62-F-130

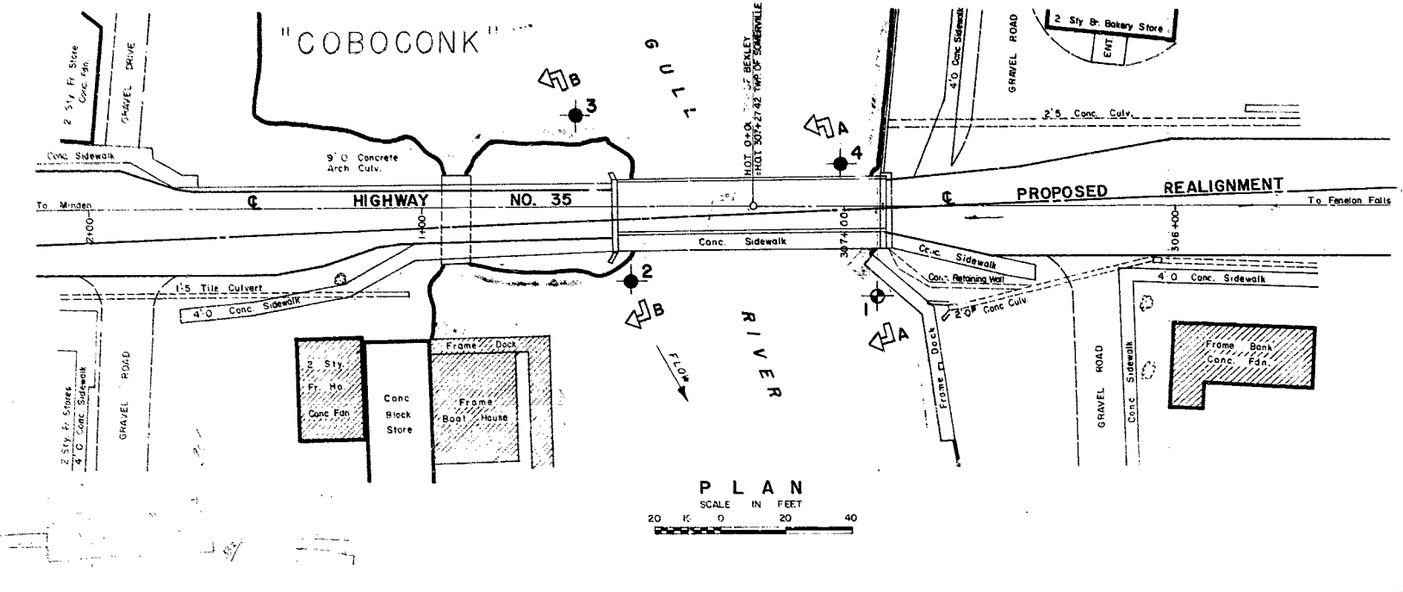
W.P. # 274-61

Hwy. # 35

CROSSING

GULL RIVER

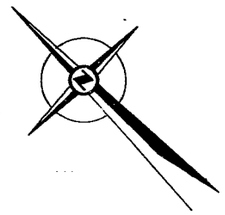
COBOCONK

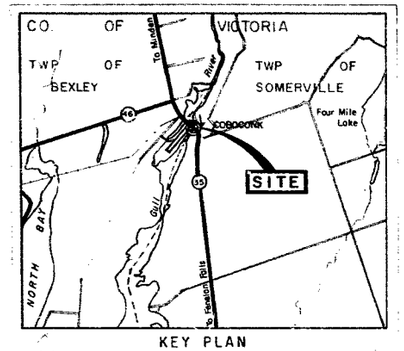


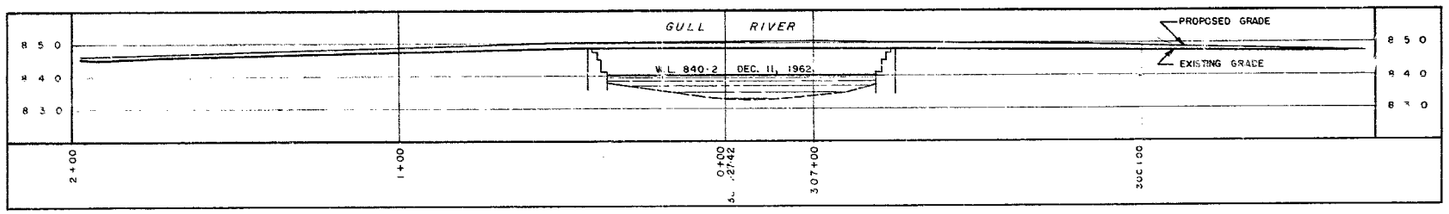
PLAN

SCALE IN FEET

20 10 0 20 40



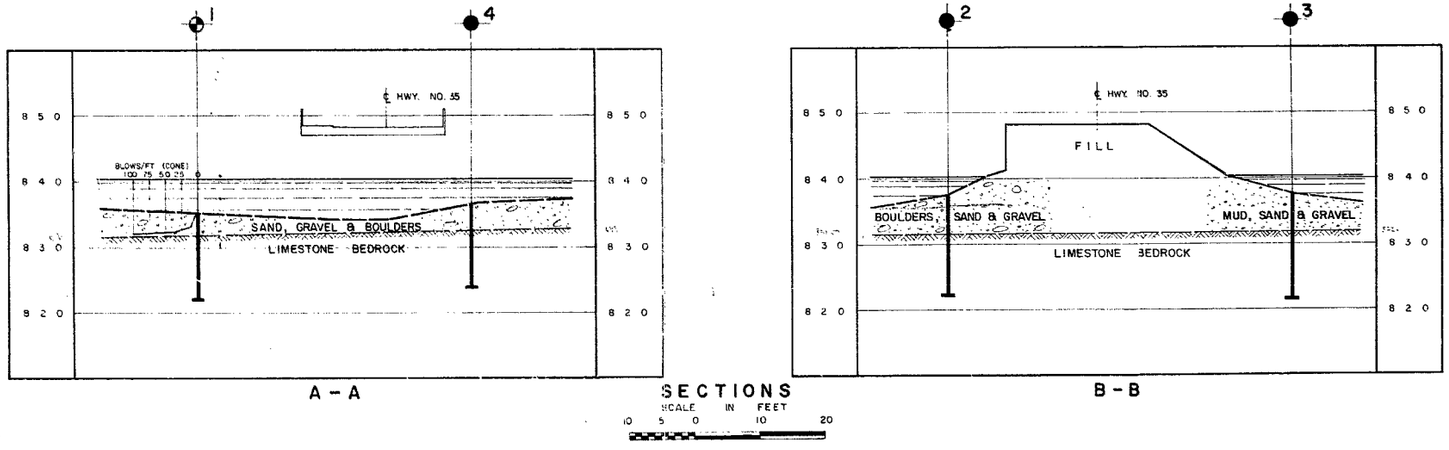




PROFILE

SCALE IN FEET

20 10 0 20 40



SECTIONS

SCALE IN FEET

10 5 0 10 20

LEGEND

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

NO.	ELEVATION	STATION	OFFSET	
1	835·3	306+90	28' LT.	840.2 W.L.
2	837·2	0+37	23' LT.	840.2 W.L.
3	837·6	0+54	28' RT.	840.2
4	836·7	307+01	13' RT.	840.2

– NOTE –

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

REVISIONS			
	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & RESEARCH

GULL RIVER

HWY. NO. 35 PROPOSED REALIGNMENT DIST NO. 7

CO. VICTORIA COBOCONK, ONTARIO

TWP. BEXLEY & SOMERVILLE LOT CON

BORE HOLE LOCATIONS & SOIL STRATA

SURVEY R. M.	CHECKED P.	A.P. No. 247-61	M.B.R. DRAWING NO. 62-F-130 A
DRAWN D. M.	CHECKED WK	L.S. No. 62-F-130	
DATE 11 JAN. 1963	SITE NO.		BRIDGE DRAWING NO.
APPROVED A.G. Thomas	CONT. NO.		

REF NO. E-2668-1

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

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

Attn.: Mr. C. Grebski

From: J. E. Curtis

Date: August 9, 1963.

Our File Ref.

In reply to

Subject: W.P. 274-61,
Gull River Bridge,
at Coboconk,
Hwy. 35, District 7

Having looked closer at the culvert, running under Hwy. 35 at this location, it is my opinion that the culvert should be completely replaced rather than extended, as I originally suggested. The closer examination revealed possible serious cracks in the existing culvert and I feel this would be a good time to replace this potential source of trouble.

JBC:ah

J. E. Curtis,
Bridge Location Engineer.

c.c. E. A. Fletcher

BA1581

DEPARTMENT OF HIGHWAYS ONTARIO

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: January 24, 1963

Our File Ref.

In reply to

Subject: D.H.O. FOUNDATION INVESTIGATION REPORT -
Proposed New Bridge at Gull River and
Hwy. #35, Coboconk, Ont., District No.7.
W.J. 62-F-130 -- W.P. ~~257~~ 274-61

Attached, we are forwarding to you the above-mentioned report for your use.

After the investigation was carried out, we were advised that a different bridge design, incorporating a pier in the middle of the river, was also being considered and that information about the soil conditions in the river bed would be required.

As it is evident from the report, bedrock was found on both sides of the river at approximately the same absolute elevation. It was also established that the bedrock surface in the direction perpendicular to the road's centre line is practically horizontal.

Because of the above-mentioned facts, we believe that the assumption that bedrock in the river bed would be encountered at approximately the same elevation as on the banks, is warranted and we would, therefore, recommend that no additional investigation be carried out at this stage.

However, if it is felt that the information about the bedrock elevation in the river is absolutely necessary, we would suggest that the additional work be done by this Section at the next convenient time - i.e., when another investigation will be carried out in the area, or by the Regional Soils Engineer's staff.

Stermac

A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

AGS/MdeF
Attach.
cc: Messrs. A. M. Toye (2).
H. A. Tregaskes
H. D. McMillan
G. K. Hunter (2)
F. B. Whiteley
T. J. Kovich
J. Roy
J. E. Gruspier
S. R. Saint
F. Norman
A. Watt

Foundations Office
Gen. Files.

TABLE OF CONTENTS

FOUNDATION INVESTIGATION

For

Proposed New Bridge at Gull River
and Hwy. #35, Coboconk, Ontario,
District #7, Port Hope.
W.J. 62-F-130 -- W.P. ~~247~~ 61.

274

1. INTRODUCTION:

A request for a foundation investigation at the site of the proposed new bridge at Gull River and Hwy. #35, was received from the Bridge Location Section in a memo dated November 14, 1962.

A field investigation was subsequently carried out by this Section to determine the subsoil conditions existing at the location of the proposed structure. Presented in this report are the results of this investigation, together with recommendations pertaining to the design of the proposed foundations and approach embankments.

2. DESCRIPTION OF THE SITE:

The Gull River, flowing in a south-westerly direction, crosses Hwy. #35 in the Village of Coboconk. The existing bridge is a single lane, single span structure built in 1911 and consisting of two steel trusses being supported on concrete abutments. The ground from the river southward, rises first gradually, and then rapidly to the outcropping bedrock located about 1,000' to the south of the bridge. To the north, the rise is more gradual and there the bedrock is only occasionally visible.

Physiographically, the site is located in the region referred to as "Shale Plains".

cont'd. /2 ...

3. FIELD INVESTIGATION PROCEDURE:

A total of four boreholes and one dynamic cone penetration test was carried out during the course of the field work. Boring was achieved by means of conventional diamond drilling equipment. All the work was carried out from a raft, provided for that purpose by the drilling company. Rock core samples were obtained by means of an AXT core barrel.

The locations and elevations of all boreholes are shown on Drawing #62-F-130A, which accompanies this report.

4. SOIL CONDITIONS:

Subsoil at the site was found to consist of from 4 to 6 feet of loose to compact sand, gravel and boulders overlying limestone bedrock. Bedrock contact varied from about 8 to 9 feet below water level (el. 840.2 - Dec. 11, 1962), at all four borehole locations. The bedrock was observed to be in a sound condition.

5. DISCUSSION & RECOMMENDATIONS:

It is proposed to construct ~~a reinforced~~ span structure at this location. The new Centre-line will be approximately in the same position as the existing one. ~~The new profile grade will be about 2' higher than the existing grade.~~

Subsoil consists of from 4 to 6 feet of loose to compact sand, gravel and boulders underlain by sound limestone bedrock.

cont'd. /3 ...

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

In view of this, it is recommended that the structure be supported on spread footings founded on the bedrock. Design loads up to 20 tons/ft.^{2} may be used.

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

6. SUMMARY:

A foundation investigation at the site of the proposed new bridge at Hwy. #35 and the Gull River is reported.

Subsoil consists of 4 to 6 feet of compact sand gravel and boulders, followed by limestone bedrock. Elevation of bedrock contact varies between 831.0 and 832.0.

It is recommended to found the structure directly on to the bedrock, by means of spread footings. Design loads of up to 20 tons per ft.^{2} may be used.

7. MISCELLANEOUS:

The field work, performed during the period of Dec. 10 - 13, 1962, together with the preparation of this report, was undertaken by Mr. P. Magi, Project Foundation Engineer. The investigation was carried out under the general supervision of Mr. K. Selby, Senior Foundation Engr., who also reviewed this report.

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

January 1963

APPENDIX I.

FORM OB - ML - 126 REV. 961
61-4391

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 62-F-130 LOCATION 20' Lt. Sta. 306/90 Twp. of Somerville ORIGINATED BY R.M.

W.P ~~247~~ 237-61 BORING DATE Dec. 11, 1962. COMPILED BY R.M.

DATUM 840.2 BOREHOLE TYPE Cone Penetration, Washboring &Diamond Drilling 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.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT %	BULK DENSITY P.C.F.	REMARKS
840.2	Water Level									
0	Water									
835.3										
4.9	Sand, gravel and boulders.						Refusal			
831.4						830				
8.8	Limestone and shale Bedrock		-	RC	-					
821.8						820				
18.4	End of borehole.									
						810				

FORM OB ML - 26 REV - 561
61-4391

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

JOB 62-F-130 LOCATION 23' Lt. Sta. 0+37 Twp. of Bexley ORIGINATED BY R.M.

W.P ~~247~~ 279-61 BORING DATE Dec. 12, 1962. COMPILED BY R.M.

DATUM 840.2 BOREHOLE TYPE Washboring & Diamond Drilling. CHECKED BY

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 WATER CONTENT %	BULK DENSITY P.C.F.	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS / FOOT					
840.2	Water Level					840				
	Water									
837.2 / 3.0										
	Sand, gravel and boulders.									
831.6 / 8.6						830				
	Limestone and shale bedrock.		-	RC	-					
821.9 / 18.3						820				
						810				

FORM 08-ML-36 REV. 61
61-4391

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 62-F-130 LOCATION 28' Rt., Sta. 0+54 Twp. of Bexley. ORIGINATED BY R.M.

W P 274-61 BORING DATE Dec. 13, 1962. COMPILED BY R.M.

DATUM 840.2 BOREHOLE TYPE Washboring & Diamond Drilling. CHECKED BY

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 WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE / BLOWS / FOOT					
840.2 0	Water Level				840				
837.6 2.6	Water								
	Sand, gravel and boulders.								
831.3 8.9					830				
	Limestone and shale bedrock.		-	RC -					
821.3 18.9	End of borehole.				820				
					810				

FORM 08 M_ 26 REV 7-1
61-4391

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 62-F-130
W P 274-61
DATUM 840.2

LOCATION 13' Rt., Sta. 307+01, Twp. of Somerville.
BORING DATE Dec. 13, 1962.
BOREHOLE TYPE Washboring & Diamond Drilling.

ORIGINATED BY R.M.
COMPILED BY R.M.
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 P C F	REMARKS
840.2	Water Level					840				
	Water									
836.8 / 3.5	Sand, gravel and boulders.									
832.5 / 7.7	Limestone and shale bedrock.		-	RC	-	830				
823.7 / 16.5	End of borehole.					820				
						810				

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 320 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 OPE
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

Qu	UNCONFINED COMPRESSION	L V	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F V	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	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 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

Mr. [illegible] M. Toye,
Bridge Engineer,
Bridge Division.

Attention: Mr. E. McCombie

Mr. [illegible] G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.
September 10, 1963

Hwy. #35 and Gull River, Dist. #7
W.J. 62-F-130 -- W.P. 274-61.
(ADDITIONAL BORING)

Enclosed is a print of an additional boring (#5) carried out at the above project; also, a print of revised Drawing #62-F-130.

These should be included with your copy(s) of Foundation Report #62-F-130.

K. L. Selby

KLS/MdeF
Encls.(2)
cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
H. D. McMillan
G. K. Hunter (2)
J. B. Whiteley
[illegible]
[illegible]

Foundations Office
Gen. Files

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

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 62-F-130 LOCATION Hwy. #35 & Gull River Sta. 307+27-31'-0" Lt. ORIGINATED BY W.W.K.

W.P. ~~247-61~~ 274-61 BORING DATE June 11 & 12 - 1963 COMPILED BY W.W.K.

DATUM 832.0 BOREHOLE TYPE BX Casing Run - AX Core Barrel CHECKED BY K.G.S.

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
840.0	Water Level					840				
0.0	Water									
832.0										
831.0	Sand					830				
9.0	Sound limestone bedrock.									
826.0										
14.0	End of borehole.					820				
						810				

SUPER IMPOSED DOCUMENT MAY APPEAR AS MULTI-FEED ON FILM.