

66 - F - 264 M

BLACK CREEK BRIDGE

ENNISKILLEN TWP.

BA. 2381
Site 14-210

E. M. PETO ASSOCIATES LIMITED

Black Creek Bridge
Enniskillen Township
for

LAMINGTON
ENNISKILLEN TOWNSHIP
c/o J. A. Montieth Associates Ltd.
Consulting Engineers
2nd Floor, 100 St. John St.

Distribution:
5 cc: Client
1 cc: File

JOB NO. 66210

August, 1966.

e. m. peto associates ltd.

YOUR REFERENCE.

OUR REFERENCE: 66210

1287 caledonia road.

TORONTO 19, ONTARIO

Telephone: 789-1128

August 12th, 1966.

Enniskillen Township,
c/o J. A. Montleth Associates Ltd.,
Consulting Engineers,
Box 579, 4244 Petrolia Street,
Petrolia, Ontario.

Attention: Mr. G. Ingram

Dear Sirs:

Re: Black Creek Bridge
Enniskillen Township

We enclose herewith, our foundation investigation report No. 66210 on the above site.

Subsoil on this site consisted of a layer of crushed stone and brown sand fill to between 1 ft. 6 ins. and 2 ft. below ground level, below which is a grey brown silty clay till extending to a maximum depth of 23 ft. 0 ins. below ground level. Underlying this to a maximum depth of 37 ft. 6 ins. below ground level is a grey firm silty clay till, which directly overlies a dark grey shaly gravel and gravelly silt till in which refusal is encountered at a depth of 38 ft. 6 ins. below ground level in borehole 1 and 33 ft. 11 ins. below ground level in borehole 2.

Due to the soft nature of the grey silty clay till, it is recommended that the abutments and piers of this bridge be founded on end bearing piles (which should meet refusal between elevation 583 and elevation 587). These piles, depending upon their type, may have a load of up to 65 tons/pile imposed upon them. Should this system be adopted, it is recommended that consideration be given to increasing the elevation of the abutment footings from those originally proposed.

Due to the very cohesive nature of the subsoil, it is thought that no major water seepage problems would be encountered during excavation for pile caps. Should excavation be carried out through the river, some form of cofferdam around the pier foundations will be required.

Whilst we trust this report to be complete within your terms of reference, should there be any points that you wish to discuss, please do not hesitate to contact us.

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.

PMcG/vm

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BOREHOLE LOGS

SITE PLAN

PROFILE

1. INTRODUCTION AND GENERAL

Authority for this work was contained in a letter from the client dated July 15th, 1966.

The field work for this investigation was carried out in mid July, 1966 using a bombardier mounted flight auger to advance the boreholes. Samples were obtained using a standard 2 inch diameter split spoon driven in accordance with the requirements of the standard penetration resistance test, and also 2 inch thin wall sampling tubes pushed hydraulically into the ground. Samples were subject to visual and tactile examination before transportation to the laboratory, where they were re-examined and selected laboratory tests were carried out on representative samples. The boreholes were surveyed by the client, who also took elevations of the ground level adjacent to each of the two boreholes.

2. SUBSOIL STRATIGRAPHY

- 2.1 Crushed stone and brown gravelly sand: From ground level to a depth of 1 ft. 6 inches below ground level in borehole 1 and 2 ft. in borehole 2, was a 6 inch layer of crushed stone underlain by a brown gravelly sand fill.
- 2.2 Grey brown silty clay till: Existing to a depth of 23 ft. below ground level in borehole 1 and 22 ft. below ground level in borehole 2 was a grey brown silty clay till. Fissures were in evidence to a depth of 14 ft. below ground level in borehole 1 and 9 ft. below ground level in borehole 2. This till took on a mottled appearance below a depth of 15 ft. below ground level in both boreholes. N-blows in this material varied between 10 blows/ft. and 35 blows/ft. indicating a consistency varying from stiff to hard, but mainly falling within the very stiff range. Moisture contents varied between 15% and 26%.
- 2.3 Grey silty clay till: This grey silty clay till extended below the grey brown till to a maximum depth of 37 ft. 6 ins. below ground level in borehole 1 and 31 ft. below ground level in borehole 2. N-blows varied from 7 to 16 blows/ft. Two unconfined compression tests performed upon samples of this material revealed shear strengths of 1130 and 1780 lbs/sq.ft. Moisture contents varied from 20% to 36%.

2. SUBSOIL STRATIGRAPHY - Cont'd.

- 2.4 Dark brown shaly gravel and silt till: This stratum, which extends below the silty clay till to refusal in both boreholes (38 ft. 6 ins. below ground level in borehole 1 and 33 ft. 11 ins. below ground level in borehole 2) exhibited a moisture content of 6%, in the only split spoon taken in this material. Should end bearing piles be used to support this structure, it is within this stratum that they are expected to meet refusal.

3. GROUND WATER LEVEL

Borehole 1 exhibited a free ground water level of 10 ft. 1 inch below ground level after completion of the hole, which remained open to the full extent of its depth. No ground water was encountered in borehole 2 which remained dry and open on completion.

4. OBSERVATIONS AND RECOMMENDATIONS

Due to the soft nature of the grey silty clay till, which would make the use of spread footings for the abutments and piers unwise, it is recommended that this bridge be founded on end bearing piles driven to refusal. This refusal is expected in the dark brown shaly silt till and should take place at between elevations of 584 and 587. Depending upon the section and type of end bearing used, load bearing may be as high as 65 tons/pile. Our terms of reference included the drilling of only two boreholes, consequently it was impossible to check the uniformity of the stratigraphy. This might vary between boreholes and produce different pile refusal elevations.

It is noted that spread footings are shown founded at an elevation of 600. Should end bearing piles be used for this foundation, the pile capping might quite advantageously be constructed at a greater elevation (say 606/607).

4. OBSERVATIONS AND RECOMMENDATIONS - Cont'd.

Where excavation must take place through the bed of the river, some form of cofferdam must be constructed to keep water from the excavation. Should excavations be carried out away from the river, it is thought that due to the exceedingly cohesive nature of the ground no major water seepage problems would attend these excavations.

Theoretically excavations in the grey brown silty clay till would stand unsupported, assuming there to be a reasonable distance between the river and the excavation. Local safety regulations must be adhered to in this respect. In this area, a frost cover of 4½ ft. may be used.

Report prepared by

Peter MA M'Sone.

P. McGlone, P.Eng.
PMcG/vm

E. M. PETO ASSOCIATES LTD

C. F. Freeman

C. F. Freeman, P.Eng.
Chief Engineer.

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 _u	UNCONFINED COMPRESSION	L.V	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V	FIELD VANE
Q _{cu}	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q _d	DRAINED TRIAXIAL		

RECORD OF BOREHOLE NO. 1

JOB NO. 66212

JOB NAME Black Creek Bridge 677 Sidgroad - Concession III

TECHNICIAN D.N.

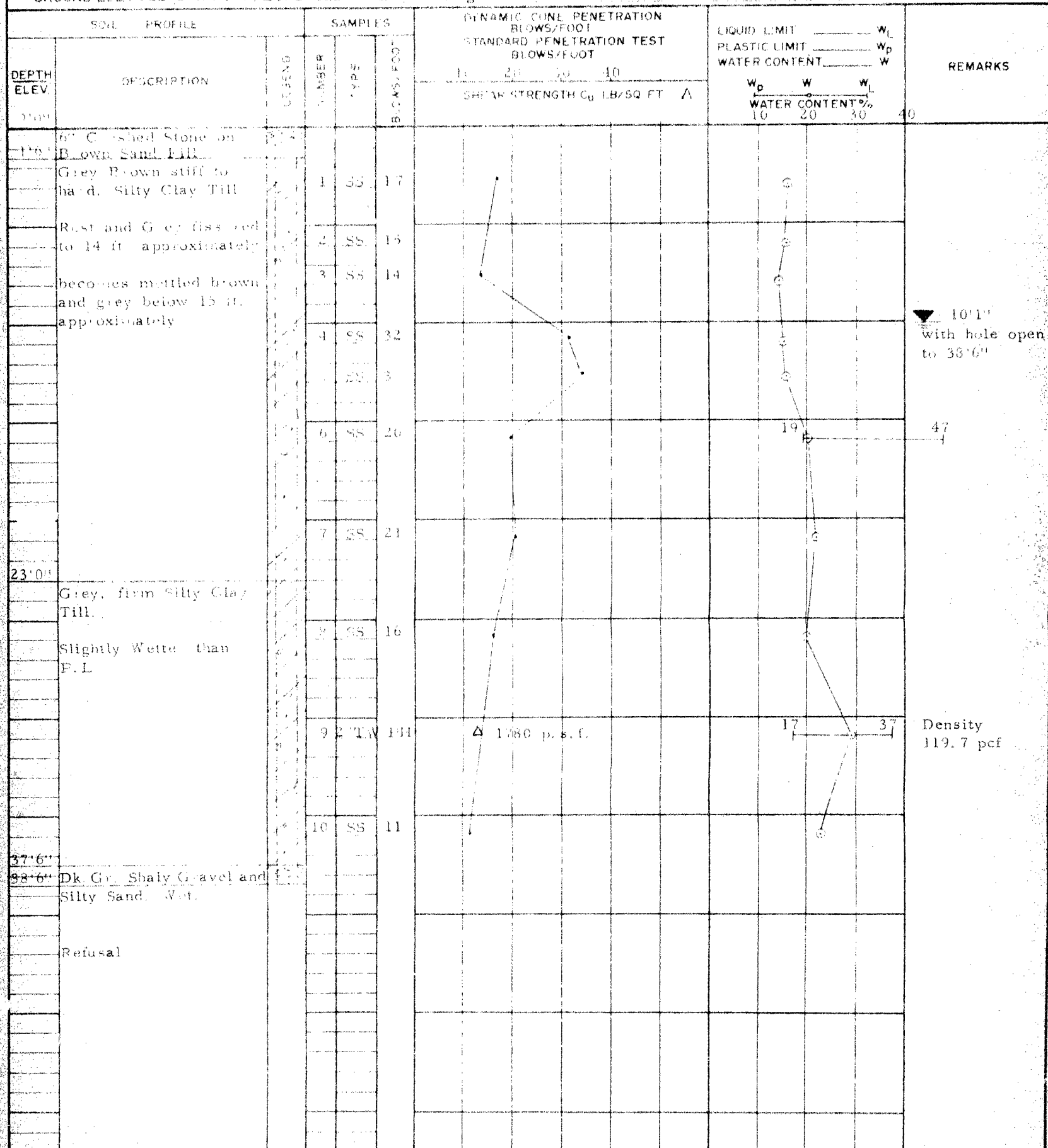
BORING DATE July 19/66

CLIENT Twp. of Chalkville, c/o J.A. Monteith Associates Ltd.

ENGINEER D.McG-CFF

GROUND ELEV 622.2 CH 1913 BOREHOLE TYPE 4 Auger

TYPED BY D.C.



e.m. peto associates ltd.

Consulting soil engineers

RECORD OF BOREHOLE NO. 2

JOB NO. 66210

JOB NAME Black Creek Bridge 6/7 Sideroad - Chancaster Hill

TECHNICIAN D.N.

BORING DATE July 12/66

CLIENT (Twp. of Timiskaming) &/& J. A. Monteith Associates Ltd.

ENGINEER I McGEE

GROUND ELEV 619.3 - CH 11+81 BOREHOLE TYPE 41 Angle

TYPED BY D.C.

SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION BLOWS/FOOT STANDARD PENETRATION TEST BLOWS/FOOT					FLUID LIMIT _____ w_L PLASTIC LIMIT _____ w_p WATER CONTENT _____ w			REMARKS	
DEPTH ELEV.	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/FOOT	10	20	30	40	50	w_p	w	w_L		
						SHEAR STRENGTH c_u LB/SQ. FT. Δ					WATER CONTENT % 10 20 30 40				
0'0"	Crushed Stone on Brown Gravelly Sand Fill.														Hole dry and open on completion.
2'0"	Grey Brown Hard to Stiff Silty Clay Till. Fissured to 9 ft. approx. Drier than P.L. Fine Sand lenses, becomes mottled below 15 ft. firm and wetter than P.L.		1	SS	14										
			2	SS	17										
			3	SS	20										
			4	SS	12										
			5	2 TY	113										
15'0"			6	SS	18										
			7	SS	10										
22'0"	Silt pockets														
	Grey firm to soft Silty Clay Till. Wetter than P.L.		8	2 TY	113										
			9	SS	8										
			10	SS	7										
31'0"	Dark Brown Shaly Silt Till		11	SS	135/11"										
33'11"	Refusal.														

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

RECEIVED BY
FBI