

65-F-275M

Lot 20, Con. XVI

GODERICH TWP

MR. B. M. ROSS
CONSULTING ENGINEER
GODERICH ONTARIO

STRUCTURE SITE No. 12-152

65-F-275M

Report on
SOIL INVESTIGATION
for
ROAD BRIDGE
LOT 20, CONCESSION XVI
TOWNSHIP OF GODERICH

by
DOMINION SOIL INVESTIGATION LIMITED
369 Queens Avenue
LONDON ONTARIO
Reference No. 5-3-L2
April 13th, 1965

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SUMMARY

The two borings showed the following ground succession: sand and gravel fill (5 feet thick), compact silty fine sand (5 feet thick in borehole 1), stiff silty clay (5 feet thick in borehole 2), hard clayey silt Till (11 feet 6 inches maximum penetrated).

It is recommended that the structure should be supported on spread footings at or below El. 76.0 using a maximum net soil pressure of 8000 pounds per square foot . The estimated total settlement is less than 1/2 inch.

No unusual construction problems are anticipated.

I INTRODUCTION

Verbal authorization was received from Mr. B.M. Ross's office to carry out a soil investigation at a site in the Township of Goderich where it is proposed to replace an existing road bridge with a new structure.

The existing steel-beam structure is located on Lot 20, Concessions 15 and 16 of the Township and has a clear span of 25 feet.

It is understood that the new structure will be a 30 foot span concrete rigid-frame and the centre-line will be approximately 15 feet north of the centre-line of the existing bridge. The deck level will be raised by about 2 feet to clear the high water level. The requirements of the project were discussed with Mr. K.G. Dunn, P. Eng., who supplied the foregoing information.

The purpose of this investigation was to reveal the sub-surface 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 12 feet 6 inches during the period March 25th to 27th, 1965, using a diamond drill machine equipped for soil sampling. The holes were advanced by washboring methods and were lined with Bx casing.

Standard Penetration Tests using a 2" O.D. split-spoon sampler were performed at frequent intervals of depth to determine the relative density or consistency of the soil and to recover representative samples. The results are plotted as 'N' values on the Geotechnical Data Sheet for each borehole and are also given on the Subsurface Profile, Enclosure 2.

Dynamic Cone Penetration Tests were performed adjacent to each borehole location. This test gives a profile of the soil density changes with depth and also gives an approximate depth to which a driven type of pile would penetrate.

The locations of the boreholes are shown on the Site Plan, Enclosure 2, and elevations have been referred to a Bench Mark which was established by the client (Low steel of existing bridge, El. 87.6).

III SUBSURFACE CONDITIONS

Detailed descriptions of the strata encountered in each borehole are given on the data sheet comprising Enclosure 3, and a general picture of the soil stratigraphy is given in the form of a Subsurface Profile on Enclosure 2.

The boreholes revealed the following general ground succession:

	Thickness
(a) Fill consisting of sand and gravel	5'- 0"
(b) Brown silty fine sand with fine gravel. This stratum was penetrated in borehole 1 only and the relative density is described as 'compact' based on a Standard Penetration Test Value of 13 blows per foot.	5'- 0"
(c) Brown silty clay with fine and medium gravel. This stratum was penetrated in borehole 2 only and the consistency is described as 'stiff' based on a Standard Penetration Test Result of 14 blows per foot.	5'- 0"
(d) Glacial Till consisting of grey clayey silt with embedded fine gravel. The consistency of this stratum is described as 'hard' based on Standard Penetration Test Results ranging from 19 to an extrapolated value of 300 blows per foot. The cone penetration tests encountered practical refusal to driving within this stratum.	Penetrated 11'6" in boreholes 1 & 2

IV GROUNDWATER CONDITIONS

At the time the field work was carried out, the stream was frozen and the elevation of the top of the ice was recorded at El. 83.6. The water level recorded in the boreholes after the drilling was completed was El. 84.7 in borehole 1, and El. 86.9 in borehole 2.

V

DISCUSSION

The natural ground consists of a five foot thick layer of compact brown silty fine sand with fine gravel at borehole 1 location and a 5 feet thick layer of stiff brown silty clay with fine and medium gravel at borehole 2 location, overlying hard grey clayey silt till which was penetrated 11 feet 6 inches in both boreholes.

The bed of the stream extends to El. 80.1 and allowing for scour it is recommended that the footings should bear at or below El. 76.0. This level lies within the stratum of hard clayey silt till and on the basis of the borehole results a maximum net soil pressure of 8000 pounds per square foot would be appropriate for the design of the footings. It is estimated that total settlement will not exceed 1/2 inch and in view of the similar conditions encountered in both boreholes, no appreciable differential settlement is anticipated. Furthermore the footings will have a factor of safety of at least 3 against shear failure.

The coefficient of friction between the footings and the clayey silt till should be taken as 0.35 and the factor of safety against horizontal sliding of the abutments should be at least 1.5.

It is anticipated that seepage into excavations will easily be controlled by pumping.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED



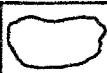



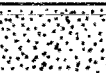


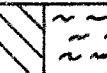


CA:sg

A handwritten signature in cursive script that reads "C.J.W. Atkinson".

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

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
ϕ	> 8"	3"	3/4"	4.76mm	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.

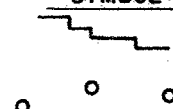
DYNAMIC PENETRATION RESISTANCE : to drive a 2" ϕ , 60° cone attached to the end of the drilling rods into the ground, expressed in blows per foot.

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 :



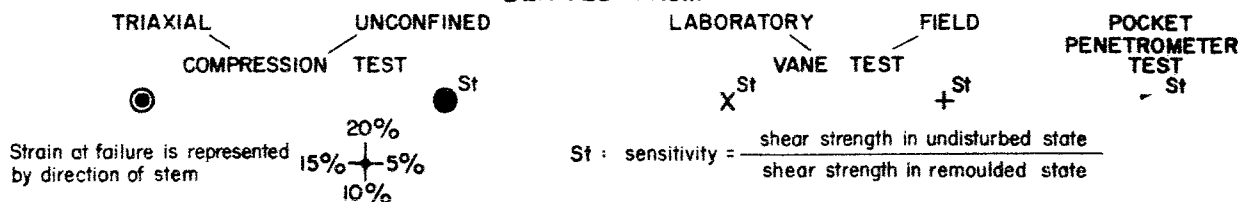
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SOIL PROPERTIES.

W % Water content	γ^* 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 total stress
PI % Plasticity index	C _v Coeff. of consolidation	C' Cohesion — in terms of effective stress
LI Liquidity index	m _v Coeff. of volume compressibility	ϕ' Angle of int. friction — in terms of effective stress

UNDRAINED SHEAR STRENGTH.

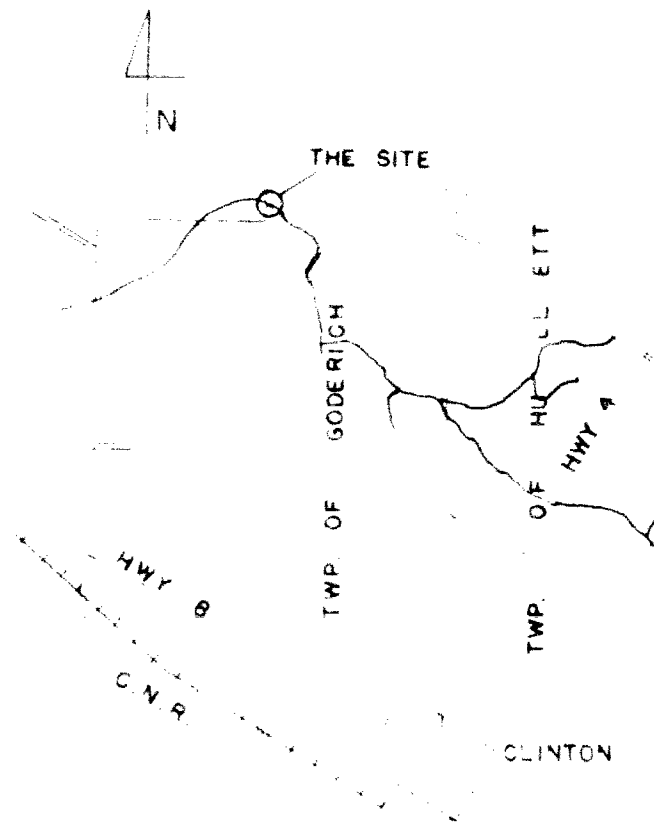
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SOIL DESCRIPTION.

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

LOT 20 CONG. XVI
TWP. OF GODERICH



KEY PLAN
SCALE 1 INCH TO 1 MILE

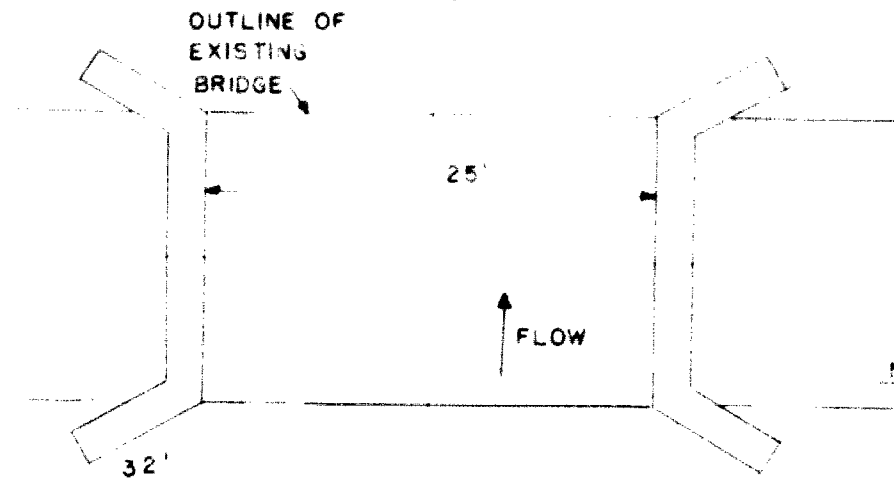
LEGEND

- FILL
- SILTY FINE SAND
- SILTY CLAY
- CLAYEY SILT TILL

8'
BH 2



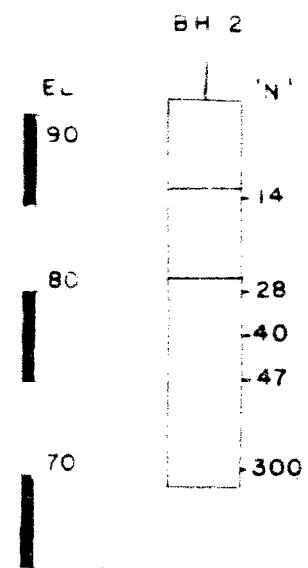
LOT 21 TWP. OF GODERICH



LOCATION OF BOREHOLES
SCALE 1 INCH TO 10 FEET

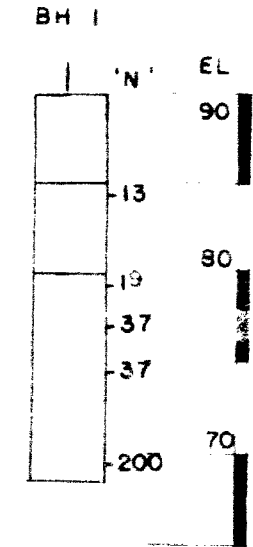
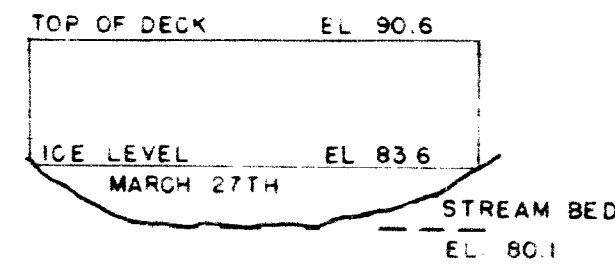
BH 1
11'-8"

NORTH



'N' DENOTES STANDARD PENETRATION
TEST RESULTS (BLOWS/FOOT)

SUBSURFACE PROFILE
SCALE 1 INCH TO 10 FEET



OUR REFERENCE NO. 5-3-12

GEOTECHNICAL DATA SHEET FOR BOREHOLES 1 & 2.

CLIENT: R.N. Ross

PROJECT: Bridge

LOCATION: Lot 20, Cone. 15 & 16, Twp. of Loderich

DATUM ELEVATION: 87.6 Feet

METHOD OF BORING: Washboring

DIAMETER OF BOREHOLE: 3-inch

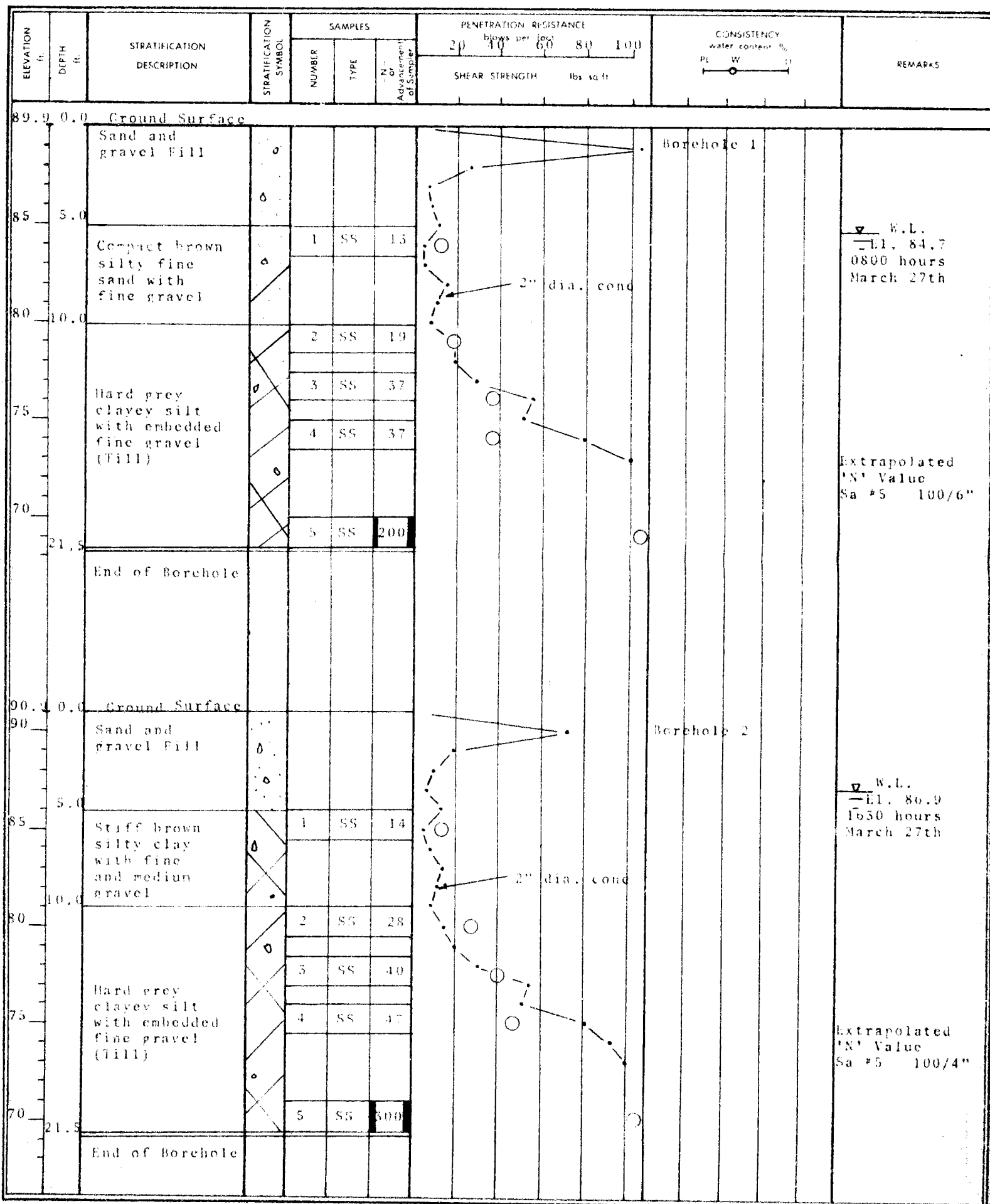
DATE: March 25th to 27th, 1965

Washboring

Bx (3-inch)

March 25th to 27th, 1965

ENCLOSURE NO. 3



VERTICAL SCALE: 1 IN TO 5 FT

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