

FOUNDATION SECTION

Mr. A. Teye,
Bridge Engineer.
Materials & Research Section.

September 4, 1957
Re: Foundation Report
Hwy. 401 & Hwy. 20 Intersection
H.P. 44-57 H.S. F57-7.

Attached herewith are 2 copies of the foundation report for the above structure.

It is pointed out that the subsoil consists of a 14 foot layer of clay over a somewhat variable till. The clay itself, will not support more than 1.5 tons per square foot nor will the till support any more at the clay-till contact line. It would appear, that much higher bearing values would be desirable at this location and this can be accomplished by the use of piles.

The length of piles are difficult to estimate on the basis of stratigraphy and penetration results, therefore it would appear that a pile driving test should be carried out to refusal to determine the lengths of piles required.

F. C. Brownridge
Materials and Research Engineer

Per:

A. Rutka

(A. Rutka)

AR/hk

Copies to: Mr. H. C. Ramsay
Mr. H. Trepankos
Mr. H. Duff
Foundation Section
FINE

FOUNDATION REPORT

on

Underpass Bridge at New Highway 401
crossing Highway 28, one mile North of Port Hope.

Plan No. E-2869-1
Station No. 437/87

Distribution:

Mr. A. Teye Bridge Engineer	(2)
Mr. H. Tregaskes Construction Engineer	(1)
Mr. D. G. Ramsay Design Engineer	(1)
Mr. H. D. Duff Dist. Eng. Port Hope	(1)
Foundation section	(1)
FILE	(1)

W. P. 44-57
W.J. F-57-7

INTRODUCTION

A subsoil investigation was carried out to determine the bearing values of layers for supporting the foundations of the proposed structure.

The location is at new highway 401 crossing highway 28 about one mile north of Port Hope, (Profile F-3131-1, Sta. 437+87.13).

The work started on April 23, 1957 and was completed on May 4, 1957.

PROCEDURE

The investigations were carried out by means of a skid mounted coredrill machine. In the course of investigations four boreholes with dynamic cone penetration tests were made, two on each side of the centre line.

The locations of the boreholes are shown on plan F-57-7A and their elevations on log sheets under Appendix I.

SUBSOIL FINDINGS AND ANALYSIS

The subsoil investigations revealed the following stratigraphy:

Under the topsoil for about 14 ft. from the ground surface the layer is light clay becoming more loamy and gravelly with depth. Below this layer the soil is sandy clay loam with some 30% gravel. Judging from the dynamic cone penetration resistance, the consistency of the layer is uniform. At about elevation 295 ft. however the layer is hard enough to refuse any penetration. Borehole No. 1 was drilled down to 76 ft. from the ground surface with the idea of detecting any change in strata or finding bedrock. However, the results showed no change in the composition of the layer, and no bedrock at this depth.

The other boreholes (No. 2, 3, 4,) were carried down to about 50-58 ft. They all revealed the same stratification.

The terrain is possibly within the boundaries of early lake Iroquois shoreline. So, basically, it represents early till plain with lacustrine deposits on the top.

From the boreholes regular samples were extracted and tested in the laboratories. From the test results the top clay layer, which is about 14' deep from the ground surface, is made up of inorganic clay with low plasticity. The samples extracted at 5-7 ft. below ground surface showed natural moisture content of 30-42%. At this depth the unconfined compression tests gave a maximum value of 1.5 T.s.f. The average standard penetration resistance in this layer is 9-15 blows per foot. The underlying layer is sandy clay loam till. The attempts for unconfined compression tests proved to be unreliable. The average standard penetration refusal in the section from elevation 335-320 ft. (assumed to correspond to 2B depth) is about 15 blows per foot.

Under these considerations the layers do not present much competence for supporting spread footing type foundations.

It will be observed from the dynamic cone penetration results, and from the number of blows needed for driving the casing, that at about elevation 295 ft. the layer is becoming extremely hard and bouldery, refusing all attempts of penetration (and of penetration in boreholes No. 1 at 299 ft., No. 2 at 301.5 ft., No. 3 at 291 ft., No. 4 at 293 ft.)

CONCLUSIONS AND RECOMMENDATIONS

From the above discussion it will follow that:

1. The terrain is probably lacustrine deposit formed on originally till shoreline of early lake Iroquois.
2. Neither the top clay layer (14 ft. below the ground surface) nor the upper 15 ft. (30 ft. below the ground surface) of the underlying sandy clay loam layer could provide bearing value more than 1.2 - 1.5 T.s.f. for supporting spread footing type foundations.

If the footings were placed in the clay layer (about elevation 343 ft.), due to the high moisture content of this layer some consolidation would be expected. However, in view of the fact that the depth of the clay layer below the footing will be considerably shallow, the amount of consolidation is not expected to be serious.

3. It is probably very desirable to obtain a higher bearing value for the structure at this location. Consequently this can only be achieved by the use of piles. While refusal to the dynamic cone penetration was achieved at elevation 295 approximately, it is not expected that piles could be driven to refusal at this elevation, mainly due to the high density and much boulder content of the till layer. The only way to determine the refusal depth of the piles would be by driving some test piles on the spot. If the precise length of the piles must be determined before the structure is called, such a pile driving test will be necessary.

4. The approach fills to the structure, placed after removal

of the topsoil and with a side slope of 2:1, do not present any stability problem.

V. Korlu,
Foundation Engineer.

A P P E N D I X I

DRILL RIG 54-1 OPERATION BORE & PINETN JOB F-57-7 W.P. 44-57 BORING 1 STA. 438-37 ^{43 TO 21 PARALLEL}
CASING B (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT JULY 1957
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY HJ CHECKED BY AL DATE BORING 25 APRIL 1957

SAMPLE TYPES

SAMPLE CONDITION

CS - CHUNK	SS - SLEEVE SAMPLE
DO - DRIVE OPEN	PS - PISTON SAMPLE
DF - DRIVE FOOT VALVE	WS - WASHED SAMPLE
TO - THIN WALLED OPEN	RC - ROCK CORE



- DISTURBED
- FAIR
- GOOD
- LOST

SHEAR STRENGTH IN LBS PER SQ. FT.

WATER CONTENT W %	O - NAT	□ - PW	Δ - LW
-------------------	---------	--------	--------

The graph shows a linear relationship between the number of days after the start of the growing season (X-axis) and the number of days after the start of the growing season (Y-axis). The X-axis ranges from 0 to 40, and the Y-axis ranges from 0 to 40. A solid line with a slope of 1 represents the relationship, starting at (0,0) and ending at (40,40). The line is labeled with the equation $y = x$.

PENETRATION TEST RESISTANCE BLOWS PER FOOT				
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	37	38	39	40
41	42	43	44	45
46	47	48	49	50
51	52	53	54	55
56	57	58	59	60
61	62	63	64	65
66	67	68	69	70
71	72	73	74	75
76	77	78	79	80
81	82	83	84	85
86	87	88	89	90
91	92	93	94	95
96	97	98	99	100

AT STANDARD ENERGY (4200 IN. LBS. PER BLOW)

D. CONE PEN. X-----X-----X STAND. PEN. ●-----●-----●

52	SAMPLES
----	---------

BU	ON	TION	PRIN	BY
----	----	------	------	----

NG	CT	ERS	ST	YI	PE	ZO	RA	TA	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
----	----	-----	----	----	----	----	----	----	---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

SYNOPSIS (A) THESSALONIANS II IDENTITY ET DISAPPEARANCE

CAC	O T	OM			EN	ES	%
-----	-----	----	--	--	----	----	---

TOP SOIL

GREY CLAY

JANDY CLAY

LOAM

WITH CRAWEL

LAND & BOAT

~~REF ID: A71157~~ 2988





END OF CASING

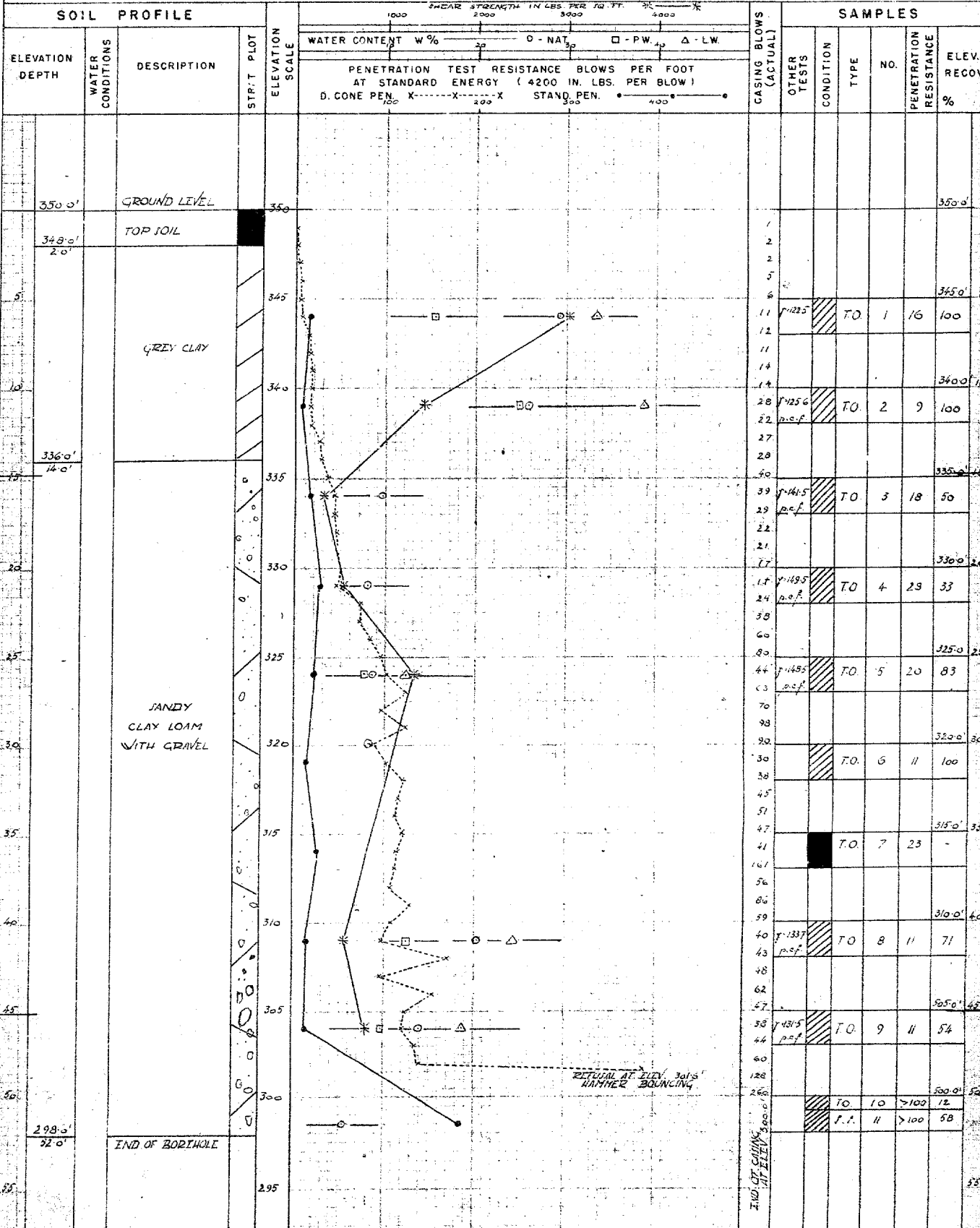
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW
OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG 54-1 OPERATION BORE & PINET N
CASING BX (standard samplers to fit unless noted)
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES

JOB F-57-7 WP 44-57
DATUM GEODETIC
COMPILED BY H.I. CHECKED BY AL

BORING 2 STA 438+37 ^{14517 PICAL}
DATE REPORT JULY 1957
DATE BORING 30 APRIL 1957

ABBREVIATIONS				SAMPLE TYPES		SAMPLE CONDITION	
V - INSITU VANE SHEAR TEST	Q - TRIAXIAL QUICK	K - PERMIABILITY	C.S. - CHUNK	SS - SLEEVE SAMPLE			- DISTURBED
M - MECHANICAL ANALYSIS	S - TRIAXIAL SLOW	C - CONSOLIDATION	D.O. - DRIVE OPEN	PS - PISTON SAMPLE			- FAIR
U - UNCONFINED COMPRESSION	WL - WATER LEVEL IN CASING	CA - CASING	DF - DRIVE FOOT VALVE	WS - WASHED SAMPLE			- GOOD
QC - TRIAXIAL CONSOLIDATED QUICK	WT - WATER TABLE IN SOIL	γ - UNIT WEIGHT	T.O. - THIN WALLED OPEN	RC - ROCK CORE			- LOST



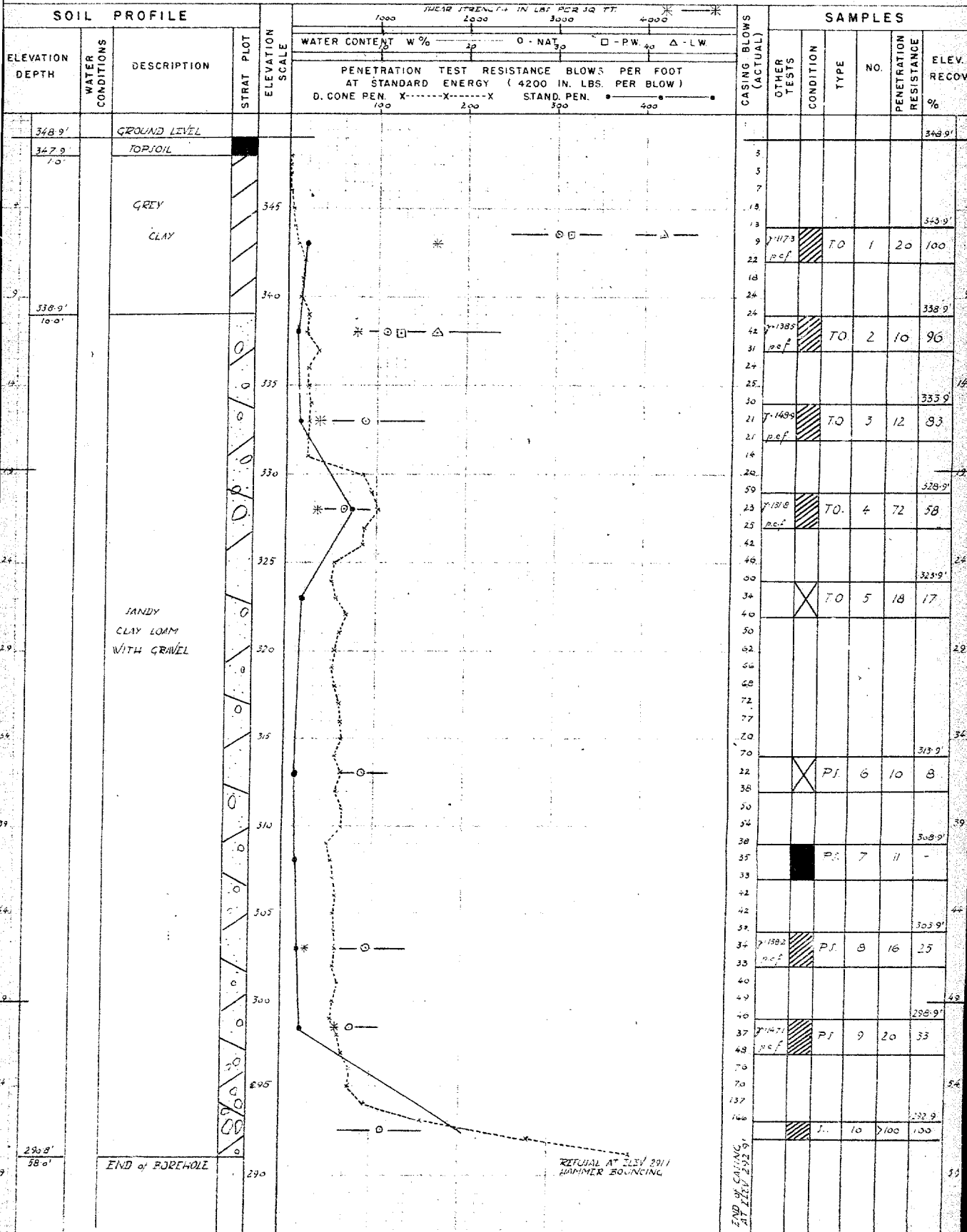
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW
OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG 54-1 OPERATION BORE & PENETIN JOB F-57-7 WP 44-57 BORING 3 STA 437+47
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT JULY 1957
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY HS CHECKED BY AL DATE BORING MAY 1957

ABBREVIATIONS
V - INSITU VANE SHEAR TEST Q - TRIAXIAL QUICK K - PERMIABILITY C.S. - CHUNK S.S. - SLEEVE SAMPLE
M - MECHANICAL ANALYSIS S - TRIAXIAL SLOW C - CONSOLIDATION D.O. - DRIVE OPEN P.S. - PISTON SAMPLE
U - UNCONFINED COMPRESSION WL - WATER LEVEL IN CASING CA - CASING D.F. - DRIVE FOOT VALVE WS - WASHED SAMPLE
Qc - TRIAXIAL CONSOLIDATED QUICK WT - WATER TABLE IN SOIL γ - UNIT WEIGHT T.O. - THIN WALLED OPEN R.C. - ROCK CORE

SAMPLE TYPES
S.S. - SLEEVE SAMPLE
P.S. - PISTON SAMPLE
WS - WASHED SAMPLE
R.C. - ROCK CORE

SAMPLE CONDITION
DISTURBED
FAIR
GOOD
LOST

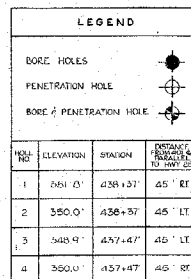


57-F- 7
W.P.# 44-57
Hwy.#401 (NEW)
CROSSING
Hwy.# 28
PORT HOPE





F - 3131
401 F - 44
E - 2869 -
7 - 20



NOTE
THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT BORE HOLE LOCATION. BETWEEN BORE HOLES THE BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE AND MAY BE SUBJECT TO CONSIDERABLE ERROR.

DEPARTMENT OF HIGHWAYS, ONTARIO
MATERIALS & RESEARCH SECTION - DOWNSVIEW

HIGHWAY No 28
PROPOSED CROSSING
1/2 MILE N. OF PORT HOPE

THE KING'S HIGHWAY No. 401 (LINE 'A')
 GO DURHAM
 HOPE 3

POSITION & ELEVATION OF HOLES

APPROVED

References

CITY ENGINEER

2	1	1
---	---	---

70428

1

1998

W.P.

APR 25	CHICAGO	1
--------	---------	---

Page No.	DATE
----------	------

F. 87

AUGUST 12, 1957

[illegible]

1. **NUMERIC**

100

1. *Journal of the American Medical Association*, 1997; 277: 1033-1038.

100

100