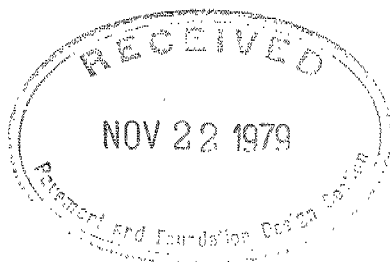


G.I.-30 SEPT. 1976

GEOCRES No. 31E-80DIST. 11 REGION W.P. No. 74-74-01/02CONT. No. 79-86W. O. No. STR. SITE No. HWY. No. 11LOCATION South C.N.R. SB. LanesNo of PAGES -=====OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. REMARKS:

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	W.P. 74-74-06 Muskoka Road #3 (Aspdin Road) Underpass
	W.P. 150-73-02 C.N.R. South Crossing North Bound Lane



NOTE: For purposes of the contract these reports supercede all other foundation reports prepared by or for the Ministry in connection with the above mentioned projects.

EXPLANATION OF TERMS USED IN REPORT

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

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

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

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

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

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

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

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

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

MODIFIED RECOVERY: SUM OF THOSE NATURALLY FRACTURED CORE PIECES, 4" IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

JOINTING AND BEDDING:

SPACING	2"	2" - 12"	1' - 3'	3' - 10'	> 10'
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

ABBREVIATIONS & SYMBOLS

LABORATORY TESTING

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

FIELD SAMPLING

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

EARTH PRESSURE TERMS

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

INDEX PROPERTIES

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

STRENGTH PARAMETERS

ϕ ANGLE OF SHEARING RESISTANCE
 τ_f PEAK SHEAR STRENGTH
 τ_R RESIDUAL SHEAR STRENGTH
 c COHESION INTERCEPT
 $\sigma_1, \sigma_2, \sigma_3$ NORMAL PRINCIPAL STRESSES
 u PORE WATER PRESSURE
 u_e EXCESS u
 r_u PORE PRESSURE RATIO
 q_u UNCONFINED COMPRESSIVE STRENGTH
 s_u UNDRAINED SHEAR STRENGTH
 ϵ LINEAR STRAIN
 γ SHEAR STRAIN
 ν POISSON'S RATIO
 E MODULUS OF ELASTICITY
 G MODULUS OF SHEAR DEFORMATION
 k_s MODULUS OF SUBGRADE REACTION
 m, n STABILITY COEFFICIENTS
 A, B PORE PRESSURE COEFFICIENTS
NOTE: EFFECTIVE STRESS PARAMETERS ARE DENOTED BY USE OF APOSTROPHE ABOVE THE SYMBOL, THUS:
 ϕ' = EFFECTIVE ANGLE OF SHEARING RESISTANCE;
 σ' = EFFECTIVE NORMAL STRESS

HYDRAULIC TERMS

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

FOUNDATION INVESTIGATION REPORT

For

- (1) C.N.R. South Crossing South Bound Lane
W.P. 74-74-01
- (2) C.N.R. South Crossing Service Road, Conn. 'B'
W.P. 74-74-02
- (3) Muskoka Road #3 (Aspdin Road) Underpass
W.P. 74-74-06
- (4) C.N.R. South Crossing North Bound Lane
W.P. 150-73-02

Huntsville Bypass, District No. 11 (Huntsville)

INTRODUCTION

This report contains the results of a number of foundation investigations which were carried out at various times between February 1956 and May 1978 in connection with the portion of Huntsville Bypass lying between Stas. 104 and 145. Fieldwork was accomplished using conventional diamond drills adapted for soil sampling purposes, continuous flight auger machines equipped with 3¼ inch I.D. hollow stem augers or 4 inch O.D. solid augers and by 2 inch O.D. hand augers. Where diamond drills were used holes were cased with NX size (3 inch I.D.) and BX size (2 3/8 inch I.D.) casings.

It should be noted that the complete contents of this report under the headings Site Description and Subsurface Conditions apply to conditions as they existed prior to the commencement of Contract 78-28 in June of 1978. Under Contract 78-28 considerable grading work has been done which involved the excavation of organic and other soft soil and the construction of various embankments using a non-cohesive material classified as 'gravelly sand with some boulders'. The excavation limits and the existing ground line are shown on Contract Drawings Sheet numbers 42-17A-2, 42-17B-2, 42-169-2 and 72-170-2.

SITE DESCRIPTION

The site is located just north of the existing intersection of Hwy. 11 and Muskoka Road No. 3 and extends for a distance of about 4000 feet to a point just south of Vernon Narrows bridge. This area is traversed from east to west by the C.N.R. which consists of a single track constructed on an embankment approximately 12 feet wide and generally 3 to 4 feet high. Existing Hwy. 11 which runs north-south, is located on the east side of the site and consists of a 24 foot wide asphalt pavement with 10 foot wide gravel shoulders. This road crosses the C.N.R. tracks via a 3 span steel plate girder, concrete deck overhead structure with perched abutments. The structure is founded on concrete filled, 12½ inch O.D. and ½ inch wall thickness steel tube piles driven closed-ended to approximate elevation 880-890. The approaches to the structure consist of embankments of maximum height about 35 feet with 2:1 side and forward slopes. These embankments were constructed using stage construction techniques as follows:

- initially about 8 feet of swamp deposits was removed by excavating and the resulting void backfilled to about elevation 940 with fine sand. Remaining lifts of fill were placed in amounts controlled by the pore pressures induced in the subsoil below the embankment which were monitored in piezometers installed for this purpose. Total construction time to full height was about 13 months in 1958/59. The terrain in the southern half of the site consists mostly of swampy bush whilst the northern half is rolling, moderately hummocky land partially bush covered. The northern portion is bounded to the east of Hunter's Bay which ranges in depth from 10 to 15 feet in the area covered by the foundation investigation.

SUBSURFACE CONDITIONS

General

Subsoil over the site area consists mainly of deposits of organic silt or clay (also referred to as muck), followed by

cohesive deposits of silty clay or clayey silt (sometimes containing silt layers) followed by deposits of silt and of sand, gravel and boulders all overlying schist bedrock. The depths and consistency or denseness of these deposits are extremely variable and reference should be made to the Record of Borehole Sheets contained in the report appendix on which are shown the boundaries between different soil types and summarized results of all field and laboratory tests. Reference should also be made to Drawing Nos. 42-17A-2, 42-17B-2, 42-169-2 and 72-170-2 of the Contract Drawings which show the locations and elevations of all borings together with the inferred subsoil stratigraphy along various longitudinal and transverse lines. In general the area south of the C.N.R. tracks contain the deepest and softest muck and other cohesive deposits, and up to 8 feet of muck is followed by up to 40 feet of very soft to stiff clayey silt. North of and including subsoil below the railway embankment conditions are generally more favourable than to the south although subsoil strata are essentially similar as to type and depth but the consistency of the cohesive deposits generally ranges from firm to stiff.

A more detailed description of the various soil types prevailing over the site is given below.

Fill Material

Fill material at the site is contained in the various roadbeds and embankments for existing Hwy. 11, the C.N.R. tracks Muskoka Rd. No.3, Old Muskoka Rd., and various abandoned Twp. roads and old driveways. The material in the Hwy. 11 embankment consists mainly of fine sand and silt down to elevation 925, roughly 8 to 10 feet below original ground level. The material in the C.N.R. embankment consists of about 18 inches of stone ballast followed by about 7 to 10 feet of a sand and clayey silt mixture in a compact or firm state. The remaining Twp. and other old roadbeds consist mainly of gravel and sand to depths of about 2 to 3 feet below the original ground surface.

Muck (Area South of Hunters Bay - Sta. 104-128)

This deposit covers most of the area investigated south of Hunters Bay except where it has been excavated or displaced by the various existing road and railway embankments. The deepest deposits are mainly found in the swampy areas on both sides of existing Hwy. 11 south of the C.N.R. tracks. The material is amorphous and it is composed mainly of organic clay and silt. It has a very high moisture content, sometimes in excess of 300%. Its undrained shear strength is very low, and is estimated to be less than 200 psf. The average depth is in general about 4 to 8 feet.

Silty Clay/Clayey Silt (Area South of Hunters Bay - Sta. 104-128)

This is the predominant deposit in the area. It has a thickness of about 15 feet to 50 feet. It is stratified throughout its entire depth, with frequent silt seams, a feature generally associated with glacio-lacustrine deposits. Because of the presence of the more permeable silt seams, this material is likely to have a relatively high rate of consolidation. The silty clay/clayey silt tends to be thicker and softer in the swamp areas than in areas north of the railway track. On the basis of undrained shear strength tests the silty clay/clayey silt in the swamp areas can be described as very soft to stiff and in areas north of the railway track, soft to stiff.

Representative undrained shear strengths are in the order of 1000 to over 2000 psf for the stiffer material and 250 to 800 psf for the softer material. The silty clay/ clayey silt in the swamp probably is a normally consolidated material as its moisture contents are generally found to be close to its liquid limits. From laboratory test results, the moisture contents and Atterberg limits show a wide range of variation, reflecting the stratified nature of this material.

Silt (Area South of Hunters Bay - Sta. 104-128)

Underlying the above mentioned cohesive clayey silt/ silty

clay deposit is a layer of silt some 10 to 20 feet thick. The exact boundary between this silt deposit and the upper cohesive stratum is however not always very distinct. The silt is slightly stratified with occasional clay seams suggesting that this material is also a glacio-lacustrine deposit. On the basis of the 'N' values, the relative density of the silt can be assessed as 'compact'.

Sand and Gravel (Area South of Hunters Bay - Sta. 104-128)

Under the silt layer is a deposit of sand and gravel, containing cobbles and boulders. The lower boundary of this deposit was not investigated in full, partly because of the presence of large boulders and partly because of artesian conditions. Inferred from information at adjacent sites and from boreholes in which bedrock was proven by rock-coring, the sand and gravel layer is believed to be underlain by metamorphic granitic bedrock. The angularity of the particles and the unsorted grain sizes of this material which range from very fine sand to large boulders, suggest the sand and gravel layer is a glacio-fluvial deposit. Because of the presence of large size particles and unsorted matrices, the 'N' values cannot be taken at face value to estimate the relative densities of the material. However, judging from the manner in which the NX casing was advanced, it is probable that the sand and gravel layer is dense to very dense.

Bedrock (Area South of Hunters Bay - Sta. 104-128)

Bedrock at the site is a fine grained micaceous schist and a medium grained biotite gneiss, with occasional quartz inclusions. Both rock types are metamorphosed granite of precambrian age.

On the basis of high rock core recovery ratios and large average core sizes, the bedrock is considered to be in a sound condition.

Groundwater

Groundwater levels which were observed during the fieldwork operations are recorded on each individual Record of Borehole sheet together with the boring date. In general these levels corresponded with the levels of adjacent bodies of water such as exist in the swampy areas, drainage ditches and in Hunters Bay. The levels were found to range from elevation 931 (Hunters Bay level at the time) and elevation 938 in the higher ground to the southwest. An artesian condition was found to exist in the sand and gravel strata which underlies existing Hwy. 11 in the vicinity of Sta. 106. This artesian water was found to have a head to elevation 941 some 4 to 6 feet higher than the adjacent swamp levels.

K. G. Selby

K. G. Selby, P. Eng.
Senior Foundation Engineer.

October, 1979.

APPENDIX

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 701

150-73-02
W/P 74-74-01.02 & 06

DIST 11 HWY 11

DATUM Geodetic

LOCATION Co-ords # 16,466,528 N; 1,065,533 E.

BORING DATE September 10, 1975

BOREHOLE TYPE Washboring with NX & BX Casings

ORIGINATED BY PL

COMPILED BY BL

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ PCF	REMARKS ∇ Art. Head %
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N° VALUES		20	40	60	80	100	w_p	w	w_L		
936.7	Ground Level															
0.0	Muck															
928.7			1	SS	3	930									69	8.9% Org.
8.0	Clayey silt Soft to firm, with frequent clay seams and fine sand partings Sensitive Becoming silty below El. 910.0		2	SS	7											0 0 86 14
			3	TH	PM	920									105	
			4	SS	3											0 0 71 29
			5	TH	PM	910									116	
904.7			6	SS	28											
32.0	Silt Loose to Compact trace of clay & sand		7	SS	16	900										0 0 99 1
			8	SS	6											
891.7																
45.0	Sand - fine to medium Dense to Very Dense some gravel		9	SS	31	890										Art. Head encountered
						880										
			10	SS	85%	870										
			11	RC	58%											
862.7			12	RC	47%											
74.0	End of Borehole N.B.: 1. C.W.L. at elev. 934.2 on Sept. 15/75. 2. Artesian pressure encountered at El. 890.± with a head 3'-9" above ground surface.															

MINISTRY OF TRANSPORT, HIGHWAYS AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 702

150-73-02

WP 74-74-01, 02 & 06

DIST 11 HWY 11

DATUM Geodetic

LOCATION Co-ords. 16,466,504 N; 1,065,423 E.

BORING DATE September 15, 1975

BOREHOLE TYPE Washboring with NX & BX Casing

ORIGINATED BY BL

COMPILED BY BL

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT Y	REMARKS ▽ Artesian Head %
ELEV DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	'N' VALUES		70	40	40	40	100	w_p	w	w_L		
936.5	Ground Level															GR SA SI CL
0.0	Clayey silt, with frequent clay seams & fine sand partings		1	SS	16	930										0 1 66 33
			2	SS	3											
			3	SS	9	920										0 0 69 11
913.5	Grey		4	SS	20											
23.0	Silt		5	SS	15	910										0 0 99 1
	Compact Grey		6	SS	2/6"											
903.5			7	SS	14	900										▽ Art. Head encountered
33.0	Sand, fine to medium dense to very dense some gravel		8	SS	60/6"	890										
	frequent cobbles and boulders below		9	WS	-											
	El. 896.±		10	WS	-	880										
						870										
866.5																
70.0	End of Borehole N.B.: Artesian pressure encountered at El. 900.± with a head 4' above ground surface.															

MINISTRY OF TRANSPORT, HIGHWAYS AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 703

150-73-02
WP 74-74-01, 02 & 06

LOCATION Co-ords. 16,466,533 N; 1,065,302 E.

ORIGINATED BY EL

DIST 11 HWY 11

BORING DATE September 10, 1975

COMPILED BY RL

DATUM Geodetic

BOREHOLE TYPE Washboring with NX & BX Casing

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
941.0	Ground Level															
0.0	Clayey stiff stiff, with frequent clay seams and fine sand partings		1	SS	19	940										Art. Head
			2	SS	10	930										0 0 72 25
			3	SS	20											
918.0	Grey		4	SS	22	920										
	Silt Compact traces of clay		5	SS	17											0 0 95 5
908.0			6	SS	21	910										
33.0	Sand-fine to medium, dense to very dense some gravel		7	SS	25											Art. Head encountered
	frequent cobbles and boulders below El. 900.±		8	SS	45	900										0 90 (10)
			9	SS	100	890										
879.5			10	SS	90	880										
61.5	End of Borehole															
	N.B.: Artesian pressure encountered at El. 907± with a head up to ground surface.															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE N2 704

150-73-02
W/P 74-74-01, 02 & 06

DIST 11 HWY 11

DATUM Geodetic

LOCATION Co-ords. 16,466,478 N; 1,065,885 E.

BORING DATE October 24, 1974

BOREHOLE TYPE Hollow Stem Auger & Cone Test

ORIGINATED BY

COMPILED BY GI

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT			LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ P.C.F.	REMARKS % OR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES		20	40	60	80	100	w_p			w	w_L
							SHEAR STRENGTH					WATER CONTENT %				
						○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE x LAB VANE										
						1000 2000					20 40 60					
935.5	Ground Level															
0.0	Clayey silt to silty clay layers of silt	<div><div>Firm</div><div>soft</div><div>firm</div></div>	1	SS	24											
				2	TW		PH									
				3	TW		PH									
				4	TW		PM									
				5	TW		PH									
				6	TW		PH									
905.5																
30.0	Silt, some clay		7	SS	10											
				8	TW	PH										
890.5	Silty sand, some clay Very loose		9	SS	33											
888.5																
47.0	End of Borehole															
876.5	End of Cone Test															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 705

150-73-02
WP 74-74-01, 02 & 06

LOCATION Co-ords. 16,466,462 N; 1,065,682 E.

ORIGINATED BY AP

DIST 11 HWY 11

BORING DATE October 25, 1974

COMPILED BY GP

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger & Cone Test

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ PCF	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	IN VALUES		20	40	60	80	100	w_p	w	w_L		
937.9	Ground Level															
0.0	Clayey stiff to very stiff with layers of silt		1	TW	PH											
			2	TW	PH											
			3	TW	PH											
919.9			4	TW	PH											
18.0	Silt trace of clay		5	TW	PH											
909.0			6	SS	8											
28.9	Silty sand, fine, some gravel		7	SS	7											
899.9			8	SS	9											
38.0	End of Borehole															
891.1																
46.8	End of Cone Test															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

150-73-02

RECORD OF BOREHOLE No 706

WP 74-74-01, 02 & 06

LOCATION Co-ords. 16,466,790 N; 1,065,300 E.

DIST 11 HWY 11

BORING DATE February 10, 1976

ORIGINATED BY BVV

DATUM Geodetic

BOREHOLE TYPE Washboring with NX Casing

COMPILED BY BVV

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT PCF	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
930.0	Ice Surface															
0.0	Water															
926.0																
4.0	Muck Very Soft		1	SS	PM		+ 5								54%	Org.
918.5			2	SS	JM	920									64%	Org.
11.5	clayey silt Stratified		3	TW	PM		+ 2								122	
909.0			4	SS	J	910	+ 11									
21.0	Silty clay to clayey silt Stratified Soft to Firm Firm to stiff		5	SS	PM		+ 2									
			6	TW	PM	900	+ 8								108	
			7	TW	PM		+ 9									
891.0																
29.0	Silt, Compact Trace of clay and stratified		8	SS	15	890	+ 5									0 0 92%
			9	SS	11	880										
	Possible sand & gravel at 61.5'															
368.0			10	SS	17	870										0 11 71 18
62.0	End of Hole															

20
15 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 707

150-73-02
WP 74-74-01, 02 & 06

DIST 11 HWY 11

DATUM Geodetic

LOCATION Co-ords. 16,466,275 N; 1,065,875 E.

BORING DATE February 11, 1976

BOREHOLE TYPE Washboring with NX Casing

ORIGINATED BY BT.

COMPILED BY BVV

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p — w — w_L		
934.0	Ground Level													
0.0	topsoil													
	Clayey silt, stratified with clay and silt seams	Stiff Soft	1	SS	24	930								
			2	SS	2									
			3	SS	8	920								
	becoming very silty		4	SS	17									
912.0														
22.0	Silt Compact					910								
	occ. clay seams		5	SS	15									
900.0														
34.0	Sand, gravel					900								
897.5	Very Dense		6	SS	105	10"								
36.5	End of Borehole													

20
15 ϕ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

150-73-02

RECORD OF BOREHOLE NO 708

WP 74-74-01, 02 & 06

LOCATION Co-ords. 16,467,557 N; 1,065,657 E.

ORIGINATED BY BL

DIST 11 HWY 11

BORING DATE August 14, 1975

COMPILED BY BL

DATUM Geodetic

BOREHOLE TYPE Washboring with NX & BX

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
935.6	Ground Level															
0.0	Sand Fill															
931.1	Clayey silt		1	SS	22	930										
4.5	Firm to Stiff		2	TW	PM											
			3	TW	PM	920										
915.6																
20.0	Silt		4	SS	20											
	Compact															
	some clay		5	SS	20	910										
904.6																
31.0	Sand, some gravel		6	RC	83%	900										
	Boulders		7	RC	50%											
895.6			8	RC	94%											
40.0	Gneiss Bedrock		9	RC	98%											
839.6																
46.0	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 709

150-73-02

WP 74-74-01, 02 & 06

DIST 11 HWY 11

DATUM Geodetic

LOCATION Co-ords. 16,467,502 N: 1,065,391 E.

BORING-DATE August 13, 1975

BOREHOLE TYPE Washboring with NX & BX Casing

ORIGINATED BY SL

COMPILED BY BL

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNST. WEIGHT Y	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N° VALUES		20	40	60	80	100	w_p	w	w_L		
935.2	Ground Level															
0.0	Sand Fill - old road bed, with crushed stone					930										
929.7			1	SS	20											
5.5	Silt and sandy silt															
922.2	Fill		2	SS	8											0 0 85 15
13.0	Clayey silt		3	TW	PM	920										
	Firm to Stiff		4	TW	PM											110
			5	TW	PM	910										
906.2																
29.0	Silt - Compact stratified trace of clay		6	TW	PM											
			7	SS	12	900										
893.2			8	SS	20											
42.0	Sand and gravel					890										0 0 95 5
387.7			9	SS	44											
47.5	End of Borehole															
	NB: BX casing bouncing at 47.5'															

MINISTRY OF TRANSPORT, HIGHWAYS AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE No 710

150-73-02
 WP 74-74-01, 02 & 06 LOCATION Co-ords. 16,467,680 N; 1,065,477 E.
 DIST 11 HWY 11 BORING DATE August 29, 1975 ORIGINATED BY BL
 DATUM Geodetic BOREHOLE TYPE Washboring with GX & BX COMPILED BY BL
 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT Y	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES		20	40	60	80	100	w_p	w	w_L		
933.7	Ground Level															
0.0	Muck					930										
925.7			1	SS	3											
8.0	Silty clay to clayey silt		2	SS	4											
	Firm to Stiff		3	TW	PM	920										
	layered		4	TW	PM											
908.2						910										
25.5	Silt		5	SS	2B											
	Compact		6	SS	34											
	trace of sand and clay seams		7	SS	15											
895.7						900										
38.0	Sand, trace of fine gravel		8	SS	5											
388.4						890										
45.3	End of Borehole N.B: Refusal at 45.3'															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 711

150-73-02
WP 74-74-01, 02 & 06

DIST 11 HWY 11

DATUM Geodetic

LOCATION Co-ords. 16,467,739 N; 1,065,481 E.

BORING DATE August 26, 1975

BOREHOLE TYPE Washboring with NX & BX

ORIGINATED BY BL

COMPILED BY BL

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLT.	NUMBER	TYPE	N _v VALUES		20	40	60	80	100	w_p	w	w_L		
935.2	Ground Level															
0.0	Sand & silt															
930.2																
5.0	Muck		1	SS	0	930										
922.2			2	SS	1/6"	920										
13.0	Clayey silt		3	TW	PM											
	Firm and layered		4	TW	PM											
	some silt and clay		5	SS	1/6"	910										
	seams		6	TW	PM											
899.2			7	SS	9	900										
36.0	Silt		8	SS	11	890										
	Compact		9	SS	35											
	trace of clay															
878.2						880										
57.0	Sand and gravel		10	RC	89%											
	with boulders		11	RC	133%	870										
866.7																
68.5	Gneiss Bedrock		12	RC	97%	860										
856.8			13	RC	95%											
78.4	End of Borehole															

MINISTRY OF TRANSPORT, HIGHWAYS AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 712

150-73-02
WP 74-74-01, 02 & 06

DIST 11 HWY 11

DATUM Geodetic

LOCATION Co-ords. 16,467,852 N; 1,065,461 E.

BORING DATE August 28, 1975

BOREHOLE TYPE Washboring with NX & BX

ORIGINATED BY EL

COMPILED BY BL

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	IN-VALUES		20	40	60	80	100	w_p	w	w_L		
934.6	Ground Level															GR SA SI CL
0.0	Silt and organics															
926.6			1	TH	PM	930										
8.0	Clayey silt		2	TH	PM											
	stratified		3	SS	14	920										
	Soft		4	TH	PM	18"										
	Firm		5	SS	14	910										
901.6			6	SS	13											
33.0	Silt		7	SS	20	900										
	Compact		8	SS	14											
	trace of clay															
689.6						890										
45.0	Sand - medium		9	SS	59											
	some fine gravels															
823.1			10	SS	N/R											
51.5	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 713

150-73-02
WP 74-74-01, 02 & 06

LOCATION Co-ords. 16,467,657 N; 1 065,652 E.

ORIGINATED BY BL

DIST 11 HWY 11

BORING DATE September 5, 1975

COMPILED BY BL

DATUM Geodetic

BOREHOLE TYPE Washboring with NX & BX Casings

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT		LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		UNIT WEIGHT γ P.C.F	REMARKS % GR SA SI C
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N VALUES		20 40 60 80 100	1000 2000	w_p — w — w_L	20 40 60		
938.9	Ground Level											
0.0	Sand Fill, some clay & brick fragments											
932.9			1	SS	8							
6.0	Clayey silt Very Stiff, Stratified some clay seams		2	SS	20							
			3	TW	FM							
	more silty		4	SS	23							
914.9												
24.0	Silt Compact		5	SS	17							
904.9	trace of sand											
29.0	Sand and gravel Very Dense occasional boulders encountered		6	SS	37							
			7	SS	100							
892.4												
46.5	End of Borehole N.B.: BX casings met refusal at 46.5'											

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORT, HIGHWAYS AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 714

150-73-02
 V/P 74-74-01, 02 & 06 LOCATION Co-ords. 16,467,846 N; 1,065,659 E. ORIGINATED BY RL
 DIST 11 HWY 11 BORING DATE August 21, 1975 COMPILED BY BL
 DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX Casings CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT % 20 40 60	UNIT WEIGHT γ	REMARKS % OR SA SI CI
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N. VALUES		20	40	60	80	100			
947.5	Ground Level													
0.0	Fill mostly sand (Embankment of Hwy. 11)		1	SS	48									
935.5						940								
12.0	Silty clay to clayey silt, with silt seams & sand partings		2	SS	42	930								
			3	SS	14	920								
	Firm		4	TW	PM	910								
			5	TW	PM	900								
899.5						890								
48.6	Sand Very Dense some gravel and boulders		6	SS	52	880								
			7	RC	50Z	870								
868.0														
79.5	End of Borehole NB: Bi-cone met refusal at 868.0'													

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

RECORD OF BOREHOLE NO 715

150-73-02
 WP 74-74-01, 02 & 06 LOCATION Co-ords. 16,467,772 N; 1,065,634 E. ORIGINATED BY BL
 DIST 11 HWY 11 BORING DATE September 2, 1975 COMPILED BY BL
 DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX Casings CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT Y	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N ₆₀ VALUES		20	40	60	80	100	w_p	w	w_L		
939.2	Ground Level															
0.0	Fill: sand & silt, some clay															
931.2	and gravel		1	SS	5											
8.0	Clayey silt: Stiff & stratified some fine sand partings		2	SS	21	930										
			3	SS	15											
			4	SS	16	920										
			5	SS	15											
908.2	Clayey silt Stiff and stratified		6	SS	22	910										
31.0	Silt Compact trace of clay		7	SS	25											
			8	SS	13	900										
396.2																
43.0	Sand and gravel		9	SS	13											
	Very Dense					890										
	occasional boulders		10	SS	78											
						880										
876.7																
62.5	Micaceous Schist Rock		11	RC	83Z	870										
367.9			12	RC	83Z											
71.3	End of Borehole															

MINISTRY OF TRANSPORT AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 716

150-73-02
 WP 74-74-01, 02 & 06 LOCATION Co-ords. 16,467,560 N: 1,065,683 E. ORIGINATED BY AD
 DIST 11 HWY 11 BORING DATE October 21 & 22, 1974 COMPILED BY GP
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Cone Test CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES		20	40	60	100	w_p	w	w_L		
936.5	Ground Level														
934.0	Mix of clayey silt sand, gravel & bricks														
2.5	Clayey silt with layers of silt		1	SS	LI									125.5	
			2	TW	PH										
			3	TW	PH										
			4	SS	5										
			5	TW	PH										
	Stiff to Very Stiff		6	TW	PH										
910.5			7	SS	8										
26.0	Silt traces of clay		8	SS	9										
			9	SS	12										
	Loose to Compact		10	SS	5										
993.4			11	TW	PH										
38.1	End of Borehole														

RECORD OF BOREHOLE No 717

WP 74-74-01, 02 & 06

DIST 11 HWY 11

DAIJM Geodetic

LOCATION	Co-ords. 16,467,455 N; 1,065,697 E.
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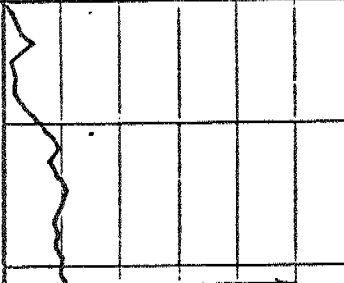
BORING DATE October 23, 1974

BOREHOLE TYPE Cone Test Only

ORIGINATED BY AD

COMPILED BY GP

CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT	L'QUID LIMIT ———— w_L	UNIT WEIGHT γ	REMARKS			
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N-VALUES		20 40 60 80 100	PLASTIC LIMIT ———— w_p			WATER CONTENT ———— w		
							SHEAR STRENGTH PSF				w_p ———— w ———— w_L		WATER CONTENT %
							○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB VANE					
938.0	Ground Level									GR SA SI CL			
0.0													
918.0													
20.4	End of Cone Test						refusal						

15 ϕ 5 % STRAIN AT FAILURE

MINISTRY OF TRANSPORT, HIGHWAYS AND COMMUNICATIONS—ONTARIO

RECORD OF BOREHOLE NO 718

150-73-02
WP 74-74+01, 02 & 06

LOCATION Co-ords. 16,467,913 N: 1,065,607 E.

DIST 11 HWY 11

BORING DATE February 1956

ORIGINATED BY Racey McCallum

DATUM Geodetic

BOREHOLE TYPE Washboring with NX & BX

COMPILED BY

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N° VALUES		20	40	60	80	100	w_p	w	w_L		
931.0	Ground Level															
0.0	Fill					930										
925.0			1	TV	PM											
6.0	Silty clay to clayey silt		2	TV	PM	920	+s3.0									
			3	TV	PM		+s3.0									
	Soft		4	TV	PM		+s3.7									
			5	TV	PM	910	+s1.7									
			6	TV	PM		+s3.0									
	stratified		7	TV	PM		+s1.3									
896.0			8	TV	PM		+s3.4									
895.0	Silt Compact		9	TV	PM	900	+s3.8									
892.0			10	TV	PM		+s2.9									
890.0	End of Borehole		11	SS	LS		+s2.4									
			12	SS	LS											

MINISTRY OF TRANSPORT, HIGHWAY AND COMMUNICATIONS - ONTARIO

RECORD OF BOREHOLE NO 719

150-73-02
 WP 74-74-01, 02 & 06 LOCATION Co-ords. 16,467,418 N: 1,065,560 E. ORIGINATED BY Racey
 DIST 11 HWY 11 BORING DATE February 1956 COMPILED BY _____
 DATUM Geodetic BOREHOLE TYPE Washboring with MX & BX CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT % 20 40 60	UNIT WEIGHT γ	REMARKS % OR S.A.S. C.
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES		20	40	60	80	100			
932.0	Ground Level													
0.0	Organic clayey Silt					930								
928.0	Vary Soft													
4.0	clayey		1	TW	PM									
	silt with silt layers		2	TW	PM	920								
	Firm		3	TW	PM									
914.5														
17.5	Silt		4	TW	PM	910								
908.0	Compact		5	SS	N/R									
24.0	End of Borehole													

MINISTRY OF TRANSPORT AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 720

150-73-02
WP 74-74-01, 02 & 06

LOCATION Co-ords. 16,468,010 N; 1,065,535 E.

DIS 11 HWY 11

BORING DATE February 11, 1976

ORIGINATED BY BVV

COMPILED BY BVV

DATUM Geodetic

BOREHOLE TYPE Washboring with NX Casing

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ PCF	REMARKS % GR SA SI C
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES		20	40	60	80	100	w_p	w	w_L		
936.0	Ground Level															
0.0	Topsoil															
933.0	Clayey silt to silt Brown, oxidized some organics stratified		1	SS	8	930										
			2	SS	11											
918.0			3	SS	21	920										
18.0	Silty clay to clayey silt, Grey and stratified Soft to Firm		4	SS	8											
			5	TW	PM	910										
			6	TW	PM											
902.0																
34.0	Silt, trace of clay Compact		7	SS	18	900										
			8	SS	19											
890.0																
46.0	Sand and Gravel Very Dense					890										
884.0																
52.0	End of Borehole N.B.: Probable bedrock at El. 884.0±		9	SS	100/2"											

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 721

150-73-02
WP 74-74-01, 02 & 06

LOCATION Co-ords. 16,467.325 N: 1,065,295 E.

ORIGINATED BY PL

DIST 11 HWY 11

BORING DATE February 9, 1976

COMPILED BY N.

DATUM Goodetic

BOREHOLE TYPE Washboring with NX Casing

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DIAPHRAGM CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ PCF	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N VALUES		20	40	60	80	100	w_p	w	w_L		
00.0	Ice Surface															
0.0	Water															
925.0																
5.0	Bottom of Swamp Muck - fibrous and silty		1	SS	0	920	+4								109	13.6% Org.
919.0			2	SS	0											7.4% Org.
11.0	Clayey silt - very silty clay soft to stiff stratified		3	TM	PH	910	+3									
			4	TM	PH											
			5	SS	1	18"	+8									
	becoming more silty		6	TM	PH	900	+8								116	
33.0	Silt - Compact trace of clay stratified trace of cohesion cohesionless		7	SS	16	890										0 0 83 17
			8	SS	20											
			9	SS	16	880										
376.0	A boulder @ 34'															
34.0	End of Borehole															
167.0																
63.0	End of Cone Test															

MINISTRY OF TRANSPORT, HIGHWAYS AND COMMUNICATIONS - ONTARIO

RECORD OF BOREHOLE NO 722

WP 74-74-01, 02 & 06 LOCATION Co-ords. 16,467,418 N; 1,065,242 E. ORIGINATED BY BL
 DIST 11 HWY 11 BORING DATE August 19, 1975 COMPILED BY
 DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ PCF	REMARKS
ELEV DEPTH	DESCRIPTION	STAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
935.0	Ground Level															
931.5	Fill - old road bed															
929.0	Muck		1	SS	16	930										5.5% Org.
927.0	Clayey silt Firm to Stiff		2	TW	PM											
	stratified with clay seams and fine sand partings		3	TW	PM	920										
			4	SS	6											
			5	TW	PM	910										
907.0	Silt Compact and trace of clay		6	SS	20											0 0 99 1
900.0	Sand with some gravel and boulders		7	SS	60.4"	890										
887.5	Gneiss Rock		8	RC	92%											
882.0			9	RC	80%											
853.0	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 723

150-73-02
 WP 74-74-01, 02 & 06 LOCATION Co-ords. 16,467,585 N; 1,065,230 E. ORIGINATED BY EL
 DIST 11 HWY 11 BORING DATE September 9, 1975 COMPILED BY
 DATUM Geodetic BOREHOLE TYPE Washboring with NX Casing CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT Y	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	W_P	W	W_L		
936.1	Ground Level															
0.0	topsoil		1	SS	18											
	Clayey silt Very Stiff		2	SS	27											0 0 82 13
	Stratified with clay seams & occasional fine sand partings		3	SS	14											
921.1																
15.0	Silt		4	SS	27											0 0 92 8
	stratified, occ. clay seams		5	SS	13											
913.1																
23.0	Sand, some gravel, frequent boulders		6	RC	50%											
905.1																
31.0	End of Borehole															
	NB: Artesean water encountered at El. 913±															

MINISTRY OF TRANSPORT AND COMMUNICATIONS - ONTARIO

RECORD OF BOREHOLE NO 724

150-73-02
 WP 74-74-01, 02 & 06 LOCATION Co-ords. 16,467,425 N; 1,065,255 E. ORIGINATED BY 37
 DIST 11 HWY 11 BORING DATE September 29, 1961 COMPILED BY UK
 DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ P.C.F.	REMARKS % OVER SA 51 CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L	
935.0	Ground level														
932.5	Fill. Silty sand with organics.		1	SS	7										
2.5			2	SS	18	930									124.9
	Silty clay to clayey silt stratified with occ. silt layers.		3	TW	PH										125.8
			4	TW	PH	920									112.4
	Stiff		5	TW	PH										
910.0			6	TW	PH	910									124.8
25.0	Silt		7	TW	PH										124.0
	Compact		8	TW	PH	900									
899.5			9	SS	42										
35.5	Sand and gravel		10	SS	100/5"										
894.5	Dense		11	RC		890									
40.5	Schist Rock		12	RC											
886.5															
48.5	End of Borehole														
	NB: Artesian pressure observed at 899.5														

MINISTRY OF TRANSPORT, HIGHWAYS AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 725

150-73-02
 WP 74-74-01, 02 & 06 LOCATION Co-ords. 16 467,650 N; 1,065,265 E. ORIGINATED BY _____
 DIST 11 HWY 11 BORING DATE October 6, 1961 COMPILED BY _____
 DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_P	w	w_L	
937.0	Ground Level														
935.0	Topsoil														
2.0	trace organic		1	SS	25										
	Silty clay to		2	SS	17										
	clayey silt		3	TW	PH										
	Stratified		4	TW	PH										
	Stiff		5	TW	PH										
915.0	becoming very silty		6	TW	PH										
22.0	Silt		7	TW	PH										
	Compact		8	TW	PH										
905.0			9	SS	7										
32.0	Sand and gravel														
	Loose to Very Dense														
893.5			10	SS	82.6"										
43.5	End of Borehole														
	NB: Artesian pressure noted at El. 905.														

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

RECORD OF BOREHOLE NO 726

150-73-02
WP 74-74-01, 02 & 06

LOCATION Co-ords. 16,467,360 N; 1,065,180 E.

ORIGINATED BY BK

DIST 11 HWY 11

BORING DATE October 10, 1961

COMPILED BY BK

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L	
935.0	Ground level														
932.5	Fill-old road bed														
2.5	Muck Soft some clay		1	SS	13	930									
927.0			2	SS	9										
8.0	Silty clay to clayey silt stratified Soft to Firm		3	TW	PH										
			4	TW	PH	920									
			5	TW	PH										
			6	TW	PH	910									
903.0			7	TW	PH										
32.0	Silt Compact		8	TW	PH	900									
			9	SS	10										
891.0	Sand and gravel Compact		10	SS	19										
44.0	End of Borehole														
272.0	NB: 1. Artesian pressure noted at El. 891.2 2. Cone refusal at 885.0														
44.0															

MINISTRY OF TRANSPORT, HIGHWAYS AND COMMUNICATIONS - ONTARIO

RECORD OF BOREHOLE NO 727

150-73-02
WP 74-74-01, 02 & 06

LOCATION Co-ords. 16,467,310 N; 1,065,255 E.

ORIGINATED BY EE

DIST 11 HWY 11

BORING DATE October 12, 1961

COMPILED BY BK

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS % OR SA S' C
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
932.0	Water Level															
931.0																
1.0	Muck, with clayey silt. Very Soft		1	SS	P	930									261Z	
924.0			2	SS	1/19"											
8.0	Clayey silt/silty clay, stratified Very Soft to Soft		3	SS	1/13"											
			4	SS	4	920										
			5	SS	1/24"										107.0	
			6	SS	2											
			7	SS	1/18"	910										
	Firm		8	SS	4											
			9	SS	6											
900.0			10	SS	8	900										
32.0	Silt Compact		11	SS	10											
891.0			12	SS	9											
61.0	Sand and gravel Compact to Dense		13	SS	16	890										
283.4																
48.6	Schist Rock															
878.4			14	RC	76Z	880										
52.6	End of Borehole NB: Artesian pressure observed at 891.±															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 747

150-73-02
WP 74-74-01, 02 & 06

LOCATION Co-ords. N 16,468,070; E 1,065,800

ORIGINATED BY MK

DIST 11 HWY 11

BORING DATE August 5, 1976

COMPILED BY JC

DATUM Geodetic

BOREHOLE TYPE NX Casing & Washboring & Cone Test

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	100	w_p	w	w_L		
941.9	Ground Level														
0.0	Fill material Mixture of sand & wood chips		1	SS	5	940									
			2	SS	8										
			3	SS	8										
926.9			4	SS	5	930									
15.0	Clayey silt Some sand, Trace of gravel		5	SS	10										
	Very soft to Firm		6	TW	PM	920									
			7	SS	0										
			8	TW	PM	910									
			9	SS	4										
			10	SS	11	900									
			11	TW	PM	890									
880.4			12	SS											
61.5	Sand & gravel Trace of silty & clay Very dense		13	SS	104	870									
867.4															
74.5	End of Borehole														

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 748

150-73-02
 W-P 74-74-01, 02 & 06 LOCATION Co-ords N 16 468 165 E 1065835 ORIGINATED BY WV
 DIST 11 HWY 11 BORING DATE August 9, 1976 COMPILED BY JC
 DATUM Geodetic BOREHOLE TYPE NX Casing and Washboring and Cone Test CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w		
940.0 0.0	Ground Level														
	Fill Material Some Sand and Wood Chip		1	SS	6										
			2	SS	7										
			3	SS	11										
			4	SS	12										
924.0 16.0	Clayey Silt Some Sand Trace of Gravel Soft to Stiff		5	SS	5										
			6	TW	PM										
			7	TW	PM										
			8	SS	1/18"										
			9	TW	PM										
			10	SS	11										
			11	TW	PM										
884.0 56.0	Sand and Gravel Traces of Silt and clay Compact		12	SS	26										
874.5 65.5			13	SS	25										
871.5	End of Borehole														
68.5	End of Cone Test														

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

150-73-02
WP 74-74-01, 02 & 06

LOCATION Co-ords. N 16,467,455; E 1,065,730

ORIGINATED BY MK

DIST 11 HWY 11

BORING DATE Aug. 11 & 12, 1976

COMPILED BY PP

DATUM Geodetic

BOREHOLE TYPE Washbore, NX Casing & Cone Test

CHECKED BY _____

SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT		LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES	GROUND WATER ELEV	20 40 60 80 100	SHEAR STRENGTH PSF O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE	WATER CONTENT % w_p — w — w_L		
934.4	Ground Level										
0.0	Trace of organics		1	SS	4						
	Clayey silt		2	SS	1/2"						
	Some sand, trace of gravel		3	SS	11						
			4	SS	1/18"						
	Occassional silt Layers		5	TW	PM						
	Very soft		6	SS	1						
	to		7	TW	PM						
	Firm		8	TW	PM						
			9	SS	19						
			10	SS	13						
878.9			11	SS	48						
55.5	End of Borehole										
867.1											
67.3	End of Cone test							100/4"			

20
15 ϕ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 750

150-73-02

WP 74-74-01, 02 & 06

LOCATION Co-ords N 16 468 355 E 1065895

ORIGINATED BY YK

DIST 11 HWY 11

BORING DATE August 16, 1976

COMPILED BY JC

DATUM Geodetic

BOREHOLE TYPE NX Casing and washboring and Cone Test CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	UNIT WEIGHT γ	REMARKS % GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	'N' VALUES						
935.5 0.0	Ground Level										
	Fill Material Mixture of Sand, Silt, Ore and Wood Chips		1	SS	2						
			2	SS	2						
924.5			3	SS	5						
11.0			4	SS	2						
	Clayey Silt some Sand and Trace of of Gravel occasional Silt Layers Very Soft to Stiff		5	TW	PM						
			6	TW	PM						
			7	SS	19						
			8	SS	16						
900.5 35.0	Silty Sand Some Gravel Compact to Dense		9	SS	19						
894.0			10	SS	50						
41.5	End of Borehole										

OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

150-73-02

LOCATION Co-ords N 16468420 E 1065885

ORIGINATED BY MK

BORING DATE August 4, 1976

COMPILED BY JC

BOREHOLE TYPE NX Casing and Washboring and Cone Test CHECKED BY

20
15 ϕ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 752

150-73-02
WP 74-74-01, 02 & 06

LOCATION Co-ords N 16468510 E 1066035

ORIGINATED BY MK

DIST 11 HWY 11

BORING DATE August 19, 1976

COMPILED BY JC

DATUM Gendetic

BOREHOLE TYPE NX Casing and Washboring and Cone Test

CHECKED BY

SOIL PROFILE		STRAT. PLT	SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE	"N" VALUES		20	40	60	80	100	SHEAR STRENGTH O UNCONFINED + FIELD VANE • QUICK TRIAXIAL X LAB VANE			
946.2	Ground Level														
0.0	Fill material (Sand)	X													
941.2	Clayey Silt Trace of Sand and Gravel, Occasional Silt Layers Stiff to very Stiff	X	1	SS	7	940									
5.0			2	SS	20										
			3	SS	17										
			4	SS	10										
928.2	Sandy Silt Trace of Gravel Compact to Dense	X	5	SS	22	930									
18.0			6	SS	14										
			7	SS	31										
			8	SS	41										
916.7	End of Borehole					920									
29.5															
						910									

OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

150-73-02
WP 74-74-01, 02 & 06 LOCATION Co-ords N 16468600 E 1065950 ORIGINATED BY MR
DIST 11 HWY 11 BORING DATE August 20, 1976 COMPILED BY JC
DATUM Geodetic BOREHOLE TYPE NX Casing and Washboring and Cone Test CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT	LIQUID LIMIT ——— w_L	UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100	PLASTIC LIMIT ——— w_p WATER CONTENT ——— w		
938.4	Ground Level						1000 2000			
0.0	Fill Material Organic Silt and Bricks	X	1	SS	12					
933.4			2	TW	PM					
5.0	Clayey Silt some sand occasional Silt Layers Stiff to very Stiff	/	3	SS	13					
		/	4	TP	PM					
920.4		/	5	TW	PM					
18.0	Sandy Silt some Gravel Compact	.	6	SS	14					
911.9		.	7	SS	21					
26.5	End of Borehole									
902.5										
35.9	End of Cone Test						100/11"			
						890				

20
15 ϕ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 754

150-73-02
WP 74-74-01, 02 & 06

LOCATION Co-ords N 16468545 E 1065915

ORIGINATED BY MK

DIST 11 HWY 11

BORING DATE August 23, 1976

COMPILED BY JC

DATUM Geodetic

BOREHOLE TYPE NX Casing and Washboring and Cone Test CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
954.4	Ground Level															
0.0	Fill Material Silty Sand Some Gravel Compact to Dense		1	SS	38	950										
			2	SS	28											
			3	SS	33											
			4	SS	28	940										
			5	SS	24											
934.9	Clayey Silt some Sand occasional Silt Layers, Stiff to very stiff		6	SS	32											
19.5			7	SS	41											
			8	SS	35	930										
			9A	TW	PM											
			10	TW	PM											
			11	TW	PM											
			12	SS	21	920										
			13	TW	PM											
913.4	Sandy Silt some Gravel dense		14	TW	PM											
41.0			15	SS		910										
908.9																
45.5	End of Borehole															
						900										

20
15 ϕ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 755

150-73-02
WP 74-74-01, 02 & 06

LOCATION Co-ords N 16 468 760 E 1066115

ORIGINATED BY HK

DIST 11 HWY 11

BORING DATE August 25, 1976

COMPILED BY JC

DATUM Geodetic

BOREHOLE TYPE NX Casing and Washbore and Cone Test

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w_L		
934.4	Ground Level														
0.0	Mixture of Sand and Organic Silt Soft		1	TP	PM	930									
926.9			2	SS	5										
7.5	Clayey Silt some Sand occasional Silt layers Firm to Stiff		3	SS	1										
			4	TP	PM										
			5	SS	7										
			6	TW	PM										
			7	TW	PM	920									
			8	TW	PM										
			9	TP	PM										
911.4	Sandy Silt Dense		10	SS	32	910									
23.0			11	SS	100										
909.2															
25.2	End of Borehole														
						900									

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 756

150-73-02
WP 74-74-01, 02 & 06

LOCATION Co-ords. N 16,468,075; E 1,065,675

DIST 11 HWY 11

BORING DATE August 30 - Sept. 1, 1976

ORIGINATED BY R.VV

DATUM Geodetic

BOREHOLE TYPE NX Casing & Washbore

COMPILED BY R. VV

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N VALUES		20	40	60	80	100	w_p w w_L		
967.3	Ground Level													
0.0	Fill material													
	Silty sand to sandy silt		1	SS	66	960								
	Some gravel (Layered)		2	SS	58/6	"								
	Very Dense		3	SS	73/3	"								
			4	SS	93	950								
			5	SS	34									
			6	SS	94	940								
			7	SS	42									
			8	SS	43									
			9	SS	25	930								
925.5			10	SS	37									
42.0	Layers of sand, silt & clayey silt		11	SS	20									
	Transition zone		12	SS	19	920								
	Clayey silt		13	TW	PM									
	Some sand, Trace of gravel.		14	SS	12									
	Occasional silt layers		15	TW	PM									
	Very stiff		16	TW	PM	910								
			17	TW	PM									
			18	SS	24									
			19	SS	15	900								
892.3			20	TW	PM									
75.0	Sandy silt, Trace of gravel & clay		21	SS	23	890								
885.3	Compact to dense		22	SS	50									
82.0			23	SS	11									

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 757

150-73-02

WP 74-74-01, 02 & 06

LOCATION Co-ords. N 16,467,500; E 1,065,725

ORIGINATED BY MK

DIST 11 HWY 11

BORING DATE August 26, 1976

COMPILED BY JC

DATUM Geodetic

BOREHOLE TYPE NX Casing, Washbore & Cone Test

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT		LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS % GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80			100
							SHEAR STRENGTH PSF ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE						w_p — w — w_L WATER CONTENT %
938.0	Ground Level						1000	2000					
0.0	Fill material clayey silt and brick		1	SS	14								
930.5			2	SS	9								
7.5	Clayey silt some sand. Trace of gravel. Occasional silt layers		3	SS	22								
			4	SS	16								
			5	SS	9								
			6	TP	PM								
	Firm to Stiff		7	TP	PM								
			8	TW	PM								
			9	SS	20								
908.0			10	SS	25								
30.0	Sandy silt some gravel Trace of clay		11	SS	17								
			12	SS	14								
	Compact to Very Dense		13	SS	19								
894.0			14	SS	55								
44.0	End of Borehole												

20
15 \diamond 5 % STRAIN AT FAILURE
10

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

150-73-02
WP 74-74-01, 02 & 06 LOCATION Co-ords N. 16 467 515 E 1 065 725 ORIGINATED BY _____
DIST 11 HWY 11 BORING DATE September 27, 1961 COMPILED BY R.N.O.
DATUM Geodetic BOREHOLE TYPE _____ CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS	
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20 40 60 80 100					w_p — w — w_L					
							SHEAR STRENGTH PSF					WATER CONTENT %					
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE											
934.5	Ground Level						1000	2000				20	40	60		% GR SA SI CL	
0.0	Fill Material		1	SS	8	930										Artesian Head.	
930.5	Brown, Grey		2	SS	9												EL 340.0
4.0	Clayey Silt to		3	SS	3												
	Silty Clay		4	SS	1	920											
	Very Soft to stiff		5	SS	5												
	grey																
	Stratified																
914.5			6	SS	20												
20.0	Silt		7	SS	21	910											
	Compact grey		8	SS	10												
901.5																	
33.0	End of Borehole															Artesian Encounter EL 901.5	

20
15 ϕ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 759

150-73-02

WP 74-74-01, 02 & 06

LOCATION Co-ords N 16 468 055 E 1 065 435

ORIGINATED BY BMGDIST 11 HWY 11BORING DATE October 3, 1961COMPILED BY RNODATUM GeodeticBOREHOLE TYPE Hollow Stem auger

CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
943.0	Ground Level															
941.0	Topsoil															
2.0	Silty Clay to Clayey Silt Some Organics at EL. 927.0 Firm to Stiff gray		1	SS	9	940										
			2	SS	22											
			3	SS	7											
						930										
			4	SS	14											
923.0																
20.0	Silt Compact gray		5	SS	17	920										
916.0																
915.3	Sand and Gravel		6	SS	21											
27.7	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 760

150-73-02

WP 74-74-01, 02 & 06

LOCATION Co-ords N 16 468 080

E 1 065 330

ORIGINATED BY BNG

DIST 11 HWY 11

BORING DATE October 4, 1961

COMPILED BY RNO

DATUM Geodetic

BOREHOLE TYPE Hollow Stem auger and Rock Coring

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N VALUES		20	40	60	80	100	w_p	w	w_L		
948.0	Ground Level															GR SA SI CL
946.5	Topsoil															
1.5	Clayey Silt to Silt Stiff brown gray		1	SS	15	940										
			2	SS	10											
938.0	Silt Compact		3	TH	PH											
10.0																
935.0	Sand and Gravel		4	SS	38											
13.0	Dense		5	SS	50											
931.0																
17.0	Bedrock Quartz Micaceous Schist		6	RC		930										
926.0																
22.0	End of Borehole															

20
15 ϕ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 761

150-73-02

WP 74-74-01, 02 & 06

LOCATION Co-ords N 16 467 865 E 1 065 290

ORIGINATED BY _____

DIST 11 HWY 11

BORING DATE Oct. 4, 1961

COMPILED BY RNO

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ PCF	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N _v VALUES		20	40	60	80	100	w_p	w	w_L		
943.0	Ground Level															
941.5	Topsoil															
1.5	Clayey silt to silt		1	SS	26	940										
	Stratified		2	SS	9											
	Stiff		3	SS	12											
930.0	Brown-Grey		4	SS	13	930										
13.0	Silt		5	SS	14											
	Compact		6	SS	15											
919.0	Grey					920										
24.0	Sand & Gravel															
916.5	Dense		7	SS	48											
26.5																

20
15 ϕ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 762

150-73-02

WP 74-74-01, 02 & 06

LOCATION Co-ords N 16 467 950 E 1 065 415

ORIGINATED BY _____

DIST 11 HWY 11


BORING DATE October 5, 1961

COMPILED BY RNO

DATUM Geodetic

BOREHOLE TYPE Hollow Stem auger

CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ PCF	REMARKS % GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L			
							SHEAR STRENGTH PSF					WATER CONTENT %					
935.0	Ground Level																
933.8	Topsoil																
	Silty Clay and Clayey Silt Organics at EL. 922.0-923.0 Firm to Stiff gray		1	SS	9	930									118.8		
			2	SS	21												
			3	SS	11												
			4	SS	4												
			5	TW	PM	920										110.8	
			6	TW	PM												
909.0	Silt Compact gray to brown gray		7	TW	PM	910										124.8	
26.0			8	TW	PM												
			9	SS	14												
			10	SS	28	900											
899.0	Sand and Gravel																
36.5	End of Borehole																

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 763

150-73-02

WP 74-74-01, 02 & 06

LOCATION Co-ords N 16 467 345

E 1 065 400

ORIGINATED BY BMG

DIST 11 HWY 11

BORING DATE October 5, 1961

COMPILED BY RNO

DATUM Geodetic

BOREHOLE TYPE Hollow Stem auger

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ pcf	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L	
933.0	Ground Level														
931.0	Topsoil														
2.0	Silty Clay and Silt stratified Trace of organics at EL. 923.0 Firm to Stiff		1	SS	5	930									
			2	SS	10										
			3	TW	PH										
			4	TW	PH	920									
			5	TW	PH										
912.0			6	TW	PH										
21.0	Silt Compact gray		7	TW	PH	910									
			8	SS	7										
900.0			9	SS	11	900									
33.0	Sand and Gravel		10	SS	27										
38.0	End of Borehole														

RECORD OF BOREHOLE No 764

CHECKED BY _____

20
15 \diamond 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 766

150-73-02

WP 74-74-01, 02 & 06

LOCATION Co-ords N 16 467 310 E 1 065 365

ORIGINATED BY BMC

DIST 11 HWY 11

BORING DATE October 18, 1961

COMPILED BY R.N.O.

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L	
931.8	Water Level					ELEV	1000	2000				20	40	60	GR SA SI CL
0.8	Ground Level					930									
924.8	Muck With Clayey silt Very Soft.		1	SS	N.A.		+s=N.A.								
7.0	Silty Clay to Clayey Silt Stratified Soft to Stiff.		2	SS	N.A.		+s=N.A.								
						920	+s=5.6								
							+s=2.9								
			5	TW	P.H.	910	+s=N.A.								
904.8			6	TW	P.H.										
27.0	Silt Sompact						+s=N.A.								
			7	TW	P.H.	900									
			8	SS	7										
892.8															
39.0	Sand and Gravel														
890.8	Dense		9	SS	48	890									
41.0	End of Borehole														

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 767

150-73-02
 WP 74-74-01, 02 & 06 LOCATION Co-ords. N 16,467,345; E 1,065,670 ORIGINATED BY AP
 DIST 11 HWY 11 BORING DATE Oct. 22, 23, 1974 COMPILED BY RNO
 DATUM Geodetic BOREHOLE TYPE Continuous Flight Auger (R.S. 8 1/2" I.D.) CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ PCF	REMARKS % GR SA SI C
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	100	w_p	w	w_L		
935.0	Water Level														
0.0	Ground Level														
	Clayey silt		1	TW	PH	930									
	Silt & Clay		2	TW	PH										
	Layers		3	SS	4										
			4	TW	PH										
			5	TW	PH	920								113	
	Very Soft		6	TW	PH										
	to		7	TW	PH	910									
	Stiff														
907.0															
28.0	Silt		8	SS	13										
	Occasional silty														
	clay seams		9	SS	14	900									0 0 79 21
	Compact														
892.5			10	SS	12										
42.5	End of Borehole														
44.2	End of Cone Test														

20
 15 \diamond 5 % STRAIN AT FAILURE
 10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 768

150-73-02

WP 74-74-01, 02 & 06

LOCATION Co-ords. N 16,467,120; E 1,065,175

ORIGINATED BY AP

DIST 11 HWY 11

BORING DATE Nov. 6, 1974

COMPILED BY RNO

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ PCF	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
935.7	Ground Level															
0.0	Clayey silt with organics Some sand Stiff		1	SS	1/	18"						$w_p=93$	$w=124$	$w_L=120$		
928.7			2	TW	PH	930			+s=7.0					$w=100$		
7.0	Clayey silt Layers of silt & clay Soft to Firm		3	TW	PH	920		+s=7.2 +s=4.0								
			4	TW	PH			+s=4.0 +s=3.0								
			5	TW	PM			+s=2.6 +s=4.9								
			6	TW	PH			+s=2.6 +s=4.0								
904.7								+s=3.0	+s=3.0							
31.0	Silt, Occasional silty clay seams		7	SS	7				+s=4.1							0 0 80 20
998.7	Compact		8	SS	22	900										0 0 85 15
37.0																0 0 84 16

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 769

150-73-02

WP 74-74-01, 02 & 06

LOCATION Co-ords. N 16,466,950; E 1,065,170

ORIGINATED BY AP

DIST 11 HWY 11

BORING DATE Nov. 6, 1974

COMPILED BY RNO

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ PCF	REMARKS % GR SA SI C
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
935.0	Ground Level															
0.0	Clayey silt with organics Some sand		1	SS	3	930						$w_p=5$	$w=117$	$w_L=62$	86	
	Firm		2	TW	PM-1 PH-6											
			3	TW	PM											
923.0																
12.0	Clayey silt		4	TW	PM	920										
	Layers of silt & clay		5	TW	PM											
	Firm to Stiff		6	TW	PM	910										
			7	TW	PH											
899.0						900										
36.0	Silt, Silty clay		8	SS	11											
896.0	layers Compact		9	SS	17											
39.0	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 770

150-73-02
W P 74-74-01, 02 & 06 LOCATION Coords. N 16 467 460 E 1 065 158 ORIGINATED BY PP
DIST 11 HWY 11 BOREHOLE TYPE Washbore, NX Casing COMPILED BY PP
DATUM Geodetic DATE May 4, 1978 CHECKED BY *Le*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ PCF	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
940.0	Ground Level																
0.0	Fill Material Sand and Clayey Silt		1	TW	PM											127.5	
932.0			2	TW	DR											119.5	
8.0	Clayey Silts (Stratified) Occasional Silt Partings Firm to Stiff		3	TW	PM		930									126	
			4	TW	PM											127.5	
			5	TW	PM											125	
			6	TW	PM											114	
			7	TW	PM											111	
	Silt to Clayey Silt, Loose		8	TW	PM		920									114	
915.5			9	TW	PM											120	
			10	TW	PM												
24.5	End of Borehole																
	Note: DR: Driven																



RECORD OF BOREHOLE No 771

150-73-02
W P 74-74-01,02 & 06 LOCATION Coords. N 16 457 479 E 1 065 190 ORIGINATED BY PP
DIST 11 HWY 11 BOREHOLE TYPE Washbore, NX Casing COMPILED BY PP
DATUM Geodetic DATE May 1, 2, 1978 CHECKED BY *PP*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH										WATER CONTENT (%)
								○ UNCONFINED		+ FIELD VANE								
940.0	Ground Level																	
0.0	Fill Material Sand (Compact) and Clayey Silt (Stiff)		1	SS	24		930											
			2	SS	12													
			3	SS	11													
928.5			4	SS	17													
11.5	Clayey Silts (Stratified) Occasional Silt Partings, Firm to Stiff Silt to Clayey Silt, Loose		5	SS	22													
			6	SS	6													
			7	SS	4													
			8	SS	2													
914.5			10	SS	11													
25.5	Silt Compact		11	SS	17													
908.5			12	SS	14													
31.5	End of Borehole																	



RECORD OF BOREHOLE No 772

150-73-02
W P 74-74-01, 02 & 06 LOCATION Coords. N 16 467 514 E 1 065 232 ORIGINATED BY PP
DIST 11 HWY 11 BOREHOLE TYPE Washbore, NX Casing COMPILED BY PP
DATUM Geodetic DATE May 2, 1978 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100				
938.5	Ground Level															
0.0	Fill Material Sand (Compact) and Clayey Silt (Firm)		1	SS	15											
			2	SS	22											
929.0			3	TW	11		930									
9.5	Clayey Silts (Stratified) Occasional Silt Partings Firm to Very Stiff		4	TW	PM										114	
			5	TW	PM										125.5	
			6	TW	PM										117	
			7	TW	PM		920								127	
			8	TW	PM										123	
914.0			9	TW	PM										126	
24.5	Silt Compact		10	SS	16		910									
			11	SS	19											
905.5																
33.0	Sand and Gravel															
901.5	Compact		12	SS	28											
37.0	End of Borehole															

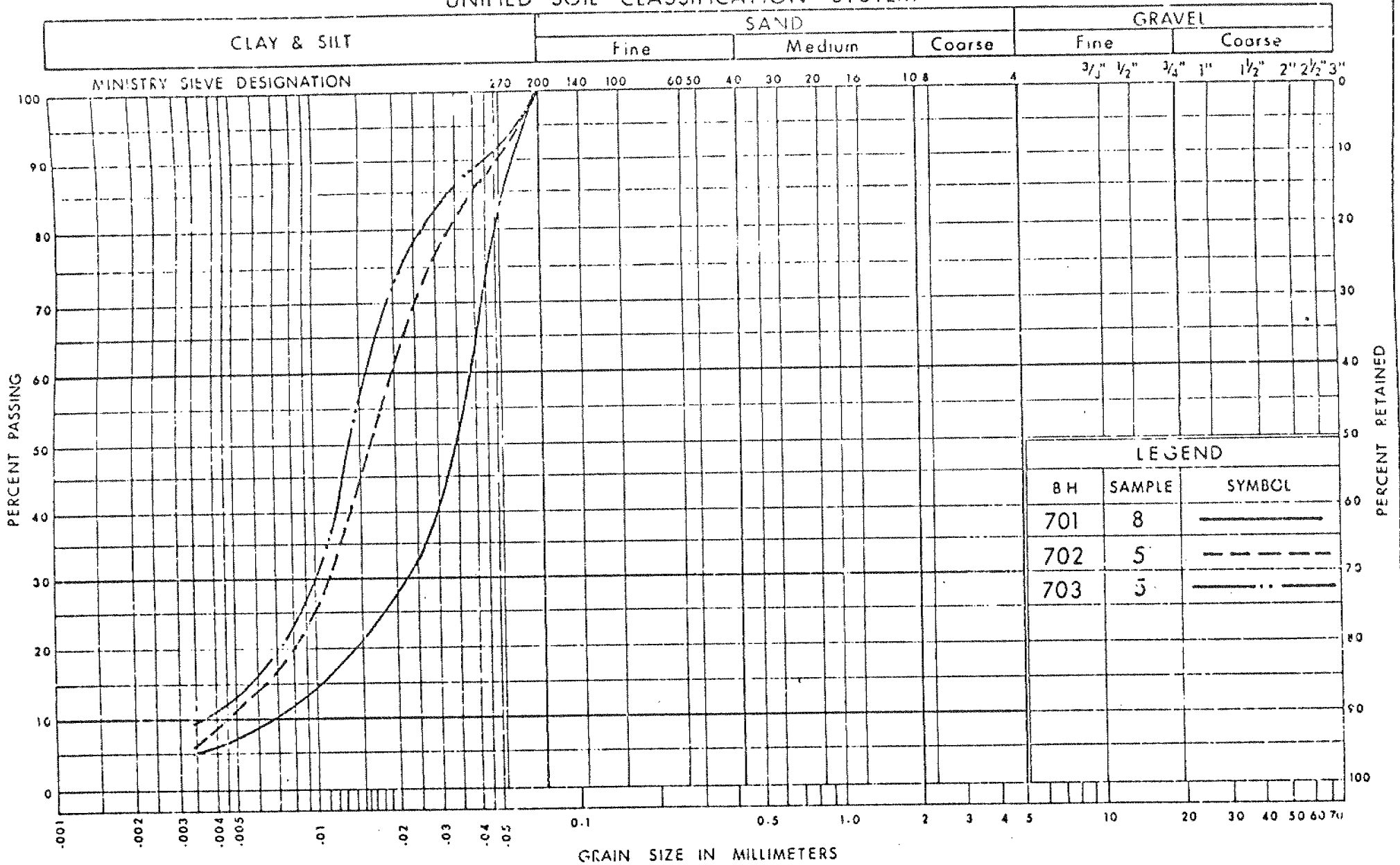


RECORD OF BOREHOLE No 773

W P 150-73-02`
74-74-01, 02 & 06 LOCATION Coords. N 16 467 535 E 1 065 285 ORIGINATED BY PP
DIST 11 HWY 11 BOREHOLE TYPE Washbore, NX Casing COMPILED BY PP
DATUM Geodetic DATE May 3, 1978 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
940.0	Ground Level																
0.0	Fill Material Sand (Compact) Clayey Silt (Stiff)		1	SS	22												
			2	SS	8												
930.0			3	SS	10												
10.0	Clayey Silts (Stratified) Occasional Silt Partings Firm to Stiff		4	SS	14												
			5	SS	10												
920.5																	
19.5	Silt Compact		6	SS	12												
			7	SS	14												
908.6	Gravel		8	SS	107	11"											
31.4	End of Borehole																

UNIFIED SOIL CLASSIFICATION SYSTEM



GRAIN SIZE DISTRIBUTION
SILT
TRACES OF VERY FINE SAND & CLAY



Ministry of
Transportation and
Communications

Ontario

ENGINEERING SERVICES BRANCH

FIG No

W P

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY & SILT

SAND

GRAVEL

Fine

Medium

Coarse

Fine

Coarse

MINISTRY SIEVE DESIGNATION

220 200 140 100 60 50 40 30 20 16 10 8 4 3/8" 1/2" 3/4" 1" 1 1/2" 2" 2 1/2" 3"

PERCENT PASSING

PERCENT RETAINED

LEGEND

BH	SAMPLE	SYMBOL
703	8	_____

GRAIN SIZE IN MILLIMETERS

GRAIN. SIZE DISTRIBUTION
SAND
MEDIUM

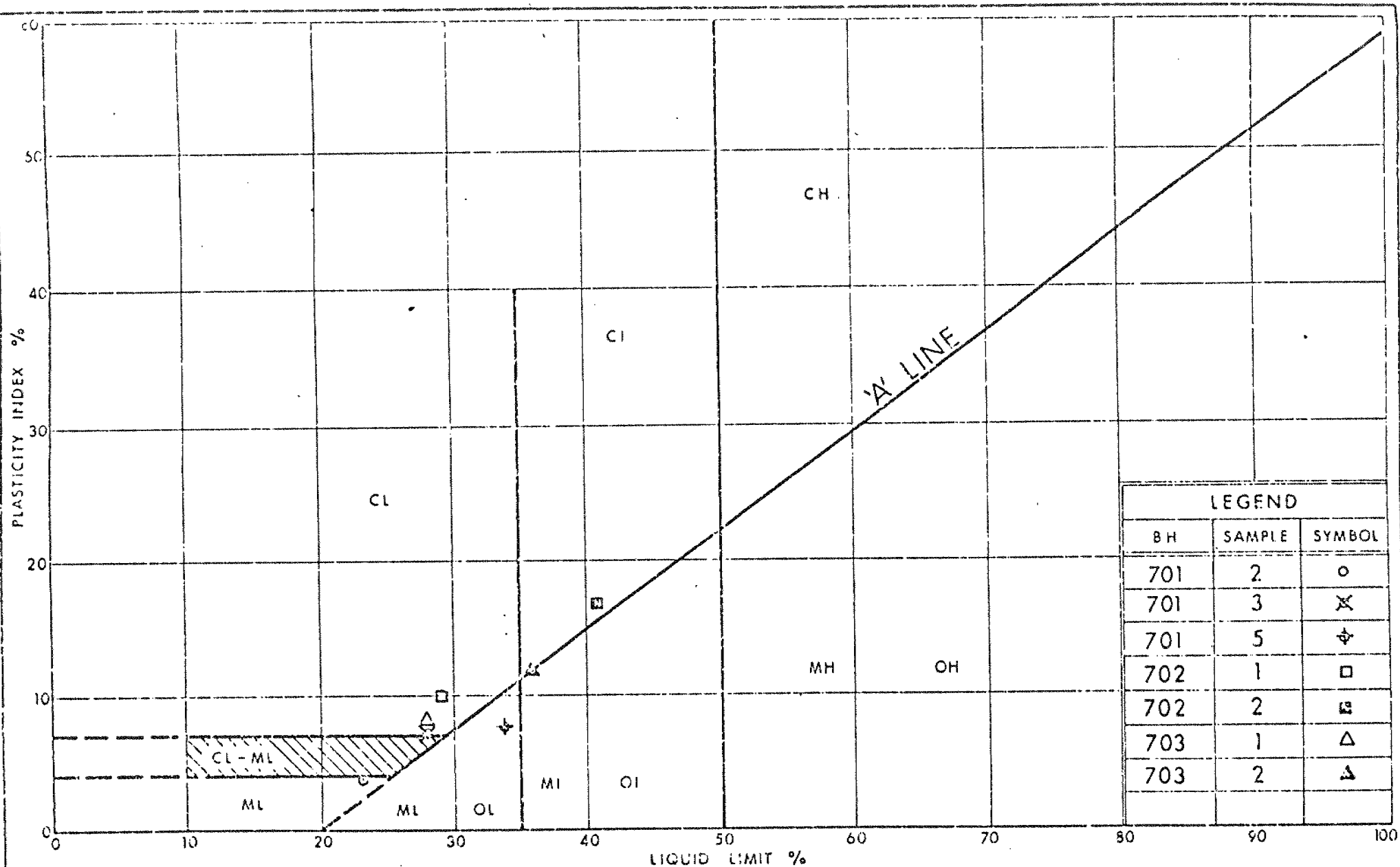
FIG No

W P



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Ontario

Ministry of
Transportation and
Communications

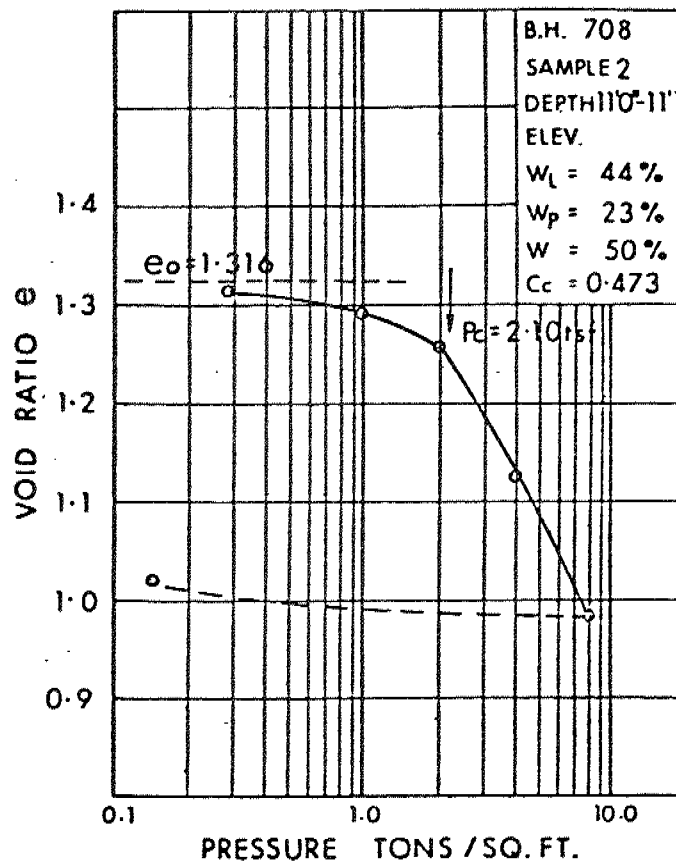
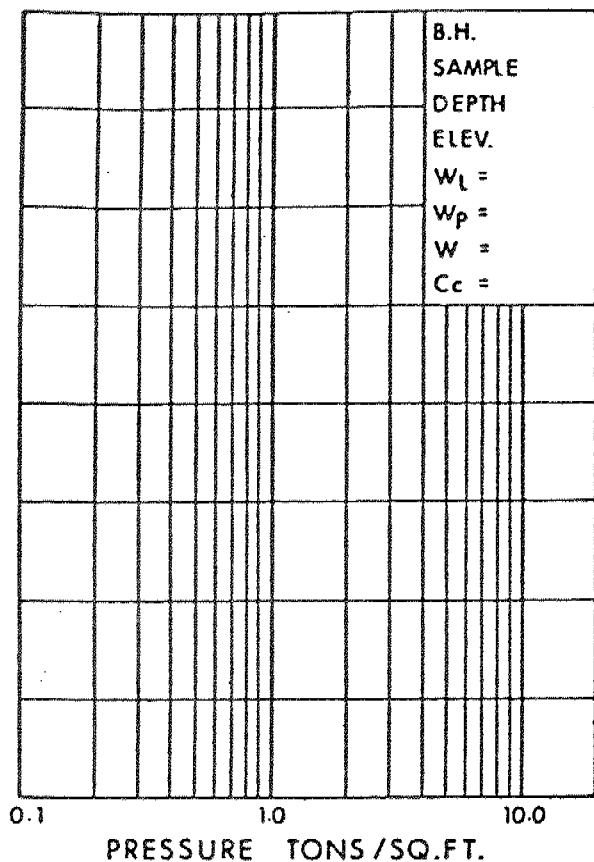
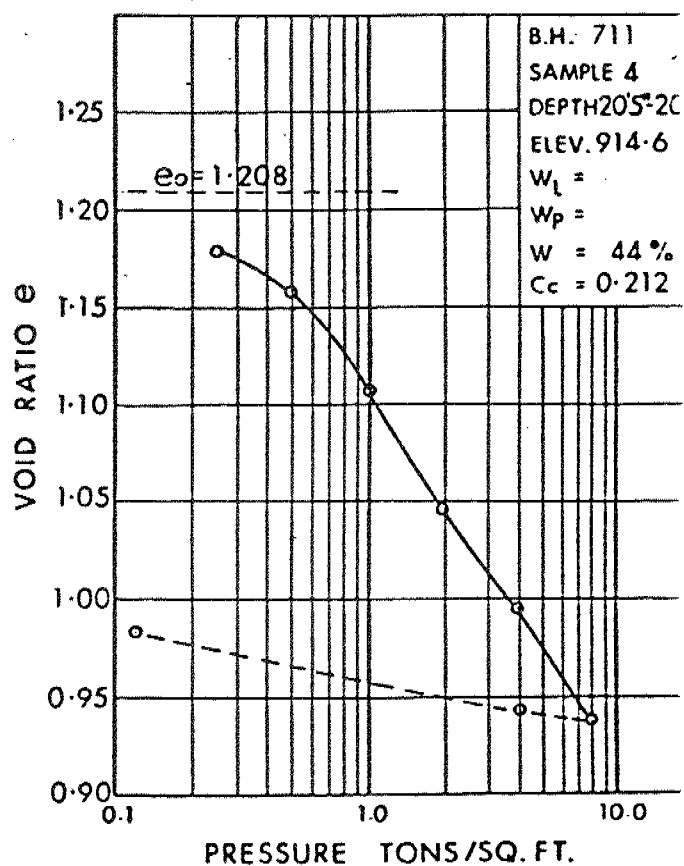
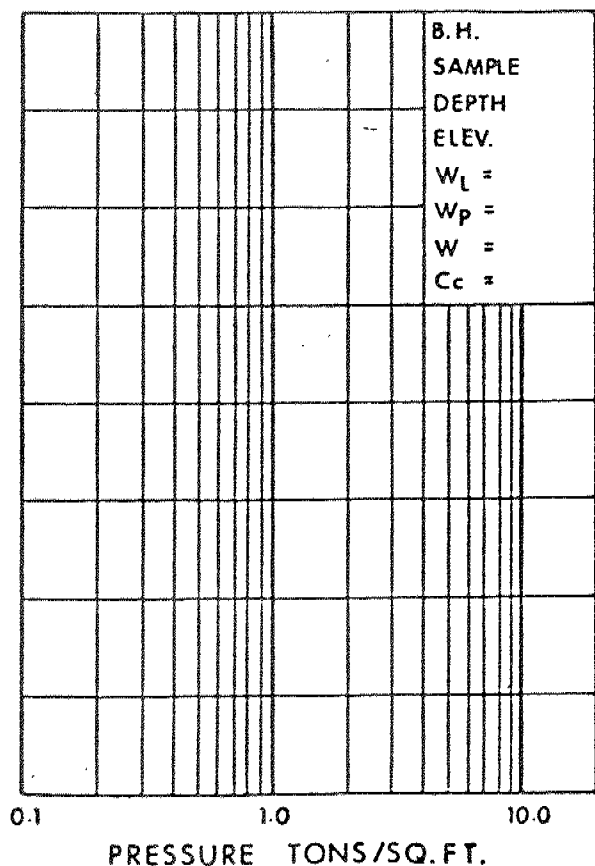
ENGINEERING SERVICES BRANCH

PLASTICITY CHART SILTY CLAY TO CLAYEY SILT

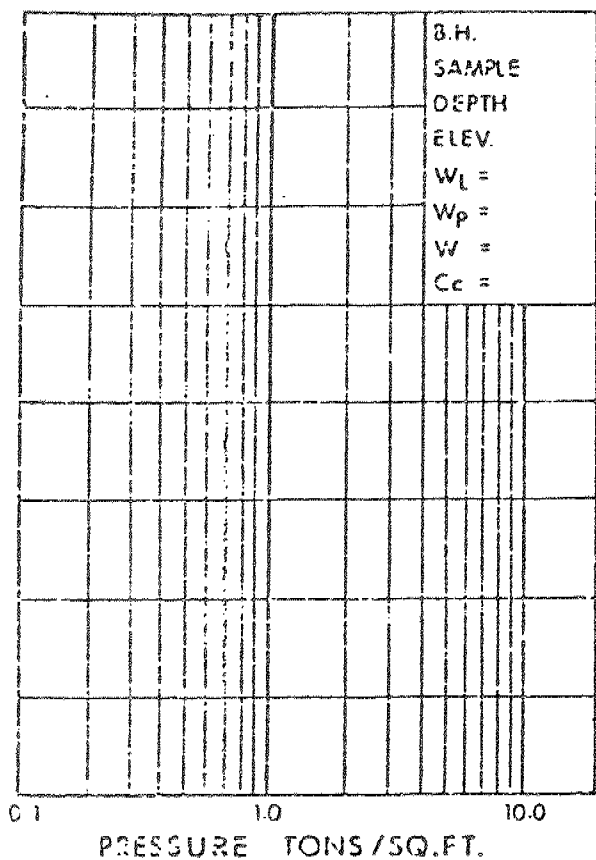
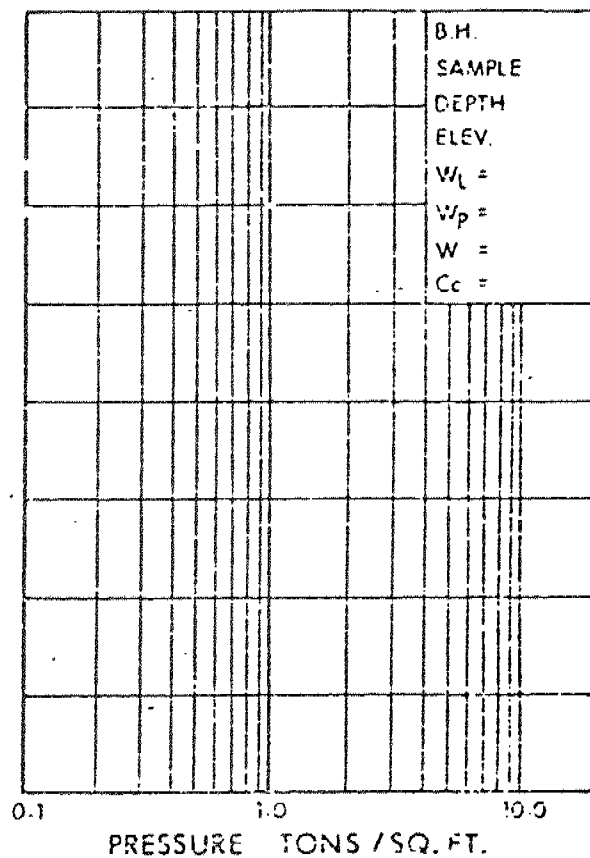
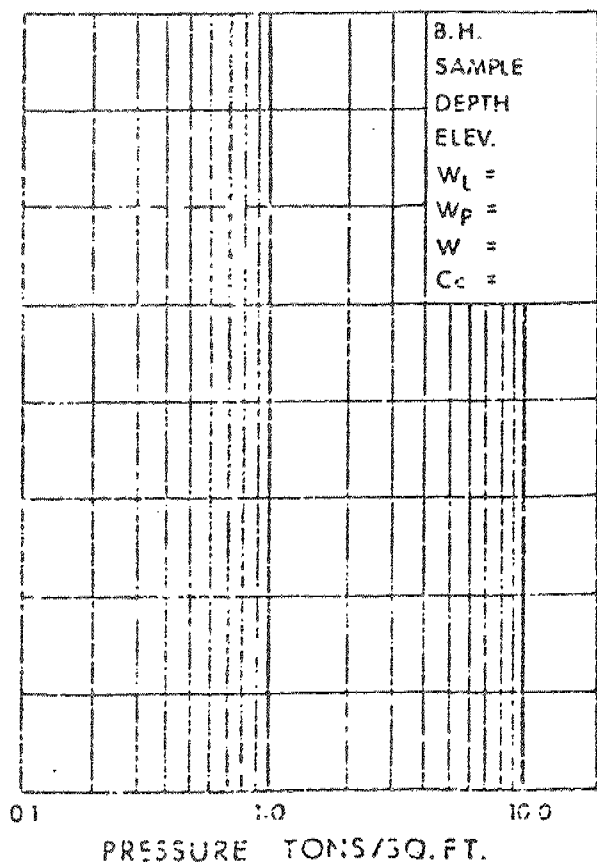
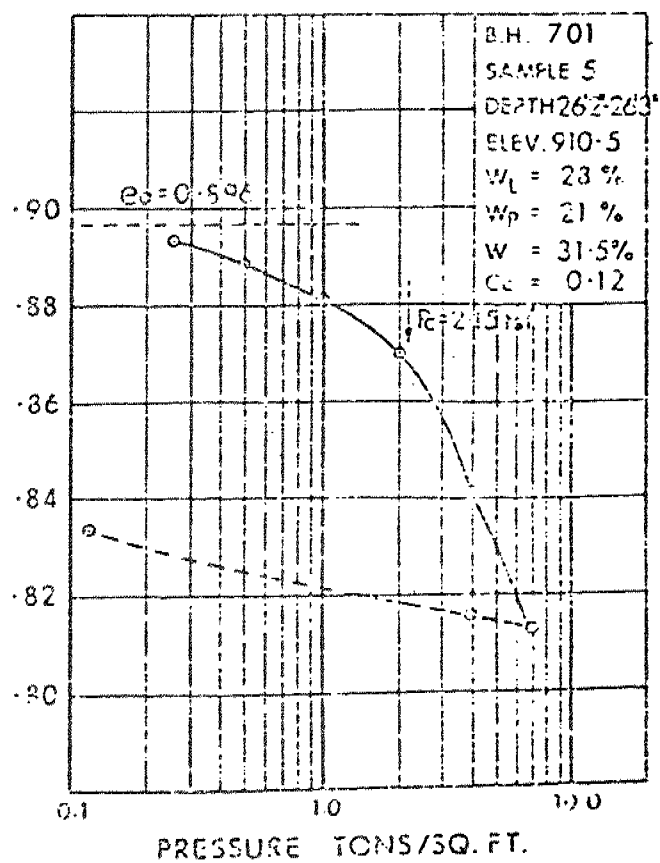
FIG No

W P

VOID RATIO - PRESSURE CURVES

VOID RATIO e VOID RATIO e 

VOID RATIO - PRESSURE CURVES

VOID RATIO e VOID RATIO e VOID RATIO e VOID RATIO e 

MEMORANDUM

31E-80

GEOCREP No.

TO: J. McAllister (2)
Head, Structural Section
Northern Region, North Bay

FROM: Soil Mechanics Section
Geotechnical Office
West Bldg.

ATTENTION:

DATE: April 9, 1976

OUR FILE REF.

IN REPLY TO

APR 26 1976

SUBJECT:

FOUNDATION INVESTIGATION REPORT

For

Huntsville By-Pass Hwy 11
South CNR O'Head Crossings
W.P. 74-74-01 SBL Structure
W.P. 150-73-02 NBL Structure
W.P. 74-74-02 South Service Road Structure
District #11, Huntsville

CONT. 79-86

Attached we are forwarding to you our detailed Foundation Investigation Report on the subsoil conditions existing at the above mentioned site.

We believe that the factual data and recommendations contained therein will prove adequate for your requirements. Should additional information be required, please do not hesitate to contact our Office.

K. G. Selby

K.G. Selby
Supervising Engineer

KGS/bp

cc: D.A.O. White (2)

~~H.J. Bernhardt~~

C.G. Campbell

C.S. Grebski

B.J. Giroux

S. McCombie

R.S. Pillar

G.A. Wrong

R. Hore

J. Anderson)

R. Murphy) Memo Only

G. Sloan)

Files

FOUNDATION INVESTIGATION REPORT

For

Huntsville By-Pass Hwy 11
South CNR O'Head Crossings
W.P. 74-74-01 SBL Structure
W.P. 150-73-02 NBL Structure
W.P. 74-74-02 South Service Road Structure
District #11, Huntsville

1. INTRODUCTION

The twinning of Hwy 11 will involve construction of three overhead structures for grade separation at the railway crossing, one for the NBL, one for the SBL and one for the South Service Road. A foundation investigation has been carried out to determine subsoil conditions, in order to provide recommendations for the design and construction of the structure foundations and approaches. Contained in this report are results of our investigation, together with our comments and recommendations.

2. SITE DESCRIPTION

The proposed structure sites are located just west of the existing Hwy 11 south CNR overhead, about $1\frac{1}{2}$ miles west of the town of Huntsville.

The existing structure is a 3-span steel plate girder, concrete deck structure with perched abutments. The foundations are composed of concrete-filled, $12\frac{1}{2}$ " O.D. by $\frac{1}{4}$ " steel tube piles, driven to "practical refusal" into the sand and gravel layer for a design load of 65 tons/pile. The approaches are about 30 ft. high, composed of sandy fill and constructed with 2:1 slopes. The structure was built in 1958-59 and the approaches were constructed using stage construction techniques. Overall, the structure and the approaches appear to be in good condition.

The southwest quadrant and part of the southeast quadrant of the intersection of Hwy 11 and CNR are waterlogged, swampy areas. The northeast quadrant and part of the southeast quadrant have been filled for industrial developments. The terrain in the northwest quadrant is an undulating field, which was once under pasture but has been used for residential developments.

Geologically, the area is located in the Canadian Shield. Bedrock is a metamorphosed granite of precambrian age. The overburden consists of glacio-acqueous deposits.

3. SUBSURFACE CONDITIONS

Apart from some surficial fill material found near existing highway embankments, subsoil in the area consists of a layer of silty clay/clayey silt, overlying a silt deposit which in turn is followed by a deposit of sand and gravel, containing cobbles and boulders. The bottom granular material is found to be underlain by metamorphic granitic bedrock. In the swamp area, muck is also noted. The inferred subsoil stratigraphy is shown on Dwg. 747401-A, 1507301-A and 747402-A. A detailed description of the subsoil types is given below:

3.1 Sandy Fill

The surficial fill material is derived from a spill-over of the highway embankment fill. It consists mainly of silty sand. Some clayey silt and occasional brick fragments are also present.

3.2 Muck

Muck is present only in the swampy areas and in ditches adjacent to the highway embankments.

Its thickness is variable, ranging from 4 to 8 ft. approximately. According to visual examination, it consists mainly of clay and silt, with very high organic contents. Its shear strength is found to be very low and its compressibility very high.

3.3 Silty Clay/Clayey Silt

This is the predominant deposit in the area. It has a thickness of about 15 ft. to 30 ft. It is stratified throughout its entire depth, with frequent silt seams, a feature generally associated with glacio-lacustrine deposits. Because of the presence of the more permeable silt seams, this material is likely to have a relatively high rate of consolidation.

The silty clay/clayey silt tends to be thicker and softer in the swamp than in area north of the railway track. On the basis of undrained shear strength, the silty clay/clayey silt in the swamp can be described as very soft to soft and in area north of the railway track, firm to stiff. Representative undrained shear strengths are in the order of 1000 to over 2000 p.s.f. for the stiffer material and 350 to 800 p.s.f. for the softer material. The silty clay/clayey silt in the swamp probably is a normally consolidated material as its moisture contents are generally found to be close to its liquid limits. From our lab test results, the moisture contents and Atterberg limits show a wide range of variation, reflecting the stratified nature of this material. A plasticity chart and grain size distribution envelope are contained in the Appendix.

3.4 Silt

Underlying the above-mentioned cohesive clayey silt/silty clay deposit is a layer of silt some 10 to 20 ft. thick. The exact boundary between this silt deposit and the upper cohesive stratum is not always very distinct. The silt is slightly stratified with occasional clay seams suggesting that this material is also a glacio-lacustrine deposit. On the basis of the 'N' values, the relative density of the silt can be assessed as 'compact'. A grain-size distribution envelope is included in the Appendix.

3.5 Sand and Gravel

Under the silt layer is a deposit of sand and gravel, containing cobbles and boulders. The lower boundary of this deposit was not investigated in full, partly because of the presence of large boulders and partly because of artesian conditions. Inferred from information at adjacent sites and from boreholes in which bedrock was proven by rock-coring, the sand and gravel layer is believed to be underlain by metamorphic granitic bedrock. The angularity of the particles and the unsorted grain sizes of this material which range from very fine sand to large boulders, suggest the sand and gravel layer is a glacio-fluvial deposit.

Because of the presence of large size particles and unsorted matrices, the 'N' values cannot be taken at face value to estimate the relative densities of the material. However, judging from the manner in which the NX

casing was advanced, it is our opinion that the sand and gravel layer is probably dense to very dense.

3.6 Bedrock

Bedrock at the site is a fine grained micaceous schist and a medium grained biotite gneiss, with occasional quartz inclusions. Both rock types are metamorphosed granite of precambrian age.

On the basis of high rock core recovery ratios and large average core sizes, the bedrock is considered to be in a sound condition.

3.7 Groundwater Conditions

For practical purposes, groundwater levels may be assumed equal to the prevailing water level in the swamp i.e. at elev. 932 \pm . Artesian conditions were encountered in the sand and gravel deposit with excess hydrostatic heads equalizing at about elev. 937 \pm .

4. DISCUSSION AND RECOMMENDATIONS

The proposed profile grades of the overhead structures are at elev. 970 approximately, resulting in a fill some 30 ft. high. The types and lengths of the proposed structures have not yet been determined, but it is assumed that a structural layout similar to the existing overhead structure may be adopted. Based on our subsoil information, the following recommendations are made:

4.1 Structure Foundations

All three structures can be supported on steel H-sections, end-bearing in the sand and gravel layer, or on bedrock. To prevent the piles from being damaged by boulders and to ensure pile penetration, the H-piles should be reinforced with flange plates at the tips. If the piles are driven in accordance with the Hiley Formular (MTC Standard SS-3-10 or SS-3-11), the piles can be designed for their maximum allowable capacities. Because of boulders and variation in bedrock elevations, it is difficult to determine accurately the founding elevations of the pile tips where the

designed loads would be attained. For design purposes, our estimations are given as follow:

<u>Footing Locations</u>	<u>Probable Pile Tip Elevations</u>		
	<u>SBL</u>	<u>NBL</u>	<u>S. Service Rd.</u>
South Abutment	890	885	880
South Pier	882	878	883
North Pier	872	872	890
North Abutment	862	865	883

To prevent frost heaves, all pile cap bases should have at least 6 ft. cover. If perched abutments are to be adopted, which are advisable so as to minimize the height of the abutments, no dewatering would be required for the construction of the abutment footings, as the pile caps would be well above the groundwater level. Similarly, if the area between the abutments is to be filled to elev. 940 and the pile cap bases of the piers are formed at elev. 934, again no dewatering problems are anticipated. Differential settlements of the piled foundations will be negligible.

4.2 Approaches

Muck in the swamp and in the ditches should be excavated and backfilled with sandy type material. The bottom of excavation is recommended at elev. 920. Except for the north approach of the NBL, berms are required for stability reasons. It is recommended that the area west of the existing Hwy #11 be filled to elev. 940, prior to construction of the various approaches. Under these conditions, all the embankments are found to be stable with 2:1 side slopes and forward slopes.

The above mentioned fill at elev. 940 is intended to serve as a berm. The lengths required for various fill heights are shown in Fig. 5. It should be noted that the berm height should not exceed elev. 940 as it itself would then suffer from stability problems. The berms on the east side of the south service road would probably merge with, or be quite close to those of Hwy 11 and the ramps. In this case, filling of the entire area to elev. 940 and then constructing the embankments would be

advisable. The westerly boundary of this fill for the South Service Rd. should be determined from Fig. 5.

Berms are also required for the ramp that connects Muskoka Rd. #3 and the NBL. Details of the berm design for this ramp are contained in our memo dated April 10, 1975, and in foundation report W.P. 74-74-06.

4.3 Placement of Fill

It should be noted that placement of fill under water should proceed outward from existing Hwy 11, so as to displace any remaining displaceable soft material after excavation by forming 'mud waves' and to avoid trapping soft material, which could result in substantial differential settlements in the embankments.

4.4 Roadway Protection

To ensure the stability of the Hwy 11 embankment and the railway track during construction the following precautions are necessary:

Excavation should not be carried out within 30 ft. of the toe of the existing Hwy 11 approach fill. Muck in this zone is to be removed by displacement. Excavation in the area between 30 to 50 ft. from the approach fill should be carried out in strips, each of which should not be wider than 20 ft. The strips should be excavated and backfilled immediately and sequentially. The pertinent requirements are shown in Fig. 6 of this report.

Similar precautions are also required for excavations adjacent to the railway track, with the safe distances being changed to 40 and 60 ft. respectively measured from the railway track, as shown in Fig. 7.

4.5 Settlements

Under a 30 ft. fill, settlements in the swamp would be in the order of 20" and in the area north of the CNR track in the order of 10". In view of the differential settlements between the approach fill and the abutments, a 35 ft. approach slab should be provided.

4.6 Staging Considerations

It is possible to construct the approaches in the swamp in stages, but this technique is not favored because of the length of time required, and because of the constraints (some indeterminate) which would have to be imposed on the contractor regarding the placing of fill material. In the present case, berming appears to be a more economical and practical scheme as the various embankments are located close to one another, thus resulting in overlapping of berms in most of the area.

Should stage construction be contemplated, the following information may be useful for estimation purposes:

Effective Shear Strength Parameters: of the clay	$C' = 0$ $\phi' = 27^\circ$
Skempton's Porewater Pressure Coef'n	$B = 1.0$
The safe allowable increase in pore- water pressure	$\Delta u = 4.5 \text{ p.s.i.}$

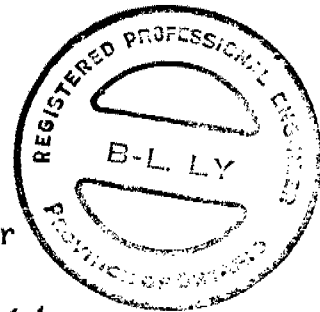
and the time in days required for the induced porewater pressure to dissipate $\Delta t = 14 \Delta h$
where Δh = increase in fill height in ft.

Based on the above information, the following tentative staging scheme is proposed :

Stage No.	Fill Height (Ft)	Time Required for Each Stage (Days)	
1	to El. 940	0	to 70
2	El. 940 to El. 945	70	to 140
3	El. 945 to El. 950	140	to 210
4	El. 950 to El. 955	210	to 280
5	El. 955 to El. 960	280	to 350
6	El. 960 to El. 965	350	to 420
7	El. 965 to El. 970	420	to -

It is to be noted that the above proposals are for estimation purposes only. Piezometers must be installed to monitor the actual build-up and dissipation of porewater pressure during placement of fill so as to control the rate of construction. Depending on the piezometric readings, the staging scheme may have to be revised accordingly. If necessary, this office will undertake the installation of piezometers, analyses of the piezometric readings, and to provide recommendations for the control of the rate of the stagings.

BLy
Bin Ly, P. Eng.
Project Engineer



K. G. Selby
K.G. Selby, P. Eng.
Supervising Engineer

BL/bp

APPENDIX

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 203

WP 150-73-02

LOCATION Co-ords. 16,467,418 N; 1,065,560 E.

ORIGINATED BY Racey
McCallum

DIST 11 HWY 11

BORING DATE February 1956

COMPILED BY

DATUM Geodetic

BOREHOLE TYPE Washboring with NX & BX

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
932.0	Ground Level															
0.0	Organic clay					930										
928.0	Very Soft															
4.0	Silty clay to clayey silt with silt layers		1	TW	PM											
			2	TW	PM	920										
	Firm		3	TW	PM											
914.5																
17.5	Silt		4	TW	PM	910										
908.0	Compact		5	SS	N/R											
24.0	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT		LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20 40 60 80 100	PSF	w_p — w — w_L	WATER CONTENT %		
938.0	Ground Level											
0.0												
						930						
						920						
918.4												
20.4	End of Cone Test							refusal				

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

RECORD OF BOREHOLE NO 101

WP 150-73-02 LOCATION Co-ords. 16,467,560 N; 1,065,683 E. ORIGINATED BY AP
 DIST 11 HWY 11 BORING DATE October 21 & 22, 1974 COMPILED BY GP
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Cone Test CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ P.C.F.	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N VALUES		20	40	60	80	100	W_P	W	W_L		
936.5	Ground Level															
0.0	Mix. of clayey silt															
934.0	sand, gravel & bricks															
2.5	Clayey silt with layers of silt		1	SS	11											
			2	TW	PH											
			3	TW	PH											
			4	SS	5											
			5	TW	PH											
	Stiff to Very Stiff		6	TW	PH											
			7	SS	8											
910.5	Silt		8	SS	9											
26.0	traces of clay		9	SS	12											
	Loose to Compact		10	SS	5											
898.4			11	TW	PH											
38.1	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 1

WP 150-73-02 LOCATION Co-ords. 16,467,657 N; 1,065,652 E. ORIGINATED BY BL
DIST 11 HWY 11 BORING DATE September 5, 1975 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX Casings CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
938.9	Ground Level															
0.0	Sand Fill, some clay & brick fragments															
932.9			1	SS	8											
6.0	Clayey silt Very Stiff, Stratified some clay seams		2	SS	20											
			3	TW	PM											
	more silty		4	SS	23											
914.9																
24.0	Silt Compact trace of sand		5	SS	17											
909.9																
29.0	Sand and gravel Very Dense occasional boulders encountered		6	SS	37											
			7	SS	100											
892.4																
46.5	End of Borehole N.B.: BX casings met refusal at 46.5'															

20
15 \diamond 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 6

WP 150-73-02

LOCATION Co-ords. 16,467,772 N; 1,065,634 E.

ORIGINATED BY BL

DIST 11 HWY 11

BORING DATE September 2, 1975

COMPILED BY BL

DATUM Geodetic

BOREHOLE TYPE Washboring with NX & BX Casings

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w			UNIT WEIGHT γ	REMARKS	
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	SHEAR STRENGTH PSF					WATER CONTENT % w_p ——— w ——— w_L 10 20 30
												O UNCONFINED + FIELD VANE					
												● QUICK TRIAXIAL X LAB VANE					
939.2	Ground Level																
0.0	Fill: sand & silt, some clay																
931.2	and gravel		1	SS	5												
8.0	Clayey silt: Stiff & stratified		2	SS	21	930											
920.2	some fine sand partings		3	SS	15	920											
19.0	Silty clay soft to firm and stratified		4	SS	16"	920											
913.2			5	SS	15	910											
26.0	Clayey silt Stiff and stratified		6	SS	22	910											
908.2			7	SS	25	900											
31.0	Silt Compact trace of clay		8	SS	13	900											
896.2			9	SS	13	890											
43.0	Sand and gravel		10	SS	78	890											
	Very Dense					880											
	occasional boulders					880											
876.7			11	RC	83%	870											
62.5	Micaceous Schist Rock		12	RC	83%	870											
867.9																	
71.3	End of Borehole																

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 5

WP 150-73-02 LOCATION Co-ords. 16,467,846 N; 1,065,659 E. ORIGINATED BY BL
DIST 11 HWY 11 BORING DATE August 21, 1975 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX Casings CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100			
947.5	Ground Level													
0.0	Fill mostly sand (Embankment of Hwy.11)		1	SS	48									
935.5														
12.0	Silty clay to clayey silt, with silt seams & sand partings		2	SS	42									
			3	SS	14									
	Firm		4	TW	PM									
			5	TW	PM									
899.5														
48.0	Sand		6	SS	52									
	Very Dense		7	RC	50%									
	some gravel and boulders													
868.0														
79.5	End of Borehole NB: Bi-cone met refusal at 868.0'													

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 42

WP 74-74-01 LOCATION Co-ords. 16,467,325 N; 1,065,295 E. ORIGINATED BY BL
DIST 11 HWY 11 BORING DATE February 9, 1976 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE Washboring with NX Casing CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100			
930.0	Ice Surface													
0.0	Water													
925.0														
5.0	Bottom of Swamp	~	1	SS	0	920	+4							13.6% Org.
	Muck - fibrous and	~												
919.0	silty	~	2	SS	0									7.4% Org.
11.0	Clayey silt - very		3	TW	PM		+3						109	
	soft to soft		4	TW	PM	910	+3							
	stratified						+8							0 1 78 21
			5	SS	1/18"		+8							
	becoming more silty		6	TW	PM	900							116	
897.0							+4							
33.0	Silt - Compact		7	SS	16									0 0 83 17
	trace of clay		8	SS	20	890								
	stratified													
	trace of cohesion													
	cohesionless		9	SS	16	880								
876.0	A boulder @ 54'													
54.0	End of Borehole													
867.0														
63.0	End of Cone Test													

20
15 ϕ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 3

WP 74-74-01 LOCATION Co-ords. 16,467,502 N; 1,065,391 E. ORIGINATED BY BL
DIST 11 HWY 11 BORING DATE August 13, 1975 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX Casing CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
935.2	Ground Level															
0.0	Sand Fill - old road bed, with crushed stone					930										
929.7			1	SS	20											
5.5	Silt and sandy silt															
	Fill		2	SS	8											
922.2																
13.0	Clayey silt		3	TW	PM	920										
	Firm to Stiff		4	TW	PM											
			5	TW	PM	910										
906.2																
29.0	Silt - Compact stratified trace of clay		6	TW	PM											
			7	SS	12	900										
			8	SS	20											
893.2																
42.0	Sand and gravel					890										
887.7			9	SS	44											
47.5	End of Borehole															
	NB: BX casing bouncing at 47.5'															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 2

WP 74-74-01 LOCATION Co-ords. 16,467,557 N; 1,065,457 E. ORIGINATED BY BL
DIST 11 HWY 11 BORING DATE August 14, 1975 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ P.C.F	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	W_P	W	W_L		
935.6	Ground Level															
0.0	Sand Fill															
931.1																
4.5	Clayey silt		1	SS	22	930										
	Firm to Stiff		2	TW	PM											
			3	TW	PM	920										
915.6			4	SS	20											
20.0	Silt															
	Compact		5	SS	20	910										
	some clay															
904.6																
31.0	Sand, some gravel		6	RC	83%	900										
895.6	Boulders		7	RC	50%											
40.0	Gneiss Bedrock		8	RC	94%											
889.6			9	RC	98%											
46.0	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 7

WP 74-74-01 LOCATION Co-ords. 16,467,680 N; 1,065,477 E. ORIGINATED BY BL
 DIST 11 HWY 11 BORING DATE August 29, 1975 COMPILED BY BL
 DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W_p	W	W_L		
933.7	Ground Level															
0.0	Peat	3 3 3 3	1	SS	3	930										
925.7			2	SS	4											
8.0	Silty clay to clayey silt Firm to Stiff layered		3	TW	PM	920										
			4	TW	PM											
908.2			5	SS	23	910										
25.5	Silt Compact trace of sand and clay seams		6	SS	34											
895.7			7	SS	15	900										
38.0	Sand, trace of fine gravel		8	SS	5	890										
888.4																
45.3	End of Borehole N.B: Refusal at 45.3'															

20
15 \diamond 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 8

WP 74-74-01 LOCATION Co-ords. 16,467,739 N; 1,065,481 E. ORIGINATED BY BL
DIST 11 HWY 11 BORING DATE August 26, 1975 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS	
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	SHEAR STRENGTH PSF					WATER CONTENT %
												O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					
						1000	2000										
935.2	Ground Level																
0.0	Sand Fill																
930.2			1	SS	0	930											
5.0	Peat		2	SS	1.6"												
922.2																	
13.0	Clayey silt		3	TW	PM	920											
	Firm and layered		4	TW	PM												
	some silt and clay seams		5	SS	1.6"	910											
			6	TW	PM												
899.2			7	SS	9	900											
36.0	Silt		8	SS	11												
	Compact					890											
	trace of clay		9	SS	35												
878.2						880											
57.0	Sand and gravel with boulders		10	RC	89%												
			11	RC	133%	870											
866.7																	
68.5	Gneiss Bedrock		12	RC	97%												
						860											
856.8			13	RC	95%												
78.4	End of Borehole																

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 9

WP 74-74-01 LOCATION Co-ords. 16,467,852 N; 1,065,461 E. ORIGINATED BY BL
DIST 11 HWY 11 BORING DATE August 28, 1975 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
934.6	Ground Level															
0.0	Silt and organics					930										
			1	TW	PM											
926.6																
8.0	Clayey silt		2	TW	PM											
	stratified		3	SS	1/18"	920										
	Soft		4	TW	PM											
			5	SS	14	910										
	Firm		6	SS	13											
901.6																
33.0	Silt		7	SS	20	900										
	Compact		8	SS	14											
	trace of clay															
889.6						890										
45.0	Sand - medium		9	SS	59											
	some fine gravels															
883.1			10	SS	N/R											
51.5	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 201

WP 74-74-01

LOCATION Co-ords. 16,467,913 N; 1,065,607 E.

ORIGINATED BY Racey McCallum

DIST 11 HWY 11

BORING DATE February 1956

COMPILED BY

DATUM Geodetic

BOREHOLE TYPE Washboring with NX & BX

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100					w_p — w — w_L				
							SHEAR STRENGTH PSF ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE 1000 2000					WATER CONTENT % 10 20 30				
931.0	Ground Level					ELEV									GR SA SI CL	
0.0	Fill					930										
925.0			1	TW	PM		+s3.0									
6.0	Silty clay to clayey silt					920	+s3.0									
			2	TW	PM		+s3.7									
			3	TW	PM		+s1.7									
	Soft		4	TW	PM		+s3.0									
			5	TW	PM	910	+s1.3									
	stratified		6	TW	PM		+s3.4									
			7	TW	PM		+s3.8									
			8	TW	PM		+s2.9									
			9	TW	PM	900	+s2.4									
			10	TW	PM											
896.0																
35.0	Silt Compact		11	SS	13											
892.0			12	SS	19											
39.0	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 41

WP 74-74-01 LOCATION Co-ords. 16,468,010 N; 1,065,535 E. ORIGINATED BY BVV
DIST 11 HWY 11 BORING DATE February 11, 1976 COMPILED BY BVV
DATUM Geodetic BOREHOLE TYPE Washboring with NX Casing CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N° VALUES		20	40	60	80	100	W_P	W	W_L		
936.0	Ground Level															
0.0	Topsoil															
933.0																
3.0	Clayey silt to silt Brown, oxidized some organics stratified		1	SS	8	930										
			2	SS	11											
			3	SS	21	920										
918.0																
18.0	Silty clay to clayey silt, Grey and stratified Soft to Firm		4	SS	8											
			5	TW	PM	910										
			6	TW	PM											
902.0																
34.0	Silt, trace of clay Compact		7	SS	18	900										
			8	SS	19											
890.0																
46.0	Sand and Gravel Very Dense					890										
884.0																
52.0	End of Borehole N.B.: Probable bedrock at El. 884.0±		9	SS	100	2"										

20
15 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 4 C

WP 74-74-02 LOCATION Co-ords. 16,467,418 N; 1,065,242 E. ORIGINATED BY BL
DIST 11 HWY 11 BORING DATE August 19, 1975 COMPILED BY _____
DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT <u>W_L</u> PLASTIC LIMIT <u>W_p</u> WATER CONTENT <u>W</u>			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N ^o VALUES		20	40	60	80	100	W _p	W	W _L		
935.0	Ground Level															
0.0	Fill - old road bed	XXXX														
931.5																
3.5	Muck	XXXX	1	SS	16	930										5.5% Org.
929.0																
6.0	Clayey silt Firm to Stiff	XXXX	2	TW	PM											
	stratified with clay seams and fine sand partings	XXXX	3	TW	PM	920										
			4	SS	6											
			5	TW	PM	910										
907.0																
28.0	Silt Compact and trace of clay	XXXX	6	SS	20											
900.0						900										
35.0	Sand with some gravel and boulders	XXXX	7	SS	60/4"											
						890										
887.5																
47.5	Gneiss Rock	XXXX	8	RC	92%											
882.0			9	RC	80%											
53.0	End of Borehole															

RECORD OF BOREHOLE NO 10 C

WP 74-74-02 LOCATION Co-ords. 16,467,585 N; 1,065,230 E. ORIGINATED BY BL
 DIST 11 HWY 11 BORING DATE September 9, 1975 COMPILED BY
 DATUM Geodetic BOREHOLE TYPE Washboring with NX Casing CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ P.C.F.	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W_P	W	W_L		
936.1	Ground Level															
0.0	topsoil		1	SS	18											0 0 82 18
	Clayey silt Very Stiff		2	SS	27	930										
	Stratified with clay seams & occasional fine sand partings		3	SS	14											
921.1																0 0 92 8
15.0	Silt		4	SS	27	920										
	stratified, occ. clay seams		5	SS	13											
913.1																
23.0	Sand, some gravel, frequent boulders		6	RC	50%	910										
905.1																
31.0	End of Borehole NB: Artesean water encountered at El. 913±															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 52

WP 74-74-02 LOCATION Co-ords. 16,467,425 N; 1,065,255 E. ORIGINATED BY BK
DIST 11 HWY 11 BORING DATE September 29, 1961 COMPILED BY BK
DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT <u>W_L</u> PLASTIC LIMIT <u>W_P</u> WATER CONTENT <u>W</u>			UNIT WEIGHT γ P.C.F.	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W _P	W	W _L		
935.0	Ground Level															
932.5	Fill. Silty sand with organics.	X														
2.5	Silty clay to clayey silt stratified with occ. silt layers. Stiff		1	SS	7	930										124.9
			2	SS	18											
			3	TW	PH											125.8
			4	TW	PH	920										112.4
			5	TW	PH											
910.0	Silt Compact		6	TW	PH	910										124.8
25.0			7	TW	PH											124.0
899.5	Sand and gravel Dense		8	TW	PH	900										
35.5			9	SS	42											
894.5	Schist Rock		10	SS	100	5"										
40.5			11	RC												
886.5	End of Borehole NB: Artesian pressure observed at 899.5		12	RC		890										
48.5																

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 58

WP 74-74-02 LOCATION Co-ords. 16 467,650 N; 1,065,265 E. ORIGINATED BY _____
 DIST 11 HWY 11 BORING DATE October 6, 1961 COMPILED BY _____
 DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
937.0	Ground Level															
935.0	Topsoil															
2.0	trace organic		1	SS	25											
	Silty clay to clayey silt		2	SS	17	930										
	Stratified		3	TW	PH											
	Stiff		4	TW	PH											
			5	TW	PH	920										
915.0	becoming very silty		6	TW	PH											
22.0	Silt		7	TW	PH	910										
	Compact		8	TW	PH											
905.0																
32.0	Sand and gravel		9	SS	7	900										
	Loose to Very Dense															
893.5			10	SS	82	6"										
43.5	End of Borehole															
	NB: Artesean pressure noted at El.905.															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 59

WP 74-74-02 LOCATION Co-ords. 16,467,360 N; 1,065,180 E. ORIGINATED BY _____
DIST 11 HWY 11 BORING DATE October 10, 1961 COMPILED BY _____
DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
935.0	Ground Level															
932.5	Fill-old road bed	⊗														
2.5	Muck Soft some clay	~	1	SS	13	930										
927.0		~	2	SS	9											
8.0	Silty clay to clayey silt stratified Soft to Firm	⊗	3	TW	PH											
		⊗	4	TW	PH	920										
		⊗	5	TW	PH											
		⊗	6	TW	PH	910										
903.0		⊗	7	TW	PH											
32.0	Silt Compact	⊗	8	TW	PH	900										
		⊗	9	SS	10											
891.0		⊗														
44.0	Sand and gravel Compact	⊗	10	SS	19											
888.5	End of Borehole	⊗														
46.5	NB: 1. Artesian pressure noted at El. 891.1 2. Cone refusal at 885.3															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 50

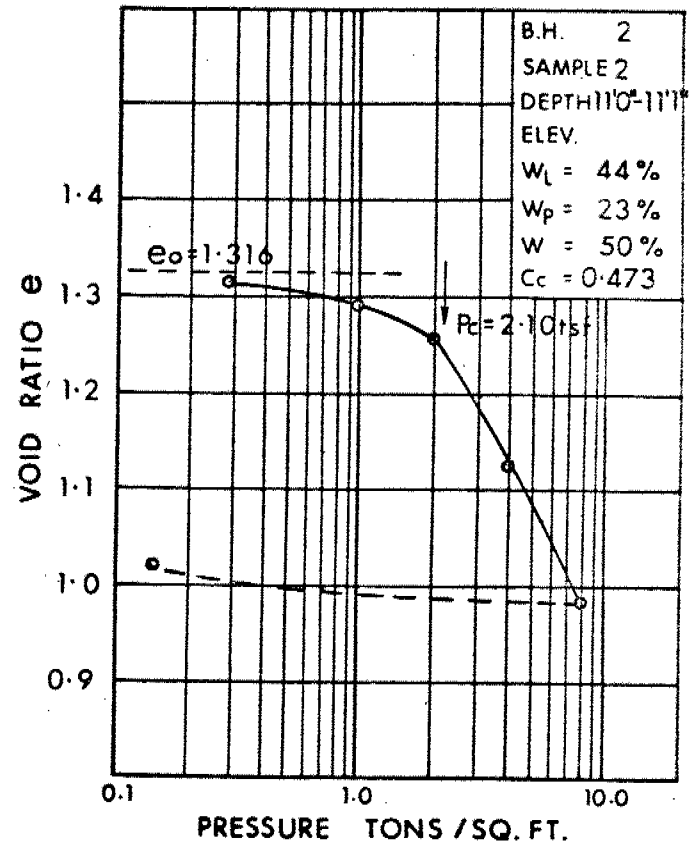
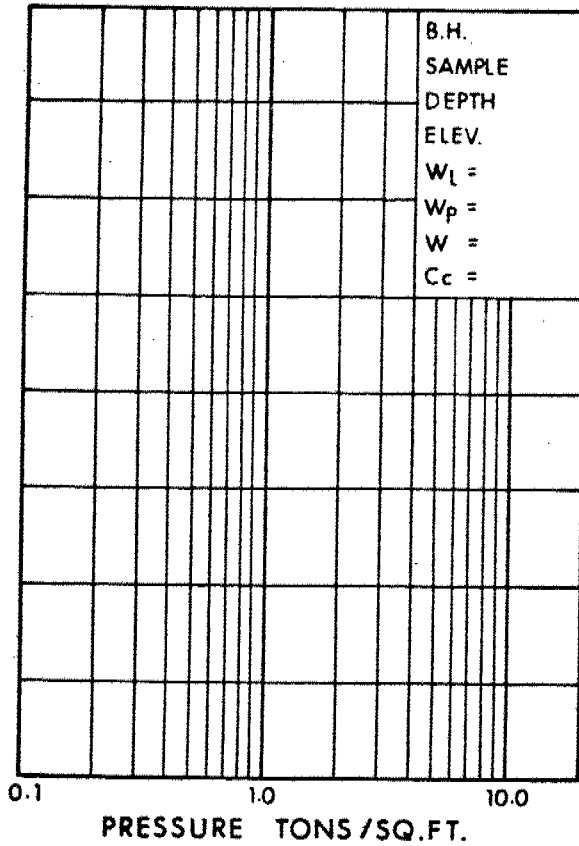
WP 74-74-02 LOCATION Co-ords. 16,467,310 N; 1,065,255 E. ORIGINATED BY BK
DIST 11 HWY 11 BORING DATE October 12, 1961 COMPILED BY BK
DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100					w_p w w_L				
							SHEAR STRENGTH P.S.F.									
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					WATER CONTENT % 20 40 60				
932.0	Water Level															
931.0	Water															
1.0	Muck, with clayey silt.	}	1	SS	P	930								261%		
	Very Soft		2	SS	1/19"											
924.0			3	SS	1/18"	+ 6.0										
8.0	Clayey silt/silty clay, stratified	}	4	SS	4	920							107.0			
	Very Soft to Soft		5	SS	1/24"	+ 7.5						H ○				
			6	SS	2	+ 8.0										
			7	SS	1/18"							┌ ○				
	Firm	}	8	SS	4	910										
			9	SS	6	+ 3.8										
			10	SS	8	+ 3.3										
900.0						900										
32.0	Silt	}	11	SS	10											
	Compact					+ 4.0						○				
891.0			12	SS	9											
41.0	Sand and gravel	}	13	SS	16	890										
	Compact to Dense															
883.4																
48.6	Schist Rock															
878.4			14	RC	76%	880										
53.6	End of Borehole															
	NB: Artesean pressure observed at 891.±															

VOID RATIO - PRESSURE CURVES

JOB NO. 150-73-02

VOID RATIO e



VOID RATIO e

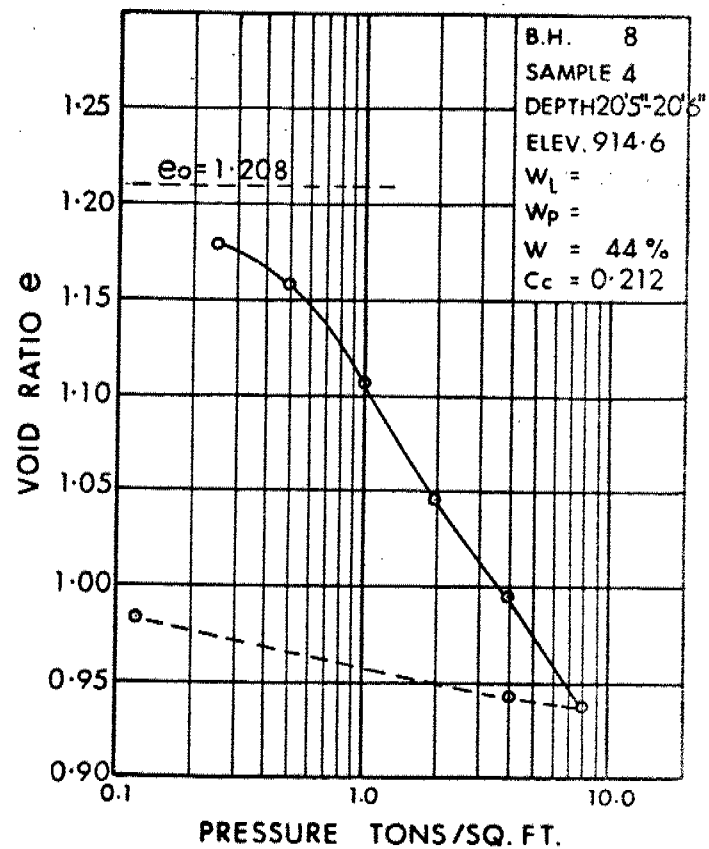
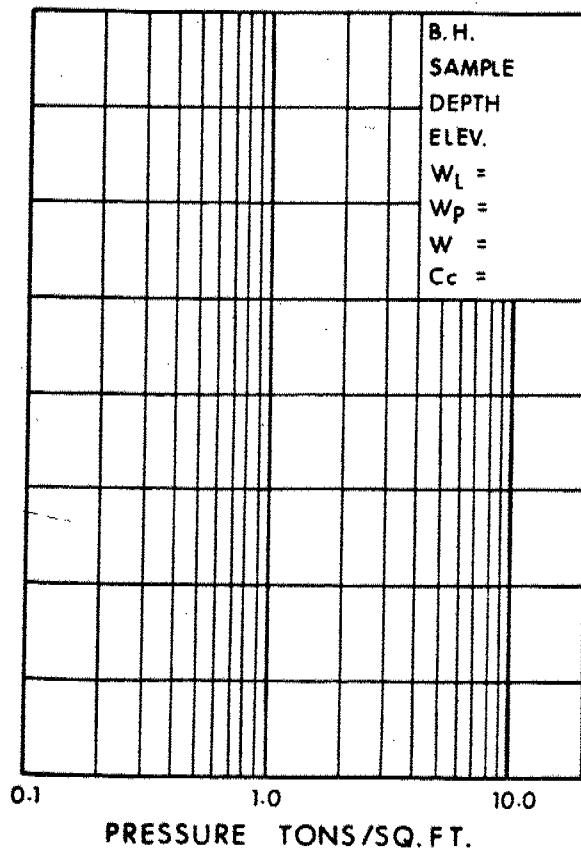
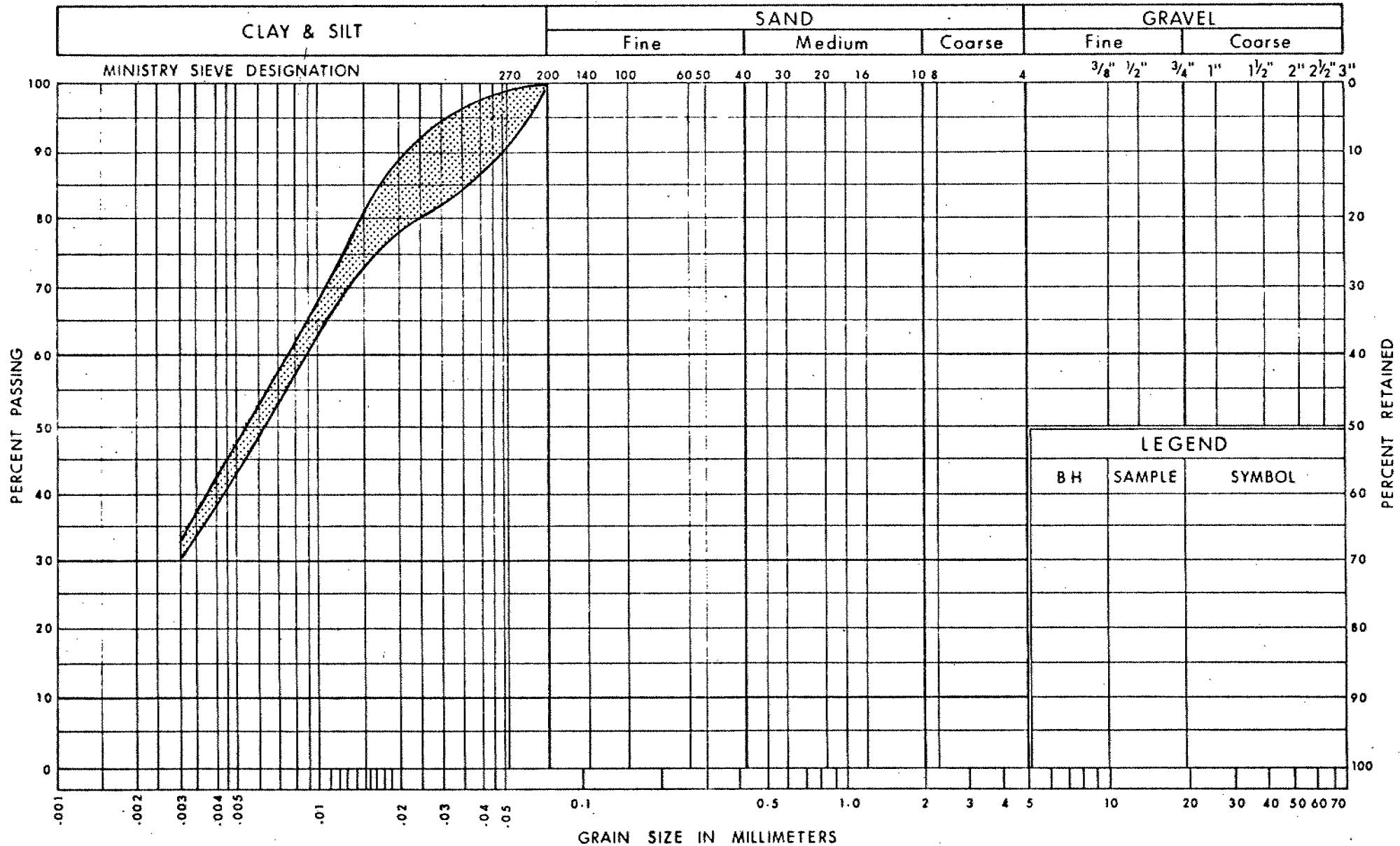


FIG. 1

UNIFIED SOIL CLASSIFICATION SYSTEM



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GRAIN SIZE DISTRIBUTION
CLAYEY SILT

FIG No 2
W P 150-73-02

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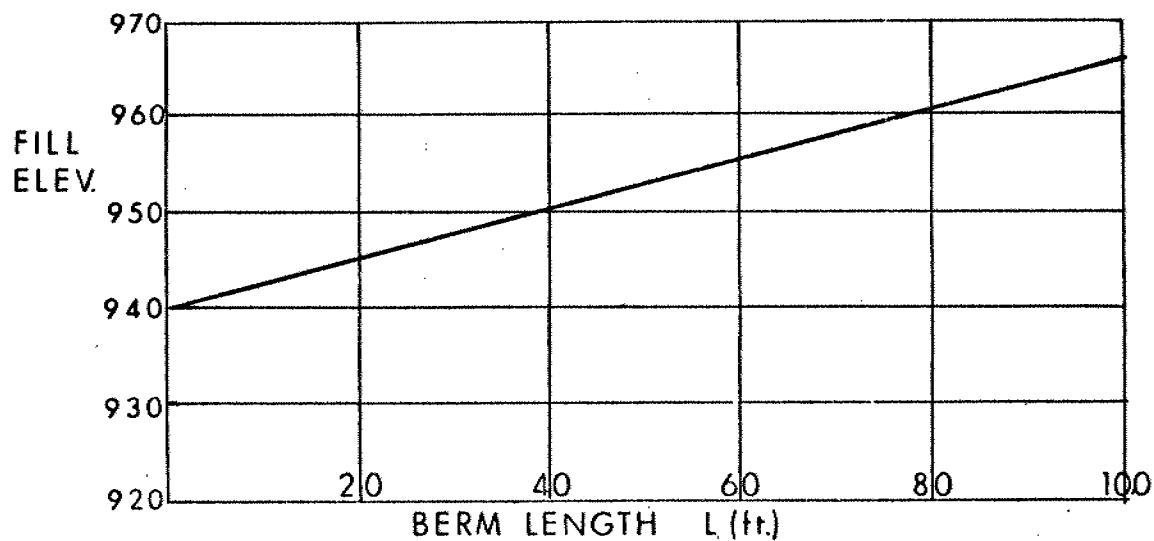
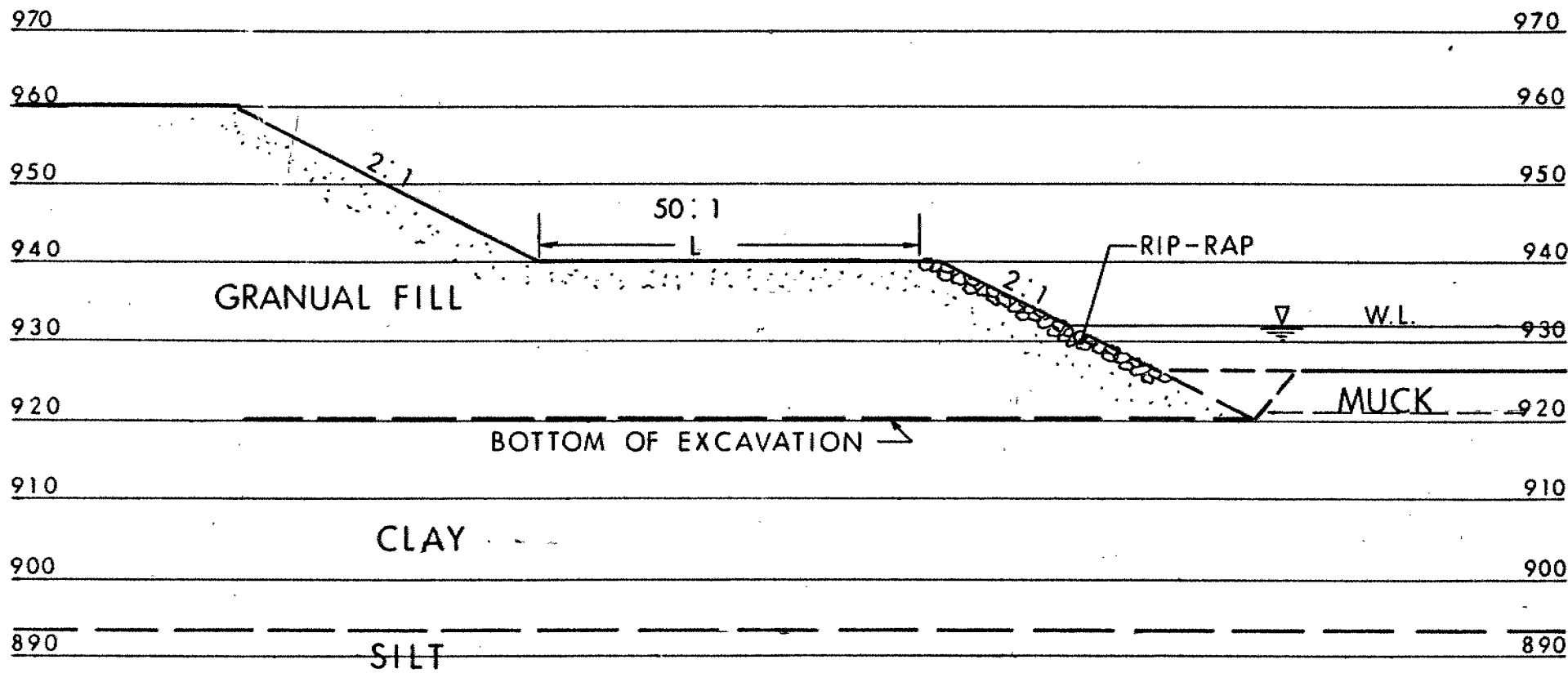
ENGINEERING SERVICES BRANCH

GRAIN SIZE DISTRIBUTION

SILT

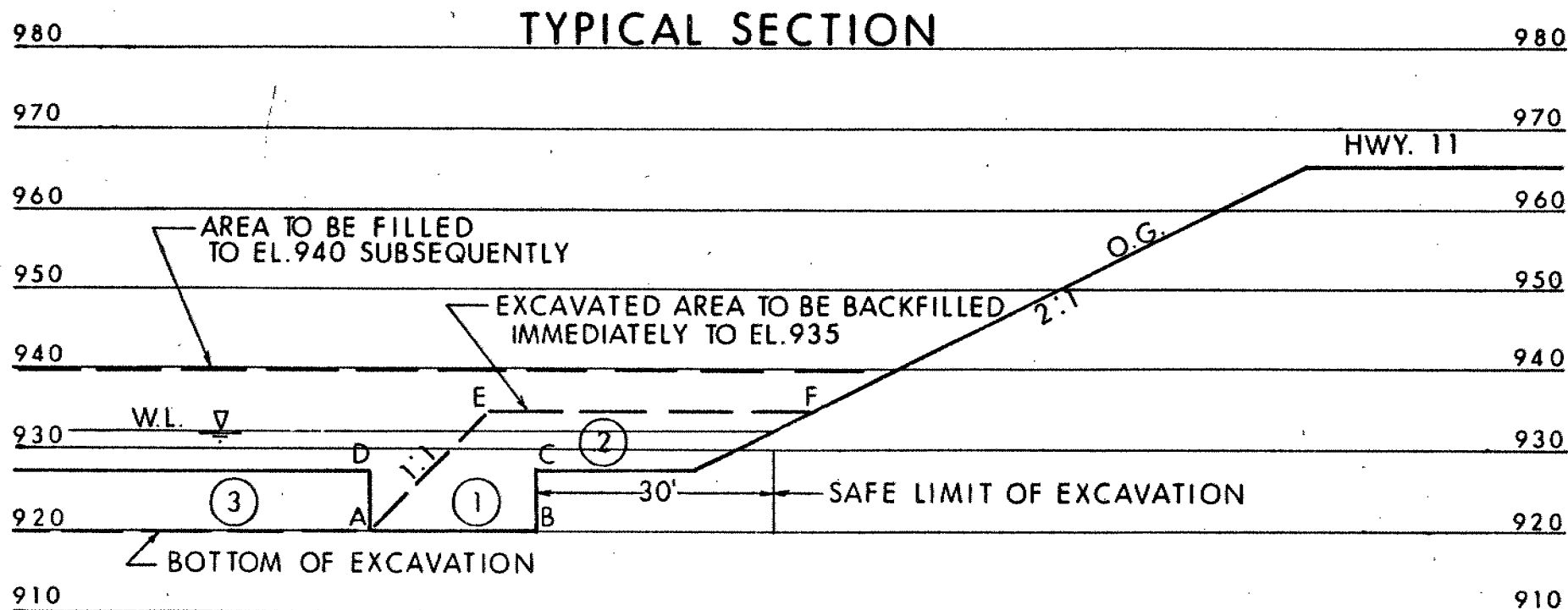
FIG No 3

W P 150-73-02



TYPICAL SECTION
BERM DESIGN
SOUTH APPROACH
OF SOUTH SERVICE RD.

FIG. 5

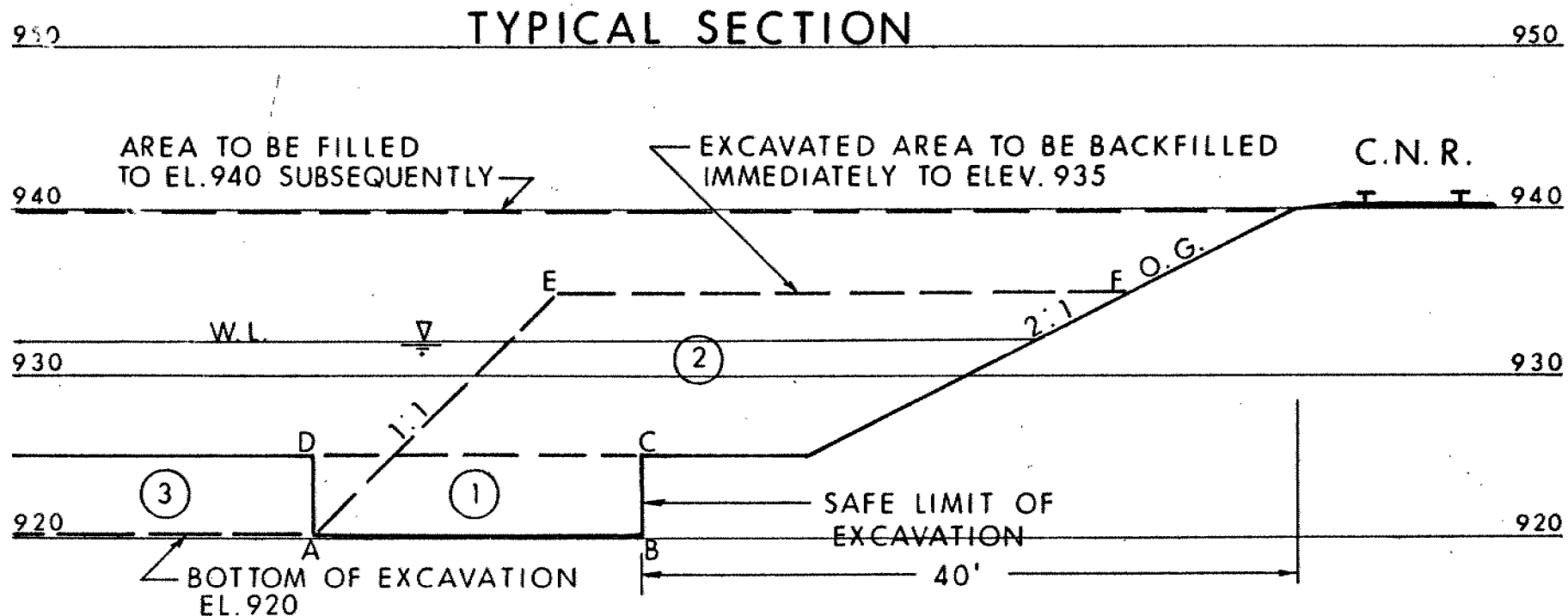


Sequence of Work:

- Stage 1: Excavate muck in ABCD, which is a 20' x 20' section located 30' from toe of the embankment.
- Stage 2: Backfill the excavated area to elev. 935 immediately with sandy type material.
- Repeat the above operations, i.e. excavation and backfilling in sections, until a berm is formed.
- Stage 3: Proceed with muck excavation in the remainder of the area, and fill to elev. 940 with sandy type material prior to construction of approach embankments.

ROADWAY PROTECTION FOR HWY.11 EMBANKMENT

FIG. 6



ROADWAY PROTECTION FOR RAILWAY TRACKS

Sequence of Work:

- Stage 1: Excavate muck in ABCD, which should not be wider than 20 ft. and closer than 40 ft. from the track.
- Stage 2: Backfill the excavated area immediately to elev. 935 with sandy type material.
- Repeat the above operations, i.e. excavation and backfilling in sections, until a berm is formed.
- Stage 3: Proceed with muck excavation in the remainder of the area, and fill to elev. 940 with sandy type material prior to construction of approach embankments.

FIG. 7

ABBREVIATIONS & SYMBOLS USED IN THIS REPORTPENETRATION RESISTANCE

'N' STANDARD PENETRATION RESISTANCE : - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE : - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS:-

<u>CONSISTENCY</u>	<u>c LB./SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 250	VERY LOOSE	0 - 4
SOFT	250 - 500	LOOSE	4 - 10
FIRM	500 - 1000	COMPACT	10 - 30
STIFF	1000 - 2000	DENSE	30 - 50
VERY STIFF	2000 - 4000	VERY DENSE	> 50
HARD	> 4000		

TERMS TO BE USED IN DESCRIBING SOILS:-

TRACE < 10% , SOME 10-25% , WITH 25-40% , > 40% SILTY, SANDY, GRAVELLY, CLAYEY ETC.

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.T.	SLOTTED TUBE SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

U	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
UU	UNCONSOLIDATED UNDRAINED TRIAXIAL	F.V.	FIELD VANE
CIU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_p	PLASTIC LIMIT
I_p	PLASTICITY INDEX
w_s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I_c	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
T_v	TIME FACTOR = $\frac{c_v t}{d^2}$ (d , DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e \sigma$ OR $\ln \sigma$	NATURAL LOGARITHM OF σ
$\log_{10} \sigma$ OR $\log \sigma$	LOGARITHM OF σ TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u'	PORE PRESSURE
σ	NORMAL STRESS
σ'	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

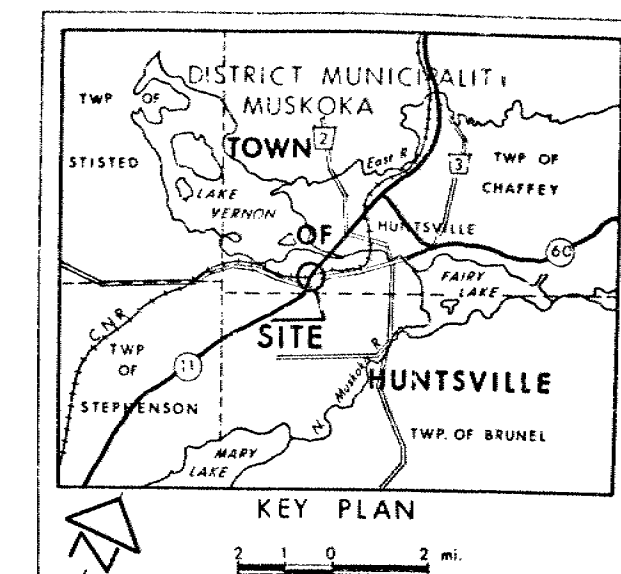
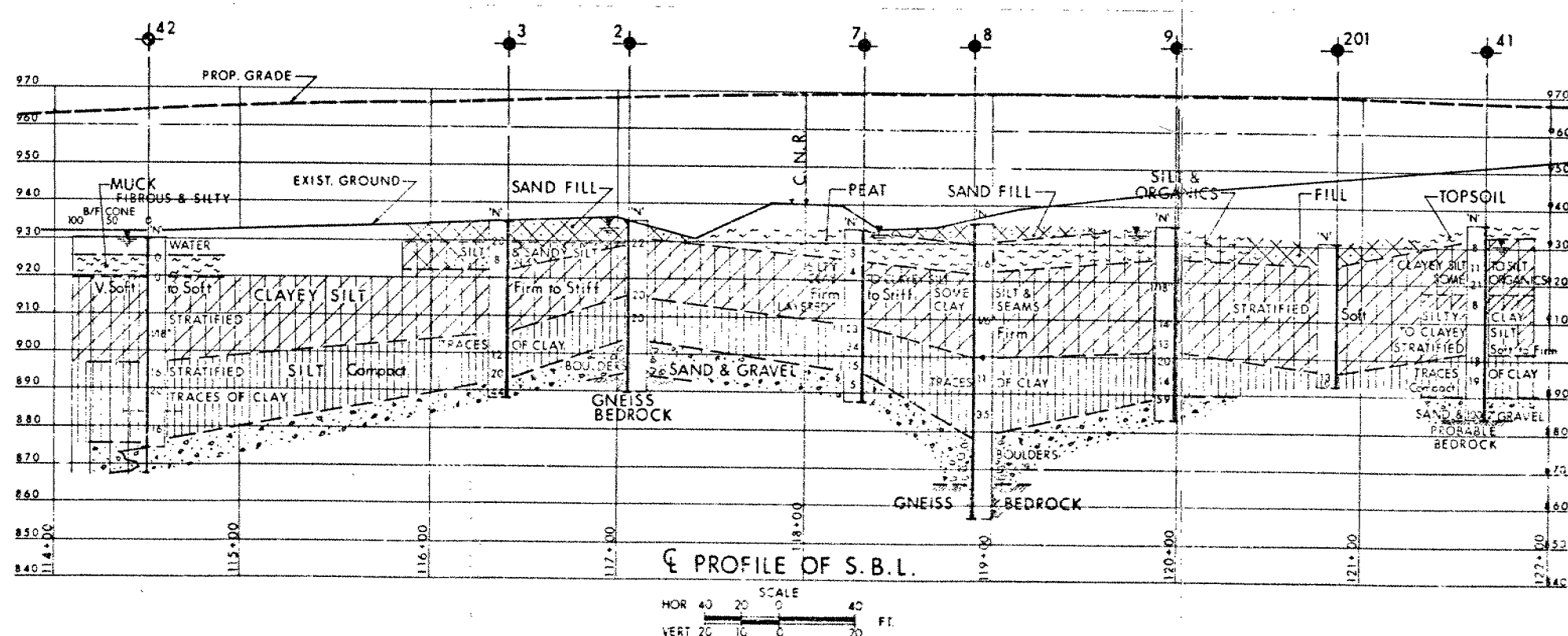
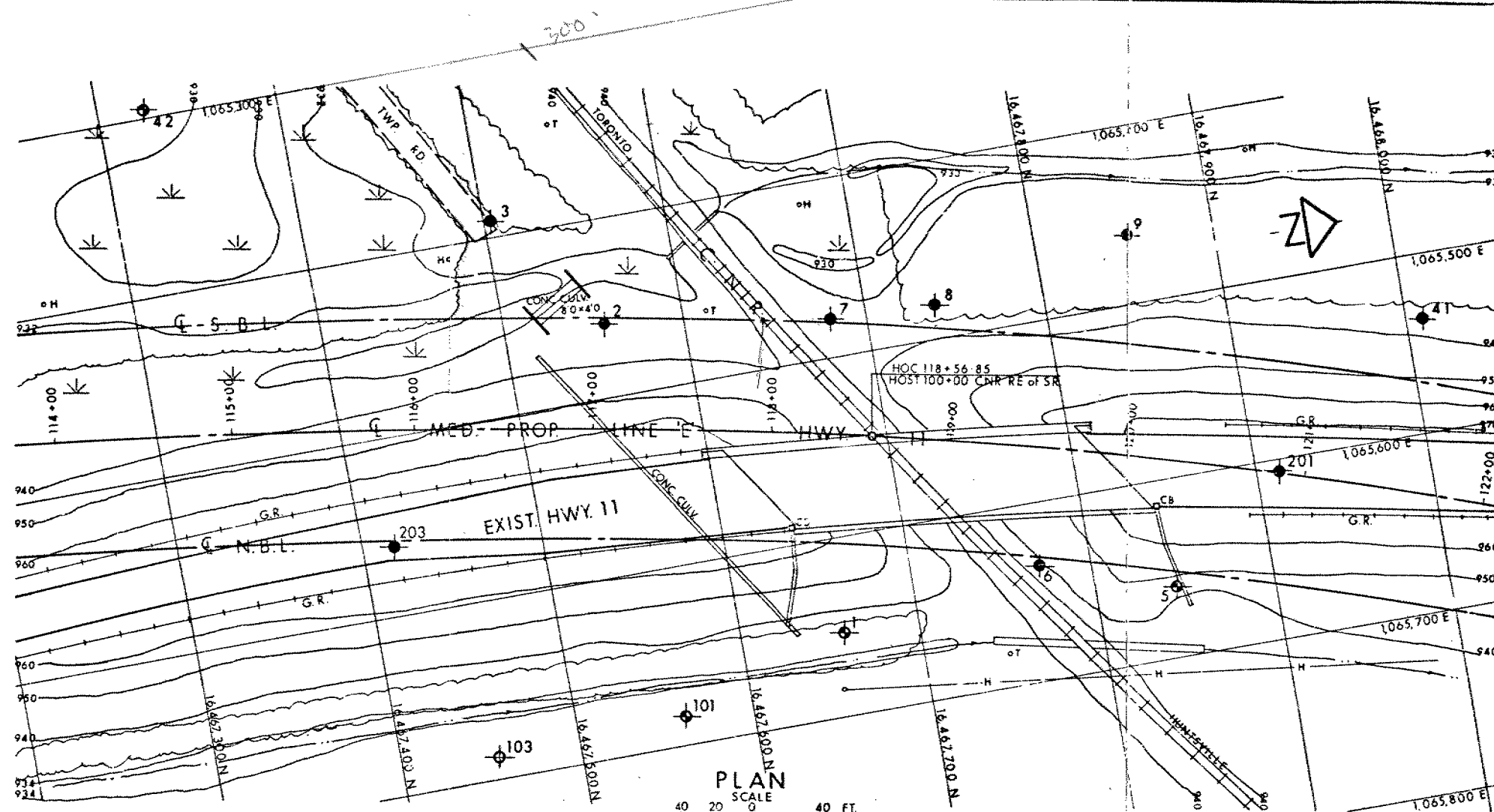
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL



LEGEND

Bore Hole

Dynamic Cone Penetration Resistance Test
B/F CONE - Blows/Ft. Cone Test (350 ft lbs. energy/blow)

Bore Hole & Cone Test

Water Levels established at time of field investigation.

B.H. No. 1 to 9 AUG. & SEPT. 1975

B.H. No. 101 & 103 OCT. 1974

B.H. No. 201 & 203 FEB. 1956

NO W.L. established B.H. No. 8 & 201

NO	ELEVATION	CO-ORDINATES	
		NORTH	EAST
2	935.6	16,467,557	1065,457
3	935.2	16,467,502	1065,391
7	933.7	16,467,680	1065,477
8	935.2	16,467,739	1065,481
9	934.6	16,467,852	1065,461
1	938.9	16,467,657	1065,652
5	947.5	16,467,346	1065,659
6	939.2	16,467,772	1065,634
101	936.5	16,467,560	1065,683
103	938.0	16,467,455	1065,687
201	931.0	16,467,913	1065,607
203	932.0	16,467,418	1065,560
41	936.0	16,468,010	1065,535
42	930.0	16,467,325	1065,295



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

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO ENGINEERING SERVICES BRANCH—TECHNICAL OFFICE—SOIL MECHANICS SECTION	
HUNTSVILLE SOUTH C.N.R. SOUTH BOUND LANE	
HIGHWAY NO. 11, PROP. LINE 'E'	DIST. NO. 11
DIST. MUNICIPALITY OF MUSKOKA TOWN OF HUNTSVILLE	
TWP. CHAFFEY LOT 8 CON. 1	
BORE HOLE LOCATIONS & SOIL STRATA	
SUBM. B.L. CHECKED	AP. NO. 74-7401
DRAWN BY J. CHECKED	747401-A
DATE 12 APR 1976	SITE NO. 42-17
APPROVED	ENGINEER NO.

G.I.-30 SEPT. 1976

GEOCRES No. 31E-80DIST. 11 REGION W.P. No. 150-73-02CONT. No. 79-86W. O. No. STR. SITE No. HWY. No. 11LOCATION South C.N.R.N.B.LNo of PAGES -=====OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. REMARKS:

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. J.C. McAllister, FROM: Soil Mechanics Section,
Reg. Structural Planning Supervisor, Geotechnical Office,
Northern Region, North Bay. West Building, Downsview.

ATTENTION: DATE: December 6th, 1974.

OUR FILE REF. IN REPLY TO

SUBJECT: RE: Proposed Shopping Centre,
(South Entrance to Huntsville),
Highway #11,
District #11, Huntsville,
W.P. 150-73-02.

We have carried out a subsoil investigation at the abovementioned site. The purpose of the investigation was to determine whether the Ministry should release a parcel of land adjacent to the proposed ramp from Muskoka Rd. #3 Westbound to Hwy. #11 Northbound. The land in question lies between the proposed underpass and the CNR overhead, and to the east of the existing Highway 11. The proposed ramp would merge with the Northbound lane of Highway at the railway overhead, consequently the maximum height of the ramp above the prevailing ground level would be in excess of 30 ft.

Subsoil Conditions.

The fieldwork consisted of six sampled boreholes and three dynamic cone penetration tests. Two cone penetration tests were adjacent to boreholes. A large number of field vane tests were performed to determine the undrained shear strength of the soil. Except at its north limits (near the C.N.R. tracks), the area, in general forms part of a low lying swamp.

The boreholes range from 38 to 44 ft. in depth. The subsoil, in general consists of cohesive deposits. The material may be described as clayey silt to silty clay, with layers of silt. In one borehole the upper 14 ft. consists of organic silt. In the lower portion of the overburden - near the bottom of borings - the material is more silty in nature. Some boreholes were terminated in a silt stratum.

..... /2

The consistency of the material varies with depth. In general, the consistency is firm near the surface and also near the bottom of the cohesive deposit. However, about 10 ft. below the ground surface and for a considerable distance below this depth, the undrained shear strength is very low and the consistency is soft to very soft. At some places, the undrained shear strength in this zone is as low as 200 lbs/sq.ft. This soft zone presents stability problems for the slopes of the proposed embankment in this area. In addition, the cohesive deposit will undergo consolidation settlements under the superimposed loads of the embankment.

The groundwater level is at or near the surface. However, it is known that the underlying pervious silt and sand deposits contain artesian conditions. The artesian pressure is also detrimental to the overall stability of the embankment.

Recommendations.

It is proposed to construct an interchange to carry Hwy. #11 over Muskoka Rd. #3 and about 1200 ft. further north to construct an overhead over the CNR tracks. The present alignment of Hwy. #11 will be revised in this area. Near the railway overhead the revised alignment will bring the NB lanes of Hwy. #11 further east. In addition, a ramp will carry traffic from WB lanes of Muskoka Rd. #3 to NB lanes of Hwy. #11. This ramp will be to the east of the present Hwy. #11 embankment throughout its length.

The Ministry owns a parcel of land about 800 ft. in length and 20-60 ft. in width, beyond the toe of 2:1 slopes for the ramp. A decision has to be made whether to release this strip to the proposed Shopping Centre Developer or not.

Because of the presence of a soft to very soft layer of clayey silt to silty clay, the proposed 2:1 slopes will not be stable. In order to stabilize the slopes, it will be necessary to construct berms. The length of berm will be dependent upon the total height of the embankment and the height of the berm. The present embankment was built by means of stage construction over a long period. The construction was carried out in small heights which were left to consolidate for some time. During this elapsed interval the subsoil gained some strength due to the dissipation of pore-pressures and the resulting consolidation. Another lift was placed when the gain in shear strength was sufficient to support it. At all times, the pore pressures were monitored to assess the gain in strength of the underlying subsoil.

As mentioned above, it will be necessary to provide berms along the most length of the ramp, in order to achieve stable slopes. Moreover, because of non-uniformity of the subsoil mass and the presence of soft layers, it is likely that small local failures of the slopes may occur during construction. In addition, settlement of the ground will occur due to the weight of the embankment. Because of the soft deposits this settlement may extend some distance away from the toe of the slope of the embankment.

In view of the abovementioned facts, it is our opinion that the strip of land in question should not be released, but should be kept by the Ministry.

We believe that this will enable you to make the decision.

A. Prakash

A. Prakash,
Senior Engineer,
For:
K.G. Selby,
Supervising Engineer.

AP/mj

c.c. S. McCombie
R. Chapman
W. Peck
C. Grebski (Attn: A. Radkowski)
J. Anderson

Files ✓
Documents

RECORD OF BOREHOLE NO 1

W.P. 150 - 73 - 02

LOCATION Co-ords. 16, 467, 560N., 1,065, 683E

ORIGINATED BY A.P.

DIST. 11 HWY. 11

BORING DATE October 21 & 22, 1974

COMPILED BY G.P.

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger & Cone Test

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		UNIT WEIGHT γ P.C.F	REMARKS % GR. SA. SI. C.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p — w — w_L			
							SHEAR STRENGTH					WATER CONTENT %			
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE								
936.5	Ground Level														
0.0	Mix. of clay & silt		1	SS	11	930	2000 + 2580	2000 +	+s=3.0	+s=2.8	2000 +	2000 +	125.5	0 0 (100) 0 0 52 48	
934.0	Sand Gravel &		2	TW	PH										
2.5			3	TW	PH										
	Clayey Silt to Silty Clay with layers of Silt		4	SS	5	920	2000 +	2000 +	+s=3.0	+s=2.8	2000 +	2000 +	105		
	Very Stiff		5	TW	PH										
	Stiff		6	TW	PH										
	Very Stiff		7	SS	8	910	2000 +	2000 +	+s=3.0	+s=2.8	2000 +	2000 +	105		
910.5	Silt		8	SS	9										
26.0	Traces of Clay		9	SS	12										
	Loose to Compact		10	SS	5	900	2000 +	2000 +	+s=3.0	+s=2.8	2000 +	2000 +	105		
898.4			11	TW	PH										
38.1	End of Borehole														

REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 2

W.P. 150 - 73 - 02 LOCATION Co-ords 16, 467, 340N., 1,065, 685E ORIGINATED BY A.P.
DIST. 11 HWY. 11 BORING DATE October 22 & 23, 1974 COMPILED BY G. P.
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Cone Test CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS % GR.SA.SI.CL.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
935.0	Water Level															
0.0	Clayey Silt to Silty Clay Firm --- Soft V. to Soft --- Firm --- Stiff		1	TW	PH											
			2	TW	PH											
			3	SS	4											
			4	TW	PH											
			5	TW	PH											
			6	TW	PH											
			7	TW	PH											
905.0	Silt Traces to some clay Loose to Compact		8	SS	12											
30.0			9	SS	12											
			10	SS	7											
892.5																
42.5	End of Borehole															
44.0	End of Cone Test															

ENGINEERING SERVICES BRANCH - GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 3

W.P. 150 - 73 - 02

LOCATION Co-ords 16, 467, 455N., 1,065, 687E

ORIGINATED BY A.P.

DIST. 11 HWY. 11

BORING DATE October 23, 1974

COMPILED BY G.P.

DATUM Geodetic

BOREHOLE TYPE Cone Test

CHECKED BY _____

[illegible]

REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE NO 4

W.P. 150 - 73 - 02 LOCATION Co-ords. 16, 466, 478N., 1,065, 825E. ORIGINATED BY A.P.
 DIST. 11 HWY. 11 BORING DATE October 24, 1974 COMPILED BY G.P.
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Cone Test CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	W_P	W	W_L		
935.5	Ground Level						400	800	1200	1600	2000	20	40	60	P.C.F.	GR.SA.SI.CL.
0.0	Clayey silt to Silty Clay Layers of silt	Firm --- Soft --- Firm	1	SS	2											
			2	TW	PH	930			+s=5.4					124.5	104	
									+s=3.5							
			3	TW	PH				+s=2.6							
									+s=3.7							
									+s=3.9							
			4	TW	PM	920									123	0 2 72 26 0 2 86 12
									+s=4.5							
									+s=4.0							
			5	TW	PH				+s=3.4							
									+s=2.8							
			6	TW	PH	910									115	
									+s=3.8							
905.5	Clayey Silt to Silt		7	SS	10				+s=3.3							
30.0									+s=5.4							
									+s=5.1							
			8	TW	PH	900										
									+s=4.3							
890.5	45.0 Silty sand, some															
888.5	gravel very loose		9	SS	3	890										17 48 34 1
47.0	End of Borehole															
876.5						880										
59.0	End of Cone Test															

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 5

W.P. 150 - 73 - 02 LOCATION Co-ords. 16, 466, 462N., 1,065, 682E. ORIGINATED BY A.P.
DIST. 11 HWY. 11 BORING DATE October 25, 1974 COMPILED BY G.P.
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Cone Test CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS % GR. S. A. S. I. C. L.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
937.9	Ground Level															
0.0			1	TW	PH											
			2	TW	PH											
			3	TW	PH											
			4	TW	PH											
			5	TW	PH											
			6	SS	8											
			7	SS	7											
899.9			8	SS	9											
38.0	End of Borehole															
891.1																
46.8	End of Cone Test															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 6

W.P. 150 - 73 - 02 LOCATION Co-ords. 16, 467, 115N., 1,065, 630E ORIGINATED BY A.P.
DIST. 11 HWY. 11 BORING DATE November 6, 1974 COMPILED BY G.P.
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS % GR. SA. SI. CL.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
935.0	Ground Level															
0.0	Clayey Silt to Silt Firm ----- Soft to V. Soft ----- Firm ----- Stiff		1	SS	1/18"											
			2	TW	PH	930										
			3	TW	PH											
			4	TW	PM	920										
			5	TW	PM											
			6	TW	PH	910										
			7	SS	6											
						900										
898.0			8	SS	18											
37.0	End of Borehole															

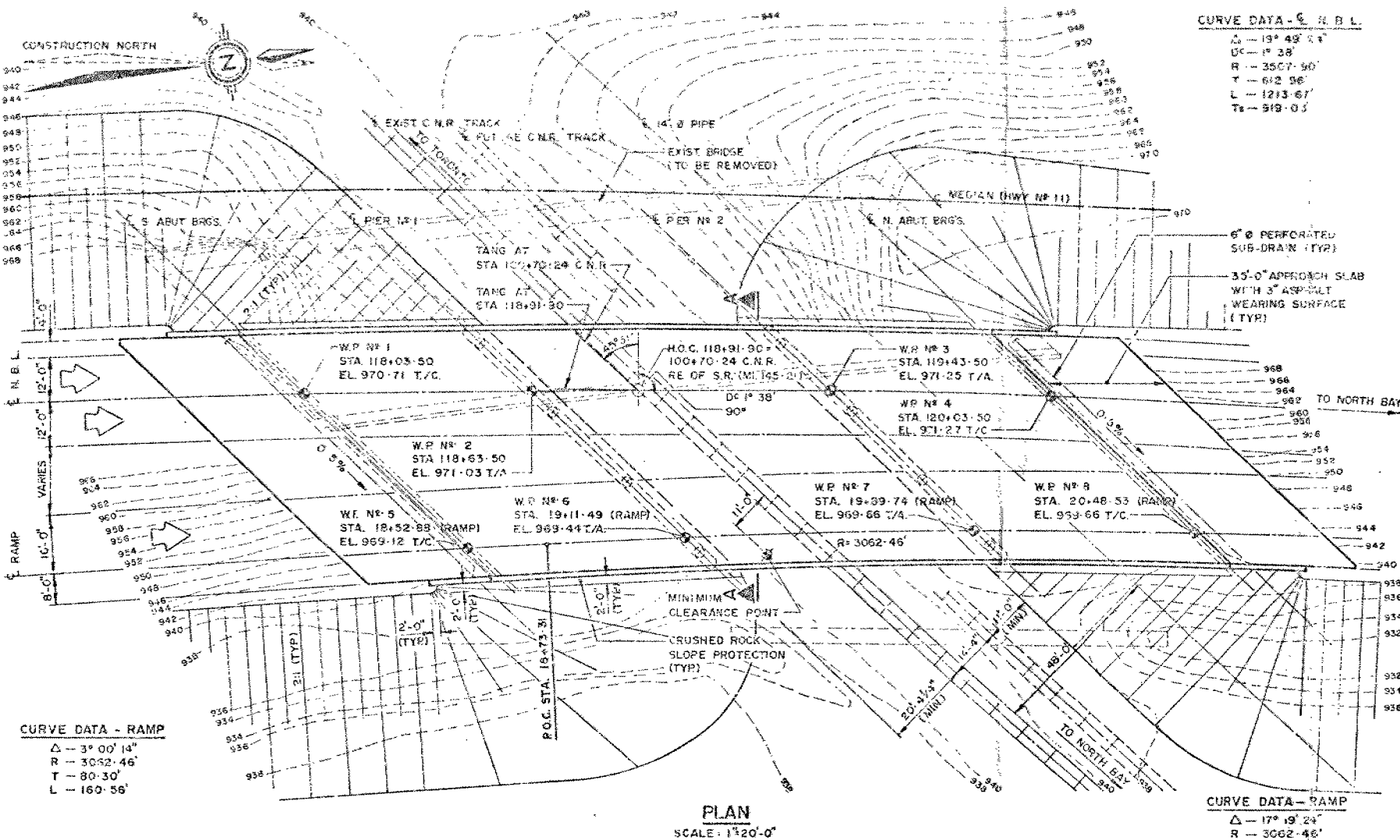
OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO
ENGINEERING SERVICES BRANCH - GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 7

W.P. 150 - 73 - 02 LOCATION Co-ords. 16, 466, 942N., 1,065, 687E. ORIGINATED BY A. P.
DIST. 11 HWY. 11 BORING DATE November 6, 1974 COMPILED BY G.P.
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS % GR. SA. SI. CL.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
935.7 0.0	Ground Level															
	Organic Silt		1	SS	3											
			2	TW	PM	930	Q		+s=3.3							
	Firm								+s=3.3							
	Organics		3	TW	PM				+s=2.7							
921.7 14.0									+s=2.0							
			4	TW	PM	920			+s=2.0							
	Clayey silt to silty clay								+s=2.7							
	Soft		5	TW	PM				+s=6.5							
	Layers of silt								+s=2.5							
			6	TW	PM	910			+s=4.0							
									+s=2.0							
			7	TW	PH				+s=5.2							
	Firm								+s=3.0							
									+s=2.8							
896.7 39.0	Silt, Some clay		8	SS	8	900										
	End of Borehole		9	SS	15											



B.M. EL. 936.59
 GEODETIC DATUM
 TOP OF 8'-0" T POST
 2:2'-0" LT 121+10.

CONT No
WP No 150-73-02

C.N.R. SOUTH CROSSING N.B.L.
GENERAL ARRANGEMENT
 HIGHWAY NO. 11 DISTRICT NO. 11

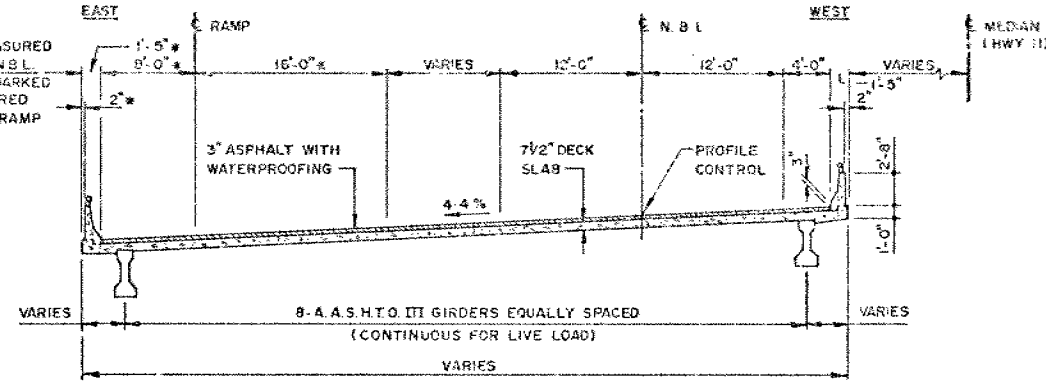


SHEET

totten sims hubicki associates limited
CONSULTANTS

- NOTES:**
- W.P. DENOTES WORKING POINT.
 - T/C DENOTES TOP OF CONCRETE DAM.
 - T/A DENOTES TOP OF ASPHALT WEARING SURFACE.
 - N.B.L. DENOTES NORTHBOUND LANE.

DIMENSIONS MEASURED
 RADIALLY TO C.N.R.
 EXCEPT THOSE MARKED
 THUS * MEASURED
 RADIALLY TO RAMP



NOTES:

CLASS OF CONCRETE:

- DECK, APPROACHES & BARRIER WALLS 4,000 P.S.I.
- PRESTRESSED GIRDERS 5,000 P.S.I.
- PIERS & APPROACH SLABS 4,000 P.S.I.
- REMAINDER 3,000 P.S.I.

CLEAR COVER TO REINFORCING STEEL:

- FOOTINGS 3"
- ABUTMENTS & WINGWALLS 3"
- DECK 1 1/2" BOT, 2" TOP
- APPROACH SLABS 2"
- GIRDERS 1"

OR AS NOTED ON THE DRAWINGS

FUNCTIONS OF 45° 51'

SIN. 0.71752
 COS. 0.69654
 TAN. 1.03012
 SEC. 1.43567

CONSTRUCTION:

- THE CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION OF SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF ± 1/8".
- NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.
- TO ACHIEVE THE MINIMUM CLEAR COVER OF 2" SPECIFIED, THE TOP LAYER OF REINFORCING STEEL IN THE DECK SLAB SHALL BE PLACED PRIOR TO CONCRETING WITH A CLEAR COVER OF 2 1/2" ± 1/2" TOLERANCE.
- REINFORCING STEEL SHALL BE IN ACCORDANCE WITH C.S.A. G 30-12-M1977, GRADE 400 EXCEPT AS NOTED.

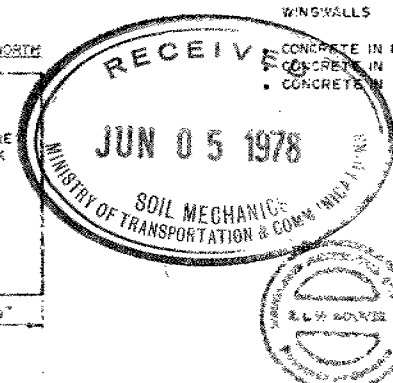
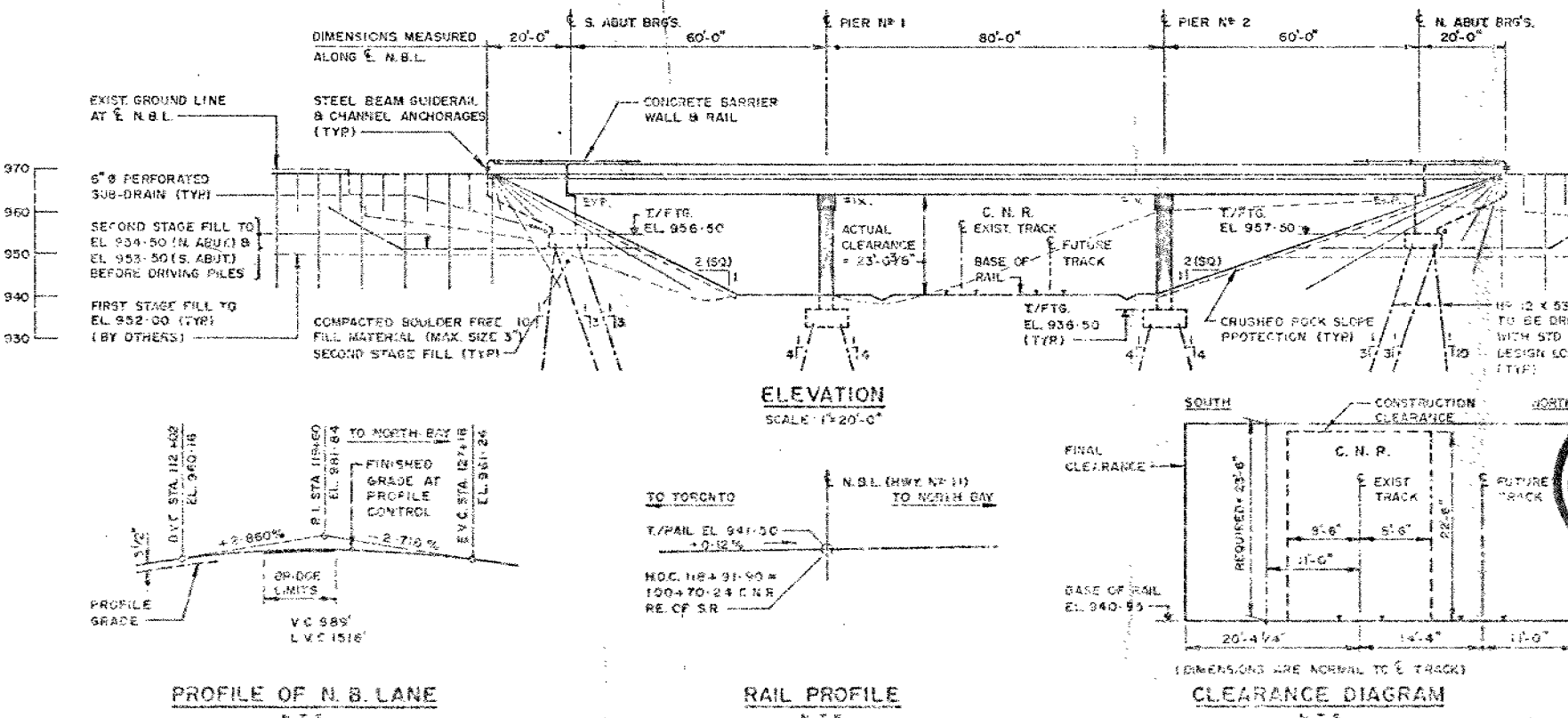
LIST OF DRAWINGS:

- 42-178-1 - GENERAL ARRANGEMENT.
- 2 - BENCHMARK LOCATIONS & SOIL STRATA.
- 3 - FOOTING LAYOUT.
- 4 - FOOTING REINFORCEMENT.
- 5 - ABUTMENTS.
- 6 - WINGWALLS.
- 7 - PIERS.
- 8 - BEARING DETAILS.
- 9 - PRESTRESSED GIRDERS.
- 10 - DECK DETAILS.
- 11 - DECK REINFORCEMENT.
- 12 - BARRIER WALL.
- 13 - 35 FT. APPROACH SLAB (BARRIER WALL).
- 14 - STEEL RAILING (SINGLE TUBE).
- 15 - STANDARDS.
- 16 - STANDARDS.
- 17 - STANDARDS.
- 18 - AS CONSTRUCTED ELEV & DIM.

CONCRETE QUANTITIES

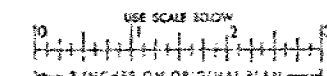
CONCRETE QUANTITIES ARE LISTED BELOW FOR THE APPROPRIATE CONCRETE LUMP SUM TENDER ITEMS:

- CONCRETE IN PIERS, ABUTMENTS & WINGWALLS 246 Cu. Yd. 3,000 psi.
- CONCRETE IN DECK & DIAPHRAGMS 140 Cu. Yd. 4,000 psi.
- CONCRETE IN BARRIER WALLS 385 Cu. Yd.
- CONCRETE IN APPROACH SLABS 33 Cu. Yd.
- CONCRETE IN APPROACH SLABS 173 Cu. Yd.



SCALE AS NOTED

FOR REDUCED PLAN



REVISIONS	DATE	BY	DESCRIPTION

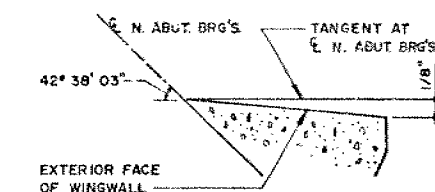
CONT No
WP No 150-73-02

C. N. R. SOUTH CROSSING N. B. L.
FOOTING LAYOUT

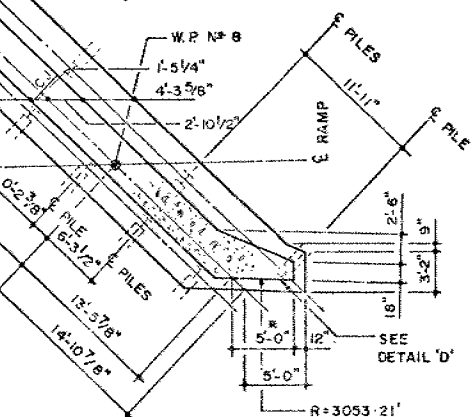


SHEET

totten sims hubicki associates limited
CONSULTANTS



DETAIL 'C'
N. T. S.

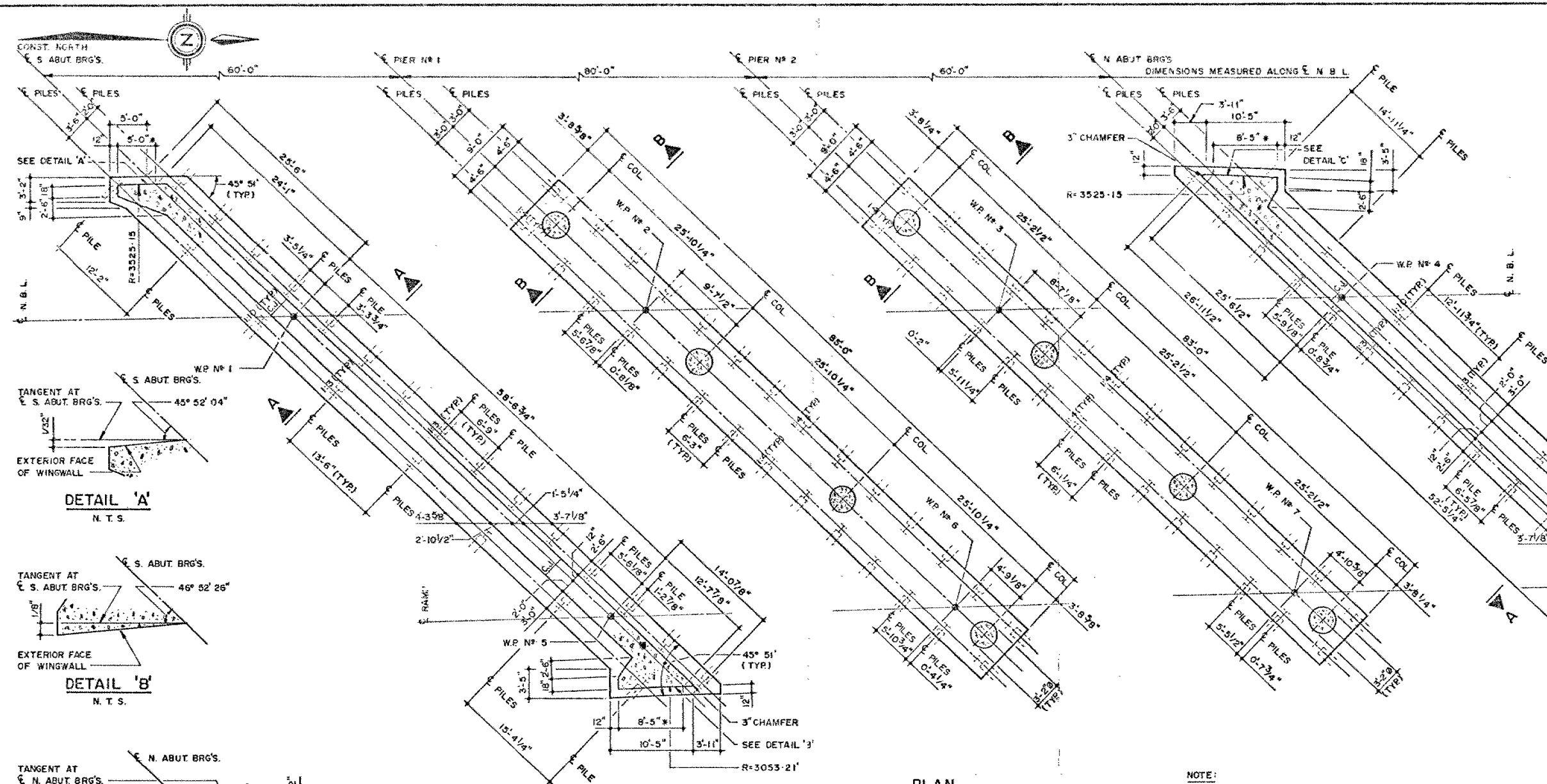


LIST OF PILES			
LOCATION	N°	LENGTH	TYPE
SOUTH ABUTMENT	23	78'-0"	HP 12 X 53
PIER N° 1	28	62'-0"	HP 12 X 53
PIER N° 2	28	68'-0"	HP 12 X 53
NORTH ABUTMENT	23	100'-0"	HP 12 X 53

NOTES:
• SPACING OF PILES TO BE MEASURED AT UNDERSIDE OF FOOTINGS.
• PILES TO BE DRIVEN IN ACCORDANCE WITH STANDARD SS 3-II USING DESIGN LOAD OF 70 TONS/PILE.

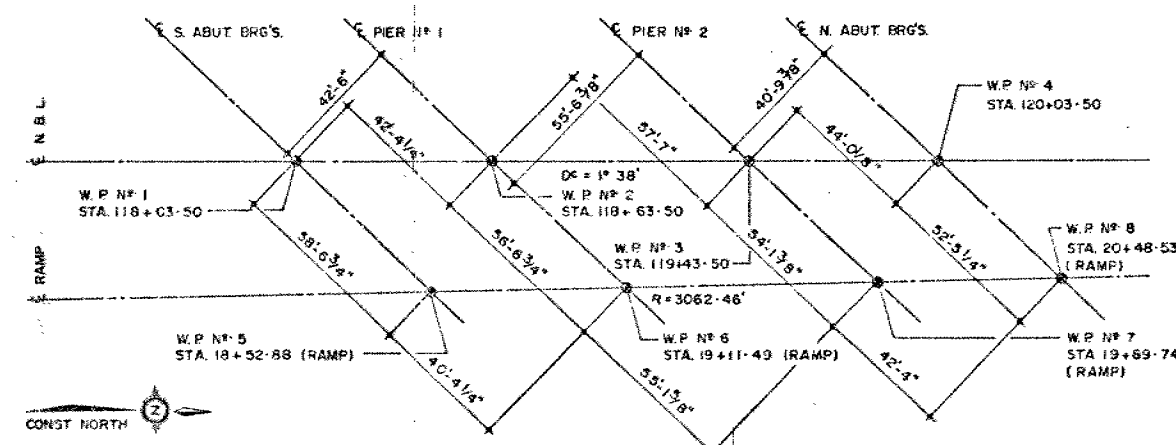
SCALE AS NOTED

REVISIONS	DATE	BY	DESCRIPTION



PLAN
SCALE: 1/8" = 1'-0"

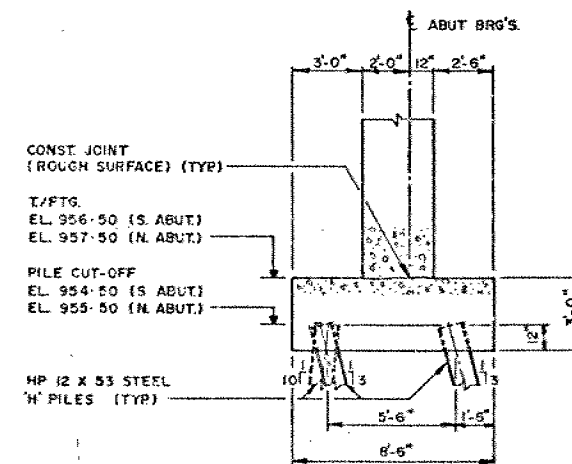
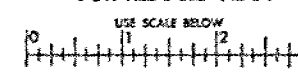
NOTE:
• * DENOTES DIMENSIONS TO BE MEASURED ALONG OUTSIDE FACE.



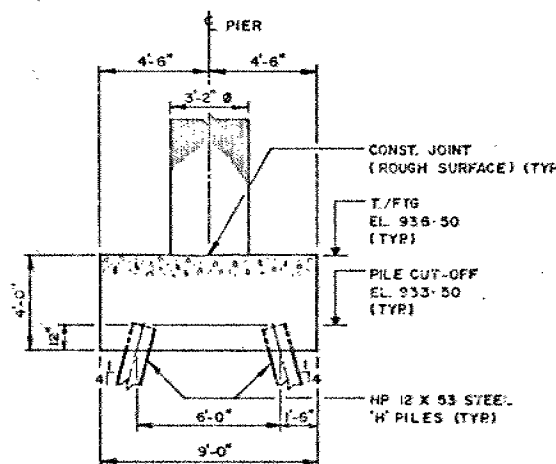
LAYOUT PLAN
N. T. S.



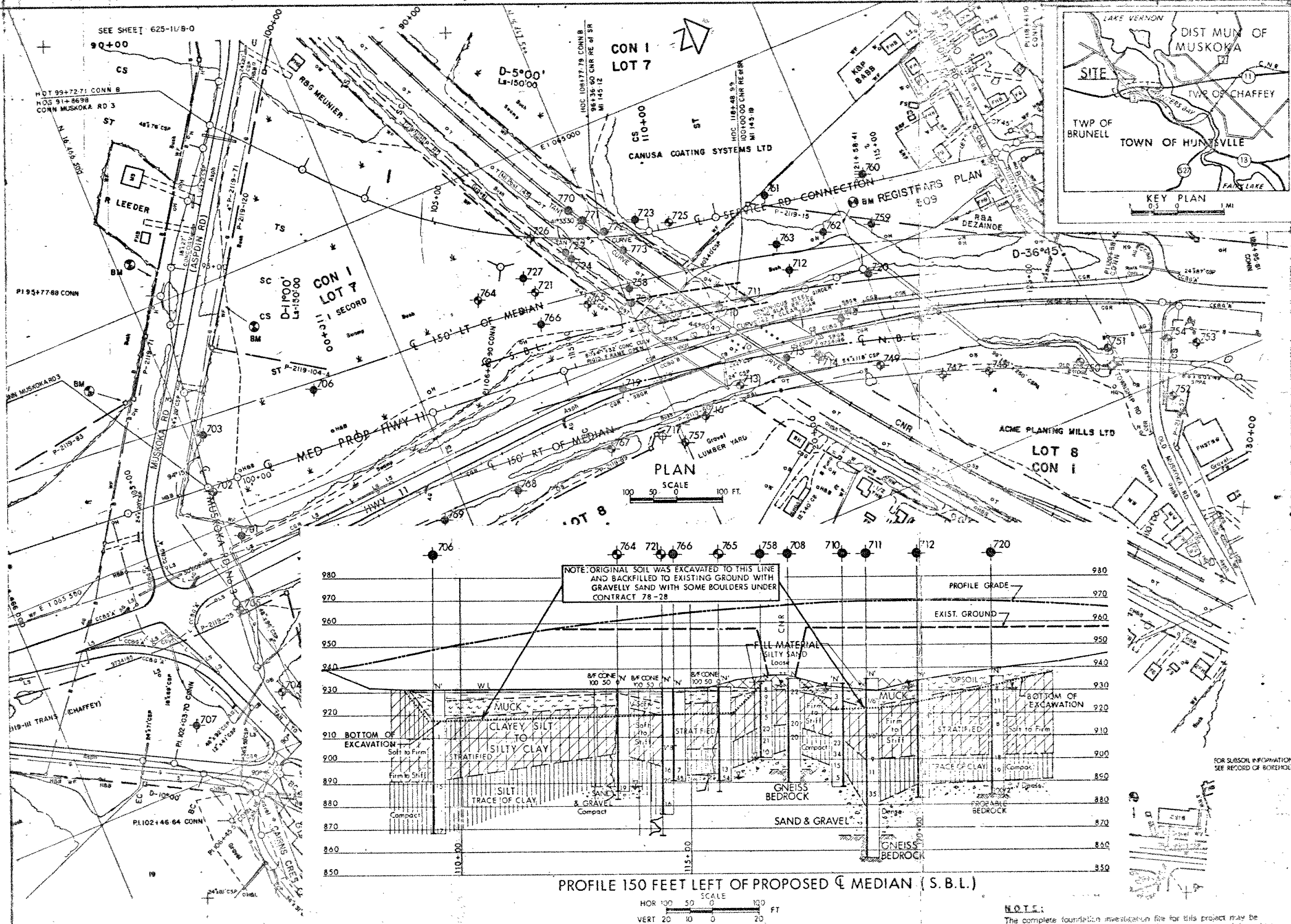
FOR REDUCED PLAN



SECTION A-A
SCALE: 1/4" = 1'-0"



SECTION B-B
SCALE: 1/4" = 1'-0"



CONT No
WP No 74-74-01

C.N.R. SOUTH CROSSING S.B.L.

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- "N" Blows/ft (Std Pen Test 350ft lbs energy)
- CONE Blows/ft (60" Cone 350ft lbs energy)
- W.L. at time of investigation

KEY PLAN

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
701	936.7	16 466 528	1 065 533
702	936.5	16 466 504	1 065 423
703	941.0	16 466 533	1 065 885
704	935.5	16 466 462	1 065 885
705	937.9	16 466 462	1 065 682
706	930.0	16 466 790	1 065 300
707	934.0	16 466 275	1 065 875
708	935.6	16 467 557	1 065 457
709	935.2	16 467 502	1 063 391
710	933.7	16 467 680	1 065 477
711	935.2	16 467 739	1 065 481
712	934.6	16 467 852	1 065 461
713	938.9	16 467 657	1 065 652
714	947.5	16 467 846	1 065 659
715	939.2	16 467 772	1 065 634
716	936.5	16 467 560	1 065 683
717	938.0	16 467 455	1 065 687
718	931.3	16 467 913	1 065 607
719	932.0	16 467 418	1 065 560
720	936.0	16 468 010	1 065 535
721	930.0	16 467 325	1 065 295
722	935.0	16 467 418	1 065 242
723	936.1	16 467 535	1 065 230
724	935.0	16 467 423	1 065 255
725	937.0	16 467 650	1 065 265
726	935.0	16 467 360	1 065 180
727	931.0	16 467 310	1 065 255
728	941.9	16 468 070	1 065 800
729	940.0	16 468 165	1 065 835
730	934.4	16 467 455	1 065 730
731	938.5	16 468 355	1 065 895
732	938.5	16 468 420	1 065 885
733	946.2	16 468 510	1 066 035
734	938.4	16 468 600	1 065 950
735	954.4	16 468 545	1 065 915
736	934.4	16 468 760	1 066 115
737	967.3	16 468 075	1 065 675
738	938.0	16 467 500	1 065 725
739	934.5	16 467 515	1 065 765
740	943.0	16 468 255	1 065 435
741	948.0	16 468 080	1 065 330
742	943.0	16 467 865	1 065 290
743	935.0	16 467 950	1 065 415
744	933.0	16 467 845	1 065 400
745	931.5	16 467 200	1 065 260
746	932.0	16 467 415	1 065 360
747	931.8	16 467 310	1 065 365
748	935.0	16 467 345	1 065 670
749	935.7	16 467 120	1 065 175
750	935.0	16 468 950	1 065 170
751	940.0	16 467 460	1 065 158
752	940.0	16 467 479	1 065 190
753	938.5	16 467 514	1 065 232
754	940.0	16 467 535	1 065 285

NOTE:

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

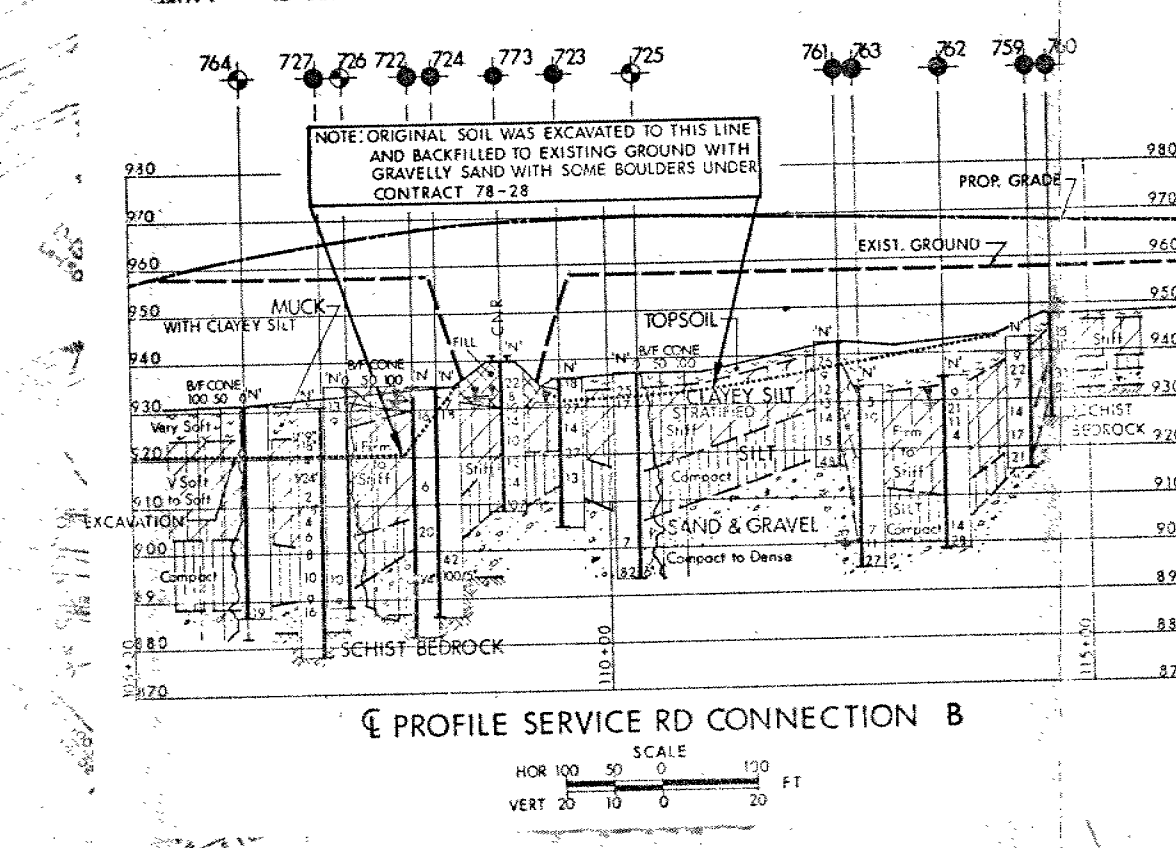
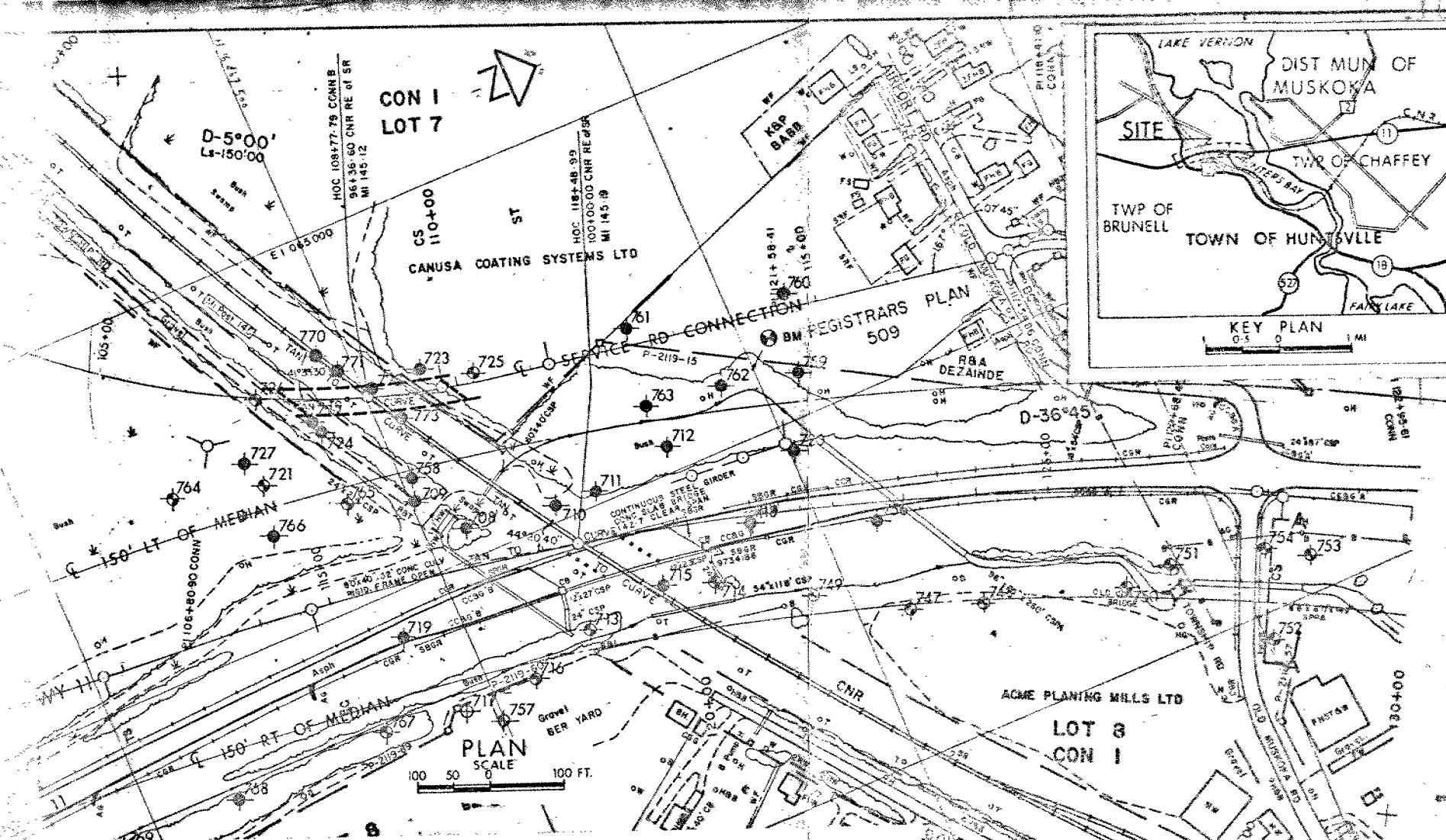
REVISIONS

DATE	BY	DESCRIPTION

NOTES:

The complete foundation investigation file for this project may be examined at the Engineering Division Office, Downsview. Information contained in this file and any other documents is confidential and is not to be released without the approval of the Ministry of Transportation and Communications.

At No. 11
DATE 29 JULY 1979
SITE 42-17A
PAGE 42-17A-2



CONT No
WP No 74-74-02

C.N.R. SOUTH CROSSING SERVICE RD. CONN. 'B'

BORE HOLE LOCATIONS & SOIL STRATA

LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊙ Bore Hole & Cone
- 'N' Blows/ft (Std Pen Test 350ft lbs energy)
- CONE Blows/ft (60° Cone 350ft lbs energy)
- W.L. at time of investigation

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
701	936.7	16 466 528	1 065 533
702	936.5	16 466 504	1 065 423
703	941.0	16 466 533	1 065 885
704	935.5	16 466 462	1 065 885
705	937.9	16 466 462	1 065 882
706	930.0	16 466 790	1 065 300
707	934.0	16 466 275	1 065 875
708	935.6	16 467 557	1 065 457
709	935.2	16 467 502	1 063 391
710	933.7	16 467 680	1 065 477
711	935.2	16 467 739	1 065 481
712	934.6	16 467 852	1 065 461
713	938.9	16 467 657	1 065 652
714	947.5	16 467 846	1 065 659
715	939.2	16 467 772	1 065 634
716	936.5	16 467 560	1 065 683
717	938.0	16 467 455	1 065 687
718	931.0	16 467 913	1 065 607
719	932.0	16 467 418	1 065 560
720	936.0	16 468 010	1 065 535
721	930.0	16 467 325	1 065 295
722	935.0	16 467 418	1 065 242
723	936.1	16 467 585	1 065 230
724	935.0	16 467 425	1 065 255
725	937.0	16 467 650	1 065 265
726	935.0	16 467 360	1 065 180
727	931.0	16 467 310	1 065 255
728	941.9	16 468 070	1 065 300
729	940.0	16 468 165	1 065 835
730	934.4	16 467 455	1 065 730
731	935.5	16 468 355	1 065 895
732	938.5	16 468 420	1 065 885
733	946.2	16 468 510	1 066 035
734	938.4	16 468 600	1 065 950
735	954.4	16 468 545	1 065 915
736	934.4	16 468 760	1 066 115
737	967.3	16 468 075	1 065 675
738	938.0	16 467 500	1 065 725
739	934.5	16 467 515	1 065 365
740	943.0	16 468 055	1 065 435
741	948.0	16 468 080	1 065 330
742	943.0	16 467 865	1 065 290
743	935.0	16 467 950	1 065 415
744	933.0	16 467 845	1 065 400
745	931.5	16 467 200	1 065 260
746	932.0	16 467 415	1 065 360
747	931.8	16 467 310	1 065 365
748	935.0	16 467 345	1 065 670
749	935.7	16 467 120	1 065 175
750	935.0	16 466 950	1 065 170
751	940.0	16 467 460	1 065 158
752	940.0	16 467 479	1 065 190
753	938.5	16 467 514	1 065 232
754	940.0	16 467 535	1 065 285

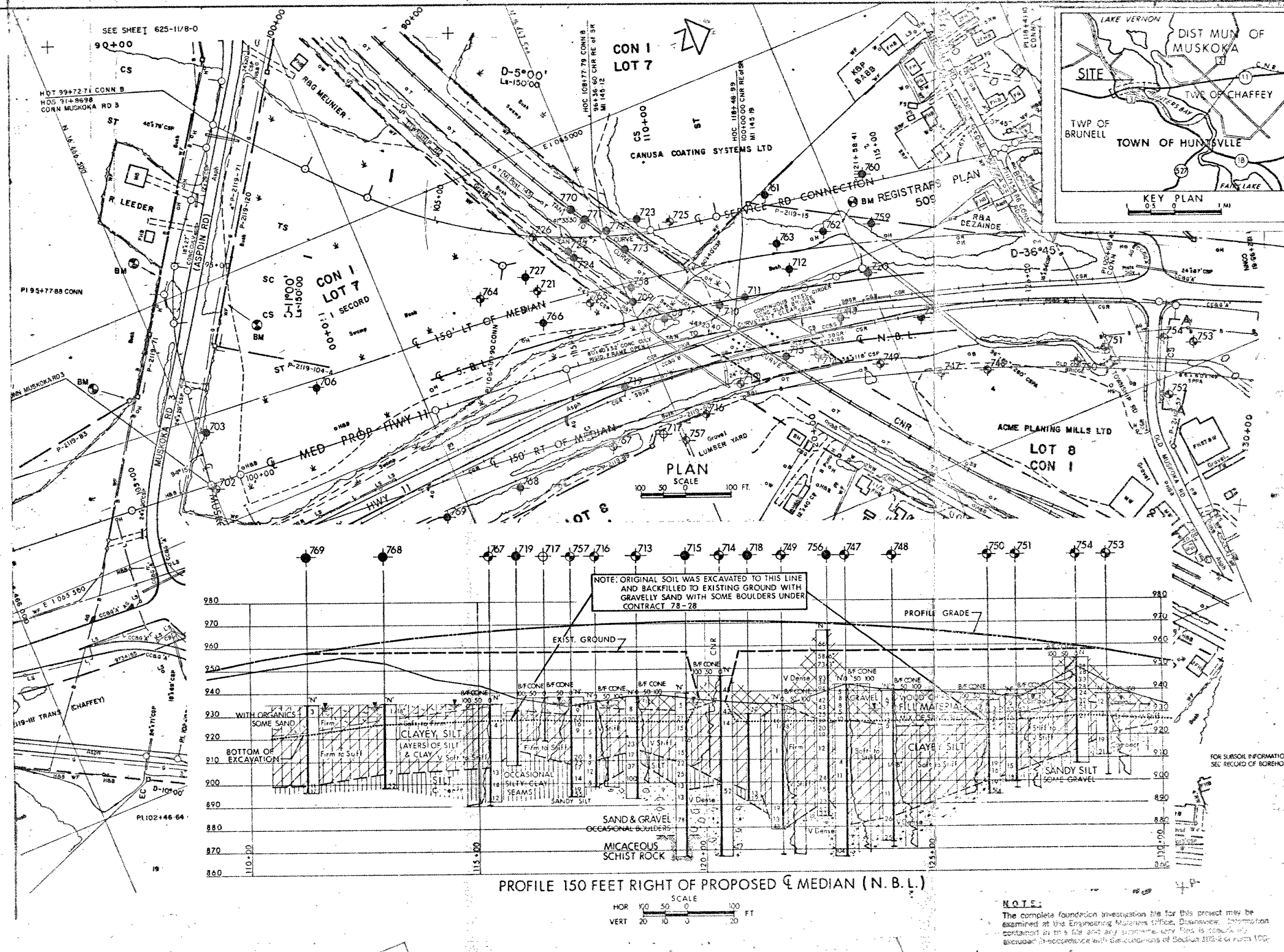
-NOTE-

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

NOTE:

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DATE	BY	DESCRIPTION
29 JULY 1979	72-170	72-170-2



CONT No
WP No 150-73-02

C.N.R. SOUTH CROSSING
N.B.L.

BORE HOLE LOCATIONS & SOIL STRATA

SHEET

LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊕ Bore Hole & Cone
- "N" Blows/ft (Std Pen Test 350ft lbs energy)
- CONE Blows/ft (60" Cone 350ft lbs energy)
- W/L at time of investigation

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
701	936.7	16 466 528	1 065 533
702	936.5	16 466 504	1 065 423
703	941.0	16 466 533	1 065 885
704	935.5	16 466 462	1 065 885
705	937.9	16 466 462	1 065 682
706	930.0	16 466 790	1 065 300
707	934.0	16 466 275	1 065 875
708	935.6	16 467 557	1 065 457
709	935.2	16 467 502	1 063 391
710	933.7	16 467 630	1 065 477
711	935.2	16 467 739	1 065 481
712	934.6	16 467 852	1 065 461
713	938.9	16 467 657	1 065 652
714	947.5	16 467 846	1 065 659
715	939.2	16 467 772	1 065 634
716	936.5	16 467 560	1 065 693
717	938.0	16 467 455	1 065 687
718	931.0	16 467 913	1 065 607
719	932.0	16 467 418	1 065 560
720	936.0	16 468 010	1 065 535
721	930.0	16 467 325	1 065 295
722	935.0	16 467 418	1 065 242
723	936.1	16 467 585	1 065 230
724	935.0	16 467 425	1 065 255
725	937.0	16 467 650	1 065 265
726	935.0	16 467 360	1 065 180
727	931.0	16 467 310	1 065 255
728	941.9	16 468 070	1 065 800
729	940.0	16 468 165	1 065 835
730	934.4	16 467 455	1 065 730
731	935.5	16 468 355	1 065 895
732	938.3	16 468 420	1 065 885
733	946.2	16 468 510	1 066 035
734	938.4	16 468 600	1 065 950
735	954.4	16 468 545	1 065 915
736	934.4	16 466 760	1 066 115
737	967.3	16 468 075	1 065 675
738	938.0	16 467 500	1 065 725
739	934.5	16 467 515	1 065 365
740	943.0	16 468 055	1 065 435
741	943.0	16 468 080	1 065 330
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745	932.0	16 467 415	1 065 360
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750	940.0	16 467 460	1 065 158
751	940.0	16 467 479	1 065 190
752	938.5	16 467 514	1 065 232
753	940.0	16 467 535	1 065 285

-NOTE-

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

REVISIONS

DATE	BY	DESCRIPTION

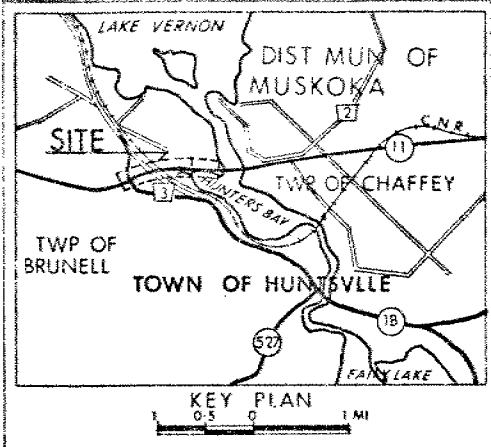
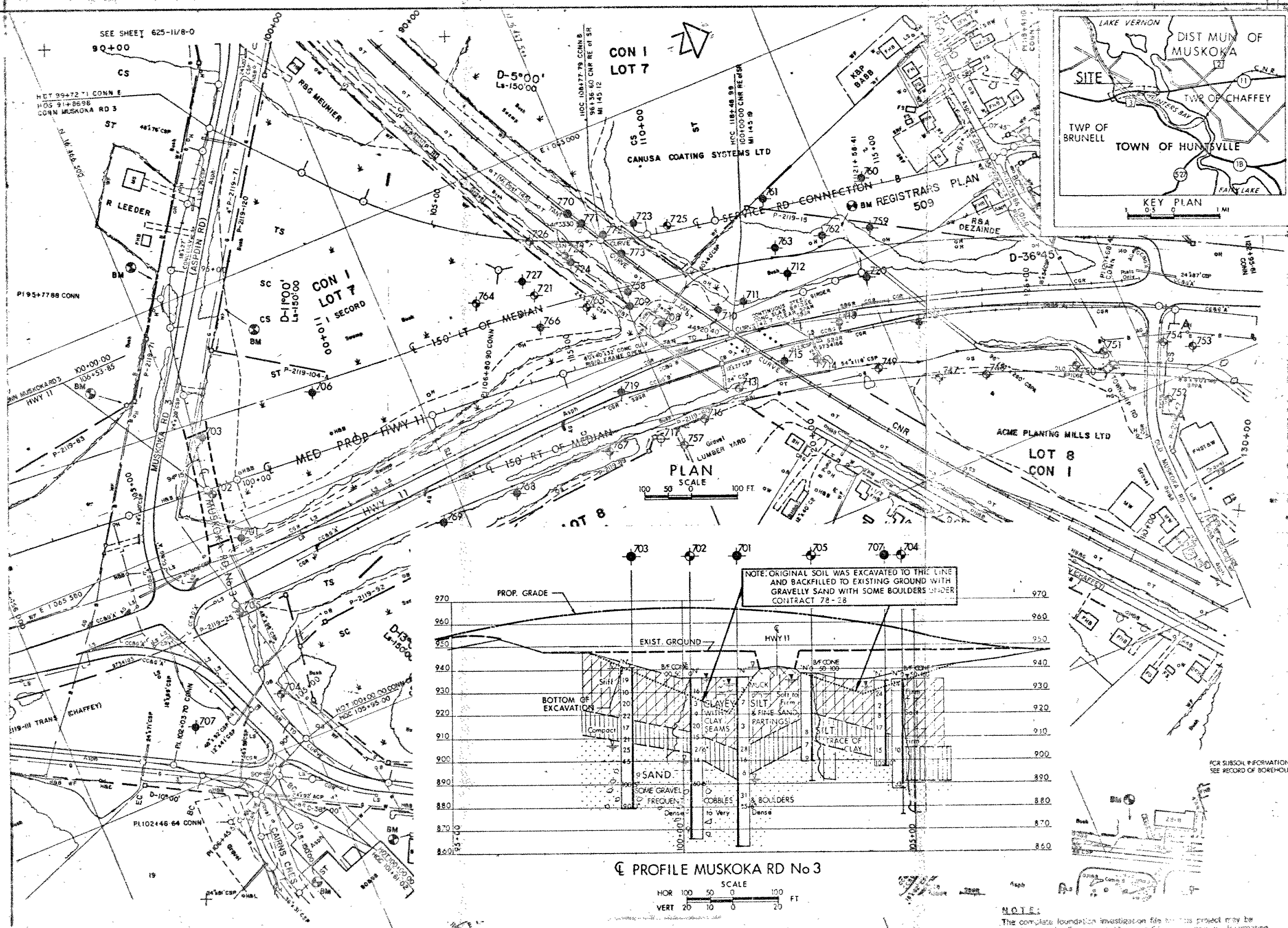
NOTES:

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DATE: 29 JULY 1979

BY: J. CHAFFEY

FOR: 42-178



CONT No
WP No 74-74-06

MUSKOKA RD No 3
(ASPDIN RD.) UNDERPASS

BORE HOLE LOCATIONS & SOIL STRATA

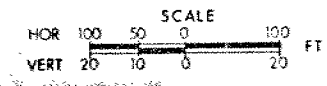
LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊕ Bore Hole & Cone
- 'N' Blows/ft (Std Pen Test 350ft lbs energy)
- CONE Blows/ft (60° Cone 350ft lbs energy)
- W.L. at time of investigation

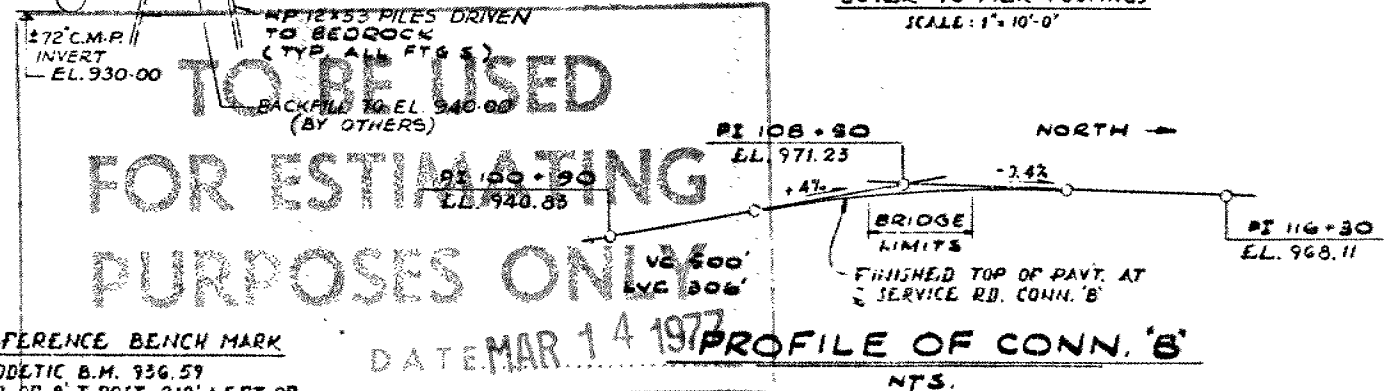
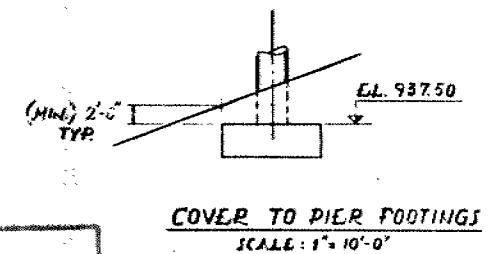
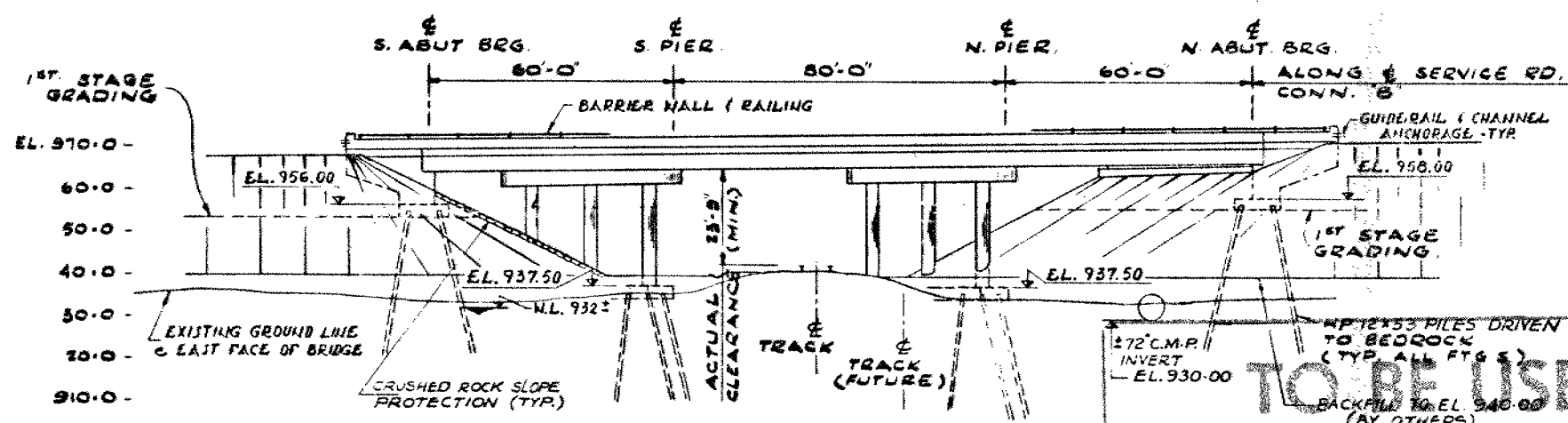
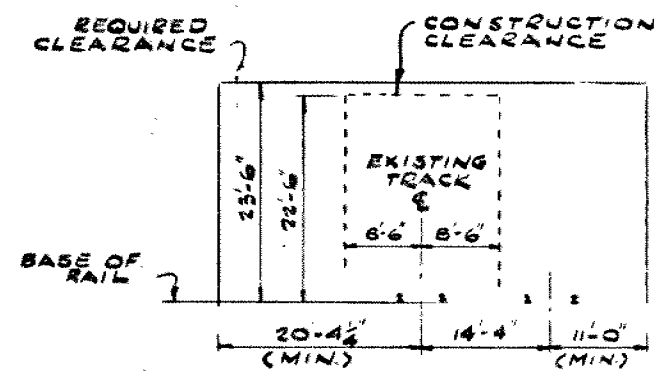
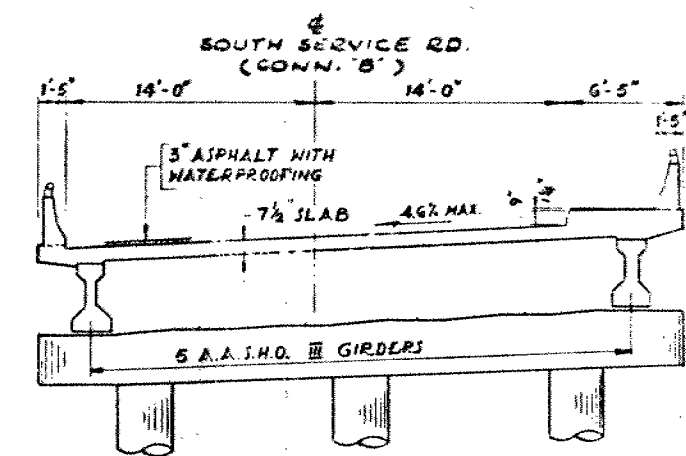
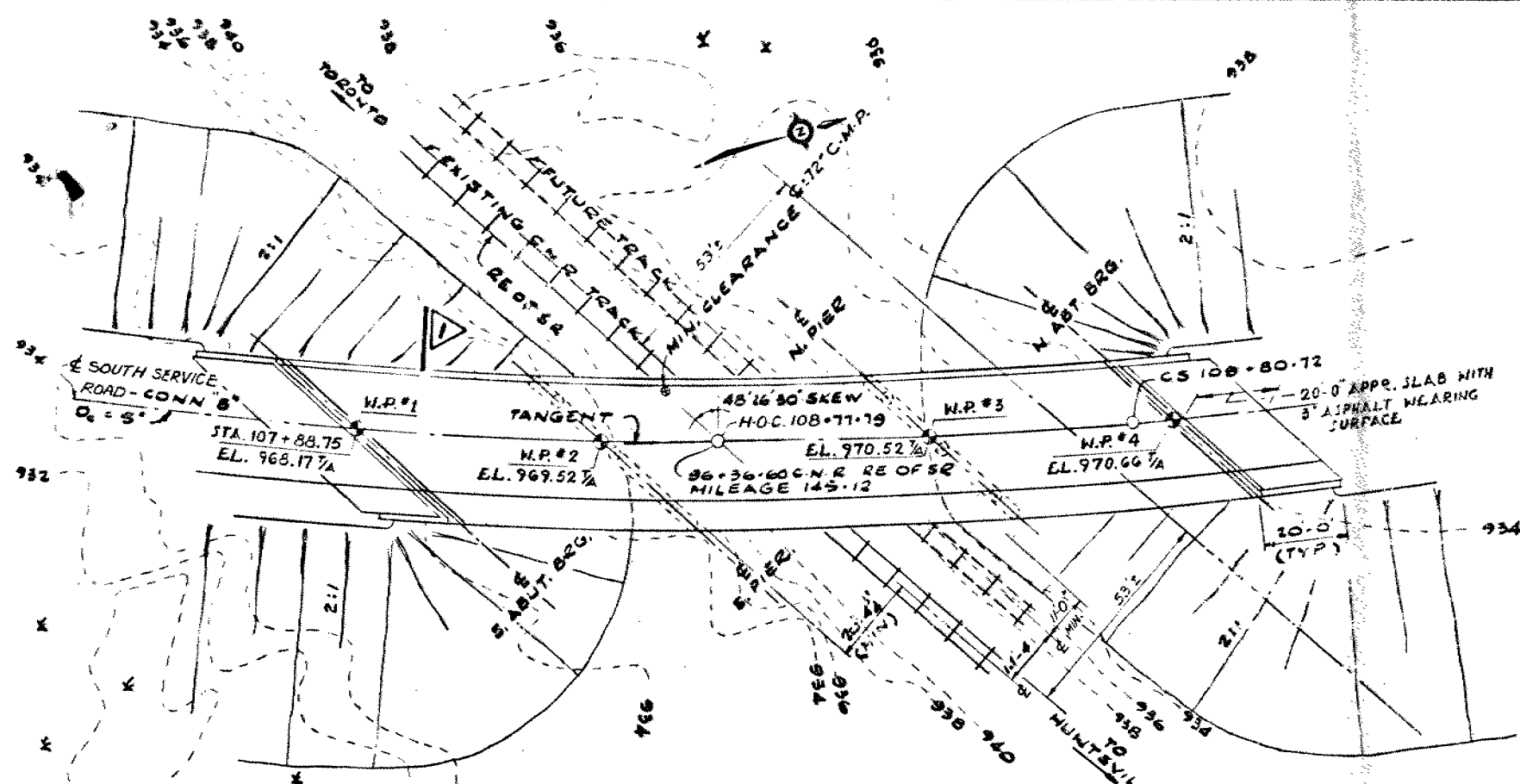
No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
701	936.7	16 465 528	1 065 533
702	936.5	16 466 504	1 065 423
703	941.0	16 466 533	1 065 685
704	935.5	16 466 462	1 065 695
705	937.9	16 466 462	1 065 682
706	930.0	16 466 790	1 065 300
707	934.0	16 466 275	1 065 875
708	935.6	16 467 557	1 065 457
709	935.2	16 467 502	1 063 391
710	933.7	16 467 680	1 065 477
711	935.2	16 467 739	1 065 481
712	934.6	16 467 852	1 065 461
713	938.9	16 467 657	1 065 652
714	947.5	16 467 846	1 065 659
715	939.2	16 467 772	1 065 634
716	936.5	16 467 560	1 065 683
717	938.0	16 467 455	1 065 687
718	931.0	16 467 913	1 065 607
719	932.0	16 467 418	1 065 560
720	936.0	16 468 010	1 065 535
721	930.0	16 467 325	1 065 295
722	935.0	16 467 418	1 065 242
723	936.1	16 467 585	1 065 230
724	935.0	16 467 425	1 065 255
725	937.0	16 467 650	1 065 265
726	935.0	16 467 360	1 065 180
727	931.0	16 467 310	1 065 255
728	941.9	16 468 070	1 065 800
729	940.0	16 468 165	1 065 825
730	934.4	16 467 455	1 065 730
731	935.5	16 468 355	1 065 895
732	938.5	16 468 420	1 065 885
733	946.2	16 468 510	1 066 035
734	939.4	16 468 600	1 065 950
735	954.4	16 468 545	1 065 915
736	934.4	16 468 760	1 066 115
737	967.3	16 468 075	1 065 675
738	938.0	16 467 500	1 065 725
739	934.5	16 467 515	1 065 365
740	943.0	16 468 055	1 065 435
741	948.0	16 468 080	1 065 330
742	943.0	16 467 865	1 065 290
743	935.0	16 467 950	1 065 415
744	933.0	16 467 845	1 065 400
745	931.5	16 467 200	1 065 260
746	932.0	16 467 415	1 065 360
747	931.8	16 467 310	1 065 365
748	935.0	16 467 345	1 065 670
749	935.7	16 467 120	1 065 175
750	935.0	16 466 950	1 065 170
751	940.0	16 467 460	1 065 158
752	940.0	16 467 479	1 065 190
753	938.5	16 467 514	1 065 232
754	940.0	16 467 535	1 065 285

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

PROFILE MUSKOKA RD No 3



NOTE:
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SKREW DATA - 48° 26' 30"
SIN 0.7482807
COS 0.6633922
TAN 1.1279782
SEC 1.5074266

REFERENCE BENCH MARK
GEODETIC B.M. 936.59
TOP OF 8" T. POST 212' LEFT OF STA. 121+10

NOTES

CLASS OF CONCRETE
DECK, BARRIER WALLS (PIERS) — 4000 P.S.I.
FOOTINGS, ABUTMENTS, WINGWALLS (APPR. SLABS) — 3000 P.S.I.
PRESTRESSED GIRDERS — 5000 P.S.I.

CLEAR COVER ON REINF. STEEL
FOOTINGS (ABUTMENTS) — 3"
PIERS — 3"

* DECK - TOP 2"
DECK - BOT. 1 1/2"
DIAPHRAGMS (BARRIER WALLS) — 1 1/2"
APPR. SLABS — 2"
AND/OR AS NOTED ON DRAWINGS

* TO ACHIEVE THE MINIMUM CLEAR COVER OF 2" SPECIFIED, THE TOP LAYER SHALL BE PLACED PRIOR TO CONCRETING WITH A CLEAR COVER OF 2 1/2" ± 1/2" TOLERANCE.

CONSTRUCTION NOTES

THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF ± 1/8".

NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.

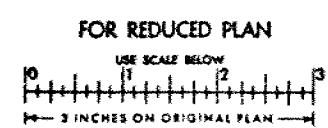
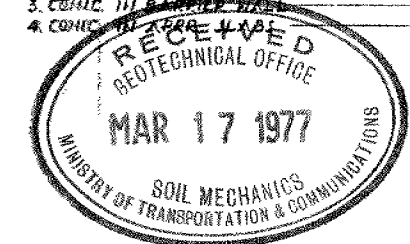
REINFORCING STEEL GRADE
GRADE 60 EXCEPT WHERE NOTED

- LIST OF DRAWINGS**
- 42-470-1 GENERAL LAYOUT
 - 2 BORE HOLE LOCATIONS (SOIL STRATA)
 - 3 FOUNDATION LAYOUT (REINH.)
 - 4 SOUTH ABUTMENT
 - 5 NORTH ABUTMENT
 - 6 PIERS
 - 7 PRESTRESSED GIRDERS
 - 8 PRESTRESSED GIRDERS (BEARINGS)
 - 9 DECK
 - 10 BARRIER WALL
 - 11 BARRIER WALL WITH SIDEWALK
 - 12 STEEL PARAPET RAILING (SINGLE TUBE)
 - 13 20 FT. APPROACH SLAB (CURB OR S.WALK)
 - 14 STANDARD DETAILS I
 - 15 STANDARD DETAILS II
 - 16 STANDARD DETAILS III
 - 42-470-17 AS CONSTRUCTED ELEV. (DIM.)

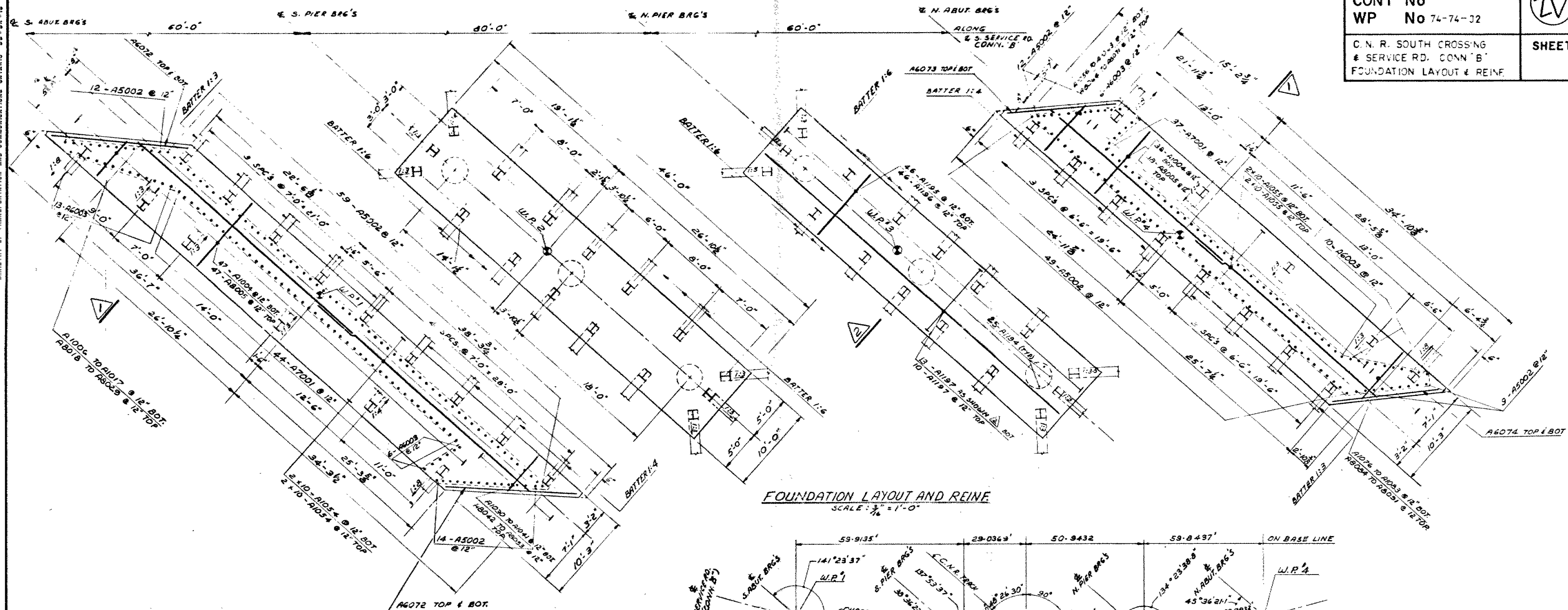
CONCRETE QUANTITIES

CONCRETE QUANTITIES ARE LISTED BELOW FOR THE APPROPRIATE CONCRETE LUMP SUM TENDER ITEMS:

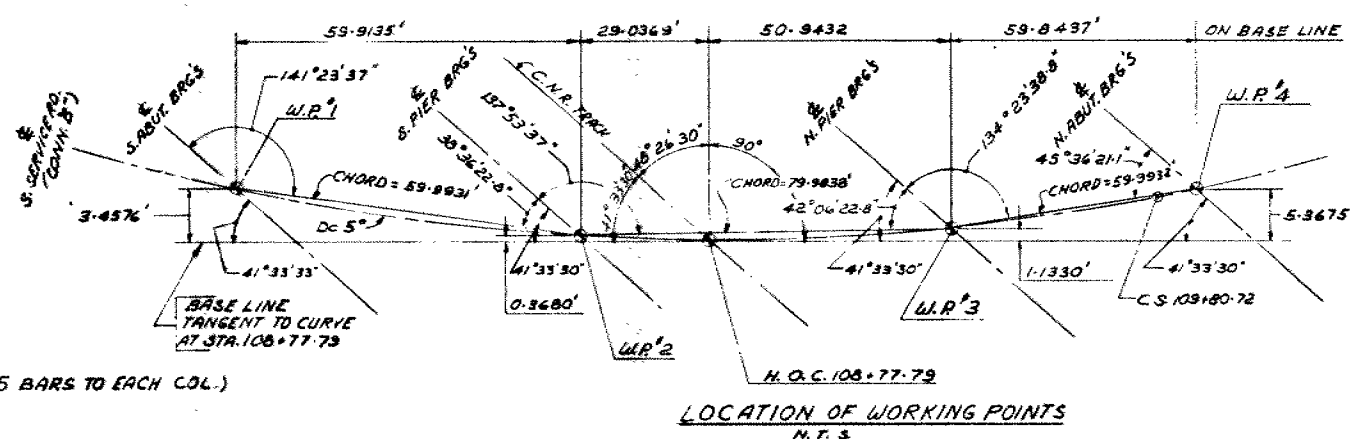
- 1. CONC. IN PIERS, ABUTMENTS — 4000 P.S.I. — 92 C.Y.
- AND WINGWALLS — 3000 P.S.I. — 166 C.Y.
- 2. CONC. IN DECK — 3500 P.S.I. — 358 C.Y.
- 3. CONC. IN BARRIER WALL — 36 C.Y.
- 4. CONC. IN PARAPET — 38 C.Y.



REVISION	DATE	BY	DESCRIPTION

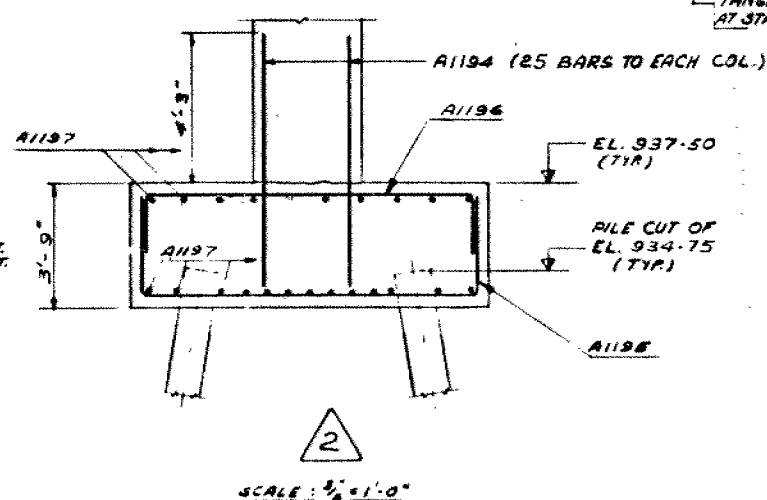
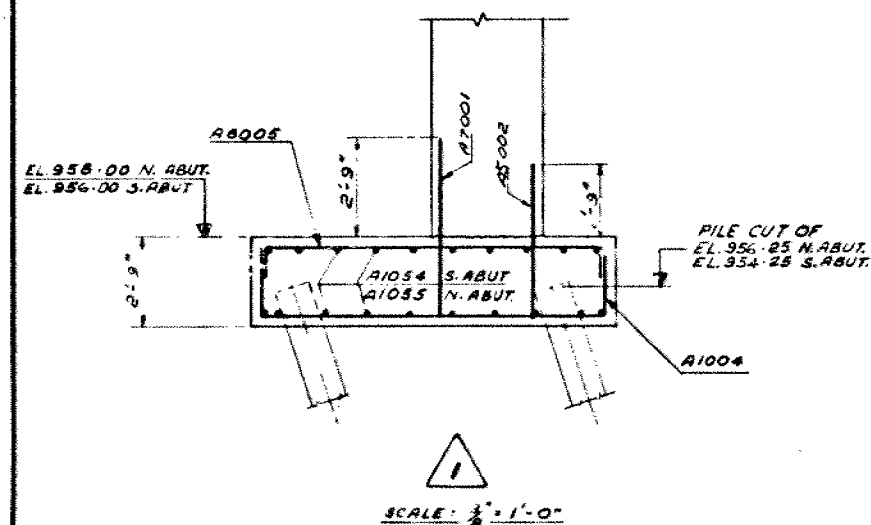


FOUNDATION LAYOUT AND REIN.
SCALE: 3/8" = 1'-0"



NOTES

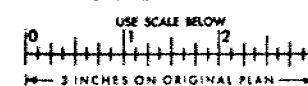
- PILE SPACING TO BE MEASURED AT UNDERSIDE OF FOOTINGS
- PILE LAYOUT AND REINFORCING SIMILAR FOR S. & N. PIERS.



PILES

LOCATION	TYPE	QU.	BATTER	LENGTH
S. ABUT.	HP 12x53	8	1:3	80'-0"
		5	1:4	78'-0"
		2	1:8	78'-0"
S. PIER	"	6	1:3	57'-0"
		10	1:6	57'-0"
N. PIER	"	6	1:3	49'-0"
		10	1:6	49'-0"
N. ABUT.	"	6	1:3	80'-0"
		5	1:4	78'-0"
		2	1:8	78'-0"

FOR REDUCED PLAN



REVISIONS	DATE	BY	DESCRIPTION

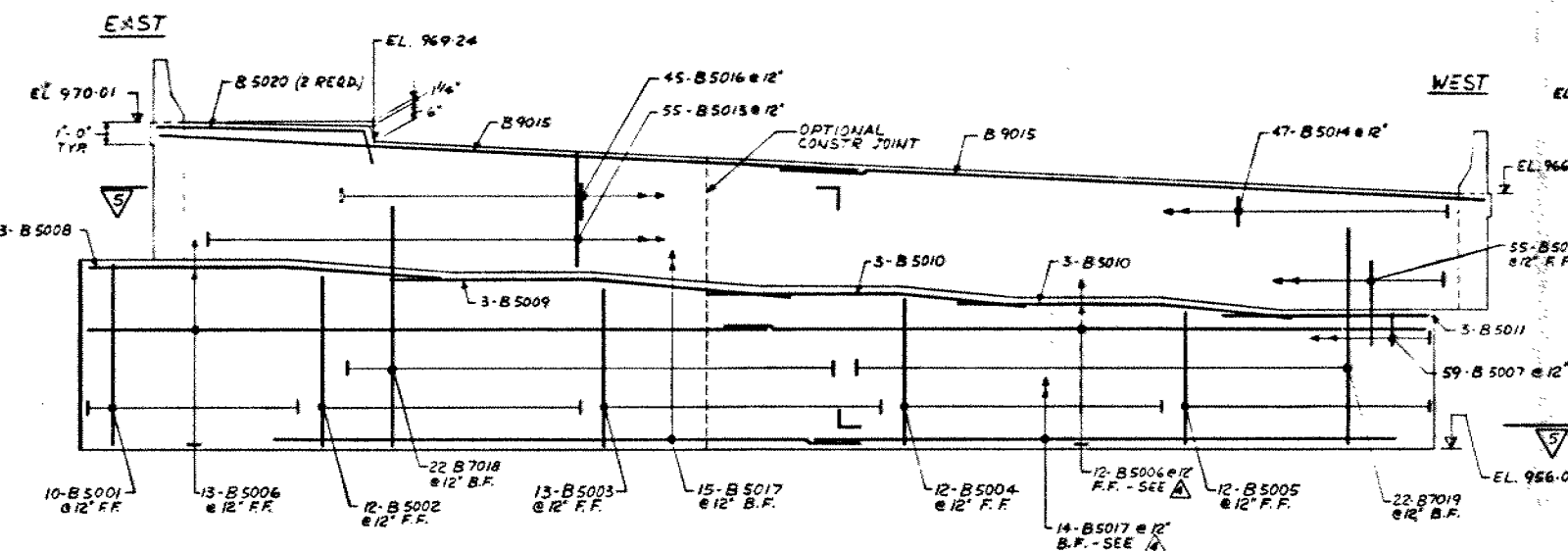
SCALE: 1/4" = 1'-0" UNLESS OTHERWISE STATED

NOTE: FF - FRONT FACE
B.F. - BACK FACE
E.F. - EACH FACE

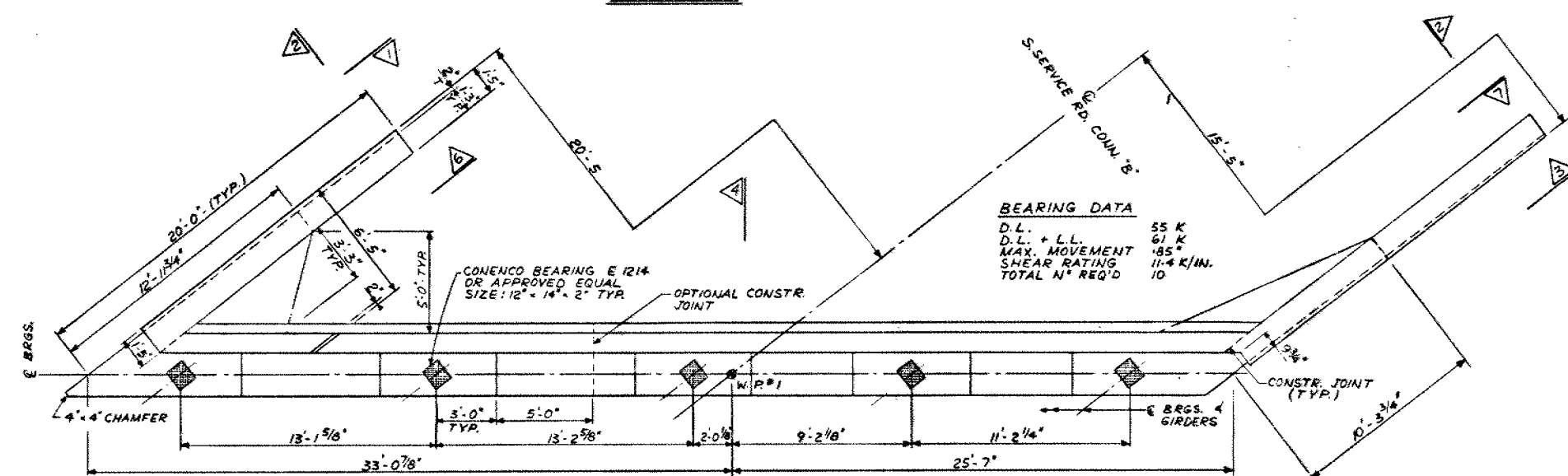
CONT No
WP No 74-74-02

C.N.R. SOUTH CROSSING &
SERVICE RD. CONN. 'B'
SOUTH ABUTMENT

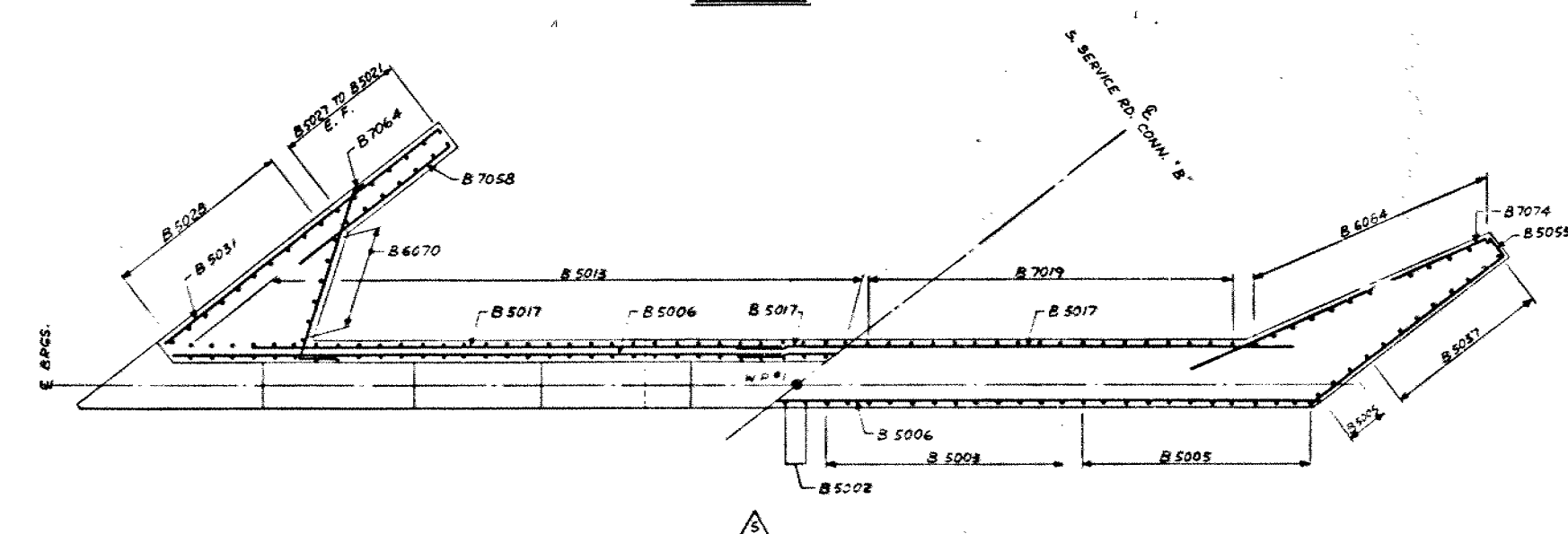
SHEET



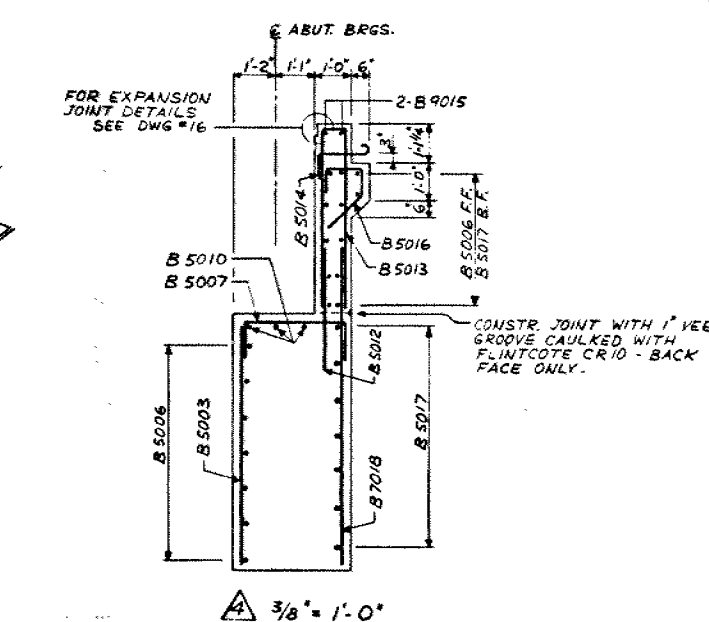
ELEVATION



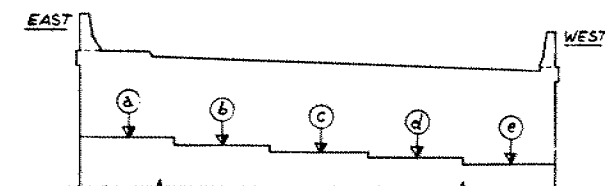
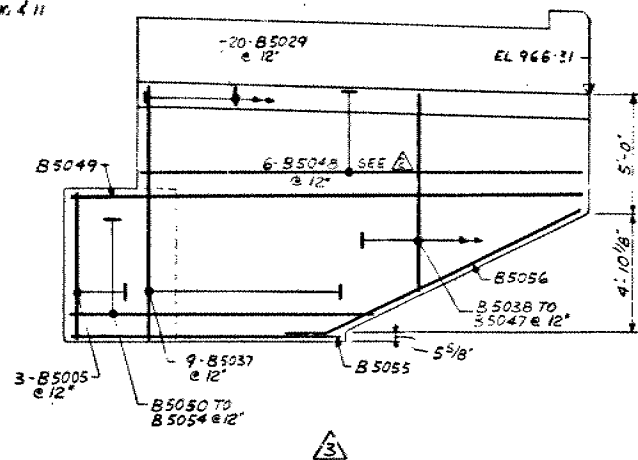
PLAN



5

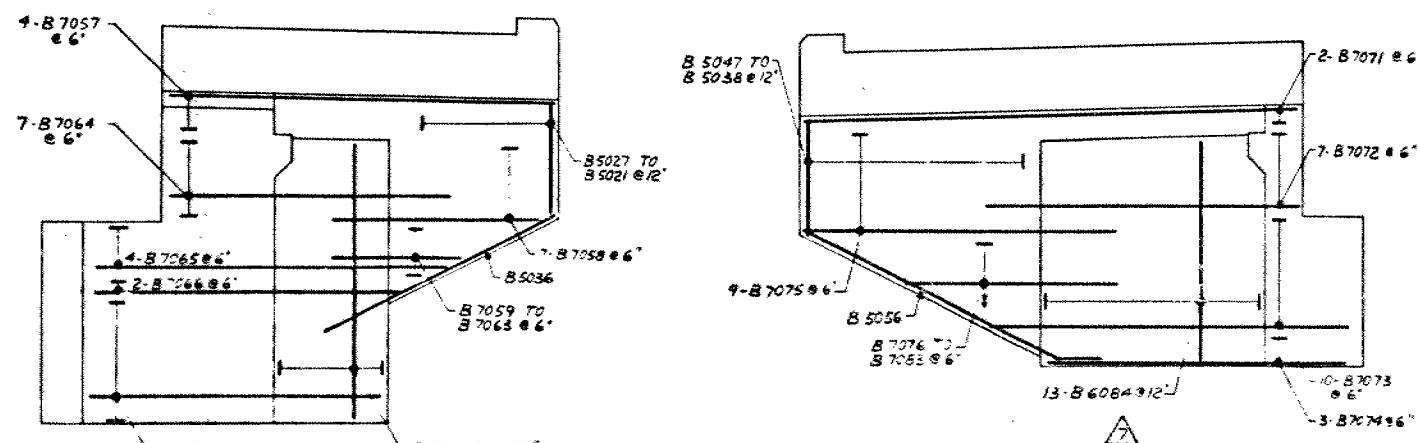


3/8" = 1'-0"

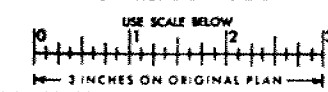


ELEVATIONS

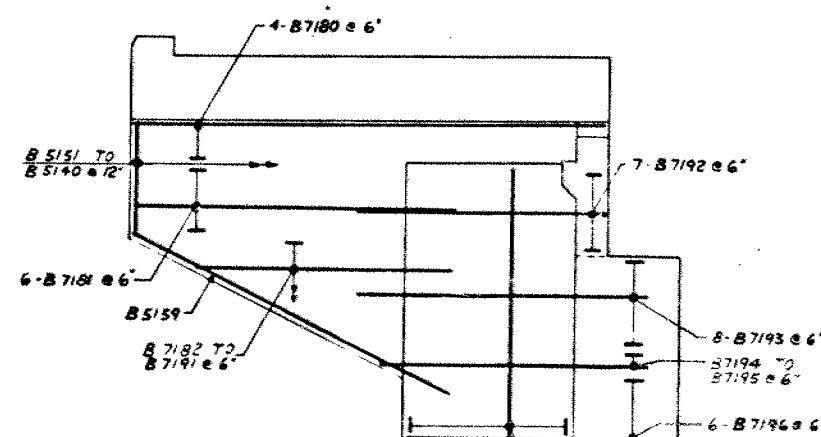
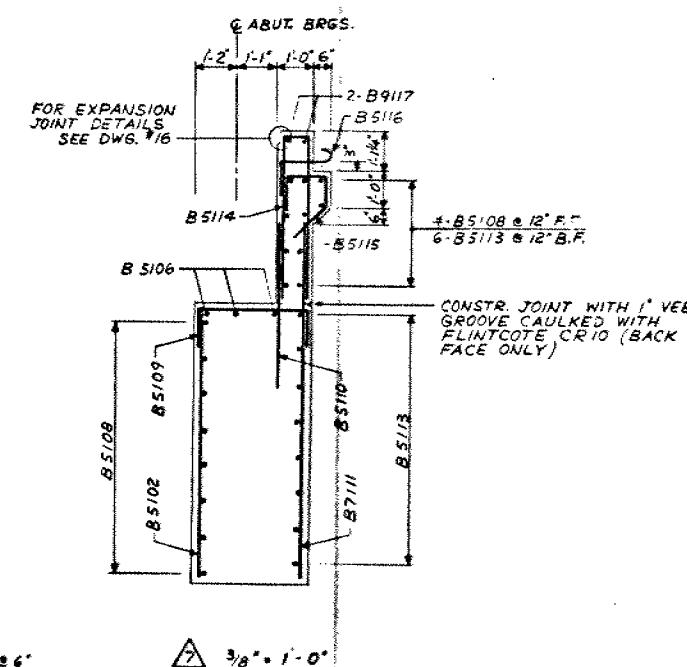
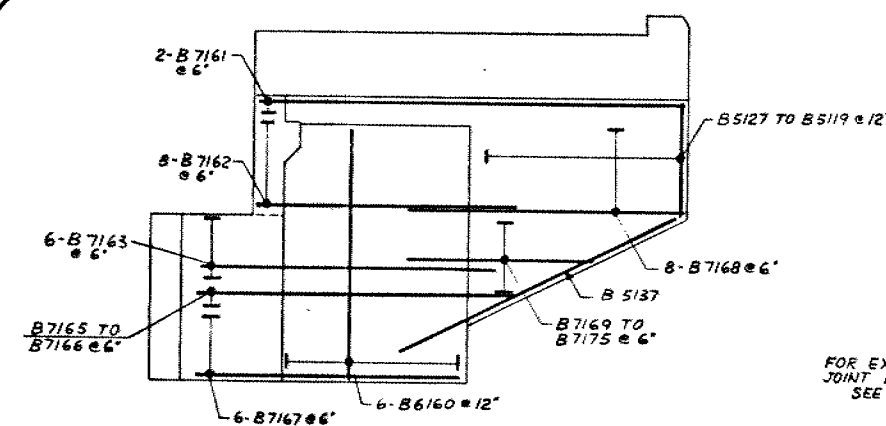
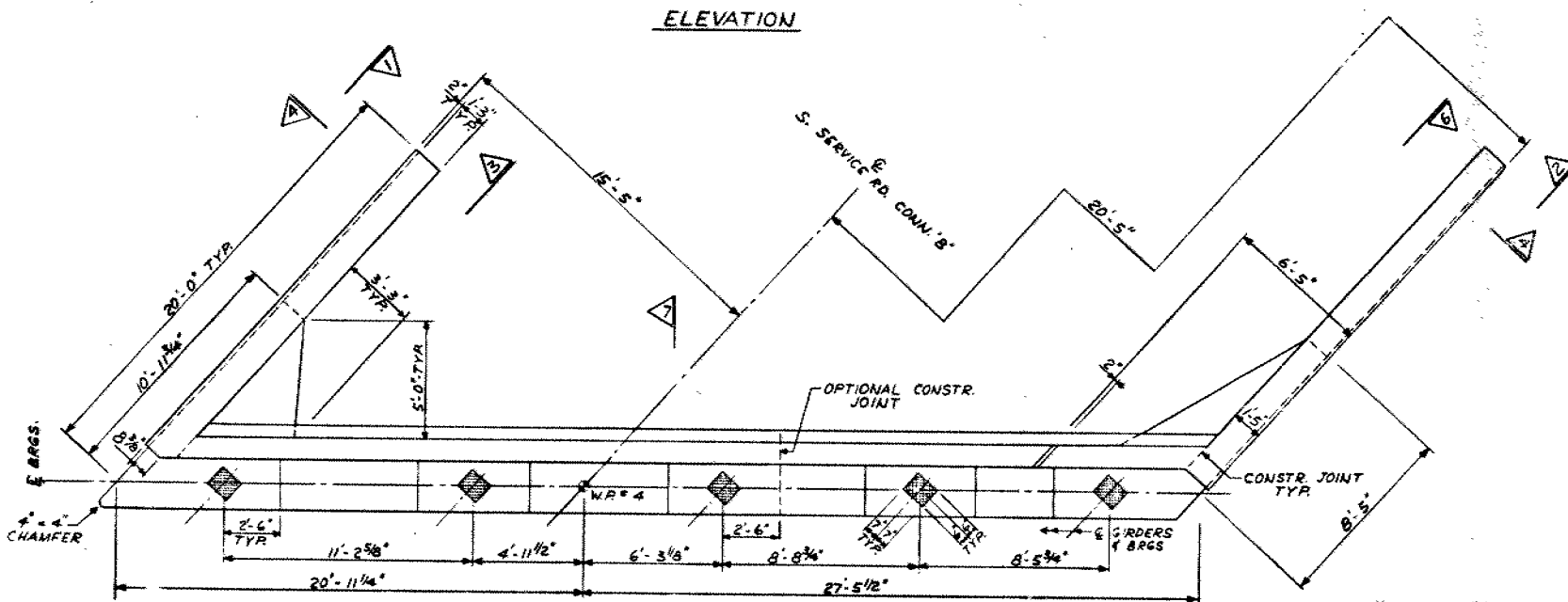
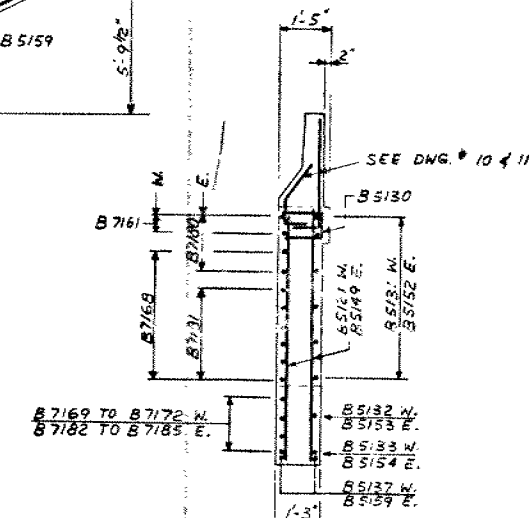
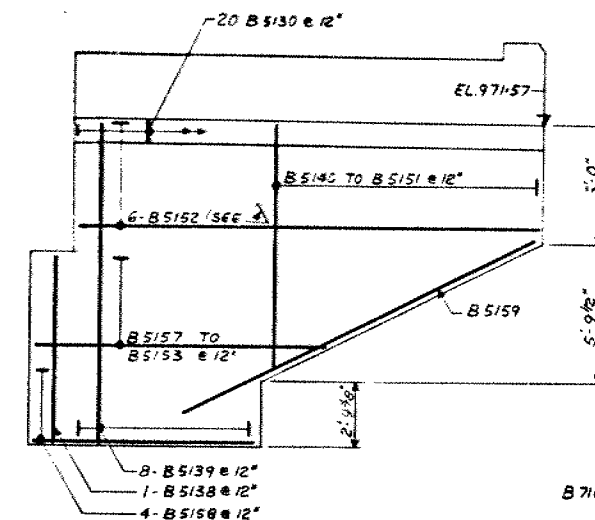
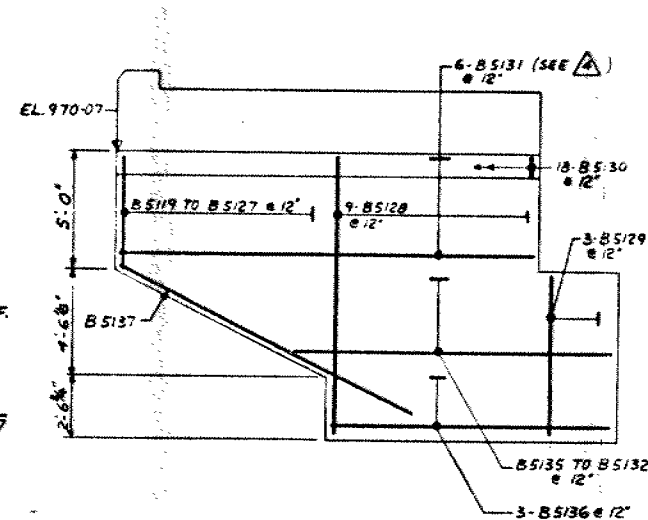
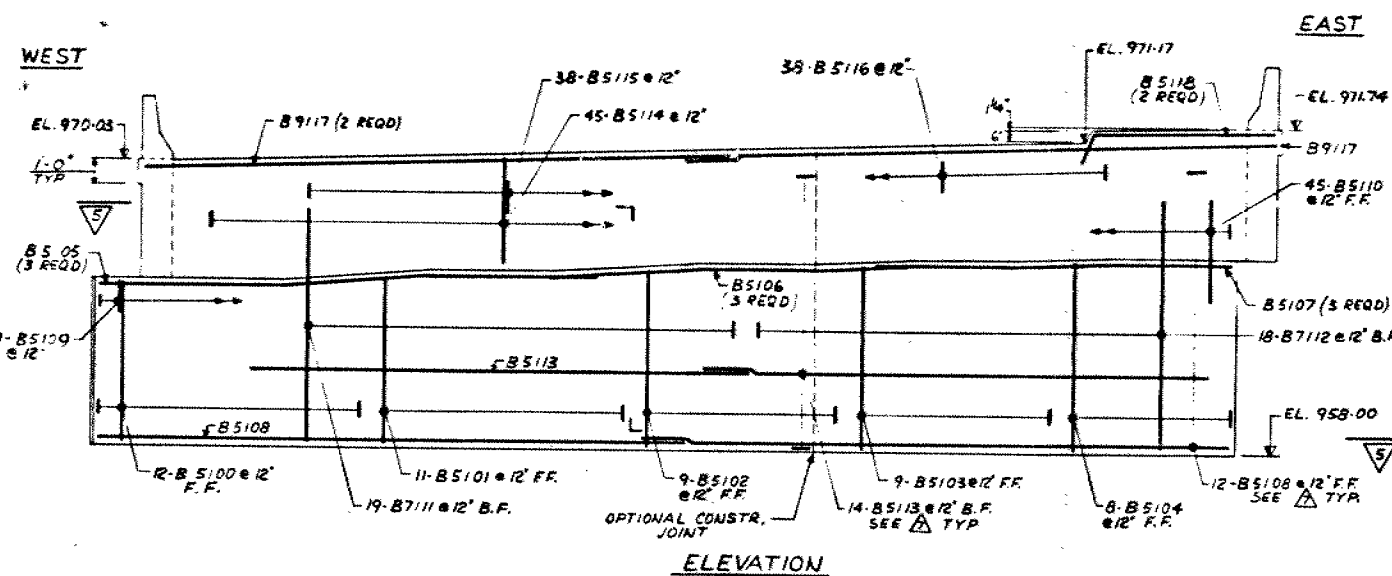
POINT	a	b	c	d	e
S. ABUT.	964.57	963.95	963.57	963.03	962.48
N. ABUT.	966.32	966.12	965.29	965.55	965.17



FOR REDUCED PLAN

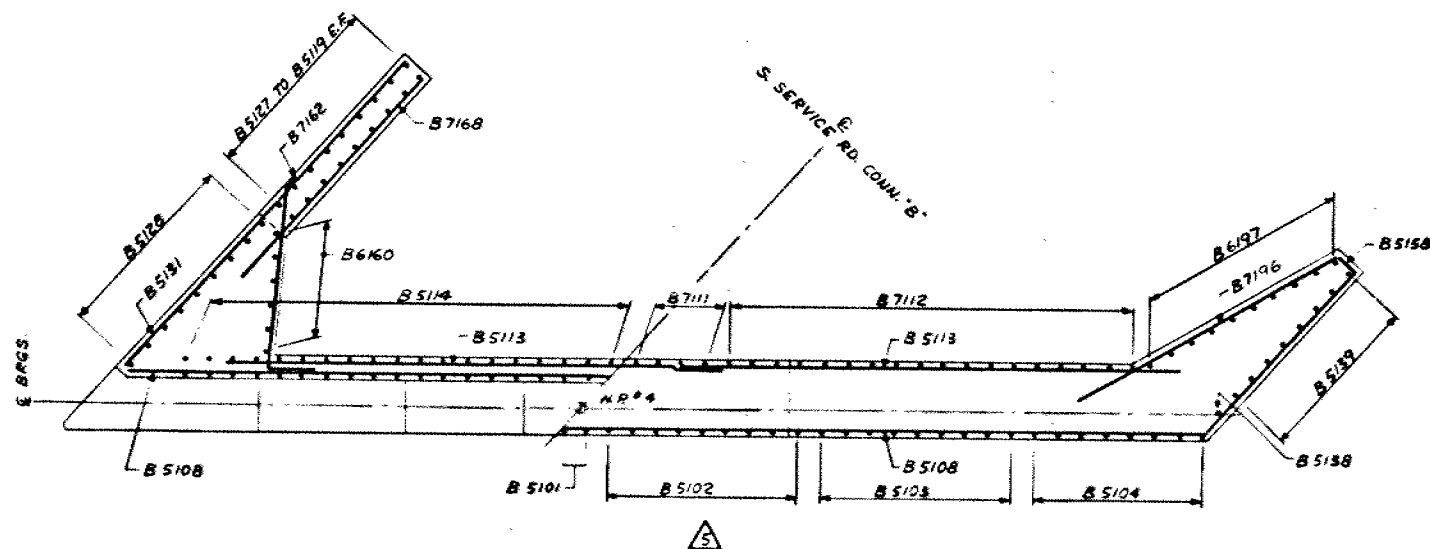


REVISIONS	DATE	BY	DESCRIPTION
DESIGN	CHECK	LOADING	4-5-44 DATE
DRAWING	MM	CHECK	D SITE No 4 DWG 4



NOTE: THIS DRAWING TO BE READ
IN CONJUNCTION WITH DWG. #4

SCALE: 1/4" = 1'-0" UNLESS OTHERWISE STATED



FOR REDUCED PLAN

10 USE SCALE BELOW

— 3 INCHES ON ORIGINAL PLAN —

REVISIONS				
	DATE	BY	DESCRIPTION	
DESIGN	CHECK	LOADING	4-20-44	DATE DEC 76
DRAWING	CHECK	SITE No	4-20-44	DWG 5

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 31E-80

DIST 11 REGION Northern

W.P. No. 74-74-01, 150-73-02, 74-74-02

CONT. No. 78-106

W. O. No. _____

STR. SITE No. _____

HWY. No. 11

LOCATION Huntsville By-pass Hwy. 11,
South CNR Overhead Crossings, SBL & NBL
Structure, and South Service Road

OVERLAP DRAWINGS TO BE INCLUDED WITH THIS REPORT. ✓

REMARKS: documents to be unfolded
before microfilming

FOUNDATION INVESTIGATION REPORT

For

Huntsville By-Pass Hwy 11
South CNR O'Head Crossings
W.P. 74-74-01 SBL Structure
W.P. 150-73-02 NBL Structure
W.P. 74-74-02 South Service Road Structure
District #11, Huntsville

1. INTRODUCTION

The twinning of Hwy 11 will involve construction of three overhead structures for grade separation at the railway crossing, one for the NBL, one for the SBL and one for the South Service Road. A foundation investigation has been carried out to determine subsoil conditions, in order to provide recommendations for the design and construction of the structure foundations and approaches. Contained in this report are results of our investigation, together with our comments and recommendations.

2. SITE DESCRIPTION

The proposed structure sites are located just west of the existing Hwy 11 south CNR overhead, about $1\frac{1}{2}$ miles west of the town of Huntsville.

The existing structure is a 3-span steel plate girder, concrete deck structure with perched abutments. The foundations are composed of concrete-filled, $12\frac{1}{2}$ " O.D. by $\frac{1}{4}$ " steel tube piles, driven to "practical refusal" into the sand and gravel layer for a design load of 65 tons/pile. The approaches are about 30 ft. high, composed of sandy fill and constructed with 2:1 slopes. The structure was built in 1958-59 and the approaches were constructed using stage construction techniques. Overall, the structure and the approaches appear to be in good condition.

The southwest quadrant and part of the southeast quadrant of the intersection of Hwy 11 and CNR are waterlogged, swampy areas. The northeast quadrant and part of the southeast quadrant have been filled for industrial developments. The terrain in the northwest quadrant is an undulating field, which was once under pasture but has been used for residential developments.

Geologically, the area is located in the Canadian Shield. Bedrock is a metamorphosed granite of precambrian age. The overburden consists of glacio-acqueous deposits.

3. SUBSURFACE CONDITIONS

Apart from some surficial fill material found near existing highway embankments, subsoil in the area consists of a layer of silty clay/clayey silt, overlying a silt deposit which in turn is followed by a deposit of sand and gravel, containing cobbles and boulders. The bottom granular material is found to be underlain by metamorphic granitic bedrock. In the swamp area, muck is also noted. The inferred subsoil stratigraphy is shown on Dwgs. 747401-A, 1507301-A and 747402-A. A detailed description of the subsoil types is given below:

3.1 Sandy Fill

The surficial fill material is derived from a spill-over of the highway embankment fill. It consists mainly of silty sand. Some clayey silt and occasional brick fragments are also present.

3.2 Muck

Muck is present only in the swampy areas and in ditches adjacent to the highway embankments.

Its thickness is variable, ranging from 4 to 8 ft. approximately. According to visual examination, it consists mainly of clay and silt, with very high organic contents. Its shear strength is found to be very low and its compressibility very high.

3.3 Silty Clay/Clayey Silt

This is the predominant deposit in the area. It has a thickness of about 15 ft. to 30 ft. It is stratified throughout its entire depth, with frequent silt seams, a feature generally associated with glacio-lacustrine deposits. Because of the presence of the more permeable silt seams, this material is likely to have a relatively high rate of consolidation.

The silty clay/clayey silt tends to be thicker and softer in the swamp than in area north of the railway track. On the basis of undrained shear strength, the silty clay/clayey silt in the swamp can be described as very soft to soft and in area north of the railway track, firm to stiff. Representative undrained shear strengths are in the order of 1000 to over 2000 p.s.f. for the stiffer material and 350 to 800 p.s.f. for the softer material. The silty clay/clayey silt in the swamp probably is a normally consolidated material as its moisture contents are generally found to be close to its liquid limits. From our lab test results, the moisture contents and Atterberg limits show a wide range of variation, reflecting the stratified nature of this material. A plasticity chart and grain size distribution envelope are contained in the Appendix.

3.4 Silt

Underlying the above-mentioned cohesive clayey silt/silty clay deposit is a layer of silt some 10 to 20 ft. thick. The exact boundary between this silt deposit and the upper cohesive stratum is not always very distinct. The silt is slightly stratified with occasional clay seams suggesting that this material is also a glacio-lacustrine deposit. On the basis of the 'N' values, the relative density of the silt can be assessed as 'compact'. A grain-size distribution envelope is included in the Appendix.

3.5 Sand and Gravel

Under the silt layer is a deposit of sand and gravel, containing cobbles and boulders. The lower boundary of this deposit was not investigated in full, partly because of the presence of large boulders and partly because of artesian conditions. Inferred from information at adjacent sites and from boreholes in which bedrock was proven by rock-coring, the sand and gravel layer is believed to be underlain by metamorphic granitic bedrock. The angularity of the particles and the unsorted grain sizes of this material which range from very fine sand to large boulders, suggest the sand and gravel layer is a glacio-fluvial deposit.

Because of the presence of large size particles and unsorted matrices, the 'N' values cannot be taken at face value to estimate the relative densities of the material. However, judging from the manner in which the NX

casing was advanced, it is our opinion that the sand and gravel layer is probably dense to very dense.

3.6 Bedrock

Bedrock at the site is a fine grained micaceous schist and a medium grained biotite gneiss, with occasional quartz inclusions. Both rock types are metamorphosed granite of precambrian age.

On the basis of high rock core recovery ratios and large average core sizes, the bedrock is considered to be in a sound condition.

3.7 Groundwater Conditions

For practical purposes, groundwater levels may be assumed equal to the prevailing water level in the swamp i.e. at elev. 932 \pm . Artesian conditions were encountered in the sand and gravel deposit with excess hydrostatic heads equalizing at about elev. 937 \pm .

4. DISCUSSION AND RECOMMENDATIONS

The proposed profile grades of the overhead structures are at elev. 970 approximately, resulting in a fill some 30 ft. high. The types and lengths of the proposed structures have not yet been determined, but it is assumed that a structural layout similar to the existing overhead structure may be adopted. Based on our subsoil information, the following recommendations are made:

4.1 Structure Foundations

All three structures can be supported on steel H-sections, end-bearing in the sand and gravel layer, or on bedrock. To prevent the piles from being damaged by boulders and to ensure pile penetration, the H-piles should be reinforced with flange plates at the tips. If the piles are driven in accordance with the Hiley Formula (MTC Standard SS-3-10 or SS-3-11), the piles can be designed for their maximum allowable capacities. Because of boulders and variation in bedrock elevations, it is difficult to determine accurately the founding elevations of the pile tips where the

designed loads would be attained. For design purposes, our estimations are given as follow:

<u>Footing Locations</u>	<u>Probable Pile Tip Elevations</u>		
	<u>SBL</u>	<u>NBL</u>	<u>S. Service Rd.</u>
South Abutment	890	885	880
South Pier	882	878	883
North Pier	872	872	890
North Abutment	862	865	883

To prevent frost heaves, all pile cap bases should have at least 6 ft. cover. If perched abutments are to be adopted, which are advisable so as to minimize the height of the abutments, no dewatering would be required for the construction of the abutment footings, as the pile caps would be well above the groundwater level. Similarly, if the area between the abutments is to be filled to elev. 940 and the pile cap bases of the piers are formed at elev. 934, again no dewatering problems are anticipated. Differential settlements of the piled foundations will be negligible.

4.2 Approaches

Muck in the swamp and in the ditches should be excavated and backfilled with sandy type material. The bottom of excavation is recommended at elev. 920. Except for the north approach of the NBL, berms are required for stability reasons. It is recommended that the area west of the existing Hwy #11 be filled to elev. 940, prior to construction of the various approaches. Under these conditions, all the embankments are found to be stable with 2:1 side slopes and forward slopes.

The above mentioned fill at elev. 940 is intended to serve as a berm. The lengths required for various fill heights are shown in Fig. 5. It should be noted that the berm height should not exceed elev. 940 as it itself would then suffer from stability problems. The berms on the east side of the south service road would probably merge with, or be quite close to those of Hwy 11 and the ramps. In this case, filling of the entire area to elev. 940 and then constructing the embankments would be

advisable. The westerly boundary of this fill for the South Service Rd. should be determined from Fig. 5.

Berms are also required for the ramp that connects Muskoka Rd. #3 and the NBL. Details of the berm design for this ramp are contained in our memo dated April 10, 1975, and in foundation report W.P. 74-74-06.

4.3 Placement of Fill

It should be noted that placement of fill under water should proceed outward from existing Hwy 11, so as to displace any remaining displaceable soft material after excavation by forming 'mud waves' and to avoid trapping soft material, which could result in substantial differential settlements in the embankments.

4.4 Roadway Protection

To ensure the stability of the Hwy 11 embankment and the railway track during construction the following precautions are necessary:

Excavation should not be carried out within 30 ft. of the toe of the existing Hwy 11 approach fill. Muck in this zone is to be removed by displacement. Excavation in the area between 30 to 50 ft. from the approach fill should be carried out in strips, each of which should not be wider than 20 ft. The strips should be excavated and backfilled immediately and sequentially. The pertinent requirements are shown in Fig. 6 of this report.

Similar precautions are also required for excavations adjacent to the railway track, with the safe distances being changed to 40 and 60 ft. respectively measured from the railway track, as shown in Fig. 7.

4.5 Settlements

Under a 30 ft. fill, settlements in the swamp would be in the order of 20" and in the area north of the CNR track in the order of 10". In view of the differential settlements between the approach fill and the abutments, a 35 ft. approach slab should be provided.

4.6 Staging Considerations

It is possible to construct the approaches in the swamp in stages, but this technique is not favored because of the length of time required, and because of the constraints (some indeterminate) which would have to be imposed on the contractor regarding the placing of fill material. In the present case, berming appears to be a more economical and practical scheme as the various embankments are located close to one another, thus resulting in overlapping of berms in most of the area.

Should stage construction be contemplated, the following information may be useful for estimation purposes:

Effective Shear Strength Parameters:
of the clay

$$C' = 0$$

$$\phi' = 27^\circ$$

Skempton's Porewater Pressure Coef'n

$$B = 1.0$$

The safe allowable increase in porewater pressure

$$\Delta u = 4.5 \text{ p.s.i.}$$

and the time in days required for the induced porewater pressure to dissipate $\Delta t = 14 \Delta h$

where Δh = increase in fill height in ft.

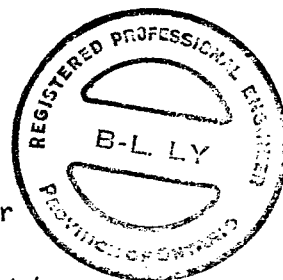
Based on the above information, the following tentative staging scheme is proposed :

Stage No.	Fill Height (Ft)	Time Required for Each Stage (Days)	
1	to El. 940	0	to 70
2	El. 940 to El. 945	70	to 140
3	El. 945 to El. 950	140	to 210
4	El. 950 to El. 955	210	to 280
5	El. 955 to El. 960	280	to 350
6	El. 960 to El. 965	350	to 420
7	El. 965 to El. 970	420	to -

It is to be noted that the above proposals are for estimation purposes only. Piezometers must be installed to monitor the actual build-up and dissipation of porewater pressure during placement of fill so as to control the rate of construction. Depending on the piezometric readings, the staging scheme may have to be revised accordingly. If necessary, this office will undertake the installation of piezometers, analyses of the piezometric readings, and to provide recommendations for the control of the rate of the stagings.

BLy

Bin Ly, P. Eng.
Project Engineer



K. G. Selby

K.G. Selby, P. Eng.
Supervising Engineer

BL/bp

RECORD OF BOREHOLE NO 203

WP 150-73-02

LOCATION Co-ords. 16,467,418 N; 1,065, 560 E.

ORIGINATED BY Racey
McCallum

DIST 11 HWY 11

BORING DATE February 1956

COMPILED BY

DATUM Geodetic

BOREHOLE TYPE Washboring with NX & BX

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
932.0	Ground Level															
0.0	Organic clay					930										
928.0	Very Soft															
4.0	Silty clay to clayey silt with silt layers		1	TW	PM											
			2	TW	PM											
	Firm		3	TW	PM											
914.5																
17.5	Silt		4	TW	PM											
908.0	Compact		5	SS	N/R	910										
24.0	End of Borehole															

WP 150-73-02 LOCATION Co-ords. 16,467,455 N; 1,065,687 E. ORIGINATED BY AP
DIST 11 HWY 11 BORING DATE October 23, 1974 COMPILED BY GP
DATUM Geodetic BOREHOLE TYPE Cone Test Only CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH PSF O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE	LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w w_p ——— w ——— w_L WATER CONTENT %	UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES					
938.0	Ground Level									
0.0										
918.4						930				
20.4	End of Cone Test					920	refusal			

20
15 ϕ 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE NO 101

WP 150-73-02 LOCATION Co-ords. 16,467,560 N; 1,065,683 E. ORIGINATED BY AP
 DIST 11 HWY 11 BORING DATE October 21 & 22, 1974 COMPILED BY GP
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Cone Test CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_P WATER CONTENT — w			UNIT WEIGHT γ P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
936.5	Ground Level															
934.0	Mix. of clayey silt sand, gravel & bricks															
2.5	Clayey silt with layers of silt		1	SS	11											
			2	TW	PH											
			3	TW	PH											
			4	SS	5											
			5	TW	PH											
	Stiff to Very Stiff		6	TW	PH											
910.5			7	SS	8											
26.0	Silt traces of clay		8	SS	9											
			9	SS	12											
	Loose to Compact		10	SS	5											
898.4			11	TW	PH											
38.1	End of Borehole															

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 1

WP 150-73-02 LOCATION Co-ords. 16,467,657 N; 1,065,652 E. ORIGINATED BY BL
 DIST 11 HWY 11 BORING DATE September 5, 1975 COMPILED BY BL
 DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX Casings CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L	
938.9	Ground Level														
0.0	Sand Fill, some clay & brick fragments														
932.9			1	SS	8										
6.0	Clayey silt Very Stiff, Stratified some clay seams		2	SS	20										
			3	TW	PM										
	more silty		4	SS	23										
914.9															
24.0	Silt Compact		5	SS	17										
909.9	trace of sand														
29.0	Sand and gravel		6	SS	37										
	Very Dense														
	occasional boulders encountered		7	SS	100										
892.4															
46.5	End of Borehole														
	N.B.: BX casings met refusal at 46.5'														

20
15 ϕ 5 % STRAIN AT FAILURE
10

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 6

WP 150-73-02 LOCATION Co-ords. 16,467,772 N; 1,065,634 E. ORIGINATED BY BL
 DIST 11 HWY 11 BORING DATE September 2, 1975 COMPILED BY BL
 DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX Casings CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w			UNIT WEIGHT γ	REMARKS % GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20 40 60 80 100					w_p ——— w ——— w_L					
							SHEAR STRENGTH PSF					WATER CONTENT %					
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					10 20 30					
939.2	Ground Level																
0.0	Fill: sand & silt, some clay																
931.2	and gravel		1	SS	5												
8.0	Clayey silt: Stiff & stratified			SS	21	930											
	some fine sand partings		3	SS	15												
920.2	Silty clay		4	SS	16"	920											
19.0	soft to firm and stratified		5	SS	15												
913.2	Clayey silt		6	SS	22	910											
26.0	Stiff and stratified		7	SS	25												
908.2	Silt		8	SS	13	900											
31.0	Compact trace of clay		9	SS	13												
896.2	Sand and gravel		10	SS	78	890											
43.0	Very Dense occasional boulders		11	RC	83%	880											
876.7	Micaceous Schist		12	RC	83%	870											
62.5	Rock																
867.9	End of Borehole																
71.3																	

WP 150-73-02 LOCATION Co-ords. 16,467,846 N; 1,065,659 E. ORIGINATED BY BL
DIST 11 HWY 11 BORING DATE August 21, 1975 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX Casings CHECKED BY _____

20
15 ϕ 5 % STRAIN AT FAILURE
10

RECORD OF BOREHOLE NO 42

WP 74-74-01 LOCATION Co-ords. 16,467,325 N; 1,065,295 E. ORIGINATED BY BL
 DIST 11 HV/Y 11 BORING DATE February 9, 1976 COMPILED BY BL
 DATUM Geodetic BOREHOLE TYPE Washboring with NX Casing CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w		
930.0	Ice Surface														
0.0	Water														
925.0															
5.0	Bottom of Swamp	~	1	SS	0										13.6% Org.
919.0	Muck - fibrous and silty	~	2	SS	0	920	+4								7.4% Org.
11.0	Clayey silt - very soft to soft stratified	~	3	TW	PM		+3							109	
		~	4	TW	PM	910	+3								0 1 78 21
		~	5	SS	1	18"	+8								
	becoming more silty	~	6	TW	PM	900	+8							116	
897.0							+4								
33.0	Silt - Compact trace of clay stratified		7	SS	16	890									0 0 83 17
	trace of cohesion cohesionless		8	SS	20										
			9	SS	16	880									
876.0	A boulder @ 54'														
54.0	End of Borehole														
867.0															
63.0	End of Cone Test														

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 3

WP 74-74-01 LOCATION Co-ords. 16,467,502 N; 1,063,391 E. ORIGINATED BY BL
 DIST 11 HWY 11 BORING DATE August 13, 1975 COMPILED BY BL
 DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX Casing CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
935.2	Ground Level															
0.0	Sand Fill - old road bed, with crushed stone					930										
929.7			1	SS	20											
5.5	Silt and sandy silt Fill		2	SS	8											0 0 85 15
922.2						920										
13.0	Clayey silt		3	TW	PM											
	Firm to Stiff		4	TW	PM											110
			5	TW	PM	910										
906.2																
29.0	Silt - Compact stratified trace of clay		6	TW	PM											
			7	SS	12	900										
			8	SS	20											0 0 95 5
893.2	Sand and gravel					890										
42.0																
887.7			9	SS	44											
47.5	End of Borehole															
	NB: BX casing bouncing at 47.5'															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 2

WP 74-74-01. LOCATION Co-ords. 16,467,557 N; 1,065,457 E. ORIGINATED BY BL
DIST 11 HWY 11 BORING DATE August 14, 1975 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
935.6	Ground Level															
0.0	Sand Fill															
931.1																
4.5	Clayey silt		1	SS	22	930										
	Firm to Stiff		2	TW	PM											
			3	TW	PM	920										
915.6																
20.0	Silt		4	SS	20											
	Compact															
	some clay		5	SS	20	910										
904.6																
31.0	Sand, some gravel		6	RC	83%	900										
	Boulders		7	RC	50%											
895.6																
40.0	Gneiss Bedrock		8	RC	94%											
889.6			9	RC	98%											
46.0	End of Borehole															

20
15 \diamond 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 7

WP 74-74-01 LOCATION Co-ords. 16,467,680 N; 1,065,477 E. ORIGINATED BY BL
 DIST 11 HWY 11 BORING DATE August 29, 1975 COMPILED BY BL
 DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT — w		UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		SHEAR STRENGTH PSF					WATER CONTENT %			
												w_p ——— w ——— w_L			
933.7	Ground Level														
0.0	Peat	~ ~ ~ ~ ~				930									
925.7			1	SS	3										
8.0	Silty clay to clayey silt		2	SS	4										0 10 45 45
	Firm to Stiff		3	TW	PM	920									
	layered		4	TW	PM										
908.2			5	SS	23	910									
25.5	Silt		6	SS	34										
	Compact		7	SS	15	900									
	trace of sand and clay seams		8	SS	5										
895.7						890									
38.0	Sand, trace of fine gravel														
888.4															
45.3	End of Borehole														
	N.B: Refusal at 45.3'														

20
15 ϕ 5 % STRAIN AT FAILURE
10

RECORD OF BOREHOLE NO 8

WP 74-74-01 LOCATION Co-ords. 16,467,739 N; 1,065,481 E. ORIGINATED BY BL
 DIST 11 HWY 11 BORING DATE August 26, 1975 COMPILED BY BL
 DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w			UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100				w_p ——— w ——— w_L				
							SHEAR STRENGTH PSF				WATER CONTENT %				
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE								
935.2	Ground Level					1000	2000								
0.0	Sand Fill														
930.2						930									
5.0	Peat		1	SS	0										
			2	SS	1.6"										
922.2															
13.0	Clayey silt		3	TW	PM										
	Firm and layered		4	TW	PM			+ s4.0							
	some silt and clay seams		5	SS	1.6"	910		+ s3.0							
			6	TW	PM										
899.2			7	SS	9	900		+ s3.3							
36.0	Silt		8	SS	11										
	Compact														
	trace of clay		9	SS	35	890									
878.2						880									
57.0	Sand and gravel		10	RC	89%										
	with boulders		11	RC	133%										
866.7						870									
68.5	Gneiss Bedrock		12	RC	97%										
			13	RC	95%	860									
856.8															
78.4	End of Borehole														

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 9

WP 74-74-01 LOCATION Co-ords. 16,467,852 N; 1,065,461 E. ORIGINATED BY BL
DIST 11 HWY 11 BORING DATE August 28, 1975 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_p WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		2'0	4'0	6'0	8'0	10'0	Wp	W	WL		
934.6	Ground Level															
0.0	Silt and organics															
926.6			1	TW	Ph											
8.0	Clayey silt		2	TW	PM											
	stratified		3	SS	14	920										
	Soft		4	TW	PM	918"										
			5	SS	14	910										
	Firm		6	SS	13											
901.6			7	SS	20	900										
33.0	Silt		8	SS	14											
	Compact		9	SS	59	890										
889.6	trace of clay		10	SS	N/R											
45.0	Sand - medium some fine gravels															
883.1																
51.5	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 201

WP 74-74-01 LOCATION Co-ords. 16,467,913 N; 1,065,607 E. ORIGINATED BY Racey
DIST 11 HWY 11 BORING DATE February 1956 COMPILED BY McCallum
DATUM Geodetic BOREHOLE TYPE Washboring with NX & BX CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
931.0	Ground Level					ELEV										GR SA SI CL
0.0	Fill					930										
925.0			1	TW	PM											
6.0	Silty clay to clayey silt		2	TW	PM	920										
			3	TW	PM											
	Soft		4	TW	PM											
			5	TW	PM	910										
	stratified		6	TW	PM											
			7	TW	PM											
			8	TW	PM											
			9	TW	PM	900										
896.0			10	TW	PM											
35.0	Silt Compact		11	SS	13											
892.0			12	SS	19											
39.0	End of Borehole															

RECORD OF BOREHOLE NO 41

WP 74-74-01 LOCATION Co-ords. 16,468,010 N; 1,065,535 E. ORIGINATED BY BVV
 DIST 11 HWY 11 BORING DATE February 11, 1976 COMPILED BY BVV
 DATUM Geodetic BOREHOLE TYPE Washboring with NX Casing CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W_p	W_L	
936.0	Ground Level													
0.0	Topsoil													
933.0														
3.0	Clayey silt to silt Brown, oxidized some organics stratified		1	SS	8	930						18	28	
			2	SS	11							19	25	0 1 80 19
			3	SS	21	920						17	25	
918.0													26	
18.0	Silty clay to clayey silt, Grey and stratified Soft to Firm		4	SS	8									
			5	TW	PM	910								
			6	TW	PM									
902.0														
34.0	Silt, trace of clay Compact		7	SS	18	900								
			8	SS	19									0 0 95 5
890.0														
46.0	Sand and Gravel Very Dense					890								
884.0			9	SS	100	2"								
52.0	End of Borehole N.B.: Probable bedrock at El. 884.0±													

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 4 C

WP 74-74-02 LOCATION Co-ords. 16,467,418 N; 1,065,242 E. ORIGINATED BY BL
DIST 11 HWY 11 BORING DATE August 19, 1975 COMPILED BY
DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		SHEAR STRENGTH P.S.F.					WATER CONTENT %				
							20 40 60 80 100					W_P W W_L				
935.0	Ground Level															
0.0	Fill - old road bed															
931.5																
3.5	Muck		1	SS	16	930									5.5% Org.	
929.0																
6.0	Clayey silt Firm to Stiff		2	TW	PM											
	stratified with clay seams and fine sand partings		3	TW	PM	920										
			4	SS	6											
			5	TW	PM	910										
907.0																
28.0	Silt Compact and trace of clay		6	SS	20	900									0 0 99 1	
900.0																
35.0	Sand with some gravel and boulders		7	SS	60/4"	890										
887.5																
47.5	Gneiss Rock		8	RC	92%											
882.0			9	RC	80%											
53.0	End of Borehole															

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 10 C

WP 74-74-02 LOCATION Co-ords. 16,467,585 N; 1,065,230 E. ORIGINATED BY BL
 DIST 11 HWY 11 BORING DATE September 9, 1975 COMPILED BY _____
 DATUM Geodetic BOREHOLE TYPE Washboring with NX Casing CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	W_P	W	W_L	
936.1	Ground Level														
0.0	topsoil		1	SS	18										
	Clayey silt Very Stiff		2	SS	27	930									0 0 82 18
	Stratified with clay seams & occasional fine sand partings		3	SS	14										
921.1			4	SS	27	920									0 0 92 8
15.0	Silt stratified, occ. clay seams		5	SS	13										
913.1															
23.0	Sand, some gravel, frequent boulders		6	RC	50%	910									
905.1															
31.0	End of Borehole NB: Artesean water encountered at El. 913±														

RECORD OF BOREHOLE NO 52

WP 74-74-02 LOCATION Co-ords. 16,467,425 N; 1,065,255 E. ORIGINATED BY BK
 DIST 11 HWY 11 BORING DATE September 29, 1961 COMPILED BY BK
 DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT			LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT — w			UNIT WEIGHT γ P.C.F	REMARKS						
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p			w	w_L	WATER CONTENT % 20 40 60			
935.0	Ground Level																			
932.5	Fill. Silty sand with organics.																			
2.5	Silty clay to clayey silt stratified with occ. silt layers. Stiff		1	SS	7															
			2	SS	18															
			3	TW	PH															
			4	TW	PH															
			5	TW	PH															
910.0	Silt Compact		6	TW	PH															
25.0			7	TW	PH															
899.5	Sand and gravel Dense		8	TW	PH															
35.5			9	SS	42															
894.5	Schist Rock		10	SS	100															
40.5			11	RC																
886.5	End of Borehole		12	RC																
48.5																				
	NB: Artesian pressure observed at 899.5																			

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 58

WP 74-74-02 LOCATION Co-ords. 16 467,650 N; 1,065,265 E. ORIGINATED BY _____
 DIST 11 HWY 11 BORING DATE October 6, 1961 COMPILED BY _____
 DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ P.C.F.	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W_P	W	W_L		
937.0	Ground Level															
935.0	Topsoil															
2.0	trace organic		1	SS	25											
	Silty clay to		2	SS	17											
	clayey silt		3	TW	PH											
	Stratified		4	TW	PH											
	Stiff		5	TW	PH											
915.0	becoming very silty		6	TW	PH											
22.0	Silt		7	TW	PH											
	Compact		8	TW	PH											
905.0			9	SS	7											
32.0	Sand and gravel															
	Loose to Very Dense															
893.5			10	SS	82.6"											
43.5	End of Borehole															
	NB: Artesian pressure noted at El. 905.															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 59

WP 74-74-02 LOCATION Co-ords. 16,467,360 N; 1,065,180 E. ORIGINATED BY _____
DIST 11 HWY 11 BORING DATE October 10, 1961 COMPILED BY _____
DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
935.0	Ground Level															
932.5	Fill-old road bed	2 2	1	SS	13	930										
2.5	Muck Soft some clay	2 2	2	SS	9											
927.0			3	TW	PH											
8.0	Silty clay to clayey silt stratified Soft to Firm		4	TW	PH											
			5	TW	PH											
			6	TW	PH											
903.0			7	TW	PH											
32.0	Silt Compact		8	TW	PH											
			9	SS	10											
891.0																
44.0	Sand and gravel		10	SS	19											
888.5	Compact															
46.5	End of Borehole															
NB: 1. Artesian pressure noted at El. 891.1 2. Cone refusal at 885.3																

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 50

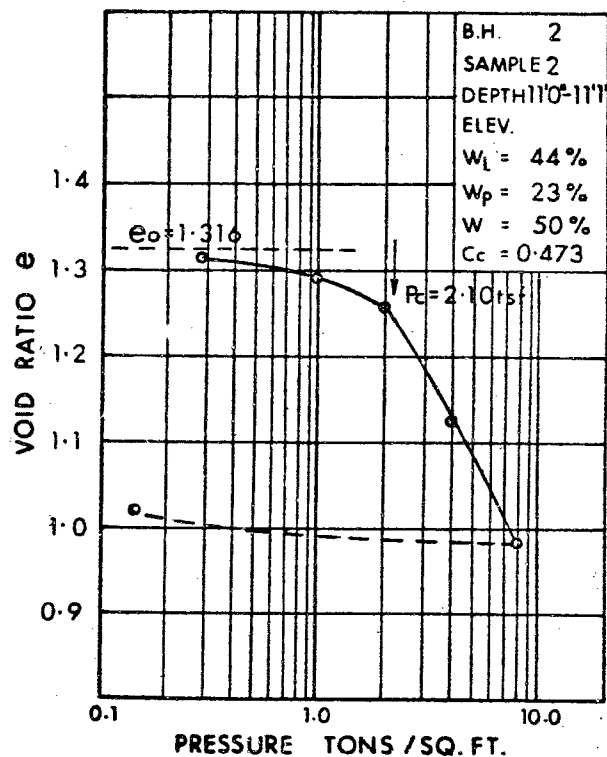
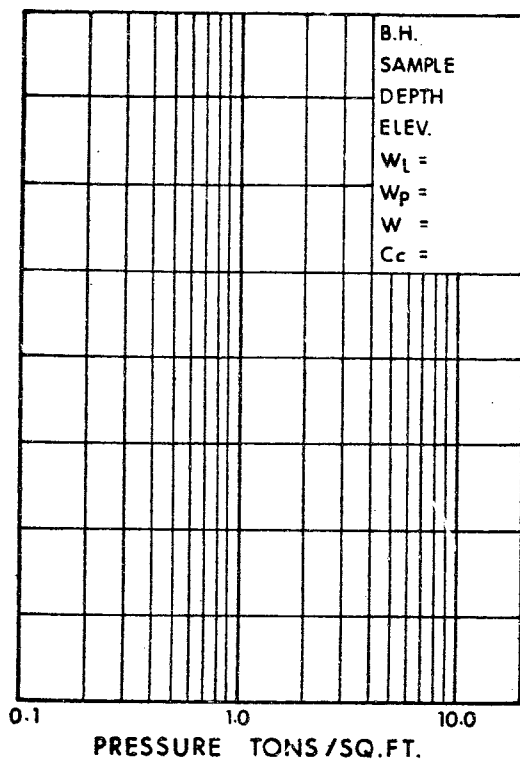
WP 74-74-02 LOCATION Co-ords. 16,467,310 N; 1,065,255 E. ORIGINATED BY EK
DIST 11 HWY 11 BORING DATE October 12, 1961 COMPILED BY BK
DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS % GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	SHEAR STRENGTH P.S.F. O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					
							WATER CONTENT %			WATER CONTENT %			WATER CONTENT %				
							20	40	60	20	40	60	20	40			60
932.0	Water Level																
931.0	Water																
1.0	Muck, with clayey silt.	}	1	SS	P	930									261%		
	Very Soft		2	SS	1/19"												
924.0			3	SS	1/18"												
8.0	Clayey silt/silty clay, stratified	}	4	SS	4	920									107.0		
	Very Soft to Soft		5	SS	1/24"												
			6	SS	2												
			7	SS	1/18"												
			8	SS	4	910											
			9	SS	6												
			10	SS	8	900											
			11	SS	10												
900.0	Silt		12	SS	9	890											
32.0	Compact		13	SS	16												
891.0																	
41.0	Sand and gravel	}															
	Compact to Dense																
883.4																	
48.6	Schist Rock		14	RC	76%	880											
878.4																	
53.6	End of Borehole																
	NB: Artesean pressure observed at 891.±																

VOID RATIO - PRESSURE CURVES

JOB NO. 150-73-02

VOID RATIO e



VOID RATIO e

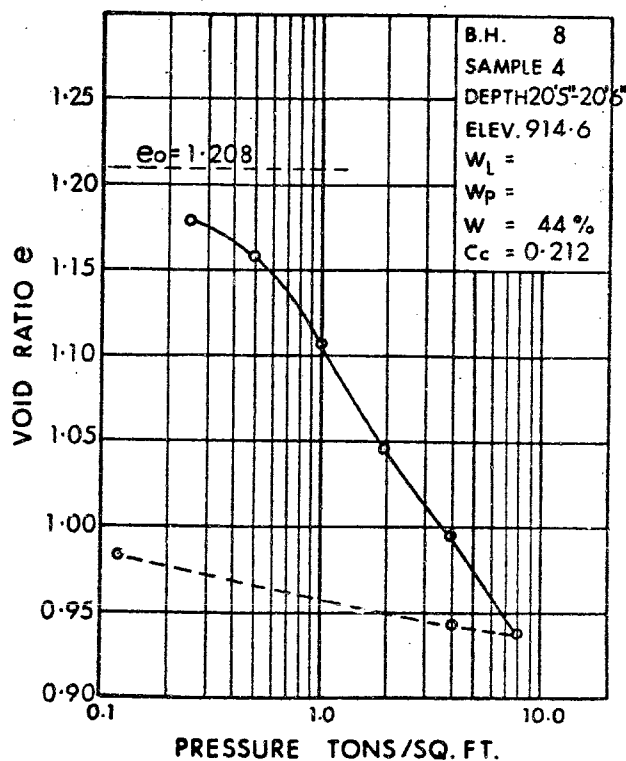
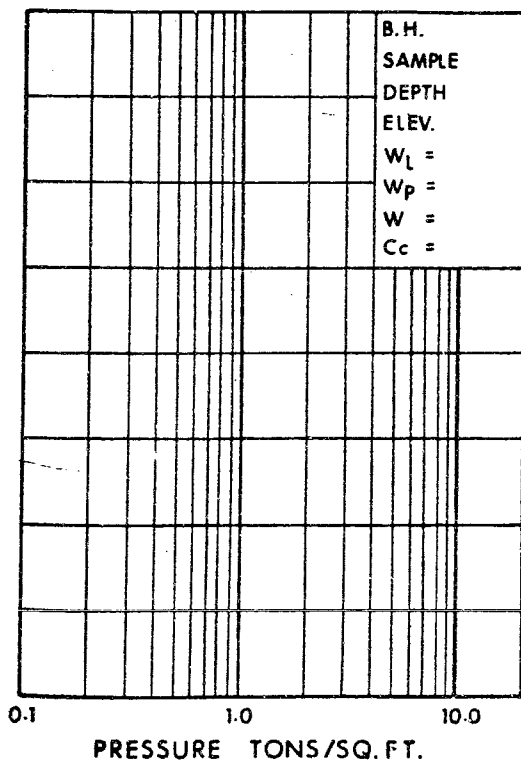


FIG. 1

[illegible]

ENGINEERING SERVICES BRANCH

W P 150-73-02

W P 150-73-02

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY & SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse

MINISTRY SIEVE DESIGNATION

270 200 140 100 60 50 40 30 20 16 10 8 4 3/8" 1/2" 3/4" 1" 1 1/2" 2" 2 1/2" 3"

PERCENT PASSING

100

90

80

70

60

50

40

30

20

10

0

PERCENT RETAINED

0

10

20

30

40

50

60

70

80

90

100

PERCENT PASSING

100

90

80

70

60

50

40

30

20

10

0

PERCENT RETAINED

0

10

20

30

40

50

60

70

80

90

100

PERCENT PASSING

100

90

80

70

60

50

40

30

20

10

0

PERCENT RETAINED

0

10

20

30

40

50

60

70

80

90

100

PERCENT PASSING

100

90

80

70

60

50

40

30

20

10

0

PERCENT RETAINED

0

10

20

30

40

50

60

70

80

90

100

PERCENT PASSING

100

90

80

70

60

50

40

30

20

10

0

PERCENT RETAINED

0

10

20

30

40

50

60

70

80

90

100



GRAIN SIZE DISTRIBUTION SILT

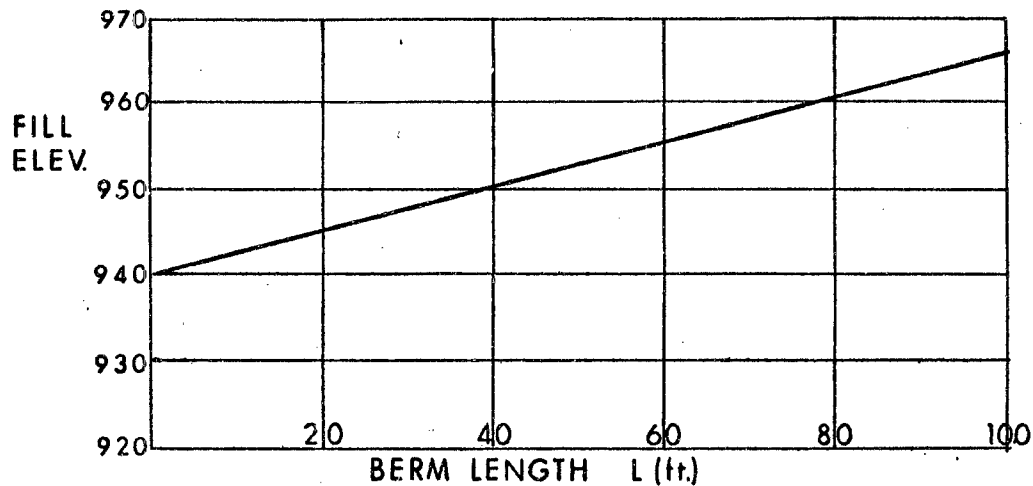
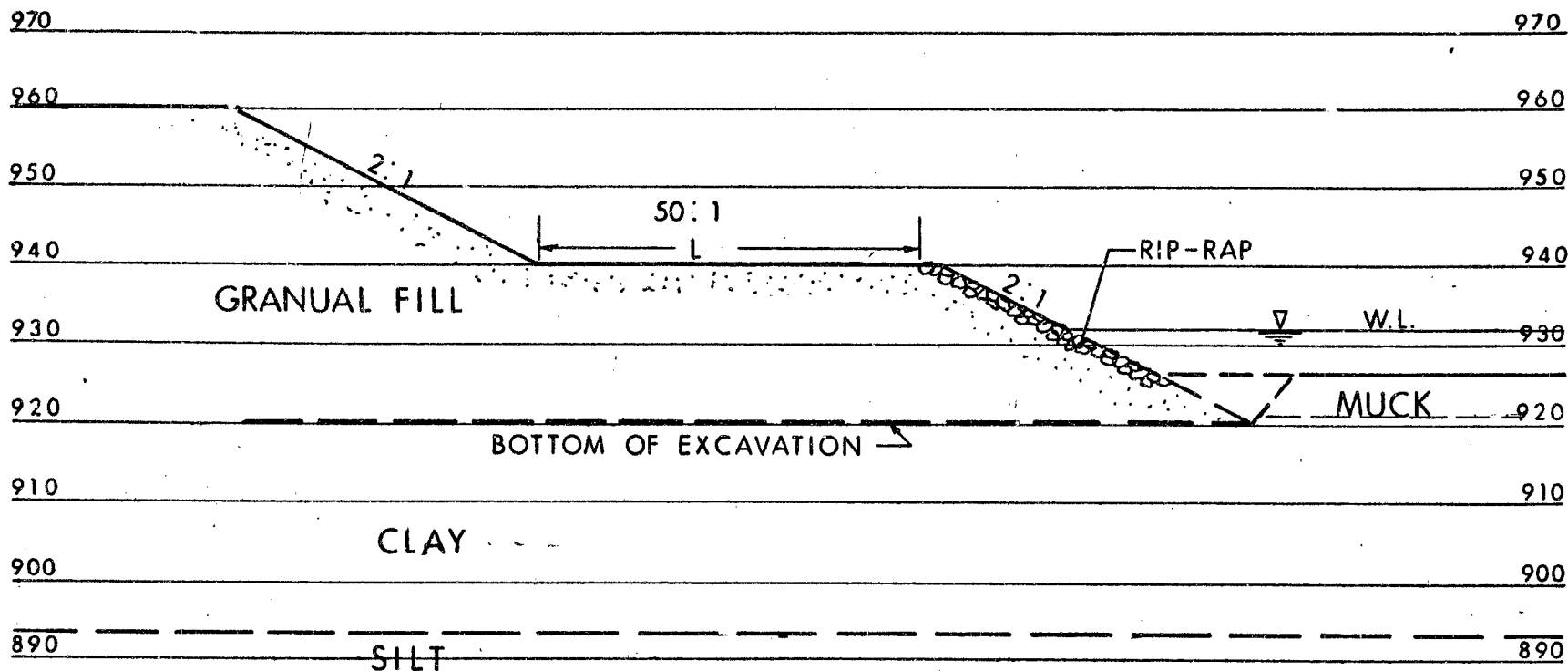
W P 150-73-02

[illegible]

ENGINEERING SERVICES BRANCH

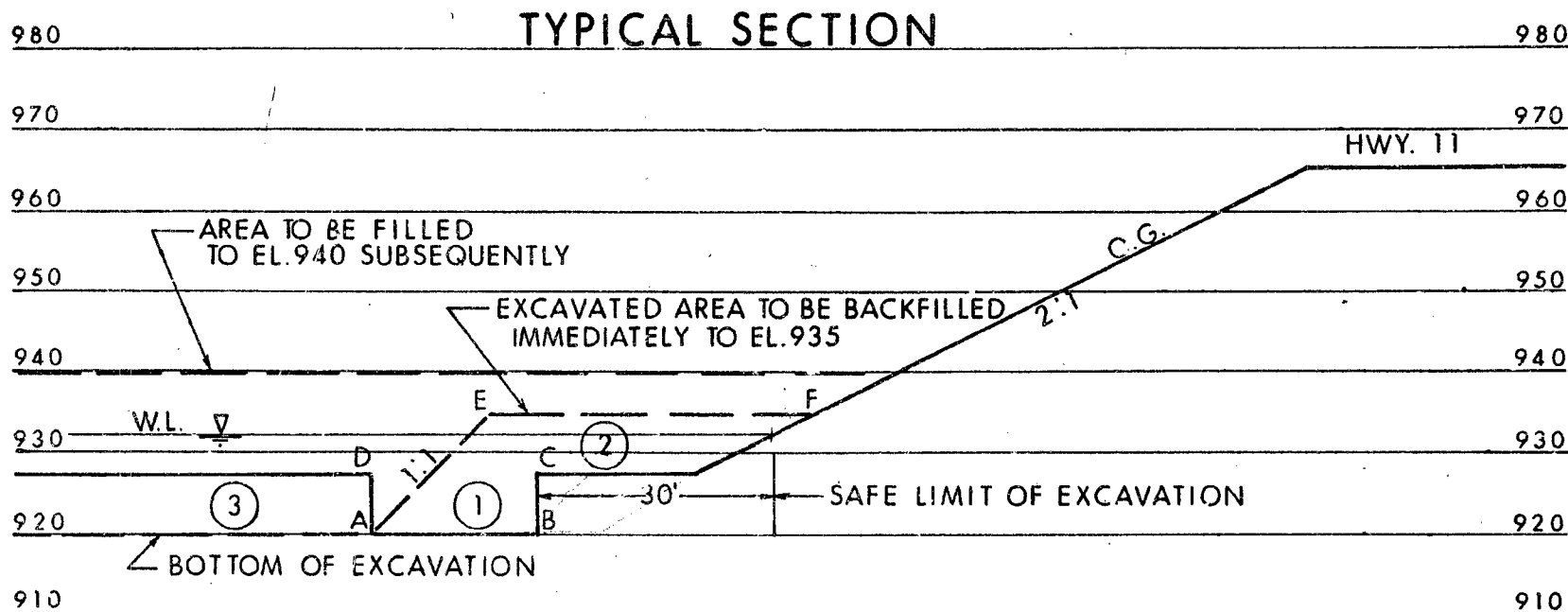
FIG No 4

W P 74-74-02



TYPICAL SECTION
BERM DESIGN
SOUTH APPROACH
OF SOUTH SERVICE RD.

FIG. 5

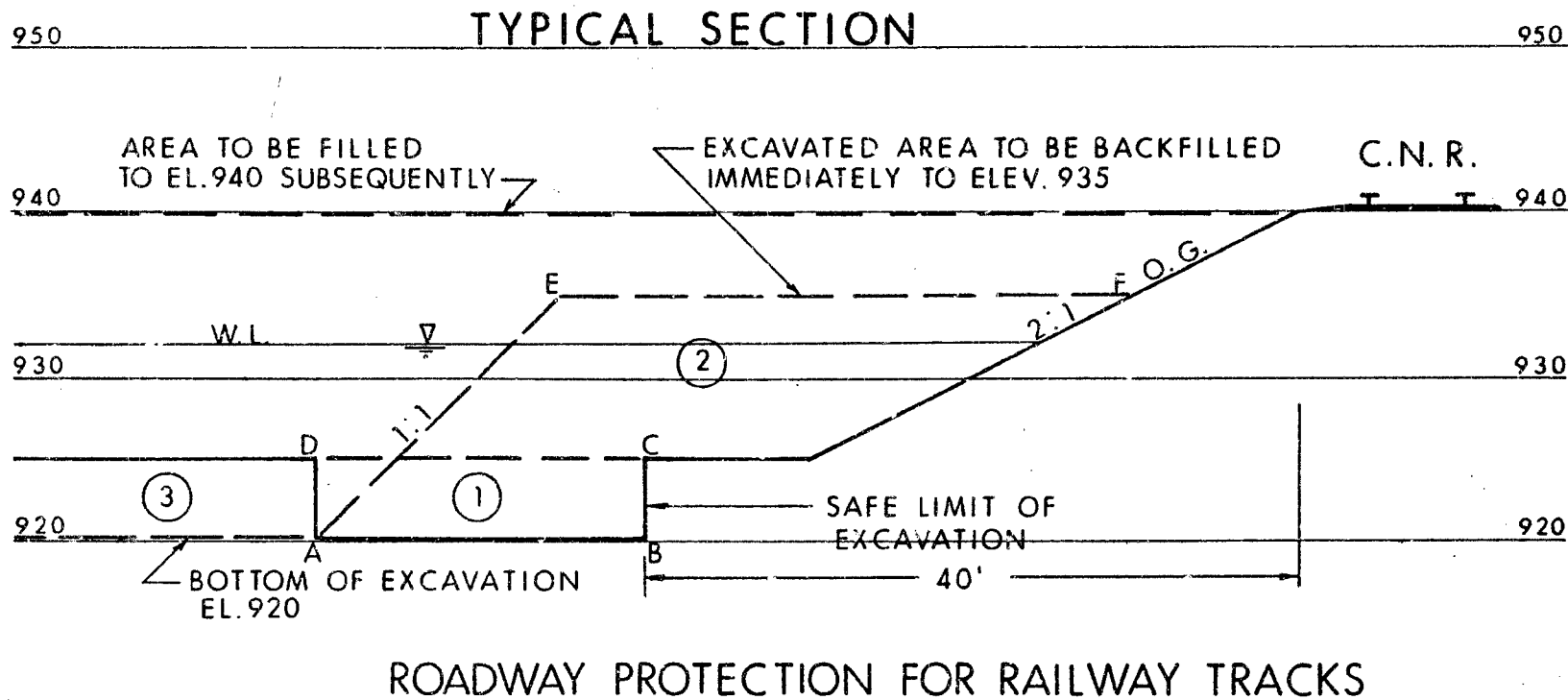


Sequence of Work:

- Stage 1: Excavate muck in ABCD, which is a 20' x 20' section located 30' from toe of the embankment.
- Stage 2: Backfill the excavated area to elev. 935 immediately with sandy type material.
- Repeat the above operations, i.e. excavation and backfilling in sections, until a berm is formed.
- Stage 3: Proceed with muck excavation in the remainder of the area, and fill to elev. 940 with sandy type material prior to construction of approach embankments.

ROADWAY PROTECTION FOR HWY. 11 EMBANKMENT

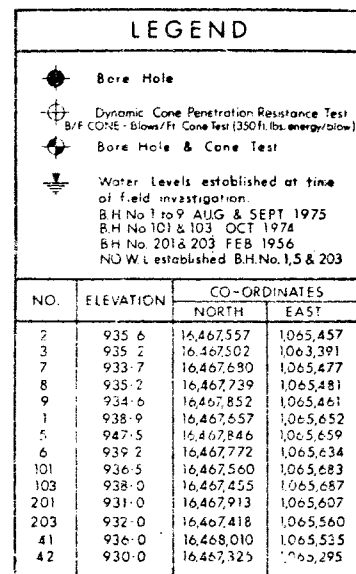
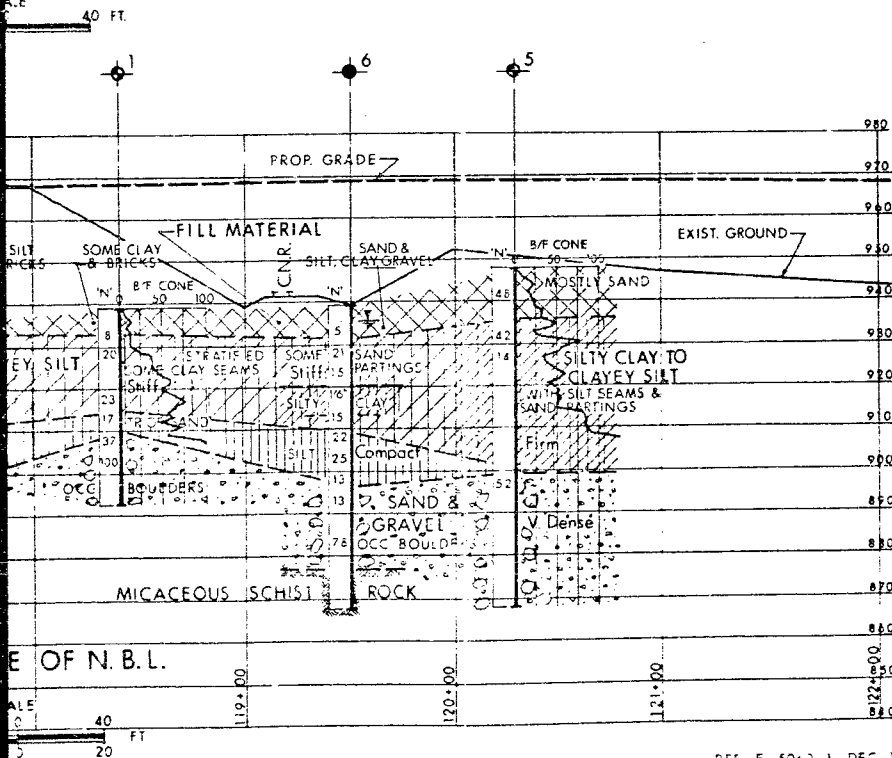
FIG. 6



Sequence of Work:

- Stage 1: Excavate muck in ABCD, which should not be wider than 20 ft. and closer than 40 ft. from the track.
- Stage 2: Backfill the excavated area immediately to elev. 935 with sandy type material.
- Repeat the above operations, i.e. excavation and backfilling in sections, until a berm is formed.
- Stage 3: Proceed with muck excavation in the remainder of the area, and fill to elev. 940 with sandy type material prior to construction of approach embankments.

FIG. 7



— NOTE —

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

[illegible]

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
 TRANSPORTATION BRANCH—TELEPHONE 14, OFFICE 101, MECHANICAL SECTION

HUNTSVILLE SOUTH C.N.R.
NORTH BOUND LANE

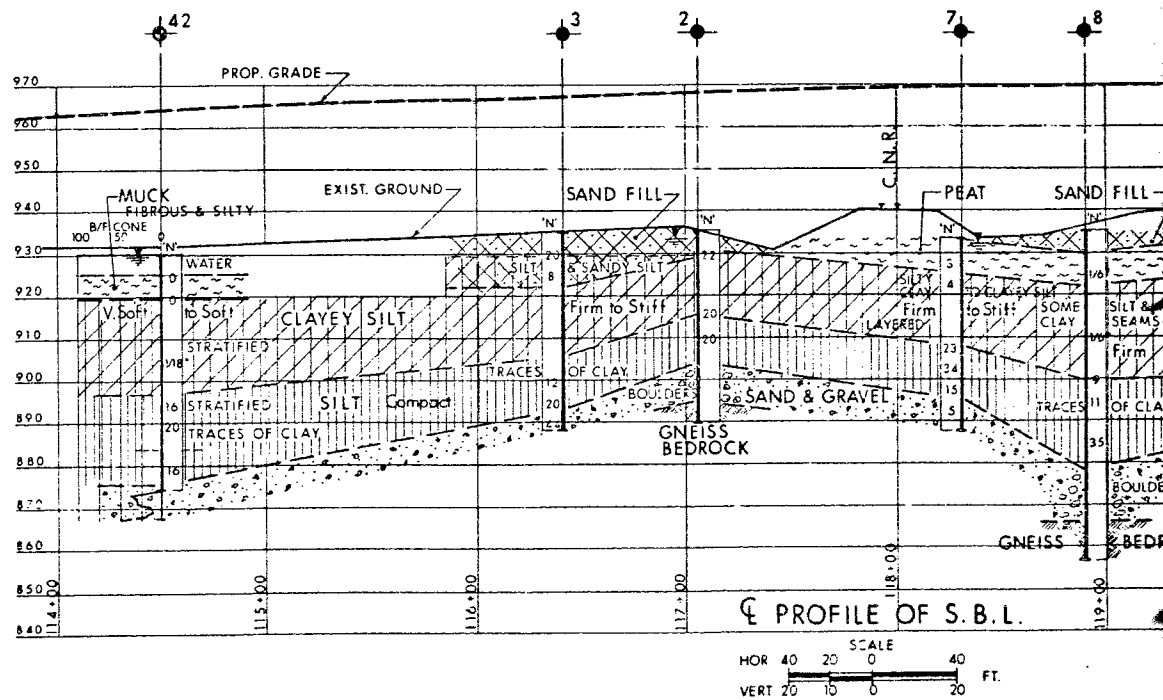
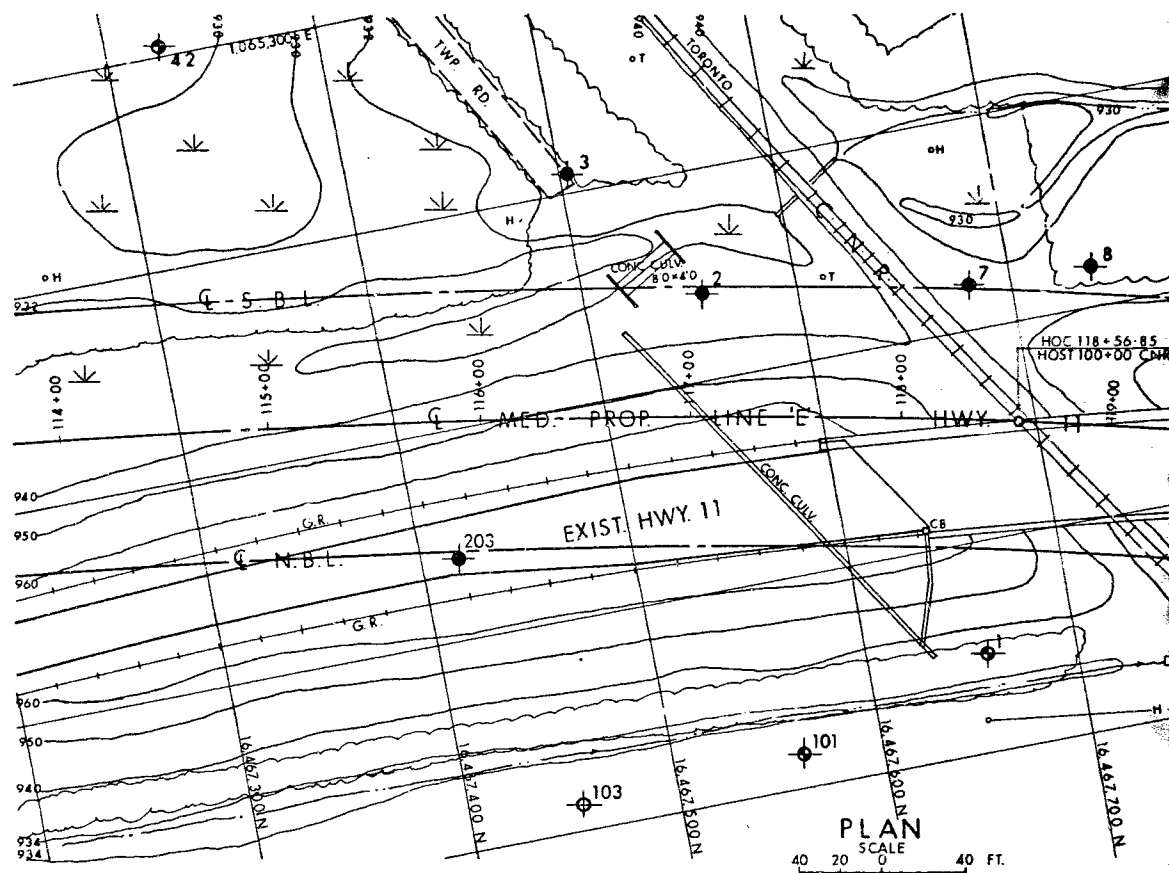
HIGHWAY NO 11 PROP LINE 'E' DIST NO 11
 DIST MUNICIPALITY OF MUSKOKA TOWN OF HUNTSVILLE
 W. CHAFFEE LOT 8 SQ. 1

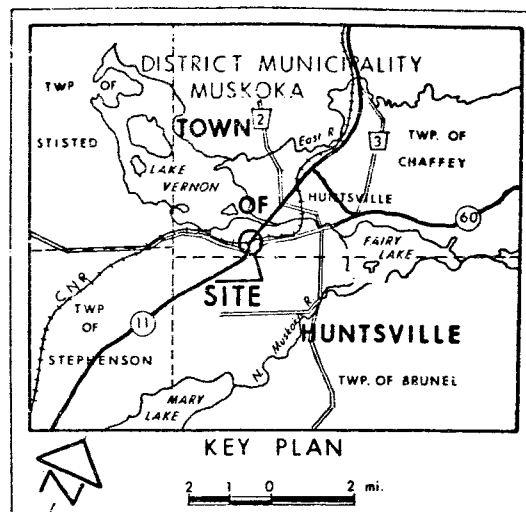
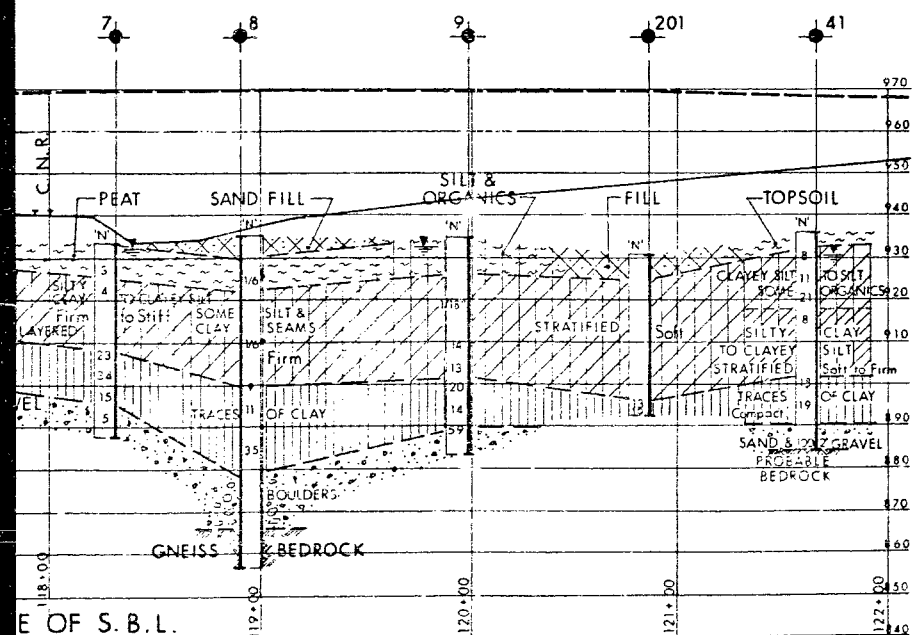
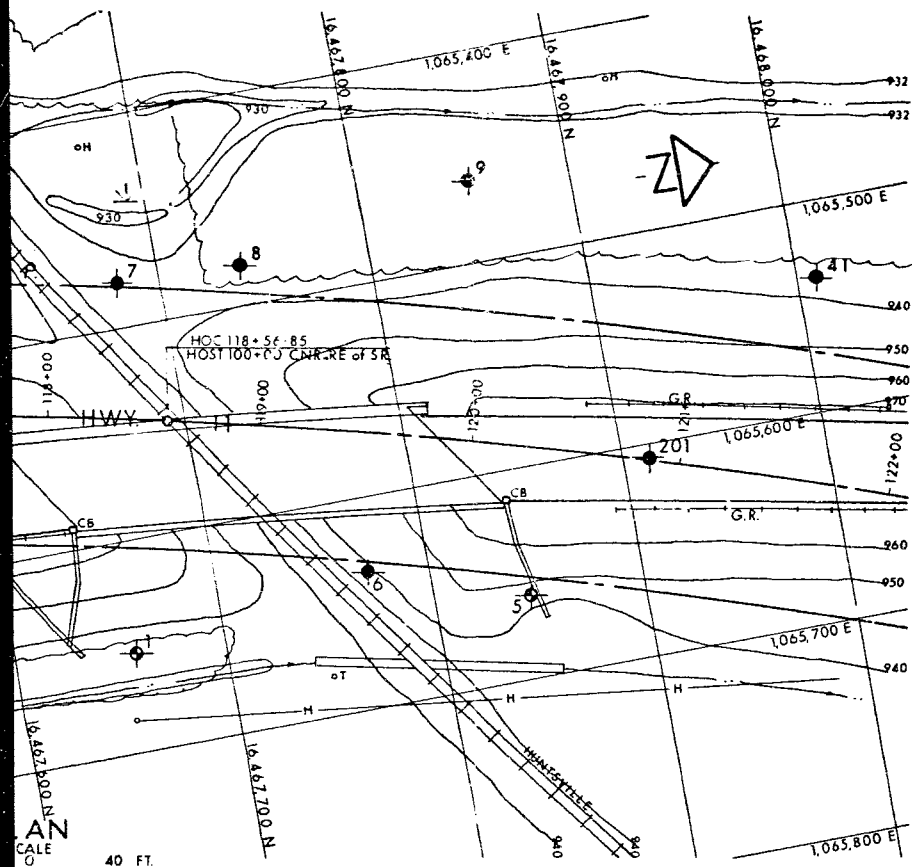
BORE HOLE LOCATIONS & SOIL STRATA

1507302-A

DATE 14 APR 1976

REF E-5040-1 DEC 1975





LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Resistance
B/F CONE - Blows/Ft. Cone Test (350 ft. lbs. energy/blow)
- ⊕ Bore Hole & Cone Test
- ⊕ Water Levels established at time of field investigation.
B.H. No. 1 to 9 AUG. & SEPT. 1975
B.H. No. 101 & 103, OCT. 1974
B.H. No. 201 & 203 FEB. 1956
NO W.L. established B.H. No. 8 & 201

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
2	935-6	16,467,557	1,065,457
3	935-2	16,467,502	1,063,391
7	933-7	16,467,680	1,065,477
8	935-2	16,467,739	1,065,481
9	934-6	16,467,852	1,065,461
1	938-9	16,467,657	1,065,652
5	947-5	16,467,846	1,065,659
6	939-2	16,467,772	1,065,634
101	936-5	16,467,560	1,065,683
103	938-0	16,467,455	1,065,687
201	931-0	16,467,913	1,065,607
203	932-0	16,467,418	1,065,560
41	936-0	16,468,010	1,065,535
42	930-0	16,467,325	1,065,295

— NOTE —

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

DATE	BY	DESCRIPTION

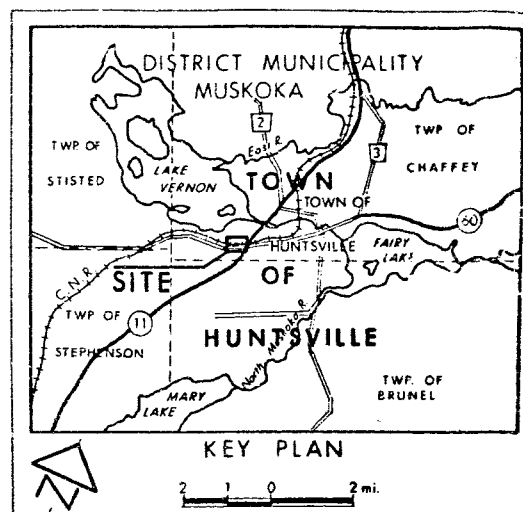
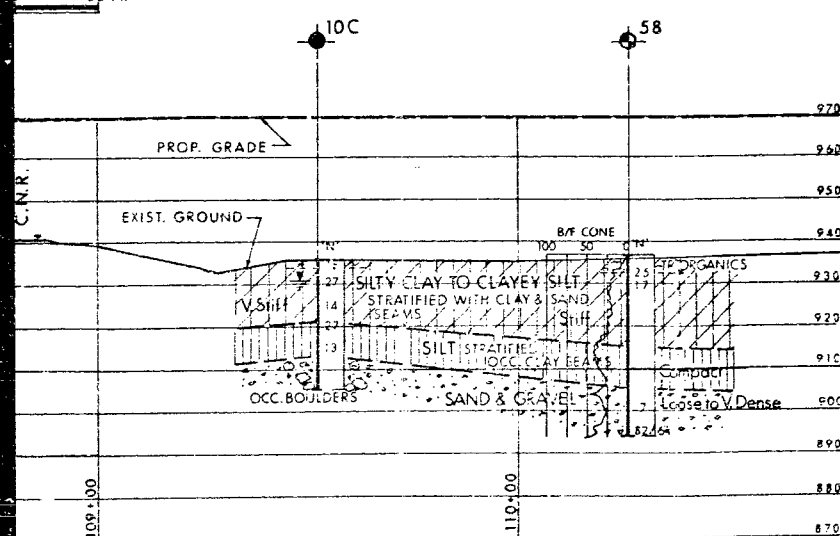
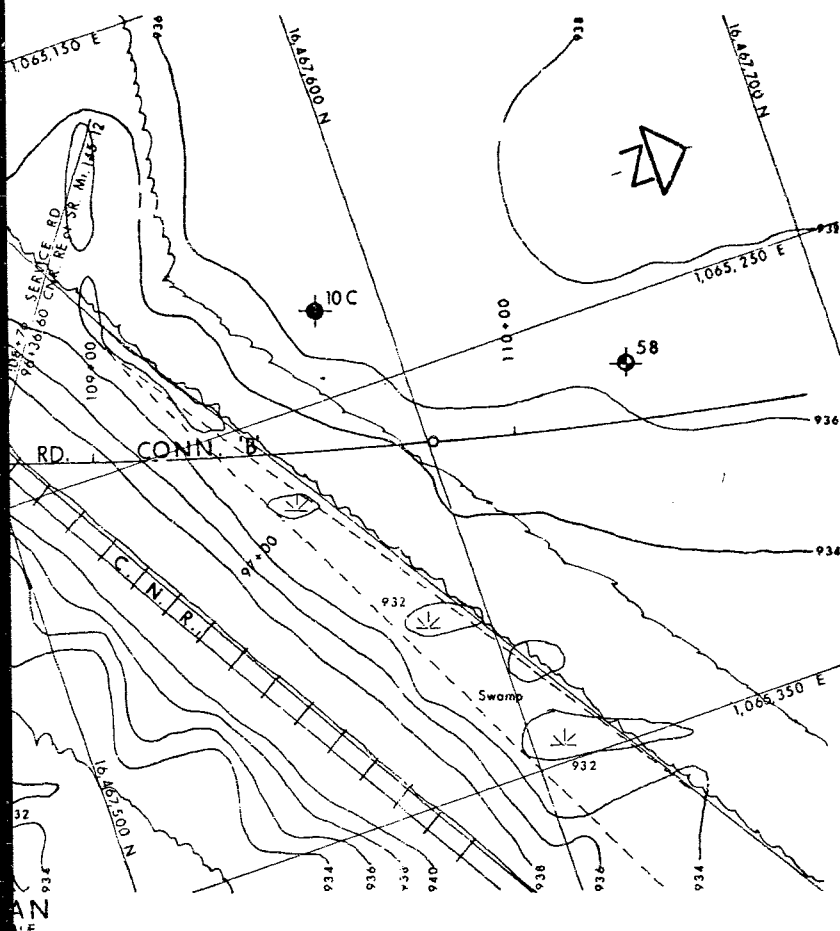
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
ENGINEERING SERVICES BRANCH—GEOTECHNICAL OFFICE—SOIL MECHANICS SECTION

HUNTSVILLE SOUTH C.N.R. SOUTH BOUND LANE

HIGHWAY NO. 11 PROP. LINE 'E' DIST NO. 11
DIST. MUNICIPALITY OF MUSKOKA TOWN OF HUNTSVILLE
TWP. CHAFFEY LOT 8 CON. 1

BORE HOLE LOCATIONS & SOIL STRATA

SUBMITTAL CHECKED	DATE 74-74-01	747401-A
DRAWING CHECKED	DATE	
DATE 12 APR 1976	DATE 42-17	BRIDGE DRAWING NO.
APPROVED	CONT NO.	



LEGEND			
	Bore Hole		
	Dynamic Cone Penetration Resistance Test B/F CONE - Blows/Ft. Cone Test (350ft lbs. energy/blow)		
	Bore Hole & Cone Test		
	Water Levels established at time of field investigation B.H. 4C & 10C, AUG. & SEPT. 1975 B.H. 2, 9, 10 SEPT. & OCT. 1961		
NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
4C	935.0	16,467,418	1,065,242
10C	936.1	16,467,585	1,065,230
52	935.0	16,467,425	1,065,255
58	937.0	16,467,650	1,065,265
59	935.0	16,467,360	1,065,180
50	931.0	16,467,310	1,065,235



ARTESIAN CONDITION ENCOUNTERED

B.H. No.	AT ELEV.	DATE
52	899.5	SEPT. 1961
58	905.0	OCT. 1961
59	891.0	OCT. 1961
50	891.0	OCT. 1961
10C	913.0	SEPT. 1975

— NOTE —

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MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO ENGINEERING SERVICES BRANCH—GEOTECHNICAL OFFICE—SOIL MECHANICS SECTION			
PROP. CROSSING C.N.R. SOUTH & SERVICE RD. CONN. 'B'			
HIGHWAY NO. 11 CONN. 'B'		DIST. NO. 11	
DIST. MUNICIPALITY MUSKOKA		TOWN OF HUNTSVILLE	
TWP. CHAFFEY		LOT 7 CON. 1	
BORE HOLE LOCATIONS & SOIL STRATA			
SUBMITTAL NO. CHECKED	W.P. NO. 74-78-02	DRAWING NO. 747402-A	
DRAWN BY J. L. HART	W. NO.		
DATE 18 MAR 1976	STATION 22-710	BRIDGE DRAWING NO.	
APPROVED	CONF. NO.		

REF. E-5055-1 NOV 1975



Ontario

Ministry of
Transportation and
Communications

MINUTES OF MEETING

Subject: W.P. 74-74-06, 01, 02, 03
Area between Muskoka Road #3 and Vernon Lake Narrows

Time & Place : 11:00 a.m. Thursday, July 22, 1976
M.T.C. Huntsville District Office and
On Site in Field.

Purpose: To determine Extent of Further Foundation Investigation and
Re-evaluation.

Attendees:

K. G. Selby -	Soils Mechanics
P. Payer -	Soils Mechanics
D. A. O. White-	Huntsville District
R. Matthews -	Huntsville District
W. Peck -	Geotechnical
J. McAllister-	Structural
A. Parnamagi -	Planning & Design

Discussion:

Action By:

1. Changes in Median Width

- Change in median width between Stations 112 + and 168 + was outlined requiring re-evaluation of the Foundation Investigation Report
- Plan showing median changes to be sent to Soils Mechanics Section

Soils Mechanics

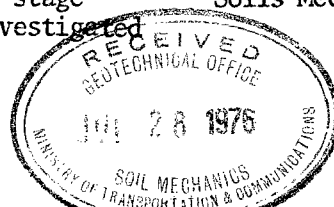
Planning & Design

2. Alternatives Between Muskoka Rd. #3 and South C.N.R. - East Side

- The disposition of the proposed Plaza development to be checked. If it is abandoned, additional property may be available and no changes in berm design will be required
- If additional property is not available stage construction without berms has to be investigated

District

Soils Mechanics



Minutes of Meeting Continued

2. Continued....

- If additional property is not available and stage construction without berms not feasible, the direct E-N ramp will be abandoned and E-N traffic directed to S-E loop by left turn off Muskoka Road #3

Soils Mechanics and
Planning & Design

- A copy of cross sections showing theoretical plot for the right side N.B.L. between Station 105 and 140 will be sent to Soils Mechanics to aid in their investigation

Planning & Design

3. Schedule

- Re-evaluated Foundation Report to be issued on or before October 1, 1976

Soils Mechanics

4. Drainage & Property

- Drainage from the area west of Muskoka Road #3 (Sta. 92 +) has to be taken to common ditch between abandoned Township Road and railway. This may require purchase an easement along Hall's property.

Planning & Design

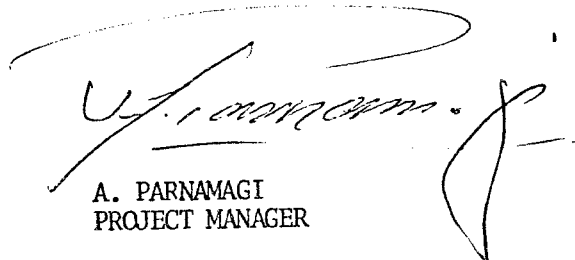
- An additional 50' of property from Hall's also may be required to accommodate excavation and backfill stability of the swampy area in front of the property

Soils Mechanics

- Hall's may also request buy-out once they become aware of the 10' high berm being constructed in front of their property. Their reaction to this should be established.

Property

Please address any errors or omissions to the writer.



A. PARNAMAGI
PROJECT MANAGER

AP/tt

cc: K. B. Selby
P. Payer
D. A. O. White
R. Matthews
W. Peck
J. McAllister
G. Wetherall

C. Campbell
B. MacKinnon