Department of Transportation and Communications

MEMORANDUM

TO: Mr. J. McAllister,
Regional Bridge Planning Supvr.,
Northern Region,
North Bay, Ontario.

FROM: Foundations Office,
Design Services Branch,
Central Bldg., Downsview.

ATTENTION:

DATE: September 30, 1971.

OUR FILE REF.

IN REPLY TO OCT 4 1971

SUBJECT:

31 L-9

FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing of Hwy. #654
And South River at Nipissing
District #13 (North Bay)
W.O. 71-11046 -- W.P. 24-69-01
CONT 72-88 sits 44-18

31 L - 9
GEOCRES No.

Attached please find our complete foundation investigation report for the above-mentioned project. The report supersedes our original report #62-F-103.

We believe you will find the factual data and the recommendations in the report sufficient for your purposes. Should any queries arise, please contact this Office.

A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER.

AGS/ao
Attach.
cc: Messrs. B. R. Davis
A. Radkowski
A. Rutka
H. McArthur
G. E. French
B. J. Giroux
R. Northwood
J. Harris
G. A. Wrong
B. A. Singh

Foundations Files
Documents

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FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing of Hwy. #654
And South River at Nipissing
District #13 (North Bay)
W.O. 71-11046 -- W.P. 24-69-01

1. INTRODUCTION:

A request for a foundation investigation at the site of the proposed new South River Bridge at Nipissing, was received from the Bridge Office in a memo dated July 31, 1962. A field investigation was subsequently carried out by this Section to determine the subsoil conditions existing at the site of the new structure. The results of this investigation, together with laboratory findings, and recommendations pertaining to the design of the proposed structure foundations were contained in Foundation Report #62-F-103.

In July 1971 additional borings were carried out at the site. These were deemed necessary due to some changes in the original proposals for the new structure. The results of this additional field work have been combined with the original work into a new report which is as follows:

2. DESCRIPTION OF THE SITE:

The site is located in the Village of Nipissing which lies on the south shore of Lake Nipissing. The topography is of a rolling nature with occasional knobs resulting from bedrock outcrops. The South River flows from east to west at this point and is roughly 90' wide and 10' deep. The water level of the river at the time of the field investigation, was about 20' below the average surrounding ground level. The river banks are covered with grass, bush and a few trees.

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

The existing bridge is a single lane, three span steel and concrete structure, in generally poor condition. The pier footings have been undercut by erosion. The new bridge will be located some 50' to the east of the existing one.

The soil in this area is of fluvial origin, being predominantly fine sand.

3. FIELD INVESTIGATION PROCEDURE:

A total of 10 borings and 5 dynamic cone penetration tests was carried out at the site. Boring was achieved by means of conventional diamond drilling equipment adapted for soil sampling purposes. Samples were recovered by means of a 2" O.D. split spoon driven into the soil with a driving energy of 350 ft.-lbs. per blow. Rock cores were obtained by means of an AXT core barrel. Dynamic cone penetration tests were carried out using an energy of 350 ft.-lbs. per blow to advance the cone. The locations and elevations of all boreholes are shown on the accompanying Drawing #71-11046A. In addition to the actual borings two X sections were surveyed at Sta. 363+90 and 364+00 where bedrock was outcropping. These are shown on Sections C-C and D-D respectively of Drawing #71-11046A.

Samples were classified in the field before being transported to the laboratory. A careful visual examination of the samples was subsequently carried out in the laboratory as a result of which it was decided that further testing was unnecessary.

4. SOIL TYPES & SOIL CONDITIONS:

Subsoil at the site was found to consist of deposits of silty fine sand, silty clay and sand and gravel, overlying granite bedrock. The boundaries of the different deposits are shown on the accompanying borelog sheets in the Appendix of this report. The estimated stratigraphical cross sections of Drawing #71-11046A are based upon this information. From ground level downwards, the various soil types encountered are as follows:

4. SOIL TYPES & SOIL CONDITIONS: (cont'd) ...

4.1) Silty Fine Sand:

The material from this deposit consists predominantly of fine sand with a small percentage of particles within the silt and clay range. The depth of the deposit varies from about 10' in B.H. #1 to about 35' in B.H. #8. Standard penetration tests gave an average 'N' value of about 5 blows per foot, showing the material to be in a loose state.

4.2) Silty Clay:

A deposit of silty clay with a very soft consistency was found to underlie the silty sand layer described above. On the north side of the river, a depth of only about 3' was observed whilst on the south side, the thickness ranged from 8' to 17'. Traces of organics were observed within the deposit on the south side, only.

4.3) Sand & Gravel:

A compact deposit of fine to coarse sand and gravel was observed to underlie the silty clay stratum. The deposit averaged about four feet in thickness. Standard penetration tests gave 'N' values ranging from 13 to 34 blows per foot.

4.4) Granite Bedrock:

Bedrock at the site was found to consist of granite gneiss, with the upper contact varying between elevations 605.0 and 647.0. Variation of the upper contact observed in adjacent borings, showed the surface to be sloping erratically with slopes as steep as 2:1. In all borings other than #9 and #12, the rock was found to be generally sound. In B.H.'s 9 and 1. xtensive fissuring and weathering was noted in the rock cores.

) Groundwater:

During both periods of field investigation the water level in the river varied between elevation 646.9 and elevation 649.4. Water levels within the overburden ranged from elevation 646.5 to elevation 656.2.

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5. DISCUSSION & RECOMMENDATIONS:

5.1) General:

It is proposed to construct a new three-span bridge at this location. The new Centre Line will be located about 50' east of the existing one. On the north approach, shallow cuts and fills up to about 10' will be required. Subsoil at the site consists of deposits of loose silty sand, soft silty clay and compact sand and gravel underlain by granite gneiss bedrock. Depths to bedrock ranged from zero to about 70' below ground level.

5.2) Structure Foundations:

The investigation has shown the subsoil at this location to be in a loose condition and unsuitable for the support of spread footings from an economical viewpoint. It is therefore recommended that piled foundations be used to support the proposed structure except for the north pier which should be founded directly on bedrock. For estimating purposes, bedrock elevation may be interpolated or extrapolated from the sections shown on the accompanying Drawing #71-11046A. The design loads to be used will be dependent on the pile sections adopted and may be as high as 95 tons in the case of 12 BP @ 74 steel 'H' piles. Because of the sloping nature of the bedrock surface, the piles for the north abutment should be keyed into the bedrock to prevent sliding of the pile tips. In the case of steel 'H' piles, a method of chiseling the pile into the bedrock until a satisfactory contact area is achieved, should be adopted. Oslo points may be fitted for this purpose. The precedure to be followed is outlined in Geotechnique, Vol. VII, page 73, 1957, and also in our Foundation Report #61-F-117.

If pile caps are formed below the ground or river water level, a dewatering scheme will be necessary. If sheeting is used for this, it should be driven to a depth below the footing base equal to the height of the prevailing water level above it. The abutments should be constructed within the approach fills with the slopes protected where necessary, by rip-rap.

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

5.2) Structure Foundations: (cont'd) ...

The south pier will be founded on relatively short piles driven through loose to compact sand. If scour is considered to be a problem here, it is recommended that the pier cap be surrounded by sufficient rip-rap to prevent scour occurring. This point should be checked with the Hydrology Engineer.

All pile caps should have a minimum of 6 ft. cover for frost protection.

With regard to the north pier footing, the surface of the bedrock varies from elevation 643.7 to elevation 641.2 from the north to the south edge of the footing respectively. The water level in the river is controlled by a series of dams operated by Ontario Hydro and during the period of investigation varied from elevation 646.9 to elevation 649.4. Hence, there could be in the order of 10 feet of water existing above the base of the footing at the time of construction. Due to the badly fractured nature of the granite gneiss bedrock there will be a problem dewatering the working area within the confines of the cofferdam. This condition may be corrected by pouring tremie concrete over the working area to a height equivalent to 0.45 the height of water above the base of the footing. Design loads for this footing may be up to 20 t.s.f. for footings founded 2 ft. or more below the surface of the bedrock.

5.3) Structure Approaches:

No stability problems are anticipated with regard to the proposed cuts and fills provided standard 2:1 slopes are adopted. Topsoil stripping should be carried out in accordance with D.H.O. standards.

6. MISCELLANEOUS:

The field work was carried out during the period of August 24 - 28, 1962, under the supervision of Mr. I. Holubec, and during July 16 - 28, 1971, under the supervision of Mr. G. Allen.

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

Equipment used was owned and operated by F. E. Johnston Drilling Co., Ltd. in 1962, and by Canadian Longyear Ltd. in 1971.

This report was prepared by Mr. G. Allen and Mr. K. G. Selby.

September, 1971.

APPENDIX I

FORM OD-MT - 126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 71-11046 LOCATION Sta. 363 + 38 o/s 23' Rt. ORIGINATED BY HS
W.P. 24-69-01 BORING DATE August 24, 1962 COMPILED BY HS
DATUM Geodetic 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. (o UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB. VANE)	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w — WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR SA SI CL
657.0	Ground Level									
0.0	Silt, Fine Sand Loose		1	SS	4	650				▼ 650.5 WL from observation in borehole
647.0										
10.0	Silty Clay Very Soft		2	SS	1					
644.0										
13.0	Silty Sand with some coarse sand & gravel. Compact		3	SS	22	640				
639.7										
17.3	End of Borehole Probable Bedrock					630				

FORM OD-MT - 126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1A

FOUNDATION SECTION

JOB 71-110h6 LOCATION Sta. 363 + 37 o/s 3' Rt. ORIGINATED BY HS

W.P. 2h-69-01 BORING DATE August 2h, 1962 COMPILED BY HS

DATUM Geodetic BOREHOLE TYPE Dynamic Cone Test CHECKED BY

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. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w — WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.C
656.5	Ground Level									
0.0						650				
						640				
631.8										
24.7	End of Cone Test Probable Bedrock					630	Refusal			

FORM OD-MT - 126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2

FOUNDATION SECTIO

JOB 71-11046 LOCATION Sta. 363 + 36 o/s 14' Lt. ORIGINATED BY BS
W.P. 24-69-01 BORING DATE August 24, 1962 COMPILED BY BS
DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE	w_P — w — w_L WATER CONTENT %		GR.SA.SI.C
656.1	Ground Level									
0.0	Silty Fine Sand Loose					650				▼649.6 WL from observatio in borehol
19.8 637.1	Silty Clay. Very Soft					640				
21.0 635.1	Silty sand with some coarse sa.& gr. Compact									
23.4 632.7	Bedrock (Granite)		1	RC		630				
626.6			2	RC						
29.5	End of Borehole					620				

FORM OD-MT - 126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 71-11046 LOCATION Sta. 363 + 64 o/s 14' Rt. ORIGINATED BY HS
W.P. 24-69-01 BORING DATE August 23, 1962 COMPILED BY HS
DATUM Geodetic BOREHOLE TYPE Washboring 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. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE	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 GR. SA. SI. CL.
655.9	Ground Level									
0.0	Silty Fine Sand Loose to Very Loose		1	SS	5	650				▼648.9 EL from observation in borehole
			2	SS	3					
645.7			3	SS	10					
10.2	Bedrock (Granite)		4	RC						
640.2			5	RC						
15.7	End of Borehole					640				
						630				

FORM OD-MT - 126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 4

FOUNDATION SECTION

JOB 71-11046 LOCATION Sta. 363 + 54 o/s 14' Lt. ORIGINATED BY HS

W.P. 24-69-01 BORING DATE August 23, 1962 COMPILED BY HS

DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY

SOIL PROFILE ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
656.7						
0.0	Silty Fine Sand Loose to Very Loose		1	SS	5	650
			2	SS	2	
			3	SS	3	
639.2			4	SS	1	640
17.5	Sand and Gravel					
634.5	Compact		5	SS	16	
22.2	Bedrock (Granite)		6	RC		630
629.7						
27.0	End of Borehole					620

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

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

w_P w w_L

WATER CONTENT %

BULK DENSITY γ P.C.F.

REMARKS

GR. SA. SI. CL.

649.3
WL from observation in borehole

FORM OD-MT - 126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 5

FOUNDATION SECTION

JOB 71-110h6 LOCATION Sta. 365 + 01 o/s 19' Rt. ORIGINATED BY HS

W.P. 2h-69-01 BORING DATE August 27, 1962 COMPILED BY HS

DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY

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. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE 1000 2000	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
655.5	Ground Level									
0.0	Silty Fine Sand Loose		1	SS	7	650				▽646.5 WL from observation in borehole
6h1			2	SS	7					
14.5	Silty Clay with traces of organics Soft to Firm		3	SS	3	640	+5.0			
			h	SS	1		+7.0			
628.0			5	SS	15	630				
27.5	Bedrock (Granite)		6	RC			Refusal			
623.5										
32.0	End of Borehole					620				

FORM OD-MT - 126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 71-11046 LOCATION Sta. 364 + 97 o/s 19' Lt. ORIGINATED BY HS
W.P. 24-69-01 BORING DATE August 27, 1962 COMPILED BY HS
DATUM Geodetic BOREHOLE TYPE Dynamic Cone Test CHECKED BY

SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB. VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE				
656.5	Ground Level									
0.0						650				
						640				
						630				
627.0										
29.5										
624.5	Probable Sand & Gravel									
32.0	End of Cone Test Probable Bedrock					620	Refusal			

FORM OD-MT - 126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 71-3106 LOCATION Sta. 365 + 69 o/s 10' Rt. ORIGINATED BY RS
W.P. 24-69-01 BORING DATE August 28, 1969 COMPILED BY HS
DATUM Geodetic BOREHOLE TYPE Dynamic Cone Test CHECKED BY

SOIL PROFILE ELEV. DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV SCALE
673.1	Ground Level					670
0.0						
						660
						650
						640
						630
						620
						610
605.1						
68.0	End of Cone Test Probable Bedrock					600

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100
SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

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

BULK DENSITY γ P.C.F.

REMARKS
GR. SA. SI. CL.

Refusal

20
15 S % STRAIN AT FAILURE
10

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

JOB 71-11046 LOCATION Sta. 355 + 69 o/s 16' Lt. ORIGINATED BY HS
W.P. 24-69-01 BORING DATE August 28, 1962 COMPILED BY HS
DATUM Geodetic BOREHOLE TYPE Washboring CHECKED BY

ELEV. / DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT; SHEAR STRENGTH P.S.F. (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE)	LIQUID LIMIT w_L / PLASTIC LIMIT w_p / WATER CONTENT w — WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
675.7	Ground Level									
0.0			1	SS	2	670				
	Silty Fine Sand		2	SS	14					
	Very Loose to Compact		3	SS	11	660				▼ 656.2 WL from observation in borehole
			4	SS	1					
			5	SS	12	650				
			6	SS	4					
640.2										
35.5	Clayey silt with traces of organics		7	SS	4	640				
631.7			8	SS	2					
44.0	Silty fine sand to silt.		9	SS	13	630				
	Compact		10	SS	13					
620.2										
55.5	Silty clay & silt. Stratified		11	SS	5	620				
613.2	Soft to Firm		12	SS	3					
62.5	Silty Fine Sand									
607.7	Compact		13	SS	18	610				
65.0	Sand and Gravel		14	SS	34					
605.2	Dense to Very Dense		15	SS	>100					
70.5	End of Borehole Probable Bedrock					600	Refusal			

20
15 5 % STRAIN AT FAILURE
10

ORM OD-MT - 126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 9

FOUNDATION SECTION

JOB 71-11046 LOCATION Sta. 364 + 12 o/s 15' Lt. ORIGINATED BY GA
W.P. 24-69-01 BORING DATE July 16 & 19, 1971 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Drill BX Casing CHECKED BY

ELEV. / DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE	LIQUID LIMIT w_L — PLASTIC LIMIT w_P — WATER CONTENT w — WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
648.3	Variation in W.L. during boring									
647.0										
1.3	Water									
641.2										
7.1	Granite Gneiss Badly Fractured		1	BX	50%	640				
			2	AXT	55%					
629.2				AXT	90%	630				
19.1	End of Borehole					620				

FORM GD-MT - 126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 10

FOUNDATION SECTION

JOB 71-11046 LOCATION Sta. 364 + 60 o/s 15' Lt. ORIGINATED BY GA
W.P. 24-69-01 BORING DATE July 20 & 22, 1971 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Washboring, drill BX Casing CHECKED BY

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
648.3	Variation in W.L. during boring					
647.6 / 0.7	Water					640
637.8 / 10.5	Silty Clay Soft to Stiff		1	SS	3	
			2	SS	-	
			3	SS		
631.1 / 17.2	Boulders		4	AXT	45%	630
628.9 / 19.4	Granite Gneiss Badly Weathered		5	AXT	30%	
	Badly Fractured		6	AXT	94%	
620.8			7	AXT	75%	
27.5	End of Borehole					620

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

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

BULK DENSITY γ P.C.F.

REMARKS
GR. SA. SI. CL.

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 11

FOUNDATION SECTION

JOB 71-11046 LOCATION Sta. 364 + 60 o/s 15' Rt. ORIGINATED BY GA
W.P. 24-69-01 BORING DATE July 26 & 27, 1971 COMPILED BY GA
DATUM Geodetic 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. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w — WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
649.3	↓ Variation in WL during boring									
648.7 0.6	Water					640				
637.0 12.3	Sand & Gravel Loose to Compact		1	SS	6					
629.8 19.5			2	SS	21	630				
	Granite Gneiss Badly Fractured		3	AXT	83%					
			4	AXT	88%					
			5	AXT	75%					
618.8 30.5	End of Borehole		6	AXT	90%	620				
						610				

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 12

FOUNDATION SECTION

JOB 71-11046 LOCATION Sta. 364 + 14 o/s 15' Rt. ORIGINATED BY CA

W.P. 24-69-01 BORING DATE July 28, 1971 COMPILED BY GA

DATUM Geodetic BOREHOLE TYPE Drill BX Casing CHECKED BY [illegible]

SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w	BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE	WATER CONTENT %	P.C.F.	GR SA SI CL
650.3	Variation in WL during boring DATUM									
0.0	648.3 / 647.9 Water									
643.7										
6.6	Granite Gneiss Badly fractured		1	AXT	60%	640				
			2	AXT	74%					
630.5			3	AXT	83%					
19.8	End of Borehole					630				

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 :-

CONSISTENCY	'N' BLOWS / FT.	c LB. / SQ. FT.	DENSENESS	'N' BLOWS / FT.
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_t	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 INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan\phi'$
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan\phi$
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	= 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
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 (YOUNGS 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_o	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

DEPARTMENT TRANSPORTATION AND COMMUNICATIONS

MEMORANDUM

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

FROM: Structural Office,
West Building,
Downsview.

ATTENTION:

DATE: November 25, 1971.

OUR FILE REF.

IN REPLY TO

SUBJECT:

South River Bridge @ Nipissing Village,
W.P. #24-69-02, Site #44-18,
Hwy. No. Sec.Rd.654, District #13

Attached herewith we are submitting the final bridge drawings which show the foundation design for this structure.

Kindly give us your comments at your earliest convenience.

C.S. Grebski,
Structural Design Engineer.

CSG:sr
Attach.

c.c. Foundation Office

8 Dec 71

No comments.

A.A.B.

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

TO: Mr. K. Selby,
Sup. Foundation Engineer.

FROM: K. W. Ingham

ATTENTION:

DATE: September 28, 1971

OUR FILE REF.

IN REPLY TO

SUBJECT: Foundation Investigation 71-~~11059~~ 11-046, South River Bridge - Nipissing

The following is a brief description of the rock-cones obtained from each borehole.

Hole No. 1 — Bedrock at 641.2

641.2 to 633.2: granite gneiss; generally fresh with occasional weathered sections; moderately fractured 641.2 to 637.7, badly fractured 637.7 to 633.2.

633.2 to 626.5: granite gneiss; alternating fresh and badly weathered sections; badly fractured throughout; appears fresh below this level.

Hole No. 2 — Bedrock at 631.1

631.1 - 628.9: diorite boulder.

628.9 - 625.8: granite gneiss; badly weathered and fractured throughout.

625.8 - 620.8: granite gneiss; fresh; moderately fractured.

Hole No. 3 — Bedrock at 629.8

629.8 - 618.8: granite gneiss; fresh, moderately fractured throughout.

Hole No. 4 — Bedrock at 643.7

643.7 - 638.0: granite gneiss; alternating fresh and weathered sections; badly fractured throughout, probably loose in the upper 1.0 ft.

638.0 - 631.8: granite gneiss; badly weathered; badly fractured.

631.8 - 630.5: granite gneiss; moderately weathered, fresh in the lower 0.3 ft.; moderate fracture pattern.

The irregularity of weathering and consequent differential hardness combined with extensive fracturing may have given rise to the ~~abnormality~~.

K. W. Ingham,
Geologist.

KWI:mv

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To:	Mr. A. G. Stermac, Principal Foundation Engineer, Downsview.	From:	Bridge Planning, North Bay.
Attention:		Date:	May 6, 1971.
Our File Ref.		In reply to	

Subject:

Re: W. P. 24-69-01 Site 44-18
South River Bridge at Nipissing
Sec. Rd. #654 District # 13

71-11-46

W. P. 249-66 Site 44-123
Magnetewan River at Katrine
Hwy. #11 District # 11

Attached are two prints of preliminary plans D-7040-PI and D-7032-PI for each of the above structures. Further foundation investigation is required at both crossings.

71-11-046 1) South River at Nipissing: A total of four further boreholes is required; two holes at each pier to determine the location of bedrock.

71-11-047 2) Magnetewan River: A total of twelve boreholes has been suggested by the designer. I think only those boreholes on either side of Hwy. #11 should be considered. These should be adequate to give accurate bedrock locations.

I have discussed, with Mr. Saint, the stability problem in filling the existing crossing at Katrine and am forwarding, with this letter, a plan and profile showing the location of the boreholes he has suggested.

I would suggest that the South River work be done first as the location of the structure may depend on the location of the bedrock at the site.

J. C. McAllister,
Regional Bridge
Planning Supervisor.

JCMcA/bn
encl.

c. c. - E. Saint

Dist. 28-12.

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

Attn: Mr. K.L. Kleinsteiber,
Mun. Bridge Liaison Engr.

Mr. A. G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.
October 4, 1962.

Re: D.H.O. FOUNDATION INVESTIGATION REPORT -
Proposed Crossing at South River and
Township Road at Nipissing, Lot 13,
Con. X, Twp. of Nipissing, District of
Parry Sound (District #13) -
W.J. 62-F-103 -- W.O. 34-62-91.

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, adequate for your future design work. Should there be any queries concerning this project, please feel free to contact our Office

KYL/MdeF
Attach.

cc: Messrs. A. M. Toye (3)
J. P. Howard
J. H. Cook
E. F. Saint
A. Watt

Foundations Office
Gen. Files.

K. Y. Lo,
SUPERVISING FOUNDATION ENGR.
For:

A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

TABLE OF CONTENTS

FOUNDATION INVESTIGATION

For

Proposed Crossing at South River
and Township Road at Nipissing,
Lot 13, Con. X, Twp. of Nipissing,
District of Parry Sound (Dist. #13)
W.J. 62-F-103 -- W.O. 34-62-91.

1. INTRODUCTION:

A request for a foundation investigation at the site of the proposed new South River Bridge at Nipissing, was received from the Bridge Office in a memo dated July 31, 1962. A field investigation was subsequently carried out by this Section to determine the subsoil conditions existing at the site of the new structure. The results of this investigation, together with laboratory findings, and recommendations pertaining to the design of the proposed structure foundations are contained in the following paragraphs of this report.

2. DESCRIPTION OF THE SITE:

The site is located in the Village of Nipissing which lies on the south shore of Lake Nipissing. The topography is of a rolling nature with occasional knobs resulting from bedrock outcrops. The South River flows from east to west at this point and is roughly 90' wide and 10' deep. The water level of the river at the time of the field investigation, was about 20' below the average surrounding ground level. The river banks are covered with grass, bush and a few trees.

cont'd. /2 ...

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

The existing bridge is a single lane, three span steel and concrete structure, in generally poor condition. The pier footings have been undercut by erosion. The new bridge will be located some 50' to the east of the existing one.

The soil in this area is of fluvial origin, being predominantly fine sand.

3. FIELD INVESTIGATION PROCEDURE:

A total of 6 borings and 5 dynamic cone penetration tests was carried out at the site. Boring was achieved by means of conventional diamond drilling equipment adapted for soil sampling purposes. Samples were recovered by means of a 2" O.D. split spoon driven into the soil with a driving energy of 350 ft.-lbs. per blow. Rock cores were obtained by means of an AXT core barrel. Dynamic cone penetration tests were carried out using an energy of 350 ft.-lbs. per blow to advance the cone. The locations and elevations of all boreholes are shown on the accompanying drawing #62-F-103A.

Samples were classified in the field before being transported to the laboratory. A careful visual examination of the samples was subsequently carried out in the laboratory as a result of which it was decided that further testing was unnecessary.

cont'd. /3 ...

4. SOIL TYPES & SOIL CONDITIONS:

Subsoil at the site was found to consist of deposits of silty fine sand, silty clay and sand and gravel, overlying granite bedrock. The boundaries of the different deposits are shown on the accompanying borelog sheets in the appendix of this report. The estimated stratigraphical cross sections of Drawing #62-F-103A are based upon this information. From ground level downwards, the various soil types encountered are as follows:-

4.1) Silty Fine Sand:

The material from this deposit consists predominantly of fine sand with a small percentage of particles within the silt and clay range. The depth of the deposit varies from about 10' in B.H. #1 to about 35' in B.H. #8. Standard penetration tests gave an average 'N' value of about 5 blows per foot, showing the material to be in a loose state.

4.2) Silty Clay:

A deposit of silty clay with a very soft consistency was found to underlie the silty sand layer described above. On the north side of the river, a depth of only about 3' was observed whilst on the south side, the thickness ranged from 8' to 17'. Traces of organics were observed within the deposit on the south side, only.

cont'd. /4 ...

4. SOIL TYPES & SOIL CONDITIONS: (cont'd.) ...

4.3) Sand & Gravel.

A compact deposit of fine to coarse sand and gravel was observed to underlie the silty clay stratum. The deposit averaged about four feet in thickness. Standard penetration tests gave 'N' values ranging from 13 to 34 blows per foot.

4.4) Granite Bedrock:

Bedrock at the site was found to consist of sound granite gneiss, with the upper contact varying between elevations 605.0 and 640.0. Variation of the upper contact observed in adjacent borings, showed the surface to be sloping erratically with slopes as high as 2:1.

5. DISCUSSION & RECOMMENDATIONS:

5.1) General:

It is proposed to construct a new three span bridge at this location. The new Centre Line will be located about 50' east of the existing one. On the north approach, fills in the order of 18' will be required. On the south approach, shallow cuts and fills up to about 10' will be required. Subsoil at the site consists of deposits of loose silty sand, soft silty clay and compact sand and gravel underlain by granite gneiss bedrock. Depths to bedrock ranged from 10' to about 70' below ground level.

cont'd. /5 ...

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

5.2) Structure Foundation:

The investigation has shown the subsoil at this location to be in a loose condition with a structural value inadequate for the support of spread footings. It is therefore recommended that piled foundations be used to support the proposed structure. Piles should be driven to bedrock. For estimating purposes, bedrock elevation may be interpolated or extrapolated from the sections shown on the accompanying Drawing #62-F-103A. The design loads to be used will be dependent on the pile sections adopted and may be as high as 75 tons in the case of 12 BP at 74 steel 'H' piles. Either steel 'H' piles or steel tube piles may be used. The final choice should be based on economical considerations.

Driving through the overburden should be relatively easy and only slight lateral deflections of the piles should occur. Because of the sloping nature of the bedrock surface, the piles should be keyed into the bedrock to prevent sliding of the pile tips. In the case of steel tube piles, a suggested method is as follows: The piles should be driven open ended to the bedrock and jetted out clean. A four-foot deep hole of suitable diameter should then be drilled into the bedrock, into which can be inserted a six-foot long dowel bar. The pile should then be filled with concrete properly compacted. In the case of steel 'H' piles, a method of chiseling the pile into the bedrock until a satisfactory contact area is achieved, should be adopted. Oslo points

cont'd. /6 ...

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

5.2) Structure Foundations: (cont'd.) ...

may be fitted for this purpose. The procedure to be followed is outlined in Geotechnique, Vol. VII, page 73, 1957, and also in our Foundation Report #61-F-117.

Timber piles at this location are not recommended for the following reasons:-

(1) The danger of structural damage during driving immediately on contact with the bedrock; and

(2) the difficulty of obtaining a satisfactory key into the rock.

If pile caps are formed below the water level, a dewatering scheme will be necessary. If sheeting is used for this, it should be driven to a depth below the footing base equal to the height of the prevailing water level above it. This problem can be avoided at the pier locations by designing the piles as columns and capping them at the deck level. The abutments should be constructed within the approach fills with the slopes protected where necessary, by rip-rap.

5.3) Structure Approaches:

No stability problems are anticipated with regard to the proposed cuts and fills provided standard 2:1 slopes are adopted. Topsoil stripping should be carried out in accordance with D.H.O. standards.

cont'd. /7 ...

6. SUMMARY:

A field investigation at the site of the proposed new bridge over the South River at Nipissing is reported.

Subsoil at the site consists of deposits of loose silty sand, soft silty clay and compact sand and gravel underlain by granite bedrock. Depth to bedrock ranges from 10' to 70' below ground level.

Piled foundations are recommended. A method of keying the piles into the bedrock is described in Section 5.2. Either steel 'H' piles or steel tube piles may be used. The final choice should be based on economy.

No stability problems are anticipated with regard to the proposed bridge approaches.

7. MISCELLANEOUS:

The field work was carried out during the period 24th - 28th August, 1962, under the supervision of Mr. I. Holubec. This report was written by Mr. K. Selby of the Foundation Section.

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

October 1962.

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 62-F-103 LOCATION Sta. 14+82 35' Rt. of ℄ ORIGINATED BY H.S.

W P. N.O. 34-62-91 BORING DATE Aug. 24, 1962. COMPILED BY H.S.

DATUM 657.0 BOREHOLE TYPE Washboring CHECKED BY K.S.

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	BLOWS / FOOT	ELEV SCALE
657.0	Groundlevel					657
	Silty fine sand- Loose		1	SS	4	
647.0						647
10.0	Silty clay Very soft		2	SS	1	
644.0						
13.0	Silty sand with some coarse sand and gravel Compact		3	SS	22	
639.7						
17.3	Probable Bedrock End of borehole					637

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

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

For 9"

WL from observation in borehole
▽ 650.5
6.5

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 1A

FOUNDATION SECTION

JOB 62-F-103 LOCATION Sta. 14+82 55' Rt. of ℄ ORIGINATED BY H.S.

W P W.O. 34-62-94 BORING DATE Aug. 24, 1962. COMPILED BY H.S.

DATUM 656.5 BOREHOLE TYPE Dynamic Cone Penetration Test CHECKED BY A.S.

SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT — w_L		
ELEV. / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE	BLOWS / FOOT 20 40 60 80 100	PLASTIC LIMIT — w_P	WATER CONTENT — w	BULK DENSITY P.C.F.
						660	SHEAR STRENGTH P.S.F.	w_P w w_L WATER CONTENT %		REMARKS
656.5	Groundlevel									
0.0						650				
						640				
631.8							For 8" (Refusal)			
24.7	Probable Bedrock					630				

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

JOB 62-F-103 LOCATION Sta. 14+82 72' Rt. of ℄ ORIGINATED BY H.S.

W.P. W.O. 34-62-91 BORING DATE Aug. 24, 1962. COMPILED BY H.S.

DATUM 656.1 BOREHOLE TYPE Washboring CHECKED BY K.S.

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: w_P w w_L; WATER CONTENT %	BULK DENSITY P.C.F.	REMARKS
656.1	Groundlevel									
0.0	Silty fine sand Loose					650				WL from observations in boreholes ▽ 649.6 6.5
						640				
637.1										
19.0										
635.1	Silty clay very soft									
21.0	Silty sand with some coarse sand & gravel - compact.									
632.7										
23.4	Bedrock (Granite)		1	RC		630				
			2	RC						
626.6										
29.5	End of borehole									
						620				

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 62-F-103 LOCATION Sta. 14+56 42' Rt. of ℄ ORIGINATED BY H.S.
W.P. W.O. 34-62-91 BORING DATE Aug. 23, 1962 COMPILED BY H.S.
DATUM 655.9 BOREHOLE TYPE Washboring CHECKED BY K.S.

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / FOOT	ELEV. SCALE	REMARKS
655.9	Groundlevel					660	
0.0	Silty fine sand Very loose to loose		1	SS	5		WL from observations in borehole
			2	SS	3	650	▽ 648.9
645.7			3	SS	10		7.0
10.2	Bedrock (Granite)		4	RC			
640.2			5	RC		640	
15.7	End of borehole						

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
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.

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OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 62-F-103 LOCATION Sta. 14/64 70' Rt. of ℄ ORIGINATED BY H.S.

W.P. W.C. 34-62-91 BORING DATE Aug. 23, 1962 COMPILED BY H.S.

DATUM 656.7 BOREHOLE TYPE Washboring CHECKED BY K.S.

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT / 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					
656.7	Groundlevel					660				
0.0										
	Silty fine sand Very loose to loose.		1	SS	5					WL from observations in borehole. ▽ 649.3 7.4
			2	SS	2	650				
			3	SS	3					
			4	SS	1					
639.2						640				
17.5	Sand and gravel Compact		5	SS	16					
634.5										
22.2	Bedrock (Granite)		6	RC						
						630				
629.7										
27.0	End of borehole									
						620				

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 62-F-103 LOCATION Sta. 13+15 33' Rt. of ℄ ORIGINATED BY H.S.

W.P. K.O. 34-62-91 BORING DATE Aug. 27, 1962. COMPILED BY H.S.

DATUM 655.5 BOREHOLE TYPE Washboring CHECKED BY K.S.

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE
655.5 / 0.0	Groundlevel					660
	Silty fine sand Loose		1	SS	7	650
			2	SS	7	
641.0 / 14.5	Silty clay with traces of organics.		3	SS	3	640
			4	SS	1	
			5	SS	15	630
628.0 / 27.5	Bedrock (Granite)		6	RC		
623.5 / 32.0	End of borehole					620

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100
SHEAR STRENGTH P.S.F.
+ Field vane test
500 1000 1500 2000 2500

+5.0

+7.0

For 9" (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

WL from observation in borehole
∇ 646.5
9.0

Dynamic cone penetration 3' from borehole

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 62-P-103 LOCATION 13/23 70' Rt. of ℄ ORIGINATED BY H.S.

W.P. W.O. 34-62-91 BORING DATE Aug. 27, 1962. COMPILED BY H.S.

DATUM 656.5 BOREHOLE TYPE Dynamic Cone Penetration Test CHECKED BY K.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 %	BULK DENSITY γ P.C.F.	REMARKS
656.5 0.0	Groundlevel									
						650				
						640				
						630				
627.0 29.5	Probable sand & gravel									
624.5 32.0	Probable Bedrock					620				

FORM OB - ML - 126 REV. 1961

81-4391

OFFICE REPORT - SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 7

FOUNDATION SECTION

JOB 62-F-103 LOCATION 12+47 39' Rt. of ℄ ORIGINATED BY H.S.

W P W.O. 34-62-91 BORING DATE Aug. 28, 1962. COMPILED BY H.S.

DATUM 672.1 BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY K.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				
672.1	Groundlevel					673				
0.0										
						663				
						653				
						643				
						633				
						623				
						613				
605.1							Refusal			
58.0	Probable Bedrock					603				

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 8

FOUNDATION SECTION

JOB 62-F-103 LOCATION Sta. 12/51 73' Rt. of ℄ ORIGINATED BY H.S.

W.P. W.O. 34-62-91 BORING DATE Aug. 23,1962 COMPILED BY H.S.

DATUM 675.7' BOREHOLE TYPE Washboring CHECKED BY K.S.

ELEV / DEPTH	SOIL PROFILE 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 WL, PLASTIC LIMIT WP, WATER CONTENT W, WP W WL, WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
675.7	Groundlevel									
0.0						670				
			1	SS	2					
			2	SS	14					
	Silty fine sar					660				w.l. from observations in borehole. ▽ 656.2 19.5
	Very loose to compact.		3	SS	11					
			4	SS	1					
			5	SS	12	650				
			6	SS	1					
640.2						640				
35.5	Clayey silt with traces of organics		7	SS	4					
	Very loose		8	SS	2					
631.7						630				
44.0			9	SS	13					
	Silty fine sand to silt-compact.									
			10	SS	13					
620.2						620				
55.5	Silty clay and silt stratified Soft		11	SS	5					
613.2			12	SS	3					
62.5	Silty fine sand					610				
607.7	Compact		13	SS	18					
68.0	Sand and gravel		14	SS	34					
605.2	Dense to very dense.		15	SS	>100					
70.5	Probable Bedrock End of Bedrock.					600	Refusal			

62-F-103

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

Bridge Division

To: Mr. A. Stermac,
Principal Foundations Engr.,
Room 107, Lab. Building,
DOWNSVIEW.

From: J. C. McAllister

Date. July 31, 1962

Our File Ref.

In reply to

Subject: Work Order 365-61-101, (X)
South River Bridge,
Lot 13, Con X,
Township of Nipissing.

A foundation investigation is required for the above crossing.

Attached please find two prints of site plan E 4120-1 showing the proposed alignment and grade. The structure here will probably be three spans having a total length of approximately 230'.

In discussing this work with you some months ago a cost of approximately $1,500.00 was quoted for the work. This should be adhered to if possible and the cost applied to the above Municipal Roads Work Order.

J. C. McAllister

JCMcA:dd

J. C. McAllister,
for S. McCombie,
Bridge Planning Engineer.

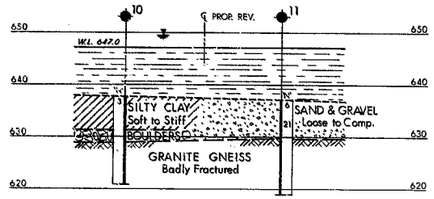
CONT. 72·88

HWY. 654 &

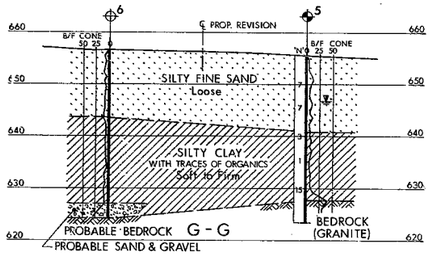
SOUTH RI. RT

NIPISSING

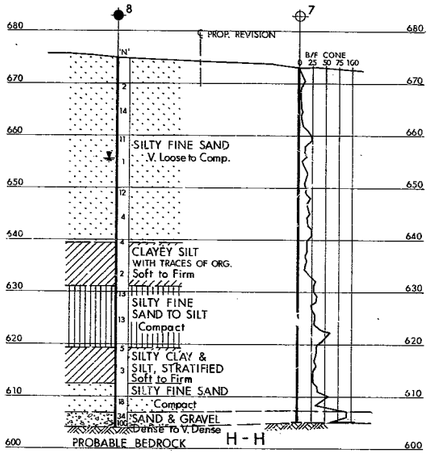
31L-9



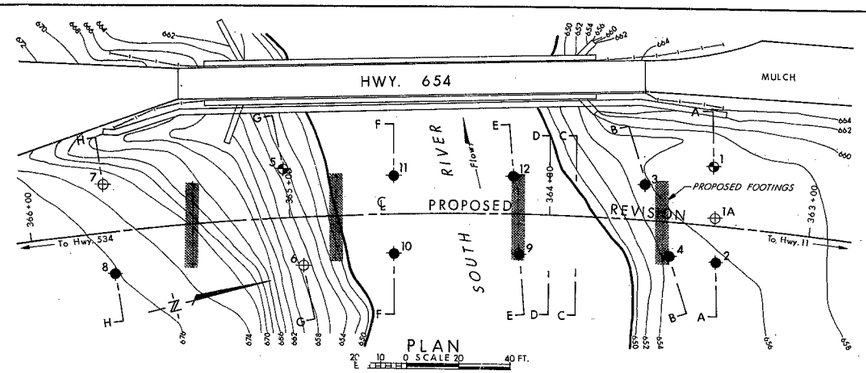
F - F



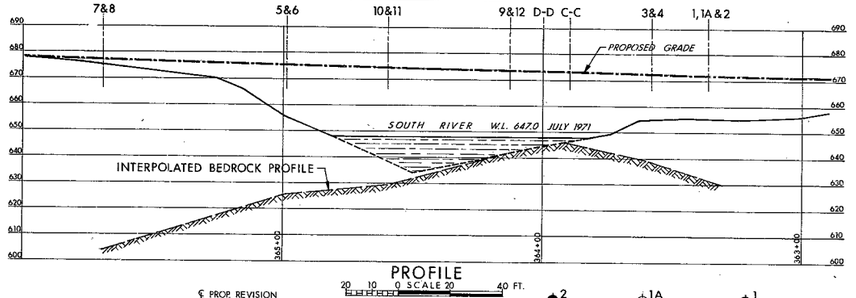
G - G



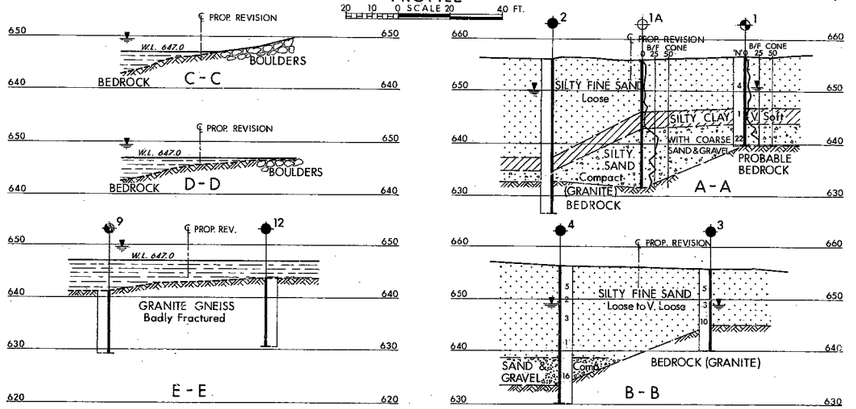
H - H



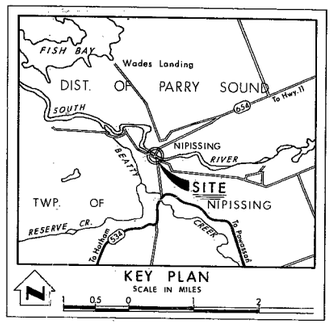
PLAN



PROFILE



SECTIONS



KEY PLAN
SCALE IN MILES

LEGEND

- Bore Hole
- Cone Penetration Test
- Bore Hole & Cone Test
- Water Levels established at time of field investigation. Aug. 1962 & July 1971.

River Level Fluctuated Between El. 647.0 & El. 649.5 during investigation.

NO.	ELEVATION	STATION	OFFSET	
1	657.0	363+38	23' RT.	AUG. 1962
1A	656.5	363+37	3' RT.	
2	656.1	363+36	14' LT.	
3	655.9	363+64	14' RT.	
4	656.7	363+54	14' LT.	
5	655.5	365+01	19' RT.	
6	656.5	364+97	19' LT.	
7	673.1	365+69	19' RT.	
8	675.7	365+69	16' LT.	
9	641.2	364+12	15' LT.	JULY 1971
10	637.8	364+60	15' LT.	
11	637.0	364+60	15' RT.	
12	643.7	364+14	15' 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	

SUPERCEDES DWG. No. 62 - F - 103 A

DEPARTMENT OF TRANSPORTATION & COMMUNICATIONS
DESIGN SERVICES BRANCH — FOUNDATION OFFICE

SOUTH RIVER

HIGHWAY NO. 654 DIST. NO. 13
~~CO.~~ DIST. PARRY SOUND
TWP. NIPISSING LOT CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD. G.A.	CHECKED	W.P. NO. 24 - 69 - 01	DRAWING NO. 71 - 11046 A
DRAWN S.R.	CHECKED	JOB NO. 71 - 11046	
DATE SEP. 21, 1971		SITE NO.	BRIDGE DRAWING NO.
APPROVED PRINCIPAL FOUNDATION ENGINEER		CONT. NO.	

REF. No. D-7040 - P1

GEOCRES NO. 31L-9

PRINT RECORD		
NO.	FOR	DATE