

G6-F-250M

LEBO CREEK

MERSEA

**e. m. peto associates ltd.**

YOUR REFERENCE -

OUR REF. # SINCE 86361

1287 caledonia road.

TORONTO 18, ONTARIO

Telephone: 789-1128

December 22nd, 1966.

66-F-250M

The Township of Mersea,  
c/o C.G. Russell Armstrong,  
Consulting Engineers,  
Bartlet Building,  
78 University Avenue West,  
Windsor, Ontario.

Attention: Mr. E.O. LaFontaine

Dear Sir:

Re: Soils Investigation  
Bridge over Lebo Creek  
Township of Mersea

We have pleasure in enclosing, herewith, our report on the soils investigation carried out in connection with the above project. The work was authorized in a letter of November 15th, 1966. The site of the investigation was the crossing of N.T.R. over Lebo Creek opposite P.L.230 N.T.R. in the Township of Mersea. It is proposed to realign the existing Lebo Creek, and construct a new bridge crossing, approximately 100 ft. East of the existing bridge.

The purpose of the investigation was to prove the underlying strata and to ascertain their bearing capacity characteristics.

The field work was carried out by a bombardier mounted, flight auger during the latter part of November, 1966; and two testholes were put down at the locations shown on the enclosed site plan. Both testholes were taken to a depth of 71 ft. 6 ins. and standard penetration tests were carried out at intervals of 2 ft. 6 ins. during the first 15 ft., and thereafter at 5 ft. intervals. A careful check was kept on the ground water conditions during the period of the investigation.

The elevations referred to on the borehole logs and profiles are given with reference to the centre of the road at the existing bridge, which was given elevation of 100.00.

The detailed description of the strata encountered is given on the borehole logs, together with the results of the in situ penetration tests and moisture determination tests carried out. The appended site plan shows the location of the testholes relative to the existing features, and in order to illustrate the inferred stratigraphy between the testholes, a simplified soil profile has been included as part of the site plan.

## 1. SOIL CONDITIONS

The two testholes revealed similar soil conditions throughout the depth investigated. Testhole 1, which was closer to the existing creek had an interbedded condition of sands and sandy clays for a depth of 7 ft., when the material became a brown mottled silty clay till. This till was found immediately below the fill material in testhole 2. At a depth of approximately 13 ft., both testholes encountered a dark brown to grey silty to very silty clay till; and at a depth of 41 ft., a layer of dark grey clay was encountered. Both testholes terminated in a layer of reddish brown very silty clay till. The following paragraphs give a more detailed description of the main strata encountered.

1.1 Mottled Clay Till: At a depth of 7 ft. 6 ins. in testhole 1 and 2 ft. 6 ins. in testhole 2, the material was a mottled grey brown silty clay till. This layer was very stiff and moist having an average N-value of 19 blows/ft., at an average moisture content of 19%. Some fissures filled with grey silt were noticeable in the samples, and the silt content of the material increased with depth.

1.2 Grey Brown Clay Till: At a depth of 13 ft. 6 ins. in testhole 1, and at 11 ft. 6 ins. in testhole 2, the material became a dark brown to grey brown very silty clay till with many grits and some small stones. This layer, although similar to the above material, was not so dense and slightly more moist. The average N-value in this layer was 14 blows/ft., at an average moisture content of 20%. The results of unconfined compressive strength tests carried out on undisturbed samples from this layer indicated a shear strength of around 2,500 lbs/sq.ft. The thickness of the layer was 28 ft.

1.3 Dark Grey Clay: At a depth of around 40 ft. in both testholes, the material became a dark grey brown very silty clay, with only the odd grit being observed in the samples. This layer, although apparently as dense as the overlying till, had a higher moisture content, with the average N-value being 15 blows/ft., at an average moisture content of 23%. The thickness of the layer, which was proved in both testholes, was approximately 18 ft.

1.4 Reddish Brown Clay Till: Both testholes terminated in a reddish brown, very silty, clay till, which was stiff to very stiff and moist to wet. The average N-value recorded in this layer was 15 blows/ft., at an average moisture content of 21%. This stratum, which was in a wetter than Plastic Limit condition, had many grits and small stones; and the odd silt seam or pocket was noticeable in the sample.

## 2. GROUND WATER

With the exception of minor seepage seams in the first 7 ft. of testhole 1, no free water was encountered in either of the test holes, and at the end of the drilling operations, both testholes were open and dry. Although casing was employed in the first 10 ft. of each hole, there was no appreciable rise in the water on the removal of the casing at the end of the investigation. However, due to the closeness of the existing creek on the northern side of the road, seepage from this can be expected during the construction at this site.

## 3. OBSERVATIONS AND CONCLUSIONS

As the elevation of the bed of the realigned creek is not known, it has been presumed that the new bed is at the same elevation as the elevation as the creek at the existing crossing, which appears to be 92.00 ft. The depths of the footings below this elevation will be governed by the necessity to protect them from scour action and frost action, and we would suggest that a depth of 6 ft. be allowed as sufficient in both cases. Thus, the footing elevation would be 86.0 ft. This places them in the dark brown to grey brown very silty clay till which is, although slightly softer than the overlying till crust, a firm to stiff material.

The allowable bearing capacity in this material can be taken as 3 kips/sq.ft. for settlements not greater than 1 inch.

#### 4. CONSTRUCTION

No major problems should arise during the excavation of the material at this site, provided that the water from the creek is kept out of the trenches. The fill material encountered in both testholes, and the sand and silty sand encountered in testhole 1, will require to be sloped back at 1 vertical to 2 horizontal in order to keep it from slipping into the excavations. The till material and the underlying silty clay till should stand at a near vertical face, but local safety regulations must be adhered to at all times. Only minor seepages were noticed in the testholes, and once the till material is encountered, there should be no seepage seams. However, we recommend that care is taken to ensure that the surface of the excavation in the grey clay till is kept free of water as rapid deterioration could take place due to weathering and water action.

The major problem will be in isolating the excavations from the adjacent existing creek on the northern side of the road, and it may be necessary to employ steel sheeting in order to prevent the incress of water and also to restrain the softer materials which exist in the immediate vicinity of the stream.

#### 5. CONCLUSIONS

It is possible to set the proposed bridge on spread footings at an elevation between 86.0 and 88.0 ft. depending on the necessary scour and frost protection.

The allowable bearing capacity of the material on which the footings will be set can be taken as 3 kips/sq.ft.

No major construction problems should arise if adequate precautions are taken to prevent the creek water entering the excavations.



Whilst we believe this report is complete within our terms of reference, we would be pleased to discuss any further points you may wish to raise.

Yours very truly,

E.M. PETO ASSOCIATES LIMITED,

Prepared by:

*James Hunter*

J. Hunter,  
Senior Soils Engineer.  
/dc

*E. M. Peto*

E. M. Peto, P. Eng.

5cc. Client  
1cc. File

## 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 CONE
S.T.	SLOTTED TUBE SAMPLE		

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

### SOIL TESTS

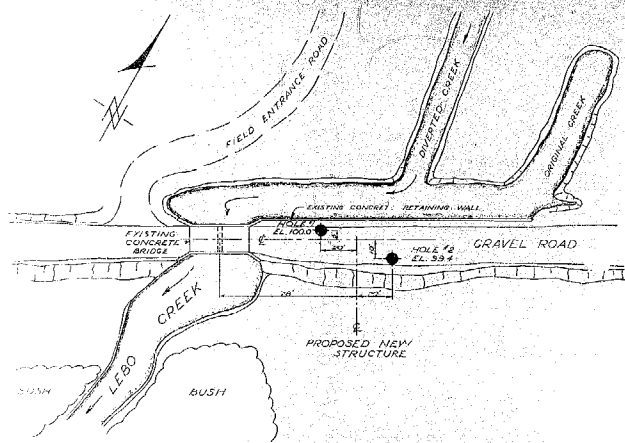
Qu	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL		

JOB NO. 66361	JOB NAME Bridge over Lake Creek	TECHNICIAN D.E.
BORING DATE Nov. 22/66	CLIENT Township of Maraca	ENGINEER E.H.B.
GROUND ELEV. 100.3	BOREHOLE TYPE 1" Auger	TYPED BY D.C.

[illegible]

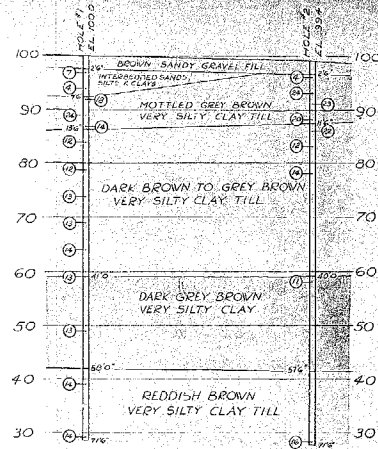
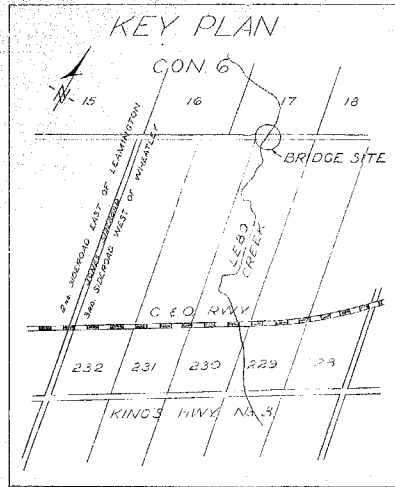


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**SITE PLAN**

SCALE: 30' TO 1"



**SECTION THROUGH HOLES 1 & 2**

SCALE: 10' TO 1" (NATURAL)

**LEGEND**

- BOREHOLE
- ⊖ BLOWS/FT

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 MERSEA  
% C.G. RUSSELL ARMISTEAD, CONS. ENGS.,  
**BRIDGE OVER LEBO CREEK**

PREPARED BY  
e.m.peto associates ltd.

JOB NO. 66361	DATE NOV. 1966	DRAWN BY D.N.	CHECKED BY J.R.
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