

## EXPLANATION OF TERMS USED IN REPORT

**N VALUE:** THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D. SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS  $\bar{N}$ .

**DYNAMIC CONE PENETRATION TEST:** CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

**COMPOSITION:** SECONDARY SOIL COMPONENTS ARE DESCRIBED ON THE BASIS OF PERCENTAGE BY MASS OF THE WHOLE SAMPLE AS FOLLOWS:

PERCENT BY MASS	0 - 10	10 - 20	20 - 30	30 - 40	> 40
	TRACE	SOME	WITH	ADJECTIVE (SILTY)	AND (AND SILT)

**CONSISTENCY:** COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH ( $c_u$ ) AS FOLLOWS:

$c_u$ (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

**DENSENESS:** COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND / OR STRENGTH.

**RECOVERY:** SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

**MODIFIED RECOVERY:** SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (R Q D), FOR MODIFIED RECOVERY, IS:

R Q D (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

**JOINTING AND BEDDING:**

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	> 3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

## ABBREVIATIONS AND SYMBOLS

### FIELD SAMPLING

S S SPLIT SPOON	T P THINWALL PISTON
W S WASH SAMPLE	O S OSTERBERG SAMPLE
S T SLOTTED TUBE SAMPLE	R C ROCK CORE
B S BLOCK SAMPLE	P H T W ADVANCED HYDRAULICALLY
C S CHUNK SAMPLE	P M T W ADVANCED MANUALLY
T W THINWALL OPEN	F S FOIL SAMPLE
F V FIELD VANE	

### STRESS AND STRAIN

$u_w$	kPa	PORE WATER PRESSURE
$u$	1	PORE PRESSURE RATIO
$\sigma$	kPa	TOTAL NORMAL STRESS
$\sigma'$	kPa	EFFECTIVE NORMAL STRESS
$\tau$	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
$\epsilon$	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
$\mu$	1	COEFFICIENT OF FRICTION

### MECHANICAL PROPERTIES OF SOIL

$m_v$	kPa <sup>-1</sup>	COEFFICIENT OF VOLUME CHANGE
$C_c$	1	COMPRESSION INDEX
$C_s$	1	SWELLING INDEX
$C_\alpha$	1	RATE OF SECONDARY CONSOLIDATION
$c_v$	m <sup>2</sup> /s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
$T_v$	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
$\sigma'_{v0}$	kPa	EFFECTIVE OVERBURDEN PRESSURE
$\sigma'_p$	kPa	PRECONSOLIDATION PRESSURE
$\tau_f$	kPa	SHEAR STRENGTH
$c'$	kPa	EFFECTIVE COHESION INTERCEPT
$\phi'$	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
$c_u$	kPa	APPARENT COHESION INTERCEPT
$\phi_u$	-°	APPARENT ANGLE OF INTERNAL FRICTION
$\tau_R$	kPa	RESIDUAL SHEAR STRENGTH
$\tau_r$	kPa	REMOULDED SHEAR STRENGTH
$S_i$	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

### PHYSICAL PROPERTIES OF SOIL

$\rho_s$	kg/m <sup>3</sup>	DENSITY OF SOLID PARTICLES	n	1, %	POROSITY	$e_{max}$	1, %	VOID RATIO IN LOOSEST STATE
$\gamma_s$	kN/m <sup>3</sup>	UNIT WEIGHT OF SOLID PARTICLES	w	1, %	WATER CONTENT	$e_{min}$	1, %	VOID RATIO IN DENSEST STATE
$\rho_w$	kg/m <sup>3</sup>	DENSITY OF WATER	$S_r$	%	DEGREE OF SATURATION	$I_D$	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
$\gamma_w$	kN/m <sup>3</sup>	UNIT WEIGHT OF WATER	$w_L$	%	LIQUID LIMIT	D	mm	GRAIN DIAMETER
$\rho$	kg/m <sup>3</sup>	DENSITY OF SOIL	$w_p$	%	PLASTIC LIMIT	$D_n$	mm	n PERCENT - DIAMETER
$\gamma$	kN/m <sup>3</sup>	UNIT WEIGHT OF SOIL	$w_s$	%	SHRINKAGE LIMIT	$C_u$	1	UNIFORMITY COEFFICIENT
$\rho_d$	kg/m <sup>3</sup>	DENSITY OF DRY SOIL	$I_p$	%	PLASTICITY INDEX = $w_L - w_p$	h	m	HYDRAULIC HEAD OR POTENTIAL
$\gamma_d$	kN/m <sup>3</sup>	UNIT WEIGHT OF DRY SOIL	$I_L$	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	q	m <sup>3</sup> /s	RATE OF DISCHARGE
$\rho_{sat}$	kg/m <sup>3</sup>	DENSITY OF SATURATED SOIL	$I_C$	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	v	m/s	DISCHARGE VELOCITY
$\gamma_{sat}$	kN/m <sup>3</sup>	UNIT WEIGHT OF SATURATED SOIL	DTPL		DRIER THAN PLASTIC LIMIT	i	1	HYDRAULIC GRADIENT
$\rho'$	kg/m <sup>3</sup>	DENSITY OF SUBMERGED SOIL	APL		ABOUT PLASTIC LIMIT	k	m/s	HYDRAULIC CONDUCTIVITY
$\gamma'$	kN/m <sup>3</sup>	UNIT WEIGHT OF SUBMERGED SOIL	WTP		WETTER THAN PLASTIC LIMIT	j	kN/m <sup>3</sup>	SEEPAGE FORCE
e	1, %	VOID RATIO						

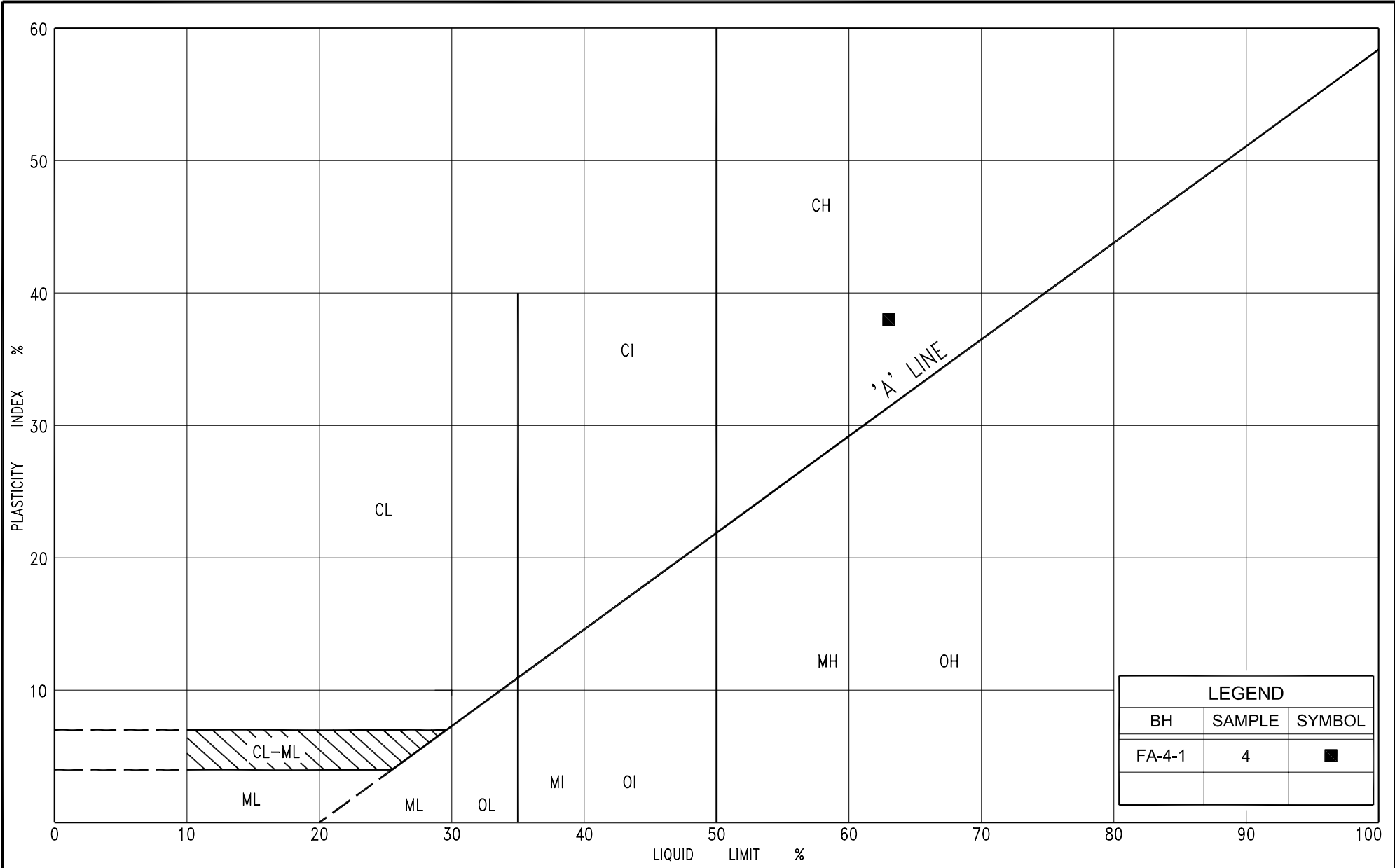
Culvert FA-4 (Site 44-547) at Sta. 12+347 (skewed)  
(Forest Access Road), Mowat Township

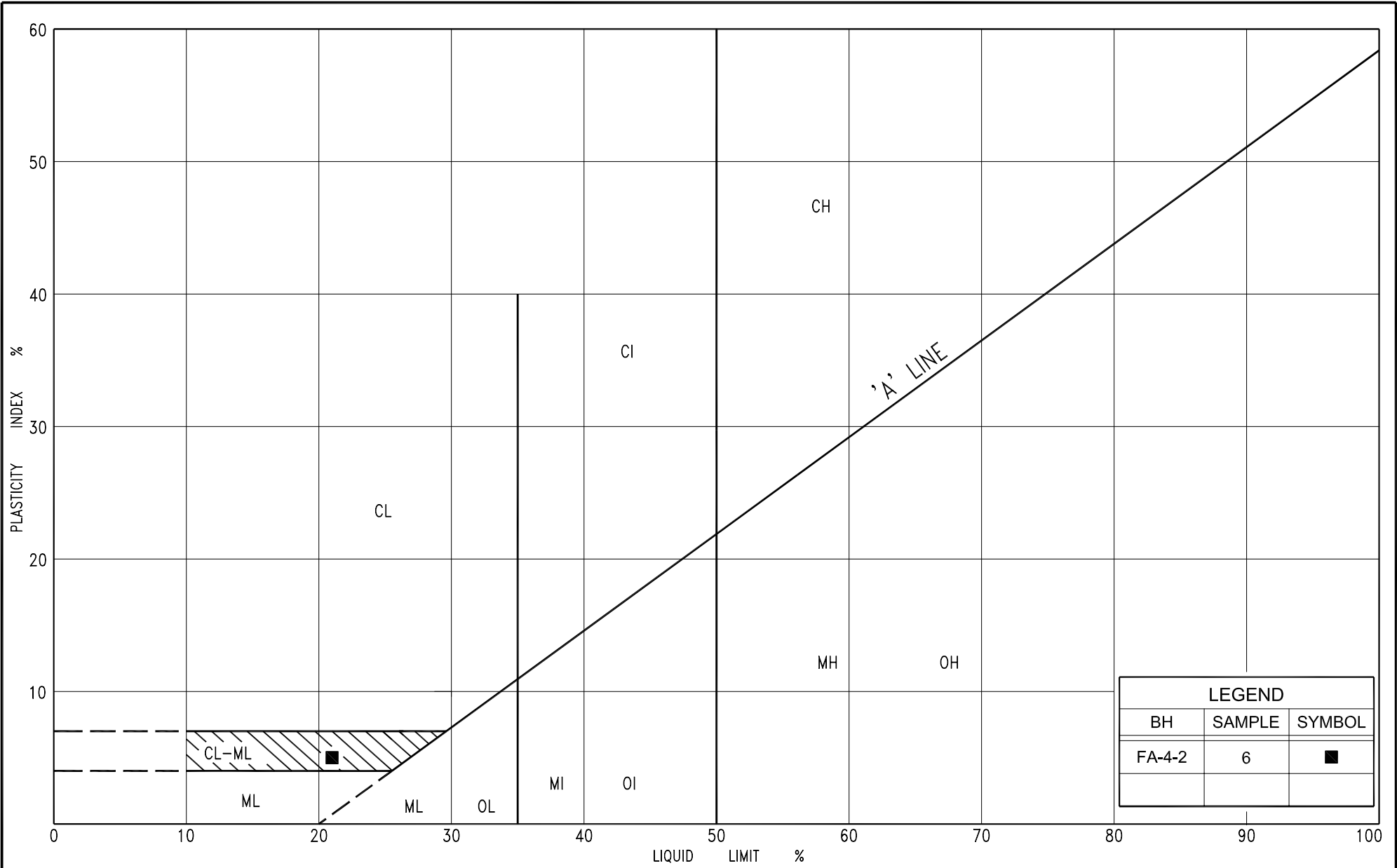
Figures PC-FA-4-1 to PC-FA-4-4 – Plasticity Charts

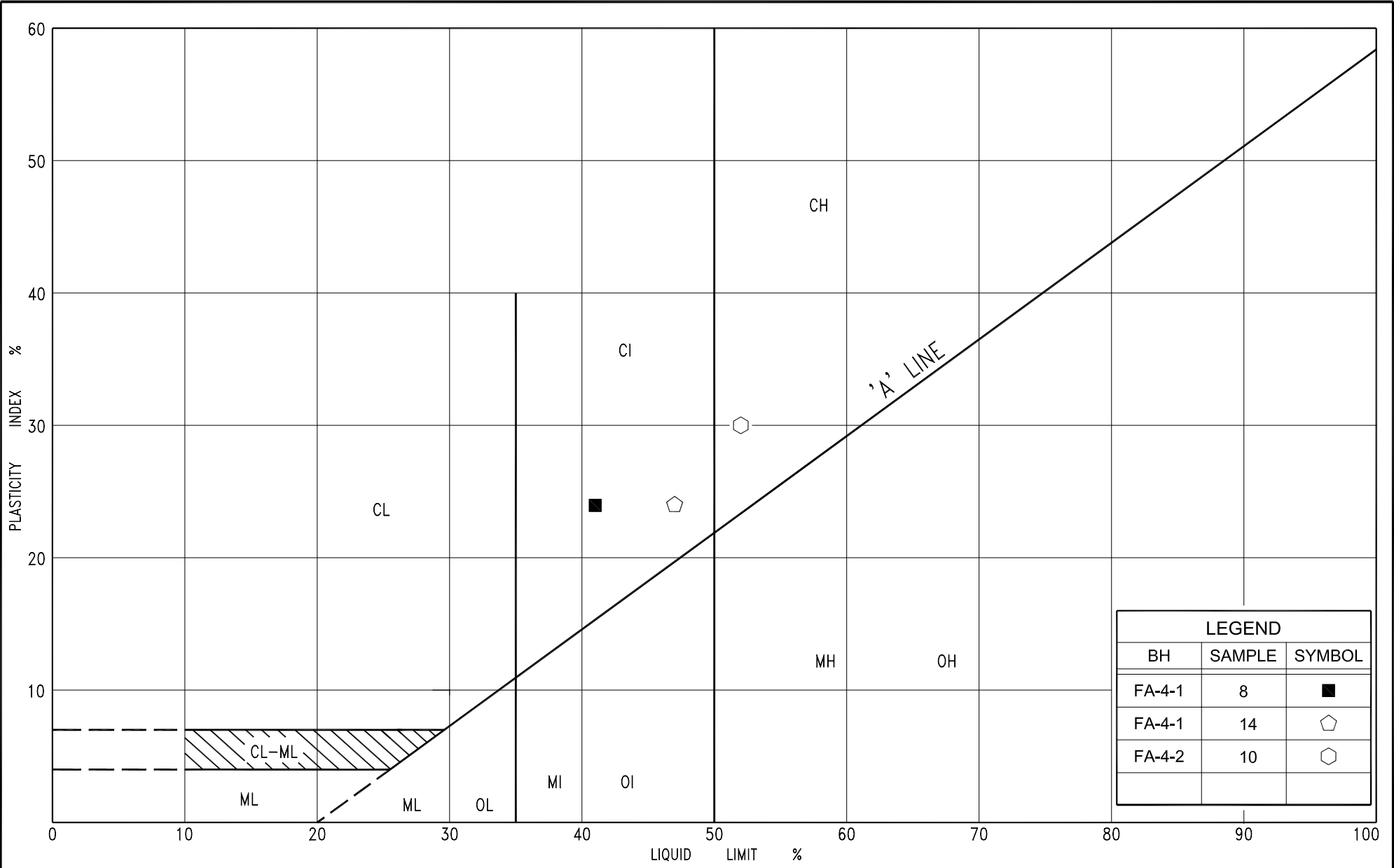
Figures GS-FA-4-1 to GS-FA-4-4 – Grain Size Distribution Charts

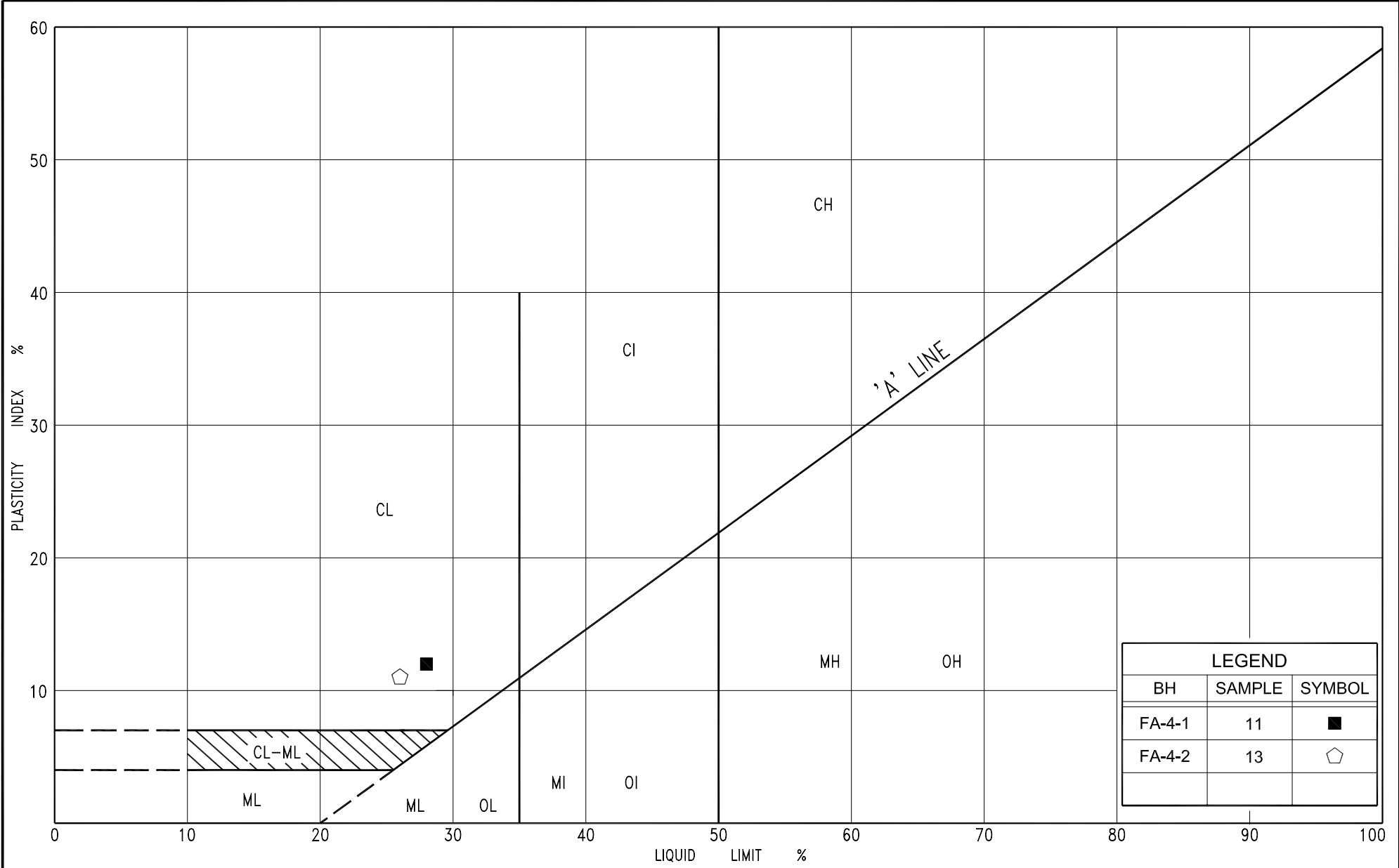
Record of Borehole Sheets

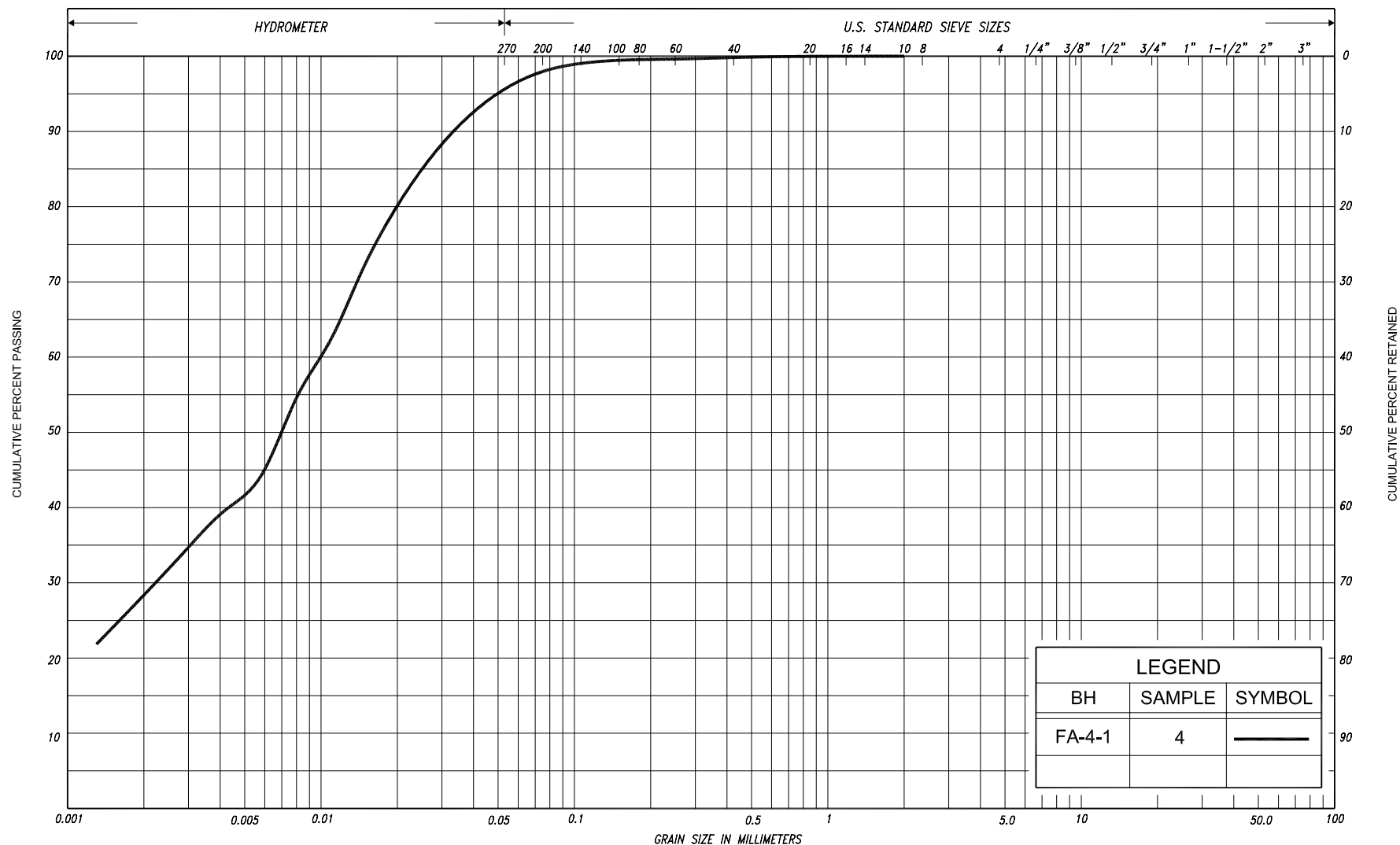
Drawing FA-4-1 – Borehole Locations and Soil Strata



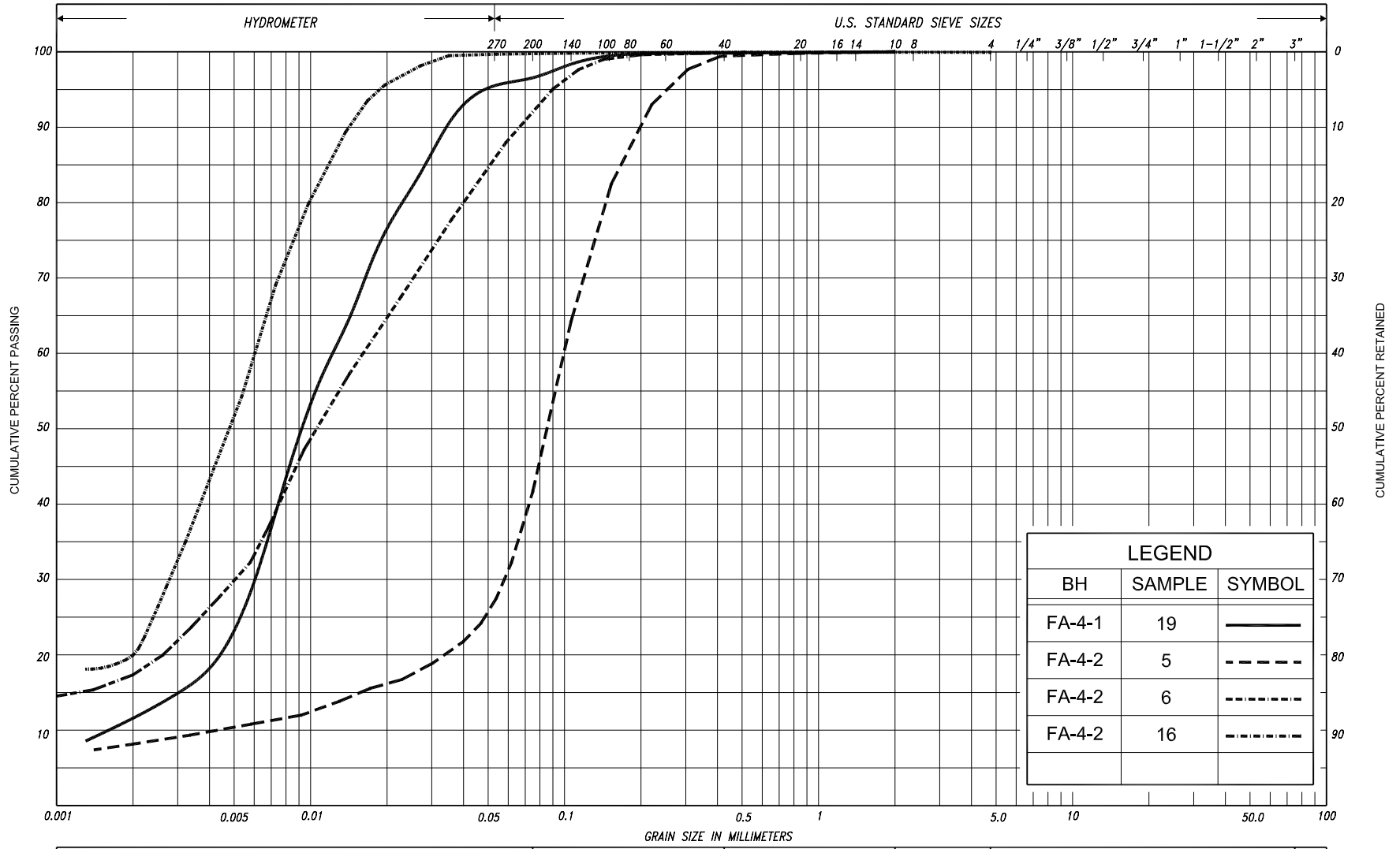






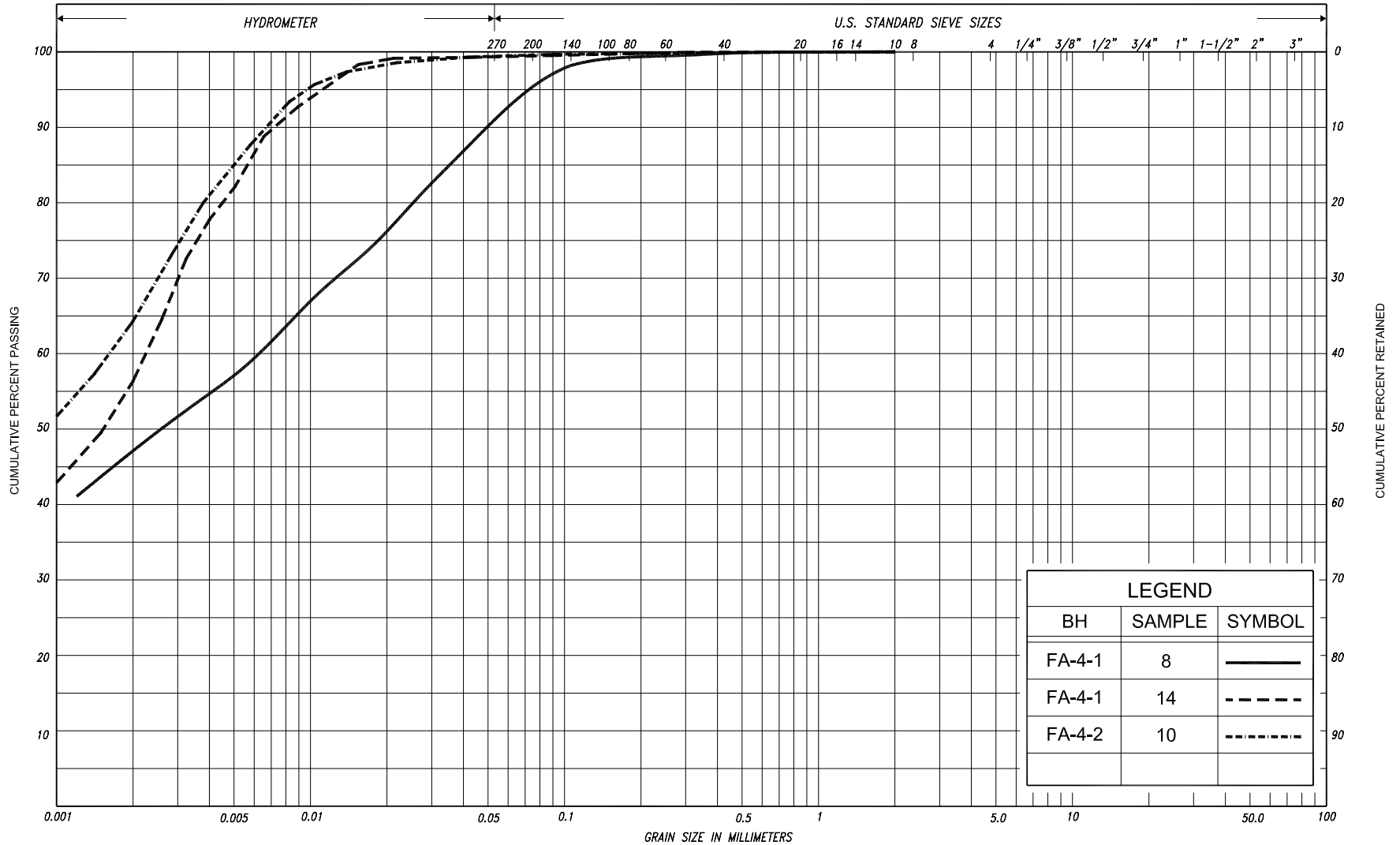


SILT & CLAY					FINE		MEDIUM		COARSE	GRAVEL			COBBLES	UNIFIED		
					SAND											
CLAY	FINE		MEDIUM		COARSE	FINE		MEDIUM		COARSE		GRAVEL			COBBLES	M.I.T.
	SILT						SAND									
CLAY		SILT			V. FINE	FINE	MED.	COARSE		GRAVEL						U.S. BUREAU
					SAND											

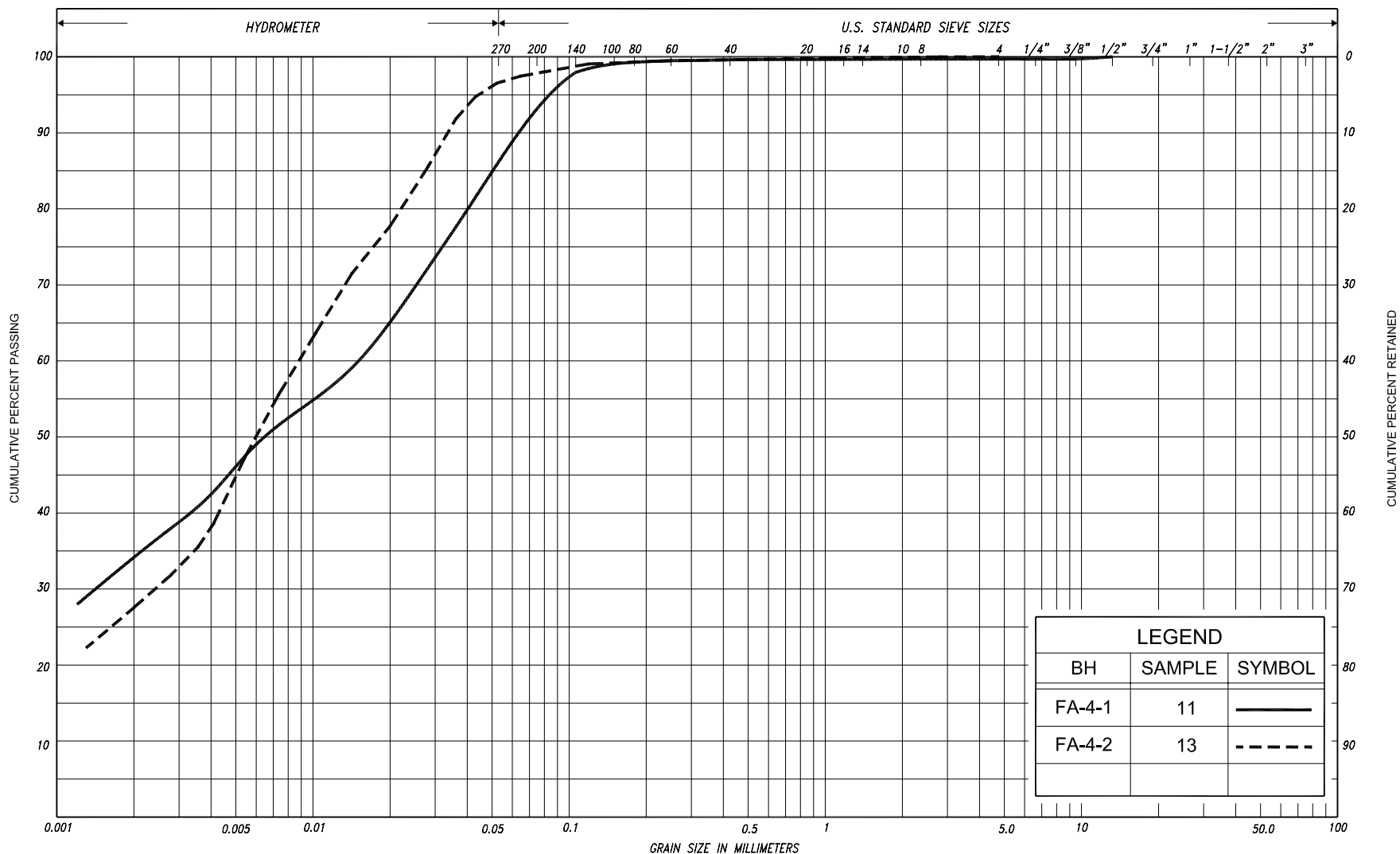


LEGEND		
BH	SAMPLE	SYMBOL
FA-4-1	19	————
FA-4-2	5	-----
FA-4-2	6	- - - - -
FA-4-2	16	- · - · -

SILT & CLAY				FINE		MEDIUM		COARSE		GRAVEL			COBBLES	UNIFIED		
CLAY	FINE		MEDIUM		COARSE		FINE		MEDIUM		COARSE		GRAVEL		COBBLES	M.I.T.
CLAY		SILT			V. FINE		FINE		MED.		COARSE		GRAVEL			U.S. BUREAU



SILT & CLAY				FINE		MEDIUM		COARSE		GRAVEL			COB BLES	UNIFIED		
				SAND												
CLAY	FINE		MEDIUM		COARSE		FINE		MEDIUM		COARSE		GRAVEL		COBBLES	M.I.T.
	SILT						SAND									
CLAY		SILT			V. FINE		FINE		MED.		COARSE		GRAVEL			U.S. BUREAU
					SAND											



SILT & CLAY					FINE		MEDIUM		COARSE		GRAVEL				COB BLES	UNIFIED		
					SAND													
CLAY	FINE		MEDIUM		COARSE		FINE		MEDIUM		COARSE		GRAVEL				COBBLES	M.I.T.
	SILT							SAND										
CLAY		SILT				V. FINE	FINE	MED.	COARSE		GRAVEL						U.S. BUREAU	
					SAND													

**RECORD OF BOREHOLE No FA-4-1**

1 of 3

**METRIC**

G.W.P. 5203-06-00 LOCATION Coords: 5 092 395.4 N; 220 941.8 E  
DIST 54 HWY 69 BOREHOLE TYPE Casing and Washboring  
DATUM Geodetic DATE March 09, 2010

ORIGINATED BY D.W.

COMPILED BY M.N.

CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		SHEAR STRENGTH kPa									
							○ UNCONFINED	● QUICK TRIAXIAL	✚ FIELD VANE	✕ LAB VANE						
186.0	Ground Surface						20	40	60	80	100	WATER CONTENT (%)				
0.0	Ice						20	40	60	80	100	20	40	60		
185.7	Peat, fine fibrous															
0.3	Dark brown		1	SS	WR**											
			2	SS	WR											
			3	SS	WR									813		
182.0	Organic clayey silt															
4.0	trace sand															
	Very soft Dark Wet		4	SS	WR									169	Org.	0 2 70 28
	grey													6.6%		
179.9	Sand		5	SS	WR											
6.1	some silt to silty															
	trace clay															
	Very loose Grey Wet															
178.4	Silty clay, trace sand		6	SS	WH***										96	
7.6	Soft to Grey Wet			FV												
	firm															
			7	SS	WH											
			8	SS	WR											
				FV												
			9	SS	WR											
			10	SS	WR											
				FV												
171.0																

**RECORD OF BOREHOLE No FA-4-1**

2 of 3

**METRIC**

G.W.P. 5203-06-00 LOCATION Coords: 5 092 395.4 N; 220 941.8 E Forest Access Road, Sta. 12+347, o/s 13m Lt. CL Med. ORIGINATED BY D.W.  
DIST 54 HWY 69 BOREHOLE TYPE Casing and Washboring COMPILED BY M.N.  
DATUM Geodetic DATE March 09, 2010 CHECKED BY C.N.

SOIL PROFILE				SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	SHEAR STRENGTH kPa															
						○ UNCONFINED			● QUICK TRIAXIAL	+ FIELD VANE	× LAB VANE	WATER CONTENT (%)									
171.0							20	40	60	80	100							GR	SA	SI	CL
15.0	Clayey silt, trace sand																				
	Firm      Grey      Wet		11	SS	WR													0	7	59	34
			12	SS	WH																
				FV																	
			13	SS	1																
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**METRIC**

G.W.P. <u>5203-06-00</u>		LOCATION <u>Forest Access Road, Sta. 12+347, o/s 13m Lt. CL Med.</u>	COORDS: <u>5 092 395.4 N; 220 941.8 E</u>	ORIGINATED BY <u>D.W.</u>
DIST <u>54</u>	HWY <u>69</u>	BOREHOLE TYPE <u>Casing and Washboring</u>	COMPILED BY <u>M.N.</u>	
DATUM <u>Geodetic</u>		DATE <u>March 09, 2010</u>	CHECKED BY <u>C.N.</u>	

[illegible]

**RECORD OF BOREHOLE No FA-4-2**

1 of 2

**METRIC**

G.W.P. 5203-06-00 LOCATION Coords: 5 092 377.8 N; 220 964.0 E  
DIST 54 HWY 69 BOREHOLE TYPE Casing and Washboring  
DATUM Geodetic DATE March 10, 2010

ORIGINATED BY D.W.

COMPILED BY M.N.

CHECKED BY C.N.

SOIL PROFILE			SAMPLES			*GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
186.3	Ground Surface													
0.0 186.0	Ice													
0.3	Peat, fine fibrous Dark brown													
			1	SS	WR**									
			2	SS	WR									
			3	SS	WR									
182.2	Organic clayey silt trace sand													
4.1	Very soft Dark Wet grey		4	SS	WR								175	
180.2	wood fragments													
6.1	Silty sand, trace clay		5	SS	WR									0 58 34 8
	Very loose Grey Wet													
178.7	Silt some clay, trace sand		6	SS	WR									0 8 75 17
7.6	Very loose Grey Wet													
177.3	Silty clay, trace sand		7	SS	WR									
9.0	Soft to Grey Wet firm			FV										
			8	SS	WR									
			9	SS	WH***									
				FV										
	clay layers		10	SS	WH								88	0 1 34 65
171.3														

Cont'd

**METRIC**

DATUM Geodetic DATE March 10, 2010 CHECKED BY C.N.

$+^7, \times^5$ : Numbers refer to Sensitivity

RECORD OF BOREHOLE No 314-9

1 of 3

METRIC

G.W.P. 5203-06-00 LOCATION Forest Access Road, Sta. 12+325, 12.0m Lt. CL ORIGINATED BY M.R.  
DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Dynamic Cone Penetration Test COMPILED BY N.S.B.  
DATUM Geodetic DATE March 07, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
186.0	Top of Ice					▼*		20	40	60	80	100					
0.0	Ice							20	40	60	80	100					
185.6																	
0.4	Peat, fine fibrous																
	Dark brown		1	SS	WH											591	
																Org.	
																52.4%	
			2	SS	WH												
182.3																	
3.7	Organic clay		3	SS	WH												
	Very soft Dark Wet																
	to firm brown		4	SS	WH												
180.5																	
5.5	Sand																
	trace silt, trace gravel																
	organic inclusions																
	Very loose Grey Wet		5	SS	1												
179.0																	
7.0	Sandy silt, trace clay																
	clayey silt seams																
	Very loose Grey Wet		6	SS	1												
177.3																	
8.7	Silty clay, trace sand																
	Soft to Grey Wet		7	SS	WH												
	firm																
																	</

RECORD OF BOREHOLE No 314-9

2 of 3

METRIC

G.W.P. 5203-06-00 LOCATION Forest Access Road, Sta. 12+325, 12.0m Lt. CL ORIGINATED BY M.R.  
DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Dynamic Cone Penetration Test COMPILED BY N.S.B  
DATUM Geodetic DATE March 07, 2008 CHECKED BY C.N.



SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
171.0								20	40	60	80	100					
15.0	Silty clay, trace sand		11	SS	1												
	Soft to Grey Wet			FV													
169.6							170										
16.4	Clayey silt, trace sand		12	SS	WH												0 2 79 19
	Firm to Grey Wet			FV													
							168										
			13	SS	1												
				FV			167										
							166										
							165										
							164										0 1 72 27
			14	SS	7												
							163										
162.8	Silt						162										
23.2	trace clay, trace sand																
	Very loose Grey Wet																
							161										
161.0	End of borehole		15	SS	1												
25.0	Probable silt																
	Very loose to compact																
							157										
							158										
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							160										
							161										
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**RECORD OF BOREHOLE No 314-9**

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**METRIC**

G.W.P. 5203-06-00 LOCATION Forest Access Road, Sta. 12+325, 12.0m Lt. CL ORIGINATED BY M.R.  
 DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Dynamic Cone Penetration Test COMPILED BY N.S.B.  
 DATUM Geodetic DATE March 07, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100	W <sub>p</sub>	W	W <sub>L</sub>		
	End of dynamic cone penetration test Refusal on probable bedrock   Sample 15: N value affected by hydraulic disturbances  * 2008 03 07   Water level observed during drilling  Water level measured after drilling  WH** Penetration due to weight of rods and hammer C.F.H.S.A. Denotes Continuous Flight Hollow Stem Augers																

## RECORD OF PENETRATION TEST No 314-10

1 of 2 **METRIC**

G.W.P. 5203-06-00	LOCATION	Forest Access Road, Sta. 12+325, 12.0m Rt. CL	ORIGINATED BY	F.P.
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DIST	54	HWY	69	BOREHOLE TYPE	Dynamic Cone Penetration Test	COMPILED BY	N.S.B
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DATUM Geodetic DATE March 06, 2008 CHECKED BY C.N.

[illegible]

RECORD OF PENETRATION TEST No 314-10

2 of 2 METRIC

G.W.P. 5203-06-00 LOCATION Forest Access Road, Sta. 12+325, 12.0m Rt. CL ORIGINATED BY F.P.  
DIST 54 HWY 69 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY N.S.B.  
DATUM Geodetic DATE March 06, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40					
171.1	Probable silty clay Soft to firm						171							
							170							
							169							
							168							
							167							
							166							
							165							
							164							
							163							
							162							
							161							
							160							
159.0							159							
27.1	End of dynamic cone penetration test													

RECORD OF BOREHOLE No 314-11

1 of 3

METRIC

G.W.P. 5203-06-00 LOCATION Forest Access Road, Sta. 12+350, CL ORIGINATED BY F.P.  
DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Dynamic Cone Penetration Test COMPILED BY N.S.B  
DATUM Geodetic DATE March 05 & 06, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)  GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										
								○ UNCONFINED	● QUICK TRIAXIAL	+ FIELD VANE	× LAB VANE							
186.1 0.0	Top of Ice					▽*	20	40	60	80	100	20	40	60				
185.6 0.5	Ice																	
	Peat, fine fibrous Dark brown		1	SS	1	▽*												
			2	SS	WH**													
			3	SS	WH									648				
			4	SS	WH								447					
182.7 3.4	Organic clay Very soft Grey Wet		5	SS	WH	▽*								179				
	6		SS	WH							90							
	7		SS	WH														
180.9 5.2	Clayey silt, with sand Soft Grey Wet			FV		▽*		2										
	8		SS	WH														
				FV														
	thin layers of sandy silt					▽*		2										
			8	SS	WH													
					FV													
177.1 9.0	Clay, trace sand Soft to firm Grey Wet		9	SS	1	▽*		3										
				FV														
	10		SS	2														
				FV														
			11	SS	1	▽*												
					FV													
			12	SS	1													
						▽*		8										
					FV													
						▽*												
171.1						▽*		6										

RECORD OF BOREHOLE No 314-11

2 of 3

METRIC

G.W.P. 5203-06-00 LOCATION Forest Access Road, Sta. 12+350, CL ORIGINATED BY F.P.  
DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Dynamic Cone Penetration Test COMPILED BY N.S.B.  
DATUM Geodetic DATE March 05 & 06, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)		
								○ UNCONFINED	+ FIELD VANE						○		
171.1							20	40	60	80	100						
15.0	Clay, trace sand																
	Soft to firm		13	SS	1												
				FV													
			14	SS	1												
				FV													
			15	SS	1												
				FV													
	clayey silt layers																
			16	TW	PM												
				FV													
			17	SS	1												
				FV													
163.5	Clayey silt																
22.6	trace clay, trace sand		18	SS	1												
	Firm																
			19	SS	1												
161.1	Silt																
25.0	trace clay, trace sand																
	Very loose		20	SS	2												
	Grey																
	Wet to loose																
			21	SS	WR***												
			22	SS	3												
156.1	Cont'd																

# RECORD OF BOREHOLE No 314-11

3 of 3

METRIC

G.W.P. 5203-06-00

LOCATION Forest Access Road, Sta. 12+350, CL

ORIGINATED BY F.P.

DIST 54 HWY 69

BOREHOLE TYPE C.F.H.S.A. and Dynamic Cone Penetration Test

COMPILED BY N.S.B

DATUM Geodetic

DATE March 05 & 06, 2008

CHECKED BY C.N.

SOIL PROFILE				SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT  W <sub>p</sub>	NATURAL MOISTURE CONTENT  W	LIQUID LIMIT  W <sub>L</sub>	UNIT WEIGHT  γ  kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)  GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	SHEAR STRENGTH kPa					WATER CONTENT (%)										
						○ UNCONFINED			+	FIELD VANE											
						● QUICK TRIAXIAL			×	LAB VANE											
156.1							20	40	60	80	100		20	40	60						
30.0	Silt trace clay, trace sand  Very loose Grey Wet to loose																				
			23	SS	8																
154.7																					
31.4	Sand, trace silt  Loose to Grey Wet compact																				
			24	SS	6																
153.5																					
32.6	End of borehole  Probable sand  Loose to compact																				
151.7																					
34.4	End of dynamic cone penetration test  Refusal on probable bedrock																				

RECORD OF PENETRATION TEST No 314-12

1 of 2 METRIC

G.W.P. 5203-06-00 LOCATION Forest Access Road, Sta. 12+375, 12.0m Lt. CL ORIGINATED BY M.R.  
DIST 54 HWY 69 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY N.S.B  
DATUM Geodetic DATE March 10, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	W <sub>p</sub> W W <sub>L</sub>	WATER CONTENT (%)			
186.2 0.0	Top of Ice Ice						186							
	Probable peat						185							
							184							
	Probable organic clay Very soft						183							
							182							
	Probable sand Loose						181							
							180							
	Probable silty clay Soft						179							
							178							
							177							
							176							
							175							
							174							
							173							
							172							

RECORD OF PENETRATION TEST No 314-12

2 of 2 METRIC

G.W.P. 5203-06-00 LOCATION Forest Access Road, Sta. 12+375, 12.0m Lt. CL ORIGINATED BY M.R.  
DIST 54 HWY 69 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY N.S.B.  
DATUM Geodetic DATE March 10, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								
								○ UNCONFINED	● QUICK TRIAXIAL	+ FIELD VANE						× LAB VANE
171.2							20	40	60	80	100	20	40	60		
15.0	Probable silty clay Soft						171									
							170									
							169									
	Probable clayey silt Soft to firm						168									
							167									
							166									
							165									
							164									
	Probable silt Compact						163									
							162									
							161									
							160									
159.1																
27.1	End of dynamic cone penetration test															

RECORD OF BOREHOLE No 314-13

1 of 3

METRIC

G.W.P. 5203-06-00 LOCATION Forest Access Road, Sta. 12+375, 12.0m Rt. CL ORIGINATED BY F.P.  
DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Dynamic Cone Penetration Test COMPILED BY N.S.B  
DATUM Geodetic DATE March 10, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								
								○ UNCONFINED	+	FIELD VANE						
								● QUICK TRIAXIAL	×	LAB VANE						
186.4	Top of Ice						20	40	60	80	100					
0.0	Ice						20	40	60	80	100					
185.9																
0.5	Peat, fine fibrous															
	Dark brown		1	SS	1											
			2	SS	1											
182.7																
3.7	Organic silty clay															
	Very soft Dark Wet		3	SS	1											
	grey															
			4	SS	1											
180.9																
5.5	Silt															
	trace clay, trace sand															
	clayey silt layers															
	Very loose Grey Wet		5	SS	1											
			6	SS	1											
178.2																
8.2	Clayey silt															
	Soft to Grey Wet															
	firm															
			7	SS	1											
				FV												
			8	SS	WH**											
				FV												
	thin silty clay layers															
			9	SS	1											
				FV												
	red/															
	grey															
			10	SS	1											
				FV												
171.4	Cont'd															

RECORD OF BOREHOLE No 314-13

2 of 3

METRIC

G.W.P. 5203-06-00 LOCATION Forest Access Road, Sta. 12+375, 12.0m Rt. CL ORIGINATED BY F.P.  
DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Dynamic Cone Penetration Test COMPILED BY N.S.B  
DATUM Geodetic DATE March 10, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED	● QUICK TRIAXIAL	+ FIELD VANE						× LAB VANE		
171.4							20	40	60	80	100	20	40	60				
15.0	grey		11	SS	1													
				FV														
			12	SS	1													
				FV														
			13	SS	2													
				FV														
			14	SS	WR***													
163.2																		
23.2	Silt trace clay, trace sand thin layers of clayey silt  Very loose Grey      Wet																	

# RECORD OF BOREHOLE No 314-13

3 of 3

**METRIC**

G.W.P.	5203-06-00	LOCATION	Forest Access Road, Sta. 12+375, 12.0m Rt. CL	ORIGINATED BY	F.P.
DIST	54	HWY	69	BOREHOLE TYPE	C.F.H.S.A. and Dynamic Cone Penetration Test
DATUM	Geodetic	DATE	March 10, 2008	CHECKED BY	C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)	
								○ UNCONFINED	+ FIELD VANE						○	
156.4								● QUICK TRIAXIAL	x LAB VANE							
30.0	Probable silt						156									
	Very loose to compact															
							155									
	Probable sand						154									
	Dense															
153.5																
32.9	End of dynamic cone penetration test															
													</			

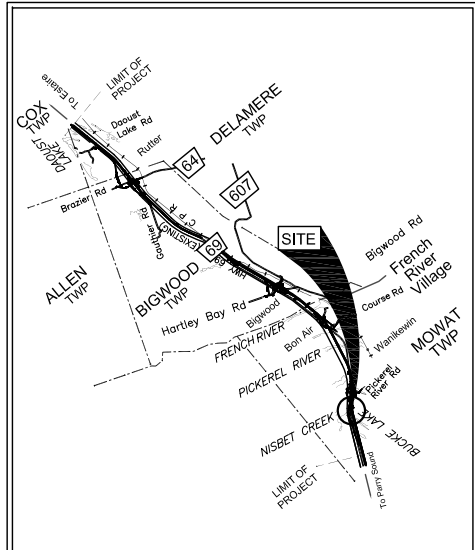
CONT No  
WP No 5573-09-01

CULVERT FA-4 (SKEWED)  
(FOREST ACCESS ROAD)  
HIGHWAY 69 FOUR-LANING  
STA. 12+347 - MOWAT TWP  
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET

**PML Peto MacCallum Ltd.**  
CONSULTING ENGINEERS



KEY PLAN  
SCALE  
0 2 4 6 km

LEGEND

- Borehole
- Dynamic Cone Penetration Test (Cone)
- Borehole & Cone
- N Blows/0.3m (Std. Pen Test, 475 J/blow)
- CONE Blows/0.3m (60' Cone, 475 J/blow)
- WH Penetration due to weight of hammer and rods
- WR Penetration due to weight of rods only
- W L at time of investigation March 2010
- Head ARTESIAN WATER Encountered
- PIEZOMETER

BH No	ELEVATION	CO-ORDS	
		NORTHING	EASTING
FA-4-1	186.0	N 5 092 395.4	E 220 941.8
FA-4-2	186.3	N 5 092 377.8	E 220 964.0

(Legend Continues)

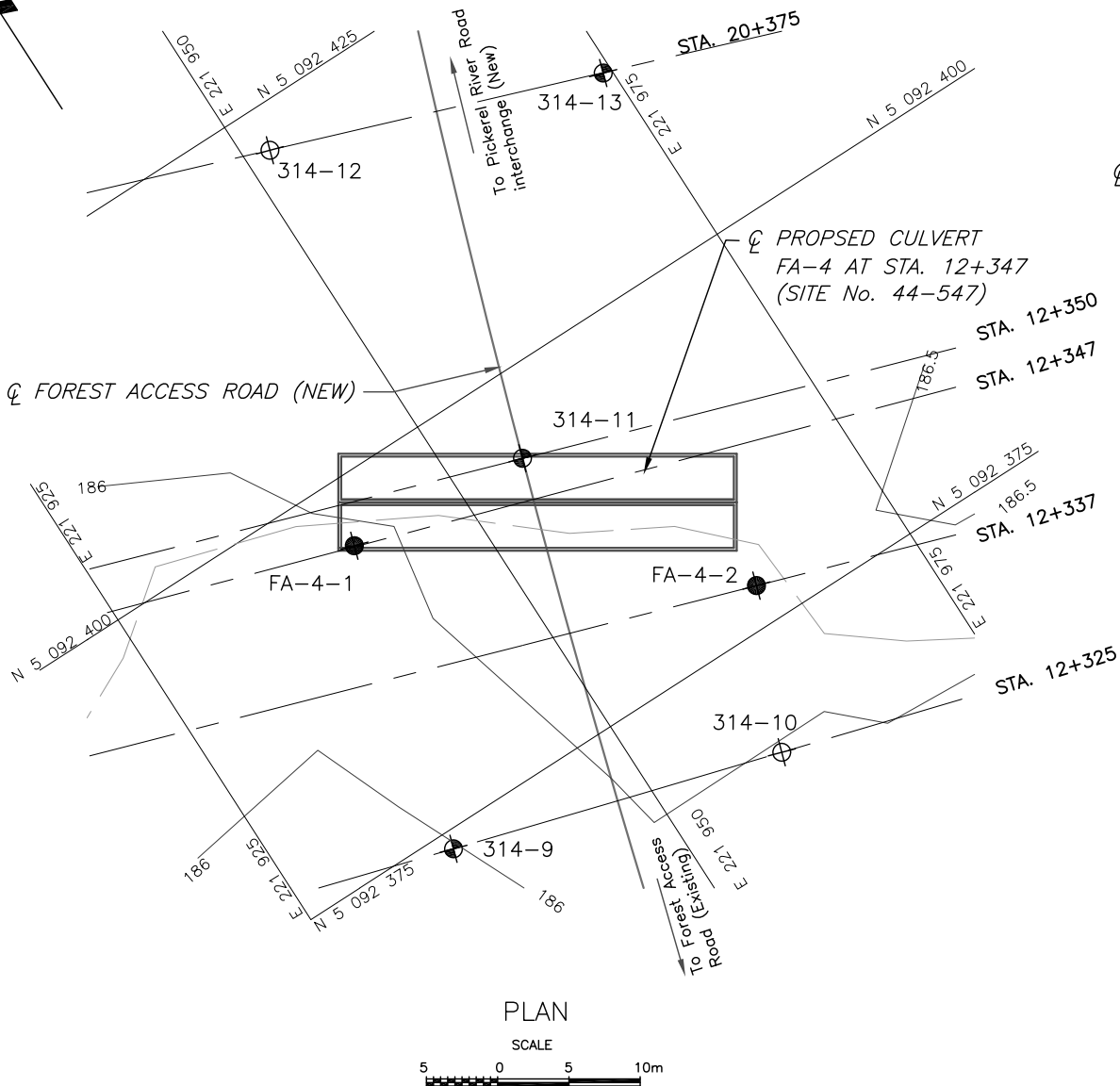
NOTE -

The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

REVISIONS	DATE	BY	DESCRIPTION

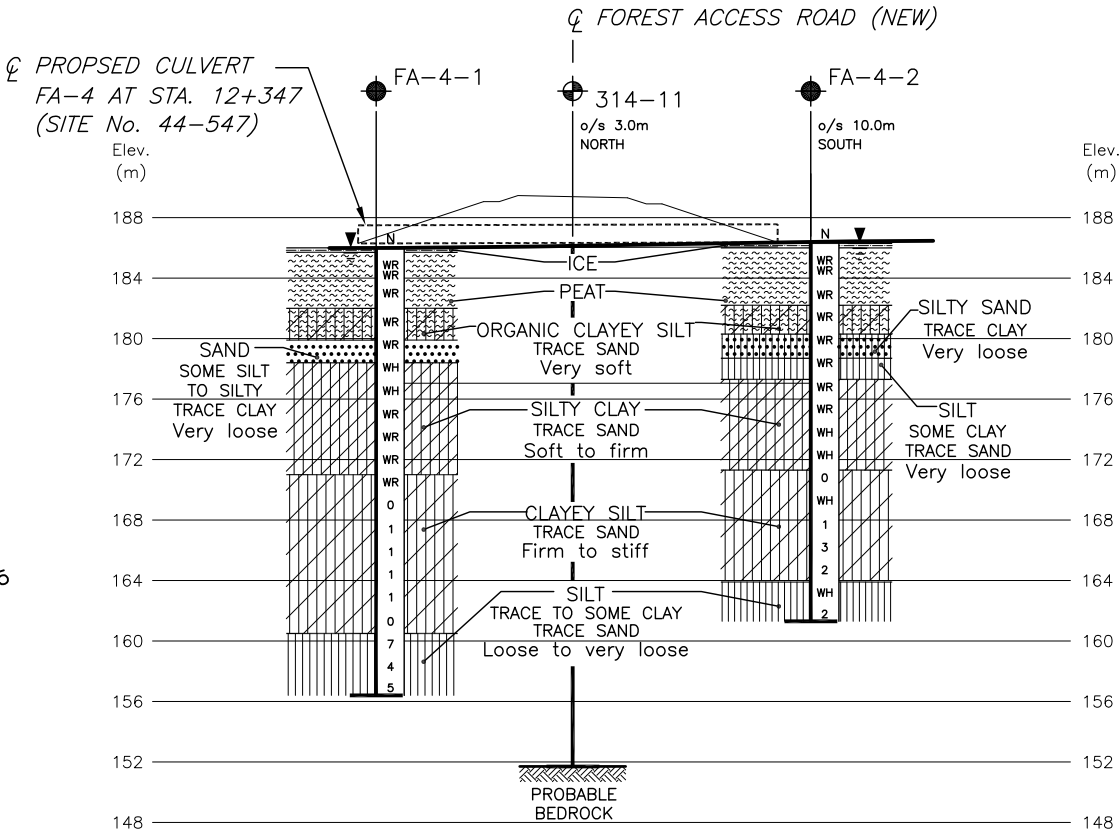
Geocres No. 41H-101

HWY No	69	DIST	54 (Sudbury)
SUBM'D	MN	CHECKED	MN
DATE	OCT. 21, 2011	SITE	44-547
DRAWN	NA	CHECKED	CN
APPROVED	BRG	DWG	FA-4-1

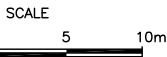


PLAN

SCALE

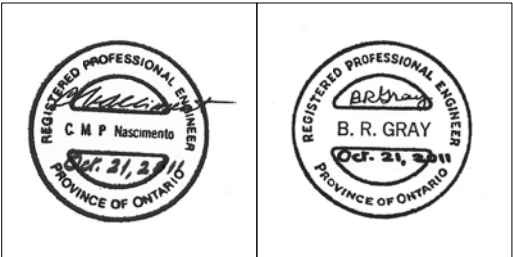


PROFILE CULVERT FA-4 AT STA. 12+347 (SKEWED)(FOREST ACCESS ROAD)



(Legend Continued)

BH No	ELEVATION	STA FOREST ACCESS ROAD	o/s CL
314-9	186.0	12+325	12.0m Lt.
314-10	186.1	12+325	12.0m Rt.
314-11	186.1	12+350	CL
314-12	186.2	12+375	12.0m Lt.
314-13	186.4	12+375	12.0m Rt.



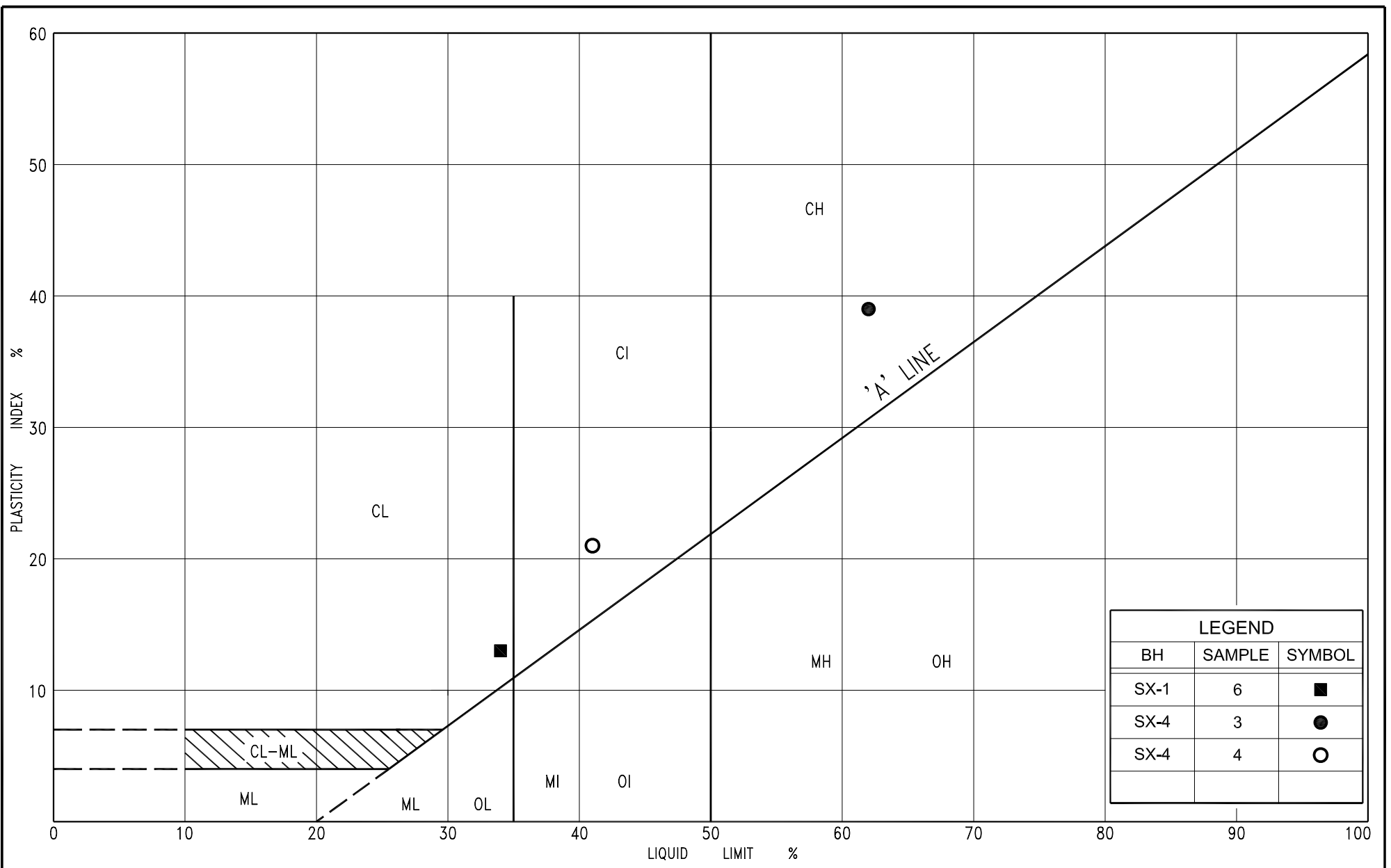
REF.: MRC DRAWINGS  
H6454\_PHASE3\_XA01.dwg; H6454\_PHASE3\_XN01.dwg;  
Phase\_3\_Culvert\_Plan\_View\_100205;  
Phase\_3\_Culvert\_Cross\_Sections\_-\_FAR\_&\_IC\_Ramps\_090722;  
H6454xb1 zone 10; H6454xb2 contours zone 10

NOTES:

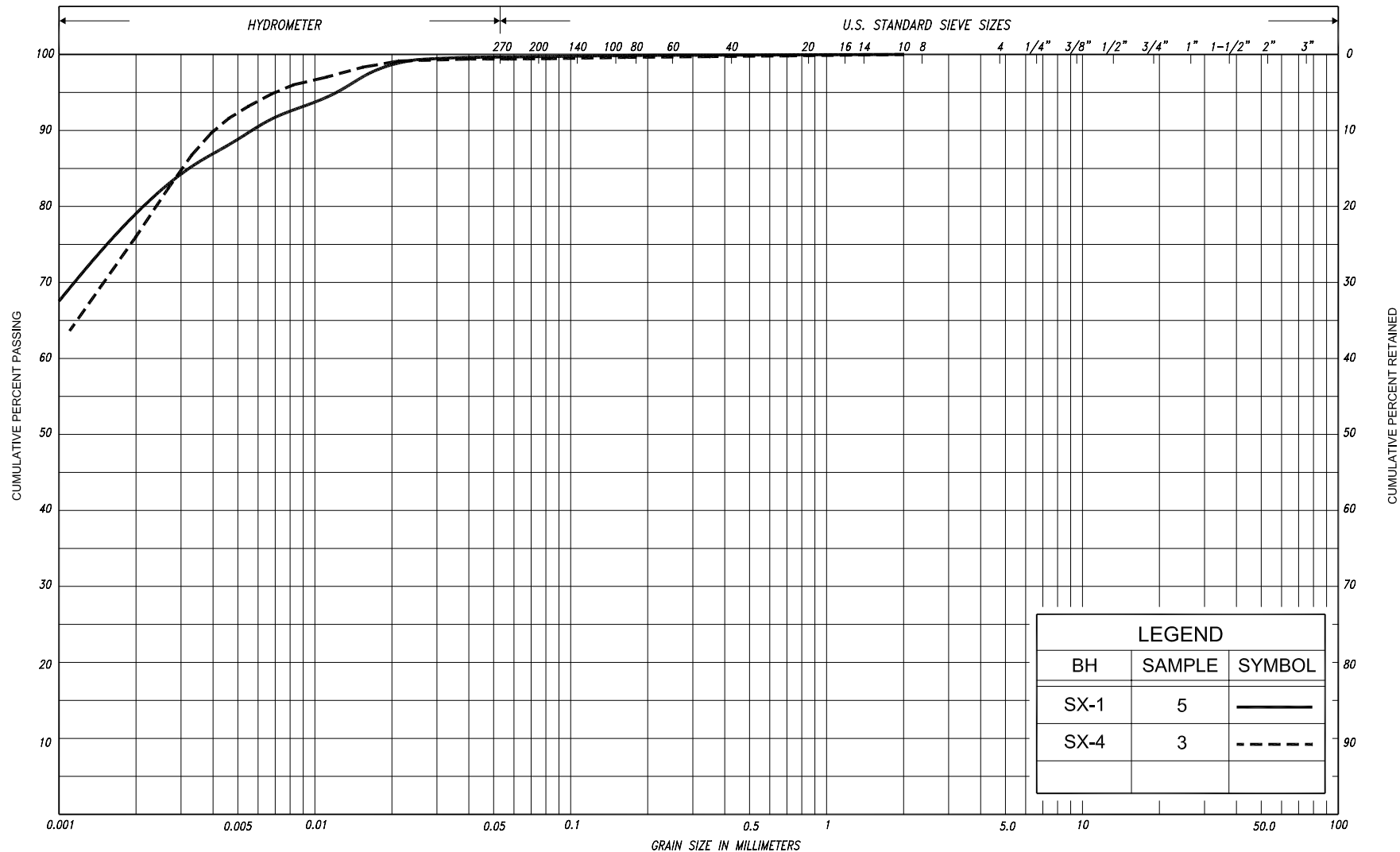
- DRAWING FA-4-1 SHOULD BE READ IN CONJUNCTION WITH THE TEXT AND RECORD OF BOREHOLE LOGS.
- CULVERT AT STA. 12+347 WAS DESIGNATED AS CULVERT FA-4 FOR THE INVESTIGATION.
- THIS DRAWING IS FOR SUBSURFACE INFORMATION ONLY. SURFACE DETAILS AND FEATURES ARE FOR CONCEPTUAL ILLUSTRATION.
- DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS ARE IN KILOMETRES AND METRES.

Culvert SX (Site No. 44-562/C1 and 44-562/C2)  
at Sta. 19+000, Mowat Township

Figure PC-SX-1 – Plasticity Chart  
Figures GS-SX-1 to GS-SX-4 – Grain Size Distribution Charts  
Record of Borehole and Auger Probe Sheets  
Drawing SX-1 – Borehole Locations and Soil Strata



LEGEND		
BH	SAMPLE	SYMBOL
SX-1	6	■
SX-4	3	●
SX-4	4	○



SILT & CLAY				FINE		MEDIUM		COARSE	GRAVEL		COB BLES	UNIFIED			
				SAND											
CLAY	FINE		MEDIUM	COARSE	FINE		MEDIUM	COARSE	GRAVEL		COBBLES	M.I.T.			
	SILT				SAND				GRAVEL				U.S. BUREAU		
CLAY		SILT		V. FINE	FINE	MED.	COARSE								
				SAND											

## GRAIN SIZE DISTRIBUTION

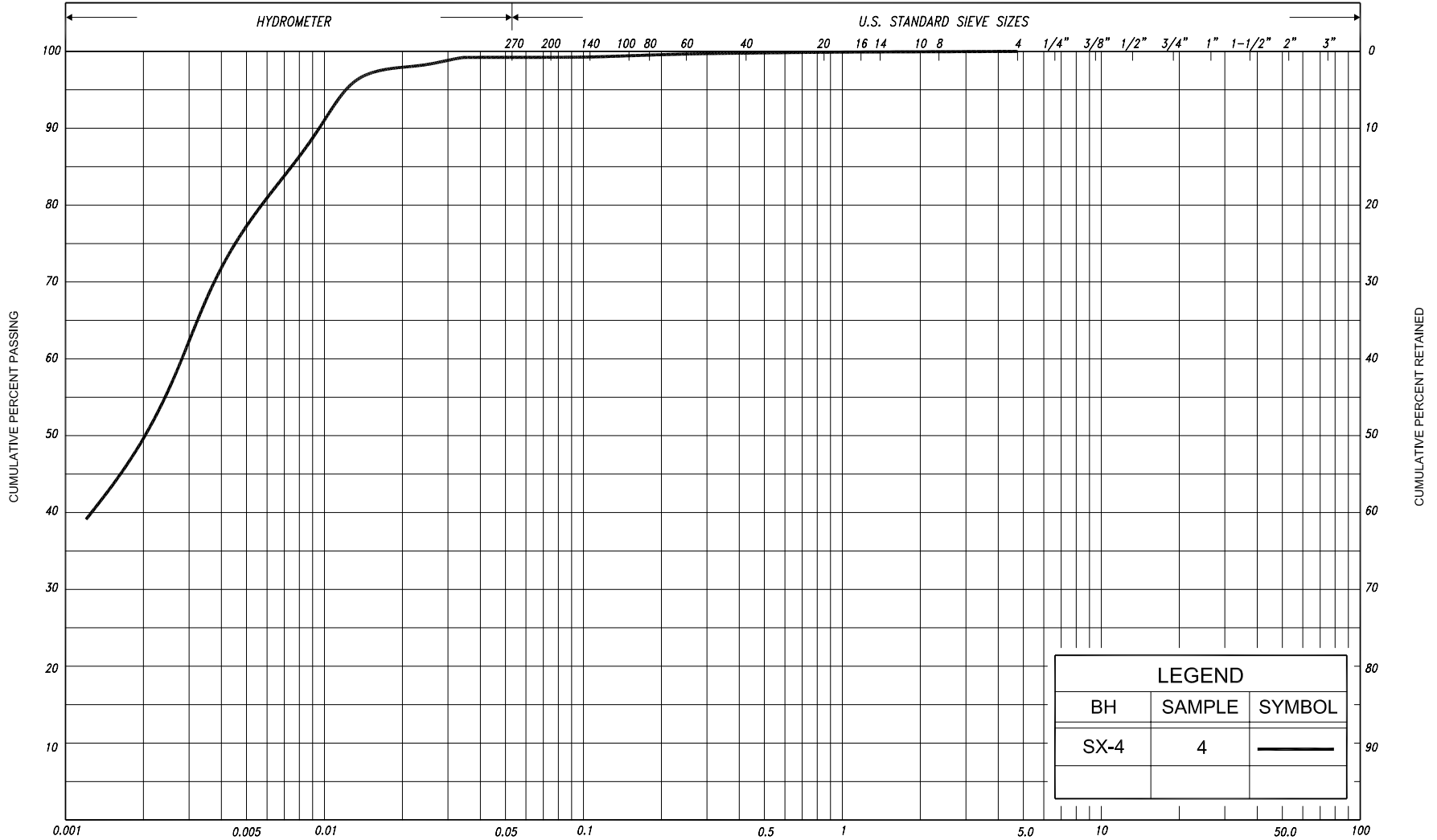
CLAY, trace sand

FIG No. GS-SX-1

HWY: 69

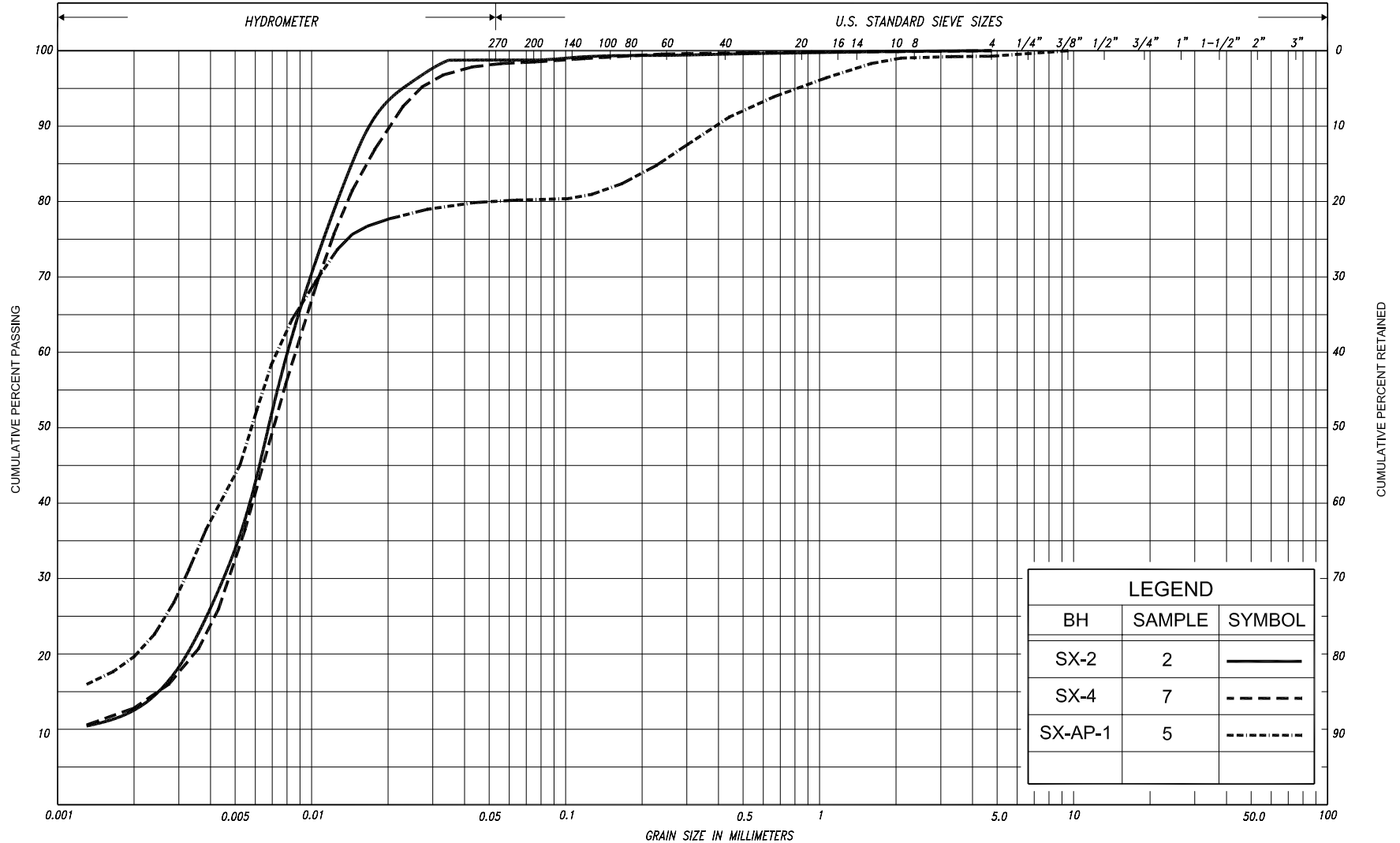
G.W.P. No. 5203-06-00





LEGEND		
BH	SAMPLE	SYMBOL
SX-4	4	—

SILT & CLAY				FINE		MEDIUM		COARSE		GRAVEL		COBBLES	UNIFIED					
				SAND														
CLAY	FINE		MEDIUM		COARSE		FINE		MEDIUM		COARSE		GRAVEL		COBBLES	M.I.T.		
	SILT						SAND											
CLAY			SILT			V. FINE		FINE		MED.		COARSE		GRAVEL				U.S. BUREAU
						SAND												



SILT & CLAY				FINE	MEDIUM	COARSE	GRAVEL		COBBLES	UNIFIED
				SAND						
CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	GRAVEL		COBBLES	M.I.T.
		SILT		V. FINE	FINE	MED.	COARSE	GRAVEL		U.S. BUREAU
CLAY				SAND						

## GRAIN SIZE DISTRIBUTION

SILT, some clay, trace to some sand

FIG No. GS-SX-4

HWY: 69

G.W.P. No. 5203-06-00

<b>RECORD OF BOREHOLE No SX-1</b> 1 of 1 <b>METRIC</b>															
G.W.P. 5203-06-00		LOCATION		Coords: 5 094 946.6 N; 221 753.6 E Hwy 69(New), Sta. 19+000, o/s 30m Lt. CL Med.				ORIGINATED BY S.A.							
DIST 54 HWY 69		BOREHOLE TYPE		Continuous Flight Hollow Stem Augers				COMPILED BY M.N.							
DATUM Geodetic		DATE		March 03, 2010				CHECKED BY C.N.							
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		SHEAR STRENGTH kPa								
181.6	Ground Surface						20	40	60	80	100				
0.0	Topsoil		1	SS	8										Top 0.3m frozen
181.3	Silty clay														
0.3	Firm Brown Moist to grey		2	SS	4										
			3	SS	2										
				FV											
178.7	Silt some clay, trace sand														
2.9	Loose Grey Wet		4	SS	5										
177.9	Clay, trace sand														
3.7	Soft to Grey Wet firm		5	SS	WH**										0 1 10 79
				FV											
175.8	Clayey silt, trace sand														
5.8	Firm Grey Wet		6	SS	WH										0 1 63 36
				FV											
173.7	Sandy silt														
7.9	Compact Grey Wet		7	SS	11										
173.1															
8.5	End of borehole														
	Refusal on probable bedrock														
<p>* 2010 03 03</p> <p>▽ Water level observed during drilling</p> <p>▼ Water level measured after drilling</p> <p>■ Penetrometer test</p> <p>WH** denotes penetration due to weight of rods and hammer</p>															

**METRIC**

Hwy 69(New), Sta. 19+000, o/s 11m Lt. CL Med.

ORIGINATED BY S.A.

COMPILED BY M.N.

— CHECKED BY C.N.

20  
15 — 5 (%) STRAIN AT FAILURE  
10

**METRIC**

G.W.P.	5203-06-00	LOCATION	Hwy 69(New), Sta. 19+005, o/s 14m Rt. CL Med.	ORIGINATED BY	S.A.
DIST	54	HWY	69	BOREHOLE TYPE	Continuous Flight Hollow Stem Augers
DATUM	Geodetic	DATE	March 02, 2010	CHECKED BY	C.N.

ON\_MOT VER3 06TF035C.GPJ ON\_MOT.GDT 6/1/2010 3:02:58 PM

**+**<sup>7</sup>, **×**<sup>5</sup>: Numbers refer to Sensitivity

**METRIC**

Hwy 69(New), Sta. 19+000, o/s 30m Rt. CL Med.

ORIGINATED BY M.R

COMPILED BY M.N.

CHECKED BY C.N.

20  
15 — 5 (%) STRAIN AT FAILURE  
10

**RECORD OF AUGER PROBE No SX-AP-1 1 of 1 METRIC**

Coords: 5 094 954.1 N; 221 787.2 E  
G.W.P. 5203-06-00 LOCATION Hwy 69(New), Sta. 19+005, o/s 4m Rt. CL Med. ORIGINATED BY S.A.  
DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY M.N.  
DATUM Geodetic DATE March 03, 2010 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED		+ FIELD VANE								○		
							20	40	60	80	100									
182.8	Ground Surface																			
0.0	Topsoil		1	AS	-											Top 0.4m frozen				
182.4	Silty sand, trace gravel		2	AS	-															
0.4	Brown (FILL)																			
182.0	Silty clay		3	AS	-															
0.8	Grey																			
181.0	Clay, trace sand layers of silty clay		4	AS	-															
1.8	Grey																			
179.0	Silt, some sand some clay, trace gravel		5	AS	-											1 19 61 19				
3.8	Grey																			
174.2	Sand and gravel																			
8.6	Grey																			
173.9	End of borehole																			
8.9	Refusal on probable bedrock																			
* 2010 03 03																				
▼ Water level measured after drilling																				

\* 2010 03 03

Water level measured  
after drilling

G.W.P. <u>5203-06-00</u>		LOCATION <u>Coords: 5 094 947.0 N; 221 759.6 E Hwy 69(New), Sta. 19+000, o/s 24m Lt. CL Med.</u>	ORIGINATED BY <u>S.A.</u>
DIST <u>54</u>	HWY <u>69</u>	BOREHOLE TYPE <u>Continuous Flight Solid Stem Augers</u>	COMPILED BY <u>M.N.</u>
DATUM <u>Geodetic</u>		DATE <u>March 03, 2010</u>	CHECKED BY <u>C.N.</u>

ON\_AP VER 3 06TF035C.GPJ ON MOT.GDT 6/1/2010 3:06:21 PM





(%) STRAIN AT FAILURE

**RECORD OF BOREHOLE No 301-1**

1 of 1

**METRIC**

G.W.P. 5203-06-00 LOCATION Hwy 69 (New), Sta. 19+000, o/s 18.8m Lt. CL Med. ORIGINATED BY N.L.B.  
 DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.S.B.  
 DATUM Geodetic DATE March 13, 2007 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			* GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT  γ  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)  GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
○ UNCONFINED      + FIELD VANE ● QUICK TRIAXIAL    × LAB VANE																	
182.0	Ground Surface							20	40	60	80	100					
0.0	Topsoil																
0.20	Clayey silt, trace sand																
	Firm      Mottled    Moist brown/    reddish brown		1	SS	5		181										
180.90	Silt, some clay																
1.10	Loose      Mottled    Moist brown/    grey		2	SS	6		180										
179.70	End of borehole																
2.30	Refusal on probable bedrock																
	*    Borehole dry upon completion of drilling																

RECORD OF BOREHOLE No 301-2

1 of 1

METRIC

G.W.P. 5203-06-00 LOCATION Hwy 69(New), Sta. 19+000, o/s 18.8m Rt. CL Med. ORIGINATED BY N.L.B.  
DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.S.B.  
DATUM Geodetic DATE March 14, 2007 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT   NATURAL MOISTURE CONTENT   LIQUID LIMIT			UNIT WEIGHT  γ  kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED   + FIELD VANE ● QUICK TRIAXIAL   × LAB VANE					W <sub>P</sub>	W	W <sub>L</sub>		WATER CONTENT (%)			
183.0	Ground Surface							20	40	60	80	100								
0.0	Peat, fine fibrous																			
0.20	Silty clay, trace sand layers of clayey silt					▼*														
	Soft                      Mottled                      Moist brown/                      to wet grey		1	SS	2	▼*	182												0   1   68   31	
181.50	Clay, trace sand layers of silty clay																			
1.50	Soft                      Brown/                      Wet grey		2	SS	1		181												0   2   34   64	
	thin layers of silt																			
			3	SS	WH**		180													
179.00	Silt trace clay, trace sand thin layers of silty clay						179													
4.00	Very loose Brown/                      Wet to loose                      grey		4	SS	WH		178													
	no layering trace gravel																			
175.10			6	SS	5/15cm		176												2   2   89   7	
7.90	End of borehole																			
	Refusal on probable bedrock																			
	Sample 4: 'N'-value affected by hydraulic disturbance																			
	Sample 6: Sampler bouncing																			
	*      2007   03   14																			
	▽      Water level observed during drilling																			
	▼      Water level measured after drilling																			
	WH**      Denotes penetration due to weight of rods and hammer																			

# RECORD OF BOREHOLE No 301-3

1 of 1

METRIC

G.W.P.	5203-06-00	LOCATION	Hwy 69 (New), Sta. 19+025, o/s 44.5m Lt. CL Med.	ORIGINATED BY	N.L.B.
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DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.S.B.

DATUM Geodetic DATE March 14, 2007 CHECKED BY C.N.

[illegible]

RECORD OF PENETRATION TEST No 301-4

1 of 1 METRIC

G.W.P. 5203-06-00 LOCATION Hwy 69 (New), Sta. 19+025 CL Med. ORIGINATED BY N.L.B.  
DIST 54 HWY 69 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY N.S.B.  
DATUM Geodetic DATE March 13, 2007 CHECKED BY C.N.


SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40					
182.1 0.0	Ground Surface Probable peat Probable silty clay Firm to soft						182							
	Probable clay Soft						181							
							180							
	Probable silt Loose to compact						179							
							178							
							177							
							176							
							175							
174.2 7.9	End of dynamic cone penetration test Refusal on probable bedrock													

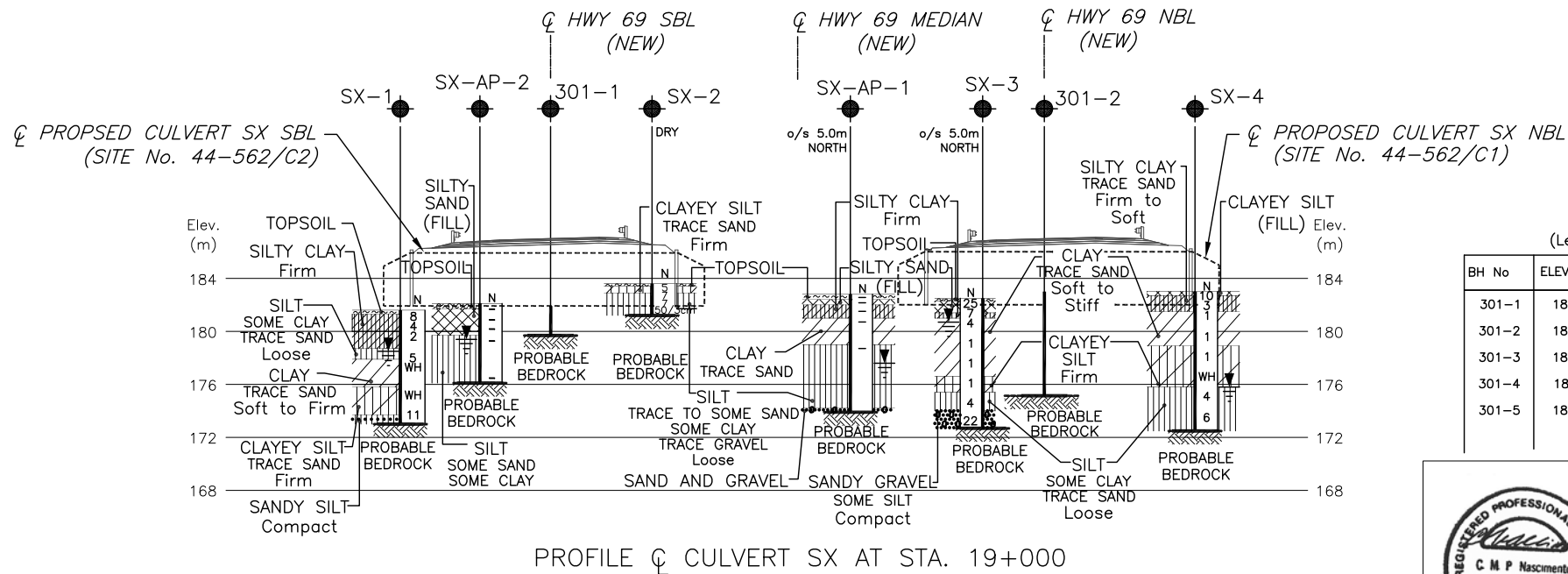
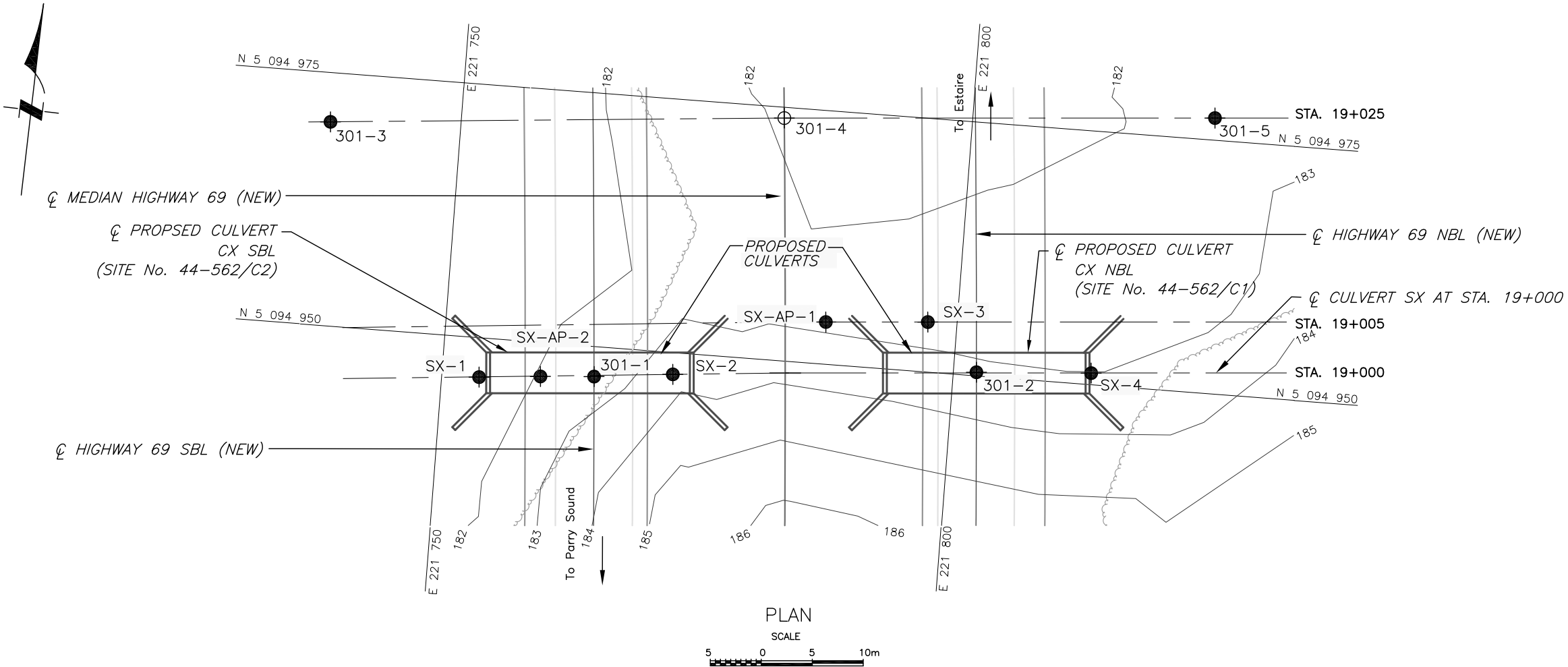
# RECORD OF BOREHOLE No 301-5

1 of 1

**METRIC**

G.W.P. 5203-06-00 LOCATION Hwy 69 (New), Sta. 19+025, o/s 42.5m Rt. CL Med. ORIGINATED BY N.L.B.  
 DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.S.B.  
 DATUM Geodetic DATE March 13, 2007 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT  $w_p$	NATURAL MOISTURE CONTENT  $w$	LIQUID LIMIT  $w_L$	UNIT WEIGHT  $\gamma$  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)  GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa												
								○ UNCONFINED      + FIELD VANE ● QUICK TRIAXIAL    × LAB VANE												
182.5	Ground Surface						20	40	60	80	100									
0.0	Peat, fine fibrous Dark brown Wet																			
0.20	Silty clay																			
	Firm Mottled brown/grey Moist		1	SS	5															
			2	SS	5															
180.00																				
2.50	Silt, some clay layers of silty clay																			
	Loose Grey Moist to wet		3	SS	6															
177.70																				
4.80			4	SS	7/15cm															
177.60	Sand, trace silt																			
4.90	Compact Grey Wet																			
	End of borehole																			
	Refusal on probable bedrock																			
	Sample 4: Sampler bouncing																			
	* 2007 03 13																			
	 Water level measured after drilling																			

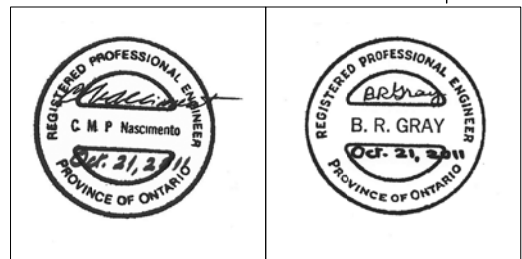


NOTES:

- DRAWING SX-1 SHOULD BE READ IN CONJUNCTION WITH THE TEXT AND RECORD OF BOREHOLE LOGS.
- CULVERTS AT STA. 19+000 WERE DESIGNATED AS CULVERT SX FOR THE INVESTIGATION.
- THIS DRAWING IS FOR SUBSURFACE INFORMATION ONLY. SURFACE DETAILS AND FEATURES ARE FOR CONCEPTUAL ILLUSTRATION.
- DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS ARE IN KILOMETRES AND METRES.

(Legend Continued)

BH No	ELEVATION	STA MOWAT TWP	o/s CL MED
301-1	182.0	19+000	18.8m Lt.
301-2	183.0	19+000	18.8m Rt.
301-3	181.5	19+025	44.5m Lt.
301-4	182.1	19+025	CL
301-5	182.5	19+025	42.5m Rt.



REF.: MRC DRAWINGS  
H6454\_PHASE3\_XA01.dwg; H6454\_PHASE3\_XN01.dwg;  
Phase\_3\_Culvert\_Plan\_View\_100205;  
Phase\_3\_Culvert\_Cross\_Sections\_-\_Mainline\_-\_100205;  
H6454xb1 zone 10; H6454xb2 contours zone 10

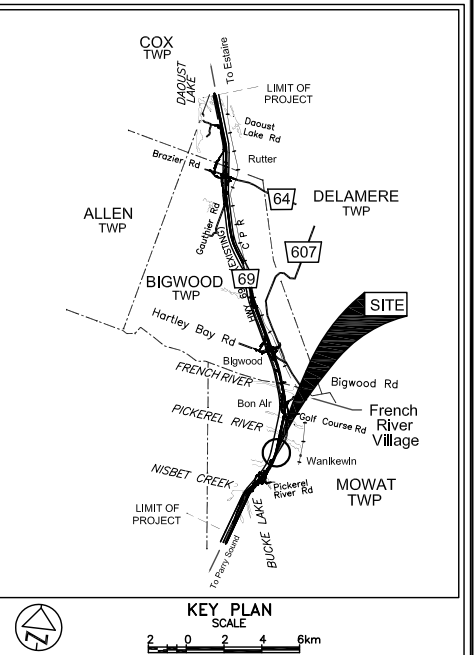
CONT No  
GWP No 5203-06-00

CULVERT SX(SNOWMOBILE CULVERTS)  
HIGHWAY 69 FOUR-LANING  
STA. 19+000 - MOWAT TWP  
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET

**PML Peto MacCallum Ltd.**  
CONSULTING ENGINEERS



LEGEND

	Borehole
	Dynamic Cone Penetration Test (Cone)
	Borehole & Cone
N	Blows/0.3m (Std. Pen Test, 475 J/blow)
CONE	Blows/0.3m (60° Cone, 475 J/blow)
WH	Penetration due to weight of hammer and rods
W L	at time of investigation Feb & Mar 2010
	Head
	ARTESIAN WATER
	Encountered
	PIEZOMETER

BH No	ELEVATION	CO-ORDS	
		NORTHING	EASTING
SX-1	181.6	N 5 094 946.6	E 221 753.6
SX-2	183.6	N 5 094 948.0	E 221 772.6
SX-3	182.5	N 5 094 954.9	E 221 797.1
SX-4	183.0	N 5 094 951.1	E 221 813.5
SX-AP-1	182.8	N 5 094 954.1	E 221 787.2
SX-AP-2	182.1	N 5 094 947.0	E 221 759.6

(Legend Continues)  
- NOTE -  
The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

REVISIONS	DATE	BY	DESCRIPTION

Geocres No. 41H-101			
HWY No	69	DIST 54 (Sudbury)	
SUBM'D	MN	CHECKED	MN
DRAWN	NA	CHECKED	CN
DATE	OCT. 21, 2011	APPROVED	BRG
SITE	44-562/C1&C2	DWG	SX-1

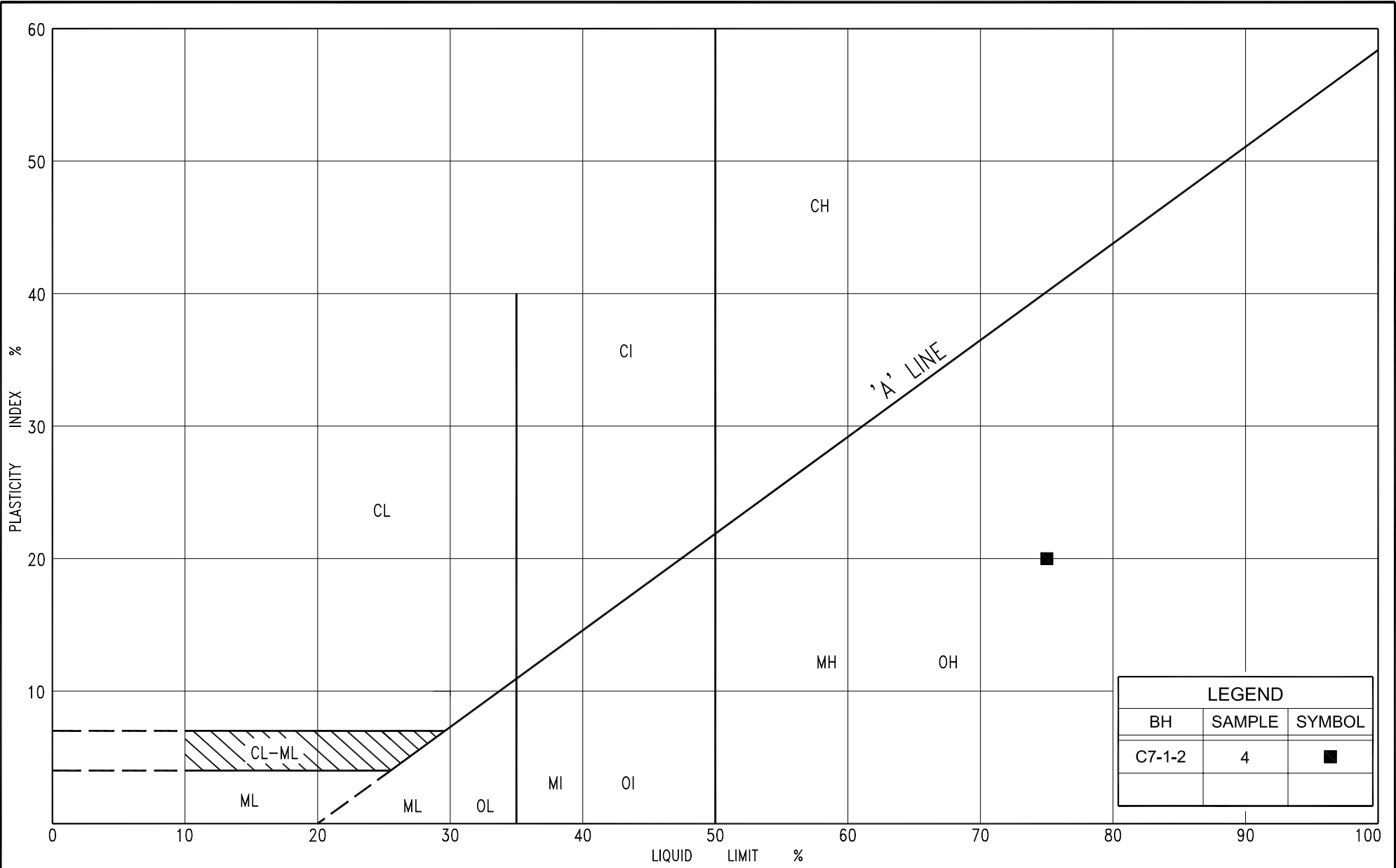
Culvert C7-1 (Site No. 44-556/C1 and 44-556/C2)  
at Sta. 19+378, Mowat Township

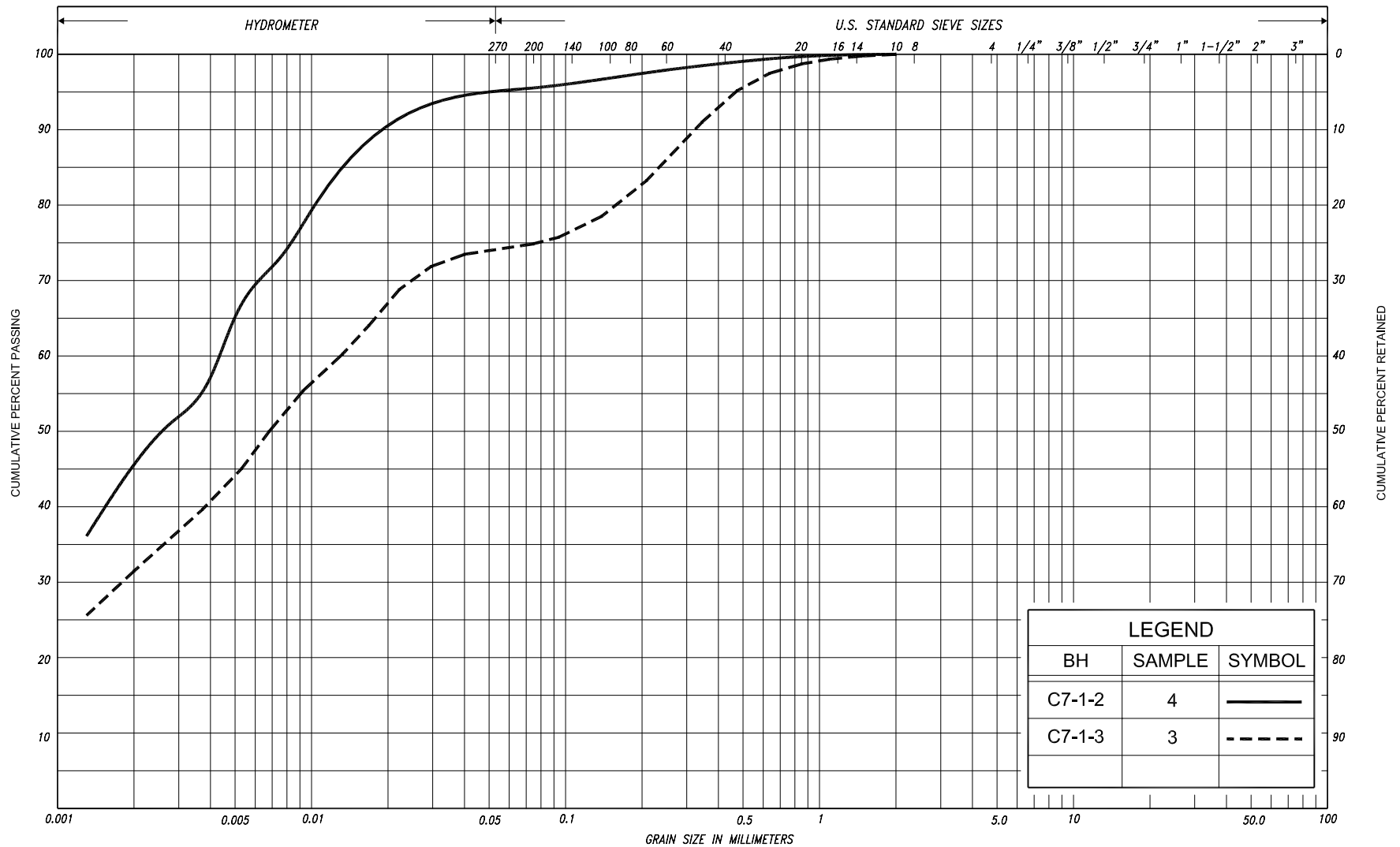
Figure PC-C7-1 – Plasticity Chart

Figure GS-C7 -1 – Grain Size Distribution Chart

Record of Borehole Sheets

Drawing C7-1-1 – Borehole Locations and Soil Strata





SILT & CLAY					FINE		MEDIUM		COARSE	GRAVEL			COB BLES	UNIFIED
					SAND									
CLAY	FINE		MEDIUM	COARSE	FINE		MEDIUM		COARSE	GRAVEL			COBBLES	M.I.T.
	SILT						SAND							
CLAY		SILT			V. FINE	FINE	MED.	COARSE	GRAVEL					U.S. BUREAU
				SAND										

**RECORD OF BOREHOLE No C7-1-1**

1 of 1

**METRIC**

Coords: 5 095 321.0 N; 221 711.9 E

G.W.P. 5203-06-00 LOCATION Hwy 69(New), Sta. 19+000, o/s 30.5m Lt. CL Med. ORIGINATED BY D.W.  
DIST 54 HWY 69 BOREHOLE TYPE Manual Probe COMPILED BY M.N.  
DATUM Geodetic DATE March 11, 2010 CHECKED BY C.N.

SOIL PROFILE				SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	SHEAR STRENGTH kPa					WATER CONTENT (%)									
						○ UNCONFINED			+ FIELD VANE		● QUICK TRIAXIAL		× LAB VANE							
180.8	Ground Surface					*			20	40	60	80	100	20	40	60	kN/m <sup>3</sup>	GR SA SI CL		
0.0	Bedrock at surface																			
	* Borehole dry																			

<b>RECORD OF BOREHOLE No C7-1-2      1 of 1      METRIC</b>													
G.W.P. 5203-06-00		LOCATION		Coords: 5 095 323.6 N; 221 734.3 E Hwy 69(New), Sta. 19+378, o/s 8m Lt. CL Med.				ORIGINATED BY D.W.					
DIST 54 HWY 69		BOREHOLE TYPE		Manual Sampling Equipment				COMPILED BY M.N.					
DATUM Geodetic		DATE		March 11, 2010				CHECKED BY C.N.					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		ELEVATION SCALE	SHEAR STRENGTH kPa					
179.1	Ground Surface												
0.0	Ice												
	water												
176.2	Peat, fine fibrous		1	SS	WR**								
2.9	Dark brown												
175.4	Organic silt		2	SS	WR								
3.7	Very loose Dark Wet brown to dark grey		3	SS	WR								
173.1	Organic clayey silt												
6.0	trace sand		4	SS	WR								
172.2	Very soft Dark Wet grey												
6.9	End of borehole												
	Refusal on probable bedrock												
	* 2010 03 11 Water level observed during drilling Water level measured after drilling WR** denotes penetration due to weight of rods only												

**RECORD OF BOREHOLE No C7-1-3**

1 of 1

**METRIC**

Coords: 5 095 325.5 N; 221 750.2 E

G.W.P. 5203-06-00 LOCATION Hwy 69(New), Sta. 19+378, o/s 8m Rt. CL Med. ORIGINATED BY D.W.  
DIST 54 HWY 69 BOREHOLE TYPE Manual Sampling Equipment COMPILED BY M.N.  
DATUM Geodetic DATE March 11, 2010 CHECKED BY C.N.



SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
179.9 0.0	Ground Surface					▽	179	20	40	60	80	100					GR SA SI CL
179.7 0.2	Ice							20	40	60	80	100					
179.7 0.2	Peat, fine fibrous  Black to dark brown		1	SS	WR**	179											
			2	SS	WR												
178.1 1.8	Organic clayey silt with sand		3	SS	WR	178											0 25 43 32
177.9 2.0	Very soft Dark grey  End of borehole  Refusal on probable bedrock																
<div><div>*</div><div>2010 03 11</div></div> <div><div>▽</div><div>Water level observed during drilling</div></div> <div><div>▼</div><div>Water level measured after drilling</div></div> <div><div>WR**</div><div>denotes penetration due to weight of rods only</div></div>																	

# RECORD OF BOREHOLE No C7-1-4

1 of 1

**METRIC**

G.W.P. <u>5203-06-00</u>		LOCATION <u>Coords: 5 095 328.1 N; 221 772.5 E Hwy 69(New), Sta. 19+378, o/s 30.5m Rt. CL Med.</u>	ORIGINATED BY <u>D.W.</u>
DIST <u>54</u>	HWY <u>69</u>	BOREHOLE TYPE <u>Manual Sampling Equipment</u>	COMPILED BY <u>M.N.</u>
DATUM <u>Geodetic</u>		DATE <u>March 11, 2010</u>	CHECKED BY <u>C.N.</u>

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT						PLASTIC LIMIT   NATURAL MOISTURE CONTENT   LIQUID LIMIT			UNIT WEIGHT  γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						W <sub>p</sub> W                      W <sub>L</sub>							
								○ UNCONFINED                      + FIELD VANE ● QUICK TRIAXIAL                      × LAB VANE						WATER CONTENT (%)							
180.3	Ground Surface						180														
0.0	Ice																				
180.0	Peat, fine fibrous		1	SS	WR**																
0.3	Dark brown																				
179.6	End of borehole																				
0.7	Refusal on probable bedrock																				
*    2010   03   11																					
Water level observed during drilling																					
Water level measured after drilling																					

**RECORD OF BOREHOLE No C7-1-AP-1 1 of 1 METRIC**

Coords: 5 095 322.4 N; 221 723.3 E

G.W.P. 5203-06-00 LOCATION Hwy 69(New), Sta. 19+378, o/s 19m Lt. CL Med. ORIGINATED BY D.W.  
DIST 54 HWY 69 BOREHOLE TYPE Manual Sampling Equipment COMPILED BY M.N.  
DATUM Geodetic DATE March 11, 2010 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								○ UNCONFINED	+	FIELD VANE	● QUICK TRIAXIAL	×					
179.6 0.0	Ground Surface					▽*	20	40	60	80	100	20	40	60			
	Ice																
	water																
176.5 3.1	Peat, fine fibrous																
	Dark brown		1	SS	WR**										286		
174.7 4.9	Organic silt																
	Very loose Dark grey		2	SS	WR												
174.0 5.6	End of Auger Probe																
	Refusal on probable bedrock																
		</															

**RECORD OF BOREHOLE No C7-1-AP-2 1 of 1 METRIC**

Coords: 5 095 326.8 N; 221 761.1 E

G.W.P. 5203-06-00 LOCATION Hwy 69(New), Sta. 19+378, o/s 19m Rt. CL Med. ORIGINATED BY D.W.  
 DIST 54 HWY 69 BOREHOLE TYPE Manual Probing COMPILED BY M.N.  
 DATUM Geodetic DATE March 11, 2010 CHECKED BY C.N.

SOIL PROFILE				SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT   NATURAL MOISTURE CONTENT   LIQUID LIMIT			UNIT WEIGHT  γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	SHEAR STRENGTH kPa					w <sub>p</sub> w                      w <sub>L</sub>			WATER CONTENT (%)	GR	SA		SI	CL			
						○ UNCONFINED                      + FIELD VANE ● QUICK TRIAXIAL                      × LAB VANE																
180.3	Ground Surface					*																
0.0	Bedrock at surface																					
	*     Borehole dry																					

## RECORD OF BOREHOLE No 301-34

1 of 1

METRIC

G.W.P.	5203-06-00	LOCATION	Hwy 69 (New), Sta. 19+350, o/s 18.8m Rt. CL Med.	ORIGINATED BY	W.L.
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DIST	54	HWY	69	BOREHOLE TYPE	Power Augering	COMPILED BY	N.S.B.
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DATUM Geodetic DATE March 20, 2007 CHECKED BY C.N.

[illegible]

## RECORD OF PENETRATION TEST No 301-35

1 of 1 **METRIC**

G.W.P.	5203-06-00	LOCATION	Hwy 69 (New), Sta. 19+375, o/s 40.5m Lt. CL Med.	ORIGINATED BY	N.L.B.
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DIST	54	HWY	69	BOREHOLE TYPE	Dynamic Cone Penetration Test	COMPILED BY	N.S.B.
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DATUM Geodetic DATE March 19, 2007 CHECKED BY C.N.

[illegible]

RECORD OF BOREHOLE No 301-36

1 of 1

METRIC

G.W.P. 5203-06-00 LOCATION Hwy 69 (New), Sta. 19+375 CL Med. ORIGINATED BY N.R.  
DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY N.S.B.  
DATUM Geodetic DATE March 19, 2007 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT  w <sub>p</sub>	NATURAL MOISTURE CONTENT  w	LIQUID LIMIT  w <sub>L</sub>	UNIT WEIGHT  γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED		+ FIELD VANE								—		
181.5	Top of Ice						20	40	60	80	100	20	40	60		GR SA SI CL				
0.0	Ice and water					178.7														
2.8	Peat, fine fibrous					178.0														
	Dark brown		1	SS	WH**	178.0									253	Org. 12.6%				
178.0	Organic silt, with sand some gravel, trace clay					177														
3.5	Very loose Dark Wet grey		2	SS	1	176.7									314	Org. 22.1%				
176.7	End of borehole																			
4.8	Refusal on probable bedrock																			

## RECORD OF PENETRATION TEST No 301-37

1 of 1 **METRIC**

G.W.P.	5203-06-00	LOCATION	Hwy 69 (New), Sta. 19+375, o/s 40.5m Rt. CL Med.	ORIGINATED BY	N.L.B.
DIST	54	HWY	69	BOREHOLE TYPE	Dynamic Cone Penetration Test
				COMPILED BY	N.S.B.
DATUM	Geodetic	DATE	March 19, 2007	CHECKED BY	C.N.

[illegible]

RECORD OF BOREHOLE No 301-38

1 of 1

METRIC

G.W.P. 5203-06-00 LOCATION Hwy 69(New), Sta. 19+400, o/s 18.8m Lt. CL Med. ORIGINATED BY N.R.  
DIST 54 HWY 69 BOREHOLE TYPE Manual Probing COMPILED BY N.S.B.  
DATUM Geodetic DATE March 29, 2007 CHECKED BY C.N.

SOIL PROFILE		SAMPLES				* GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT			UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100	W <sub>p</sub>	W	W <sub>L</sub>		
183.0	Ground Surface																
0.0	Bedrock at surface																
	* Borehole dry																

RECORD OF BOREHOLE No D6-9

1 of 1

METRIC

G.W.P. 5378-02-00 LOCATION Hwy. 69 (New) Sta. 19+350, o/s 20m Lt. CL Med. ORIGINATED BY R.E.  
DIST 54 HWY 69 BOREHOLE TYPE Casing + Washboring COMPILED BY R.E.  
DATUM Geodetic DATE March 15, 2004 CHECKED BY C.N.

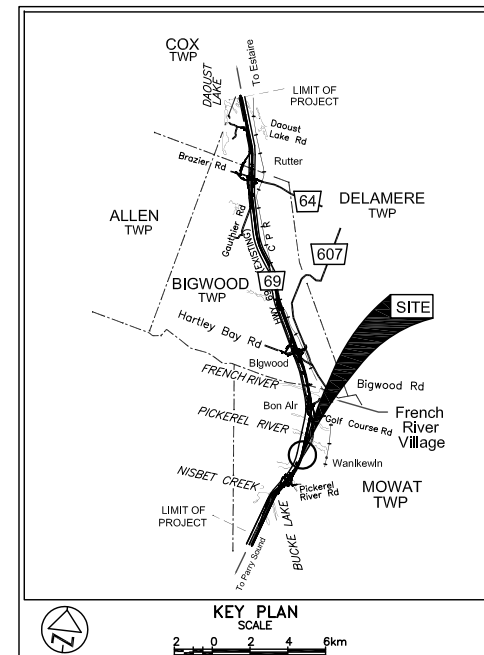
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT  w <sub>p</sub>	NATURAL MOISTURE CONTENT  w	LIQUID LIMIT  w <sub>L</sub>	UNIT WEIGHT  γ  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)  GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								○ UNCONFINED		+ FIELD VANE							
								● QUICK TRIAXIAL		× LAB VANE							
WATER CONTENT (%)																	
180.6 0.0	Top of Ice Ice					▼*		20	40	60	80	100	20	40	60		
180.0 0.6	Water					▽*	180										
							179										
							178										
177.0 3.6	Organic silt, trace clay Very loose Brown Wet  (Alluvium)  trace sand		1	SS	WR**		177									168	
							176										
			2	SS	WH***		175									193	
							174										
173.6 7.0	Silt trace sand, trace clay organics  Very loose Grey Wet  trace gravel Loose		3	SS	WR		173									171	
							172										
			4	SS	10		171										
170.7 9.9	End of borehole Refusal on probable bedrock  * 2004 03 15  ▽ Water level observed during drilling ▼ Water level measured after drilling  WR** Refers to penetration under weight of rods only WH*** Refers to penetration under weight of rods and hammer "N" values converted from 31.8 kg (70 lb) hammer																

**RECORD OF PENETRATION TEST No D6-11**

1 of 1 **METRIC**

G.W.P. 5378-02-00 LOCATION Hwy. 69 (New) Sta. 19+398, o/s 18m Rt. CL Med. ORIGINATED BY R.E.  
 DIST 54 HWY 69 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY R.E.  
 DATUM Geodetic DATE March 15, 2004 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100	W <sub>p</sub>	W	W <sub>L</sub>		
180.6 0.0	Top of Ice Ice																
	Probable Peat and Alluvium																
179.1	Very loose																
1.5	End of dynamic cone penetration test Refusal on probable bedrock																



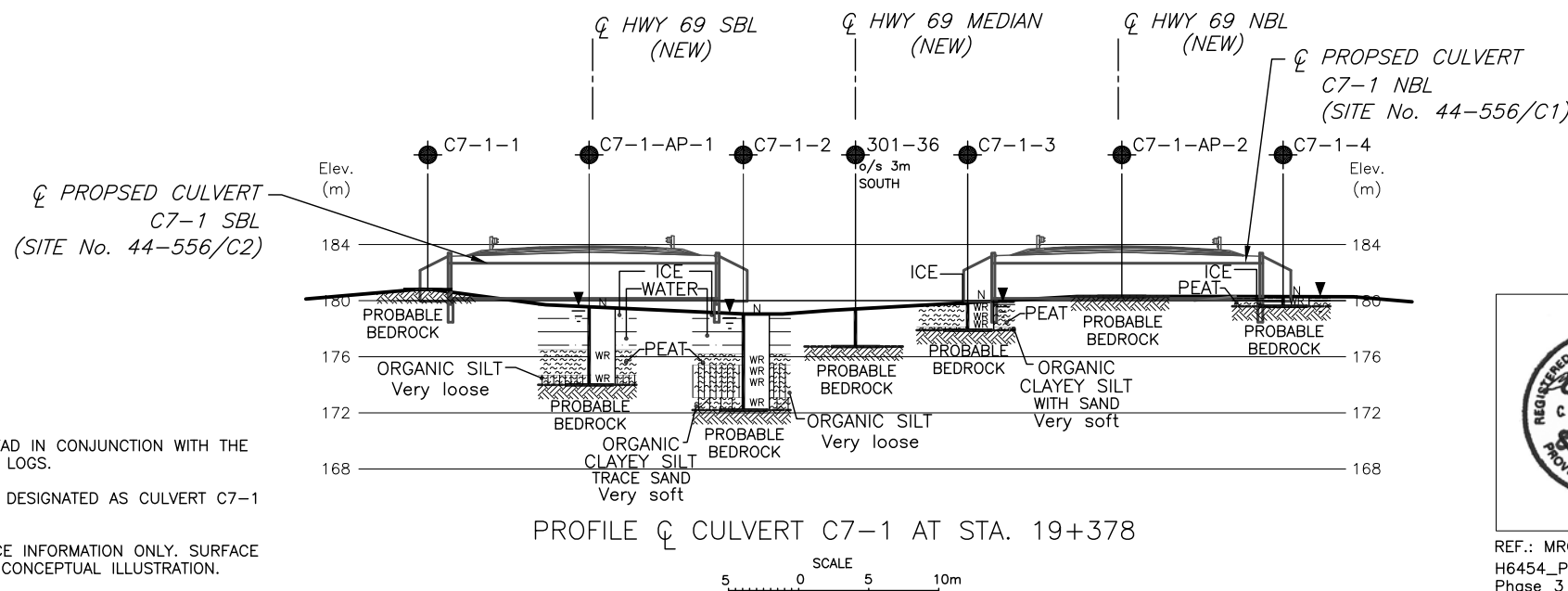
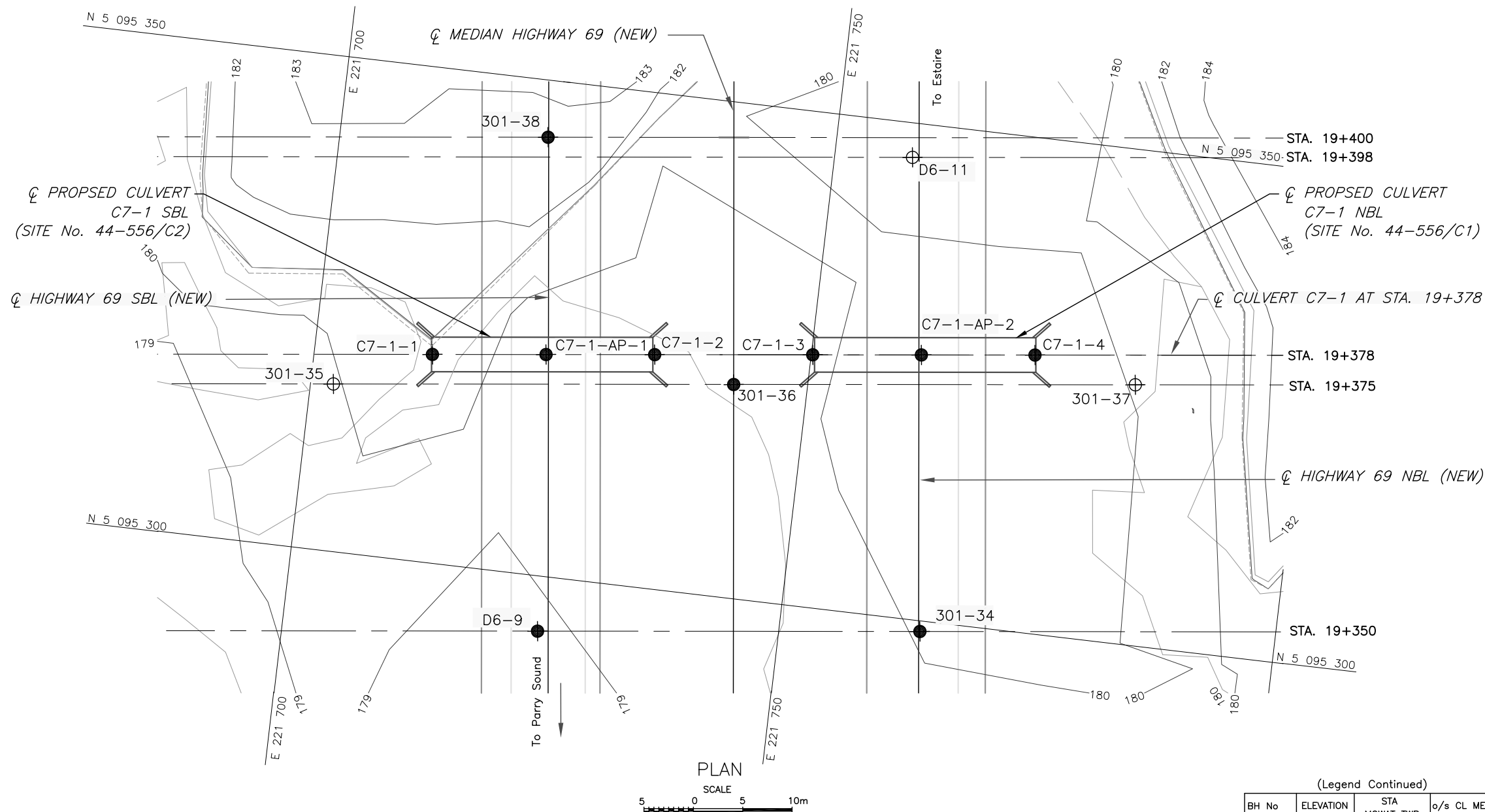
LEGEND			
	Borehole		
	Dynamic Cone Penetration Test (Cone)		
	Borehole & Cone		
N	Blows/0.3m (Std. Pen Test, 475 J/blow)		
CONE	Blows/0.3m (60° Cone, 475 J/blow)		
WH	Penetration due to weight of hammer and rods		
WR	Penetration due to weight of rods only		
	W L at time of investigation Mar 2010		
	Head and rods		
	ARTESIAN WATER Encountered		
	PIEZOMETER		

BH No	ELEVATION	CO-ORDS	
		NORTHING	EASTING
C7-1-1	180.8	N 5 095 321.0	E 221 711.9
C7-1-2	179.1	N 5 095 323.6	E 221 734.3
C7-1-3	179.9	N 5 095 325.5	E 221 750.2
C7-1-4	180.3	N 5 095 328.1	E 221 772.5
C7-1-AP-1	179.6	N 5 095 322.4	E 221 723.3
C7-1-AP-2	180.3	N 5 095 326.8	E 221 761.1

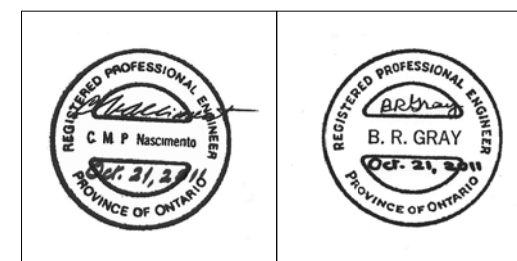
— NOTE —  
The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

REVISIONS		DATE		BY		DESCRIPTION	

Geocres No. 41H-101		HWY No 69		DIST 54 (Sudbury)	
SUBM'D	MN	CHECKED	MN	DATE OCT. 21, 2011	SITE 44-558/C1&C2
DRAWN	NA	CHECKED	CN	APPROVED BRG	DWG C7-1-1



- NOTES:
- DRAWING C7-1-1 SHOULD BE READ IN CONJUNCTION WITH THE TEXT AND RECORD OF BOREHOLE LOGS.
  - CULVERTS AT STA. 19+378 WERE DESIGNATED AS CULVERT C7-1 FOR THE INVESTIGATION.
  - THIS DRAWING IS FOR SUBSURFACE INFORMATION ONLY. SURFACE DETAILS AND FEATURES ARE FOR CONCEPTUAL ILLUSTRATION.
  - DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS ARE IN KILOMETRES AND METRES.



REF.: MRC DRAWINGS  
H6454\_PHASE3\_XA01.dwg; H6454\_PHASE3\_XN01.dwg;  
Phase\_3\_Culvert\_Plan\_View\_100205;  
Phase\_3\_Culvert\_Cross\_Sections\_-\_Mainline\_-\_100205;  
H6454xb1 zone 10; H6454xb2 contours zone 10