



**TABLE 1**  
**Atterberg Limits**

<b>SOIL TYPE</b>	<b>BOREOLE NO.</b>	<b>SAMPLE NO.</b>	<b>LIQUID LIMIT</b>	<b>PLASTIC LIMIT</b>	<b>PLASTICITY INDEX</b>	<b>MOISTURE CONTENT (%)</b>
Clayey Silt	SP-N1	3	28	19	9	26
	SP-N2	2	32	20	12	28
	SP-N14	2	28	18	10	23
	SP-N14	4	27	20	7	31
Silt	SP-N10	4	27	24	3	25
	SP-N14	5	22	19	3	11



TABLE 2  
 ROCK CORE DESCRIPTION

CORE RECOVERY					CORE DESCRIPTION	
HOLE NO.	CORE NO.	DEPTH (m)	RECOVERY (%)	RQD (%)	DEPTH (m)	DESCRIPTION
SP-N3	2	0.5 – 1.4	74	28	0.5 – 4.1	GRANITIC GNEISS: Pink and grey with slight banding, fine to medium grained, high strength, slightly weathered to unweathered, very close to close spaced flat cross joints with intersecting vertical fissures to 1.4 m depth, becoming moderate to wide spaced flat cross joints, rough planar, tight to slightly altered with green or red oxidation on partings, poor becoming excellent quality.
	3	1.4 – 3.0	97	94		
	4	3.0 – 4.1	99	99		
SP-N4	1	0.0 – 1.6	100	100	0.0 – 3.6	GRANITIC GNEISS: Pink and grey with slight banding, fine to medium grained, high strength, slightly weathered to unweathered, close to moderate spaced flat cross joints, rough planar, tight to slightly altered with white scale on partings, locally separating on black biotite seams, with vertical parting at 2.3 to 2.8 m depth, rough planar, with red oxidation and/or silt on parting, fair to excellent quality.
	2	1.6 – 2.8	96	57		
	3	2.8 – 3.6	91	91		
SP-N5	1	0.4 – 1.2	94	41	0.4 - 3.5	GRANITIC GNEISS: Pink and grey with slight banding, fine to medium grained, high strength, unweathered, close spaced (locally multiple) dipping to vertical cross joints to 2.6 m depth, rough planar, tight to slightly altered with red oxidation on partings, occasionally separates on biotite concentrations, close to moderate spaced flat cross joints, rough planar, tight, poor to good quality.
	2	1.2 – 2.6	95	75		
	3	2.6 – 3.5	86	86		
SP-N6	1	0.6 – 1.5	94	29	0.6 – 4.2	GRANITIC GNEISS: Pink and grey with slight banding, fine to medium grained, high strength, unweathered, close to moderate (locally wide) spaced flat cross joints, smooth to rough planar, generally tight, locally slightly altered with brown oxidation on partings, with close spaced vertical partings to 1.6 m depth, rough planar, tight, poor becoming excellent quality.
	2	1.5 – 3.0	97	97		
	3	3.0 – 4.2	98	93		

NOTE: RQD = Rock Quality Designation

Originated: FP  
 Compiled: PML  
 Checked: CN

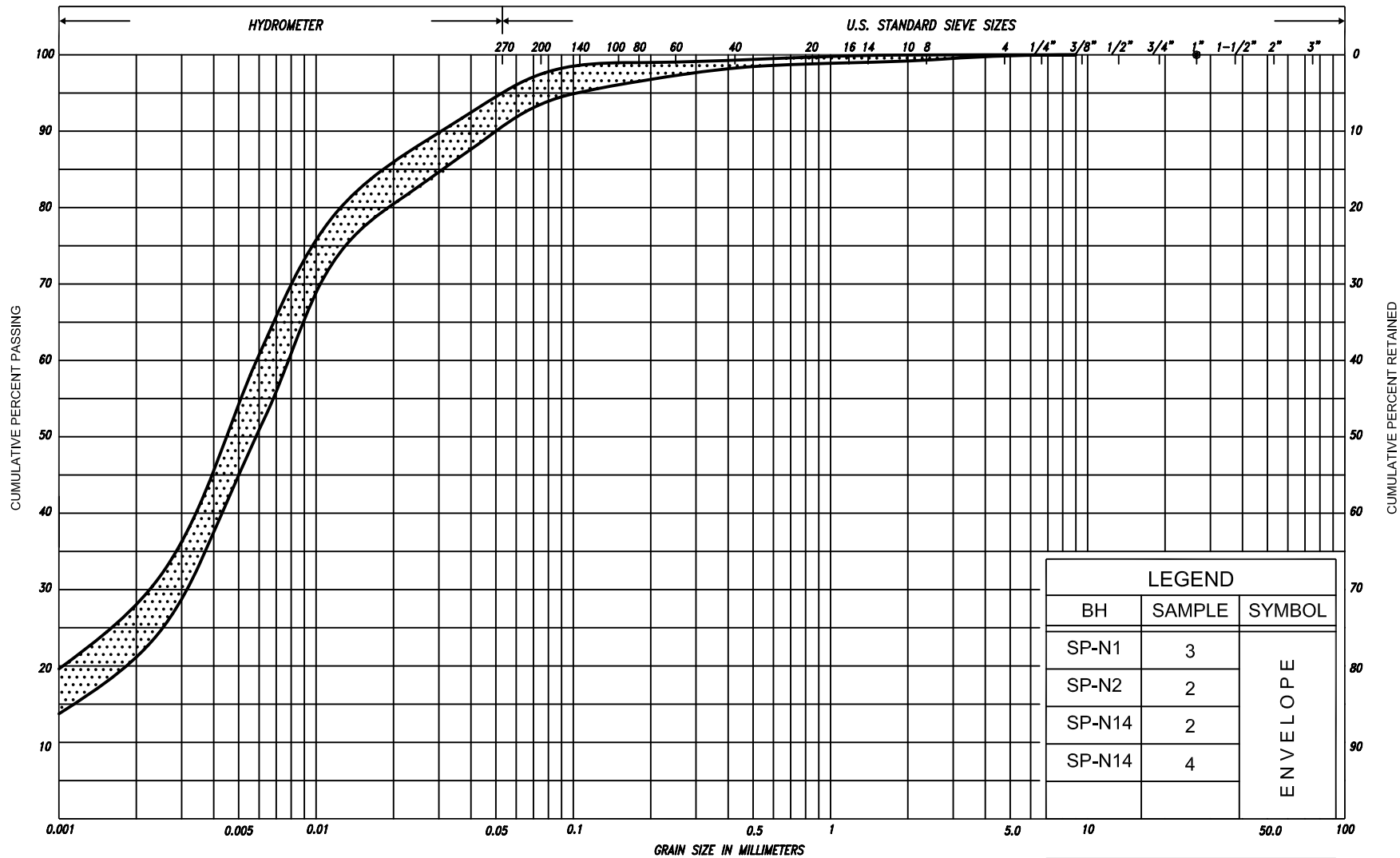


TABLE 2  
 ROCK CORE DESCRIPTION

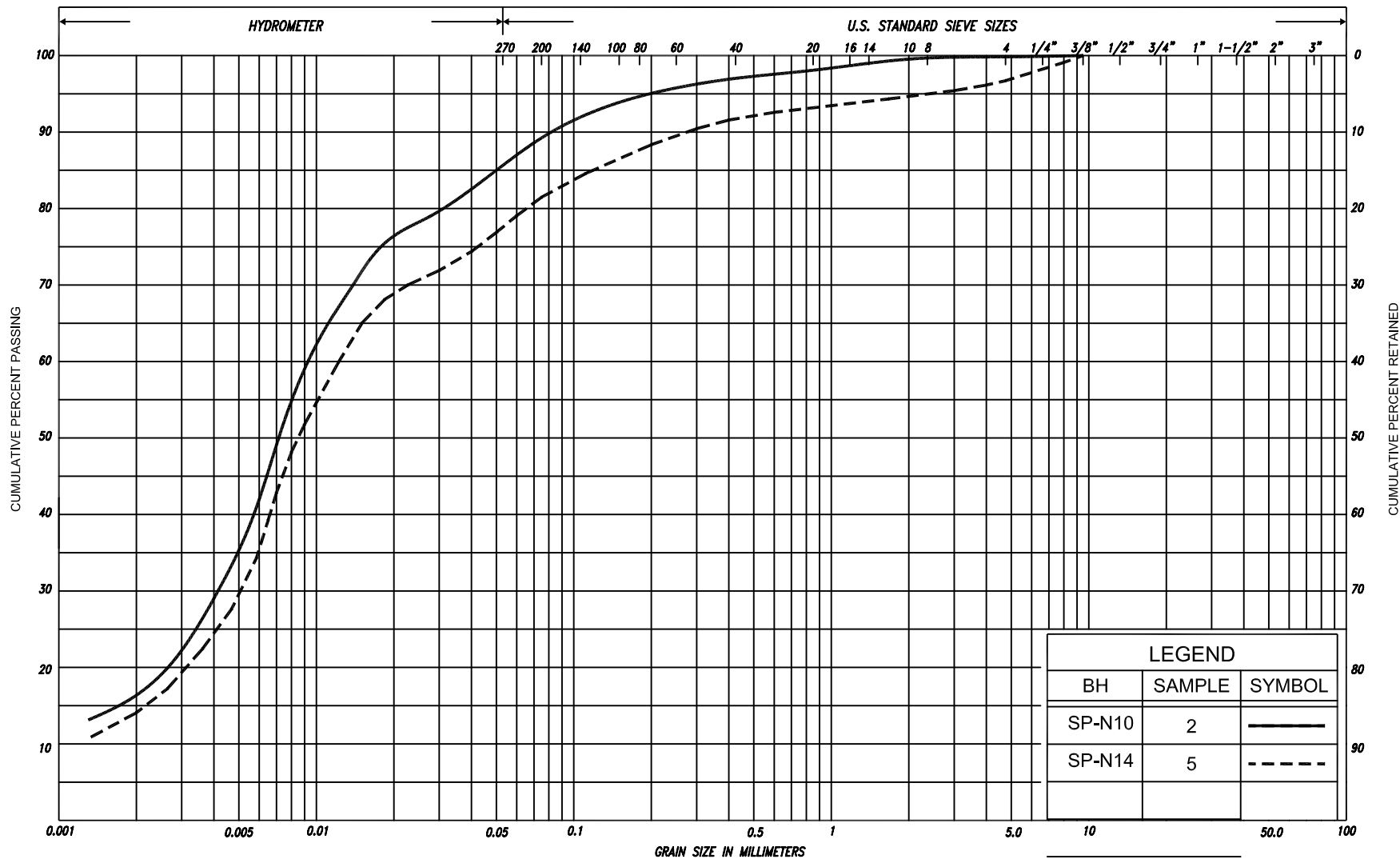
HOLE NO.	CORE RECOVERY				CORE DESCRIPTION	
	CORE NO.	DEPTH (m)	RECOVERY (%)	RQD (%)	DEPTH (m)	DESCRIPTION
SP-N9	3	1.5 – 3.0	92	79	1.5 – 4.6	GRANITIC GNEISS: Pink and grey with slight banding, fine to medium grained, high strength, unweathered, moderate spaced vertical partings to 3.4 m depth, rough planar, slightly altered with red or brown oxidation on partings, occasionally separates on biotite concentrations, close to moderate spaced flat cross joints, rough planar, tight, good to excellent quality.
	4	3.0 – 3.9	100	89		
	5	3.9 – 4.6	100	96		
SP-N10	3	1.1 – 2.6	96	73	1.1 – 4.3	GRANITIC GNEISS: Pink and grey with slight banding, changing to pink with black biotite concentrations, fine to medium grained, high strength, slightly weathered to unweathered, very close to close becoming close to moderate spaced flat cross joints, rough planar, tight, with moderate spaced vertical cross joints, rough planar, tight to slightly altered with red oxidation and/or white/light grey scale on parting, fair to excellent quality.
	4	2.6 – 2.9	95	95		
	5	2.9 – 4.3	100	88		
SP-N11	2	0.7 – 0.9	94	56	0.7 - 3.9	GRANITIC GNEISS: Pink and grey with occasional pink bands, fine to medium grained, high strength, unweathered, close to moderate (locally very close) spaced flat to dipping cross joints, rough planar, tight to slightly altered with red oxidation on partings, fair to excellent quality.
	3	0.9 – 2.5	94	94		
	4	2.5 – 3.9	92	83		
SP-N12	1	0.5 – 1.4	90	80	0.5 - 3.8	GRANITIC GNEISS: Pink and grey with slight banding, occasional 10 mm thick dark layers, fine to medium grained (locally coarse grained at depth), high strength, unweathered, close to moderate spaced flat to dipping cross joints, occasional vertical, rough planar, tight to slightly altered with red or brown oxidation on partings, good to excellent quality.
	2	1.4 – 2.9	97	76		
	3	2.9 – 3.8	100	91		

NOTE: RQD = Rock Quality Designation

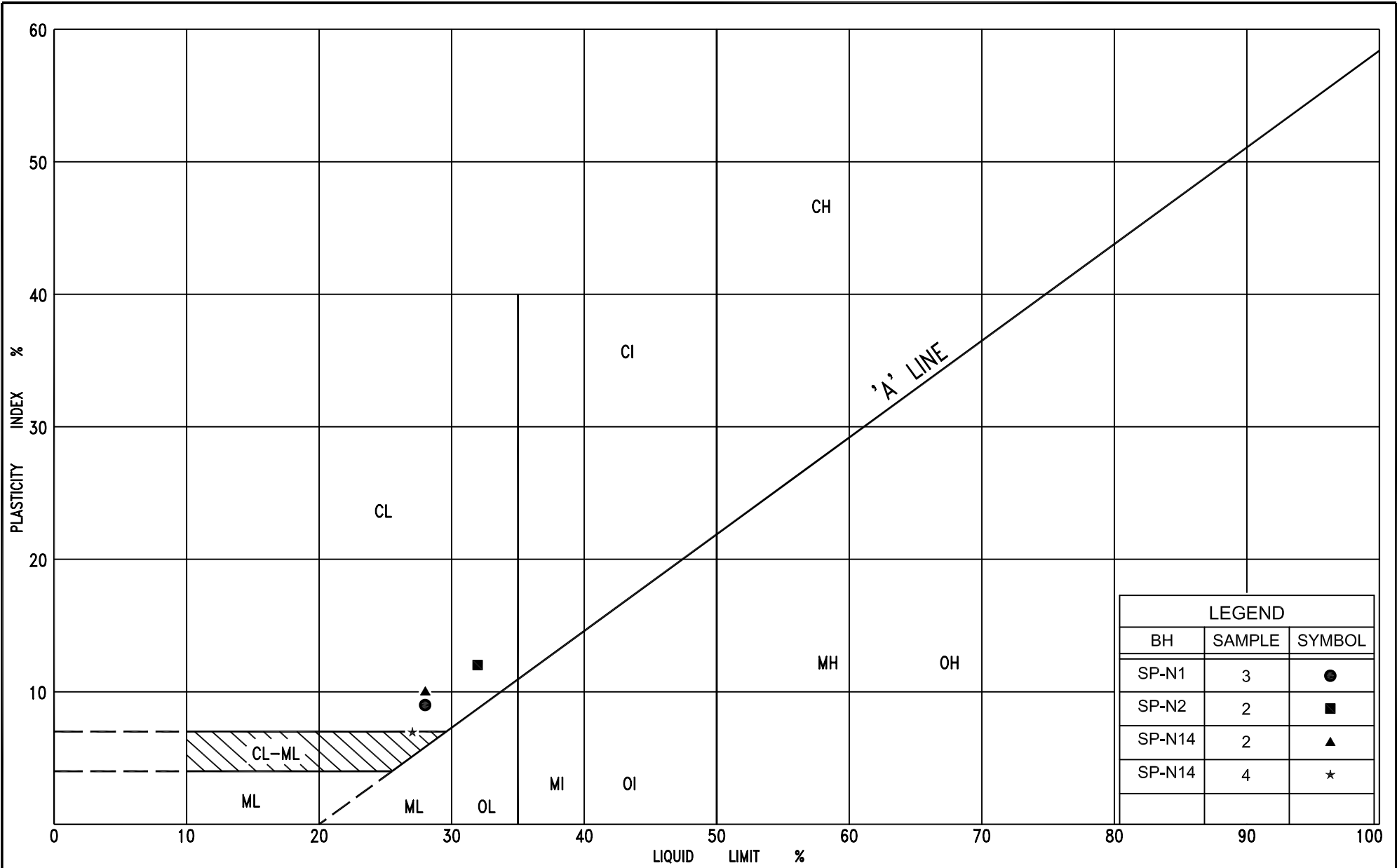
Originated: FP  
 Compiled: PML  
 Checked: CN

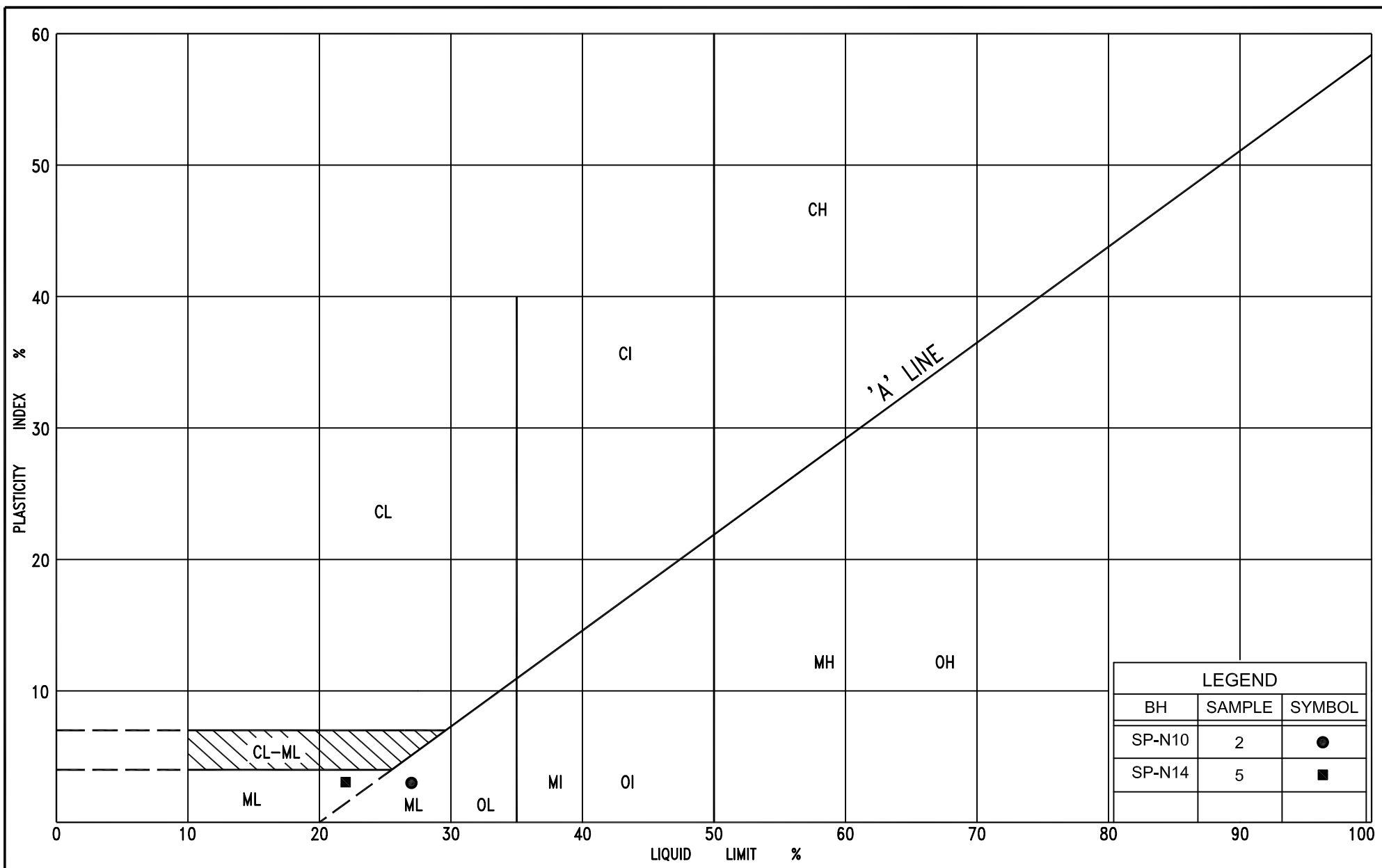


SILT & CLAY					FINE		MEDIUM		COARSE	GRAVEL			COB BLES	UNIFIED			
					SAND												
CLAY	FINE		MEDIUM		COARSE		FINE		MEDIUM		COARSE		GRAVEL			COBBLES	M.I.T.
	SILT							V. FINE		FINE	MED.	COARSE	GRAVEL				U.S. BUREAU
CLAY			SILT			SAND											



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





## 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.

**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:

RQD (%)	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

$m_v$	$kPa^{-1}$	COEFFICIENT OF VOLUME CHANGE
$C_c$	1	COMPRESSION INDEX
$C_s$	1	SWELLING INDEX
$C_\alpha$	1	RATE OF SECONDARY CONSOLIDATION
$c_v$	$m^2/s$	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
$T_v$	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
$\sigma'_{vo}$	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
$S_t$	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

### PHYSICAL PROPERTIES OF SOIL

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



**RECORD OF BOREHOLE No SP-N1**

1 of 1

**METRIC**

W.P. 5275-05-01 LOCATION Coords: 5 097 933.6 N; 337 056.5 E ORIGINATED BY F.P.  
 DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.R.  
 DATUM Geodetic DATE January 25, 2009 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						WATER CONTENT (%)			GR	SA	SI		CL										
						○ UNCONFINED      + FIELD VANE ● QUICK TRIAXIAL    × LAB VANE																							
207.4	Ground Surface								20	40	60	80	100		20	40	60												
0.0 207.1	Topsoil		1	SS	12		207								○														
0.3	Clayey silt trace sand, trace gravel  Stiff to Brown Moist hard		2	SS	23		206								○														
205.3			3	SS	45										1-e											1	5	69	25
2.1	End of borehole  Refusal on probable bedrock                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                <																												

**RECORD OF BOREHOLE No SP-N2**

1 of 1

**METRIC**

W.P. 5275-05-01 LOCATION Coords: 5 097 944.8 N; 337 041.5 E ORIGINATED BY F.P.  
 DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.R.  
 DATUM Geodetic DATE January 25, 2009 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER * CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT 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 (%)				
207.1	Ground Surface						20	40	60	80	100						GR SA SI CL
0.0	Topsoil		1	SS	9												
206.7																	
0.4	Clayey silt trace sand, trace gravel																
205.9	Stiff to Brown Moist hard		2	SS	10/10cm												0 3 69 28
1.2	End of borehole																
	Refusal on probable bedrock																
	Sample 2: Sampler bouncing																
	* Borehole dry																

**RECORD OF BOREHOLE No SP-N3**

1 of 1

**METRIC**

W.P. 5275-05-01 LOCATION Coords: 5 097 952.3 N; 337 053.5 E ORIGINATED BY F.P.  
 DIST 54 HWY 69 BOREHOLE TYPE C.F.S.S.A. AND NW CORE COMPILED BY N.R.  
 DATUM Geodetic DATE January 22, 2009 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	×					
208.1	Ground Surface						20	40	60	80	100						
0.0 207.8	Topsoil		1	SS	37/15cm												
0.3 207.6	Silty sand, trace gravel																
0.5 207.6	Very dense Brown Moist Granitic Gneiss bedrock  Slightly weathered to unweathered  High strength  Poor becoming excellent quality		2	RC NQ	REC 74%											RQD 28%	
			3	RC NQ	REC 97%											RQD 94%	
			4	RC NQ	REC 99%											RQD 99%	
204.0 4.1			End of borehole														
	* Borehole charged with drilling water  C.F.S.S.A. denotes Continuous Flight Solid Stem Augers																

**RECORD OF BOREHOLE No SP-N4**

1 of 1

**METRIC**

W.P. 5275-05-01 LOCATION Coords: 5 097 950.6 N; 337 046.0 E ORIGINATED BY F.P.  
 DIST 54 HWY 69 BOREHOLE TYPE NW CORE COMPILED BY N.R.  
 DATUM Geodetic DATE January 22, 2009 CHECKED BY C.N.




SOIL PROFILE			SAMPLES			GROUND WATER * CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT  $\gamma$  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)							
								<div><div>20406080100</div><div>○ UNCONFINED + FIELD VANE</div><div>● QUICK TRIAXIAL x LAB VANE</div></div>					<div><div>W<sub>p</sub>Ww<sub>L</sub></div><div>—○—</div></div>							
207.9	Ground Surface																			
0.0	Granitic Gneiss bedrock High strength Slightly weathered to unweathered Fair to excellent quality		1	RC NQ	REC 100%	207												RQD 100%		
			2	RC NQ	REC 96%		206													RQD 57%
			3	RC NQ	REC 91%		205													
204.3	End of borehole																			
3.6																				
	* Borehole charged with drilling water																			

**RECORD OF BOREHOLE No SP-N5**

1 of 1

**METRIC**

W.P. 5275-05-01 LOCATION Coords: 5 097 948.1 N; 337 039.5 E ORIGINATED BY F.P.  
 DIST 54 HWY 69 BOREHOLE TYPE C.F.S.S.A. AND NW CORE COMPILED BY N.R.  
 DATUM Geodetic DATE January 23, 2009 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					w <sub>p</sub> w                      w <sub>L</sub>						
								○ UNCONFINED                      + FIELD VANE ● QUICK TRIAXIAL                      x LAB VANE					WATER CONTENT (%)						
207.0	Ground Surface					*	ELEVATION SCALE	20	40	60	80	100						GR SA SI CL	
0.0	Topsoil							20	40	60	80	100							
206.6																			
0.4	Granitic Gneiss bedrock																		
	High strength		1	RC NQ	REC 94%			206											RQD 41%
	Unweathered		2	RC NQ	REC 95%			205											RQD 75%
	Poor to good quality					204										RQD 86%			
203.5	End of borehole			3	RC NQ	REC 86%													
3.5																			
	* Borehole charged with drilling water																		
	C.F.S.S.A. denotes Continuous Flight Solid Stem Augers																		

**RECORD OF BOREHOLE No SP-N6**

1 of 1

**METRIC**

W.P. 5275-05-01 LOCATION Coords: 5 097 949.7 N; 337 042.1 E ORIGINATED BY F.P.  
 DIST 54 HWY 69 BOREHOLE TYPE C.F.S.S.A. AND NW CORE COMPILED BY N.R.  
 DATUM Geodetic DATE January 23, 2009 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					W <sub>p</sub>	W	W <sub>L</sub>						
								○ UNCONFINED      + FIELD VANE ● QUICK TRIAXIAL    × LAB VANE					WATER CONTENT (%)								
207.1	Ground Surface					*	207	20	40	60	80	100						GR SA SI CL			
0.0	Topsoil																				
206.5	Granitic Gneiss bedrock High strength Unweathered Poor becoming excellent quality		1	RC NQ	REC 94%		206													RQD 29%	
0.6			2	RC NQ	REC 97%		205														RQD 97%
			3	RC NQ	REC 98%		204														
									203												
202.9	End of borehole																				
4.2																					
	* Borehole charged with drilling water  C.F.S.S.A. denotes Continuous Flight Solid Stem Augers																				

**RECORD OF BOREHOLE No SP-N7**

1 of 1

**METRIC**

W.P. 5275-05-01 LOCATION Coords: 5 097 955.5 N; 337 051.5 E ORIGINATED BY F.P.  
 DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.R.  
 DATUM Geodetic DATE January 25, 2009 CHECKED BY C.N.

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT			UNIT WEIGHT $\gamma$	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		20	40	60	80	100	$W_p$	$W$	$W_L$		
208.2	Ground Surface															
0.0 207.9	Topsoil	~ ~ ~	1	SS	7/15cm	208										
0.3	End of borehole															
	Refusal on probable bedrock															
	Sample 1: Sampler bouncing															
	* Borehole dry															

**RECORD OF BOREHOLE No SP-N8**

1 of 1

**METRIC**

W.P. 5275-05-01 LOCATION Coords: 5 097 957.8 N; 337 033.5 E ORIGINATED BY F.P.  
 DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.R.  
 DATUM Geodetic DATE January 25, 2009 CHECKED BY C.N.

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT			UNIT WEIGHT $\gamma$	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>		
207.2	Ground Surface						20	40	60	80	100					
0.0	Topsoil		1	SS	11	207										
0.3	Silt trace clay, trace sand															
206.9	Compact Brown Moist		2	SS	10/8cm											
0.9	End of borehole															
	Refusal on probable bedrock															
	Sample 2: Sampler bouncing															
	* Borehole dry															







**RECORD OF BOREHOLE No SP-N9**

1 of 1

**METRIC**

W.P. 5275-05-01 LOCATION Coords: 5 097 963.3 N; 337 042.5 E ORIGINATED BY F.P.  
 DIST 54 HWY 69 BOREHOLE TYPE C.F.S.S.A. AND NW CORE COMPILED BY N.R.  
 DATUM Geodetic DATE January 25, 2009 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 (%)  GR   SA   SI   CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	*N* VALUES			SHEAR STRENGTH kPa					w <sub>p</sub>	w	w <sub>L</sub>					
207.4 0.0	Ground Surface Topsoil		1	SS	1		207										RQD 79%			
206.8 0.6	Clayey silt trace sand, trace gravel		2	SS	1		206													
205.9 1.5	Very soft Mottled Moist grey/brown						205													
	Granitic Gneiss bedrock High strength Unweathered Good to excellent quality		3	RC NQ	REC 92%		204													
			4	RC NQ	REC 100%		203													
			5	RC NQ	REC 100%															
202.8 4.6	End of borehole																			
	*   Borehole charged with drilling water  C.F.S.S.A. denotes Continuous Flight Solid Stem Augers																			

**RECORD OF BOREHOLE No SP-N10**

1 of 1

**METRIC**

W.P. 5275-05-01 LOCATION Coords: 5 097 965.2 N; 337 045.5 E ORIGINATED BY F.P.  
 DIST 54 HWY 69 BOREHOLE TYPE C.F.S.S.A. AND NW CORE COMPILED BY N.R.  
 DATUM Geodetic DATE January 25, 2009 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			● QUICK TRIAXIAL      × LAB VANE										
207.9	Ground Surface							20	40	60	80	100									
0.0	Topsoil		1	SS	3																
207.6	Silt, some clay some sand, trace gravel																				
0.3	Compact    Grey/    Moist brown		2	SS	22																
206.8	Granitic Gneiss bedrock High strength Slightly weathered to unweathered Fair to excellent quality		3	RC NQ	REC 96%																
1.1			4	RC NQ	REC 95%																
			5	RC NQ	REC 100%																
203.6	End of borehole																				
4.3																					
	*    Borehole charged with drilling water  C.F.S.S.A. denotes Continuous Flight Solid Stem Augers																				

# RECORD OF BOREHOLE No SP-N11

1 of 1



**METRIC**

W.P. 5275-05-01 LOCATION Coords: 5 097 962.5 N; 337 038.6 E ORIGINATED BY F.P.  
 DIST 54 HWY 69 BOREHOLE TYPE C.F.S.S.A. AND NW CORE COMPILED BY N.R.  
 DATUM Geodetic DATE January 23, 2009 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					
207.3	Ground Surface						20	40	60	80	100						
0.0	Topsoil		1	SS	1												
207.0	Clayey silt																
0.3	trace sand, trace gravel																
206.6	Very soft Mottled Moist grey/brown		2	RC NQ	REC 94%											RQD 56%	
0.7	Granitic Gneiss bedrock																
	High strength																
	Unweathered		3	RC NQ	REC 94%											RQD 94%	
	Fair to excellent quality																
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
																	
203.4	End of borehole																
3.9																	
	<div>* Borehole charged with drilling water</div> <div>C.F.S.S.A. denotes Continuous Flight Solid Stem Augers</div>																

**RECORD OF BOREHOLE No SP-N12 1 of 1 METRIC**

W.P. 5275-05-01 LOCATION Coords: 5 097 961.0 N; 337 031.5 E ORIGINATED BY F.P.  
 DIST 54 HWY 69 BOREHOLE TYPE C.F.S.S.A. AND NW CORE COMPILED BY N.R.  
 DATUM Geodetic DATE January 23, 2009 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			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												
206.9	Ground Surface					*	206	20	40	60	80	100	20	40	60	kN/m³	GR SA SI CL			
0.0	Topsoil																			
206.4	Granitic Gneiss bedrock High strength Unweathered Good to excellent quality		1	RC NQ	REC 90%			205												RQD 80%
0.5			2	RC NQ	REC 97%				204											
			3	RC NQ	REC 100%											RQD 91%				
203.1	End of borehole																			
3.8	<div>* Borehole charged with drilling water</div> <div>C.F.S.S.A. denotes Continuous Flight Solid Stem Augers</div>																			

**RECORD OF BOREHOLE No SP-N13**

1 of 1

**METRIC**

W.P. 5275-05-01 LOCATION Coords: 5 097 968.4 N; 337 043.5 E ORIGINATED BY F.P.  
 DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.R.  
 DATUM Geodetic DATE January 25, 2009 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT 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 (%)				GR	SA	SI	CL	
207.8 0.0	Ground Surface Topsoil		1	SS	2	207										Org. 9.5%					
207.3 0.5	Clayey silt trace sand, trace gravel																				
206.4 1.4	Hard Mottled Moist grey/brown		2	SS	12/10cm																
	End of borehole Refusal on probable bedrock																				
	* Borehole dry																				

**RECORD OF BOREHOLE No SP-N14**

1 of 1

**METRIC**

W.P. 5275-05-01 LOCATION Coords: 5 097 979.5 N; 337 028.1 E ORIGINATED BY F.P.  
 DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.R.  
 DATUM Geodetic DATE January 25, 2009 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 (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					W <sub>p</sub>	W	W <sub>L</sub>		GR	SA	SI	CL	
					○ UNCONFINED      + FIELD VANE ● QUICK TRIAXIAL    × LAB VANE					WATER CONTENT (%)											
207.1	Ground Surface					*	207														
0.0	Topsoil		1	SS	9																
206.8	Clayey silt, trace sand																				
0.3																					
				2	SS		16														
	Stiff to Mottled Moist very stiff grey/ to wet brown																				
				3	SS	18															
															</						

1 of 1 **METRIC**


20  
15 — 5 (%) STRAIN AT FAILURE  
10

RECORD OF BOREHOLE No SPR-4

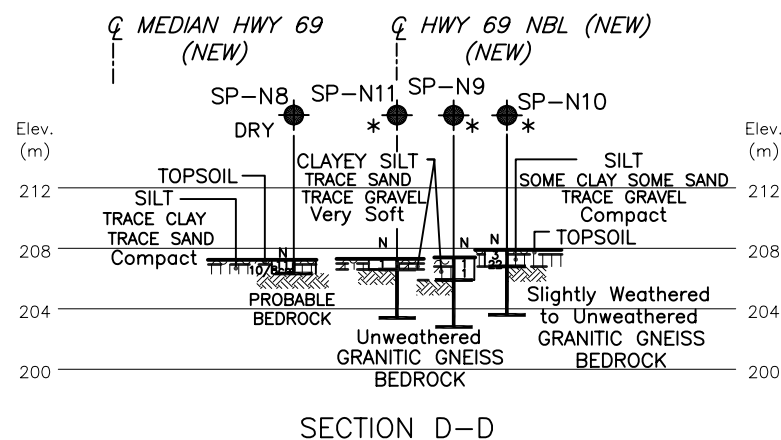
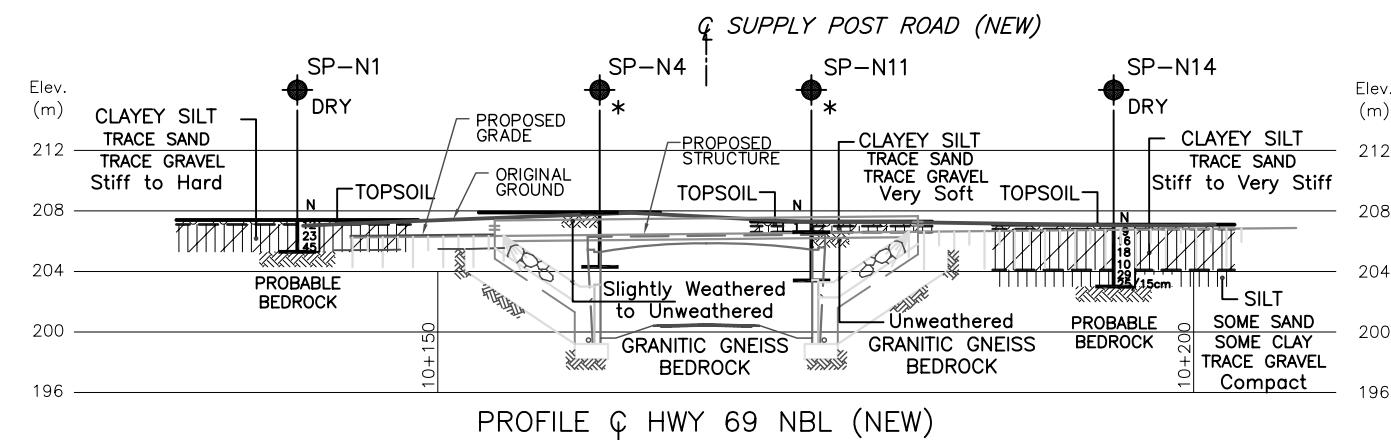
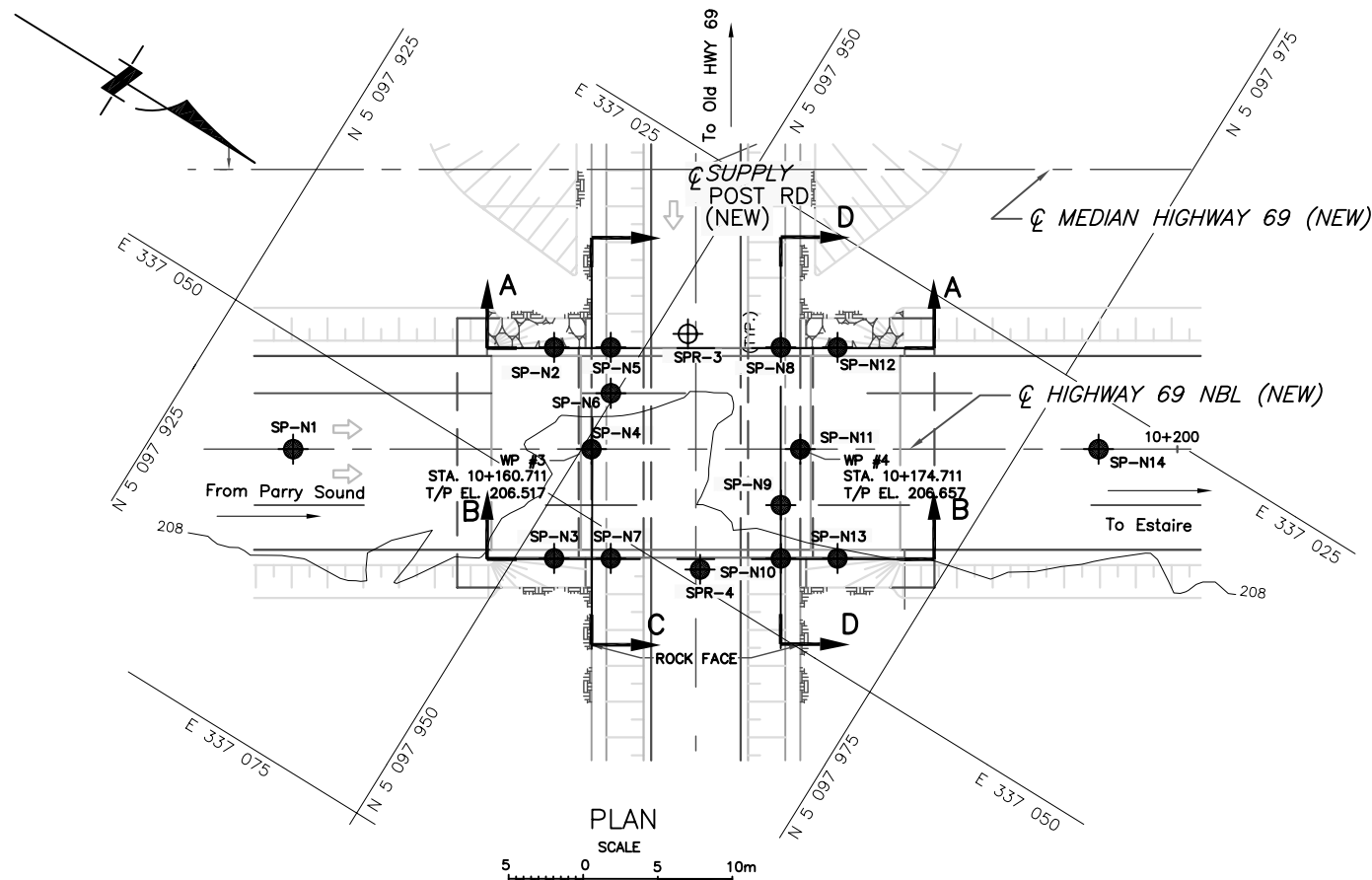
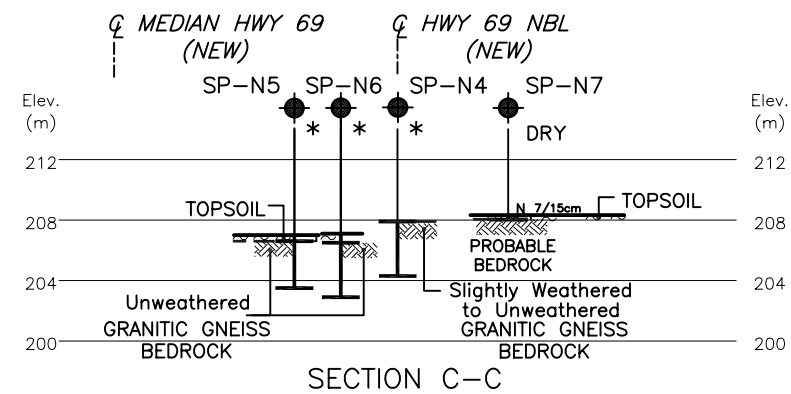
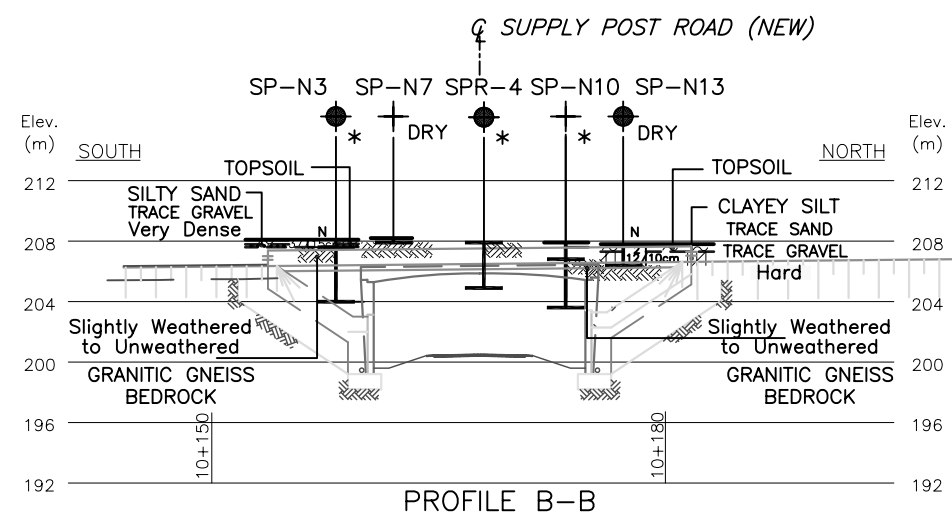
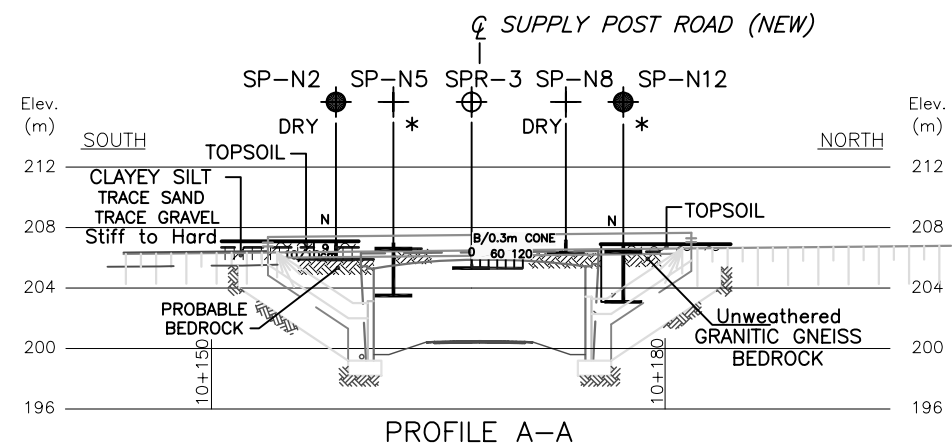
1 of 1

METRIC

W.P. 5275-05-01 LOCATION Supply Post Road Overpass  
Co-ords. 5 097 961 N; 337 049 E  
DIST 54 HWY 69 BOREHOLE TYPE NQ Rock Coring  
DATUM Geodetic DATE May 28, 2004  
ORIGINATED BY M.R.  
COMPILED BY M.R.  
CHECKED BY D.W.K.

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	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>		
207.9	Ground Surface						20	40	60	80	100					
0.0	Bedrock		1	RC NQ	REC 98%											RQD 87%
	Granitic Gneiss															
	High strength		2	RC NQ	REC 95%											RQD 87%
	Good quality															
204.9	End of borehole															
3.0	Borehole charged with drilling water															





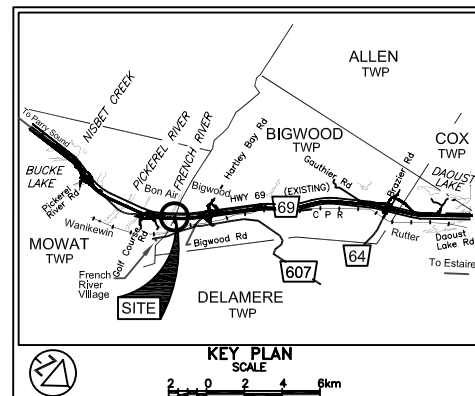
NOTES:









1. THE DRAWING SPN-1 SHOULD BE READ IN CONJUNCTION WITH THE TEXT AND THE RECORD OF BOREHOLE LOGS.
2. THIS DRAWING IS FOR SUBSURFACE INFORMATION ONLY. SURFACE DETAILS AND FEATURES ARE FOR CONCEPTUAL ILLUSTRATION.
3. BOREHOLES SPR-3 AND SPR-4 WERE DRILLED FOR THE PRELIMINARY INVESTIGATION IN 2004.
4. DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS ARE IN KILOMETRES AND METRES.

CONT No  
WP No 5275-05-01

**SUPPLY POST ROAD NB OVERPASS**  
**HIGHWAY 69**  
**BOREHOLE LOCATIONS AND SOIL STRATA**

**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)
	W L at time of investigation Jan 2009; May 2004 (SPR-4)
*	W L not established
	Head
	ARTESIAN WATER
	Encountered
	PIEZOMETER

BH No	ELEVATION	CO-ORDINATES	
		NORTHINGS	EASTINGS
SP-N1	207.4	5 097 933.6	337 056.5
SP-N2	207.1	5 097 944.8	337 041.5
SP-N3	208.1	5 097 952.3	337 053.5
SP-N4	207.9	5 097 950.6	337 046.0
SP-N5	207.0	5 097 948.1	337 039.5
SP-N6	207.1	5 097 949.7	337 042.1
SP-N7	208.2	5 097 955.5	337 051.5
SP-N8	207.2	5 097 957.8	337 033.5
SP-N9	207.4	5 097 963.3	337 042.5
SP-N10	207.9	5 097 965.2	337 045.5
SP-N11	207.3	5 097 962.5	337 038.6
SP-N12	206.9	5 097 961.0	337 031.5
SP-N13	207.8	5 097 968.4	337 043.5
SP-N14	207.1	5 097 979.0	337 028.1
SPR-3	206.4	5 097 952.5	337 036.0
SPR-4	207.9	5 097 961.0	337 049.0

- 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. 411-237							
HWY No 69						DIST 54	
SUBM'D NR		CHECKED NR	DATE AUG. 26, 2009			SITE 44-433	
DRAWN NA		CHECKED CN	APPROVED BRG			DWG SPN-1	

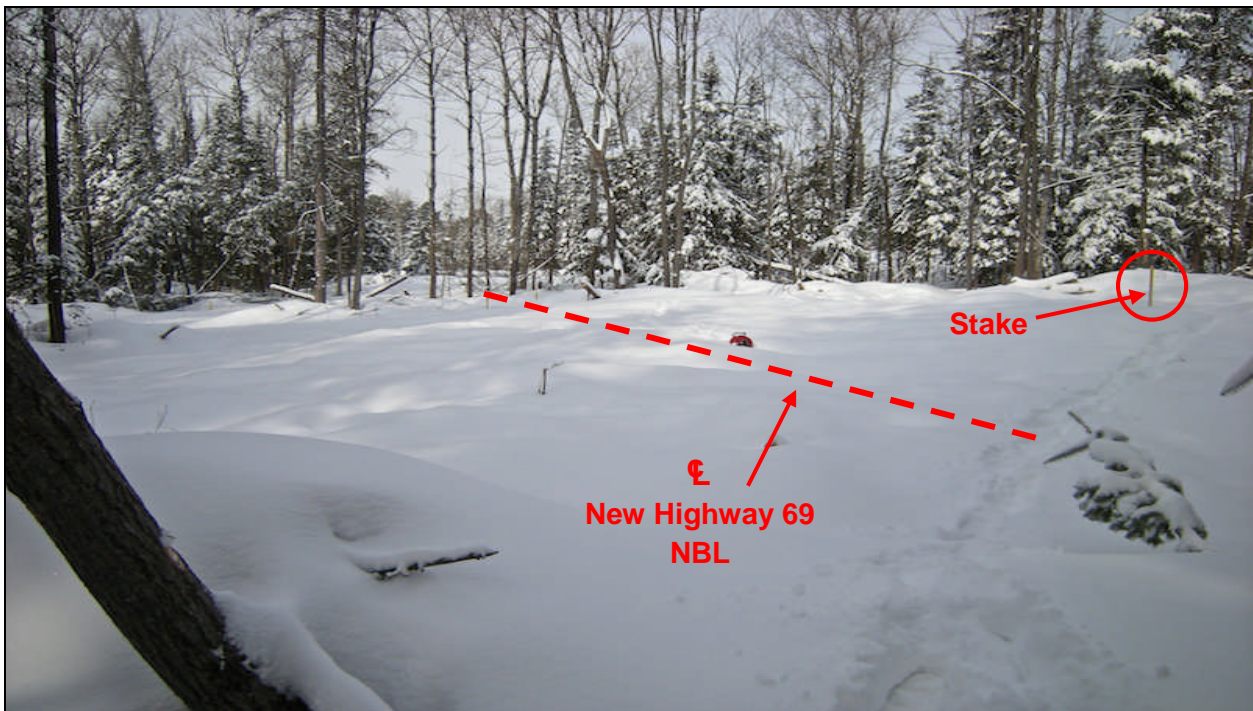


## **APPENDIX A**

### Site Photographs

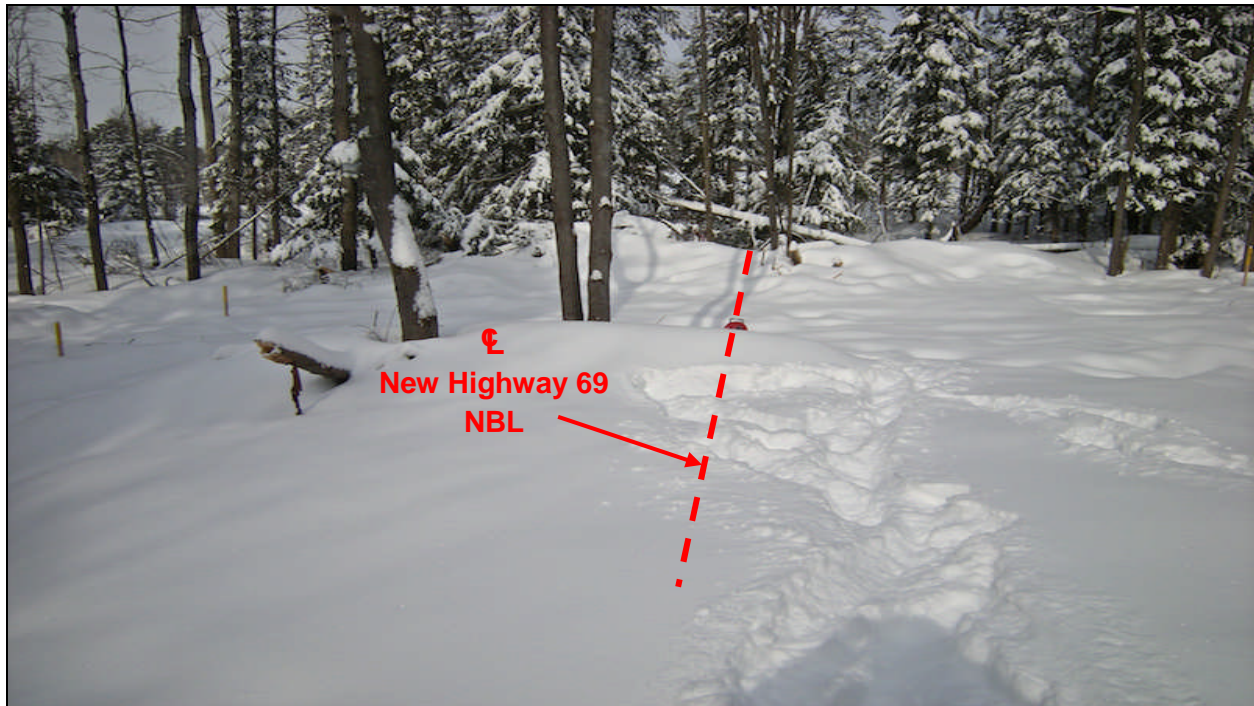


**Photograph 1:** Looking south towards the south abutment, approximate Sta. 10+161. The ground is covered in snow. Wooded area in view of the background of the photograph. Note that the red water level meter has been placed in the middle of the south abutment. (February, 2009)

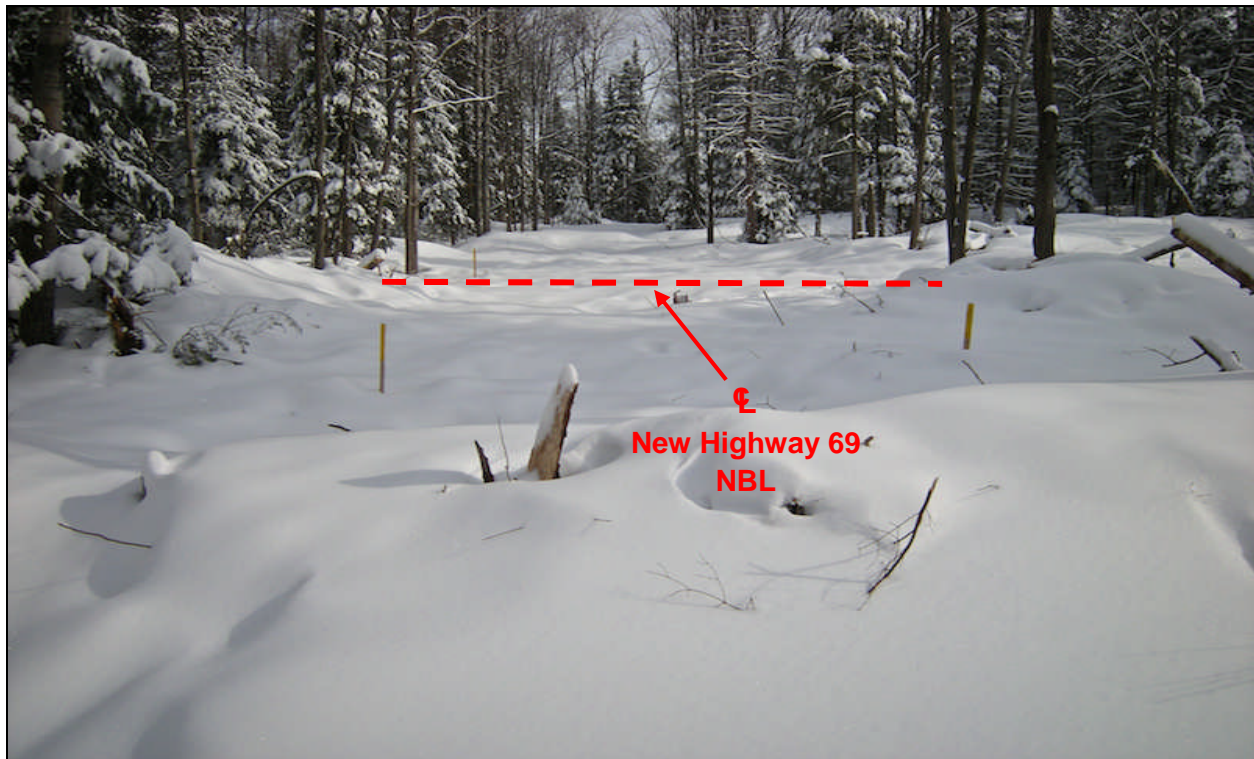


**Photograph 2:** Looking northeast towards the south abutment, approximate Sta. 10+161. The ground is covered in snow. Looking at the wooded area in the background of the photograph. Note that the red water level meter has been placed in the middle of the south abutment. (February, 2009)

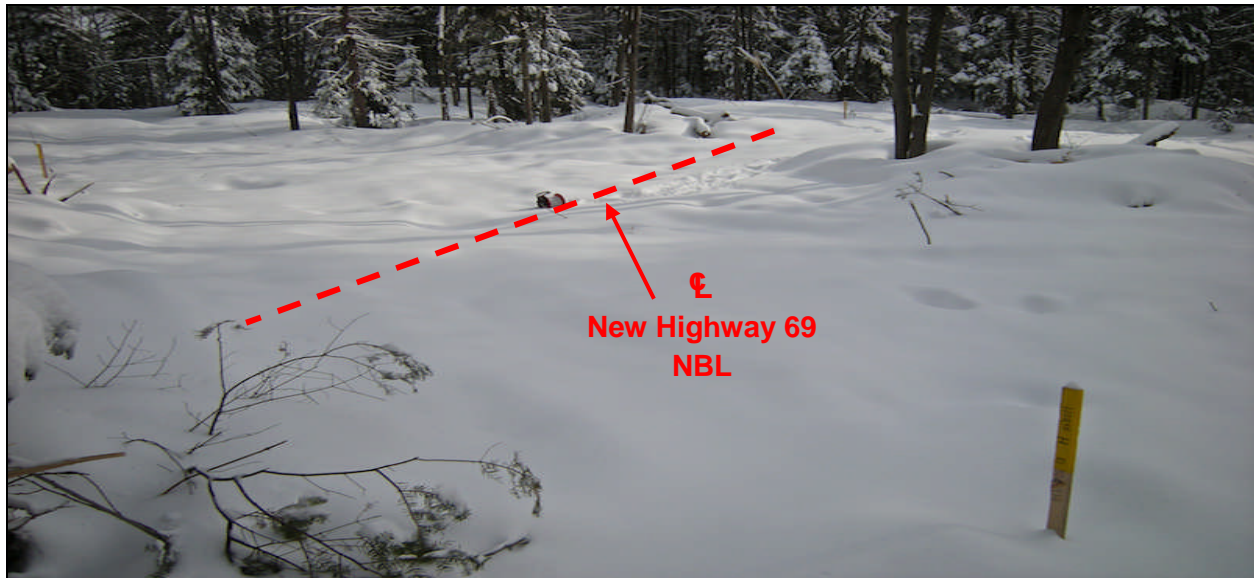




**Photograph 3:** Facing north towards the north abutment, approximate Sta. 10+175. The ground is covered in snow. Lightly dense wooded area in view of the background of the photograph. Note that the red water level meter has been placed in the middle of the north abutment. (February, 2009)



**Photograph 4:** Looking east towards the north abutment, approximate Sta. 10+175. The ground is covered in snow. Wooded areas flanking an open area on both sides. Note that the red water level meter has been placed in the middle of the north abutment. (February, 2009)



**Photograph 5:** Viewing southeast towards the north abutment, approximate Sta. 10+175. The ground is covered in snow. Densely wooded area in view in the background of the photo. Note that the red water level meter has been placed in the middle of the north abutment. (February, 2009)



## **APPENDIX B**

### Rock Core Photographs





**Photograph 1:** Rock cores retrieved from borehole SP-N3. Samples RC-2 to RC-4.



**Photograph 2:** Rock cores retrieved from borehole SP-N4. Samples RC-1 to RC-3.



**Photograph 3:** Rock cores retrieved from borehole SP-N5. Samples RC-1 to RC-3.



**Photograph 4:** Rock cores retrieved from borehole SP-N6. Samples RC-1 to RC-3.





**Photograph 5:** Rock cores retrieved from borehole SP-N9. Samples RC-3 to RC-5.



**Photograph 6:** Rock cores retrieved from borehole SP-N10. Samples RC-3 to RC-5.



**Photograph 7:** Rock cores retrieved from borehole SP-N11. Samples RC-2 to RC-4.



**Photograph 8:** Rock cores retrieved from borehole SP-N12. Sample RC-1 to RC-3.