

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 30M5-183

DIST. 4 REGION

W.P. No. 199-77-01(A)

CONT. No. 93-89

W. O. No.

STR. SITE No.

HWY. No. 403/QEW

LOCATION Hwy 403/Q.E.W. Interchange
(Overhead Signs)

No of PAGES -

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OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

G.I.-30 SEPT. 1976

ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

WP 199-77-01 (A) DIST 4
HWY Q.E.W. & 403 STR SITE

Sign Support Structures
Q.E.W. and Hwy. 403 Interchange

CONT 93-89

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FOUNDATION INVESTIGATION REPORT

For

Sign Support Structures

Q.E.W. and Hwy. 403 Interchange

W.P. 199-77-01 (A)

District 4, Burlington

INTRODUCTION

The subsoil information contained in this report was obtained from various foundation investigations carried out for existing and proposed structures in this area under W.P. 194-58, W.P. 199-77-01, W.P. 83-74-07, W.P. 199-77-02 and W.P. 516-90-02. No additional borings were carried out in the area where the sign support structures are proposed to be constructed. Based on the existing information, this report provides recommendation pertaining to the design of the proposed sign support structures.

SITE DESCRIPTION

The six sites for the proposed sign support structures are located within the ultimate QEW/Hwy. 403 interchange between Brant Street and King Road in the City of Burlington, Regional Municipality of Halton.

As a part of the reconstruction of the QEW/Hwy. 403 interchange, it is proposed to construct the sign support structures at various locations for directing the traffic.

This site is located within the physiographic region known as the "South Slope". The area is characterized by a ground moraine of limited relief. The bedrock underlying the site is a red shale with siltstone of the Queenston Formation.

SUBSURFACE CONDITIONS

General

The underlying subsoil in the area proposed for sign support structures consists of very stiff to hard cohesive glacial till underlain by shale bedrock of the Queenston Formation, and in addition, isolated pockets of silty clay to clay and compacted fills in the area where there are approach embankments. The extent of the area involved covers more than a kilometre in length and it is not practical to give detail description for the individual strata. Reference should be made to the Record of Borehole sheets where details of the stratification at a particular boring location are given. However, for classification purposes, the soils encountered in the project area can be divided in to four different zones.

- a) Silty Clay (BH #7, Fill Material)
- b) Silty Clay to Clay
- c) Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till)
- d) Queenston Shale Bedrock

The subsurface conditions that may be expected at the proposed locations of the sign support structures, together with the field and laboratory test results are shown on the Record of Borehole sheets contained in the Appendix of this report. The results of the Atterberg Limit Test are shown on Figures 1 and 2. In addition, the Gradation Test results for cohesive glacial till deposit are shown on Figure 3 in an envelope form. The location of the boreholes are shown on the Dwg. No. 1997701(A)-1.

Groundwater Conditions

It appears that five of the boreholes were dry during the investigations. However, in the remaining boreholes, the groundwater level is as follows:

<u>Borehole No.</u>	<u>Elevation</u>
2	101.8
3	101.9
6	103.3
8	100.7
9	101.3

Since these boreholes were not advanced at the locations where the sign support structures are proposed, the groundwater conditions may vary from those given in the Record of Borehole sheets. However, for the purposes of design, the groundwater level may be assumed at elevation 101.5 m.

DISCUSSION AND RECOMMENDATIONS

General

It is proposed to construct sign support structures at six locations within the ultimate QEW/Hwy. 403 interchange between Brant Street and King Road. The location of the sign support structures as well as the pedestal base elevations are as follows:

Sign Support Structure	Station	Pedestal Base Elevation		Span (m)	Remarks
		Left	Right		
1	15+886 Hwy. 403 EBL	108.4	108.1	29	Refer to BH's 1&2
2	10+150 Ramp 403/W-QEW/S	109.8	107.8	24	Refer to BH's 3&4
3	10+420 Ramp 403/W-QEW/S	107.3	106.5	17	Refer to BH's 5&6
4	10+500 Ramp 403/W-QEW/E	110.3	110.7	15	Refer to BH's 7&8
5	11+030 Ramp 403/W-QEW/E	112.2	112.2	25	Refer to BH's 9&10
6	11+040 Ramp 403/E-QEW/S	N/A	N/A	-	-

The sign support structure No. 6 is proposed to be mounted on bridge No. 37 and as such no foundation information is provided.

Foundation Design

The design of the foundation for the sign support structures (Single Concrete Caisson) should be in accordance with the method as outlined in the following papers.

Broms, B. B. "Lateral Resistance of Piles in Cohesive Soil" Journal of the Soil Mechanics and Foundation Division. ASCE Vol. 90 No. SM2, paper 3285, March, 1964.

Broms, B. B. "Lateral Resistance of Piles in Cohesionless Soil" Journal of the Soil Mechanics and Foundation Division, ASCE Vol. 90 No. SM3, paper 3909, May 1964.

The design parameters are given in Table 1 appended to this report. The material located within the zone of frost penetration (1.2 m) should be neglected in the calculation of lateral resistance.

MISCELLANEOUS

This report was prepared by Mr. M. Vasavithasan, Foundation Engineer, reviewed by Mr. P. Payer, Senior Foundation Engineer, and approved by Mr. M. S. Devata, Chief Foundation Engineer.



M. Vasavithasan

M. Vasavithasan, P.Eng.
Foundation Engineer

M. S. Devata

M. S. Devata, P.Eng.
Chief Foundation Engineer

APPENDIX

Table 1

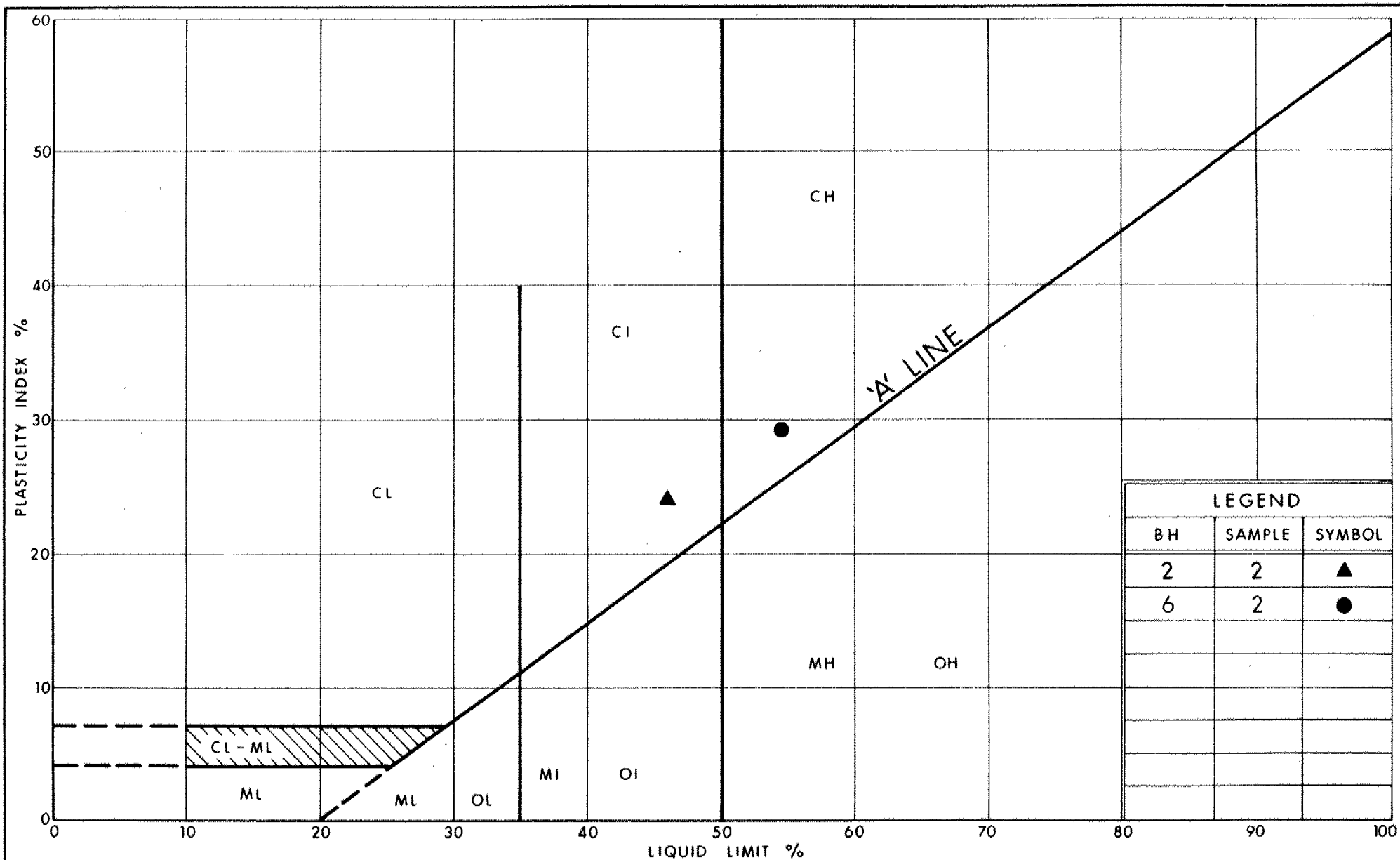
Sign Support Structure	Soil Boundary Elevation	Soil Type	Design Parameters	
			q_u (kPa)	(γ kN/m ³)
1	108.2-105.0	Cohesive	100	18.5
	105.0-101.0	Cohesive	500	20.5
	101.0-100.0	Rock	500	21.0
2	109.6-104.5	Cohesive	150	19.5
	104.5-100.0	Cohesive	500	20.5
3	107.1-102.5	Cohesive	100	18.5
	102.5-97.5	Cohesive	500	20.5
	97.5-95.0	Rock	750	21.0
4	110.5-102.0	Fill (Cohesive)	100	20.0
	102.0-96.5	Cohesive	500	20.5
	96.5-95.0	Rock	750	21.0
5	112.0-103.0	Fill (Cohesive)	100	20.0
	103.0-99.0	Rock	750	21.0

NOTE: q_u = Unconfined Compressive Strength (kPa)

γ = Bulk Unit Weight (kN/m³)

Rock = Highly Weathered to Unweathered Bedrock

The caissons for the sign support structure No.'s 4 & 5
should be extended at least 1.0 m into the natural subsoil.

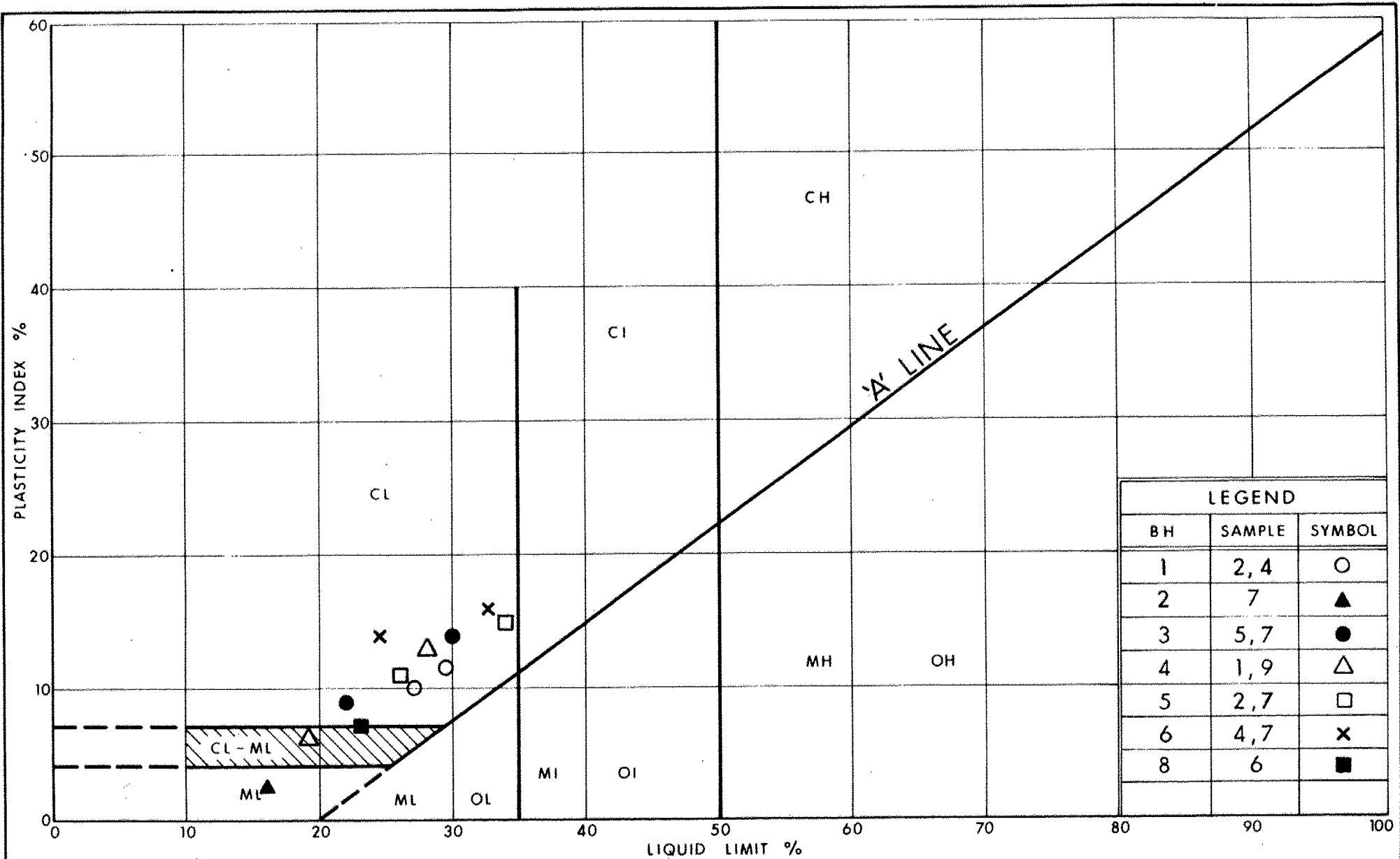


Ministry of
Transportation

PLASTICITY CHART SILTY CLAY TO CLAY

FIG No 1

W P 199-77-01 (A)



Ministry of
Transportation

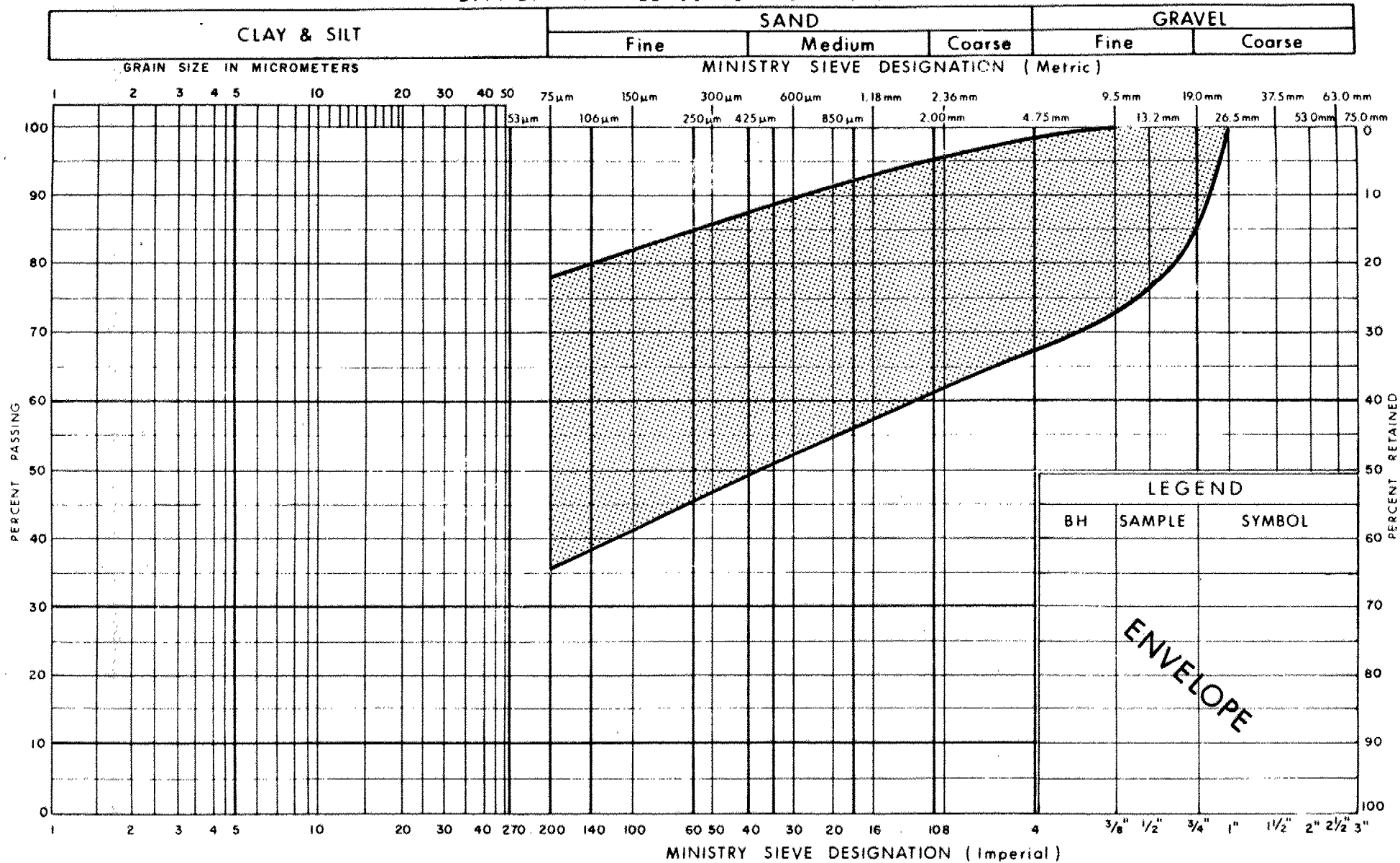
Ontario

PLASTICITY CHART
HET MIXTURE OF
CLAYEY SILT, SAND & GRAVEL (Glacial Till)

FIG No 2

W P 199-77-01 (A)

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of
Transportation

GRAIN SIZE DISTRIBUTION

HET MIXTURE OF CLAYEY SILT, SAND & GRAVEL (Glacial Till)

FIG No 3

W P 199-77-01(A)

EXPLANATION OF TERMS USED IN REPORT

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

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

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

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

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

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

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

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

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

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (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	50mm	50 - 300mm	0.3m - 1m	1m - 3m	> 3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

SS	SPLIT SPOON	TP	THINWALL PISTON
WS	WASH SAMPLE	OS	OSTERBERG SAMPLE
ST	SLOTTED TUBE SAMPLE	RC	ROCK CORE
BS	BLOCK SAMPLE	PH	TW ADVANCED HYDRAULICALLY
CS	CHUNK SAMPLE	PM	TW ADVANCED MANUALLY
TW	THINWALL OPEN	FS	FOIL SAMPLE

MECHANICAL PROPERTIES OF SOIL

u_w	kPa	PORE WATER PRESSURE	m_v	kPa^{-1}	COEFFICIENT OF VOLUME CHANGE
r_u	1	PORE PRESSURE RATIO	C_c	1	COMPRESSION INDEX
σ	kPa	TOTAL NORMAL STRESS	C_s	1	SWELLING INDEX
σ'	kPa	EFFECTIVE NORMAL STRESS	C_α	1	RATE OF SECONDARY CONSOLIDATION
τ	kPa	SHEAR STRESS	c_v	m^2/s	COEFFICIENT OF CONSOLIDATION
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES	H	m	DRAINAGE PATH
ϵ	%	LINEAR STRAIN	T_v	1	TIME FACTOR
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS	U	%	DEGREE OF CONSOLIDATION
E	kPa	MODULUS OF LINEAR DEFORMATION	σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
G	kPa	MODULUS OF SHEAR DEFORMATION	σ'_p	kPa	PRECONSOLIDATION PRESSURE
μ	1	COEFFICIENT OF FRICTION	τ_f	kPa	SHEAR STRENGTH
			c'	kPa	EFFECTIVE COHESION INTERCEPT
			ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
			c_u	kPa	APPARENT COHESION INTERCEPT
			ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
			τ_R	kPa	RESIDUAL SHEAR STRENGTH
			τ_r	kPa	REMOULDED SHEAR STRENGTH
			S_t	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

STRESS AND STRAIN

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m^3	DENSITY OF SOLID PARTICLES	e	1, %	VOID RATIO	e_{min}	1, %	VOID RATIO IN DENSEST STATE
γ_s	KN/m^3	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
ρ_w	kg/m^3	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
γ_w	KN/m^3	UNIT WEIGHT OF WATER	S_r	%	DEGREE OF SATURATION	D_n	mm	n PERCENT - DIAMETER
ρ	kg/m^3	DENSITY OF SOIL	w_L	%	LIQUID LIMIT	C_u	1	UNIFORMITY COEFFICIENT
γ	KN/m^3	UNIT WEIGHT OF SOIL	w_p	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
ρ_d	kg/m^3	DENSITY OF DRY SOIL	w_s	%	SHRINKAGE LIMIT	q	m^3/s	RATE OF DISCHARGE
γ_d	KN/m^3	UNIT WEIGHT OF DRY SOIL	I_p	%	PLASTICITY INDEX = $w_L - w_p$	v	m/s	DISCHARGE VELOCITY
ρ_{sat}	kg/m^3	DENSITY OF SATURATED SOIL	I_L	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	i	1	HYDRAULIC GRADIENT
γ_{sat}	KN/m^3	UNIT WEIGHT OF SATURATED SOIL	I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	k	m/s	HYDRAULIC CONDUCTIVITY
ρ'	kg/m^3	DENSITY OF SUBMERGED SOIL	e_{max}	1, %	VOID RATIO IN LOOSEST STATE	j	KN/m^2	SEEPAGE FORCE
γ'	KN/m^3	UNIT WEIGHT OF SUBMERGED SOIL						

RECORD OF BOREHOLE No 1

1 OF 1 METRIC

W.P. 199 - 77 - 01(A) LOCATION CO - ORDS. N 4 798 594.5; E 277 027.0 ORIGINATED BY B K
 DIST 4 HWY 403 BOREHOLE TYPE WASH BORING & AXI ROCK CORING COMPILED BY
 DATUM GEODETIC DATE 59 07 08 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					
110.8	Ground Surface																
0.0						*											
			1	SS	54		110							o		20.4	
			2	SS	75		109							o			
			3	SS	76		108							o			
			4	SS	70		107										
			5	SS	111		106										
			6	SS	112		105							o			
			7	RC	REC		104										
101.7							103										
9.1	QUEENSTON SHALE BEDROCK, Weathered						102							o			
100.1							101										
10.7	End of Borehole																
	* Note: Groundwater Level Not Established																
	Note: Formerly BH# 1 of W.P. - 194 - 58																

RECORD OF BOREHOLE No 2

1 OF 1

METRIC

W.P. 199 - 77 - 01(A) LOCATION CO - ORDS. N 4 798 819.8; E 277 177.7 ORIGINATED BY M. V&M P
DIST 4 HWY QEW/403 BOREHOLE TYPE CONTINUOUS FLIGHT HOLLOW STEEL AUGER & CONE TEST COMPILED BY M. V
DATUM GEODETIC DATE 91 01 28 & 91 01 29 CHECKED BY P. P

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	20 40 60 80 100					
108.4	Ground Surface													
0.0	SILTY CLAY, Trace of Sand, Trace of Gravel, Firm to Stiff		1	SS	7									
			2	SS	12									
106.2			3	SS	18									
2.2	Heterogeneous Mixture of CLAYEY SILT, SAND and GRAVEL, Very Stiff to Hard (Glacial Till)		4	SS	45									
			5	SS	137									
			6	SS	100	/1cm								
			7	SS	105	/15cm								
			8	SS	120	/8cm								
101.2			9	SS	120	/15cm								
7.2			10	SS	120	/15cm								
100.5	QUEENSTON SHALE BEDROCK, Highly Weathered													
7.9	End of Borehole													
	Note: Formerly BH# 6 of W.P. - 199 - 77 - 01													

RECORD OF BOREHOLE No 3

1 OF 1

METRIC

W.P. 199 - 77 - 01(A) LOCATION CO - ORDS, N 4 799 095.4; E 277 396.4 ORIGINATED BY M P
DIST 4 HWY QEW/403 BOREHOLE TYPE CONTINUOUS FLIGHT HOLLOW STEM AUGER & CONE TEST COMPILED BY M V
DATUM GEODETIC DATE 91 01 30 CHECKED BY P P

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 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20 40 60 80 100						20 40 60 80 100
108.3	Ground Surface													
0.0	Heterogeneous Mixture of CLAYEY SILT, SAND and GRAVEL. Very Stiff to Hard (Glacial Till)		1	SS	21									
			2	SS	19									
			3	SS	16									
			4	SS	30									
			5	SS	87									
			6	SS	90									
			7	SS	120	/11cm								
			8	SS	120	3cm								
			9	SS	120	/1cm								
100.7	End of Borehole													
7.6	Note: Formerly BH# 4 of W.P - 199 -77 - 01													

RECORD OF BOREHOLE No 4

1 OF 1

METRIC

W.P. 199 - 77 - 01(A) LOCATION CO - ORDS. N 4 799 192.5; E 277 497.2 ORIGINATED BY M V&M P
DIST 4 HWY QEW/403 BOREHOLE TYPE CONTINUOUS FLIGHT HOLLOW STEM AUGER & CONE TEST COMPILED BY M V
DATUM GEODETIC DATE 91 01 29 CHECKED BY P P

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 7 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100	20 40 60 80 100					
109.1	Hwy. 403 Shoulder												
0.0													
	Very Stiff to Stiff		1	SS	21								3 35 (62)
			2	SS	14								
			3	SS	10								
			4	SS	15								
			5	SS	23								
	Heterogeneous Mixture of CLAYEY SILT, SAND and GRAVEL, Very Stiff to Hard (Glacial Till)		6	SS	77								
			7	SS	86								
			8	SS	57								
			9	SS	120	/15cm							20 34 (46)
100.3													
8.8	End of Borehole												
	Note: Formerly BH# 3 of W.P. - 199 - 77 - 01												

RECORD OF BOREHOLE No 5

1 OF 1

METRIC

W.P. 199 - 77 - 01(A) LOCATION CO - ORDS. N 4 799 279.4; E 277 605.7 ORIGINATED BY M.P.
 DIST 4 HWY QEW/403 BOREHOLE TYPE CONTINUOUS FLIGHT HOLLOW STEM AUGER & CONE TEST COMPILED BY M.V.
 DATUM GEODETIC DATE 91 01 29 CHECKED BY P.P.

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	20 40 60 80 100					
109.1	403 E/QEW Ramp Shoulder													
0.0						DRY *								
	Heterogeneous Mixture of CLAYEY SILT, SAND and GRAVEL, Very Stiff to Stiff (Glacial Till)		1	SS	21									
			2	SS	29									
			3	SS	23									
			4	SS	15									
			5	SS	8									
	Very Stiff to Hard		6	SS	26									
			7	SS	51									
			8	SS	122	/27cm								
			9	SS	120	/8cm								
101.9														
7.2	End of Borehole													
	Note: Formerly BH# 2 of W.P. - 199 - 77 - 01													

RECORD OF BOREHOLE No 6

1 OF 1

METRIC

W.P. 199 - 77 - 01(A) LOCATION CO - QRS. N 4 799 228.0; E 277 831.0 ORIGINATED BY R T
DIST 4 HWY QEW/403 BOREHOLE TYPE SOLID STEM AUGER & BXL ROCK CORING COMPILED BY
DATUM GEODETIC DATE 85 02 06 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 7 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100							WATER CONTENT (%) 10 20 30			
								SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100										
104.6	Ground Surface																	
0.0	SILTY CLAY to CLAY, Some Sand, Some Gravel, Very Stiff						104							3 19 48 30				
102.6			2	SS	16		103											
2.0			3	SS	44		102											
			4	SS	64		101											
			5	SS	81		100											
			6	SS	74		99											
			7	SS	67		98											
			8	SS	100		97											
			9	SS	100		96											
97.5	Weathered QUEENSTON SHALE BEDROCK, Unweathered												RQD 41%					
7.1			10	RC BX	REC 95%													
95.2	End of Borehole Note: Formerly BH# 13 of W.P- 83 - 74 - 07																	
9.4																		

RECORD OF BOREHOLE No 7

1 OF 1

METRIC

W.P. 199 - 77 - 01(A) LOCATION CO - QRS. N 4 799 370.5; E 277 934.7 ORIGINATED BY GOLDER
DIST 4 HWY QEW/403 BOREHOLE TYPE SOLID STEM AUGER COMPILED BY
DATUM GEODETIC DATE 90 08 24 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 (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa						
103.4	Ground Surface							20 40 60 80 100						
0.0	SILTY CLAY, Trace of Sand, Occasional Gravel, Trace of Organics, Stiff (Fill)					DRY *	103							
102.3			1	SS	12									
1.1			2	SS	73		102							
			3	SS	37		101							
			4	SS	50	/8cm	100							
99.0			5	SS	50	/5cm	99							
98.7	QUEENSTON SHALE BEDROCK		6	SS	60	/10cm								
4.7	End of Borehole													
	Note: Formerly BH# 22 of W.P - 199 - 77 - 02													

RECORD OF BOREHOLE No 8

1 OF 1

METRIC

W.P. 199 - 77 - 01(A) LOCATION CO - ORDS. N 4 799 341.0; E 278 002.0 ORIGINATED BY R.T.
DIST 4 HWY GEW/403 BOREHOLE TYPE SOLID STEM AUGER & EXL ROCK CORING COMPILED BY
DATUM GEODETTIC DATE 85 02 08 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					
102.2	Ground Surface																
0.0																	
	Heterogeneous Mixture of CLAYEY SILT, SAND and GRAVEL, Very Stiff to Hard (Glacial Till)		1	SS	24												14 22 46 18
			2	SS	51												17 28 45 10
			3	SS	69												
			4	SS	100	/15cm											
	Silty Sand		5	SS	100	/23cm											
			6	SS	100	/8cm											
			7	SS	100	/10cm											
96.6	Silty Sand																
5.6	Weathered																
	QUEENSTON SHALE BEDROCK, Unweathered		8	RC	REC												RQD 88%
94.9				BX	98%												
7.3	End of Borehole																
	Note: Formerly BH# 8 of W.P. - 83 - 74 - 07																

RECORD OF BOREHOLE No 9

1 OF 1

METRIC

W.P. 199 - 77 - 01(A) LOCATION CO - ORDS. N 4 799 687.0; E 278 325.5 ORIGINATED BY GOLDER
DIST 4 HWY GEW/403 BOREHOLE TYPE HOLLOW STEM AUGER & NQ ROCK CORING COMPILED BY
DATUM GEODETIC DATE 90 08 15 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT 7 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100	W _P	W	W _L		
103.7	Ground Surface																
0.0	Topsoil																
0.3	Completely to Highly Weathered		1	SS	96												
	Moderately to Slightly Weathered		2	RC NQ	REC 92%												
	QUEENSTON SHALE BEDROCK		3	RC NQ	REC 97%												
99.0	End of Borehole																
4.7	Note: Formerly BH# 5 of W.P. - 516 - 90 - 02																
	90 09 14 * GROUND WATER CONDITIONS																
	PIEZO. NO. 1																
	GROUND WATER ELEVATION (Metres) 101.27																

RECORD OF BOREHOLE No 10

1 OF 1

METRIC

W.P. 199 - 77 - 01(A) LOCATION CO - ORDS. N 4 799 668.5; E 278 331.5 ORIGINATED BY GOLDER
 DIST 4 HWY QEW/403 BOREHOLE TYPE CONTINUOUS FLIGHT HOLLOW STEM AUGER COMPILED BY
 DATUM GEODETIC DATE 90 08 14 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			20	40	60	80	100					
103.4	Ground Surface															
0.0	Topsoil				DRY	103										
0.5	Completely to Highly Weathered		1	SS	64											
	Moderately to Slightly Weathered		2	SS	70	102										
	QUEENSTON SHALE BEDROCK		3	SS	60	101										
100.3			4	SS	50	100										
3.1	End of Borehole															
Note: Formerly BH# 4 of W.P. - 516 - 90 - 02																

METRIC

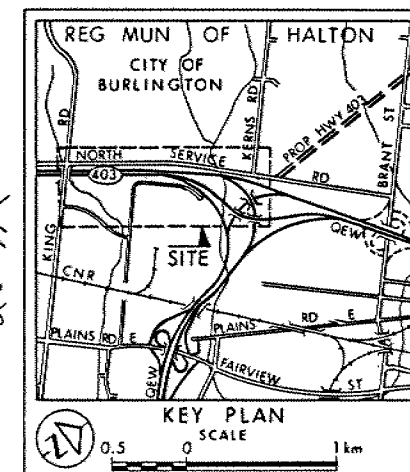
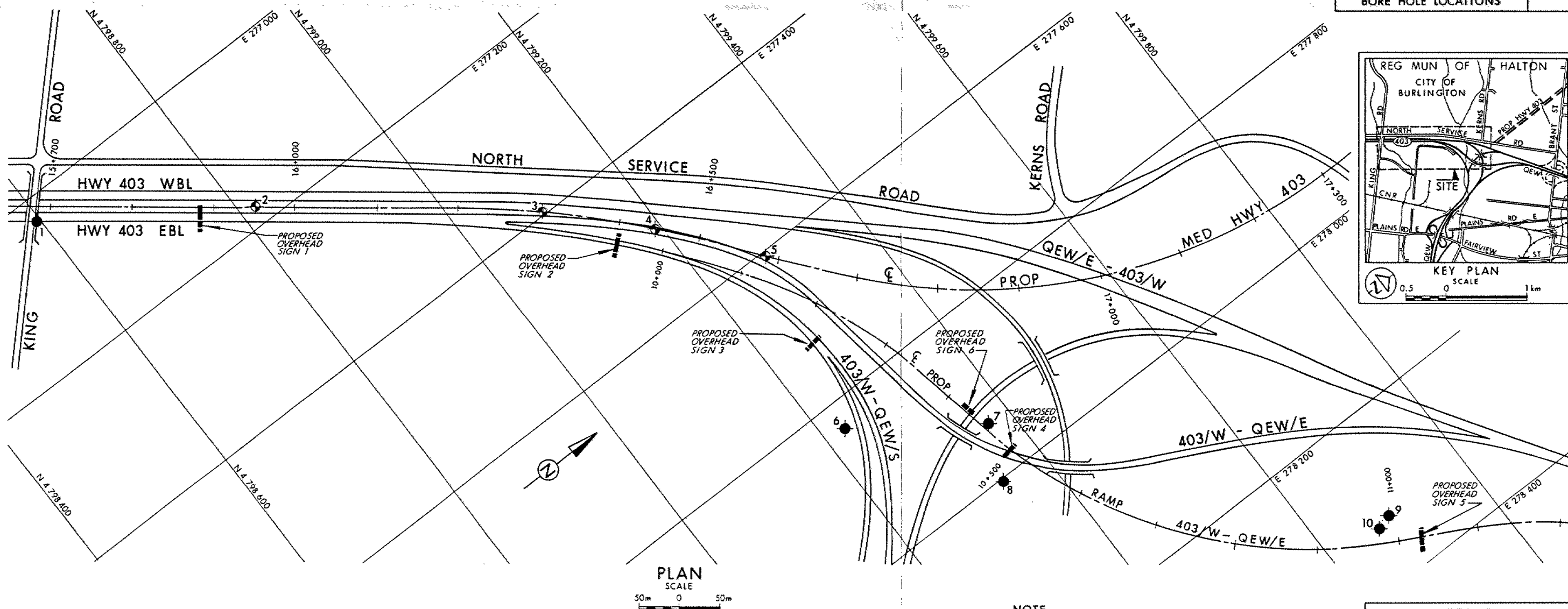
DIMENSIONS ARE IN METRES
AND / OR MILLIMETRES UNLESS
OTHERWISE SHOWN. STATIONS
IN KILOMETRES + METRES.

CONT No
WP No 199-77-01(A)

SIGN SUPPORT STRUCTURES
Q.E.W. & HWY 403 INTERCHANGE
BORE HOLE LOCATIONS



SHEET



NOTE
For Subsoil information refer
to Record of Borehole Sheets.

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	110.8	4 798 594.5	277 027.0
2	108.4	4 798 819.8	277 177.7
3	108.3	4 799 095.4	277 396.4
4	109.1	4 799 192.5	277 497.2
5	109.1	4 799 279.4	277 605.7
6	104.6	4 799 228.0	277 831.0
7	103.4	4 799 370.5	277 934.7
8	102.2	4 799 341.0	278 002.0
9	103.7	4 799 687.0	278 325.5
10	103.4	4 799 668.5	278 331.5

LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊗ Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- W.L. at time of investigation 1959 07, 1985 02, 1990 08 & 1991 01.

NOTE

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

NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section 102-2 of Form 100.

DATE	BY	DESCRIPTION
1991 07 09	DATE	1991 07 09
1991 07 09	CHECKED	1991 07 09
1991 07 09	APPROVED	1991 07 09

REF McCormick Rankin Consulting Engineers

Geocres No 30 M5 - 183
HWY No 403 / QEW
SUBM'D BY [] CHECKED [] DATE 1991 07 09 SITE
DRAWN RS [] CHECKED [] APPROVED [] DWG 1997701(A)-A