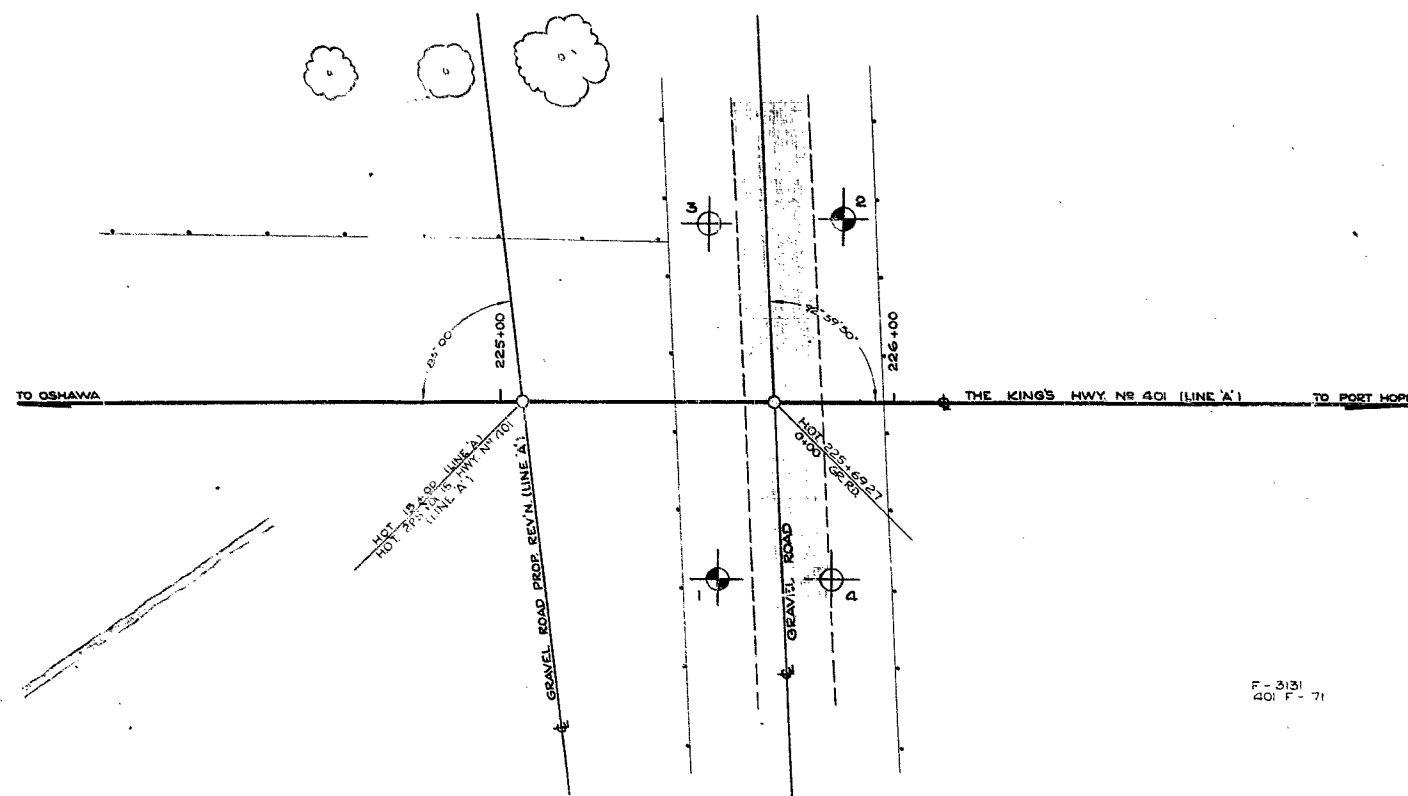
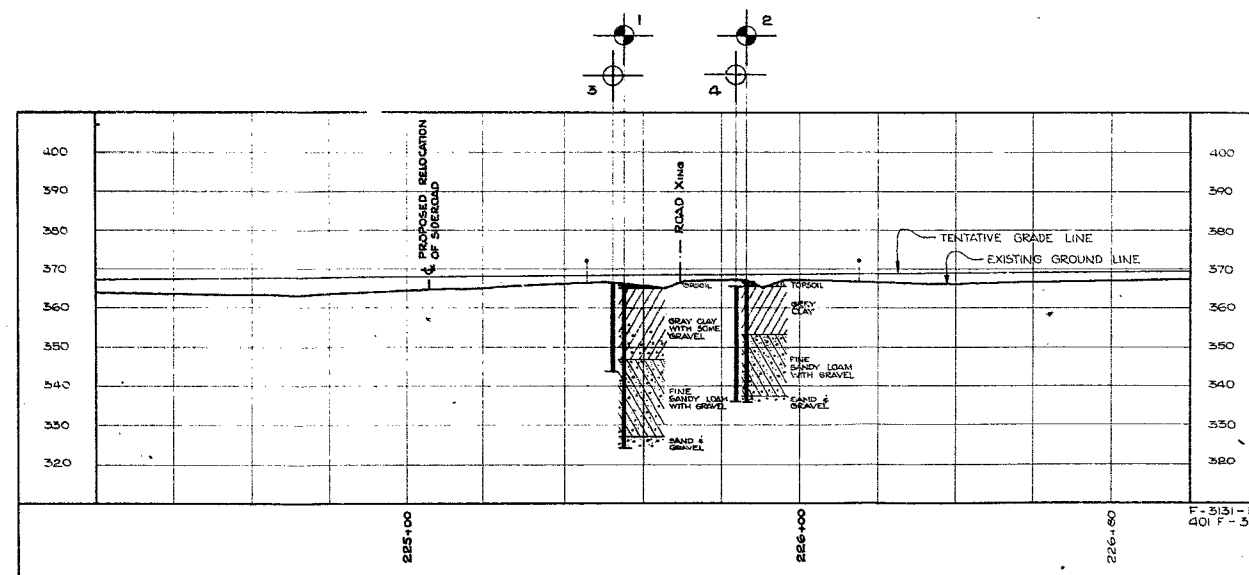


#57-F-15
W.P.#86-57
Hwy.#401
CROSSING
GRAVEL RD.
4 MILES W. OF
PORT HOPE





PLAN SCALE 1 IN = 20 FT



PROFILE SCALE 1 IN = 20 FT

LEGEND			
BORE HOLES			
PENETRATION HOLE			
BORE & PENETRATION HOLE			
HOLE NO.	ELEVATION	STATION	DISTANCE FROM C.
1	366.0'	225+55'	45' RT
2	366.5'	225+87'	47' LT
3	366.5'	225+53'	46' LT
4	365.5'	225+84'	45' RT

NOTE
THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT BORE HOLE LOCATIONS. 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

GRAVEL ROAD REVISION PROPOSED CROSSING 2 MILES W. OF PORT HOPE

THE KING'S HIGHWAY NO. 401 (LINE A') DIV. NO. 7
CO. DURHAM
TWP. HOPE LOT 18 & 19 SEC. II

POSITION & ELEVATION OF HOLES

APPROVED		ENGINEER		CHIEF ENGINEER	
DESIGN	CHECK	DESIGN	CHECK	DESIGN	CHECK
DRAWING	CHECK	DRAWING	CHECK	DRAWING	CHECK
PLACING	CHECK	PLACING	CHECK	PLACING	CHECK
AUGUST 20, 1957		CONTRACT NUMBER		W.P. 86-57	
		DRAWING NUMBER		F-57-15A	

cc: Foundation Section

Vert. Dec 5/57 - upon further
discussion with Lawrence Lock, it
was decided to place the footing at elev
353 with a bearing capacity of 2 T/O. / FT.
Mr. A. Toye, September 3, 1957.

Bridge Engineer.

Materials & Research Section.

Foundation Report -
Hwy. 401 and Road Allowance between
Lots 18 and 19 - Hope Township,
W.P. 86-57 W.J. F 86-15

Attached herewith are two copies of the above
mentioned foundation report.

The bore holes were placed on either side of
the existing township road assuming the structure would
span this road. However, the township road has been re-
vised and the new line is 70' to the east of the gravel
road. Inasmuch as the terrain is similar in both loc-
ations and the line is not too far removed, it is reason-
able to assume that the same soil conditions will be found.

F. C. Brownridge,
MATERIALS & RESEARCH ENGR.

Per:

A.R.

(A. Rutka,
Principal Soils Engr.)

AR/MdAF
Attach.

cc: Messrs. G. Ramsay
H. Tregaskes
H. Duff

Foundation Section✓
File

① $L_u = 30$ $u = 23$ $P_u = 15$ ($P.I. = 15$)

$\sigma = 124$ p.c.f.

assuming clay as normally-loaded

$C_c = 0.009(30-10) = 0.18$

$S_c = \frac{C_c H}{1 + e_0} \log \frac{p_0 + \Delta p}{p_0}$



$LG = se$ assumed $S = 1$

$e = 0.23 \times 2.71 = 0.624$

$p_0 = 13 \times 0.124 = 1.61$ k.s.f.

$\Delta p = 0.55 \times 2 \times 2 = 2.2$ k.s.f.

$S_c = \frac{0.18 \times 12}{1 + 0.624} \log \frac{1.61 + 2.2}{1.61}$

$S_c = \frac{0.18 \times 12}{1.624} \times 0.374 = 0.494' = \underline{\underline{5.95''}}$

②

$p_0 = 2.5 \times 0.124 = 1.18$ k.s.f.

$\Delta p = 2 \times 2 \times 0.8 = 3.2$ k.s.f.



$S_c = \frac{0.18 \times 5}{1.624} \times \log \frac{1.18 + 3.2}{1.18}$

$= \frac{0.9}{1.624} \times 0.569 = 0.3155 = \underline{\underline{3.78''}}$

$\frac{1.18}{3.2}$
 $\frac{4.38}{4.38}$

Foundation Report

on

Underpass Bridge at Highway 401 Crossing Gravel
Road Between Lots 18 & 19 (Con. II) about 4
miles West of Port Hope.

Plan No.: F-3131

Station: 225+06

Distribution:

Mr. A. Teye
Bridge Engineer (2)

Mr. H. Tregaskes
Construction Engineer (1)

Mr. D. G. Ramsay
Design Engineer (1)

Mr. H. D. Duff
District Engineer
Port Hope, Ontario (1)

Foundation Section (1)

File (1)

W. P. 26-57

W. J. F-57-15

Introduction

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

The location is at the new Highway 401 (Line "A") Crossing Gravel Road (proposed revision Line "A") between Lots 18 & 19 (Concession II), Station 225+06.15, Profile No. F-3131-1.

The work started on May 9, 1957 and was completed on May 17, 1957.

Procedure

The investigations were carried out by means of a skid mounted coredrill machine. In the course of investigations, two boreholes with dynamic cone penetration tests and two other dynamic cone penetration tests were made.

The location of the holes is shown on plan F-57-15A, and their elevations on log sheets under Appendix I.

Subsoil Findings and Analysis

The terrain is till plain. The investigations revealed the following stratigraphy:

Under the topsoil, the layer is grey clay becoming gravelly by depth. Below about 15 ft. depth from the ground surface, the layer is fine sandy loam with increased amount of gravel. At elevations 327 ft. in borehole No. 1 and 337 ft. in borehole No. 2, the layer is a dense sand and gravel. Borehole No. 1 was carried down 41 ft. below the ground level. Borehole No. 2 was carried down 31 ft. below the ground level and after the stratification was confirmed it was stopped.

The samples extracted from the boreholes were tested in the laboratories. From the test results, the top grey clay layer is made up of inorganic clay of low to medium plasticity. Its average liquid limit was found to be 31%, plastic limit 16%, moisture content 24% and density 125 p.c.f. The unconfined compression tests gave shear values of 3200 - 5450 p.s.f.

The fine sandy loam layer underlying the grey clay layer is made up of clay, silt, sand and gravel. The clay decreases with depth from 60% to 5%. The gravel increases with depth from 15% to 55%. The layer has very low plastic and liquid limits. Its moisture content is about 9% and its density about 143 p.c.f. The attempts at unconfined compression tests failed, or gave some unreliable results. The standard penetration results in this layer indicated an average value of 60 blows per foot penetration.

The boreholes were stopped in the dense sand and gravel layer, where over 100 blows per foot penetration were registered during the standard penetration tests.

Under these considerations the subsoil stratification is favorable for spread footing type foundations. The top grey clay layer will provide 2 T.s.f. bearing value, while higher bearing values could be obtained at lower elevations.

Conclusions and Recommendations

From the above discussion it will follow that:

1. The subsoil is till, being grey clay at the top becoming sandy, silty, and gravelly loam with depth, ending in a dense sand and gravel formation.

2. It will be convenient to support the proposed structure on spread footing type foundations. If these foundations are placed about 7 feet below the ground surface, i.e. elevation 358, the layer can provide a bearing value of 2 T.s.f. If desired, at lower elevations, higher bearing values could be obtained.
3. The approach fills to the structure do not present any stability problems.

Remarks

The soil investigations were made where Highway 401 crosses the existing gravel road. However, later on a revision line "A" has been proposed in place of the existing gravel road. This revision line is only 70 ft. centre to centre to the ^{WEST} ~~East~~ of the existing gravel road. By all observations there is no indication of change of terrain in this space between the existing gravel road and the new revision line. It can be assumed that the above conclusions and recommendations will be applicable at the revision line "A" intersection as well.

V. Korlu

Foundation Engineer

VK:GUP

APPENDIX I

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

DRILL RIG 54-1 OPERATION BORE & PENET'N JOB T-57-15 WP 86-57 BORING 1 STA 225+55 (M 27)
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT AUG. 1957
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY AL CHECKED BY DATE BORING MAY 13, 1957

ABBREVIATIONS

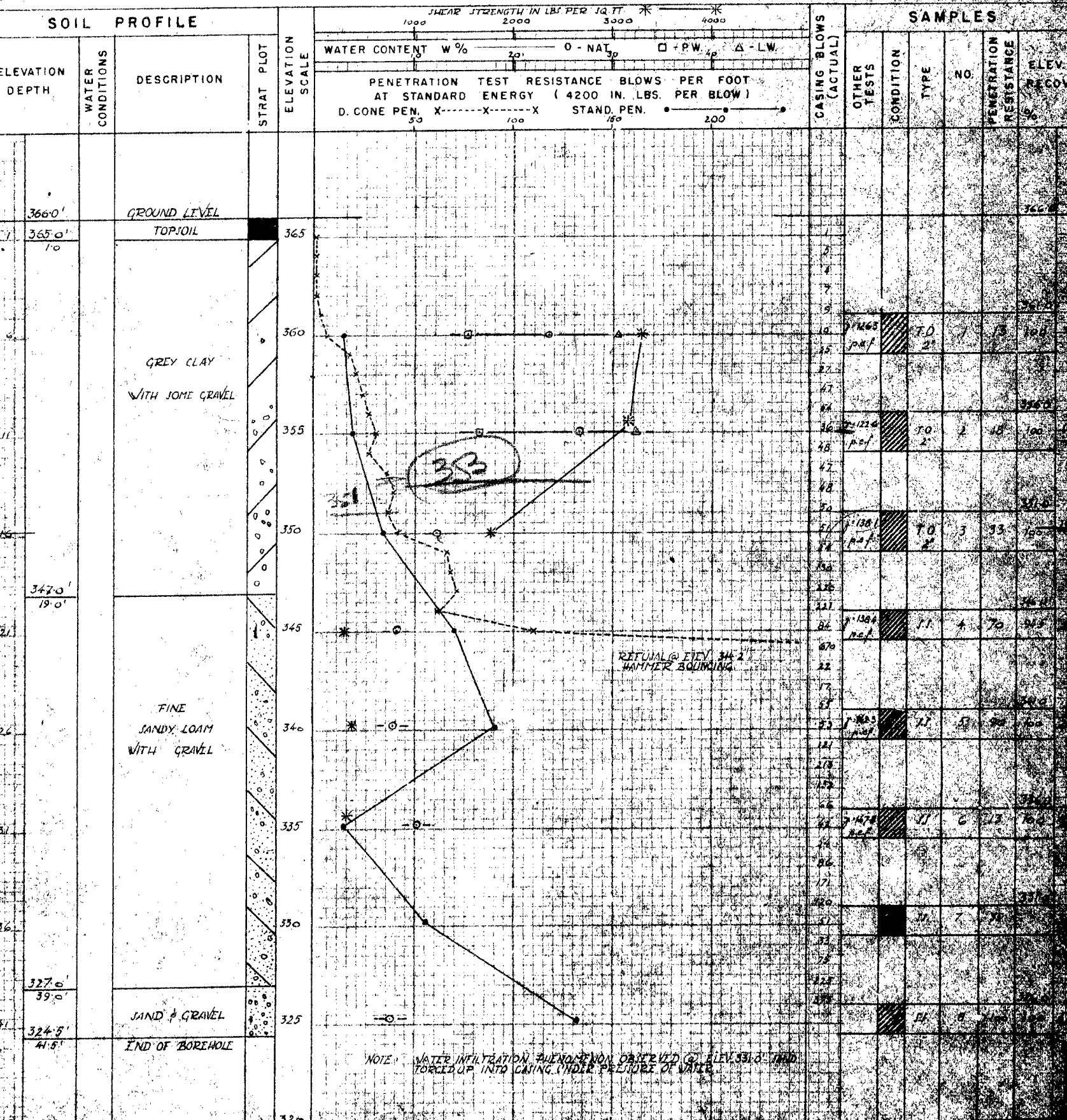
V - INSITU VANE SHEAR TEST Q - TRIAXIAL QUICK K - PERMIABILITY
M - MECHANICAL ANALYSIS S - TRIAXIAL SLOW C - CONSOLIDATION
U - UNCONFINED COMPRESSION WL - WATER LEVEL IN CASING CA - CASING
Qc - TRIAXIAL CONSOLIDATED QUICK WT - WATER TABLE IN SOIL γ - UNIT WEIGHT

SAMPLE TYPES

C.S. - CHUNK D.O. - DRIVE OPEN P.S. - SLEEVE SAMPLE
D.F. - DRIVE FOOT VALVE W.S. - WASHED SAMPLE PS - PISTON SAMPLE
T.O. - THIN WALLED OPEN R.C. - ROCK CORE

SAMPLE CONDITION

 - DISTURBED
 - FAIR
 - GOOD
 - LOST



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

DRILL RIG 54-1 OPERATION BORE & PENET'N JOB # 57-15 WP B6-37 BORING 2 STA 229+07.67 (67' LL)
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT AUG 1957
SAMPLER HAMMER WT. 250 LBS. DROP 72 INCHES COMPILED BY A.L. CHECKED BY DATE BORING 1949.15.1957

ABBREVIATIONS

V - INSITU VANE SHEAR TEST
M - MECHANICAL ANALYSIS
U - UNCONFINED COMPRESSION
Q - TRIAXIAL CONSOLIDATED QUICK
Q - TRIAXIAL QUICK
S - TRIAXIAL SLOW
WL - WATER LEVEL IN CASING
WT - WATER TABLE IN SOIL
K - PERMIABILITY
C - CONSOLIDATION
CA - CASING
γ - UNIT WEIGHT

SAMPLE TYPES

C.S. - CHUNK
D.O. - DRIVE OPEN
D.F. - DRIVE FOOT VALVE
T.O. - THIN WALLED OPEN
S.S. - SLEEVE SAMPLE
P.S. - PISTON SAMPLE
W.S. - WASHED SAMPLE
R.C. - ROCK CORE

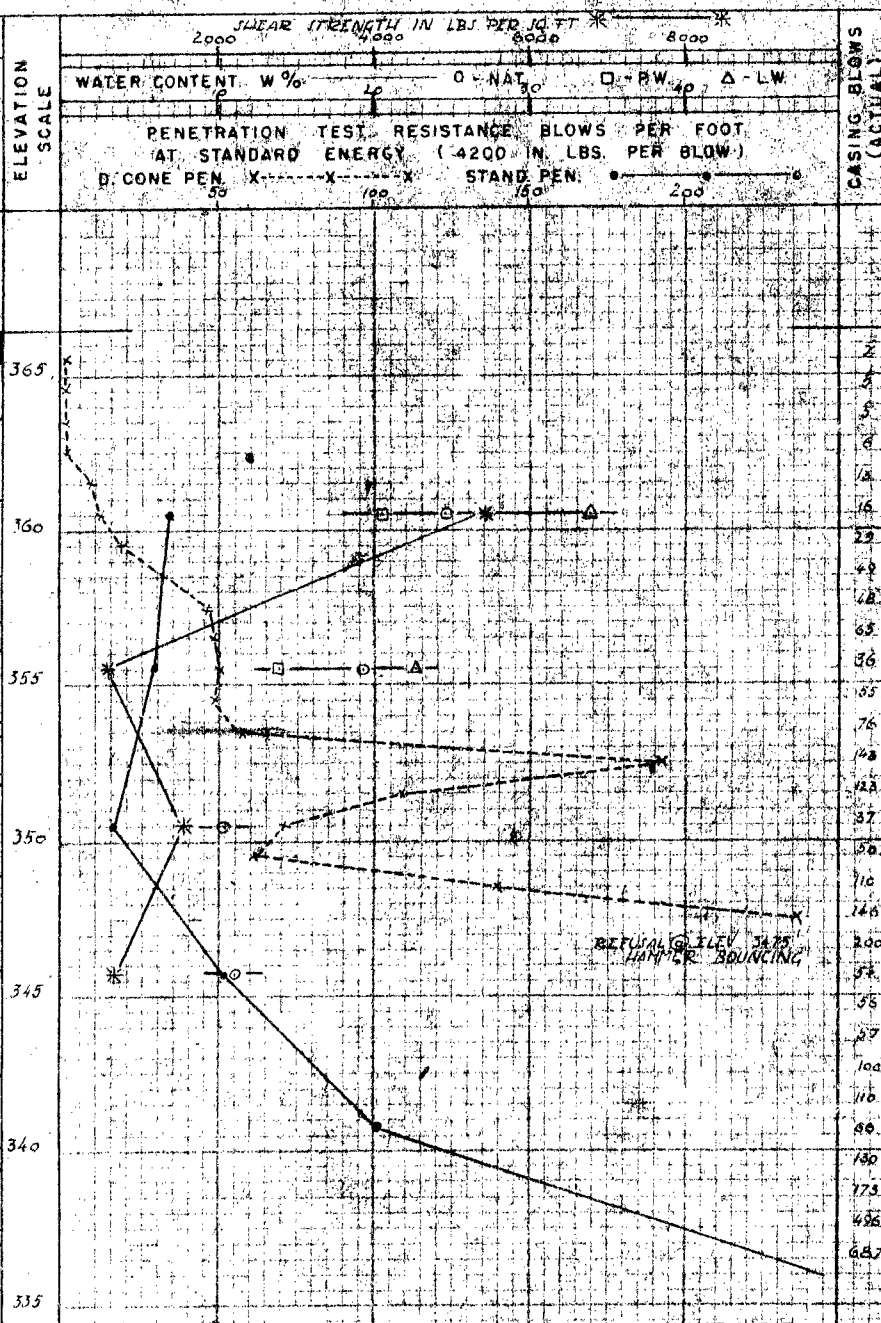
SAMPLE CONDITION



DISTURBED
FAIR
GOOD
LOST

SOIL PROFILE

ELEVATION DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT PLOT	ELEVATION SCALE
366.50'		GROUND LEVEL		
365.5'		TOPSOIL		365
365.5'				
365.5'		GREY CLAY		360
365.5'				
355.5'				355
355.5'				
355.5'		FINE SANDY LOAM WITH GRAVEL		350
355.5'				
355.5'				345
355.5'				
355.5'				340
355.5'				
355.5'		SAND & GRAVEL		335
355.5'				
355.5'		END of BOREHOLE		330



SAMPLES

CASING BLOWS (ACTUAL)	OTHER TESTS	CONDITION	TYPE	NO.	PENETRATION RESISTANCE	ELEV. RECOVER
2						366.5
3						365.5
4						365.5
5						365.5
6						365.5
7						365.5
8						365.5
9						365.5
10						365.5
11						365.5
12						365.5
13						365.5
14						365.5
15						365.5
16						365.5
17						365.5
18						365.5
19						365.5
20						365.5
21						365.5
22						365.5
23						365.5
24						365.5
25						365.5
26						365.5
27						365.5
28						365.5
29						365.5
30						365.5
31						365.5
32						365.5
33						365.5
34						365.5
35						365.5
36						365.5
37						365.5
38						365.5
39						365.5
40						365.5
41						365.5
42						365.5
43						365.5
44						365.5
45						365.5
46						365.5
47						365.5
48						365.5
49						365.5
50						365.5
51						365.5
52						365.5
53						365.5
54						365.5
55						365.5
56						365.5
57						365.5
58						365.5
59						365.5
60						365.5
61						365.5
62						365.5
63						365.5
64						365.5
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66						365.5
67						365.5
68						365.5
69						365.5
70						365.5
71						365.5
72						365.5
73						365.5
74						365.5
75						365.5
76						365.5
77						365.5
78						365.5
79						365.5
80						365.5
81						365.5
82						365.5
83						365.5
84						365.5
85						365.5
86						365.5
87						365.5
88						365.5
89						365.5
90						365.5
91						365.5
92						365.5
93						365.5
94						365.5
95						365.5
96						365.5
97						365.5
98						365.5
99						365.5
100						365.5

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

DRILL RIG 54-1 OPERATION PENETRATION JOB F-57-15 WP 86-57 BORING 3 STA 275+14.5 (E)
 CASING B1 (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT AUG 1957
 SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY AL CHECKED BY DATE BORING MAY 15 1957

ABBREVIATIONS

SAMPLE TYPES

SAMPLE CONDITION

V - INSITU VANE SHEAR TEST Q - TRIAXIAL QUICK K - PERMIABILITY
 M - MECHANICAL ANALYSIS S - TRIAXIAL SLOW C - CONSOLIDATION
 U - UNCONFINED COMPRESSION WL - WATER LEVEL IN CASING CA - CASING
 QC - TRIAXIAL CONSOLIDATED QUICK WT - WATER TABLE IN SOIL γ - UNIT WEIGHT

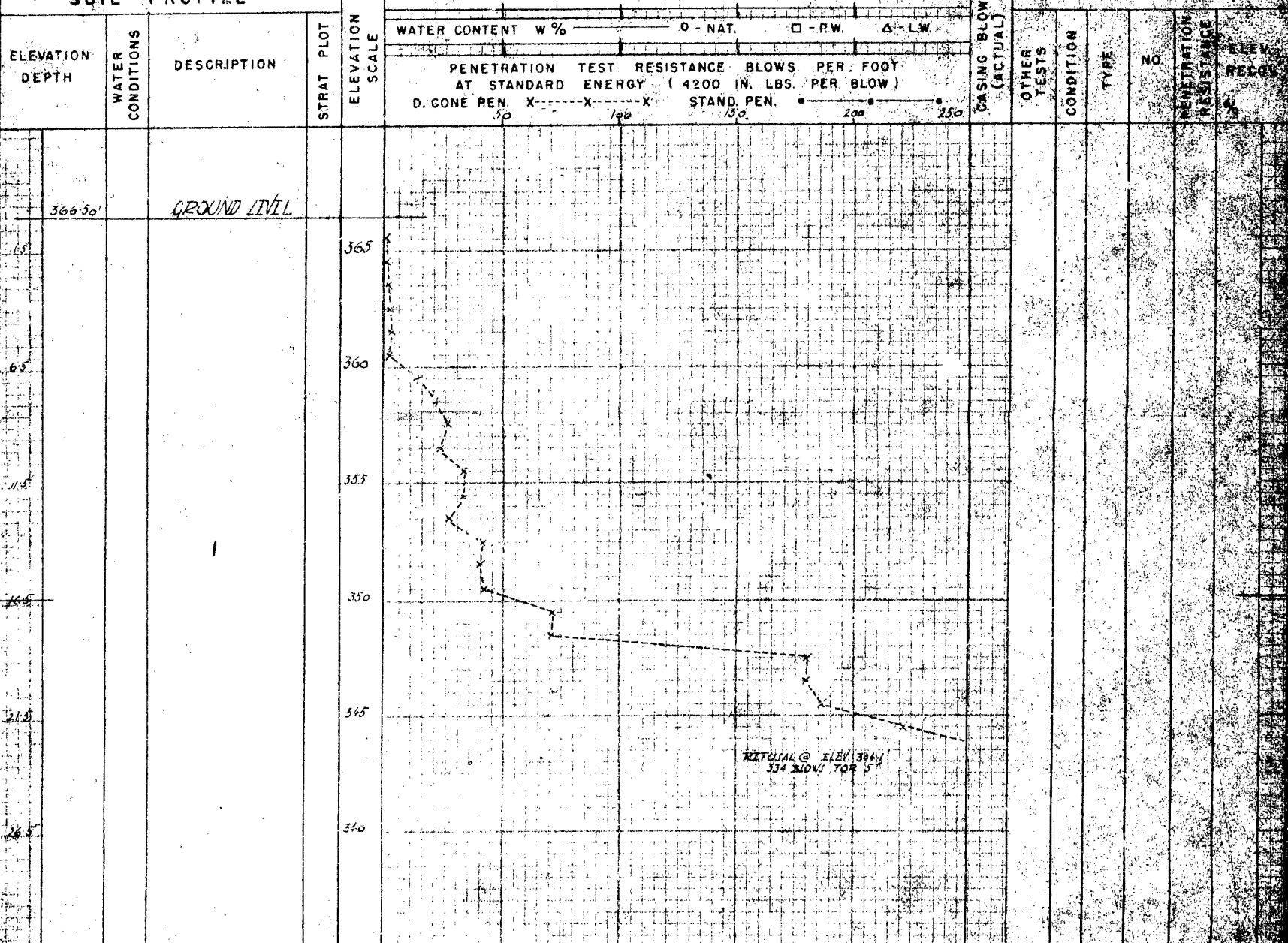
C.S. - CHUNK S.S. - SLEEVE SAMPLE
 D.O. - DRIVE OPEN PS - PISTON SAMPLE
 D.F. - DRIVE FOOT VALVE WS - WASHED SAMPLE
 T.O. - THIN WALLED OPEN RC - ROCK CORE



DISTURBED
 - FAIR
 GOOD
 LOST

SOIL PROFILE

SAMPLES



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

DRILL RIG 54-1 OPERATION FENITIN JOB F-57-15 WP 86-57 BORING 4 STA 225+84 (45 FT.)
CASING BA (standard samplers to fit unless noted) DATUM GLODITIC DATE REPORT AUG 1957
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY AL CHECKED BY DATE BORING MAY 17, 1957

ABBREVIATIONS

V - INSITU VANE SHEAR TEST	Q - TRIAXIAL QUICK	K - PERMIABILITY
M - MECHANICAL ANALYSIS	S - TRIAXIAL SLOW	C - CONSOLIDATION
U - UNCONFINED COMPRESSION	WL - WATER LEVEL IN CASING	CA - CASING
Q _c - TRIAXIAL CONSOLIDATED QUICK	WT - WATER TABLE IN SOIL	γ - UNIT WEIGHT

SAMPLE TYPES

C.S. - CHUNK	S.S. - SLEEVE SAMPLE
D.O. - DRIVE OPEN	P.S. - PISTON SAMPLE
D.F. - DRIVE FOOT VALVE	W.S. - WASHED SAMPLE
T.O. - THIN WALLED OPEN	R.C. - ROCK CORE

SAMPLE CONDITION



SOIL PROFILE

ELEVATION DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT PLOT	ELEVATION SCALE	WATER CONTENT W %			GASING BLOW (ACTUAL)	OTHER TESTS	CONDITION	TYPE	NO.	PENETRATION RESISTANCE	FLEV. RECON.
					O - NAT.	□ - P.W.	△ - L.W.							
					PENETRATION TEST RESISTANCE BLOWS PER FOOT AT STANDARD ENERGY (4200 IN. LBS. PER BLOW)									
					O. CONE PEN. X-----X-----X STAND. PEN. ●-----●-----●									
					50 100 150 200									
365.50		GROUND LEVEL		365	HAMMER									
360				360										
358				358										
350				350										
345				345										
340				340										
335				335										
330				330										