

August 29, 2019

Mr. Chris Boudreau, P. Eng.
Strum Consulting Ltd.
Via email

Dear Mr. Boudreau,

Re: Geotechnical Investigation – Proposed Road (Revised Alignment)
Mount Uniacke Business Park, Mount Uniacke, NS

This provides the findings of our geotechnical investigation for the proposed road (revised alignment) in the Mount Uniacke Business Park on James Boyle Drive in Mount Uniacke, NS. Bedrock was encountered at shallow depths between 0.2 m to 2.1 m from existing grades in the recent test pits (TP101 to TP107). Blasting or hydraulic breaking may be needed depending on design grades. Recommendations are provided herein for road design and earthworks for the proposed development.

MAIN FINDINGS

The subsurface conditions encountered include rootmat and topsoil overlying native soil and/or bedrock. Native soil was encountered in all test pits at depths of 0.1 m to 0.6 m. Bedrock was encountered in all test pits at depths of 0.2 m to 2.1 m. Groundwater was encountered in four test pits (TP103 to TP105 and TP107) during recent test pit excavation.

Based on our investigation, our recommendations are as follows:

- The subsurface conditions are generally favourable, but bedrock is very shallow and bedrock excavation will be necessary if there are any cuts to achieve design subgrade elevations. Bedrock excavation is typically a more costly item. The bedrock on the site is slate of the Halifax Formation, which many times is found to be a sulphide bearing materials, which is a regulated material under the NS Environment Act. The results from the previous test pits show that the bedrock is not a sulphide bearing material (the results from the recent bedrock testing is still pending). However, additional sulphide sulphur testing should be conducted if there are deeper cuts (say more than about 0.5 m into bedrock). If the bedrock in deeper cuts (if any) is not a sulphide bearing materials, then excavated slate material could be considered for reuse as subgrade fill. Some sorting or processing of the material may be necessary to allow for reuse.
- Geotechnical inspection and testing will be necessary during earthworks.

FIELD INVESTIGATION

The field program consisted of seven test pits (TP101 to TP107) and seven hand probes (P1 to P7) completed on August 20, 2019. The test pit locations are shown in Figure A and on the appended Drawing 1.

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 soil conditions encountered at the site are summarized in the following paragraph and Table A.

The subsurface conditions encountered include rootmat and topsoil overlying native soil and/or bedrock. Native soil was encountered in all test pits at depths of 0.1 m to 0.6 m. Bedrock was encountered in all test pits at depths of 0.2 m to 2.1 m. Groundwater was encountered in four test pits (TP103 to TP105 and TP107) during testing pit excavation.

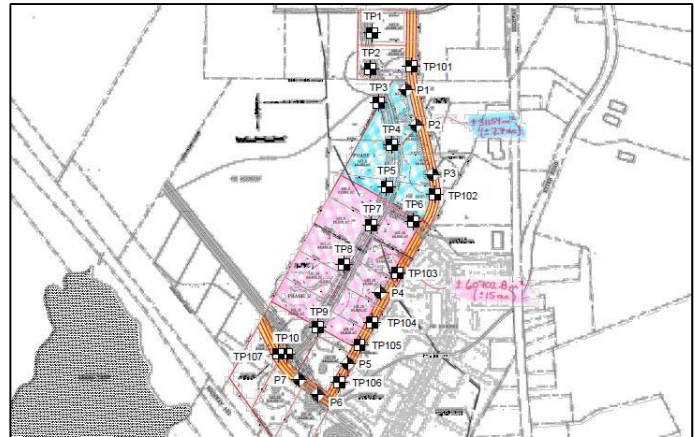


Figure A: Test Pit and Probe Locations

Grain size testing is being conducted on one sample of the glacial till from the recent investigation (TP1 to TP10). The results are pending.

Three (3) bedrock samples were collected and submitted to Dalhousie Minerals Engineering Centre for sulphide sulphur testing during the previous investigation. The results show non-detectable sulphide sulphur in all four samples. The results are shown in the appended report. Samples were also taken during the recent investigation, but the results are pending.

Table A: Summary of Test Pit Findings

Location	Elevation ¹ , m	Thickness of Rootmat/Topsoil, m	Depth to Native Soil, m	Depth to Bedrock, m	Depth of Test Pit, m
Current Investigation					
TP101	159.5	0.1	0.1	0.2	0.2
TP102	150.7	0.5	0.5	1.2	1.4
TP103	148.2	0.3	0.3	2.1	2.4
TP104	144.3	0.2	0.2	1.2	1.7
TP105	141.2	0.6	0.6	1.2	1.7
TP106	136.8	0.5	0.5	1.2	1.4
TP107	135.6	0.2	0.2	1.8	1.9
Previous Investigation					
TP1	161.3	0.3	--	0.3	0.3
TP2	159.4	0.3	--	0.3	0.3
TP3	157.7	0.1	--	0.1	0.1
TP4	157.7	0.2	--	0.2	0.2
TP5	156.6	0.6	0.6	1.2	1.5
TP6	152.4	0.0	--	0.0	0.0
TP7	153.6	0.0	--	0.0	0.0
TP8	148.7	0.4	0.4	0.6	0.7
TP9	143.1	0.6	0.6	1.1	1.1
TP10	137.5	0.3	0.3	0.4	0.4

1. Geodetic Datum

Table B: Summary of Hand Probe Findings

Location	Elevation, m	Thickness of Rootmat/Organic Soils, m	Depth to Refusal, m
P1	156.5	0.4	0.4
P2	154.3	0.3	0.3
P3	152.5	0.4	0.4
P4	147.0	0.6	0.6
P5	140.2	0.6	0.6
P6	137.1	1.0	1.0
P7	135.2	0.8	0.8

Note: Elevations based on Geodetic Datum

DISCUSSION AND RECOMMENDATION

It is understood that a new road is proposed for the site. The site conditions are generally good with rootmat/topsoil and/or native soil overlying bedrock. Bedrock outcrops and surface boulders were frequently encountered throughout the site.

Earthworks

Earthworks for this project will involve excavations of rootmat and topsoil to native soil and/or bedrock, and cuts and fills depending on design grades.

Surface Water Control and Erosion Control

Prior to excavations, surface water drainage controls should be provided on the up-gradient (north) 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.

Excavation

Excavation into the site soils will be practical with conventional earth-moving equipment. Bedrock removal may require blasting or rock breaking, depending on design grades. Some ripping of the bedrock surface may be possible with a large dozer but this may be limited.

Temporary excavation side slopes in soil should be stable at one horizontal to one vertical (1H:1V). Bedrock slopes can be cut 1H:4V, pending review at the time of construction.

Dewatering of Excavations

With proper surface water controls, dewatering of excavations through the use of ditches and swales draining to sumps would be practical.

Fill Placement and Compaction

Fill required for road subgrade should consist of the following:

- selected excavation site soil or bedrock with a maximum particle size of 200 mm, or
- imported, quarried gravel or well-graded rockfill with a maximum particle size of 200 mm.

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 200 mm for backfilling of foundations and services.

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

- | | |
|---|------|
| • Base and subbase gravels | 100% |
| • Fill within 300 mm of driveway/parking subgrade | 98% |
| • Fill below 300 mm of driveway/parking subgrade | 95% |
| • Landscaped areas | 93% |

Slopes and Toe Drainage

Permanent fill slopes should be 2H:1V, or lower. Permanent cut slopes should be stable at 2H: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 or a 3H:1V slope. A toe drain or swale should be provided for drainage at the base of cut slopes.

Inspection and Testing

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

Road Structure

The road areas should be cut to subgrade elevation and proof-rolled. Any soft or wet material should be replaced with approved, granular material. The slate bedrock may actually breakdown into a finer material if there is repeated construction trucking directly on the material. This should be avoided or the contractor should replace such material with approved granular fill.

The following pavement structure from the Specifications for Subdivision Road would be acceptable. The use of a geotextile should be considered depending on design elevations and the time of year of construction.

Material	Thicknesses
Asphalt, Mix Type C-HF Mix Type B-HF	40 mm 100 mm
Type 1 Gravel Type 2 Gravel	150 mm 450 mm

All aggregate should meet the NSTIR Standard Specifications. The gravels should be compacted to 100% of Standard Proctor maximum dry density.

If there are any unpaved yard areas, a geotextile (such as Terratrack 400) could be added at subgrade level for strength and separation.

Please contact us if you have any questions.

Regards,



Amanda Hickey, CET
Geotechnical Technologist
ahickey@MacNeilEng.com



R. Bruce MacNeil, P.Eng.
Senior Geotechnical Engineer
bmacneil@MacNeilEng.com

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>Frequent</i>	Greater than 20%

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 (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>	

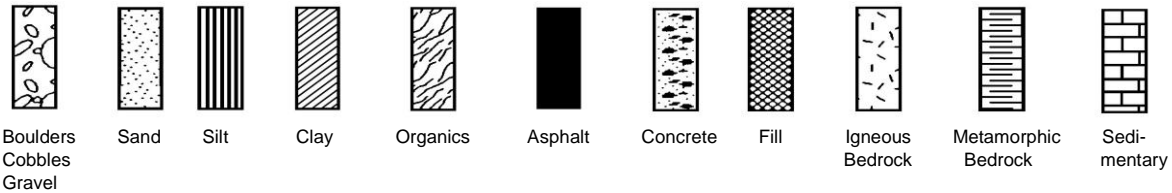
Strength Classification	Uniaxial Compressive Strength (MPa)
<i>Very Weak</i>	1 – 5
<i>Weak</i>	5 – 25
<i>Medium Strong</i>	25 – 50
<i>Strong</i>	50 – 100
<i>Very Strong</i>	100 – 250
<i>Extremely Strong</i>	> 250

Terminology describing weathering:

<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

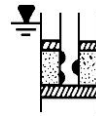
Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:



WATER LEVEL MEASUREMENT



Borehole or
Standpipe



Piezometer

SAMPLE TYPE AND/OR FIELD TESTS

SS	Split Spoon Sample (obtained by performing the Standard Penetration Test)	AS	Auger Sample
		BS	Bulk Sample
		WS	Wash Sample
ST	Shelby Tube or Thin Wall Tube	HQ, NQ, BQ, etc.	Rock Core Samples (obtained with the use of standard size diamond drilling bits)
PS	Piston sample		
DC	Dynamic Cone Penetration		
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 _s	Specific gravity of soil particles	□	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; using casing	UU	Unconsolidated undrained triaxial
↓	Falling head permeability test using well point or piezometer	DS	Direct shear
		Q _u	Unconfined compression
		I _p	Point Load Index (I _p on Borehole Records equals I _p (50); the index corrected to a reference diameter of 50 mm)
		MSV	Laboratory Miniature Shear Vane

TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS




Water Level Date: --

Test Pit: 101

Sheet: 1 of 1

Date Drilled: August 20, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	159.5				
		ROOTMAT/TOPSOIL	159.4				
		TILL: Compact light brown silty sand with gravel	159.3				
		End of Test Pit at 0.2 m - REFUSAL ON BEDROCK - no groundwater encountered					
1							
2							
3							
4							
5							

TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS

Water Level Date: --

Test Pit: 102

Sheet: 1 of 1

Date Drilled: August 20, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	150.7				
		ROOTMAT/TOPSOIL					
			150.2				
		TILL: Compact brownish grey silty sand with gravel					
1			149.5				
		WEATHERED BEDROCK	149.3				
		End of Test Pit at 1.4 m - REFUSAL ON BEDROCK - no groundwater encountered					
2							
3							
4							
5							

TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS






Water Level Date: August 20, 2019

Test Pit: 103

Sheet: 1 of 1

Date Drilled: August 20, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	148.2				
		ROOTMAT/TOPSOIL	147.9				
		TILL: Compact greyish brown silty sand with gravel - some cobbles					
1							
2		WEATHERED BEDROCK	146.1				
		End of Test Pit at 2.4 m - REFUSAL ON BEDROCK - slight to moderate seepage at 2.2 m	145.8				
3							
4							
5							

TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS






Water Level Date: August 20, 2019

Test Pit: 104

Sheet: 1 of 1

Date Drilled: August 20, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	144.3				
		ROOTMAT/TOPSOIL	144.1				
		TILL: Compact light grey to greyish brown silty sand with gravel - some cobbles					
1			143.1				
		WEATHERED BEDROCK					
			142.6				
2		End of Test Pit at 1.7 m - REFUSAL ON BEDROCK - slight seepage at 0.5 m					
3							
4							
5							

TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS


Water Level Date: August 20, 2019

Test Pit: 105

Sheet: 1 of 1

Date Drilled: August 20, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	141.2				
		ROOTMAT/TOPSOIL					
			140.6				
1		TILL: Compact dark grey to brownish grey silty sand with gravel - some cobbles	140.0				
		WEATHERED BEDROCK	139.5				
2		End of Test Pit at 1.7 m - REFUSAL ON BEDROCK - slight seepage at 1.2 m					
3							
4							
5							

TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS

Water Level Date: --

Test Pit: 106

Sheet: 1 of 1

Date Drilled: August 20, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	136.8				
		ROOTMAT/TOPSOIL					
			136.3				
		TILL: Compact brownish grey silty sand with gravel					
1			135.6				
		WEATHERED BEDROCK	135.4				
		End of Test Pit at 1.4 m - REFUSAL ON BEDROCK - no groundwater encountered					
2							
3							
4							
5							

TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS

Water Level Date: August 20, 2019

Test Pit: 107

Sheet: 1 of 1

Date Drilled: August 20, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	135.6				
		ROOTMAT/TOPSOIL	135.4				
		TILL: Compact brownish grey silty sand with gravel - frequent cobbles and boulders (up to 0.9 m in diameter)					
1							
			133.8				
		WEATHERED BEDROCK	133.7				
2		End of Test Pit at 1.9 m - REFUSAL ON BEDROCK - heavy seepage at 0.6 m					
3							
4							
5							



TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS

Water Level Date: --

Test Pit: 1

Sheet: 1 of 1

Date Drilled: May 30, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	161.3				
		ROOTMAT/TOPSOIL					
			161.0				
		End of Test Pit at 0.3 m - REFUSAL ON BEDROCK - no groundwater encountered					
1							
2							
3							
4							
5							

TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS





Water Level Date: --

Test Pit: 2

Sheet: 1 of 1

Date Drilled: May 30, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0	   	Ground Surface	159.4		RS	1	
		ROOTMAT/TOPSOIL					
			159.1				
		End of Test Pit at 0.3 m - REFUSAL ON BEDROCK - no groundwater encountered					
1							
2							
3							
4							
5							

TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS



Water Level Date: --

Test Pit: 3

Sheet: 1 of 1

Date Drilled: May 30, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	157.7				
		ROOTMAT	157.6				
		End of Test Pit at 0.1 m - REFUSAL ON BEDROCK - no groundwater encountered					
1							
2							
3							
4							
5							

TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS

Water Level Date: --

Test Pit: 4

Sheet: 1 of 1

Date Drilled: May 30, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	157.7				
		ROOTMAT/TOPSOIL	157.5				
		End of Test Pit at 0.2 m - REFUSAL ON BEDROCK - no groundwater encountered					
1							
2							
3							
4							
5							

TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS

Water Level Date: --

Test Pit: 5

Sheet: 1 of 1

Date Drilled: May 30, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	156.6				
		ROOTMAT/TOPSOIL					
			156.0				
1		TILL: Compact to dense light brown to brown silty sand with gravel - occasional cobble	155.4				
		WEATHERED BEDROCK	155.1				
		End of Test Pit at 1.5 m - REFUSAL ON BEDROCK - no groundwater encountered			RS	1	
2							
3							
4							
5							



TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS

Water Level Date: --

Test Pit: 6

Sheet: 1 of 1

Date Drilled: May 30, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	152.4				
		BEDROCK OUTCROP					
		End of Test Pit at 0.0 m - REFUSAL ON BEDROCK					
		- no groundwater encountered					
1							
2							
3							
4							
5							

TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS

Water Level Date: --

Test Pit: 7

Sheet: 1 of 1

Date Drilled: May 30, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	153.6				
		BEDROCK OUTCROP					
		End of Test Pit at 0.0 m - REFUSAL ON BEDROCK					
		- no groundwater encountered					
1							
2							
3							
4							
5							

TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS

Water Level Date: --

Test Pit: 8

Sheet: 1 of 1

Date Drilled: May 30, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	148.7				
		ROOTMAT/TOPSOIL					
			148.3				
		TILL: Compact to dense light brown to brown silty sand with gravel - occasional cobble	148.1				
		WEATHERED BEDROCK	148.0				
		End of Test Pit at 0.7 m - REFUSAL ON BEDROCK - no groundwater encountered					
1							
2							
3							
4							
5							

TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS

Water Level Date: --

Test Pit: 9

Sheet: 1 of 1

Date Drilled: May 30, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	143.1				
		ROOTMAT/TOPSOIL					
			142.5				
		TILL: Compact grey silty sand with gravel					
1			142.0		GS	1	
		End of Test Pit at 1.1 m - REFUSAL ON BEDROCK - no groundwater encountered					
2							
3							
4							
5							

TEST PIT RECORD

Project Name: Mount Uniacke Business Park

Project No.: 093-008

Client: Strum Consulting

Location: Mount Uniacke, NS


Water Level Date: --

Test Pit: 10

Sheet: 1 of 1

Date Drilled: May 30, 2019

Datum: Geodetic

SUBSURFACE PROFILE				SAMPLE			Comments
Depth (m)	Symbols	SOIL AND/OR ROCK DESCRIPTION	Elevation (m)	Water Level (m)	Type	Number	
0		Ground Surface	137.5		RS	1	
		ROOTMAT/TOPSOIL					
			137.2				
			137.1				
		TILL: Compact greyish brown to brown silty sand with gravel					
		End of Test Pit at 0.4 m - REFUSAL ON BEDROCK - no groundwater encountered					
1							
2							
3							
4							
5							



Photograph 1: Test pit 101. August 20, 2019.



Photograph 2: Test pit 102. August 20, 2019.



Photograph 3: Test pit 103. August 20, 2019.



Photograph 4: Test pit 104. August 20, 2019.



Photograph 5: Test pit 105. August 20, 2019.



Photograph 6: Test pit 106. August 20, 2019.



Photograph 7: Test pit 107. August 20, 2019.



Photograph 8: Hand probe 2 area. August 20, 2019.



Photograph 9: A view of the site looking east. May 30, 2019.



Photograph 10: A view of the site looking south. May 30, 2019.



Photograph 11: A view of the site looking south/southeast. May 30, 2019.



Photograph 12: A view of the site looking west. May 30, 2019.



Photograph 13: Excavating test pit 1. May 30, 2019.



Photograph 14: Test pit 1. May 30, 2019.



Photograph 15: Test pit 2. May 30, 2019.



Photograph 16: Test pit 3. May 30, 2019.



Photograph 17: Test pit 4. May 30, 2019.



Photograph 18: Test pit 5. May 30, 2019.



Photograph 19: Test pit 8. May 30, 2019.



Photograph 20: Test pit 9. May 30, 2019.



Photograph 21: Test pit 10. May 30, 2019.

06-Jun-19

BME - Bruce MacNeil Engineering
61 Bluewater Road
Bedford, NS
B4B 1G8
Atten: Michael Sanford

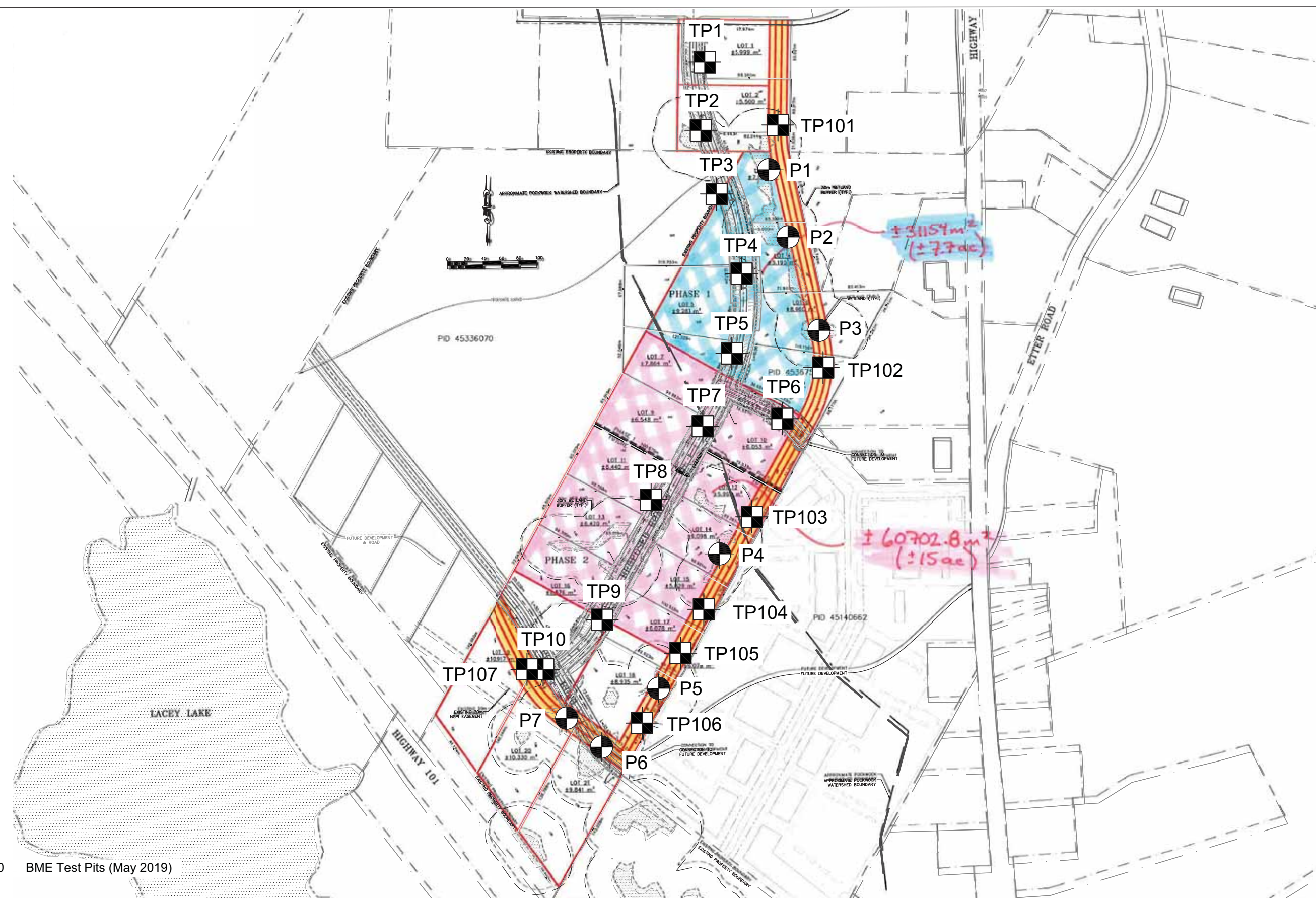
RUSH

Re: Results of analysis on submitted samples.
PN#




Sample	Wt. %		kg/t
	S(Total)	S(Sulphide)	Acid Prod. Potential
BME Engineering - TP2	<0.001	NR	<0.03
BME Engineering - TP5	<0.001	NR	<0.03
BME Engineering - TP8	<0.001	NR	<0.03

Refer. Sample	Wt. % S (Total)
KZK-1 (0.80% S)	0.800

Daniel Chevalier, MASc
Manager, Minerals Engineering Centre



LEGEND:

-  TP1 - TP10 BME Test Pits (May 2019)
-  TP101 - TP107 BME Test Pits (August 2019)
-  P1 - P7 BME Hand Probes (August 2019)

BME Engineering Ltd.
61 Bluewater Road
Bedford, NS
B4B 1G8

Mount Uniacke Business Park
Test Pit & Hand Probe Locations
James Boyle Drive
Mount Uniacke, NS

JOB #:	093-008	DOCUMENTS PREPARED BY BRUCE MACNEIL ENGINEERING LTD. ARE TO BE USED ONLY FOR THE SPECIFIC PROJECT AND SPECIFIC USE FOR WHICH THEY WERE PREPARED. ANY EXTENSION OF USE TO OTHER PROJECTS, BY OWNER, OR ANY OTHER PARTY, WITHOUT THE EXPRESSED, WRITTEN AUTHORIZATION OF BRUCE MACNEIL ENGINEERING LTD. IS DONE AT THE USER'S OWN RISK. IF USED IN A WAY OTHER THAN WHAT WAS SPECIFICALLY INTENDED, THE OWNER WILL HOLD BRUCE MACNEIL ENGINEERING LTD. HARMLESS FROM ALL CLAIMS AND LOSSES.	1
SCALE:	NTS		
DATE:	21-AUG-19		
DRAWN BY:	AH		
CHECKED BY:	RBM		
		REV:	0