GEOTECHNICAL INVESTIGATION
PROPOSED LOCAL 93 CARPENTERS UNION HALL AND TRAINING CENTER
765, GREEN CREEK DRIVE
CITY OF OTTAWA, ONTARIO

Prepared for

DOLYN DEVELOPMENTS INC
ATTN.: MR. DOUGLAS BURNSIDE
1518, SCOTT STREET, UNIT 1
CITY OF OTTAWA, ONTARIO
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By

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LRL File No: 08124

April 2008

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1 INTRODUCTION

Dolyn Development Inc. retained the services of Levac Robichaud Leclerc Associates Ltd. (LRL) to perform a geotechnical investigation for the proposed Local 93 Carpenter's Union hall and Training Center located at 765, Green Creek Drive in the City of Ottawa, Ontario.

It is our understanding that the site development plan will consist in constructing a 1,290m^2 one storey (37m long by 35m wide) steel frame structure located near the center of the property. Approximately one third of the structure will contain a mezzanine with office spaces while the remaining two thirds will be 10.5m high open space area used for training. It is currently proposed to set the structure over conventional strip and column footings founded below frost depth. The building will have a slab-on-grade with no basement. Parking areas and access lanes are proposed to the west and south of the building. Finally, the site will be serviced by the municipal sewers and water.

This geotechnical investigation was undertaken to:

a) Establish the geotechnical conditions underlying the site;

b) Confirm that the proposed type of foundations are suitable for this site and provide recommendation in regards to founding depth and the limit state bearing pressures of the founding stratum;

c) Discuss excavation conditions during the construction;

d) Comment on backfilling requirements and the suitability of the on-site soils for backfilling purposes; and

e) Recommend a pavement structure for the access road and parking areas.

This report has been prepared in consideration of the terms and conditions noted above and with the assumption that the design of the project will satisfy any applicable codes and standards. Should there be any changes in the design features, which may relate to the geotechnical considerations, Levac Robichaud Leclerc Associates Ltd. should be advised in order to review the report recommendations.

2 SITE DESCRIPTION

The site under investigation is located at 765, Green Creek Drive in the city of Ottawa. It is legally described as Part of Lot 14, Concession 1 (Ottawa Front), being Part 1 of Registered Plan 4R-22204 in the Geographic Township of Gloucester, now the city of Ottawa.

The property fronts approximately 83m along Green Creek Drive and is approximately 109m deep for a total surface area of 8,938m^2 (2.2 acres). At the time of our investigation, the site was vacant and entirely covered with snow (as much as 1.2m). The property appears to be more or less flat with grades ranging between 52.85 and 53.35 except the northeast corner slightly raised above the surrounding terrain with grades up to 54.22. The terrain appears to be covered with overgrown wild grasses with some scattered trees.

3 FIELDWORK

The fieldwork for this project comprised of digging five (5) test pits (TP-1 to TP-5) and one (1) deep borehole (BH-6) under the supervision of LRL technical staff. The borehole and the test pits were performed near the proposed building and access lane location as shown on the site plan provided by the client. Please refer to **Appendix A** for the approximate location of the borehole and all test pits performed as part of this investigation.

The test pits were performed across the property using a backhoe from a local contractor. The undrained shear strength of the cohesive soils in the test pits was determined using a calibrated Geonor M-3 inspection vane performed at various depths below ground surface (bgs).

George Downing Estates Drilling Inc was retained to carry out the intrusive drilling activities. The borehole was drilled using a track mounted CME 75 drill equipped with continuous flight hollow stem auger. A "two man" crew experienced with geotechnical drilling operated the rig. The borehole was advanced by augering through the overburden soil down to 16.5m bgs. The borehole was further advanced using a dynamic penetrometer cone (50mm), which was hammered down to a depth of 27.30m bgs within an inferred till deposit.

A split spoon sampler of 0.62m in length, calibre B was used to perform standard penetration tests ("N" value) and to recover soil samples. All soil samples collected from the split spoons were placed and sealed in plastic bags to prevent the evaporation of their moisture content. The shear strength (Cu) of the cohesive soils was determined using a calibrated field vane according to ASTM D-2573. Shelby tubes were obtained from the clay deposit at different depths for potential laboratory analysis.

Every soil type and interface were described, measured and logged. All soil samples were visually examined, described, logged and stored before being transported to our office for further examination by our geotechnical engineer.

Finally, the ground surface elevation of the test pits were interpolated from the survey provided by the client. All elevations are referenced to site benchmark given the top of

the top of fire hydrant spindle on Green Creek Drive located near the northwest corner of the property; Elevation 54.26.

3.1 Laboratory Testing

Several soil samples were selected for laboratory analysis, which included moisture content, Atterberg Limit and consolidation analyses. The physical soil analyses were submitted to LVM-Fondatec Inc., an accredited soil & material testing laboratory.

All samples collected during this project will be kept in storage for a period of six (6) months at which time, they shall be destroyed unless a written or verbal notice is received, stating otherwise.

4 SUBSURFACE SOIL AND GROUNDWATER CONDITIONS

4.1 Geological Mapping

A review of surficial geology maps provided by Department of Energy, Mines and Resources Canada suggest that the surficial geology for this area consist of erosional terraces composed mostly of silty clay. The overburden thickness of this deposit would locally range between 15m to 25m.

4.2 Soil Stratigraphy

Table 1 provides a summary of the soils encountered in the borehole and each test pit location including the depth of each soil interface. For more details, please refer to the attached Test Pit and Borehole Logs presented in **Appendix B**. Explanatory notes of the test holes logs are presented in **Appendix D.**

Table 1: Soil Depth Summary

Soil encountered	Depth of soil interface (m)		
	TP-1	**TP-2**	**TP-3**
Elevation	54.11	53.09	52.99
Topsoil	0.00 – 0.10	0.00 – 0.20	0.00 – 0.20
Fill	0.00 – 1.37	NE	ME
Clay	1.37 – 4.57	0.20 – 4.70	0.20 – 3.65
End of Test hole (Depth/Elev.)	4.57 / 49.54	4.70 / 48.39	3.65 / 49.34
Soil encountered	**TP-4**	**TP-5**	**BH-6**
Elevation	52.94	52.87	52.85
Topsoil	0.00 – 0.15	0.00 – 0.30	0.00 – 0.20
Clay	0.15 – 3.60	0.30 – 3.50	0.20 – 25.80
Till	NE	NE	25.8 – 27.30
End of Test hole (Depth/Elev.)	3.60 / 49.34	3.50 / 49.37	27.30 / 25.55

NE: Not Encountered.

4.2.1 Topsoil

Topsoil was encountered in all boreholes and test pits. The topsoil can be described as a dark brown clayey loam. The topsoil has a measured thickness varying between 100mm to 300mm and was found resting over a clay deposit in all test holes, except in TP-1, where the topsoil was resting over fill.

4.2.2 Fill

A fill layer was encountered in TP-1 only, which is located near the northeast corner of the proposed structure. The fill is composed of disturbed clay with presence of debris (i.e. car bumper and wires). It is brown in colour and moist. The fill layer was 1.27m thick and was found resting over native clay.

4.2.3 Native Clay

All test pits and boreholes encountered a marine clay deposit. In general, the clay is silty, olive grey in colour, of high plasticity and weathered by frost, friable and desiccated up to 1.0m bgs. The clay has a blocky texture to an average depth of 3.5m. Its consistency was measured to be very stiff (more than 120 kPa). Onwards, the clay becomes massive in texture and its plasticity increases. Its measured consistency is stiff to very stiff with measured shear strength greater than 76 kPa and up to 117 kPa down to 16.5m bgs. All test pits were terminated within the clay deposit.

Representative clay samples were submitted for laboratory analysis. Four clay samples were analysis for Atterberg limits and four samples were sent for water content analysis. The following **Table 2** summarises the results, while the laboratory test report is presented in **Appendix C**.

Table 2: Summary of Clay Analysis

Test Hole	Location	Depth (m)	Moisture content (percent)				
			Natural	Liquid limit	Plastic Limit	Plasticity Index	Liquidity Index
BH-6	SS-3	2.5	60.0	74	26	48	0.7
BH-6	SS-4	4.0	70.0	-	-	-	-
BH-6	SS-5	5.5	69.9	-	-	-	-
BH-6	SH-6	6.5	49	-	-	-	-
BH-6	SS-7	8	67	69	28	41	0.9
BH-6	SS-8	9.25	68.7	-	-	-	-
BH-6	SS-9	10.5	64	67	25	42	0.9
BH-6	SS-11	13.75	61.7	-	-	-	-
BH-6	SS-12	15.25	59	65	26	39	0.9

The analysis revealed that the clay has a natural moisture content varying between 49 to 70 percent, a Liquid Limit (w_l) between 65 to 74 percent, a Plastic Limit of (w_p) between 26 to 28 percent, a Plasticity Index (I_p) between 41 to 42 percent and a Liquidity Index (I_l) of 0.7 at 2.5m bgs and 0.9 onwards.

According to the Unified Soil Classification System, the clay is classified as CH. The clay's moisture content is well over the range of which it could easily be compacted. In general to compact clay soil, its moisture content must be within 6 percent of its plastic limit.

Furthermore, a sample taken from a depth of 6.5m bgs was submitted for a consolidation test. The complete consolidation tests results are given in **Appendix C**.

The test indicates that the preconsolidation pressure was measured at 325 KPa , the overconsolidation ratio (OCR) is 4.33 (over-consolidated clay). The estimated shear strength (calculated as Su = P'c/3.4) confirms the shear strength measured in BH-6.

4.2.4 Till

Base on our interpretation of the dynamic penotrometer cone hammered down in BH-6, it would appear that the till deposit would start at an approximate depth of 25.8m bgs and that the till would be fairly dense. The dynamic cone was terminated within this soil stratum.

4.2.5 Refusal/Bedrock

All test pits were terminated within the clay deposit, except BH-6, which was terminated in a till deposit at a depth of 27.30m. All test pits were terminated at a depth of 3.50m to 4.57m bgs without reaching refusal.

4.2.6 Groundwater Conditions

No groundwater infiltration was noted during the digging of the test pits. Nevertheless, the groundwater level would be located near the depth of 3m, which is where the clay changes in texture. It is also noted that a perched water table is to be expected within the weathered and fracture clay depending on the time of year (i.e Spring). It should be noted that groundwater levels could fluctuate with seasonal weather conditions, (i.e.: rainfall, droughts, spring thawing).

5 GEOTECHNICAL CONSIDERATIONS AND RECOMMENDATIONS

It is our understanding that the site development plan will consist in constructing a 1,290m^2 one storey (37m long by 35m wide) steel frame structure located near the center of the property. Approximately one third of the structure will contain a mezzanine with office spaces while the remaining two thirds will be 10.5m high open space area used for training. It is currently proposed to set the structure over conventional strip and column footings founded below frost depth. The building will have a slab-on-grade with no basement. Parking areas and access lanes are proposed to the west and south of the building. Finally, the site will be serviced by the municipal sewers and water.

5.1 Foundations

Based on the subsurface soil conditions encountered, the footings can be founded over the clay deposit set below frost depth. Therefore, all topsoil and fill material must be removed from the footprint of the footings.

The foundations for the proposed new building may be supported by conventional strip and column footings founded over the above mentioned soil. The Serviceability Limit State (SLS) capacity is **175 kPa** and the Ultimate Limit State (ULS) bearing capacity of **250 kPa** may be used for the design of the foundations. The soil is classified site class "D" as per the Site Classification for Seismic Site Response in the latest Ontario Building Code as the clay deposit encountered is not to contain a very sensitive layer.

The given allowable bearing capacity is based on concrete continuous footings being not less than 0.6m wide or more than 2.0m wide and on reinforced concrete bases not exceeding 5.0m along any sides.

Where excavation below the underside of the footing is performed, consideration shall be given to support the footings on structural fill. The structural fill must extend 1m beyond the outside edges of the footings and a distance equal to the depth of the structural fill below the footing. The recommended material to be used as structural fill to support the footings shall consist of Granular B Type II crushed stone, or an approved equivalent material.

The structural fill shall be placed over undisturbed native soils in layers not exceeding 300 mm and compacted to 98 percent of its Standard Proctor Maximum Dry Density (SPMDD) as per ASTM D-698. Prior to placing any structural fill or to pouring the footings, it is required that any disturbed soils along the base of the footing be removed and that the subgrade soils be inspected and approved by the geotechnical engineer. Furthermore, the structural fill must be tested to ensure that the specified compaction level was achieved.

5.2 Settlement

The estimated total settlement of the foundations, designed using the Serviceability Limit State bearing value given herein is less than 25mm. The differential settlement between adjacent column footings is anticipated to be 15mm or less. The estimated foundation settlement is considered to be within tolerable and acceptable limits for masonry construction.

5.3 Slab-on-grade Construction

The slab-on-grade construction will be acceptable over the native clay only. Therefore, all topsoil and fill shall be stripped from the footprint of the building. Any underfloor fill needed to raise the general floor grade shall consist of Granular B – Type I compacted to 95 percent of its SPMDD. The final lift shall be compacted to 98 percent of its SPMDD. A 200 mm layer of Granular A material shall be placed under the slab and compacted to at least 98% of the SPMDD. In order to further minimize and control cracking, the floor slab shall be provided with wire mesh reinforcement and construction or control joints. The construction or control joints shall be spaced equal distance in both direction and where possible not exceeding a distance of 4.5m. The wire mesh reinforcement shall be carried through the joints.

5.4 Frost Protection

Exterior footings and any footings located in unheated portions of the building shall be protected against frost heaving by providing a minimum of 1.5m of earth cover under snow covered surface or 1.7m under exposed surfaces (i.e. sidewalks, paved areas, etc.), or its equivalent in insulation protection. LRL shall review the detail design of frost protection with the use of equivalent insulation prior to construction.

In the event that foundations are to be constructed during winter months, foundation soils are required to be protected from freezing temperatures using suitable construction techniques. Therefore, the base of all excavations should be insulated from freezing

temperature immediately upon exposure, until the time that heat can be supplied to the building interior and footings have sufficient soil cover to prevent freezing of the subgrade soils.

5.5 Permanent Drainage

Permanent perimeter drainage for the proposed building is not required as it will not contain a basement.

In order to prevent the ponding of water adjacent to the foundation walls, the roof water should be controlled by a roof drainage system and the exterior grade should be sloped to shed water away from the walls.

6 Excavation and Backfilling Requirements

6.1 Excavation Requirements

It is anticipated that the excavations for the foundation would not extend below 1.5m bgs and those of the municipal services would not extend below 3.6m bgs.

The excavation conducted at this site will uncover mostly very stiff to firm clay. According to the Ontario's Occupational Health and Safety Act (OHSA), O. Reg. 527/00, excavation limited to the very stiff clay will be classified as Type 2. However, where fill material is encountered, the excavations shall be classified as Type 3.

According to the Ontario's Occupational Health and Safety Act (OHSA), O. Reg. 527/00, shallow temporary excavation in the overburden soil classified as Type 3 shall be sloped at 1 horizontal to 1 vertical (45 degrees) from the base of the excavations and as per requirements of the OHSA regulations. Shallow excavation in Type 2 soil shall be sloped at 1 horizontal to 1 vertical (45 degrees) starting at 1.2m from the base of the excavation.

The listed slopes are for fully drained conditions. Much gentler slopes could be required under undrained conditions, where local water infiltrations occur and where the excavations are exposed for prolonged period of time. Any excavated material stockpiled near a trench shall be stored at a distance equal to or greater than the depth of the excavated soil within the trench.

If the aforementioned slopes are not possible or practical to achieve due to space restrictions or obstacles, the excavation shall be shored according to OHSA Reg. 213/91. A geotechnical engineer shall design and approve the shoring and establish the shoring depth under the excavation profile.

6.2 Groundwater Control

It is expected that any surface groundwater seepage or infiltration entering the excavations can be controlled with an effective sump and pump system. Surface water runoff into the excavation should be avoided and diverted away from the excavation.

6.3 Trench Backfill

It is anticipated that the services will be founded over the stiff clay. Bedding, thickness of cover material and compaction requirements for sewers and watermains shall conform to the manufacture's design requirements and to the requirements and detail installations outlined in the Ontario Provincial Standard Specifications (OPSS), drawings OPSD 802-030 or 802.031 Class B or Class C for concrete pipes and OPSD 802.01 for flexible pipes as well as any generic standards established by the City of Ottawa.

All service trenches shall be backfilled using compactable material, free of organic, debris and large cobbles or boulders. Within the top 1.8m below proposed paved areas, the material shall consist of material similar to that excavated from the trenches in order to prevent differential frost heaving. Such heaving will occur where non-frost-susceptible granular fill is used to backfill trenches through frost-susceptible soils. This material shall be placed in lifts not exceeding 300mm, within ±2% of its optimal moisture content and compacted to at least 95% of its SPMDD.

Catch basins and manholes shall be backfilled using Granular B – Type I. A 3 horizontal to 1 vertical frost taper shall be constructed within the upper 1.5m to the subgrade. It is recommended, due to the nature of the native soils, that the joints between catch basin and manhole sections be wrapped with non-woven geotextile as per OPSS 1860 - Type I in order to prevent fine soil infiltration.

6.4 Foundation walls backfill

Backfill materials against shallow foundation walls should consist of free draining, non-frost-susceptible granular material (i.e., Granular "C", clean sand) compacted to 90 percent of its SPMDD using light compaction equipment. The compaction should be increased to 95 percent under walkways or paved areas close to the foundation wall. Site grading should be sloped away from the building area. Where specified, backfilling against foundation walls should be carried out on both sides of the wall at the same time.

6.5 Suitability of On-site Soils

The existing native overburden soil consists of very stiff to stiff clay, which are frost susceptible and are not recommended for backfilling purposes against foundation walls. However, they could be reused as general backfill material (service trenches and general landscaping/backfilling), if it can be compacted according to the specifications outlined herein at the time of construction. Any imported material should conform to OPSS Granular B - Type I.

It shall be noted that the adequacy of a material for reuse as backfill will depend on its water content at the time of its use and on the weather conditions prevailing prior and during that time. Therefore, all excavated materials to be reused shall be stockpiled in a manner that will prevent any significant changes in their moisture content, especially during wet conditions.

It is noted that waste debris (car bumper and wires) were encountered as part of the fill. Any waste material shall be sorted from the fill and be transported to the local landfill.

7 PAVEMENT DESIGN

It anticipated that the subgrade soils will consist mostly of clay. The representative soil modulus of the subgrade soils is 39 MPa (4 500 psi). The Granular Base Equivalency (GBE) thickness was calculated at 300mm for the light duty areas and 450mm for the heavy duty areas.

The following **Table 3** presents the recommended pavement structure to be constructed over a stable subgrade along the proposed parking areas and access road.

Table 3: Recommended Pavement Structure

Course	Material	Thickness (mm)	
		Light Duty (mm)	Heavy Duty (mm)
GBE		300	450
Surface	HL3 A/C	50	40
Binder	HL8 A/C	-	40
Base course	Granular "A"	100	150
Sub base	Granular "B" Type II	300	400
Total:		450	630

The base and sub base granular materials shall conform to OPSS Form 1010 material specifications. The sub base material shall be free draining and not prone to capillary uprising. They shall be tested and approved by a geotechnical engineer prior to delivery to the site and shall be compacted to at least 100% SPMDD.

Asphalt concrete shall conform to OPSS Form 1150 and be placed and compacted to at least 97% of the Marshall Density. The mix and its constituents shall be reviewed, tested and approved by a geotechnical engineer prior to delivery to the site.

7.1 Paved Areas Subgrade Preparation

The surficial soils should be stripped of vegetation, debris and other obvious objectionable material. Following the backfilling and satisfactory compaction of any underground service trenches up to the subgrade level, the subgrade shall be shaped, crowned and proof-rolled using heavy roller with any resulting soft areas sub excavated down to an adequate bearing layer and replaced with approved backfill. Any subgrade fill needed should be placed in small lifts and compacted to 95 percent of SPMDD.

The preparation of subgrade shall be scheduled and carried out in manner so that a protective cover of overlying granular material is placed as quickly as possible in order to avoid unnecessary circulation by heavy equipment, except on unexcavated or protected surfaces. Frost protection of the surface shall be implemented if works are carried out during the winter months.

8 INSPECTION SERVICES

The use of the limit state bearing pressures contained in this report for the design of spread footings is conditional on footings being constructed on undisturbed soil or suitably prepared structural fill reviewed and approved as such by this firm.

As such, a geotechnical construction review program is recommended, whereby the following aspects of construction are reviewed:

a) Inspection of in-situ soil subgrade prior to backfilling.

b) Field density tests during the backfilling program, to ensure that the specified level of compaction has been achieved.

c) Inspection of all bearing surfaces prior to the placement of concrete for the footings.

The completion of a review program of this type will result in the issuance of an engineering report confirming that these works have been completed in accordance with and in compliance with the general intent of the geotechnical recommendations.

9 REPORT CONDITIONS AND LIMITATIONS

The recommendations and data contained in this report are intended for design purpose only. The use of this report as a construction document is neither intended nor authorized by Levac Robichaud Leclerc Associates Ltd. Contractors and others involved in the construction of this project are advised to make an independent assessment of the subsurface soil and groundwater conditions for the purpose of establishing quantities, schedules and construction techniques.

The recommendations provided in this report are based on subsurface data obtained at the test locations. Experience indicates that the subsurface soil and groundwater conditions can vary significantly between and beyond the test locations. For this reason, the recommendations given in this report are subject to a field verification of the subsurface soil conditions at the time of construction.

The report recommendations are applicable only to the project described in the report. Any changes will require a review by Levac Robichaud Leclerc Associates Ltd., to insure compatibility with the recommendations contained in this project.

We trust that this report will meet your requirements. Should you have any questions or comments, please contact the undersigned.

Yours truly,
Levac Robichaud Leclerc Associates Ltd.

Prepared by

Benoît Charlebois, EIT

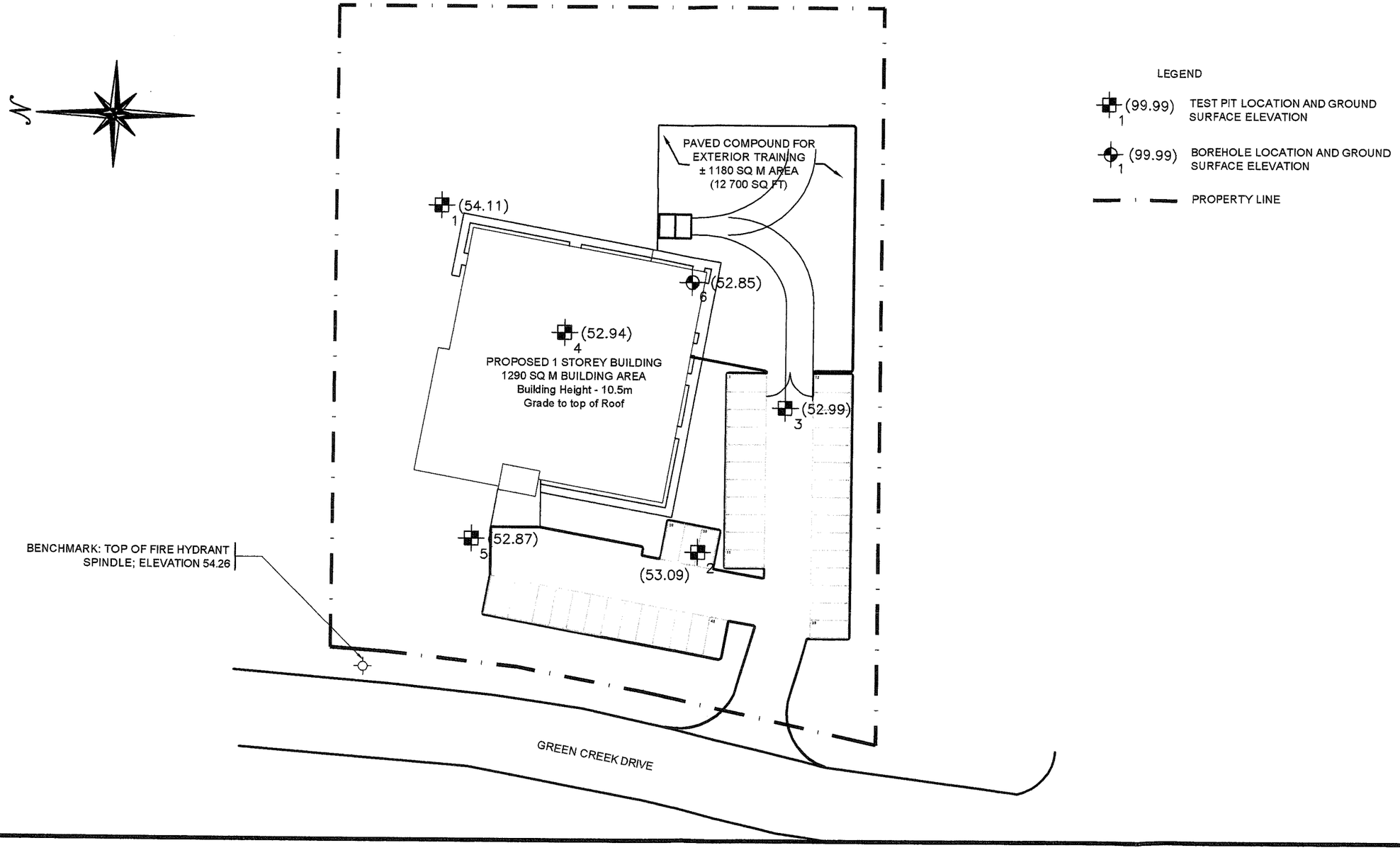
Approved by

LICENSED PROFESSIONAL ENGINEER
14-04-08
J.R.M.A. LAFORTE
PROVINCE OF ONTARIO

Marc-Antoine Laforte, P. Eng. P.E.D.

APPENDIX A

TEST PIT AND BOREHOLE LOCATION PLAN



LEGEND

(99.99) TEST PIT LOCATION AND GROUND SURFACE ELEVATION
1

(99.99) BOREHOLE LOCATION AND GROUND SURFACE ELEVATION
1

PROPERTY LINE

NOT AUTHENTIC UNLESS SIGNED AND DATED

PROJECT

GEOTECHNICAL INVESTIGATION
PROPOSED CARPENTER'S UNION HALL AND TRAINING CENTER
765, GREEN CREEK DRIVE
CITY OF OTTAWA

DRAWING TITLE

BOREHOLE AND TEST PIT
LOCATION PLAN

LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

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CLIENT

DOLYN DEVELOPMENTS INC.

DATE	FILE	DWG No.
APRIL 2008	08124	08124-G

APPENDIX B

TEST PIT AND BOREHOLE LOGS

LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

Test Pit: TP-1

Project No: 08124

Date: March 19, 2008

Project: Proposed Carpenter's Union Hall and Training Center

Technician: Benoît Charlebois

Client: Dolyn Developments Inc.

Datum: Geodetic

Location: 765, Green Creek Drive, City of Ottawa, Ontario

Equipment: Backhoe

STRATIGRAPHY				CONSISTENCY	
Depth (m)	Elev./Depth (m)	Soil Description	Sample	SHEAR STRENGHT (kN/m2) 30 60 90 / PENETRATION TEST (Blows/0.1m) 10 20 30 40	LIQUID LIMIT (WL) 25 50 75 / WATER CONTENT (W) 25 50 75	WATER LEVEL
0.0	54.11	Ground surface				
	0.00	***Topsoil:*** 100mm of dark brown clayey loam				
		Fill: Distrubed clay with a presence of debris (car bumper, wires) brown in colour and moist.	1			
0.5						
1.0						
	52.74					
	1.37	***Clay:*** Silty, olive grey in colour, weathered by frost, friable and desiccated on the surface with a blocky texture down to 3.5m and a massive texture onwards, high plasticity, moist and very stiff in consistency.	2	>120		
1.5						
2.0						
2.5						
3.0			3	>120		
3.5						
4.0				100		
4.5	49.54		4	100		
	4.57	End of Test Pit				

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LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

Test Pit: TP-2

Project No: 08124

Date: March 19, 2008

Project: Proposed Carpenter's Union Hall and Training Center

Technician: Benoît Charlebois

Client: Dolyn Developments Inc.

Datum: Geodetic

Location: 765, Green Creek Drive, City of Ottawa, Ontario

Equipment: Backhoe

STRATIGRAPHY				CONSISTENCY	
Depth (m)	Elev./Depth (m)	Soil Description	Sample	SHEAR STRENGHT (kN/m2) ○ 30 60 90 ○ / PENETRATION TEST ▲ (Blows/0.1m) ▲ 10 20 30 40	LIQUID LIMIT × (WL) × 25 50 75 / WATER CONTENT □ (W) □ 25 50 75	WATER LEVEL
0.0	53.09	Ground surface				
	0.00	***Topsoil:*** Dark brown clayey loam				
	52.89					
	0.20	***Clay:*** Silty, olive grey in colour, weathered by frost, friable and desiccated on the surface with a blocky texture down to 3.5m and a massive texture onwards, high plasticity, moist and very stiff in consistency.				
0.5						
1.0				>120		
1.5			1			
2.0						
2.5						
3.0			2	>120		
3.5				100		
4.0						
4.5			3	100		
	48.39					
	4.70	End of Test Pit				

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LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

Test Pit: TP-3

Project No: 08124

Date: March 19, 2008

Project: Proposed Carpenter's Union Hall and Training Center

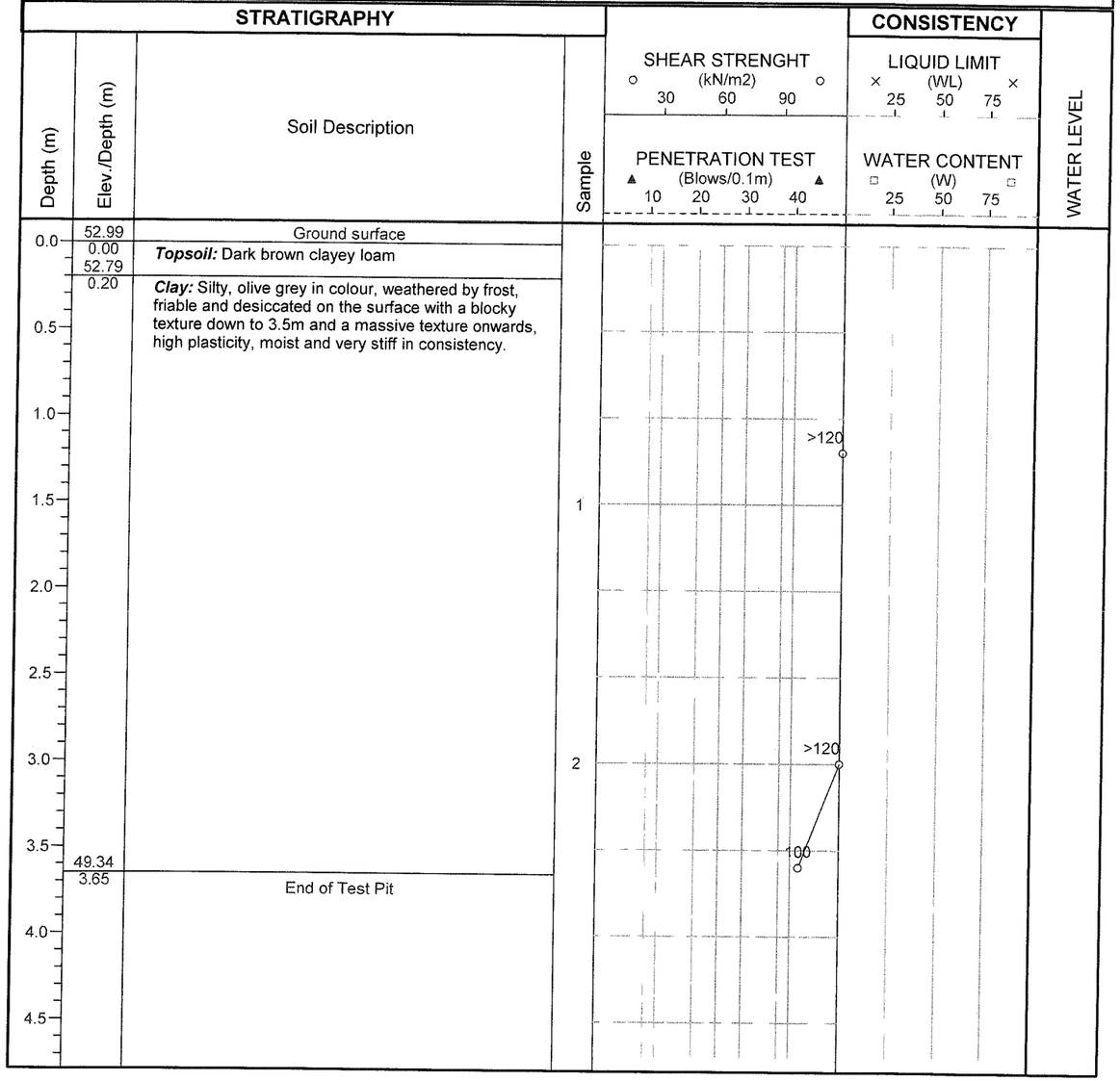
Technician: Benoît Charlebois

Client: Dolyn Developments Inc.

Datum: Geodetic

Location: 765, Green Creek Drive, City of Ottawa, Ontario

Equipment: Backhoe



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LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

Test Pit: TP-4

Project No: 08124

Date: March 19, 2008

Project: Proposed Carpenter's Union Hall and Training Center

Technician: Benoît Charlebois

Client: Dolyn Developments Inc.

Datum: Geodetic

Location: 765, Green Creek Drive, City of Ottawa, Ontario

Equipment: Backhoe

STRATIGRAPHY				CONSISTENCY	
Depth (m)	Elev./Depth (m)	Soil Description	Sample	SHEAR STRENGHT (kN/m2) 30 60 90 / PENETRATION TEST (Blows/0.1m) 10 20 30 40	LIQUID LIMIT (WL) 25 50 75 / WATER CONTENT (W) 25 50 75
0.0	52.94	Ground surface			
	0.00 / 52.79	***Topsoil:*** Dark brown clayey loam			
	0.15	***Clay:*** Silty, olive grey in colour, weathered by frost, friable and desiccated on the surface with a blocky texture down to 3.5m and a massive texture onwards, high plasticity, moist and very stiff in consistency.			
0.5					
1.0				>120	
1.5			1		
2.0					
2.5					
3.0			2	>120	
3.5				100	
	49.34 / 3.60	End of Test Pit			

WATER LEVEL

1-2884, Chamberland Street
Rockland, ON K4K 1M6
Tel: 613-446-7777 Fax: 613-446-1427

LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

Test Pit: TP-5

Project No: 08124

Date: March 19, 2008

Project: Proposed Carpenter's Union Hall and Training Center

Technician: Benoît Charlebois

Client: Dolyn Developments Inc.

Datum: Geodetic

Location: 765, Green Creek Drive, City of Ottawa, Ontario

Equipment: Backhoe

STRATIGRAPHY				CONSISTENCY	
Depth (m)	Elev./Depth (m)	Soil Description	Sample	SHEAR STRENGHT (kN/m2) ○ 30 60 90 ○ / PENETRATION TEST ▲ (Blows/0.1m) ▲ 10 20 30 40	LIQUID LIMIT × (WL) × 25 50 75 / WATER CONTENT □ (W) □ 25 50 75	WATER LEVEL
0.0	52.87	Ground surface				
	0.00	***Topsoil:*** Dark brown clayey loam				
	52.57					
	0.30	***Clay:*** Silty, olive grey in colour, weathered by frost, friable and desiccated on the surface with a blocky texture down to 3.5m and a massive texture onwards, high plasticity, moist and very stiff in consistency.				
0.5						
1.0				>120		
1.5			1			
2.0						
2.5						
3.0			2	>120		
				100		
3.5	49.37					
	3.50	End of Test Pit				

1-2884, Chamberland Street
Rockland, ON K4K 1M6
Tel: 613-446-7777 Fax: 613-446-1427

LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

Project No: 08124

Project: Proposed Carpenter's Union Hall and Training Center

Client: Dolyn Developments Inc.

Location: 765, Green Creek Drive, City of Ottawa

Borehole: BH-6

Date: March 24, 2008

Technician: Benoît Charlebois

Datum: Geodetic

Drill Type: CME 45 ***Driller:*** Downing

SUBSURFACE PROFILE			SAMPLE				SHEAR STRENGTH (kN/m2) 20 40 60 80 / Penetration Resistance (blows/0.3m) 10 20 30	CONSISTENCY: LIQUID LIMIT (WL) 25 50 75 / WATER CONTENT (W) 25 50 75	WATER LEVEL
Depth (m)	Elev./Depth (m)	Soil Description	Number	Type	% Recovery	BLOWS (N) / RQD			
0.0	52.85	Ground Surface							
	0.00	***Topsoil:*** 200mm of dark brown clayey loam.							
		Clay: Silty, olive grey in colour, weathered by frost, friable and desiccated on the surface with a blocky texture down to 3.5m and a massive texture onwards, high plasticity, moist and very stiff in consistency.	SS1		80	7	7		
			SS2		100	5	5		
			SS3		100	2	2		
							>76 >76		
			SS4		100	1	1		
							>76 >76		
			SS5		100	1	1		
			SH6		100				
							92 92		
			SS7		100	1	1		

1-2884 Chamberland Street
Rockland, ON K4K 1M6
Tel: 613-446-7777 Fax: 613-446-1427

LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

Borehole: BH-6

Project No: 08124

Date: March 24, 2008

Project: Proposed Carpenter's Union Hall and Training Center

Technician: Benoît Charlebois

Client: Dolyn Developments Inc.

Datum: Geodetic

Location: 765, Green Creek Drive, City of Ottawa

Drill Type: CME 45 ***Driller:*** Downing

SUBSURFACE PROFILE			SAMPLE					CONSISTENCY	
Depth (m)	Elev./Depth (m)	Soil Description	Number	Type	% Recovery	BLOWS (N) / RQD	SHEAR STRENGTH (kN/m2) 20 40 60 80 Penetration Resistance (blows/0.3m) 10 20 30	LIQUID LIMIT (WL) 25 50 75 WATER CONTENT (W) 25 50 75	WATER LEVEL
8.5							>100		
9.0							>100		
9.5			SS8		100	1			
10.0							97		
10.5							>100		
11.0			SS9		100	2	2		
11.5							>100		
12.0							>100		
12.5			SH10		100				
13.0							>100		
13.5									
14.0			SS11		100	2	2		
14.5							>100		
15.0									
15.5			SS12		100	2	2		
16.0							>100		

1-2884 Chamberland Street
Rockland, ON K4K 1M6
Tel: 613-446-7777 Fax: 613-446-1427

LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

Borehole: BH-6

Project No: 08124

Date: March 24, 2008

Project: Proposed Carpenter's Union Hall and Training Center

Technician: Benoît Charlebois

Client: Dolyn Developments Inc.

Datum: Geodetic

Location: 765, Green Creek Drive, City of Ottawa

Drill Type: CME 45 ***Driller:*** Downing

SUBSURFACE PROFILE			SAMPLE					CONSISTENCY		
Depth (m)	Elev./Depth (m)	Soil Description	Number	Type	% Recovery	BLOWS (N) / RQD	SHEAR STRENGTH (kN/m2) 20 40 60 80 Penetration Resistance (blows/0.3m) 10 20 30	LIQUID LIMIT (WL) 25 50 75 WATER CONTENT (W) 25 50 75	WATER LEVEL
16.5									
17.0			SH13		100				
17.5							7		
18.0							8		
18.5							8 9		
19.0							9 8		
19.5							10		
20.0							10 10		
20.5							11		
21.0							12 13		
21.5							13 13		
22.0							16		
22.5							14 17		
23.0							16 18		
23.5							18 22		
24.0							22		

1-2884 Chamberland Street
Rockland, ON K4K 1M6
Tel: 613-446-7777 Fax: 613-446-1427

LEVAC ROBICHAUD LECLERC ASSOCIATES LTD.
Project Managers and Consulting Engineers

Borehole: BH-6

Project No: 08124

Date: March 24, 2008

Project: Proposed Carpenter's Union Hall and Training Center

Technician: Benoît Charlebois

Client: Dolyn Developments Inc.

Datum: Geodetic

Location: 765, Green Creek Drive, City of Ottawa

Drill Type: CME 45 ***Driller:*** Downing

SUBSURFACE PROFILE			SAMPLE				SHEAR STRENGTH ○ (kN/m2) ○ 20 40 60 80 / Penetration Resistance ▲ (blows/0.3m) ▲ 10 20 30	CONSISTENCY: LIQUID LIMIT × (WL) × 25 50 75 / WATER CONTENT □ (W) □ 25 50 75	WATER LEVEL
Depth (m)	Elev./Depth (m)	Soil Description	Number	Type	% Recovery	BLOWS (N) / RQD			
24.5							22		
25.0							22 21		
25.5							21 23		
	27.05						>40		
26.0	25.80	***Inferred Till***: Dense					>40		
26.5							>40		
27.0							>40		
	25.55								
27.5	27.30	End of Borehole							
28.0									
28.5									
29.0									
29.5									
30.0									
30.5									
31.0									
31.5									
32.0									

1-2884 Chamberland Street
Rockland, ON K4K 1M6
Tel: 613-446-7777 Fax: 613-446-1427

APPENDIX C

LABORATORY TEST REPORTS

LVM
TECHNISOL

900, boul. de la Carrière, bur. 100
Gatineau, J8Y 6T5
Téléphone: (819) 778-3143

Testing on Soils, Aggregates and Other Materials

Client : LEVAC, ROBICHAUD, LECLERC & ASSOCIÉS LTÉE
Project : Laboratory Testing; Season 2008
Location :

Project # : P011195-0501
Client ref. : 8124
Report # : 7 Rev. 0
Page 1 of 1

Sampling

Sampling #	:	7
Your sampling #	:	BH6- SS 4
Material	:	Clay
Source; location	:	
Sampling location	:	765, Green Creek Drive, Ottawa; BH 1- SS 4; 4.0 m

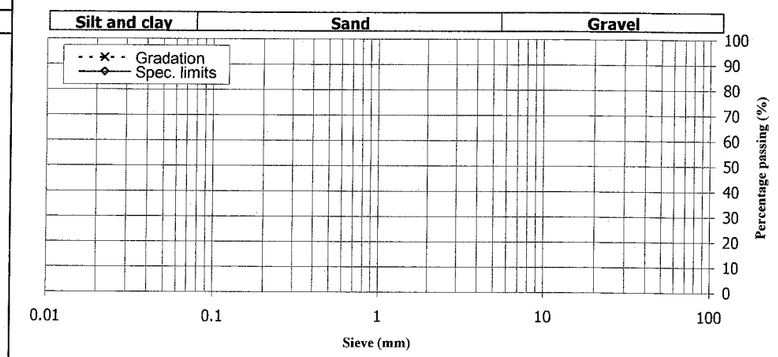
Spécification n° 2

Reference	:	Various
Use	:	
Calibre	:	
Class	:	

Sampling date	:	3/24/2008
By	:	le client
Date received	:	3/26/2008

Sieve analysis

SIEVE (mm)	% PASSING REQUIREMENTS	% PASSING RESULT



Cu : Cc : Fineness modulus :

Modified Proctor Test 152 mm (NQ 2501-255) Method : C

Maximum dry density kg/m³	Optimum moisture %	Retained 5 mm %

Proportions from sleeve analysis (%)

Rock :	Sand :
Gravel :	Silt and clay :

Other testing	Required	Result
Water content (%)		70,0

Remarks

RESULTS WITH AN ASTERISK DO NOT MEET REQUIREMENTS.

Prepared by :	Date :
Jean-Pierre Lavoie, chef d'équipe	3/27/2008

Approved by : Jean-Pierre Lavoie
Jean-Pierre Lavoie, chef d'équipe **Date : 3/27/2008**

LVM
TECHNISOL

900, boul. de la Carrière, bur. 100
Gatineau, J8Y 6T5
Téléphone: (819) 778-3143

Testing on Soils, Aggregates and Other Materials

Client : LEVAC, ROBICHAUD, LECLERC & ASSOCIÉS LTÉE
Project : Laboratory Testing; Season 2008
Location :

Project # : P011195-0501
Client ref. : 8124
Report # : 8 Rev. 0
Page 1 of 1

Sampling

Sampling #	:	8
Your sampling #	:	BH 6 SS 5
Material	:	Clay
Source; location	:	
Sampling location	:	765, Green Creek Drive, Ottawa; BH 1- SS 5; 5.5 m

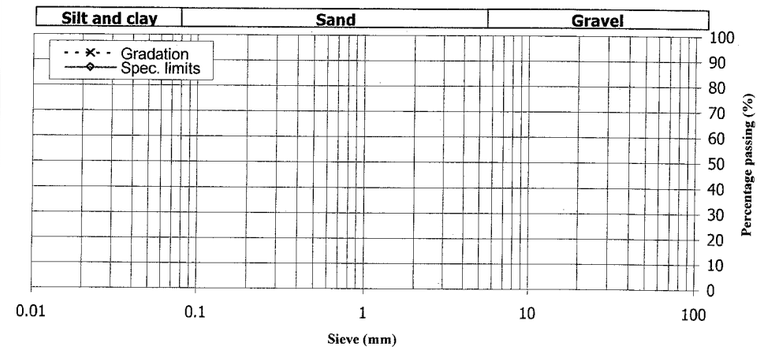
Spécification n° 2

Reference	:	Various
Use	:	
Calibre	:	
Class	:	

Sampling date	:	3/24/2008
By	:	le client
Date received	:	3/26/2008

Sieve analysis

SIEVE (mm)	% PASSING REQUIREMENTS	% PASSING RESULT



Cu : Cc : Fineness modulus :

Modified Proctor Test 152 mm (NQ 2501-255) Method : C

Maximum dry density kg/m³	Optimum moisture %	Retained 5 mm %

Proportions from sleeve analysis (%)

Rock :	Sand :
Gravel :	Silt and clay :

Other testing	Required	Result
Water content (%)		69,9

Remarks

RESULTS WITH AN ASTERISK DO NOT MEET REQUIREMENTS.

Prepared by : Jean-Pierre Lavoie, chef d'équipe — **Date :** 3/27/2008

Approved by : Jean-Pierre Lavoie, chef d'équipe — **Date :** 3/27/2008

LVM
TECHNISOL

900, boul. de la Carrière, bur. 100
Gatineau, J8Y 6T5
Téléphone: (819) 778-3143

Testing on Soils, Aggregates and Other Materials

Client : LEVAC, ROBICHAUD, LECLERC & ASSOCIÉS LTÉE
Project : Laboratory Testing; Season 2008
Location :

Project # : P011195-0501
Client ref. : 8124
Report # : 10 Rev. 0
Page 1 of 1

Sampling

Sampling #	:	10
Your sampling #	:	BH 6- SS 8
Material	:	Clay
Source; location	:	
Sampling location	:	765, Green Crek Drive, Ottawa; BH 1- SS 8; 9.25 m

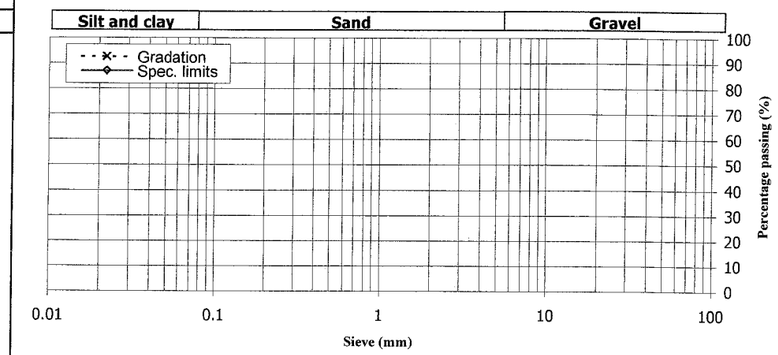
Spécification n° 2

Reference	:	Various
Use	:	
Calibre	:	
Class	:	

Sampling date	:	3/24/2008
By	:	le client
Date received	:	3/26/2008

Sieve analysis

SIEVE (mm)	% PASSING REQUIREMENTS	% PASSING RESULT



Cu : Cc : Fineness modulus :

Modified Proctor Test 152 mm (NQ 2501-255) Method : C

Maximum dry density kg/m³	Optimum moisture %	Retained 5 mm %

Proportions from sleeve analysis (%)

Rock :	Sand :
Gravel :	Silt and clay :

Other testing	Required	Result
Water content (%)		68,7

Remarks

RESULTS WITH AN ASTERISK DO NOT MEET REQUIREMENTS.

Prepared by : Jean-Pierre Lavoie, chef d'équipe — **Date :** 3/27/2008

Approved by : Jean-Pierre Lavoie, chef d'équipe — **Date :** 3/27/2008

LVM
TECHNISOL

900, boul. de la Carrière, bur. 100
Gatineau, J8Y 6T5
Téléphone: (819) 778-3143

Testing on Soils, Aggregates and Other Materials

Client : LEVAC, ROBICHAUD, LECLERC & ASSOCIÉS LTÉE
Project : Laboratory Testing; Season 2008
Location :

Project # : P011195-0501
Client ref. : 8124
Report # : 12 **Rev.** 0
Page 1 **of** 1

Sampling

Sampling #	:	12
Your sampling #	:	BH 6 SS 11
Material	:	Clay
Source; location	:	
Sampling location	:	765, Green Creek Drive, Ottawa; BH 1- SS 11; 13.75 m

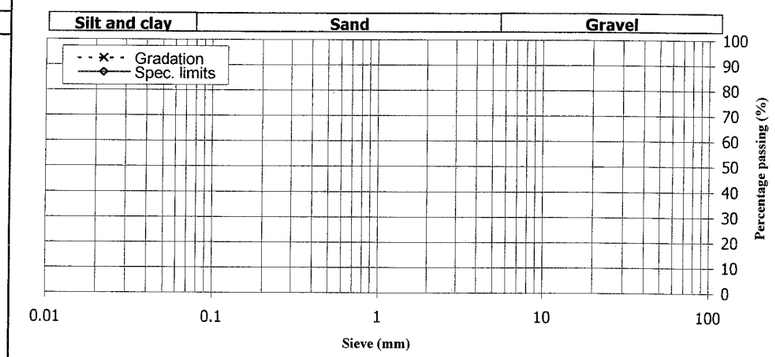
Spécification n° 2

Reference	:	Various
Use	:	
Calibre	:	
Class	:	

Sampling date	:	3/24/2008
By	:	le client
Date received	:	3/26/2008

Sieve analysis

SIEVE (mm)	% PASSING	
	REQUIREMENTS	RESULT



Cu : Cc : Fineness modulus :

Modified Proctor Test 152 mm (NQ 2501-255) Method : C

Maximum dry density kg/m³	Optimum moisture %	Retained 5 mm %

Proportions from sleeve analysis (%)

Rock :	Sand :
Gravel :	Silt and clay :

Other testing	Required	Result
Water content (%)		61,7

Remarks

RESULTS WITH AN ASTERISK DO NOT MEET REQUIREMENTS.

Prepared by :	Date :
Jean-Pierre Lavoie, chef d'équipe	3/27/2008

Approved by :	Date :
Jean-Pierre Lavoie, chef d'équipe	3/27/2008

LVM TECHNISOL

Liquid and Plastic Limits

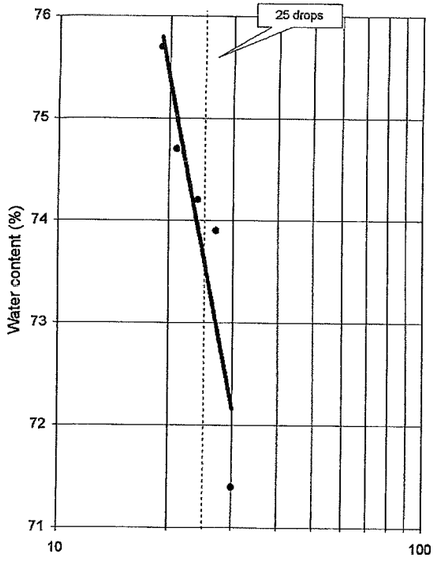
Casagrande

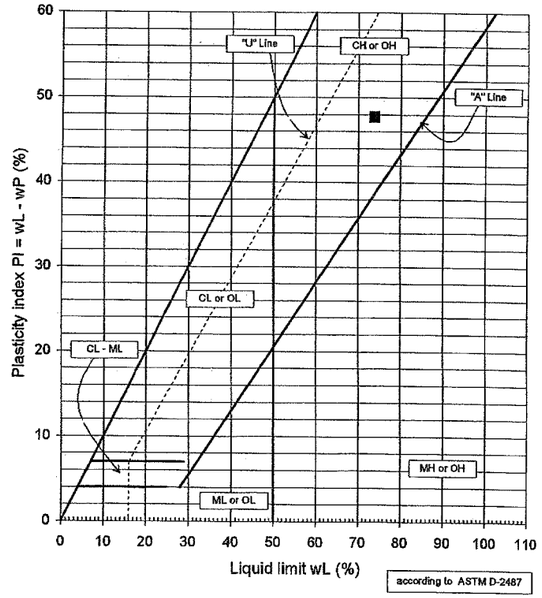
Client :	**Levac Robichaud Leclerc Associates Ltd**	**Ref. Client :**	**08124**
Project :	**Proposed Carpenters**	**Project No. :**	**P011195-501**
Location :	**765, Green Creek Drive, Ottawa**	**Sample :**	**006**
		Page:	

Passed through the 400-µm sieve by :

		Natural humidity		Plastic limit		
Cup		T	H-H	W	Y	C
Cup weight	(g)	16,120	15,990	16,090	16,000	15,980
Cup weight + moist soil	(g)	53,030	51,690	22,380	22,150	21,730
Cup weight + dry soil	(g)	39,100	38,320	21,080	20,850	20,540
Water content	(%)	60,6	59,9	26,1	26,8	26,1
		Liquid limit				
Number of drops		30	27	24	21	19
Cup		R	A	J	O	X
Cup weight	(g)	15,910	16,060	16,190	15,970	16,250
Cup weight + moist soil	(g)	37,730	35,950	37,200	35,290	35,230
Cup weight + dry soil	(g)	28,640	27,500	28,250	27,030	27,050
Water content	(%)	71,4	73,9	74,2	74,7	75,7

Borehole :	**BH-6**	**Natural humidity (%)**	**60**	**Plasticity index (%)**	**48**
Sample :	**SS-3**	**Plastic limit (%)**	**26**	**Liquidity index**	**0,7**
Depth :	**2.5 m**	**Liquid limit (%)**	**74**	**Classification**	**CH**





Prepared by	Date	Approved by	Date
Sanja Tokmacic	**2008-03-28**	**Jean-Pierre Lavoie, T.P.**	**2008-03-28**

LVM TECHNISOL

Liquid and Plastic Limits

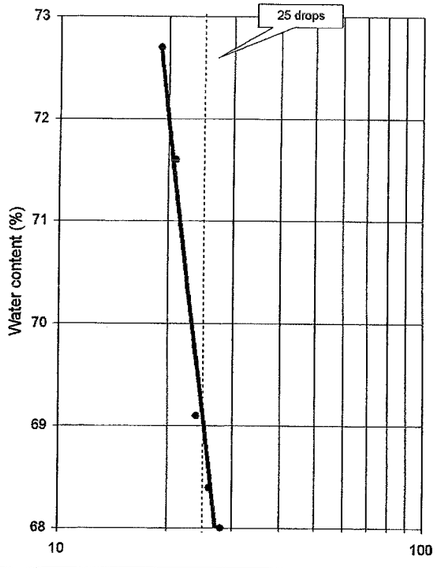
Casagrande

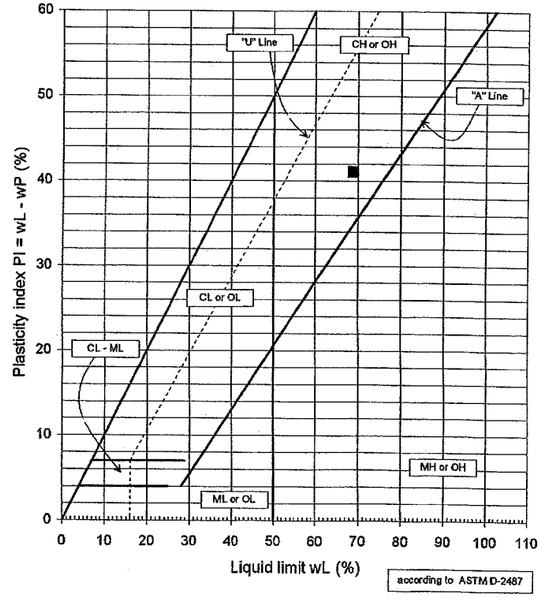
Client :	**Levac Robichaud Leclerc Associates Ltd**	**Ref. Client :**	**08124**
Project :	**Proposed Carpenters**	**Project No. :**	**P011195-501**
Location :	**765, Green Creek Drive, Ottawa**	**Sample :**	**009**
		Page:	

Passed through the 400-µm sieve by :

		Natural humidity		Plastic limit		
Cup		C-C	F-F	F-F	H-H	J-J
Cup weight	(g)	15,960	15,870	15,860	15,990	16,130
Cup weight + moist soil	(g)	48,230	46,810	24,340	24,620	24,660
Cup weight + dry soil	(g)	35,230	34,520	22,490	22,730	22,800
Water content	(%)	67,5	65,9	27,9	28,0	27,9
		Liquid limit				
Number of drops		28	26	24	21	19
Cup		T	R	O	B	I
Cup weight	(g)	16,130	15,910	15,960	16,010	16,100
Cup weight + moist soil	(g)	36,290	36,820	40,620	37,100	38,470
Cup weight + dry soil	(g)	28,130	28,330	30,540	28,300	29,050
Water content	(%)	68,0	68,4	69,1	71,6	72,7

Borehole :	**BH-6**	**Natural humidity (%)**	**67**	**Plasticity index (%)**	**41**
Sample :	**SS-7**	**Plastic limit (%)**	**28**	**Liquidity index**	**0,9**
Depth :	**8.0 m**	**Liquid limit (%)**	**69**	**Classification**	**CH**





Prepared by	Date	Approved by	Date
Sanja Tokmacic	**2008-03-31**	**Jean-Pierre Lavoie, T.P.**	**2008-04-01**

LVM TECHNISOL

Liquid and Plastic Limits

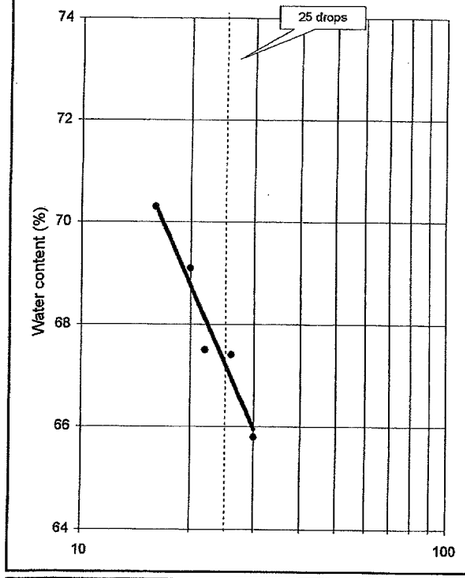
Casagrande

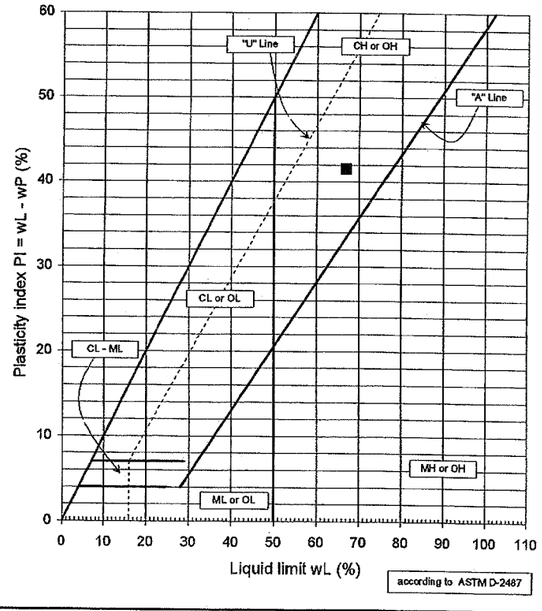
Client :	**Levac Robichaud Leclerc Associates Ltd**	**Ref. Client :**	**08124**
Project :	**Proposed Carpenters**	**Project No. :**	**P011195-501**
Location :	**765, Green Creek Drive, Ottawa**	**Sample :**	**011**
		Page:	

Passed through the 400-µm sieve by :

		Natural humidity		Plastic limit		
Cup		C	I	F-F	H-H	J-J
Cup weight	(g)	15,990	16,090	15,880	16,000	16,150
Cup weight + moist soil	(g)	59,380	58,940	23,990	24,650	25,070
Cup weight + dry soil	(g)	42,460	42,120	22,340	22,910	23,250
Water content	(%)	63,9	64,6	25,5	25,2	25,6
		Liquid limit				
Number of drops		30	26	22	20	16
Cup		B	U	K	Y	T
Cup weight	(g)	16,030	16,160	16,120	16,030	16,160
Cup weight + moist soil	(g)	31,700	33,850	32,050	33,060	32,410
Cup weight + dry soil	(g)	25,480	26,730	25,630	26,100	25,700
Water content	(%)	65,8	67,4	67,5	69,1	70,3

Borehole :	**BH-6**	**Natural humidity (%)**	**64**	**Plasticity index (%)**	**42**
Sample :	**SS-9**	**Plastic limit (%)**	**25**	**Liquidity index**	**0,9**
Depth :	**10.5 m**	**Liquid limit (%)**	**67**	**Classification**	**CH**





Prepared by	Date	Approved by	Date
Sanja Tokmacic	**2008-04-01**	**Jean-Pierre Lavoie, T.P.**	**2008-04-01**

LVM TECHNISOL

Liquid and Plastic Limits

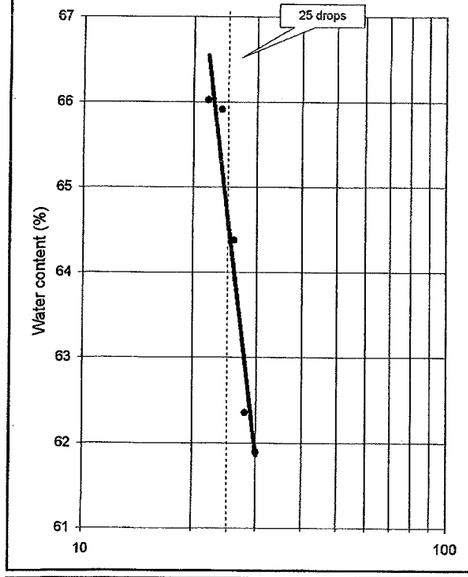
Casagrande

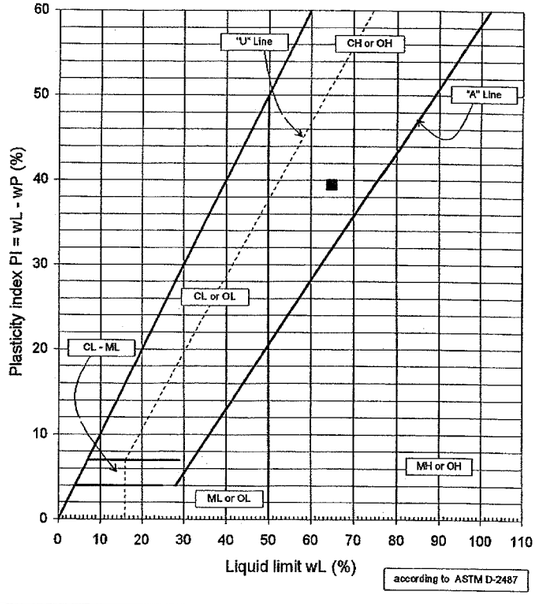
Client :	**Levac Robichaud Leclerc Associates Ltd**	**Ref. Client :**	**08124**
Project :	**Proposed Carpenters**	**Project No. :**	**P011195-501**
Location :	**765, Green Creek Drive, Ottawa**	**Sample :**	**013**
		Page:	

Passed through the 400-µm sieve by :

		Natural humidity		Plastic limit		
Cup		U	G	2	18	34
Cup weight	(g)	16,110	16,230	16,250	16,340	16,190
Cup weight + moist soil	(g)	50,750	45,160	23,810	23,590	23,030
Cup weight + dry soil	(g)	37,730	34,470	22,260	22,120	21,640
Water content	(%)	60,2	58,6	25,8	25,4	25,5
		Liquid limit				
Number of drops		30	28	26	24	22
Cup		P	I	R	O	S
Cup weight	(g)	16,240	16,100	15,890	15,960	16,160
Cup weight + moist soil	(g)	38,100	32,580	32,590	31,290	32,380
Cup weight + dry soil	(g)	29,740	26,250	26,050	25,200	25,930
Water content	(%)	61,9	62,4	64,4	65,9	66,0

Borehole :	**BH-6**	**Natural humidity (%)**	**59**	**Plasticity index (%)**	**39**
Sample :	**SS-12**	**Plastic limit (%)**	**26**	**Liquidity index**	**0,9**
Depth :	**15.25 m**	**Liquid limit (%)**	**65**	**Classification**	**CH**





Prepared by	Date	Approved by	Date
Sanja Tokmacic	**2008-04-01**	**Jean-Pierre Lavoie, T.P.**	**2008-04-01**

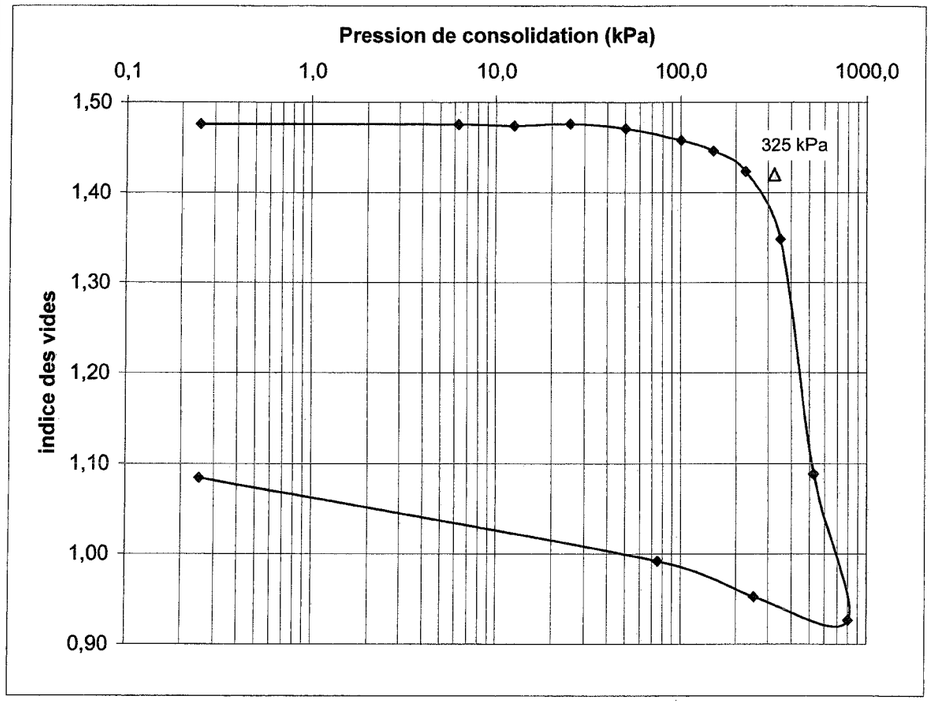
LVM
TECHNISOL

Rapport d'essai de consolidation oedométrique

Client : Levac
Projet : Essais de laboratoire

Date : 2008-04-11
Dossier : 033-P011995-501n° 5
V/Réf : 08124

Sondage No : BH-1 Échantillon No : SH-6 Profondeur (m) : 6,5 m
Niveau de la nappe d'eau (date) : 3,5 m à venir



Caractéristiques géotechniques des sols :

Indice des vides initial (e_o) :	1,48		
Teneur en eau initiale (w) :	49%		
Poids volumique humide initial (γ_T) :	16 kN/m³		
Degré de saturation initial (S_r) :	108%		
Pression de préconsolidation (σ'_p):	325 kPa	Contrainte effective initiale (σ'_v) :	75 kPa
Indice de recompression (C_r) :	0,038	Écart de surconsolidation ($\Delta\sigma$) :	250 kPa
Indice de compression vierge (C_c) :	0,884		

Préparé par :

Claire Pelletier, Chef d'équipe

Vérifié par :

Yaya Coulibaly, ing.jr

APPENDIX D

TEST HOLE LOGS
EXPLANATORY NOTES

TEST HOLE LOGS EXPLANATORY NOTES

GENERAL NOTES

The purpose of the test hole logs is to assemble as much of the data obtained from field observations and laboratory testing on a single sheet. The borehole tables contain a detailed summary of subsoil, bedrock, and groundwater conditions, which are considered to be important in formulating the recommendations contained in the report.

The soil descriptions provided are based on commonly accepted methods of classification employed in geotechnical practice. Classification and identification of soil involves some judgment and LRL does not guarantee the descriptions as exact, but infers accuracy to the extent that is common in current geotechnical practice. For a precise soil classification, additional laboratory testing would need to be accomplished but was not deemed necessary for the purpose of this investigation.

The following explains the data contain in the borehole tables.

Depth

The depth column gives the boundaries between the various geological strata encountered during the field testing. The accuracy of the boundary between the various strata is dependent on the spacing between the samples. Under normal conditions of sampling, an accuracy of ± 0.3 m should be assigned to the elevation at strata boundaries.

Soil Description

Each geological stratum is described on the basis of a visual examination of the subsoil or bedrock recovered from the borehole, from laboratory test results, and from field observations at the time of drilling.

The description utilizes standard geotechnical terminology. The state of compactness of granular soils is defined on the basis of the Standard Penetration Test and on Cone Penetrometer values. The consistency of clayey or cohesive soils is based on the shear strength of the soil, as determined by the laboratory or field vane tests, by laboratory compressive strengths, or by a visual assessment of the soil strength.

The proportion of each constituent part, as defined by the grain size distribution, is denoted by the following terms:

Term	Proportions
"trace"	1% to 10%
"some"	10% to 20%
prefix (i.e. "sandy" silt)	20% to 35%
"and" (i.e. sand "and" gravel)	35% to 50%

The state of compactness of granular soils and the consistency of cohesive soils are defined by the following terms:

State of Compactness Granular Soils	Standard Penetration Test Value "N"
very loose	0 – 4
Loose	4 – 10
compact or medium	10 - 30
Dense	30 - 50
very dense	over - 50

Consistency Cohesive Soils	Undrained Shear Strength (Cu) (kPa)
very soft	under 10
Soft	10 - 25
medium or firm	25 - 50
Stiff	50 - 100
very stiff	100 - 200
Hard	over - 200

Sample Information

Data pertaining to the samples is described in the five (5) columns shown below the sample information column

1. Number

Each sample taken from the borehole is numbered in the field as shown in this column. The type of sample taken from the borehole is indicated by a two (2) letter code, as indicated below:

AS: Auger Sample
SS: Split Spoon Sample
ST: Shelby Tube Sample
WS: Washed Sample
RC: Core Sample

2. Blows (N)

This column indicates the Standard Penetration Resistance (N). It is defined as the number of blows required to advance a Standard Split Barrel sampler 0.3 m into the subsoil, driven by means of a hammer, having 63.5 kg (± 0.5 kg) mass, falling freely a distance of 0.76 m (± 0.02 m). This is used to determine the state of compactness of the soil sampled.

3. Rec (%)

This column shows the percentage of the recovered sample obtained versus the length sampled. In the case of rock, the percentage is the length of rock core recovered compared to the length of the drill run

4. Depth (m)

This column shows the depth of which the sample was collected.

5. RQD or Cu

The Rock Quality Designation (RQD) is a measurement in percentage of the rock quality as determined by examination and measurements of the rock core. It is considered to be a more sensitive means of evaluating the rock quality than is the gross core recovery value. The relationship between RQD and Rock Quality is given below;

Rock Quality Designation (RQD)	Description of Rock Quality
0 –25	very poor
25 – 50	poor
50 – 75	fair
75 – 90	good
90 – 100	excellent

Cu is the shear strength measured on cohesive soils in kPa using a field vane or a calibrated pocket penetrometer. The values obtained are used to determine the consistency of the soil.

Comments

General comments are placed in this column such as the water content (W) of a recovered sample determined in the laboratory.

Interpretation of Technical Data

The data contained on the borehole tables are considered to be specialized technical information. Often the data in these sections are used as the basis for establishing the bearing capacity of the soil or in evaluating other important geotechnical considerations.

The interpretation of the technical data contained in the above noted sections, by persons other than those approved by Levac Robichaud Leclerc Associates Ltd, is neither recommended nor authorized.