

Mr. A. M. Teye,
Bridge Engineer.
Materials & Research Section.

March 8, 1960.

D.B.C. SUPPLEMENTARY SUBSOIL
INVESTIGATION. W.P. 26-57.
W.J. P-60-26.

Attention: Mr. S. McCoombie.

Re: Hwy. No. 5 & Credit River Crossing
at Erindale, Township of Toronto -
District No. 6 (West).

As requested, we have recently completed a supplementary subsoil investigation at the above noted structure location. The investigation, consisting of 5 borings, was carried out by a power auger. The locations of the borings and the subsoil profile, as defined by these borings, are shown in the accompanying Drawing No. F-26-57A.

The initial investigation, consisting of 3 borings - (B.H. No's. 1-A, 2-A & 3-A) was carried out in 1957. Results of these 3 borings have been presented and are also shown in the accompanying Drawing No. F-26-57A.

Soil types encountered, are as follows:-

cont'd. /2 ...

<u>Hole No.</u>	<u>Ground Elev.</u>	<u>Sand & Gravel</u>	<u>Weathered Shale</u>	<u>Sound Shale</u>
1 A	332.81	No Overburden.	332.81 - 328.81	328.81 - 318.81
2 A	317.46	317.46 - 308.46	308.46 - 306.46	306.46 - 303.46
3 A	316.62	316.62 - 308.62	308.62 - 306.62	306.62 - 303.62
1	330.50	330.5 - 330.	330. - 325.5	325.5 -
2	330.80	330. - 329.	329. - 325.	325. -
3	312.00	312. - 308.5	308.5 - 307.	307. -
4	315.00	315. - 307.	307. - 306.	306. -
5	330.00	330. - 329.5	329.5 - 326.	326. -

It appears that with bedrock contacted at, or shallow depths below the existing ground surface, spread footings founded in the shale formation would be most feasible for the foundation support of the structure. As it can be seen that the upper portion, as much as 4 ft. to 5 ft. of the shale is badly weathered and fragmented, scaling of all the weathered and fragmented portion of the bedrock should be carried out prior to the placing of the footings. In view of the fact that Queenston shale is well known for its susceptibility to weathering, it is recommended that if excavations are to be left open for a period of time (say, one or two days), a lean concrete mix be placed on the shale bedrock immediately upon excavations. A conservative bearing pressure of 10 t.s.f. can be used for the design of footings placed on sound shale bedrock.

At the location of the East abutment, footings should be placed at Elev. 306' or below, where sound bedrock is contacted. Placing footings at this elevation or below, will involve excavations through 8' to 9' of granular material. Depending on the ground water conditions during construction, shoring or, possibly, sump pumping operations appear to be necessary.

At the location of the West abutment, footings should be founded at Elev. 325' or below, where sound shale bedrock is contacted. To avoid erosion due to weathering of the shale underneath and around

the footings, it is recommended that footings be placed at sufficient distance away from the vertical bank slope. The outside edge of the footing should be kept at a distance not less than 10 ft. from the edge of the vertical bank slope.

If we can be of further assistance in the foundation design of this structure, do not hesitate to contact our Office.

L. G. Soderman,
PRINCIPAL SOILS & FOUNDATIONS ENGR.
per:

AKL/MdeF
Attach.

AKGL
(A. K. Loh,
PROJECT FOUNDATION ENGR.)

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
D. G. Ramsay
I. Campbell
C. Fraser
P. F. Weber
Foundations Office
Gen. Files.

FOUNDATION REPORT

on

New Bridge at Highway No. 5
crossing Credit River at Brindale

Site Plan: E-3205-1
Station: 1/00

Distribution:

Mr. A. Teye Bridge Engineer	(2)
Mr. H. Tregaskes Construction Engineer	(1)
Mr. C. C. Hausay Design Engineer	(1)
Mr. J. B. Wilkes Dist. Eng., Toronto	(1)
Foundation Section	(1)
FILE	(1)

N.P. 25-57
E.S. 2-57-6

INTRODUCTION

A subsoil investigation was carried out to determine the bearing values of layers to support the foundations of a new bridge.

The site is where highway No. 5 crosses Credit River at Brindale. The existing bridge is a steel truss bridge supported on piers. The new bridge is on the revision line some 58 ft. center to center to the south. The location is shown on profile No. C 689-1 Station 1+00.

The work started on April 23, 1957 and was completed on April 27, 1957.

PROCEDURE

The subsoil investigation was carried out by means of a skid mounted core drill machine. Three boreholes were made, No. 1 on the north west side and No. 2 & 3 on the north and south east of the central line. Due to difficult approach to south west corner of the site no borehole could be made.

The locations of the boreholes are shown on plan P-57-6A and the elevations on log sheets under Appendix I.

SUBSOIL FINDINGS AND ANALYSIS

The Credit River has eroded its western shore and the ground surface is some 14 ft. above the present water level. This erosion is in the form of a sharp vertical cut. Consequently it exposes the entire subsurface stratification. The layer hardly has any topsoil and is entirely made up of shale of various strength. A borehole (No. 1) was drilled some 14 ft. deep, to extract core samples and test the strength of the shale.

On the eastern side the ground level is some 12 ft. lower and apparently must have been once the river bed. Here the top surface is elevated by alluvial material of sandy loam and gravel some 3-7 ft. under which is found the shale stratum. This shale layer was drilled and core samples were extracted in order to test the strength of the shale.

SUBSOIL FINDINGS AND ANALYSIS (continued)

The samples of shale which were tested showed great amount of crushing strength, which indicates the material is well stratified hard shale bedrock. The placing of the footings presents two alternatives. In both cases the footing on the eastern side must be placed at about elevation 308 ft. While on the western side the footing could either be placed at the same elevation of 308 ft. or at somewhat higher level provided the hazards of erosion and scouring are well taken care of.

CONCLUSIONS AND RECOMMENDATIONS

The Credit River basin is characterized by its stratified shale embankments. At this site the stratigraphy is typical and very convenient for spread footing foundations.

The proposed structure could be supported on spread footing foundations placed at about elevation 308 ft. on eastern side and at the same elevation or somewhat higher on the western side. Provided, the necessary precautions for erosion and scouring have been taken. Based on the crushing strength tests of the shale samples the layer can easily provide some 5-10 T.s.f. bearing value.

V. Korlu
Foundation Engineer

APPENDIX I

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW
OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG 5A-2 OPERATION BORE & PENET N JOB F-57-6 W.P. 26-57 BORING 1 STA. 1+49.6 ^{52' LT.} (EXISTING &)
CASING BK (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT MAY 1957
SAMPLER HAMMER WT. 250 LBS. DROP 23 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 24 APRIL 1957

ABBREVIATIONS

V - INSITU VANE SHEAR TEST Q - TRIAXIAL QUICK K - PERMIABILITY
M - MECHANICAL ANALYSIS S - TRIAXIAL SLOW C - CONSOLIDATION
U - UNCONFINED COMPRESSION WL - WATER LEVEL IN CASING CA - CASING
QC - TRIAXIAL CONSOLIDATED QUICK WT - WATER TABLE IN SOIL γ - UNIT WEIGHT

SAMPLE TYPES

C.S. - CHUNK D.O. - DRIVE OPEN S.S. - SLEEVE SAMPLE
D.F. - DRIVE FOOT VALVE PS - PISTON SAMPLE
T.O. - THIN WALLED OPEN WS - WASHED SAMPLE
R.C. - ROCK CORE

SAMPLE CONDITION



- DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE

SAMPLES

ELEVATION DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT	PLOT	ELEVATION SCALE	<div> <div>WATER CONTENT W %</div> <div> <div>○ - NAT</div> <div>□ - PW</div> <div>△ - LW</div> </div> </div>	CASING BLOWS (ACTUAL)	OTHER TESTS	CONDITION	TYPE	NO.	PENETRATION RESISTANCE	ELEV. RECOV.
						<div> <div>PENETRATION TEST RESISTANCE BLOWS PER FOOT</div> <div>AT STANDARD ENERGY (4200 IN. LBS. PER BLOW)</div> <div>D. CONE PEN. X-----X-----X STAND. PEN. ●-----●-----●</div> <div>100 200 300 400</div> </div>							
532.8'		GROUND LEVEL											
331.3'	1.5'	WEATHERED SHALE								D.O.	1	14	332.8'
328.8'	2.0'	SOFT SHALE			330								3
													328.8'
										AxT.	2	60	8
		SHALE			325					R.C.			323.8'
										AxT.	3	100	13
					320					R.C.			318.8'
318.8'	10.0'	END OF BOREHOLE											

REFUSAL AT ELEV. 330'-0"
HAMMER BOUNCING

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW
OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG 54-2 OPERATION BORE & PENET JOB F-57-6 WP 26-57 BORING 2 STA. 0+25 (^{53' LT.} EXISTING ~~4~~)
CASING 3A (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT MAY 1957
SAMPLER HAMMER WT. 250 LBS. DROP 23 INCHES COMPILED BY H.S. CHECKED BY AL DATE BORING 26 APRIL 1957

ABBREVIATIONS

V - INSITU VANE SHEAR TEST Q - TRIAXIAL QUICK K - PERMIABILITY
M - MECHANICAL ANALYSIS S - TRIAXIAL SLOW C - CONSOLIDATION
U - UNCONFINED COMPRESSION WL - WATER LEVEL IN CASING CA - CASING
Q - TRIAXIAL CONSOLIDATED QUICK WT - WATER TABLE IN SOIL γ - UNIT WEIGHT

SAMPLE TYPES

C.S. - CHUNK	S.S. - SLEEVE SAMPLE
D.O. - DRIVE OPEN	P.S. - PISTON SAMPLE
D.F. - DRIVE FOOT VALVE	W.S. - WASHED SAMPLE
T.O. - THIN WALLED OPEN	R.C. - ROCK CORE

SAMPLE CONDITION



- DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE

SOIL PROFILE				ELEVATION SCALE	WATER CONTENT W %			CASING BLOWS (ACTUAL)	SAMPLES					
ELEVATION DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT PLOT		0 - NAT. 15 20 Δ - L.W.				OTHER TESTS	CONDITION	TYPE	NO.	PENETRATION RESISTANCE	ELEV. RECOV. %
					PENETRATION TEST RESISTANCE BLOWS PER FOOT AT STANDARD ENERGY (4200 IN. LBS. PER BLOW)									
					D. CONE PEN. X-----X-----X STAND. PEN. ●-----●-----●									
					50 100 150 200									
37.46'		GROUND LEVEL											317.46'	
2.5		SANDY LOAM		315				3		X	D.O.	1	5	67
		GRAVEL						5						2.5
								4						
								7						313.46'
7.5				310				3		X	D.O.	2	21	39
								12						311.46'
								1		X	D.O.	3	12	44
								10						309.46'
308.46'	9.0'	BEDROCK						140		X	D.O.	4	>100	100
		SHALE		305							A.T.	5		100
303.46'	14.0'	END OF BOREHOLE									R.C.			

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW
OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG 54-2 OPERATION BORE & PENET N JOB F-57-6 WP 26-57 BORING 3 STA. 0+22 ^{97' LT} ~~EXISTING C~~
CASING 3X (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT MAY 1957
SAMPLER HAMMER WT. 250 LBS. DROP 23 INCHES COMPILED BY H.S. CHECKED BY _____ DATE BORING 27 APRIL 1957

ABBREVIATIONS

V - INSITU VANE SHEAR TEST Q - TRIAXIAL QUICK K - PERMIABILITY
M - MECHANICAL ANALYSIS S - TRIAXIAL SLOW C - CONSOLIDATION
U - UNCONFINED COMPRESSION WL - WATER LEVEL IN CASING CA - CASING
QC - TRIAXIAL CONSOLIDATED QUICK WT - WATER TABLE IN SOIL γ - UNIT WEIGHT

SAMPLE TYPES

C.S. - CHUNK
D.O. - DRIVE OPEN
D.F. - DRIVE FOOT VALVE
T.O. - THIN WALLED OPEN
S.S. - SLEEVE SAMPLE
P.S. - PISTON SAMPLE
W.S. - WASHED SAMPLE
R.C. - ROCK CORE

SAMPLE CONDITION

 - DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE

SAMPLES

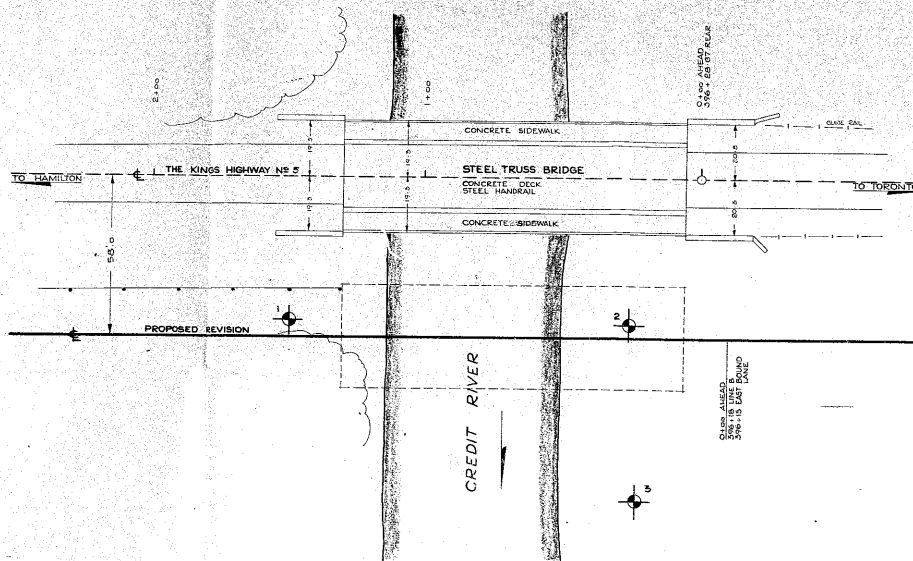
ELEVATION DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT	PLOT	ELEVATION SCALE	WATER CONTENT W %				CASING BLOWS (ACTUAL)	OTHER TESTS	CONDITION	TYPE	NO.	PENETRATION RESISTANCE	ELEV. RECOVER %
						5	10	15	20							
						PENETRATION TEST RESISTANCE BLOWS PER FOOT AT STANDARD ENERGY (4200 IN. LBS. PER BLOW) D. CONE PEN. X-----X-----X STAND. PEN. •-----•-----•										
						50	100	150	200							
30.62		GROUND LEVEL														
1.5		SANDY LOAM GRAVEL			3.5					3		X	D.O.	1	9	28
										5						
										2						
										2						
6.5		BEDROCK			3.0					4		X	D.O.	2	17	33
										16						
		SHALE								7		X	D.O.	3	22	56
										78						
		END OF BOREHOLE			30.5								AXT. R.C.	4		60
16.5																

-X-
REFUSAL AT ELEV. 30.8-62'
HAMMER BLOWING

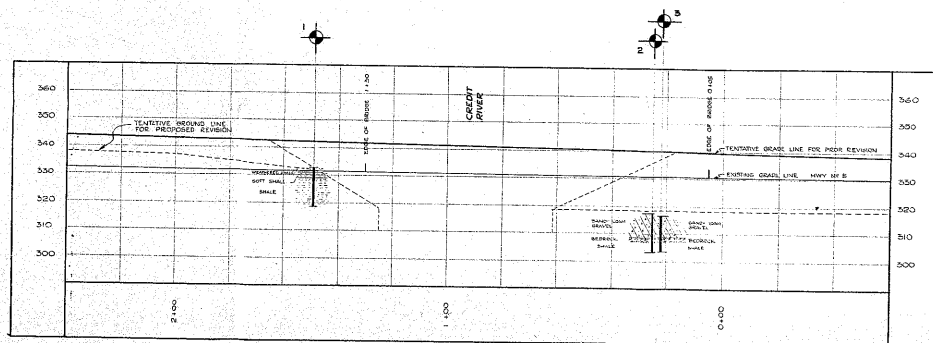
END OF CASING
AT ELEV. 30.8-62'

57-F-6
W.P.# 26-57
Hwy. # 5
CREDIT RIVER
CROSSING
ERINDALE





PLAN SCALE 1 IN = 20 FT



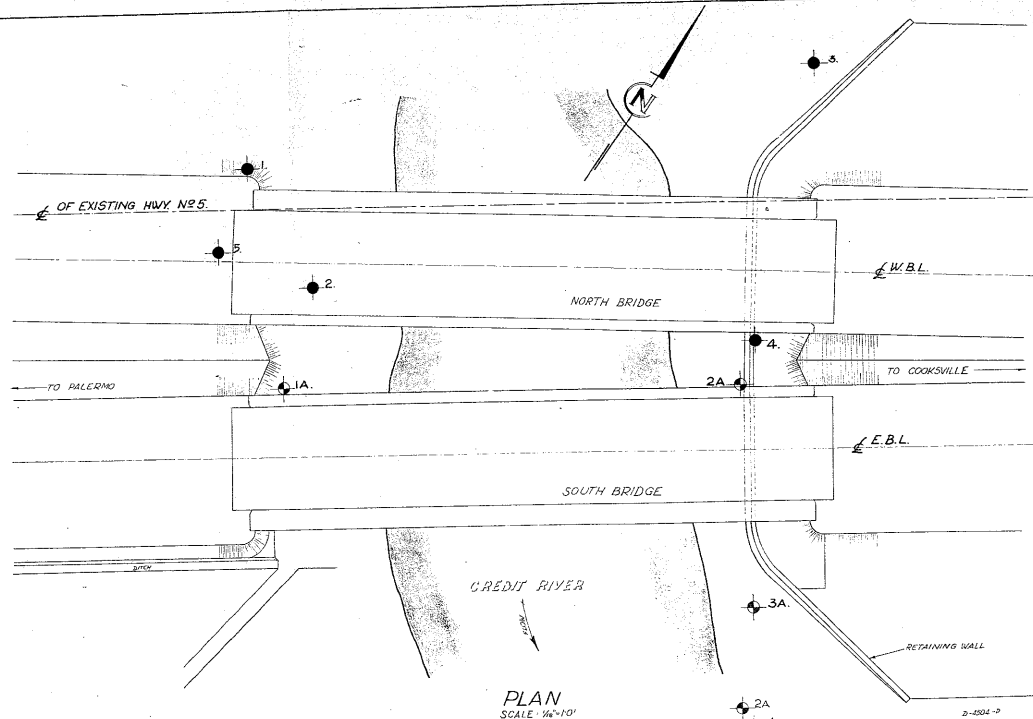
PROFILE SCALE HOR. 1 IN = 20 FT
VER.

LEGEND			
BORE HOLES			
PENETRATION HOLE			
BORE & PENETRATION HOLE			
HOLE NO.	ELEVATION	STATION	DISTANCE FROM C.
1	332.81	1+49.6	52' LT.
2	317.46	0+25	53' LT.
3	316.62	0+22	97' LT.

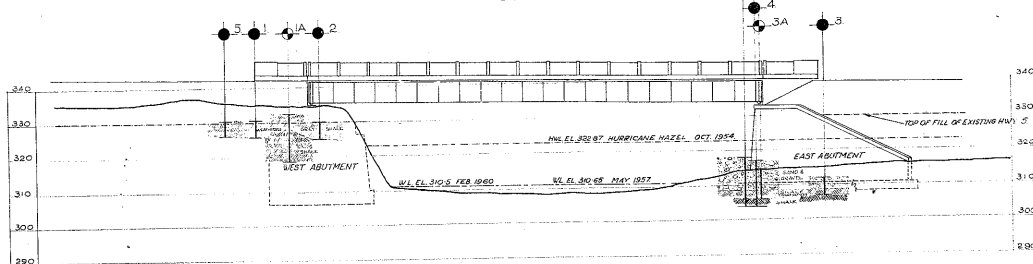
NOTE: REFER TO THE & OF EXISTING HWY FOR LOCATION OF HOLES.

— 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.

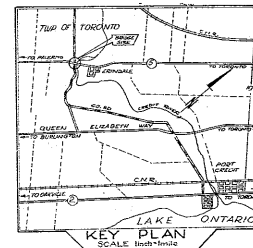
DEPARTMENT OF HIGHWAYS - ONTARIO			
MATERIALS & RESEARCH SECTION - DOWNSVIEW			
CREDIT RIVER PROPOSED CROSSING			
THE KING'S HIGHWAY NO. 5		DIV. NO. 6	
CO. PEEL			
TWP. TORONTO	LOT 3	CON. RANGE 1 S05	
POSITION & ELEVATION OF HOLES			
APPROVED			
ENGINEER		CHIEF ENGINEER	
DESIGN	CHECK	CONTRACT	W.B.
DRAWING	D.F.	CHECK	26-57
TRADING	CHECK	CHECK	F-57-6A
DATE 3 JUNE, 1957			



PLAN
SCALE: 1/4" = 10'



PROFILE
SCALE: 1/4" = 10'



LEGEND	
SOFT HOLE BY POWER AUGER FEB. 1960	●
SOFT HOLE BY DIAMOND DRILL MAY 1957	●
NO. HOLE	ELEVATION
1	330.50
2	330.00
3	312.00
4	315.00
5	330.00
1A	332.81
2A	317.46
3A	316.62

NOTE
THE BOUNDARIES BETWEEN SOIL STRATS HAVE BEEN ESTABLISHED ONLY AT SOFT HOLE LOCATIONS. BETWEEN SOFT HOLES THE BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE AND MAY BE SUBJECT TO CONSIDERABLE ERROR.

60-F-26

DEPARTMENT OF HIGHWAYS - ONTARIO
SURVEYING & RESEARCH SECTION

CREDIT RIVER PROPOSED CROSSING

SHOWING POSITIONS & ELEVATIONS OF HOLES

HWY. 5	DISTRICT 6	COUNTY PEEL
TOWNSHIP TORONTO	LOT 3	CON. I
LOCATION EDINDALE	DESIGNED BY [Signature]	CHECKED BY [Signature]
DRAWN BY [Signature]	DATE 20 FEB. 1960	W.P. 26-57
SCALE 1/16" = 1'-0"	APPROVED BY [Signature]	DRAWING NO. F-26-57A