## **CONSOLIDATED REPORT ON**

Preliminary Geotechnical Investigation
Proposed Residential Development
Parcels A to J
Ninth Line, Mississauga, Ontario

## PREPARED FOR:

Derry Britannia Developments Limited

## **PREPARED BY:**

DS Consultants Ltd.

**Project No:** 18-692-100 **Date:** June 5, 2019



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#### 1. INTRODUCTION

DS Consultants Ltd. (DS) was retained by Derry Britannia Developments Limited to prepare a consolidated preliminary geotechnical investigation report for the proposed residential development located at Ninth Line in Mississauga, Ontario.

The subject property consists of ten (10) parcels, Parcels A to J, located on the west side of Ninth Line between Derry Road West and Britannia Road West, bounded by Highway 407 ETR on the west side. It is understood that the redevelopment of the site will consist of a subdivision including residential houses, roads and sewers.

DS Consultants carried out an environmental investigation at the subject site and drilled nineteen (19) boreholes in May 2019. AMEC Earth & Environmental (AMEC), Shad and Associates Inc. (Shad), AME Materials engineering (AME), and Sirati and Partners Consultants Limited (Sirati) have carried out geotechnical investigations at these parcels previously.

This report is a consolidated report, prepared on the basis of all the boreholes drilled on these parcels by DS and other consultants.

This report deals with geotechnical issues only. Environmental investigation reports by DS are submitted under separate covers.

The purpose of this geotechnical investigation was to obtain information about the subsurface conditions at DS boreholes locations, review the other consultants borehole logs (AMEC, Shad, AME & Sirati) and from the findings in the boreholes to make preliminary engineering recommendations pertaining to the geotechnical design of underground utilities, roads and to comment on the foundation conditions for the building construction.

The geotechnical recommendations in this report are preliminary. Further geotechnical investigations are recommended for the final design of the developments.

This report is provided on the basis of the terms of reference presented above and, on the assumption, that the design will be in accordance with 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.

Geotechnical reports prepared by other consultants were provided to our office by the client. At the time of preparation of this report, no design information is available to us. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for Derry Britannia Developments Limited and its architect and designers. Third party use of this report without DS consent is prohibited.

## 2. AVAILABLE REPORTS

The following geotechnical reports are available for the subject property. These geotechnical reports are consolidated to include the factual information available from all these reports. Logs from all these reports are included in Appendices A to J of this report.

- Parcel A Preliminary Geotechnical Investigation Report by AMEC for 6588 & 6596 Ninth Line, Mississauga; AMEC Project No. TT63043, report dated April 28, 2006;
- 2. Parcel B Preliminary Geotechnical Investigation Report by Shad for Property P455; Shad Project No. T08046, report dated October 8, 2008;
- 3. Parcel C Geotechnical Investigation Report by AME for 6432 Ninth Line, Mississauga; AME Project No. 40859, report dated January 2006;
- 4. Parcel D Preliminary Geotechnical Investigation Report by Shad for Property P456; Shad Project No. T08046, report dated October 7, 2008;
- 5. Parcel E Preliminary Geotechnical Investigation Report by Sirati for 6314 Ninth Line, Mississauga; Sirati Project No. SP16-181-10, report dated January 30, 2017;
- Parcel F Preliminary Geotechnical Investigation Report by Shad for 6302 Ninth Line, Mississauga; Shad Project No. T08040, report dated September 8, 2008;
- 7. Parcel G Preliminary Geotechnical Investigation Report by Shad for Property P457; Shad Project No. T08046, report dated October 6, 2008;
- 8. Parcel H Preliminary Geotechnical Investigation Report by Shad for 6252 Ninth Line, Mississauga; Shad Project No. T08005, report dated May 30, 2008;
- 9. Parcel I Preliminary Geotechnical Investigation Report by Shad for Property P458-6168 Ninth Line, Mississauga; Shad Project No. T18723-B, report dated April 6, 2018;
- Parcel J Preliminary Geotechnical Investigation Report by AMEC for 6136 Ninth Line, Mississauga; AMEC Project No. TT63045, report dated May 26, 2006.

## 3. FIELD AND LABORATORY WORK

A total of nineteen (19) boreholes (BH19-1 through BH19-19, see Drawings 1 to 4 for borehole locations) were drilled at the subject site by DS, to depths ranging from 3.3 to 8m. Boreholes were drilled with solid and hollow stem continuous flight augers equipment by a drilling sub-contractor under the direction and supervision of DS personnel. 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 laboratory for detailed examination by the project engineer and for laboratory testing.

As well as visual examination in the laboratory, all soil samples from geotechnical boreholes were tested for moisture contents. Grain size analyses of five (5) selected soil samples were conducted and the results are presented in **Drawing 25**. Atterberg Limits testing was conducted on selected two soil samples and results are presented on the respective borehole logs.

Water level observations were made during and upon completion of drilling. Eight (8) monitoring wells of 50mm diameter were installed for the long-term groundwater monitoring in boreholes BH19-6 to BH19-8, BH19-11, BH19-12, BH19-15, BH19-17 and BH19-18.

The surface elevations at the borehole locations were surveyed by DS staff, using a differential GPS unit leased from Sokkia.

## 4. SUBSURFACE CONDITIONS

The borehole location plans are shown on Drawings 1 to 4. General notes on sample description are provided on Drawing 5. The subsurface conditions in the boreholes by DS are presented in the individual borehole logs presented on **Drawings 6 to 24**. The borehole logs by others are attached in Appendices A to J.

The subsurface conditions are detailed below for each separate parcel of the project.

## 4.1 Parcel A

AMEC drilled two boreholes (BH1 and BH4) on Parcel A, to a depth of 4.6m below the existing grade. Other two boreholes (BH2 and BH3) were located outside of Parcel A boundary, but very close to the north property line. Therefore, soil and groundwater conditions in all four (4) boreholes are summarized in this section. AMEC borehole logs and location plan are attached in **Appendix A** of this report.

#### 4.1.1 Soil Conditions

<u>Topsoil & Weathered/Disturbed Native Soils:</u> A surficial layer of topsoil, about 280mm to 410mm thick, was found in all boreholes. It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

Below the topsoil, a weathered/disturbed clayey silt to silty clay layer was found in all boreholes, extending to a depth of 0.6m below the existing grade. This material contained trace topsoil/organics and rootlets.

<u>Silty Clay to Clayey Silt Till:</u> Below the weathered/ disturbed soils in BH2 to BH4 and silty sand to sandy silt till in BH1, silty clay to clayey silt till deposits were encountered, extending to the maximum explored depth of BH1, overlying sandy silt to silty sand till in BH2 and BH3; and overlying till/shale complex in

BH4. These deposits were found to have generally a stiff to hard consistency with occasional stiff layers, with measured SPT 'N' values ranging from 14 to more than 50 blows per 300 mm of penetration.

<u>Sandy Silt to Silty Sand Till:</u> Below the weathered/ disturbed soils in BH1 and clayey silt to silty clay till in BH2 & BH3, sandy silt to silty sand till deposits were encountered, overlying clayey silt to silty clay till in BH1, extending to the maximum explored depth of BH2, overlying till/shale complex in BH3. These deposits were found to be in dense to very dense state, with measured SPT 'N' values ranging from 32 to more than 50 blows per 300 mm of penetration.

<u>Till / Shale Complex</u>: A till shale complex unit was encountered in BH3 and BH4 below the till deposits and overlying shale bedrock. This unit is transition zone from till to shale bedrock and contain properties of hard/dense sandy silt to silty sand till with bedrock slabs.

<u>Shale Bedrock:</u> Shale bedrock of Queenston Formation was encountered in BH4 at a depth of 2.9m, corresponding to Elevation 193.5m. Shale bedrock was not proven by rock coring.

#### 4.1.2 Groundwater Conditions

During drilling or upon completion, short-term (unstabilized) groundwater levels were found in BH1 to BH3 at depths ranging from 0.9 to 3.8m below the existing grade. BH4 was found dry and open upon completion.

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

#### 4.2 Parcel B

Three boreholes (BH19-3 to BH19-5, See Drawing 2 for borehole locations) were drilled on Parcel B by DS to a depth of 4.8m below the existing grade. Shad drilled five (5) boreholes (BH1 to BH5) on Parcel B in October 2008, to depths varying from 4.1 to 5.1m below the existing grade. DS borehole logs for Parcel B are provided on Drawings 8 to 10. Shad borehole logs and location plan are attached in Appendix B of this report.

#### 4.2.1 Soil Conditions

<u>Topsoil, Fill and Weathered/Disturbed Soils:</u> A surficial layer of topsoil of 150mm to 350mm thick was found in the boreholes. It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

Fill materials consisting of sandy silt, silty sand, sand and clayey silt were encountered in the boreholes, extending to depths of 0.8 to 1.5m. The clayey silt fill encountered in BH19-3 below the sandy silt fill is possibly the weathered/disturbed native as a result of agricultural use of the land. A ploughed/

disturbed silty clay / clayey silt layer, extending to depths of 0.5 m to 1.8 m, was also noted on Shad borehole logs.

<u>Clayey Silt to Silty Clay Till Deposit:</u> Below the fill material or weathered/disturbed native, a clayey silt to silty clay till deposit was encountered in all boreholes, overlying shale bedrock or sandy silt to silty sand till. The cohesive till deposits were present in a stiff to hard consistency, with measured SPT 'N' values ranging from 11 to over 50 blows per 300mm penetration. Occasional cobble and boulder and wet sand seams were inferred within the till deposits.

<u>Sandy Silt to Silty Sand Till:</u> Below the clayey silt till in BH19-4 & BH19-5, a sandy silt to silty sand till deposit was encountered, overlying shale bedrock. Sandy silt to silty sand till was present in a very dense state, with measured SPT 'N' values of greater than 50 blows per 300 mm of penetration. Occasional cobble and boulder and wet sand seams were inferred within the till deposits.

<u>Shale Bedrock:</u> Shale bedrock of Queenston Formation was encountered in the boreholes (DS & Shad) at depths ranging from 2.5 to 4.6m below the existing grade. Shale bedrock was not proven by rock coring. The approximate depth and elevation of the shale bedrock surface at the borehole locations are listed on Table 4.2.1 below.

Borehole	Depth of Shale Bedrock Surface	Approximate Elevation of	Notes
No.	below Existing Ground (m)	Shale Bedrock Surface (m)	
BH19-3 4.6		189.3	Augered
BH19-4	4.6	189.3	Augered
BH19-5	4.6	188.6	Augered
BH1 2.7		-	Augered
BH2 2.7		-	Augered
вн3	2.5	-	Augered
BH4	3.8	-	Augered
BH5	3.0	-	Augered

Table 4.2.1: Approximate Depth and Elevation of Shale Bedrock Surface

#### 4.2.2 Groundwater Conditions

During drilling or upon completion, all DS boreholes were found dry and open. Short-term groundwater (upon completion of boreholes) in Shad boreholes was measured at 1.8 m, 2.7m and 4.2 m depths at BH1, BH3 and BH4, respectively.

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

#### 4.3 Parcel C

Three boreholes (BH19-1, BH19-2 & BH19-6, See Drawing 2 for borehole locations) were drilled on Parcel C by DS to depths ranging from 3.3 to 7.9m below the existing grade. AME drilled eight (8)

boreholes (BH1 to BH8) on Parcel C in January 2006, to depths varying from 2.0 to 4.8m below the existing grade. AME borehole logs and location plan are attached in Appendix C of this report.

## 4.3.1 Soil Conditions

<u>Topsoil, Fill and Weathered/Disturbed Soils:</u> A surficial layer of topsoil of 50mm to 200mm thick was found in the boreholes. It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

Fill materials consisting of sandy silt and clayey silt were encountered in the boreholes, extending to depths of 0.8 to 1.6m. The clayey silt fill encountered in BH19-1 and BH19-2 is possibly the native soil weathered/disturbed as a result of agricultural use of the land.

<u>Clayey Silt Till:</u> Below the fill materials or weathered/ disturbed soils, clayey silt till deposits were encountered, overlying sandy silt to silty sand till or overlying till/shale complex and shale bedrock. These deposits were found to have generally a stiff to hard consistency, with measured SPT 'N' values ranging from 12 to more than 50 blows per 300 mm of penetration. Occasional cobble/boulders were inferred within the till deposit during drilling.

<u>Sandy Silt to Silty Sand Till:</u> Below the clayey silt till in BH19-1, BH19-6, AME BH1 to BH3, & BH8, sandy silt to silty sand till deposits were encountered, extending to the maximum explored depths of boreholes. These deposits were found to be in dense to very dense state, with measured SPT 'N' values ranging from 41 to more than 50 blows per 300 mm of penetration. Occasional cobble/boulders were inferred within the till deposit during drilling.

<u>Till / Shale Complex</u>: A till shale complex unit was encountered in BH19-2 below the clayey silt till deposit. This unit is the transition zone from till to shale bedrock and contain properties of hard/dense till and bedrock slabs.

**Shale Bedrock:** Shale bedrock was encountered in AME boreholes BH5 to BH7 at depths ranging from 2.1to 2.7m below the existing grade, corresponding to Elevation 190.0 to 190.7m. Shale bedrock was not proven by rock coring.

Table 4.3.1: Approximate Depth and Elevation of Shale Bedrock Surface

Borehole	Depth of Shale Bedrock Surface	Approximate Elevation of	Notes
No.	below Existing Ground (m)	Shale Bedrock Surface (m)	
BH5 2.1		190.7	Augered
BH6	2.1	190.0	Augered
BH7	2.7	190.1	Augered

#### 4.3.2 Groundwater Conditions

During drilling or upon completion, short-term (unstabilized) groundwater levels were found in boreholes at depths ranging from 1.8 to 4.6m below the existing grade. Long-term (stabilized) groundwater levels in the monitoring wells were found at depths ranging from 0.8m above the ground to 0.7m below the existing grade, as summarized on Table 4.3.2 below.

				<b>-</b>
Borehole	Surface	Date of Observation	Water Level	Water Level
	Elevation (m)		Depth (mbgs)	Elev. (m)
BH19-6	191.7	May 17, 2018	0.3	191.4
BH1*	191.0	Jan. 17, 2006	0.7	190.3
BH2*	191.1	Jan. 17, 2006	0.5	190.6
BH6*	192.1	Jan. 17, 2006	-0.7**	192.8**
BH7*	192.8	Jan. 17, 2006	-0.8**	193.6**

**Table 4.3.2: Groundwater Levels Observed in Monitoring Wells** 

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

#### 4.4 Parcel D

Shad drilled seven boreholes (BH1 to BH7, See Drawing 2 for borehole locations) on Parcel D in October 2008, to depths varying from 4.8 to 5.1m below the existing grade. Shad borehole logs and location plan are attached in **Appendix D** of this report.

#### 4.4.1 Soil Conditions

Topsoil & Weathered/Disturbed Native Soils: A surficial topsoil layer was contacted at all borehole locations, generally ranging in thickness from 100 to 200mm, with the exception of BH6 where the topsoil layer was 450mm thick. It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

The topsoil layer at all borehole locations was underlain by a weathered and disturbed silty clay / clayey silt with trace topsoil and organics, extending to depths ranging from 0.9 m to 1.8 m below the existing grade. The weathered/disturbed layer is possibly a result of agricultural use of the land.

<u>Silty Clay to Clayey Silt Till:</u> Clayey silt / silty clay till was encountered below the weathered/disturbed layer at all borehole locations and extended to maximum explored depths of boreholes. Occasional sand seams were encountered within the till deposit across the site. Furthermore, it should be noted that, at the boreholes drilled in the vicinity of the north property line (i.e., BH5 and BH6), weathered shale fragments were present within the till below a depth of about 2.5 m below the ground surface.

<sup>\*</sup>AME Wells; \*\*Artisan Conditions (above grade water levels)

Standard Penetration Tests performed within the glacial clayey silt / silty clay till deposit yielded 'N'-values ranging from 16 to over 50 blows per 300mm penetration, indicating a very stiff to hard consistency. However, immediately below the weathered/disturbed layer, stiff deposits with lower 'N'-values of 10 and 14 blows per 300mm spoon penetration were also encountered.

#### 4.4.2 Groundwater Conditions

Groundwater conditions were monitored during drilling and upon the completion of drilling. Short-term (unstabilized) groundwater in boreholes was measured at depths ranging from 1.5m to 4.4m below existing ground surface, except for BH3 and BH6 which were found to be dry.

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

#### 4.5 Parcel E

Four boreholes (BH19-12 to BH19-15, see Drawing 3 for borehole locations) were drilled on Parcel E by DS Consultants Ltd. to depths ranging from 4.8 to 6.7m. Sirati drilled four boreholes (BH1 to BH4) on Parcel E in January 2017, to a depth of 8.2m below the existing grade. Sirati's borehole logs and location plan is attached in **Appendix E** of this report.

## 4.5.1 Soil Conditions

<u>Topsoil & Fill Materials:</u> A 100 to 250 mm thick surficial layer of topsoil was found at the location of BH19-13, BH19-14, and BH4. Fill material was encountered in all the boreholes, extending to depths ranging from 0.9 to 2.3m. Fill material was heterogeneous and consisted of sand & gravel, sandy silt and clayey silt to silty clay. Inclusions of topsoil and organics were noted in the fill material. A buried topsoil layer about 50mm thick was noted in Sirati BH1 within the fill.

<u>Silty Clay/Clayey Silt:</u> Below the fill material, upper native soil consisting of clayey silt to silty clay was encountered in the boreholes, overlying silty clay till. Clayey silt to silty clay was present in a firm to stiff consistency, with measured SPT 'N' values ranging from 5 to 9 blows per 300mm penetration.

<u>Glacial Till Deposits:</u> Below the clayey silt to silty clay or fill material, glacial till deposits consisting of sandy clayey silt to silty clay till were encountered in all the boreholes, extending to the maximum explored depths of boreholes. The till deposits were present in a stiff to hard consistency and dense to very dense state, with measured SPT 'N' values ranging from 12 to over 50 blows per 300mm penetration. Occasional cobble and boulder and wet sand seams were inferred within the till deposits.

#### 4.5.2 Groundwater Conditions

During drilling or upon completion, no free-standing water was found in the boreholes on short-term basis. Long-term (stabilized) groundwater levels in the monitoring wells were found at depths ranging

from 0.4 to 2.1m below the existing grade, corresponding to Elevations 188.8 to 190.7m, as summarized on Table 4.5.2 below.

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Borehole	Surface	Date of Observation	Water Level	Water Level
	Elevation (m)		Depth (mbgs)	Elev. (m)
BH19-12	190.9	May 17, 2018	0.9	190.0
BH19-15	191.1	May 17, 2018	0.4	190.7
BH1*	191.1	Jan. 23, 2017	0.7	190.4
BH3*	190.9	Jan. 23, 2017	0.8	190.1
BH4*	190.9	Jan. 23, 2017	2.1	188.8

Table 4.5.2: Groundwater Levels Observed in Monitoring Wells

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

#### 4.6 Parcel F

Four boreholes (BH19-16 to BH19-19, see Drawing 3 for borehole locations) were drilled by DS on Parcel F to a depth of about 6.5m below the existing grade. DS's borehole logs are provided on Drawings 21 to 24.

It is understood that Shad drilled five (5) boreholes (BH1 to BH5) in Parcel F in September 2008, however the borehole logs and location plan were missing from Shad's report provided to our office.

#### 4.6.1 Soil Conditions

<u>Fill Materials:</u> Fill material was encountered in all the boreholes, extending to depths ranging from 1.5 to 2.6m. Fill material was heterogeneous and consisted of wood chips, gravelly sand and clayey silt. Inclusions of topsoil and organics in varying proportions were noted in the fill materials.

<u>Clayey Silt/Silty Clay:</u> Below the fill material, upper native soil consisting of clayey silt to silty clay was encountered in boreholes BH19-16 to BH19-18, overlying clayey silt till. Clayey silt to silty clay was present in a firm to very stiff consistency, with measured SPT 'N' values ranging from 6 to 16 blows per 300mm penetration.

<u>Cohesive Till Deposits:</u> Below the clayey silt to silty clay or fill material, clayey silt till deposits were encountered in all boreholes extending to the maximum explored depths. The till deposits were present in a stiff to hard consistency, with measured SPT 'N' values ranging from 10 to over 50 blows per 300mm penetration. Occasional cobble and boulder and wet sand seams were inferred within the till deposits.

<u>Sand:</u> A water bearing sand deposit was found embedded within the clayey silt till in BH19-19, at a depth of 6.1m. Occasional wet sand seams embedded in till were also noted in other boreholes. Sand was present in a compact state, with measured SPT 'N' value of 21 blows per 300mm penetration.

<sup>\*</sup>Sirati Wells

#### 4.6.2 Groundwater Conditions

During drilling or upon completion, no free standing water was found in the boreholes, except in BH19-19 where the short-term water level was found at a depth of 5.5m. Stabilized groundwater levels in the monitoring wells installed in BH19-17 and BH19-18 were found at a depth of 0.6m below the existing grade, corresponding to Elevations 190.3 to 190.5m, as summarized on Table 4.6.2 below.

Borehole	Surface Elevation (m)	Date of Observation	Water Level Depth (mbgs)	Water Level Elev. (m)
BH19-17	191.0	May 17, 2018	0.6	190.5
BH19-18	190.9	May 17, 2018	0.6	190.3

**Table 4.6.2: Groundwater Levels Observed in Monitoring Wells** 

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

#### 4.7 Parcel G

Shad drilled five (5) boreholes (BH1 to BH5) on Parcel G in October 2008, to a depth of about 5m below the existing grade. Shad borehole logs and location plan is attached in Appendix G of this report.

#### 4.7.1 Soil Conditions

<u>Topsoil & Weathered/Disturbed Native Soils:</u> A surficial layer of topsoil of 100mm to 150mm thick was found at borehole locations. This was then underlain by a weathered and disturbed silty clay / clayey silt deposit with traces of topsoil and/or organic stains, extending to depths ranging from 0.6 to 1.5 m below existing ground surface.

It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

<u>Silty Clay to Clayey Silt Till:</u> Clayey silt to silty clay till was encountered below the weathered/disturbed layer at all borehole locations and extended to the maximum explored depths of boreholes. Standard Penetration Tests were performed within the glacial clayey silt / silty clay till deposit, and the 'N'-values were found to predominantly range from 15 to in excess of 50 blows per 300mm penetration, indicating a very stiff to hard consistency. However, at BH4, lower 'N'-values of 4 and 14 blows were also measured, indicating firm to stiff layers within the glacial deposit at this location.

#### 4.7.2 Groundwater Conditions

During drilling or upon completion, short-term (unstabilized) groundwater levels in Shad boreholes were found at depths ranging from 1.2 to 4.4m below the existing grade.

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

#### 4.8 Parcel H

One borehole (BH19-7, See Drawing 4 for borehole location) was drilled by DS Consultants in Parcel H, to a depth of 8m below the existing grade. Shad drilled five boreholes (BH-F1 to BH-F5) on Parcel H in May 2008, to a depth of about 5m below the existing grade. Shad borehole logs and location plan are attached in Appendix H of this report.

#### 4.8.1 Soil Conditions

<u>Topsoil, Fill & Weathered/Disturbed Native Soils:</u> A surficial layer of topsoil of 100mm to 400mm thick was found at borehole locations. This was then underlain by a fill layer or weathered and disturbed silty clay / clayey silt with trace topsoil/organics, extending to depths ranging from 0.8 to 2.3m below the existing ground surface.

It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

<u>Silty Clay to Clayey Silt Till:</u> Clayey silt / silty clay till was encountered below the fill materials or weathered/disturbed layer at all borehole locations and extended to the maximum explored depths of boreholes. Standard Penetration Tests were performed within the glacial clayey silt / silty clay till deposit, and the 'N'-values were found to predominantly range from 10 to in excess of 50 blows per 300mm penetration, indicating a stiff to hard consistency. Occasional cobble/boulder and sand seams/layers were present embedded within the till deposits.

### 4.8.2 Groundwater Conditions

During drilling or upon completion, short-term (unstabilized) groundwater levels in Shad boreholes were found at depths ranging from 1.3 to 4.2m below the existing grade. The stabilized (long-term) groundwater table in the monitoring well installed in BH19-7 was measured at a depth of 1.1m on May 17, 2019, corresponding to Elevation. 189.6m.

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

#### 4.9 Parcel I

One borehole (BH19-8, See Drawing 4 for borehole location) was drilled by DS Consultants in Parcel I, to a depth of 6.6m below the existing grade. Shad drilled six boreholes (BH1 to BH6) on Parcel I in March 2018, to a depth of about 5m below the existing grade. Shad borehole logs and location plan are attached in Appendix I of this report.

#### 4.9.1 Soil Conditions

<u>Topsoil, Fill & Weathered/Disturbed Native Soils:</u> A surficial layer of topsoil of 300mm to 500mm thick was found at Shad borehole locations. The surficial topsoil was then underlain by a fill layer or weathered and disturbed clayey silt to sandy silt with traces of topsoil and/or organic stains, extending to depths ranging from 0.8 to 2.3m below existing ground surface.

It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

<u>Clayey Silt to Silty Clay</u>: Clayey silt to silty clay deposit was encountered below the fill materials or weathered/ disturbed native soils that extended to depths of 1.9 to 6.1m below the existing ground surface. Standard Penetration Tests performed within the clayey silt to silty clay deposit revealed its soft to very stiff consistency, as indicated with measured SPT 'N'-values of 2 to 18 blows per 300mm penetration. The moisture contents in the tested samples of clayey silt to silty clay ranged between 14 to 35%.

In BH19-8, a layer of soft silty clay was encountered at depth of 4.6 to 6.1m, with a measured SPT 'N' value of 2 blows per 300mm penetration.

<u>Silty Clay to Clayey Silt Till:</u> Clayey silt / silty clay till was encountered below the silty clay to clayey silt and extended to the maximum explored depths of boreholes. Standard Penetration Tests performed within the glacial clayey silt to silty clay till deposit indicated a very stiff to hard consistency, with measured SPT 'N'-values ranging from 18 to in excess of 50 blows per 300mm penetration. Occasional cobble/boulder were present embedded within the till deposits.

#### 4.9.2 Groundwater Conditions

During drilling or upon completion, short-term (unstabilized) groundwater levels were found in boreholes at depths ranging from 1.0 to 4.6m below the existing grade. Stabilized groundwater levels in the monitoring wells were found at 0.1m above the ground to 0.4m below the existing grade, corresponding to Elevations 189.5 to 190.1m, as summarized on Table 4.9.2 below.

**Date of Observation Borehole** Surface **Water Level** Water Level Elevation (m) Depth (mbgs) Elev. (m) -0.1\*\* BH19-8 190.0 May 17, 2019 190.1 **BH3\*** 190.0 April 4, 2018 0.5 189.5 **BH4\*** 190.1 April 4, 2018 0.1 190.0

**Table 4.9.2: Groundwater Levels Observed in Monitoring Wells** 

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

<sup>\*</sup>Shad Wells; \*\*Artesian Conditions (above ground water levels)

#### 4.10 Parcel J

Three boreholes (BH19-9 to BH19-11, See Drawing 4 for borehole location) were drilled by DS Consultants in Parcel J, to depths varying from 3.1 to 6.1m below the existing grade. AMEC drilled five boreholes (BH1 to BH5) on Parcel J in May 2006, to depths ranging from 5.5 to 6m below the existing grade. AMEC borehole logs and location plan are attached in Appendix J of this report.

#### 4.10.1 Soil Conditions

<u>Topsoil & Fill Materials:</u> A surficial layer of topsoil of 100mm to 360mm thick was found in all boreholes. It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil at the site.

Below the topsoil, fill materials consisting of clayey silt to sandy silt, sandy silt to silty sand and silt were found in boreholes BH19-9 to BH19-11, extending to a depth of 2.3m below the existing grade. Fill materials contained traces of topsoil/organics and concrete fragments; and was generally present in a loose state, with occasional compact layers.

<u>Clayey Silt to Silty Clay:</u> Below the fill materials in DS boreholes and surficial topsoil in AMEC boreholes, a clayey silt to silty clay deposit was encountered, extending to the maximum explored depths of boreholes or underlain by clayey silt to silty clay till deposit. These deposits were found to have generally a firm to hard consistency, with measured SPT 'N' values ranging from 4 to more than 30 blows per 300 mm of penetration.

In BH19-11 and BH2, weak soils of soft to firm silty clay was encountered at depths of 4.6 to 6.1m, with measured SPT 'N' values of 4 to 6 blows per 300mm penetration.

<u>Clayey Silt to Silty Clay Till:</u> Below the clayey silt to silty clay deposit, a clayey silt to silty clay till deposit was encountered in AMEC boreholes BH1 and BH4 below depths of 4.0 to 5.5m, extending to the maximum explored depths of boreholes. These deposits were found to have very stiff to hard consistency, with measured SPT 'N' values ranging from 20 to more than 50 blows per 300 mm of penetration.

#### 4.10.2 Groundwater Conditions

During drilling or upon completion, short-term (unstabilized) groundwater levels were found in AMEC BH1 to BH3 at depths ranging from 3.1 to 3.4m below the existing grade. The stabilized (long-term) groundwater table in the monitoring well installed in DS borehole BH19-11, was measured at a depth of 0.2m on May 17, 2019, corresponding to Elevation. 190.0m.

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

#### 4.11 Comments on Shale Bedrock

Because of the method of drilling and sampling, the surface elevations of the bedrock can be different than indicated on the borehole logs. With augering, the auger may penetrate some of the more weathered shale and the coring may therefore begin below the bedrock surface. Commonly the overburden 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.

The shale bedrock generally contains layers of siltstone, limestone and dolostone. Typically, the hard layers comprise about 15 to 20 percent of the unit. However, higher concentrations of hard layers can be present. The hard layers are usually less than 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 other sites. The layers are actually lenses and they can vary significantly in thickness over short distance.

Methane gas is anticipated in the bedrock. Appropriate care and monitoring is essential in all confined bedrock excavations, particularly for caissons. Stress relief features such as folds and faults are common in the shale bedrock. **Appendix K** presents more details and general comments about the shale bedrock.

## 5. DISCUSSION AND RECOMMENDATIONS

It is proposed to develop the site as a residential subdivision. The lots will therefore be serviced by a network of roads, storm and sanitary sewers and watermains.

## 5.1 WEAK SOIL CONDITIONS AND ARTESIAN GROUNDWATER CONDITIONS

In Parcel I and Parcel J, weak soils of soft to firm silty clay deposits were encountered in BH19-8 in Parcel I and BH19-11 and BH2 in Parcel J. Excessive settlements may occur in these areas due to loads from grade raise and from house/structures. Additional boreholes are required to delineate the horizontal and vertical extents of weak soils. Depending upon the final grade levels and proposed facilities/structures in this area, surcharge preloading may be required to consolidate the weak ground, in order to reduce the post-construction settlements. This must be further investigated during the final geotechnical investigation stage.

Water levels above ground (artesian conditions) were observed in BH6 and BH7 (AME boreholes) in Parcel C and BH19-8 in Parcel J. A hydrogeologist should be retained to review the artesian groundwater conditions for the proposed excavations such as basement excavation and trenching for underground services.

## 5.2 SITE GRADING & ENGINEERED FILL

The development of the site will require demolition of existing structures, clearing and stripping of all topsoil, fill materials and weathered/disturbed native soils containing topsoil/organics. Since all areas

will be developed as either residential lots and/or road/driveways, it is recommended that all fill be placed as engineered fill to provide competent subgrade below house foundations, roads, boulevards, etc.

Prior to placement of engineered fill, all existing surficial topsoil, fill materials and weathered/disturbed native soils containing topsoil/organics should be stripped from planned fill areas to expose the inorganic subgrade. The exposed subgrade should then be proof rolled with a heavy sheepsfoot roller to identify weak areas. Any weak or excessively wet zones identified during proof-rolling should be subexcavated and replaced with compacted competent material to establish stable and uniform conditions. Prior to placement of engineered fill, the subgrade should be inspected and approved by a geotechnical engineer.

General guidelines for the placement and preparation of engineered fill are presented on **Appendix L**. To reduce the risk of improperly placed engineered compacted fill, full-time supervision of the contractor is essential.

The inorganic clayey silt to silty clay (till), sandy silt and silt, free to topsoil & organics, are considered suitable for use as engineered fill, provided that their moisture contents at the time of construction are at or near optimum. Clayey tills are likely to be excavated in cohesive chunks or blocks and will be difficult to compact. They should be pulverized and placed in thin layers not exceeding 150 to 200 mm and compacted using heavy equipment suitable for these types of soils (e.g. heavy sheepsfoot compactors).

## **5.3 ROADS**

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 to silty clay soils.

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

#### For Minor Local or local roads

40 mm HL3 Asphaltic Concrete 50 mm HL8 Asphaltic Concrete 150 mm Granular 'A' 300 mm Granular 'B'

## For collector roads

40 mm HL3 Asphaltic Concrete 80 mm HL8 Asphaltic Concrete 150 mm Granular 'A' 350 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.

## 5.3.1 STRIPPING, SUB-EXCAVATION AND GRADING

The site should be stripped of all topsoil, fill materials and weathered/disturbed soils containing topsoil/organics 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 ±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 Township Standards. The compaction of the new fill should be checked by frequent field density tests.

## 5.3.2 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.

#### 5.3.3 DRAINAGE

The City of Mississauga requires 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 5.3.1, by means of good planning any water trapped in the granular sub-base materials should be drained rapidly towards subdrains or other interceptors.

#### **5.4 SEWERS**

As a part of the site development, a network of new storm and sanitary sewers is to be constructed. It is assumed that the trenches are generally within 4 to 5 m below the existing grade.

#### 5.4.1 TRENCHING

Groundwater table was very high at the time of our investigation, almost at the surface to about 0.8m below the surface. Artisan conditions were encountered in Parcel C and Parcel I with above groundwater levels. Water levels in AME monitoring wells installed in Parcel C at BH6 & BH7 locations was recorded at about 0.7 to 0.8m above the existing grades. Water level in DS monitoring well installed in Parcel I was also recorded at 0.1m above the existing grade.

Further monitoring of groundwater table is recommended at this site. Section 5.1 of this report presents more comments on the artesian groundwater conditions.

Dewatering will be required prior to any excavation in sand and sandy silt to silty sand till below the groundwater table, otherwise it will result in an unstable base and flowing sides. To prevent disturbance of the soil at the bedding level, the groundwater table must be lowered to at least 1.0 m below the lowest excavation base.

The boreholes show that below the existing topsoil and fill, the trenches will be predominantly dug through the silty clay to clayey silt till, sandy silt to silty sand till, till/shale complex and shale bedrock. Groundwater seepage within the clayey silt to silty clay (till) is expected to be minor and manageable by gravity drainage and pumping from filtered sumps.

Excavations can be carried out with heavy hydraulic backhoe. Excavation of the shale can be carried out using heaviest available single tooth ripper equipment. The limestone beds are frequent 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.

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 construction program should be well planned so that the excavation and construction of the sewers would minimize the exposure time for the shale. Otherwise, the application of a thin layer of lean concrete or sprayed concrete may be required.

The sides of excavations in the natural strata can be expected to be temporarily stable at relatively steep side slopes for short periods of time but they should be cut back at slopes no steeper than 1:1 in order to comply with the safety regulations. Where wet sand layers and soft clayey soils are encountered, flattened slopes will be required.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the stiff to hard clayey soils can be classified as Type 2 Soil above groundwater and Type 3 Soil below groundwater. The fill, weathered/disturbed soft to firm native soils and cohesionless soils (silty sand/sand and gravel, sand) can be classified as Type 3 Soil above groundwater and Type 4 Soil below the water table.

It should be noted that the till is a non-sorted sediment and therefore contain cobble and boulders. Possible large obstructions such as buried concrete pieces are also anticipated in the fill material. Provisions must be made in the excavation contract for the removal of possible boulders in the till or obstructions in the fill material.

For sewer trenches dug in shale (weathered or un-weathered) and sewers installed under the groundwater table, seepage between the trench backfill material and the trench wall may cause erosion of the backfill materials. it is recommended that nominal anti-seepage collars be provided to prevent erosion of the backfill materials.

The anti-seepage collar may consist of a clay plug surrounding the sewer pipe. A typical clay plug will be about 1 m thick and extends laterally to a minimum distance of 0.5 m from the pipe circumference with a minimum of 0.3 m embedment into the shale. The on-site native clayey soils may be suitable for such purpose subject to additional sampling and testing.

## 5.4.2 BEDDING

The boreholes show that the sewer pipes will be predominantly laid within the native soils which will provide adequate support for the sewer pipes and allow the use of normal 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 or soft clay. The bedding material should consist of well graded granular material such as Granular 'A' or equivalent. After installing the pipe on

the bedding, a granular surround of approved bedding material, which extends at least 300 mm above the obvert of the pipe, or as set out by the local Authority, should be placed.

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

#### 5.4.3 BACKFILLING OF TRENCHES

Based on visual and tactile examination, the on-site excavated inorganic native soils are considered to be suitable for re-use as backfill in the service trenches provided their moisture contents at the time of construction are within 2 percent of their optimum moisture content. Significant aeration of the wet excavated soils will be required prior to their use as backfill material.

The clayey deposits especially when its consistency is hard is likely to be excavated in cohesive chunks or blocks and will be difficult to compact in confined areas. For use as backfill, the clayey material will have to pulverized and placed in thin layers. The clayey soils will have to be compacted using heavy equipment suitable for these soils which may be difficult to operate in the narrow confines of the trenches. Unless the clayey materials are properly pulverized and compacted in sufficiently thin lifts post-construction settlements could occur. Their use in narrow trenches such as laterals (where heavy compaction equipment cannot be operated) may not be feasible.

Selected inorganic fill and the native soils free from topsoil and organics can be used as general construction backfill where it can be compacted with sheep's foot type compactors. 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 handheld 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.

The backfill should be placed in maximum 200 mm thick layers at or near (±2%) their optimum moisture content and each layer should be compacted to at least 95% SPMDD. In the upper 1.0 m, underneath the road base, the compaction should be increased to 98% SPMDD. Unsuitable materials such as organic soils, boulders, cobbles, frozen soils, etc. should not be used for backfilling.

The on-site excavated soils and especially the clayey soils should not be used in confined areas (e.g. around catch-basins and laterals under roadways) where heavy compaction equipment cannot be operated. The use of imported granular fill together with an appropriate frost taper would be preferable in confined areas and around structures, such as catch-basins.

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.

The topsoil encountered at the site can be used for landscaping fill to raise the grades. Topsoil cannot be reused as foundation and trench backfill material.

#### 5.5 FOUNDATION CONDITIONS

It is understood that the proposed subdivision will consist of single-family homes (detached, townhomes, back-to-backs, and stacked) with one level basement. The finish floor elevations of these proposed singles are not known to us at the time of writing this report.

It should be noted that soft soil conditions were encountered in boreholes BH19-8 in Parcel I and BH19-11 and BH2 in Parcel J) below a depth of about 4.6m, extending to depths of 6.1m and greater than 6.1m respectively. If there is any grade raise proposed in this area, this soft silty clay deposit will undergo consolidation settlement from increased loading conditions from grade raise and house load, resulting in excessive long-term settlements. Depending upon the proposed grade raise (If any) and basement floor elevations of the proposed houses, ground improvement such as surcharge preloading may be required in this area. More comments on the weak soils are presented in Section 5.1 of this report.

The grading plan and founding elevations of the proposed houses/structures must be reviewed by our office when available. Additional boreholes will be required in this area, when final grading plans are available and reviewed.

In other areas where the native soils are competent (stiff to hard or compact to dense soils), the proposed singles homes with one level basement can be supported by spread and strip footings founded on the undisturbed native soils for a bearing capacity of 150 kPa at SLS (Serviceability Limit State), and for a factored geotechnical resistance of 225 kPa at ULS (Ultimate Limit State).

Alternatively, the proposed houses can also be supported by spread and strip footings founded on engineered fill for a bearing capacity of 150 kPa at the serviceability limit states (SLS) and for a factored geotechnical resistance of 225 kPa at the ultimate limit states (ULS), provided all requirements on **Appendix L** are adhered to.

Foundations designed to the specified bearing capacities 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, the upper footing must be founded below an imaginary 10 horizontal to 7 vertical line drawn up from the base of the lower footing. The lower footing must be installed first to help minimize the risk of undermining the upper footing.

It should be noted that the recommended bearing capacities have been calculated by DS from the borehole information for the preliminary design stage only. The investigation and comments are

necessarily on-going as new information of the underground conditions becomes available. For example, more specific information is available with respect to conditions between 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 to validate the information for use during the construction stage.

#### 5.6 FLOOR SLAB

The floor slab can be supported on grade provided all topsoil, fill, and surficially softened/disturbed native 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).

Where engineered fill is used to support the foundations, the floor slab can also be supported by engineered fill.

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

A perimeter drainage system will be required around the exterior basement walls. Basement floor slab should be kept at least 0.5m above the stabilized groundwater table. Otherwise, underfloor drainage system will also be required. The perimeter and underfloor drainage system shown on Drawing 26 is recommended for the basement walls where open cut procedures are used.

#### **5.7 EARTH PRESSURES**

The lateral earth pressures acting on foundation and basement walls may be calculated from the following expression:

$$p = k(\gamma h + q)$$

where, p = Lateral earth pressure in kPa acting at depth h

K = Earth pressure coefficient, assumed to be 0.40 for vertical walls and horizontal backfill for permanent construction

Unit weight of backfill, a value of 21 kN/m3 may be assumed

h = Depth to point of interest in metres

q = Equivalent value of surcharge on the ground surface in kPa

The above expression assumes that the perimeter drainage system prevents the build up of any hydrostatic pressure behind the wall.

## 6. GENERAL COMMENTS AND LIMITATIONS OF REPORT

DS Consultants Ltd. (DS) 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 will assume no responsibility for interpretation of the recommendations in the 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 at the time of preparation. Unless otherwise agreed in writing by DS, 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 test hole 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 test holes may differ from those encountered at the test hole 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 test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

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 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.

DS CONSULTANTS LTD.

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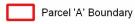
DS Consultants Ltd.

June 5, 2019

# **Drawings**







Borehole (AMEC)



## DS CONSULTANTS LTD.

6221 Highway 7, UNIT 16 Vaughan, Ontario L4H 0K8 Telephone: (905) 264-9393 www.dsconsultants.ca

Title	

Project:

GEOTECHNICAL INVESTIGATION	
Ninth Line Properties, Ninth Line, Mississauga,	ON



Client:
DERRY BRITANNIA DEVELOPMENTS
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Borehole (DS)

Borehole (AME)

Borehole (Shad & Associates INC.)



## DS CONSULTANTS LTD.

6221 Highway 7, UNIT 16 Vaughan, Ontario L4H 0K8 Telephone: (905) 264-9393 www.dsconsultants.ca

DERRY BRITANNIA DEVELOPMENTS LTD.

Project:	GEOTECHNICAL INV	ESTIGATIO	ON	
	Ninth Line Properties	Ninth Line	Mississauga	ON

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Image/Map Source: Google Satellite Image



Project No.: 18-692-100

## **Drawing 5: Notes On Sample Descriptions**

1. 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.

						IS	SMFE SC	IL CLA	SSIFIC	CATION	٧				
CLAY			SILT				SAND				GRA	VEL		COBBLES	BOULDERS
		FINE	MEDIUM	COARSI	FII	NE	MEDIUM	COA	RSE	FINE	MED	MUIC	COARSE		
	0.00	)2	0.006	0.02	0.06	0.2		0.6	2.	0	6.0	20	) 60	) 20	00

#### **EQUIVALENT GRAIN DIAMETER IN MILLIMETRES**

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)		SAND			RAVEL

#### UNIFIED SOIL CLASSIFICATION

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



PROJECT: Preliminary Geotechnical Investigation

CLIENT: Derry Britannia Developments Ltd.

PROJECT LOCATION: Ninth Line, Mississauga, ON

DATUM: Geodetic

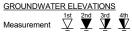
**DRILLING DATA** 

Method: Solid Stem Auger

Diameter: 150mm REF. NO.: 18-692-100

Date: May-13-2019 ENCL NO.: 6

	SOIL PROFILE		8	SAMPL	.ES	<u>بر</u>		RESIS	MIC CO STANCE	PLOT	NE IKA	HON		PLASTI	C NATI	URAL	LIQUID	_	WT	METH	
(m) LEV EPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	SHE O U	AR STI NCONF UICK TE	INED RIAXIAL	TH (kF + ×	FIÉLD VA & Sensiti LAB VA	ANE vity ANE	W <sub>P</sub>	CON \ TER CO	TENT W O ONTENT		POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	AN GRAIN DISTRIE (%	I SIZ BUTIC
0.0	FILL: sandy silt, some asphalt, concrete, trace organics, brown, very moist, compact	IS X	1	SS	<u>부</u> 13	15 X	<u> </u>	-	20 4	0 6	0 8	80 10	00	1	0 2	0 3	30			GR SA	SI
91.2	FILL: silty clay, trace topsoil, greyish brown, trace gravel, moist, loose (possibly weathered/disturbed native)		2	SS	5		191	-									0	-			
90.4	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, stiff		3	SS	14	- - -	190	-							Ю	1		-		8 22	51
2.3	SANDY SILT TILL: some clay, occasional sand seams, trace gravel, brown to grey, moist, dense		4	SS	41	-	400	-							0						
3.1	SILTY SAND TILL: trace clay, trace gravel, occasional cobble/boulder, reddish brown, moist, very dense		5	SS	59		189	-							0					5 34	53
							188	-										-			
87.0	wet below 4.6m		6	SS	98	-	187	-						o							
5.0	END OF BOREHOLE: Notes: 1) Water level at 4.6 mbgl during drilling.																				



GRAPH NOTES





GROUNDWATER ELEVATIONS 

**LOG OF BOREHOLE BH19-2** 1 OF 1 DRILLING DATA PROJECT: Preliminary Geotechnical Investigation CLIENT: Derry Britannia Developments Ltd. Method: Solid Stem Auger PROJECT LOCATION: Ninth Line, Mississauga, ON Diameter: 150mm REF. NO.: 18-692-100 DATUM: Geodetic Date: May-13-2019 ENCL NO.: 7

(m)  ELEV DEPTH  DESCRIPTION  LIMIT CONTENT CO	SOIL PRO				SAMPL		_		DYNAI RESIS	MIC CO TANCE	NE PEN PLOT	NETRAT	ION		DI ASTI	c NATI	JRAL	LIQUID		5	METH	ANE
199.0 TOPSOIL: 125mm FILL: clayey silt, some organics, trace topsoil, dark grey to grey, very moist, compact  1 possibly weathered/disturbed native below 0.8m  2 SS 11  199.8  1.5 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, reddish brown, moist, hard  2 SS 11  190  190  190  190  190  190  190	DESCRI	RIPTION	STRATA PLOT	NUMBER	IYPE	'N" BLOWS 0.3 m	GROUND WATER	ELEVATION	SHEA O UI	AR STI NCONF JICK TE	RENG INED RIAXIAL	TH (kF + . ×	Pa) FIELD V & Sensit LAB V	ANE ivity ANE	W <sub>P</sub> ⊢ WAT	TER CC	N DOMTEN	LIQUID  LIMIT  W <sub>L</sub> ——  Γ (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT W (kN/m³)	AN GRAIN DISTRIB (% GR SA	SIZE UTIC
trace topsoli, dark grey to grey, very moist, compact  1 SS 10 192    possibly weathered/disturbed native below 0.8m    2 SS 11 191    190.8    1.5 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, reddish brown, moist, hard    3 SS 34 190    4 SS 68    190    4 SS 68    189.2    CLAYEY SILT TILL/ SHALE COMPLEX; reddish brown, moist, hard    2 SS 11    191    192    194    195    196    197    198    190    190    189.2    CLAYEY SILT TILL/ SHALE COMPLEX; reddish brown, moist, hard    189.2    COMPLEX; reddish brown, moist, hard    189.2    COMPLEX; reddish brown, moist, hard    189.3    Notes:	TOPSOIL: 125mm	m		⊢	<u> </u>	-	-	_	-												OIT OIT	
below 0.8m  2 SS 11  190.8  1.5 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, reddish brown, moist, hard  3 SS 34  190  4 SS 68  189.2  189.2  COMPLEX: reddish brown, meist, hard  5 SS 58  189  189  189  189  189	FILL: clayey silt, so trace topsoil, dark	some organics, k grey to grey, very		1	SS	10		192	-									0				
1.5 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, reddish brown, moist, hard  3 SS 34  189.2 189.0 CLAYEY SILT TILL/ SHALE COMPLEX: roddish brown, moist, hard  5 SS 58 189 0	possibly weathered below 0.8m	ed/disturbed native		2	SS	11		191	- - - -							0						
189.2 188.0 CLAYEY SILT TILL/ SHALE COMPLEX: reddich brown, moiet, hard END OF BOREHOLE: Notes:	CLAYEY SILT TIL gravel, occasional reddish brown, mo	LL: sandy, trace al cobble/boulder, loist, hard		3	SS	34	-		-								0					
189.2    89.0   CLAYEY SILT TILL/ SHALE   0   5   SS   58     3.3   CLAYEY SILT TILL/ SHALE   0   5   SS   58     189   COMPLEX: reddich brown, moiet, hard   END OF BOREHOLE: Notes:								190	-													
188:0 CLAYEY SILT TILL/ SHALE OS SS 58 189 SS 58 SN DOT BOREHOLE: Notes:				4	SS	68			-							0						
3.3 Aard END OF BOREHOLE: Notes:	CLAYEY SILT TIL	LL/ SHALE	-	F	90	50	1		ļ.							0						
END OF BOREHOLE: Notes:	COMPLEX: roddie	ieh brewn, meiet,	$\frac{1}{1}$	3	ు	26		189								J			$\vdash$	$\vdash$		_
Notes:		OLE:	/																			
		OLE:																				
		pon completion.																				



PROJECT: Preliminary Geotechnical Investigation

CLIENT: Derry Britannia Developments Ltd.

PROJECT LOCATION: Ninth Line, Mississauga, ON

DATUM: Geodetic

DRILLING DATA

Method: Solid Stem Auger

Diameter: 150mm REF. NO.: 18-692-100

Date: May-14-2019 ENCL NO.: 8

	HOLE LOCATION: See Drawing 1 N 4 SOIL PROFILE			AMPL				DYNA RESIS	MIC CO TANCE	NE PEN PLOT	ETRATIC	N		NIAT	IIDAI				METHAN
()						GROUND WATER CONDITIONS			0 4	-		100	PLAST LIMIT	IC NAT MOIS CON	UKAL STURE TENT	LIQUID LIMIT W <sub>L</sub> T (%)	Ä.	IIT WT	METHAN AND
(m)		7.01			S E	WA	z				TH (kPa	\	W <sub>P</sub>		W	$\mathbf{W}_{\!\scriptscriptstyle L}$	(KPa)	NL UN	GRAIN SI
LEV EPTH	DESCRIPTION	Ι¥	3ER		BLOWS 0.3 m	S E	ATIC	O UI	NCONF	INED	+ FIE	LD VANE Sensitivity		TED 04		- (0()	Š (S	TUR/	DISTRIBUT
93.9		STRATA PLOT	NUMBER	TYPE	ż	SROI	ELEVATION		JICK TF 10 4		× ĹÅ ) 80	B VANE 100		TER CO		I (%) 30		≥	GR SA SI
93.9 93.7	TOPSOIL: 150mm	7/1/	-		-			-											G1
0.2	FILL: sandy silt, trace rootlets,	XX	1	SS	8			-						0					
	brown, moist to very moist, loose	$\bowtie$						E											
93.1		$\otimes$						[											
0.8	FILL: clayey silt, some topsoil, dark brown, moist, compact (possibly						193												
	brown, moist, compact (possibly weathered/disturbed native)	$\bowtie$	2	SS	13			[							0				
	,	$\otimes$						-											
92.4	OLAVEY OUT TILL							-											
1.5	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder,							F											
	reddish brown, moist, very stiff to hard		3	SS	17		192							0					
	nard		<u> </u>					-											
								[											
	grey below 2.3m	19						F											
			4	SS	27			F						0					
							191										1		
		1						-											
					50/			_											
			5	SS	100mr	ή.		ŀ						0					
								_											
			1				190												
								-											
								-											
89.3								-											
89:1	SHALE: weathered, reddish brown		6	SS	50/ 125mr	1		-					0						
4.8	END OF BOREHOLE:				<u> 25m</u>	Ï													
	Notes: 1) Borehole dry upon completion																		
1																			
					l .														



PROJECT: Preliminary Geotechnical Investigation

CLIENT: Derry Britannia Developments Ltd.

PROJECT LOCATION: Ninth Line, Mississauga, ON

DATUM: Geodetic

DRILLING DATA

Method: Solid Stem Auger

Diameter: 150mm REF. NO.: 18-692-100

Date: May-14-2019 ENCL NO.: 9

BORE	HOLE LOCATION: See Drawing 1 N 4  SOIL PROFILE	8244		E 598 SAMPL				DYNAI	MIC CO	NE PEN PLOT	ETRAT	TION								
(m)		_				TER			0 4	•	$\sim$	0 1	00	PLASTI LIMIT	C MATI MOIS CON	URAL TURE TENT	LIQUID LIMIT	Ä.	TW TIN	METHANE AND
ELEV EPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	0 UI • QI	CONF	RIAXIAL	+ ×	FIÉLD V & Sensit LAB V	ANE ivity ANE 00		TER CC	N DNTENT	w <sub>L</sub> Γ (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	GRAIN SIZ DISTRIBUTI (%) GR SA SI
99.9	TOPSOIL: 150mm FILL: silty sand, trace gravel, trace organics, grey, wet, very loose		1	SS	1			- - - -									0			
0.8	CLAYEY SILT: some sand, grey, moist, stiff		2	SS	11		193	-							0					
1.5	CLAYEY SILT TILL: sandy, occasional sand seams, trace gravel, occasional cobble/boulder, reddish brown, moist, very stiff		3	SS	21	-	192	- - - - -							0					
	grey below 2.3m		4	SS	25	-		-							0					
3.1	SANDY SILT TO SILTY SAND TILL: trace clay, trace gravel, grey, occasional cobble/boulder, moist to very moist, very dense		5	SS	60	-	191	- - - -							o					
		•					190	-										-		
89.3 4.6 89.1	SHALE: weathered, reddish brown		6	SS	50/									0						
4.8	END OF BOREHOLE: Notes: 1) Borehole dry upon completion.				(25m)															



CLIENT: Derry Britannia Developments Ltd.

PROJECT LOCATION: Ninth Line, Mississauga, ON

DATUM: Geodetic

DRILLING DATA

Method: Solid Stem Auger

Diameter: 150mm REF. NO.: 18-692-100

Date: May-14-2019 ENCL NO.: 10

	SOIL PROFILE		s	AMPL	.ES	~		DYN/ RESI	AMIC CO STANCE	NE PEI E PLOT	NETRA	IION		PI ASTI	C NAT	URAL	חטווט		₽	METH	ANE
(m) ELEV EPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	SHE	AR ST JNCONF QUICK T	RENG INED RIAXIAL	TH (kl + - ×	Pa) FIELD V & Sensit LAB V 30 1	ANE ivity ANE	W <sub>P</sub> ⊢ WA	TER CC	w O ONTEN	LIQUID LIMIT W <sub>L</sub> (%)	POCKET PEN. (Cu) (KPa)	-	ANI GRAIN DISTRIB (% GR SA	SIZ IUTI( o)
0.0	TOPSOIL: 300mm	1/ 1/		SS			193										0				
0.3	FILL: sandy silt, trace wood pieces, trace organics/rootlets, brown, wet, very loose		1		2	_		-									0				
0.8	CLAYEY SILT TILL: sandy, trace gravel, reddish brown, moist, hard to very stiff		2	SS	31		192	-							0			-			
	grey below 1.5m		3	SS	25			-							0						
190.9	SANDY SILT TO SILTY SAND						191	_										-			
2.5	TILL: trace clay, trace gravel, occasional cobble/boulder, grey, moist, very dense	0	4	SS	56	-		- - -							0						
		0	5	SS	50/ 25mm	-	190	-							0						
		φ					100	-													
188.6							189	-													
188:4	SHALE: weathered, reddish brown		6	SS	50/ 100mr			-							0						
4.8	END OF BOREHOLE: Notes: 1) Borehole dry upon completion.																				









CLIENT: Derry Britannia Developments Ltd.

PROJECT LOCATION: Ninth Line, Mississauga, ON

DATUM: Geodetic

DRILLING DATA

Method: Solid Stem Auger

Diameter: 150mm REF. NO.: 18-692-100

Date: May-14-2019 ENCL NO.: 11

	SOIL PROFILE		S	AMPL	ES.	~		DYNA RESIS	MIC CO STANCE	NE PE E PLOT	NETRA	TION		рі деті	C NAT	URAL	LIQUID		7	ME	THANE
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	ТУРЕ	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	SHEA O U	AR ST NCONF UICK T	RENG INED RIAXIAI	TH (k + L ×	Pa) FIELD V & Sensit LAB V	OO L ANE vivity ANE OO	W <sub>P</sub> WA	TER C	w o ONTEN	LIMIT W <sub>L</sub>	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	GR/ DISTI	AND AIN SIZE RIBUTIO (%)
191.7 191.5	TOPSOIL: 200mm	71 14		_	-	0 0	ш	-		+0 (	1	1		<del> </del>		20	1			GR S	A SI (
191.5	FILL: clayey silt, trace sand, trace topsoil/ rootlets, brown, moist, very loose		1	SS	2	<u> </u>	W. L. May 2:	-  -  -  -  -  -  -  -  -  -	           							o		-			
0.8	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble, brown, moist, stiff to hard		2	SS	12			[ - - - - -							0						
- - - - - - 2			3	SS	18		190	- - - -							0						
- - - -			4	SS	41		189	- - - - -							0			-			
3188.6 3.1	SANDY SILT TO SILTY SAND TILL: trace clay, trace gravel, occasional/ cobble boulder, brown, moist, dense to very dense	0	5	SS	80		188	-						c				-			
		. 0						-													
. <u>5</u>	wet below 4.6m	0	6	SS	46		187	- - - - -							0					8 4	1 48
- - - - - - - 6		0					186	-										-			
- - - -		•	7	SS	50/ 10mm		185	-						0							
-								- - - - -													
183.8			8	SS	50/ 50mm		184	-						c				-			
183.8 7.9	END OF BOREHOLE: Notes: 1) 50 mm dia. monitoring well installed upon completion Date Water Level(m) May 17, 2019 0.3 mbgl																				





CLIENT: Derry Britannia Developments Ltd.

PROJECT LOCATION: Ninth Line, Mississauga, ON

DATUM: Geodetic

DRILLING DATA

Method: Solid Stem Auger

Diameter: 150mm REF. NO.: 18-692-100

Date: May-14-2019 ENCL NO.: 12

BOREHOLE LOCATION: See Drawing 1 N	N 4823818.8 E 599415.58
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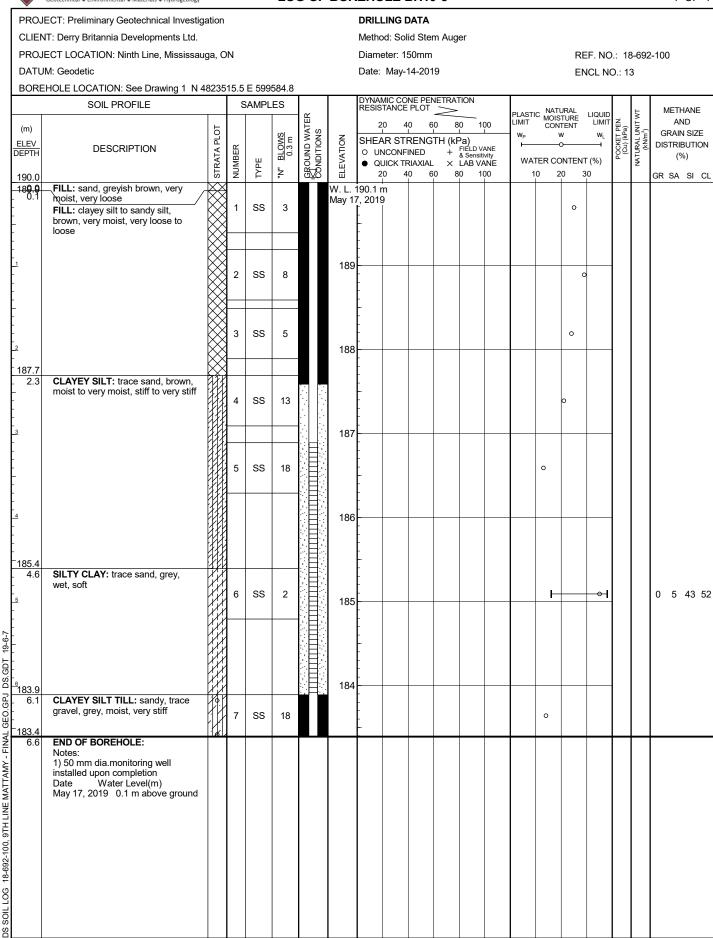
	SOIL PROFILE		S	AMPL	ES	m.		DYNAI RESIS	MIC CO TANCE	NE PEI PLOT	NETRA	TION		PLASTI	C NAT	URAL	LIQUID		ΤV		THAN
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER	ELEVATION	SHEA O UI	AR STI NCONF JICK TE	LENG RENG INED RIAXIAL	TH (kl	Pa) FIELD & Sens LAB \	VANE itivity /ANE 100		TER CO	w o ONTEN	LIMIT W <sub>L</sub>	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	GR/ DISTI	AND AIN SIZ RIBUTI (%) A SI
0.0 - 190.5 - 0.3	TOPSOIL: 250mm  FILL: clayey silt, trace topsoil/	<u>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</u>	1	SS	4			-								0					
189.9	organics, brown, very moist, very loose	$\otimes$					190	-  - 													
0.8 1 - -	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, stiff to hard		2	SS	12	<u>V</u>	W. L.	-  -  189.6    7, 2019  -	m Đ						0						
2			3	SS	20		189	- - - - -							0			-			
3	grey below 2.3m		4	SS	34		188	3							0			-			
-			5	SS	34		187	-							0						
<u>4</u>							107	-													
<u>5</u>			6	SS	28		186	-  -  -  -  -  -							0			-			
<u>6</u>							185	- - - - -										-			
- - - - -			7	SS	46		184	-						c				-			
	25mm sand layer at 7.5m		8	SS	93		183	-						0				-			
8.0	END OF BOREHOLE: Notes: 1) 50 mm dia.monitoring well installed upon completion Date Water Level(m) May 17, 2019 1.1 mbgl																				





GROUNDWATER ELEVATIONS

Measurement  $\sqrt[1st]{2}$   $\sqrt[2nd]{3}$   $\sqrt[3rd]{4}$ 



GRAPH NOTES





PROJECT: Preliminary Geotechnical Investigation

CLIENT: Derry Britannia Developments Ltd.

DRILLING DATA

Method: Solid Stem Auger

PROJECT LOCATION: Ninth Line, Mississauga, ON Diameter: 150mm REF. NO.: 18-692-100

	M: Geodetic							Date:	May-	14-201	9					EN	ICL N	0.: 1	4		
BORE	HOLE LOCATION: See Drawing 1 N 4  SOIL PROFILE	8234	_	E 599 SAMPL				DYNA! RESIS	MIC CO	NE PEN	NETRA	TION			NATI	IDAL		ĺ	l	METHAI	NE.
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	ТҮРЕ	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	SHEA O UN	0 4 AR STI NCONF JICK TE	0 6 RENG INED RIAXIAL	TH (kF + . ×	Pa) FIELD V & Sensii	00 /ANE tivity ANE 00	W <sub>P</sub> WA	C NATU MOIS CON' V TER CC	TENT v D ONTENT	LIQUID LIMIT W <sub>L</sub> ——I F (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	AND GRAIN S DISTRIBU (%) GR SA S	SIZE TIOI
0.0	FILL: silt to clayey silt, trace gravel, concrete fragments, grey, very moist, loose		1	SS	9			-													
1			2	SS	4		189	-								0		-			
1.5	FILL: sandy silt to silty sand, trace topsoil/ organics, greyish brown, wet, loose (possibly weathered/disturbed native)		3	SS	5		188	- - - - -								0					
2.3	CLAYEY SILT: trace sand, brown, moist, very stiff		4	SS	19			- - - -								0					
3 186.9							187														
	1) Borehole dry upon completion.																				

DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7



CLIENT: Derry Britannia Developments Ltd.

PROJECT LOCATION: Ninth Line, Mississauga, ON

DATUM: Geodetic

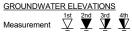
**DRILLING DATA** 

Method: Solid Stem Auger

Diameter: 150mm REF. NO.: 18-692-100

Date: May-14-2019 ENCL NO.: 15

	HOLE LOCATION: See Drawing 1 N 4 SOIL PROFILE			SAMPL				DYNA RESIS	MIC CO	NE PEN PLOT	IETRAT	ΓΙΟΝ			_ NATI	JRAI			_	METHA	NI.
()						GROUND WATER CONDITIONS				0 60		0 10	00	PLASTI LIMIT	MOIS CON	TURE	LIQUID LIMIT W <sub>L</sub> ——•	Ä.	TW TI	AND	
(m)		STRATA PLOT			BLOWS 0.3 m	WA	Z							W <sub>P</sub>	٧	v	WL	KET P (KPa	AL UN N/m³)	GRAIN S DISTRIBU	
LEV PTH	DESCRIPTION	4TA	BER		BLO 0.3	UND	Ĭ	0 U	NCONF	RENG	÷	FIÉLD V & Sensiti	ANE vity	١٨/٨٦	TER CC	NITENI	F (0/ )	POC DO	ATUR (k	(%)	
90.0		STR/	NUMBER	TYPE	þ	SRO	ELEVATION		UICK 11 20 4	RIAXIAL 0 60				1		0 3	30		Ž	GR SA S	3
89:8 89:8	TOPSOIL: 150mm	711/	<del>                                     </del>	·				t	<del>                                     </del>									t		011 071 0	_
0.2	FILL: sandy silt, brown, very moist,	XX	1	ss	5			ŀ								0					
	loose	X	·					F													
00.0		$\bowtie$	┢			1		F													
89.2 0.8	FILL: clayey silt, trace sand,					1		F													
	brownish grey, moist, compact	$\bowtie$	2	SS	12		189	_										ł			
		$\otimes$	_	33	12			ŀ													
88.5		$\bowtie$	_			ł		-													
1.5	FILL: silt to sandy silt, trace clay, brown, wet, loose	$\otimes$						-													
	prown, wet, loose	$\otimes$	3	SS	7			-								0					
		$\bowtie$	1				188														
87.7		$\bowtie$				1		ļ.													
2.3	CLAYEY SILT: trace sand, brown,					1		ļ.													
	moist, very stiff		4	SS	17			-								0					
								ŀ													
86.9						1	187														
3.1	END OF BOREHOLE:	<u>гил.</u>					107														-
	Notes: 1) Borehole dry upon completion.																				
	1) Boronolo dry apon completion.																				









PROJECT: Preliminary Geotechnical Investigation **DRILLING DATA** Method: Solid Stem Auger CLIENT: Derry Britannia Developments Ltd. PROJECT LOCATION: Ninth Line, Mississauga, ON Diameter: 150mm REF. NO.: 18-692-100 DATUM: Geodetic Date: May-14-2019 ENCL NO.: 16 BOREHOLE LOCATION: See Drawing 1 N 4823500.3 E 599757.7 DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE **SAMPLES** PLASTIC NATURAL MOISTURE CONTENT METHANE GROUND WATER CONDITIONS LIQUID AND LIMIT 40 60 NATURAL UNIT 80 100 (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE
Sensitivity
UICK TRIAXIAL X LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) 60 80 20 30 190.2 GR SA SI CL TOPSOIL:100mm 19**0.0** FILL: sandy silt, trace topsoil/ SS 5 0 organics, brownish grey, moist, May 17, 2019 189.4 0.8 POSSIBLE FILL: silt to sandy silt, trace clay, brown, very moist to wet, 2 SS 6 189 3 SS 4 0 188 CLAYEY SILT: trace sand, occasional sand seams, brown, SS 13 moist, stiff to very stiff 0 grey below 3.1m 187 5 SS 20 186 185.6 SILTY CLAY: trace sand, grey, wet, soft to firm 6 SS 4 0 185 7 SS 5 184 END OF BOREHOLE: 6.3 Notes: 1) Water level at 4.6 mbgl during drilling 2) 50 mm dia. monitoring well installed upon completion Water Level(mbgl) May 17, 2019 0.2 m

GEO.GPJ DS.GDT 19-6-7

DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL



CLIENT: Derry Britannia Developments Ltd.

PROJECT LOCATION: Ninth Line, Mississauga, ON

DATUM: Geodetic

DRILLING DATA

Method: Solid Stem Auger

Diameter: 150mm REF. NO.: 18-692-100

Date: May-14-2019 ENCL NO.: 17

	SOIL PROFILE		S	AMPL	ES.	_		DYNAI RESIS	MIC CC TANCE	NE PEN PLOT	VETRAT	ION		ודפא ום	<sub>C</sub> NAT	URAL	רוטוויט		5	METHAI
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER	ELEVATION	SHEA O UI	L AR ST NCONF JICK T	RIAXIAL	TH (kF	Pa) FIELD V & Sensit LAB V	ANE ivity ANE		TER CO		LIQUID LIMIT W <sub>L</sub> ————————————————————————————————————	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	AND GRAIN S DISTRIBU (%) GR SA S
0.0	FILL: asphalt, silty sand with gravel, grey, very moist, loose		1	SS	6			- - - -												
0.8	FILL: clayey silt, trace topsoil, trace sand, grey, very moist, loose		2	SS	8	<u> </u>	190 W. L. May 1	190.0 r	m 9							0		_		
1.5	CLAYEY SILT: trace sand, greyish brown, moist, stiff (weathered/disturbed)		3	SS	8		∴ 189 ∴	-								•		-		
2.3	CLAYEY SILT TILL: sandy, trace gravel, greyish brown to grey, moist, very stiff to hard		4	SS	23		188	-							o					
	grey below 3.1m		5	SS	35			- - - - -							0					
							187	- - - - -										-		
			6	SS	16		186	- - - - - -							0			-		
						□. -	185	-										-		
184.6 6.3	END OF BOREHOLE: Notes: 1) 50 mm dia. monitoring well installed upon completion Date Water Level(m) May 17, 2019 0.9 mbgl		7	SS	56									0						



#### DS CONSULTANTS LTD. **LOG OF BOREHOLE BH-19-13** 1 OF 1 Geotechnical ♦ Environmental ♦ Materials ♦ Hydrogeology DRILLING DATA PROJECT: Preliminary Geotechnical Investigation CLIENT: Derry Britannia Developments Ltd. Method: Solid Stem Auger PROJECT LOCATION: Ninth Line, Mississauga, ON Diameter: 150mm REF. NO.: 18-692-100 DATUM: Geodetic Date: May-14-2019 ENCL NO.: 18 BOREHOLE LOCATION: See Drawing 1 N 4823934.6 E 599211.1 DYNAMIC CONE PENETRATION RESISTANCE PLOT SOIL PROFILE SAMPLES PLASTIC NATURAL MOISTURE CONTENT METHANE GROUND WATER CONDITIONS LIQUID AND LIMIT 40 60 80 100 NATURAL UNIT (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa) O UNCONFINED + FIELD VANE QUICK TRIAXIAL X LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) ż 60 80 10 20 30 GR SA SI CL 190.7 TOPSOIL:100mm 19**0.6** FILL: clayey silt, trace sand, SS 6 0 greyish brown, moist, loose 190 2 SS 6 0 189.2 CLAYEY SILT TILL: sandy, trace 189 gravel, greyish brown, moist, stiff to 3 SS 14 0 SS 20 4 188 occasional sand seams, grey below

187

186

END OF BOREHOLE:
Notes:
1) Borehole open and dry upon

5 SS 32

SS 21

6

3.1m

185.5

DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL GEO.GPJ DS.GDT 19-6-7

GROUNDWATER ELEVATIONS

GRAPH NOTES

+  $^3$ ,  $\times$   $^3$ : Numbers refer to Sensitivity

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



CLIENT: Derry Britannia Developments Ltd.

PROJECT LOCATION: Ninth Line, Mississauga, ON

DATUM: Geodetic

DRILLING DATA

Method: Solid Stem Auger

Diameter: 150mm REF. NO.: 18-692-100

Date: May-14-2019 ENCL NO.: 19

BOREHOLE LOCATION: See Drawing 1 N 4823969.7 E 599261.8

SOIL PROFILE   SAMPLES	METHANE AND GRAIN SIZE JUNE DISTRIBUTION (%)
Characteristics   Characteri	AND
191.3   190.0   TOPSOIL: 200mm   10.0   10.0   20.0   30.0   191.0   10.0   10.0   20.0   30.0   191.0   10.0   10.0   20.0   30.0   191.0   10.0   10.0   20.0   30.0   191.0   10.0   10.0   30.0   10.0   10.0   20.0   30.0   10.0   10.0   20.0   30.0   20.0	2
191.3   190.0   TOPSOIL: 200mm   10.0   10.0   20.0   30.0   191.0   10.0   10.0   20.0   30.0   191.0   10.0   10.0   20.0   30.0   191.0   10.0   10.0   20.0   30.0   191.0   10.0   10.0   30.0   10.0   10.0   20.0   30.0   10.0   10.0   20.0   30.0   20.0	GRAIN SIZE  DISTRIBUTION
191.3   190.0   TOPSOIL: 200mm   10.0   10.0   20.0   30.0   191.0   10.0   10.0   20.0   30.0   191.0   10.0   10.0   20.0   30.0   191.0   10.0   10.0   20.0   30.0   191.0   10.0   10.0   30.0   10.0   10.0   20.0   30.0   10.0   10.0   20.0   30.0   20.0	(%)
Top.0. Topsoil: 200mm  191. SS 2  Fill: clayey silt, trace rootlets, trace organics, brown, moist, very loose to loose  2 SS 7  189.8  1.5 CLAYEY SILT: trace sand, greyish brown, moist, firm (weathered/disturbed)  2 SS 7  189.0  2.3 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard  4 SS 20	GR SA SI CL
FILL: clayey silt, trace rootlets, trace organics, brown, moist, very loose to loose  1 SS 2 191 189.8 1.5 CLAYEY SILT: trace sand, greyish brown, moist, firm (weathered/disturbed) 2 SS 7 189.0 2.3 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard  4 SS 20 1889	
trace organics, brown, moist, very loose to loose  2 SS 7  190  189.8  1.5  CLAYEY SILT: trace sand, greyish brown, moist, firm (weathered/disturbed)  2 SS 7  190  2 SS 7  189.0  CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard  4 SS 20	
189.8 1.5 CLAYEY SILT: trace sand, greyish brown, moist, firm (weathered/disturbed) 2 SS 7  190 2 189.0 2.3 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard  4 SS 20	
189.8  1.5 CLAYEY SILT: trace sand, greyish brown, moist, firm (weathered/disturbed)  2.3 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard  4 SS 20	
189.8  1.5 CLAYEY SILT: trace sand, greyish brown, moist, firm (weathered/disturbed)  2.3 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard  4 SS 20	
189.8  1.5 CLAYEY SILT: trace sand, greyish brown, moist, firm (weathered/disturbed)  2.3 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard  4 SS 20	
189.8 1.5 CLAYEY SILT: trace sand, greyish brown, moist, firm (weathered/disturbed) 3 SS 7  189.0 2.3 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard  4 SS 20	
1.5 CLAYEY SILT: trace sand, greyish brown, moist, firm (weathered/disturbed)  3 SS 7  189.0  2.3 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard  4 SS 20	
(weathered/disturbed)  189.0  2.3  CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard  4 SS 20	
189.0  2.3 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard  4 SS 20	
2.3 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard  4 SS 20	
2.3 CLAYEY SILT TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, very stiff to hard  4 SS 20	
grey, moist, very stiff to hard  4 SS 20	
5 SS 20 188 0 0	
5 SS 20 188	
5 SS 20 188	
186.5 6 SS 50/	
4.8 END OF BOREHOLE:	
Notes: 1) Borehole dry and open upon	
completion completion	
	1



DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL GEO GPJ DS GDT 19-6-7



**GROUNDWATER ELEVATIONS** 

PROJECT: Preliminary Geotechnical Investigation **DRILLING DATA** Method: Solid Stem Auger CLIENT: Derry Britannia Developments Ltd. PROJECT LOCATION: Ninth Line, Mississauga, ON REF. NO.: 18-692-100 Diameter: 150mm DATUM: Geodetic Date: May-14-2019 ENCL NO.: 20 BOREHOLE LOCATION: See Drawing 1 N 4823846.4 E 599163.6 DYNAMIC CONE PENETRATION RESISTANCE PLOT SAMPLES SOIL PROFILE PLASTIC NATURAL MOISTURE CONTENT METHANE GROUND WATER CONDITIONS LIQUID AND LIMIT 40 60 NATURAL UNIT 80 100 (m) STRATA PLOT GRAIN SIZE BLOWS 0.3 m SHEAR STRENGTH (kPa)

O UNCONFINED + FIELD VANE
Sensitivity
UICK TRIAXIAL X LAB VANE ELEVATION ELEV DEPTH DISTRIBUTION **DESCRIPTION** NUMBER (%) WATER CONTENT (%) TYPE 60 80 20 30 GR SA SI CL 191.1 FILL: sandy silt mixed with topsoil, 0.0 191 sand & gravel, dark grey, moist, 7 SS 0 W. L. 190.7 m May 17, 2019 190.3 FILL: clayey silt, brown, very moist, 0.8 loose (possibly weathered/disturbed native) 2 SS 5 190 189.6 FILL: clayey silt, trace sand, brown, moist, firm (Possibly weathered/disturbed native) 3 SS 5 0 189 188.8 **CLAYEY SILT TILL:** sandy, trace gravel, occasional sand seams, SS 22 occasional cobble/boulder, grey, 4 O moist, very stiff to hard 188 5 SS 22 0 187 SS 6 34 0 186 GEO.GPJ DS.GDT 19-6-7 185 SS 47 DS SOIL LOG 18-692-100, 9TH LINE MATTAMY - FINAL END OF BOREHOLE: 1) 50 mm dia. monitoring well installed upon completion
Date Water Level(m) May 17, 2019 0.41 mbgl





CLIENT: Derry Britannia Developments Ltd.

PROJECT LOCATION: Ninth Line, Mississauga, ON

DATUM: Geodetic

DRILLING DATA

Method: Solid Stem Auger

Diameter: 150mm REF. NO.: 18-692-100

Date: May-14-2019 ENCL NO.: 21

	HOLE LOCATION: See Drawing 1 N 4 SOIL PROFILE			SAMPL		m m		DYNA RESIS	MIC CC TANCE	NE PEI PLOT	NETRA	TION		PLASTI	C NAT	URAL	LIQUID		TV.	ME	THANE
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	SHEA O UI	AR ST NCONF UICK TI	L RENG INED RIAXIAL	TH (k + - ×	Pa) FIELD & Sens LAB \	VANE itivity /ANE 100		TER CO	w o ONTEN	LIMIT W <sub>L</sub>	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	DIST	AND AIN SIZE RIBUTIO (%)  SA SI
0.0	FILL: woodchips, loose		1	SS	8	-	191	-									17	7			
0.8	FILL: clayey silt, trace to some organics, dark grey, very moist, loose		2	SS	8	-	190	-								C	o	_			
2			3	SS	6	-	189	- - - - -							0						
188.6	Possibly weathered/disturbed native 2.3m  SILTY CLAY: trace sand, brown, moist to wet, firm to very stiff		4	SS	7	-	100	- - - -								0					
			5	SS	16	-	188	- - - - -												0	7 45
4.0	CLAYEY SILT TILL: sandy, trace gravel, grey, moist, hard						187	-										-			
i			6	SS	31		186	-										-			
<u>3</u>								- - - - -													
184.5 6.7	END OF BOREHOLE:		7	SS	30		185	- - - -							0						
184.5 6.7	Notes: 1) Borehole dry upon completion.																				









CLIENT: Derry Britannia Developments Ltd.

PROJECT LOCATION: Ninth Line, Mississauga, ON

DATUM: Geodetic

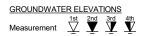
DRILLING DATA

Method: Solid Stem Auger

Diameter: 150mm REF. NO.: 18-692-100

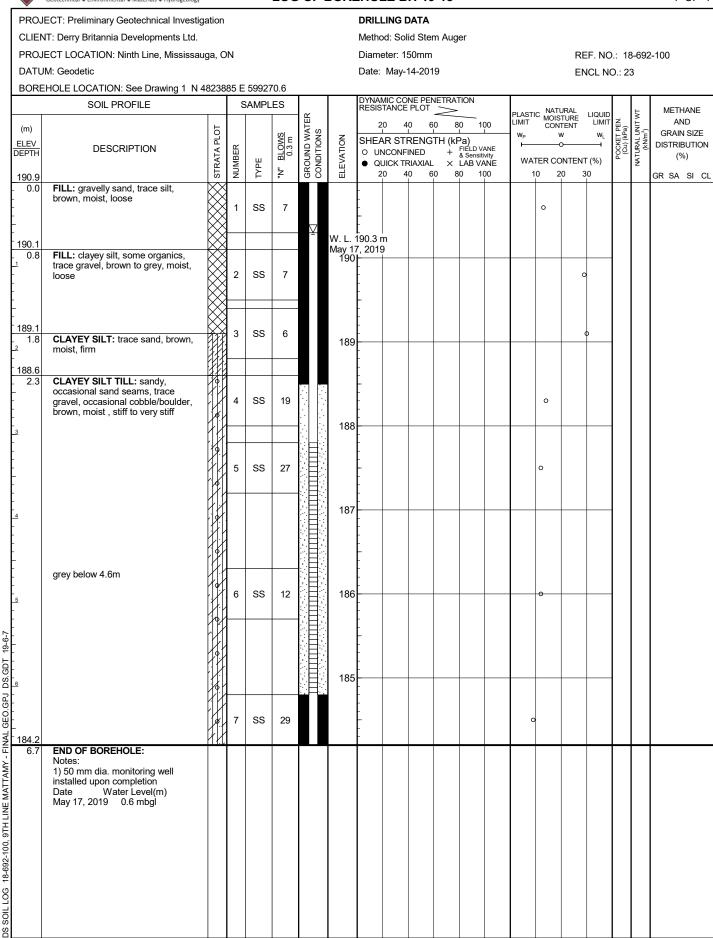
Date: May-14-2019 ENCL NO.: 22

	SOIL PROFILE		S	SAMPL	.ES			DYNA RESIS	MIC CC TANCE	NE PEN PLOT	IETRAT	ION		Ы РЕТІ	C NAT	URAL	HUIID		Þ	METHAN
(m) ELEV EPTH	DESCRIPTION	STRATA PLOT	NUMBER	ТУРЕ	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	SHEA O UI	AR ST NCONF UICK TI	RENG INED RIAXIAL	TH (kP +	a) FIELD VA Sensitiv AB VA	NE ity NE	PLASTI LIMIT W <sub>P</sub> 	TER CC		LIQUID LIMIT W <sub>L</sub> ——I	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	AND GRAIN S DISTRIBU <sup>*</sup> (%) GR SA S
0.0	FILL: woodchips, dark brown, very loose		1	SS	2	<u>∑</u>	W. L. May 1	190.5 7, 201	m 9								184			<u> </u>
0.8	FILL: clayey silt, trace topsoil/ organics, brown and grey, very moist to wet, very loose to loose		2	SS	3		190	-								0		-		
189.2 1.8 188.7	CLAYEY SILT: trace sand, brown, moist, firm		3	SS	8		189	-								0		-		
2.3	CLAYEY SILT TILL: sandy, trace gravel, brown, moist, stiff to hard		4	SS	14		188	- - - - -							(	•		-		
	grey below 3.1m		5	SS	24			- - - - -								0				
							187	- - - -										-		
	occasional cobble/boulder below 4.6 m		6	SS	25		186	- - - - -							0			-		
							185	- - - - -												
184.5			7	SS	79			-							<b>&gt;</b>					
6.5	END OF BOREHOLE: Notes: 1) 50 mm dia. monitoring well installed upon completion Date Water Level(m) May 17, 2019 0.6 mbgl																			





**GROUNDWATER ELEVATIONS** 







CLIENT: Derry Britannia Developments Ltd.

PROJECT LOCATION: Ninth Line, Mississauga, ON

DATUM: Geodetic

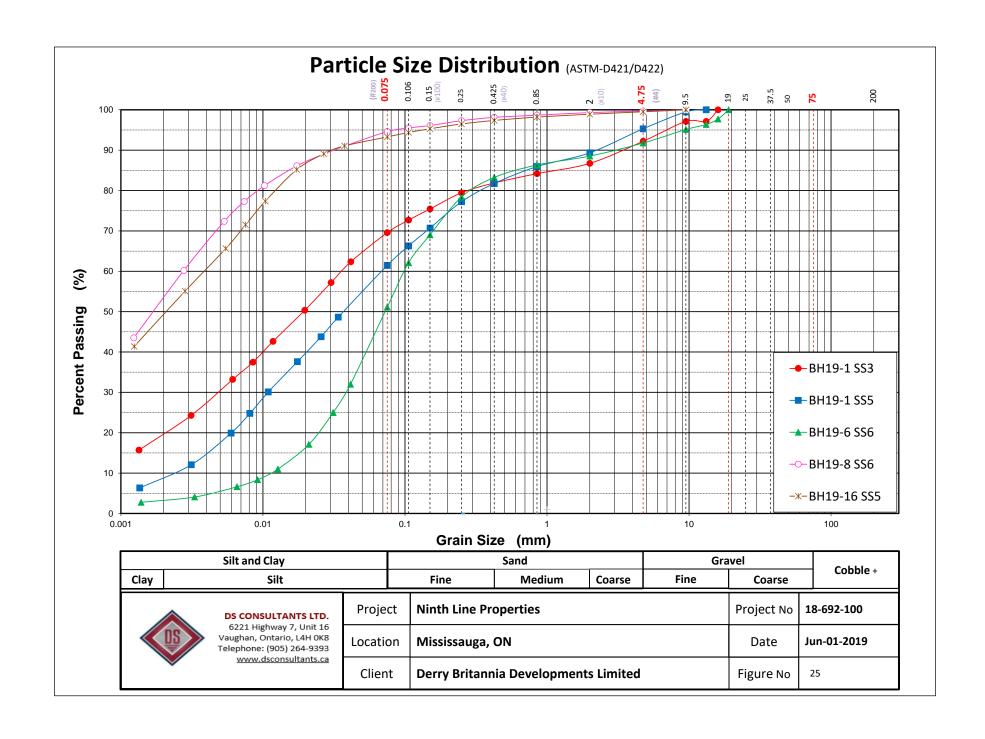
DRILLING DATA

Method: Solid Stem Auger

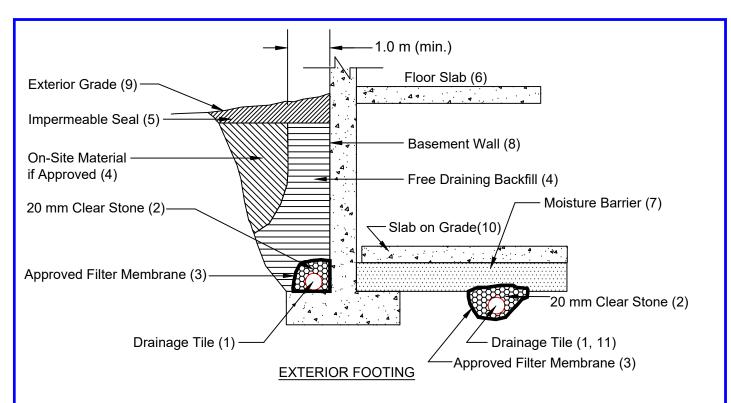
Diameter: 150mm REF. NO.: 18-692-100

Date: May-14-2019 ENCL NO.: 24

	SOIL PROFILE		S	SAMPL	ES	~		DYNA RESIS	MIC CC TANCE	NE PEI PLOT	NETRA	TION		PLASTI	C NAT	URAL	רוטווי		ΤΛ	METHANE
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	ТҮРЕ	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	SHEA O UI	AR ST NCONF UICK TI	RENG INED RIAXIAL	TH (ki + - ×	Pa) FIELD V & Sensit LAB V	ANE ivity ANE 00	PLASTI LIMIT W <sub>P</sub> 	ER C	w o ONTEN	LIQUID LIMIT W <sub>L</sub> T (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (KN/m³)	
191.1 - 0.0 - - - -	FILL: clayey silt, trace topsoil/ rootlets, brown, compact	s X	1	SS	10	00	ш 191	-	20 4	10 6	50 6	50 1			0 2	20 .	30	-		GR SA SI C
- - - 1 - -			2	SS	10		190	-								0		-		
189.6 - 1.5 - - - -	CLAYEY SILT TILL: sandy, trace gravel, occasional cobble, greyish brown, moist, stiff to very stiff		3	SS	10		189	-							C	>				
- - - -			4	SS	21		100	- - - - -							0					
- _3 - -							188	- - - - -										-		
- - - -			5	SS	22			- - - -							0					
- - - -							187	-										-		
- - - <u>-</u> 5	grey below 4.6m		6	SS	13		186	- - - -							0			-		
- 185.6 - 5.5 - - - - -	SAND: trace gravel, grey, wet, compact							-												
	CLAYEY SILT TILL: sandy, trace		7	SS	21	-	185	-							0			-		
184.6 184.5 6.7	gravel, grey, meist, very stiff END OF BOREHOLE: Notes: 1) Water level at 6.1 m during drilling																			



Project: 18-692-100 Drawing No. 26



#### **Notes**

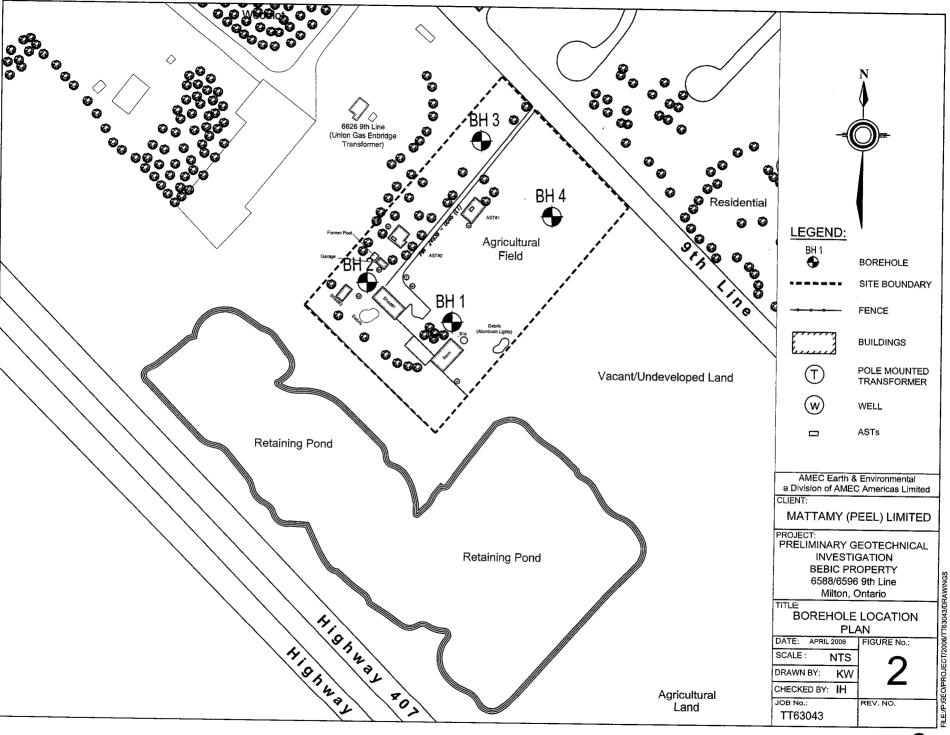
- 1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
- 2. 20 mm (3/4") clear stone 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
- 3. Wrap the clear stone with 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)

## Appendix A

Logs & Location Plan of AMEC Boreholes Drilled in Parcel A







					COF							οВ	H 1		1 OF	1	_			
REF	NT Mattamy Homes Limited (Peel Di									ton, Or										DBY_JF
	UM Geodetic				YPE_				ing					<del></del> .						BY <u>SN</u>
<b>-</b> -	SOIL PROFILE		_	SAMP		<del></del>			DY	NAMIC	CONE	PENET	RATIO	N .				HECK	T	YIH
ELEV DEPTH (m)		STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER	DEPTH	BELEVATION SCALE	SH	20 EAR S	40 TREN	60 IGTH I	80 Pa	100 D VANE	- w <sub>p</sub> ⊢		ATURAL DISTURE DISTURE DISTURE W	W <sub>L</sub>	IT L	DISTRIBUTION
198	about 280 mm TOPSOIL	S	-		F	b \	m		╄	QUICK 20		1AL >		VANE 100	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	10	20	30		GR SA SI CI
1 <u>97.8</u> 0.3 1 <u>97.5</u> 0.6	dark brown to brown SILTY CLAY (Disturbed Native) \ some sand, trace rootlets and		1	ss	11		<u></u>	19												
	organics  organics  moist brown  SILTY SAND / SANDY SILT TILL trace clay, trace to some gravel dense to very dense	0 0	2	SS	32		-  - 1  -	19	7							-				
  - 	moist occasional cobbles	0.0	3	SS	50/3		-	-												
195.5			4	SS	34		<u> </u>	196												
2.6	brown to reddish brown CLAYEY SILT TILL trace gravel trace shale fragments hard moist		5	SS	50/13		_ - 3	195											-	
						Ţ	- 4 	194												
193.5 4.6	End of Borehole		6	<del>- \$\$</del> -	50/3			-		-			+	-	-	_	-	ļ	<u> </u>	
	Groundwater in open borehole on completion: 3.8 m  Depth of cave-in on completion: 3.8 m																			



													3H 2	2	1 OF	- 1				·
RE	IENT Mattamy Homes Limited (Peel Div																	DRIGIN	IATE	BY JF
1	TUM Geodetic								ring											SY SN
-	···	——				_			- 100	/NIAN/IC	CONF	DEME			·		c	HECK	(ED B	Y <u>IH</u>
-	SOIL PROFILE	Τ.	-	SAMF	<del></del>	— 世	ပ္ခ	A S	RE	/NAMIC SISTAI		OT _		)N ~	PLAS	TIC N	ATURAL DISTURE	LIQU	IID.	REMARKS
ELEV DEPT (m) 198	TH DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER	CONDITION		Si o	ZO HEAR : UNCC QUICI 20	NFINE	D XIAL	kPa + FIE	100 LD VANE VANE 100	W <sub>P</sub>		W O	. w <sub>i</sub> 	1 I Σ	DISTRIBUTION (%)
1 <u>98</u> . 0. 1 <u>98</u> .	4 dark brown to brown		1	SS	10		-		-								0	_30	kN/m	Borehole moved 4.0 m south wes as the original location was under power
1 30.	6 \ (Disturbed Native)				┼-	┨	$\vdash$		$\dashv$			ł							1	lines
	\ some sand, trace rootlets and / organics \ \mdist \ brown \ SILTY CLAY / CLAYEY SILT TILL		2	SS	14		- 1	19	98   								d			
	some sand, trace gravel stiff to hard moist					}	L		-											
			3	ss	65		- - 2	19	   <del>  </del>											
			4	ss	58		-								,					
195.7	,		1			Ψ	- - 3	194	6	-		+								
3.1	brown to reddish brown SILTY SAND TILL some gravel very dense moist	φ   φ	5	SS	65		_	-								0				·
							- 4 -	195												
:	occasional cobbles		_				_	-												
193.8			6	SS	68		_	194	<del> </del>			+		1		<del>-</del>	_			
5.0	End of Borehole	1017	-				=_5_	<del>-</del>		-	-	+-	╁	+			-	<u> </u>	$\vdash$	
	Groundwater in open borehole on completion: 2.9 m  Depth of cave-in on completion: 2.9 m																			
																,				



				RE	COF	RD (	<b>OF</b>	ВО	RE	HOL	ΕN	lo E	H 3		1 OF	- 1		-		
CLIENT	COLUMN TO THE PROPERTY OF THE PARTY OF THE P						_			ilton, O	ntario						c	RIGIN	ATEC	BY_JF
REF.	TT63043								ring								c	OMPI	ED B	Y SN
DATUM	Geodetic	DA.	TE .			25 Ap	ril 20	06						<u> </u>			c	HECK	ED B	YIH
ļ	SOIL PROFILE		<u> </u>	SAM	PLES	   # g	<u>0</u>	14 C	DR	YNAMIC ESISTAN	CONE ICE PL	PENET OT _	RATIO	N	PLAS	STIC N	ATURAL DISTURE	. LIQU	iD.	REMARKS
ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER	DEPTH	I Y	S	HEAR S UNCO	NFINEI (TRIA)	D -	FIEL	D VANE	W <sub>P</sub>	ATER (	ONTENT W 	w <sub>L</sub> 	NO N	DISTRIBUTION (%)
197.1 0.0 196.8 0.4	about 360 mm TOPSOIL		1	ss	12		m		97	20	40	60	80	100		_10	20	30	kN/m	Borehole moved 0.6 m north as the original location was
1 <u>96.5</u> 0.6	CLAYEY SILT (Distubed Native)  trace rootlets and organics /  mgist				-	Σ	-		-											close to gas line
195.8	brown CLAYEY SILT TILL some sand, trace gravel hard		2	ss	35	-	- 1  -	19	6				-		-	-				
1.4	brown to reddish brown SILTY SAND TILL trace to some gravel occasional cobbles	0	3	SS	32				-											
	dense to very dense moist						- 2 -	19	5				1			-				
		0	4	ss	55		_		-		ļ									
		0	5	ss	50/15	,	- 3 -	19	4											
193.2 4.0 192.5	reddish brown TILL / SHALE hard damp		6		50/8		- 4 4	19	3											
Gro	End of Borehole  pundwater in open borehole on inpletion: 0.9 m																			

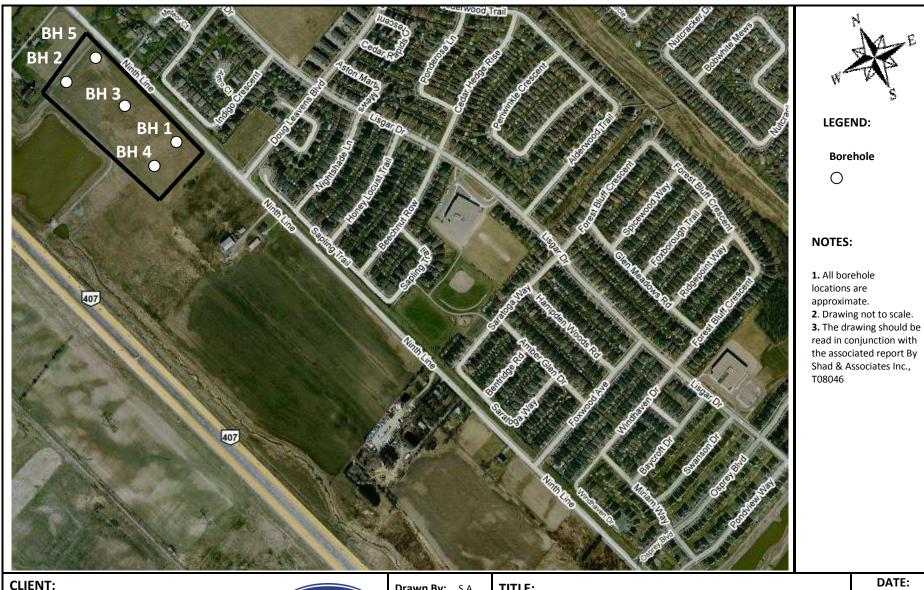


			-	RE	COF	RD (	OF	ВО	REI	HOL	E N	lo B	H 4		1 0	= 1				
CLIEN	Cartering (Territor Elimitor (1 00) Di									ton, Oı	ntario						(	DRIGIN	NATE	D BY <u>JF</u>
REF.	TT63043  M Geodetic								ring											BY <u>SN</u>
- DATE		. DA				25 Ap	_		- Inv		00115						<u> </u>	CHECK	(ED B	Y <u>IH</u>
<u> </u>	SOIL PROFILE		-	SAME	LES	Ĕ <u>c</u>	2	CALE	RE	SISTAN	ICE PL	PENET OT _	RATIC	•N -	PLAS	STIC N	ATURAL DISTURI ONTENT	LIQU	מונ	REMARKS
ELEV DEPTH (m) 196.4	DESCRIPTION	STRAT PLOT	NUMBER	TPE	"N" VALUES	GROUND WATER	B DEPTH	E. I	SH o	UNCO	NFINE	60 IGTH F D + (IAL >	FIEI	D VANI	W <sub>P</sub>	ATER	W O CONTE		/  <u>  ξ</u>	DISTRIBUTION (%)
1	about 300 mm TOPSOIL		Γ		_		Τ'''	1	1	7	40_	1	_80	_100	1	10	_20	30	kN/ı	m GR SA SI CL
196.1 0.3 195.8 0.6	dark brown to brown SILTY CLAY (Disturbed Native)		1	SS	11			19	6		-			-	-	-	0		-	
0.0	\ some sand, trace organics / molst brown to reddish brown CLAYEY SILT TILL trace gravel		2	SS	29		  -  -									0				
	occasional cobbles very stiff to hard damp						<u> -</u>	19	- 5				-					ļ.		
194.5	trace shale fragments		3	SS	50/15		F								,					
2.0	reddish brown TILL / SHALE hard damp						- 2  -	-												
			4	SS	50/10		-	192	1						10					
193.5 2.9	red WEATHERED SHALE		. 5	SS	50/8		- 3 -	-								Ь				
							_	193	1											
							-   4 	-												
	•							107												
191.9 4.6	End of Borehole		-0-	-69	50/1		-	192								-			<u> </u>	<del></del>
t	No noticeable groundwater in open porehole on completion																			
														j						

### Appendix B

Logs & Location Plan of Shad Boreholes Drilled in Parcel B

DS Consultants Ltd. June 5, 2019



Derry Britannia Developments Limited C/o Mattamy Developments Corporation



Drawn By: S.A. TITLE:

**BOREHOLE LOCATION PLAN** 

October 2008 PROJECT NO.: T08046

FIGURE No.:

DATE:

**LEGEND:** 

Borehole

0

**SHAD & ASSOCIATES INC.** 

GEOTECHNICAL, ENVIRONMENTAL AND MATERIALS ENGINEERS

83 Citation Drive, Unit 9, Vaughan, Ontario, L4K 2Z6 Tel: (905) 760-5566 Fax: (905) 760-5567 www.shadinc.ca



**PROJECT:** Datum:

N.T.S.

Checked By: N.S.

Projection: -

Scale:

**Geotechnical Investigation** Property P455 Ninth Line, Milton, Ontario

2

#### **RECORD OF BOREHOLE BH 1**

CLIENT: Mattamy Development Corporation

LOCATION: Ninth Line, Milton, Ontario

ORIGINATED BY: N.S.

**REF.**: T0<u>8046 - P455</u>

BOREHOLE TYPE: Solid Stem Auger

COMPILED BY: N.S.

DATUM	: N/ <u>A</u>		_ D	ATE	: <u>Oc</u>	tober	2008				_	CHE	CKED	BY:	H.	S		83 Ci	itatior	DCIATES INC. Dr, Unit 9, tario,L4K 2Z6
		SOIL PROFILE			S	AMPI	ES		ימ	/NAMIC	CON	F PFNF	TRAT	ON						REMARKS
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	ТҮРЕ	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS		RE 20 4 SHE	SISTAI 10 6 AR STF	NCE PL 50 8 RENGT	_OT 30 1 H kPa				<b>ONTEN</b>	Γ <b>(%)</b> 30	TOV	GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0		Ground Surface																		
-0.3	0 _	300 mm TOPSOIL  Sand FILL	[ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]	S1	SS	41	12										21 ○			
-0.9	1—	moist to wet		S2	SS	50	13									13				
	' - - - -	ploughed/disturbed Silty Clay/Clayey Silt some rootlets occasional topsoil damp															27			
-1.8	2	greyish brown  CLAYEY SILT/SILTY CLAY TILL		S3	SS	30	13	<u>_</u>											-	
	-	some shale fragments moist, very stiff to hard		S4	SS	53	38										1 <b>9</b>			
-2.7	_																			
	3-	reddish brown Highly weathered Shale moist,hard		S5	SS	15	50/13 cm													
	4-			S6	SS	13	50/5 cm												-	
-5.1	5			S7	AU															
	- - - - - -	End of Borehole Water Level on Completion: 1.8 m																		
	6-																		-	
	- - - - -																			
	7																			

#### **RECORD OF BOREHOLE BH 2**

CLIENT: Mattamy Development Corporation

LOCATION: Ninth Line, Milton, Ontario

ORIGINATED BY: N.S.

**REF.**: T0<u>8046 - P455</u>

DATUM: N/A

BOREHOLE TYPE: Solid Stem Auger

DATE: October 2008

COMPILED BY: N.S.

CHECKED BY: H.S.



83 Citation Dr, Unit 9, Vaughan, Ontario,L4K 2Z6

												J\	-VED				٧	augha	in, On	tario,L4K 2Z6
	Г	SOIL PROFILE			S	AMPL	ES		nv	NAMIC	CONE	DENE	TDATI	ΟN						REMARKS
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	ТҮРЕ	RECOVERY (cm)	"N"VALUES	GROUND WATER CONDITIONS		RES 0 40 SHEAF	ISTAN 60 R STR	ICE PL 0 8	.OT 0 1	00			<b>DNTENT</b>	Γ <b>(%)</b> 30	TOV ppm	GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0 -0.1	0	Ground Surface	~ ,														26			
-0.1		dark brown ploughed/disturbed Silty Clay/Clayey Silt some sand trace rootlets trace organics		S1	SS	48	29									14	0			
-0.9	1-	moist stiff		S2	SS	46	14									14 0			-	
	- - - -	greyish brown  CLAYEY SILT/SILTY CLAY TILL  trace shale fragments  damp, hard		S3	SS	38	37	_								15				
	2-	•						-								15			-	
-2.7	- - - -			S4	SS	53	62													
	3			S5	SS	3	50/10 cm	_											-	
	4-	reddish brown Highly Weathered SHALE moist, hard		S6	AU			-							5				-	
-5.1	5			S7	AU			_											-	
	- - - - - - -	End of Borehole  Dry on Completion																		
	6																			
	7 <sup>-</sup> - - - - -																			

#### **RECORD OF BOREHOLE BH 3**

CLIENT: Mattamy Development Corporation

LOCATION: Ninth Line, Milton, Ontario

ORIGINATED BY: N.S.

**REF.**: T0<u>8046 - P455</u>

BOREHOLE TYPE: Solid Stem Auger

COMPILED BY: N.S.

DATUM: N/A DATE: October 2008

CHECKED BY: НS

ATUM:	: N/ <u>A</u>		_ [	DAIL		tober					CHI	ECKE	D BY:	H.	S		83 C Vaugha	itatior an, On	n Dr, Unit 9, itario,L4K 2Z6
ELEVATION (metres)	DEPTH SCALE (metres)	SOIL PROFILE  DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	N. VALUES	GROUND WATER CONDITIONS	SHEA	SISTA 0 AR ST	NCE I 60 RENG	PLOT 80 TH kP	100				NT (%)	TOV	REMARKS  GRAIN SIZE DISTRIBUTION (%)  GR SA SI CL
0.0	<u>a</u> )	Ground Surface	S	/S	7	22	F .	<u> </u>	 U 4		00	00	100		10	20	30	ppm	
0.0	0_	300 mm TOPSOIL	727													23			
-0.3 -0.5	- - - -	mottled brown ploughed/disturbed Silty Clay/Clayey Silt		S1	SS	46	10												
	1-	some sand, trace rootlets trace organics damp		S2	SS	48	42								13 ○ 12 ○				
	- - - -	reddish brown  CLAYEY SILT/SILTY CLAY TILL  trace to some shale fragments damp, hard						-											
	2-		1.	S3	SS	48	42												
2.5	- - - -			S4	SS	38	61/13 cm								15				
	3							<u>_</u>							0				
	- - -	reddish brown Highly Weathered SHALE moist, hard		S5	SS	25	50/14 cm												
4	- - - 4			S6	AU			_						6					
1.1	- -	End of Borehole	20200					-											
	- - - -	Auger Refusal at : 4.1 m  Water Level on Completion: 2.7 m																	
	5 <del>-</del> -																		
	- - - -																		
	6																		
	- - - -																		
	- - 7-																		
	- - - -																		

### **RECORD OF BOREHOLE BH 4** CLIENT: Mattamy Development Corporation LOCATION: Ninth Line, Milton, Ontario

**REF.**: T0<u>8046 - P455</u>

DATUM: N/A

ORIGINATED BY: N.S.

BOREHOLE TYPE: Solid Stem Auger COMPILED BY: N.S.

DATE: October 2008 CHECKED BY: H.S.



		SOIL PROFILE			S	AMPI	LES		<b>D</b>		NETD : T.C.			REMARKS
(metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N"VALUES	GROUND WATER CONDITIONS		STANCE 60 STRENG	NETRATION PLOT 80 100  GTH kPa 80 100  80 100	ONTENT (%) 20 30	TOV ppm	GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	0	Ground Surface	~									30		
	٠- ا	250 mm TOPSOIL	~~									30		
0.3	- - - -	mottled brown ploughed/disturbed Silty Clay/Clayey Silt with sand and rootlets		S1	SS	50	4					<b>22</b>		
1.0	1 -	trace of organics moist		S2	SS	38	14							
	- - -													
	- - - -	brown to mottled brown		S3	SS	53	23							
	2— - -	CLAYEY SILT/SILTY CLAY TILL trace to some shale fragments damp,stiff to very stiff												
	- - -	brown hard, moist	) 	S4	SS	56	35							
	3	nara, morot	H.											
	3 - - -		1.	S5	SS	46	40					19		
3.8	- - -	reddish brown												
1.2	4-	Highly Weathered SHALE damp, hard		S6	AU	-	-	<u>_</u>						
	-	End of Borehole  Water Level on Completion: 4.2 m												
	5													
	6													
	- - - -													
	_ _ _													
	7-													

#### **RECORD OF BOREHOLE BH 5** CLIENT: Mattamy Development Corporation LOCATION: Ninth Line, Milton, Ontario ORIGINATED BY: N.S. BOREHOLE TYPE: Solid Stem Auger **REF.**: T0<u>8046 - P455</u> COMPILED BY: N.S. DATUM: N/A DATE: October 2008

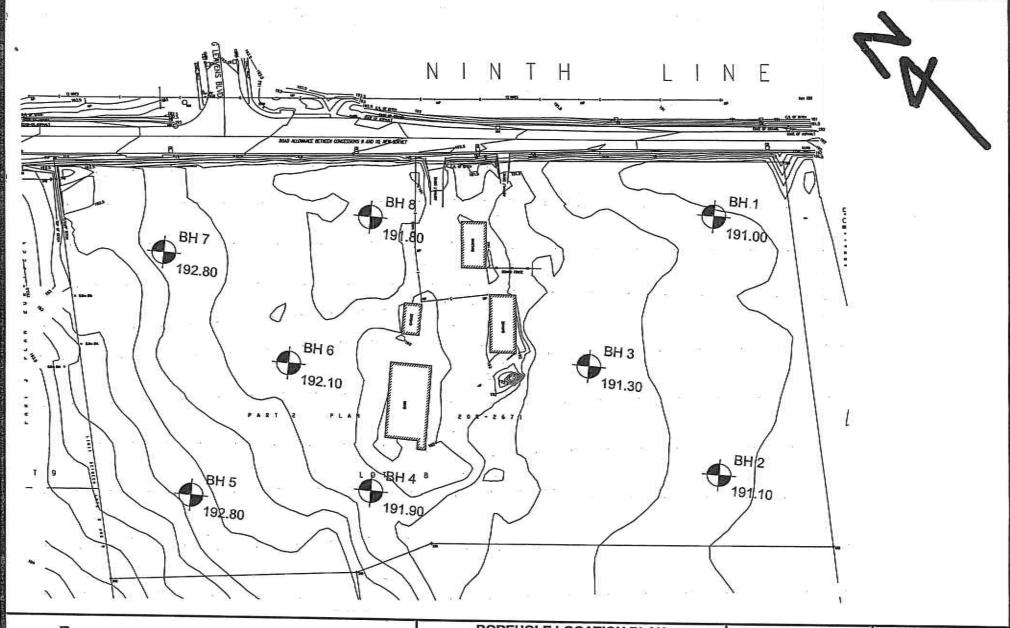


ATUM:	: N/ <u>A</u>		_ D	ATE	: <u>Oc</u>	tober	2008				. (	CHECK	(ED BY:	H.	<u>S.</u>	V	83 Ci augha	itatior ın, On	n Dr, Unit 9, tario,L4K 2Z6
	4	SOIL PROFILE	ТО	MBER	S	AMPI (E)		ATER .	<b>DY</b> I	NAMIC RES 0 40	CONE I	PENET CE PLO 80	RATION T 100						REMARKS GRAIN SIZE DISTRIBUTION
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N"VALUES	GROUND WATER CONDITIONS	<b>▲</b> 20	SHEA	R STRE	NGTH				ONTENT		TOV ppm	(%) GR SA SI CL
0.0	0	Ground Surface	~														35		
-0.3	- - -	350 mm TOPSOIL	\[\frac{1}{2}\right\]\[\frac{1}{2}\right\]	S1	SS	48	13								17		0		
0.8	-	ploughed/disturbed Silty Clay/Clayey Silt trace rootlets, trace topsoil													Ö				
	1-	moist very stiff	/  .	S2	SS	58	28												
	- - -	rteddish brown	#																
	- - -	CLAYEY SILT/SILTY CLAY TILL some weathered shale fragments damp,hard		S3	SS	38	50/15 cm								12				
	2— - - -														0				
	-			S4	SS	15	40/10 cm	_											
.0	3— - -			S5	SS	29	84/5 cm											-	
	- - -	reddish brown <b>Highly Weathered SHALE</b> damp, hard																	
.1	4— 4—	End of Borehole		S6	AU	-	-							5				-	
	_																		
	- - -	Auger Refusal at 4.1 m  Dry on Completion																	
	5-																	-	
	- - -																		
	6—																	-	
	- - - -																		
	- - - -																		
	7 <sup></sup> - -																		
	- -																		

### Appendix C

Logs & Location Plan of AME Boreholes Drilled in Parcel C

DS Consultants Ltd. June 5, 2019





AME - MATERIALS ENGINEERING 117 Ringwood Drive, Unit #6 Stouffville, Ontario, L4A 8C1

Tel: (905) 640 7772

Fax: (905) 640 8512

### **BOREHOLE LOCATION PLAN** 6432 NINTH LINE ARGO DEVELOPMENTS

Milton

Project No.:	40859.10
Scale:	N.T.S.
Date:	January 2006
Drawing No.:	1B

Ontario



Shear Strength by   Shear Strength by   Penetrometer Test
SANDY SILT TILL: grey, moist, trace gravel, very stiff gravel, very dense 188.30  End of borehole at 4.70 m

Notes:

Sheet No. 1 of 1

Date/Time	Water Level (m)	Depth to Cave (m)
Upon Competion January 9, 2006 January 10, 2006	0.50 0.50	No Cave
January 17, 2006	0.70	



40859.10 Project No.: Project Name: 6432 North Line Figure No. Milton, Ontario Location: Split Spoon Sample Combustible Vapour Reading 01/02/06 Date Drilled: ×  $\boxtimes$ Auger Sample Natural Moisture Content Ð SPT (N) Value Atterberg Limits Solid Stem Auger Drill Type: Dynamic Cone Test Undrained Triaxial at 0 Geodetic Shelby Tube % Strain at Failure Datum: Shear Strength by Shear Strength by Penetrometer Test Vane Test Standard Penetration Test N Value Total Combustible Vapours (ppm) Natural 25 50 75 Natural Moisture Content % Atterberg Limits (% Dry Weight) ELEV. Unit Weight kN/m³ 40 60 Shear Strength SOIL DESCRIPTION 91.10 ~ 150 mm TOPSOIL over \_ \_ CLAYEY SILT TILL: brown to 190.95 brownish-grey, moist, trace gravel, very stiff -190.60 to hard 186.90 SANDY SILT TILL: grey, moist, trace gravel, very dense 186.27 End of borehole at 4.83 m

Notes:

LOG OF BOREHOLE 40859.10, 6432 NORTH LINE, MILTON.GPJ AME\_ON.GDT 01/31/06

Sheet No. 1 of 1

Date/Time	Water Level (m)	Depth to Cave (m)
Upon Competion	Dry	No Cave
January 9, 2006	0.80	199 (277) 1 234 (417)
January 10, 2006	0.80	
January 17, 2006	0.50	



cation	n:	Milton, Ontario				-				_						_
ite Dr	illed:	01/02/06		_	Split Sp	oon San	nple		Ø ⊠				pour Rea	(L)() (A)( <del>) (</del>		O X
Drill Type: Solid Stem Auger				= 7/	SPT (N) Value   Dynamic Cone Test			•		Atterber	rg Limits		ı		0	
tum:		Geodetic			Shelby 1		est				% Strain	ed Triax n at Fallu	ire			0
				Shear Strength by Vane Test S				\$		Penetro	itrength I meter Te	est		181	_	
SYZBOL		SOIL DESCRIPTION	ELEV.	DWD.HI	Standard Penetration Test N Value				Value 80		3	25	urs (ppm) 75 teot %	SAM MAN	Na	
1001/10		SOIL DESCRIPTION	m 191.30	H	50 100 150 20					Pa	Atter	Natural Moisture Conten Atterberg Limits (% Dry Wo			SIE	W ki
	CLAY	mm TOPSOIL over	191.15	,	•			2 22					×			
	90 ETO 2	-		-	3 (1) 3 (1)											
				•	3010											
	8											×	1233	:   \$ (-1.9 :   \$ (-1.9 :   \$ (-1.9		
	-	188.40	2	-5 (-1-5 -2 (-1-5 -5 (-1-5 -5 (-1-5				50/10		4 (+) 4 4 (+) 4 n (+) 4		1111111				
				3413 3313				: : : : : : : : : : : : : : : : : : : :	:::							
	PY SILT TILL: grey, moist, trace I, very dense		3	3 3 1 3 3 3 1 3 3 3 1 3		-50/100 n				×				Z		
	-															
	2		4	3211	1122	12122										
	brown	silty sand seam	186.57		-9 (-1-9	11.53	50/150 m	m			1111	-}-:-:	. (.1.2.)	2010		
<b>基門</b> brow		End of borehole at 4.73 m														
es:							173.55	1.1.3	.,,,	1.2	Date/T	ime		Water Level	De C	pth



Project No.: Project Name:	40859.10 6432 North Line									Fig	gure No	· _	5	
Location:	Milton, Ontario		_		_			==	-		-	-		
Date Drilled: Drill Type: Datum:	01/02/06 Solid Stem Auger Geodetic		=:	Split Spo Auger S SPT (N) Dynamic Shelby T Shear Si	ample Value Cone To ube	est	× •		Natural Atterber Undrain % Strain Shear S	stible Vapou Moisture Co g Limits ed Triaxial a n at Fallure strength by	ontent	)  -	О Х Ф	
SY-MBOL	SOIL DESCRIPTION	ELEV. m	CWOLLI	Vane Te	st Indard Po 20 Si	enetration	§ Test N Valu 60 80 gth	kPa	Total 0	meter Test Combustible 25 50 tural Moistur perg Limits (*	Vapours 75 re Content % Dry We	pours (ppm) 5 75 ontent % F lry Weight) E		
- 150 CLAY	mm TOPSOIL over EY SILT TILL: brown to ish-grey, moist, trace gravel, hard	191.90 191.75	0	12 0 1 2 22 <b>9</b> 12 23 12 24 12 24 24 12 24 12 26					0 (110 0		×		WekN	
		189.92									6:1:0 6: 1 6:1:0 6: 1 5:1:0 6: 1 6:1:0 6: 1			
Votes:								U	Date/I			/ater evel 'm) Dry	Depth Cav (m) No Ca	
heet No. 1	of _1_													



Location		6432 North Line Milton, Ontario		_											gure N			6
Date Dri	illed:	01/02/06			Split Sp Auger S			le		<b>2</b>			stible \		ur Read	ing		×
Drill Typ	e:	Solid Stem Auger		-	SPT (N)	) Val	lue	-1		•		Atterbe	erg Limi	ts			<b>—</b>	<b>−</b> €
Datum:		Geodetic			Shelby '	Tube	В					% Stra	ned Tri in at Fa Strengt	llure	at			Ð
				36 V	Shear S Vane Te	est		netration	Toet M	S Value		Penetr	ometer	Test		rs (ppm)	Te	4
SY MBO		SOIL DESCRIPTION	ELEV.	DHIDH	0.500	20	- 4	10	60	80			25	50	re Conte	76	SASP	N
2	\ ~ 50 n	nm_TOPSOIL over	192.80	H	ADDA	50		ear Strer	150	200	kPa ) (-)-(-)	Atte	10	20	(% Dry v	30	- I	V.
	CLAY	EY SILT TILL: brown to ish-grey, moist, trace gravel, hard		1000		•			1121			3 (1)				×	1	1
	- DI OWII	isii-grey, moist, trace graver, nard	192.20	)	12 (1.1.2 12 (1.1.2		.; ; ; ;	* 1:33		:::		21:1:				400	6	1
	<u>2</u> 8		=	1						•							V	
					2213							: (+2+ :::::::::::::::::::::::::::::::::::		::::		\$ (:):		]
										•	•	×	1333	:::	106 12 11 201 10 20 201 10 20	0.01	6	
2222	SHALI	E: red, weathered, dry	190.70	2	2013			50/50 m	m			0 (+) 4 2 (+) 5	110	:::	0100 3133	2 (1)	1	
	9		=		2512	-	0.01	0.00		_	(+) (+) (+ (+) (+) (+)	0.0000 0.0000 0.0000			6106 6106 6106	3.4.1.		
	65		_	3	3813	i i		50/30 m	η::::::							2013		
					3313													
												2012				2011		
			-	4	****			****	-2-2-2-			0.1120	1000			2010		
				П	2212			50/30 mr				31113	33	13.40		0.010		
		End of borehole at 4.75 m	188.05	Н	1111	1:1:			1111		1111	1111	1325	: : : :	140	2013	Z	0
lotes:			-		000 E			. 2020		1		Date/		_		Water Level	D	epi Ca



Project No.: Project Name: Location:	40859.10 6432 North Line Milton, Ontario								_	Figure N	lo	
Date Drilled: Drill Type: Datum:	01/02/06 Solid Stem Auger Geodetic		-	Split Spo Auger S SPT (N) Dynamic Shelby T Shear St	ample Value Cone To ube rength b	est	Ø ■		Combustible \ Natural Moist. Atterberg Limi Undrained Tria % Strain at Fa Shear Strengt! Penetrometer	re Content ts exial at ilure h by	ing  -	
CLAY	SOIL DESCRIPTION  mm TOPSOIL over  EY SILT TILL: brown to lish-grey, moist, trace gravel, hard	ELEV. m 192.10 191.995.10	O I-Tump		ndard Pe 20 SI 50	near Stren	60 gth 50 2	80 kPa 200	Total Combu 25	stible Vapour	75	Ø4≥a_wø
_ _ _	ion-groy, moior, vace graver, nard		ĩ	3513		50/130 m	12 25 25 25		×			
SHAL	E: red, weathered, dry	190.00	3			50/50 mr				-1		<del>22</del>
			4									
	End of borehole at 4.62 m	187.48				50/50 mm					3 6 1 9 1	

Notes:

Sheet No. 1 of 1

Dry	No Cave
	Oave
-0.60	
-0.70	
0.00	
	0.00



Project No.:	40859.10 6432 North Line									F	igure N	No.		8
Location:	Milton, Ontario										.90.01			
Drill Type:	01/02/06 Solid Stem Auger Geodetic	193.60	-	Split Spo Auger Si SPT (N) Dynamic Shelby T Shear Si Vane Te	ample Value Cone To ube rength b	est y	•		Atterber Undrain % Strain Shear S Penetro	stible Vap Moisture rg Limits ned Triaxion at Fallur Strength b ometer Te	Content al at e y st			
SY M BO	SOIL DESCRIPTION	ELEV.	DHO-I	Sta	20	enetration  40 hear Streng	60 (	80 kPa	111111111111	Combustii 25 tural Mois berg Limit	50	75	-IMI	Na W kl
CLAY Drown	mm TOPSOIL over EY SILT TILL: brown to ish-grey, moist, trace gravel, hard  onal shale fragments : red, weathered, dry	192.80 192.70	1 2		50	100 1	50 2	200		10	20	30		k
	End of borehole at 4.65 m	188.15	4			50/80 mm							777	
			_			1111	1111					Water Level	Dep	

10.00.

Sheet No. 1 of 1

Water Level (m)	Depth to Cave (m)
1.80	No Cave
0.60	
0.50	
-0.80	
	Level (m) 1.80 0.60 0.50



. 5		6432 North Line									F	igure N	۷o	_	9
Locatio	on:	Milton, Ontario				-									
Date D	rilled:	01/02/06			Split Spo		ple	12			stible Vap		ling		×
Orill Ty	pe:	Solid Stem Auger			SPT(N)	Value		•		Atterbe	rg Limits		1		–€
Datum:		Geodetic		=//	Dynamic Shelby T	ube		10	i	% Strain	ned Triaxia n at Failun	9			Ð
-	-				Shear St Vane Te:	st	y enetration	S Test N Vo	lua	Penetro	Strength by ometer Tes Combustib	it	rs (nom)	Is	_ <u> </u>
S>ZBOL		SOIL DESCRIPTION	ELEV.	Dung-H		20		60	80 kPa		25 ( tural Moist berg Limits	50	75	SASA	ΙW
- XXX	FILL	granulars, sand, and topsoil	191.80	H	13 (14.1)		100 1	50 2	00 		10 2	0	30	Es	N k
$\bowtie$		gramator carra, and topoci					1 2132	13333		×			34.10		
$\otimes$					13 41 11 1 12 61 112 13 7 113									7	
	CLĀY	EY SILT TILL: brown, moist, trace	_= 190.70	1								×			
	_grave	l, hard	=							0000		- (+1+2+4+	2010		
	_		189.70	2	(\$ \$ 1 i 5 i	1531	• .	15 (16)	1.53.4	31113 2012			12:313:12	_	
Ш	SAND	Y SILT TILL: grey, moist, trace , very dense	100.70		0 0 1 0 1 0 0 1 0 1 0 0 1 0 1	11:2:9:1 11:2:0:1	50/150 m	2252  2252  1252		2133			2212		
384	=	End of borehole at 2.59 m	189.21	Н			Ĭ							19	-
otes:				13	4 2 2 [ 4			1011	[	Date/T	ime	1	Water Level	De	ept Car
										Date/ I	iiile		(m)	_	(m

# Appendix D

Logs & Location Plan of Shad Boreholes Drilled in Parcel D



## CLIENT:

**Derry Britannia Development Limited** C/o Mattamy Development Corporation

## **SHAD & ASSOCIATES INC.**

GEOTECHNICAL, ENVIRONMENTAL AND MATERIALS ENGINEERS

83 Citation Drive, Unit 9, Vaughan, Ontario, L4K 2Z6 Tel: (905) 760-5566 Fax: (905) 760-5567 www.shadinc.ca



Drawn By: S.A.

Datum:

Checked By: N.S.

TITLE:

**BOREHOLE LOCATION PLAN** 

DATE: October 2008

**PROJECT:** 

**Geotechnical Investigation** 

Property P456 Ninth Line, Milton, Ontario PROJECT NO.: T08046

FIGURE No.:

2



Scale: N.T.S.

Projection: -

				F	REC	OR	D OF B	ORE	HOLE BI	H 1					
CLIENT	: Mattamy	y Development Corporation	_ [	_OCA	TION	I: <u>9th I</u>	_ine, Milton,	Ontari	0	ORIG	INATED BY	': <u>N.S.</u>			
REF.:	T0 <u>8046</u>	- P456	_ E	BORE	HOL	E TYP	E: Solid Ste	em Aug	er	COMF	PILED BY:	N.S.	SHAD 8	ASSO	OCIATES INC.
DATUM	I: N <u>/A</u>		_ [	DATE	:_0	ctober	2008			CHEC	KED BY:	<u>H.S.</u>	83 Ci	tatior	Dr, Unit 9, tario,L4K 2Z6
		SOIL PROFILE			S	SAMPI	LES						vaugna	11, 01	
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS		STANCE PLO 60 80 8 STRENGTH	OT ) 100 I kPa	<b>WATER CON</b> 10 20		TOV ppm	GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	0	Ground Surface 200 mm TOPSOIL	~~												
-0.2	- - - - -	mottled brown ploughed/disturbed Silty Clay/Clayey Silt occ. topsoil, organic stains damp to moist	1	S1	SS	30	6						>	40 >	
-1.2	1-			S2	SS	38	9						34		
	- - - -	greyish brown SILTY CLAY/CLAYEY SILT TILL occ. oxidized fissures Silty Sand/Sandy Silt interbedding damp, stiff					40					15			
	2-			S3	SS	58	10								
	- - - - -	hard		S4	SS	61	40								
	3			S5	SS	58	54					12			
	4-	grey		S6	SS	46	56	<u>_</u>				12			
-4.8	- - -			S7	SS	30	110/28 cm					9			
	5—	End of Borehole  Water Level on Completion: 3.9 m													
	6	Trace Level on Completion. 5.3 III													

83 Citation Dr, Unit 9,

CLIENT: Mattamy Development Corporation LOCATION: 9th Line, Milton, Ontario ORIGINATED BY: N.S. **REF.**: T0<u>8046 - P456</u> BOREHOLE TYPE: Solid Stem Auger COMPILED BY: N.S. DATUM: N/A DATE: October 2008 CHECKED BY: H.S.

ELEVATION (metres)	DEPTH SCALE (metres)	SOIL PROFILE			S	AMPI	_ES													
ELEVATION (metres)	SCALE es)			i .			1	+	DV	IAMIA	ONE	DENIE	TDAT	ON						REMARKS
-	DEPTH (metr	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	ТҮРЕ	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS		SHEAR	STAN( 60	CE PL ) 8 E <b>NGT</b>	.OT  0 1	00			<b>DNTEN1</b>	「 <b>(%)</b> 50	TOV ppm	GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0		Ground Surface																		
-0.2	0	200 mm TOPSOIL	~~															32		
0.2	- - - -			S1	SS	25	5											0		
	1— 1—	mottled brown ploughed/disturbed Silty Clay/Clayey Silt occ. topsoil, organic stains moist		S2	SS	30	5										28			
-1.8	- - - -			S3	SS	50	17													
	2-	very stiff	1																	
	_	brown	1																	
	- - - -	SILTY CLAY/CLAYEY SILT TILL occ. sand seams interbeddings damp, hard		S4	SS	29	71/30 cm									<b>12</b> O				
	3-			S5	SS	53	74/25 cm	-												
	- - - -	grey		,											6					
	4			S6	SS	50	81	<u>*</u>							0					
-5.1	- - - - - 5		//; //,	S7	SS	60	55													
0.1	-	End of Borehole Water Level on Completion: 4.2 m																		
	6																			
	- - - -																			
	7— - - - -																			

				F	REC	OR	D OF B	ORE	НОІ	E E	3H 3	3						
CLIENT	: Mattamy	Development Corporation	_ L	OCA	TION	: <u>9th l</u>	Line, Milton,	Ontari	0		_	ORIG	INAT	ED BY	': <u>N.S.</u>	_		
REF.:	T0 <u>8046 -</u>	P456	_ E	BORE	HOL	E TYP	E: Solid Ste	m Aug	er		_	СОМ	PILED	BY:	N.S.	_   s	HAD & AS	SOCIATES INC.
DATUM	: N <u>/A</u>		_ [	ATE	:_0	ctober	2008				_	CHE	CKED	BY:	<u>H.S.</u>	_	83 Citati ughan, (	on Dr, Unit 9, Ontario,L4K 2Z6
		SOIL PROFILE			S	AMPI	LES											REMARKS
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS		RE 0 4 SHE	SISTA 10 6 Ar Stf	E PENE NCE PL 50 8 RENGT	OT 0 1	00	<b>WATE</b>	R CONTENT	то	GRAIN SIZE DISTRIBUTION (%)
0.0 -0.1	0	Ground Surface 100 mm TOPSOIL	~														>40	
		mottled brown ploughed/disturbed Silty Clay/Clayey Silt occ. topsoil, organic stains		S1	SS	30	2											
-1.1	1-	moist to wet		S2	SS	30	13									20 ○		
	- - - -	very stiff																
	2-	brown to mottled brown SILTY CLAY/CLAYEY SILT TILL occ. sand seams interbeddings occ. oxidized fissures		S3	SS	56	28								12	2		
	- - - -	damp, hard		S4	SS	63	73											
	3	grey		S5	SS	63	54								10			
	4-			S6	SS	60	59											
	_ _ _							-										
-5.1	5—			S7	SS	58	79								8 0			
V.1	6	End of Borehole  Dry on Completion																
	-																	

							D OF B												
	-	Development Corporation					Line, Milton,					INATED			_				
		P456					E: Solid Ste				COM	PILED E	BY:	N.S.		4	SHAD 8	ASSC	CIATES INC.
DATUM	: N/A		_ [	ATE	: _0	ctober	2008			_	CHEC	KED B	<b>Y</b> :	H.S.	—	٧	83 Ci augha	tatior n, On	Dr, Unit 9, tario,L4K 2Z6
		SOIL PROFILE			S	AMPI	LES												
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N"VALUES	GROUND WATER CONDITIONS	RE 0 4 SHE	SISTAI 10 6 AR STR	NCE PL	0 100 I kPa	_	<b>WA</b> 7		<b>DNTENT</b>	Γ <b>(%)</b>	TOV	REMARKS  GRAIN SIZE DISTRIBUTION (%)  GR SA SI CL
0.0	0	Ground Surface	$\sim$														34		
0.1		100 mm TOPSOIL  mottled brown ploughed/disturbed		S1	SS	30	8									<b>2</b> 9	9		
-1.4	1-	Silty Clay/Clayey Silt occ. topsoil, organic stains damp to moist		S2	SS	30	12												
-1.4		stiff to very stiff		S3	SS	56	14								15 O				
	2	mottled brown SILTY CLAY/CLAYEY SILT TILL occ. oxidized fissures damp, hard		S4	SS	63	40												
	3-	grey		S5	SS	63	84/30 cm							7 0					
	4— - - -			S6	SS	60	80	<u>_</u>											
-4.8	5-	End of Borehole Water Level on Completion: 4.2 m	1.	S7	SS	58	96/30 cm							8 0					
	6																		
	7-																		

				F	REC	OR	D OF B	ORE	НО	LE I	3H (	5								
CLIENT	: Mattamy	Development Corporation	[	OCA	TION	I: <u>9th</u>	Line, Milton,	Ontari	0		_	ORIG	SINAT	ED BY	<b>/:</b> N.S.					
REF.:	T0 <u>8046</u> -	P456	_ E	BORE	HOL	E TYP	E: Solid Ste	m Aug	er		_	COM	PILE	BY:	N.S.			SUAD S	L	OCIATES INC.
DATUM	: N/A		_ [	DATE	:_0	ctober	2008				_	CHE	CKED	BY:	<u>H.S.</u>			83 C	itatior	Dr, Unit 9,
		SOIL PROFILE				SAMP	FS										v	augha	an, On	tario,L4K 2Z6
		OOL I NOTICE		œ				١				E PENE		ION						REMARKS
Tion es)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER		RECOVERY (cm)	N " VALUES	GROUND WATER CONDITIONS	2	20 4	40	60 E	30 1	00	WA	TER CO	ONTEN <sup>1</sup>	Γ (%)		GRAIN SIZE DISTRIBUTION (%)
ELEVATION (metres)	DEPTH (met		STRAI	SAMP	TYPE	RECO	> : z	GROU	<b>A</b> 2	20 4	40	60 8	30 1	00	1	10 2	20 3	30	TOV ppm	GR SA SI CL
0.0	0	Ground Surface 100 mm TOPSOIL	$\sim$															34		
0.1	1 1	100 mm TOPSOIL																0		
	-	mottled brown ploughed/disturbed Silty Clay/Clayey Silt some rootlets, trace organics		S1	SS	20	4										28			
-1.1	1— 1—	damp		S2	SS	53	10													
	_ _ _	brown						<u> </u>												
	-	SILTY CLAY/CLAYEY SILT TILL damp, stiff to very stiff		S3	SS	44	16									15 O				
	2-															10				
	-	reddish brown trace to some shale fragments damp, occ moist seams, hard		S4	SS	60	23	-								0				
	3-																			
	-			S5	SS	60	56													
	4-			S6	SS	5	50/10 cm													
	-																			
	-			S7	SS	44	74									<b>12</b> O				
-5.1	5-	End of Borehole		-				-												
	-	Water Level on Completion: 1.5 m																		
	6																			
	-																			
	7-																			
	_ _ _																			

CLIENT: Mattamy Development Corporation

LOCATION: 9th Line, Milton, Ontario

ORIGINATED BY: N.S.

**REF.**: T0<u>8046 - P456</u>

BOREHOLE TYPE: Solid Stem Auger

COMPILED BY: N.S.

83 Citation Dr. Unit 9.

DATUM: N/A

DATE: October 2008

CHECKED BY: H.S.

															Va	ughan	, On	Dr, Unit 9, tario,L4K 2Z6
		SOIL PROFILE			S	AMP	LES		DVMARA	r cour	DENET	DATION						REMARKS
(metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	ТҮРЕ	RECOVERY (cm)	"N"VALUES	GROUND WATER CONDITIONS	DYNAMIO RE 20 SHE	SISTAI 40 6 AR STR	NCE PLC	100 kPa	WAT		<b>NTENT (</b>	1	FOV opm	GRAIN SIZE DISTRIBUTION (%) GR SA SI CI
0.0		Ground Surface																
	0 -	450 mm TOPSOIL	~~~													.		
-0.5			~~~	S1	SS	36	10									34		
-0.9	_ _ _ _	mottled brown ploughed/disturbed Silty Clay/Clayey Silt some rootlets, trace organics																
	1-	moist / very stiff		, S2	SS	46	17							16 O				
	-																	
	2-	light brown SILTY CLAY/CLAYEY SILT TILL occ. sand seams moist, hard		S3	SS	50	34											
	- - - -			S4	SS	58	93						11	)				
	3-	reddish brown trace to some shale fragments damp																
	- - - -	greyish red some highly weathered shale interbeddings		S5	SS	43	93						9					
	4-			S6	SS	5	50/10 cm											
	- - - -												5					
5.1	5			S7	SS	0	50/3 cm						0					
	-	End of Borehole  Dry on Completion																
	6																	
	- - - - -																	
	7-																	
	/																	

CLIENT: Mattamy Development Corporation

LOCATION: 9th Line, Milton, Ontario

DATE: October 2008

ORIGINATED BY: N.S.

**REF.**: T0<u>8046 - P456</u>

DATUM: N/A

BOREHOLE TYPE: Solid Stem Auger

COMPILED BY: N.S.

CHECKED BY: H.S.



83 Citation Dr, Unit 9, Vaughan, Ontario,L4K 2Z6

										CHECKED B1.	п.ა.	Vaugha	n, On	tario,L4K 2Z6
		SOIL PROFILE			S	AMPI	ES		DANVMIC CO	ONE PENETRATION				REMARKS
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	ТҮРЕ	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS		TANCE PLOT	WATER COI		TOV ppm	GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	0	Ground Surface										35		
-0.2	_	200 mm TOPSOIL	\{\{									0		
	- - -	mottled brown ploughed/disturbed Silty Clay/Clayey Silt trace topsoil, organic stains damp		S1	SS	36	8							
-1.1	1			S2	SS	50	11				19			
	_	very stiff	1/1					-						
	=		1											
	- - - - 2	brown SILTY CLAY/CLAYEY SILT TILL occ. sand seam interbeddings embeddings		S3	SS	63	32							
	-	damp, hard	1											
	- - -			S4	SS	63	55				11 0			
	3— 3—							-					-	
	- - -	grey occ. sand seams intebeddings		S5	SS	36	90/28 cm							
	- - - 4	damp, occ. moist to wet seams		S6	SS	41	82	_			8			
	· -		<b>)</b>					<u> </u>						
	- - - - 5			S7	SS	58	91/28 cm							
-5.1	, -	End of Borehole						-						
	- - - -	Water Level on Completion: 4.4 m												
	6													
	· -													
	- - -													
	7— 7— –													
	-													

# Appendix E

Logs & Location Plan of Sirati Boreholes Drilled in Parcel E



## NOTES:

- The boundaries and soil types have been established only at borehole locations.
   Between and beyond boreholes they are assumed and may be subject to considerable error.
- Soil samples will be retained in storage for 3 months and then destroyed unless the client advises an extended time period is required.
- Topsoil / granular quantities should not be established from the information provided at the borehole locations.
- Borehole elevations should not be used to design building(s) or floor slab(s) or parking lot(s) grades.
- This drawing forms part of the report (project number as referenced) and should only be used in conjunction with

Client:		Mattamy Homes		Project No:	SP-16-181-10	Drawing No:	1
Ciletit.		Mattainy nomes		Title:	Bor	ehole Location Plan	
Drawn:	JD	Approved:	AS	Project:	•	Geotechnical Investig th Line, Mississauga, (	•
Date:	18-Jan-17	Scale:	N.T.S		Sirati &	Partners Consulta	ants Ltd.
Original Size:	Tabloid	Rev:	N/A		Geotechn	tical & Environmenta ing Solutions	

PROJECT: Preliminary Geotechnical Investigation

CLIENT: Mattamy Homes

PROJECT LOCATION: 6314 Ninth Line, Mississauga, ON

DATUM: Geodetic

DRILLING DATA

Method: Solid Stem Augers

Diameter: 150mm REF. NO.: SP16-181-10

Date: Jan/09/2017 ENCL NO.: 2

	SOIL PROFILE		SAMPI	ES			DYNA RESIS	MIC CC TANCE	NE PEN E PLOT	NETRA	TION		PLASTI	C NAT	URAL	LIQUID		5	REM	ARKS
(m)		5		l	ATEF		2	!0 4	10 6	0 8	30 10	00		CON	ITENT	LIMIT	PEN.	NIT V	Al	ND N SIZE
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	O UI ● QI	NCONF JICK T	RIAXIAL	+ . ×	FIÉLD VA & Sensiti LAB VA	ANE		TER C	w O ONTEN		POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)		BUTIO
191.1 19 <b>0.0</b> 0.2	GRANULAR BASE: 150mm (Sand	) Z	-	-	Ø 0 ▼ <b>▼</b>			20 4	10 6	0 8	30 10	00	1	0 .	20 :	30			GR SA	SI
	& Gravel)  FILL: sand & gravel, interbedded with a layer of topsoil, brown, moist,	1	ss	39			-						0							
190.3 19 <b>0.8</b> 1 0.9	dense  POSSIBLE FILL: clayey silt, some sand, brown, wet, very soft  SILTY CLAY: trace sand, brown, moist, stiff	2	ss	8	-	W. L. <sup>2</sup> Jan 23 Jan 13	, 2017	'n							0					
2	layer of silt at 1.2m	3	SS	9		189	- - - - -								<del> </del>	-1			0 2	53
2.3	SILTY CLAY TILL: sandy, trace gravel, occasional cobble/boulder, grey, moist, stiff to very stiff	4	SS	12			- - - - - -							0						
-		5	ss	29		188	-							0						
4						187	- - - - -										-			
186.7	SANDY SILT TILL: some clay to					1	-													
. <u>5</u>	clayey, trace gravel, occasional cobble/boulder, grey, moist, dense to very dense	6	SS	51		186	-						0				=		10 36	38
·    - ·							- - - -													
6 - - -	-   -  -  -  -	7	ss	38		185	-							0			-			
- -		<u> </u>					-													
	. † 					184	-										-			
182.9		8	SS	50/ 150mr		183	-							0						
8.2	END OF BOREHOLE Notes: 1) Monitoring well installed in the borehole upon completion. 2)Water level in monitoring well at 0.85m on Jan 13,2017 3)Water level in monitoring well at 0.71m on Jan 23,2017																			



GRAPH NOTES

+  $^3$ ,  $\times$   $^3$ : Numbers refer to Sensitivity

 $\bigcirc$  8=3% Strain at Failure



PROJECT: Preliminary Geotechnical Investigation

CLIENT: Mattamy Homes

PROJECT LOCATION: 6314 Ninth Line, Mississauga, ON

DATUM: Geodetic

DRILLING DATA

Method: Solid Stem Augers

Diameter: 150mm REF. NO.: SP16-181-10

Date: Jan/10/2017 ENCL NO.: 3

	SOIL PROFILE		s	AMPL	ES.			DYNA RESIS	MIC CO TANCE	NE PEN PLOT	NETRAT	ION		PLASTI	C NAT	URAL	רוטוווט		Ţ.	REMARI
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	SHE/	AR STI NCONF UICK TE	INED RIAXIAL	TH (kP	a) FIELD V & Sensiti LAB V	ANE vity ANE		TER CO	w o ONTENT	LIQUID LIMIT W <sub>L</sub> (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT W (kN/m³)	AND GRAIN S DISTRIBU' (%)
0.0	FILL: clayey silt mixed with shale fragments, brownish grey, moist, hard		1	SS	41			-							0					
0.8	FILL: clayey silt, trace organics, brownish grey, moist, firm		2	SS	7	-	190	-								0		_		
188.9	SILTY CLAY: trace sand, brown,		3	SS	8		189									0		-		
2.3	moist, stiff  SILTY CLAY TILL: sandy, trace gravel, occasional cobble/boulder, brown, moist, very stiff to hard		4	SS	17	-		-							0					
			5	SS	33		188								0					
						-	187	-										-		
4.4	SANDY SILT TILL: some clay to cleyey, trace gravel, occasional cobble/boulder, grey, moist, compact to very dense		6	SS	19		186								0					
							185	-										-		
		0	7	SS	50									C	<b>&gt;</b>					
							184	-										-		
182.7			8	SS	50/ 100mn	- M	183	-						•				=		
182.7 8.2	END OF BOREHOLE Notes: 1) Borehole dry on completion.																			



GRAPH NOTES  $+3, \times^3$ : Numbers refer to Sensitivity

 $\bigcirc$  8=3% Strain at Failure



PROJECT: Preliminary Geotechnical Investigation

CLIENT: Mattamy Homes

PROJECT LOCATION: 6314 Ninth Line, Mississauga, ON

DATUM: Geodetic

DRILLING DATA

Diameter: 150mm

Method: Solid Stem Augers

+  $^3$ ,  $\times$   $^3$ : Numbers refer to Sensitivity

GRAPH NOTES

REF. NO.: SP16-181-10

Date: Jan/10/2017 ENCL NO.: 4

	SOIL PROFILE		8	SAMPL	.ES			DYNA RESIS	MIC CC	NE PEN PLOT	NETRA	TION			_ NATI	URAI			-	REMARKS
(m)		F				GROUND WATER CONDITIONS					_	_	00	PLASTI LIMIT			LIQUID LIMIT	PEN.	NATURAL UNIT WT (KN/m³)	AND
LEV	DESCRIPTION	STRATA PLOT	~		BLOWS 0.3 m	D WA	No			RENG	TH (kf	Pa)	ANIE	W <sub>P</sub>	١	<i>w</i>	W <sub>L</sub>	POCKET PEN. (Cu) (kPa)	RAL UI	GRAIN SIZ
EPTH	DESCRIPTION	ATA	NUMBER	Й		JUNC	ELEVATION		NCONF	INED RIAXIAL		FIELD V & Sensiti LAB V		WAT	TER CC	ONTEN	Γ(%)	8°	NTA PTT □	(%)
90.9		STF	Ñ	TYPE	ż	9.0 0.0	1						00	1	0 2	20 3	30			GR SA SI
0.0	FILL: sand and gravel mixed with clayey silt, dark grey, moist, very	$\otimes$	١.		50/	V. V		-												
	dense	$\otimes$	1	SS	100mn			F						°						
90.1		$\boxtimes$				lacksquare		ŀ												
8.0	FILL: silty clay, trace to some organics, grey, moist, firm	$\bowtie$		00			W. L. Jan 23	190.1 3, 2017	m 7									l		
		$\bowtie$	2	SS	6			E								0				
1.5	SILTY CLAY TILL: sandy, trace							Ē												
	gravel, occasional cobble/boulder, brown, moist, stiff to very stiff		3	SS	13		100	J.							0					
	brown, moist, sun to very sun						189	<u>'</u>										1		
						. ⊻		⊩ 188.7												
			4	SS	20		Jan 13	3, 2017 	<b>7</b> 						0					
							188	<u></u>												
								Ė												
			5	SS	27			Ė							0					
								-												
							187	<b>├</b>										-		
							:	-												
	grey below 4.3m						1	-												
			6	SS	14			Ė							0					
	interbed of silt at 4.8m						186	i <del> </del>												
								-												
								F												
							185													
84.8 6.1	SANDY SILT TILL: some clay to						. 100	<u>'</u>												
0.1	clayey, trace gravel, occasional		7	SS	50/			Ē												
	cobble/boulder, grey, moist, very dense				150mr	<b>]</b> : [] :	1	Ė												
							184	<u> </u>										l		
								F												
								Ė												
								-												
			8	SS	51		183	3						-	-					
82.7	END OF BOREHOLE	1.9.1					<del>                                     </del>	-												
0.2	Notes: 1) Monitoring well installed in the																			
	borehole upon completion.																			
	2)Water level in monitoring well at 2.25m on Jan 13,2017																			
	3)Water level in monitoring well at 0.77m on Jan 23,2017																			
	,																			
			1				1	1			1	1		l				1	l	



PROJECT: Preliminary Geotechnical Investigation

CLIENT: Mattamy Homes

PROJECT LOCATION: 6314 Ninth Line, Mississauga, ON

DATUM: Geodetic

DRILLING DATA

Method: Solid Stem Augers

Diameter: 150mm REF. NO.: SP16-181-10

Date: Jan/10/2017 ENCL NO.: 5

	SOIL PROFILE		Ls	SAMPL	ES			DYN. RES	AMIC C STANC	ONE PE E PLOT	NETRA	TION		DI ACT	LC NAT	URAL	HOUR	] _	F	REMAR	RKS
(m)		Ŀ				GROUND WATER							00	LIMIT	IC NAT MOIS CON	TURE	LIQUID	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (KN/m³)	AND	)
ELEV		STRATA PLOT	l		BLOWS 0.3 m	W O		SHE	AR S	RENG	TH (k	Pa)	-	W <sub>P</sub>		w 0	W <sub>L</sub>	A S	AL U	GRAIN S DISTRIBL	
EPTH	DESCRIPTION	Ι¥	BER		BLO 0.3		Ĭ Į		JNCON		÷	FIELD V & Sensi	ANE tivity	10/0		_	T (0/ )	900	TUR.	(%)	
400.0		IX/	NUMBER	TYPE	ž	O'RO N	ELEVATION	•		TRIAXIAI 40 (		LAB V. 30 1	ANE 00		TER CO		1 (%) 30		≥	GR SA S	
190.9	TOPSOIL: 250mm	1/1/	-		-	7]	<b>V</b>	╁	Ť	Ť			H							GIV SA	31 (
0.3	FILL: clayey silt, trace gravel, trace	XX	1	SS	6			ŀ								0					
0.0	sand, trace rootlets, brown, moist,	$\otimes$						F													
	soft to firm							E													
.							19	0													
		$\otimes$	2	SS	6			Ē									0				
		$\otimes$						ŀ													
		$\bowtie$		00				ŀ													
		$\otimes$	3	SS	3		18	9[	-							(	1	1			
188.6		$\otimes$				¥	W. L	. 1 . 188.8	m												
2.3	SILTY CLAY TILL: sandy, trace	132					Jan 2	23, 201 •	7												
	gravel, occasional cobble/boulder, grey, moist, very stiff to hard		4	SS	20			E							0	<del></del>	I			6 26 4	18 2
	3 3, , ,		<u> </u>				18	8													
								ŧ													
		191	5	SS	35			Ŀ							0						
			-			-		F													
			1				18	7 <u> </u>													
			1				10	` <b> </b>													
186.5		12					·	Ē													
4.4	SANDY SILT TILL: some clay to cleyey, trace gravel, grey, moist,							ŧ													
	dense to very dense		6	SS	53		∴ 18	<u>_</u>							0						
							.   '0	°F													
								ŧ													
						目		E													
								_													
						Ĵ∄	18	5										1			
							:	Ł.													
			7	SS	40		∴ W. L Jan 1	. 184.6 13, 201	m 7												
						╁┋	.:	Ė													
							18	4		+				1				1			
			l					Ē													
								F													
					F0.			ŧ													
			8	SS	50/ 150mr	<b> </b> :	18	3	+	+				+ •				1			
182.7 8.2	END OF BOREHOLE	<u>          </u>	_			F:H	1	+		1				1				$\vdash$			
0.2	Notes:																				
	Monitoring well installed in the borehole upon completion.																				
	2) Water level in monitoring well at																				
	6.3m on Jan 13,2017 3)Water level in monitoring well at																				
	3)Water level in monitoring well at 2.09m on Jan 23,2017																				
		1		1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	i	



## Appendix F

Logs & Location Plan of Shad Boreholes Drilled in Parcel F (Missing from Shad's geotechnical report)

# Appendix G

Logs & Location Plan of Shad Boreholes Drilled in Parcel G



## **CLIENT:**

**Derry Britannia Developments Limited** C /o Mattamy Development Corporation



# Drawn By: S.A.

TITLE:

## **BOREHOLE LOCATION PLAN**

DATE: October 2008

**LEGEND:** 

Borehole

0

PROJECT NO.: T08046

FIGURE No.:

## SHAD & ASSOCIATES INC.

GEOTECHNICAL, ENVIRONMENTAL AND MATERIALS ENGINEERS

83 Citation Drive, Unit 9, Vaughan, Ontario, L4K 2Z6 Tel: (905) 760-5566 Fax: (905) 760-5567 www.shadinc.ca



Checked By: N.S.	
Datum: -	PROJECT:
Projection: -	
Scale: N.T.S.	

Property P457 Ninth Line, Milton, Ontario

**Geotechnical Investigation** 

2

				F	REC	OR	D OF B	ORE	НО	LE E	3H 1								
CLIENT		my Development Corporation					th line, Miltor							ED BY		.S			
REF.:		46 - P457					E: Solid St		-			COM	PILED	BY:		A			OCIATES INC.
DATUM	: <u>N/A</u>		_ D	ATE	: <u>Oct</u>	ober 2	2008				_	CHE	CKED	BY:	<u>H.</u>	.S	83 ( Vaugh	Citation an, Or	n Dr, Unit 9, ntario,L4K 2Z6
		SOIL PROFILE			S	AMPL	LES												REMARKS
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N"VALUES	GROUND WATER CONDITIONS		RE 20 4 SHE	SISTAN 0 6 AR STR	NCE PL 0 8	OT 0 10 H <b>kPa</b>	)0 		TER CO	NTENT (%)	TOV ppm	GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	0_	Ground Surface 150 mm Topsoil	}														<b>29</b>		
	- - -	mottled brown ploughed / disturbed Silty Clay/Clayey Silt occasional topsoil, organic stains damp	/415	S1	SS	28	6	_									O		
	1— 1— -			S2	SS	56	31									15			
	- - -	brown SILTY CLAY/CLAYEY SILT TILL occasional oxidized fisssures damp, hard		S3	SS	56	31	-											
	2							-											
	- - - -			S4	SS	61	38	_											
	3— — — —		#	S5	SS	46	54									17 O			
	- - - 4	grey		S6	SS	56	26	¥								12 ○			
	-							-											
	- - 5	End of Borehole		S7	SS	64	26									15 O			
	-	Water Level on Completion: 3.9 m																	
	6																		
	7— - - - - -																		

CLIENT: Mattamy Development Corporation

LOCATION: Ninth line, Milton, Ontario

ORIGINATED BY: N.S.

REF.:

T08046 - P457

BOREHOLE TYPE: Solid Stem Auger

COMPILED BY: S.A.

DATUM:	N/A		_ [	ATE	: <u>Oct</u>	tober 2	2008			CHE	CKED BY:	H.S.	83 C	itation	ociates inc. n Dr, Unit 9, itario,L4K 2Z6
	ı	SOIL PROFILE			S	AMPI			DYNAMIC COI	NE PENE	TRATION				REMARKS
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N"VALUES	GROUND WATER CONDITIONS		ANCE PL 60 8 FRENGTI	OT 30 100		ONTENT (%) 20 30	TOV ppm	GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
		Ground Surface											26		
	0	100 mm Topsoil		1									26 O		
	- - - -	mottled brown ploughed / disturbed Silty Clay/Clayey Silt occasional organic stains		S1	SS	46	12								
	1— 1—			S2	SS	53	31								
	- - - -	CLAYEY SILT/SILTY CALY TILL occasional oxidized fissures damp, very stiff to hard	1.												
	2-			S3	SS	46	17					15			
	- - - -			S4	SS	56	49								
	3-											11			
	- - - -			S5	SS	61	48					0			pp>225 kPa
	4-			S6	SS	46	26					11			pp>225 kPa
	- - -	grey						¥							
	_ _ _ 5—	occasional sand seams		S7	SS	56	36					12 ○			
	7	End of Borehole													
	- - - - - -	Water Level on Completion: 4.35 m													
	6 <del>-</del> - - -														
	- - - - -														
	7— - - -														
	_													-	

CLIENT: Mattamy Development Corporation

LOCATION: Ninth line, Milton, Ontario

ORIGINATED BY: N.S.

REF.:

T08046 - P457

BOREHOLE TYPE: Solid Stem Auger

COMPILED BY: S.A.



DATUM	l: <u>N/A</u>		_ [	ATE	: <u>Oct</u>	ober :	2008			CHECKE		H.S.	_			DCIATES INC. Dr, Unit 9,
										OHLONE				Vaugha	an, Or	tario,L4K 2Z6
ELEVATION (metres)	DEPTH SCALE (metres)	SOIL PROFILE  DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)		GROUND WATER CONDITIONS	DYNAMIC CON RESISTA 20 40 SHEAR ST	ANCE PLOT 60 80 RENGTH KP	100	<b>WATE</b>	R CON1	Γ <b>ΕΝΤ (%)</b> 30	TOV ppm	REMARKS  GRAIN SIZE DISTRIBUTION (%)  GR SA SI CL
Ш		Ground Surface		S	-	12	=	00							ppiii	
	0 -	nottled brown ploughed / disturbed, Silty Clay/Clayey Silt occasional organic stains		S1	SS	48	6							33		
	1-	moist		S2	SS	48	9							34		
	- - - - - -			S3	SS	48	21									pp>225 kPa
	2	brown  CLAYEY SILT/SILTY CLAY TILL  damp, very stiff to hard		S4	SS	63	48						14			pp>225 kPa
	3-			S5	SS	56	47	<u></u>								
	4—	grey occasional sandy seams		S6	SS	43	33	_				1	3			
	- - - - -			S7	SS	10	84/25 mm	_				110				
	5	End of Borehole  Water Level on Completion: 3.3 m														
	7														-	

\_\_\_

## **RECORD OF BOREHOLE BH 4**

CLIENT: Mattamy Development Corporation

LOCATION: Ninth line, Milton, Ontario

ORIGINATED BY: N.S.

REF.:

T08046 - P457

BOREHOLE TYPE: Solid Stem Auger

COMPILED BY: S.A.



DATUM	: <u>N/A</u>		_ D	ATE	: <u>Oct</u>	tober 2	2008		CHECKED BY:	H.S	83 C	itatio	DCIATES INC.  1 Dr, Unit 9, stario,L4K 2Z6
		SOIL PROFILE			S	AMP	LES					Ì	REMARKS
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION  RESISTANCE PLOT  20		ONTENT (%) 20 30	TOV ppm	GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	0	Ground Surface									31		
		150 mm Topsoil	~~								b		
	- - - -	mottled brown ploughed / disturbed Silty Clay/Clayey Silt occasional organic stains and rootlets moist		S1	SS	46	7	-					
	1-	mottled brown to brown SILTY CLAY/CLAYEY SILT TILL moist to wet, firm		S2	SS	43	4				28		
	- - -							_					
	2-	moist, stiff to very stiff		S3	SS	66	14						
	-							<u></u>					
	- - - -			S4	SS	55	28				25 ○		
	3-			S5	SS	58	13						pp=100 kPa
	4-			S6	SS	38	101/230 mm			6			
	- - -	grey hard occasional sand seams											
	5—			S7	SS	28	105/150 mm			9			pp >225 kPa
	6-	End of Borehole  Water Level on Completion: 2.10 m											
	7												

CLIENT: Mattamy Development Corporation

LOCATION: Ninth line, Milton, Ontario

ORIGINATED BY: N.S.

REF.:

T08046 - P457

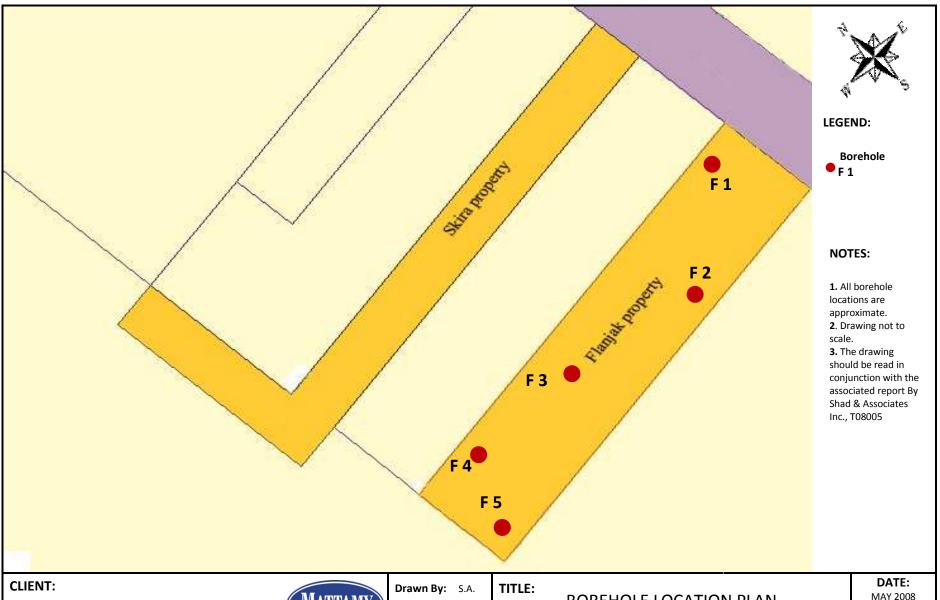
BOREHOLE TYPE: Solid Stem Auger

COMPILED BY: S.A.

DATUM	l: <u>N/A</u>			ATE	: Octo	ober 2	1008				ECKED BY:	H.S					CIATES INC.  Dr, Unit 9,
										CIII	ECKED B1.		J	Va	ughan,	Ont	tario,L4K 2Z6
		SOIL PROFILE		es.	S	AMP		~	DYNAMIC CO	TANCE I	PLOT						REMARKS
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	" N " VALUES	GROUND WATER CONDITIONS	20 40 SHEAR 3 ▲ 20 40	60	80 100	<b>WAT</b>		<b>ONTENT</b> (	TC		GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
		Ground Surface		0,		_	=									,,,,	
	0 -	150 mm Topsoil	~~	1											32		
	- - -	mopttled brown Ploughed / disturbed Silty Clay/Clayey Silt occasional topsoil, organic stains and rootlets		S1	SS	48	9										
	1-	moist		S2	SS	40	4	<u> </u>						27			
	_							-									
	- - - 2	brown SILTY CLAY/CLAYEY SILT TILL moist, stiff to very stiff		S3	SS	48	15										pp = 100 kPa
														00			
			1.	S4	SS	45	21							28 ○			pp = 175 kPa
	3-	grey damp															
	- - - -			S5	SS	53	20	_									
	4—			S6	SS		50/130 mm	_				9					
	-																
	- - - -			S7	SS		50/130 mm	_					13 ○				
	5— —	End of Borehole						-									
	-	Water Level on Completion: 1.2 m															
	_																
	6-																
	7-																
	_																

# Appendix H

Logs & Location Plan of Shad Boreholes Drilled in Parcel H



### MAY 2008 **BOREHOLE LOCATION PLAN Mattamy Development Corp** PROJECT NO.: Checked By: N.S. T08005 **SHAD & ASSOCIATES INC.** FIGURE No.: **PROJECT:** Datum: **Geotechnical Investigation** GEOTECHNICAL, ENVIRONMENTAL AND MATERIALS ENGINEERS Flanjak Property Projection: -83 Citation Drive, Unit 9, 2 Milton, Ontario Vaughan, Ontario, L4K 2Z6 Tel: (905) 760-5566 Scale: N.T.S. Fax: (905) 760-5567 www.shadinc.ca

CLIENT: Mattamy Development Corp

LOCATION: 6252 - 9th Line, Milton, Ontario

ORIGINATED BY: N.S.

REF.: T08005 BOREHOLE TYPE: Solid Stem Augering

COMPILED BY: N.S.

DATUM: N/A **DATE:** May 23, 2008

DATUM:	: <u>N/A</u>		. D	ATE		ay 23,			CHECKED BY:	H.S.	83 C Vaugha	itatior an, On	Dr, Unit 9, tario,L4K 2Z6
ELEVATION (metres)	DEPTH SCALE (metres)	SOIL PROFILE  DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)		GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION  RESISTANCE PLOT 20 40 60 80 100  SHEAR STRENGTH kPa  20 40 60 80 100	<b>WATER COM</b> 10 20		TOV ppm	REMARKS  GRAIN SIZE DISTRIBUTION (%)  GR SA SI CL
	0	Ground Surface	$\sim$										
	- - -	Topsoil		1	SS	18	4			2	2 <b>2</b>		
	- - -	moist, stiff					10	-		20 ©	1		
	1- - - -	brown		2	SS	56	18	-					
	- - - -	Clayey Silt TILL damp, very stiff to hard		3	SS	25	22			<b>16</b> O			
	2 — - - - - -			4	SS	50	37	-		11 0			
	3-	grey oxidized fissures											
	- - -			5	SS	23	37						
	- - -							-					
	4			6	SS	55	26	<u> </u>		0			
	- - - -	grey Silty Clay TILL with Silty Sand inclusions damp, hard		7	SS	43	59	_					
	5 - - -	End of Borehole Measured depth on completion: 5.0 m Ground water depth on completion: 4.2 m											
	- - -												
	6												
	-												
	7-												

CLIENT: Mattamy Development Corp

LOCATION: 6252 - 9th Line, Milton, Ontario

ORIGINATED BY: N.S.

REF.:

<u>T08005</u>

BOREHOLE TYPE: Solid Stem Augering

COMPILED BY: N.S.

DATUM: N/A			. D	ATE	:_M	ay 23,	2008		CHECKED BY:	_H.S	83 C	itatior	ion Dr, Unit 9, Ontario,L4K 2Z6	
SOIL PROFILE				SAMPLES							vaugna	aii, Oii		
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N" VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION           RESISTANCE PLOT         20         40         60         80         100           SHEAR STRENGTH kPa           ▲         20         40         60         80         100		ONTENT (%)	TOV	REMARKS  GRAIN SIZE DISTRIBUTION (%)  GR SA SI CL	
	0	Ground Surface												
	- - - - -	Topsoil  mottled brown ploughed/disturbed Clayey Silt FILL	7277	1	SS	10	10				28 ○ 23 ○			
	- - 1— -	trace organics, trace rootlets wet		2	SS	47	7				24 O 26			
	- - - -	brown Clayey Silt TILL moist to wet firm									26			
	2— 2—	stiff to very stiff		. 3	SS	27	11				0			
	- - - -			4	SS	53	25							
	3 <del>-</del> - - -	oxidized fissures damp, hard		5	SS	27	53			15 O				
	- - - -							_		0				
	4 — - - -			6	SS	60	35	_		13				
	- - - -	trace shale fragments		7	SS	45	72							
	5 - - - -	End of Borehole  Measured depth on completion: 5.0 m  Groundwater depth on completion: 2.25 m												
	- - - 6													
	- - - -													
	- - - 7-													

CLIENT: Mattamy Development Corp

LOCATION: 6252 - 9th Line, Milton, Ontario

ORIGINATED BY: N.S.

REF.: T08005 BOREHOLE TYPE: Solid Stem Augering

COMPILED BY: N.S.

DATUM: N/A					: <u>M</u>	ay 23,	2008			CHECKED BY:						S		83 C	itatio	ssociates inc. tion Dr, Unit 9, Ontario,L4K 2Z6		
SOIL PROFILE				SAMPLES													•			REMARKS		
ELEVATION (metres)	DEPTH SCALE (metres)	DESCRIPTION	STRATA PLOT	SAMPLE NUMBER	TYPE	RECOVERY (cm)	"N"VALUES	GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION  RESISTANCE PLOT  20				WATER CONTENT (%) 10 20 30			TOV	GRAIN SIZE DISTRIBUTION (%)					
	0	Ground Surface	~																			
		Topsoil	27	1	SS	38	7										2	29 O				
	1-	mottled brown ploughed/disturbed Clayey Silt FILL trace organics, trace rootlets		2	SS	13	7										<b>22</b>					
	- - - - -	molted brown Clayey Silt oxidized fissures wet, firm		3	SS	48	5										2	29 O				
	2	brown	4 SS 30 20	20	<u>*</u>									23								
	3-	Clayey Silt TILL moist to wet, very stiff						_														
	- - - - -	grey damp		5	SS	63	24								11 0							
	4-			6	SS	40	29									<b>11</b> 0						
	- - - -	grey <b>Silty Clay TILL</b> damp, hard		7	SS	55	98	_														
	5	End of Borehole  Measured depth on completion: 5.0 m  Groundwater depth on completion: 2.4 m																				
	6																					
	7-																					

LOCATION: 6252 - 9th Line, Milton, Ontario CLIENT: Mattamy Development Corp

REF.:

T08005

ORIGINATED BY: N.S.

BOREHOLE TYPE: Solid Stem Augering

COMPILED BY: N.S.

DATE: May 23, 2008



DATUM: N/A 83 Citation Dr, Unit 9, Vaughan, Ontario,L4K 2Z6 CHECKED BY: \_\_H.S. **SOIL PROFILE SAMPLES** REMARKS DYNAMIC CONE PENETRATION RESISTANCE PLOT GROUND WATER CONDITIONS SAMPLE NUMBER **GRAIN SIZE** <u>E</u> 40 60 80 DEPTH SCALE (metres) PLOT DISTRIBUTION 'N" VALUES ELEVATION (metres) RECOVERY DESCRIPTION (%) STRATA F SHEAR STRENGTH kPa WATER CONTENT (%) TYPE TOV GR SA SI CL 100 ppm **Ground Surface** 25 ○ Topsoil SS 15 8 mottled brown ploughed/disturbed Clayey Silt FILL 23 ○ SS 43 8 trace rootlets, trace organics 23 3 SS 10 5 mottled brown 2-Silty ClayTILL moist to wet, firm SS 56 18 brown moist 3 5 SS 60 13 greyish brown Silty Clay /Clayey Silt TILL damp, stiff to very stiff SS 6 56 16 grey hard 13 SS 46 55 **End of Borehole** Measured depth on completion: 5.0 m Groundwater depth on completion: 2.1 m 6-

CLIENT: Mattamy Development Corp

REF.:

T08005

LOCATION: 6252 - 9th Line, Milton, Ontario

ORIGINATED BY: N.S.

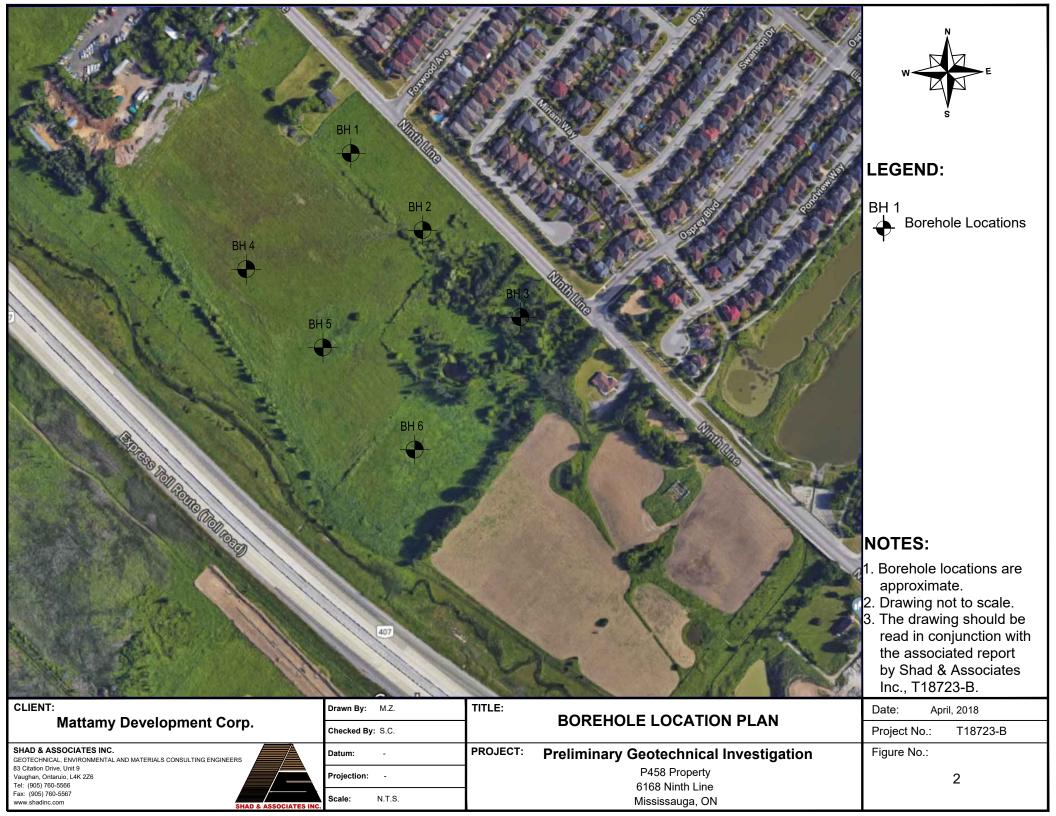
BOREHOLE TYPE: Solid Stem Augering

COMPILED BY: N.S.

DATUM: N/A DATE: May 26, 2008 83 Citation Dr, Unit 9, Vaughan, Ontario,L4K 2Z6 CHECKED BY: H.S. **SOIL PROFILE SAMPLES** REMARKS DYNAMIC CONE PENETRATION RESISTANCE PLOT GROUND WATER CONDITIONS SAMPLE NUMBER **GRAIN SIZE** (E) 40 60 80 DEPTH SCALE (metres) PLOT DISTRIBUTION 'N" VALUES ELEVATION (metres) RECOVERY ( DESCRIPTION (%) STRATA F SHEAR STRENGTH kPa WATER CONTENT (%) TYPE TOV GR SA SI CL 40 100 20 ppm **Ground Surface** Topsoil 25 O SS 19 26 ○ 25 ○ 2 SS 13 4 brown ploughed SiltyClay/Clayey Silt FILL some Sand moist 23 3 SS 33 9 brown 2-Clayey Silt TILL with Silty Clay zones occasional oxidized fissures moist, stiff to very stiff 4 SS 35 20 grey 3 SS 5 35 10 6 SS 50 19 SS 51 89 with Silty Clay zones damp, hard **End of Borehole** Measured depth on completion: 1.5 m Groundwater depth on completion: 1.3 m 6-

# Appendix I

Logs & Location Plan of Shad Boreholes Drilled in Parcel I



### **RECORD OF BOREHOLE 1** Project No.: T18723-B ORIGINATED BY: M.Z. CLIENT: Mattamy Development Corp. March 20, 2018 DATE: LOCATION: Mississauga, Ontario COMPILED BY: M.Z. 83 Citation Dr, Unit 9, Vaughan, Ontario, L4K 2Z6 BOREHOLE TYPE: Solid Stem Auger DATUM: CHECKED BY: H.S. Geodetic **SOIL PROFILE SAMPLES** WATER CONTENT REMARKS AND DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 MONITORING GROUND WATER CONDITIONS SAMPLE NUMBER **GRAIN SIZE** <u>E</u> DEPTH SCALE (metres) PLOT WELL DISTRIBUTION 'N" VALUES ELEVATION (metres) RECOVERY ( DESCRIPTION (%) STRATA SHEAR STRENGTH kPa TYPE GR SA SI CL 60 80 100 5 15 25 35 190.2 Ground Surface Topsoil Ground surface frozen at the time of 189.9 fieldwork. SS 30 1 5 mottled brown 27 Ploughed Sandy Silt Fill some organic stains, moist 189.5 trace organis stains, trace rootlets Gradation Analysis 23 & Atterberg Limits, 2 SS 30 S(2): 1 10 58 31 1-12 stiff, damp to moist LL: 33% PL: 19% brown PI: 14% Silty Clay oxx. oxidized fissures 18 damp, very stiff 3 SS 35 24 188.3 very stiff 2greyish brown Silty Clay Till 12 SS 38 some oxidized fissures damp, hard 3 10 SS 30 5 68 grey 12 SS 30 6 35 185.2 5-**End of Borehole** Cave-in Depth on Completion: None Groundwater Depth on Completion: Dry

6

#### **RECORD OF BOREHOLE 2** Project No.: T18723-B ORIGINATED BY: M.Z. CLIENT: Mattamy Development Corp. March 20, 2018 DATE: LOCATION: Mississauga, Ontario COMPILED BY: M.Z. 83 Citation Dr, Unit 9, Vaughan, Ontario, L4K 2Z6 BOREHOLE TYPE: Solid Stem Auger DATUM: CHECKED BY: H.S. Geodetic **SOIL PROFILE SAMPLES** WATER CONTENT REMARKS AND DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 MONITORING GROUND WATER CONDITIONS SAMPLE NUMBER **GRAIN SIZE** Ē DEPTH SCALE (metres) PLOT WELL DISTRIBUTION 'N" VALUES ELEVATION (metres) RECOVERY DESCRIPTION (%) STRATA SHEAR STRENGTH kPa TYPE GR SA SI CL 60 80 5 15 25 35 189.9 Ground Surface Topsoil Ground surface frozen at the time of 189.6 fieldwork. SS 30 1 5 mottled brown 30 Ploughed Sandy Silt Fill some organic stains, moist 189.0 25 stiff 2 SS 30 10 1 trace to some sand 23 brown Silty Clay damp to moist, very stiff 3 SS 35 19 2 22 occ. silt seams, occ. oxidized fissures SS 25 3-22 186.6 SS 30 5 17 11 damp to moist, very stiff Gradation Analysis & Atterberg Limits, grey 9 S(6): 5 18 49 28 LL: 22% Silty Clay Till 2018 SS 30 some oxidized fissures 6 42 occ. sand seams March 20, 3 damp, hard PL: 14% PI: 8% 11 SS 23 35 7 184.9 5-**End of Borehole**

Cave-in Depth on Completion: None Groundwater Depth on Completion: 4.6m

6

### **RECORD OF BOREHOLE 3** Project No.: T18723-B ORIGINATED BY: M.Z. CLIENT: Mattamy Development Corp. March 21, 2018 DATE: LOCATION: Mississauga, Ontario COMPILED BY: M.Z. 83 Citation Dr, Unit 9, Vaughan, Ontario, L4K 2Z6 DATUM: BOREHOLE TYPE: Solid Stem Auger CHECKED BY: H.S. Approximate Geodetic **SOIL PROFILE SAMPLES** WATER CONTENT REMARKS AND DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 NUMBER GROUND WATER CONDITIONS MONITORING **GRAIN SIZE** Ē DEPTH SCALE (metres) PLOT WFII DISTRIBUTION 'N" VALUES ELEVATION (metres) RECOVERY DESCRIPTION (%) SAMPLE N STRATA SHEAR STRENGTH kPa TYPE GR SA SI CL 60 80 100 5 15 25 35 ~190.0 Ground Surface April 4, 201 Topsoil Ground surface 2018 frozen at the time of fieldwork. 23 1 SS 5 March 29, 2 189.5 24 mottled brown Ploughed Clayey Sandy Silt Fill Borehole moved to some organic stains, moist 20m west, 5m 189.1 south of staked occ. sand seams 24 2 SS 28 1-12 location due to moist, stiff access. brown 24 Silty Clay 3 SS 15 17 damp to moist, very stiff 2 24 2018 SS 25 March 21, 3-26 SS 5 23 16 grey occ. sand seams moist to wet, stiff 26 185.9 SS 6 35 11 damp to moist, stiff grey Silty Clay Till 14 occ. sand seams 7 SS 35 damp, very stiff 24 185.0 5-End of Borehole Cave-in Depth on Completion: None Groundwater Depth on Completion: 3.1m Measured Water Level in installed Piezometer on: March 29, 2018: 0.8 m 6-April 4, 2018: 0.5 m

### **RECORD OF BOREHOLE 4** Project No.: T18723-B ORIGINATED BY: M.Z. CLIENT: Mattamy Development Corp. March 21, 2018 DATE: LOCATION: Mississauga, Ontario COMPILED BY: M.Z. 83 Citation Dr, Unit 9, Vaughan, Ontario, L4K 2Z6 DATUM: BOREHOLE TYPE: Solid Stem Auger CHECKED BY: H.S. Geodetic **SOIL PROFILE SAMPLES** WATER CONTENT REMARKS AND DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 MONITORING GROUND WATER CONDITIONS SAMPLE NUMBER **GRAIN SIZE** Ē DEPTH SCALE (metres) PLOT WFII DISTRIBUTION 'N" VALUES ELEVATION (metres) RECOVERY DESCRIPTION (%) STRATA SHEAR STRENGTH kPa TYPE GR SA SI CL 2018 60 80 5 15 25 35 , 2018 April 4, 190.1 Ground Surface March 29, Topsoil Ground surface frozen at the time of 189.8 fieldwork. 30 1 SS 5 mottled brown 21 Ploughed Sandy Silt Fill occ. organic stains, moist 189.4 2018 occ. organic stains, trace rootlets March 21, 25 brown 2 SS 28 9 1-**Clayey Sandy Silt** occ. oxidized fissures wet, loose 188.7 brown Silty Clay occ. oxidized fissures 24 3 SS 35 21 damp to moist, very stiff 2 22 SS 25 3greyish brown occ. silt seams 186.7 SS 5 35 25 24 grey Silty Clay Till damp, very stiff occ. silty sand till seams 11 SS 15 50/13cm 6 hard 185.2 End of Borehole 5-Cave-in Depth on Completion: None Groundwater Depth on Completion: 1.3m Measured Water Level in installed Piezometer on: March 28, 2018: 0.4 m April 4, 2018: 0.1 m 6-

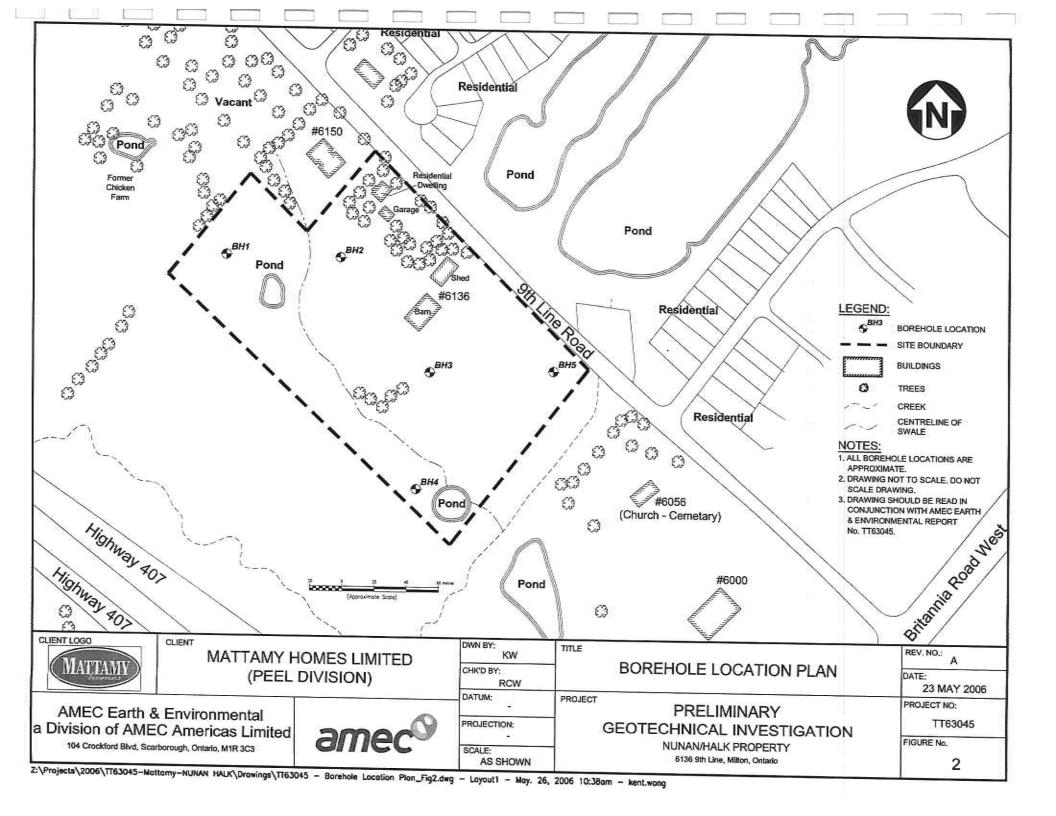
### **RECORD OF BOREHOLE 5** Project No.: T18723-B ORIGINATED BY: M.Z. CLIENT: Mattamy Development Corp. March 20, 2018 DATE: LOCATION: Mississauga, Ontario COMPILED BY: M.Z. 83 Citation Dr, Unit 9, Vaughan, Ontario, L4K 2Z6 BOREHOLE TYPE: Solid Stem Auger DATUM: CHECKED BY: H.S. Geodetic **SOIL PROFILE SAMPLES** WATER CONTENT REMARKS AND DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 GROUND WATER CONDITIONS MONITORING SAMPLE NUMBER **GRAIN SIZE** Ē DEPTH SCALE (metres) PLOT WFII DISTRIBUTION 'N" VALUES ELEVATION (metres) RECOVERY DESCRIPTION (%) STRATA SHEAR STRENGTH kPa TYPE GR SA SI CL 60 80 100 5 15 25 35 191.3 Ground Surface Topsoil Ground surface 191.0 frozen at the time of fieldwork. mottled brown SS 1 30 6 2018 17 Ploughed Sandy Silt Fill some organic stains, moist 20, 190.6 March mottled brown, occ. organic stains -----22 ¥ 2 SS 30 10 1brown Clayey Sandy Silt occ. sand interbeddings moist to wet, loose to compact 189.4 3 SS 35 13 24 brown 2greyish brown Silty Clay 21 occ. sand seams damp to moist, very stiff SS 3-23 moist, stiff SS 5 15 13 187.6 grey Silty Clay Till 12 occ. sand seams 4-SS 28 damp to moist, very stiff 6 23 186.8 grey Silty Clay 21 damp to moist, very stiff SS 30 27 186.3 5-**End of Borehole** Cave-in Depth on Completion: None Groundwater Depth on Completion: 1.0m 6

### **RECORD OF BOREHOLE 6** Project No.: T18723-B ORIGINATED BY: M.Z. CLIENT: Mattamy Development Corp. March 21, 2018 DATE: LOCATION: Mississauga, Ontario COMPILED BY: M.Z. 83 Citation Dr, Unit 9, Vaughan, Ontario, L4K 2Z6 BOREHOLE TYPE: Solid Stem Auger DATUM: CHECKED BY: H.S. Geodetic **SOIL PROFILE SAMPLES** WATER CONTENT REMARKS AND DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 MONITORING GROUND WATER CONDITIONS SAMPLE NUMBER **GRAIN SIZE** Ē DEPTH SCALE (metres) PLOT WFII DISTRIBUTION 'N" VALUES ELEVATION (metres) RECOVERY DESCRIPTION (%) STRATA SHEAR STRENGTH kPa TYPE GR SA SI CL 60 80 100 5 15 25 35 189.9 Ground Surface Topsoil Ground surface frozen at the time of 189.6 fieldwork. SS 1 20 5 mottled brown 23 Ploughed Clayey Sandy Silt Fill March 21, 2018 occ. organic stains, moist 189.3 brown 22 **Clayey Sandy Silt** 2 SS 30 8 1occ. sand interbeddings moist to wet, loose 188.5 brown 24 Silty Clay 3 SS 28 16 occ. silt seams damp to moist, very stiff 2 -----24 some oxidized fissures SS 30 3moist 26 SS 5 17 18 186.3 grey 14 Silty Clay Till SS 23 6 16 occ. sand seams damp to moist, very stiff 11 damp 7 SS 28 26 184.9 5-**End of Borehole** Cave-in Depth on Completion: 4.5m Groundwater Depth on Completion: 1.1m 6

## Appendix J

Logs & Location Plan of AMEC Boreholes Drilled in Parcel J

DS Consultants Ltd. June 5, 2019





REF.	Mattamy Homes Limited (Peel Div TT63045							Augerin		1000000									BY MA Y SN
	M Geodetic											===							/IH
	SOIL PROFILE	-		SAM	PLES	<u> </u>	<b>(0</b>	SALE	DYNAMI RESISTA	C CONE	PENET	RATIO	N	PLAST	IC NA			Γ	REMARKS
LEV EPTH (m) 189.8	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER	CONDITION 3 DEPTH	BELEVATION SCALE	SHEAR O UNC	ONFINE	) +	Pa FIEL	D VANE VANE 100	W <sub>P</sub>	TER C	ONTE	W <sub>L</sub>	γ	& GRAIN SIZE DISTRIBUTIO (%) GR SA SI
89.4 0.4	about 360 mm TOPSOIL  dark brown to brown SILTY CLAY / CLAYEY SILT		1	SS	8		F					, av				0	50:		IGR SA SI
	trace rootlets in SS1 stiff to hard moist		2	ss	311		_ _ 1	189				-		- 5		0			
	grey		3	ss	17			188								0			
	**********						- 2 -	-											
	brownish grey		4	SS	33		_ _ _ 3	- 18 <del>7</del>								0			
			5	ss	25	⊽	-	-								0			
5.8 4.0	grey SILTY CLAY stiff moist						- - 4 -	18 <del>6</del> - - -	100 (100 (100 (100 (100 (100 (100 (100								-+		
			6	SS	8		_ _ _ 5	- 18 <del>5</del> -							-0				
4.3 5.5 <b>S</b>	grey  ILTY CLAY / CLAYEY SILT TILL  trace sand and gravel hard  moist						_ _ _ _ 6	184			51-1				5. Table 1				
3.3	End of Borehole		7	ss	61/23		-	-						Þ					
Gre	oundwater in open borehole on npletion; 3.4 m																		



DAT	UM Geodetic				_			Augeri	194										BY SN
DAI		DA		_		11 Ma	-	14	TOVNIAMI	CONE	DENET	DATION				_ cı	HECK	ED B	YIH
3.8	SOIL PROFILE	Т.	_	SAMF	PLES	E E	2	SCALE	DYNAMI RESISTA			-		PLAST	IC NA	TURAL STURE NTENT	LIQUII		REMARKS
EPTH (m) 190	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER	нтезо Е	BELEVATION SCALE	SHEAR O UNC O QUIC	ONFINE	) + IAL X	FIELD LAB V	VANE ANE	W <sub>P</sub> WAT	TER C	W ONTEN	₩, NT (%)	γ	GRAIN SIZE DISTRIBUTIO
89.9 0.3	about 200 mm Tor OOIL		1	ss	12			190		40		80 1			0	20	30	kN/n	GR SA SI
	moist trace rootlets		2	SS	28		_ - 1	189											
	brown and grey				40			-											
			3	SS	12		- - 2 -	188											
			4	ss	31		=	-											
16. <u>6</u>			5	ss	39	∡ -	- 3 -	187 - -											
3.5	grey SILTY CLAY firm to stiff moist		6	ss	12		- 4	186		4.5									
								100											
			7	ss	6		- 5	185	11 - 23				_						
								-											
.5			8	ss	8		6	184											
.6	End of Borehole Groundwater in open borehole on completion: 3.1 m	all																	



DA"	520 10-2460/40044				TPE_			Augeri 16	19											Y SN
-	SOIL PROFILE	-		SAMF		-		2	DYN	AMIC CO	NE PE	NETR	ATION	_	r		- 5-4	74-27-51PV		Y <u>IH</u>
ELEV (m)	V DESCRIPTION	STRAT PLOT	NUMBER	0.210,100,000	N. VALUES	GROUND WATER	DEPTH	ELEVATION SCALE	SHE	20 4 AR STI	O E RENG INED	TH kF	e Pa FIELD	100 VANE	W <sub>P</sub>		524.00	LIQUII LIMI WL 	Y UNIT	REMARKS & GRAIN SIZE DISTRIBUTIO (%)
189. 189. 0.	about 250 mm TOPSOIL	ST	-		150	. B	_m_	<u>                                     </u>	• (	UICK TI 20 4				ANE		10		30 0	kN/m	GR SA SI
0.:	SILTY CLAY / CLAYEY SILT trace rootlets in SS1 stiff to hard		1	SS	8		=	=									0			
	moist		2	ss	8		- -1	189 -									0			
			3	ss	20			- 18 <del>0</del>									0			
				A104			- 2 -	- H												
			4	ss	35	Ā	- - - 3	18 <del>7</del>									٥			
<u>86.1</u>			5	SS	32	¥	- - -										o			
3.7	grey SILTY CLAY stiff wet		6	SS	8		- - 4 -	18 <del>6</del> - -									c			
			7	ss	11			- 18 <del>5</del>										-0		
5.0	L		- 5   12				- 5	2												



REF	F. T163045	ВС				Solid S	tem	Augeri		(NUNA	ANDROSE Te									BY MA SY SN
DAT	TUM Geodetic					11 Ma														YIH
	SOIL PROFILE		Т	SAME	PLES	00	2.00	Щ	DYN/	MIC CO	NE PE	NETR	ATIO	1	П	1000				
ELEV EPTF (m)	H DESCRIPTION	STRAT PLOT	NUMBER	TYPE	N. VALUES	GROUND WATER CONDITIONS	DEPTH	BELEVATION SCALE	SHE.	AR STE	ENGT	TH KF	80 Pa FIELI	100 D VANE	W <sub>P</sub>	A-NET	TURAL DISTURE DISTURE DISTURE W		TIND I	REMARKS & GRAIN SIZE DISTRIBUTIO (%)
189		S	Ē		7	9	m	ᇤ	• 0	UICK TE				VANE 100	VVA	10	20	NT (%) 30		GR SA SI
1 <u>89.0</u> 0.4			L	ss	8			18 <del>9</del>				-								
	moist trace rootlets		2	ss	14		- 1													
								188			1									
			3	SS	28		- - 2 -	1 10 1							Vi					
			4	ss	42			18 <del>7</del> –					-							
			5	ss	27		- 3	=												
							3 6 7	18 <del>6</del>												
4.0	grey SILTY CLAY / CLAYEY SILT TILL some sand and gravel very stiff moist						4	185												
4.4	to wet		6	ss	20		5	-												
5.0	End of Borehole  No noticeable groundwater in open borehole on completion																			
							ŀ													



CLIENT REF.	Mattamy Homes Limited (Peel Div					Solid :				HONAIN	/ II/IL	N.				- 100			BY MA
	Geodetic					11 Ma			114										Y SN
	SOIL PROFILE		-	_		_	_		IDYNA	MIC CON	E PENE	TRATIC	NON NO				HECKED B		
	SOIL PROFILE	TE	+	SAME	T	A HE W	_	SCAL		MIC CON TANCE P		_	104	PLAST	IG NAT	URAL STURE	LIQUIE	9 5	REMARKS &
ELEV EPTH (m)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	DEPTH	BELEVATION SCALE	SHEA	R STRE	ED XIAL	+ FIE × LAE		W <sub>P</sub>	TER CO	W O ONTER	WL WL NT (%)	Y	DISTRIBUTIO (%)
189.6	about 250 mm TOPSOIL	88				-	m	m	2	0 40	60	80_	100		0 3	20	30	kN/m	GR SA SI
0.3	dark brown to yellowish brown SILTY CLAY / CLAYEY SILT trace rootlets in SS1 stiff to hard		1	SS	10			189								0			
	moist		2	ss	10		- 1									o			
			3	ss	23			188								0			
							- 2 -	-											
			4	SS	44			18 <del>7</del>			-					9			
			5	ss	20		- 3 -									0			
5.9				55	20			186						- 51-4		0			
3.7	grey SILTY CLAY stiff			-		-		_											
	moist to wet		6	SS	13		- 4	-								o			
			7	ss	14			18 <del>5</del>							+				
4.6 5.0	End of Borehole	Щ		55	1.9	_	- 5	_				-				0			
No bore	noticeable groundwater in open ehole on completion																		

# Appendix K General Comments on Bedrock in Toronto Area

DS Consultants Ltd. June 5, 2019

Project: 18-692-100 Appendix K

### 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.

# Appendix L Engineered Fill Guidelines

Project: 18-692-100 Appendix L

## **GENERAL REQUIREMENTS FOR ENGINEERED FILL**

Compacted imported soil that meets specific engineering requirements and is free of organics and debris and that has been continually monitored on a full-time basis by a qualified geotechnical representative is classified as engineered fill. Engineered fill that meets these requirements and is bearing on suitable native subsoil can be used for the support of foundations.

Imported soil used as engineered fill can be removed from other portions of a site or can be brought in from other sites. In general, most of Ontario soils are too wet to achieve the 100% Standard Proctor Maximum Dry Density (SPMDD) and will require drying and careful site management if they are to be considered for engineered fill. Imported non-cohesive granular soil is preferred for all engineered fill. For engineered fill, we recommend use of OPSS Granular 'B' sand and gravel fill material.

Adverse weather conditions such as rain make the placement of engineered fill to the required degree of density difficult or impossible; engineered fill cannot be placed during freezing conditions, i.e. normally not between December 15 and April 1 of each year.

The location of the foundations on the engineered fill pad is critical and certification by a qualified surveyor that the foundations are within the stipulated boundaries is mandatory. Since layout stakes are often damaged or removed during fill placement, offset stakes must be installed and maintained by the surveyors during the course of fill placement so that the contractor and engineering staff are continually aware of where the engineered fill limits lie. Excavations within the engineered fill pad must be backfilled with the same conditions and quality control as the original pad.

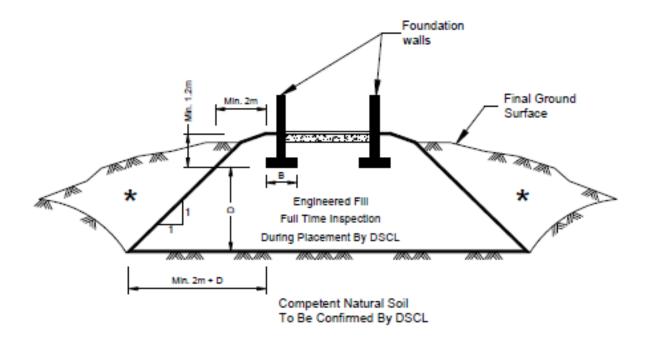
To perform satisfactorily, engineered fill requires the cooperation of the designers, engineers, contractors and all parties must be aware of the requirements. The minimum requirements are as follows; however, the geotechnical report must be reviewed for specific information and requirements.

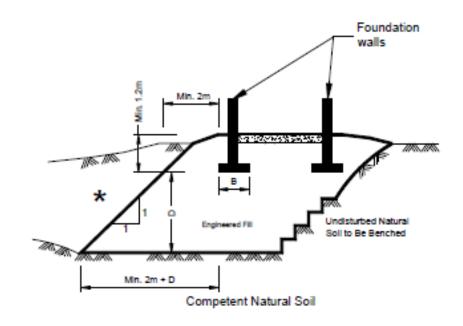
- 1. Prior to site work involving engineered fill, a site meeting to discuss all aspects must be convened. The surveyor, contractor, design engineer and geotechnical engineer must attend the meeting. At this meeting, the limits of the engineered fill will be defined. The contractor must make known where all fill material will be obtained from and samples must be provided to the geotechnical engineer for review, and approval before filling begins.
- 2. Detailed drawings indicating the lower boundaries as well as the upper boundaries of the engineered fill must be available at the site meeting and be approved by the geotechnical engineer.
- 3. The building footprint and base of the pad, including basements, garages, etc. must be defined by offset stakes that remain in place until the footings and service connections are all constructed. Confirmation that the footings are within the pad, service lines are in place, and that the grade conforms to drawings, must be obtained by the owner in writing from the surveyor and DS Consultants Ltd (DSCL). Without this confirmation no responsibility for the performance of the structure can be accepted by DSCL. Survey drawing of the pre and post fill location and elevations will also be required.
- 4. The area must be stripped of all topsoil and fill materials. Subgrade must be proof-rolled. Soft spots must be dug out. The stripped native subgrade must be examined and approved by a DSCL engineer prior to placement of fill.

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5. The approved engineered fill material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. Engineered fill should not be placed during the winter months. Engineered fill compacted to 100% SPMDD will settle under its own weight approximately 0.5% of the fill height and the structural engineer must be aware of this settlement. In addition to the settlement of the fill, additional settlement due to consolidation of the underlying soils from the structural and fill loads will occur and should be evaluated prior to placing the fill.

- 6. Full-time geotechnical inspection by DSCL during placement of engineered fill is required. Work cannot commence or continue without the presence of the DSCL representative.
- 7. The fill must be placed such that the specified geometry is achieved. Refer to the attached sketches for minimum requirements. Take careful note that the projection of the compacted pad beyond the footing at footing level is a minimum of 2 m. The base of the compacted pad extends 2 m plus the depth of excavation beyond the edge of the footing.
- 8. A bearing capacity of 150 kPa at SLS (225 kPa at ULS) can be used provided that all conditions outlined above are adhered to. A minimum footing width of 500 mm (20 inches) is suggested and footings must be provided with nominal steel reinforcement.
- 9. All excavations must be done in accordance with the Occupational Health and Safety Regulations of Ontario.
- 10. After completion of the engineered fill pad a second contractor may be selected to install footings. The prepared footing bases must be evaluated by engineering staff from DSCL prior to footing concrete placements. All excavations must be backfilled under full time supervision by DSCL to the same degree as the engineered fill pad. Surface water cannot be allowed to pond in excavations or to be trapped in clear stone backfill. Clear stone backfill can only be used with the approval of DSCL.
- 11. After completion of compaction, the surface of the engineered fill pad must be protected from disturbance from traffic, rain and frost. During the course of fill placement, the engineered fill must be smooth-graded, proof-rolled and sloped/crowned at the end of each day, prior to weekends and any stoppage in work in order to promote rapid runoff of rainwater and to avoid any ponding surface water. Any stockpiles of fill intended for use as engineered fill must also be smooth-bladed to promote runoff and/or protected from excessive moisture take up.
- 12. If there is a delay in construction, the engineered fill pad must be inspected and accepted by the geotechnical engineer. The location of the structure must be reconfirmed that it remains within the pad.
- 13. The geometry of the engineered fill as illustrated in these General Requirements is general in nature. Each project will have its own unique requirements. For example, if perimeter sidewalks are to be constructed around the building, then the projection of the engineered fill beyond the foundation wall may need to be greater.
- 14. These guidelines are to be read in conjunction with DS Consultants Ltd report attached.





Backfill in this area to be as per the DSCL report.