

E. M. PETO ASSOCIATES LIMITED

1287 Caledonia Road,
Toronto 19, Ontario,
789-1126.

Our Job Number 6473.

13th April, 1964.

Township of North Grimsby,
c/o MacKay, MacKay & Peters,
25 Hughson Street,
Hamilton, Ontario.

64-F-268 M

Attention: Mr. Bernard Riegler, P. Eng.

Gentlemen:

Re: Soil Investigation Results
Wilcox Bridge
(Concession IV - V - Lots 14-15.)

We have pleasure in forwarding herewith, the results of the field investigation carried out recently at the site of the proposed new Wilcox Bridge.

The attached sketch illustrates the locations of the two testholes as set out by Mr. Riegler in the field. The enclosed borehole logs provide details of the soil conditions formed at each testhole. A simplified soil profile has been included as part of the site plan.

The elevations referred to on the borehole logs, site plan and profile were supplied by Mr. Riegler and are referred to a temporary bench mark of assumed elevation of 100.0 ft.

SOIL CONDITIONS

There appears to be a surficial cover of approximately 5 inches of dark brown topsoil followed by a mottled brown silt loam with roots to about the 12 to 16 inch depth.

From 2 ft. to about the 8 ft. depth, the soil is a mottled grey-brown silty clay containing pockets and lenses of medium sand. This clay is stiff to very stiff (average N value is about 18 below the 3 ft. depth) and is wetter than the plastic limit; the average moisture content is initially about 20%, increasing to about 25% with depth.

Below about the 9 ft. depth, the clay becomes less stiff and more grey-brown, and the sand lenses disappear. The minimum N-value is only 9 and the moisture contents increase slightly to about 27 or 28%.

Testhole 1 refused at 16 ft. 2 inches (elevation 78.7) and testhole 2 refused at 14 ft. (elevation 80.6). The soil for the last foot or so is described as a brownish grey sandy clay till in a rather wet condition.

WATER CONDITIONS

Testhole 2 was dry on completion. Testhole 1 was dry until the sampling tube was extracted from the 15 ft. to 16 ft. 2 inch depth; then water entered the bottom of the hole and rose rapidly to the 8 ft. depth, thereafter more slowly to 2 ft. 3 inches from surface in about 20 minutes. Overnight, the level of the water at this hole 1 rose to ground surface.

The water level in the creek was at elevation 92.8 on April 8th, according to Mr. Riegler's figures.

CONCLUSIONS & RECOMMENDATIONS

The elevation of the existing creek bottom is $90.3 \pm$ to Mr. Riegler's datum. Therefore, any foundations placed adjacent to the creek would probably have to be placed at about elevation $85.0 \pm$. This level would provide for future scour to a maximum depth of about 5 ft. before presenting a danger to the abutment footings.

At this level, the footings would be placed approximately at the level where general softening of the silty clay stratum commences. Based on the minimum N value (9) alone, the allowable bearing value would be only of the order of 1.0 tons/sq. ft. for long strip footings, without consideration of the possibility of some long term settlement.

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After preliminary review of the field data, Mr. Riegler decided to forego the original concept of a rigid frame structure supported on spread footings at shallow depth, and to substitute a two pier structure with simply supported short approach spans with light abutments carried on the existing grade, or placed in the new approach fill. The central piers will be supported on piles carried down to refusal encountered at elevations 78.7 to 80.6 at the two testholes. Since the new approach fill will only be about 3 ft. thick, no stability problem is considered likely to exist.

As a result of this review, it was decided not to carry out any laboratory testing of samples of the overburden, apart from natural moisture content determinations, since most of the load from the new structure would be supported on piles driven to refusal.

At Mr. Riegler's request, the refusal medium was not cored to establish that bedrock had been encountered. However, well-drilling records indicate bedrock below "blue clay" at depths ranging from 21 ft. (Concession IV, Lot 9) to 20 ft. (Concession IV, Lot 16) to 24 ft. (Concession IV, Lot 21) to 33 ft. (Concession IV, Lot 12). Since the surrounding area is generally 5 ft. or more above the level

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of surface at the test piles, the refusal level at the testholes does not appear to be unassociated with the bedrock levels from the well drillers' records. It must be appreciated that bedrock may be lower in the immediate vicinity of an old stream bed.

Piles should be driven to virtual refusal. Pre-boring may be advantageous if you wish to use tubular displacement piles.

Alternatively, you may wish to use bored cast-in-place concrete piles augered to refusal. Some problems may be encountered in this case with the water bearing stratum found at terminal depth in hole 1, and it may be necessary to use "tremie" concrete in such a case.

Without "proof" of bedrock at refusal depth, we recommend that tube piles be driven to virtual refusal and limited to a maximum load of 40 tons/pile unless a pile loading test is carried out.

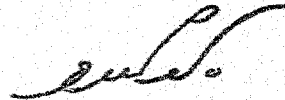
For bored caissons, where the presence of bedrock can be established at terminal depth if required, we recommend limiting the allowable bearing value to 45 tons/sq. ft.

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For the "light" abutments carried either on the existing soil at shallow depth, or on newly placed and compacted fills, we recommend using a nominal bearing value of 1.0 tons/sq. ft. ; the short approach spans should be simply supported in order to allow for any minor movement of the abutments.

Yours very truly,

E. M. PETO ASSOCIATES LTD.,

A handwritten signature in dark ink, appearing to read 'E. M. Peto', with a stylized flourish at the end.

E. M. Peto, P. Eng.





EMP/vm

e. m. peto associates ltd.
SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

BOREHOLE LOG

Job Name Wilcox Bridge Job No. 6473 Borehole No. 1 & 1A
Twp. of North Grimsby
 Client c/o MacKay, MacKay & Peters Casing EX Boring Date 8 April 1964
 Elevation 94.9 Compiled By F.M.P. Checked By V.M.

SAMPLE CONDITION

 UNDISTURBED
 FAIR
 DISTURBED
 LOST

SAMPLE TYPE

A.S. AUGER SAMPLE
 C.S. CASING SAMPLE
 S.S. 2" STANDARD SPLIT TUBE SAMPLE
 S.L. SPLIT BARREL WITH LINERS
 S.T. THIN-WALLED SHELBY TUBE SAMPLE
 W.S. WASH SAMPLE
 R.C. ROCK CORE

ABBREVIATIONS

V.T. IN SITU VANE SHEAR TEST
 M. MOIST
 W.L. WATER LEVEL IN CASING
 W.T. GROUND WATER TABLE IN SOIL
 W.T.P.L. WETTER THAN PLASTIC LIMIT
 D.T.P.L. DRIER THAN PLASTIC LIMIT
 A.P.L. ABOUT PLASTIC LIMIT

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth (Elevation)	Legend	Sample No. and Conditions	Sample Type	No. of Blows per Ft.	Notes	WATER LEVELS & REMARKS
Ground Surface			0'0"						
Approx. 5" of Topsoil	Very dark brown		04.9						Very moist
Silty clay	Mottled grey-brown	Firm			1	SS	8	21.3	Creek W.L. 92.8 April 8/64 W.T.P.L.
									(Stiffer at about 5'6")
ditto, odd sand pockets and lense	Mottled grey & brown	Stiff to very stiff			2	SS	18	24.5	W.T.P.L.
Ditto	Ditto	Ditto			3	SS	16	25.7	W.T.P.L.
					x	2" SL	-	26.9	(Softer below about 9')
Layered silty clay	Grey brown	Firm to stiff			4	SS	9	28.3	W.T.P.L.
					y	2" ST			
Sandy clay till	Brownish grey	Stiff	15'2"		5	SS	7/6"	13.1	Wet and
			78.7				30'2"		W.T.P.L.

TESTHOLE TERMINATED AT 16'2" (Penning Refusal)

Water Table Data

Casing Depth	Hole Depth	Depth to Water Level	Remarks
10'	15'	NUL	Hole dry
10'	16'2"	8'0"	2 minutes after last sample
		5'0"	10 " " " "
		2'3"	20 " " " "
		Surface	Overnight

BOREHOLE LOG

Job No. 6473
Casing BX
Compiled By F.

Borehole No. 2
Boring Date 9th April 1964
Checked By V. M.

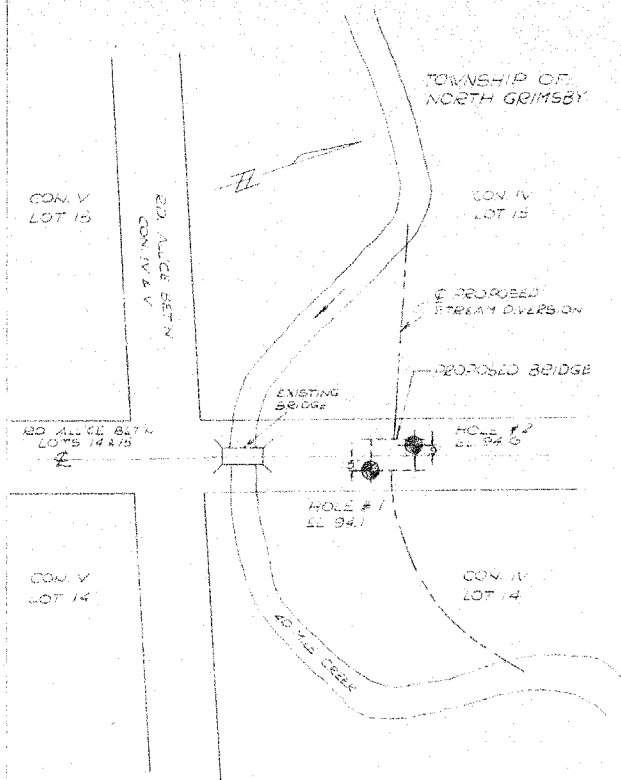
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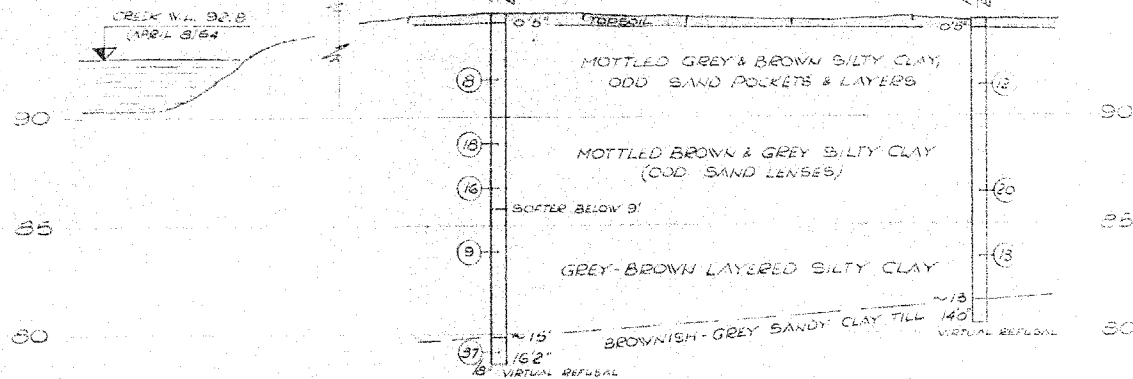
V.T.	IN SITU VANE SHEAR TEST
M.	MOIST
W.L.	WATER LEVEL IN CASING
W.T.	GROUND WATER TABLE IN SOIL
W.T.P.L.	WETTER THAN PLASTIC LIMIT
D.T.P.L.	DRIER THAN PLASTIC LIMIT
A.P.L.	ABOUT PLASTIC LIMIT

[illegible]



SITE PLAN

SCALE: 100' TO 1"





SECTION THROUGH HOLES 1 & 2

HOR: 10' TO 1"

SCALES:
VERT: 5' TO 1"

LEGEND

-  BOREHOLE
-  BLOWS/FOOT SPT

NOTE:

SEE BOREHOLE LOGS FOR
COMPLETE SOIL DETAILS.

NOTE: The actual soil stratification has been verified from data obtained at the borehole locations only. The inferred contacts shown are based on geological evidence and these may vary from those shown between borings.



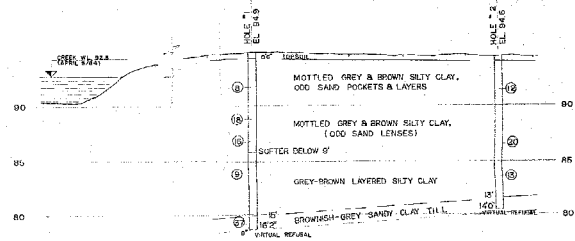
TOWNSHIP OF NORTH GRIMSBY
50 MACKAY, MACKAY & PETERS

WILCOX BRIDGE
(CONCESSION IV & V - LOTS 14 & 15)

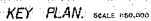
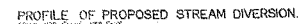
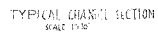
PREPARED BY
e.m. petro associates ltd.

JOB NO. 6473	DATE APRIL 1964	DRAWN BY K.K.	CHECKED BY E.M.P.
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64-F-268M
WILCOX BRIDGE
LOT 14, 15, CON. 4
N. GRIMSBY



SCALE: VERT 1"=6'
(16) BLOWS/FOOT S.P.T.
NOTE: SEE BOREHOLE LOGS FOR
COMPLETE SOIL DETAILS.

[illegible]

IS DYCK STREAM RIVER GRADIENT LIKELY TO BE LOWERED ? NO

6. INDICATION CLEARANCES REQUIRED, IF ANY : NONE
MINIMUM CLEARANCE REQUIRED, IF ANY : NONE
IF STRUCTURE IS OVER OR UNDER A RAILWAY HAS APPROVAL BEEN OBTAINED ?
7A) FROM RAILWAY CO. :
7B) FROM BOARD OF TRANSPORT COMMISSIONERS :



8. HAS APPROVAL BEEN OBTAINED UNDER NUTRIABLE WATERS PROTECTION ACT ? NO

9. " A TEMPORARY DETOUR REQUIRED ? NO
WHO WILL BUILD IT ?
WHO WILL MAINTAIN IT ?

10. INFORMATION AND EVIDENCE OF EXTREME FLOODING HAS OBTAINED FROM LOCAL RESIDENTS, DISTRICTS AND DELTIC REGION WATER ELEVATION IN THE AREA OF THIS CONSTRUCTION TO BE 380 AND THE LOWEST WATER ELEVATION TO BE 380.

11. ROAD DESIGN INFORMATION:
ESTIMATED A.D.T. 300-400
DESIGN SPEED 40
SIGHTING DIST. 200.

FIELD INVESTIGATION MADE 5 APRIL 1964
BY B. R. D. R. R.
RAYEY ENGINEER

	15 APRIL 1984		 DESIGN ENGINEER
	DATE		
BRIDGE NAME		WILCOX BRIDGE.	
LOADING	BRIDGE No.	SPANS No.	
H20-44		1 OF	