

#

65-F-60

W.P. #182-63-02

HWY. #2, C.N.R.

OVERHEAD AT

CATARAQUI

PROFILE  
OF  
PROPOSED REVISION  
OF  
HIGHWAY 2  
KINGSTON TOWNSHIP  
FRONTENAC COUNTY

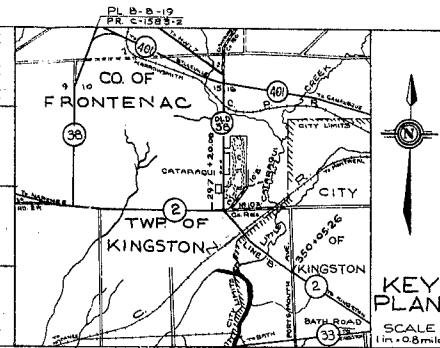
297+20.00 TO 350+05.26

LINE "B"

ALSO

PROPOSED CO. RD. 10A REV'D

0+00 TO 8+46.69



PL. B-19-15  
PR. C-19-7

DEPARTMENT OF HIGHWAYS ONTARIO			
DESIGN BRANCH			
ENGINEERING SURVEYS DIVISION			
SCALE	DISTRICT	REGION	
HOR. 1" = 100 FT. VERT. 1" = 10 FT.	KINGSTON	EASTERN	
W.O.N. 7016-64-61	Date of Survey FEB. 65	Date of Profile MAR. 65	
SURVEY BY Chief of Party - C. BUFFMAN Supervisor - G. COSTELLO		DRAWN BY Draftsman - W. LAMBLE Supervisor - G. BROWN	
TRACED BY Draftsman - G. LEWIS Supervisor - G. BROWN		CHECKED BY Draftsman - G. MARTIN Supervisor - G. BROWN	
PROFILE NO. C-19-32	STUDY PLAN NO. F-3049 & F-3035 & F-4116	PLAN NO. B-19-15	
DATE	REVISIONS & ADDITIONS	BY	CHKD

BM 33207  
N.W. in N. Road 6 2/3 Map  
32.5 RT of STA. 291+00

15% CL  
+9.4% 200 FT. 332.5

CO. RD. 10A  
(OLD HWY. 38)

SYDENHAM RD.

PROFILE OF BL.  
0+00 = 301+

C-19-32

PROF. C-19-32

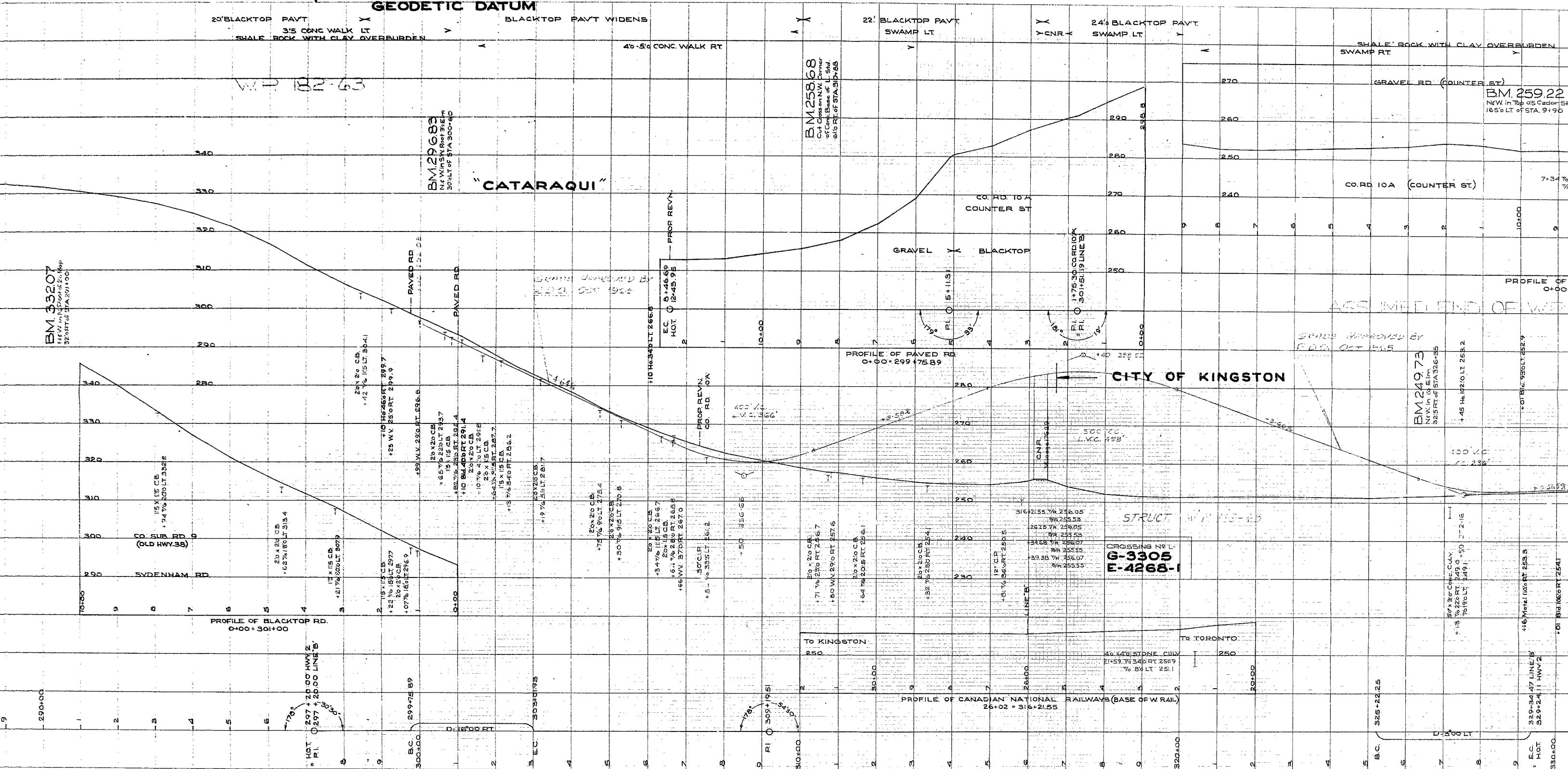
C-19-32

C-19-32

HWY 2 PLAN B-19-15  
PROF. C-19-7

LINE 'B' PLAN B-19-15  
PROF. C-19-32

GEODETIC DATUM



1:2500

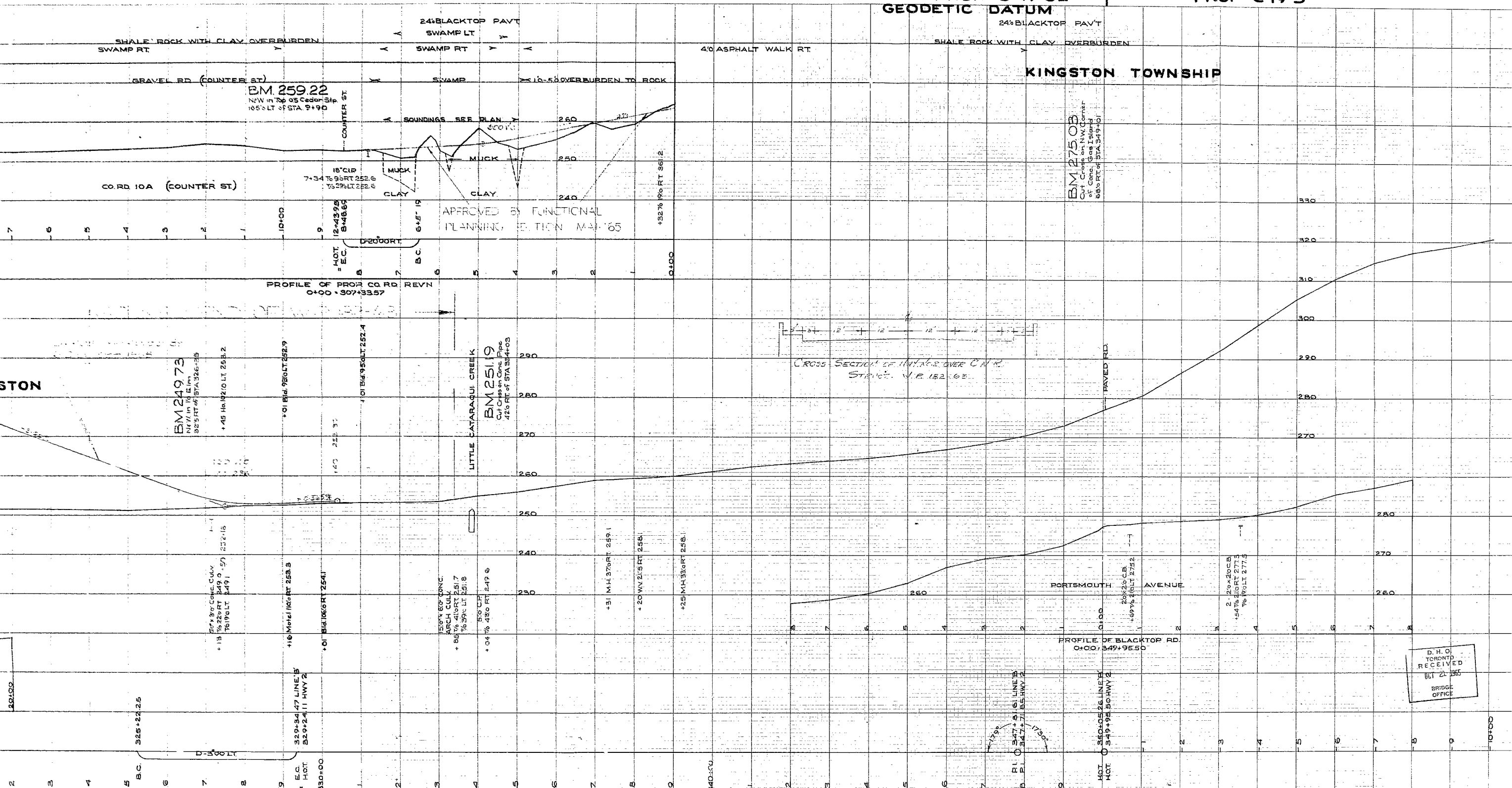
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1:2500

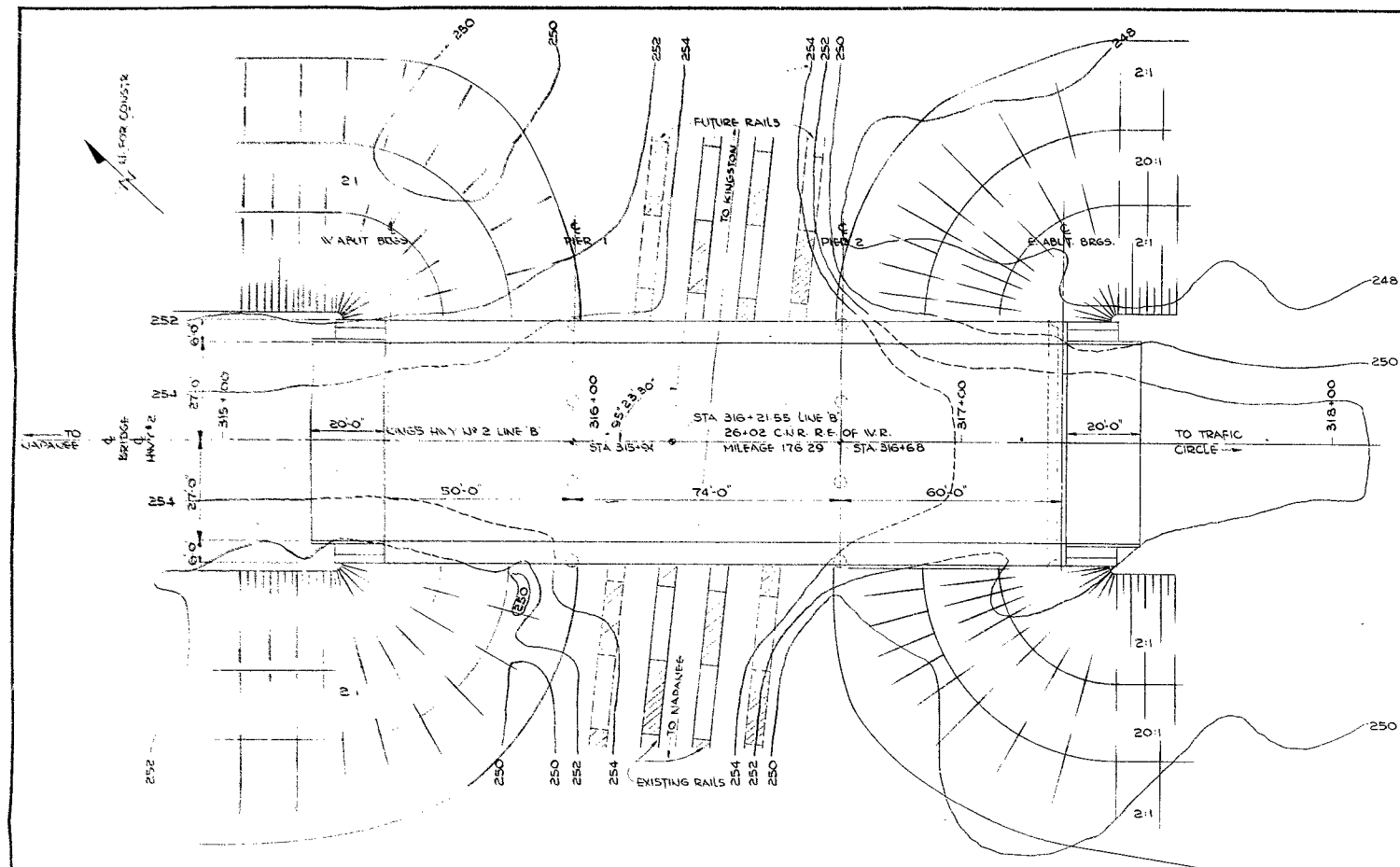
LINE 'B' PLAN B-19-15  
PROF C-19-32  
GEODETIC DATUM

HWY 2 PLAN B-19-10  
PROF C-19-5

KINGSTON TOWNSHIP

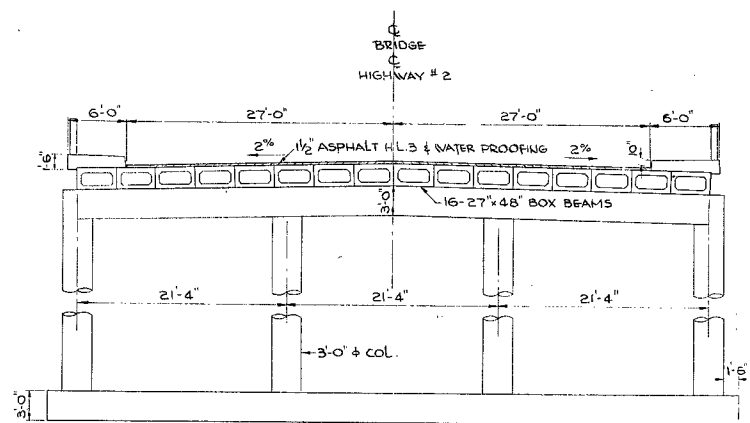


D.H.O. TORONTO  
RECEIVED  
OCT 21 1965  
BRIDGE  
OFFICE

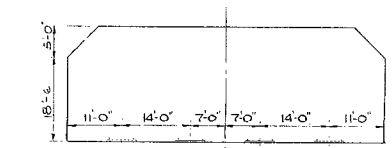


B.M. EL. 255.65  
 GEODETIC DATUM  
 CUT CROSS ON N.W. CORNER OF CONC. BASE OF  
 LIGHT STANDARD 6' RT. OF STA. 310+75 HWY. #2

**PLAN**  
 SCALE: 1" = 20'-0"



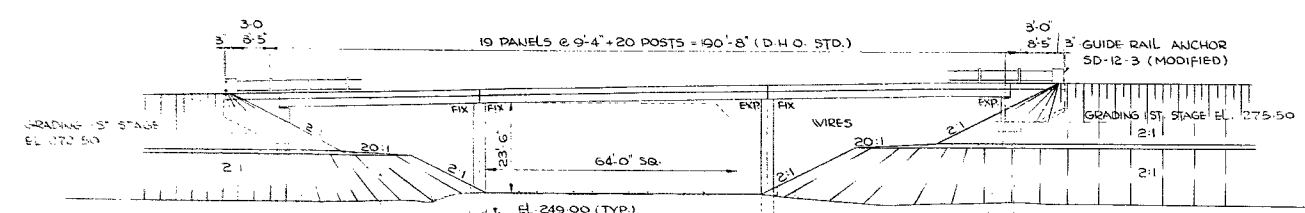
**SECTION**  
 SCALE: 1/8" = 1'-0"



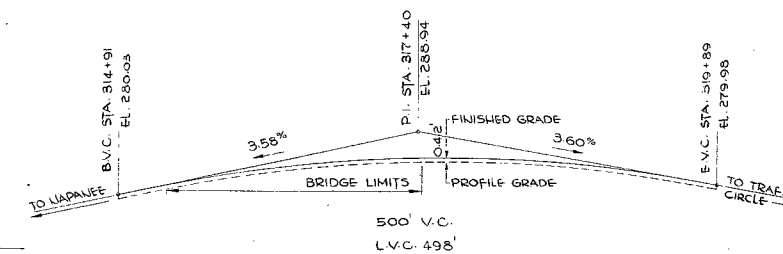
**DETAILS OF CLEARANCE**  
 N.T.S.

**NOTES**

- CLASS OF CONCRETE**  
 PRE-CAST MEMBERS 5000 P.S.I.  
 REMAINDER 3000 P.S.I.
- CLEAR COVER ON REINFORCING STEEL**  
 FOOTINGS, ABUTMENTS & PIERS 3"  
 PRE-CAST MEMBERS 1"  
 CURBS 2"
- CONSTRUCTION NOTES**  
 THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF  $\pm 1/8"$ .  
 NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.

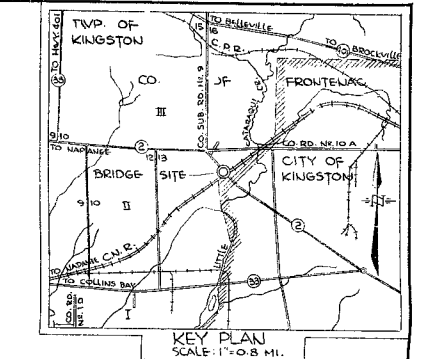


**ELEVATION**  
 SCALE: 1" = 20'-0"



**PROFILE of HWY. #2**  
 N.T.S.

**NOTES TO R.O.O.**  
 PRIOR TO PLACING THE FUTURE HIGHWAY FILL, ALL SOFT ORGANIC MATERIAL SHOULD BE REMOVED IN THE MARSHY AREAS LOCATED ON THE N.E. SIDE OF THE HWY. THE EXCAVATION SHOULD BE CARRIED OUT AS PER CURRENT D.H.O. METHODS DD 406 & BACKFILLED WITH SUITABLE GRANULAR MATERIAL. IN THE AREA WHERE PILES HAVE TO BE DRIVEN, FILLED MATERIAL SHOULD NOT CONSIST OF ANY BOULDERS.



**LIST of DRAWINGS**

1. GENERAL PLAN
- 2.
- 3.
- 4.
- 5.

PRINT RECORD		
NO.	FOR	DATE

REVISIONS	
DATE	DESCRIPTION
<b>DEPARTMENT OF HIGHWAYS ONTARIO</b> BRIDGE DIVISION	
<b>C.N.R. OVERHEAD</b> (AT KINGSTON WEST LIMITS)	
KING'S HIGHWAY No. 2 CO. FRONTENAC TWP. KINGSTON	DIST. No. 8 LOT 15 & 16 CON. II
PRELIMINARY	
APPROVED _____ BRIDGE ENGINEER	SITE No. 7-84 W.P. No. 182-63-2
DESIGN R.L.L. CHECK _____ DRAWING R.M. CHECK _____ DATE OCT. 65	CONTRACT No. _____ DRAWING No. D-5801-P

23-67-197

## MEMORANDUM

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

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

Attention: Mr. S. McCombie

Date: August 9, 1965

Our File Ref.

In Reply To

SUBJECT:

## FOUNDATION INVESTIGATION REPORT

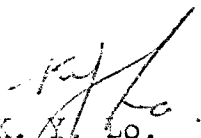
For  
C.N.R. Overhead on Hwy. 2 at  
Cataraqui, District No. 8 (Kingston)  
W.J. 65-F-60 -- W.P. 182-63-02

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 you require additional information, please do not hesitate to contact our Office.

KYL/MdeF  
Attach.

cc: Messrs. B. R. Davis (2)  
H. A. Tregaskes  
D. W. Farren  
J. Ford  
E. A. Cash  
J. E. Gruspier  
A. Watt

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

Foundations Office  
Gen. Files

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-

FOUNDATION INVESTIGATION REPORT  
For  
C.N.R. Overhead on Hwy. 2 at  
Cataraqui, District No. 8 (Kingston)  
W.J. 65-F-60      --      W.P. 182-63

1. INTRODUCTION:

It is proposed to construct an overhead structure where the C.N.R. crosses Hwy. No. 2 in the Town of Cataraqui, to carry the future 4-lane traffic.

A request for a foundation investigation at the above location was received from Mr. A. P. Watt, Regional Bridge Location Engineer, to the Foundation Section in a memo dated May 7, 1965. Subsequently, a foundation investigation consisting of 6 boreholes and 3 dynamic penetration tests was undertaken. Presented in this report are the results of this investigation, together with the recommendations pertaining to the structure foundations and approach embankments.

2. DESCRIPTION OF SITE AND GEOLOGY:

The site, at the crossing of the C.N.R. and Hwy. No. 2, is situated just west of the city limit of Kingston and is about half a mile east of Cataraqui. The topography is gently undulating. On the south-west side of the highway at the C.N.R. crossing the area is covered with grass. On the north-east side of the highway, there are some marshy areas existing on both sides of the railway fill, which is approximately 6' to 7' above the original ground surface.



2. DESCRIPTION OF SITE AND GEOLOGY: (cont'd.) ...

Physiographically, the site is located on the "Napanee Plain", which is a flat to undulating plain of limestone from which the glaciers stripped most of the overburden. In general, the soil is only a few inches to a few feet deep over much of the region; however, the overburden in some of the river valleys is quite thick.

It is believed that the site was part of the glacial channel that was filled with clay.

3. FIELD WORK AND LABORATORY WORK:

The field work consisted of 6 sampled holes and 3 dynamic penetration tests. Samples were recovered at the required depths by means of a 2-in. O.D. split-spoon sampler and by a 2-in. I.D. Shelby tube sampler. The dimensions of the split-spoon sampler and the energy used in driving it, conform to the requirements of the Standard Penetration Test. In-situ vane tests were carried out wherever possible, in order to determine the undrained shear strength of the cohesive material. A 60 deg. 2-in. O.D. cone was used in the dynamic penetration test and the energy used in the test was 350 ft.-lbs. per blow.

The locations and elevations of all boreholes are shown on the accompanying log sheets, included in the Appendix of this report.

Samples were visually examined and identified in the laboratory as well as in the field. Tests were carried out in the laboratory on a selection of samples to determine:

cont'd. /3 ...

3. FIELD WORK AND LABORATORY WORK: (cont'd.) ...

- (1) Natural Moisture Contents
- (2) Bulk Densities
- (3) Grain Size Distributions
- (4) Atterberg Limits
- (5) Undrained Shear Strengths
- (6) Consolidation Tests

Laboratory test results have been summarized and are included under Appendix I of this report.

4. SUBSOIL CONDITIONS:

4.1) General:

Subsoil at the site consists of a surface layer of fill material, approximately 4.5 to 9 ft. underlain by 32 to 41 ft. of silty clay, followed by a stratum of silt with clay layers. Below this silt deposit was a layer about 25 to 45.5 ft. of sandy silt grading to fine sand with depth. In B.H. #2 and B.H. #3, medium sand was encountered underneath fine sand.

In the order of stratigraphic succession, the following soil types are discussed:

4.2) Fill Material:

This material is approximately 4.5 to 9 ft. in thickness. In general, it is either a heterogeneous mixture of gravel, sand, silt and lumps of silty clay or clayey silt, brownish in colour. This clayey material probably was obtained from the vicinity of the site.

cont'd. /4 ...

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.3) Silty Clay:

Below the fill material, a layer of silty clay varying from 32 to 41 ft. was encountered. The upper 10 to 15 ft. of the stratum has been subjected to oxidation resulting in its present greyish-brown colour. Below the oxidized zone, the colour is grey. Except in B.H. #3, brown and grey laminations, ranging from 1/4 to 2 inches in thickness, are observed some 20 ft. below the ground surface. These brown and grey materials are both silty clays; however, the latter has a lower liquid limit. The thickness of this "laminated" soil is approximately 10 ft. Occasional silt seams or pockets are observed underneath the laminated portion of the soil. In B.H. #3, no laminations or silt seams are encountered.

The consolidation test results show that the soil is over-consolidated. The sensitivity of the soil to remolding, as measured by in-situ vane tests, ranges from about 2 to 10.

The unit weights, moisture contents, liquid and plastic limits, shear strength and sensitivity of the soil have been summarized and plotted on the borehole log sheets included in the Appendix. Moisture contents, liquid and plastic limits were determined on clayey as well as silty materials.

A shear strength profile of the deposit is also included in the Appendix.

4.4) Silt with Clay Layers:

Below the deposit of silty clay, a stratum of silt with clay layers was encountered. This stratum contains layers of silt,

cont'd. /5 ...

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.4) Silt with Clay Layers: (cont'd.) ...

3 to 6 inches in thickness, interbedded with thin clay layers, 1/4 to 2 inches thick. Essentially, the deposit may be described as fine-grained granular material having a relative density of loose to compact with 'N' values ranging from 1 to 12 blows/ft.

4.5) Sandy Silt to Fine Sand:

This granular deposit contains occasional thin clay seams, about 1/4 to 2 inches thick and they appear to be quite fissured. The thickness of this stratum varies from 25 to 45.5 ft. and the particle sizes of the material, in general, increase with depth. Its relative density ranges from loose to very dense. Typical grain size curves are included in the Appendix.

4.6) Medium Sand:

This deposit was found only in B.H. #2 and B.H. #3. Its relative density varies from compact to very dense, with 'N' values ranging from 33 to 78 blows/ft.

5. WATER CONDITIONS:

Field measurements of water levels in the boreholes undertaken during the field investigation, indicate that the water level was 3 to 6 ft. below the existing ground surface. The elevations of the exact water levels observed, are shown in the bore log sheets included in the Appendix.

cont'd. /6 ...

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct a three-span structure (45' - 64' - 45') over the C.N.R. tracks at the crossing of Hwy. #2 in the Town of Cataragui.

The subsoil at the site consists of silty clay, silt with clay layers and silty fine sand to medium sand.

6.2) Stability of Approach Embankment:

The maximum height of the proposed approach embankments is in the order of 32 ft. Stability analyses were carried out in terms of total stresses (" $\phi = 0$ " analysis).

From the strength profile, it is seen that discrepancy exists between the field and laboratory results of shear strength measurements. It is believed that the strength given by the field vane tests may be higher than the true strength of the soil because of the presence of thin silt layers or pockets in the clayey deposit. On the other hand, the laboratory values of shear strength may be too low due to sample disturbance.

It is also noticed in the strength profile that, in general, the results of B.H.'s #2 and #4, are lower than those of B.H.'s #1 and #3. Therefore, a strength profile based on the results of B.H. #2 and B.H. #4 is used in the stability analysis.

Stability analyses, in terms of total stresses, have been carried out with the following assumptions:

cont'd. /7 ...

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

6.2) Stability of Approach Embankment: (cont'd.) ...

Fill Material - Granular type of material -

$$\phi = 30^\circ$$

$$\gamma = 130 \text{ p.c.f.}$$

Tension Crack = 6 ft. deep

Fill Slopes = 2:1

Subsoil - Fill material and silty clay down to elev. 207 -

$$\gamma = 115 \text{ p.c.f.}$$

	<u>Shear Strength</u>
Elev. 253 - Elev. 245	2,000 p.s.f.
Elev. 245 - Elev. 240	1,600 p.s.f.
Elev. 240 - Elev. 230	1,000 p.s.f.
Elev. 230 - Elev. 207	750 p.s.f.
Below Elev. 207	Silt (fine-grained granular material)

Design Factor of Safety - 1.25

Since the layer of silt begins at El. 207 approximately, the lowest level to which the slip circles are tangential to is arbitrarily chosen to be El. 207.

On the basis of the stability analyses, it was concluded that:

1) No stability problems are anticipated for approach fills up to 27 ft. for standard 2:1 slopes.

cont'd. /8 ...

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

6.2) Stability of Approach Embankment: (cont'd.) ...

ii) Berms are required in all directions for approach fills in excess of 27 ft. in height in order to improve the stability. A graph showing the relationship of the berm length and the embankment height is included in the Appendix.

iii) Since berms are required for fills in excess of 27 ft. in height, additional spans for the structure may be required to accommodate this in the longitudinal direction.

iv) Prior to placing the future highway fill, all soft organic material should be removed in the marshy areas located on the N.-E. side of the highway. The excavation should be carried out as per current D.H.O. methods DD 406 and backfilled with suitable granular material.

6.3) Structure:

6.3.1) Foundation for Piers and Abutments -

An overhead structure is proposed at the crossing of the C.N.R. and Hwy. #2.

In view of the presence of the stiff crust of the silty clay, it is suggested that spread footings founded at approximate El. 246 with a safe net bearing pressure of 2 t.s.f. may be used for the piers. For the abutments, it is recommended that they should be supported on friction piles, 45' in length, driven through the fill material into the subsoil. A class #14 timber pile should provide a safe design load of 20 tons/pile. In the areas where piles have to be driven, fill material should not consist of any boulders.

cont'd. /9 ...

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

6.3) Structure:

6.3.2) Settlement Estimation -

An analysis based on Skempton and Bjerrum's method\* has been made to estimate the amount of settlement under the footings and the embankment load. Soil properties for the calculations were obtained for the consolidation test results which are included in the Appendix. It is assumed in the calculations that  $\mu = 0.6$ .

Results of the analysis are as follows:

(a) Ultimate settlement at the pier locations -

Induced by footing pressure of 2 t.s.f. -  
(Assume footing size 8' x 69')  $\approx 4.0''$

Induced by embankment load (height = 32')  $\approx 2.0''$

Total  $\approx 6.0''$

(b) Ultimate settlement at the abutment locations -

Induced by the load on friction piles  $\approx 2.5''$

Induced by embankment load (height = 32')  $\approx 7.5''$

Total  $\approx 10.0''$

Maximum differential consolidation settlements for the piers and the abutments are estimated to be approximately 4".

In addition to the aforementioned consolidation settlements, there will be elastic or immediate settlements. It is estimated that the amount of elastic settlement will be in the order of 2". It can be assumed that the elastic settlement will take place during and immediately after construction.

\* Skempton, A. W. and Bjerrum, L. -- "A Contribution to the Settlement Analysis of Foundations on Clay", Geotechnique, 1958, p. 168.

cont'd. /10 ...



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

6.3.2) Settlement Estimation - (cont'd.) ...

In view of the fact that the magnitude of differential settlement between the abutments and the piers is in the order of 4", a simply-supported structure should be adopted.

No major dewatering problems are anticipated because of the relatively impermeable nature of the silty clay. However, care should be taken to prevent softening of the subsoil at footing levels by the surface run-off.

7. SUMMARY:

This site is underlain by silty clay, silt with clay layers, and silty fine sand to medium sand.

Recommendations pertaining to the structure and the approach embankments are summarized as follows:

- (1) A simply-supported structure should be adopted.
- (2) The piers can be supported on spread footings founded at approx. El. 246. A safe net bearing pressure of 2 tons per sq. ft. may be used for design.
- (3) The abutments can be supported on piles driven through the embankment fill into the subsoil. Friction piles are recommended, for example: a class #14 timber pile can provide 20 tons/pile.
- (4) Since berms are required for fills in excess of 27 ft. in height, additional spans may be required to accommodate the berms.

cont'd. /11 ...

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

(5) Consolidation settlements at the pier and abutment locations are estimated to be about 6" and 10", respectively. The maximum differential settlements between the piers and the abutments are in the order of 4".

(6) Berms are required in all directions for fills in excess of 27 ft. in height. A graph showing the relationship of the berm length and the embankment height is included in the Appendix of the report. In addition, all soft organic material should be subexcavated and backfilled with granular material as per D.H.O. methods in marshy area located at the N.-E. portion of the highway.

(7) No major dewatering problems are anticipated, with respect to footing excavations.

8. MISCELLANEOUS:

The field work, performed during June 1965, was undertaken by Mr. T. Chan, Project Foundation Engineer, who also wrote this report. The investigation was carried out under the general supervision of Mr. M. Devata, Senior Foundation Engineer, who also reviewed this report.

The stability analyses were carried out by the Electronic Computer Branch.

August 1965

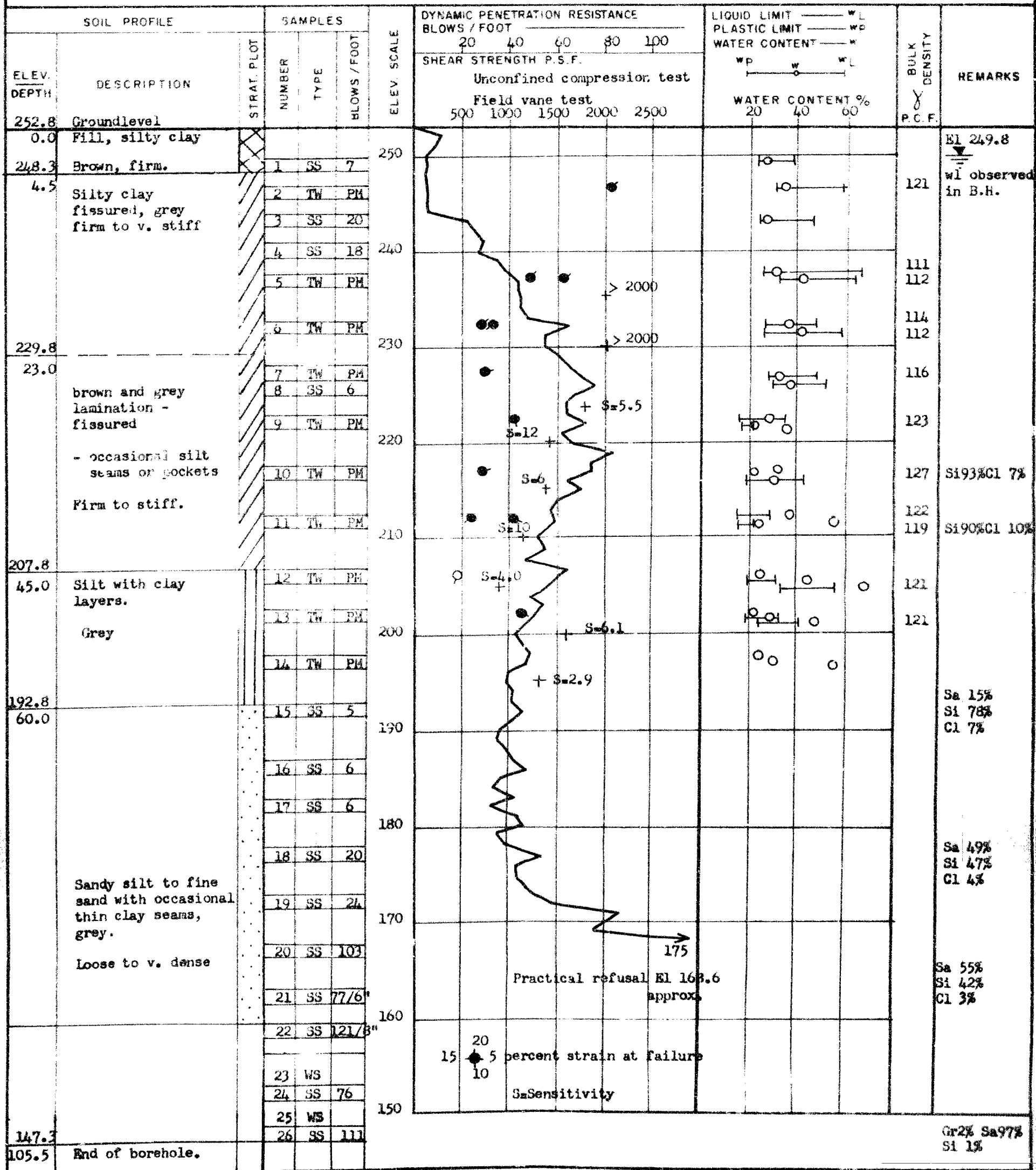
APPENDIX I.

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING DIVISION

# RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 65-F-60 LOCATION Line 'B', Sta. 315+59, 29' Rt. ORIGINATED BY T.C.  
W.P. 182-63 BORING DATE June 3, 1965. COMPILED BY T.C.  
DATUM G.S.C. BOREHOLE TYPE Washboring using NX Casing. CHECKED BY \_\_\_\_\_



FOUNDATION SECTION

CHECKED BY \_\_\_\_\_

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
FLEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F. ● Unconfined comp. ○ Triaxial comp. + Field vane test	WATER CONTENT % wp      w      WL 20      40      60		
252.1	Groundlevel									
244.6	Fill, heterogeneous mixture of gravel, sand, silt and chunks of silty clay.	X X X X X X	1	SS	5	250				EI 248.1
7.5	SILTY CLAY fissured, grey firm to very stiff.	/ / / / / /	2	SS	7					WL observed in B.H.
			3	TW	PM					120
			4	TW	PM	240				118
			5	TW	PM		+ S=2.1			119
232.1	brown and grey laminations - fissured - occasional thin silt seams or pockets	/ / / / / /	6	TW	PM	230	S=8.0			116
20.0	Soft to stiff.	/ / / / / /	7	TW	PM		+ S=7.7			109
			8	TW	PM	220	S=6.8			109
			9	TW	PM		+ S=8.0			116
			10	TW	PM	210	+ S=8.6			113
207.1	SILT with clay clays. grey.		11	TW	PM		+ S=8.0			110
45.0			12	TW	PM	200	+ S=6.7			118
			13	SS	12		+ S=8.0			125
			14	TW	PM		+ S=4.0			123
192.1	sandy silt to fine sand with occasional clay seams.	. . . . .	15	SS	8	190				124
60.0	Grey.	. . . . .	16	SS	10					121
	Loose to v. dense.	. . . . .	17	SS	12	180				119
		. . . . .	18	SS	8					124
		. . . . .	19	WS		170				121
		. . . . .	20	SS	38					119
		. . . . .	21	WS						124
		. . . . .	22	SS	80					121
158.1	MEDIUM SAND	.	23	SS	29	160				125
94.0	Grey, v. dense	.	24	SS	70					123
150.6		.	25	SS	78					121
101.5	End of borehole.	.				150				124

DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS &amp; TESTING DIVISION

## RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 55-F-60

LOCATION Line 'B', Sta. 316+54, 24' Rt.

ORIGINATED BY T.C.

W. P. 182-63

BORING DATE June 11, 1965.

COMPILED BY \_\_\_\_\_ T.C.

DATUM            G.S.C.

BOREHOLE TYPE Washboring using NX Casing.

CHECKED BY \_\_\_\_\_

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	Blovs./Foot		SHEAR STRENGTH P.S.F. ● Unconfined comp. test + Field Vane test	WATER CONTENT % wp      w      WL 20    40    60		
255.3	Groundlevel									
0.0	Fill, heterogeneous mixture of gravel, sand, silt and chunks of silty clay.	X X X X X	1	SS	5	250				
247.3		X X X X X	2	SS	6					
8.0	Silty clay	/ / / / /	3	TW	PM					
		/ / / / /	4	SS	30					
		/ / / / /	5	SS	24					
	-fissured, grey firm to v. stiff		6	TW	PM	240				
			7	TW	PM					
			8	TW	PM	230				
			9	TW	PM					
			10	TW	PM	220				
215.3										
40.0	Silt with clay layers, grey.		11	TW	PM					
			12	TW	PM	210				
			13	TW	PM					
			14	TW	PM	200				
195.3										
60.0	Sandy silt to fine sand with occasional clay seams. Grey, Loose to compact.	. . . . .	15	SS	5					
		. . . . .	16	SS	9	190				
		. . . . .	17	SS	8					
		. . . . .	18	SS	23	180				
		. . . . .	19	SS	27					
170.3		. . . . .								
85.3	Med. sand. grey, compact to v. dense.	. . . . .	20	SS	72	170				
		. . . . .	21	SS	58/6*					
		. . . . .	22	SS	38					
		. . . . .	23	SS	33	160				
153.8		. . . . .								
101.5	End of borehole.	.	24	SS	71	150				

DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS & TESTING DIVISION

JOB 65-F-60

LOCATION Line 'B' Sta. 316+03, 21' Lt.

ORIGINATED BY T.C.

W.P. 182-63

BORING DATE June 14, 1965.

COMPILED BY T.C.

DATUM G.S.C.

BOREHOLE TYPE Washboring using NX Casing.

CHECKED BY \_\_\_\_\_

[illegible]

FOUNDATION SECTION

CHECKED BY

[illegible]



64.3040

FOUNDATION SECTION

ORIGINATED BY T.C.

COMPILED BY T.C.

CHECKED BY \_\_\_\_\_

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT ——— w <sub>L</sub> PLASTIC LIMIT ——— w <sub>p</sub> WATER CONTENT ——— w				BULK DENSITY  P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.	w <sub>p</sub>	w	w <sub>L</sub>			
255.6	Groundlevel												
0.0	Fill	X	1	SS	9	250							
	Gravelly silty sand.	X	2	SS	7								
246.6		X	3	SS	6								
9.0	Silty clay grey, Stiff to hard.	/	4	SS	17	240							
		/	5	SS	31								
		/	6	SS	14								
238.3		/	7	SS	18								
17.3	End of borehole.					230							

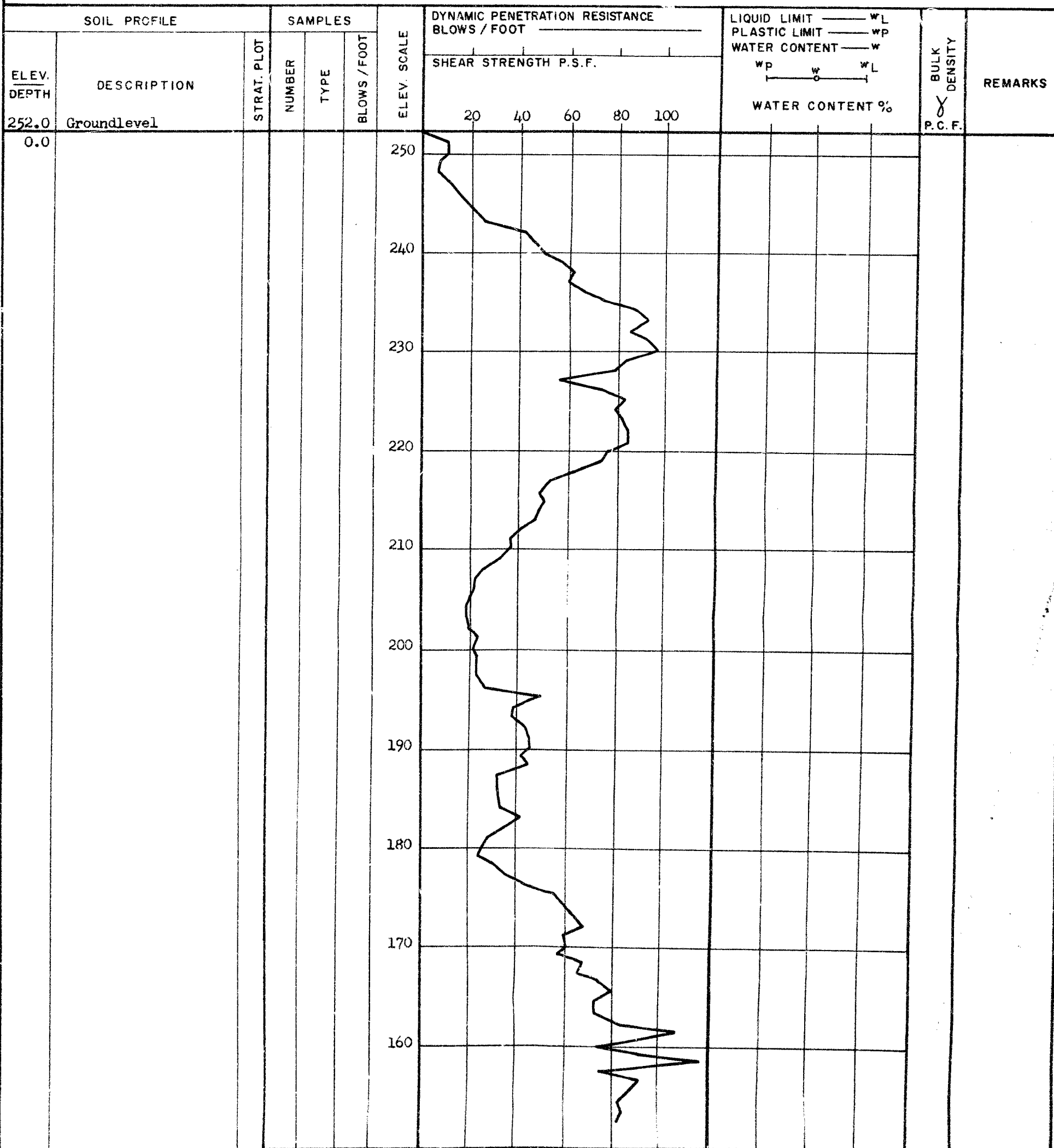
DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 7

FOUNDATION SECTION

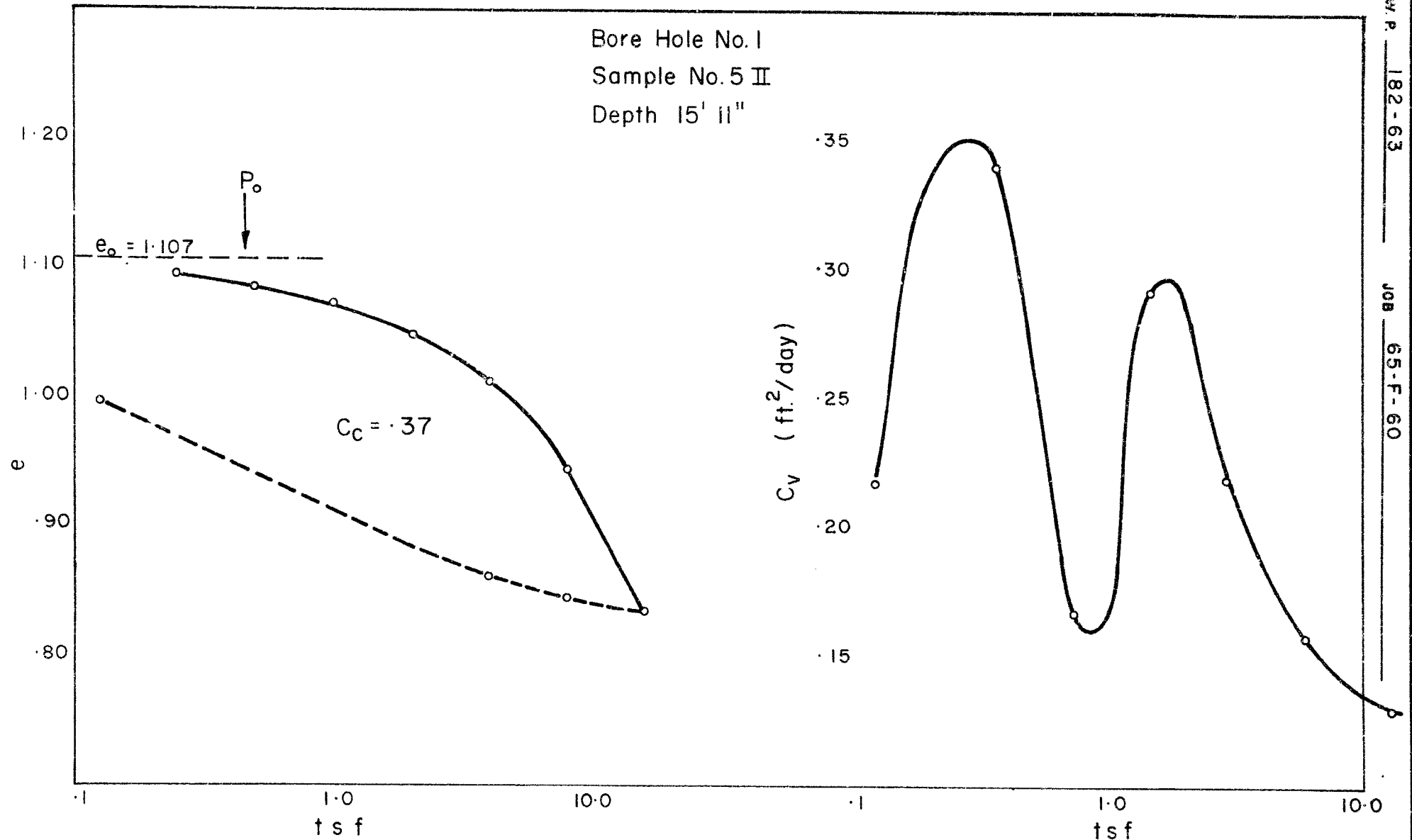
JOB 65-F-60 LOCATION Line 'B', Sta. 316+95, 32' Rte. ORIGINATED BY T.C.  
W.P. 182-63 BORING DATE June 21, 1965. COMPILED BY T.C.  
DATUM G.S.C. BOREHOLE TYPE Dynamic penetration test. CHECKED BY \_\_\_\_\_



# PRECONSOLIDATION PRESSURE

$$P_c = 5.5 \text{ t.s.f.}$$

Bore Hole No. I  
Sample No. 5 II  
Depth 15' 11"



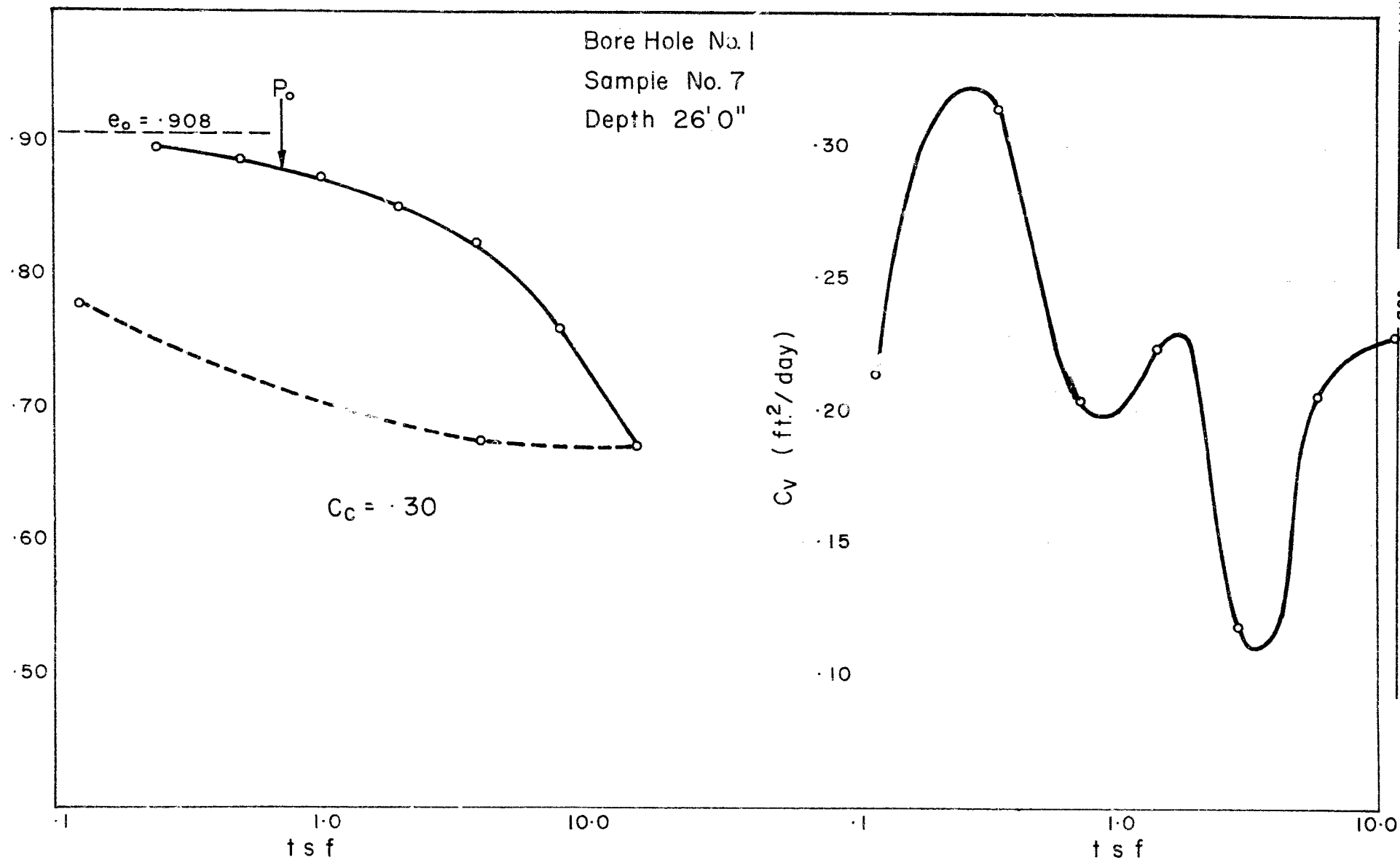
# PRECONSOLIDATION PRESSURE

$P_c = 5.5 \text{ t.s.f.}$

Bore Hole No. 1

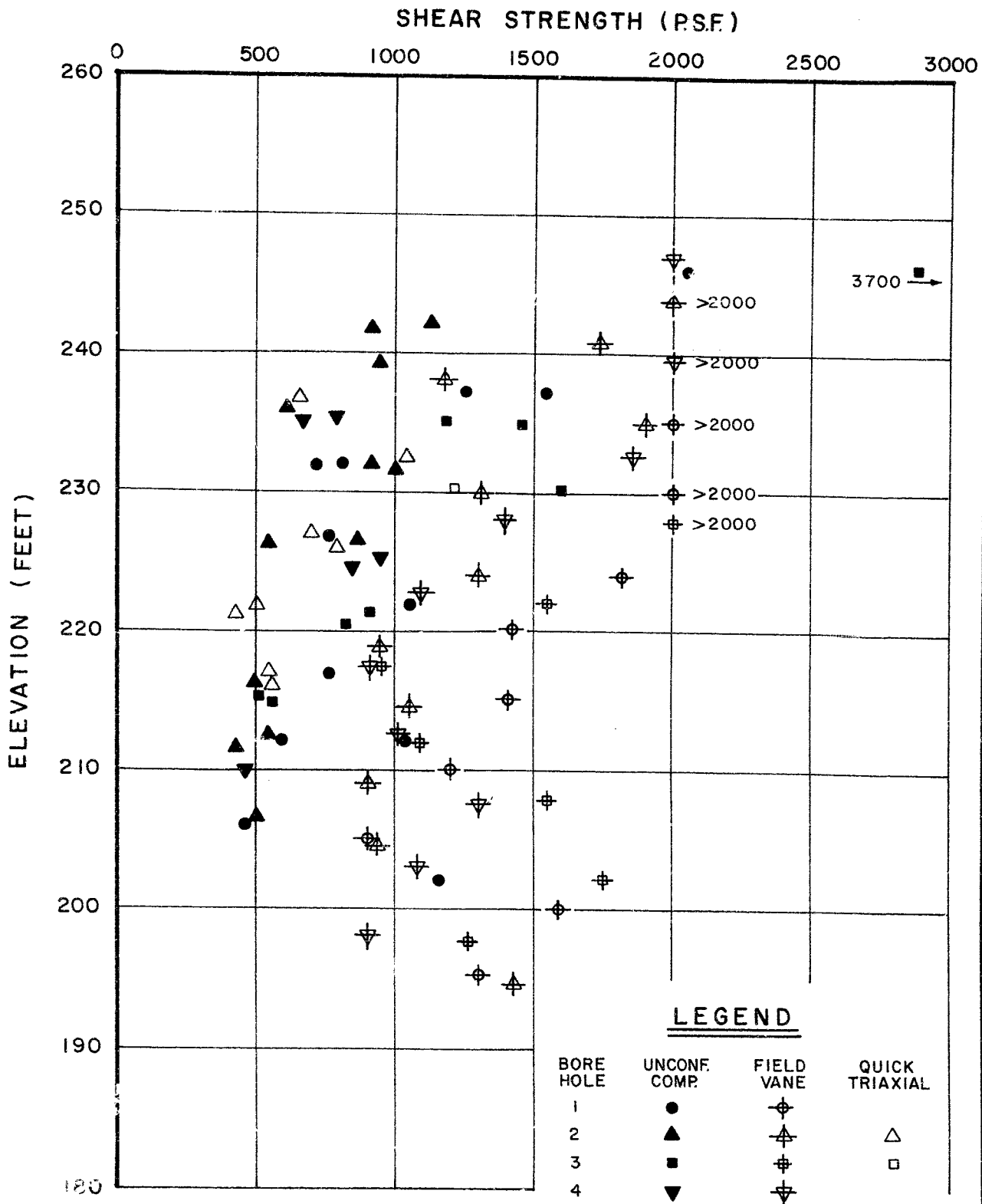
Sample No. 7

Depth 26'0"



W.P. 182-63

JOB 65-F-60



ONTARIO

DEPARTMENT OF HIGHWAYS  
**MATERIALS and  
TESTING  
DIVISION**

## SHEAR STRENGTH PROFILE

W.P. 182-63

DIST. 8

JOB 65-F-60

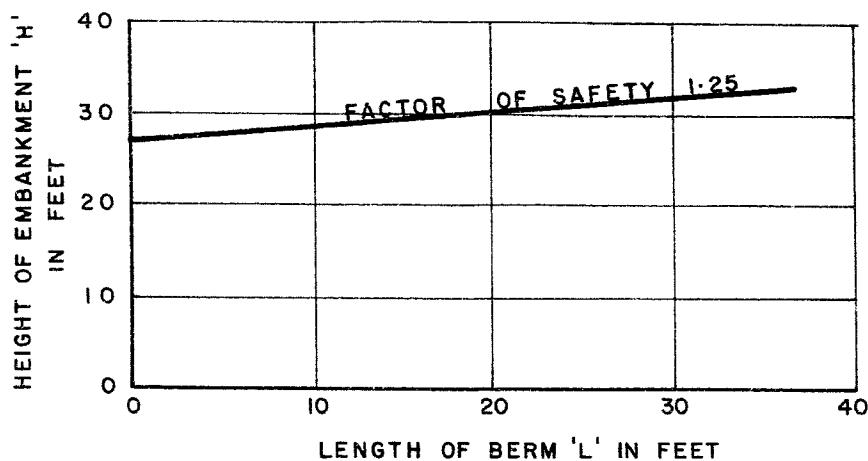
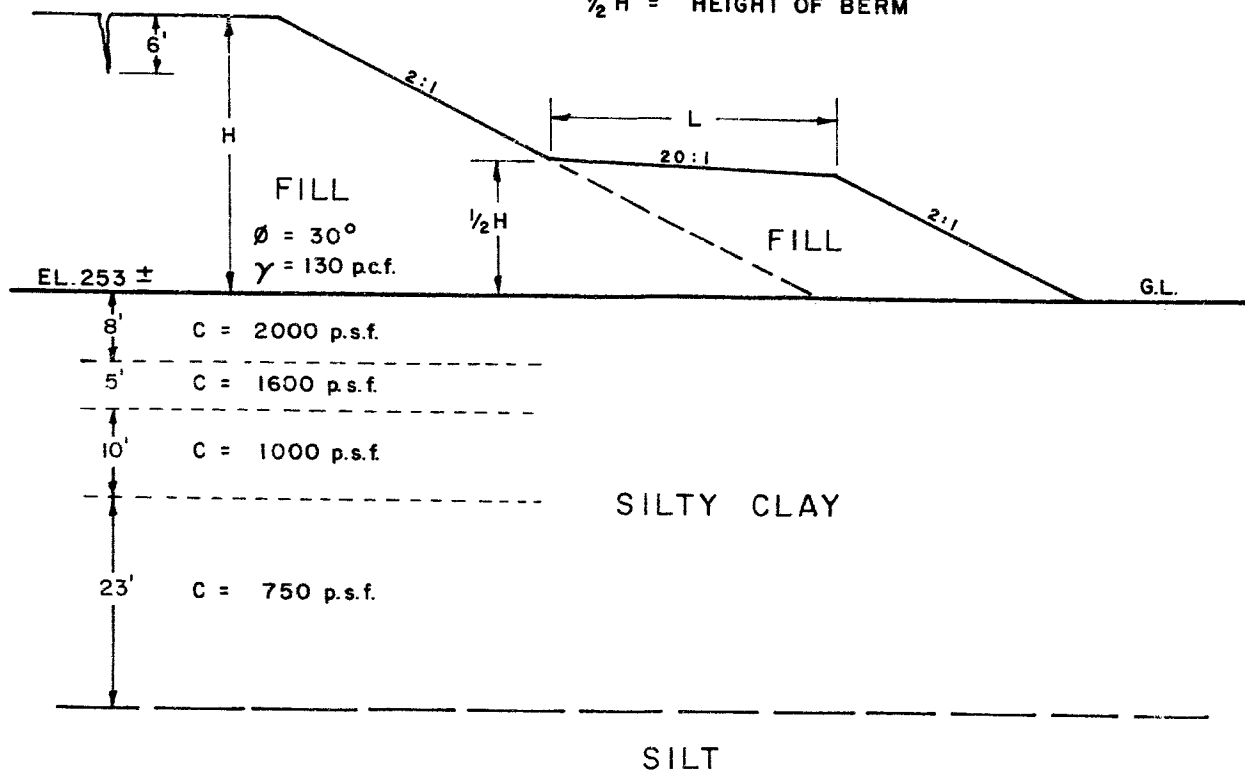
DATE 12 AUG. 1965

APPROVED

*M. Devata*

DRAWING NO. 65-F-60B

L = LENGTH OF BERM  
H = HEIGHT OF EMBANKMENT  
 $\frac{1}{2} H$  = HEIGHT OF BERM



ONTARIO

DEPARTMENT OF HIGHWAYS  
**MATERIALS and  
TESTING  
DIVISION**

## DESIGN CURVE for APPROACH EMBANKMENTS

W.P. 182-63

DIST. 8

JOB 65-F-60

DATE 12 AUG. 1965

APPROVED

*M. Devata*

DRAWING NO. 65-F-60 C

## 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.	FO'L 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 <sub>u</sub>	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Q <sub>cu</sub>	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q <sub>d</sub>	DRAINED TRIAXIAL	S	SENSITIVITY

## ABBREVIATIONS 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
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
$\phi'$	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
$c_u$	APPARENT COHESION
$\phi_u$	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
$\mu$	COEFFICIENT OF FRICTION
$S_r$	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

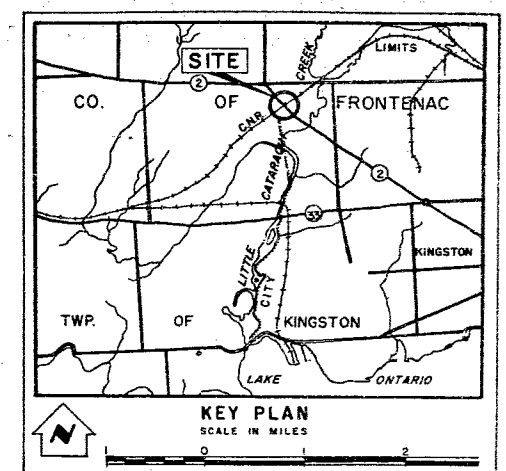
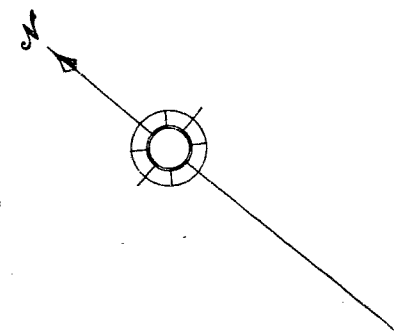
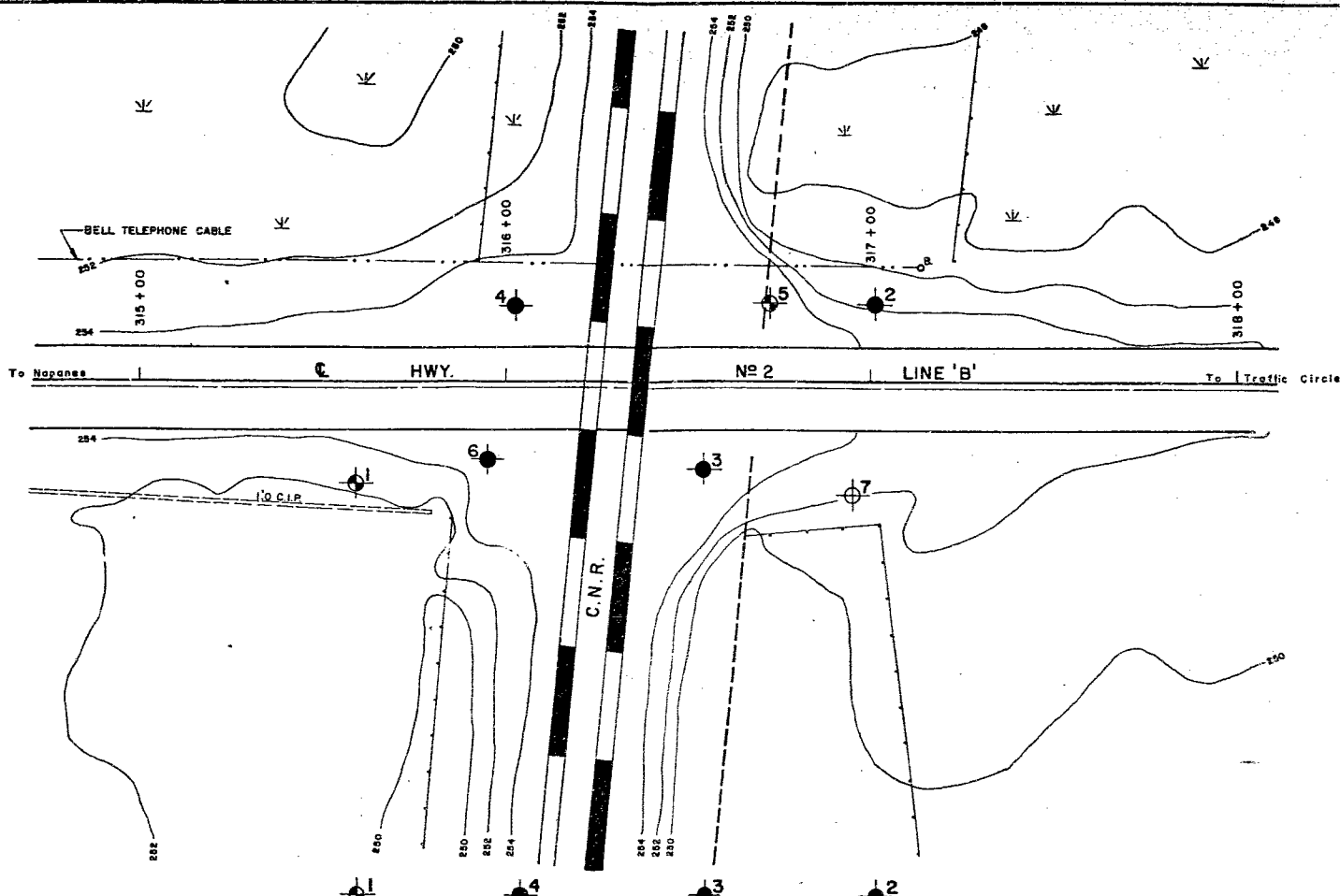
### FOUNDATIONS

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



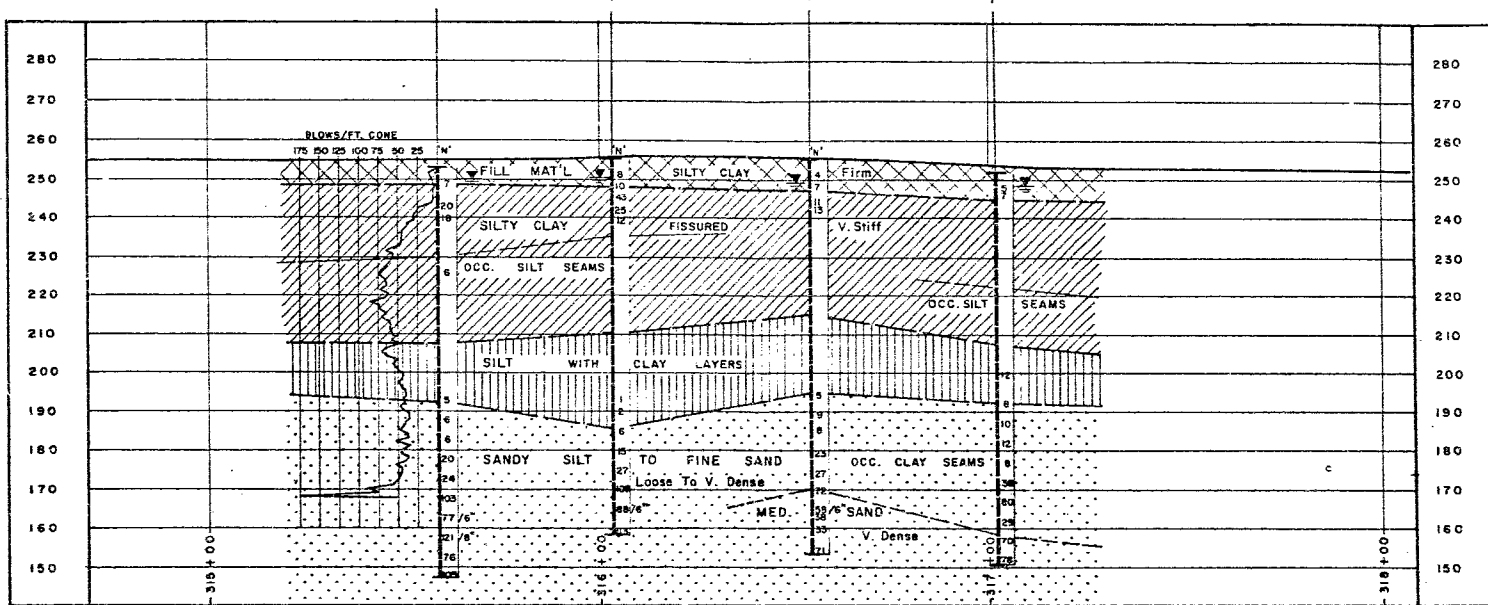


LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation.		

NO.	ELEVATION	STATION	OFFSET
1	252.8	315+59	29' RT.
2	252.1	317+02	21' LT.
3	255.3	316+54	24' RT.
4	255.4	316+03	21' LT.
5	255.3	316+73	22' LT.
6	255.6	315+95	22' RT.
7	252.0	316+95	32' RT.

**- 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**  
 'KINGSTON'

KING'S HIGHWAY NO. 2 LINE 'B' DIST. NO. 8  
 CO. FRONTENAC  
 TWP. KINGSTON LOT 15 & 16 CON. II

**BORE HOLE LOCATIONS & SOIL STRATA**

SUBM'D. T.C.	CHECKED <i>g</i>	W.P. NO. 182-63	D.B.T. DRAWING NO.
DRAWN D.G.H.	CHECKED	JOB NO. 65-F-60	<b>65-F-60A</b>
DATE 21 July 65	SITE NO.		BRIDGE DRAWING NO.
APPROVED <i>[Signature]</i>	CONT. NO.		



## MEMORANDUM

(2)

To: Mr. K. Y. Lo,  
Supervising Foundation Engineer,  
Materials and Testing,  
Lab. Bldg.

FROM: Bridge Division,  
Downsview, Ontario.

DATE: May 7, 1965.

65-F-60

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 162-63, Site #7-84,  
C.N.R. Overhead, Kingston West  
Limits, Hwy. 2, District 6.

Would you kindly arrange to have a foundation investigation conducted at the above location. I have enclosed one copy of the site plan number E-4268-1 with the probable footing locations marked in red. Would you also check the approach stability. Bedrock will likely not be encountered near the surface in any of the holes.


Accommodation is available at Caturaqui or Kingston, Ontario.



APW/ag  
c.c. N. D. Smith  
R. Fitzgibbon

A. P. Watt,  
Regional Bridge Location Engineer.

Rec'd May 10, 1965

July 7/65 

## MEMORANDUM

To: Mr. A. G. Stermac,  
Principal Foundation Engineer,  
Room 107, Lab. Bldg.

FROM: Bridge Division,  
Downsview, Ontario.

DATE: October 29, 1965.

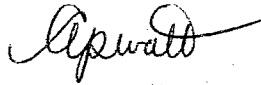
OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 182-63-2 - Site #7-84,  
C.N.R. Overhead at Kingston West Limits,  
Hwy. 2 - District 8.

Enclosed please find one copy of the preliminary plan D-5801-P for the above structure.

Would you kindly review the bridge foundations proposed and inform us if they are satisfactory.



APW/im

A. P. Watt,  
Regional Bridge Location Engineer.

*as follows*  
Advised Mr. A. Watt regarding the above mentioned job on Nov 15/65 by Telephone.

~~COMPLETION DATE~~

- 1) No comments regarding the structure foundations
- 2) Any stability problems between Sta 32+00 and Sta 33+00 will be discussed at a later date when additional information is available from Mr. J. Graff.

DD: Dura  
Nov 15/65.

## MEMORANDUM

To: Mr. A.C. Stermac,  
Principal Foundation Engineer,  
M.&T. Division, DOWNSVIEW.

FROM: M.&T. Division, KINGSTON.

ATTENTION: Mr. M. Devatta.

DATE: October 6, 1965.

OUR FILE REF.

IN REPLY TO

SUBJECT: Re: Hwy. 2. W.P. 182-63.

Further to our discussion a few days ago, enclosed is a sketch showing the locations of soundings carried out in the vicinity of the railway crossing at Cataragui.

The depths indicated adjacent to the boreholes are the depths of soft materials. The blue broken line indicates the approximate 5' contours of soft materials and the broken red lines indicate the approximate contours of the 10' depth of soft materials. A few of the borings in the vicinity of Sta. 318 to Sta. 320 indicate soft materials from 6' - 15½' or 5' - 15½'. The initial 5' is the existing fill of Hwy. 2 with a remaining depth of soft material down to a depth of 15½'.

Vane tests were carried out at several of these locations, three of them being completed and the fourth could not be obtained due to layers of sandy materials. It is felt that the soft materials should be excavated down to the maximum depth shown. Where soft materials underly the existing Hwy. 2 fill, excavation should only be carried out on the widening with no excavation of the existing roadway fill.

I would be pleased to hear your comments on our proposals as to whether you are in agreement or feel that some other form of treatment is necessary.

JEG:cdr  
Encl.

*J. E. Gruspier*  
J. E. Gruspier  
Regional Materials Engineer

c.c. File

## DEPTH OF SOFT MATERIALS.

V.P. 182-63-2

Hwy 2

✓ # 4

1.5 - 400/50

3.5 - 1280/480

3.5 + 4.5 = 8

Y# 2

1.5 - 720/40

360/74

7.5- 320/80

9.5. 250/120

11.5-609270

—

CATARAQUI

V#1

15 - 320/40

3.5 - 320/60

5.5 - 360/20

7.5 - 360/30

9.5 - 360/100

11.5 = 240/100

13.5 - 320/180

14.5 - N.F.P

V 转 3

1.5 = 400/40

5.5 - 440/160

5.5 440/80

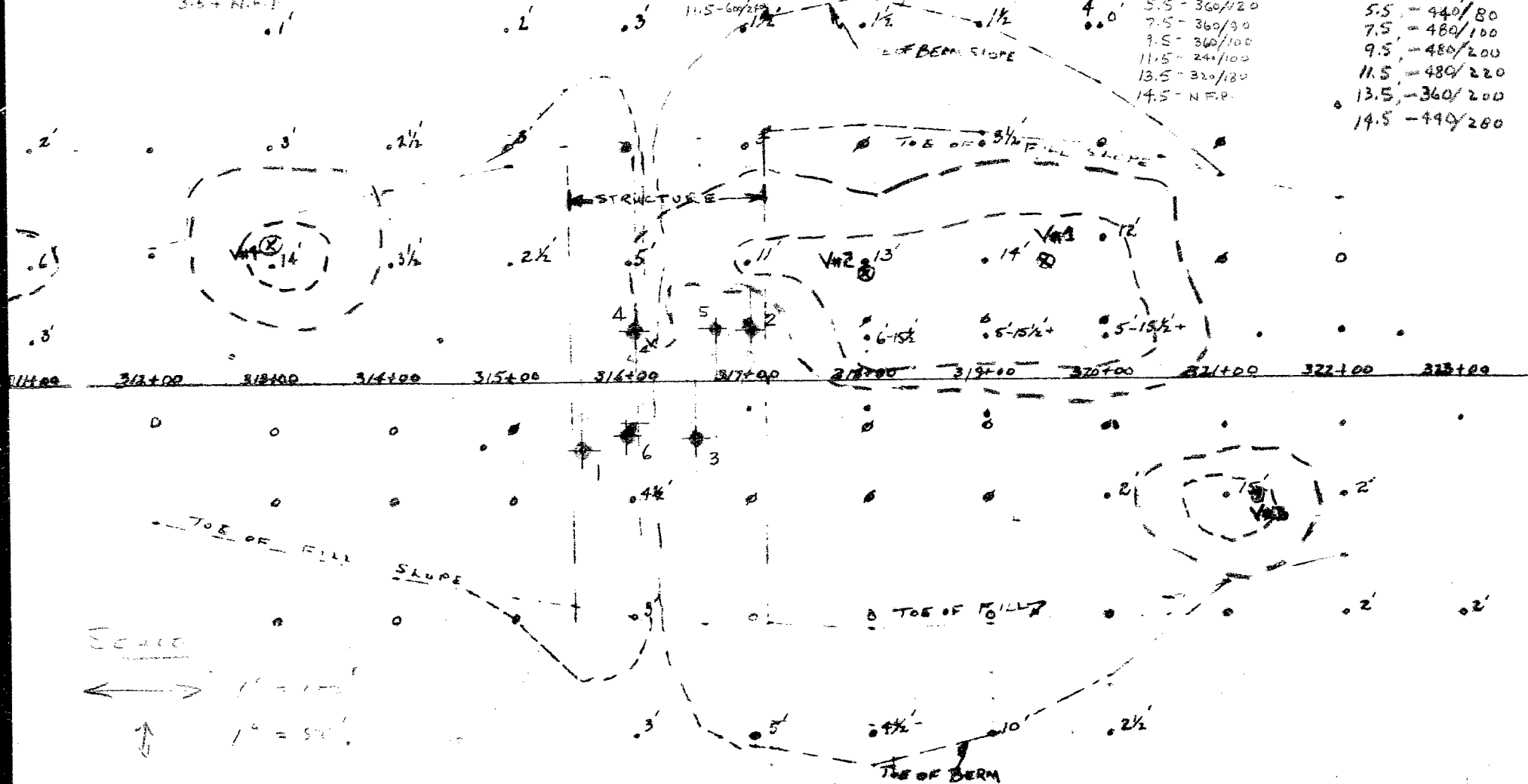
$$7.5' = 480/100$$

4.3 - 480/200

1.3 404 220  
2.5 310 220

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 84

7-11-1972



Gun River CNR owned W.P. 182-63

depth of organic soft material adj  
railway

15' - soft material — str 318-320

1/ Can we use ~~table~~ m

2/ organic or also soft material

3/ Berms still after removal & replacement

## MEMORANDUM

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

FROM: Mr. E. A. Cash,  
District Engineer,  
Kingston.

Attention: Mr. A. P. Watt

DATE: December 8th, 1965.

OUR FILE REF.

IN REPLY TO

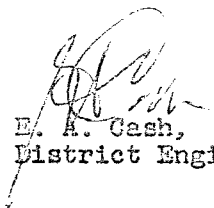
SUBJECT: W.P. 179-61  
W.P. 178-61  
W.P. 182-63-2

The writer understands that the return of plans is requested with comments.

No comments at this stage about the enclosed plans are offered except W.P. 182-63-2 where a large safety factor is suggested in the use of timber piles plus pile shoes where necessary as the type of borrow and granular filled employed will be uncertain.

The employment of longer timber piles say 60 feet or the use of concrete or Frankl type should be considered.

EAC/sr  
Attach.

  
E. A. Cash,  
District Engineer.



## MEMORANDUM

To: Mr. K. Y. Lo,  
Supervising Foundation Engineer,  
Materials and Testing,  
Lab. Bldg.

FROM: Bridge Division,  
Downsview, Ontario.

DATE: May 7, 1965.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 182-63, Site #7-84,  
C.N.R. Overhead, Kingston West  
Limits, Hwy. 2, District 8.

Would you kindly arrange to have a foundation investigation conducted at the above location. I have enclosed one copy of the site plan number E-4268-1 with the probable footing locations marked in red. Would you also check the approach stability. Bedrock will likely not be encountered near the surface in any of the holes.

Accommodation is available at Cataraqui or Kingston, Ontario.

*Apwatt*

APW/ag  
c.c. N. D. Smith  
R. Fitzgibbon

A. P. Watt,  
Regional Bridge Location Engineer.

*Rec'd May 11, 1965*

*July 7/65*

*County of Frontenac*

*15-F-60*

## MEMORANDUM

To: Mr. A. G. Stermac,  
Principal Foundation Engineer,  
Room 107, Lab. Bldg.

FROM: Bridge Division,  
Downsview, Ontario.

DATE: July 19, 1965.

OUR FILE REF.


IN REPLY TO

SUBJECT: W.P. 182-63-2, Site #7-84,  
C.N.R. Overhead, Kingston West Limits,  
Hwy. 2, District 8.

Please be advised that the structure over the C.N.R. Railway at the above location is to be built to accommodate four tracks as pointed out in the attached memorandum and attached sketch.

Provisions for these two future tracks means that a clear span of 64'-0 is required rather than the 36'-0 originally required. Therefore in the preparation of your report would you kindly consider the probable footing locations as being 45'-0, 68'-0, 45'-0 measured from west to east instead of the probable footing locations shown on E 4268-1 sent to the Foundation Section on May 7, 1965. The centre line of the structure still remains the same.

APW/ag  
c.c. N. D. Smith  
R. Fitzgibbon

  
A. P. Watt,  
Regional Bridge Location Engineer.

## MEMORANDUM

TO: Mr. S. McCombie,  
Bridge Planning Engineer,  
Bridge Office,  
Downsview.

FROM: Functional Planning Section,  
Kingston.

DATE: July 12, 1965

Attention: Mr. A. Watt

OUR FILE REF.

IN REPLY TO

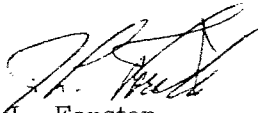
SUBJECT: W.P. 182-63-1, From Hwy. 38 E'ly to Little Cataraqui Creek,  
Highway No. 2, District 3 - Kingston.

The structure over the C.N.R. railway at the above location is to be built to accommodate two future additional tracks as shown in the attached sketch.

Also attached is a copy of the Railway Clearance Standard at overhead structures.

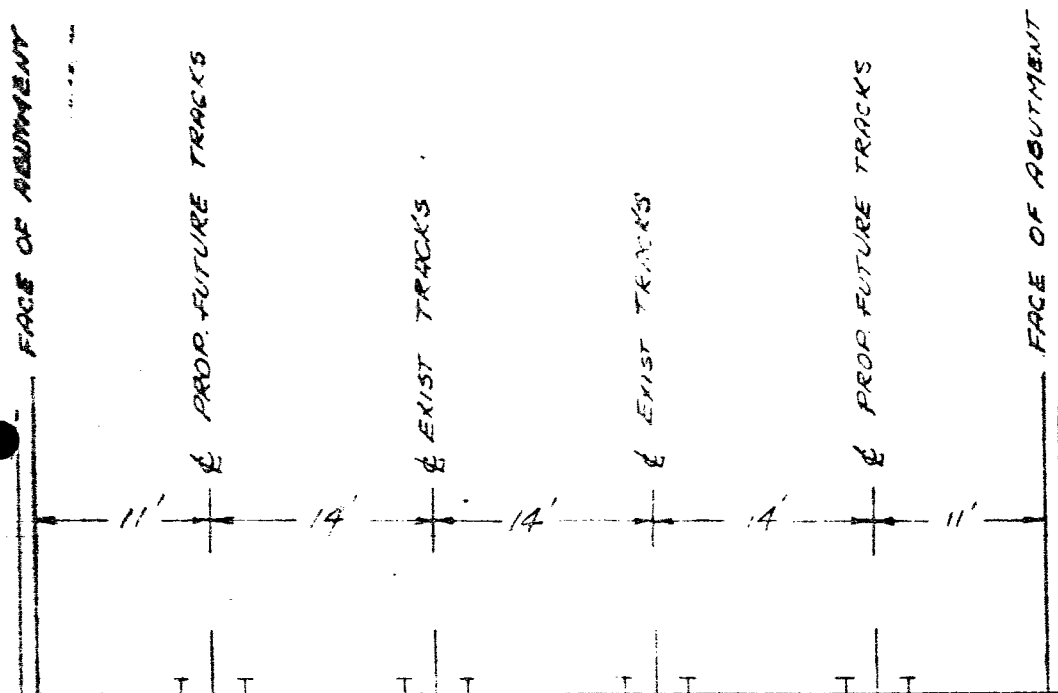
Provision for two additional tracks means that the clear span required at this structure will be 64' rather than the 36' stated in the Functional Report for this project.

The gradeline at the structure as issued on March 15, 1965 still applies and no further issue is proposed.

  
J.L. Forster,  
Regional Functional Planning Engineer

MJM/cam  
Att'd.

c.c. E.A. Cash  
G. Booth



HORIZONTAL CLEARANCE OF STRUCTURE AT C.N.R.  
CROSSING & HWY NO. 2 "CATARAQUI"

V.P. 182-63

SCALE 1 IN. = 10 FT. HOR.

Mr. S. McCombie,  
Bridge Planning Engr.,  
Bridge Division.

Foundation Section,  
Materials and Testing Div.,  
Room 107, Lab. Bldg.

Attention: Mr. A. Watt

December 15, 1965

C.N.R. Overhead on Hwy. #2 at Catarague,  
-- District #8 (Kingston) --  
N.J. 65-F-60 -- T.P. 182-63

Further to the memo of Mr. E. A. Cash, District Engineer,  
dated December 8, 1965, to Mr. A. Watt of the Bridge Office, this  
Section has re-reviewed the foundation report and submits the  
following comments:

1) The longer timber piles will undoubtedly increase the  
bearing capacity since these are friction piles. However, the increase  
in cost of obtaining the longer timber piles should also be taken into  
account, and it is believed that the 45 ft. long piles will be a more  
economical proposition.

2) Concrete or Franki piles can be utilized, provided they are  
founded on end-bearing strata. At the proposed abutment locations, the  
dense granular deposit was encountered some 100 ft. below the footing  
base. Since the depth to the granular stratum is considerable, this type  
of pile will most probably be uneconomical.

MB/HdeF

cc: Foundations Office ✓  
Gen. Files

*M. Devata*

M. Devata,  
SENIOR FOUNDATION ENGINEER  
For:

A. G. Stermac,  
PRINCIPAL FOUNDATION ENGINEER