

#66-F-269M

SPORTSMAN'S

BRIDGE, LOT 1.

CONC. 283

NORTH DORCHESTER

TWP.

BRANCH  
563 QUEENS AVENUE  
LONDON, ONTARIO  
TELEPHONE GE. 3-3551



FOUNDATION ENGINEERS

ASSOCIATED COMPANY  
SOIL TESTING AND ENGINEERING LTD.  
14 BRENTFORD ROAD,  
KINGSTON 5, JAMAICA, WEST INDIES  
TELEPHONE: 68989

London  
October 13, 1966

Report  
6-9-L7

A. M. Spriet & Associates Ltd.,  
264 Wellington Street,  
LONDON, Ontario.

Gentlemen:

66-F-269M

Soil Investigation for  
Sportsman's Bridge, Lot 1,  
Concessions 2 & 3,  
Township of North Dorchester

#### REPORT

We have completed this project in accordance with your verbal authorization of September 21, 1966. This report contains a record of our findings and presents our recommendations for the foundation design of the proposed structure.

#### FIELD WORK

The field work, consisting of one borehole was carried out on September 26, 1966, at the location shown on Enclosure 2.

Standard Penetration Tests using a 2 inch outside diameter split-spoon sampler were performed at frequent intervals of depth, using a driving force of a 140 lb. hammer falling freely through 30 inches. The tube is first driven an initial 6 inches to allow for the presence of disturbed material at the bottom of the borehole. The number of standard blows required to drive the sampler a further 12 inches was recorded as the standard penetration resistance (or 'N' value). This test determines the relative density of granular strata and gives an indication of the consistency of cohesive strata. It also enables samples to be obtained for classification purposes.

The results of the field tests are presented on the Geotechnical Data Sheet, Enclosure 3. Elevations were referred to a spike in a telephone pole at Sta. 1+10W which was given the arbitrary value, El. 100 feet.

#### SUBSURFACE CONDITIONS

The borehole penetrated the existing road embankment fill which consists of an 8 foot thick layer of gravelly sand. Natural subsoil consisting of glacial sandy silty clay containing a trace of gravel was encountered at El. 92 $\frac{1}{2}$  and the borehole was terminated in this stratum at El. 74.

Cont'd over....

The consistency of the clay till is described as 'hard' as indicated by 'N' values ranging from 70 to 124 blows per foot. Atterberg Limit tests carried out on a sample of the clay till gave a Liquid Limit value of 18%; Plastic Limit of 9% and Plasticity Index of 9, indicating that the soil is a clay of low plasticity and compressibility. The Liquidity Index which relates the natural moisture content of the soil to the Atterberg Limits was -0.3 confirming the 'hard' consistency obtained from visual and tactile examination.

The water level observed in the borehole was at El. 92.6 feet, while the water level in the adjacent creek was at El. 89.2 feet.

#### DISCUSSION

The bed of the creek extends to El. 88.9 therefore allowing 4 feet of cover for frost protection, it is recommended that footings should bear at or below El. 84.9. The footing depth should be decided after a hydrological study has been made to determine the maximum depth of scour. This level lies within the stratum of hard clay till and on the basis of the borehole results a maximum net soil pressure of 10,000 pounds per square foot is appropriate for the design of footings. Furthermore the footings will have a factor of safety of at least 3 against shear failure of the underlying soil. It is estimated that total settlement of footings mobilizing the above soil pressure will not exceed 1/2 inch.

The hard cohesive soil will present no unusual construction problems. The volume of seepage into excavations will probably be small and should be collected in sumps dug below the footing grade and removed by pumping.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED



*C.J.W. Atkinson*  
C.J.W. Atkinson, M.Sc., P.Eng.,  
Branch Manager

CJWA:jms

Enclosures

# LIST OF SYMBOLS, ABBREVIATIONS AND NOMENCLATURE.

## SOIL COMPONENTS AND GROUND WATER CONDITIONS.

												
<b>BOULDER</b>	<b>COBBLE</b>	<b>GRAVEL</b>		<b>SAND</b>			<b>SILT</b>	<b>CLAY</b>	<b>ORGANICS</b>	<b>BEDROCK</b>	<b>GROUND WATER LEVEL</b>	<b>DEPTH OF CAVE-IN</b>
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

**SYMBOLS:**

	Washwater returns
	Washwater lost

### PENETRATION RESISTANCES.

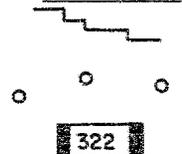
**DYNAMIC PENETRATION RESISTANCE :** to drive a 2"Ø, 60° cone attached to the end of the drilling rods into the ground, expressed in blows per foot.

**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 :**



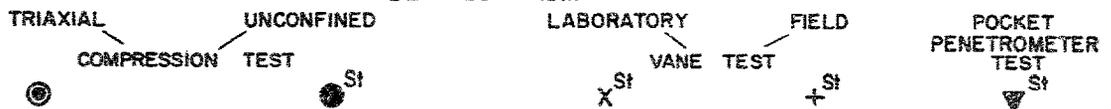
322

### SOIL PROPERTIES.

- |                       |   |                           |
|-----------------------|---|---------------------------|
| W % Water content     | γ <sup>n</sup> Natural bulk density (unit weight) | k Coeff. of permeability  |
| LL % Liquid limit     | e Void ratio                                      | φ Shear strength          |
| PL % Plastic limit    | RD Relative density                               | φ' Angle of int. friction |
| PI % Plasticity index | C <sub>v</sub> Coeff. of consolidation            | c Cohesion                |
| LI Liquidity index    | m <sub>v</sub> Coeff. of volume compressibility   | φ' Angle of int. friction |
- } in terms of total stress  
 } in terms of effective stress

### UNDRAINED SHEAR STRENGTH.

- DERIVED FROM -



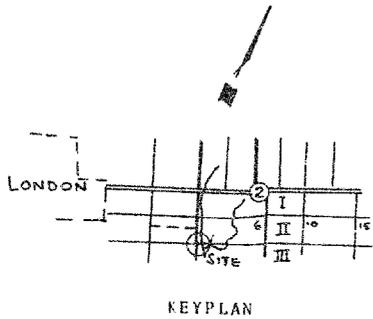
Strain at failure is represented by direction of stem

20%  
 15% — 5%  
 10%

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

### SOIL DESCRIPTION.

<b>COHESIONLESS SOILS :</b>	<b>RD :</b>	<b>COHESIVE SOILS :</b>	<b>c</b> 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



KEYPLAN

TWD  
OF  
N. DORCHESTER

B.M. Spike in  
Tel. Pole @  
1+10W, E1. 100  
feet.

5'

34'

BH1

Existing Bridge

Flow

LOCATIONS OF BOREHOLES

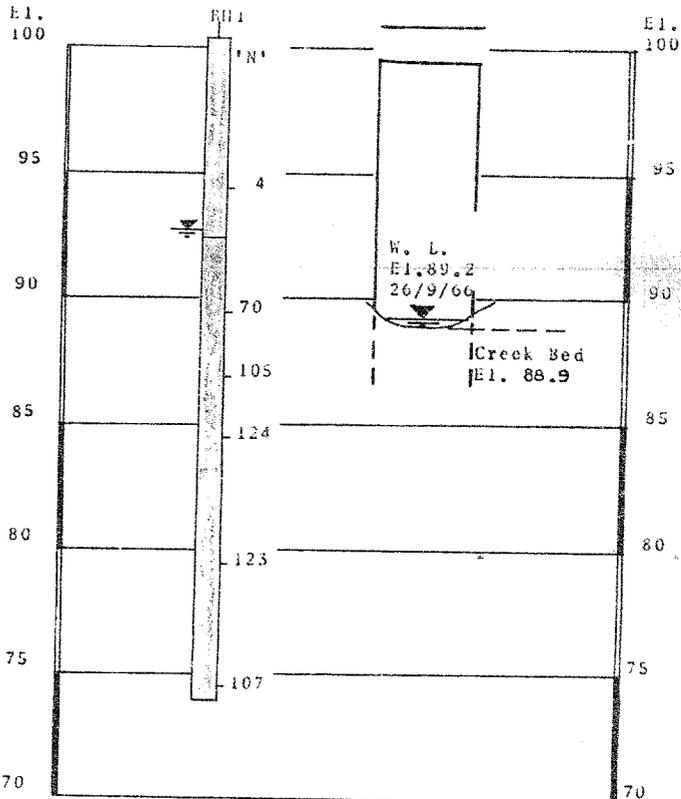
Scale 1-inch to 20 feet

LEGEND

Very loose  
Sandy Fill



Hard  
Sandy Silty Clay,  
Till.



SUBSURFACE PROFILE

Vert. Scale 1-inch to 5 feet

OUR REFERENCE NO 6-9-L7

# GEOTECHNICAL DATA SHEET FOR BOREHOLE . . . . .

CLIENT: A.M. Sprit & Associates

METHOD OF BORING Washboring

ENCLOSURE NO 3

PROJECT: Proposed Bridge

DIAMETER OF BOREHOLE Bx (3-inch)

LOCATION Lot 1, Conc. 2 & 3, Twp. of N. Dorchester

DATE September 26, 1966

DATUM ELEVATION: El. 100 feet (See Enclosure 2)

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %				REMARKS
				NUMBER	TYPE	IN- ADVANCEMENT of sampler	20	40	60	80	100	PI	W	LI		
100.3	0.0	Ground Surface														
		Very loose														
		Brown														
		sandy gravelly														
95				1	SS	4										
	8.0	Fill.														
		Hard														
90		Sandy		2	SS	70										
		silty brown														
		grey		3	SS	105										
85		clay,		4	SS	124										
		traces														
80		of														
		gravel.		5	SS	123										
		(Glacial Till)														
75				6	SS	107										
26.5		End of Borehole														
70																

W. L.  
El. 92.6  
  
September  
27, 1966.