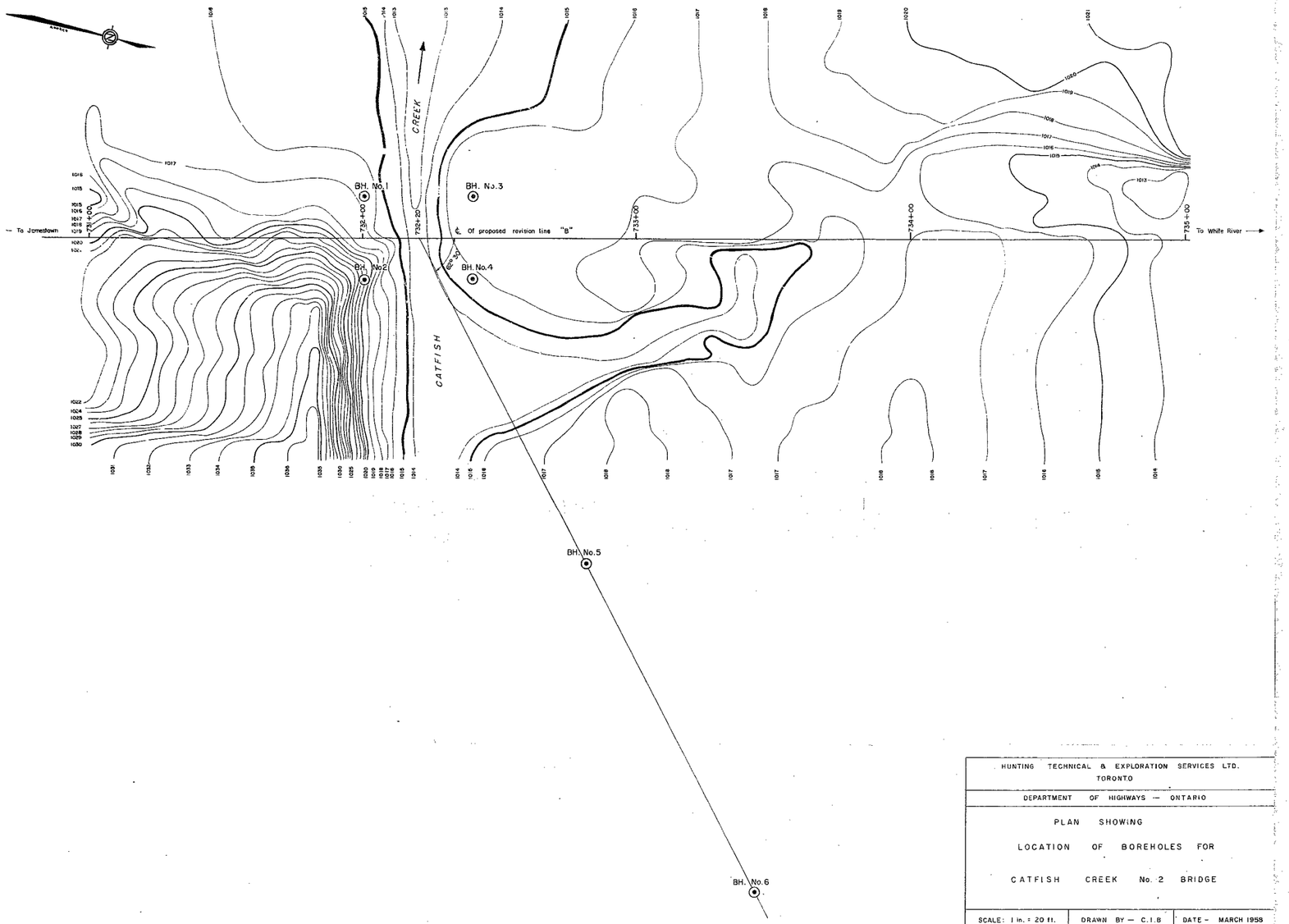
58-F-289C
W.P. 931-57
Hwy. #17
CATFISH CREEK
#2 BRIDGE



HUNTING TECHNICAL & EXPLORATION SERVICES LTD. TORONTO		
DEPARTMENT OF HIGHWAYS — ONTARIO		
PLAN SHOWING LOCATION OF BOREHOLES FOR CATFISH CREEK No. 2 BRIDGE		
SCALE: 1 in. = 20 ft.	DRAWN BY — C.I.B	DATE — MARCH 1958
REFERENCE — DWG. E 3349-1		

BA 717

HUNTING TECHNICAL AND EXPLORATION SERVICES LIMITED

RESOURCES AND DEVELOPMENT STUDIES

1450 O'CONNOR DRIVE
TORONTO 16, CANADA
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NEW YORK
CARACAS
RIO DE JANEIRO

March 24th., 1958.

WP-931-57

Mr. S. McCombie,
Bridge Officer,
Department of Highways - Ontario.

Dear Sir;

We are transmitting herewith four (4) copies of our report entitled "Preliminary Site Investigation for the Proposed Catfish Creek No. 2 Bridge".

We trust that this report will be to your satisfaction and that we may have the pleasure of working for you again.

Yours very truly,

HUNTING TECHNICAL AND EXPLORATION SERVICES LIMITED

F. Kilgour
for

D. R. Lueder,
Chief,
Engineering Division.

DRL/ko

PRELIMINARY SITE INVESTIGATION

for the

PROPOSED CATFISH CREEK NO. 2 BRIDGE

near

JAMESTOWN, ONTARIO

for the

DEPARTMENT OF HIGHWAYS - ONTARIO

by the
ENGINEERING DIVISION
HUNTING TECHNICAL AND EXPLORATION SERVICES LIMITED

March, 1958

Toronto, Ontario.

ORDER OF CONTENTS

Section 1.1

PURPOSE OF REPORT

1.11 General

The purpose of this report is to present the results of a sub-surface soil investigation for the proposed Catfish Creek No. 2 Bridge near Jamestown, Ontario.

Section 1.2

DISCUSSION OF PROCEDURES

1.21 Location of Boreholes

The borehole locations for this investigation were established by Department of Highways' surveyors. At the completion of the work, each borehole was marked with a large stake denoting the hole number for future reference. The borehole locations are shown on the plan in Appendix 1.51.

1.22 Subsurface Drilling and Sampling

A primary program, specified by the client, of 4 soil borings was initiated in the vicinity of the proposed site of the Catfish Creek No. 2 Bridge. The program was later enlarged to include 2 additional holes along the route of a proposed channel improvement in connection with the bridge construction.

A skid mounted, hydraulic head junior Longyear diamond drilling rig was used on this project. All boring and sampling operations were completed by an experienced soil sampling crew under the supervision of a geologist experienced in soil sampling procedures.

In the first boring, an attempt was made to advance the hole by the standard wash boring method. In this procedure, drill casing is driven into the soil by a 350 lb. hammer to a depth of 5 feet. All the contained soil is thoroughly washed out to the bottom of the casing. Sampling tools are then lowered on the ends of the rods to the bottom of the hole. The sample is taken and the sampling tools removed from the hole. An additional 5 foot length of casing is added and the procedure is repeated. However, in the loose material in the first hole, it was found that the impact method of advancing the casing caused the material to "flow" into the casing. As a result, the soil at the bottom of the casing was considered unlikely to be in its natural state. Thus, the field boring supervisor decided to advance the casing by diamond drilling techniques. In this procedure, the bottom end of the casing is fitted with a diamond shoe bit, and is fed into the ground by the diamond drill. Water is used in this method to clean and cool the diamond drill bit as well as carry the sludge out of the hole during the actual drilling operations. It was found that this method allowed the hole to be advanced with a minimum of disturbance to the loose sand. An additional advantage with this method is that, whenever large boulders or glacial till were encountered they were easily penetrated with the diamond shoe bit.

Wherever possible, split spoon samples were obtained in cohesionless materials by means of a 2 inch O.D. standard split spoon sampler. The standard penetration test using a 140 lb. hammer falling 30 inches was recorded for each foot of sample taken with the split spoon sampler. Great difficulties were encountered in obtaining a split spoon sample in the loose sand, even though trap valves, spring type sample retainers, and basket shoes were used to help retain the sample. In this material, it was found necessary to take the penetration tests with the split spoon sampler then lower a side slit sampler to recover the sample.

1.23 Soil Testing

All disturbed representative samples, i.e., split spoon samples and side slit samples, were visually examined and classified on the site, then placed in jars and forwarded to the engineering office. Selective samples from each strata were forwarded to the laboratory as a check on the visual field classification.

The results of all tests are given in the Appendices. The laboratory tests on the samples were performed by:

Donald Inspection Ltd.,
340 Richmond St. West,
Toronto, Ontario.

Section 1.3

DISCUSSION OF SITE

1.31 Geographic Location

The proposed bridge site is located on Catfish Creek at the proposed crossing of the King's Highway No. 17, (revision line "B". The site is in the District of Algoma approximately 9 miles north of the village of Jamestown. The bridge site location is shown on the airphoto in Appendix 1.54.

1.32 Bedrock Geology

The bedrock in the vicinity of the bridge site is entirely Precambrian in age, and appears to consist generally of assorted gneisses and greywacke.

1.33 Overburden Geology

The landform in the general area of the proposed site consists of a relatively flat river valley bounded on the east and west by Precambrian hills of low relief under a shallow to moderately deep glacial till mantle. The valley is partially filled with post-glacial lacustrine deposits of a lake that once filled the entire valley. Catfish Lake is one of the remnants of this glacial lake (see Appendix 1.54).

The soil deposits within the valley are typical of a post-glacial emergent landform. A glacial till overlies the bedrock which in turn is overlain by glacio-lacustrine deposits. On top of these we find beach or glacio-fluvial material as shown in the soil profiles in Appendix 1.52.

1.34 Soil Conditions

Soils encountered at the site consisted primarily of three structural types. Overlying the bedrock, a medium dense to dense glacial till was found. A medium dense sand with silt strata was encountered on top of the till. The sand with silt was in turn overlain by several feet of loose sand topped by a few feet of loose sand and gravel.

The physical properties of each type of soil encountered at the site are summarized below in the order of their occurrence above bedrock.

1. - Medium Dense to Dense Gravel with Sand, some Silt (till texture)

This soil was encountered immediately above bedrock over the entire site. The physical properties for this soil are listed below:

Gradation (M.I.T. Classification)

Gravel	50% - 67%
Sand	22% - 35%
Silt	10% - 16%

Specific Gravity (Ave.)	2.68 (range 2.66 to 2.70)
Average Depth	21.2 feet
Top Elevation Range	965 feet to 982 feet
Bottom Elevation Range	946 feet to 955 feet
Penetration Resistance average	33 blows/foot
Range	23 to 50 blows/foot
Nomenclature	Medium dense to dense grey gravel with sand, some silt, occasional boulder (till texture)

2. Medium Dense Sand with Silt

This material overlies the glacial till and is found in all boreholes except No. 3. This stratum contains a layer of sand. However, for structural purposes, in this investigation, they can be treated as one stratum. The physical properties for this soil are listed below:

Gradation (M.I.T. Classification)

Gravel	None
Sand	65% to 87%
Silt	13% to 35%

Specific Gravity (Ave.)	2.64 (range 2.63 to 2.66)
Average Depth	28.8 feet
Top Elevation Range	992 feet to 998 feet
Bottom Elevation Range	965 feet to 970 feet
Penetration Resistance average	18 blows/foot
Range	10 to 38 blows/foot
Nomenclature	Medium dense grey sand with silt.

3. Loose Sand

This material overlies the medium dense sand with silt and is found in all the boreholes. The physical properties for this stratum are listed below:

Gradation (M.I.T. Classification)

Gravel	0% to 5%
Sand	92% to 100%
Silt	0% to 8%

Specific Gravity (Ave.)	2.66 (range 2.62 to 2.70)
Average Depth	17.5 feet
Top Elevation Range	1005 feet to 1012 feet
Bottom Elevation Range	982 feet to 999 feet
Penetration Resistance average	3.75 blows/foot
Range	1 to 12 blows/foot
Nomenclature	Loose grey sand, trace of silt.

4. Loose Gravel with Sand

This material is found at ground surface as a capping on top of the loose sand. The physical properties for this material are listed below:

Gradation (M.I.T. Classification)	
Gravel	69%
Sand	21%
Silt	None
Specific Gravity	2.68
Average Depth	7 feet
Top Elevation Range	1015 feet to 1020 feet
Bottom Elevation Range	1005 feet to 1012 feet
Penetration Resistance Average	6 blows/foot
Range (unfrozen state)	3 to 10 blows/foot
Nomenclature	loose brown gravel, some sand.

1.35 Comments

Our understanding of the initial bridge design is that abutments are contemplated at chainages 732+00 and 732+40. The approaches to the bridge are to be made on fill, contained and protected by wing walls.

With reference to this proposal, we would like to make the following comments for your consideration:

1. Considering the possibility of using spread footings for the base of the abutments and wing walls, we estimate the bearing capacity of the soil beneath the base of the footing to be in the order of 350 lbs. per square foot. It can therefore be concluded that the soil does not have adequate bearing capacity for this type of foundation.

2. It appears that it will be necessary to support the bridge abutments and wing walls on pile foundations. Since pipe piles and H piles are rarely used unless they reach a stratum of exceptionally high supporting capacity, and the soil profile does not indicate an exceptionally firm strata within a reasonable depth from surface, we recommend that consideration be given to friction piles of the compaction type for the abutment and wing wall foundations.

3. We have assumed that wooden friction piles will prove to be the most economical and convenient type of pile to use on this structure. As the ultimate bearing capacity of piles in sand increases roughly with the square of the depth of penetration, we assume that the wooden piles will be driven as deep as possible without injuring the pile.

   Assuming that the pile foundation will be designed on the basis of pile driving formula, in order to assist the designer in determining the required pile length, we have enclosed a graph (Fig. 1) roughly indicating the depth of pile penetration versus the blows per inch for the loose sand and for the medium dense sand shown in the soil profiles.

4. With reference to horizontal loads on the vertical piles beneath the structure, we would not recommend the use of loads greater than 1000 lbs. at the top of each pile.

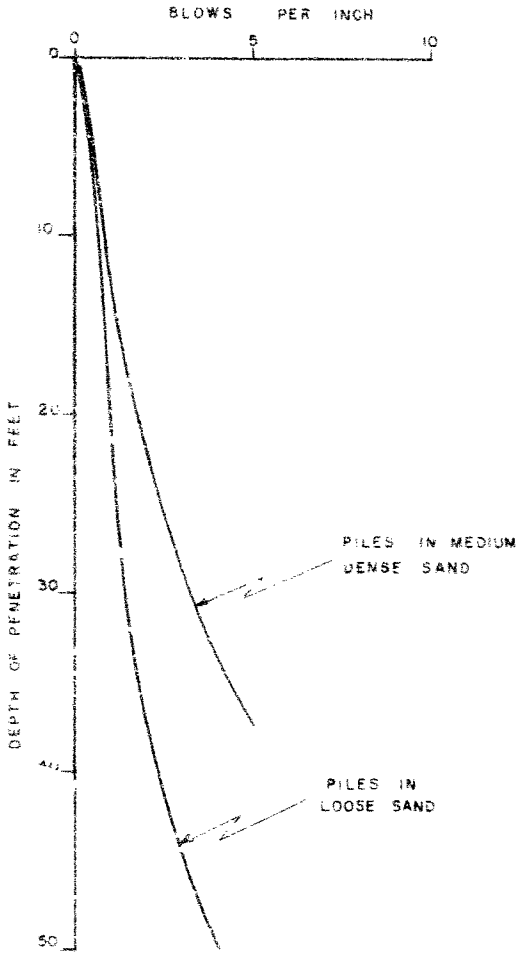


Fig.

RELATION BETWEEN BLOWS PER INCH OF PENETRATION AND TOTAL DEPTH OF PENETRATION FOR WOOD PILES

after TERZAGHI and PECK

Section 1.4

PERSONNEL

The field work was performed under the supervision of Mr. D. G. Fraser.

This report was written by J. Kilgour, P. Eng., with the assistance of P. Arkema, P. Eng.

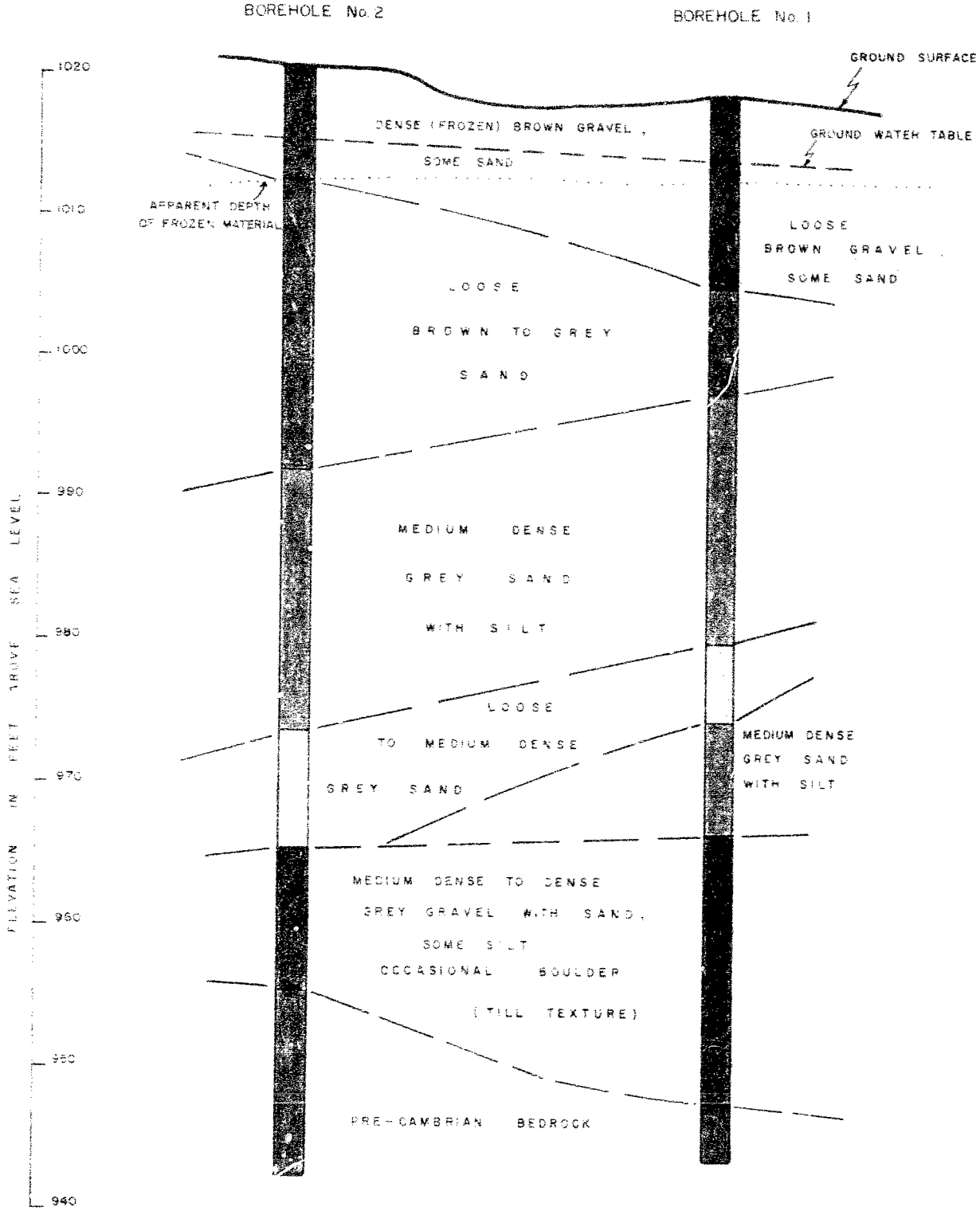
D. R. Lueder, P. Eng., provided administrative supervision of the work.

Section 1.5

APPENDICES

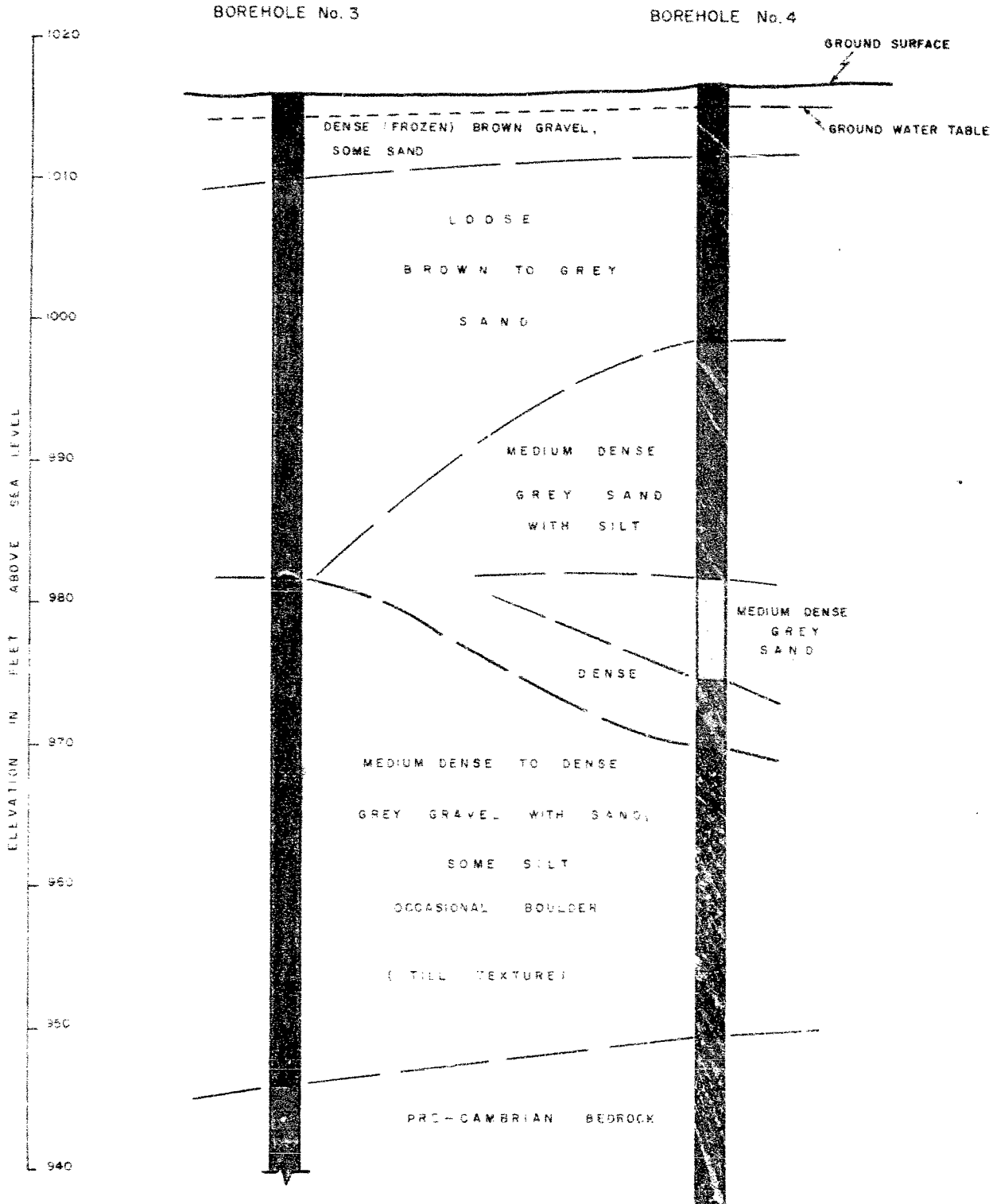
1.51 GENERAL PLAN OF SITE

1.52 SUBSURFACE SECTIONS



SUB-SURFACE SECTION ALONG PROPOSED SOUTH ABUTMENT CENTRE LINE - LOOKING SOUTH

Scale - 1" - 10'



SUB-SURFACE SECTION ALONG PROPOSED NORTH ABUTMENT CENTRE LINE - LOOKING NORTH.

Scale - 1" = 10'

HUNTING TECHNICAL and EXPLORATION SERVICES

JOB H273/57
BOREHOLE 1
COMPILED J.K.
CHECKED P.A.

PAGE 1.

JOB NO. H273/57 LOCATION CATFISH CREEK No 2
CLIENT DEPARTMENT OF HIGHWAYS - ONTARIO
COORDINATES CH. 732 + 00 - 15' LEFT
ELEV (Surface) 1018·4' (Collar) Datum D.H.O.

BOREHOLE NUMBER 1

Date (Started) Jan 21, 1958 (Finished) Jan. 23, 1958
RIG NO. 1 TYPE LONGYEAR Jr. A

silt, clay, sand, gravel, peat, fill, limestone rock, igneous or metamorphic rock

C - Consolidation test
γ_d - dry density
γ_f - field density
M - mechanical analysis
WEIGHT OF HAMMER 140 lb DROP 30 IN.

Q - unconsol undr. shear
Qc - consol drained shear
S - drained shear
V - vane shear (in situ)
U - unconfined compressive strength

C - core
K - Permeability
w_n - field moisture content
w_p - plastic limit
w_l - liquid limit

Up approx. U as indicated by calibrated penetrometer
P - field penetration tests
x - standard penet. 2 S.S.
o - cone penetration (60 2½)
Δ - other

E.S. - chunk
S.S. - split spoon
S.L. - sleeve sample
S.T. - shelby tube
B.A. - barrel auger
S.A - Spiral auger

T.W. - thin, walled, open
T.W.P. - thin walled piston
D.P. - drive pistor.
D.F.V. - drive foot valve
D.B. - diamond bit
R.B. - Rock bit

F.T. - fish-tail
W.O. - wash-out
undisturbed
disturbed but represent.
lost

BORING LOG

TESTS

SAMPLES

REMARKS

SCALE DEPTH ELEV CASING	WATER OBSERVATION	LOG	DESCRIPTION
ft ft ft			
5			FROZEN TOPSOIL
5 9" 1012·6			DENSE (FROZEN) BROWN GRAVEL SOME SAND & SILT
10 NX GWT			LOOSE BROWN GRAVEL , SOME SAND
3·6' 1004·9			
15			LOOSE BROWN TO GREY SAND
20 2 997·4			
25			MEDIUM DENSE
30			GREY SAND
35			WITH SILT
40			MEDIUM DENSE GREY SAND
45			MEDIUM DENSE GREY SAND WITH SILT

FIELD. ft — 5 15 25 50 100 150 — PENETRATION TEST RESULTS (P. in blows per foot)

LABORATORY. DENSITY and NATURAL WATER CONTENT (wn % of dry weight); □ — DENSITY; ● — NATURAL WATER CONTENT; ATTERBERG LIMITS w_p ——— w_l

ELEV.	γ_d (pcf)	γ_f (pcf)	O	Qc	S	C	M	Other
1012·6								
1004·9							✓	
997·4							✓	

No.	COND.	DEPTH From	DEPTH To	TYPE	RECOVERY Length Rec. / Dist. Drive.	HYD. PRESS (p.s.i.)	PENET. RESIS. on SAMPLER BLOWS PER FOOT
1		0	1'6"	S S	17/18		39
2		2'	3'6"	S S	15/18		40
3		6'6"	8'	S S	13/18		3
4		10'	11'6"	S S	→		-
5		14'	15'6"	S S	→		2
6		19'	20'6"	S S	→		2
7		24'	25'6"	S S	→		12
8		29'	30'6"	S S	7/18		15
8A		36'	37'6"	S S	10/18		28
9		40'	41'6"	S S	0/18		14
10		45'	46'6"	S S	6/18		30
11		48	49'6"	S S	0/18		22

SCALE: 5, 10, 15, 20, 25, 30, 35, 40, 45

SAMPLE RECOVERED WITH SIDE SLIT SAMPLER

1.53 OFFICE LOG OF BOREHOLES

HUNTING TECHNICAL and EXPLORATION SERVICES

JOB H273/57
BOREHOLE 1
COMPILED J.K.
CHECKED P.A.

JOB NO. H273/57 LOCATION CATFISH CREEK No 2
CLIENT DEPARTMENT OF HIGHWAYS – ONTARIO
COORDINATES CH. 732 + 00 – 15' LEFT
ELEV. (Surface) 1018·4' (Collar) Datum D.H.O.

BOREHOLE NUMBER 1

Date (Started) Jan. 21, 1958 (Finished) Jan. 23, 1958
RIG NO. 1 TYPE LONGYEAR Jr A

silt, clay, sand, gravel, peat, fill, limestone rock, igneous rock

C — Consolidation test
γ_d — dry density
γ_f — field density
M — mechanical analysis
WEIGHT OF HAMMER 140 lb

Q — unconsol. undr. S. Shear
Qc — consol. drained shear
S — drained shear
V — vane shear (in situ)
DROP 30 IN.

C — core
K — Permeability
wn — field moisture content
wp — plastic limit
w$_l$ — liquid limit
U — unconfined compressive strength

Up — approx. U as indicated by calibrated penetrometer
P — field penetration tests
x — standard penet. 2 S.S.
□ — cone penetration (60 2½)
△ — other

E.S. — chunk
S.S. — split spoon
S.L. — sleeve sample
S.T. — shelby tube
B.A. — barrel auger
S.A. — Spiral auger

T.W. — thin, walled, open
T.W.P. — thin walled piston
D.P. — drive piston
D.F.V. — drive foot valve
D.B. — diamond bit
R.B. — Rock bit

F.T. — fish-tail
W.O. — wash-out
— undisturbed
— disturbed but represent.
— fair
— lost

BORING LOG

TESTS

SAMPLES

REMARKS

SCALE DEPTH	ELEV	CASING.	WATER OBSERVATION	LOG.	DESCRIPTION
ft	ft	ft	ft		
52	966·4				MEDIUM DENSE GREY SAND WITH SILT
55					DENSE GREY GRAVEL WITH SAND, SOME SILT, OCCASIONAL BOULDER (TILL TEXTURE)
60					
65					
70	712	947·3			
					BEDROCK SURFACE
75	750	943·4			
80					END OF BOREHOLE
90					
95					

FIELD.

ft — 5 — 15 — 25 — 50 — 100 — 150
PENETRATION TEST RESULTS (P. in blows per foot)

966·4
947·3
943·4

LABORATORY.

DENSITY and NATURAL WATER CONTENT (wt. % of dry weight)
□ — DENSITY
● — NATURAL WATER CONTENT
ATTERBERG LIMITS wp ——— wl

γ_d (pcf)	γ_f (pcf)	Q	Qc	S	C	M	Other

No.	COND.	DEPTH From	DEPTH To	TYPE	RECOVERY Length Rec / Dist. Drive	HYD. PRESS	PENET. RESIS. on SAMPLER BLOWS PER FOOT (p.s.i.)	SCALE
12		52'	52'6"	S S	4/6		40	
13		53'	54'	S S	8/12		34	
14		55'	56'6"	S S	4/18		40	
15		57'6"	59'	S S	2/18		50	
16		65'	66'6"	S S	0/18		23	
17		71'1"	71'2"	S S				
18		71'2"	75'	D.B.				

BOULDERY

54 BLOWS FOR 1" IN PENETRATION

HUNTING TECHNICAL and EXPLORATION SERVICES

JOB H273/57
BORI HOLE 2
COMPILED J.K.
CHECKED P.A.

PAGE 1.

JOB NO. H273/57 LOCATION CATFISH CREEK No 2
CLIENT DEPARTMENT OF HIGHWAYS - ONTARIO
COORDINATES CHNG. 732 + 00 - 15' Right
ELEV. (Surface) 1020·4 (Collar) Datum D.H.O.

BOREHOLE NUMBER 2

Date (Started) Feb 6, 1958 (Finished) Feb. 10, 1958
RIG NO. 1 TYPE LONGYEAR Jr. A

silt, clay, sand, gravel, peat, fill, limestone rock, igneous origin rock

C - Consolidation test
γ_d - dry density
γ_f - field density
M - mechanical analysis
WEIGHT OF HAMMER 140 lb
DROP 30 IN.

Q - unconsol undr. shear
Qc - consol drained shear
S - drained shear
V - vane shear (in situ)
C - core
K - Permeability
wn - field moisture content
wp - plastic limit
wl - liquid limit
U - unconfined compressive strength

Up - approx. U as indicated by calibrated penetrometer
P - field penetration tests
x - standard penet. 2 S.S.
□ - cone penetration (60 2½)
⊥ - other

E.S. - chunk
S.S. - split spoon
S.L. - sleeve sample
S.T. - shelby tube
B.A. - barrel auger
S.A. - Spiral auger

T.W. - thin, walled, open
T.W.P. - thin walled piston
D.P. - drive piston
D.F.V. - drive foot valve
D.B. - diamond bit
R.B. - Rock bit

F.T. - fish-tail
W.O. - wash-out
undisturbed
disturbed - but represent.
fair
lost

BORING LOG

SCALED DEPTH ft	ELEV. CASING ft	WATER OBSERVATION	LOG	DESCRIPTION
5				FROZEN TOPSOIL. BROWN TO GREY DENSE (FROZEN) SAND AND GRAVEL.
8·0	1012·4			MEDIUM DENSE BROWN GRAVEL, SOME SAND & SILT
10		G.W.T.		LOOSE BROWN TO GREY SAND
15				
20				
25				
28·5	991·9			
30				MEDIUM DENSE GREY SAND, SOME SILT
35				
40				
45				
47·0	973·4			
50				LOOSE GREY SAND

TESTS

FIELD.

PENETRATION TEST RESULTS (P, in blows per foot) — ft: 5, 15, 25, 50, 100, 150

LABORATORY.

DENSITY and NATURAL WATER CONTENT (wn % of dry weight)
□ — DENSITY
● — NATURAL WATER CONTENT
ATTERBERG LIMITS wp ——— wl

γ_d (pcf)	γ_f (pcf)	O	Qc	S	C	M	Other
						✓	

SAMPLES

No.	COND.	DEPTH From	DEPTH To	TYPE	RECOVERY Length Rec. / Dist. Drv	HYD. PRESS (p.s.i.)	PENET. RESIS. on SAMPLER BLOWS PER FOOT	SCALE
1		0	1'0"	SS	20/21		16	
2		2'6"	3'5"	SS	10/11		60	5
3		6'	7'6"	SS	10/18		10	
4		9'6"	11'	SS	6/18		28	10
5		13'	14'6"	SS	2/18		5	15
6		18'	19'6"	SS	0/18		12	
7		20'	21'6"	SS	0/18		5	20
8		25'	26'6"	SS	6/18		6	25
9		29'	30'6"	SS	2/18 →		15	30
10		35'	36'6"	SS	17/18		13	35
11		40'	41'6"	SS	→		14	40
12		45'	46'6"	SS	15/18		16	45

REMARKS

BLOWS ERRATIC DUE TO PUSHING PEBBLE

ADDITIONAL SAMPLE RECOVERED WITH SIDE SLIT SAMPLER

SAMPLE RECOVERED WITH SIDE SLIT SAMPLER

HUNTING TECHNICAL and EXPLORATION SERVICES

JOB H273/57
BOREHOLE 2
COMPILED J.K.
CHECKED P.A.

PAGE 2.

JOB NO. H273/57 LOCATION CATFISH CREEK No 2
CLIENT DEPARTMENT OF HIGHWAYS — ONTARIO
COORDINATES CHNG. 732 + 00 — 15' Right
ELEV. (Surface) 1020.4 (Collar) Datum D.H.O.
BOREHOLE NUMBER 2
Date (Started) Feb 6, 1958 (Finished) Feb. 10, 1958
RIG NO. TYPE LONGYEAR Jr A

Legend: silt, gravel, clay, peat, sand, fill, limestone rock, igneous origin rock

C — Consolidation test; γ_d — dry density; γ_f — field density; M — mechanical analysis
WEIGHT OF HAMMER 140 lb DROP 30 IN.
Q — unconsol. undr. shear; Qc — consol. drained shear; S — drained shear; V — vane shear (in situ)
C — core; K — Permeability; wn — field moisture content; wp — plastic limit; wl — liquid limit; U — unconfined compressive strength
Up — approx. U as indicated by calibrated penetrometer; P — field penetration tests; x — standard penet. 2 S.S.; o — cone penetration (60 2½); △ — other
E.S. — chunk; S.S. — split spoon; S.L. — sleeve sample; S.T. — shelby tube; B.A. — barrel auger; S.A. — Spiral auger
T.W. — thin, walled, open; T.W.P. — thin walled piston; D.P. — drive piston; D.F.V. — drive foot valve; D.B. — diamond bit; R.B. — Rock bit
F.T. — fish-tail; W.O. — wash-out; — undisturbed; — disturbed — but represent.; — fair; — lost

BORING LOG

Scale/Depth (ft)	Elev (ft)	Casing	Log	Description	Elev.
55.2	965.2	NX		LOOSE GREY SAND	965.2
64.0	956.4	BX		MEDIUM DENSE GREY GRAVEL WITH SAND, SOME SILT OCCASIONAL BOULDER (TILL TEXTURE)	956.4
78.0	942.4			BEDROCK SURFACE. BLUISH GREEN POST-DOREAN SCHIST	942.4
				END OF BOREHOLE	

TESTS

Laboratory: M √ (sample 13)

SAMPLES

No.	Cond	Depth From	To	Type	Recovery	Penet. Resis. on Sampler Blows per Foot
13		51'	52'6"	SS	17/18	6
14		55'	56'6"	SS	10/18	28
15	lost	60'	61'6"	SS	0/18	26
		64'	78'	DB	Good	

REMARKS

HUNTING TECHNICAL and EXPLORATION SERVICES

JOB H273/57
BOREHOLE 3
COMPILED J.K.
CHECKED P.A.

PAGE 1.

JOB NO. H273/57 LOCATION CATFISH CREEK No. 2
CLIENT DEPARTMENT OF HIGHWAYS — ONTARIO
COORDINATES Ch 732440 , 15' LEFT
ELEV. (Surface) 1016.0' (Collar) Datum D.H.O.

BOREHOLE NUMBER 3

Date (Started) Jan. 24, 1958 (Finished) Jan. 29, 1958
RIG NO. 1 TYPE LONGYEAR JR. A

silt, clay, sand, gravel, peat, fill, limestone rock, igneous rock, sedimentary rock

C Consolidation test; γ_d dry density; γ_f field density; M mechanical analysis
O unconsol undr. shear; Qc consol drained shear; S drained shear; V vane shear (in situ)
C core; K Permeability; w_n field moisture content; w_p plastic limit; w_l liquid limit; U unconfined compressive strength
Up approx. U as indicated by calibrated penetrometer; P field penetration tests; x standard penet. 2 S.S.; o cone penetration (90 2½); Δ other
WEIGHT OF HAMMER 140 lb DROP 30 IN.

S.S. chunk; S.S. split spoon; S.L. sleeve sample; S.T. shelby tube; B.A. barrel auger; S.A. Spiral auger
T.W. thin, walled, open; T.W.P. thin walled piston; D.P. drive piston; D.F.V. drive foot valve; D.B. diamond bit; R.B. Rock bit
F.T. fish-tail; W.O. wash-out; undisturbed; disturbed; part represent.; fair; lost

BORING LOG			TESTS			SAMPLES								REMARKS
SCALED DEPTH ELEV. CASING	LOG.	DESCRIPTION	ELEV.	FIELD.	LABORATORY.	No.	COND.	DEPTH From / To	TYPE	RECOVERY Length Rec. / Nat. Dev.	STD. PENET. RESIS. (p.s.i.)	PENET. RESIS. as SAMPLER BLOWS PER FOOT	SCALE	
WATER OBSERVATION ft ft ft			ft	5 15 25 50 100 150 PENETRATION TEST RESULTS (P. in blows per foot)	DENSITY and NATURAL WATER CONTENT (wn % of dry weight) □ — DENSITY ● — NATURAL WATER CONTENT ATTERBERG LIMITS wp ⊢——⊣ wl γ_d (pcf) γ_f (pcf) Q Qc S C M Other								
5 6.0 1010.0 GWT		FROZEN TOPSOIL DENSE (FROZEN) BROWN GRAVEL WITH SAND & SILT	1010.0			1		3' 4'6"	SS	4/18		36	5	
10 15 20 25 30		LOOSE BROWN TO GREY SAND			✓	2		7' 8'6"	SS	2/18		3	10	
						3		12' 13'6"	SS	5/18		2	15	
						4		16' 17'6"	SS	0/18		1	20	
						5		21' 22'6"	SS	0/18		4	25	
						6		26' 27'6"	SS	0/18		1	30	
34.5 981.5 N X		DENSE TO MEDIUM DENSE GREY GRAVEL WITH SAND, SOME SILT OCCASIONAL BOULDER (TILL TEXTURE)	981.5		✓	7		34'6" 35'9"	SS	7/15		33	35	
40 45						7A		35'9" 40'9"	DB	45%			40	BOULDERY
						8		40'9" 42'3"	SS	10/18		34	45	
						9		47' 48'	SS	5/12		26		
						9A		48'6" 51'	DB	50%				BOULDERY

HUNTING TECHNICAL and EXPLORATION SERVICES

JOB H273/57
BOREHOLE 3
COMPILED J.K.
CHECKED P.A.

JOB NO. H273/57 LOCATION CATFISH CREEK No. 2
CLIENT DEPARTMENT OF HIGHWAYS - ONTARIO
COORDINATES CH. 732+40 , 15' LEFT
ELEV. (Surface) 1016.0' (Collar) Datum G.S.C.

BOREHOLE NUMBER 3

Date (Started) Jan 24, 1958 (Finished) Jan 29, 1958
RIG NO. TYPE LONGYEAR JR. A

silt, clay, sand, gravel, peat, fill, limestone rock, igneous rock

C Consolidation test
γ_d dry density
γ_f field density
M mechanical analy.
WEIGHT OF HAMMER 140 lb DROP 30 IN.

O — unconsol undr. shear
Qc — consol drained shear
S — drained shear
V — vane shear (in situ)
U — unconfined compressive strength

C — core
K — Permeability
wn — field moisture content
wp — plastic limit
wl — liquid limit
Up — approx. U as indicated by calibrated penetrometer
P — field penetration tests
x — standard penet. 2 S.S.
o — cone penetration (60 2½)
Δ — other

E.S. — chunk
S.S. — split spoon
S.L. — sleeve sample
S.T. — shelby tube
B.A. — barrel auger
S.A. — Spiral auger

T.W. — thin, walled, open
T.W.P. — thin walled piston
D.P. — drive pistor
D.F.V. — drive foot valve
D.B. — diamond bit
R.B. — Rock bit

F.T. — fish-tail
W.O. — wash-out
— undisturbed
— dist. represent.
— fair
— loar

BORING LOG

SCALE DEPTH	ELEV.	CASING	LOG.	DESCRIPTION
		WATER OBSERVATION		
ft	ft	ft		
55				MEDIUM DENSE TO DENSE
60				GREY GRAVEL ,
65		BX		SOME SAND & SILT ,
70	70.0	946.0		OCCASIONAL BOULDER
				(TILL TEXTURE)
				BEDROCK SURFACE
75				PRE-CAMBRIAN AGE GNEISS
				WITH ALTERNATE BANDS OF BLUE-GREY
80				IMPURE QUARTZITE WITH
				BLACK MICA SCHIST LAYERS
85	86.0	930.0		
				END OF BOREHOLE
90				
95				

TESTS

FIELD.

ft — 5 — 25 — 50 — 100 — 150
PENETRATION TEST RESULTS (P, in blows per foot)

LABORATORY.

DENSITY and NATURAL WATER CONTENT (wn % of dry weight)
□ — DENSITY
● — NATURAL WATER CONTENT
ATTERBERG LIMITS wp ⟷ wl

ELEV.	γ_d (pcf)	γ_f (pcf)	Q	Qc	S	C	M	Other
946.0							✓	
930.0								

SAMPLES

No.	COND	DEPTH From	DEPTH To	TYPE	RECOVERY Length / Dist.	Rq. / Riv.	HYD. PRESS (p.s.i.)	PENET. RESIS. on SAMPLER BLOWS PER FOOT	SCALE
9A		48'6"	51'	D.B.	50%				55
10		53'6"	55'	S.S.	10/18			28	
11		59'	60'6"	S.S.	6/18			26	60
11A		61'	65	D.B.	25%				
12		66'6"	68'	S.S.				42	65
		70'	86	D.B.	Good				70
									75
									80
									85
									90
									95

REMARKS

BOULDERY

HUNTING TECHNICAL and EXPLORATION SERVICES

JOB H273/57
BOREHOLE 4
COMPILED J.K.
CHECKED P.A.

PAGE 1.

JOB NO. H273/57 LOCATION CATFISH CREEK No. 2
CLIENT DEPARTMENT OF HIGHWAYS – ONTARIO
COORDINATES CHNG 732+40 – 15' Right
ELEV. (Surface) 1016.7 (Collar) Datum D.H.O.

BOREHOLE NUMBER 4

Date (Started) Jan. 30, 1958 (Finished) Feb. 2, 1958
RIG NO. _ TYPE _ LONGYEAR Jr. A

silt, clay, sand, gravel, peat, fill, limestone rock, igneous origin rock

C – Consolidation test; γ_d – dry density; γ_t – field density; M – mechanical analysis; WEIGHT OF HAMMER 140 lb; DROP 30 IN.

Q – unconsol. undr. shear; Qc – consol. drained shear; S – drained shear; V – vane shear (in situ); wp – plastic limit; wl – liquid limit; U – unconfined compressive strength

C – core; K – Permeability; wn – field moisture content

Up – approx. U as indicated by calibrated penetrometer; P – field penetration tests; x – standard penet. 2 S.S.; □ – cone penetration (60 2½); △ – other

E.S. – clunk; S.S. – split spoon; S.L. – sleeve sample; S.T. – shelby tube; B.A. – barrel auger; S.A. – Spiral auger

T.W. – thin, walled, open; T.W.P. – thin walled piston; D.P. – drive piston; D.F.V. – drive foot valve; D.B. – diamond bit; R.B. – Rock bit

F.T. – fish-tail; W.O. – wash-out; undisturbed; disturbed – bit represent.; lair; lost

BORING LOG

SCALE DEPTH	ELEV	CASING	WATER OBSERVATION	LOG	DESCRIPTION
ft	ft	ft			
5	5.0	01.6	G W T		FROZEN TOPSOIL DENSE (FROZEN) BROWN GRAVEL WITH SAND & SILT
10					LOOSE BROWN TO GREY SAND
15	5.0	998.7			
20					MEDIUM DENSE GREY SAND, SOME SILT
25					
30					
35	35.0	981.7	N Y		
40					MEDIUM DENSE GREY SAND
45	42.0	974.7			DENSE GREY SAND WITH SILT
50	47.0	969.7			MEDIUM DENSE TO DENSE DARK GREY GRAVEL WITH SAND, SOME SILT, OCCASIONAL BOULDER (TILL TEXTURE)

TESTS

FIELD. ELEV. ft

PENETRATION TEST RESULTS (P, in blows per foot): 5, 15, 25, 50, 100, 150

LABORATORY.

DENSITY and NATURAL WATER CONTENT (wn % of dry weight)

□ — DENSITY
● — NATURAL WATER CONTENT

ATTERBERG LIMITS wp ▸——◂ wl

γ_d (pcf)	γ_t (pcf)	Q	Qc	S	C	M	Other
						✓	
						✓	
						✓	

SAMPLES

No.	COND.	DEPTH From	DEPTH To	TYPE	RECOVERY Length Rec. / Dist. Driv.	HYD. PRESS (psi)	PENET. RESIS. or SAMPLER BLOWS PER FOOT
1		0	1'6"	S S	7/18		5
2		3'	4'6"	S S	5/18		36
3		6'	7'6"	S S	0/18		4
4		10'	11'6"	S S	6/18		2
5		14'	15'6"	S S	0/18		4
6		20'	21'6"	S S	7/18		16
7		25'	26'6"	S S	8/18		16
8		30'	31'6"	S S	7/18		19
9		35'	36'6"	S S	14/18		11
10		40'	41'6"	S S	0/18		10
11		45'	46'6"	S S	14/18		38
12		48'	49'6"	S S	5/18		25

SCALE: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

REMARKS

HUNTING TECHNICAL and EXPLORATION SERVICES

JOB H273/57
BOREHOLE 4
COMPILED J.K.
CHECKED P.A.

PAGE 2

JOB NO. H273/57 LOCATION CATFISH CREEK No. 2
CLIENT DEPARTMENT OF HIGHWAYS – ONTARIO
COORDINATES CHNG 732 + 40 — 15' Right
ELEV. (Surface) 1016·7 (Collar) Datum D.H.O.

BOREHOLE NUMBER 4

Date (Started) Jan. 30, 1958 (Finished) Feb. 2, 1958
RIG NO. 1 TYPE LONGYEAR Jr. A

silt, clay, sand, gravel, peat, till; limestone rock, igneous origin rock

C —Consolidation test; γ_d —dry density; γ_f —field density; M —mechanical analysis
Q — unconsol undr. shear; Qc— consol drained shear; S —drained shear; V —vane shear (in situ)
WEIGHT OF HAMMER 140 lb DROP 30 IN.
C —core; K —Permeability; wn —field moisture content; wp —plastic limit; wl —liquid limit; U —unconfined compressive strength
Up—approx. U as indicated by calibrated penetrometer; P —field penetration tests; x —standard penet. 2 S.S.; a —cone penetration (60 2½); Δ —other
E.S. —chunk; S.S. —split spoon; S.L. —sleeve sample; S.T. —shelby tube; B.A. —barrel auger; S.A. —Spiral auger
T.W. —thin, walled, open; T.W.P. —thin walled piston; D.P. —drive piston; D.F.V. —drive foot valve; D.B. —diamond bit; R.B. —Rock bit
F.T. —fish-tail; W.O. —wash-out; undisturbed; disturbed — not represent.; fair; lost

BORING LOG			TESTS											SAMPLES							REMARKS
SCALE DEPTH ELEV. CASING. WATER OBSERVATION	LOG.	DESCRIPTION	ELEV.	FIELD.	LABORATORY.									No.	COND.	DEPTH From	DEPTH To	TYPE	RECOVERY Length Rec. / Diat. Driv.	HYD. PRESS	PENET. RESIS. on SAMPLER BLOWS PER FOOT	SCALE	
ft ft ft			ft	PENETRATION TEST RESULTS (P, in blows per foot) 5 15 25 50 100 150	DENSITY and NATURAL WATER CONTENT (wn % of dry weight) □ — DENSITY ● — NATURAL WATER CONTENT ATTERBERG LIMITS wp ——— wl	γ_d (pcf)	γ_f (pcf)	Q	Qc	S	C	M	Other							(p.s.i.)			
55		MEDIUM DENSE TO DENSE DARK GREY GRAVEL WITH SAND, SOME SILT, OCCASIONAL BOULDER (TILL TEXTURE)											13		54'	55'6"	S S	5/18		39	55
60																					60
65 673 9494 B.X.			9494									√	14		62'	63'6"	S S	8/18		33	65
70		BEDROCK SURFACE PRE-CAMBRIAN PARA-GNEISS WITH ALTERNATE BANDS OF BLUE-GREY IMPURE QUARTZITE WITH BLACK MICA SCHIST LAYERS													67'4"	80'	D B	Good			70
75																					75
80 80 0 9367			936.7																		80
85		END OF BOREHOLE																			85
90																					90
95																					95

HUNTING TECHNICAL and EXPLORATION SERVICES

JOB H273/57
BOREHOLE 5
COMPILED J.K.
CHECKED P.A.

JOB NO. H273/57 LOCATION CATFISH CREEK # 2
CLIENT DEPARTMENT OF HIGHWAYS - ONTARIO
COORDINATES CHNG. 772+81 117' Right
ELEV. (Surface) 1018.0 (Colour) Datum G.S.C.

BOREHOLE NUMBER 5

Date (Started) Feb. 17, 1958 (Finished) Feb. 17, 1958
RIG NO. 1 TYPE LONGYEAR JR. A

silt, clay, sand, gravel, peat, fill, limestone rock, igneous or metamorphic rock

C --Consolidation test
γ_d --dry density
γ_f --field density
M --mechanical analysis
WEIGHT OF HAMMER 140 lb DROP 30 IN.

Q -- unconsol undr. shear
Qc-- consol drained shear
S --drained shear
V --vane shear (in situ)
wp --plastic limit
wl --liquid limit
U --unconfined compressive strength

C --core
K --Permeability
wn --field moisture content

Up--approx. U as indicated by calibrated penetrometer
P --field penetration tests
x --standard pen.set. 2 S.S.
□ --core penetration (60 2½)
△ --other

E.S. --chunk
S.S. --split spoon
S.L. --sleeve sample
S.T. --shelby tube
B.A. --barrel auger
S.A. --Spiral auger

T.W. --thin, walled, open
T.W.P. --thin walled piston
D.P. --drive piston
D.F.V. --drive foot valve
D.B. --diamond bit
R.B. --Rock bit

F.T. --fish-tail
W.O. --wash-out
--undisturbed
--disturbed -- not represent.
--fair
--lost

BORING LOG			TESTS			SAMPLES			REMARKS
SCALE DEPTH ELE./ CASING	LOG.	DESCRIPTION	ELEV.	FIELD.	LABORATORY.	No. COND.	DEPTH From To	TYPE RECOVERY Length Rec. / Dist. Driv.	HYD. PRESS (psi.) PENET. RESIS. or SAMPLER BLOWS PER FOOT
WATER OBSERVATION ft ft ft			ft	5 15 25 50 100 150 PENETRATION TEST RESULTS (P, in blows per foot)	DENSITY and NATURAL WATER CONTENT (wn % of dry weight) □ — DENSITY ● — NATURAL WATER CONTENT ATTERBERG LIMITS wp ——— wl γ_d (pcf) γ_f (pcf) Q Qc S C M Other				
2' 1016.8		MEDIUM DENSE BROWN TO GREY FINE GRAVEL AND SAND (Gravel content decreases with depth)	1012			1	2'6" 4'	SS 9/18	28
5 6.0 1012	B.X.					2	5' 6'6"	SS →	14* ×
G.W.T.		LOOSE DARK GREY FINE TO MEDIUM SAND, SOME SILT AND GRAVEL	1005			3	8' 9'6"	SS →	7
10 10.0 1008		END OF BOREHOLE							
15									
20									
25									
30									
35									
40									
45									

SAMPLE RECOVERED BY SIDE SLIT SAMPLER

SAMPLE RECOVERED BY SIDE SLIT SAMPLER

* BLOWS TAKEN IN GRAVEL & SAND

×BLOWS BELOW 6" INDICATE PENETRATION RESISTANCE OF 6 BLOWS PER FOOT

HUNTING TECHNICAL and EXPLORATION SERVICES

JOB H273/57
BOREHOLE 6
COMPILED J.K.
CHECKED P.A.

JOB NO. H273/57 LOCATION CATFISH CREEK No.2
CLIENT DEPARTMENT OF HIGHWAYS - ONTARIO
COORDINATES CHNG. 733+43 236' Right
ELEV. (Surface) 1019.0' (Collar) 1021.0 Datum D.H.O.

BOREHOLE NUMBER 6

Date (Started) Feb. 17, 1958 (Finished) Feb. 17, 1958
RIG NO. 1 TYPE LONGYEAR JR. A

silt, clay, sand, gravel, peat, fill, limestone rock, igneous or gin rock

C — Consolidation test; γ_d — dry density; γ_f — field density; M — mechanical analysis
Q — unconsol. undr. shear; Qc — consol drained shear; S — drained shear; V — vane shear (in situ)
WEIGHT OF HAMMER 140 lb DROP 30 IN.

C — core; K — Permeability; wn — field moisture content; wp — plastic limit; wl — liquid limit; U — unconfined compressive strength
Up — approx. U as indicated by calibrated penetrometer; P — field penetration tests; x — standard penet. 2 S.S.; o — cone penetration (60 2½); Δ — other

E.S. — chunk; S.S. — split spoon; S.L. — sleeve sample; S.T. — shelby tube; B.A. — barrel auger; S.A. — Spiral auger
T.W — thin, walled, open; T.W.P. — thin walled piston; D.P. — drive piston; D.F.V. — drive foot valve; D.B. — diamond bit; R.B. — Rock bit
F.T. — fish-tail; W.O. — wash-out; undisturbed; disturbed but represent.; fair; lost

BORING LOG

SCALE DEPTH ELEV. CASING.	WATER OBSERVATION	LOG.	DESCRIPTION
ft ft ft			
2.0 1019.0			CASING IN AIR
5	GWT		FROZEN ORGANIC MATERIAL
5.5 1014.5			DENSE BROWN GRAVEL AND SAND
10	BX		LOOSE BROWN TO GREY SAND
12.0 1009.0			
15 4.0 1007.0			LOOSE GREY SAND, SOME SILT
			END OF BOREHOLE
20			
25			
30			
35			
40			
45			

TESTS

FIELD.

ELEV. ft

PENETRATION TEST RESULTS (P, in blows per foot)
5 15 25 50 100 150

LABORATORY.

DENSITY and NATURAL WATER CONTENT (wn % of dry weight)
□ — DENSITY
● — NATURAL WATER CONTENT
ATTERBERG LIMITS wp ⊢——○ wl

	γ_d (pcf)	γ_f (pcf)	Q	Qc	S	C	M	Other

SAMPLES

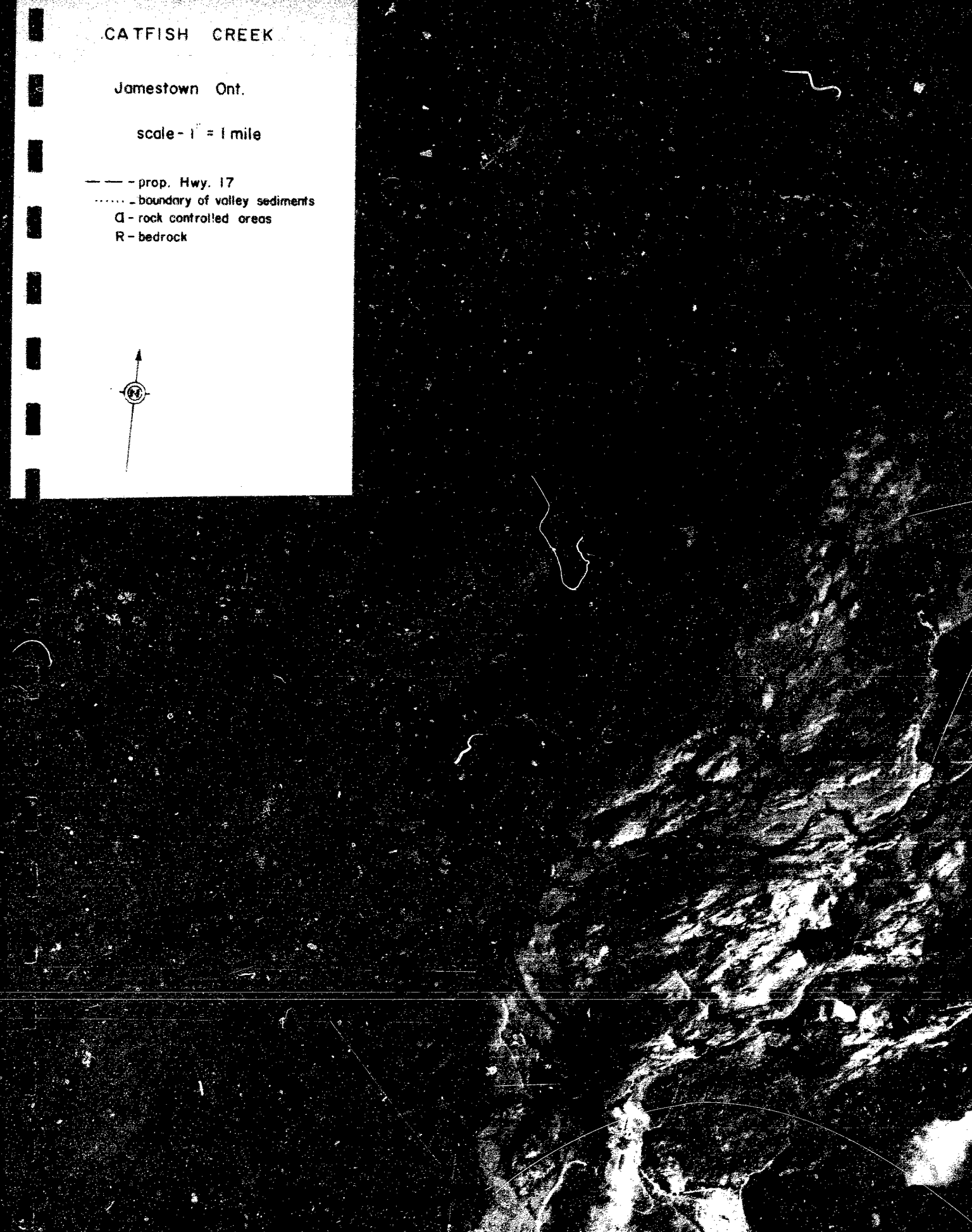
No.	COND.	DEPTH From	DEPTH To	TYPE	RECOVERY Length Rec. / Dist. Driv.	HYD. PRESS (p.s.i.)	PENET. RESIS. on SAMPLER BLOWS PER FOOT
1		4.3	5.8	SS	14/18		52
2		8.0	9.5	SS	→		1
3		12.0	13.5	SS	18/18		5

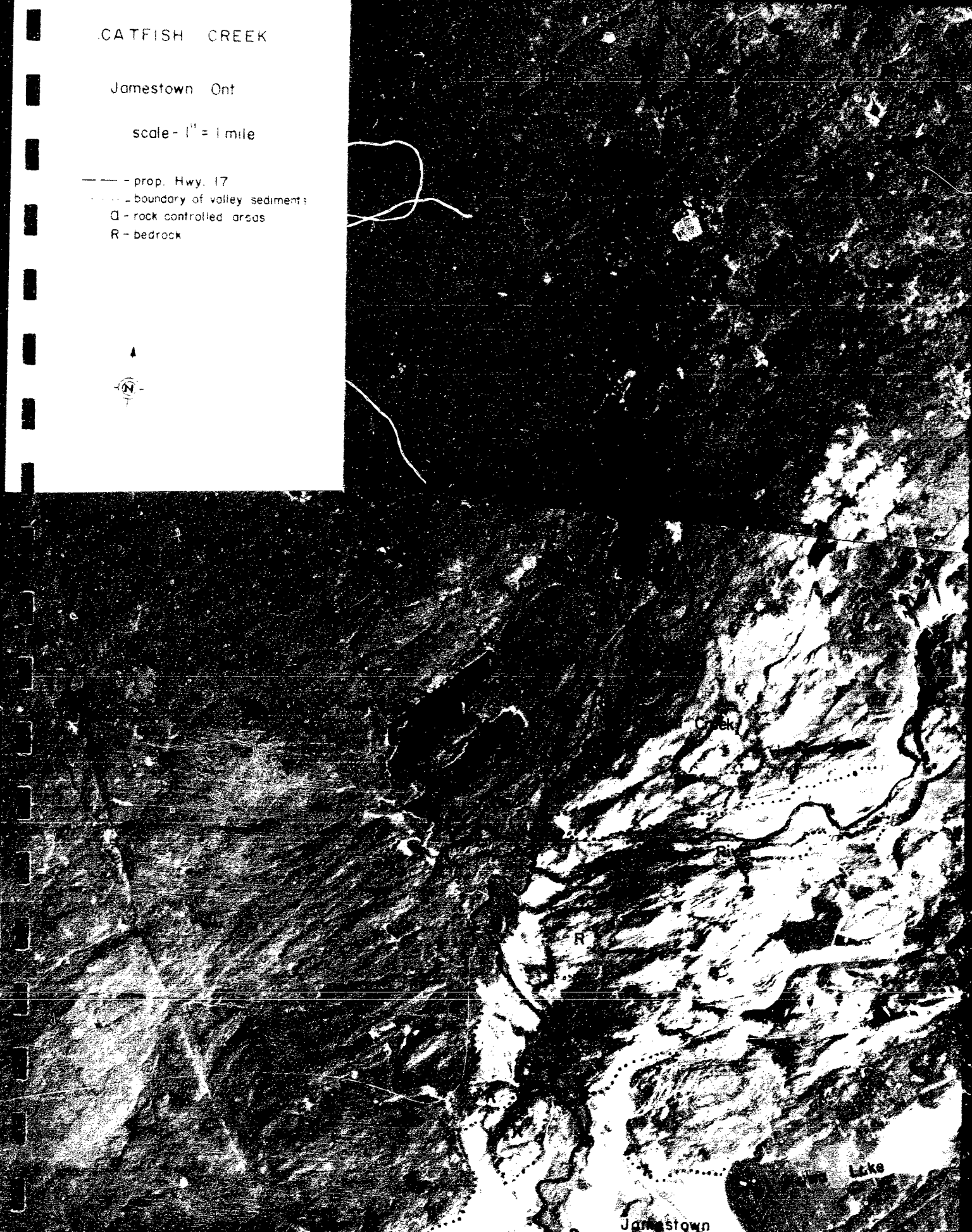
SCALE: 5, 10, 15, 20, 25, 30, 35, 40, 45

REMARKS

SAMPLE RECOVERED WITH SIDE SLIT SAMPLER

1.54 AIR-PHOTO WITH INTERPRETED GEOLOGY


CATFISH CREEK
Jamestown Ont.
scale - 1" = 1 mile
— — - prop. Hwy. 17
..... - boundary of valley sediments
CI - rock controlled areas
R - bedrock
N


CATFISH CREEK
Jamestown Ont
scale - 1" = 1 mile
— — - prop. Hwy. 17
. . . . - boundary of valley sediments
O - rock controlled areas
R - bedrock
N
Creek
R
Lake
Jamestown

1.55 PHOTOS OF SITE AND RIG

STEREOGRAPHIC PHOTO PAIR SHOWING GENERAL VIEW
OF SITE FROM CHAINAGE 738+00 LOOKING SOUTH,
DRILL IS SET UP AT HOLE NO. 1.

STEREOGRAPHIC PHOTO PAIR SHOWING GENERAL VIEW
OF SITE FROM CHAINAGE 738+00 LOOKING SOUTH,
DRILL IS SET UP AT HOLE NO. 1.

GENERAL VIEW OF SOUTH ABUTMENT AREA
DRILL SETUP AT HOLE NO. 2

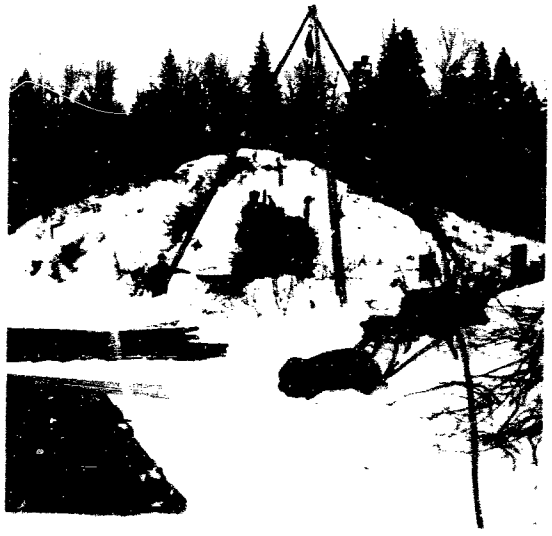
VIEW SHOWING OVERBURDEN MATERIALS
VICINITY BOREHOLE NO. 2

GENERAL VIEW OF SOUTH ABUTMENT AREA
DRILL SETUP AT HOLE NO. 2

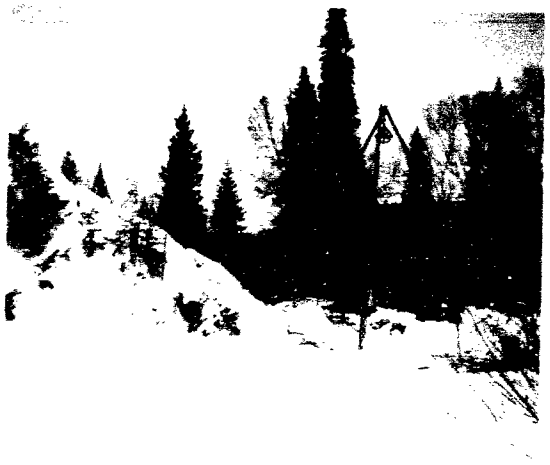
VIEW SHOWING OVERBURDEN MATERIALS
VICINITY BOREHOLE NO. 2

GENERAL VIEW OF SOUTH ABUTMENT LOOKING EAST
DRILL SETUP AT HOLE NO. 1

GENERAL VIEW OF SOUTH ABUTMENT LOOKING WEST
DRILL SETUP AT HOLE NO. 1.

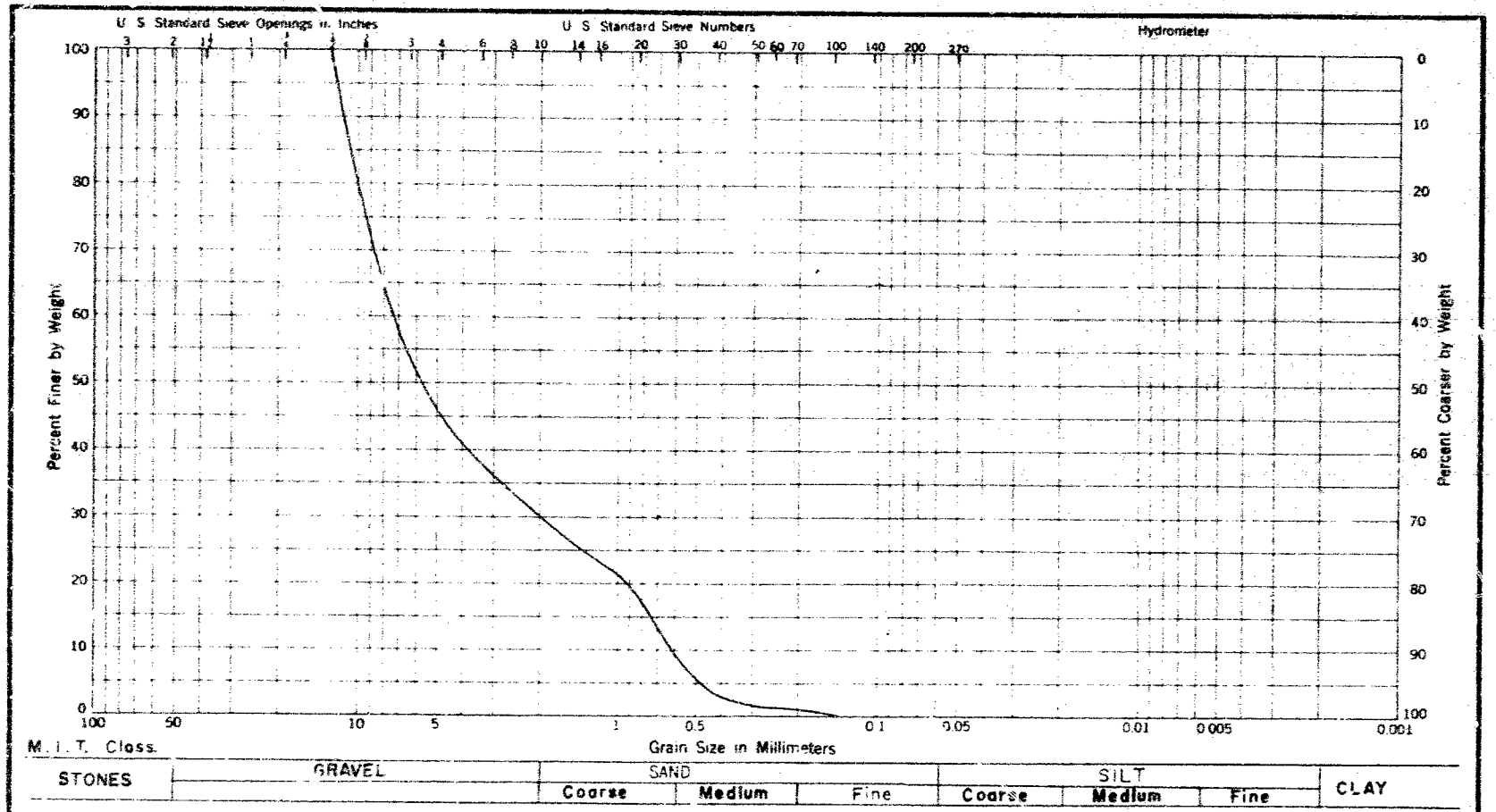


GENERAL VIEW OF SOUTH ABUTMENT LOOKING EAST
DRILL SETUP AT HOLE NO. 1



GENERAL VIEW OF SOUTH ABUTMENT LOOKING WEST
DRILL SETUP AT HOLE NO. 1.

1.56 SOIL CLASSIFICATION CHARTS



69%	Gravel
31%	Sand

Classification

GRAVEL , SOME SAND

S.G. = 2·68

HUNTING TECHNICAL and EXPLORATION SERVICES

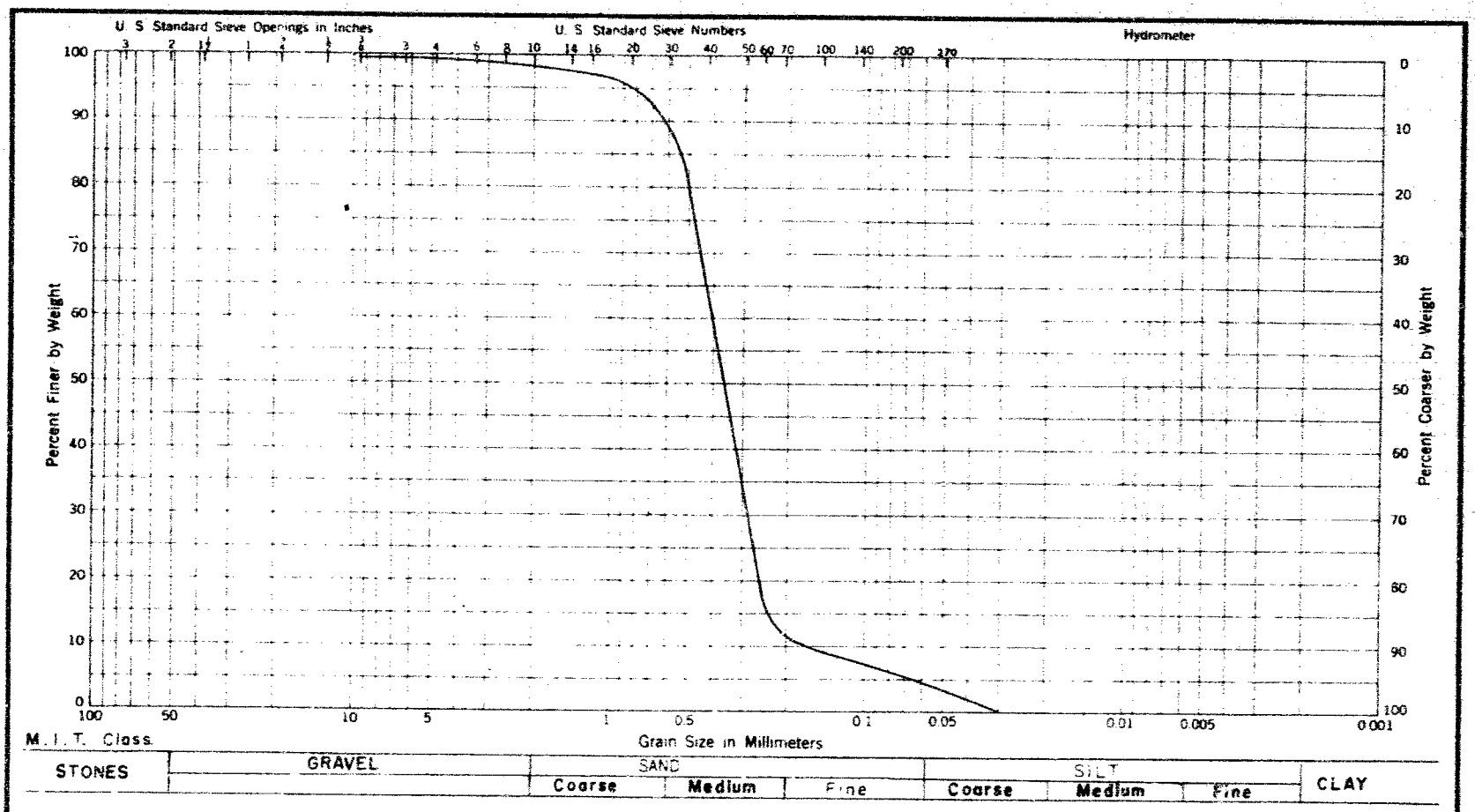
DEPARTMENT OF HIGHWAYS — ONTARIO

PROPOSED BRIDGE SITE

CATFISH CREEK NO. 2

SOIL MECHANICAL ANALYSIS

BOREHOLE NO. 1 DEPTH: 7 FT.



10%	Coarse Sand
78%	Med. Sand
8%	Fine Sand
4%	Silt

Classification

SAND, TRACE OF SILT

S.G. = 2·62

HUNTING TECHNICAL and EXPLORATION SERVICES

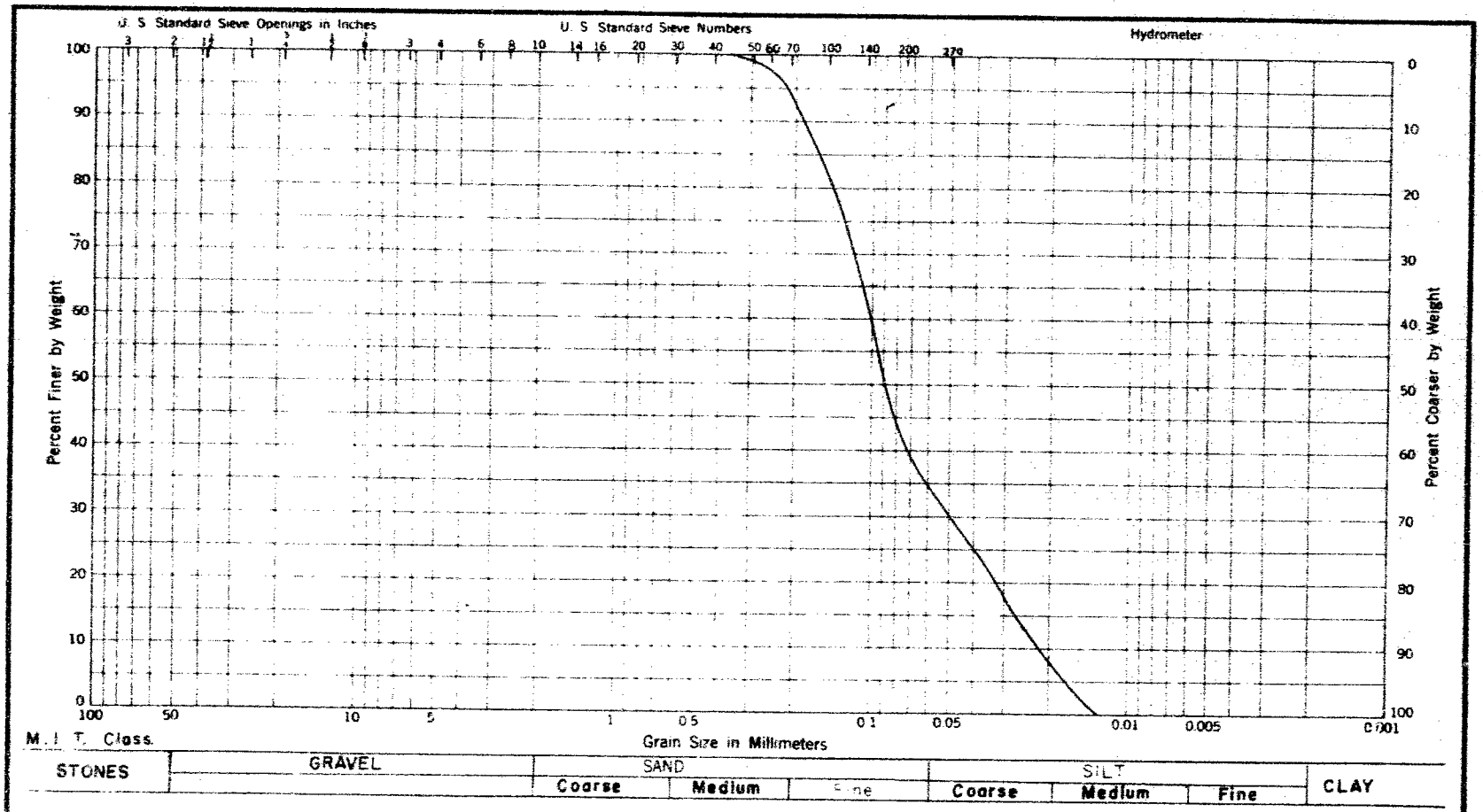
DEPARTMENT OF HIGHWAYS — ONTARIO

PROPOSED BRIDGE SITE

CATFISH CREEK NO. 2

SOIL MECHANICAL ANALYSIS

BOREHOLE NO. 1 DEPTH 20 FT.



8%	Med. Sand
57%	Fine Sand
27%	Coarse Silt
8%	Med. Silt

Classification

SAND WITH SILT

S.G. = 2·66

HUNTING TECHNICAL and EXPLORATION SERVICES

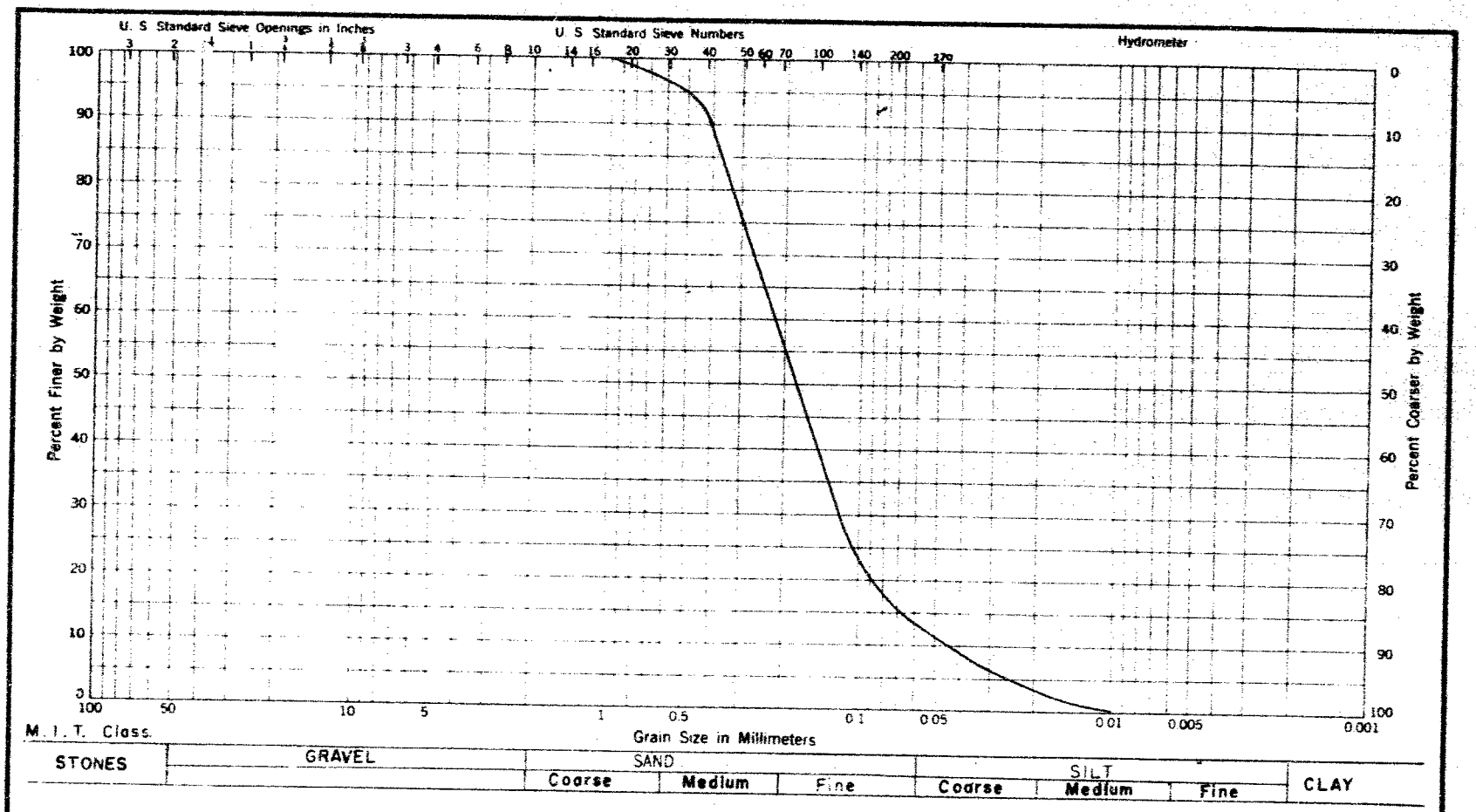
DEPARTMENT OF HIGHWAYS — ONTARIO

PROPOSED BRIDGE SITE

CATFISH CREEK NO. 2

SOIL MECHANICAL ANALYSIS

BOREHOLE NO. 1 DEPTH: 30 FT.



4%	Coarse Sand
44%	Med Sand
39%	Fine Sand
9%	Coarse Silt
4%	Med. Silt

Classification

SAND, SOME SILT

HUNTING TECHNICAL and EXPLORATION SERVICES

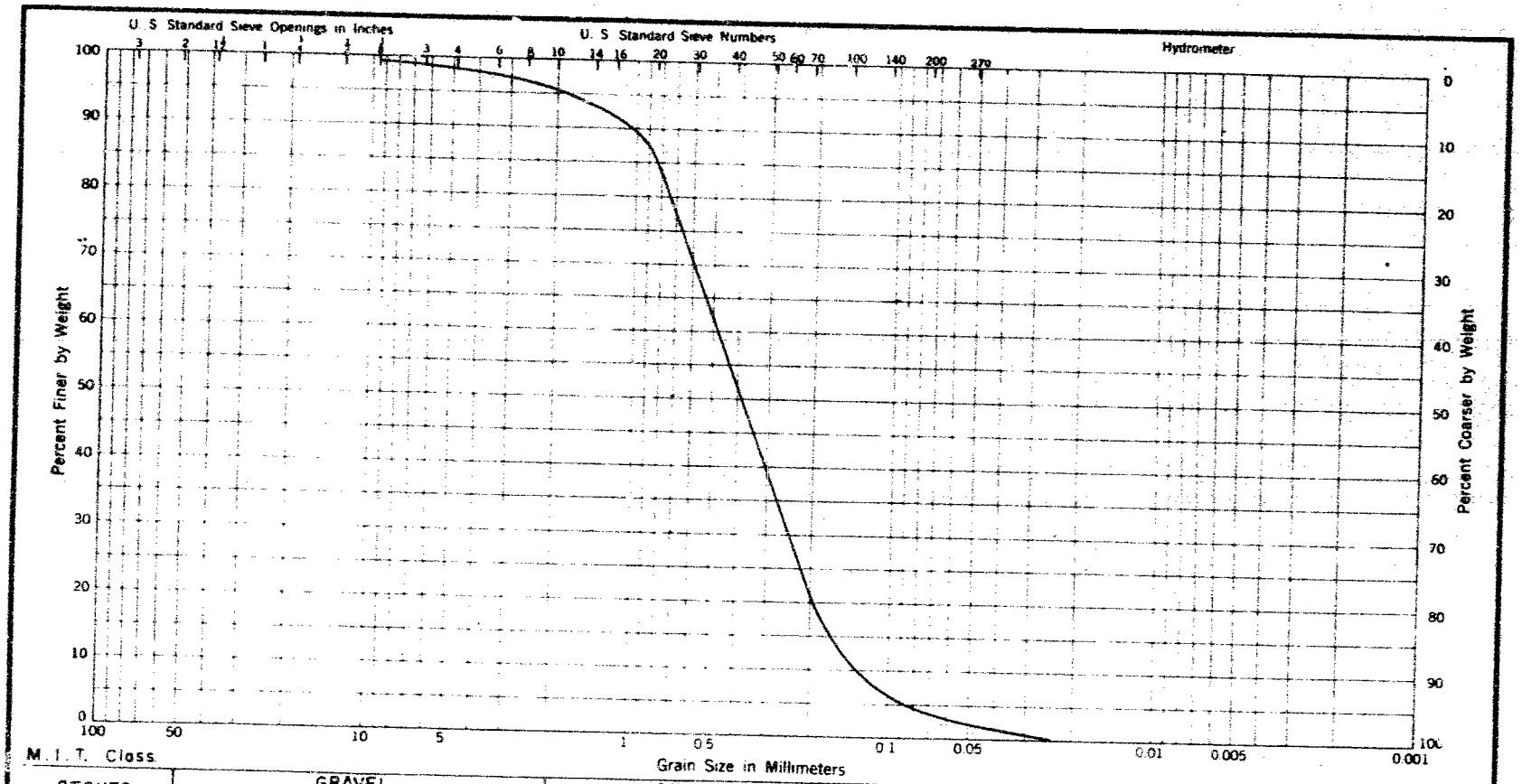
DEPARTMENT OF HIGHWAYS — ONTARIO

PROPOSED BRIDGE SITE

CATFISH CREEK NO. 2

SOIL MECHANICAL ANALYSIS

BOREHOLE NO. 2 DEPTH 46 FT.



5%	Gravel
25%	Coarse Sand
50%	Med. Sand
17%	Fine Sand
3%	Silt

Classification

SAND TRACE OF GRAVEL AND SILT

S.G. = 2·66

HUNTING TECHNICAL and EXPLORATION SERVICES

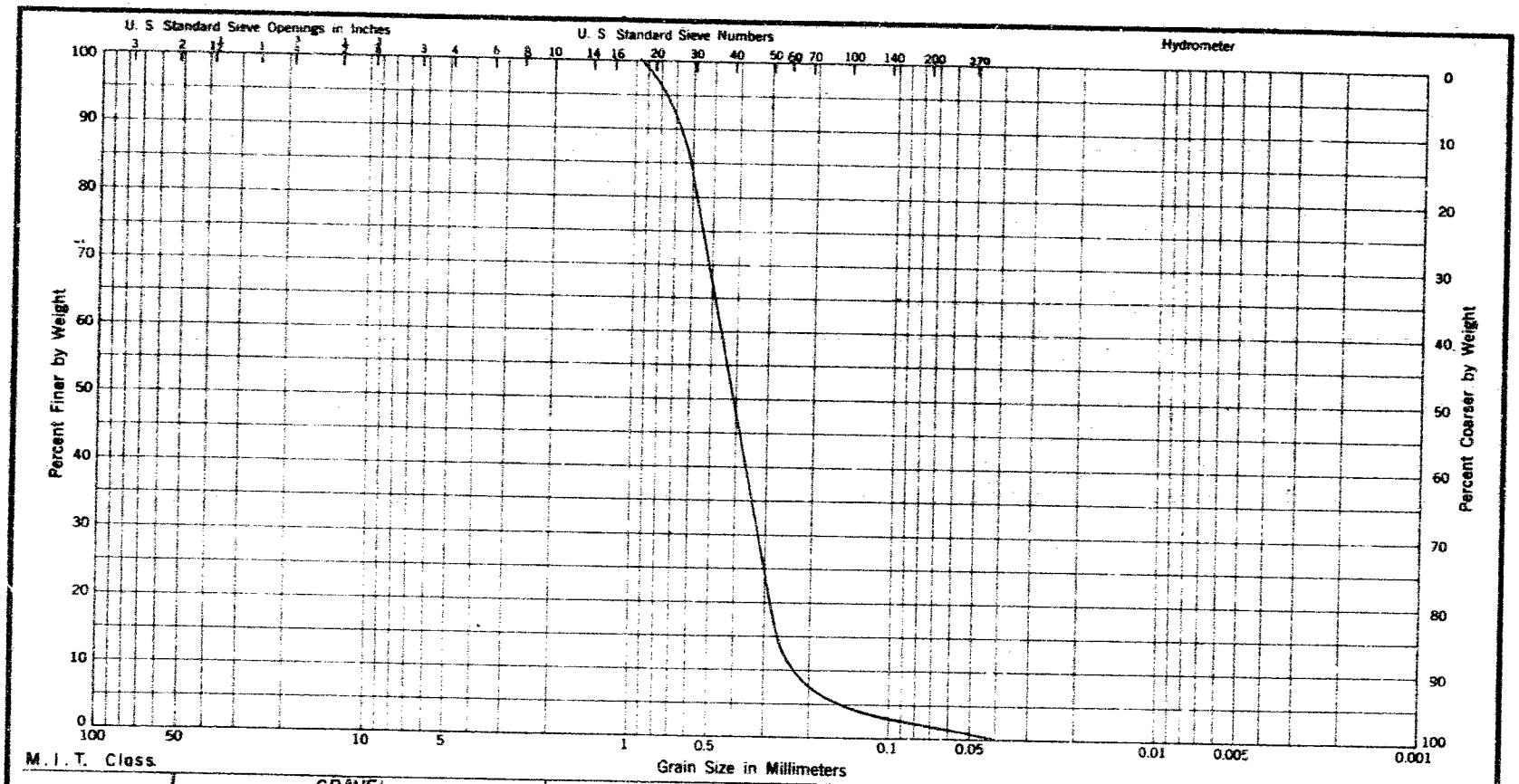
DEPARTMENT OF HIGHWAYS — ONTARIO

PROPOSED BRIDGE SITE

CATFISH CREEK NO. 2

SOIL MECHANICAL ANALYSIS

BOREHOLE NO. 2 DEPTH 52 FT.



17%	Coarse Sand
75%	Med. Sand
6%	Fine Sand
2%	Silt

Classification

SAND

S.G. = 2·7

HUNTING TECHNICAL and EXPLORATION SERVICES

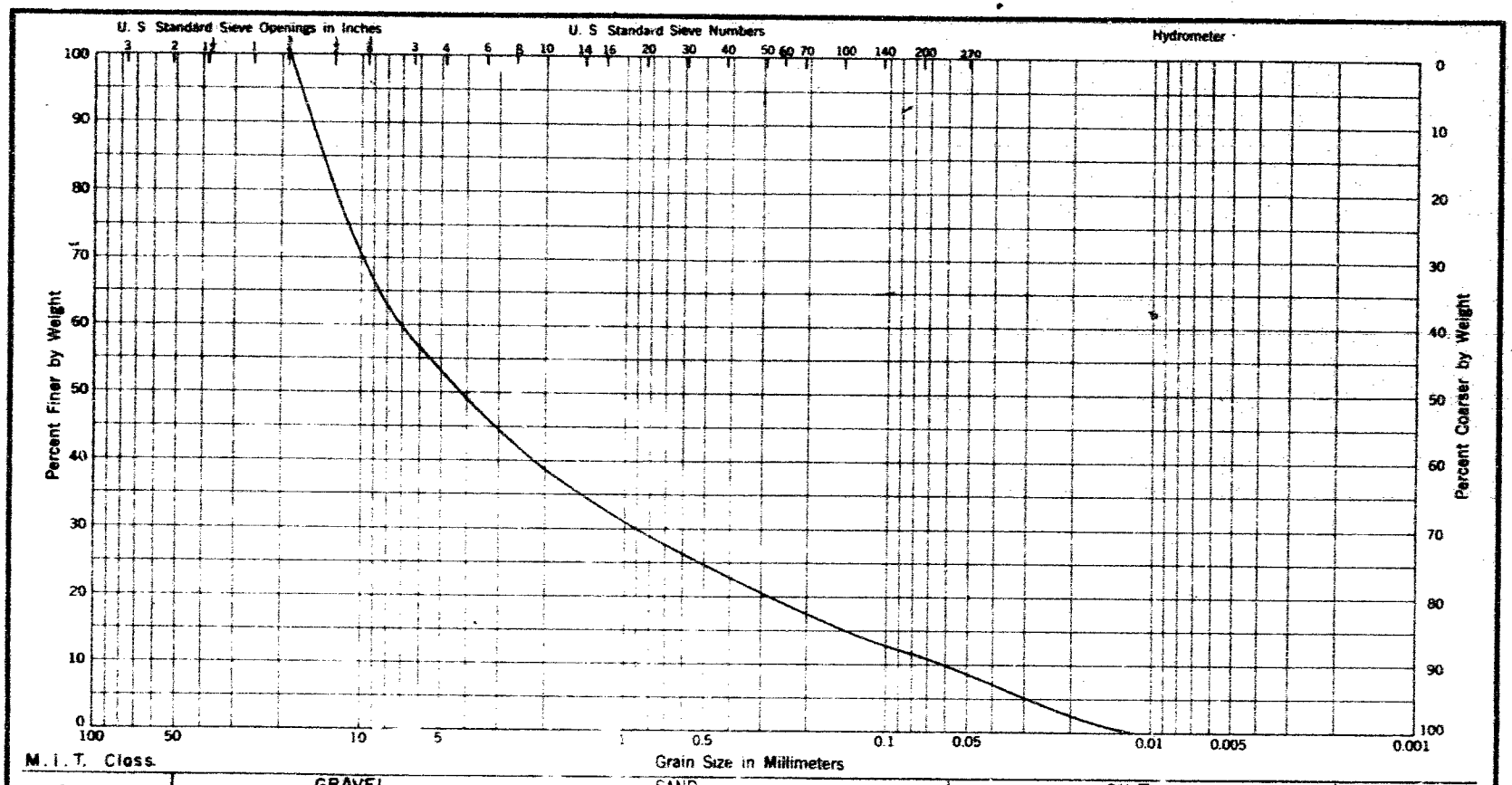
DEPARTMENT OF HIGHWAYS — ONTARIO

PROPOSED BRIDGE SITE

CATFISH CREEK NO. 2

SOIL MECHANICAL ANALYSIS

BOREHOLE NO. 3 DEPTH: 13 FT.



61%	Gravel
29%	Sand
10%	Silt

Classification

GRAVEL WITH SAND, SOME SILT

(TILL TEXTURE)

S.G. = 2-68

HUNTING TECHNICAL and EXPLORATION SERVICES

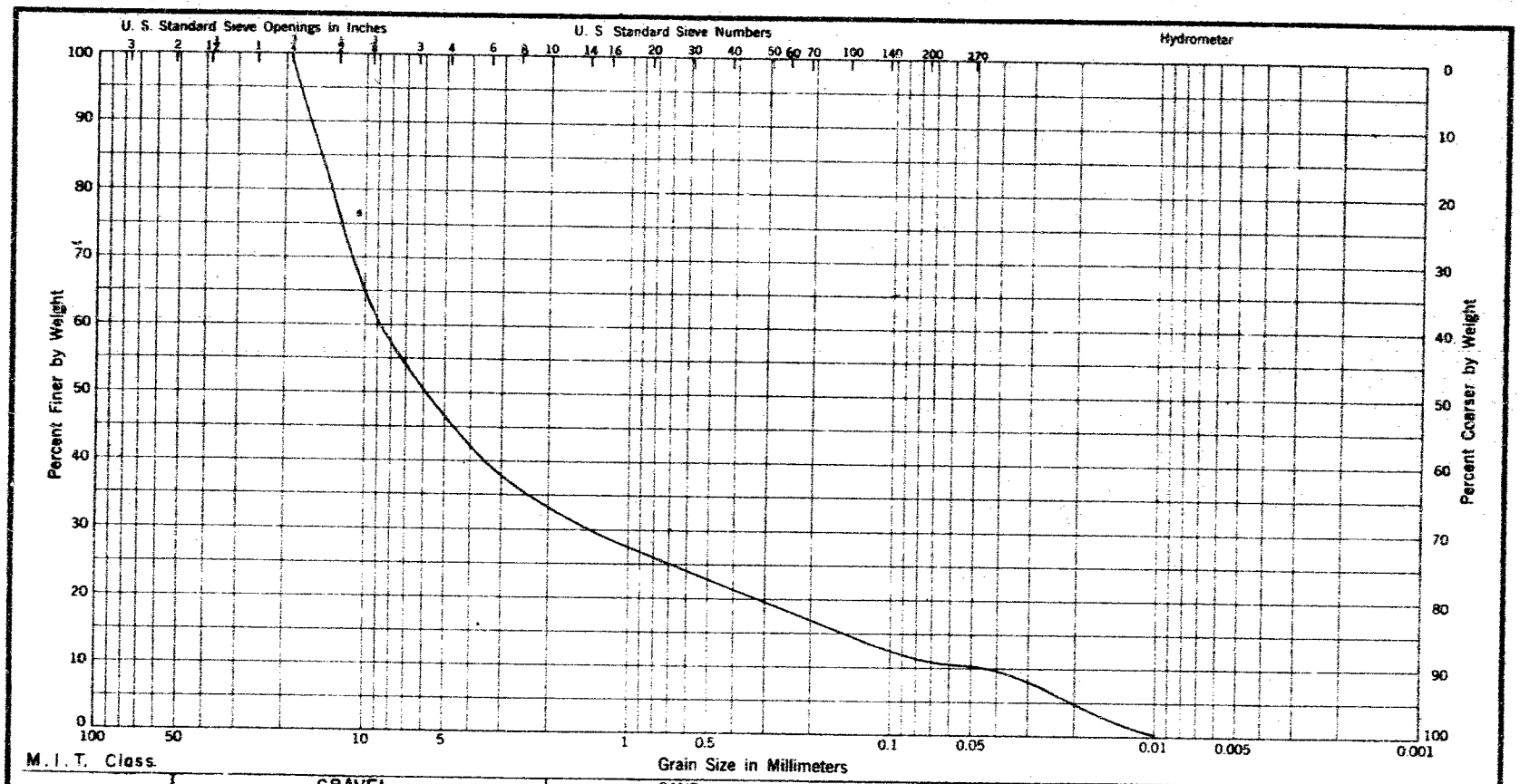
DEPARTMENT OF HIGHWAYS — ONTARIO

PROPOSED BRIDGE SITE

CATFISH CREEK NO. 2

SOIL MECHANICAL ANALYSIS

BOREHOLE NO.: 3 DEPTH: 41 FT.



67%	Gravel
22%	Sand
11%	Silt

Classification

GRAVEL WITH SAND, SOME SILT

(TILL TEXTURE)

S.G.= 2·66

HUNTING TECHNICAL and EXPLORATION SERVICES

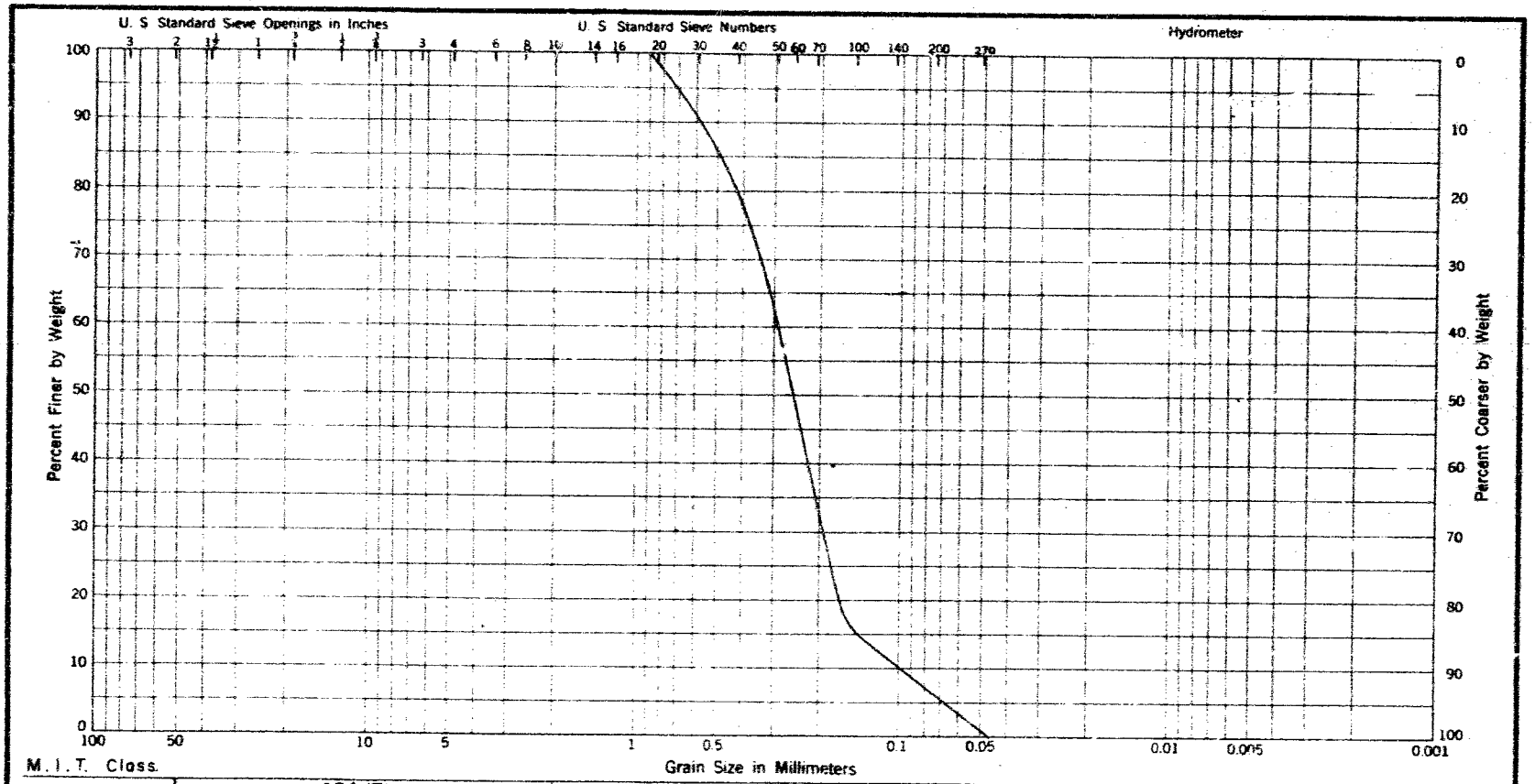
DEPARTMENT OF HIGHWAYS — ONTARIO

PROPOSED BRIDGE SITE

CATFISH CREEK NO.2

SOIL MECHANICAL ANALYSIS

BOREHOLE NO. 3 DEPTH: 54 FT.



9%	Coarse Sand
58%	Med. Sand
29%	Fine Sand
4%	Silt

Classification

SAND, TRACE OF SILT

S.G. = 2·68

HUNTING TECHNICAL and EXPLORATION SERVICES

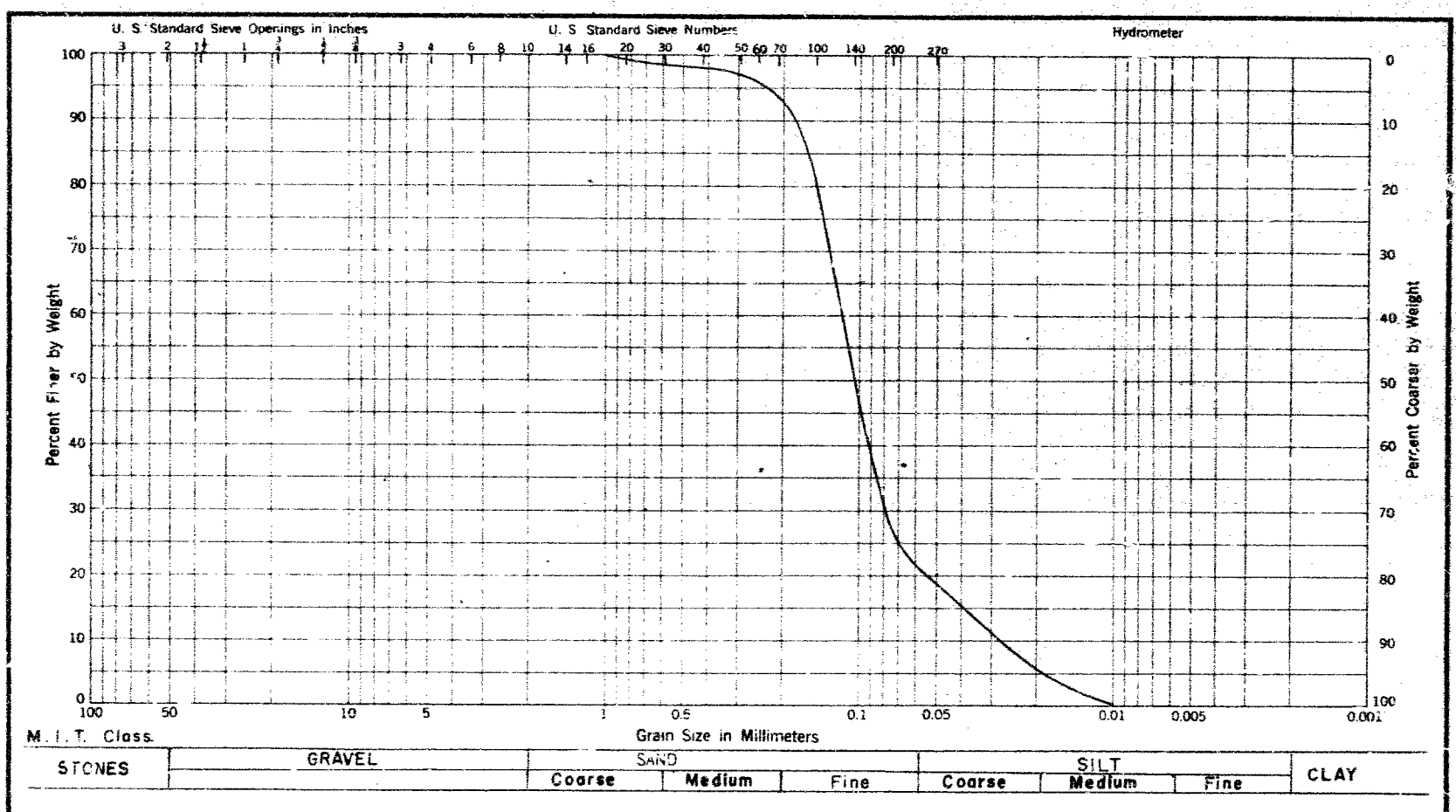
DEPARTMENT OF HIGHWAYS — ONTARIO

PROPOSED BRIDGE SITE

CATFISH CREEK NO. 2

SOIL MECHANICAL ANALYSIS

BOREHOLE NO. 4 DEPTH 11 FT.



7%	Med. Sand
71%	Fine Sand
16%	Coarse Silt
6%	Med. Silt

Classification

SAND SOME SILT

S.G. = 2·63

HUNTING TECHNICAL and EXPLORATION SERVICES

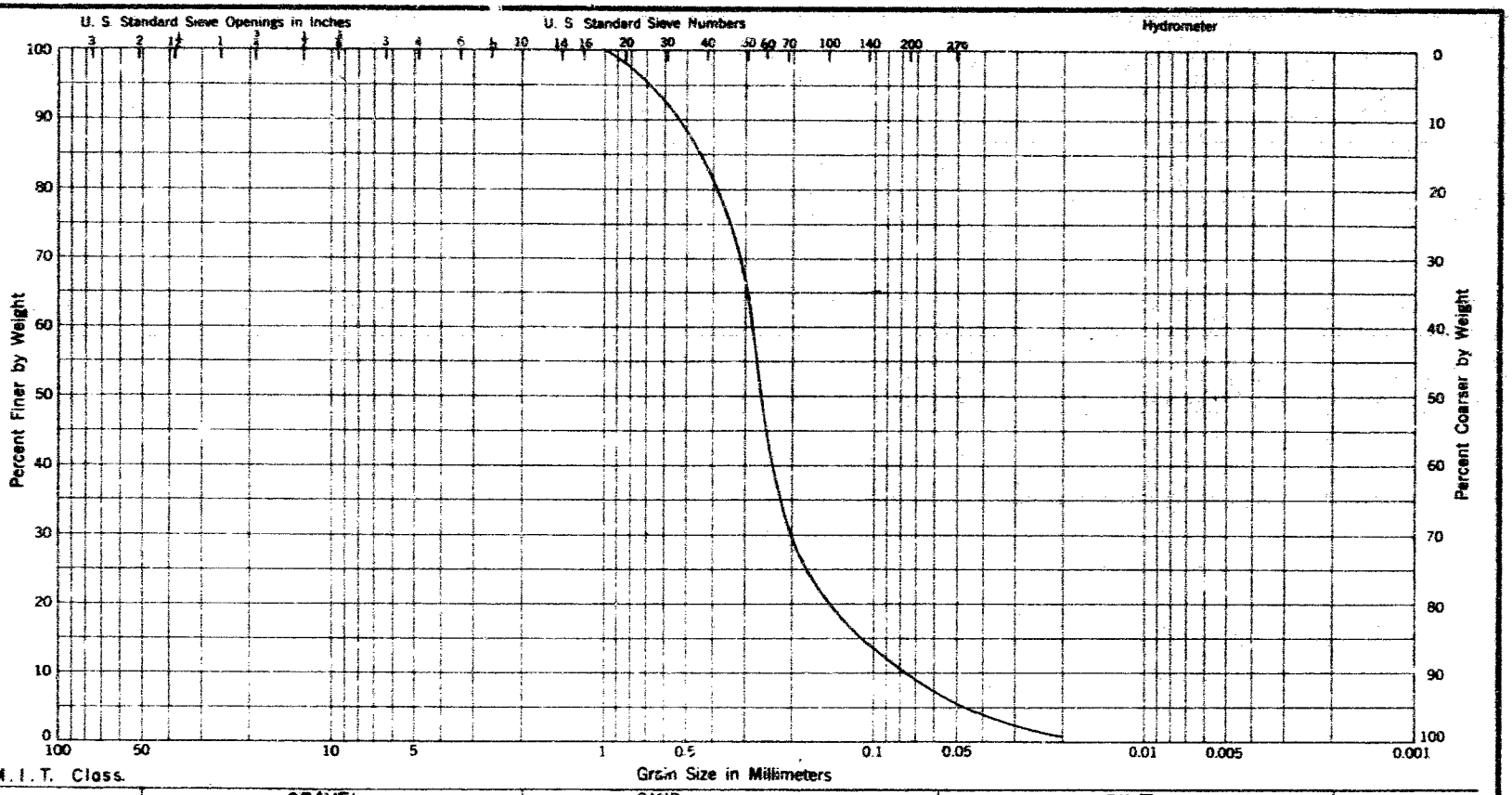
DEPARTMENT OF HIGHWAYS — ONTARIO

PROPOSED BRIDGE SITE

CATFISH CREEK NO. 2

SOIL MECHANICAL ANALYSIS

BOREHOLE NO:4 DEPTH:21 FT.



7%	Coarse Sand
63%	Med. Sand
22%	Fine Sand
8%	Silt

Classification

SAND, TRACE OF SILT

S.G. = 2·70

HUNTING TECHNICAL and EXPLORATION SERVICES

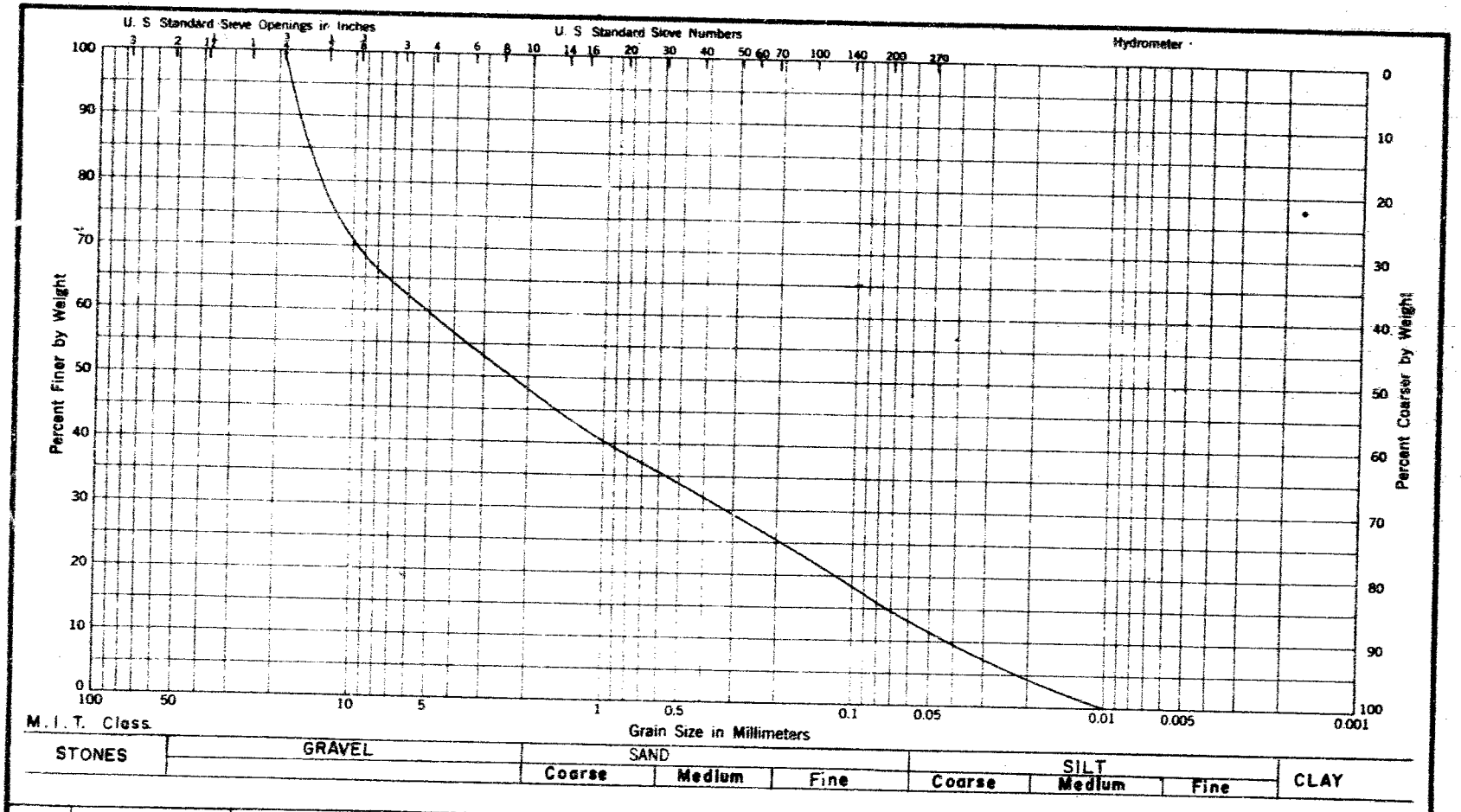
DEPARTMENT OF HIGHWAYS — ONTARIO

PROPOSED BRIDGE SITE

CATFISH CREEK NO. 2

SOIL MECHANICAL ANALYSIS

BOREHOLE NO. 4 DEPTH: 36 FT.



52%	Gravel
35%	Sand
13%	Silt

Classification

GRAVEL WITH SAND, SOME SILT

(TILL TEXTURE)

S.G. - 2·68

HUNTING TECHNICAL and EXPLORATION SERVICES

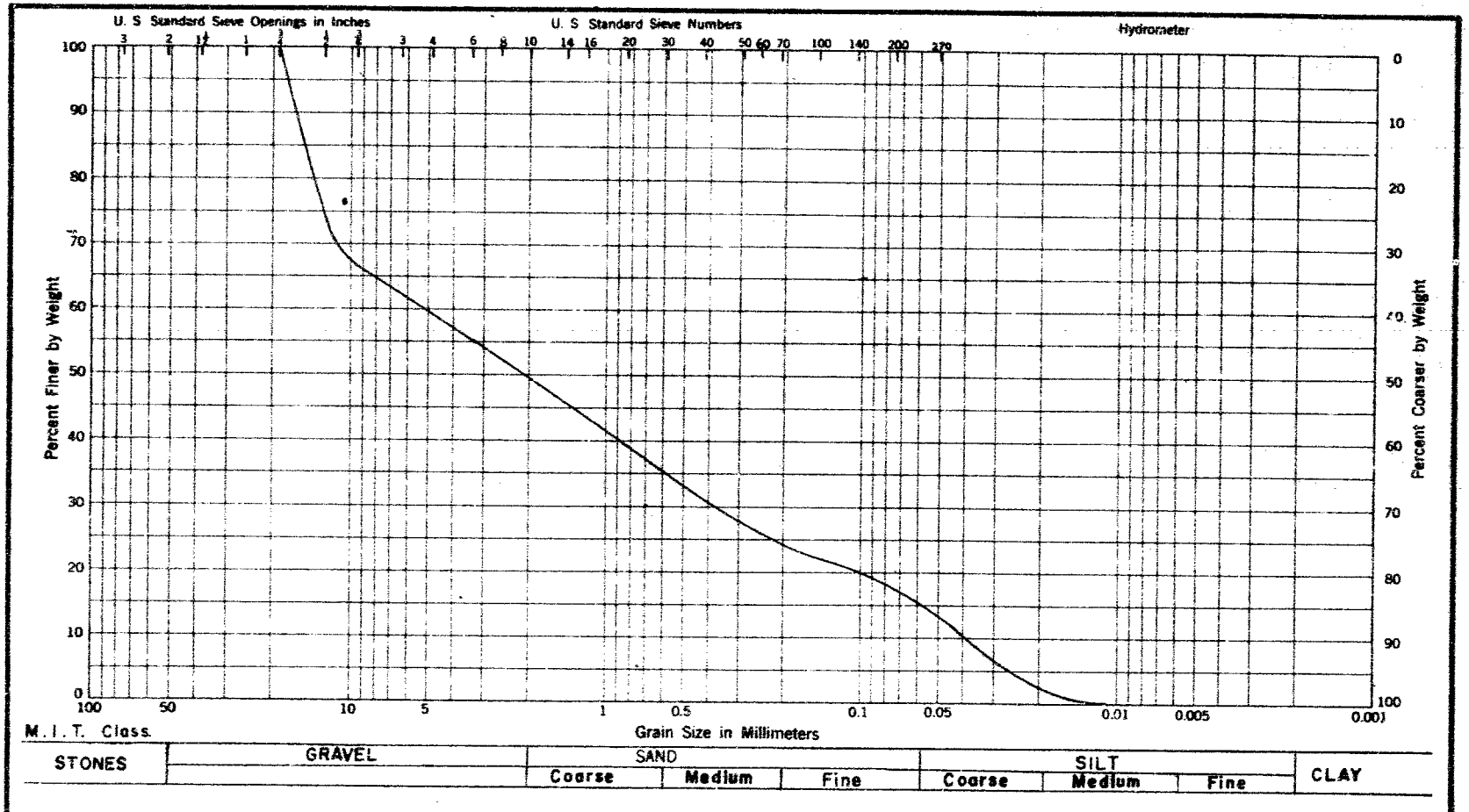
DEPARTMENT OF HIGHWAYS – ONTARIO

PROPOSED BRIDGE SITE

CATFISH CREEK NO. 2

SOIL MECHANICAL ANALYSIS

BOREHOLE NO.: 4 DEPTH: 49 FT.



50%	Gravel
34%	Sand
16%	Silt

Classification

GRAVEL WITH SAND, SOME SILT

(TILL TEXTURE)

S.G. = 2·70

HUNTING TECHNICAL and EXPLORATION SERVICES

DEPARTMENT OF HIGHWAYS — ONTARIO

PROPOSED BRIDGE SITE

CATFISH CREEK NO. 2

SOIL MECHANICAL ANALYSIS

BOREHOLE NO. 4 DEPTH: 63 FT.

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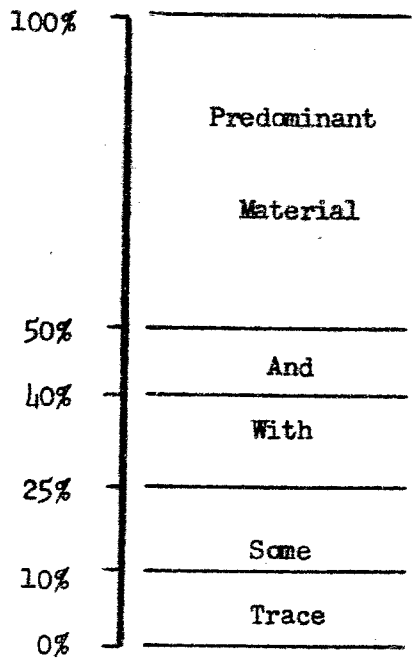
1450 O'Connor Drive Toronto, Ontario

SOIL TYPES

The following system was used in classifying the various soils by name:



Example:

Medium dense	grey	silt	with	fine sand
(Penet. resist.) or relative density	(colour)	(pred. type)	(25%-40%)	(other type)

Unless believed to have a significant effect on the soil characteristics the minor soil types (i.e. traces) present are disregarded in the name used on the boring log and cross-sections. The complete classification is given with the gradation analysis.

In all cases the strength characteristics (e.g. penetration resistance) is quoted first, followed by the colour and finally the descriptive name based on the mechanical analysis.

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CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

Soils encountered in sub surface exploration for engineering purposes are composed of organic or inorganic materials, water, air and dissolved salts. The water and air are generally considered to be uniform so that identification is primarily in the nature of organic or inorganic (mineral grains) and dissolved salts.

In the field a soil is generally identified in terms of grain size characteristics, color and mineral content — properties of the mineral grains. Occasionally, the origin of a soil is included in the identification.

The systems used to describe soils in terms of engineering properties are called classification systems. In the system described below, the soils are first identified and then classified in terms of strength characteristics which are of prime importance in utilizing the soil boring data in designing a safe and economical foundation.

Penetration measured by dropping 140 lb. hammer 30" on 2" O.D. split spoon sampler.

Identification (Soil Type)	Classification	Classification Criteria Unconfined Compressive Strength	
Clay	Soft	Less than 0.50 Tons/Sq. Ft.	
	Medium	0.50 to 1.00 Tons/Sq. Ft.	
	Stiff	1.00 to 2.00 Tons/Sq. Ft.	
	Very Stiff	2.00 to 4.00 Tons/Sq. Ft.	
	Hard	Greater than 4.00 Tons/Sq. Ft.	
		Density	
Silt	Loose	Less than 80 lbs./Cu. Ft.	
	Medium Dense	80 to 95 lbs./Cu. Ft.	
	Dense	Greater than 95 lbs./Cu. Ft.	
		Relative Density	Penetration Resist.
Sand	Loose	0 - 30%	0 - 10 Blows/Ft.
	Medium Dense	30 - 60%	10 - 30 Blows/Ft.
	Dense	60 - 90%	30 - 50 Blows/Ft.
	Very Dense	90 -100%	Over 50 Blows/Ft.
			Penetration Resist.
Gravel	Loose		Less than 30 Blows
	Dense		Over 30 Blows/Ft.
Hardpan		Cemented on partially cemented sandy gravels, sands, gravels with or without some clay and silt and having unconfined compression strength greater than 5 tons/Sq. Ft.	
Fill	Organic	Very Loose	0 - 4 Blows/Ft.
		Loose	4 - 10 Blows/Ft.
		Medium	10 - 30 Blows/Ft.
	Inorganic	Dense	30 - 50 Blows/Ft.
		Very Dense	Over 50 Blows/Ft.
		Unconfined Compressive Strength	
Peat	Very Soft	Less than 0.30 Tons/Sq. Ft.	
	Soft	0.30 to 0.60 Tons/Sq. Ft.	
	Stiff	Greater than 0.60 Tons/Sq. Ft.	
		Density	
Organic Silt (Muck)	Loose	Less than 30 lbs./Cu. Ft.	
	Medium Dense	Greater than 80 lbs./Cu. Ft.	