

MEMORANDUM

CC: GEN. FILES

W.P. 252-62

To: Mr. B. R. Davis,
Bridge Engineer,
Bridge Division.

FROM: Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

Attention: Mr. S. McCombie

DATE: March 29, 1966

OUR FILE REF.

IN REPLY TO

APR - 6 1966

SUBJECT:

FOUNDATION INVESTIGATION REPORT
At
The Site of the Proposed Crossing
of Hwy. #24 and the C.N.R. Track,
Town of Simcoe, District #2 (London).

W.J. 66-F-13 -- W.P. 252-62

Attached, we are forwarding to you, our detailed foundation investigation report on the subsoil conditions existing at the above structure site.

We believe that you will find the factual data and recommendations contained therein, adequate for your design requirements.

Should additional information be required, please do not hesitate to contact our Office.

AGS/MdeF

Attach.

cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
A. Gater
H. C. Dernier
J. Roy
A. Watt

Foundations Office
Gend Files

Afterman
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

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FOUNDATION INVESTIGATION REPORT
At
The Site of the Proposed Crossing
of Hwy. #24 and the C.N.R. Track,
Town of Simcoe, District #2 (London).
W.J. 66-F-13 -- W.P. 252-62

1. INTRODUCTION:

In a memo, dated January 11, 1966, the Bridge Location Section requested a foundation investigation at the site of the proposed crossing of Hwy. #24 and the C.N.R. track at Simcoe, Ontario. Accordingly, a field investigation and subsequent laboratory test program were undertaken by this Section.

Presented in this report are the results of the above investigation, together with recommendations regarding the foundations.

2. DESCRIPTION OF THE SITE:

The site is located at the north side of the Town of Simcoe, some 0.35 mi. north of the crossing of Hwy. #24 and Hwy. #3. The proposed Hwy. #24, Line "L" crosses the C.N.R. tracks some 70 ft. west of the existing highway. Physiographically, the area is known as the "Norfolk Sand Plain". The sands and silts of this region were deposited as a delta in glacial lakes Whittlesey and Warren. Most of the moraines are partially or entirely buried by these sands, the depth of which is usually around 30 ft.

3. FIELD INVESTIGATION PROCEDURE:

Four sampled boreholes and two additional cone penetration tests were carried out during the field investigation. The soil exploration was performed by means of a conventional diamond drill rig adapted for soil sampling purposes. Standard split-spoon samplers were used to recover soil specimens and to record the Penetration "N" values. Driving energy of the Standard and Cone penetration tests was 350 ft. lbs. per blow.

3. FIELD INVESTIGATION PROCEDURE: (cont'd.)

Locations and elevations of the boreholes are shown on Drawing #66-F-13A, appended to this report.

4. SUBSOIL CONDITIONS:

4.1) General:

Soil samples were visually examined and identified upon recovery. In order to determine the physical properties of the soils, standard laboratory tests of moisture content, plasticity index, and grain size analyses were carried out.

Laboratory and field test results are compiled on the borelog sheets under Appendix I. The estimated soil profile may be seen on Drawing #66-F-13A. A brief discussion of the subsoils is given below:

4.2) Silty Sand:

Under a 2 - 3 ft. thick sand and gravel railway fill, a brown silty sand layer was observed in every borehole, extending to a depth of about 23 ft. (El. 701.0 ft.). The relative density of the deposit, as indicated by the Standard Penetration "N" values of 6 to 85 blows/ft., ranges from loose to very dense. The sand is a water-bearing stratum; the observed ground water level in the boreholes lies between El. 712 and 711.2 ft. For the subway crossing this material will be almost entirely excavated, so that it is not considered to be contributing to the support of the proposed bridge.

4.3) Silt:

Underlying the silty sand, a grey silt material was encountered at each borehole location, extending to the full depth of the soil explorations, to some 51.5 ft. below ground level. The silt was found to have a very dense relative density, corresponding to "N" values from 55 up to 109 blows/ft. The layer exhibits very slight plasticity in the deeper elevations, otherwise, it can be regarded as "non plastic". The grain size analyses revealed an average of 5% sand, 85% silt, and traces of clay size particles.

cont'd. /3

5. DISCUSSION AND RECOMMENDATIONS:

It is proposed to construct a subway at the crossing of Hwy. #24, Line "L" and the C.N.R. in the Town of Simcoe.

The grade elevation of Hwy. #24, Line "L" is designed to be at around El. 702.0 ft. It is assumed that the bridge will be a single-span structure with closed type abutments.

Subsoil below the future grade of Hwy. #24 consists of a silt stratum having a very dense relative density. It is believed that this material has adequate strength to support the structure on spread footings at a shallow depth. The bottom of the footings may be placed just below the zone of frost penetration. Assuming a depth of 5 ft. of frost penetration, the elevation of the bottom of the footings will be around 697.0 ft. At this depth the safe bearing pressure is estimated to be 2.5 t.s.f. Settlements below the footings are estimated to be not greater than 1.0 inch. As it was mentioned earlier, the ground water level lies around elevation 711 - 712 ft. The excavation for the proposed grade of Hwy. #24 will result in a depression of the ground water level below the future grade. Provision for standard drainage for the abutments is essential

The excavations for the bridge footings are likely to be below water level. The silt soil is very susceptible to "boiling", if under unbalanced hydrostatic head; consequently, a dewatering scheme is recommended. Dewatering and prevention of boiling efficiently, may be achieved by excavating inside a cofferdam of interlocking sheetpiles driven to a depth below the bottom of the excavation equal to or greater than the head of water above the bottom of the excavation.

If a three-span structure is contemplated for the subway with perched abutments, the latter may be supported on piles, or on spread footings. Concrete or steel displacement piles are recommended, driven to approximate elevation 680 ft. In the case of 12" diam. displacement piles, it is estimated that a design load of 55 T/pile

cont'd. /4

5. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

can be achieved at around the above elevation. It is recommended, however, that the working load on the piles be checked during pile driving according to the Hiley formula (D.H.O. standards DD 1218 and 1219). Pile caps may be placed within the approach cut side slopes at around El. 715 ft. where the excavation may be achieved in the dry.

The abutment may also be supported on spread footings at or about El. 715.0 ft. A safe bearing pressure of 2.5 t.s.f. may be used for the spread footings. For the calculations of the bearing capacity on the sand layer, the penetration "N" values were corrected according to Gibbs and Holtz, (4th Int. Conf. of Found. Eng., London, 1957).

No stability problem is foreseen for the approach cuts, provided they are excavated with side slopes of 2 horizontal to 1 vertical. In the case of building the structure as a single-span bridge, free draining granular backfill should be used behind the abutments.

6. SUMMARY:

The foundation investigation for the proposed subway at the crossing of Hwy. #24, Line "L" and the C.N.R. is reported.

The strength of the very dense silt subsoil was found to be adequate to support the bridge on spread footings at a shallow depth. Footings placed below the zone of frost penetration, will have a safe bearing capacity of 2.5 t.s.f.

Dewatering due to high unbalanced hydrostatic head and susceptible soil conditions, will likely be necessary for the footing excavations, as described under Section 5.

If the structure is constructed as a three-span bridge with perched abutments, they may be supported on 12" concrete or steel displacement piles, driven to approx. El. 680 ft., with an estimated safe load of 55 T/pile. Pile driving should be checked during driving by means of the Hiley formula.

cont'd. /5

6. SUMMARY: (cont'd.) ...

No stability problem is anticipated for the approach cuts, provided they are excavated with side slopes of 2 horizontal to 1 vertical.

7. MISCELLANEOUS

The field work, carried out during the period February 9 to 11, 1966, was supervised by Mr. W. W. Kulmatickas, Project Foundation Engineer.

Equipment used was owned and operated by Johnston Drilling Co. Ltd.

This report was prepared by Mr. A. K. Barsvary, Project Foundation Engineer. The general supervision was undertaken by Mr. K. G. Selby, Senior Foundation Engineer.

March 1966

APPENDIX I

FOUNDATION SECTION

JOB 66-F-13 LOCATION C.N.R. & Hwy. #24 Line "L" Ch. 18/37 33'-0" Rt. ORIGINATED BY W.W.K.
W.P. 252-62 BORING DATE Feb. 9, 1966. COMPILED BY W.W.K.
DATUM 725.0 BOREHOLE TYPE Washboring - BX Casing. CHECKED BY K.G.S. *ll*

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT ——— WL PLASTIC LIMIT ——— wp WATER CONTENT ——— w			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F.			WATER CONTENT % 10 20 30			
725.0	Groundlevel												
722.0	Sand and gravel Fill Material												
3.0	Silty sand Very dense Brown	.	1	SS	2	720							
			2	SS	60								
			3	SS	50	710							
701.0	Silt Very dense Grey					700							
24.0			4	SS	55								
			5	SS	109	690							
678.5	End of borehole.		6	SS	88	680							
46.5							670						
							660						

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 3-2

FOUNDATION SECTION

JOB 66-F-13 LOCATION C.N.R. & Hwy. 24 Line "L" Ch 18/88 33'-0" Rt. ORIGINATED BY W.W.K.
W.P. 252-62 BORING DATE Feb. 11, 1966. COMPILED BY W.W.K.
DATUM 724-6 BOREHOLE TYPE Washboring - BX Casing. CHECKED BY K.G.S.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.				WP	W	WL		
724.6	Groundlevel														
722.6	Sand and gravel.														
2.0	Fill Material														
			1	SS	7	720									
			2	SS	53										
	Silty sand					710									
	Very dense		3	SS	51										
	Brown		4	SS	85										
701.6						700									
23.0			5	SS	62										
	Silt		6	SS	84										
	Very dense					690									
	Grey.														
			7	SS	51	680									
673.1															
			8	SS	59										
51.5	End of borehole.					670									
						660									

Grl%Sa73%
S125%Cl 1%

W1 El
711.3
Observed in
casing.

Sa5%
S187%
Cl 8%

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 33

FOUNDATION SECTION

JOB 66-F-13 LOCATION C.N.R. & Hwy. 24 Ch 18/61 33'-0" Lt. ORIGINATED BY W.W.K.
W.P. 252-62 BORING DATE Feb. 9, 1966. COMPILED BY W.W.K.
DATUM 724.4 BOREHOLE TYPE Washboring - BX Casing. CHECKED BY K.G.S.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F.	LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W Wp — W — WL WATER CONTENT % 10 20 30	BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT					
724.4	Groundlevel									
721.9	Sand and gravel. Fill Material									
2.5	Silty sand		1	SS	6	720				
	Loose to very dense.		2	SS	7					
	Brown		3	SS	79	710				
			4	SS	80					
701.4						700				
23.0	Silt		5	SS	70					
	Very dense		6	SS	51					
	Grey		7	SS	65	690				
			8	SS	91					
						680				
672.9			9	SS	76					
51.5	End of borehole.					670				
						660				

W.L. Elev
711.7
Observed in
Casing.
Sa85%
Si15%
Sa5%
Si186%
Cl 9%

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 66-P-13 LOCATION C.N.R. & Hwy. 24 Line "L" Ch 19+12 33'-0" Lt. ORIGINATED BY W.W.K.
W.P. 252-62 BORING DATE Feb. 10, 1966. COMPILED BY W.W.K.
DATUM 723.3 BOREHOLE TYPE Washboring - 9X Casing. CHECKED BY K.G.S.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.				W _P — W — W _L WATER CONTENT % 10 20 30				
723.3	Groundlevel														
720.8	Sand and gravel. Fill Material.					720									
2.5			1	SS	5										
	Silty sand		2	SS	17	710									
	Loose to very dense.		3	SS	151										
	Brown		4	SS	63	700									
700.8															
22.5			5	SS	76	690									
	Silt														
	Very dense		6	SS	61	680									
	Grey														
671.8			7	SS	75	670									
51.5	End of borehole.					660									

W.L. Elev
711.2

Observed in
Casing.
Sa 87%
Si & Cl 13%

Si 76%
Cl 24%

W.L. Elev
711.2
Observed in
Casing.
Sa 87%
Si & Cl 13%

Si 76%
Cl 24%

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' - 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>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

SOIL TESTS

Q _u	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Q _{cu}	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q _d	DRAINED TRIAXIAL	S	SENSITIVITY

ABBREVIATIONS 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
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
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

MEMORANDUM

To: Mr. L. E. Walker,
District Engineer,
District #2 (London).

FROM: Foundation Section,
Materials & Testing Office,
Room 107, Lab. Bldg.

ATTENTION: Mr. H. Greenly,
District Construction
Engineer

DATE: July 29, 1969

OUR FILE REF.

IN REPLY TO

SUBJECT: Hwy. 24 & C.N.R., Simcoe, Ontario --
District #2 (London) - W.P. 252-62, W.J. 66-F-13

As requested by you, the above mentioned site was visited by the writer on July 25, 1969, the purpose being to assess groundwater conditions and to give advice to the C.N.R. Construction Staff relating to dewatering procedures. Prior to the site visit, telephone conversations were held with Mr. T. Smolders, Structural Engineer and Mr. W. Wong, Senior Geotechnical Engineer of the C.N.R.

The new C.N.R. Subway is being constructed under supervision of the C.N.R. Their design calls for interlocking steel sheeting to be driven to elevations 691 and 689 for the two abutment spread footings prior to excavating below el. 712.0. This requirement was deemed necessary since the Foundation Report (66-F-13) indicated the groundwater to be at el. 712.0.

Excavations for the new highway and for a storm sewer have recently been carried out in the vicinity of the proposed structure. These excavations have apparently had the effect of drawing down the groundwater to about el. 707.0 in this area. This statement is based on visual observations made by the writer at the time of the visit.

Subsoil at the site consists of deposits of silty fine sand overlying dense silt. It is necessary, in our opinion, to provide a dewatering scheme for excavations within this material in order to prevent 'boiling' due to unbalanced hydrostatic heads. A suitable scheme would be one in which interlocking steel sheeting is driven to a depth below the footing base equal to the height of the prevailing groundwater level above it. In this particular case, excavations may be carried down to el. 707 prior to driving sheeting. Due to the dilatant nature of the soil, however, it would be advisable to place a 2-ft. thick granular pad for the operation of heavy equipment which might otherwise disturb and loosen up the upper layers of the silty subsoil.

Mr. L. E. Walker,
District Engineer,
District #2 (London).

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Attn: Mr. H. Greenly, Const. Engr.

July 29, 1969

The foregoing was discussed at the site with Mr. R. MacEwen
of the C.N.R., who indicated his agreement with our recommendations.

If we can be of any further assistance in this matter,
please contact this office.

K. G. Selby

KGS/MdeF

K. G. Selby,
SUPERVISING FOUNDATION ENGR.
For:
A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

cc: Messrs. H. A. Tregaskes
B. R. Davis
J. Roy
T. Smolders C.N.R. (Toronto)
W. Wong C.N.R. (Montreal)

Foundations Files
Gen. Files

66-F-13

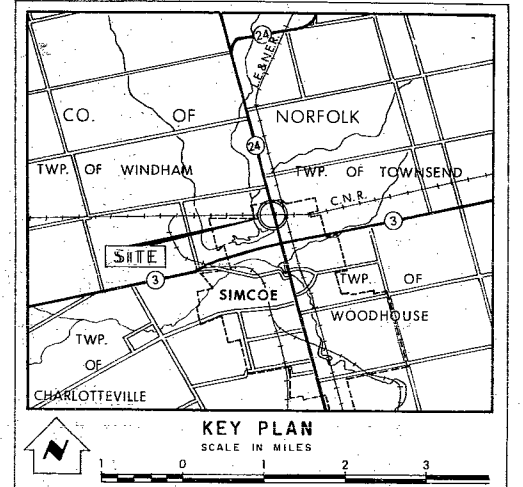
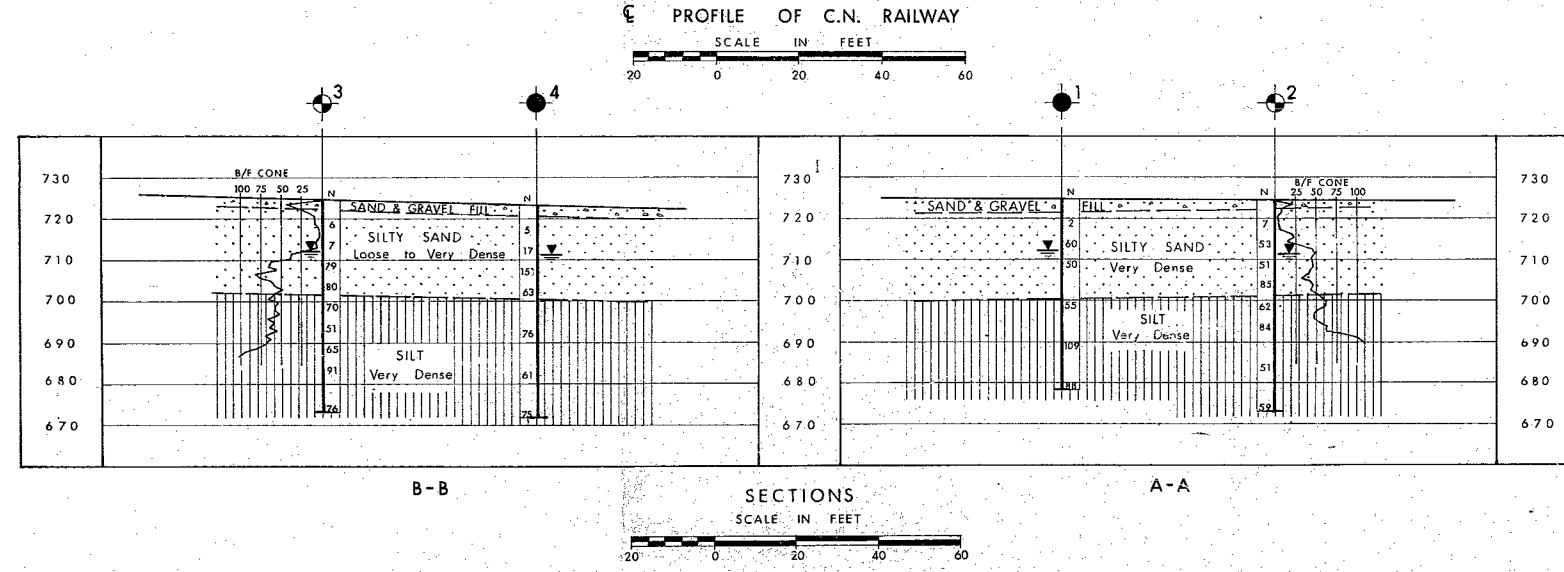
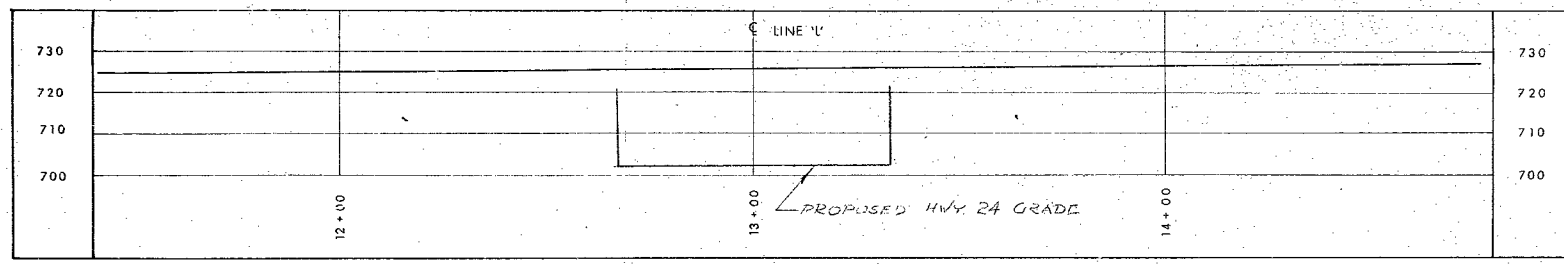
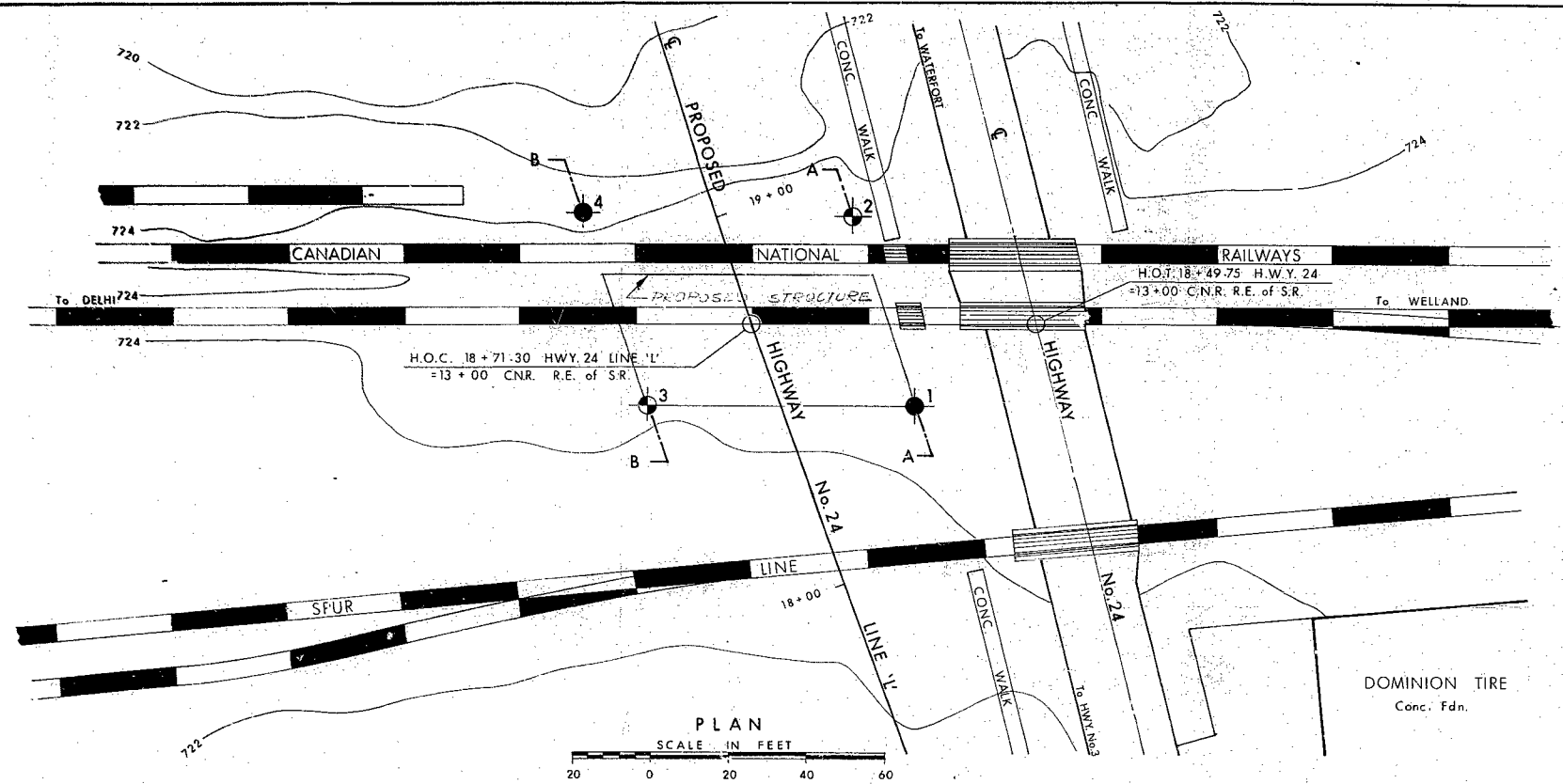
W.P. # 252-62

Hwy. # 24

CROSSING

C.N.R.

SIMCOE T.



LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation. Feb. 1966		

NO.	ELEVATION	STATION	OFFSET
1	725.0	18+37	33'RT.
2	724.6	18+88	33'RT.
3	724.4	18+61	33'LT.
4	723.3	19+12	33'LT.

NOTE -
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

REVISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS - ONTARIO			
MATERIALS & TESTING DIVISION - FOUNDATION SECTION			
CANADIAN NATIONAL RAILWAYS			
KING'S HIGHWAY NO. 24 LINE 'L'		DIST. NO. 2	
CO. NORFOLK		TOWN OF SIMCOE	
TWP. WINDHAM		LOT 1 CON. XIV	
BORE HOLE LOCATIONS & SOIL STRATA			
SUBM'D W.W.K.	CHECKED <i>[Signature]</i>	W.P. NO. 252-62	M.B.T. DRAWING NO.
DRAWN D.G.H.	CHECKED <i>[Signature]</i>	JOB NO. 66-F-13	66-F-13A'
DATE 23 MAR. 1966	SITE NO.	BRIDGE DRAWING NO.	
APPROVED <i>[Signature]</i>		CONT. NO.	

PRINT RECORD		
NO	FOR	DATE