

November 5, 2018

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Subject: Pre-Design Geotechnical Investigation – Revision 1
Geotechnical Investigation – Proposed New Roadway
Elmsdale Business Park, Elmsdale, NS
Our ref.: B-0020021-1

Mr. Andrew S. Forsythe:

Englobe Corp., at your request, has undertaken a geotechnical investigation for a new roadway proposed for construction in the Elmsdale Business Park Subdivision in Elmsdale, NS. The purpose of the investigation was to assess the subsurface conditions and make recommendations related to geological and hydrological aspects of the project as it relates to the roadway construction.

The proposed development consists of a new approximately 600 metre road constructed off Park Road. The roadway will be serviced with water mains, sanitary sewer and open ditches for storm water. A site plan showing the proposed development area is provided in Figure 1.

Topics discussed in the current report include the following as it relates to subdivision construction:

- slope stability,
- identification of poor subgrade materials,
- proposed methodologies to mitigate the effects of unsuitable conditions,
- preliminary hydrologic analysis including identification of groundwater levels at test pit locations and the effects of elevated and fluctuating water levels and,
- roadway cross section

DESCRIPTION OF THE EXISTING ENVIRONMENT

Site Location

The proposed development is located within the Elmsdale Business Park in Elmsdale, Nova Scotia. Existing commercial development lies to the east and south of the proposed development, while wooded areas lie to the north and to the west. Access to the proposed development area is provided by the existing Park Road.

Topography and Drainage

Existing topography along the proposed route can be characterized as gently sloping downward from west to east. Currently runoff from light precipitation is controlled by infiltration into the subsurface. Preliminary design drawings of the development indicate that surface runoff from heavier precipitation events will be collected by open ditches along the roadway.

Geology

Available surficial geological mapping of the Elmsdale area indicates that the site is underlain by glacial till deposits known as hummocky ground moraine. Typically, the till is a mix of gravel, sand, silt and clay.

Geological mapping of the area indicates bedrock underlying the proposed development site is part of the Windsor Group, consisting of anhydrite, salt, marine dolostone and limestone.

Subsurface Investigation

The information presented in the previous sections is based largely on available documentation for the Elmsdale area. To confirm the reported site and subsurface conditions, a subsurface investigation has been undertaken.

The subsurface investigation of the site consisted of a series of eight (8) test pits excavated along the route of the proposed roadway on September 7, 2018. Conditions encountered at the test pit locations generally consisted of rootmat/topsoil/organic soils overlying sand deposits and/or glacial till. The surface rootmat/organic soils layer at the test pit locations was generally 0.5 metres to 0.9 metres in thickness. Sand deposits were encountered at test pits TP 1, TP 2, and TP 6 and were proven to a depth ranging from 1.2 metres to 2.4 metres. Sand deposits consisted of sand, some silt and trace gravel. The sand deposits were lightly compact to compact, moist to saturated and light brown in colour. Glacial till deposits were encountered at all test pits either below the surface organic soils or below the sand. The till was proven to total depths ranging from 1.8 to 3.2 metres. Glacial till encountered in the test pits can be described as silty sand, some gravel, trace to some clay with occasional cobbles and boulders. The till deposits were compact, moist to wet and brown to dark brown in colour. Bedrock was not encountered during the investigation. Minor groundwater seepage was encountered in test pit TP 6 at a depth of 2.2 metres.

Laboratory gradation testing was completed on a select sand deposit sample (TP6-2) and a select till deposit sample (TP5-2). The test results for sample TP6-2 showed a gravel percentage of 0 percent, a sand percentage of 74 percent and a fines content (i.e. silt and clay sizes) of 26 percent. The test results for sample TP5-2 showed a gravel percentage of 11 percent, a sand percentage of 34 percent and a fines content (i.e. silt and clay sizes) of 55 percent. Moisture content testing was conducted on eight (8) soil samples obtained from the test pits with moisture contents ranging from 10.2 percent to 25.9 percent. The following table summarizes the laboratory test results.

Table 2: Summary of Laboratory Data

SAMPLE #	GRAVEL %	SAND %	FINES %	MOISTURE CONTENT %
TP2-1	--	--	--	19.2
TP2-2	--	--	--	12.2
TP2-3	--	--	--	10.2
TP5-1	--	--	--	14.6
TP5-2	11	34	55	12.8
TP5-3	--	--	--	11.2
TP6-1	--	--	--	15.7
TP6-2	0	74	26	25.9

DISCUSSION and RECOMMENDATIONS

Development Limitations

At the current stage, preliminary design of the proposed roadway has been completed. The impact of the project on the observed environment(s) can therefore be characterised in accordance with the available conceptual and preliminary design information. In the following sections these limitations are discussed and design recommendations are presented.

Slopes

Natural slopes which are presently vegetated with mature tree growth, if not disturbed, will minimize environmental impact. Difficulty will arise, however, when vegetation and soil cover are removed and erosion and subsequent runoff of silt-laden water occurs.

Slopes in excess of 33 percent (i.e. 3:1 horizontal to vertical) gradient are typically very difficult to revegetate. Site soils are moderately erodible and can become unstable at slopes steeper than 33 percent in which vegetation has been removed or excavation of the toe or slope has occurred. All slopes, which are disturbed or exposed during construction, will have to be re-vegetated or protected using gravel, rip-rap, sodding, seeding or other slope protection measures. Excavated slopes should be limited to 33 percent maximum grade during design and construction phases of the development. The exception to this would be shallow cut slopes/ embankments less than 2.5 metres in height where a steeper slope up to 40 percent inclination (i.e. 2.5:1 horizontal to vertical) can be realized.

Groundwater

Groundwater may pose limitations on development over select areas of the proposed site. During the investigation, groundwater was encountered in test pit TP 6. At the construction stage, efforts to stabilize slopes during and following construction may include controlling groundwater at exposed slopes (e.g. ditching, slope drains, etc.).

Surface Water

An erosion and sediment control plan should be established to protect against silt-laden site runoff leaving the site. To mitigate impacts an erosion and sediment control plan should be designed and constructed in accordance with accepted environmental codes-of-practice.

Construction Recommendations

Roads

The construction of the roadway will involve conventional site preparation and earthworks construction practices. Care in site preparation will be required and should include installation of all environmental control measures necessary for the project.

It is important that this work be limited to the Line of Disturbance (i.e. right-of-way) defined for the project. In general, maintaining tree cover and vegetation on designated undisturbed areas is essential and will minimize the potential for soil loss through erosion.

To prepare the subgrade for the roadway, all unsuitable fill materials, rootmat/organic soils and loose, wet soil should be sub-excavated down to sand deposits or native glacial till.

Following removal of all unsuitable material, the exposed soil should be proof roll tested with a fully loaded tandem truck and any soft/weak soils identified should be removed and replaced with approved structural fill. To reach design subgrade elevations, approved site or imported structural fill should be placed in lifts and compacted.

Imported structural fill should consist of an approved glacial till, well-graded sand and gravel or rockfill with a maximum particle size of 200 mm diameter. The fill is to be free of organics, debris, and slate. The material should be placed in lifts not exceeding 300 mm in thickness compacted to 95 percent of the material's standard Proctor maximum dry density (SPMDD) or equivalent for rockfill and 98 percent of the material's SPMDD for the top 300 mm of subgrade. Water and loose/soft soils should be removed from excavations, and bearing stratum approved prior to fill placement.

Based on the subsurface conditions encountered in the test pits, we recommend the following roadway cross sections for the proposed development. The following gravel and asphalt thicknesses assume a silt/clay subgrade above optimum moisture content as encountered during the investigation.

Rural Industrial

50 mm, Asphaltic Concrete Type C-HF
50 mm, Asphaltic Concrete Type B-HF
150 mm, NSTIR Type 1 Gravel
350 mm, NSTIR Type 2 Gravel
400 mm, 150 mm Minus Well-Graded Rockfill

Minor Collector

50 mm, Asphaltic Concrete Type C-HF
75 mm, Asphaltic Concrete Type B-HF
150 mm, NSTIR Type 1 Gravel
400 mm, NSTIR Type 2 Gravel
500 mm, 150 mm Minus Well-Graded Rockfill

If the subgrade is constructed and allowed to naturally drain and stiffen for a period of time, a reduction in gravel thickness may be warranted. Condition of the subgrade should be evaluated during construction by the project geotechnical engineer to determine the appropriate option. For design purposes, we provide the following sections assuming that prepared subgrade is allowed to naturally drain and stiffen for a period of time prior to gravel placement.

Rural Industrial

50 mm, Asphaltic Concrete Type C-HF
50 mm, Asphaltic Concrete Type B-HF
150 mm, NSTIR Type 1 Gravel
600 mm, NSTIR Type 2 Gravel

Minor Collector

50 mm, Asphaltic Concrete Type C-HF
75 mm, Asphaltic Concrete Type B-HF
150 mm, NSTIR Type 1 Gravel
600 mm, NSTIR Type 2 Gravel

Roadway subgrade soil should be proof-roll tested with a fully loaded tandem truck by a qualified Geotechnical Engineer prior to placement of the 150 mm minus rockfill. Additional rock fill or reworking of the site till/sand will be required for areas of the roadway subgrade that do not pass the proof-roll test as directed by the Geotechnical Engineer.

Quality Control Inspection and Testing is recommended during site earthworks including periodic compaction testing of trench backfill, proof-roll testing of all roadway subgrade prior to placement of rockfill and roadway subbase gravels (Type 2 gravel), compaction testing of roadway subbase and base gravels (Type 1 and Type 2 gravels) and asphalt pavement placement inspection and testing.

Re-use of On-site Materials

In general, the site soils are considered acceptable for re-use in the construction of the roadway subgrade. Successful re-use of the site till will be dependant on the moisture content of the soil at time of placement and compaction. The moisture content should be at or near the Optimum Moisture Content of soil. Elevated moisture content of the soil will make proper compaction of the re-worked site soils very difficult. Proper stockpiling of soil to protect it from rainfall and possible spreading and drying prior to placement may be required.

To prepare the existing site soils for re-use as structural fill, all organics, oversized boulders and segregated material must be removed. Soil with elevated moisture contents would not be considered acceptable for re-use. The approved material should be placed in lifts not exceeding 300 mm in thickness at its optimum moisture content and compacted to 95 percent of the material's standard Proctor maximum dry density or equivalent and 98 percent SPMDD for the top 300 mm of subgrade. Water and loose/soft soils should be removed from excavations, and bearing stratum approved prior to fill placement. Quality control inspection and testing of engineered fill is recommended.

Suitability and success of roadway construction using the on-site and imported materials will depend on the construction scheduling, the frequency of precipitation events, construction practices, etc. Site earthworks should be suspended during and immediately following rainfall events to allow excess moisture to dry prior to resuming earthworks.

Erosion and Sedimentation Control Guidelines

Nova Scotia Environment has published a set of guidelines dealing with environmental protection for erosion and sedimentation control. The document is of a general nature, however, presents proven methods for lessening the impact of soil erosion on downstream receptors. These guidelines should be adopted for when developing an erosion and sediment control plan.

CONCLUSIONS

A pre-construction geotechnical investigation has been undertaken for the proposed new roadway located in the Elmsdale Business Park in Elmsdale, NS. Current topography along the proposed roadway route would be considered gently sloped. Subsurface conditions along the proposed roadway route generally consists of a rootmat/topsoil layer overlying sand deposits and/or glacial till. Re-use of site native soils is considered acceptable provided construction procedures as noted in the above section “*Construction Recommendations*” are followed. **Quality control inspection and testing is recommended.** Englobe personnel can provide this service at your request.

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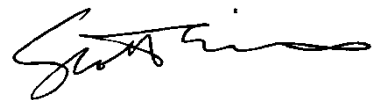
November 5, 2018

We trust that this information meets with your present requirements. If any questions arise regarding the contents of this report, please contact the undersigned at 468-6486.

Yours very truly,
Englobe Corp

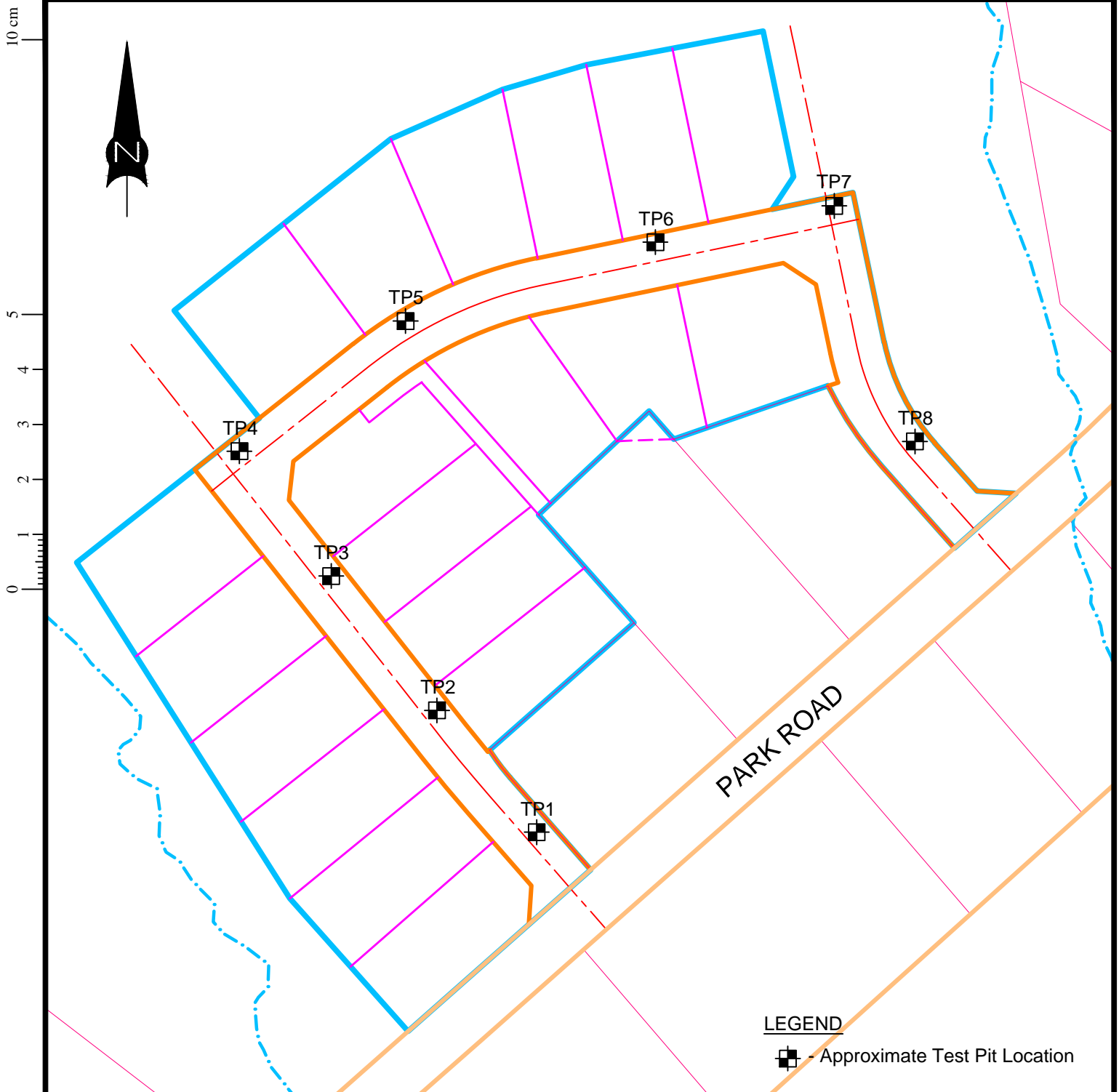
A handwritten signature in blue ink that reads "Richard W. Henry".

Richard Henry, P. Eng.
Project Manager
Geotechnical Division

A handwritten signature in black ink that reads "Scott A. Simms".

Scott A. Simms, M. Eng., P. Eng.
Team Leader
Geotechnical Division

Encl.



Client

Design Point Engineering and Surveying Ltd.

Project

Elmsdale Business Park Development

Elmsdale, Nova Scotia

Title

Test Pit Location Plan



Englobe Corp.

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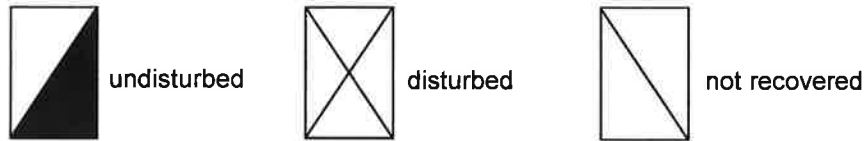
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Appendix 1 Terms and Symbols

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 _R	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 _U	Unconfined compressive strength
*SB	Shearbox test
SO ₄	Concentration of water-soluble sulphate
*ST	Swelling test
TV	Torvane shear strength
VS	Vane Shear Strength (undisturbed-remolded)
ε _f	Unit strain at failure
γ	Unit weight of soil or rock
γ _d	Dry unit weight of soil or rock
ρ	Density of soil or rock
ρ _d	Dry density of soil or rock

* The results of these tests usually are reported separately

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 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; NEGLECTIBLE 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; NEGLECTIBLE 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

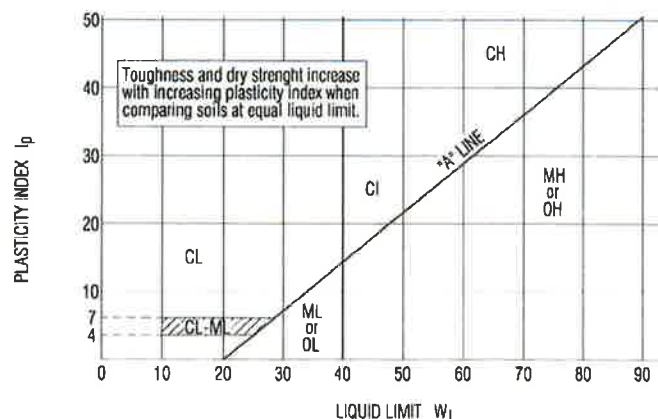


BEDROCK

- 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



Englobe

Appendix 2 Test Pit Logs



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TEST PIT LOG

PROJECT

Geotechnical Investigation
Park Road, Elmsdale

LOGGED/DWN. NMD

CKD.

DATE OF INVEST. 9/7/18

JOB B-0020021-1

TEST PIT TP 1

WC % 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		
						Topsoil/Rootmat/Organic Soils.					
1						SP	SAND: some silt, trace gravel, lightly compact, moist, light brown.				
2											
3											
4						TILL: silty sand, some gravel, trace to some clay, occasional cobbles and boulders, compact, moist to wet, brown to dark brown.					
5											
6											
7											
8						End of Test Pit at 2.4 metres in Till.					
9						Test Pit dry upon completion.					
10											
11											
12											
13											
14						4					
15											
16											
5											



PROJECT

Geotechnical Investigation Park Road, Elmsdale

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PROJECT

Geotechnical Investigation Park Road, Elmsdale

LOGGED/DWN. NMD				CKD.		DATE OF INVEST. 9/7/18		JOB B-0020021-1		TEST PIT TP 3			
				DEPTH ft m		MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		BACKHOE TYPE	
WC % wp- □ w- ● wl- △ 10 20 30 40 50								DATUM Existing Ground Surface		COND .	TYPE	POCKET PENE .	Excavator
								SURFACE ELEVATION					
								Topsoil/Rootmat/Organic Soils.					
				1				TILL: silty sand, some gravel, trace to some clay, occasional cobbles and boulders, compact, moist to wet, dark brown.					
				2									
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				11									
				12									
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				14									
				15									
				16									
				5									
								End of Test Pit at 2.1 metres in Till.					
								Test Pit dry upon completion.					



Englobe

TEST PIT LOG

PROJECT

Geotechnical Investigation
Park Road, Elmsdale

LOGGED/DWN. NMD		CKD.		DATE OF INVEST. 9/7/18		JOB B-0020021-1		TEST PIT TP 4	
		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	
WC % wp- □ w- ● wl- △					Topsoil/Rootmat/Organic Soils.				
10	20	30	40	50	1				
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TEST PIT LOG

PROJECT

Geotechnical Investigation
Park Road, Elmsdale

LOGGED/DWN. NMD		CKD.		DATE OF INVEST. 9/7/18		JOB B-0020021-1		TEST PIT TP 5	
		DEPTH ft m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		BACKHOE TYPE
					DATUM Existing Ground Surface	COND.	TYPE	POCKET PENE.	Excavator
WC % 10 20 30 40 50					SURFACE ELEVATION				OTHER TESTS
					Topsoil/Rootmat/Organic Soils.				
		1							
		2							
		3	1		TILL: silty sand, some gravel, trace to some clay, occasional cobbles and boulders, compact, moist to wet, dark brown.		X	G	
		4							
		5							
		6	2				X	G	
		7							
		8							
		9							
		10	3				X	G	
		11			End of Test Pit at 3.2 metres in Till.				
		12			Test Pit dry upon completion.				
		13	4						
		14							
		15							
		16	5						



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TEST PIT LOG

PROJECT

Geotechnical Investigation
Park Road, Elmsdale

LOGGED/DWN. NMD

CKD.

DATE OF INVEST. 9/7/18

JOB B-0020021-1

TEST PIT TP 6

WC % 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
					Topsoil/Rootmat/Organic Soils.				
					SAND: some silt, trace gravel, lightly compact to compact, moist to saturated, light brown.				
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PROJECT

Geotechnical Investigation Park Road, Elmsdale

LOGGED/DWN. NMD										CKD.		DATE OF INVEST.9/7/18					JOB B-0020021-1		TEST PIT TP 7		
<div> <div>WC %</div> <div> <div>wp-□</div> <div>w-●</div> <div>wl-△</div> </div> <div> <div>10</div> <div>20</div> <div>30</div> <div>40</div> <div>50</div> </div> </div>										<div>DEPTH</div> <div>ft m</div>		MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION			SOIL SAMPLE		BACKHOE TYPE		
														DATUM Existing Ground Surface			COND .	TYPE	POCKET PENE .	Excavator	
														SURFACE ELEVATION						OTHER TESTS	
										1		Topsoil/Rootmat/Organic Soils.									
										2		TILL: silty sand, some gravel, trace to some clay, occasional cobbles and boulders, compact, moist to wet, dark brown.									
										3											
										4											
										5											
										6		End of Test Pit at 1.8 metres in Till.									
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										10		Test Pit dry upon completion.									
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Englobe

TEST PIT LOG

PROJECT

Geotechnical Investigation
Park Road, Elmsdale

LOGGED/DWN. NMD		CKD.		DATE OF INVEST. 9/7/18		JOB B-0020021-1		TEST PIT TP 8	
		DEPTH ft m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION		SOIL SAMPLE		BACKHOE TYPE
WC % wp- □ w- ● wl- △ 10 20 30 40 50					DATUM Existing Ground Surface	COND.	TYPE	POCKET PENE.	Excavator
					SURFACE ELEVATION				OTHER TESTS
					Topsoil/Rootmat/Organic Soils.				
1									
2					TILL: silty sand, some gravel, trace to some clay, occasional cobbles and boulders, compact, moist to wet, dark brown.				
3									
4									
5									
6									
7									
8					End of Test Pit at 2.1 metres in Till.				
9					Test Pit dry upon completion.				
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Appendix 3 Laboratory Results

97 TROOP AVE., DARTMOUTH, N.S. B3B 2A7 - TEL (902) 468-6486 FAX 468-4919

Client:

Design Point Engineering & Surveying Ltd.
222 Waterfront Drive, Suite 104
Bedford, NS
B4A 4J4

Our Project No:

B-0020021-1

Client Contract No.:
Client PO.:
CC:

Attn: Andrew Forsythe

PHONE (902) 832-5597

FAX:

Project: Geotechnical Investigation - Elmsdale Business Park

Source: 1.8m - 2.1m

Sample No: TP5-2

Date Sampled: 07-Sep-18

Location:

Sampled by: NMD

Date Received: 07-Sep-18

Date Tested: 14-Sep-18

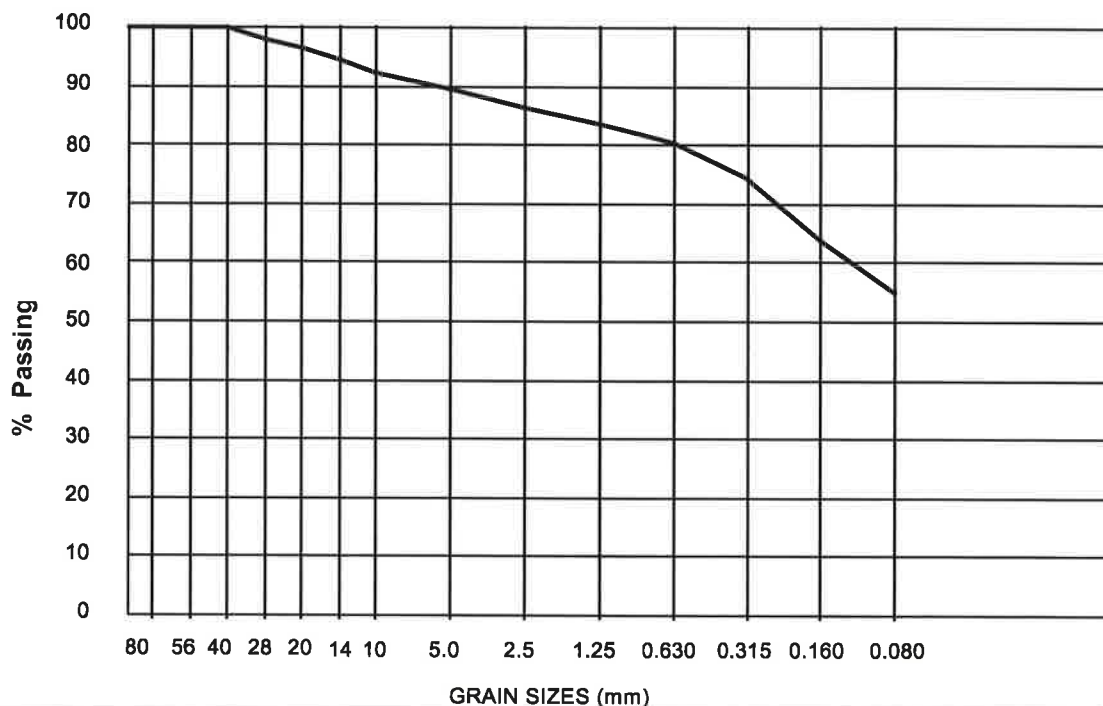
PHYSICAL PROPERTY TESTS

Soil Type		Liquid Limit		Flat and Elongated Particles, %	
Gravel, %	11	Plastic Limit		Coarse Spec. Gravity	
Sand, %	34	Plasticity Index		Fractured Faces, %	
Silt and Clay, %	55	Coarse Absorption, %		Petrographic No.	
Moisture Cont., %	12.8	Fine Absorption, %		Max. Dry Density, (kg/m3)	
Abrasion Loss, %		Micro Deval Loss, %		Optimum Moisture, %	

Sieve Size (mm)	Percent Passing	Spec. Band
112		
80		
56		
40	100	
28	98	
20	97	
14	94	
10	92	
5.0	89	
2.5	86	
1.25	84	
0.630	80	
0.315	75	
0.160	64	
0.080	54.8	

GRAIN SIZE CURVE

Spec Band
NO SPEC



Comments:

Record No: 11341

Englobe Tech: BM/ZZ

PER



CERTIFIED LABORATORY
FOR TESTING CONCRETE

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of test results is provided only on request.

project manager Richard Henry

97 TROOP AVE., DARTMOUTH, N.S. B3B 2A7 - TEL (902) 468-6486 FAX 468-4919

Client:

Design Point Engineering & Surveying Ltd.
222 Waterfront Drive, Suite 104
Bedford, NS
B4A 4J4

Our Project No:

B-0020021-1

Client Contract No.:
Client PO.:
CC:

Attn: Andrew Forsythe

PHONE (902) 832-5597

FAX:

Project: Geotechnical Investigation - Elmsdale Business Park

Source: 1.5m - 1.8m

Sample No: TP6-2

Date Sampled: 07-Sep-18

Sampled by: NMD

Date Received: 07-Sep-18

Location:

Date Tested: 14-Sep-18

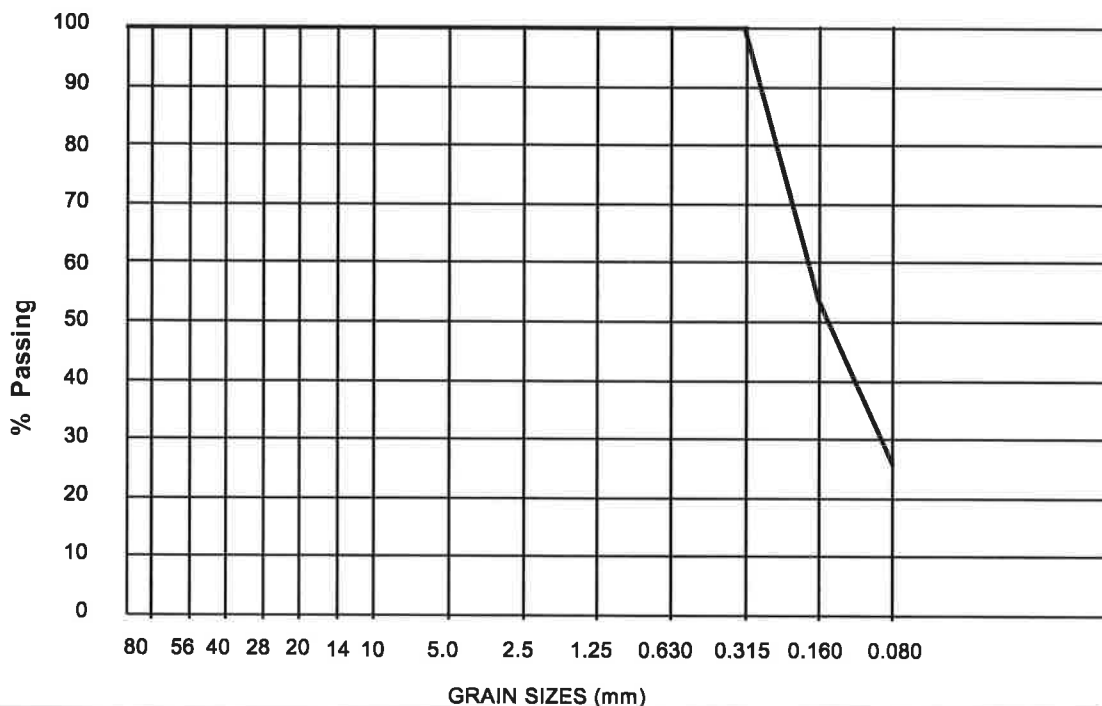
PHYSICAL PROPERTY TESTS

Soil Type		Liquid Limit		Flat and Elongated Particles, %	
Gravel, %	0	Plastic Limit		Coarse Spec. Gravity	
Sand, %	74	Plasticity Index		Fractured Faces, %	
Silt and Clay, %	26	Coarse Absorption, %		Petrographic No.	
Moisture Cont., %	25.9	Fine Absorption, %		Max. Dry Density, (kg/m3)	
Abrasion Loss, %		Micro Deval Loss, %		Optimum Moisture, %	

Sieve Size (mm)	Percent Passing	Spec. Band
112		
80		
56		
40		
28		
20		
14		
10		
5.0		
2.5	100	
1.25	100	
0.630	100	
0.315	100	
0.160	54	
0.080	26.0	

GRAIN SIZE CURVE

Spec Band
NO SPEC



Comments:

Record No: 11340

Englobe Tech: BM/ZZ

PER



CERTIFIED LABORATORY
FOR TESTING CONCRETE

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of test results is provided only on request.

project manager Richard Henry

TABLE 2: SUMMARY OF LABORATORY DATA
Geotechnical Investigation
Elmsdale Business Park, Elmsdale, NS
Project No. B-0019824-1

Test Pit No.	Sample No.	Depth (metres)	Description	Moisture Content (%)	Particle Size Distribution		
					Gravel (%)	Sand (%)	Fines (silts and clays) (%)
TP 2	1	0.8 - 1.1		19.2			
	2	1.5 - 1.8		12.2			
	3	2.4 - 2.7		10.2			
TP 5	1	0.9 - 1.2		14.6			
	2	1.8 - 2.1	Till: silty sand, some gravel and trace to some clay	12.8	11	34	55
	3	2.9 - 3.2		11.2			
TP 6	1	0.8 - 0.9		15.7			
	2	1.5 - 1.8	Sand: some silt	25.9	0	74	26