REPORT ON PRELIMINARY GEOTECHNICAL INVESTIGATION PROPOSED NEW DEVELOPMENT 231, 235, 237, 245 AND 249 REACH STREET UXBRIDGE, ONTARIO

Prepared for:

PALMER ENVIRONMENTAL CONSULTING GROUP

Prepared By:

SIRATI & PARTNERS CONSULTANTS LIMITED

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

750 Millway Avenue, Unit 8
Vaughan, Ontario L4K 3T7
Tel: 905.669.4477
Fax: 905.669.4488

Project: SP17-275-10
April 27, 2018

TABLE OF CONTENTS

1. INTRODUCTION

Sirati & Partners Consultants Limited (SPCL) was retained by Palmer Consulting Engineering Group Ltd. (Palmer) to undertake a preliminary geotechnical investigation at the properties located at 231, 235, 237, 245, 249 Reach Street in Uxbridge, Ontario.

It is understood that a previous geotechnical investigation was carried out by WSP on 241 Reach Street, located north of the subject properties (see **Drawing 1**):

"Geotechnical Investigation, 241 Reach Street, Uxbridge, Ontario, Mr. Robert Kennedy; Project No. 141-19775-000, dated April 2015".

It is understood that the hydrogeological investigation of the subject properties will be carried out by Palmer under a separate report cover.

The properties under this investigation are currently occupied by 5 single- and multi-storey residential houses. It is understood that the properties located at 231, 235, 237, 241, 245 and 249 Reach Street will be developed into twelve blocks of town houses with one level of basement as shown in **Appendix A**. The current geotechnical investigation report does not address the geotechnical issues on 241 Reach Street.

The purpose of this preliminary geotechnical investigation was to obtain information about the subsurface conditions at borehole locations and from the findings in the boreholes to make preliminary recommendations pertaining to the geotechnical design of underground utilities, subdivision roads and to comment on the foundation conditions for general house construction.

This report is provided based on the terms of reference presented above and on the assumption that the design will be in accordance with the applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations of this office can be relied upon.

The recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for Palmer Environmental Consulting Group Ltd., Mr. Morris Bonakdar and its architects and designers. Third party use of this report without Sirati & Partners Consultants Limited (SPCL) consent is prohibited. The limitation conditions presented in **Appendix B** form an integral part of the report and they must be considered in conjunction with this report.

2. FIELD AND LABORATORY WORK

A total of six (6) boreholes (BH1 to BH6, see Drawing 1 for location plan) were drilled to depths ranging from 7.6 m to 8.2 m below the existing grade. Boreholes were drilled with solid stem continuous flight auger equipment by a drilling sub-contractor under the direction and supervision of SPCL personnel. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method. The samples were logged in the field and returned to the SPCL laboratory for detailed examination by the project engineer and for laboratory testing.

In addition to visual examination in the laboratory, all soil samples were tested for moisture content. Selected two (2) soil samples were subjected to grain size analyses and gradation curves are presented in Figure 8.

Water level observations were made during drilling and in the open boreholes at the completion of the drilling operations. Monitoring wells were installed in three (3) boreholes (BH2, BH3 and BH6) for the long-term (stabilized) groundwater level monitoring.

The elevations at the borehole locations were surveyed by an SPCL personnel using differential GPS system and varied from 282.5 m to 289.0 m.

3. SITE AND SUBSURFACE CONDITIONS

The borehole location plan is shown in Drawing 1. Notes on soil descriptions are presented in Drawing 1A. The subsurface conditions in the boreholes are presented in the individual borehole logs (Encl. 2 to 7 inclusive). The subsurface conditions in the boreholes are summarized in the following paragraphs.

3.1 SOIL CONDITIONS:

Topsoil/Fill Material: a 250 mm to 400 mm thick surficial layer of topsoil was found at all borehole locations. The thickness of the topsoil in each borehole was shown in the borehole logs. It should be noted that the thickness of the topsoil explored at the borehole locations may not be representative for the entire site and should not be relied on to calculate the amount of topsoil at the site.

Below the topsoil, fill material was encountered in all boreholes, extending to depths ranging from 0.8 m to 1.5 m below the existing ground surface. The fill material mainly consisted of sand. The measured SPT 'N' values in the fill material ranged from 1 to 25 blows for 300 mm penetration. The high blow counts could be attributed to frost at the time of drilling and, the fill material was found to be generally in a very loose compaction state.

Sandy to Sandy Silt: The native soil underlying the fill material in all boreholes consisted of sand to sandy silt, extending to the termination depth of the boreholes. The SPT 'N' values were found ranging between 3 and 35 blows per 300 mm penetration, indicating a very loose to dense compaction state. The native stratum was observed to be in a very loose to loose compaction at

shallow depths, possibly due to freeze-thaw weathering cycles, and becoming compact to dense at greater depths.

Grain size analyses of two sand samples (BH1/SS4 and BH3/SS4) were conducted and the results are presented in Figure 8, with the following fractions:

Clay: 6% to 8%
Silt: 4% to 9%
Sand: 83% to 90%

Grain size analysis of a sandy silt sample (BH1/SS8) was conducted and the results are presented in Figure 8, with the following fractions:

Clay: 10%
Silt: 63%
Sand: 27%

3.2 GROUNDWATER CONDITIONS

During drilling (short-term), no groundwater was found in the boreholes. The monitoring wells installed in BH2, BH3 and BH6 were observed to be dry on February 2, 2018.

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events.

4. DISCUSSION AND RECOMMENDATIONS

It is understood that the properties will be developed with 1 ½ Storey townhouses with one level of basement. The following sections pertaining to the design and construction recommendations for the proposed development will need to be re-assessed by SPCL upon availability of the grade elevations, loading conditions, and other information pertinent to the proposed development. The following recommendation should therefore be considered as preliminary.

4.1 ROADS

The investigation has shown that the predominant subgrade soil at the site, after stripping the topsoil, fill material and any other organic and otherwise unsuitable material will consist of sand sandy silt.

Based on the above and assuming that traffic usage will be residential minor local or local, the following minimum pavement thickness is recommended:

40 mm HL3 Asphaltic Concrete
50 mm HL8 Asphaltic Concrete
150 mm Granular ‘A’
450 mm Granular ‘B’

These values may need to be adjusted according to the Town of Uxbridge Standards. The pavement structure recommended above assumes that the subgrade has sufficient bearing capacity to accommodate the applied pavement structure and local traffic. The site subgrade and weather conditions (i.e. if wet) at the time of construction may necessitate the placement of thicker granular sub-base layer in order to facilitate the construction. Furthermore, heavy construction equipment may have to be kept off the newly constructed roads before the placement of asphalt and/or immediately thereafter, to avoid damaging the weak subgrade by heavy truck traffic.

4.1.1 Stripping, Sub-excavation and Grading

The site should be stripped of all topsoil, weathered/disturbed soils and any organic or otherwise unsuitable soils to the full depth of the roads, both in cut and fill areas.

Following stripping, the site should be graded to the subgrade level and approved. The subgrade should then be proof-rolled, in the presence of the Geotechnical Engineer, by at least several passes of a heavy compactor having a rated capacity of at least 10 tonnes. Any soft spots thus exposed should be removed and replaced by select fill material, similar to the existing subgrade soil and approved by the Geotechnical Engineer. The subgrade should then be recompacted from the surface to at least 98% of its Standard Proctor Maximum Dry Density (SPMDD). The final subgrade should be cambered or otherwise shaped properly to facilitate rapid drainage and to prevent the formation of local depressions in which water could accumulate.

Proper cambering and allowing the water to escape towards the sides (where it can be removed by means of subdrains) is considered to be beneficial. Otherwise, any water collected in the granular sub-base materials could be trapped thus causing problems due to softened subgrade, differential frost heave, etc. For the same reason damaging the subgrade during and after placement of the granular materials by heavy construction traffic should be avoided. If the moisture content of the local material cannot be maintained at ±2% of the optimum moisture content, imported granular material must be used.

Any fill required for regrading the site or backfill should be select, clean material, free of topsoil, organic or other foreign and unsuitable matter. The fill should be placed in thin layers and compacted to at least 95% of its SPMDD. The degree of compaction should be increased to 98% within the top 1.0 m of the subgrade, as per Town Standards. The compaction of the new fill should be checked by frequent field density tests.

4.1.2 Construction

Once the subgrade has been inspected and approved, the granular base and sub-base course materials should be placed in layers not exceeding 200 mm (uncompacted thickness) and should be compacted to at least 100% of their respective SPMDD. The grading of the material should conform to current OPS Specifications.

The placing, spreading and rolling of the asphalt should be in accordance with OPS Specifications or, as required by the local authorities.

Frequent field density tests should be carried out on both the asphalt and granular base and sub-base materials to ensure that the required degree of compaction is achieved.

4.1.3 Drainage

The Town of Uxbridge requires the installation of full-length subdrains on all roads. The subdrains should be properly filtered to prevent the loss of (and clogging by) soil fines.

All paved surfaces should be sloped to provide satisfactory drainage towards catch basins. As discussed in Section 4.1.1, by means of good planning any water trapped in the granular sub-base materials should be drained rapidly towards subdrains or other interceptors.

4.2 SEWERS

As a part of the site development, a network of new storm and sanitary sewers is to be constructed.

4.2.1 Trenching

It is expected that the trenches will be dug through the sand and sandy silt deposits. No groundwater was observed in the monitoring wells on February 2, 2018 and as such no need for dewatering is anticipated. However, for any information regarding the long-term groundwater table and dewatering requirements, reference should be made to the hydrogeological report, that will be provided by Palmer.

In case groundwater was anticipated, water table must be lowered to 1 m below the lowest excavation level. Further monitoring of the groundwater table is recommended to establish the seasonally high groundwater levels.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the overburden can be classified as Type 3 Soil above the groundwater table and Type 4 Soil below the groundwater table.

4.2.2 Bedding

The boreholes show that, in their undisturbed state, native soils will provide adequate support for the sewer pipes and allow the use of normal Class B type bedding. The recommended minimum thickness of granular bedding below the invert of the pipes is 150 mm. The thickness of the bedding may, however, have to be increased depending on the pipe diameter. The bedding material should consist of well-graded granular material such as Granular ‘A’ or equivalent. After installing the pipe on the bedding, a granular surround of approved bedding material, which extends at least 300 mm above the obvert of the pipe, or as set out by the local Authority, should be placed.

To avoid the loss of soil fines from the subgrade, uniformly graded clear stone should not be used unless, below the granular bedding material, a suitable, approved filter fabric (geotextile) is placed. The geotextile should extend along the sides of the trench and should be wrapped all around the poorly graded bedding material.

4.2.3 Backfilling of Trenches

Based on visual and tactile examination, and the measured moisture contents of the soil samples, the onsite excavated soils from above the groundwater table will generally need to be brought to ±2% of the optimum moisture content whether by adding water or aerating. Soils excavated from below the groundwater table will be too wet to compact and will require significant aeration prior to their use as backfill material.

Unless the materials are properly pulverized and compacted in sufficiently thin lifts, post-construction settlements could occur. The backfill should be placed in maximum 200 mm thick layers at or near (±2%) their optimum moisture content, and each layer should be compacted to at last 95% SPMDD. Unsuitable materials such as organic soils, boulders, cobbles, frozen soils, etc. should not be used for backfilling. Otherwise imported selected inorganic fill will be required for backfilling at this site.

The onsite excavated soils should not be used in confined areas (e.g. around catch basins and laterals under roadways) where heavy compaction equipment cannot be operated. The use of imported granular fill together with an appropriate frost taper would be preferable in confined areas and around structures, such as catch basins.

4.3 SITE GRADING AND ENGINEERED FILL

In the areas where earth fill is required for site grading purposes, an engineered fill may be constructed below house/building foundations, roads, boulevards, etc.

Prior to the construction of engineered fill, all topsoil, fill material, weak weathered / disturbed and any other unsuitable materials must be removed in this area. After the removal of all unsuitable materials, the excavation base consisting of native soil deposits must be inspected and approved by a qualified geotechnical engineer prior to any placement of engineered fill. The base of the excavation should be compacted and proof rolled with heavy compactors (minimum 10,000 kg). During proof rolling, spongy, wet or soft/loose spots should be sub-excavated to stable subgrade and replaced with approved soil, compatible with subgrade conditions, as directed by the geotechnical engineer.

The material for engineered fill should consist of approved inorganic soil, compacted to 100 percent of Standard Proctor Maximum Dry Density (SPMDD). Recommendations regarding engineered fill placement are provided in **Appendix B** of this report.

To reduce the risk of improperly placed engineered compacted fill, full-time supervision of the contractor is essential by SPCL to certify the engineered fill. Despite full time supervision, it has

been found that contractors frequently bulldoze loose fill into areas and compact only the surface. The inspector, either busy on other portions of the site or absent during "off hours" will be unaware of this condition. This potential problem must be recognized and discussed at a pre-construction meeting.

Depending upon the amount of grade raise, there will be consolidation settlement of the underlying soils. Additionally, there will be settlement of the engineered fill under its own weight, approximately 0.5% of the fill height. A waiting period of 3 to 6 months may be required prior to the construction of any structures on engineered fill. This should be confirmed during the detail design stage, once the grading plans for the proposed development are available.

4.4 FOUNDATION CONDITIONS

It is understood that the subject properties will be developed to 1 ½ storey residential houses with one level of basement.

The boreholes show that provided the foundation soil is undisturbed during the construction, in general, allowable soil bearing values of 150 kPa at serviceability limit state and 225 kPa at ultimate limit state are feasible in the undisturbed inorganic natural soils, at or below a depth of 3.0 m from the existing grade. The bearing value would be suitable for the use of normal spread footings to support low-rise developments.

Where the grade needs to be raised, the proposed structures can be supported by spread and strip footings founded on engineered fill for an allowable bearing pressure of 150 kPa at SLS and 225 kPa at ULS. The engineered fill supporting footings should be constructed in accordance with the guidelines presented in **Appendix B**. Other requirements of engineered fill are given in Section 4.4.

All footings must be founded below the frost depth of 1.5 m.

5. EARTH PRESSURES

The lateral earth and water pressure acting at any depth on potential basement walls can be calculated by the following formula:

In soils above the groundwater table ($z < d_w$):

$$p = K (\gamma z + q)$$

In soils below the groundwater table ($z \geq d_w$):

$$p = K \{\gamma d_w + \gamma_1 (z - d_w) + q\} + p_w$$

In which, $p_w = \gamma_w (z - d_w)$

where p = lateral earth and water pressure in kPa acting at a depth of z below ground surface

K	=	earth pressure coefficient K=0.5
γ	=	unit weight of soil above groundwater table, assuming γ = 21 kN/m^3
γ_1	=	submerged unit weight of soil below groundwater table, assuming γ_1 = 11.2 kN/m^3
γ_w	=	unit weight of water, assuming γ_w = 9.8 kN/m^3
z	=	depth below ground surface to point of interest, in meters
d_w	=	depth of groundwater table below ground surface, in meters
q	=	value of surcharge in kPa
p_w	=	hydrostatic water pressure in kPa

6. EARTHQUAKE CONSIDERATIONS

Based on the borehole information and according to Table 4.1.8.4.A of OBC 2012, the subject site for the proposed buildings with one level of basement with spread footings bearing on sandy, can be classified as "Class D" for seismic site response.

7. GENERAL COMMENTS ON REPORT

Sirati & Partners Consultants Limited (SPCL) should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, Sirati & Partners will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

The limitation conditions presented in **Appendix C** form an integral part of the report and they must be considered in conjunction with this report.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

Yours truly,

SIRATI & PARTNERS CONSULTANTS LIMITED

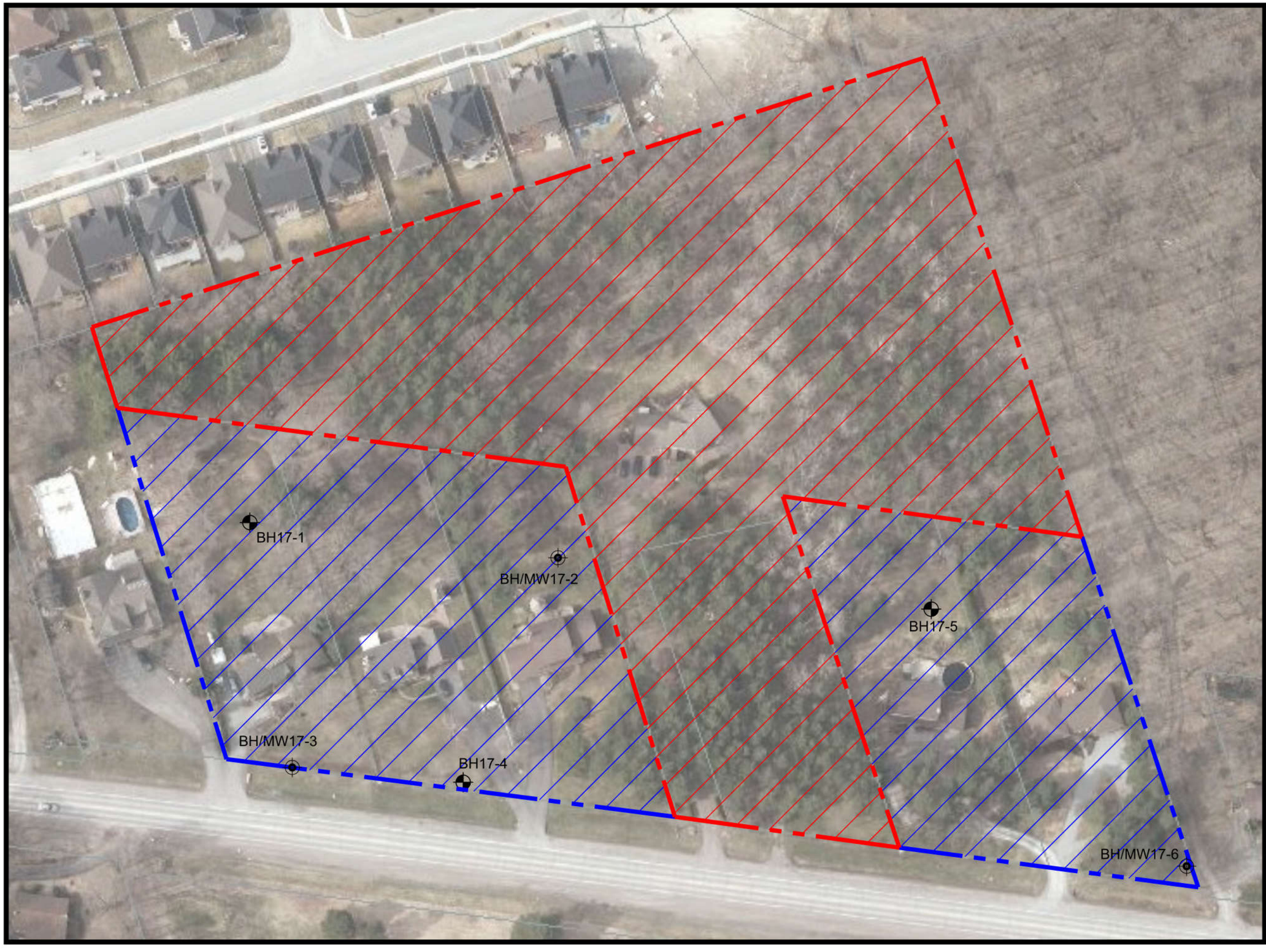
Meysam Najari

Meysam Najari, Ph.D., E.I.T.

A. Sirati

Archie Sirati, Ph.D., P.Eng.

Drawings



Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

750 Millway Avenue, Unit-8,
Vaughan, ON L4K 0M7
Phone#905-669-4477, Fax#905-669-4488

North:

Legend:

- Previously Acquired Property
- Additionally Acquired Properties
- Proposed Boreholes
- Proposed Boreholes / Monitoring Well

Project Title:

Geotechnical Investigation and Enviromental Assessment

Site Location:

241 Reach Street, Uxbridge, ON.

Figure Title:

Borehole Location Plan

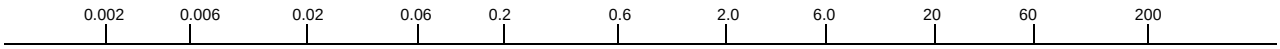
Scale:	Project Number:
0m 10m 20m	SP17-275-10
Date:	**Figure Number:**
February 2018	1

Drawing 1A: Notes on Sample Descriptions

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by Sirati & Partners Consultants Limited also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH1

PROJECT: Proposed Geotechnical Investigation
CLIENT: Palmer Environmental Consulting Group Ltd.
PROJECT LOCATION: Reach Street, Uxbridge
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150 mm
Date: Jan/26/2018
Drilling Contractor:

REF. NO.: SP17-275-10
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	CHEMICAL ANALYSIS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
282.5												
0.0 / 282.3	**TOPSOIL:** 250 mm											
0.3	**FILL:** Sand, trace silt, brown, very moist		1	SS	8		282		○			
1			2	SS	1				○			
280.7			3	SS	6		281		○			
1.8 / 2	**SAND:** trace to some silt, greyish brown, compact, moist		4	SS	28		280		○			83 8 9
279.5												
3.0	**SANDY SILT:** greyish brown, compact, moist		5	SS	24		279		○			
4												
			6	SS	21		278		○			
5												
6							277					
			7	SS	27		276		○			
7												
	becoming dense						275					
8 / 274.3			8	SS	35				○			27 63 10
8.2	**END OF BOREHOLE:**											

Notes:
1. Borehole was open and dry upon completion of drilling

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

SPCL SOIL LOG SP17-275-10.GPJ SPCL.GDT 2/2/18

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH2

PROJECT: Proposed Geotechnical Investigation
CLIENT: Palmer Environmental Consulting Group Ltd.
PROJECT LOCATION: Reach Street, Uxbridge
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150 mm
Date: Jan/28/2018
Drilling Contractor:

REF. NO.: SP17-275-10
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
283.5							
0.0 / 283.3	**TOPSOIL:** 280 mm		1	SS	3		283
0.3 / 282.8	**FILL** sand, trace silt, brown, very moist						
0.8	**SAND:** trace silt, greyish brown, loose, moist		2	SS	5		
1							282
2 / 281.2			3	SS	10		
2.3	**SANDY SILT:** greyish brown, compact, moist		4	SS	25		281
3			5	SS	20		
4							280
							279
5			6	SS	21		
							278
6							
276.8			7	SS	25		277
6.7	**END OF BOREHOLE:**						

Notes:

1. Monitoring well was installed in the borehole upon completion of drilling
2. The monitoring well was observed to be dry on Feb. 2, 2018

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

CHEMICAL ANALYSIS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

SPCL SOIL LOG SP17-275-10.GPJ SPCL.GDT 2/2/18

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH3

PROJECT: Proposed Geotechnical Investigation
CLIENT: Palmer Environmental Consulting Group Ltd.
PROJECT LOCATION: Reach Street, Uxbridge
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150 mm
Date: Jan/26/2018
Drilling Contractor:

REF. NO.: SP17-275-10
ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	CHEMICAL ANALYSIS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
282.8												
0.0 / 282.5	**TOPSOIL:** 300 mm		1	SS	1		282		○			
0.3 / 282.0	**FILL:** sand, trace silt, brown, very moist											
0.8	**SAND:** trace silt, greyish brown, very loose to compact, moist		2	SS	3				○			
			3	SS	8		281		○			
	becoming compact		4	SS	15				○			81 13 6
			5	SS	20		280		○			
							279					
			6	SS	20		278		○			
276.7							277					
6.1 / 276.1	**SANDY SILT:** greyish brown, compact, moist		7	SS	26				○			
6.7	**END OF BOREHOLE:**											

Notes:
1. Monitoring well was installed upon completion of drilling
2. The monitoring well was observed to be dry on Feb. 2, 2018

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

SPCL SOIL LOG SP17-275-10.GPJ SPCL.GDT 2/2/18

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH4

PROJECT: Proposed Geotechnical Investigation
CLIENT: Palmer Environmental Consulting Group Ltd.
PROJECT LOCATION: Reach Street, Uxbridge
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150 mm
Date: Jan/28/2018
Drilling Contractor:

REF. NO.: SP17-275-10
ENCL NO.: 5

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
284.5							
0.0 / 284.2	**TOPSOIL:** 300 mm		1	SS	4		284
0.3 / 283.7	**FILL:** sand, trace silt, brown, very moist						
0.8	**SAND:** trace silt, light brown, compact, moist		2	SS	16		283
			3	SS	18		
			4	SS	20		282
			5	SS	22		281
279.9							280
4.6	**SANDY SILT:** light brown, compact, moist		6	SS	25		279
			7	SS	28		278
277.8							
6.7	**END OF BOREHOLE:**						

Notes:
1. Borehole was open and dry upon completion of drilling

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)
SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)
CHEMICAL ANALYSIS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

SPCL SOIL LOG SP17-275-10.GPJ SPCL.GDT 2/2/18

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH5

PROJECT: Proposed Geotechnical Investigation
CLIENT: Palmer Environmental Consulting Group Ltd.
PROJECT LOCATION: Reach Street, Uxbridge
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150 mm
Date: Jan/28/2018
Drilling Contractor:

REF. NO.: SP17-275-10
ENCL NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	CHEMICAL ANALYSIS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
286.9												
0.0 / 286.5	**TOPSOIL:** 400 mm		1	SS	1							
0.4 / 286.1	**FILL:** sand, trace silt, brown, very moist											
0.8	**SAND:** trace to some silt, greyish brown, loose, moist		2	SS	8		286					
			3	SS	9		285					
			4	SS	9							
	becoming compact		5	SS	15		284					
			6	SS	13		283					
			7	SS	21		282					
280.2							281					
6.7	**END OF BOREHOLE**											

Notes:
1. Borehole was open and dry upon completion of drilling

SPCL SOIL LOG SP17-275-10.GPJ SPCL.GDT 2/2/18

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH6

PROJECT: Proposed Geotechnical Investigation
CLIENT: Palmer Environmental Consulting Group Ltd.
PROJECT LOCATION: Reach Street, Uxbridge
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Solid Stem Augers
Diameter: 150 mm
Date: Jan/26/2018
Drilling Contractor:

REF. NO.: SP17-275-10
ENCL NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
289.0							
0.0 / 288.6	**TOPSOIL:** 360 mm		1	SS	25		
0.4 / 288.2	**FILL:** sand, brown, very moist						
0.8	**SAND:** trace to some silt, greyish brown, loose to compact, moist		2	SS	5		288
1							
			3	SS	14		287
2 / 286.7							
2.3	**SANDY SILT:** greyish brown, compact, moist		4	SS	19		
3							286
			5	SS	22		
4							285
			6	SS	18		284
5							
6							283
			7	SS	27		
282.3							
6.7	END OF BOREHOLE:						

Notes:
1. Monitoring well was installed upon completion of drilling
2. The monitoring well was observed to be dry on Feb. 2, 2018

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

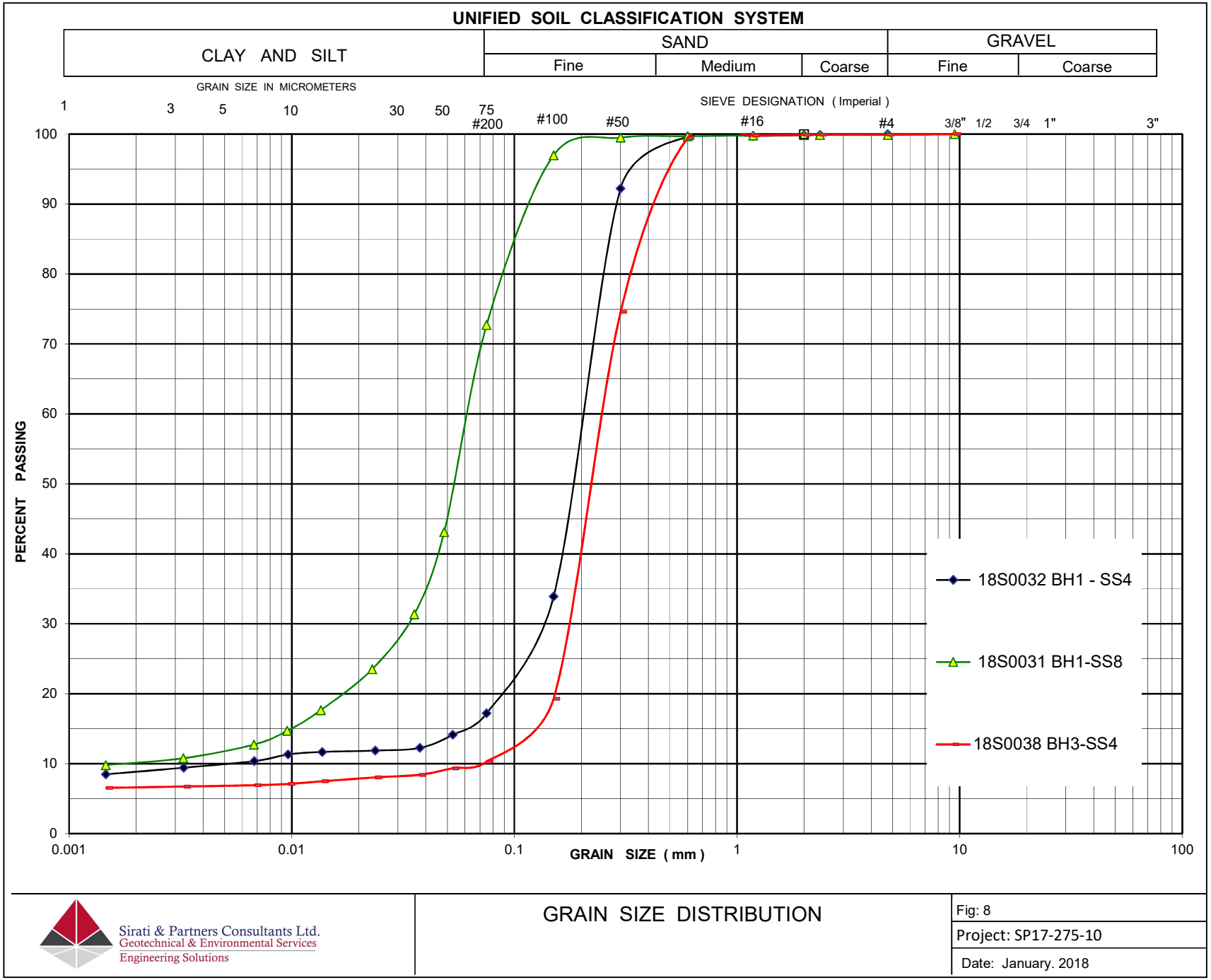
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)
CHEMICAL ANALYSIS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

SPCL SOIL LOG SP17-275-10.GPJ SPCL.GDT 2/2/18



Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

GRAIN SIZE DISTRIBUTION

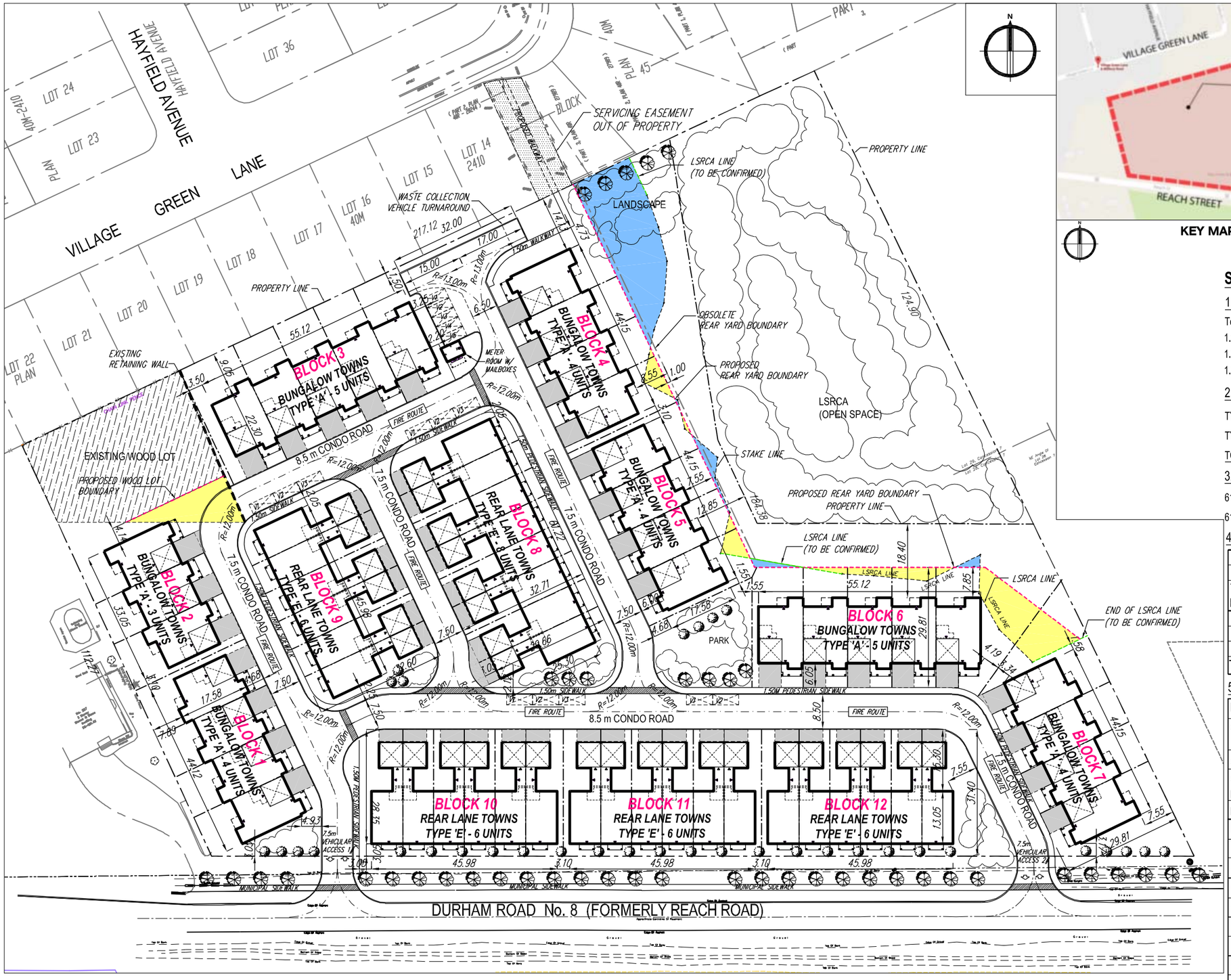
Fig: 8

Project: SP17-275-10

Date: January. 2018

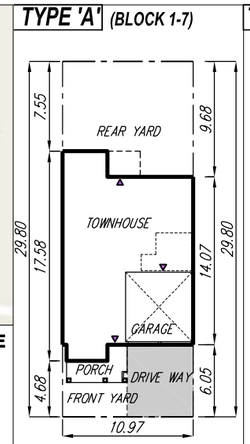
APPENDIX A

SITE DEVELOPMENT PLAN



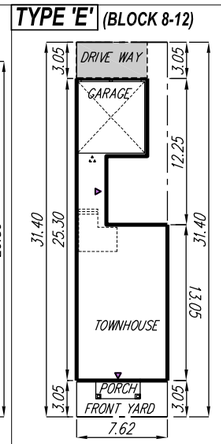
KEY MAP - NOT TO SCALE

TYPE 'A' (BLOCK 1-7)



1-1/2 STOREY BUNGALOW TOWNHOUSE 11.0m X 29.8m MAX. +/- 2265 SQ.FT.

TYPE 'E' (BLOCK 8-12)



1-1/2 STOREY REAR LANE TOWNHOUSE 7.62 m X 31.40 m MAX. +/- 2150 SQ.FT.

SCHEME 'E4'

1. SITE AREA:

Total area = 3.59 ha (8.87 acre)

1.1. Wood lot area = 0.13 ha

1.2. LSRCA = 0.82 ha

1.3. Net area = 2.64 ha (6.52 acre)

2. NUMBER OF UNITS:

TYPE 'A', 11.0 m BUNGALOW TOWNHOUSE,	1-1/2 STOREY	= 29 UNITS
TYPE 'E', 7.6 m REAR LANE TOWNHOUSE,	1-1/2 STOREY	= 32 UNITS
TOTAL		= 61 UNITS

3. DENSITY: (NET AREA)

61 UNITS / 6.52 ACRE = 9.36 UNITS PER ACRE

61 UNITS / 2.64 HECTARE= 23.11 UNITS PER HECTARE

4. PARKING:

RESIDENT :	61 UNITS X 2 SPACES/UNIT=122		
VISITOR :	61 UNITS X 0.25 = 16		
TOTAL REQUIRED PARKING SPACES :	=138		
	TYPE A	TYPE E	SUBTOTAL
RESIDENT	116	96	212
VISITOR (ON STREET)	16		
TOTAL PARKING PROVIDED	228 (3.74 / UNIT)		

5. AREA BALANCE OF LSRCA LINE AND WOOD LOT:

DEFINITION	AREA		LEGEND
AREA OF ENCROACHMENT LSRCA LINE AND WOOD LOT (TAKEN)	-570.53 sqm	-6108.84 sq.ft.	
AREA OF CONSERVED WOOD LOT	1157.52 sqm	12459.44 sq.ft.	
AREA OF ADDITIONAL LANDS OUTSIDE OF LSRCA TO BE CONVEYED TO LSRCA (GIVEN)	+577.74sqm	+6218.74 sq.ft.	
RESULT (EXTRA COMPENSATION)	+7.21 sqm	+109.9 sq.ft.	

LEGEND:

	SERVICING EASEMENT
	OBSOLETE REAR YARD BOUNDARY
	PROPOSED REAR YARD BOUNDARY
	LSRCA LINE (TO BE CONFIRMED)
	STAKE LINE
	FIRE ROUTE
	PROPERTY LINE
	GROUND PARKING SPACE

SITE PLAN

SCALE: 1:1000

HUNT DESIGN ASSOCIATES INC.
www.huntdesign.ca

VENETIAN GROUP - 217049

REACH STREET, UXBRIDGE, ONTARIO

SITE PLAN-SCHEME E4

SCALE = 1:1000

8966 Woodbine Ave, Markham, ON L3R 0J7 ■ T 905.737.5133 ■ F 905.737.7326 ■ OCT. 2017 ■ JZ ■ 217049DSP01-SCHEME E4

APPENDIX B

GUIDELINES FOR ENGINEERED FILL

GENERAL REQUIREMENTS FOR ENGINEERED FILL

Compacted imported soil that meets specific engineering requirements and is free of organics and debris and that has been continually monitored on a full-time basis by a qualified geotechnical representative is classified as engineered fill. Engineered fill that meets these requirements and is bearing on suitable native subsoil can be used for the support of foundations.

Imported soil used as engineered fill can be removed from other portions of a site or can be brought in from other sites. In general, most of Ontario soils are too wet to achieve the 100% Standard Proctor Maximum Dry Density (SPMDD) and will require drying and careful site management if they are to be considered for engineered fill. Imported non-cohesive granular soil is preferred for all engineered fill. For engineered fill, we recommend use of OPSS Granular 'B' sand and gravel fill material.

Adverse weather conditions such as rain make the placement of engineered fill to the required degree of density difficult or impossible; engineered fill cannot be placed during freezing conditions, i.e. normally not between December 15 and April 1 of each year.

The location of the foundations on the engineered fill pad is critical and certification by a qualified surveyor that the foundations are within the stipulated boundaries is mandatory. Since layout stakes are often damaged or removed during fill placement, offset stakes must be installed and maintained by the surveyors during the course of fill placement so that the contractor and engineering staff are continually aware of where the engineered fill limits lie. Excavations within the engineered fill pad must be backfilled with the same conditions and quality control as the original pad.

To perform satisfactorily, engineered fill requires the cooperation of the designers, engineers, contractors and all parties must be aware of the requirements. The minimum requirements are as follows; however, the geotechnical report must be reviewed for specific information and requirements.

1. Prior to site work involving engineered fill, a site meeting to discuss all aspects must be convened. The surveyor, contractor, design engineer and geotechnical engineer must attend the meeting. At this meeting, the limits of the engineered fill will be defined. The contractor must make known where all fill material will be obtained from and samples must be provided to the geotechnical engineer for review, and approval before filling begins.

2. Detailed drawings indicating the lower boundaries as well as the upper boundaries of the engineered fill must be available at the site meeting and be approved by the geotechnical engineer.

3. The building footprint and base of the pad, including basements, garages, etc. must be defined by offset stakes that remain in place until the footings and service connections are all constructed. Confirmation that the footings are within the pad, service lines are in place, and that the grade conforms to drawings, must be obtained by the owner in writing from the surveyor and Sirati & Partners Consultants Limited. Without this confirmation, no responsibility for the performance of the structure can be accepted by Sirati & Partners Consultants Limited (SPCL). Survey drawing of the pre-and post-fill location and elevations will also be required.

4. The area must be stripped of all topsoil and fill materials. Subgrade must be proof-rolled. Soft spots must be dug out. The stripped native subgrade must be examined and approved by a SPCL engineer prior to placement of fill.

5. The approved engineered fill material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. Engineered fill should not be placed during the winter months. Engineered fill compacted to 100% SPMDD will settle under its own weight approximately 0.5% of the fill height and the structural engineer must be aware of this settlement. In addition to the settlement of the fill, additional settlement due to consolidation of the underlying soils from the structural and fill loads will occur and should be evaluated prior to placing the fill.

6. Full-time geotechnical inspection by SPCL during placement of engineered fill is required. Work cannot commence or continue without the presence of the SPCL representative.

7. The fill must be placed such that the specified geometry is achieved. Refer to the attached sketches for minimum requirements. Take careful note that the projection of the compacted pad beyond the footing at footing level is a minimum of 2 m. The base of the compacted pad extends 2 m plus the depth of excavation beyond the edge of the footing.

8. A bearing capacity of 150 kPa at SLS (225 kPa at ULS) can be used provided that all conditions outlined above are adhered to. A minimum footing width of 500 mm (20 inches) is suggested and footings must be provided with nominal steel reinforcement.

9. All excavations must be done in accordance with the Occupational Health and Safety Regulations of Ontario.

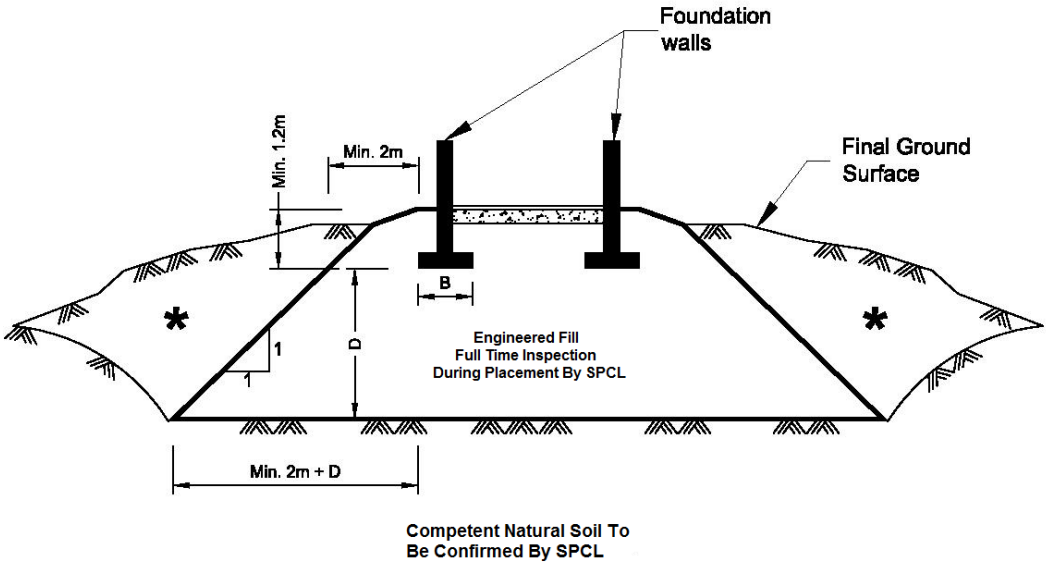
10. After completion of the engineered fill pad a second contractor may be selected to install footings. The prepared footing bases must be evaluated by engineering staff from SPCL prior to footing concrete placements. All excavations must be backfilled under full time supervision by SPCL to the same degree as the engineered fill pad. Surface water cannot be allowed to pond in excavations or to be trapped in clear stone backfill. Clear stone backfill can only be used with the approval of SPCL.

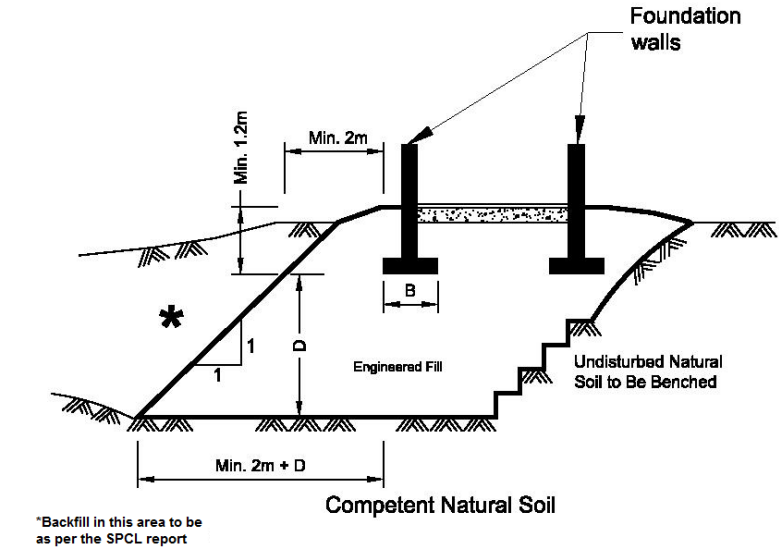
11. After completion of compaction, the surface of the engineered fill pad must be protected from disturbance from traffic, rain and frost. During the course of fill placement, the engineered fill must be smooth-graded, proof-rolled and sloped/crowned at the end of each day, prior to weekends and any stoppage in work in order to promote rapid runoff of rainwater and to avoid any ponding surface water. Any stockpiles of fill intended for use as engineered fill must also be smooth-bladed to promote runoff and/or protected from excessive moisture take up.

12. If there is a delay in construction, the engineered fill pad must be inspected and accepted by the geotechnical engineer. The location of the structure must be reconfirmed that it remains within the pad.

13. The geometry of the engineered fill as illustrated in these General Requirements is general in nature. Each project will have its own unique requirements. For example, if perimeter sidewalks are to be constructed around the building, then the projection of the engineered fill beyond the foundation wall may need to be greater.

14. These guidelines are to be read in conjunction with Sirati & Partners Consultants Limited (SPCL) report attached.


Foundation walls
Final Ground Surface
Min. 1.2m
Min. 2m
B
D
1
1
Engineered Fill
Full Time Inspection
During Placement By SPCL
Min. 2m + D
Competent Natural Soil To
Be Confirmed By SPCL


Foundation walls
Min. 1.2m
Min. 2m
B
D
1
1
Engineered Fill
Undisturbed Natural Soil to Be Benched
Min. 2m + D
Competent Natural Soil
*Backfill in this area to be as per the SPCL report

Appendix C: Limitation and Use of the Report

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to Sirati & Partners Consultants Limited (SPCL) at the time of preparation. Unless otherwise agreed in writing by SPCL, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the borehole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the boreholes may differ from those encountered at the borehole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the borehole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc. Professional judgement was exercised in gathering and analyzing data and formulation of recommendations using current industry guidelines and standards. Similar to all professional persons rendering advice, SPCL cannot act as absolute insurer of the conclusion we have reached. No additional warranty or representation, expressed or implied, is included or intended in this report other than stated herein the report.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of boreholes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. SPCL accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time. Any user of this report specifically denies any right to claims against the Consultant, Sub-Consultants, their officers, agents and employees in excess of the fee paid for professional services.

SPCL engagement hereunder is subject to and condition upon, that SPCL not being required by the Client, or any other third party to provide evidence or testimony in any legal proceedings pertaining to this finding of this report, or providing litigations support services which may arise to be required in respect of the work produced herein by SPCL. It is prohibited to publish, release or disclose to any third party the report produced by SPCL pursuant to this engagement and such report is produced solely for the Client own internal purposes and which shall remain the confidential proprietary property of SPCL for use by the Client, within the context of the work agreement. The Client will and does hereby remise and forever absolutely release SPCL, its directors, officers, agents and shareholders of and from any and all claims, obligations, liabilities, expenses, costs, charges or other demands or requirements of any nature pertaining to the report produced by SPCL hereunder. The Client will not commence any claims against any Person who may make a claim against SPCL in respect of work produced under this engagement.