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SOLICITATION AMENDMENT
MODIFICATION DE L'INVITATION

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Title - Sujet Hampton Harbour Approach	
Solicitation No. - N° de l'invitation EB144-192089/A	**Amendment No. - N° modif.** 004
Client Reference No. - N° de référence du client EB144-19-2089	**Date** 2018-11-28
GETS Reference No. - N° de référence de SEAG PW-$PWA-110-5819	
File No. - N° de dossier PWA-8-80086 (110)	**CCC No./N° CCC - FMS No./N° VME**
Solicitation Closes - L'invitation prend fin **at - à 02:00 PM** **on - le 2018-12-04**	**Time Zone** **Fuseau horaire** Atlantic Standard Time AST
F.O.B. - F.A.B. **Plant-Usine:** ☐ **Destination:** ☑ **Other-Autre:** ☐	
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La modification 004 vise à intégrer les éléments suivants :

Supprimer dans son intégralité :
Rapport géotechnique précédente

Insérer :
Rapport géotechnique révisée

TOUTES LES AUTRES MODALITÉS ET CONDITIONS DEMEURENT LES MÊMES.

GEOTECHNICAL INVESTIGATION
HAMPTON WHARF
HAMPTON, NOVA SCOTIA

Submitted to:

Public Works and Government Services Canada
1713 Bedford Row
Halifax, Nova Scotia □□□1T□

Submitted by:

Amec □o□ter □ □ee□er □n□ronment □ □nfr□□tructure
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1 INTRODUCTION

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2 PROJECT AND SITE DESCRIPTION

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3 INVESTIGATION PROCEDURE

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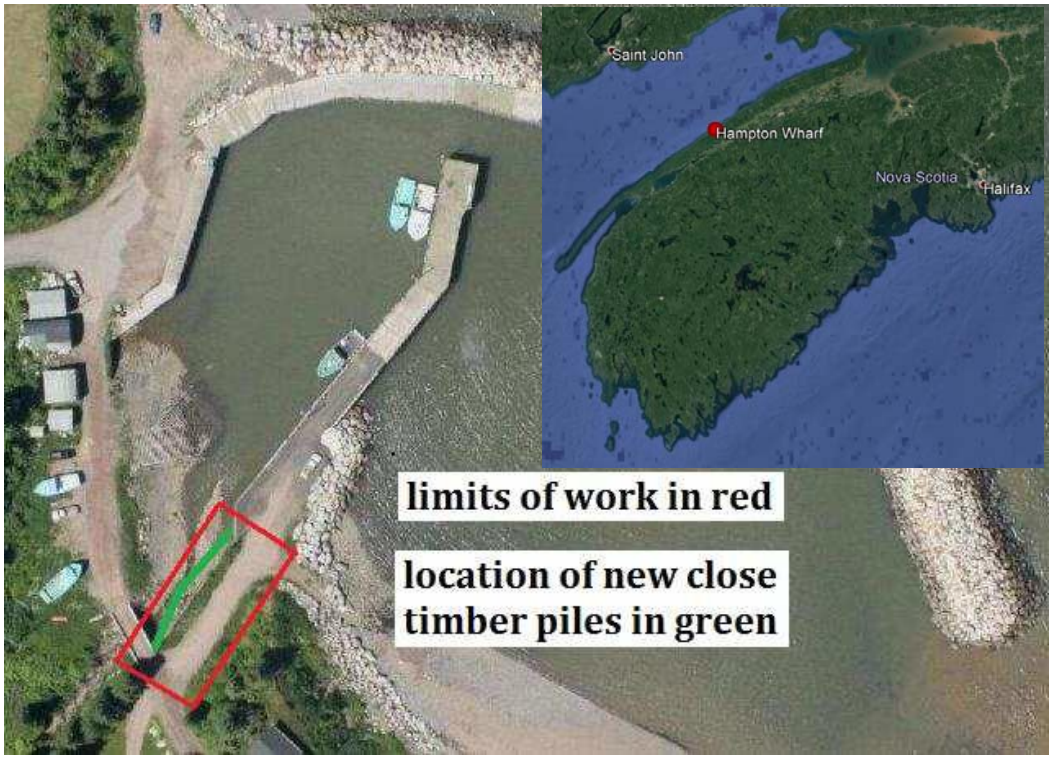

Figure 1: Site Location and Project Layout

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4 SUBSURFACE CONDITIONS

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4.1 Silty Sand with Cobbles

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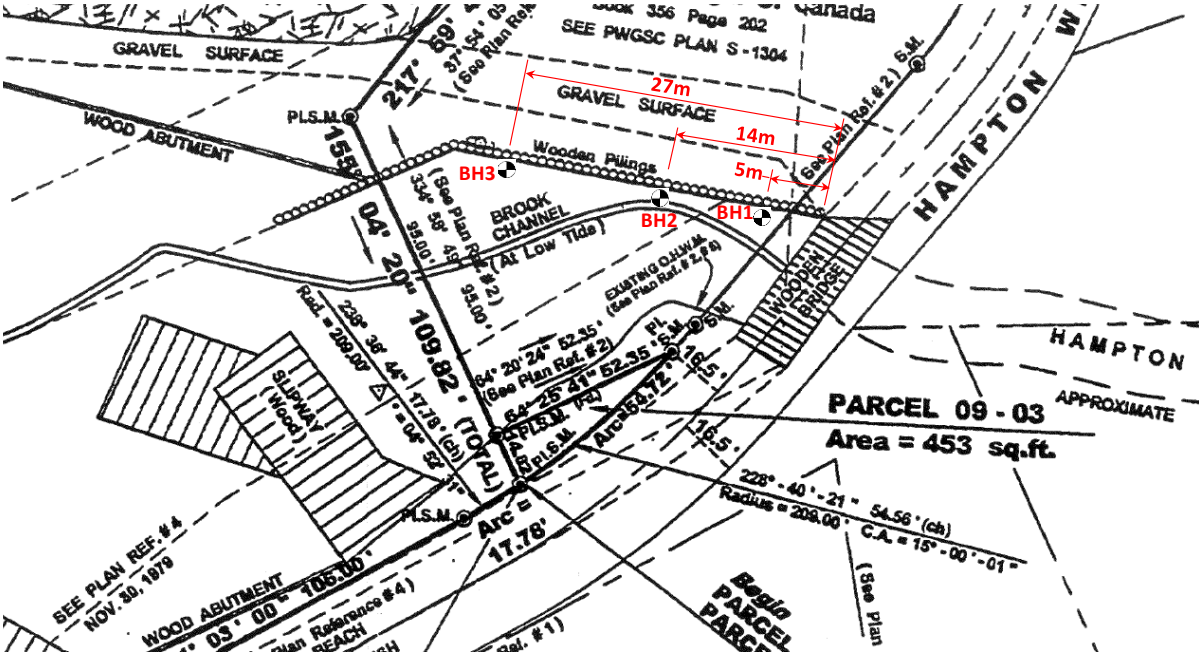

Figure 2: Borehole Location Plan

Measured ‘N’ values in this layer ranged from □ to □□□ □ndic□tin□ □ □er□ loo□e to com□□ct com□□ctne□□ condition□T□e □□□□ N □□ue □□ □ttributed to t□e □re□ence of cobb□e□□

4.2 Sandy Silty Clay

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4.3 Sandy Clay

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4.4 Inferred Bedrock

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4.5 Groundwater Conditions

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5 DESIGN RECOMMENDATIONS

5.1 General

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5.2 Timber Piles

5.2.1 Structural Design

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5.2.2 Penetration Depth

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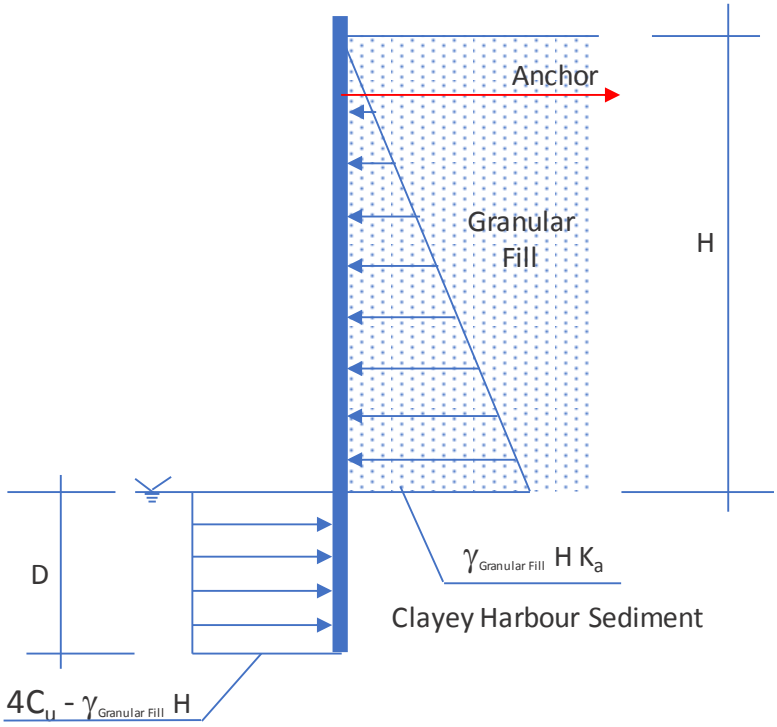

Figure 3. Schematic lateral pressure distribution on anchored sheet pile wall in clay

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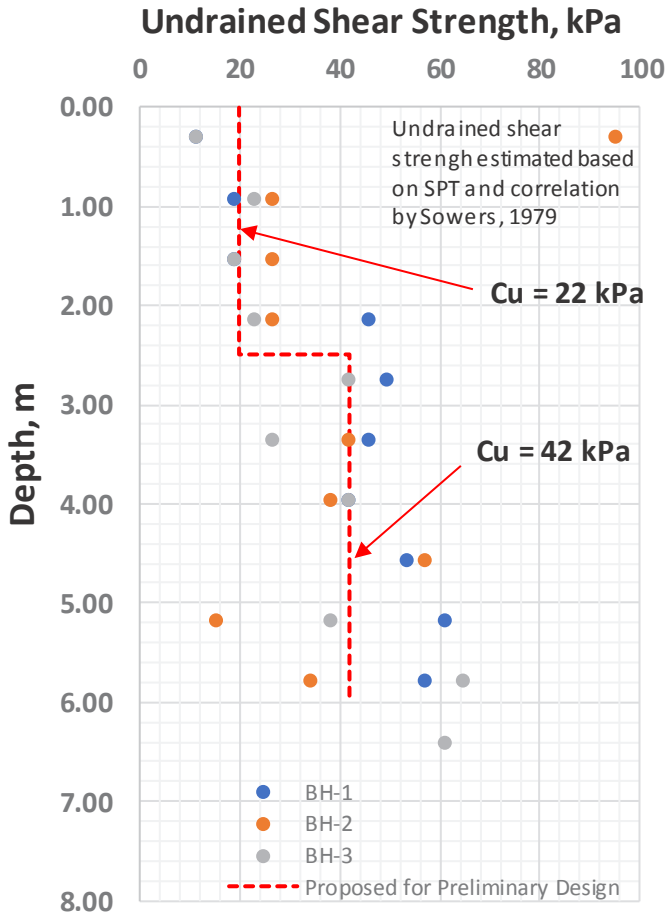

Figure 4. Proposed undrained shear strength of harbour sediment

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5.2.3 Negative Friction (down drag)

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5.2.4 Installation of Timber Piles

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5.3 New Granular fill

5.3.1 Fill Gradation

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5.3.2 Consolidation Settlement under the New Fill

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6 CLOSURE

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AMEC Foster Wheeler Environment & Infrastructure
A division of AMEC Foster Wheeler Americas Limited

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APPENDIX A

BOREHOLE LOGS

GENERAL REPORT NOTES

STANDARD PENETRATION TEST—SPT

The standard penetration values are recorded on the Borehole Records as N values. The N values are the number of blows required to advance a standard, 50 mm diameter, split spoon sampler a distance of 305 mm into the soil using a 63.5 kg hammer freely falling a distance of 760 mm.

DYNAMIC CONE PENETRATION TEST----DCPT

This is a similar procedure to that used in driving a standard 50 mm split spoon sampler except that a cone is driven rather than a soil sampler. A variety of cones can be used. Often the cones are 51 mm diameter with a 60 degree taper from the tip.

SAMPLE TYPE ABBREVIATION USED ON BOREHOLE LOGS

S.S.	Split spoon	S. H.	Shelby tube	W.S.	Wash sample
A.S.	Auger sample	R. C.	Rock Core	P.	Sample pushed

SOIL DESCRIPTION

The standard terminology to describe cohesionless soils includes the compactness condition as generally determined by the SPT.

The standard terminology to describe cohesive soils includes the consistency, which is based on various methods of determining undrained shear strength, and by SPT

Cohesionless Soils.		**Cohesive Soils**		
Compactness Condition	N Values	Consistency	N Values	Undrained Shear Strength, kPa
Very loose	0 – 4	Very soft	0 – 2	< 12.5
Loose	4 – 10	Soft	2 – 4	12.5 - 25
Compact	10 – 30	Firm	4 – 8	25 – 50
Dense	30 – 50	Stiff	8 – 15	50 - 100
Very Dense	> 50	Very stiff	15 – 30	100 – 200
		Hard	>30	>200

NOTE

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

LOG OF BOREHOLE BH1

PROJECT No.:	**TV177001**	ELEVATION:	**---**
CLIENT:	**PWGSC**	DATUM:	
PROJECT NAME:	**PRO Delhaven & Hampton**	METHOD:	**SS / Auger**
LOCATION:	**Hampton Warf**	DIAMETER:	**100 mm**
DATE DRILLED:	**9-14-17**	WATER LEVEL:	
LOGGED BY:	**A. Gale**	CONTRACTOR:	**Nova Drilling**

amec foster wheeler

DEPTH (m)	ELEVATION (m)	STRATIGRAPHIC DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE or RQD%	SAMPLES OTHER TESTS
0		Red / Brown, silty SAND with cobbles, small boulders and clay			SS	1	25	3	
		Red / Brown, sandy silty CLAY (CL-ML)			SS	2	500	5	
1					SS	3	425	5	
					SS	4	600	12	S, L, M
2					SS	5	225	13	
					SS	6	225	12	
3					SS	7	600	11	
					SS	8	450	14	
4					SS	9	250	16	
					SS	10	450	15	
5					SS	11	200	77 / 400mm	
		Inferred Grey, sand stone bedrock			AU				
6		End of Borehole @ 6.7 m							

UNDRAINED SHEAR STRENGTH (kPa) △ Peak ▲Residual — 20 40 60 80

STANDARD PENETRATION TEST Blows/0.3m — 20 40 60 80 >>

PLASTIC LIMIT W_P — NATURAL MOISTURE CONTENT W — LIQUID LIMIT W_L

WATER CONTENT (%) — 10 20 30

GEOTECHNICAL BOREHOLE TV177001_HAMPTON WHARF.GPJ AMEC HALIFAX.GDT 10/18/17

LOG OF BOREHOLE BH2

PROJECT No.:	**TV177001**	ELEVATION:	**---**
CLIENT:	**PWGSC**	DATUM:	
PROJECT NAME:	**PRO Delhaven & Hampton**	METHOD:	**SS / Auger**
LOCATION:	**Hampton Warf**	DIAMETER:	**100 mm**
DATE DRILLED:	**9-14-17**	WATER LEVEL:	
LOGGED BY:	**A. Gale**	CONTRACTOR:	**Nova Drilling**

amec foster wheeler

DEPTH (m)	ELEVATION (m)	STRATIGRAPHIC DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE or RQD%	SAMPLES OTHER TESTS
0		Red / Brown, silty SAND with cobbles, small boulders and clay			SS	1	100	25	
					SS	2	325	7	
1		Red / Brown, sandy silty CLAY (CL-ML)			SS	3	325	7	
					SS	4	500	7	
2					AU				
					SS	5	25	11	
3					SS		0	10	
					SS	6	350	15	
4					SS	7	300	4	
					SS	8	450	9	
5									
6		Red / Brown, sandy CLAY with occasional cobbles			AU				
7									
8		End of Borehole @ 8.8 m							

UNDRAINED SHEAR STRENGTH (kPa) — △ Peak ▲Residual — 20 40 60 80

STANDARD PENETRATION TEST Blows/0.3m — 20 40 60 80

PLASTIC LIMIT W_P — NATURAL MOISTURE CONTENT W — LIQUID LIMIT W_L

WATER CONTENT (%) — 10 20 30

GEOTECHNICAL BOREHOLE TV177001_HAMPTON WHARF.GPJ AMEC HALIFAX.GDT 10/18/17

LOG OF BOREHOLE BH3

PROJECT No.:	**TV177001**	ELEVATION:	**---**
CLIENT:	**PWGSC**	DATUM:	
PROJECT NAME:	**PRO Delhaven & Hampton**	METHOD:	**SS / Auger**
LOCATION:	**Hampton Warf**	DIAMETER:	**100 mm**
DATE DRILLED:	**9-14-17**	WATER LEVEL:	
LOGGED BY:	**A. Gale**	CONTRACTOR:	**Nova Drilling**

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DEPTH (m)	ELEVATION (m)	STRATIGRAPHIC DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY (mm)	N-VALUE or RQD%	OTHER TESTS
0		Red / Brown, silty SAND with cobbles, small boulders and clay			SS	1	100	3	
		Red / Brown, sandy silty CLAY (CL-ML)			SS	2	125	6	
1					SS	3	600	5	
					SS	4	375	6	
2					SS	5	225	11	
					SS	6	125	7	
3					SS	7	125	11	
					AU	8			
4					SS	9	250	10	
					SS	10	500	17	S, M
5					SS	11	400	16	
6		End of Borehole @ 6.7 m							

UNDRAINED SHEAR STRENGTH (kPa) — △ Peak ▲Residual — 20 40 60 80

STANDARD PENETRATION TEST Blows/0.3m — 20 40 60 80

PLASTIC LIMIT — NATURAL MOISTURE CONTENT — LIQUID LIMIT

W_P — W — W_L

WATER CONTENT (%) — 10 20 30

GEOTECHNICAL BOREHOLE TV177001_HAMPTON WHARF.GPJ AMEC HALIFAX.GDT 10/18/17

APPENDIX B

LAB TEST RESULTS

Appendix B. Summary of Laboratory Results

Project No.: TV177001
Client: PWGSC
Project Name: PRO Delhaven & Hampton
Location: Hampton Warf

GENERAL INFORMATION:

Number of BH/TP: 3
Total Length of Drilling: 22.3 m

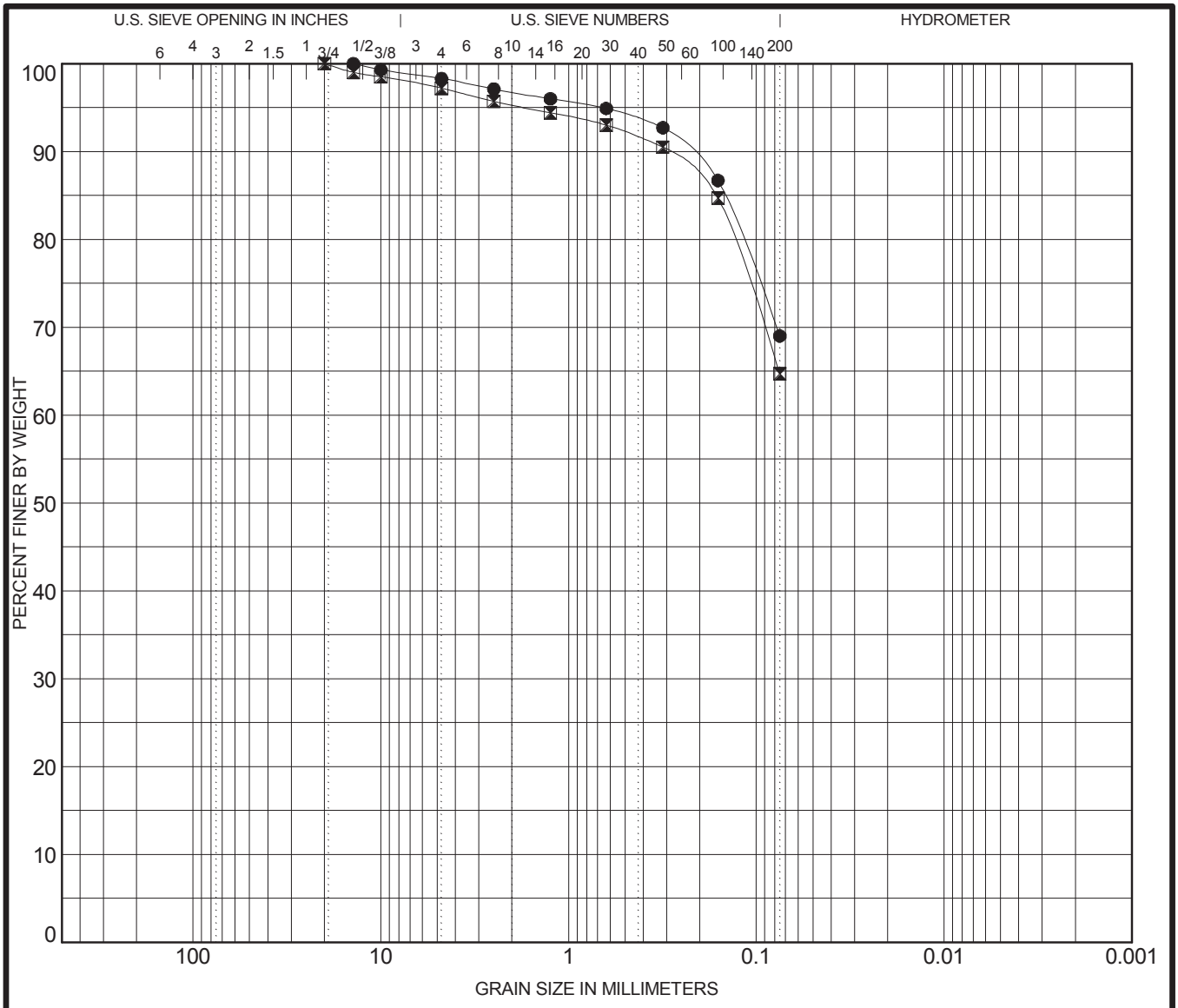
SAMPLING:

Auger Cuttings 4
Split Spoon 30

LAB TEST STATISTICS:

Moisture Content: 2
Atterberg Limits: 1
Sieve Analysis: 2
Hydrometer Analysis: 0

Borehole	Depth (m)	Liquid Limit	Plastic Limit	Plasticity Index	% Gravel	% Sand	% Silt and Clay	Class-ification	Water Content (%)	Dry Density (Mg/m^3)	Void Ratio
BH1	2.13	20	13	7	1.7	29.3	69.0	CL-ML	20.0		
BH3	5.79				2.8	32.5	64.7	CL-ML	18.1		



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● **BH1**	**2.13 m**	**SANDY SILTY CLAY(CL-ML)**	**20**	**13**	**7**		
⊠ **BH3**	**5.79 m**	**SANDY SILTY CLAY(CL-ML)**					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **BH1**	**2.13 m**	**14**				**1.7**	**29.3**	**69.0**	
⊠ **BH3**	**5.79 m**	**20**				**2.8**	**32.5**	**64.7**	

GRAIN SIZE DISTRIBUTION

Project No.: TV177001
Client: PWGSC
Project Name: PRO Delhaven & Hampton
Location: Hampton Warf

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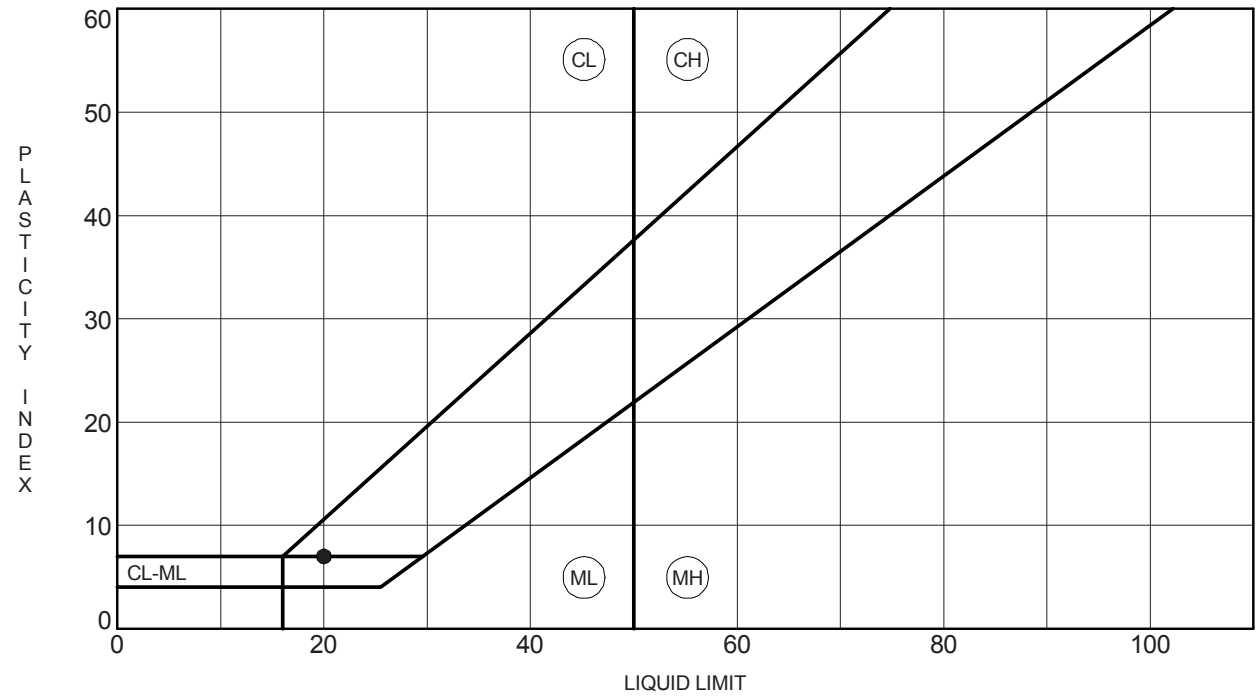
GRAIN SIZE TV177001 HAMPTON WHARF.GPJ AMEC HALIFAX.GDT 10/18/17



Specimen Identification	LL	PL	PI	Fines	Classification
● **BH1 2.13 m**	**20**	**13**	**7**	**69**	**SANDY SILTY CLAY(CL-ML)**

ATTERBERG LIMITS' RESULTS (Appendix B)

Project No.: TV177001
Client: PWGSC
Project Name: PRO Delhaven & Hampton
Location: Hampton Warf

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CAN EM ATTERBERG LIMITS TV177001 HAMPTON WHARF.GPJ AMEC HALIFAX.GDT 10/18/17

APPENDIX C

REPORT LIMITATIONS

REPORT LIMITATIONS

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environmental aspect of the project unless otherwise stated. Subsurface and groundwater conditions between and beyond the test hole locations may differ from those encountered at the test hole locations and conditions may become apparent during construction which could not be detected or anticipated at the time of the site investigation or the recommendations presented herein may be revised or changed when 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 test holes.

The design recommendations given in this report are applicable only to the project described in the test and then only if constructed substantially in accordance with the details presented in this report. Since details of the design may not be known we recommend that we be retained during the final design to certify that the design is consistent with our recommendations and that any interpretations 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 test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, variations of subsurface conditions from the holes may occur. The contractor 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 practice. No other warranty is expressed or implied.

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 Foster Wheeler accepts no responsibility for damages suffered by any third party as a result of decisions made or actions based on this report.