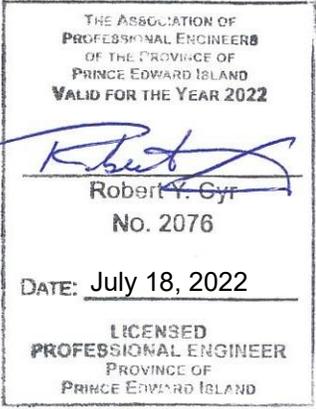




# Geotechnical Investigation Report Community Campus Site Servicing Stratford, PE



222617.00 • July 18, 2022

01	Final	R. Cyr	July 18, 2022	D. McKenney
Issue or Revision		Reviewed By:	Date	Issued By:
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Project No. 222617.00



July 18, 2022

Jeannie Gallant  
Town of Stratford  
234 Shakespeare Drive  
Stratford, PE C1B 2V8

Dear Ms. Gallant:

*RE: Geotechnical Investigation – Community Campus Site Servicing*

Please find below our geotechnical investigation report for the community campus site servicing in Stratford, Prince Edward Island. This report presents our findings and our geotechnical recommendations for foundation design and general site work.

Yours very truly,

CBCL Limited

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Project No.: 222617.00

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# 1 Introduction

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CBCL Limited, have conducted a geotechnical investigation for the Community Campus Site Servicing in Stratford, Prince Edward Island. This investigation was conducted at the request of the Town of Stratford, PE. The purpose of this investigation was to evaluate the subsurface conditions throughout the site and to provide geotechnical recommendations for construction and design of the following items:

- ▶ Roadways
- ▶ Solar Arrays
- ▶ Stormwater Detention Ponds
- ▶ Pumping Station

This report presents our findings and our geotechnical recommendations for foundation design and general site work within the areas investigated. The heavily treed area at the south end of the site was not investigated due to access constraints. The subsurface conditions in this area should be investigated at a later date.

## 2 Site Description and Geology

---

The site is located at Lots 21-1 and 21-2 between Bunbury Road and Hollis Avenue in Stratford, PE. The site mainly consists of grass covered fields (agricultural land); however, a heavily treed area is located along the southern portion of the site. There is a large change in elevation throughout the site with the terrain generally sloping down to the east.

Surficial geologic mapping indicates the principal soil type in the area is glacial till. Bedrock in the area is mapped as sedimentary rock of the Kildares Cape Formation and Wood Islands Member.

## 3 Summarized Subsurface Conditions

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The field program consisted of twenty-five (25) test pits completed on May 25 and 26, 2022. The test pit locations are shown in Drawing 01 in Appendix A.

The test pits were conducted using an excavator. Representative samples were taken during the field work and the conditions at the test pits were logged in detail. The subsurface conditions encountered at the site are described in detail on the appended Test Pit Records and summarized below in the following paragraphs and Table 1.

The subsurface conditions encountered throughout the site generally consist of the following profile:

- ▶ ROOTMAT
- ▶ REWORKED GLACIAL TILL
- ▶ UNDISTURBED GLACIAL TILL
- ▶ BEDROCK (INFERRED)

Rootmat was encountered throughout the site and was generally observed to be 150 mm thick; however, its thickness ranged between 120 mm and 400 mm throughout the site.

Reworked glacial till was encountered below the rootmat at all test pit locations with the exception of TP-24. The reworked glacial till layer was observed to be up to 1.4 m thick. It generally consisted of a loose silty sand with gravel and occasional organics overlying a loose clayey sand with gravel to firm sandy lean clay with gravel. Several samples of the reworked till were tested for moisture content. Testing revealed the moisture content ranged between 11.8% and 25.2%, with the higher values generally closer to the surface.

Undisturbed glacial till stratum was encountered throughout the site at depths ranging between 0.3 m and 1.6 m. The till stratum generally consisted of very stiff sandy lean clay with gravel to compact clayey sand with gravel. Occasional cobbles and boulders were generally encountered throughout and increasing in frequency and size with depth. Moisture content testing was conducted on multiple samples and a moisture density relationship test (ASTM D698) was conducted on a composite sample. Testing revealed the moisture content ranged between 12.8% and 21.7%, with an average of 15.5%. Moisture density testing revealed an optimum moisture content of 14.3%.

Bedrock (inferred) was encountered throughout the site at depths ranging between 2.0 m and 4.3 m.

Groundwater was observed within a few test pits at depths between 2.6 m and 4.3 m. Groundwater should be expected to fluctuate seasonally, in response to rain events, construction activity, and/or site use.

**Table 3.1: Summary of Findings**

Location	Coordinates (m) <sup>1</sup>	Elevation (m) <sup>2</sup>	Thickness of Rootmat (mm)	Thickness of Reworked Till (m)	Depth to Undisturbed Till (m)	Depth to Inferred Bedrock (m)	Groundwater Depth (m) <sup>3</sup>	Depth of Test Pit (m)
TP-01	N 687050.0 E 394062.5	28.6	150	0.4	0.6	2.8	--	2.8
TP-02	N 687054.9 E 394007.3	29.7	150	1.1	1.3	2.9	--	2.9
TP-03	N 686950.9 E 394041.3	31.2	150	1.1	1.3	3.4	--	3.4
TP-04	N 686853.4 E 394094.7	29.7	150	1.4	1.6	2.7	--	2.7
TP-05	N 686744.1 E 394111.0	26.5	150	0.8	1.0	3.4	--	3.4
TP-06	N 686646.9 E 394164.3	21.7	150	0.8	1.0	3.2	--	3.3
TP-07	N 686535.2 E 394163.1	19.2	150	0.6	0.8	2.7	--	2.7
TP-08	N 686424.2 E 394150.2	20.5	150	0.5	0.7	3.6	--	3.6
TP-09	N 686320.2 E 394116.0	23.7	150	0.8	1.0	2.1	--	3.6
TP-10	N 686221.2 E 394163.9	20.0	200	0.6	0.8	2.0	--	3.9
TP-11	N 686113.0 E 394183.3	19.2	200	0.6	0.8	4.0	--	4.0
TP-12	N 686009.7 E 394221.2	17.3	150	0.1	0.3	4.2	--	4.2
TP-13	N 685907.9 E 394179.6	21.7	200	0.5	0.7	3.6	--	3.6
TP-14	N 685782.8 E 394216.4	21.7	150	1.4	1.6	3.3	2.6	3.5
TP-15	N 686267.6 E 394061.7	26.9	200	0.7	0.9	3.7	--	3.7
TP-16	N 686250.4 E 393966.0	32.0	150	0.5	0.7	2.3	--	3.6
TP-17	N 685854.6 E 394175.8	22.9	200	1.2	1.4	3.9	--	3.9
TP-18	N 685852.8 E 394072.4	28.4	150	0.5	0.7	2.3	--	4.5
TP-19	N 685795.9 E 394083.5	28.4	150	0.7	0.9	2.9	--	3.0
TP-20	N 685811.4 E 394182.5	23.1	200	1.3	1.5	4.0	--	4.0
TP-21	N 686567.7 E 394321.6	12.1	120	0.3	0.4	4.3	4.3	4.3
TP-22	N 686426.0 E 394388.1	9.5	300	0.2	0.5	3.3	3.3	3.3
TP-23	N 686215.1 E 394357.2	8.4	200	0.1	0.3	3.4	3.2	3.4
TP-24	N 686184.9 E 394368.8	8.7	400	--	0.4	--	3.3	3.8
TP-25	N 686038.1 E 394294.7	13.3	300	0.5	0.8	4.7	--	4.7

Notes: <sup>1</sup>Coordinate system PEI Grid NAD83 CSRS.<sup>2</sup>Geodetic Datum (HTv2).<sup>3</sup>Measured during excavation.

# 4 Discussion and Recommendations

---

Geotechnical recommendations are presented herein for construction and design of the following items:

- ▶ Roadways
- ▶ Solar Arrays
- ▶ Stormwater Detention Ponds
- ▶ Pumping Station

The treed portion of the site (south side) was not investigated due to access constraints. The subsurface conditions in this area should be investigated at a later date.

Final details of the proposed development are unknown to us at this time. We should be contacted as the design progresses to allow us to review and adjust our recommendations accordingly.

## 4.1 Earthworks

### 4.1.1 Surface Water 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.

### 4.1.2 Excavation

---

Within the foundation areas for the solar arrays and pumping station, the existing rootmat and reworked till should be removed and reinstated with structural fill, as required.

Where the material encountered at footing base elevation consists of glacial till, we recommend a 300 mm thick layer of Granular Class A or approved granular borrow below the footing.

Within the stormwater detention pond area, the existing rootmat and reworked till should be removed and reinstated with structural fill, as required.

Within the roadways, the existing rootmat and upper portion of the reworked till (with occasional roots/rootlets) should be removed and the subgrade proof-rolled with a

10-tonne steel drum roller. Any excessively weak zones (> 25mm ruts) should be replaced with structural fill.

Inferred bedrock was encountered throughout the site at depths between 2.0 m and 4.3 m. Depending on final grades of the infrastructure, excavation into bedrock may be required in areas.

Test pits located within the foundation and detention pond areas should be re-excavated and reinstated with structural fill. Structural fill should be placed and compacted in lifts to design grade, as required.

The on-site soils could become easily disturbed/softened during construction when exposed to wet conditions or significant traffic. A woven geotextile (such as Terratrack 400) and additional granular material is recommended for construction access roads and travel ways throughout the site. Travel over exposed reworked till or undisturbed till should be minimized.

Temporary excavated side slopes in unsaturated conditions should be stable at one horizontal to one vertical (1H:1V). Saturated slopes should be reviewed by geotechnical personnel during construction.

Stockpiled excavated material should be placed at a distance away from the excavations to ensure the stability of the slopes are not compromised. This should be reviewed by geotechnical personnel during construction.

### 4.1.3 Dewatering of Excavations

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The contractor undertaking the earthworks must be prepared to dewater excavations. Footings should not be placed in standing water, slough, or over softened bearing soils.

Discharge from the dewatering activities must be carried out in strict accordance with environmental regulations. Discharge may have to be collected and/or filtered to meet environmental guidelines.

### 4.1.4 Structural Fill Placement and Compaction

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Structural fill required throughout the site should consist of the following:

- ▶ Approved, imported, quarried rockfill and gravel,
- ▶ Approved sand and gravel pit run,
- ▶ Approved borrow, or;
- ▶ Approved on-site soils.

To prevent adfreeze, backfill directly against the exterior of foundations should consist of a well-graded granular material, containing less than 5% fines (silt/clay). Alternatively, a bond break (such as 2 layers of polyethylene) could be placed directly against the foundations within the frost zone. The backfill material should have a maximum particle size of 80 mm.

Reuse of the on-site soils may be permissible in areas; however, overly wet and/or oversized material will have to be removed.

Structural fill should be placed at or near the optimum moisture content (ASTM D698).

The lift thickness used during placement of structural fill must be compatible with the compaction equipment and the material type to ensure the specified density throughout. For preliminary consideration, the lift thickness should not exceed 300 mm for mass filling and 200 mm for backfilling foundations. The maximum particle size should be no larger than  $\frac{2}{3}$  of the lift thickness. If the on-site soils are being considered for reuse, special procedures for placement will be required due to soil's clayey nature. We should be contacted if this is the case.

Structural fill should be compacted to the following percentage of maximum standard Proctor dry density (ASTM D698):

▶ Structural fill within building/foundation areas	100%
▶ Structural fill within detention pond	98%
▶ Structural fill within 300 mm of roadway subgrade	98%
▶ Structural fill 300 mm or more below roadway subgrade	95%

Where structural 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.

#### 4.1.5 Roadway Subgrade

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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 aggregates.

#### 4.1.6 Slopes

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The embankment slopes for the detention pond should not be steeper than 3H:1V for both the inner and outer slopes; however, this should be reviewed once more details are known. The outer slopes of the embankment should be vegetated.

Along the roadway, permanent structural fill slopes should be 2H:1V, or lower. If permanent cut slopes are proposed, we should be contacted.

#### 4.1.7 Winter Construction

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Additional effort will be required to conduct earthwork during winter conditions. Winter construction guidelines are attached in Appendix D.

Undertaking earthworks in the winter is not ideal and despite best efforts and good intentions, the quality of earthworks often is compromised.

## 4.1.8 Observation and Testing

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It is recommended that all footing bearing surfaces be observed by an experienced geotechnical engineer prior to placement of concrete. Observation and testing are also recommended during site grading and backfilling operations.

## 4.2 Foundations

Conventional strip and spread footings and a slab on grade may be considered for the proposed pumping station.

Helical piles were considered for the proposed solar array foundations; however, due to the depth of bedrock in the area and the presence of cobbles and boulders within the till, we would recommend considering the use of spread footings instead.

Recommendations for site preparation are provided in Section 4.1.

### 4.2.1 Spread/Strip Footings

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For strip (continuous) and spread (square) footings founded on undisturbed glacial till or structural fill, the following geotechnical bearing resistances are recommended for design:

- ▶ Factored Geotechnical Bearing Resistance (ULS): 250 kPa
- ▶ Geotechnical Bearing Resistance (SLS): 150 kPa

The above noted resistances are based on the following assumptions:

- ▶ Footings are under level ground and are loaded concentrically
- ▶ Strip footings
  - founded a minimum of 1.5 m below grade
  - footing width between 0.6 m and 1.0 m
- ▶ Spread footings
  - founded a minimum of 0.6 m below grade
  - footing width between 1.2 m and 2.5 m

Under service loading, total and differential settlement will be less than 25 mm and 20 mm respectively for the service bearing pressure (SLS) mentioned above.

Geotechnical bearing resistances for other footing sizes or conditions can be provided upon request.

For strip (continuous) and spread (square) founded directly on undisturbed bedrock, the following geotechnical bearing resistance is recommended for design:

- ▶ Factored Geotechnical Bearing Resistance (ULS): 500 kPa
  - The settlement for footings bearing on bedrock would be negligible (<5 mm).

For foundations on bedrock, the use of lean concrete may be considered to provide a level surface for footing construction.

Exterior footings for a heated structure should be founded a minimum of 1.5 m below grade for frost protection. For an unheated structure, footings should be founded a minimum of 1.8 m below grade. To reduce the amount of cover, the use of insulation could be considered.

## 4.2.2 Pumping Station Basement

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A perimeter foundation drainage and underslab drainage system is recommended for the basement level. The system should include clean-outs. A water-proofing system is recommended for the basement walls.

It is recommended that the abutments 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 basement wall design, the following parameters can be used:

- Total unit weight of soil,  $\gamma_T = 22 \text{ kN/m}^3$  (granular backfill, such as crushed rock aggregate subbase)
- Ultimate friction factor for sliding,  $\mu = 0.6$  (cast-in-place concrete to bedrock)
- Ultimate friction factor for sliding,  $\mu = 0.35$  (cast-in-place concrete to glacial till)
- Angle of internal friction,  $\Phi = 36$  degrees (granular backfill, such as crushed rock aggregate subbase)
- At-rest earth pressure coefficient,  $K_o = 0.4$  (if laterally restrained)

The wall design should include the influence of sloping backfill, surcharge loads behind the wall, and the effects of compaction equipment.

### 4.2.3 Slab on Grade

A 150 mm thick layer of Granular Class A is recommended below the floor slab for levelling and support purposes. The aggregate should be compacted to 100% Standard Proctor.

A modulus of subgrade reaction,  $k$ , of 50 MPa/m may be used for the slab design. This modulus corresponds to a 300 mm x 300 mm square bearing plate.

### 4.2.4 Seismic Classification

With the foundation areas prepared as discussed in the sections above, the recommended site classification for seismic site response, as per Table 4.1.8.4.B of NBCC 2020 is Site Class C.

## 4.3 Pavement Structure

For preliminary consideration, the following pavement structures can be considered for the site; however, this should be reviewed once the anticipated traffic loading is known and the subsurface conditions along the south side of site are determined.

**Table 4.1: Preliminary Pavement Structure Thicknesses**

Material	Light Duty Pavement <sup>1</sup>	Heavy Duty Pavement
Asphalt Concrete:		
Top Course (Type B)	40 mm	50 mm
Base Course (Type A)	60 mm	75 mm
Granular Base (Granular Class A)	150 mm	250 mm
Granular Subbase (Select Borrow)	300 mm	300 mm
Geotextile	See Note <sup>2</sup>	See Note <sup>2</sup>

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

<sup>2</sup>A woven geotextile (such as Terratrack 400) is recommended where the subgrade consists of glacial till (ie. has a high percentage of fines).

Prior to placement of aggregates, it will be critical to review the subgrade. Recommendations for site preparation are provided in Section 4.1.

Adequate drainage (subsurface, perforated drain pipe and/or ditching) should be in place to remove water from within the pavement structure. The drainage system should be such that the pavement structure remains adequately drained. Lack of drainage will cause premature deterioration of the asphalt pavement.

All materials should meet the PEIDTIE specifications. The granular base and subbase should be compacted to 100% of Standard Proctor maximum dry density. Asphalt concrete should be compacted as per the PEIDTIE Specifications.

## 5 Closure

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This report has been prepared for the sole benefit of the Client. All information, documentation or other material contained in, attached to, or forming part of this report reflects CBCL's opinion and best judgment based on the information available to us at the time of preparation. Any use or reliance on this report by the Client in circumstances where there has been a change in site conditions or for any purpose not expressly intended by or delineated in this report shall be the sole responsibility of the Client and CBCL accepts no liability for such use or reliance. Any use or reliance on this report by any third party, without CBCL's prior express written consent, shall be the sole responsibility of that third party. CBCL accepts no liability whatsoever for such use or reliance.

The information and conclusions contained in this report are generally consistent with professional standards for engineering and scientific professionals providing similar services at the same time, in similar locations and under similar circumstances.

A geotechnical 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 technical judgment of CBCL, based on the data obtained from the work and on CBCL's understanding of the project. The data obtained by CBCL is specific to the time the work was performed at the specific testing and/or sampling locations and can only be extrapolated to an undefined limited area surrounding 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, CBCL cannot and does not warrant that undiscovered environmental liabilities and/or undetected subsurface conditions may not arise.

If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we require that we be notified immediately to allow for reassessment of the conclusions provided herein. Further, if there are changes to Client's design, we require that we be notified to allow for review and possible changes to our recommendations.

We trust this is the information you require at this time. We are available to discuss the contents of this report at your convenience.



Prepared by:  
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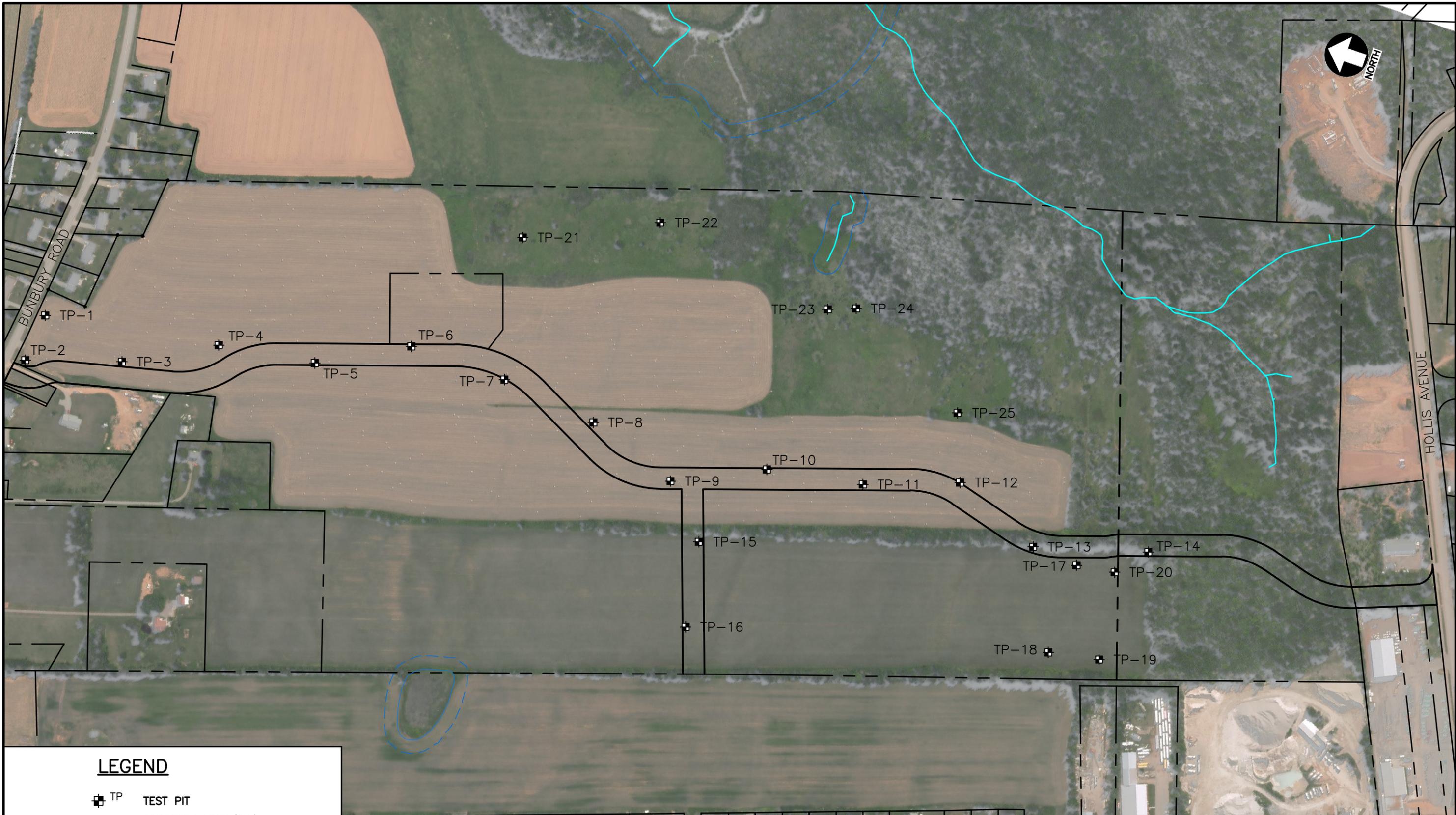
Reviewed by:  
Robert Y. Cyr, M.A.Sc., P.Eng.  
Senior Technical Specialist

# APPENDIX A

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## Test Pit Location Plan – Drawing 01

DRAWING NAME: Y:\CHARLOTTETOWN\DATA\CBCL\_JOB FOLDERS\2022\222617.00 STRATFORD - COMMUNITY CAMPUS SITE SERVICING\44 CAD\01 CIVIL\02 WORKING FILES\02 DESIGN FILES\222617 GEOTECH.DWG LAYOUT NAME: TEST PIT LOCATION SKETCH.PLOT DATE: JULY 13, 2022 9:00:31 AM CAD OPERATOR: AGLINS



**LEGEND**

- TP** TEST PIT
- PROPERTY LINE (EX.)
- PROPERTY LINE (PR.)
- RIGHT OF WAY (PR.)
- PROVINCIAL MAPPED WATERCOURSE (EX.)
- 15m WETLAND BUFFER ZONE
- PROVINCIAL MAPPED WETLAND (EX.)

No.	Description
1	GEOTECHNICAL INVESTIGATION REPORT

Date JULY 2022	Scale 1:4000	Designed TSL	Drawn AHG	Checked DM	Approved TSL	CBCL No. 222617	Contract 222617
 <b>CE Conquest Engineering</b> <small>Experience commitment</small> <small>A division of CBCL Limited</small>		STRATFORD COMMUNITY CAMPUS SITE SERVICING				Drawing <span style="font-size: 2em; font-weight: bold;">01</span>	
		TEST PIT LOCATION PLAN					

# APPENDIX B

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## Symbols and Terms used on Borehole and Test Pit Records

**Geotechnical and Materials Engineers**

**SOIL DESCRIPTION**

Terminology describing common soil genesis:

- Topsoil*            variable mixture of mineral particles and organic matter
- Peat*                decomposing vegetative matter having fibrous and/or amorphous structure
- Till*                 unstratified glacial deposit which may range from clay to boulders
- Fill*                 any materials below the surface identified as placed by humans (excluding buried services)

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 successions of different soil types, e.g. silt and sand
- Layer*                 >75 mm
- Seam*                 2 mm to 75 mm
- Parting*              < 2 mm
- Well Graded*        having wide range in grain sizes and substantial amounts of all intermediate particle sizes
- Uniformly Graded*    predominantly of one grain size

Terminology describing soils on the basis of grain size and plasticity is based on the ASTM D2488 – Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). 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:

- Trace, or occasional*            Less than 10%
- Some*                                10-20%
- Frequent*                            Greater than 20%

The standard terminology to describe cohesionless soils includes the compactness 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 in-situ vane tests, penetrometer tests, unconfined compression tests, or occasionally by standard penetration tests.

Consistency	Undrained Shear Strength (Su)		'N' Value
	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 sound core over 100 mm long are counted as recovery. 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	Excellent, intact, very sound
75 – 90	Good, massive, moderately jointed or sound
50 – 75	Fair, blocky and seamy, fractured
25 – 50	Poor, shattered and very seamy or blocky, severely fractured
0 – 25	Very poor, crushed, 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>	

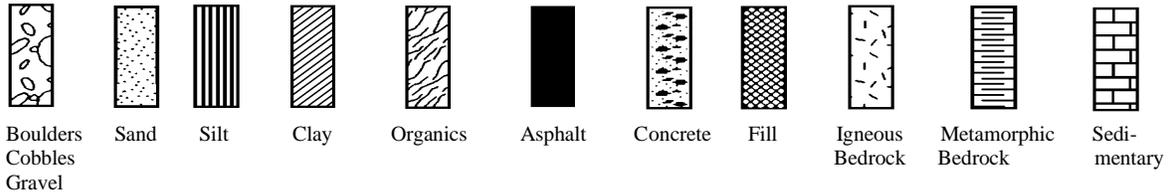
Strength Classification	Uniaxial Compressive Strength (MPa)
<i>Very Weak</i>	1 – 5
<i>Weak</i>	5 – 25
<i>Medium Strong</i>	25 – 50
<i>Strong</i>	50 – 100
<i>Very Strong</i>	100 – 250
<i>Extremely Strong</i>	> 250

Terminology describing weathering:

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

## STRATA PLOT

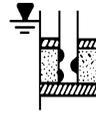
Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:



## WATER LEVEL MEASUREMENT



Borehole or  
Standpipe



Piezometer

## SAMPLE TYPE AND/OR FIELD TESTS

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)
FSV	Field Shear Vane		

## N- VALUE

Numbers in this column are the results of the SPT (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 abbreviation SSR (Split Spoon Refusal) will appear in place of a numerical value.

## 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	Consolidated 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)
		MSV	Laboratory Miniature Shear Vane

# APPENDIX C

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## Test Pit Records



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 687050.0 m, E 394062.5 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 01**

**Sheet:** 1 of 1

**Date:** May 26, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE						SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number		
0.0		ROOTMAT - 150 mm thick	28.6 0.0					
1.0		Loose brown silty sand with gravel (SM): REWORKED TILL - occasional rootlets - moist			BS	1		
2.0		Very stiff reddish brown sandy lean CLAY with gravel (CL) to compact reddish brown clayey SAND with gravel (SC): TILL - some cobbles below 1.4 m - moist	28.0 0.6					
3.0					BS	2	Moisture Content = 12.8%	
4.0								
5.0								
6.0								
7.0					BS	3	Moisture Content = 13.9%	
8.0								
9.0								
10.0		End of Test Pit at 2.8 m - INFERRED BEDROCK SURFACE - groundwater not observed	25.8 2.8					
11.0								
12.0								
13.0								
14.0								
15.0								
16.0								



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 687054.9 m, E 394007.3 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 02**

**Sheet:** 1 of 1

**Date:** May 26, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments	
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number		
0.0		ROOTMAT - 150 mm thick	29.7 0.0					
1.0		Loose brown silty sand with gravel (SM): REWORKED TILL - occasional rootlets - moist	29.2 0.5		BS	1		
2.0		Loose reddish brown clayey sand with gravel (SC): REWORKED TILL - occasional rootlets - moist			BS	2		Moisture Content = 13.9%
3.0		Very stiff reddish brown sandy lean CLAY with gravel (CL): TILL - occasional to some cobbles - some boulders (up to 1.5 m in diameter) below 1.6 m - moist	28.4 1.3		BS	3		Moisture Content = 14.4%
4.0					BS	4	Moisture Content = 15.8%	
5.0								
6.0								
7.0								
8.0								
9.0								
10.0		End of Test Pit at 2.9 m - INFERRED BEDROCK SURFACE - groundwater not observed	26.8 2.9					
11.0								
12.0								
13.0								
14.0								
15.0								
16.0								



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 686950.9 m, E 394041.3 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 03**

**Sheet:** 1 of 1

**Date:** May 26, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 150 mm thick	31.2 0.0				Moisture Content = 11.8%
1.0		Loose brown silty sand (SM) to silty sand with gravel (SM): REWORKED TILL - moist			BS	1	
2.0		Loose reddish brown silty sand with gravel (SM): REWORKED TILL - occasional cobbles - moist			BS	2	
3.0					BS	3	Moisture Content = 16.8%
4.0			29.9 1.3				
5.0		Very stiff reddish brown sandy lean CLAY with gravel (CL): TILL - occasional to some cobbles - moist					
6.0					BS	4	
7.0							
8.0							
9.0							
10.0							
11.0			27.8 3.4				
12.0		End of Test Pit at 3.4 m - INFERRED BEDROCK SURFACE - groundwater not observed					
13.0							
14.0							
15.0							
16.0							



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 686853.4 m, E 394094.7 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 04**

**Sheet:** 1 of 1

**Date:** May 26, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE						SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number		
0.0		ROOTMAT - 150 mm thick	29.7 0.0					
1.0		Loose silty sand with gravel (SM): REWORKED TILL - occasional rootlets - moist	29.2 0.5		BS	1		
2.0		Loose reddish brown clayey gravel with sand (GC): REWORKED TILL - some cobbles - moist	28.1 1.6		BS	2	Moisture Content = 13.1%	
3.0		Very stiff reddish brown sandy lean CLAY with gravel (CL): TILL - some cobbles and boulders (up to 0.9 m in diameter) - moist	27.0 2.7		BS	3	Moisture Content = 14.6%	
4.0		End of Test Pit at 2.7 m - INFERRED BEDROCK SURFACE - groundwater not observed						

## TEST PIT RECORD



**CE** A division of CBCL Limited

**Project Name:** Community Campus Site Servicing

**Location:** N 686744.1 m, E 394111.0 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 05**

**Sheet:** 1 of 1

**Date:** May 26, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 150 mm thick	26.5 0.0				
1.0		Loose brown silty sand with gravel (SM): REWORKED TILL - occasional rootlets - moist	26.0 0.5		BS	1	
2.0		Loose reddish brown clayey sand with gravel (SC): REWORKED TILL - occasional cobbles - moist	25.5 1.0		BS	2	
3.0		Very stiff reddish brown sandy lean CLAY with gravel (CL): TILL - some cobbles - occasional boulders (up to 0.9 m in diameter) below 2.0 m - moist	23.1 3.4		BS	3	Moisture Content = 15.2%
4.0		End of Test Pit at 3.4 m - INFERRED BEDROCK SURFACE - groundwater not observed			BS	4	Moisture Content = 16.5%



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 686646.9 m, E 394164.3 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 06**

**Sheet:** 1 of 1

**Date:** May 26, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 150 mm thick	21.7 0.0				
1.0		Loose brown silty sand with gravel (SM): REWORKED TILL - moist	21.4 0.3		BS	1	
2.0		Loose reddish brown clayey sand with gravel (SC): REWORKED TILL - occasional cobbles - moist			BS	2	Moisture Content = 12.8%
3.0			20.7 1.0				
4.0		Very stiff reddish brown sandy lean CLAY with gravel (CL) to compact reddish brown clayey SAND with gravel (SC): TILL - occasional to some cobbles - occasional boulders (up to 0.9 m in diameter) below 2.0 m - moist			BS	3	Moisture Content = 14.8%
5.0							
6.0							
7.0							
8.0							
9.0					BS	4	Moisture Content = 16.5%
10.0			18.5 3.2				
11.0		INFERRED SANDSTONE BEDROCK					
12.0		End of Test Pit at 3.3 m - groundwater not observed					
13.0							
14.0							
15.0							
16.0							



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 686535.2 m, E 394163.1 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 07**

**Sheet:** 1 of 1

**Date:** May 26, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 150 mm thick	19.2 0.0				
1.0		Loose brown silty sand with gravel (SM): REWORKED TILL - moist	18.9 0.3		BS	1	
2.0		Loose reddish brown clayey sand with gravel (SC): REWORKED TILL - moist	18.4 0.8		BS	2	
3.0		Very stiff reddish brown sandy lean CLAY with gravel (CL): TILL - occasional to some cobbles - moist to wet (at depth)			BS	3	Moisture Content = 14.4%
4.0							
5.0							
6.0							
7.0					BS	4	Moisture Content = 15.6%
8.0							
9.0			16.5 2.7				
10.0		End of Test Pit at 2.7 m - INFERRED BEDROCK SURFACE - groundwater not observed					
11.0							
12.0							
13.0							
14.0							
15.0							
16.0							



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 686424.2 m, E 394150.2 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 08**

**Sheet:** 1 of 1

**Date:** May 26, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 150 mm thick	20.5 0.0				
1.0		Loose brown silty sand with gravel (SM): REWORKED TILL - occasional rootlets - moist	20.2 0.3		BS	1	Moisture Content = 14.8%
2.0		Firm reddish brown sandy lean clay (CL): REWORKED TILL - occasional gravel - moist	19.8 0.7		BS	2	
3.0		Very stiff reddish brown sandy lean CLAY with gravel (CL): TILL - occasional to some cobbles - some boulders (up to 1.0 m in diameter) below 2.3 m - moist			BS	3	Moisture Content = 14.1%
4.0					BS	4	Moisture Content = 14.1%
5.0							
6.0							
7.0							
8.0							
9.0							
10.0					BS	5	
11.0							
12.0		End of Test Pit at 3.6 m - INFERRED BEDROCK SURFACE - groundwater not observed	16.9 3.6				
13.0							
14.0							
15.0							
16.0							



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 686320.2 m, E 394116.0 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 09**

**Sheet:** 1 of 1

**Date:** May 26, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 150 mm thick	23.7 0.0				
1.0		Loose brown silty sand (SM): REWORKED TILL - occasional rootlets and gravel - moist	23.4 0.3		BS	1	Moisture Content = 14.0%
2.0		Firm reddish brown sandy lean clay with gravel (CL) to loose reddish brown clayey sand with gravel (SC): REWORKED TILL - occasional cobbles - moist	22.7 1.0		BS	2	
3.0		Very stiff reddish brown sandy lean CLAY (CL): TILL - occasional to some gravel and cobbles - moist					Moisture Content = 16.0%
4.0		INFERRED SANDSTONE BEDROCK	21.6 2.1				
5.0							
6.0							
7.0							
8.0							
9.0							
10.0					BS	4	
11.0							
12.0			20.1 3.6				
13.0		End of Test Pit at 3.6 m - groundwater not observed					
14.0							
15.0							
16.0							



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 686221.2 m, E 394163.9 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 10**

**Sheet:** 1 of 1

**Date:** May 25, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 200 mm thick	20.0 0.0				
1.0		Loose brown silty sand with gravel (SM): REWORKED TILL - occasional rootlets - moist	19.8 0.2		BS	1	
3.0		Very stiff reddish brown sandy lean CLAY (CL) to sandy lean CLAY with gravel (CL): TILL - some cobbles below 1.6 m - moist	19.2 0.8		BS	2	Moisture Content = 13.2%
6.0					BS	3	Moisture Content = 15.2%
7.0		INFERRED SANDSTONE BEDROCK	18.0 2.0				
10.0					BS	4	
13.0		End of Test Pit at 3.9 m - groundwater not observed	16.1 3.9				

## TEST PIT RECORD



**CE** A division of CBCL Limited

**Project Name:** Community Campus Site Servicing

**Location:** N 686113.0 m, E 394183.3 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 11**

**Sheet:** 1 of 1

**Date:** May 25, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 200 mm thick	19.2 0.0				
1.0		Loose brown silty sand with gravel (SM): REWORKED TILL - occasional rootlets - moist	19.0 0.2		BS	1	Moisture Content = 18.2%
3.0		Very stiff reddish brown sandy lean CLAY (CL): TILL - some gravel - some cobbles below 1.7 m - moist	18.4 0.8		BS	2	Moisture Content = 17.4%
10.0					BS	3	Moisture Content = 17.1%
13.0		End of Test Pit at 4.0 m - INFERRED BEDROCK SURFACE - groundwater not observed	15.2 4.0				



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 686009.7 m, E 394221.2 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 12**

**Sheet:** 1 of 1

**Date:** May 25, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 150 mm thick	17.3 0.0				
1.0		Loose brown silty sand with gravel (SM): REWORKED TILL - occasional rootlets - moist	17.0 0.3		BS	1	
2.0		Very stiff reddish brown sandy lean CLAY (CL) to sandy lean CLAY with gravel (CL): TILL - occasional to some cobbles - some boulders (up to 0.6 m in diameter) below 2.0 m - moist					
3.0						BS	2
4.0							
5.0							
6.0							
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0		End of Test Pit at 4.2 m - INFERRED BEDROCK SURFACE - groundwater not observed	13.1 4.2				
15.0							
16.0							



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 685907.9 m, E 394179.6 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 13**

**Sheet:** 1 of 1

**Date:** May 25, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 200 mm thick	21.7 0.0				
1.0		Loose brown silty sand with gravel (SM): REWORKED TILL - occasional rootlets - moist	21.5 0.2		BS	1	
2.0		Very stiff reddish brown sandy lean CLAY (CL): TILL - occasional to some gravel and cobbles - moist to wet (at depth)	21.0 0.7				
3.0					BS	2	Moisture Content = 14.1%
4.0							
5.0							
6.0							
7.0							
8.0							
9.0							
10.0					BS	3	Moisture Content = 21.7%
11.0							
12.0		End of Test Pit at 3.6 m - INFERRED BEDROCK SURFACE - groundwater not observed	18.1 3.6				
13.0							
14.0							
15.0							
16.0							



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 685782.8 m, E 394216.4 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** 2.6 m

**TP - 14**

**Sheet:** 1 of 1

**Date:** May 25, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 150 mm thick	21.7 0.0				
1.0		Loose brown silty sand with gravel (SM): REWORKED TILL - occasional rootlets - moist			BS	1	
3.0		Firm reddish brown sandy lean clay (CL): REWORKED TILL - occasional gravel - moist	20.8 0.9		BS	2	Moisture Content = 16.5%
6.0		Very stiff reddish brown sandy lean CLAY with gravel (CL): TILL - occasional cobbles - moist to wet	20.1 1.6				
8.0				2.6	BS	3	Moisture Content = 15.2%
11.0		INFERRED SANDSTONE BEDROCK	18.4 3.3		BS	4	
12.0		End of Test Pit at 3.5 m - slight groundwater seepage observed at 2.6 m	18.2 3.5				



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 686267.6 m, E 394061.7 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 15**

**Sheet:** 1 of 1

**Date:** May 25, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 200 mm thick	26.9 0.0				
1.0	[Cross-hatch symbol]	Loose brown silty sand with gravel (SM): REWORKED TILL - occasional rootlets - moist	26.7 0.2		BS	1	
2.0	[Cross-hatch symbol]	Loose reddish brown clayey sand (SC): REWORKED TILL - occasional gravel - moist	26.2 0.7 26.0 0.9		BS	2	Moisture Content = 14.3%
3.0	[Diagonal lines symbol]	Very stiff reddish brown sandy lean CLAY with gravel (CL): TILL - some cobbles and boulders (up to 1.0 m in diameter) below 1.6 m - moist			BS	3	Moisture Content = 16.5%
4.0	[Diagonal lines symbol]				BS	4	Moisture Content = 16.3%
12.0		End of Test Pit at 3.7 m - INFERRED BEDROCK SURFACE - groundwater not observed	23.2 3.7				



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 686250.4 m, E 393966.0 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 16**

**Sheet:** 1 of 1

**Date:** May 26, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 150 mm thick	32.0 0.0				
1.0		Loose brown silty sand with gravel (SM): REWORKED TILL - occasional rootlets - moist			BS	1	
2.0			31.3 0.7				
3.0		Very stiff reddish brown sandy lean CLAY (CL): TILL - occasional to some gravel - some cobbles below 1.3 m - moist			BS	2	Moisture Content = 16.7%
4.0							
5.0							
6.0					BS	3	Moisture Content = 15.1%
7.0							
8.0		INFERRED SANDSTONE BEDROCK	29.7 2.3				
9.0							
10.0					BS	4	
11.0							
12.0		End of Test Pit at 3.6 m - groundwater not observed	28.4 3.6				
13.0							
14.0							
15.0							
16.0							



## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing  
**Location:** N 685854.6 m, E 394175.8 m  
**Project No.:** 222617.00  
**Client:** Town of Stratford  
**Water Level:** N/A

**TP - 17**  
**Sheet:** 1 of 1  
**Date:** May 25, 2022  
**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 200 mm thick	22.9 0.0				
1.0		Loose brown silty, clayey sand (SM): REWORKED TILL - occasional rootlets - occasional to some gravel - moist	22.7 0.2		BS	1	Moisture Content = 17.1%
2.0		Firm to stiff reddish brown sandy lean clay with gravel (CL) to loose to compact reddish brown clayey sand with gravel (SC): REWORKED TILL - moist	22.3 0.6		BS	2	Moisture Content = 13.1%
3.0		Very stiff reddish brown sandy lean CLAY (CL): TILL - occasional to some gravel and cobbles - moist	21.5 1.4				
4.0		End of Test Pit at 3.9 m - INFERRED BEDROCK SURFACE - groundwater not observed	19.0 3.9				



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 685852.8 m, E 394072.4 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 18**

**Sheet:** 1 of 1

**Date:** May 25, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 150 mm thick	28.4 0.0				Moisture Content = 15.5%
1.0		Loose brown clayey sand with gravel (SC): REWORKED TILL - occasional rootlets - moist			BS	1	
2.0		Very stiff reddish brown sandy lean CLAY with gravel (CL): TILL - occasional to some gravel and cobbles - moist	27.7 0.7				
3.0					BS	2	
4.0							
5.0							
6.0							
7.0							
8.0		INFERRED SANDSTONE BEDROCK	26.1 2.3				
9.0							
10.0							
11.0					BS	3	
12.0							
13.0							
14.0							
15.0		End of Test Pit at 4.5 m - groundwater not observed	23.9 4.5				
16.0							



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 685795.9 m, E 394083.5 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 19**

**Sheet:** 1 of 1

**Date:** May 25, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 150 mm thick	28.4 0.0				Moisture Content = 18.2%
1.0		Loose brown clayey sand (SC): REWORKED TILL - occasional rootlets and gravel - moist			BS	1	
3.0		Very stiff reddish brown sandy lean CLAY with gravel (CL): TILL - some cobbles - some boulders (up to 0.6 m in diameter) below 1.5 m - moist	27.5 0.9		BS	2	
2.0					BS	3	Moisture Content = 16.5%
10.0		INFERRED SANDSTONE BEDROCK	25.5 2.9				
3.0		End of Test Pit at 3.0 m - groundwater not observed					
4.0							



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 685811.4 m, E 394182.5 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 20**

**Sheet:** 1 of 1

**Date:** May 25, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 200 mm thick	23.1 0.0				
1.0		Loose brown silty sand with gravel (SM): REWORKED TILL - occasional rootlets - moist	22.9 0.2		BS	1	
3.0		Firm sandy lean clay with gravel (CL): REWORKED TILL - moist	22.2 0.9		BS	2	Moisture Content = 12.4%
5.0		Very stiff reddish brown sandy lean CLAY with gravel (CL): TILL - some cobbles and boulders (up to 0.9 m in diameter) below 2.4 m - moist	21.6 1.5		BS	3	Moisture Content = 16.1%
10.0							
11.0							
13.0		End of Test Pit at 4.0 m - INFERRED BEDROCK SURFACE - groundwater not observed	19.1 4.0				Moisture Content = 16.7%



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 686567.7 m, E 394321.6 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** 4.3 m

**TP - 21**

**Sheet:** 1 of 1

**Date:** May 25, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 120 mm thick	12.1 0.0				
1.0		Loose brown clayey sand with gravel (SC): REWORKED TILL - occasional rootlets - moist	11.7 0.4		BS	1	
2.0		Very stiff reddish brown sandy lean CLAY with gravel (CL) to compact reddish brown clayey SAND with gravel (SC): TILL - occasional to some cobbles - moist					
3.0							
4.0							
5.0					BS	2	Moisture Content = 16.2%
6.0							
7.0							
8.0							
9.0							
10.0							
11.0							
12.0					BS	3	Moisture Content = 15.2%
13.0							
14.0			7.8 4.3	▼ —			
15.0		End of Test Pit at 4.3 m - INFERRED BEDROCK SURFACE - slight groundwater seepage observed at 4.3 m					
16.0							



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 686426.0 m, E 394388.1 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** 3.3 m

**TP - 22**

**Sheet:** 1 of 1

**Date:** May 25, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments			
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number				
0.0		ROOTMAT - 300 mm thick	9.5 0.0							
1.0		Loose brown clayey sand (SC): REWORKED TILL - occasional roots - moist	9.2 0.3 9.0 0.5					BS	1	
2.0		Compact reddish brown clayey SAND with gravel (SC): TILL - some cobbles and boulders (up to 1.2 m in diameter) - moist to wet (below 1.8 m)								
3.0		BS						2	Moisture Content = 13.8%	
4.0										
5.0		End of Test Pit at 3.3 m - INFERRED BEDROCK SURFACE - slight groundwater seepage observed at 3.3 m								
6.0								BS	3	Moisture Content = 15.7%
7.0										
8.0		End of Test Pit at 3.3 m - INFERRED BEDROCK SURFACE - slight groundwater seepage observed at 3.3 m	6.2							
9.0			3.3							
10.0		End of Test Pit at 3.3 m - INFERRED BEDROCK SURFACE - slight groundwater seepage observed at 3.3 m								
11.0										
12.0		End of Test Pit at 3.3 m - INFERRED BEDROCK SURFACE - slight groundwater seepage observed at 3.3 m								
13.0										
14.0		End of Test Pit at 3.3 m - INFERRED BEDROCK SURFACE - slight groundwater seepage observed at 3.3 m								
15.0										
16.0		End of Test Pit at 3.3 m - INFERRED BEDROCK SURFACE - slight groundwater seepage observed at 3.3 m								
17.0										



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 686215.1 m, E 394357.2 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** 3.2 m

**TP - 23**

**Sheet:** 1 of 1

**Date:** May 25, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 200 mm thick	8.4 0.0				
1.0		Loose brown clayey sand (SC): REWORKED TILL - occasional rootlets - moist	8.2 0.2		BS	1	Moisture Content = 18.0%
2.0		Compact reddish brown clayey SAND with gravel (SC) to very stiff reddish brown sandy lean CLAY with gravel (CL): TILL - occasional to some cobbles - some boulders (up to 0.7 m in diameter) below 1.9 m - moist to wet (at depth)			BS	2	Moisture Content = 16.1%
3.0							
4.0							
5.0							
6.0							
7.0							
8.0							
9.0					BS	3	Moisture Content = 14.7%
10.0							
11.0			5.0 3.4				
12.0		End of Test Pit at 3.4 m - INFERRED BEDROCK SURFACE - moderate groundwater seepage observed at 3.2 m					
13.0							
14.0							
15.0							
16.0							



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 686184.9 m, E 394368.8 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** 3.3 m

**TP - 24**

**Sheet:** 1 of 1

**Date:** May 25, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments					
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number						
0.0		ROOTMAT / TOPSOIL - 400 mm thick	8.7 0.0		BS	1	Moisture Content = 14.9%					
1.0			Compact reddish brown clayey SAND with gravel (SC) to very stiff reddish brown sandy lean CLAY with gravel (CL): TILL - some cobbles and boulders (up to 0.8 m in diameter) below 2.0 m - moist to wet (at depth)			8.3 0.4		BS	2			
2.0						1.0			BS	3	Moisture Content = 15.7%	
3.0		End of Test Pit at 3.8 m - bedrock not encountered - slight to moderate groundwater seepage observed at 3.3 m	4.9 3.8	BS	3	Moisture Content = 15.7%						
4.0			3.0				BS	3	Moisture Content = 15.7%			
5.0										BS	3	Moisture Content = 15.7%
6.0												
7.0	BS	3	Moisture Content = 15.7%									
8.0				BS	3	Moisture Content = 15.7%						
9.0	BS	3	Moisture Content = 15.7%									
10.0				BS	3	Moisture Content = 15.7%						
11.0	BS	3	Moisture Content = 15.7%									
12.0				BS	3	Moisture Content = 15.7%						
13.0	BS	3	Moisture Content = 15.7%									
14.0				BS	3	Moisture Content = 15.7%						
15.0	BS	3	Moisture Content = 15.7%									
16.0				BS	3	Moisture Content = 15.7%						



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## TEST PIT RECORD

**Project Name:** Community Campus Site Servicing

**Location:** N 686038.1 m, E 394294.7 m

**Project No.:** 222617.00

**Client:** Town of Stratford

**Water Level:** N/A

**TP - 25**

**Sheet:** 1 of 1

**Date:** May 25, 2022

**Datum:** Geodetic

SUBSURFACE PROFILE					SAMPLE		Comments
Depth	Symbol	Soil and/or Rock Description	Elevation / Depth (m)	Water Level (m)	Type	Number	
0.0		ROOTMAT - 300 mm thick	13.3 0.0				
1.0		Loose brown silty sand with gravel (SM): REWORKED TILL - occasional rootlets and gravel - moist	13.0 0.3		BS	1	Moisture Content = 25.2%
3.0		Very stiff reddish brown sandy lean CLAY with gravel (CL) to compact reddish brown clayey SAND with gravel (SC): TILL - occasional to some cobbles - some boulders (up to 0.6 m in diameter) below 2.5 m - moist	12.5 0.8		BS	2	Moisture Content = 14.5%
10.0							
12.0					BS	3	Moisture Content = 14.7%
15.0			8.6 4.7				
16.0		End of Test Pit at 4.7 m - INFERRED BEDROCK SURFACE - groundwater not observed					

# APPENDIX D

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## Geotechnical Guidelines for Winter Construction

**Geotechnical and Materials Engineers**

The following are general geotechnical recommendations for earthworks for building areas in winter conditions.

**General**

- Earthworks conducted during freezing conditions are suspect. Special procedures and precautions must be exercised to minimize the risk of future problems.
- A site meeting should be held at project start-up to discuss the schedules of the various contractors in relation to the following geotechnical recommendations.

**Excavation**

- The rootmat/topsoil layer and any overlying snow will reduce the frost penetration. Conducting only the excavation work required for each day of work is recommended to minimize freezing of the soil in the foundation areas.
- Excavated material to be used as structural fill should not be stockpiled, but should be placed and compacted immediately after excavation.

**Fill Placement**

Based on our experience, it is generally impractical to place well-graded gravel, sand, or fine-grained soils in temperatures lower than about -5 degrees Celsius. On very cold days, loose material starts to freeze within about 15 minutes. At temperatures below -5 degrees Celsius, clear gravel or clear rockfill is recommended but subject to design considerations governing the work.

The following provides recommendations for all structural fill types.

- Structural fill placement should be conducted in small areas. Depending on the temperature, this may allow for continuous placement of fill lifts during the work day without the requirement for excavation of frozen material prior to placement of the next lift.
- Material containing snow or ice should not be incorporated in the work. During snow events, fill placement should be stopped. When the earthwork restart, all snow and ice should be removed from the fill surface prior to subsequent fill placement. In order to remove all snow and/or ice after a snow event, some of the underlying fill may have to be removed and wasted.
- For intermediate fill lifts, frost protection (e.g.; straw, insulated tarp, etc) should be provided at the end of the work day, or alternatively, fill that freezes overnight should be removed in the morning. Also, any snow or ice should also be removed. Fill surfaces should be sloped to prevent ponding of water during milder weather.

- The final fill surface, the base of footing excavations and slab subgrade should be protected from freezing. If the final fill surface is exposed to freezing temperatures, heat will be required to thaw the soil. Test pits and temperature readings could be completed to determine if the soil is above freezing. Consideration should also be given to the installation of thermocouples in the fill during placement, as a means of reading temperatures at depth. The areas that were frozen should be proof-rolled.
- The moisture content of fill materials should be approximately 2% below optimum. Fill materials with moisture contents above the optimum should not be used.
- Loose edges of the structural fill lifts should be avoided to reduce frost penetration. Edges of fill lifts should be tapered and compacted.
- Regular checks of the temperature of the fill should be made. The soil temperature should be greater than +2°C to allow for compaction to the specified degree.

### **Footing Construction**

- Footings should not be placed on frozen material.
- Where the footing elevation is within approved finer-grained materials, we recommend over-excavation by at least 6 inches and placement of nominal 1 inch stone or other clean gravel. This will reduce disturbance of the bearing surface.
- Following construction of footings, temporary frost protection must be provided to avoid freezing of the bearing surface and for protection of the concrete during curing.
- Consideration should be given to specifying that the footing depth for interior foundations be 1.2 m below slab subgrade for frost protection during construction; or alternatively, fill could be temporary bermed over interior footings to provide insulation.
- Foundations should be backfilled with a free-draining granular material and drainage provided to prevent adfreeze of foundations, particularly during construction.
- Cast-in-place concrete should be protected during colder weather conditions as per CSA A23.1-2009.

### **Geotechnical Inspection and Testing**

The information herein should be reviewed by geotechnical personnel and customized to the specific geotechnical aspects and design considerations of a site. Full-time inspection and testing by experience geotechnical personnel is particularly important during earthworks in winter conditions and is strongly recommended.



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