EXPLANATION OF BOREHOLE LOG

This form describes some of the information provided on the borehole logs, which is based primarily on examination of the recovered samples, and the results of the field and laboratory tests. Additional description of the soil/rock encountered is given in the accompanying geotechnical report.

GENERAL INFORMATION
Project details, borehole number, location coordinates and type of drilling equipment used are given at the top of the borehole log.

SOIL LITHOLOGY

Elevation and Depth
This column gives the elevation and depth of inferred geologic layers. The elevation is referred to the datum shown in the Description column.

Lithology Plot
This column presents a graphic depiction of the soil and rock stratigraphy encountered within the borehole.

Description
This column gives a description of the soil strata, based on visual and tactile examination of the samples augmented with field and laboratory test results. Each stratum is described according to the Modified Unified Soil Classification System.

The compactness condition of cohesionless soils (SPT) and the consistency of cohesive soils (undrained shear strength) are defined as follows (Ref. Canadian Foundation Engineering Manual):

<table>
<thead>
<tr>
<th>Compactness of Cohesionless Soils</th>
<th>SPT N-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very loose</td>
<td>0 to 4</td>
</tr>
<tr>
<td>Loose</td>
<td>4 to 10</td>
</tr>
<tr>
<td>Compact</td>
<td>10 to 30</td>
</tr>
<tr>
<td>Dense</td>
<td>30 to 50</td>
</tr>
<tr>
<td>Very Dense</td>
<td>&gt; 50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consistency of Cohesive Soils</th>
<th>Undrained Shear Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very soft</td>
<td>0 to 12</td>
</tr>
<tr>
<td>Soft</td>
<td>12 to 25</td>
</tr>
<tr>
<td>Firm</td>
<td>25 to 50</td>
</tr>
<tr>
<td>Stiff</td>
<td>50 to 100</td>
</tr>
<tr>
<td>Very stiff</td>
<td>100 to 200</td>
</tr>
<tr>
<td>Hard</td>
<td>Over 200</td>
</tr>
</tbody>
</table>

Soil Sampling
Sample types are abbreviated as follows:

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS</td>
<td>Split Spoon</td>
</tr>
<tr>
<td>AS</td>
<td>Auger Sample</td>
</tr>
<tr>
<td>TW</td>
<td>Thin Wall Open (Pushed)</td>
</tr>
<tr>
<td>TP</td>
<td>Thin Wall Piston (Pushed)</td>
</tr>
<tr>
<td>RC</td>
<td>Rock Core</td>
</tr>
<tr>
<td>WS</td>
<td>Washed Sample</td>
</tr>
</tbody>
</table>

Additional information provided in this section includes sample numbering, sample recovery and numerical testing results.

Field and Laboratory Testing
Results of field testing (e.g., SPT, pocket penetrometer, and vane testing) and laboratory testing (e.g., natural moisture content, and limits) executed on the recovered samples are plotted in this section.

Instrumentation Installation
Instrumentation installations (monitoring wells, piezometers, inclinometers, etc.) are plotted in this section. Water levels, if measured during fieldwork, are also plotted. These water levels may or may not be representative of the static groundwater level depending on the nature of soil stratum where the piezometer tips are located, the time elapsed from installation to reading and other applicable factors.

Comments
This column is used to describe non-standard situations or notes of interest.
### Soil Components

<table>
<thead>
<tr>
<th>Fraction</th>
<th>U.S Standard Sieve Size</th>
<th>Passing</th>
<th>Retained</th>
<th>Percent</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravel</td>
<td>76 mm</td>
<td>19 mm</td>
<td>56-50</td>
<td>AMN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19 mm</td>
<td>4.75 mm</td>
<td>20-35</td>
<td>Y/EY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.75 mm</td>
<td>2.00 mm</td>
<td>10-20</td>
<td>SOME</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.00 mm</td>
<td>425 µm</td>
<td>1-10</td>
<td>TRACE</td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td>425 µm</td>
<td>75 µm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fines</td>
<td>75 µm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oversized</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Oversized Material**
- Rounded or Subrounded: Cobble 76 mm to 200 mm
- Boulders > 200 mm

### Plasticity Chart for Soil Passing 425 Micron Sieve

- **Wp = 50**
- **Wp = 30**
- **Wp = 20**

**Note 1:** Soils are classified and described according to their engineering properties and behaviour.

**Note 2:** The modifying adjectives used to define the actual or estimated percentage range by weight of minor components are consistent with the Canadian Foundation Engineering Manual.
Auger refusal. Borehole was moved 4 times within 1 m radius and auger refusal was encountered at 1.2 m depth.

Groundwater encountered on completion of drilling on 19/10/2017 at a depth of: 0.0 m.
RECORD OF BOREHOLE No.  BH 17-2

LITHOLOGY PROFILE

DESCRIPTION

Geodetic Ground Surface Elevation: 100.3 m

100.0

about 225 mm TOPSOIL

Sandy Silt FILL
trace to some clay, with rock fragments
moist

SS  1  83  29

100

99

2

98

2

97.4

WEATHERED SHALE
Georgian Bay Formation
Highly weathered

SS  5  100  25 / 130mm

97.7

97.2

SILTY CLAY
some sand, trace gravel
hard

SS  4  100  25 / 100mm

96.7

96.2

2

SOIL SAMPLING

Sample Type
Sample Number
Recovery (%)
SPT N / RQD (%)
DEPTH (m)

Sample Type
Sample Number
Recovery (%)
SPT N / RQD (%)
DEPTH (m)

SS  3  100  25 / 100mm

SS  2  100  25 / 150mm

FIELD TESTING

Penetration Testing

MTO Vane*  Intact  Intact
Nilon Vane*  Remould  Remould

Undrained Shear Strength (kPa)

20  40  60  80

LAB TESTING

Soil Vapor Testing

COV ppm

DCPT

* Undrained Shear Strength (kPa)

SPT 'N' / RQD (%)

2  4  6  8

ELEVATION (m)

Instruments

Installing

Remould

Intact

Nilcon Vane*

MTO Vane*

Soil Vapor Reading

W W

L L

TOV (ppm)

100  200  300  400

COV (ppm)

W W

L L

COV (LEL)

TOV (LEL)

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR  BA  SI  CL

Amec Foster Wheeler
Environment & Infrastructure
50 Vogell Road
Richmond Hill, Ontario, L4B 3K6
Canada
Tel. No.: (905) 403-5014
amecw.com

Groundwater encountered on completion of drilling on 29/09/2017 at a depth of: dry. Cave in depth after removal of augers: 0.6 m.

Auger Refusal.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 26
Page: 1 of 1
Auger refusal. Borehole was moved within 1 m radius and auger refusal was encountered at 0.9 m depth on October 12, 2017, another borehole was augered down to 0.9 m and followed with SPT.

**Lithology Profile**

<table>
<thead>
<tr>
<th>Lithology Type</th>
<th>Sample Type</th>
<th>Sample Number</th>
<th>Recovery (%)</th>
<th>SPT 'N' / RQD (%)</th>
<th>Elevation (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>about 100 mm TOPSOIL</td>
<td>SS</td>
<td>1</td>
<td>58</td>
<td>10</td>
<td>99</td>
</tr>
<tr>
<td>Sandy Silt FILL</td>
<td>SS</td>
<td>2</td>
<td>67</td>
<td>25 / 150 mm</td>
<td>25</td>
</tr>
<tr>
<td>hit rock fragment</td>
<td>SS</td>
<td>3</td>
<td>100</td>
<td>25 / 150 mm</td>
<td>1</td>
</tr>
<tr>
<td>Silty Clay</td>
<td>SS</td>
<td>4</td>
<td>100</td>
<td>25 / 150 mm</td>
<td>1</td>
</tr>
<tr>
<td>Weathered Shale</td>
<td>SS</td>
<td>5</td>
<td>100</td>
<td>25 / 150 mm</td>
<td>1</td>
</tr>
</tbody>
</table>

**Soil Sampling**

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Sample Number</th>
<th>Recovery (%)</th>
<th>SPT 'N' / RQD (%)</th>
<th>Elevation (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS</td>
<td>1</td>
<td>58</td>
<td>10</td>
<td>99</td>
</tr>
<tr>
<td>SS</td>
<td>2</td>
<td>67</td>
<td>25 / 150 mm</td>
<td>25</td>
</tr>
<tr>
<td>SS</td>
<td>3</td>
<td>100</td>
<td>25 / 150 mm</td>
<td>1</td>
</tr>
<tr>
<td>SS</td>
<td>4</td>
<td>100</td>
<td>25 / 150 mm</td>
<td>1</td>
</tr>
<tr>
<td>SS</td>
<td>5</td>
<td>100</td>
<td>25 / 150 mm</td>
<td>1</td>
</tr>
</tbody>
</table>

**Field Testing**

- SPT
- Penetration Testing
- Soil Vapor Testing
- DCPT

**Lab Testing**

- Undrained Shear Strength (kPa)
- MTO Vane
- Nilson Vane
- COV (ppm)
- TOV (ppm)

**Comments & Grain Size Distribution (%)**

<table>
<thead>
<tr>
<th>Grain Size</th>
<th>0</th>
<th>18</th>
<th>48</th>
<th>34</th>
</tr>
</thead>
<tbody>
<tr>
<td>GR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Groundwater encountered on completion of drilling on 12/10/2017 at a depth of: dry.
Cave in depth after removal of augers: 0.0 m.

Auger refusal. Borehole was moved within 1 m radius and auger refusal was encountered at 0.9 m depth on October 12, 2017, another borehole was augered down to 0.9 m and followed with SPT.

Auger refusal.
On Oct. 12, 2017, another borehole was augered down to 0.5 m and followed with SPT, auger refusal was encountered at 1.1 m depth.

On October 19, 2017, test pit was conducted to 1.1 m depth and followed with SPT.

Auger refusal.

Groundwater encountered on completion of drilling on 19/10/2017 at a depth of: dry.

Cave in depth after removal of augers: 0.0 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geological report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.
**LITHOLOGY PROFILE**

<table>
<thead>
<tr>
<th>Lithology</th>
<th>Sample Type</th>
<th>Sample Number</th>
<th>Recovery (%)</th>
<th>Elevation (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandy Gravel FILL</td>
<td>GB</td>
<td>1</td>
<td>100</td>
<td>95.0</td>
</tr>
<tr>
<td>Sandy Silt FILL</td>
<td>SS</td>
<td>2</td>
<td>100</td>
<td>94.0</td>
</tr>
<tr>
<td>WEATHERED SHALE</td>
<td>SS</td>
<td>4</td>
<td>100</td>
<td>94.2</td>
</tr>
<tr>
<td>End of Borehole</td>
<td>SS</td>
<td>5</td>
<td>100</td>
<td>93.9</td>
</tr>
</tbody>
</table>

**DESCRIPTION**

- Sandy Gravel FILL: trace rootlets, trace rock fragments, moist
- Sandy Silt FILL: trace clay, trace gravel, moist
- WEATHERED SHALE: Georgian Bay Formation, Highly weathered

**SOIL SAMPLING**

- Recovery (%)

**FIELD TESTING**

- Penetration Testing
- MTO Vane
- Nilson Vane
- Unconfined Compressibility (kPa)
- Undrained Shear Strength (kPa)
- Penetration Testing
- Remould Shear Strength (kPa)
- Remould Shear Strength (kPa)
- DCPT
- Undrained Shear Strength (kPa)
- Unconfined Compressibility (kPa)
- Penetration Testing

**LAB TESTING**

- Soil Vapor Testing
- COV (ppm)
- TOV (ppm)
- COV (LEL)
- TOV (LEL)

**COMMENTS & GRAIN SIZE DISTRIBUTION (%)**

- Groundwater encountered on completion of drilling on 06/10/2017 at a depth of 0.9 m.
- Cave in depth after removal of augers: 1.6 m.

Auger Refusal.

Groundwater encountered on completion of drilling on 06/10/2017 at a depth of 0.9 m. Cave in depth after removal of augers: 1.6 m.

Borehole details presented do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 26

Page: 1 of 1
**LITHOLOGY PROFILE**

<table>
<thead>
<tr>
<th>Lithology</th>
<th>Sample Type</th>
<th>Sample Number</th>
<th>Recovery (%)</th>
<th>Depth (m)</th>
<th>Elevation (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandy Gravel FILL trace rootlets</td>
<td>SS</td>
<td>1</td>
<td>25</td>
<td>16</td>
<td>92</td>
</tr>
<tr>
<td>Sandy Silt FILL trace clay, trace gravel, trace rootlets &amp; organic matter moist</td>
<td>SS</td>
<td>2</td>
<td>78</td>
<td>16</td>
<td>91.5</td>
</tr>
<tr>
<td>WEATHERED SHALE Georgian Bay Formation Highly weathered brown</td>
<td>SS</td>
<td>3</td>
<td>44</td>
<td>50/80mm</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>SS</td>
<td>4</td>
<td>100</td>
<td>50/100mm</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>SS</td>
<td>5</td>
<td>100</td>
<td>50/80mm</td>
<td>89</td>
</tr>
</tbody>
</table>

**SOIL SAMPLING**

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Sample Number</th>
<th>Recovery (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>SS</td>
<td>2</td>
<td>78</td>
</tr>
<tr>
<td>SS</td>
<td>3</td>
<td>44</td>
</tr>
<tr>
<td>SS</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>SS</td>
<td>5</td>
<td>100</td>
</tr>
</tbody>
</table>

**FIELD TESTING**

<table>
<thead>
<tr>
<th>Penetration Testing</th>
<th>Soil Vapor Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPT</td>
<td>DCPT</td>
</tr>
</tbody>
</table>

**LAB TESTING**

<table>
<thead>
<tr>
<th>Soil Vapour Testing</th>
<th>Instrumentation Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>COV (ppm)</td>
<td>TOV (ppm)</td>
</tr>
</tbody>
</table>

**COMMENTS & GRAIN SIZE DISTRIBUTION (%)**

<table>
<thead>
<tr>
<th>Grain Size Distribution (%)</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

**RECORD OF BOREHOLE No. BH 17-6**

**Project Number:** TT163003.9000  
**Drilling Location:** Proposed Bridge E  
**Drilling Method:** 150 mm Solid Stem Auger  
**Drilling Machine:** Track Mounted Drill  
**Date Started:** 5 Oct 17  
**Date Completed:** 13 Oct 17

**Lithology Plot**

- **Geodetic Ground Surface Elevation:** 92.7 m
- **SPT 'N' / RQD (%)**
- **Unconfined Shear Strength (kPa)**
- **DCPT**
- **Undrained Shear Strength (kPa)**

**Geotechnical Details**

- **Groundwater encountered on completion of drilling on 13/10/2017 at a depth of: 4.6 m.**
- **Auger Refusal.**

**Amec Foster Wheeler**

Environment & Infrastructure

50 Vogel Road  
Richmond Hill, Ontario, L4B 3K6  
Canada

Tel No.: (905) 403-5014  
amecfw.com

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying ‘Explanation of Borehole Log’.
**RECORD OF BOREHOLE No. **  BH 17-7

<table>
<thead>
<tr>
<th>Lithology Plot</th>
<th>Sample Type</th>
<th>Sample Number</th>
<th>Recovery (%)</th>
<th>SP'T N / RQD (%)</th>
<th>SP’T (in m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>about 150 mm TOPSOIL</td>
<td>AS</td>
<td>1</td>
<td>93.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>brown to grey</td>
<td>Sandy Silt FILL</td>
<td>0.2</td>
<td>SS</td>
<td>2</td>
<td>67</td>
</tr>
<tr>
<td>trace to some clay, trace gravel, with rock fragments, trace rootlets</td>
<td>moist</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>brown to grey</td>
<td>SILTY CLAY</td>
<td>1.1</td>
<td>SS</td>
<td>3</td>
<td>79</td>
</tr>
<tr>
<td>sandy, trace gravel</td>
<td>hard</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEODETIC GROUND SURFACE ELEVATION: 93.7 m</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEODETIC GROUND SURFACE ELEVATION: 93.7 m</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEATHERED SHALE</td>
<td>Georgian Bay Formation</td>
<td>91.7</td>
<td>SS</td>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>Highly weathered</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>End of Borehole</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SOIL SAMPLING**

**DESCRIPTION**

- **Sample Type**: AS
- **Sample Number**: 1
- **Recovery (%)**: 93.5
- **SP’T (in m)**: 93.7

**SOIL TESTING**

- **Penetration Testing**
  - SP’T
  - SP’T N
  - RQD

**FIELD TESTING**

- **MT0 Vane**
  - Intact
  - Remould
- **Nilcon Vane**
  - Intact
  - Remould

- **Unconfined Shear Strength (kPa)**
  - 20
  - 40
  - 60
  - 80

- **SPT ‘N’ / RQD (%)**
  - 20
  - 40
  - 60
  - 80

- **DCPT**
  - 2
  - 4
  - 6
  - 8

**LAB TESTING**

- **Soil Vapour Testing**
  - COV (ppm)
  - TOV (ppm)
  - COV (LEL)
  - TOV (LEL)

- **GRAIN SIZE DISTRIBUTION (%)**

- **COMMENTS & GRAIN SIZE DISTRIBUTION (%)**

- **END OF BOREHOLE**

- **Groundwater encountered on completion of drilling on 05/10/2017 at a depth of: 0.0 m.**

- **Cave in depth after removal of augers: 0.0 m.**

- **Auger Refusal.**
LITHOLOGY PROFILE

DESCRIPTION

Geodetic Ground Surface Elevation: 92.4 m

Sample Type

Sample Number

RECORD OF BOREHOLE No. BH 17-8

about 150 mm TOPSOIL

brown

SS 1 67 15

92.2

Sandy Silt FILL

trace to some gravel
trace rootlets
moist

SS 2 60

25 / 100 mm

92

hit rock fragment

Brown to grey

SS 3 50

25 / 100 mm

91

trace to some sand, trace gravel, with shale pieces hard

SS 4 83

48

90

WEATHERED SHALE

Georgian Bay Formation

Highly weathered

SS 5 100

25

90

End of Borehole

SS 6 100

25

Auger Refusal.

Ch2m Hill Canada Limited

100 mm Solid Stem Auger

Drilling Location: Proposed Bridge F

Drilling Method: 100 mm Solid Stem Auger

Drilling Machine: Minute Man

Proposed Bridges A to F, Highland Sewershed Trunk Sewer Rehabilitation

Ivan Franko Ukrainian Home to the Hydro Corridor (South Mimico Site), Toronto, ON

Mimico Site, Toronto, ON

5 Oct 17

5 Oct 17

CH2M HILL Canada Limited

Amec Foster Wheeler Environment & Infrastructure

50 Vogell Road

Richmond Hill, Ontario, L4B 3K6 Canada

Tel. No.: (905) 403-5014

amecfw.com

A record of water encountered on completion of drilling on 05/10/2017 at a depth of: 0.0 m.

Cave in depth after removal of augers: 0.0 m.
APPENDIX A

Record of Boreholes BH 4 to BH 8

(Amec Foster Wheeler Reference No. TT163003)
**LITHOLOGY PROFILE**

**DESCRIPTION**

<table>
<thead>
<tr>
<th>Lithology Plot</th>
<th>Sample Type</th>
<th>Sample Number</th>
<th>Recovery (%)</th>
<th>Depth (m)</th>
<th>Elevation (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>about 100 mm TOPSOIL</td>
<td>SS</td>
<td>1</td>
<td>42</td>
<td>4</td>
<td>92</td>
</tr>
<tr>
<td>greyish brown Silty Clay / Clayey Silt FILL</td>
<td>SS</td>
<td>2</td>
<td>42</td>
<td>8</td>
<td>91</td>
</tr>
<tr>
<td>trace sand, trace gravel with rootlets and organics</td>
<td>SS</td>
<td>3</td>
<td>29</td>
<td>10</td>
<td>90.1</td>
</tr>
<tr>
<td>with shale fragments</td>
<td>SS</td>
<td>4</td>
<td>64</td>
<td>59/13</td>
<td>90</td>
</tr>
<tr>
<td>grey WEATHERED SHALE</td>
<td>SS</td>
<td>5</td>
<td>69</td>
<td>50/13</td>
<td>89.5</td>
</tr>
<tr>
<td>End of Borehole</td>
<td>SS</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>87.5</td>
</tr>
</tbody>
</table>

**SOIL SAMPLING**

**FIELD TESTING**

- **Penetration Testing**
  - SPT
  - PPT
  - DCPT
- **Lithology Plot**
  - Remould
  - Intact
  - Unrestrained Shear Strength (kPa)

**LAB TESTING**

- **Soil Vapour Reading**
- **Geodetic Ground Surface Elevation**: 92.6 m

**COMMENTS & GRAIN SIZE DISTRIBUTION (%)**

**INSTRUMENTATION INSTALLATION**

- **Logging**: 31/03/2016
- **Date Started**: 31/03/2016
- **Date Completed**: 31/03/2016
- **Project Client**: CH2M HILL Canada Limited
- **Project Name**: Highland Sewershed Trunk Sewer Rehabilitation
- **Project Location**: Queensway and Royal York Road Vicinity (South Mimico Site), Toronto, ON
- **Drilling Method**: 150 mm Solid Stem Augers
- **Drilling Machine**: Track Mounted Drill
- **Monitored Borehole Details**: (50 mm Dia.)
  - Protective Flush Mount Cover Installed
  - Bentonite: 0.0 - 1.2 m
  - Sand Filler: 1.2 - 1.5 m
  - Screen: 1.5 - 3.0 m
  - Sand Filler: 3.0 - 3.1 m

**RECORD OF BOREHOLE No. BH 4**

No freestanding groundwater measured in open borehole on completion of drilling.

Groundwater depth observed on 10/04/2016 at a depth of: 0.0 m

Borehole details presented do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.
**LITHOLOGY PROFILE**

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Sample Number</th>
<th>Recovery (%)</th>
<th>Depth Value (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS</td>
<td>1</td>
<td>33</td>
<td>8</td>
</tr>
<tr>
<td>SS</td>
<td>2</td>
<td>75</td>
<td>8</td>
</tr>
<tr>
<td>SS</td>
<td>3</td>
<td>100</td>
<td>50/10</td>
</tr>
<tr>
<td>SS</td>
<td>4</td>
<td>100</td>
<td>50/13</td>
</tr>
<tr>
<td>SS</td>
<td>5</td>
<td>100</td>
<td>50/15</td>
</tr>
<tr>
<td>SS</td>
<td>6</td>
<td>100</td>
<td>60/15</td>
</tr>
<tr>
<td>SS</td>
<td>7</td>
<td>50</td>
<td>40</td>
</tr>
</tbody>
</table>

**SOIL SAMPLING**

<table>
<thead>
<tr>
<th>Lithology Plot</th>
<th>Sample Type</th>
<th>Sample Number</th>
<th>Recovery (%)</th>
<th>Depth Value (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clayey Silt FILL</td>
<td>SS</td>
<td>1</td>
<td>33</td>
<td>8</td>
</tr>
<tr>
<td>SANDY SILT</td>
<td>SS</td>
<td>2</td>
<td>75</td>
<td>8</td>
</tr>
<tr>
<td>WEATHERED SHALE</td>
<td>SS</td>
<td>3</td>
<td>100</td>
<td>50/10</td>
</tr>
<tr>
<td>SE</td>
<td>SS</td>
<td>4</td>
<td>100</td>
<td>50/13</td>
</tr>
<tr>
<td>SE</td>
<td>SS</td>
<td>5</td>
<td>100</td>
<td>50/15</td>
</tr>
<tr>
<td>SE</td>
<td>SS</td>
<td>6</td>
<td>100</td>
<td>60/15</td>
</tr>
<tr>
<td>SE</td>
<td>SS</td>
<td>7</td>
<td>50</td>
<td>40</td>
</tr>
</tbody>
</table>

**FIELD TESTING**

- Penetration Testing
  - SPT
  - PPT
  - DCPT
- MTC Vane
  - Intact
  - Remould
- Nilcon Vane
  - Intact
  - Remould
- Unrestrained Shear Strength (kPa)
- pore 24 Values
- Soil Vapour Reading of COV parts per million (ppm)
- TOV parts per million (ppm)
- Vw
- Vw
- Vw

**LAB TESTING**

<table>
<thead>
<tr>
<th>Instrumentation</th>
<th>Distribution (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GR</td>
<td>BA</td>
</tr>
</tbody>
</table>

**COMMENTS & GRAIN SIZE DISTRIBUTION (%)**

- Hard augering from 4.6 m to 5.2 m depth
- Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.
LITHOLOGY PROFILE

DESCRIPTION

Sample Type | Sample Number | Recovery (%) | SPT 'N' Value | Depth (m) | Elevation (m) | Lithology Plot
--- | --- | --- | --- | --- | --- | ---
SS | 1 | 29 | 11 | 98 | 96.0 | about 150 mm TOPSOIL
SS | 2 | 38 | 7 | 100 | 96.0 | Silty Clay / Clayey Silt FILL
SS | 3 | 100 | 50 | 150 | 96.7 | WEATHERED SHALE

End of Borehole

Borehole was terminated due to auger refusal.

Monitoring Well Installation Details:
Screen: 0 - 1.5 m
Sand Filter: 1.5 - 1.6 m

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

Groundwater depth observed on 10/04/2016 at a depth of: 1.2 m. Groundwater depth on completion of drilling on 01/04/2016 at a depth of: 1.5 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.
**LITHOLOGY PROFILE**

**DESCRIPTION**
- **about 100 mm TOPSOIL**
  - Dark brown Claysy Silt FILL
  - Some sand, trace gravel with rootles

- **100 mm**
  - Brown to grey Clayey Silt
  - Trace clay, trace gravel and cobbles dense moist

- **100 mm**
  - Greyish brown Silty Clay
  - Trace sand, with shale fragments hard

- **WEATHERED SHALE**

**SOIL SAMPLING**

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Sample Number</th>
<th>Recovery (%)</th>
<th>SPT N Value</th>
<th>ELEVATION (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS</td>
<td>1</td>
<td>75</td>
<td>2</td>
<td>101</td>
</tr>
<tr>
<td>SS</td>
<td>2</td>
<td>83</td>
<td>32</td>
<td>100</td>
</tr>
<tr>
<td>SS</td>
<td>3</td>
<td>100</td>
<td>50/13</td>
<td>99</td>
</tr>
<tr>
<td>SS</td>
<td>4</td>
<td>100</td>
<td>50/13</td>
<td>99</td>
</tr>
<tr>
<td>SS</td>
<td>5</td>
<td>100</td>
<td>50/13</td>
<td>99</td>
</tr>
<tr>
<td>SS</td>
<td>6</td>
<td>100</td>
<td>50/13</td>
<td>99</td>
</tr>
</tbody>
</table>

**FIELD TESTING**

- **Penetration Testing**
  - SPT
  - PPT
  - DCPT

- **Lithology Plot**

- **Comments & Grain Size Distribution (%)**

**COMMENTS**

- Hard augering from 4.6 m to 6.9 m depth.

**LAB TESTING**

- **Soil Vapour Reading**
  - W, L, R
- **Terrestrial & Underground Water**
  - TOV parts per million (ppm)
- **Geotechnical Testing**
  - SPT PPT
  - DCPT
  - Nilcon Vane
  - MTO Vane

**INSTRUMENTATION INSTALLATION**

- **Geodetic Ground Surface Elevation:** 101.6 m
- **MTO Vane Undrained Shear Strength (kPa):**
  - 50

**MONITORING WELL INSTALLATION DETAILS:**

Concrete: 0 - 0.3 m
Bentonite: 0.3 - 3.4 m
Sand Filter: 3.4 - 3.8 m
Screen: 3.8 - 6.9 m

**Amec Foster Wheeler**

Environment & Infrastructure
104 Crooked Boulevard
Scarborough, Ontario
Canada M1R 3C3
Tel: +1(416) 751-6565
amecw.com

Groundwater depth on completion of drilling on 10/03/2016 at a depth of: 5.5 m
Groundwater depth observed on 10/04/2016 at a depth of: 2.9 m

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.
### Lithology Profile

<table>
<thead>
<tr>
<th>Lithology</th>
<th>Recovery (%)</th>
<th>Sample Type</th>
<th>Sample Number</th>
<th>Depth (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>About 200 mm Topsoil</td>
<td>50</td>
<td>SS</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Brown Sand / Silty Sand Fill with rootlets and organics moist</td>
<td>42</td>
<td>SS</td>
<td>2</td>
<td>100.4</td>
</tr>
<tr>
<td>Brown Sandy Silt</td>
<td>100</td>
<td>SS</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>Compact</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weathered Shale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitoring Well Installation Details:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete: 0 - 0.3 m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bentonite: 0.3 - 3.2 m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand Filter: 3.2 - 3.8 m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screen: 3.8 - 6.9 m</td>
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</tbody>
</table>

### Soil Sampling

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Recovery (%)</th>
<th>Sample Number</th>
<th>Depth (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS</td>
<td>100</td>
<td>4</td>
<td>100.6</td>
</tr>
<tr>
<td>SS</td>
<td>100</td>
<td>5</td>
<td>100.10</td>
</tr>
</tbody>
</table>

### Field Testing

- **Penetration Testing**
  - SPT 'N' Value
  - MTO Vane
  - Nilson Vane
  - Undrained Shear Strength (kPa)

### Lab Testing

- **Soil Vapour Reading**
  - COV parts per million (ppm)
- **Remould Shear Strength (kPa)**
  - Undrained Shear Strength (kPa)

### Comments & Grain Size Distribution (%)

- **GR**
- **BA**
- **Si**
- **CL**

### Instrumentation Installation

- **GRD**
- **BA**
- **Si**
- **CL**

- **Graded**
- **Bedrock**
- **Hard augering from 3.0 m to 4.6 m depth**

---

**Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer.** Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.
<table>
<thead>
<tr>
<th>Soil Laboratory Test Results</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
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</tr>
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<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GRAIN SIZE DISTRIBUTION
Silt and Clay

Size of openings, inches  U.S. Sieve size, meshes/inch

PERCENT FINER THAN

GRAIN SIZE, mm

COBBLE SIZE  COARSE  FINE  COARSE  MEDIUM  FINE  SILT and CLAY
GRANULAR  SAND  FINE GRAINED  FINE GRAINED

SYMBOL  BOREHOLE  SAMPLE  DEPTH (m)  ELEVATION (m)

●  BH 17-2  4  2.3  98.0

▲  BH 17-3  4  1.5  97.8

▲  BH 17-7  4  1.5  92.1

★  BH 17-8  4  1.5  90.8

Date  November 2017
Prep'd  ............
Project  TT163003.9000
Chkd.  .................
ATTERBERG LIMIT TEST RESULTS  
Silt and Clay

**SYMBOL** | **BOREHOLE** | **SAMPLE** | **DEPTH (m)** | **ELEVATION (m)** | **LL** | **PL** | **PI**
---|---|---|---|---|---|---|---
● | BH 17-2 | 4 | 2.3 | 98.0 | 38 | 19 | 19
● | BH 17-3 | 4 | 1.5 | 97.8 | 35 | 17 | 18
▲ | BH 17-7 | 4 | 1.5 | 92.1 | 33 | 19 | 14
* | BH 17-8 | 4 | 1.5 | 90.8 | 39 | 21 | 18

**FIGURE No. A2**

*Proposed Bridges A to F, Highland Sewershed Trunk Sewer Rehabilitation*

*AMECFW ATTERBERG LIMITS  TT163003.9000.GPJ  AMEC SCARBOROUGH LOG 2009.GDT  07/11/17*
NOTES:

1. CONTRACTOR TO DETERMINE CROSSING LENGTH AND UNDERSIDE CLEARANCE CONDITIONS.
2. THE TEMPORARY BRIDGE, OR AN ALTERNATIVE BRIDGE OR EQUIVALENT, MUST BE FORGED OF STEEL UNGEARED COMPARE WITH MATERIAL.
3. CONTRACTOR TO PROVIDE SHOP DRAWINGS SHOWING ALL MATERIALS AND DETAILS AS NOTED (APPROXIMATE).
4. CONTRACTOR TO PROVIDE SHOP DRAWINGS SHOWING ALL MATERIALS AND DETAILS AS NOTED (APPROXIMATE).
5. CONTRACTOR TO PROVIDE SHOP DRAWINGS SHOWING ALL MATERIALS AND DETAILS AS NOTED (APPROXIMATE).

REMOVAL OF EXISTING GROUND AT CENTRELINE 3.5m MIN. (APPROXIMATE)

CONSTRUCTION SEQUENCE:
1. INSTALL SEDIMENTATION AND EROSION CONTROL MEASURES.
2. INSTALL SOIL ANCHORS.
3. BACKFILL TO TOP OF BEARING SEAT.
4. INSTALL BEARING AND BRIDGE.
5. INSTALL ARMOUR STONE.
6. INSTALL BEARING AND BRIDGE.
7. INSTALL ARMOUR STONE.
8. INSTALL BEARING AND BRIDGE.
9. INSTALL ARMOUR STONE.
10. INSTALL BEARING AND BRIDGE.
11. INSTALL ARMOUR STONE.
12. BACKFILL WITH NATIVE MATERIAL AND SEED WITH TRCA SEEDING MIX.
13. COMPLETELY REMOVED WITHIN THE ABUTMENT FOOTPRINT.
14. EXCAVATED MATERIALS SHALL BE STORED ON-SITE.
15. NO STOCKPILING OF MATERIALS SHALL BE PERMITTED WITHIN 15M OF THE EMBANKMENTS.
16. EROSION CONTROL BLANKET (SEE DETAIL ON C40).
Photograph No. 3: Bridge A – Left Bank

Photograph No. 4: Bridge B – Profile and Left Bank
Photograph No. 5: Bridge B – Right Bank

Photograph No. 6: Bridge C – Profile
Photograph No. 9: Bridge D – Right Bank

Photograph No. 10: Bridge D – Left Bank
Photograph No. 13: Bridge F – Profile and Right Bank

Photograph No. 14: Bridge F – Left Bank