

TROW, SODERMAN AND ASSOCIATES

SITE INVESTIGATIONS
AND
SOIL MECHANICS CONSULTATION

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Project: C108/J238

July 21, 1958.

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

Attention: Mr. S. McCombie

Foundations - Bronte Creek Bridge,
Queen Elizabeth Highway

Dear Sirs:

Reported herein are the results of the investigation to determine the elevations of the bottoms of the existing piers and abutments of the above-noted bridge. These results and our opinions concerning the safety of the foundations during and subsequent to the proposed bridge widening are summarized as follows:

- 1) The elevations of the bottoms of the existing footings are recorded in Table No.1 and the drawing attached to this letter. With the exception of the west abutment, these measurements agree very closely with the footing depth record engraved in the concrete of most of these members. The engraved record for the west abutment indicated a footing depth approximately $2\frac{1}{2}$ feet lower than was measured in borehole No. 8. No check was obtainable for the east abutment and the second pier to the west because the records were buried in fill.
- 2) Except for some small voids, the concrete in each footing appeared to be in good condition. The underlying bedrock consisted of the red Queenston shale formation which is exposed in the valley walls. This red shale contained occasional greenish limestone or calcareous shale interbeds. Recovery of the Queenston shale generally was very good except in hole No. 2 of Pier 4 and holes Nos. 3 and 4 of Pier 3, where grinding of core took place. Loss of core was believed to be due to grinding rather than the result of mud seams because the drill was under full pressure at all times. A temporary

loss of pressure would be experienced if a mud seam was intersected.

3) Even if mud seams were present below footing level, no plastic flow should be anticipated when excavations are made to present footing level for the future widening of the piers and abutments. Any mud seam under the existing footings should be fully consolidated now by the weight of the bridge. Therefore, the existing piers and abutments should be unaffected by the proposed modifications to the bridge. In addition, since the competence of the bedrock has been proven by the existing bridge, no foundation difficulties should be anticipated under the additions. It is assumed that allowance will be made for a very small amount of differential movement due to elastic compression of the bedrock. This movement should be less than 0.1 inches.

4) Water will enter any footing excavations that extend below river level in the valley of Bronte Creek. The approximate level of the river at the time of the investigation was Elev. 304 feet. Light shoring may be required to support the walls of these excavations. It should be possible to control the flow of water by pumping from the open excavation.

5) Although the Queenston shale will remain sound below the water level, it should be expected to crumble within a day or two if exposed to the air during periods of freezing and thawing. Deterioration will occur more gradually above the water level in warmer weather. Because of this undesirable condition, water should be kept in the footing excavations as long as possible prior to pouring concrete.

For record purposes the details of the field boring program are described briefly in the following sentences. All rock drilling was performed using AX drill rods and the core obtained was approximately $1\frac{1}{4}$ inches in diameter. The elevations of all borings were determined approximately by reference to established measurements on the centre line of the Queen Elizabeth Highway and to the other datum references shown on drawing No. 1. These measurements were confirmed independently by a survey crew of the Dept. of Highways.

The field work of this investigation was performed during the period from July 3rd to 15th. Engineering supervision of the field work was maintained at all times.

We hope that the information of this investigation assists you in the planning of the proposed Bronte Creek Bridge enlargement.

Yours very truly,

W. A. Trow

William A. Trow (P. Eng.)

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Encls.

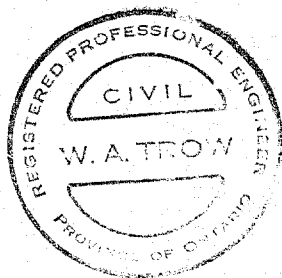


TABLE NO. 1SUMMARY OF FOOTING LEVEL MEASUREMENTS

Pier No.	Hole No.	Location	Elev. top of footing Ft.	Elev. bottom of footing Ft.	Remarks
4	1	S.W.corner	294.45	284.65	Agrees with record engraved in pier within one inch.
4	2	N.E.corner	294.45	284.45	" " "
3	3	S.W.corner	294.27	284.27	" " "
3	4	N.E.corner	294.27	284.37	" " "
2	5	Near North end	316.7	301.86	Record buried under fill.
1	6	Near South end	350.82	345.32	Agrees with record engraved in pier within about 3 ins.
East Abut.	7	South side	not determined	363.0	Record buried under fill.
West Abut.	8	South side	not determined	360.13	Record in concrete indicates footing at approx. Elev. 357 ft.
5	9	Near North end.	314.1	304.59	Agrees with record engraved in pier.

TABLE NO. 2LOG OF BORING NO. 1 (PIER 4)

Depth Feet	Type of Core	Recovery %	Description
0 - 3.7	Concrete	70	Good condition.
3.7- 6.0	" "	93	" "
6.0- 8.4	" "	100	" "
8.4-11.6	Concrete and red Queenston Shale	94	20 ins. concrete; 16 ins. Queenston Shale with occasional interbeds of greenish argillaceous limestone.
11.6-16.2	Shale	83	Queenston shale with interbeds of argillaceous limestone.
16.2-19.8	Shale	99	" "

End of bore. Bottom of footing 10.2 feet below top of footing.

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TABLE NO. 3LOG OF BORING NO. 2 (PIER 4)

Depth Feet	Type of Core	Recovery %	Description
0 - 1.1	Concrete	100	Good condition.
1.1- 3.1	" "	92	" "
3.1- 5.4	" "	100	" "
5.4-10.1	"	87	Voids in concrete 6 ft. to 8½ ft. Lost water return at 9 feet. Red Queenston shale at 10 ft. = bottom of footing.
10.1-15.1	Shale	53	Red Queenston shale with occasional interbeds of green argillaceous limestone. Core badly ground. Machine carried pressure at all times.
15.1-20.25	Shale	99	Red Queenston shale with green interbeds.

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TABLE NO. 4LOG OF BORING NO. 3 (PIER 3)

Depth Feet	Type of Core	Recovery %	Description
0 - 3	Shale particles, rootlets and silty sand.		No sampling
3 - 5.2	Concrete	100	Good condition.
5.2- 10.33	" "	98	" "
10.3-15.6	Concrete & shale	96	32 ins. concrete; 28 ins. Queenston Shale with occasional green interbeds.
Bottom of footing at 13 feet or 10 feet below top of footing.			
15.6-20.9	Shale	57	Red Queenston shale with green interbeds. Core badly ground; possible mud seams; machine carried pressures at all times.
20.9-24.2	Shale	80	as above.

TABLE NO. 5LOG OF BORING NO. 4 (PIER 3)

Depth Feet	Type of Core	Recovery %	Description
0 - 3	Weathered shale silty sand and other fill		No sampling.
3 - 4.4	Concrete	99	Good condition
4.4- 6.8	" "	83	" " more voids in concrete
6.8-11.6	" "	100	" "
11.6-16.95	Concrete and shale	89	15 ins. concrete; 42 ins. Queenston shale, with 3 possible mud seams. Bottom of footing at 12.9 feet or 10 feet below top of footing.
16.95-21.95	Shale	38	Badly broken Queenston shale, possible mud seams and grinding; machine carried pressures at all times.

TABLE NO. 6LOG OF BORING NO. 5 (PIER 2)

Depth Feet	Type of Core	Recovery %	Description
0 - .67	Concrete	100	Good condition.
.67- 2.9	" "	100	" "
2.9 - 5.25	" "	95	" "
5.25-10.3	" "	100	" "
10.3-15.33	" "	100	" "
15.33-20.46	" "	87	" "
20.46-25.75	Concrete & shale	93	10 ins. concrete; 49 ins. red Queenston shale. Bottom of footing at 21.3 ft.
25.75-31.7		88	Good condition.

TABLE NO. 7LOG OF BORING NO. 6 (PIER 1)

Depth Feet	Type of Core	Recovery %	Description
0 - 5.25	Red sandy clay and broken shale		No sampling. Top footing approx. 5 feet below ground surface.
5.25-10.33	Concrete	100	Good condition. Evidence of shale at end of run.
10.33-16.1	Shale	97	Red Queenston shale - good condition.
16.1-21.25	Shale	100	" " " "

TABLE NO. 8LOG OF BORING NO. 7 (EAST ABUTMENT)

Depth Feet	Type of Core	Recovery %	Description
0 - 9	Sandy clay, shale and roots		Datum 6 ins. above ground; inclined at 7° to vertical into abutment. Top concrete 9 feet below ground surface.
9 -10.67	Concrete	100	Good condition.
10.67-15.5	" "	100	" "
15.5-21.1	" "	96	50 ins. concrete; 14 $\frac{1}{2}$ ins. red Queenston shale. Good condition. Bottom of footing at 19.75 feet.
21.1-26.25	Shale	84	Red Queenston shale, good condition.
26.25-31.4	" "	79	" " (lost rest of core in hole). No loss of pressure.

TABLE 9LOG OF BORING NO. 8 (WEST ABUTMENT)

Depth Feet	Type of Core	Recovery %	Description
0 -13	Red clay with shale particles.		Datum - ground level, marked on concrete; hole inclined at 6° to vertical into abutment; top of footing not encountered within 13 feet.
13 -14.6	Concrete	75	Good condition.
14.6 -16.6	" "	100	" " drill piece of reinforcing steel.
16.6-20.7	Concrete & shale.	100	26 $\frac{1}{2}$ ins. concrete; 48 $\frac{1}{2}$ ins. Queenston shale with limestone interbeds. Bottom of footing at 16.75 ft.
20.7-27	Shale	80	Queenston shale - good condition.

TABLE NO. 10LOG OF BORING NO. 9 (PIER 5)

Depth Feet	Type of Core	Recovery %	Description
0 - 2.2	Concrete	100	Good condition.
2.2 - 4.4	" "	100	" "
4.4 - 9.5	" "	100	" "
9.5 -14.6	" "	100	" "
14.6-19.67	Concrete & shale.	100	17 ins. concrete; 44 $\frac{1}{2}$ ins. Queenstone shale. Footing at 16 ft.
19.67-25	Shale	96	Good condition.

