Public Works and Government Services Canada

Travaux publics et Services gouvernementaux Canada

RETURN BIDS TO:
RETOURNER LES SOUMISSIONS À:
Public Works Government Services Canada- Bid Receiving / Réception des soumissions
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

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

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

Instructions: See Herein

Instructions: Voir aux présentes

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

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

Canada

Cette modification à l’invitation numéro trois (3) est soumise pour inclure l’addenda numéro 3 suivant.

La modification qui suit apportée aux documents de soumission entre en vigueur dès maintenant. L'Addenda fera partie des documents de contrat.

Toutes autres conditions ne changent pas.

Addenda numéro 3.

QUESTIONS ET RÉPONSES

Q1 : Nous voulons faire la demande d'utiliser l'adhésif UCAN FR5 comme un alternatif aux produits répertoriés pour travaux au-dessus de l'eau. Section 03 30 00, clause 2.1.12, Adhésif pour ancrage (au-dessus du niveau de l'eau) : conforme à la norme C881/C881M, Type IV, catégorie 3, Classe A, B et C. ce produit peut être utilisé au-dessus et au-dessous du niveau de l'eau.

R1 : Nous avons examiné la fiche technique et constatons que l'adhésif proposé, UCAN FR5, serait un substitut acceptable aux produits répertoriés pour usage au-dessus du niveau de l'eau.

Q2 : Nous demandons que l'adhésif époxy UCAN FR5 soit approuvé comme substitut à C6 Fast Curing Epoxy. Section 030 30 00, clause 2.1.13.

R2 : L'adhésif époxy UCAN FR5 est aussi un substitut acceptable à C6 Fast Curing Epoxy comme spécifié dans la section 03 30 00, clause 2.1.13.

Q3 : Quel est la composition du fond marin a excaver au quai 408 coté portuaire voir plan M1/de 18 coupe A-1/1 ?

R3 : Les plans originaux référencés pour la structure 408 sont (Plan No. C-143 – 1959).

Ceux-ci démontrent les forages no. 5, 6, 7, et 8 le long de la palplanche du côté du havre. La description des sols varie de sable mou et limon à limon et sable tassé, à argile et sable tassé au niveau ou de l'excavation serait requise.

L'entrepreneur peut voir les plans existants au bureau de TPSGC et il serait mieux pour l'entrepreneur de faire sa propre évaluation des conditions basé sur les plans référencés.

Q4 : Après avoir examiné la documentation je n'était pas capable de localiser la quantité de pieux à section en H requise.

J'ai trouvé que 118 unités étaient requises sur le bordereau de soumission mais je ne suis pas certain sur l'unité de mesure. Est-ce ça serait en metres?

R4 : L'unité de mesure est par unité. Voir le tableau de prix unitaires, article 33.

Q5 : Dessin C1, Il n'y a pas d'élévation montrant la ligne d'eau existante (sur la note 1), Quelle élévation devrait-on présumer afin de pouvoir commander la bonne longueur de boîte à vannes?

Dessin C2, détail du bas de la page, Il nous manque une ligne ou de l'information concernant le pièces, ou ils vont. Pouvez-vous clarifier? Est-ce que tout du PEHD? Quel sorte de raccord doit aller dessous la ligne principale? Comment est-ce que nous connectons le tout? Est-ce que l'on utiliserait une croix sur la ligne principale?

Dessin C2, détail du bas de la page, Il nous manque une ligne ou de l'information sur tous les pièces, ou ils vont. Pouvez-vous clarifier? Est-ce que nous serions exigés de fournir du matériel d'assise pour les services?

R5: Nous ne connaissons pas la profondeur de la conduite d'eau principale existante. Elle devrait être confirmée par l'entrepreneur. Elle devrait être approximativement à 1.8 metres de profondeur (profondeur standard)

Toute la tuyauterie avant d'arriver sur le quai est en PVC DR 18 et toute la tuyauterie sur le quai est de PEHD tel que démontrer sur le dessin C1.

Tous les tuyaux enterrés devront avoir le matériel d'assise d'inclus dans les services.

Q6 : Sur le dessin E3 et/ou M16, il n'y a pas de détail à propos de l'encrage du mur à ossature à la fondation. Pouvez-vous spécifier et/ou clarifier?

R6: Installer des ancrages galvanisés de 12.7 mm de diametre, espacés au maximum à 1200 mm c/c et aux coins.

Ancrage à être enchâsser dans le béton à 300mm, 50 mm distance libre du bord extérieur. Fond à être recourbé 50 mm.

Q7 : Sur le dessin E3, le détail démontrant le mur typique semble indiquer qu'il pourrait y avoir une couche de gypse, mais ce n'est pas indiqué sur la description de mur typique. Pouvez-vous vérifier ceci?

R7: Il n'y aura pas de couche de gypse à être installé, seulement du contreplaqué de qualité marine. Voir notes sur la construction de mur typique sur le dessin E3 of/de 11.

Q8 : S.V.P. confirmer la quantité de panneaux type ''A''.

R8: Il y a 211 panneaux de type ''A''. Le tableau de prix unitaires sera modifié pour refléter cette quantité.

Q9: Pouvons nous avoir plus de détailles sur le support tenant le système électrique dessous le quai 411?

R9: Sur le quai 411 le détail de support de conduits K-K et L-L seront de 13mm tiges filetées fixées avec des vis tap-con dans le tablier de béton avec des supports en canal au bout des tiges filetées selon la section 26 05 29. Révisé la section 26 05 29.3.1.8 pour que l'espacement des canaux est a un maximum de 1.0 metres. Tous les canaux, tiges, tap-con, et matériel doivent être d'acier inoxydable de grade 316.

Q10 : 1) Sur la structure 406/409 il n'y a pas de détail pour l'épaississement de la dalle de 325 mm aux centres d'énergie. Je me demande s'il y a de l'armature additionnelle requise semblable à l'épaississement de dalle de 400 mm, détail D51/M12 ou est-ce que l'armature 15M@350 H et B, E et W pour renforcer la dalle de tablier sera suffisante où a lieu l'épaississement de 325 mm?

2) Sur le dessin E6 détails de tranchées F-F, G-G, et H-H démontrent de l'armature 20M @ E.W., H et B qui est différent du détail d'armature D38/M12 qui montre du 15M@350 E.W., H,B. Est-ce que le 20M est de l'armature additionnelle requise aux conduits ou est-ce qu'elle remplace le 15M aux conduits ou est-ce une erreur de dactylo?

3) Détail F-F sur le dessin E4 est coupé dans la section de quai où il va y avoir de la nouvelle asphalte, cependant le détail F-F sur le dessin E6 représente une dalle de béton. Est-ce que ça devrait représenter des conduits enrobés de béton enfouis?

R10: 1) Ceci est couvert dans le dessin typique de dalle, détail D38. La même armature mais plus d'espace entre les couches d'armature pour permettre l'installation de conduits.

2) C'est une erreur de dactylo. L'armature de la dalle comme démontré sur les dessins de structure.

3) Les conduits électrique enfouis (ductbank) seront applicables où l'asphaltage sera requis.

Q11: Savez-vous si le rapport géotechnique pour les forages sur le dessin M18 sont disponibles? Est-ce c'est quelque chose que vous pourriez demander?

R11: Vous trouverez ci-inclus les rapports géotechniques qui se rapportent à ce projet. Ceux-ci ce rapporteront aux rapports de forage sur les dessins.

Q12: Sur le dessin M8, en bas à droite, il y a un détail démontrant l'attache de raidisseur. Est-ce que l'on doit considérer que le raidisseur sera installer tout le long, chaque bord du quai? Il n'y a aucun autre détail démontrant cette pièce.

R12: Les endroits où et l'ampleur (quantité) de raidisseur est démontré sur le dessin M6.

GEMTEC

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

GEMTEC Limited
77 Rooney Crescent
Moncton, NB
E1E 4M4

tel: 506.858.7180
fax: 506.858.0742
gemtecm@gemtec.ca
www.gemtec.ca

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

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.

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

Table of Contents

Appendices ii
List of Figures ii
1.0 Introduction 1
2.0 Site Conditions 3
3.0 Soil and Bedrock Conditions 3
3.1 Soil 3
3.2 Bedrock 3
4.0 Discussion and Recommendations 4
5.0 General 5

Appendices

A Descriptive Terms, CPT and Detailed Borehole Logs
B Laboratory Index Test Results
C Rock Core Photos

List of Figures

Figure 1 Site Plan 2

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.

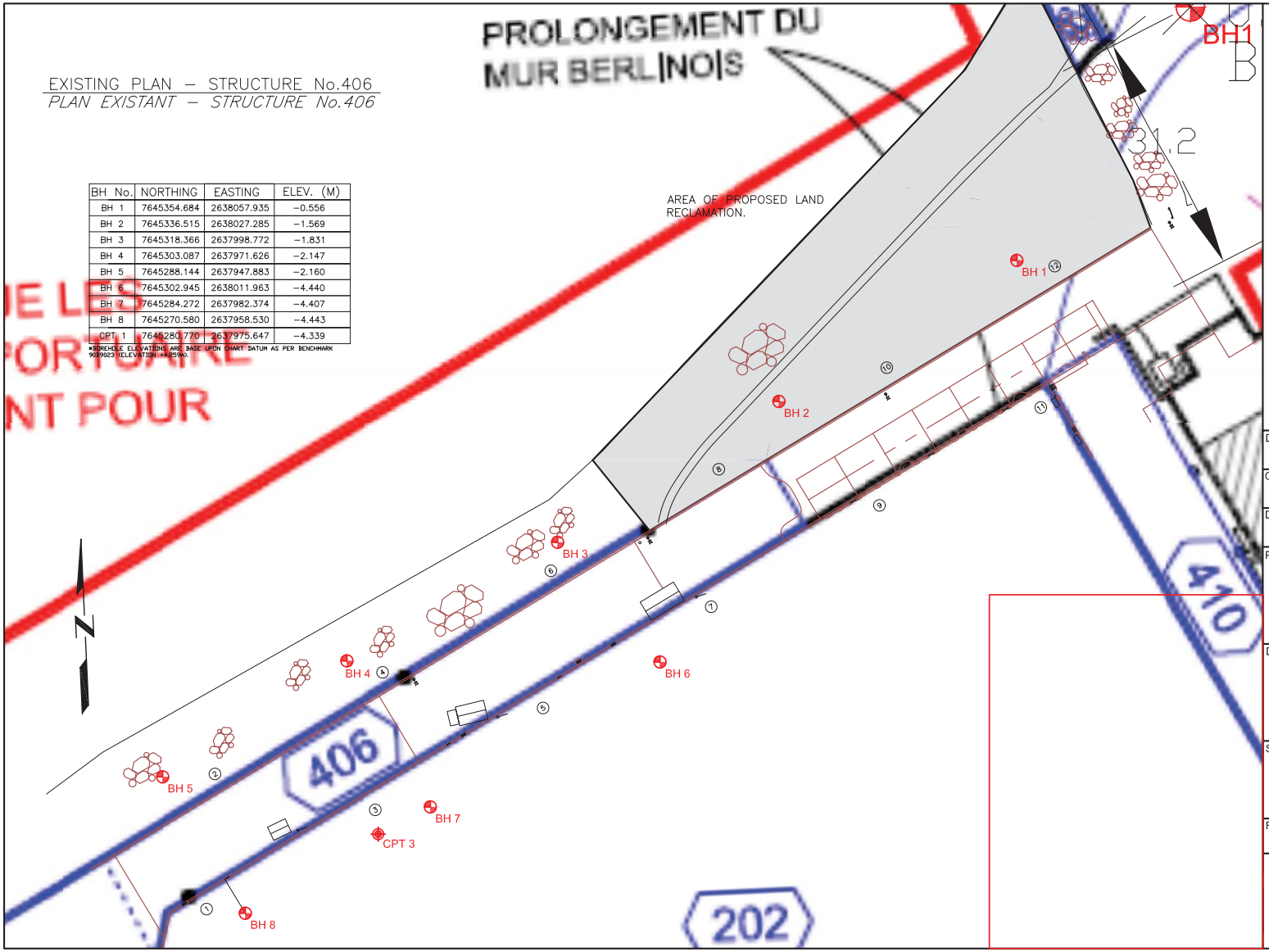
In order to assess the soil and bedrock conditions, eight boreholes (BH) were put down from 25 to 30 May 2010 using geotechnical drill rig mounted on a barge. Six boreholes were put down along the perimeter of the proposed wharf reconstruction and two were placed within the proposed land reclamation 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.

EXISTING PLAN – STRUCTURE No.406
PLAN EXISTANT – STRUCTURE No.406

BH No.	NORTHING	EASTING	ELEV. (M)
BH 1	7645354.684	2638057.935	−0.556
BH 2	7645336.515	2638027.285	−1.569
BH 3	7645318.366	2637998.772	−1.831
BH 4	7645303.087	2637971.626	−2.147
BH 5	7645288.144	2637947.883	−2.160
BH 6	7645302.945	2638011.963	−4.440
BH 7	7645284.272	2637982.374	−4.407
BH 8	7645270.580	2637958.530	−4.443
CPT 1	7645280.770	2637975.647	−4.339

*BOREHOLE ELEVATIONS ARE BASE UPON CHART DATUM AS PER BENCHMARK 9089025 (ELEVATION =4.2596)



LEGEND

- BH — BOREHOLE LOCATION - MAY 2010
- BOREHOLE LOCATION - FEB 1955 (APRROX. LOCATION)
- CPT — CPT LOCATION - MAY 2010

Drawn By: TDS	Checked By:
Calculations By:	Checked By:
Date: AUGUST 2014	

Project: GEOTECHNICAL INVESTIGATION LAMEQUE WHARF, NEW BRUNSWICK

Drawing: BOREHOLE AND CPT LOCATION PLAN (REVISED)

Scale: 1:500 (0, 10, 20, 30m)

File No.	Drawing	Revision No.
07371501	D01	0

GEMTEC
Consulting Engineers and Scientists

`

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 of 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^2 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^3, 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

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

FREDERICTON, MONCTON, BATHURST, GRAND FALLS, SAINT JOHN, NB

DESCRIPTIVE TERMS- BOREHOLE/TEST PIT LOG

SOILS

GRAIN SIZE

0.01 – 0.08	0.08 – 0.4	0.4 – 2	2 – 5	5 – 80	80 – 200	200 – 1000mm
SILT CLAY	SAND F	SAND M	SAND C	GRAVEL	Cobble	BOULDER

DESCRIPTIVE TERMINOLOGY

weight. % of material

0 – 10	10 – 20	20 – 35	35 –
TRACE	SOME	ADJECTIVE	and > 35% noun > 35% and main fraction
trace clay, etc.	some gravel, etc.	silty, etc.	sand and gravel, etc.

COMPACTNESS gravels, sands, tills

N, RANGE	0 - 4	4 - 10	10 - 30	30 - 50	> 50
DENSITY	V. LOOSE	LOOSE	MEDIUM	DENSE	V. DENSE

CONSISTENCY silt, clay

S, KPa	< 12.5	12.5 - 25	25 - 50	50 - 100	100 - 200
CONSISTENCY	V. SOFT	SOFT	MEDIUM	STIFF	V. STIFF

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

ROCK CORES

A(30mm); B(41mm); N(54mm)

LOG SYMBOLS

GRAVEL, SAND, SILT, CLAY, ORGANIC, BOULDER, ROCK, TILL

WELL SYMBOLS

SCREEN WITH SAND, PIPE WITH SAND, PIPE WITH BENTONITE, PIPE WITH BACKFILL

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)
RECOVERY - sample recovery expressed as percent or length
S - shear strength , kPa; vane ⊕ ; penetrometer ■; unconfined ○; Uc unconfined compressive strength
Sr - shear strength, remoulded; vane ⊗ ; penetrometer □
Dd - dry density; t/m^3
W - natural moisture content, percent ✳
PL - plastic limit, percent ⊢—
LL - liquid limit, percent —⊣
ND - non detect, total petroleum hydrocarbons (TPH) not detected in soil

Groundwater Level ▼ ; Seepage ▽

Revised Oct, 2009
BHDESCRM-2009.CDR

GEMTEC
Consulting Engineers and Scientists

BOREHOLE LOGS

Client	VALRON Engineers Inc	Proj No. 737.15	BOREHOLE BH 1
Project	Geotechnical Investigation - North Wharf (Structure 406)	Date Drilled 28.May.2010	Page 1 of 1
Location	Lameque Wharf, New Brunswick		
Ground Level, m -0.56	Datum: Chart	Logged By TDS	

Undrained Shear Strength - kPa: 0, 25, 50, 75, 100

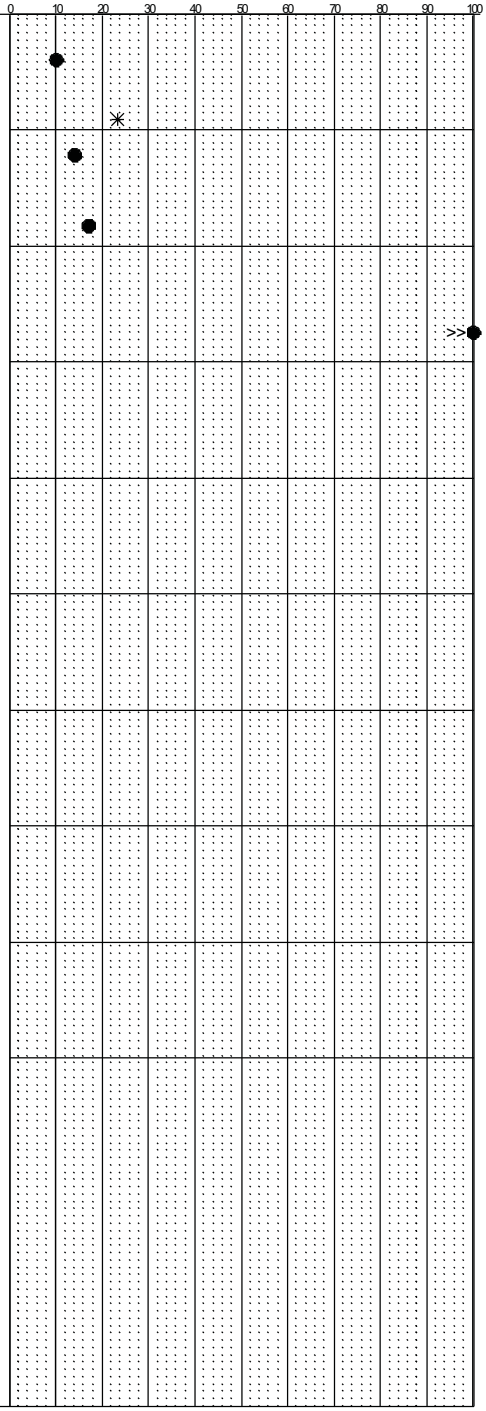
Unconfined Compression; Pocket Penetrometer; Field Vane Test; Remoulded

Water Content & Atterburg Limits (W_P, W, W_L)

Dynamic Penetration Test, blows/0.3m

Standard Penetration Test, blows/0.3m

DEPTH m	SAMPLE No	TYPE	N (RQD)	REC (mm)	LOG	DESCRIPTION
0	1	S	10	450		Dark grey gravelly SAND, some organics, trace silt
1	2	S	14	480		
	3	S	17	610		
					1.92 (-2.48)	Reddish brown silty sand, some gravel and sandstone cobbles, trace to some clay (GLACIAL TILL)
2					2.46 (-3.02)	Highly weathered MUDSTONE BEDROCK
	4	S	101	620		
3	5	NQ	0	127		
	6	NQ	0	1270		
4					4.57 (-5.13)	Highly weathered green to grey SANSTONE BEDROCK
	7	NQ	0	991		
5					5.46 (-6.02)	Interbedded MUDSTONE/SILTSTONE BEDROCK with mud seams
6	8	NQ	0	1118		
7						
	9	NQ	0	1118		
8						
9					9.02 (-9.58)	End of borehole 9.02



GEMTEC
Consulting Engineers and Scientists

BOREHOLE LOGS

Client	VALRON Engineers Inc	Proj No. 737.15	BOREHOLE BH 2
Project	Geotechnical Investigation - North Wharf (Structure 406)	Date Drilled 29.May.2010	Page 1 of 1
Location	Lameque Wharf, New Brunswick		
Ground Level, m -1.57	Datum: Chart	Logged By TDS	

Undrained Shear Strength - kPa (0, 25, 50, 75, 100)
Unconfined Compression
Field Vane Test
Pocket Penetrometer
Remoulded
Water Content & Atterburg Limits (W_P, W, W_L)
Dynamic Penetration Test, blows/0.3m
Standard Penetration Test, blows/0.3m

DEPTH m	SAMPLE No	TYPE	N (RQD)	REC (mm)	LOG	DESCRIPTION	Elevation
0	1	S	0	300		Black SAND and SILT, some organics, trace gravel	
1	2	S	2	580			
	3	S	2	370			
						1.50	-3.07
2						Reddish brown silty sand, some clay and sandstone cobbles, trace gravel (GLACIAL TILL)	
						2.30	-3.87
	4	S	40	410		Highly weathered MUDSTONE BEDROCK	
3	5	S	77	305			
	6	NQ	0	787			
4							
	7	NQ	0	813			
5							
6	8	NQ	0	1270			
						6.83	-8.40
7						Highly weathered SILTSTONE BEDROCK	
	9	NQ	13	1321			
8						8.08	-9.65
						Grey, coarse grain SANDSTONE BEDROCK	
						8.99	-10.56
						End of borehole at 8.99 metres.	

GEMTEC
Consulting Engineers and Scientists

BOREHOLE LOGS

Client	VALRON Engineers Inc	Proj No. 737.15	BOREHOLE BH 3
Project	Geotechnical Investigation - North Wharf (Structure 406)	Date Drilled 29.May.2010	Page 1 of 1
Location	Lameque Wharf, New Brunswick		
Ground Level, m -1.83	Datum: Chart	Logged By TDS	

Undrained Shear Strength - kPa (0, 25, 50, 75, 100)
Unconfined Compression
Field Vane Test
Pocket Penetrometer
Remoulded
Water Content & Atterburg Limits (W_P, W, W_L)
Dynamic Penetration Test, blows/0.3m
Standard Penetration Test, blows/0.3m

DEPTH m	SAMPLE No	TYPE	N (RQD)	REC (mm)	LOG	DESCRIPTION
0	1	S	1	310		Black silt, some organics (seashells)
1	2	S	3	500		- some clay
	3	S	0	350		- wood debris
					1.77 (-3.60)	
2	4	S	8	300		Reddish brown silty sand, some gravel and sandstone cobbles, trace to some clay (GLACIAL TILL)
	5	S	22	250	2.61 (-4.44)	Highly weathered MUDSTONE BEDROCK
3	6	S	33	390		
4	7	S	29	200		
5	8	S	74	300		
	9	NQ	0	991	5.89 (-7.72)	
6						Highly weathered SILTSTONE BEDROCK
7	10	NQ	0	1448	7.52 (-9.35)	
8						Grey, coarse to medium SANDSTONE BEDROCK with horizontal fractures
9	11	NQ	13	1524	9.93 (-11.76)	
						End of borehole at 9.93 metres.

GEMTEC
Consulting Engineers and Scientists

BOREHOLE LOGS

Client	VALRON Engineers Inc	Proj No. 737.15	BOREHOLE BH 4
Project	Geotechnical Investigation - North Wharf (Structure 406)	Date Drilled 28.May.2010	Page 1 of 1
Location	Lameque Wharf, New Brunswick		
Ground Level, m -2.15	Datum: Chart	Logged By TDS	

Undrained Shear Strength - kPa: 0, 25, 50, 75, 100

Unconfined Compression; Pocket Penetrometer; Field Vane Test; Remoulded

Water Content & Atterburg Limits (W_P, W, W_L)

Dynamic Penetration Test, blows/0.3m

Standard Penetration Test, blows/0.3m

0 10 20 30 40 50 60 70 80 90 100

DEPTH m	SAMPLE No	TYPE	N (RQD)	REC (mm)	LOG	DESCRIPTION
0	1	S	0	100		Black SILT, some organics, trace to some clay
1	2	S	0	610		
						1.68 -3.83
2	3	S	4	570		Reddish brown SAND, some clay and silt
	4	S	8	570		2.54 -4.69
3						Reddish brown SAND, some gravel and cobble
						3.25 -5.40
	5	S	9	450		Brown sandy SILT, some clay, trace gravel
						3.65 -5.80
4						Reddish brown silty sand, some gravel and sandstone cobbles, trace to some clay (GLACIAL TILL)
5	6	S	16	430		
	7	S	32	510		
6	8	S	34	0		
						6.86 -9.01
7	9	S	32	410		Weathered MUDSTONE BEDROCK
						7.75 -9.90
	10	S	101	205		Greenish brown to grey medium grain SANDSTONE BEDROCK, with horizontal fractures
8	11	NQ	0	254		
	12	NQ	28	1448		
9						
10	13	NQ	17	1499		
11						
						11.28 -13.43
						End of borehole at 11.28 metres.

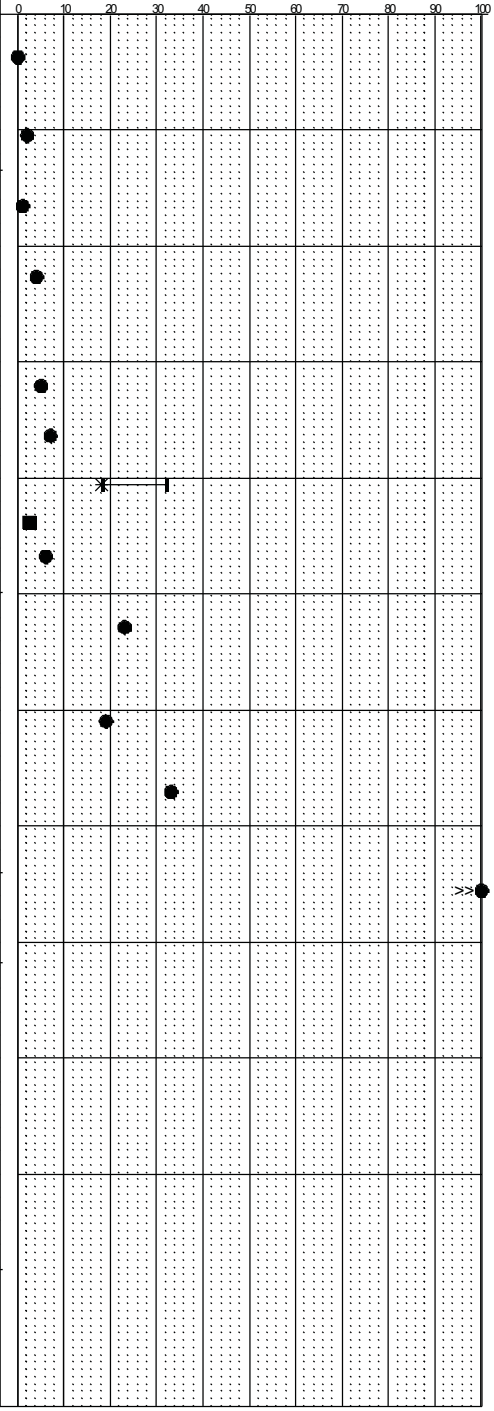
GEMTEC
Consulting Engineers and Scientists

BOREHOLE LOGS

Client	VALRON Engineers Inc	Proj No. 737.15	BOREHOLE BH 5
Project	Geotechnical Investigation - North Wharf (Structure 406)	Date Drilled 29.May.2010	Page 1 of 1
Location	Lameque Wharf, New Brunswick		
Ground Level, m -2.16	Datum: Chart	Logged By TDS	

Undrained Shear Strength - kPa (0, 25, 50, 75, 100)
Unconfined Compression
Field Vane Test
Pocket Penetrometer
Remoulded
Water Content & Atterburg Limits (W_P, W, W_L)
Dynamic Penetration Test, blows/0.3m
Standard Penetration Test, blows/0.3m

DEPTH m	SAMPLE No	TYPE	N (RQD)	REC (mm)	LOG	DESCRIPTION
0	1	S	0	130		Black silt, some organics (seashells)
1	2	S	2	250		
						1.35 -3.51
	3	S	1	400		Brown SAND and SILT, trace gravel
2	4	S	4	410		
3	5	S	5	0		
	6	S	7	300		
						- wood debris
4						
	7	S	6	430		- some clay
						4.98 -7.14
5	8	S	23	390		Reddish brown silty sand, some gravel and sandstone cobbles, trace to some clay (GLACIAL TILL)
6	9	S	19	180		
	10	S	33	150		
7						7.40 -9.56
	11	S	101	520		Weathered MUDSTONE BEDROCK
8	12	NQ	0	1422		
						8.18 -10.34
						Grey medium grained SANDSTONE BEDROCK, horizontal fractures
9	13	NQ	8	1524		
10						
						10.82 -12.98
						End of borehole at 10.82 metres.



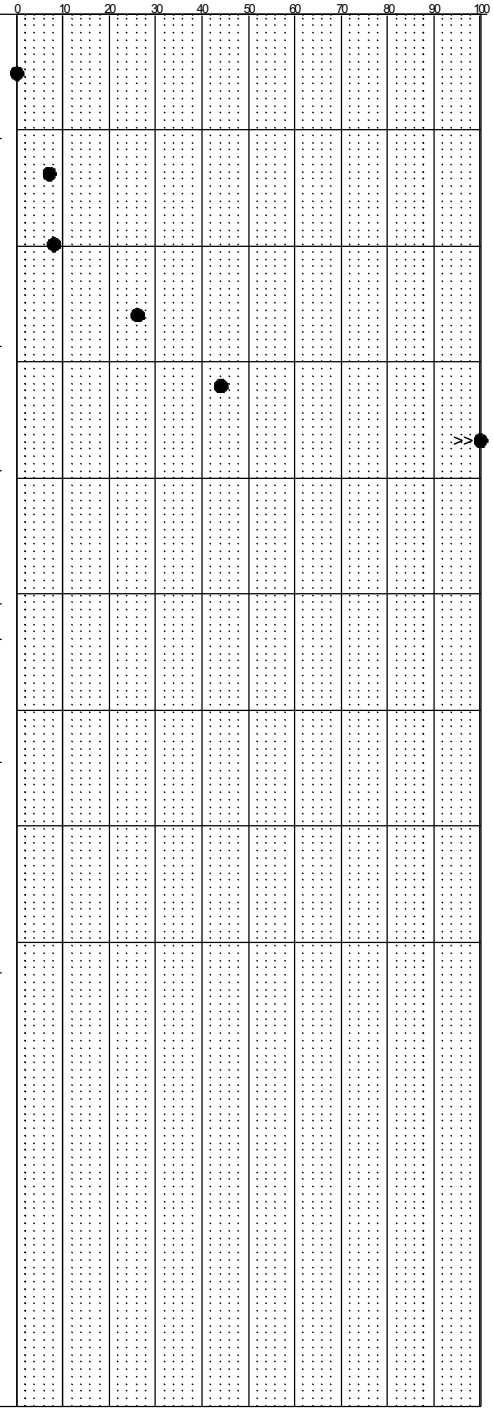
GEMTEC
Consulting Engineers and Scientists

BOREHOLE LOGS

Client	VALRON Engineers Inc	Proj No. 737.15	BOREHOLE BH 6
Project	Geotechnical Investigation - North Wharf (Structure 406)	Date Drilled 27.May.2010	Page 1 of 1
Location	Lameque Wharf, New Brunswick		
Ground Level, m -4.44	Datum: Chart	Logged By TDS	

Undrained Shear Strength - kPa (0, 25, 50, 75, 100)
Unconfined Compression
Field Vane Test
Pocket Penetrometer
Remoulded
Water Content & Atterburg Limits (W_P, W, W_L)
Dynamic Penetration Test, blows/0.3m
Standard Penetration Test, blows/0.3m

DEPTH m	SAMPLE No	TYPE	N (RQD)	REC (mm)	LOG	DESCRIPTION	Elevation
0	1	S	0	230		Black SILT, some orgainics	
1.07							-5.51
1	2	S	7	370		Reddish brown silty sand, some gravel and sandstone cobble, trace to some clay (GLACIAL TILL)	
2	3	S	8	360			
	4	S	26	320			
2.87							-7.31
3	5	S	44	300		Highly weathered MUDSTONE BEDROCK	
	6	S	101	200			
3.94							-8.38
4	7	NQ	0	100		Highly weathered and fractured SILTSTONE BEDROCK	
	8	NQ	0	1016			
5.08							-9.52
5						Highly weathered MUDSTONE BEDROCK	
5.39							-9.83
	9	NQ	0	1448		Grey weathered SANDSTONE BEDROCK	
6							
6.45							-10.89
						Grey SANDTONE BEDROCK with horizontal fractures	
7	10	NQ	0	1473			
8							
8.26							-12.70
						End of borehole at 8.26 metres	



GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

BOREHOLE LOGS

Client	VALRON Engineers Inc	Proj No. 737.15	BOREHOLE BH 7
Project	Geotechnical Investigation - North Wharf (Structure 406)	Date Drilled 27.May.2010	Page 1 of 1
Location	Lameque Wharf, New Brunswick		
Ground Level, m -4.41	Datum: Chart	Logged By TDS	

Undrained Shear Strength - kPa: 0, 25, 50, 75, 100

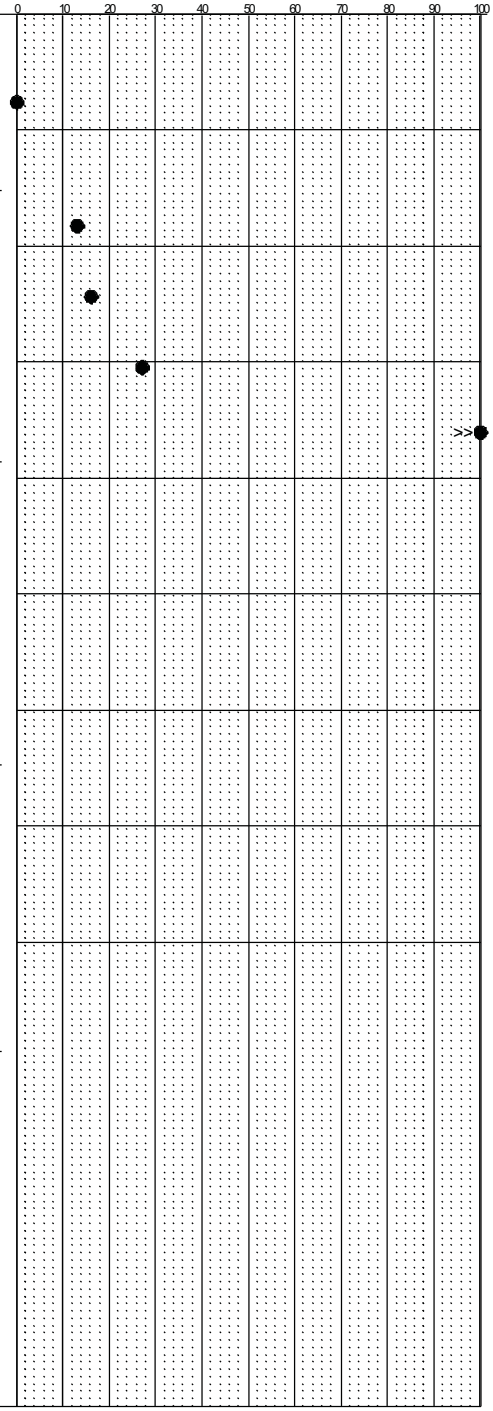
Unconfined Compression; Pocket Penetrometer; Field Vane Test; Remoulded

Water Content & Atterburg Limits (W_P, W, W_L)

Dynamic Penetration Test, blows/0.3m

Standard Penetration Test, blows/0.3m

DEPTH m	SAMPLE No	TYPE	N (RQD)	REC (mm)	LOG	DESCRIPTION
0	1	S	0	100		Black SILT, some organics
1.52 / -5.93						
	2	S	13	370		Reddish brown silty sand, some gravel and sandstone cobble, trace to some clay (GLACIAL TILL)
	3	S	16	510		
	4	S	27	260		
	5	S	101	370		
3.86 / -8.27						
	6	NQ	0	381		Weathered MUDSTONE BEDROCK
	7	NQ	0	1092		
	8	NQ	7	1524		
6.47 / -10.88						
						Grey coarse to medium grained SANDSTONE BEDROCK
	9	NQ	0	1549		
8.94 / -13.35						
						End of borehole 8.94 metres.



GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

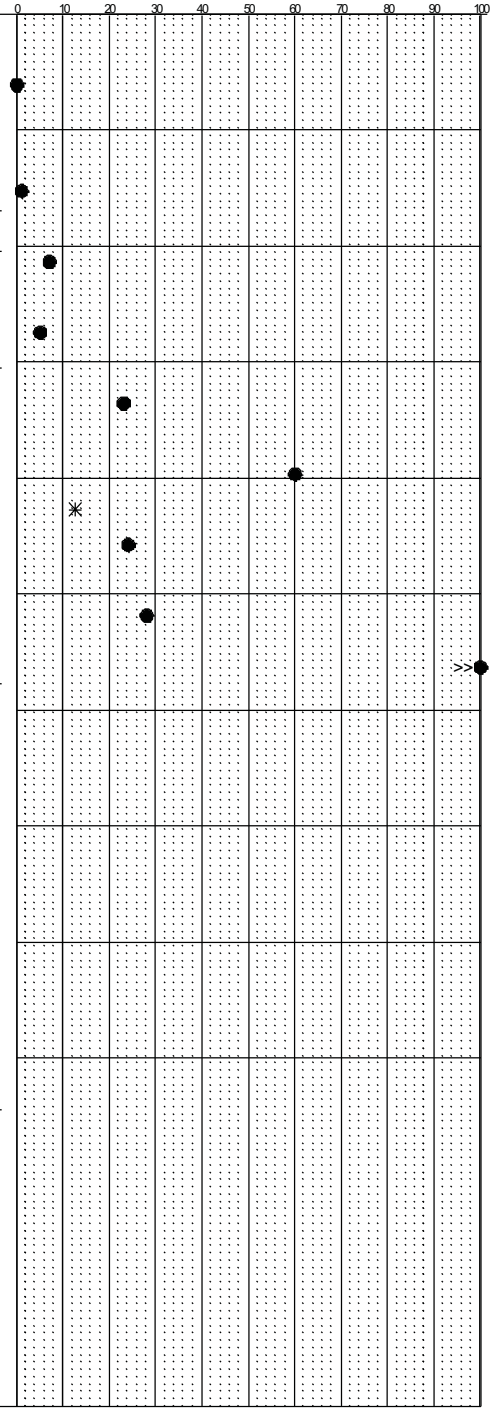
BOREHOLE LOGS

Client	VALRON Engineers Inc	Proj No. 737.15	BOREHOLE BH 8
Project	Geotechnical Investigation - North Wharf (Structure 406)	Date Drilled 26.May.2010	Page 1 of 1
Location	Lameque Wharf, New Brunswick		
Ground Level, m -4.44	Datum: Chart	Logged By TDS	

Undrained Shear Strength - kPa (0, 25, 50, 75, 100)

Unconfined Compression
Field Vane Test
Pocket Penetrometer
Remoulded
Water Content & Atterburg Limits (W_P, W, W_L)
Dynamic Penetration Test, blows/0.3m
Standard Penetration Test, blows/0.3m

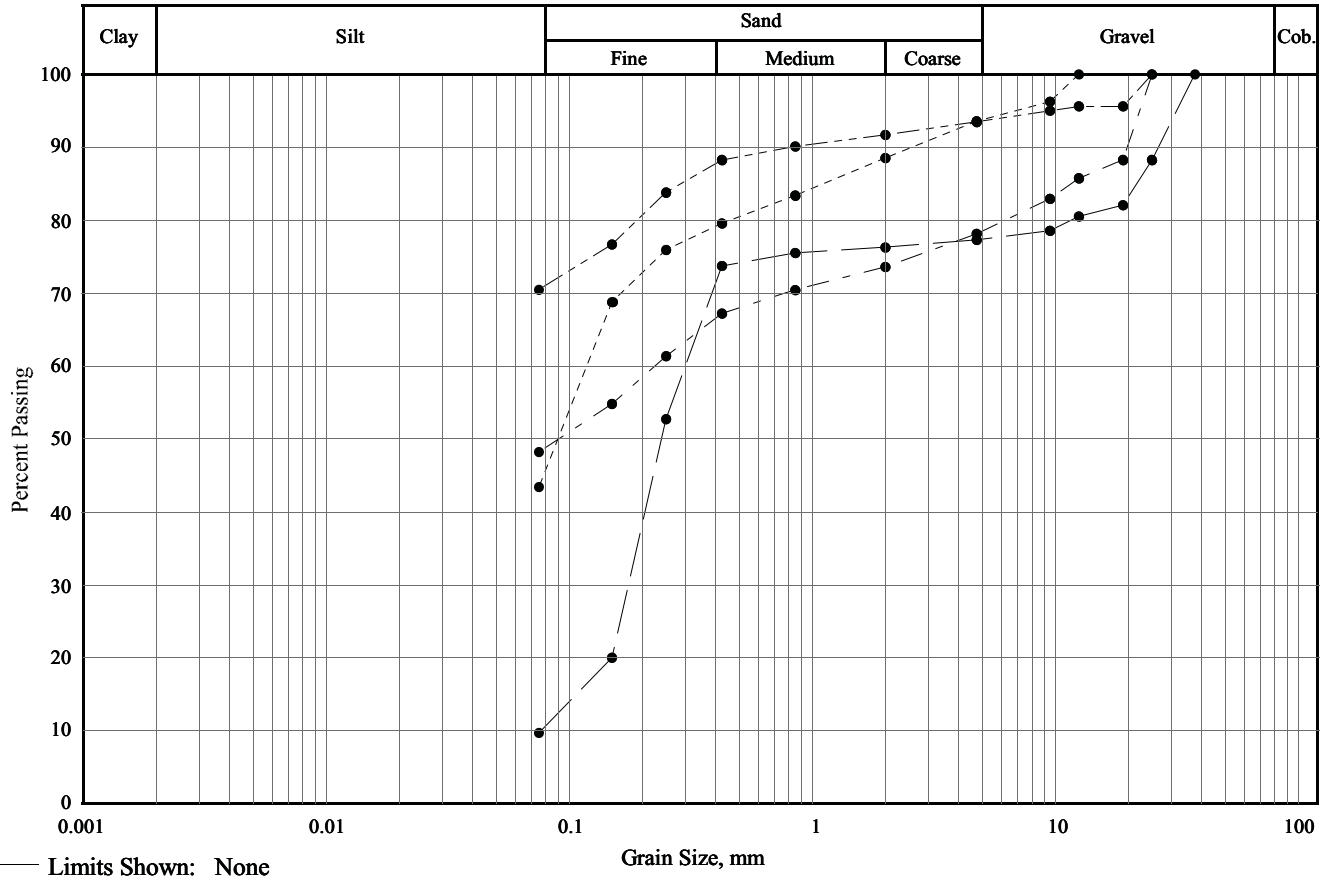
DEPTH m	SAMPLE No	TYPE	N (RQD)	REC (mm)	LOG	DESCRIPTION	Elevation
0	1	S	0	550		Black SILT, some organics (seashells and wood)	
1	2	S	1	260			
						1.70	-6.14
						Reddish brown SAND, trace gravel	
2	3	S	7	470		2.04	-6.48
						Light brown clayey SILT, some pebbles and gravel	
	4	S	5	390			
3						3.05	-7.49
	5	S	23	450		Reddish brown SILT and SAND, some gravel and sandstone cobbles, trace to some clay (GLACIAL TILL)	
	6	S	60	400			
4	7	S	24	410			
5	8	S	28	310			
	9	S	101	230		5.77	-10.21
6	10	NQ	0	580		Grey coarse to medium grained SANDSTONE BEDROCK	
7	11	NQ	14	1470			
8	12	NQ	27	1520			
9						9.45	-13.89
						End of borehole at 9.45 metres.	



Appendix B

Laboratory Index Test Results

GEMTEC LIMITED GROUND ENGINEERING & MATERIALS TECHNOLOGY	Client: VALRON Engineers Inc.	Soils Grading Chart
	Project: Geotechncial Investigation, Lamèque Wharf Structure No	
	Project #: 073715	

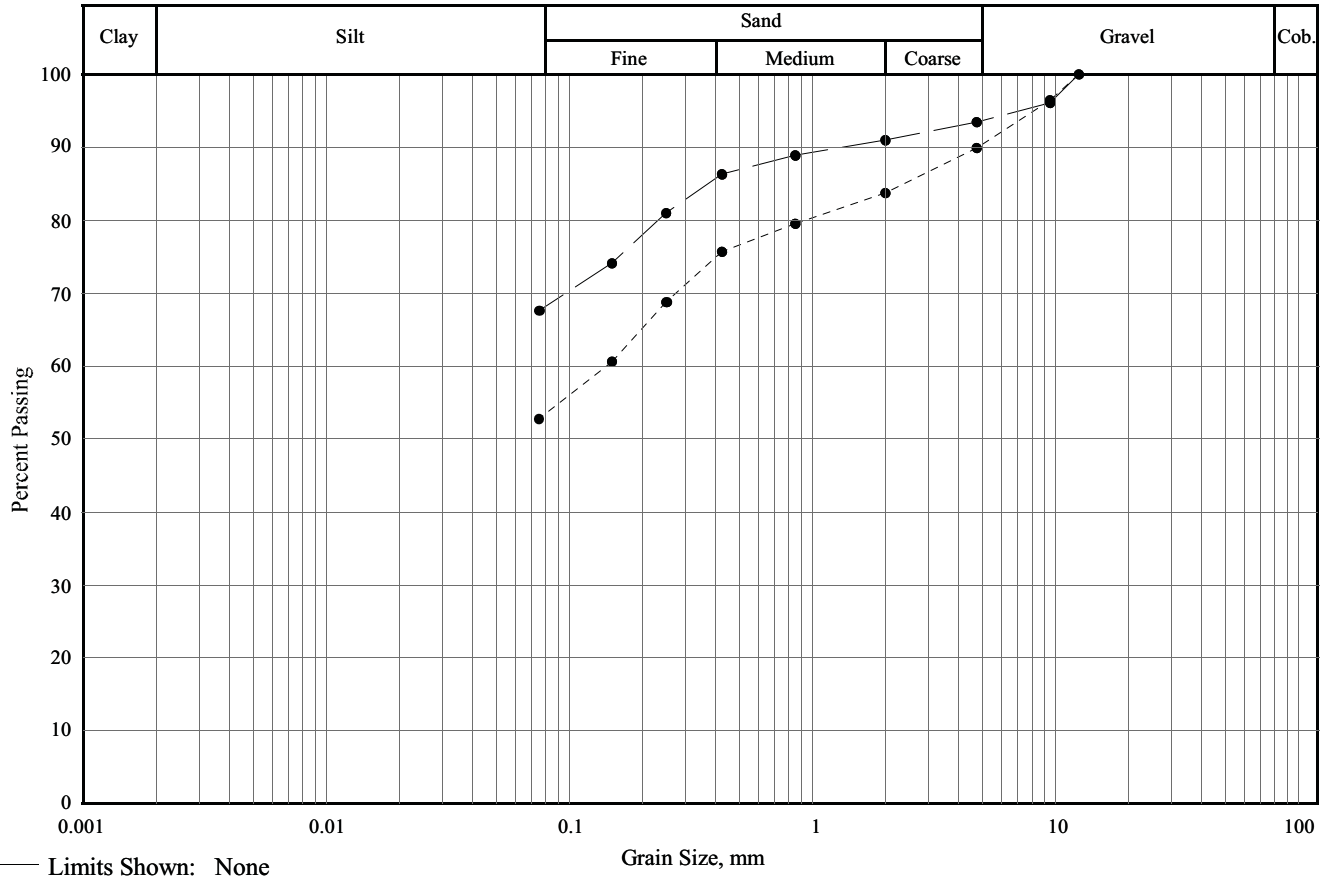


Limits Shown: None

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_{10}	D_{15}	D_{50}	D_{85}	% 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	---

GEMTEC LIMITED GROUND ENGINEERING & MATERIALS TECHNOLOGY	Client: VALRON Engineers Inc.	Soils Grading Chart
	Project: Geotechncial Investigation, Lamèque Wharf Structure No	
	Project #: 073715	



Limits Shown: None

Line Symbol	Description	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay	Date Sampled
—— ——		5	7	4.06-4.67m	6.6	25.9	67.6		02/06/2010
- - - - - - -		8	7	4.27-4.88m	10.1	37.1	52.7		02/06/2010

Line Symbol	Sample Description	AASHTO	D_{10}	D_{15}	D_{50}	D_{85}	% 5-75µm
—— ——	Sandy silt , trace gravel	A-6(7)	---	---	---	0.3736	---
- - - - - - -	Silt and sand , some gravel	A-4 to A-7	---	---	---	2.4021	---

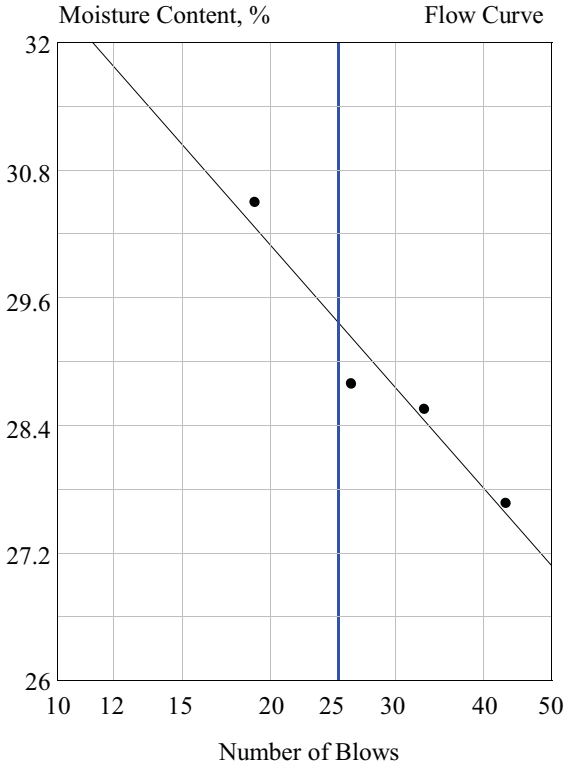
GEMTEC LIMITED GROUND ENGINEERING & MATERIALS TECHNOLOGY	Client: VALRON Engineers Inc. Project: Geotechncial Investigation, Lamèque Wharf Structure No Project #: 073715	Atterberg Limits

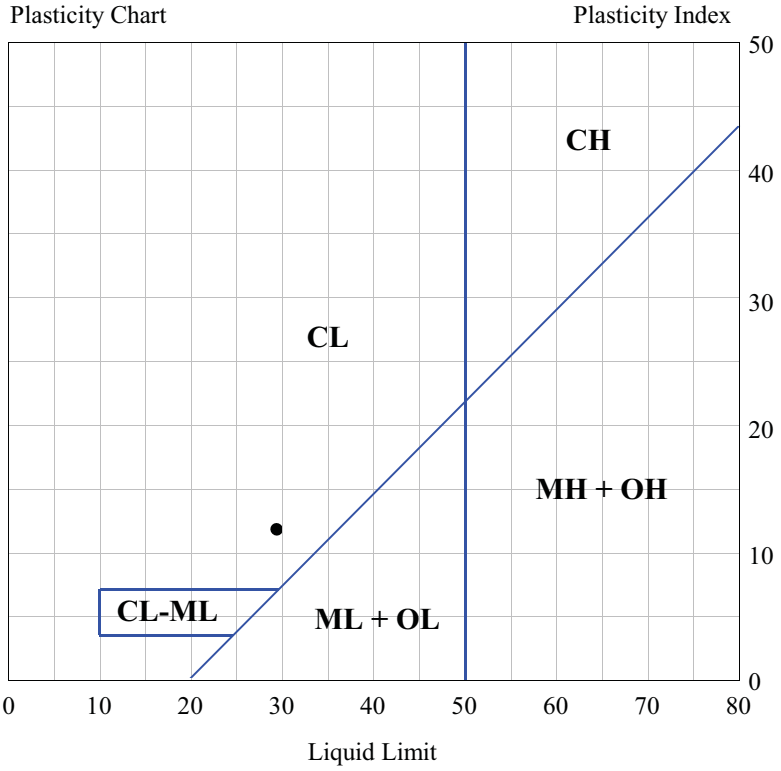
Description:			Borehole/Test Pit: 4
Sample Number: 5	Depth: 3.20-3.81m	Date Sampled: 02/06/2010	Date Tested: 07/06/2010

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	☐ NP
Plasticity Index:	11.8	





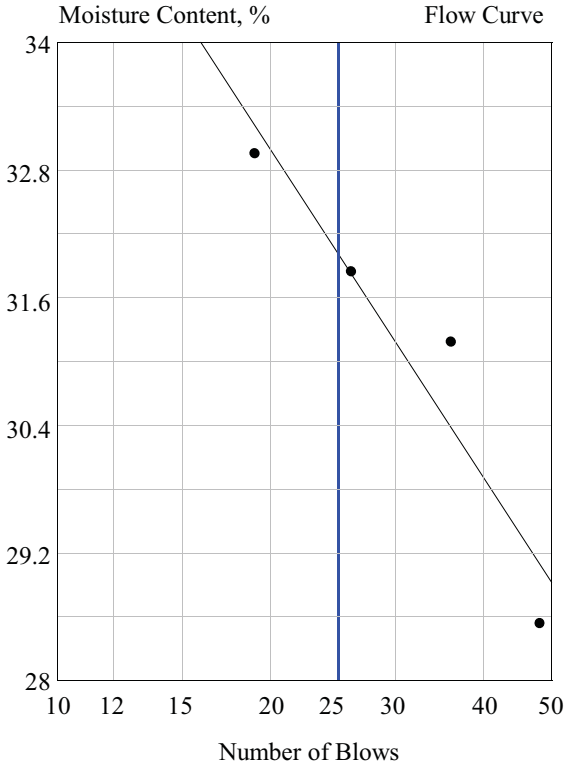
GEMTEC LIMITED GROUND ENGINEERING & MATERIALS TECHNOLOGY	Client: VALRON Engineers Inc. Project: Geotechncial Investigation, Lamèque Wharf Structure No Project #: 073715	Atterberg Limits

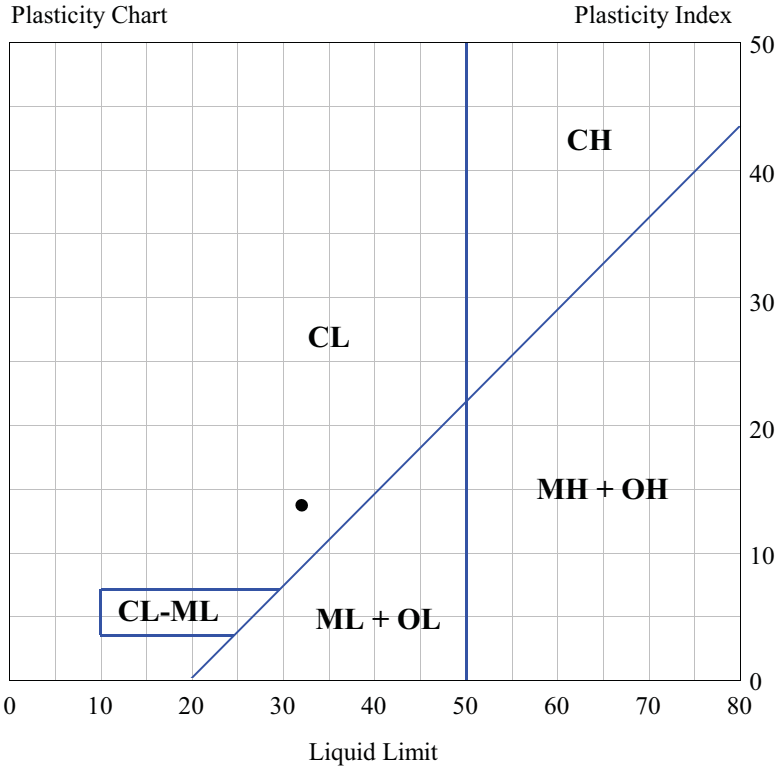
Description:			Borehole/Test Pit: 5
Sample Number: 7	Depth: 4.06-4.67m	Date Sampled: 02/06/2010	Date Tested: 07/06/2010

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	☐ NP
Plasticity Index:	13.7	





GEMTEC LIMITED GROUND ENGINEERING & MATERIALS TECHNOLOGY	Client	VALRON Engineers Inc.	Moisture Content and Density
	Project:	Geotechncial Investigation, Lamèque Wharf Structure N	
	Project #	073715	

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, mm³	
				Wet Density, kg/m³	
				Dry Density, kg/m³	
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, mm³	
				Wet Density, kg/m³	
				Dry Density, kg/m³	
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, mm³	
				Wet Density, kg/m³	
				Dry Density, kg/m³	

GEMTEC LIMITED GROUND ENGINEERING & MATERIALS TECHNOLOGY	Client VALRON Engineers Inc.	Moisture Content and Density
	Project: Geotechncial Investigation, Lamèque Wharf Structure N	
	Project # 073715	

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, mm³	
				Wet Density, kg/m³	
				Dry Density, kg/m³	
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, mm³	
				Wet Density, kg/m³	
				Dry Density, kg/m³	
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, mm³	
				Wet Density, kg/m³	
				Dry Density, kg/m³	

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)