

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)	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 #10 to #4 #40 to #10 #200 to #40 < #200	Sand Coarse Medium Fine Silt or Clay			
		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 2.00 to 4.75 0.425 to 2.00 0.075 to 0.425 < 0.075	Sand Coarse Medium Fine Silt or Clay		
			SP		Poorly-graded sands, gravelly sands, little or no fines					
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures				Atterberg limits below "A" line or P.I. less than 4 Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols	
			SC		Clayey sands, sand-clay mixtures					Atterberg limits above "A" line or P.I. greater than 7 Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
					Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: 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*					
Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)	Silts 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	Plasticity Chart 	mm > 300 75 to 300 19 to 75 4.75 to 19	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						
	Silts 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 Incliner	

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

Client: City of Winnipeg - Public Works **Project Number:** 0015 008 00
Project Name: Lyndale Drive Retaining Wall Assessment **Location:** UTM N-5526079.846, E-634790.178
Contractor: Maple Leaf Drilling **Ground Elevation:** 231.23 m
Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount **Date Drilled:** 6 May 2013 - 6 May 2013

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	Slope Inclinerometer	VW Piezo	VW Piezo	MATERIAL DESCRIPTION	Sample Type	Sample Number	RQD (%)	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)
											16	17	
231.1	0.0					GRAVEL - trace sand, well graded - damp, compact		G01					
230.5	0.5					CLAY (Fill) - silty - black, moist, stiff, high plasticity - trace organics, trace rootlets							
229.7	1.0					CLAY - silty, stratified - dark brown, moist, firm to stiff, high plasticity - trace sand, trace to some light grey silt inclusions 1-25mm dia.		G02					△
229.1	1.5					SILT - tan, moist, soft, non-plastic		G03					
	2.0					CLAY - silty - brown, moist, firm to stiff, high plasticity - trace oxidations, trace silt inclusions							
	2.5												
	3.0					- light brown below 3.0 m		G04					△
	3.5												
	4.0												
	4.5												
	5.0					- firm below 4.6 m		G06					△
	5.5												
	6.0												
	6.5					- slickensided surface (52 degrees from horizontal) at 6.5 m		T08					△
	7.0												
	7.5												
	8.0					- trace coarse gravel particle (20 mm diameter), trace oxidations at 7.6 m - trace tan silt inclusions below 7.6 m		T10					△
	8.5					- grey below 8.7 m							

SUB-SURFACE LOG 0015 008 00 LYNDALE DRIVE LOGS.GPJ TREK GEOTECHNICAL_GDT_2008/13

Logged By: Michael Van Helden **Reviewed By:** Ken Skafffeld **Project Engineer:** Ken Skafffeld



Sub-Surface Log

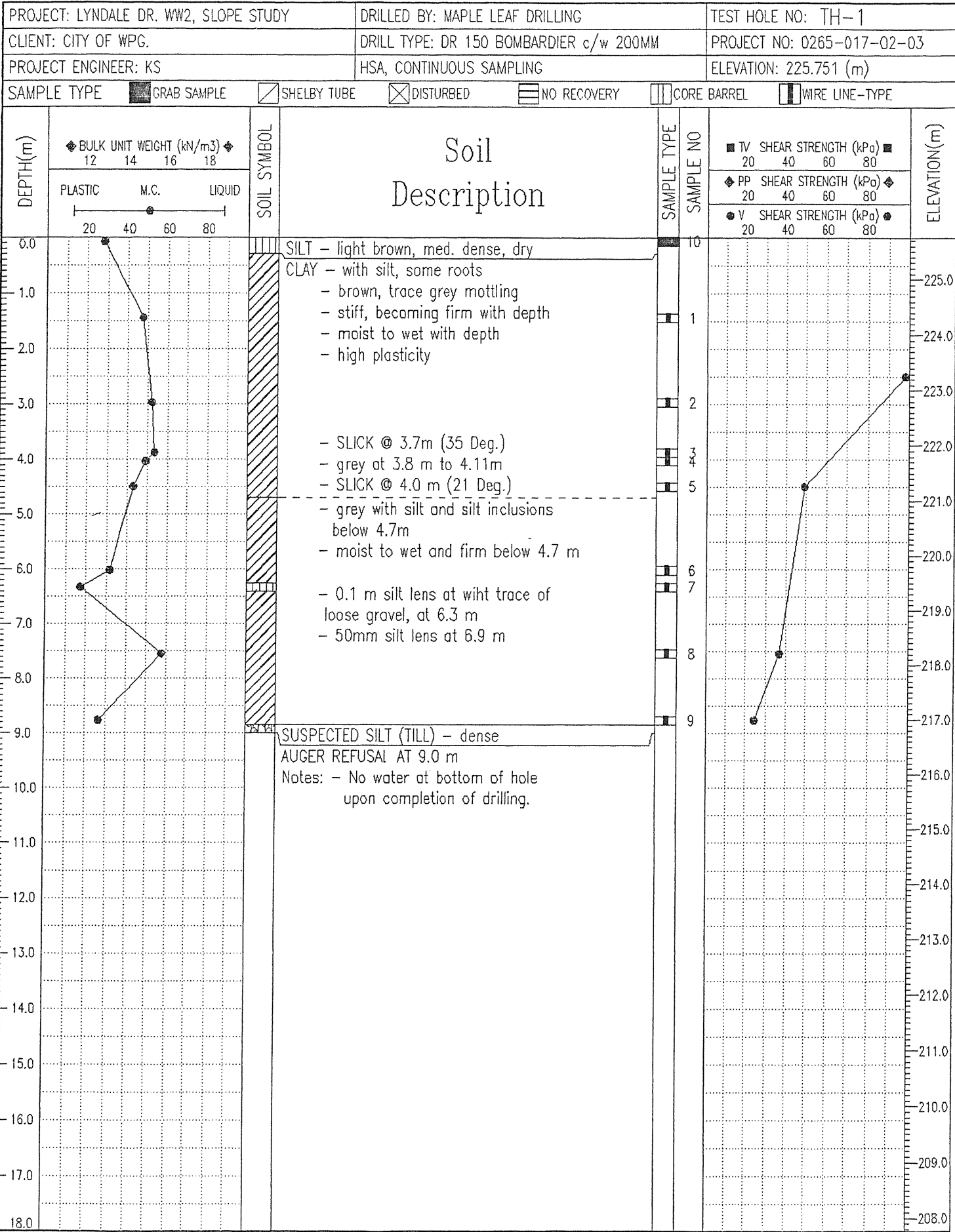
Test Hole TH13-01 R1

2 of 2

Elevation (m)	Depth (m)	Soil Symbol	Slope Inclinator	VW Piezo	VW Piezo	MATERIAL DESCRIPTION	Sample Type	Sample Number	ROD (%)	SPT (N)	Bulk Unit Wt (kN/m ³)		Undrained Shear Strength (kPa)	
											18	19	20	21
						- trace white precipitates below 9.1 m		G11						
	9.5					- soft below 9.8 m		T12						
	10.0													
	10.5							G13						
	11.0							T14						
	11.5													
	12.0							G15						
	12.5							T16						
	13.0					- trace coarse gravel 20 mm diameter at 12.8 m								
	13.5					- very soft below 13.4 m		G17						
	14.0													
	14.5													
	15.0							G18						
	15.5					SILT (TILL) - trace sand, tan, moist, compact								
	16.0					- wet, trace sand, trace to some gravel below 15.8 m								
	16.5					- moist, dense, trace gravel below 16.1 m								
	17.0					- very dense below 16.7 m		G19						

END OF HOLE AT 17.1 m IN TILL
 Notes:
 1) Power auger refusal (PAR) at 17.1 m
 2) Seepage observed below 15.8 m
 3) No sloughing observed.
 4) Water level at 16.8 m upon completion of drilling.
 5) Vibrating wire piezometers VW-1A and VW-1B installed in test hole.
 6) Slope inclinometer SI-1 installed in test hole.

SUB-SURFACE LOG 00115 008 00 LYNDALE DRIVE LOGS.GPJ TREK GEOTECHNICAL.GDT 20/08/13

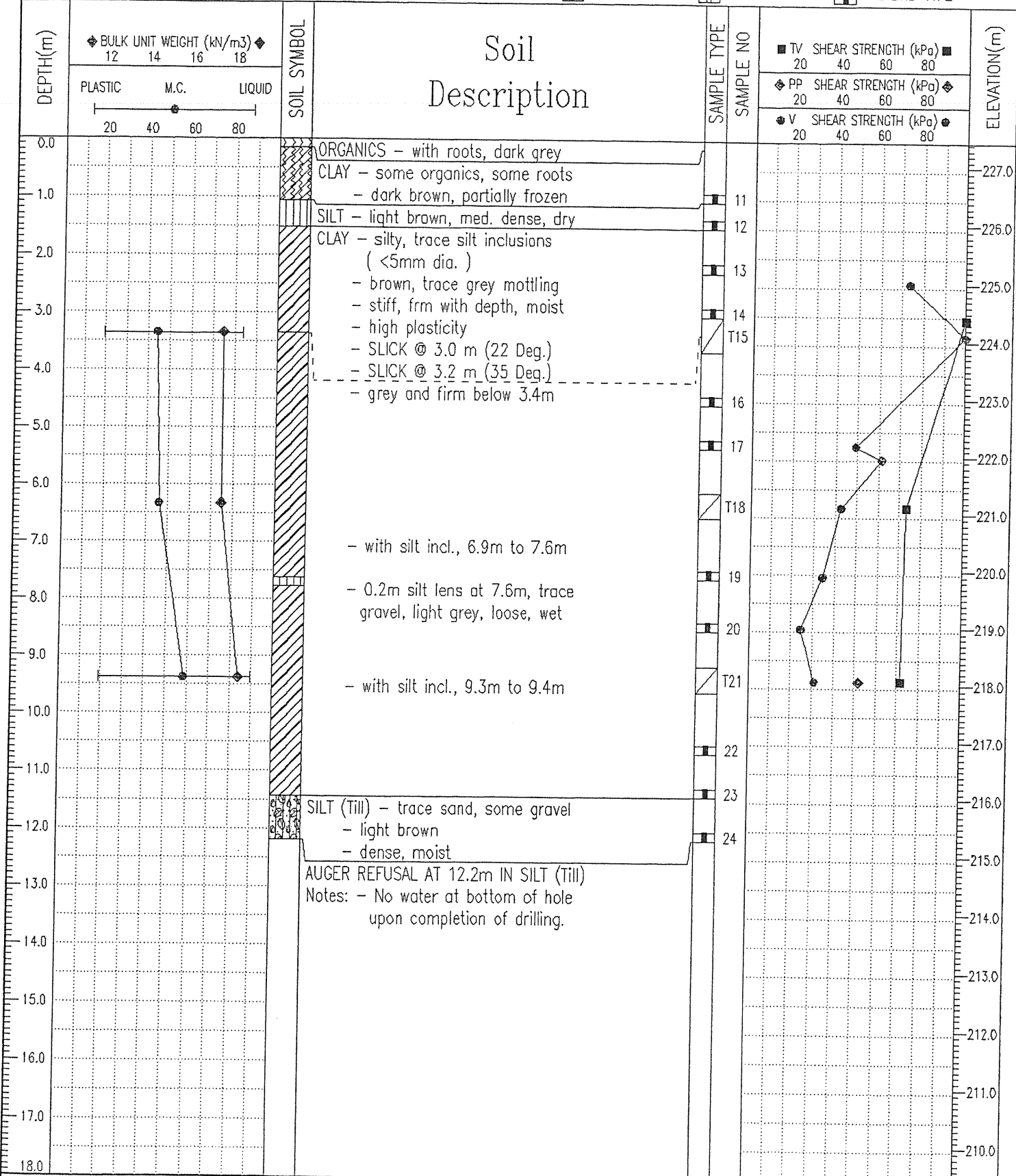


UMA Engineering Ltd.
Winnipeg, Manitoba

LOGGED BY: MM
REVIEWED BY: KS
Fig. No:

COMPLETION DEPTH: 9.0 m
COMPLETE: 98/03/02

PROJECT: LYNDALE DR. WW2, SLOPE STUDY	DRILLED BY: MAPLE LEAF DRILLING	TEST HOLE NO: TH-2
CLIENT: CITY OF WPG.	DRILL TYPE: DR 150 BOMBARDIER c/w 200MM	PROJECT NO: 0265-017-02-03
PROJECT ENGINEER: KS	HSA, CONTINUOUS SAMPLING	ELEVATION: 227.435 (m)
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB SAMPLE	<input type="checkbox"/> SHELBY TUBE
	<input type="checkbox"/> DISTURBED	<input type="checkbox"/> NO RECOVERY
	<input type="checkbox"/> CORE BARREL	<input type="checkbox"/> WIRE LINE-TYPE



UMA Engineering Ltd.
Winnipeg, Manitoba

LOGGED BY: MM
REVIEWED BY: KS
Fig. No:

COMPLETION DEPTH: 12.2 m
COMPLETE: 98/03/02