N.O. 70-F. 205 M

BRIDGE 237

LOT 10, CON. 8+9

ASHFIELD TWP.

40P13-6

DOMINION SOIL INVESTIGATION LIMITED

CONSULTING SOIL & FOUNDATION ENGINEERS

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ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
39 BRENTFORD ROAD
KINGSTON 5, JAMAICA
WEST INDIES

London
February 23, 1970

Report
70-1-L5

ELEV. EQUATION
PLAN GEOD EL 848.23 = SOIL REPORT EL 100.00

B. M. Ross & Associates Limited,
Consulting Engineers,
41 West Street,
Goderich, Ontario.

70-F-205 M

Attn: Mr. K. G. Dunn P.Eng.

Dear Sirs:

Soil Investigation for
Proposed Bridge Br-237,
Lot 10, Concs. 8 & 9,
Township of Ashfield.

We have completed one additional borehole at this site and the borehole location together with the location of previous boreholes is shown on Enclosure 1. The soil profile revealed by the borehole is presented on Enclosure 2.

The initial soil investigation, Ref: 3-8-29, was carried out to determine the soil conditions below a proposed new culvert. It is understood that the adjacent river has since been relocated, and that the new structure will be a 60 foot span rigid frame. The purpose of the additional borehole was to reveal the soil conditions at a greater depth, and to determine the relevant soil properties for the design and construction of the new foundations.

II FIELD WORK

The borehole was put down on February 4 and 5, 1970, using a diamond drill machine, which was equipped for soil sampling. The hole was advanced by washboring methods and was lined with Bx size casing.

Standard penetration tests were performed at frequent intervals of depth, as detailed in Appendix 'A', and the results are recorded on the borehole log as 'N' values.

A dynamic cone penetration test was performed adjacent to the borehole location to obtain an indication of soil density and strata changes with depth.

The field work was supervised by a soils engineer who also determined the ground surface elevation. This was referred to the same benchmark as was used for the previous investigation (nail and washer in tree, El. 100 feet).

III SUBSURFACE CONDITIONS

Detailed descriptions of the strata which were encountered in the borehole are given on Enclosure 2. The following notes are intended only to amplify this data:-

The borehole penetrated a layer of clayey silt fill, which is associated with the construction of the approaches to the existing structure. The natural subsoil consists of successive layers of fine sand, silty clay, sand and gravel, clayey silt, gravelly sand and silty fine sand. The upper layer of fine sand has a loose relative density, however below this stratum the subsoil is generally in a 'dense' condition as indicated by 'N' values ranging from 17 blows per foot to 100 blows for a 5-inch penetration of the sampler.

Grading analyses of two samples from the clayey silt and gravelly sand strata are shown on Enclosure 3.

The water level in the borehole reached equilibrium at El. 84.6.

IV DISCUSSION AND RECOMMENDATIONS

It is understood that the proposed footing grade is at about El. 75, therefore on the basis of the results from the additional borehole (borehole 2) and borehole 1 of the previous investigation, it is appropriate to use a maximum allowable soil pressure of 5 tons per square foot for the design of footings. Total settlement of footings mobilizing the above soil pressure is estimated to be ½ inch or less.

A major problem in constructing footings will be to control the ground water and to prevent seepage into the footing excavations. In view of the very dense nature of the granular soil, the use of sheet piling is considered impractical. If the ground water cannot be controlled by normal pumping procedures it may be necessary to carry out the excavation under water and use tremie concrete to seal the footing grade. Lateral seepage may be controlled by the use of light sheeting, or the construction of an impervious berm around the excavation.

We trust that the above recommendations are sufficient for your requirements, however if further discussion is necessary please do not hesitate to contact us.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED

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

CJWA/jmc

APPENDIX 'A'.

THE STANDARD PENETRATION TEST.

In order to determine the relative density of non-cohesive soils such as sands and gravels, the standard penetration test has been adopted. The test also gives an indication of the consistency of cohesive soils.

A two inch external diamter thick-walled sample tube is driven into the ground at the bottom of the borehole by means of a 140 lb. hammer falling freely through 30-ins. 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 (N) required to drive the sampler a further 12-in. is recorded. The sample tube is one originally developed by Raymond Concrete Pile Company in the United States, where a sufficient number of tests have been made in conjunction with field investigations to show that the results, although essentially empirical, may be applied to foundation design.

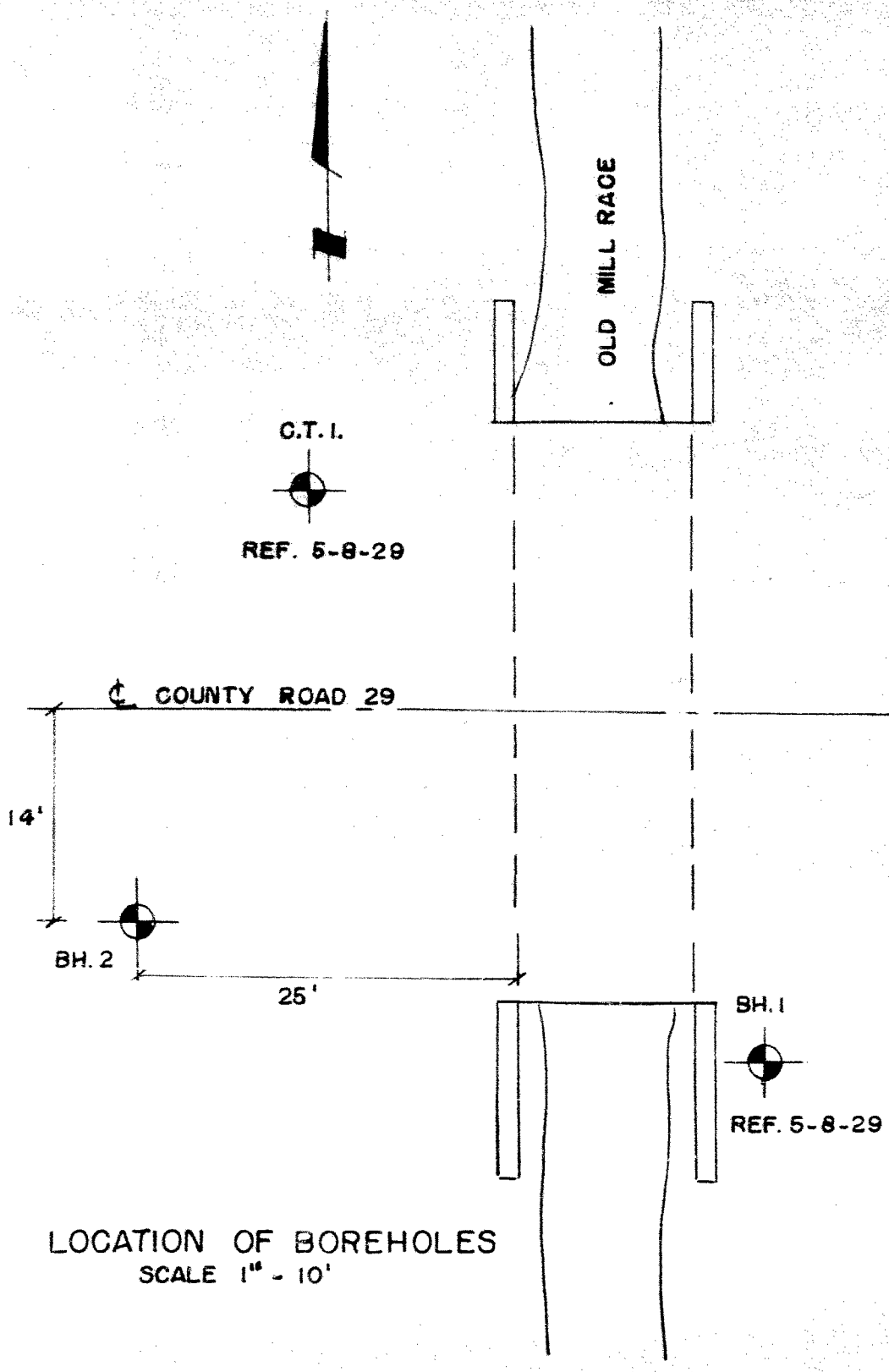
For Sands:-

Values of 'N'.	Density.
Less than 10	Loose
Between 10 and 30	Compact
Between 30 and 50	Dense
Greater than 50	Very dense.

Our Ref. No. 70-1-L5

Enclosure No. 1

Prep. By



LOCATION OF BOREHOLES
SCALE 1" - 10'

DOMINION SOIL INVESTIGATION LIMITED

LOG OF BOREHOLE ..2.....

Our Reference Nº 70-1-L5

Enclosure Nº 2

CLIENT: B. M. Ross & Associates Ltd
PROJECT: Bridge BR-237
LOCATION: Lot 10, Concs 8 & 9, Twp. of Ashfield
DATUM ELEVATION: Nail and washer in tree, El.100 feet

DRILLING DATA
Method: Washboring
Diameter: Bx (3-inch)
Date: February 4 & 5, 1970

ELEVATION Ft.	DEPTH Ft.	DESCRIPTION	SYMBOL	GROUND WATER	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' Blows/Foot	REMARKS
92.8	0.0	Ground Surface						
	0.5	Sandy gravel						
90		Brown clayey silt with organics (Fill)			1	SS	11	
	6.5	Loose brown fine sand						
85	8.0	Very stiff brown silty clay			2	SS	17	
	10.8	Dense sand and gravel seams of silty clay			3	SS	52	
80	14.0	Hard grey clayey silt trace of sand			4	SS	85	
	17.5	Very dense gravelly sand with some silt			5	SS	100/5"	
75	23.0	Very dense silty fine sand, some gravel			6	SS	74	
70	26.5	End of Borehole						

PENETRATION RESISTANCE Blows / Foot — 20 40 60 80 100
UNDRAINED SHEAR STRENGTH lbs/sq.ft. + FIELD VANE TEST ● COMPRESSION TEST

WATER CONTENT % — PLASTIC LIMIT w_P — NATURAL w — LIQUID LIMIT w_L — 10 20 30 40 50

2-inch diameter cone

VERTICAL SCALE: 1 inch to 5 feet

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MADE CHECKED

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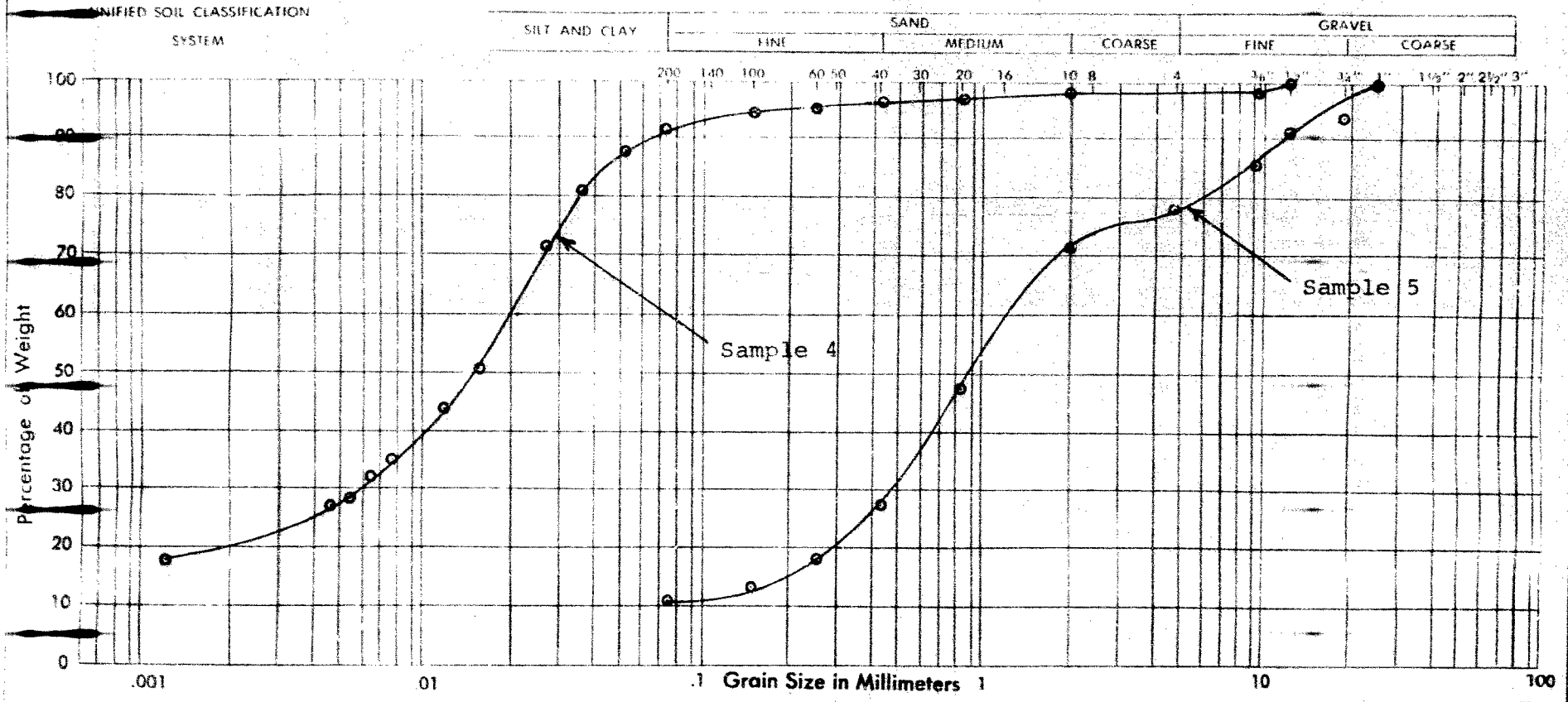
GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 70-1-L5



PROJECT: Huron Street Reconstruction

LOCATION: London, Ontario.

BOREHOLE NO: 3

SAMPLE NOS: 4 & 5

DEPTH OF SAMPLE: 15 & 20 feet

ELEVATION OF SAMPLE: 77 & 72 feet

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

Classification of Sample and Group Symbol:

Sa #4 CLAYEY SILT, TRACE OF SAND

Sa # 5 GRAVELLY SAND, WITH SOME SILT

PLASTIC PROPERTIES:

LIQUID LIMIT	%	=
PLASTIC LIMIT	%	=
PLASTICITY INDEX	%	=
MOISTURE CONTENT	%	=
ACTIVITY		=

Enclosure No. 3