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W.P. No. 658-93-01

CONT. No. 96-12

W. O. No.

STR. SITE No. 37-0994

HWY. No. 427

LOCATION Disco Rd. Overpass
NBL & SB2

No of PAGES -

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

FOUNDATION INVESTIGATION REPORT

CONTRACT NO. 96-12



Ontario

**Ministry of
Transportation**

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Note: For purposes of the contract, this report supersedes all other Foundation Reports prepared by, or for the Ministry in connection with the above-mentioned project.

EXPLANATION OF TERMS USED IN REPORT

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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 (R Q D), FOR MODIFIED RECOVERY, IS:

R Q D (%)	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

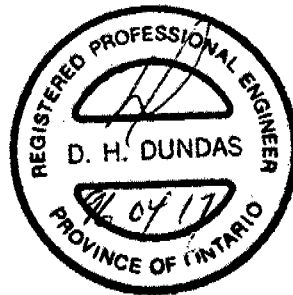
ρ_s	kg/m ³	DENSITY OF SOLID PARTICLES	e	1, %	VOID RATIO	e_{min}	1, %	VOID RATIO IN DENSEST STATE
γ_s	kn/m ³	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
ρ_w	kg/m ³	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
γ_w	kn/m ³	UNIT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

Foundation Investigation Report
for
Highway 427 Overpass Widening at Goreway Drive and Disco Road
W.P. 658-93-01, Site 37-0994
Central Region

The following report is a copy of the factual information from the Foundation Investigation and Design Report for WP 387-65-00, Contract 76-01. The foundation investigation report was prepared for the existing structures by MTO Foundations Unit and represents the subsurface conditions for the proposed widening of the existing CNR Overhead structures at Highway 427.

Imperial units of measure are used in the report and on the Record of Borehole sheets. The original ground elevations shown on the borehole logs may differ from present day elevations as a result of the construction of the existing structures.

This report contains the detailed subsurface conditions, the Record of Borehole sheets, and the location of the borings in plan.



D. Dundas, P.Eng.
Sr. Foundation Engineer

FOUNDATION INVESTIGATION REPORT

For

Proposed Overpass Structures at the Crossing
of Hwy. #427 (S.B.L. and N.B.L.)
Disco Rd. (Realign.) - Goreway Drive (Ext.)
Borough of Etobicoke, Metropolitan Toronto
District No. 6 (Toronto)
W.O. 72-11002 -- W.P. 387-65

I. INTRODUCTION:

It is proposed to extend the present airport expressway northerly toward Finch Avenue; this expressway will closely follow existing Indian Line Rd. This expressway will be designated as Hwy. #427. In connection with this expressway a major complex will be required at the crossing of proposed Hwy. #427 and i) the Mimico Creek Diversion and ii) the Disco Road realignment - Goreway Drive extension. This is known as the Mimico Creek Complex. The western portion of this complex is located in the Town of Mississauga, County of Peel, while the eastern portion is in the Borough of Etobicoke, Metropolitan Toronto.

The Foundation Office was requested to carry out a subsurface investigation for the various components associated with the Mimico Creek complex. The request was contained in a memo from Mr. G.C.E. Burkhardt, Regional Bridge Planning Engineer, Central Region, dated December 29, 1971. Subsequently, an investigation was carried out by this Office to determine the subsoil, bedrock and groundwater conditions in this area.

This report will be concerned with the twin parallel overpass structures to be constructed at the crossing of Hwy. #427 (N.B.L. and S.B.L.) and the Disco Rd. realignment - Goreway Drive extension. As such it presents the factual

information obtained in this specific area, as well as recommendations pertaining to the foundation design of the proposed structures and the stability and settlement considerations associated with the approach fills.

Foundation reports for the other proposed structures within this complex will be presented in the following reports:

	<u>Report No.</u>
Ramp N.-E. over the Goreway Drive Extension	72-11003
Culvert - Mimico Creek Diversion	72-11004

2. SITE AND GEOLOGY:

The area under investigation is located in the immediate vicinity of Mimico Creek and Indian Line Road, which is partially in the Town of Mississauga and partially in Metropolitan Toronto. The east flowing Mimico Creek meanders along the floor of a valley which ranges from 100 to 180 feet in width. The creek channel is about 15 to 20 feet wide and 10 feet in depth with the water level varying between elevations 502 to 504 (3 to 4 feet of water). The grass and brush covered valley banks range from 22 to 26 feet in height. They are standing at slopes which vary from 2:1 to 3:1.

The surrounding terrain is flat to gently undulating in relief between about elevation 527 to 536. This area has been developed for small industrial enterprises.

Twin 517 feet long Bailey Bridge structures exist at the crossing of Indian Line Road and Mimico Creek.

The site is located in the physiographic region known as the "Peel Plain." The characteristic deposit in this region is a ground moraine laid down during the Wisconsin Glacial Age. In the vicinity of the area under investigation, the moraine is primarily composed of a cohesive glacial till whose thickness generally ranges 35 to 66 feet. In this region the Humber River, Etobicoke and Mimico Creeks have cut deep valleys into the overburden. There is, therefore, no large undrained depression, swamp or bog, although in many of the instream areas drainage is still imperfect. The overburden is underlain by

grey shale bedrock of the Meaford-Dundas formation, Ordovician Period. Available geological information indicates that the surface of the bedrock varies somewhere between elevation 460 and elevation 475.

3. FIELD AND LABORATORY WORK:

A total of eighteen boreholes, all of which were accompanied by a dynamic cone penetration test, was carried out at the site during the course of the field investigation. The boreholes and the cone penetration tests were advanced by means of a continuous flight auger machine (Penn Drill) or a diamond drill rig, both of which were adapted for soil sampling purposes.

Samples were obtained at required depths in a 2-inch O.D. split spoon sampler which was hammered into the soil. The method of driving the split-spoon conformed to the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone penetration tests. Bedrock was proven at five of the boring locations by obtaining BX size rock core samples.

During sampling and drilling operations, detailed logs of the borings were made. These logs contain a record of the drilling and sampling techniques used, together with the soil types and bedrock encountered. The location and elevation of all the boreholes are shown on Drawing No. W.O. 72-11002 A and B, together with estimated stratigraphical sections across the site. Surveying at the site was carried out by the personnel from the Central Region Engineering Survey Section. The elevations given in this report are referred to a Geodetic datum.

All samples were subjected to a careful visual examination in the field and subsequently in the laboratory. Following this examination, laboratory testing was carried out on selected representative samples to determine the following physical properties of the overburden:

- Natural Moisture Content
- Atterberg Limits
- Grain-Size Distribution

The results of these tests are plotted on the Record of Borelog sheets as well as the figures located in Appendix I of this report.

4. SUBSOIL AND BEDROCK CONDITIONS:

4.1) General:

The predominant stratum across the site is a cohesive glacial till, the thickness of which varies from 35 feet to 60 feet. This cohesive deposit is underlain by shale bedrock.

In some localized areas the glacial till is overlain by cohesive and garbage fill material, with a combined thickness as much as 21.5 feet.

The boundaries of the various deposits, as determined in the boreholes, are shown on the accompanying Record of Borehole sheets. The stratigraphical sections, shown on Drawing No. 72-11002A and B have been inferred from this data. From ground surface downward, the soil types and bedrock encountered are as follows.

4.2) Fill Material:

At a few random locations (B.H.'s #11, #16 and #17), fill material ranging in thickness from 4.5 to 21.5 feet was encountered. The upper portion of fill material consists of either gravel and sand (B.H. #11) or clayey silt (B.H. #16). This upper fill material is underlain by up to 14 feet of sanitary fill material (garbage fill). However, at B.H. #17, no sanitary fill material was encountered, and the fill material mainly composed of clayey silt, sand and gravel.

Standard penetration testing carried out within the fill material, gave 'N' values which range from 3 to 34 blows/foot, which would indicate that it has been subjected to a poor to moderate compactive effort.

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

Directly beneath the surficial deposits, where these exist, or a nominal topsoil cover (1 foot or less) elsewhere

is the predominant stratum across the site, which is composed of a heterogeneous mixture of clayey silt with sand and gravel. The thickness of this glacial till varies from 35 feet (B.H. #1) to 60 feet (B.H. #12). Occasional layers of sand and gravel, up to 4 feet in thickness, were encountered randomly throughout the deposit. The lower 5 to 15 feet of the stratum often contains numerous shale fragments, as well as occasional small boulders (up to 5 inches in size). Grain-size distribution curves, for samples of the cohesive stratum, obtained with 2" O.D. sampling equipment, are shown on Figure No. 2 in Appendix I.

Atterberg limit tests were performed on samples of the glacial till. The results, which are shown on the borelog sheets and on the Plasticity Chart, Figure #1, are tabulated below:

			<u>Range</u>
Liquid Limit	(W _L)	(%)	17 - 39
Plastic Limit	(W _p)	(%)	13 - 23
Natural Moisture Content	(W)	(%)	5 - 28

Based on these values it is estimated that the cohesive deposit has a matrix, which is inorganic and of low to intermediate plasticity.

The Standard Penetration Tests, carried out within this glacial till stratum, are plotted on the Record of Borehole sheets. This testing gave 'N' values which ranged from 2 blows/ft. to 100 blows for 1 inch. The lower 'N' values were encountered, in the upper few feet of the stratum at a few of the borings put down on the floor of the Mimico Creek valley. The consistency of this upper softened zone was determined by carrying out undrained shear strength testing both in the field and the laboratory. This testing gave undrained shear strength values which ranged from 500 to 700 p.s.f. These results are summarized on the Record of Borelog sheets appended to this report. Based on the testing results it is estimated that the consistency of the overall deposit varies from stiff to hard, with the exception of the upper softened zone which is in the firm range.

4.4) Shale Bedrock:

The cohesive glacial till stratum is directly underlain

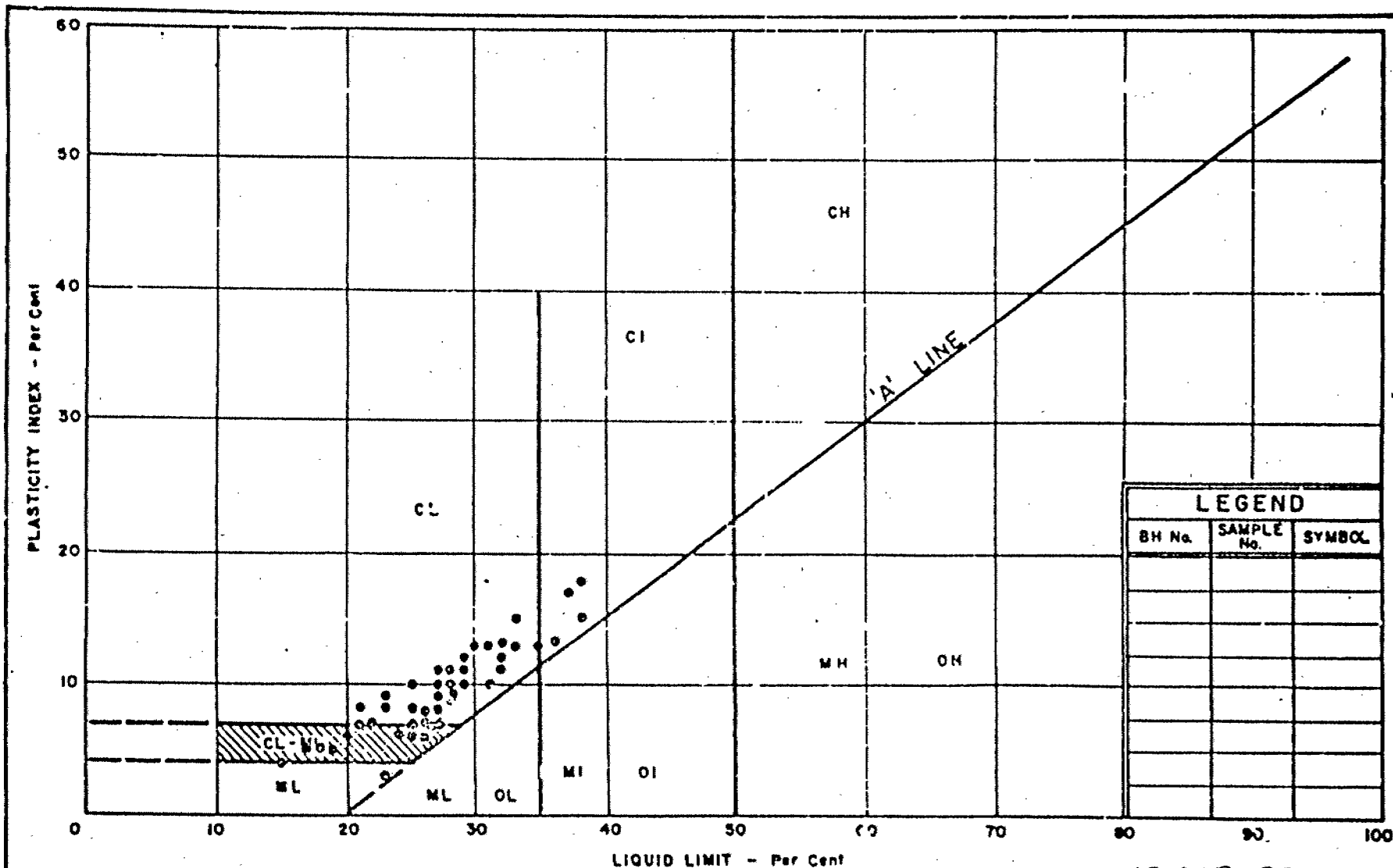
by bedrock which was proven in five of the boreholes by obtaining up to 10 feet of EX size rock core samples. In addition, the surface of the bedrock, at a number of other boring locations, was inferred to exist at the level where the hammer driven casing met practical refusal. Over the site the bedrock surface was found to vary randomly between elevations 460 and 476. The bedrock is composed of a grey shale - the upper 3 feet of which is in a weathered condition. Below this weathered zone the shale bedrock is in a sound state as evidenced by the high percentage of core recovered.

5. GROUNDWATER CONDITIONS:

The groundwater level conditions across the site, during the period of the investigation (February 1972), were observed by taking readings in the open boreholes. The results of the readings are shown on the borelog sheets, as well as on Drawing No. 72-11002A.

The observations indicate that the groundwater level is located between elevations 503 and 507, which corresponds to levels which range from 4 to 23 feet below existing ground surface. These levels correspond closely to the water level in the creek, which was at about elevation 502 to 503.

APPENDIX



WP 658-93-01



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

PLASTICITY CHART GLACIAL TILL

WP No. 387 - 65
JOB No. 72 - 11C02

FIG. 1



WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1 IMPERIAL FOUNDATION SECTION

JOB 72-11002 LOCATION Co-ords: N 4 839 920.1, E 295 980.0
W.P. 387-65 BORING DATE Feb. 3, 1972 Co-ords. 15,879,003 N; 971,063 E.
DATUM Geodetic BOREHOLE TYPE Auger

ORIGINATED BY VK
COMPILED BY TST
CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT.	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.					WATER CONTENT %				
509.6	Ground Level															
0.0	H.t. mix. of clayey silty sand & occ. gravel.		1	SS	13										503.	
	Very Stiff - Hard		2	SS	88										11 31 47 11	
	Glacial Till		3	SS	140	500										
	Silty sand with gravel		4	SS	30											
			5	SS	120											
			6	SS	107 1/6"	490										
	Glacial Till		7	SS	100 1/6"											
			8	SS	125											
			9	SS	58	480										
473.6			10	SS	100 1/3"											
36.0	End of Borehole Probable Bedrock					470										

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO		RECORD OF BOREHOLE No. 2 IMPERIAL FOUNDATION SECTION	
MATERIALS & TESTING OFFICE		Co-ords: N 4 839 918.3, E 295 944.3	
JOB 72-11002	LOCATION	Co-ords. 15,878,997 N; 270,946 E.	ORIGINATED BY VK
W.P. 387-65	BORING DATE	Feb. 1, 1972	COMPILED BY TST
DATUM Geodetic	BOREHOLE TYPE	Auger	CHECKED BY S.R.

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — W _L		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT — W _P	WATER CONTENT — W		
508.9	Ground Level					20 40 60 80 100	0 UNCONFINED + FIELD VANE • QUICK TRIAXIAL x LAB. VANE				
490.0	Het. mix. of clayey silt, sand and occ. gravel.		1	SS	74						
			2	SS	17						
			3	SS	24						
	Very Stiff to Hard		4	SS	12						
	Glacial Till		5	SS	20						
			6	SS	65						
			7	SS	94						
	Sand and gravel		8	SS	70						
	with occ. boulders		9	SS	100						
			10	SS	63						
468.9											
460.0	weathered		11	SS	100						
462.9	shale bedrock sound		12	BXL	100						
460.0	End of Borehole										

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No.3 IMPERIAL FOUNDATION SECTION

Co-ords: N 4 839 918.0, E 295 915.4

LOCATION

Co-ords. 15,878,976 N; 970,851 E.

ORIGINATED BY VK

BORING DATE

Jan. 27, 1972

COMPILED BY TST

BOREHOLE TYPE

Außer

CHECKED BY

15

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO MATERIALS & TESTING OFFICE			RECORD OF BOREHOLE No. 6			IMPERIAL FOUNDATION SECTION				
JOB 72-11002			LOCATION			Co-ords: N 4 839 934.7, E 295 970.6				
W.P. 387-65			BORING DATE Feb. 3, 1972			ORIGINATED BY VK				
DATUM Geodetic			BOREHOLE TYPE AVECT			COMPILED BY TST				
						CHECKED BY K.				
SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — w _L PLASTIC LIMIT — w _P WATER CONTENT — w		BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	20 40 60 80 100	10 20 30		
510.3	Ground Level									
0.0	Het. mix. of clayey silt, sand & gravel		1	SS	6	510				9 31 49 20
	Glacial Till		2	SS	13					504.
	Very Stiff - Hard		3	SS	25	500				
			4	SS	21					
			5	SS	113					
			6	SS	72/9"	490				
			7	SS	83					
	Sand and gravel		8	SS	102/8"					23 35 29 13
			9	SS	60/2"	480				
			10	SS	60/2"					
	with shale frags.		11	SS	126/2"	470				
40.5	End of Borehole weathered shale probably bedrock									

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No.7 IMPERIAL FOUNDATION SECTION

Co-ords: N 4 839 935.7, E 295 936.4

JOB 72-11002

LOCATION

Co-ords. 15,872,051 N; 970,920 E.

ORIGINATED BY VK

W.P. 387-65

BORING DATE Feb. 3, 1972

COMPILED BY TST

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY S.K.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT — w _L PLASTIC LIMIT — w _P WATER CONTENT — w			BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.			WATER CONTENT %				
							20	40	60	80	100	w _p		
						○ UNCONFINED	+	FIELD VANE						
						● QUICK TRIAXIAL	x	LAB. VANE						
510.8	Ground Level													GR. S.A.S. CL
0.0						510								
			1	SS	8									
	Sand and gravel		2	SS	4									504.5
			3	SS	11									21 29 35 15
	Het. mix. of clayey silt and sand		4	SS	24									
	Glacial Till		5	SS	16									
	Stiff to Hard		6	SS	65									
	Sand and gravel		7	SS	74									34 24 31 11
			8	SS	110									
			9	SS	107 6"									
			10	SS	63 7 1/4"									
	with shale frags.		11	SS	100 1"									
160.3														
113.5	End of Borehole Probable Bedrock					117								

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 8 IMPERIAL FOUNDATION SECTION

CO-ORDS: N4 839 935.7, E 295 905.0

JOB 72-11002 LOCATION Co-ords. 15,879,054 N; 970,817 E.

ORIGINATED BY VI

W.P. 387-65

BORING DATE Jan. 28, 1972

COMPILED BY TST

DATUM Geodetic

BOREHOLE TYPE Auger, EXL Core

CHECKED BY S.A.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					SHEAR STRENGTH P.S.F.					WATER CONTENT %
							20	40	60	80	100	○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL			
512.8	Ground Level																
0.0	Het. mix. of clayey sil and sand, trace of gravel Glacial Till Stiff to Hard		1	SS	12	51											
			2	SS	11												
			3	SS	31												
			4	SS	54	500											
			5	SS	118												
			6	SS	57												
			7	SS	26	490											
			8	SS	18												
			9	SS	30	480											
			10	SS	15												
472.8	with shale frags.																
470.0	weathered Shale Bedrock			EXL		470											
145.8	Ground			EX													

506.5
3 35 48 14

0 5 47 48

WP 658-93-01

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 11 IMPERIAL FOUNDATION SECTION

JOB 72-11002

LOCATION

Co-ords: N 4839 963.4, E 295 958.7
Co-ords. 15,879,145 N; 970,993 E.

ORIGINATED BY VK

W.P. 387-65

BORING DATE Feb. 11, 1972

COMPILED BY TST

DATUM Geodetic

BOREHOLE TYPE Washboring, NX Casing

CHECKED BY S.R.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT.	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	WATER CONTENT % w_p — w — w_L				
522.5	Ground Level															
0.0	Gravel, some sand, trace of clay & silt. Compact Fill		1	SS	11	520									64 26 (10)	
517.5	Garbage Fill		2	SS	5											
5.0			3	SS	12											
			4	SS	12											
			5	SS	19											
			6	SS	71											
506.5	Glacial Till Het. mix. of clayey silt, sand & gravel		7	SS	60	510									505.	
16.0			8	SS	43											
			9	SS	100											
			10	SS	81											
486.0	Stiff to Hard					500									11 28 43 18	
36.5	End of Borehole					490										
						480										

WP 658-93-01

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS & TESTING OFFICE			RECORD OF BOREHOLE No. 12 Co-ords: N 4839 970.4, E 295 925.4 Co-ords. 15,879,138 N; 970,951 E.				IMPERIAL FOUNDATION SECTION				
72-11002			LOCATION				ORIGINATED BY VK				
P. 387 - 65			BORING DATE Feb. 1, 1972				COMPILED BY TST				
DATUM Geodetic			BOREHOLE TYPE Auger, EXL Core				CHECKED BY				
SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100				LIQUID LIMIT — PLASTIC LIMIT — WATER CONTENT —		BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. NO.	NUMBER TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F. ○ UNCONFINED * FIELD VANE ● QUICK TRIAXIAL x LAB. VANE		WATER CONTENT % 10 20 30			
0.0	Ground Level				510						
	Het. mix. of clayey silt, sand & gravel		1 SS 0								0 29 57 1L
	Glacial Till		2 SS 37								505.0
	Stiff to Hard		3 SS 46		500						
			4 SS 70								
			5 SS 11								
			6 SS 71								
	Sand and Gravel		7 SS 52		490						21 33 32 1L
			8 SS 130		480						
					480						
					470						
			13 SS 100		470						
			14 SS 100		470						
160.5			13 SS 100		460						
50.0	Weathered		14 EXL NR								
150.5	Shale Bedrock Sound		15 RC 90%								
60.0	End of Borehole				450						

20
10-5 % STRAIN AT FAILURE
10

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 13 IMPERIAL FOUNDATION SECTION

Co-ords: N 4 839 960.3, E 295 894.4

JOB 72-11002

LOCATION

Co-ords. 15,879,135 N; 970,792 E.

ORIGINATED BY VK

W.P. 387-65

BORING DATE

Feb. 31, 1972

COMPILED BY TST

DATUM Geodetic

BOREHOLE TYPE

Auger

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	w_p	w	w_L		
513.0	Ground Level															
0.0	Het. mix. of clayey silt, sand & gravel		1	SS	4	510										0 44 42 14
			2	SS	2											505.0
	Glacial Till		3	SS	102											
	Firm to Hard		4	SS	66	3" 50										
			5	SS	106											
			6	SS	20											
			7	SS	104	1"										
	Sand & gravel		8	SS	107	"										22 39 28 11
	shale frags.		9	SS		"										
			10	SS		5"										
472.8			11	SS												
40.2	End of Borehole Probable Pedrock					470										

WP 658-93-01

DEPARTMENT OF HIGHWAYS-ONTARIO MATERIALS & TESTING OFFICE		RECORD OF BOREHOLE No. 16 IMPERIAL FOUNDATION SECTION	
72-11002	LOCATION	CO-ORDS: N 4 839 977.1, E 295 948.6	ORIGINATED BY HS & VK
387-65	BORING DATE	Feb. 2 & 27 Jan. 1972	COMPILED BY TST
DATUM: Geodetic	BOREHOLE TYPE	Auger, NX Casings, Washboring	CHECKED BY S.R.

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE			LIQUID LIMIT — PLASTIC LIMIT — WATER CONTENT			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. NOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	BLOWS/FOOT	20	40	60	80			100
						SHEAR STRENGTH P.S.F.								
						○ UNCONFINED + FIELD VANE								
						● QUICK TRIAXIAL x LAB. VANE								
									WATER CONTENT %					
									10 20 30					
528.9	Ground Level													
0.0	Fill material, clayey silt with sand and gravel.		1	SS	10									7 29 43 27
503.4			2	SS	11									
7.5			3	SS	22	520								
			4	SS	35									
	Garbage Fill		5	SS	3									
			6	SS	5	510								
507.1			7	SS	23									
21.5	Glacial Till		8	SS	23									505.5 7 23 43 27
	Het. mix. of clayey silt sand & gravel		9	SS	13	500								
	Stiff to Hard		10	SS	137	490								
	Sand and gravel		11	SS	111									16 40 26 19
			12	SS	101	480								
			13	SS	101									
	with shale frags.		14	SS	101	470								
			15	SS	101									
463.9	weathered		16	SS	101	460								
65.0	Shale Bedrock		17	SHL	101									
459.9	Sound													
70.0	End of Borehole													

20
15-15 % STRAIN AT FAILURE
10

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 17 IMPERIAL FOUNDATION SECTION

CO-ORDS: N4 839 974.7, E 295 918.1
JOB 72-11002 LOCATION Co-ords. 15,879,162 N; 970,860 E.

ORIGINATED BY VK

W.P. 387-65 BORING DATE Feb. 3, 1972

COMPILED BY TST

DATUM Geodetic BOREHOLE TYPE Auger

CHECKED BY S.C.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT					SHEAR STRENGTH P.S.F.					WATER CONTENT %
							20	40	60	80	100	○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL			
512.6	Ground Level																
0.0	Fill Material					510									5 24 51 20		
508.1			1	SS	23										505.		
4.5			2	SS	77												
	Glacial Till		3	SS	75												
	Het. mix. of clayey		4	SS	110	500											
	silt, sand & gravel		5	SS	111												
			6	SS	27										14 21 41 21		
	Very Stiff to Hard		7	SS	31	490											
			8	SS	95												
			9	SS	103	480											
	with shale frags.		10	SS	103												
476.6																	
36.0	weathered shale																
	End of Borehole																
	Probable Bedrock					477											

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 18 IMPERIAL FOUNDATION SECTION

Co-ords: N 4839 998.7, E 295 883.1

JOB 72-11002

LOCATION

Co-ords. 15,879,205 N; 970,745 E.

ORIGINATED BY VK

W.P. 387.- 65

BORING DATE

Feb. 1, 1972

COMPILED BY TST

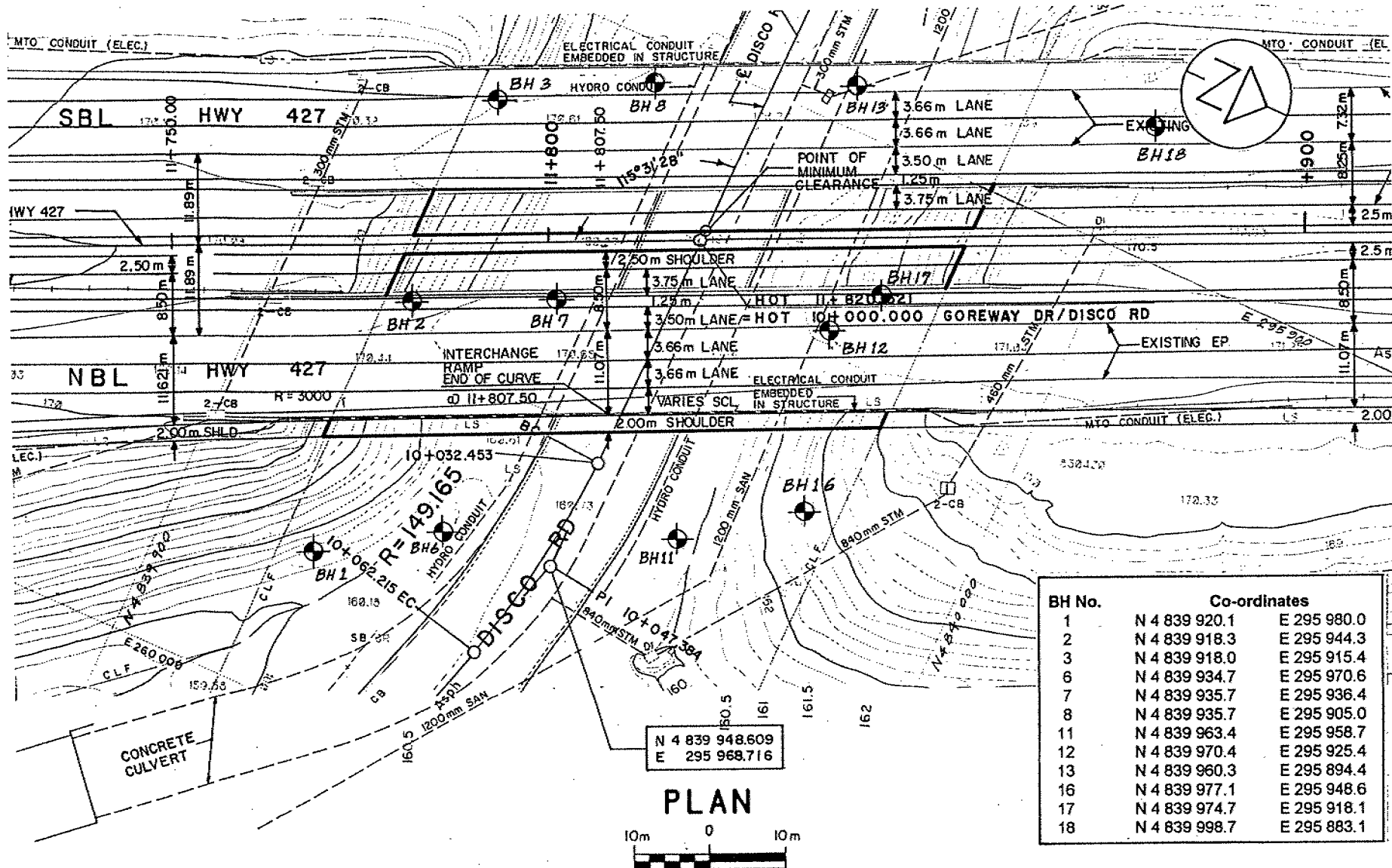
DATUM Geodetic

BOREHOLE TYPE

Auger, BXL Core

CHECKED BY S.Z.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W			BULK DENSITY Y	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	W _P	W	W _L		
509.3	Ground Level															
0.0	Hot mix of clayey silt, sand & gravel		1	SS	5											
			2	SS	69											
	Glacial Till		3	SS	84	500										
			4	SS	80											
	Firm to Hard		5	SS	57											
			6	SS	63	490										
			7	SS	200											
			8	SS	100											
			9	SS	100											
			10	SS	100											
			11	RC	100											
467.8						470										
461.5	Shale Bedrock															
462.8	Sound															
464.5	End of Borehole															



NOTE

For Subsoil Information Refer
Record of Borehole Sheets.

HWY 427 & DISCO RD / GOREWAY DR

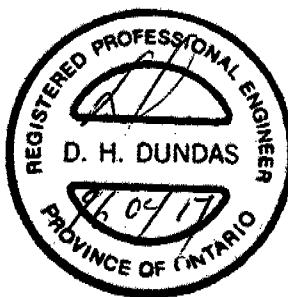
WP 658-93-01
SITE 37-994

Foundation Investigation Report
for
Highway 427 Widening
CNR Overhead NBL and SBL
W.P. 659-93-01, Site 37-0984
Central Region

The following report is a copy of the factual information from the Foundation Investigation and Design Report for WP 213-65-00, Contract 78-111. The foundation investigation report was prepared for the existing structures by MTO Foundations Unit and represents the subsurface conditions for the proposed widening of the existing CNR Overhead structures at Highway 427.

Imperial units of measure are used in the report and on the Record of Borehole sheets. The original ground elevations shown on the borehole logs may differ from present day elevations as a result of the construction of the existing structures.

This report contains the detailed subsurface conditions, the Record of Borehole sheets, and the location of the borings in plan.



D. Dundas

D. Dundas, P.Eng.
Sr. Foundation Engineer

FOUNDATION INVESTIGATION REPORT

For

Twin Overhead Structures at the Crossings
of the N.B. and S.B. Lanes of Hwy. #427

With the C.N.R.

Borough of Etobicoke, County of York

District No. 6 (Toronto)

W.O. 72-11022

-

W.P. 213-65

1. INTRODUCTION:

The Foundations Office was requested to carry out a subsurface investigation for the twin three span structures to be constructed at the crossings of the proposed N.B. and S.B. lanes of Hwy. 427 with the C.N.R., in the Borough of Etobicoke, County of York. The request was contained in a memo from the Bridge Office (Mr. G.C.E. Burkhardt, Regional Structural Planning Engineer, Central Region) dated January 31, 1972. Subsequently, an investigation was carried out by this Office to determine the subsoil, bedrock and groundwater conditions at the site.

The factual data obtained from this investigation, together with our recommendations for the design of the structure foundations as well as the stability considerations associated with the approach fills, are presented in this report.

2. DESCRIPTION OF SITE AND GEOLOGY:

The site is located immediately to the east of Indian Line Road, approximately 1-1/4 miles south of Rexdale Blvd., in the Borough of Etobicoke. The area has been developed for commercial purposes; numerous industrial buildings are present. The terrain is flat to gently undulating in relief between elevations 540 and 550. A single line C.N.R. track traverses across the

site; the track is located in a cut section which extends some 5 to 6 feet below the surrounding ground level.

The site is located in the physiographic region known as the "Peel Plain." The characteristic deposit in this region is a ground moraine laid down during the Wisconsin Glacial Age. In the vicinity of the area under investigation the moraine is primarily composed of a cohesive glacial till whose thickness generally ranged from 70 to 85 feet. Interglacial deposits of granular material are frequently found interbedded within the glacial till. The overburden is underlain by grey shale bedrock of the Meaford-Dundas formation, Ordovician Period.

3. FIELD AND LABORATORY WORK:

Ten boreholes, all of which were accompanied by a dynamic cone penetration test were put down during the field investigation phase. The boreholes and the cone penetration tests were advanced by means of a continuous flight auger machine (C.M.E.) adopted for soil sampling purposes.

At required depths samples were obtained by means of a 2" O.D. split-spoon sampler. The method of driving the split-spoon conformed to the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone penetration tests. Bedrock was proven at four of the boring locations by obtaining BX size rock core samples. The groundwater level conditions across the site, during the period of the investigation, were determined by recording the water levels in the open boreholes.

During sampling and drilling operations, detailed logs of the borings were made. These logs contain a record of the drilling and sampling techniques used, together with the soil types and bedrock encountered. The location and elevation of all the boreholes are shown on Drawing No. W.O. 72-11022A, together with a number of estimated stratigraphical sections across the site. Surveying at the site was carried out by personnel from the Central Region Engineering Survey Section. The elevations given in this

report are referenced to a Geodetic datum.

All the samples were subjected to a careful visual examination in the field and subsequently in the laboratory. Following this examination, laboratory testing was carried out on selected representative samples to determine the following physical properties of the overburden:

Natural Moisture Content

Atterberg Limits

Grain-Size Distribution

The results of these tests are plotted on the Record of Borehole sheets as well as Figures 1, 2 and 3, all of which are located in Appendix I of this report.

4. SUBSOIL AND BEDROCK CONDITIONS:

4.1) General:

The predominant stratum across the site is a stiff to hard cohesive glacial till, the base of which extends anywhere from 48 to 84 feet below existing ground surface. Over the major portion of the site a compact to very dense silty sand to sandy silt deposit is interbedded within the glacial till. The thickness of the granular deposit varies from 4 to 34 feet. The overburden is underlain by sound shale bedrock.

The boundaries of the various deposits, as determined in the boreholes, are shown on the accompanying Record of Borehole sheets. The stratigraphical sections, shown on Drawing No. 72-11022A, have been inferred from this data. From ground surface downward, the soil types and bedrock encountered are as follows:

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

The thin (1 to 1.5 feet thick) topsoil cover is underlain by a glacial till stratum which is composed of a heterogeneous mixture of clayey silt with sand and gravel. The base of this stratum extends anywhere from 48 feet (B.H. #6) to 84 feet (B.H. #9)

existing ground surface. The upper 11 to 14 feet of the till is brown in colour which indicates that this zone has been subjected to desiccation, below this zone of stratum is grey. Fragments of shale were encountered in the lower 6 to 16 feet of the glacial till at many of the boring locations.

Grain-size distribution curves for samples of the cohesive stratum, obtained with a 2-inch O.D. split-spoon sampler, are shown on Figure No. 1 in Appendix I: Atterberg limit tests were performed on samples of the glacial till, the results were plotted on the Record of Borelog sheets, as well as on a Plasticity Chart (Figure #2), are summarized in tabular form below.

	<u>Range</u>	<u>Average</u>
Liquid Limit (W_L) (%)	17 - 37	27
Plastic Limit (W_P) (%)	12 - 20	16
Natural Moisture Content (W) (%)	10 - 20	15

Based on these values it is estimated that the cohesive deposit has a matrix which is inorganic and of low to intermediate plasticity.

The Standard Penetration Tests, carried out with this glacial till stratum, are plotted on the Record of Borehole sheets. This testing gave "N" values ranging from 13 blows/ft. to in excess of 100 blows per foot. Based on this testing it is estimated that the consistency of this cohesive deposit varies from stiff to hard.

4.3) Silty Sand to Sandy Silt:

In some areas a granular deposit is interbedded within the glacial till deposit, while at other locations this granular material extends from the base of the till to bedrock. The granular deposit is composed of a compact to very dense ('N' values 23 to 162 blows/ft.) silty sand to sandy silt with a trace of clay and gravel. Its thickness varies from 4 feet (B.H. #10) to 34.5 feet (B.H. 7). Grain-size distribution curves for samples of this granular material are shown on Figure No. 3.

4.4) Shale Bedrock:

The overburden is underlain by bedrock, which was proven in four of the boreholes by obtaining between 4 and 5 feet of BX size rock core samples. The bedrock surface was found to vary between elevations 458 and 472, corresponding to depths of from 76.5 to 84 feet below existing ground surface.

The bedrock is composed of a grey shale, which is in a sound state as evidenced by the high percentage of core recovered.

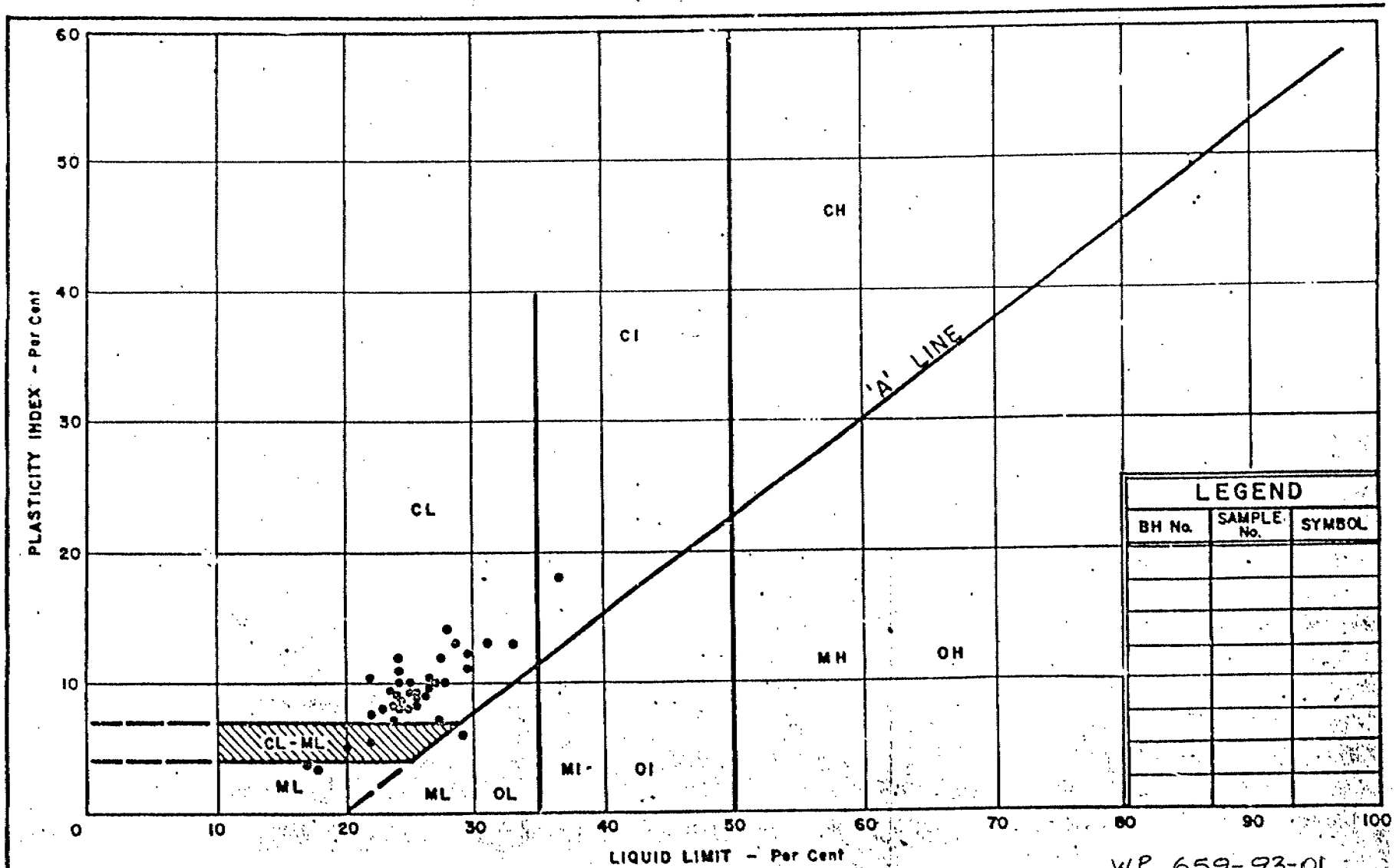
5. GROUNDWATER CONDITIONS:

The groundwater level conditions, across the site, were observed by taking readings in the open boreholes during the period of the field investigation (March 1972). The results of the readings are shown on the borelog sheets as well as on Drawing No. 72-11022A.

The observations indicate that the groundwater level, during this time, was located between elevations 541 and 542.5, which corresponds to levels ranging from existing ground surface to 6.5 feet below ground surface.

APPENDIX





WP 659-93-01



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

PLASTICITY CHART GLACIAL TILL

WP No. 213-65

JOB No. 72-11022

FIG. 2



DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO. 1

FOUNDATIONS OFFICE

IMPERIAL

WP 659-93-01

Co-ORDS: N 4840353.2, E 275735.9

JOB 72-11022

LOCATION Co-ord's 880,424 N. 970,262 E.

ORIGINATED BY V.K.

WP 21 65

BORING DATE March 13, 1972

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and Sample with C.M.E.

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE			LIQUID LIMIT — w_L			BULK DENSITY	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT			PLASTIC LIMIT — w_p						
							20	40	60	80	100	WATER CONTENT — w				
												w_p			w	w_L
SHEAR STRENGTH P.S.F.							WATER CONTENT %			P.C.F.						
○ UNCONFINED + FIELD VANE							10 20 30			Y						
● QUICK TRIAXIAL x LAB VANE																
545.7	Ground level.															
0.0	Het. mixture of clayey silt, sand & gravel.															
	Glacial Till.															
532.7	Brown															
13.0	Grey															
	Very stiff to hard.															
												</				

 20
15 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 2

FOUNDATIONS OFFICE
IMPERIAL

WP 659-93-01

Co-ords: N 4 840 364.5, E 295 760.2

JOB 72-11022

LOCATION Co-ord's 880,461 N. - 970,342 E.

ORIGINATED BY V.K.

W.P. 213-65

BORING DATE March 6, 1972

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and Sample with C.M.E. Machine.

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w — w_L WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT					
546.9	Ground level.									
0.0	L. mixture of clayey silt, sand & gravel. Glacial Till.		1	SS	17	540				
			2	SS	36					
532.9	Brown		3	SS	57					
14.0	Grey.		4	SS	37	530				
	Stiff to hard.		5	SS	13					
			6	SS	19	520				
			7	SS	22					
			8	SS	15	510				
			9	SS	24					
			10	SS	44	500				
			11	SS	100/5"	490				
			12	SS	120/5"	480				
469.9	Fragments of shale		13	BXL	Rec. 40%	470				
77.0	Shale Bedrock.		14	BXL	Rec. 90%					
465.9	Grey. Sound									
81.0	End of borehole.					460				

20
15 \div 5 % STRAIN AT FAILURE
10

DESIGN SERVICES BRANCH

WP 659-93-01

Co-ords: N 840 375.2, E 205 755.4

FOUNDATIONS OFFICE

JOB 72-11022

LOCATION Co-ord's 880,496 N. 970,326 E.

IMPERIAL

W.P. 213-65

BORING DATE March 13, 1972

ORIGINATED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and Sample with C.M.E. Machine

COMPILED BY V.K.

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W ₁ W _P — W — W _L WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. FLOT	NUMBER	TYPE					
547.9	Ground level.								
0.0	Het. mixture of clayey silt, sand & gravel.								
	Glacial Till.		1	SS	29				
			2	SS	27				
			3	SS	76				
535.4	Brown.		4	SS	26				
12.5	Grey.		5	SS	19				
	Very stiff to hard.		6	SS	18				
			7	SS	23				
			8	SS	19				
			9	SS	25				
512.9	156.3		10	SS	31				
35.0	Silty sand, traces of clay & gravel.								
	Dense.		11	SS	40				
503.9									
44.0	Het. mix. of clayey silt, sand & gravel.		12	SS	97				
	Glacial Till.								
	Hard.		13	SS	55				
477.4			14	SS	100				
70.5	End of borehole.								

W.L. 542.

1 22 60 17

20
15 \diamond 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

DESIGN SERVICES BRANCH				RECORD OF BOREHOLE NO 4				FOUNDATIONS OFFICE					
WP 659-93-01				Co-ords: N 4840 395.4, E 225 745.3				IMPERIAL					
JOB 72-11022				LOCATION Co-ord's 880,563 N. 970,293 E.				CORRECTED BY V.K.					
W.P. 213-65				BORING DATE March 7, 1972				CHECKED BY V.K.					
DATUM Geodetic				BOREHOLE TYPE Auger and Sample with C.M.E. Machine.				CHECKED BY <u>LD</u>					
SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE			LIQUID LIMIT — W _L			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	BLOWS/FOOT	20 40 60 80 100	PLASTIC LIMIT — W _P	WATER CONTENT — W _T	W _P — W _L		
548.4	Ground level.												
0.0	Het. mix. of clayey silt, sand & gravel. Glacial Till.		1	SS	26								
			2	SS	35								
36.9	Brown		3	SS	63								
11.5	Grey		4	SS	59								
	Very stiff to hard.		5	SS	23								
			6	SS	27								
			7	SS	39								
			8	SS	31								
			9	SS	37								
512.4	156.2		10	SS	90								
36.0	Silty sand, traces of clay and gravel. Dense.		11	SS	44								
502.4													
46.0	Het. mix. of clayey silt, sand & gravel. Glacial Till.		12	SS	51								
	Hard.												
			13	SS	72								
			14	SS	100 3"								
	Fragments of shale		15	BXL	Rec. 5%								
471.9													
76.5	Shale bedrock.		16	BXL	Rec. 90%								
467.4	Grey. Sound												
81.0	End of borehole.												

20
15 \div 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

DESIGN SERVICES BRANCH				RECORD OF BOREHOLE NO 5				FOUNDATIONS OFFICE					
WP 659-93-01				COORDS: N 4840415.7, E 255735.6				IMPERIAL					
JOB 72-11022				LOCATION Co-ord's 880,629 N. 970,261 N.				ORIGINATED BY V.K.					
W.P. 213-65				BORING DATE March 6, 1972				COMPILED BY V.K.					
DATUM Geodetic				BOREHOLE TYPE Auger and Sample with C.M.E. Machine				CHECKED BY <i>[Signature]</i>					
SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — W _L		PLASTIC LIMIT — W _P		WATER CONTENT — W ₁		BULK DENSITY γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	BLOWS / FOOT 20 40 60 80 100	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	WATER CONTENT % 10 20 30	P.C.F.	GR.SA.SI.CL		
546.5	Ground level.												
0.0	Het. mix. of clayey silt, sand & gravel. Glacial Till.		1	SS	37								
			2	SS	26								
535.5	Brown		3	SS	55								
11.0	Grey.		4	SS	23								
	Stiff to hard.		5	SS	13								
			6	SS	17								
			7	SS	29								
			8	SS	36								
			9	SS	28								
508.5	156		10	SS	74								
38.0	Silty sand, traces of clay & few gravel. Dense.		11	SS	30								
500.5													
46.0	Het. mix. of clayey silt, sand & gravel. Glacial Till. Hard.		12	SS	36								
			13	SS	71								
476.4	Fragments of shale		14	SS	100								
70.1	End of borehole.												

20
15 ± 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

DESIGN SERVICES BRANCH				RECORD OF BOREHOLE NO 6				FOUNDATIONS OFFICE			
WP 659-93-01				CO-ORDS: N 4840 362.7, E 295 687.8				IMPERIAL			
JOB 72-11022				LOCATION Co-ord's 880,455 N. 970,137 E.				ORIGINATED BY V.K.			
W.P. 213-LS				BORING DATE March 10, 1972				COMPILED BY V.K.			
DATUM Geodetic				BOREHOLE TYPE Auger and Sample with C.H.Z. Machine.				CHECKED BY [Signature]			
SOIL PROFILE		SAMPLES		ELEV. SCALE		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — W _L		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	20' 40 60 80 100	PLASTIC LIMIT — W _P	WATER CONTENT — W	WATER CONTENT %		
546.6	Ground level.										
0.0	Het. mix. of clayey silt, sand & gravel.		1	SS	20						541.1 W.L.
	Glacial Till.		2	SS	32						1 27.56.16
			3	SS	50						
533.1	Brown		4	SS	52						
13.5	Grey		5	SS	18						
	Very stiff to hard.		6	SS	30						
			7	SS	41						
			8	SS	46						
			9	SS	31						
			10	SS	70						
			11	SS	124						
498.6	152.0		12	SS	131						
48.0	Silty sand, traces of clay and some gravel.		13	SS	48						22 44 30 4
	Dense to very dense.		14	SS	152						
476.5			15	SS	10072"						
70.1	End of borehole.										

20
15 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

DESIGN SERVICES BRANCH				RECORD OF BOREHOLE NO 7				FOUNDATIONS OFFICE			
WP 659-93-01				Co-ords N 4840373.4, E 255493.2				IMPERIAL			
JOB 72-11022				LOCATION Co-ord's 880,490 N. 970,122 E.				ORIGINATED BY V.K.			
W.P. 213-65				BORING DATE March 7, 1972				COMPILED BY V.K.			
DATUM Geodetic				BOREHOLE TYPE Auger and Sample with C.M.E. Machine.				CHECKED BY <i>[Signature]</i>			
SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE				LIQUID LIMIT — w_L		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	BLOWS / FOOT 20 40 60 80 100	PLASTIC LIMIT — w_p	WATER CONTENT — w		
548.8	Ground level.										
0.0	Het. mix. of clayey silt, sand & gravel. Glacial Till.		1	SS	14						
			2	SS	29						
534.8	Brown.		3	SS	29						
14.0	Grey.		4	SS	14						
	Stiff to hard.		5	SS	15						
			6	SS	28						
			7	SS	20						
			8	SS	21						
			9	SS	20						
502.8	153.3										
46.0	Sandy silt to silty sand with traces of clay and gravel. Very dense.		10	SS	100						
			11	SS	57						
			12	SS	74						
468.3			13	SS	100						
80.5	Shale Bedrock.		14	BXL	Rec. 90%						
463.3	Grey Sand										
85.5	End of borehole.										

20
15 \div 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

DESIGN SERVICES BRANCH			RECORD OF BOREHOLE NO 8			FOUNDATIONS OFFICE		
WP 659-93-01			Co-ords: N 840 392.6, E 295 684.7			ORIGINATED BY V.K.		
JOB 72-11022			LOCATION Co-ord's 880,553 N. 970,094 E.			COMPILED BY V.K.		
W.P. 213-65			BORING DATE March 8, 1972			CHECKED BY <i>[Signature]</i>		
DATUM Geodetic			BOREHOLE TYPE Auger and Sample with C.M.E. Machine.					
SOIL PROFILE		SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w WATER CONTENT % 10 20 30	BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER TYPE BLOWS/FOOT					
545.6	Ground level.							
0.0	Het. mix. of clayey silt, sand & gravel. Glacial Till.		1 SS 34	540				V.L. 541.6
			2 SS 40					2 20 63 15
534.6	Brown.		3 SS 55					
11.0	Grey.		4 SS 21					
	Very stiff to hard.		5 SS 22	530				
			6 SS 38					
			7 SS 43					
			8 SS 50	520				
			9 SS 89					0 4 88 8
			10 SS 96	510				
504.6	153.8		11 SS 109					
41.0	Silty sand with traces of clay and gravel.			500				
	Very dense.							
494.6			12 SS 108					3 20 68 9
51.0	Het. mix. of clayey silt, sand & gravel. Glacial Till.			490				
	Hard.		13 SS 97					
				480				
475.5			14 SS 100					
70.1	End of borehole.			470				

20
15-5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 9

FOUNDATIONS OFFICE

WP 659-93-01

CO-ORDS: N 4840414.2, E 295475.5

IMPERIAL

JOB 72-11022

LOCATION Co-ord's 880,624 N, 970,064 E,

ORIGINATED BY V.K.

W.P. 213-65

BORING DATE March 6, 1972

COMPILED BY V.K.

DATUM Geodetic

BOREHOLE TYPE Auger and Sample with C.M.E. Machine

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		BULK DENSITY γ	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80			100	w_p
542.1	Ground level.													
0.0	Het. Mix. of clayey silt, sand and gra. Glacial Till.		1	SS	27	540								
			2	SS	41									
531.1	Brown		3	SS	57									
11.0	Grey		4	SS	39									
	Very stiff to hard.		5	SS	39									
			6	SS	51									
			7	SS	61									
			8	SS	41									
			9	SS	22									
			10	SS	133									
			11	SS	150									
494.1	EL 150.0		12	SS	73									
48.0	Silty sand, gravel with traces of clay.		13	SS	162									
488.1	Very dense.													
54.0	Het. mix. of clayey silt, sand & gravel. Glacial Till Hard		14	SS	116									
	Fragments of shale		15	SS	100%									
458.1			16	BXL	100%									
84.0	Shale bedrock.		17	BXL	Rec.									
453.1	Grey. Sound				100%									
89.0	End of borehole.													

20
15-5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

WP 659-93-01

RECORD OF BOREHOLE NO 10

CO-ORDS: N 4840 425.5, E 225 701.7

IMPERIAL

JOB 72-11022

LOCATION Co-ord's 880.661 N. 970.150 E.

ORIGINATED BY V.K.

W.P. 215-65

BORING DATE March 3, 1972

COMPILED BY V.K.

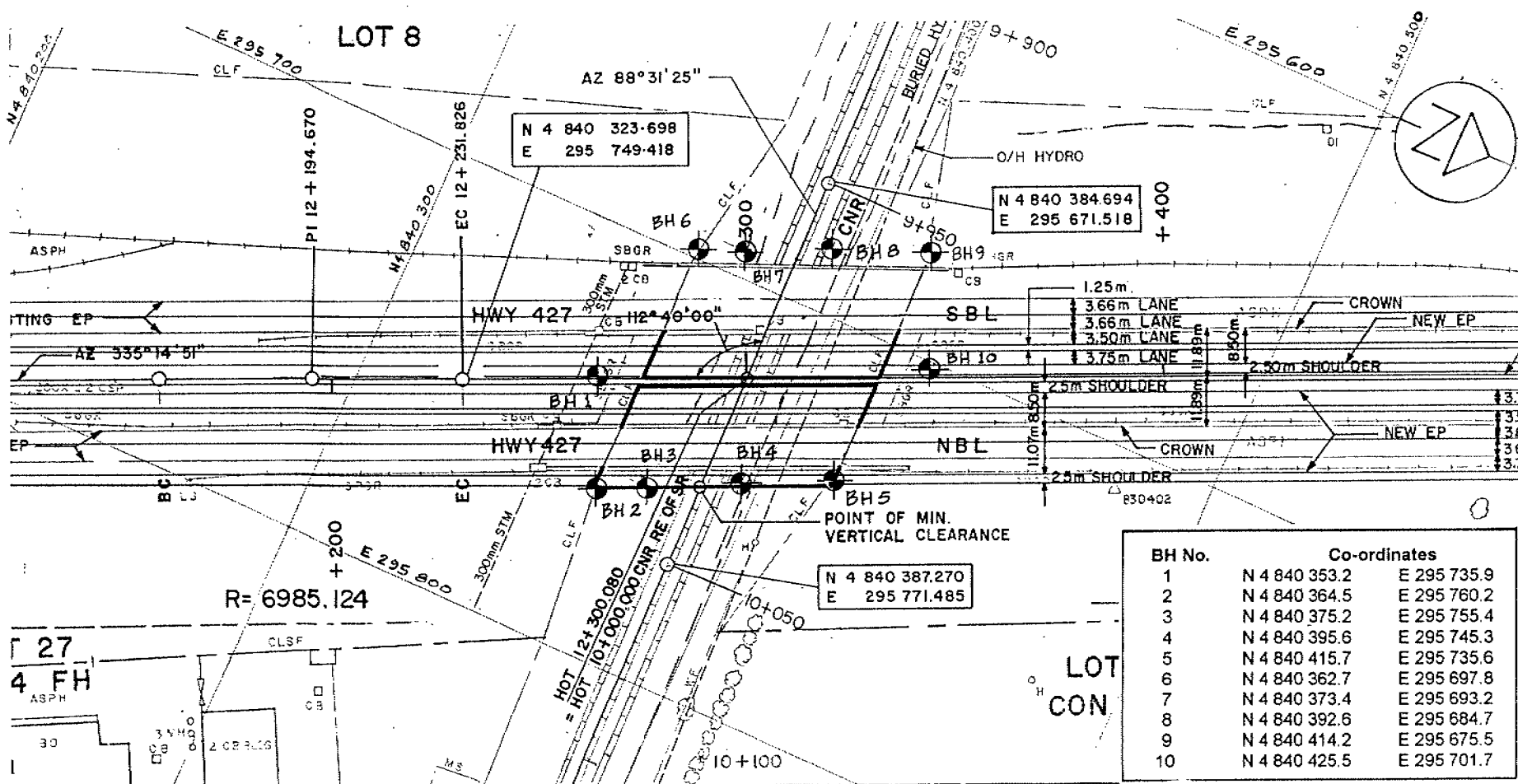
DATUM Geodetic

BOREHOLE TYPE Auger and Sample with C.M.E. Machine.

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W _p	W	W _L		
544.3	Ground level.															
0.0	Het. mix. of clayey silt, sand and grav. Glacial Till.		1	SS	33	540										W.L. 540.8
			2	SS	18											1 28 54 17
533.3	Brown		3	SS	50											
11.0	Grey		4	SS	13	530										
	Stiff to hard.		5	SS	12											
			6	SS	21											
			7	SS	15	520										
			8	SS	42											
			9	SS	18											
510.3	156.6					510										
34.0	Silty sand, trace of cl. & gra. Compact.		10	SS	23											
506.3																
38.0	154.2		11	SS	100/	500										
	Het. mix. of clayey silt, sand & gravel.															
	hard.		12	SS	22	490										
			13	SS	160/	480										
	Fragments of shale															
474.2			14	SS	100/											
70.1	End of borehole.					470										

20
15 5 % STRAIN AT FAILURE
10



Foundation Investigation Report
for
Highway 427 Overpass Widening at Woodbine Racetrack Entrance
W.P. 660-93-01, Site 37-0983
Central Region

The following report is a copy of the factual information from the Foundation Investigation and Design Report for WP 48-71-02, Contract 78-111. The foundation investigation report was prepared for the existing structures by MTO Foundations Unit and represents the subsurface conditions for the proposed widening of the existing overpass structures at Highway 427.

Imperial units of measure are used in the report and on the Record of Borehole sheets. The original ground elevations shown on the borehole logs may differ from present day elevations as a result of the construction of the existing structures.

This report contains the detailed subsurface conditions, the Record of Borehole sheets, and the location of the borings in plan.



D. Dundas
D. Dundas, P.Eng.
Sr. Foundation Engineer

FOUNDATION INVESTIGATION REPORT
For
Proposed Twin Overpass Structures
At the Crossing of Hwy. 427
And Woodbine Racetrack Entrance Road
Borough of Etobicoke, County of York
District No. 6 (Toronto)
W.O. 72-11023 -- W.P. 48-71-02

1. INTRODUCTION:

The Foundations Office was requested to carry out a subsurface investigation for the twin single span structures to be constructed at the crossing of the proposed Hwy. 427 and Woodbine Racetrack Entrance Road, in the Borough of Etobicoke, County of York. The request was contained in a memo from the Bridge Office (Mr. G.C.E. Burkhardt, Regional Structural Planning Engineer, Central Region) dated January 31, 1972. Subsequently, an investigation was carried out by this Office to determine the subsoil, bedrock and groundwater conditions at the site.

The results of the investigation are presented in this report, together with our recommendations for the design of the structure foundations as well as the stability considerations associated with the approach fills.

2. DESCRIPTION OF SITE AND GEOLOGY:

The site is located immediately to the east of the existing Indian Line road, approximately 1 mile south of Rexdale Blvd. in the Borough of Etobicoke. The area, which is within the Woodbine Racetrack compound, is grass covered. The terrain is flat to undulating in relief between elevations 540 and 550. The grade of the existing Woodbine Racetrack

entrance road is at the level of the surrounding ground.

The site is located in the physiographic region known as the "Peel Plain." The characteristic deposit in this region is a ground moraine laid down during the Wisconsinian Glacial Age. In the vicinity of the area under investigation, the moraine is primarily composed of a cohesive glacial till whose thickness generally ranges from 60 to 70 feet. The overburden is underlain by grey shale bedrock of the Meaford-Dundas formation, Ordovician Period. Available geological information indicates that the surface of the bedrock is at about elevation 470 ft.

3. FIELD AND LABORATORY WORK:

Five boreholes, each of which was accompanied by a dynamic cone penetration test, was put out by augering five boreholes. Each down during the field investigation. The boreholes and the cone penetration tests were advanced by means of a continuous flight auger machine (C.M.E.) adapted for soil sampling purposes.

At required depths samples were obtained by means of a 2 inch O.D. split spoon sampler. The method of driving the split spoon conformed to the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone penetration tests. Bedrock was proven at two of the boring locations by obtaining BX size rock core samples.

During sampling and drilling operations, detailed logs of the borings were made. These logs contain a record of the drilling and sampling techniques used, together with the soil types and bedrock encountered. The location and elevation of all the boreholes are shown on Drawing No. W.O. 72-11023A, together with estimated stratigraphical sections across the site. Surveying was carried out by the personnel from the Central Region Engineering Survey Section. The elevations given in this report are referred to a Geodetic datum.

All samples were subjected to a careful visual examination in the field and subsequently in the laboratory. Following this examination, laboratory testing was carried out on selected representative samples to determine the following physical properties of the overburden.

Natural Moisture Content

Atterberg Limits

Grain-Size Distribution

The results of these tests are plotted on the Record of Borelog sheets as well as on Figure #1, all of which are located in Appendix I of this report.

4. SUBSOIL AND BEDROCK CONDITIONS:

4.1) General:

The predominant structure across the site is a cohesive glacial till, the thickness of which varies from 60.5 to 64 feet. This cohesive deposit is underlain by shale bedrock.

The boundaries of the various deposits, as determined in the boreholes, are shown on the accompanying Record of Borehole sheets. The stratigraphical sections, shown on Drawing No. 72-11023A, have been inferred from this data. From ground surface downward, the soil types and bedrock encountered are as follows.

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

Directly beneath a nominal topsoil cover (1 foot) across the site is a glacial till stratum which is composed of a heterogeneous mixture of clayey silt with sand and gravel. The thickness of this glacial till varies from 60.5 to 64 feet.

In Boreholes 3 and 4 the upper 5 ft. is made up of fill material whose composition is similar to that of the

glacial till; a trace of organic matter is, however, present throughout. In Boreholes 2, 3, 4 and 5 a layer of silty sand varying in thickness from 3 feet (B.H. 4) to 10 feet (B.H. 2) was intersected at elevations between 505 and 508. Grain-size distribution curves for samples of the cohesive stratum, obtained with a 2" O.D. split-spoon sampler, are shown on Figure No. 1 in Appendix I.

Atterberg limit tests were performed on samples of the glacial till. The results are tabulated below:

		<u>Range</u>	<u>Average</u>
(W _L)	Liquid Limit (%)	17 - 39	28
(W _p)	Plastic Limit (%)	12 - 22	17
(W)	Natural Moisture Content (%)	6.5 - 28	17

Based on these values it is estimated that the cohesive deposit has a matrix, which is inorganic and of low to intermediate plasticity.

The Standard Penetration Tests, carried out within this glacial till stratum, are plotted on Record of Borehole sheets. This testing gave "N" value range of 10 to greater than 100 blows per foot. Based on this testing it is estimated that the consistency of this cohesive deposit varies from stiff to hard. The penetration testing carried out in the granular layers within the glacial till indicate that the relative density of this layer ranges from compact to very dense.

4.3) Shale Bedrock:

The cohesive glacial till is directly underlain by bedrock which was proven in two of the boreholes by obtaining BX size rock core samples. In the remainder of the boreholes the bedrock surface was inferred to exist at the level where the auger met practical refusal. The surface of the bedrock across the site varies from elevations 479 to 482.5 which corresponds to depths of from 60.5 to 64 feet below existing

ground surface.

The bedrock is composed of a grey shale. The upper 8.5 to 10.5 feet is in a weathered condition. Below this zone the bedrock is in a reasonably sound condition as evidenced by the high percentage of core recovery.

5. GROUNDWATER CONDITIONS:

The groundwater level conditions across the site, during the period of the field investigation (February 1972), were observed by taking readings in the open boreholes. The results of the readings are shown on the borelog sheets, as well as on Drawing No. 72-11023A.

The observations indicate that the groundwater level was located between elevations 539 and 542; i.e., 2 to 4 ft. below existing ground surface.

APPENDIX



DESIGN SERVICES BRANCH				RECORD OF BOREHOLE NO. 1				FOUNDATIONS OFFICE					
WP 660-93-01				Co-ords. N 4840614.8, E 295645.3				IMPERIAL					
JOB 72-11023				LOCATION Co-ords. 15,881,282 N; 969,965 E.				ORIGINATED BY VK					
W.P. 48-72-02				BORING DATE Feb. 21, 1972				COMPILED BY VK					
DATUM Gravitic				BOREHOLE TYPE Auger & sample with C.M.E. machine				CHECKED BY <u>SK</u>					
SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT		PLASTIC LIMIT		WATER CONTENT		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	BLOWS / FOOT 20 40 60 80 100	W _p — W _L	W _p — W _L	W _p — W _L	W _p — W _L		
543.5	Ground Level												
0.0	Het. mix. of clayey silt, sand & gravel. (Glacial Till)		1	SS	12	540							541.0
			2	SS	14								2 27 57 lb
533.5	Brown Grey		3	SS	15								
10.0			4	SS	27	530							
	Stiff to Hard		5	SS	25								
			6	SS	27								
			7	SS	27								
			8	SS	33	520							
			9	SS	17								
			10	SS	21	510							
			11	SS	20								
			12	SS	39	500							
			13	SS	16								
			14	SS	41	490							
			15	SS	92								
480.5						480							
63.0	Weathered Shale		16	SS	100	5"							
			17	BXL	100								
			18	BXL	50								
470.0						470							
73.5	Sound Shale Redrock												
465.5	Grey		19	BXL	100								
78.0	End of Borehole					460							

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

DESIGN SERVICES BRANCH				RECORD OF BOREHOLE NO 2				FOUNDATIONS OFFICE					
WP 660-93-01				Co-ords. N 4840 592.2; E 295 596.3 Co-ords. 15,881,208 N; 969,804 E.				IMPERIAL					
JOB 72-1023				LOCATION				ORIGINATED BY <u>VK</u>					
W.P. LB-71-02				BORING DATE February 27, 1972				COMPILED BY <u>VK</u>					
DATUM Geodetic				BOREHOLE TYPE Auger & sample with C.H.E.				CHECKED BY <u>[Signature]</u>					
SOIL PROFILE		SAMPLES		ELEV. SCALE		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT <u>W_L</u> PLASTIC LIMIT <u>W_P</u> WATER CONTENT <u>W</u>		BULK DENSITY		REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	BLOWS / FOOT 20 40 60 80 100	SHEAR STRENGTH P.S.F. ○ UNCONFINED • FIELD VANE ● QUICK TRIAXIAL x LAB VANE	W _L ——— W _P ——— W ——— WATER CONTENT % 10 20 30	Y P.C.F.	GR SA SI CL		
513.0	Ground Level												
0.0	Het. mix. of clayey silt, sand & gravel. (Glacial Till)		1	SS	13	510							51.1
			2	SS	13								6 15 54 25
532.0	Brown		3	SS	20								
11.0	Grey		4	SS	22	530							
			5	SS	17								
	Stiff to Hard		6	SS	23								
			7	SS	22	520							
			8	SS	24								
			9	SS	32	510							
			10	SS	26								0 48 47 5
505.0													
38.0	Silty sand with traces of clay.		11	SS	87	500							
495.0	Very Dense												
48.0			12	SS	22	490							
482.7													
60.3	Weathered Shale Bedrock		13	SS	100 5"	480							
472.8													
70.2	End of Borehole					470							

70
15 5 % STRAIN AT FAILURE
10

DESIGN SERVICES BRANCH

WP 660-93-01

RECORD OF BOREHOLE NO 3

Co-ords. N 4840 612.3 ; E 295 616.4

Co-ords. 15,881,271.4 ; 969,870.2.

FOUNDATIONS OFFICE

IMPERIAL

JOB 72-11073

LOCATION

ORIGINATED BY VK

W.P. 48-71-02

BORING DATE March 2, 1972

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Auger and sample with C.M.E. machine

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	10	20	30	
501.0	Ground Level														
0.0	Silty clay with some sand & gravel, traces of organics. Stiff		1	SS	15	540									542.
509.0			2	SS	25										3 38 48 11
5.0	Mixture of clayey		3	SS	20										
533.0	Brown Grey		4	SS	15	530									
11.0	Silt, sand & gravel (Glacial Till)		5	SS	14										
	with occ. layers of silty clay.		6	SS	18										
			7	SS	10	520									
	Stiff to Hard		8	SS	10										
			9	SS	19	510									
508.5			10	SS	32										0 30 69 1
35.5	Silty sand with traces of clay.		11	SS	62										
501.0	Very Dense					500									
43.0			12	SS	18	490									
			13	SS	110	480									
180.0															
64.0	Weathered Shale					470									
473.8															
70.2	End of Borehole														

20
15 5 % STRAIN AT FAILURE
10

DESIGN SERVICES BRANCH			RECORD OF BOREHOLE NO 4			FOUNDATIONS OFFICE			
WP 660-93-01			Co-ords. N 4840 632.4 ; E 295 637.7			IMPERIAL			
JOB 72-11-23			LOCATION Co-ords. 15,881,360 N; 949,960 E.			ORIGINATED BY VK			
W.P. 48-71-C2			BORING DATE Feb. 24, 1972			COMPILED BY VK			
DATUM Geodetic			BOREHOLE TYPE Auger and sample with C.M.E. Machine			CHECKED BY <i>SKL</i>			
SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — %		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	PLASTIC LIMIT — %		
543.8	Ground Level								
0.0	Silty clay with some sand & gravel, traces of organics. Stiff		1	SS	0	540			543.3
538.8	5.0 Wet mix of clayey		2	SS	12				1 24 57 18
532.8	11.0 Brown Grey		3	SS	48				
	silt, sand & gravel		4	SS	14				
	(Glacial Till)		5	SS	23				
	Stiff to Hard		6	SS	23				
			7	SS	25				
			8	SS	26				
			9	SS	14				
507.8	36.0 Silty sand & thin layers of clay. Compact		10	SS	29				
504.8	39.0		11	SS	90				
			12	SS	46				
			13	SS	59				
479.8	64.0 Weathered Shale								
473.3	70.5 End of Borehole								

15 \pm 5 % STRAIN AT FAILURE

DESIGN SERVICES BRANCH

WP 660-93-01

RECORD OF BOREHOLE NO 6

Co-ords. N 4840 634.9, E 295 612.7
Co-ords. 891,348 N; 969,858 E.

FOUNDATIONS OFFICE

IMPERIAL

JOB 72-12023

LOCATION

ORIGINATED BY VK

W.P. 10-19-02 47-71-02

BORING DATE Nov. 13, 1972

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Auger & sample with Q3 Machine

CHECKED BY *[Signature]*

SOIL PROFILE		SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE					
543.8	Ground Level							
0.0								
	Brown Grey	1	SS	31				
		2	SS	15				
		3	SS	24				
	Heterogeneous mixture of clayey silt, sand and gravel	4	SS	24				
		5	SS	20				
		6	SS	24				
	(Glacial Till)	7	SS	19				
		8	SS	21				
	Stiff to Hard	9	SS	13				
		10	TV	PL				
		11	SS	140				
494.8								
49.0	Silty sand and few gravel.	12	SS	45				
486.8	Dense							
57.0								
480.8		13	SS	57				
475.0	Bedrock							
477.8	Weathered Shale							
66.0	End of Borehole							

20
15 \pm 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

DESIGN SERVICES BRANCH
WP 660-93-01

RECORD OF BOREHOLE NO 7

Co-ords N 4840 592.8, E 295 629.5
Co-ords. 881,210 N; 969,913 E.

FOUNDATIONS OFFICE

IMPERIAL

JOB 72-11023

LOCATION

ORIGINATED BY YK

W.P. 10-69-89 48-71-02

BORING DATE Nov. 8, 1972

COMPILED BY YK

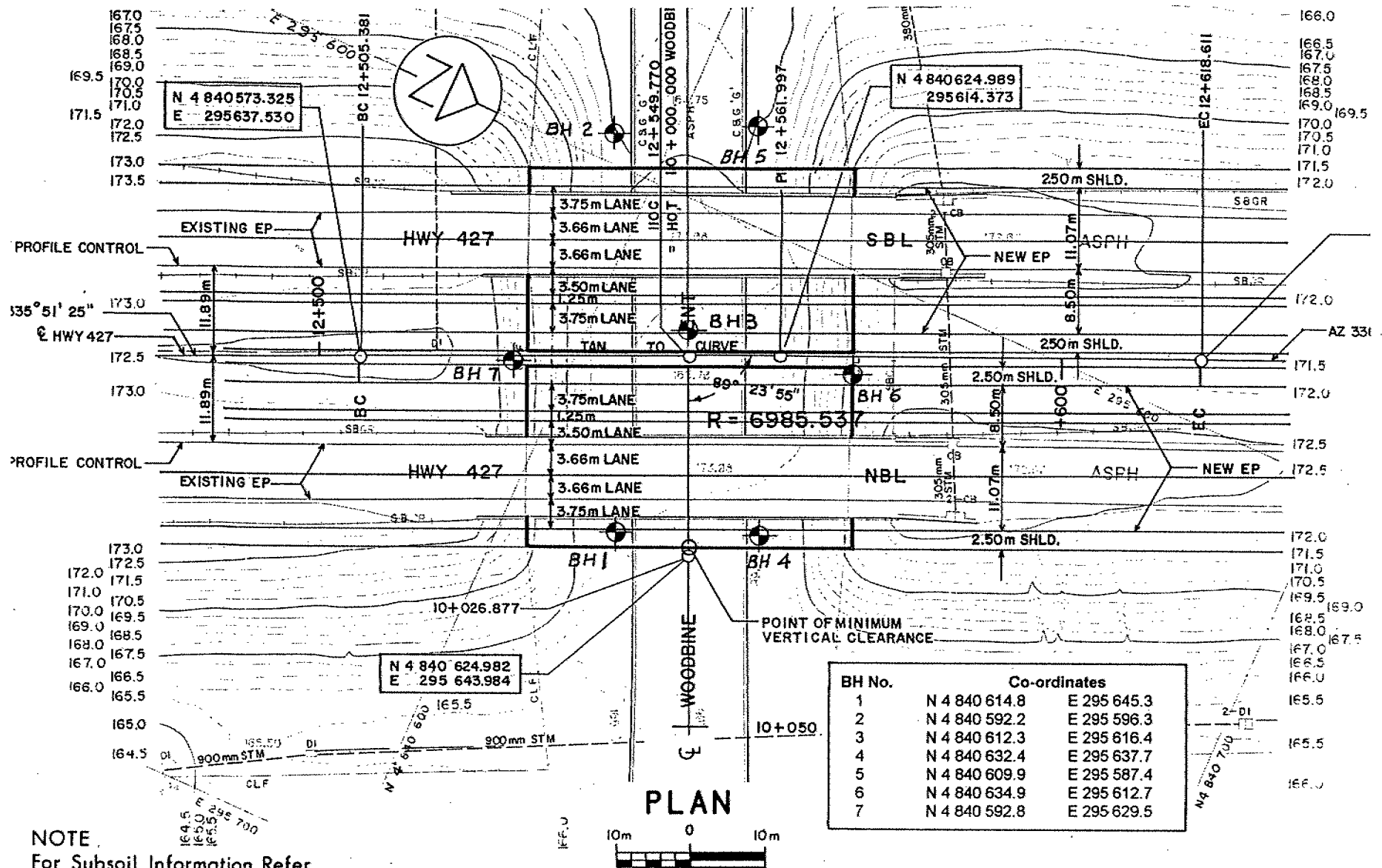
DATUM Geodetic

BOREHOLE TYPE Auger & sample with C&C Machine

CHECKED BY J.L.

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — w _p		BULK DENSITY	REMARKS
ELEV	DEPTH	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT	20 40 60 80 100	PLASTIC LIMIT — w _p	WATER CONTENT — w		
542.3	Ground Level										
0.0											
		1	SS	13							
		2	SS	17							
	Brown Grey	3	SS	35							
		4	SS	33							
	Heterogeneous mixture of clayey silt, sand and gravel.	5	SS	20							
	(Glacial Till)	6	SS	22							
		7	SS	25							
	Stiff to Hard	8	SS	13							
		9	SS	12							
505.3											
37.0	Silty sand with few gravel.	10	SS	180							
499.3	Very Dense										
43.0											
		11	SS	36							
481.3											
61.0	Bedrock	12	SS	180							
	Weathered Shale										
472.3											
469.8	Sound Shale	13	EXL	900							
72.5	End of Borehole										

20
15 \div 5 % STRAIN AT FAILURE
10



HWY 427 & WOODBINE RACETRACK ENTRANCE

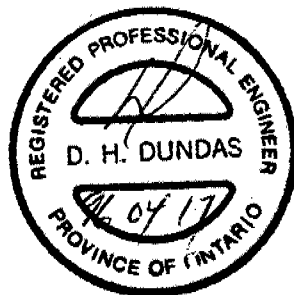
WP 660-93-01
SITE 37-0983

Foundation Investigation Report
for
Highway 427 Overpass Widening at Goreway Drive and Disco Road
W.P. 658-93-01, Site 37-0994
Central Region
CONT. 96-12

The following report is a copy of the factual information from the Foundation Investigation and Design Report for WP 387-65-00, Contract 76-01. The foundation investigation report was prepared for the existing structures by MTO Foundations Unit and represents the subsurface conditions for the proposed widening of the existing CNR Overhead structures at Highway 427.

Imperial units of measure are used in the report and on the Record of Borehole sheets. The original ground elevations shown on the borehole logs may differ from present day elevations as a result of the construction of the existing structures.

This report contains the detailed subsurface conditions, the Record of Borehole sheets, and the location of the borings in plan.



D. Dundas

D. Dundas, P.Eng.
Sr. Foundation Engineer

FOUNDATION INVESTIGATION REPORT
For
Proposed Overpass Structures at the Crossing
of Hwy. #427 (C.B.L. and N.B.L.)
Disco Rd. (Realign.) - Goreway Drive (Ext.)
Borough of Etobicoke, Metropolitan Toronto
District No. 6 (Toronto)
W.O. 72-11002 -- W.P. 387-65

L. INTRODUCTION:

It is proposed to extend the present airport expressway northerly toward Finch Avenue; this expressway will closely follow existing Indian Line Rd. This expressway will be designated as Hwy. #427. In connection with this expressway a major complex will be required at the crossing of proposed Hwy. #427 and i) the Mimico Creek Diversion and ii) the Disco Road realignment - Goreway Drive extension. This is known as the Mimico Creek Complex. The western portion of this complex is located in the Town of Mississauga, County of Peel, while the eastern portion is in the Borough of Etobicoke, Metropolitan Toronto.

The Foundation Office was requested to carry out a subsurface investigation for the various components associated with the Mimico Creek complex. The request was contained in a memo from Mr. G.C.E. Burkhardt, Regional Bridge Planning Engineer, Central Region, dated December 29, 1971. Subsequently, an investigation was carried out by this Office to determine the subsoil, bedrock and groundwater conditions in this area.

This report will be concerned with the twin parallel overpass structures to be constructed at the crossing of Hwy. #427 (N.B.L. and S.B.L.) and the Disco Rd. realignment - Goreway Drive extension. As such it presents the factual

information obtained in this specific area, as well as recommendations pertaining to the foundation design of the proposed structures and the stability and settlement considerations associated with the approach fills.

Foundation reports for the other proposed structures within this complex will be presented in the following reports:

	<u>Report No.</u>
Ramp N.-E. over the Goreway Drive Extension	72-11003
Culvert - Mimico Creek Diversion	72-11004

2. SITE AND GEOLOGY:

The area under investigation is located in the immediate vicinity of Mimico Creek and Indian Line Road, which is partially in the Town of Mississauga and partially in Metropolitan Toronto. The east flowing Mimico Creek meanders along the floor of a valley which ranges from 100 to 180 feet in width. The creek channel is about 15 to 20 feet wide and 10 feet in depth with the water level varying between elevations 502 to 504 (3 to 4 feet of water). The grass and brush covered valley banks range from 22 to 26 feet in height. They are standing at slopes which vary from 2:1 to 3:1.

The surrounding terrain is flat to gently undulating in relief between about elevation 527 to 536. This area has been developed for small industrial enterprises.

Twin 517 feet long Bailey Bridge structures exist at the crossing of Indian Line Road and Mimico Creek.

The site is located in the physiographic region known as the "Peel Plain." The characteristic deposit in this region is a ground moraine laid down during the Wisconsin Glacial Age. In the vicinity of the area under investigation, the moraine is primarily composed of a cohesive glacial till whose thickness generally ranges 35 to 66 feet. In this region the Humber River, Etobicoke and Mimico Creeks have cut deep valleys into the overburden. There is, therefore, no large undrained depression, swamp or bog, although in many of the instream areas drainage is still imperfect. The overburden is underlain by

grey shale bedrock of the Meaford-Dundas formation, Ordovician Period. Available geological information indicates that the surface of the bedrock varies somewhere between elevation 460 and elevation 475.

3. FIELD AND LABORATORY WORK:

A total of eighteen boreholes, all of which were accompanied by a dynamic cone penetration test, was carried out at the site during the course of the field investigation. The boreholes and the cone penetration tests were advanced by means of a continuous flight auger machine (Penn Drill) or a diamond drill rig, both of which were adapted for soil sampling purposes.

Samples were obtained at required depths in a 2-inch O.D. split spoon sampler which was hammered into the soil. The method of driving the split-spoon conformed to the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone penetration tests. Bedrock was proven at five of the boring locations by obtaining BX size rock core samples.

During sampling and drilling operations, detailed logs of the borings were made. These logs contain a record of the drilling and sampling techniques used, together with the soil types and bedrock encountered. The location and elevation of all the boreholes are shown on Drawing No. W.O. 72-11002 A and B, together with estimated stratigraphical sections across the site. Surveying at the site was carried out by the personnel from the Central Region Engineering Survey Section. The elevations given in this report are referred to a Geodetic datum.

All samples were subjected to a careful visual examination in the field and subsequently in the laboratory. Following this examination, laboratory testing was carried out on selected representative samples to determine the following physical properties of the overburden:

- Natural Moisture Content
- Atterberg Limits
- Grain-Size Distribution

The results of these tests are plotted on the Record of Borelog sheets as well as the figures located in Appendix I of this report.

4. SUBSOIL AND BEDROCK CONDITIONS:

4.1) General:

The predominant stratum across the site is a cohesive glacial till, the thickness of which varies from 35 feet to 60 feet. This cohesive deposit is underlain by shale bedrock.

In some localized areas the glacial till is overlain by cohesive and garbage fill material, with a combined thickness as much as 21.5 feet.

The boundaries of the various deposits, as determined in the boreholes, are shown on the accompanying Record of Borehole sheets. The stratigraphical sections, shown on Drawing No. 72-11002A and B have been inferred from this data. From ground surface downward, the soil types and bedrock encountered are as follows.

4.2) Fill Material:

At a few random locations (B.H.'s #11, #16 and #17), fill material ranging in thickness from 4.5 to 21.5 feet was encountered. The upper portion of fill material consists of either gravel and sand (B.H. #11) or clayey silt (B.H. #16). This upper fill material is underlain by up to 14 feet of sanitary fill material (garbage fill). However, at B.H. #17, no sanitary fill material was encountered, and the fill material mainly composed of clayey silt, sand and gravel.

Standard penetration testing carried out within the fill material, gave 'N' values which range from 3 to 34 blows/foot, which would indicate that it has been subjected to a poor to moderate compactive effort.

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

Directly beneath the surficial deposits, where these exist, or a nominal topsoil cover (1 foot or less) elsewhere

is the predominant stratum across the site, which is composed of a heterogeneous mixture of clayey silt with sand and gravel. The thickness of this glacial till varies from 35 feet (B.H. #1) to 60 feet (B.H. #12). Occasional layers of sand and gravel, up to 4 feet in thickness, were encountered randomly throughout the deposit. The lower 5 to 15 feet of the stratum often contains numerous shale fragments, as well as occasional small boulders (up to 5 inches in size). Grain-size distribution curves, for samples of the cohesive stratum, obtained with 2" O.D. sampling equipment, are shown on Figure No. 2 in Appendix I.

Atterberg limit tests were performed on samples of the glacial till. The results, which are shown on the borelog sheets and on the Plasticity Chart, Figure #1, are tabulated below:

			<u>Range</u>
Liquid Limit	(W_L)	(%)	17 - 39
Plastic Limit	(W_P)	(%)	13 - 23
Natural Moisture Content	(W)	(%)	5 - 28

Based on these values it is estimated that the cohesive deposit has a matrix, which is inorganic and of low to intermediate plasticity.

The Standard Penetration Tests, carried out within this glacial till stratum, are plotted on the Record of Borehole sheets. This testing gave 'N' values which ranged from 2 blows/ft. to 100 blows for 1 inch. The lower 'N' values were encountered, in the upper few feet of the stratum at a few of the borings put down on the floor of the Mimico Creek valley. The consistency of this upper softened zone was determined by carrying out undrained shear strength testing both in the field and the laboratory. This testing gave undrained shear strength values which ranged from 500 to 700 p.s.f. These results are summarized on the Record of Borelog sheets appended to this report. Based on the testing results it is estimated that the consistency of the overall deposit varies from stiff to hard, with the exception of the upper softened zone which is in the firm range.

4.4) Shale Bedrock:

The cohesive glacial till stratum is directly underlain

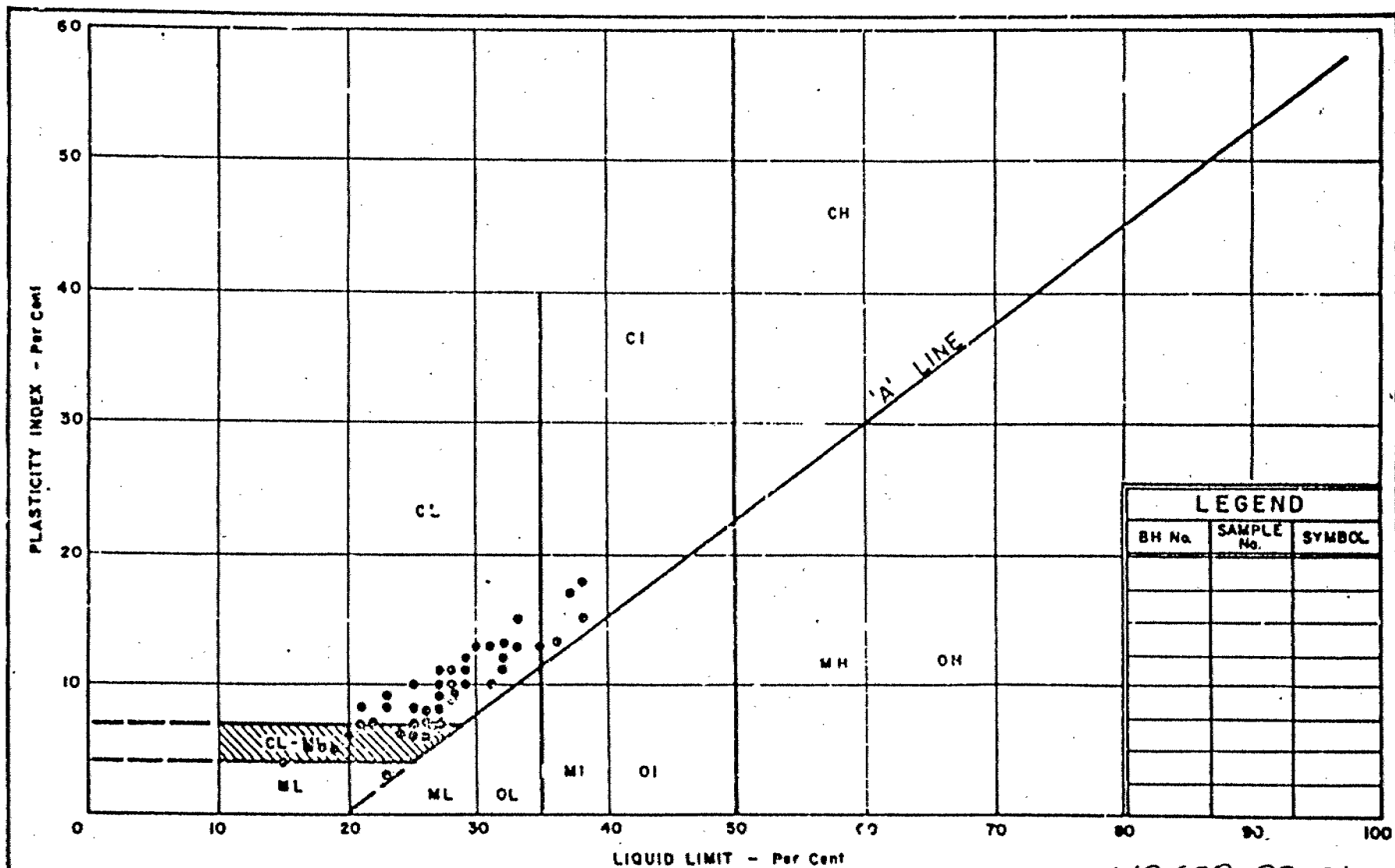
by bedrock which was proven in five of the boreholes by obtaining up to 10 feet of EX size rock core samples. In addition, the surface of the bedrock, at a number of other boring locations, was inferred to exist at the level where the hammer driven casing met practical refusal. Over the site the bedrock surface was found to vary randomly between elevations 460 and 476. The bedrock is composed of a grey shale - the upper 3 feet of which is in a weathered condition. Below this weathered zone the shale bedrock is in a sound state as evidenced by the high percentage of core recovered.

5. GROUNDWATER CONDITIONS:

The groundwater level conditions across the site, during the period of the investigation (February 1972), were observed by taking readings in the open boreholes. The results of the readings are shown on the borelog sheets, as well as on Drawing No. 72-11002A.

The observations indicate that the groundwater level is located between elevations 503 and 507, which corresponds to levels which range from 4 to 23 feet below existing ground surface. These levels correspond closely to the water level in the creek, which was at about elevation 502 to 503.

APPENDIX



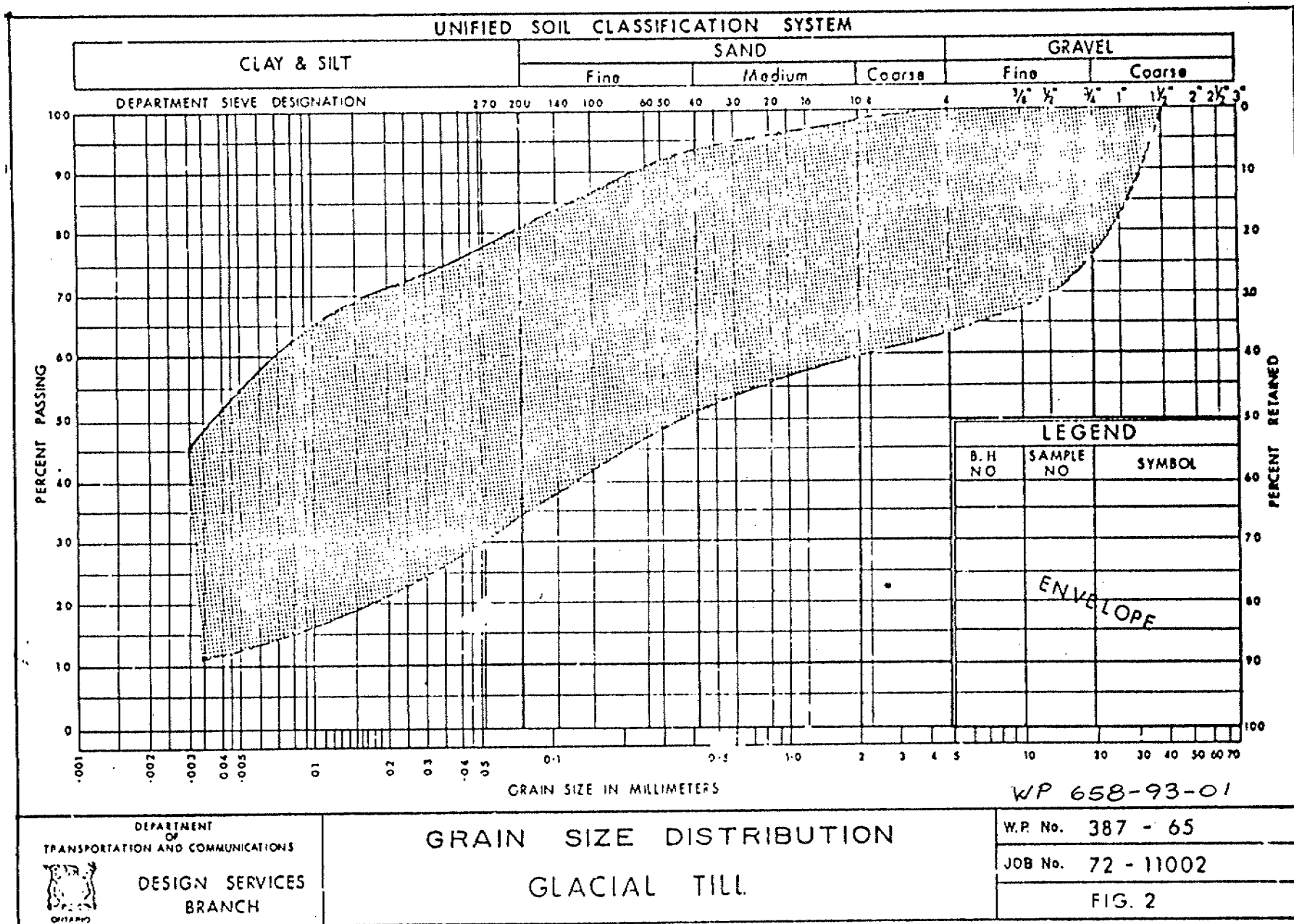
WP 658-93-01



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

PLASTICITY CHART GLACIAL TILL

WP No. 387 - 65
JOB No. 72 - 11002
FIG. 1



WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

JOB 72-11002

W.P. 387-65

DATUM Geodetic

LOCATION

BORING DATE Feb. 3, 1972

BOREHOLE TYPE Auger

Co-ords: N 4 839 920.1, E 295 980.0
Co-ords. 15,879,003 N; 971,063 E.

ORIGINATED BY VK

COMPILED BY TST

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE				
509.6	Ground Level															
0.0	H.t. mix. of clayey silty sand & occ. gravel. Very Stiff - Hard Glacial Till Silty sand with gravel		1	SS	13											
			2	SS	RR											
			3	SS	119	500										
			4	SS	30											
			5	SS	120											
			6	SS	107/6"	490										
			7	SS	100/6"											
			8	SS	125											
			9	SS	58	480										
473.6			10	SS	100/3"											
36.0	End of Borehole Probable Bedrock					47"										

503.
1 18 56 25

11 31 47 11

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2 IMPERIAL FOUNDATION SECTION

Co-ords: N 4 839 918.3, E 295 944.3

JOB 72-11002

LOCATION

Co-ords. 15,878,997 N; 270,946 E.

ORIGINATED BY VK

W.P. 387-65

BORING DATE

Feb. 1, 1972

COMPILED BY TST

DATUM Geodetic

BOREHOLE TYPE

Auger

CHECKED BY S.R.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— w _L PLASTIC LIMIT ——— w _p WATER CONTENT ——— w			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					SHEAR STRENGTH P.S.F.					WATER CONTENT %
							20	40	60	80	100	○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE					
508.9	Ground Level																
0.0																	
	Het. mix. of clayey silt, sand and occ. gravel.		1	SS	14												
			2	SS	17												
			3	SS	24												
	Very Stiff to Hard		4	SS	19												
	Glacial Till		5	SS	20												
			6	SS	65												
			7	SS	90 1/2"												
	Sand and gravel		8	SS	70 1/2"												
			9	SS	100 1/2"												
	with occ. boulders		10	SS	60 1/2"												
468.9																	
40.0	weathered		11	SS	100 1/2"												
462.9	shale bedrock sound		12	BXL	100 1/2"												
461.9	End of Borehole																

WP 658-93-01

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3 IMPERIAL FOUNDATION SECTION

Co-ords: N 4 839 918.0, E 295 915.4

JOB 72-11002

LOCATION

Co-ords. 15,878,926 N; 970,852 E.

ORIGINATED BY VK

W.P. 387-65

BORING DATE

Jan. 27, 1972

COMPILED BY TST

DATUM Geodetic

BOREHOLE TYPE

Auger

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT.	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80		
513.0	Ground Level											
0.0	Sand and gravel with clayey silt. Compact		1	SS	10	510						36 29 27 8
508.0			2	SS	39							
5.0	Het. mix. of clayey silt, sand & gravel		3	SS	25							
	Glacial Till		4	SS	30	500						
	Very Stiff to Hard		5	SS	28							
			6	SS	21							
			7	SS	20	490						
			8	SS	17							
			9	SS	59	480						
474.9			10	SS	69/10"							
			11	SS	100/11"							
38.1	End of Borehole Probably Bedrock					470						

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 6

IMPERIAL FOUNDATION SECTION

JOB 72-11002

LOCATION

Co-ords: N 4 839 934.7, E 295 970.6
Co-ords. 15,879,051 N; 971,032 E.

ORIGINATED BY VK

W.P. 387-65

BORING DATE

Feb. 3, 1972

COMPILED BY TST

DATUM Geodetic

BOREHOLE TYPE

Aveer

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					SHEAR STRENGTH P.S.F.					WATER CONTENT %
							20	40	60	80	100	○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB. VANE				
510.3	Ground Level																
0.0	Het. mix. of clayey silt, sand & gravel		1	SS	6	510									9 31 49 20		
	Glacial Till		2	SS	13											504.	
	Very Stiff - Hard		3	SS	25	500											
			4	SS	21												
			5	SS	113												
			6	SS	7 1/2	490											
			7	SS	83												
	Sand and gravel		8	SS	7 1/2	480										23 35 29 13	
			9	SS	6 1/2												
			10	SS	6 1/2												
169.8	with shale frags.		11	SS	1 1/2												
140.5	End of Borehole weathered shale probably bedrock																

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 7 IMPERIAL FOUNDATION SECTION

JOB 72-11002 LOCATION Co-ords: N 4 839 935.7, E 295 936.4
 W.P. 387-65 BORING DATE Feb. 3, 1972 Co-ords. 15,879,051 N; 970,920 E.
 DATUM Geodetic BOREHOLE TYPE Auger

ORIGINATED BY VK

COMPILED BY TST

CHECKED BY C.L.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. LOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	w_p	w	w_L		
510.8	Ground Level															
0.0						510										
	Sand and gravel		1	SS	8											
			2	SS	11											
	Het. mix. of clayey silt and sand		3	SS	11											
			4	SS	21											
	Glacial Till		5	SS	16											
	Stiff to Hard		6	SS	65											
	Sand and gravel		7	SS	71											
			8	SS	110											
			9	SS	107 1/2"											
	with shale frags.		10	SS	63 3/4"											
160.3			11	SS	111 1/2"											
117.5	End of Borehole Probable Bedrock					117										

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 8 IMPERIAL FOUNDATION SECTION

Co-ords: N4 839 935.7, E 295 905.0

JOB 72-11002 LOCATION Co-ords. 15,879,054 N; 970,817 E:

ORIGINATED BY VI

W.P. 387-65

BORING DATE Jan. 28, 1972

COMPILED BY TST

DATUM Geodetic

BOREHOLE TYPE Auger, EXL Core

CHECKED BY S.A.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT					SHEAR STRENGTH P.S.F.					WATER CONTENT %
							20	40	60	80	100	○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL			
512.8	Ground Level																
0.0	Het. mix. of clayey sil and sand, trace of gravel Glacial Till Stiff to Hard		1	SS	12	51											
			2	SS	11												
			3	SS	31												
			4	SS	54	500											
			5	SS	48												
			6	SS	57												
			7	SS	26	490											
			8	SS	18												
			9	SS	30	480											
			10	SS	30												
	with shale frags.																
472.8																	
470.0	weathered Shale Bedrock			EXL		470											
145.8	Sound			EXL													

506.5
3 35 48 14

0 5 47 48

WP 658-93-01

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 11 IMPERIAL FOUNDATION SECTION

JOB 72-11002

LOCATION

Co-ords: N 4839 963.4, E 295 958.7
Co-ords. 15,079,145 N; 970,993 E.

ORIGINATED BY VK

W.P. 387.-65

BORING DATE Feb. 11, 1972

COMPILED BY TST

DATUM Geodetic

BOREHOLE TYPE Washboring, NX Casing

CHECKED BY S.R.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	WATER CONTENT % w_p — w — w_L 10 20 30				
522.5	Ground Level															
0.0	Gravel, some sand, trace of clay & silt. Compact Fill		1	SS	11	520									64 26 (10)	
517.5			2	SS	5											
5.0	Garbage Fill		3	SS	11											
			4	SS	10	510										
506.5			5	SS	19											
16.0	Glacial Till		6	SS	71											
	Het. mix. of clayey silt, sand & gravel		7	SS	60	500										
			8	SS	43											
	Stiff to Hard		9	SS	100	490										
486.0			10	SS	81											
36.5	End of Borehole					480										

WP 658-93-01

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS & TESTING OFFICE			RECORD OF BOREHOLE No. 12			IMPERIAL FOUNDATION SECTION									
72-11002			LOCATION Co-ords: N 4839 970.4, E 295 925.4 Co-ords. 15,879,138 N; 970,851 E.			ORIGINATED BY VK									
P. 387 - 65			BORING DATE Feb. 1, 1972			COMPILED BY TST									
DATUM Geodetic			BOREHOLE TYPE Auger, BXL Core			CHECKED BY									
ELEV. DEPTH	SOIL PROFILE DESCRIPTION	STRAT. MOT	SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — % PLASTIC LIMIT — % WATER CONTENT — %		BULK DENSITY Y	REMARKS	
			NUMBER	TYPE		20	40	60	80	100	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB. VANE				WATER CONTENT % 10 20 30
510.5	Ground Level				510										
0.0	Het. mix. of clayey silt, sand & gravel		1	SS											0 29 57 1L
			2	SS	37										505.0
	Glacial Till		3	SS	46										
			4	SS	70										
	Stiff to Hard		5	SS	11										
			6	SS	11										
	Sand and Gravel		7	SS	52										21 33 32 1L
			8	SS	137										
460.5			11	SS	105										
			12	SS	100										
50.0	Weathered		13	SS	104										
			14	BXL NR											
450.5	Shale Bedrock Sound		15	RC	90%										
60.0	End of Borehole														

20
10-5 % STRAIN AT FAILURE
10

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 13 IMPERIAL FOUNDATION SECTION

CO-ORDS: N 4 839 960.3, E 295 894.4

JOB 72-11002

LOCATION

Co-ords. 15,879,135 N; 970,782 E.

ORIGINATED BY VK

W.P. 387-65

BORING DATE

Feb. 31, 1972

COMPILED BY TST

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.					WATER CONTENT %					
							UNCONFINED		FIELD VANE			w_p — w — w_L					
						QUICK TRIAXIAL		LAB. VANE									
513.0	Ground Level																
0.0	Het. mix. of clayey silt, sand & gravel		1	SS	4	510										0 44 42 16	
			2	SS	2												505.0
	Glacial Till		3	SS	12												
	Firm to Hard		4	SS	10	3" 50											
			5	SS	10												
			6	SS	20												
			7	SS	10	1" 490											
	Sand & Gravel		8	SS	10												22 39 28 11
	shale frags.		9	SS	10												
			10	SS	10	5" 480											
			11	SS	10	1" 470											
472.8																	
40.2	End of Borehole Probable Pedrock					470											

WP 658-93-01

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS & TESTING OFFICE			RECORD OF BOREHOLE No. 16 IMPERIAL FOUNDATION SECTION					
72-11002		LOCATION		CO-ORDS: N4 839 977.1, E 295 948.6		ORIGINATED BY HS & VK		
V.P. 387-65		BORING DATE Feb. 2 & 27 Jan. 1972				COMPILED BY TST		
DATUM Geodetic		BOREHOLE TYPE Auger, NX Casinr, Washborin				CHECKED BY S.R.		
ELEV. DEPTH	DESCRIPTION	STRAT. MOT	SAMPLES NUMBER TYPE BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT 20 40 60 80 100	LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W ₁ W ₂ — W ₁ WATER CONTENT % 10 20 30	BULK DENSITY P.C.F.	REMARKS
526.9	Ground Level							
0.0	Fill material, clayey silt with sand and gravel.		1 SS 10					7 29 43 1/
521.4			2 SS 11					
7.5			3 SS 22	520				
			4 SS 35					
	Garbage Fill		5 SS 3					
			6 SS 5	510				
507.1			7 SS 23					
21.5	Glacial Till		8 SS 23					505.5
	Het. mix. of clayey silt sand & gravel		9 SS 13	500				7 23 43 27
	Stiff to Hard		10 SS 137					
	Sand and gravel		11 SS 111	490				16 40 26 18
			12 SS 101	480				
	with shale frags.		13 SS 101					
			14 SS 101	470				
			15 SS 101					
463.9	weathered		16 SS 101	460				
65.0	Shale Bedrock		17 BXL 1-6					
453.9	Sound							
70.0	End of Borehole							

20
10-3 % STRAIN AT FAILURE
10

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 17 IMPERIAL FOUNDATION SECTION

CO-ORDS: N4 839 974.7, E 295 918.1

JOB 72-11002

LOCATION

Co-ords. 15,879,162 N; 970,860 E.

ORIGINATED BY VK

W.P. 387-65

BORING DATE

Feb. 3, 1972

COMPILED BY TST

DATUM Geodetic

BOREHOLE TYPE

Auger

CHECKED BY J.S.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	w_p	w	w_L		
512.6	Ground Level															
0.0	Fill Material															
508.1			1	SS	23	510										5 24 51 20
4.5			2	SS	77											505.
	Glacial Till		3	SS	75											
	Net. mix. of clayey		4	SS	110	500										
	silt, sand & gravel		5	SS	111											
			6	SS	27											11 21 41 21
	Very Stiff to Hard		7	SS	31	490										
			8	SS	65											
			9	SS	100	480										
	with shale frags.		10	SS	120											
476.6																
36.0	weathered shale End of Borehole Probable Bedrock					470										

WP 658-93-01

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 18 IMPERIAL FOUNDATION SECTION

Co-ords: N 4839 998.7, E 295 883.1

JOB 72-11002

LOCATION

Co-ords. 15,879,205 N; 970,745 E.

ORIGINATED BY VK

W.P. 387-65

BORING DATE

Feb. 1, 1972

COMPILED BY TST

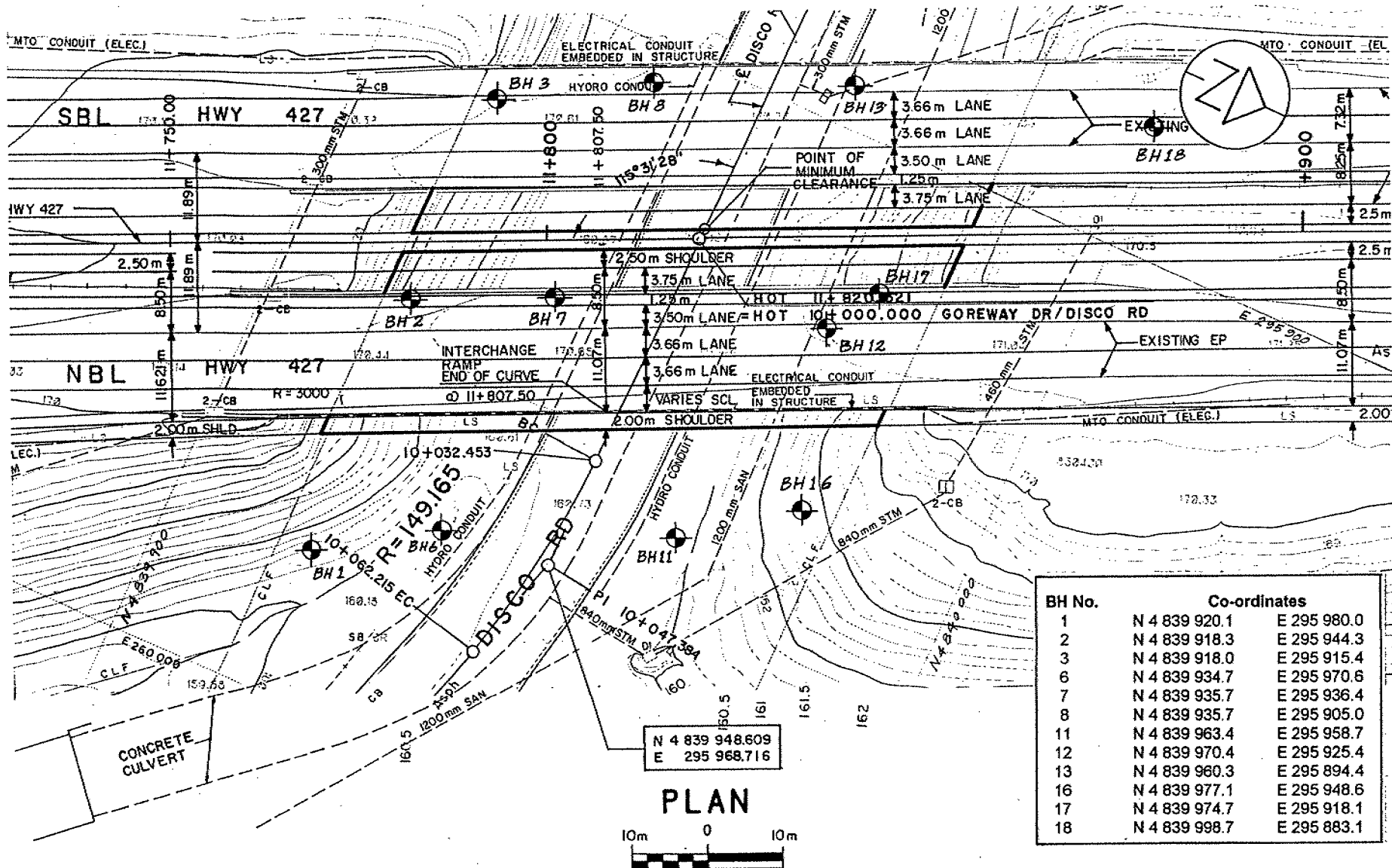
DATUM Geodetic

BOREHOLE TYPE

Auger, BXL Core

CHECKED BY S.Z.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. POT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	W _P	W	W _L		
509.3	Ground Level															
0.0	Het. mix. of clayey silt, sand & gravel		1	SS	5											
			2	SS	69											
	Glacial Till		3	SS	84	500										
			4	SS	80											
	Firm to Hard		5	SS	57											
			6	SS	63	490										
			7	SS	200											
			8	SS	114											
			9	SS	114	480										
			10	SS	114											
	with shale frags.		11	RC	800	470										
467.8																
461.5	Shale Bedrock															
462.0	Sound															
464.5	End of Borehole															



BH No.	Co-ordinates	
1	N 4 839 920.1	E 295 980.0
2	N 4 839 918.3	E 295 944.3
3	N 4 839 918.0	E 295 915.4
6	N 4 839 934.7	E 295 970.6
7	N 4 839 935.7	E 295 936.4
8	N 4 839 935.7	E 295 905.0
11	N 4 839 963.4	E 295 958.7
12	N 4 839 970.4	E 295 925.4
13	N 4 839 960.3	E 295 894.4
16	N 4 839 977.1	E 295 948.6
17	N 4 839 974.7	E 295 918.1
18	N 4 839 998.7	E 295 883.1

NOTE
For Subsoil Information Refer
Record of Borehole Sheets.

HWY 427 & DISCO RD / GOREWAY DR

WP 658-93-01
SITE 37-994

memorandum



To: G. Al-Basi, P. Eng.
Design Engineer
Structural Office

Date: 94 08 12

From: Foundation Design Section
Room 315, Central Building

Subject: Proposed Widening
Hwy 427 Overpass at Disco Road
W.P. 658-93-01, Site No. 37-0994
District 6, Toronto

We refer to the letter from J. Sherlock, P. Eng. of Giffels Associates Ltd. dated 94 08 08 addressed to us and copied to you among others. Giffels has now identified two areas that required shoring during construction of the widening, namely the abutments between the existing structures and the abutments along the east edge of the NBL.

We have reviewed the old foundation reports and have come up with the following simplified stratigraphy based on available borehole information :

Shoring between existing structures -

	<u>Fill</u>	<u>Cohesive Till</u>
South Abutment(BH 2)	From existing grade to 508.9'(155.1 m)	508.9'-470' (155.1-143.3 m)
North Abutment(BH 17)	From existing grade to 508.1'(154.9 m)	508.1'-476.6' (154.9-145.3 m)

Shoring on east edge of NBL -

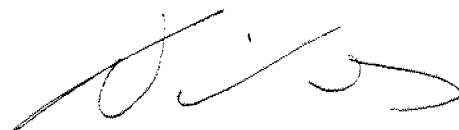
	<u>Fill</u>	<u>Cohesive Till</u>
South Abutment(BH 1)	From existing grade to 509.6' (155.3 m)	509.6'-473.6' (155.3-144.4 m)
North Abutment(BH 16)	From existing grade to 507.4' (154.7 m)	507.4'-463.9' (154.7-141.4 m)

For shoring design, the following soil parameters are recommended:

	ϕ	C_u	γ
Fill	28°	0	19kN/m ³
Cohesive Till	0	100kPa	20kN/m ³
Sound Shale	Bond capacity between bedrock and grout = 500 kPa		

Groundwater level assumed to be at El. 505' (153.9 m)

We believe the above is sufficient for your purposes. If you require further information, please contact us.



David Kwok, P. Eng.
Project Foundation Engineer
for
Paul Payer, P. Eng.
Senior Foundation Engineer

c.c. John Lam, P. Eng. (Structural Section)
James Sherlock, P. Eng. (Giffels Associates Ltd)

30 International Blvd.
Toronto (Rexdale), Ontario
Canada M9W 5P3

FAX (416) 675-4620
Telephone
(416) 675-5950

Offices:
Toronto,
Ottawa

August 8, 1994

Paul Payer, P.Eng.
Senior Foundation Engineer
Ministry of Transportation, Ontario
Foundation Design Section
Room 315, Central Building
1201 Wilson Avenue
Downsview ON M3M 1J8

Re: Proposed Widening
Highway 427 Overpass at Disco Road
W.P. 658-93-01, Site No. 37-0994
District 6, Toronto
Giffels Project No. W94105

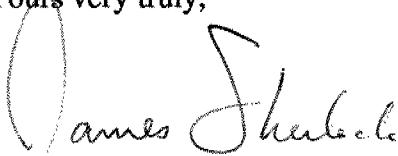
Attention: Mr. David Kwok, P.Eng.
Project Foundation Engineer

Dear Sir:

The construction of the abutment widenings will require shoring between the existing structures and along the east edge of the N.B.L. The shoring will consist of either cantilevered or tied back soldier pile walls. We request soil parameters for this design. At this time we do not anticipate requiring roadway protection for construction of the pier footings.

Should you require any further information, please do not hesitate to call.

Yours very truly,



James Sherlock, P.Eng.
Direct Line - (416) 675-5950, Ext. 5853

JS:jsm(W94105)Kwok-Aug8

cc: G. Al-Bazi, MTO, Design Section
B. Bridges - Giffels
Project File



memorandum



To: V.F. Boehnke, P. Eng.
Head, Structural Section
Central Region

Attn: John Lam, P. Eng.

From: Foundation Design Section
Room 315, Central Building

Subject: Proposed Widening
Hwy 427 Overpass at Disco Road
W.P.658-93-01, Site No. 37-0994
District 6, Toronto

Date: 94 05 25

We refer to your memorandum dated 94 02 15 and the updated E-plan attached therein. Based on this and the subsequent discussions, we provide herewith our detailed foundation recommendations for the proposed widening of the above structure. This memorandum is intended to include and supplement the recommendations given in our previous memorandum dated 93 11 08.

Based on the updated plan, it is understood that the widening will be carried out in the median of both the NBL and SBL structures and on the outer side of the NBL as well. The existing overpass is a three span structure. Both the abutment and pier footings are supported on 12BP74 (HP 310X110) piles, driven to refusal within the lower portion of the glacial till deposit with a design load of 95 tons/pile. A buried box culvert carrying water from Mimico Creek runs between the north and south piers.

The subsurface stratigraphy typically comprises 10 to 20 m of cohesive glacial till deposit overlying bedrock. Some municipal land fill was found in local areas around the northeast portion of the existing NBL structure. This land fill was supposedly removed under Cont. 76-01 and replaced with earth fill material. Based on a review of the available borehole data, it is envisaged that the subsoil condition is quite uniform across the site and the present information is sufficient for us to provide the foundation recommendations, as follows:

Foundation

Steel H-pile -

The proposed widening can be supported by 310X110 steel H-piles driven to refusal into the competent glacial till or possibly to bedrock. The following pile capacities

should be employed in the design as per O.H.B.D.C :

Factored Axial Capacity at U.L.S.	1600 kN/pile
Axial Capacity at S.L.S. Type II	1150 kN/pile

Piles shall be driven in accordance with Standard SS 103-10 or SS 103-11 using an ultimate capacity of 3450 kN/pile, but must be driven below the following design elevations:

	<u>NBL/SBL Median</u>	<u>NBL Outer Side</u>
South Abut.	El 487 ft (148.4 m)	El 492 ft (150.0 m)
North Abut.	El 483 ft (147.2 m)	El 492 ft (150.0 m)
South Pier	El 480 ft (146.3 m)	El 491 ft (149.7 m)
North Pier	El 485 ft (147.8 m)	El 494 ft (150.6 m)

The field investigation has revealed shale fragments in the glacial till stratum. Piles should be equipped with reinforced pile tips in accordance with OPSD-3301.00.

Pile caps should be located at the same elevation as the existing pile caps. For frost protection, an earth cover of 1.2 m should be provided. New piles should be properly arranged to avoid interference with existing piles. In addition, in order to avoid adverse effects of pile driving on the existing pile foundation, it is recommended pre-augering be carried out at new pile locations at the abutments to a depth of 3 m below the bottom elevation of the existing pile cap. These pre-augered holes should be backfilled with suitable granular material upon completion of pile driving.

The pier foundations for the widening come very close to the existing culvert, especially at the outer edge of the NBL structure where the new piles may be as close as 4 ±m from the culvert wall. To avoid overstressing the culvert walls during piling, it is recommended pre-augering be carried out for all the pier piles to a depth of 2 m below the bottom of the culvert, at El 494 ±ft (150.6 m). Due to the presence of non-cohesive layers in the glacial till stratum below groundwater table, a liner has to be provided during pre-augering.

Caisson -

Alternatively, the abutments and piers can be supported on caissons socketed 1.5 m into bedrock. Minimum caisson diameter should be 900 mm to allow for down-the-hole cleaning and inspection. The following axial design values may be assumed in

accordance with the O.H.B.D.C.:

Factored Bearing Capacity at U.L.S. = 3500 kPa

Bearing Capacity at S.L.S. Type II will not govern the design

For caisson foundation, the differential settlement between the new and existing foundations will be negligible. Due to the presence of non-cohesive layers in the glacial till stratum, liners are required for caisson construction.

For preliminary design purpose, the following are the anticipated founding elevations for caisson construction:

	<u>NBL/SBL Median</u>	<u>NBL Outer Side</u>
South Abut.	El 464 ft (141.4 m)	El 468 ft (142.6 m)
North Abut.	El 472 ft (143.9 m)	El 459 ft (139.9 m)
South Pier	El 464 ft (141.4 m)	El 465 ft (141.7 m)
North Pier	El 455 ft (138.7 m)	El 450 ft (137.2 m)

These tip elevations are estimated based on available borehole data. Actual founding elevations may vary and have to be verified in the field. Caisson caps should be constructed at the same elevation as the existing pile caps. Alternatively, caisson caps may be omitted and pile bent type of construction be adopted.

Backfill

Backfill to abutments or retaining walls should consist of granular material in accordance with MTO Standard Special Provision No. 109F03 (92 03). Computation of earth pressure shall be in accordance with Section 6.7.4 of the O.H.B.D.C. Unfactored properties for backfill materials are provided in the following table:

<u>Material</u>	ϕ	γ
Granular 'A'	35°	22.8 kN/m ³
Granular 'B'	30°	21.2 kN/m ³

For areas close to the existing culvert, compaction should be carried out by light compactors to avoid overstressing the culvert walls.

Construction

Temporary excavation is required for the construction of the pile caps and footings. Cut slopes may be formed at an angle of 1H:1V or flatter up to a maximum height of 3 m. Shoring may be required when excavation is carried out close to the existing structure. Soil parameters for the design of roadway protection will be provided after the location and extent of shoring requirements are identified by your office. Shoring associated with caisson cap construction can be eliminated by adopting pile bent construction.

No major dewatering measure is required. Minor seepage from sand layers or surface runoffs can be handled by sump pumping.

It is recommended that a pre-construction survey be carried out on the integrity of the culvert prior to the commencement of foundation works, to determine the influence of new foundation works on the culvert, if any.

Miscellaneous

The original memorandum dated 93 11 08 was prepared by David Kwok, Project Foundation Engineer, for Balu Iyer, Senior Foundation Engineer.

We believe the above is sufficient for your present purposes. Should you require further information, please contact our office. We will comment further when the design drawings are available.



David Kwok, P. Eng
Project Foundation Engineer
for
Paul Payer, P. Eng.
Senior Foundation Engineer

c.c. Has Shah (Planning & Design)
George Al-Bazi (Structural Office)

MEMORANDUM



To: Ed Ellard, P. Eng.
Head(Acting), Planning & Design Section
Central Region

Date: 93 11 08

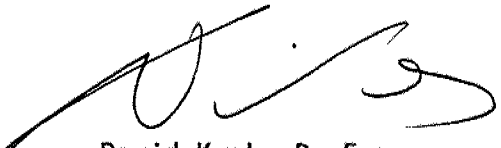
Attn: Paul Jankowski, Sr. Project Manager

From: Foundation Design Section
Room 315, Central Building

Re: Proposed Widening
Hwy 427 Overpass at Disco Road
W.P. 658-93-01, Site No. 37-0994
District 6, Toronto

Further to the telephone conversation (Jankowski/Iyer) on 93 10 29 regarding possible light weight fill placed at the above site, we have gone through the relevant files and our records indicate the following :

- Sanitary land fill material had existed on site from Sta 393+00 to Sta 401+50 (Imperial Units) of the highway. The foundation report issued in April, 1973 (W.P. 48-71-01) recommended removal of the sanitary land fill within the limits of the highway and replacing it with granular fill up to one foot above the water level and local cohesive till above this level.
- During the construction of the culvert that runs between the north and south piers of the above structures in 1976, failure of the culvert wall and associated retaining walls had taken place. An investigation was carried out and the remedial measures recommended in the report (Cont. 76-01) include setting back of the approach fill away from the walls, and excavation of relieving trenches behind the culvert and backfilling with loosely placed sand material.
- We do not have records of light weight fill being employed in association with the replacement of the old landfill or construction of the structures. To our knowledge, and with reference to the above-mentioned reports, conventional granular fill material was used. When the final layout and pertinent information are available for the stormwater lagoon, we are pleased to carry out the necessary field investigation.


David Kwok, P. Eng.
Project Foundation Engineer
for
Balu Iyer, P. Eng.
Senior Foundation Engineer

c.c. V. Boehnke, P. Eng.

MEMORANDUM



To: V.F. Boehnke, P. Eng.
Head, Structural Section
Central Region

Date: 93 11 08

Attn: John Lam, P. Eng.

From: Foundation Design Section
Room 315, Central Building

Re: Proposed Widening
Hwy 427 Overpass at Disco Road
W.P.653-93-01, Site No. 37-0994
District 6, Toronto

Further to your memorandum dated 93 09 23, we provide herewith our foundation recommendations for the proposed widening of the above structure. It is understood that the widening will be carried out in the median.

The existing overpass is a three span structure with both the abutment and pier footings supported by HP 12x74 (Imperial units) piles, driven to refusal within the lower portion of the glacial till deposit with a design load of 95 tons/pile. A buried box culvert carrying water from Mimico Creek runs between the north and south piers.

The subsurface stratigraphy typically comprises 10 to 20 m of cohesive glacial till deposit overlying bedrock. Some municipal land fill was found in local areas around the northeast portion of the existing NBL structure. This is outside the limits of the current widening. In any case, this land fill was supposedly removed under Cont 76-01 and replaced with earth fill material. From a review of the available borehole data, it is envisaged that the subsoil condition is quite uniform across the site and the present information is sufficient for us to provide with the foundation recommendations, as follows:

Foundation -

The proposed widening can be supported by 310x110 steel H-piles driven to refusal into the competent non-cohesive glacial till or possibly to bedrock. The following pile capacities should be employed in the design as per O.H.B.D.C :

Factored Axial Capacity at U.L.S.	1600 kN/pile
Axial Capacity at S.L.S. Type II	1150 kN/pile

Pile driving should be controlled by the Hiley Formula as per MTO Standards SS103-10 or SS103-11, assuming an ultimate capacity of 3450 kN/pile.

The field investigation has revealed shale fragments in the glacial till stratum. Piles should be equipped with reinforced pile tips in accordance with OPSD-3301.00. Pile caps should be located at the same elevation as the existing pile caps. For frost protection, an earth cover of 1.2 m or equivalent insulation should be provided.

New piles should be properly arranged to avoid interference with existing piles and buried box culvert.

Construction -

Temporary excavation is required for the construction of the pile caps. Cut slopes may be formed at an angle of 1H:1V or flatter up to a maximum height of 4 m. Shoring may be required when excavation is carried out close to the existing structure. No major dewatering measure is required. Minor seepage or surface runoffs can be handled by sump pumping. The excavations should be backfilled with approved earth fill material and compacted. For areas close to the existing culvert, compaction should be carried out by light compactors to avoid overstressing the culvert walls.

We believe the above is sufficient for your present purposes. Should you require further information, please contact our office.



David Kwok, P. Eng
Project Foundation Engineer

for

Balu Iyer, P. Eng.
Senior Foundation Engineer

c.c. Paul Jankowski
Sr. Project Engineer