REPORT ON

Preliminary Geotechnical Investigation Proposed Residential & Commercial Development 800 Hydro Road Mississauga, Ontario



PREPARED FOR: Lakeview Community Partners Limited

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1. INTRODUCTION

DS Consultants Ltd. (DSCL) was retained by the ARGO Development Corporation on behalf of Lakeview Community Partners Limited to carry out preliminary geotechnical and hydrogeological investigations for the proposed Lakeview Village on the lands of the former Lakeview Power Generation Station located at 800 Hydro Road in Mississauga, Ontario.

It is understood that the proposed 71.6-hectare Lakeview Village will include 5,000 to 7,000 new homes in a variety of housing options, including townhouses, mid-rise and high-rise buildings. There will be more than 600,000 square feet of employment and institutional use and another 200,000 square feet of cultural space. Lakeview Village will include a Serson Square, a year-round central gathering space with retail offices and homes that can be used as an arts and cultural hub.

The proposed high-rise structures will entail up to 3-levels of basement. The finished basement floor elevations are not available to us at the time of writing this report.

exp Services Inc (exp.) conducted a preliminary geotechnical investigation at the subject site in December 2017 and drilled nine (9) boreholes as a part of their field work. The logs and location plan of exp. boreholes (BH1 to BH9) are attached in **Appendix B** of this report.

The purpose of this geotechnical investigation was to determine the subsurface conditions at the borehole locations and make preliminary engineering recommendations for the following:

- 1. Foundations
- 2. Floor slabs and permanent drainage
- 3. Earth pressures
- 4. Excavations and backfill
- 5. Earthquake considerations
- 6. Pavements
- 7. Underground utilities

This report deals with geotechnical issues only. Preliminary hydrogeological findings by DSCL will be presented in a separate report. Environmental testing was not part of our scope of work.

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

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario, Canada. The format and contents are guided by client specific needs and economics and conform to generalized standards for services. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

The foundation recommendations made in this report are based on the subsoil conditions found during the field investigation. The comments made in this report on potential construction problems and possible construction options intended only for guidance of the designer.

This report has been prepared for Lakeview Community Partners Limited and its architects and designers. Third party use of this report without DS Consultants Ltd. consent is prohibited.

2. FIELD WORK & LAB TESTING

Forty-five (45) boreholes (BH18-1 to BH18-49, except BH18-22 to BH18-24 and BH18-26, see Drawing 1 for location plan) were drilled at the site to depths varying from 1.7 m to 48.3m below the existing grade.

Four boreholes (BH18-22 to BH18-24 and BH18-26) were not be drilled due to the on-going construction work related to removal of buried concrete slabs associated with the former power house.

Boreholes were drilled with solid stem and hollow stem continuous flight auger equipment by a drilling sub-contractor under the direction and supervision of DS Consultants Limited personnel. Mud rotary was used in the drilling of some deep boreholes. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method. The samples were logged in the field and returned to the DS Consultants Limited laboratory for detailed examination by the project engineer and for laboratory testing.

Shale bedrock was cored at five (5) borehole locations (BH18-19, BH18-29, BH18-32, BH18-37 and BH18-45), with HQ double tube wireline equipment providing 63.5mm diameter rock core samples. The coring was carried out under the full-time supervision of a representative from DSCL who identified and described the rock samples, noting and recording the percentages of total and solid rock core recovery, RQD values, fracture index and the percentage and thicknesses of hard layers.

As well as visual examination in the laboratory, majority of the soil samples were tested for moisture contents. Selected fourteen (14) soil samples were subjected to grain size analyses and gradation curves are presented on Drawings 58 & 59. Atterberg's Limits tests were conducted on selected five (5) soil samples and results are presented on the respective borehole logs.

Water level observations were made during drilling and in the open boreholes at the completion of the drilling operations. Monitoring wells were installed in overburden and bedrock at seven (7) borehole locations for the longer-term groundwater level monitoring.

Methane gas measurements were taken in boreholes during drilling and upon completion of drilling, using a portable multi-gas detector RKI Eagle 2 instrument.

The ground surface elevations at the borehole locations was undertaken by DSCL personnel, using the differential GPS unit, leased from Sokkia Inc.

Geophysical survey was carried out at the subject site by the sub-contractor, Geophysics GPR International Inc. and their report is attached in **Appendix C** of this report.

3. SITE AND SUBSURFACE CONDITIONS

The subject site is located at 800 Hydro Road in Mississauga, approximately three kilometers east of Port Credit, on Mississauga's waterfront. The subject property primarily consists of former OPG Lakeview Coal plant that was decommissioned between 2006 & 2008 and the City own lands that is currently being used as playing fields and parking lot. The topography of the site has gentle slope towards south towards Lake Ontario, with elevations decreasing from 84m to 77m. At the time of our field work, the existing concrete slabs associated with the former OPG power house were being removed by the contractor.

The borehole location plan is shown on Drawing 1. Notes on samples description are provided on Drawing 1A. The subsurface conditions in the boreholes are presented in the individual borehole log on Drawings 2 to 46. Generalized sub-surface profiles are provided on Drawing 47 to 57.

Based on the borehole information, there is a significant variation in the bedrock depths at site along the north-south and east-west directions. There is a bedrock valley within the site, with the bedrock surface depths varying from 1.5m to at or below 48.3m. To delineate the bedrock valley and for the ease of describing the geotechnical conditions, the site is sub-divided into three areas (Area A, Area B & Area C, see Drawing 1 for areas & respective borehole locations). The subsurface conditions in the boreholes, area wise, are summarized in the following paragraphs.

3.1 Soil Conditions in Area 'A'

Seventeen boreholes (BH18-14, BH18-19, BH18-21, BH18-25, BH27 to BH18-38 and BH18-49) were drilled within Area 'A'. All boreholes were drilled to shale bedrock.

Topsoil, Pavement Structure & Fill Materials: A surficial topsoil layer, ranging in thickness from 125 to 350mm, was encountered at BH18-21, BH18-33 to BH18-38 & BH18-49. Two boreholes (BH18-28 & BH18-30) drilled on the paved areas encountered 70mm of asphalt at the surface, overlying granular base/subbase. Fill materials were found in all boreholes, extending to depths varying from 0.8 to 4.2m below the existing grade. Fill material was heterogeneous and consisted of sand & gravel, crusher run limestone, silty sand, sandy silt and clayey silt to silty clay, with inclusions of organics/topsoil, wood,

concrete, asphalt and shale fragments. The SPT 'N' values recorded in fill materials ranged from 5 to over 50 blows per 300mm of spoon penetration, indicating loose to very dense state of relative density.

<u>Clayey Silt to Silty Clay Till</u>: Below the fill materials, clayey silt to silty clay till deposits were encountered in BH18-14, BH18-19, BH18-29, and BH18-34 to BH18-38 (except BH18-35), overlying shale bedrock or silty clay. Clayey silt till was present in a stiff to hard consistency, with measured SPT 'N' values ranging from 8 to over 50 blows per 300mm of spoon penetration. Occasional cobble/boulders and sand seams were encountered within this deposit.

Grain size analysis of one soil sample (BH18-33/SS3) was conducted. The results are shown on Drawing 59, with the following fractions:

Clay:	29%	
Silt:	46%	
Sand:	23%	
Gravel: 2%		

Atterberg limits testing of one soil sample (BH18-33/SS3) was conducted. The results are shown on the borehole log and are summarized as follows:

Liquid limit (W _L):	34%
Plastic limit (W _P):	21%
Plasticity index (PI):	13

<u>Silty Clay:</u> A silty clay deposit was encountered in BH18-25, BH18-27, BH18-30 and BH18-36, below the fill material, or cohesionless soils or clayey silt till, and overlying shale bedrock. Silty clay was present in a firm to hard, generally hard consistency, with measured SPT 'N' values ranging from 6 to more than 50 blows for 300 mm penetration.

Grain size analysis of one soil sample (BH18-36/SS4) was conducted. The results are shown on Drawing 59 with the following fractions:

Clay:	32%
Silt:	57%
Sand:	11%

Atterberg limits testing of same soil sample (BH18-36/SS7) was conducted. The results are shown on the borehole log and are summarized as follows:

Liquid limit (W _L):	37%
Plastic limit (W _P):	23%
Plasticity index (PI):	14

<u>Cohesionless Soils (Sand & Gravel, Sand)</u>: Cohesionless soils consisting of sand and gravel and sand were encountered in boreholes BH18-25, to BH18-28, BH18-32 below the fill material. These

cohesionless soils were water bearing and present in a very loose to very dense state, as indicated by the measured SPT 'N' values of nil to over 50 blows per 300mm of spoon penetration.

Sandy Silt Till: A sandy silt till deposit was encountered in BH18-49 below the fill material, extending to a depth of 4.5m, overlying shale bedrock. Sandy silt till was present in a compact to dense state, as indicated by the measured SPT 'N' values of 29 to 31 blows per 300mm of spoon penetration. Occasional cobble/boulders and sand seams were encountered within this deposit.

Shale Bedrock:

In Area 'A', shale bedrock of Georgian Bay Formation was found at all borehole locations, at depths ranging from 1.5 to 6.3m below the existing grade, corresponding to elevations ranging from 71.2 to 80.1m. The approximate depth and elevation of the shale bedrock surface at the borehole locations are listed on Table 3.1 below.

Borehole	Depth of Shale	Approximate Elevation	Notes
No.	Bedrock Surface below	of Shale Bedrock	
	Existing Ground (m)	Surface (m)	
BH18-14	2.3	78.1	Augered
BH18-19	4.5	76.2	CORED
BH18-21	1.5	78.2	Augered
BH18-25	4.2	73.3	Augered
BH18-27 (30a)	3.8	73.5	Augered
BH18-28	3.3	79.5	Auger refusal
BH18-29A	6.3	71.2	cored
BH18-30	1.5	75.7	Augered
BH18-31	3.8	73.5	Augered
BH18-32	4.3	72.9	CORED
BH18-33	3.8	75.7	Augered
BH18-34	3.1	77.0	Augered
BH18-35	4.2	73.7	Augered
BH18-36	4.6	75.7	Augered
BH18-37	3.1	78.2	CORED
BH18-38	4.6	75.7	Augered
BH18-49	4.5	76.3	Augered
BH3*	3.2	74.1	CORED
BH5*	3.5	76.8	Augered
BH6*	1.3	75.8	Augered
BH9*	4.4	74.6	CORED

Table 3.1: Approximate Depth and Elevation of Shale Bedrock Surface in Area 'A'

*exp. boreholes

Detailed description of shale bedrock is provided in Section 3.4.

3.2 Soil Conditions in Area 'B'

Twenty-two (22) boreholes (BH18-1 to BH18-13, BH18-15 to BH18-18, BH18-20, BH18-39, BH18-40, BH18-46 & BH18-48) were drilled within Area 'B', to depths ranging from 11.1 to 48.3m.

Topsoil, Pavement Structure & Fill Materials: A surficial topsoil layer, ranging in thickness from 100 to 350mm, was encountered at BH18-1, BH18-3 to BH18-6, BH18-10 to BH18-12, BH18-16, BH18-39, BH18-40 and BH18-48). Three boreholes (BH18-2, BH18-17 and BH18-20) drilled on the paved areas encountered 70 to 100mm of asphalt at the surface, overlying granular base/subbase. Fill materials were found in all boreholes, extending to depths varying from 0.8 to 3.1m below the existing grade. Fill material was heterogeneous and consisted of clayey silt, silty clay, silty sand, sandy silt, silt and sand and gravel, with inclusions of organics/topsoil in varying proportions and trace asphalt & shale fragments. The SPT 'N' values recorded in fill materials ranged from 4 to 50 blows per 300mm of spoon penetration, indicating loose to very dense state of relative density.

<u>Clayey Silt to Silty Clay Till</u>: Clayey silt to silty clay till deposits of varying thicknesses were encountered in boreholes at varying depths. Clayey silt to silty clay till was present in a stiff to hard consistency, with measured SPT 'N' values ranging from 14 to over 50 blows per 300mm of spoon penetration. Occasional cobble/boulders and sand seams were encountered within this deposit.

Grain size analysis of four soil samples from clayey silt to silty clay till (BH18-1/SS5, BH18-2/SS6, BH18-7/SS12 & BH18-15/SS3) were conducted. The results are shown on Drawings 58 & 59, with the following fractions:

Clay:	16 to 37%
Silt:	33 to 48%
Sand:	15 to 49%
Gravel:	1 to 9%

Atterberg limits testing of two soil samples (BH18-2/SS6 & BH18-3/SS15) were conducted. The results are shown on the borehole logs and are summarized as follows:

Liquid limit (W∟):	19 to 20%
Plastic limit (W _P):	11 to 12%
Plasticity index (PI):	8

<u>Clayey Silt to Silty Clay:</u> Clayey silt to silty clay deposit of varying thicknesses were encountered in boreholes at varying depths of the boreholes. Clayey silt o silty clay was present in a firm to hard, generally in very stiff consistency, with measured SPT 'N' values ranging from 6 to more than 50 blows for 300 mm penetration.

Grain size analysis of one soil sample (BH18-6/SS12) was conducted. The results are shown on Drawings 58 with the following fractions:

Clay:	68%
Silt:	26%
Sand:	6%

Atterberg limits testing of same soil sample (BH18-6/SS12) was conducted. The results are shown on the borehole log and are summarized as follows:

Liquid limit (W _L):	48%
Plastic limit (W _P):	23%
Plasticity index (PI):	25

<u>Sandy Silt to Silty Sand Till</u>: Sandy silt to silty sand till deposits of varying thicknesses were encountered in boreholes at varying depths. Sandy silt to silty sand till was generally water bearing and present in a very dense state, with measured SPT 'N' values of over 50 blows per 300mm of spoon penetration. Occasional to frequent cobble/boulders should be expected within this deposit.

<u>Cohesionless Soils (Sand & Gravel, Sand, Silty Sand, Sandy Silt, Silt)</u>: Cohesionless soils consisting of sand & gravel, sand, silty sand, sandy silt, silt were encountered in majority of boreholes, embedded within the glacial till, at varying depths. These cohesionless soils were water bearing and present in a compact to very dense state, as indicated by the measured SPT 'N' values of 22 to over 50 blows per 300mm of spoon penetration.

Grain size analyses of seven (7) soil sample (BH18-2/SS3, BH18-3/SS10, BH18-8/SS7, BH18-8/SS8, BH18-8/SS12, BH18-9/SS5 and BH18-40/SS7) were conducted. The results are shown on Drawings 58 and 59, with the following fractions: 2

Clay: 2 to 10% Silt: 3 to 62% Sand: 23 to 95% Gravel: up to 4%

Shale Bedrock:

In Area 'B', shale bedrock Georgian Bay Formation was found at five (5) borehole locations (BH18-6, BH18-9, BH18-15, BH18-18 & BH18-20), at depths ranging from 9.1 to 48.1 below the existing grade, corresponding to elevations ranging from 34.7 to 71.3m. There is a bedrock valley in this area which was further confirmed by the geophysics testing. The approximate depth and elevation of the shale bedrock surface at the borehole locations are listed on Table 3.2 below.

Borehole No.	Depth of Shale Bedrock Surface below Existing Ground (m)	Approximate Elevation of Shale Bedrock Surface (m)	Notes
BH18-6	48.1	34.7	Augered
BH18-7	>30.7		Not encountered at 30.7m
BH18-9	15.2	65.0	Augered
BH18-15	9.1	71.3	Augered
BH18-18	13.7	67.4	Augered
BH18-20	10.7	69.6	Augered
BH2*	12.0	68.3	Augered

*exp. boreholes

Detailed description of shale bedrock is provided in Section 3.4.

3.3 Soil Conditions in Area 'C'

Six boreholes (BH18-41 to BH18-45 and BH18-47) were drilled within Area 'C'. All boreholes were drilled to shale bedrock.

Topsoil & Fill Materials: A surficial topsoil layer, ranging in thickness from 150 to 400mm, was encountered at borehole locations. Fill materials were found in all boreholes, extending to depths varying from 0.8 to 3.4m below the existing grade. Fill material was heterogeneous and consisted of clayey silt, silty clay, sandy silt, and sand & gravel with trace inclusions of organics/topsoil, brick, concrete, asphalt and shale fragments. The SPT 'N' values recorded in fill materials ranged from 4 to 17 blows per 300mm of spoon penetration, indicating loose to compact/firm to stiff state of compactness.

<u>Clayey Silt to Silty Clay Till</u>: Below the fill materials or silt/sandy silt, clayey silt to silty clay till deposits were encountered in boreholes, overlying shale bedrock or silt/sandy silt. Clayey silt till was present in a stiff to hard consistency, with measured SPT 'N' values ranging from 13 to over 50 blows per 300mm of spoon penetration.

<u>Cohesionless Soils (Silt, Sandy Silt to Silty Sand)</u>: Cohesionless soils consisting of silt and sandy silt to silty sand were encountered in all boreholes, except in BH18-43 and BH18-44 below the fill material or clayey silt till. These cohesionless soils were generally water bearing and present in a very loose to dense state, as indicated by the measured SPT 'N' values of 5 to 32 blows per 300mm of spoon penetration.

Shale Bedrock: In Area 'C', shale bedrock of Georgian Bay Formation was found at all borehole locations, at depths ranging from 3.1 to 7.6m below the existing grade, corresponding to elevations ranging from 75.7 to 80.4m. The approximate depth and elevation of the shale bedrock surface at the borehole locations are listed on Table 3.3 below.

Borehole	Depth of Shale	Approximate Elevation of	Notes
No.	Bedrock Surface below	Shale Bedrock Surface (m)	
	Existing Ground (III)		
BH18-41	7.6	75.7	Augered
BH18-42	6.1	79.6	Augered
BH18-43	3.1	80.4	Augered
BH18-44	3.8	80.1	Augered
BH18-45	3.8	79.2	CORED
BH18-47	6.1	76.3	Augered
BH7*	3.6	79.8	CORED

Table 3.3: Approximate De	oth and Elevation of Shale	Bedrock Surface in Area 'C
Tuble 3.3. Approximate De	perior and Elevation of Shale	bearber Surface in Area e

*exp. boreholes

Detailed description of shale bedrock is provided in Section 3.4.

3.4 Shale Bedrock (Georgian Bay Formation)

Shale bedrock belonging to Georgian Bay Formation was encountered at this site. Because of the method of drilling and sampling, the surface elevations of the bedrock can be different than indicated on the borehole logs (Drawings 2 to 46). Commonly the till overlying the shale contains slabs of limestone which would give a false indication of the bedrock level. Similarly, the depth of weathering cannot be determined accurately due to the presence of limestone layers.

Shale bedrock was cored at five (5) borehole locations (BH18-19, BH18-29, BH18-32, BH18-37 and BH18-45) to confirm the depth and quality of bedrock.

Photographs of the bedrock cores are also presented in **Appendix A** of the report. The descriptive terms used on the record of rock cores and throughout this report are explained on the "Explanation of Terms Used in the Bedrock Core Log" sheet in Appendix A. **Appendix A** also presents more details and general comments about the shale bedrock in Toronto area.

Total Core Recovery (TCR):

The total core recovery indicates the total length of rock core recovered, expressed as a percentage of the actual length of the core run. The total core recovery for the cored runs ranged from 67 to 100%. Generally, less core recovery was experienced only near the surface of the rock, where the formation is highly to moderately weathered and was almost full as depth increased.

Solid Core Recovery (SCR):

The solid core recovery is the total length of solid, full diameter rock core that was recovered, expressed as a percentage of the length of the core run. Solid core recovery ranged from 28 to 98%, and also

appears to generally improve with depth. The SCR index was generally influenced by the orientations of the fractures. SCR was low when fractures oblique to the borehole axis were intercepted.

Rock Quality Designation (RQD):

The rock quality designation index is obtained by measuring the total length of recovered rock core pieces which are longer than 100mm and expressing their sum total length as a percentage of the length of the core run. RQD is a function of the frequency of joints, bedding plane partings and fractures in the rock cores. While the use of double tube core barrels provided reasonably good protection of the core during drilling and core retrieval, the fissile nature of the shale greatly influences the RQD values of the rock cores. Consequently, it is believed that the RQD values recorded underestimate the rock quality classification of the laminated fissile shale. On the basis of the recorded RQD values which range from nil to 97%, the rock quality is estimated to be "very poor" to "excellent", and the average value of more than 50% suggests a rock of generally "fair" quality.

Hard Layers:

Based on the visual examination of the rock cores, an attempt was made to identify and record the thickness and percentages of the relatively harder siltstone and limestone layers. The percentage of the "hard layers" per core run ranges between nil and 32%. The thickness of these layers varied but was generally varied from 50 to 380mm, but thicker layers have been observed to be as much as 750 to 900 mm at other sites. The layers are actually lenses and they can vary significantly in thickness over short distance. Encountering such thick layers should be anticipated. It is also common to encounter closely spaced groupings of thin strong limestone/siltstone layers which individually may only be 25 to 50mm thick but collectively can be 1m in thickness.

Fracture Index:

When logging the rock cores, the fracture Index (i.e. the number of fractures for each 0.3m length of core) was also recorded. The recorded values range between nil and greater than 25. Occasional fragmented and broken zones were encountered within the solid core. Bedrock was fragmented up to a depth of about 4.9m m in BH18-37, as indicated by nil solid core recovery in this zone. It was observed that the planes of weaknesses along which the cores tended to break, included planes of fissility and bedding, the contact surfaces between shale and siltstone or limestone bands and some oblique and subvertical joints.

Weathering:

In general, moderately weathered zone in the bedrock was limited to about 1.5 m from the bedrock surface. Below this, the degree of weathering ranged from slightly weathered to fresh. The siltstone and limestone layers were generally fresh with only slight surficial weathering on joint surfaces in the zone close to bedrock surface.

Methane Gas:

Methane gas under pressure was encountered in BH18-13 below a depth of about 11m, which is possibly just above the bedrock surface. The borehole was terminated at this depth and properly sealed. Although, during the rock coring there were no physical indications of the presence of gas in the coreholes, the Georgian Bay Formation is known to contain pockets of combustible gas. Therefore, appropriate care and monitoring are essential in all confined excavation work, particularly caissons and tunnels.

3.5 Groundwater Conditions

During drilling, short-term (un-stabilized) groundwater levels were found at depths ranging from 1.5 to 18.3m below the existing grade. Long-term (stabilized) groundwater levels in the monitoring wells were found at depths ranging from 2.0 to 8.0m below the existing grade, corresponding to Elevations of 74.9 to 80.2m. The results of the water level readings taken on Sept. 26, 2018 in the monitoring wells are summarized on Table 3.5.

Borehole	Surface	Date of	Water Level	Water Level	Notes
	Elevation (m)	Observation	Depth (mbgs)	Elev. (m)	
BH18-8	81.6	Sept. 26, 2018	2.8	78.8	Screened in overburden
BH18-12	83.2	Sept. 26, 2018	8.0	75.2	Screened in overburden
BH18-16	82.9	Sept. 26, 2018	2.7	80.2	Screened in overburden
BH18-19	80.7	Sept. 26, 2018	4.7	76.0	Screened in bedrock
	77 5	Sont 26 2019			Screened in bedrock
BU10-23A	77.5	3ept. 20, 2018	-	-	(Well not accessible)
BH18-32	77.2	Sept. 26, 2018	2.3	74.9	Screened in bedrock
BH18-37	81.3	Sept. 26, 2018	2.0	79.3	Screened in bedrock

Table 3.5: Groundwater Levels Observed in DS Monitoring Wells

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

4. FOUNDATIONS

It is understood that the 71.6-hectare Lakeview Village will include 5,000 to 7,000 new homes in a variety of housing options, including townhouses, mid-rise and high-rise buildings. The proposed structures will entail up to 3-levels of basement. The finished basement floor elevations are not available to us at the time of writing this report. It is assumed that P1, P2 and P3 basement levels will approximately be at 3m, 6m and 9m depths respectively below the existing grade. Footings will be 1m to 2m below the lowest basement slab.

Based on the encountered bedrock depths, the subject site is sub-divided into three areas (Area A, Area B and Area C), as summarized in Sections 3.1 to 3.3. The foundation recommendations for these three areas are provided below:

4.1 Proposed Buildings in Area 'A'

Boreholes drilled within Area 'A' (BH18-14, BH18-19, BH18-21, BH18-25, BH27 to BH18-38 and BH18-49) reported shale bedrock at depths ranging from 1.5 to 6.3m below the existing grade, corresponding to elevations ranging from 71.2 to 80.1m. Due to the shallow bedrock depths, this area is considered more suitable for high-rise development with one or more basement levels.

Depending upon the finished lowest basement floor elevation, the proposed buildings can be supported by conventional spread and strip footings / mat foundations or short drilled piers founded on shale bedrock, at minimum 0.3 m below the shale bedrock surface, for a bearing pressure values of 2.5 MPa at the Serviceability Limit States (SLS), and for a factored geotechnical resistance of 3.75 MPa at the Ultimate Limit States (ULS).

The footings/piers founded on sound shale, at minimum 1.5 m below the shale surface can be designed for a bearing pressure of 5.0 MPa at SLS, and a factored geotechnical resistance of 7.5 MPa at ULS.

The depths and elevations of shale bedrock at the borehole locations in Area 'A' are provided in Table 3.1 of this report.

4.2 Proposed Buildings in Area 'B'

Twenty-two (22) boreholes (BH18-1 to BH18-13, BH18-15 to BH18-18, BH18-20, BH18-39, BH18-40, BH18-46 & BH18-48) were drilled within Area 'B', to depths ranging from 11.1 to 48.3m.

There is a bedrock valley within Area 'B', with bedrock depths ranging from 9.1 to 48.1m below the existing grade, corresponding to elevations ranging from 34.7 to 71.3m. Therefore, this area is more suitable for low-rise to mid-rise development to be supported by shallow foundations (footings/raft) founded on undisturbed native soil.

Depending upon the location of the building and number of basement levels, it may be possible to support the proposed development in this area on footings or deep foundations such as caissons founded on bedrock.

Additional boreholes will be required to further delineate and confirm the bedrock depths if foundations are to be supported on bedrock.

Footings and/or raft founded on undisturbed native soils can be designed for a bearing capacity values of 300 to 500 kPa at SLS (serviceability limit states) and for a factored geotechnical resistance of 450 to 750 kPa at ULS (ultimate limit states). The bearing values and the corresponding founding elevations at the borehole locations are summarized on Table 4.2.

	Table 4.2: I	Bearing Valu	es and Foundin	g Levels of Spre	ad Footings	
BH No.	Material	Bearing Capacity at SLS (kPa)	Factored Geotechnical Resistance at ULS (kPa)	Minimum Depth below Existing Ground (m)	Founding Level At or Below Elevation (m)	Notes/WL Elevation (m)
BH18-1	Silty clay Till/ Sandy Silt Till	500	750	3.4	79.4	during drilling WL at 76.7m
BH18-2	Clayey Silt Till	500	750	2.6	81.2	
BH18-3	Clayey Silt Till/ sandy silt to silty sand	500	750	1.0	80.4	during drilling WL at 76.8m
BH18-4	Sandy silt to silty sand	400	600	2.1	79.0	during drilling WL at 75.1m
BH18-5	Clayey Silt Till	500	750	2.6	81.4	
BH18-6	Clayey Silt Till	500	750	1.8	81.0	
BH18-7	Clayey Silt Till	500	750	1.5	80.6	
BH18-8	Clayey Silt/sandy silt	400	600	1.1	80.5	WL at 78.8m on Sept. 26/18
BH18-9	Clavey Silt/sandy silt	300	450	2.3	77.9	during drilling WL at
DITIO-5	Clayey Sht/ Sandy Sht	500	750	6.1	74.1	77.1m
BH18-10	Clayey Silt Till/clayey silt/sandy silt till	500	750	1.8	80.5	during drilling WL at 76.5m
BH18-11	Clayey Silt Till	500	750	3.4	81.7	
D110-11	Silty Clay	300	450	13.0	72.1	
BH18-12	Clayey Silt Till	500	750	3.0	80.2	WL at 75.2m
51120 12	Clayey Silt	300	450	8.0	75.2	on Sept. 26/18
	Clayey Silt Till/Clayey	300	450	1.8	78.4	during drilling WL at
BH18-13	Silt/Sandy silt to silty	500	750	4.6	75.6	75.6m; methane gas
	sand till					encountered at 11m
BH18-15	Silt/silty sand/silty clay	500	750	3.1	77.3	
BH18-16	Clayey silt till	500	750	2.6	80.3	WL at 80.2m on Sept. 26/18
BH18-17	Clayey Silt Till/Clayey Silt	500	750	1.8	78.5	
BH18-18	Clayey silt till Silty clay/silt	300	450	2.1	79.0	
BH18-20	Clayey silt till/silty clay/silt to clayey silt	500	750	1.0	79.3	during drilling WL at 77.2m
BH18-39	Sandy silt till/silty clay till	500	750	3.4	78.4	
BH18-40	Sandy Silt to silty sand/silty clay till	500	750	2.5	79.3	during drilling WL at 79.5m
BH18-46	Silty clay till	500	750	1.1	80.3	
BH18-48	Clayey silt till/sandy silt till	500	750	1.8	79.3	during drilling WL at 78.0m

4.3 Proposed Buildings in Area 'C'

Boreholes drilled in Area 'C' (BH18-41 to BH18-45 and BH18-47) reported shale bedrock depths ranging from 3.1 to 7.6m below the existing grade, corresponding to elevations ranging from 75.7 to 80.4m. Due to the shallow bedrock depths, this area is also suitable for high-rise development with one or more basement levels.

Depending upon the finished lowest basement floor elevation, the proposed buildings can be supported by conventional spread and strip footings / mat foundations or short drilled piers founded on shale bedrock, at minimum 0.3 m below the shale bedrock surface, for a bearing pressure values of 2.5 MPa at the Serviceability Limit States (SLS), and for a factored geotechnical resistance of 3.75 MPa at the Ultimate Limit States (ULS).

The footings/piers founded on sound shale, at minimum 1.5 m below the shale surface can be designed for a bearing pressure of 5.0 MPa at SLS, and a factored geotechnical resistance of 7.5 MPa at ULS.

The depths and elevations of shale bedrock at the borehole locations are provided in Table 3.3 of this report.

Footings and/or raft founded on undisturbed native soils can be designed for a bearing capacity values of 300 to 500 kPa at SLS (serviceability limit states) and for a factored geotechnical resistance of 450 to 750 kPa at ULS (ultimate limit states). The bearing values and the corresponding founding elevations at the borehole locations are summarized on Table 4.3.

BH No.	Material	Bearing Capacit y at SLS (kPa)	Factored Geotechnical Resistance at ULS (kPa)	Minimum Depth below Existing Ground (m)	Founding Level At or Below Elevation (m)	Notes/WL Elevation (m)
BH18-41	Silty clay Till/ silt	500	750	2.6	80.7	during drilling WL at 78.7m
BH18-42	Clayey Silt Till	500	750	4.6	81.1	
BH18-43	Clayey Silt Till	500	750	1.1	82.4	
BH18-44	Clayey Silt Till	300	450	1.5	82.4	
BH18-45	Silty Clay Till	400	600	2.6	80.7	
BH18-47	Clayey Silt Till / Silt/sandy silt to silty sand	300	450	1.0	81.4	during drilling WL at 77.8m

Table 4.3: Bearing Values and Founding Levels of Spread Footings

4.4 Other Comments on Foundations

Foundations designed to the specified bearing capacity at the serviceability limit states (SLS) are expected to settle less than 25 mm total and 19 mm differential.

Where it is necessary to place footings at different levels in soil, the upper footing must be founded below an imaginary 10 horizontal to 7 vertical line drawn up from the base of the lower footing. Where it is necessary to place footings at different levels on bedrock, the upper footing must be founded below an imaginary 1 horizontal to 1 vertical line (1H:1V in bedrock) drawn up from the base of the lower footing. The lower footing must be installed first to help minimize the risk of undermining the upper footing.

All foundation bases must be inspected by this office prior to pouring concrete.

The shale bedrock weathers rapidly between wetting and drying cycles. In view of this, it is suggested that a lean concrete mat slab be placed immediately after the excavation is complete to keep the shale intact, unless the footings are cast immediately after excavating.

The inspected and approved footing base should be covered with 50 mm thick mud slab immediately in order to avoid disturbance of the founding soil due to construction activity and weathering /drying.

It should be noted that the recommended bearing capacities have been calculated by DS Consultants Limited from the borehole information for the preliminary design stage only. Additional boreholes may be required when the final building plans are available. The investigation and comments are necessarily on-going as new information of the underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field inspections provided by DS Consultants Limited to validate the information for use during the construction stage.

5. FROST PROTECTION

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

There is no official rule governing the required founding depth for footings below unheated basement floors. Certainly, it will not be greater than the 1.2 m required in Southern Ontario for exterior footings. Un-monitored experience indicates that a shallower depth ranging from 0.82 to 0.9 m for interior column footings and 0.4 m for wall footings has been successful where 2 or more basement levels apply. The 0.82 m depth is believed to be close to the minimum structural requirement for interior column footings. Adjacent to air shafts and entrance and exit doors, a footing depth of 1.2 m below floor level is required or, alternatively, insulation protection must be provided.

It is also emphasized that underfloor drainage and/or an adequate free draining gravel base is required to minimize the risk of floor dampness. Floor dampness could lead to temporary icing and the risk of accidents.

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6. FLOOR SLAB AND PERMANENT DRAINAGE

The floor slab can be supported on grade provided all existing fill material and disturbed soils are removed and the base thoroughly proof rolled. The fill required to raise the grade can consist of inorganic soil, placed in shallow lifts and compacted to 98 percent of Standard Proctor Maximum Dry Density (SPMDD). A moisture barrier consisting of at least 200 mm of 19 mm clear crushed stone should be installed under the floor slab.

In the area where shale bedrock is encountered at floor slab level, the floor slab can be cast as slab-ongrade, provided a 200 mm layer of clear crushed stone (19 mm maximum size) is placed between the underside of the floor slab and the exposed bedrock surface.

A perimeter and underfloor drainage system will be required for buildings with basements. Typical drainage and backfill recommendations are illustrated on Drawings 60 to 62 for the open cut and shored excavation system.

7. ELEVATOR AND SUMP PITS

If elevator/sump pits are to be installed in cohesionless soils (sandy silt, sand, silt) below the water table, drainage systems at the base level of the pits are not recommended, due to the concern of loss of fines. In this case, the pits can be designed as water-tight structures, and water pressure on the pit walls and the pit base slab should be considered.

8. EARTH, ROCK AND WATER PRESSURES

The design of basement walls can incorporate the conventional design in the overburden using the earth pressure coefficient $K_1=0.40$. In the rock, the earth pressure coefficient K can be reduced to $K_2=0.20$.

The lateral earth/rock pressure acting at any depth on basement walls can be calculated as follows:

	In soil:	$p = K_1 (\gamma_1 h_1 + q) + p_w$
	In rock:	$p = K_2 (\gamma_1 H_1 + q + \gamma_2 h_2) + p_w$
here p	=	lateral earth and water pressure in kPa acting at depth $h_1 \text{or} h_2$
K1, K2	=	earth pressure coefficients, K_1 =0.40 for overburden soil; K_2 =0.20 for rock
γ1	=	unit weight of overburden soil, assuming 20.5 kN/m^3 above the water table and 11 kN/m^3 below the water table
γ2	=	unit weight of rock below water, assuming 15 kN/m ³
h1	=	Depth in overburden soil, below ground surface

w

- H₁ = thickness of soil above rock
- h₂ = Depth in rock, below rock surface
- q = value of surcharge in kPa
- p_w = hydrostatic water pressure

When the foundation wall is poured against the caisson wall, the foundation wall as well as the caisson wall should be designed for hydrostatic pressure, even though a drainage board is provided between the basement wall and the caisson wall.

9. EXCAVATIONS AND GROUNDWATER CONTROL

Excavations can be carried out with heavy hydraulic backhoe. Long-term (stabilized) groundwater levels in the monitoring wells were found at depths ranging from 2.0 to 8.0m below the existing grade, corresponding to Elevations of 74.9 to 80.2m. Positive dewatering will be required prior to any excavation in water bearing cohesionless soils below the groundwater table, otherwise it will result in an unstable base and flowing sides. A contractor specializing in dewatering should be retained to design the dewatering systems for excavations below the groundwater table.

Further comments on groundwater control during construction and permanent drainage are provided in our preliminary hydrogeology report.

It should be noted that the glacial till soils may contain boulders. Large obstructions in the fill material are anticipated. Provisions must be made in the excavation contract for the removal of boulders in the till and large obstructions in the fill material.

Excavation of the shale can be carried out using heaviest available single tooth ripper equipment. The limestone beds are present and may overly the shale bedrock surface at some locations. It may be necessary at some locations to utilize jackhammer type equipment to "open" the limestone layers for the ripper.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the fill material can be classified as Type 3 soil above the groundwater table. The very stiff to hard clayey soils can be classified as Type 2 Soil above the groundwater table and as Type 3 below the groundwater table. The cohesionless soils of sand and silty sand can be classified as Type 3 Soil above the groundwater table and Type 4 soil below the groundwater table.

The native soils free from topsoil and organics can be used as general construction backfill, provided its moisture content is within 2 percent of the optimum moisture content. Loose lifts of soil, which are to

be compacted, should not exceed 200 mm. Depending on the time of construction and weather, some excavated material may be too wet to compact and will require aeration prior to its use.

Imported granular fill, which can be compacted with hand held equipment, should be used in confined areas. The excavated soils are not considered to be free draining. Where free draining backfill is required, imported granular fill such as OPSS Granular B should be used.

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

10. EARTHQUAKE CONSIDERATIONS

Based on the existing borehole information and according to Table 4.1.8.4.A of OBC 2012, the subject site for the proposed development can be classified as "Class C" for seismic site response.

In Area 'A' and Area 'B', for the proposed buildings with one or more levels of basement, founded on sound shale bedrock, it may be possible to classify the site as "Class B" for seismic site response. This should be further confirmed during the detail design stage.

11. ROADS

The proposed development will be serviced by a network of roads.

11.1 Pavement Thickness

The investigation has shown that the predominant subgrade soil, after stripping the topsoil and any other organic and otherwise unsuitable subsoil, will generally consist of clayey silt till, clayey silt, clayey silt till shale complex and shale bedrock.

Based on the above and assuming that traffic usage will be residential/commercial collector road, the following minimum pavement thickness is recommended for roads to be constructed within the development:

40 mm HL3 Asphaltic Concrete 85 mm HL8 Asphaltic Concrete 200 mm Granular 'A' 325 mm Granular 'B'

These values may need to be adjusted according to the City of Mississauga Standards. The site subgrade and weather conditions (i.e. if wet) at the time of construction may necessitate the placement of thicker granular sub-base layer in order to facilitate the construction. Furthermore, heavy construction equipment may have to be kept off the newly constructed roads before the placement of asphalt and/or immediately thereafter, to avoid damaging the weak subgrade by heavy truck traffic.

11.2 Stripping, Sub-excavation and Grading

The site should be stripped of all topsoil and any organic, weathered or otherwise unsuitable soils to the full depth of the roads, both in cut and fill areas. Following stripping, the site should be graded to the subgrade level and approved. The subgrade should then be proof-rolled, in the presence of the Geotechnical Engineer, by at least several passes of a heavy compactor having a rated capacity of at least 8 tonnes. Any soft spots thus exposed should be removed and replaced by select fill material, similar to the existing subgrade soil and approved by the Geotechnical Engineer. The subgrade should then be re-compacted from the surface to at least 98% of its Standard Proctor Maximum Dry Density (SPMDD). The final subgrade should be cambered or otherwise shaped properly to facilitate rapid drainage and to prevent the formation of local depressions in which water could accumulate.

Owing to the clayey (i.e. impervious) nature of some subsoils at the site, proper cambering and allowing the water to escape towards the sides (where it can be removed by means of subdrains) is considered to be beneficial for this project. Otherwise, any water collected in the granular sub-base materials could be trapped thus causing problems due to softened subgrade, differential frost heave, etc. For the same reason damaging the subgrade during and after placement of the granular materials by heavy construction traffic should be avoided. If the moisture content of the local material cannot be maintained at $\pm 2\%$ of the optimum moisture content, imported granular material may need to be used.

Any fill required for re-grading the site or backfill should be select, clean material, free of topsoil, organic or other foreign and unsuitable matter. The fill should be placed in thin layers and compacted to at least 95% of its SPMDD. The degree of compaction should be increased to 98% within the top 1.0 m of the subgrade, or as per City Standards. The compaction of the new fill should be checked by frequent field density tests.

11.3 Construction

Once the subgrade has been inspected and approved, the granular base and sub-base course materials should be placed in layers not exceeding 200 mm (uncompacted thickness) and should be compacted to at least 100% of their respective SPMDD. The grading of the material should conform to current OPS Specifications.

The placing, spreading and rolling of the asphalt should be in accordance with OPS Specifications or, as required by the local authorities.

Frequent field density tests should be carried out on both the asphalt and granular base and sub-base materials to ensure that the required degree of compaction is achieved.

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11.4 Drainage

The City of Mississauga may require the installation of full-length subdrains on all roads. The subdrains should be properly filtered to prevent the loss of (and clogging by) soil fines.

All paved surfaces should be sloped to provide satisfactory drainage towards catch-basins. As discussed in Section 11.2, by means of good planning any water trapped in the granular sub-base materials should be drained rapidly towards subdrains or other interceptors.

12. UNDERGROUND UTILITIES

It is understood that underground services (watermains, storm and sanitary sewer) will be installed at the site to service the proposed development. Based on the preliminary servicing plans prepared by Urbantech, invert levels of the proposed utilities will be about 2 to 6m below the existing grade, with sanitary sewer at the deepest point at about 6m below the existing grade.

Trenches will be dug through fill materials followed by native soils of cohesive and cohesionless nature. Long-term (stabilized) groundwater levels in the monitoring wells were found at depths ranging from 2.0 to 8.0m below the existing grade, corresponding to Elevations of 74.9 to 80.2m. Positive dewatering will be required prior to any excavation in water bearing cohesionless soils below the groundwater table, otherwise it will result in an unstable base and flowing sides. Water table must be lowered to at least 1m below the lowest excavation level.

Detailed comments on excavation and groundwater control are provided in Section 9.

The undisturbed native soils encountered in the boreholes will provide adequate support for the service pipes and allow the use of Class B type bedding. The recommended minimum thickness of granular bedding below the invert of the pipes is 150 mm. The thickness of the bedding may, however, have to be increased depending on the pipe diameter or in accordance with local standards or if wet or weak subgrade conditions are encountered, especially when the soil at the trench base level consists of wet, dilatant silt.

The bedding material should conform to City of Mississauga bedding stone gradation requirements. Where the bedding falls below the anticipated water table, the bedding stone must be surrounded with a geotextile filter cloth.

For deep trenches, i.e. more than 2.0 m below the shale surface, a minimum 50 mm thick polystyrene etc. layer will be required at both sides of the pipe to avoid rock squeezing. The polystyrene layer should extend vertically to at least 0.3 m above the pipe. The rock trench should be wide enough so that at each side, the horizontal distance between the pipe side and the cut rock surface is at least 0.3 m.

The select inorganic fill materials or native soils free from topsoil / organics can be used as general construction backfill, provided their moisture contents at the time of construction are within 2% of their optimum moisture content.

In any case the degree of compaction of the trench backfill should be at least 95% of the material's Standard Proctor Maximum Dry Density (SPMDD). This value should be increased to at least 98% within 2 m of the road surface. The granular pavement sub-base and base materials should be compacted to at least 100% of their respective SPMDD.

13. GENERAL COMMENTS AND LIMITATIONS OF REPORT

This geotechnical report is preliminary, prepared based on the conceptual design plans. Additional boreholes will be required, once the detailed development plans are available to confirm the findings and recommendations provided in this report.

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

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

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

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. DS Consultants Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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

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

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Drawings



Drawing 1A: Notes On Sample Descriptions

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

					ISSM	IFE SOIL CLA	SSIFICATI	ON				
CLAY		SILT			S/	AND		GRA	VEL		COBBLES	BOULDERS
	FIN	NE MEDIUN	1 COA	RSE FIN	E M	EDIUM COA	RSE FINE	MED	DIUM CO	ARSE		
	0.002	0.006 	0.02	0.06 I EQUIVA	0.2 I ALENT (0.6 I GRAIN DIAME	2.0 I TER IN MI	6.0 I _LIMETRE	20 S	60		00
CLAY (F	PLASTIC)	то		FI	NE	MEDIUM	CRS.	FINE	COAF	RSE	7	
SILT (N	ONPLAST	IC)				SAND			GRAVEL		7	



- 2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.
- 3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.



(m)

LOG OF BOREHOLE BH18-01

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DRILLING DATA

Method: Hollow Stem Auger

DYNAMIC CONE PENETRATION RESISTANCE PLOT

REF. NO.:	18-519-10
ENCL NO.	2

LIQUID

PLASTIC NATURAL MOISTURE LIMIT CONTENT GROUND WATER CONDITIONS AND LIMIT 40 60 POCKET PEN. (Cu) (kPa) NATURAL UNIT 20 80 100 STRATA PLOT GRAIN SIZE BLOWS 0.3 m Wp w WL

 SHEAR STRENGTH (kPa)

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 LAB VANE

 ELEVATION ELEV DEPTH DISTRIBUTION -0 _ DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 10 20 30 20 100 82.8 GR SA SI CL TOPSOIL:350mm 11 0.0 1/ SS о 1 14 82.4 0.4 FILL: clayey silt, some organics, trace gravel, grey, moist, stiff 82 2 SS 8 0 3 SS 10 81 80.5 FILL: sandy silt, some organics, 2.3 grey, moist, loose SS 4 8 80 79.7 3.1 SILTY CLAY TILL: some sand, trace gravel, brown, moist, very stiff 225 1 15 47 37 5 SS 17 0 79 78.2 SANDY SILT TILL: trace to some 4.6 clay, trace gravel, grey, moist, very 78 6 SS 50 0 dense 77 76.7 ∇ SAND: trace silt, brown, wet, 6.1 W. L. 76.7 m during drilling dense 7 SS 45 0 76 SAND AND GRAVEL: trace silt, 7.6 ò 0 75 brown, wet, very dense 8 SS 50 0 0. ó. o. ö 74 6 73.7 SILTY SAND TILL: some gravel to 9.1 Ι¢Ι gravelly, occassional cobble/boulders, trace clay, grey, SS 78 9 moist to wet, very dense 73 Continued Next Page + ³, ×³: Numbers refer O ^{8=3%} Strain at Failure <u>GRAPH</u> GROUNDWATER ELEVATIONS NOTES to Sensitivity

18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12

SOIL LOG

SO

75.2



DRILLING DATA

Diameter: 200 mm

Date: Jul-18-2018

Method: Hollow Stem Auger

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

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| SOIL PROFILE | | | SAMPLES | | | | DYNAMIC CONE PENETRATION
RESISTANCE PLOT
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(Cu) (kPa) | NATURAL UNIT W
(kN/m ³) | AND
GRAIN SIZE
DISTRIBUTION
(%)
GR SA SI CL |
| SILTY SAND TILL: some gravel to
gravelly, occassional
cobble/boulders, trace clay, grey,
moist to wet, very dense(Continued) | | | | | | |
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| | | | | | | 71 | -
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 | | | | |
 | | |
 | - | | |
| wet below 12.2 m | | 11 | SS | 76 | | 70 | -
 |

 | | | | | | | |
 | | 0 |
 | | | |
| Notes:
1) Water level at 6.1 mbgl during
drilling | | | | | | |
 |

 | | | | | | | | | | | | | | | | | | | | |
 | | |
 | | | |
| | DESCRIPTION SILTY SAND TILL: some gravel to gravelly, occassional cobble/boulders, trace clay, grey, moist to wet, very dense(Continued) wet below 12.2 m PEN OF BOREHOLE Notes: 1) Water level at 6.1 mbgl during drilling | DESCRIPTION Image: Construction of gravelity coccasional cobble/boulders, trace clay, grey, moist to wet, very dense(Continued) wet below 12.2 m END OF BOREHOLE Notes: 1 valuer level at 6.1 mbgl during drilling | DESCRIPTION Image: constraint of gravely, occassional coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) wet below 12.2 m Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Wet below 12.2 m Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Notes: 1 Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Wet below 12.2 m Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Wet below 12.2 m Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Wet below 12.2 m Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Wet below 12.2 m Image: coble/boulders, trace clay, grey, moist to wet, very dense(Continued) Image: coble/boulders, tr | DESCRIPTION OP US Image: state in the s | DESCRIPTION Image: Display biology biolo | DESCRIPTION Image: Note of the second s | DESCRIPTION Image: bit of the second se | DESCRIPTION Understand Understand </td <td>DESCRIPTION Image: Bar and the second constraints of the second co</td> <td>DESCRIPTION Note of the second seco</td> <td>DESCRIPTION Note of the second s</td> <td>DESCRIPTION Image: bit of the second se</td> <td>DESCRIPTION Image: Base of the second s</td> <td>DESCRIPTION Image: Bit of the state of the</td> <td>DESCRIPTION Note that the second second</td> <td>DESCRIPTION V <th< td=""><td>DESCRIPTION 6 8 8 8 9 <th< td=""><td>DESCRIPTION Value Value</td><td>DESCRIPTION Image: Second second</td></th<></td></th<></td> | DESCRIPTION Image: Bar and the second constraints of the second co | DESCRIPTION Note of the second seco | DESCRIPTION Note of the second s | DESCRIPTION Image: bit of the second se | DESCRIPTION Image: Base of the second s | DESCRIPTION Image: Bit of the state of the | DESCRIPTION Note that the second | DESCRIPTION V <th< td=""><td>DESCRIPTION 6 8 8 8 9 <th< td=""><td>DESCRIPTION Value Value</td><td>DESCRIPTION Image: Second second</td></th<></td></th<> | DESCRIPTION 6 8 8 8 9 <th< td=""><td>DESCRIPTION Value Value</td><td>DESCRIPTION Image: Second second</td></th<> | DESCRIPTION Value Value | DESCRIPTION Image: Second |

REF. NO.: 18-519-10

ENCL NO.: 2



(m)

ELEV DEPTH

83.8

8**9.0** 0.1

83.4 0.4

83.0

82.3

81.5 2.3

1.5

0.8

wet

wet. dense

LOG OF BOREHOLE BH18-02

DRILLING DATA

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

Method: Hollow Stem Auger Diameter: 200 mm REF. NO.: 18-519-10 Date: Jul-19-2018 ENCL NO.: 3 DYNAMIC CONE PENETRATION RESISTANCE PLOT SAMPLES SOIL PROFILE PLASTIC NATURAL MOISTURE LIMIT CONTENT GROUND WATER CONDITIONS LIQUID LIMIT 40 60 100 POCKET PEN. (Cu) (kPa) NATURAL UNIT 20 80 STRATA PLOT BLOWS 0.3 m Wp w WL SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL × LAB VANE ELEVATION -0 _ DESCRIPTION NUMBER WATER CONTENT (%) TYPE ż 40 60 80 10 20 30 20 100 ASPHALT: 100 mm SAND AND GARVEL: 250 mm 0 AS 0 1 FILL: silty sand, trace gravel, grey, 83 CLAYEY SILT TILL: some sand, trace gravel, brown, moist, very stiff 2 SS 22 0 SILTY SAND: trace clay, brown, 3 SS 40 82 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, SS 4 46 225 0 grey, moist, very stiff to hard 81 225 5 SS 40 80 79 6 SS 28 **♦** |-225 78

18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12 SOIL LOG SO

6

Continued Next Page GROUNDWATER ELEVATIONS Measurement $\overset{1st}{\checkmark} \overset{2nd}{\checkmark} \overset{3rd}{\checkmark} \overset{4th}{\checkmark}$

<u>GRAPH</u> $+3, \times 3$: Numbers refer NOTES

77

76

75

74

wet spoon

SS 41

7

8 SS 70

SS

44

9

O ^{8=3%} Strain at Failure to Sensitivity

METHANE

AND

GRAIN SIZE

DISTRIBUTION

(%)

GR SA SI CL

0 72 22 6

1 49 33 17

July 19, 2018

July 20, 2018

225

225

225

¢



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DRILLING	DATA
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Method: Hollow Stem Auger

Diameter: 200 mm Date: Jul-19-2018

DYNAMIC CONE PENETRATION RESISTANCE PLOT

				SAMPL	_ES	с		RESIS	TANCE	PLOT	\geq			PLASTI			LIQUID		WT	METHANE
(m)		LOT			S F	WATE	z	2 SHEA	0 4			0 10	00	LIMI I W _P	CON	TENT N	WL	ET PEN (kPa)	L UNIT (m ³)	GRAIN SIZE
LEV EPTH	DESCRIPTION	ATA P	BER		BLOV 0.3 r		ATIO	O UN		INED	+	FIELD V. & Sensiti	ANE					POCKI (Cu)	ATURA (kN	DISTRIBUTION (%)
		STRA	NUM	TYPE	z	GRO	ELEV	 QL 2 	JICK TF 0 4	RIAXIAL 0 6	× 0 8	LAB VA 0 1	ANE 00	WA 1	1ER CC	20 3	I (%) 30		٩	GR SA SI C
	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to							-												
	hard(Continued)		_				70	-												1
		; 0 ;	10	SS	21		73	-							0			225		l
								-												1
							72	-												l
			11	SS	40			-							o					l
			/ / /				71	-												1
).1								-												1
3.7	CLAYEY SILT: trace sand, grey, moist, very stiff		12	ss	21		70	-							0			225		1
								-												1
							69	-												l
								-												l
			13	ss	19	-	68	-								>		225		l
								-												l
							67	-												l
			14	SS	18			-							0			225		l
							66	-												l
	stiff at 18.3 m							-												l
	Sun at 10.0 m		15	ss	19		65	-								0		225		l
																				l
								-												l
						1	64	-												



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DRILLING DAT	Ά
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Method: Hollow Stem Auger

DYNAMIC CONE PENETRATION RESISTANCE PLOT

Diameter: 200 mm Date: Jul-19-2018

PLASTIC NATURAL MOISTURE LIMIT CONTENT GROUND WATER CONDITIONS LIQUID LIMIT POCKET PEN. (Cu) (kPa) AND 20 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE w WL BLOWS 0.3 m WP SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH -0 -1 DISTRIBUTION DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 20 40 60 80 100 10 20 30 GR SA SI CL CLAYEY SILT: trace sand, grey, 16 SS 18 0 225 moist, very stiff(Continued) 63.4 END OF BOREHOLE 20.4 Notes: 1) Borehole dry upon completion

DS SOIL LOG 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DRILLING I	DATA
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Method: Hollow Stem Auger

DYNAMIC CONE PENETRATION RESISTANCE PLOT

Diameter: 150mm Date: Jun-25-2018 REF. NO.: 18-519-10 ENCL NO.: 4

LIQUID

PLASTIC NATURAL MOISTURE LIMIT CONTENT GROUND WATER CONDITIONS POCKET PEN. (Cu) (kPa) AND LIMIT 40 60 100 NATURAL UNIT 20 80 (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m Wp w WL

 SHEAR STRENGTH (kPa)

 O UNCONFINED
 +

 PUICK TRIAXIAL
 ×

 LAB VANE

 ELEVATION ELEV DEPTH DISTRIBUTION -0 _ DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 81.4 GR SA SI CL TOPSOIL: 350mm 11 0.0 1 SS 13 0 1/ 81.0 81 0.4 POSSIBLE FILL: clayey silt, brown, moist, stiff 80.6 CLAYEY SILT:some sand, 0.8 occassional sand seams, brown, 2 SS 22 >225 moist, very stiff to hard 80 79.7 3 SS 33 о >225 1.7 CLAYEY SILT TILL : some sand, trace gravel, occassional sand seams, brown, moist, very stiff 79 SS 4 24 0 78.3 3.1 SANDY SILT TO SILTY SAND 50/ trace clay, trace gravel, brown, 5 SS 78 100mr moist to wet, very dense 77 ∇ grey, wet below 4.6 m W. L. 76.8 m 50/ during drilling 6 SS 00mr 76 6 7 SS 80 0 75 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12 74 73.8 SILTY SAND TO SAND: trace clay, 7.6 grey, wet, dense SS 8 46 с 73 72.3 SILTY SAND TILL: trace to some 9.1 ļφ 50/ clay, trace gravel, occasional cobble/boulder, grey, wet, very 9 SS SOIL LOG 72 50mr dense SO Continued Next Page + ³, × ³: Numbers refer O ^{8=3%} Strain at Failure <u>GRAPH</u> GROUNDWATER ELEVATIONS NOTES to Sensitivity





18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12

SOIL LOG

SO

LOG OF BOREHOLE BH18-03

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150mm Date: Jun-25-2018

DYNAMIC CONE PENETRATION RESISTANCE PLOT PLASTIC NATURAL MOISTURE LIMIT CONTENT METHANE GROUND WATER CONDITIONS LIQUID POCKET PEN. (Cu) (kPa) AND LIMIT 20 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m Wp w W_{L} SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH -0 DISTRIBUTION -1 DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 GR SA SI CL SILTY SAND TILL: trace to some ļģ clay, trace gravel, occasional cobble/boulder, grey, wet, very 71 dense(Continued) |¢ 70.7 10.7 SAND: trace silt, grey, wet, dense to very dense 10 SS 42 0 0 95 (5) 70 69 11 SS 64 68 67.7 SANDY SILT TO SILTY SAND: 13.7 trace to some clay, some gravel, 12 SS 80 grey, wet, very dense 67 66 50/ 13 SS 0 50mr 16 65 50/ SS 14 75mn 64 63.1 CLAYEY SILT TILL: sandy, trace 18.3 14 63 50/ gravel, occasssional 15 SS 50mr cobble/boulders, grey, moist, hard 19 62 Continued Next Page + ³, × ³: Numbers refer O ^{8=3%} Strain at Failure <u>GRAPH</u> GROUNDWATER ELEVATIONS **NOTES** to Sensitivity Measurement $\underbrace{\stackrel{1st}{\nabla}} \stackrel{2nd}{\Psi} \underbrace{\stackrel{3rd}{\Psi}} \stackrel{4th}{\Psi}$



DATUM: Geodetic

LOG OF BOREHOLE BH18-03

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DRILLING DATA Method: Hollow Stem Auger

Diameter: 150mm

Date: Jun-25-2018

REF. NO.: 18-519-10 ENCL NO.: 4

BOREHOLE LOCATION: See Dr

SOIL PROFILE			SAMPLES					DYNA													
(m)						ЪЩ		20 40 60 80 100					00	PLASTIC NATURA MOISTUI		URAL TURE	LIQUID LIMIT	ż	IT WT	METHANE AND	
(m) ELEV								SHEAR STRENGTH (kPa)						W _P W			WL	KET PI) (kPa)	AL UN N/m ³)	GRAIN	
DEPTH	DESCRIPTION	ATA	1BER	ш	<u>BLO</u> 0.3		VATI	O UNCONFINED + FIÉLD VANE & Sensitivity						wa	ATER CONTENT (%)		DO DO	ATUR (k			
		STR	NUN	μ	ż	GRO	ELE	2	20 4		 108	30 1	00	1	0 2	20 3	30		2	GR SA	SI CL
61.2		19.	16	SS	92			-										>225			
20.2	END OF BOREHOLE																				
	1) Water level at 4.6 mbgl during																				
	drilling																				




DRILLING DATA

LOG OF BOREHOLE BH18-04

REF. NO.: 18-519-10 ENCL NO.: 5

> POCKET PEN. (Cu) (kPa) NATURAL UNIT

1 OF 3

METHANE

AND

GRAIN SIZE

DISTRIBUTION

(%)

GR SA SI CL

Continued Next Page GROUNDWATER ELEVATIONS

Measurement $\stackrel{1st}{\checkmark} \stackrel{2nd}{\checkmark} \stackrel{3rd}{\checkmark} \stackrel{4th}{\checkmark}$

SO

+ ³, × ³: Numbers refer <u>GRAPH</u> NOTES to Sensitivity

O ^{8=3%} Strain at Failure



ELEV DEPTH

3

67.4

13.7

LOG OF BOREHOLE BH18-04

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

Method: Hollow Stem Auger

Diameter: 150mm Date: Jun-22-2018

DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE LIMIT CONTENT METHANE GROUND WATER CONDITIONS LIQUID POCKET PEN. (Cu) (kPa) AND LIMIT 20 40 60 80 100 NATURAL UNIT STRATA PLOT GRAIN SIZE w WL BLOWS 0.3 m WP SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL × LAB VANE ELEVATION -0 DISTRIBUTION -1 DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 GR SA SI CL SILTY SAND TILL: trace clay, ļφ 71 some gravel, occassional cobble/boulders, grey, wet, very dense(Continued) SS hammer bounced 10 70 69 50/ 11 SS 0 25m 68 SAND: trace silt, grey, wet, very dense 12 SS 62 0 67 66 13 SS 53 ο 65





DRILLING DATA

Diameter: 150mm

Date: Jun-22-2018

Method: Hollow Stem Auger

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

	SOIL PROFILE		S	SAMPI	ES			DYNA			NETRA	TION									
					-	TER		2	0 4	. FLUI	ج م	30 1	00	PLASTI LIMIT		URAL TURE	LIQUID LIMIT	Ľ.	IT WT	METH. AN	ANE D
(m) EL EV		PLOI	~		SN E	.WA.	No	SHEA	AR ST	RENG	TH (kl	Pa)	<u> </u>	W _P	1	» »	WL	KET P (kPa)	AL UN	GRAIN	SIZE
DEPT		RATA	MBER	щ	BLC 0.3		VATI			INED RIAXIAI	+	FIELD V & Sensit	ANE ivity ANF	WA	TER CC		Г (%)	201	NATUR A)	(%)
		STR	NUN	ΤYP	ż	GR	ELE	2	20 4	0 6	ιο ε	30 1	00	1	0 2	20 3	80			GR SA	SI CL
-	SILTY CLAY TILL: some sand, trace gravel, grev, moist,		16	SS	42		61	-								•		>225			
- <u>60.</u> 20	7 hard(Continued)	X.X						_													
20.	Notes:																				
	1) Water level at 6.0 mbgl during drilling																				
10-12																					
, 18 1																					
.GDT																					
SO L																					
D.GP																					
ROAI																					
DRO																					
0 HYI																					
10 80																					
519-î																					
18																					
L LOG																					
s soll																					
ő																					

REF. NO.: 18-519-10

ENCL NO.: 5



ELEV DEPTH

84.0

8**9.9**

81.7

6

18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12

SOIL LOG

S

2.3

LOG OF BOREHOLE BH18-05

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

TYPE ż

SS 22

SS 4

45

STRATA PLOT

NUMBER

1

2 SS 11

3 SS 50

5 SS 69

6 SS 93

7 SS 58

8 SS 60

SS 9

39

GROUND WATER CONDITIONS

ELEVATION

83

82

81

80

79

78

77

76

75

BLOWS 0.3 m

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

TOPSOIL: 127mm

SOIL PROFILE

DESCRIPTION

FILL: clayey silt, trace rootlet, trace

organic, brown, moist, stiff to hard

CLAYEY SILT TILL: some sand,

trace gravel, occassional cobble/boulder, brown to grey,

moist, hard

grey below 4.9 m

DRILLING I	DATA
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Method: Solid Stem Auger

Diameter: 150 mm

DYNAMIC CONE PENETRATION RESISTANCE PLOT PLASTIC NATURAL MOISTURE LIMIT CONTENT METHANE LIQUID AND LIMIT 20 40 60 80 100 POCKET PEN. (Cu) (kPa) NATURAL UNIT GRAIN SIZE WP w WL SHEAR STRENGTH (kPa) O UNCONFINED + ^{FIELD} VANE QUICK TRIAXIAL × LAB VANE DISTRIBUTION -0 -1 (%) WATER CONTENT (%) 40 60 80 100 10 20 30 20 GR SA SI CL 0

0

0

0

0

0

0

Date: Jul-26-2018

	0	onun	ucu	I VOAL I
GROUNDWATE	ER EL	EVAT	IONS	5
Measurement		2nd	3rd	^{4th}

Continued Next Page

<u>GRAPH</u> $+3, \times3$: Numbers refer **NOTES** to Sensitivity



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING	DATA
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Method: Solid Stem Auger

Diameter: 150 mm Date: Jul-26-2018

See Drawing 1

	SOIL PROFILE		S	AMPL	ES			DYNAI RESIS	MIC CO TANCE	NE PEN PLOT		TION		DIAGT	_ NAT	URAL			т	METH	IANE
(m)		F.				ATER S		2	20 4	06	i0 8	80 1	100	LIMIT	C MOIS	TURE	LIQUID	PEN.	» TINL (°		ID
ELEV	DESCRIPTION	A PLO	к		3 m	ID W	lion	SHEA		RENG	TH (kl	Pa) FIELD V	ANE	W _P		N 0	WL	CKET (kF	(kN/m)	DISTRIE	BUTION
DEPTH		RAT	MBE	ЫП	립이		EVAI	• QI	JICK TF	INED RIAXIAL	. ×	& Sensi LAB V	itivity ANE	WA	TER CO		Г (%)	6 S	NATL	(%	b)
		т ли	R	≿	Ż	ц В О	EL	2	0 4	0 6	i0 8	80 1	100	1	0 2	20 3	80			GR SA	SI CL
-	trace gravel, occassional							-													
-	cobble/boulder, brown to grey, moist_bard(Continued)							-													
-								-													
-			10	~~	54		70	-													
Ē		Ĩ.	10	55	51		13	_										1			
-								-													
		11						-													
-								-													
71.8							72	-													
- 12.2	SILTY CLAY: trace sand, grey,	7						-													
-			11	SS	32			-							0						
-		1																			
<u>13</u> -							71	-													
E	ft ft							-													
-								-													
-								-													
14			12	SS	19		70									o					
-								-													
E								-													
-								-													
15							69	-													
68.8 15.2	CLAYEY SILT: trace sand, grey,	*) 71						_													
F	moist, very stiff		13	SS	21			-							0						
								_													
16							68														
E								-													
E								_													
2								-													
5 <u>17</u>							67	-													
			14	SS	19		07	-								0					
								-													
								-													
								-													
							00	_										1			
<u>05.7</u> - 18.3	SILT: trace clay, trace sand, grey,	悄						ŀ													
	wet, compact		15	SS	26			Ē							0						
								-													
2							65	-													
19.5	SANDY SILT TO SILTY SAND							-													
	TILL : interbed of wet sand, grey, wet, very dense	╢┠						_													
20	Continued Next Page											L		1	1		I	L			



O^{8=3%} Strain at Failure



DRILLING DATA

Diameter: 150 mm

Date: Jul-26-2018

Method: Solid Stem Auger

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DOIN					FS			DYNA			NETRA	TION						1			
						Ë		RESIS		PLUI	\geq	-	00	PLAST	IC NAT	URAL		z	T WT	METH/ ANI	ANE D
(m)		LoT			ଧ୍ୟ	WAT NS	z					30 1 	00	WP	CON	W W	WL	ET PE (kPa)	"""	GRAIN	SIZE
ELEV DEPTH	DESCRIPTION	TAP	Щ		0.3 r		0IT	O UI	NCONF	INED	іп (кі +	FIELD V & Sensit	ANE			0		(CCK	(kn	DISTRIB	
		TRA	UMB	/PE			E ≪	• Q		RIAXIAL	. ×	LAB V	ANE	WA	TER CO	ONTEN	T (%)	L.	¥	(70	,
		0 1	z	۲ ۵۵	£	υõ		2	20 4	0 6	3 0	30 1	00	1	0 2	20 ;	30			GR SA	SI CL
-			16	SS	66			-							0						
63.6 20.4																					
20.4	Notes:																				
	1) Water level at 18.3 mbgl upon completion																				
	completion.																				
																	1	1			
																	1	1			
																	1	1			





REF. NO.: 18-519-10 ENCL NO.: 6



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150mm Date: Jun-18-2018

	SOIL PROFILE		s	SAMPL	ES	щ	_	DYNAI RESIS	MIC CO TANCE	NE PEN PLOT		TION		PLASTI		LIQUID		ΨΤ	METHANE
(m) <u>ELEV</u> DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	гуре	N" <u>BLOWS</u> 0.3 m	SROUND WATE	ELEVATION	2 SHEA 0 UI • QI 2	0 4 AR STI NCONF JICK TF 0 4	0 6 RENG INED RIAXIAL	0 8 TH (kF + ×	Pa) FIELD V & Sensit LAB V/	00 ANE ivity ANE 00			LÎMIT W _L (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT V (kN/m ³)	AND GRAIN SIZE DISTRIBUTION (%)
82.8 82:8	TOPSOIL: 230 mm	<u>st 1,</u>	2		-														
- 0.2 - -	FILL: sand and gravel, brown, moist, compact	×	1	SS	13			-							0				
82.0 0.8	FILL: silty clay, trace gravel, brown,	\bigotimes	-			-	82	-											
_1 - -	moist, compact		2	SS	13			-							0				
<u>81.3</u> 1.5	CLAYEY SILT TILL: some sand to							-											
- - - 2	sandy trace gravel, brown, moist, hard		3	SS	28		81	-							o		>225	5	
-								-											
-			4	SS	44		0	-							þ		>225	5	
3							00	-											
-	grey below 3.1 m		5	ss	34			-						0			>225		
						_													
- 							/9	-											
-								-											
-			6	ss	40	-	78	-						0			>225	5	
-						-		-											
-								-											
							77	-											
-								-											
-			7	SS	51			-							0				
-							76												
-																			
-								-											
-			8	SS	54		75	-							0		>225		
			<u> </u>			-		-											
-																			
							74	-											
			╞					-											
			9	SS	54			-							0		>225	5	
10							73												
GROUN	Continued Next Page					<u>GRAPH</u> NOTES	73 + ³ ,	× ³ : ¦	Number o Sensi	s refer tivity	С	8=3%	Strain	at Failur	e				



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DRILLING D	ATA
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Method: Hollow Stem Auger

Diameter: 150mm Date: Jun-18-2018

DYNAMIC CONE PENETRATION RESISTANCE PLOT PLASTIC NATURAL MOISTURE LIMIT CONTENT METHANE GROUND WATER CONDITIONS LIQUID AND LIMIT 20 40 60 80 100 POCKET PEN. (Cu) (kPa) NATURAL UNIT (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m Wp w WL SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION -0 -1 DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 GR SA SI CL CLAYEY SILT TILL: some sand to 1 sandy trace gravel, brown, moist, hard(Continued) 72 10 SS 54 22 71 11 SS 64 >225 70 69.1 SILTY CLAY: trace sand, 13.7 69 48 occasional sand seams, grey, moist, 12 SS 0 6 26 68 16 125 very stiff F 68 13 SS 26 0 200 67 16 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12 66.0 66 16.8 **CLAYEY SILT TO SILT : some** clay, trace sand, grey, moist, compact SS 200 14 23 о 65 15 SS 26 >225 64 DS SOIL LOG 63 Continued Next Page O ^{8=3%} Strain at Failure <u>GRAPH</u> $+3, \times 3$: Numbers refer GROUNDWATER ELEVATIONS NOTES to Sensitivity $\begin{array}{c|c} \mbox{Measurement} & \underline{\overset{1st}{\underline{V}}} & \underline{\overset{2nd}{\underline{V}}} & \underline{\overset{3rd}{\underline{V}}} & \underline{\overset{4th}{\underline{V}}} \end{array}$



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

Method: Hollow Stem Auger

Diameter: 150mm Date: Jun-18-2018

DYNAMIC CONE PENETRATION RESISTANCE PLOT Ë Т Т I 40 20 60 00

SAMPLES

	SOIL PROFILE		S	AMPL	ES	~		RESIS	STANCE	PLOT	\geq				_ NAT	URAL			F	METHANE
(m <u>ELE</u> DEP		STRATA PLOT	NUMBER	түре	"N" <u>BLOWS</u> 0.3 m	GROUND WATER CONDITIONS	ELEVATION	SHE. OU • Q	AR ST NCONF UICK TI 20 4	RENG	i0 8 TH (kł + . × i0 8	30 1 Pa) FIELD V & Sensit LAB V. 30 1	00 I ANE ivity ANE 00		TER CC		шол шміт w _L Г (%) 80	POCKET PEN. (Cu) (kPa)	NATURAL UNIT M (kN/m ³)	AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
-	CLAYEY SILT TO SILT : some clay, trace sand, grey, moist,		16	SS	23			-									0	200		
-	compact(Continued)							-												
- 21 -							62	-										-		
						-		-												
-			17	SS	28		61	-								0		200		
22 - - -								-												
-								-												
- 59 23 22	 9.9 SILT:some clay, grey, very moist to wet, dense 	22				-	60	- - -										-		
-			18	SS	32			-								¢				
-							59	-												
- 58	3.4							-												
- 24	SAND: trace silt, some gravel to gravelly, grey, wet, very dense		19	SS	81			- - -								0				
- 25 -							58	-												
-								-												
						-	57	-										-		
-			20	SS	87			-							0					
12							50	-												
T 18-10							50	-												
09 5 09 2	5.4 7.4 SANDY SILT TO SILTY SANDUTODO CION WOLL WOLL					-		-												
- 1 - 1 - 28 - 54	dense		21	SS	58		55	-							0			-		
28 28 28 28 28 28 28 28 28 28 28 28 28 2	3.0 SILTY CLAY: trace sand, trace gravel, grey, moist, hard							-												
0 800 H)							5/	-												
8-519-1(- 181			22	SS	81	-	04	-								0		>225		
L LOG						-		-												
IOS SO 30 52	2.8		1				53	-												
GRO	Continued Next Page <u>DUNDWATER ELEVATIONS</u> 1st 2nd 3rd 4th 7d 4th					<u>GRAPH</u> NOTES	+ 3	× ³ :	Number to Sens	rs refer itivity	С	8=3%	Strain	at Failur	e					
Mea	isurement <u>V</u> <u>V</u> <u>V</u>																			



ELEV DEPTH

30.0

51.8

31.0

50.8

32.0

LOG OF BOREHOLE BH18-06

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

"N" B

STRATA PLOT

Ġ.

24 SS 80

0

0 0 0

0

.0

0 0 0

ò.

0

0

° 28 SS

o

° 0 ° 0

Ö.

29 SS 80

27 SS 76

0 0 26 SS

NUMBER

23 SS 45

GROUND WATER CONDITIONS

ELEVATION

52

51

50

49

48

47

46

45

44

43

BLOWS 0.3 m

87

50/

25mr

50/

150mr

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

wet, dense

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DESCRIPTION

SILT: some clay, trace sand, grey,

SAND:trace silt, grey, wet, dense

SAND AND GRAVEL:trace silt,

wet, very dense

occassional cobble/boulders, grey,

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150mm

POCKET PEN. (Cu) (kPa)

NATURAL UNIT ((kN/m³)

LIQUID

w

-0

WATER CONTENT (%)

WP

10 20 30

0

0

LIMIT

 W_{L}

-1

Date: Jun-18-2018 E

SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL × LAB VANE

40 60 80 100

20

4 OF 5

METHANE

AND

GRAIN SIZE

DISTRIBUTION

(%)

GR SA SI CL

DS SOIL LOG 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12





Numbers refer to Sensitivity O^{8=3%} Strain at

O ⁸=3% Strain at Failure

0



GROUNDWATER ELEVATIONS $\begin{array}{c|c} \hline \\ Measurement \\ \hline \underline{V} \\ \hline \underline{V} \\ \underline{V} \\$ O ^{8=3%} Strain at Failure

5 OF 5

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

S CONSULTANTS LTD. echnical Environmental Materials Hydrogeology

DRILLING DATA

LOG OF BOREHOLE BH18-06

D!
Geot



Geotechnical Environmental Materials Hydrogeology

DS CONSULTANTS LTD.

LOG OF BOREHOLE BH18-07



ELEV DEPTH

71.4 10.7

12 70.0

3

12.1

LOG OF BOREHOLE BH18-07

DRILLING DATA

Method: Hollow Stem Auger

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

Diameter: 150mm Date: Jun-20-2018 ENCL NO.: 8 DYNAMIC CONE PENETRATION RESISTANCE PLOT SAMPLES SOIL PROFILE PLASTIC NATURAL MOISTURE LIMIT CONTENT METHANE GROUND WATER CONDITIONS LIQUID AND LIMIT 40 60 100 POCKET PEN. (Cu) (kPa) NATURAL UNIT 20 80 STRATA PLOT GRAIN SIZE BLOWS 0.3 m Wp w WL SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL × LAB VANE ELEVATION DISTRIBUTION -0 -1 DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 GR SA SI CL SILT: trace sand, grey, moist to very moist, compact(Continued) 72 SANDY SILT TO SILTY SAND: trace gravel, grey, wet, very dense 10 SS 77 0 71 70 SILTY CLAY TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, hard 11 SS 59 0 >225 69 2 27 48 23 SS 12 59 0 >225 68 67 13 SS 79 0 66



Measurement $\underbrace{\stackrel{1st}{\checkmark}} \underbrace{\stackrel{2nd}{\Psi}} \underbrace{\stackrel{3rd}{\Psi}} \underbrace{\stackrel{4th}{\Psi}}$

REF. NO.: 18-519-10



DRILLING DATA

Diameter: 150mm

Date: Jun-20-2018

Method: Hollow Stem Auger

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DYNAMIC CONE PENETRATION RESISTANCE PLOT SAMPLES SOIL PROFILE PLASTIC NATURAL MOISTURE LIMIT CONTENT METHANE GROUND WATER CONDITIONS LIQUID POCKET PEN. (Cu) (kPa) AND LIMIT 20 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE w WL BLOWS 0.3 m WP SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION -0 -1 DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 GR SA SI CL SILTY CLAY: trace sand, grey, 16 SS 39 62 0 200 moist, hard(Continued) 61 17 SS 34 175 60 59 SS 56 >225 18 58 19 SS 52 0 >225 57 56 20 SS 57 0 >225 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12 55 50/ 21 SS о >225 25mn 54 53.1 SANDY SILT TILL: trace to some 29.0 53 clay, trace gravel, occasional cobble/boulder, grey, wet, very DS SOIL LOG dense Continued Next Page O ^{8=3%} Strain at Failure <u>GRAPH</u> $+3, \times3$: Numbers refer GROUNDWATER ELEVATIONS **NOTES** to Sensitivity Measurement $\underbrace{\stackrel{1st}{\underbrace{}}}_{\underline{\underbrace{}}} \underbrace{\stackrel{2nd}{\underbrace{}}}_{\underline{\underbrace{}}} \underbrace{\stackrel{3rd}{\underbrace{}}}_{\underline{\underbrace{}}} \underbrace{\stackrel{4th}{\underbrace{}}}_{\underline{\underbrace{}}}$

REF. NO.: 18-519-10

ENCL NO.: 8



DRILLING DATA

Diameter: 150mm

Date: Jun-20-2018

Method: Hollow Stem Auger

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

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BORE					F 0			DYNA			VETRA	TION		<u> </u>				1	1	
	SUIL PRUFILE			ampl	.ES	ĥ		RESIS	TANCE	PLOT	\geq			PLASTI	C NAT	URAL		7	TW-	METHANE
(m) <u>ELEV</u> DEPTH	DESCRIPTION	RATA PLOT	JMBER	ΡE	" BLOWS 0.3 m	ROUND WATE	EVATION	2 SHEA 0 UI • QI	AR STI NCONF	0 6 RENG INED RIAXIAL	0 8 TH (kf + . ×	BO 1 Pa) FIELD V & Sensit LAB V/	OO ANE ivity ANE	WA1		TENT w D DNTEN ⁻	с імі ї w _L ——-і Т (%)	POCKET PEr (Cu) (kPa)	NATURAL UNIT (kN/m ³)	GRAIN SIZE DISTRIBUTION (%)
-	SANDY SILT TILL: trace to some clay, trace gravel, occasional cobble/boulder, grey, wet, very dense(Continued)	o ST	NU		2 50/	E C	급 52	2	0 4	06	8 0	30 1	00	1	0 2	20 3	30	-		GR SA SI CL
DS SOIL LOG 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12 2.15	END OF BOREHOLE Notes: 1) Water level at 7.6m during drilling.																			

REF. NO.: 18-519-10 ENCL NO.: 8

PROJ CLIEN PROJ DATU BORE	ECT: Preliminary Geotechnical Investig IT: Lakeview Community Partners Ltd. ECT LOCATION: 800 Hydro Road, Mis M: Geodetic HOLE LOCATION: See Drawing 1	ation sissa	- Pro uga,	posed ON	Develo	pmer	nt		DRILLING D Method: Holl Diameter: 15 Date: Jun-26	ATA ow Ste 50mm 8-2018	em Auge	er			RI El	EF. NC	D.: 11 O.: 9	8-519	9-10	
	SOIL PROFILE		s	SAMPL	ES				DYNAMIC CON RESISTANCE	NE PEN PLOT		N	DIACT	NAT	URAL			F	METH	ANE
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	үре	N" <u>BLOWS</u> 0.3 m	SROUND WATER CONDITIONS	ELEVATION		20 40 SHEAR STF O UNCONFII O QUICK TR 20 40) 60 RENGT NED IAXIAL	H (kPa + ^{FIE} × LA	100 LD VANE Sensitivity B VANE 100			STURE ITENT w o ONTEN 20 :	LIQUID LIMIT WL T (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT W (kN/m ³)	AN GRAIN DISTRIE (%	ID I SIZE BUTIC 6)
0.0	FILL: sand and gravel, brown, wet, compact	X	1	SS	17			81					0						GR GA	5
0.8	CLAYEY SILT : trace sand, brown to grey, moist, very stiff to hard		2	SS	16				-					0						
			3	SS	20			80	-						0					
Ŀ	grey below 2.3 m		4	SS	28	¥	W. I Sep	79 L. 7	8.8 m 2018					- 0			-			
			5	SS	32			78							0		-			
								77	-											
76.7 4.9	SAND & SILT: trace to some clay, grey, wet, compact to dense		6	SS	24				-						o					
<u>.</u>							-Ber	76 ntor	ite								_			
			7	SS	46			75							φ				0 43	47 ⁻
74.0 7.6	SANDY SILT: trace clay, grey, wet,							74												
1	very dense		8	SS	66				-					0					0 31	62
72.5	CLAYEY SILT TILL: some sand to							73	-											
	sandy, trace gravel, occasional cobble/boulder, grey, moist, hard		9	SS	71			72						0			_			





ELEV DEPTH

61.2

20.4

LOG OF BOREHOLE BH18-08

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING DA

Method: Hollow Stem Auger

Diameter: 150mm Date: Jun-28-2018

DYNAMIC CONE PENETRATION RESISTANCE PLOT SAMPLES SOIL PROFILE PLASTIC NATURAL MOISTURE LIMIT CONTENT METHANE GROUND WATER CONDITIONS LIQUID POCKET PEN. (Cu) (kPa) AND LIMIT 20 40 60 80 100 NATURAL UNIT STRATA PLOT GRAIN SIZE w WL BLOWS 0.3 m WP SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL × LAB VANE ELEVATION -0 -1 DISTRIBUTION DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 GR SA SI CL SILTY CLAY: trace sand, grey, 16 SS 35 0 >22 moist, hard(Continued) END OF BOREHOLE Notes: 1) Water level at 4.9 mbgl during drilling 2) Water level in the monitoring well recorded at 2.8m on Sept. 26, 2018.









2 OF 2

DS SOIL LOG 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12

DS CONSULTANTS LTD.

Geotechnical Environmental Materials Hydrogeology

O ^{8=3%} Strain at Failure



LOG OF BOREHOLE BH18-10

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DRILLING I	DATA
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Method: Solid Stem Auger

Diameter: 150 mm Date: Jul-25-2018

REF. NO.: 18-519-10 ENCL NO.: 11

DYNAMIC CONE PENETRATION RESISTANCE PLOT PLASTIC NATURAL LIMIT NOISTURE CONTENT 100 20 40 60 80 WP w

	SOLET TROTILE					~		RESIS	TANCE	PLOT	\geq			PLASTI	C NAT	URAL			₅	METHANE
(m)		Ь.			ທ_	VATE	7	2	0 4	0 60) 8	0 1	00	LIMIT W⊳	CON	TENT	LIMIT Wi	T PEN.	UNIT)	AND GRAIN SIZE
ELEV DEPTH	DESCRIPTION	LA PL	Ë		LOW 0.3 m	ND V ITION	VTION		AR STI NCONF	RENG1 INED	「H (kF +	Pa) FIELD V	ANE	ļ		0	<u> </u>	OCKE (Cu)	(kN/r	
52		TRAT	UMB	ΥΡΕ	 	ROU OND	LEVA	• QI			X	LAB V		WA	TER CO		T (%)	_	LAN	(%)
82.3	TOPSOIL: 300 mm	0 14	z	Г-	£	00			20 4	0 60	5 8	0 1	00	1		20 3	1			GR SA SI CL
82.0				88	14		82	<u> </u>												
- 0.3	FILL: silty clay, trace topsoil, trace gravel, brown, wet, stiff	\otimes	1		'-															
81.5	g,,,,							-												
- 0.8	CLAYEY SILT TILL: sandy, trace					1		Ē												
-	hard		2	SS	19										0			200		
-		jø,					81	-												
-			1					-												
-			3	SS	50			E						0				>225	5	
2		71						-												
-		r k				-	80											4		
-				~~~	45			-										222		
-		19	4	33	45			-						Ĭ				-22	1	
- <u>3</u>			┢					-												
-		r.					70	F												
E		H	5	SS	30		/9	[0			>225		
-			·					-												
4			1					-												
			1					E												
-							78	-												
- 77.7	CLAVEY SILT: trace sand grey		1			-		-												
- 4.0	moist, very stiff		6	88	20			-										225		
5					20			ŀ								1		225		
-						1	77	·										-		
								-												
						Ā		F												
- 6 76.2			1				during	drilling)]											
6.1	SILT: trace clay, trace to some		1				76	E												
	Sand, grey, wet, compact		7	SS	23			1								þ				
			<u> </u>			-		-												
								-												
								-												
							75	-												
74.7	SANDY SILT TILL: some clay.		-			1		E												
	frequent seams of wet sand, trace		8	ss	54			-							0					
	grey, moist, very dense							-												
							74	.[-		
		. . .						ţ.												
080			1					F						1						
-19-1 -		.	1					Ē						1						
<u>*</u> -			[73	E						1				1		
		. . .	9	SS	73			ŀ						1	0					
						-		Ē						1						
20 10								F						1						
<u>GR</u> OUN	Continued Next Page DWATER ELEVATIONS						+ 3	×3: !	Number	s refer	0	8 =3%	Strain	at Failur	e					
Measure	ment $\sum_{n=1}^{1 \text{ st}} \sum_{n=1}^{2 \text{ nd}} \sum_{n=1}^{3 \text{ rd}} \nabla_{n}^{4 \text{ th}}$					NUIES		ı		avity										

METHANE



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DRILLING DATA	
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Method: Solid Stem Auger

DYNAMIC CONE PENETRATION RESISTANCE PLOT

Diameter: 150 mm Date: Jul-25-2018

REF. NO.: 18-519-10 ENCL NO.: 11

LIQUID

PLASTIC NATURAL MOISTURE LIMIT CONTENT GROUND WATER CONDITIONS POCKET PEN. (Cu) (kPa) AND LIMIT 40 60 80 100 NATURAL UNIT 20 (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m WP w WL SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION -0 -1 DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 GR SA SI CL SANDY SILT TILL: some clay, 16 frequent seams of wet sand, trace 72 gravel, occassional cobbe/boulders, grey, moist, very dense(Continued) 10 SS 50 71 70.1 SILTY CLAY: trace sand, grey, 12.2 70 moist, very stiff 11 SS 27 69 SS 12 28 68 67 13 SS 30 16 66 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12 SS 14 24 65 64 0 64 SAND AND GRAVEL: trace silt, 18.3 ò 0 grey, saturated, very dense 15 SS 76 0 ò. 19 2 D 63 SOIL LOG , D 6 .O` 50/ SO 16 SS 62.3

Continued Next Page GROUNDWATER ELEVATIONS $\begin{array}{c|c} \mbox{Measurement} & \underline{\overset{1st}{\underline{V}}} & \underline{\overset{2nd}{\underline{V}}} & \underline{\overset{3rd}{\underline{V}}} & \underline{\overset{4th}{\underline{V}}} \end{array}$

<u>GRAPH</u> $+3, \times 3$: Numbers refer NOTES

to Sensitivity

O ^{8=3%} Strain at Failure

METHANE



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING DA	TΑ
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Method: Solid Stem Auger

Diameter: 150 mm Date: Jul-25-2018

REF. NO.: 18-519-10 ENCL NO.: 11

		SOIL PROFILE		S	SAMPL	.ES			DYNAI RESIS	MIC CO TANCE	NE PEN PLOT		TION			- NAT	URAL			⊢	METHANE
	(m) <u>ELEV</u> DEPTH	DESCRIPTION	RATA PLOT	MBER	PE	BLOWS 0.3 m	COUND WATER	EVATION	2 SHEA O UN ● QU	AR STI NCONF	06 RENG INED RIAXIAL	i0 8 TH (kl + . ×	BO 10 Pa) FIELD V. & Sensiti LAB V.	00 ANE vity ANE			TURE TENT W D	LIQUID LIMIT WL T (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT W (kN/m ³)	AND GRAIN SIZE DISTRIBUTION (%)
LLOG 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12	20.0	END OF BOREHOLE Notes: 1) Water level at 5.8 mbgl during drilling	STRAT		Түре			ELEVA							WA1					NAT	(%) GR SA SI CL
DS SC																					



LOG OF BOREHOLE BH18-11

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DRILLING DATA

Method: Hollow Stem Auger

DYNAMIC CONE PENETRATION RESISTANCE PLOT

40 60 80 100

Diameter: 200 mm Date: Jul-20-2018

20

LIQUID

LIMIT

WL

PLASTIC NATURAL MOISTURE LIMIT CONTENT

w

Wp

GROUND WATER CONDITIONS POCKET PEN. (Cu) (kPa) NATURAL UNIT STRATA PLOT BLOWS 0.3 m SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION -0 -1 DESCRIPTION NUMBER WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 GR SA SI CL 85.1 TOPSOIL: 250 mm 11 84:9 85 FILL: clayey silt, mixed with topsoil, 0.2 SS 18 0 1 trace gravel, grey, moist, compact 84.3 FILL:silty clay, trace to some 0.8 organics, trace gravel, grey, moist, loose to compact 2 SS 20 84 SS 9 3 83 4 SS 7 82.0 82 3.1 CLAYEY SILT TILL: sandy, trace gravel, greyish brown, moist, very >225 5 SS 22 0 stiff to hard 81 6 SS 58 0 >225 80 6 79 7 SS 34 22 78 >22 8 SS 35 0 77 76 SS 9 39 ŝ Continued Next Page $+3, \times3$: Numbers refer

GROUNDWATER ELEVATIONS Measurement $\stackrel{1st}{\nabla} \stackrel{2nd}{\Psi} \stackrel{3rd}{\Psi} \stackrel{4th}{\Psi}$

18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12

SOIL LOG

<u>GRAPH</u> **NOTES**

to Sensitivity

O ^{8=3%} Strain at Failure

METHANE

AND

GRAIN SIZE

(%)



LOG OF BOREHOLE BH18-11

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DRILLING DATA

Method: Hollow Stem Auger

DYNAMIC CONE PENETRATION RESISTANCE PLOT

Diameter: 200 mm Date: Jul-20-2018

> 20 40 60 80 100

REF. NO.: 18-519-10 ENCL NO.: 12

175

LIQUID

LIMIT

WL

PLASTIC NATURAL MOISTURE LIMIT CONTENT

WP

w

GROUND WATER CONDITIONS POCKET PEN. (Cu) (kPa) NATURAL UNIT STRATA PLOT BLOWS 0.3 m SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION -0 -1 DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 GR SA SI CL CLAYEY SILT TILL: sandy, trace 75 gravel, greyish brown, moist, very stiff to hard(Continued) wet sand seams below 10.7 m wet spoon 1 10 SS 50 74 73 11 SS 41 0 >225 72 71.4 SILT CLAY: trace sand/silt seams, 13.7 grey, moist, stiff to very stiff 12 SS 14 125 71 70 13 SS 21 150 С 16 69 DS SOIL LOG 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12 SS 19 68 150 14 67

Continued Next Page GROUNDWATER ELEVATIONS Measurement $\stackrel{1st}{\nabla} \stackrel{2nd}{\Psi} \stackrel{3rd}{\Psi} \stackrel{4th}{\Psi}$

<u>GRAPH</u> $+3, \times3$: Numbers refer **NOTES** to Sensitivity

66

15 SS 23

O ^{8=3%} Strain at Failure

METHANE

AND

GRAIN SIZE



DRILLING DATA

Diameter: 200 mm

Date: Jul-20-2018

Method: Hollow Stem Auger

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BORI	EHOLE LOCATION: See Drawing 1				50	i	i	DYNA	AIC CO	NE PEN	VETRA	TION						<u> </u>	<u> </u>		
			5	SAMPL	.ES	Ë		RESIS	TANCE	PLOT	\geq			PLASTI	C NAT	URAL	LIQUID	÷	۲M.	METH	IANE
(m) <u>ELEV</u> DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	түре	"N" <u>BLOWS</u> 0.3 m	GROUND WATI CONDITIONS	ELEVATION	2 SHEA O UN • QU 2	0 4 AR STH NCONFI JICK TF 0 4	0 6 RENG INED RIAXIAL 0 6	i0 8 TH (kf + . × i0 8	Pa) FIELD V/ & Sensiti LAB V/ 0 10	ANE vity ANE 20	W _P WAT	CON TER CO	TENT N D DNTEN 20 3	UMIT ₩L T (%)	POCKET PEI (Cu) (kPa)	NATURAL UNIT (kN/m ³)	GRAIN DISTRIE (%	SIZE
- - - 64.7	SILT CLAY: trace sand/silt seams, grey, moist, stiff to very stiff(Continued)		16	SS	16		65	-										150			
DS SOIL LOG 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12	END OF BOREHOLE Notes: 1) Borehole dry upon completion																				

REF. NO.: 18-519-10 ENCL NO.: 12



PROJ CLIEN PROJ DATU	ECT: Preliminary Geotechnical Investig IT: Lakeview Community Partners Ltd. ECT LOCATION: 800 Hydro Road, Mis IM: Geodetic	ation	- Proj luga,	posed ON	Devel	opment		DRILI Metho Diamo Date:	LING I od: Sol eter: 1 Jul-24	DATA id Sten 50 mm 4-2018	n Auge	٢				REF. N ENCL M	0.: 1 NO.: 1	8-519 3	-10
BORE	HOLE LOCATION: See Drawing 1				ES			DYNA			ETRATI	ON						1	
(m) <u>ELEV</u> DEPTH	DESCRIPTION	TRATA PLOT	UMBER	J. Inc.	1" BLOWS	ROUND WATER ONDITIONS	EVATION	22 SHEA 0 UI • QI	AR STI	RENGI) 80 FH (kPa + ^F × L	a) IELD VA Sensitiv AB VA	NE vity NE		NATUR MOISTU CONTE W 		POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m ³)	METHANE AND GRAIN SIZE DISTRIBUTION (%)
-	CLAYEY SILT: trace seams/partings of silt, grey, moist, very stiff(Continued)	S.	N	F	2	00	□ 73	-		0 60	0 80	10		1	0 20	30	_		GR SA SI C
- - - <u>11</u> - -			10	SS	26		72	 - - - -							0				
- - - - - 12								- - - - -											
71.0 12.2	SILT : trace to some clay, trace sand, grey, very moist to wet, compact to dense		11	SS	18		71	- - - - - -							0		175	5	
- - - - -							70 -Filter	Pack									-		
- - - <u>14</u> -			12	SS	30		69	- - - - -							0		_		
- - - - 15							Slotte	f d pipe - - - - -											
68.0 15.2	CLAYEY SILT TO SILTY CLAY trace sand, grey, moist, very stiff to hard		13	SS	21		68	- - - - -							0		>22	5	
- 16 - - -							67	-									_		
- - - 17 -			14	SS	42		66	-							ο		>22!	5	
- - -							-Bento	nite											
18 - 64.9 - 18.3 -	SILT TO CLAYEY SILT: some clay, grey, moist, compact to dense		15	SS	29		65	-							•		_		
5 - - - - - -							64	- - - - -									_		
								- - - -											



ELEV DEPTH

62.8 20.4

LOG OF BOREHOLE BH18-12

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

TYPE ż

STRATA PLOT

NUMBER

16 SS 34 GROUND WATER CONDITIONS

ELEVATION

63

BLOWS 0.3 m

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DESCRIPTION

SILT TO CLAYEY SILT: some

clay, grey, moist, compact to dense(Continued)

1) 50 mm dia monitoring well installed upon completion. 2) Water level in moniotring well at

END OF BOREHOLE:

8m on Sept. 26, 2018.

Notes:

DRILLING D	ATA
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Method: Solid Stem Auger

DYNAMIC CONE PENETRATION RESISTANCE PLOT

SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL × LAB VANE

Diameter: 150 mm

20 40 60 80 100

20 40 60 80 100

Date: Jul-24-2018

ENCL NO.: 13

POCKET PEN. (Cu) (kPa)

₹

NATURAL UNIT

LIQUID

LIMIT

WL

-1

PLASTIC NATURAL MOISTURE LIMIT CONTENT

WP

н

10 20 30

w

-0

WATER CONTENT (%)

0

DS SOIL LOG 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12

GROUNDWATE	ER EL	EVAT	IONS	5
Measurement	∫ Ist	2nd	3rd	4th

METHANE

AND

GRAIN SIZE

DISTRIBUTION

(%)

GR SA SI CL





DRILLING DATA

Diameter: 150mm

Date: Jul-16-2018

Method: Solid Stem Auger

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE				SAMPLES				DYNA	MIC CC		NETRA	TION			NAT					METHANE
(772)		F				TER		2	20 4	40 6		 30 1	00	PLAST LIMIT		URAL STURE ITENT	LIQUID LIMIT	Ľ.	IT WT	AND
(m) FLEV					SNE	NNS ONS	Z	SHEA	AR ST	RENG	TH (k	Pa)	1	W _P		w	WL	KET P (KPa	AL UN	GRAIN SIZE
DEPTH	DESCRIPTION	ATA	1BER	ш	BLO 0.3		VATI				+	FIELD \ & Sensi	ANE tivity	WA	TER CO		T (%)	90 20	NTUR (×)	(%)
		STR	NUN	ΤΥΡ	ž	GRC	ELE		20 4		0 8	30 1	00	1	0 2	20	30		Ĺ	GR SA SI CL
-	SILTY CLAY: frequent seams of	K					70	_												
-	siit, grey, moist, naid(Continued)	R	1				''	-												
- 69.5								-												
- 10.7	SILT TO CLAYEY SILT: seams of	T	10	00	70/			-												
¹¹ 69.1	sand, trace gravel, grey, moist, very dense		10	55	279mn	•		-						0						
11.1	END OF BOREHOLE:																			
	1) Borehole terminated due to																			
	eruption of gas with mud and water from hole.																			
	2) Water level at 4.6 mbgl during																			
	anning																			
			1																	
			1																1	
			1																1	
		1																I		

REF. NO.: 18-519-10 ENCL NO.: 14



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING [DATA
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Method: Hollow Stem Auger

Diameter: 200 mm Date: Jul-11-2018

SOIL PROFILE			s	AMPL	ES			DYNAMIC CONE PENETRATI												METH	
						Ë		112010		0 6	\geq	1	00	PLASTI LIMIT			LIQUID LIMIT	ż	ΤWT	METH/ ANI	ANE D
(m)		LOT			SIE	WAT NS	z						1	WP	CON	N	WL	ET PE (KPa)	L UNI (m ³)	GRAIN	SIZE
ELEV DEPTH	DESCRIPTION	TA P	Ш		0.3 r		ATIO		VCONF	INED	іп (кі +	FIELD V. & Sensiti	ANE			-0I		(OCK	tura (kn	DISTRIB	
		TRA ⁻	UMB	ŕΡΕ		ROU							WATER CONTENT (%)					¥	(70)	
80.4	FULL cond and gravel trace	s.	ž	F	2	ΰŭ	Ē	2	0 4	0 6	8 0	0 1	00	1	0 2	20 3	80			GR SA	SI CL
- 0.0	rootlets, grey, moist	\bigotimes						-													
-		\bigotimes	1	AS			80							0							
-		\bigotimes						-													
79.6	FILL: silty clay, trace gravel pieces	\bigotimes						-													
1 0.0	of wood, grey, moist, loose	\bigotimes	2	66				-							0						
-		\bigotimes	2	33	°			-							0						
78.9		\bigotimes					79	[
- 1.5	CLAYEY SILT TILL: sandy, trace							[
	gravel, brown, moist, very stin		3	SS	29			_							0			>225			
2		jø,																			
78.1		łИ																			
- 2.3	SHALE: Georgian Bay Formation, weathered grey				50/		78	-													
	weathered, grey		4	SS	50			-						0							
-					mm			_													
77 2			E	66	E0/			-													
3.2	END OF BOREHOLE:		2		50									Ŭ							
	Notes: 1) Borehole dry and open upon				<u>mm</u>																
	completion.																				

 \bigcirc ${}^{\pmb{8}=3\%}$ Strain at Failure



4

18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12

DS SOIL LOG

71.3 79:1

9.3

LOG OF BOREHOLE BH18-15

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 200 mm Date: Jul-11-2018

REF. NO.: 18-519-10 ENCL NO.: 16

DYNAMIC CONE PENETRATION RESISTANCE PLOT PLASTIC NATURAL MOISTURE LIMIT CONTENT METHANE GROUND WATER CONDITIONS LIQUID AND LIMIT 40 60 100 POCKET PEN. (Cu) (kPa) NATURAL UNIT 20 80 (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m Wp w WL

 SHEAR STRENGTH (kPa)

 O UNCONFINED
 +

 PUICK TRIAXIAL
 ×

 LAB VANE

 ELEVATION ELEV DEPTH DISTRIBUTION -0 _ DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 80.4 GR SA SI CL FILL: sand and gravel, trace 0.0 rootlets, grey, moist AS 1 80 79.6 FILL: clayey silt, trace organics, 0.8 grey, moist, compact 2 SS 18 ю 79 78.9 Þ CLAYEY SILT TILL: sandy, trace 1.5 gravel, grey, moist, stiff 3 SS 9 125 9 33 42 16 0 78.1 SILT: trace to some clay, trace 2.3 78 sand, brown, moist, compact SS 4 22 >22 С 77.3 3.1 SILTY SAND: some gravel, brown, 50/ moist, very dense 5 SS 100 77 mm 76.6 SILTY CLAY: trace sand, grey, 3.8 ł moist, hard to very stiff 6 SS 33 >22 76 7 SS 21 0 >225 75 74.3 SILT TO CLAYEY SILT: trace 6.1 sand, grey, moist, compact to very 8 SS 22 22 74 dense 73 50/ 9 SS 50 0 mm

GROUNDWATER ELEVATIONS Measurement $\overset{1st}{\checkmark} \overset{2nd}{\checkmark} \overset{3rd}{\checkmark} \overset{4th}{\checkmark}$

Notes:

completion.



1) Borehole dry and open upon

SHALE: Georgian Bay Formation,

END OF BOREHOLE

10 SS 50/

mm

72

PROJI CLIEN PROJI	ECT: Preliminary Geotechnical Investig T: Lakeview Community Partners Ltd. ECT LOCATION: 800 Hydro Road, Miss M: Geodetic	ation-	· Proj uga,	posed ON	Develo	opmen	t	DRIL Metho Diam	LING od: Ho eter: 2	DATA Illow St 200 mm	em A	uger			RE	EF. NC).: 18 0 · 1	8-519	-10
BORE	HOLE LOCATION: See Drawing 1							Date.	Jui-2	.0-2010	,						0 1	1	
	SOIL PROFILE		s	SAMPL	ES			DYNA RESIS	MIC CO TANCE	DNE PEI E PLOT		TION			URAL			F	METHANE
(m) <u>ELEV</u> EPTH	DESCRIPTION	TRATA PLOT	UMBER	үре	V" BLOWS 0.3 m	ROUND WATER ONDITIONS	LEVATION	2 SHE/ 0 UI • Q	AR ST	40 6 RENG FINED RIAXIAL	TH (k	80 1 Pa) FIELD V & Sensi LAB V	00 /ANE tivity ANE				POCKET PEN. (Cu) (kPa)	NATURAL UNIT W (kN/m ³)	AND GRAIN SIZE DISTRIBUTIC (%)
82.9 8 2.9 0.1	TOPSOIL: 100 mm FILL: clayey silt, mixed with topsoil, brown moiet compact		2 1	⊢ SS	19	00	ш	-											GR SA SI
	brown, moist, compact	\bigotimes						- - - -											
			2	SS	10		82 -Bento	nite											
		\bigotimes	3	SS	15		01	-											
80.6		X					01	- - -											
2.3	gravel, brown, moist, very stiff to hard		4	SS	21	⊻	. W. L.	F 6 80.2 m									>225	5	
70 /	frequent wet sand seams		5	SS	28			5, 2010 [- -											
3.5	SAND: trace silt, brown, wet, compact						Slotte	- - d Pipe - - - -									-		
78.3	CLAYEY SILT TILL: sandy, trace gravel, grey, moist, hard		6	SS	30		78	 - - - -									-		
								-											
			7	SS	36			-									>225	5	
							76										-		
75.3 7.6	SANDY SILT TILL: some clay, trace gravel, sand seams, grey, very																		
	moist to wet, dense	 0 	ð	55	38		/5	- - - -											
73.8							74	- - - -											
9.1	gravel, grey, moist, very stiff to hard		9	SS	30												>225	5	
		HH					73	-											



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING	DATA
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Method: Hollow Stem Auger

Diameter: 200 mm Date: Jul-23-2018

	SOIL PROFILE		s	SAMPL	/PLES										URAL			TW.	METH	AN
(m) LEV EPTH	DESCRIPTION	STRATA PLOT	JUMBER	ЧРЕ	N" <u>BLOWS</u> 0.3 m	SROUND WATE	ELEVATION	: SHE. ○ U ● Q	AR ST NCONF UICK TI 20 4	IO 6 RENG INED RIAXIAL	0 8 TH (kF + . ×	Pa) FIELD V & Sensit LAB V	00 ANE ivity ANE 00			LIMIT WL T (%)	POCKET PEN (Cu) (kPa)	NATURAL UNIT (kN/m ³)	ANI GRAIN DISTRIB (%	U SI UT
	CLAYEY SILT TILL: sandy, trace gravel, grey, moist, very stiff to hard(Continued)		2		-			- - -											GR SA	0
			10	SS	33		72	- - - - -									-			
							71	- - - -									-			
<u>′0.7</u> 2.2	CLAYEY SILT: trace sand, occassional seams of silt, grey, moist, very stiff to hard		11	SS	21			-									>225			
							70	- - - - -												
			12	SS	29	-	69	- - - - -									-			
							68	- - - - -									-			
			13	ss	30			-												
							67	-									-			
	frequent seams of silt below 16.8 m		14	SS	28	-	66	- - - - -									-			
							65	- - - -												
			15	SS	24		64	- - - -												
								-												
						-	63	-												



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

Method: Hollow Stem Auger

Diameter: 200 mm Date: Jul-23-2018

		SOIL PROFILE				SAMPLES														F	METHANE
	(m) <u>ELEV</u> DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	түре	"N" <u>BLOWS</u> 0.3 m	GROUND WATER CONDITIONS	ELEVATION	2 SHEA O UN • QL 2	0 4 AR STI NCONF JICK TF 0 4	0 6 RENG NED RIAXIAL 0 6	0 8 TH (kF + × 0 8	0 10 Pa) FIELD V/ & Sensiti LAB V/ 0 10	ANE vity ANE 20	UMIT WP WA		STURE ITENT w o ONTEN ⁻ 20 3	LIQUID LIMIT w _L T (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT W (kN/m ³)	AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	62.5			16	SS	25			-												
DS SOIL LOG 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12	20.4	 In the installed beside BH18-16. 2) Water level in the monitoring well at 2.7m on Sept. 26, 2018. 																			




PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DRILLING	DATA
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Method: Solid Stem Auger

DYNAMIC CONE PENETRATION RESISTANCE PLOT

40 60 80 100

Diameter: 150 mm Date: Jul-16-2018

20

REF. NO.: 18-519-10 ENCL NO.: 18

LIQUID

LIMIT

PLASTIC NATURAL MOISTURE LIMIT CONTENT GROUND WATER CONDITIONS POCKET PEN. (Cu) (kPa) NATURAL UNIT (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m Wp w WL SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION -0 -1 DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 GR SA SI CL SILT: some clay, trace sand, grey, moist to wet, compact(Continued) 70 10 SS 27 69 68.1 SILTY CLAY & SILT: interbedded, 12.2 ŀ 68 trace sand, grey, moist, hard 11 SS 37 0 67 SS 12 45 66 65.1 SILT TO SANDY SILT: trace clay, 15.2 65 grey, wet, very dense 13 SS 53 С 16 64 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12 63.5 SILTY CLAY:trace sand, grey, 16.8 moist, hard SS 73 14 63 62.0 62 SILT:trace to some clay, grey, wet, 18.3 very dense 70/ 15 SS 280mr 19 61 SOIL LOG 60.8 CLAYEY SILT TILL:sandy, trace 19.5 K gravel, grey, moist, hard Continued Next Page O ^{8=3%} Strain at Failure <u>GRAPH</u> $+3, \times 3$: Numbers refer GROUNDWATER ELEVATIONS **NOTES** to Sensitivity

 $\begin{tabular}{cccc} Measurement & $$\underline{\overset{1st}{\underline{\bigvee}}}$ & $\underline{\overset{2nd}{\underline{\bigvee}}}$ & $\underline{\overset{3rd}{\underline{\bigvee}}}$ & $\underline{\overset{4th}{\underline{\bigvee}}}$ \\ \end{tabular}$

SO

METHANE

AND



DRILLING DATA

Diameter: 150 mm

Date: Jul-16-2018

Method: Solid Stem Auger

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

_

BOR	EHOLE LOCATION: See Drawing 1		1															-	1	
	SOIL PROFILE		5	SAMPL	.ES	ſſ		RESIS	TANCE	PLOT		TION		PLAST		URAL	LIQUID		Ę	METHANE
(m)		1	1			ATE		2	20 4	40 6	60 E	30 1	00	LIMIT	CON	ITENT	LIMIT	PEN.	JNIT (AND
ELEV	DESCRIPTION	A PLO	~		3 m	NO NO	NOI	SHE	AR ST	RENG	TH (kl	Pa)		W _P		w o	WL	E S S	RAL ((kN/m	DISTRIBUTION
DEPTH		RAT/	MBE	щ	OBLo		LAT		NCONF UICK TI	INED RIAXIAL	+ . ×	& Sensit		WA	TER CO	ONTEN	T (%)	9 0 0 0	NATU	(%)
		STF	Ŋ	μĘ	ž	S O	E		20 4	10 6	ε ο ε	30 1	00	1	10 2	20	30			GR SA SI CL
-	CLAYEY SILT TILL:sandy, trace	19.	16	SS	50/			-							0					
59.9	gravel, grey, moist, hard (Continued)				John		60													
20.4																				
	1) Water level at 9.1m during																			
	drilling.																			
			1																	
			1																	
			1																	
			1																	



REF. NO.: 18-519-10

ENCL NO.: 18



Measurement $\stackrel{1st}{\checkmark} \stackrel{2nd}{\checkmark} \stackrel{3rd}{\checkmark} \stackrel{4th}{\checkmark}$

DS CONSULTANTS LTD.

1 OF 2



DRILLING DATA

Diameter: 200 mm

Date: Jul-11-2018

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BORE					_ 0			DYNA	MIC CO		VETRA	TION		<u> </u>							
1				AIVIPL	E9	Ĥ		RESIS	TANCE	PLOT	\geq			PLASTI	C NATI	URAL		-	۲.	METH	
(m)		-o			ର ୮	NATE VS	~	2	20 4	0 6	8 0	30 10	00	W _P	CON	TENT N	LIMIT Wi	:T PEN kPa)	- UNIT	GRAIN	I SIZE
	DESCRIPTION	A PL	К		LOW 0.3 m	ND V TION	UIO	SHEA	AR STI NCONF	RENG INED	TH (kF +	Pa) FIELD V	ANE	<u>-</u>	(OCKE (Cu) (I	URAL (KN/i	DISTRIE	UTION
50 11		TRAT	JMB	ЪЕ		ROU	EVA.	• QI	UICK TF	RIAXIAL	. ×	LAB VA		WA	TER CC	ONTENT	(%)	ē.	NAT	(%)
		ی ا	ž	ŕ	Z.	ΰŬ		2	20 4	0 6	8 0	80 10	00	1	0 2	20 3	0			GR SA	SI CL
-	grey, wet, very dense(Continued)	0					/1	-													
_		0						-													
70.4		0						-													
- 10.7	SILT: trace to some clay, trace sand. arev. wet. verv dense							-													
-	, g, , , ,		10	SS	76		70	-							0						
-								-													
-								E													
-																					
12								-													
68.9		Щ					69	-													
- 12.2	moist, hard				F 4			-										2005			
-			11	55	51			-								0		>225			
-								-													
-							68	-													
-								-													
-								Ē													
- 13.7	SHALE: Georgian Bay Formation,		10	00	50/										<u> </u>						
14 67.1	weathered, grey		12	55	50			-							0						
14.0	Notes:				<u></u>																
	1) Water level at 6.1m during drilling																				
		1										1		I I	1						



REF. NO.: 18-519-10 ENCL NO.: 19

Method: Hollow Stem Auger



Measurement $\underbrace{\overset{1st}{\checkmark}} \overset{2nd}{\overset{3rd}{\checkmark}} \overset{3rd}{\overset{4th}{\checkmark}}$

SOIL

1 OF 2

DS CONSULTANTS LTD.





(m)

LOG OF BOREHOLE BH18-19

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DRILLING D	ATA
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Method: Hollow Stem Auger

DYNAMIC CONE PENETRATION RESISTANCE PLOT

Diameter: 200 mm Date: Jul-11-2018

> 20 40 60 80 100

REF. NO.: 18-519-10 ENCL NO.: 20

LIQUID

LIMIT

PLASTIC NATURAL MOISTURE LIMIT CONTENT

GROUND WATER CONDITIONS POCKET PEN. (Cu) (kPa) NATURAL UNIT ((kN/m³) STRATA PLOT GRAIN SIZE w WL BLOWS 0.3 m WP SHEAR STRENGTH (kPa) O UNCONFINED + ^{FIELD} VANE QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH -0 -1 DISTRIBUTION DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 GR SA SI CL Total Core Recovery = 100% Solid Core Recovery = 40% RQD = 30% 5 RC Hard Layer (Limestone/Siltstone)= 15% 70 Maximum Thickness of Hard Layer = 125mm(Continued) 69.5 END OF BOREHOLE: 11.2 Notes: 1) Monitoring well was installed in the borehole upon completion. 2) Water level in the monitoring well at 4.7m on Sept. 26, 2018.



METHANE

AND



PROJECT: Preliminary Geotechnical Investigation- Proposed Dev

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DYNAMIC CONE PENETRATION RESISTANCE PLOT SAMPLES SOIL PROFILE PLASTIC NATURAL MOISTURE LIMIT CONTENT METHANE GROUND WATER CONDITIONS LIQUID AND LIMIT 40 60 POCKET PEN. (Cu) (kPa) NATURAL UNIT 20 80 100 (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m Wp w WL SHEAR STRENGTH (kPa) O UNCONFINED + PUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION -0 _ DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 80.3 GR SA SI CL ASPHALT: 70mm 80.0 GRANULAR BASE: 300mm AS 80 79.9 1 0.4 FILL: clayey silt, some sand, trace gravel, greyish brown, moist 79.5 CLAYEY SILT TILL: sandy, trace 0.8 gravel, grey, moist, hard 2 SS 33 79 3 SS 45 78 SS >225 4 83 0 77.2 3.1 SAND: trace silt, grey, wet, 77 compact 76.9 5 SS 28 0 SILTY CLAY : trace sand, grey, 3.4 moist, very stiff 76 75.7 SILT TO CLAYEY SILT: trace sand, Wet Spoon 4.6 occassional wet sand seams, grey, 6 SS 52 >225 moist, hard 75 74.2 SILT:trace to some clay, some 6.1 74 sand, grey, wet, dense to very SS 57 о 7 dense 73 8 SS 48 0 72 71.2 SILT TO CLAYEY SILT:trace sand, 9.1 grey, moist to very moist, hard 71 9 SS 39 0 >22

Continued Next Page GROUNDWATER ELEVATIONS

18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12

SOIL LOG

SO

Measurement $\underbrace{\stackrel{1st}{\checkmark}} \underbrace{\stackrel{2nd}{\Psi}} \underbrace{\stackrel{3rd}{\Psi}} \underbrace{\stackrel{4th}{\Psi}}$

+ ³, × ³: Numbers refer <u>GRAPH</u> NOTES to Sensitivity

O ^{8=3%} Strain at Failure

1 OF 2

REF. NO.: 18-519-10 ENCL NO.: 21

~		501					
/elop	omen	t	D	RILI	G D/	41	·A

Method: Hollow Stem Auger

Diameter: 200 mm

Date: Jun-26-2018



DRILLING DATA

Diameter: 200 mm

Date: Jun-26-2018

Method: Hollow Stem Auger

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DOIL					FS	<u> </u>		DYNA	MIC CO		IETRA	TION						1		
		1	<u> </u>			н		RESIS	TANCE	PLOT	\geq			PLASTI		URAL	LIQUID		TW.	METHANE
(m)										06	0 E	30 1	00	W _D	CON	ITENT W	LIMIT Wi	T PEN	UNIT (°u	GRAIN SIZE
	DESCRIPTION	APL	н		0 0 0 0 0 0		Í É		AR STI		TH (ki	Pa) FIELD V	ANE	ļ í		o		OCKE OCKE	(KN/r	DISTRIBUTION
DEPIR		RAT	MBE	씸			EVA	• Q	UICK TF	RIAXIAL	. ×	& Sensit	ivity ANE	WA	TER CO	ONTEN	T (%)	P C	ITAN	(%)
		ST	Z	≽	Ż	<u></u> Б С		2	20 4	06	ο ε	30 1	00	1	0 2	20	30			GR SA SI CL
t T	SILT TO CLAYEY SILT: trace sand,		1					5										1		
	hard(Continued)						70													
- 60.6																				
- 20.7	SHALE: Georgian Bay Formation,	Ë	10	SS	50/			-							0					
10.9	weathered, grey		1.0		100mn															
	END OF BOREHOLE Notes:																			
	1) Water level at 3.1m during																			
	drilling.																			
			1															1		
			1															1		
			1															1		
			1															1		
			1															1		





PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING	DATA
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Method: Hollow Stem Auger

Diame	eter: 200 mm
Date:	Jun-26-2018

REF. NO.: 18-519-10 ENCL NO.: 22

	SOIL PROFILE		S	ampl	ES			DYNAI RESIS	VIC CO TANCE	NE PEN PLOT		FION		- NATI	JRAL			⊢	METHANE
(m) <u>ELEV</u> DEPTH	DESCRIPTION	TRATA PLOT	UMBER	YPE	v" <u>BLOWS</u> 0.3 m	ROUND WATER ONDITIONS	LEVATION	2 SHEA 0 UN • QI	0 4 AR STF NCONFI	0 6 RENG NED RIAXIAL	0 8 TH (kF +	0 10 Pa) FIELD V/ & Sensiti LAB V/				LIQUID LIMIT W _L (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT W (kN/m ³)	AND GRAIN SIZE DISTRIBUTION (%)
79.7 - 0.0 - 79.4 - 0.3 -	TOPSOIL: 350mm FILL: silty clay mixed with topsoil, trace gravel, brown, moist, loose		z 1	r- ss	8	00	Ш	-	0 4	0 6	0 8			0 2	0 3				GR SA SI CL
79.0 - 0.7 -	FILL: sand and gravel mixed with weathered shale, brown, moist, compact	\times	2	SS	23		79	-						0					
78.2 1.5 - - -	SHALE: Georgian Bay Formation, weathered, grey		3	SS	50/ 100mn	n	78	-									-		
77.3			4	SS	50/			-											
2.4	END OF BOREHOLE Notes: 1) Borehole dry and open upon completion.				-60/ (00mr)														



DS SOIL LOG 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12









PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING DATA

Method: Hollow Stem Auger/Rock Coring

Diameter: 200 mm Date: Jul-09-2018

	SOIL PROFILE		s	SAMPL	.ES			DYNAI RESIS	MIC CO TANCE	NE PEI PLOT		TION			NAT	IRAI			Т	METHANE
(m)		F				ATER		2	0 4	0 6	i0 8	30 1	00	LIMIT	C MOIS	TURE	LIQUID	PEN. a)	NIT (AND
ELEV	DESCRIPTION	A PLO	~		3 m	IONS	NO	SHEA	R ST	RENG	TH (kl	Pa)		W _P	\ 	м Э————	WL	u) (kP	RAL U (kN/m ³	DISTRIBUTION
DEPTH	DESCRIPTION	RAT ^A	MBE	щ	OBC.	NUO	EVAT	0 UN • QI	VCONF	INED RIAXIAL	+ . ×	& Sensi LAB V	tivity ANE	WA	TER CO		F (%)	9 <u>0</u>	NATU	(%)
77.5		STF	R	ž	ż	<u>я</u> 8	ELE	2	0 4	0 6	i0 8	80 1	00	1	0 2	20 3	0			GR SA SI CL
- 0.0	FILL: sand and gravel, brown, moist	\mathbb{X}						-												
	molot	\bigotimes	1	AS				-						0						
76.8		\bigotimes	<u> </u>				77	-										1		
- 0.7	FILL: clayey silt, some sand and	ĬX	 					-												
1	compact	\otimes	2	55	17			-							0					
		\otimes	-	00	''			-							Ū					
76.0		R.					76	-												
- 1.5	gravel, greyish brown to grey, moist,			~~~	40			-												
2	stiff to very stiff	ł	3	55	12			-							0					
		Hij	<u> </u>					_												
	grey below 2.3 m		<u> </u>					-												
-			4	SS	8		75	-							0					
-								-												
3								_												
		HH	1					-												
-			5	SS	8		74	-							0					
								-												
4		[]\$						-												
E		Xł	6	AS				-							0					
								-												
-			<u> </u>				73	-												
-			7	ee	21			-												
5		ſ₩	l '	33	21		-Bento	r nite												
								-												
-		ŀ.					72	-												July 00, 2019
-								-												July 09, 2010
6		FIH						_												
- 71.2								-												
- 79.8	GEORGIAN BAY FORMATION:		8	SS	69			-						c						
6.5	 shale interbedded with imestone/siltstone lavers, grev 						71	-												July 10, 2018
	SHALE BEDROCK:							_												
	Solid Core Recovery = 96%							-												
	RQD = 37% Hard Laver (Limestone/Siltstone)=		RUN 1	RC				-												
S - DS	27%						70	-												
GB	Maximum Thickness of Hard Layer = 270mm																			
G 8 <u>69</u> .5								_												
8.0 0	SHALE BEDROCK: Total Core Recovery = 100%							-												
	Solid Core Recovery = 77%							-												
8	Hard Layer (Limestone/Siltstone)=		RUN				69	_										1		
108	27% Maximum Thickness of Hard Laver		2	RC																
	= 230mm							F												
								-												
							68					-						-		
								_												
S 10								-												
<u>GR</u> OUN	Continued Next Page DWATER ELEVATIONS				1		+ 3,	×3: !	Number	s refer	С	8 =3%	Strain	at Failur	e					
Measure	ement $\stackrel{1 \text{st}}{\nabla} \stackrel{2 \text{nd}}{\Psi} \stackrel{3 \text{rd}}{\nabla} \stackrel{4 \text{th}}{\Psi}$!	NUIES		ι	o Gensi	uvity										



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING DATA

Method: Hollow Stem Auger/Rock Coring

Diameter: 200 mm Date: Jul-09-2018

	SOIL PROFILE		s	SAMPL	ES			DYNAI RESIS	MIC CO TANCE	NE PEN PLOT		FION			ΝΔΤΙ					METHAN	F
(m)		Ц				ATER		2	0 4	06	0 8	0 1	00	PLASTI LIMIT	MOIS CON	TURE	LIQUID	PEN.	NIT WI	AND	-
	DESCRIPTION	A PLO	R		OWS .3 m	ND W. TION	NOIL	SHEA			TH (kF	Pa) FIELD V	ANE	W _P	\	<i>N</i> 0	WL	OCKET (Cu) (KF	(kN/m	DISTRIBUT	ION
		STRAT	NMB	ΥPE	۵ z		ELEVA	• QI		RIAXIAL	×	LAB VA	ANE	WA 1	TER CC	ONTEN	T (%) 30	ē.	NAT	(%)	CI
	SHALE BEDROCK:		∠ RUN		-	: I:	ш		- 4		_ 0			'						ur da Si	UL
-	Solid Core Recovery = 100% Solid Core Recovery = 93%		3	RC			-Filter	- Pack													
-	Hard Layer (Limestone/Siltstone)=						1 11.01,1	 -													
66. <u>6</u>	– Maximum Thickness of Hard Layer	_						-													
	SHALE BEDROCK:							-													
-	Solid Core Recovery = 98%		RUN	50			66	-													
-	Hard Layer (Limestone/Siltstone)=		4	RC				-													
- 12 -	Maximum Thickness of Hard Layer = 100mm							-													
- <u>65.2</u> - 12.3	SHALE BEDROCK:						-Slotte	l d Pipe													
	Total Core Recovery = 100% Solid Core Recovery = 97%						65	-													
- 13	RQD = 97% Hard Layer (Limestone/Siltstone)=		RUN	DO				-													
-	Maximum Thickness of Hard Layer		5	RC				-													
-							64	-													
63.6								-													
13.9	END OF BOREHOLE Notes:																				
	1) Monitoring well was installed in the borehole upon completion.																				
	2) Monitoring well was not accessible on Sept. 26, 2018. Area																				
	is covered with a stock-pile.																				





O ^{8=3%} Strain at Failure







PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

DRILLING DATA

Method: Hollow Stem Auger/Rock Coring

Diameter: 200 mm Date: Jul-06-2018

REF. NO.: 18-519-10 ENCL NO.: 29

BOREHOLE LOCATION: See Drawing 1

ſ		SOIL PROFILE		s	SAMPL	ES	~		DYNAI RESIS	MIC CO TANCE	NE PEN PLOT		TION		PLACT	C NAT	URAL			Ļ	METHA	NE
	(m) ELEV DEPTH	DESCRIPTION	ATA PLOT	ABER	ш	BLOWS 0.3 m	JUND WATEF	VATION		0 4 AR STI	0 6 RENG	0 8 TH (ki	BO 1 Pa) FIELD V & Sensit				STURE ITENT W O ONTEN	LIMIT WL T (%)	POCKET PEN. (Cu) (KPa)	JATURAL UNIT M (kN/m ³)	AND GRAIN S DISTRIBL (%)) BIZE JTION
		Total Core Recovery = 100%	STR.		ΙЧΥΡΙ	ż	CON CON	ELEY	• Qi 2	0 4	0 6	. × 0 ε	LAB V/ 30 1	ANE 00	1	0 2	20 3	30		z	GR SA S	SI CL
		Solid Core Recovery = 93% RQD = 93%		5	RC			67	-													
ŧ		Hard Layer (Limestone/Siltstone)= 15%]:目::		-													
E	66.3	Maximum Thickness of Hard Layer							-													
	10.9	END OF BOREHOLE: Notes: 1) Monitoring well was installed in the borehole upon completion. 2) Water level in the monitoring well at 2.3m on Sept. 26, 2018.																				
DS SOIL LOG 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12																						



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DYNAMIC CONE PENETRATION RESISTANCE PLOT SAMPLES SOIL PROFILE PLASTIC NATURAL MOISTURE LIMIT CONTENT METHANE GROUND WATER CONDITIONS LIQUID POCKET PEN. (Cu) (kPa) AND LIMIT 20 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE WL BLOWS 0.3 m WP w SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION -0 -1 DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 GR SA SI CL 79.5 0.0 TOPSOIL: 300mm 11 79.2 SS 52 0 1 0.3 FILL: silty clay, trace sand, grey, 79 moist, compact 78.4 125 2 SS 14 0 1.1 SILTY CLAY TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, stiff to hard 78 3 SS 33 >225 2 23 46 29 0 -77 SS 4 55 0 >22 5 SS 62 0 76 75.7 SHALE: Georgian Bay Formation, 50/ SS 73:8 6 4.0 END OF BOREHOLE Notes: 1) Borehole dry and open upon completion.



REF. NO.: 18-519-10 ENCL NO.: 30

Diameter: 150mm Date: Jul-04-2018

DRILLING DATA

Method: Hollow Stem Auger



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

	SOIL PROFILE		s	ampl	ES			DYNA RESIS	MIC CO	NE PEN PLOT		TION		DIAGTI	_ NAT	URAL			F	METHANE	
(m)		ы				ATER		2	20 4	06	0 8	30 1	00	LIMIT	C MOIS	TURE	LIQUID	PEN.	3) WIT W		-
ELEV	DESCRIPTION	A PLO	н.		OWS .3 m		NOIT	SHEA			TH (kf	Pa) FIELD V	ANE	₩ _P		w o	WL	OCKET Cu) (KF	(kN/m	DISTRIBUTIO	N
DEPTH		TRAT	UMBE	ŕΡΕ		ROUN	EVA	• Q	UICK TH		×	& Sensit	ivity ANE	WA	TER CO	ONTEN	Г (%)	P C	ITAN	(%)	
80.1	TOPSOIL: 200mm	0 1/1/2	ž	F	f	σŏ	団 80	2	20 4	0 6	8 0	80 1	00	1	0 2	20 3	30			GR SA SI C	CL
- 0.2	FILL: silty clay, trace gravel, dark		1	SS	8			-							0						
-	grey, moist, loose	\otimes						-													
79.3	CLAYEY SILT TILL: trace gravel	₩¥	-																		
-	brown, moist, very stiff to hard		2	SS	27		79	-							0			>225			
-																					
								-													
-			3	SS	31			-							0			>225			
-							78	-													
-		- A	4	SS	72			-							0						
- 			⊢					-													
- 78:8	SHALE: Georgian Bay Formation,		5	SS	50/		11	-													_
3.3	END OF BOREHOLE																				
	1) Borehole dry and open upon																				
	completion.																				
		1								<u> </u>	1							I			



REF. NO.: 18-519-10 ENCL NO.: 31

Diameter: 150mm Date: Jul-04-2018

DRILLING DATA

Method: Hollow Stem Auger



DRILLING DATA

Diameter: 150mm

Date: Jun-27-2018

Method: Hollow Stem Auger

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DORL	SOIL PROFILE		5	AMPL	ES			DYNA	MIC CO		IETRA	FION								NAC-72.	
(m)		-				TER		2	0 4	0 6	0 8	0 1	00	PLASTI LIMIT	MOIS CON	UKAL TURE TENT	LIQUID LIMIT	EN.	NIT WT	ANI	nne D
ELEV		PLO.	æ		3 m	D WA	NO	SHEA	AR STI	RENG	TH (kf	Pa)		W _P		<i>N</i> 0	WL	CKET F (I) (KPa	RAL UN (kN/m ³)	GRAIN DISTRIB	SIZE UTION
DEPTH	DESCRIPTION	RAT ^A	IMBE	ЫЕ	- BLo	NUOS	EVAT	0 UN • QI	NCONF JICK TF	ined Riaxial	+ ×	& Sensit	ivity ANE	WA	TER CO	ONTEN	Г (%)	9 0 0 0	NATU	(%)
77.9	TOPSOIL :125 mm	ST	z	Ϋ́	Ż	9 9 9 9	Ц	2	0 4	0 6	0 8	0 1	00	1	0 2	20 3	80			GR SA	SI CL
- 0.1	FILL : clayey silt, trace gravel, trace	\bigotimes	1	SS	11										0						
-	to compact	\bowtie						-													
		\bigotimes				-	77	-													
1		\bigotimes	2	SS	20			-							0						
-		\bigotimes						-													
-		\otimes																			
2		\bigotimes	3	SS	13		76	-							0						
-		\bigotimes						-													
-		\boxtimes						-													
		\bigotimes	4	SS	10										0						
3		\bigotimes					75														
-			_	~~~	_			-													
-		\bigotimes	Э	33	5											ľ					
		\boxtimes					74	-													
73.7		\boxtimes																			
4.3	weathered, grey																			wet spo	on
	END OF BOREHOLE: Notes:																				
	 Water level at 4.1 m upon completion of borehole. 																				
							2	~ •													



DS CONSULTANTS LTD.

O ^{8=3%} Strain at Failure



GROUNDWATER ELEVATIONS

Measurement $\underbrace{\overset{1st}{\checkmark}} \overset{2nd}{\overset{3rd}{\checkmark}} \overset{3rd}{\overset{4th}{\checkmark}}$

+ ³, ×³: Numbers refer <u>GRAPH</u> NOTES to Sensitivity

O ^{€=3%} Strain at Failure

1 OF 2

AND

(%)

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

DS CONSULTANTS LTD.

Geotechnical Environmental Materials Hydrogeology

LOG OF BOREHOLE BH18-37



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING DATA

Method: Hollow Stem Auger/Rock Coring

Diameter: 150mm Date: Jun-27-2018

		SOIL PROFILE		s	SAMPL	.ES			DYNAI RESIS	MIC CO TANCE	NE PEN PLOT		TION			_ NAT	URAL			т	METHANE
	(m) <u>ELEV</u> DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	үре	N" <u>BLOWS</u> 0.3 m	SROUND WATER	ELEVATION	2 SHEA O UN • QI 2	0 4 AR STF NCONFI JICK TF 0 4	0 6 RENG NED RIAXIAL 0 6	0 8 TH (kF + × 0 8	0 10 Pa) FIELD V/ & Sensiti LAB V/ 0 10	ANE vity ANE 00	PLASTI LIMIT W _P WA			LIQUID LIMIT WL T (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT W (kN/m ³)	AND GRAIN SIZE DISTRIBUTION (%)
	70.4	Total Core Recovery = 100% Solid Core Recovery = 88% RQD = 88% Hard Layer (Limestone/Siltstone)= less than 10% Maximum Thickness of Hard Layer = 100mm(Continued)		RUN 5	RC	-		71													GR SA SI CL
2S SOIL LOG 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12	10.9	 Homm(Continued) END OF BOREHOLE Notes: Monitoring well was installed in the borehole upon completion. Water level in the monitoring well at 2.0m on Sept. 26, 2018. 																			



1 OF 1

DS CONSULTANTS LTD.

Geotechnical Environmental Materials Hydrogeology

O ^{8=3%} Strain at Failure



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150mm Date: Jun-21-2018 REF. NO.: 18-519-10 ENCL NO.: 36

	SOIL PROFILE		s	SAMPL	ES			DYNA RESIS	MIC CC	NE PEN PLOT		TION			- NAT	URAL			F	METHANE	1
(m)		oT			(0)	ATER S		2	20 4	40 6	0 8	30 1	100	LIMIT		TURE TENT	LIQUID	- PEN. Pa)	UNIT W ([°] r	AND GRAIN SIZE	
ELEV DEPTH	DESCRIPTION	LA PL	ER		LOWS 0.3 m	ND V ITION	NOITA	SHEA O UI	AR ST	RENG	TH (kl +		/ANE	•••p		o		OCKET (Cu) (k	rural (kn/m	DISTRIBUTION	
		TRAT	IUMB	ΥPE	۵ı-	SROU	ILE VA	• Q			. ×	LAB V		WA1			T (%)	۵.	LAN		
81.8 - 0.0	TOPSOIL: 250mm	<u>x¹ 1_y</u>	2	-	-			-					1							GR SA SI CL	1
0.3	FILL: sandy silt mixed with topsoil,	\boxtimes	1	SS	14			-						0							
	brown, moist, compact					-		-													
81.0 - 0.8	FILL: silt to clayey silt, trace gravel,	\bigotimes					81														
-	trace topsoil/organics, grey, moist, compact	\bigotimes	2	SS	12			-							о						
-						-		-													
		\otimes						-													
2		\otimes	3	SS	19		80	-													
-								-													
								-													
-			4	SS	13		79	-								0					
- 3 78.7		\otimes					,,,	-													
- 3.1	SANDY SILT TILL : trace to some clay, trace gravel, grey, moist, very				50/			-													
	dense		5	SS	125mn	h		-						°							
-							78														
-								-													
								-													
- 77.2	SILTY CLAY TILL: sandy trace							-												Mud Potony	
4.0	gravel, grey, moist, hard		6	SS	65		77	-						0				>225		Drilling	
5								-													
-								-													
			1					-													
6							76	-													
-			\vdash			-		-													
-			7	SS	64			-							ō			>225			
			-			-	75	-													
<u>-</u>							10	-													
								-													
Ś						_		-													
							74	-													
			8	55	38			-								0		>225			
						-		-													
								-													
							73	-													
	SILT : some clay. trace gravel.	H				-															
3	grey, wet, dense		9	SS	36			F								0					
								-													
0 - 2 - 10							72	-													
<u>GROU</u> N	Continued Next Page						+ 3,	× ³ :	Number	rs refer	С	8=3%	Strain	at Failur	e						
Measure	ement $\sum_{n=1}^{1 \text{ st}} \sum_{n=1}^{2 \text{ nd}} \sum_{n=1}^{3 \text{ rd}} \sum_{n=1}^{4 \text{ th}} \sum_{n=1}^{4 \text{ th}}$					10120			0 00118	avity											



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING DATA

Method: Hollow Stem Auger

DYNAMIC CONE PENETRATION RESISTANCE PLOT

Diameter: 150mm Date: Jun-21-2018

ENCL NO.: 36

SAMPLES SOIL PROFILE Ы (m) ŝ

		SOIL PROFILE		s	AMPL	ES.			RESIS	TANCE	E PLOT		HON .		DIACT		JRAL			F	METH	HANE
	(m) <u>ELEV</u> DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	түре	"N" <u>BLOWS</u> 0.3 m	GROUND WATER CONDITIONS	ELEVATION	2 SHE/ 0 UI • Q	AR ST NCONF UICK TI 20 4	IO E RENG INED RIAXIAL IO E	50 8 TH (kl + 50 8	B0 1 Pa) FIELD \ & Sensi LAB V B0 1	ANE tivity ANE		TER CC		LIQUID LIMIT w _L T (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT W (kN/m³)	AN GRAIN DISTRII (؟ GR SA	ND N SIZE BUTION %) SI CL
	-	SILT : some clay, trace gravel, grey, wet, dense(Continued)							-													0. 02
									-													
	- 10.7	SILTY SAND TILL: trace clay, trace gravel, grey, wet, very dense		10	55	75		71	-													
	-					15			-													
	-								-													
	-							70	-													
	69.6	SILTY CLAY TILL: sandy. trace							-													
	-	gravel, grey, moist, hard		11	SS	40			-								0		>225			
	- 13							69	-													
	-								-													
	-								-													
	- - 14	seams of sand at 13.7 m		12	22	50/		68	-								0		>225			
	-				00	150mn	n		-								0		- 220			
	-								-													
	- 15							67	-													
	66.6 515.2	SILT:trace clay, trace sand, grey,							- -													
	-	wet, dense		13	SS	44			-							0						
	- 16							66	-													
	-								-													
2									-													
8-10-1	65.0 - 16.8	SILTY CLAY TILL: sandy, seams of sand, trace gravel, grey, moist,						65	-													
GDT 1	-	hard		14	SS	84			-							0			>225			
PJ DS	-								-													
OAD.G	- 18							64	-													
DRO R	63.5	SILTY CLAY:trace sand grey							-													
300 HYI	-	moist, hard	ß	15	SS	64			-								o		>225			
19-10 8	- 19							63	-													
G 18-5									-													
									-													
DS S(20	Continued Next Page						62	-													
	GROUN	DWATER ELEVATIONS 1st 2nd 3rd 4th				1	<u>GRAPH</u> NOTES	+ 3,	Х ³ :	Numbei to Sens	rs refer itivity	С	8=3%	Strain	at Failur	e						
	Measure	ement 🖳 🗶 🖳 🖳																				



(m)

LOG OF BOREHOLE BH18-39

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

Method: Hollow Stem Auger

DYNAMIC CONE PENETRATION RESISTANCE PLOT

Diameter: 150mm Date: Jun-21-2018

> 20 40 60 80 100

REF. NO.: 18-519-10 ENCL NO.: 36

LIQUID LIMIT

PLASTIC NATURAL MOISTURE LIMIT CONTENT

GROUND WATER CONDITIONS POCKET PEN. (Cu) (kPa) NATURAL UNIT STRATA PLOT w WL BLOWS 0.3 m WP SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH -0 -1 DISTRIBUTION DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 20 40 60 80 100 10 20 30 GR SA SI CL SILTY CLAY:trace sand, grey, 16 SS 52 b >22 moist, hard(Continued) 61.4 END OF BOREHOLE: 20.4 Notes: 1) Water level at 9 mbgl during drilling



METHANE

AND

GRAIN SIZE

PROJ CLIEN PROJ	ECT: Preliminary Geotechnical Investig IT: Lakeview Community Partners Ltd. ECT LOCATION: 800 Hydro Road, Mis	gation ssissa	- Pro uga,	posed ON	Devel	opmen	t	DRILI Metho Diame	LING I	DATA low St	em Au	uger				RI	EF. NC	0.: 18	3-519	9-10
BORE	M: Geodetic HOLE LOCATION: See Drawing 1							Date:	Jun-2	25-2018	3					El	NCL N	0.: 3	7	
	SOIL PROFILE		s	SAMPL	.ES			DYNAI RESIS	VIC CO TANCE	NE PEN PLOT		TION			ΝΔΤ				L	METHANE
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	үре	N" <u>BLOWS</u> 0.3 m	BROUND WATER	ELEVATION	2 SHEA O UN • QU	0 4 AR STI NCONF JICK TF 0 4	0 6 RENG INED RIAXIAL 0 6	0 8 TH (kl + ×	B0 FIELD & Sens LAB V 30	100 VANE itivity VANE 100	PLAST LIMIT - W _P 		ONTEN ONTEN	LIQUID LIMIT WL T (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT W (kN/m ³)	AND GRAIN SIZE DISTRIBUTION (%)
81.8	TOPSOIL: 200mm	<u>x1//</u>			:			-					1							GR SA SI C
0.2	FILL:clayey silt, trace topsoil/organics, shale fragments, dark brown, moist, compact		1	SS	16		81	-							0					
- <u>1</u> - - - -			2	SS	12			-									þ			
- 1.5 	CLAYEY SILT TILL : sandy, trace gravel, brown, moist, stiff		3	SS	10		80	- - - -								0		125		
79.5						Į⊥		E												
- 2.3 - - - - 3	trace clay, brown, wet, very dense		4	SS	50/ 100mn	m -	during	drilling	1						0			_		
<u>78.7</u> 3.1	SAND AND GRAVEL: trace silt,					-		-												Wet Spoon
- - - -	grey, wet, very dense	0	5	SS	52	-	78								0					
- <u>4</u> - - - -		0																		
4.6	SILTY CLAY TILL : sandy, trace gravel, grey, moist, hard		6	SS	34	-	77	- - - -							0			-		
- - - -							76	-												
<u>6</u> 75.7 6.1	SANDY SILT : trace clay, grey, wet, very dense					-		- - - -												
- - - -				55	58	-	75	-							0			-		0 23 70 7
- - - - - - 71 2								- - - -												
- 7.6 	SILTY CLAY TILL : sandy, trace gravel, grey, moist, hard		8	SS	44		74	-							0			>225		
- - - -								- - - -												
- <u>9</u> - -	interbed of sand at 9.1 m		 			-	73	- - - -												
- 			9	SS	66	-	72	-							0			>225		
10	Continued Next Page	[j¢j	1		I	GRADH		1	Jumber	s refer		8=20	6	I				L		





DRILLING DATA

Diameter: 150mm

Date: Jun-25-2018

Method: Hollow Stem Auger

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE LIMIT CONTENT METHANE GROUND WATER CONDITIONS LIQUID POCKET PEN. (Cu) (kPa) AND LIMIT 20 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE w BLOWS 0.3 m WP WL SHEAR STRENGTH (kPa) O UNCONFINED + ^{FIELD} VANE QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION -0 -1 DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 GR SA SI CL SILTY CLAY TILL : sandy, trace gravel, grey, moist, hard(Continued) K) 71 10 SS 90 22 70 11 SS 73 >225 69 68 12 SS 23 0 175 67 13 SS 31 0 >225 66 16 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12 65 SS 30 175 14 о 64 15 SS 30 >225 0 63 19 DS SOIL LOG 62.0 62 19.8 ΚX Continued Next Page O ^{8=3%} Strain at Failure <u>GRAPH</u> $+3, \times 3$: Numbers refer GROUNDWATER ELEVATIONS **NOTES** to Sensitivity

2 OF 3



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

HOLE LOCATION. See Drawing 1																			
SOIL PROFILE		s	AMPL	ES	~		DYNAN RESIS	IC CO	NE PEN PLOT		ION		DIACTI		JRAL			F	METHANE
DESCRIPTION	STRATA PLOT	NUMBER	ТҮРЕ	"N" <u>BLOWS</u> 0.3 m	GROUND WATER CONDITIONS	ELEVATION	2 SHEA 0 UN • QL 2	0 4 R STI NCONF JICK TF 0 4	0 6 RENG INED RIAXIAL 0 6	0 8 TH (kF + X 0 8	0 10 Pa) FIELD V/ & Sensiti LAB VA 0 10	NE vity NE 00		TER CC	TURE TENT V DONTENT 0 3		POCKET PEN. (Cu) (kPa)	NATURAL UNIT M (kN/m³)	AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
SILTY CLAY: trace sand, grey, moist, very stiff(Continued)		16	SS	26			-								0		200		
END OF BOREHOLE																			
SILTY CLAY: trace sand, grey, moist, very stiff(Continued) END OF BOREHOLE Notes: 1) Water level at 2.3 mbgl during drilling		<u>∩</u> <u>16</u>	∑ SS	26	GR CO			0 4	0 6	0 8	0 10		1	0 2		0	200		GR SA SI CL
	SOIL PROFILE DESCRIPTION SILTY CLAY: trace sand, grey, moist, very stiff(Continued) END OF BOREHOLE Notes: 1) Water level at 2.3 mbgl during drilling	SOIL PROFILE DESCRIPTION SILTY CLAY: trace sand, grey, moist, very stiff(Continued) END OF BOREHOLE Notes: 1) Water level at 2.3 mbgl during drilling	SOIL PROFILE S DESCRIPTION Io SILTY CLAY: trace sand, grey, moist, very stiff(Continued) 16 END OF BOREHOLE Notes: 1) Water level at 2.3 mbgl during drilling I	SOLL PROFILE SAMPL DESCRIPTION USE STREAM OF THE SAMPL DESCRIPTION USE STREAM OF THE SAMPL SILTY CLAY: trace sand, grey, moist, very stiff(Continued) END OF BOREHOLE Notes: 1) Water level at 2.3 mbgl during drilling	SOLL PROFILE SAMPLES DESCRIPTION USE Stating I DESCRIPTION USE Stating I SILTY CLAY: trace sand, grey, moist, very stiff(Continued) END OF BOREHOLE Notes: 1) Water level at 2.3 mbgl during drilling I	Solid PROFILE SAMPLES BESCRIPTION UP of the second grey, moist, very stiff(Continued) SILTY CLAY: trace sand, grey, moist, very stiff(Continued) END OF BOREHOLE Notes: 1 10 1 Silling 1 10 1 10 1 11 1 12 26 13 1 14 55 26 1 15 55 26 1 10 1 11 1 15 55 26 1 16 55 26 1 17 16 18 1 19 16 10 1 10 1 11 1 11 1 11 1 11 1 10 1 11 1 11 1 11 1 12 1 13 1 14 1 15 1 15	Solid PROFILE Solid PROFILE SAMPLES DESCRIPTION 10 UP 16 SS 26 END OF BOREHOLE Notes: Notes: 10 10 10 10 11 12 13 14 15 16 17 18 19 10 10 10 10 10 11 12 11 12 11 12 13 14 15 15 16 17 18 19 10 10 10 11 11 12 13 14 15 16 17 18 19 19 11 10 11 11 12 13 14 15 <td>Soll PROFILE SAMPLES Press DESCRIPTION Image: Colspan="2">Image: Colspan="2">Colspan="2">Image: Colspan="2">Colspan="2" SILTY CLAY: trace sand, grey, molet, very stiff(Continued) 16 SS 26 Image: Colspan="2">Image: Colspan="2" END of BOREHOLE Image: Colspan="2" Image: Colspan="2">Image: Colspan="2" Image: Colspan="2">Image: Colspan="2" Image: Colspan="2">Image: Colspan="2" Image: Colspan="2">Image: Colspan="2" Image: Colspan="2">Image: Colspan="2" SILTY CLAY: trace sand, grey, molet, very stiff(Continued) Image: Colspan="2" Image: Colspan="2" END of BOREHOLE Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Notes: 1 Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2">Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" <td< td=""><td>Solu PROFILE SAMPLES Image: SampleS PRINTANCE DESCRIPTION Image: SampleS Image: SampleS</td><td>SOLL DOUTION OF BUE SAMPLES U Description U</td><td>SOLL PROFILE SAMPLES UP AND CONTROL OF CONTR</td><td>SOLL PROFILE SOLL PROFILE SAMPLES DESCRIPTION SILTY CLAY: trace sand, grey, molet, very stiff(continued) END OF BOREHOLE Notes: 1) Water level at 2.3 mbgl during driling</td><td>Solid PROFILE SAMPLES DESCRIPTION</td><td>Solut PROFILE SAMPLES DESCRIPTION 0</td><td>Solution of the second of the</td><td>SAMPLES DESCRIPTION SAMPLES USE ROLL Samples DESCRIPTION State State State SILTY CLAY: trace sand, grey. To Sold Total very stiff (Continued) State Notes: Total very stiff (Continued) 1 total very stiff (Continued) State Notes: Total very stiff (Continued) 1 total very stiff (Continued) State Notes: Total very stiff (Continued) 1 total very stiff (Continued) State Notes: Total very stiff (Continued) 1 total very stiff (Continued) State 1 total very stiff (Continued)</td><td>Solution for the second second</td><td>Solid PROFILE SAMPLES Provide Control of the Parton in th</td><td>Solid PROFILE SAMPLES Description Solid Profile Solid Profile</td></td<></td>	Soll PROFILE SAMPLES Press DESCRIPTION Image: Colspan="2">Image: Colspan="2">Colspan="2">Image: Colspan="2">Colspan="2" SILTY CLAY: trace sand, grey, molet, very stiff(Continued) 16 SS 26 Image: Colspan="2">Image: Colspan="2" END of BOREHOLE Image: Colspan="2" Image: Colspan="2">Image: Colspan="2" Image: Colspan="2">Image: Colspan="2" Image: Colspan="2">Image: Colspan="2" Image: Colspan="2">Image: Colspan="2" Image: Colspan="2">Image: Colspan="2" SILTY CLAY: trace sand, grey, molet, very stiff(Continued) Image: Colspan="2" Image: Colspan="2" END of BOREHOLE Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Notes: 1 Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2">Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" Image: Colspan="2" <td< td=""><td>Solu PROFILE SAMPLES Image: SampleS PRINTANCE DESCRIPTION Image: SampleS Image: SampleS</td><td>SOLL DOUTION OF BUE SAMPLES U Description U</td><td>SOLL PROFILE SAMPLES UP AND CONTROL OF CONTR</td><td>SOLL PROFILE SOLL PROFILE SAMPLES DESCRIPTION SILTY CLAY: trace sand, grey, molet, very stiff(continued) END OF BOREHOLE Notes: 1) Water level at 2.3 mbgl during driling</td><td>Solid PROFILE SAMPLES DESCRIPTION</td><td>Solut PROFILE SAMPLES DESCRIPTION 0</td><td>Solution of the second of the</td><td>SAMPLES DESCRIPTION SAMPLES USE ROLL Samples DESCRIPTION State State State SILTY CLAY: trace sand, grey. To Sold Total very stiff (Continued) State Notes: Total very stiff (Continued) 1 total very stiff (Continued) State Notes: Total very stiff (Continued) 1 total very stiff (Continued) State Notes: Total very stiff (Continued) 1 total very stiff (Continued) State Notes: Total very stiff (Continued) 1 total very stiff (Continued) State 1 total very stiff (Continued)</td><td>Solution for the second second</td><td>Solid PROFILE SAMPLES Provide Control of the Parton in th</td><td>Solid PROFILE SAMPLES Description Solid Profile Solid Profile</td></td<>	Solu PROFILE SAMPLES Image: SampleS PRINTANCE DESCRIPTION Image: SampleS Image: SampleS	SOLL DOUTION OF BUE SAMPLES U Description U	SOLL PROFILE SAMPLES UP AND CONTROL OF CONTR	SOLL PROFILE SOLL PROFILE SAMPLES DESCRIPTION SILTY CLAY: trace sand, grey, molet, very stiff(continued) END OF BOREHOLE Notes: 1) Water level at 2.3 mbgl during driling	Solid PROFILE SAMPLES DESCRIPTION	Solut PROFILE SAMPLES DESCRIPTION 0	Solution of the second of the	SAMPLES DESCRIPTION SAMPLES USE ROLL Samples DESCRIPTION State State State SILTY CLAY: trace sand, grey. To Sold Total very stiff (Continued) State Notes: Total very stiff (Continued) 1 total very stiff (Continued) State Notes: Total very stiff (Continued) 1 total very stiff (Continued) State Notes: Total very stiff (Continued) 1 total very stiff (Continued) State Notes: Total very stiff (Continued) 1 total very stiff (Continued) State 1 total very stiff (Continued)	Solution for the second	Solid PROFILE SAMPLES Provide Control of the Parton in th	Solid PROFILE SAMPLES Description Solid Profile Solid Profile





REF. NO.: 18-519-10 ENCL NO.: 37

Date: Jun-25-2018

DRILLING DATA

Diameter: 150mm

Method: Hollow Stem Auger



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING DATA

Method: Solid Stem Auger

Diameter: 150 mm Date: Jul-26-2018

	SOIL PROFILE		s	SAMPL	.ES			DYNA RESIS	MIC CO	NE PEN PLOT		TION		DI LOT	NAT	URAL			⊢	METH	ANE
(m)		5				ATER		2	20 4	06	i0 8	30	100	LIMIT		STURE	LIQUID	a) BEN.	"NIT W		ID
	DESCRIPTION	A PL	H.		.3 m	VD W TION	NOIL	SHE/			TH (kl +	Pa)	/ANE	W _P		w o	WL	OCKET (Cu) (KF	(kN/m	DISTRIE	BUTION
DEPTH		TRAT	UMBE	ΥΡΕ		ROUI	LEVA	• Q	UICK TH		. ×	& Sensi LAB V	ANE	WA	TER CO		T (%)	e.	NAT	(%	a)
83.3 - 0.0	TOPSOIL: 152mm	0 <u>11/</u>	z	Ĥ	÷	00		-	20 4	0 6		1				20 ,	30			GR SA	SI CL
- 0.2	FILL: clayey silt, trace rootlet, trace		1	SS	12		83								o						
-	asphait, brown, moist, stiπ	\otimes						-													
E		\otimes	<u> </u>					-													
-		\otimes	2	SS	12										0						
		\otimes					82	-													
- 1.5	SILT : some sand, trace clay,	fffi						-													
	brown, wet, loose		3	SS	5			-								0					
-								-													
- <u>81.0</u> - 2.3	CLAYEY SILT TILL : some sand,						81	-										-			
-	trace gravel, trace cobble, brown to grey, moist, very stiff to hard		4	SS	18			-							0						
								-													
-			—			-															
-			5	SS	50/		80								0						
					2/111	l															
		Ĥł						-													
			1				79	-													
- 4.6	SILT : some sand, trace clay, grey,	ΗĤ						-													
5	very moist to wet, dense		6	SS	32			-							0						
-			<u> </u>			-	70	-													
							/0	-													
								-													
⁻ 6 77.2								-													
- 6.1	CLAYEY SILT TILL : some sand, trace gravel_trace cobble_grev				50/	1	77														
	moist, hard		7	SS	127mn	h								0							
<u>s</u> [╞──					-													
2																					
			1				76	-													
<u>- 75.7</u>																					
75:5	SHALE: Georgian Bay Formation,		8	SS	50/			-													
	END OF BOREHOLE Notes:																				
	1) Borehole open and dry upon completion																				
· L		-		1		GRAPH	. 3	3	Number	s refer		8=3%	6		1	1	1				





1 OF 1



DS CONSULTANTS LTD.

Geotechnical Environmental Materials Hydrogeology

O ^{8=3%} Strain at Failure



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING I	DATA
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Method: Hollow Stem Auger

Diameter: 150mm Date: Jun-29-2018

	SOIL PROFILE		s	SAMPL	ES	~		DYNAI RESIS	MIC CO TANCE	NE PEN PLOT		TION				URAL			F	METHANE
(m) <u>ELEV</u> DEPTH	DESCRIPTION	RATA PLOT	IMBER	ЪЕ	BLOWS 0.3 m	ROUND WATER	EVATION	2 SHEA 0 UI • QI	AR STI NCONF JICK TF	0 6 RENG INED RIAXIAL	0 8 TH (kF + ×	Pa) FIELD V/ & Sensiti LAB V/	OO ANE vity ANE			TURE TENT W D		POCKET PEN. (Cu) (kPa)	NATURAL UNIT W (kN/m ³)	AND GRAIN SIZE DISTRIBUTION (%)
83.5 - 0.0 - 83.2	TOPSOIL: 350mm	ST ST	N	≽	ŗ	<u>ң</u> С	Ш	2	4	06	0 8	0 10	00	1	0 2	20 3	30			GR SA SI CL
- 0.3	FILL: clayey silt, brown, moist, stiff	×	1	SS	10		83	-							0					
- 82.7 - 0.8 - - -	CLAYEY SILT TILL: sandy, trace gravel, brown, moist, very stiff to hard		2	SS	24			- - - -							o					
- - - - - -			3	ss	28		82	- - - - -							0			>22	5	
-	grey below 2.3 m		4	SS	33		81	- - - - -							Þ			-		
⁻³ 80.4 - 3.1	SHALE: Georgian Bay Formation,		5	SS	50/			-							D					
3.4	END OF BOREHOLE Notes: 1) Borehole open and dry upon completion																			



PROJECT: Preliminary Geotechnical Investigation- Proposed Development DRILLING DATA

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BORE	HOLE LOCATION: See Drawing 1		-											<u> </u>				i -	1		
	SOIL PROFILE	-	S	AMPL	ES	к		RESIS	TANCE	PLOT	\geq			PLASTI		JRAL	LIQUID		WT	METHAN	=
(m)		DT.			<u>v</u>	VATE JS	-	2	0 4	0 6	0 8	0 1	00	LIMIT w₀	CON		LIMIT Wi	T PEN (Pa)	UNIT (°n	AND GRAIN SIZ	E
ELEV EPTH	DESCRIPTION	LA PL	Я		0.3 m	ND V ITION	OIT	SHEA	AR STI	RENG INED	TH (kF +	Pa) FIELD V.	ANE	ļ –	()	— [`]	OCKE (Cu) (F	(kN/r		ON
		TRA	IUMB	ΥPE	۵۱- z		LEV#	• QI			. X	LAB VA	ANE	WA 1			Г (%)	۵.	A	(%)	
83.9 0.0	TOPSOIL: 350mm	0 <u>11/</u>	z	н	f	00	ш		4						0 2	0 3				GR SA SI	CL
83.6		i	1	SS	7			-							о						
0.3	FILL: clayey slit, trace organics, brown, moist, firm	\bigotimes						-													
83.1		\bigotimes																			
0.8	CLAYEY SILT TILL: sandy, trace gravel, brown, moist, stiff to hard			~~			83	-							_						
	-		2	55	14										0						
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				66	22			-							0						
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	trace shale fragments below 2.6 m		4	SS	35			-							0						
							81														
								-													
			5	SS	43			-						0							
80.1								_													
79:9	SHALE: Georgian Bay Formation,		6	SS	50/		80	-													
4.0	END OF BOREHOLE																				
	Notes: 1) Borehole open and dry upon																				
	completion																				
I					1		1					1		1					1		



REF. NO.: 18-519-10 ENCL NO.: 41

Method: Hollow Stem Auger
Diameter: 150mm

Date: Jun-29-2018


PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150mm Date: Jun-29-2018

		SOIL PROFILE		5	SAMPL	.ES			RESIS	STANCE	PLOT		HON			- NATI	URAL			⊢	METHANE			
	()		_				TER			20 4	ю е	50 6	30 10	00	PLASTI LIMIT	C MOIS	TURE	LIQUID	Ľ.	Μ	AND			
	(m)		[0]			Şε	NA NS	z	SHE			I TH (kl	L Pa)	I	WP	V	N	WL	(kPa	L UN	GRAIN SIZE			
	DEPTH	DESCRIPTION	∐ ≚	Щ		0.31	ND	DIT		NCONF	INED		FIELD V	ANE		(э———		δĝ	LRA A	DISTRIBUTION			
			RA	MB	뷥			Z Z Z	• 0	UICK TI	RIAXIAL	- ×	LAB VA	ANE	WA	TER CC	DNTENT	「(%)	۵.	A	(%)			
	83.0		ST	₽	F	z	R C	ELI	:	20 4	10 E	50 E	30 10	00	1	0 2	20 3	0			GR SA SI CI			
	- 0.0	TOPSOIL: 400mm	<u>x17</u>						-															
			12.5		00	11			Ł							_								
	82.6	FILL cond and gravel trace	Ŕċ	1'	33	14			F							0								
	- 0.4	concrete/ brick pieces brown	\otimes	<u> </u>					F															
	-	moist, compact	\otimes						ŀ															
	F.		\mathbb{X}						F															
	Ľ		\otimes	2	SS	17		82	-									0						
	-		\mathbb{N}	1		''			ŀ									-						
	815		\bigotimes						F															
	- 1.5	SILT TO CLAYEY SILT: brown,	ĬŤſŤ						F															
		moist, stiff			~~~	10			ŀ															
	- -			3	SS	13			Ē							0	1		>225					
	2							81	-															
	80.7								ŀ															
	- 2.3	SILTY CLAY TILL: trace gravel,	1.61	1					ţ.															
	-	grey, moist, very stiff to hard	XX	1.	~~~	25			-															
	-			4	33	25			F															
			jø,						t i															
	3		11	1				80																
	-								F															
			19.	5	22	50/			È .															
	-		11	1	00	100mn			F												luno 20, 2019			
	79.2		1.X	1					ļ.												June 29, 2010			
	- 3.8	GEORGIAN BAY FORMATION:	171	6	SS	50/			È .						0									
	4	shale interbedded with			\sim	50mm		79											-		July 27 2018			
	787	limestone/siltstone layers, grey							Ē.												July 27, 2010			
	4.3	Bedrock Coring started at 4.3 m					-					E .												
		SHALE BEDROCK:		RUN									-											
	-	Solid Core Recovery = 75%		1	RC				È .															
	78.1	RQD = 50%							ŀ															
	<u>5</u> 4.9	Hard Layer (Limestone/Siltstone)= /						78																
		less than 10%							t i															
	-	Maximum Thickness of Hard Layer							ŀ															
	-			L					F															
		Solid Core Recovery = 93%			RC				È .															
	-	RQD = 65%		-					ŀ															
	6	Hard Layer (Limestone/Siltstone)=						77	Ē															
		less than 10%		1					t															
	76.6	= 75mm		1					ŀ															
	6.4	SHALE BEDROCK:					1		F	1									1	1				
~	E	Total Core Recovery = 100%							Ł															
-1-0	-	Solid Core Recovery = 57%	E	1					ŀ															
8-1	7	RQD = 72%		L.				76	-	-									1	1				
Ě		naid Layer (Limestone/Siltstone)=			RC				Ł															
Ъ		Maximum Thickness of Hard Laver		3	-				ŀ															
DS.	L	= 75mm		1					ļ.															
2				1					ŀ	1									1	1				
Ю.	75 1			1					F															
DAL	7.9	END OF BOREHOLE							İ											1				
) RC																								
JRC																								
Η				1						1									1	1				
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0 8(1						1									1	1				
9-1				1						1									1	1				
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SOI				1						1									1	1				
SC				1																				
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DS SOIL LOG

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement $\overset{1st}{\checkmark} \overset{2nd}{\checkmark} \overset{3rd}{\checkmark} \overset{4th}{\checkmark}$

LOG OF BOREHOLE BH18-46

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING DATA

Method: Solid Stem Auger

Diameter: 150mm Date: Jul-17-2018

DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE LIMIT CONTENT METHANE GROUND WATER CONDITIONS LIQUID AND LIMIT 20 40 60 80 100 POCKET PEN. (Cu) (kPa) NATURAL UNIT ((kN/m³) (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m WP w WL SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL × LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION -0 -1 DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 GR SA SI CL 81.4 FILI: sand and gravel, grey, moist 0.0 AS 0 1 81 80.6 SILTY CLAY TILL : sandy, trace gravel, brown, moist, hard to very stiff 1.1 0.8 1 2 SS 16 80 >225 3 SS 48 grey below 2.3 m 79 SS 4 33 >22 0 78 5 SS 36 >22 77 6 SS 24 с 200 76 6 7 SS 22 200 75 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12 74 73.8 $\overline{\Delta}$ 7.6 SANDY SILT : trace to some clay, W. L. 73.8 m during drilling grey, wet, compact to very dense 8 SS 24 73

9 SS

94

<u>GRAPH</u>

NOTES

72

 $+3, \times 3$: Numbers refer

to Sensitivity

O ^{8=3%} Strain at Failure



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

Measurement $\underbrace{\stackrel{1st}{\underline{\checkmark}}} \underbrace{\stackrel{2nd}{\underline{\checkmark}}} \underbrace{\stackrel{3rd}{\underline{\checkmark}}} \underbrace{\stackrel{4th}{\underline{\checkmark}}}$

DRILLING DATA

Method: Solid Stem Auger

Diameter: 150mm Date: Jul-17-2018

(m) <u>ELEV</u> DESCRIPTION LUX DESCRIPTION LUX DESCRIPTION LUX LUX LUX LUX LUX LUX LUX LU	OCKET PEN. (Cu) (kPa) 'URAL UNIT W	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		(%)
grey, wet, compact to very	Ź	GR SA SI CL
	1	
10.7 SILT TO SANDY SILT: trace to some clay, grey, moist to very moist, very dense 10 SS 50 10 SS 50 70		
3 11 SS 50/ 127mm		
13.7 moist, hard CLAYEY SILT: trace sand, grey, moist, hard 12 SS 77	>225	
13 SS 36 66 0 0		
14 SS 31	>225	
15 SS 51 63 0		
61.6		



(m)

ELEV DEPTH

61.0

20.4

LOG OF BOREHOLE BH18-46

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DESCRIPTION

SILT : some clay, grey, wet, very

1) Water level at 7.6 mbgl during drilling

dense(Continued)

Notes:

END OF BOREHOLE:

Method: Solid Stem Auger

Diameter: 150mm Date: Jul-17-2018

DYNAMIC CONE PENETRATION RESISTANCE PLOT SAMPLES PLASTIC NATURAL MOISTURE LIMIT CONTENT METHANE GROUND WATER CONDITIONS LIQUID LIMIT POCKET PEN. (Cu) (kPa) AND 20 40 60 80 100 NATURAL UNIT ((kN/m³) STRATA PLOT GRAIN SIZE w WL BLOWS 0.3 m WP SHEAR STRENGTH (kPa) O UNCONFINED + ^{FIELD} VANE QUICK TRIAXIAL × LAB VANE ELEVATION -0 -1 DISTRIBUTION NUMBER (%) WATER CONTENT (%) TYPE ż 20 40 60 80 100 10 20 30 GR SA SI CL 16 SS 62 b

DS SOIL LOG 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12





1 OF 1

DS CONSULTANTS LTD.

Geotechnical Environmental Materials Hydrogeology





PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150mm Date: Jul-05-2018

ENCL NO.: 45

DYNAMIC CONE PENETRATION RESISTANCE PLOT SAMPLES SOIL PROFILE PLASTIC NATURAL MOISTURE LIMIT CONTENT METHANE GROUND WATER CONDITIONS LIQUID AND LIMIT 40 60 80 100 POCKET PEN. (Cu) (kPa) NATURAL UNIT 20 (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m Wp w WL

 SHEAR STRENGTH (kPa)

 O UNCONFINED
 +

 PUICK TRIAXIAL
 ×

 LAB VANE

 ELEVATION ELEV DEPTH DISTRIBUTION -0 -1 DESCRIPTION NUMBER (%) WATER CONTENT (%) TYPE ż 40 60 80 100 10 20 30 20 GR SA SI CL SAND AND GRAVEL: trace silt, ò 7 ngrey, wet, very dense(Continued) · o · ò, 0 o 50/ 10 SS 00mr 70 ö. 0 0 .0[`] 69 68.9 SILTY SAND: trace clay, grey, wet, 12.2 ł very dense 11 SS 57 c 3 68 67.4 13.7 SILT : trace clay, grey, wet, very dense 50/ 12 SS 0 50mr 67 66 65.8 SILTY CLAY TILL : some sand to 15.3 sandy, trace gravel, grey, moist hard 13 SS 79 0 >22 6 65 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12 64.3 SILTY CLAY: trace sand, grey, 16.8 moist, hard 64 >225 14 SS 47 0 63 62.8 SILT TO CLAYEY SILT: trace 18.3 sand, grey, very moist, very dense 15 SS 50 >225 0 19 62 DS SOIL LOG Continued Next Page O ^{8=3%} Strain at Failure <u>GRAPH</u> $+3, \times3$: Numbers refer GROUNDWATER ELEVATIONS **NOTES** to Sensitivity Measurement $\overset{1st}{\checkmark} \overset{2nd}{\checkmark} \overset{3rd}{\checkmark} \overset{4th}{\checkmark}$



PROJECT: Preliminary Geotechnical Investigation- Proposed Development

SAMPLES

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

BOREHOLE LOCATION: See Drawing 1

SOIL PROFILE

DRILLING DATA

Method: Hollow Stem Auger

DYNAMIC CONE PENETRATION RESISTANCE PLOT

Diameter: 150mm Date: Jul-05-2018

(m) 20 40 60 80 100 LINIT CONTENT LINIT	E L	LIN (AND
	E Å	AL U	GRAIN SIZE
$\begin{array}{c c} \hline \hline \\ $	0 20 0	AT UT S	(%)
$\begin{bmatrix} 2 \\ 1 \\ 1 \\ 2 \\ 2 \\ 2 \\ 2 \\ 2 \\ 2 \\ 2 \\$		Ż	
	>221	5	GR SA SI CL
sand, grey, very moist, very	-22		
Notes:			
1) Water level at 3.1 mbgl during			



1 OF 1

PROJECT: Preliminary Geotechnical Investigation- Proposed Development

CLIENT: Lakeview Community Partners Ltd.

PROJECT LOCATION: 800 Hydro Road, Mississauga, ON

DATUM: Geodetic

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150mm Date: Jul-04-2018

BOREHOLE LOCATION: See Drawing 1

		SOIL PROFILE		s	SAMPL	.ES			DYNA RESIS	MIC CO STANCE	NE PEI PLOT		FION		DIAST	o NAT	URAL			F	METHANE
(r <u>EL</u> DEI	n) . <u>EV</u> PTH	DESCRIPTION	TRATA PLOT	UMBER	үре	v" <u>BLOWS</u> 0.3 m	ROUND WATER ONDITIONS	LEVATION	: SHE. ○ U ● Q	AR STI	0 6 RENG INED RIAXIAL	TH (kF + - ×	0 1 Pa) FIELD V & Sensit LAB V/	ANE vity ANE			STURE TENT W O ONTENT		POCKET PEN. (Cu) (kPa)	NATURAL UNIT W (kN/m ³)	AND GRAIN SIZE DISTRIBUTION (%)
8	0.8 0.8 0.2	TOPSOIL: 200 mm FILL: silty clay, trace asphalt, some gravel, dark grey, moist, firm	s <u>\l</u>	2 1	SS	5	υō		-		.0 6		0 1		1	0 2	0 3	30			GR SA SI CL
- 8 	0.0 0.8	FILL : sandy silt, dark grey, moist, very dense		2	SS	50/ 50mm		80	-							0			-		
				3	ss	50/ 75mm		79	- - - - -						•				-		
- 7 	7 <u>8.5</u> 2.3	SANDY SILT TILL : some clay, trace gravel, grey, moist, compact to dense	•	4	SS	29		78	-								¢		_		
 - - - -			•	5	SS	31			-								o				
- - - - -			• 0 •					77	-										_		
- 7	6.3 6:1	SHALE: Georgian Bay Formation,		6	SS	50/			-						0						
DS SOIL LOG 18-519-10 800 HYDRO ROAD.GPJ DS.GDT 18-10-12	4.7	END OF BOREHOLE: Notes: 1) Borehole dry and open upon completion.																			























90						LEGEND	
	BH18-12	BH18-11	BH18-02			Topsoil	
	× 23	20 9	'N'	····· DFI 10-VO ······ ^{'N'} ¹³	יאין ואין 14	Fill	
10 18 80				13 14 28 44 34		Silty Clay Till	
75 ·····	W. L. 75.2 m ⊻			40 51 	W. L. 76.7 m during drilling 	Sandy Silt Till	
70 ··· 21	26 18 30	41 14 21	19. 21 40 			Sand	
65	21 42 29	19 23 16	19 18 19	26		Sand and Gravel + Boulders	
60 ·····	34		<u>LEL</u> 18	20 23 28		Silty Sand Till	
				81 87		Asphalt	
55				81 45		Clayey Silt Til	
50					n	Silty Sand	
45					n	Clayey Silt	
40					n nn	Silty Clay	
35				50/100mr 	n n n	Silt	
30						Sandy Silt	
		Distance Along Bas	seline (Not to Scale)				
					DRAWING NO.	57	
Generalized Sub-surface Profile JOB NO. 18-519-10							







Notes

- 1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
- 2. 20 mm (3/4") clear stone 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
- 3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
- 4. Free Draining backfill OPSS Granular B or equivalent compacted to the specified density. Do not use heavy compaction equipment within 450 mm (18") of the wall. Use hand controlled light compaction equipment within 1.8 m (6') of wall. The minimum width of the Granular 'B' backfill must be 1.0 m.
- 5. Impermeable backfill seal compacted clay, clayey silt or equivalent. If original soil is free-draining, seal may be omitted. Maximum thickness of seal to be 0.5 m.
- 6. Do not backfill until wall is supported by basement and floor slabs or adequate bracing.
- 7. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
- 8. Basement wall to be damp proofed /water proofed.
- 9. Exterior grade to slope away from building.
- 10. Slab on grade should not be structurally connected to the wall or footing.
- 11. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab.
- 12. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
- 13. The entire subgrade to be sealed with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
- 14. Do not connect the underfloor drains to perimeter drains.
- 15. Review the geotechnical report for specific details.

DRAINAGE AND BACKFILL RECOMMENDATIONS Basement with Underfloor Drainage

(not to scale)



EXTERIOR FOOTING

Notes

- 1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet, spaced between columns.
- 2. 20 mm (3/4") clear stone 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
- 3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
- 4. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
- 5. Slab on grade should not be structurally connected to the wall or footing.
- 6. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
- 7. Do not connect the underfloor drains to perimeter drains.
- 8. Solid discharge pipe located at the middle of each bay between the solider piles, approximate spacing 2.5 m, outletting into a solid pipe leading to a sump.
- 9. Vertical drainage board with filter cloth should be kept a minium of 1.2 m below exterior finished grade.
- 10. The entire subgrade to be sealed with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
- 11. The basement walls should be water proofed using bentonite or equivalent water-proofing system.
- 12. Review the geotechnical report for specific details. Final detail must be approved before system is considered acceptable.

DRAINAGE RECOMMENDATIONS Shored Basement wall with Underfloor Drainage System (not to scale)



EXTERIOR FOOTING

Notes

- 1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet, spaced between columns.
- 2. 20 mm (3/4") clear stone 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
- 3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
- Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
- 5. Slab on grade should not be structurally connected to the wall or footing.
- 6. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
- 7. Do not connect the underfloor drains to perimeter drains.
- 8. Solid discharge pipe located at the middle of each bay between the solider piles, approximate spacing 2.5 m, outletting into a solid pipe leading to a sump.
- 9. Vertical drainage board mira-drain 6000 or eqivalent with filter cloth should be continous from bottom to 1.2 m below exterior finished grade.
- 10. The entire subgrade to be sealed with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
- 11. The basement walls must be water proofed using bentonite or equivalent water-proofing system.
- 12. Review the geotechnical report for specific details. Final detail must be approved before system is considered acceptable.

DRAINAGE RECOMMENDATIONS Shored Basement wall with Underfloor Drainage System (not to scale)

Appendix A Photographs of Rock Cores

General Comments – Bedrock in Greater Toronto Area

The bedrock that makes spread footings or caissons a popular choice for high-rise foundation support is a shale or shale limestone composition. The highest member, the Queenston Formation, is generally found west of Toronto, while the Georgian Bay Formation underlies most of Metro Toronto, with the Collingwood and Whitby Formations east of Toronto. The Queenston is, relatively speaking, the weaker of the four formations that are likely to support caissons or footings.

The Georgian Bay as well as the Queenston and Collingwood/Whitby Formation are of Middle Ordovician Age. It is defined as the rock unit that overlies the bluish grey shales of the Collingwood Formation and is in turn overlain by the red shale of the Queenston Formation. The Georgian Bay Formation consists of bluish and grey shale with interbeds of sandstone, limestone and dolostone. Towards the west where the Georgian Bay formation underlies the Queenston Formation, the limestone content increases significantly and limestone and/or sandstone may comprise as much as 70 to 90 percent of the bedrock. The hard layers are usually less than about 100 to 150 mm thick but some layers are much thicker. The thicker layers have been observed to be as much as 750 to 900 mm at some sites. The layers are actually lenses and they can vary significantly in thickness over short distances.

The upper portion of the bedrock is commonly weathered for a depth of 600 to 1000 mm and within this weathered zone hard limestone layers or lenses are common. These hard limestone layers can result in contractual problems for augers, and can provide misleading bedrock elevations. Where the weathering is more extensive a shale till layer may be found above the bedrock. In the sound bedrock, the limestone, sandstone, dolostone is hard to very hard.

Stress relief features such as folds and faults are common in the bedrock. In these features, the rock is heavily fractured and sheared, and contains layers of shale rubble and clay. Weathering is much deeper than the surrounding rock in these features and often there is a lateral migration of the stress relief features resulting in sound unweathered bedrock overlying fractured and weather bedrock. The stress relief features are usually in the order of 4 to 6 m wide, but the depth can vary from 4 to 5 m to in excess of 10 m. These features occur randomly.

The bedrock contains significant high locked in horizontal stresses. These stresses can impose significant loads on tunnel walls but the slower rate of construction for basements allows for a relaxation of these stresses and they are not normally a problem for basement construction.

Groundwater seepage below the top 1000 mm is generally small, however, at several locations in Toronto and Mississauga large quantities have been encountered.

Bedding joints in the bedrock are very close-to-close, smooth planar in the shale and rough planar in the limestone. Significant vertical jointing is common.

Where the bedrock was cored, a detailed description of the rock core is appended to the borehole log.

Design features related to the bedrock are discussed in other sections of this report, and these general comments must be considered with these comments.

Methane gas exists in the bedrock, normally below the top 1000 mm and more concentrated with depth. Appropriate care and monitoring is essential in all confined bedrock excavations, particularly caissons and tunnels.

Explanation of Terms Used in the Bedrock Core Log Weathering (ISRM)

Strength	(ISRIVI)				Term	Grade	Description
Term	Grade	Description	Unconfine	d	Fresh	W1	No visible sign of rock material weathering
Extremely weak rock	RO	Co	mpressive Sti (MPa) 0.25-1.0	r ength (psi) 36-145	Slightly weathered	W2	Discolouration indicates weathering of rock material and discontinuity surface. All the rock material may be discoloured by weathering and may be somewhat weaker than in its fresh condition
Very weak	R1	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	1.0-5.0	145-725	Moderatel weathered	y W3	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a either as a continuous framework or as corestones
Weak rock	R2	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	5.0-25	725-3625	Highly weathered	W4	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a continuous framework or as corestones
Medium Strong	R3	Cannot be scraped or peeled with a pocket knife, specimen can be fractured	25-50	3625-7250	Completely weathered	y W5	All rock material is decomposed and/or disintegrated to a soil. The original mass structure is still largely intact
		with single firm blow of geological hammer			Residual sc	oil W6	All rock material is converted to soil. The mass structure and material fabric are destroyed. There
Strong rock	< R4	Specimen require more than one blow of geological hammer to fracture it	50-100	7250-14500			is a large change in volume, but the soil has not been significantly transported
Vonstron	- 05		100 250	14500 26250	(FI) Fractu	ure Index	(
rock	s Ko	blows of geological hammer to fracture it	100-250	14500-36250	Expressed drill-induce	as the nui	mber of discontinuities per 300mm (1 ft). Excludes es and fragmented zones. Reported as ">25" if
Extremely strong rock	R6	Specimen can only be chipped with geological hammer	>250	>36250	Broken Z	one	.5 Iractures/0.5m.

Bedding (Geological Society Eng. Group Working Party, 1970. Q.J. of Eng. Geol. Vol. 3)

Term Be	ed Thickness	
Very thickly bedded	>2 m	>6.5 ft
Thickly bedded	600 mm-2 m	2.00-6.50 ft
Medium bedded	200 mm-600 mm	0.65-2.00 ft
Thinly bedded	60 mm-200 mm	0.20-0.65 ft
Very thinly bedded	20 mm-60 mm	0.06-0.20 ft
Laminated	6 mm-20 mm	0.02-0.06 ft
Thinly laminated	<6 mm	<0.02 ft

TCR (Total Core Recovery)

Strength (ISRM)

Sum of lengths of rock core recovered from a core run, divided by the length of the core run and expressed as a percentage.

SCR (Solid Core Rocovery)

Sum length of solid, full diameter drill core recovered expressed as a percentage of the total length of the core run.

RQD (Rock Quality Designation, after Deere, 1968)

Sum of lengths of pieces of rock core measured along centreline of core equal to or greater than 100 mm from a core run, divided by the length of the core run and expressed as a percentage. Core fractured by drilling is considered intact. RQD normally quoted for N-size or H-size core.

RQD(%)	Rock Quality
90-100	Excellent
75-90	Good
50-75	Fair
25-50	Poor
0-25	Very poor

FI) Fracture Index	
xpressed as the number of discontinuities per 300mm (1 ft). Excludes Irill-induced fractures and fragmented zones. Reported as ">25" if requency exceeds 25 fractures/0.3m.	
Broken Zone	

Zone of full diameter core of very low RQD which may include some drillinduced fractures.

Fragmented Zone

Zone where core is less than full diameter and RQD = 0.

Discontinuity Spacing (ISRM)

Term	Average Spacing						
Extremely widely spaced	>6 m	>20.00 ft					
Very widely spaced	2 m-6 m	6.50-20.00 ft					
Widely spaced	600 mm-2 m	2.00-6.50 ft					
Moderately spaced	200 mm-600 mm	0.65-2.00 ft					
Closely spaced	60 mm-200 mm	0.20-0.65 ft					
Very closely spaced	20 mm-60 mm	0.06-0.20 ft					
Extremely closely spaced	<20 mm	>0.06 ft					
Note: Excludes drill-induced fractures and fragmented rock.							

Discontinuity Orientation

Discontinuity, fracture and bedding plane orientations are cited as the acute angle measured with respect to the core axis. Fractures perpendicular to the core axis are at 90° and those parallel to the core axis are at 0°.

BH18-19A – Rock Cores

Run 1– 15' to 17'

Run 2–17' to 22'



Run 3–22' to 26'10"

Run 4– 26'10" to 31'10"



Run 5 - 31'10" to 36'10"



BH18-29 – Rock Cores

Run 1-20'9" to 25'9"

RUN2 - 25'9" to 30'9"



Run 3 - 30'9" to 35'8"

Run 4 - 35'8" to 40'5"



Res starte and an at a point of the term of the start as the decision of the decis

BH18-32 – Rock Cores

Run 1–14' to 16'3"

Run 2–16'3" to 20'10"



Run 5 – 40'5" to 45'6"

BH18-37 – Rock Cores

Run 1– 12.5' to 16'

Run 2–16' to 21'



Run 3– 21' to 26'2" Run 4– 26'2" to 31'5"



Run 5 – 31'5" to 35'9"



BH18-45 – Rock Cores

Run 1 – 13'10" to 15'10"

Run 2 – 15'10" to 20'10"



Run 3 – 20'10" to 25'10"



Appendix B:

Logs and Location Plan of EXP Boreholes



oject No.	MRK-00243747-AO						K-00243747-AO			wing N	lo	2
oject:	Preliminary Geotechnical Investigation - Proposed Developme					nt Sheet No1_ of						
cation:	Former OPG Lakeview Site	e, 800 H	lydro F	Road,	Missi	ssau	ga, O	ntaric)			
ite Drilled: ill Type: itum:	November 8, 2017 CME 75 Geodetic	nber 8, 2017 Auger Sample 75 Dynamic Cone Test Shelby Tube Field Vane Test				Auger Sample SPT (N) Value Dynamic Cone Test Shelby Tube Field Vane Test			ustible Va I Moistur and Liqu ned Triax in at Fail	apour Rea e uid Limit cial at ure	iding I E	□ × ♀
SYMBO-	Soil Description	ELEV. m	D E P T Sheat	20 4 Strength	N Value 10 6	0	30 MPa	Combu 2 Nat Attert	stible Vap 50 5 tural Mois perg Limit	oour Read 500 7 ture Conte s (% Dry V	ng (ppm) 750 ent % Velght)	SAMP LE
FILL -follow grave -brick sility of mois -CLA brow - - - - - - - - - - - - -	- grass/topsoil to ~0.15m wed by silt to sandy silt, some al, topsoil inclusions, pieces of ; brown, moist, loose clay, topsoil inclusions; brown, t, loose YEY SILT TILL - some gravel; n, moist, hard DY SILT TILL - scattered gravel cobbles; grey, moist, very dense YEY SILT - silt seams and s; grey, moist, hard - - - clayey silt seams; grey, moist - - - clayey silt seams; grey, moist - -	79.2	0 B 0 2 1 7 2 0 3 4 5 6 1 7 8 8 9 9 10 11 12 1 13	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	52/150m	m Ø						
	- YEY SILT - grey, moist, hard -	68.4	14	Ö	5				×	×		

exp.

Time	Water Level (m)	Depth to Cave (m)												
On completion	13.72	15.24												
Proiect No.	MRK-00243747-AO	5 01								Dra	wina N	0.	3	3
--	---	------------	-------	---	---	----------	----------	----------------	--	--	--	---	----------	--
Project:	Preliminary Geotechnical I	nvestia	atio	on - F	Propo	sed [Develo	opme	nt	S	heet N	lo. 1	0	f 1
Location:	Former OPG Lakeview Sit	e 800 H	-lva	dro R	oad	Missi	issaud	na O	ntario	,)			_ `	
Date Drilled: Drill Type: Datum:	November 6, 2017 CME 75 Geodetic	· ·	_	Auger Sa SPT (N) Dynamic Shelby T Field Var	ample Value Cone Te ube ne Test	əst		 	Combu Natura Plastic Undrai % Stra Penetr	ustible Va I Moisture and Liqui ned Triax in at Failu rometer	cour Rea d Limit al at re	iding I	×	
SYMBOL GWL	Soil Description	ELEV. m	DEPTH	2 Shear S	20 A	N Value	60 B	0 MPa	Combu 2 Nat Atter	stible Vapo 50 50 tural Moist berg Limits	our Readi 00 7 ure Conte (% Dry V	ng (ppm) /50 Int % Velght) 30	SAZP-Ima	Natural Unit Weight kN/m ³
Fill	- 300mm crushed limestone	80.25	0	ð					1111				Ø	
layer	rs; brown, moist, very stiff to hard	1			20					*				
		1	1	Ċ	P			Á		×				
		-			28 O					×				
			2					>						
	TILL - some sand and gravel;	77.7			Č					×				
dens	I - brown becoming grey at ~3m, moist, dense		3		3									
													4	
		75.0	4		Ì	3				×			0	
CLA	YEY SILT - silt seams and				28			2						
laye	rs; grey, moist, naro	-	5										4	
		-			29 O				++++					
	- trace to some sand, clayey silt	74.3	6		35									
satu	ns and layers; grey, moist to rated, dense to very dense	-			C					X				
		-	7		3					×			-7	
		-												
		_	8			Ö				×				
		-					82 O				x			
		4	9											
	avelly zone	_					- Ö			×			-0	
		_	10		E.	45								
		_				U				×				
		_	11			5	5			×				
		_												
		68.3	12											
wea	thered	67.8				60/	O							
ži – L	END OF BOREHOLE													
AGV														

TimeWater
Level
(m)Depth to
Cave
(m)On completion8.3812.19

*exp.

Project: _ocation: Date Drilled: Drill Type:	Preliminary Geotechnical Ir Former OPG Lakeview Site November 6 and 7, 2017 CME 75	nvestiga e, 800 l	ation - Iydro -	Prop Road	osed [, Miss	Develo	opme na. Oi	nt	SI	neet No.	1	of	1
Location: Date Drilled: Drill Type:	Former OPG Lakeview Site November 6 and 7, 2017 CME 75	e, 800 l	- -	Road	, Miss	issauc	na. Oi		U.	ieet ivo.	_ _	0	
Date Drilled: Drill Type:	November 6 and 7, 2017 CME 75		-	1040	, 191100	เออสนบู	161. \ 7	ntario					
Date Drilled: Drill Type:	November 6 and 7, 2017 CME 75		-				10, 01	nano					
			- SPT (Dynar - Shelb	Sample N) Value nic Cone y Tube	Test	0 2	 -	Combu Natura Plastic Undrai % Stra	stible Vap I Moisture and Liqui ned Triaxi in at Fallu	oour Readin d Limit al at re		ן ג פ	
Datum:	Geodetic		Field	/ane Tes	t	s	1	Penetr	ometer				
SY XBOL	Soil Description	ELEV. m	D E P T H She	20 ar Strengt	N Value 40 h 0.1	60 <u>8</u>	0 MPa 2	Combus 25 Nat Attert	stible Vapo 50 50 ural Moistu erg Limits 0 2	ur Reading 0 750 Ire Content (% Dry Wel	(ppm) S A % P ght) L S	Na L We kN	tural Init eight
FILL	- heterogeneous mixture of v silt and sand and gravel, topsoil		0	27					×				
inclu	sions, pieces of brick; brown,	-						×					
			1	18				>					
		75.0		9					×				
silt to clay	clayey silt, some sand and	=	7										
loos	gravel; brown and grey, very moist,		2 0						×				
	-	-	Ô						>				
	-	- 74 1	3		50/150m	n i			~				
SHA	LE BEDROCK - grey, weathered	-//4./			0								
	- sound below	1											
	-	-	4										
	SEE ATTACHED ROCK CORE _ LOG)	-	5										
	,												
		-	6										
<u></u>	END OF BOREHOLE	71.0											
1. B	ES: edrock cored from 3.35 to 6.35m HQ size using diamond drilling juipment.												

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H

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140000 LAGWGL02 MRK00243747AO.GPJ NEW.GDT

©exp.

Depth to Cave (m) 3.05 Water Level (m) Dry Time On completion

1

1

			RUCK CURE	<u> </u>	<u>_U</u>	G										5	3			
PROJ	ECT		echnical investigation	OF	IENT	ATIC	N	E	LEVA	TION	N (m)		ATUM Geode	tic		T	PROJ	ECT	NUM	IE V
	TION	y deol			TE S		TED		COMP	LETE	ĒD		OGGE	D BY			DRAV	NING	NUN	4 Л
800	Hydro	Road,	Mississauga, Ontario		1/06/	/17		4	11/07	7/17			CC/AN	/	-		0115-	4		
	Deve	lopmer	t Group of Companies		ontil	n Drillir	ng		CME	1 Y P 75			HQ	DAHR			SHEE	: I 1 of	f 1	
(m) NO	m)				ETS		CHA	RAC	SSE	STIC	S BE	RING	H	RE	NCY	ABER	RY (%)		RY (%)	
ELEVATI	DEPTH (SYMBOL	GENERAL DESCRIPTION		NO. OF S	T TNIOL	ORIENT/	SPACING	ROUGHN	FILLING	APERTU (mm)	WEATHE	STRENG	FRACTU	FREQUE	RUN NUR	RECOVE	RQD	WATER	
1 74 0	2	3	4		5	6	7	8	9	10	11	12	13	1	4	15	16	17	18	-
, 4.0	-		- Core loss due to possible shale rubble la	yer																
73.5																				
	-		GEORGIAN BAY FORMATION:													1	61	41	-	
	-4		Shale with Interbedded Limestone and Siltstone																	
73.2 73.1	-		Shale (75%) Thinly bedded or laminated, c grey, generally unweathered with moderate to heavily weathered layers, low to very low strength	lark ely v	1	в	F	с	SU	т	0									
	-		Limestone (25%) Fine grained to medium grained, grey, unweathered, medium stren	gth	1	С	V		SP	Т	0									
72.8	-		Discontinuities: Bedding joints are smooth undulating, flat and at close intervals; Verti joints are smooth planar at 3.45m and 5.0r	cal n																
72.6	-				1	В	F	С	SU	Т	0					2	100	92	100	
72.5	-																			
72.4 72.3	-																			
72.3	-5																			
72.2	-																			
74 0	-																			
71.9 71.9																				
, 1.0					1	BC	F	С	SU	T T	0					3	100	83	100)
71.7 71.6	-															-				
71.4	-																			
	-6																			
	ļ																			
71.0			End of Borehole at 6.4 m																	-

Log of Borehole 4

Project No.	<u>MRK-00243747-A</u> O			Drawi	ing No.	5		
Project:	Preliminary Geotechnical Inves	tigation - Proposed	Developme	nt She	eet No.	1_ of	1	_
Location:	Former OPG Lakeview Site, 80	0 Hydro Road, Mis	sissauga, O	ntario				
Date Drilled: Drill Type: Datum:	November 8 and 9, 2017 CME 75 Geodetic	Auger Sample SPT (N) Value Dynamic Cone Test Shelby Tube Field Vane Test		Combustible Vapo Natural Moisture Plastic and Liquid I Undrained Triaxial % Strain at Failure Penetrometer	ur Reading Limit at	□ × ⊕		



®exp.

Time	Water Level (m)	Depth to Cave (m)
On completion	Dry	15.24

Log of Borehole 5

Project No.	<u>MRK-00243747-A</u> O				Drawing No.	6	
Project:	Preliminary Geotechnical Investig	ation - Proposed	Developm	ent	Sheet No.	_1_ of	_1
Location:	Former OPG Lakeview Site, 800	-lydro Road, Mis	sissauga, (Ontario			
Date Drilled: Drill Type: Datum:	November 10, 2017 CME 75 Geodetic	Auger Sample SPT (N) Value Dynamic Cone Test Shelby Tube Field Vane Test		Combustib Natural Mo Plastic and Undrained % Strain a Penetrome	le Vapour Reading iisture I Liquid Limit Triaxial at t Failure eter	; □ × ⊕ ●	
S		N Val	lue	Combustible	e Vapour Reading (r	opm) S N	atural

G M W B L O L	Soil Description	ELEV. m		2 Shear S	20 Strength	<u>40 (</u>	<u>30</u>	80 MPa	250 Natural M Atterberg Li	500 75 olsture Conten mits (% Dry W	0 A No t% P W eight) L W	Unit Veigh (N/m
	FILL - 125mm sand and gravel followed by clayey silt, some gravel, _ pieces of brick; brown, moist, compact _ CLAYEY SILT TILL - some gravel; _ brown, moist with wet sand seams,	79.6	1	10 0 13 0						<		
	SILT TILL - some sand and gravel; 	78.1	2		õ		<u>81</u>		×			
a		76.8	3			50/150m	O n		×			
	SHALE BEDROCK - grey, weathered	76.4						100/1	0mm		77	

[∞]exp.

Time	Water Level (m)	Depth to Cave (m)
On completion	Dry	3.81

	Logo	of Boreho	le 6					
Project No.	MRK-00243747-AO				Drawing No.		7	
Project:	Preliminary Geotechnical Inves	tigation - Propose	d Developme	nt	Sheet No.	1	of	1
Location:	Former OPG Lakeview Site, 80	0 Hydro Road, Mi	ssissauga, O	ntario				
Date Drilled:	November 6, 2017	Auger Sample		Combus Natural M	tible Vapour Reading Moisture	ļ	□ ×	

Date Drilled:	November 6, 2017	Auger Sample		Natural Moisture	×
		SPT (N) Value	0 🛛	Plastic and Liquid Limit	—-Ә
Drill Type:	CIVIE 75	Dynamic Cone Test		Undrained Triaxial at	Ð
Datum:	Geodetic	Field Vane Test	- I	Penetrometer	
			5		-

U V L	NV V	SY MBOL	Soil Description	ELEV. m	DEPTH	Shear	20 Str	41 rength 0.	N Value	<u>i0 80</u>) MPa	Combus 2: Nat Atterb	stible Vapo 50 5 ural Moist erg Limits 0 2	our Readir 00 7: ure Conter 1 (% Dry W	ig (ppm) 50 1t % /eight) 10	S <z0,< th=""><th>Natural Unit Weight kN/m³</th></z0,<>	Natural Unit Weight kN/m ³
	000000000000000000000000000000000000000		FILL - sand and gravel, some silt; brown, moist, compact		1	13 O	č	3				×					
	00000111111111100000		SHALE BEDROCK - grey, weathered to ~2.5m, sound below	75.8	2				0/150mm O	1 70/150mm							
				74.2	3				50/50mm	Ő							
LAGWGL02 MRK00243747AO.GPJ NEW.GDT 12/20/17			END OF BOREHOLE														

Time	Water Level (m)	Depth to Cave (m)
On completion	Dry	3.05



	Log of]	Borehol	e 7				
Project No.	<u>MRK-00243747-A</u> O			Drawir	ig No	8	
Project:	Preliminary Geotechnical Investigat	tion - Proposed	Developme	nt She	et No.	1 of	1
Location:	Former OPG Lakeview Site, 800 Hy	ydro Road, Miss	issauga, Or	ntario			
Date Drilled: Drill Type: Datum:	November 10 and 14, 2017 CME 75 Geodetic	Auger Sample SPT (N) Value Dynamic Cone Test Shelby Tube Field Vane Test		Combustible Vapou Natural Moisture Plastic and Liquid Li Undrained Triaxial a % Strain at Failure Penetrometer	r Reading imit H- it	□ ★ ⊕	

	ş			D			N Value			Combustible Va	pour Reading (ppm)	S Natura
G W L	м в о	Soil Description	ELEV. m	EP TH	2 Shear S	0 4 Strength	0 (50 8	0 MPa	250 Natural Mol Atterberg Limi	sture Content % ts (% Dry Weight)	- M Unit L Weight
	~~~	TOPSOIL - silt with rootlets; dark	83.59	0	12 O				2		<u>20 30</u>	S
		-SANDY SILT - brown, moist, compact	1							*		
		CLAYEY SILT - silt seams; brown, moist, hard	82.5	1		Ő			2	Îx		
00000		SILT TILL - some sand, scattered gravel and cobbles; brown becoming _grey at ~2.5m, moist, very dense		2				ő		×		
	a	-1	-					ð		*		
	a	-	-	3				71		×		
	• •	SHALE BEDROCK - grey, weathered	79.8	4					100/1	8 ^{0mm}		
			_					80/1	Omm			
		_	-	5								
		(SEE ATTACHED ROCK CORE	_	6								
		,										
11/02/21		-	-	7								
			75.8									
00243/4/AU.0PJ N		END OF BOREHOLE NOTES: 1. Bedrock cored from 4.72 to 7.75m in HQ size using diamond drilling equipment.										
AGWGLUZ MH												



Time	Water Level (m)	Depth to Cave (m)
On completion	Dry	4.57

	ROCK CORE LOG										BH 7							
PROJ Prel LOCA 800	ECT iminar TION Hydro	y Geot Road,	echnical Investigation Mississauga, Ontario	ORIEN Vertic DATE \$ 11/14	TATIC al STAR /17	DN TED	C	LEVA 83.6 OMP 11/14	LETE	I (m)		Geodetic LOGGED BY AJ/AM			DRAWING NUME			BEF 17-A IBEI
CCI	Devel	opmen	t Group of Companies	Pontil	Drilli	ng		CME	75	= 	ľ				SHE	HEET 1 of 1		
ELEVATION (m)	DEPTH (m)	SYMBOL	GENERAL DESCRIPTION	NO. OF SETS			SPACING			APERTURE		STRENGTH		RUN NUMBER	RECOVERY (%)	ROD	MATER RECOVERY (%)	WATER COLOUR
78.9		3	4	5	6		8	9	10	11	12	13	14	15	16	17	18	19
78.8 78.7	-		GEORGIAN BAY FORMATION: Shale with interbedded Limestone and Siltstone															
78.6	—5 - -		Shale (82%) Thinly bedded or laminated, dar grey, generally unweathered with moderately to heavily weathered layers, low to very low strength Limestone (17%) Fine grained to medium grained, grey, unweathered, medium strength Clay (1%) Contains shale fragments, very low	k n														
77.9	- - -		Strength Discontinuities: Bedding joints are smooth undulating, flat and at close intervals; no vertical joints present	1	В	F	С	SU	Т	0				1	100	87	100	Grev
77.5	- 6							-							1			
	- - -																	
76 4	-7			1	в	F	С	SU	Т	0				2	100	80	100	Grev
76.3 76.3 76.3	-																	
76.0 76.0 75.9 75.8 75.8	-		End of Borebole et 7.8 m															

Pro	oject N	No.	MRK-00243747-AO										Dra	wing N	o		9	
Pro	oject:		Preliminary Geotechnical I	nvestiga	atic	n - P	ropo	ose	ed D	evel	opme	nt	S	heet N	o. <u>1</u>	_ (	of <u>1</u>	
Loc	cation	:	Former OPG Lakeview Site	e, 800 H	lyd	lro Re	oad,	M	lissis	sau	ga, O	ntario	)					
Dat Dril Dat	Date Drilled:       November 7, 2017         Drill Type:       CME 75         Datum:       Geodetic				- 4 - 5 - 5 - 5 - 5	Auger Sa SPT (N) N Dynamic Shelby Tu Field Van	Sample N) Value nic Cone Test / Tube /ane Test						Combustible Vapour Read Natural Moisture Plastic and Liquid Limit Undrained Triaxial at % Strain at Failure Penetrometer			ding X X ⊕ ▲		
G W L	SY MBOL		Soil Description	ELEV.	DEPTH	20 Shear S	0 Strength	40	Value 60	) 8	0 MPa	Combu: 2: Nat Attert	stible Vap 50 5 ural Moist berg Limits	our Readi 00 7 ure Conte 3 (% Dry V	ng (ppm) 50 nt % √eight)	SAZ0.JWC	Natura Unit Weigh kN/m	
		CLA Garage SANI 	Ved by silt, some gravel; brown, t, compact SOIL - silt; black, moist YEY SILT - some sand; brown, t, hard TILL - some sand, scattered el and cobbles; brown, moist, very - e YEY SILT - silt seams and s; grey, moist, hard DY SILT - trace to some gravel; moist to saturated, very dense like	68.3 68.3	1 2 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14													
		-		65.8	15				Č							0		
			END OF BOREHOLE												-	ľ		

LAGWG			
	Time	Water Level (m)	Depth to Cave (m)
rexp.	On comple	ition 15.09	15.24
I			

			Lo	g of	I	Bor	eh	ole	9							
Р	roject	No.	<u>MRK-00243747-A</u> O									Drav	wing No	). <u> </u>	1	0
Р	roject:		Preliminary Geotechnical Investigation - Proposed Development										heet No	. <u>1</u>	_	of <u>1</u>
Le	ocatio	n:	Former OPG Lakeview Site, 800 Hydro Road, Mississauga, Ontario									)				
D	Date Drilled:		November 7, 2017				ample Value			]	Combo Natura	ustible Vap Il Moisture	oour Read	ling	×	
D	rill Typ	be:	CME 75		_	Dynamic	Cone Te	est		•	Plastic Undrai	and Liqui ned Triaxi	d Limit al at		E	)
D	atum:		Geodetic		-	Shelby T Field Va	'ube ne Test		S		% Stra Penetr	iin at Failu ometer	If <del>C</del>			
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		FILL by si _ orav	- grass/topsoil to ~0.1m followed It to clayey silt, some sand and el. topsoil inclusions, pieces of	/0.95	0	13 O						×	×			
		shale mois	e; brown and grey, moist to very st, loose to compact		1	Ľ						×				
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		_		-	3	ð						×				
		-		74.6	4		3					×				
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12/20/17				_	7											
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SWGL02																
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exp.

Time	Water Level (m)	Depth to Cave (m)
On completion	3.81	4.57

											BHS					9				
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CCI	Deve	lopmer	t Group of Companies	F	Pontil	Drillin	ng CHA	RAC	CME 75				На			1 of 1				
ELEVATION (m)	DEPTH (m)	SYMBOL	GENERAL DESCRIPTION		NO. OF SETS	JOINT TYPE	ORIENTATION	SPACING	ROUGHNESS	FILLING	APERTURE (mm)	WEATHERING	STRENGTH	FRACTURE	RUN NUMBER	RECOVERY (%)	RQD	WATER RECOVERY (%)		
1	2	3	4		_5	6	7	8	9	10	11	12	13	14	15	16	17	18	F	
74.1	- - 5		- Core loss due to possible shale rubble la	iyer															-	
73.8	-																			
73.6	-		GEORGIAN BAY FORMATION: Shale with interbedded Limestone and Siltstone Shale (84%) Thinly bedded or laminated, o grey, generally unweathered with moderati	lark ely	1	В	F	c	SP	Т	0									
	-		Limestone (16%) Fine grained to medium grained, grey, unweathered, medium stren Clay (0%)	v gth											1	82	60	-		
73.1 73.0 73.0	-		Discontinuities: Bedding joints are smooth undulating to smooth planar, flat and at clo intervals; Vertical joints are smooth planar 5.25m and 7.39m	se at																
72.9	— <b>6</b> -																			
72.7	-																			
72.3 72.3	-																			
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71.2	[		End of Borehole at 7.7 m																_	

# **Appendix C:**

Geophysical Survey Report by Geophysics GPR International Inc.



# **GEOPHYSICS GPR** INTERNATIONAL INC.

# GEOPHYSICAL SURVEY AT 800 HYDRO ROAD, MISSISSAUGA.

**Presented to:** 

# DS Consultants Ltd.

6221 HIGHWAY 7, UNIT 16 VAUGHAN, ON L4H 0K8



Geophysics GPR International Inc. 6741 Columbus Road, Unit 14 Mississauga (Ontario) L5T 2G9 Tel. : +1 905.696.0656 info@geophysicsgpr.com July 2018 T-18662

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# **1 INTRODUCTION**

Geophysics GPR International Inc. (GPR) was requested DS consultants Limited to carry out a geophysical survey at 800 Hydro Road, Mississauga. (Figure 1).

The goal of this investigation was to determine the bedrock surface profile along four profiles for the purpose of defining the shape and location of a large buried valley under mostlyformer OPG property of a former thermal power station. The most accurate geophysical method for this objective is seismic refraction. The method is not limited by depth but rather by the seismic source being used. It was anticipated that the bedrock would probably be within 30 meters of surface so a 'buffalo gun' was used for this survey where there was no roadway and an elastic hammer was used where there was roadway.

The geophysical fieldwork was carried out on May 28th to June 7th, 2018.

The following report describes the survey design, the principles of the applied methods, the methodology for interpreting the data and finally a culmination of the results in the form of interpreted profiles.



Figure 1: Survey location with Seismic Lines



# 2 METHODOLOGY

## 2.1 Personnel

The GPR field personnel involved in this project and the dates that they were on-site are outlined in Table 1, below:

Employee	Title	Dates On-Site
Cameron Coatsworth	GIT	May 28 th to June 7 th
Tomas Westerbloom	Technician	June 5 th and 7 th
Mauritz Van Zyl	Technician	June 6 th
Norbert Kappa	Technician	May 28 th to June 7 th
Basil Khan	Technician	May 28 th to June 7 th
Lhoucin Taghya	Geophysicist	May 28 th

Table 1: Field personnel and survey dates

## 2.2 Positioning, Topography and Units of Measurement

The positions are in the WGS84, UTM Zone 17N datum.

All geophysical measurements are reported in SI units.

The start and end of line coordinates are provided in Table 2.

Table 2: Seismic Line UTM Coordinates

Seismic Line	Start Easting	Northing	End Easting	Northing	Length (m)
SL-1	616842	4825202	616466	4825589	480
SL-2	616924	4825341	616553	4825644	540
SL-3	617110	4825459	616641	4825953	690
SL-4	617225	4825766	616925	4826049	380
SL-4_1	617186	4825746	617106	4825829	115
SL-4_2	616853	4825953	616758	4826020	116

### 2.3 Seismic Refraction

Seismic methods for geologic mapping involve measuring/recording the response of vibration sensors. Multiple techniques and methodologies are available for analysis of the data depending on the ultimate goal of the investigation. The profiles were collected using a standard stationary geophone arrangement.



#### **Basic Theory**

The seismic refraction method relies on measuring the transit time of the wave that takes the shortest time to travel from the shot-point to each geophone. The fastest seismic waves are the compressional (P) or acoustic waves, where displaced particles oscillate in the direction of wave propagation. The energy that follows this first arrival, such as reflected waves, transverse (S) waves and resonance, is not considered under routine seismic refraction interpretation. (Figure 2) illustrates the basic operating principle for refraction surveys.



Figure 2: Seismic Refraction Operating Principle

#### **Survey Design**

This investigation used 12 to 24 - 4.5 Hz geophones with a spacing between geophones of 5 m.

Typically, seven or more shots are executed per seismic spread; three to five shots within the profile to obtain the lateral velocity variation in the overburden and two shots on either side of the spread to provide the true velocity of the bedrock surface.

#### **Interpretation Method and Accuracy of Results**

Interpretation of the seismic data was primarily done using the Hawkins' method. The Hawkins' method allows the computation of the rock depth to every geophone. This method provides information on the thickness of the various overburden layers, depth to bedrock and rock quality. It is based on the closure times of the inner shots. It can calculate the true velocities of the rock using the apparent velocities, measured with information provided by the outer shots. A full description of the strengths and limitations of the refraction seismic method is presented in Appendix A. A basic description of the Hawkins' method can also be found in the article Seismic Refraction Surveys for Civil Engineering by L. Hawkins (1961).

The standard seismic refraction method typically allows the determination of the bedrock profile with a precision of 10% or better for depths greater than 10 m and a precision of 1 m for depths less than 10 m. The precision in the determination of rock velocities is plus or minus 3%. The vertical contacts (lateral velocity change), usually associated with faults and deep valleys, are



generally accurate to within 5 m in width; although, this is somewhat site specific.

The two most significant problem areas for refraction mapping are the "hidden" layer and effect of velocity inversions.

A "hidden" layer or "blind zone" is a stratigraphic layer that is not possible to discern from the arrival time data due to insufficient velocity variation or thickness. The unknown presence of a hidden layer has the effect of making the interpreted bedrock depth too shallow. The presence of a "hidden" layer is typically revealed through borehole or test-pit data and calculations can be made to compensate for the presence of such a layer.

Velocity inversions occur when the velocity does not increase with depth. The velocity inversion can result from the presence of a low or high velocity layer. Refractions from low-velocity layers cannot be determined from the arrival time data. The unknown presence of a low velocity layer has the effect of making the interpreted depths deeper than actual depths. At this particular site, the presence of a velocity inversion is unlikely.

Along with hidden layers and velocity inversions, other inherent limitations of the seismic refraction method are approached as the depth to bedrock decreases. This is especially apparent with higher velocity overburden material. Identification and interpretation of vertical and lateral velocity variations and the time spent in each layer is critical to accurate interpretations. Irregularities in the bedrock surface and weathered bedrock at shallow depths will also have a more pronounced effect on accuracy than irregularities at greater depths.

### 3 RESULTS

The results of the seismic surveys are presented in Figure 4 in the form of interpreted cross-sections. The data quality for the surveys were generally good, however a great deal of effort was taken to overcome the heavy construction equipment that was jack hammering concrete slabs. GPR made the additional effort to collect the data from late afternoon to dusk.

The overburden P-wave velocities ranged from 800m/s to approximately 2400 m/s. Values of 1500 m/s are simply saturated soft sediments that assume the velocity of water.

### SL-1

The bedrock P-wave velocities was predominantly in the 3200 m/s range but there was a zone near the north end where 2100 m/s was measured. This weak zone may be related to heavy preferential weathering not unusual for the local shales. The depth to bedrock was shallower on the south side with depths at less than or equal to 5 m. At chainage 250 m there was a gradual increase in depth leading to the base of the valley at chainage 430 m and depth of 25 m. The north end of the profile (chainage 540) has a bedrock depth of about 5 meters.

### SL-2

The bedrock P-wave velocities ranged from approximately 3600 m/s to 2600 m/s. Again the weaker rock values were found on the northern portion of the profile. The depth to bedrock was also shallower on the



south side (5 m). At chainage 220 m there was a gradual increase in depth leading to the base of the valley at chainage 350 m and depth of 25 m. Again the north edge of the valley could be seen at chainage 480 m where the depth was again 5 meters.

### SL-3

The bedrock P-wave velocities ranged from approximately 3200 m/s to 3400 m/s. The depth to bedrock like SL-1 and SL-2 is 5m deep and decends at chainage 170 m to a depth of 25 m at chainage 400 m. It is not certain the northern edge of the valley was reached but it rock depth rose to 15 meters at chainage 530 m.

## SL-4, SL-4-1 and SL-4-2

The bedrock P-wave velocities ranged from approximately 3200 m/s to 3400 m/s. The depth to bedrock like the other spreads were shallowest on the south side. At chainage 50 m on SL-4 there was a gradual increase in depth leading to a possible valley at chainage 260 m and depth of approximately 30 m. Spread SL-4-1 was within the southern section of the survey area and bedrock appeared to be at depth of less than or equal to 5 m. Spread SL-4-2 showed bedrock on a steep climb from a depth of 20 m to 5 meters at the north end.

Figure 3 shows a drawing of the seismic spreads with the approximate location of the possible valley. It is uncertain where the valley extends to SL-4 as the collected data between SL-4 and SL-3 did not show it's possible boundaries.



Appendix A contains a table of seismic velocities for various soil and rock types.

Figure 3: Seismic Lines with Possible Valley location





## **4** CONCLUSIONS

Geophysics GPR was requested by DS Consultants to carry out a geophysical survey to map bedrock trends and locate a buried valley at 800 Hydro Road, Mississauga, Ontario (Figure 1).

The results of the bedrock and overburden mapping are presented in the form of interpreted profiles in Figure 4. A total of approximately 2.3 km of seismic data were collected.

Seismic refraction was completed to aid in the interpretation of the bedrock and possible valley locating. It is uncertain where the possible valley extends between SL-3 and SL-4 as the data collected between did not show it's possible boundaries.

The interpreted bedrock depth ranged from roughly 5 meters at each end of the valley to greater than 25 m in the center (Figures 3 and 4).

Interpretation of the seismic data was performed by Lhoucin Taghya.

This report has been prepared by Carolyn Boone, P.Geo. and reviewed by Milan Situm, P.Geo.

Milan Situm, P.Geo. Manager



#### APPENDIX A

Seismic Refraction Information Fact Sheets



## SEISMIC REFRACTION

Seismic refraction consists of recording the length of time taken for an artificially provoked surface vibration to propagate through the earth. By processing the data, the seismic velocities and depths of the underlying rock layers can be determined. These velocities are characteristic of the nature and quality of the bedrock; a fissured, fractured or sheared rock will be characterized by reduced seismic velocities.

The method is generally used to obtain a better geological analysis of the sub-surface and to determine the following characteristics: the quality, profile and depth of bedrock, its nature, degree of alteration and any other physical contrasts. Seismic refraction ensures that maximum information may be gained from geological field work, and that direct investment costs (drilling, excavation), will be reduced.



PRINCIPLE OF SEISMIC REFRACTION

#### FEATURES

- Precise determination of soil thickness.
- Precise determination of the seismic velocities (rock type and quality).
- Localization and identification of geological units.
- Detailed analysis of soil.
- Year-round use.
- Sea and land surveys (above and below ground).
- Great accessibility possible to rough terrain and remote regions.

#### **AREAS OF APPLICATION**

Civil Engineering/Mining Exploration - Exploitation/Petroleum and Gas Sectors/ Geotechnology/Geology/ Hydrology.

- Identification of faults, fractures, shear zones.
- Detection of rock differences (veins, dykes, cavities,
- etc.).

  Determination of rock topography.
- Evaluation of volume of soil present or to be
- excavated.
- Excellent complement to geological mapping.
- Recognition of geophysical anomalies such as VLF, gravimetry, etc.
- Drill site selection, better target identification.
- Evaluation of the size, thickness and condition of surface shafts (mining exploitation).
- Mass Rock Quality Determination (MRQD).
- Detection of rock irregularities and breaks.
- Hydrogeology (detection of water tables, veins, reservoirs).
- Excellent complement to any geological analysis.





#### **ADDITIONAL REMARKS**

Geophysics GPR International Inc. has been recognized for the past fifteen years as a leader in both the application and the development of seismic methods. Seismic refraction is currently used in both civil and mining engineering; the use of lighter high-performance equipment and better tomographical interpretation of the results have contributed to its growing popularity.



#### SEISMIC VELOCITIES VERSUS GEOLOGICAL MATERIALS

The seismic refraction differentiates the overburden layers from the bedrock. In general, a layer of overburden material, with associated velocities of 300 - 500 m/sec is seen followed by a second layer under the water table with a velocity corresponding to an impermeable material 1400 - 1600 m/sec.

In some cases, certain limitations may arise, such as differentiation between two different layers having approximately the same velocity. As an example:

- a contact within sand under the water table
- a contact between till and sand, under the water table (both at 1500 m/sec)

As a guideline, the following figure shows a classification of geological material by seismic velocities.

#### Seismic velocities in the overburden

Variations in the overburden layer can vary over a wide range as a function of its age, its depth of burial, differences in the granular state, degree of porosity, and whether water or air fills the voids (Telford 1976).

#### Seismic velocities in bedrock

A significant variation in seismic velocities for a particular rock mass may be caused by several factors. These factors include a change in the rock quality when the rock is weathered, sheared, faulted or fractured, a radical topographic change or a rock type change. Other features, such as the distribution of rock types, mineral content, the bonding of the minerals, joints opening, rock pressure, saturation and chemical composition of the minerals may all affect the velocities to some degree, explaining the differences of velocities in sound rock.

#### Rock type or change in bedrock quality

A rock type change will generally result in a different velocity because of differences in crystallization, mineralization or other physiochemical properties.

In the same way, a change in rock quality such as the presence of large open joints or several small open joints will undoubtedly bring about a velocity change for the same type of rock. Features such as a weathered, sheared, fractured or faulted rock will cause a drop in the velocity.

#### Faults, deep valleys

A radical topographic change in the bedrock profile may also cause a drop in the measured velocity. The cause of this is geometric and the use of specialized interpretative methods permits an estimation of the true depth of bedrock. A fault will also cause a similar velocity anomaly in the bedrock. These anomalies may be due to either a deep valley or a cavity like feature (which may be water or sediment filled), or a physical feature in the rock such as a fault or open joints. Since the analysis of the time distance curve does not allow the differentiation of the anomalies, the two possible interpretations are presented on the drawings. In such a case, borehole data gives the best information to assess the true nature of the anomaly.

		SEISMIC VELOCITY ( m / sec)																						
c	000	2000	600	006	1200	1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	1500	4300	5100	5400	5700	6000	6300	6600	0069
TOP SOIL, ORGANIC MATERIAL																								
LOOSE SAND																								
SILT											AE	ovi	E WA	TER	TA	BLE	_							
GRAVEL																								
CLAY, TILL																								
COMPACTED CLAY, TILL																								
WEATHERED, SHEARED FRACTURED ROCKS																								
SANDSTONE, GRAYWACKE CONGLOMERATE																								
SHALE, ARGILITE																								
LIMESTONE, DOLOMITE																								
METASEDIMENTS, IGNEOUS ACID AND VOLCANICS																								
BASIC IGNEOUS & VOLCANIC ROCKS, HIGH GRADE METAMORPHICS																								
c	200	2	600	006	1200	1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	1500	4800	5100	5400	5700	6000	6300	6600	0069
TOP SOIL, ORGANIC MATERIAL																								
LOOSE SAND																								
SILT									BELOW WATER TABLE															
GRAVEL																								
CLAY, TILL																								
COMPACTED CLAY, TILL																								
WEATHERED, SHEARED FRACTURED ROCKS																								
SANDSTONE, GRAYWACKE CONGLOMERATE																								
SHALE, ARGILITE																								
LIMESTONE, DOLOMITE																								
METASEDIMENTS, IGNEOUS ACID AND VOLCANICS																								
BASIC IGNEOUS & VOLCANIC ROCKS, HIGH GRADE METAMORPHICS																								

Figure 5: Classification of Geological Materials by Seismic Velocities