

APPENDIX 'A'

GEO TECHNICAL REPORT

AECOM Canada Ltd.

GENERAL STATEMENT

NORMAL VARIABILITY OF SUBSURFACE CONDITIONS

The scope of the investigation presented herein is limited to an investigation of the subsurface conditions as to suitability for the proposed project. This report has been prepared to aid in the evaluation of the site and to assist the engineer in the design of the facilities. Our description of the project represents our understanding of the significant aspects of the project relevant to the design and construction of earth work, foundations and similar. In the event of any changes in the basic design or location of the structures as outlined in this report or plan, we should be given the opportunity to review the changes and to modify or reaffirm in writing the conclusions and recommendations of this report.

The analysis and recommendations presented in this report are based on the data obtained from the borings and test pit excavations made at the locations indicated on the site plans and from other information discussed herein. This report is based on the assumption that the subsurface conditions everywhere are not significantly different from those disclosed by the borings and excavations. However, variations in soil conditions may exist between the excavations and, also, general groundwater levels and conditions may fluctuate from time to time. The nature and extent of the variations may not become evident until construction. If subsurface conditions differ from those encountered in the exploratory borings and excavations, are observed or encountered during construction, or appear to be present beneath or beyond excavations, we should be advised at once so that we can observe and review these conditions and reconsider our recommendations where necessary.

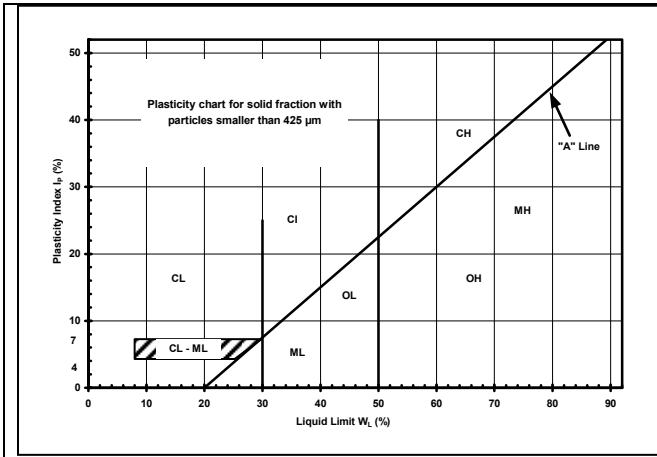
Since it is possible for conditions to vary from those assumed in the analysis and upon which our conclusions and recommendations are based, a contingency fund should be included in the construction budget to allow for the possibility of variations which may result in modification of the design and construction procedures.

In order to observe compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated, we recommend that all construction operations dealing with earth work and the foundations be observed by an experienced soils engineer. We can be retained to provide these services for you during construction. In addition, we can be retained to review the plans and specifications that have been prepared to check for substantial conformance with the conclusions and recommendations contained in our report.

EXPLANATION OF FIELD & LABORATORY TEST DATA

Description			UMA Log Symbols	USCS Classification	Laboratory Classification Criteria				
					Fines (%)	Grading	Plasticity	Notes	
COARSE GRAINED SOILS	GRAVELS (More than 50% of coarse fraction of gravel size)	CLEAN GRAVELS (Little or no fines)	Well graded gravels, sandy gravels, with little or no fines		GW	0-5	$C_u > 4$ $1 < C_c < 3$	Dual symbols if 5-12% fines. Dual symbols if above "A" line and $4 < W_p < 7$ $C_u = \frac{D_{60}}{D_{10}}$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$	
			Poorly graded gravels, sandy gravels, with little or no fines		GP	0-5	Not satisfying GW requirements		
		DIRTY GRAVELS (With some fines)	Silty gravels, silty sandy gravels		GM	> 12			Atterberg limits below "A" line or $W_p < 4$
			Clayey gravels, clayey sandy gravels		GC	> 12			Atterberg limits above "A" line or $W_p < 7$
	SANDS (More than 50% of coarse fraction of sand size)	CLEAN SANDS (Little or no fines)	Well graded sands, gravelly sands, with little or no fines		SW	0-5	$C_u > 6$ $1 < C_c < 3$		
			Poorly graded sands, gravelly sands, with little or no fines		SP	0-5	Not satisfying SW requirements		
		DIRTY SANDS (With some fines)	Silty sands, sand-silt mixtures		SM	> 12			Atterberg limits below "A" line or $W_p < 4$
			Clayey sands, sand-clay mixtures		SC	> 12			Atterberg limits above "A" line or $W_p < 7$
FINE GRAINED SOILS	SILTS (Below 'A' line negligible organic content)	$W_L < 50$	Inorganic silts, silty or clayey fine sands, with slight plasticity		ML		Classification is Based upon Plasticity Chart		
		$W_L > 50$	Inorganic silts of high plasticity		MH				
	CLAYS (Above 'A' line negligible organic content)	$W_L < 30$	Inorganic clays, silty clays, sandy clays of low plasticity, lean clays		CL				
		$30 < W_L < 50$	Inorganic clays and silty clays of medium plasticity		CI				
		$W_L > 50$	Inorganic clays of high plasticity, fat clays		CH				
	ORGANIC SILTS & CLAYS (Below 'A' line)	$W_L < 50$	Organic silts and organic silty clays of low plasticity		OL				
		$W_L > 50$	Organic clays of high plasticity		OH				
	HIGHLY ORGANIC SOILS		Peat and other highly organic soils		Pt	Von Post Classification Limit		Strong colour or odour, and often fibrous texture	
	Asphalt		Till			AECOM			
	Concrete		Bedrock (Undifferentiated)						
	Fill		Bedrock (Limestone)						

When the above classification terms are used in this report or test hole logs, the designated fractions may be visually estimated and not measured.



FRACTION	SEIVE SIZE (mm)		DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
	Passing	Retained	Percent	Identifier
Gravel	Coarse	76	19	35-50 and
	Fine	19	4.75	
Sand	Coarse	4.75	2.00	20-35 "y" or "ey" *
	Medium	2.00	0.425	
	Fine	0.425	0.075	
Silt (non-plastic) or Clay (plastic)	< 0.075 mm		10-20	some
			1-10	trace

* for example: gravelly, sandy clayey, silty

Definition of Oversize Material
 COBBLES: 76mm to 300mm diameter
 BOULDERS: >300mm diameter

LEGEND OF SYMBOLS

Laboratory and field tests are identified as follows:

- qu - undrained shear strength (kPa) derived from unconfined compression testing.
- Tv - undrained shear strength (kPa) measured using a torvane
- pp - undrained shear strength (kPa) measured using a pocket penetrometer.
- Lv - undrained shear strength (kPa) measured using a lab vane.
- Fv - undrained shear strength (kPa) measured using a field vane.
- γ - bulk unit weight (kN/m³).
- SPT - Standard Penetration Test. Recorded as number of blows (N) from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 51 mm O.D. Raymond type sampler 0.30 m into the soil.
- DPPT - Drive Point Pentrometer Test. Recorded as number of blows from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 50 mm drive point 0.30 m into the soil.
- w - moisture content (W_L, W_P)

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

Su (kPa)	CONSISTENCY
<12	very soft
12 – 25	soft
25 – 50	medium or firm
50 – 100	stiff
100 – 200	very stiff
200	hard

The resistance (N) of a non-cohesive soil can be related to compactness condition as follows

N – BLOWS/0.30 m	COMPACTNESS
0 - 4	very loose
4 - 10	loose
10 - 30	compact
30 - 50	dense
50	very dense



◆ Test Hole Location (AECOM)

50 0 50 100
m

1:4,250

NAD 1983 UTM Zone 14N

PROJECT: Waverley Underpass - Detailed Design CLIENT: Dillon Consulting Ltd. TESTHOLE NO: TH16-01
 LOCATION: UTM: 14U,5523569 m N,630934 m E, 7.6 m south of CN south track, 10.0 south east of Waverley Street PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA/ HQ Coring ELEVATION (m): 234.08

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION
						Blows/300mm	Total Unit Wt (kN/m ³)	(kPa)	(kPa)		
0	XXXX	SAND (FILL)- silty, gravelly - light brown, moist - CRUSHED LIMESTONE- - ASPHALT AND CONCRETE-									234
1											233
2											232
3		CLAY - trace silt - brown mottled grey, firm to stiff, moist - high plasticity - trace oxidation - trace silt inclusions (<6 m in dia.) - trace sulphate									231
4											230
5		- brown to brown mottled grey below 4.7 m	X	S1	4	◆	●			SPT Blows: (1,2,2) 100 % Recovery	229
6											228
7		- firm below 6.2 m		G2			●				227
8				G3			●				226
9		- grey, soft below 7.7 m	X	S4	3	◆	●			SPT Blows: (2,1,2) 100 % Recovery	225
10				G3			●				225
		- trace till inclusions below 9.2 m	X	S5	3	◆	●			SPT Blows: (1,1,2) 100 % Recovery	225

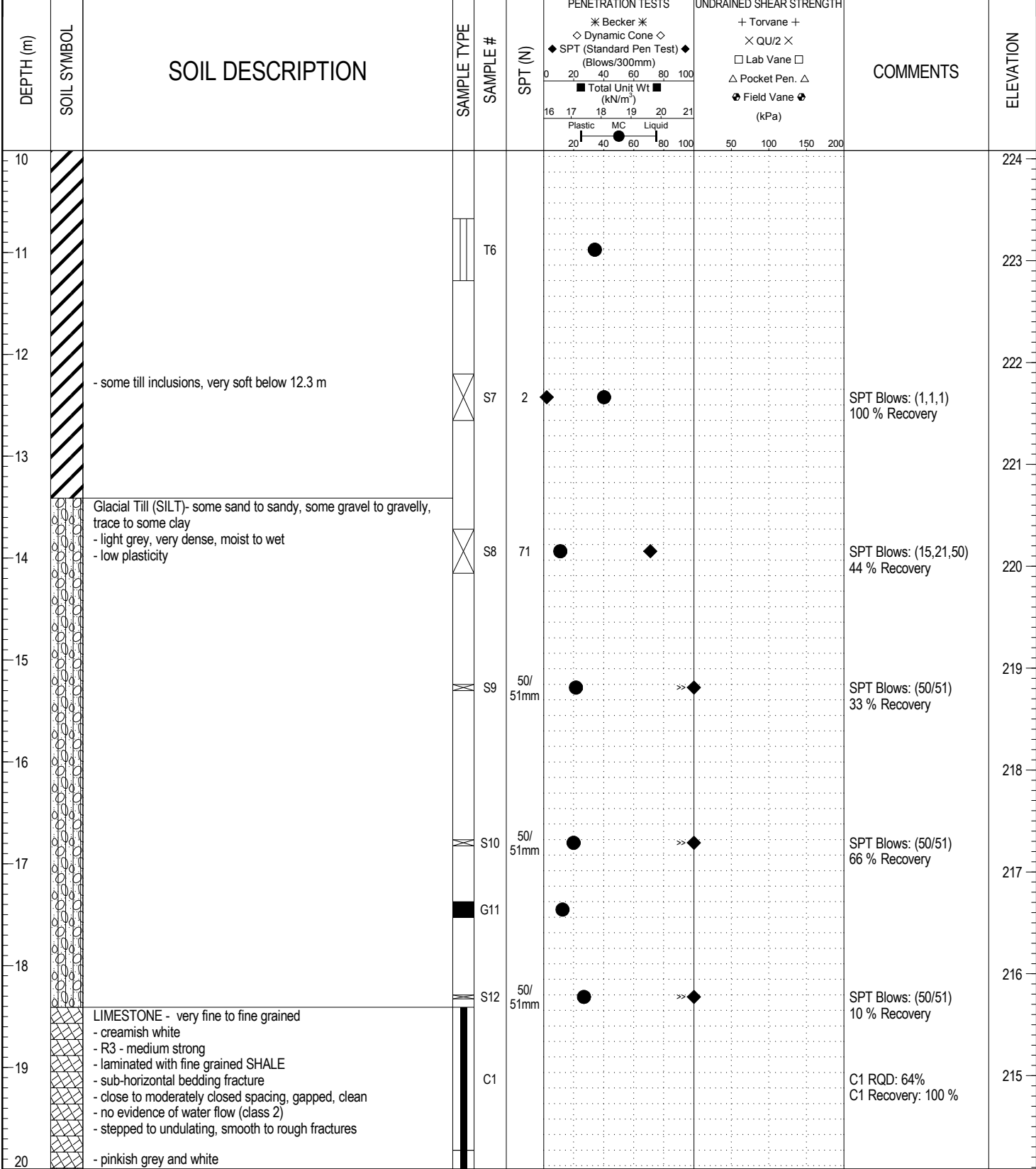
LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS REV 02.GPJ UMA WINN.GDT 9/29/16



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 25.91 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 4/13/16
 PROJECT ENGINEER: Zeyad Shukri Page 1 of 3

PROJECT: Waverley Underpass - Detailed Design CLIENT: Dillon Consulting Ltd. TESTHOLE NO: **TH16-01**
 LOCATION: UTM: 14U,5523569 m N,630934 m E, 7.6 m south of CN south track, 10.0 south east of Waverley Street PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA/ HQ Coring ELEVATION (m): 234.08

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE



LOG OF TEST HOLE WAVERLEY UP. TEST HOLE LOGS REV 02.GPJ UMA WINN.GDT 9/29/16



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 25.91 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 4/13/16
 PROJECT ENGINEER: Zeyad Shukri Page 2 of 3

PROJECT: Waverley Underpass - Detailed Design		CLIENT: Dillon Consulting Ltd.		TESTHOLE NO: TH16-01	
LOCATION: UTM: 14U,5523569 m N,630934 m E, 7.6 m south of CN south track, 10.0 south east of Waverley Street				PROJECT NO.: 60321148	
CONTRACTOR: Maple Leaf Drilling Ltd.		METHOD: 125 mm SSA/ HQ Coring		ELEVATION (m): 234.08	
SAMPLE TYPE		GRAB		SHELBY TUBE	
		SPLIT SPOON		BULK	
		NO RECOVERY		CORE	

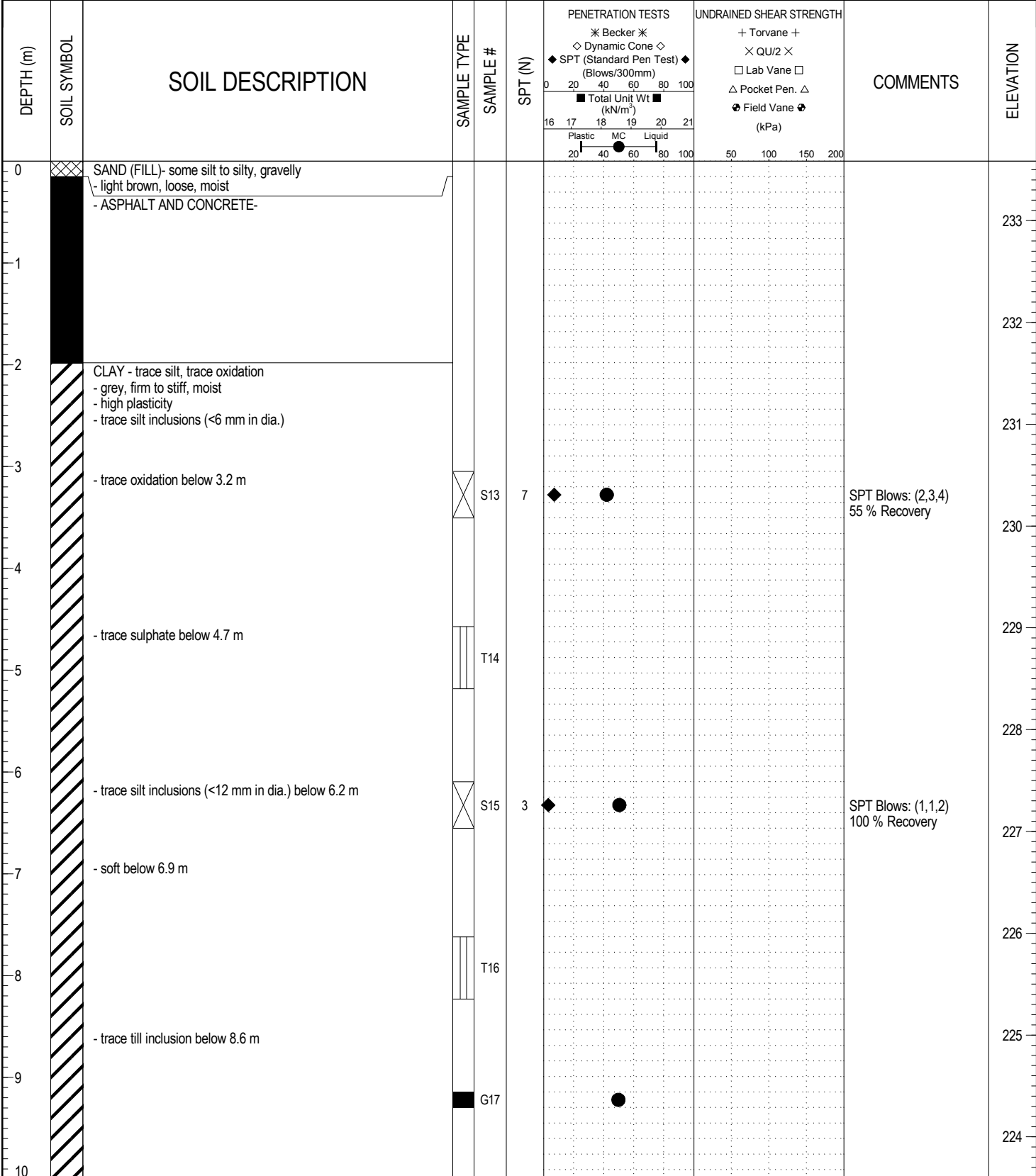
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) Total Unit Wt (kN/m ³) Plastic MC Liquid	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)				
20		- close to widely spaced, undulating, rough, close to gapped fractures		C2						C2 RQD: 66% C2 Recovery: 100%	214
21		- creamish grey - laminated with fine grained dark grey SHALE - planar fractures		C3						C3 RQD: 23% C3 Recovery: 86%	213
22		- very close to closed spacing, close to gapped, clean - stepped to undulating, smooth to rough fractures		C4						C4 RQD: 15% C4 Recovery: 100%	212
23		- R2 - weak - gapped to open, evidence of water flow (class 3)		C5						C5 RQD: 41% C5 Recovery: 100%, UCS=107.7 MPa	211
24		- creamish white - R5 - very strong - sub-horizontal bedding fracture - close to moderately closed spacing, gapped to open, clean - no evidence of water flow (class 2) - undulating to planar									210
25		- prominent joint set between 25.4 to 25.6 m (20 to 45 degrees at core axis)									209
26		END OF TEST HOLE AT 25.9 m IN BEDROCK Notes: 1. Power Auger Refusal at 18.3 m in Glacial TILL. 2. HQ coring below 18.3 m. 3. No sloughing was observed upon drilling completion. 4. No seepage was observed upon drilling completion. 5. Test hole backfilled with bentonite up to 1.0 m and plugged with auger cutting to ground surface.									208
27											207
28											206
29											205
30											

LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS REV 02.GPJ UMA WINN.GDT 9/29/16



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 25.91 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 4/13/16
PROJECT ENGINEER: Zeyad Shukri	Page 3 of 3

PROJECT: Waverley Underpass - Detailed Design		CLIENT: Dillon Consulting Ltd.		TESTHOLE NO: TH16-02	
LOCATION: UTM: 14U,5523572 m N,630943 m E, 6.5 m south of CN south track, 19.5 south east of Waverley Street				PROJECT NO.: 60321148	
CONTRACTOR: Maple Leaf Drilling Ltd.			METHOD: 125 mm SSA/ HQ Coring		ELEVATION (m): 233.58
SAMPLE TYPE		GRAB	SHELBY TUBE	SPLIT SPOON	BULK
		NO RECOVERY	CORE		

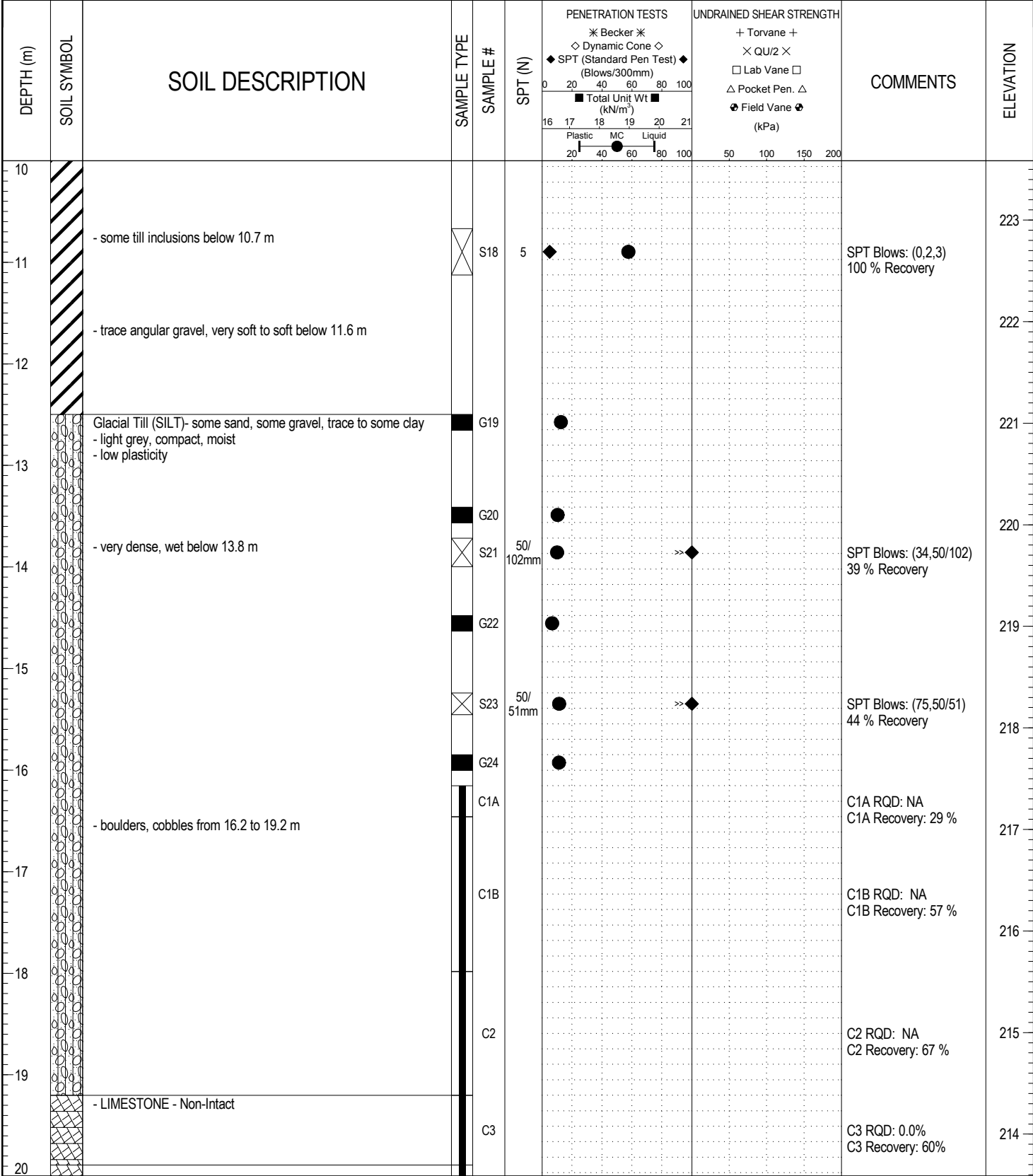


LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS REV 02.GPJ UMA WINN.GDT 9/29/16



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 22.48 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 4/14/16
PROJECT ENGINEER: Zeyad Shukri	Page 1 of 3

PROJECT: Waverley Underpass - Detailed Design		CLIENT: Dillon Consulting Ltd.		TESTHOLE NO: TH16-02	
LOCATION: UTM: 14U,5523572 m N,630943 m E, 6.5 m south of CN south track, 19.5 south east of Waverley Street				PROJECT NO.: 60321148	
CONTRACTOR: Maple Leaf Drilling Ltd.		METHOD: 125 mm SSA/ HQ Coring		ELEVATION (m): 233.58	
SAMPLE TYPE		GRAB		SHELBY TUBE	
		SPLIT SPOON		BULK	
		NO RECOVERY		CORE	



LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS REV 02.GPJ UMA WINN.GDT 9/29/16



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 22.48 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 4/14/16
PROJECT ENGINEER: Zeyad Shukri	Page 2 of 3

PROJECT: Waverley Underpass - Detailed Design	CLIENT: Dillon Consulting Ltd.	TESTHOLE NO: TH16-02
LOCATION: UTM: 14U,5523572 m N,630943 m E, 6.5 m south of CN south track, 19.5 south east of Waverley Street	PROJECT NO.: 60321148	
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA/ HQ Coring	ELEVATION (m): 233.58
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) Total Unit Wt (kN/m ³) Plastic MC Liquid	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ⊕ Field Vane ⊕ (kPa)				
20		LIMESTONE - very fine to fine grained - pinkish yellow and grey - R3 - medium strong - sub-horizontal bedding fracture, close to widely spaced, closed and clean, no evidence of water flow (class 2), planar, smooth to rough fractures		C4						C4 RQD: 70% C4 Recovery: 80%	213
21		- non- intact zone from 21.1 to 21.3 m, R1 to R2 - very weak to weak, greyish white - non- intact hard CLAY SHALE and fractured LIMESTONE between 21.3 to 21.6 m		C5						C5 RQD: 0.0% C5 Recovery: 100 %	212
22		- creamish white and grey, R3 - medium strong - laminated with fine grained SHALE and hard dark grey CLAY - close to moderately closed spaced, closed to gapped and clean to infilled with hard clay (class 2) - rough and undulating fractures		C6						C6 RQD: 54% C6 Recovery: 95 %	211
23		END OF TEST HOLE AT 22.5 m IN BEDROCK Notes: 1. Power Auger Refusal at 16.2 m in Glacial TILL. 2. HQ coring below 16.2 m. 3. No sloughing was observed upon drilling completion. 4. No seepage was observed upon drilling completion. 5. Test hole backfilled with bentonite up to 1.0 m below ground level and with auger cutting to the ground surface.									210
24											209
25											208
26											207
27											206
28											205
29											204
30											

LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS REV 02.GPJ UMA WINN.GDT 9/29/16



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 22.48 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 4/14/16
PROJECT ENGINEER: Zeyad Shukri	Page 3 of 3

PROJECT: Waverley Underpass - Detailed Design CLIENT: Dillon Consulting Ltd. TESTHOLE NO: **TH16-03**
 LOCATION: UTM: 14U,5523582 m N,630892 m E, 5.3 m north of CN north track, 7.9 north west of Waverley Street PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA/ HQ Coring ELEVATION (m): 233.88

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

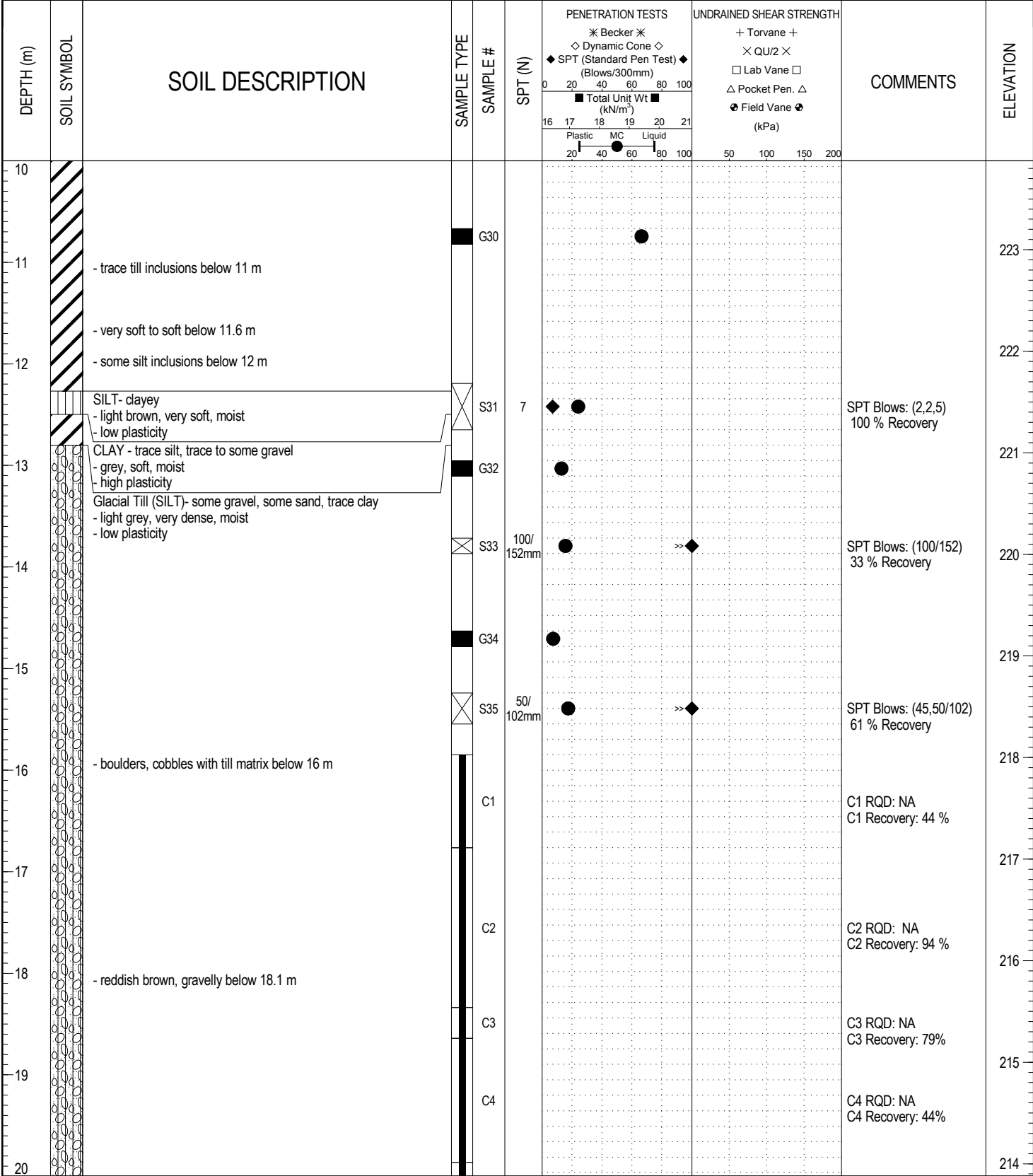
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	ELEVATION
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt ■ (kN/m ³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ⊕ Field Vane ⊕ (kPa)			
0		SAND (FILL) - some silt, some gravel to gravelly - light brown, loose, moist								
1		CLAY (FILL) - silty to some silt, trace to some sand - dark brown, firm, moist - high to intermediate plasticity								233
2		CLAY - trace silt - grey, firm to stiff, moist - high plasticity								232
3		- brown mottled grey, trace silt inclusions (< 12 mm in dia.) below 3.1 m		S25	5	◆	●		SPT Blows: (1,2,3) 100 % Recovery	231
4										230
5				G26			●			229
6		- trace oxidation below 6.1 m		S27	3	◆	●		SPT Blows: (1,1,2) 100 % Recovery	228
7										227
8		- grey below 7.4 m - soft below 7.7 m		G28			●			226
9										225
10		- some silt below 7.8 m		T29						224

LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS REV 02.GPJ UMA WINN.GDT 9/29/16



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 27.48 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 4/19/16
 PROJECT ENGINEER: Zeyad Shukri Page 1 of 3

PROJECT: Waverley Underpass - Detailed Design		CLIENT: Dillon Consulting Ltd.		TESTHOLE NO: TH16-03	
LOCATION: UTM: 14U,5523582 m N,630892 m E, 5.3 m north of CN north track, 7.9 north west of Waverley Street				PROJECT NO.: 60321148	
CONTRACTOR: Maple Leaf Drilling Ltd.			METHOD: 125 mm SSA/ HQ Coring		ELEVATION (m): 233.88
SAMPLE TYPE		GRAB	SHELBY TUBE	SPLIT SPOON	BULK
		NO RECOVERY	CORE		



LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS REV 02.GPJ UMA WINN.GDT 9/29/16



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 27.48 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 4/19/16
PROJECT ENGINEER: Zeyad Shukri	Page 2 of 3

PROJECT: Waverley Underpass - Detailed Design	CLIENT: Dillon Consulting Ltd.	TESTHOLE NO: TH16-03
LOCATION: UTM: 14U,5523582 m N,630892 m E, 5.3 m north of CN north track, 7.9 north west of Waverley Street		PROJECT NO.: 60321148
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA/ HQ Coring	ELEVATION (m): 233.88
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	

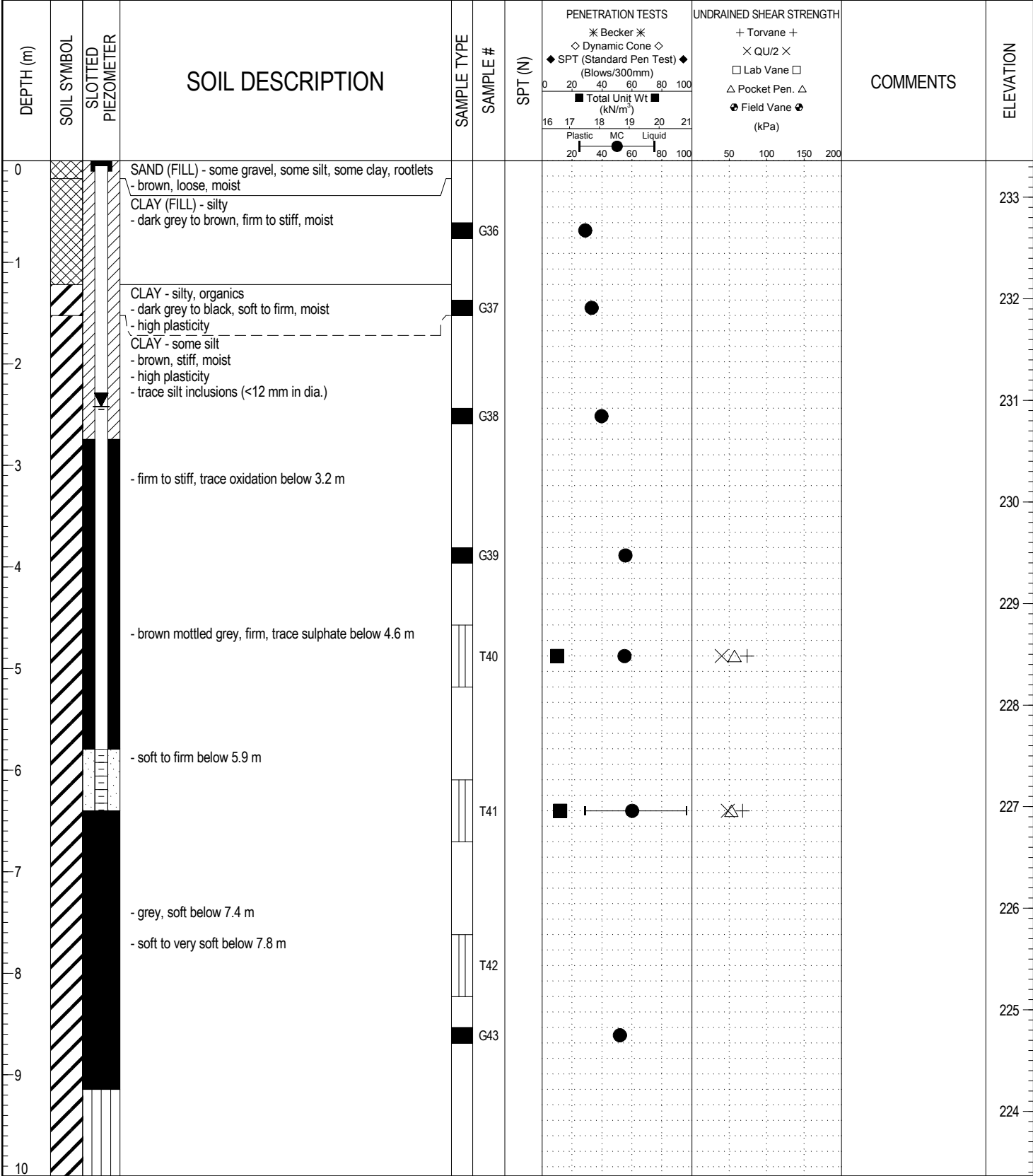
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	ELEVATION
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 ■ Total Unit Wt ■ (kN/m ³) 16 17 18 19 20 21 Plastic MC Liquid 20 40 60 80 100	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa) 50 100 150 200			
20				C5					C5 RQD: NA C5 Recovery: 20%	
21		- C6 RQD: NA C6 Recovery: 100%		C6 C7A C7B					C7A RQD: NA C7A Recovery: 100 % C7B RQD: 52% C7B Recovery: 100 % C8 RQD: 67% C8 Recovery: 89 %	213
		LIMESTONE - very fine to fine grained - greyish white to creamish grey and white - R2 to R3 - weak to medium strong - laminated with fine grained SHALE - sub-horizontal bedding fractures, externally closed to closed spaced, close to open, clean, evidence of water flow (class 3)		C8						212
22		- CLAY SHALE infilling between 22.25 to 22.5 m		C9					C9 RQD: 30% C9 Recovery: 100 %	
23		- light grey and white, R5 - very strong - non intact to moderately closed spaced, close to open, clean - no evidence of water flow (class 3) - undulating to planar, smooth to rough fractures		C10					C10 RQD: 44% C10 Recovery: 93 %, UCS=145.1 MPa	211
24		- non intact to widely closed spaced below 24.5 m		C11					C11 RQD: 66% C11 Recovery: 91 %	210
25		- prominent joint set between 24.9 to 25.2 m (10 to 25 degrees at core axis), open and clean (class 3)		C12					C12 RQD: 73% C12 Recovery: 100 %	209
26		- closed to moderately spaced, close to open, clean below 26 m								208
27										207
28		END OF TEST HOLE AT 27.5 m IN BEDROCK NOTES: 1. Power Auger Refusal at 15.8 m in Glacial TILL. 2. HQ coring below 15.8 m. 3. Seepage observed below 9.0 m upon drilling completion. 4. No sloughing was observed upon drilling completion. 5. Test hole backfilled with bentonite up to 1 m below ground surface and plugged with auger cutting to ground surface.								206
29										205
30										204

LOG OF TEST HOLE WAVERLEY UP. TEST HOLE LOGS REV 02.GPJ UMA WINN.GDT 9/29/16



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 27.48 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 4/19/16
PROJECT ENGINEER: Zeyad Shukri	Page 3 of 3

PROJECT: Waverley Underpass - Detailed Design		CLIENT: Dillon Consulting Ltd.		TESTHOLE NO: TH16-04		
LOCATION: UTM: 14U,5523519 m N,630502 m E, vicinity of LDS/CN crossing, north of CN north track				PROJECT NO.: 60321148		
CONTRACTOR: Maple Leaf Drilling Ltd.		METHOD: 125 mm SSA		ELEVATION (m): 233.36		
SAMPLE TYPE	GRAB	SHELBY TUBE	SPLIT SPOON	BULK	NO RECOVERY	CORE
BACKFILL TYPE	BENTONITE	GRAVEL	SLOUGH	GROUT	CUTTINGS	SAND



LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS REV 02.GPJ UMA WINN.GDT 9/29/16



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 10.67 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 4/19/16
PROJECT ENGINEER: Zeyad Shukri	Page 1 of 2

PROJECT: Waverley Underpass - Detailed Design		CLIENT: Dillon Consulting Ltd.		TESTHOLE NO: TH16-04	
LOCATION: UTM: 14U,5523519 m N,630502 m E, vicinity of LDS/CN crossing, north of CN north track				PROJECT NO.: 60321148	
CONTRACTOR: Maple Leaf Drilling Ltd.		METHOD: 125 mm SSA		ELEVATION (m): 233.36	
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB	<input type="checkbox"/> SHELBY TUBE	<input checked="" type="checkbox"/> SPLIT SPOON	<input type="checkbox"/> BULK	<input type="checkbox"/> NO RECOVERY
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> CUTTINGS
				<input type="checkbox"/> SAND	

DEPTH (m)	SOIL SYMBOL	SLOTTED PIEZOMETER	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) Total Unit Wt (kN/m ³) Plastic MC Liquid	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ⊕ Field Vane ⊕ (kPa)				
10			- trace till inclusions below 10.2 m		G44	5	20					223
11			END OF TEST HOLE AT 10.67 m in CLAY NOTES: 1. Groundwater was observed at 1.5 m upon drilling completion. 2. Sloughing was observed at 3.0 m below ground upon drilling completion. 3. Installed 25 mm diameter standpipe piezometer (SP16-04) to 6.5 m below ground surface with 0.3 m casagrande tip and flush mount at ground surface. 4. Test hole backfilled with slough up to 9.1 m, bentonite up to 6.5, silica sand up to 5.8 m below ground surface, plugged with bentonite to 2.75 m below ground surface and finished with auger cutting to ground surface. 5. Groundwater monitoring: - April 29, 2016 at Elv. 230.20 m - May 13, 2016 at Elv. 230.60 m - June 18, 2016 at Elv. 231.02 m - June 24, 2016 at Elv. 231.08 m - July 18, 2016 at Elv. 231.08 m - August 30, 2016 at Elv. 230.98 m									222
12												221
13												220
14												219
15												218
16												217
17												216
18												215
19												214
20												214

LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS REV 02.GPJ UMA WINN.GDT 9/29/16



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 10.67 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 4/19/16
PROJECT ENGINEER: Zeyad Shukri	Page 2 of 2

PROJECT: Waverley Underpass - Detailed Design CLIENT: Dillon Consulting Ltd. TESTHOLE NO: TH16-05
 LOCATION: UTM: 14U,5523497 m N,630504 m E, vicinity of LDS/CN crossing, south of CN south track PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m): 233.48

SAMPLE TYPE		GRAB	SHELBY TUBE	SPLIT SPOON	BULK	NO RECOVERY	CORE				
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION			SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS	UNDRAINED SHEAR STRENGTH	COMMENTS	ELEVATION
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 ■ Total Unit Wt ■ (kN/m ³) 16 17 18 19 20 21 Plastic MC Liquid 20 40 60 80 100	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ⊕ Field Vane ⊕ (kPa) 50 100 150 200			
0		SAND (FILL) - clayey, silty, some gravel - dark grey, loose, moist									233
0.5		CLAY (FILL) - silty to some silt - dark grey to brown, stiff, moist				G45		●			
1		CLAY - some silt - brown, firm to stiff, moist - high plasticity				G46		●			
1.5		- trace sulphate inclusions below 1.6 m									232
2.5		SILT - clayey - light brown, soft to firm, moist - low plasticity				G47		●			231
3		CLAY - some silt - brown, firm to stiff, moist - high plasticity - trace silt inclusions (<12 mm in dia.)									230
4						G48		●			
5						T49					229
5.5		- brown mottled grey, firm, trace oxidations below 5.3 m - trace gravel below 5.5 m									228
6.5		- grey, soft to firm below 6.2 m				T50		■ ●	△		227
7.5		- silty below 7.3 m									226
8						T51		■ ●	△ ×		225
8.5		- trace till inclusions, very soft to soft below 8.5 m									224

LOG OF TEST HOLE WAVERLEY UP - TEST HOLE LOGS REV 02.GPJ UMA WINN.GDT 9/29/16



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 13.72 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 4/19/16
 PROJECT ENGINEER: Zeyad Shukri Page 1 of 2

PROJECT: Waverley Underpass - Detailed Design CLIENT: Dillon Consulting Ltd. TESTHOLE NO: TH16-05
 LOCATION: UTM: 14U,5523497 m N,630504 m E, vicinity of LDS/CN crossing, south of CN south track PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m): 233.48

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

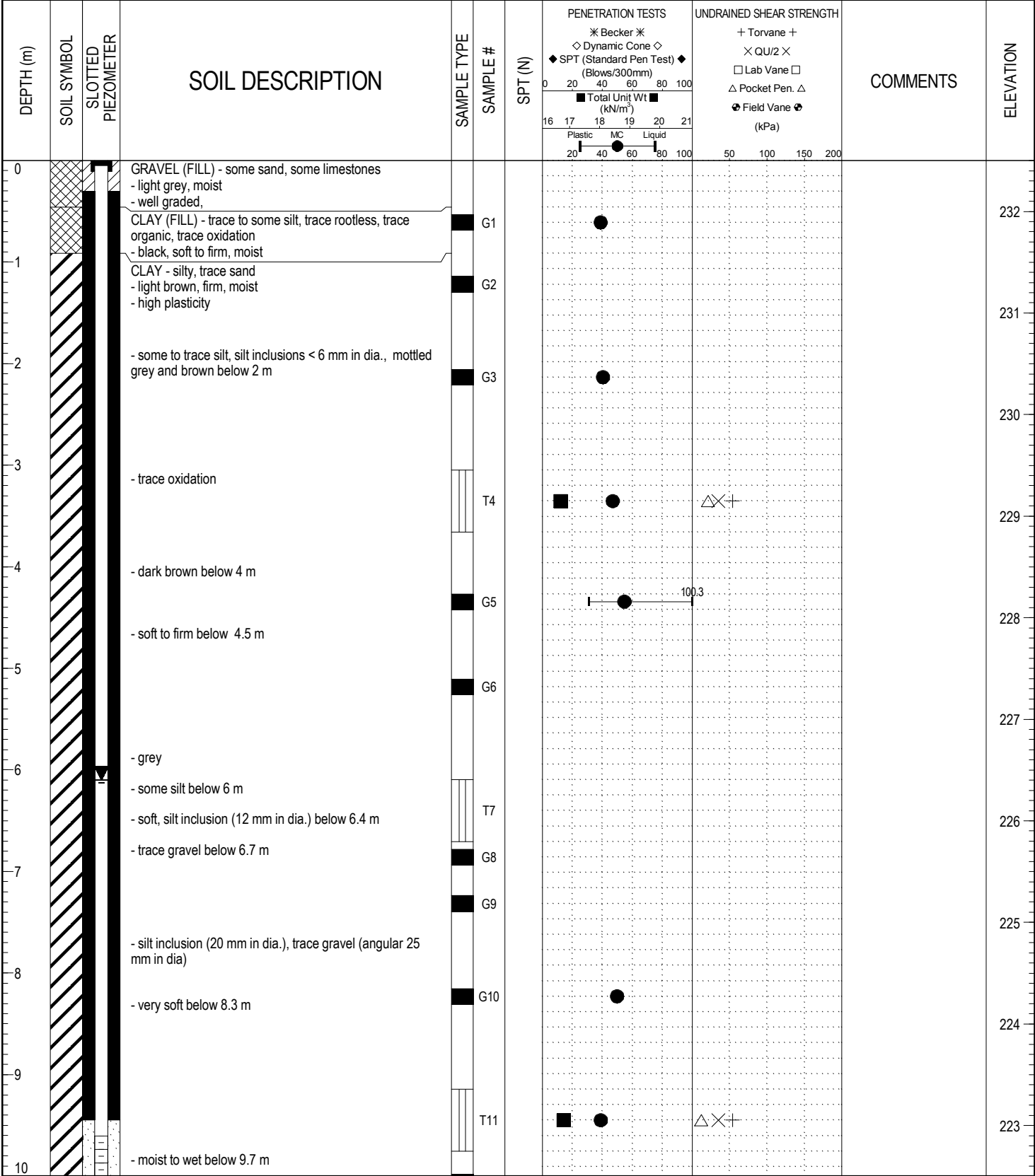
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION
						Blows/300mm	Total Unit Wt (kN/m ³)	Lab Vane	Field Vane		
10		- some till inclusions, very soft below 10.7 m		G52	~55						223
11				G53	~55						222
12		SILT- clayey - light grey, very soft, moist - low plasticity		G54	~55						221
13		Glacial Till (SILT)- some sand, some gravel, trace clay - light grey, compact, moist - low plasticity		G55	~55						220
14		END OF TEST HOLE AT 13.7 m in GLACIAL TILL NOTES: 1. Groundwater was observed at 9.75 m upon drilling completion. 2. No sloughing was observed upon drilling completion. 3. Test hole backfilled with bentonite up to 1.0 m below ground level and with auger cutting to the ground surface.									219
15											218
16											217
17											216
18											215
19											214
20											214

LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS REV 02.GPJ UMA WINN.GDT 9/29/16



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 13.72 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 4/19/16
 PROJECT ENGINEER: Zeyad Shukri Page 2 of 2

PROJECT: Waverley Underpass		CLIENT: City of Winnipeg		TESTHOLE NO: TH14-01		
LOCATION: UTM: 14U, 5523653 m N, 630934 m E				PROJECT NO.: 60321148		
CONTRACTOR: Maple Leaf Drilling Ltd.		METHOD: 125 mm SSA		ELEVATION (m): 232.50		
SAMPLE TYPE	GRAB	SHELBY TUBE	SPLIT SPOON	BULK	NO RECOVERY	CORE
BACKFILL TYPE	BENTONITE	GRAVEL	SLOUGH	GROUT	CUTTINGS	SAND

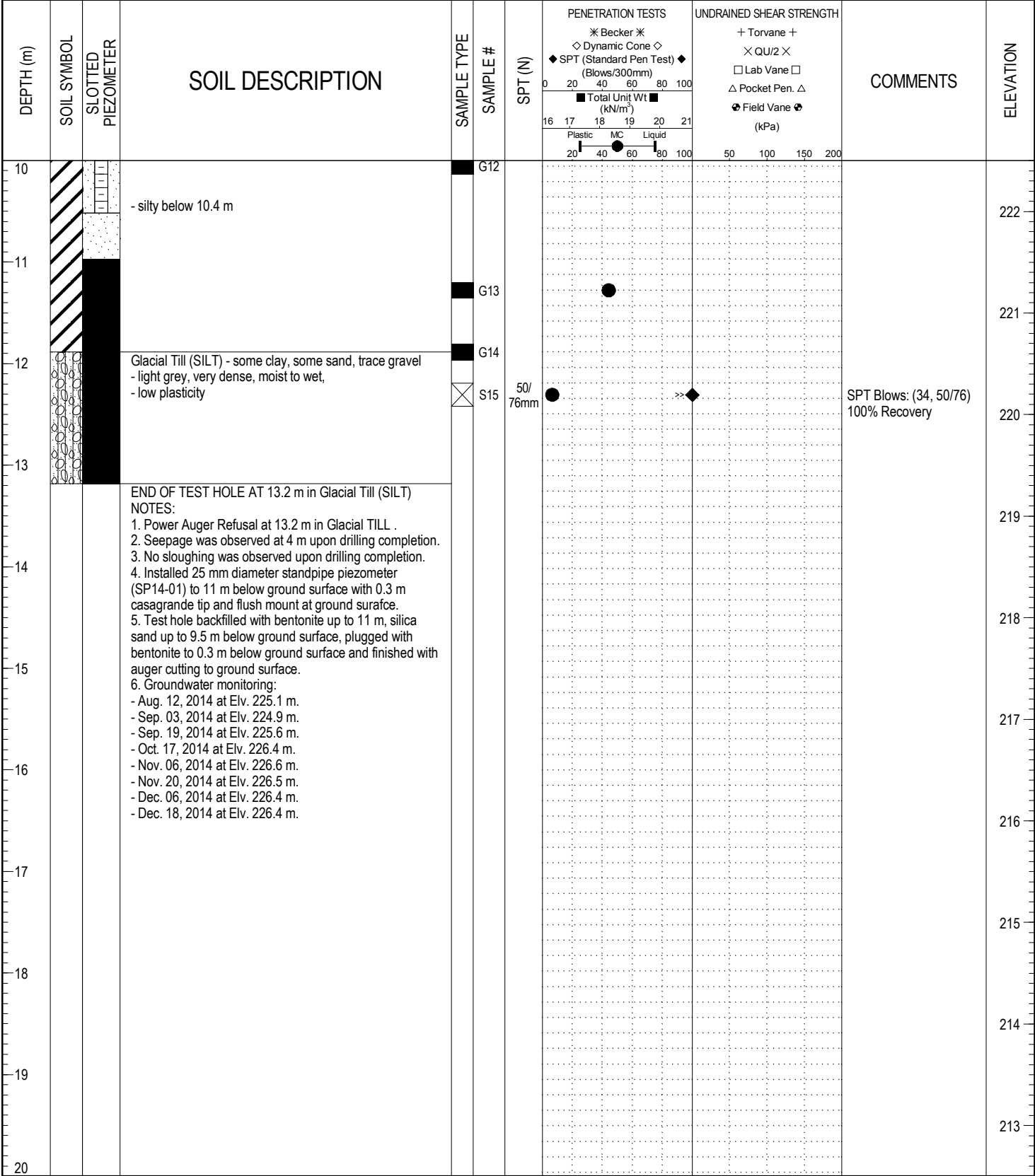


LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS - REVISION 5.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 13.18 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 7/9/14
PROJECT ENGINEER: Faris Khalil	Page 1 of 2

PROJECT: Waverley Underpass		CLIENT: City of Winnipeg		TESTHOLE NO: TH14-01		
LOCATION: UTM: 14U, 5523653 m N, 630934 m E				PROJECT NO.: 60321148		
CONTRACTOR: Maple Leaf Drilling Ltd.		METHOD: 125 mm SSA		ELEVATION (m): 232.50		
SAMPLE TYPE	GRAB	SHELBY TUBE	SPLIT SPOON	BULK	NO RECOVERY	CORE
BACKFILL TYPE	BENTONITE	GRAVEL	SLOUGH	GROUT	CUTTINGS	SAND

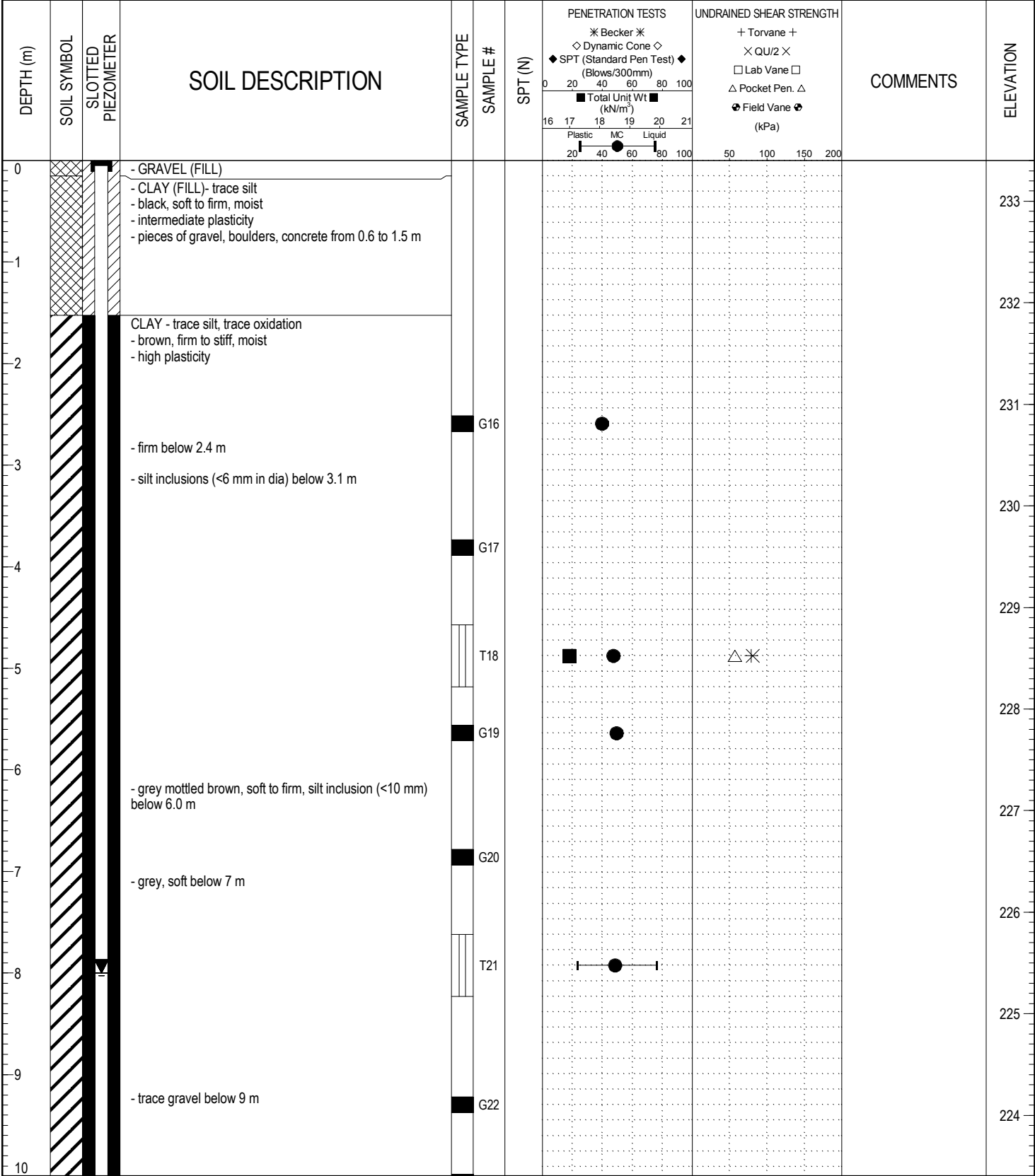


LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS - REVISION 5.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 13.18 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 7/9/14
PROJECT ENGINEER: Faris Khalil	Page 2 of 2

PROJECT: Waverley Underpass		CLIENT: City of Winnipeg		TESTHOLE NO: TH14-02		
LOCATION: UTM: 14U, 5523559 m N, 630870 m E				PROJECT NO.: 60321148		
CONTRACTOR: Maple Leaf Drilling Ltd.		METHOD: 125 mm SSA/ HQ Coring		ELEVATION (m): 233.40		
SAMPLE TYPE	GRAB	SHELBY TUBE	SPLIT SPOON	BULK	NO RECOVERY	CORE
BACKFILL TYPE	BENTONITE	GRAVEL	SLOUGH	GROUT	CUTTINGS	SAND

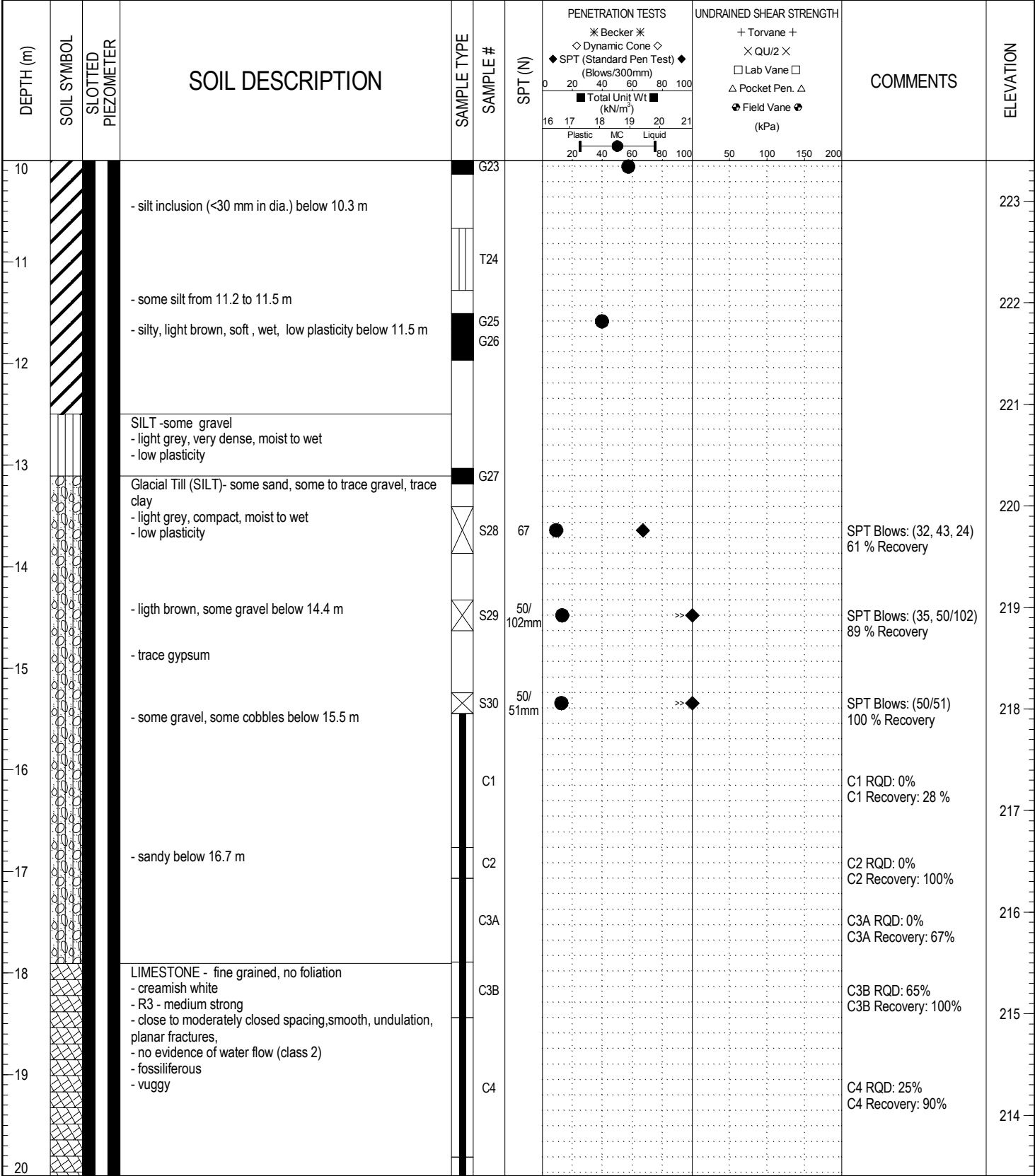


LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS - REVISION 5.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 24.38 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 7/11/14
PROJECT ENGINEER: Faris Khalil	Page 1 of 3

PROJECT: Waverley Underpass		CLIENT: City of Winnipeg		TESTHOLE NO: TH14-02	
LOCATION: UTM: 14U, 5523559 m N, 630870 m E				PROJECT NO.: 60321148	
CONTRACTOR: Maple Leaf Drilling Ltd.		METHOD: 125 mm SSA/ HQ Coring		ELEVATION (m): 233.40	
SAMPLE TYPE	GRAB	SHELBY TUBE	SPLIT SPOON	BULK	NO RECOVERY
BACKFILL TYPE	BENTONITE	GRAVEL	SLOUGH	GROUT	CUTTINGS
					CORE
					SAND



LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS - REVISION 5.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 24.38 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 7/11/14
PROJECT ENGINEER: Faris Khalil	Page 2 of 3

PROJECT: Waverley Underpass		CLIENT: City of Winnipeg		TESTHOLE NO: TH14-02		
LOCATION: UTM: 14U, 5523559 m N, 630870 m E				PROJECT NO.: 60321148		
CONTRACTOR: Maple Leaf Drilling Ltd.			METHOD: 125 mm SSA/ HQ Coring		ELEVATION (m): 233.40	
SAMPLE TYPE	GRAB	SHELBY TUBE	SPLIT SPOON	BULK	NO RECOVERY	CORE
BACKFILL TYPE	BENTONITE	GRAVEL	SLOUGH	GROUT	CUTTINGS	SAND

DEPTH (m)	SOIL SYMBOL	SLOTTED PIEZOMETER	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) Total Unit Wt (kN/m ³) Plastic MC Liquid	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ⊕ Field Vane ⊕ (kPa)				
20			- altered yellow and red below 20 m - extremely close to moderately closed spaced, smooth planar fractures - evidence of water flow (class 3)		C5						C5 RQD: 43% C5 Recovery: 98%	213
21			- laminated below 21.2 m - close spaced to moderately closed spaced, smooth planar fractures, - no evidence of water flow (class 2)		C6						C6 RQD: 29% C6 Recovery: 75 %	212
22					C6							211
23					C7							210
24			- R5- very strong		C7						C7 RQD: 93% C7 Recovery: 100 %, qu = 194.4 MPa	209
25			END OF TEST HOLE AT 24.4 m IN BEDROCK Notes: 1. Power Auger Refusal at 15.4 m in Glacial TILL. 2. HQ coring below 15.4 m. 3. Seepage observed at 3.0 m upon drilling completion. 4. Installed 25 mm diameter standpipe piezometer (SP14-02) to 23.5 m below ground surface with 0.3 m casagrande tip and flush mount at ground surface. 5. Test hole backfilled with silica sand up to 22 m below ground surface, bentonite up to 1.5 m and plugged with auger cutting to ground surface. 6. Prominent sub-vertical fracture (180 degrees to core axis), closed to gapped, smooth undulating, evidence of water flow (class 3) between 17.9 to 18.4 m. 7. Groundwater monitoring: - Aug. 12, 2014 at Elv. 225.29 m. - Sep. 03, 2014 at Elv. 225.0 m. - Sep. 19, 2014 at Elv. 225.5 m. - Oct. 17, 2014 at Elv. 225.8 m. - Nov. 06, 2014 at Elv. 225.7 m - Nov. 20, 2014 at Elv. 225.6 m - Dec. 06, 2014 at Elv. 225.4 m - Dec. 18, 2014 at Elv. 225.4 m								208	
26												207
27												206
28												205
29												204
30												204

LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS - REVISION 5.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 24.38 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 7/11/14
PROJECT ENGINEER: Faris Khalil	Page 3 of 3

PROJECT: Waverley Underpass	CLIENT: City of Winnipeg	TESTHOLE NO: TH14-03
LOCATION: UTM: 14U, 5523562 m N, 630895 m E		PROJECT NO.: 60321148
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA/ HQ Coring	ELEVATION (m): 233.66
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	ELEVATION
						Blows/300mm	Total Unit Wt (kN/m ³)			
0		-GRAVEL (FILL)								233
0-1		- CLAY (FILL)-trace silt - black, soft to firm, moist - intermediate plasticity - pieces of gravel, boulders, concrete from 0.6 to 1.5 m								
1-2		CLAY - some silt, trace oxidation - dark brown, firm to stiff, moist - intermediate to high plasticity - silt inclusion (<12 mm in dia.) - brown mottled grey below 2.1 m		G31	~55					232
2-3				T32						231
3-4		- brown, high plasticity, firm below 3.7 m								230
4-5		- dark brown below 4.6 m								229
5-6		- firm , trace gypsum below 5.2 m		G33	~55					228
6-7				T34						227
7-8		- soft to firm, dark brown, trace gravel below 7 m		G35	~55					226
8-9		- grey, soft, silt inclusion (6-30 mm in dia.) below 7.6 m		G36	~55					225
9-10				T37						224

LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS - REVISION 5.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 24.38 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 7/14/14
PROJECT ENGINEER: Faris Khalil	Page 1 of 3

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-03
 LOCATION: UTM: 14U, 5523562 m N, 630895 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA/ HQ Coring ELEVATION (m): 233.66

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	ELEVATION
						Becker	SPT (Standard Pen Test)			
10		- silt pocket , trace gravel below 10 m								223
11		- very soft, moist to wet, light grey mottled gery below 11.3 m		G38						222
12		SILT - clayey, trace gravel - light brown, soft, moist to wet - intermediate to low plasticity		G39						221
13				T40						220
14		Glacial Till (SILT)- some sand, some gravel, some clay - light grey, very dense, moist - low plasticity		G41						219
14				S42	50/102mm				SPT Blows: (48, 50/102) 100 % Recovery	218
15				C1					C1 RQD: 0% C1 Recovery: 63 %	217
16		- ligh brown, gravelly below 16.3 m								216
17		- boulders form 16.9 to 17.5 m		C2A					C2A RQD: 0% C2A Recovery: 74 %	215
18		LIMESTONE - fine grained - cremish white and grey - no foliation, vuggy - R3- medium strong - very closed to moderately spaced, rough undulating fractures, closed to gapped		C2B					C2B RQD: 88% C2B Recovery: 95 %	214
19		- no evidence of water flow (class 2)		C3					C3 RQD: 16 % C3 Recovery: 88%	214

LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS - REVISION 5.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 24.38 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 7/14/14
 PROJECT ENGINEER: Faris Khalil Page 2 of 3

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-03
 LOCATION: UTM: 14U, 5523562 m N, 630895 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA/ HQ Coring ELEVATION (m): 233.66

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

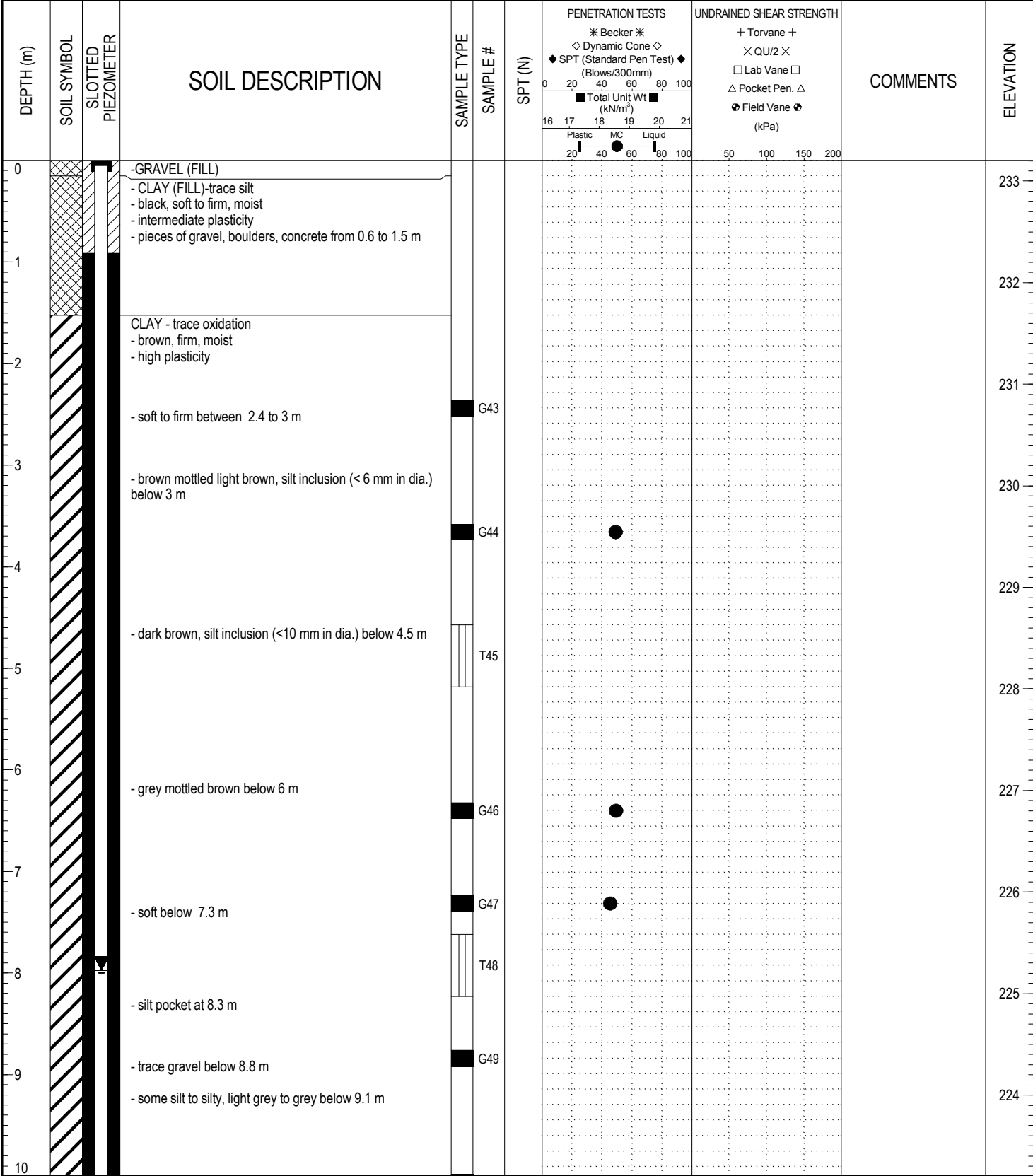
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	ELEVATION
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) Total Unit Wt (kN/m ³) Plastic MC Liquid	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ⊕ Field Vane ⊕ (kPa)			
20		- recovered as coarse, sub angular to sub rounded light grey gravel between 20.3 to 21.9 m		C4					C4 RQD: 0% C4 Recovery: 100%	213
21				C5					C5 RQD: 19% C5 Recovery: 68 %	212
22		SHALE - very fine grained - blue, green - no foliation - R1- very weak - extremely close spaced, rough undulating fractures		C6					C6 RQD: 76% C6 Recovery: 100 %	211
23		LIMESTONE - white - fine grained - no foliation - R3- medium strong - close to moderately spaced, smooth fractures, closed, no evidence of water flow (class 2) - laminated below 22 m		C7					C7 RQD: 80% C7 Recovery: 100 % qu =120.9 MPa	210
24		- R5- very strong								
25		END OF TEST HOLE AT 24.4 m IN BEDROCK Notes: 1. Power Auger Refusal at 14.3 m in Glacial TILL. 2. HQ coring below 14.3 m. 3. No sloughing was observed upon drilling completion. 4. No seepage was observed upon drilling completion. 5. Test hole backfilled with bentonite up to 3 m below ground level and with auger cutting to the ground surface.								209
26										208
27										207
28										206
29										205
30										204

LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS - REVISION 5.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 24.38 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 7/14/14
 PROJECT ENGINEER: Faris Khalil Page 3 of 3

PROJECT: Waverley Underpass		CLIENT: City of Winnipeg		TESTHOLE NO: TH14-04		
LOCATION: UTM: 14U, 5523599 m N, 630952 m E				PROJECT NO.: 60321148		
CONTRACTOR: Maple Leaf Drilling Ltd.		METHOD: 125 mm SSA/ HQ Coring		ELEVATION (m): 233.20		
SAMPLE TYPE	GRAB	SHELBY TUBE	SPLIT SPOON	BULK	NO RECOVERY	CORE
BACKFILL TYPE	BENTONITE	GRAVEL	SLOUGH	GROUT	CUTTINGS	SAND

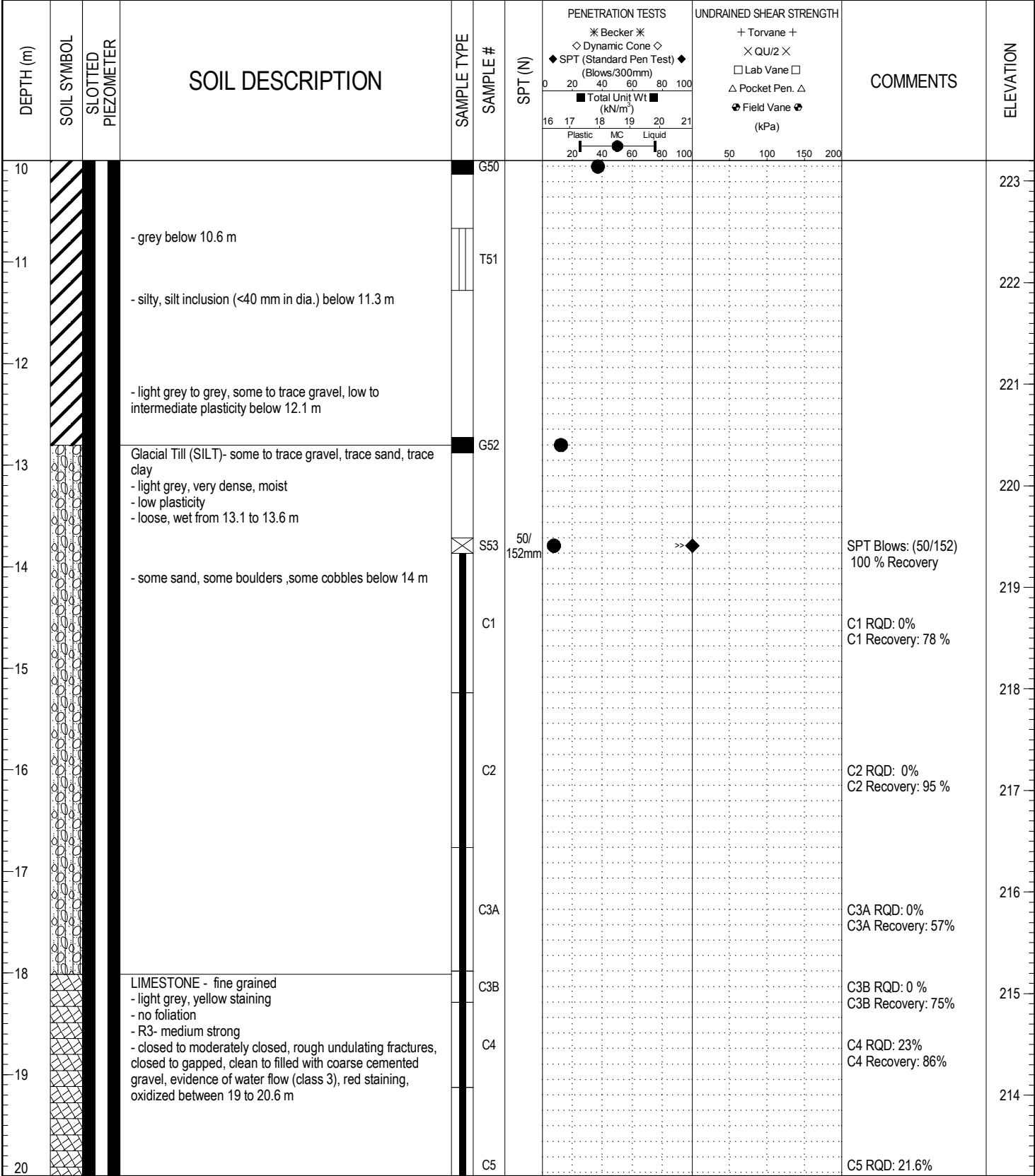


LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS - REVISION 5.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 25.73 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 7/15/14
PROJECT ENGINEER: Faris Khalil	Page 1 of 3

PROJECT: Waverley Underpass		CLIENT: City of Winnipeg		TESTHOLE NO: TH14-04	
LOCATION: UTM: 14U, 5523599 m N, 630952 m E				PROJECT NO.: 60321148	
CONTRACTOR: Maple Leaf Drilling Ltd.		METHOD: 125 mm SSA/ HQ Coring		ELEVATION (m): 233.20	
SAMPLE TYPE	GRAB	SHELBY TUBE	SPLIT SPOON	BULK	NO RECOVERY
BACKFILL TYPE	BENTONITE	GRAVEL	SLOUGH	GROUT	CUTTINGS
					SAND



LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS - REVISION 5.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 25.73 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 7/15/14
PROJECT ENGINEER: Faris Khalil	Page 2 of 3

PROJECT: Waverley Underpass		CLIENT: City of Winnipeg		TESTHOLE NO: TH14-04	
LOCATION: UTM: 14U, 5523599 m N, 630952 m E				PROJECT NO.: 60321148	
CONTRACTOR: Maple Leaf Drilling Ltd.		METHOD: 125 mm SSA/ HQ Coring		ELEVATION (m): 233.20	
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB	<input type="checkbox"/> SHELBY TUBE	<input checked="" type="checkbox"/> SPLIT SPOON	<input type="checkbox"/> BULK	<input type="checkbox"/> NO RECOVERY
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> CUTTINGS
				<input type="checkbox"/> CORE	<input type="checkbox"/> SAND

DEPTH (m)	SOIL SYMBOL	SLOTTED PIEZOMETER	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 ■ Total Unit Wt ■ (kN/m ³) 16 17 18 19 20 21 Plastic MC Liquid 20 40 60 80 100	+ Torvane + × QU/2 × <input type="checkbox"/> Lab Vane <input type="checkbox"/> △ Pocket Pen. △ ⊕ Field Vane ⊕ (kPa) 50 100 150 200				
20											C5 Recovery: 71 %	213
21			SHALE - blue / green - fine grained - no foliation - R1- very weak - close spacing		C6						C6 RQD: 0% C6 Recovery: 56 %	212
22			LIMESTONE - fine grained - creamish white and grey - no foliation - R3- medium strong - moderately closed too widely spaced, planner smooth features, clean, no evidence of water flow (class 2) - gapped fractures(180 degrees to core axis), rough undulating , clean between 21.6 to 22.6 m		C7						C7 RQD: 23% C7 Recovery: 81 %	211
23			- gapped fractures(180 degrees to core axis), rough undulating , clean between 23 to 23.5 m		C8						C8 RQD: 60% C7 Recovery: 100 %	210
24			- gapped fractures(180 degrees to core axis), rough undulating , clean between 24.2 to 25 m		C9						C9 RQD: 26% C7 Recovery: 100 % qu= 114.9 MPa	209
25			- R5- very strong									208
26			END OF TEST HOLE AT 25.7 m IN BEDROCK NOTES: 1. Power Auger Refusal at 13.8 m in Glacial TILL. 2. HQ coring below 13.8 m. 3. Seepage observed at 3.0 m upon drilling completion. 4. Installed 25 mm diameter standpipe piezometer (SP14-04) to 23.5 m below ground surface with 0.3 m casagrande tip and flush mount at ground surface. 5. Test hole backfilled with silica sand up to 23.6 m below ground surface, bentonite up to 1 m and plugged with auger cutting to ground surface. 6. Groundwater monitoring: - Aug. 12, 2014 at Elv. 225.2 m. - Sep. 03, 2014 at Elv. 225.0 m. - Sep. 19, 2014 at Elv. 225.6 m. - Oct. 17, 2014 at Elv. 225.5 m. - Nov. 06, 2014 at Elv. 225.4 m. - Nov. 20, 2014 at Elv. 225.4 m. - Dec. 06, 2014 at Elv. 225.2 m. - Dec. 18, 2014 at Elv. 225.2 m.									207
27												206
28												205
29												204
30												204

LOG OF TEST HOLE WAVERLEY UP- TEST HOLE LOGS - REVISION 5.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 25.73 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 7/15/14
PROJECT ENGINEER: Faris Khalil	Page 3 of 3

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-05
 LOCATION: UTM: 14U, 5523582 m N, 631025 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)	(kPa)	(kPa)		
0		CLAY (FILL) - silty, some sand - brown to dark brown, firm, moist - intermediate to high plasticity									
0.9		- black below 0.9 m									
1.0		CLAY - trace silt, trace oxidation - dark brown, firm, moist - high plasticity		G54	55					Gravel: 0.0%, Sand: 12.9%, Silt: 23.4%, Clay: 63.7%	1
1.5		- silty, brown mottled light brown, soft from 1.5 m to 1.7 m									
1.7		- some silt, stiff to firm below 1.7 m									
2.0				G55	55						
2.0											
2.2				G56	55						
2.2											
3.0				G57	55						
3.0											
3.05		END OF TEST HOLE AT 3.05 m IN CLAY. NOTES: 1. Hole open to 1.4 m immediately following drilling. 2. Seepage was observed at 1.2 m and from 2.4 m to 2.7 m. 3. Test hole backfilled with auger cuttings upon drilling completion.									

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 3.05 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/23/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-06
 LOCATION: UTM: 14U, 5523587 m N, 631095 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)			
0		SAND and GRAVEL (FILL) - light brown, dry to moist								
		CLAY (FILL)- silty - light grey to grey, firm, moist - high plasticity		G58						
		CLAY- some silt - brown, firm to stiff, moist - high plasticity		G59	~55					1
		- silt pocket, soft to firm, trace oxidation below 1.5 m		G60						2
		- silty, soft below 2.4 m		G61	~55					3
3		END OF TEST HOLE AT 3.05 m IN CLAY. NOTES: 1. Hole open to 2.9 m immediately following drilling. 2. No seepage was observed upon drilling completion. 3. Water level measured at 1.8 m below ground surface immediately following drilling. 4. Test hole backfilled with auger cuttings upon drilling completion.								4

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINNI.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 3.05 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/23/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass	CLIENT: City of Winnipeg	TESTHOLE NO: TH14-07
LOCATION: UTM: 14U, 5523614 m N, 631190 m E		PROJECT NO.: 60321148
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)			
0		GRAVEL and SAND (FILL) - some clay								
		CLAY (FILL) - silty - light grey and grey-black, firm, moist - intermediate plasticity								
		CLAY AND SILT- organic, silty, some sand - black, firm, moist - intermediate plasticity		G62					Gravel: 0.0%, Sand: 19.6%, Silt: 36.1%, Clay: 44.2%, AASHTO classification (A-7-6)	
1		SILT - clayey - light grey, firm, moist, - low plasticity		G63						1
		CLAY - some silt - grey, firm, moist, - high plasticity								
		- trace silt inclusions (< 6 mm in dia.), brown, firm to stiff below 1.5 m		G64						
2				G65						2
3		END OF TEST HOLE AT 3.05 m IN CLAY. NOTES: 1. Hole open to 3.05 m immediately following drilling. 2. No sloughing was observed upon drilling completion. 3. Seepage was observed at 0.9 m and 1.5 m below ground surface. 4. Test hole backfilled with auger cuttings upon drilling completion.								3

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 3.05 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 10/23/14
PROJECT ENGINEER: Faris Khalil	Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-08
 LOCATION: UTM: 14U, 5523551 m N, 630836 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)			
0		CLAY (FILL) - silty, sandy - grey, moist								
			<input checked="" type="checkbox"/>	G66	●				Gravel: 0.0%, Sand: 23.4%, Silt: 27.5%, Clay: 49.1%	
1			<input checked="" type="checkbox"/>	G67	●					1
		CLAY - silty - light grey, soft, moist - low to intermediate plasticity - brown, firm to stiff, moist, high plasticity below 1.5 m								
2			<input checked="" type="checkbox"/>	G68						
			<input checked="" type="checkbox"/>	G69	●					
3										
4		END OF TEST HOLE AT 3.05 m IN CLAY. NOTES: 1. Hole open to 3.05 m immediately following drilling. 2. No sloughing was observed upon drilling completion. 3. Seepage observed at 2.4 during drilling. 4. Water level measured at 2.9 m immediately following drilling. 5. Test hole backfilled with auger cuttings upon drilling completion.								

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 3.05 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/23/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-09
 LOCATION: UTM: 14U, 5523533 m N, 630753 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)	(kPa)	(kPa)		
0		CLAY (FILL) - silty, some organic - black and light grey, firm, moist									
1		- some sand below 0.9 m									
2		CLAY - brown mottled grey, firm to stiff, moist - high plasticity - silty, soft from 1.7 m to 1.9 m									
3		- trace oxidation below 2.13 m - silt inclusion (< 6 mm in dia.) from 2.1 m 2.3 m									
4		END OF TEST HOLE AT 3.05 m IN CLAY. NOTES: 1. No sloughing was observed upon drilling completion. 2. Seepage was observed at 1.2 m and 1.52 m during drilling. 3. Test hole backfilled with auger cuttings upon drilling completion.									

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 3.05 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/23/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-10
 LOCATION: UTM: 14U, 5523516 m N, 630610 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m ³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ⊕ Field Vane ⊕ (kPa)				
0		CLAY (FILL) - silty - black to light grey, firm, moist - low to intermediate plasticity		G74							
1		CLAY - organic, silty to some silt, some sand - black, soft to firm, moist to wet, - low plasticity - grey, firm below 1.4 m		G75						Gravel: 0.0%, Sand: 14.1%, Silt: 33.5%, Clay: 52.4%	1
2		SILT - some clay - brown, soft, moist to wet - low plasticity CLAY - some to trace silt - grey mottled brown, firm to stiff, moist, - high plasticity - silt inclusions (<6 mm in dia.) below 2.4 m		G76							2
3				G77							3
4		END OF TEST HOLE AT 3.05 m IN CLAY. NOTES: 1. Hole open to 3.05 m immediately following drilling. 2. Sloughing was observed at 1.8 m. 3. Seepage was observed at 1.1 m and below 1.5 m. 4. Test hole backfilled with auger cuttings upon drilling completion.									4

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 3.05 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/23/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-11
 LOCATION: UTM: 14U, 5523574 m N, 630822 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ⊕ Field Vane ⊕ (kPa)			
0		TOPSOIL								
		SAND and GRAVEL (FILL) - light brown, moist to wet	<input checked="" type="checkbox"/>	G78	●					
		CLAY (FILL) - organic, sandy, trace wood - black, firm, moist to wet	<input checked="" type="checkbox"/>	G79						
		SILT - some clay - light grey, soft, moist - low plasticity	<input checked="" type="checkbox"/>	G80	●					
		CLAY - trace silt - brown mottled grey, firm to stiff, moist, - high plasticity	<input checked="" type="checkbox"/>							
		- trace silt inclusions (< 12 mm in dia.) below 2.3 m	<input checked="" type="checkbox"/>	G81						
3		END OF TEST HOLE AT 3.05 m IN CLAY. NOTES: 1. Hole open to 3.05 m immediately following drilling. 2. No sloughing was observed upon drilling completion. 3. Seepage was observed at 1.1 m. 4. Test hole backfilled with auger cuttings upon drilling completion.								

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 3.05 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/23/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-12
 LOCATION: UTM: 14U, 5523563 m N, 630774 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)	(kPa)	(kPa)		
0		GRAVEL (FILL) - light brown, moist									
		CLAY (FILL) - some gravel, trace to some silt, trace oxidation - grey, firm, moist		G82							
1		CLAY - organic, some silt, trace gravel, trace oxidation - black, firm, moist - pieces of wood from 0.9 m to 1.2 m		G83	55						1
		SILT - light brown, soft, moist, - low plasticity		G84							
2		CLAY - trace to some silt - brown mottled grey, soft to stiff, moist, - high plasticity - silt pocket from 1.8 m to 2 m		G85	65						2
		- trace oxidation below 2.5 m									
		- silty, soft to firm below 2.75 m									
3		END OF TEST HOLE AT 3.05 m IN CLAY. NOTES: 1. Hole open to 1.74 m immediately following drilling. 2. No seepage was observed upon drilling completion. 3. Test hole backfilled with auger cuttings upon completion.									3
4											4

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 3.05 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/23/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-13
 LOCATION: UTM: 14U, 5523544 m N, 630678 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)			
0		TOPSOIL								
		SAND and GRAVEL (FILL) - light brown, moist								
		CLAY (FILL) - silty, trace organics - black to brown, firm, moist, - intermediate to low plasticity		G86						
		CLAY (FILL) - silty, trace organics - black to brown, firm, moist, - intermediate to low plasticity		G87						
		CLAY - trace silt - brown to dark brown, firm to stiff, moist, - high plasticity		G88						
		- silty, soft to firm, trace oxidation from 2 m to 2.3 m								
		- silt inclusion (< 6 mm in dia.) below 2.3 m		G89						
3		END OF TEST HOLE AT 3.05 m IN CLAY. NOTES: 1. Hole open to 2.90 m immediately after drilling. 2. No seepage observed upon drilling completion. 3. Test hole backfilled with auger cuttings upon drilling completion.								

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ - UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 3.05 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/23/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-14
 LOCATION: UTM: 14U, 5523606 m N, 630544 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) Total Unit Wt (kN/m ³) Plastic MC Liquid	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ⊕ Field Vane ⊕ (kPa)			
0		TOPSOIL								
		CLAY (FILL) - some silt, trace sand, trace gravel, trace oxidation - light grey and black, moist - intermediate plasticity		G90						
		CLAY - trace silt, trace gypsum - brown, firm to stiff, moist, - high plasticity		G91						
1				G92						1
		- trace silt inclusion < 12 mm in dia. below 1.5 m		G93						
				G94						
		- silty, light brown, low plasticity from 1.8 m to 2 m		G95						
2				G96						2
		END OF TEST HOLE AT 2.44 m IN CLAY. NOTES: 1. Hole open to 2.3 m immediately after drilling. 2. No seepage was observed upon drilling completion. 3. Test hole backfilled with auger cuttings upon completion.								
3										3
4										4

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 2.44 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/24/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-15
 LOCATION: UTM: 14U, 5523571 m N, 630387 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)			
0		TOPSOIL								
		CLAY (FILL) - some silt, trace gravel - black and grey, soft to firm, moist, - intermediate to high plasticity	<input checked="" type="checkbox"/>	G97						
		CLAY - trace silt - grey, firm, moist, - high plasticity	<input checked="" type="checkbox"/>	G98	~45	~18				
			<input checked="" type="checkbox"/>	G99						
			<input checked="" type="checkbox"/>	G100	~45	~18				
			<input checked="" type="checkbox"/>	G101						
		- silty, low plasticity, trace oxidation from 1.5 m to 1.7 m	<input checked="" type="checkbox"/>	G102						
			<input checked="" type="checkbox"/>	G103						
		END OF TEST HOLE AT 2.44 m IN CLAY. NOTES: 1. Hole open to 2.3 m immediately following drilling. 2. No seepage was observed upon drilling completion. 3. Test hole backfilled with auger cutting upon drilling completion.								

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA -REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 2.44 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/24/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-16
 LOCATION: UTM: 14U, 5523647 m N, 630668 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)			
0		TOPSOIL								
0		CLAY - silty, trace sand - brown, firm, moist, - high plasticity		G104	●					
0.5				G105	●	—			Gravel: 0.0%, Sand: 5.5%, Silt: 29.0%, Clay: 65.5%, AASHTO classification (A-7-6)	
1				G106	●					1
1.5		- light brown, soft below 1.5 m		G107						
2				G108	●					
2.44				G109						
2.44		END OF TEST HOLE AT 2.44 m IN CLAY. NOTES: 1. Hole open to 2.4 m immediately following drilling. 2. No seepage was observed upon drilling completion. 3. Test hole backfilled with auger cutting upon drilling completion.		G110						

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 2.44 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/24/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-17
 LOCATION: UTM: 14U, 5523683 m N, 630802 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ⊕ Field Vane ⊕ (kPa)			
0		TOPSOIL								
		CLAY (FILL) - trace sand, trace gravel, trace silt - black to grey, firm, moist - intermediate to high plasticity		G111						
		CLAY - silty, trace sand - grey, firm to stiff, moist - high plasticity		G112						
1				G113					Gravel: 0.0%, Sand: 5.1%, Silt: 24.4%, Clay: 70.5%, AASHTO classification (A-7-6)	1
				G114						
		- grey mottled brown from 1.5 m to 1.8 m		G115						
		- brown, trace oxidation from 1.8 m to 2.2 m		G116						
		- some silt, grey below 2.2 m		G117						
2										2
3		END OF TEST HOLE AT 2.44 m IN CLAY. NOTES: 1. Hole open to 2.4 m immediately following drilling. 2. No seepage was observed upon drilling completion. 3. Test hole backfilled with auger cutting upon drilling completion.								3
4										4

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 2.44 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/24/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-18
 LOCATION: UTM: 14U, 5523429 m N, 630866 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)	+	(kPa)		
0	TOPSOIL										
		CLAY (FILL) - some gravel, some silt, trace sand - grey, firm to stiff, moist, - low to intermediate plasticity		G118							
				G119							
				G120	~45						
		SILT - clayey, some sand - light brown, soft, moist, - low plasticity		G121	~55						
				G122	~65						
		CLAY- trace to some silt - grey mottled brown, firm, moist to wet, - high to intermediate plasticity		G123							
		SILT - clayey, some sand - light brown, soft, moist, - low plasticity		G124	~45						
		CLAY- trace silt - grey mottled brown, firm to stiff, moist to wet, - high plasticity		G125							
				G126							
		- silty below 3.8 m									
4		END OF TEST HOLE AT 3.96 m IN CLAY. NOTES: 1. Hole open to 2.1 m upon drilling completion. 2. Seepage and sloughing were observed below 3 m. 3. Test hole backfilled with auger cuttings upon drilling completion.									

Gravel: 0.0%, Sand: 17.0%, Silt: 60.9%, Clay: 22.1%. AASHTO Classification (A-4)

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 3.96 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/24/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-19
 LOCATION: UTM: 14U, 5523343 m N, 630875 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)			
0		TOPSOIL								
		CLAY (FILL) - trace gravel, trace silt, trace sand - black, firm to stiff, moist, - high plasticity		G127						
				G128						
1		CLAY - trace silt - brown, firm, moist, - high plasticity		G129	18					1
				G130						
		- grey mottled brown, silt inclusion < 6 mm in dia. below 1.5 m - silty to some silt, low to intermediate plasticity from 1.5m to 1.7m		G131	45					
				G132						
				G133						
				G134						
3		END OF TEST HOLE AT 3.0 m IN CLAY. NOTES: 1. Hole open to 2.7 m immediately following drilling. 2. No seepage was observed upon drilling completion. 3. Test hole backfilled with auger cutting upon drilling completion.								3
4										

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 3.05 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/24/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-20
 LOCATION: UTM: 14U, 5523235 m N, 630888 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ⊕ Field Vane ⊕ (kPa)			
0	TOPSOIL									
		CLAY - some silt - grey, soft to firm, moist, - intermediate to high plasticity		G135						
		- trace silt below 0.5m		G136						
1				G137						1
		- brown, trace silt inclusion < 6 mm in dia. below 1.5m - silty, light brown below 1.7 m		G138						
				G139						
2				G140						2
				G141						
3										3
4										4

END OF TEST HOLE AT 2.44 m IN CLAY.
 NOTES:
 1. Hole open to 2.4 m immediately following drilling.
 2. No seepage was observed upon drilling completion.
 3. Test hole backfilled with auger cutting upon drilling completion.

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 2.44 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/24/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-21
 LOCATION: UTM: 14U, 5523227 m N, 631020 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)			
0		TOPSOIL								
		CLAY (FILL) - some silt, trace organic - black, firm to stiff, moist - intermediate to high plasticity		G142						
		CLAY and SILT - some sand - light brown, soft to firm, moist, - intermediate plasticity		G143	18				Gravel: 0.0%, Sand: 13.3%, Silt: 42.8%, Clay: 43.9%, AASHTO Classification (A-7-6)	
1				G144						1
				G145	20					
		CLAY - trace silt - brown, moist - high plasticity - trace silt inclusion < 12 mm in dia., trace gravel below 1.7m		G146	21					
2				G147						2
				G148						
		END OF TEST HOLE AT 2.44 m IN CLAY. 1. Hole open to 2.4 m immediately following drilling. 2. No seepage was observed upon drilling completion. 3. Test hole backfilled with auger cutting upon drilling completion.								
3										3
4										4

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA -REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 2.44 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/24/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass	CLIENT: City of Winnipeg	TESTHOLE NO: TH14-22
LOCATION: UTM: 14U, 5523219 m N, 631078 m E		PROJECT NO.: 60321148
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS	UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0		TOPSOIL							
		CLAY (FILL)- some silt, trace gravel, trace oxidation - black to brown, firm to stiff, moist, - high plasticity		G149	●				
		CLAY - silty, trace sand - brown, firm, moist, - intermediate plasticity - silt pocket between 0.3 m and 1.2 m		G150	●			Gravel: 0.0%, Sand: 1.4%, Silt: 33.1%, Clay: 65.5%	
				G151					1
		- silt inclusion < 12 mm in dia. below 1.2 m		G152	●				
		- trace oxidation from 1.5 m to 2.1 m		G153	●				
		SILT - some clay to clayey - light brown, soft to firm, moist, - low plasticity		G154					2
		- very soft below 2.1 m		G155					
		END OF TEST HOLE AT 2.44 m IN SILT. NOTES: 1. Hole open to 2.4 m immediately following drilling. 2. No seepage was observed upon drilling completion. 3. Test hole backfilled with auger cutting upon drilling completion.							3
4									4

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA -REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 2.44 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 10/24/14
PROJECT ENGINEER: Faris Khalil	Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-23
 LOCATION: UTM: 14U, 5523200 m N, 631272 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):
 SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)			
0	TOPSOIL									
		CLAY - trace silt - grey, firm, moist, - high plasticity		G156						
				G157						
		- trace gravel, dark grey from 0.7 m to 0.9 m		G158						
1		SILT - clayey - light brown, soft, moist - low plasticity		G159						1
		CLAY - trace silt - brown mottled grey, firm, moist, - high plasticity		G160						
		- silt pocket below 1.75 m - silt inclusion < 12 mm in dia. below 1.8 m		G161						2
2				G162						
		END OF TEST HOLE AT 2.44 m IN CLAY. NOTES: 1. Hole open to 2.4 m immediately following drilling. 2. No seepage was observed upon drilling completion. 3. Test hole backfilled with auger cutting upon drilling completion.								

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 2.44 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/24/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-24
 LOCATION: UTM: 14U, 5523700 m N, 631092 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ⊕ Field Vane ⊕ (kPa)			
0		TOPSOIL								
		CLAY (FILL) - some silt, trace sand - black to grey, moist - intermediate plasticity		G163						
		CLAY and SILT - trace sand - brown, firm to stiff, moist, - intermediate plasticity		G164	●				Gravel: 0.0%, Sand: 7.3%, Silt: 45.2%, Clay: 47.5%	
1				G165						1
				G166	●					
		CLAY - silty to some silt, trace oxidation - brown to light brown, soft to firm, moist, - high plasticity		G167	●					
2				G168						2
				G169						
		END OF TEST HOLE AT 2.44 m IN CLAY. NOTES: 1. Hole open to 2.4 m immediately following drilling. 2. Seepage was observed below 2.3 m upon drilling completion. 3. Test hole backfilled with auger cutting upon drilling completion.								
3										3
4										4

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 2.44 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/26/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-25
 LOCATION: UTM: 14U, 5523746 m N, 631270 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)			
0	TOPSOIL									
		CLAY (FILL) - some silt, trace sand - black to dark grey, firm, moist, - intermediate to high plasticity		G170	●					
		SILT - clayey, trace sand - light brown, moist, - intermediate plasticity		G171	—●—				Gravel: 0.0%, Sand: 8.1%, Silt: 60.0%, Clay: 31.9%, AASHTO Classification (A-6)	
1		- brown from 0.9 m to 1.5 m		G172						1
		- silt pocket, silt inclusion < 6 mm in dia. below 1.2 m		G173	●					
		CLAY - trace silt - brown, firm to stiff, moist, - intermediate to high plasticity - trace oxidation at 1.7 m		G174						
2				G175						2
				G176						
		END OF TEST HOLE AT 2.44 m IN CLAY. NOTES: 1. Hole open to 2.4 m immediately following drilling. 2. No seepage was observed upon drilling completion. 3. Test hole backfilled with auger cutting upon drilling completion.								
3										3
4										4

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 2.44 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/26/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-26
 LOCATION: UTM: 14U, 5523720 m N, 630895 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)	+	(kPa)		
0		TOPSOIL									
		CLAY (FILL) - some silt, trace sand - dark to light grey, firm, moist, - high plasticity		G177							
		CLAY - trace silt - grey, firm to stiff, moist, - high plasticity		G178							
				G179							
		- grey mottled brown below 1.5 m		G180							
				G181							
		- silty, trace oxidation below 2.1 m		G182							
		END OF TEST HOLE AT 2.44 m IN CLAY. NOTES: 1. Hole open to 2.4 m immediately following drilling. 2. No seepage was observed upon drilling completion. 3. Test hole backfilled with auger cutting upon drilling completion.									

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 2.44 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/26/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-27
 LOCATION: UTM: 14U, 5523208 m N, 630727 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

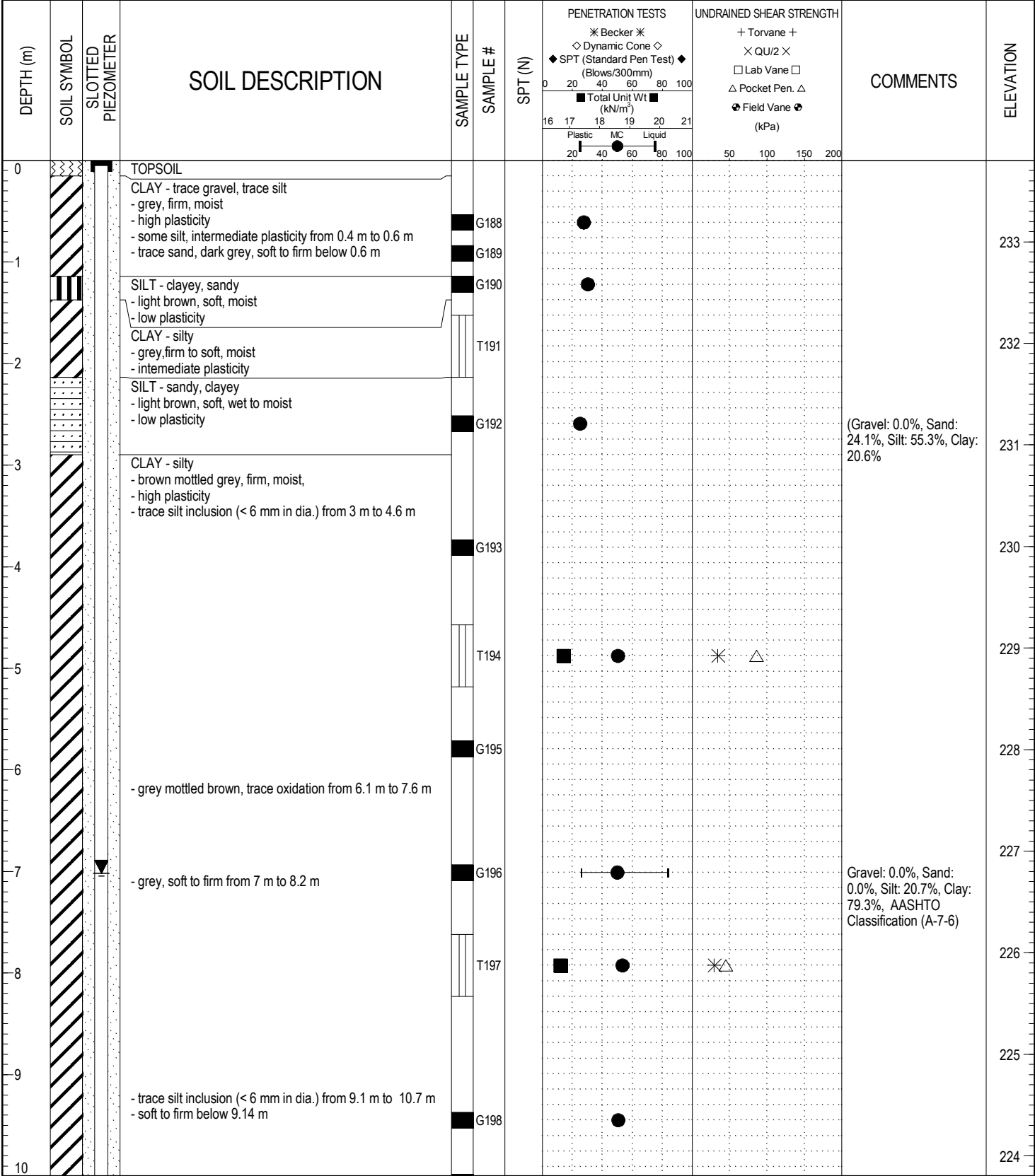
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						UNDRAINED SHEAR STRENGTH (kPa)				
0		GRAVEL and SAND (FILL) - some clay, some silt - light brown, dry to moist								
1		CLAY - silty, trace sand - grey, firm, moist, - high plasticity		G183	●					
1				G184	●				(G184): Gravel: 0.0%, Sand: 6.8%, Silt: 27.7%, Clay: 65.5%	1
1				G185	●					
2		- light brown, trace oxidation from 1.8 m to 2 m		G186						
2		- grey mottled brown below 2 m		G187						
3		END OF TEST HOLE AT 2.44 m IN CLAY. NOTES: 1. Hole open to 2.4 m immediately following drilling. 2. No seepage was observed upon drilling completion. 3. Test hole backfilled with auger cutting upon drilling completion.								

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA -REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim COMPLETION DEPTH: 2.44 m
 REVIEWED BY: Zeyad Shukri COMPLETION DATE: 10/26/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass		CLIENT: City of Winnipeg		TESTHOLE NO: TH14-28	
LOCATION: UTM: 14U, 5523511 m N, 630871 m E				PROJECT NO.: 60321148	
CONTRACTOR: Maple Leaf Drilling Ltd.		METHOD: 125 mm SSA		ELEVATION (m): 233.80	
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB	<input type="checkbox"/> SHELBY TUBE	<input checked="" type="checkbox"/> SPLIT SPOON	<input type="checkbox"/> BULK	<input type="checkbox"/> NO RECOVERY
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> CUTTINGS
				<input type="checkbox"/> CORE	<input type="checkbox"/> SAND



LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 13.87 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 10/26/14
PROJECT ENGINEER: Faris Khalil	Page 1 of 2

PROJECT: Waverley Underpass		CLIENT: City of Winnipeg		TESTHOLE NO: TH14-28	
LOCATION: UTM: 14U, 5523511 m N, 630871 m E		METHOD: 125 mm SSA		PROJECT NO.: 60321148	
CONTRACTOR: Maple Leaf Drilling Ltd.		ELEVATION (m): 233.80			
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB	<input type="checkbox"/> SHELBY TUBE	<input checked="" type="checkbox"/> SPLIT SPOON	<input type="checkbox"/> BULK	<input type="checkbox"/> NO RECOVERY
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> CUTTINGS
				<input type="checkbox"/> CORE	<input type="checkbox"/> SAND

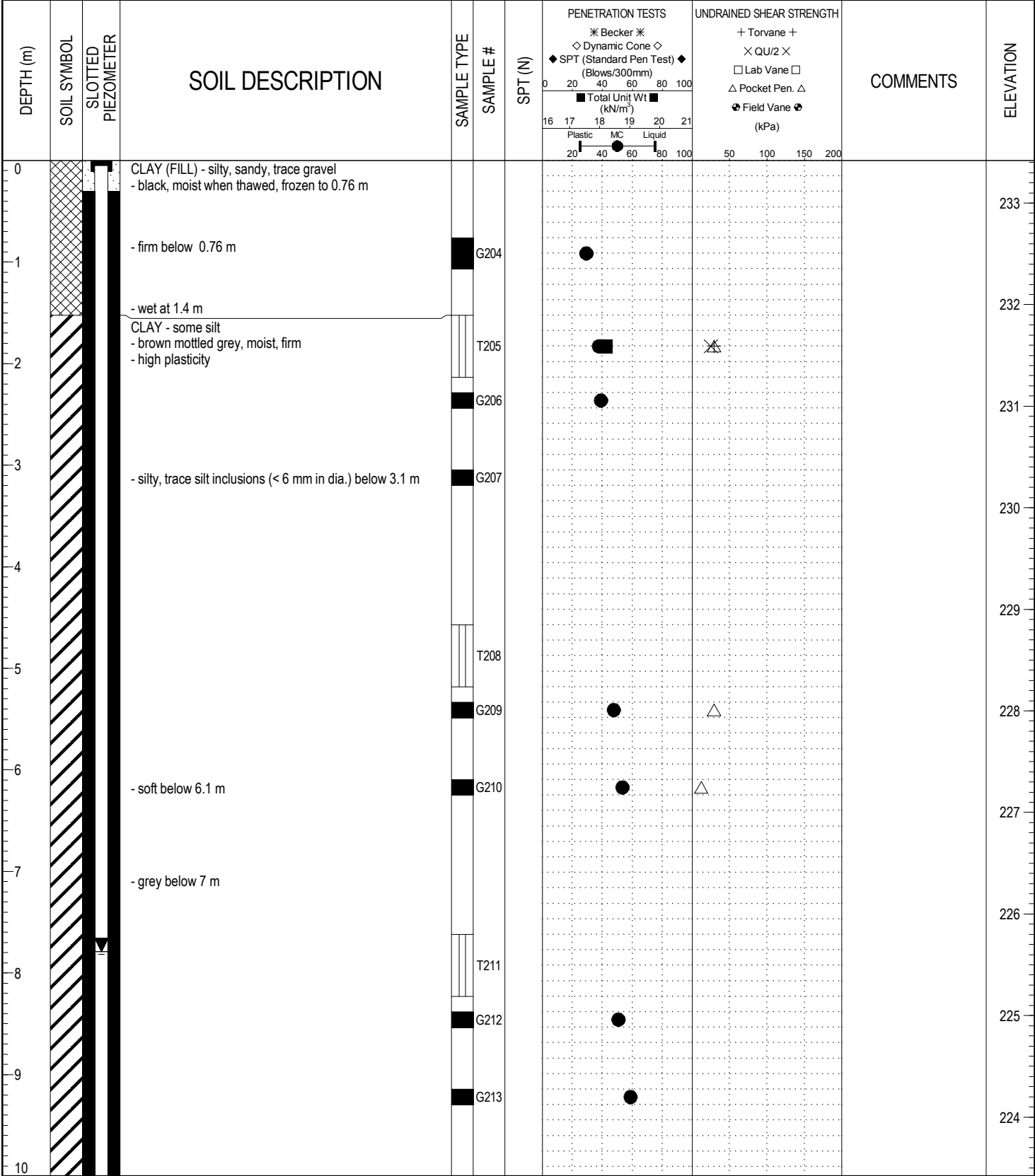
DEPTH (m)	SOIL SYMBOL	SLOTTED PIEZOMETER	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION
							Blows/300mm	Total Unit Wt (kN/m ³)	+	+		
10					G199							233
11					T200							223
12			- some sand, some gravel from 12 m to 13.4 m		T201							222
13					T201							221
13.87			Glacial Till (SILT) - some gravel, some sand, some to trace clay - light grey, very dense, moist, - low plasticity		S202	23	23				SPT Blow Count: (10,10,13) 75 %Recovery	220
14			END OF TEST HOLE AT 13.87 m IN Glacial Till (SILT). NOTES: 1. Power auger refusal at 13.87 m in Glacial Till . 2. Seepage was observed from silt layer below 2.1 m. 3. Sloughing was observed from silt layer below 2.1 m. 4. Installed 25 mm diameter standpipe piezometer (SP14-28) to 11 m below ground surface with 0.3 m casagrande tip and flush mount up to 0.3 m below ground surface. 5. Test hole backfilled with slough up to 11 m and silica sand up to 0.3 m below ground surface and plugged with top soil to ground surface. 6. Groundwater monitoring: - Nov. 06, 2014 at Elv. 226.3 m. - Nov. 20, 2014 at Elv. 226.6 m. - Dec. 06, 2014 at Elv. 226.6 m. - Dec. 18, 2014 at Elv. 226.6 m.		G203							220
15												219
16												218
17												217
18												216
19												215
20												214

LOG OF TEST HOLE WAVERLEY UP - PHASE II - TEST HOLE LOGS - WITH LAB DATA - REVISION 1.GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Saba Ibrahim	COMPLETION DEPTH: 13.87 m
REVIEWED BY: Zeyad Shukri	COMPLETION DATE: 10/26/14
PROJECT ENGINEER: Faris Khalil	Page 2 of 2

PROJECT: Waverley Underpass		CLIENT: City of Winnipeg		TESTHOLE NO: TH14-29	
LOCATION: UTM: 14U, 5523602 m N, 630869 m E				PROJECT NO.: 60321148	
CONTRACTOR: Maple Leaf Drilling Ltd.		METHOD: 125 mm SSA		ELEVATION (m): 233.42	
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB	<input type="checkbox"/> SHELBY TUBE	<input type="checkbox"/> SPLIT SPOON	<input type="checkbox"/> BULK	<input type="checkbox"/> NO RECOVERY
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> CUTTINGS
					<input type="checkbox"/> CORE
					<input type="checkbox"/> SAND

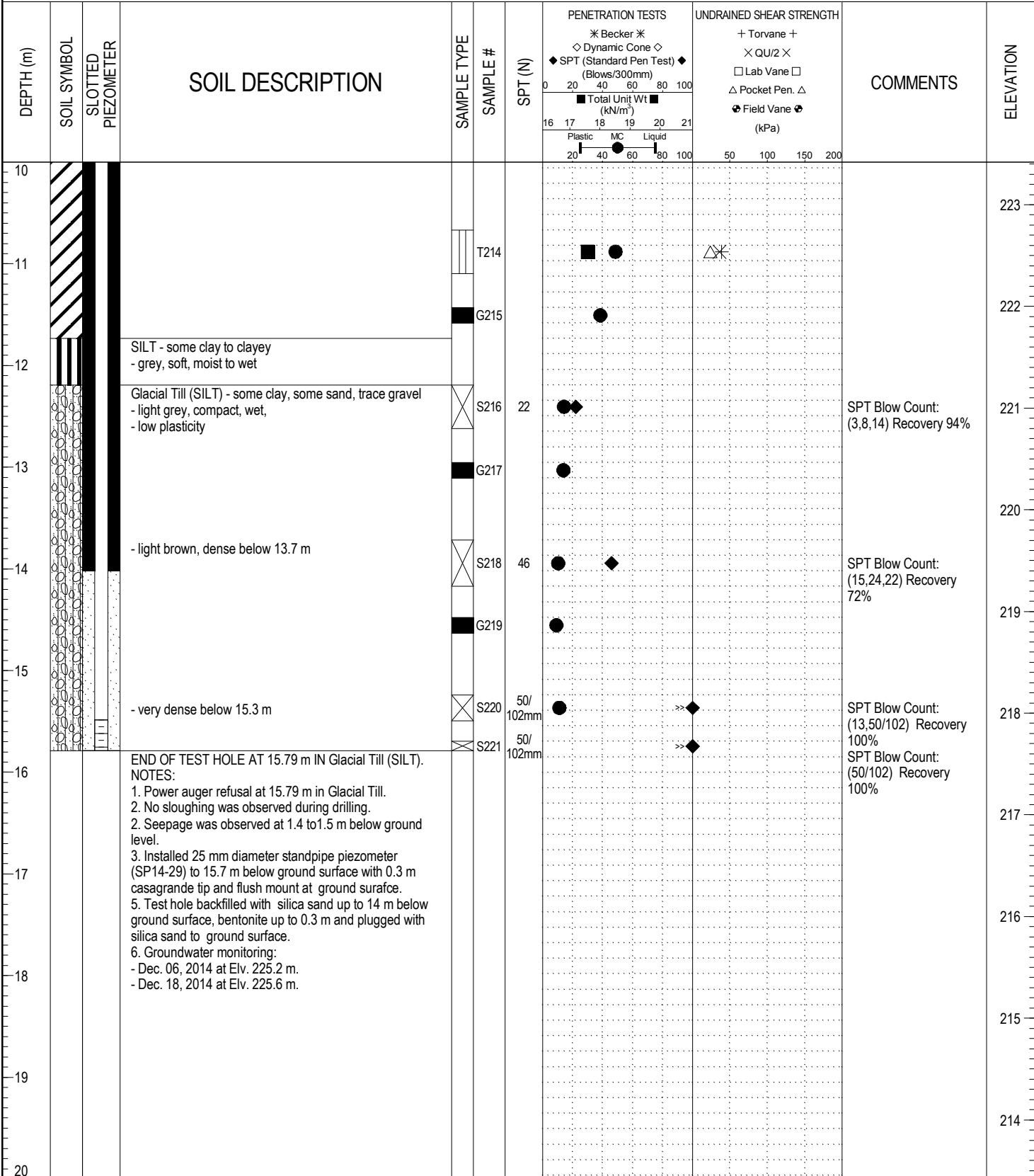


LOG OF TEST HOLE WAVERLEY UP - PHASE III - TEST HOLE LOGS - GPJ - UMA WINN.GDT 1/12/15



LOGGED BY: Mustafa Alkiki	COMPLETION DEPTH: 15.79 m
REVIEWED BY:	COMPLETION DATE: 12/1/14
PROJECT ENGINEER: Faris Khalil	Page 1 of 2

PROJECT: Waverley Underpass		CLIENT: City of Winnipeg		TESTHOLE NO: TH14-29		
LOCATION: UTM: 14U, 5523602 m N, 630869 m E		METHOD: 125 mm SSA		PROJECT NO.: 60321148		
CONTRACTOR: Maple Leaf Drilling Ltd.		ELEVATION (m): 233.42				
SAMPLE TYPE	GRAB	SHELBY TUBE	SPLIT SPOON	BULK	NO RECOVERY	CORE
BACKFILL TYPE	BENTONITE	GRAVEL	SLOUGH	GROUT	CUTTINGS	SAND



LOG OF TEST HOLE WAVERLEY UP - PHASE III - TEST HOLE LOGS - GPJ UMA WINN.GDT 1/12/15



LOGGED BY: Mustafa Alkiki	COMPLETION DEPTH: 15.79 m
REVIEWED BY:	COMPLETION DATE: 12/1/14
PROJECT ENGINEER: Faris Khalil	Page 2 of 2

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-30
 LOCATION: UTM: 14U, 5523626 m N, 631117 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)	(kPa)	(kPa)		
0		SAND (FILL) - some gravel, trace cobble - brown, moist, frozen									
1		CLAY AND SILT, some sand, trace sulphates - brown, firm, moist, - low plasticity	<input checked="" type="checkbox"/>	G226	40					Gravel: 0.0%, Sand : 16.8%, Silt: 37.4 %, Clay: 45.9%	1
2			<input checked="" type="checkbox"/>	G227							2
3			<input checked="" type="checkbox"/>	G228	60						3
4			<input checked="" type="checkbox"/>	G229							4
5		END OF TEST HOLE AT 4.6 m IN CLAY AND SILT. NOTES: 1. No sloughing was observed upon drilling completion. 2. Seepage observed at 3.7 m. 3. Test hole backfilled with auger cuttings and silica sand, and sealed with bentonite at surface.									5

LOG OF TEST HOLE WAVERLEY UP - PHASE III - TEST HOLE LOGS - GPJ - UMA WINN. GDT 1/12/15



LOGGED BY: Aaron Kaluzniak COMPLETION DEPTH: 4.57 m
 REVIEWED BY: COMPLETION DATE: 12/2/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-31
 LOCATION: UTM: 14U, 5523623 m N, 631090 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)	+	(kPa)		
0		SAND (FILL) - gravelly, some cobble, trace organics - brown, frozen									
1		CLAY - silty, trace sand - brown, firm, moist, - high plasticity		G222							1
2				G223	45	18	18				2
3				G224	55	18	18				3
4		SILT - clayey - brown, very soft, moist to wet, - intermediate plasticity		G225							4
5		END OF TEST HOLE AT 4.6 m IN SILT. NOTES: 1. No sloughing was observed upon drilling completion. 2. Seepage was observed at 3.7 m. 3. Test hole backfilled with cuttings and silica sand, and sealed with bentonite at surface.									5






LOG OF TEST HOLE WAVERLEY UP - PHASE III - TEST HOLE LOGS - GPJ - UMA WINN. GDT 1/12/15



LOGGED BY: Aaron Kaluzniak COMPLETION DEPTH: 4.57 m
 REVIEWED BY: COMPLETION DATE: 12/2/14
 PROJECT ENGINEER: Faris Khalil Page 1 of 1

PROJECT: Waverley Underpass CLIENT: City of Winnipeg TESTHOLE NO: TH14-32
 LOCATION: UTM: 14U, 5523594 m N, 630979 m E PROJECT NO.: 60321148
 CONTRACTOR: Maple Leaf Drilling Ltd. METHOD: 125 mm SSA ELEVATION (m):

SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
						Blows/300mm	Total Unit Wt (kN/m ³)	+	(kPa)		
0		SAND (FILL) - gravelly, trace cobble, trace organics - brown, frozen									
0.5		CLAY (FILL) - some gravel - grey, moist, frozen									
2.0		- cobble (200 mm in dia., angular) at 2 m									
2.5		CLAY - silty, trace sand lenses - brown to grey, moist, firm - high plasticity - trace sulphates		G230		55	1850				
3.5				G231		55	1850				
4.5				G232		55	1850				
4.6		END OF TEST HOLE AT 4.6 m IN CLAY. NOTES: 1. Seepage was observed at 2.0 m. 2. Sloughing was observed at 2.0 m. 3. Test hole backfilled with cuttings and silica sand, and sealed with bentonite at surface.									

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