Peto MacCallum Ltd.
CONSULTING ENGINEERS

FOUNDATION INVESTIGATION REPORT

for

SUPPLY POST ROAD OVERPASS SOUTHBOUND
HIGHWAY 69
SITE NO. 44-433, W.P. 5276-05-01
DISTRICT 54, SUDBURY, ONTARIO

PHASE 2, STA. 10+000 TO 15+070 (TOWNSHIP OF BIGWOOD)
STA. 20+300 TO 22+485 (TOWNSHIP OF MOWAT)

PETO MacCALLUM LTD.
165 CARTWRIGHT AVENUE
TORONTO, ONTARIO
M6A 1V5
Phone: (416) 785-5110
Fax: (416) 785-5120
Email: toronto@petomaccallum.com

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Phase 2, Sta. 10+000 to 15+070 (Township of Bigwood)
Sta. 20+300 to 22+485 (Township of Mowat)

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1. INTRODUCTION

This report summarizes the results of the foundation investigation carried out for the proposed Supply Post Road Overpass Southbound on the realigned Highway 69 to be located about 70 km south of Sudbury. The investigation was conducted for McCormick Rankin Corporation on behalf of the Ministry of Transportation of Ontario (MTO).

The proposed bridge will carry the new Highway 69 southbound lanes (SBL) over the future Supply Post Road between approximate Sta. 10+161 and 10+175 in the Township of Bigwood.

A previous preliminary foundation investigation was carried out by Peto MacCallum Ltd. (PML) (Ref. No.: 04TF020, dated September 3, 2004). The results from the preliminary foundation investigation carried out by PML included one borehole, SPR-1 and one dynamic cone penetration test (DCPT), SPR-2.

This report provides subsurface information pertaining to the foundation of the proposed new Highway 69 southbound overpass and approaches within about 20 m of the abutments, between approximate Sta. 10+141 and 10+195.

2. SITE DESCRIPTION AND GEOLOGY

The site is located approximately 12 km south of existing Highway 69 and Highway 64 intersection and to about 55 m east of the existing Highway 69. The French River is about 250 m south of the site. The local topography is irregular and comprises wooded areas with open ground areas. The terrain has a general rugged topography with numerous rock outcrops.

165 Cartwright Avenue, Toronto, Ontario M6A 1V5
Tel: (416) 785-5110 Fax: (416) 785-5120
E-mail: toronto@petomaccallum.com
BARRIE, HAMILTON, KITCHENER, TORONTO

The site is generally located within a structural subdivision of the Canadian Precambrian Shield identified as the Grenville Province. In particular, the study area traverses the western portion of the Central Gneiss Belt within the Grenville Province wherein pink and grey gneisses are predominant.

3. INVESTIGATION PROCEDURES

The field work for the north and south abutments and approaches for the SBL overpass was carried out during the periods from December 11 to 15, 2008 and January 12 to 21, 2009. The site photographs are shown in Appendix A.

The scope of the subsurface investigation comprised 14 boreholes, SP-S1 to SP-S14, that were advanced through the soil cover to depths of 3.9 to 8.8 m, elevations ranging from 196.8 to 201.6, at the locations shown on Drawing SPS-1, appended. Eight of the boreholes, SP-S3 to SP-S6 at the south abutment and SP-S9 to SP-S12 at the north abutment, were cored 3.0 to 3.4 m into the bedrock to depths between 8.3 to 12.2, elevations ranging from 193.4 to 197.2.

The previous borehole SPR-1 and DCPT, SPR-2 extended to 8.8 and 8.2 m depth below ground surface, elevations 196.0 and 196.8, respectively. Borehole SPR-1 was cored 3.0 m into the bedrock from 5.8 to 8.8 m depth, from elevations 199.0 to 196.0.

Callon Dietz Inc. staked the alignment of Highway 69 at the structure location and the borehole locations where selected by MRC. PML surveyed the final location of the boreholes. Callon Dietz Inc. provided the following temporary benchmarks (TBM).

TBM (BH No.)	DESCRIPTION	ELEVATION (*)
SP-S3	Existing ground at N5097930.2; E337022.6	205.3
SP-S10	Existing ground at N5097945.2; E337013.2	205.4
SP-S12	Existing ground at N5097943.1; E336997.8	205.3
SP-S13	Existing ground at N5097950.6; E337009.8	205.5

(*) Geodetic, metric; BH - Borehole

Boreholes SP-S1 to SP-S14 were advanced using continuous flight solid and hollow stem augers powered by a track mounted CME-55 rig , equipped for rotary core (NQ size) drilling, supplied and operated by a specialist drilling contractor. The drilling crews worked under the full-time supervision of a member of our engineering staff. Photographs of the rock cores are shown in Appendix B.

Representative samples of the soils encountered in the boreholes were recovered at 0.75 m depth intervals. In the boreholes advanced with conventional drill rigs, soil samples were obtained using a split spoon sampler in conjunction with standard penetration tests. Field vane testing and penetrometer tests were carried out to estimate the consistency of the encountered soils. The penetrometer tests results typically provide lower shear strength values than the actual values due to sample disturbance. Where standard penetration tests were not carried out in soils containing cobbles and boulders the consistency/relatively density of the encountered soils was estimated from manual examination or the rate (ease) of advances of the augers.

The boreholes were backfilled in accordance with the MTO guidelines and MOE regulation 903 for borehole abandonment procedures using a bentonite/cement mixture grout.

The groundwater conditions at the borehole locations were assessed during drilling by visual examination of the soil, the sampler and drill rods as the samples were retrieved and, when appropriate, by measurement of the water level in the open boreholes. Two piezometers were installed in boreholes SP-S2 and SP-S13 for subsequent groundwater monitoring.

Soils were identified in the field in accordance with the MTO Soil Classification procedures. Recovered soil samples were returned to our laboratory for detailed visual examination and soil classification. The current laboratory test program comprised the following tests:

- Natural moisture content determinations (91)
- Grain size analyses (24)
- Atterberg limits tests (22)

The results of the laboratory natural moisture content determinations, grain size analyses, and Atterberg limits are shown on the Record of Borehole sheets. The grain size distribution charts are presented on Figures SPS-GS-1 to SPS-GS-5. The Atterberg limits are presented on Figures SPS-PC-1 to SPS-PC-4. The Atterberg limits and corresponding sample natural water content determinations are listed in the appended Table 1.

4. SUMMARIZED SUBSURFACE CONDITIONS

Reference is made to the appended Record of Borehole sheets for details of the subsurface conditions including soil classifications, bedrock descriptions inferred stratigraphy, boundary elevations and groundwater observations. Site photographs are included in Appendix A.

The borehole locations, stratigraphic profile and cross-sections prepared from the borehole data are presented on the foundation Drawing SPS-1.

The depth of the soil cover revealed in the boreholes varied from 3.9 to 8.8 m, elevations ranging from 196.8 to 201.6. The soil stratigraphy at the borehole locations generally comprised topsoil covering a discontinuous deposit of firm to very stiff clay overlying a continuous cohesive firm to hard 1.6 to 4.4 m thick silty clay layer. A discontinuous 0.9 to 4.4 m thick clayey silt layer was encountered below the silty clay and clay layers and was underlain by loose to very dense cohesionless silt, sand and gravelly sand units. The clayey silt, silt, sand and gravelly sand layers mantled granitic gneiss bedrock. Localized cobble and boulder zones about 1.6 and 1.1 m thick were encountered in two of the boreholes (SP-S6 and SP-S11, respectively) immediately over the bedrock surface.

4.1 Topsoil

A 100 to 300 mm thick surficial layer of topsoil is present in all of the current boreholes extending to 0.1 to 0.3 m depths, elevations 205.0 to 205.6. Moisture contents ranged from 15 to 21%.

A 100 mm thick layer of topsoil was also encountered in the previous borehole SPR-1 extending to elevation 204.7.

4.2 Clay

A discontinuous 0.9 to 3.6 m thick cohesive clay unit was encountered below topsoil layer at 0.1 to 0.3 m depth, elevations 205.0 to 205.4, in boreholes SP-S4 to SP-S6, SP-S8, SP-S9, SP-S12 and SP-S13 and extended to 1.2 to 3.8 m depth, elevations 201.5 to 204.3. The consistency of the clay typically ranged from firm to very stiff. N values ranged from 3 to 16. Penetrometer tests ranged from 12 to 162 kPa. The low penetrometer test value (12 kPa) reflected disturbed soil samples.

Grain size distribution charts of selected clay samples are presented in Figure SPS-GS-1. The silty clay comprised 58 to 66% clay, 33 to 41% silt, 1% sand and 0 to 1% gravel sized materials. The plasticity chart of the tested clay samples is presented in Figure SPS-PC-1. The Atterberg liquid and plastic limits ranged from 52 to 57 and 23 to 24, respectively, with plasticity index values ranging from 28 to 33. Moisture contents ranged from about 31 to 43%.

4.3 Silty Clay

A cohesive silty clay layer of 1.6 to 4.4 m thickness was encountered below the topsoil in boreholes SPR-1, SP-S1 to SP-S3, SP-S7, SP-S10, SP-S11 and SP-S14 and below clay in boreholes SP-S4 to SP-S6, SP-S8 and SP-S9 and extended to 2.9 to 4.6 m depth below ground surface, elevations 200.7 to 202.8. The consistency of the silty clay ranged from firm to hard. N values ranged from 2 to 19. In borehole SPR-2, DCPT obtained 0 to 20 blows for the upper 3.8 m depth, from elevations 205.0 to 201.2, in probable silty clay layer. Penetrometer tests ranged from 12 to more than 225 kPa and field vane tests ranged from 38 to 100 kPa with sensitivity ranging from 4 to 10. The low penetrometer test values (12 to 25 kPa) reflect disturbed soil samples.

Grain size distribution charts of selected silty clay samples are presented in Figure SPS-GS-2. The silty clay comprised 40 to 59% clay, 40 to 58% silt and 1 to 4% sand, 0 to 1% gravel sized materials. The plasticity chart of the silty clay samples is presented in Figure SPS-PC-2. The Atterberg liquid and plastic limits ranged from 38 to 49 and 20 to 22, respectively, with plasticity index ranging from 18 to 27. Moisture contents determined ranged from about 18 to 41%.

4.4 Clayey Silt

Cohesive clayey silt layers of 0.9 to 4.4 m thickness were encountered below the silty clay unit at 2.9 to 4.6 m depth, elevations 200.7 to 202.6, in boreholes SP-S1 to SP-S4, SP-S6, SP-S8, SP-S9, SP-11 and SP-S14 and below clay layer in borehole SP-S12 at 3.8 m depth, elevation 201.5, and extended to 3.9 to 8.1 m depth below grade, elevations 197.3 to 201.6. Cobbles and boulders were encountered in the clayey silt matrix in borehole SP-S11 at 7.0 m depth, elevation 198.4 and extended to the bedrock surface found at 8.1 m depth, elevation 197.3. Bedrock/probable bedrock was encountered below the clayey silt unit in boreholes SP-S1, SP-S8, SP-S11, SP-S12 and SP-S14 at 3.9 to 8.1, elevations 197.3 to 201.6.

The consistency of the clayey silt ranged from firm to very stiff with local hard consistency zone. N values typically ranged from 3 to 26 with local 5 blows for 10 cm penetration and 6 and15 blows for 15 cm penetration where the sampler met refusal on probable bedrock or on cobbles and boulders. One penetrometer test obtained 25 kPa and two field vane tests of 34 and 46 kPa with sensitivity 4 and 6 in boreholes SP-S4 and SP-S8.

Grain size distribution charts of selected clayey silt samples are presented in Figure SPS-GS-3. The clayey silt comprised 12 to 25% clay, 74 to 84% silt, 1 to 3% sand and 0 to 1% gravel sized materials. The plasticity chart of the tested clayey silt samples is presented in Figure SPS-PC-3. The Atterberg liquid and plastic limits ranged from 24 to 29 and 19 to 20, respectively, with plasticity index ranging from 4 to 9. Moisture contents determined ranged from about 10 to 32%.

4.5 Silt

A local deposit of 0.9 to 1.8 m thick silt unit was encountered below silty clay at 3.6 to 4.6 m depth, elevations 201.0 to 201.8, in boreholes SPR-1, SP-S5, SP-S7 and SP-S10 and below the clay layer in borehole SP-S13 and extended to 5.0 to 6.1 m depth, elevations 199.0 and 200.3. The silt layer mantled the bedrock surface in boreholes SPR-1, SP-S5, SP-S10 and SP-S13. The consistency of the silt was loose. N values ranged from 5 to 9. In the DCPT SPR-2, 20 blows to 120 blows for 23 cm were obtained from 3.8 to 8.2 m depth, elevations 201.2 to 196.8, in a probable silt layer, which is mantling probable bedrock.

Grain size distribution charts of selected silt samples are presented in Figure SPS-GS-4. The silt comprised 10 to 15% clay, 82 to 83% silt, 2 to 7% sand and 0 to 1% gravel sized materials. The plasticity chart of the silt samples is presented in Figure SPS-PC-4. The Atterberg liquid and plastic limits of two silt samples are 21 and 23, and 19 and 20, respectively, with plasticity index of 2 and 3, indicating non-plastic behaviour. Moisture contents determination ranged from about 22 to 30%.

4.6 Sand/Gravelly Sand

A localized 0.9 m thick deposit of compact to very dense sand overlying bedrock was encountered in borehole SP-S9 below clayey silt at 5.5 m depth, elevation 199.8 and extended to 6.4 m depth, elevation 198.9. N values of 18 and 20 blows for 15 cm penetration were recorded. A moisture content of about 22% was obtained.

A discontinuous layer 0.1 to 1.2 m thick, locally 3.0 m thick at SP-S7, of compact to very dense gravelly sand was encountered below clayey silt in boreholes SP-S2, SP-S3, SP-S4 and SP-S6 and below silt in borehole SP-S7 at 4.9 to 6.1 m depth, elevations ranging from 199.6 to 200.5, and extended to 5.0 to 8.8 m depth, elevations 196.8 to 200.4. Cobbles and boulders were mixed with the gravelly sand matrix from depth 7.2 to 8.8 m depth in borehole SP-S6, elevations 198.4 to 196.8. N values ranged 15 to 45.

Grain size distribution charts of the gravelly sand are presented in Figure SPS-GS-5. The gravelly sand included 2 and 6% clay, 8 and 22% silt, 36 and 54% sand and 36% gravel sized materials. Two moisture contents obtained were about 15 and 23%.

4.7 Bedrock

A detailed description of the rock cores retrieved from boreholes SP-S3 to SP-S6 at the south abutment and SP-S9 to SP-S12 at the north abutment is provided in Table 2 and summarized on the record of borehole logs.

In the preliminary investigation, the bedrock surface was encountered at 5.8 and 8.2 m depths, elevations 199.0 and 196.8, in borehole SPR-1 and DCPT SPR-2, respectively. A 3.0 m long rock core was retrieved from borehole SPR-1. The measured core recovery was 100% and the rock consisted of medium to high strength and fair to excellent quality (RQD of 93 and 72%) granitic gneiss.

At the south abutment and approach, the bedrock surface was encountered at 4.4 to 8.8 m depth, elevations ranging from 196.8 to 201.5 in the current boreholes SP-S1 to SP-S7. Where rock cores were not obtained, the bedrock surface was inferred by auger and/or spoon refusal. The following table summarizes the depth of bedrock surface encountered in each borehole.

LOCATION	BOREHOLE No.	DEPTH (m)	BEDROCK ELEVATION	ROCK CORE LENGTH (m) (*)
South Approach	SP-S1	4.4	201.5	-
South Abutment	SP-S2	5.0	200.4	-
	SP-S3	5.3	200.0	3.2
	SP-S4	7.1	198.4	3.4
	SP-S5	5.2	200.3	3.1
	SP-S6	8.8	196.8	3.4
	SP-S7	6.7	199.0	-

The bedrock surface was confirmed at the south abutment location by extracting four cores in boreholes SP-S3 to SP-S6 of lengths varying from 3.1 to 3.4 m into the rock from a depth of 5.2 to 8.8 m, elevations 196.8 to 200.3, and extending to 8.3 to 12.2 m depths, elevations 193.4 to 197.2, indicating maximum bedrock surface relief of 3.6 m between borehole locations. The slope of the bedrock surface descends at an angle of about 17° from boreholes SP-S5 to SP-S6, elevations 200.3 to 196.8 and then rises at an angle about 46° to borehole SP-S7. Photographs of the rock cores taken from boreholes SP-S3 to SP-S6 are shown on Photographs 1 to 6, Appendix B.

At the north end of the overpass, the bedrock surface was encountered at 3.9 to 8.1 m depths, elevations 197.3 to 200.3. The table below summarizes the depth of bedrock surface encountered in each borehole:

LOCATION	BOREHOLE No.	DEPTH (m)	BEDROCK ELEVATION	ROCK CORE LENGTH (m) (*)
North Abutment	SP-S8	5.0	200.3	-
	SP-S9	6.4	198.9	3.4
	SP-S10	5.8	199.6	3.0
	SP-S11	8.1	197.3	3.2
	SP-S12	5.7	199.6	3.0
	SP-S13	5.3	200.2	-
North Approach	SP-S14	3.9	201.6	-

The bedrock surface was confirmed at the north abutment location by drilling four rock cores 3.0 to 3.4 m long in boreholes SP-S9 to SP-S12. The rock were extracted from a depth of 5.7 to 8.1 m, elevations 197.3 to 199.6, and extending to 8.7 to 11.3 m depths, elevations 194.1 to 196.6, indicating maximum bedrock surface relief of 2.4 m between borehole locations. The slope of the bedrock surface between boreholes SP-S8 and SP-S9 dips west to east downward 1.4 m at an angle of about 35° and continues to slope downwards 1.6 m at about 19^{o} to borehole SP-S11. The bedrock surface then ascends 2.3 m at an angle of about 18^{o} to borehole SP-S10. Photographs of the rock cores taken from boreholes SP-S9 to SP-S12 are shown on Photographs 7 to 12, Appendix B.

At the south abutment, the measured core recovery from the boreholes SP-S3 to SP-S6, ranged from 83 to 100%. The RQD determined from the rock cores is typically from 56 to 95%, with three isolated values of 0, 37 and 25 % in boreholes SP-S3, SP-S4 and SP-S5, respectively, indicating fair to excellent quality rock with local very poor to poor quality rock.

In the north abutment boreholes, the measured core recovery typically ranged from 95 to 100%, with two isolated values of 71 and 56% in borehole SP-S9 and SP-S11, respectively. The RQD determined from the north abutment rock cores is typically greater than 89%, with two isolated

values of 71 and 26% in boreholes SP-S9 and SP-S11, indicating good to excellent quality rock with local poor to fair quality rock.

4.8 Groundwater

Groundwater was observed during augering in boreholes SP-S1 and SP-S4 to SP-S9 at 3.0 to 4.6 m depths, elevations 200.9 to 202.9. Upon completion of augering, groundwater was observed in boreholes SP-S1 and SP-S6 to SP-S8 at 3.0 to 4.0 m depths below ground surface, elevations 201.3 to 202.6.

Two piezometers were installed in boreholes SP-S2 and SP-S13 for subsequent groundwater measurement. The following table summarizes the groundwater levels observed in the two piezometers:

BOREHOLE No.	SURFACE ELEVATION (m)	DATE OBSERVED	DEPTH TO GROUNDWATER (m)	GROUNDWATER ELEVATION (m)
SP-S2	205.4	14 Dec. 2008	2.3	203.1
		19 Feb. 2009	2.7	202.7
SP-S13	205.5	14 Dec. 2008	0.8	204.7
		19 Feb. 2009	0.9	204.6

Artesian conditions were observed in boreholes SP-S4, SP-S5, SP-S6, SP-S7 and SP-S9 where cohesive soils were found overlying non-cohesive sandy/silty soils mantling bedrock.

The groundwater levels in the boreholes indicated that the artesian condition occur with a hydrostatic head of about 0.7 to 1.3 m above the sandy deposits.

The groundwater is subject to fluctuations at the site due to seasonal conditions and rainfall patterns.

5. CLOSURE

The field work was carried out under the supervision of Frank Portela, Senior Technician and Mike Rapsey, Senior Technician, and direction of Mr. C. M. P. Nascimento, P.Eng., Senior Project Engineer. Walker Drilling Co. Ltd. and Aardvark Drilling Inc. supplied the soil and rock drilling equipment.

The report was prepared by Mr. C. M. P. Nascimento, P.Eng. with the assistance of Mr. N. Rahman, BASc and reviewed by Mr. B. R. Gray, MEng, P.Eng., MTO Designated Principal Contact, carried out an independent review of the report.

Yours very truly,

Peto MacCallum Ltd.

C. M. P. Nascimento, P.Eng.,
Senior Project Engineer

Brian R. Gray, MEng, P.Eng.
MTO Designated Principal Contact

CN/BRG/nr-mi

TABLE 1

LIST OF ATTERBERG LIMITS

SOIL TYPE	BOREHOLE NO.	SAMPLE NO.	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)
Clay	SP-S4	2	52	24	28	34
	SP-S5	2	54	23	31	34
	SP-S8	2	57	24	33	34
	SP-S12	2	53	24	29	37
	SP-S13	2	54	23	31	32
Silty Clay	SP-S1	2	44	21	23	32
	SP-S1	3	41	21	20	35
	SP-S4	4	46	22	24	33
	SP-S5	4	38	20	18	31
	SP-S7	3	41	21	20	33
	SP-S10	3	46	22	24	37
	SP-S14	2	49	22	27	24
Clayey Silt	SP-S1	5	28	20	8	31
	SP-S4	6	29	20	9	30
	SP-S8	6	28	19	9	26
	SP-S11	6	24	20	4	- *
	SP-S12	4	29	20	9	32
	SP-S14	5	25	20	5	27
Silt	SP-S5	7	Non-plastic			26
	SP-S7	7	Non-plastic			30
	SP-S10	6	23	20	3	24
	SP-S13	5	21	19	2	23

Note: * - Sufficient amount of soil sample not recovered.

TABLE 2

ROCK CORE DESCRIPTION

CORE RECOVERY					CORE DESCRIPTION	
HOLE NO.	**CORE NO.**	**DEPTH (m)**	**RECOVERY (%)**	**RQD (%)**	**DEPTH (m)**	**DESCRIPTION**
SP-S3	7 8 9	5.3 – 5.8 5.8 – 7.4 7.4 – 8.5	100 100 100	0 63 94	5.3 – 8.5	GRANITIC GNEISS: Grey with pink bands, fine to medium grained, high strength, slightly weathered to unweathered, multiple vertical fissures in upper 0.7 m, locally infilled with secondary carbonates, rough planar, light grey to brown scale on surface, close to moderate spaced flat cross joints, rough planar, tight, locally separating on black biotite seams, occasional vertical partings at depth, very poor becoming fair to excellent quality.
SP-S4	10 11 12	7.1 – 8.3 8.3 – 9.8 9.8 – 10.5	100 93 85	37 91 65	7.1 – 10.5	GRANITIC GNEISS: Grey with pink bands, fine to medium grained, medium to high strength, slightly weathered to unweathered, core shattered in upper 0.5 m due to vertical fissure, slightly altered with black oxidation/scale and minor silt on surface, generally close becoming moderate (locally very close) spaced flat to dipping cross joints, rough planar, tight, locally separating on black biotite seams, poor becoming fair to excellent quality.
SP-S5	8 9 10	5.2 – 6.1 6.1 – 6.7 6.7 – 8.3	97 83 97	56 25 85	5.2 – 8.3	GRANITIC GNEISS: Pink and grey with slight banding, fine to medium grained, high strength, unweathered, close to moderate spaced dipping to vertical cross joints, rough planar, tight to slightly altered with black, dark green, or bluish grey oxidation on partings, also very close to close becoming close to moderate spaced flat cross joints, rough planar, poor to fair, becoming good quality.
SP-S6	10 11 12	8.8 – 9.8 9.8 – 11.3 11.3 – 12.2	96 100 89	62 95 81	8.8 – 12.2	GRANITIC GNEISS: Pink and grey with slight banding, occasional 25 mm thick pink layers with black biotite concentrations, fine to medium grained, high strength, slightly weathered to unweathered, close to moderate spaced flat to dipping cross joints, rough planar, tight to slightly altered with red oxidation or grey silt on partings, occasionally separates on biotite concentrations, locally vertical fissure open to 2 mm with partial infilling by secondary mineralization, fair to excellent quality.

Originated:	FP and MR
Compiled:	PML
Checked:	CN

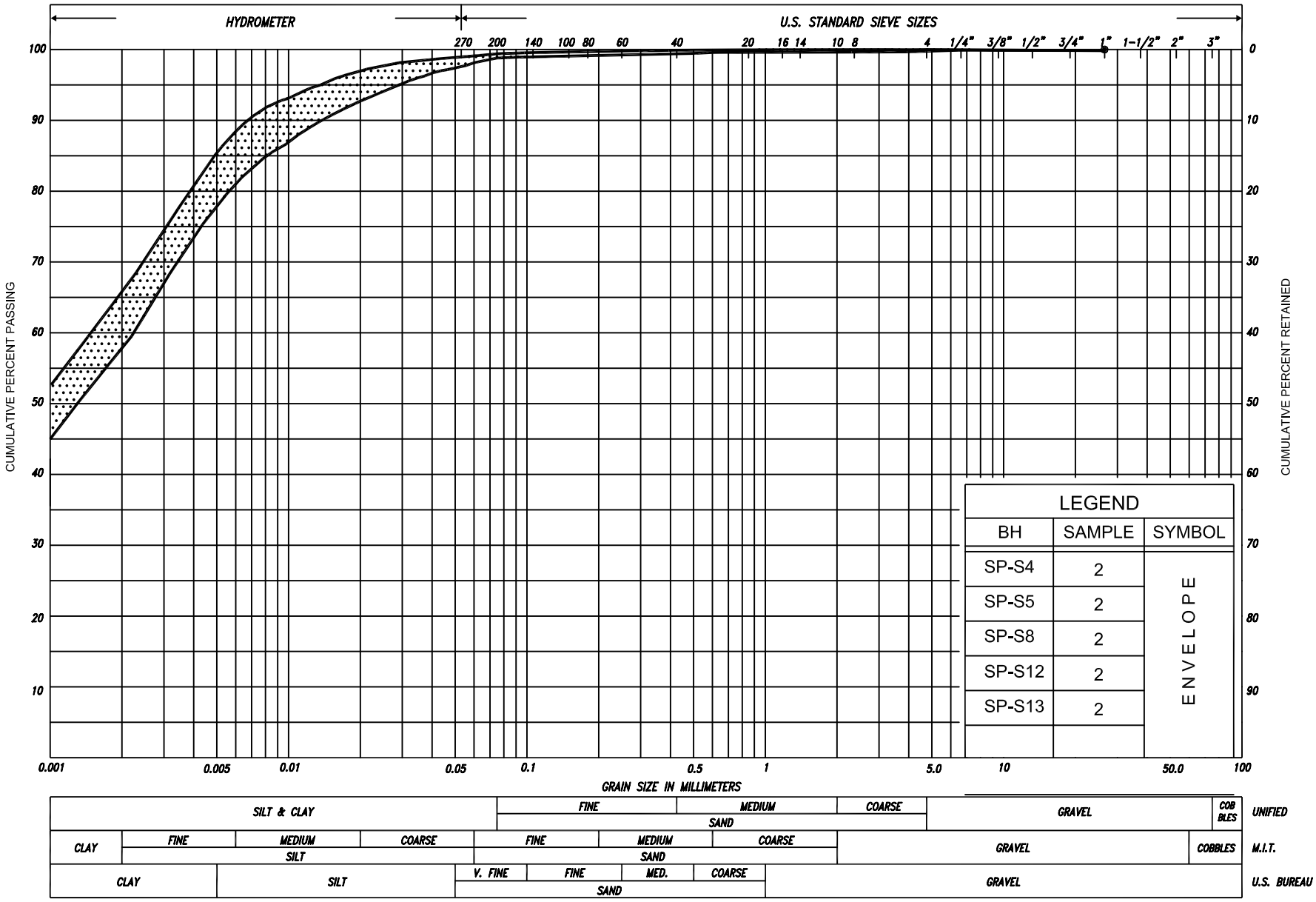
TABLE 2

ROCK CORE DESCRIPTION

CORE RECOVERY					CORE DESCRIPTION	
HOLE NO.	**CORE NO.**	**DEPTH (m)**	**RECOVERY (%)**	**RQD (%)**	**DEPTH (m)**	**DESCRIPTION**
SP-S9	10	6.4 – 7.0	100	100	6.4 – 9.8	GRANITIC GNEISS: Pink and grey with slight banding, fine to medium grained, high strength, unweathered, moderate (locally close) spaced flat cross joints, smooth to rough planar, tight, occasionally separates on biotite concentrations, good to excellent quality, becoming dark grey below 9.2 m depth, very close to close spaced flat with occasional vertical cross joints, rough planar, tight to slightly altered with green oxidation or white scale on partings, fair to excellent quality.
	11	7.0 – 7.9	100	89		
	12	7.9 – 9.2	100	100		
	13	9.2 – 9.8	71	71		
SP-S10	7	5.8 – 7.2	100	93	5.8 – 8.8	GRANITIC GNEISS: Grey with pink bands, fine to medium grained, high strength, unweathered, moderate to wide spaced flat to dipping cross joints, rough planar, light grey scale or silt on parting surface, locally separating on black biotite seams, excellent quality.
	8	7.2 – 8.8	100	100		
SP-S11	8	7.0 – 7.5	-	-	5.8 – 8.1	BOULDERS/COBBLES/GRAVEL
	9	7.8 – 8.6	56	26	8.1 – 11.3	GRANITIC GNEISS: Grey with pink bands, fine to medium grained, high strength, unweathered, close to wide spaced flat to dipping cross joints, rough planar, tight to slightly altered with red oxidation or minor silt on parting, poor becoming excellent quality.
	10	8.6 – 10.1	95	92		
	11	10.1 – 11.3	98	98		
SP-S12	7	5.7 – 5.8	100	100	5.7 – 8.7	GRANITIC GNEISS: Pink and grey with slight banding, occasional 75 mm thick pink layers, fine to medium grained, high strength, slightly weathered to unweathered, close to moderate spaced flat to dipping cross joints, occasional vertical, rough planar, tight to slightly altered with red oxidation or silt on partings, excellent quality.
	8	5.8 – 7.2	100	95		
	9	7.2 – 8.7	98	94		

NOTE: RQD = Rock Quality Designation

Originated:	FP and MR
Compiled:	PML
Checked:	CN

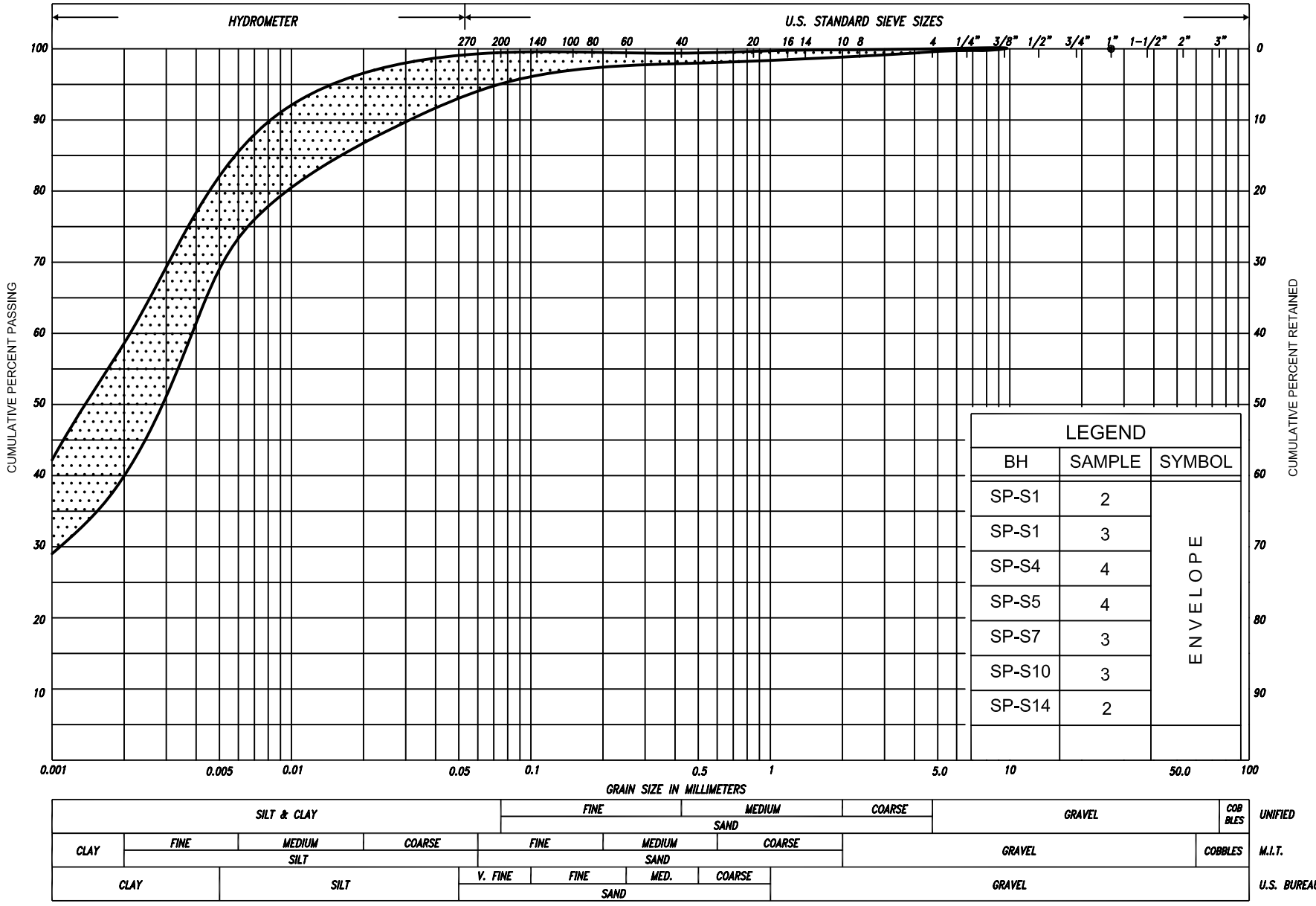


Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION

CLAY, trace sand, trace gravel

FIG No.	SPS-GS-1
HWY:	69
W.P. No.	5276-05-01



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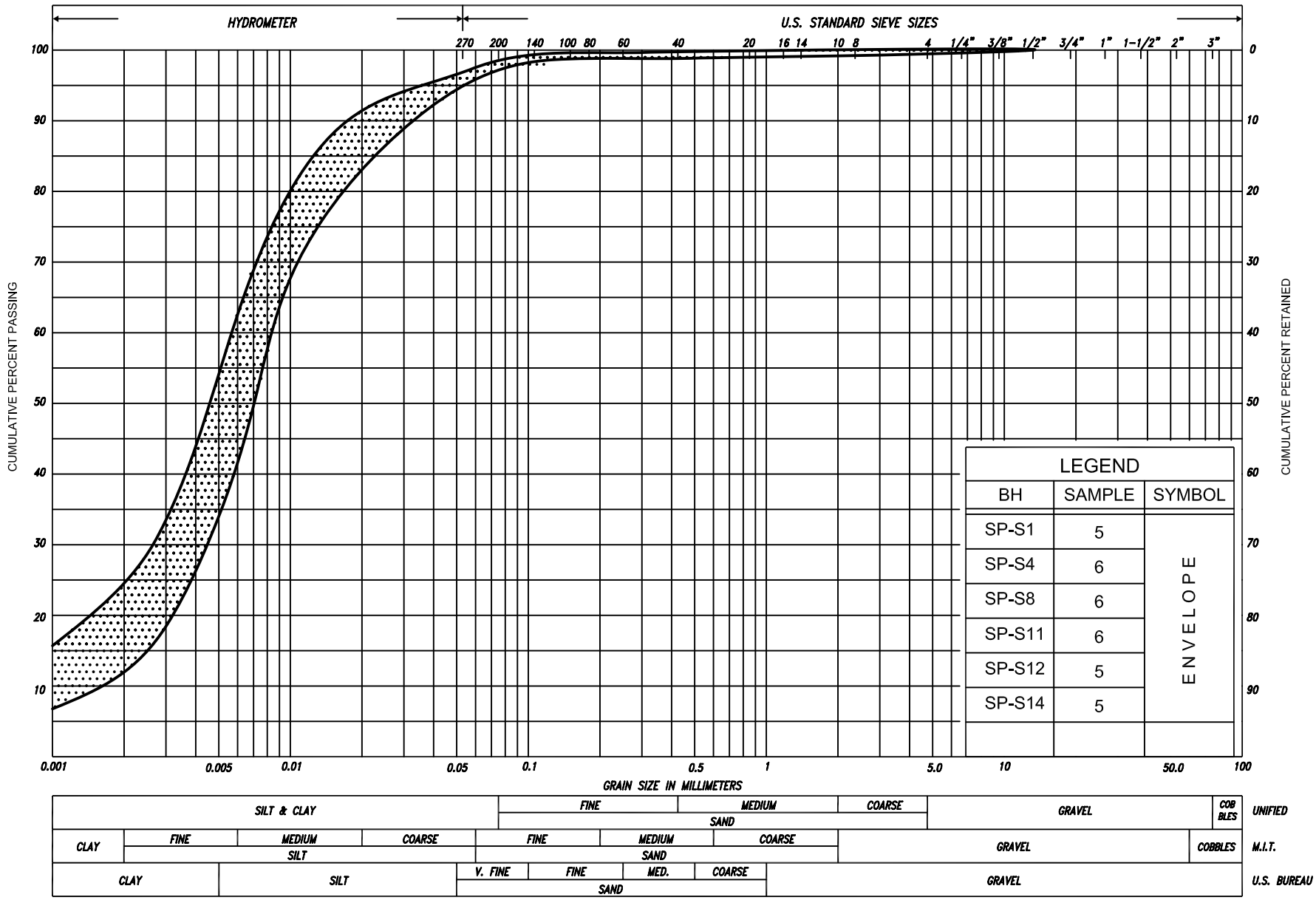
GRAIN SIZE DISTRIBUTION

SILTY CLAY, trace sand, trace gravel

FIG No.	SPS-GS-2
HWY:	69
W.P. No.	5276-05-01



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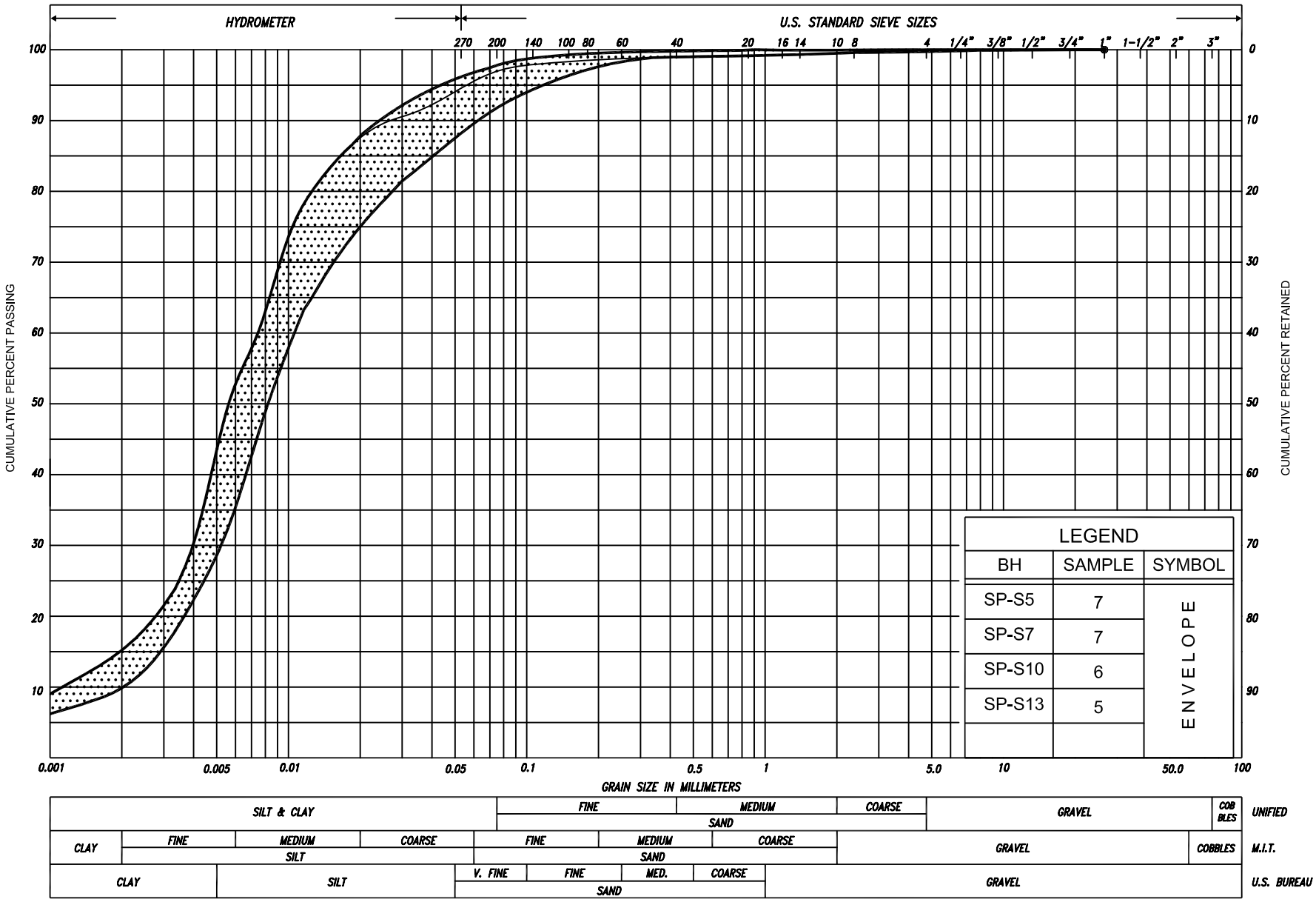
GRAIN SIZE DISTRIBUTION

CLAYEY SILT, trace sand, trace gravel

FIG No.	SPS-GS-3
HWY:	69
W.P. No.	5276-05-01



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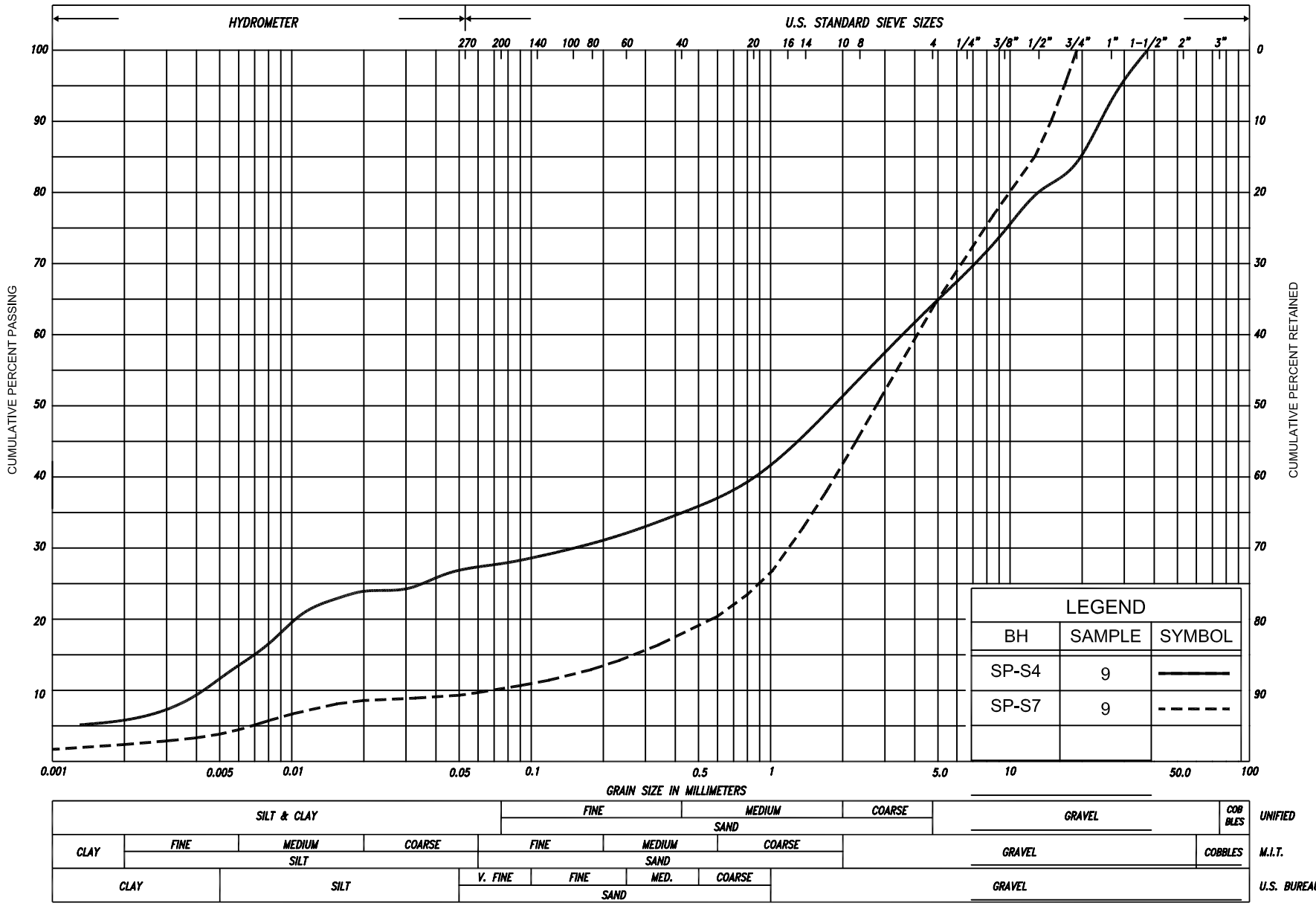
GRAIN SIZE DISTRIBUTION

SILT, some clay, trace sand, trace gravel

FIG No.	SPS-GS-4
HWY:	69
W.P. No.	5276-05-01



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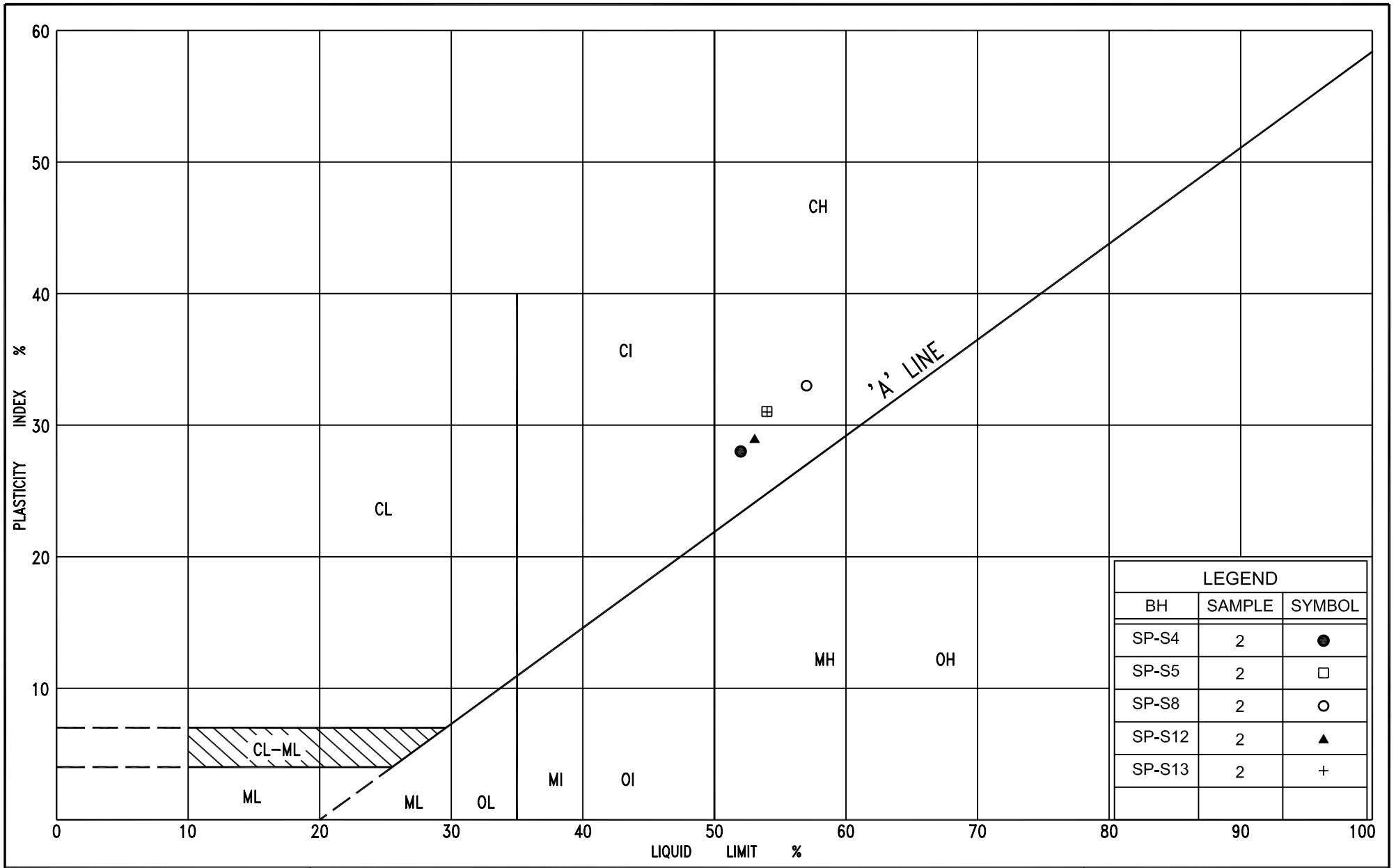
GRAIN SIZE DISTRIBUTION

GRAVELLY SAND, some to trace silt, trace clay

FIG No.	SPS-GS-5
HWY:	69
W.P. No.	5276-05-01



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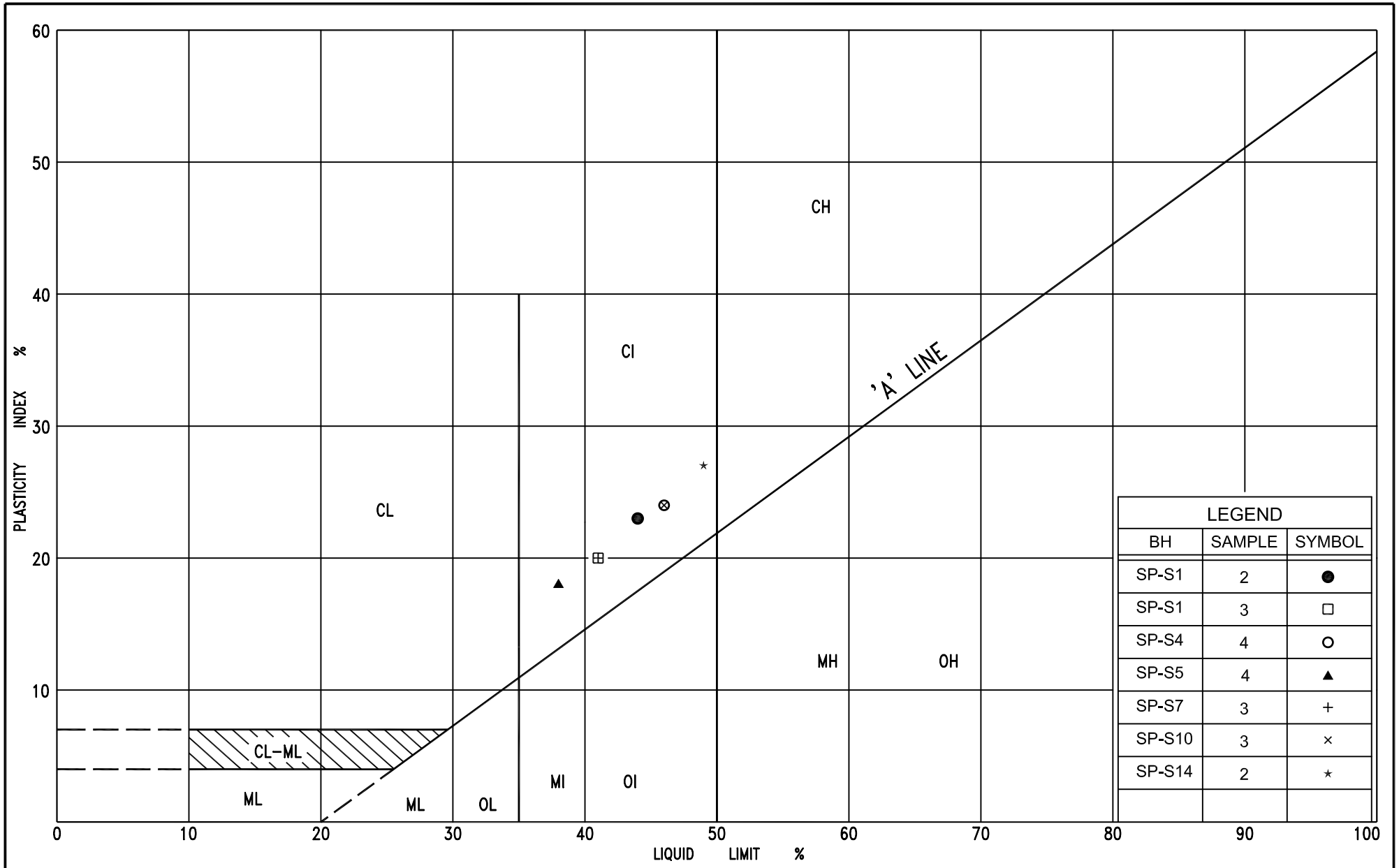
PLASTICITY CHART

CLAY, trace sand, trace gravel

FIG No.	SPS-PC-1
HWY:	69
W.P. No.	5276-05-01



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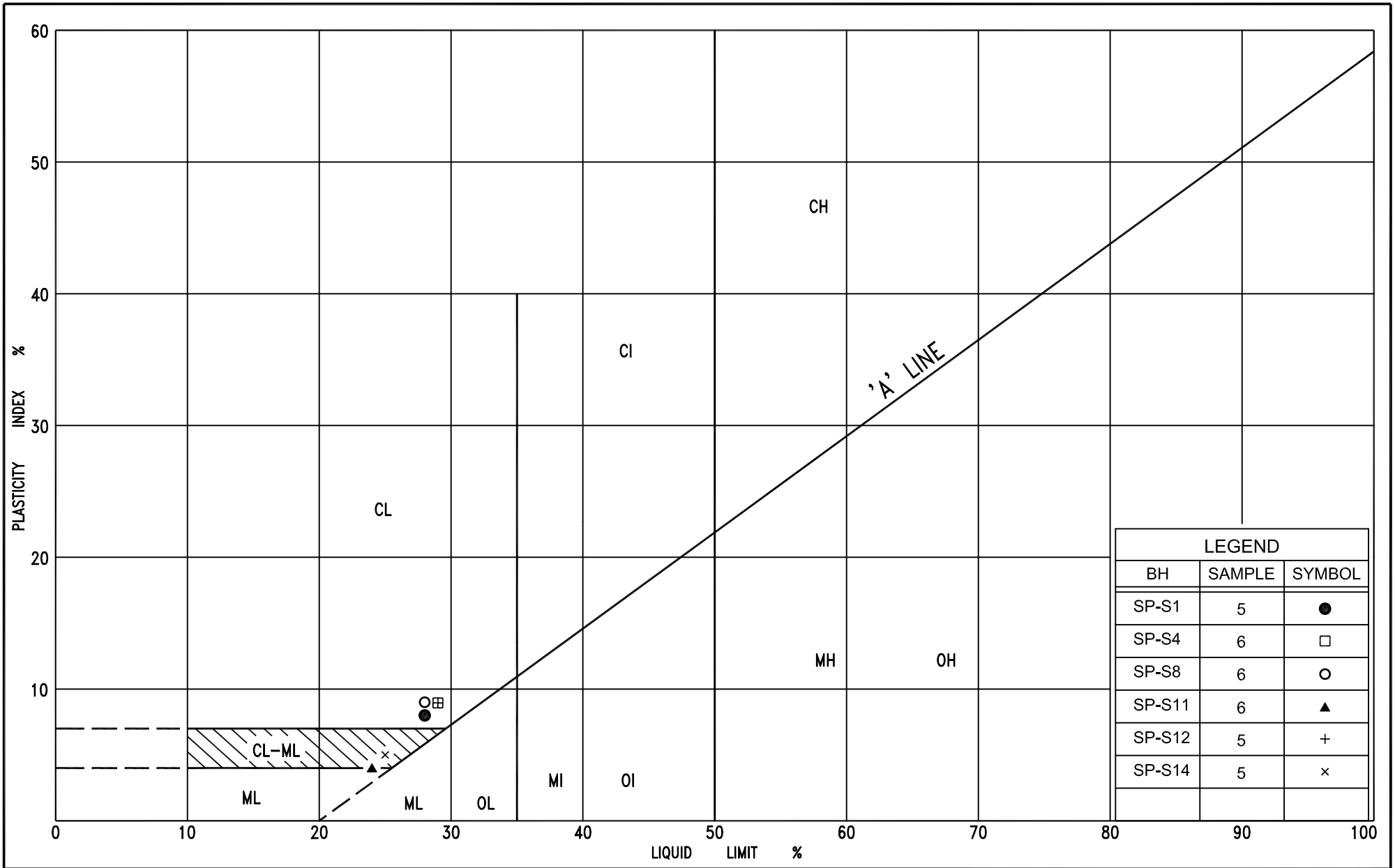
PLASTICITY CHART

SILTY CLAY, trace sand, trace gravel, trace clay

FIG No.	SPS-PC-2
HWY:	69
W.P. No.	5276-05-01



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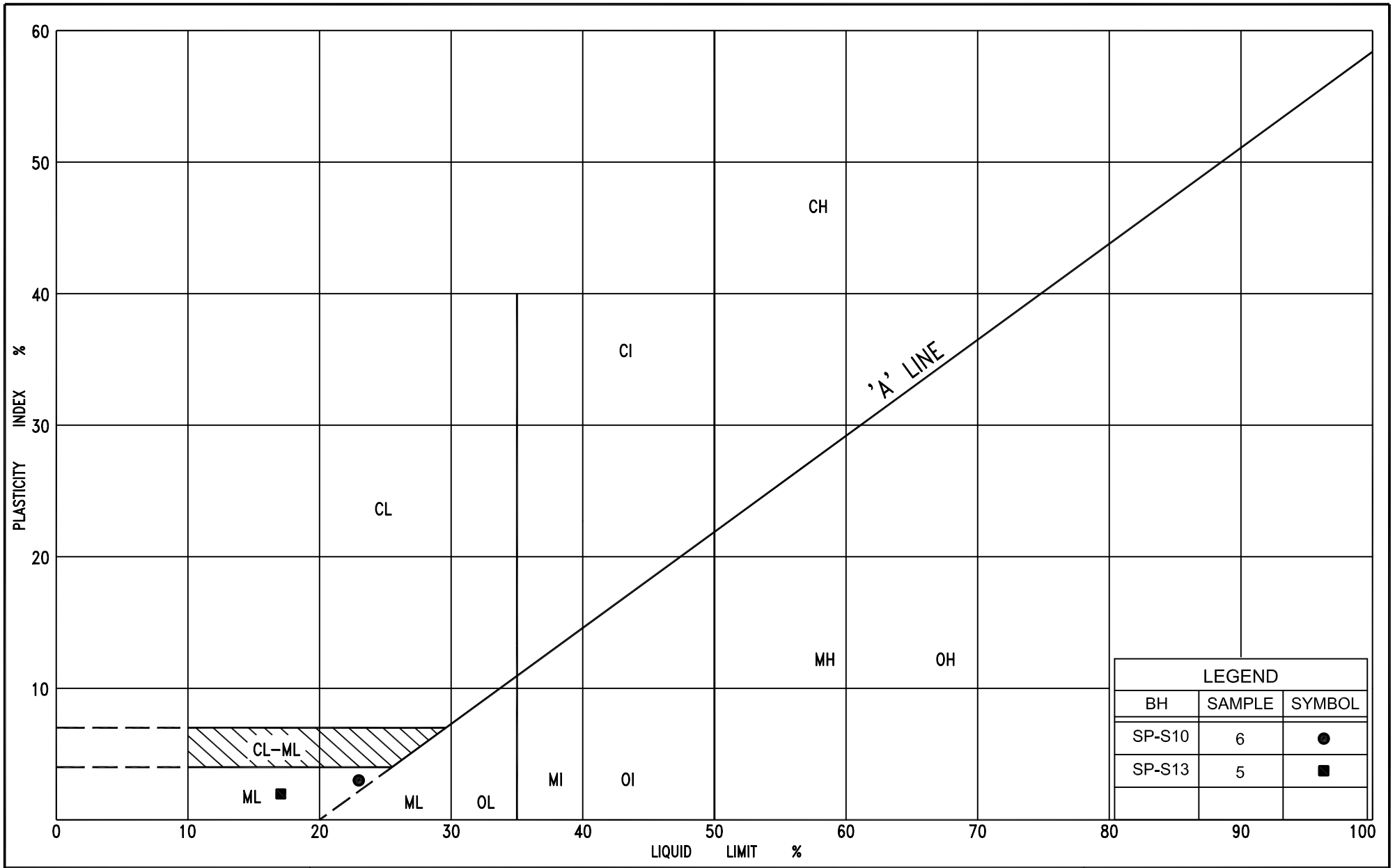
PLASTICITY CHART

CLAYEY SILT, trace sand, trace gravel

FIG No.	SPS-PC-3
HWY:	69
W.P. No.	5276-05-01



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PLASTICITY CHART

SILT, some clay, trace sand, trace gravel

FIG No.	SPS-PC-4
HWY:	69
W.P. No.	5276-05-01

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 $\tilde{N}$.

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
r_u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	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_α	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
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_t	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m^3	DENSITY OF SOLID PARTICLES
γ_s	kN/m^3	UNIT WEIGHT OF SOLID PARTICLES
ρ_w	kg/m^3	DENSITY OF WATER
γ_w	kN/m^3	UNIT WEIGHT OF WATER
ρ	kg/m^3	DENSITY OF SOIL
γ	kN/m^3	UNIT WEIGHT OF SOIL
ρ_d	kg/m^3	DENSITY OF DRY SOIL
γ_d	kN/m^3	UNIT WEIGHT OF DRY SOIL
ρ_{sat}	kg/m^3	DENSITY OF SATURATED SOIL
γ_{sat}	kN/m^3	UNIT WEIGHT OF SATURATED SOIL
ρ'	kg/m^3	DENSITY OF SUBMERGED SOIL
γ'	kN/m^3	UNIT WEIGHT OF SUBMERGED SOIL
e	1,%	VOID RATIO
n	1,%	POROSITY
w	1,%	WATER CONTENT
S_r	%	DEGREE OF SATURATION
w_L	%	LIQUID LIMIT
w_P	%	PLASTIC LIMIT
w_S	%	SHRINKAGE LIMIT
I_P	%	PLASTICITY INDEX = $w_L - w_P$
I_L	1	LIQUIDITY INDEX = $\frac{w - w_P}{I_P}$
I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_P}$
DTPL		DRIER THAN PLASTIC LIMIT
APL		ABOUT PLASTIC LIMIT
WTPL		WETTER THAN PLASTIC LIMIT
e_{max}	1,%	VOID RATIO IN LOOSEST STATE
e_{min}	1,%	VOID RATIO IN DENSEST STATE
I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
D	mm	GRAIN DIAMETER
D_n	mm	n PERCENT - DIAMETER
C_U	1	UNIFORMITY COEFFICIENT
h	m	HYDRAULIC HEAD OR POTENTIAL
q	m^3/s	RATE OF DISCHARGE
v	m/s	DISCHARGE VELOCITY
i	1	HYDRAULIC GRADIENT
k	m/s	HYDRAULIC CONDUCTIVITY
j	kN/m^3	SEEPAGE FORCE

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RECORD OF BOREHOLE No SP-S1 1 of 1 METRIC

W.P. 5276-05-01 LOCATION Coords: 5 097 913.8 N; 337 024.6 E ORIGINATED BY F.P.

DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.R.

DATUM Geodetic DATE January 13, 2009 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
205.9	Ground Surface										
0.0 / 205.6	Topsoil		1	SS	5						
0.3	Silty clay trace sand, trace gravel Firm to Reddish Moist very stiff brown		2	SS	11		205				1 4 46 49
			3	SS	12		204	200 ■			0 2 51 47
	clayey silt layers		4	SS	9	▽*	203	■			
202.8											
3.1	Clayey silt trace sand, trace gravel Firm to Grey/ Wet very stiff brown		5	SS	6	▼*		■			0 3 78 19
			6	SS	26		202				
201.5											
4.4	End of borehole Refusal on probable bedrock										

* 2009 01 13

▽ Water level observed during drilling

▼ Water level measured after drilling

■ Penetrometer test

+7, ×5 : Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

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RECORD OF BOREHOLE No SP-S2 1 of 1 METRIC

W.P. 5276-05-01 LOCATION Coords: 5 097 922.8 N; 337 010.6 E ORIGINATED BY M.R.

DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY N.R.

DATUM Geodetic DATE December 14, 2008 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
205.4	Ground Surface										
0.0	Topsoil										
205.2	Silty clay, trace sand										
0.2	Very stiff to firm Reddish brown Moist		1	SS	19		205				
			2	SS	13		204				
			3	SS	10	▼*	203	■			
	clayey silt layers		4	SS	6		202				
201.7											
3.7	Clayey silt, trace sand										
	Firm to hard Grey Moist		5	SS	5		201				
200.5											
4.9	silty clay layers		6	SS	5/10cm						
200.4	Gravelly sand, some silt										
5.0	End of borehole										
	Refusal on probable bedrock										

sample 6: Sampler bouncing

* 2008 12 14

▼ Water level measured after drilling

■ Penetrometer test

Piezometer Legends :

Bentonite seal

Filter sand

Screen

Water Level Readings :

Date	Depth (m)	Elev.
12/14/2008	2.3	203.1
02/19/2009	2.7	202.7

+7 , ×5 : Numbers refer to Sensitivity

20 / 15 — 5 / 10 (%) STRAIN AT FAILURE

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RECORD OF BOREHOLE No SP-S3 1 of 1 METRIC

W.P. 5276-05-01 LOCATION Coords: 5 097 930.2 N; 337 022.6 E ORIGINATED BY M.R.

DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Drilling COMPILED BY N.R.

DATUM Geodetic DATE December 15, 2008 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
205.3	Ground Surface										
0.0	Topsoil										
205.1 / 0.2	Silty clay, trace sand Stiff to firm Reddish brown Moist		1	SS	13		205				
			2	SS	10		204				
			3	SS	7		203				
201.6			4	SS	3		202				
3.7	Clayey silt, trace sand Firm to stiff Brown Moist		5	SS	5		201				
200.3	Grey		6	SS	10						
5.0 / 200.0	Gravelly sand, some silt						200				
5.3	Granitic Gneiss Bedrock Slightly weathered to unweathered High strength Very poor, becoming fair to excellent quality		7	RC NQ	REC 100%						RQD 0%
			8	RC NQ	REC 100%		199				RQD 63%
			9	RC NQ	REC 100%		198				RQD 94%
196.8							197				
8.5	End of borehole										

* Borehole charged with drilling water

■ Penetrometer test

C.F.H.S.A. denotes Continuous Flight Hollow Stem Augers

+7, ×5 : Numbers refer to Sensitivity

20 / 15 — 5 / 10 (%) STRAIN AT FAILURE

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RECORD OF BOREHOLE No SP-S4 1 of 1 METRIC

W.P. 5276-05-01 LOCATION Coords: 5 097 930.8 N; 337 014.1 E ORIGINATED BY F.P.

DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Drilling COMPILED BY N.R.

DATUM Geodetic DATE January 12, 2009 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
205.5	Ground Surface										
0.0 / 205.2	Topsoil		1	SS	12		205				
0.3	Clay trace sand, trace gravel Very stiff Reddish Moist brown		2	SS	12						1 1 35 63
204.3							204				
1.2	Silty clay trace sand, trace gravel Very stiff Brown Moist to stiff		3	SS	12			125			
			4	SS	7		203				0 1 46 53
				FV				6			
			5	TW	PH						
201.7				FV			202	5			
3.8	Clayey silt, trace sand Stiff Grey Moist to wet		6	CS	4						0 1 77 22
				FV		▽*	201	6			
			7	SS	11						
			8	SS	11		200				
199.6											
5.9	Gravelly sand with silt, trace clay Compact Grey Wet		9	SS	15		199				36 36 22 6
198.4											
7.1	Granitic Gneiss Bedrock Slightly weathered to unweathered Medium strength Poor, becoming fair to excellent quality		10	RC NQ	REC 100%		198				RQD 37%
	High strength		11	RC NQ	REC 93%		197				RQD 91%
							196				
195.0			12	RC NQ	REC 85%		195				RQD 65%
10.5	End of borehole										

* 2009 01 12

▽ Water level observed during drilling

■ Penetrometer test

C.F.S.S.A. denotes Continuous Flight Solid Stem Augers

+7, ×5 : Numbers refer to Sensitivity

20 / 15 — 5 / 10 (%) STRAIN AT FAILURE

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RECORD OF BOREHOLE No SP-S5 1 of 1 METRIC

W.P. 5276-05-01 LOCATION Coords: 5 097 928.1 N; 337 007.2 E ORIGINATED BY F.P.

DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Drilling COMPILED BY N.R.

DATUM Geodetic DATE January 13, 2009 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
205.5	Ground Surface										
0.0 / 205.2	Topsoil		1	SS	7		205				
0.3	Clay, trace sand Firm to Reddish Moist Very stiff brown		2	SS	10						0 1 41 58
203.7			3	SS	9		204	150			
1.8	Silty clay trace sand, trace gravel Stiff to Brown Moist firm to wet		4	SS	6		203				1 1 58 40
			5	SS	4		202				
	clayey silt layers Grey		6	SS	3	▽*					
201.2							201				
4.3	Silt some clay, trace sand Loose Grey Wet		7	SS	7				Non plastic		0 5 85 10
200.3											
5.2	Granitic Gneiss Bedrock Unweathered High strength Poor to fair, becoming good quality		8	RC NQ	REC 97%		200				RQD 56%
			9	RC NQ	REC 83%		199				RQD 25%
			10	RC NQ	REC 97%		198				RQD 85%
197.2											
8.3	End of borehole										

* 2009 01 13

▽ Water level observed during drilling

■ Penetrometer test

C.F.S.S.A. denotes Continuous Flight Solid Stem Augers

+7, ×5 : Numbers refer to Sensitivity

20 / 15 — 5 / 10 (%) STRAIN AT FAILURE

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RECORD OF BOREHOLE No SP-S6 1 of 1 METRIC

W.P. 5276-05-01 LOCATION Coords: 5 097 933.2 N; 337 018.5 E ORIGINATED BY F.P.

DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Drilling COMPILED BY N.R.

DATUM Geodetic DATE January 13 and 21, 2009 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
205.6	Ground Surface										
0.0 / 205.3	Topsoil		1	SS	7		205				
0.3	Clay trace sand, trace gravel Stiff Grey/Brown Moist		2	SS	14						
	Brown		3	SS	7		204				
203.5											
2.1	Silty clay trace sand, trace gravel Stiff Brown Moist		4	SS	9	▼*	203				
	Grey		5	SS	5	▽*	202				
201.9											
3.7	Clayey silt trace sand, trace gravel Firm to stiff Grey Wet		6	SS	4						
	silt, trace sand layers		7	SS	5		201				
199.8			8	SS	12		200				
5.8	Gravelly sand with silt, trace clay Dense Grey Wet		9	SS	34		199				
	cobbles and boulders						198				
196.8							197				
8.8	Granitic Gneiss Bedrock Slightly weathered to unweathered High strength Fair to excellent quality		10	RC NQ	REC 96%		196				RQD 62%
			11	RC NQ	REC 100%		195				RQD 95%
193.4			12	RC NQ	REC 89%		194				RQD 81%
12.2	End of borehole										

* 2009 01 13

▽ Water level observed during drilling

▼ Water level measured after drilling

■ Penetrometer test

C.F.S.S.A. denotes Continuous Flight Solid Stem Augers

+7, ×5 : Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

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RECORD OF BOREHOLE No SP-S7 1 of 1 METRIC

W.P. 5276-05-01 LOCATION Coords: 5 097 935.5 N; 337 019.2 E ORIGINATED BY F.P.

DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.R.

DATUM Geodetic DATE January 12, 2009 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
205.7	Ground Surface										
0.0	Topsoil										
205.5 / 0.2	Silty clay trace sand, trace gravel		1	SS	17						
	Stiff Reddish Moist		2	SS	12		205				
	to firm brown		3	SS	9		204				0 2 49 49
			4	SS	9		203				
	Grey		5	SS	4						
	silty clay layers			FV			202	6			
			6	CS	4	▼*					
201.1				FV		▽*		5			
4.6	Silt some clay, trace sand		7	SS	6		201		Non plastic		0 2 86 12
	Loose Grey Wet		8	SS	5		200				
199.6											
6.1	Gravelly sand trace silt, trace clay		9	SS	45		199				36 54 8 2
199.0	Dense Grey Wet										
6.7	End of borehole										
	Refusal on probable bedrock										

* 2009 01 12

▽ Water level observed during drilling

▼ Water level measured after drilling

■ Penetrometer test

ON_MOT VER 3A 06TF032E_SBL.GPJ ON_MOT.GDT 8/20/2009 8:21:44 AM

+7, ×5 : Numbers refer to Sensitivity

20 / 15 — 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

Peto MacCallum Ltd.
Foundation Design

RECORD OF BOREHOLE No SP-S8 1 of 1 METRIC

W.P. 5276-05-01 LOCATION Coords: 5 097 937.8 N; 337 001.2 E ORIGINATED BY F.P.

DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY N.R.

DATUM Geodetic DATE January 13, 2009 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
205.3	Ground Surface										
0.0	Topsoil										
205.1 / 0.2	Clay, trace sand Stiff to very stiff Brown Moist		1	SS	6		205				
204.1			2	SS	9			162			0 1 33 66
1.2	Silty clay trace sand, trace gravel Hard to firm Brown Moist		3	SS	9		204	>225			
			4	SS	4		203				
				FV				10			
			5	SS	2		202				
201.5				FV				4			
3.8	Clayey silt trace sand, trace gravel Firm to hard Grey Wet		6	CS	3	▼* ▽*	201				1 2 81 16
				FV				4			
200.3			7	SS	15/15cm						
5.0	End of borehole Refusal on probable bedrock Sample 7: Sampler bouncing * 2009 01 13 ▽ Water level observed during drilling ▼ Water level measured after drilling ■ Penetrometer test										

ON_MOT VER 3A 06TF032E_SBL.GPJ ON_MOT.GDT 8/20/2009 8:21:45 AM

+7, ×5: Numbers refer to Sensitivity

20 / 15 — 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

Peto MacCallum Ltd.
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RECORD OF BOREHOLE No SP-S9 1 of 1 METRIC

W.P. 5276-05-01 LOCATION Coords: 5 097 940.7 N; 337 002.1 E ORIGINATED BY F.P.

DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Drilling COMPILED BY N.R.

DATUM Geodetic DATE January 21, 2009 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
205.3	Ground Surface										
0.0 / 205.0	Topsoil		1	SS	8		205				
0.3	Clay, trace sand Firm to very stiff Grey/brown Moist		2	SS	16						
			3	SS	11		204				
202.6			4	SS	5		203				
2.7	Silty clay, trace sand Firm Brown Moist		5	SS	3						
	Grey Wet			FV		▽*	202	+7			
			6	CS	3						
200.7				FV			201	+6			
4.6	Clayey silt, trace sand Firm Grey Moist to wet		7	TW	PH						
199.8	silt, trace clay layers						200				
5.5	Sand trace silt, trace gravel Compact Grey Wet		8	SS	18						
198.9			9	SS	20/15cm		199				
6.4	Granitic Gneiss Bedrock Unweathered High strength Good to excellent quality		10	RC NQ	REC 100%						RQD 100%
			11	RC NQ	REC 100%		198				RQD 89%
			12	RC NQ	REC 100%		197				RQD 100%
	Fair quality		13	RC NQ	REC 71%		196				RQD 71%
195.5											
9.8	End of borehole										

* 2009 01 21

▽ Water level observed during drilling

■ Penetrometer test

C.F.S.S.A. denotes Continuous Flight Solid Stem Augers

+7 , ×5 : Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

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Ontario

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RECORD OF BOREHOLE No SP-S10 1 of 1 METRIC

W.P. 5276-05-01 LOCATION Coords: 5 097 945.2 N; 337 013.2 E ORIGINATED BY M.R.

DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Drilling COMPILED BY N.R.

DATUM Geodetic DATE December 11 and 12, 2008 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
205.4	Ground Surface										
0.0	Topsoil										
205.2 / 0.2	Silty clay, trace sand Stiff to firm Reddish brown Moist		1	SS	12		205	■	○		
			2	SS	11		204	■	○		
			3	SS	7		203		○		0 1 40 59
			4	SS	4		202	■	○		
	silt lenses		5	SS	3				○		
201.0 / 4.4	Grey Silt, some clay trace sand, trace gravel Loose Grey Wet		6	SS	7		201		H○		1 2 82 15
199.6							200				
5.8	Granitic Gneiss Bedrock Unweathered High strength Excellent quality		7	RC NQ	REC 100%		199				RQD 93%
			8	RC NQ	REC 100%		198				RQD 100%
196.6							197				
8.8	End of borehole										

* Borehole charged with drilling water

■ Penetrometer test

C.F.S.S.A. denotes Continuous Flight Solid Stem Augers

+7, ×5 : Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

Peto MacCallum Ltd.
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RECORD OF BOREHOLE No SP-S11 1 of 1 METRIC

W.P. 5276-05-01 LOCATION Coords: 5 097 942.8 N; 337 006.7 E ORIGINATED BY M.R.

DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Drilling COMPILED BY N.R.

DATUM Geodetic DATE December 14 and 15, 2008 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
205.4	Ground Surface										
0.0	Topsoil										
205.2 / 0.2	Silty clay, trace sand Very stiff to firm Mottled reddish brown Moist		1	SS	12		205				
			2	SS	9		204				
			3	SS	8		203				
201.7			4	SS	4		202				
3.7	Clayey silt trace sand, trace gravel Firm Grey Moist		5	SS	4		201				
			6	SS	3						1 1 84 14
			7	SS	6/15cm		200				
	cobbles and boulders		8	RC NQ	-		199				-
197.3							198				
8.1	Granitic Gneiss Bedrock Unweathered High strength Poor, becoming excellent quality		9	RC NQ	REC 56%		197				RQD 26%
			10	RC NQ	REC 95%		196				RQD 92%
194.1			11	RC NQ	REC 98%		195				RQD 98%
11.3	End of borehole										

* Borehole charged with drilling water

■ Penetrometer test

C.F.S.S.A. denotes Continuous Flight Solid Stem Augers

+7, ×5 : Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

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RECORD OF BOREHOLE No SP-S12 1 of 1 METRIC

W.P. 5276-05-01 LOCATION Coords: 5 097 943.1 N; 336 997.8 E ORIGINATED BY M.R.

DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. and Rotary Diamond Drilling COMPILED BY N.R.

DATUM Geodetic DATE December 13 and 14, 2008 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
205.3	Ground Surface										
0.0	Topsoil										
205.1 / 0.2	Clay, trace sand Very stiff Mottled Moist to firm brown		1	SS	12		205				
			2	SS	12		204	150			0 1 34 65
			3	SS	8		203				
			4	SS	4		202				
201.5											
3.8	Clayey silt trace sand, trace gravel Firm Brown Wet to grey		5	SS	4		201				1 1 73 25
			6	SS	5		200				
199.6											
5.7	Granitic Gneiss Bedrock Slightly weathered to unweathered High strength Excellent quality		7	RC NQ	REC 100%						RQD 100%
			8	RC NQ	REC 100%		199				RQD 95%
			9	RC NQ	REC 98%		198				RQD 94%
196.6							197				
8.7	End of borehole										

* Borehole charged with drilling water

■ Penetrometer test

C.F.S.S.A. denotes Continuous Flight Solid Stem Augers

+7, ×5 : Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

Peto MacCallum Ltd.
Foundation Design

RECORD OF BOREHOLE No SP-S13 1 of 1 METRIC

W.P. 5276-05-01 LOCATION Coords: 5 097 950.6 N; 337 009.8 E ORIGINATED BY M.R.

DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY N.R.

DATUM Geodetic DATE December 11, 2008 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
205.5 / 0.0	Ground Surface										
205.4 / 0.1	Topsoil										
	Clay, trace sand Very stiff to firm Mottled redish brown Moist		1	SS	14	*	205				
			2	SS	13		204	150			0 1 39 60
			3	SS	8		203				
201.8 / 3.7			4	SS	3		202				
	Silt, some clay trace sand, trace gravel Loose Brown Wet Grey		5	SS	5						1 7 81 11
200.2 / 5.3			6	SS	9		201				
	End of borehole Refusal on probable bedrock										

* 2008 12 14

Water level measured after drilling

■ Penetrometer test

Piezometer Legends :

Bentonite seal

Filter sand

Screen

Water Level Readings :

Date	Depth (m)	Elev.
12/14/2008	0.8	204.7
02/19/2009	0.9	204.6

+7, ×5 : Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

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Foundation Design

RECORD OF BOREHOLE No SP-S14 1 of 1 METRIC

W.P. 5276-05-01 LOCATION Coords: 5 097 959.8 N; 336 996.2 E ORIGINATED BY M.R.

DIST 54 HWY 69 BOREHOLE TYPE Continuous Flight Hollow Stem Augers COMPILED BY N.R.

DATUM Geodetic DATE December 11, 2008 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	*					GR SA SI CL
205.5 / 0.0	Ground Surface										
205.4 / 0.1	Topsoil										
	Silty clay, trace sand Very stiff Mottled Moist to stiff redish brown		1	SS	3		205				
			2	SS	5			175 ■	○		0 3 43 54
			3	SS	9		204	125 ■	○		
202.6			4	SS	8		203	■	○		
2.9	Clayey silt, trace sand Firm Brown Wet		5	SS	5		202		⊢○		0 3 85 12
201.6											
3.9	End of borehole Refusal on probable bedrock										

* Borehole dry

■ Penetrometer test

+7, ×5 : Numbers refer to Sensitivity

20 / 15 — 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

Peto MacCallum Ltd.
Foundation Design

RECORD OF BOREHOLE No SPR-1 1 of 1 METRIC

W.P. 5276-05-01 LOCATION Supply Post Road Overpass Co-ords. 5 097 932 N; 337 003 E ORIGINATED BY M.R.

DIST 54 HWY 69 BOREHOLE TYPE C.F.H.S.A. & NQ Rock Coring COMPILED BY M.R.

DATUM Geodetic DATE May 28, 2004 CHECKED BY D.W.K.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS *	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
204.8 / 0.0	Ground Surface										
204.7 / 0.1	Peat, coarse fibrous Dark brown		1	SS	5		204				
	Silty clay, trace sand silt lenses, trace clay										
	Firm Brown APL		2	SS	8		203	125 ■	○		
			3	SS	2		202	■	○		
200.8 / 4.0	Silt, trace clay						201	+ 4			
	Loose Grey Wet		4	SS	5		200		○		
199.0 / 5.8	Bedrock						199				
	Granitic Gneiss		5	RC NQ	REC 100%		198				RQD 93%
	Medium to high strength										
	Fair to excellent quality		6	RC NQ	REC 100%		197				RQD 72%
196.0 / 8.8	End of borehole						196				

* Borehole charged with drilling water

■ Penetrometer test

ON_MOT VER 3A 06TF032E_SBL.GPJ ON_MOT.GDT 8/25/2009 2:36:27 PM

+7, ×5 : Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

Peto MacCallum Ltd.
Foundation Design

RECORD OF PENETRATION TEST No SPR-2 1 of 1 METRIC

Supply Post Road Overpass

W.P. 5276-05-01 LOCATION Co-ords. 5 097 941 N; 337 017 E ORIGINATED BY M.R.

DIST 54 HWY 69 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY M.R.

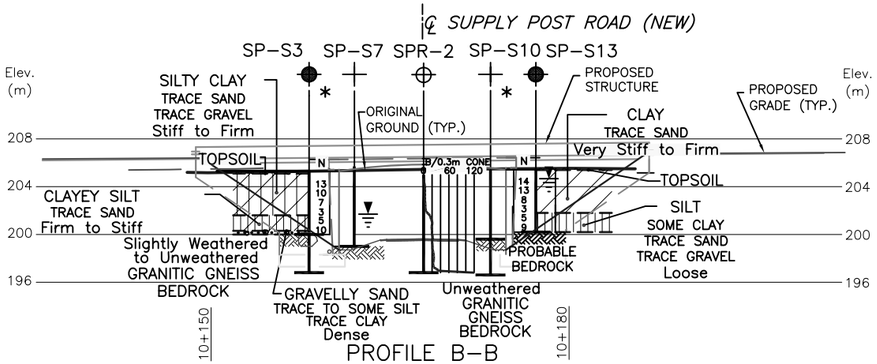
DATUM Geodetic DATE May 28, 2004 CHECKED BY D.W.K.

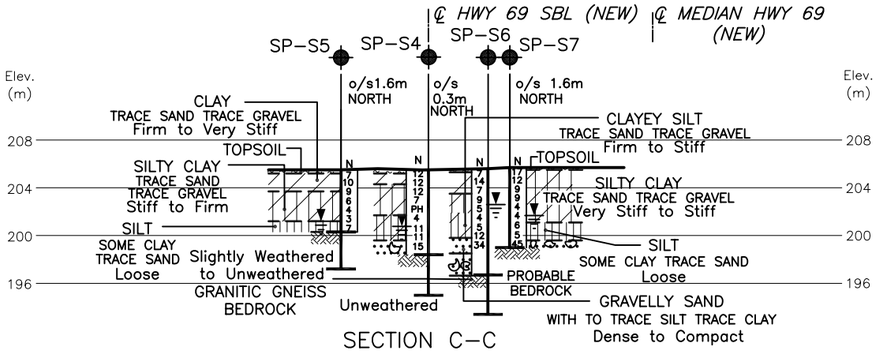
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
205.0 0.0	Ground Surface										
	Possible silty clay						204				
							203				
							202				
	— — — — — Possible silt						201				
							200				
							199				
							198				
196.8 8.2							197				
	End of dynamic cone penetration test							120/23cm			
	Refusal on probable bedrock										

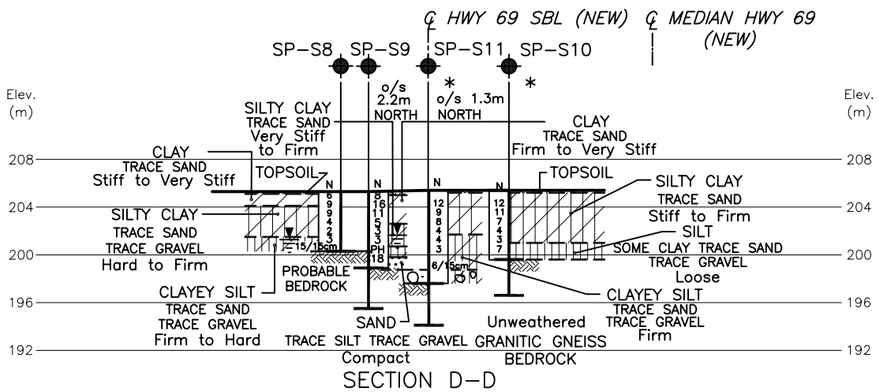
MOT_DCPT R2004 06TF032E_SBL.GPJ ON_MOT.GDT 8/25/2009 2:45:10 PM

+7, ×5 : Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

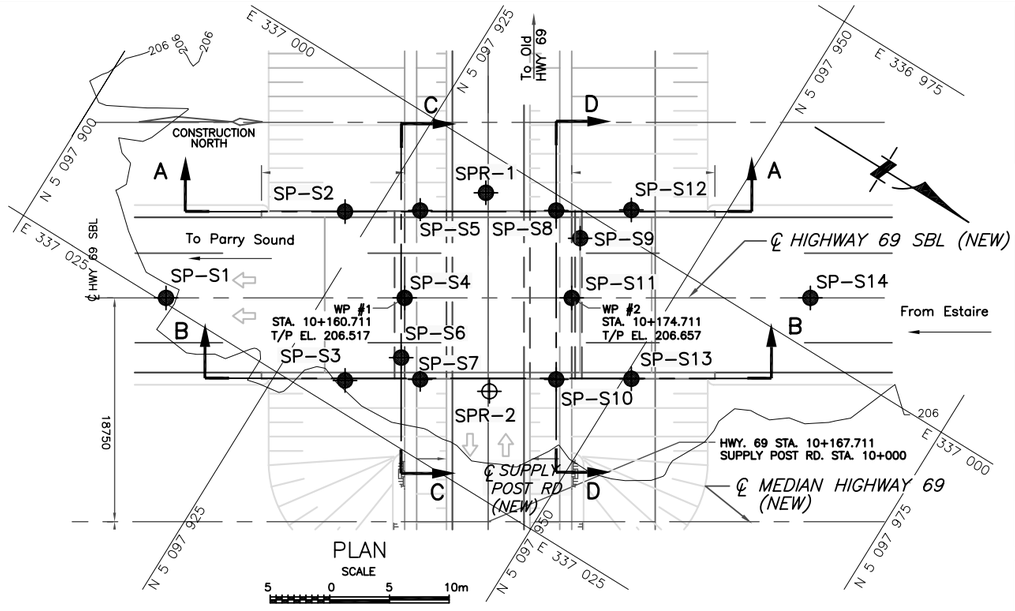


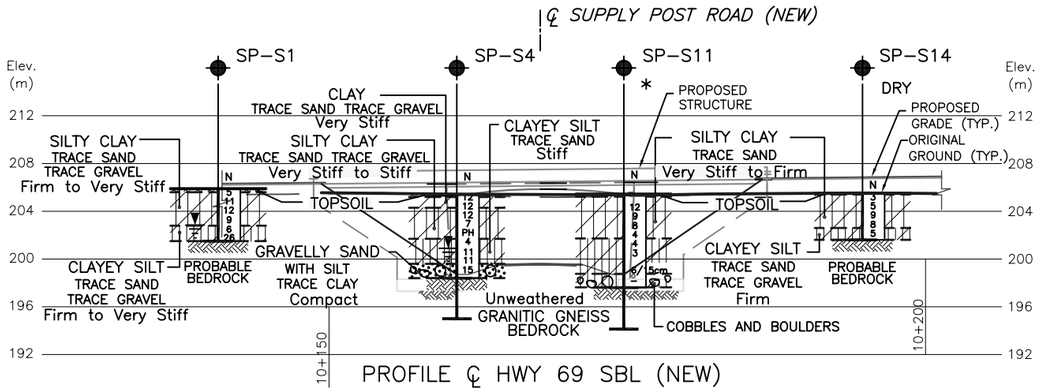


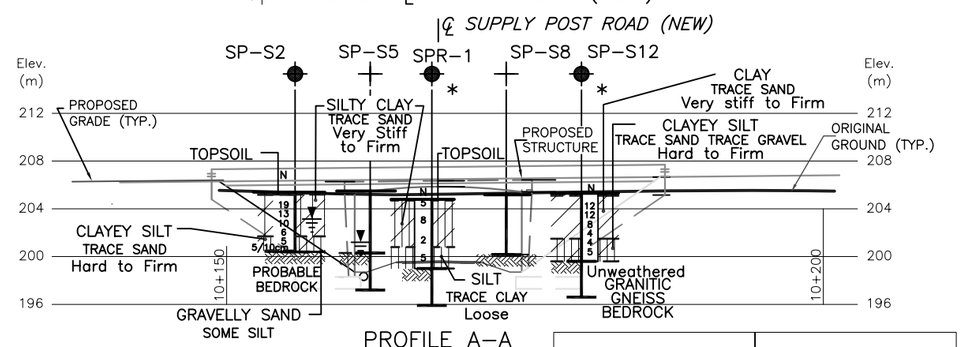


NOTES:

1. DRAWING SR–1 SHOULD BE READ IN CONJUNCTION WITH THE TEXT AND RECORD OF BOREHOLE LOGS.
2. THIS DRAWING IS FOR SUBSURFACE INFORMATION ONLY. SURFACE DETAILS AND FEATURES ARE FOR CONCEPTUAL ILLUSTRATION.
3. BOREHOLES SPR–1 AND SPR–2 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.







SCALE
5 0 5 10m

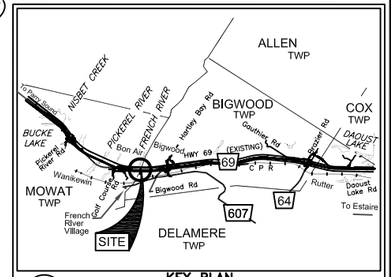
REF No. MRC Drawing; S6454–324–001GA.dwg; dated July 2008 (Modified on February 17, 2009)

CONT No
WP No 5276–05–01

SHEET

SUPPLY POST ROAD SB 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)
- PH Thinwall Sample – Advanced Hydraulically
- W L at time of investigation Dec 2008 and Jan 2009; SPR–2 May 2004
- W L not established
- Head
- ARTESIAN WATER
- Encountered
- PIEZOMETER

BH No	ELEVATION	CO–ORDINATES NORTHINGS	EASTINGS
SP–S1	205.9	5 097 913.8	337 024.6
SP–S2	205.4	5 097 922.8	337 010.6
SP–S3	205.3	5 097 930.2	337 022.6
SP–S4	205.5	5 097 930.8	337 014.1
SP–S5	205.5	5 097 928.1	337 007.2
SP–S6	205.6	5 097 933.2	337 018.5
SP–S7	205.7	5 097 935.5	337 019.2
SP–S8	205.3	5 097 937.8	337 001.2
SP–S9	205.3	5 097 940.7	337 002.1
SP–S10	205.4	5 097 945.2	337 013.2
SP–S11	205.4	5 097 942.8	337 006.7
SP–S12	205.3	5 097 943.1	336 997.8
SP–S13	205.5	5 097 950.6	337 009.8
SP–S14	205.5	5 097 959.8	336 996.2
SPR–1	204.8	5 097 932.0	337 003.0
SPR–2	205.0	5 097 941.0	337 017.0

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

REVISIONS

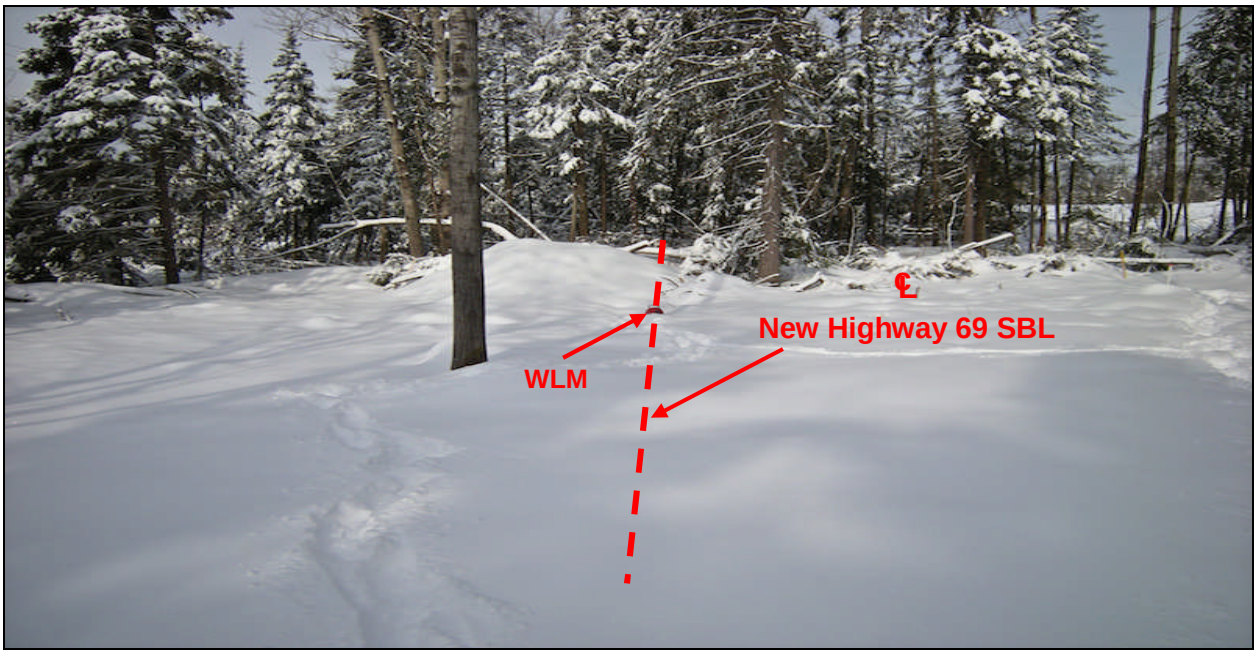
DATE	BY	DESCRIPTION

Geocres No. 411–236

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

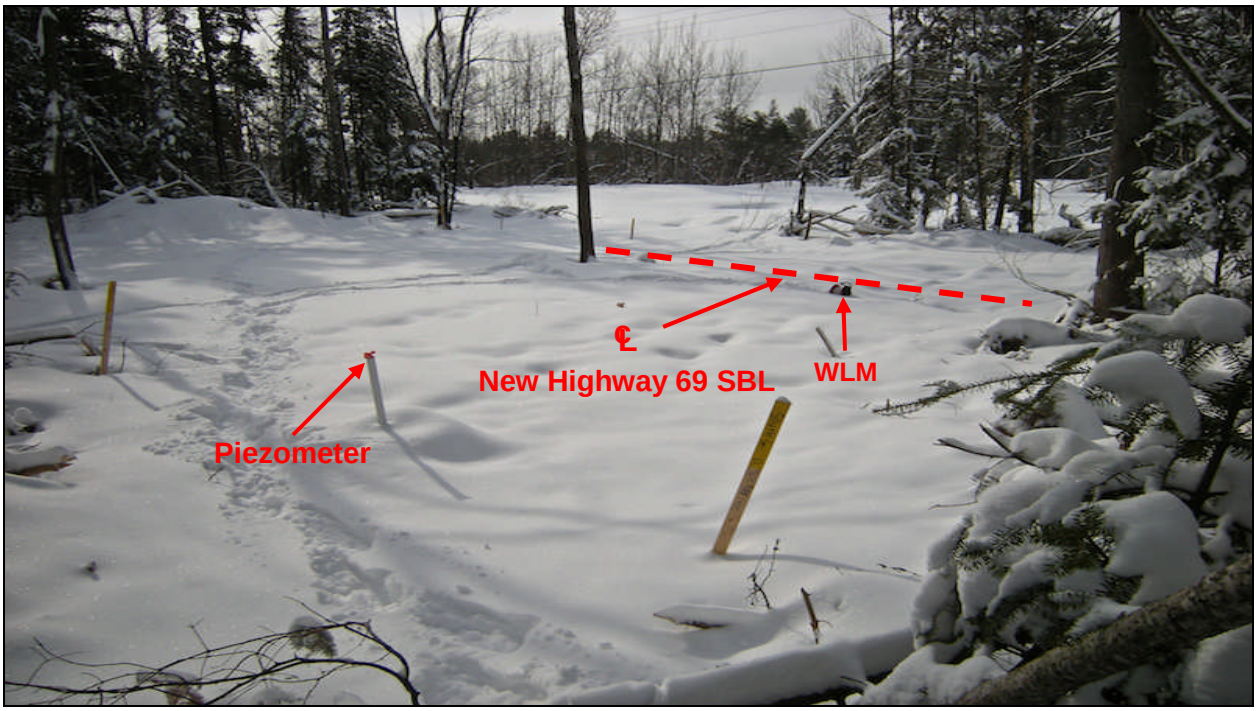
APPENDIX A

Site Photographs

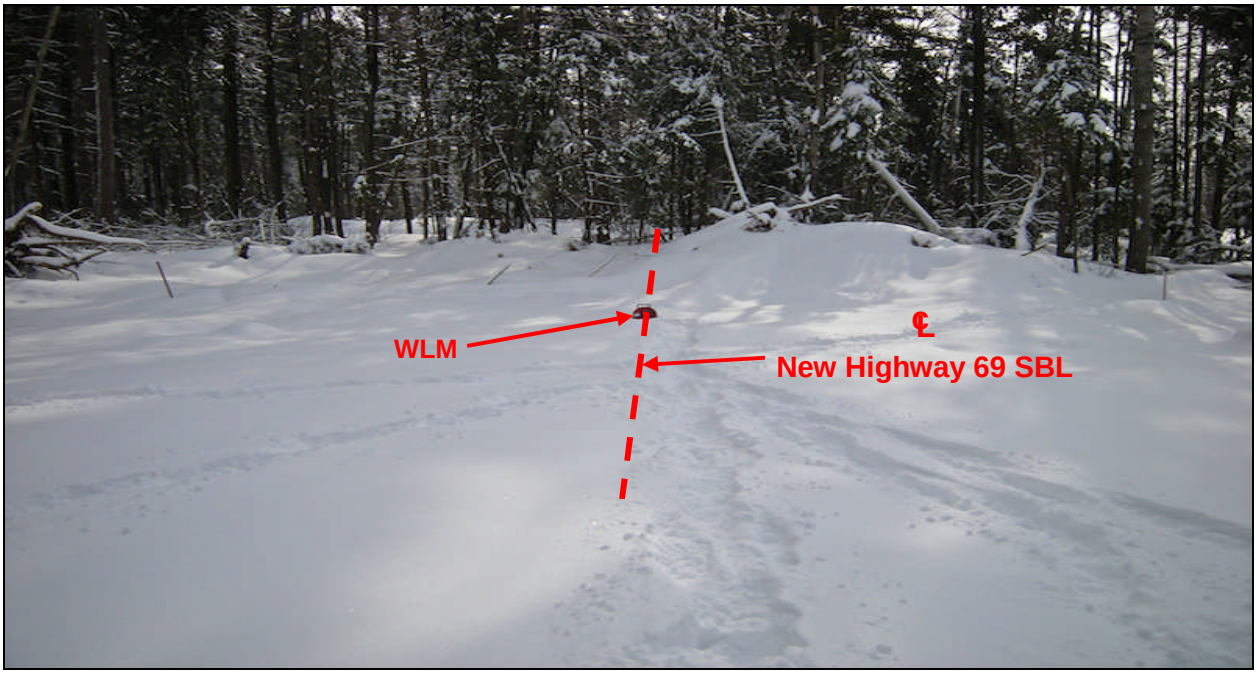


Photograph 1: Viewing north towards the north abutment, approximate Sta. 10+175. Wooded area in the background of the photo. The ground is covered in snow. Water level meter (WLM) has been placed in the middle of the north abutment. (February, 2009)

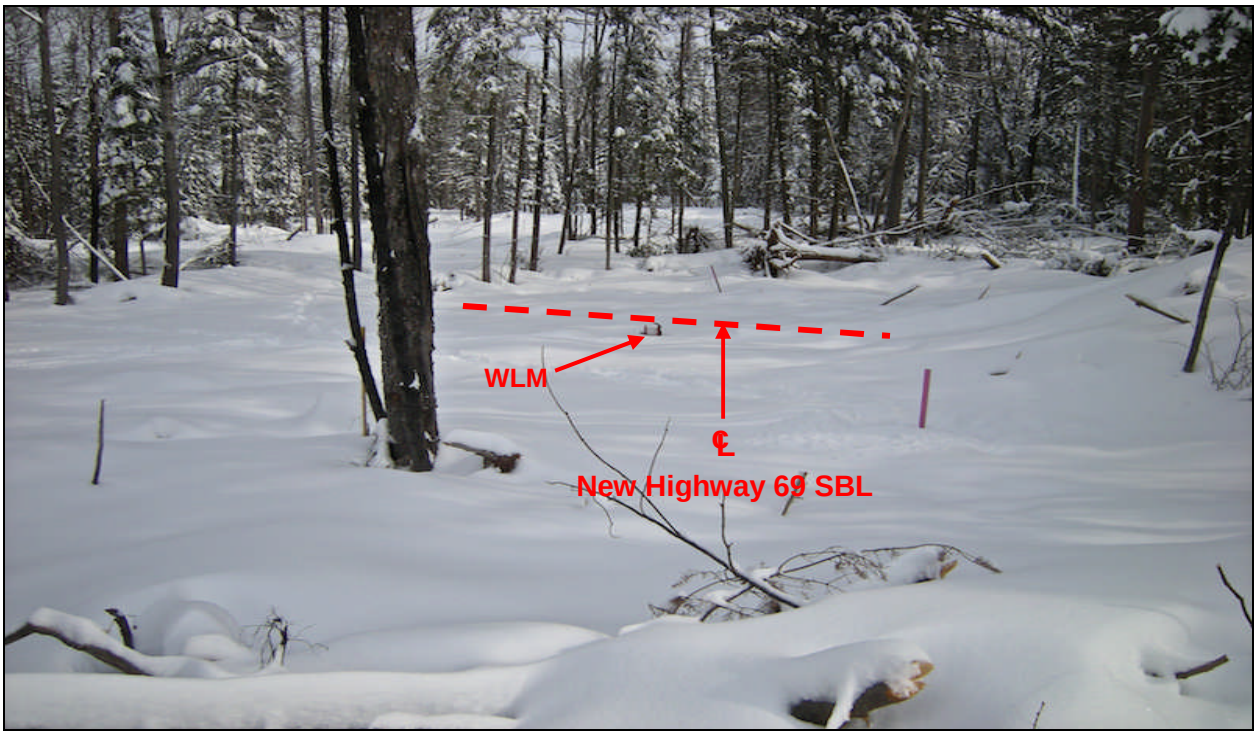
Photograph 2: Viewing east towards the north abutment, approximate Sta. 10+175. Note flat terrain and wooded area in the background of the photograph. Water level meter (WLM) has been placed in the middle of the north abutment. (February, 2009)



Photograph 3: Viewing south west towards the north abutment, approximate Sta.10+175. Piezometer installed in borehole SP-S13 in the foreground of the photograph. Water level meter (WLM) is marking the middle of the north abutment. (February, 2009)

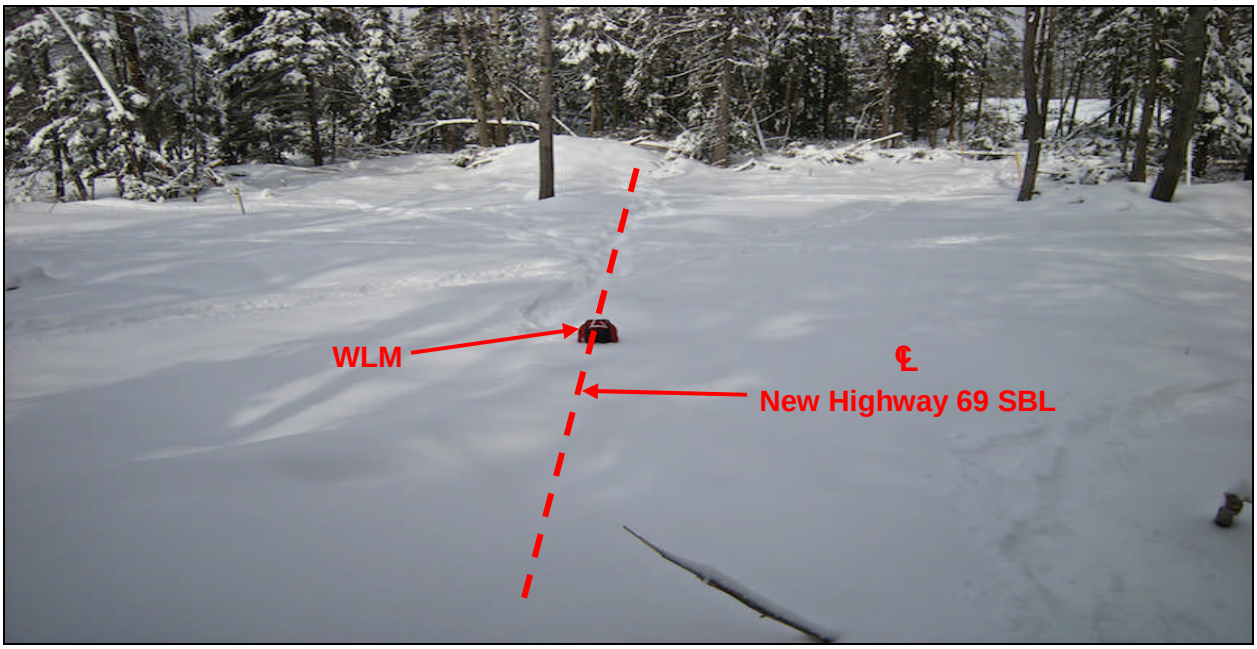


Photograph 4: Looking south towards the south abutment, approximate Sta. 10+161. The ground is covered in snow. Wooded area in the background of the photograph. Water level meter (WLM) is marking the middle of the south abutment. (February, 2009)



Photograph 5: Looking east towards the south abutment, approximate Sta. 10+161. Wooded area in the background of the photograph. Water level meter (WLM) marks the middle of the south abutment. (February, 2009)

Photograph 6: Looking west towards the south abutment, approximate Sta. 10+161. Note generally flat ground. Water level meter (WLM) has been placed in the middle of the south abutment. (February, 2009)



Photograph 7: Viewing north towards the south abutment, approximate Sta. 10+161. Wooded area in the background of the photograph. The water level meter (WLM) has been placed in the middle of the south abutment. (February, 2009)

APPENDIX B

Rock Core Photographs

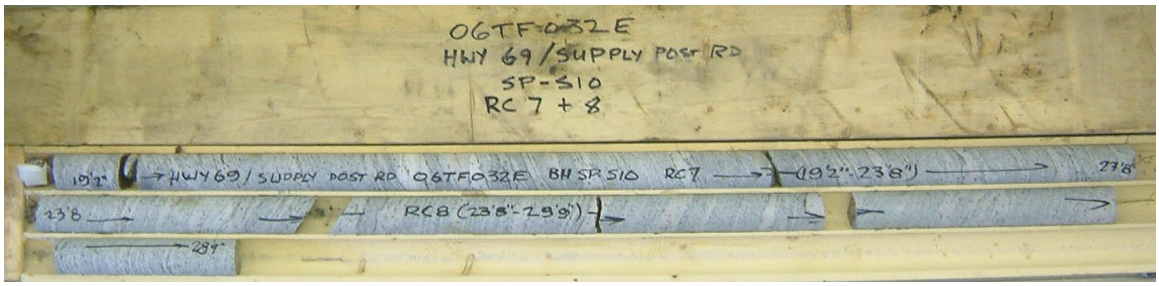
Photograph 1: Rock cores retrieved from borehole SP-S3. Samples RC-7 to RC-9.

Photograph 2: Rock cores retrieved from borehole SP-S4. Samples RC-10 to RC-12.

Photograph 3: Rock cores retrieved from borehole SP-S5. Samples RC-8 to RC-10.

Photograph 4: Rock cores retrieved from borehole SP-S6. Samples RC-10 to RC-12.

Photograph 5: Rock cores retrieved from borehole SP-S9. Samples RC-10 to RC-13.



Photograph 6: Rock cores retrieved from borehole SP-S10. Samples RC-7 and RC-8.

Photograph 7: Rock cores retrieved from borehole SP-S11. Samples RC-8 to RC-11.

Photograph 8: Rock cores retrieved from borehole SP-S12. Samples RC-7 to RC-9.