

Copy to: Foundation Section

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

February 13, 1957.

Re: Foundation Report -
C.N.R. Crossing Callender
By-pass - Station 114+75
W.P. 621-56 W.J. P-56-17.

Two copies of the above mentioned Foundation Report are being forwarded herewith.

The subsoil consists of loose sand to a considerable depth with about a 10-foot layer of very soft clay approximately 10 feet below the surface. While it is evident that a piled foundation is the best type for this site, the construction of the embankment and its effect upon the stability of the structure must be considered in view of the soft clay layer.

The embankment may be constructed in one of two ways:

1. Stage construction with the embankment constructed to standard cross-sections. Only a portion of the fill would be added and a time lapse would be necessary for the soft clay to gain strength.
2. Complete construction of the embankment to grade with stabilizing side berms.

In this particular case, we would prefer the berms because of the fact that the time element required for stage construction is difficult to estimate. The berms should be in the order of 15 ft. high and 50 ft. wide and should be constructed to approximately elevation 703 between stations 113+00 - 121+50.

cont'd. /2

February 13, 1957.

It would also be advisable to:

1. Construct the approach fills and berms, particularly in the vicinity of the structure location, with a granular type of material rather than rock, as pile driving in rock would be difficult. This information will be passed on to the Design Section.
2. Construct the fills on both sides of the railroad tracks, more or less at the same rate, to avoid any possible longitudinal failures.

F. C. Brownridge
MATERIALS & RESEARCH ENGR.

per:

ER

(A. Ruths)

AR/MdF
attach. (2)

cc: Messrs. H. Tregaskes
G. D. Ramsay
D. Foster

Foundation Section
File

FOUNDATION REPORT

on

C.N.R. Prop. Crossing, North Bay

By-pass at North Callender

Site Plan No. F-3279-9

Station: 114/75

Distribution:

Mr. A. Toye,
Bridge Engineer (2)

Mr. H. Tregaskes,
Construction Engineer (1)

Mr. J. Walter,
Design Engineer (1)

Mr. D. Foster,
District Engineer,
North Bay (1)

Foundation Section (1)

File (1)

W.P. No. 621-56

W.J. No. F-56-17

C.N.R. Prop. Crossing, North Bay
By-pass at North Callender

I. INTRODUCTION:

A subsoil investigation was carried out to measure the bearing capacity of the soil for supporting the foundations of the proposed new structure.

The location is north of Callender (North Bay), where the Proposed Revision Line "D" crosses the Canadian National Railways, (profile No. F-3279-31, station 114/75).

The work started on 15 October 1956 and was completed on 30 October 1956.

II. PROCEDURE:

The investigation was performed with a skid mounted core drill machine. For the foundation support, two boreholes and three dynamic cone penetrations were made on the eastern side and one borehole and two dynamic cone penetrations were made on the western side of the railway track. Also, two boreholes and three dynamic penetrations were made to investigate the subsoil for the approach fill stability.

The locations and elevations of the boreholes are shown in Drawing F-56-17A, and their logs under Appendix I.

cont'd. .../2

III. SUBSOIL FINDINGS AND ANALYSIS:

The area is spotted with outcropping rocks and in between depressions filled with Lacustrine material. The subsoil investigations revealed alternating layers of sand and clay. Under the topsoil there is a layer of fine sand with an average thickness of 10 ft. Underneath this sand layer there is a soft clay layer of about 10 ft. thick, which in turn is underlain by another layer of fine sand. Underneath this second sand layer is the bedrock as shown on the profile. The underground water table is located at about elevation 687 ft., accordingly, all the layers below the topsoil should be considered as submerged.

The average penetration resistance of the top sand layer is found to be about 5 blows per foot. The sand layer here is considered as loose and saturated. As such, the evaluated bearing value of this layer is given to be 300 p.s.f. Also, due to the presence of the underlying soft clay layer, the hazard of differential settlement will be considerable.

Point bearing piles would be considered. On the eastern side the piles will be driven down to elevation about 652 ft. On the western side the piles will be driven down to elevation about 625 ft. The assumed inclined bedrock surface will not favour the use of wooden piles. For this purpose steel H-Beam bearing piles seem much to be recommended.

IV. CONCLUSIONS AND RECOMMENDATIONS:

From the above discussion it will follow that:

1. For spread footing the top sand layer does not have adequate bearing value and the underlying soft clay layer will cause differential settlement considerably.
2. When piles are driven down to bedrock, elevation about 652 ft. on the eastern side and elevation about 625 ft. on the western side, sufficient end bearing value will be provided by these piles to support the foundations.

With this subsoil situation the end bearing piles will provide sufficient support for the foundation. In this case, the use of steel H-Pile bearing piles have much to recommend for this purpose.

3. Approach fills for the new structure is some 30 ft. high. In connection with the stability of this fill the following should be given due consideration:
 - a) Against a slope failure hazard, two to one side slope and $C = 500$ p.s.f., $\phi = 10^\circ$, $\gamma = 120$ p.c.f. will give a safety factor of 2.
 - b) The hazard of base failure, due to the presence of the soft clay layer underlying the top sand layer, is eliminated by ~~the~~ stabilizing the fill by means of side berms of 15 x 50 ft. This will provide a safety factor of 1.85 against base failure
 - c) Due to this 30 ft. of fill, some ultimate settlement of one foot is expected in the soft clay layer.

APPENDIX I.

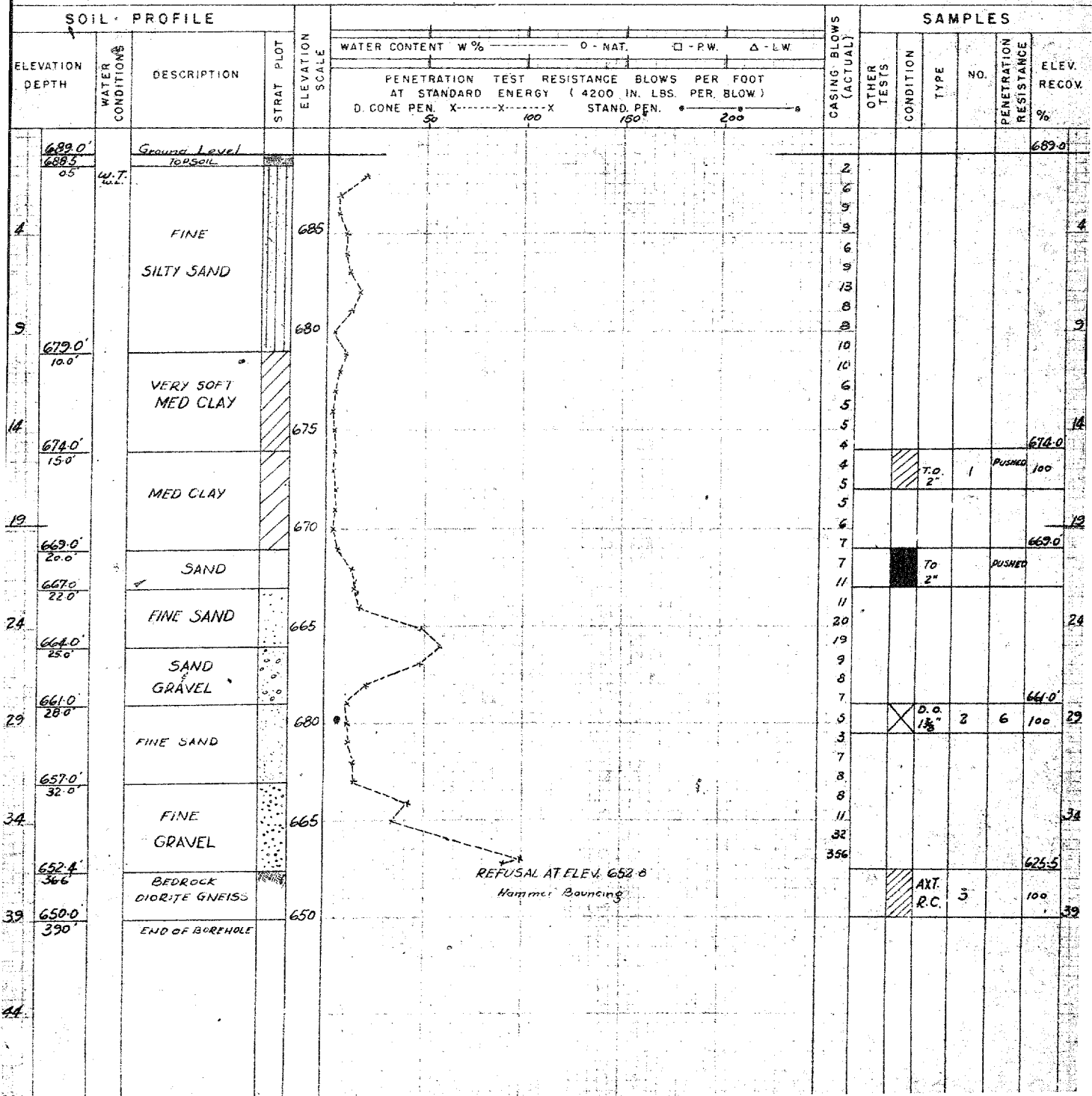
DRILL RIG 54-2 OPERATION BORE & PENETN JOB E-56-17 WP 621-56 BORING 1 STA 113+96 20.514
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT NOVEMBER 1956
SAMPLER HAMMER WT. 250 LBS. DROP 24 INCHES COMPILED BY HS CHECKED BY _____ DATE BORING 17 OCTOBER 1956

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 - TRIAXIAL CONSOLIDATED QUICK	WT - WATER TABLE IN SOIL	γ - UNIT WEIGHT

SAMPLE TYPES	
C.S. - CHUNK	S.S. - SLEEVE SAMPLE
DO - DRIVE OPEN	P.S. - PISTON SAMPLE
DF - DRIVE FOOT VALVE	WS - WASHED SAMPLE
TO - THIN WALLED OPEN	RC - ROCK CORE

- DISTURBED
- FAIR
- GOOD
- LOST



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

DRILL RIG 54-2 OPERATION PENETRATION JOB F-54-17 WP G21-56 BORING 1A STA. 113+45.4
CASING 3x (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT NOVEMBER 1956
SAMPLER HAMMER WT. 220 LBS. DROP 22 INCHES COMPILED BY H.E. CHECKED BY DATE BORING 19 OCTOBER 1956

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

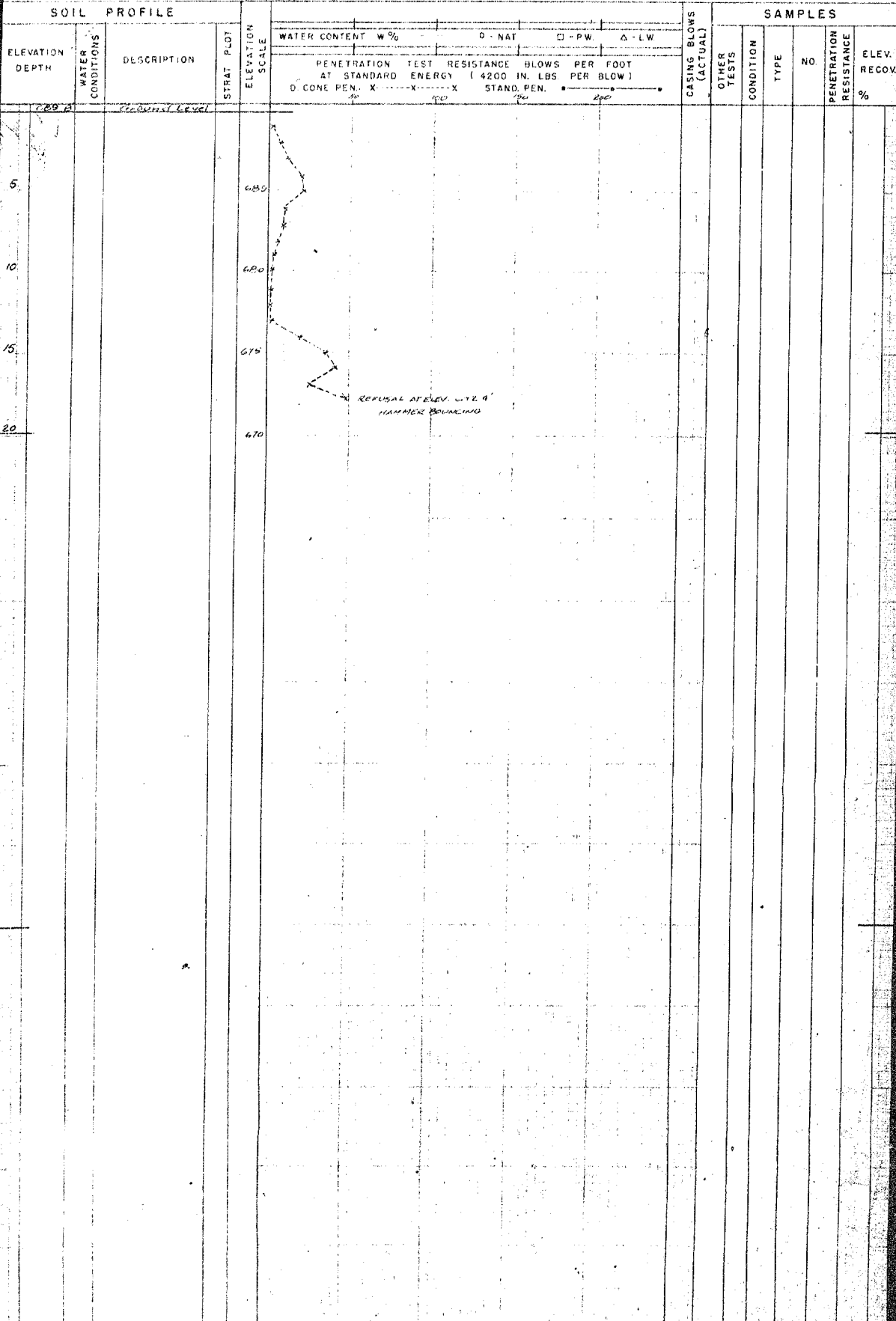
SAMPLE TYPES

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

SAMPLE CONDITION

 - DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE



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

DRILL RIG 5A-2 OPERATION BORE & PENET'N JOB F-56-17 WR 62-56 BORING 2 STA. 11A+02.5 30' 27"
CASING NX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT NOVEMBER 1956
SAMPLER HAMMER WT. 250 LBS. DROP 24 INCHES COMPILED BY H.S. CHECKED BY DATE BORING OCTOBER 19, 1956

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

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

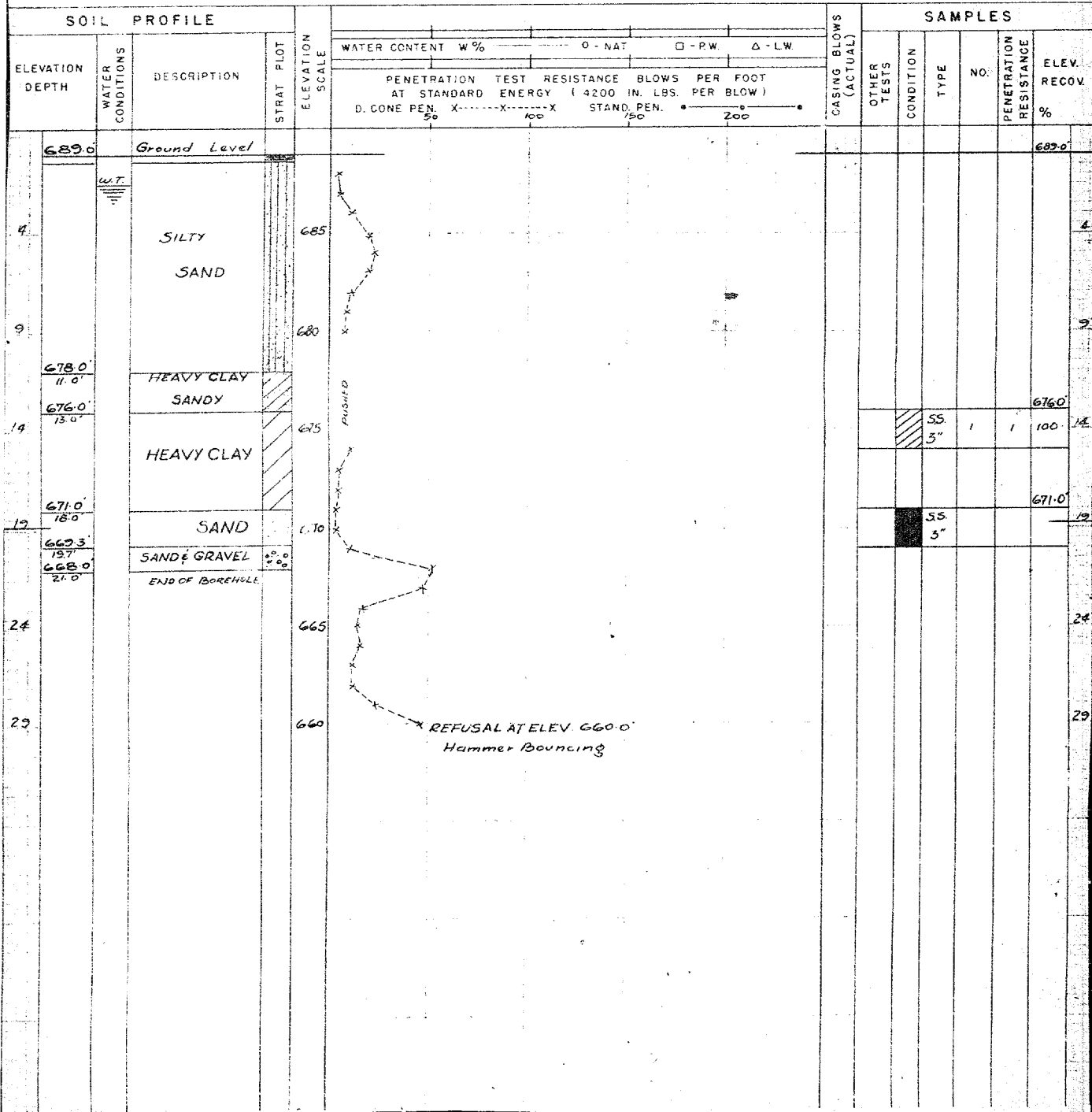
SAMPLE CONDITION



- DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE

SAMPLES



OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG 54-2 OPERATION BORE PENETR'N
CASING ~~4X 5X~~ (standard samplers to fit unless noted)
SAMPLER HAMMER WT. 250 LBS. DROP 24 INCHES

JOB. F-56-17 WP. 621-56
 DATUM GEODETIC
 COMPILED BY H. S. CHECKED BY

BORING 3 STA. 115+33.5 18' R/C
DATE REPORT NOVEMBER 1956
DATE BORING OCTOBER 23 1956

ABBREVIATIONS

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

SAMPLE TYPES

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

SAMPLE CONDITION



- DISTURBED
- FAIR
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- LOST

SOIL PROFILE

SOIL PROFILE					SAMPLES																	
ELEVATION DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLOT	ELEVATION SCALE	WATER CONTENT %				D. NAT. □ - PW. Δ - LW				CASING BLOWS (ACTUAL)	OTHER TESTS	CONDITION	TYPE	NO.	PENETRATION RESISTANCE	ELEV. RECOV.			
					PENETRATION TEST RESISTANCE BLOWS PER FOOT AT STANDARD ENERGY (4200 IN. LBS PER BLOW)																	
					D. CONE PEN. X-----X-----X				STAND. PEN. •-----•-----•													
		GROUND LEVEL																	688.1			
		PERSON																				
3		FINE SAND		685									3						3			
8													12									
		LIGHT - MED CLAY											9	5.5	3"	1	9	100	678.1			
13													12									
		HEAVY CLAY											13	5.5	3"	2	PURNER	100	673.1			
18													10									
													9									
23		FINE SAND											8									
28													7									
33		FINE SAND											6									
38													5									
43													4									
													3									
		FINE COARSE SAND											2	4.5		3			43			
48													2									
		COARSE SAND											2									
53		FINE GRAVEL											2									
		COARSE GRAVEL											2									
58		BOULDERS											2									

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

DRILL RIG 52-2 OPERATION PENETRATION JOB F-56-17 WP 621-56 BORING 3A STA 115+42.24-547
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT NOVEMBER 1956
SAMPLER HAMMER WT. 35.0 LBS. DROP 24 INCHES COMPILED BY H.S. CHECKED BY DATE BORING 25 OCTOBER 1956

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

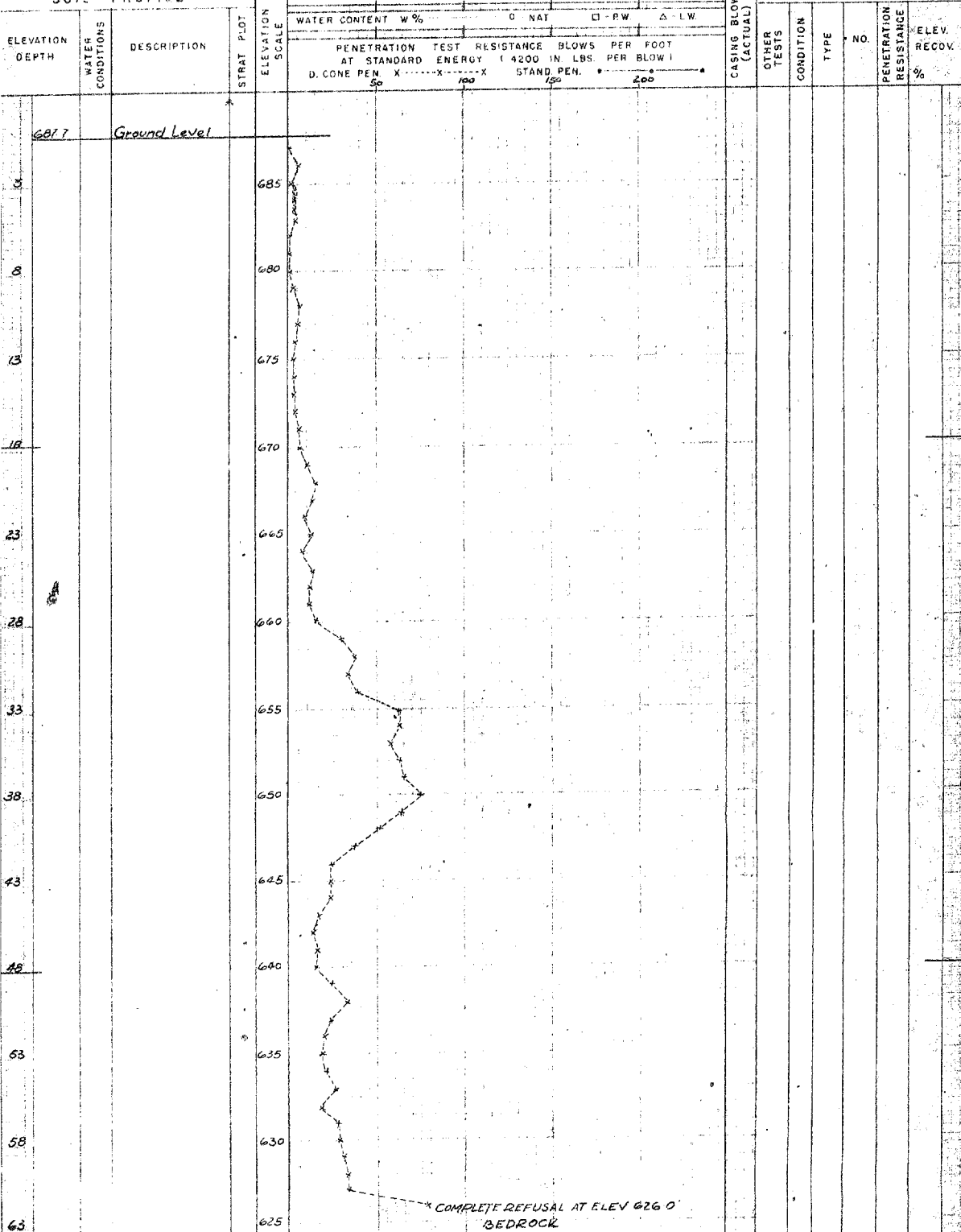
CS - CHUNK SS - SLEEVE SAMPLE
DO - DRIVE OPEN PS - PISTON SAMPLE
DF - DRIVE FOOT VALVE WS - WASHED SAMPLE
TO - THIN WALLED OPEN RC - ROCK CORE

- DISTURBED
- FAIR
- GOOD
- LOST



SOIL PROFILE

SAMPLES



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

DRILL RIG 54-2 OPERATION BORE PENET N JOB E-56-17 WP 621-56 BORING 4 STA. 117+21.5
CASING NX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT NOVEMBER 1956
SAMPLER HAMMER WT. 250 LBS. DROP 24 INCHES COMPILED BY H.S. CHECKED BY DATE BORING 25 OCTOBER 1956

ABBREVIATIONS

V - INSITU VANE SHEAR TEST
M - MECHANICAL ANALYSIS
U - UNCONFINED COMPRESSION
QC - TRIAXIAL CONSOLIDATED QUICK
O - 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

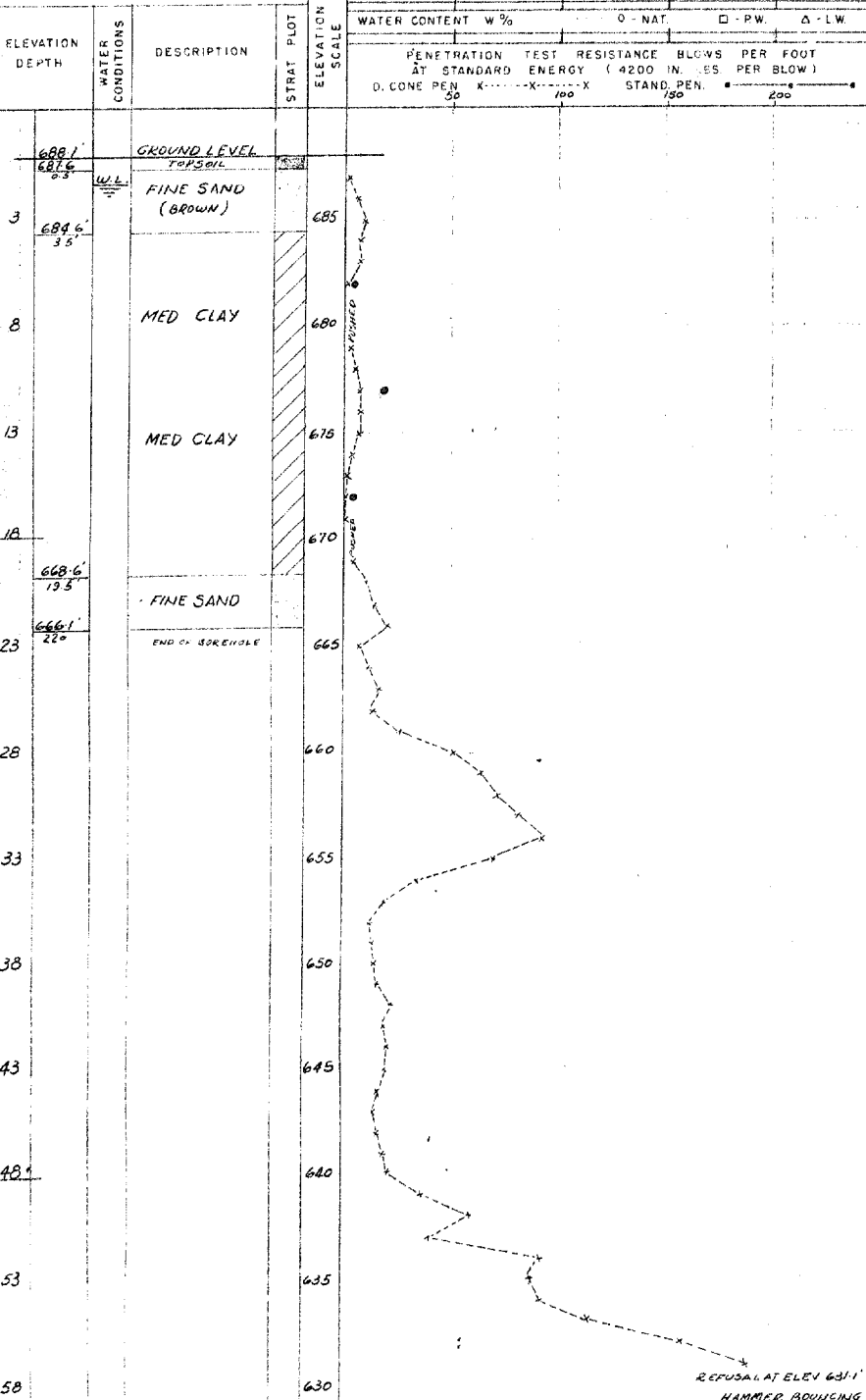
CS - CHUNK
DO - DRIVE OPEN
DF - DRIVE FOOT VALVE
TO - THIN WALLED OPEN
SS - SLEEVE SAMPLE
PS - PISTON SAMPLE
WS - WASHED SAMPLE
RC - ROCK CORE

SAMPLE CONDITION

- DISTURBED
- FAIR
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SOIL PROFILE



SAMPLES

OTHER TESTS	CONDITION	TYPE	NO.	PENETRATION RESISTANCE	ELE REC
					688.1
					683.1
		S.S. 3"	1	75	
					678.1
		S.S. 3"	2	100	
					673.1
		S.S. 3"	3	100	
					668.1
		W.S.	4		

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

DRILL RIG 54-2 OPERATION BORE & PENETR. JOB E-56-17 WP 621-56 BORING 5 STA 120+06.255 RT
CASING 2X (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT NOVEMBER 1956
SAMPLER HAMMER WT. 250 LBS. DROP 24 INCHES COMPILED BY H.S. CHECKED BY DATE BORING OCTOBER 29, 1956

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

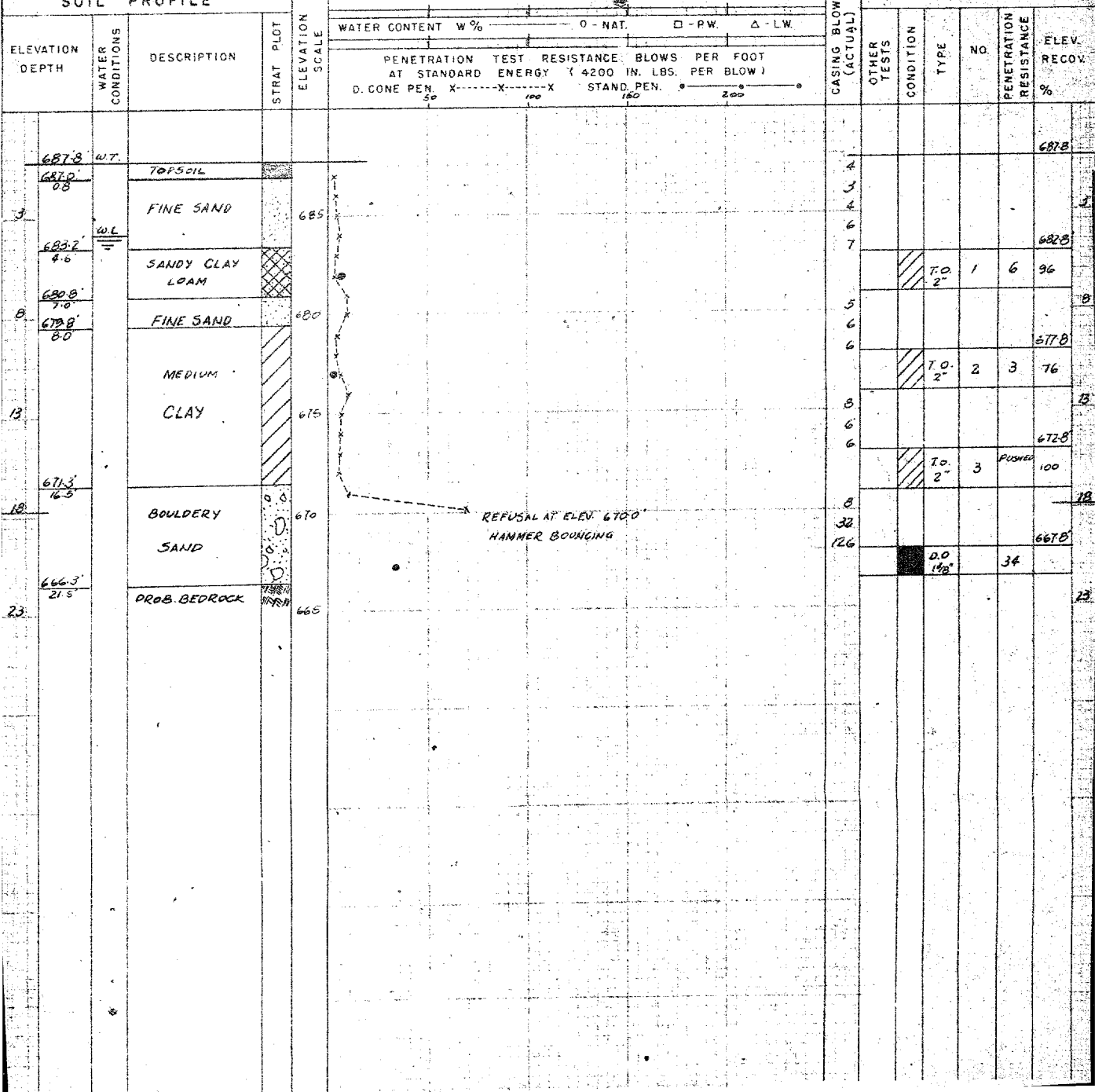
C.S. - CHUNK S.S. - SLEEVE SAMPLE
D.O. - DRIVE OPEN P.S. - PISTON SAMPLE
D.F. - DRIVE FOOT VALVE W.S. - WASHED SAMPLE
T.O. - THIN WALLED OPEN R.C. - ROCK CORE

SAMPLE CONDITION



- DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE



OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG 54-2 OPERATION PENETRATION JOB. F. 56-17 WP. 621-36 BORING 5A STA. 101-58 417 E
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT NOVEMBER 1956
SAMPLER HAMMER WT. 250 LBS. DROP 24 INCHES COMPILED BY H.S. CHECKED BY _____ DATE BORING 30 OCTOBER 1956

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 _T - TRIAXIAL CONSOLIDATED QUICK	WT - WATER LEVEL IN SOIL	γ - UNIT WEIGHT

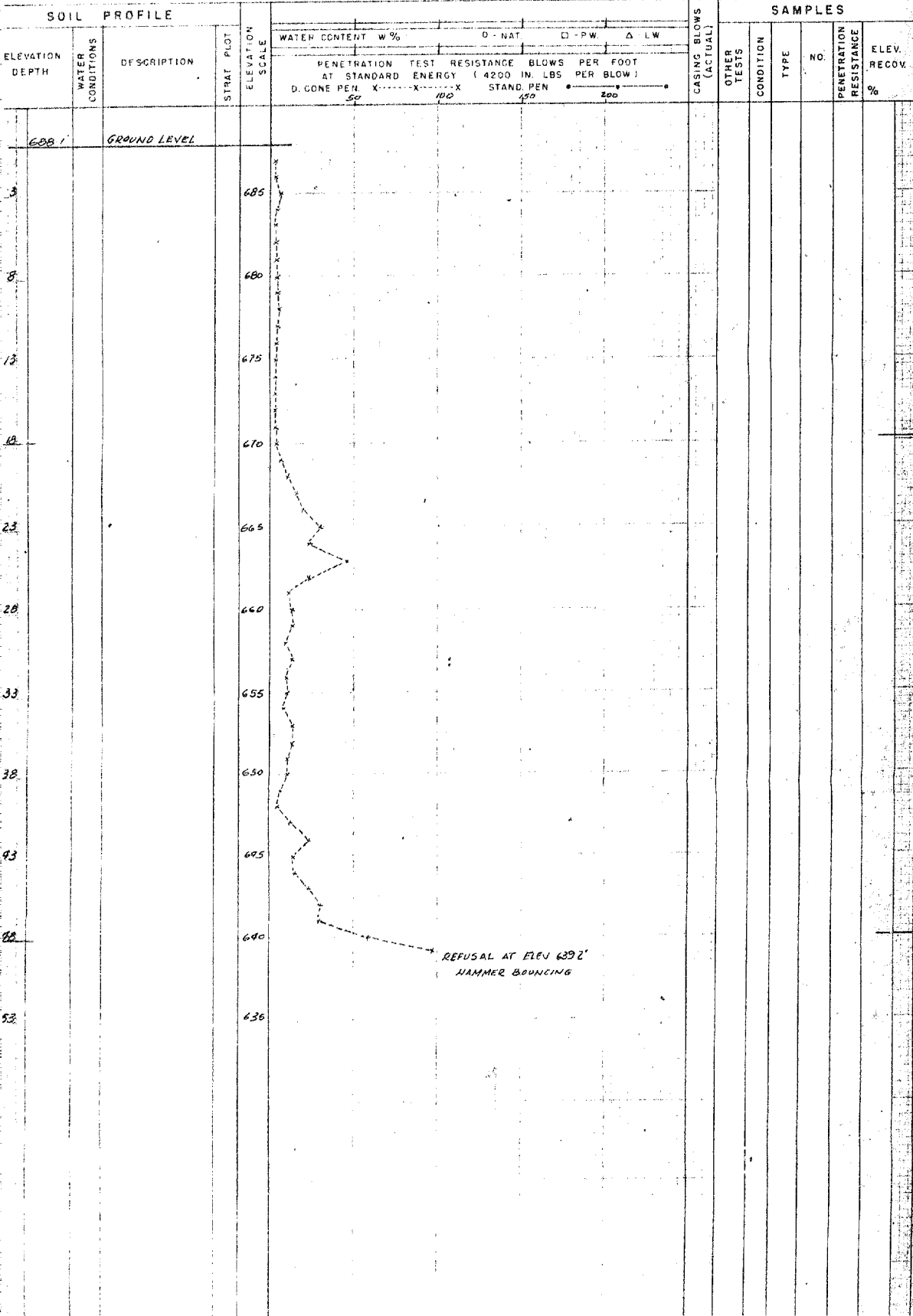
SAMPLE TYPES

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

SAMPLE CONDITION

- DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE



56-F-17

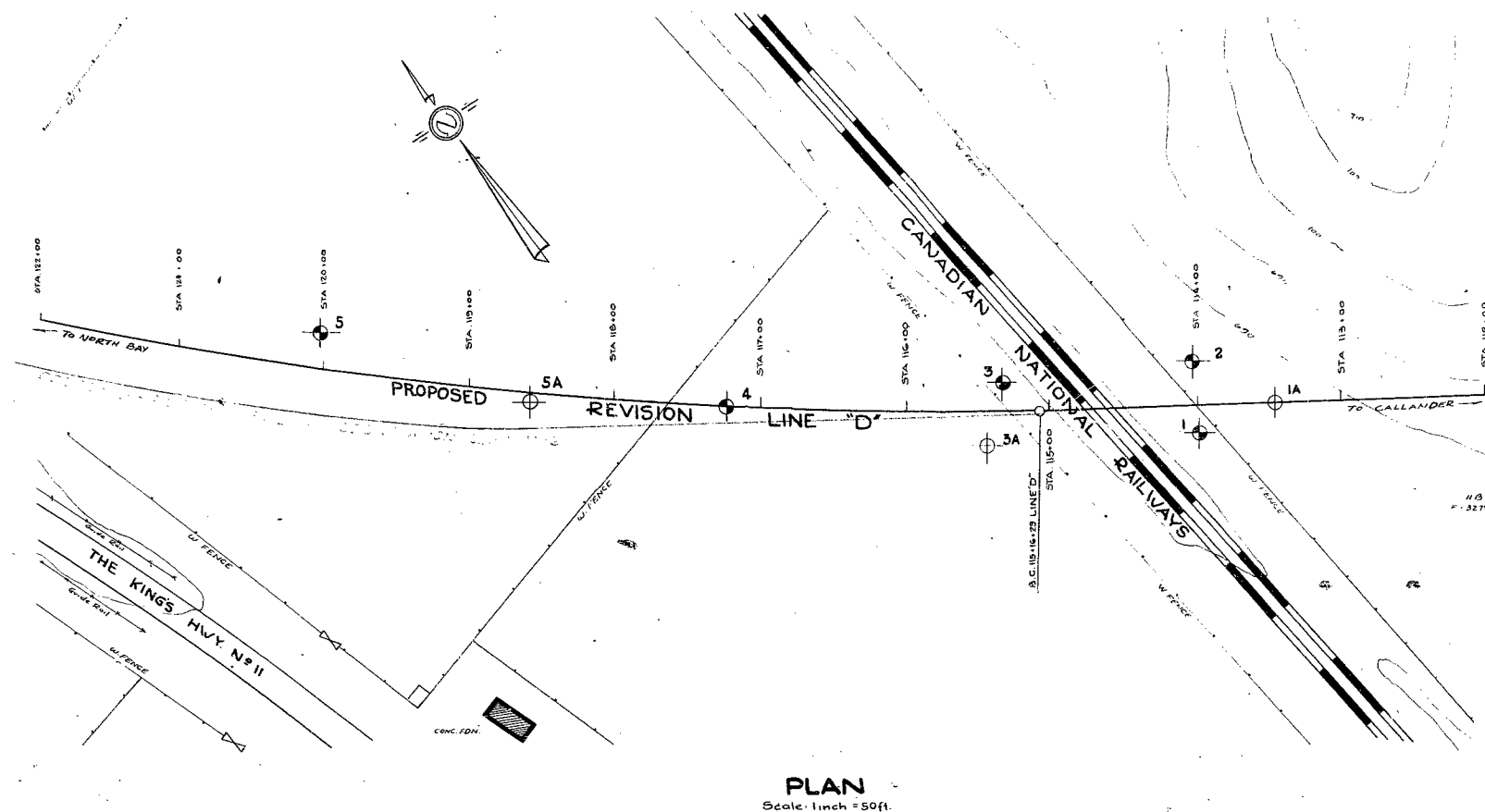
W.P. # 621-56

NORTH BAY

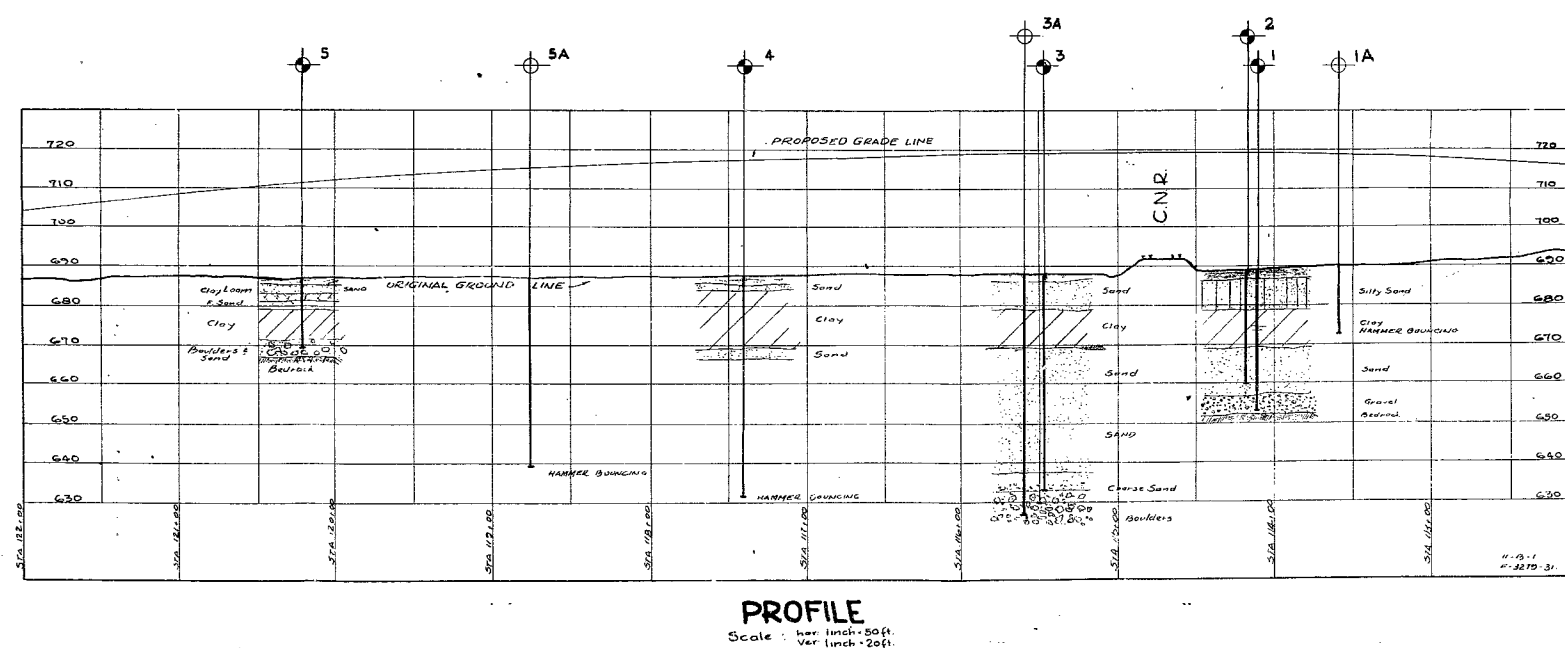
BY-PASS AT

N. CALLANDER

EDITED
FOR MICROFILMING
BY ES DATE 3/10



LEGEND			
BORE HOLES			●
PENETRATION HOLE			⊙
BORE / PENETRATION HOLES			⊕
HOLE NO.	ELEVATION	STATION	DISTANCE FROM
1	689.0'	113+56	20.5' C.
2	689.0'	114+02.5	30' RT.
3	688.1'	115+33.5	18' RT.
4	688.1'	117+21.5	CL
5	687.8'	120+06	25.5' RT.
1A	689.8'	113+45	CL
3A	687.7'	115+42	24.5' LT.
5A	688.1'	118+58	4' LT.



PRINT RECORD		
NO.	FOR	DATE

DEPARTMENT OF HIGHWAYS, ONTARIO			
MATERIALS & RESEARCH SECTION DOWNSVIEW			
PROPOSED C.N.R. CROSSING NORTH OF CALLANDER			
THE KING'S HIGHWAY NO. 11		DIV. NO. 13	
CO. PARRY SOUND		CON. XXVIII	
TWP. NORTH HIMS WORTH LOT 2		CON. XXVIII	
POSITION & ELEVATIONS OF HOLES			
APPROVED			
ENGINEER		CHIEF ENGINEER	
DESIGN	W. P.	CONTRACT NUMBER	621-56
DRAWING	W. P.	DATE	18 DECEMBER 1956
ERECTING	W. P.	DATE	18 DECEMBER 1956
F-56-17A			