GEOTECHNICAL INVESTIGATION
FEASIBILITY STUDY & SLOPE STABILITY ASSESSMENT
2L49 LAKESHORE ROAD
WAINFLEET, ONTARIO

Submitted To:

Robert McDowell

[redacted]

Attention: Mr. Robert McDowell

Submitted by:

AMEC Earth & Environmental,
A division of AMEC Americas Limited
3300 Merrittville Highway, Unit 5
Thorold, Ontario
Canada, L2V 4Y6

November 2010
TG103046B

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APPENDIX A

1. AUTHORIZATION

Authorization to proceed with this investigation was received from Mr. Robert McDowell, in a signed Professional Service Agreement, dated September 13, 2010.

2. INTRODUCTION

AMEC Earth & Environmental, a division of AMEC Americas Limited ('AMEC'), has been retained to carry out a geotechnical investigation for the feasibility study and slope assessment at 2L49 Lakeshore Road in Wainfleet, Ontario. The site is shown on the Site Location Plan appended as Figure 1.

The investigation obtained subsurface information relating to the project site by means of sampled boreholes. The data was gathered from this investigation and used to perform slope stability analysis and provide geotechnical engineering recommendations.

2.1 Site and Project Description

It is proposed to construct a one-storey dwelling with a full basement, as well as a septic system on the lot. The lot is currently vacant, with a gravelled driveway leading up from the north to the location of the proposed dwelling. There is a slope located to the west of the proposed dwelling area, as well as a steeper slope to the south towards the lake.

2.2 Terms of Reference

The findings of the investigation, together with AMEC's comments and recommendations, are presented in this report. The anticipated construction conditions are also discussed but only to the extent that they may influence the design decisions. Any construction methods discussed express AMEC's opinions only and are not intended to direct contractors on how to carry out the construction. Contractors should also be aware that the data and the interpretation presented in this report may not be sufficient to assess all the factors that may have an effect on construction.

This report was prepared with the assumption that the design will be in accordance with applicable standards and codes, regulations of authorities having jurisdiction, and good engineering practices.

Further, the recommendations and opinions expressed in this report are only applicable to the proposed project as described above.

An ongoing liaison with AMEC must be maintained during both the design and construction phases of the project to ensure that the recommendations in this report have been interpreted and implemented correctly. Also, if any further clarification and/or elaboration are needed concerning the geotechnical aspects of this project, AMEC should be contacted immediately.

2.3 Geological Setting

Preliminary Map P796, Geological Series, Quaternary Geology of the Welland Area, Southern Ontario indicates that the native soils consist of Lake Erie beach sand and gravel, and dune sand.

3. FIELD AND LABORATORY INVESTIGATION

The investigation was carried out to obtain information about the soils at this site by means of sampled boreholes and laboratory testing.

3.1 Field Work

A total of 4 sampled boreholes were drilled on September 20th, 2010. Borehole 1 and 2 were located in the vicinity of the proposed dwelling footprint, as close to the top of the slopes as possible, and drilled to depths of 9.8 and 9.6 m, respectively. The other 2 boreholes were drilled at the proposed septic system location and drilled to depths of 3.1 and 5.2 m (Boreholes 3 and 4, respectively). The approximate locations of the boreholes are shown on the Borehole Location Plan on Figure 2 in Appendix A.

The boreholes were put down using a truck-mounted drilling rig equipped with 150 mm solid stem augers. Samples were recovered from the overburden soil by driving a standard split spoon-sampling device. In-situ testing was carried out in these boreholes to determine the relative density/consistency of the soils, in accordance with the requirements of the Standard Penetration Test (SPT) according to ASTM D1586.

Prior to carrying out any fieldwork, the appropriate utility companies were notified to carry out underground service clearances at the borehole locations. As well, a private utility locator was hired to locate privately-owned utilities.

Upon recovery, all of the samples retrieved were examined and placed in appropriate containers and returned to AMEC's laboratory for further examination and water content determinations. AMEC personnel supervised the fieldwork, performed preliminary sample identification and prepared field borehole logs. The ground surface elevations at the borehole locations were surveyed and referenced to a temporary benchmark (TBM) described as "the centreline of Lakeshore Road directly adjacent to the driveway of the property. According to the drawings supplied by Upper Canada Consultants entitled 'Sandhill Grading Plan: 5115-GP1', this TBM had a geodetic elevation of 178.0 m. Please note that the supplied topographical plans were completed in 1986. The road grade may have changed since that time. For the purposes of this report, we will assume that the road grade has not changed.

3.2 Physical Laboratory Work

The soil samples were returned to our laboratory for visual examination and classification. Moisture content determinations on each of the soil samples were performed. One grain-size analysis of the native soil was also conducted. The result was compared to the OBC Supplementary Standard SB-6 which estimate the permeability of the soil based on grain-size

distribution. The sewage system appraisal is discussed in a separate report entitled 'Sanitary Sewage Appraisal – Proposed Residence – 2L49 Lakeshore Road, Township of Wainfleet, Ontario".

All soil samples will be stored for 3 months after completion of this report. The samples will then be discarded unless AMEC is instructed otherwise.

4. SUBSURFACE CONDITIONS

Descriptions of the soils encountered at each location during this investigation can be found on the Logs of Boreholes 1 through 4 in Appendix A. It should be noted that the soil conditions are based on soils encountered at the borehole locations, which may vary between and beyond the locations. The following is a brief summary of those conditions.

Fill

Approximately 50 to 100 mm of silty topsoil was encountered in the boreholes with the exception of Borehole 2, where dark brown sandy silt fill was encountered at the surface. Red-brown sandy silt fill was also found underlying the topsoil in Borehole 1. The sandy silt contained traces of gravel and asphalt pieces.

Underlying the topsoil in Boreholes 3 and 4, dark brown silty clay fill was encountered, which was generally mottled and contained traces of gravel.

The fill extended to an approximate depth of 0.2 m below existing grade in all of the boreholes.

Sand

Underlying the Fill, light-brown sand was encountered. This layer extended to at least the maximum depth investigated in the boreholes.

The sand was generally fine-grained. SPT tests gave 'N' values ranging from 4 blows for 0.3 m to 50 blows for 0.15 m, indicating loose to very dense relative denseness. An isolated value of 2 blows for 0.3 m (very loose) was encountered in Borehole 1 at a depth of 4.6 m. Natural moisture contents were between 2 and 7 %

The result of one grain size analysis can be found on Figure 3 in Appendix A and is summarized below.

	Depth (m)	Particle Size Distribution			
		>4.75mm	75µm to 4.75mm	2µm to 75µm	<2µm
BH3	1.5 to 2.0	0%	100%	0%	0%

Groundwater:

Upon completion, all of the boreholes remained open and dry.

5. DISCUSSION AND RECOMMENDATIONS

It is understood that it is proposed to construct a one-storey dwelling with a full basement, as well as a septic system on the lot. The results of the site-specific geotechnical investigation indicate that the native soil consists very loose to very dense fine-grained sand.

5.1 Preliminary Foundation Design

The native sand is considered suitable for foundation support in its undisturbed state. Due to the inconsistencies of the denseness of the sand, surface compaction will be required prior to forming for the foundation concrete. The proposed founding surface should be inspected and compacted to 100% of its Standard Proctor Maximum Dry Density (SPMDD, ASTM D698).

Conventional spread and/or strip footings founded on the compacted native sand may be designed using a factored ultimate limit state (ULS) bearing value of 120 kPa and service limit state (SLS) bearing value of 80 kPa. These bearing values are conservative and preliminary. AMEC should be contacted once foundation designs are available.

The total settlement beneath any footing is anticipated to be less than 25 mm. This is the normally used settlement criterion. Differential settlement between footings will typically be about half of the estimated total settlement.

If spread foundations are stepped up or down, AMEC recommends that they be stepped at a maximum vertical distance of 0.5 m for each 1.0 m horizontal run of footing (1V:2H). Stepped strip footings should be constructed in accordance with the 2006 Ontario Building Code (OBC), Section 9.15.3.9.

Depending upon the conditions encountered during construction, areas of localized deepening of footings may be required. It may be more economical to dig to an appropriate foundation bearing level and use a thicker footing (or mass fill beneath the standard footing with a lean concrete) than to step down the footing and foundation wall.

The footings should be covered with a minimum of 1.2 metres of overburden soil (or equivalent insulation) below the exterior finished grade in order to provide for frost protection.

In conformance to the criteria in Table 4.1.8.4A, Part 4, Division B of the National Building Code (NBC 2005), the project site is classified as Site Class "E – Soft Soil".

5.2 Excavations and Groundwater during Construction

No significant problems are anticipated during excavation through the upper overburden soils, provided ground water conditions during construction are similar to those encountered during the investigation.

All excavations must comply with the Occupational Health & Safety Act and Regulations for Construction Projects (OHSARCP). The side slopes of any excavations through the overburden, deeper than 1.2 metres, must be sloped as outlined in the Act. Based on the criteria in the Act, all fills and the native sand must be considered as Type 3 soils.

All excavations must comply with the Occupational Health & Safety Act and Regulations for Construction Projects (OHSARCP). The side slopes of any excavations through the overburden, deeper than 1.2 metres, must be sloped as outlined in the Act. Based on the criteria in the Act, all fills and the native sand must be considered as Type 3 soils.

If the groundwater conditions at the time of the construction are significantly different than described in this report, the soils classifications could change and the excavation requirements would need to be revised.

In general, temporary excavation side slopes of 1 vertical to 1 horizontal are expected to remain stable through the overburden. All surface drainage should be directed away from any open excavations and trenches.

5.3 Slope Stability Assessment

A professional engineer from AMEC carried out a site visit on September 22, 2010 to review the conditions of the slopes located at the south west end of the subject property.

Two slopes were noted in the proposed house site (to the west and to the south). The west slope is located within the adjacent property (3L53) and was found to be approximately 8 m high. The south slope was found to be approximately 9 m high and sloping towards the lake shore. Rock blocks were placed at the bottom of the south slope (presumably) for lake erosion protection. A significant erosion channel (gully) appears to have occurred close to the south west corner of the property with a depth of approximately 0.5 m. The gulley is probably formed from surface runoff. No scarps or seepage were observed from the slope face.

The subsurface soils consist of fine sand which is considered susceptible to erosion. It is obvious however, that there is instability due to erosion of the upper slope soils. Leaning trees were noted on the west slope and on the south slope of the adjacent property (2L47), also indicating some shallow instability. There are no trees and/or healthy vegetation covering on the south slope which is either due to erosion or previous excavation associated with the construction of the subdivision to the west. The rate of the erosion depends both on the amount of surface runoff and also on the wind transporting the surface soils. It will be significantly worse with the lack of non-erodable surface soils and/or vegetation to anchor the slope soils in place.

A new topographic survey of the subject property was carried by Rasch & Hyde Ltd on November 4, 2010. While there are two main slopes on site as noted above, the excavation for the house construction will result in additional slope of concern between the site and the adjacent property to the east. The critical slip surfaces (AA', BB' & CC') of the three slopes and the result of the new topographic survey are shown on Figure 4 enclosed in Appendix A. The west, south and east slopes were found to be as steep as approximately 1.9H:1V, 1.5H:1V and 2.2H:1V, respectively.

The subsurface conditions, the existing ground surface elevations taken from the updated topographic survey (November 2010) and an assumed building apron grade of 186.25 m were used in a SLOPE/W computer program to determine the factors of safety for the current slope.

Bishop and Janbu methods were used for the slope stability analyses. The factor of safety against deep seated slope failure of the south slope was found to be 1.1. This is considerably less than 1.5 which is considered to be an acceptable value. A copy of the computer printout of the south slope stability analysis is shown on Figure 5 enclosed in Appendix A.

AMEC recommends maintaining slopes not steeper than 2:1 which will provide safety factor of 1.5. A combination of a retaining wall and 2:1 slopes can be use to substitute for the portion of the slope that is steeper than 2:1. The pre-construction stable top of bank according to 2:1 criterion is drawn on Figure 4.

For erosion protection, a layer of clayey materials and vegetation cover should be used to stop the sand weathering due to the wind effect. In addition, proper grading should be utilized to discourage concentrated runoff above the slope.

5.4 Construction Feasibility

Based on the subsurface conditions and the slope stability assessment, conventional footings such as spread or strip footings are feasible. Spread or strip footings at the south side of the building envelope area should be founded at an elevation of 183.6 m or lower. All other footings should be placed below an upward 3H:1V line from the south side of the building envelope to the north starting from an elevation of 183.6 m.

If walk-out basement option is approved for the south slope, it will permit utilizing the area of the top portion of the slope as a backyard. Assuming the top of bank of the walkout backyard has an elevation of 184.0 m, the corresponding post-construction stable top of bank is also drawn on Figure 4.

Regarding the west slope, no issues are anticipated with its stability if the house is supported on conventional footings as described above.

Regarding the east slope, slope stabilities during three stages should be considered:

- Pre-construction or existing conditions during which no deep seated stability is anticipated.
- During construction: shoring for the excavation may be required if any settlement sensitive structure such as footings or concrete slabs of the adjacent property are located above a 2H:1V line projected from the bottom of the excavation.
- Post-construction: the slope will be less steep than 2H:1V, therefore, no stability issues are anticipated. However, the basement wall at the east of the building envelope should be designed as a retaining wall to support the higher finish grade to the east.

In summary and from an engineering standpoint, the construction of a single dwelling with a walk-out basement is feasible. It is advised, however, to check with the Township of Wainfleet and/or Niagara Peninsula Conservation Authority to determine where they will permit such development in relation to the slope.

6. CLOSURE

The Report Limitations given on the following page are an integral part of this report. The geotechnical aspects of the final design drawings and specifications should be reviewed by this office to confirm that the intent of this report has been met. During construction, sufficient subgrade inspections, excavation monitoring and materials testing should be carried out to confirm that the conditions exposed are consistent with those encountered in the boreholes and to monitor conformance to the pertinent project specifications.

We trust that this report is complete within our present terms of reference. If you have any questions, please do not hesitate to contact our office.

Yours truly,

AMEC EARTH & ENVIRONMENTAL

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Geotechnical Engineer

Reviewed By:

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REPORT LIMITATIONS

The conclusions and recommendations given in this report are based on information determined at the testhole locations. The information contained herein in no way reflects on the environmental aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Geotechnical Engineer be retained during the construction to confirm that the subsurface conditions across the site do not deviate materially from those encountered in the testholes.

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. Since all details of the design may not be known, we recommend that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

The comments made in this report relating to potential construction problems and possible methods of construction are intended only for the guidance of the designer. The number of testholes 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. No other warranty is expressed or implied.

The benchmark and elevations mentioned in this report were obtained strictly for use by this office in the geotechnical design of the project. They should not be used by any other party for any other purpose.

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. AMEC Americas Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

APPENDIX A

Reference: Base Map from http://www.mapquest.com

For Illustration Purposes Only. NOTE: All Location Approximate.

CLIENT: Robert McDowell

AMEC Earth & Environmental
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3300 Merrittville Hwy, Unit 5
Thorold, Ontario
L2V 4Y6

DWN BY:	DG
CHK'D BY:	KS
DATUM:	NAD 83
PROJECTION:	UTM Zone 17
SCALE:	UNKNOWN

PROJECT: GEOTECHNICAL INVESTIGATION
FEASIBILITY STUDY & SLOPE STABILITY ASSESSMENT
2L49 LAKESHORE ROAD
WAINFLEET, ONTARIO

TITLE: SITE LOCATION PLAN

REV. NO.:	A
DATE:	SEPTEMBER 2010
PROJECT NO.:	TG103046
FIGURE No.:	1

Reference: Base Map from Niagara Navigator.

For Illustration Purposes Only. NOTE: All Location Approximate.

CLIENT:
Robert McDowell

LEGEND:
SITE BOUNDARY
BH-1 BOREHOLE LOCATION

DWN BY: DG
CHK'D BY: KS
DATUM: NAD 83
PROJECTION: UTM Zone 17
SCALE: AS SHOWN

PROJECT:
GEOTECHNICAL INVESTIGATION
FEASIBILITY STUDY & SLOPE STABILITY ASSESSMENT
2L49 LAKESHORE ROAD
WAINFLEET, ONTARIO

TITLE:
SITE AND BOREHOLE PLAN

REV. NO.: A
DATE: SEPTEMBER 2010
PROJECT NO.: TG103046
FIGURE No.: 2

AMEC Earth & Environmental
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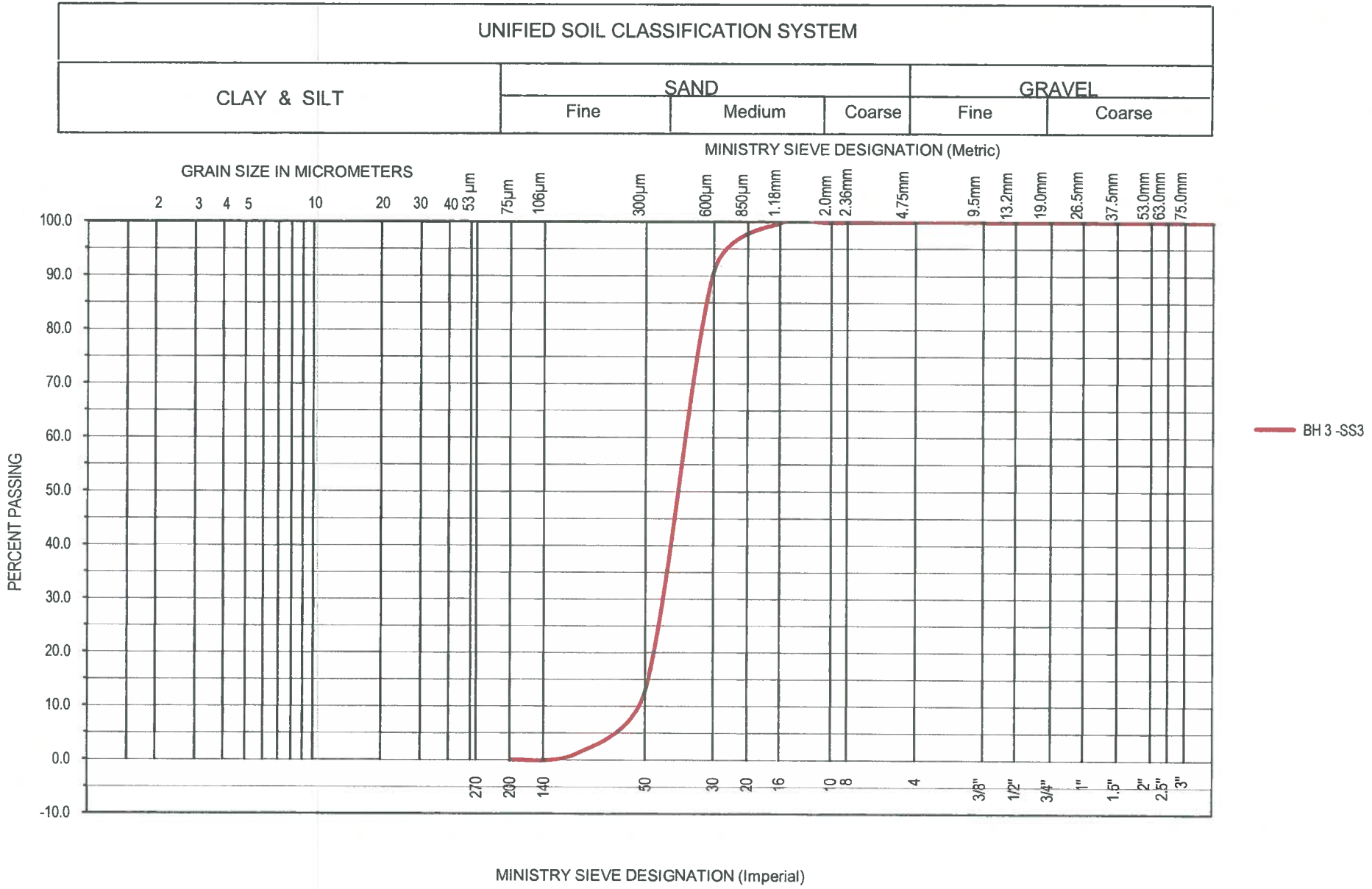
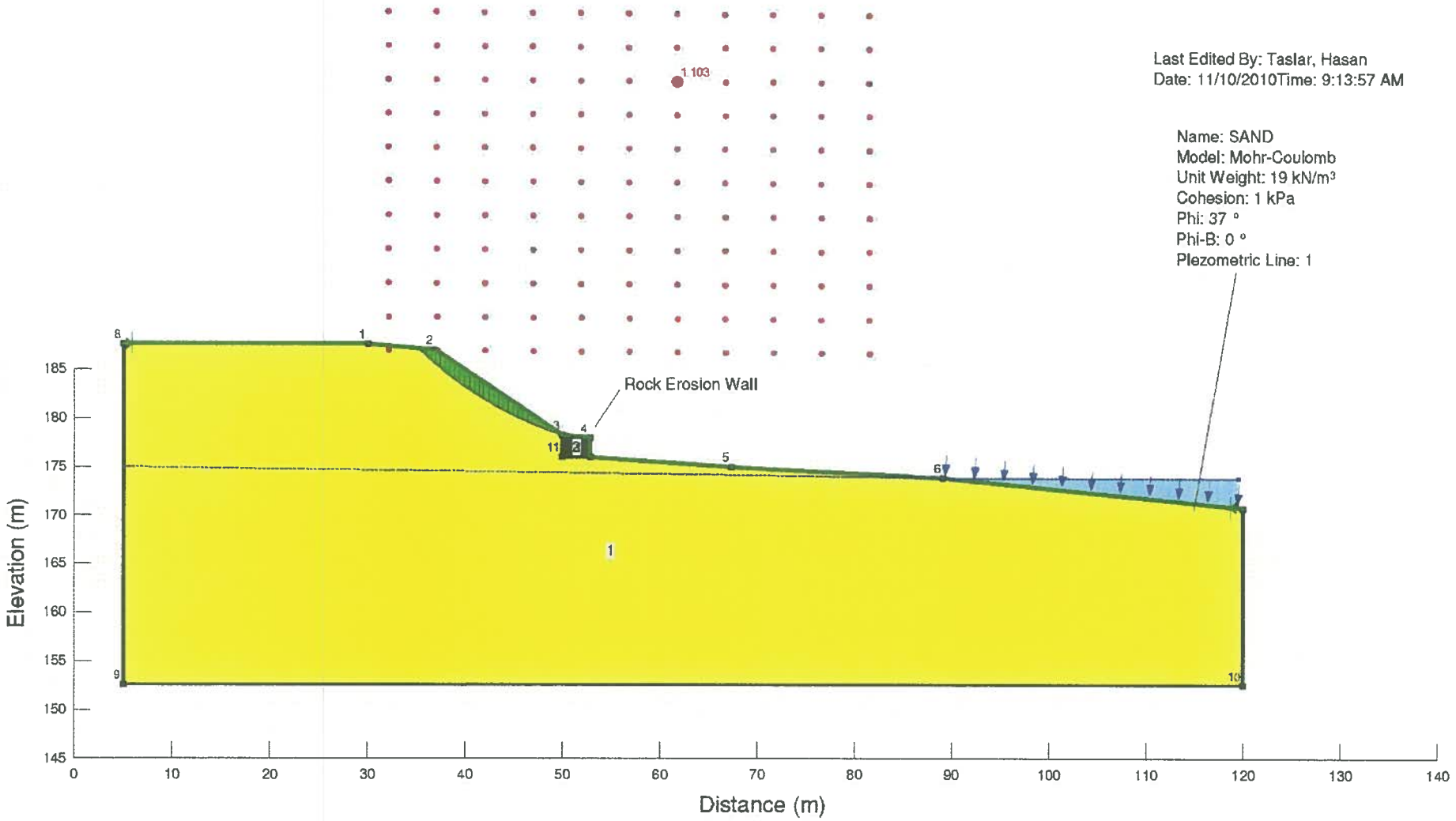


CLIENT: Robert McDowell	PREPARED BY: RD	PROJECT: Geotechnical Investigation, 2L49 Lakeshore Road, Wainfleet, Ontario	DATE: September 20, 2010
AMEC Earth & Environmental Limited, 3300 Merrittville Highway, Unit #5, Thorold, Ontario	CHECKED BY: PM	TITLE: Grain Size Distribution	PROJECT NO: TG103046
			FIGURE NO: 3

Pre-construction Slope Stability of the South Slope based on November, 2010 Survey (Section CC')



For Illustration Purposes Only. NOTE: All Location Approximate.

CLIENT: Robert McDowell

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L2V 4Y6

DWN BY:	NM
CHK'D BY:	PM
DATUM:	NAD 83
PROJECTION:	UTM Zone 17
SCALE:	AS SHOWN

PROJECT: GEOTECHNICAL INVESTIGATION
FEASIBILITY STUDY & SLOPE STABILITY ASSESSMENT
2L49 LAKESHORE ROAD
WAINFLEET, ONTARIO

TITLE: PRE-CONSTRUCTION SLOPE STABILITY OF SOUTH SLOPE

REV. NO.:	A
DATE:	NOVEMBER 2010
PROJECT NO.:	TG103046B
FIGURE No.:	5

GENERAL REPORT NOTES

DEFINITIONS OF PENETRATION RESISTANCE

Standard penetration resistance 'N': -- The number of blows required to advance a standard split spoon sampler 30 cm into the subsoil, driven by means of a 63.5 kg hammer falling freely a distance of 70 cm.

Dynamic penetration resistance: -- The number of blows required to advance a 50 mm, 60 degree cone, fitted to the end of drill rods, 30 cm into the subsoil, the driving energy being 475 Joules per blow.

SAMPLE TYPE ABBREVIATIONS USED IN BOREHOLE LOGS

S.S.	Split spoon	T.W.	Thinwall open	R.C.	Rock core
A.S.	Auger sample	T.P.	Thinwall piston	W.S.	Washed sample
P.H.	Sample pushed hydraulically			P.M.	Sample pushed manually

SOIL TEST SYMBOLS USED IN BOREHOLE LOGS

☐ Standard penetration resistance	▼ Laboratory vane	○ Unconfined compression
■ Dynamic penetration resistance	▲ Field vane	● Undrained triaxial
	× Penetrometer	S Sensitivity

CONVENTIONAL SOIL DESCRIPTIONS

COHESIVE (CLAYS ETC.)

Consistency	'N' blows/30cm	c kPa
Very Soft	0 - 2	0 - 12
Soft	2 - 4	12 - 25
Firm	4 - 8	25 - 50
Stiff	8 - 15	50 -100
Very Stiff	15 - 30	100 -200
Hard	>30	> 200

GRANULAR (SANDS ETC.)

Denseness	'N' blows/30 cm
Very Loose	0 - 4
Loose	4 - 10
Compact	10 - 30
Dense	30 - 50
Very Dense	>50

ABBREVIATIONS FOR MOISTURE CONDITIONS

sdtpl - slightly drier than the plastic limit.
dtpl - drier than the plastic limit.
apl - about the plastic limit.
swtpl - slightly wetter than the plastic limit.
wtpl - wetter than the plastic limit.
mwtpl - much wetter than the plastic limit.

NOTE

The soil conditions, profiles, comments, conclusions and recommendations found in this report are based upon the samples recovered during the field work. Soils are heterogeneous materials and, consequently, variations (possibly extreme) may be encountered at site locations away from boreholes. During construction, competent, qualified inspection personnel should verify that no significant variations exist from the conditions described in this report.

RECORD OF BOREHOLE No 1

1 OF 1

PROJECT Feasibility Study & Slope Stability Analysis LOCATION Refer to Borehole Location Plan (Figure 2) ORIGINATED BY KS

CLIENT Mr. Robert McDowell COMPILED BY KS

JOB NO. TG103046 DATE 09/20/2010 CHECKED BY HT

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST □ / DYNAMIC PENETRATION TEST ■ — SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL ▲ FIELD VANE ❖ LAB VANE	WATER CONTENT (%)	OBSERVATIONS & REMARKS
185.2								10 20 30 40 50 / 100 200 300	20 40 60	
0.0 185.0	**FILL** - 50mm **Topsoil,** over red-brown **Sandy Silt** with some Gravel.		1	SS	64		0			
0.2	Light brown **SAND,** fine grained, trace iron staining, loose to compact, moist.		2	SS	7		1			
			3	SS	10		2			
			4	SS	13		3			
			5	SS	8		4			
	Very loose at 4.6 m±.		6	SS	2		5			
			7	SS	11		6			
			8	SS	22		7			
			9	SS	11		8			
175.5 9.8	**Borehole Terminated.**						9			Upon completion: Borehole dry and open.

RECORD OF BOREHOLE No 2

1 OF 1

PROJECT Feasibility Study & Slope Stability Analysis LOCATION Refer to Borehole Location Plan (Figure 2) ORIGINATED BY KS

CLIENT Mr. Robert McDowell COMPILED BY KS

JOB NO. TG103046 DATE 09/20/2010 CHECKED BY HT

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST □ / DYNAMIC PENETRATION TEST ■ 10 20 30 40 50 SHEAR STRENGTH (kPa) ○ UNCONFINED ▲ FIELD VANE ● QUICK TRIAXIAL ✥ LAB VANE 100 200 300	WATER CONTENT (%) 20 40 60	OBSERVATIONS & REMARKS
185.0										
184.8 0.0	**FILL** - 180mm dark brown **Sandy Silt** with Gravel and Asphalt pieces.		1	SS	11		0			
184.6 0.2	Light brown **SAND,** fine grained, compact to very dense with depth, moist.		2	SS	12		1			
			3	SS	12		2			
			4	SS	13		3			
			5	SS	17		4			
			6	SS	18		5			
			7	SS	33		6			
			8	SS	34		7			
							8			
175.4 9.6	**Borehole Terminated.**		9	SS	50/15cm		9			Upon completion: Borehole dry and open.

RECORD OF BOREHOLE No 3

1 OF 1

PROJECT Feasibility Study & Slope Stability Analysis LOCATION Refer to Borehole Location Plan (Figure 2) ORIGINATED BY KS

CLIENT Mr. Robert McDowell COMPILED BY KS

JOB NO. TG103046 DATE 09/20/2010 CHECKED BY HT

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST □ / DYNAMIC PENETRATION TEST ■ (10 20 30 40 50) / SHEAR STRENGTH (kPa) ○ UNCONFINED ▲ FIELD VANE ● QUICK TRIAXIAL ✥ LAB VANE (100 200 300)	WATER CONTENT (%) (20 40 60)	OBSERVATIONS & REMARKS
183.1										
183.0	**FILL** - 80mm **Topsoil,**									
0.2	over 80mm dark brown **Silty Clay,** mottled, dtpl.		1	SS	10					
	Light brown **SAND,** fine grained, compact to loose with depth, moist.		2	SS	17		1			
			3	SS	8					
			4	SS	5		2			
			5	SS	7					
180.1							3			
3.1	**Borehole Terminated.**									Upon completion: Borehole dry and open.

RECORD OF BOREHOLE No 4

1 OF 1

PROJECT Feasibility Study & Slope Stability Analysis LOCATION Refer to Borehole Location Plan (Figure 2) ORIGINATED BY KS

CLIENT Mr. Robert McDowell COMPILED BY KS

JOB NO. TG103046 DATE 09/20/2010 CHECKED BY HT

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	DEPTH (m)	STANDARD PENETRATION TEST □ / DYNAMIC PENETRATION TEST ■ (10 20 30 40 50) SHEAR STRENGTH (kPa) ○ UNCONFINED ▲ FIELD VANE ● QUICK TRIAXIAL ✥ LAB VANE (100 200 300)	WATER CONTENT (%) (20 40 60)	OBSERVATIONS & REMARKS
181.3 0.0 181.1 0.2	**FILL** - 100mm **Topsoil,** over 100mm dark brown **Silty Clay,** mottled, trace Gravel, dtpl.		1	SS	10		1			
	Light brown **SAND,** fine grained, very loose to compact, moist.		2	SS	7					
			3	SS	5		2			
			4	SS	4					
			5	SS	4		3			
							4			
176.1 5.2	**Borehole Terminated.**		6	SS	14		5			Upon completion: Borehole dry and open.