

November 30, 2017

**Mr. Michael Hatfield**  
**Municipality of East Hants**  
230-15 Commerce Court  
Elmsdale, NS B2S 3K5

Dear Mr. Hatfield,

**Re: Geotechnical Investigation – Proposed Building Development  
Lot 92-5a1, Commerce Court, Elmsdale, NS**

This is our geotechnical investigation report for the proposed building development at Lot 92-5a1 on Commerce Court in Elmsdale, NS. This report is an update of our 2016 geotechnical investigation report to include boreholes from 2017 and test pits from 2011 that are in the area currently proposed for the gravel access road to Industrial Way.

It is understood that the lot is intended to be developed for the new Municipal Aquatic Centre with an associated parking area and gravel access road extending to Industrial Way. The subsurface conditions are generally good within the proposed building area for conventional spread footing foundations and a grade slab. The subsurface conditions encountered along the proposed gravel access road are generally poor due to the organic deposits and low quality fill. Some ground improvement will be necessary in this area.

The subsurface conditions encountered throughout the proposed building development area generally consist of rootmat overlying glacial till. Fill and re-worked till were encountered in two test pits and ranged in thickness from 0.5 m to 0.6 m. Native soil was encountered in all boreholes and test pits and ranged in depth from 0.1 m to 1.8 m. Bedrock was not encountered. Groundwater was encountered in Borehole 1 at a depth of 1.3 m. It appears as though groundwater levels did not re-charge to a static level in Borehole 2.

The subsurface conditions in the proposed gravel access road area generally consist of peat throughout the wetland, and low quality fill overlying the original rootmat and glacial till on the higher terrain. The test pits were excavated to depths of up to 3.7 m. Slight to heavy groundwater seepage was encountered at depths between 0.2 m and 1.3 m. Bedrock was not encountered during test pit excavation.

The main findings/recommendations from our investigations are as follows:

- A foundation system with footings founded on undisturbed native soil or structural fill would be practical for this site following site work. In the proposed sump pit and basement area,

the glacial till extends deeper than the proposed founding elevations; therefore, no different or special construction procedures are necessary (for example, bedrock was not encountered).

- The existing fill, re-worked till, and rootmat should be removed from within the building areas and reinstated with approved structural fill. Approved structural fill should be placed and compacted in lifts to design grades, as required.
- The peat, rootmat, and loose fill in the proposed the gravel access road should be replaced with approved fill. Approved structural fill should be placed and compacted in lifts to design grades, as required. Flatter excavation slopes will be required in this area.
- The rootmat should be removed from the roadway/parking areas on the north side of the site. The existing fill and re-worked till can likely remain in roadway/parking areas. Proof-rolling should be conducted at design subgrade in pavement areas. Weak zones should be replaced with approved structural fill. Approved structural fill should be placed and compacted in lifts to design grades, as required.
- Geotechnical inspection of earthworks is recommended (and is required for building permits).

Please contact us if you have any questions.

Thank you,



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## **1.0 INTRODUCTION**

We have conducted three separate geotechnical investigations for the proposed building development at Lot 92-5a1 on Commerce Court in Elmsdale, Nova Scotia at the request of the Municipality of East Hants. The purpose of these investigations was to evaluate the subsurface conditions at the site and to provide recommendations.

This report presents all of our findings and our recommendations for foundation design and general site work. This report includes recommendations for geotechnical works only.

## **2.0 SITE DESCRIPTION AND GEOLOGY**

The proposed building development is located at Lot 92-5a1 on Commerce Court in Elmsdale, Nova Scotia. The proposed development is currently an undeveloped lot covered in vegetation (most trees have been removed).

Photograph A shows a view of the site looking south.

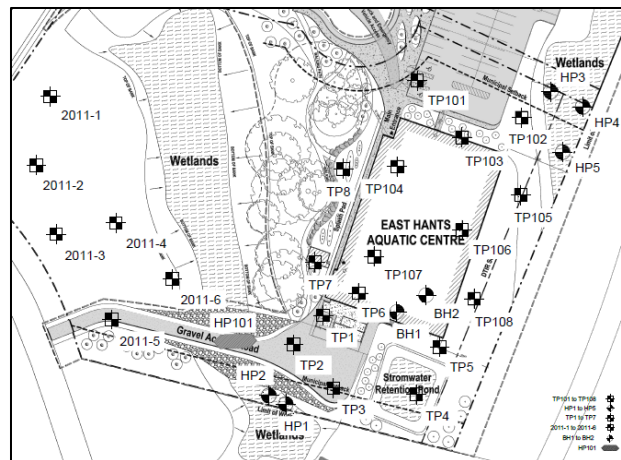
Based on geological mapping the principal soil type in the area is silty till plains. Bedrock in the area is mapped as anhydrite and gypsum of the Carrolls Corner Formation, which is part of the Windsor Group.



**Photograph A: View of the site looking south.**

### 3.0 SUMMARIZED SUBSURFACE CONDITIONS

The field program consisted of two (2) boreholes (BH1 to BH2), and six (6) hand probes (HP101-1 to HP101-6) completed on November 18, 2017, eight (8) test pits (TP101 to TP108) and five (5) hand probes (HP1 to HP5), completed on August 3, 2016, and six (6) test pits (2011-1 to 2011-6), completed on April 26, 2011. Eight test pits (TP1 to TP8) were conducted at the proposed development area in 2014 by LVM. The borehole, test pit and hand probe locations are shown in Figure A (a complete location plan is attached in the appendix).



**Figure A: Borehole, Test Pit, and Hand Probe Locations**

The boreholes were conducted using a tracked drill rig. The test pits were conducted using an excavator. Representative samples were taken during the field work and the conditions at the boreholes and test pits were logged in detail. The soil conditions encountered at the site are described in detail on the appended Borehole and Test Pit Records and summarized below in the following paragraphs and Tables A to E.

The subsurface conditions encountered throughout the proposed building development area generally consist of rootmat overlying glacial till. Fill and re-worked till were encountered in two test pits and ranged in thickness from 0.5 m to 0.6 m. Native soil was encountered in all boreholes and test pits and ranged in depth from 0.1 m to 1.8 m. Bedrock was not encountered. Groundwater was encountered in Borehole 1 at a depth of 1.3 m. It appears as though groundwater levels did not re-charge to a static level in Borehole 2.

The subsurface conditions in the proposed gravel access road area generally consist of peat throughout the wetland, and low quality fill overlying the original rootmat and glacial till on the higher terrain. The test pits were excavated to depths of up to 3.7 m. Slight to heavy groundwater seepage was encountered at depths between 0.2 m and 1.3 m. Bedrock was not encountered during test pit excavation.

Hand probes were conducted in low lying areas where peat deposits were expected. The peat encountered in the hand probes ranged in thickness from 0.3 m to 1.2 m. The results are shown below in Tables B and C.

Grain size testing conducted on one sample of the native glacial till shows 14% gravel, 32% sand, and 55% fines (silt and clay). Moisture content of the sample was 10.9%. The grain size curve is shown in Figure 1 in the appendix.

Atterberg Limit results on one sample of the glacial till from Test Pit 101 showed a Liquid Limit of 24.0% with a corresponding Plastic Limit of 14.9%, and a Plasticity Index of 8, indicative of low plasticity clay (CL).

**Table A: Summary of Findings – Test Pits (August 3, 2016)**

Location	Elevation <sup>1</sup> (m)	Thickness of Rootmat (m)	Thickness of Fill (m)	Depth to Native Soil (m)	Groundwater Depth <sup>2</sup> (m)	Depth of Test Pit (m)
TP101	20.7	--	0.5 <sup>3</sup>	0.5	--	4.6
TP102	19.3	0.1	--	0.1	--	5.2
TP103	20.2	0.1	--	0.1	--	5.0
TP104	21.0	0.1	--	0.1	--	3.8
TP105	20.3	0.1	--	0.1	--	3.8
TP106	20.2	0.2	--	0.2	--	4.1
TP107	22.0	0.1 <sup>4</sup>	0.6	0.7	--	3.8
TP108	19.9	0.1	--	0.1	--	3.8

Notes: <sup>1</sup>Geodetic Datum. Ground surface elevation taken with GPS mapping unit.

<sup>2</sup>Measured during excavation.

<sup>3</sup>Re-worked till.

<sup>4</sup>Encountered below fill.

**Table B: Summary of Findings – Boreholes (November 18, 2017)**

Location	Elevation <sup>1</sup> (m)	Thickness of Rootmat/Topsoil (m)	Depth to Native Soil (m)	Groundwater Depth <sup>2</sup> (m)	Depth of Borehole (m)
BH1	21.1	0.2	0.2	1.3	8.2
BH2	20.7	0.2	0.2	-- <sup>3</sup>	8.2

Notes: <sup>1</sup>Geodetic Datum. Ground surface elevation taken with GPS mapping unit.

<sup>2</sup>Groundwater depth was measured on November 27, 2017.

<sup>3</sup>Did not re-charge to static level.

**Table C: Summary of Findings – Hand Probes (August 3, 2016)**

<b>Location</b>	<b>Elevation<sup>1</sup> (m)</b>	<b>Thickness of Peat (m)</b>
HP1	19.1	0.6
HP2	19.2	0.5
HP3	18.9	0.5
HP4	19.0	0.5
HP5	18.8	0.6

Notes: <sup>1</sup>Geodetic Datum. Ground surface elevation taken with GPS mapping unit.

**Table D: Summary of Findings – Hand Probes (November 18, 2017)**

<b>Location</b>	<b>Elevation<sup>1</sup> (m)</b>	<b>Thickness of Peat (m)</b>
HP101-1	19.1	0.3
HP101-2	19.1	1.1
HP101-3	19.1	1.1
HP101-4	19.1	1.2
HP101-5	19.1	1.1
HP101-6	19.1	0.5

Notes: <sup>1</sup>Geodetic Datum. Ground surface elevation taken with GPS mapping unit.

**Table E: Summary of Findings – Test Pits (April 26, 2011)**

Location	Elevation <sup>1</sup> (m)	Thickness of Rootmat (m)	Thickness of Fill (m)	Depth to Native Soil (m)	Groundwater Depth <sup>2</sup> (m)	Depth of Test Pit (m)
2011-1	21.7	0.4	1.0	1.4	--	2.5
2011-2	22.0	0.5	1.1	1.6	--	2.6
2011-3	22.6	0.2	1.6	1.8	--	2.6
2011-4	22.1	0.1	0.9	1.0	--	1.5
2011-5	20.5	0.3, 0.5 <sup>3</sup>	0.2	1.0	--	1.7
2011-6	21.8	0.2, 0.8 <sup>3</sup>	0.4	1.4	1.3	2.7

Notes: <sup>1</sup>Geodetic Datum. Ground surface elevation taken with GPS mapping unit.  
<sup>2</sup>Measured during excavation.  
<sup>3</sup>Encountered below fill.



## **4.0 DISCUSSION AND RECOMMENDATIONS**

### **4.1 Main Findings**

It is understood that the lot is intended to be developed for the new Municipal Aquatic Centre with an associated parking area and gravel access road extending to Industrial Way. The subsurface conditions are generally good within the proposed building area for conventional spread footing foundations and a grade slab. The subsurface conditions encountered along the proposed gravel access road are generally poor due to the organic deposits and low quality fill. Some ground improvement will be necessary in this area.

The main findings/recommendations from our investigation are as follows:

- A foundation system with footings founded on undisturbed native soil or structural fill would be practical for this site following site work. In the proposed sump pit and basement area, the glacial till extends deeper than the proposed founding elevations; therefore, no different or special construction procedures are necessary (for example, bedrock was not encountered).
- The existing fill, re-worked till, and rootmat should be removed from within the building areas and reinstated with approved structural fill. Approved structural fill should be placed and compacted in lifts to design grades, as required.
- The peat, rootmat, and loose fill in the proposed the gravel access road should be replaced with approved fill. Approved structural fill should be placed and compacted in lifts to design grades, as required. Flatter excavation slopes will be required in this area.
- The rootmat should be removed from the roadway/parking areas on the north side of the site. The existing fill and re-worked till can likely remain in roadway/parking areas. Proof-rolling should be conducted at design subgrade in pavement areas. Weak zones should be replaced with approved structural fill. Approved structural fill should be placed and compacted in lifts to design grades, as required.
- Geotechnical inspection of earthworks is recommended (and is required for building permits).

The following sections outline our geotechnical recommendations for site preparation and design.

### **4.2 Earthworks**

Earthworks for this project will likely involve excavations into the existing fill and native soil in the proposed development areas, and placement of structural fill to achieve design grade elevations if required.

#### 4.2.1 Surface Water Control and Erosion Control

Prior to excavations, surface water drainage controls should be provided on the up-gradient side of the site to minimize run-off onto exposed soils. Suitable erosion and sedimentation control measures should be employed. These may include silt fences, check dams in ditches, and granular working pads.

#### 4.2.2 Excavation

Excavation into the site soils will be practical with conventional earth-moving equipment.

The existing fill, re-worked till, and rootmat should be removed from within the building areas and reinstated with approved structural fill. Approved structural fill should be placed and compacted in lifts to design grades, as required.

The peat, rootmat, and loose fill in the proposed the gravel access road should be replaced with approved fill. Approved structural fill should be placed and compacted in lifts to design grades, as required. The excavation slopes should be cut 1.5H:1V, or flatter. Dewatering of excavations in this area will be necessary. The contractor will have to establish several sumps.

The rootmat should be removed from the roadway/parking areas on the north side of the site. The existing fill and re-worked till can likely remain in roadway/parking areas. Proof-rolling should be conducted at design subgrade in pavement areas. Weak zones should be replaced with approved structural fill. Approved structural fill should be placed and compacted in lifts to design grades, as required.

Temporary excavation side slopes in soil should be stable at one horizontal to one vertical (1H:1V) in the building area.

Material that is planned for re-use should be placed directly in the intended areas or compacted in stockpiles for later use. Unsuitable materials should be used in landscaped areas or wasted off-site.

Excavated existing fill material could be considered for reuse on site if possible; otherwise, this material should be exported off-site and disposed properly. Excavated fill containing organics will not be suitable for reuse.

#### 4.2.3 Dewatering of Excavations

With proper surface water controls, dewatering of excavations through the use of ditches and swales draining to sumps would be practical. Sumps should be anticipated by the contractor for the building, gravel access road, and underground service excavation.

A slug test was conducted in Borehole 1 on November 27, 2017. The hydraulic conductivity,  $k$ , was observed to be  $7.11 \times 10^{-7}$  cm/sec.

#### 4.2.4 Fill Placement and Compaction

Fill required for the building, roadway, and parking area should consist of the following:

- approved on-site soils, or;

- imported, quarried rockfill and gravel or sand and gravel pit run.

Excavated fill containing organic material will not be suitable for re-use.

Re-use of approved, drier portions of the glacial till may be practical but may require some careful planning by the contractor and low amounts of precipitation during site grading. The moisture content would have to be within 2% of optimum (based on ASTM D698) to allow for reuse. For this reason, the percentage of excavated material that will be suitable for reuse should be expected to be very low.

The lift thickness used during placement of fills must be compatible with the compaction equipment and the material type to ensure the specified density throughout. The lift thickness should not exceed approximately 400 mm for mass filling and 200 mm for backfilling of foundations and services. The maximum particle size should be no larger than  $\frac{2}{3}$  of the lift thickness.

Fill materials should be compacted to the following percentage of maximum Standard Proctor dry density:

- |   |      |
|---|------|
| • Fill in building areas                    | 100% |
| • Fill within 300 mm of paved area subgrade | 98%  |
| • Fill below 300 mm of paved area           | 95%  |
| • Landscaped areas                          | 93%  |

Where fill is needed below footings, the fill must be extended laterally beyond the edges of the footings to include a 0.3 m bench and the conventional 1H:1V splay.

#### 4.2.5 Slopes and Toe Drainage

Permanent fill slopes should be 2H:1V, or lower. Permanent cut slopes should be stable at 3H:1V for slope heights of less than 2 m. Cut slopes of greater heights will require a 300 mm thick granular blanket or deep rooting vegetation to reinforce the slope. A toe drain or swale should be provided for drainage at the base of cut slopes.

#### 4.2.6 Building Area Subgrade

The contractor must take precautions to avoid disturbance of the site soils, or reinstate the material to the required condition. The condition of the subgrade should be reviewed prior to placement of base gravel.

#### 4.2.7 Inspection and Testing

It is recommended that inspection of all footing bearing surfaces be conducted by experienced geotechnical personnel prior to placement of concrete. Inspection and testing is also recommended during site grading and backfilling operations.

## **4.3 Foundations**

A foundation system consisting of spread footings and a grade slab founded on structural fill or native soil is favorable for the proposed building.

### **4.3.1 Shallow Foundations**

For analysis using Limit States Design, we calculated bearing capacities for square and strip footings up to 3 m for a settlement tolerance of 25 mm. Other bearing capacities for other footing sizes (or settlement tolerances) can be provided at your request. Bearing resistance values for square and strip footings founded on native soil or structural fill are plotted on Figures 2 and 3 in the appendix.

For comparison using the old Working Stress design approach, an allowable bearing pressure of 150 kPa for a tolerable settlement of 25 mm and footing size up to 2.0 m would have been used for a footing founded on native soil or structural fill. This includes a global factor of safety of 3.

Footings should be founded a minimum of 1.2 m below grade for frost protection, or equivalent insulation provided.

### **4.3.2 Slab on Grade, Exterior Slabs, and Basement**

A conventional grade slab founded on approved undisturbed site soils or structural fills is practical for this site. A 150 mm thick layer of Type 1 Gravel is recommended below the floor slab for levelling and support purposes. The gravel should be compacted to 100% Standard Proctor.

For a slab on grade, a perimeter foundation system is recommended, unless the surrounding finished exterior grades are below the floor elevation. A perimeter foundation drainage system is also recommended for basement levels. A water-proofing system is suggested for the basement walls.

For levels below ground, such as the basement and pool, a sub-slab and perimeter drainage system should be designed. This would typically consist of 150 mm diameter perforated PVC pipe bedded in clear stone and a geotextile used as a filter layer. The hydraulic conductivity of the soils in this area is quite low.

We typically recommend a 50 mm thickness of approved insulation for frost protection of exterior slabs but this may vary depending on subgrade type and slab thickness and should be reviewed once more details are known. The insulation should extend 1.0 m beyond the slab edge.

For basement walls it is recommended that the walls be designed based on backfill consisting of a granular wedge within a zone bounded by the wall and a line drawn upwards and outwards at 45 degrees from the base of the wall. Drainage from the backfill zone with a positive outlet is recommended.

For design, the following parameters can be used:

- Total unit weight of soil,  $\gamma_T = 19 \text{ kN/m}^3$  (in-situ)
- Total unit weight of soil,  $\gamma_T = 21 \text{ kN/m}^3$  (granular backfill)
- Ultimate friction factor for sliding,  $\mu = 0.35$  (concrete to glacial till)
- At-rest earth pressure coefficient,  $K_o = 0.43$
- Angle of internal friction,  $\Phi = 35$  degrees (granular backfill)
- Wall friction angle,  $\delta = 23$  degrees (granular backfill)

The retaining wall design should include the influence of sloping backfill or surcharge loads behind the wall.

#### **4.4 Pavement Structure**

With the subgrade prepared as outlined in Section 4.2, the following pavement structure is recommended. However, it will be critical to evaluate the subgrade prior to placement of gravel.

**Table F: Pavement Structure Thicknesses**

<b>Material</b>	<b>Standard Duty Pavement<sup>1</sup></b>	<b>Heavy Duty Pavement</b>
Asphalt Concrete:		
Top Course	75 mm	40 mm
Base Course	-	50 mm
Type 1 Gravel	300 mm	150 mm
Type 2 Gravel	-	200 mm

Notes: <sup>1</sup>Cars and light trucks.

All aggregate and asphalt concrete materials should meet the DTIR Standard Specifications. The gravels should be compacted to 100% of Standard Proctor maximum dry density. Asphalt concrete should be compacted to 92.5% of Maximum Theoretical Relative Density.

The contractor should consider the use of a geotextile at subgrade level if the project driveway is used as a construction access road.

#### **4.5 Additional Geotechnical Services**

It is recommended that inspection of the footing bearing surfaces be conducted by Conquest Engineering prior to placement of concrete. Inspection and testing is recommended during site grading and backfilling operations.

## **5.0 CLOSURE**

This report has been prepared for the sole benefit of the Municipality of East Hants, its designates, nominees and partners. Any use or reliance on this report under any of the following conditions would render this report inapplicable:

- where there have been any change in site conditions; or
- where used for purposes not intended or delineated in this report; or
- where used by third parties without express written agreement of Conquest Engineering.

Any use of, or reliance upon, this report under such circumstances or by such parties is strictly prohibited and without risk or liability to Conquest.

Conquest Engineering used reasonable care, skill, competence and judgment in the preparation of this report. The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff in accordance with generally accepted engineering and scientific practices current at the time the work was performed. The information and conclusions contained in this report are generally consistent with professional standards for individuals providing similar services at the same time, in the same locale and under like circumstances.

A field investigation is a limited sampling of a site. Some variation between sampling locations should be expected. The conclusions presented in this report represent the best technical judgment of Conquest Engineering based on the data obtained from the work. The conclusions are based on the site conditions observed by Conquest Engineering at the time the work was performed at the specific testing and/or sampling locations, and can only be extrapolated to an undefined limited area around these locations. The extent of the limited area depends on the soil and groundwater conditions, as well as the history of the site reflecting natural, construction and other activities. Due to the nature of the investigation and the limited data available, Conquest Engineering cannot warrant against undiscovered environmental liabilities.

If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein. Further, if there are changes to the proposed work, such as adjustments in founding elevation or building loads, etc., we require that we be notified to allow for review of our recommendations.



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## **APPENDIX A**

## **SOIL DESCRIPTION**

Terminology describing common soil genesis:

<i>Topsoil</i>	- mixture of soil and humus capable of supporting good vegetative growth
<i>Peat</i>	- fibrous aggregate of visible and invisible fragments of decayed organic matter
<i>Till</i>	- unstratified glacial deposit which may range from clay to boulders
<i>Fill</i>	- any materials below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

<i>Desiccated</i>	- having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
<i>Fissured</i>	- having cracks, and hence a blocky structure
<i>Varved</i>	- composed of regular alternating layers of silt and clay
<i>Stratified</i>	- composed of alternating successions of different soil types, e.g. silt and sand
<i>Layer</i>	- >75 mm
<i>Seam</i>	- 2 mm to 75 mm
<i>Parting</i>	- < 2 mm
<i>Well Graded</i>	- having wide range in grain sizes and substantial amounts of all intermediate particle sizes
<i>Uniformly Graded</i>	- predominantly of one grain size

Terminology describing soils on the basis of grain size and plasticity is based on the Unified Soil Classification System (USCS) (ASTM D-2488). The classification excludes particles larger than 76 mm (3 inches). This system provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present:

<i>Trace or occasional</i>	Less than 10%
<i>Some</i>	10-20%
<i>Numerous or Frequent</i>	20% - 50%

The standard terminology to describe cohesionless soils includes the compactness (formerly “relative density”), as determined by laboratory test or by the Standard Penetration Test ‘N’ – value.

Relative Density	‘N’ Value	Compactness %
<i>Very Loose</i>	<4	<15
<i>Loose</i>	4-10	15-35
<i>Compact</i>	10-30	35-65
<i>Dense</i>	30-50	65-85
<i>Very Dense</i>	>50	>85

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression tests, or occasionally by standard penetration tests.



Consistency	Undrained Shear Strength		'N' Value (approx.)
	kips/sq.ft.	kPa	
<i>Very Soft</i>	< 0.25	< 12.5	< 2
<i>Soft</i>	0.25 – 0.5	12.5 – 25	2 – 4
<i>Firm</i>	0.5 – 1.0	25 – 50	4 – 8
<i>Stiff</i>	1.0 – 2.0	50 – 100	8 – 15
<i>Very Stiff</i>	2.0 – 4.0	100 – 200	15 – 30
<i>Hard</i>	> 4.0	> 200	> 30

## ROCK DESCRIPTION

### Rock Quality Designation (RQD)

The classification is based on a modified core recovery percentage in which all pieces of intact core over 100 mm long are totalled and divided by the core drilled length. The smaller pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. RQD was originally intended to be done on N-size (45 mm) core; however, it can be used on different core sizes if the bulk of the fractures caused by drilling stresses are easily distinguishable from in situ fractures.

RQD	ROCK QUALITY
90 – 100	very sound
75 – 90	sound
50 – 75	fractured
25 – 50	severely fractured
0 – 25	very severely fractured

Terminology describing rock mass:

Spacing (mm)	Bedding, Laminations, Bands	Discontinuities
2000 – 6000	<i>Very Thick</i>	<i>Very Wide</i>
600 – 2000	<i>Thick</i>	<i>Wide</i>
200 – 600	<i>Medium</i>	<i>Moderate</i>
60 – 200	<i>Thin</i>	<i>Close</i>
20 – 60	<i>Very Thin</i>	<i>Very Close</i>
< 20	<i>Laminated</i>	<i>Extremely Close</i>
< 6	<i>Thinly Laminated</i>	

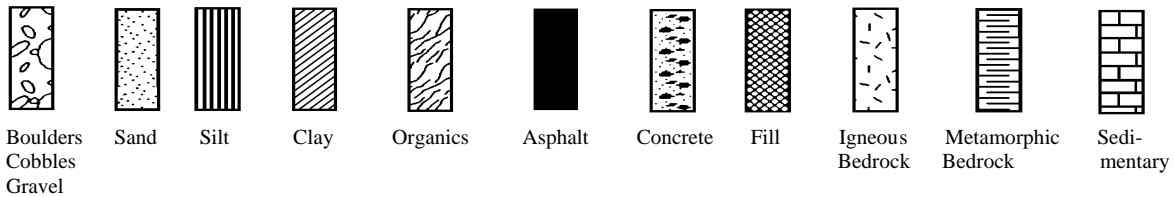
Strength Classification	Uniaxial Compressive Strength (MPa)
<i>Very Weak</i>	1 – 5
<i>Weak</i>	5 – 25
<i>Medium Strong</i>	25 – 50
<i>Strong</i>	50 – 100
<i>Very Strong</i>	100 – 250
<i>Extremely Strong</i>	> 250

Terminology describing weathering:

<i>Slight</i>	-	Weathering limited to the surface of major discontinuities. Typically iron stained.
<i>Moderate</i>	-	Weathering extends throughout rock mass. Rock is not friable.
<i>High</i>	-	Weathering extends throughout rock mass. Rock is friable.

## STRATA PLOT

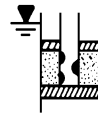
Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:



## WATER LEVEL MEASUREMENT



Borehole or  
Standpipe



Piezometer

## SAMPLE TYPE

SS	Split spoon sample (obtained by performing the standard Penetration Test)	AS	Auger Sample
ST	Shelby tube or thin wall tube	BS	Bulk Sample
PS	Piston sample	WS	Wash Sample
DC	Dynamic Cone Penetration	HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond drilling bits
SV	Field Shear Vane		

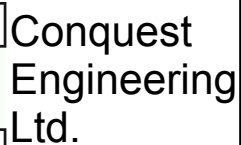
## N- VALUE

Numbers in this column are the results of the Standard Penetration Test: the number of blows of a 140 pound (64kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil. For split spoon samples where insufficient penetration was achieved and 'N' values cannot be presented, the blow count and penetration are shown.

## OTHER TESTS

Symbols in this column indicate that the following laboratory tests have been carried out and the results are presented separately.

S	Sieve analysis	H	Hydrometer analysis
G <sub>s</sub>	Specific gravity of soil particles	γ	Unit weight
k	Permeability	C	Consolidation
⌋	Single packer permeability test; test interval from depth shown to bottom of borehole	CD	Consolidation drained triaxial
⌋	Double packer permeability test; Test interval as indicated	CU	Consolidated undrained triaxial with pore pressure measurements
○	Falling head permeability test using casing	UU	Unconsolidated undrained triaxial
○	Falling head permeability test using well point or piezometer	DS	Direct shear
		Q <sub>u</sub>	Unconfined compression
		I <sub>p</sub>	Point Load Index (I <sub>p</sub> on Borehole Records equals I <sub>p</sub> (50); the index corrected to a reference diameter of 50 mm)



**Project Name:** Proposed Building Development

**Project No.: 394-005**

**Client:** Municipality of East Hants

**Location:** Lot 92-5a1, Commerce Court, Elmsdale, NS

**Water Level Date:** Nov 27, 2017

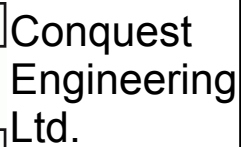
**Borehole No.: 1**

Page: 1 of 1

**Date Drilled:** Nov 18, 2017

Datum: Geodetic

[illegible]



**Project Name:** Proposed Building Development

**Project No.: 394-005**

**Client:** Municipality of East Hants

**Location:** Lot 92-5a1, Commerce Court, Elmsdale, NS

**Water Level Date:** Nov 27, 2017

**Borehole No.: 2**

Page: 1 of 1

**Date Drilled:** Nov 18, 2017

Datum: Geodetic

[illegible]



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## TEST PIT RECORD

**Project Name:** Proposed Building Development

**Location:** Lot 92-5a1, Commerce Court, Elmsdale, NS

**Project No.:** 394-005

**Client:** Municipality of East Hants

**Water Level Date:** --

**Test Pit:** 101

**Sheet:** 1 of 1

**Date:** August 3, 2016

**Datum:** Geodetic

### SUBSURFACE PROFILE

### SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	20.7				
		RE-WORKED TILL: Stiff, light brown, sandy clay -trace organics -trace gravel -subrounded to subangular clasts -dry to moist	20.2				
1		TILL: Very stiff to hard, brown, sandy clay -trace gravel and cobbles -subrounded to subangular clasts -moist					
					GS	1	Moisture Content = 10.9%
2							
3							
4							
			16.1		GS	2	
5		End of Test Pit at 4.6 m -no bedrock encountered -no groundwater encountered					



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## TEST PIT RECORD

**Project Name:** Proposed Building Development

**Location:** Lot 92-5a1, Commerce Court, Elmsdale, NS

**Project No.:** 394-005

**Client:** Municipality of East Hants

**Water Level Date:** --

**Test Pit:** 102

**Sheet:** 1 of 2

**Date:** August 3, 2016

**Datum:** Geodetic

### SUBSURFACE PROFILE

### SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	19.3				
		ROOTMAT	19.2				
		TILL: Loose, grey, silty sand -trace roots/rootlets -trace gravel	18.8		GS	1	
		-subrounded to subangular clasts -moist to wet					
1		TILL: Stiff, light brown, sandy clay -trace gravel and cobbles -subrounded to subangular clasts -moist	18.2				
		TILL: Very stiff to hard, brown, sandy clay -trace gravel -trace cobbles and boulders (up to 1.0 m in diameter) -subrounded to subangular clasts -moist					
2							
3							
4							
5							



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## TEST PIT RECORD

**Project Name:** Proposed Building Development

**Location:** Lot 92-5a1, Commerce Court, Elmsdale, NS

**Project No.:** 394-005

**Client:** Municipality of East Hants

**Water Level Date:** --

**Test Pit:** 102

**Sheet:** 2 of 2

**Date:** August 3, 2016

**Datum:** Geodetic

### SUBSURFACE PROFILE

### SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
			14.1				
		End of Test Pit at 5.2 m -no bedrock encountered -no groundwater encountered					
6							
7							
8							
9							
10							



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## TEST PIT RECORD

**Project Name:** Proposed Building Development

**Location:** Lot 92-5a1, Commerce Court, Elmsdale, NS

**Project No.:** 394-005

**Client:** Municipality of East Hants

**Water Level Date:** --

**Test Pit:** 103

**Sheet:** 1 of 1

**Date:** August 3, 2016

**Datum:** Geodetic

### SUBSURFACE PROFILE

### SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	20.2				
		ROOTMAT	20.1				
		TILL: Loose, grey, silty sand -trace rootlets -trace gravel	19.7				
		-subrounded to subangular clasts -moist					
1		TILL: Stiff, light brown, sandy clay -trace gravel -trace cobbles and boulders (up to 0.3 m in diameter) -subrounded to subangular clasts -moist	19.0				
		TILL: Very stiff to hard, brown, sandy clay -trace gravel -trace cobbles and boulders (up to 0.3 m in diameter) -subrounded to subangular clasts -moist					
2							
3							
4							
5		End of Test Pit at 5.0 m -no bedrock encountered -no groundwater encountered	15.2				





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## TEST PIT RECORD

**Project Name:** Proposed Building Development

**Location:** Lot 92-5a1, Commerce Court, Elmsdale, NS

**Project No.:** 394-005

**Client:** Municipality of East Hants

**Water Level Date:** --

**Test Pit:** 104

**Sheet:** 1 of 1

**Date:** August 3, 2016

**Datum:** Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	21.0				
		ROOTMAT	20.9				
		TILL: Loose, grey, silty sand -trace rootlets -trace gravel -subrounded to subangular clasts -moist	20.5				
1		TILL: Stiff, light brown, sandy clay -trace gravel -trace cobbles and boulders (up to 0.5 m in diameter) -subrounded to subangular clasts -moist	19.8				
		TILL: Very stiff to hard, brown, sandy clay -trace gravel -trace cobbles and boulders (up to 0.5 m in diameter) -subrounded to subangular clasts -moist			GS	1	
2							
3							
			17.2				
4		End of Test Pit at 3.8 m -no bedrock encountered -no groundwater encountered					
5							



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## TEST PIT RECORD

**Project Name:** Proposed Building Development

**Location:** Lot 92-5a1, Commerce Court, Elmsdale, NS

**Project No.:** 394-005

**Client:** Municipality of East Hants

**Water Level Date:** --

**Test Pit:** 105

**Sheet:** 1 of 1

**Date:** August 3, 2016

**Datum:** Geodetic

### SUBSURFACE PROFILE

### SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	20.3				
		ROOTMAT	20.2				
		CLAY: Stiff, dark grey, clay -trace rootlets and organics -trace sand -subrounded to subangular clasts -dry to moist	19.5		GS	1	
1		TILL: Loose to compact, brown, silty sand -trace rootlets -trace gravel -subrounded to subangular clasts -moist	19.2				
2		TILL: Very stiff to hard, brown, sandy clay -trace gravel -trace cobbles and boulders (up to 0.3 m in diameter) -subrounded to subangular clasts -moist					
3							
4		End of Test Pit at 3.8 m -no bedrock encountered -no groundwater encountered	16.5				
5							



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## TEST PIT RECORD

**Project Name:** Proposed Building Development

**Location:** Lot 92-5a1, Commerce Court, Elmsdale, NS

**Project No.:** 394-005

**Client:** Municipality of East Hants

**Water Level Date:** --

**Test Pit:** 106

**Sheet:** 1 of 1

**Date:** August 3, 2016

**Datum:** Geodetic

### SUBSURFACE PROFILE

### SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	20.2				
		ROOTMAT	20.0				
		TILL: Loose to compact, brown, silty sand -trace gravel -subrounded to subangular clasts -moist	19.6				
1		TILL: Stiff, brown, sandy clay -trace gravel and cobbles -subrounded to subangular clasts -moist	19.3				
2		TILL: Very stiff to hard, brown, sandy clay -trace gravel and cobbles -subrounded to subangular clasts -moist					
3							
4			16.1				
5		End of Test Pit at 4.1 m -no bedrock encountered -no groundwater encountered					



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## TEST PIT RECORD

**Project Name:** Proposed Building Development

**Location:** Lot 92-5a1, Commerce Court, Elmsdale, NS

**Project No.:** 394-005

**Client:** Municipality of East Hants

**Water Level Date:** --

**Test Pit:** 107

**Sheet:** 1 of 1

**Date:** August 3, 2016

**Datum:** Geodetic

### SUBSURFACE PROFILE

### SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	22.0				
		FILL: Loose to compact, brown, sand with gravel -french drain at surface -15 mm of rootmat at surface -subrounded to subangular clasts -moist	21.4				
		ROOTMAT	21.3				
		TILL: Loose to compact, light brown, silty sand -trace gravel -subrounded to subangular clasts -moist	21.1				
1		TILL: Very stiff, brown, sandy clay -trace to some gravel -trace cobbles and boulders (up to 0.6 m in diameter) -subrounded to subangular clasts -moist					
2							
3							
4		End of Test Pit at 3.8 m -no bedrock encountered -no groundwater encountered	18.2				
5							



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## TEST PIT RECORD

**Project Name:** Proposed Building Development

**Location:** Lot 92-5a1, Commerce Court, Elmsdale, NS

**Project No.:** 394-005

**Client:** Municipality of East Hants

**Water Level Date:** --

**Test Pit:** 108

**Sheet:** 1 of 1

**Date:** August 3, 2016

**Datum:** Geodetic

### SUBSURFACE PROFILE

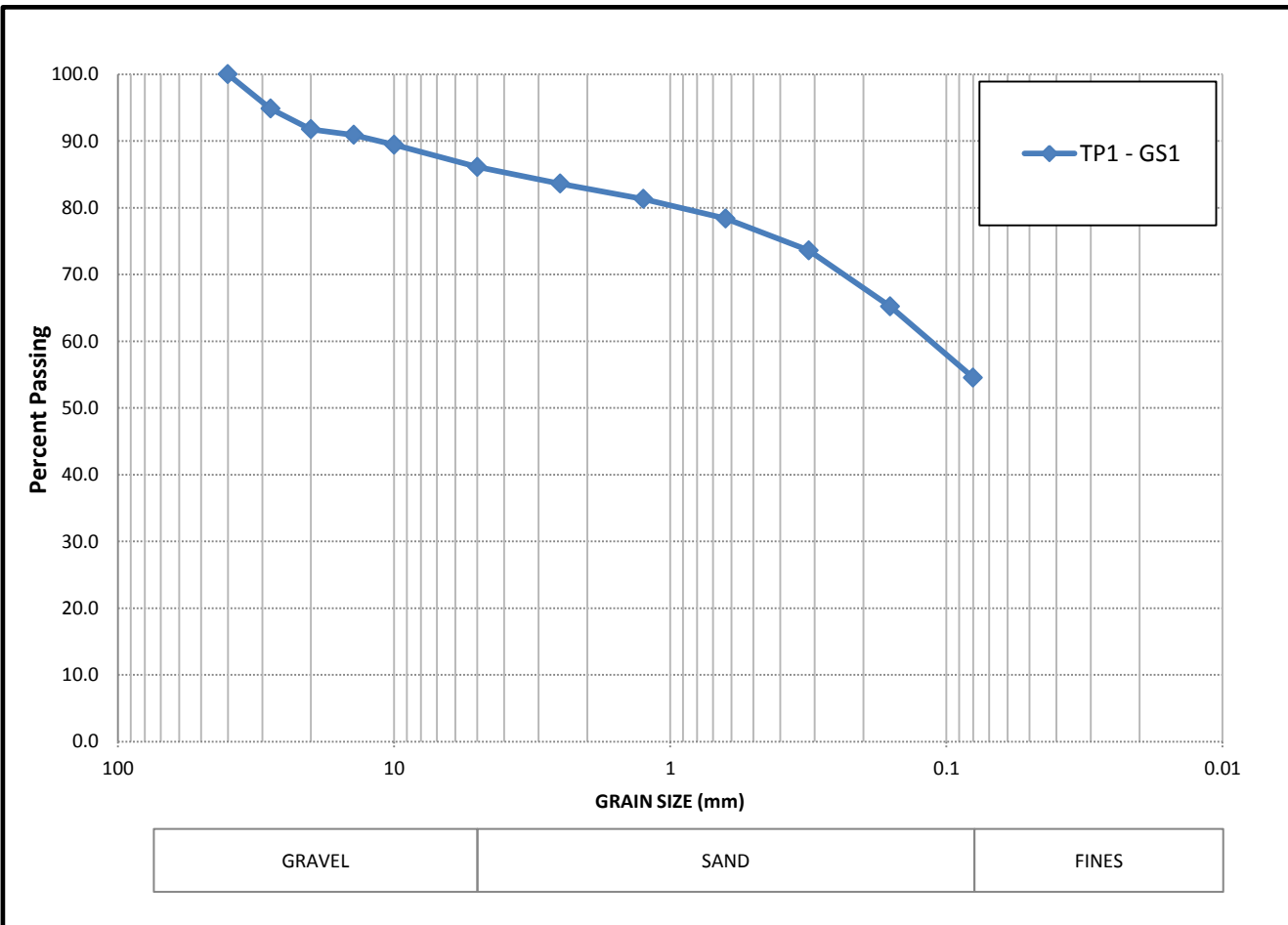
### SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	19.9				
		ROOTMAT	19.8				
		TILL: Soft to stiff, brown, clayey sandy silt -trace rootlets -trace gravel -moist	19.1				
1		TILL: Stiff to very stiff, brown, sandy clay -trace gravel -trace boulders (up to 0.3 m in diameter) -subrounded to subangular clasts -moist					
2					GS	1	
3							
4		End of Test Pit at 3.8 m -no bedrock encountered -no groundwater encountered	16.1				
5							

# GRAIN SIZE REPORT

Project: Proposed Building Development  
Client: Municipality of East Hants  
Project No: 394-005

## GRAIN SIZE DISTRIBUTION PLOT



## SOIL CLASSIFICATION

Sample No	Depth	Classification	Moisture Content (%)	Gravel (%)	Sand (%)	Silt and Clay (%)
TP1 - GS1	1.2 m	Sandy lean clay (CL)	10.9	14	32	55

### Conquest Engineering Limited

348 Bluewater Road, Bedford, NS B4B 1J6  
Office (902) 835-7313 • Fax (902) 835-1260

**Comments:** Samples taken from test pits conducted on August 3, 2016.

## FACTORED ULS BEARING RESISTANCE (NATIVE SOIL OR STRUCTURAL FILL)

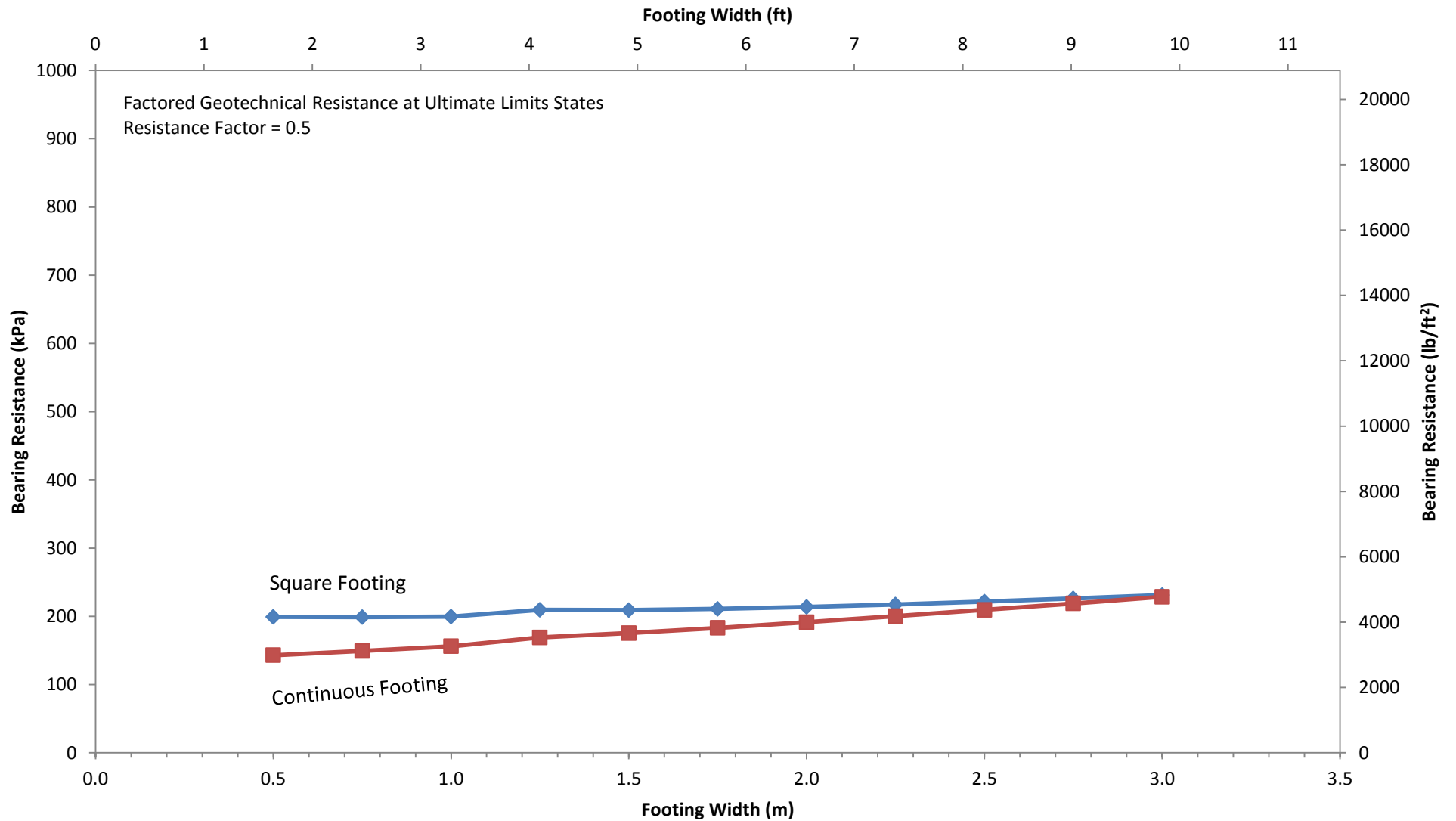


Figure 2

Project # 394-005

## SLS BEARING RESISTANCE (NATIVE SOIL OR STRUCTURAL FILL)

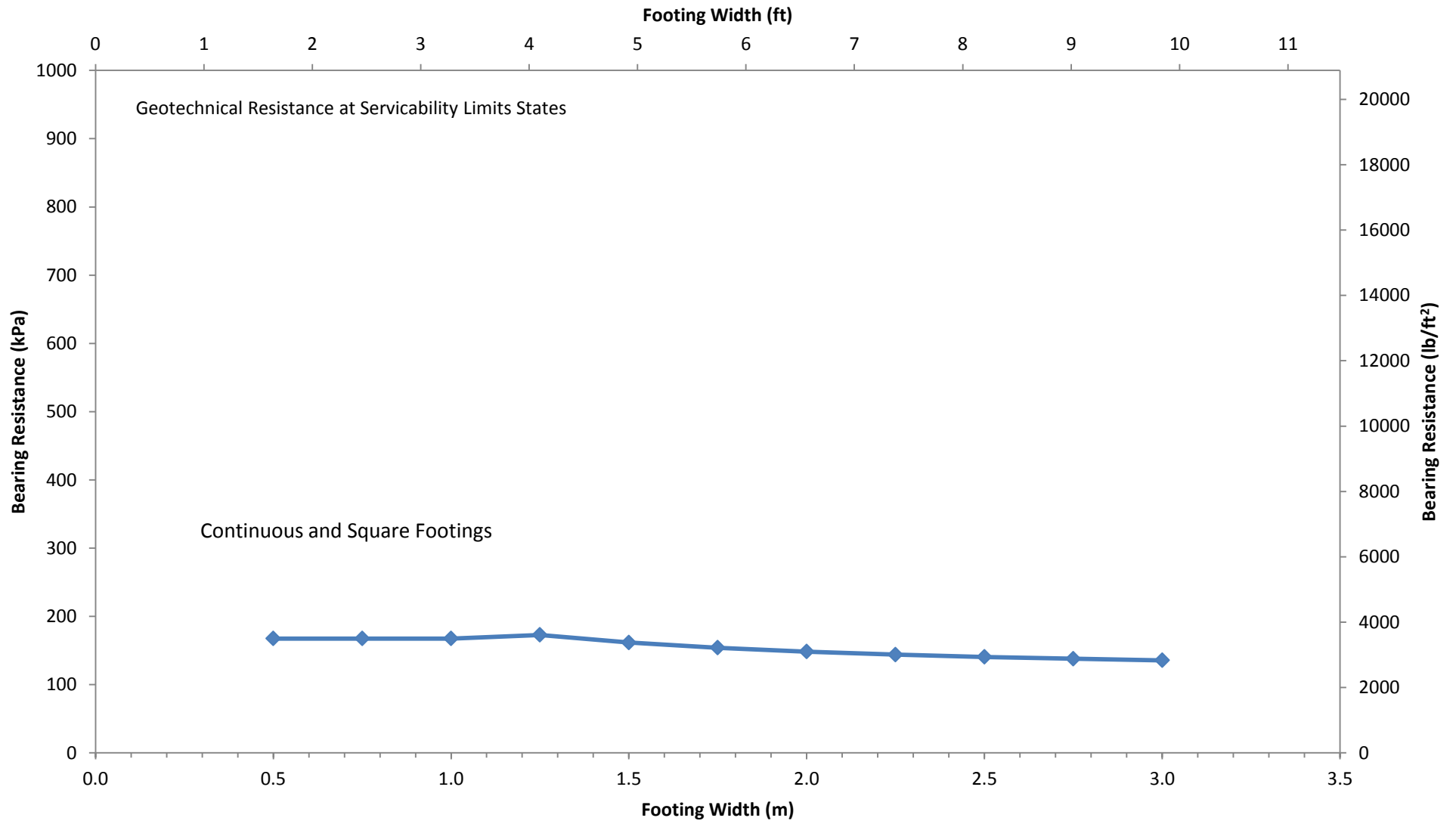


Figure 3

Project # 394-005





Photograph 1: Test Pit 101. August 3, 2016.



Photograph 2: Test Pit 102. August 3, 2016.





Photograph 3: Test Pit 103. August 3, 2016.



Photograph 4: Test Pit 104. August 3, 2016.





Photograph 5: Test Pit 105. August 3, 2016.



Photograph 6: Test Pit 106. August 3, 2016.





Photograph 7: Test Pit 107. August 3, 2016.



Photograph 8: Test Pit 108. August 3, 2016.



## **APPENDIX B**

## SYMBOLS AND TERMS USED ON THE BOREHOLE AND TEST PIT RECORDS

### SOIL DESCRIPTION

Behavioural properties (i.e. plasticity, permeability) take precedence over particle gradation in describing soils.

Terminology describing soil structure:

Desiccated	- having visible signs of weathering by oxidation of clay minerals, shrinkage cracks etc.
Fissured	- having cracks, and hence a blocky structure
Varved	- composed of regular alternating layers of silt and clay
Stratified	- composed of alternating layers of different soil types, e.g. silt and sand or silt and clay
Well Graded	- having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Uniformly Graded	- predominantly of one grain size.

Terminology used for describing soil strata based upon the proportion of individual particle size present:

Trace, or occasional	Less than 10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. silt and sand)	35-50%

The standard terminology to describe cohesionless soils includes the relative density, as determined by laboratory test or by the Standard Penetration Test 'N' - value: the number of blows of 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil.

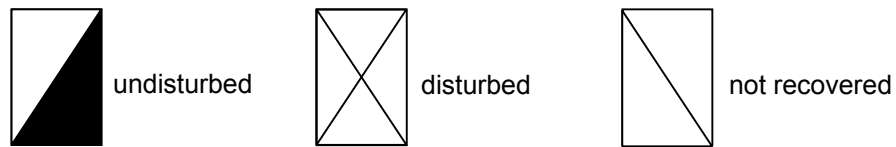
Relative Density	'N' Value	Relative Density %
Very loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression test, or occasionally by standard penetration tests.

Consistency	Undrained Shear Strength		'N' Value
	Kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25-0.5	12.5-25	2-4
Firm	0.5-1.0	25-50	4-8
Stiff	1.0-2.0	50-100	8-15
Very Stiff	2.0-4.0	100-200	15-30
Hard	>4.0	>200	>30

## SOIL SAMPLES

CONDITION – This column graphically indicates the depth and condition of the sample:



TYPE – The type of sample is indicated in this column as follows:

- A auger sample
- B block sample
- C rock core, or frozen soil core
- D drive sample
- G grab sample
- SS split spoon
- P Pitcher tube sample
- U tube sample (usually thin-walled)
- W wash or air return sample
- O other (see report text)

PENETRATION RESISTANCE – Unless otherwise noted this column refers to the number of blows (N) of a 140 pound (63.5 kg) hammer freely dropping 30 inches (0.76 m) required to drive a 2 inch (50.8 mm) O.D. open-end sampler 0.5 feet (0.15 m) to 1.5 feet (0.45 m) into the soil, or until 100 blows have been applied, in which case, the penetration is stated. This is the standard penetration test referred to in ASTM D 1586.

## OTHER TESTS

In this column are tabulated results of other laboratory tests as indicated by the following symbols:

*C	Consolidation test
Fines	Percentage by weight smaller than #200 sieve
D <sub>R</sub>	Relative density (formerly specific gravity)
k	Permeability coefficient
*MA	Mechanical grain size analysis and hydrometer test (if appropriate)
pp	Pocket penetrometer strength
*q	Triaxial compression test
q <sub>U</sub>	Unconfined compressive strength
*SB	Shearbox test
SO <sub>4</sub>	Concentration of water-soluble sulphate
*ST	Swelling test
TV	Torvane shear strength
VS	Vane Shear Strength (undisturbed-remolded)
ε <sub>f</sub>	Unit strain at failure
γ	Unit weight of soil or rock
γ <sub>d</sub>	Dry unit weight of soil or rock
ρ	Density of soil or rock
ρ <sub>d</sub>	Dry density of soil or rock

\* The results of these tests usually are reported separately



# SOIL CLASSIFICATION SYSTEM (MODIFIED U.S.C.)

MAJOR DIVISION			GROUP SYMBOL	GRAPHIC SYMBOL	COLOR CODE	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
HIGHLY ORGANIC SOILS			Pt		ORANGE	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOR OR ODOR, AND OFTEN FIBROUS TEXTURE
COARSE-GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN NO. 200 SIEVE SIZE)	GRAVELS MORE THAN HALF COARSE FRACTION LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS	GW		RED	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, <5% FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$
			GP		RED	POORLY-GRADED GRAVELS, AND GRAVEL-SAND MIXTURES, <5% FINES	NOT MEETING ALL ABOVE REQUIREMENTS
		DIRTY GRAVELS	GM		YELLOW	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR $I_p < 4$
			GC		YELLOW	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE "A" LINE OR $I_p > 7$
	SANDS MORE THAN HALF COARSE FRACTION SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS	SW		RED	WELL-GRADED SANDS, GRAVELLY SANDS, <5% FINES	$C_u = \frac{D_{60}}{D_{10}} > 6$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$
			SP		RED	POORLY-GRADED SANDS, OR GRAVELLY SANDS, <5% FINES	NOT MEETING ALL ABOVE REQUIREMENTS
		DIRTY SANDS	SM		YELLOW	SILTY SANDS, SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR $I_p < 4$
			SC		YELLOW	CLAYEY SANDS, SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE "A" LINE OR $I_p > 7$
FINE - GRAINED SOILS (MORE THAN HALF BY WEIGHT PASSES NO.200 SIEVE SIZE)	SILTS  BELOW "A" LINE ON PLASTICITY CHART; NEGLEGIBLE ORGANIC CONTENT		ML		GREEN	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	$W_L < 50$
			MH		BLUE	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	$W_L > 50$
	CLAYS  ABOVE "A" LINE ON PLASTICITY CHART; NEGLEGIBLE ORGANIC CONTENT		CL		GREEN	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS	$W_L < 30$
			CI		GREEN-BLUE	INORGANIC CLAYS OF MEDIUM PLASTICITY SILTY CLAYS	$W_L > 30, < 50$
			CH		BLUE	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	$W_L > 50$
	ORGANIC SILTS & ORGANIC CLAYS  BELOW "A" LINE ON PLASTICITY CHART		OL		GREEN	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	$W_L < 50$
			OH		BLUE	ORGANIC CLAYS OF HIGH PLASTICITY	$W_L > 50$
							SEE CHART BELOW



FILL



TILL

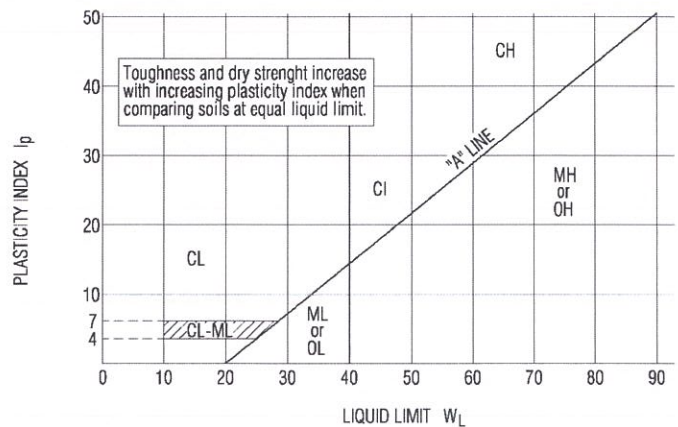


BEDROCK


- All sieve sizes mentioned on this chart are U.S. Standard, ASTM E11.
- Boundary classifications possessing characteristics of two groups are given combined group symbols eg GW-GC is a well-graded gravel-sand mixture with clay binder between 5% and 12%.
- Soil fractions and limiting textural boundaries are in accordance with the Unified Soil Classification System, except that an inorganic clay of medium plasticity (CI) is recognized.
- The following adjectives may be employed to define percentage ranges by weight of minor components:

and	50 - 36%
gravelly, sandy, silty, clayey, ect.	35 - 21%
some	20 - 11%
trace	10 - 1%


PLASTICITY CHART



<div>LVM   MARITIME TESTING</div>				TEST PIT LOG							
				PROJECT Geotechnical Investigation - Proposed New Building Lot 92-5A1, Commerce Court, Elmsdale, NS							
LOGGED/DWN. BAM		CKD. TKM		DATE OF INVEST. 1/30/14		JOB NO. 18369		TEST PIT TP 1			
<div>WC % 10 20 30 40 50</div> <div>wp- □ w- ● wl- △</div>		DEPTH ft m		MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		BACKHOE TYPE	
						DATUM Existing Ground Surface		COND.	TYPE	POCKET PENE.	Excavator
						SURFACE ELEVATION					
								OTHER TESTS			
		1			FILL : mixture of soil and organics, loose, wet, brown.						
		2									
		3									
		4			TILL : silty sandy clay, trace gravel, occasional cobble, compact, moist, reddish brown to brown.						
		5									
		6									
		7			End of Test Pit at 1.8 metres in Till.						
		8			Test Pit dry upon completion.						
		9									
		10									
		11									
		12									
		13									
		14									
		15									
		16									
		17									
		18									
		19									
		20									
		21									
		22									
		23									
		24									
		25									
		26									
		27									
		28									
		29									
		30									
		31									
		32									
		33									
		34									
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				TEST PIT LOG								
				PROJECT Geotechnical Investigation - Proposed New Building Lot 92-5A1, Commerce Court, Elmsdale, NS								
LOGGED/DWN. BAM		CKD. TKM		DATE OF INVEST. 1/30/14		JOB NO. 18369		TEST PIT TP 2				
WC %    wp- □    w- ●    wl- △ 10    20    30    40    50		DEPTH ft    m		MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		BACKHOE TYPE		
						DATUM Existing Ground Surface		COND.	TYPE	POCKET PENE.	Excavator	
						SURFACE ELEVATION					OTHER TESTS	
						FILL : mixture of soil, organics, roots, loose, wet, brown.						
		1										
		2										
		3										
		4				Rootmat / Topsoil						
		5										
		6				TILL : silty sandy clay, trace gravel, occasional cobble, compact, moist, reddish brown to brown.						
		7										
		8				End of Test Pit at 2.4 metres in Till.						
		9				Test Pit dry upon completion.						
		10										
		11										
		12										
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											PLATE 2	



				TEST PIT LOG								
				PROJECT Geotechnical Investigation - Proposed New Building Lot 92-5A1, Commerce Court, Elmsdale, NS								
LOGGED/DWN. BAM		CKD. TKM		DATE OF INVEST. 1/30/14		JOB NO. 18369		TEST PIT TP 4				
WC %    wp- □    w- ●    wl- △ 10    20    30    40    50		DEPTH ft    m		MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		BACKHOE TYPE		
						DATUM Existing Ground Surface		COND.	TYPE	POCKET PENE.	Excavator	
						SURFACE ELEVATION					OTHER TESTS	
						FILL : mixture of soil, organics, roots, loose, wet, brown.						
		1										
		2										
		3										
		1										
		4				TILL : silty sandy clay, trace gravel, occasional cobble, compact, moist, reddish brown to brown.						
		5										
		6										
		2				End of Test Pit at 1.8 metres in Till.						
		7				Test Pit dry upon completion.						
		8										
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											PLATE 4	





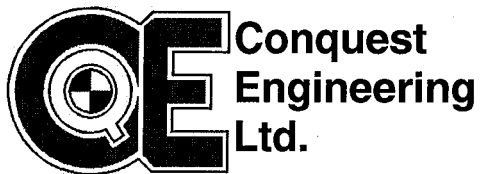






<div>LVM   MARITIME TESTING</div>				TEST PIT LOG								
				PROJECT Geotechnical Investigation - Proposed New Building Lot 92-5A1, Commerce Court, Elmsdale, NS								
LOGGED/DWN. BAM		CKD. TKM		DATE OF INVEST. 1/30/14		JOB NO. 18369		TEST PIT TP 8				
<div>WC % 10 20 30 40 50</div> <div>wp- □ w- ● wl- △</div>		DEPTH ft m		MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		BACKHOE TYPE		
						DATUM Existing Ground Surface		COND.	TYPE	POCKET PENE.	Excavator	
						SURFACE ELEVATION					OTHER TESTS	
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						TILL : silty sandy clay, trace gravel, occasional cobble, compact, moist, reddish brown to brown.						
						End of Test Pit at 2.1 metres in Till.						
						Test Pit dry upon completion.						

## **APPENDIX C**



## TEST PIT RECORD

**Project Name:** MEH-Proposed Building -Site 2

**Location:** Elmsdale, Nova Scotia

**Project No.:** 394-002

**Client:** The Municipality of East Hants

**Water Level Date:** April 26, 2011

**Test Pit:** No. 1

**Sheet:** 1 of 1

**Date:** April 26, 2011

**Datum:** Geodetic

### SUBSURFACE PROFILE

### SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	21.7				
		ROOTMAT/TOPSOIL	21.3				
		Fill: loose to compact reddish brown sandy silt with gravel - some cobbles					
1					GS	SA1	
			20.3				
		Till: very stiff reddish brown sandy clay with gravel - some cobbles					
2					GS	SA2	
			19.2				
3		End of test pit at 2.5 m - slight seepage encountered at 1.2m					
4							
5							

Moisture content  
10.8%



## TEST PIT RECORD

**Project Name:** MEH-Proposed Building -Site 2

**Location:** Elmsdale, Nova Scotia

**Project No.:** 394-002

**Client:** The Municipality of East Hants

**Water Level Date:** April 26, 2011

**Test Pit:** No. 2

**Sheet:** 1 of 1

**Date:** April 26, 2011

**Datum:** Geodetic

### SUBSURFACE PROFILE

### SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	22.0				
		ROOTMAT/TOPSOIL	21.5				
		Fill: Loose to compact silty sand with gravel -Some cobbles -Medium moisture	20.4		GS	SA1	Moisture content 12.7
		Till: Very stiff reddish brown sandy clay with gravel -Some cobbles	19.4		GS	SA2	Moisture content 12.5%
3		End of test pit at 2.6 m - slight seepage encountered at 0.8m					
4							
5							



## TEST PIT RECORD

**Project Name:** MEH-Proposed Building -Site 2

**Location:** Elmsdale, Nova Scotia

**Project No.:** 394-002

**Client:** The Municipality of East Hants

**Water Level Date:** April 26, 2011

**Test Pit:** No. 3

**Sheet:** 1 of 1

**Date:** April 26, 2011

**Datum:** Geodetic

### SUBSURFACE PROFILE

### SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	22.6				
		ROOTMAT/TOPSOil	22.4				
		Fill: Loose dark grey to black sandy silt			GS	SA1	
1		Fill: Loose to compact medium brown sandy silt with gravel -Some cobbles	21.7				
					GS	SA2	
2		Till: dense to very dense reddish brown sandy clay with gravel -Some Cobbles	20.8				
					GS	SA3	
			20.0				Moisture content 13.1%
3		End of test pit at 2.6 m - Light Seepage encountered at 0.7m					
4							
5							



## TEST PIT RECORD

**Project Name:** MEH-Proposed Building -Site 2

**Location:** Elmsdale, Nova Scotia

**Project No.:** 394-002

**Client:** The Municipality of East Hants

**Water Level Date:** April 26, 2011

**Test Pit:** No. 4

**Sheet:** 1 of 1

**Date:** April 26, 2011

**Datum:** Geodetic

### SUBSURFACE PROFILE

### SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	22.1				
		ROOTMAT/TOPSOIL	22.0				
		Fill: Loose to compact reddish brown sandy silt with gravel. -Some cobbles					
1		Till: Dense reddish brown sandy clay with gravel -Some cobbles -Lower moisture	21.1		GS	SA1	Moisture content 12.6
			20.6		GS	SA2	Moisture content 13.0%
2		End of test pit at 1.50 m - Light Seepage encountered at 0.2m					
3							
4							
5							



# TEST PIT RECORD

**Project Name:** MEH-Proposed Building -Site 2  
**Location:** Elmsdale, Nova Scotia  
**Project No.:** 394-002  
**Client:** The Municipality of East Hants  
**Water Level Date:** April 26, 2011

**Test Pit:** No. 5  
**Sheet:** 1 of 1  
**Date:** April 26, 2011  
**Datum:** Geodetic

## SUBSURFACE PROFILE

## SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	20.5				
		ROOTMAT/TOPSOIL	20.2		GS	SA1	
		Fill: Loose to compact medium brown sandy silt with gravel. -Some cobbles -Low moisture	20.0				
		ORIGINAL ROOTMAT/TOPSOIL	19.5				
1		Till: Dense to very dense redish brown sandy clay with gravels. -Some cobbles	18.8		GS	SA2	
2		End of test pit at 1.7m					Moisture content 12.3 %
3							
4							
5							



## TEST PIT RECORD

**Project Name:** MEH-Proposed Building -Site 2

**Location:** Elmsdale, Nova Scotia

**Project No.:** 394-002

**Client:** The Municipality of East Hants

**Water Level Date:** April 26, 2011

**Test Pit:** No. 6

**Sheet:** 1 of 1

**Date:** April 26, 2011

**Datum:** Geodetic

### SUBSURFACE PROFILE

### SAMPLE

Depth (m)	Symbol	Soil and/or Rock Description	Elevation (m)	Water Level (m)	Type	Number	Comments
0		Ground Surface	21.8				
		ROOTMAT/TOPSOIL	21.6				
		Fill: Loose medium brown to dark brown silty sand with gravel. -Some cobbles -High moisture	21.2		GS	SA1	Moisture content 33.5%
1		ORIGINAL ROOTMAT/TOPSOIL: Dark grey to black original grassy layer and rootmat. - organics, tree limbs and roots.	20.4				
2		Till: Loose reddish brown sandy clay with gravel. - Some cobbles.			GS	SA2	Moisture content 17.2%
3							
4		End of test pit at 3.7 m - Heavy seepage encountered at 1.3m	18.1				
5							