#64-F-286 m

MONTROSE

BRIDGE

WELLAND

RIVER

B.A. 2976
Site 34-68

E. M. PETO ASSOCIATES LIMITED

1287 Caledonia Road,
Toronto 19, Ontario,

789-1126.

Job Number 6139.

7th May, 1964.

64-F-286 M

The County of Welland,
County Building,
102 Main Street, East,
Welland, Ontario.

Attention: Mr. W. Smith, P. Eng.,
County Engineer

Gentlemen:

Re: Subsoil investigation
Montrose Bridge
Welland River at Montrose

We have pleasure in forwarding to you five copies of our soil investigation report.

The subsoil conditions warrant the use of a pile foundation for the bridge foundations. The piles may be founded upon a stratum of sandy silt till, which was found some 34 feet below the River water level. The most suitable pile type seems to be a driven displacement type pile using a working load of 30 tons per pile of unit cross sectional area subject to a group reduction factor. If a pile foundation resting upon the bedrock is contemplated an allowable load of 100 tons per pile of unit

cross sectional area may be used. However, difficulties will be met when penetrating through dense deposits overlying the bedrock and special pile types and driving methods may have to be employed.

The raising of the grade of the embankment presents a further problem due to the weak nature of the soft clay and peat deposits. The recommended slope of the new embankment is not steeper than 1 vertical to 3 horizontal and it is further recommended to place the fill before the pile driving operations are started.

While we consider the report to be comprehensive within your terms of reference, we would be pleased to be of further service should you have some questions arising from this report.

Yours very truly,

E. M. PETO ASSOCIATES LIMITED,

E. M. Peto, P. Eng.

EL/vm

THE COUNTY OF WELLAND

SUBSOIL INVESTIGATION

MONTROSE BRIDGE

WELLAND RIVER AT MONTROSE

E. M. PETO ASSOCIATES LIMITED

1287 Caledonia Road,

Toronto 19, Ontario

TABLE OF CONTENTS

A. INTRODUCTION

We were authorized by the County of Welland (letter of authority of 21st February, 1966) to conduct a subsoil investigation at the location of the present Lincoln Bridge over the Welland River.

We understand that it is proposed to erect a new bridge on the line of the existing structure and to raise the road grade by some 8 feet above the present grade.

B. GENERAL INFORMATION

1. The location of the boreholes, together with the inferred soil profile is shown on the attached site plan.

2. The elevations given in the report, borehole logs and drawings are in reference to elevation 100.0 as denoted for the T.B.M. which was lodge at the north-east corner of the South abutment.

3. The laboratory test results are given on Tables A and B and Figures 1 to 8 inclusive.

4. The geotechnical properties of the soil deposits are given in graphical form versus elevation on Figure 12.

C. SITE AND GEOLOGY

The present bridge is a three-span steel girder type of bridge. The total span is 177 feet. The bridge originally was designed as a "swing" bridge with specially adapted piers and abutments. The bridge is only 16 feet wide. The existing piers and abutments are in poor condition, the concrete of the piers being in a particularly bad state.

The subsoil investigation showed that the bedrock is some 75 feet below the level of the present bridge deck. The bedrock consists of argillaceous dolomite and stratigraphically it belongs to the lowest beds of the Silurian Salina Formation. The overlying glacial drift consists of several strata which were laid down during the latter part of the Pleistocene period. The bedrock is immediately overlain by a layer of about 16 feet of fine sand. It is possible that this is a pre-Wisconsin, interglacial deltaic deposit. The next layer, the sandy silt till, was deposited during the Wisconsin glaciation. The upper part of this till has a more pronounced clay content and could have been deposited during the Port Huron glacial sub-stage when the ice covered this area for the last time.

As the glacier retreated the position of the ice front changed from time to time and several glacial lakes covered the area.

C. SITE AND GEOLOGY Cont'd.

It is probable that the next layer was formed in this environment as a sub-aqueous till. Later the lakes become free of ice and stratified silts and clays were laid down. The profile is completed by recent alluvial, organic deposits and by a man-made fill.

D. SOIL CONDITIONS

In order of occurrence the soil strata were:

i) Fill,

ii) Peat,

iii) Soft silty clay with seams and layers of silt

iv) Soft, reddish-brown silty clay,

v) Stiff to hard sandy silt till, and

vi) Fine to silty fine sand.

The stratification is shown on the attached soil profile. A more detailed soil description is given on borehole logs. In addition, the more important characteristics of the deposits are given on Figure 12.

A brief description of each layer follows:

D. SOIL CONDITIONS - Cont'd.

i) Fill

A mixed fill, consisting of crushed stone, some sand and clay, was found in the area of testholes 1 and 5. A maximum depth of 12.5 feet was noted at testhole 5, suggesting that the fill on the south side may have displaced previously existing organic material.

ii) Peat

Testholes put down away from existing road on the north side showed the presence of an organic deposit. It is extremely organic with high water contents (155 to 292%). The bulk density is about 75 lb/cu.ft. with dry density of 23 lb/cuft. The value of shear strength is unknown but it may be assumed to be very low (100 to 200 lb/sq.ft.).

iii) Soft silty clay with seams of silt

Underlying the peat or fill there was a reddish grey deposit of silty clay containing some seams and lamina of silt. The average lower limit of this deposit was at about elevation 78. Grading curves are given on Figures 1 to 5.

D. SOIL CONDITIONS Cont'd.

The unconfined compressive tests gave what were believed to be low values for the shear strength, caused by sample disturbance. The field vane tests performed in this stratum gave a more realistic average undrained shear strength of 400 lb/sq. ft.

Three consolidation tests were carried out, but after careful examination of the results, only one was accepted. The others were discarded, because it was believed that sample disturbance had a pronounced effect on the results; in fact an extra testhole(#5) was put down in order to obtain satisfactory "undisturbed" samples. The result of the consolidation test, given on Figure 11, confirms that the deposit is a normally loaded clay.

The recommended densities are:

Wet density	122.0 lb/cu.ft.
Dry density	94.0 lb/cu.ft.

iv) Soft reddish-brown silty clay

An average thickness of 13 feet of soft reddish-brown silty clay followed the reddish-grey soft silty clay. The densities were similar to those of the overlying stratum, the wet density being 122 lb/cu.ft., but the dry density was 96 lb/cu.ft.

D. SOIL CONDITIONS - Cont'd.

The assumed undrained shear strength for this stratum, which also was normally loaded, was 500 lb/sq.ft. A typical grading curve is given on Figure 4.

v) Stiff to hard sandy silt till

The grading curves, given on Figures 5, 6 and 7, depict the layer as a silty sand to sandy silt, with a variable clay content of between 0 and 16%; thus, texturally, it is a sandy silt to silt till. The N-values, or number of blows/ft. penetration obtained during standard penetration test, increased rapidly with depth and have an average value of about 46.

The Atterberg Limits are:

Liquid limit	18 to 23,
Plastic limit	10 to 13

The bulk density is much higher than for the overlying strata, and a value of 130 lb/cu.ft. for wet density may be adopted.

D. SOIL CONDITIONS - Cont'd.

vi) Silty fine sand

Overlying the bedrock there was a layer of silty fine to fine sand, typical grading curves are given on Figures 8 to 10 inclusive. The stratum is compact to extremely dense with N values between 23 and 115 for 6 inches.

An average wet density of at least 130 lb/cu.ft. may be adopted for this deposit.

During the present investigation it was established that this deposit contained water under pressure. The water pressure corresponded to the water level in the Welland River.

vii) Bedrock

The bedrock was cored at a depth of 65 ft. 10 in. in the area of testhole #4 and at 74 ft. 8 in. at testhole #1.

It consisted of a dense argillaceous dolomite. The upper 1 foot layer approximately was somewhat porous and

D. SOIL CONDITIONS Cont'd.

brownish-grey in colour. The remainder of the core was a very dense, finely crystalline dolomite. At both testholes some gypsum crystals were found.

E. WATER CONDITIONS

The ground water conditions in the area close to the Welland River are regulated by the water level in the Welland River. Thus the equilibrium ground water level is likely to be at the river water level. The water under pressure encountered in the stratum of fine sand which overlies the bedrock is governed by the Welland River water level; above this ground water there is very little seepage.

F. OBSERVATIONS AND CONCLUSIONS

1) Summary of Soil Conditions

The soft clays overlying the till deposit have a low shear strength and are, because of their normally loaded nature, very compressible, when subjected to loads.

The first stratum which is capable of supporting large loads is the layer of till overlying the silty fine sand deposit. This deposit was encountered at an average depth of about 32 feet below the river water level.

The underlying stratum of sand is dense (average N value 44), and will not undergo long term settlements when surcharged.

The bedrock was found to be in a sound condition and capable of supporting very large loads.

2) Bridge Foundations

The upper strata of fill, peat and soft silty clay were found to be weak, compressible, and quite unsuitable for bridge foundations.

F. OBSERVATIONS AND CONCLUSIONS Cont'd.

A good bearing medium for a pile foundation is offered by the glacial till deposit which was at an average depth of some 32 feet below river water level. Because of a relatively shallow depth a displacement, end-bearing pile may be used. It is estimated (based on the average N-values) that a pile having a crossectional area of 1 sq.ft. and penetrating at least 5 ft. into the till stratum could safely carry a load of about 30 tons. The underlying stratum is a dense fine sand deposit and no harmful settlements are expected.

A much higher bearing value will be achieved by resting the piles upon the bedrock. However, due to the high density of the overlying till which contains boulders, and the dense fine sand deposit, difficulties will be met when driving the pile through these strata. In order to penetrate to the bedrock reinforced steel H-piles are recommended, and further, some assistance from jetting may be necessary. The allowable load on a pile resting upon bedrock will be determined chiefly by the structural strength of such a pile, however, for the design purposes a load of 100 tons/pile of unit crossectional area may be assumed.

F. OBSERVATIONS AND CONCLUSIONS - Cont'd.

The use of piles to the bedrock may encounter additional difficulty due to the presence of water under pressure in the sand deposit.

The length of a pile founded upon the till stratum may vary, depending on the local density of the deposit and the presence of boulders; for this reason piles resting in this stratum should be subject to load test.

A more exact estimate of the required pile length may be made for the piles founded in or upon bedrock, where it may be assumed that the bedrock surface at the site is practically even.

3) Embankment

We understand that it is proposed to raise the existing grade by about 8 feet. During the investigation it was found that the fill is resting, either upon peat, or soft clay. At the south end it seems that the organic deposit, which formerly may have existed, has been displaced by the weight of the fill. At the north end the testholes do not show the actual conditions below the embankment because they were set out to one side of the present road.

F. OBSERVATIONS AND CONCLUSIONS Cont'd.

The organic deposit has such a low shear strength, that it can be displaced by the new fill. The ideal solution would be, of course, to remove any existing organic deposit, before additional fill is placed.

Assuming that the organic deposit is either replaced or displaced, the side slopes of embankment should not be steeper than 1 vertical to 3 horizontal.

There may be local failures, when the soft organic deposit is displaced, and for this reason, construction of the embankment before the commencement of pile driving operations is recommended. The new embankment should be constructed from the outer edge inwards, towards the road centre whilst building outwards from the river banks in the form of a causeway. By this means it should be possible to displace the soft organic material ahead of the new fill by end filling.

It is estimated that when the full height of fill is placed the settlement which will occur under the shoulders of the new embankment will be a maximum and in order of 6 to 7 inches.

F. OBSERVATIONS AND CONCLUSIONS - Cont'd.

Less settlement will take place under the centre of existing road, because this area will have been consolidated to some extent under the load of the existing embankment.

E. M. PETO ASSOCIATES LTD.

Report prepared by:

B. Lewicki, P. Eng.

BL/vm

C. F. Freeman, P. Eng.,
Chief Engineer.

Job Number 6439

7th May, 1964.

TABLE NO. 1

ATTERBERG LIMIT [illegible]

Borehole	Depth	[illegible]	Liquid Limit	Plastic Limit %	Plasticity Index %
1	15'0"-15'0"	59.5	50.9	[illegible]	13.6
1	35'0"-36'0"	70.5	55.4	36.7	19.7
4	21'0"-22'0"	77.5	33.8	17.2	16.6
4	35'0"-36'0"	63.2	33.6	17.2	10.4
4	45'0"-46'6"	53.2	17.5	9.9	7.6

Job No. 5[illegible]

TABLE "B"

UNCONFINED COMPRESSION TEST DATA SHEET

Hole No.	Sample No.	Depth	Elevation	M.C. %	Wet density p.c.f.	Dry density p.c.f.	Void ratio e	% Saturation Approx.	Unit Shear Strength p.s.f.	Note
1	6	10'-10.4"	90.8	30.5	120.0	92.0	0.83	20	260	
1	13	25'-26'	80.5	31.3	125.5	95.5	0.77	20	63[illegible]	
1	17	35.4"-35'-6"	70.5	26.4	121.5	96.0	0.75	20	[illegible]	Undisturbed
1	17	[illegible] 35'-6"	70.5	26.4	124.0	98.0	0.72	[illegible]	[illegible]	Remolded
1		45'-[illegible]	60.2	16.3	130.0	111.0	0.45	--	--	
2	3	[illegible]-26'	71.4	26.8	123.5	97.0	0.74	20	[illegible]	
2	4	25'-25'-6"	70.4	34.2	[illegible]	[illegible]	[illegible]	20	[illegible]	
3	2	10'-27'-6"	75.9	30.4	120.0	[illegible]	[illegible]	20	[illegible]	
3	10	21'-22'	77.5	26.2	121.5	94.5	0.73	20	[illegible]	
4	5	[illegible]-32	67.5	23.1	75.0	22.5	--	20	600	

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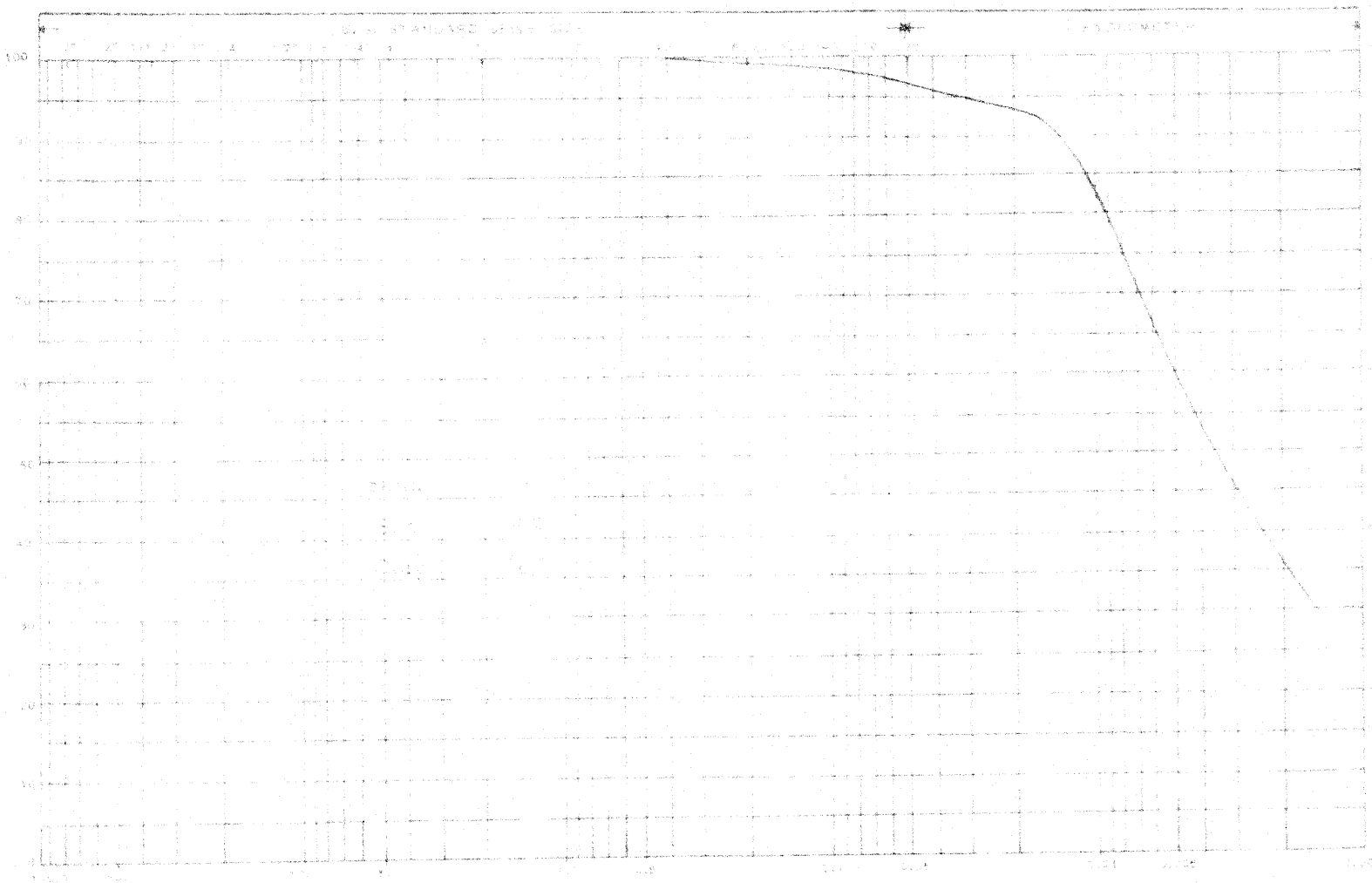
Toronto 19, Ontario



STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY

MASS. INST. OF TECH. CLASSIFICATION

JOB NAME Montrose Bridge JOB NO. 6137 HOLE NO. 1 SAMPLE NO. 6

DEPTH 15'-16' ELEVATION _____ REMARKS Silty clay

GRAIN SIZE DISTRIBUTION

Fig. 1

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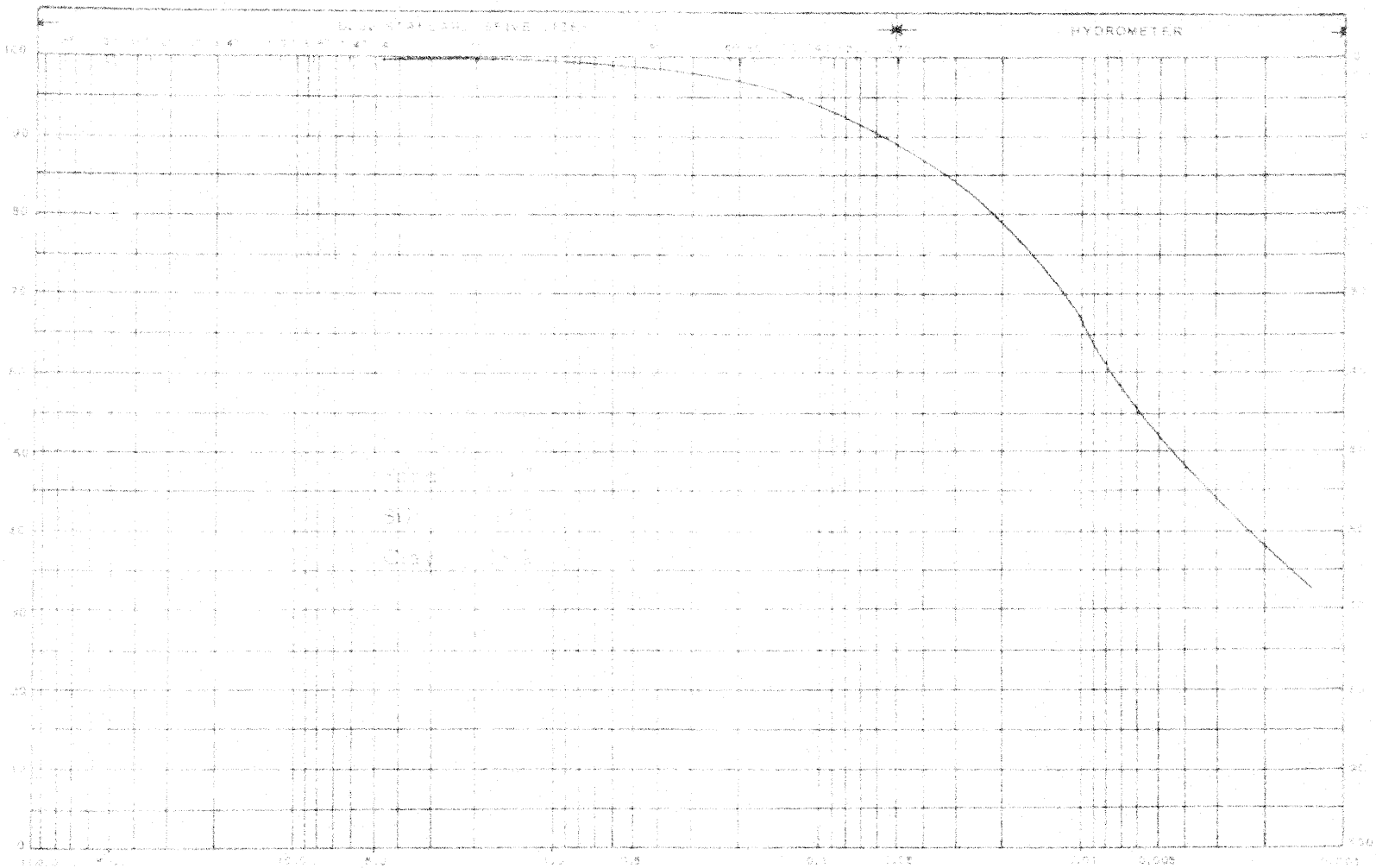
Toronto 18, Ontario



COBBLES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY

MASS. INST. OF TECH. CLASSIFICATION

JOB NAME Montrose Bridge JOB NO. 6439 HOLE NO. 4 SAMPLE NO. 10

DEPTH 21.22' ELEVATION _____ REMARKS Silty clay

GRAIN SIZE DISTRIBUTION

Fig. 2

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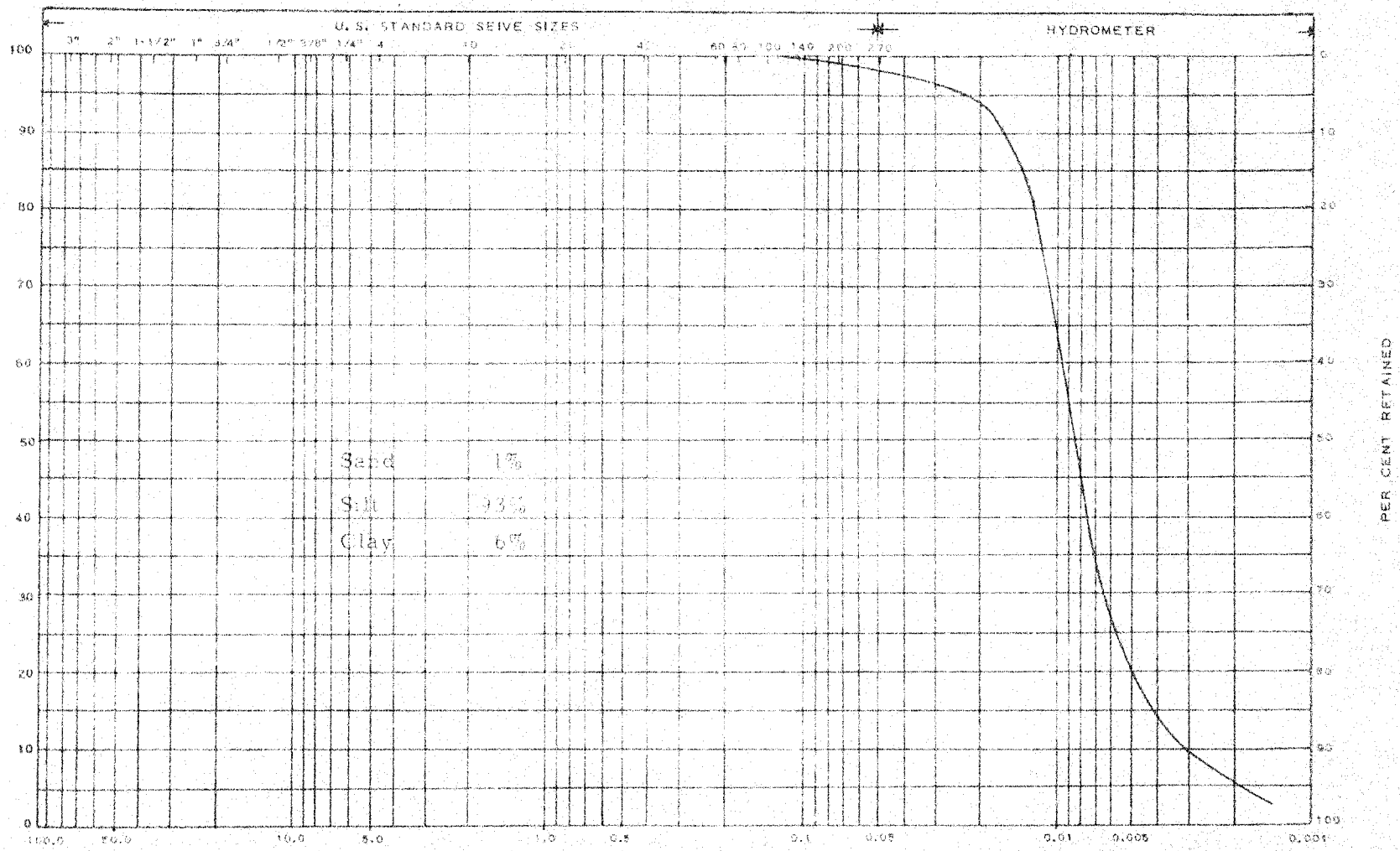
Toronto 19, Ontario



STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY

MASS. INST. OF TECH. CLASSIFICATION

JOB NAME Montrose Bridge JOB NO. 6439 HOLE NO. 4 SAMPLE NO. 10

DEPTH 21'-22' ELEVATION _____ REMARKS Silt

GRAIN SIZE DISTRIBUTION

Fig. 3

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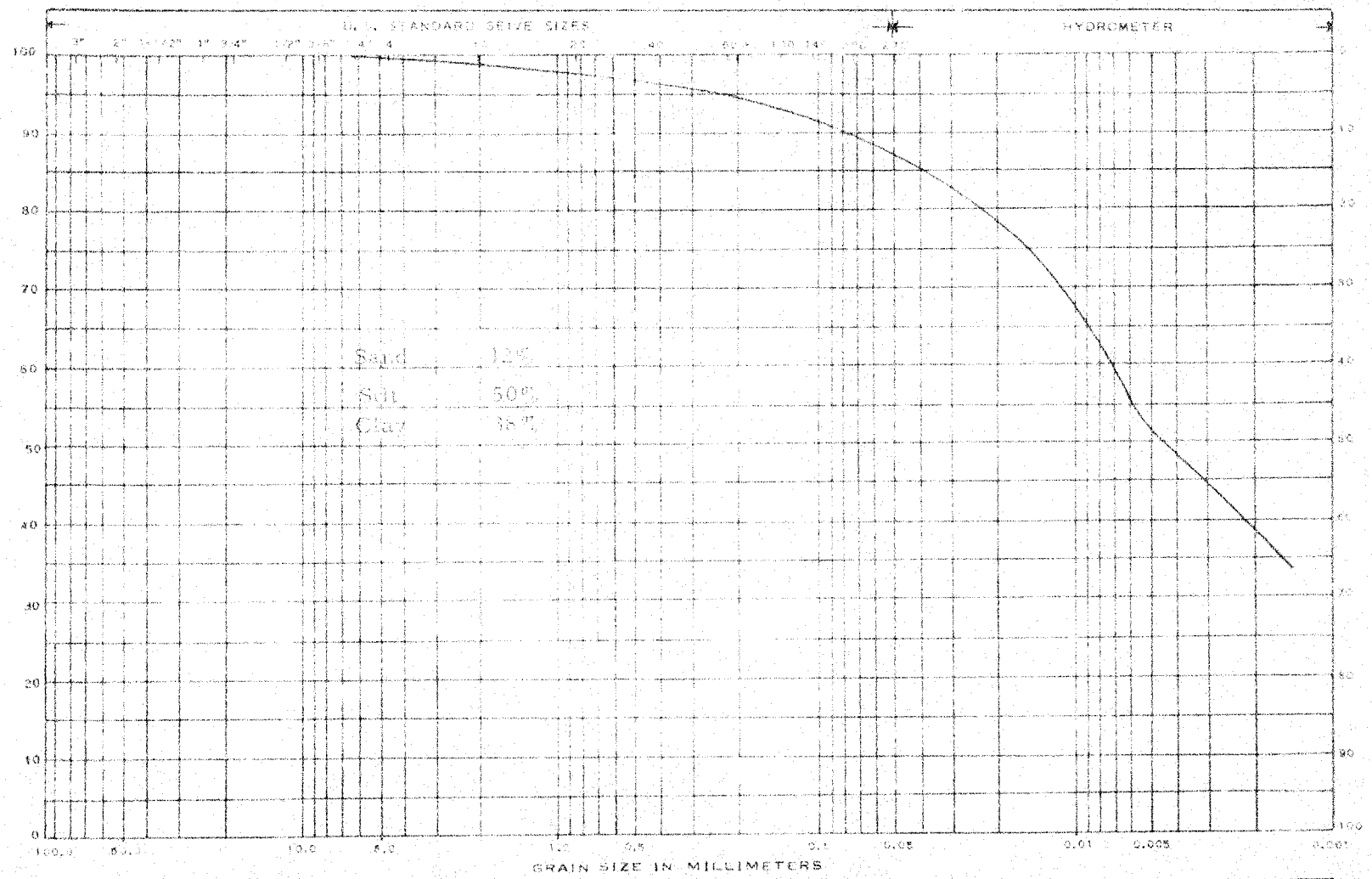

STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY

MASS. INST. OF TECH. CLASSIFICATION

JOB NAME Montrose Bridge JOB NO. 6439 HOLE NO. 1 SAMPLE NO. 17

DEPTH 35'-36' ELEVATION _____ REMARKS Silty clay

GRAIN SIZE DISTRIBUTION

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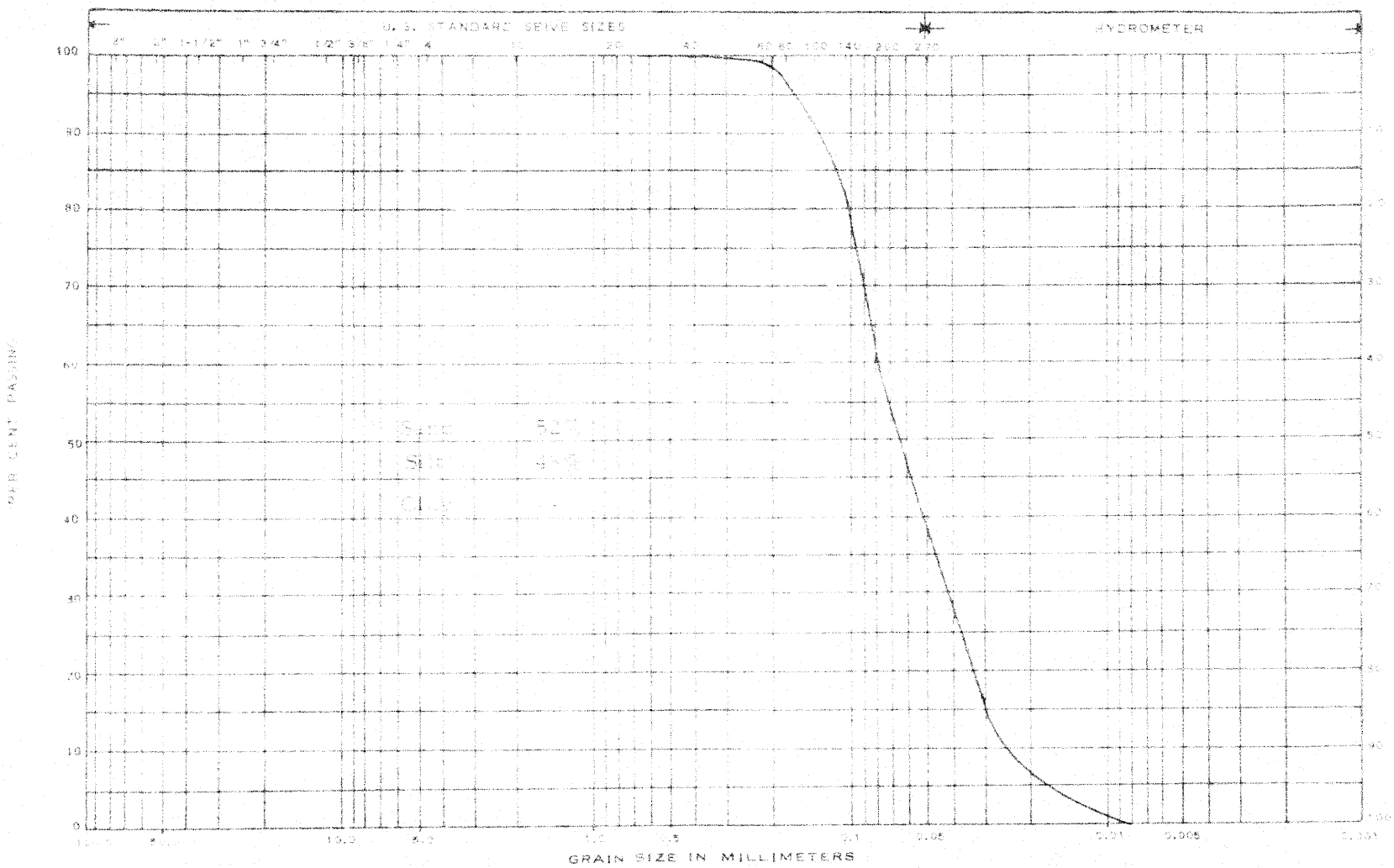


STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY

MASS. INST. OF TECH. CLASSIFICATION

JOB NAME Montrose Bridge JOB NO. 6439 HOLE NO. 1 SAMPLE NO.

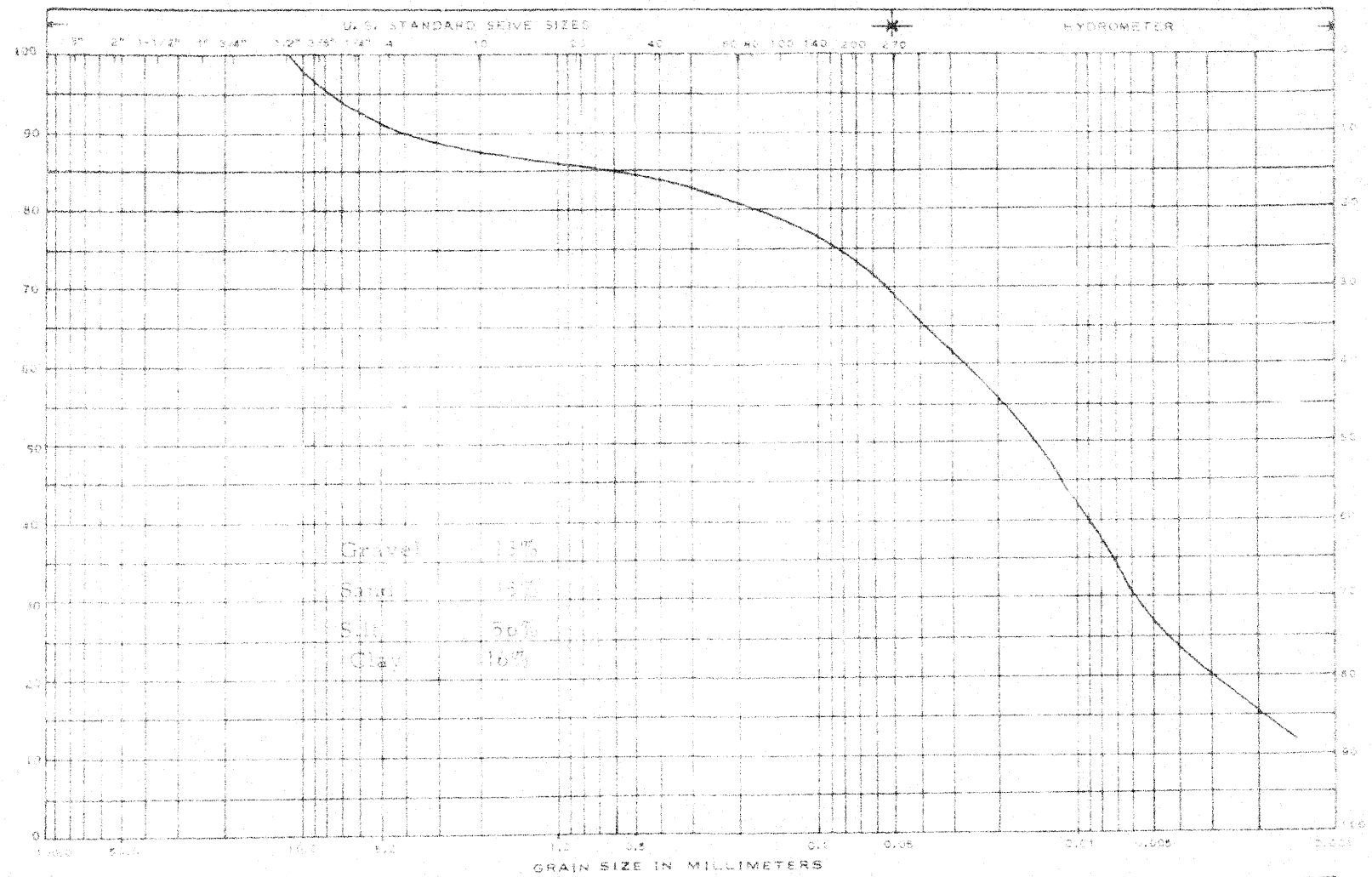
DEPTH 45'-46'6" ELEVATION REMARKS Silty sand

GRAIN SIZE DISTRIBUTION

DEFECTS IN NEGATIVE DUE TO CONDITION OF ORIGINAL DOCUMENT

e. m. peto associates ltd.

Toronto 19, Ontario



STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY

MASS. INST. OF TECH. CLASSIFICATION

JOB NAME Montrose Bridge JOB NO. 6439 HOLE NO. 4 SAMPLE NO. 17

DEPTH 35'-36'6" ELEVATION _____ REMARKS Sandy silt

GRAIN SIZE DISTRIBUTION

Fig. 6

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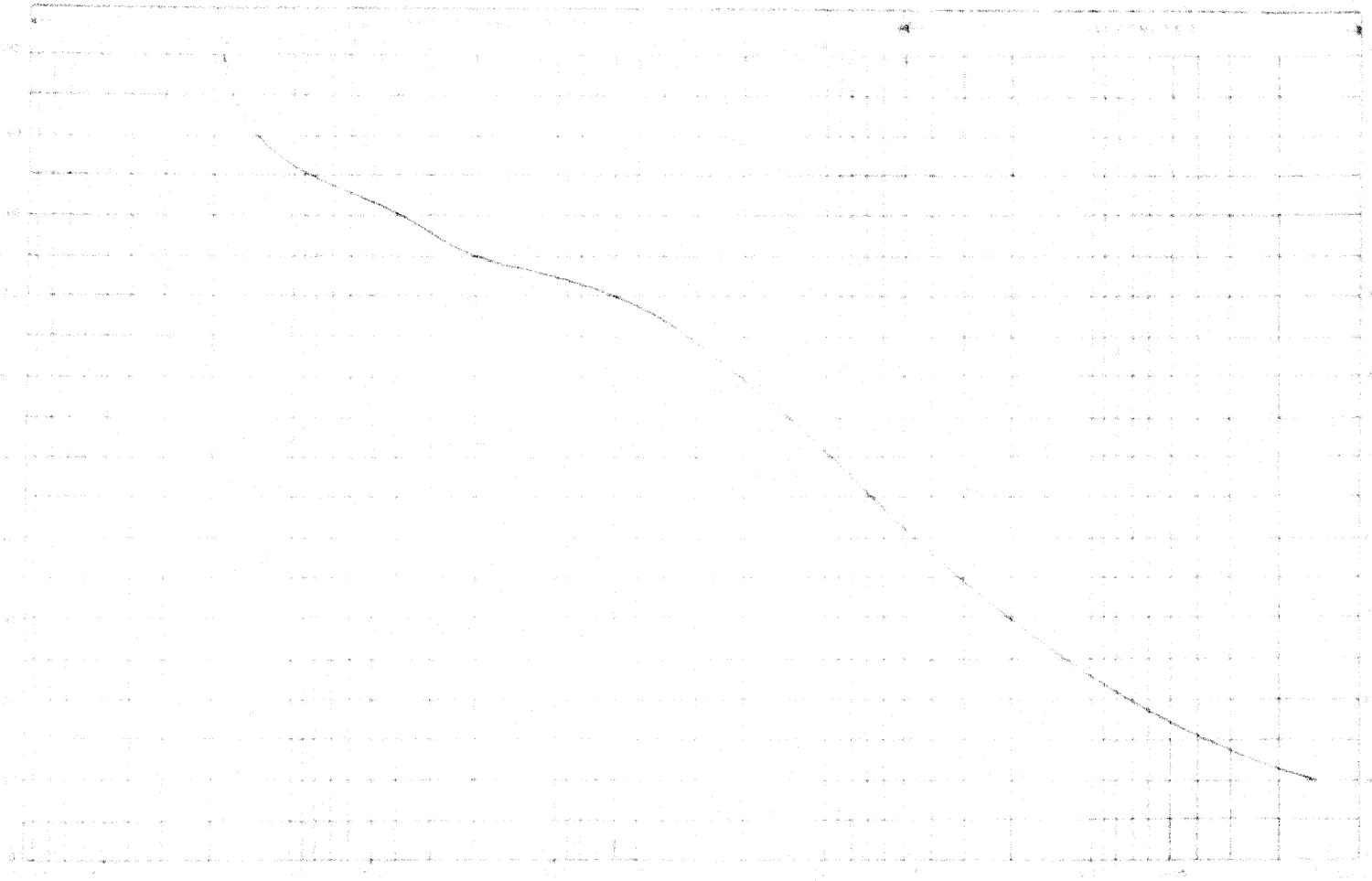
Toronto 19 Ontario



GRAIN SIZE IN MILLIMETERS

GRAVEL		SAND			SILT		CLAY
COARSE	FINE	COARSE	MEDIUM	FINE			

MASS PART OF EACH CLASSIFICATION

JOB NAME [illegible] JOB NO. [illegible] HOLE NO. _____ SAMPLE NO. _____

DEPTH [illegible] ELEVATION _____ REMARKS [illegible]

GRAIN SIZE DISTRIBUTION

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

Fig 7

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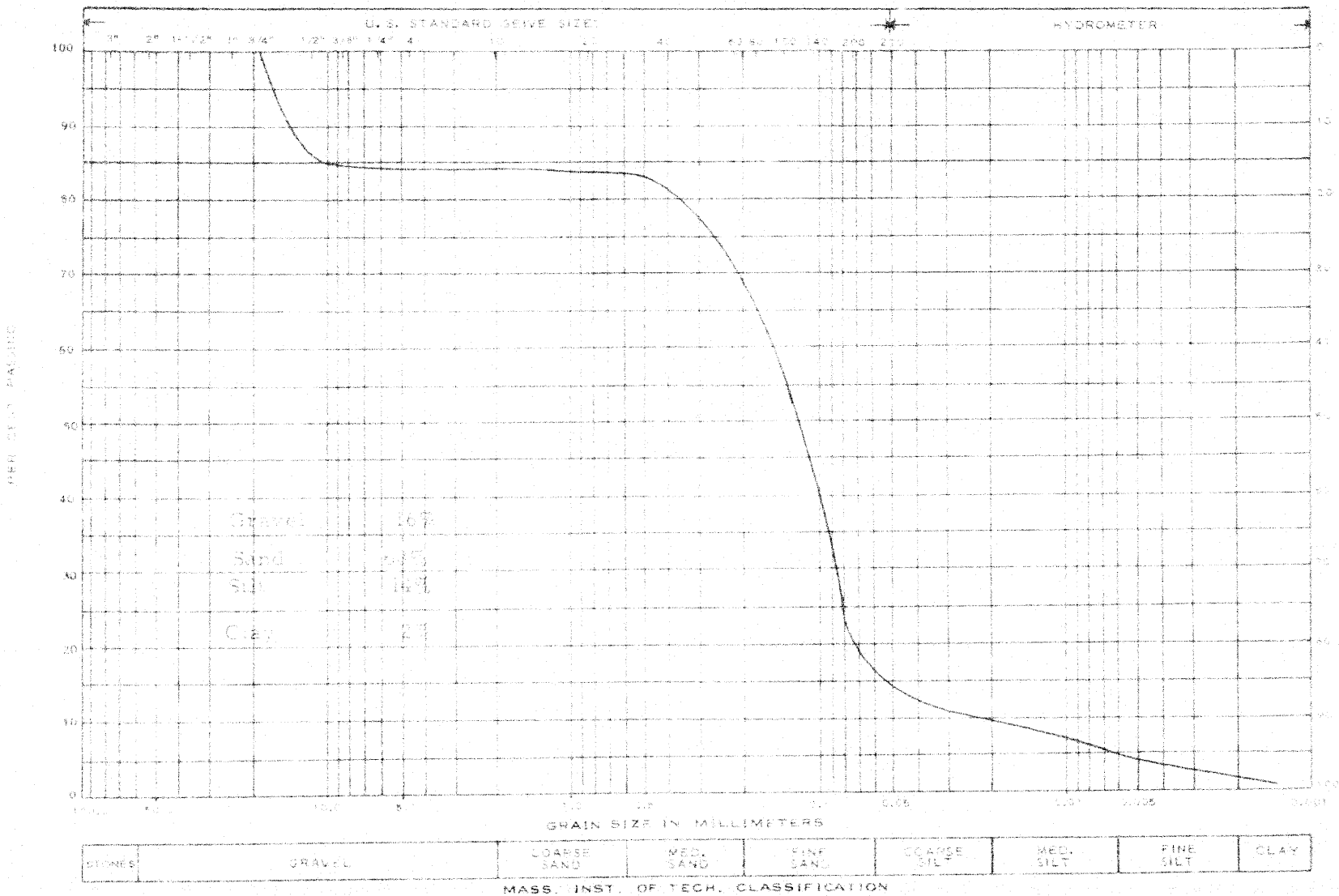

JOB NAME Montrose Bridge JOB NO. 6439 HOLE NO. 3 SAMPLE NO. 9

DEPTH 50'-51'6" ELEVATION _____ REMARKS sand

GRAIN SIZE DISTRIBUTION

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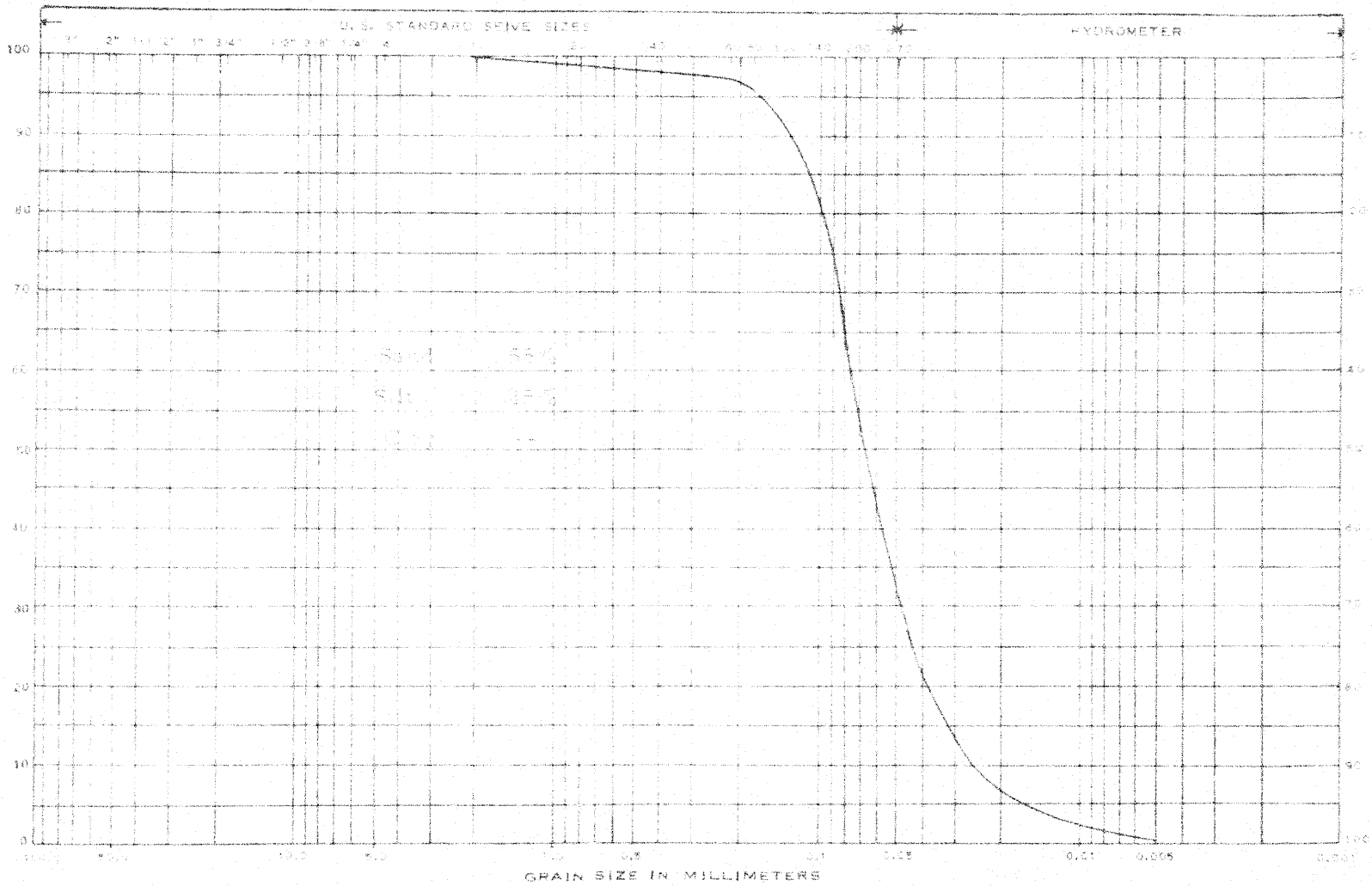
Toronto 19, Ontario



STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY

MASS. INST. OF TECH. CLASSIFICATION

JOB NAME Montrose Bridge JOB NO. 6439 HOLE NO. 4 SAMPLE NO. 22

DEPTH 55'-56'6" ELEVATION _____ REMARKS Very silty sand

GRAIN SIZE DISTRIBUTION

6-514

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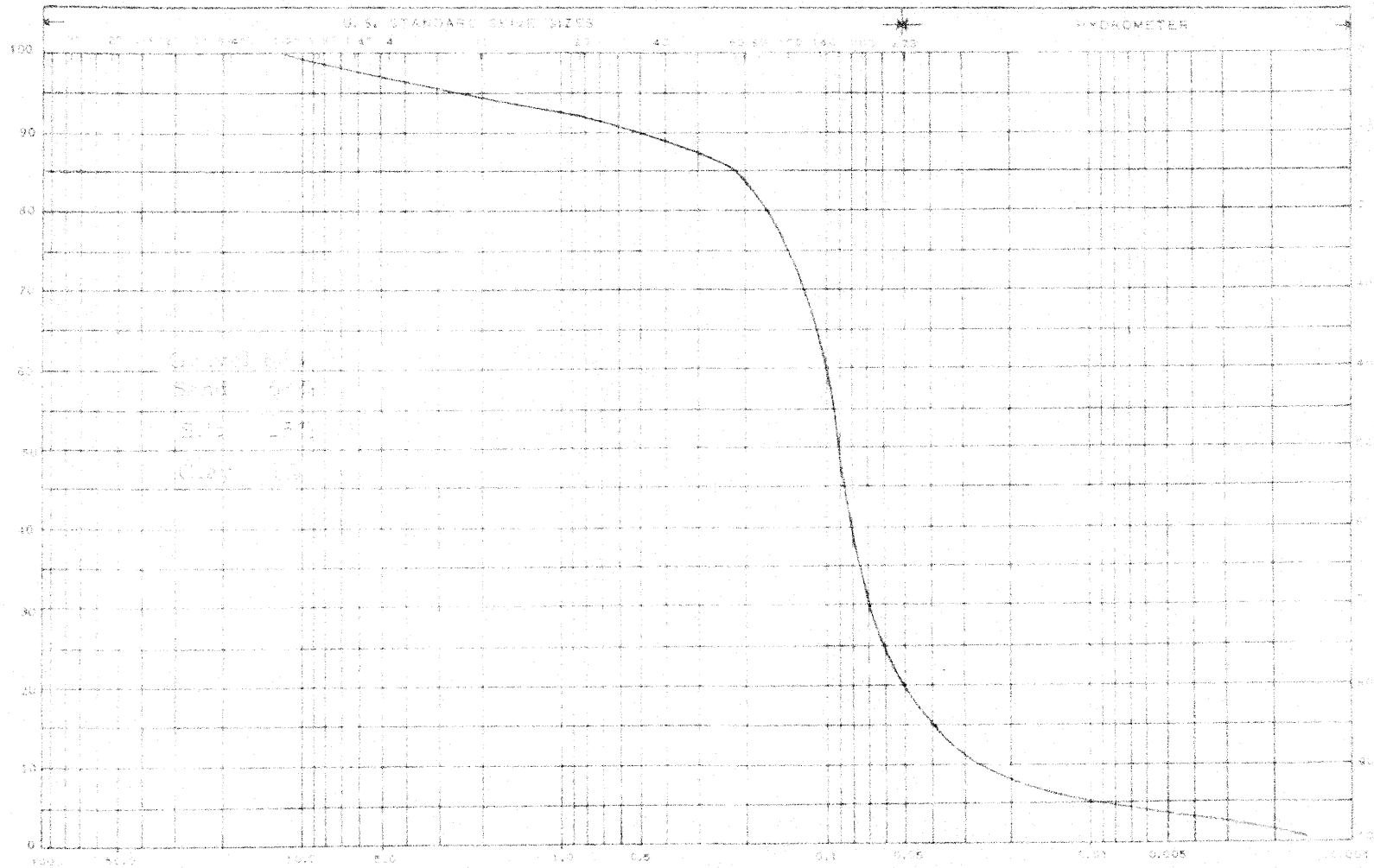
Toronto 19, Ontario



STONES	GRAVEL	COARSE SAND	MED. SAND	FINE SAND	COARSE SILT	MED. SILT	FINE SILT	CLAY

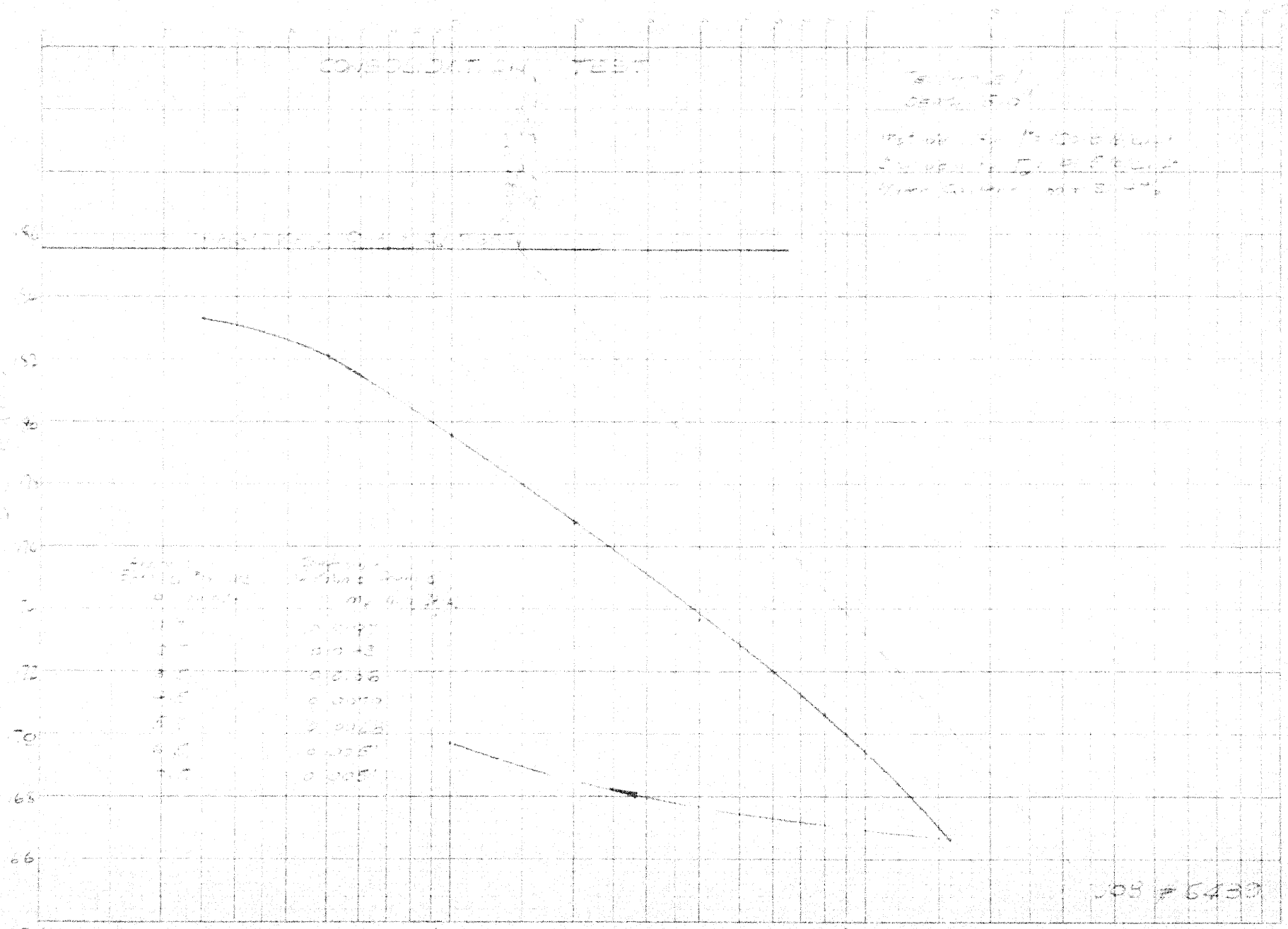
MASS. INST. OF TECH. CLASSIFICATION

JOB NAME Montrose Bridge JOB NO. 6439 HOLE NO. 4 SAMPLE NO. 23

DEPTH 60'-61'6" ELEVATION _____ REMARKS Sand

GRAIN SIZE DISTRIBUTION

1-19



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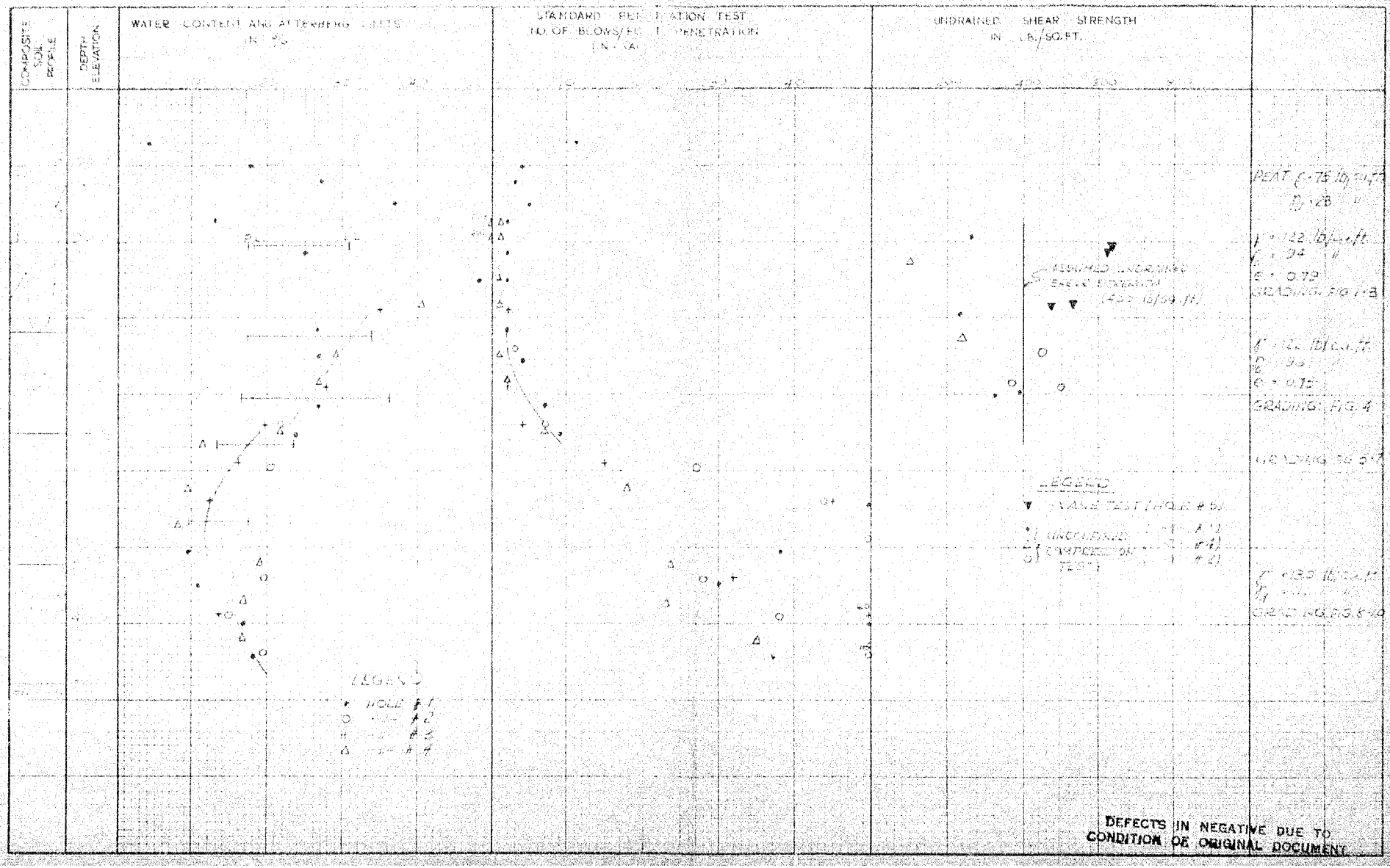
GEOTECHNICAL SOIL PROPERTIES

JOB NO. 6439
APPENDIX
FIG. 12



C. M. [illegible] Associates Ltd.

Job Name: [illegible]

Client: [illegible]

Elevation: [illegible]

SAMPLE CONDITIONS

- UNDISTURBED
- FAIR
- DISTURBED
- LOST

[illegible]

[illegible] BROWN [illegible]

Mixed silt and gravel [illegible] asphalt

Ditto mainly medium [illegible]

Organic [illegible]

Silty [illegible]

Ditto

As above

Ditto

Ditto

Clayey silt interbedded with clay layers

Silty [illegible]

Ditto

Ditto [illegible]

Fine and [illegible]

Limestone bedrock

Sandy clay till

[illegible]

Ditto

Ditto

Ditto

Angular [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Ditto

this margin reserved for binding

e. m. peto associates ltd.

SOIL ENGINEERING SERVICE — TORONTO, ONTARIO

BOREHOLE LOG

Job Name: Mississauga Pipeline — Job No.: [illegible] — Borehole No.: [illegible]

Client: The County of Wellington — Location: [illegible] — Logged By: [illegible]

Elevation: [illegible] — Completed By: [illegible] — Checked By: [illegible]

SAMPLE CONDITION

- UNDISTURBED
- FAIR
- DISTURBED
- LOST

SAMPLE TYPE

A.S. AUGER SAMPLE
C.S. CAMING SAMPLE
S.S. SPLIT SPOON SAMPLE
S.T. THIN WALL TUBE SAMPLE
W.S. WASH SAMPLE
S.G. SAND CORE

GROUND WATER

G.T. [illegible]
N. NONE
W.L. WATER LEVEL [illegible]
W.S. [illegible]
A.B.H. [illegible]
B.H.D. [illegible]
A.D. [illegible]

SOIL DESCRIPTION	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
River Bottom at 14'0"						
organic alluvium	[illegible]	[illegible]	[illegible]			
Silty clay silt layers odd gritty	[illegible]	[illegible]	[illegible]			
Ditto	[illegible]		[illegible]			
Silty clay silt layers odd clots	[illegible]		[illegible]			
Granular fill	[illegible]	[illegible]	[illegible]			
		[illegible]	[illegible]			
Fine very fine sand	[illegible]	[illegible]	[illegible]			
Ditto	[illegible]	[illegible]	[illegible]			
Fine [illegible] sandy silt	[illegible]	[illegible]	[illegible]			
Virtual refusal [illegible]	[illegible]	[illegible]	[illegible]			

BOREHOLE TERMINATED AT [illegible]

DEPTHS IN [illegible]

CONDITION OF [illegible] DOCUMENT

e. m. peto associates ltd.

SOIL ENGINEERING SERVICES — TORONTO, ONTARIO

BOREHOLE LOG

Job Name: [illegible] B.H. No.: [illegible] Date: [illegible]

Client: [illegible] Contract: [illegible] Sheet: [illegible]

Elevation: [illegible] Datum: [illegible] Co-ordinates: [illegible]

SAMPLE CONDITION

- UNDISTURBED
- FAIR
- DISTURBED
- LOST

SAMPLE TYPE

[illegible]

SAMPLE PREPARATION

[illegible]

SOIL DESCRIPTION	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Silty clay and [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Silty clay and sand	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ditto with [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Silt, fill material, [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ditto	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Fine sand	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ditto with [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vertical [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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SOIL ENGINEERING SERVICES — TORONTO, ONTARIO

BOREHOLE LOG

Job Name: Algonquin Estates
Client: The County of Peterborough
Elevation: [illegible]
Job No.: [illegible]
Grading: [illegible]
Compiled By: [illegible]
Location: [illegible]
Date: [illegible]
Checked By: [illegible]

SAMPLE CONDITION

- UNDISTURBED
- FAIR
- DISTURBED
- LOST

SAMPLE TYPE

- A.S. AUGER SAMPLE
- C.S. CHISEL SAMPLE
- S.S. SPLIT SPOON SAMPLE
- S.T. SHELBY TUBE SAMPLE
- C.T. TOPSAW TUBE SAMPLE
- W.S. WASH SAMPLE
- R.C. ROCK CORE

TERMS USED

- V.L. Very Loose
- L. Loose
- M. Medium
- S.L. Slightly Loose
- S.D. Slightly Dense
- D. Dense
- V.D. Very Dense
- S.F. Stiff
- V.S. Very Stiff
- H. Hard
- C.P.T. Cone Penetrometer Test
- A.S.T. Auger Sample Test

SOIL DESCRIPTION	SAMPLE	DEPTH	ELEVATION	SAMPLE TYPE	SAMPLE CONDITION	TERMS USED
[illegible] of 10 to 20 [illegible] vegetable matter roots, grass [illegible]						
Silty peat, non fibrous	[illegible]	[illegible]	[illegible]			
Ditto						
Ditto	[illegible]	[illegible]				
Ditto changing to silty clay with silt layers	[illegible] brown	[illegible]	[illegible]			
Silt	[illegible]	[illegible]	[illegible]			
Silty clay getting odd pebbles	Reddish brown soft					
Ditto	[illegible]	[illegible]				
Silty clay getting [illegible] odd stones, silt [illegible]	[illegible]	[illegible]				
Ditto						
Coarse to fine gravelly silt Sandy silt silt, [illegible]	[illegible]	[illegible]				
Silt fine sand & pebbles	Reddish brown	[illegible]	[illegible]			
Silty clay	[illegible] brown	[illegible]	[illegible]			
Very [illegible]	[illegible]	[illegible]				
Silt [illegible] and [illegible]						
Purpose for [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]	[illegible]	[illegible]				

DEFECTS IN NEGATIVE DUE TO CONDITION OF ORIGINAL DOCUMENT

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SOIL ENGINEERING SERVICE – TORONTO, ONTARIO

BOREHOLE LOG

Job Name: Montrose Bridge | Job No.: 6439 | Borehole No.: 5

Client: The County of Welland | Casing: 4" | Boring Date: 20th - 21st April 1964.

Elevation: 106.2 | Compiled By: B. L. | Checked By: A. P.

SAMPLE CONDITION

- UNDISTURBED
- FAIR
- DISTURBED
- LOST

SAMPLE TYPE

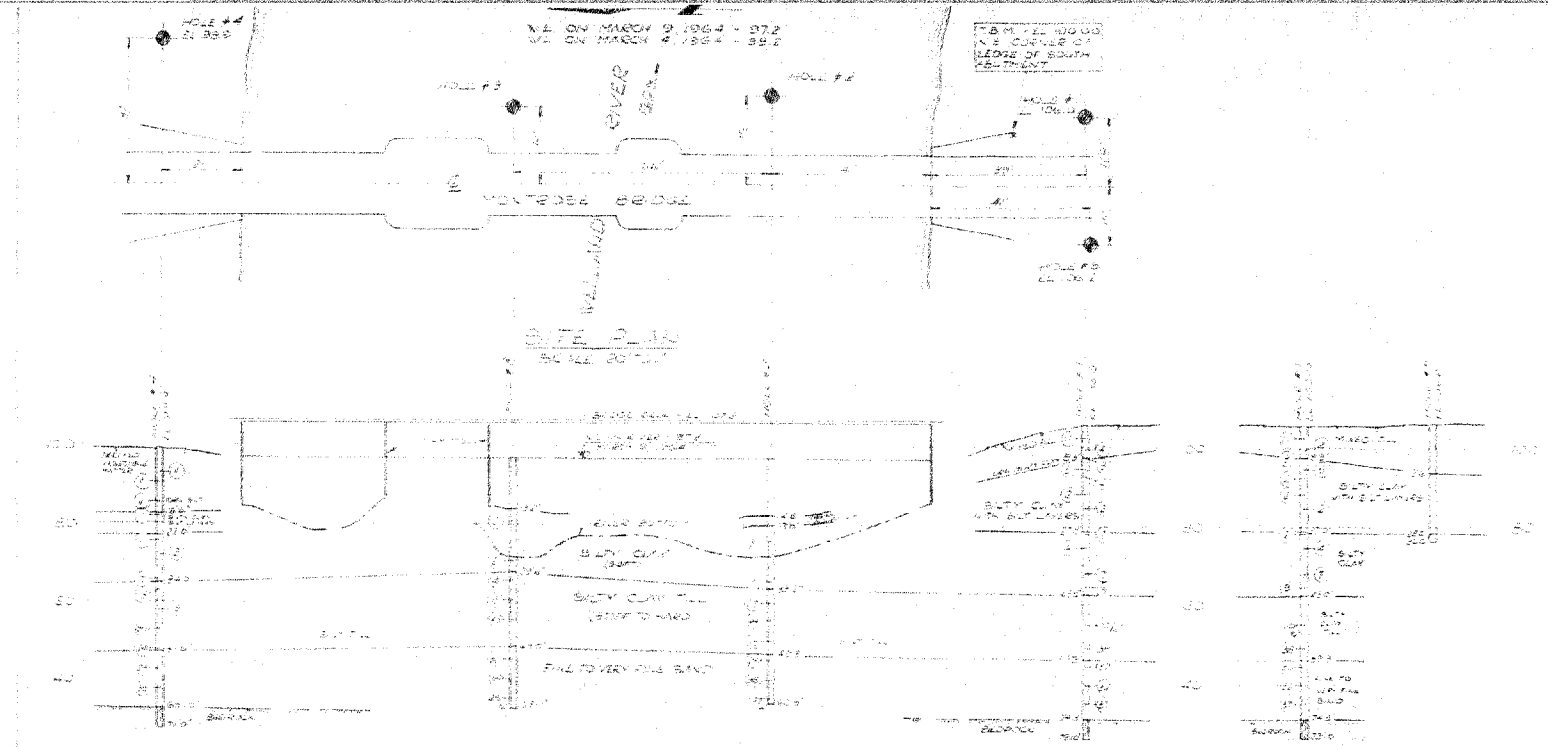
- A.S. AUGER SAMPLE
- C.S. CASING SAMPLE
- S.S. 2" STANDARD SPLIT TUBE SAMPLE
- S.L. SPLIT BARREL WITH LINERS
- S.T. THIN-WALLED SHELBY TUBE SAMPLE
- W.S. WASH SAMPLE
- R.C. ROCK CORE

ABBREVIATIONS

- V.T. IN SITU VANE SHEAR TEST
- M. MOIST
- W.L. WATER LEVEL IN CASING
- W.T. GROUND WATER TABLE IN SOIL
- W.T.P.L. WETTER THAN PLASTIC LIMIT
- D.T.P.L. DRIER THAN PLASTIC LIMIT
- A.P.L. ABOUT PLASTIC LIMIT

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Scale Elev.	Legend	Sample No. and Condition	Sample Type	Blows per 1'	Moisture Content	WATER LEVELS & REMARKS
	Existing Grade		0'0"						
									Augered down to 15 feet. No samples recovered.
Fill (crushed stone and silty clay)									
			12'0"						
Silty clay with silt lamina	Reddish-brown with grey				1	3"SL			Much W. T. P. L.
						VT			VT = 637 lb/sq. ft.
						VT			VT = 628 lb/sq. ft.
As above	As above				2	3"SL			Much W. T. P. L.
						VT			VT = 532 lb/sq. ft.
As above	As above					VT			VT = 462 lb/sq. ft.
					3	3"SL			Much W. T. P. L.
			28'0"						
Silty clay, silt seams odd g & p	Reddish-brown		30'0"						

TEST HOLE TERMINATED AT 30 FEET.



LEGEND

● BOREHOLE

—2 BLOWS/FOOT S.T.P.

NOTE

SEE BOREHOLE LOGS FOR COMPLETE SOIL DETAILS.

NOTE: [illegible] vary from those shown on cross sections.

THE COUNTY OF WELLAND
[illegible]

VENTROSS BRIDGE
[illegible]

PREPARED BY
[illegible]

JOB NO	DATE	DWN. BY	CHECKED BY
5489	MAY 1964	KK	[illegible]