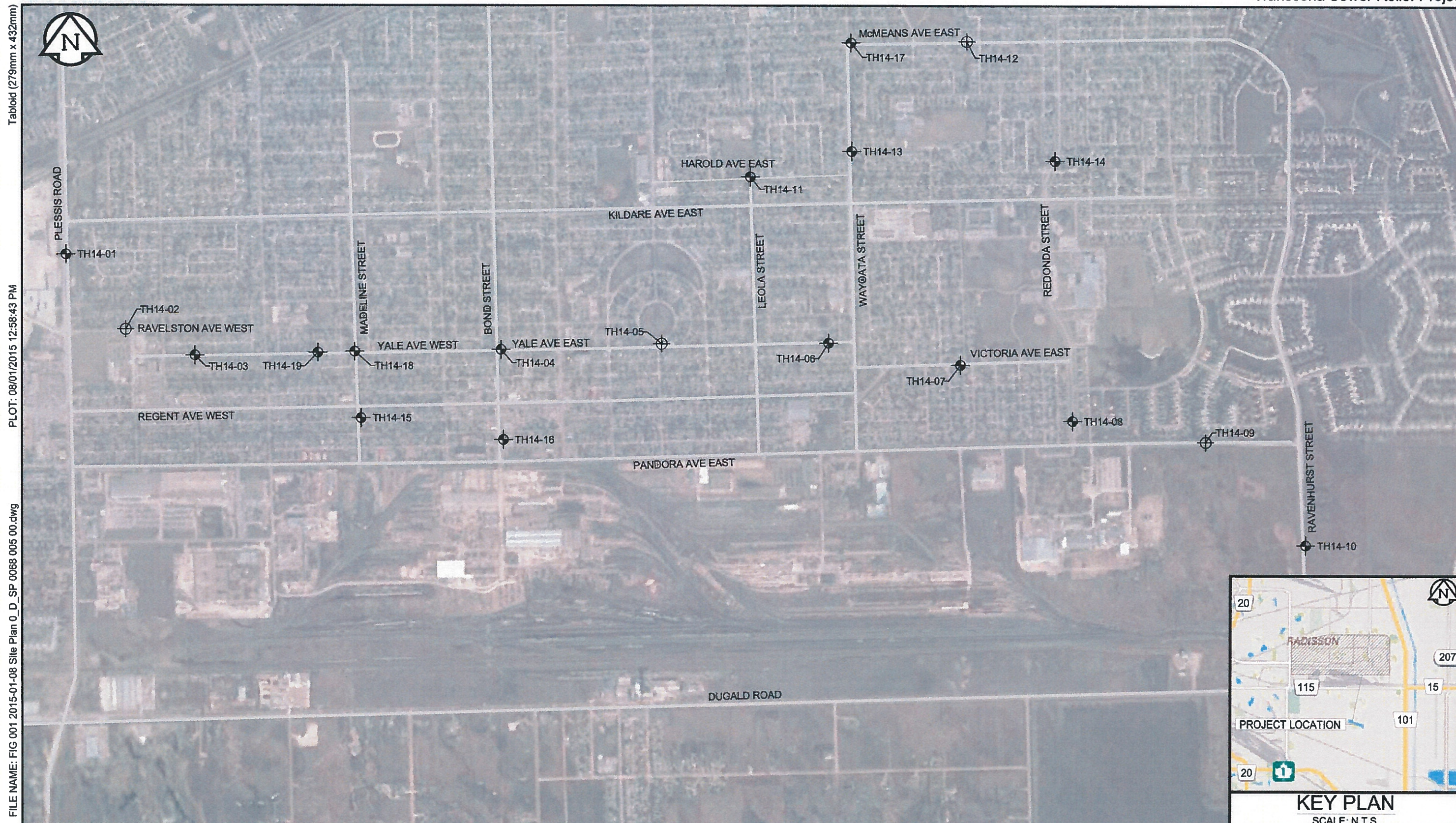


APPENDIX A – TEST HOLE LOGS



Tabloid (279mm x 432mm)

PLOT: 08/01/2015 12:58:43 PM

FILE NAME: FIG 001 2015-01-08 Site Plan 0_SP_0068 005 00.dwg

0 100 200 300 400m
SCALE : 1:12000 (279mm x 432mm)

LEGEND :

- ⊕ TEST HOLE (TREK, NOVEMBER 20-25, 2014)
- ⊕ TEST HOLE WITH STANDPIPE (TREK, NOVEMBER 20-25, 2014)

NOTES :

1. AERIAL IMAGE FROM GOOGLE EARTH MAY 2, 2013

KEY PLAN
SCALE: N.T.S.

Figure 01
Test Hole Location Plan

GENERAL NOTES

- Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
- Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
- When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions	USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria		Particle Size	Material					
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm) Clean gravel (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3 Not meeting all gradation requirements for GW	mm	Sand Coarse Medium Fine					
		GP		Poorly-graded gravels, gravel-sand mixtures, little or no fines								
		GM		Silty gravels, gravel-sand-silt mixtures								
		GC		Clayey gravels, gravel-sand-silt mixtures								
	Sands (More than half of coarse fraction is smaller than 4.75 mm) Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3 Not meeting all gradation requirements for SW	mm	Sand Coarse Medium Fine					
		SP		Poorly-graded sands, gravelly sands, little or no fines								
		SM		Silty sands, sand-silt mixtures								
		SC		Clayey sands, sand-clay mixtures								
		Sands with fines (Appreciable amount of fines)							Atterberg limits below "A" line or P.I. less than 4	mm	Sand Coarse Medium Fine	
									Atterberg limits above "A" line or P.I. greater than 7			
Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)	Sils and Clays (Liquid limit less than 50)	ML		Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve). Less than 5 percent..... GW, GP, SW, SP More than 12 percent..... GM, GC, SM, SC 6 to 12 percent..... Borderline cases requiring dual symbols*		mm	Boulders Cobbles Gravel Coarse Fine				
		CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays								
		OL		Organic silts and organic silty clays of low plasticity								
	Sils and Clays (Liquid limit greater than 50)	MH		Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts								
		CH		Inorganic clays of high plasticity, fat clays								
		OH		Organic clays of medium to high plasticity, organic silts								
	Highly Organic Soils	Pt		Peat and other highly organic soils					Von Post Classification Limit	Strong colour or odour, and often fibrous texture		

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)	▽ Water Level at Time of Drilling
PL - Plastic Limit (%)	▼ Water Level at End of Drilling
PI - Plasticity Index (%)	▽ Water Level After Drilling as Indicated on Test Hole Logs
MC - Moisture Content (%)	
SPT - Standard Penetration Test	
RQD - Rock Quality Designation	
Qu - Unconfined Compression	
Su - Undrained Shear Strength	
VW - Vibrating Wire Piezometer	
SI - Slope Inclinator	

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

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

<u>Descriptive Terms</u>	<u>Undrained Shear Strength (kPa)</u>
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200



Sub-Surface Log

Test Hole TH14-01

1 of 1

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5529374, E-641800
 Contractor: Paddock Drilling Ltd. Ground Elevation: 232.37 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 20, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)						
						16	17	18	19	20	21	Test Type					
						Particle Size (%)											
						0	20	40	60	80	100						
						PL MC LL											
						0	20	40	60	80	100	0	50	100	150	200	250
231.6	0.5		ORGANIC CLAY (FILL) - silty, trace sand, trace gravel (<20 mm dia.), trace rootlets - black - moist, very stiff (frozen from ground surface to 100 mm depth) - intermediate plasticity	<input checked="" type="checkbox"/>	G14												
231.2	1.0		SILT - trace clay, trace sand - brown - moist, soft to firm, low plasticity	<input checked="" type="checkbox"/>	G15												
	1.5		CLAY - silty, trace sand, trace silt inclusions (<10 mm dia.), trace oxidation - mottled brown and grey - moist, stiff to very stiff - high plasticity	<input checked="" type="checkbox"/>	G16												
	3.0		trace precipitates (sulphates, <10 mm dia.) below 3.0 m	<input checked="" type="checkbox"/>	G17												
	4.5			<input checked="" type="checkbox"/>	G18												
	6.0		- grey below 5.8 m	<input checked="" type="checkbox"/>	G19												
224.8	7.5		END OF TEST HOLE AT 7.6 m IN CLAY.	<input checked="" type="checkbox"/>	G20												

Notes:
 1) No seepage or sloughing.
 2) Squeezing below 3.7 m depth.
 3) Test hole backfilled with auger cuttings.
 4) Test hole drilled in boulevard between the road.

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL.GDT 1/8/15

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-02

1 of 2

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5529125, E-641999
 Contractor: Paddock Drilling Ltd. Ground Elevation: 232.41 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 20, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)
 Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders
 Backfill Legend: Bentonite Cement Drill Cuttings Filter Pack Sand Grout Slough

Elevation (m)	Depth (m)	Soil Symbol	Standpipe	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)
							16	17	18	19	20	
231.8	0.5	[Symbol]		ORGANIC CLAY (FILL) - silty, trace sand, trace rootlets - black - moist, very stiff (frozen from ground surface to 100 mm depth) - intermediate plasticity	G01							
231.0	1.0	[Symbol]		SILT - trace clay, trace sand - brown - moist, soft to firm - low plasticity	G02							
	1.5	[Symbol]		CLAY - silty, trace sand, trace silt inclusions (<10 mm dia.), trace precipitates (sulphates, <10 mm dia.), trace oxidation - mottled brown and grey - moist, stiff - high plasticity	G03							
	3.0	[Symbol]			G04							
	5.0	[Symbol]			T05							
	5.5	[Symbol]		- grey below 5.5 m								
	6.0	[Symbol]			G06							
	6.1	[Symbol]		- trace gravel (<20 mm dia.) below 6.1 m								
	8.0	[Symbol]			T07							
	8.8	[Symbol]		- soft below 8.8 m								

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL.GDT 1/8/15

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-02

2 of 2

Elevation (m)	Depth (m)	Soil Symbol	Standpipe	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)										
							16	17											
							Particle Size (%)		Test Type △ Torvane △ ⊕ Pocket Pen. ⊕ ⊠ Qu ⊠ ○ Field Vane ○										
							0	20											
							PL	MC		LL									
							0	20	40	60	80	100	0	50	100	150	200	250	
220.4	9.5			- trace till inclusions (<50 mm dia.) below 10.4 m		G08													
	11.0					T09													
217.8	12.0			SILT (TILL) - trace to some clay, some gravel (<50 mm dia.) - light grey - moist, compact to dense - low plasticity		G10													
	13.0					G11													
	14.0					G12													
	14.5					G13													

END OF TEST HOLE AT 14.6 m IN SILT TILL.
 Notes:
 1) Power Auger Refusal at 14.6 m depth.
 3) Squeezing below 6.1 m depth.
 4) Sloughing below 12.0 m depth.
 6) Standpipe (SP-02) installed in silt till.
 5) Water level at 9.2 m depth measured on January 7, 2015.
 7) Test hole backfilled with sand and bentonite.
 8) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0066-005-00.GPJ TREK GEOTECHNICAL_GDT 1/8/15



Sub-Surface Log

Test Hole TH14-03

1 of 1

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5529038, E-642230
 Contractor: Paddock Drilling Ltd. Ground Elevation: 232.34 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 20, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
						16	17	
						Particle Size (%)		Test Type
						0	20	

231.6	0.5		ORGANIC CLAY (FILL) - silty, trace sand, trace gravel (<20 mm dia.), trace rootlets - black - moist, very stiff (frozen from ground surface to 100 mm depth) - intermediate plasticity	G21				
	1.0		CLAY - silty, trace sand, trace silt inclusions (<10 mm dia.), trace oxidation - mottled brown and grey - moist, stiff to very stiff - high plasticity	G22				<input checked="" type="checkbox"/>
	1.5			G23				<input checked="" type="checkbox"/>
	2.0		trace precipitates (sulphates, <10 mm dia.) below 3.0 m					
	3.0			G24				<input checked="" type="checkbox"/>
	4.5			G25				<input checked="" type="checkbox"/>
	6.0		- grey, trace gravel (<25 mm dia.), trace silt inclusions (<15 mm dia.) below 5.8m	G26				<input checked="" type="checkbox"/>
224.7	7.5			G27				<input checked="" type="checkbox"/>

END OF TEST HOLE AT 7.6 m IN CLAY.
 Notes:
 1) No seepage or sloughing.
 2) Test hole backfilled with auger cuttings.
 3) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL.GDT 1/8/15

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-04

1 of 1

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5529058, E-643249
 Contractor: Paddock Drilling Ltd. Ground Elevation: 232.44 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 21, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)
 Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)						
						16	17	18	19	20	21	Test Type					
						Particle Size (%)											
						0	20	40	60	80	100						
						PL MC LL											
						0	20	40	60	80	100	0	50	100	150	200	250
230.6	0.5		ORGANIC CLAY (FILL) - silty, trace sand, trace gravel (<20 mm dia.), trace organics (rootlets and roots) - grey to black - moist, very stiff (frozen from ground surface to 100 mm depth) - high plasticity	<input checked="" type="checkbox"/>	G57												
	1.0			<input checked="" type="checkbox"/>	G58												
	1.5			<input checked="" type="checkbox"/>	G59												
230.2	2.0		SILT - trace to some clay - brown - moist, firm, intermediate plasticity	<input checked="" type="checkbox"/>	G60												
	2.5		CLAY - silty, trace sand, trace precipitates (<10 mm dia.), trace oxidation - mottled brown and grey - moist, stiff - high plasticity	<input checked="" type="checkbox"/>	G61												
	3.0			<input checked="" type="checkbox"/>	G62												
	4.5			<input checked="" type="checkbox"/>	G63												
	5.0		- grey, trace gravel (<15 mm dia.) below 5.0 m	<input checked="" type="checkbox"/>	G64												
224.8	7.5		END OF TEST HOLE AT 7.6 m IN CLAY.	<input checked="" type="checkbox"/>	G64												

Notes:
 1) Squeezing below 4.0 m depth.
 2) No seepage or sloughing.
 3) Test hole backfilled with auger cuttings.
 4) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL_GDT 1/8/15

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-05

1 of 2

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5529078, E-643784
 Contractor: Paddock Drilling Ltd. Ground Elevation: 233.94 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 24, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Backfill Legend: Bentonite Cement Drill Cuttings Filter Pack Sand Grout Slough

Elevation (m)	Depth (m)	Soil Symbol	Standpipe	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
							16 17 18 19 20 21	0 20 40 60 80 100	
233.5	0.5	[Symbol]		ORGANIC CLAY (FILL) - silty, trace sand, trace gravel (<20 mm dia.), trace rootlets - black, moist (frozen from ground surface to 100 mm depth), very stiff, intermediate plasticity	G	G100	●		
	1.0	[Symbol]		CLAY - silty, trace sand - mottled brown and grey - moist, very stiff - high plasticity	G	G101	●		
232.4	1.5	[Symbol]		SILT - trace clay, trace sand - brown - moist, compact - no to low plasticity	G	G102	●		
231.3	2.5	[Symbol]		CLAY - silty, trace sand, trace precipitates (<10 mm dia.), trace oxidation - mottled brown and grey - moist, firm to stiff - high plasticity	G	G103	●	△	
	4.5	[Symbol]			G	G104	●	⊕	
	5.0	[Symbol]			T	T105	□ ●	⊗ ⊕	
	6.0	[Symbol]		- grey below 5.9 m	G	G106	●	⊕	
	7.5	[Symbol]		- soft below 7.3 m depth	T	T107	□ ●	⊕ ⊗	

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL.GDT 1/8/15

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-05

2 of 2

Elevation (m)	Depth (m)	Soil Symbol	Standpipe	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)	Particle Size (%)					Undrained Shear Strength (kPa)
							16 17 18 19 20 21	0 20 40 60 80 100	PL	MC	LL	0 50 100 150 200 250	
222.4	9.5			- trace sand inclusions (<20 mm dia.) and trace gravel inclusions (<25 mm dia.) below 9.1 m depth		G108							
	10.7			- trace till inclusions (<25 mm dia.) below 10.7 m depth		G109							
	11.0					T110							
222.4	11.5			SILT (TILL) - trace to some clay, trace gravel (<20 mm dia.) - light grey - moist - compact to dense, no to low plasticity		G111							
	12.0												
	12.5												
	13.0												
	13.5												
	14.0												
	14.5												
	15.0					G113							
	15.5			- wet below 15.4 m depth		G114							

END OF TEST HOLE AT 15.9 m IN SILT TILL.

Notes:

- 1) Power auger refusal at 15.9 m depth.
- 2) Seepage below 14.0 m depth.
- 3) Squeezing below 9.1 m depth.
- 4) Water level at 8.9 m depth measured on January 7, 2015.
- 5) Standpipe (SP-05) installed in silt till.
- 6) Test hole backfilled with sand and bentonite.
- 7) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0 A ML 0068-005-00.GPJ TREK GEOTECHNICAL.GDT 1/8/15

Logged By: Martial Lemoine

Reviewed By: N.J Ferreira

Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-06

1 of 1

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5529081, E-644342
 Contractor: Paddock Drilling Ltd. Ground Elevation: 233.98 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 21, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
						16 17 18 19 20 21	0 20 40 60 80 100	
						Particle Size (%)		Test Type <input type="checkbox"/> Torvane <input type="checkbox"/> <input type="checkbox"/> Pocket Pen. <input type="checkbox"/> <input type="checkbox"/> Qu <input type="checkbox"/> <input type="checkbox"/> Field Vane <input type="checkbox"/>
						PL MC LL	0 50 100 150 200 250	
233.5	0.5		ORGANIC CLAY (FILL) - silty, trace sand, trace gravel (<20 mm dia.), trace organics (rootlets and roots), grey to black, moist, very stiff (frozen from ground surface to 100 mm depth), high plasticity		G65			
232.6	1.0		CLAY - silty, trace sand, trace gravel, trace oxidation - mottled brown and grey - moist, very stiff - high plasticity		G66			
232.5	1.5		SILT - trace to some clay, brown, moist, firm, intermediate plasticity		G67			<input type="checkbox"/>
	2.0		CLAY - silty, trace silt inclusions (<15 mm dia.), trace precipitates (<10 mm dia.), trace oxidation - mottled brown and grey - moist, firm to stiff - high plasticity					<input type="checkbox"/>
	3.0				G68			<input type="checkbox"/>
	4.5				G69			<input type="checkbox"/>
	6.0				G70			<input type="checkbox"/>
	7.5		- grey, trace gravel (<15 mm dia.) below 6.7 m		G71			<input type="checkbox"/>

END OF TEST HOLE AT 7.6 m IN CLAY.
 Notes:
 1) No seepage or sloughing.
 2) Squeezing below 6.0 m depth.
 3) Test hole backfilled with auger cuttings.
 4) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL.GDT 1/8/15

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-07

1 of 1

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5529009, E-644783
 Contractor: Paddock Drilling Ltd. Ground Elevation: 233.58 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 21, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)
						16	17	18	19	20	

						Particle Size (%)					Test Type						
						0	20	40	60	80	100	0	50	100	150	200	250
						PL MC LL					<input type="checkbox"/> Torvane <input type="checkbox"/> <input checked="" type="checkbox"/> Pocket Pen. <input checked="" type="checkbox"/> <input type="checkbox"/> Qu <input type="checkbox"/> <input type="checkbox"/> Field Vane <input type="checkbox"/>						
233.0	0.5		ORGANIC CLAY (FILL) - silty, trace sand, trace gravel (<20 mm dia.), trace organics (rootlets and roots), grey to black, moist (frozen from ground surface to 100 mm depth), very stiff, high plasticity	G72													
	1.0		CLAY - silty, trace silt inclusions (<15 mm dia.), trace precipitates (<10 mm dia.), trace oxidation - mottled brown and grey - moist, firm to stiff - high plasticity	G73													
	1.5		- silt layer (~50 mm thick) at 1.7 m depth	G74													
	3.0			G75													
	4.5			G76													
	6.0			G77													
	6.5		- grey, trace gravel (<15 mm dia.), trace sand below 6.4 m														
226.0	7.5			G78													

END OF TEST HOLE AT 7.6 m IN CLAY.
 Notes:
 1) No seepage or sloughing.
 2) Squeezing below 6.0 m depth.
 3) Test hole backfilled with auger cuttings.
 4) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0 A_ML_0068-005-00.GPJ TREK GEOTECHNICAL.GDT 1/8/15

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-08

1 of 1

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5528823, E-645157
 Contractor: Paddock Drilling Ltd. Ground Elevation: 234.53 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 24, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)									
						16	17										
						Particle Size (%)		Test Type <input type="checkbox"/> Torvane <input type="checkbox"/> <input type="checkbox"/> Pocket Pen. <input type="checkbox"/> <input type="checkbox"/> Qu <input type="checkbox"/> <input type="checkbox"/> Field Vane <input type="checkbox"/>									
						0	20										
						PL	MC	LL									
						0	20	40	60	80	100	0	50	100	150	200	250
234.1	0.5		ORGANIC CLAY (FILL) - silty, trace sand, trace gravel (<20 mm dia.), trace organics (rootlets and roots) - grey to black, moist (frozen from ground surface to 100 mm depth), very stiff, high plasticity	▲	G79	●											
	1.0		CLAY - silty, trace sand, trace gravel (<15 mm dia.), trace oxidation - mottled brown and grey - moist, very stiff - high plasticity	▲	G80	●											
233.0	1.5		- laminated silt and clay (<2 mm thick)	▲	G81	●											
232.7	2.0		SILT - trace to some clay - brown, moist, firm, intermediate plasticity	▲	G82	●											
	2.5		CLAY - silty, trace silt inclusions (<15 mm dia.), trace precipitates (<10 mm dia.), trace oxidation - mottled brown and grey - moist, firm to stiff - high plasticity														
	3.0				G83	●											
	4.5				G84	●											
	6.0				G85	●											
	7.5		- grey and soft below 6.3 m		G86	●											

END OF TEST HOLE AT 7.6 m IN CLAY.
 Notes:
 1) No seepage or sloughing.
 2) Squeezing below 5.9 m depth.
 3) Test hole backfilled with auger cuttings.
 4) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL.GDT 1/8/15

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-09

1 of 2

Client: CH2M Hill Canada Limited **Project Number:** 0068 005 00
Project Name: Transcona Sewer Relief Project **Location:** UTM N-5528753, E-645602
Contractor: Paddock Drilling Ltd. **Ground Elevation:** 234.32 m
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** November 24, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)
Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders
Backfill Legend: Bentonite Cement Drill Cuttings Filter Pack Sand Grout Slough

Elevation (m)	Depth (m)	Soil Symbol	Standpipe	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)						
							16	17	18	19	20	21	Test Type					
							Particle Size (%)											
							0	20	40	60	80	100						
							PL MC LL											
							0	20	40	60	80	100	0	50	100	150	200	250
234.0	0.0			ORGANIC CLAY (FILL) - silty, trace sand, trace gravel (<15 mm dia.), trace rootlets, black, moist (frozen from ground surface to 100 mm depth), very stiff, intermediate plasticity	G	G87	●											
	0.5			CLAY (FILL) - silty, trace sand, trace gravel (<20 mm dia.), trace oxidation - mottled brown and grey - moist, stiff - high plasticity - laminated silt and clay (~ 2 mm thick layers)	G	G88	●											
232.9	1.0			SILT - trace sand, some clay, brown, moist, firm, low to intermediate plasticity	G	G89	●											
232.8	1.5			CLAY - silty, trace sand, trace precipitates (<10 mm dia.), trace oxidation - mottled brown and grey - moist, stiff - high plasticity														
	3.0				G	G90	●	—					⊕					
	5.0				T	T91	□	●					⊗	△	⊕			
	6.0			- grey below 5.9 m depth	G	G92	●						⊕					
	6.7			- trace sand inclusions (<20 mm dia.) below 6.7 m depth														
	8.0			- trace gravel inclusions (<25 mm dia.) below 8.2 m depth	T	T93	□	●					⊗	⊕				

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL_GDT 1/8/15

Logged By: Martial Lemoine **Reviewed By:** N.J Ferreira **Project Engineer:** Kent Bannister



Sub-Surface Log

Test Hole TH14-09

2 of 2

Elevation (m)	Depth (m)	Soil Symbol	Standpipe	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)		
							16 17 18 19 20 21	0 20 40 60 80 100			
							Particle Size (%)		Test Type		
							PL	MC	LL	0 50 100 150 200 250	△ Torvane △ ⊕ Pocket Pen. ⊕ ⊗ Qu ⊗ ○ Field Vane ○
				- soft below 9.1 m depth		T94	□	●		⊕⊗	
						G95		●		⊕△	
						G96		●		⊕△	
						G97		●			
220.3	14.0			SILT (TILL) - trace to some clay, trace gravel (<20 mm dia.) - light grey - moist - compact, low plasticity		G98		●			
217.4	16.5					G99		●			

END OF TEST HOLE AT 16.9 m IN SILT TILL.

Notes:

- 1) Power auger refusal at 16.9 m depth.
- 2) No seepage or sloughing.
- 3) Squeezing below 9.1 m depth.
- 4) Standpipe (SP-09) installed in silt till.
- 5) Water level at 8.9 m depth measured on January 7, 2015.
- 6) Test hole backfilled with sand and bentonite.
- 7) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL.GDT 1/8/15

Logged By: Martial Lemoine

Reviewed By: N.J Ferreira

Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-10

1 of 1

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5528410, E-645942
 Contractor: Paddock Drilling Ltd. Ground Elevation: 235.06 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 25, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)	
						16 17 18 19 20 21	Test Type		
						Particle Size (%)		Test Type	
						0 20 40 60 80 100	△ Torvane △	✦ Pocket Pen. ✦	
						PL MC LL	⊠ Qu ⊠	○ Field Vane ○	
						0 20 40 60 80 100	0 50 100 150 200 250		
235.0			SAND AND GRAVEL (FILL) - brown, moist, compact		G130	●			
234.5	0.5		ORGANIC CLAY (FILL) - silty, trace sand - black, moist (frozen from ground surface to 100 mm depth), hard, intermediate plasticity		G131	●			
233.5	1.0		CLAY - silty - dark grey - moist, stiff - high plasticity		G132	●	— —		
233.1	1.5		SILT - trace clay - brown - moist, soft, no to low plasticity		G133	●			
	2.0		CLAY - silty, trace sand, trace silt inclusions (<25 mm dia.) - mottled brown and grey - moist, firm to stiff - high plasticity		G134	●		✦	
	3.0				G135	●		✦	
	4.5				G136	●		✦ △	
	5.5		- grey and trace precipitates (<10 mm dia.) below 5.5 m depth		G137	●		✦	

END OF TEST HOLE AT 7.6 m IN CLAY.

- Notes:
- 1) No seepage or sloughing.
 - 2) Squeezing below 4.9 m depth.
 - 3) Test hole backfilled with auger cuttings.
 - 4) Test hole drilled in the shoulder of the road.

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-11

1 of 1

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5529633, E-644080
 Contractor: Paddock Drilling Ltd. Ground Elevation: 233.46 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 25, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)
 Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)									
						16	17										
						Particle Size (%)		Test Type									
						0	20		△ Torvane △ ⊕ Pocket Pen. ⊕ ⊠ Qu ⊠ ○ Field Vane ○								
						PL MC LL											
						0	20	40	60	80	100	0	50	100	150	200	250
233.1	0.5		ORGANIC CLAY (FILL) - silty, trace sand, trace gravel (<25 mm dia.), trace rootlets, dark grey to black, moist (frozen from ground surface to 100 mm depth), very stiff, intermediate plasticity	▲	G115	●											
	1.0		CLAY - silty, trace organics (woody), trace oxidation - dark grey - moist, stiff - high plasticity	▲	G116	●											
231.9	1.5		SILT - some clay, trace gravel (<20 mm dia.) - brown - moist, firm, intermediate plasticity	▲	G117	●							△	⊕			
231.5	2.0		CLAY - silty, trace sand, trace silt inclusions (<10 mm dia.), trace oxidation - mottled brown and grey - moist, firm - high plasticity	▲	G118	●											
	3.0			▲	G119	●								⊕			
	4.5			▲	G120	●								⊕			
	6.0		- soft and grey below 6.1 m depth	▲	G121	●								⊕			
	7.0		- trace gravel (<15 mm dia.) below 7.0 m depth	▲	G122	●								⊕	△		

END OF TEST HOLE AT 7.6 m IN CLAY.
 Notes:
 1) No seepage or sloughing.
 2) Squeezing below 6.0 m depth.
 3) Test hole backfilled with auger cuttings.
 4) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL_GDT 1/8/15

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister

Client: CH2M Hill Canada Limited **Project Number:** 0068 005 00
Project Name: Transcona Sewer Relief Project **Location:** UTM N-5530084, E-644800
Contractor: Paddock Drilling Ltd. **Ground Elevation:** 234.29 m
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** November 25, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)
Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders
Backfill Legend: Bentonite Cement Drill Cuttings Filter Pack Sand Grout Slough

Elevation (m)	Depth (m)	Soil Symbol	Standpipe	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)
							16	17	18	19	20	
232.8	0.0			CLAY (FILL) - silty, trace sand - mottled brown and grey - moist, very stiff - high plasticity	G145							
	0.5				G146							
	1.0				G147							
	1.5			- silt layer (~ 25 mm thick) at 1.5 m depth								
	2.0			CLAY - silty, trace sand, trace silt inclusions (<10 mm dia.), trace precipitates (<10 mm dia.), trace oxidation - mottled brown and grey - moist, firm to stiff - high plasticity	G148						102	
	2.5											
	3.0											
	3.5											
	4.0											
	4.5											
	5.0				T149							
	5.5			- trace gravel inclusions (<20 mm dia.) below 5.5 m depth								
	6.0			- grey below 5.8 m depth	G150							
	6.5											
	7.0											
	7.5											
	8.0				T151							
	8.5			- soft below 8.2 m depth								

SUB-SURFACE LOG LOGS 2014-11-07-0 A ML 0068-005-00.GPJ TREK GEOTECHNICAL.GDT 1/8/15

Logged By: Martial Lemoine **Reviewed By:** N.J Ferreira **Project Engineer:** Kent Bannister



Sub-Surface Log

Test Hole TH14-12

2 of 2

Elevation (m)	Depth (m)	Soil Symbol	Standpipe	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)									
							16	17										
							Particle Size (%)		Test Type									
							0	20	40	60	80	100	△ Torvane △ ⊕ Pocket Pen. ⊕ ⊠ Qu ⊠ ○ Field Vane ○					
							PL	MC	LL									
							0	20	40	60	80	100	0	50	100	150	200	250
222.6	9.5			- trace till inclusions (<25 mm dia.) and wet below 10.5 m depth		G152												⊕△
	11.0					T153												⊕△
221.8	12.0			SILT (TILL) - some clay, trace sand, trace gravel (<20 mm dia.) - light grey - moist, soft - low to intermediate plasticity		G154												
						G155												

END OF TEST HOLE AT 12.5 m IN SILT TILL.

Notes:

- 1) Power auger refusal at 12.5 m depth.
- 2) No seepage or sloughing.
- 3) Squeezing below 8.2 m depth.
- 4) Standpipe (SP-12) installed in silt till.
- 5) Water level at 9.0 m depth measured on January 7, 2015.
- 6) Test hole backfilled with sand and bentonite.
- 7) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL.GDT 1/8/15

Logged By: Martial Lemoine

Reviewed By: N.J Ferreira

Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-13

1 of 1

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5529718, E-644418
 Contractor: Paddock Drilling Ltd. Ground Elevation: 233.48 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 25, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)						
						16	17	18	19	20	21	Test Type					
						Particle Size (%)											
						0	20	40	60	80	100						
						PL MC LL											
						0	20	40	60	80	100	0	50	100	150	200	250
233.3	0.0		ORGANIC CLAY (FILL) - silty, trace sand, trace gravel (<25 mm dia.), trace rootlets, dark grey to black, moist (frozen from ground surface to 100 mm depth), very stiff, intermediate plasticity		G123												
	0.5		CLAY (FILL) - silty, trace organics (woody), trace oxidation - dark grey - moist, stiff - high plasticity		G124												
232.0	1.5		- silt layer (~ 50 mm thick) 1.4 m depth														
	2.0		CLAY - silty, trace sand, trace silt inclusions (<10 mm dia.), trace precipitates (<10 mm dia.), trace oxidation - mottled brown and grey - moist, firm to stiff - high plasticity		G125												
	3.0				G126												
	4.5				G127												
	6.0				G128												
	7.5		- grey below 7.0 m depth		G129												

END OF TEST HOLE AT 7.6 m IN CLAY.
 Notes:
 1) No seepage or sloughing.
 2) Test hole backfilled with auger cuttings.
 3) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL_GDT 1/8/15

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-14

1 of 1

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5529687, E-645096
 Contractor: Paddock Drilling Ltd. Ground Elevation: 234.12 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 25, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
						16 17 18 19 20 21	0 20 40 60 80 100	
234.0	0.0		ORGANIC CLAY (FILL) - silty, trace rootlets, black, moist, hard (frozen from ground surface to 100 mm depth), intermediate plasticity					
	0.5		CLAY (FILL) - silty, trace rootlets, trace oxidation - dark grey - moist, stiff - high plasticity	G	G138			
233.1	1.0		CLAY (FILL) - silty, trace rootlets, trace oxidation - dark grey - moist, stiff - high plasticity	G	G139			
232.7	1.5		CLAY - silty, trace sand - mottled grey and brown, moist, stiff, high plasticity	G	G140			
232.3	2.0		SILT - trace clay - brown, moist, firm, low plasticity	G	G141			
	2.5		CLAY - silty, trace sand, trace silt inclusions (<20 mm dia.), trace oxidation - mottled brown and grey - moist, firm - high plasticity					
	3.0			G	G141			
	3.5							
	4.0							
	4.5			G	G142			
	5.0							
	5.5							
	6.0			G	G143			
	6.5							
	7.0							
226.5	7.5			G	G144			

END OF TEST HOLE AT 7.6 m IN CLAY.
 Notes:
 1) No seepage or sloughing.
 2) Squeezing below 6.0 m depth.
 3) Test hole backfilled with auger cuttings.
 4) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0 A_ML_0068-005-00.GPJ TREK GEOTECHNICAL.GDT 11/8/15

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-15

1 of 1

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5528830, E-642783
 Contractor: Paddock Drilling Ltd. Ground Elevation: 232.62 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 21, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)
 Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)						
						16	17	18	19	20		21					
						Particle Size (%)					Test Type <input type="checkbox"/> Torvane <input type="checkbox"/> <input checked="" type="checkbox"/> Pocket Pen. <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Qu <input checked="" type="checkbox"/> <input type="checkbox"/> Field Vane <input type="checkbox"/>						
						0	20	40	60	80		100					
						PL MC LL											
						0	20	40	60	80	100	0	50	100	150	200	250
231.9	0.5		CLAY (FILL) - silty, trace to some sand, some gravel (<20 mm dia.) - brown and grey - moist, very stiff (frozen from ground surface to 100 mm depth) - intermediate plasticity, friable	<input checked="" type="checkbox"/>	G43												
	1.0		CLAY - silty, trace sand, trace oxidation - mottled brown and grey - moist, firm to stiff - high plasticity	<input checked="" type="checkbox"/>	G44												
	1.5			<input checked="" type="checkbox"/>	G45												
	3.0			<input checked="" type="checkbox"/>	G46												
	4.5			<input checked="" type="checkbox"/>	G47												
	6.0			<input checked="" type="checkbox"/>	G48												
	7.5			<input checked="" type="checkbox"/>	G49												

END OF TEST HOLE AT 7.6 m IN CLAY.
 Notes:
 1) No seepage or sloughing.
 2) Squeezing below 3.0 m depth.
 3) Test hole backfilled with auger cuttings.
 4) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL_GDT 1/8/15

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-16

1 of 1

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5528758, E-643258
 Contractor: Paddock Drilling Ltd. Ground Elevation: 232.73 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 21, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
						16 17 18 19 20 21	0 20 40 60 80 100	
232.0	0.5		ORGANIC CLAY (FILL) - silty, trace sand, trace gravel (<20 mm dia.), trace organics (rootlets and wood) - grey to black - moist, very stiff (frozen from ground surface to 100 mm depth) - intermediate to high plasticity	G50				
	1.0		CLAY - silty, trace sand, trace precipitates (<10 mm dia.), trace oxidation - mottled brown and grey - moist, stiff to very stiff - high plasticity	G51				
	1.5			G52				△ ⊕
	3.0			G53				△ ⊕
	4.5		- trace silt inclusions (<20 mm dia.) below 3.7 m	G54				△ ⊕
	6.0			G55				⊕
	6.5		- firm and trace gravel (<20 mm dia.) below 5.8 m					
225.1	7.5			G56				⊕

END OF TEST HOLE AT 7.6 m IN CLAY.

- Notes:
- No seepage or sloughing.
 - Squeezing below 6.0 m depth.
 - Test hole backfilled with auger cuttings.
 - Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL_GDT 1/8/15

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister



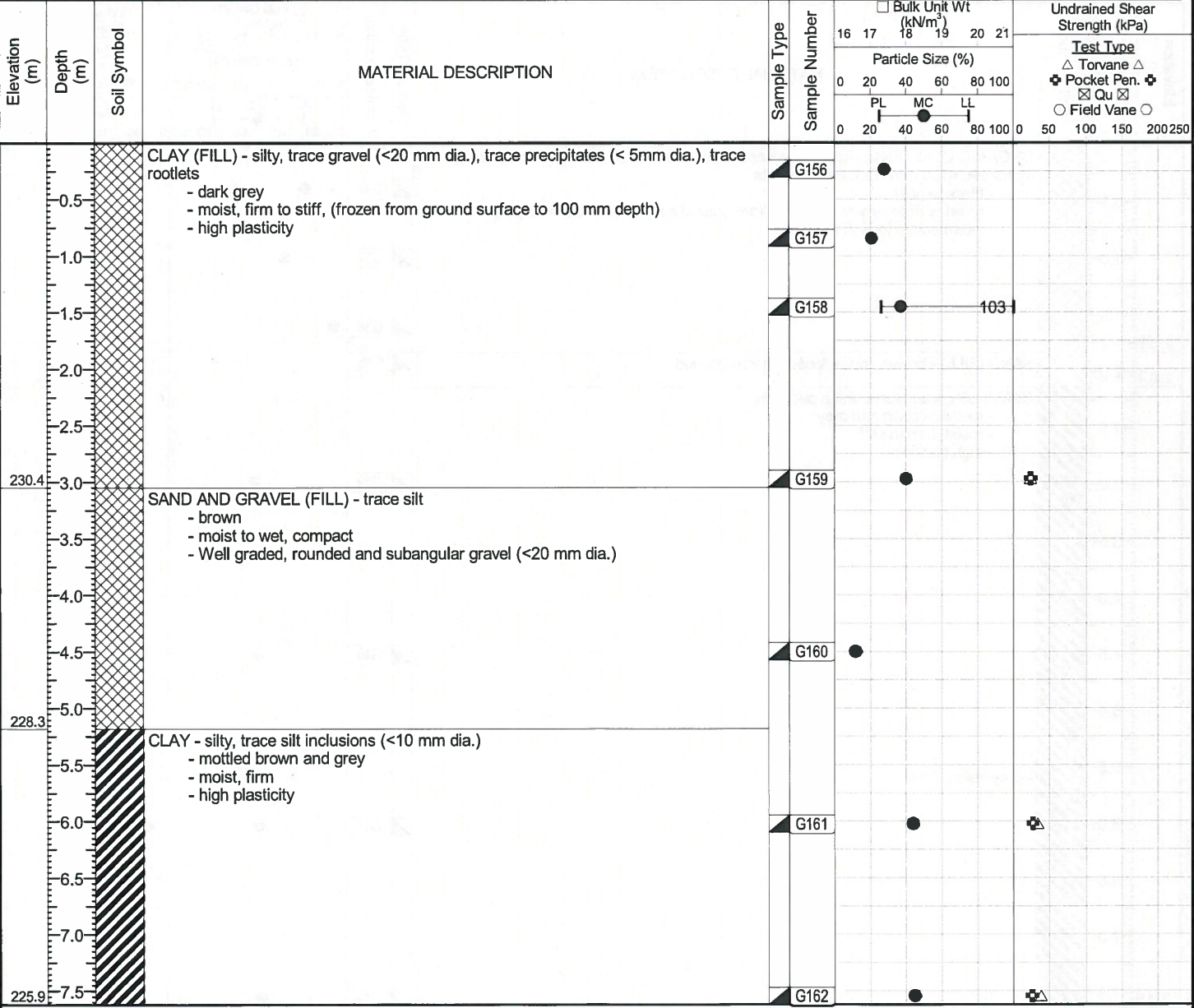
Sub-Surface Log

Test Hole TH14-17

1 of 1

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5530080, E-644414
 Contractor: Paddock Drilling Ltd. Ground Elevation: 233.49 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 25, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)
 Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders



Notes:
 1) Sloughing below 3.0 m depth (sand and gravel layer).
 2) No seepage observed.
 3) Test hole backfilled with auger cuttings.
 4) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL.GDT 1/8/15

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-18

1 of 1

Client: CH2M Hill Canada Limited Project Number: 0068 005 00
 Project Name: Transcona Sewer Relief Project Location: UTM N-5529051, E-642764
 Contractor: Paddock Drilling Ltd. Ground Elevation: 232.50 m
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: November 20, 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
						16 17 18 19 20 21	Test Type	
						Particle Size (%)		
						0 20 40 60 80 100	PL MC LL	<input type="checkbox"/> Torvane <input type="checkbox"/> <input checked="" type="checkbox"/> Pocket Pen. <input checked="" type="checkbox"/> <input type="checkbox"/> Field Vane <input type="checkbox"/>
						0 20 40 60 80 100	0 50 100 150 200 250	
230.7	0.5		ORGANIC CLAY (FILL) - silty, trace sand, trace gravel (<20 mm dia.), trace debris (concrete, <100 mm dia.), trace rootlets - black to grey - moist, stiff to very stiff (frozen from ground surface to 100 mm depth) - intermediate to high plasticity		G36	●		
	1.0				G37	●		
	1.5				G38	●		
230.4	2.0		SAND (FILL) - brown, moist, loose, coarse grained		G38			
	2.5		CLAY - silty, trace sand, trace oxidation - mottled brown and grey - moist, firm to stiff - high plasticity					
	3.0				G39	●		<input checked="" type="checkbox"/>
	4.5				G40	●		<input checked="" type="checkbox"/>
	5.5		- grey below 5.5 m					
	6.0				G41	●		<input checked="" type="checkbox"/>
224.9	7.5		END OF TEST HOLE AT 7.6 m IN CLAY.		G42	●		<input checked="" type="checkbox"/>

Notes:
 1) No seepage or sloughing.
 2) Squeezing below 2.1 m
 3) Test hole backfilled with auger cuttings.
 4) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0 A_ML_0068-005-00.GPJ TREK GEOTECHNICAL_GDT 1/8/15

Logged By: Martial Lemoine Reviewed By: N.J Ferreira Project Engineer: Kent Bannister



Sub-Surface Log

Test Hole TH14-19

1 of 1

Client: CH2M Hill Canada Limited	Project Number: 0068 005 00
Project Name: Transcona Sewer Relief Project	Location: UTM N-5529048, E-642640
Contractor: Paddock Drilling Ltd.	Ground Elevation: 233.17 m
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount	Date Drilled: November 20, 2014

Sample Type:	<input checked="" type="checkbox"/> Grab (G)	<input type="checkbox"/> Shelby Tube (T)	<input type="checkbox"/> Split Spoon (SS)	<input type="checkbox"/> Split Barrel (SB)	<input type="checkbox"/> Core (C)
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Particle Size Legend:	Fines	Clay	Silt	Sand	Gravel	Cobbles	Boulders
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Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)						
						16	17	18	19	20	21	Test Type					
						Particle Size (%)											
						0	20	40	60	80	100						
						PL MC LL											
						0	20	40	60	80	100	0	50	100	150	200	250
232.6	0.5		ORGANIC CLAY (FILL) - silty, trace sand, trace gravel (<20 mm dia.), trace rootlets, black, moist (frozen from ground surface to 100 mm depth), very stiff, intermediate plasticity	G28													
232.0	1.0		CLAY - silty, trace precipitates (sulphates, <15 mm dia.), trace oxidation - mottled brown and grey - moist, very stiff, high plasticity	G29													
231.6	1.5		SILT - trace sand - brown, moist, compact, no plasticity	G30													
	2.0		CLAY - silty, trace sand, trace precipitates (<10 mm dia.), trace oxidation - mottled brown and grey - moist, firm to stiff - high plasticity	G31													
	3.0			G32													
	4.5			G33													
	6.0		- grey below 5.8 m	G34													
	7.5			G35													

END OF TEST HOLE AT 7.6 m IN CLAY.
Notes:
1) Sloughing at 1.2 m depth (silt layer).
2) No seepage observed.
3) Test hole backfilled with auger cuttings.
4) Test hole drilled in boulevard near the road.

SUB-SURFACE LOG LOGS 2014-11-07-0_A_ML_0068-005-00.GPJ TREK GEOTECHNICAL_GDT 1/8/15