DOCUMENT MICROFILMING IDENTIFICATION.

G.I.-30 SEPT. 1976

GEOCRES No. 31E - 86

DIST. 11 REGION NORTHERN

W.P. No.

CONT. No.

W. O. No.

STR. SITE No.

HWY. No.

LOCATION LOT 13 CON. 5

HARBURN TWP.

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS: DOCUMENTS TO BE UNFOLDED BEFORE MICROFILM

31 E map

31 E map

MUNICIPALITY OF

DYSART ET AL

TOWNSHIP OF HARBURN

SOIL INVESTIGATION REPORT

FOR SOUTH BAY BRIDGE

LOT 13, CON. V

BA 1502

31 E-86

WARNOCK HERSEY SOIL INVESTIGATIONS LTD.

S-62-185

Sept. 7, 1962.

31E-86
GEOCRES No.

INTRODUCTION

We were authorized by Mr. Sim, District Municipal Engineer, to carry out a soil investigation for a proposed new bridge at South Bay on Halliburton Lake.

The purpose of the investigation was to determine: -

(1) the engineering properties of the soil

(2 the probable depth of scour

(3) the most suitable type of foundation and depth of the foundation.

P R O C E D U R E

The test holes were located, laid out and the elevations taken by a D.N.D.O. surveyor. As we do not have a scale drawing of the site, we are enclosing a sketch of the approximate location of the holes.

The field work commenced on August 14th, 1962 and was completed the same day.

The test holes were advanced, using an auger drill 6" in diameter and split spoon samples were obtained from the bottom of the hole. For each split spoon sample, the penetration blows to drive the sampler one foot were recorded. The energy of each blow was 4200 in-pounds obtained by a 140 lb. hammer falling a distance of 30 inches. The penetration blows (N value) in sand and finer grained soils provide an empirical means of determining the strength, density and bearing value of the soil.

The standard split spoon samples were returned to our laboratory for classification and interpretation.

Ground water levels were checked by observation on completion

(Procedure - continued)

and then by observing the equilibrium water conditions, if any, at intervals of time after completion of the test hole. Since no drilling water is used in this procedure, the water level observed is entirely due to the local conditions. See the attached bore logs for details of each boring.

SOIL PROFILES

Both holes show similar subsoil conditions. The top 6' of soil is a sandy gravel with a fairly high penetration resistance, which is probably due to the stone content in the gravel.

The soil below the 6' depth changes to a grey fine sand. The sand is medium dense near the surface, but decreases in density at the lower depths.

B. H. #2 was completed at 25' but B. H. #1 was drilled to refusal at 28'.

A detailed description of the soil is given on the attached bore logs.

Since the holes were drilled at the edge of the lake, the water table was measured at 1' in B. H. #1 and 1'6" in B.H. #2.

CONCLUSIONS

(1) Following is a table of the allowable bearing values as interpreted from the Standard Penetration Test: -

	Allowable Bearing Values in Tons/Sq. ft.			
Bore Hole #	1		2	
Footing Width	5' or less	5' to 10'	5' or less	5' to 10'
Depth				
5	1.75	1.46	1.75	1.46
7	1.25	1.02	1.50	1.24
10	1.50	1.24	1.25	1.02
12	1.62	1.35	1.12	.91
15	1.37	1.13	1.25	1.02

These bearing values are based on a factor of safety with respect to strength of 3, and maximum settlement of 1".

(2) In designing footings, the least allowable bearing value, for a distance of 1½ times the footing width below the bottom of the footing must be chosen.

e.g.: footing width 4 ft., at depth 5 ft. in B.H. #2, the allowable load would be 1.25 tons/sq. ft., since the bulb of pressure would extend to 11' depth.

(3) If it would not be economical to construct normal spread footings, using the bearing values given in Conclusion #1, we would

(Conclusions - continued)

suggest using short creasoted timber piles. This would be a friction type pile driven through the fairly dense upper layer to a depth of 20' - 25'. Since we are not familiar with the loads involved, we cannot determine the size or number of piles required. However, we would suggest that a skin friction value of 1000 lbs/sq. ft. be used in the design of the piles.

The following formulas can be used in determining the safe bearing values: -

$P = \frac{2WH}{S+1.0}$ for gravity hammers

$P = \frac{2WH}{S+1.0}$ for single acting steam hammers

$P = \frac{2H(W+Ap)}{S+0.1}$ for double acting steam hammers

P - safe bearing power in pounds

W - weight, in pounds, of striking parts of hammers

H - height of fall in feet

A - area of piston in square inches

p - steam pressure in pounds per square inch at the hammer

S - the average penetration in inches per blow for the last 10 to 20 blows for steam hammers.

This formula may also be used during the pile driving to determine the required number of blows/inch for the designed bearing value.

(4) The depth of footing or pile caps below ground surface

(Conclusions - continued)

below ground surface will be determined by the depth of scour or frost penetration.

We would suggest a minimum cover of 5' for frost action. The depth of scour at this site is probably negligible as the lake is on both sides of the bridge site and the water movement would be slow.

SUMMARY

The soil at this site is of medium to low bearing capacit,. This is a borderline case, between piles and spread footings, depending on the bridge size and traffic loads.

Respectfully submitted,

WARNOCK HERSEY SOIL INVESTIGATIONS LTD.

P. B. Lawrence, P. Eng.,
Manager.

REGISTERED PROFESSIONAL ENGINEER
P. B. LAWRENCE
PROVINCE OF ONTARIO

PBL/os

Encs.

Warnock Hersey Soil Investigations Ltd

Office Report Of Soil Exploration

Casing Auger — Diameter 6" — Elevn.
Casing Hammer — Wt. - — Drop -
Sample Hammer — Wt. 140 lbs. — Drop 30"

Client

Order Number S-62-185
Borehole Number 1
Date August 14, 1962.

GEOCRES No. 31E-86

SAMPLE CONDITION & TYPE

Disturbed
Good
Lost

S.S. - Split Spoon
CS - Chunk
DO - Drive Open
DF - Drive Footvalve
TO - Thinwalled Open
WS - Washed Sample
RC - Rock Core

ABBREVIATIONS

V - Insitu Vane Shear Test
M - Mechanical Analysis
U - Unconfined Compression
Qc - Triaxial Consolidated Quick
Q - Triaxial Quick
S - Triaxial Slow

- Unit Weight
K - Permeability
C - Consolidation
CA - Casing
WL - Water Level in Casing
WT - Water Table in Soil

SOIL PROFILE				SHEAR STRENGTH	WATER CONTENT	SAMPLES				
Elevn. Depth ft.	Description	Strata Plot	Elevation Scale	tons/sq. ft. or Qu/2 PENETRATION TESTS standard energy 4200 in. lb. blows/foot of penetration	w% ⊡ p.l. ▲ l.l.	Condition	Type	Number	Pen. Resistance	Depth Elevn. Recvry. Ft.
	Brown fine to coarse sand; saturated with few pebbles.		0'.00"	Split spoon 0 10 20 30						
		W.T.	1'	ON COMPLETION			SS	1	18	2-3
	Grey medium to fine sand; very wet; dense to med. dense.		4'	5			"	2	33	5-6
			6'6"				"	3	18	7-8
				10			"	4	21	10-11
	Grey fine sand with odd small pebbles; very wet; medium dense.			15			"	5	28	12-13
							"	6	19	15-16
				20			"	7	16	20-21
				25			"	8	13	25-26
				30			"	9	12	30-31
				35			A	-	-	31-38
			38' Refusal							
	(Hole caving below 31')									

Warnock Hersey Soil Investigations Ltd

Office Report Of Soil Exploration

Client

Order Number S-62-185
Borehole Number 2
Date August 14, 1962.

~~Casing~~ Auger Diameter 6" Elevn.
Casing Hammer Wt. - Drop -
Sample Hammer Wt. 140 lbs. Drop 30"

GEOCRES No. 31F-82

SAMPLE CONDITION & TYPE

Disturbed
Good
Lost

CS - Chunk
DO - Drive Open
DF - Drive Footvalve
TO - Thinwalled Open
WS - Washed Sample
RC - Rock Core

ABBREVIATIONS

V - Insitu Vane Shear Test
M - Mechanical Analysis
U - Unconfined Compression
Qc - Triaxial Consolidated Quick
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- Unit Weight
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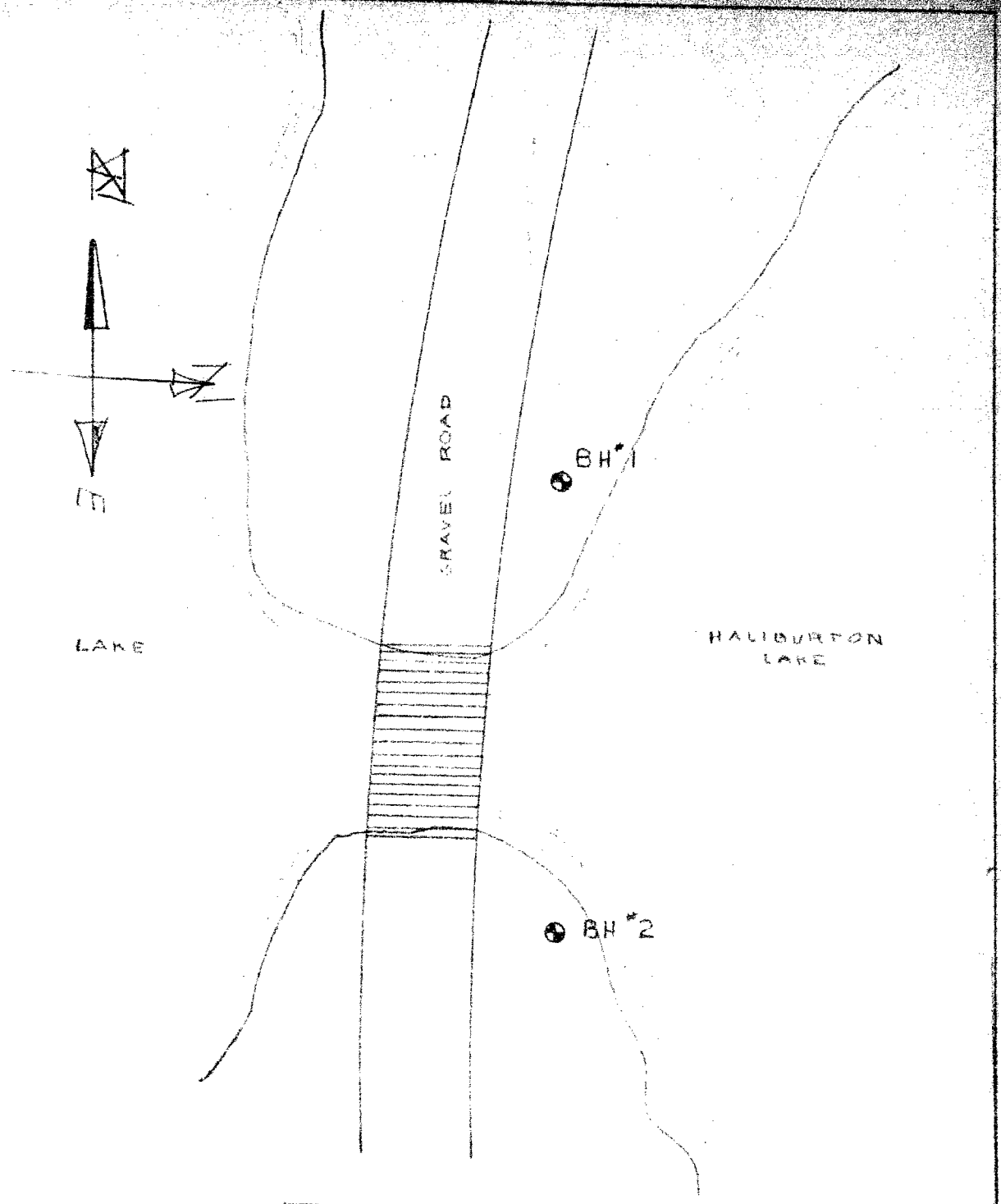
SOIL PROFILE				SHEAR STRENGTH tons/sq. ft. or Qu/2	WATER CONTENT w%	SAMPLES				
Elevn. Depth	Description	Strata Plot	Elevation Scale	PENETRATION TESTS Split Spoon standard energy 4200 in. lb. blows/foot of penetration	▣ p.l. ▲ l.l.	Condition	Type	Number	Pen. Resistance	Depth Elevn. Recvry. ft.
			10.0'	10 20						
	Brownish grey fine sand & fine to coarse gravel; saturated.	W.T.	1'6"				SS	1	21	2-3
	Ditto + odd pebbles no gravel.		4'				SS	2	29	5-6
			7'				SS	3	21	7-8
	Grey medium to fine sand with odd small pebbles; very wet; Medium dense.						SS	4	18	10-11
							SS	5	16	12-13
							SS	6	18	15-16
			18'							
	Grey fine sand; very wet; medium dense.						SS	7	15	20-21
							SS	8	13	24-25
	End of hole (Hole caving)									



WARNOCK HERSEY SOIL INVESTIGATIONS LTD.

SOUTH BAY BRIDGE

HALIBURTON COUNTY

D H O

HUNTSVILLE ONTARIO

JOB NO. 9-62-185 DATE SEPT 5/62	APP'D. BY DWN. BY DR. WARD	SCALE NOT TO SCALE