

G.I.F-30 SEPT. 1976

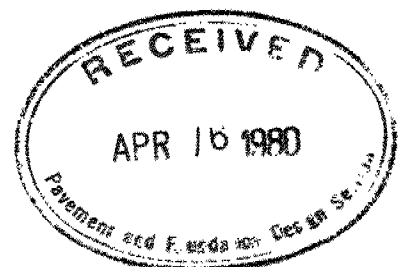
GEOCRES No. 30M12-133DIST. 6 REGION W.P. No. 156-75-03CONT. No. 80-29W. O. No. STR. SITE No. 24-438HWY. No. 403LOCATION Relocated Creditview Rd.No. of PAGES -OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. REMARKS:

FOUNDATION INVESTIGATION REPORT

CONTRACT NO 80-29



Ministry of
Transportation and
Communications



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	Creditview Road Underpass W.P. 156-75-03, Site 24-438 Hwy. 403, District 6, Toronto

NOTE: For purposes of the contract this report supercedes all other foundation reports prepared by or for the Ministry in connection with the above mentioned project.

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 N_c .

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 1/2" 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. CIU = CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL WITH PORE PRESSURE MEASUREMENT UNLESS OTHERWISE SPECIFIED IN REPORT ALL TESTS ARE IN COMPRESSION

FIELD SAMPLING

SS SPLIT SPOON
WS WASH SAMPLE
ST SLOTTED TUBE SAMPLE
BS BLOCK SAMPLE
CS CHUNK SAMPLE
TW THINWALL OPEN
TP THINWALL PISTON
OS OSTERBERG SAMPLE
FS FOIL SAMPLE
RC ROCK CORE
PH T.W. ADVANCED HYDRAULICALLY
PM 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_q, N_c, N_{γ} 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 = $\frac{I_P \text{ of soil}}{I_P \text{ of } 2\mu m \text{ Soil Fraction}}$
 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

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)

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

FOUNDATION INVESTIGATION REPORT

For

Creditview Road Underpass
W.P. 156-75-03, Site 24-438
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 August 10, 1978 to August 15, 1978. The field-work consisted of six sampled boreholes, each accompanied by a dynamic cone penetration test. The borings were advanced by augering and diamond drilling techniques to depths ranging from 34 feet to 39.5 feet below the ground surface. Bedrock was proven by obtaining BXL size rock core samples.

SITE AND GEOLOGY

The site is located approximately 0.9 miles east of Mississauga Road and approximately 0.8 miles south of Eglinton Avenue in the City of Mississauga, Regional Municipality of Peel. A CPR track is located some 1000 feet west of the site and the south flowing Credit River is located about another 3000 feet further west. A key plan on Contract Drawing No. 24-438-2 shows the site location.

Terrain at the site is bush covered, moderately undulating and gently sloping down towards the south. The internal drainage of the area is poor. Some of the low lying area at times may be ponded with water.

The area under investigation is located in a drumlinized till plain which forms part of a physiographic region known as the "South Slope". This physiographic region is the southern slope of the interlobate moraine laid down in the Pleistocene epoch. The drift in the till plain is a clayey silt closely related to the local bedrock which is a shale of the Dundas-Meaford formation.

SUBSURFACE CONDITIONS

General

The overburden at this site has a thickness of about 27 to 32 feet and is composed of a heterogeneous mixture of clayey silt, some sand and gravel. Across the site the overburden is underlain by shale bedrock.

Factual data on the subsurface conditions is shown on the Borehole Record Sheets. The location and the elevation of the borings, together with the estimated stratigraphical sections, are shown on Contract Drawing No. 24-438-2. A description of the subsoil and the bedrock conditions is as follows.

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

The predominant subsoil at this site is a glacial till composed of a heterogeneous mixture of clayey silt, some sand and gravel which extends beneath a thin veneer of topsoil to bedrock for a thickness of about 27 to 32 feet. The glacial till is brown and weathered in the upper 13 to 14 feet and becomes grey and relatively intact below that depth. Typical grain size distribution curves for samples from this deposit are shown in an envelope form in Figure 1. In certain locations boulders were encountered in the overburden. Across the site the lower 2 to 5 feet of the glacial till stratum contains some shale fragments. Geotechnical identity indices of the glacial till as determined from laboratory testing are summarized in a tabular form below.

		<u>Range</u>
Natural Moisture Content	(W) %	8-17
Liquid Limit	(W _L) %	27-37
Plastic Limit	(W _p) %	17-31

The results of the Atterberg Limit Testing are also plotted on the Plasticity Chart, Figure 2, which indicates that the glacial till is cohesive with a low plasticity.

Most of the Standard Penetration Test 'N' values are in the range of 50 blows to over 100 blows per foot, with the exception of one low 'N' value of 18 blows per foot recorded in the surficial portion of the overburden at the southeast corner of the site. The generally very high 'N' values indicate that the consistency of the glacial till is hard.

Bedrock (Shale Interbedded With Limestone)

Bedrock was encountered beneath the glacial till stratum approximately between elevations 480 and 474, sloping down in a southwesterly direction. The contact between the overburden and the bedrock is not very distinct. Bedrock may be described as a shale interbedded with limestone. The shale is soft to medium hard, somewhat fissile and weathered in the upper portion.

Groundwater Conditions

The boreholes were dry during the augering operation but were full of water subsequent to rock coring because water was used during the rock coring process. Due to the very low permeability of the subsoil this water did not dissipate during the period of fieldwork. As a result the prevailing groundwater levels in the boreholes were not established.

M MacLean

M. MacLean
Project Foundations Engineer



M. Devata

M. Devata
Senior Foundations Engineer

APPENDIX

RECORD OF BOREHOLE No 1

W P 156-75-03 LOCATION Coords. N 15,831,688; E 953,781 ORIGINATED BY V.K.
DIST 6 HWY 403 BOREHOLE TYPE 3 1/2" ϕ H.S. & S.S. Auger, Core With BXL & Cone Test COMPILED BY B.L.
DATUM Geodetic DATE August 10, 1978 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	100					
506.1	Ground Level													
0.0	Heterogeneous Mixture of Clayey Silt, Some Sand and Gravel (Glacial Till)		1	SS	51		500		100/5"					9 14 50 27
	Hard		2	SS	71									
			3	SS	100/	6"								15 23 41 21
	Brown Grey		4	SS	103		490							
			5	SS	140/	8"								9 12 60 19
			6	SS	91									
			7	SS	59		480							
474.6	Numerous Shale Fragments		8	SS	100/	5"								
31.5	Shale Bedrock With Limestone Layers		9	BXL	Rec 100%		470							
469.6														
36.5	End of Borehole													
	Note: Groundwater Level Not Established													

RECORD OF BOREHOLE No 2

W P 156-75-03 LOCATION Coords. N 15,831,744; E 953,816 ORIGINATED BY V.K.
DIST 6 HWY 403 BOREHOLE TYPE 3 1/2" ϕ H.S. & S.S. Auger, Core With BXL & Cone Test COMPILED BY B.L.
DATUM Geodetic DATE August 10, 1978 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	100					
506.1	Ground Level													
0.0	Heterogeneous Mixture of Clayey Silt, Some Sand and Gravel (Glacial Till)		1	SS	18		500		100/10"					3 12 60 25
	Hard		2	SS	76									6 24 47 23
			3	SS	98									
	Brown Grey		4	SS	150/	10"	490							17 11 45 27
	Frequent Boulders Below 15 Feet Deep		5	SS	100/	5"								
			6	SS	100/	5"								
479.1	Some Shale Fragments		7	SS	100/	5"	480							
27.0	Shale Bedrock With Limestone Layers		8	BXL	Rec 100%									
472.1														
34.0	End of Borehole													
	Note: Groundwater Level Not Established													

+³, x⁵: Numbers refer to
Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 3

W P 156-75-03 LOCATION Coords. N 15,831,806; E 953,747 ORIGINATED BY V.K.
DIST 6 HWY 403 BOREHOLE TYPE 3 1/2" ϕ H.S. & S.S. Auger, Core With BXL & Cone Test COMPILED BY B.L.
DATUM Geodetic DATE August 11, 1978 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40						60	80	100
								SHEAR STRENGTH							WATER CONTENT (%)		
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE										
506.2	Ground Level																
0.0	Heterogeneous Mixture of Clayey Silt, Some Sand and Gravel (Glacial Till) Hard		1	SS	52												
			2	SS	68												
			3	SS	90												
			4	SS	125												
			5	SS	102												
			6	SS	86												
			7	SS	150/ 8"												
479.2	Some Shale Fragments																
27.0	Shale Bedrock With Limestone Layers		8	BXL	Rec												
472.2					90%												
34.0	End of Borehole																
	Note: Groundwater Level Not Established																

RECORD OF BOREHOLE No 4

W P 156-75-03 LOCATION Coords. N 15,831,813; E 953,642 ORIGINATED BY V.K.
DIST 6 HWY 403 BOREHOLE TYPE 3 1/2" ϕ H.S. & SS. Auger, Core With BXL & Cone Test COMPILED BY B.L.
DATUM Geodetic DATE August 15, 1978 CHECKED BY

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES						20 40 60 80 100
504.6	Ground Level												
0.0	Heterogeneous Mixture of Clayey Silt, Some Sand and Gravel (Glacial Till) Hard		1	SS	68							9 10 46 35	
			2	SS	100/	5"							8 22 46 24
			3	SS	170/	9"							
			4	SS	112								
			5	SS	100/	4"							
			6	SS	150/	11"							13 18 44 25
			7	SS	100/	3"							
474.6	Some Shale Fragments												
30.0	Shale Bedrock With Limestone Layers		8	BXL									
469.6													
35.0	End of Borehole												
	Note: Groundwater Level Not Established												

+3, x5: Numbers refer to 20
Sensitivity 15 ϕ 5 (%) STRAIN AT FAILURE
10

REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 5

W P 156-75-03 LOCATION Coords. N 15,831,869; E 953,676 ORIGINATED BY V.K.
DIST 6 HWY 403 BOREHOLE TYPE 3 1/2" ϕ H. S. & SS. Auger, Core With BXL and Cone Test COMPILED BY B.L.
DATUM Geodetic DATE August 14, 1978 CHECKED BY E.C.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100				
506.8	Ground Level															
0.0	Heterogeneous Mixture of Clayey Silt, Some Sand and Gravel (Glacial Till) Hard		1	SS	77											
			2	SS	60											
			3	SS	177	10"										
			4	SS	120											
	Brown Grey		5	SS	97											
			6	SS	100	6"										
479.8	Some Shale Fragments		7	SS	135	7"										
27.0	Shale Bedrock With Layers of Limestone		8	SS	100	2"										
469.8			9	BXL	Rec 100%											
37.0	End of Borehole															
	Note: Groundwater Level Not Established															

+³, x⁵: Numbers refer to
Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 6

W P 156-75-03 LOCATION Coords. N 15,831,750; E 953,712 ORIGINATED BY V.K.
DIST 6 HWY 403 BOREHOLE TYPE 3 1/2" ϕ H.S. & SS. Auger, Core With BXL & Cone Test COMPILED BY B.L.
DATUM Geodetic DATE August 14, 1978 CHECKED BY

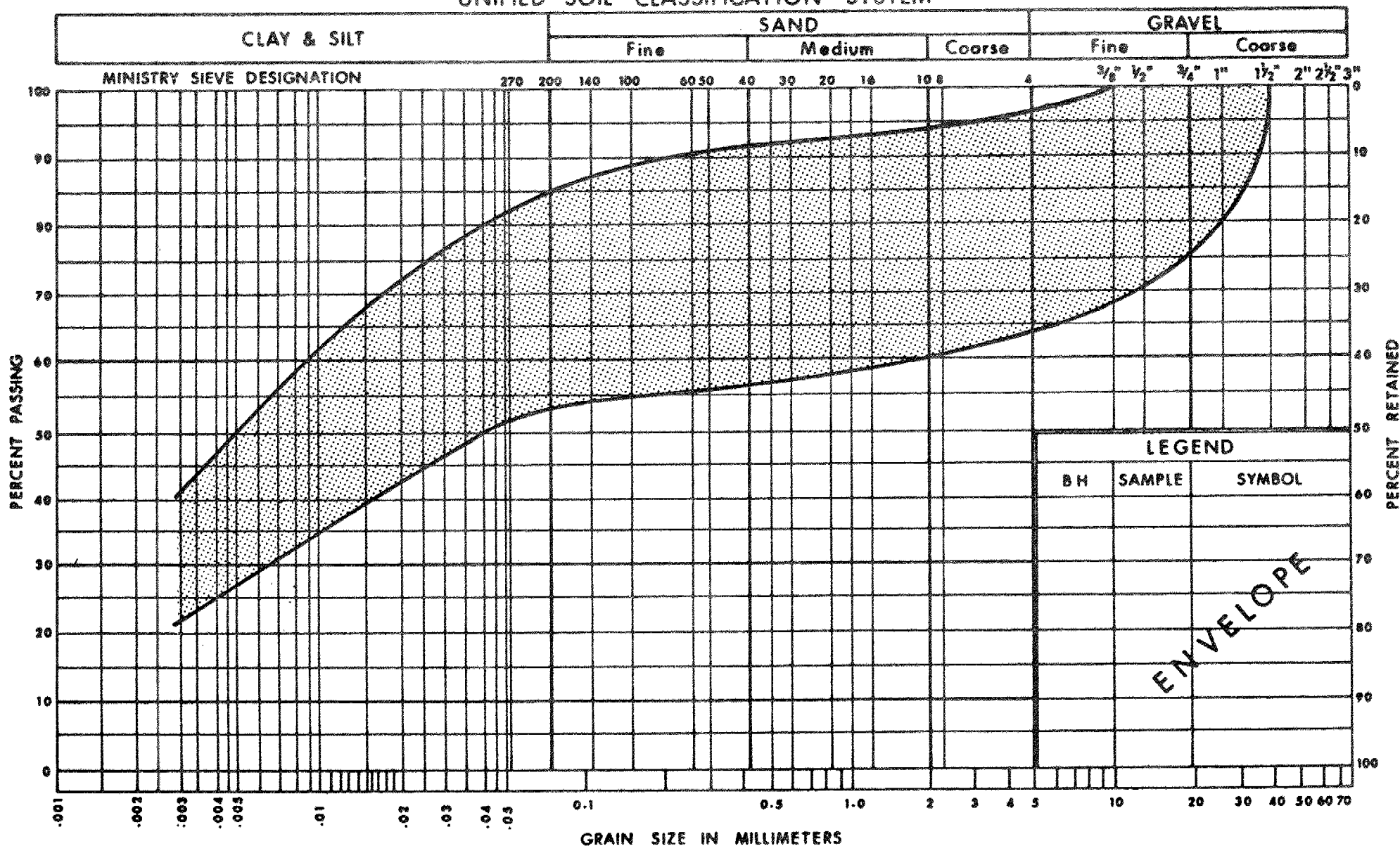
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100						
506.6	Ground Level													
0.0	Heterogeneous Mixture of Clayey Silt, Some Sand and Gravel (Glacial Till) Hard		1	SS	52									9 12 48 31
			2	SS	53									15 26 39 20
			3	SS	133									
			4	SS	165/	11"								
			5	SS	139/	11"								
			6	SS	150/	11"								35 12 32 21
			7	SS	100/	3"								
			8	SS	100/	4"								
474.1	Some Shale Fragments													
32.5	Shale Bedrock With Layers of Limestone		9	SS	100/	7"								
467.1			10	BXL	Rec 100%									
39.5	End of Borehole Note: Groundwater Level Not Established													

+³, x⁵: Numbers refer to
Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

UNIFIED SOIL CLASSIFICATION SYSTEM



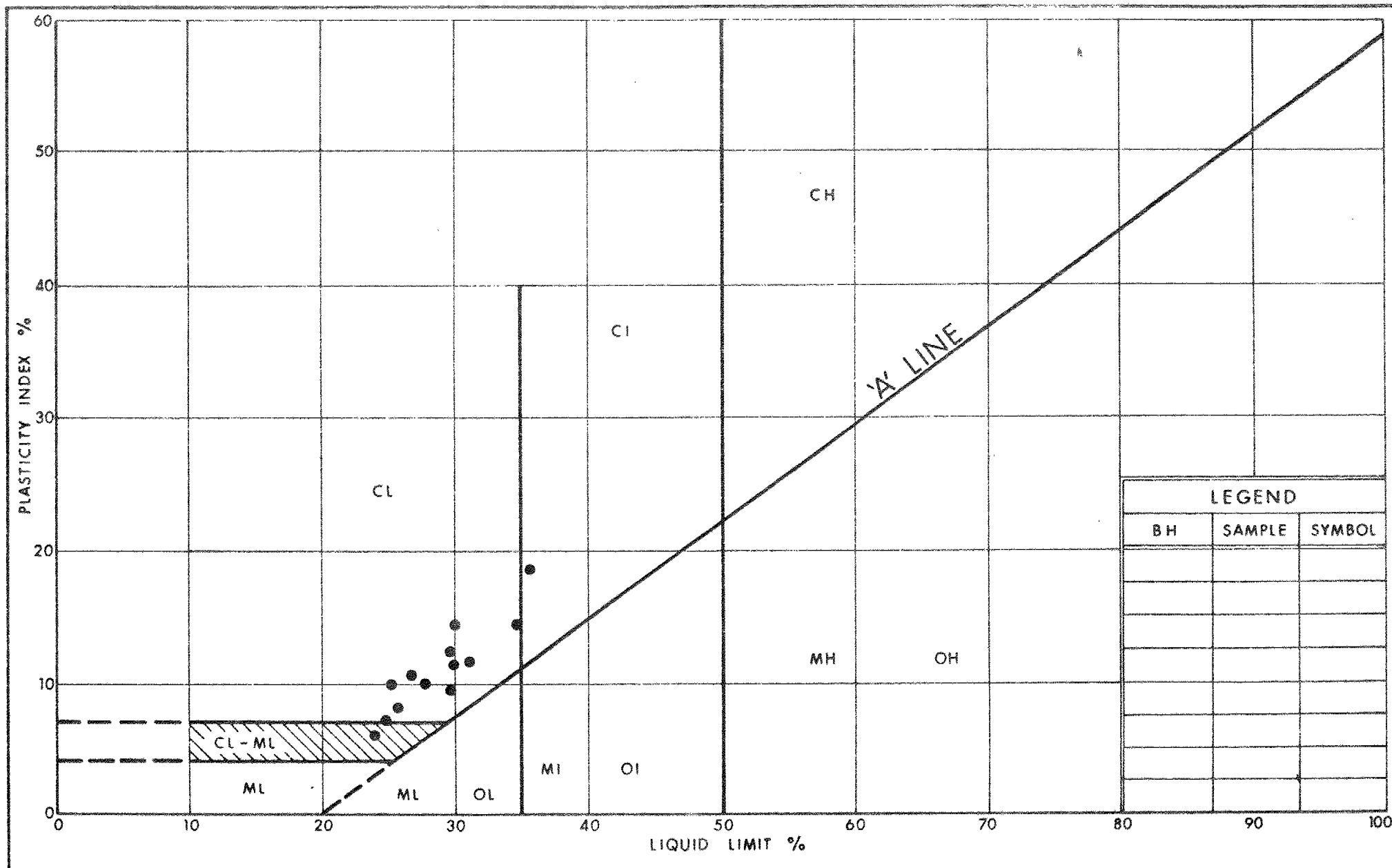
Ontario

**Ministry of
Transportation and
Communications**

GRAIN SIZE DISTRIBUTION
HET MIX OF CLAYEY SILT
SOME SAND & GRAVEL (GLACIAL TILL)

FIG No 1

WP 156 - 75 - 03



Ministry of
Transportation and
Communications

PLASTICITY CHART
HET MIX OF CLAYEY SILT
SOME SAND & GRAVEL (GLACIAL TILL)

FIG No 2

W P 156 - 75 - 03

ENGINEERING MATERIALS OFFICE
SOIL MECHANICS SECTION

WP 156-75-03

DIST 6

HWY 403

STR SITE 24-438

CONT 80-29

Creditview Road Underpass

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SAMPLE DISPOSITION NOTICE		
TYPE	DISCARD AFTER	RECOMM. BY
JARS	78 1) 15	dm ds
TUBES	—	—
ROCK CORES	See record of cont	dm ds

FOUNDATION INVESTIGATION REPORT

For

Creditview Road Underpass
W.P. 156-75-03, Site 24-438
Hwy. 403, District 6, Toronto

INTRODUCTION

This report contains the results of the foundation investigation done by the Soil Mechanics Section at the site of the above mentioned structure during the period of August 10, 1978 to August 15, 1978. The fieldwork consisted of six sampled boreholes, each accompanied by a dynamic cone penetration test. The borings were advanced by augering and diamond drilling techniques to depths ranging from 34 feet to 39.5 feet below the ground surface. Bedrock was proven by obtaining BXL size rock core samples.

SITE AND GEOLOGY

The site is located approximately 0.9 miles east of Mississauga Road and approximately 0.8 miles south of Eglinton Avenue in the City of Mississauga, Regional Municipality of Peel. A CPR track is located some 1000 feet west of the site and the south flowing Credit River is located about another 3000 feet further west. A key plan on Drawing No. 1567503-A shows the site location.

Terrain at the site is bush covered, moderately undulating and gently sloping down towards the south. The internal drainage of the area is poor. Some of the low lying area at times may be ponded with water.

The area under investigation is located in a drumlinized till plain which forms part of a physiographic region known as the "South Slope". This physiographic region is the southern slope of the interlobate moraine laid down in the Pleistocene epoch. The drift in the till plain is a clayey silt closely related to the local bedrock which is a shale of the Dundas-Meaford formation.

SUBSURFACE CONDITIONS

General

The overburden at this site has a thickness of about 27 to 32 feet and is composed of a heterogeneous mixture of clayey silt, some sand and gravel. Across the site the overburden is underlain by shale bedrock.

Factual data on the subsurface conditions is shown on the Borehole Record Sheets. The location and the elevation of the borings, together with the estimated stratigraphical sections, are shown on Drawing No. 1567503-A. A description of the subsoil and the bedrock conditions is as follows.

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

The predominant subsoil at this site is a glacial till composed of a heterogeneous mixture of clayey silt, some sand and gravel which extends beneath a thin veneer of topsoil to bedrock for a thickness of about 27 to 32 feet. The glacial till is brown and weathered in the upper 13 to 14 feet and becomes grey and relatively intact below that depth. Typical grain size distribution curves for samples from this deposit are shown in an envelope form in Figure 1. In certain locations boulders were encountered in the overburden. Across the site the lower 2 to 5 feet of the glacial till stratum contains some shale fragments. Geotechnical identity indices of the glacial till as determined from laboratory testing are summarized in a tabular form below.

		<u>Range</u>
Natural Moisture Content	(W) %	8-17
Liquid Limit	(W _L) %	27-37
Plastic Limit	(W _p) %	17-31

The results of the Atterberg Limit Testing are also plotted on the Plasticity Chart, Figure 2, which indicates that the glacial till is cohesive with a low plasticity.

Most of the Standard Penetration Test 'N' values are in the range of 50 blows to over 100 blows per foot, with the exception of one low 'N' value of 18 blows per foot recorded in the surficial portion of the overburden at the southeast corner of the site. The generally very high 'N' values indicate that the consistency of the glacial till is hard.

Bedrock (Shale Interbedded With Limestone)

Bedrock was encountered beneath the glacial till stratum approximately between elevations 480 and 474, sloping down in a southwesterly direction. The contact between the overburden and the bedrock is not very distinct. Bedrock may be described as a shale interbedded with limestone. The shale is soft to medium hard, somewhat fissile and weathered in the upper portion.

Groundwater Conditions

The boreholes were dry during the augering operation but were full of water subsequent to rock coring because water was used during the rock coring process. Due to the very low permeability of the subsoil this water did not dissipate during the period of fieldwork. As a result the prevailing groundwater levels in the boreholes were not established.

DISCUSSION AND RECOMMENDATIONS

In conjunction with the construction of Hwy. 403 in the City of Mississauga, the existing Creditview Road will be realigned. The proposed Hwy. 403 crosses the realigned Creditview Road approximately 3/4 miles southeasterly from the corner of Eglinton Avenue West and the existing Creditview Road. At this new crossing, a two span structure (95'+95') is proposed to carry the realigned Creditview Road over Hwy. 403. The profile grade of the realigned Creditview Road will be at about elevation 507 and that of Hwy. 403 at about elevation 485. These profile grades will necessitate a cut about 23 feet deep for Hwy. 403 and fill one to two feet in height for the realigned Creditview Road. Our recommendations for the structural foundations and the related earthworks are as follows.

Structure Foundations

The subsoil conditions are such that it would be most advantageous to support the proposed underpass structure on spread footings. Recommendations for the respective footing elements are given below.

<u>Footing Location</u>	<u>Reference Boreholes</u>	<u>Recommendations</u>
North Abutment	4, 5	Spread footings within the glacial till with an allowable bearing pressure up to 4 tsf
Centre Pier	3, 6	Spread footings at or below elevation 479 with an allowable bearing pressure up to 5 tsf
South Abutment	1, 2	Same as for the North Abutment

The lateral forces on the footings can be assumed to be resisted by friction on the underside of the footings. To compute the frictional resistance an adhesion of 2000 psf can be used. It should be noted that the passive earth pressure in front of the footings should be neglected.

There should be a minimum of 4 feet of earth cover for the underside of the footings for frost protection purposes. No major dewatering problems are anticipated for the construction of the footings because of the relatively impermeable nature of the subsoil; any minor seepage into the excavation can be removed by pumping from sumps.

Other Considerations

Backfill to the abutments should be of a free draining granular type of material. In addition, proper drainage measures consisting of weep holes and perforated pipes should be provided in order to prevent build-up of water pressure behind the abutment walls.

To estimate the lateral earth pressure acting on the abutment wall due to the granular backfill, a coefficient of earth pressure of 0.5 should be used if the abutment is of a rigid type. If some translocation of the abutment is permitted, a coefficient of earth pressure of 0.3 can be used. For all cases, a bulk unit weight equal to 130 pcf should be assumed for the granular backfill material.

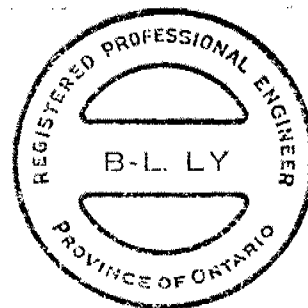
Approaches

The 23 foot deep cut section required for Hwy. 403 at this location can be constructed with standard 2:1 side slopes. The subsoil is competent and no stability problems are anticipated for such a cut.

MISCELLANEOUS

Mr. V. Korlu supervised the fieldwork. Mr. B. Ly prepared this report and Mr. M. Devata reviewed it.

B. Ly
B. Ly, P. Eng.
Senior Engineer



M. Devata
M. Devata, P. Eng.
Supervising Engineer

September, 1978

APPENDIX



RECORD OF BOREHOLE No 1

W P 156-75-03 LOCATION Coords. N 15,831,688; E 953,781 ORIGINATED BY V.K.
DIST 6 HWY 403 BOREHOLE TYPE 3 1/2" H.S. & S.S. Auger, Core With BXL & Cone Test COMPILED BY B.L.
DATUM Geodetic DATE August 10, 1978 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60					
506.1	Ground Level														
0.0	Heterogeneous Mixture of Clayey Silt, Some Sand and Gravel (Glacial Till)		1	SS	51										
			2	SS	71										9 14 50 27
	Hard		3	SS	100/	6"									15 23 41 21
	Brown Grey		4	SS	103										
			5	SS	140/	8"									9 12 60 19
			6	SS	91										
			7	SS	59										
474.6	Numerous Shale Fragments		8	SS	100/	5"									
31.5	Shale Bedrock With Limestone Layers		9	BXL	Rec 100%										
469.6															
36.5	End of Borehole														
	Note: Groundwater Level Not Established														

RECORD OF BOREHOLE No 2

W P 156-75-03 LOCATION Coords. N 15,831,744; E 953,816 ORIGINATED BY V.K.
DIST 6 HWY 403 BOREHOLE TYPE 3 1/2" H.S. & S.S. Auger, Core With BXL & Cone Test COMPILED BY B.L.
DATUM Geodetic DATE August 10, 1978 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60					
506.1	Ground Level														
0.0	Heterogeneous Mixture of Clayey Silt, Some Sand and Gravel (Glacial Till)		1	SS	18										3 12 60 25
			2	SS	76										
	Hard		3	SS	98										6 24 47 23
	Brown Grey		4	SS	150/	10"									
			5	SS	100/	5"									17 11 45 27
	Frequent Boulders Below 15 Feet Deep		6	SS	100/	5"									
			7	SS	100/	5"									
479.1	Some Shale Fragments														
27.0	Shale Bedrock With Limestone Layers		8	BXL	Rec 100%										
472.1															
34.0	End of Borehole														
	Note: Groundwater Level Not Established														



RECORD OF BOREHOLE No 3

W P 156-75-03 LOCATION Coords. N 15,831,806; E 953,747 ORIGINATED BY V.K.
DIST 6 HWY 403 BOREHOLE TYPE 3 1/2" ϕ H.S. & S.S. Auger, Core With BXL & Cone Test COMPILED BY B.L.
DATUM Geodetic DATE August 11, 1978 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100		W _p	W	W _L		
506.2	Ground Level													GR SA SI CL
0.0	Heterogeneous Mixture of Clayey Silt, Some Sand and Gravel (Glacial Till) Hard		1	SS	52		500		100/9"					8 25 40 27
			2	SS	68									21 20 38 21
			3	SS	90									
			4	SS	125									
			5	SS	102		490							
			6	SS	86									26 10 48 18
479.2	Some Shale Fragments		7	SS	150/8"		480							
27.0	Shale Bedrock With Limestone Layers		8	BXL	Rec 90%									
472.2														
34.0	End of Borehole													
	Note: Groundwater Level Not Established													

RECORD OF BOREHOLE No 4

W P 156-75-03 LOCATION Coords. N 15,831,813; E 953,642 ORIGINATED BY V.K.
DIST 6 HWY 403 BOREHOLE TYPE 3 1/2" ϕ H.S. & SS. Auger, Core With BXL & Cone Test COMPILED BY B.L.
DATUM Geodetic DATE August 15, 1978 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100		W _p	W	W _L		
504.6	Ground Level													GR SA SI CL
0.0	Heterogeneous Mixture of Clayey Silt, Some Sand and Gravel (Glacial Till) Hard		1	SS	68		500		100/8"					9 10 46 35
			2	SS	100/5"									
			3	SS	170/9"									8 22 46 24
			4	SS	112									
			5	SS	100/4"		490							
			6	SS	150/11"									13 18 44 25
			7	SS	100/3"		480							
474.6	Some Shale Fragments													
30.0	Shale Bedrock With Limestone Layers		8	BXL			470							
469.6														
35.0	End of Borehole													
	Note: Groundwater Level Not Established													

+3, x5: Numbers refer to
Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 5

W P 156-75-03 LOCATION Coords. N 15,831,869; E 953,676 ORIGINATED BY V.K.
DIST 6 HWY 403 BOREHOLE TYPE 3 1/2" ϕ H. S. & SS. Auger, Core With BXL and Cone Test COMPILED BY B.L.
DATUM Geodetic DATE August 14, 1978 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
506.8	Ground Level																GR SA SI CL
0.0	Heterogeneous Mixture of Clayey Silt, Some Sand and Gravel (Glacial Till) Hard		1	SS	77												
			2	SS	60												
			3	SS	177	10"											
			4	SS	120												
			5	SS	97												
			6	SS	100	6"											
479.8	Some Shale Fragments		7	SS	135	7"											
27.0	Shale Bedrock With Layers of Limestone		8	SS	100	2"											
469.8			9	BXL	Rec 100%												
37.0	End of Borehole																
	Note: Groundwater Level Not Established																

+³, x⁵: Numbers refer to
Sensitivity

20
15 \div 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 6

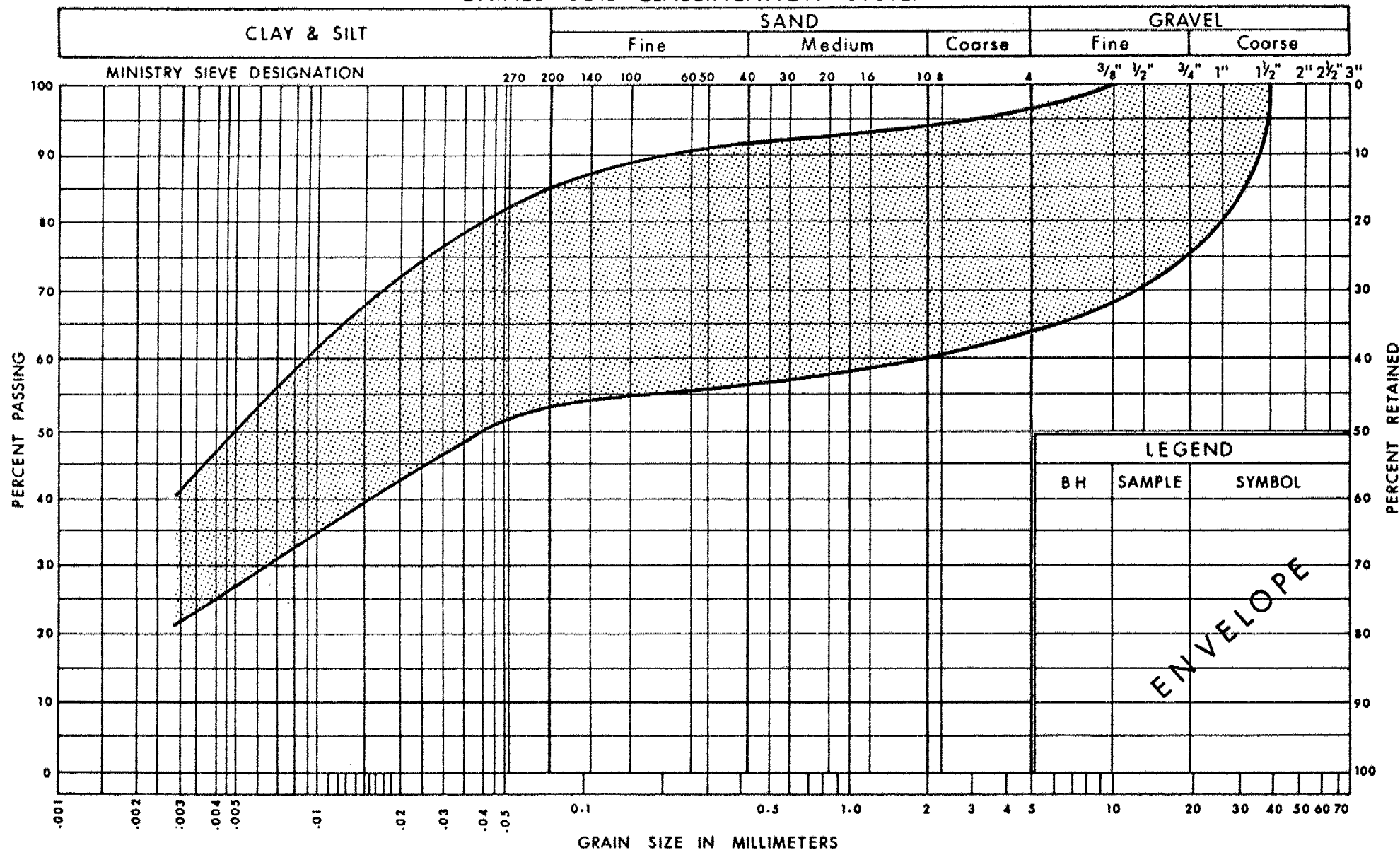
W P 156-75-03 LOCATION Coords. N 15,831,750; E 953,712 ORIGINATED BY V.K.
DIST 6 HWY 403 BOREHOLE TYPE 3 1/2" ϕ H.S. & SS. Auger, Core With BXL & Cone Test COMPILED BY B.L.
DATUM Geodetic DATE August 14, 1978 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
506.6	Ground Level																
0.0	Heterogeneous Mixture of Clayey Silt, Some Sand and Gravel (Glacial Till) Hard		1	SS	52		500										9 12 48 31
			2	SS	53												15 26 39 20
			3	SS	133												
			4	SS	165	11"											
			5	SS	139	11"	490										
			6	SS	150	11"											35 12 32 21
			7	SS	100	3"	480										
			8	SS	100	4"											
474.1	Some Shale Fragments																
32.5	Shale Bedrock With Layers of Limestone		9	SS	100	7"	470										
467.1			10	BXL	Rec 100%												
39.5	End of Borehole Note: Groundwater Level Not Established																

+3, x5: Numbers refer to
Sensitivity

20
15 \div 5 (%) STRAIN AT FAILURE
10

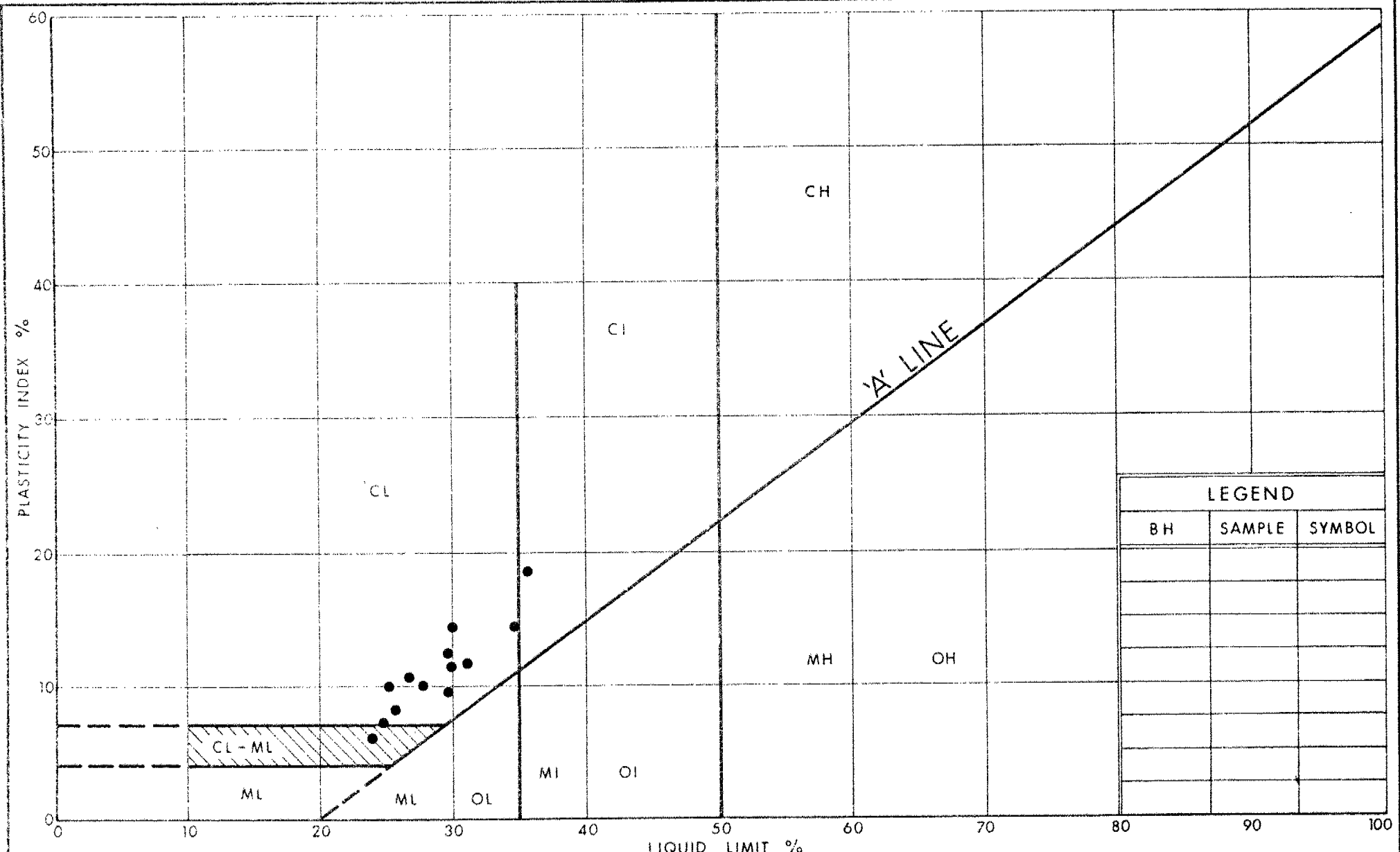
UNIFIED SOIL CLASSIFICATION SYSTEM

Ministry of
Transportation and
Communications

GRAIN SIZE DISTRIBUTION
HET MIX OF CLAYEY SILT
SOME SAND & GRAVEL (GLACIAL TILL)

FIG No 1

W P 156 - 75 - 03

Ministry of
Transportation and
Communications

PLASTICITY CHART
HET MIX OF CLAYEY SILT
SOME SAND & GRAVEL (GLACIAL TILL)

FIG No 2

W P 156 - 75 - 03

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 N_c .

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. $C\bar{U}$ = 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
 ω SLOPE ANGLE-BACKFACE OF WALL
 β ANGLE OF SLOPE
 N_c, N_q, N_{γ} 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 = $\frac{I_P \text{ of soil}}{I_P \text{ of } 2\mu m \text{ Soil Fraction}}$
 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

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_c OVERCONSOLIDATION RATIO (OCR)

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

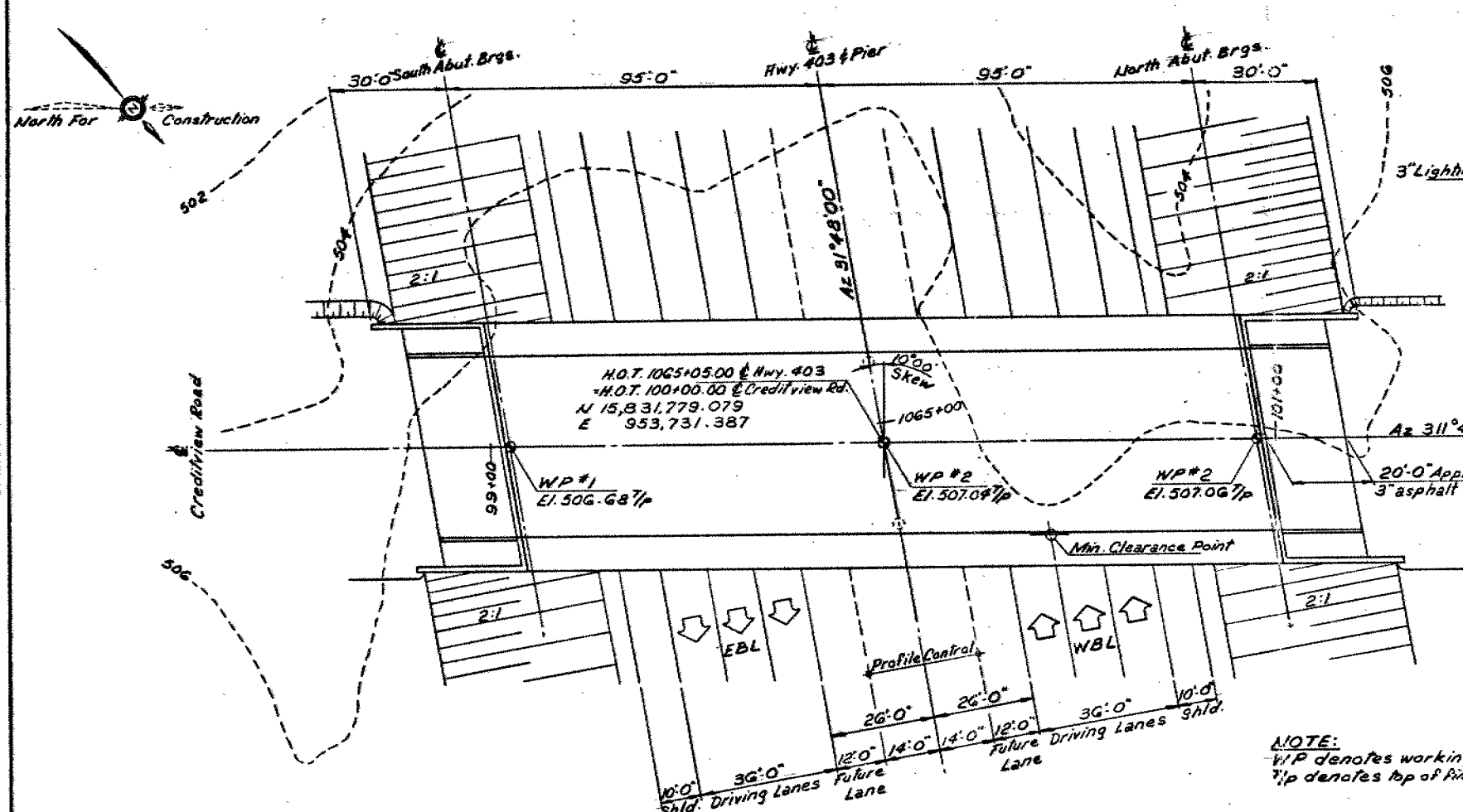
HWY No 403 DIST 0
SUBMITTAL CHECKED DATE Sept 18, 1978 SITE 24 - 438
DRAWN RS CHECKED APPR 15 DWG 1567503-

DIST. 6 HWY. 403
CONT No
WP No 156-75-03

CREDITVIEW ROAD UNDERPASS
GENERAL LAYOUT

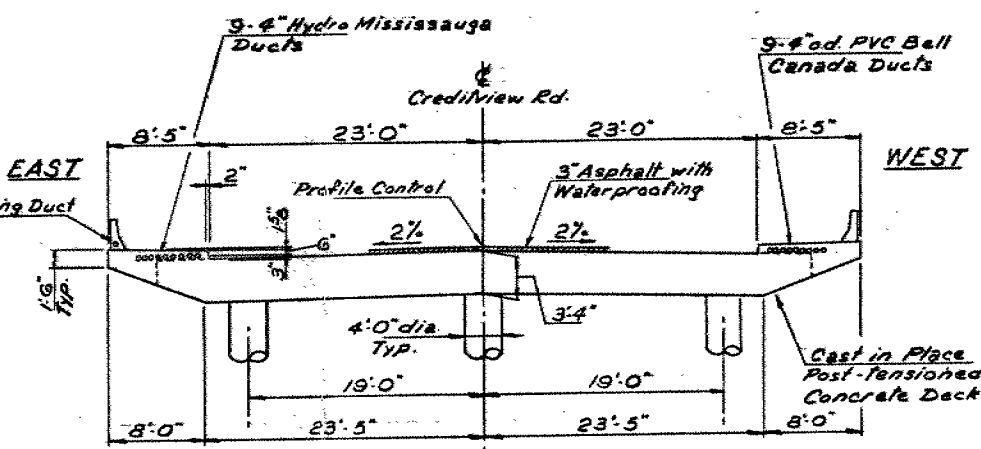
SHEET

CS COLE
SHERMAN

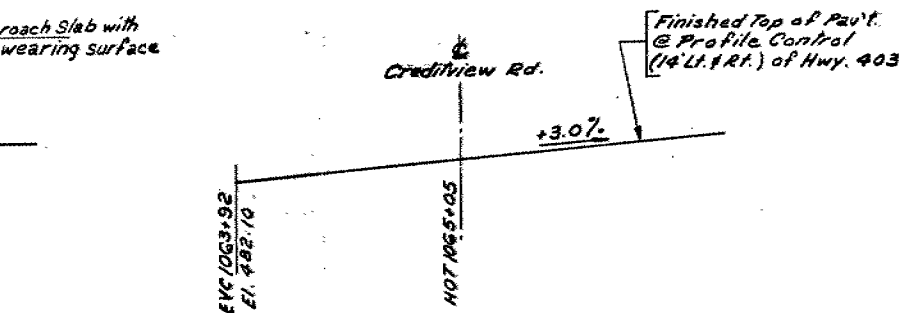


PLAN
Scale: 1" = 20'-0"

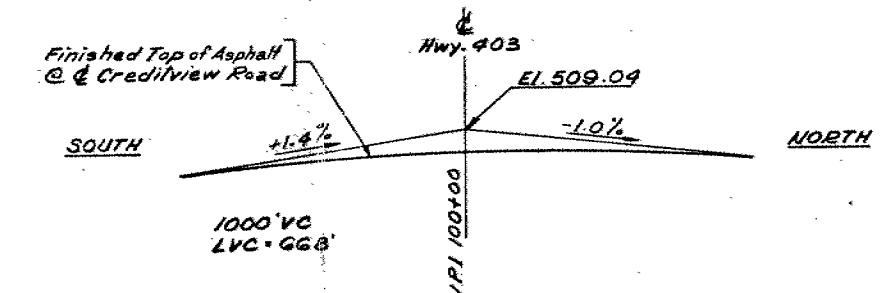
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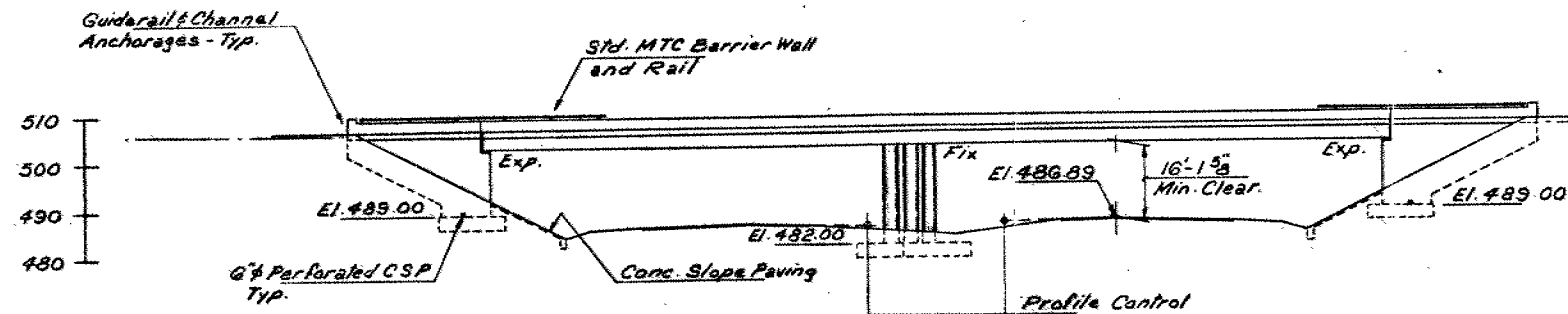
TYPICAL DECK SECTION
Scale: 1/8" = 1'-0"



PROFILE OF HWY. 403
NTS



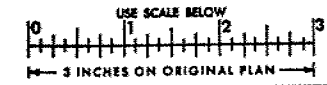
PROFILE OF CREDITVIEW RD.
NTS



ELEVATION
Scale: 1" = 20'-0"

LIST OF DRAWINGS

- 24-438-1 General Layout
- 2 Borehole Locations & Soil Strata
- 3 Footing Details
- 4 Abutment Details
- 5 Pier Details
- 6 Deck Layout
- 7 Longitudinal Cable Details
- 8 Deck Reinforcement & Transverse Cables
- 9 Deck Sections and Details
- 10 Barrier Walls With Sidewalks
- 11 Steel Railing (Single Tube)
- 12 20' Approach Slab
- 13 Details of Concrete Slope Paving
- 14 Standard Details I
- 15 Standard Details II
- 16 Standard Details III
- 17 As Constructed Elevations & Dimensions FOR REDUCED PLAN



NOTES

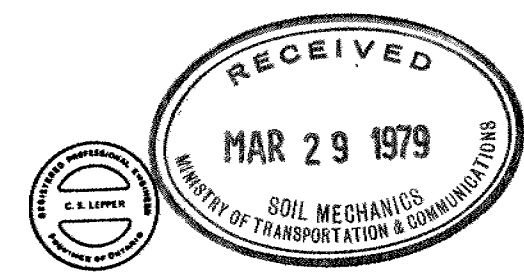
CLASS OF CONCRETE
Deck and Pier Columns 5,000 psi
Barrier Walls 4,000 psi
Remainder 3,000 psi
Or as noted on the drawings.

CLEAR COVER TO REINFORCING
Footings Abutments Pier Columns
3" 2" 2 1/2"
Deck-Top Bot Approach Slabs
2" 1 1/2" 2"
Or as noted on the drawings.

REINFORCING STEEL
All steel Grade 400 Reinforcing bars with the designation "C" shall be coated bars.

CONSTRUCTION NOTES
The Contractor is responsible for finishing the bearing seats dead level to the specified elevations with a tolerance of $\pm 1/8$ inch. To achieve the minimum clear cover of 2" as specified, the top layer of reinf. shall be placed prior to concreting with a clear cover of $2 1/2 \pm 1/2$ tolerance. No concrete shall be placed above the abutment bearing seats until the concrete in the deck has been placed, stressed and grouted.

CONCRETE QUANTITIES
Concrete quantities are listed below for the appropriate concrete lump sum items.
1. Concrete in piers, abutments & wing walls - 3,000 psi 30 cu yds
2. Prestressed concrete bridge deck - 3,000 psi 321 cu yds
3. Concrete in barrier walls 32 cu yds
4. Concrete in approach slabs 60 cu yds
5. Concrete in slope paving 45 cu yds

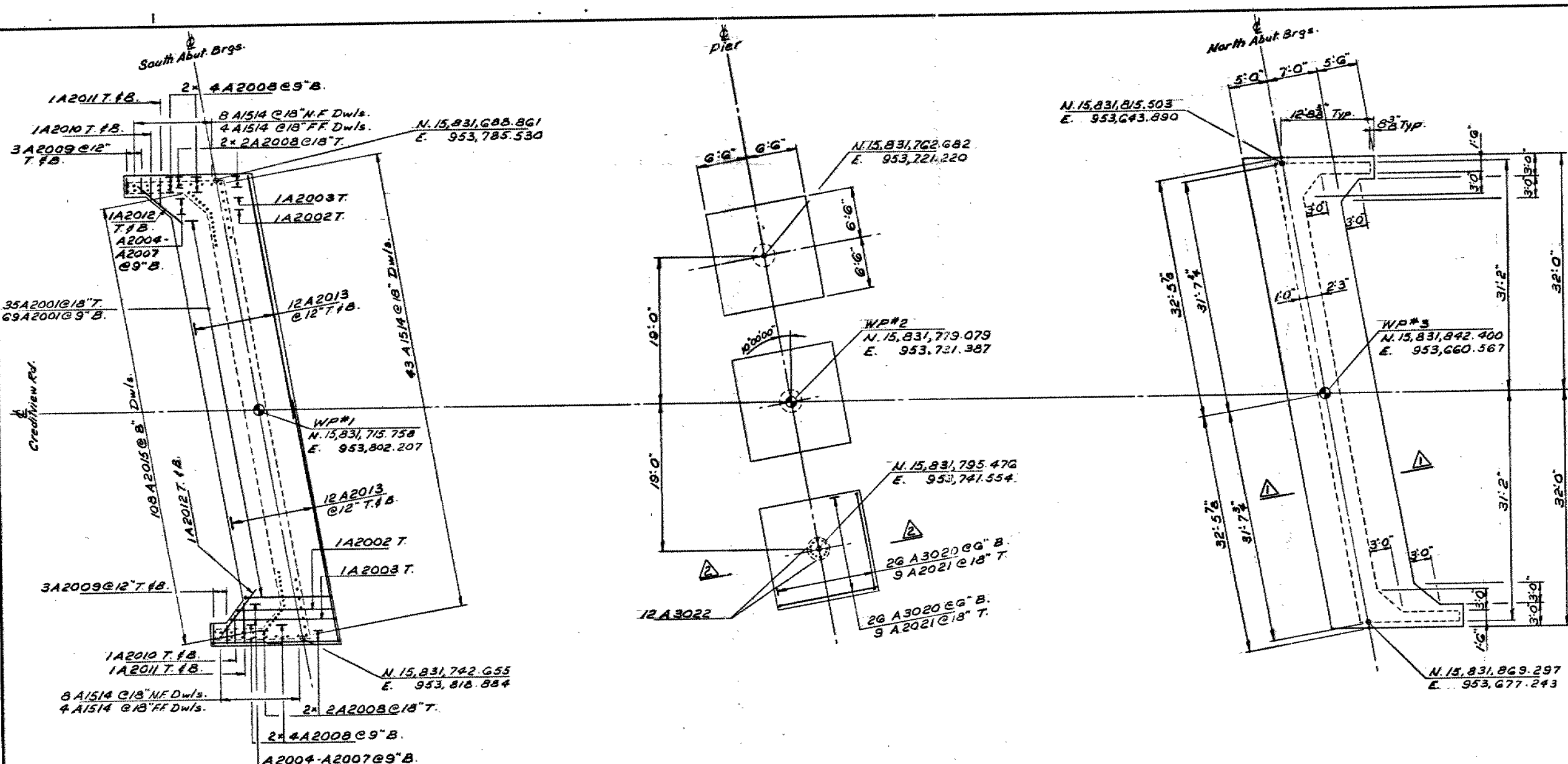


REVISIONS	DATE	BY	DESCRIPTION
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			



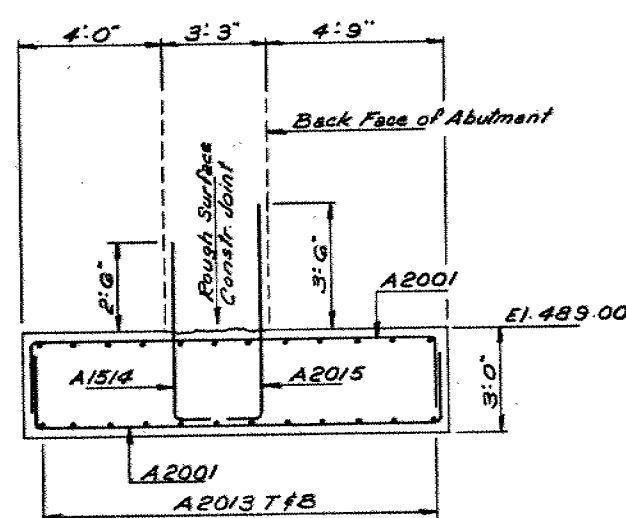
NOTE:

Layout and reinforcement similar for North and South Abutments.
Dimensions and reinforcement similar for each pier footing.

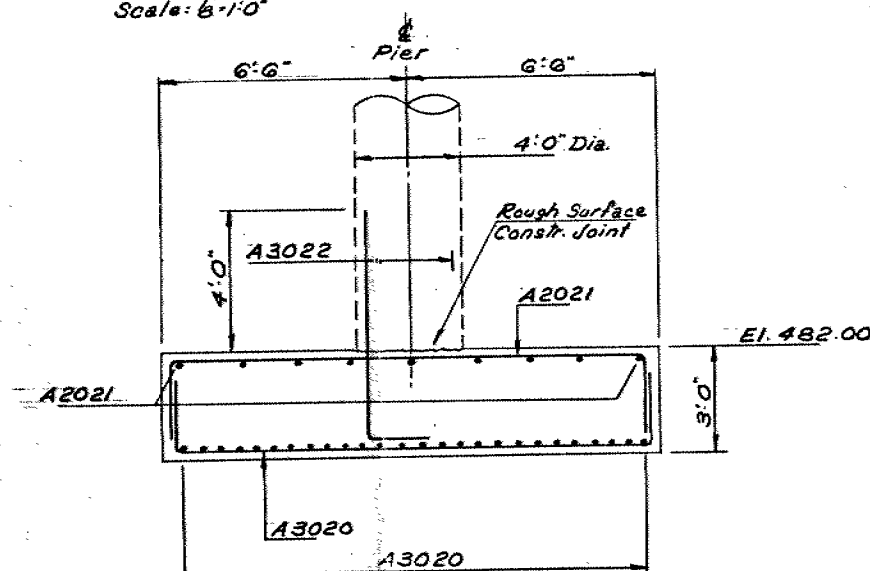


FOOTING LAYOUT

Scale: 6"=1'-0"



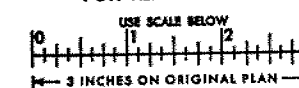
Scale: 3"=1'-0"



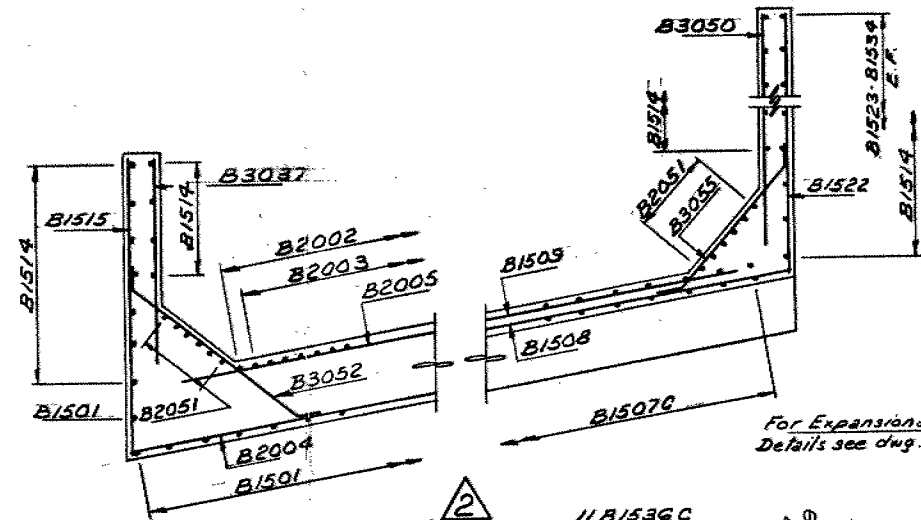
Scale: 3"=1'-0"



FOR REDUCED PLAN



REVISION	DATE	BY	DESCRIPTION	DATE	BY
DESIGN	CSL	CHECKED	LOADINGS 20-44	DATE	Jan. 79
DRAWING	FWL	CHECKED	SITE No 24-438	DWG	3



Scale: $\frac{1}{4}'' = 1'-0''$ @ $4\frac{1}{2}''$

33B1536C @ 9"

1B1522

2B1522 in curb

29B1535C @ 12"

1B1522

8B1523-8B1534 @ 18"

1B1521

7B1514 @ 18"

3B1515 @ 18"

1B1559

2B1516-2B1520 @ 18"

5'-3"

9'-0"

1'-0"

1B1501

S.W. N.E.

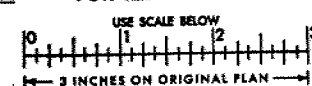
S.E. 3'-8 $\frac{1}{2}$ "
S.W. 3'-7 $\frac{1}{2}$ "
N.E. 4'-2"
N.W. 4'-2 $\frac{1}{2}$ "

3-3

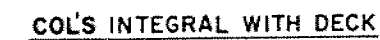
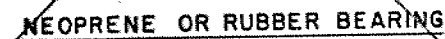
S.E. 41.506.8
S.W. 41.506.8
N.E. 41.507.42
N.W. 41.507.44

[illegible]

FOR REDUCED PLAN



REVISIONS									
	DATE	BY	DESCRIPTION						
	DESIGN <i>CSL</i>	CHECK <i>RH</i>	LOADING <i>HS 20-44</i>						DATE <i>Jan 7.</i>
	DRAWING <i>F.W.</i>	CHECK <i>RH</i>	SITE No <i>24-438</i>						DWG <i>4</i>



SS106-1

REVISIONS	DATE		BY		DESCRIPTION
	DESIGN	CSL	CHECK	RM	LOADING HS 20-44
	DRAWING	FW	CHECK	RM	SITE No 24-438
					DWG 5

93 05 17

Road Widening - Hwy 403

W.P. 156-75-03 - Creditview River

W.P. 157-75-05 - Mullet Cr. Bridge

MD & BS

Reviewed borehole coverage for above projects and concluded that there is sufficient info. available for proposed road widening at these locations.

No additional geotechnical investigation is considered necessary

BS



Memorandum

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

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

Attention:

Date: 78 04 17

Our File Ref.

In Reply to

Subject: Re: Hwy 403 Underpass at Relocated Creditview
W.P. 156-75-03, Site 24-438
District 6, Toronto

As per your request, we have carried out a preliminary investigation at the revised crossing of the realigned Creditview Road and Hwy. 403, and submit herein a summary of the subsurface conditions together with our preliminary geotechnical recommendations.

Our preliminary investigation revealed that the site is underlain by a 23 foot thick stratum of very stiff to hard clayey silt, which in turn is followed by shale bedrock at elevation 483.5. Within the clayey silt stratum occasional cobbles and boulders up to 8" in size were encountered at a depth from 10 to 15 feet below the ground surface.

According to available information a two span structure is being considered to carry the realigned Creditview Road over Hwy. 403. At the revised crossing, the profile grade of Hwy. 403 will be at elevation 487, whereas that of the realigned Creditview Road will be at elevation 510.0. These profile grades will necessitate cuts up to 20 feet deep for Hwy. 403 and fills of 4 feet in height for the approaches of Creditview Road. The profile grade of Hwy 403 is such that the footing formation level of the centre pier will be very close to bedrock. In view of this, the centre pier could be supported on spread footings founded in shale bedrock at or below elevation 482.0 and designed for a bearing pressure of up to 10 tsf. With regard to the abutment footings, they can be placed in the clayey silt stratum at or below elevation 503.0 and designed for a bearing pressure of up to 4 tsf. The underside of the footings should have a minimum 4 feet of earth cover for frost protection purposes. No major dewatering problems during construction are anticipated as the clayey silt is relatively impervious.

The granular backfill to the abutments should be free draining and should be provided with adequate drainage. The coefficient of lateral earth pressure for the granular backfill may be taken as 0.33 and 0.5 for the 'active' and the 'at rest' conditions respectively. To compute the sliding resistance between the concrete footing base and the clayey silt or shale bedrock, a value of 2000 psf. can be used.

cont'd.....

The proposed cuts and approach fills can be constructed at a 2:1 slope angle without having dangers of failure.

It should be noted that a detailed investigation will be necessary when the design concepts are finalized. A final foundation report will be issued after the completion of the necessary fieldwork.

B. Ly
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



RECORD OF BOREHOLE No 13 A

W P 156-75-04 LOCATION Realigned Creditview Rd. & Hwy. 403 ORIGINATED BY VK
DIST 6 HWY 403 BOREHOLE TYPE 3 1/4 M.V.H.S Auger & Cone Test COMPILED BY VK
DATUM Geodetic DATE March 2, 1978 CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ	REMARK & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	
506.5	Ground Level											
0.0	Clayey Silt with some sand and gravel		1	SS	51							
	Hard		2	SS	80							
	Occasional cobbles & boulders		3	SS	115							
			4	SS	142	/11"						
483.5			5	SS	100	/1 1/2"						
23.0	Shale bedrock											
25.0	End of Borehole											



HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

W P 156-75-04 LOCATION Realigned Creditview Rd. & Hwy. 403 ORIGINATED BY VK
DIST 6 HWY 403 BOREHOLE TYPE 3 1/4" M.V.H.S Auger & Cone Test COMPILED BY VK
DATUM Geodetic DATE March 2, 1978 CHECKED BY R.S.

[illegible]

+3, x5 : Numbers refer to Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

20

15 

10

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

Soil Mechanics Section
Engineering Materials Office
Room 315, Central Building

78 11 29

Re: Creditview Road Underpass
W.P. 156-75-03, Site 24-438
Hwy. 403, District 6, Toronto

We have reviewed the preliminary bridge plan drawing
No. 24-438-P1 for the above mentioned structure.

According to the plan the foundation of the new structure
complies with our recommendations presented in our report.
We do not anticipate any foundations problems at this site.

V. Korlu
Project Engineer

For: M. Devata
Supervising Engineer

VK/MD/gs

cc: Files J



Memorandum

WP156-75-03

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, Ontario.

Date: 79 10 05

Our File Ref.

In Reply to

Subject: Re: Creditview Road Underpass,
W.P. 156-75-03, Site 24-438,
Hwy. 403, District 6, Toronto.

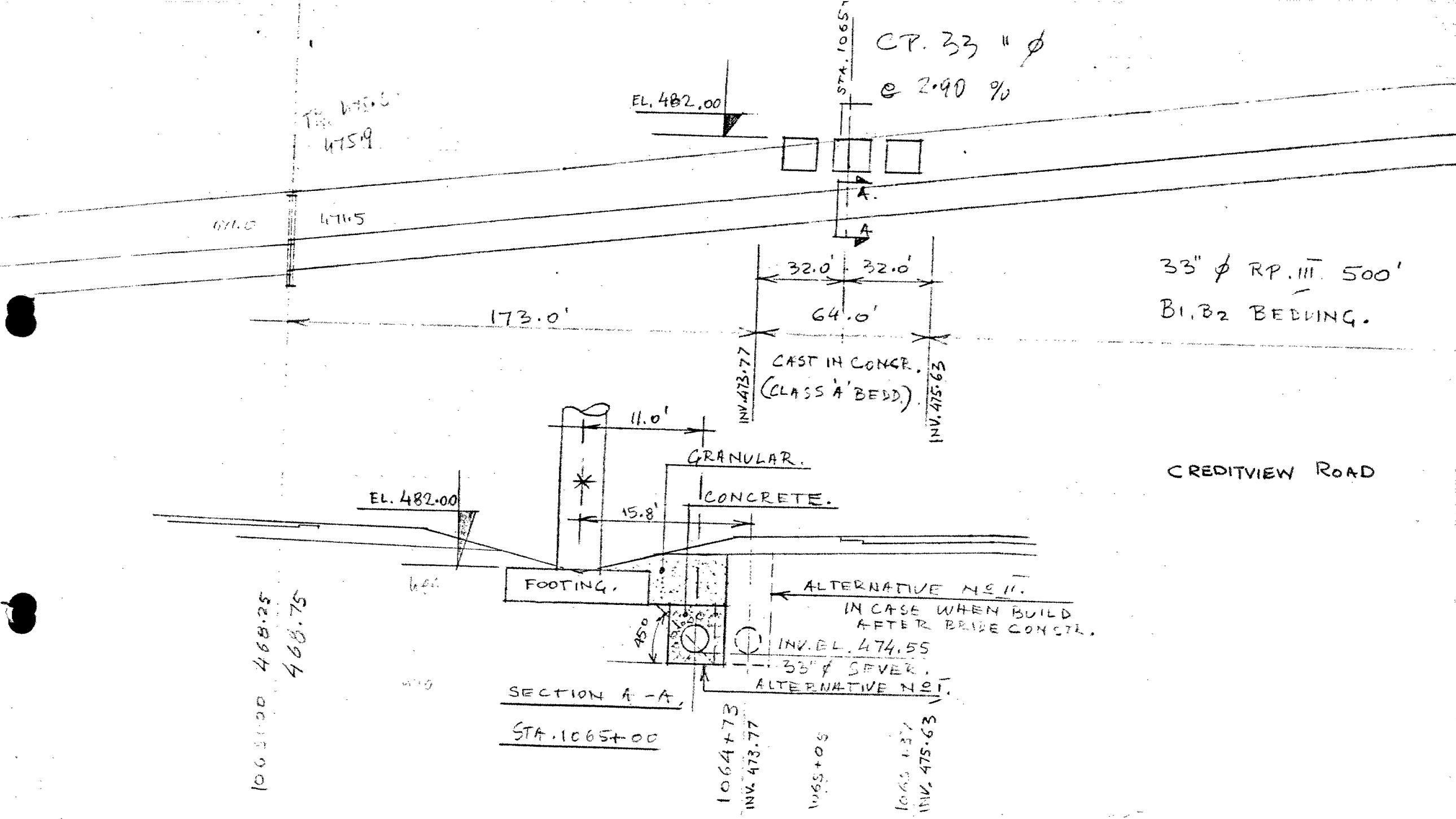
As per your request, we have reviewed the proposed construction of a 33" diameter sewer in the vicinity of the centre pier and submit the following comments.

- 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) Since the sewer trench will be partly located in the bedrock, an item for rock excavation should be included in the contract for the construction of the sewer. If blasting is employed, such an operation must be carried out by means of controlled wall blasting technique to minimize disturbance in the new footing area.
- 3) The portion of the trench adjacent to the pier foundation should be backfilled with mass concrete up to the footing formation level.
- 4) The sewer should be installed and backfilled prior to the construction of the pier footings.

BL/MD/cy

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

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



memorandum



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.

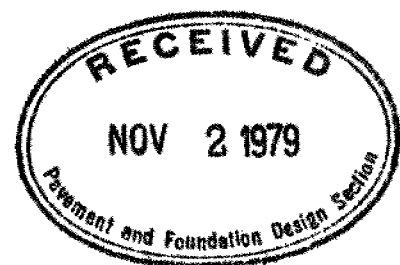
Mavis Road

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

N. Sen,
Project Manager.

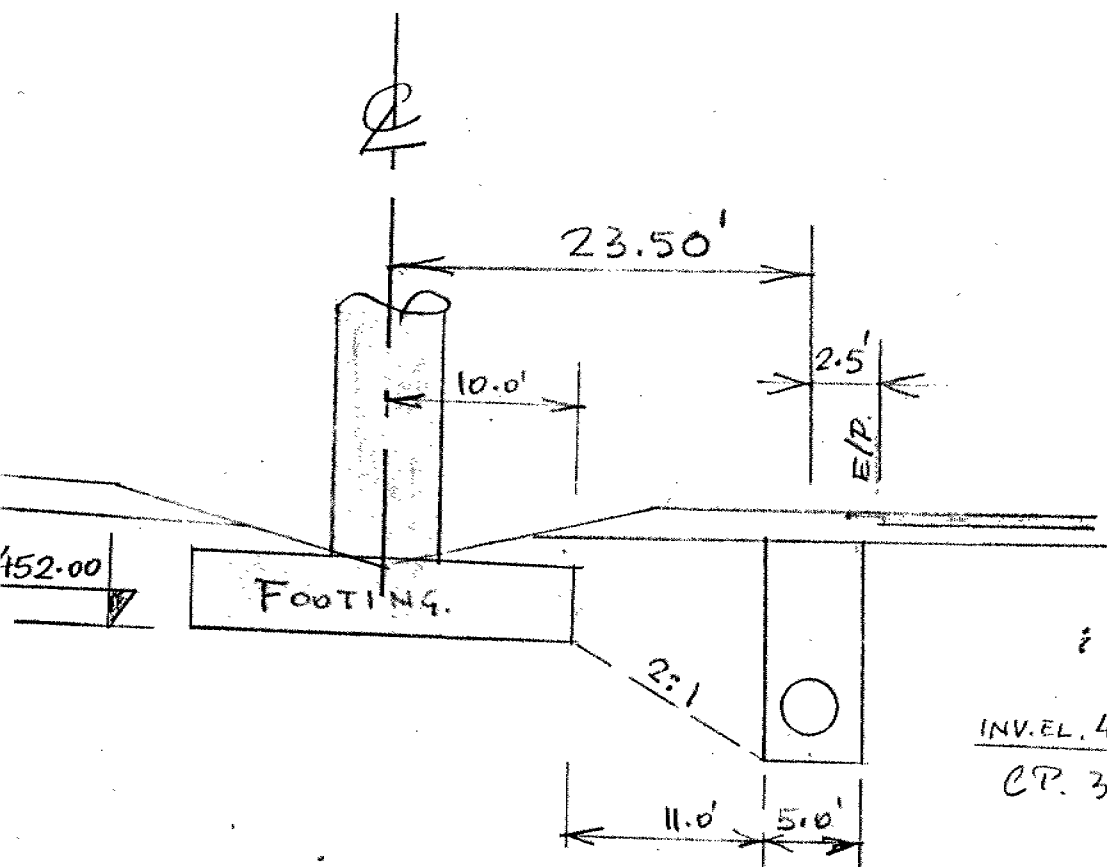
NS/aa

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



C.P.R. CROSSING.

#WY. 403 STA. 1054+00.



480.40 y.c.
1000

INV. EL. 447.80
CP. 36" ϕ

CREDITVIEW RD.
HWY. 403. STA. 1065+00

506.6 G.E.L.
11/15

