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58-F 264 C

O. E. W. & CREDIT RIVER

BA 782

TROW, SODERMAN AND ASSOCIATES

SITE INVESTIGATIONS
AND
SOIL MECHANICS CONSULTATION

58-F-264 C

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Project: C168/J2

August 31, 1958.

Mr. A. M. Toye,
Bridge Engineer,
Dept. of Highways of Ontario,
280 Davenport Road,
Toronto, Ontario.

Attention: Mr. McCombie

Core Drilling To Determine Underside of Existing Footings
Oakville Creek And Credit River Bridges
Queen Elizabeth Highway

Dear Sir:

Reported herein are the results of a drilling program carried out to determine the elevations of the underside of the footings supporting the piers and abutments of the above two bridges. Field work was performed during the period from July 16 to August 15, 1958.

borings were performed using a standard rotary drilling machine fitted with AIT size diamond coring bits. A continuous log of each hole was prepared by our qualified Soils Engineer, who personally assisted with the drilling. Elevations of the top of the borehole were supplied by the local D.S.O. survey party.

The results of this investigation have been summarized for each bridge site; these summaries are included as Tables numbered 1 and 2. In addition, the continuous logs of each boring carried out are included for record purposes. The following comments are enumerated for your consideration:

(1) The bedrock formation supporting piers and abutments of these two structures is the Dundas Shale. This formation is grey in colour and is characterized by thin limestone interbeds. Mud seams are not uncommon in the upper zone of this formation.

The shale formation is competent, but is susceptible to severe disintegration upon drying and exposure to the elements. Freezing and thawing is not necessary to cause the shale to disintegrate. Excavations should not be allowed to remain open for any

period of time unless they are flooded to prevent disintegration of the shale. Exposed areas should be sealed prior to pouring concrete.

(2) Credit River Bridge: The concrete core recovered from the borings in abutments and piers of this structure, indicates that the concrete is free of voids and in sound condition. No mud seams were intersected within the depth of borings (10 feet below underside of footings). Footing performance is considered satisfactory.

(3) Oakville Creek Bridge: Concrete cored in the abutment and pier members of this structure is sound, with the exception of a few small zones of unassorted aggregate cored in Piers No. 3 and 4. With the exception of a possible thin mud seam 5 feet below underside of footing at Pier No. 3, the strata below the footings is competent and free of mud seams.

The east abutment of this structure which is a fixed support, shows evidence of movement. The north girder of the end span has moved away from the abutment and resulted in a structural crack along the plane of connection of this girder with the abutment. Closer inspection of the girders themselves, revealed vertical cracks at the mid-span sections of these members. It could not be concluded whether these cracks were structural cracks or shrinkage cracks. Visual observations could not fix the time at which these movements took place (i.e. during construction or post-construction).

No mud seams were encountered below the footing of the east abutment. This noted absence of mud seams would allow the footings for the proposed abutment extensions to be carried deeper than the footing of the existing abutment. In view of the movements evidenced, it appears advisable to found the new footings below the elevation of the underside of the existing footing.

We are pleased to have had this opportunity to be of service to you. If questions come to mind regarding either the factual data contained herein, or the comments submitted, please contact us.

Yours very truly,

L. G. Soderman

Lawrence G. Soderman (P. Eng.)

LGS/lcs
Encl.

**Gravel River Crossing
Main Highway, Ont. Prov.**

TABLE NO. 1

**SUMMARY OF PIER/ABUTMENT LOCATIONS
AND
ELEVATIONS OF UNDERSIDE OF FOOTINGS**

Pier No.	Pole No.	Pole Location	Elevation of Underside of Footing.
West Abutment	1	14'6" north of E of Bridge, 1'7" east of abutment breast-wall.	226.6
Pier No.1	2	4' south of E of Bridge, 4' east of E of columns.	236.3
Pier No.2	3	24'6" north of E of Bridge, 2'6" west of E of columns.	226.36
Pier No.3	4	23'3" north of E of Bridge, 5' west of E of columns.	223.0
Pier No.3	5	22'6" south of E of Bridge, 4'0" west of E columns.	221.6
Pier No. 4	6	18' north of E of Bridge, 5' east of E columns.	224.3
Pier No.5	7	3' south of E of Bridge, 0' west of E columns.	236.8
Pier No.6	8	17'8" south of E of Bridge, 4'4" west of E of columns.	273.9
East Abutment	9	5' south of E of Bridge, 11" west of breastwall face.	239.8
East Abutment	10	17' north of E of Bridge, 1' west of breastwall face.	228.8

Above pier numbers correspond to those noted on Dept. of Highways of Ontario drawing No.D 2241-1, dated November 21, 1933.

**SIXTEEN MILE CREEK CROSSING
(OAKVILLE CREEK)
QUEEN ELIZABETH BR. BRIDGE**

TABLE NO. 2

**SUMMARY OF BORING LOCATIONS
AND
ELEVATIONS OF UNDERSIDES OF FOOTINGS**

Pier No.	Hole No.	Hole Location	Elevation of Underside of Footing (Ft.)
Pier No. 1	5	Top of pedestal 15' north of north face of south column on E of columns.	314.0
Pier No. 2	4	Top of pedestal 11' south of south face of north column on E of columns.	273.4
Pier No. 3	2	South west corner of Pier No. 3.	270.4
Pier No. 3	1	North east corner of Pier No. 3.	268.3
Pier No. 4	3	Top of pedestal 3' north of north face south column on E of columns.	277.4
Pier No. 5	6	Top of pedestal 4' south of south face of north column 2' east of E of columns.	301.9
Pier No. 6	8	Top of pedestal 1' north of north face of south column on E of columns.	321.7
East Abutment	7	1 1/2' west of face of breastwall 10' south of bridge centre line.	334.9
West Abutment		No boring carried out.	

NOTE: Vertical cracks noted at mid-span of both girders of Span A. Evidence of movement also noted where south girder forms into abutment.

Above pier numbers correspond to those given on Dept. of Highways of Ontario drawing No. O 2301-1, dated April 13, 1936.

CREDIT RIVER CROSSING
QUEEN ELIZABETH HWY. WEST
BOREHOLE LOG

**CREDIT RIVER
BORING NO. 1**

<u>Depth</u>	<u>Type of Core</u>	<u>Recovery</u>	<u>Remarks</u>
0' - 5"	—	—	Top of casing @ elevation 299.33 5" casing stick-up. Hole inclined @ 15°
5" - 9"	Concrete	—	Drain trough.
9" - 6'9"	—	—	Drill sand fill.
6'9" - 7'10"	Concrete	100%	Abutment wall, sound concrete.
7'10" - 13'2"	Concrete	96%	Sound concrete.
13'2" - 13'7"	Shale	100%	Bottom of footing @ 13'2". No mud seams noted.
13'7" - 15'5"	Shale	55%	No mud seams noted. Shale ground while drilling.
15'5" - 16'2"	Shale	100%	No mud seams noted.
16'2" - 17'11"	Shale	95%	" " " "
17'11" - 23'3"	Shale	94%	" " " "

**CREDIT RIVER
BORING NO. 2**

<u>Depth</u>	<u>Type of Core</u>	<u>Recovery</u>	<u>Remarks</u>
0' - 1'11"	Concrete	96%	Top of hole @ top of concrete pedestal, elevation 260.00. Vertical hole. Sound concrete.
1'11" - 3'9"	Concrete	96%	Sound concrete.
3'9" - 5'7"	"	96%	" " "
5'7" - 10'10"	"	97%	" " "
10'10" - 16'0"	"	100%	" " "
16'0" - 21'2"	"	92%	" " "
21'2" - 22'10"	Concrete & Shale	100%	7" sound concrete and 13" shale. (no mud seams noted). Footing bottom at 21'9".
22'10" - 27'10"	Shale	98%	No mud seams noted.

CREDIT RIVER BORING NO. 3

27'10" - 30'11" Shale	51%	No mud seams noted. Shale probably ground during drilling.
30'11" - 32'9" Shale	96%	Shale probably ground during drilling.

CREDIT RIVER BORING NO. 3

Depth	Type of Core	Recovery	Remarks
0' - 2'0"	Concrete	38%	Hole inclined @ 26° to vertical. Top of hole @ elevation 243.46. Sound concrete.
2'0" - 4'4"	"	79%	" " probably ground during drilling.
4'4" - 6'1"	"	100%	Sound concrete.
6'1" - 10'9"	"	100%	" "
10'9" - 15'11"	"	98%	" "
15'11" - 19'8"	"	36%	Appears to be sound concrete. Machine on pressure, probably ground core.
19'8" - 24'8"	"	75%	Sound concrete.
24'8" - 30'3"	Shale	50%	No mud seams noted, core probably ground while drilling. Bottom of footing @ 24'8".
30'3" - 36'2"	Shale	25%	Core probably ground, no mud seams noted.

CREDIT RIVER BORING NO. 4

Depth	Type of Core	Recovery	Remarks
0' - 8"	_____	_____	Hole inclined @ 20° to vertical. Stick-up of casing = 8". Top of casing @ elev. 243.75.
8" - 2'0"	_____	_____	Drill fill sand.
2'0" - 3'6"	Concrete	72%	Sound concrete.
3'6" - 5'3"	Concrete	95%	" "
5'3" - 10'3"	Concrete	100%	" "

CREDIT RIVER BORING NO. 4

10'3" - 15'6"	Concrete	97%	Sound concrete.
15'6" - 20'8"	Concrete	97%	" "
20'8" - 25'10"	Concrete & Shale	94%	43" of sound concrete and 19" of sound shale recovered. Bottom of footing @ 24'9".
25'10" - 30'5"	Shale	76%	No mud seams noted.
30'5" - 35'9"	Shale	95%	" " " "

CREDIT RIVER BORING NO. 5

Depth	Type of Core	Recovery	Remarks
0' - 1'10"	Concrete	93%	Hole inclined @ 19° to vertical. Top of hole in footing @ elev. 248.27 Sound concrete.
1'10" - 3'8"	"	100%	" "
3'8" - 8'7"	"	100%	" "
8'7" - 13'9"	"	87%	" "
13'9" - 18'8"	"	83%	" "
18'8" - 22'3"	"	91%	" "
22'3" - 27'7"	"	95%	" "
27'7" - 32'10"	Concrete & Shale	97%	11" of sound concrete and 4'2" of sound shale recovered. Bottom of footing @ 28'6".

CREDIT RIVER BORING NO. 6

Depth	Type of Core	Recovery	Remarks
0' - 1'4"	-----	-----	Hole inclined @ 25° to vertical. 1'4" is distance from concrete through water to raft deck.
1'4" - 3'8"	Concrete	86%	Sound concrete.
3'8" - 5'10"	"	100%	" "
5'10" - 11'1"	"	97%	" "
11'1" - 16'3"	"	98%	" "

CREDIT RIVER BORING NO. 6

14'3" - 21'3"	Concrete	100%	Sound concrete.
21'3" - 26'7"	Concrete & Shale	73%	7" of sound concrete and 3'4" of shale recovered. No mud seams noted. Shale probably ground by drilling. Bottom of footing @ 21'20".
26'7" - 31'6"	Shale	100%	No mud seams noted.

CREDIT RIVER

BORING NO. 7

Depth	Type of Core	Recovery	Remarks
0' - 3"	---	---	Hole inclined @ 23° to vertical. 3" stick-up of casing. Top of casing @ elevation 251.63.
3" - 3'2"	---	---	Backfill around footing.
3'2" - 5'4"	Concrete	100%	Sound concrete.
5'4" - 10'5"	"	100%	" "
10'5" - 15'6"	"	100%	" "
15'6" - 20'11"	Concrete & Shale	94%	12" of sound concrete and 4'1" of shale recovered. (no mud seams noted). Bottom of footing @ 16'0".
20'11" - 26'	Shale	100%	No mud seams noted.

CREDIT RIVER

BORING NO. 8

Depth	Type of Core	Recovery	Remarks
0' - 10"	---	---	10" casing stick-up. Hole inclined @ 15° to vertical. Elevation of top of hole = 294.22.
10" - 3'0"	---	---	Sand backfill.
3'0" - 4'7"	Concrete	100%	Sound concrete.
4'7" - 9'10"	"	95%	" "
9'10" - 11'6"	Concrete & Shale	100%	1'5" of sound concrete & 3" of sound shale recovered. Bottom of footing @ 11'3".
11'6" - 16'9"	Shale	80%	No mud seams noted, core probably ground while drilling.
16'9" - 21'10"	Shale	78%	" " "

**CREDIT RIVER
HOLE NO. 9**

Depth	Type of Core	Recovery	Remarks
0' - 2'5"	Concrete	100%	Hole inclined @ 21° to vertical. Elevation of top of hole = 297.17 Concrete is sound.
2'5" - 4'10"	Concrete	86%	Sound concrete.
4'10" - 10'11"	Concrete	51%	3'1" of sound concrete recovered, from 7'11" machine not on pressure, probably shale not too well cemented therefore grinds easily. Inspection of the shale face exposed by the river @ the same elevation, indicates the shale to be dense and sound. Bottom of footing @ 7'11".
10'11" - 14'	—	0%	Evidence that the shale is being ground. No mud seen suspected.

**CREDIT RIVER
HOLE NO. 10**

Depth	Type of Core	Recovery	Remarks
0' - 4"	Concrete	100%	Hole inclined @ 17.7° to vertical. Elevation of top of hole = 297.17 Concrete is sound.
4" - 2'8"	Concrete	93%	Sound Concrete.
2'8" - 5'0"	Concrete	97%	" "
5'0" - 10'0"	Concrete	71%	3'10" of sound concrete recovered. Drill entered shale at this depth but shale would not core, although evidence along bank shows shale to be dense and sound. Bottom of footing @ 8'10".
10'0" - 16'5"	Shale	17%	Shale would not core, heavy water return indicates grinding. Deposit exposed on bank is sound shale.

OAKVILLE CREEK CROSSING
GREEN ELIZABETH HWY. WEST
FORENSIC LOGS

**OAKVILLE CREEK
BORING NO. 1 PIER NO. 1**

Depth	Type of Core	Recovery	Remarks
0' - 2'2"	Concrete	100%	Top of hole elevation 255.47. Hole inclined @ 23° to vertical concrete is sound.
2'2" - 7'6"	Concrete	100%	Concrete is sound.
7'6" - 13'2"	Concrete	89%	Void or broken concrete at 11'8".
13'2" - 19'6"	Concrete & Shale	67%	Void and poor concrete noted at two depths to 16'6". 41" concrete 9" mainly limestone. Bottom of footing @ 16'7".
19'6" - 25'6"	Shale	71%	No mud seams noted.
25'6" - 31'3"	Shale	70%	" " " "

**OAKVILLE CREEK
BORING NO. 2 PIER NO. 2**

Depth	Type of Core	Recovery	Remarks
0' - 2'3"	Concrete	100%	Top of hole @ Elevation 254.71. Vertical hole. Concrete is sound.
2'3" - 2'8"	Concrete	93%	Concrete is sound.
2'8" - 9'10"	Concrete	100%	Few small air voids, otherwise sound.
9'10" - 14'8"	Concrete	100%	Concrete is sound.
14'8" - 20'6"	Concrete & Shale	90%	Concrete is sound. 43" concrete, 20" shale recovered. Shale is sandy, mudseams possible. Bottom of footing @ 18'4".
20'6" - 23'2"	Shale	63%	Mud seam suspected @ 23'. Shale is soft and probably washed away.
23'2" - 29'	Shale	54%	Shale appears sound while drilling but soft.

JACKVILLE CREEK
BOSSING NO. 1 PIER NO. 4

Depth	Type of Core	Recovery	Remarks
0' - 2'3"	Concrete	100%	Top of hole @ elevation 297.90 Vertical hole. Concrete is sound.
2'3" - 4'1"	Concrete	100%	Concrete is sound.
4'1" - 5'9"	Concrete	100%	" " " "
5'9" - 10'9"	Concrete	100%	" " " "
10'9" - 11'4"	Concrete	100%	Concrete is crumbly.
11'4" - 16'7"	Concrete	67%	Uncemented aggregates present, lost drilling water, hit voids on occasion.
16'7" - 19'8"	Concrete	76%	Uncemented aggregates 16'7" to 18'6" No water return.
19'8" - 20'2"	Concrete	100%	Uncemented aggregates, no water return.
20'2" - 24'10"	Shale	86%	43' of soft shale recovered. Bottom of footing @ 20'6".
24'10" - 30'1"	Shale	75%	No mud seams noted. Top half of core is limestone.

JACKVILLE CREEK
BOSSING NO. 4 PIER NO. 2

Depth	Type of Core	Recovery	Remarks
0' - 1'8"	Concrete	100%	Top of hole at elevation 296.21. Vertical hole. Concrete is sound.
1'8" - 3'5"	Concrete	100%	Concrete is sound.
3'5" - 5'2"	Concrete	100%	" " " "
5'2" - 10'5"	Concrete	100%	Uncemented aggregates & voids at 10', rest of concrete is sound.
10'5" - 15'8"	Concrete	100%	Sound concrete.
15'8" - 20'10"	Concrete	100%	Sound concrete.

Oakville Creek Boring No. 1, Pier No. 1

20'10" - 25'5"	Concrete and Shale.	93%	13" sound concrete recovered. 16" shale, no mud seams noted. Footing at 21'1".
25'5" - 28'0"	Shale	100%	Sound shale, limestone 25'5" to 26'9".
28'0" - 32'5"	Shale	100%	Sound shale.

OAKVILLE CREEK
BORING NO. 1, PIER NO. 1

Depth	Type of Core	Recovery	Remarks
0' - 4'8"	Concrete	78%	Vertical Hole. Top of hole @ elevation 321.44. Concrete starts at 2'0", crumbly at 3". No water return.
4'8" - 7'4"	Concrete	94%	Concrete sound except for uncemented aggregates @ 7".
7'4" - 10'7"	Concrete & Shale	61%	2" of concrete and then shale. No mud seams noted. Bottom of footing @ 7'6".
10'7" - 15'2"	Shale	47%	Core ground, no mud seams noted. Limestone makes up first 14".
15'2" - 18'0"	Shale	100%	Sound shale.

OAKVILLE CREEK
BORING NO. 2, PIER NO. 2

Depth	Type of Core	Recovery	Remarks
0' - 3'2"	—	—	Vertical hole. Top of hole @ elev. 310.77. Casing through fill to concrete.
3'2" - 5'2"	Concrete	83%	Sound concrete.
5'2" - 7'8"	Concrete	57%	Uncemented gravel noted @ two depths.
7'8" - 9'5"	Concrete & Shale	93%	16" of sound concrete and 3" of mudded shale recovered. Bottom of footing @ 8'11".
9'5" - 11'10"	Shale	61%	No mud seams noted.

OAKVILLE CREEK BORING NO. 6, PIER NO. 1 (Cont.)

11'10" - 12'11"	Shale	100%	Very little water return, as mud seams noted.
12'11" - 14'7"	Shale	100%	No mud seams noted.
14'7" - 19'9"	Shale	89%	" " " "

OAKVILLE CREEK
BORING NO. 7, EAST ABUTMENT

Depth	Type of Core	Recovery	Remarks
0' - 2'2"	---	---	Hole at 11° to vertical. Top of hole @ elev. 339.79. Concrete starts at 2'2", drill through fill.
2'2" - 4'3"	Concrete	61%	Concrete sound, hit reinforcing steel at 4'3".
4'3" - 5'4"	Concrete & Shale	61%	7" concrete recovered, and 1" shale, water changed color @ 5'0". Bottom of footing @ 5'0".
5'4" - 9'1"	Shale	80%	No mud seams noted.
9'1" - 13'1"	Shale	100%	" " " "
13'1" - 15'1"	Shale	100%	" " " "

OAKVILLE CREEK
BORING NO. 8, PIER NO. 6

Depth	Type of Core	Recovery	Remarks
0' - 5'0"	---	---	Vertical Hole. Top of hole @ ground level, elevation 332.1. Drill through fill.
5'0" - 6'11"	Concrete	70%	Sound concrete, ground during drilling.
6'11" - 10'8"	Concrete & Shale	91%	3'4" of concrete recovered and 1" of shale.
10'8" - 11'3"	Shale	57%	No mud seams noted.
11'3" - 13'1"	Shale	82%	" " " "
13'1" - 18'2"	Shale	80%	" " " "
18'2" - 20'11"	Shale	70%	" " " "

Toronto 3,
Sept. 3, 1938.

MEMORANDUM TO:

Mr. A. Astin,
Acting Materials & Research Engineer,
Brimley, Ontario.

RE: BA 782 Credit River Bridge,
Oakville Creek Bridge,
C.E.N., Dist. 25.

Attached please find copy of above soil
report BA 782 for your file.

~~JCH:ARF~~

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