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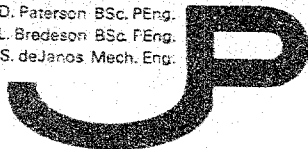
GEOCRES No. 31G-179
DIST. 9 REGION south western
W.P. No. _____
CONT. No. _____
W. O. No. _____
STR. SITE No. _____
HWY. No. _____
LOCATION LOT 4 CONCESSION
8 & 9 RUSSELL TWP.

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. _____

REMARKS: _____

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L. Bredeon BSc. PEng.
S. deJano Mech. Eng.



JOHN D. PATERSON & ASSOCIATES LTD.

Consulting Engineers & Geologists
Soil Investigations
Inspection & Testing Services
Damage Claims

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1479 Laperriere Ave.
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316-179

GEOCRES No.

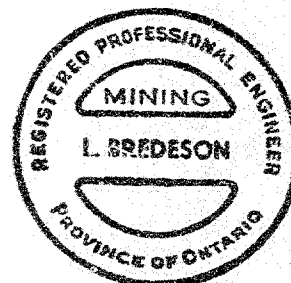
REPORT OF SOIL INVESTIGATION
PROPOSED NEW BRIDGE
LOT 4 CONCESSIONS VIII & IX
RUSSELL TOWNSHIP

FOR
TOWNSHIP OF RUSSELL

ALEX J. GRAHAM
CONSULTING DESIGN ENGINEER
OTTAWA

REPORT NO. 5516-66

MAY 3, 1966



INTRODUCTION

At the request of Alex. J. Graham, Consulting Engineer, on behalf of Russell Township, a soil investigation was conducted at the site of a proposed bridge over the Little Castor River.

There is an existing concrete arch bridge over the river at Lot 4 on the road between Concessions VIII and IX.

Consideration in the investigation was to be given to relocating the centre of the bridge to Station 2 + 40 more or less to accommodate a realignment of the stream to the north.

It appears from Drawing No. 1608-1 supplied by the Design Consultants that the deck of the proposed bridge will be 6' to 8' higher than the old deck.

FIELDWORK PROCEDURE

Three test holes were put down at the locations shown on the Test Boring Plan, which conform more or less to the locations proposed by the Design Consultants.

At each of the test hole locations a cone probe was driven to refusal to check the uniformity of the soils and to help in determining the sample locations at holes 1 and 2.

In conjunction with the probes at holes 1 and 2 casing was driven and the soils sampled to the point of refusal of the split spoon to further penetration.

A standard drilling rig operated by a crew of two was supervised and directed at all times by a Geologist on our staff.

SAMPLING AND TESTING

The fill material to a depth of six feet was sampled for classification purposes only, by driving the BX casing into the ground two feet at a time, withdrawing the casing and knocking out the sample.

Samples of the granular soils were recovered by means of a split spoon sampler. During the recovery of each split spoon sample the Standard Penetration Test was conducted and the results are recorded as "N" values.

After classification the BX and SS samples were retained in plastic bags.

Samples of the clay soils were recovered by Shelby thin-walled tubes and sealed air-tight in the field. At our laboratory the samples were extruded and tested for unconfined compressive strength.

Bedrock was not confirmed by diamond drilling, but the point of refusal of the split spoon sampler, the BX casing or the cone probe to further penetration is taken to be the bedrock surface.

OBSERVATIONS

(a) Soil Types

A layer of miscellaneous granular and clay fill which is thickest at the bridge overlies a layer of clay from 19' to 30' thick. The clay varies in silt content and in consistency from very soft to stiff and overlies glacial till which appears to have an irregular surface. Our interpretation of the bedrock surface indicates that it is relatively flat at elevation 172 ± 1 .

The variations in the consistency of the clay and the relative positions of the various soils are shown below in the soil profile of Hole No. 1.

In Hole No. 1 the following soil profile occurs:

0	-	3	Mixed granular and clay fill with some mixed peat.
3	-	4	Brown silty sand fill.
4	-	9	Loose, brown-grey clayey silt mixed with peat throughout.
9	-	15	Medium dense, brown and grey clayey silt inter-banded with medium stiff grey and reddish brown layers of silty clay.
15	-	23.5	Medium stiff, grey, silty clay (in places pinkish brown) with black organic mottling. Partly fissured to 21'. Thin silt lenses from 21'.
23.5	-	24.5	Stiff grey silty clay.
24.5	-	30	Soft grey silty clay with black organic mottling and an odd thin silt layer.
30	-	38	Very soft grey silty clay with black organic mottling.

38 - 42.5 Dense glacial till.
42.5 - Refusal.

The details of the test holes and an interpretation of cone probe 3 based on cone blows per foot and the associated Test Holes 1 and 2 are shown on the Soil Profile sheets.

(b) Ground Water

The ground water levels were recorded on April 6 after they had been allowed to stabilize for two days.

In Holes 1 and 2 the water levels were 5.2 feet (el.209.7) and 5.6 feet (el.209.9) respectively. On April 4 the water level at Hole No. 3 was 10.7 feet (el.203.8) but on April 6 the hole was plugged and dry at 2.9 feet (el.211.6).

(c) Test Results

The unconfined compressive strength of the clay was found to vary from very soft (0.22 tons per sq. ft.) to stiff (1.28 tons per sq. ft.). At a possible footing level the clay is of medium stiff consistency (an average value of 0.65 tons per sq. ft.).

CONCLUSIONS AND RECOMMENDATIONS

At elevation 195, which is a convenient footing level, the clay can be loaded to a maximum of 1300 pounds per square foot. Since a bridge structure is expected to require a higher unit loading than this it is our recommendation that the abutments of the bridge be supported on piles.

Creosoted timber piles will be satisfactory and if driven to refusal into the very dense glacial till or to the bedrock surface will be approximately 20-25 feet long after cut off.

STABILITY ANALYSIS

Because the shear strength of the clay underlying this site is rather low it is recommended that (when a profile of the approach fill has been established) a stability analysis be conducted to determine the factor of safety against failure of the embankments.

A preliminary calculation indicates that final grade can be established at elevation 218 with a satisfactory factor of safety against slope failure of the approach fills.

JOHN D. PATERSON & ASSOCIATES LTD.

L. Bredeson

L. Bredeson, P. Eng.

ASSOCIATES LTD.
INCORPORATED ENGINEERS
1275 Imperiere Ave.

SOIL PROFILE AND LABORATORY TESTS

Lot 4 Con VIII & IX
LOCATION: Russell Township
(Sta 1+96 5' RT)

Ottawa Canada

Elevation (Zero Depth) B.M. No. 1 El. 220.06

Remarks Cone probe and test boring hole.

Sheet No. 1 of 3

P.P. = Pocket Penetrometer

Borings By: F.E. Johnston Drilling Co. Date: Mar. 31 & Apr. 1/66

Hole No. 1

Blows per Foot	Soil Description	Sample Type	Gr No./ Sgt.	N	Depth in Feet	Elev.	Moisture Content Per Cent.				
							30	40	50	60	70
Cone	Ground Surface										
-	Mixed granular and clay	BX	1		0	214.9					
-	fill with some mixed										
-	peat.	BX	2		3						
13	Brown silty sand fill		4								
5	Loose, brown-grey	SS	3								
4	clayey silt mixed										
9	with peat throughout.				6	208.9					
11											
6			9		9						
15	Medium dense, brown &										
18	grey clayey silt, inter-	SS	4	14							
15	banded with medium stiff				12	202.9					
13	grey and reddish brown										
20	layers of silty clay.										
13			15		15						
10	Medium stiff, grey, silty	TW	5	0.86							
8	clay (in places pinkish										
9	brown) with black organ-				18	196.9					
9	ic mottling. Partly fis-										
11	sured to 21'. Thin	TW	6	0.71							
12	silt lenses from 21'.				21						
10		TW	7	0.68	PP						
10											
10			23.5								
10	Stiff grey silty clay.	TW	8	1.28		24	190.0				
11	Soft grey silty clay	TW	9	0.30							
11	with black organic mot-				27						
12	tling and an odd thin	TW	10	0.28							
11	silt layer.										
14			30		30	184.9					
16											
14											
15	Very soft grey silty	TW	11	0.22	PP	33					
13	clay with black										
13	organic mottling.				36	178.9					
12											
13			38								
25					39						
52											
43	Dense glacial till.										
49	(Very dense at 41')	SS	12	105	42	172.9					
67			42.5								
for 0.5'	Refusal				45	169.9					

Ground Water
Level 5.2 feet
April 6, 1966.

Bottom of Stream
Elevation 198.9

SOIL PROFILE AND LABORATORY TESTS

Older

Canada:

Lot 4 Con VIII & IX

LOCATION: Russell Township

(Sta 3+47.5 14' LT)

Elevation (Zero Depth): B.M. No. 1 El. 220.06

Cone probe and test boring hole

Sheet No: 2 of 3

Remarks: P.P. = Pocket Penetrometer

Borings By: F.E. Johnston Drilling Co. Date: Apr. 1 & 4/66

Hole No: 2

Blows per Foot	Soil Description	Sample		N	Depth in Feet	Elev.	Moisture Content Per Cent.					
		Type	No.				Qu Tons/ sq.ft.	30	40	50	60	70
Cone	Ground Surface				0	215.3						
-	Miscellaneous granular and clay fill.	BX	13		3							
-												
-												
3												
2												
2		6	SS	14	2	6	209.3	Ground Water Level 5.6 feet April 6, 1966.				
2												
2												
3	Soft, intermixed pink and grey, silty clay with black organic mottling (some organic matter at 12')					9						
4												
5			TW	15	0.44							
5						12	203.3					
6												
5												
4						15						
3			TW	16	0.38							
2												
2		18				18	197.3	Stream Bottom Elevation 198.9				
3												
3												
3			TW	17	0.64	21						
3												
4												
4						24	191.3					
4	Medium stiff, grey, silty clay with black organic mottling.											
3			TW	18	0.56	27						
4												
3							30	185.3				
4				TW	19	0.52						
4												
3						33						
4												
5												
16		36	SS	20	36	36	179.3					
24												
21												
31	Dense glacial till.					39						
39												
47												
75			SS	21	38	42	173.3					
		42.4										
100	Refusal											
for 0.4							45	170.3				

JOHN D. PATERSON & ASSOCIATES LTD.
CONSULTING ENGINEERS
1479 Laperriere Ave.

SOIL PROFILE AND LABORATORY TESTS

Lot 4 Con VIII & IX
LOCATION: Russell Township
(Sta 2+72.5 4' LT)

Ottawa

Canada

Elevation (Zero Depth): B.M. No. 1 El. 220.06

Remarks: Cone probe only. Interpretation based on cone
blows per foot and associated bore holes.

Sheet No: 3 of 3

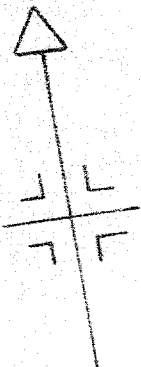
Borings By: F.E. Johnston Drilling Co. Date: April 4, 1966.

Hole No: 3

Blows per Foot	Soil Description	Sample Type	Qu lb/ft ²	N	Depth in Feet	Elev.	Moisture Content Per Cent.				
							30	40	50	60	70
Cone	Ground Surface				0	214.5					
-											
-											
-	Miscellaneous granular				3						
-	and clay fill.										
-											
-					6	208.5					
-											
1					9						
7	Very loose										
3	clayey silt.										
10					12	202.5					
11	Medium dense silt inter-										
14	banded with medium										
12	stiff clay.				15						
11											
9											
10	Medium stiff grey				18	196.5					
12	silty clay.										
11					21						
11											
10											
8					24	190.5					
5											
6											
6	Very soft to soft				27						
6	grey silty clay.										
7											
11					30	184.5					
10											
10											
10											
18					33						
26											
25	Medium dense				36	178.5					
23	glacial till.										
25											
36					39						
53											
53	Very dense										
72	glacial till.				42	172.5					
100											
for 0.8	Refusal				45	169.5					

Plugged & Dry
April 6, 1966.

Ground Water
Level 10.7 Feet
April 4, 1966.



No1
214.9
1+96

BM No1 El 220.06 nail
in root of maple 68' Lt.
Sta. 1+35

No3
214.5
2+72.5

214.8

LITTLE

CASTOR

RIVER

3+47.5

No2
215.3

14

TEST BORING PLAN
PROPOSED BRIDGE
LOT 4 CON. 8 & 9
RUSSEL TOWNSHIP

Scale 1"=20' Apr 1966
Report Number
S516-66