

# 68 - F - 209 M

AUCHRIM BRIDGE

EUPHEMIA TWP.

BA 2915  
Site 14-228

PETO ASSOCIATES LIMITED

SOILS INVESTIGATION  
AUCHRIM BRIDGE  
TOWNSHIP OF EUPHEMIA

for

EUPHEMIA TOWNSHIP  
c/o MCNEILTH-INGRAM ENGINEERING LTD.

Distribution:  
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JOB NO. 68-F102

JULY, 1968.



**PETO ASSOCIATES LTD.**  
CONSULTING SOIL ENGINEERS  
1287 Caledonia Rd. Toronto 19 - Ontario - Phone (416) 789-1126

JOB NO. 68-F102

July 8, 1968.

68-F-209M

Euphemia Township,  
c/o Monteith-Ingram Engineering Ltd.,  
Consulting Engineers,  
Box 579,  
Petrolia, Ontario.

Attention: Mr. G.W. Ingram, P. Eng.

Dear Sir:

Re: Soils Investigation  
Auchrim Bridge  
Township of Euphemia.

We have pleasure in reporting, herewith, on the soils investigation carried out in connection with the proposed new Auchrim Bridge.

The work described in this report was authorized in your letter of May 15th 1968.

The site of the investigation was on the side road between lots 30 and 31 in the Township of Euphemia, where the road crosses the Sydenham Road. The boreholes were located on the centre line of the new road, one on either side of the river, to the north of the existing crossing. It is proposed to construct a new bridge at this site with the bridge being a three span structure, probably with piers.



Two testholes were put down during the latter part of May 1968, by a self-propelled, track-mounted flight auger to the depth of refusal, which was presumed to be on bedrock. Standard Penetration tests were carried out at intervals of 2 ft. 6 ins. during the first 15 ft. thereafter, at 5 ft. intervals. A careful check was kept on ground water conditions and for seepage seams during the sinking of the testholes.

A detailed description of the stratum encountered is given on the appended borehole logs, together with results of the in situ penetration tests and laboratory moisture determination tests. The enclosed site plan shows the location of the testholes, and in order to illustrate the inferred stratigraphy, a simplified soils profile has been included with the site plan.

#### 1. SOIL CONDITIONS.

Both testholes encountered similar soil conditions with the strata being very interlayered, but basically a fine sandy silt. The silt layers varied, mainly, in colour and in the inclusion of either shale pieces or small grits and stones. All the strata were loose to compact and from a depth below approximately 5 ft., they were in a very wet condition.

In testhole 1, the brown fine sandy silt and an underlying brown slightly clayey silt were in a compact condition with an average "N" value of 15 blows per ft. at an average moisture content of 22%. Underlying the clayey silt, the material was a grey to reddish grey slightly clayey silt in which some larger stones were encountered. This material was in a wetter than plastic limit condition and loose, with an average "N" value of 8 blows per ft. at an average moisture content of 33%.

In testhole #2, which was on the northern bank of the river, no apparent crust was encountered, and the layers to a depth of 16 ft. below the existing grade were all very fine sandy silts, with little or no clay content. The strata immediately above the rock, from 21 ft. 9 ins. to 25 ft. 0 ins., appeared to be a darkish grey clayey silt till and this material was in a compact condition. The average "N" value in borehole #2 for the total depth of overburden was 4 blows per ft., at a moisture content of 25%.

Both testholes were taken to refusal on what was to be presumed to be bedrock. Testhole #1 encountered a gray weathered shale at a depth of 23 ft., and augering continued to depths of 25 ft. 9 ins., when refusal occurred. This gave an elevation to the hard rock of 632.75 ft. Testhole #2 encountered a weathered shale at a depth of 25 ft., and augering continued to 26 ft. 6 ins. This made the elevation of the hard rock in this testhole at 628.0 ft. This difference of 5 ft. 9 ins., to the surface of the hard rock causes some concern, as the bedrock in the area is thought to be horizontal. A standard drilling rig was dispatched to the site, and both testholes were diamond drilled so that a core of the rock could be recovered for examination and to ensure that the higher refusal did not occur on a large boulder. Both testholes were cored to a depth of 6 ft. approximately and core recovery was excellent, especially in the hard rock.

A water table was established in both testholes, at a depth of 12 ft. 6 ins. in testhole #1, and at 12 ft. 3 ins. in testhole #2. Due to the short duration of the field work, it is thought that this water table is slightly lower than the level at which it would establish itself with time, this elevation being closer to the water level in the river.

## 2. OBSERVATIONS AND RECOMMENDATIONS.

The results of the two testholes put down at this site indicate that the strata overlying the bedrock are not suitable for the proposed loads and that the abutments will require to be founded on piles driven to bedrock. The bearing capacity of the rock can be taken as 30 Tons per sq. ft.


The difference in elevation of the bedrock as recorded from these two testholes gives some cause for concern. It is impossible from this information to ascertain if the testholes have located an isolated depression in the bedrock due to ancient stream, or if the bedrock is sloping at a gradual grade from one side to the other. As the intermediate piers for the bridge will require to be founded on the bedrock, we would recommend that additional testholes are put down at the location of these piers in order to confirm the depths to which the foundations must be carried.

Major problems during construction are not expected, although any excavations into the softer material will require to be timbered, especially in the area of testhole #2. As we have no details of any embankments which may be required, we cannot make definite recommendations. However, due to the soft nature of the material, again especially in testhole #2, settlements can be expected beneath the embankment. The magnitude of these settlements will depend, naturally, on the height and width of the proposed embankments.

While we believe that this report is complete within our terms of reference, we will be pleased to discuss any points you may wish to raise.

Yours very truly,

PETO ASSOCIATES LTD.

  
J. Hunter, P. Eng.

JH/jc

## LIST OF ABBREVIATIONS

### 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 350 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:-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
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		
W.T.P.L. WETTER THAN PLASTIC LIMIT			D.T.P.L. DRIER THAN PLASTIC LIMIT	
A.P.L. ABOUT PLASTIC LIMIT				

### TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
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

Q <sub>u</sub>	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Q <sub>cu</sub>	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q <sub>d</sub>	DRAINED TRIAXIAL		

DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

CONSULTING SOIL ENGINEERS



PETO ASSOCIATES LTD.

# RECORD OF BOREHOLE NO. 1

JOB NO. 68F102      JOB NAME Auchrim Bridge      TECHNICIAN DJ  
BORING DATE May 24/68      CLIENT Euphemia Township c/o Monteith Ingram Consulting Engrs      ENGINEER JH  
GROUND ELEV. 658.5      BOREHOLE TYPE 3 1/2" Auger - BX Casing      TYPED BY JC

SOIL PROFILE			SAMPLES		DYNAMIC CONE PENETRATION BLOWS/FOOT STANDARD PENETRATION TEST BLOWS/FOOT		LIQUID LIMIT _____ W <sub>L</sub> PLASTIC LIMIT _____ W <sub>P</sub> WATER CONTENT _____ W		REMARKS
DEPTH ELEV.	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/FOOT	SHEAR STRENGTH C <sub>u</sub> LB/SQ. FT.		W <sub>P</sub> _____ W _____ W <sub>L</sub> WATER CONTENT % 10 20 30	
1'2"	TOPSOIL								
	SILT. Brown very fine sandy silt wet compact		1	SS	15				
4'0"									
	SILT. Brown clayey silt. Mottled with grey and rust fissures odd grit and sand pocket wet compact		2	SS	15				
			3	SS	19				
9'6"									
	SILT. Grey to reddish grey clayey silt. Odd large stone. W.T.P.L.		4	SS	12				
			5	SS	9				
			6	3"ST					
			7	SS	9				
	Wet to very wet		8	SS	7				
23'0"	Loose								
	SHALE. Grey weathered shale								
25'9"			9	SS	18	70/3"			
	SHALE. Black bituminous shale soft to 26'6" good core below Core recovery 90% largest piece 1'3"		10	WS					
31'6"	Terminated at 31'6"								

WX casing to 25'9" - washed hole. Refusal on augers at 25'9" Water at 12'6"

BX casing to 25'9" - washed hole. Refusal on augers at 25'9" Water at 12'6"





PETO ASSOCIATES LTD.

# RECORD OF BOREHOLE NO. 2

CONSULTING SOIL ENGINEERS

JOB NO. 68F102

JOB NAME Auchrim Bridge

TECHNICIAN DJ

BORING DATE May 24/68

CLIENT Euphemia Township c/o Monteith Ingram Consulting Engs.

ENGINEER JH

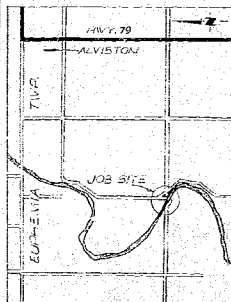
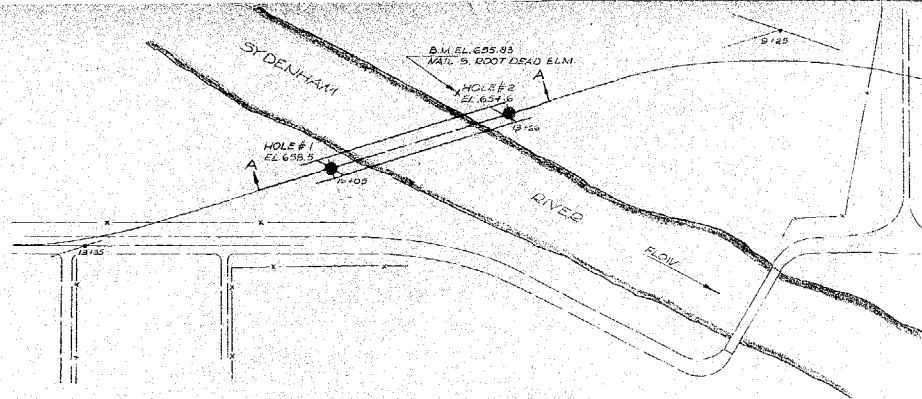
GROUND ELEV. 654.6

BOREHOLE TYPE 3 1/2" Auger - BX Casing

TYPED BY JC

SOIL PROFILE		LEGEND	SAMPLES			DYNAMIC CONE PENETRATION BLOWS/FOOT STANDARD PENETRATION TEST BLOWS/FOOT					LIQUID LIMIT _____ W <sub>L</sub> PLASTIC LIMIT _____ W <sub>p</sub> WATER CONTENT _____ W			REMARKS
DEPTH ELEV.	DESCRIPTION		NUMBER	TYPE	BLOWS/FOOT	5	10	15	20	25	W <sub>p</sub>	W	W <sub>L</sub>	
						SHEAR STRENGTH C <sub>u</sub> LB/SQ. FT.					WATER CONTENT % 10 20 30			
1'0"	TOPSOIL													
	SILT. Reddish brown very fine sandy silt shells. Moist loose		1	SS	3									
4'6"														
	SILT. Brown very fine sandy silt, grits wet loose		2	SS	4									
7'0"														
	SILT. Grey & brown very fine sandy silt shells		3	SS	3									
9'0"														
	SILT. Brownish grey very fine sandy silt. Tree roots wet		4	SS	5									
			5	SS										
16'0"	Loose		6	SS	3									
	SILT. Grey clayey silt. W.T.L.L. very wet loose													
21'0"			7	SS	7									
	TILL. Dark grey clayey silt till D.T.L.L. Moist COMPACT		8	WS										
25'0"														
	SHALE. Soft weath- ered shale													
26'8"	SHALE. Black Bituminous shale core recovery 100% Largest piece 1'0"													
31'9"	Terminated at 31'9"													

Hole at 26'8"  
Water at 12'  
3"  
Cave at 24'3"  
BX casing  
to 26'4"-5"  
below ground  
level



KEY PLAN  
SCALE 1" TO 5000'

SITE PLAN  
SCALE 100' TO 1"

DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

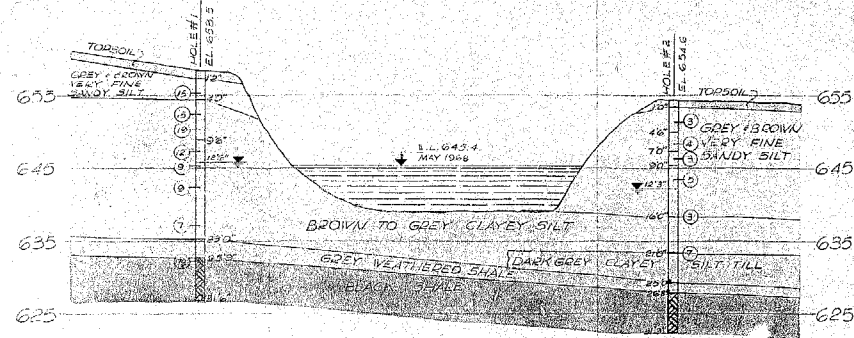
### LEGEND

- BOREHOLE
- BLOGS / FT.
- WATER LEVEL

### 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.



SECTION A-A  
HORIZ. 40' TO 1"  
VERT. 10' TO 1"



EUPHEMIA TOWNSHIP  
c/o MONTEITH-INGRAM ENGINEERS LTD.

AULCHIRM BRIDGE

PREPARED BY  
PETO ASSOCIATES LTD.

JOB No. 68-F-02	DATE JULY 1968	DRAWN BY P	CHECKED BY H
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