ole is tumbled w	vith de-ionized (DI) water. The ratio of wa	ater to soil is 2:1 v/w. After tumbling the sample is then analyzed by a conductivity meter.	
	Analysis conducted in acc	cordance with th	ne Protocol for Analytical Methods Used	in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (Jul	y 1, 2011).
	MOISTURE-WT	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)	
	PH-WT	Soil	рН	MOEE E3137A	
	A minimum 10g portion of using a pH meter and electron		extracted with 20mL of 0.01M calcium ch	hloride solution by shaking for at least 30 minutes. The aqueous layer is separated from th	e soil and then analyzed
	Analysis conducted in acc	cordance with th	ne Protocol for Analytical Methods Used	in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (Jul	y 1, 2011).
	REDOX-POTENTIAL-WT	Soil	Redox Potential	APHA 2580	
			e with the procedure described in the "AF tion potential of the platinum metal-refer	PHA" method 2580 "Oxidation-Reduction Potential" 2012. Samples are extracted at a fixed rence electrode employed, in mV.	d ratio with DI water. Results
	RESISTIVITY-CALC-WT	Soil	Resistivity Calculation	APHA 2510 B	
	Resistivity are calculated I	based on the co	onductivity using APHA 2510B where Co	onductivity is the inverse of Resistivity.	
	RESISTIVITY-CALC-WT	Soil	Resistivity Calculation	MOECC E3138	
	Resistivity are calculated I	based on the co	onductivity using APHA 2510B where Co	onductivity is the inverse of Resistivity.	
	SO4-WT	Soil	Sulphate	EPA 300.0	
	5 grams of soil is mixed w	ith 50 mL of dis	stilled water for a minimum of 30 minutes	s. The extract is filtered and analyzed by ion chromatography.	
	SULPHIDE-WT	Soil	Sulphide, Acid Volatile	APHA 4500S2J	
			e with the method described in APHA 45 ution by inert gas. The acid volatile sulfid	00 S2-J. Hydrochloric acid is added to sediment samples within a purge and trap system. le is then determined colourimetrically.	The evolved hydrogen
**A	LS test methods may incor	porate modifica	ations from specified reference methods	to improve performance.	
С	hain of Custody Numbers:				
	17-732945				
Т	he last two letters of the ab	ove test code(s) indicate the laboratory that performed	analytical analysis for that test. Refer to the list below:	
	Laboratory Definition Code	Laboratory	Location		

ALS EI

WΤ

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:	L228507	5	Report Date: 11-	-JUN-19		Page 1 of 3	
Client:	401 Hanla		o Inc. (Vaughan)							
Contact:	Brendan									
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
CL-R511-WT		Soil								
Batch	R4663324									
WG3072202- Chloride	3 CRM		AN-CRM-WT	100.2		%		70-130	10-JUN-19	
WG3072202- Chloride	4 DUP		L2285075-1 5.3	5.3		ug/g	0.5	30	10-JUN-19	
WG3072202-: Chloride	2 LCS			102.9		%		80-120	10-JUN-19	
WG3072202- Chloride	1 MB			<5.0		ug/g		5	10-JUN-19	
EC-WT		Soil								
Batch	R4662549									
WG3072201- Conductivity	4 DUP		WG3072201-3 0.324	0.334		mS/cm	3.0	20	10-JUN-19	
WG3072201- Conductivity	2 IRM		WT SAR3	104.8		%		70-130	10-JUN-19	
WG3072326- Conductivity	1 LCS			100.2		%		90-110	10-JUN-19	
WG3072201- Conductivity	1 MB			<0.0040		mS/cm		0.004	10-JUN-19	
MOISTURE-WT		Soil								
Batch	R4659710									
WG3067846-3 % Moisture	3 DUP		L2284971-6 14.2	15.1		%	5.8	20	06-JUN-19	
WG3067846-: % Moisture	2 LCS			99.9		%		90-110	06-JUN-19	
WG3067846- % Moisture	1 MB			<0.10		%		0.1	06-JUN-19	
PH-WT		Soil								
Batch	R4661669									
WG3067615- рН	1 DUP		L2283122-7 7.39	7.38	J	pH units	0.01	0.3	07-JUN-19	
WG3071086- рН	1 LCS			7.06		pH units		6.9-7.1	07-JUN-19	
REDOX-POTEN	TIAL-WT	Soil								
Batch	R4660250									
WG3068764- Redox Poten			WT-REDOX	98.3		%		80-120	06-JUN-19	
WG3067645-	1 DUP		L2285078-1							



Quality Control Report

			Workorder:	L2285075		Report Date:	11-JUN-19		Page 2 of 3	
Client:	401 Hanla	ilin GEM Ontaric in Road ON L4L 3T1	o Inc. (Vaughan)							
Contact:	Brendan V	Veaver								
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
REDOX-POTEN	TIAL-WT	Soil								
Batch WG3067645- Redox Poten	-		L2285078-1 245	242		mV	1.2	25	06-JUN-19	
SO4-WT		Soil								
	R4661440									
WG3067929- Sulphate	4 CRM		AN-CRM-WT	94.8		%		60-140	06-JUN-19	
WG3067929- Sulphate	3 DUP		L2285075-2 74	75		mg/kg	2.2	30	06-JUN-19	
WG3067929- Sulphate	2 LCS			102.4		%		80-120	06-JUN-19	
WG3067929- Sulphate	1 MB			<20		mg/kg		20	06-JUN-19	
SULPHIDE-WT		Soil								
	R4659035									
WG3068180- Acid Volatile	Sulphides		L2285078-1 <0.20	<0.20	RPD-NA	mg/kg	N/A	30	05-JUN-19	
WG3068180- Acid Volatile	Sulphides			85.8		%		70-130	05-JUN-19	
WG3068180- Acid Volatile				<0.20		mg/kg		0.2	05-JUN-19	

Workorder: L2285075

Report Date: 11-JUN-19

Client:	SNC-Lavalin GEM Ontario Inc. (Vaughan)
	401 Hanlan Road
	Vaughan ON L4L 3T1
Contact:	Brendan Weaver

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 predetermined data quality objectives to provide confidence in the accuracy of associated test results.

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



Chain of Custody (COC) / Analytical





L2285075-COFC

COC Number: 17 - 732945 Page 1 of 1

sample is hazardous (please provide further details

OF CONTAINERS

JUMBER

(ALS)	Environmencal Canad	a Toll Free: 1 800 6																
Report To	Contact and company name below will appear on the final report		Report Format			L	Select Service Level Below - Contact your AM to con										may app	ply)
Company:	SNC-LAVALIM	Select Report F	ormat: 🕅 🕅 PDF 🕻	EXCEL ED	D (DIGITAL)			ular [R]										
Contact:	Brenday Weaver		QC) Report with Repo			1631		[P4-20%			<u> i i</u>	Business						
Phone:	U167099880	Compare Res	ults to Criteria on Report - p	provide details below if	box checked		3 day				Sa Sa	Same Day, Weekend or Statutory holiday [E2-200% (Laboratory opening fees may apply)]						
	Company address below will appear on the final report	Select Distributi		MAIL [2 day				1	aboratory	opening i	ees ma				_
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Released by:	BW Date: 04/JUNE/19	me: Received by:		Date:		Time				1	P		Ju	m	4		Tim	5:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

YELLOW - CLIENT COPY WHITE - LABORATORY COPY

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.

JULY 2017 FROM

Time: 15:40



SNC-Lavalin GEM Ontario Inc. (Vaughan) ATTN: Brendan Weaver 401 Hanlan Road Vaughan ON L4L 3T1 Date Received:05-JUN-19Report Date:11-JUN-19 12:04 (MT)Version:FINAL

Client Phone: 905-851-0090

Certificate of Analysis

Lab Work Order #: L2285990

Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED 665125 17-732946

Mathy Mahadeva Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 5730 Coopers Avenue, Unit #26 , Mississauga, ON L4Z 2E9 Canada | Phone: +1 905 507 6910 | Fax: +1 905 507 6927 ALS CANADA LTD Part of the ALS Group An ALS Limited Company

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L2285990 CONT'D.... Job Reference: 665125 PAGE 2 of 8 11-JUN-19 12:04 (MT)

Summary of Guideline Exceedances

Guideline						
ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontorio Boo	vulation 152/04 A	pril 15, 2011 Standarda, T1 Sail Bac/Bark/	nct/Ind/Com/Con			

Ontario Regulation 153/04 - April 15, 2011 Standards - T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use (No parameter exceedances)



L2285990 CONT'D.... Job Reference: 665125 PAGE 3 of 8 11-JUN-19 12:04 (MT)

Physical Tests - SOIL

		l	_ab ID	L2285990-1	L2285990-2	L2285990-3	L2285990-4	L2285990-5	L2285990-6
	:	Sample	e Date	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19
			BH61-SS02	BH16-SS02	BH59-SS02	BH67-SS02	BH49-SS02		
		Guide	Limits						
Analyte	Unit	#1	#2						
Conductivity	mS/cm	0.57	-	0.361	0.202	0.137	0.214	0.177	0.205
% Moisture	%	-	-	15.6	14.6	13.0	16.0	10.7	18.1
рН	pH units	-	-	7.92	7.76	7.81	7.81	7.86	7.77
Redox Potential	mV	-	-	210	209	211	197	202	193
Resistivity	ohm*cm	-	-	2770	4950	7320	4670	5640	4880

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



L2285990 CONT'D.... Job Reference: 665125 PAGE 4 of 8 11-JUN-19 12:04 (MT)

Leachable Anions & Nutrients - SOIL

		I	_ab ID	L2285990-1	L2285990-2	L2285990-3	L2285990-4	L2285990-5	L2285990-6
		Sample	e Date	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19
		Sam	ple ID	BH64-SS02	BH61-SS02	BH16-SS02	BH59-SS02	BH67-SS02	BH49-SS02
		Guide	Limits						
Analyte	Unit	#1	#2						
Chloride	ug/g	-	-	38.2	9.9	9.7	12.9	5.7	<5.0

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



L2285990 CONT'D.... Job Reference: 665125 PAGE 5 of 8 11-JUN-19 12:04 (MT)

Anions and Nutrients - SOIL

		I	_ab ID	L2285990-1	L2285990-2	L2285990-3	L2285990-4	L2285990-5	L2285990-6
		Sample	e Date	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19
		Sam	ple ID	BH64-SS02	BH61-SS02	BH16-SS02	BH59-SS02	BH67-SS02	BH49-SS02
		Guide	Limits						
Analyte	Unit	#1	#2						
Sulphate	mg/kg	-	-	118	75	29	92	66	78

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



L2285990 CONT'D.... Job Reference: 665125 PAGE 6 of 8 11-JUN-19 12:04 (MT)

Inorganic Parameters - SOIL

inorganio i arametero	0012							
		Lab I	D L2285990-1	L2285990-2	L2285990-3	L2285990-4	L2285990-5	L2285990-6
		Sample Dat	e 04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19
		Sample I	D BH64-SS02	2 BH61-SS02	BH16-SS02	BH59-SS02	BH67-SS02	BH49-SS02
		Guide Limi	ts					
Analyte	Unit	#1 #2						
Acid Volatile Sulphides	mg/kg		<0.20	0.78	0.25	0.30	0.39	<0.20

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

Reference Information

ethods Listed (if applicat	pie):		
LS Test Code	Matrix	Test Description	Method Reference**
CL-R511-WT	Soil	Chloride-O.Reg 153/04 (July 2011)	EPA 300.0
5 grams of dried soil is m	ixed with 10	grams of distilled water for a minimum of 3	0 minutes. The extract is filtered and analyzed by ion chromatography.
Analysis conducted in ac	cordance wi	th 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 subsam	ple is tumble	ed with de-ionized (DI) water. The ratio of w	ater to soil is 2:1 v/w. After tumbling the sample is then analyzed by a conductivity meter.
Analysis conducted in ac	cordance wi	th the Protocol for Analytical Methods Used	I in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).
MOISTURE-WT	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)
PH-WT	Soil	рН	MOEE E3137A
A minimum 10g portion c using a pH meter and ele		e is extracted with 20mL of 0.01M calcium c	chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil and then analyzed
Analysis conducted in ac	cordance wi	th the Protocol for Analytical Methods Used	I in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).
REDOX-POTENTIAL-WT	Soil	Redox Potential	APHA 2580
		ance with the procedure described in the "A eduction potential of the platinum metal-refe	PHA" method 2580 "Oxidation-Reduction Potential" 2012. Samples are extracted at a fixed ratio with DI water. Re rence electrode employed, in mV.
RESISTIVITY-CALC-WT	Soil	Resistivity Calculation	APHA 2510 B
Resistivity are calculated	based on th	ne conductivity using APHA 2510B where C	onductivity is the inverse of Resistivity.
RESISTIVITY-CALC-WT	Soil	Resistivity Calculation	MOECC E3138
Resistivity are calculated	based on th	ne conductivity using APHA 2510B where C	onductivity is the inverse of Resistivity.
SO4-WT	Soil	Sulphate	EPA 300.0
5 grams of soil is mixed v	vith 50 mL o	f distilled water for a minimum of 30 minute	es. The extract is filtered and analyzed by ion chromatography.
SULPHIDE-WT	Soil	Sulphide, Acid Volatile	APHA 4500S2J
		ance with the method described in APHA 45 solution by inert gas. The acid volatile sulfi	500 S2-J. Hydrochloric acid is added to sediment samples within a purge and trap system. The evolved hydrogen de is then determined colourimetrically.
LS test methods may inco	rporate mod	ifications from specified reference methods	to improve performance.
Chain of Custody Numbers:			
17-732946			
The least time letters of the e		da(a) indicate the leberatory that performed	analytical analysis for that test. Refer to the list below:

ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

WΤ

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

				Quant	y conti	or Kepon	•		
			Workorder:	L2285990	C	Report Date:	11-JUN-19		Page 1 of 3
Client:	401 Hanla	alin GEM Ontario an Road ON L4L 3T1) Inc. (Vaughan)						
Contact:	Brendan	Weaver							
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-R511-WT		Soil							
Batch F	R4663324								
WG3072202-3 Chloride	CRM		AN-CRM-WT	100.2		%		70-130	10-JUN-19
WG3072202-4 Chloride	DUP		L2285075-1 5.3	5.3		ug/g	0.5	30	10-JUN-19
WG3072202-2 Chloride	LCS			102.9		%		80-120	10-JUN-19
WG3072202-1 Chloride	MB			<5.0		ug/g		5	10-JUN-19
EC-WT		Soil							
Batch F	R4662549								
WG3072201-4 Conductivity	DUP		WG3072201-3 0.324	0.334		mS/cm	3.0	20	10-JUN-19
WG3072201-2 Conductivity	IRM		WT SAR3	104.8		%		70-130	10-JUN-19
WG3072326-1 Conductivity	LCS			100.2		%		90-110	10-JUN-19
WG3072201-1 Conductivity	MB			<0.0040		mS/cm		0.004	10-JUN-19
Batch F	R4663425								
WG3073270-4 Conductivity	DUP		WG3073270-3 2.84	2.79		mS/cm	1.8	20	11-JUN-19
WG3073270-2 Conductivity	IRM		WT SAR3	102.4		%		70-130	11-JUN-19
WG3073515-1 Conductivity	LCS			99.1		%		90-110	11-JUN-19
WG3073270-1 Conductivity	MB			<0.0040		mS/cm		0.004	11-JUN-19
MOISTURE-WT		Soil							
Batch F	R4661118								
WG3070383-3 % Moisture	DUP		L2285946-1 20.7	20.8		%	0.1	20	07-JUN-19
WG3070383-2 % Moisture	LCS			100.3		%		90-110	07-JUN-19
WG3070383-1 % Moisture	MB			<0.10		%		0.1	07-JUN-19
PH-WT		Soil							



Quality Control Report

	Quality Control Report									
			Workorder:	L2285990		Report Date: 1	11-JUN-19		Page 2 of 3	
Client: Contact:	401 Hanla	ON L4L 3T1	Inc. (Vaughan)							
	Diendan									
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
PH-WT		Soil								
Batch I	R4662809									
WG3070126-2 рН	2 DUP		L2285967-6 7.98	7.97	J	pH units	0.01	0.3	10-JUN-19	
WG3072312-1 рН	LCS			7.06		pH units		6.9-7.1	10-JUN-19	
REDOX-POTENT	IAL-WT	Soil								
Batch I WG3072471-1 Redox Potent			WT-REDOX	99.0		%		80-120	10-JUN-19	
WG3071300-1			L2284516-9	00.0		70		00-120	10-3011-19	
Redox Potent			263	272		mV	3.4	25	10-JUN-19	
SO4-WT		Soil								
	R4662516									
WG3070305-4 Sulphate	CRM		AN-CRM-WT	109.5		%		60-140	07-JUN-19	
WG3070305-3 Sulphate	B DUP		L2285990-3 29	26		mg/kg	9.9	30	07-JUN-19	
WG3070305-2 Sulphate	LCS			103.1		%		80-120	07-JUN-19	
WG3070305-1 Sulphate	MB			<20		mg/kg		20	07-JUN-19	
SULPHIDE-WT		Soil								
Batch I	R4661044									
WG3069416-3 Acid Volatile S			L2285990-1 <0.20	<0.20	RPD-NA	mg/kg	N/A	30	06-JUN-19	
WG3069416-2 Acid Volatile				90.2		%		70-130	06-JUN-19	
WG3069416-1 Acid Volatile S				<0.20		mg/kg		0.2	06-JUN-19	

Workorder: L2285990

Report Date: 11-JUN-19

Client: SNC-Lavalin GEM Ontario Inc. (Vaughan) 401 Hanlan Road Vaughan ON L4L 3T1 Contact: Brendan Weaver

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 predetermined data quality objectives to provide confidence in the accuracy of associated test results.

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



Chain of Custody (COC) / Analytical **Request Form**



COC Number: 17 - 732946

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(ALS)	Environmental Canada	1 Toll Free: 1 800 6	68 9878) 6			_						
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REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION 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.

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



SNC-Lavalin GEM Ontario Inc. (Vaughan) ATTN: Mavara Turab 401 Hanlan Road Vaughan ON L4L 3T1 Date Received:19-JUN-19Report Date:25-JUN-19 10:36 (MT)Version:FINAL

Client Phone: 905-851-0090

Certificate of Analysis

Lab Work Order #: L2295097

Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED 665125 17-621536

Mathy Mahadeva Account Manager

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L2295097 CONT'D.... Job Reference: 665125 PAGE 2 of 8 25-JUN-19 10:36 (MT)

Summary of Guideline Exceedances

Guideline						
ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontaria Bag	sulation 152/04	April 15, 2011 Standarda, T1 Sail Bac/Park/k	mu Proportivilloo			

Ontario Regulation 153/04 - April 15, 2011 Standards - T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use (No parameter exceedances)



L2295097 CONT'D.... Job Reference: 665125 PAGE 3 of 8 25-JUN-19 10:36 (MT)

Physical Tests - SOIL

		l	_ab ID	L2295097-1	L2295097-2
	5	Sample	e Date	17-JUN-19	17-JUN-19
		Sam	ple ID	BH#39 SS2	BH#48 SS2
Analyte	Unit	Guide #1	Limits #2		
Conductivity	mS/cm	0.57	-	0.198	0.179
% Moisture	%	-	-	14.2	18.1
рН	pH units	-	-	7.75	7.47
Redox Potential	mV	-	-	232	246
Resistivity	ohm*cm	-	-	5050	5600

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



L2295097 CONT'D.... Job Reference: 665125 PAGE 4 of 8 25-JUN-19 10:36 (MT)

Leachable Anions & Nutrients - SOIL

		Sampl	Lab ID e Date ple ID	L2295097-1 17-JUN-19 BH#39 SS2	L2295097-2 17-JUN-19 BH#48 SS2
Analyte	Unit	Guide #1	Limits #2		
Chloride	ug/g	-	-	<5.0	<5.0

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



L2295097 CONT'D.... Job Reference: 665125 PAGE 5 of 8 25-JUN-19 10:36 (MT)

Anions and Nutrients - SOIL

		Sampl	Lab ID e Date ple ID	L2295097-1 17-JUN-19 BH#39 SS2	L2295097-2 17-JUN-19 BH#48 SS2
Analyte	Unit	Guide #1	Limits #2		
Sulphate	mg/kg	-	-	91	47

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



L2295097 CONT'D.... Job Reference: 665125 PAGE 6 of 8 25-JUN-19 10:36 (MT)

Inorganic Parameters - SOIL

		Sampl	Lab ID e Date ple ID	L2295097-1 17-JUN-19 BH#39 SS2	L2295097-2 17-JUN-19 BH#48 SS2
Analyte	Unit	Guide #1	Limits #2		
Acid Volatile Sulphides	mg/kg	-	-	<0.20	<0.20

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

Reference Information

				25-JUN-19 10:36 (MT)
Methods Listed (if applicab ALS Test Code	Matrix	Test Description	Method Reference**	
CL-R511-WT	Soil	Chloride-O.Reg 153/04 (July 2011)	EPA 300.0	
5 grams of dried soil is m	ixed with 10 gra	ms of distilled water for a minimum of 30	0 minutes. The extract is filtered and analyzed by ion chromatography.	
Analysis conducted in acc	cordance with th	e 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 subsam	ple is tumbled w	rith de-ionized (DI) water. The ratio of wa	ater to soil is 2:1 v/w. After tumbling the sample is then analyzed by a conductivity meter.	
			in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July	(1.2011)
MOISTURE-WT	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)	., _0,
PH-WT	Soil	рН	MOEE E3137A	
A minimum 10g portion o using a pH meter and ele		extracted with 20mL of 0.01M calcium ch	hloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the	e soil and then analyzed
Analysis conducted in acc	cordance with th	e Protocol for Analytical Methods Used	in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July	/ 1, 2011).
REDOX-POTENTIAL-WT	Soil	Redox Potential	APHA 2580	
		with the procedure described in the "AF tion potential of the platinum metal-refer	PHA" method 2580 "Oxidation-Reduction Potential" 2012. Samples are extracted at a fixed rence electrode employed, in mV.	ratio with DI water. Results
RESISTIVITY-CALC-WT	Soil	Resistivity Calculation	APHA 2510 B	
Resistivity are calculated	based on the co	onductivity using APHA 2510B where Co	onductivity is the inverse of Resistivity.	
RESISTIVITY-CALC-WT	Soil	Resistivity Calculation	MOECC E3138	
Resistivity are calculated	based on the co	onductivity using APHA 2510B where Co	onductivity is the inverse of Resistivity.	
SO4-WT	Soil	Sulphate	EPA 300.0	
5 grams of soil is mixed w	vith 50 mL of dis	tilled water for a minimum of 30 minutes	s. The extract is filtered and analyzed by ion chromatography.	
SULPHIDE-WT	Soil	Sulphide, Acid Volatile	APHA 4500S2J	
		e with the method described in APHA 45 ution by inert gas. The acid volatile sulfid	00 S2-J. Hydrochloric acid is added to sediment samples within a purge and trap system. de is then determined colourimetrically.	The evolved hydrogen
**ALS test methods may inco	rporate modifica	tions from specified reference methods	to improve performance.	
Chain of Custody Numbers:				
17-621536				
The last two letters of the ab	pove test code(s) indicate the laboratory that performed	analytical analysis for that test. Refer to the list below:	
Laboratory Definition Code	e Laboratory	Location		

ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

WT

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

				L uant	.,				
			Workorder:	L229509	7	Report Date: 25-	JUN-19		Page 1 of 3
Client:	401 Hanla		o Inc. (Vaughan)						
Contact:	Mavara T								
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-R511-WT		Soil							
Batch	R4683547								
WG3085870- Chloride	3 CRM		AN-CRM-WT	91.5		%		70-130	24-JUN-19
WG3085870- Chloride	4 DUP		L2296665-3 10.9	10.8		ug/g	0.7	30	24-JUN-19
WG3085870- Chloride	2 LCS			102.8		%		80-120	24-JUN-19
WG3085870- Chloride	1 MB			<5.0				5	
EC-WT		Soil		<0.0		ug/g		5	24-JUN-19
	D 4000 500	3011							
Batch WG3084826-	R4682502 4 DUP		WC2094826.2						
Conductivity	-		WG3084826-3 2.45	2.35		mS/cm	4.2	20	24-JUN-19
WG3084826- Conductivity			WT SAR3	91.7		%		70-130	24-JUN-19
WG3086139- Conductivity				99.6		%		90-110	24-JUN-19
WG3084826- Conductivity				<0.0040		mS/cm		0.004	24-JUN-19
MOISTURE-WT		Soil							
Batch	R4677554								
WG3082614- % Moisture	3 DUP		L2295203-3 15.8	16.1		%	2.1	20	21-JUN-19
WG3082614- % Moisture	2 LCS			100.0		%		90-110	21-JUN-19
WG3082614- % Moisture	1 MB			<0.10		%		0.1	21-JUN-19
PH-WT		Soil							
Batch	R4677828								
WG3082460- рН	1 DUP		L2294997-1 7.74	7.78	J	pH units	0.04	0.3	20-JUN-19
WG3082812- рН	1 LCS			7.04		pH units		6.9-7.1	20-JUN-19
REDOX-POTEN	TIAL-WT	Soil							
Batch	R4681505								
WG3084413- Redox Poter	1 CRM		WT-REDOX	98.5		%		80-120	21-JUN-19
WG3083830-	1 DUP		L2295097-1						



Quality Control Report

				Quanty	, 00110	ornepon			
			Workorder:	L2295097		Report Date: 25-J	JN-19		Page 2 of 3
Client:	401 Hanla		o Inc. (Vaughan)						
Contact:	Mavara T								
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
	R4681505	Soil	1 2205007 4						
WG3083830- ⁻ Redox Poten	-		L2295097-1 232	228		mV	1.7	25	21-JUN-19
SO4-WT		Soil							
Batch	R4682445								
WG3082907-4 Sulphate	4 CRM		AN-CRM-WT	120.3		%		60-140	21-JUN-19
WG3082907- Sulphate	3 DUP		L2295105-1 54	57		mg/kg	5.5	30	21-JUN-19
WG3082907-2 Sulphate	2 LCS			102.4		%		80-120	21-JUN-19
WG3082907- Sulphate	1 MB			<20		mg/kg		20	21-JUN-19
SULPHIDE-WT		Soil							
Batch	R4677926								
WG3082745- Acid Volatile			L2292733-5 <0.20	<0.20	RPD-NA	mg/kg	N/A	30	20-JUN-19
WG3082745-2 Acid Volatile				80.6		%		70-130	20-JUN-19
WG3082745- Acid Volatile				<0.20		mg/kg		0.2	20-JUN-19

Workorder: L2295097

Report Date: 25-JUN-19

Client:	SNC-Lavalin GEM Ontario Inc. (Vaughan)
	401 Hanlan Road
	Vaughan ON L4L 3T1
Contact:	Mavara Turab

Jonaol.

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:

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Chain of Custody (COC) / Analytical Request Form



COC Number: 17 - 621536

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Canada Toll Free: 1 800 668 9878

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	BH#48 552			17-06-19	14,20DN	SS	X												÷
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SNC-Lavalin GEM Ontario Inc. (Vaughan) ATTN: Mavara Turab 401 Hanlan Road Vaughan ON L4L 3T1 Date Received:21-JUN-19Report Date:28-JUN-19 09:36 (MT)Version:FINAL

Client Phone: 905-851-0090

Certificate of Analysis

Lab Work Order #: L2296665

Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED 665125 17-621538

Mathy Mahadera Account Manager

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L2296665 CONT'D.... Job Reference: 665125 PAGE 2 of 8 28-JUN-19 09:36 (MT)

Summary of Guideline Exceedances

Guideline						
ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontaria Bag	sulation 152/04	April 15, 2011 Standarda, T1 Sail Bac/Park/I	not/Ind/Com/Com	mu Proportivilloo		

Ontario Regulation 153/04 - April 15, 2011 Standards - T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use (No parameter exceedances)



L2296665 CONT'D.... Job Reference: 665125 PAGE 3 of 8 28-JUN-19 09:36 (MT)

Physical Tests - SOIL

		L	_ab ID	L2296665-1	L2296665-2	L2296665-3	L2296665-4
		Sample	e Date	18-JUN-19	18-JUN-19	18-JUN-19	20-JUN-19
		Sam	ple ID	BH#57 SS2	BH#60 SS2	BH#66 SS2	BH#45 SS2
		Guide	Limits				
Analyte	Unit	#1	#2				
Conductivity	mS/cm	0.57	-	0.266	0.226	0.219	0.208
% Moisture	%	-	-	17.3	19.9	16.8	16.2
рН	pH units	-	-	7.76	7.50	7.75	7.70
Redox Potential	mV	-	-	209	224	209	220
Resistivity	ohm*cm	-	-	3760	4420	4570	4810

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.



L2296665 CONT'D.... Job Reference: 665125 PAGE 4 of 8 28-JUN-19 09:36 (MT)

Leachable Anions & Nutrients - SOIL

		Sampl	Lab ID e Date	L2296665-1 18-JUN-19	L2296665-2 18-JUN-19	L2296665-3 18-JUN-19	L2296665-4 20-JUN-19
			nple ID	BH#57 SS2	BH#60 SS2	BH#66 SS2	BH#45 SS2
		Guide	Limits				
Analyte	Unit	#1	#2				
Chloride	ug/g	-	-	22.8	8.9	10.9	<5.0

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



L2296665 CONT'D.... Job Reference: 665125 PAGE 5 of 8 28-JUN-19 09:36 (MT)

Anions and Nutrients - SOIL

		Sampl	Lab ID e Date ple ID	L2296665-1 18-JUN-19 BH#57 SS2	L2296665-2 18-JUN-19 BH#60 SS2	L2296665-3 18-JUN-19 BH#66 SS2	L2296665-4 20-JUN-19 BH#45 SS2
Analyte	Unit	Guide #1	Limits #2				
Sulphate	mg/kg	-	-	113	94	76	72

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



L2296665 CONT'D.... Job Reference: 665125 PAGE 6 of 8 28-JUN-19 09:36 (MT)

Inorganic Parameters - SOIL

		Sampl	Lab ID e Date ple ID	L2296665-1 18-JUN-19 BH#57 SS2	L2296665-2 18-JUN-19 BH#60 SS2	L2296665-3 18-JUN-19 BH#66 SS2	L2296665-4 20-JUN-19 BH#45 SS2
Analyte	Unit	Guide #1	Limits #2				
Acid Volatile Sulphides	mg/kg	-	-	<0.20	0.46	0.24	0.41

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

Reference Information

		1-1			28-JUN-19 09:36 (MT)
	ethods Listed (if applicable)		Test Description	Method Reference**	
	CL-R511-WT	Soil	Chloride-O.Reg 153/04 (July 2011)	EPA 300.0	
			č (<i>j</i> ,) minutes. The extract is filtered and analyzed by ion chromatography.	
	5	Ū.		in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July	(1. 2011)
	EC-WT	Soil	Conductivity (EC)	MOEE E3138	1, 2011).
	A representative subsamp	ble is tumbled w	ith de-ionized (DI) water. The ratio of wat	ter to soil is 2:1 v/w. After tumbling the sample is then analyzed by a conductivity meter.	
	Analysis conducted in acc	ordance with th	e Protocol for Analytical Methods Used i	in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July	r 1, 2011).
	MOISTURE-WT	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)	
	PH-WT	Soil	рН	MOEE E3137A	
	A minimum 10g portion of using a pH meter and elec		extracted with 20mL of 0.01M calcium ch	loride solution by shaking for at least 30 minutes. The aqueous layer is separated from the	e soil and then analyzed
	Analysis conducted in acc	ordance with th	e Protocol for Analytical Methods Used i	in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July	<i>י</i> 1, 2011).
	REDOX-POTENTIAL-WT	Soil	Redox Potential	APHA 2580	
			with the procedure described in the "AP tion potential of the platinum metal-reference	PHA" method 2580 "Oxidation-Reduction Potential" 2012. Samples are extracted at a fixed ence electrode employed, in mV.	ratio with DI water. Results
	RESISTIVITY-CALC-WT	Soil	Resistivity Calculation	APHA 2510 B	
	Resistivity are calculated I	based on the co	nductivity using APHA 2510B where Co	nductivity is the inverse of Resistivity.	
	RESISTIVITY-CALC-WT	Soil	Resistivity Calculation	MOECC E3138	
	Resistivity are calculated I	based on the co	nductivity using APHA 2510B where Co	nductivity is the inverse of Resistivity.	
	SO4-WT	Soil	Sulphate	EPA 300.0	
	5 grams of soil is mixed w	ith 50 mL of dis	tilled water for a minimum of 30 minutes	. The extract is filtered and analyzed by ion chromatography.	
	SULPHIDE-WT	Soil	Sulphide, Acid Volatile	APHA 4500S2J	
			with the method described in APHA 450 tion by inert gas. The acid volatile sulfide	00 S2-J. Hydrochloric acid is added to sediment samples within a purge and trap system. e is then determined colourimetrically.	The evolved hydrogen
**A	LS test methods may incor	porate modifica	tions from specified reference methods t	to improve performance.	
C	Chain of Custody Numbers:				
	17-621538				
7	The last two letters of the ab	ove test code(s) indicate the laboratory that performed a	analytical analysis for that test. Refer to the list below:	
	Laboratory Definition Code	Laboratory	Location		

ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

WΤ

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.



				Quant	<i>y</i> 0011110	n nopon				
			Workorder:	L2296665	5 F	Report Date: 28	3-JUN-19		Page 1 of 4	4
	401 Hanla	lin GEM Ontario n Road ON L4L 3T1	Inc. (Vaughan)							
Contact:	Mavara Tu	urab								
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	_
CL-R511-WT		Soil								_
Batch R	4683547									
WG3085870-3 Chloride	CRM		AN-CRM-WT	91.5		%		70-130	24-JUN-19	
WG3085870-4	DUP		L2296665-3	40.0				00		
Chloride WG3085870-2	LCS		10.9	10.8		ug/g	0.7	30	24-JUN-19	
Chloride	200			102.8		%		80-120	24-JUN-19	
WG3085870-1 Chloride	МВ			<5.0		ug/g		5	24-JUN-19	
Batch R	4689912									
WG3089486-3 Chloride	CRM		AN-CRM-WT	90.4		%		70-130	27-JUN-19	
				50.4		70		70-130	27-3010-19	
WG3089486-4 Chloride	DUP		L2297191-1 182	180		ug/g	1.2	30	27-JUN-19	
WG3089486-2 Chloride	LCS			103.6		%		80-120	27-JUN-19	
WG3089486-1 Chloride	МВ			<5.0		ug/g		5	27-JUN-19	
EC-WT		Soil								
Batch R	4683186									
WG3085873-4	DUP		WG3085873-3							
Conductivity			1.18	1.20		mS/cm	1.7	20	24-JUN-19	
WG3085873-2 Conductivity	IRM		WT SAR3	100.5		%		70-130	24-JUN-19	
WG3086146-1 Conductivity	LCS			99.9		%		90-110	24-JUN-19	
WG3085873-1	МВ									
Conductivity				<0.0040		mS/cm		0.004	24-JUN-19	
	4689209									
WG3088682-4 Conductivity	DUP		WG3088682-3 0.0101	0.0102		mS/cm	0.4	20	27-JUN-19	
WG3088682-2 Conductivity	IRM		WT SAR3	97.1		%		70-130	27-JUN-19	
WG3089759-1 Conductivity	LCS			100.4		%		90-110	27-JUN-19	
WG3088682-1 Conductivity	МВ			<0.0040		mS/cm		0.004	27-JUN-19	
MOISTURE-WT		Soil							-	



				Quant	y Cont	or report			
			Workorder:	L2296665	5	Report Date: 28-	JUN-19		Page 2 of 4
Client:	401 Hanla	alin GEM Ontario an Road ON L4L 3T1	Inc. (Vaughan)						
Contact:	Mavara T	urab							
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MOISTURE-WT		Soil							
Batch I WG3085200-3 % Moisture	R4682273 B DUP		L2296781-6 12.4	12.4		%	0.3	20	23-JUN-19
WG3085200-2 % Moisture	LCS			100.7		%		90-110	23-JUN-19
WG3085200-1 % Moisture	MB			<0.10		%		0.1	23-JUN-19
Batch I WG3086170-3 % Moisture	R4682849 DUP		L2296791-9 5.63	6.39		%	13	20	24-JUN-19
WG3086170-2 % Moisture	LCS			100.1		%		90-110	24-JUN-19
WG3086170-1 % Moisture	MB			<0.10		%		0.1	24-JUN-19
PH-WT		Soil							
	R4682809								
WG3084760- 1 pH			L2296536-1 7.66	7.67	J	pH units	0.01	0.3	24-JUN-19
WG3086103- 1 pH	LCS			7.02		pH units		6.9-7.1	24-JUN-19
Batch I WG3086209-1	R4683179 DUP		1 220666E 4						
рН	DUP		L2296665-4 7.70	7.74	J	pH units	0.04	0.3	24-JUN-19
WG3086780- 1 рН	LCS			7.01		pH units		6.9-7.1	24-JUN-19
REDOX-POTENT	IAL-WT	Soil							
	R4682990								
WG3086204-1 Redox Potent			WT-REDOX	98.3		%		80-120	24-JUN-19
WG3085188-1 Redox Potent			L2296665-1 209	201		mV	3.9	25	24-JUN-19
Batch I WG3087692-1 Redox Potent			WT-REDOX	97.9		%		80-120	26-JUN-19
WG3086039-1 Redox Potent			L2296625-9 197	217		mV	9.7	25	26-JUN-19
SO4-WT		Soil							



				Quant		or Report			
			Workorder:	L2296665	5	Report Date: 2	8-JUN-19		Page 3 of 4
Client: Contact:	401 Hanla	ON L4L 3T1	Inc. (Vaughan)						
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-WT		Soil							
Batch F WG3085199-4 Sulphate	24683547 CRM		AN-CRM-WT	88.2		%		60-140	24-JUN-19
WG3085199-3 Sulphate	DUP		L2296665-1 113	107		mg/kg	4.8	30	24-JUN-19
WG3085199-2 Sulphate	LCS			102.6		%		80-120	24-JUN-19
WG3085199-1 Sulphate	MB			<20		mg/kg		20	24-JUN-19
Batch F WG3086156-4 Sulphate	4688448 CRM		AN-CRM-WT	99.5		%		60-140	25-JUN-19
WG3086156-3 Sulphate	DUP		L2296625-9 69	72		mg/kg	3.7	30	25-JUN-19
WG3086156-2 Sulphate	LCS			102.9		%		80-120	25-JUN-19
WG3086156-1 Sulphate	МВ			<20		mg/kg		20	25-JUN-19
SULPHIDE-WT		Soil							
	4682952								
WG3086248-3 Acid Volatile S	Sulphides		L2295053-1 0.46	0.39		mg/kg	16	30	24-JUN-19
WG3086248-2 Acid Volatile S				93.3		%		70-130	24-JUN-19
WG3086248-1 Acid Volatile S				<0.20		mg/kg		0.2	24-JUN-19
	4688414								
WG3088655-3 Acid Volatile S			L2296625-5 0.35	0.38		mg/kg	9.1	30	26-JUN-19
WG3088655-2 Acid Volatile S				84.6		%		70-130	26-JUN-19
WG3088655-1 Acid Volatile S				<0.20		mg/kg		0.2	26-JUN-19

Workorder: L2296665

Report Date: 28-JUN-19

SNC-Lavalin GEM Ontario Inc. (Vaughan) Client: 401 Hanlan Road Vaughan ON L4L 3T1 Mavara Turab

Contact:

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.

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 predetermined 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.



ALS) Environmental



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Drinki	ng Water (DW) Samples ¹ (client use)	(ele	ectronic COC only)			Froz					F Obser	122 - 12		'es			No	20.001	
Are samples tak	en from a Regulated DW System?					Ice F	Packs		Cubes	0	istody s	eal intac	x	Yes			No		
	YES NO					Cool	ing Initia	les les			1		je Viša – vi	ala			化、调整		4 163
· ·	human consumption/ use?						j B	NITIAL CO	OLER TEM	PERATUR	58 °C			F	NE COOLE	R TEMPE	ATURES	<u>.*C</u>	
						18.	21	<u> </u>				10		5.1					
	SHIPMENT RELEASE (client use)		INITIAL SHIPMEN	T RECEPTION (lab use only)		3.5			FI	NAL SH	IPMEN	Rect	PTION	(lab use	only)			
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REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY GOPY 'YELLOW - CLIENT COPY' 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.



SNC-Lavalin GEM Ontario Inc. (Vaughan) ATTN: Mavara Turab 401 Hanlan Road Vaughan ON L4L 3T1 Date Received:24-JUN-19Report Date:28-JUN-19 09:45 (MT)Version:FINAL

Client Phone: 905-851-0090

Certificate of Analysis

Lab Work Order #: L2297331

Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED 665125 17-621541

Mathy Mahadeva Account Manager

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L2297331 CONT'D.... Job Reference: 665125 PAGE 2 of 8 28-JUN-19 09:45 (MT)

Summary of Guideline Exceedances

Guideline						
ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontaria Bag	sulation 152/04	April 15, 2011 Standarda, T1 Sail Bac/Park/k	not/Ind/Com/Com	mu Proportivilloo		

Ontario Regulation 153/04 - April 15, 2011 Standards - T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use (No parameter exceedances)



L2297331 CONT'D.... Job Reference: 665125 PAGE 3 of 8 28-JUN-19 09:45 (MT)

Physical Tests - SOIL

		Sample	_ab ID e Date ple ID	L2297331-1 21-JUN-19 BH#69 SS2
Analyte	Unit	Guide #1	Limits #2	
Conductivity	mS/cm	0.57	-	0.302
% Moisture	%	-	-	16.0
рН	pH units	-	-	7.55
Redox Potential	mV	-	-	241
Resistivity	ohm*cm	-	-	3310

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

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



L2297331 CONT'D.... Job Reference: 665125 PAGE 4 of 8 28-JUN-19 09:45 (MT)

Leachable Anions & Nutrients - SOIL

		Sampl	Lab ID e Date nple ID	L2297331-1 21-JUN-19 BH#69 SS2
Analyte	Unit	Guide #1	Limits #2	
Chloride	ug/g	-	-	47.8

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



L2297331 CONT'D.... Job Reference: 665125 PAGE 5 of 8 28-JUN-19 09:45 (MT)

Anions and Nutrients - SOIL

		Sampl	Lab ID e Date ple ID	L2297331-1 21-JUN-19 BH#69 SS2
Analyte	Unit	Guide #1	Limits #2	
Sulphate	mg/kg	-	-	70

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



L2297331 CONT'D.... Job Reference: 665125 PAGE 6 of 8 28-JUN-19 09:45 (MT)

Inorganic Parameters - SOIL

		Sampl	Lab ID e Date ple ID	L2297331-1 21-JUN-19 BH#69 SS2
Analyte	Unit	Guide #1	Limits #2	
Acid Volatile Sulphides	mg/kg	-	-	<0.20

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

Reference Information

					28-JUN-19 09:45 (MT)
	ethods Listed (if applicabl LS Test Code	le): Matrix	Test Description	Method Reference**	
	CL-R511-WT	Soil	Chloride-O.Reg 153/04 (July 2011)	EPA 300.0	
			č (<i>j</i> ,	minutes. The extract is filtered and analyzed by ion chromatography.	
	0	0			(1, 2011)
	EC-WT	Soil	Conductivity (EC)	n the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July MOEE E3138	/ 1, 2011).
	20-111	301		MOEE ES130	
	A representative subsamp	ble is tumbled w	ith de-ionized (DI) water. The ratio of wat	ter to soil is 2:1 v/w. After tumbling the sample is then analyzed by a conductivity meter.	
	Analysis conducted in acc	ordance with th	e Protocol for Analytical Methods Used i	n the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July	/ 1, 2011).
	MOISTURE-WT	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)	
	PH-WT	Soil	рН	MOEE E3137A	
	A minimum 10g portion of using a pH meter and elec		extracted with 20mL of 0.01M calcium ch	loride solution by shaking for at least 30 minutes. The aqueous layer is separated from the	e soil and then analyzed
	Analysis conducted in acc	ordance with th	e Protocol for Analytical Methods Used i	n the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July	/ 1, 2011).
	REDOX-POTENTIAL-WT	Soil	Redox Potential	APHA 2580	
			with the procedure described in the "AP tion potential of the platinum metal-reference.	HA" method 2580 "Oxidation-Reduction Potential" 2012. Samples are extracted at a fixed ence electrode employed, in mV.	ratio with DI water. Results
	RESISTIVITY-CALC-WT	Soil	Resistivity Calculation	APHA 2510 B	
	Resistivity are calculated I	based on the co	nductivity using APHA 2510B where Co	nductivity is the inverse of Resistivity.	
	RESISTIVITY-CALC-WT	Soil	Resistivity Calculation	MOECC E3138	
	Resistivity are calculated I	based on the co	nductivity using APHA 2510B where Co	nductivity is the inverse of Resistivity.	
	SO4-WT	Soil	Sulphate	EPA 300.0	
	5 grams of soil is mixed w	ith 50 mL of dis	tilled water for a minimum of 30 minutes	. The extract is filtered and analyzed by ion chromatography.	
	SULPHIDE-WT	Soil	Sulphide, Acid Volatile	APHA 4500S2J	
	,		with the method described in APHA 450 tion by inert gas. The acid volatile sulfide	00 S2-J. Hydrochloric acid is added to sediment samples within a purge and trap system. e is then determined colourimetrically.	The evolved hydrogen
**A	LS test methods may incor	porate modifica	tions from specified reference methods t	o improve performance.	
С	hain of Custody Numbers:				
	17-621541				
T	he last two letters of the ab	ove test code(s) indicate the laboratory that performed a	analytical analysis for that test. Refer to the list below:	
	Laboratory Definition Code	Laboratory	Location		

ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

WΤ

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.



			Workorder:	L229733	-	Report Date: 28	-JUN-19		Page 1 of 3
Client:	401 Hanla Vaughan	an Road ON L4L 3T1	o Inc. (Vaughan)						
Contact:	Mavara T	urab							
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-R511-WT		Soil							
Batch I WG3089486-3 Chloride	R4689912 8 CRM		AN-CRM-WT	90.4		%		70-130	27-JUN-19
WG3089486-4 Chloride	DUP		L2297191-1 182	180		ug/g	1.2	30	27-JUN-19
WG3089486-2 Chloride	2 LCS			103.6		%		80-120	27-JUN-19
WG3089486-1 Chloride	MB			<5.0		ug/g		5	27-JUN-19
EC-WT		Soil							
Batch I	R4688439								
WG3087975-4 Conductivity	L DUP		WG3087975-3 0.531	0.544		mS/cm	2.4	20	26-JUN-19
WG3087975-2 Conductivity	2 IRM		WT SAR3	92.3		%		70-130	26-JUN-19
WG3088604-1 Conductivity	LCS			100.1		%		90-110	26-JUN-19
WG3087975-1 Conductivity	MB			<0.0040		mS/cm		0.004	26-JUN-19
MOISTURE-WT		Soil							
	R4683316								
WG3086619-3 % Moisture			L2297030-1 4.13	4.07		%	1.7	20	25-JUN-19
WG3086619-2 % Moisture				100.3		%		90-110	25-JUN-19
WG3086619-1 % Moisture	MB			<0.10		%		0.1	25-JUN-19
PH-WT		Soil							
Batch I WG3087026-1 pH	R4685930 DUP		L2297433-7 7.59	7.62	J	pH units	0.03	0.3	25-JUN-19
WG3087423-1 рН	LCS			7.00	-	pH units		6.9-7.1	25-JUN-19
REDOX-POTENT	TAL-WT	Soil							
Batch I WG3087692-1	R4688994 CRM		WT-REDOX			~			
Redox Potent WG3086039-1			L2296625-9	97.9		%		80-120	26-JUN-19



				Quanty	y 001111	ornepon			
			Workorder:	L2297331		Report Date: 28-J	IUN-19		Page 2 of 3
Client:	401 Hanla		o Inc. (Vaughan)						
Contact:	Mavara T								
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
REDOX-POTEN Batch WG3086039-	R4688994	Soil	L2296625-9						
Redox Poten	-		197	217		mV	9.7	25	26-JUN-19
SO4-WT		Soil							
	R4688448								
WG3087190- Sulphate	4 CRM		AN-CRM-WT	90.6		%		60-140	25-JUN-19
WG3087190-3 Sulphate	3 DUP		L2297628-1 71	73		mg/kg	1.7	30	25-JUN-19
WG3087190-2 Sulphate	2 LCS			102.1		%		80-120	25-JUN-19
WG3087190- Sulphate	1 MB			<20		mg/kg		20	25-JUN-19
SULPHIDE-WT		Soil							
Batch	R4689508								
WG3090035- Acid Volatile			L2297191-1 <0.20	<0.20	RPD-NA	mg/kg	N/A	30	27-JUN-19
WG3090035- Acid Volatile				92.4		%		70-130	27-JUN-19
WG3090035- Acid Volatile				<0.20		mg/kg		0.2	27-JUN-19

Workorder: L2297331

Report Date: 28-JUN-19

SNC-Lavalin GEM Ontario Inc. (Vaughan) Client: 401 Hanlan Road Vaughan ON L4L 3T1 Mavara Turab

Contact:

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 predetermined data quality objectives to provide confidence in the accuracy of associated test results.

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



Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878



COC Number: 17 - 621541

Page of

JULY 2017 FRONT

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Report To	Contact and company name below will appear	on the final report	Report Forma	t / UISUIDuuon					lov	v - Cont	act your A	M to con	firm all E	&P TATs (s	urcharges r	nay app	piy)	
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Contact:	Manara Turab	Quality Cor	trol (QC) Report with Rep	oort YES	5 NO	L C C L	day (P4	-		ENCY	1 Busin	ess day	[E-100%	6]				
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ALS Sample # (lab use only)	Sample Identification a (This description will ap	ind/or Coordinates	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type											SAMPLES	Sample i	NUMBEF
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REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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.



SNC-Lavalin GEM Ontario Inc. (Vaughan) ATTN: MAVARA TURAB 401 Hanlan Road Vaughan ON L4L 3T1 Date Received:16-OCT-19Report Date:22-OCT-19 08:20 (MT)Version:FINAL

Client Phone: 905-851-0090

Certificate of Analysis

Lab Work Order #: L2366164

Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED 665125 17-730642

Frank

Gayle **Bra**un Senior Account Manager

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L2366164 CONT'D.... Job Reference: 665125 PAGE 2 of 8 22-OCT-19 08:20 (MT)

Summary of Guideline Exceedances

Guideline						
ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontaria Bag	sulation 152/04	April 15, 2011 Standarda, T1 Sail Bac/Park/k	not/Ind/Com/Com	mu Proportivilloo		

Ontario Regulation 153/04 - April 15, 2011 Standards - T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use (No parameter exceedances)



L2366164 CONT'D.... Job Reference: 665125 PAGE 3 of 8 22-OCT-19 08:20 (MT)

Physical Tests - SOIL

		L	_ab ID	L2366164-1	L2366164-2
	S	Sample	e Date	15-OCT-19	15-OCT-19
		Sam	ple ID	BH#76 SS2	BH#77 SS3
Analyte	Unit	Guide #1	Limits #2		
Conductivity	mS/cm	0.57	-	0.191	0.221
% Moisture	%	-	-	17.8	11.7
рН	pH units	-	-	7.55	7.52
Redox Potential	mV	-	-	260	269
Resistivity	ohm*cm	-	-	5230	4520

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



L2366164 CONT'D.... Job Reference: 665125 PAGE 4 of 8 22-OCT-19 08:20 (MT)

Leachable Anions & Nutrients - SOIL

		Sampl	Lab ID e Date ple ID	L2366164-1 15-OCT-19 BH#76 SS2	L2366164-2 15-OCT-19 BH#77 SS3
Analyte	Unit	Guide #1	Limits #2		
Chloride	ug/g	-	-	13.6	45.0

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



L2366164 CONT'D.... Job Reference: 665125 PAGE 5 of 8 22-OCT-19 08:20 (MT)

Anions and Nutrients - SOIL

		Sampl	Lab ID e Date ple ID	L2366164-1 15-OCT-19 BH#76 SS2	L2366164-2 15-OCT-19 BH#77 SS3
Analyte	Unit	Guide #1	Limits #2		
Sulphate	mg/kg	-	-	<20	<20

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



L2366164 CONT'D.... Job Reference: 665125 PAGE 6 of 8 22-OCT-19 08:20 (MT)

Inorganic Parameters - SOIL

		Sampl	Lab ID e Date ple ID	L2366164-1 15-OCT-19 BH#76 SS2	L2366164-2 15-OCT-19 BH#77 SS3
Analyte	Unit	Guide #1	Limits #2		
Acid Volatile Sulphides	mg/kg	-	-	<0.20	<0.20

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

Reference Information

LS Test Code	Matrix	Test Description	Method Reference**
CL-R511-WT	Soil	Chloride-O.Reg 153/04 (July 2011)	EPA 300.0
			0 minutes. The extract is filtered and analyzed by ion chromatography.
-		-	I 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 subsam	ole is tumble	ed with de-ionized (DI) water. The ratio of w	ater to soil is 2:1 v/w. After tumbling the sample is then analyzed by a conductivity meter.
			I in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).
MOISTURE-WT	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)
PH-WT	Soil	рН	MOEE E3137A
A minimum 10g portion o using a pH meter and ele		e is extracted with 20mL of 0.01M calcium c	hloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil and then analyze
Analysis conducted in ac	cordance wi	th the Protocol for Analytical Methods Used	I in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).
REDOX-POTENTIAL-WT	Soil	Redox Potential	APHA 2580
		ance with the procedure described in the "A eduction potential of the platinum metal-refe	PHA" method 2580 "Oxidation-Reduction Potential" 2012. Samples are extracted at a fixed ratio with DI water. Re prence electrode employed, in mV.
RESISTIVITY-CALC-WT	Soil	Resistivity Calculation	APHA 2510 B
Resistivity are calculated	based on th	e conductivity using APHA 2510B where C	onductivity is the inverse of Resistivity.
RESISTIVITY-CALC-WT	Soil	Resistivity Calculation	MOECC E3138
Resistivity are calculated	based on th	e conductivity using APHA 2510B where C	onductivity is the inverse of Resistivity.
SO4-WT	Soil	Sulphate	EPA 300.0
5 grams of soil is mixed v	/ith 50 mL o	f distilled water for a minimum of 30 minute	es. The extract is filtered and analyzed by ion chromatography.
SULPHIDE-WT	Soil	Sulphide, Acid Volatile	APHA 4500S2J
		ance with the method described in APHA 45 solution by inert gas. The acid volatile sulfi	500 S2-J. Hydrochloric acid is added to sediment samples within a purge and trap system. The evolved hydrogen de is then determined colourimetrically.
LS test methods may inco	porate mod	ifications from specified reference methods	to improve performance.
Chain of Custody Numbers:			
17-730642			
The last two letters of the al	ove test co	de(s) indicate the laboratory that performed	analytical analysis for that test. Refer to the list below:

ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

WΤ

Reference Information

GLOSSARY OF REPORT TERMS

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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

 $\ensuremath{\textit{mg/L}}\xspace$ - 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.

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				Quant	y Conti	ioi kepoit			
			Workorder:	L2366164	4	Report Date:	22-OCT-19		Page 1 of 3
Client:	401 Hanla	alin GEM Ontaric an Road ON L4L 3T1) Inc. (Vaughan)						
Contact:	MAVARA								
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-R511-WT		Soil							
WG3194396-3	R4876149 CRM		AN-CRM-WT			0/			
Chloride WG3194396-4	DUP		L2366164-2	90.8		%		70-130	18-OCT-19
Chloride WG3194396-2	LCS		45.0	40.2		ug/g	11	30	18-OCT-19
Chloride WG3194396-1	МВ			102.5		%		80-120 c	18-OCT-19
Chloride EC-WT		Soil		<5.0		ug/g		5	18-OCT-19
	R4875868	3011							
WG3196316-4 Conductivity			WG3196316-3 0.858	0.803		mS/cm	6.6	20	21-OCT-19
WG3196316-2 Conductivity	IRM		WT SAR3	94.4		%		70-130	21-OCT-19
WG3196390-1 Conductivity	LCS			101.2		%		90-110	21-OCT-19
WG3196316-1 Conductivity	MB			<0.0040		mS/cm		0.004	21-OCT-19
Batch F	R4875874								
WG3196315-4 Conductivity	DUP		WG3196315-3 0.199	0.196		mS/cm	1.3	20	21-OCT-19
WG3196315-2 Conductivity	IRM		WT SAR3	98.1		%		70-130	21-OCT-19
WG3196391-1 Conductivity	LCS			102.3		%		90-110	21-OCT-19
WG3196315-1 Conductivity	MB			<0.0040		mS/cm		0.004	21-OCT-19
MOISTURE-WT		Soil							
Batch F	R4872392								
WG3192963-3 % Moisture	DUP		L2366055-7 3.01	2.96		%	1.6	20	17-OCT-19
WG3192963-2 % Moisture	LCS			99.7		%		90-110	17-OCT-19
WG3192963-1 % Moisture	MB			<0.25		%		0.25	17-OCT-19
PH-WT		Soil							



				Quality	Contr	ol Report			
			Workorder:	L2366164		Report Date:	22-OCT-19		Page 2 of 3
Client: Contact:	401 Hanla	ON L4L 3T1	Inc. (Vaughan)						
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-WT		Soil							
Batch I WG3191799- 1 рН	R4873288 DUP		L2365228-9 7.94	7.99	J	pH units	0.05	0.3	17-OCT-19
WG3193199- 1 pH	LCS			6.96		pH units		6.9-7.1	17-OCT-19
REDOX-POTENT	IAL-WT	Soil							
Batch I WG3194843-1 Redox Potent			WT-REDOX	102.7		%		80-120	18-OCT-19
WG3193716-1 Redox Potent	-		L2366120-2 275	274		mV	0.4	25	18-OCT-19
SO4-WT		Soil							
Batch I WG3193734-4 Sulphate	R4876149 I CRM		AN-CRM-WT	105.9		%		60-140	18-OCT-19
WG3193734-3 Sulphate	B DUP		L2366164-2 <20	<20	RPD-NA	mg/kg	N/A	30	18-OCT-19
WG3193734-2 Sulphate	2 LCS			103.2		%		80-120	18-OCT-19
WG3193734-1 Sulphate	MB			<20		mg/kg		20	18-OCT-19
SULPHIDE-WT		Soil							
Batch I WG3194692-3 Acid Volatile			L2367347-1 <0.20	<0.20	RPD-NA	mg/kg	N/A	30	18-OCT-19
WG3194692-2 Acid Volatile				87.3		%		70-130	18-OCT-19
WG3194692-1 Acid Volatile				<0.20		mg/kg		0.2	18-OCT-19

Workorder: L2366164

SNC-Lavalin GEM Ontario Inc. (Vaughan) Client: 401 Hanlan Road Vaughan ON L4L 3T1 MAVARA TURAB

Contact:

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 predetermined data quality objectives to provide confidence in the accuracy of associated test results.

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



Chain of Custody (COC) / Analytical Request Form



OC Number: 17 - 730642

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Canada	Toll	Free: 1	800	668	9878
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Report To	Contact and company name below will appe	ear on the final report		Report Format	/ Distri	1	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)											
Company:	SNCL.		elect Report For			DD (DIGITAL)	Re	egular (R)	Sta	ndard TAT if	received by	3 pm - busine	ss days - no	surcharges	apply			
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Phone:	9058510090 × 13	3.6	Compare Result	ts to Criteria on Report - J	provide details below if	box checked	a da	iy [P3-25%	J 🗌	ERG	Same Da	ay, Weeken	d or Stat	utory ho	liday [E2-	200%		_
	Company address below will appear on the fina	al report S	elect Distribution	i: 🗹 EMAIL		FAX	1 a da	iy (P2-50%	J 🗌		(Laborat	ory openin	g fees m	ay appiy)]			L
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Invoice To	Same as Report To YES	NO		Invoice Dis	stribution			Indicat	te Filtered (F	Preserved	(P) or Filtere	d and Preserve	ed (F/P) belo	w			details	
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LSD:			ocation:										1			НОГР	g	NO
ALS Lab Wor	k Order # (lab use only):	61644	LS Contact:		Sampler:		I'M Kada									ð	is haza	NUMBER OF CONTAINERS
ALS Sample # (lab use only)	Sample Identification (This description will	n and/or Coordinates appear on the report)		Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	200									SAMPLES	Sample	NUMBE
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Drinking	g Water (DW) Samples ¹ (client use)	Special Instructions / Sp		dd on report by clicl tronic COC only)	king on the drop-do	own list below	Frozen		and the second se		Observatio			ase only	No			<u>.</u>
-	n from a Regulated DW System?						Ice Packs Cooling Ini		Cubes				- <u>19</u> 0 - 1 - 1		No		. 3	۔ د
	uman consumption/ use?							INIITIAL COO		ERATURES	°C		FINAL	COOLER	TEMPERATI	IRES °C) 	
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	SHIPMENT RELEASE (client use)	l		INITIAL/SHIPMEN	T RECEPTION (la	b use only)	<u>اللو</u>			FINA	L SHIPM	ENT RECE	PTION (I	ib use o	nly)	and the second s		
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	PAGE FOR ALS LOCATIONS AND SAMPLING IN		m the user acknowled		TE - LABORATORY		W - CLIENT C		CODY		$\overline{)}$		10				JULY 2	017 FRON

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



SNC-Lavalin GEM Ontario Inc. (Vaughan) ATTN: Brendan Weaver 401 Hanlan Road Vaughan ON L4L 3T1 Date Received:07-JUN-19Report Date:13-JUN-19 14:14 (MT)Version:FINAL

Client Phone: 905-851-0090

Certificate of Analysis

Lab Work Order #: L2287933

Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc: NOT SUBMITTED 665725 17-621535

Mathy Mahadeva Account Manager

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L2287933 CONT'D.... Job Reference: 665725 PAGE 2 of 8 13-JUN-19 14:14 (MT)

Summary of Guideline Exceedances

Guideline						
ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Ontorio Dec		Annii 45 2014 Stondarda - T1 Sail Baa/Bark/				

Ontario Regulation 153/04 - April 15, 2011 Standards - T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

(No parameter exceedances)



L2287933 CONT'D.... Job Reference: 665725 PAGE 3 of 8 13-JUN-19 14:14 (MT)

Physical Tests - SOIL

	\$	Sampl	Lab ID e Date ple ID	L2287933-1 05-JUN-19 BH14 SS2	L2287933-2 05-JUN-19 BH34 SS2	L2287933-3 05-JUN-19 BH41 SS2
Analyte	Unit	Guide #1	Limits #2			
Conductivity	mS/cm	0.57	-	0.212	0.116	0.193
% Moisture	%	-	-	15.7	11.6	16.4
рН	pH units	-	-	7.65	7.74	7.76
Redox Potential	mV	-	-	198	208	205
Resistivity	ohm*cm	-	-	4720	8600	5190

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	e Limits listed. See Summary of Guideline Exceedances	<i>.</i>



Leachable Anions & Nutrients - SOIL

Analyte	Unit	#1	#2			
A	Unit	Guide #1	Limits #2			
		Sam	ple ID	BH14 SS2	BH34 SS2	BH41 SS2
		Sample	e Date	05-JUN-19	05-JUN-19	05-JUN-19
			Lab ID	L2287933-1	L2287933-2	L2287933-3

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.



L2287933 CONT'D.... Job Reference: 665725 PAGE 5 of 8 13-JUN-19 14:14 (MT)

Anions and Nutrients - SOIL

Analyte Sulphate	Unit mg/kg	Guide #1	Limits #2			
			-	Difficult	21101002	Dirit COL
			ple ID	BH14 SS2	BH34 SS2	BH41 SS2
		Sample	Lab ID	L2287933-1 05-JUN-19	L2287933-2 05-JUN-19	L2287933-3 05-JUN-19

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.



L2287933 CONT'D.... Job Reference: 665725 PAGE 6 of 8 13-JUN-19 14:14 (MT)

Inorganic Parameters - SOIL

		Sampl	Lab ID e Date ple ID	L2287933-1 05-JUN-19 BH14 SS2	L2287933-2 05-JUN-19 BH34 SS2	L2287933-3 05-JUN-19 BH41 SS2
Analyte	Unit	Guide #1	Limits #2			
Acid Volatile Sulphides	mg/kg	-	-	0.37	<0.20	<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.

Reference Information

	atha da Liata d <i>'it</i> ann liach	1			13-JUN-19 14:14 (MT)
	l <mark>ethods Listed (if applicab</mark> ALS Test Code	Matrix	Test Description	Method Reference**	
	CL-R511-WT	Soil	Chloride-O.Reg 153/04 (July 2011)	EPA 300.0	
	5 grams of dried soil is mi	ixed with 10 gra	ms of distilled water for a minimum of 30	0 minutes. The extract is filtered and analyzed by ion chromatography.	
	Analysis conducted in acc	cordance with th	ne Protocol for Analytical Methods Used	in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (Jul	ly 1, 2011).
	EC-WT	Soil	Conductivity (EC)	MOEE E3138	
	A representative subsamp	ole is tumbled w	vith de-ionized (DI) water. The ratio of wa	ater to soil is 2:1 v/w. After tumbling the sample is then analyzed by a conductivity meter.	
	Analysis conducted in acc	cordance with th	ne Protocol for Analytical Methods Used	in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (Jul	ly 1, 2011).
	MOISTURE-WT	Soil	% Moisture	CCME PHC in Soil - Tier 1 (mod)	
	PH-WT	Soil	рН	MOEE E3137A	
	A minimum 10g portion of using a pH meter and ele		extracted with 20mL of 0.01M calcium ch	hloride solution by shaking for at least 30 minutes. The aqueous layer is separated from th	ne soil and then analyzed
	Analysis conducted in acc	cordance with th	ne Protocol for Analytical Methods Used	in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (Jul	ly 1, 2011).
	REDOX-POTENTIAL-WT	Soil	Redox Potential	APHA 2580	
			e with the procedure described in the "AF tion potential of the platinum metal-refer	PHA" method 2580 "Oxidation-Reduction Potential" 2012. Samples are extracted at a fixed rence electrode employed, in mV.	d ratio with DI water. Results
	RESISTIVITY-CALC-WT	Soil	Resistivity Calculation	APHA 2510 B	
	Resistivity are calculated	based on the co	onductivity using APHA 2510B where Co	onductivity is the inverse of Resistivity.	
	RESISTIVITY-CALC-WT	Soil	Resistivity Calculation	MOECC E3138	
	Resistivity are calculated	based on the co	onductivity using APHA 2510B where Co	onductivity is the inverse of Resistivity.	
	SO4-WT	Soil	Sulphate	EPA 300.0	
	5 grams of soil is mixed w	/ith 50 mL of dis	stilled water for a minimum of 30 minutes	s. The extract is filtered and analyzed by ion chromatography.	
	SULPHIDE-WT	Soil	Sulphide, Acid Volatile	APHA 4500S2J	
			e with the method described in APHA 45 ution by inert gas. The acid volatile sulfic	i00 S2-J. Hydrochloric acid is added to sediment samples within a purge and trap system. de is then determined colourimetrically.	The evolved hydrogen
**/	ALS test methods may incor	porate modifica	ations from specified reference methods	to improve performance.	
(Chain of Custody Numbers:				
_	17-621535				
7	The last two letters of the ab	ove test code(s) indicate the laboratory that performed	analytical analysis for that test. Refer to the list below:	
	Laboratory Definition Code	Laboratory	/ Location		

ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

WT

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

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			Workorder:	L228793	3	Report Date: 13-	JUN-19		Page 1 of 3
Client:	401 Hanla	alin GEM Ontaric an Road ON L4L 3T1	o Inc. (Vaughan)						
Contact:	Brendan	Weaver							
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-R511-WT		Soil							
Batch	R4667967								
WG3074465- Chloride	3 CRM		AN-CRM-WT	99.6		%		70-130	12-JUN-19
WG3074465- Chloride	4 DUP		L2287418-15 9170	9110		ug/g	0.6	30	12-JUN-19
WG3074465- Chloride	2 LCS			102.7		%		80-120	12-JUN-19
WG3074465- Chloride	1 MB			<5.0		ug/g		5	
EC-WT		Soil		<0.0		ug/g		5	12-JUN-19
	R4667870	3011							
WG3075682-			WG3075682-3						
Conductivity			1.66	1.75		mS/cm	5.4	20	13-JUN-19
WG3075682- Conductivity	2 IRM		WT SAR3	99.0		%		70-130	13-JUN-19
WG3075894- Conductivity	1 LCS			97.9		%		90-110	13-JUN-19
WG3075682- Conductivity	1 MB			<0.0040		mS/cm		0.004	13-JUN-19
MOISTURE-WT		Soil							
Batch	R4663189								
WG3072238- % Moisture	3 DUP		L2287933-3 16.4	16.7		%	2.2	20	10-JUN-19
WG3072238- % Moisture	2 LCS			98.6		%		90-110	10-JUN-19
WG3072238- % Moisture	1 MB			<0.10		%		0.1	10-JUN-19
PH-WT		Soil							
Batch	R4665792								
WG3072182- рН	1 DUP		L2287721-1 7.50	7.55	J	pH units	0.05	0.3	12-JUN-19
WG3074771- рН	1 LCS			7.05		pH units		6.9-7.1	12-JUN-19
REDOX-POTEN	TIAL-WT	Soil							
Batch	R4662871								
WG3072471- Redox Poter			WT-REDOX	99.0		%		80-120	10-JUN-19
WG3071300-	1 DUP		L2284516-9						



Quality Control Report

					,				
			Workorder:	L2287933	F	Report Date: 1	3-JUN-19		Page 2 of 3
Client:	401 Hanla	llin GEM Ontaric n Road ON L4L 3T1	lnc. (Vaughan)						
Contact:	Brendan V								
Test		Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
REDOX-POTENT	IAL-WT	Soil							
Batch I	R4662871								
WG3071300-1	DUP		L2284516-9						
Redox Potent	ial		263	272		mV	3.4	25	10-JUN-19
SO4-WT		Soil							
Batch I	R4663324								
WG3072184-4	CRM		AN-CRM-WT						
Sulphate				103.6		%		60-140	10-JUN-19
WG3072184-3	DUP		L2287525-1						
Sulphate			<20	<20	RPD-NA	mg/kg	N/A	30	10-JUN-19
WG3072184-2	LCS								
Sulphate				102.3		%		80-120	10-JUN-19
WG3072184-1	МВ								
Sulphate				<20		mg/kg		20	10-JUN-19
SULPHIDE-WT		Soil							
Batch	R4668848								
WG3076035-3			L2287525-1						
Acid Volatile	-		<0.20	<0.20	RPD-NA	mg/kg	N/A	30	13-JUN-19
WG3076035-2									
Acid Volatile				84.1		%		70-130	13-JUN-19
WG3076035-1	MB								
Acid Volatile				<0.20		mg/kg		0.2	13-JUN-19

Workorder: L2287933

Report Date: 13-JUN-19

Client:	SNC-Lavalin GEM Ontario Inc. (Vaughan)
	401 Hanlan Road
	Vaughan ON L4L 3T1
Contact:	Brendan Weaver

Contact:

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	lifier Description						
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).						
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.

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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 predetermined data quality objectives to provide confidence in the accuracy of associated test results.

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



Chain of Custody (COC) / Analytical

Request Form

Canada Toll Free: 1 800 668 9878



COC Number: 17 - 621535

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Report To Contact and company name below will appear on the final report			Report Format / Distribution				Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)									
Company: SNCL			Select Report Format: PDF V EXCEL EDD (DIGITAL)				Regular [R] Standard TAT if received by 3 pm - business days - no surcharges apply									
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City/Province:	Vauchap ON	Email 2 Dre	ndan weak	r RSNCLOW	alin.Con	For tests that ca	an not be perfor	med according	to the servi	ce level select	ed, you will be a	ontacted.				
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Appendix E

MASW Test Results (6 pages)



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GPR file: T191494

July 4, 2019

Marva Turab, PMP Geotechnical Project Manager **SNC-Lavalin** 401 Hanlan Road Vaughan, ON L4L 3T1

RE: Shear-wave velocity sounding at 10192 Highway 50, Brampton, Ontario

Dear Ms Turab:

Geophysics GPR International Inc. has been requested by SNC to carry out a shear-wave velocity sounding at the above site in Brampton. Figure 1 shows the location of the test profile.

The survey was performed on June 25th, 2019.

The investigation included the multi-channel analysis of surface waves (MASW), the micro-tremor array measurements (MAM) and the refraction methods to generate a shear-wave velocity model (Figures 4 & 5).

The following paragraphs describe the survey design, the principles of the test method, the methodology for interpreting the data, and provide a culmination of the results in table format.





Figure 1: Approximate location of the shear-wave velocity soundings

MASW and MAM Surveys

Basic Theory

The Multi-channel Analysis of Surface Waves (MASW) and the Micro-tremor Array Measurements (MAM) are seismic methods used to evaluate the shearwave velocities of subsurface materials through the analysis of the dispersion properties of Rayleigh surface waves ("ground roll"). The dispersion properties are measured as a change in phase velocity with frequency. Surface wave energy will decay exponentially with depth. Lower frequency surface waves will travel deeper and thus be more influenced by deeper velocity layering than the shallow higher frequency waves. Inversion of the Rayleigh wave dispersion curve yields a shear-wave (V_s) velocity depth profile (sounding). Figure 2 outlines the basic operating procedure for the MASW method. Figure 3 is an example image of a typical MASW record and resulting 1D V_s model. A more detailed description of the method can be found in the paper *Multi-channel Analysis of Surface Waves*, Park, C.B., Miller, R.D. and Xia, J. Geophysics, Vol. 64, No. 3 (May-June 1999); P. 800–808.

Survey Design

The geometry of an MASW survey is similar to that of a seismic refraction investigation (i.e. 24 geophones in a linear array). The fundamental principle involves intentionally generating an acoustic wave at the surface and digitally recording the surface waves from the moment of source impact with a linear series of geophones on the surface. This is referred to as an "active source" method. An elastic-wave hammer was used as the primary energy source with traces being recorded at 6 locations: approximately 6 m off both ends, 25 to 30 m off both



ends, and in the middle of the spread. Data were collected with geophones spacing of 3m and 1m for a total of 10 shot records per sounding.

Unlike the refraction method, which produces a data point beneath each geophone, the shear-wave depth profile is the average of the bulk area within the middle third of the geophone spread.

The theoretical maximum depth of penetration (34.5m) is half of the maximum seismic array length (69 m), in practice the maximum depth of penetration is often influenced by the geology.

The MAM/passive survey used the same geophone array set up as for the MASW survey. Unlike the MASW survey, the MAM method is considered a "passive source" method in that there is no time break and the motions recorded are from ambient energy generated by cultural noise such as traffic, wind, wave motion, etc. Data collection for the passive method involves recording approximately 10 minutes of background "noise." The records generated by the MAM method contain lower frequency data, thus increasing the data resolution at greater depths of investigation. Typically the MAM results aid in clarifying the MASW results for depths greater than 20 m; however, the direction of noise propagation relative to the spread orientation can influence the results.

Interpretation Method and Accuracy of Results

The main processing sequence involved plotting, picking, and 1-D inversion of the MASW/MAM shot records using the SeisimagerSWTM software package. In theory, all MASW shot records should produce a similar shear-wave velocity profile. In practice, however, differences can arise due to energy dissipation and localized surface variations. The results of the inversion process are inherently non-unique and the final model must be judged to be geologically realistic. The inversion modelling also assumes that all layering is flat/horizontal and laterally uniform.

The results of the MASW/MAM tests are presented in chart format as Figures 4 & 5. The chart presents the 1-D shear wave velocity values from the inversion models of the passive and active seismic records.

The V_s30 values for the sounding are presented in Table 1. The V_s30 values are based on the harmonic mean of the shear wave velocities over the upper 30 m. The V_s30 value is calculated by dividing the total depth of interest (e.g. 30 m) by the sum of the time spent in each velocity layer up to that depth. This harmonic mean value reflects the equivalent single layer response.

The estimated error in the average V_s30 value determined through MASW tests is typically +/-10 to 15% for overburden sites. The shear-wave velocities modelled through the MASW method within bedrock have a higher estimated error.



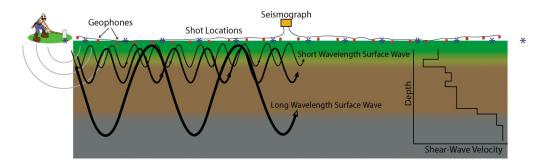


Figure 2: MASW Operating Principle

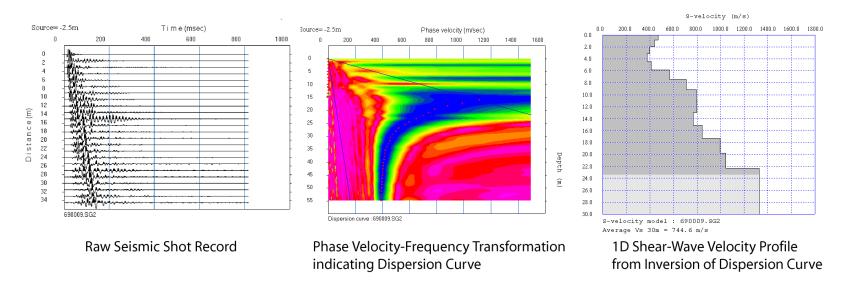
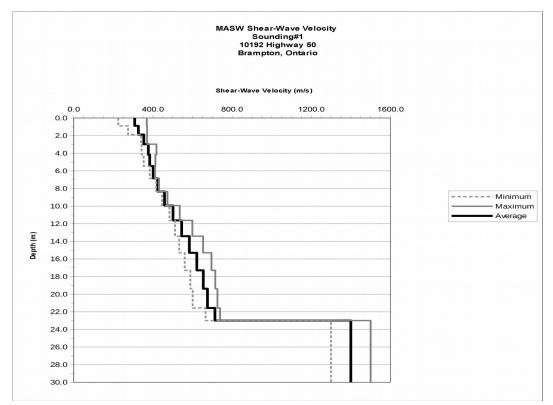
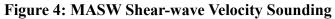


Figure 3: Example of a typical MASW shot record, phase velocity/frequency curve and resulting 1D shear-wave velocity model.







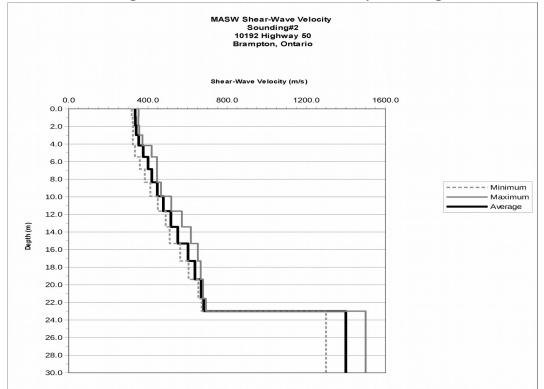


Figure 5: MASW Shear-wave Velocity Sounding



CONCLUSIONS

The approximate location of the shear-wave soundings is indicated in Figure 1.

The MASW shear-wave models are presented in Figures 4 & 5. The results are summarized in Table 1. The background seismic noise levels at this site were moderate. The quality of the seismic records and the resulting dispersion curves was good.

Simple critical distance calculations from refracted P-waves show that the water table could at 2m deep. The bedrock could be at 23m deep.

Only limited boreholes data were available at the time of this report.

Table 1: Calculated V_s30 values (m/s) from the MASW data (0 to 30m)

Sounding	Minimum	Average	Maximum	Site Class			
1	522	571	616	С			
2	523	560	598	С			

The calculated average V_s30 values from the 1D MASW soundings collected was 571 and 560m/s +/-10% to 15% respectively for soundings 1 and 2.

The $V_s 30$ values calculated for the minimum and the maximum envelopes ranged from 522 to 616m/s.

Based on the average V_s30 values (as determined through the MASW method) and table 4.1.8.4.A of the National Building Code of Canada, 2015 Edition, the investigated area is site class "C" ($360 < V_s 30 \le 760$ m/s).

It must be noted that the site classification provided in this report is based solely on the V_s30 value as derived from the MASW method and that it can be superseded by other geotechnical information. This geotechnical information includes, but is not limited to, the presence of sensitive and/or liquefiable soils, more than 3m of soft clays, high moisture content, etc. The reader is referred to section 4.1.8.4 of the National Building Code of Canada, 2015 Edition for more information on the requirements for site classification.

This report has been written by Lhoucin Taghya, P.Geo.

Thanin Taying

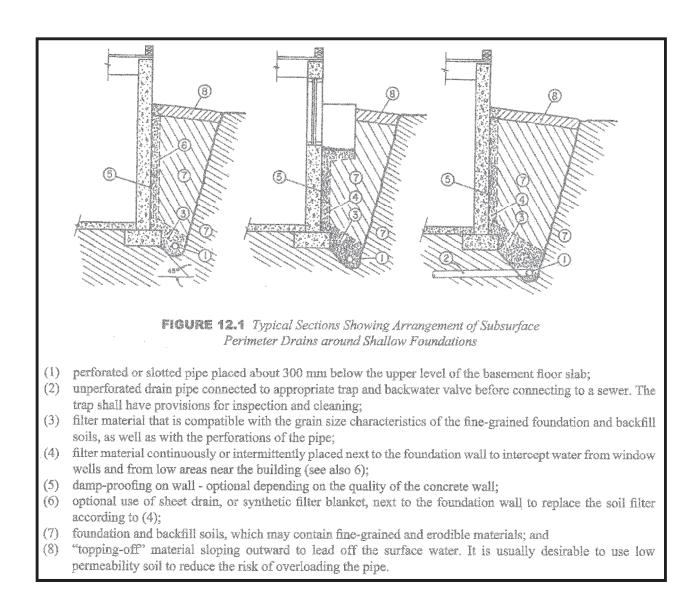
Lhoucin Taghya, P.Geo. Geophysicist





Appendix F

Perimeter Drainage Details (1 pages)



<u>Refer to</u>: Canadian Foundation Engineering Manual (2006), 4th Edition, Canadian Geotechnical Society, p. 184



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