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NEW BRIDGE

THAMES RIVER

LOT 4. CON 14 11

N. DORCHESTER

B.A. 1979

MESSRS. A. M. SPRIET AND ASSOCIATES LIMITED
CONSULTING ENGINEERS
264 WELLINGTON ROAD
LONDON ONTARIO

Report on
SOIL INVESTIGATION

for

PROPOSED NEW BRIDGE
SPANNING A TRIBUTARY OF THE
THAMES RIVER
LOT 4, CONCESSIONS I AND II
TOWNSHIP OF N. DORCHESTER

by

DOMINION SOIL INVESTIGATION LIMITED
363 Queens Avenue
LONDON ONTARIO
Reference No. 4-11-L2
November 1964

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SUMMARY

The strata consist of about 10 foot thickness of loose granular fill overlying dense to very dense sandy glacial till.

It is recommended that the structure be supported on spread footings at El. 80.0 and using a maximum net allowable bearing pressure of 4,000 pounds per square foot. Total settlement would not exceed 1 inch and differential settlement between abutments 3/4 inch.

It will be necessary to lower the water table in order to excavate for the abutment foundations and a well-point system is suggested.

I INTRODUCTION

The Township of North Dorchester propose to replace the existing bridge spanning a tributary of the Thames River on the road running between concession's I and II with a new structure.

Authorization was given by A. M. Spriet and Associates, the consulting engineers on the 3rd of November, 1964 to carry out a soil investigation. The purpose of this investigation was to reveal the subsurface conditions at the site and to determine the relevant soil properties for the design and construction of the new foundations.

II FIELD WORK

Two boreholes were put down to a maximum depth of 31 feet 6 inches during the period 12th and 13th of November, 1964. The holes were advanced by washboring and lined with Bx casing.

Standard penetration tests were performed at frequent intervals of depth to determine the relative density of the soil and to recover representative samples. The results are plotted as 'N' values on the geotechnical data sheets for each borehole at the depths to which they refer.

Dynamic cone penetration tests were performed adjacent to each borehole and at two other locations.

The locations of the boreholes and cone penetration tests are shown on the site plan, enclosure 2. Elevations have been referred to a site bench mark (spike in hydro pole at the south end of the east abutment of the existing bridge, El. 100.0 feet established by D.S.1 L).

III SUBSURFACE CONDITIONS

Detailed descriptions of the strata encountered at each borehole are shown on enclosure 3 and a general picture of the soil stratigraphy is given in the form of a section on enclosure 2.

Both boreholes penetrated a fill deposit which is associated with the construction of the approaches to the existing bridge. This material is 12 feet thick in borehole 1 and 10 feet thick in borehole 2, and consists of generally loose fine and medium sand with fine gravel containing traces of decomposed wood.

Natural soil was encountered at an average level of El. 86 feet. This is a dense to very dense glacial till deposit consisting mainly of grey medium and coarse sand with fine and medium gravel. In borehole 2 a lens of grey fine sand was encountered between 23 feet 6 inches and 27 feet 6 inches of depth.

IV GROUND WATER CONDITIONS

From observations of the water levels taken in the boreholes it would appear that the ground water table is the same as the water level in the river. (El. 85.5 feet at the time of the field work).

V DISCUSSION

The soil profile at each abutment is generally similar and consists of about 10 feet of loose fill material overlying the dense sand and gravel glacial till deposit.

The bed of the river extends to El. 84.2 and allowing for scour it is recommended that the footings should bear at El. 80.0. This level lies within the dense till stratum and on the basis of the field observations a maximum net bearing pressure of 4,000 pounds per square foot would be appropriate for the design of footings. The total settlement of the foundation would not exceed 1 inch and differential settlement between abutments 3/4 inch.

Construction of the footings will entail excavation below the ground water table and due to the fairly high permeability of the till strata it will be necessary to lower the water table below El. 80.0 for this operation.

It is suggested that a well-point system be employed and that the lines of wells are spaced to allow for a 1:1 slope for the sides of the excavation.

The coefficient of friction between the footings and the sandy till should be taken as 0.45 and the factor of safety against horizontal sliding of the abutments should be at least 1.5. If this can not be achieved by friction alone, the footings should be lowered below the assumed level of scour. The passive resistance of the soil can then be utilized. The coefficient of passive earth pressure can be taken as 10.0 and the submerged unit weight of the soil 70 pounds per cubic foot.

This report was prepared by Mr. C. J. W. Atkinson, M. Sc. and has been reviewed by Mr. J. Park, P. Eng.

DOMINION SOIL INVESTIGATION LIMITED



C. J. W. Atkinson, M. Sc.
Project Engineer

CA/sg

LIST OF SYMBOLS, ABBREVIATIONS AND NOMENCLATURE.

SOIL COMPONENTS AND GROUND WATER CONDITIONS.

BOULDER	COBBLE	GRAVEL		SAND			SILT	CLAY	ORGANICS	BEDROCK	GROUND WATER LEVEL	DEPTH OF CAVE-IN
		COARSE	FINE	COARSE	MEDIUM	FINE						
Ø	> 8"	3"	3/4"	4.75mm	2.0	0.42	0.074	0.002	>	NO SIZE LIMIT		
U.S. Standard Sieve Size :		No. 4		No. 10		No. 40		No. 200				

SAMPLE TYPES.

AS Auger sample	RC Rock core	TP Piston, thin walled tube sample
CS Sample from casing	% Recovery	TW Open, thin walled tube sample
ChS Chunk sample	SS Split spoon sample	WS Wash sample

SAMPLER ADVANCED BY static weight : w
 " pressure : p
 " tapping : t

OBSERVATIONS MADE WHILE CORING

Steady pressure
 No pressure
 Intermittent pressure

Washwater returns
 Washwater lost

PENETRATION RESISTANCES.

DYNAMIC PENETRATION RESISTANCE : to drive a 2"Ø, 60° cone attached to the end of the drilling rods into the ground, expressed in blows per foot

STANDARD PENETRATION RESISTANCE, -N- : to drive a 2" outside dia. split spoon sampler 1 foot into the ground, expressed in blows per foot.

EXTRAPOLATED -N- VALUE

The energy for the penetration resistances is supplied by a 140 lb. hammer falling 30 inches

SYMBOL :



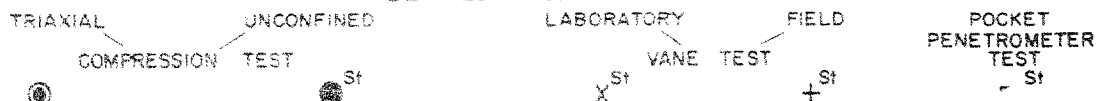
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SOIL PROPERTIES.

W % Water content	δ [*] Natural bulk density (unit weight)	k Coeff. of permeability
LL % Liquid limit	e Void ratio	C Shear strength in terms of total stress
Pl % Plastic limit	RD Relative density	φ Angle of int. friction in terms of effective stress
PI % Plasticity index	C _v Coeff. of consolidation	c' Cohesion
LI Liquidity index	m _v Coeff. of volume compressibility	φ' Angle of int. friction

UNDRAINED SHEAR STRENGTH.

— DERIVED FROM —

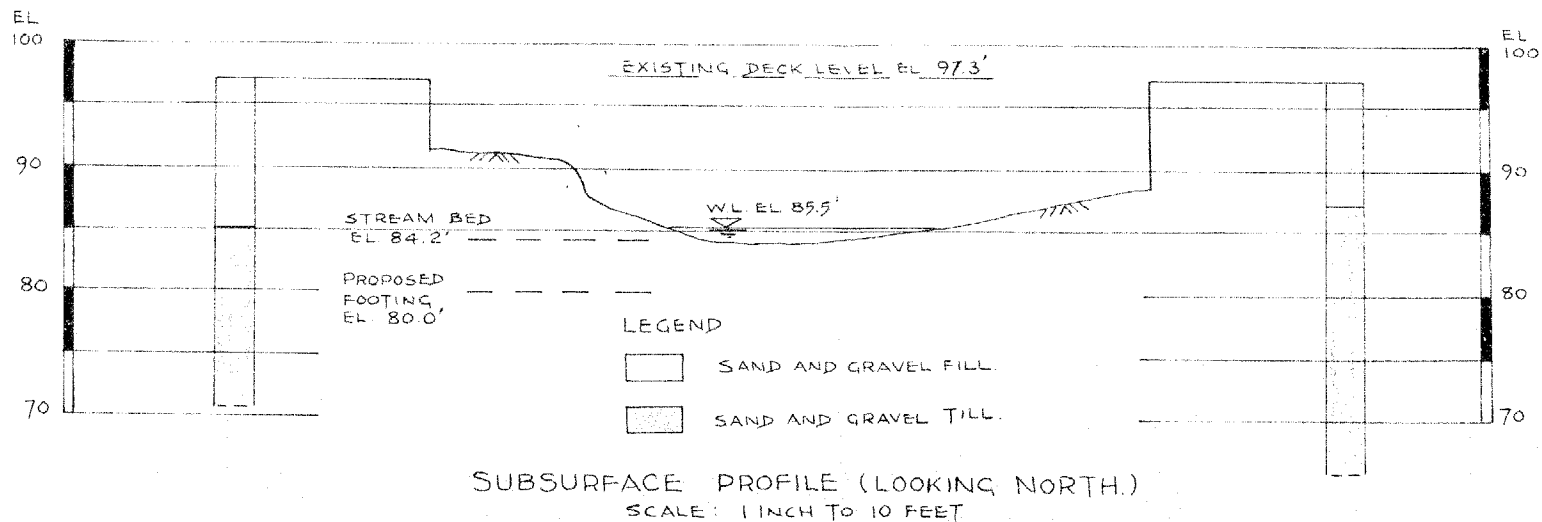
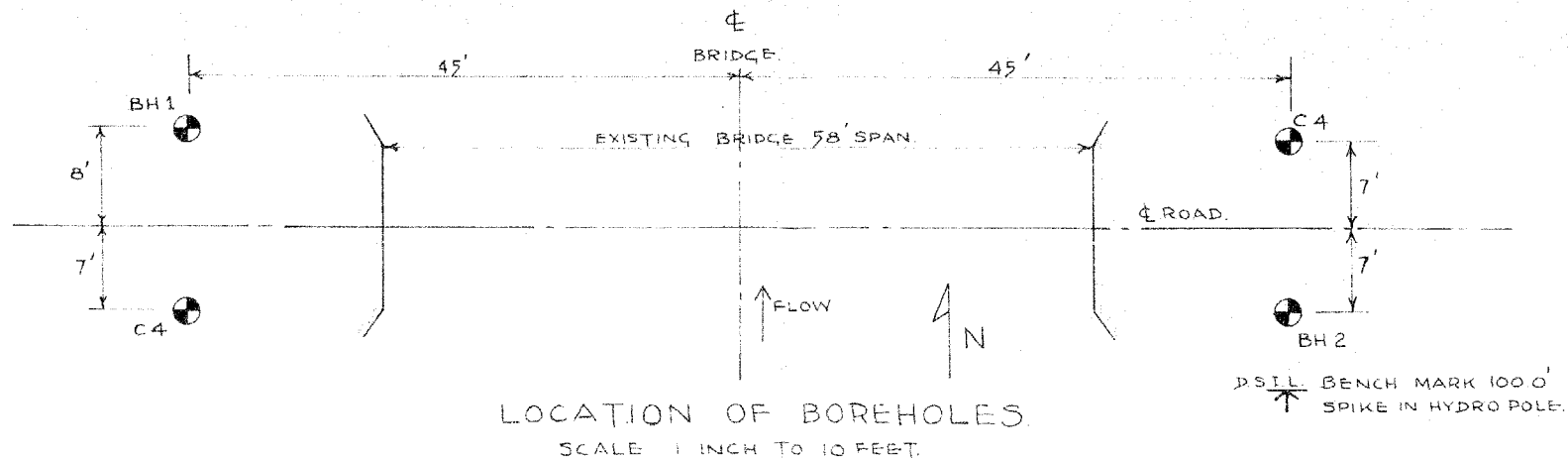


Strain at failure is represented by direction of stem
 20%
 15% — 5%
 10%

St : sensitivity = $\frac{\text{shear strength in undisturbed state}}{\text{shear strength in remoulded state}}$

SOIL DESCRIPTION.

COHESIONLESS SOILS :	RD :	COHESIVE SOILS :	C lbs/sq.ft.
Very loose	0 - 15 %	Very soft	less than 250
Loose	15 - 35 %	Soft	250 - 500
Compact	35 - 65 %	Firm	500 - 1000
Dense	65 - 85 %	Stiff	1000 - 2000
Very dense	85 - 100 %	Very stiff	2000 - 4000
		Hard	over 4000



GEOTECHNICAL DATA SHEET FOR BOREHOLE ... 1 ...

OUR REFERENCE NO. 4-11-L2

CLIENT: A. M. Spriet & Associates

PROJECT: Bridge

LOCATION: Township of North Dorchester

DATUM ELEVATION: 100.0 feet

METHOD OF BORING: Washboring

DIAMETER OF BOREHOLE: Bx (3 inch)

DATE: November 21st, 1964

ENCLOSURE NO. 3

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot	SHEAR STRENGTH lbs/sq ft	CONSISTENCY water content % PL W LI	REMARKS
				NUMBER	TYPE	2' or Adjustment to Standard				
97.0	0.0	Loose brown fine and medium sand with fine gravel, containing traces of decomposed wood (fill)	S	1	SS	6				
95.0										
90.0										
87.0										
85.0	12.0			2	SS	6				
83.0				3	SS	55				
81.0				4	SS	57				
80.0		Dense to very dense fine and medium gravel with fine medium and coarse sand, occasionally clayey (Glacial Till)	S	5	SS	36				
78.0				6	SS	24				
76.0										
74.0										
72.0				7	SS	64				
70.0	26.5	End of borehole								

W.L.
 El. 85.7
 1400 hrs.
 12th November

GEOTECHNICAL DATA SHEET FOR BOREHOLE

OUR REFERENCE NO. 4-11-12

 CLIENT: A.M. Spriet
 PROJECT: Bridge
 LOCATION: Township of N. Dorchester
 DATUM ELEVATION: 100.0 feet

 METHOD OF BORING: Washboring
 DIAMETER OF BOREHOLE: Bx (3-inch)
 DATE: 12th and 13th November, 1964

ENCLOSURE NO. 4

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE <small>Blows per foot</small>		CONSISTENCY <small>water content %</small>		REMARKS
				NUMBER	TYPE	2-in. or Adaptation of Sampler	SHEAR STRENGTH <small>lbs./sq. ft.</small>		PL	LL	
97.2	0.0	Loose brown fine and medium sand containing pieces of decomposed wood (Fill)		1	SS	6					
95											
90											
10.0		dense to very dense medium coarse sand with fine and medium gravel, occasionally clayey (Glacial Till)		2	SS	67					
85				3	SS	21					
80				4	SS	60					
75				5	SS	34					
				6	SS	12					
23.5				7	SS	62					
		Grey fine sand (Glacial Till)		8	SS	17					
27.5		Very dense medium and coarse sand with fine gravel (Glacial Till)									
65	31.5			9	SS	64					
		End of borehole									

VERTICAL SCALE: 1 IN TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE:

CHD: