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DIST. 6 REGION

W.P. No. 156-75-05

CONT. No. 81-50

W. O. No.

STR. SITE No. 24-369

HWY. No. 403

LOCATION CPR Subway East of Credit River

No OF PAGES -

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

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Other maps
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SB-OS-35A 8-77

ENGINEERING MATERIALS OFFICE
SOIL MECHANICS SECTION

WP 156-75-05 DIST 6

HWY 403 STR SITE 24-369

CPR Subway East of Credit River

CONT 81-50

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GEOCRES 30M12-134 DATE NOV 21 1978

FOUNDATION INVESTIGATION REPORT
For
CPR Subway East of Credit River
W.P. 156-75-05, Site 24-369
Hwy. 403, District 6, Toronto

INTRODUCTION

This report contains the results of a foundation investigation carried out at the site of the above mentioned project during the period of September 6 to September 13, 1978.

The fieldwork consisted of 10 sampled boreholes advanced by means of an auger machine which was equipped with solid and hollow stem continuous flight augers. In addition, diamond drilling techniques were employed to obtain BXL size rock core samples of the bedrock. The boreholes ranged in depth from 41.0 to 51.0 feet below ground surface.

SITE DESCRIPTION AND GEOLOGY

The site is located about 1½ miles south of Eglinton Avenue and about one mile west of Creditview Road in the City of Mississauga, Regional Municipality of Peel.

The land immediately adjacent to the site has a gentle topography and is sloping down westward.

Physiographically the site is situated in the border region of the " Peel Plain " and the "South Slope". The characteristic deposit in the vicinity of the area under investigation is mainly a cohesive glacial till underlain by shale or limestone bedrock.

SUBSURFACE CONDITIONS

General

The subsurface conditions at this site were found to be generally uniform. Under a thin layer of topsoil the overburden material is a cohesive glacial till which was investigated to its full depth in all the boreholes. The overburden is underlain by

limestone bedrock. At one location the glacial till is overlain by a 7.5 foot thick layer of silt. A detailed description of the subsoil and bedrock conditions encountered in the investigation is given in the Record of Borehole Sheets. The estimated stratigraphical profile and sections shown on Drawing No. 1567505-A are based on this information. From ground level downwards the subsurface conditions are described as follows.

Silt

In one location immediately below ground surface the cohesive glacial till is overlain by a silt layer having a total thickness of 7.5 feet which appears to be a localized deposit. Based on one Standard Penetration 'N' value of 39 blows/foot it is estimated that the relative density of this surficial stratum is dense. One typical grain size distribution curve obtained from a sample of this material gave the following:

Sand 2%: Silt 89%; Clay 9%

Heterogeneous Mixture of Clayey Silt Sand and Gravel (Glacial Till)

Underlying a thin (maximum 12") layer of topsoil a deposit of cohesive glacial till was encountered at most locations over the site. The glacial till varies in thickness from 36 feet to 46.5 feet. The cohesive glacial till is composed of a heterogeneous mixture of clayey silt, sand and gravel. Occasional boulders and also seams of silt and sand were encountered within this deposit. The Standard Penetration Test 'N' values are generally in excess of 100 blows per foot with occasional values of 46 to 77 blows/foot indicating that the glacial till has a hard consistency. The physical properties of the glacial till as determined from laboratory testing are summarized below.

		Range
Liquid Limit	(W_L) %	21-34
Plastic Limit	(W_p) %	11-18
Moisture Content	(W) %	5-13

The results of the Atterberg Limit Tests are shown on Plasticity Chart (Fig. 1) and the typical grain size distribution curves are presented in an envelope form in Figure 2 which are included in the Appendix of this report.

The Atterberg Limits indicate that the cohesive stratum is inorganic and of low plasticity (CL).

Bedrock (Limestone With Occasional Shale Seams)

Bedrock was encountered immediately below the cohesive glacial till overburden. The bedrock was proven at all borehole locations (except B.H. #1) by obtaining BXL size rock core samples. The dominant type of bedrock encountered across the site is identified as medium hard limestone interbedded with occasional seams of shale.

The bedrock surface in the area investigated varies from elevation 433.5 to 442.8. The bedrock in general was found to be sound. However, in certain locations the upper 1 to 2 feet of the bedrock was found to be in a weathered condition. The recovery ratio was generally high, being close to 100% with few exceptions and the average RQD was found to be in the order of 30% to 50%.

Groundwater Conditions

The groundwater conditions were observed in the open boreholes during and after the completion of the foundation investigation. These observations concluded that the boreholes were generally dry to their full depth except in one area (B.H. #8 and #9) where the water was observed some 23 to 29 feet below ground surface which corresponds to elevation 455 to elevation 451. It should be noted that in view of the impervious nature of the subsoil, the water levels may not have been stabilized during the short period of investigation.

DISCUSSION AND RECOMMENDATIONS

As part of the Hwy. 403 construction a subway structure is planned at the crossing of the new Hwy. 403 and C.P.R. in the City of Mississauga, Regional Municipality of Peel.

The proposed plan calls for a four span structure having a total length of 260 feet (50'+80'+80'+50') and a width of 68 feet at the south end and 59 feet at the north end. The elevation of the existing C.P.R. tracks is 483.0 and the proposed grade of new Hwy. 403 is at elevation 459.5 (mid-point). This will necessitate cuts up to 24 feet in depth.

Pier Foundations

The proposed three piers may be founded on spread footings within the hard glacial till stratum at or below elevation 455.0 with an allowable bearing pressure of up to 5 tsf. A minimum earth cover of 4 feet above the base of the footings should be provided for frost protection requirements.

No dewatering problems are anticipated for the construction of the pier foundations since the subsoil is relatively impervious. However, any minor seepage or surface run-off into the excavation could be controlled by pumping from the sumps. It should be noted that the foundation excavation base should be kept dry at all times prior to the placing of concrete.

Abutment Foundations

If closed type abutments are constructed their foundation support will be similar to that of the pier footings as described elsewhere. Alternatively, if perched abutments are contemplated the footings can be supported within the competent hard glacial till stratum as high as possible within the approach cuts with an allowable bearing pressure of up to 5 tsf. The footings should be provided with a minimum earth cover of 4 feet from the base of the footing for frost protection purposes.

Other Related Considerations

In order to relieve the buildup of hydrostatic pressure behind the abutment wall, free draining granular material should be used as backfill and suitable drainage measures consisting of weep holes and perforated pipes should be provided.

To estimate the lateral earth pressure induced on the abutment wall by the granular backfill, a coefficient of earth pressure of 0.5 should be used if the wall is rigid. If some movement at the top of the wall is permitted, a coefficient of earth pressure of 0.33 can be used. For either case, a unit weight of 130 pcf should be assumed for the granular backfill material. Further heavy vibratory compaction equipment should not be used in close proximity of the wall.

Approaches

The CPR tracks will be maintained at the same grade. However, the proposed Hwy. 403 will be in a cut section. The profile grades are such that cuts up to 24' deep will be required for the construction of the approaches for the new subway at this location. The cohesive glacial till is very competent and, therefore, no stability problems are anticipated provided the cuts are constructed with 2:1 side slopes. It should be noted, however, in one of the localized areas the presence of silt immediately below ground surface may result in minor sloughing. This type of condition is observed in the area of the northern portion of the east approach cut. To prevent continued maintenance problems, this portion of the cut in the silt layer should be protected with filter fabric covered with granular material.

It is desirable to construct the approach cuts to the required grade prior to the construction of foundations of the subway structure.

V. Korlu, P. Eng.
Project Engineer

M. Devata, P. Eng.
Supervising Engineer

November, 1978

APPENDIX

FIELD AND LABORATORY WORK

The subsurface investigation was carried out from September 6 to September 13, 1978 consisting of 10 sampled boreholes. All the boreholes were advanced by augering and each was accompanied by a dynamic cone penetration test.

Samples of the overburden were obtained in a 2" O.D. split-spoon sampler at required depths. The sampler was hammered into the soil according to the specifications of the Standard Penetration Test. Bedrock was proven in boreholes by obtaining BXL size rock core samples.

Groundwater level observations were carried out during the time of investigation in the open boreholes. The soil, bedrock and groundwater conditions encountered at the borehole locations are presented in the Record of Borehole Sheets. The locations and elevations of the various boreholes were provided by personnel from Construction Office, Central Region. The elevations in this report are referred to a geodetic datum. Boring locations and elevations are shown on Drawing No. W.P. 1567505-A.

All samples were subjected to careful visual examinations in the field and subsequently in the laboratory. Following this examination, laboratory tests were carried out on selected representative samples to determine the physical properties of the various soil types encountered, namely:

Atterberg Limits
Grain Size Distribution

The results of this testing are plotted on the Record of Borehole Sheets and summarized on Figure 1 and 2, all contained in this report.

Ministry of Transportation and Communications
Ontario

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 1

W P 156-75-05 LOCATION Coords. N 15,830,962; E 953,079 ORIGINATED BY V.K.

DIST 6 HWY 403 BOREHOLE TYPE Auger - Solid Stem, Core Drill BXL & Cone Test COMPILED BY V.K.

DATUM Geodetic DATE September 6, 1978 CHECKED BY RS

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 (o UNCONFINED, • QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL / WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
480.4	Ground Level										
0.0	Topsoil						480				
	Heterogeneous Mixture of Clayey Silt Sand and Gravel (Glacial Till)		1	SS	95				o		6 24 46 24
			2	SS	133		470				
	Brown										
	Grey		3	SS	128				o		
			4	SS	122/10"		460				
	With Boulders			BXL	22" Rec.						
			5	SS	98				o		20 23 41 16
			6	SS	155/9"		450				
	Hard		7	SS	100/5"						
	With Frequent Boulders		8	SS	100/1"		440				
437.9											
42.5	Auger Refusal End of Borehole Note: Borehole Was Dry and Open										

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation and Communications
Ontario

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 2

W P 156-75-05 LOCATION Coords. N 15,830,933; E 953,118 ORIGINATED BY V.K.

DIST 6 HWY 403 BOREHOLE TYPE Auger - Solid Stem, Core Drill - BXL & Cone Test COMPILED BY V.K.

DATUM Geodetic DATE September 7, 1978 CHECKED BY KS

SOIL PROFILE 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 o UNCONFINED + FIELD VANE • QUICK TRIAXIAL × LAB VANE	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL / WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
479.8	Ground Level										
0.0	Topsoil										
	Heterogeneous Mixture of Clayey Silt Sand and Gravel (Glacial Till)		1	SS	158/ 10"				o		12 16 44 28
			2	SS	145/ 10"		470				
	Brown										
	Grey		3	SS	97				o		23 18 41 18
	Occasional Boulders										
			4	SS	68		460				
			5	SS	120/ 6"						
	Hard		6	SS	132/ 10"		450		o		32 21 32 15
442.8			7	SS	170/ 11"						
37.0	Limestone Bedrock		8	BXL	90% Rec.		440				
438.3	Sound										
41.5	End of Borehole										
	Note: Borehole Was Dry and Open										

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 3

W P 156-75-05 LOCATION Coords. N 15,830,885; E 953,184 ORIGINATED BY V.K.

DIST 6 HWY 403 BOREHOLE TYPE Auger - Solid Stem; Core Drill - BXL & Cone Test COMPILED BY V.K.

DATUM Geodetic DATE September 7, 1978 CHECKED BY RS

SOIL PROFILE 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 (o UNCONFINED, • QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL / WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
480.4	Ground Level										
0.0	Topsoil						480				
	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till)		1	SS	100/ 5"						16 13 46 25
			2	SS	150/ 11"		470				
	Brown		3	SS	160/ 9"						11 23 42 24
	Grey										
	With Random Boulders		4	SS	77		460				
			5	SS	100/ 3"						
			6	SS	110/ 4"		450				41 20 24 15
	Hard		7	SS	100/ 4"						
442.4											
38.0	Limestone Bedrock		8	BXL	90% Rec.						
437.4	Sound						440				
43.0	End of Borehole										
	Note: Borehole Was Dry and Open										

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

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

Ministry of Transportation and Communications
Ontario

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 4

W P 156-75-05 LOCATION Coords. N 15,830,839; E 953,248 ORIGINATED BY V.K.

DIST 6 HWY 403 BOREHOLE TYPE Auger - Solid Stem; Core Drill - BXL & Cone Test COMPILED BY V.K.

DATUM Geodetic DATE September 8, 1978 CHECKED BY JS

SOIL PROFILE 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 (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
480.3	Ground Level										
0.0	Topsoil										
	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till)		1	SS	112		480	100/6"			12 15 46 27
			2	SS	135		470				
	Brown Grey		3	SS	143						6 25 41 28
	With Occasional Boulders		4	SS	95		460				
			5	SS	67						15 21 45 19
	Hard		6	SS	100/6"		450				
442.3			7	SS	100/5"						
38.0	Limestone Bedrock		8	BXL	95% Rec.						
438.4	Sound						440				
41.9	End of Borehole										

Note: Borehole Was Dry and Open

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

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

Ministry of Transportation and Communications
Ontario

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 5

W P 156-75-05 LOCATION Coords. N 15,830,900; E 953,032 ORIGINATED BY V.K.

DIST 6 HWY 403 BOREHOLE TYPE Auger - Solid Stem, Core Drill - BXL & Cone Test COMPILED BY V.K.

DATUM Geodetic DATE September 13, 1978 CHECKED BY RS

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 (o UNCONFINED, • QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
480.0	Ground Level										
0.0	Topsoil										
	Heterogeneous Mixture of Clayey Silt Sand and Gravel (Glacial Till)		1	SS	112			100/9"			9 12 43 36
			2	SS	100/6"		470				
			3	SS	135						
			4	SS	77		460				10 22 42 26
			5	SS	156						
	Brown										
	Grey		6	SS	126		450				23 22 40 15
			7	SS	100/6"						
			8	SS	100/3"		440				
433.5	Hard		9	SS	100/2"						
46.5	Weathered										
429.0	Limestone Bedrock Sound		10	BXL	65% Rec.		430				
51.0	End of Borehole										

Note: Borehole Was Dry and Open

$+^3$, $\times^5$: Numbers refer to Sensitivity

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

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 6

W P 156-75-05 LOCATION Coords. N 15,830,870; E 953,072 ORIGINATED BY V.K.

DIST 6 HWY 403 BOREHOLE TYPE Auger - Solid Stem, Core Drill - BXL & Cone Test COMPILED BY V.K.

DATUM Geodetic DATE September 11, 1978 CHECKED BY RS

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 (o UNCONFINED, • QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
479.2	Ground Level										
0.0	Topsoil										
	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till)		1	SS	135			100/6"	o —		6 13 51 30
			2	SS	135		470				
			3	SS	174						
	Brown										
	Grey		4	SS	92		460		o —		22 20 42 16
	Occasional Silt Seams		5	SS	80						
			6	SS	145/10"		450				
	Hard		7	SS	160/10"				o —		45 17 25 13
438.7							440				
40.5	Weathered Limestone Bedrock		8	BXL	65% Rec.						
434.2	Sound										
45.0	End of Borehole										
	Note: Borehole Was Dry and Open										

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 7

W P 156-75-05 LOCATION Coords. N 15,830,822; E 953,135 ORIGINATED BY V.K.

DIST 6 HWY 403 BOREHOLE TYPE Auger - Solid Stem, Core Drill - BXL & Cone Test COMPILED BY V.K.

DATUM Geodetic DATE September 11, 1978 CHECKED BY R.S.

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 (o UNCONFINED, • QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
478.9	Ground Level										
0.0	Topsoil										
	Heterogeneous Mixture of Clayey Silt Sand and Gravel (Glacial Till)		1	SS	122			100/6"			20 21 39 20
			2	SS	115		470				
			3	SS	46						8 23 48 21
							460				
			4	SS	85						
	Brown / Grey		5	SS	116/9"						12 26 37 25
			6	SS	100/6"		450				
			7	SS	100/3"						
	Hard										
438.9							440				
40.0	Limestone Bedrock With Thin Bands of Shale		8	BXL	90% Rec.						
433.9	Sound										
45.0	End of Borehole Note: Borehole Was Dry and Open										

$+^{3}$, $\times^{5}$: Numbers refer to Sensitivity

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

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 8

W P 156-75-05 LOCATION Coords. N 15,830,774; E 953,200 ORIGINATED BY V.K.

DIST 6 HWY 403 BOREHOLE TYPE Auger - Solid Stem, Core Drill - BXL & Cone Test COMPILED BY V.K.

DATUM Geodetic DATE September 11, 1978 CHECKED BY

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 (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
478.4	Ground Level										
0.0	Topsoil										
	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till)		1	SS	125		470	100/ 6"	○		41 9 33 17
			2	SS	137						
			3	SS	165/ 9"		460		○		4 20 48 28
	Brown / Grey		4	SS	120	▽					
	With Occasional Boulders and Seams of Silt and Sand		5	SS	115		450				
	Hard		6	SS	100				○		28 20 47 5
442.4			7	SS	100/ 1"						
36.0	Limestone Bedrock With Bands of Shale		8	SS	100% Rec.		440				
437.4	Sound										
41.0	End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

15 20 5 10 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 9

W P 156-75-05 LOCATION Coords. N 15,830,744; E 953,240 ORIGINATED BY V.K.

DIST 6 HWY 403 BOREHOLE TYPE Auger - Solid Stem, Core Drill - BXL and Cone Test COMPILED BY V.K.

DATUM Geodetic DATE September 11, 1978 CHECKED BY RS

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 (o UNCONFINED, • QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
479.7	Ground Level										
0.0	Topsoil										
	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till)		1	SS	135				o		7 7 51 35
			2	SS	140/7"		470				
			3	SS	157						
			4	SS	120/8"		460		o		15 22 30 33
	Brown / Grey										
			5	SS	76						
	With Occasional Boulders and Seams of Silt and Sand		6	SS	145	▽	450		o		41 31 22 6
			7	SS	100/6"						
439.7	Hard										
40.0	Weathered						440				
434.7	Limestone Bedrock With Seams of Shale, Sound		8	BXL	60% Rec.						
45.0	End of Borehole										

OFFICE REPORT ON SOIL EXPLORATION

$+^3$, $\times^5$: Numbers refer to Sensitivity

$15 \overset{20}{\underset{10}{\diamond}} 5$ (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 10

W P 156-75-05 LOCATION Coords. N 15,830,810; E 953,289 ORIGINATED BY V.K.

DIST 6 HWY 403 BOREHOLE TYPE Auger- Solid Stem, Core Drill - BXL and Cone Test COMPILED BY V.K.

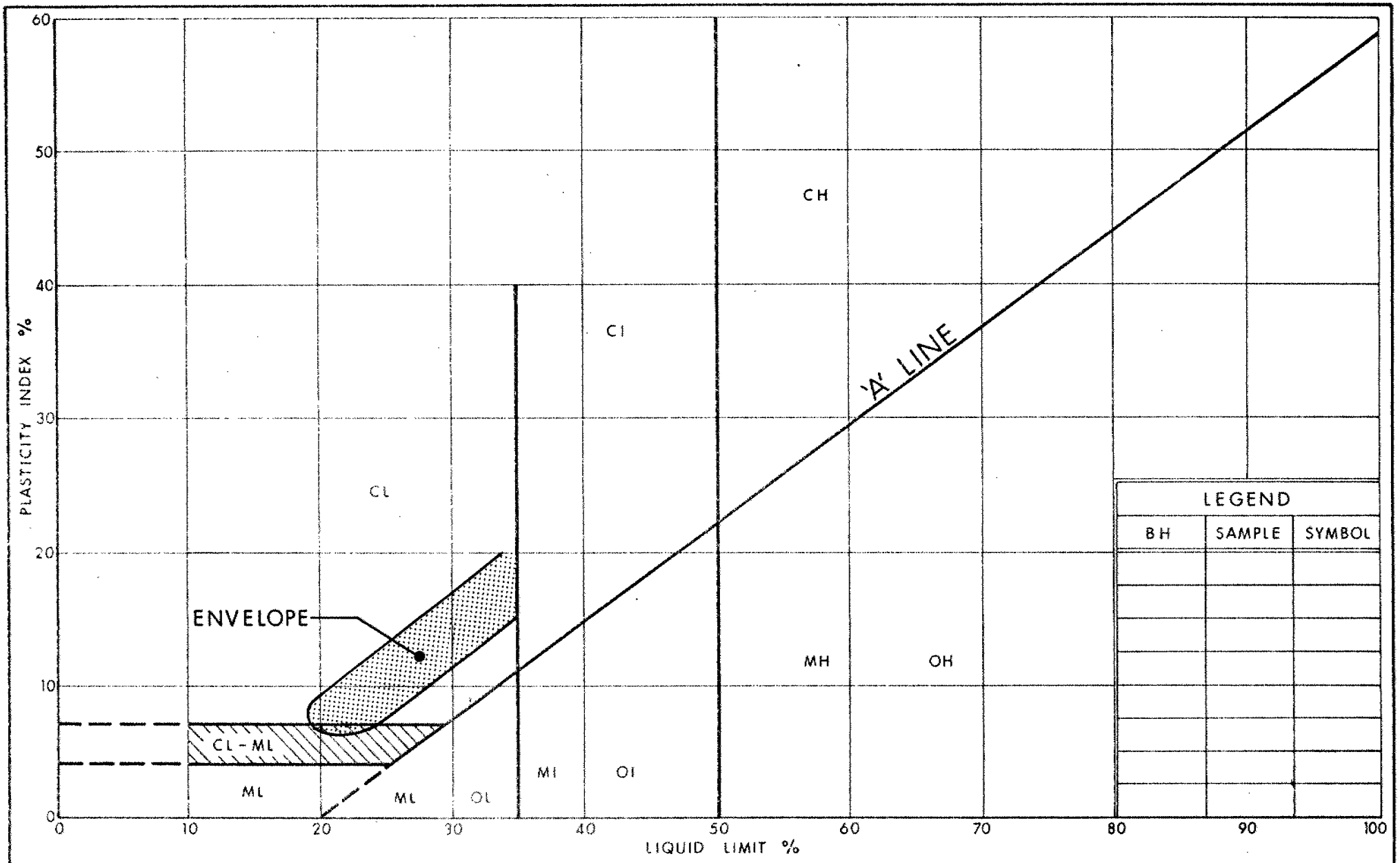
DATUM Geodetic DATE September 8, 1978 CHECKED BY R S

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
480.2 / 0.0	Ground Level Topsoil						480				
472.7	Brown Silt With Seams of Clay Dense		1	SS	39				○		0 2 89 9
7.5	Heterogeneous Mixture of Clayey Silt Sand and Gravel (Glacial Till) Brown Grey With Occasional Boulders		2	SS	117		470	100/9"			
			3	SS	110/6"						
			4	SS	123		460		○		29 21 38 12
			5	SS	74						
			6	SS	110/3"		450				
442.2	Hard		7	SS	100/6"				○		42 8 39 11
38.0 / 437.2	Limestone Bedrock With Seams of Shale Sound		8	BXL	100% Rec.		440				
43.0	End of Borehole Note: Borehole Was Dry and Open										

+3, ×5 : Numbers refer to Sensitivity

15 20 5 10 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

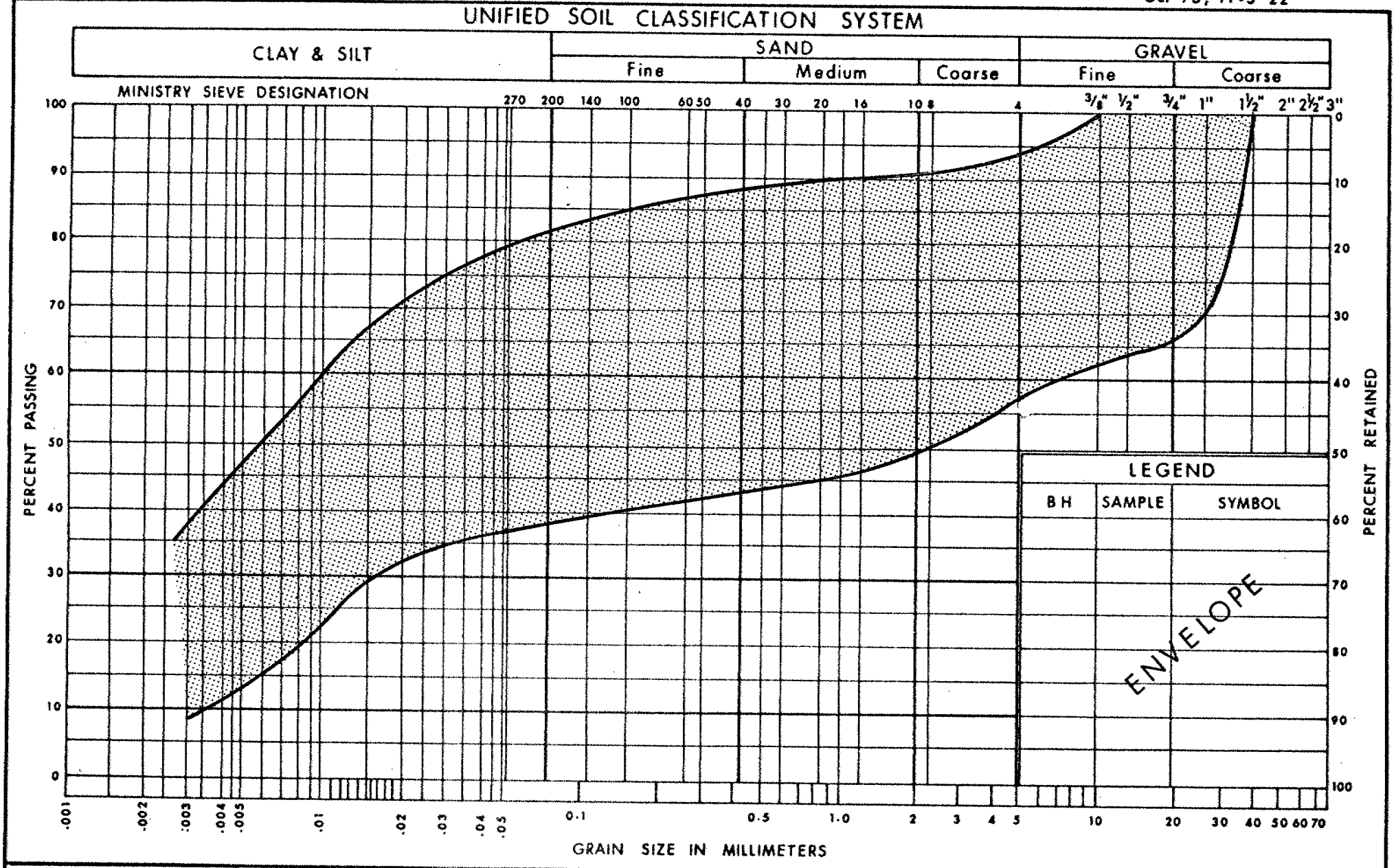


Ministry of Transportation and Communications
Ontario

PLASTICITY CHART
GLACIAL TILL
HET. MIX. OF CLAYEY SILT, SAND & GRAVEL

FIG No 1
W P 156 - 75 - 05

Oct 75, FF-S-22



Ministry of Transportation and Communications
Ontario

GRAIN SIZE DISTRIBUTION
GLACIAL TILL
HET. MIX. OF CLAYEY SILT, SAND & GRAVEL

FIG No 2
W P 156-75-05

Ministry of Transportation and Communications
Ontario

DIAMOND DRILL RECORD

HOLE NO. _____ SHEET NO. 1

PROPERTY W.P.156-75-05
LOCATION Mississauga Dist.6
LATITUDE
DEPARTURE
BEARING

DIP 90°
TOTAL FOOTAGE

ELEV. COLLAR
DATUM
DATE STARTED
DATE COMPLETED
DRILLED BY
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	FORMATION	SAMPLE NUMBER			REMARKS
		Hole #1				
21'	26'	Limestone, light grey colour, hard to medium hard, fine texture.				core broken, ground and missing
		Hole #2				
37'	41'5"	Limestone, light grey colour, soft to medium hard, fine to medium texture, fossiliferous.				
		Hole #3				
38'	43'	Same as hole #2 and medium hard.				
		Hole #4				
38'	41'9"	Same as hole #2 and medium hard.				
		Hole #5				
46'5"	51'0"	Same as hole #2 and medium hard.				broken ground and missing core consolidated mud and broken shale 8" at bottom of core.

DATE OF EXAMINATION _____

08-MT-113

Ministry of Transportation and Communications
Ontario

DIAMOND DRILL RECORD

HOLE NO. _____ SHEET NO. 2

DIP

PROPERTY W.P. 156-75-05
LOCATION Mississauga
District 6
LATITUDE
DEPARTURE
BEARING

TOTAL FOOTAGE

ELEV. COLLAR
DATUM
DATE STARTED
DATE COMPLETED
DRILLED BY
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	FORMATION	SAMPLE NUMBER			REMARKS
		Hole #6				
40'5"	45'0"	Same as hole #2 and medium hard.				broken ground and missing core.
		Hole #7				
40'0"	45'0"	Same as hole #2 and medium hard.				broken ground and missing core with consilidated mud and shale particles alternately throughout core between limestone bedding.
		Hole #8				
36'0"	41'0"	Same as hole #2 and medium hard.				shale and mud at 38'8" - 39'0" 40'0" - 40'6"
		Hole #9				
40'0"	45'0"	Same as hole #2 and medium hard.				broken ground and missing core ground shale and mud at end of core for uncertain footage.

DATE OF EXAMINATION _____

OB-MT-113

Ministry of Transportation and Communications
Ontario

DIAMOND DRILL RECORD

HOLE NO. _____ SHEET NO. 3

PROPERTY W.P. 156-75-05
LOCATION Mississauga
District 6

LATITUDE
DEPARTURE
BEARING

DIP

TOTAL FOOTAGE

ELEV. COLLAR
DATUM
DATE STARTED
DATE COMPLETED
DRILLED BY
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	FORMATION	SAMPLE NUMBER			REMARKS
		Hole #10				
38'0"	43'0"	Same as hole #2 and medium hard.				3" shale seam at 42'9" - 43'0"

DATE OF EXAMINATION October 3rd, 1978

B.K. Glassford

08-MT-113

EXPLANATION OF TERMS USED IN REPORT

'N' VALUE: AN INDICATOR OF SUBSOIL QUALITY. IT IS OBTAINED FROM THE STANDARD PENETRATION TEST (CSA STD. A119.1). SPT 'N' VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 2 INCH O.D. SPLIT-BARREL SAMPLER TO PENETRATE 12 INCHES INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WEIGHING 140 POUNDS, FALLING FREELY A DISTANCE OF 30 INCHES. FOR PENETRATIONS OF LESS THAN 12 INCHES 'N' VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. 'N' VALUES CORRECTED FOR OVERBURDEN PRESSURE ARE DENOTED THUS $\bar{N}$.

DYNAMIC CONE PENETRATION TEST (CSA STD. A119.3): CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (2" O.D. 60 CONE ANGLE) DRIVEN BY 350 FT-LB IMPACTS ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 12 INCH ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOIL QUALITY: SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSITY.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH AS FOLLOWS:

S_u (PSF)	0 - 250	250 - 500	500 - 1000	1000 - 2000	2000 - 4000	> 4000
	VERY SOFT	*SOFT*	*FIRM*	*STIFF*	*VERY STIFF*	*HARD*

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF SPT 'N' VALUES AS FOLLOWS:

'N' (BLOW/FT)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	*LOOSE*	*COMPACT*	*DENSE*	*VERY DENSE*

ROCK QUALITY: 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 DRILLED IN THAT CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE NATURALLY FRACTURED CORE PIECES, 4"+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), 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	2"	2" - 12"	1' - 3'	3' - 10'	> 10'
JOINTING	*VERY CLOSE*	*CLOSE*	*MOD. CLOSE*	*WIDE*	*VERY WIDE*
BEDDING	*VERY THIN*	*THIN*	*MEDIUM*	*THICK*	*VERY THICK*

ABBREVIATIONS & SYMBOLS

LABORATORY TESTING

TRIAXIAL TESTS ARE DESCRIBED IN TERMS OF WHETHER THEY ARE CONSOLIDATED (C) OR NOT (U)
ISOTROPICALLY (I) OR NOT (A)
AND SHEARED DRAINED (D) OR UNDRAINED (U)
WITH PORE PRESSURE MEASUREMENTS (BAR OVER SYMBOLS)
EG. $\overline{CIU}$ = CONSOLIDATED ISOTROPIC UNDRAINED
TRIAXIAL WITH PORE PRESSURE MEASUREMENT
UNLESS OTHERWISE SPECIFIED IN REPORT ALL TESTS ARE IN COMPRESSION

FIELD SAMPLING

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

EARTH PRESSURE TERMS

μ	COEFFICIENT OF FRICTION
δ	ANGLE OF WALL FRICTION
k_o	COEFFICIENT OF EARTH PRESSURE AT REST
k_A	COEFFICIENT OF ACTIVE EARTH PRESSURE
k_p	COEFFICIENT OF PASSIVE EARTH PRESSURE
i	ANGLE OF INCLINATION OF SURCHARGE
w	SLOPE ANGLE-BACKFACE OF WALL
β	ANGLE OF SLOPE
N_γ, N_q, N_c	BEARING CAPACITY FACTORS
D_f	DEPTH OF FOOTING
B,L	FOOTING DIMENSIONS

INDEX PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G_s	SPECIFIC GRAVITY OF SOLIDS
e	VOIDS RATIO
e_o	INITIAL VOIDS RATIO
e_{max}	e IN LOOSEST STATE
e_{min}	e IN DENSEST STATE
D_r	RELATIVE DENSITY = $\frac{e_{max} - e}{e_{max} - e_{min}}$
n	POROSITY
w	WATER CONTENT
w_L	LIQUID LIMIT
w_P	PLASTIC LIMIT
w_S	SHRINKAGE LIMIT
I_P	PLASTICITY INDEX = $w_L - w_P$
I_L	LIQUIDITY INDEX = $\frac{w - w_P}{I_P}$
I_C	CONSISTENCY INDEX = $\frac{w_L - w}{I_P}$
A_C	ACTIVITY = $\frac{I_P \text{ of soil}}{\%\text{ of } 2\mu m \text{ Soil Fraction}}$
Om	ORGANIC MATTER CONTENT
S_r	DEGREE OF SATURATION
S	SENSITIVITY = $\frac{S_u \text{ (undisturbed)}}{S_u \text{ (remoulded)}}$

STRENGTH PARAMETERS

ϕ	ANGLE OF SHEARING RESISTANCE
τ_f	PEAK SHEAR STRENGTH
τ_R	RESIDUAL SHEAR STRENGTH
c	COHESION INTERCEPT
$\sigma_1, \sigma_2, \sigma_3$	NORMAL PRINCIPAL STRESSES
u	PORE WATER PRESSURE
u_e	EXCESS u
r_u	PORE PRESSURE RATIO
q_u	UNCONFINED COMPRESSIVE STRENGTH
s_u	UNDRAINED SHEAR STRENGTH
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO
E	MODULUS OF ELASTICITY
G	MODULUS OF SHEAR DEFORMATION
k_s	MODULUS OF SUBGRADE REACTION
m,n	STABILITY COEFFICIENTS
A,B	PORE PRESSURE COEFFICIENTS

NOTE: EFFECTIVE STRESS PARAMETERS ARE DENOTED BY USE OF APOSTROPHE ABOVE THE SYMBOL, THUS:
ϕ' = EFFECTIVE ANGLE OF SHEARING RESISTANCE;
σ' = EFFECTIVE NORMAL STRESS

HYDRAULIC TERMS

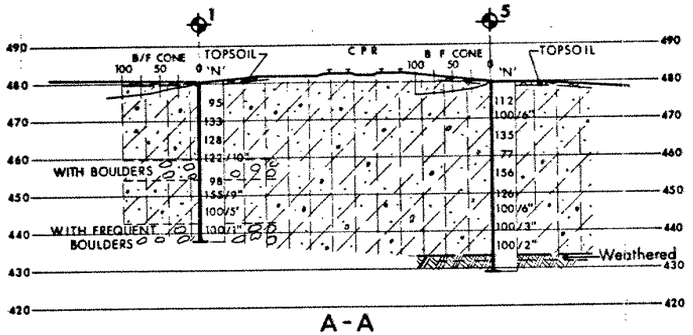
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
j	SEEPAGE FORCE PER UNIT VOLUME
η	COEFFICIENT OF VISCOSITY
k	COEFFICIENT OF HYDRAULIC CONDUCTIVITY
k_h	k IN HORIZONTAL DIRECTION
k_v	k IN VERTICAL DIRECTION
m_v	COEFFICIENT OF VOLUME CHANGE
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX
C_r	RECOMPRESSION INDEX
d	DRAINAGE PATH DISTANCE
T_v	TIME FACTOR
U	DEGREE OF CONSOLIDATION
O_r	OVERCONSOLIDATION RATIO (OCR)

CONT No
WP No 156-75-05

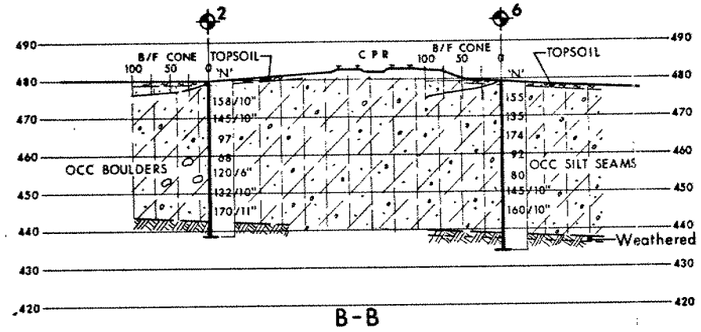
CAN PAC RWY SUBWAY

BORE HOLE LOCATIONS & SOIL STRATA

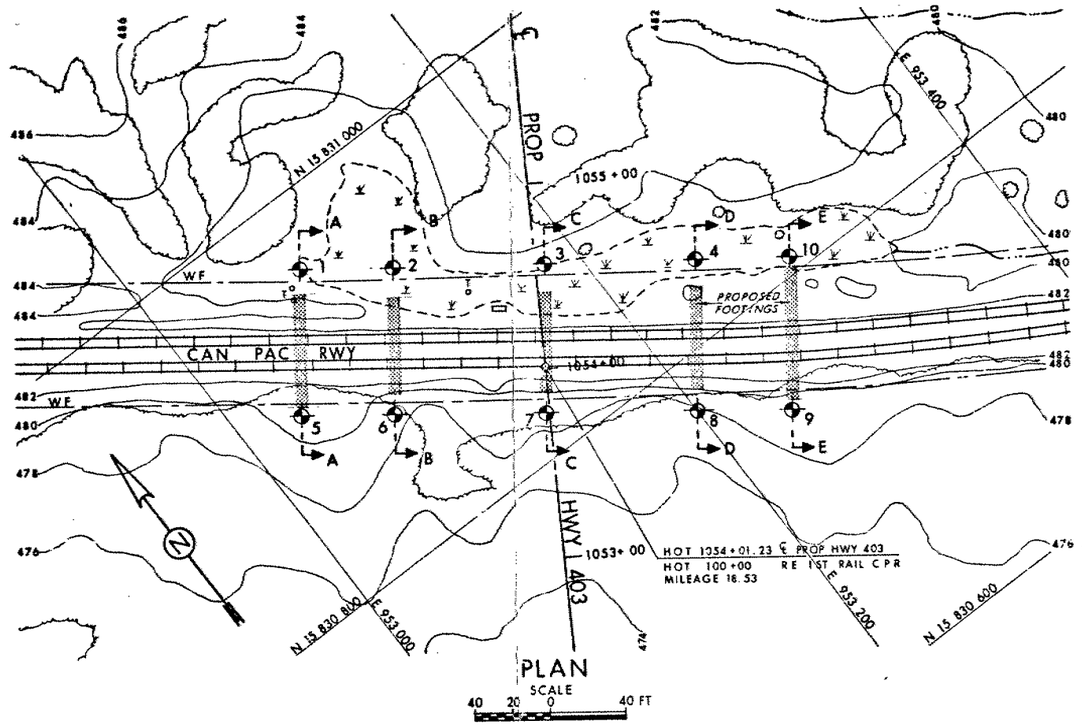
SHEET

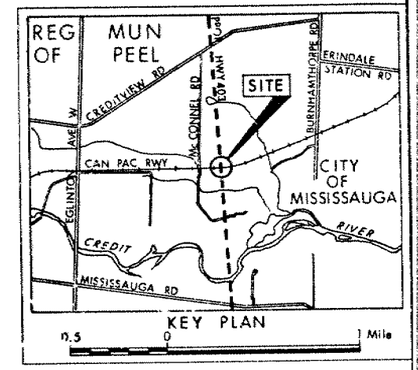


A-A



B-B



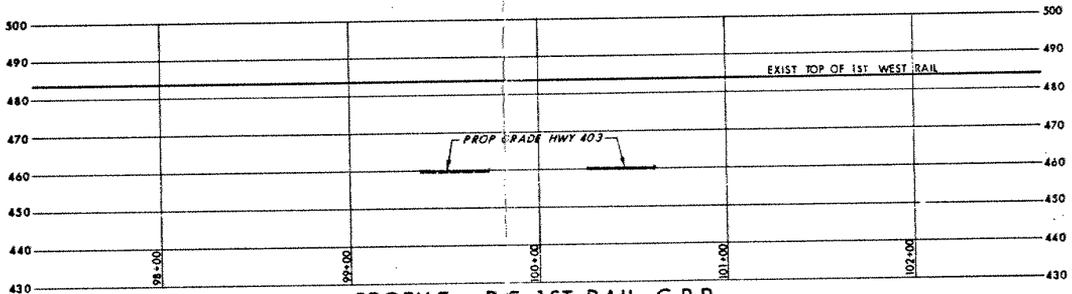


LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- 'N' Blows/ft (Std Pen Test 350 ft lbs energy)
- CONE Blows/ft (60° Cone, 350 ft lbs energy)
- WL at time of investigation Sept 1978

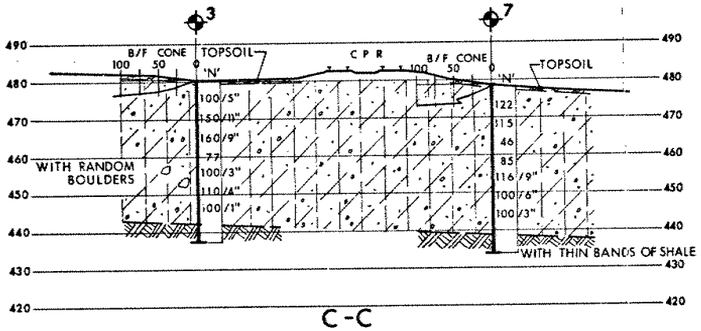
Bore Holes 1, 2, 3, 4, 5, 6, 7 & 10 were Dry & Open.

No	ELEVATION	CO-ORDINATES NORTH	EAST
1	480.4	15 830 962	953 079
2	479.8	15 830 933	953 118
3	480.4	15 830 885	953 184
4	480.3	15 830 839	953 248
5	480.0	15 830 900	953 032
6	479.2	15 830 870	953 072
7	478.9	15 830 822	953 135
8	478.4	15 830 774	953 200
9	479.7	15 830 744	953 240
10	480.2	15 830 810	953 289

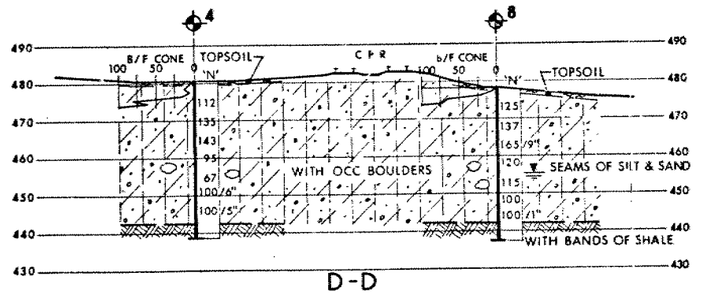


PROFILE - R E 1ST RAIL C P R

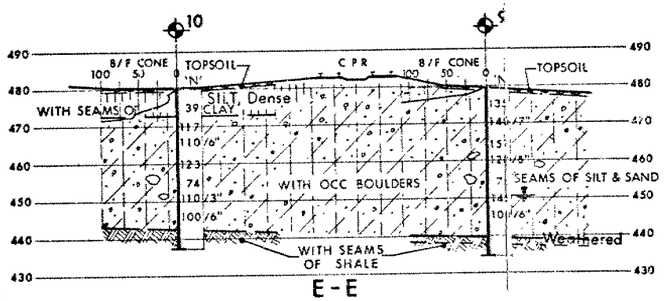
SCALE
40 20 0 40 FT
20 10 0 20 FT



C-C



D-D



E-E

SECTIONS
SCALE
20 10 0 20 FT

LEGEND

GLACIAL TILL
HETEROGENEOUS MIXTURE OF CLAYEY SILT, SAND & GRAVEL.
Hard

LIMESTONE BEDROCK
Sound

-NOTE-

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

REVISIONS

DATE	BY	DESCRIPTION

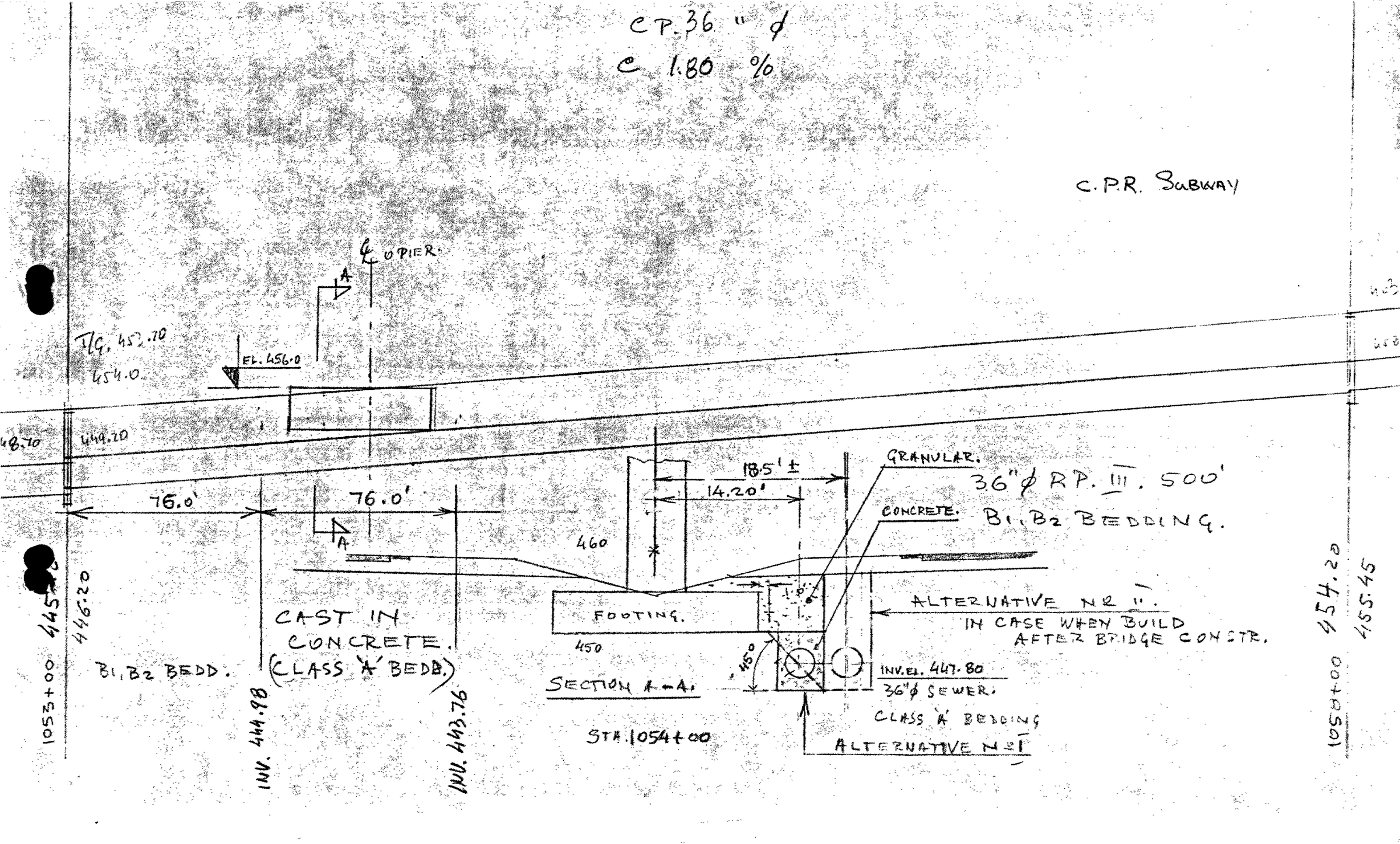
GEOCRES No 30M12-134

HWY No 403 DIST 6
SUBMD V.K. CHECKED DATE Nov 15,1978 SITE 24-369
DRAWN R.S. CHECKED APPROVED DWG 1567505-A

REF: COLE, SHERMAN & ASSOC LTD AND PLAN B-81-403-2

CP. 36" ϕ
@ 1.80 %

C.P.R. SUBWAY



Ministry of Transportation and Communications
Ontario

Memorandum

To: Mr. C. Mirza,
Head, Soil Mechanics Section,
West Building, Downsview.

From: G.C.E. Burkhardt,
Structural Section,
Central Region.

Attention: Mr. M. Devata

Date: 1978-08-18

Our File Ref.

In Reply to

Subject:

RE: C.P.R. Subway at Hwy. 403
W.P. 156-75-05, Site 24-369
District 6, Toronto

Further to our memo of 1978-01-30 this is to inform you that as a result of a recent review with the Structural Office of the span arrangement to be assumed for subject bridge, it was decided to consider a four span 50'±, 80'±, 80'±, 50'± scheme instead of the original 95'±, 95'± layout.

Please find on the attached two marked-up prints the approximate revised footing locations as well as the latest profiles of both Hwy. 403 and the C.P.R. line.

If you need further clarification, please call.

M.D. Bendayan,
Senior Structural Engineer,
for:
G.C.E. Burkhardt,
Head, Structural Section.

MDB:pp
Attach.

c.c. N. Sen
R. Fitzgibbon
J. Anderson
B. Hurd (Cole, Sherman)

memorandum

Ontario

Planning & Design Section, Central Region

To: Mr. M. Devata,
Sr. Foundation Engineer,
Pavement & Foundation Design Section,
Engineering Materials Office,
Room 315, Central Building.

Date: 79-11-01

Attention: Mr. B. Ly,
Foundation Engineer

Re: W.P. 156-75-03, -5 Highway 403
Underpasses at Creditview Road
C.P. Railway and Mavis Road
Installation of Storm Sewer Pipe

Further to your memorandum of 79-10-05 to our Regional Structural Office and to our subsequent discussion, I wish to confirm our agreement on minor modifications to your recommendations as follows.

Creditview Road & C.P. R'ly

As shown on the attached sketch, the sewer trench shall be located at least eleven feet (11') away from the closest edge of the centre pier footing.

Other recommendations have been accepted.

Mavis Road

Your recommendations as outlined in your memo and sketch will be followed.

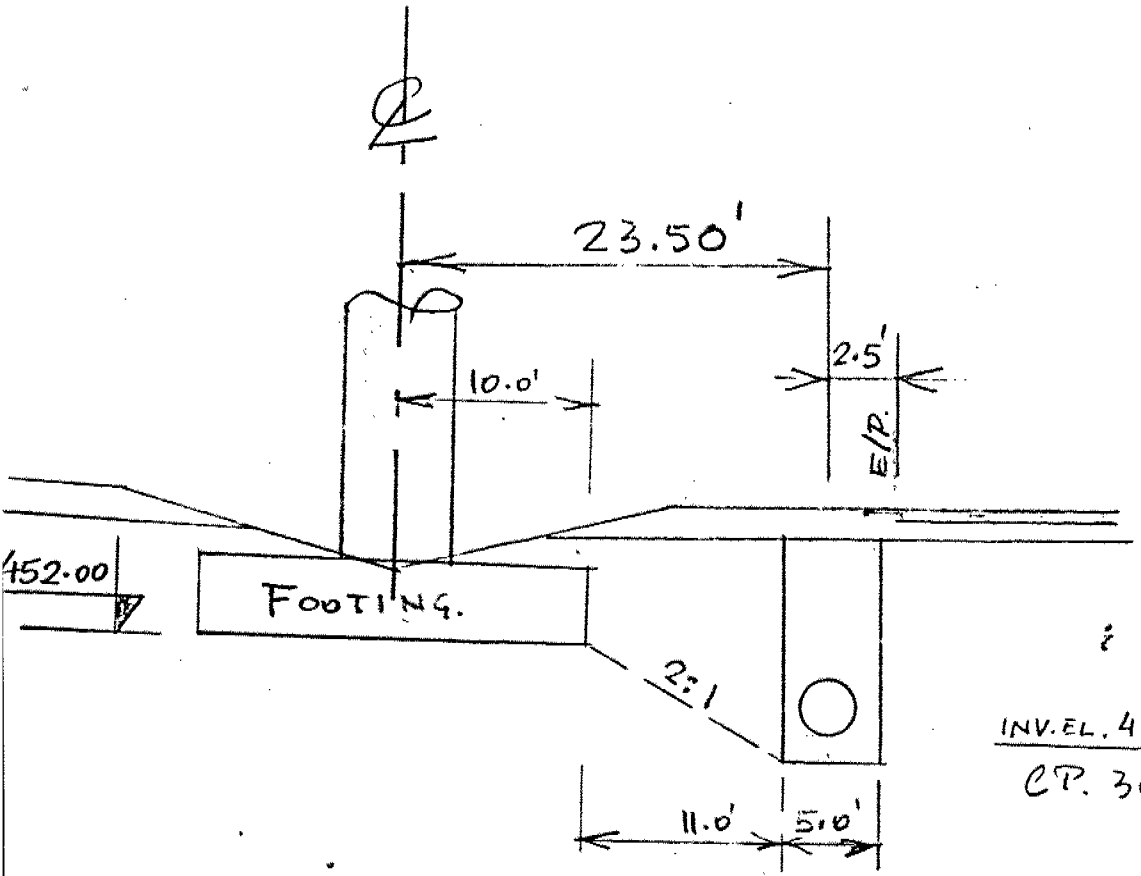
N. Sen,
Project Manager.

NS/aa

cc M. Bendayan
C. Grebski
W. Lin
R. Northwood
H. Chyc

C.P.R. CROSSING.

HWY. 403 STA. 1054+00



480.40 G.L.

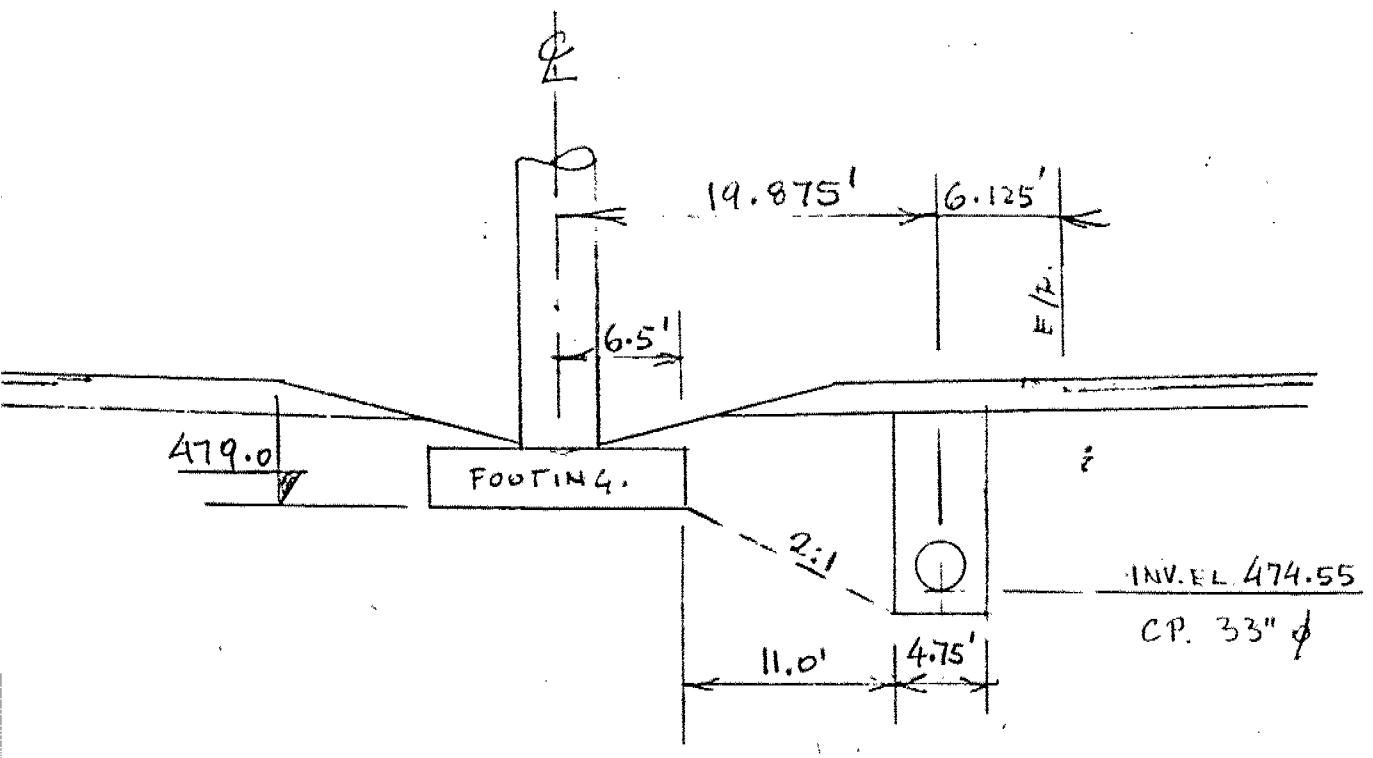
INV. EL. 447.80

CP. 36" ϕ

CREDITVIEW RD.

HWY. 403. STA. 1065+00

Sat. G.E.L.



WP 156-75-05

Ministry of Transportation and Communications
Ontario

[redacted] [redacted]

Memorandum

To: Mr. G. C. E. Burkhardt,
Head,
Structural Office,
Central Region.

Attention: Mr. M. Bendayan.

From: Pav't. & Foundation Design Section,
Engineering Materials Office,
Room 315, Central Building,
Downsview.

Date: 79 10 05

Our File Ref.

In Reply to

Subject: Re: C.P.R. Subway East of Credit River,
W.P. 156-75-05, Site 24-369,
Hwy. 403, District 6, Toronto.

As per your request, we have reviewed the proposed construction of a 36" diameter sewer in the vicinity of the centre pier. Our comments are as follows:

1) The sewer trench should be located at least 15 feet away from the closest edge of the centre pier footing or outside an assumed line drawn at 2h:1v from the lower edge of the said footing, whichever distance is the greater spacing.

2) The portion of the trench within 15 feet of the centre pier should be backfilled with mass concrete up to the footing founding level. The sides of the sewer trench in the footing area should be sheeted and braced in order to minimize the quantity of mass concrete. Elsewhere, the trench can be excavated with back slopes of 1:1.

3) The sewer should be installed and backfilled prior to the construction of the pier foundations.

B. Ly

BL/MD/cy

B. Ly,
Foundation Engineer,
For: M. Devata,
Senior Foundation Engineer.

c.c. C. G. S. Grebski
W. Lin
R. Northwood
K. Cameron
H. Chyc
Files

Mr. C.S. Grebski
Head, Central Section
Structural Office
2nd Floor, West Building

Soil Mechanics Section
Engineering Materials Office
Room 315, Central Building

79 01 09

Re: C.P.R. Subway
W.P. 156-75-05, Site 24-369
Hwy. 403, District 6, Toronto

We have reviewed the Preliminary Bridge Plan Drawing No. 24-369-P1 for the above mentioned structure.

According to this plan the initial 4 span structure concept has been replaced by a 2 span structure. In view of the presence of uniform competent subsoil conditions at this site, our foundation recommendations as presented in our report dated 1978 11 02 are still applicable.

V. Korlu
Project Engineer

VK/gs

cc: G.C.E. Burkhardt
Files

Ministry of Transportation and Communications

Ontario

Memorandum

To: Mr. G.C. E. Burkhardt
Head, Structural Section
Central Region
3501 Dufferin St., Downsview

From: Soil Mechanics Section
Engineering Matrials Office
3rd Floor, Central Building

Attention:

Date: 78 04 17

Our File Ref.

In Reply to

Subject: Re: ~~CPR Subway at Hwy 403~~
W.P. 156-75-05, Site 24-369
District 6, Toronto
Hwy 403 U' Pass at Mavis Road
W.P 156-75-04, Site 24-439
District 6, Toronto

Further to your recent request, we submit herewith a summary of our preliminary subsurface data and recommendations for the above projects which were reported previously in our Preliminary Foundation Investigation and Design Report under W.O. 76-1105, dated October 28, 1976. We trust this information will be sufficient for your preliminary design purposes at this stage.

It is to be noted that a detailed foundation investigation will be necessary for these two projects when the design concepts are finalized. A complete foundation report will be issued after the completion of the necessary fieldwork.

B. Ly
Senior Engineer

For: M. Devata
Supervising Engineer

BL/ig

cc: C.S. Grebski
N. Sen
R. Fitzgibbon
J. Anderson
B. Hurd (Cole, Sherman)
Files

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

ENGINEERING SERVICES BRANCH - GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 14

WP 157-75-01 (W.O.76-1100) LOCATION Co-ord's.15,836,960N; 957,570E. Hwy.403 & Mavis Rd. ORIGINATED BY VK

DIST 6 HWY 403 BORING DATE July 12, 1976 COMPILED BY VK

DATUM Geodetic BOREHOLE TYPE H.S. 3¼" Ø Auger - core with BXL CHECKED BY a.j.

ELEV / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	LIQUID LIMIT W_L / PLASTIC LIMIT W_P / WATER CONTENT W (W_P W W_L) / WATER CONTENT % (10 20 30)	UNIT WEIGHT γ	REMARKS % GR SA SI C
549.0	Ground Level									
0.0	Het.mix.of clayey silt with sand and occasional gravel		1	SS	15					2 19 64
	(Glacial Till) Brown / Grey		2	SS	31					
			3	SS	24	540				0 2 80
	Very Stiff to Hard		4	SS	28					
531.5			5	SS	31					0 2 (98
17.5	Silty sand with traces of gravel.					530				
526.5	Very Dense		6	SS	80/6"					10 76 10
22.5	Sound Shale Bedrock		7	BXL	100% Rec.					
521.5										
27.5	End of Borehole					520				

20
15 ◇ 5 % STRAIN AT FAILURE
10

Hwy. 403 and Mavis Rd. Crossing (Ref. B.H. 14)

Approx. isting Ground evation Approx. ade of Hwy. 403	Predominant overburden strata Approx. thickness in feet	Recommendations		
		Structure	Approaches: fills (fill & cut) 1. Longitudinal - 23 ft. 2. Transverse - (fill) 12 ft.	Remarks
A. Elev. 549.0 B. [redacted]ev. 537.0 Grade of Mavis Rd. Elev. 560.5	Glacial Till - 0 to 17.5 ft. - cohesive - very stiff to hard Granular - 17.5 to 22.5 ft. silty sand with traces of gravel - very dense Bedrock - Shale 22.5 ft. below ground Water Level 5.0 ft. below ground surface (elev. 544.0)	Piers of Mavis Rd. Underpass Spread footings founded within the glacial till stratum or silty sand deposit. An allowable bearing pressure up to 3 tsf. in glacial till and up to 5.0 tsf. in silty sand stratum. Abutments 1. "Perched" on spread footings in the approach fills within a zone composed of well compacted granular material, (Granular 'A') using an allowable bearing pressure of 2.5 tsf. 2. Alternately supported on end bearing piles driven to shale bedrock (approx. elev. 596.5) and designed for the maximum capacity of the pile section chosen.	Stability of Fills & Cuts Proposed fills in the order of 12 ft. in height and cuts about 11 ft. in depth will be stable if 2:1 slopes are used.	A dewatering scheme will be necessary if footings are located in granular strat below prevaili ground water l

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

ENGINEERING SERVICES BRANCH - GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 12

WP 157-75-01 (W.O.76-1100) LOCATION Co-ord's.15,830,880N;953,210E. Hwy.403 & C.P.R.(E) ORIGINATED BY VK

DIST 6 HWY 403 BORING DATE July 8, 1976 COMPILED BY VK

DATUM Geodetic BOREHOLE TYPE H.S. 3¼" Ø Auger - CME 55 M.V. CHECKED BY A.J.

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	LIQUID LIMIT — W_L / PLASTIC LIMIT — W_P / WATER CONTENT — W / W_P W W_L / WATER CONTENT % 10 20 30	UNIT WEIGHT γ	REMARKS % GR SA SI CL
483.0	Ground Level									
0.0	Het.mix.of clayey silt with sand and occasional gravel		1	SS	31	480				4 15 58 23
	(Glacial Till)		2	SS	62					
			3	SS	90/9"					4 23 52 21
	Brown		4	SS	105	470				
	Grey		5	SS	82/6"					29 42 20 9
463.0	Hard									
20.0	Silty sand with gravel trace of clay		6	SS	100/3"					
			7	SS	50/3"	460				
456.0	Very Dense									
27.0	End of Borehole									
	Water Level not established									

20
15 ◇ 5 % STRAIN AT FAILURE
10

Hwy. 403 and C.P.R. Crossing (Ref. B.H. 12)

Approx. isting Ground evation Approx. ade of Hwy. 403	Predominant overburden strata Approx. thickness in feet	Recommendations		
		Structure	Approaches:fills 1. Longitudinal - up to 2. Transverse - 24 ft.	Remarks
A. [redacted]lev. 483.0 B. Elev. 459.0 Grade of C.P.R. Elev. 483.0	Glacial Till - 0 to 20 ft. - cohesive - hard Granular - 20 to 27.0 ft. - silty sand with gravel and trace of clay - very dense	C.P.R. Subway Piers Spread footings founded within the silty sand stratum. Allowable bearing pressure up to 5 tsf. Abutments Spread footings founded within the glacial till as high as possible. Allowable bearing pressure 5 tsf.	Proposed cuts up to 24 ft. will be stable with 2:1 slopes.	A minimum earth cover of 4 ft. should be provi for footings fo frost protectio purposes.