

G.I.-30 SEPT. 1976

GEOCRES No. 31E-87DIST. 11 REGION W.P. No. 32-77-02CONT. No. 78-082W. O. No. STR. SITE No. 42-<sup>174</sup>~~147~~HWY. No. 11LOCATION Proposed Underpass  
Interchange at W. 1st. Hwy 11 & 117No. of PAGES - 

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OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. REMARKS:

ENGINEERING MATERIALS OFFICE  
SOIL MECHANICS SECTION

WP 32-77-02

DIST 11

HWY 11

STR SITE 42-174

Proposed Underpass  
Interchange at N. Jct. Hwy. #11 & Hwy. #117  
3.0 miles North of Bracebridge

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ROCK CORES	77-07-05	148

## FOUNDATION INVESTIGATION REPORT

For

Proposed Underpass  
Interchange at N. Jct. Hwy. #11 & Hwy. #117  
3.0 miles North of Bracebridge  
Hwy. #11, Site 42-174  
W.P. 32-77-02, District 11

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### INTRODUCTION

This report contains the results of our foundation investigation at the above mentioned site. The field work was carried out during the period of March 23 to April 12, 1977, utilizing a continuous flight auger machine equipped with 3¼ inch I.D. hollow stem augers mounted on a muskeg vehicle.

### SITE DESCRIPTION

The site is located at the north junction of Hwy. #11 and Hwy. #117, approx. 900 ft. south of north Muskoka River. The area adjacent to the site is tree covered. Topographically the countryside is hilly with frequent rock outcrops.

### SUBSURFACE CONDITIONS

#### General

Underlying a surficial cover of topsoil across the site is a granular deposit ranging in thickness between 16 and 70 ft. The granular deposit is followed either by sound gneiss bedrock or a bouldery zone.

#### Silty Sand to Sandy Silt, Traces of Gravel, and Clay

This deposit was encountered at every boring location and extends immediately below the topsoil down to a maximum depth of 71 ft. (BH #6). In BH #3, the lower boundary was found to be at elev. 893 ± some 16 ft. below ground level. At the other boring locations the thickness of the deposit was found to vary between the above quoted figures.

The material in the stratum consists of sands and silts in varying proportions. Mechanical analyses performed on selected samples indicate that in most cases, the sand is the predominant grain size. Traces of gravel and clay were also encountered. The test results are shown in envelope form on Fig. 1, attached to the appendix. In most of the borings an approx. 3-4 ft. thick gravelly layer was observed at or slightly above elev. 890.

Standard Penetration Tests carried out within the main deposit indicate that the relative density varies randomly from loose to very dense. The obtained 'N' values varied from 4 to 65 blows/ft. Some of the low 'N' values may be attributed to 'quick' conditions induced by boring operations. References should be made to the Record of Borehole Sheets for 'N' values. The natural moisture content ranges from 3% to 24%, the average being in the order of 17%.

#### Bouldery Zone

Refusal to conventional washboring technique was reached in BH #6 at elev. 846 ±. The borehole was advanced by drilling BXL core barrel for an approximate distance of 10 ft. Several rock fragments ranging from ¼" to 3½" in sizes, together with some gravel pieces were recovered.

#### Gneiss Bedrock

The bedrock at this location as described by Mr. B.K. Glassford, Geologist, consists of grey pink coloured gneiss containing high mica content. With the exception of the upper 4-8" the bedrock is sound.

#### GROUNDWATER CONDITIONS

The groundwater level was observed at 6 to 24 ft. below existing ground level. It appears that the gravelly layer is the water bearing zone.

The following groundwater levels were established in the boreholes during the field investigation:

Borehole #1	Elevation 895.5
#2	893.5
#3	902.5
#4	894.5
#5	891.0
#6	888.0

## DISCUSSION AND RECOMMENDATIONS

### General

It is proposed to construct an interchange at the present level crossing of Hwy. #11 and Hwy. #117. The Hwy. #117 traffic will be carried over the divided four lane Hwy. #11 by means of a two span (110'-110') structure.

The profile grade of Hwy. #117 is set at elev. 928 (H.O.T. 313+55.75, Hwy. #11 median). The lowest ground level adjacent to the proposed structure is at about elev. 900  $\pm$  thus requiring up to 28 ft. high approach embankments.

The subsoil at this site was found to consist of a 16 to 66 ft. thick deposit of sandy silt to silty sand, traces of gravel and clay, followed by gneiss type bedrock, and/or bouldery zone.

### Structure Foundations

All of the footings (abutments & pier) may be supported on end-bearing steel 'H' piles driven to practical refusal.

It is expected from the boring information that the piles will meet practical refusal at the following levels:

East Abutment	elev. 876-878
Pier	elev. 888-893
West Abutment	elev. 840-846

Design loads up to 120 tons per pile may be assumed for HP 12x74 piles. The pile tips should be reinforced to prevent damage during pile driving.

As an alternative, the abutments may be supported on spread footings placed on well compacted suitable granular material within the approach fills. A safe design load of 3.0 tsf may be assumed.

The granular material should consist of granular 'A' and should be fully compacted according to the current MTC standards. A construction scheme is outlined on Fig. 2 of the Appendix.

As an alternative to a piled foundation, the pier may be founded on compacted granular 'A' core placed within the original ground. The following construction procedures are recommended.

Excavate the silty sand to sandy silt subsoil at the footing locations beginning at the north end.

The width and the length of the excavation should be 6 ft. larger than the footing size. (i.e. 3 ft. at each side)

The depth should be in accordance with the frost protection requirements plus 4 ft.

Place 5 ft. of granular 'A' at the bottom of excavation. This should be compacted to 100% proctor density.

Excavate compacted granular 'A' (1 ft. deep) for footing.

The sandy silt to silty sand subsoil is susceptible to 'boiling' when subjected to unbalanced hydrostatic pressure. The magnitude of this pressure should be determined at the time of construction. Should the excavation base be located below the prevailing groundwater level a dewatering scheme will be required. If closed, interlocking steel sheet piling is incorporated into the scheme it should be driven to a depth below the excavation base equal to the prevailing groundwater pressure head existing above this level.

If the above recommendations are followed an allowable bearing value of 3.0 tsf may be used for design purposes. Up to 1 inch of differential settlement is expected to take place if a combination of piled and spread footing type foundations (abutments and pier) are constructed. A similar amount of differential settlement is anticipated if the abutments and pier are founded on spread footings on compacted fill. If the entire structure is founded on end-bearing piles the differential settlements will be negligible. The choice of foundation support should be governed by economical considerations.

#### Approach Embankments

The maximum height of the proposed approaches is in the order of 28 ft. Fills of this height will be stable with respect to failure within the foundation subsoil provided, the fill is properly placed and compacted and

2:1 side and forward slopes are employed.

The granular subsoil will settle due to the induced footing and embankment loading. This settlement will be elastic in nature; i.e., take place during or immediately following the construction period.

The fill should consist of well compacted acceptable material. Care should be taken to ensure that no bouldery material is placed within the approaches through which piles have to be driven and it is recommended that this portion of the fill contain grain sizes not larger than 3 inches.

#### Other Considerations

The pile caps and/or the base of spread footings should be protected against frost action with a minimum of 6 ft. of earth cover.

For computation of sliding resistance for abutments founded on spread footings a friction coefficient of 0.55 may be assumed to apply between bases of footing and underlying compacted granular 'A' fill.

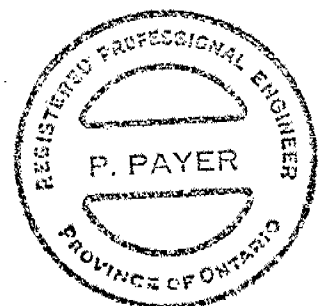
#### MISCELLANEOUS

The field investigation was carried out under the supervision of Mr. J. Murray, Student Technician.

The equipment was owned and operated by Master Soil Investigation Ltd. This report was written by Mr. P. Payer.

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KGS/PP/bp  
June, 1977


## APPENDIX



MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 1

WP 32-77-02 LOCATION Co-ords. N 16,384,017; E 1,052,076 ORIGINATED BY JM  
 DIST 11 HWY 11 BORING DATE March 23,24,25,28, 1977 COMPILED BY JM  
 DATUM Geodetic BOREHOLE TYPE Cont.' Flight Auger & BXL Rock Coring 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 × LAB VANE	LIQUID LIMIT $w_L$ PLASTIC LIMIT $w_p$ WATER CONTENT $w$ $w_p$ — $w$ — $w_L$ WATER CONTENT % 10 20 30	UNIT WEIGHT $\gamma$	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N° VALUES					
908.2	Ground Level									
0.0	Silty Sand to Sandy silt Traces of gravel, clay  Loose to Dense		1	SS	48					2 94 (4)
			2	SS	33					
			3	SS	18					
			4	SS	12					0 36 63 1
			5	SS	20					
			6	SS	6					
			7	SS	11					
			8	SS	-					
			9	SS	6					0 67 32 1
			10	SS	11					
875.4			11	SS	47					0 93 (7)
32.8	Weathered Gneiss		12	BXL RC	84%					
870.4	Bedrock Sound		13	BXL RC	94%					
37.8	End of Borehole									

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 2

WP 32-77-02 LOCATION Co-ords. N 16,384,045; E 1,052,064 ORIGINATED BY JM  
 DIST 11 HWY 11 BORING DATE March 29,30,31, 1977 COMPILED BY JM  
 DATUM Geodetic BOREHOLE TYPE Cont.' Flight Auger & BXL Rock Coring CHECKED BY EP  
 & Cone Test

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT $w_L$ PLASTIC LIMIT $w_p$ WATER CONTENT $w$ $w_p \quad w \quad w_L$ WATER CONTENT % 10 20 30	UNIT WEIGHT $\gamma$	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100			
907.3	Ground Level													
0.0	Silty Sand to Sandy Silt Traces of gravel, clay		1	SS	65									
			2	SS	29									
			3	SS	34									
			4	SS	9									
			5	SS	4									
	- Some - Gravel		6	SS	16									
	Loose to Very Dense		7	WS	-									
			8	SS	24									
877.2			9	SS	35									
30.1 874.2	Gneiss Weathered Bedrock Sound		10	BXL RC	97%									
33.1	End of Borehole													

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 3

WP 32-77-02 LOCATION Co-ords. N 16,383,949; E 1,051,987 ORIGINATED BY JM  
 DIST 11 HWY 11 BORING DATE April 1,7,12, 1977 COMPILED BY JM  
 DATUM Geodetic BOREHOLE TYPE Cont.' Flight Auger & Cone Test CHECKED BY GP

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 % 10 20 30	UNIT WEIGHT $\gamma$	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES					
909.0	Ground Level									
0.0	Some Gravel		1	SS	8					21 74 (5)
	Silty Sand to Sandy Silt		2	SS	18					0 86 13 1
	Trace of clay		3	SS	32					
	Loose to Dense		4	SS	20					
			5	SS	12					0 38 62 0
892.7			6	SS	113	10"				
16.3	End of Borehole (Refusal)					890				

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 4

WP 32-77-02 LOCATION Co-ords. N 16,384,023; E 1,051,953 ORIGINATED BY JM  
 DIST 11 HWY 11 BORING DATE April 1,11,12, 1977 COMPILED BY JM  
 DATUM Geodetic BOREHOLE TYPE Cont.' Flight Auger & BXL Rock Coring CHECKED BY SP

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 % 10 20 30	UNIT WEIGHT $\gamma$	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES					
907.5	Ground Level									
0.0	Silty Sand Traces of gravel, clay  Loose to Compact		1	SS	12				0 93 (7)	
			2	SS	21					
			3	SS	14					
			4	SS	6					
			5	SS	-					
			6	SS	-					
888.0						890				
19.5	Gneiss Bedrock Sound		7	RC	100 %					
881.7			8	RC	100 %					
25.8	End of Borehole									

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 5

WP 32-77-02 LOCATION Co-ords. N 16,383,927; E 1,051,876 ORIGINATED BY JM  
 DIST 11 HWY 11 BORING DATE April 1,5,6,7, 1977 COMPILED BY JM  
 DATUM Geodetic BOREHOLE TYPE Cont.' Flight Auger & Cone Test CHECKED BY JP

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT			LIQUID LIMIT ——— $w_L$ PLASTIC LIMIT ——— $w_p$ WATER CONTENT ——— $w$			UNIT WEIGHT $\gamma$	REMARKS	
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	$w_p$			$w$
906.3	Ground Level														
0.0	Silty Sand to Sandy Silt Traces of gravel, clay  Loose to Very Dense		1	SS	29										7 78 14 1
			2	SS	18										4 73 22 1
			3	SS	8										
			4	SS	13										
			5	SS	69										
			6	SS	53										
			7	SS	28										
			8	SS	22										10 55 34 1
			9	SS	26										2 30 66 2
			10	SS	18										
			11	SS	23										1 55 43 1
			12	SS	13										
			13	WS											
840.3			14	SS	120										
66.0	End of Borehole (Refusal)														

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

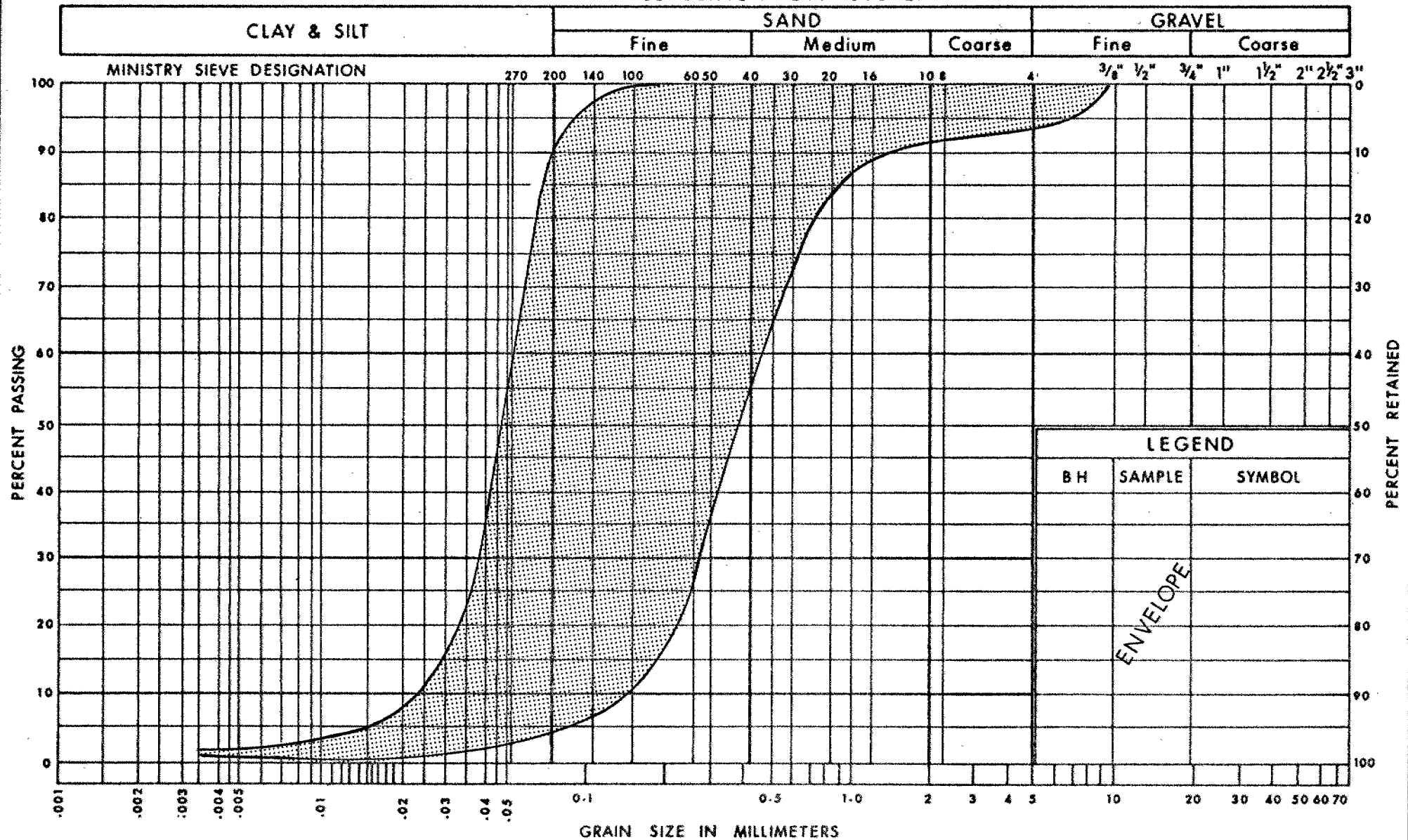
HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 6

WP 32-77-02 LOCATION Co-ords. N 16,383,954; E 1,051,863 ORIGINATED BY JM  
 DIST 11 HWY 11 BORING DATE March 31, April 1, 1977 COMPILED BY JM  
 DATUM Geodetic BOREHOLE TYPE Cont.' Flight Auger, Wash Bore & BXL Rock Coring & 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 $W$ $W_P$ $W$ $W_L$ WATER CONTENT % 10 20 30	UNIT WEIGHT $\gamma$	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100			
906.6	Ground Level													
0.0	Silty Sand to Sandy Silt		1	SS	64									0 72 27 1
			2	SS	15									
			3	SS	8									
			4	SS	17									
	Sand & Gravel		5	SS	54									45 51 (4)
	Traces of gravel, clay		6	SS	44									
			7	SS	19									
			8	SS	15									3 29 67 1
			9	SS	19									
	Loose to Very Dense		10	SS	28									
			11	SS	16									0 82 18 0
			12	SS	13									
			13	SS	14									
			14	SS	6									
845.6			15	SS	8									0 67 31 2
61.0	Boulders (Refusal to conventional boring methods)		16	BXL RC	12%									
836.0														
70.6	End of Borehole													

# UNIFIED SOIL CLASSIFICATION SYSTEM



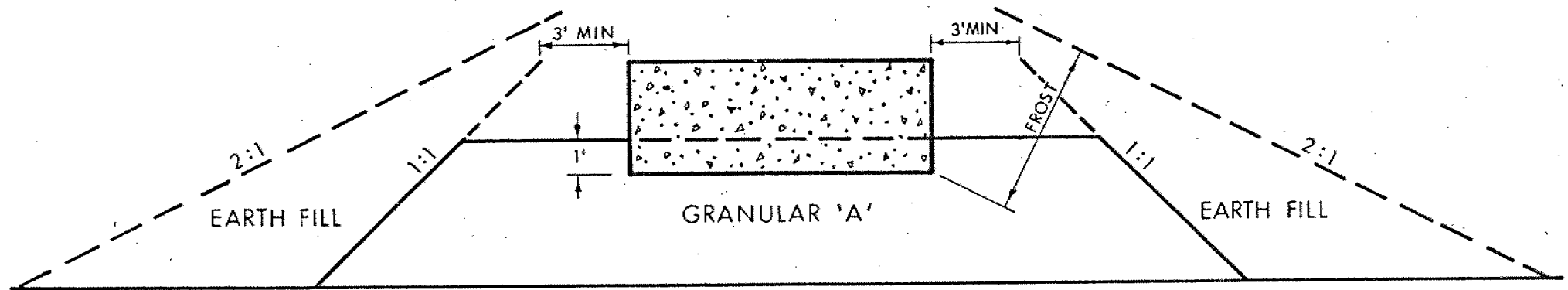
**Ministry of  
Transportation and  
Communications**

GRAIN SIZE DISTRIBUTION  
SILTY SAND TO SANDY SILT

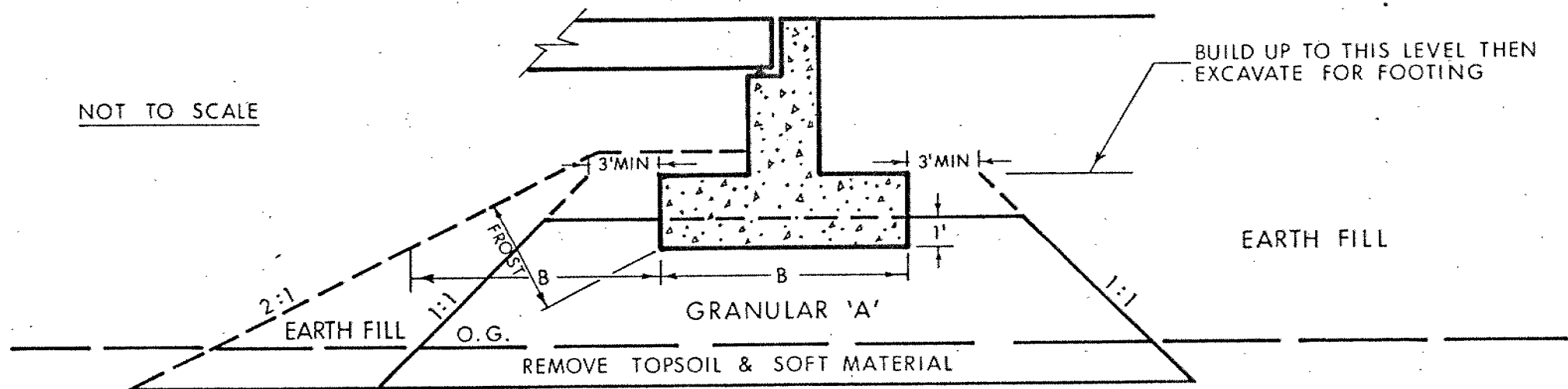
FIG No 1

WP 32-77-02

## ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



X SECTION



LONGITUDINAL SECTION

### NOTES:

- 1- REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A' & EARTH FILL.
- 2- PLACE GRANULAR 'A' & EARTH FILL TO TOP OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M.T.C. STANDARDS.
- 3- EXCAVATE COMPACTED GRANULAR 'A' & EARTH FILL FOR FOOTING.

FIG. 2



## ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

### PENETRATION 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

$\gamma$	UNIT WEIGHT OF SOIL (BULK DENSITY)
$\gamma_s$	UNIT WEIGHT OF SOLID PARTICLES
$\gamma_w$	UNIT WEIGHT OF WATER
$\gamma_d$	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
$\gamma'$	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
$\tau_f$	SHEAR STRENGTH
$c'$	EFFECTIVE COHESION INTERCEPT
$\phi'$	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
$c_u$	APPARENT COHESION
$\phi_u$	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
$\mu$	COEFFICIENT OF FRICTION
$S_t$	SENSITIVITY

### GENERAL

$\pi$	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a 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
$\sigma$	NORMAL STRESS
$\bar{\sigma}$	NORMAL EFFECTIVE STRESS ( $\bar{\sigma}$ IS ALSO USED)
$\tau$	SHEAR STRESS
$\epsilon$	LINEAR STRAIN
$\gamma$	SHEAR STRAIN
$\nu$	POISSON'S RATIO ( $\mu$ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
$\eta$	COEFFICIENT OF VISCOSITY

### EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
$\delta$	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

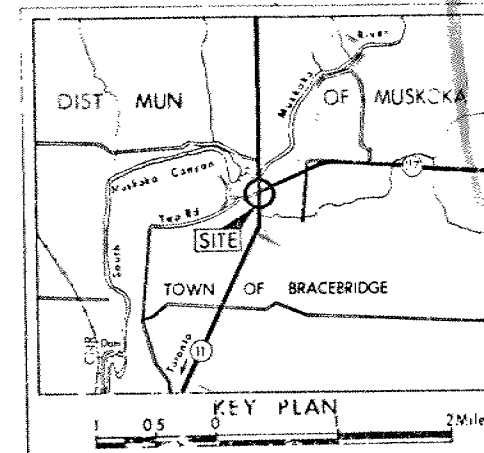
H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
$\beta$	ANGLE OF SLOPE TO HORIZONTAL

CONT No  
WP No 32-77-02

INTERCH N JCT HWY 11 & 117

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)
- WL at time of investigation  
Mar & Apr 1977

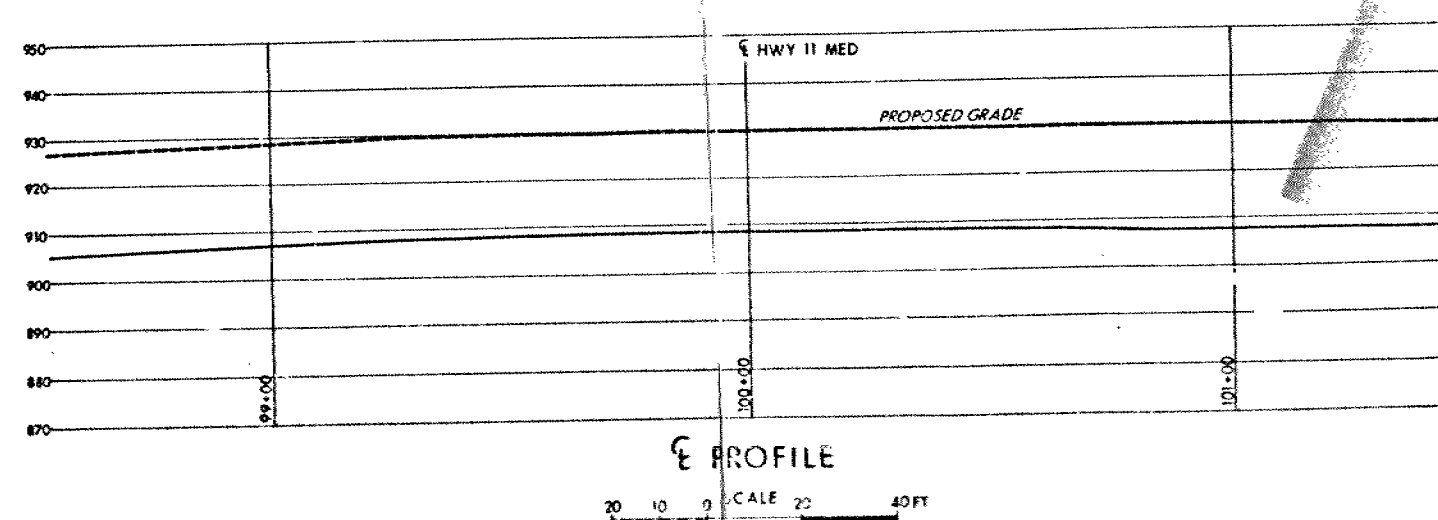
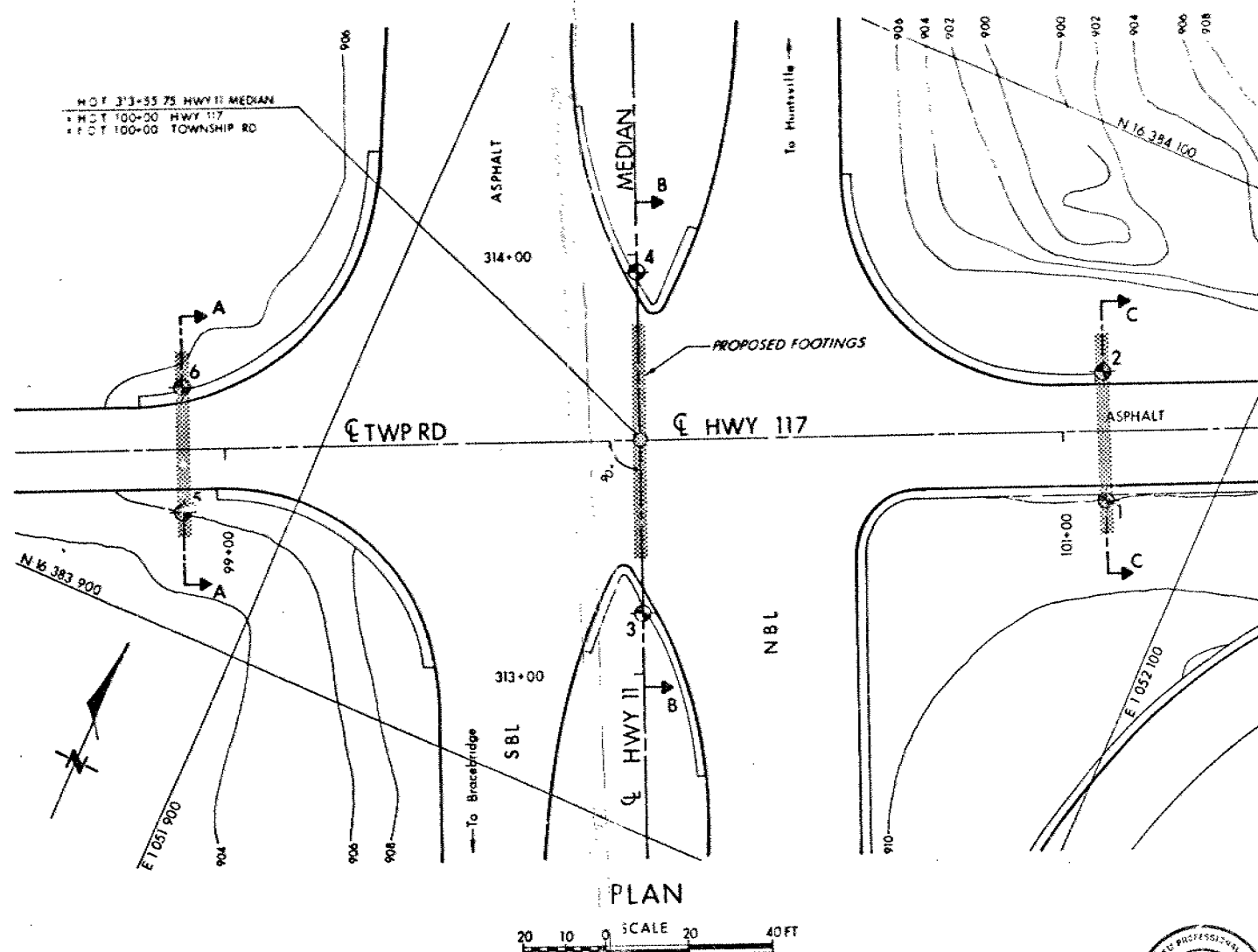
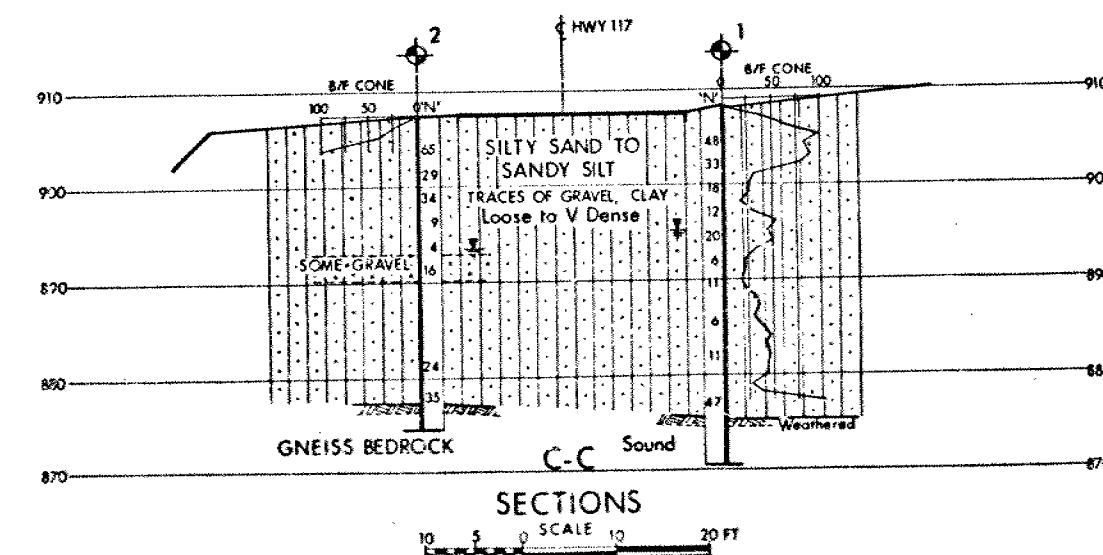
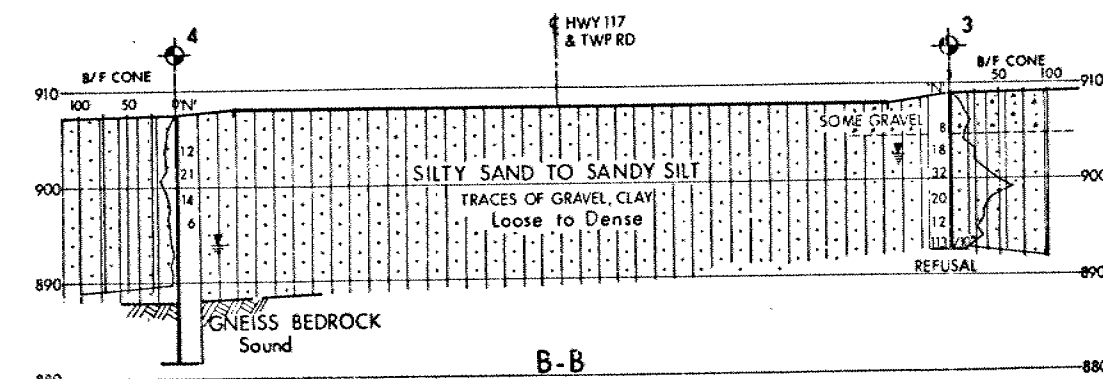
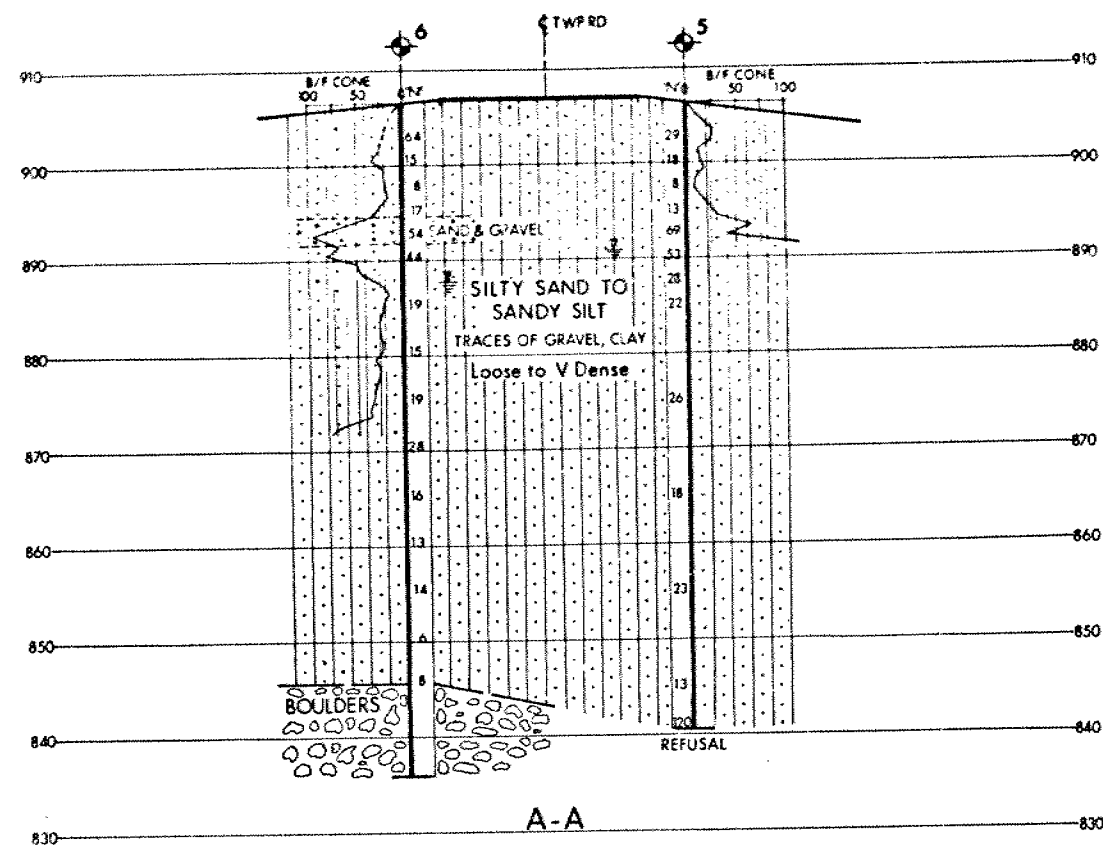
No	ELEVATION	CO-ORDINATES NORTH	EAST
1	908.2	16 384 017	1052 076
2	907.3	16 384 045	1052 064
3	909.0	16 383 949	1051 987
4	907.5	16 384 023	1051 953
5	906.3	16 383 927	1051 876
6	908.6	16 383 954	1051 863

# -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

MAP No 11  
SIGNED P.P. CHECKED DATE JUNE 27, 1977 BY 42-174  
DRAWN J.N. CHECKED DATE JUNE 27, 1977 BY 327702-A



6-1-79 5:45 PM

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 31E-87

DIST. II REGION NORTHERN

W.P. No. 32-77-02

CONT. No. 78-82

W. O. No. \_\_\_\_\_

STR. SITE No. 42-174

HWY. No. \_\_\_\_\_

LOCATION HWY II AND HWY 117

INTERCHANGE

\_\_\_\_\_

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT 3

REMARKS: \_\_\_\_\_

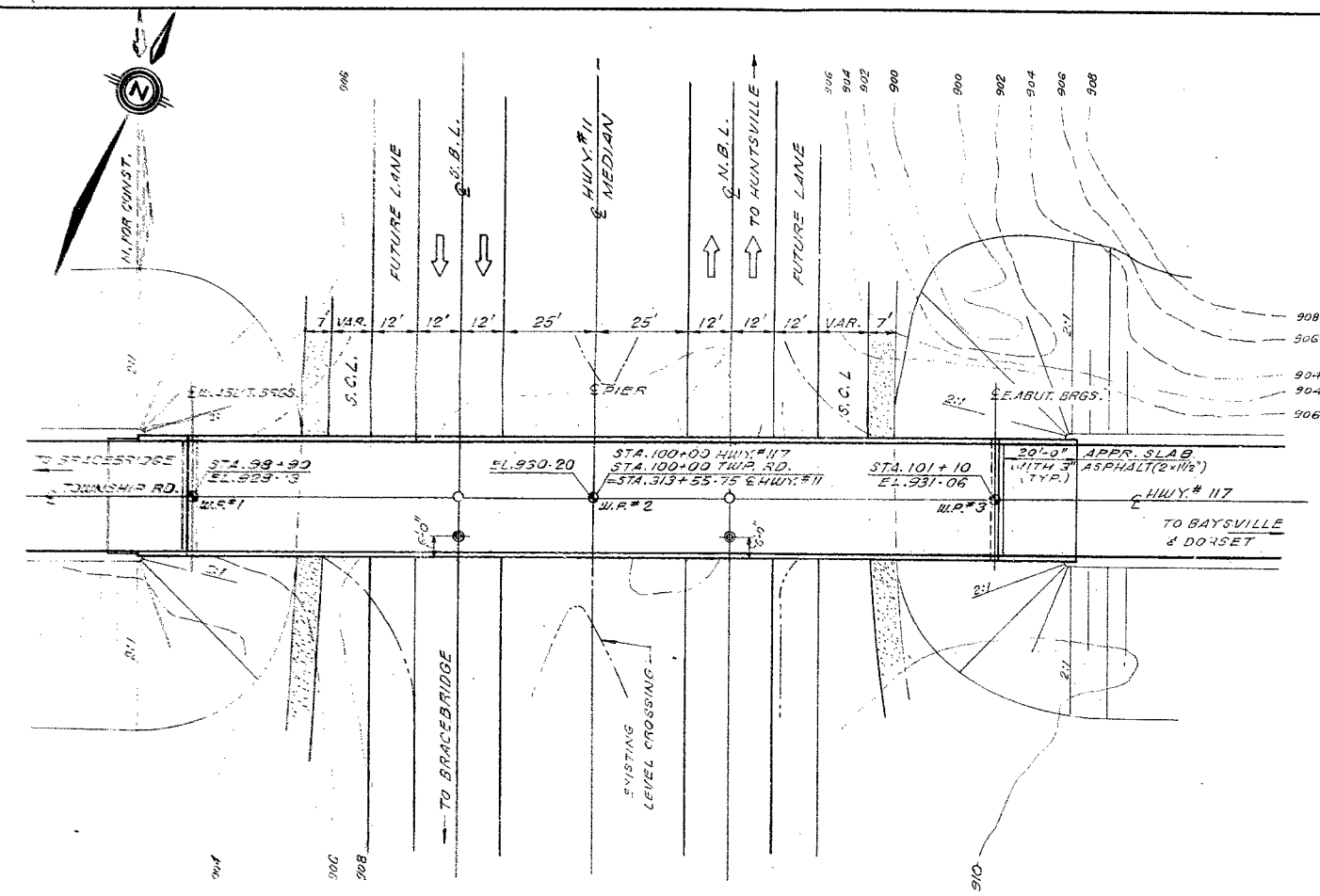
\_\_\_\_\_

\_\_\_\_\_

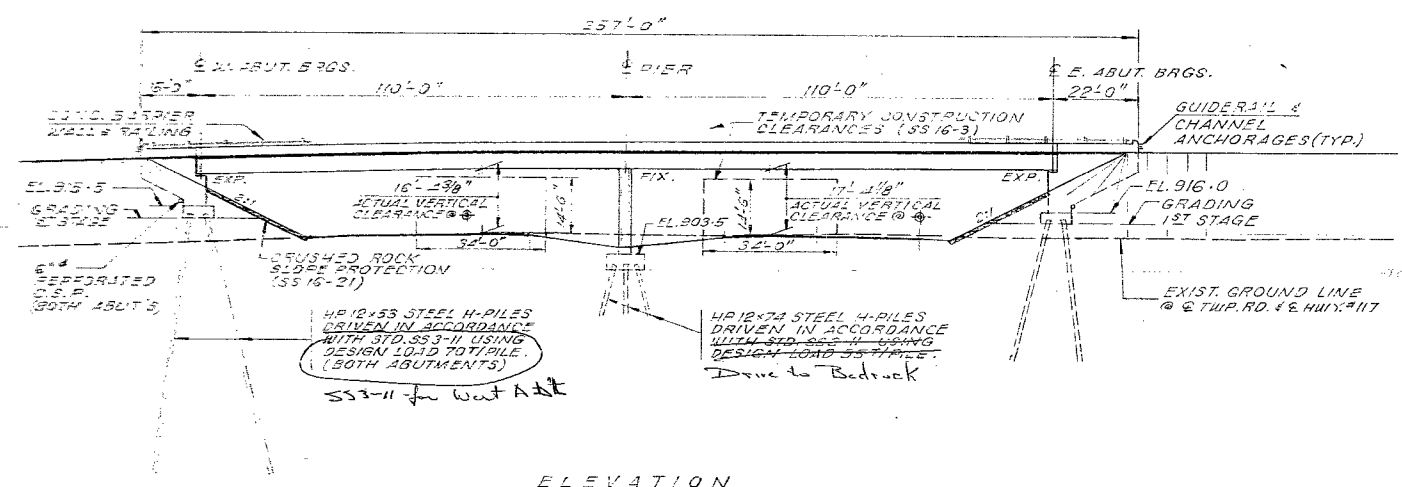
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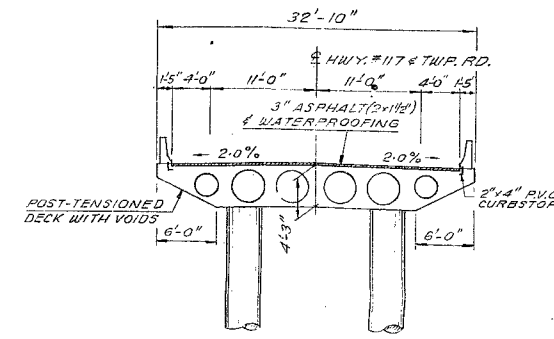
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO 315 LORRIS AVE.



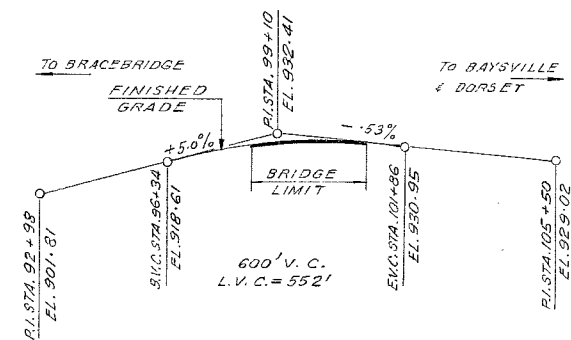
PLAN  
1" = 20'-0"



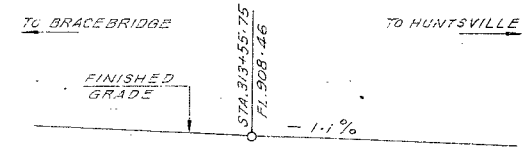
ELEVATION  
1" = 20'-0"



TYP. DECK SECTION  
1/8" = 1'-0"



PROFILE @ HWY. #117 & TWP. RD.  
N.T.S.



PROFILE @ S.B.L. & Q.N.B.L. (HWY. #117)  
N.T.S.

31E-87

DIST. 11	SHEET
CONT. No WP No 32-77-72	
HWY. #11 & HWY. #117 INTERCHANGE GENERAL LAYOUT	

- NOTES:
- REINFORCING STEEL GRADES  
50 K.S.I.
- CLASS OF CONCRETE  
DECK & BARRIER WALLS - 4,500 P.S.I.  
PIER COLUMNS - 4,000 P.S.I.  
REMAINDER - 3,000 P.S.I.
- CLEAR COVER ON REINFORCING STEEL  
FOOTINGS & ABUTMENTS - 3"  
PIER COLUMNS - 2 1/2"  
DECK TOP - 2"  
DECK BOTTOM - 1 1/2"  
BARRIER WALLS - 1 1/2"  
APPROACH SLABS - 2"  
AND/OR AS NOTED ON DRAWINGS.
- CONSTRUCTION NOTES  
THE CONTRACTOR SHALL FINISH THE  
BEARING SEATS DEAD LEVEL TO THE  
SPECIFIED ELEVATIONS TO A  
TOLERANCE OF ± 1/8".
- NO CONCRETE SHALL BE PLACED  
ABOVE THE ABUTMENT BEARING  
SEATS UNTIL THE CONCRETE IN  
THE DECK HAS BEEN PLACED,  
STRESSED AND GROUTED.
- TO ACHIEVE THE MINIMUM CLEAR COVER  
OF 2" SPECIFIED THE TOP LAYER OF  
REINFORCEMENT SHALL BE PLACED PRIOR  
TO CONCRETING WITH A CLEAR COVER  
OF 2 1/2" ± 1/8" TOLERANCE.

- LIST OF DRAWINGS
- 42-174-1 GENERAL LAYOUT  
2 BORE HOLE LOCATIONS & SOIL STRATA  
3 FOOTING LAYOUT  
4 WEST ABUTMENT  
5 EAST ABUTMENT  
6 PIER  
7 DECK LAYOUT, ELEVATIONS, ABUT. BEARINGS  
8 LONGITUDINAL CABLE DETAILS  
9 TRANSVERSE CABLE DETAILS  
10 DECK REINFORCEMENT  
11 BARRIER WALL  
12 STEEL RAILING (SINGLE TUBE)  
13 20 FT. APPROACH SLAB  
14 STANDARD DETAILS I  
15 STANDARD DETAILS II  
16 STANDARD DETAILS III  
42-174-11 AS CONSTRUCTED ELEV. & DIA.

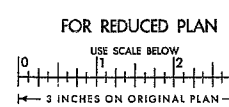
CONCRETE QUANTITIES

CONCRETE IN PIERS	16	CY (4,000 P.S.I.)
ABUTMENTS & BARRIER WALLS	122	CY (3,000 P.S.I.)
PRESTRESSED CONCRETE BRIDGE DECK	728	CY.
CONCRETE IN BARRIER WALLS	39	CY.
CONCRETE IN APPROACH SLABS	38	CY.

30/Nov/77  
Finalized  
RS



B.M. EL. 902.06  
N.E. W. IN EAST FOOT  
OF 1.0' PINE TREE  
160' LT. 310+05



REVISIONS

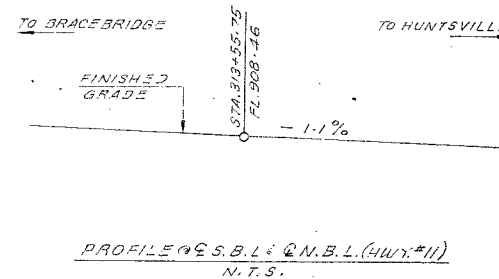
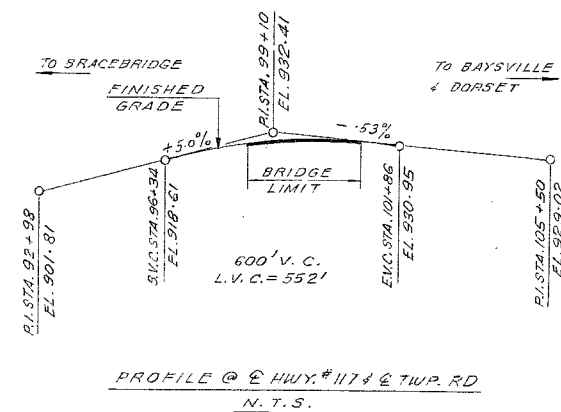
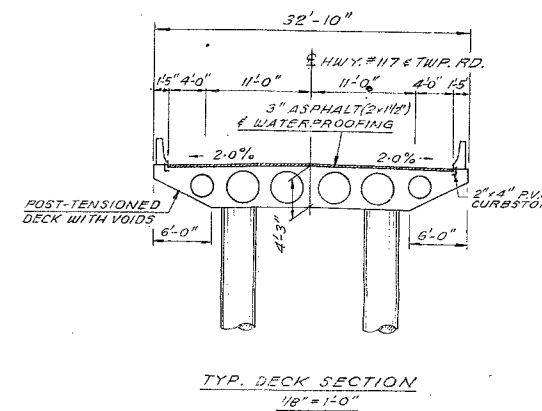
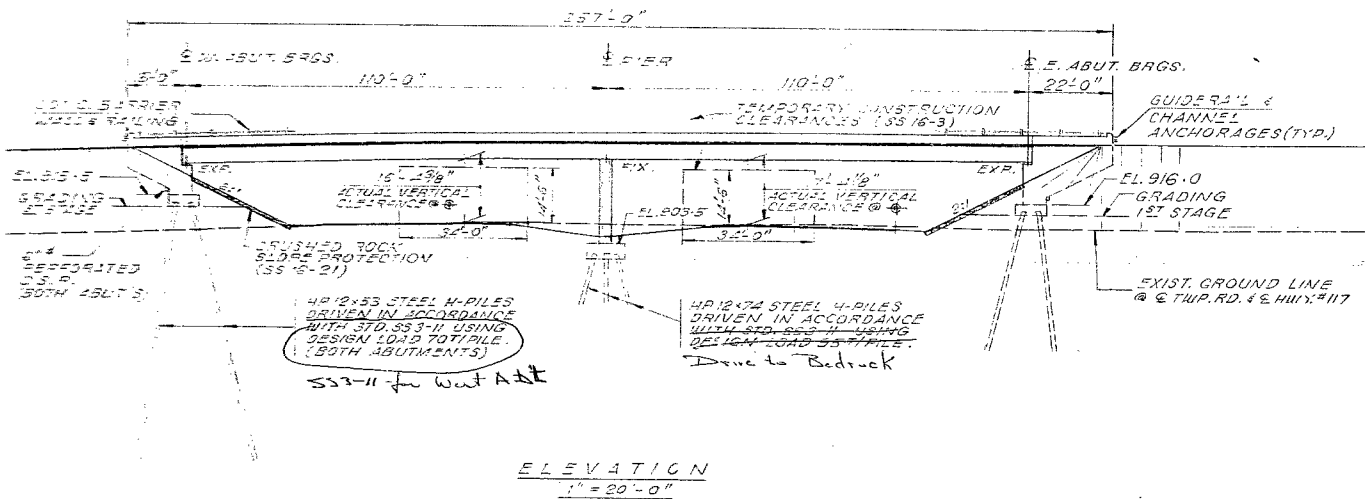
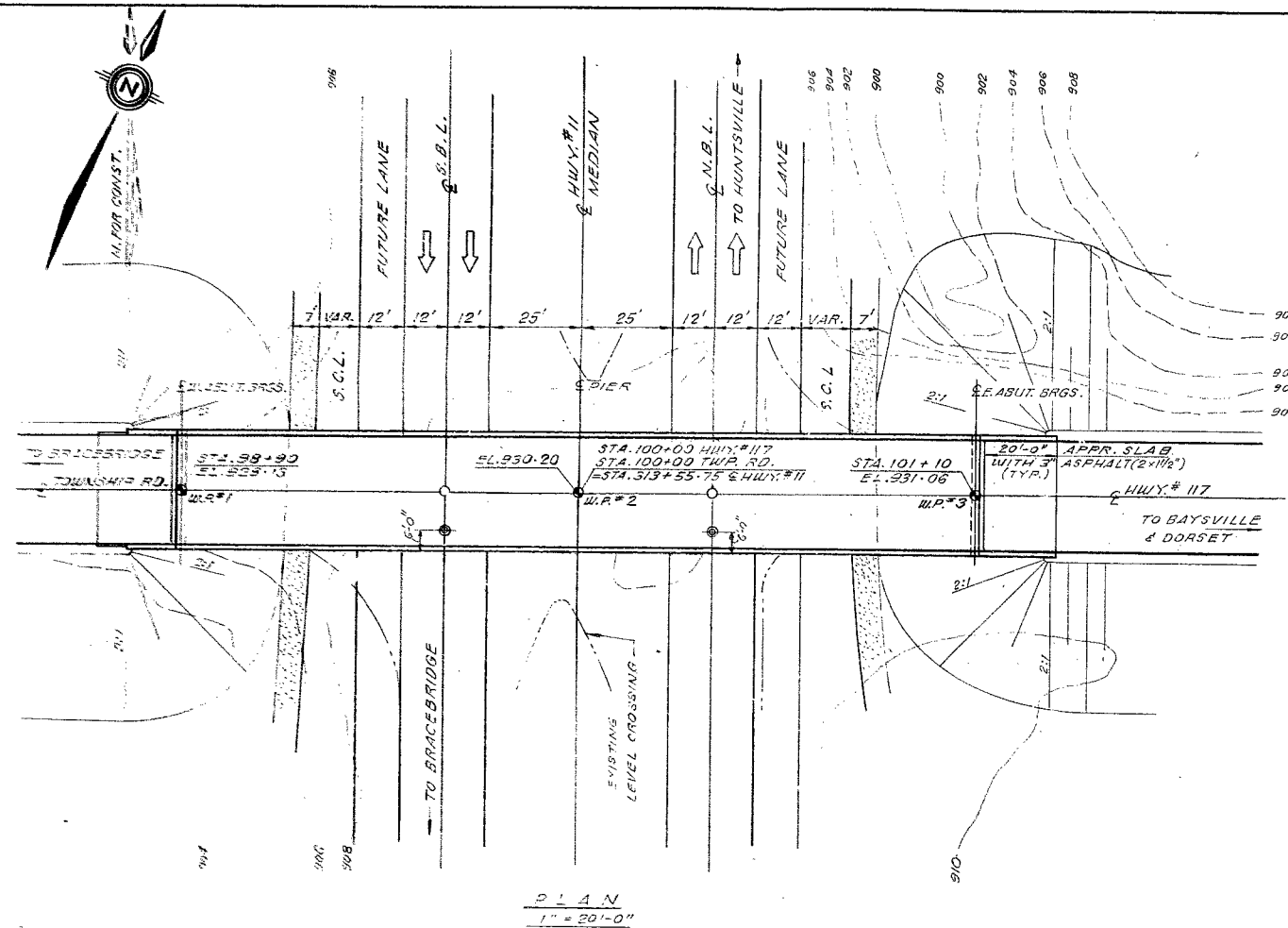
DATE	BY	DESCRIPTION
DESIGN P.O.L.	CHECK F.C. LOADING	15-12-12 DATE NOV. 79
DRAWING L.S.	CHECK P.O.L. SITE	No 42-174 DWG 1

31E-87

DIST. II  
CONT. No  
WP No 32-77-02

HWY #11 & HWY #117  
INTERCHANGE  
GENERAL LAYOUT

SHEET



## NOTES:

REINFORCING STEEL GRADES  
50 K.S.I.

CLASS OF CONCRETE

DECK & BARRIER WALLS - 4,500 P.S.I.  
PIER COLUMNS - 4,000 P.S.I.  
REMAINDER - 3,000 P.S.I.

CLEAR COVER ON REINFORCING STEEL

FOOTINGS & ABUTMENTS - 3"  
PIER COLUMNS - 2 1/2"  
DECK TOP - 2"  
DECK BOTTOM - 1 1/2"  
BARRIER WALLS - 2"  
APPROACH SLABS - 1 1/2"  
AND/OR AS NOTED ON DRAWINGS.

## CONSTRUCTION NOTES

THE CONTRACTOR SHALL FINISH THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS TO A TOLERANCE OF 1/8".

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

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

## LIST OF DRAWINGS

42-174-1 GENERAL LAYOUT  
2 BORE HOLE LOCATIONS & SOIL STRATA  
3 FOOTING LAYOUT  
4 WEST ABUTMENT  
5 EAST ABUTMENT  
6 PIER  
7 DECK LAYOUT, ELEVATIONS & ABUT. BEARINGS  
8 LONGITUDINAL CABLE DETAILS  
9 TRANSVERSE CABLE DETAILS  
10 DECK REINFORCEMENT  
11 BARRIER WALL  
12 STEEL RAILING (SINGLE TUBES)  
13 20 FT. APPROACH SLAB  
14 STANDARD DETAILS I  
15 STANDARD DETAILS II  
16 STANDARD DETAILS III  
42-174-1 AS CONSTRUCTED ELEV. & DIM.

## CONCRETE QUANTITIES

CONCRETE IN PIER 16 C.Y. (3,000 P.S.I.)  
ABUTMENTS & BARRIER WALLS 122 C.Y. (3,000 P.S.I.)

PRESTRESSED CONCRETE BRIDGE DECK 728 C.Y.

CONCRETE IN BARRIER WALLS 39 C.Y.

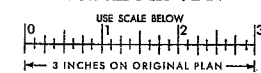
CONCRETE IN APPROACH SLABS 38 C.Y.

30/Nov/77  
Finalized  
RS



B.M. EL. 902.06  
11' & 11" IN EAST FOOT  
OF 1.0' PINE TREE  
160' LT. 310+05

FOR REDUCED PLAN



REVISIONS	DATE	BY	DESCRIPTION
1	NOV 29 1977	RS	DESIGN P.O. CHECK F.C. LOADING HS 20-44
2			DRAWING L.S. CHECK R.O. SITE No 42-174 DWG 1

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO 315 DUNDAS ST. W. TORONTO, ONT. M5G 1B6

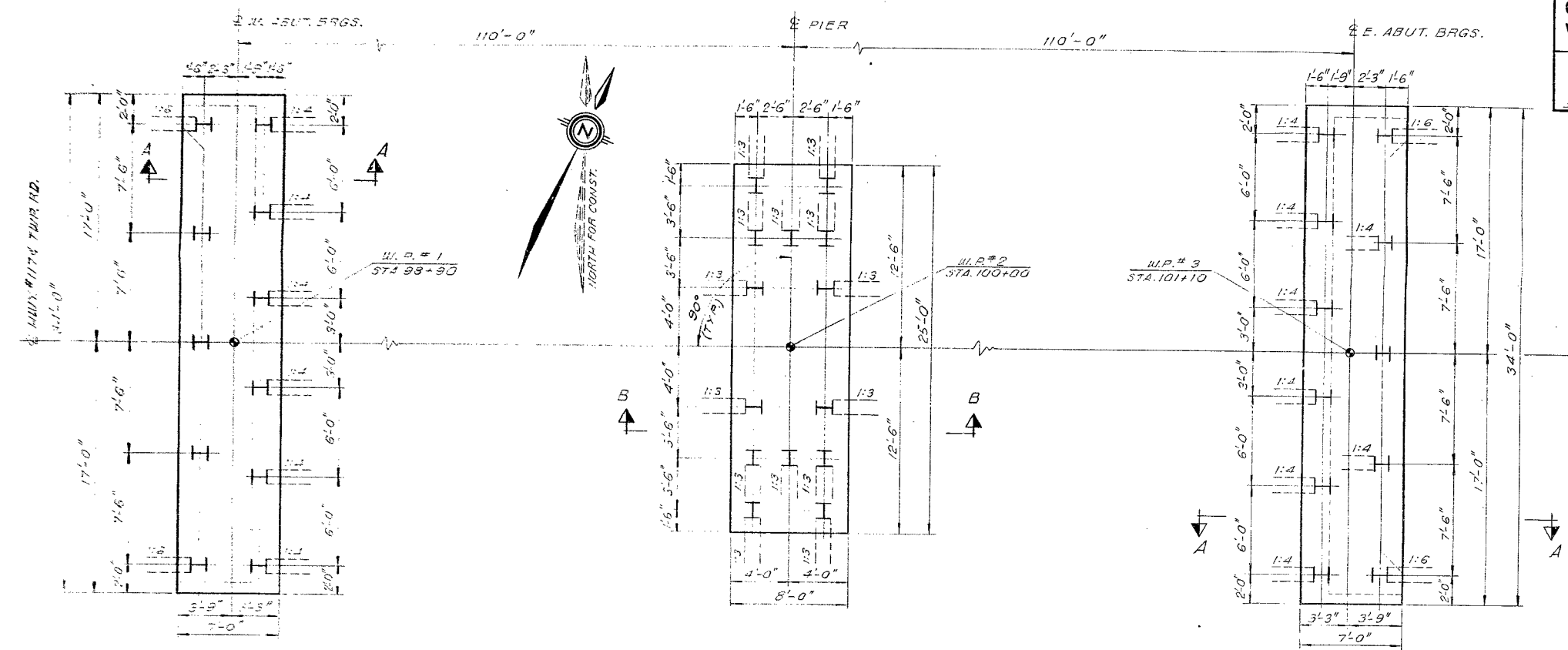
31E-87

DIST. 11  
CONT No  
WP No 32-77-02

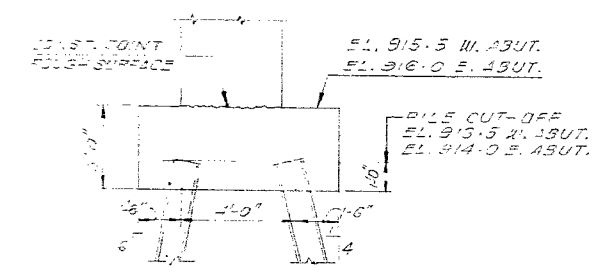
HWY. #11 & HWY. #117  
INTERCHANGE  
FOOTING LAYOUT



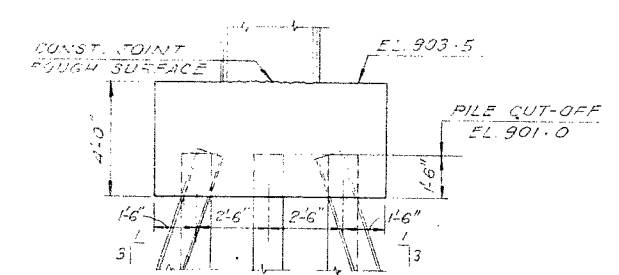
SHEET



FOOTING LAYOUT  
1/4" = 1'-0"



SECTION A-A  
3/8" = 1'-0"



SECTION B-B  
3/8" = 1'-0"

LIST OF STEEL H-PILES

LOCATION	TYPE	NO REQ'D	LENGTH	REMARKS
W. ABUTMENT	HP 12 x 53	11	78'-0"	WITH
PIER	HP 12 x 74	14	16'-0"	DRIVING
E. ABUTMENT	HP 12 x 53	11	42'-0"	SHOE

OK

OK



FOR REDUCED PLAN  
USE SCALE BELOW  
1 2 3  
0 1 2 3  
3 INCHES ON ORIGINAL PLAN

REVISIONS	DATE	BY	DESCRIPTION
DESIGN P.O.L.	CHECK F.C.	LOADING 4/5 20-24	DATE NOV 1977
DRAWING L.S.	CHECK P.O.L.	SITE No 22-174	DWG 3



# FOUNDATION INVESTIGATION REPORT

For

Hwy. 11 and Hwy. 117 Interchange  
W.P. 32-77-02, Site 42-174  
Hwy. 11, District 11, Huntsville

---

## INTRODUCTION

This report contains the results of our foundation investigation at the above mentioned site. The fieldwork was carried out during the period of March 23 to April 12, 1977 utilizing a continuous flight auger machine equipped with 3¼ inch I.D. hollow stem augers mounted on a muskeg vehicle.

## SITE DESCRIPTION

The site is located at the north junction of Hwy. 11 and Hwy. 117 approximately 900 feet south of north Muskoka River. The area adjacent to the site is tree covered. Topographically, the countryside is hilly with frequent rock outcrops.

## SUBSURFACE CONDITIONS

### General

Underlying a surficial cover of topsoil across the site is a granular deposit ranging in thickness between 16 and 70 feet. The granular deposit is followed either by sound gneiss bedrock or a bouldery zone. Reference should be made to the Record of Borehole Sheets which are contained in the report Appendix. These sheets contain descriptions of the soil and bedrock types encountered and in summarized form the results of 11 laboratory and field tests performed. Reference should also be made to Drawing No. 42-174-2 of the Contract Drawings. This Drawing shows the locations and elevations of borings, together with the estimated soil and bedrock stratigraphy. Detailed descriptions of the various strata are given below.

### Silty Sand to Sandy Silt, Traces of Gravel and Clay

This deposit was encountered at every boring location and extends immediately below the topsoil down to a maximum depth of 71 feet (BH #6). In BH #3, the lower boundary was found to be at elevation 893+, some 16 feet below ground level. At the other boring locations the thickness of the deposit was found to vary between the above quoted figures.

The material in the stratum consists of sands and silts in varying proportions. Mechanical analyses performed on selected samples indicate that in most cases the sand is the predominant grain size. Traces of gravel and clay were also encountered. The test results are shown in envelope form on Figure 1 attached to the Appendix. In most of the borings an approximate 3-4 foot thick gravelly layer was observed at or slightly above elevation 890.

Standard Penetration Tests carried out within the main deposit indicate that the relative density varies randomly from loose to very dense. The obtained 'N' values varied from 4 to 65 blows/foot. Some of the low 'N' values may be attributed to 'quick' conditions induced by boring operations. References should be made to the Record of Borehole Sheets for 'N' values. The natural moisture content ranges from 3% to 24%, the average being in the order of 17%.

### Bouldery Zone

Refusal to conventional washboring technique was reached in BH #6 at elevation 846+. The borehole was advanced by drilling BXL core barrel for an approximate distance of 10 feet. Several rock fragments ranging from 1/4 inch to 3 1/2 inches in size, together with some gravel pieces, were recovered.

### Bedrock

The bedrock at this location as described by Mr. B.K. Glassford, Geologist, consists of grey pink coloured gneiss containing high mica content. With the exception of the upper 4-8 inches, the bedrock is sound.

### Groundwater Conditions

The groundwater level was observed at 6 to 24 feet below existing ground level. It appears that the gravelly layer is the water bearing zone.

The following groundwater levels were established in the boreholes during the field investigation:

Borehole #1	Elevation 895.5
2	893.5
3	902.5
4	894.5
5	891.0
6	888.0

*P. Payer*  
P. Payer, P. Eng.  
Senior Engineer



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

## HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

## RECORD OF BOREHOLE NO 1

WP 32-77-02

LOCATION Co-ords. N 16,384,017; E 1,052,076

ORIGINATED BY JM

DIST 11 HWY 11

BORING DATE March 23,24,25,28, 1977

COMPILED BY JM

DATUM Geodetic

BOREHOLE TYPE Cont.' Flight Auger &amp; BXL Rock Coring

CHECKED BY Sp.

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	6 Cone Test		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE			LIQUID LIMIT — w <sub>L</sub> PLASTIC LIMIT — w <sub>p</sub> WATER CONTENT — w w <sub>p</sub> — w — w <sub>L</sub> WATER CONTENT % 10 20 30	% GR SA SI CL		
908.2	Ground Level									
0.0	Silty Sand to Sandy silt Traces of gravel, clay  Loose to Dense		1	SS	48					2 94 (4)
			2	SS	33					0 36 63 1
			3	SS	18					
			4	SS	12					
			5	SS	20					
			6	SS	6					
			7	SS	11					
			8	SS	-					
			9	SS	6					0 67 32 1
			10	SS	11					
			11	SS	47					0 93 (7)
875.4			12	BXL RC	84%					
32.8	was there		13	BXL RC	94%					
870.4	Gneiss Bedrock Sound									
37.8	End of Borehole									

## HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

## RECORD OF BOREHOLE NO 2

WP 32-77-02

LOCATION Co-ords. N 16,384,045; E 1,052,064

ORIGINATED BY JM

DIST 11 HWY 11

BORING DATE March 29,30,31, 1977

COMPILED BY JM

DATUM Geodetic

BOREHOLE TYPE Cont.' Flight Auger &amp; BXL Rock Coring

 CHECKED BY *el*

&amp; Cone Test

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT $W_L$ PLASTIC LIMIT $W_P$ WATER CONTENT $W$			UNIT WEIGHT $\gamma$	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	VALUES	20	40	60	80	100	$W_p$	$W$	$W_L$		
907.3	Ground Level														
0.0	Silty Sand to Sandy Silt Traces of gravel, clay		1	SS	65										
			2	SS	29										
			3	SS	34										
			4	SS	9										
			5	SS	4										
	- Some Gravel		6	SS	16										
	Loose		7	WS	-										
	to Very Dense														
			8	SS	24										
877.2			9	SS	35										
30.1	Weathered														
874.2	Gneiss Bedrock Sound		10	BXL RC	97%										
33.1	End of Borehole														

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 3

WP 32-77-02 LOCATION Co-ords. N 16,383,949; E 1,051,987 ORIGINATED BY JM  
 DIST 11 HWY 11 BORING DATE April 1,7,12, 1977 COMPILED BY JM  
 DATUM Geodetic BOREHOLE TYPE Cont.' Flight Auger & Cone Test CHECKED BY CP

SOIL PROFILE		STRAT. PLOT	SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT $W_L$ PLASTIC LIMIT $W_P$ WATER CONTENT $W$			UNIT WEIGHT $\gamma$	REMARKS
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE	'N' VALUES		20	40	60	80	100	$W_P$	$W$	$W_L$	
909.0	Ground Level														
0.0	Some Gravel		1	SS	8										
	Silty Sand to Sandy Silt		2	SS	18										
	Trace of clay		3	SS	32										
	Loose to Dense		4	SS	20										
892.7			5	SS	12										
			6	SS	113	10"									
16.3	End of Borehole (Refusal)					890									

OFFICE REPORT ON SOIL EXPLORATION

## HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

## RECORD OF BOREHOLE NO 4

WP 32-77-02 LOCATION Co-ords. N 16,384,025; E 1,051,953 ORIGINATED BY JM  
 DIST 11 HWY 11 BORING DATE April 1,11,12, 1977 COMPILE. BY JM  
 DATUM Geodetic BOREHOLE TYPE Cont.' Flight Auger & BXL Rock Coring CHECKED BY JP

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 % 10 20 30	UNIT WEIGHT $\gamma$	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE					
907.5	Ground Level								
0.0	Silty Sand		1	SS	12				
	Traces of gravel, clay		2	SS	21				
	Loose to Compact		3	SS	14				
			4	SS	6				
			5	SS	-				
			6	SS	-				
888.0			7	RC	100 %				
19.5	Gneiss Bedrock Sound		8	RC	100 %				
881.7									
25.8	End of Borehole								

OFFICE REPORT ON SOIL EXPLORATION

## HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

## RECORD OF BOREHOLE NO 5

WP 32-77-02

LOCATION Co-ords. N 16,383,927; E 1,051,876

ORIGINATED BY JM

DIST 11 HWY 11

BORING DATE April 1,5,6,7, 1977

COMPILED BY JM

DATUM Geodetic

BOREHOLE TYPE Cont.' Flight Auger &amp; Cone Test

CHECKED BY *JP*

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 % 10 20 30	UNIT WEIGHT $\gamma$	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE					
906.3	Ground Level								
0.0	Silty Sand to Sandy Silt Traces of gravel, clay  Loose to Very Dense		1	SS	29				7 78 14 1
			2	SS	18				
			3	SS	8				
			4	SS	13				4 73 22 1
			5	SS	69				
			6	SS	53				
			7	SS	28				
			8	SS	22				10 55 34 1
			9	SS	26				2 30 66 2
			10	SS	18				
			11	SS	23				1 55 43 1
			12	SS	13				
840.3			13	WS					
66.0	End of Borehole (Refusal)		14	SS	120				

OFFICE REPORT ON SOIL EXPLORATION



## HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

## RECORD OF BOREHOLE NO 6

WP 77-02

LOCATION Co-ords. N 16,383,954; E 1,051,863

ORIGINATED BY JM

DIST 11 HWY 11

BORING DATE March 31, April 1, 4, 1977

COMPILED BY JM

DATUM Geodetic

BOREHOLE TYPE Cont.' Flight Auger, Wash Bore &amp; BXL Rock

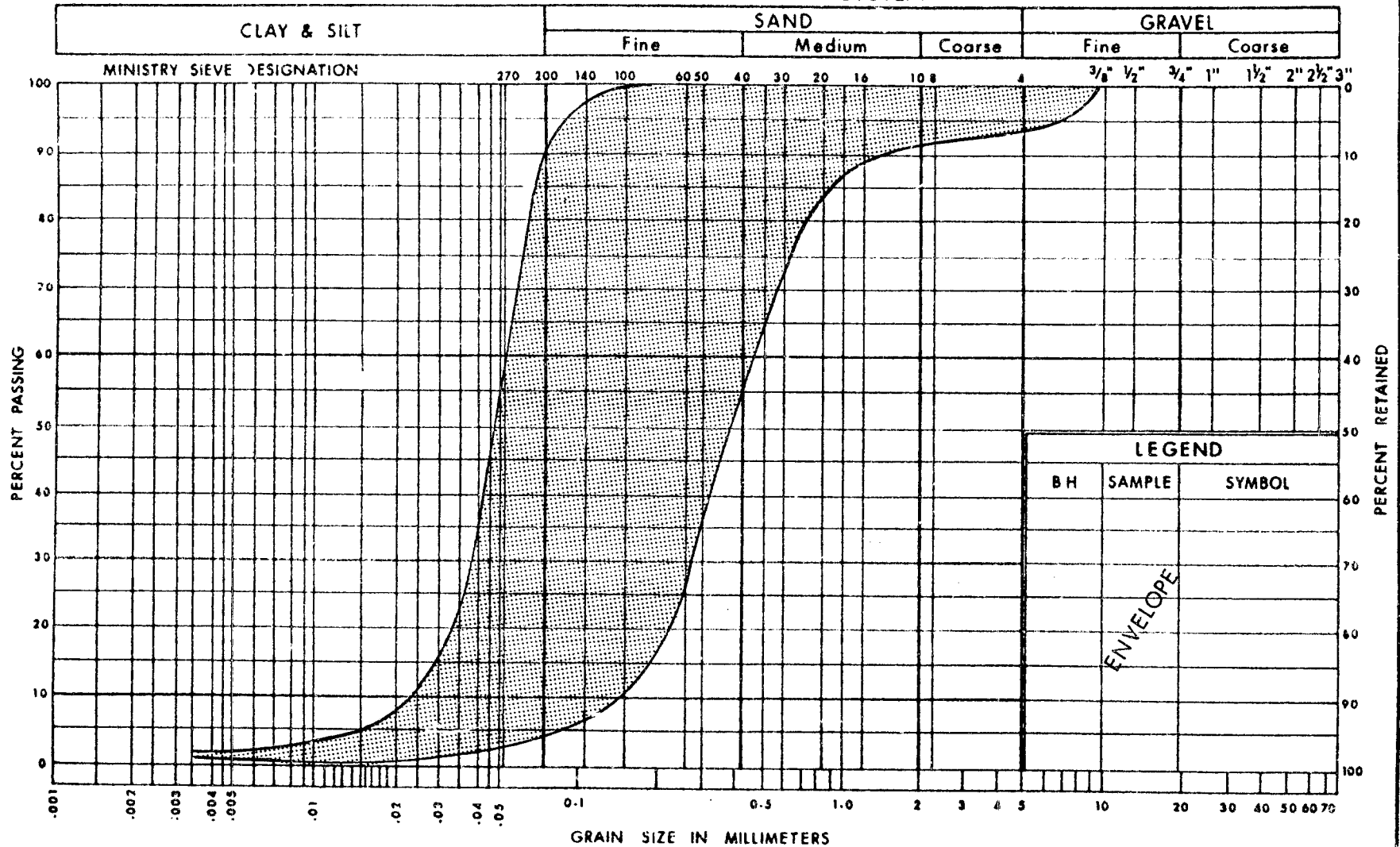
CHECKED BY

Coring &amp; Cone Test

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$			UNIT WEIGHT $\gamma$	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	N' VALUES	20	40	60	80	100	$w_p$	$w$	$w_L$		
906.6	Ground Level														
0.0	Silty Sand to Sandy Silt		1	SS	64										0 72 27 1
			2	SS	15										
			3	SS	8										
			4	SS	17										
	Sand & Gravel		5	SS	54										45 51 (4)
	Traces of gravel, clay		6	SS	44										
			7	SS	19										
			8	SS	15										3 29 67 1
			9	SS	19										
	Loose to Very Dense		10	SS	28										
			11	SS	16										0 82 18 0
			12	SS	13										
			13	SS	14										
			14	SS	6										
845.6			15	SS	8										0 67 31 2
61.0	Boulders (Refusal to conventional boring methods)		16	BXL RC	12%										
836.0															
70.6	End of Borehole														

OFFICE REPORT ON SOIL EXPLORATION

## UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of  
Transportation and  
Communications

GRAIN SIZE DISTRIBUTION  
SILTY SAND TO SANDY SILT

FIG No 1

W P 32-77-02

PRESENT: S. Kryzevicius - Structural Office  
A. McKim " "  
✓ P. Payer - Geotechnical Office.

- 1) Atikokan River Bridge, W.P. 201-77-02, Site 45-112,  
Highway 622, District 19. -----

Foundations: The Geotechnical Office is satisfied with the foundations of the structure. It was noted that driving shoes are called for on all the piles since they are being driven to bed rock.

Hydrology: Following the meeting the hydrology was discussed with J. Carter. While the Hydrology Section feels the 10° skew is not necessary at this location, it will not likely present a problem. All other aspects such as size of opening, rip rap, and apron are satisfactory.

There were no comments on the drawings except as indicated.

- 7 Change Conenco bearings to those of a supplier on the Designated Sources List.

- 13 & -14 It was suggested that the supply of expansion joints be opened up to Classes other than just Class A.

The deck is to be machine finished.

- 2) Highway 117 Interchange, W.P. 32-77-02, Site 42-174,  
Highway 11, District 11. -----

Foundations: The notes on sheet -1 are to be changed to have the piles at the pier and east abutment driven to bedrock. Those at the west abutment will be driven to a capacity of 70 tons in accordance with Std. SS3-11. It was decided not to limit the particle size of the first stage grading in the vicinity of the piles since the height of fill is only approximately 5 feet.

There were no comments on the drawings except as indicated.

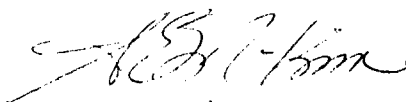
- 11 Construction joint between barrier wall and deck to be updated.
- 15 Details of steel angles at abutments to be revised in accordance with current policy. It was also suggested that the expansion joints be opened up to Classes other than just Class A
- 16 Update the Bridge Deck Waterproofing standard.



The D4 and Special Provisions are to be updated.

The deck is to be machine finished.

AEM/cf



A. E. McKim,  
Head, Southwestern Section.

c.c. Those in attendance.

J. B. Wilkes  
R. A. Dorton  
J. Carter  
E. Van Beilen  
J. McAllister  
W. Kulmatickas



## Memorandum

To: Mr. K.G. Selby  
Supervising Engineer

From: Soil Mechanics Section  
Engineering Materials Office  
West Building, Downsview

Attention:

Date: 77 04 15

Our File Ref.

In Reply to

Subject:

Re: Accident at W.P. 32-77-01 on April 11, 1977

On April 11, 1977 at the intersection of Hwy. 11 and Hwy. 117, a 2 inch O.D. rubber water hose which ran across the two southbound lanes of Hwy. 11, was picked up by the rear trailer wheels of a transport truck. The estimated speed of the vehicle was 75 mph when it passed over the hose. Approximately 200 feet of hose was dragged for 600 feet where it dis-entangled itself from the trailer.

The driller, Mr. B. Austin, of Master Soil Investigation Ltd., was struck across the back as the hose was pulled away by the truck. His injuries were limited to back pain for the remainder of the day and drilling continued using a 500 gallon tank. Damage included a broken water hose, a bent highway sign and a damaged guard rail.

On April 6, 1977, I had applied for permission to run a hose across the highway. Mr. M. Rodgers of Huntsville visited the site on April 6, 1977 and subsequently permission was granted to run the hose across the highway by M.T.C. District 11. At the time of the accident bump warning signs and men at work signs with orange cones around the drill machine were in place.

*J. Murray*

J. Murray  
Student Technician

JM/gs

cc: Files  
Record Services

I contacted H. Dagenais of Master Soil by 'phone on 77-04-15. He advised me that the accident was not reported to the police since it was impossible to get the number of the truck involved and since in his opinion the damage was minor and since Mr. Austin was not injured in any way.

K. G. Selby  
77-04-15

c.c. District Engineer  
Insurance & Claims  
P.L. ✓