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189 Prince William Street  
Room 405  
Saint John  
New Brunswick  
E2L 2B9

**SOLICITATION AMENDMENT**  
**MODIFICATION DE L'INVITATION**

The referenced document is hereby revised; unless otherwise indicated, all other terms and conditions of the Solicitation remain the same.

Ce document est par la présente révisé; sauf indication contraire, les modalités de l'invitation demeurent les mêmes.

Comments - Commentaires

Vendor/Firm Name and Address  
Raison sociale et adresse du  
fournisseur/de l'entrepreneur

**Issuing Office - Bureau de distribution**  
Public Works Government Services Canada- Bid  
Receiving / Réception des soumissions  
189 Prince William Street  
Room 405  
Saint John  
New Bruns  
E2L 2B9

<b>Title - Sujet</b> DFO Lameque, Wharf Reconstruction	
<b>Solicitation No. - N° de l'invitation</b> EC015-151659/A	<b>Amendment No. - N° modif.</b> 003
<b>Client Reference No. - N° de référence du client</b> R.068072/073056	<b>Date</b> 2014-12-29
<b>GETS Reference No. - N° de référence de SEAG</b> PW-\$PWB-004-3523	
<b>File No. - N° de dossier</b> PWB-4-37132 (004)	<b>CCC No./N° CCC - FMS No./N° VME</b>
<b>Solicitation Closes - L'invitation prend fin</b> <b>at - à 02:00 PM</b> <b>on - le 2015-01-13</b>	
<b>F.O.B. - F.A.B.</b> <b>Plant-Usine:</b> <input type="checkbox"/> <b>Destination:</b> <input checked="" type="checkbox"/> <b>Other-Autre:</b> <input type="checkbox"/>	
<b>Address Enquiries to: - Adresser toutes questions à:</b> Doucet, Gisele PWB	<b>Buyer Id - Id de l'acheteur</b> pwb004
<b>Telephone No. - N° de téléphone</b> (506) 636-4541 ( )	<b>FAX No. - N° de FAX</b> (506) 636-4376
<b>Destination - of Goods, Services, and Construction:</b> <b>Destination - des biens, services et construction:</b>	

Instructions: See Herein

Instructions: Voir aux présentes

<b>Delivery Required - Livraison exigée</b>	<b>Delivery Offered - Livraison proposée</b>
<b>Vendor/Firm Name and Address</b> <b>Raison sociale et adresse du fournisseur/de l'entrepreneur</b>	
<b>Telephone No. - N° de téléphone</b> <b>Facsimile No. - N° de télécopieur</b>	
<b>Name and title of person authorized to sign on behalf of Vendor/Firm</b> <b>(type or print)</b> <b>Nom et titre de la personne autorisée à signer au nom du fournisseur/</b> <b>de l'entrepreneur (taper ou écrire en caractères d'imprimerie)</b>	
<b>Signature</b>	<b>Date</b>

Solicitation No. - N° de l'invitation

EC015-151659/A

Client Ref. No. - N° de réf. du client

R.068072/073056

Amd. No. - N° de la modif.

003

File No. - N° du dossier

PWB-4-37132

Buyer ID - Id de l'acheteur

pwb004

CCC No./N° CCC - FMS No/ N° VME

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This Solicitation Amendment No. Three (3) is raised to include the following addendum no.3

The following addendum to the tender documents is effective immediately. This addendum shall form part of the contract documents.

All other terms and conditions remain the same.

Addendum 3.

**QUESTIONS AND ANSWERS**

- Q1: We would like to request for UCAN FR5 adhesive to be accepted as an equal to the listed products for above water. Section 03 30 00 clause 2.1.12, Anchorage Adhesive (Above Water): to ASTM C881/C881M, Type IV, Grade 3, Class A, B, and C. This product can be used both above or under water.
- A1: We have reviewed the technical data and find the proposed UCAN FR5 Adhesive to be an acceptable alternate to the listed products for above water.
- Q2: We request that UCAN FR5 epoxy adhesive be approved as an equal to Epcon Ceramic 6. Div 03 2.1.13.
- A2: The UCAN FR5 Epoxy Adhesive is also an acceptable alternate to Epcon Ceramic 6 as specified under Division 03 Art. 2.1.13.
- Q3: What is the composition of the seabed material to be excavated on wharf 408 on the harbour side, see plan M1/ of 18 section A-1/1?
- A3: The original referenced plans for Structure 408. are (Plan No. C-143 - 1959).  
  
These show boreholes No. 5, 6, 7, and 8 along the SSP wharf harbour side. Material description varies from a soft sand and silt to a silt and sand-packed, to a clay and sand packed at the level where excavation would be required.  
  
The contractor can view the existing drawings at PWGSC and it may be best for him to make his own assessment of conditions based on the referenced drawings.
- Q4: After reviewing the documentation I was unable to locate the quantity of H-Piles required. I did find that 118 units were required on the tender document but I am unsure of the unit of measure. Would it be meters?
- A4: The unit of measure is by unit.
- Q5: Drawing C1, there is no elevation showing the existing water line (at note 1), what elevation can we assume so we can have the correct length of valve box ordered?  
  
Drawing C2 detail below, we are missing line or info of all the pieces, where they go. Could you clarify? Is it all in HDPE? What is the fitting that goes below the main line? How do we connect everything up? Would we use a cross on the main line?  
  
Drawing C2 detail below, we are missing line or info of all the pieces, where they go. Could you clarify? Would we required any bedding for the services?
- A5: We don't know the depth of the existing watermain. It should be confirmed by the contractor. Should be approx. 1.8m standard depth.

All piping before the wharf are pvc dr18 and all piping on the wharf are hdpe as shown on C01.

All buried pipes shall have bedding including services.

- Q6: On drawing E3 and/or M16, there is no detail about the anchoring of the stud wall to the foundation. Could you specify and/or clarify?  
There is a location for insulation, and the wall seem offset from the side of the wall.
- A6: Install 12.7mm diameter galvanized anchors spaced at maximum 1200 mm on centre and at corners.  
  
Anchor to be embedded 300 mm into concrete, 50 mm clear from outside edge. Bottom to be hooked 50 mm.
- Q7: On drawing E3, the detail showing typical wall seems to indicate there could be a layer of gypsum board, but it is not indicated in the typical wall description. Could you check this up?
- A7: Gypsum board is not to be installed, just 19 mm marine grade plywood. See typical wall construction notes on page E3 of/de 11.
- Q8: Item number 11 on the "Bid and Acceptance Form" is 213 Type "A" precast concrete panels. We have reviewed the project drawings and can only count 211 Type "A" panels. Can you please confirm the correct number of the Type "A" panels.
- A8: There are 211 Type 'A' Panels. The unit price table shall be modified to reflect this quantity.
- Q9: Could we have more detail of the connection holding electrical system beneath wharf 411?
- A9: On wharf 411 conduit support details K-K and L-L are to be 13 mm threaded rods fastened to tap-con screws in concrete deck with channel supports on end of threaded rods to Section 26 05 29. Revise Section 26 05 29.3.1.8 so that all channel spacing is a maximum of 1.0 metres. All channels, rods, tap-con, and hardware are to be 316 grade stainless steel. Use double back-to-back channels in all cases for added strength.
- Q10: 1) On structure 406/409 there is no detail for the 325mm slab thickening at the electrical shrouds. I am wondering if there is additional reinforcing required similar to the 400mm slab thickenings detail D51/M17 or will the 15M @350 T&B E.W. deck reinforcing be sufficient in the 325mm slab thickenings?

2) On drawing E6 trench details F-F,G-G, & H-H show 20M @200 E.W.T&B which differs from the deck reinforcing shown in detail D38/M12 15M@350 E.W. T&B. Will the 20M be additional steel required at the conduit or will it replace the 15M at the conduit or is this just a typo?

3) Detail F-F on drawing E4 is cut in the section of wharf which will require new asphalt pavement however the detail for F-F on drawing E6 represents a reinforced concrete deck. Should this represent a buried concrete ductbank?

A10: 1) This is covered in the typical slab detail D38. Same reinforcing but increased clearance between top and bottom mats to allow for crossover of conduits.

2) This is a typo. Deck reinforcing is as per Structural drawings.

3) In areas to be paved, a buried electrical ductbank would be applicable.

Q11: Do you know if the geotech report as per drawing M18 is available? If not, is this something you could request?

A11: Please find enclosed the Geotechnical reports that would apply to this project. These cover the borehole logs shown on the plans.

Q12: On page M8 bottom right, there is a detail about a waler tie detail, do I consider that waler to be all long both side of the wharf? There is no more detail showing this piece.

A12: The locations and extent of the waler ties are as shown on drawing M6.



**REVISED Geotechnical Investigation  
North Wharf (Structure 406)**

Lamèque, New Brunswick  
12 August 2014

Prepared for Valron Engineers Inc.  
**Project No. 737.15-R01(Revised 2014)**





# GEMTEC

CONSULTING ENGINEERS  
AND SCIENTISTS

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12 August 2014

File: 737.15 – R01 (REVISED 2014)

Valron Engineers Inc.  
83 Botsford Street  
Moncton, NB  
E1C 4X2

Attention: Robert Vale, P.Eng

**Re: REVISED Geotechnical Investigation, North Wharf (Structure 406)  
Lamèque Wharf, New Brunswick**

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Enclosed is our REVISED geotechnical report for the above noted project. The elevations referenced in the report and on the attached borehole logs were adjusted by +0.53 metres to reflect chart datum as opposed to geodetic datum.

If you have any questions concerning this report or require further details, please contact the undersigned.



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Serge Bourque, M.Sc.E, P.Eng.  
GEMTEC Limited

SB/jml

Enclosures

N:\Files\0700\0737.15\2010jml0603R01 (REVISED 2014).doc



**REVISED Geotechnical Investigation  
North Wharf (Structure 406)  
Lamèque, New Brunswick**

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**REVISED Geotechnical Investigation  
North Wharf (Structure 406)  
Lamèque, New Brunswick**

## **1.0 Introduction**

GEMTEC Limited was retained by Valron Engineers Inc. to undertake a geotechnical investigation for the proposed replacement of the north wharf (structure 406) in Lamèque, New Brunswick. The proposed wharf design will consist of two Berlin Wall structures tied together with a slab-on-grade deck.

In order to assess the soil and bedrock conditions, eight boreholes (BH) were put down from 25 to 30 May 2010 using geotechnical drill rig mounted on a barge. Six boreholes were put down along the perimeter of the proposed wharf reconstruction and two were placed within the proposed land reclamation area. A cone penetration test (CPT) was also carried out within the inner harbour, adjacent to the wharf.

A site plan showing BH and CPT locations is presented in Figure 1. Boreholes were surveyed by GEMTEC Limited and reference Benchmark 90B9023, which has Chart Datum elevation of +4.259 metres.



## 2.0 Site Conditions

The existing wharf consists of a timber crib structure founded on timber piles with a concrete panel deck. The existing concrete deck elevation is at +2.89 metres±. The elevation at the bottom of the inner harbour, adjacent to the wharf, is at about -4.5 metres±. The elevation at the bottom of the outside face of the harbour ranges from -0.5 to -2.2 metres.

## 3.0 Soil and Bedrock Conditions

The soil and bedrock encountered generally consists of a layer of marine silt/sand underlain by glacial till to bedrock.

### 3.1 Soil

The compactness of the marine silt/sand ranges from very loose to medium based on standard penetration test (SPT) N-values that range from 0 to 17, averaging 4. The results of four moisture content and grain size analyses shows that the silt/sand layer has a natural moisture content that ranges from 18.1 to 69.4% averaging 33.2%, and contains 7 to 23% gravel, 23 to 68% sand and 10 to 71% silt and clay sized particles. Detailed laboratory index tests are appended (Appendix B).

The glacial till consists of reddish brown silt and sand with some gravel and sandstone cobbles. The till was encountered at depths ranging from 1.1 to 5.0 metres, averaging 2.4 metres below the harbour bottom. The compactness of the till ranges from loose to very dense based on SPT N-values that range from 7 to 60, averaging 22. The results of one moisture content and grain size analysis shows that the till layer has a natural moisture content of 12.6%, and contains 10% gravel, 37% sand and 53% silt and clay sized particles.

The result of the CPT test shows that the upper 1 metre (±) of soil below the harbour bottom is very loose based on a CPT tip stress of about 100 kPa. Below this, a medium to dense silt/sand was encountered with a tip stress of about 3500 kPa on average. Detailed CPT log is appended (Appendix A)

### 3.2 Bedrock

Weathered mudstone bedrock was encountered at depths ranging from 2.3 to 7.4 metres, averaging 4.1 metres below the harbour bottom. The mudstone quality is very poor based on rock quality designation (RQD) of 0%.

Siltstone bedrock was encountered at BH 1, 2, 3, and 6 at depths ranging from 3.94 to 6.83 metres, averaging 5.5 metres below the harbour bottom. The siltstone quality is very poor based on RQD of 0%.

Sandstone bedrock was encountered at depths ranging from 4.6 to 8.2 metres, averaging 6.7 metres below the harbour bottom. The sandstone quality is very poor to poor based on RQD values that range from 0 to 28%, averaging 10%.

Refer to borehole logs for detailed soil and bedrock stratigraphy (Appendix A)

Digital photos of the bedrock core samples are appended (Appendix C)

## 4.0 Discussion and Recommendations

We understand that the new wharf will consist of a double Berlin wall design. This design consists of steel H piles driven into bedrock with pre-cast concrete panels installed between the piles.

### Wharf Replacement

At this time we provide the following design recommendations:

- Steel H piles may be driven about 3 metres into the mudstone bedrock provide that piles are driven to refusal (i.e. > 10 blows per 25 mm) using a hammer with a rated energy of at least 2000 ft-lbs/in<sup>2</sup> of steel cross sectional area. In addition, piles should be equipped with a driving shoe.
- The highly weathered mudstone/siltstone/sandstone may behave as a stiff soil. For design purposes, the passive resistance of the bedrock could be estimated using an undrained shear strength ( $C_u$ ) of 150 kPa. In addition, the upper 1 metre of the bedrock should not be taken into account for passive resistance.
- The Berlin wall should be backfilled using NBDOT 75 mm minus crushed rock or gravel subbase placed in 300 mm thick lifts and compacted to 95% of the maximum dry density as determined by ASTM D698 (Standard Proctor).
- A 150 mm thick layer of NBDOT 31.5 mm minus crushed rock or gravel base should be placed directly below the slab-on-grade. This layer should be compacted to 95% of standard proctor.
- The friction angle and bulk unit weight of the compacted crushed rock backfill may be taken as 36 degrees and 22 kN/m<sup>3</sup>, respectively. Therefore, the active ( $K_a$ ), passive ( $K_p$ ) and at-rest ( $K_o$ ) pressure coefficients may be taken as;  $K_a = 0.26$ ,  $K_p = 2.43$  and  $K_o = 0.41$ .
- During construction, a geotechnical engineer should assess the bottom of the timber crib wharf excavation to ensure that the remaining timber crib and sandstone fill is suitable to support the new granular backfill. Some isolated settlement may occur if voids are

present within the existing sandstone fill or if the remaining timber crib decays significantly over the years. The reinforced concrete slab-on-grade deck should be designed to bridge some minor localized settlements.

### **Proposed Land Reclamation**

The harbour bottom at BH 1 and BH 2, within the proposed land reclamation area, is at elevation  $-0.6$  and  $-1.6$  metres, respectively. Therefore, about 3 to 4 metres of fill would be required to raise the area to elevation of  $+2.89$  metres (existing wharf deck).

Based on a 1.5 and 1.9 metre thick layer of loose to medium dense silt and sand at BH 1 and BH 2 we would anticipate about 150mm of settlement under fill loading.

For preliminary design purposes, we would recommend 3H:1V side sloped. The steepness of the slope is a function of the infill soil type and thickness. Once the design of the proposed land reclamation area is finalized, GEMTEC Ltd. would be pleased to review the stability of the final geometry.

We understand that others will design the armour stone.

## **5.0 General**

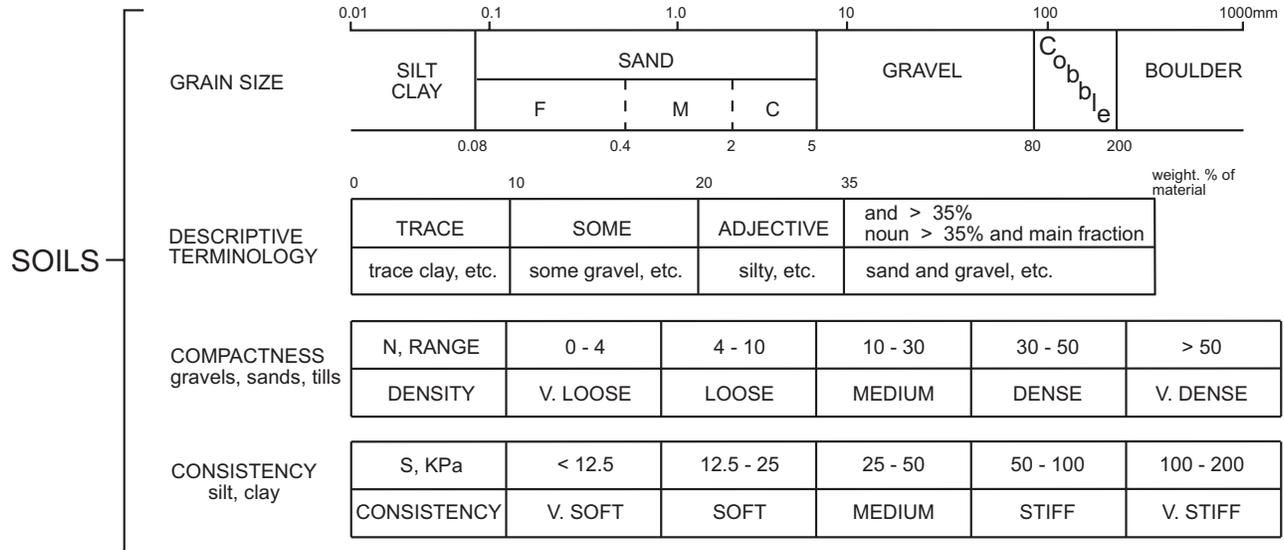
This report solely addresses the geotechnical aspects of the site and cannot be regarded as an environmental assessment of the site.

The boreholes and the CPT put down on this site were widely separated therefore soil and bedrock conditions may vary from those determined at the borehole locations. Although representative samples have been collected throughout the site, GEMTEC Limited should be contacted immediately if the soil and bedrock encountered during excavation differs from those encountered in our geotechnical investigation in order to reassess our recommendations.

## **Appendix A**

Descriptive Terms, CPT and Detailed Borehole Logs

## DESCRIPTIVE TERMS- BOREHOLE/TEST PIT LOG



**ROCK**

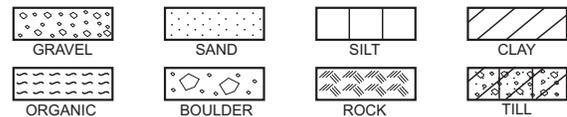
RQD	OVERALL QUALITY	FRACTURE SPACING
0 - 25	VERY POOR	VERY CLOSE 20 - 60 mm
25 - 50	POOR	CLOSE 60 - 200 mm
50 - 75	FAIR	MODERATE 200 - 600 mm
75 - 90	GOOD	WIDE 600 - 2000 mm
90 - 100	EXCELLENT	VERY WIDE 2 - 6 m

COMP. STR. MPa	1 - 5	5 - 25	25 - 50	50 - 100	100 - 250
DESCRIPTION	V. WEAK	WEAK	MODERATE	STRONG	V. STRONG

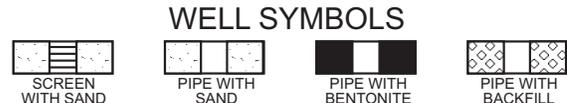
### SAMPLE TYPES (location to scale on log)

S SPLIT TUBE	G SHOVEL
T SHELBY TUBE	H CARVED BLOCK
P PISTON	K SLOTTED
F AUGER	V IN SITU VANE
W WASH	NR NO RECOVERY

### LOG SYMBOLS



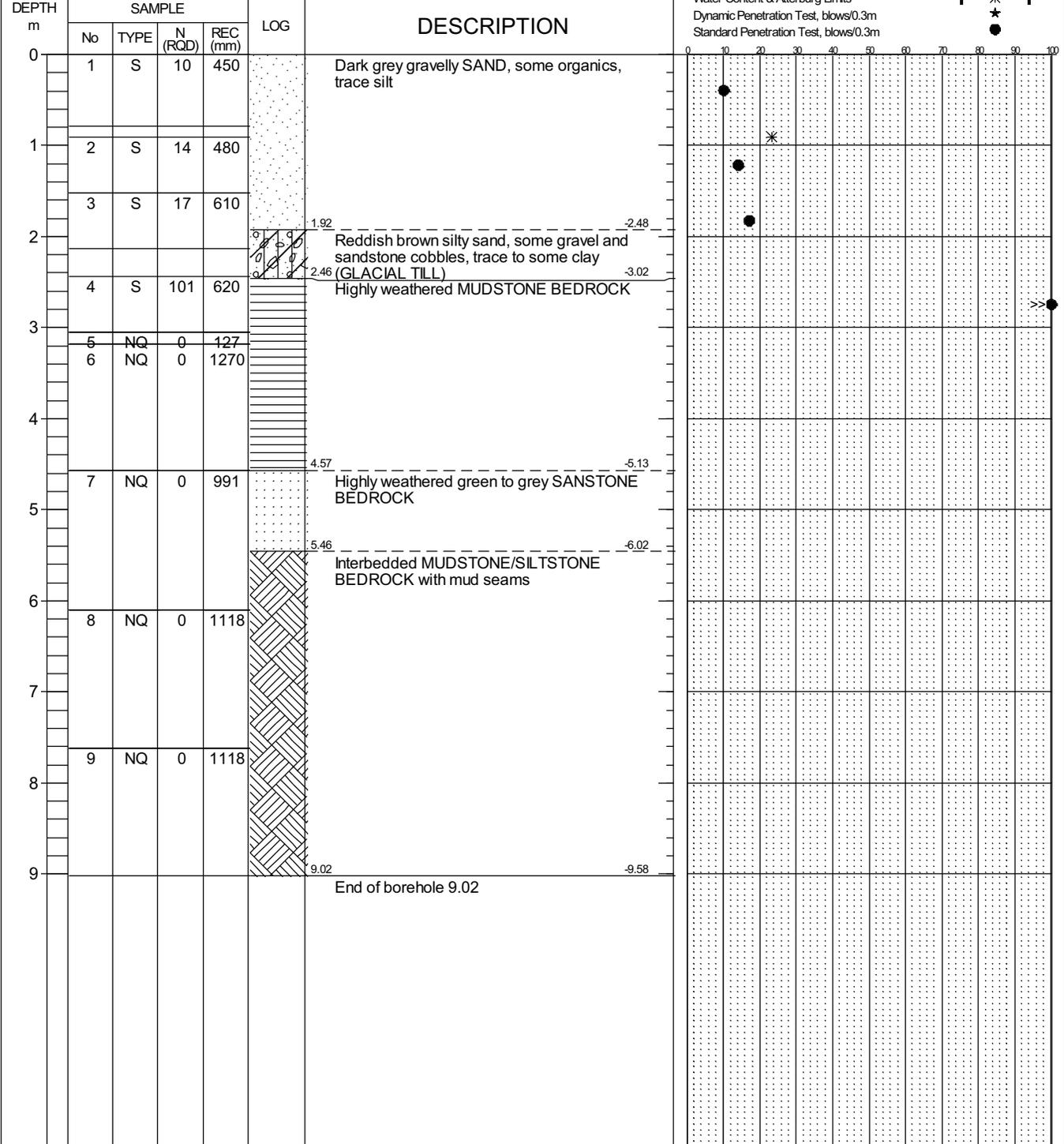
### ROCK CORES A(30mm); B(41mm); N(54mm)



- RECOVERY**
- N - standard penetration test; blows by 475 J drop hammer to advance Std. 50mm O.D. split tube sampler 0.3m
  - RQD - percent of core consisting of hard, sound pieces in excess of 100mm long (excluding machine breaks)
  - S - shear strength, kPa; vane  $\oplus$ ; penetrometer  $\blacksquare$ ; unconfined  $\circ$ ;  $U_c$  unconfined compressive strength
  - Sr - shear strength, remoulded; vane  $\otimes$ ; penetrometer  $\square$
  - Dd - dry density;  $t/m^3$
  - W - natural moisture content, percent \*
  - PL - plastic limit, percent  $\text{---}$
  - LL - liquid limit, percent  $\text{---}$
  - ND - non detect, total petroleum hydrocarbons (TPH) not detected in soil
- Groundwater Level  $\nabla$  ; Seepage  $\nabla$

Client	VALRON Engineers Inc	Proj No.	737.15	BOREHOLE
Project	Geotechnical Investigation - North Wharf (Structure 406)	Date Drilled	28.May.2010	BH 1
Location	Lameque Wharf, New Brunswick			Page 1 of 1

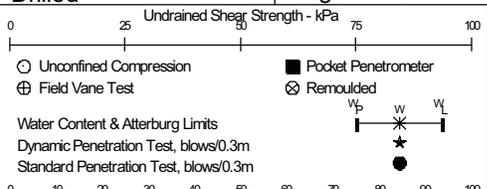
Ground Level, m	-0.56	Datum:	Chart	Logged By	TDS
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Client	VALRON Engineers Inc	Proj No.	737.15	BOREHOLE BH 2 Page 1 of 1
Project	Geotechnical Investigation - North Wharf (Structure 406)	Date Drilled	29.May.2010	
Location	Lameque Wharf, New Brunswick			

Ground Level, m	-1.57	Datum:	Chart	Logged By	TDS
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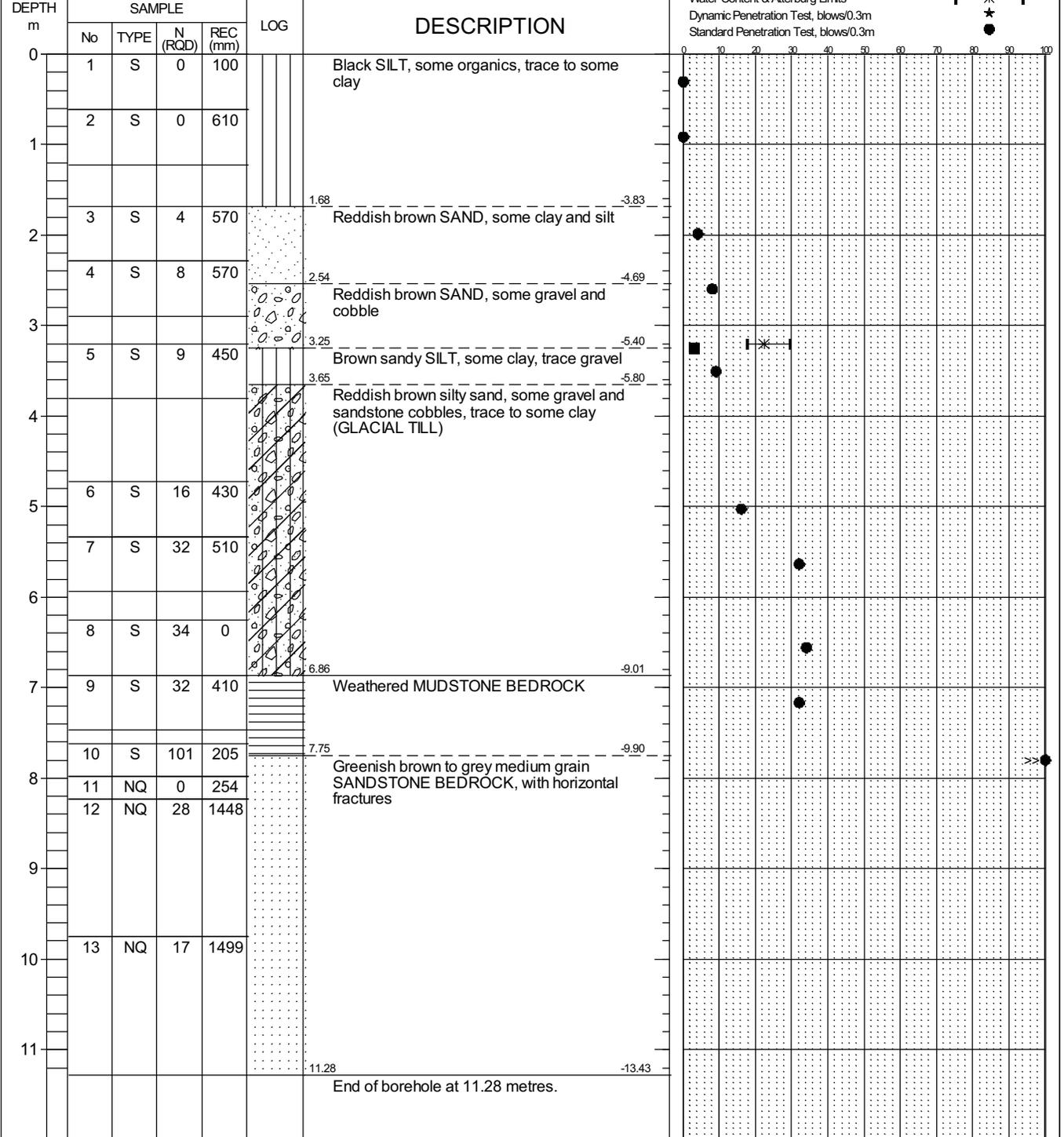
DEPTH m	SAMPLE				LOG	DESCRIPTION	Undrained Shear Strength - kPa	
	No	TYPE	N (RQD)	REC (mm)			0	100
0	1	S	0	300		Black SAND and SILT, some organics, trace gravel	0	0
1	2	S	2	580				
2	3	S	2	370				
2	4	S	40	410	1.50	Reddish brown silty sand, some clay and sandstone cobbles, trace gravel (GLACIAL TILL)		
3	5	S	77	305	2.30	Highly weathered MUDSTONE BEDROCK		
4	6	NQ	0	787				
5	7	NQ	0	813				
6	8	NQ	0	1270				
7					6.83	Highly weathered SILTSTONE BEDROCK		
8	9	NQ	13	1321	8.08	Grey, coarse grain SANDSTONE BEDROCK		
					8.99	End of borehole at 8.99 metres.		





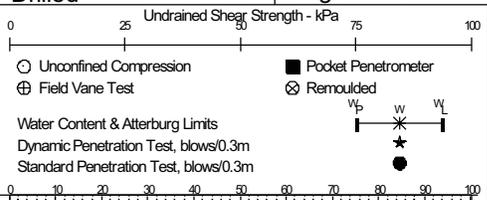
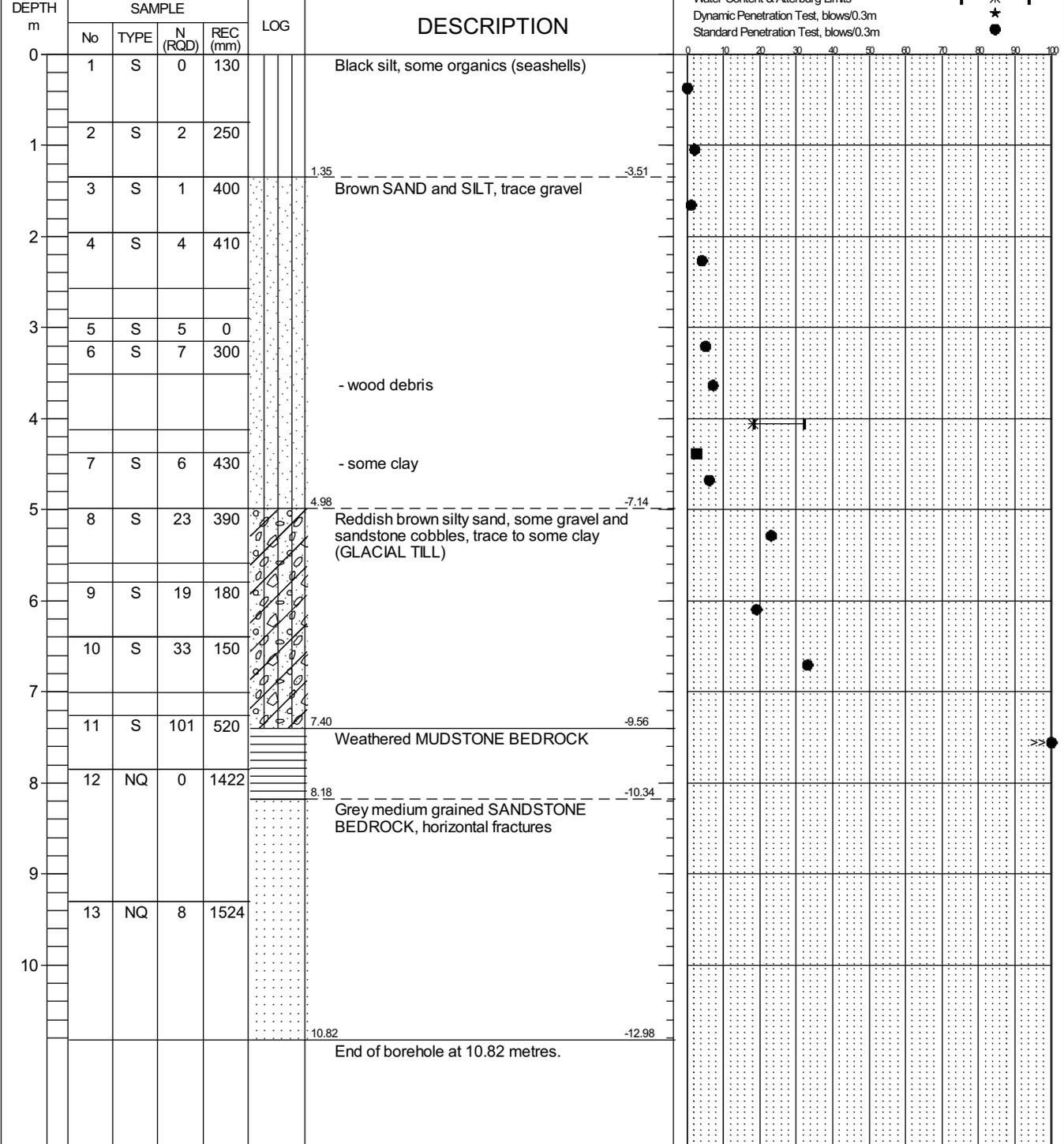
Client	VALRON Engineers Inc	Proj No.	737.15	BOREHOLE
Project	Geotechnical Investigation - North Wharf (Structure 406)	Date Drilled	28.May.2010	BH 4
Location	Lameque Wharf, New Brunswick			Page 1 of 1

Ground Level, m	-2.15	Datum:	Chart	Logged By	TDS
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Client	VALRON Engineers Inc	Proj No.	737.15	BOREHOLE BH 5 Page 1 of 1
Project	Geotechnical Investigation - North Wharf (Structure 406)	Date Drilled	29.May.2010	
Location	Lameque Wharf, New Brunswick			

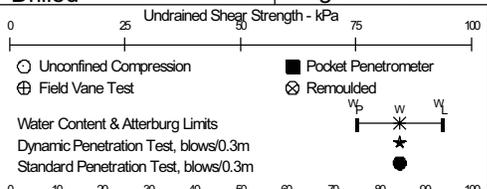
Ground Level, m	-2.16	Datum:	Chart	Logged By	TDS
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Client	VALRON Engineers Inc	Proj No.	737.15	BOREHOLE
Project	Geotechnical Investigation - North Wharf (Structure 406)	Date Drilled	27.May.2010	BH 6
Location	Lameque Wharf, New Brunswick			Page 1 of 1

Ground Level, m	Datum:	Chart	Logged By
-4.44			TDS

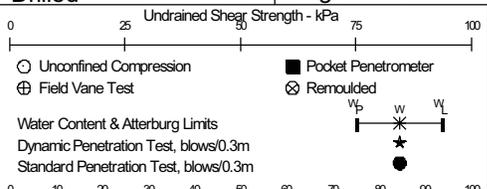
DEPTH m	SAMPLE				LOG	DESCRIPTION	TEST RESULTS							
	No	TYPE	N (RQD)	REC (mm)			UC	FVT	PP	Remoulded				
0	1	S	0	230		Black SILT, some organics								
1	2	S	7	370	1.07	Reddish brown silty sand, some gravel and sandstone cobble, trace to some clay (GLACIAL TILL)								
2	3	S	8	360										
	4	S	26	320										
3	5	S	44	300	2.87	Highly weathered MUDSTONE BEDROCK								
	6	S	101	200										
4	7	NQ	0	100	3.94	Highly weathered and fractured SILTSTONE BEDROCK								
	8	NQ	0	1016										
5					5.08	Highly weathered MUDSTONE BEDROCK								
	9	NQ	0	1448	5.39	Grey weathered SANDSTONE BEDROCK								
6														
7	10	NQ	0	1473	6.45	Grey SANDTONE BEDROCK with horizontal fractures								
8														
					8.26	End of borehole at 8.26 metres								



Client	VALRON Engineers Inc	Proj No.	737.15	BOREHOLE BH 7 Page 1 of 1
Project	Geotechnical Investigation - North Wharf (Structure 406)	Date Drilled	27.May.2010	
Location	Lameque Wharf, New Brunswick			

Ground Level, m	-4.41	Datum:	Chart	Logged By	TDS
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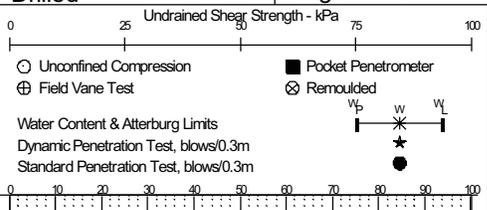
DEPTH m	SAMPLE				LOG	DESCRIPTION	Undrained Shear Strength - kPa													
	No	TYPE	N (RQD)	REC (mm)			0	25	50	75	100									
0	1	S	0	100		Black SILT, some organics														
1																				
2	2	S	13	370	1.52	Reddish brown silty sand, some gravel and sandstone cobble, trace to some clay (GLACIAL TILL)														
3	3	S	16	510																
4	4	S	27	260																
5	5	S	101	370																
6	6	NQ	0	381	3.86	Weathered MUDSTONE BEDROCK														
7	7	NQ	0	1092																
8	8	NQ	7	1524	6.47	Grey coarse to medium grained SANDSTONE BEDROCK														
9	9	NQ	0	1549																
8.94					8.94	End of borehole 8.94 metres.														



Client	VALRON Engineers Inc	Proj No.	737.15	BOREHOLE
Project	Geotechnical Investigation - North Wharf (Structure 406)	Date Drilled	26.May.2010	BH 8
Location	Lameque Wharf, New Brunswick			Page 1 of 1

Ground Level, m	-4.44	Datum:	Chart	Logged By	TDS
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DEPTH m	SAMPLE				LOG	DESCRIPTION	TEST RESULTS						
	No	TYPE	N (RQD)	REC (mm)			UC	FP	W	WL			
0	1	S	0	550		Black SILT, some organics (seashells and wood)							
1	2	S	1	260									
2	3	S	7	470		Reddish brown SAND, trace gravel							
	4	S	5	390		Light brown clayey SILT, some pebbles and gravel							
3	5	S	23	450		Reddish brown SILT and SAND, some gravel and sandstone cobbles, trace to some clay (GLACIAL TILL)							
4	6	S	60	400									
	7	S	24	410									
5	8	S	28	310									
	9	S	101	230									
6	10	NQ	0	580		Grey coarse to medium grained SANDSTONE BEDROCK							
	11	NQ	14	1470									
8	12	NQ	27	1520									
9						End of borehole at 9.45 metres.							



## **Appendix B**

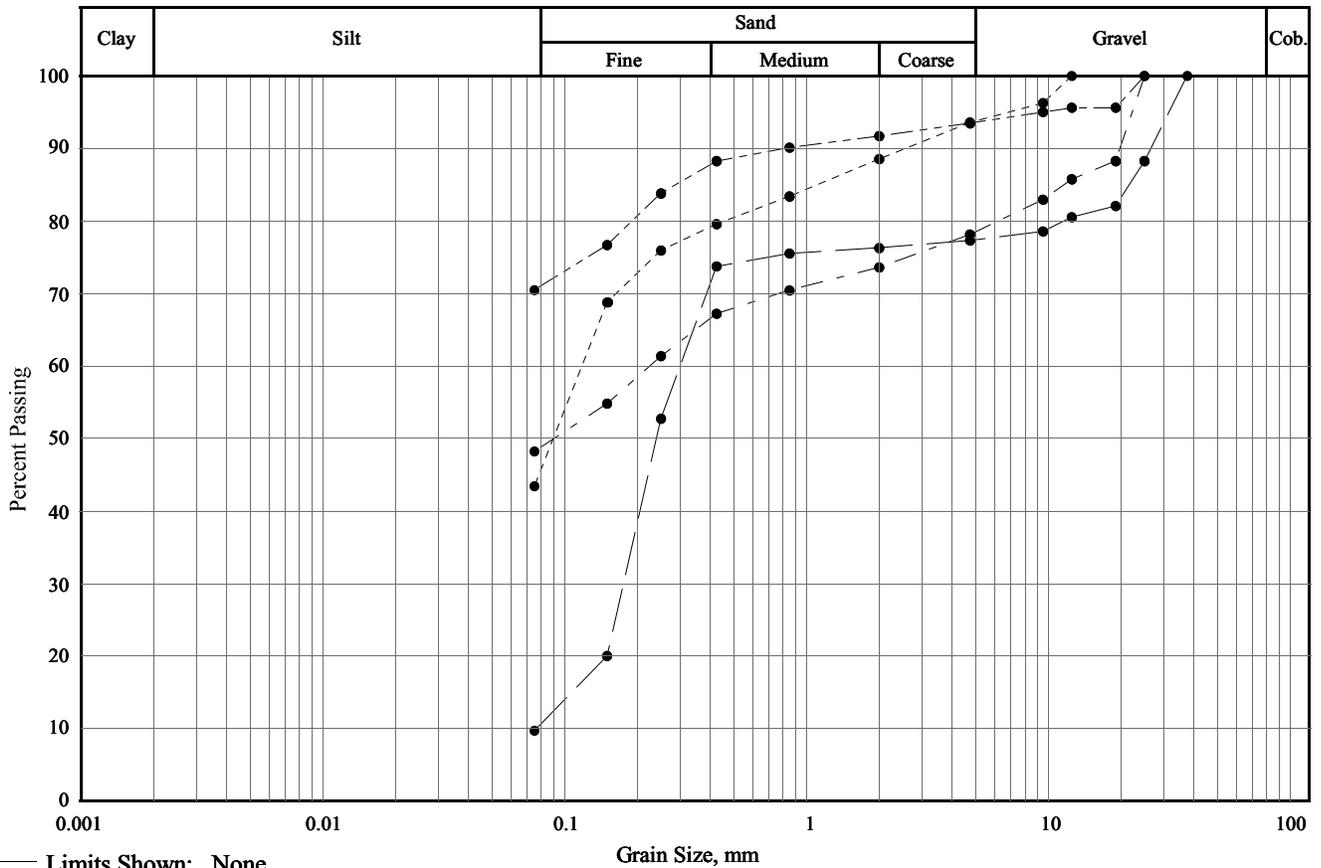
### Laboratory Index Test Results



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Client: VALRON Engineers Inc.  
Project: Geotechnical Investigation, Lamèque Wharf Structure No  
Project #: 073715

# Soils Grading Chart



Line Symbol	Description	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay	Date Sampled
— — — —		1	2	.91-1.52m	22.7	67.6	9.7		02/06/2010
- - - - -		2	2	.61-1.22m	6.5	50.1	43.4		02/06/2010
- . - . - .		3	6	3.05-3.66m	21.9	30.0	48.2		02/06/2010
. . . . .		4	5	3.20-3.81m	6.5	23.0	70.5		02/06/2010

Line Symbol	Sample Description	AASHTO	D <sub>10</sub>	D <sub>15</sub>	D <sub>50</sub>	D <sub>85</sub>	% 5-75µm
— — — —	Gravelly sand , trace silt	A-2-4	0.0765	0.1072	0.2397	21.6663	---
- - - - -	Sand and silt , trace gravel	A-4 to A-7	---	---	0.0898	1.1166	---
- . - . - .	Gravelly sandy silt	A-4 to A-7	---	---	0.0906	11.6437	---
. . . . .	Sandy silt , trace gravel	A-6(6)	---	---	---	0.2884	---





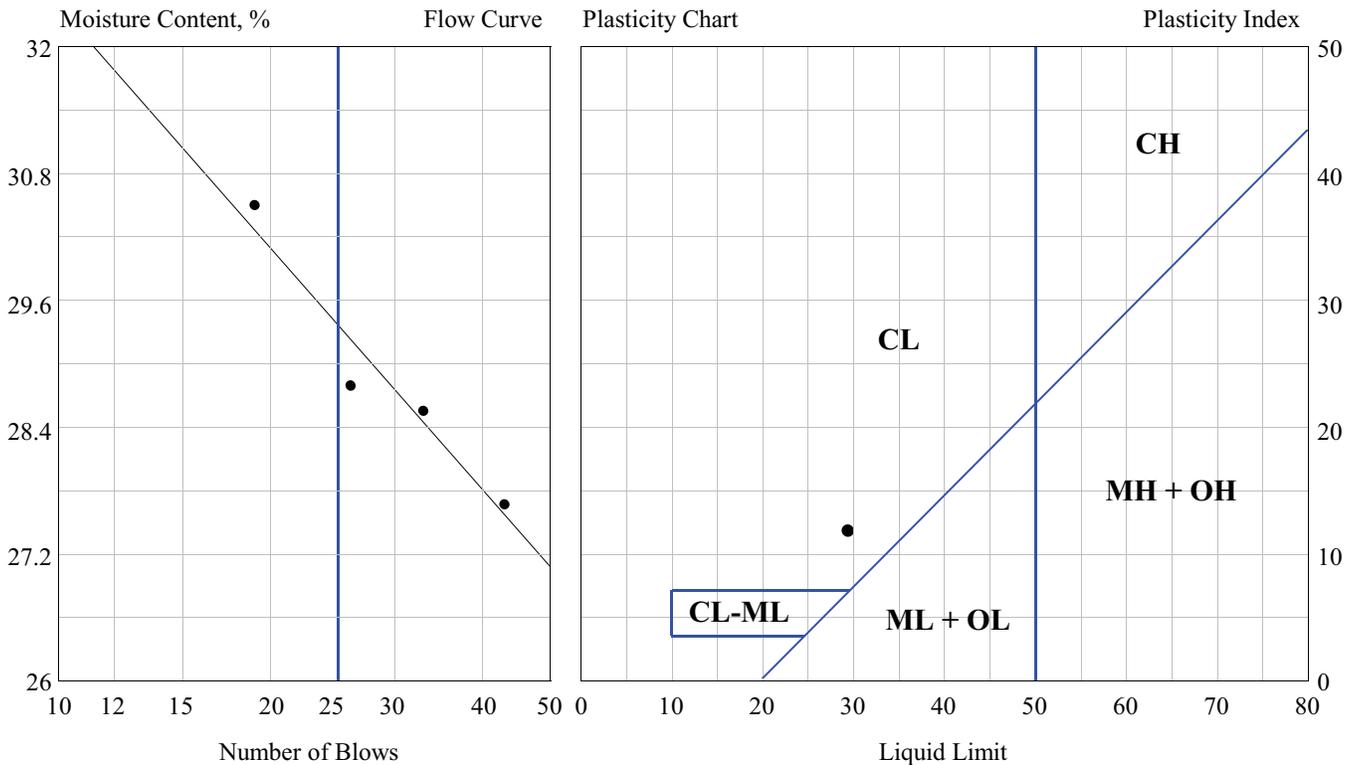
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Project: Geotechnical Investigation, Lamèque Wharf Structure No  
Project #: 073715

# Atterberg Limits

Description:			Borehole/Test Pit: 4
Sample Number: 5	Depth: 3.20-3.81m	Date Sampled: 02/06/2010	Date Tested: 07/06/2010

Liquid Trial #	1	2	3	4	5	6
Number of blows:	43	33	26	19		
Mass of cont. + wet soil, g:	23.02	22.95	26.74	23.99		
Mass of cont. + dry soil, g:	20.74	20.50	24.16	21.37		
Mass of container, g:	12.50	11.92	15.20	12.78		
Moisture content, %:	27.7	28.6	28.8	30.5		
Plastic Trial #	1	2	3			
Mass of cont. + wet soil, g:	15.09	17.21	17.98			
Mass of cont. + dry soil, g:	14.68	16.85	17.62			
Mass of container, g:	12.30	14.87	15.52			
Moisture content, %:	17.2	18.2	17.1			
Liquid Limit:	29.4					
Plastic Limit:	17.5	<input type="checkbox"/> NP				
Plasticity Index:	11.8					





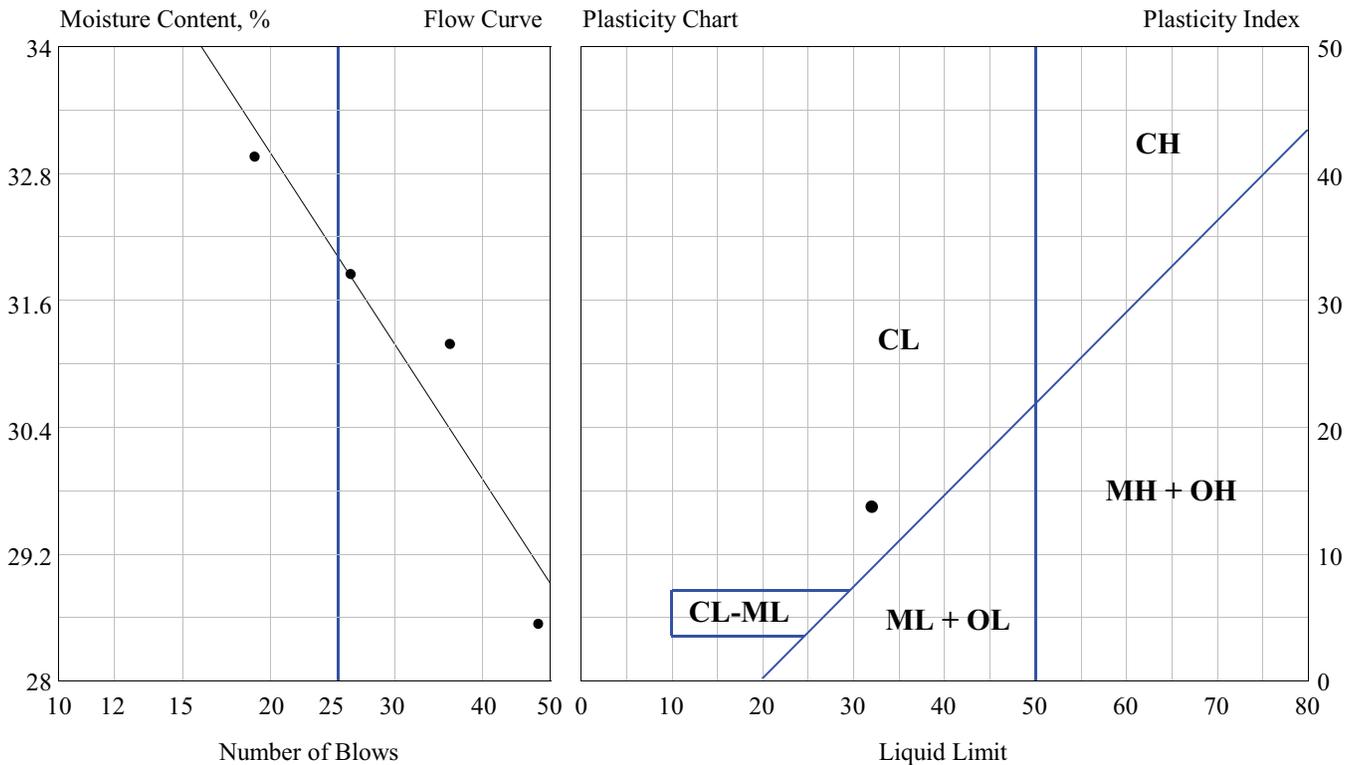
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Project: Geotechnical Investigation, Lamèque Wharf Structure No  
Project #: 073715

# Atterberg Limits

Description:			Borehole/Test Pit: 5
Sample Number: 7	Depth: 4.06-4.67m	Date Sampled: 02/06/2010	Date Tested: 07/06/2010

Liquid Trial #	1	2	3	4	5	6
Number of blows:	48	36	26	19		
Mass of cont. + wet soil, g:	25.85	21.80	23.30	23.48		
Mass of cont. + dry soil, g:	23.31	19.57	21.30	20.54		
Mass of container, g:	14.41	12.42	15.02	11.62		
Moisture content, %:	28.5	31.2	31.8	33.0		
Plastic Trial #	1	2	3			
Mass of cont. + wet soil, g:	14.76	17.79	15.07			
Mass of cont. + dry soil, g:	14.32	17.34	14.63			
Mass of container, g:	11.92	14.91	12.18			
Moisture content, %:	18.3	18.5	18.0			
Liquid Limit:	32.0					
Plastic Limit:	18.3 <input type="checkbox"/> NP					
Plasticity Index:	13.7					





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Client	VALRON Engineers Inc.
Project:	Geotechnical Investigation, Lamèque Wharf Structure N
Project #	073715

## Moisture Content and Density

Borehole: 1	Date/Time Sampled: 10-06-02 4:22:00 PM	Mass of Cont. + Wet Soil, g:	858.60
Depth: .91-1.52m	Date/Time Tested: 10-06-07 4:23:22 PM	Mass of Cont. + Dry Soil, g:	728.20
Sample: 2		Mass of Container, g:	166.10
Description:		Moisture Content, %:	23.20
		Sample Length, mm:	
		Sample Diameter, mm:	
		Sample Mass, g:	
		Sample Volume, mm <sup>3</sup>	
		Wet Density, kg/m <sup>3</sup>	
		Dry Density, kg/m <sup>3</sup>	
Borehole: 2	Date/Time Sampled: 10-06-02 4:24:00 PM	Mass of Cont. + Wet Soil, g:	661.60
Depth: .61-1.22m	Date/Time Tested: 10-06-07 4:24:59 PM	Mass of Cont. + Dry Soil, g:	457.50
Sample: 2		Mass of Container, g:	163.20
Description:		Moisture Content, %:	69.35
		Sample Length, mm:	
		Sample Diameter, mm:	
		Sample Mass, g:	
		Sample Volume, mm <sup>3</sup>	
		Wet Density, kg/m <sup>3</sup>	
		Dry Density, kg/m <sup>3</sup>	
Borehole: 3	Date/Time Sampled: 10-06-02 4:26:00 PM	Mass of Cont. + Wet Soil, g:	765.70
Depth: 3.05-3.66m	Date/Time Tested: 10-06-07 4:26:56 PM	Mass of Cont. + Dry Soil, g:	706.30
Sample: 6		Mass of Container, g:	203.30
Description:		Moisture Content, %:	11.81
		Sample Length, mm:	
		Sample Diameter, mm:	
		Sample Mass, g:	
		Sample Volume, mm <sup>3</sup>	
		Wet Density, kg/m <sup>3</sup>	
		Dry Density, kg/m <sup>3</sup>	



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Client VALRON Engineers Inc.

Project: Geotechnical Investigation, Lamèque Wharf Structure N

Project # 073715

## Moisture Content and Density

Borehole: 4	Date/Time Sampled: 10-06-02 9:16:00 AM	Mass of Cont. + Wet Soil, g:	629.10
Depth: 3.20-3.81m	Date/Time Tested: 10-06-07 4:20:31 PM	Mass of Cont. + Dry Soil, g:	545.40
Sample: 5		Mass of Container, g:	169.50
Description:		Moisture Content, %:	22.27
		Sample Length, mm:	
		Sample Diameter, mm:	
		Sample Mass, g:	
		Sample Volume, mm <sup>3</sup>	
		Wet Density, kg/m <sup>3</sup>	
		Dry Density, kg/m <sup>3</sup>	
Borehole: 5	Date/Time Sampled: 10-06-02 9:19:00 AM	Mass of Cont. + Wet Soil, g:	578.40
Depth: 4.06-4.67m	Date/Time Tested: 10-06-07 4:18:44 PM	Mass of Cont. + Dry Soil, g:	516.00
Sample: 7		Mass of Container, g:	170.40
Description:		Moisture Content, %:	18.06
		Sample Length, mm:	
		Sample Diameter, mm:	
		Sample Mass, g:	
		Sample Volume, mm <sup>3</sup>	
		Wet Density, kg/m <sup>3</sup>	
		Dry Density, kg/m <sup>3</sup>	
Borehole: 8	Date/Time Sampled: 10-06-02 4:29:00 PM	Mass of Cont. + Wet Soil, g:	697.70
Depth: 4.27-4.88m	Date/Time Tested: 10-06-07 4:30:35 PM	Mass of Cont. + Dry Soil, g:	638.60
Sample: 7		Mass of Container, g:	170.80
Description:		Moisture Content, %:	12.63
		Sample Length, mm:	
		Sample Diameter, mm:	
		Sample Mass, g:	
		Sample Volume, mm <sup>3</sup>	
		Wet Density, kg/m <sup>3</sup>	
		Dry Density, kg/m <sup>3</sup>	

**Appendix C**  
Rock Core Photos



**Figure 1 Borehole 1 (3.02 – 7.62 metres)**



**Figure 2 Borehole 1 (7.62 – 9.02 metres)**



**Figure 3 Borehole 2 (3.43 – 8.99 metres)**



Figure 4 Borehole 2 (3.43 – 8.99 metres)



Figure 5 Borehole 3 (5.18 – 9.93 metres)



Figure 6 Borehole 4 (7.98 – 11.28 metres)



**Figure 7 Borehole 5 (7.85 – 10.82 metres)**



**Figure 8 Borehole 6 (3.84 – 8.26 metres)**



**Figure 9 Borehole 7 (3.86 – 3.94 metres)**



**Figure 10 Borehole 7 (3.86 – 8.94 metres)**



**Figure 11 Borehole 8 (5.77 – 9.45 metres)**