G.I.-30 SEPT. 1976

GEOCRES No. 30M12-191

DIST. 4 REGION

W.P. No. 197-77-07

CONT. No.

W. O. No.

STR. SITE No.

HWY. No. 403 / 407

LOCATION HIGH MAST LIGHTING
Hwy 403/407 INTERCHANGE
COMPLEX

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

Ontario

Ministry of
Transportation and
Communications

foundation investigation and design report

This Report contains the originals of the typewritten text, figures, and Borelog sheets.

Please Return to:
Soil Mechanics Section
Room 315, Central Building
Downsview

Attention: Mr. S. Osellame

ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

WP 197-77-07 DIST 4

HWY 403/407 STR SITE NA

High Mast Lighting
Hwy. 403/407 Interchange Complex

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FOUNDATION INVESTIGATION REPORT

For

High Mast Lighting

Hwy. 403/407 Interchange Complex

W.P. 197-77-07, Site NA

District 4, Burlington

INTRODUCTION

This report summarizes the factual information obtained from a foundation investigation performed at the aforementioned site between 84 12 04 and 84 12 07. Some borings which were carried out for other projects in the same area are also incorporated into this report. A total of seven sampled boreholes were carried out during the course of the fieldwork for depths ranging between 10.7 m and 12.6 m. The borings were advanced by a continuous flight auger machine mounted on a muskeg vehicle and equipped with either 83 mm I.D. hollow stem augers or solid augers.

SITE DESCRIPTION

The high mast light poles will be located throughout the future Hwy. 407 and existing Hwy. 403 interchange complex which is located near the boundary between the City of Mississauga and the City of Oakville.

The surrounding terrain, with the exception of the existing road network is relatively flat to gently rolling.

Physiographically the site is located in the Region referred to as the Peel Plain.

SUBSURFACE CONDITIONS

General

The subsoil in the future Hwy. 407/Hwy. 403 interchange complex was found to consist of cohesive and non-cohesive glacial deposits overlying shale bedrock. The boundaries of the various strata, together with the field and laboratory test results obtained are shown on the Record of Borehole Sheets located in the Appendix.

The pole locations, along with the applicable boreholes for each pole, are given in the following table and are illustrated on the key map in the Appendix.

Pole No.	Type	Location		Proposed Ground Elevation (m)	Applicable Borehole Number
		Easting	Northing		
1	C	286 497	4820 450	180.6	4
2	B	286 510	4820 570	176.7	5A
3	C	286 497	4820 701	180.5	22
4	C	286 504	4820 830	180.5	24
5	C	286 634	4820 460	180.2	5
6	C	286 625	4820 596	181.1	14
7	C	286 630	4820 727	177.7	13
8	C	286 631	4820 857	180.3	1
9	C	286 758	4820 608	180.7	14
10	C	286 730	4820 852	179.5	16
11	C	286 751	4821 008	179.8	16
12	C	286 821	4821 121	181.2	17
13	C	286 964	4821 193	179.4	18
14	C	286 975	4821 384	177.2	19
15	C	287 153	4821 472	181.2	20
16	C	287 192	4821 660	177.3	21
17	B	286 362	4820 387	182.8	5B
18	B	286 362	4820 387	182.1	119
19	B	286 258	4820 257	182.6	119
20	B	286 172	4820 120	180.4	121
21	B	286 002	4820 091	179.8	121
22	B	285 959	4819 009	179.9	123
23	B	285 775	4819 834	183.3	123
24	C	286 860	4820 734	179.0	15
25	C	286 714	4820 395	180.4	5
26	B	286 821	4820 464	182.0	2
27	B	286 940	4820 531	180.7	127
28	B	286 920	4820 328	179.8	129
29	B	287 092	4820 376	180.6	129
30	B	287 176	4820 212	180.1	130
31	B	287 365	4820 172	180.6	25
32	B	287 501	4820 094	181.7	25
33	B	287 645	4820 000	182.7	133

A description of the various strata encountered is given below.

Heterogeneous Mixture of Silty Clay, Sand & Gravel (Glacial Till)

Immediately below a thin layer of topsoil, a till-like stratum was encountered in every borehole. The thickness ranges from 2.2 m at borehole 123 to 14.6 m at borehole 4. This material was found to be basically cohesive in nature with localized pockets of less cohesive material. Standard Penetration Tests carried out within this deposit yielded 'N' values ranging from 8 to over 100 blows per 0.30 m. Based on these values the deposit is classified as firm to hard but was generally found to be very stiff to hard.

Physical properties of selected samples of the material as determined from laboratory tests, are summarized on the Plasticity Chart Figure 1, located in the Appendix of this report.

The results of grain size distribution tests are shown in envelope form on Figure 2 in the Appendix.

Occasional cobbles and boulders were encountered within the deposit during the augering operation. In all cases, it was possible to progress beyond the boulders using conventional augers.

Sandy Silt to Silty Sand, Trace to Some Gravel and Clay

This stratum was encountered in all borings that were advanced through the cohesive till deposit described above. For thickness, reference should be made to the Record of Borehole Log Sheets in the Appendix. The deposit is generally non-cohesive in nature with an occasional cohesive layer of silt or silty clay at depth. Standard Penetration Test 'N' values ranged from 13 to over 100 per 0.3 m. Based on these values the deposit is classified as compact to very dense but generally dense to very dense. The moisture content varied from 6 to 15% with an average of 11.

The results of grain size distribution tests performed on selected samples are plotted in envelope form on Figure 3 of the Appendix.

Occasional cobbles and boulders were encountered randomly distributed throughout this deposit. However, further progress below the boulders was possible using conventional augers.

Silty Clay

This deposit was encountered at boreholes 2, 14, 17, 18, 19, 20, and 22. Generally, it was found overlying weathered shale bedrock except at borehole 22 were it was located within the sandy silt to silty sandy deposit described above.

The material consists of cohesive silty clay, some sand. In cases where it was found overlying weathered shale bedrock, broken rock fragments were contained within the deposit. Based on Standard Penetration 'N' values of greater than 100 blows per 0.30 m, the consistency of the deposit is hard.

Weathered Shale Bedrock

This zone was encountered at the following borehole locations: 2, 4, 5, 5A & B, 7, 13, 14, 17, 18, 19, 20, 22, 24 and 123. For the boundaries between this stratum and the previously described Sandy Silt to Silty Sand or Silty Clay, reference should be made to the Record of Borehole sheets contained in the Appendix.

The main component of this material is a reddish silty clay to clay. Most of the deposit is highly weathered and was penetrated by conventional drilling using augers.

Groundwater Conditions

Groundwater level observations were carried out in the open boreholes during the course of the various investigations. The groundwater levels obtained are shown on the Record of Borehole Sheets in the Appendix. In most of the borings, the groundwater was found to be at or close to the ground surface. In cases where no actual measurements were performed, the estimated groundwater level is shown on the Borehole Sheets.

DISCUSSION AND RECOMMENDATIONS

As part of the construction of the new Hwy 403/407 interchange, it has been proposed to provide illumination utilizing a total of 33 high mast light pole installations. The height of the poles will be either 30 m (Type 'B') or 35 m (Type 'C').

Conventional spread footings for these light poles would likely be quite expensive. However, high mast light poles have ben installed economically in many areas of North America and Europe using a design method proposed by B.B. Broms and others in which the poles are supported on a concrete caisson pile. The Structural Office has decided to adopt this same method described by Broms in two separate papers; Broms, B.B. "Lateral Resistance of Piles in Cohesive Soils", Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 90, No. SM2, Paper 3825, March 1964.; and "Lateral Resistance of Piles in Cohesionless Soils", Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 90 No. SM3, Paper 3909, May, 1964.

In the following paragraphs, the feasibility of constructing concrete caissons at the site is discussed and the various parameters to be used in the caisson design are provided.

At all locations, except poles No. 3 and 26, the poles are to be installed in the original ground in areas where no significant amount of fill will be placed. Approximately 3.8 m and 2.1 m of fill material is to be placed at poles No. 3 and No. 26 respectively.

Generally the subsoil conditions are fairly uniform across the site with a cohesive silty clay till overlying a non-cohesive sandy silt to silty sand. Depending on the length of the caissons, some may be located wholly within the cohesive till, with the remainder partly in cohesive till and partly in non-cohesive sandy silt. In the latter case, a boiling condition may be created, and therefore the caissons should be restricted to the cohesive till wherever possible.

In all cases, the material located within the zone of frost penetration, (1.2 m) should be neglected in the calculation of lateral resistance. Likewise, the contribution from fill material should also be ignored. For the cohesive

soils located at this site, the coefficient of horizontal subgrade reaction should be computed in accordance with the following formula: (The design parameters are presented in Imperial Units, since the design example provided by the Structural Office used Imperial Units throughout).

$$K_h = \frac{n_1 \; n_2 \; 80 \; q_u}{D}$$

Where:

K_h - coefficient of horizontal subgrade reaction (lb/in^3)

D - Diameter of concrete caisson pile (in)

n_1 - coefficient as defined below:

Unconfined Compressive Strength qu (psi)	n_1
Less than 7	0.32
7 to 28	0.36
Greater than 28	0.40

n_2 - coefficient based on pile material = 1.15 for concrete

q_u - unconfined compressive strength (psi)

For the non-cohesive soils, K_h should be computed from the following formula:

$$K_h = n_h \frac{z}{D}$$

K_h - coefficient of horizontal subgrade reaction ($tons/ft^3$)

z - depth below ground surface (ft.)

D - diameter of caisson (ft)

n_h - Coefficient evaluated as follows:

Coefficient n_h in $tons/ft^3$

Relative Density	Loose	Compact	Dense
Above Groundwater table	7	21	56
Below Groundwater table	4	14	34

The following soil parameters are recommended:

For Pole Numbers: 1, 2, 3, 5, 6, 7, 8, 16, 17, 18, 19, 20, 21, 22

Cohesive Soils;

Unconfined Compressive Strength, q_u	(psi)	40
Unit Weight,	(lb/ft^3)	135

Non-Cohesive Soils;

Angle of Internal Friction		27° (Loose)
Unit Weight	(lb/ft^3)	125

For Pole Numbers: 4, 9, 10, 13, 14, 25, 26, 28, 29

Cohesive Soils;

Unconfined Compressive Strength, q_u	(psi)	50
Unit Weight	(lb/ft^3)	140

Non-Cohesive Soils;

Angle of Internal Friction		27° (Loose)
Unit Weight	(lb/ft^3)	125

For Pole Numbers: 11, 12, 15, 23, 24, 27, 30, 31, 32, 33

Cohesive Soils;

Unconfined Compressive Strength, q_u	(psi)	80
Unit Weight	(lb/ft^3)	145

Non-Cohesive Soils

Angle of Internal Friction		27° (Loose)
Unit Weight	(lb/ft^3)	125

References should be made to the applicable borehole logs for groundwater elevations (see chart on pp's 2-3 for cross-reference between boreholes and light poles).

CAISSON CONSTRUCTION

Conventional augering equipment can be utilized for the installation of concrete caissons at this site. Holes augered within the surficial cohesive silty clay till should stand up without support for several hours, however, concrete should be placed as soon as possible after augering to prevent

softening of the soil. Seepage into holes of this type is not anticipated to be a major problem and water entering the hole should be pumped out prior to placing concrete.

As noted previously, whenever possible the caissons should be limited entirely to the upper cohesive till layer. In cases where this may not be possible and the caissons extend into the underlying non-cohesive soil, then a temporary liner will be required during caisson installation below the contact zone between the cohesive and non-cohesive soils.

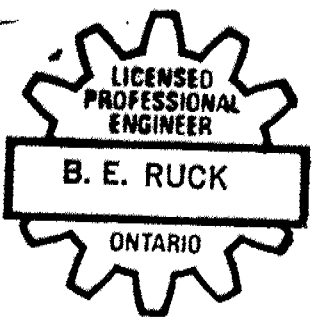
We recommended that water entering augered holes of this type not be pumped out because a boiling condition may be created due to an unbalanced hydrostatic head. Instead, concrete should be placed using a tremie design. Once the concrete has been placed to a level above the contact between the cohesive and non-cohesive soils, then any water can be pumped out and the remaining concrete placed "in the dry". Alternatively, the tremie placement could be continued to cut-off elevation.

MISCELLANEOUS

The fieldwork for this investigation was carried out under the supervision of Mr. J. Clunas, Student Specialist Engineer using equipment owned and operated by Atcost Soil Investigation Ltd., Concord. This report was written by Mr. B. Ruck, Project Foundations Engineer and reviewed by Mr. K. Selby, Chief Foundations Engineer, West.

Brian Ruck

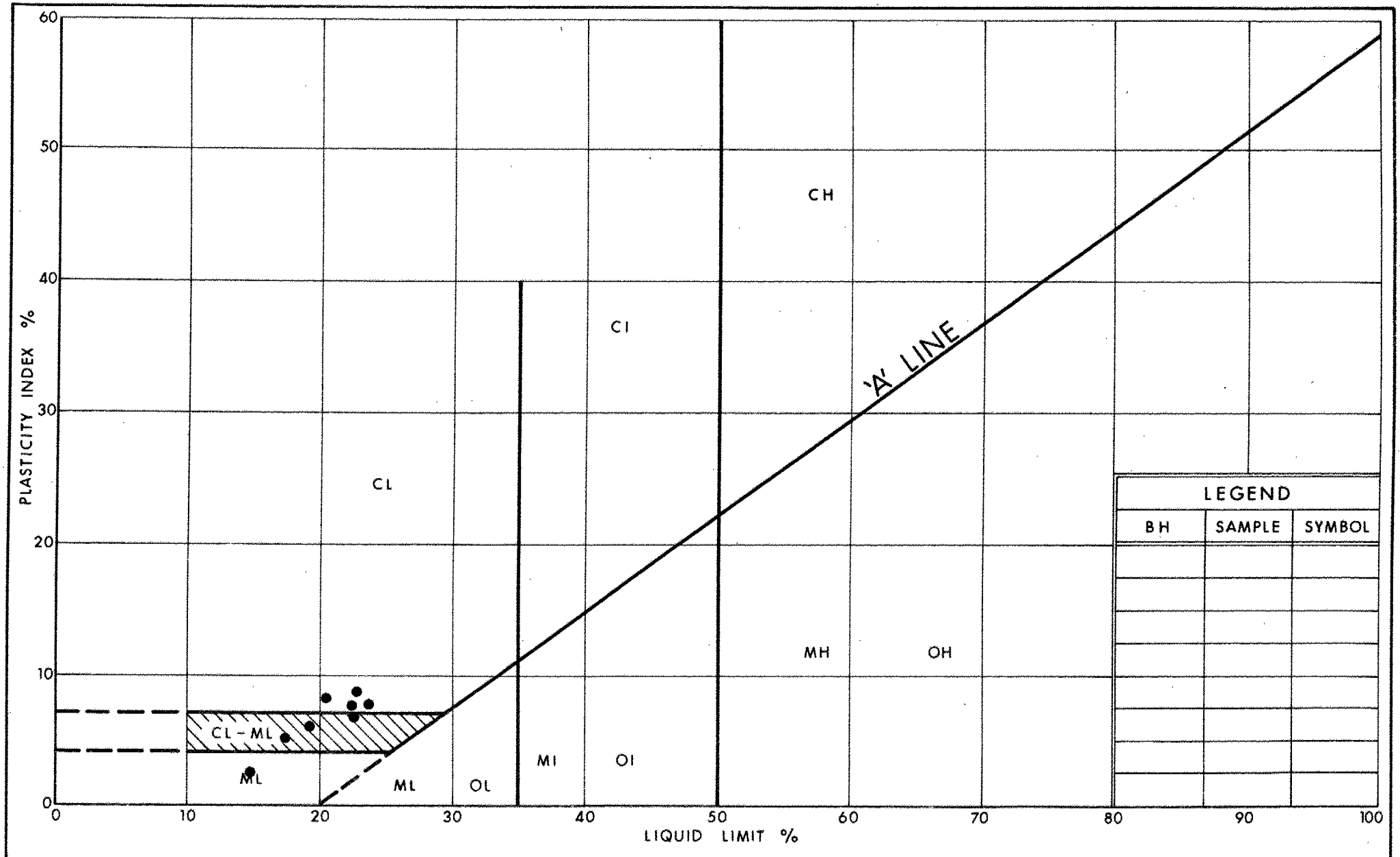
B. E. Ruck, P. Eng.
Project Foundations Engineer



K. G. Selby

K. G. Selby P. Eng.
Chief Foundations Engineer
(West)

APPENDIX



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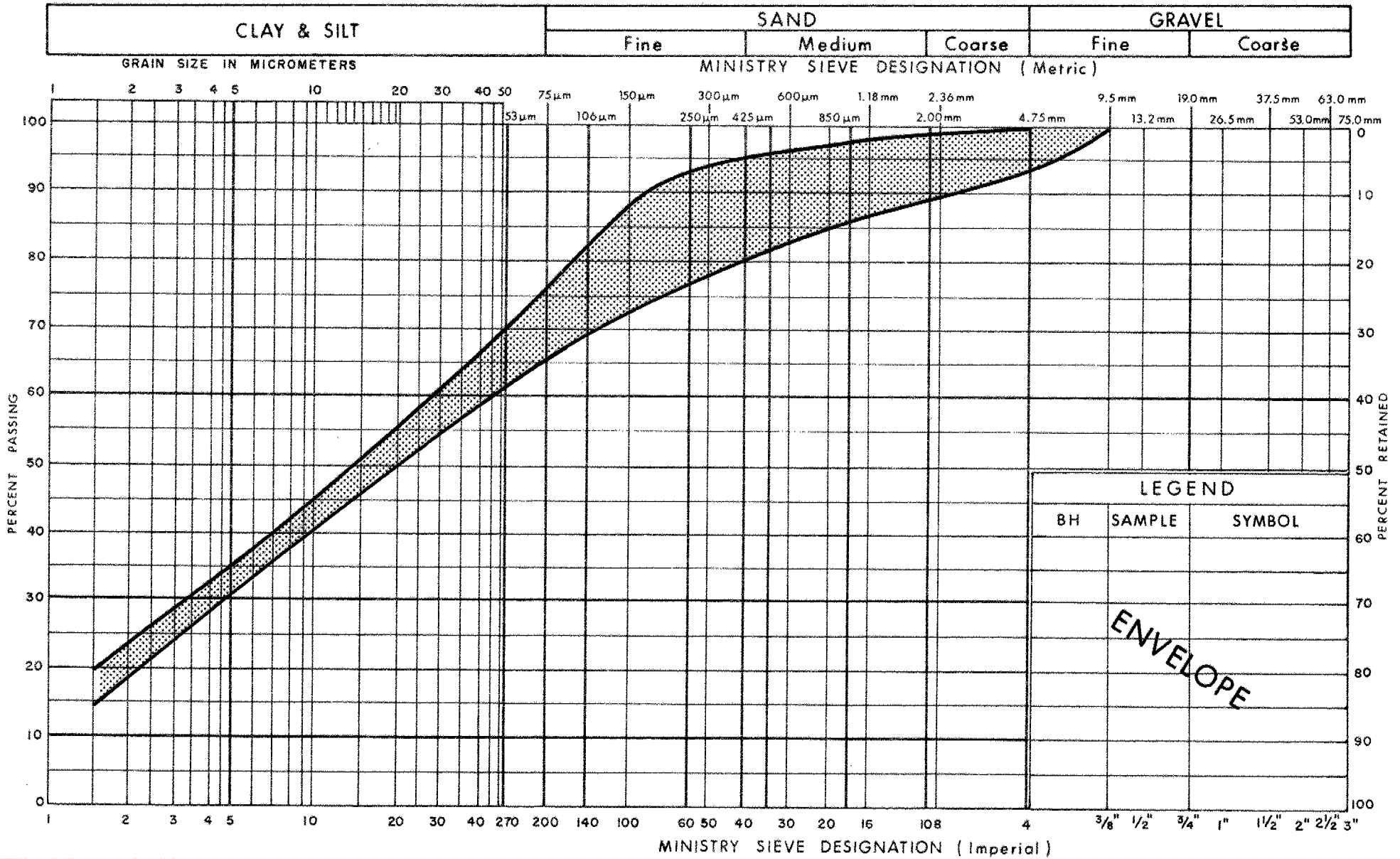
PLASTICITY CHART
HET. MIXTURE OF
SILTY CLAY, SAND & GRAVEL (Glacial Till)

FIG No 1
W P 197-77-07

UNIFIED SOIL CLASSIFICATION SYSTEM



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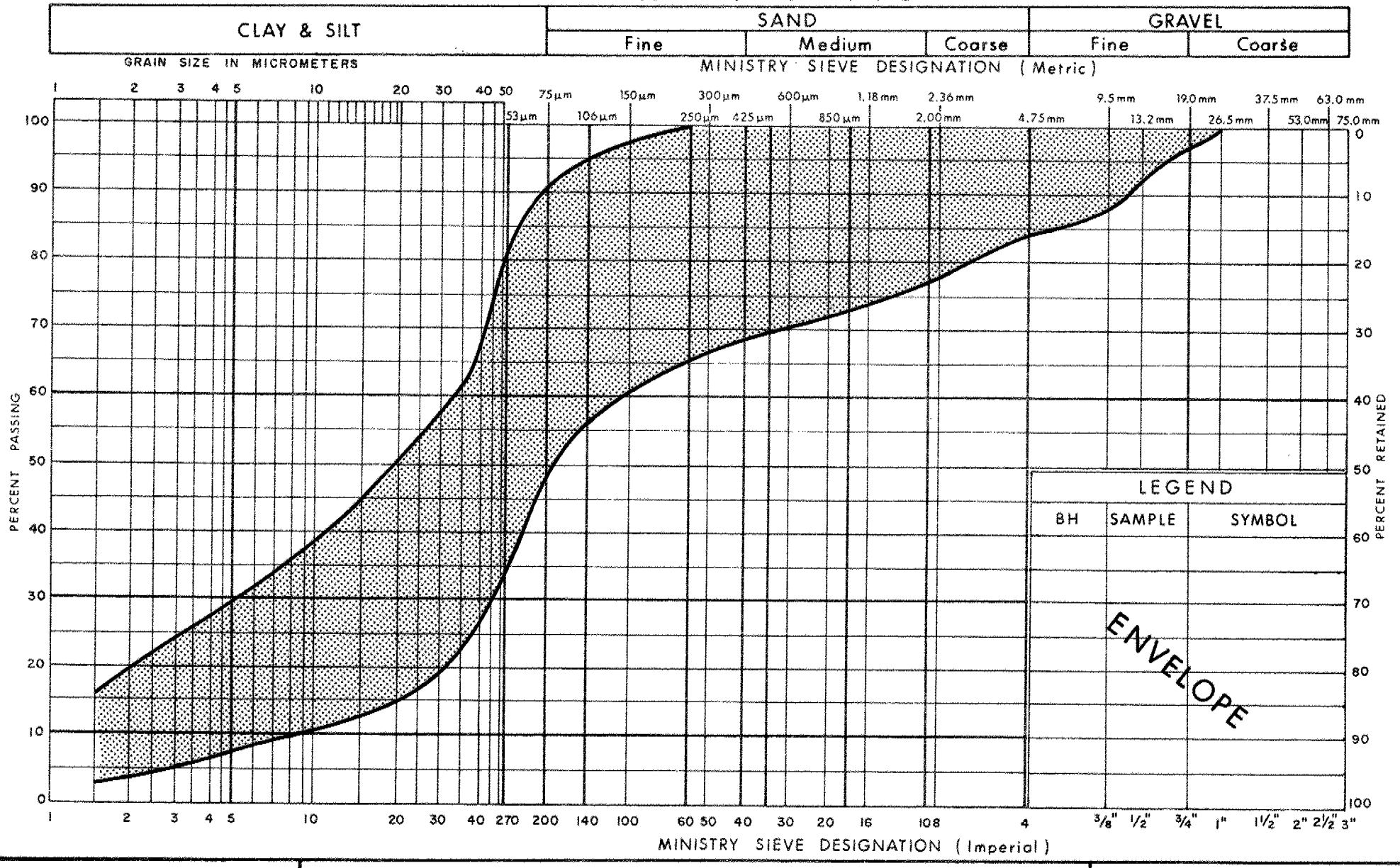
GRAIN SIZE DISTRIBUTION
HET MIXTURE OF
SILTY CLAY, SAND & GRAVEL (Glacial Till)

FIG No 2
W P 197-77-07

UNIFIED SOIL CLASSIFICATION SYSTEM



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GRAIN SIZE DISTRIBUTION

SILTY SAND, SOME GRAVEL TRACE OF CLAY

FIG No 3

W P 197-77-07

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

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

STRESS AND STRAIN

u_w	kPa	PORE WATER PRESSURE
r_u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

MECHANICAL PROPERTIES OF SOIL

m_v	kPa^{-1}	COEFFICIENT OF VOLUME CHANGE
C_c	1	COMPRESSION INDEX
C_s	1	SWELLING INDEX
C_α	1	RATE OF SECONDARY CONSOLIDATION
c_v	m^2/s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_t	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m^3	DENSITY OF SOLID PARTICLES
γ_s	kN/m^3	UNIT WEIGHT OF SOLID PARTICLES
ρ_w	kg/m^3	DENSITY OF WATER
γ_w	kN/m^3	UNIT WEIGHT OF WATER
ρ	kg/m^3	DENSITY OF SOIL
γ	kN/m^3	UNIT WEIGHT OF SOIL
ρ_d	kg/m^3	DENSITY OF DRY SOIL
γ_d	kN/m^3	UNIT WEIGHT OF DRY SOIL
ρ_{sat}	kg/m^3	DENSITY OF SATURATED SOIL
γ_{sat}	kN/m^3	UNIT WEIGHT OF SATURATED SOIL
ρ'	kg/m^3	DENSITY OF SUBMERGED SOIL
γ'	kN/m^3	UNIT WEIGHT OF SUBMERGED SOIL

e	1,%	VOID RATIO
n	1,%	POROSITY
w	1,%	WATER CONTENT
S_r	%	DEGREE OF SATURATION
w_L	%	LIQUID LIMIT
w_p	%	PLASTIC LIMIT
w_S	%	SHRINKAGE LIMIT
I_p	%	PLASTICITY INDEX = $w_L - w_p$
I_L	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
e_{max}	1,%	VOID RATIO IN LOOSEST STATE

e_{min}	1,%	VOID RATIO IN DENSEST STATE
I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
D	mm	GRAIN DIAMETER
D_n	mm	n PERCENT - DIAMETER
C_U	1	UNIFORMITY COEFFICIENT
h	m	HYDRAULIC HEAD OR POTENTIAL
q	m^3/s	RATE OF DISCHARGE
v	m/s	DISCHARGE VELOCITY
i	1	HYDRAULIC GRADIENT
k	m/s	HYDRAULIC CONDUCTIVITY
j	kN/m^3	SEEPAGE FORCE

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APPLICABLE TO POLE : 8

RECORD OF BOREHOLE No 1

FORMERLY BH 2 WP 197-77-03

METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 805.5; E 286 649.5 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY PP

DATUM Geodetic DATE 82 10 29 CHECKED BY

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 W_L — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
181.3	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay (CL)					▽	180				
	Sand & Gravel		1	SS	38/23 cm						
	Hard		2	SS	76/23 cm		178				
	Glacial Till		3	SS	32			90/21 cm			7 28 50 15
			4	SS	60/15 cm		176				
			5	SS	60/15 cm						10 35 44 11
174.3			6	SS	60/15 cm						13 32 40 15
7.0	Sandy Silt to Silty Sand						174				
	Some Gravel		7	SS	60/15 cm						
	Traces of Clay		8	SS	80/ 8 cm		172				13 49 32 7
			9	SS	75/ 8 cm		170				
	Very Dense		10	SS	75/ 8 cm						10 43 38 9
							168				
			11	SS	90/ 8 cm		166				
							164				
			12	SS	60/ 10 cm						1 22 75 2
							162				
159.9			13	SS	80/ 10 cm		160				
21.4	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

FOR INFORMATION ONLY

RECORD OF BOREHOLE No 1A

METRIC

FORMERLY BH 3 WP 197-77-08

W P 197-77-07 LOCATION Co-ords N 4 820 951; E 286 559 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 15 CHECKED BY

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 W_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
180.0	Ground Level										GR SA SI CL
0.0			1	SS	25						
			2	SS	30		178				
	Heterogeneous mixture of silty clay sand and gravel occ. sand seams		3	SS	35						
			4	SS	64		176				
	V. Stiff to Hard Glacial till		5	SS	85/15 cm		174				30 30 32 8
172.1			6	SS	75/15 cm						12 34 42 12
7.9	End of Borehole										

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 26

RECORD OF BOREHOLE No 2

FORMERLY BH 5 WP 197-77-03

METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 516.5; E 286 734.0 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY GP

DATUM Geodetic DATE 82 11 01 and 02 CHECKED BY

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 W_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
180.5	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay		1	SS	35		180				
			2	SS	76						
	Sand & Gravel					▽ Estimated	178				
			3	SS	65						
	Hard		4	SS	38		176				6 25 43 26
	Glacial Till		5	SS	42		174				
			6	SS	66/ 23 cm		172				
170.0			7	SS	101						
10.5	Silty Sand to Sandy Silt		8	SS	86/ 23 cm		170				8 44 43 5
	Traces of Gravel & Clay		9	SS	80/ 15 cm		168				
	V. Dense						166				
163.6			10	SS	70/ 15 cm						4 52 39 5
16.9	Silty Clay						164				
	Traces of Sand		11	SS	65/ 15 cm		162				
	Hard						160				
			12	SS	100/ 15 cm						0 9 64 27
157.6							158				
22.9 / 156.1	Reddish Brown Weathered Shale										
24.4	End of Borehole										

Note:

No Groundwater Level Measurements Were Carried Out.

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

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

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

FOR INFORMATION ONLY

RECORD OF BOREHOLE No 3

FORMERLY BH 14 WP 197-77-03

METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 467.5; E 286 767.0 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY PP

DATUM Geodetic DATE 82 11 22 CHECKED BY GP

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 + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	PLASTIC LIMIT Wp — NATURAL MOISTURE CONTENT W — LIQUID LIMIT W_L WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.8	Ground Level										
0.0	V. Soft to Soft		1	SS	4	45 cm					
			2	SS	13						
	Heterogeneous Mixture of Silty Clay		3	SS	38		178				
			4	SS	84						
	Sand & Gravel		5	SS	91		176				
	Stiff to Hard		6	SS	60						
174.8			7	SS	59						
5.0	End of Borehole										
	Surface Water Level 15 cm above Ground Level (82 11 22)										

OFFICE REPORT ON SOIL EXPLORATION

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

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

Ministry of Transportation and Communications
Ontario

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RECORD OF BOREHOLE No 3A

METRIC

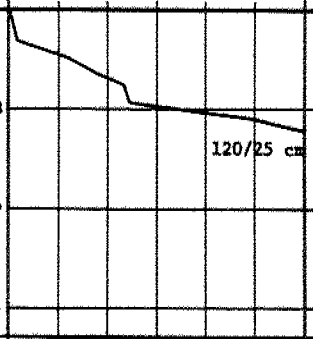
FORMERLY BH 15 WP 197-77-03

W P 197-77-07 LOCATION Co-ords. N 4 820 415.0; E 286 838.5 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY PP

DATUM Geodetic DATE 82 11 22 CHECKED BY GP.

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 W_L WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
180.0	Ground Level										
0.0	Soft										
	Heterogeneous Mixture of Silty Clay		1	SS	37						
			2	SS	98/28 cm						
	Sand & Gravel		3	SS	89						
	Hard		4	SS	71						
	Glacial Till		5	SS	34						
173.4			6	SS	40						
6.6	End of Borehole										



+3, ×5 : Numbers refer to Sensitivity

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

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 1

RECORD OF BOREHOLE No 4

FORMERLY BH 12 WP 197-77-04

METRIC

W P 197-77-07 LOCATION Co-ords. 4 820 405.0 N; 286 539.0 E ORIGINATED BY JH

DIST 4 HWY 403/407 BOREHOLE TYPE Cont'. Flight Auger (S.A.) & Cone Test COMPILED BY JH

DATUM Geodetic DATE 82 11 09 CHECKED BY

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
180.3	Ground Surface						180				
0.0			1	SS	25						4 22 53 21
			2	SS	24		178	65/25 cm boulders			
			3	SS	45						
			4	SS	91		176				
			5	SS	91						
	Heterogeneous Mixture of Silty Clay (CL) Sand & Gravel V. Stiff to Hard Glacial Till		6	SS	106		174				
			7	SS	79						7 29 46 18
			8	SS	60/ 15 cm		172				15 30 40 15
			9	SS	60/ 15 cm		170				
165.7							168				
14.6			10	SS	112						4 38 53 5
	Sandy Silt to Silty Sand, Some Gravel Trace of Clay V. Dense						166				
			11	SS	83/ 15 cm		164				10 18 67 5
158.9							162				
21.4	End of Borehole		12	SS	80/ 10 cm		160				
	Weathered Red Shale										

+3, ×5 : Numbers refer to Sensitivity

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

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLES : 5 & 25

RECORD OF BOREHOLE No 5

METRIC

FORMERLY BH 13 WP 197-77-04

W P 197-77-07 LOCATION Co-ords. 4 820 420.6 N; 286 606.8 E ORIGINATED BY JH

DIST 4 HWY 403/407 BOREHOLE TYPE Cont'. Flight Auger (S.A.) & Cone Test COMPILED BY JH

DATUM Geodetic DATE 82 11 09 CHECKED BY

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 (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
180.1	Ground Surface										
0.0	Heterogeneous Mixture of Silty Clay (CL) Sand & Gravel Hard Glacial Till		1	SS	40		180				
			2	SS	52		178				
			3	SS	67						
			4	SS	42		176				0 27 49 24
			5	SS	49						
			6	SS	110		174				
			7	SS	100/ 7.5 cm		172				
			8	SS	100/ 12.5 cm						5 26 54 15
			9	SS	68/ 15 cm		170				
			10	SS	70/ 15 cm		168				29 38 29 5
165.5			11	SS	100/ 12.5 cm		166				16 29 43 12
14.6	Sandy Silt to Silty Sand, Some Gravel Trace of Clay V. Dense		12	SS	80/ 7.5 cm						2 44 47 7
							164				
			13	SS	100/ 7.5 cm		162				16 35 39 10
158.7											
			14	SS	100/ 5 cm		160				
21.4	End of Borehole										
	Weathered Red Shale										

+3, ×5 : Numbers refer to Sensitivity

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

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 2

RECORD OF BOREHOLE No 5A

METRIC

FORMERLY BH 10 WP 197-77-05

W P 197-77-07 LOCATION Co-ords. N 4 820 518.2; E 286 466.6 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone COMPILED BY JH

DATUM Geodetic DATE 82 11 08 CHECKED BY

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT Wl — WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.2	Ground Surface						182				
0.0	Heterogeneous Mixture of Silty Clay, Sand & Gravel (Glacial Till) Very Stiff to Hard		1	SS	40		180				8 22 51 19
			2	SS	78			100/27.5 cm			
			3	SS	45		178				6 31 44 19
			4	SS	18						
			5	SS	42						
			6	SS	41		176				7 31 42 20
			7	SS	33						
			8	SS	23						3 31 45 21
			9	SS	67/23 cm		174				
			10	SS	60/5 cm						6 38 43 13
			11	SS	68		172				
			12	SS	90/25 cm		170				6 31 45 18
168.5											
13.7	Sandy Silt to Silty Sand, Traces of Gravel & Clay Compact to Very Dense		13	SS	13		168				
							166				
			14	SS	60/8 cm		164				3 41 48 8
162.4											
19.8	Weathered Red Shale						162				
			15	SS	110/5 cm		160				
157.7											
			16	SS	100/10 cm		158				
24.5	End of Borehole										

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 17

RECORD OF BOREHOLE No 5B

METRIC

FORMERLY BH 11 WP 197-77-05

W P 197-77-07 LOCATION Co-ords. N 4 820 560.3; E 286 415.4 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone COMPILED BY JH

DATUM Geodetic DATE 82 11 08 CHECKED BY

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 W_L — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.7	Ground Surface						182				
0.0	Heterogeneous Mixture of Silty Clay, Sand & Gravel (Glacial Till) Very Stiff to Hard		1	SS	37		180				
			2	SS	88						
			3	SS	79		178				
			4	SS	47						
			5	SS	29						5 29 47 19
			6	SS	24		176				
			7	SS	28						3 28 48 21
			8	SS	28						
			9	SS	40	23 cm	174				5 25 46 24
			10	SS	60	10 cm					9 39 43 9
			11	SS	50/	8 cm	172				
168.2			12	SS	70/	15 cm					18 26 39 17
14.5	Sandy Silt to Silty Sand, Some Gravel, Trace Clay Very Dense		13	SS	60		170				
			14	SS	30/	3 cm	168				13 48 34 5
162.9							166				
19.8	Weathered Red Shale						164				
161.3			15	SS	100/	8 cm	162				
21.4	End of Borehole										

OFFICE REPORT ON SOIL EXPLORATION

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

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation and Communications
Ontario

FOR INFORMATION ONLY

RECORD OF BOREHOLE No 6

METRIC

FORMERLY BH 1 WP 197-77-08

W P 197-77-07 LOCATION Co-ords N 4 821 000; E 286 667 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 16 CHECKED BY

SOIL PROFILE			SAMPLES			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 (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
180.7	Ground Level										
0.0							180				
			1	SS	49	▽ Estimated					
							178				
	Heterogeneous mixture of silty clay sand and gravel occ. sand seams		2	SS	105						
			3	SS	58		176				
	Hard Glacial Till										
			4	SS	111						
							174				
172.6			5	SS	89						
8.1	End of Borehole										
	WL not observed										

+3, ×5 : Numbers refer to Sensitivity

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

Ministry of Transportation and Communications
Ontario

FOR INFORMATION ONLY

RECORD OF BOREHOLE No 9

FORMERLY BH 7 WP 197-77-08

METRIC

W P 197-77-0 LOCATION Co-ords N 4 820 628; E 286 428 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 14 CHECKED BY

SOIL PROFILE			SAMPLES			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 (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
182.4	Ground Level										GR SA SI CL
0.0							182				
			1	SS	35						
	Heterogeneous mixture of silty clay sand and gravel						180				
			2	SS	69						3 26 49 22
	Occasional sand and silt seams										
			3	SS	26		178				9 24 47 20
			4	SS	26		176				
	V. Stiff to Hard Glacial Till										
			5	SS	35						8 28 48 16
							174				
			6	SS	33						
							172				
171.3			7	SS	63						
11.1	End of Borehole										

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

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

OFFICE RETURN ON SOIL CLASSIFICATION

Ministry of Transportation and Communications
Ontario

FOR INFORMATION ONLY

RECORD OF BOREHOLE No 10

FORMERLY BH 9 WP 197-77-08

METRIC

W P 197-77-07 LOCATION Co-ords N 4 820 488; E 286 595 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 11 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH: o UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE	WATER CONTENT (%) 10 20 30		GR SA SI CL
180.2	Ground Level										
0.0	Heterogeneous mixture of silty clay sand and gravel		1	SS	37	▼	180				
							178				
			2	SS	76						
	Hard Glacial Till		3	SS	35		176				
			4	SS	33		174				
			5	SS	47		172		o ⊢		9 32 43 16
170.6			6	SS	91				o ⊢		5 38 47 10
9.6	End of Borehole										

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

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

Ministry of Transportation and Communications
Ontario

FOR INFORMATION ONLY

RECORD OF BOREHOLE No 11

METRIC

FORMERLY BH 10 WP 197-77-08

W P 197-77-07 LOCATION Co-ords N 4 820 554; E 286 596 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 14 CHECKED BY

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						
180.8	Ground Level										GR SA SI CL
0.0	Heterogeneous mixture of silty clay sand and gravel		1	SS	24	▼	180		o——		6 20 48 26
			2	SS	50		178				
	V. Stiff to Hard Glacial Till		3	SS	34		176				
			4	SS	33		174				
			5	SS	99		172				
171.2			6	SS	42						
9.6	End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

15 20/10 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

FOR INFORMATION ONLY

RECORD OF BOREHOLE No 12 (FORMERLY BH 6 WP 197-77-02) METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 651 ; E 286 577 ORIGINATED BY JH
DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY JH
DATUM Geodetic DATE 1982 11 02 and 03 CHECKED BY

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
181.6	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay, Sand, Gravel (Glacial Till) Very Stiff to Hard		1	SS	22		180				8 23 49 20
			2	SS	42						
			3	SS	67		178				
			4	SS	86						5 21 52 22
175.3			5	SS	75/23 cm		176				13 23 44 20
6.3	Some Gravel		6	SS	82		174				10 40 43 7
	Sandy Silt to Silty Sand Trace Clay Very Dense Glacial Till with Gravel		7	SS	40/8 cm		172				
			8	SS	78		170				37 37 24 2
	Trace Gravel		9	SS	72/15 cm		168				
			10	SS	100/8 cm		166				7 43 44 6
161.8							164				
19.8	Weathered Red Shale						162				
158.7							160				
22.9	End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 7

RECORD OF BOREHOLE No 13 (FORMERLY BH 102 WP 197-77-03) METRIC

W P 197-77-07 LOCATION Co-ords N 4 820 741 ; E 286 632 ORIGINATED BY DBC
DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (H.S.) & Cone Test COMPILED BY PP
DATUM Geodetic DATE 81 12 23 - 82 01 05 CHECKED BY

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
181.0	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay		1	SS	22		180				16 23 43 18
	Sand & Gravel		2	SS	29	▽ Estimated					
	V. Stiff to Hard		3	SS	27						3 31 42 24
	Glacial Till		4	SS	72		178				
			5	SS	38						
			6	SS	33		176				
			7	SS	39						26 23 32 20
			8	SS	111						6 31 55 8
			9	SS	83		174				15 34 38 13
172.5			10	SS	110/18 cm						10 30 45 15
8.5	Sandy Silt to Silty Sand		11	SS	125/23 cm		172				
	Traces of Gravel & Clay		12	SS	186/15 cm		170				6 24 61 9
	Occ. Silty Clay Layers		13	SS	100/10 cm						
	V. Dense						168				
	Glacial Till		14	SS	115/13 cm						11 43 40 6
			15	SS	49		166				
			16	SS	100/ 10 cm		164				4 38 48 10
			17	SS	100/ 15 cm						
			18	SS	67/ 15 cm		162				1 12 82 5
160.3											
20.7 159.5	Reddish Brown Weathered Shale		19	SS	100/ 15 cm		160		Wp = 14% WL = 52%		0 26 57 17
21.5	End of Borehole										
	WL not observed										

+3, ×5 : Numbers refer to Sensitivity

15 20/10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLES : 6 & 9

RECORD OF BOREHOLE No 14 (FORMERLY BH 4 WP 197-77-03) METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 604 ; E 286 684 ORIGINATED BY JH
DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY PP
DATUM Geodetic DATE 82 10 29 and 82 11 01 CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
180.8	Ground Level							
0.0	Heterogeneous Mixture of Silty Clay, Sand & Gravel, Hard, Glacial Till		1	SS	30	▼	180	
			2	SS	42			
			3	SS	61			
			4	SS	92		178	11 23 44 22
			5	SS	40/8 cm		176	
			6	SS	43			
			7	SS	60/15 cm		174	
170.7			8	SS	30/8 cm		172	
10.1	Silty Sand to Sandy Silt, Traces of Gravel & Clay, V. Dense Glacial Till		9	SS	30/8 cm		170	
			10	SS	90/3 cm		168	
165.6							166	
15.2	Silty Clay, Some Sand, Hard		11	SS	30/8 cm		164	0 12 61 27
							162	
160.9			12	SS	60/8 cm			
19.9	End of Borehole — Reddish Brown Weathered Shale							

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

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

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 24

RECORD OF BOREHOLE No 15

METRIC

FORMERLY BH 14 WP 197-77-08

W P 197-77-07 LOCATION Co-ords N 4 820 743; E 286 734 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 11 CHECKED BY

SOIL PROFILE			SAMPLES			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
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
179.3	Ground Level										
0.0	Heterogeneous mixture of silty clay sand and gravel occasional boulders		1	SS	34		178				
	Hard Glacial Till		2	SS	63		176				
174.7											
4.6	Sandy silt to silty sand Traces of gravel and clay		3	SS	70	15cm	174		o		4 42 49 5
			4	SS	85	15cm			o		8 39 43 10
	Occasional silty clay layers		5	SS	90	15cm	172				
	V. dense Glacial Till										
170.0			6	SS	105	15cm	170				
9.3	End of borehole										

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLES: 10, 11

RECORD OF BOREHOLE No 16

FORMERLY BH 15 WP 197-77-08

METRIC

W P 197-77-07 LOCATION Co-ords N 4 820 874; E 286 754 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 10 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 WL — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
181.0	Ground Level										
0.0	Heterogeneous mixture of silty clay sand and gravel occasion sand seams		1	SS	33	▼	180				
			2	SS	65		178				
	Hard Glacial Till		3	SS	57		176				
175.8											
5.2	Sandy silt to silty sand		4	SS	97	20cm			○		11 41 43 5
			5	SS	59		174				
			6	SS	64						
	Traces of gravel and clay		7	SS	39						
			8	SS	82						
			9	SS	120	25cm					
			10	SS	118	28cm	172				
	Occasional silty clay layers		11	SS	100	13cm			○ H		12 24 54 10
	Dense to V. Dense Glacial Till		12	SS	100	15cm	170				
			13	SS	108	15cm			○		3 36 56 5
			14	SS	105	15cm	168				
165.1			15	SS	110		166		G		5 66 27 2
15.9	End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 12

RECORD OF BOREHOLE No 17

METRIC

FORMERLY BH 16 WP 197-77-08

W P 197-77-07 LOCATION Co-ords N 4 821 081; E 286 892 ORIGINATED BY PP

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 03 CHECKED BY JD

SOIL PROFILE			SAMPLES			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 W_L 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
181.0	Ground Level										
0.0	Heterogeneous mixture of silty clay, sand and gravel		1	SS	71		180				
			2	SS	91		178				
	Hard Glacial Till		3	SS	88		176		o ⊢		
			4	SS	121						
			5	SS	104		174				
			6	SS	133	23cm			o		
			7	SS	110	20cm					6 22 39 33
			8	SS	128	23cm			o ⊢		10 32 48 10
172.1			9	SS	94	15cm	172				
8.9	Sandy silt to Silty sand Traces of gravel and clay Occasional silty clay layers V. dense Glacial Till		10	SS	100	13cm					
			11	SS	107	15cm					
			12	SS	149	23cm			o ⊢		
			13	SS	101						10 27 48 15
			14	SS	120		170				
168.2			15	SS	100	10cm					
12.8	Silty clay and/or Weathered shale Hard weathered shale		16	SS	100	8cm	168				
165.6			17	SS	95	15cm	166		o ⊢		18 21 48 13
15.4	End of Borehole										

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

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 13

RECORD OF BOREHOLE No 18

FORMERLY BH 17 WP 197-77-08

METRIC

W P 197-77-07 LOCATION Co-ordsN4 821 206; E 286 974 ORIGINATED BY DD

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 04 CHECKED BY LO

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 W_L — 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
179.6	Ground Level										
0.0	Heterogeneous mixture of silty clay (Low to medium plasticity) sand and gravel Hard Glacial till		1	SS	37		178				
			2	SS	102	▼	176		○		3 29 55 13
175.3											
4.3	Silty sand to sandy silt traces of gravel and clay V. dense Glacial till		3	SS	100		174				
			4	SS	130						
			5	SS	100	15 cm					
			6	SS	85	15 cm					
			7	SS	120	15 cm	172				
			8	SS	100	8 cm					
			9	SS	100	15 cm					
			10	SS	100	8 cm			○		4 50 44 2
			11	SS	100	8 cm					
			~~12~~	~~SS~~	~~140~~	8 cm					
			13	SS	85						
			14	SS	85	15 cm					
166.4			15	SS	100		168				
13.2	Silty clay some sand occ. shale fragments and layers Hard		~~16~~	~~SS~~	~~125~~	15 cm	166				
			~~17~~	~~SS~~	~~125~~	8 cm					
162.8			~~18~~	~~SS~~	~~100~~	8 cm	164				
16.8	End of Borehole										

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

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

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 14

RECORD OF BOREHOLE No 19

FORMERLY BH 18 WP 197-77-08

METRIC

W P 197-77-07 LOCATION Co-ords N 4 821 348; E 287 065 ORIGINATED BY PP & BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 07 and 83 02 08 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 (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
178.5	Ground Level						178				
0.0	Heterogeneous mixture of silty clay, sand and gravel occ. boulders Hard Glacial till		1	SS	40						
			2	SS	107		176				
173.9											
4.6			3	SS	47		174		o		0 22 76 2
	Silty sand to sandy silt traces of gravel and clay Dense to V. Dense		4	SS	100/13 cm						
			5	SS	115/15 cm		172				
			6	SS	100/5 cm				o		5 38 52 5
			7	SS	100/15 cm						
			8	SS	100/5 cm						
			9	SS	100/10 cm						
			10	SS	100/15 cm		170		o		1 39 56 4
168.6	Glacial Till										
9.9	Silty clay and/or weathered shale Hard		11	SS	100/15 cm		168				
166.3			12	SS	60/3 cm						
12.2	Refusal End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

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

APPLICABLE TO POLE : 15

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Ontario

RECORD OF BOREHOLE No 20

METRIC

FORMERLY BH 19 WP 197-77-08

W P 197-77-07 LOCATION Co-ords N 4 821 500; E 287 169 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 08 CHECKED BY

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 W_L — WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
174.6	Ground Level										
0.0	Heterogeneous mixture of silty clay, sand and gravel		1	SS	72	▽ Estimated	174				
			2	SS	65/15cm		172				
	Hard Glacial Till		3	SS	58						
170.2			4	SS	100/15cm						
4.4	Silty clay and/or weathered shale		5	SS	60/5cm		170				
			6	SS	70/15cm						
168.4	Shale Hard		7	SS	95/15cm						
6.2	End of borehole										
	WL not observed										

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

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APPLICABLE TO POLE: 16

RECORD OF BOREHOLE No 21

METRIC

FORMERLY BH 21 WP 197-77-08

W P 197-77-07 LOCATION Co-ords N 4 821 647; E 287 275 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 08 and 09 CHECKED BY [illegible]

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 W_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
178.3 / 0.0	Ground Level						178				GR SA SI CL
			1	SS	56	▽ Estimated	176				
			2	SS	64						
							174				
	Heterogeneous mixture of silty clay sand and gravel occ. sand and silt seams		3	SS	30				○ —		13 28 40 19
			4	SS	27		172				
	Hard		5	SS	23						
	Glacial Till		6	SS	63						
			7	SS	60		170				
			8	SS	75/15 cm						
	occ. shale fragments and layers		9	SS	80/3 cm		168				
166.1											
12.2	End of Borehole										
	WL not observed										

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

$15 \diamond^{20}_{10} 5$ (%) STRAIN AT FAILURE

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Ontario

APPLICABLE TO POLE : 3

RECORD OF BOREHOLE No 22

FORMERLY BH 7 WP 197-77-17

METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 695.2; E 286 518.5 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY JH

DATUM Geodetic DATE 1982 11 05 and 08 CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
180.9	Ground Level							
0.0	Heterogeneous Mixture of Silty Clay, Sand, Gravel (Glacial Till) Very Stiff to Hard		1	SS	19		180	
			2	SS	35			
			3	SS	51			6 25 50 19
			4	SS	43		178	
			5	SS	20			10 26 48 16
			6	SS	16			5 26 44 25
175.0			7	SS	24		176	9 25 42 24
5.9	Sandy Silt to Silty Sand, Some Gravel, Trace Clay Dense to Very Dense		8	SS	27			
			9	SS	43		174	
			10	SS	62			25 44 26 5
			11	SS	60/ 15 cm		172	
170.6								
10.3	Silty Clay with Sand Trace Gravel Hard		12	SS	60/ 15 cm		170	9 30 42 19
			13	SS	80/ 10 cm			5 31 42 22
167.2							168	
13.7	Sandy Silt to Silty Sand, Trace Gravel, Clay Very Dense						166	
			14	SS	60/ 15 cm			6 36 54 4
							164	
			15	SS	60/ 8 cm			
161.4							162	
19.5	Weathered Red Shale							
159.5			16	SS	80/ 8 cm		160	
21.4	End of Borehole							

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L
WATER CONTENT (%) 10 20 30

UNIT WEIGHT γ

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

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

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Ministry of Transportation and Communications
Ontario

FOR INFORMATION ONLY

RECORD OF BOREHOLE No 23

FORMERLY BH 17 WP 197-77-17

METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 692.5; E 286 607.3 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY JH

DATUM Geodetic DATE 1982 11 03 CHECKED BY

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 W_L — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
180.6	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay, Sand, Gravel (Glacial Till) Very Stiff to Hard		1	SS	23		180				
			2	SS	36						3 27 50 20
			3	SS	66	Estimated	178				
			4	SS	64		176				
173.4			5	SS	42		174				8 25 44 23
7.2	Sandy Silt to Silty Sand, Some Gravel Trace Clay Very Dense		6	SS	70						2 74 20 4
			7	SS	94		172				
			8	SS	60/8 cm		170				18 48 28 5
			9	SS	70/15 cm		168				
			10	SS	90/10 cm		166				12 46 37 5
			11	SS	100/15 cm		164				
160.8							162				
19.8	Weathered Red Shale						160				
159.2			12	SS	100/8 cm						10 15 52 23
21.4	End of Borehole										

Note:

No Groundwater Level Measurements Were Carried Out.

+3, ×5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 4

RECORD OF BOREHOLE No 24

FORMERLY BH 9 WP 197-77-17

METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 735.6; E 286 548.0 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY JH

DATUM Geodetic DATE 1982 11 04 and 05 CHECKED BY

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
180.1	Ground Level						180				
0.0	Heterogeneous Mixture of Silty Clay, Sand, Gravel (Glacial Till) Very Stiff to Hard		1	SS	26		178				
			2	SS	70						5 27 46 22
			3	SS	36		176				8 30 43 19
			4	SS	41		174				17 22 45 16
			5	SS	46		172				
169.1			6	SS	97						17 26 43 14
11.0	Sandy Silt to Silty Sand, Trace Gravel, Clay Very Dense		7	SS	60/ 15 cm		170				
			8	SS	71/ 15 cm		168				3 27 64 6
			9	SS	62/ 15 cm		166				10 48 37 5
160.3							164				
19.8	Weathered Red Shale						162				
158.7			10	SS	60/ 3 cm		160				
21.4	End of Borehole										

OFFICE REPORT ON SOIL EXPLORATION

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

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLES: #31, #32

RECORD OF BOREHOLE No 25

(Formerly B.H. 2 W.P. 158-75-04)

METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 118 E 287 395 ORIGINATED BY VK

DIST 4 HWY 403 BOREHOLE TYPE Hollow Stem Auger COMPILED BY VK

DATUM Geodetic DATE 76 06 30 CHECKED BY RS

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
181.4	Ground Level							
0.0	Topsoil							
	Heterogeneous Mixture of Silty Clay, with sand occasional gravel		1	SS	45		180	0 34 52 14
			2	SS	100/ 23 cm			
			3	SS	98/ 23 cm	▼	178	
	Brown / Grey		4	SS	100/ 20 cm			
	(Glacial Till)		5	SS	100/ 15 cm		176	
	Hard		6	SS	125/ 15 cm			
			7	SS	100/ 23 cm		174	
171.0			8	SS	97		172	0 11 47 42
10.4	Silt with trace of sand, occasional silty clay layers		9	SS	54			0 23 68 9
	Very Dense gravelly sand		10	SS	115		170	22 75 (3)
			11	SS	125/ 27 cm		168	
	Silty Clay Hard		12	SS	100/ 23 cm		166	0 2 87 11
			13	SS	70/ 28 cm		164	0 3 95 2
162.8	Silty Clay Hard		14	SS	100			0 1 89 10
18.6	End of Borehole						162	

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT W_p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W_L

WATER CONTENT (%) 10 20 30

UNIT WEIGHT γ

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

15 20 5 10 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
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APPLICABLE TO POLES: #18, #19

RECORD OF BOREHOLE No 119 METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 269; E 286 258 ORIGINATED BY JC
DIST 4 HWY 407/403 BOREHOLE TYPE SS Auger COMPILED BY BR
DATUM Geodetic DATE 84 12 07 CHECKED BY

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 (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
182.9	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay (CL) Sand and Gravel Glacial Till Very Stiff to Hard		1	SS	36	▼	182				
			2	SS	40						
			3	SS	44		180				
			4	SS	46						
			5	SS	35		178				
			6	SS	24						
			7	SS	24		176				6 28 47 19
172.9			8	SS	55		174				
10.0	Silty Sand Some Gravel trace clay Very Dense occasional boulders		9	SS	100/ 31 cm		172				17 31 42 10
170.5			10	SS	100/ 23 cm						
12.4	End of Borehole						170				

+3, ×5 : Numbers refer to Sensitivity

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

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLES: #20, #21

RECORD OF BOREHOLE No 121

METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 091; E 286 002 ORIGINATED BY JC

DIST 4 HWY 407/403 BOREHOLE TYPE SS Auger COMPILED BY BR

DATUM Geodetic DATE 84 12 06/07 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
179.7	Ground Level										
	Heterogeneous Mixture of Silty Clay (CL) Sand and Gravel		1	SS	67						
			2	SS	43		178				
	Glacial Till		3	SS	82						7 27 45 21
			4	SS	61		176				
	Very Stiff to Hard		5	SS	25						3 29 46 22
			6	SS	29		174				
			7	SS	22		172				
170.7											
9.0	Silty Sand to Sandy Silt Very Dense, some clay Trace Gravel occasional boulders		8	SS	100		170				
169.0			9	SS	100/8 cm						4 35 45 16
10.7	End of Borehole						168				

+3, ×5 : Numbers refer to Sensitivity

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

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLES: #22, #23

RECORD OF BOREHOLE No 123 METRIC

W P 197-77-07 LOCATION Co-ords. N 4 819 835; E 285 782 ORIGINATED BY JC
DIST 4 HWY 407/403 BOREHOLE TYPE SS Auger COMPILED BY BR
DATUM Geodetic DATE 84 12 06 CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS
183.3	Ground Level					
0.0	Heterogeneous Mixture of Silty Clay Sand and Gravel Hard		1	SS	44	
			2	SS	71	
181.1						
2.2	Sandy Silt to Silty Sand trace of clay trace of gravel		3	SS	75/23cm	▼
			4	SS	100	
			5	SS	100	
	Very Dense — Fine Sand Layer		6	SS	100	
			7	SS	100/18cm	
			8	SS	100/23cm	
172.6						
10.7	Weathered Shale bedrock Red		9	SS	100/10cm	
171.0						
			10	SS	100/10cm	
12.3	End of Borehole					

ELEVATION SCALE: 182, 180, 178, 176, 174, 172, 170

DYNAMIC CONE PENETRATION RESISTANCE PLOT — 20 40 60 80 100

SHEAR STRENGTH
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × 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
	0	50	46	4
	1	86	10	3
	5	40	35	20

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

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

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : #27

RECORD OF BOREHOLE No 127 METRIC

W P 199-77-07 LOCATION Co-ords. N 4 820 531; E 286 940 ORIGINATED BY JC
DIST 4 HWY 407/403 BOREHOLE TYPE SS Auger COMPILED BY MJK
DATUM Geodetic DATE 84 12 05 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
179.7	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay (CL) Sand and Gravel Glacial Till Very Stiff to Hard		1	SS	18	▼					
			2	SS	63						
			3	SS	70						5 26 48 21
175.7			4	SS	100/31 cm		178				
4.0	Silty Sand to Sandy Silt Trace of Clay Trace of Gravel Very Dense		5	SS	100/23 cm		176				6 42 41 11
			6	SS	100/10 cm		174				
			7	SS	100/10 cm		172				
			8	SS	100/25 cm		170				1 17 78 4
			9	SS	100/28 cm		168				
167.2			10	SS	100/34 cm						
12.5	End of Borehole						166				

+3, ×5 : Numbers refer to Sensitivity

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

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Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLES: #28, #29

RECORD OF BOREHOLE No 129

METRIC

W.P 197-77-07 LOCATION Co-ords. N 4 820 377; E 287 093 ORIGINATED BY JC

DIST 4 HWY 407/403 BOREHOLE TYPE SS Auger COMPILED BY MJK

DATUM Geodetic DATE 84 12 05/06 CHECKED BY

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 W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — 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
181.2	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay (CL-CI) Sand and Gravel Glacial Till Hard		1	SS	60/23 cm	▼	180				
			2	SS	47		178				
			3	SS	32		176		○		
175.8											
5.4	Sandy Silt to Silty Sand Trace to Some Clay Trace Gravel		4	SS	22		174				0 49 47 4
			5	SS	100/18 cm						
	Silt Layer		6	SS	100/20 cm		172				1 10 75 14
	Compact to Very Dense						170				
169.0			7	SS	100/ 8 cm						3 45 44 8
12.2	End of Borehole						168				

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

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APPLICABLE TO POLE : #30

RECORD OF BOREHOLE No 130 METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 212; E 287 175 ORIGINATED BY JC
DIST 4 HWY 407/403 BOREHOLE TYPE SS Auger COMPILED BY MJK
DATUM Geodetic DATE 84 12 04 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 Wl / WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
180.2	Ground Level						180				
0.0	Heterogeneous Mixture of Silty Clay (CL) Sand and Gravel Glacial Till Very Stiff to Hard		1	SS	27						
			2	SS	41						
			3	SS	82	▼	178		○		
176.3			4	SS	93/28 cm						
3.9	Sandy Silt Some Clay Trace Gravel Very Dense occasional cobbles or boulders		5	SS	102/28 cm		176				1 32 48 19
			6	SS	100/16 cm		174				
			7	SS	100/17 cm		172				0 19 65 16
			8	SS	100/15 cm						
			9	SS	100/23 cm		170				
167.9			10	SS	100/15 cm		168				
12.3	End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

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

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APPLICABLE TO POLE : - #33

RECORD OF BOREHOLE No 133

METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 000; E 287 645 ORIGINATED BY JC

DIST 4 HWY 407/403 BOREHOLE TYPE SS Auger COMPILED BY MJK

DATUM Geodetic DATE 84 12 04/05 CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE
182.7	Ground Level						
0.0	Heterogeneous Mixture of Silty Clay (CL) Sand and Gravel Glacial Till Stiff to Hard		1	SS	8		182
			2	SS	44		
			3	SS	76/23 cm		180
			4	SS	100/25 cm		
			5	SS	100/18 cm	▼	178
176.4			6	SS	100/31 cm		
6.3	Sandy Silt trace clay Dense to Very Dense		7	SS	42		176
			8	SS	100/20 cm		174
			9	SS	100/18 cm		172
170.1			10	SS	82/28 cm		
12.6	End of Borehole						170

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × 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
	2	26	49	23
	1	25	52	22
	0	10	85	5

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

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

OFFICE REPORT ON SOIL EXPLORATION

G.I.-30 · SEPT. 1976

GEOCRES No. 30M12-191

DIST. 4 REGION

W.P. No. 197-77-07

CONT. No.

W. O. No.

STR. SITE No. 10-82-280

HWY. No. 407

LOCATION RETAINING WALLS
BURNHAMTHORPE RD UNDERPASS

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

WP 197-77-07 DIST 4

HWY 403/407 STR SITE NA

High Mast Lighting
Hwy. 403/407 Interchange Complex

DISTRIBUTION

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GEOCRES 30M12-191 DATE 85 07 08

FOUNDATION INVESTIGATION REPORT

For

High Mast Lighting

Hwy. 403/407 Interchange Complex

W.P. 197-77-07, Site NA

District 4, Burlington

INTRODUCTION

This report summarizes the factual information obtained from a foundation investigation performed at the aforementioned site between 84 12 04 and 84 12 07. Some borings which were carried out for other projects in the same area are also incorporated into this report. A total of seven sampled boreholes were carried out during the course of the fieldwork for depths ranging between 10.7 m and 12.6 m. The borings were advanced by a continuous flight auger machine mounted on a muskeg vehicle and equipped with either 83 mm I.D. hollow stem augers or solid augers.

SITE DESCRIPTION

The high mast light poles will be located throughout the future Hwy. 407 and existing Hwy. 403 interchange complex which is located near the boundary between the City of Mississauga and the City of Oakville.

The surrounding terrain, with the exception of the existing road network is relatively flat to gently rolling.

Physiographically the site is located in the Region referred to as the Peel Plain.

SUBSURFACE CONDITIONS

General

The subsoil in the future Hwy. 407/Hwy. 403 interchange complex was found to consist of cohesive and non-cohesive glacial deposits overlying shale bedrock. The boundaries of the various strata, together with the field and laboratory test results obtained are shown on the Record of Borehole Sheets located in the Appendix.

The pole locations, along with the applicable boreholes for each pole, are given in the following table and are illustrated on the key map in the Appendix.

Pole No.	Type	Location		Proposed Ground Elevation (m)	Applicable Borehole Number
		Easting	Northing		
1	C	286 497	4820 450	180.6	4
2	B	286 510	4820 570	176.7	5A
3	C	286 497	4820 701	180.5	22
4	C	286 504	4820 830	180.5	24
5	C	286 634	4820 460	180.2	5
6	C	286 625	4820 596	181.1	14
7	C	286 630	4820 727	177.7	13
8	C	286 631	4820 857	180.3	1
9	C	286 758	4820 608	180.7	14
10	C	286 730	4820 852	179.5	16
11	C	286 751	4821 008	179.8	16
12	C	286 821	4821 121	181.2	17
13	C	286 964	4821 193	179.4	18
14	C	286 975	4821 384	177.2	19
15	C	287 153	4821 472	181.2	20
16	C	287 192	4821 660	177.3	21
17	B	286 362	4820 387	182.8	5B
18	B	286 362	4820 387	182.1	119
19	B	286 258	4820 257	182.6	119
20	B	286 172	4820 120	180.4	121
21	B	286 002	4820 091	179.8	121
22	B	285 959	4819 009	179.9	123
23	B	285 775	4819 834	183.3	123
24	C	286 860	4820 734	179.0	15
25	C	286 714	4820 395	180.4	5
26	B	286 821	4820 464	182.0	2
27	B	286 940	4820 531	180.7	127
28	B	286 920	4820 328	179.8	129
29	B	287 092	4820 376	180.6	129
30	B	287 176	4820 212	180.1	130
31	B	287 365	4820 172	180.6	25
32	B	287 501	4820 094	181.7	25
33	B	287 645	4820 000	182.7	133

A description of the various strata encountered is given below.

Heterogeneous Mixture of Silty Clay, Sand & Gravel (Glacial Till)

Immediately below a thin layer of topsoil, a till-like stratum was encountered in every borehole. The thickness ranges from 2.2 m at borehole 123 to 14.6 m at borehole 4. This material was found to be basically cohesive in nature with localized pockets of less cohesive material. Standard Penetration Tests carried out within this deposit yielded 'N' values ranging from 8 to over 100 blows per 0.30 m. Based on these values the deposit is classified as firm to hard but was generally found to be very stiff to hard.

Physical properties of selected samples of the material as determined from laboratory tests, are summarized on the Plasticity Chart Figure 1, located in the Appendix of this report.

The results of grain size distribution tests are shown in envelope form on Figure 2 in the Appendix.

Occasional cobbles and boulders were encountered within the deposit during the augering operation. In all cases, it was possible to progress beyond the boulders using conventional augers.

Sandy Silt to Silty Sand, Trace to Some Gravel and Clay

This stratum was encountered in all borings that were advanced through the cohesive till deposit described above. For thickness, reference should be made to the Record of Borehole Log Sheets in the Appendix. The deposit is generally non-cohesive in nature with an occasional cohesive layer of silt or silty clay at depth. Standard Penetration Test 'N' values ranged from 13 to over 100 per 0.3 m. Based on these values the deposit is classified as compact to very dense but generally dense to very dense. The moisture content varied from 6 to 15% with an average of 11.

The results of grain size distribution tests performed on selected samples are plotted in envelope form on Figure 3 of the Appendix.

Occasional cobbles and boulders were encountered randomly distributed throughout this deposit. However, further progress below the boulders was possible using conventional augers.

Silty Clay

This deposit was encountered at boreholes 2, 14, 17, 18, 19, 20, and 22. Generally, it was found overlying weathered shale bedrock except at borehole 22 were it was located within the sandy silt to silty sandy deposit described above.

The material consists of cohesive silty clay, some sand. In cases where it was found overlying weathered shale bedrock, broken rock fragments were contained within the deposit. Based on Standard Penetration 'N' values of greater than 100 blows per 0.30 m, the consistency of the deposit is hard.

Weathered Shale Bedrock

This zone was encountered at the following borehole locations: 2, 4, 5, 5A & B, 7, 13, 14, 17, 18, 19, 20, 22, 24 and 123. For the boundaries between this stratum and the previously described Sandy Silt to Silty Sand or Silty Clay, reference should be made to the Record of Borehole sheets contained in the Appendix.

The main component of this material is a reddish silty clay to clay. Most of the deposit is highly weathered and was penetrated by conventional drilling using augers.

Groundwater Conditions

Groundwater level observations were carried out in the open boreholes during the course of the various investigations. The groundwater levels obtained are shown on the Record of Borehole Sheets in the Appendix. In most of the borings, the groundwater was found to be at or close to the ground surface. In cases where no actual measurements were performed, the estimated groundwater level is shown on the Borehole Sheets.

DISCUSSION AND RECOMMENDATIONS

As part of the construction of the new Hwy 403/407 interchange, it has been proposed to provide illumination utilizing a total of 33 high mast light pole installations. The height of the poles will be either 30 m (Type 'B') or 35 m (Type 'C').

Conventional spread footings for these light poles would likely be quite expensive. However, high mast light poles have ben installed economically in many areas of North America and Europe using a design method proposed by B.B. Broms and others in which the poles are supported on a concrete caisson pile. The Structural Office has decided to adopt this same method described by Broms in two separate papers; Broms, B.B. "Lateral Resistance of Piles in Cohesive Soils", Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 90, No. SM2, Paper 3825, March 1964.; and "Lateral Resistance of Piles in Cohesionless Soils", Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 90 No. SM3, Paper 3909, May, 1964.

In the following paragraphs, the feasibility of constructing concrete caissons at the site is discussed and the various parameters to be used in the caisson design are provided.

At all locations, except poles No. 3 and 26, the poles are to be installed in the original ground in areas where no significant amount of fill will be placed. Approximately 3.8 m and 2.1 m of fill material is to be placed at poles No. 3 and No. 26 respectively.

Generally the subsoil conditions are fairly uniform across the site with a cohesive silty clay till overlying a non-cohesive sandy silt to silty sand. Depending on the length of the caissons, some may be located wholly within the cohesive till, with the remainder partly in cohesive till and partly in non-cohesive sandy silt. In the latter case, a boiling condition may be created, and therefore the caissons should be restricted to the cohesive till wherever possible.

In all cases, the material located within the zone of frost penetration, (1.2 m) should be neglected in the calculation of lateral resistance. Likewise, the contribution from fill material should also be ignored. For the cohesive

soils located at this site, the coefficient of horizontal subgrade reaction should be computed in accordance with the following formula: (The design parameters are presented in Imperial Units, since the design example provided by the Structural Office used Imperial Units throughout).

$$K_h = \frac{n_1\ n_2\ 80\ q_u}{D}$$

Where:

K_h - coefficient of horizontal subgrade reaction (lb/in^3)

D - Diameter of concrete caisson pile (in)

n_1 - coefficient as defined below:

Unconfined Compressive Strength qu (psi)	n_1
Less than 7	0.32
7 to 28	0.36
Greater than 28	0.40

n_2 - coefficient based on pile material = 1.15 for concrete

q_u - unconfined compressive strength (psi)

For the non-cohesive soils, K_h should be computed from the following formula:

$$K_h = n_h \frac{z}{D}$$

K_h- coefficient of horizontal subgrade reaction ($tons/ft^3$)

z - depth below ground surface (ft.)

D - diameter of caisson (ft)

n_h - Coefficient evaluated as follows:

Coefficient n_h in $tons/ft^3$

Relative Density	Loose	Compact	Dense
Above Groundwater table	7	21	56
Below Groundwater table	4	14	34

The following soil parameters are recommended:

For Pole Numbers: 1, 2, 3, 5, 6, 7, 8, 16, 17, 18, 19, 20, 21, 22

Cohesive Soils;

Unconfined Compressive Strength, q_u (psi)		40
Unit Weight,	(lb/ft^3)	135

Non-Cohesive Soils;

Angle of Internal Friction		27° (Loose)
Unit Weight	(lb/ft^3)	125

For Pole Numbers: 4, 9, 10, 13, 14, 25, 26, 28, 29

Cohesive Soils;

Unconfined Compressive Strength, q_u (psi)		50
Unit Weight	(lb/ft^3)	140

Non-Cohesive Soils;

Angle of Internal Friction		27° (Loose)
Unit Weight	(lb/ft^3)	125

For Pole Numbers: 11, 12, 15, 23, 24, 27, 30, 31, 32, 33

Cohesive Soils;

Unconfined Compressive Strength, q_u (psi)		80
Unit Weight	(lb/ft^3)	145

Non-Cohesive Soils

Angle of Internal Friction		27° (Loose)
Unit Weight	(lb/ft^3)	125

References should be made to the applicable borehole logs for groundwater elevations (see chart on pp's 2-3 for cross-reference between boreholes and light poles).

CAISSON CONSTRUCTION

Conventional augering equipment can be utilized for the installation of concrete caissons at this site. Holes augered within the surficial cohesive silty clay till should stand up without support for several hours, however, concrete should be placed as soon as possible after augering to prevent

softening of the soil. Seepage into holes of this type is not anticipated to be a major problem and water entering the hole should be pumped out prior to placing concrete.

As noted previously, whenever possible the caissons should be limited entirely to the upper cohesive till layer. In cases where this may not be possible and the caissons extend into the underlying non-cohesive soil, then a temporary liner will be required during caisson installation below the contact zone between the cohesive and non-cohesive soils.

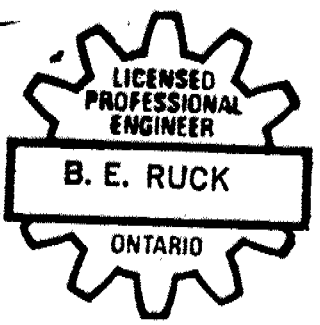
We recommended that water entering augered holes of this type not be pumped out because a boiling condition may be created due to an unbalanced hydrostatic head. Instead, concrete should be placed using a tremie design. Once the concrete has been placed to a level above the contact between the cohesive and non-cohesive soils, then any water can be pumped out and the remaining concrete placed "in the dry". Alternatively, the tremie placement could be continued to cut-off elevation.

MISCELLANEOUS

The fieldwork for this investigation was carried out under the supervision of Mr. J. Clunas, Student Specialist Engineer using equipment owned and operated by Atcost Soil Investigation Ltd., Concord. This report was written by Mr. B. Ruck, Project Foundations Engineer and reviewed by Mr. K. Selby, Chief Foundations Engineer, West.

Brian Ruck

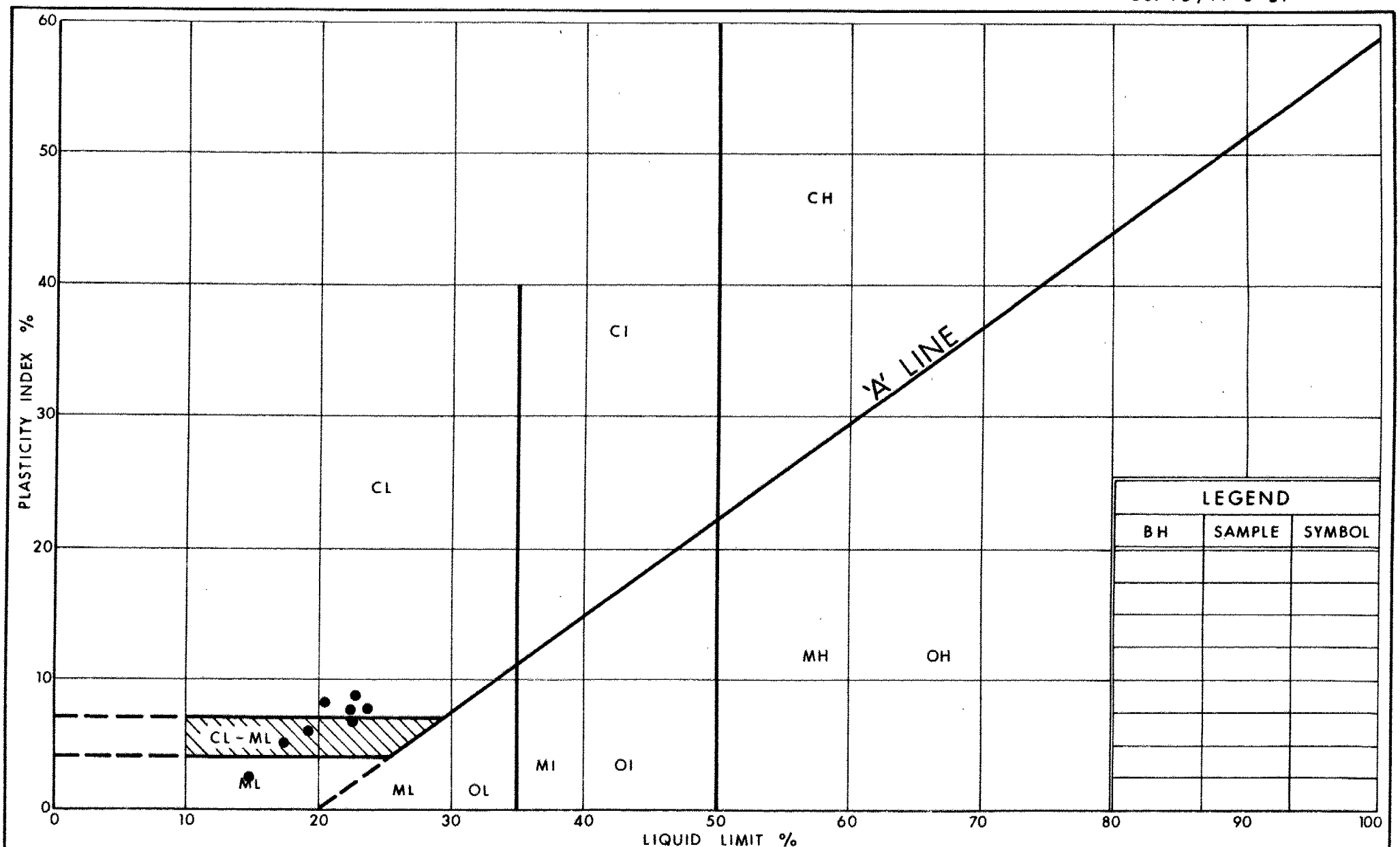
B. E. Ruck, P. Eng.
Project Foundations Engineer



K. G. Selby

K. G. Selby P. Eng.
Chief Foundations Engineer
(West)

APPENDIX



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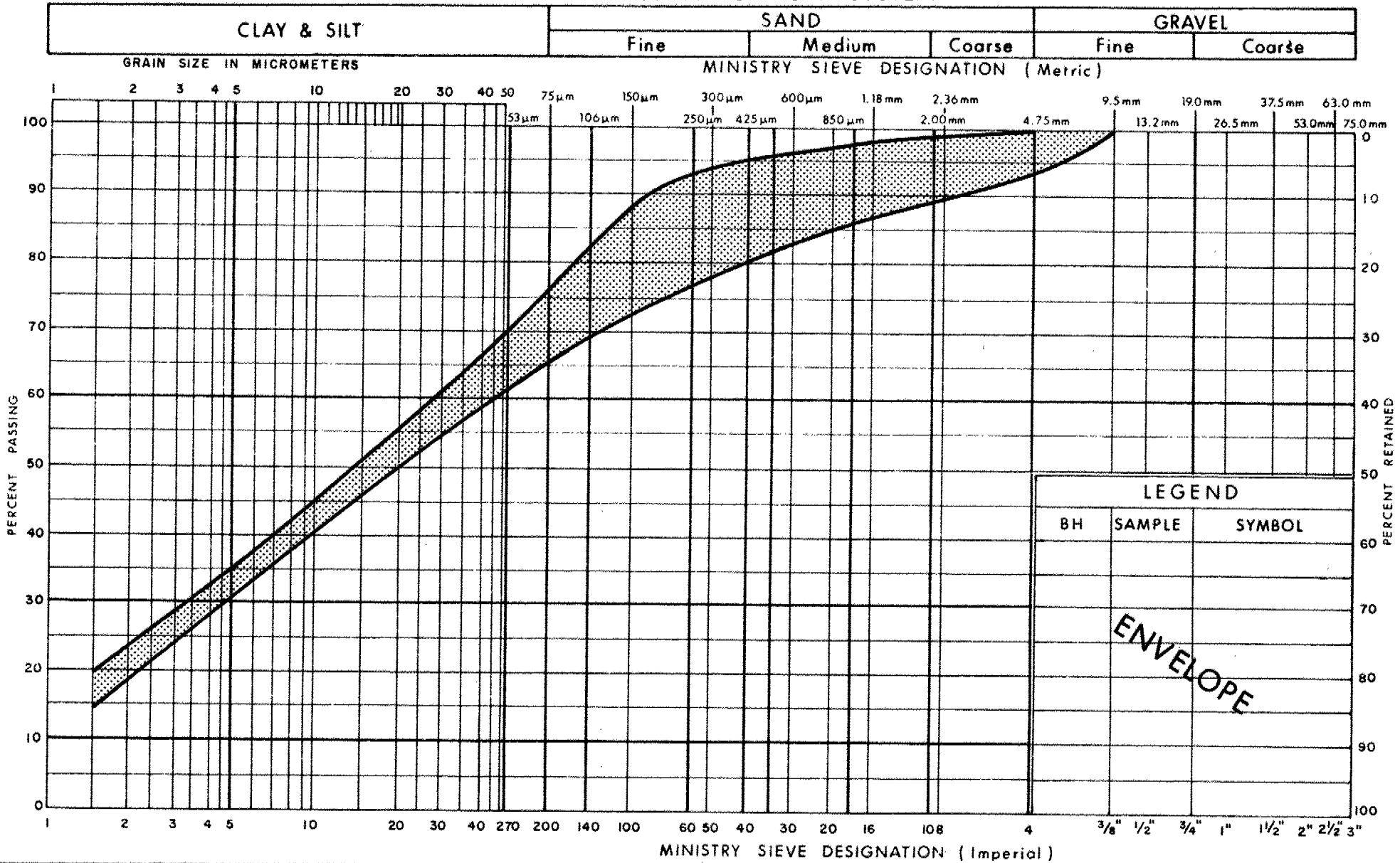
PLASTICITY CHART
HET. MIXTURE OF
SILTY CLAY, SAND & GRAVEL (Glacial Till)

FIG No 1

W P 197-77-07

UNIFIED SOIL CLASSIFICATION SYSTEM



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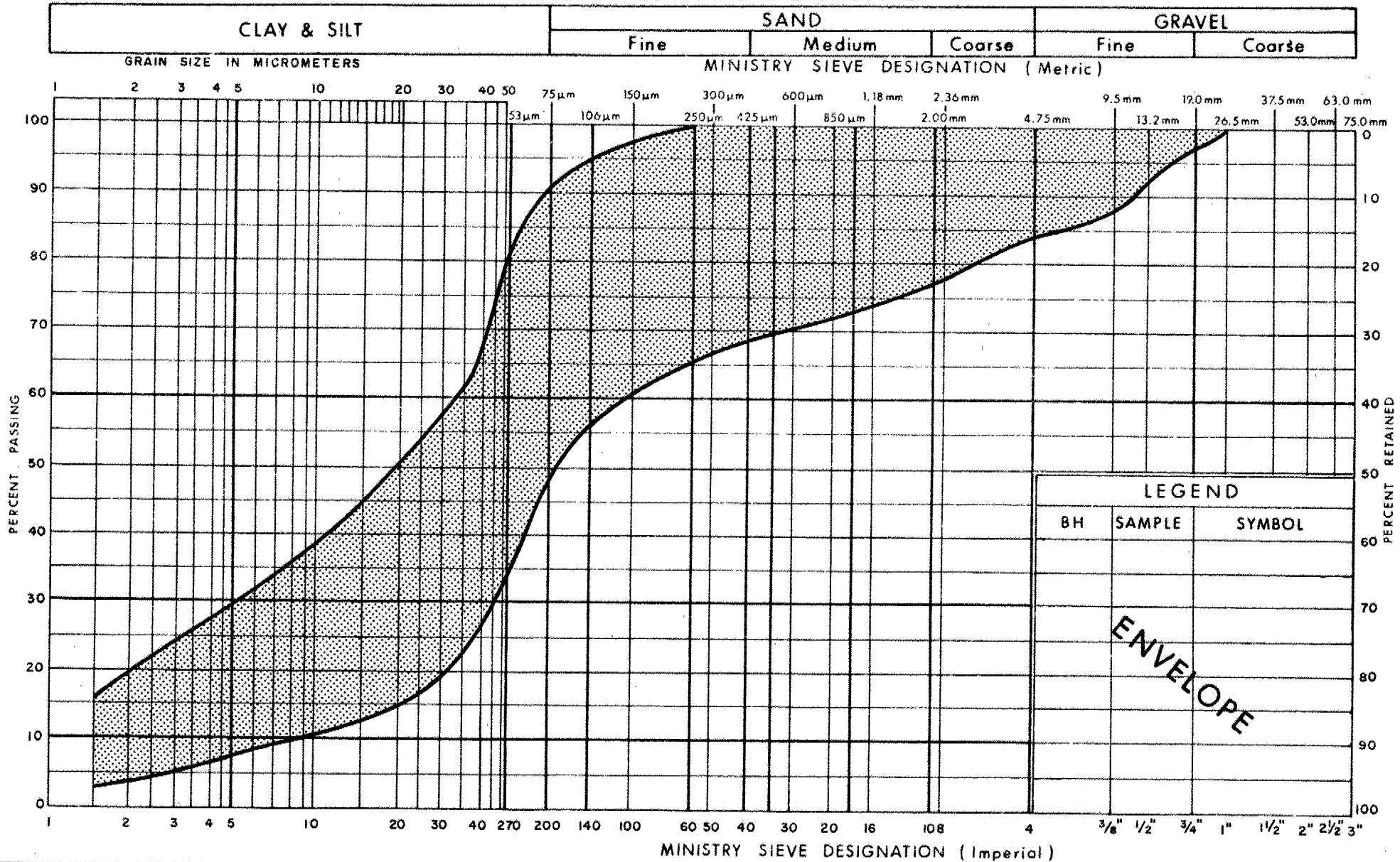
GRAIN SIZE DISTRIBUTION
HET MIXTURE OF
SILTY CLAY, SAND & GRAVEL (Glacial Till)

FIG No 2
W P 197-77-07

UNIFIED SOIL CLASSIFICATION SYSTEM



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GRAIN SIZE DISTRIBUTION

SILTY SAND, SOME GRAVEL TRACE OF CLAY

FIG No 3

W P 197-77-07

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

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

STRESS AND STRAIN

u_w	kPa	PORE WATER PRESSURE
r_u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

MECHANICAL PROPERTIES OF SOIL

m_v	kPa^{-1}	COEFFICIENT OF VOLUME CHANGE
C_c	1	COMPRESSION INDEX
C_s	1	SWELLING INDEX
C_α	1	RATE OF SECONDARY CONSOLIDATION
c_v	m^2/s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_t	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m^3	DENSITY OF SOLID PARTICLES
γ_s	kN/m^3	UNIT WEIGHT OF SOLID PARTICLES
ρ_w	kg/m^3	DENSITY OF WATER
γ_w	kN/m^3	UNIT WEIGHT OF WATER
ρ	kg/m^3	DENSITY OF SOIL
γ	kN/m^3	UNIT WEIGHT OF SOIL
ρ_d	kg/m^3	DENSITY OF DRY SOIL
γ_d	kN/m^3	UNIT WEIGHT OF DRY SOIL
ρ_{sat}	kg/m^3	DENSITY OF SATURATED SOIL
γ_{sat}	kN/m^3	UNIT WEIGHT OF SATURATED SOIL
ρ'	kg/m^3	DENSITY OF SUBMERGED SOIL
γ'	kN/m^3	UNIT WEIGHT OF SUBMERGED SOIL

e	1,%	VOID RATIO
n	1,%	POROSITY
w	1,%	WATER CONTENT
S_r	%	DEGREE OF SATURATION
w_L	%	LIQUID LIMIT
w_P	%	PLASTIC LIMIT
w_S	%	SHRINKAGE LIMIT
I_P	%	PLASTICITY INDEX = $w_L - w_P$
I_L	1	LIQUIDITY INDEX = $\frac{w - w_P}{I_P}$
I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_P}$
e_{max}	1,%	VOID RATIO IN LOOSEST STATE

e_{min}	1,%	VOID RATIO IN DENSEST STATE
I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
D	mm	GRAIN DIAMETER
D_n	mm	n PERCENT - DIAMETER
C_U	1	UNIFORMITY COEFFICIENT
h	m	HYDRAULIC HEAD OR POTENTIAL
q	m^3/s	RATE OF DISCHARGE
v	m/s	DISCHARGE VELOCITY
i	1	HYDRAULIC GRADIENT
k	m/s	HYDRAULIC CONDUCTIVITY
j	kN/m^3	SEEPAGE FORCE

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 8

RECORD OF BOREHOLE No 1

FORMERLY BH 2 WP 197-77-03

METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 805.5; E 286 649.5 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY PP

DATUM Geodetic DATE 82 10 29 CHECKED BY GP.

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 W_L — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
181.3	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay (CL)										
	Sand & Gravel		1	SS	38/23 cm		180				
	Hard		2	SS	76/23 cm		178				
	Glacial Till		3	SS	32			90/21 cm			7 28 50 15
			4	SS	60/15 cm		176				
			5	SS	60/15 cm						10 35 44 11
174.3			6	SS	60/15 cm						13 32 40 15
7.0	Sandy Silt to Silty Sand		7	SS	60/15 cm		174				
	Some Gravel		8	SS	80/ 8 cm		172				13 49 32 7
	Traces of Clay		9	SS	75/ 8 cm		170				
	Very Dense		10	SS	75/ 8 cm						10 43 38 9
			11	SS	90/ 8 cm		168				
			12	SS	60/ 10 cm		166				1 22 75 2
159.9			13	SS	80/ 10 cm		164				
21.4	End of Borehole						162				
							160				

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

FOR INFORMATION ONLY

RECORD OF BOREHOLE No 1A

METRIC

FORMERLY BH 3 WP 197-77-08

W P 197-77-07 LOCATION Co-ords N 4 820 951; E 286 559 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 15 CHECKED BY

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 W_L — 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
180.0	Ground Level										
0.0	Heterogeneous mixture of silty clay sand and gravel occ. sand seams		1	SS	25						
			2	SS	30		178				
			3	SS	35						
							176				
			4	SS	64						
	V. Stiff to Hard Glacial till		5	SS	85	15 cm	174				30 30 32 8
172.1			6	SS	75	15 cm					12 34 42 12
7.9	End of Borehole										

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

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

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 26

RECORD OF BOREHOLE No 2

FORMERLY BH 5 WP 197-77-03

METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 516.5; E 286 734.0 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY GP

DATUM Geodetic DATE 82 11 01 and 02 CHECKED BY GP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
180.5	Ground Level							
0.0	Heterogeneous Mixture of Silty Clay		1	SS	35		180	
			2	SS	76			
	Sand & Gravel					▽ Estimated	178	
			3	SS	65			
	Hard		4	SS	38		176	6 25 43 26
	Glacial Till		5	SS	42		174	
			6	SS	66/ 23 cm		172	
170.0			7	SS	101			
10.5	Silty Sand to Sandy Silt		8	SS	86/ 23 cm		170	8 44 43 5
	Traces of Gravel & Clay		9	SS	80/ 15 cm		168	
	V. Dense						166	
			10	SS	70/ 15 cm			4 52 39 5
163.6							164	
16.9	Silty Clay							
	Traces of Sand		11	SS	65/ 15 cm		162	
	Hard							
							160	
			12	SS	100/ 15 cm			0 9 64 27
157.6							158	
22.9	Reddish Brown Weathered Shale							
156.1								
24.4	End of Borehole							

Note:

No Groundwater Level Measurements Were Carried Out.

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE

PLASTIC LIMIT W_p NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L

WATER CONTENT (%) 10 20 30

UNIT WEIGHT γ

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

15 20 10 ◇ 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

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RECORD OF BOREHOLE No 3

FORMERLY BH 14 WP 197-77-03

METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 467.5; E 286 767.0 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY PP

DATUM Geodetic DATE 82 11 22 CHECKED BY GP

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 W_L — WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
179.8	Ground Level										
0.0	V. Soft to Soft		1	SS	4	45 cm					
			2	SS	13						
	Heterogeneous Mixture of Silty Clay		3	SS	38		178				
			4	SS	84						
	Sand & Gravel		5	SS	91		176				
	Stiff to Hard		6	SS	60						
174.8			7	SS	59						
5.0	End of Borehole										
	Surface Water Level 15 cm above Ground Level (82 11 22)										

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

15 20/10 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

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RECORD OF BOREHOLE No 3A

FORMERLY BH 15 WP 197-77-03

METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 415.0; E 286 838.5 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY PP

DATUM Geodetic DATE 82 11 22 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 Wl — WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
180.0	Ground Level										
0.0	Soft										
	Heterogeneous Mixture of Silty Clay		1	SS	37						
			2	SS	98/28 cm		178				
	Sand & Gravel		3	SS	89						
			4	SS	71			120/25 cm			
	Hard						176				
	Glacial Till		5	SS	34						
173.4			6	SS	40		174				
6.6	End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 1

RECORD OF BOREHOLE No 4

FORMERLY BH 12 WP 197-77-04

METRIC

W P 197-77-07 LOCATION Co-ords. 4 820 405.0 N; 286 539.0 E ORIGINATED BY JH

DIST 4 HWY 403/407 BOREHOLE TYPE Cont'. Flight Auger (S.A.) & Cone Test COMPILED BY JH

DATUM Geodetic DATE 82 11 09 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
180.3	Ground Surface						180				
0.0			1	SS	25						4 22 53 21
			2	SS	24		178	65/25 cm boulders			
			3	SS	45						
			4	SS	91		176				
			5	SS	91						
	Heterogeneous Mixture of Silty Clay (CL) Sand & Gravel V. Stiff to Hard Glacial Till		6	SS	106		174				
			7	SS	79						7 29 46 18
			8	SS	60/ 15 cm		172				15 30 40 15
			9	SS	60/ 15 cm		170				
165.7							168				
14.6			10	SS	112		166				
	Sandy Silt to Silty Sand, Some Gravel Trace of Clay V. Dense						164				4 38 53 5
			11	SS	83/ 15 cm		162				10 18 67 5
158.9							160				
21.4	End of Borehole		12	SS	80/ 10 cm						
	Weathered Red Shale										

+3, ×5 : Numbers refer to Sensitivity

15 20 10 ◇ 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLES : 5 & 25

RECORD OF BOREHOLE No 5

METRIC

FORMERLY BH 13 WP 197-77-04

W P 197-77-07 LOCATION Co-ords. 4 820 420.6 N; 286 606.8 E ORIGINATED BY JH

DIST 4 HWY 403/407 BOREHOLE TYPE Cont'. Flight Auger (S.A.) & Cone Test COMPILED BY JH

DATUM Geodetic DATE 82 11 09 CHECKED BY

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
180.3	Ground Surface										
0.0	Heterogeneous Mixture of Silty Clay (CL) Sand & Gravel Hard Glacial Till		1	SS	40		180				
			2	SS	52		178				
			3	SS	67						
			4	SS	42		176				0 27 49 24
			5	SS	49						
			6	SS	110		174				
			7	SS	100/	7.5 cm					
			8	SS	100/	12.5 cm	172				5 26 54 15
			9	SS	68/	15 cm	170				
			10	SS	70/	15 cm					29 38 29 5
165.5			11	SS	100/	12.5 cm	168				16 29 43 12
14.6	Sandy Silt to Silty Sand, Some Gravel Trace of Clay V. Dense		12	SS	80/	7.5 cm	166				2 44 47 7
			13	SS	100/	7.5 cm	164				
158.7			14	SS	100/	5 cm	162				16 35 39 10
21.4	End of Borehole						160				
	Weathered Red Shale										

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

15 20/10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 2

RECORD OF BOREHOLE No 5A

METRIC

FORMERLY BH 10 WP 197-77-05

W P 197-77-07 LOCATION Co-ords. N 4 820 518.2; E 286 466.6 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone COMPILED BY JH

DATUM Geodetic DATE 82 11 08 CHECKED BY

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 W_L — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.2	Ground Surface						182				
0.0	Heterogeneous Mixture of Silty Clay, Sand & Gravel (Glacial Till) Very Stiff to Hard		1	SS	40		180		○		8 22 51 19
			2	SS	78			100/27.5 cm			
			3	SS	45		178		○		6 31 44 19
			4	SS	18				○		
			5	SS	42						
			6	SS	41		176		○		7 31 42 20
			7	SS	33						
			8	SS	23				○		3 31 45 21
			9	SS	67	23 cm	174				
			10	SS	60	5 cm			○		6 38 43 13
			11	SS	68		172				
			12	SS	90	25 cm	170		○		6 31 45 18
168.5											
13.7	Sandy Silt to Silty Sand, Traces of Gravel & Clay Compact to Very Dense		13	SS	13		168				
							166				
			14	SS	60	8 cm	164		○		3 41 48 8
162.4											
19.8	Weathered Red Shale						162				
			15	SS	110	5 cm					
							160				
157.7											
			16	SS	100	10 cm	158				
24.5	End of Borehole										

+[3], ×[5] : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications, Ontario

APPLICABLE TO POLE : 17

RECORD OF BOREHOLE No 5B

METRIC

FORMERLY BH 11 WP 197-77-05

W P 197-77-07 LOCATION Co-ords. N 4 820 560.3; E 286 415.4 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone COMPILED BY JH

DATUM Geodetic DATE 82 11 08 CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	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 W_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.7	Ground Surface						182				
0.0	Heterogeneous Mixture of Silty Clay, Sand & Gravel (Glacial Till) Very Stiff to Hard		1	SS	37		180				
			2	SS	88						
			3	SS	79		178				
			4	SS	47						
			5	SS	29		176				5 29 47 19
			6	SS	24						
			7	SS	28		174				3 28 48 21
			8	SS	28						
			9	SS	40	23 cm					5 25 46 24
			10	SS	60	10 cm	172				9 39 43 9
			11	SS	50	8 cm					
168.2			12	SS	70	15 cm	170				18 26 39 17
14.5	Sandy Silt to Silty Sand, Some Gravel, Trace Clay Very Dense		13	SS	60		168				
			14	SS	30	3 cm	166				13 48 34 5
162.9											
19.8	Weathered Red Shale						164				
161.3			15	SS	100	8 cm	162				
21.4	End of Borehole										

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

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

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

FOR INFORMATION ONLY

RECORD OF BOREHOLE No 6

METRIC

FORMERLY BH 1 WP 197-77-08

W P 197-77-07 LOCATION Co-ords N 4 821 000; E 286 667 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 16 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH: ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	WATER CONTENT (%)		GR SA SI CL
180.7 0.0	Ground Level						180				
			1	SS	49	▽ Estimated					
	Heterogeneous mixture of silty clay sand and gravel occ. sand seams		2	SS	105		178				
			3	SS	58		176				
	Hard Glacial Till		4	SS	111		174				
172.6 8.1	End of Borehole		5	SS	89						
	WL not observed										

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

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

Ministry of Transportation and Communications
Ontario

FOR INFORMATION ONLY

RECORD OF BOREHOLE No 9

FORMERLY BH 7 WP 197-77-08

METRIC

W P 197-77-0 LOCATION Co-ords N 4 820 628; E 286 428 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geoderic DATE 83 02 14 CHECKED BY

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 W_L — 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
182.4	Ground Level										
0.0							182				
			1	SS	35						
	Heterogeneous mixture of silty clay sand and gravel						180				
			2	SS	69						3 26 49 22
	Occasional sand and silt seams										
			3	SS	26		178				9 24 47 20
			4	SS	26		176				
	V. Stiff to Hard Glacial Till										
			5	SS	35						8 28 48 16
							174				
			6	SS	33						
171.3							172				
			7	SS	63						
11.1	End of Borehole										

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

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

OFFICE RETURN ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

FOR INFORMATION ONLY

RECORD OF BOREHOLE No 10

FORMERLY BH 9 WP 197-77-08

METRIC

W P 197-77-07 LOCATION Co-ords N 4 820 488; E 286 595 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 11 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) SHEAR STRENGTH: o UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, x 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
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
180.2	Ground Level										
0.0	Heterogeneous mixture of silty clay sand and gravel						180				
			1	SS	37	▼	178				
			2	SS	76						
	Hard Glacial Till		3	SS	35		176				
			4	SS	33		174				
			5	SS	47		172		o ⊢		9 32 43 16
170.6			6	SS	91				o ⊢		5 38 47 10
9.6	End of Borehole										

$+^3$, x^5 : Numbers refer to Sensitivity

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

Ministry of Transportation and Communications
Ontario

FOR INFORMATION ONLY

RECORD OF BOREHOLE No 11

METRIC

FORMERLY BH 10 WP 197-77-08

W P 197-77-07 LOCATION Co-ords N 4 820 554; E 286 596 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 14 CHECKED BY LD

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
180.8	Ground Level										
0.0	Heterogeneous mixture of silty clay sand and gravel		1	SS	24	▼	180		○		6 20 48 26
			2	SS	50		178				
	V. Stiff to Hard Glacial Till		3	SS	34		176				
			4	SS	33		174				
			5	SS	99		172				
171.2			6	SS	42						
9.6	End of Borehole										

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

15 20/10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications, Ontario

FOR INFORMATION ONLY

RECORD OF BOREHOLE No 12 (FORMERLY BH 6 WP 197-77-02) METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 651 ; E 286 577 ORIGINATED BY JH

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY JH

DATUM Geodetic DATE 1982 11 02 and 03 CHECKED BY

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, x LAB VANE)	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
181.6	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay, Sand, Gravel (Glacial Till) Very Stiff to Hard		1	SS	22		180				8 23 49 20
			2	SS	42						
			3	SS	67		178				
			4	SS	86						5 21 52 22
175.3							176				
6.3	Some Gravel		5	SS	75/23 cm						13 23 44 20
			6	SS	82		174				10 40 43 7
	Sandy Silt to Silty Sand Trace Clay Very Dense Glacial Till with Gravel		7	SS	40/8 cm		172				
			8	SS	78		170				37 37 24 2
	Trace Gravel		9	SS	72/15 cm		168				
			10	SS	100/8 cm		166				7 43 44 6
161.8							164				
19.8	Weathered Red Shale						162				
158.7							160				
22.9	End of Borehole										

+3, x5 : Numbers refer to Sensitivity

15 20 5 (%) STRAIN AT FAILURE 10

Ministry of Transportation and Communications Ontario

APPLICABLE TO POLE : 7

RECORD OF BOREHOLE No 13 (FORMERLY BH 102 WP 197-77-03) METRIC

W P 197-77-07 LOCATION Co-ords N 4 820 741 ; E 286 632 ORIGINATED BY DBC

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (H.S.) & Cone Test COMPILED BY PP

DATUM Geodetic DATE 81 12 23 - 82 01 05 CHECKED BY GP.

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
181.0	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay Sand & Gravel V. Stiff to Hard Glacial Till		1	SS	22		180				16 23 43 18
			2	SS	29	▽ Estimated					
			3	SS	27						3 31 42 24
			4	SS	72		178				
			5	SS	38						
			6	SS	33		176				
			7	SS	39						26 23 32 20
			8	SS	111						6 31 55 8
			9	SS	83		174				15 34 38 13
172.5			10	SS	110/18 cm						10 30 45 15
8.5	Sandy Silt to Silty Sand Traces of Gravel & Clay Occ. Silty Clay Layers V. Dense Glacial Till		11	SS	125/23 cm		172				
			12	SS	186/15 cm		170				6 24 61 9
			13	SS	100/10 cm						
			14	SS	115/13 cm		168				11 43 40 6
			15	SS	49		166				
			16	SS	100/ 10 cm		164				4 38 48 10
			17	SS	100/ 15 cm		162				
			18	SS	67/ 15 cm						1 12 82 5
160.3											
20.7 / 159.5	Reddish Brown Weathered Shale		19	SS	100/ 15 cm		160		Wp = 14% WL = 52%		0 26 57 17
21.5	End of Borehole WL not observed										

+3, ×5 : Numbers refer to Sensitivity

15 20/10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLES : 6 & 9

RECORD OF BOREHOLE No 14 (FORMERLY BH 4 WP 197-77-03) METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 604 ; E 286 684 ORIGINATED BY JH
DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY PP
DATUM Geodetic DATE 82 10 29 and 82 11 01 CHECKED BY

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 W_L — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
180.8	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay Sand & Gravel Hard Glacial Till		1	SS	30	▼	180				
			2	SS	42						
			3	SS	61						
			4	SS	92		178				11 23 44 22
			5	SS	40/8 cm		176				
			6	SS	43						
			7	SS	60/15 cm		174				
170.7			8	SS	30/8 cm		172				
10.1	Silty Sand to Sandy Silt Traces of Gravel & Clay V. Dense Glacial Till		9	SS	30/8 cm		170				
			10	SS	90/3 cm		168				
165.6							166				
15.2	Silty Clay Some Sand Hard		11	SS	30/8 cm		164				0 12 61 27
160.9			12	SS	60/8 cm		162				
19.9	End of Borehole Reddish Brown Weathered Shale										

+3, ×5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 24

RECORD OF BOREHOLE No 15

METRIC

FORMERLY BH 14 WP 197-77-08

W P 197-77-07 LOCATION Co-ords N 4 820 743; E 286 734 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 11 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
179.3	Ground Level										
0.0	Heterogeneous mixture of silty clay sand and gravel occasional boulders		1	SS	34	▼	178				
	Hard Glacial Till		2	SS	63		176				
174.7											
4.6	Sandy silt to silty sand Traces of gravel and clay		3	SS	70	15cm	174		○		4 42 49 5
			4	SS	85	15cm			○		6 39 43 10
	Occasional silty clay layers		5	SS	90	15cm	172				
	V. dense Glacial Till										
170.0			6	SS	105	15cm	170				
9.3	End of borehole										

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

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

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLES: 10, 11

RECORD OF BOREHOLE No 16

METRIC

FORMERLY BH 15 WP 197-77-08

W P 197-77-07 LOCATION Co-ords N 4 820 874; E 286 754 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 10 CHECKED BY

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
181.0	Ground Level										
0.0	Heterogeneous mixture of silty clay sand and gravel occasion sand seams		1	SS	33	▼	180				
			2	SS	65		178				
	Hard Glacial Till		3	SS	57		176				
175.8											
5.2	Sandy silt to silty sand		4	SS	97	20cm			○		11 41 43 5
			5	SS	59						
			6	SS	64		174				
	Traces of gravel and clay		7	SS	39						
			8	SS	82						
			9	SS	120	25cm					
			10	SS	118	28cm	172		○ H		
	Occasional silty clay layers		11	SS	100	13cm					12 24 54 10
	Dense to V. Dense Glacial Till		12	SS	100	15cm	170				
			13	SS	108	15cm			○		3 36 56 5
			14	SS	105	15cm	168				
165.1			15	SS	110		166		○		5 66 27 2
15.9	End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

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

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 12

RECORD OF BOREHOLE No 17

METRIC

FORMERLY BH 16 WP 197-77-08

W P 197-77-07 LOCATION Co-ords N 4 821 081; E 286 892 ORIGINATED BY PP

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 03 CHECKED BY [illegible]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT N (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 (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
181.0	Ground Level										
0.0	Heterogeneous mixture of silty clay, sand and gravel		1	SS	71	▼	180				
			2	SS	91		178				
	Hard Glacial Till		3	SS	88		176		o		
			4	SS	121						
			5	SS	104		174				
			6	SS	133/23cm				o		6 22 39 33
			7	SS	110/20cm						
			8	SS	128/23cm				o		10 32 48 10
172.1			9	SS	94/15cm		172				
8.9	Sandy silt to Silty sand Traces of gravel and clay Occasional silty clay layers V. dense Glacial Till		10	SS	100/13cm						
			11	SS	107/15cm						
			12	SS	149/23cm						
			13	SS	101				o		10 27 48 15
			14	SS	120		170				
			15	SS	100/10cm						
168.2											
12.8	Silty clay and/or Weathered shale Hard weathered shale		16	SS	100/8cm		168				
165.6			17	SS	95/15cm		166		o		18 21 48 13
15.4	End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 13

RECORD OF BOREHOLE No 18

METRIC

FORMERLY BH 17 WP 197-77-08

W P 197-77-07 LOCATION Co-ordsN4 821 206; E 286 974 ORIGINATED BY DD

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 04 CHECKED BY LO

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, x 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
179.6	Ground Level										
0.0	Heterogeneous mixture of silty clay (Low to medium plasticity) sand and gravel Hard Glacial till		1	SS	37		178				
			2	SS	102	▼	176		o		3 29 55 13
175.3											
4.3	Silty sand to sandy silt traces of gravel and clay V. dense Glacial till		3	SS	100		174				
			4	SS	130						
			5	SS	100	15 cm					
			6	SS	85	15 cm					
			7	SS	120	15 cm	172				
			8	SS	100	8 cm					
			9	SS	100	15 cm					
			10	SS	100	8 cm					
			11	SS	100	8 cm					
			~~12~~	~~SS~~	~~180~~	8 cm	170				
			13	SS	85						
			14	SS	85	15 cm					
			15	SS	100		168				
166.4											
13.2	Silty clay some sand occ. shale fragments and layers Hard		~~16~~	~~SS~~	~~125~~	15 cm	166				
			~~17~~	~~SS~~	~~125~~	8 cm					
162.8			~~18~~	~~SS~~	~~100~~	8 cm	164				
16.8	End of Borehole										

+3, x5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 14

RECORD OF BOREHOLE No 19

METRIC

FORMERLY BH 18 WP 197-77-08

W P 197-77-07 LOCATION Co-ords N 4 821 348; E 287 065 ORIGINATED BY PP & BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 07 and 83 02 08 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 WL — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
178.5	Ground Level						178				
0.0	Heterogeneous mixture of silty clay, sand and gravel occ. boulders Hard Glacial till		1	SS	40		176				
			2	SS	107						
173.9							174				
4.6	Silty sand to sandy silt traces of gravel and clay Dense to V. Dense Glacial Till		3	SS	47				○		0 22 76 2
			4	SS	100/13 cm		172				
			5	SS	115/15 cm						
			6	SS	100/ 5 cm				○		5 38 52 5
			7	SS	100/15 cm						
			8	SS	100/ 5 cm						
			9	SS	100/10 cm		170				
			10	SS	102/15 cm				○		1 39 56 4
168.6											
9.9	Silty clay and/or weathered shale Hard		11	SS	100/15 cm		168				
166.3											
12.2	Refusal End of Borehole		12	SS	60/ 3 cm						

+3, ×5 : Numbers refer to Sensitivity

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

APPLICABLE TO POLE : 15

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 20

FORMERLY BH 19 WP 197-77-08

METRIC

W P 197-77-07 LOCATION Co-ords N 4 821 500; E 287 169 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 08 CHECKED BY Le

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 (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
174.6	Ground Level										
0.0	Heterogeneous mixture of silty clay, sand and gravel		1	SS	72	▽	174				
			2	SS	65/15cm		Estimated				
	Hard Glacial Till		3	SS	58		172				
170.2			4	SS	100/15cm						
4.4	Silty clay and/or weathered shale		5	SS	60/ 5cm		170				
			6	SS	70/15cm						
	Shale Hard		7	SS	95/15cm						
6.2	End of borehole										
	WL not observed										

+3, ×5 : Numbers refer to Sensitivity

15 20 5 10 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE: 16

RECORD OF BOREHOLE No 21

METRIC

FORMERLY BH 21 WP 197-77-08

W P 197-77-07 LOCATION Co-ords N 4 821 647; E 287 275 ORIGINATED BY BR

DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP

DATUM Geodetic DATE 83 02 08 and 09 CHECKED BY [illegible]

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 Wl — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
178.3	Ground Level										
0.0							178				
			1	SS	56	▽ Estimated	176				
			2	SS	64						
							174				
	Heterogeneous mixture of silty clay sand and gravel occ. sand and silt seams		3	SS	30				○ ⊢		13 28 40 19
			4	SS	27		172				
			5	SS	23						
	Hard Glacial Till		6	SS	63						
			7	SS	60		170				
			8	SS	75/15 cm						
	occ. shale fragments and layers		9	SS	80/3 cm		168				
166.1											
12.2	End of Borehole WL not observed										

+3, ×5 : Numbers refer to Sensitivity

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

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 3

RECORD OF BOREHOLE No 22

METRIC

FORMERLY BH 7 WP 197-77-17

W P 197-77-07 LOCATION Co-ords. N 4 820 695.2; E 286 518.5 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY JH

DATUM Geodetic DATE 1982 11 05 and 08 CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
180.9	Ground Level							
0.0	Heterogeneous Mixture of Silty Clay, Sand, Gravel (Glacial Till) Very Stiff to Hard		1	SS	19		180	
			2	SS	35			
			3	SS	51		178	6 25 50 19
			4	SS	43			
			5	SS	20			10 26 48 16
			6	SS	16		176	5 26 44 25
175.0			7	SS	24			9 25 42 24
5.9	Sandy Silt to Silty Sand, Some Gravel, Trace Clay Dense to Very Dense		8	SS	27		174	
			9	SS	43			
			10	SS	62			25 44 26 5
170.6			11	SS	60/15 cm		172	
10.3	Silty Clay with Sand Trace Gravel Hard		12	SS	60/15 cm		170	9 30 42 19
			13	SS	80/10 cm			5 31 42 22
167.2							168	
13.7	Sandy Silt to Silty Sand, Trace Gravel, Clay Very Dense		14	SS	60/15 cm		166	6 36 54 4
			15	SS	60/8 cm		164	
161.4							162	
19.5	Weathered Red Shale							
159.5			16	SS	80/8 cm		160	
21.4	End of Borehole							

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE

PLASTIC LIMIT W_p NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L

WATER CONTENT (%) 10 20 30

UNIT WEIGHT γ

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

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

FOR INFORMATION ONLY

RECORD OF BOREHOLE No 23

METRIC

FORMERLY BH 17 WP 197-77-17

W P 197-77-07 LOCATION Co-ords. N 4 820 692.5; E 286 607.3 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY JH

DATUM Geodetic DATE 1982 11 03 CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	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
180.6	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay, Sand, Gravel (Glacial Till) Very Stiff to Hard		1	SS	23		180				
			2	SS	36				○		3 27 50 20
			3	SS	66	▽ Estimated	178				
			4	SS	64		176				
173.4			5	SS	42		174		○		8 25 44 23
7.2	Sandy Silt to Silty Sand, Some Gravel Trace Clay Very Dense		6	SS	70				○		2 74 20 4
			7	SS	94		172				
			8	SS	60/ 8 cm		170		○		18 48 28 5
			9	SS	70/ 15 cm		168				
			10	SS	90/ 10 cm		166		○		12 46 37 5
			11	SS	100/ 15 cm		164				
160.8							162				
19.8	Weathered Red Shale										
159.2			12	SS	100/ 8 cm		160		○		10 15 52 23
21.4	End of Borehole										

Note:

No Groundwater Level Measurements Were Carried Out.

+3, ×5 : Numbers refer to Sensitivity

15 20 10 ◇ 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : 4

RECORD OF BOREHOLE No 24

FORMERLY BH 9 WP 197-77-17

METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 735.6; E 286 548.0 ORIGINATED BY JH

DIST 4 HWY 403 BOREHOLE TYPE Cont. Flight Auger (S.A.) & Cone Test COMPILED BY JH

DATUM Geodetic DATE 1982 11 04 and 05 CHECKED BY

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 (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
180.1	Ground Level						180				
0.0			1	SS	26						
			2	SS	70		178				5 27 46 22
	Heterogeneous Mixture of Silty Clay, Sand, Gravel (Glacial Till) Very Stiff to Hard		3	SS	36		176				8 30 43 19
			4	SS	41		174				17 22 45 16
			5	SS	46		172				
			6	SS	97						17 26 43 14
169.1							170				
11.0			7	SS	60/ 15 cm		168				3 27 64 6
	Sandy Silt to Silty Sand, Trace Gravel, Clay Very Dense		8	SS	71/ 15 cm		166				10 48 37 5
							164				
			9	SS	62/ 15 cm		162				
160.3											
19.8	Weathered Red Shale						160				
158.7			10	SS	60/ 3 cm						
21.4	End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

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

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLES: #31, #32

RECORD OF BOREHOLE No 25

(Formerly B.H. 2 W.P. 158-75-04)

METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 118 E 287 395 ORIGINATED BY VK

DIST 4 HWY 403 BOREHOLE TYPE Hollow Stem Auger COMPILED BY VK

DATUM Geodetic DATE 76 06 30 CHECKED BY RS

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	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
181.4	Ground Level										
0.0	Topsoil										
	Heterogeneous Mixture of Silty Clay, with sand occasional gravel		1	SS	45		180				0 34 52 14
			2	SS	100/23 cm						
			3	SS	98/23 cm		178				
	Brown Grey		4	SS	100/20 cm	▼					
	(Glacial Till)		5	SS	100/15 cm		176		○		
	Hard		6	SS	125/15 cm						
			7	SS	100/23 cm		174				
171.0			8	SS	97		172				0 11 47 42
10.4	Silt with trace of sand, occasional silty clay layers		9	SS	54				○		0 23 68 9
	Very Dense gravelly sand		10	SS	115		170		○		22 75 (3)
			11	SS	125/27 cm		168				
	Silty Clay Hard		12	SS	100/23 cm		166				0 2 87 11
			13	SS	70/28 cm				○		0 3 95 2
162.8	Silty Clay Hard		14	SS	100		164				0 1 89 10
18.6	End of Borehole						162				

+3, ×5 : Numbers refer to Sensitivity

15 20 5 (%) STRAIN AT FAILURE 10

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Ontario

APPLICABLE TO POLES: #18, #19

RECORD OF BOREHOLE No 119 METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 269; E 286 258 ORIGINATED BY JC
DIST 4 HWY 407/403 BOREHOLE TYPE SS Auger COMPILED BY BR
DATUM Geodetic DATE 84 12 07 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 WL / WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.9	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay (CL) Sand and Gravel Glacial Till Very Stiff to Hard		1	SS	36	▼	182		○		
			2	SS	40						
			3	SS	44		180				
			4	SS	46						
			5	SS	35		178				
			6	SS	24				○		
			7	SS	24		176				6 28 47 19
172.9			8	SS	55		174				
10.0	Silty Sand Some Gravel trace clay Very Dense occasional boulders		9	SS	100/ 31 cm		172				17 31 42 10
170.5			10	SS	100/ 23 cm				○		
12.4	End of Borehole						170				

+3, ×5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

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Ontario

APPLICABLE TO POLES: #20, #21

RECORD OF BOREHOLE No 121 METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 091; E 286 002 ORIGINATED BY JC
DIST 4 HWY 407/403 BOREHOLE TYPE SS Auger COMPILED BY BR
DATUM Geodetic DATE 84 12 06/07 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 WL — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
179.7	Ground Level										
	Heterogeneous Mixture of Silty Clay (CL) Sand and Gravel Glacial Till Very Stiff to Hard		1	SS	67		178				
			2	SS	43						
			3	SS	82						7 27 45 21
			4	SS	61		176				
			5	SS	25						3 29 46 22
			6	SS	29		174				
170.7			7	SS	22		172				
9.0	Silty Sand to SandySilt Very Dense, some clay Trace Gravel occasional boulders		8	SS	100		170				
169.0			9	SS	100/8 cm						4 35 45 16
10.7	End of Borehole						168				

+3, ×5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

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Ministry of Transportation and Communications
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APPLICABLE TO POLES: #22, #23

RECORD OF BOREHOLE No 123 METRIC

W P 197-77-07 LOCATION Co-ords. N 4 819 835; E 285 782 ORIGINATED BY JC
DIST 4 HWY 407/403 BOREHOLE TYPE SS Auger COMPILED BY BR
DATUM Geodetic DATE 84 12 06 CHECKED BY

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 W_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
183.3	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay Sand and Gravel Hard		1	SS	44						
181.1			2	SS	71		182				
2.2	Sandy Silt to Silty Sand trace of clay trace of gravel		3	SS	75/23cm	▼					
			4	SS	100		180				0 50 46 4
			5	SS	100				○		
	Very Dense Fine Sand Layer		6	SS	100		178				1 86 10 3
			7	SS	100/18cm		176				
			8	SS	100/23cm		174				
172.6											
10.7	Weathered Shale bedrock Red		9	SS	100/10cm		172		○ H		5 40 35 20
171.0			10	SS	100/10cm						
12.3	End of Borehole						170				

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

15 20/10 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

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Ontario

APPLICABLE TO POLE : #27

RECORD OF BOREHOLE No 127 METRIC

W P 199-77-07 LOCATION Co-ords. N 4 820 531; E 286 940 ORIGINATED BY JC
DIST 4 HWY 407/403 BOREHOLE TYPE SS Auger COMPILED BY MJK
DATUM Geodetic DATE 84 12 05 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT N 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
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
179.7	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay (CL) Sand and Gravel Glacial Till Very Stiff to Hard		1	SS	18	▼	178				5 26 48 21
			2	SS	63						
			3	SS	70						
175.7			4	SS	100/31 cm		176				
4.0	Silty Sand to Sandy Silt Trace of Clay Trace of Gravel Very Dense		5	SS	100/23 cm						6 42 41 11
			6	SS	100/10 cm		174				
			7	SS	100/10 cm		172				
			8	SS	100/25 cm						1 17 78 4
			9	SS	100/28 cm		170				
167.2			10	SS	100/34 cm		168				
12.5	End of Borehole						166				

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLES: #28, #29

RECORD OF BOREHOLE No 129 METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 377; E 287 093 ORIGINATED BY JC
DIST 4 HWY 407/403 BOREHOLE TYPE SS Auger COMPILED BY MJK
DATUM Geodetic DATE 84 12 05/06 CHECKED BY

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 W_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
181.2	Ground Level										
0.0	Heterogeneous Mixture of Silty Clay (CL-CI) Sand and Gravel Glacial Till		1	SS	60/23 cm	▼	180				
	Hard		2	SS	47		178		○		
175.8			3	SS	32		176				
5.4	Sandy Silt to Silty Sand Trace to Some Clay Trace Gravel		4	SS	22						0 49 47 4
			5	SS	100/18 cm		174				
	Silt Layer		6	SS	100/20 cm		172				1 10 75 14
	Compact to Very Dense						170				
169.0			7	SS	100/8 cm						3 45 44 8
12.2	End of Borehole						168				

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : #30

RECORD OF BOREHOLE No 130 METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 212; E 287 175 ORIGINATED BY JC
DIST 4 HWY 407/403 BOREHOLE TYPE SS Auger COMPILED BY MJK
DATUM Geodetic DATE 84 12 04 CHECKED BY

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 W_L / WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
180.2	Ground Level						180				
0.0	Heterogeneous Mixture of Silty Clay (CL) Sand and Gravel Glacial Till Very Stiff to Hard		1	SS	27						
			2	SS	41						
			3	SS	82	▼	178		○ —		
176.3			4	SS	93/28 cm						
3.9			5	SS	102/28 cm		176				1 32 48 19
	Sandy Silt Some Clay Trace Gravel Very Dense occasional cobbles or boulders		6	SS	100/16 cm		174				
			7	SS	100/17 cm		172				0 19 65 16
			8	SS	100/15 cm						
			9	SS	100/23 cm		170				
167.9			10	SS	100/15 cm		168				
12.3	End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

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

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

APPLICABLE TO POLE : . #33

RECORD OF BOREHOLE No 133 METRIC

W P 197-77-07 LOCATION Co-ords. N 4 820 000; E 287 645 ORIGINATED BY JC
DIST 4 HWY 407/403 BOREHOLE TYPE SS Auger COMPILED BY MJK
DATUM Geodetic DATE 84 12 04/05 CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.7	Ground Level							
0.0	Heterogeneous Mixture of Silty Clay (CL) Sand and Gravel Glacial Till Stiff to Hard		1	SS	8		182	
			2	SS	44			
			3	SS	76/23 cm		180	2 26 49 23
			4	SS	100/25 cm			
			5	SS	100/18 cm	▼	178	1 25 52 22
176.4			6	SS	100/31 cm			
6.3	Sandy Silt trace clay Dense to Very Dense		7	SS	42		176	
			8	SS	100/20 cm		174	0 10 85 5
			9	SS	100/18 cm		172	
170.1			10	SS	82/28 cm		170	
12.6	End of Borehole							

DYNAMIC CONE PENETRATION RESISTANCE PLOT — 20 40 60 80 100

SHEAR STRENGTH
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT Wp — NATURAL MOISTURE CONTENT W — LIQUID LIMIT W_L
WATER CONTENT (%) 10 20 30

UNIT WEIGHT γ

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

15 ⟨ 20/10 ⟩ 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO ONHWY 1967 79 01

METRIC

DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.
ELEVATIONS, COORDINATES, CURVE AND ALIGNMENT DATA ARE IN METRES.
STATIONS ARE IN KILOMETRES + METRES.

CONT No
WP No 197-77-16

RETAINING WALLS AT BURNHAMTHORPE RD. U'PASS
GENERAL ARRANGEMENT

SHEET

GENERAL NOTES

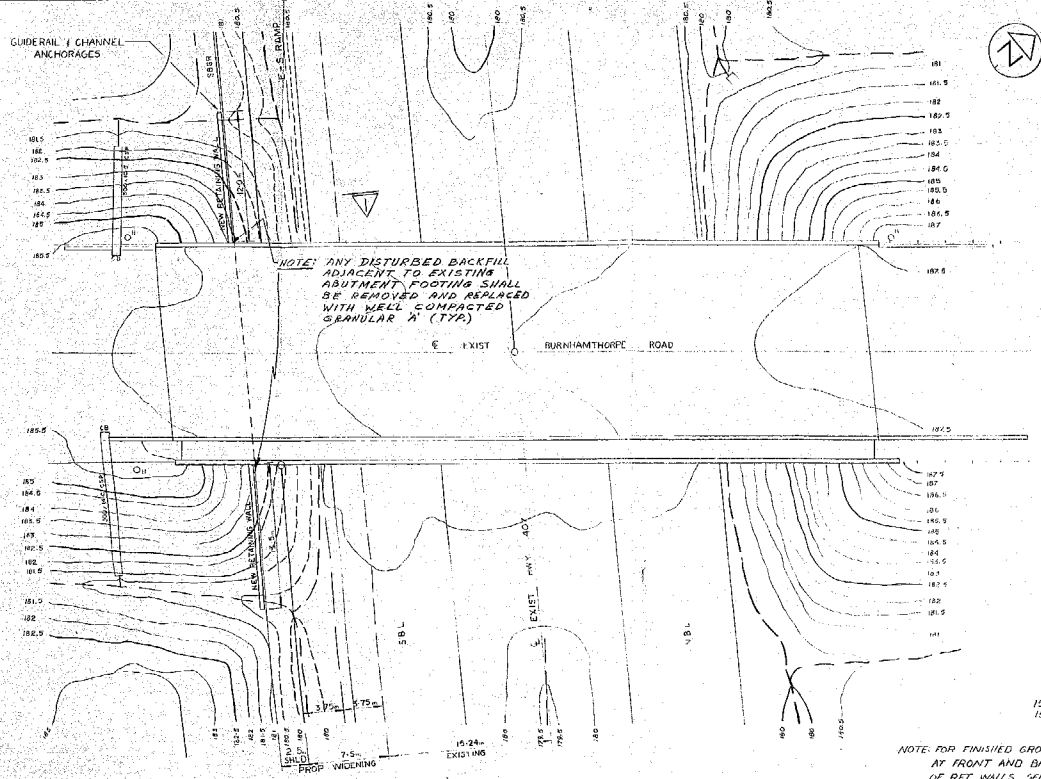
CLASS OF CONCRETE : 20MPa

REINFORCING STEEL
1. REINFORCING STEEL SHALL BE GRADE 400
2. BARS MARKED WITH SUFFIX 'C' SHALL BE COATED BARS
3. CLEAR COVER TO REINFORCING STEEL SHALL BE 70±20mm EXCEPT AS NOTED

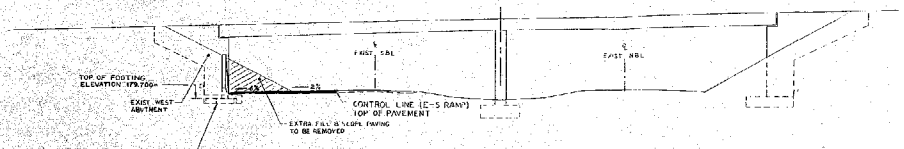
CONCRETE QUANTITIES
FOOTINGS ..... 35 m³
RETAINING WALLS .. 29 m³
(LUMP SUM TENDER ITEM)

NOTE:
CONTRACTOR SHALL EXERCISE CARE AND PROVIDE PREVENTATIVE MEASURES TO AVOID UNDERMINING OF APPROACH SLAB DURING EXCAVATION OF EMBANKMENT AT ABUTMENT/RETAINING WALL LOCATION.

LIST OF DRAWINGS
1. GENERAL ARRANGEMENT
2. DETAILS

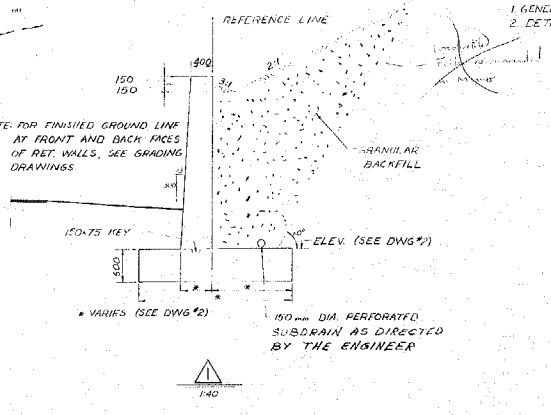


PLAN
SCALE 1:200



NOTE: FOOTINGS FOR RET. WALLS SHALL NOT BE PLACED LOWER THAN THE EXISTING ABUTMENT FOOTINGS.

ELEVATION
SCALE 1:200



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DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

REVISIONS			
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DESIGN H.K.T.	CHECK	LOADING	DATE 06 85
DRAWING S.G.	CHECK	SITE No 10-82-R80	DWG 1

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO DB-BT 1324-73-01

METRIC

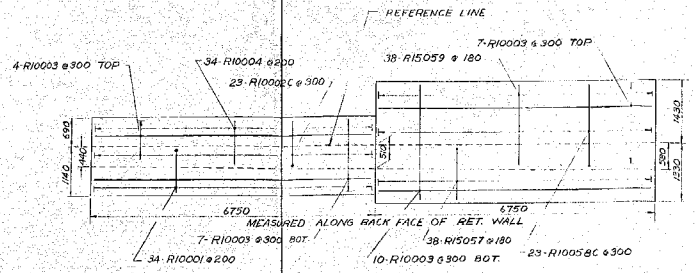
DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN. ELEVATIONS, COORDINATES, CURVE AND ALIGNMENT DATA ARE IN METRES. STATIONS ARE IN KILOMETRES – METRES.

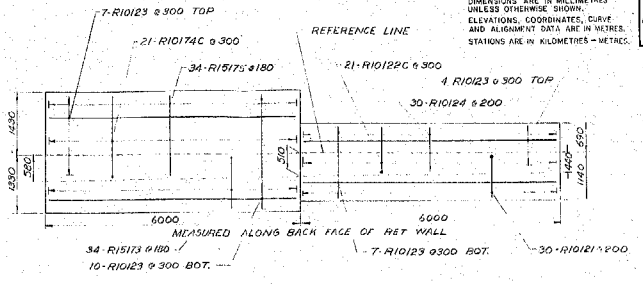
CONT No
WP No 197-77-16

RETAINING WALLS AT BURNHAMTHORPE RD. U'PASS
DETAILS

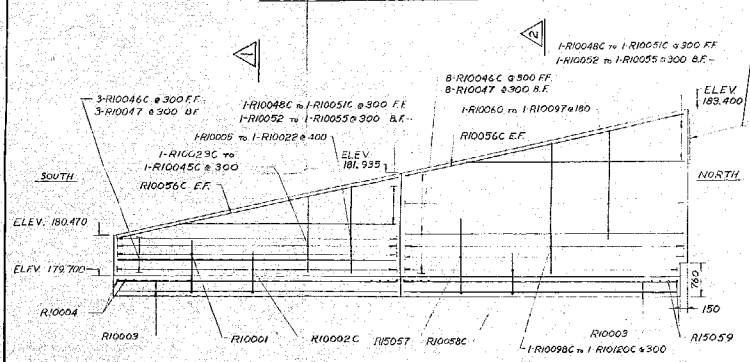
SHEET

NOTES:
FF. DENOTES FRONT FACE
BF. DENOTES BACK FACE
EF. DENOTES EACH FACE

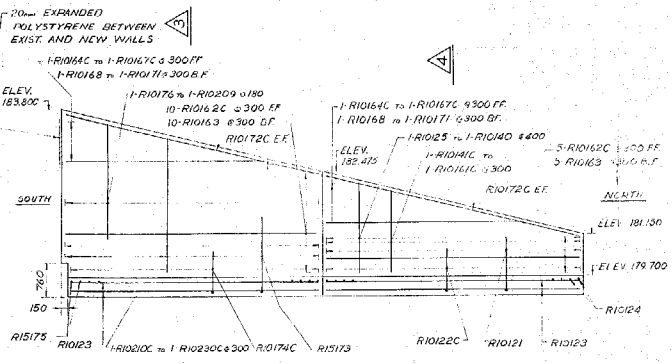




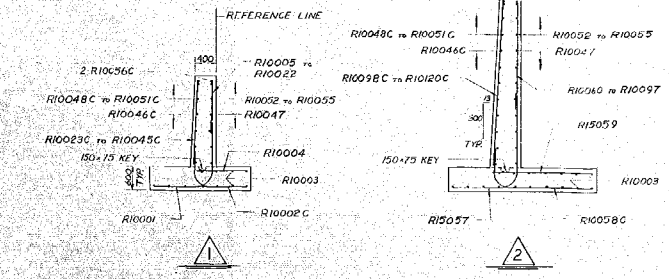
PLAN OF SOUTH FOOTING



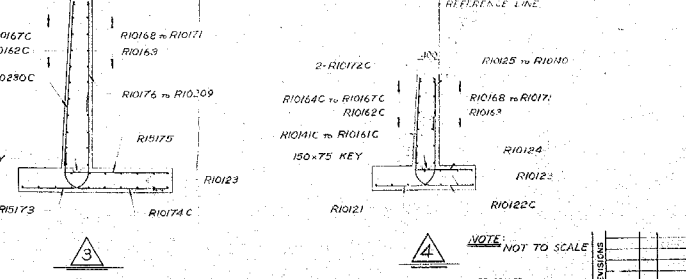
PLAN OF NORTH FOOTING



ELEVATION OF SOUTH WALL



ELEVATION OF NORTH WALL



4 NOTE: NOT TO SCALE

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

REVISIONS			
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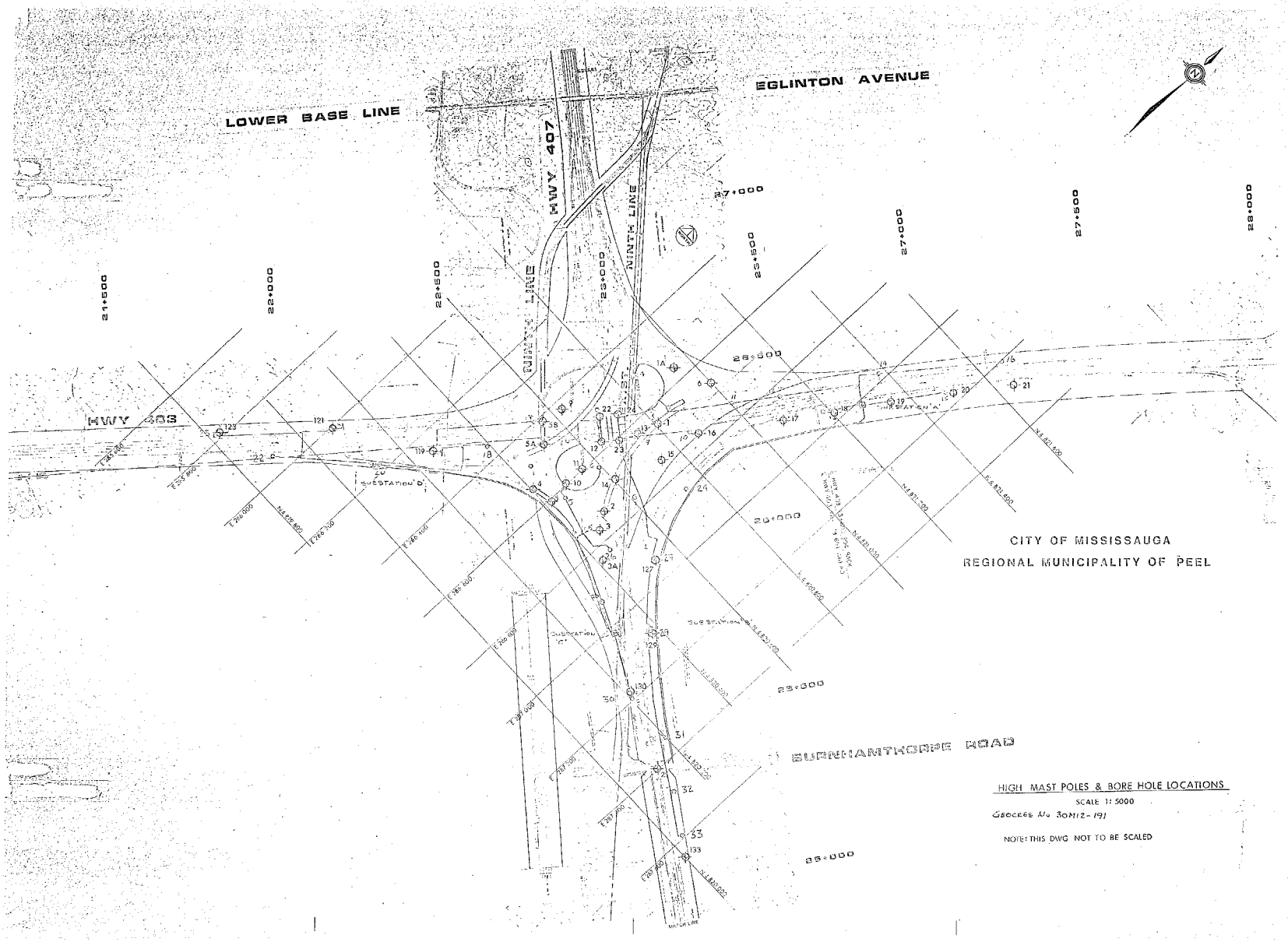
LOWER BASE LINE
EGLINTON AVENUE
HWY 407
CHINGUACOUSY LINE
NINTH LINE
HWY 403
BURNHAMTHORPE ROAD
21+500
22+000
22+500
23+000
23+500
24+000
24+500
25+000
25+500
26+000
26+500
27+000
27+500
28+000
Substation 'D'
Substation 'C'
CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF PEEL
HIGH MAST POLES & BORE HOLE LOCATIONS
SCALE 1: 5000
Geocres No 30M12-191
NOTE: THIS DWG NOT TO BE SCALED