62-F-98

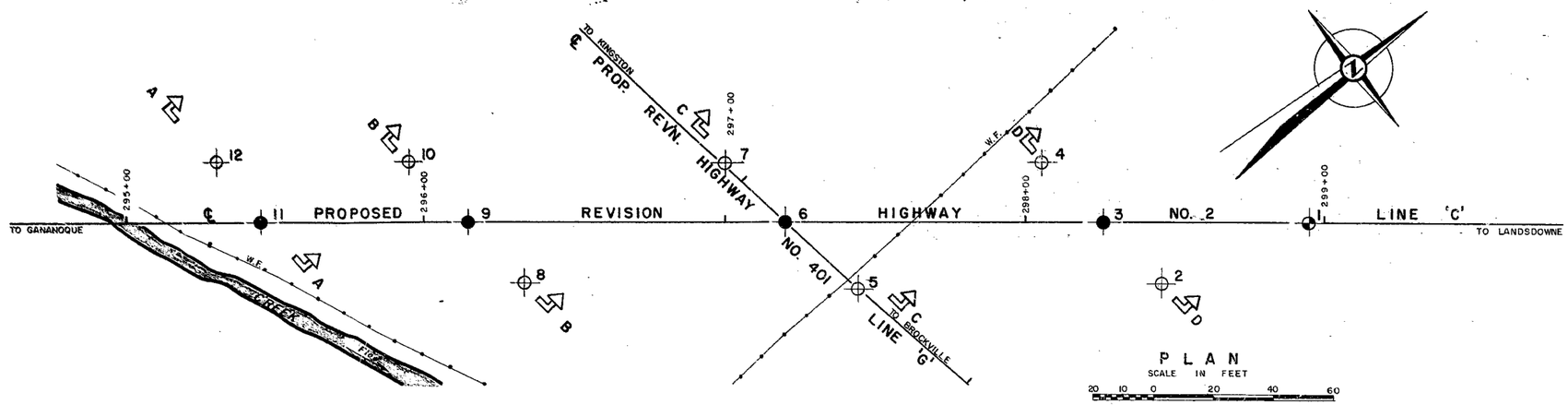
W.P.# 173-61

Hwy. # 2 &

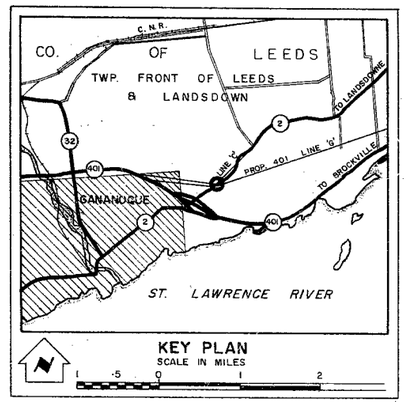
Hwy. # 401

1/2 MILES E. OF

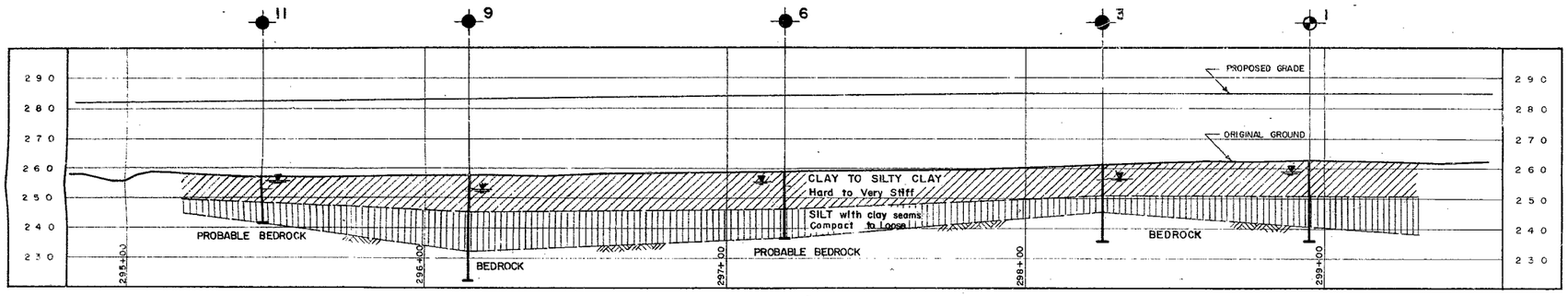
GANANOQUE



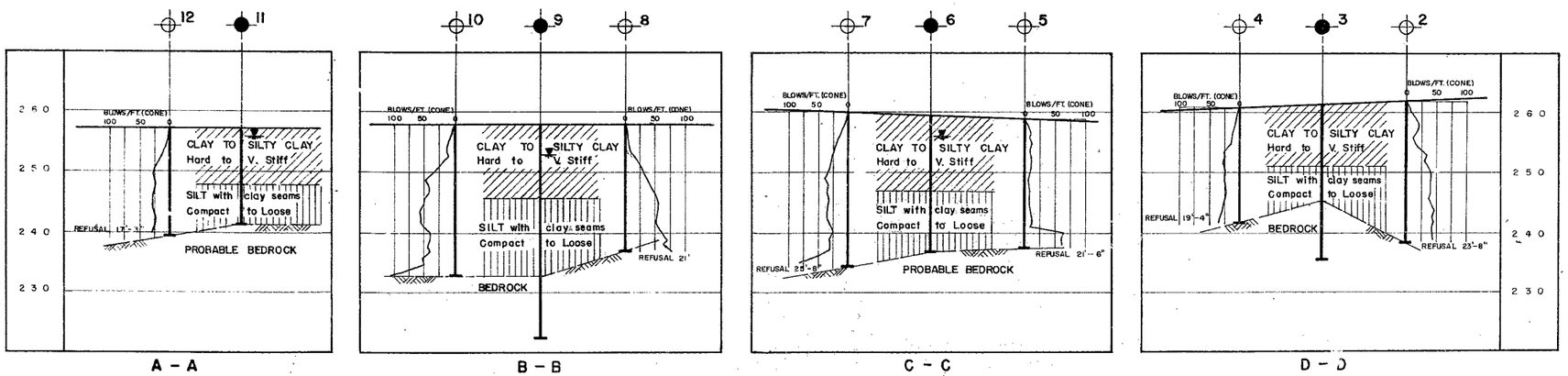
PLAN
SCALE IN FEET
20 10 0 20 40 60



KEY PLAN
SCALE IN MILES
1 .5 0 1 2



PROFILE
SCALE IN FEET
20 10 0 20 40



A – A B – B C – C D – D

SECTIONS
SCALE IN FEET
10 5 0 10 20 VERTICAL
20 10 0 20 40 HORIZONTAL

LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation. Aug. 1962

NO.	ELEVATION	STATION	OFFSET
1	263·0	298+95	℄
2	262·0	298+45	20' RT.
3	261·5	298+26	℄
4	261·0	298+05	20' LT.
5	259·0	297+44	22' RT.
6	259·5	297+20	℄
7	260·0	297+00	20' LT.
8	258·0	296+33	20' RT.
9	258·0	296+15	℄
10	258·0	295+95	20' LT.
11	257·0	295+45	℄
12	257·0	295+30	20' LT.

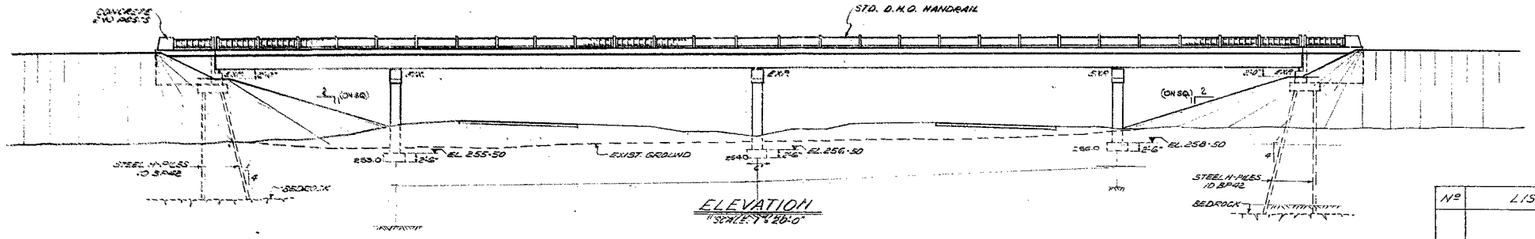
– NOTE –

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.

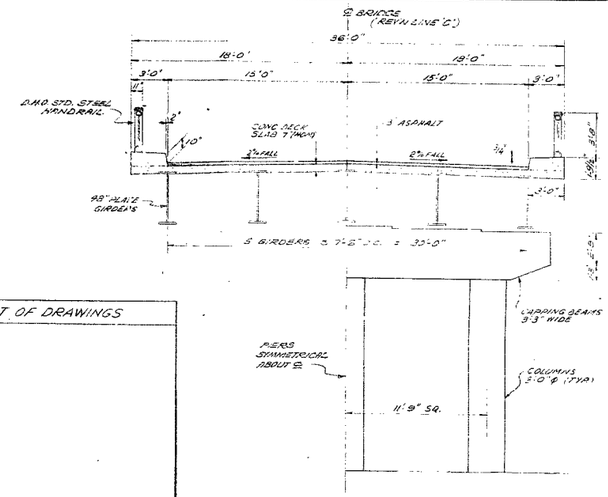
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH SECTION

HIGHWAY NO. 2 LINE 'C' REVISION AND HIGHWAY NO. 401 LINE 'G' REVISION AT GANANOQUE

ORIGINATED G. CHERRINGTON	DISTRICT NO. 8	DATE 30 AUGUST 1962
DRAWN D. MUMFORD	W.P. NO. 173 – 61	JOB NO. 62 – F – 98
CHECKED	CONTRACT NO.	DRAWING NO. 62 – F – 98 A
APPROVED		



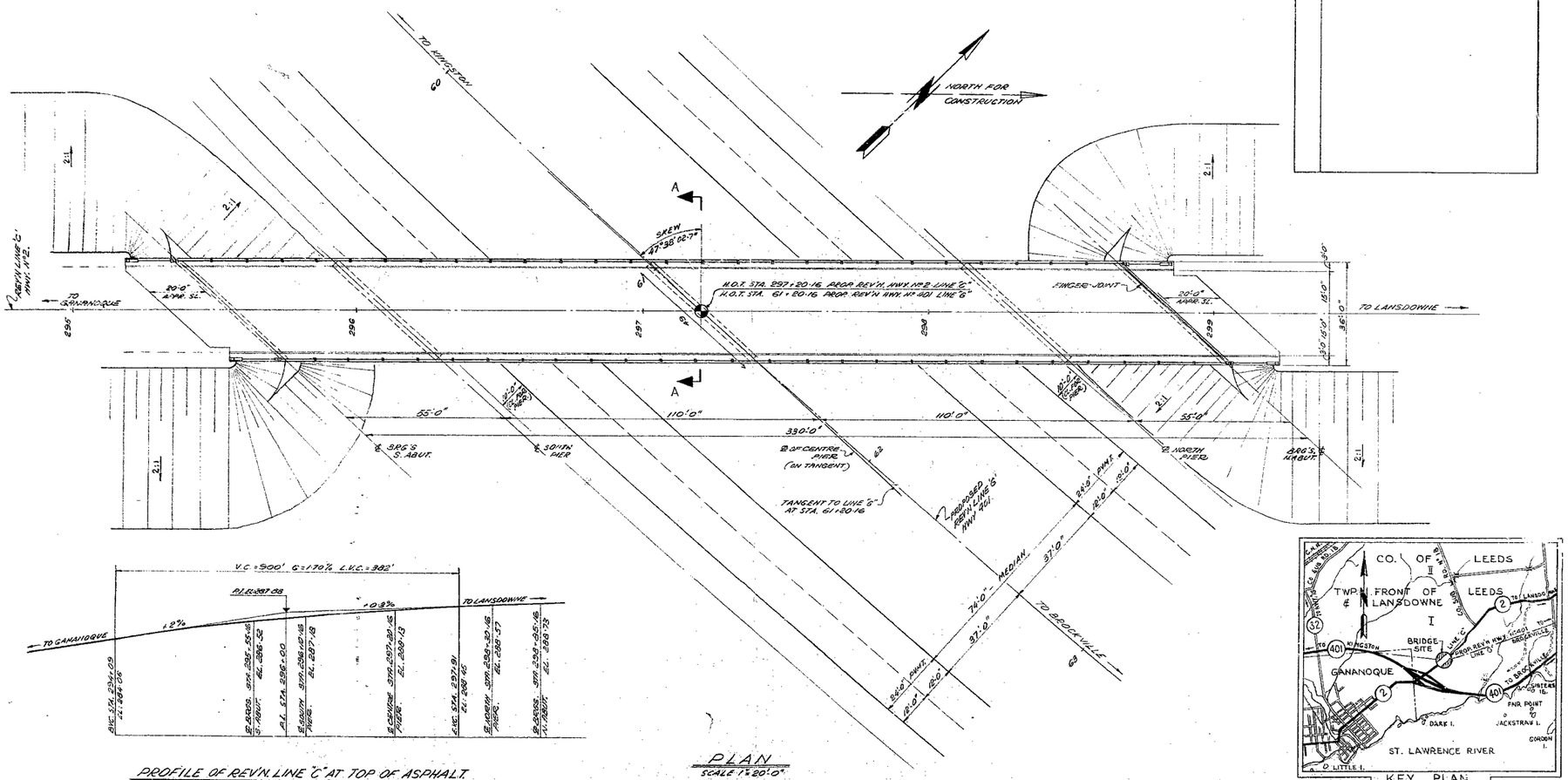
ELEVATION
SCALE 1"=20'-0"



SECTION A-A
SCALE 3/16" = 1'-0"

No.	LIST OF DRAWINGS

NOTES:



PLAN
SCALE 1"=20'-0"

PROFILE OF REV'N LINE 'C' AT TOP OF ASPHALT
N.T.S.

(N.B. PROFILE CAN BE LOWERED BY 9")

KEY PLAN
SCALE - 1 IN. = 0·8 MI

PRINT RECORD		
No.	FOR	DATE

62-F-98

REVISIONS		
DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

HWY. 2 INTERCHANGE UNDERPASS AT GANANOQUE

KING'S HIGHWAY No. 401 — DIST. No. 8
CO. LEEDS
TWP. FRONT OF LEEDS & LANSDOWNE LOT 19 — CON. I

PRELIMINARY GENERAL ARRANGEMENT

APPROVED	BRIDGE ENGINEER			SITE No.	W.P. No. 173-61
DESIGN		CHECK		CONTRACT Nos.	
DRAWING	B.P.D.	CHECK	X.F.		
DATE		LOADING		DRAWING No.	D-5169-PI

Damas & Smith Limited • Consulting Engineers • Toronto

23-64-303.

Mr. A. M. Toye,
Bridge Engineer.
Materials & Research Division,
(Foundation Section)
Attention: Mr. S. McCombie.

September 5, 1962.
D.H.O. FOUNDATION INVESTIGATION REPORT.
W.J. 62-F-98 -- W.P. 173-61.

Re: Proposed Structure - Hwy. #2, Line 'C', Station 297+20 and Hwy. #401, Line 'G', Station 61+20, 1/2 Mi. E. of Gananoque, District #8.

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

We believe you will find the factual data and recommendations contained therein, self-explanatory. However, should further information be desired, please do not hesitate to contact our Office.

AGS/MdeF
Attach.

A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
H. D. McMillan
J. Ford
E. A. Cash
J. E. Gruspier
T. J. Kovich
J. Roy
E. R. Saint
F. Norman
A. Watt
Foundations Office ✓
Gen. Files.

TABLE OF CONTENTS

FOUNDATION INVESTIGATION

For

Proposed Structure - Hwy. #2, Line 'C',
Station 297+20 and Hwy. #401, Line 'C',
Station 61+20, 1/2 Mi. E. of Gananoque,
District #8.
W.J. 62-F-98 ---- W.P. 173-61

1. INTRODUCTION:

A request was received from the Bridge Location Section dated July 19, 1962, for a foundation investigation at the site of a proposed structure to carry Hwy. #2, Line 'C' over Hwy. #401, Line 'C'.

A field investigation to determine the subsoil conditions at the site of the proposed structure was carried out by this Section.

Presented in this report are the results of this investigation, together with the recommendations pertaining to the design of the structure foundations.

2. DESCRIPTION OF SITE:

The proposed site is located about 100 yards North of existing Hwy. #2 and one-half mile East of the Town of Gananoque.

The site is located in a relatively flat meadow surrounded by rolling countryside with numerous rock outcrops of igneous and metamorphic rock.

Physiographically, the area is located in a section known as the "Leeds Knobs and Flats". Typically, this area consists of

cont'd. /2 ...

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

knobs of granite and other Precambrian rocks with the low areas being filled with clay left by the Champlain Sea.

3. FIELD AND LABORATORY WORK:

The field work consisted of 5 sampled boreholes and 3 dynamic cone penetration tests.

Samples were recovered at required depths by means of a 2" O.D. split-spoon sampler. The dimensions of the split-spoon sampler and the energy used in driving it, conform to the requirements of the Standard Penetration Test. Driving energy to advance the 2-inch diameter cone was 350 ft.-lbs. per blow.

AXT rock core samples were obtained in B.H.'s 1, 3 & 9.

The locations and elevations of all boreholes are shown on Dwg. 62-F-98A which accompanies this report.

4. SUBSOIL CONDITIONS:

4.1) General:

The soil stratigraphy at the site was found to be generally uniform. Detailed descriptions of the soil types encountered in each boring, are given in Appendix I of this report. The estimated stratigraphical profile of Dwg. 62-F-98A is based upon this information.

From ground level downwards, the various soil types encountered, are as follows:

cont'd. /3 ...

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

4.2) Hard to Med. Stiff Brown Clay to Silty Clay:

A surface layer of hard to med. stiff brown silty clay varying between 9 and 12' in thickness, was found in all sampled boreholes.

'N' values in the material ranged from 53 blows/ft. at the upper part, to a low of 15 blows/ft. near the bottom of the layer.

Representative values for this material are noted below:

	Range	Average Values
w_L	55% to 41%	45%
w_p	31% to 21%	24%
w	25% to 30%	27%
γ	124 to 131 p.c.f.	127 p.c.f.
'N'	53 to 15 blows/ft.	30 blows/ft.
Shear Strength	- 3000 to 5000 p.s.f.	4000 p.s.f.

The Atterberg limits show the clay is of high plasticity near the surface, but decreases in plasticity with depth.

4.3) Compact to Loose Grey Silt containing Thin Layers of Clay:

This layer varies in thickness between 6 and 13', and lies between the surface crust of brown clay to silty clay and the underlying bedrock.

cont'd. /4 ...

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

4.3) Compact to Loose Grey Silt containing Thin Layers of Clay: (cont'd.) ...

'N' values in this material varied between 8 to 14 blows per ft. which would classify the material as being loose to compact. This deposit contains occasional thin layers of clay approx. 1/4" thick.

The moisture content of the silt was found to be approx. 22%. Due to lack of sufficient material, Atterberg limits were not carried out on the clay layers, but one moisture content test was carried out and a value of 31.7% was obtained. Visual examination of the clay layers indicated the material appeared to be dark grey, highly plastic and with a brittle texture.

4.4) Bedrock:

The bedrock was found to vary between 15 ft. and 25 ft. below the surface (el. 245 to el. 233).

All boreholes were advanced to rock contact. In B.H. #1, 5' of rock core (in AXT size) was taken with 100% recovery; 10' of AXT core was taken in B.H.'s 3 and 9 with 95% recovery in B.H. #3, and 100% recovery in B.H. #9.

The bedrock was found to be a sound granite in B.H.'s 1 and 3, and sound quartzite in B.H. #9.

5. GROUND WATER CONDITIONS:

The ground water level was found to vary between 1 and 5' below the surface.

The ground water elevations taken at the time of investigation, are shown on the borehole logs and Dwg. 62-F-98A.

cont'd. /5 ...

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct a 4-span structure just East of the Town of Gananoque, to carry the relocated Hwy. #2 over relocated Hwy. #401.

The subsoil consists of 9 - 12' of hard to very stiff brown clay overlying 6 to 23' of compact to loose grey silt containing thin layers of clay.

This material is underlain by sound bedrock.

6.2) Structure:

Spread footings placed 5 ft. below ground surface are capable of supporting 2 T.S.F. with resultant settlements not exceeding 1".

If higher loads are desired, the structure should be supported on end-bearing piles driven to bedrock. For a 12" Ø timber pile, a design load of 20 T/pile may be used. Such piles should be treated if their cut-off is above the lowest known ground water elevation. For a 12¾" O.D. steel tube pile driven to bedrock, a design load of 60 T/pile can be used.

6.3) Approach Fills:

No stability problems are anticipated with a fill height of 25' having 2:1 side slopes.

Since the footing excavation will extend below the free water table, some seepage may occur; however, this should be easily handled by ordinary pumping methods.

cont'd. /6 ...

7. SUMMARY:

The subsoil at the site consists of a clay overlying a deposit of silt. This material is underlain by bedrock.

Spread footings placed 5 ft. or below the ground surface, are capable of supporting 2 T.S.F. with settlements not greater than 1 inch.

For higher loadings, 12" Ø timber piles, or 12¾" O.D. steel tube piles driven to bedrock, are capable of supporting 20 and 60 Tons/pile, respectively.

No major dewatering problems are anticipated.

Stability problems are not anticipated provided the approaches are constructed with side slopes 2 horizontal to 1 vertical.

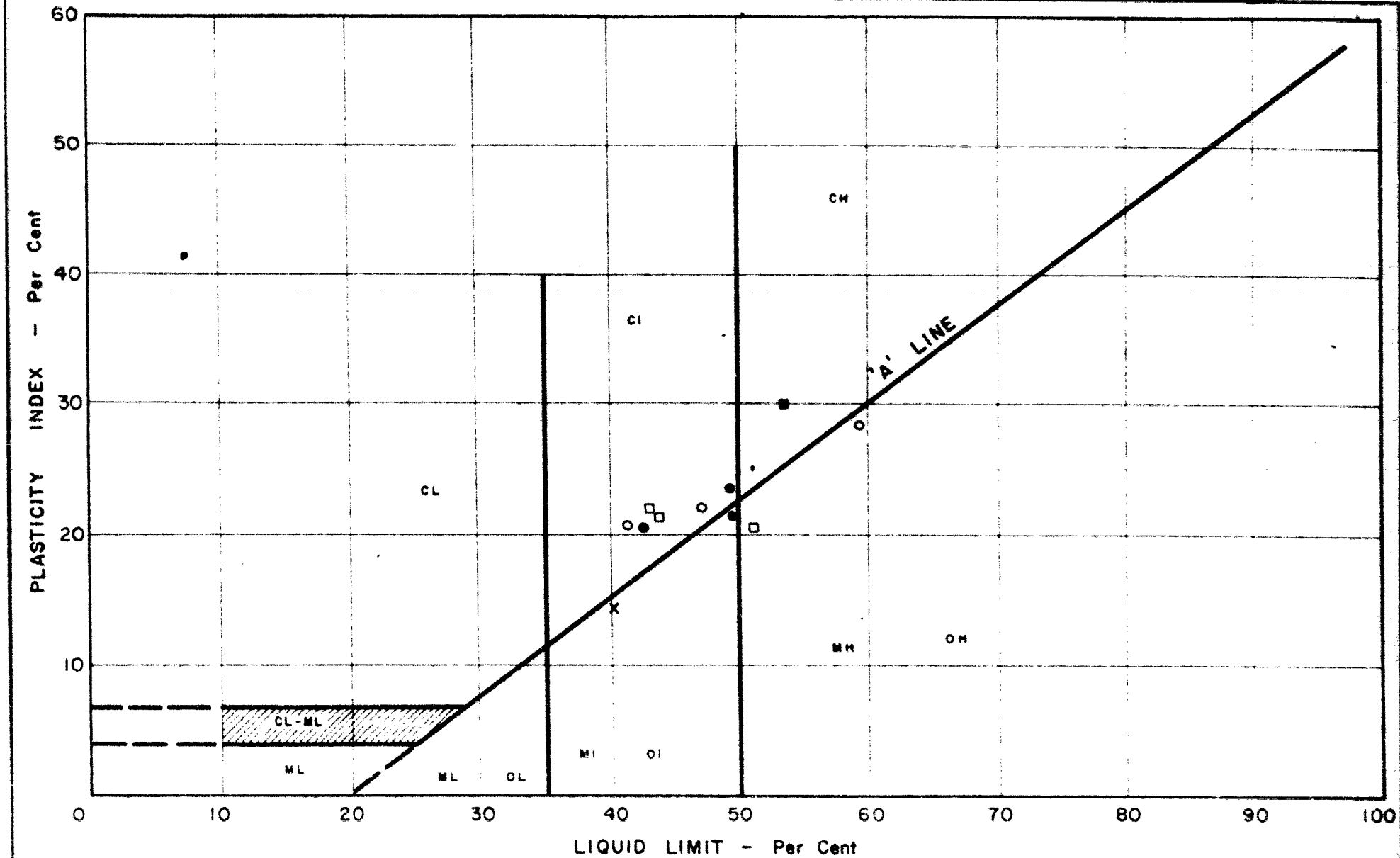
8. MISCELLANEOUS:

The field work, performed during the period from August 9 to August 17, together with the preparation of this report, was undertaken by Mr. G. G. Cherrington. The investigation was carried out under the general supervision of Mr. M. Devata, who also reviewed the report.

September 1962.

APPENDIX I.

FORM 08-ML-252 (REV. MARCH 62)



NOTES BORE HOLE 1 - ●
" " 3 - ■
" " 6 - ○
" " 9 - □
" " 11 - X

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

PLASTICITY CHART

Job No. 62-F-98 W.P. No. 173-61

Location HWY. 2 - PROP. LINE 'G' AT GANANOQUE

FORM OB - ML - 126 REV 1961

61-4391

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 298/95 ℄ ORIGINATED BY M.D.

W.P. 173-61 BORING DATE Aug. 9, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Washboring. CHECKED BY H.S.

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F.	REMARKS
263.0	Groundlevel									W.L. from observations in borehole.
0.0	Silty clay-Hard to v. stiff-Brown.					260			124.0	▽ 259.0 4.0
			1	SS	53					
			2	SS	49					
			3	SS	29				127.0	
250.5						250				
12.5	Silt with clay seams compact-grey.		4	SS	11					
			5	SS	11					
241.0						240	Refusal			
22.0	Bedrock-sound granite 100% recovery.									
236.0										
27.0	End of borehole.									

FORM 08 - ML - 126 REV 1961 OFFICE REPORT SOIL EXPLORATION
61-4391

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 298+45 - 20' Rt. of ℄ ORIGINATED BY M.D.
W.P. 173-61 BORING DATE Aug. 13, 1962. COMPILED BY M.D.
DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY H.S.

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV SCALE
262.0 / 0.0	Groundlevel					260
						250
						240
238.2 / 23.8						230

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100
SHEAR STRENGTH P.S.F.

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT %

BULK DENSITY γ P.C.F.

REMARKS

Refusal

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 298+26 ℄ ORIGINATED BY M.D.
W.P. 173-61 BORING DATE Aug. 13, 1962. COMPILED BY M.D.
DATUM G.S.C. BOREHOLE TYPE Washboring. CHECKED BY H.S.

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w — WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F.	REMARKS
261.5	Groundlevel									Waterlevel from observation in borehole.
0.0	Silty clay-V. stiff Brown to grey.					260				
			1	SS	17					▽ 256.5 5.0
252.0										
9.5	Silt with clay seams compact-loose.		2	SS	14	250				Clay 23% Silt 75% Sand 2%
			3	SS	8					
245.0			4	SS	>9					
16.5	AXT core-95% recovery Sound granite.					240				
235.4										
26.1	End of borehole.					230				

FORM OB - ML - 126 REV. 1951
61-4391

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 298/05 20' Rt. of ℄ ORIGINATED BY M.D.

W.P. 173-61 BORING DATE Aug. 14, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY H.S.

SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w w_P w w_L WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE				
261.0 / 0.0	Groundlevel					260				
						250				
244.7 / 19.3	End of Conehole.					240	Refusal			

FORM OB - ML - 126 REV. 1961

OFFICE REPORT ON SOIL EXPLORATION

61-4391

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 297+44 22' Rt. of ℄ ORIGINATED BY M.D.

W.P. 173-61 BORING DATE Aug. 14, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY H.S.

SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w w_P w w_L WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE				
259.0 / 0.0						260				
						250				
						240	Refusal			
237.5 / 27.5	End of Conehole					230				

FORM 08 - ML - 196 REV 1961 OFFICE REPORT SOIL EXPLORATION

81-4391

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS RESEARCH DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB ____ LOCATION Sta. 297+20 ℄ ORIGINATED BY M.D.

* ____ BORING DATE Aug. 15, 1962. COMPILED BY M.D.

DATE ____ BOREHOLE TYPE Washboring. CHECKED BY AL

SOIL PROFILE ELEV / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / w_P w w_L / WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
259.5 0.0	Groundlevel Silty c y-Hard to v. stiff-brown to grey.					260				▽ wl 256.0 3.5
			1	SS	23				115.0	
			2	SS	20	250				
			3	SS	15				131.0	
12.5	Silt with clay seams compact.		4	SS	13					
			5	SS	13	240				Clay&Silt 97% Sand 3%
22.5	Probable bedrock. End of borehole.					230				

FORM OB - ML - 126 REV. 1961 OFFICE REPORT ON SOIL EXPLORATION

61-4391

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 7

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 297+00 20 ft. Lt. of ℄ ORIGINATED BY M.D.

W.P. 173-61 BORING DATE Aug. 15, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / FOOT
260.0 0.0	Groundlevel				
234.2 25.8	End of conehole.				

ELEV SCALE: 260, 250, 240, 230

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT — 20 40 60 80 100
SHEAR STRENGTH P.S.F.

Refusal

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT %

BULK DENSITY γ P.C.F.

REMARKS

FORM OB-ML-[illegible] REV. 1961

OFFICE REPORT [illegible] SOIL EXPLORATION

61-4391

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 8

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 296+33 20 ft. Rt. of ℄ ORIGINATED BY H.D.

W.P. 173-61 BORING DATE Aug. 15, 1962. COMPILED BY H.D.

DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY [illegible]

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / FOOT	ELEV SCALE	DYNAMIC PENETRATION RESISTANCE: BLOWS / FOOT (20 40 60 80 100) / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
258.0 / 0.0	Groundlevel					260				
						250				
						240	Refusal			
237.0 / 21.0	End of conehole.					230				

FORM OB-ML-136 REV 1961

61-4391

OFFICE REPORT OF SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 9

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 296+15 ℄ ORIGINATED BY M.D.

W.P. 173-61 BORING DATE Aug. 16, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Washboring. CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F.	REMARKS
						260				
258.0 / 0.0	Groundlevel									
	Silty clay-Hard brown to grey brown.		1	SS	38					▽wl 253.0 / 5.0 Clay&Silt 88% Sand 12%
			2	SS	36	250				
			3	SS	22					
245.5 / 12.5	Silt with clay seams compact.		4	SS	19					Clay&Silt 98% Sand 2%
						240				
			5	SS	10					
232.8 / 25.2	Bedrock AXT core-100% recovery Sound Quartzite.					230				
222.5 / 35.5	End of borehole.					220				

FORM OB - ML - REV. 1961

OFFICE REPORT SOIL EXPLORATION

61-4391

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 10

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 295+95 20' Lt. of ℄ ORIGINATED BY M.D.

W.P. 173-61 BORING DATE Aug. 17, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F.	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT					
258.0 / 0.0						260				
						250				
						240				
25.1	End of Conehole.					230				

FORM OB-ML-26 REV. 1961
81-4391

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 11

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 295+45 ℄ ORIGINATED BY M.D.
W.P. 173-61 BORING DATE Aug. 17, 1962. COMPILED BY M.D.
DATUM G.S.C. BOREHOLE TYPE Washboring - BX Casing. CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L — PLASTIC LIMIT w_P — WATER CONTENT w — WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
						260				
257.0	Groundlevel									
0.0	Silty clay-Hard-Brown.									▽wl 256.0
										1.0
			1	SS	34					
						250				Clay & silt 89%
248.0										Sand 11%
9.0	Silt with clay seams-Loose.		2	SS	8					
241.5	Probable bedrock.		3	SS	>15					
15.5	End of borehole.					240				

FORM DE-ML-[illegible] REV 1961

OFFICE REPORT [illegible] SOIL EXPLORATION

61-4391

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 12

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 295+30 20' Lt. of ℄ ORIGINATED BY M.D.

W.P. 173-61 BORING DATE Aug. 17, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY [illegible]

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE: BLOWS / FOOT (20 40 60 80 100) / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT % (20 40 60)	BULK DENSITY γ P.C.F.	REMARKS
257.0 / 0.0						260				
						250				
239.8 / 17.2	End of Conehole.					240	Refusal			

DEPARTMENT OF HIGHWAYS ONTARIO

~~BA-1625~~ BA 1591 - File

MEMORANDUM

To: Mr. A. M. Toye,
Bridge Engineer,
Bridge Division.

Attention: Mr. S. McCombie.

From: Mr. A. G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.

Date: October 31, 1962.

Our File Ref.

In reply to

Subject: D.H.O. FOUNDATION INVESTIGATION REPORT -
Proposed Structure - Hwy. #2, Line 'C',
Station 297+20 and Hwy. #401, Line 'G',
Station 61+20, 1/2 Mi. E. of Gananoque,
District #8 - W.J. 62-F-98 -- W.P. 173-61. ← File

Attached, we are forwarding log sheets to be inserted in your copy(s) of the above report which was submitted to you on Sept. 26, 1962.

for A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

AGS/MdeF
Encls.

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
H. D. McMillan
J. Ford
E.A. Cash
J.E. Gruspier
T.J. Kovich
J. Roy
E.R. Saint
F. Norman
A. Watt
Foundations Office
Gen. Files.

cc: Bridge Office (2nd copy)

BA 1511-E

~~BA 1525~~

Mr. A. M. Toye,
Bridge Engineer,
Bridge Division.

Attention: Mr. S. McCombie.

Mr. A. G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.

October 31, 1962.

D.H.O. FOUNDATION INVESTIGATION REPORT -
Proposed Structure - Hwy. #2, Line 'C',
Station 297+20 and Hwy. #401, Line 'G',
Station 61+20, 1/2 Mi. E. of Gananoque,
District #8 - W.J. 62-F-98 -- W.P. 173-61.

Attached, we are forwarding log sheets to be inserted in your copy(s) of the above report which was submitted to you on Sept. 26, 1962.

A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

AGS/MdeF
Encls.

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
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Foundations Office
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DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 298+45 - 20' Rt. of ℄ ORIGINATED BY M.D.
W.P. 173-61 BORING DATE Aug. 13, 1962. COMPILED BY M.D.
DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY H.S.

SOIL PROFILE ELEV./DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w (w_P w w_L) WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
262.0	Groundlevel									
0.0						260				
						250				
						240	Refusal			
238.2										
23.8						230				

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 298+26 ℄ ORIGINATED BY M.D.
W.P. 173-61 BORING DATE Aug. 13, 1962. COMPILED BY M.D.
DATUM G.S.C. BOREHOLE TYPE Washboring. CHECKED BY H.S.

ELEV. / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F.	REMARKS
261.5	Groundlevel									Waterlevel from observation in borehole.
0.0	Silty clay-V. stiff Brown to grey.					260				▽ 256.5 5.0
			1	SS	17					
252.0								0		
9.5	Silt with clay seams compact-loose.		2	SS	14	250				Clay 23% Silt 75% Sand 2%
			3	SS	8					
245.0			4	SS	>9					
16.5	AXT core-95% recovery, Sound granite.					240				
235.4										
26.1	End of borehole.					230				

FORM OB - ML - REV 96

OFFICE REPORT - SOIL EXPLORATION

61-4391

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 298/95 ℄ ORIGINATED BY M.D.

W.P. 173-61 BORING DATE Aug. 9, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Washboring. CHECKED BY H.S.

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F.	REMARKS
263.0 / 0.0	Groundlevel									W.L. from observations in borehole.
	Silty clay-Hard to v. stiff-Brown.		1	SS	53	260			124.0	▽ 259.0 / 4.0
			2	SS	49					
			3	SS	29	250			127.0	
250.5 / 12.5	Silt with clay seams compact-grey.		4	SS	11					
			5	SS	11					
241.0 / 22.0	Bedrock-sound granite 100% recovery.					240	Refusal			
236.0 / 27.0	End of borehole.									

FORM OB - ML - 106 REV. 1961

61-4391

OFFICE REPORT — SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 298+05 20' Rt. of ℄ ORIGINATED BY MD.

W.P. 173-61 BORING DATE Aug. 14, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY H.S.

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / FOOT	ELEV SCALE
261.0 / 0.0	Groundlevel					260
						250
244.7 / 19.3	End of Conehole.					240

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT — 20 40 60 80 100
SHEAR STRENGTH P.S.F.

Refusal

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT %

BULK DENSITY γ P.C.F.

REMARKS

FORM OB - ML - [illegible] REV '961 OFFICE REPORT - SOIL EXPLORATION

61-4391

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 297/44 22' Rt. of ℄ ORIGINATED BY M.D.

W.P. 173-61 BORING DATE Aug. 14, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY H.S.

SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w w_D w w_L WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE				
259.0 / 0.0						260				
						250				
						240				
							Refusal			
237.5 / 27.5	End of Conehole					230				

FORM OB - ML [redacted]6 REV 1961 OFFICE REPORT [redacted] SOIL EXPLORATION

61-4391

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 297+20 ℄ ORIGINATED BY M.D.

W.P. 173-61 BORING DATE Aug. 15, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Washboring. CHECKED BY AL

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w (w_P w w_L) WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
259.5	Groundlevel					260				
0.0	Silty clay-Hard to v. stiff-brown to grey.		1	SS	23				115.0	▽ wl 256.0 3.5
			2	SS	20	250				
			3	SS	15				131.0	
12.5	Silt with clay seams compact.		4	SS	13					
			5	SS	13	240				Clay&Silt 97% Sand 3%
22.5	Probable bedrock. End of borehole.					230				

FORM OB - ML - [illegible] REV 1961 OFFICE REPORT SOIL EXPLORATION

61-4391

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 7

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 297/00 20 ft. Lt. of ℄ ORIGINATED BY M.D.

W.P. 173-61 BORING DATE Aug. 15, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY [illegible]

SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE				
260.0 / 0.0	Groundlevel					260				
						250				
						240				
							Refusal			
234.2 / 25.8	End of conehole.					230				

FORM OB - ML - 126 REV 1961

61-4391

OFFICE REPORT — SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 9

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 296+15 ℄ ORIGINATED BY M.D.

W.P 173-61 BORING DATE Aug. 16, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Washboring. CHECKED BY —

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w — w_P w w_L — WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F.	REMARKS
						260				
258.0 / 0.0	Groundlevel									
	Silty clay-Hard brown to grey brown.		1	SS	38					▽wl 253.0 5.0 Clay&Silt 88% Sand 12%
			2	SS	36	250				
			3	SS	22					
245.5 / 12.5	Silt with clay seams compact.		4	SS	19					Clay&Silt 98% Sand 2%
						240				
			5	SS	10					
232.8 / 25.2	Bedrock AXT core-100% recovery Sound Quartzite.					230				
222.5 / 35.5	End of borehole.					220				

FORM OB - ML - 126 REV - 961

61-4391

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 10

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 295+95 20' Lt. of ℄ ORIGINATED BY M.D.

W.P. 173-61 BORING DATE Aug. 17, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w ; w_P w w_L ; WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F.	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT					
258.0 0.0						260				
						250				
						240				
25.1	End of Conehole.					230				

FORM OB - ML - REV. 1961

61-4391

OFFICE REPORT ● SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 11

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 295+45 ℄ ORIGINATED BY M.D.

W.P 173-61 BORING DATE Aug. 17, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Washboring - BX Casing. CHECKED BY

SOIL PROFILE ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — SHEAR STRENGTH P.S.F.	LIQUID LIMIT — w_L PLASTIC LIMIT — w_P WATER CONTENT — w WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
						260				
257.0	Groundlevel									
0.0	Silty clay-Hard-Brown.									gwl 256.0
			1	SS	34	250				1.0
248.0										Clay & silt 89%
9.0	Silt with clay seams-Loose.		2	SS	8					Sand 11%
241.5	Probable bedrock.		3	SS	>15					
15.5	End of borehole.					240				

FORM 08-ML-[illegible]6 REV 1961

61-4391

OFFICE REPORT — SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 12

FOUNDATION SECTION

JOB 62-F-98 LOCATION Sta. 295+30 20' Lt. of ℄ ORIGINATED BY M.D.

W.P 173-61 BORING DATE Aug. 17, 1962. COMPILED BY M.D.

DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w w_P w w_L WATER CONTENT % 20 40 60	BULK DENSITY γ PCF	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT					
						260				
257.0										
0.0										
						250				
239.8						240	Refusal			
17.2	End of Conehole.									

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

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

From: A.P. Watt

Date: February 22, 1963.

Our File Ref.

In reply to 62-F-98

Subject: W.P. 173-61, Bridge Site 17-137,
Hwy. 2 Interchange U'Pass
at Gananoque,
Hwy. 401, Dist. 8.

Enclosed please find one copy of the preliminary plan D- 5169- P1 for the above structure.

The designer appears to have complied with the requirements of the foundation report but we would appreciate any comments you wish to make.

apwatt

APW:db

Per A.P. Watt, 3506
Bridge Location Engineer.

1) What contact pressure is being used?