

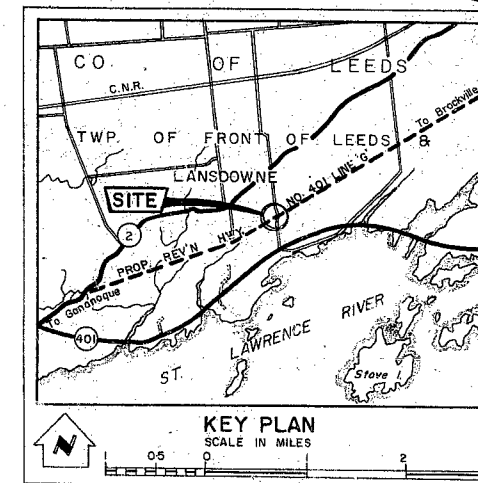
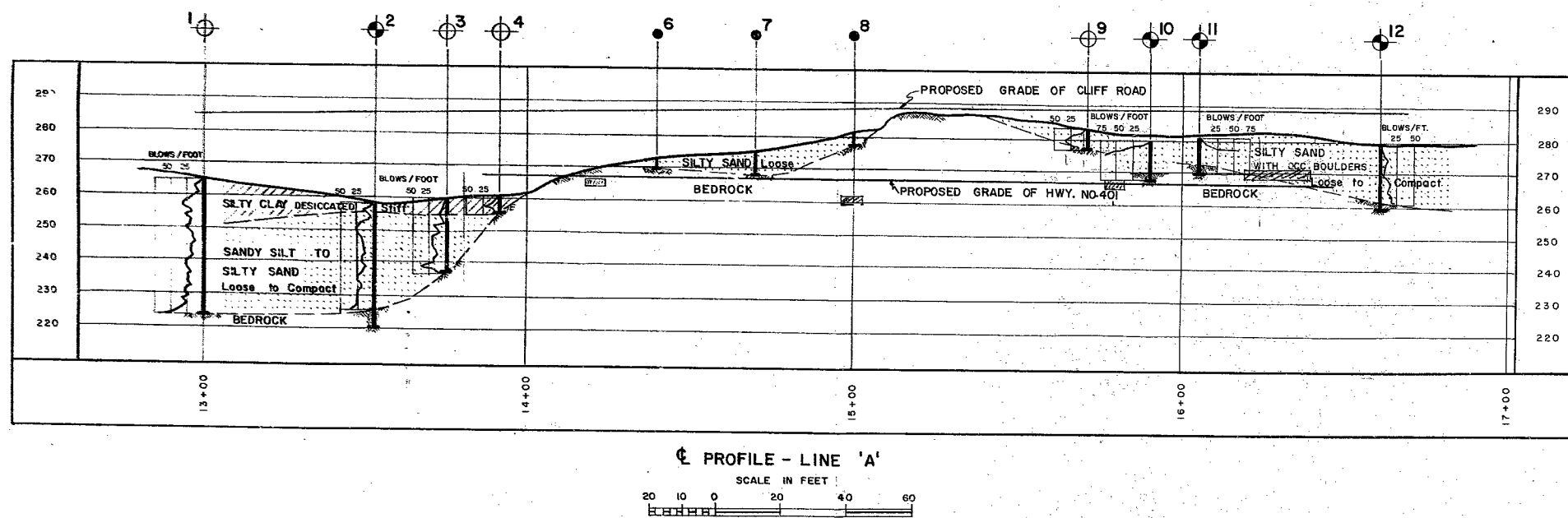
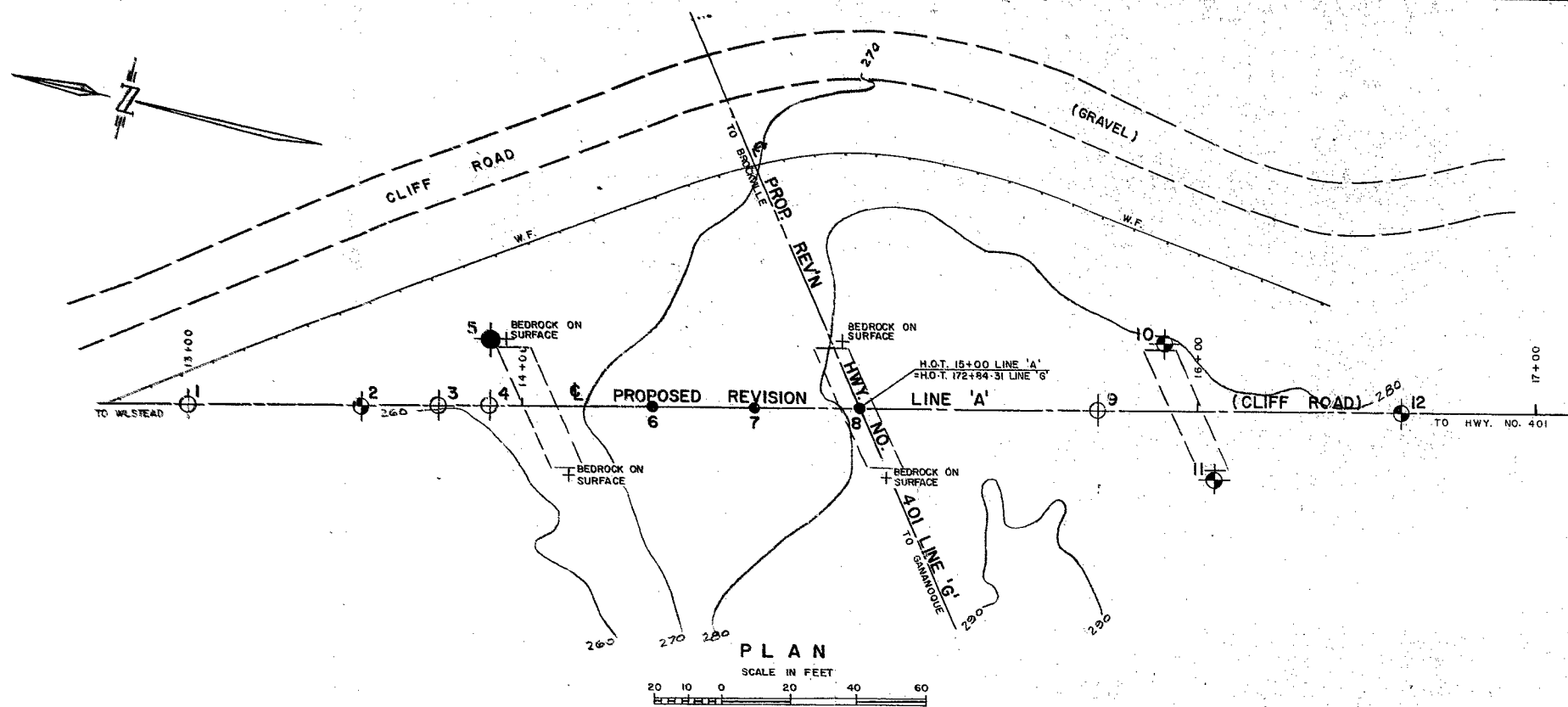
62-F-91

W.P. # 169-61

Hwy. # 401 E

CLIFF RD.

NEAR GANANOQUE



LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation Aug. 2, 1962
- Probe Hole

NO.	ELEVATION	STATION	OFFSET
1	263.0	13+00	£
2	258.8	13+53	£
3	260.1	13+75	£
4	261.9	13+90	£
5	261.0	13+90	20'LT.
6	272.5	14+40	£
7	275.8	14+70	£
8	281.0	15+00	£
9	282.5	15+70	£
10	279.3	15+90	20'LT.
11	280.9	16+04	20'RT.
12	279.8	16+60	£

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

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH SECTION

**CLIFF ROAD REVISION
AND
HIGHWAY NO. 401 LINE 'G' REVISION
3 MILES EAST OF GANANOQUE**

ORIGINATED BY B. KLIEM	DISTRICT NO. 8	DATE AUG. 31, 1962
DRAWN BY F. CLARK	W.P. NO. 169-61	JOB NO. 62-F-91
CHECKED BY [Signature]	CONT. NO.	DRAWING NO.
APPROVED BY [Signature]		62-F-91A

REF. NO. E-4098-1

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

September 5, 1962.

D.H.C. FOUNDATION INVESTIGATION
REPORT.
W.J. 62-F-91 -- W.P. 169-61.

Re: Proposed Hwy. #401, Line 'G' and Cliff Rd.
near Gananoque, County of Leeds, Twp.
Front of Leeds and Lansdowne, 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.

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.

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

TABLE OF CONTENTS

1. INTRODUCTION.
 2. DESCRIPTION OF SITE.
 3. FIELD AND LABORATORY INVESTIGATION.
 4. SUBSOIL CONDITIONS.
 - 4.1) General.
 - 4.2) Topsoil.
 - 4.3) Silty Clay.
 - 4.4) Sandy Silt.
 - 4.5) Silty Sand.
 5. GROUND WATER CONDITIONS.
 6. DISCUSSION AND RECOMMENDATIONS.
 7. SUMMARY.
 8. MISCELLANEOUS.
-

FOUNDATION INVESTIGATION

For

Proposed Hwy. #401, Line 'G' and Cliff Rd.
near Gananoque, County of Leeds, Twp.
Front of Leeds and Lansdowne, District #8.
W.J. 62-F-91 -- W.P. 169-61.

1. INTRODUCTION:

A subsoil investigation was requested in a memo dated July 13, 1962, for the proposed underpass of Hwy. #401, Line 'G' and Cliff Rd., 4.0 miles E. of Gananoque. The requested investigation was carried out by the Foundation Section. Presented in this report, are all field and laboratory results, their interpretation and discussion, as well as the necessary recommendations for the footing design.

2. DESCRIPTION OF SITE:

The proposed underpass structure of Hwy. #401, Line 'G' and Cliff Rd. is located on top of an outcrop of the Canadian Shield. The surrounding area is of an undulating nature with frequent rock outcrops, some exposing almost sheer cliffs of up to 20.0'.

3. FIELD AND LABORATORY INVESTIGATION:

To determine the subsoil conditions of the above site, five sampled boreholes and seven dynamic cone penetrations as well as three probes, were carried out at the abutments, pier and approach locations. A conventional diamond drill adapted for soil sampling was used in obtaining 2" O.D. split-spoon samples.

cont'd. /2 ...

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

The energy for driving the split-spoon was 350 ft.-lbs. per blow. Bedrock was confirmed by drilling with a standard AX core barrel. Penetration values obtained from the dynamic cone penetration tests are plotted on the borehole logs as well as all laboratory tests.

Dwg. No. 62-F-91A shows both location and elevation of each borehole referred to a G.B.M. located in the vicinity and established by a D.H.O. survey crew.

Each sample of the subsoil was visually classified in the field and again in the laboratory. On representative samples, moisture contents and grain size distributions were established by conventional laboratory tests.

4. SUBSOIL CONDITIONS:

4.1) General:

The subsoil conditions at the site were found to be generally uniform with minor local variations. From ground level to bedrock, the soil types are as follows:

4.2) Topsoil:

This is a minor deposit varying from 1/4 to 1/2 ft. in depth and consists of silty clay with abundant roots and fibers as well as a high organic content.

4.3) Silty Clay:

A desiccated layer of stiff brown silty clay with a depth of 4.0' in B.H. #5, 3.0' in B.H. #2, and of increasing thickness towards the north.

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

4.4) Sandy Silt:

Below the silty clay deposit, grey sandy silt extending from 3.0' below ground level to 14.0' in B.H. #2 (between elev. 256.0' and 242.0') occurred. This stratum was loose to compact with 'N' values between 9 and 15 blows/ft. Grain size analyses yielded the following average results: 1% gravel, 31% sand, 58% silt, and an average moisture content of 22%.

4.5) Silty Sand:

Underlying the above stratum in B.H. #2 and continuous from topsoil to bedrock in B.H.'s 10, 11 and 12, a brown to grey-brown, loose to compact silty sand was found. Local variations occur in B.H.'s 6, 7 and 8. In B.H.'s 6 and 7, a great number of boulders, especially in the last three feet above bedrock, was found, while in B.H. #8, intermittent 1/4" layers of clayey silt and 1/2" layers of silty sand were found. 'N' values ranged from 7 to 22 blows/ft. Grain size analyses yielded the following average results: 12% gravel, 67% sand, 21% silt, and an average moisture content of 21%.

cont'd. /4 ...

5. GROUND WATER CONDITIONS:

Water levels were checked in all boreholes and observed as follows:

B.H. #2 Elev. 254.4'

B.H. #10 Elev. 275.6'

B.H. #12 Elev. 273.2'

In all other boreholes, no water was observed during the time of field investigation.

6. DISCUSSION AND RECOMMENDATIONS:

It is understood that presently a two-span bridge (100', 100') is proposed to carry Cliff Rd. over proposed Hwy. #401 Line 'G', 1.0 mile S. of Wilstead.

Due to the shallow depth at which bedrock was established over the entire bridge site, spread footings founded on bedrock are recommended.

The proposed grade of Hwy. #401 at the structure location of 267.0' was supplied by the Bridge Office. At the time of writing of this report, it had not been definitely decided as to the type of structure and exact number of spans and their locations. The field investigation was carried out on the assumption that the structure would be a two-span (100', 100') bridge with footing locations as shown on Dwg. No. 62-F-91A.

cont'd. /5 ...

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

At the proposed south abutment and centre pier locations, footings may be placed at elevations 270' and 267', respectively, or at a lower elevation.

For spread footings, founded at or below these elevations, on sound granite-gneiss bedrock, a safe design load of 20 tons per square foot may be used. For the north abutment, no footing elevation can be recommended at this time. The bedrock dips rapidly in a northerly direction and an exact footing elevation cannot be determined until preliminary bridge plan drawings showing the details of the proposed footings are available.

No stability problems with regard to the embankment fills are expected, nor are dewatering problems anticipated.

7. SUMMARY:

The subsoil conditions were found as follows: At the bridge location a shallow deposit of brown, loose to compact, silty sand with numerous boulders, followed by granite-gneiss bedrock and frequent rock outcrops, was established. At the south approach, a deposit of brown, loose to compact, silty sand with thin clayey silt seams of up to 20.0' depth, occurred. At the north approach, underlying a thin deposit of topsoil, stiff, desiccated silty clay of 3.0' to 4.0' depth was followed by 14.0' of grey-brown, loose to compact sandy silt. Below the sandy silt deposit, brown-grey, loose to compact, silty sand was found

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

overlying a northerly sloping granite-gneiss bedrock.

A safe bearing capacity of 20 tons/sq. ft. is recommended for footings founded on bedrock. No embankment fill stability problems are anticipated.

8. MISCELLANEOUS:

The field work performed during the period of July 24 to August 8, 1962, was undertaken by Mr. B. Kliem, and the report prepared under the supervision of Mr. M. Devata.

The equipment used was owned and operated by D.H.O.

September 1962.

APPENDIX I.

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 62-F-91 LOCATION 401 - Cliff Rd. Gananoque Sta. 13+53 @ ORIGINATED BY B.K.
W.P. 169-61 BORING DATE July 24, 1962. COMPILED BY B.K.
DATUM 258.8 BOREHOLE TYPE Washboring. CHECKED BY M.D.

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — %L PLASTIC LIMIT — %P WATER CONTENT — %			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS / FOOT		10	20	30	40	50	%P	%L	%W		
							SHEAR STRENGTH P.S.F.					WATER CONTENT %				
258.8	Groundlevel		1	SS	16	250									254.6'	
258.0	Topsoil		2	SS	17											
	Loose to compact grey sandy silt.		3	SS	9											
			4	SS	10											
244.8			5	SS	10	240										
14.0			6	SS	22											
	Compact brown silt sand.		7	SS	15											
			8	SS	15	230										
226.5			9	RC	-											
32.3	Bedrock-granite gneiss badly weathered top 2.0'		10	RC	-	220										
220.3																
38.5	End of borehole.															

W.L.
254.6'

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

FOUNDATION SECTION

JOB <u>62-F-91</u>	LOCATION <u>401-Cliff Rd. Gananoque Sta. 13490 E</u>	INITIATED BY <u>B.K.</u>
W.P. <u>169-61</u>	BORING DATE <u>July 30, 1962.</u>	COMPILED BY <u>B.K.</u>
DATUM <u>261.9</u>	BORHOLE TYPE <u>Cone Penetration.</u>	CHECKED BY <u>M.D.</u>

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	PLASTIC LIMIT	WATER CONTENT		
261.9	Groundlevel								
256.4	Probably grey silty sand to sandy silt loose with occasional boulder.				260				
5.5	Cone refusal-bedrock				250				

FOUNDATION SECTION

JOB <u>62-F-91</u>	LOCATION <u>401-Cliff Rd. Cananogue Sta. 13-00 E</u>	DESIGNATED BY <u>B.K.</u>
W.P. <u>169-61</u>	BORING DATE <u>July 31, 1962.</u>	COMPILED BY <u>B.K.</u>
DATUM <u>263.0</u>	BOREHOLE TYPE <u>Cone Penetration.</u>	CHECKED BY <u>M.D.</u>

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 2A

FOUNDATION SECTION

JOB 62-F-91 LOCATION 401-Cliff Rd. Gananoque Sta. 13+90 (20' Lt.) ORIGINATED BY B.K.
W.P. 169-61 BORING DATE July 30, 1962. COMPILED BY B.K.
DATUM 261.0 BOREHOLE TYPE Washboring CHECKED BY M.D.

SOIL PROFILE		SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— WL		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT ——— WP	WATER CONTENT ——— W		
							WP ——— W ——— WL	WATER CONTENT %		
261.0	Groundlevel									
256.9	Desiccated crust of topsoil clay and roots hard, brown with occasional boulders			260						
4.1	Bedrock Granite-gneiss	1	RC							
		2	RC							
		3	RC							
250.0				250						
11.0	End of borehole.									
				240						

DEPARTMENT OF HIGHWAYS - ONTARIO
 MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 5A

FOUNDATION SECTION

JOB 62-F-91 LOCATION 401-Cliff Rd. Gananoque Sta. 15+70 E INITIATED BY B.K.
 W P 169-61 BORING DATE Aug. 1, 1962. COMPILED BY B.K.
 DATUM 282.5 BOREHOLE TYPE Cone Penetration. CHECKED BY M.D.

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w_L		BULK DENSITY γ P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLT.	NUMBER TYPE	BLOWS / FOOT	ELEV SCALE	BLOWS / FOOT 10 20 30 40 50	PLASTIC LIMIT ——— w_p		
						WATER CONTENT ——— w			
						SHEAR STRENGTH P.S.F.			
						WATER CONTENT %			
282.5	Groundlevel								
	Probably brown silty sand loose to compact with boulders.				280				
276.0									
6.5	Cone refusal-bedrock								
					270				

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 62-F-91

LOCATION 401-Cliff Rd. Gananoque Sta. 15/94 20' Lt.

ORIGINATED BY B.K.

W P 169-61

BORING DATE July 31, 1962.

COMPILED BY B.K.

DATUM 279.3'

BOREHOLE TYPE Washboring

CHECKED BY M.D.

SOIL PROFILE		SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — % PLASTIC LIMIT — % WATER CONTENT — %		BULK DENSITY P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAIT. PILOT	NUMBER	TYPE		BLOWS / FOOT	10	20	30	40	50	WATER CONTENT %		
279.3	Groundlevel				280									
	Loose to compact brown silty sand occasional boulders.													
270.2			1	SS	21									
9.1	Bedrock-Granite gneiss		2	RC	-									
266.5														
12.8	End of borehole.													
					260									

W.L.
275.6

JOB	62-F-91	LOCATION	401-Cliff Rd. Gananoque Sta. 16704 (20' Rt.)	ORIGINATED BY	B.K.
W.P.	169-61	BORING DATE	August 1, 1962.	COMPILED BY	B.K.
DATUM	280.9	BOREHOLE TYPE	Washboring	CHECKED BY	H.D.

SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— W _L		BULK DENSITY P.C.F.	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT				PLASTIC LIMIT ——— W _P	
							10 20 30 40 50				WATER CONTENT ——— W	
							SHEAR STRENGTH P.S.F.				W _D ——— W _O ——— W _L	
WATER CONTENT %												
280.9	Groundlevel					280						
	Brown loose to compact silty sand with boulders.											
273.4			1	RC	-							
7.5	Bedrock-Granite Gneiss											
269.7			2	RC	-	270						
11.2	End of borehole.											
						260						

RECORD OF BOREHOLE NO. 8

JOB 62-F-91 LOCATION 401-Cliff Rd. Gananoque Sta. 1640 2 ORIGINATED BY B.K.
W P 169-61 BORING DATE August 2, 1962. COMPILED BY B.K.
DATUM 277.8' BOREHOLE TYPE Washboring. CHECKED BY M.D.

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w _L		BULK DENSITY P.C.F.	REMARKS					
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE	BLOWS / FOOT	PLASTIC LIMIT ——— w _p	WATER CONTENT ——— w							
							10	20	30			40	50	SHEAR STRENGTH P.S.F.		
												w _p	w	w _L		
							WATER CONTENT %									
							10	20	30							
279.8	Groundlevel					280										
	Loose to compact brown silty sand with thin clayey silt layers occasional boulders.		1	SS	7											
			2	SS	14											
			3	SS	22											
			4	RC	-											
259.8						260										
20.0	End of borehole.															
						250										

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS:-

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

TYPE OF SAMPLE

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

SOIL TESTS

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

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_p	PLASTIC LIMIT
I_p	PLASTICITY INDEX
s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX $= \frac{w - w_p}{I_p}$
I_c	CONSISTENCY INDEX $= \frac{w_L - w}{I_p}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX $= \frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE $= \frac{-\Delta e}{(1+e)\Delta\sigma'}$
C_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX $= \frac{\Delta e}{\Delta \log_{10} \sigma'}$
T_v	TIME FACTOR $= \frac{C_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ 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
$\bar{\sigma}$	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL

MEMORANDUM

TO: Mr. A. G. Stermac,
Principal Foundations Engineer,
Room 107,
Lab. Building.

FROM: Mr. A. P. Watt,
Bridge Location Engineer.

DATE: February 22nd, 1963.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 169-61 - Bridge Site 17-157,
Cliff Road U'Pass,
1.2 miles east of Jct. Hwy. 2,
Hwy. 401,
District 8.

Enclosed please find one copy of the preliminary plan
D-5144 -P2 for the above structure.

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



AW:ap

A. P. Watt,
Bridge Location Engineer.

Checked Feb 26/63

H. Widdis, M. Devata

Turn page →

BED ROCK UNDER SOUTH ABUTMENT

*SHOULD BE PROVEN BEFORE FINAL DESIGN
OR CONSTRUCTION.*

Mr. A. P. Bates,
Bridge Location Engineer,

Mr. A. G. Starnes,
Principal Foundation Engineer,
Room 107,
Lab. Building.

Date February 2nd, 1963.

North abutment was discussed with
Ted Hewson. Steepness of bedrock was
pointed out in connection with possible
slippage of piles along smooth inclined
rock surface.

It was agreed that once the piles are
driven no serious damage can occur.

If slippage of piles along rock is encountered
it would not be serious because of the
density of the overburden.

Apart from that if abutment settles
and span could be jacked up.

Feb. 26. 1963

Agsturnac,

With reference to your letter of Feb. 22
1963, and the enclosed preliminary plan D-5141-P2
for the above structure we would like to ~~point~~
~~out that it would be~~ to recommend that a
special provision be included in the contract
that would take care of the fact that, due to
the irregular bedrock surface the precise length
of the piles cannot be determined in advance.
Consequently, flexibility in this respect should
be provided.

AJL