

# 58-F-31

W.P. # 20-58

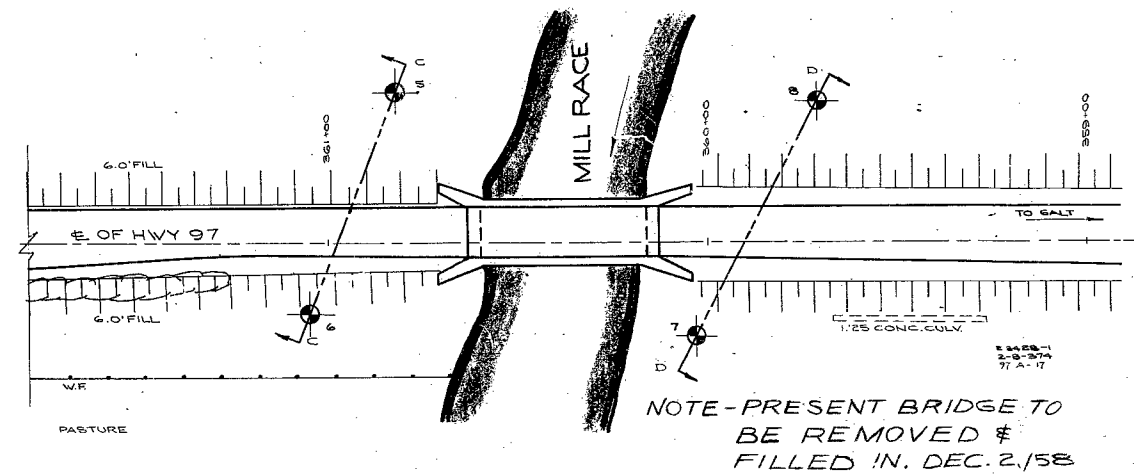
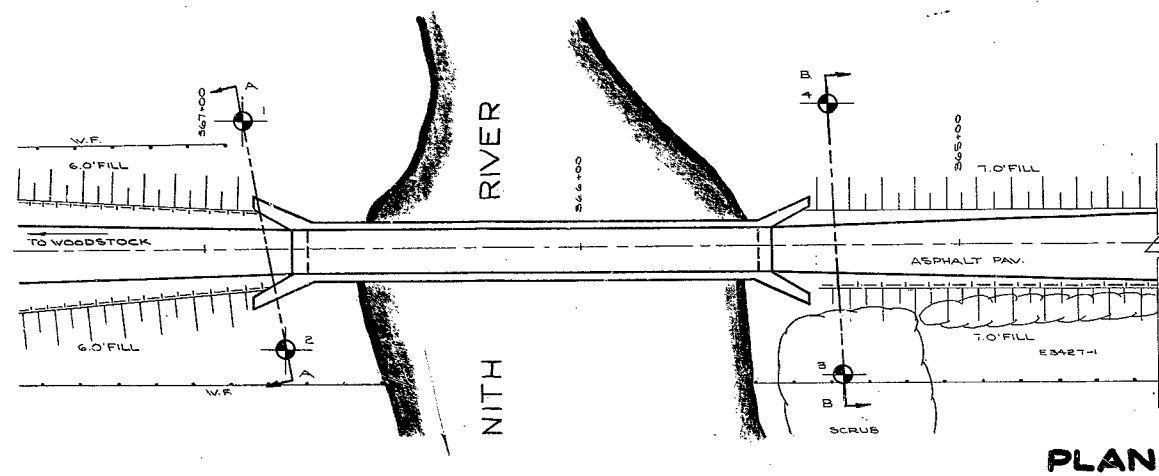
Hwy. # 97

NITH RIVER

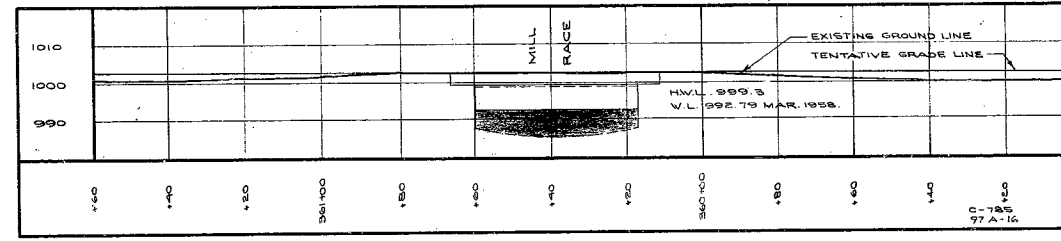
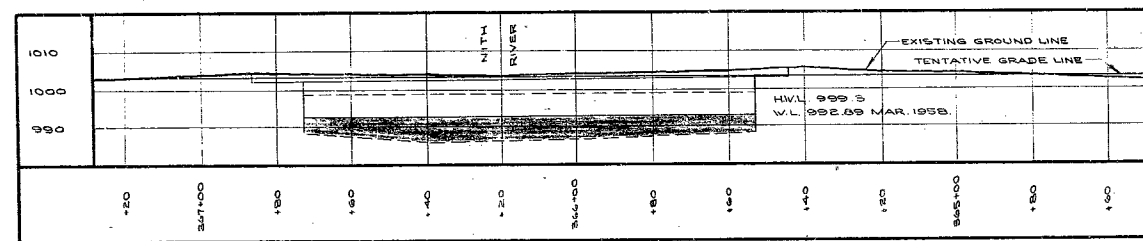
CROSSING AT

PLATTSVILLE

BLENHEIM

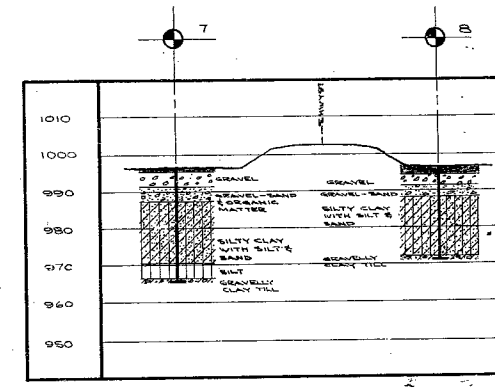
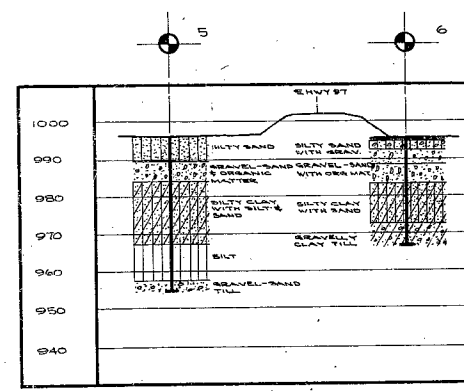
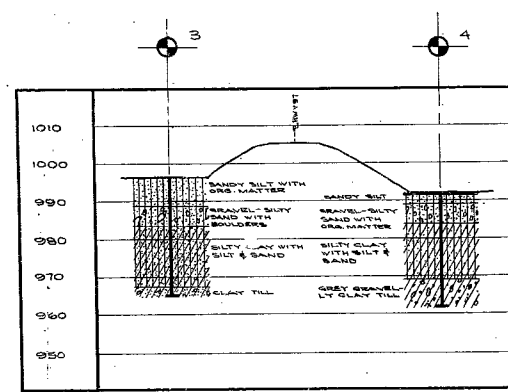
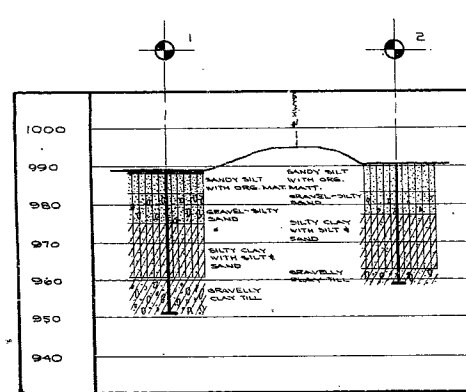


NOTE - PRESENT BRIDGE TO BE REMOVED & FILLED IN. DEC. 2, 1958



LEGEND			
BORE HOLE			
PENE'T HOLE			
BORE & PENE'T HOLE			
HOLE NO.	ELEVATION	STATION	DISTANCE FROM
1	989.20'	346+80	34' RT.
2	990.32'	346+18	27' LT.
3	996.25'	345+30	34' LT.
4	992.26'	345+35	37' RT.
5	996.35'	361+83	39' RT.
6	995.85'	361+05	18' LT.
7	996.65'	360+03	24' LT.
8	996.88'	359+11	37' 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 DOWNVIEW			
NITH RIVER & MILL RACE			
PROPOSED CROSSING			
AT PLATSVILLE			
SHOWING POSITION & ELEVATION OF HOLES			
HWY NO. 97	VR 20-58	LOT 18 & 19	
CO. OXFORD	CON. XII	DIV. 3	
TWP. BLENHEIM			
SCALE	SUBMITTED BY	DATE	
1" = 20'		8 DEC. 58	
DRAWN BY	APPROVED BY	DRAWING NO.	
T.M.		F 58-31A	



ONTARIO

DEPARTMENT OF HIGHWAYS

Memo to Mr. A. Toye,  
 Bridge Engineer,  
 From Materials & Research Section.

Date December 12th, 1958.  
 Subject Re: Foundation Investigation at  
 Highway # 97 & Nith River  
 Crossing at Plattsville, T.  
 of Blenheim.

W.P. 20-58 W.J.F. 58-31.

Attached please find two copies of the above mentioned report.

It is understood that the river channel at this crossing will be widened and a three span structure with two piers is contemplated.

The subscil investigations indicate that the silty clay layer, extending from elevations about 975 ft. to 961 ft. (boreholes no. 1 & 2) on the western side and elevation about 984 ft. to 968 ft. (boreholes no. 3 & 4) on the eastern side of the existing structure, can provide a bearing value of 2 t.s.f. to support spread footing type foundations. However, from the calculations it is seen that about 15 ft. of the soil under the river bed is susceptible to scour action. This will limit the placement of the spread footings not higher than elevation about 970 ft.

For the two piers that will be constructed in the river channel a rather elaborate operation of erecting caissons and dewatering, etc., is anticipated. The use of piles for supporting the piers will diminish most of these operations. It is believed that short piles driven to elevation about 960 ft. will meet refusal in the till layer.

A. RUTKA,  
 Acting Materials & Research Engineer

Per: *A. Rutka*  
 V. KORLU.

VK/pw  
 cc: Mr. A. Toye  
 Mr. H. Tregaskes  
 Mr. D.G. Ramsay  
 Mr. L.D. Barrett  
 Mr. A. Watt  
 Dr. P. Karrow  
 Foundation Section ✓  
 File (3).

FOUNDATION REPORT  
ON  
HIGHWAY NO. 97 & NITH RIVER CROSSING  
@ PLATTSVILLE, TOWNSHIP OF BLENNHEIM

Sta. No. 366/00  
Site Plane No. E-3428-1

Distribution:-

Mr. A. Toye  
Bridge Engineer (2)

Mr. H. Tregaskes  
Construction Engineer (1)

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

Mr. L.D. Barrett  
District Engineer, Stratford (1)

Mr. A. Watt  
Water Resources Commission (1)

Dr. P. Karrow  
Department of Mines (1)

Foundation Section (1)

File (1)

W.P. 20-58.  
W.J.F.-58-31.

INTRODUCTION:

An investigation was carried out to determine the bearing capacity of the subsoil layers for supporting the foundations of the proposed structures at the site where Highway 97 crosses the Nith River and the Mill Race at Plattsville, concession III in the township of Blenheim (Sta. 366/00 & Sta. 367/40, Profile No. C-785).

The fieldwork commenced on September 8th, 1958, and was completed on September 30th, 1958.

After the field investigation was completed it is understood from the Bridge Office that the present two bridges will be replaced by a single structure on the main river. It is further understood that the channel measured at elevation 991.0' will be widened to a width of 195 feet above and below the bridge and that there will be two piers. The following report, therefore deals with the subsoil conditions at the Nith River only.

DESCRIPTION OF THE SITE:

The site under consideration is located on the flood plain of the Nith River, which cuts across the Oxford Till plain and meets the Grand River at Paris to drain into Lake Erie. The topography of the site is level to undulating. The Nith River meanders at the site and its flow is rather sluggish. At times of floods the high water level rises some 9 feet above the normal elevation. From an inspection of the site and available geological information, it is known that the site is covered by silts, sands and gravels of fluvial origin overlying glacial till which extends to shaly dolomite bedrock of the Salina formation.

FIELDWORK:

The investigation was carried out by a skid-mounted core-drill machine. In the course of investigation 4 boreholes with dynamic core penetration test adjacent to each hole were made. Boreholes were advanced by the conventional wash boring procedure with sample extracted at regular depth intervals. Upon recovery, samples were visually examined in the field and delivered to the laboratory for testing. B.H. Nos. 1 & 2 were located on the west side and B.H. Nos. 3 & 4 on the east side of the river. The location of boreholes are shown in Drawing No. F-58-31-A and their logs under Appendix 1.

### SUBSOIL CONDITIONS:

The exploration revealed the stratigraphy of the site as fluvial deposits of sandy silts, silty sands and gravels are overlying silty clays with traces of silts and sands and occasionally varved, believed to be of lacustrine origin, underlain by glacial clay till.

The stratum of sandy silts, silty sands and gravel is in a rather loose state except where boulders are present. It contains decayed and organic matters down to a depth of about 6 to 8 feet and is saturated. The deposits are scour susceptible and cannot be relied upon to provide satisfactory foundation support.

Below the stratum of sandy silts, silty sands and gravels a layer of silty clays with traces of silts and sands was encountered. Occasionally the clays are varved or interbedded with thin layers of silt or sand. Generally the layer is in a stiff state with an average shear strength of about 1500 p.s.f. as obtained from laboratory unconfined compression tests and its relative consistency increases with depths. The average wet unit weight is about 136 p.s.f. and the average moisture content is about 17%.

Underneath the layer of silty clays, glacial till was encountered. The till is hard, rich in clay and has a fairly high content of gravel. This layer of till was explored in all four of the boreholes.

### WATER CONDITIONS:

From visual observation it was seen that the water level at the site was at or close to the ground surface. Water levels in the boreholes were recorded and they confirmed that the water level was at approximately elevation 992', which corresponds to the normal water elevation of the Nith River. According to past flood records reported, the highest flood elevation of the Nith River at the site is about 10000'.

### SCOUR:

Field observations of eroded banks and washed down gravel from upstream at the site picture the scouring action of the river. Based on a maximum flood elevation of about 1000' or a maximum rise in water level of about 9 feet, it is calculated that the probable maximum depth of scour is about 15 feet (safety factor of 1.5 has been applied) below the river bed. As such considerations should be given to the fact that footings if founded above this level (approximately elevation 970) will be subjected to the hazard of undercutting of the foundations by the scouring action of the river.

### FOUNDATION SUPPORT:

It will be seen that the fluvial deposits of silts, sands and gravels are scour susceptible and cannot be relied upon to provide safe foundation support.

Support for the foundations of the structure can be derived from the layer of silty clays. A bearing capacity of about 2 t.s.f. can be provided by the clays for spread footing foundations at approximately elevation 974' or below. To guard against the hazard of undercutting of the foundations by the scouring action of the river, footings should not be placed higher than elevation 970 or less than 15 feet below the river bed. As this will involve some 20 feet of excavations in saturated soils below ground water table. Spread footings may appear to be uneconomical especially for the piers.

As such end-bearing piles driven to refusal appear to be more advantageous. Piles driven to refusal in the till layer will provide sufficient support for the foundations of the structure deriving from the skin friction provided by the silty clay and from end-bearing provided by the till. It is believed that piles will meet refusal between elevation 968' and elevation 960'. If large displacement piles are used (e.g. timber piles) refusals are believed to be met at a higher elevation.

### CONCLUSIONS & RECOMMENDATIONS:

From the foregoing discussion it will follow that

1. The stratigraphy of the site as revealed by the exploration is composed of fluvial deposits of silts, sands and gravels overlying silty clays with traces of silt and sand possibly of lacustrine origin, underlain by glacial clay till.
2. If spread footings are used they can be placed in the silty clay layer at approximately elevation 974'. At this elevation a bearing capacity of 2 t.s.f. is provided by the subsoil. While the footings may be placed at elevation 974 they should not be placed higher than elevation 970 in order to avoid the hazard of undercutting of the foundations by the scouring action of the river. As this will involve some 20 feet of excavations below the ground water table, spread footings may appear to be uneconomical especially for the piers.
3. End-bearing piles driven to refusal in the till layer appear

to be more advantageous especially in the case of the piers. It is believed that piles driven into the till layer will meet refusal between elevation 968' and elevation 960'. If large displacement piles are used, refusals are believed to be met at a higher elevation.

4. The proposed grade line does not present any approach fill stability problem except that rip-rap protection may be required for bank slopes under the bridge.

AL/pw

A. LOH.  
Foundations Engineer.

APPENDIX

I

## SAMPLE TYPES

### SAMPLE CONDITION

V - INSITU VANE SHEAR TEST	Q - TRIAXIAL QUICK	K - PERMIABILITY	CS - CHUNK	SS - SLEEVE SAMPLE
M - MECHANICAL ANALYSIS	S - TRIAXIAL SLOW	C - CONSOLIDATION	DO - DRIVE OPEN	PS - PISTON SAMPLE
U - UNCONFINED COMPRESSION	WL - WATER LEVEL IN CASING	CA - CASING	DF - DRIVE FOOT VALVE	WS - WASHED SAMPLE
QC - TRIAXIAL CONSOLIDATED QUICK	WT - WATER TABLE IN SOIL	$\gamma$ - UNIT WEIGHT	TO - THIN WALLED OPEN	RC - ROCK CORE

- DISTURBED
- FAIR
- GOOD
- LOST

SHEAR STRENGTH IN LBS. PER SQ. FT. \*

## SAMPLES

[illegible]

DRILL RIG 54-5 OPERATION BORE & PENET'N JOB F-58-31 WP 20-58 BORING 2 STA. 366+78.27 LT. 2  
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT NOV. 1958  
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 11 SEPT. 1958

## SAMPLE TYPES

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	W.S. - WASHED SAMPLE
Q <sub>c</sub> - TRIAXIAL CONSOLIDATED QUICK	WT - WATER TABLE IN SOIL	$\gamma$ - UNIT WEIGHT	T.O. - THIN WALLED OPEN	R.C. - ROCK CORE



- DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE				ELEVATION SCALE	SHEAR STRENGTH IN LBS. PER SQ. FT.				CASING BLOWS (ACTUAL)	SAMPLES					
ELEVATION DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT PLOT		WATER CONTENT W %					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. •-----•-----•										
				2000	4000	6000	8000								
				10	20	30	40								

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

DRILL RIG 54-5 OPERATION BORE & PENETIN JOB F-58-31 WP 20-58 BORING 3 STA. 165+30 34' LT.  
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT Nov. 1958  
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 15 SEPT. 1958

## 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<sub>c</sub> - TRIAXIAL CONSOLIDATED QUICK WT - WATER TABLE IN SOIL γ - UNIT WEIGHT

## SAMPLE TYPES

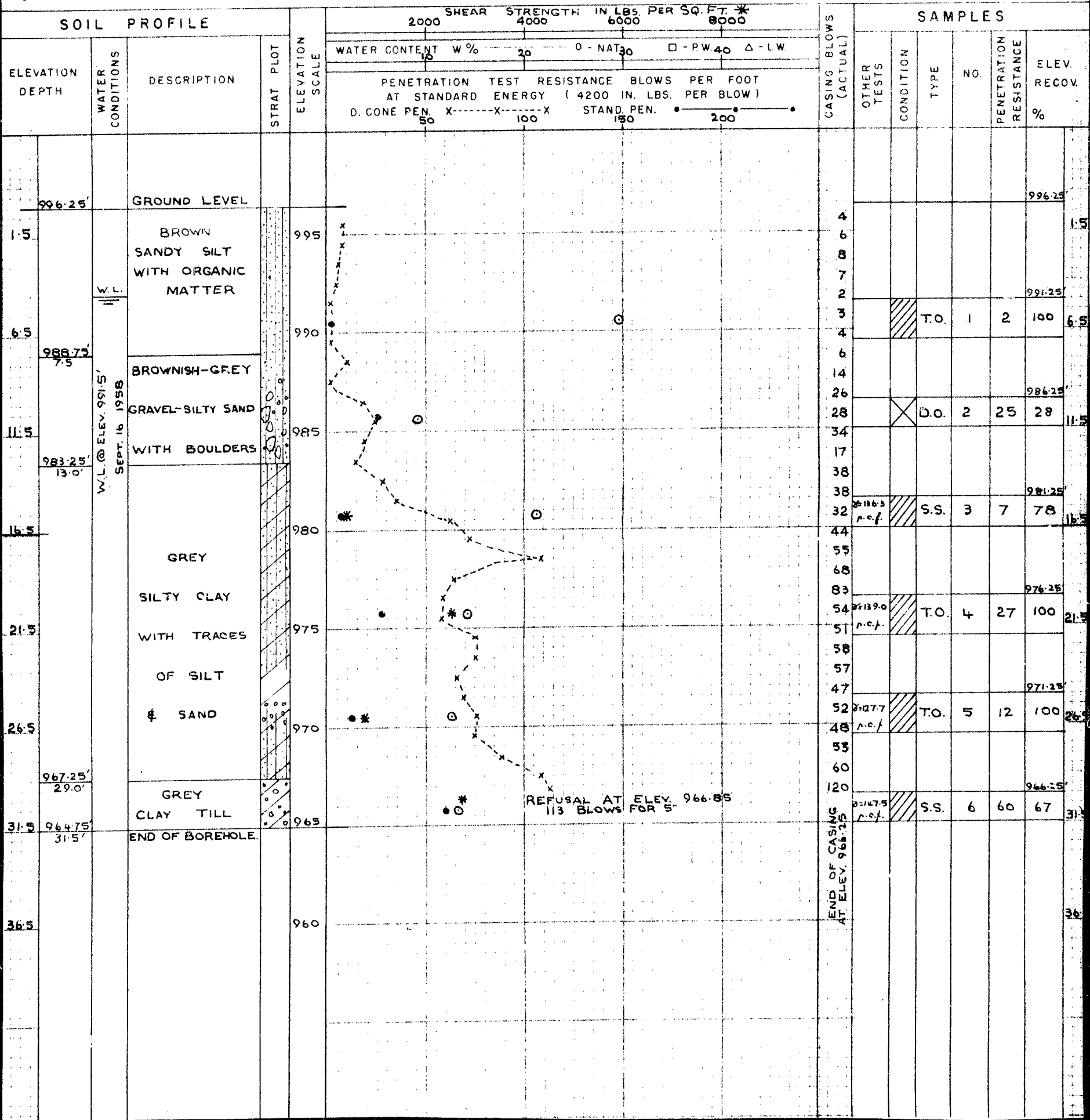
CS - CHUNK SS - SLEEVE SAMPLE  
D.O. - DRIVE OPEN PS - PISTON SAMPLE  
D.F. - DRIVE FOOT VALVE WS - WASHED SAMPLE  
T.O. - THIN WALLED OPEN R.C. - ROCK CORE

## 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 54-5 OPERATION BORE & PENET JOB E-58-31 WP 20-58 BORING 4 STA. 365+35 37' RT  
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT \_\_\_\_\_  
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 17 SEPT 1958

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

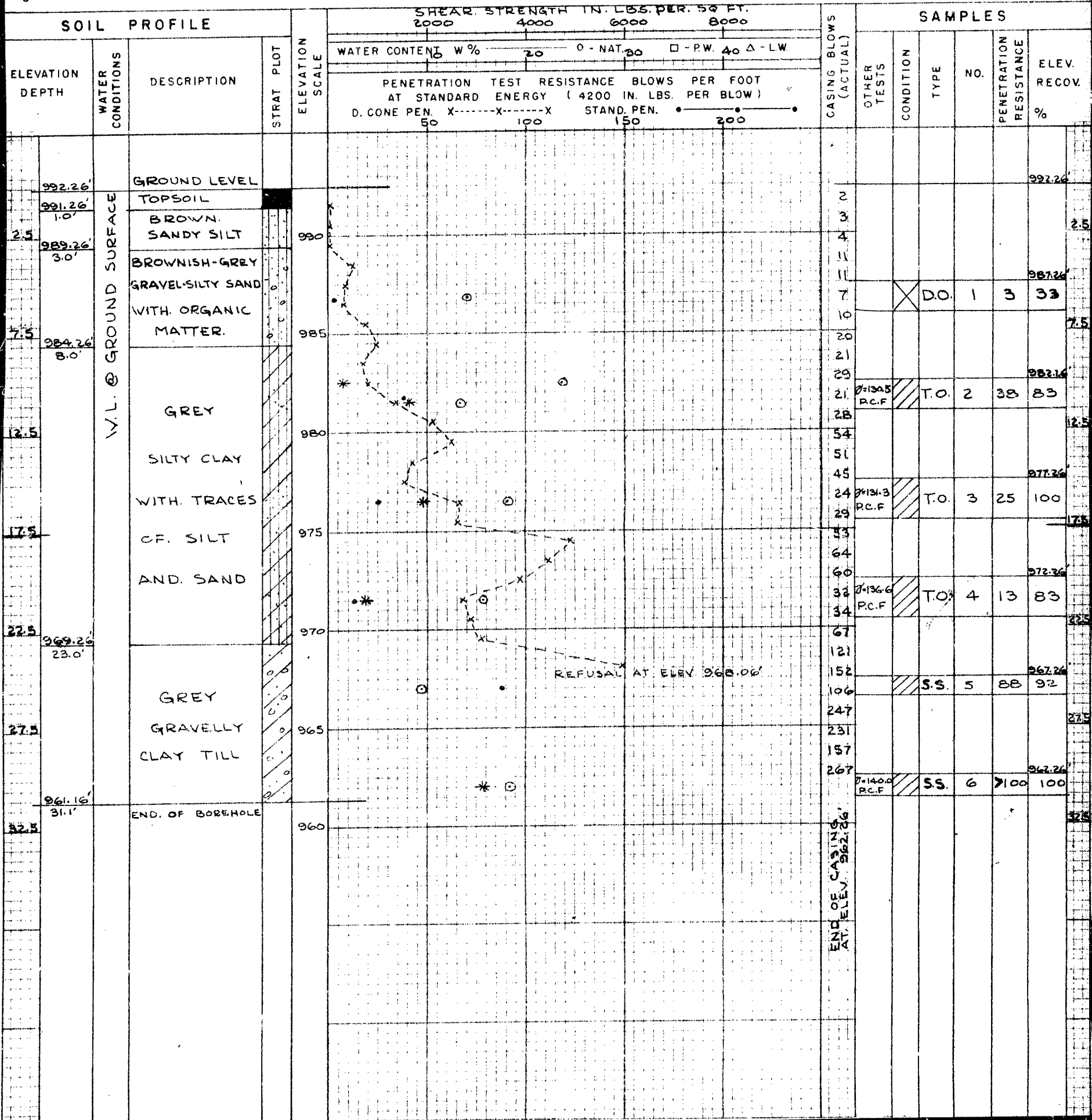
SAMPLE TYPES

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



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

DRILL RIG 54.5 OPERATION BORE & PENET'N JOB E-58-33 WP 20-58 BORING G STA 361+05.18' LT 2  
 CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT NOV. 1958  
 SAMPLER HAMMER WT. 250 LBS. DROP 1 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 24 SEPT. 1958

## 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

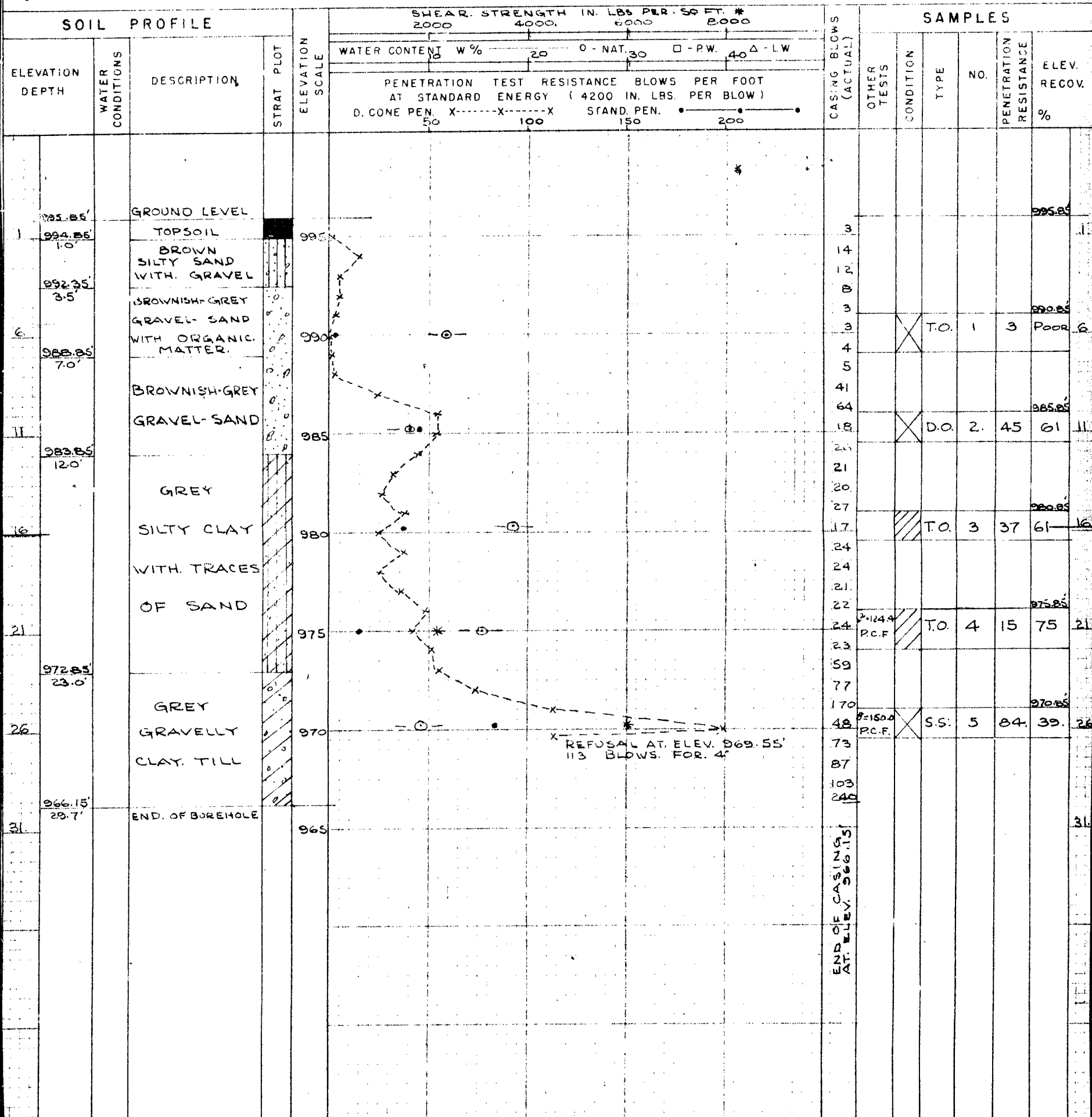
CS - CHUNK SS - SLEEVE SAMPLE  
 DO - DRIVE OPEN PS - PISTON SAMPLE  
 DF - DRIVE FOOT VALVE WS - WASHED SAMPLE  
 TO - THIN WALLED OPEN RC - ROCK CORE

## SAMPLE CONDITION



- DISTURBED  
 - FAIR  
 - GOOD  
 - LOST

## SOIL PROFILE



DRILL RIG 54-3 OPERATION BORE & PENETR JOB F-58-33 WP 20-58 BORING 7 STA 360+03.24 LT  
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT NOV. 1958  
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 25 SEPT 1958

## SAMPLE TYPES

### SAMPLE CONDITION

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
Q - TRIAXIAL CONSOLIDATED QUICK	WT - WATER TABLE IN SOIL	$\gamma$ - UNIT WEIGHT	T.O. - THIN WALLED OPEN	R.C. - ROCK CORE



- DISTURBED
- FAIR
- GOOD
- LOST

[illegible]

DRILL RIG 54-5 OPERATION BORE & PENET'N JOB F-5B-33 WP. 20-5B BORING 8 STA. 359+71.37' RT 2  
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT NOV. 1958  
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 30 SEPT. 1958

## 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       $\gamma$  - UNIT WEIGHT

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



- DISTURBED
- FAIR
- GOOD
- LOST

[illegible]

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

DRILL RIG 54.5 OPERATION BORE & PENET'N JOB F-58-33 WP 20-58 BORING 5 STA. 361+83.39 R. 2  
CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT NOV. 1958  
SAMPLER HAMMER WT. 250 LBS. DROP 19 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 12 SEPT. 1958

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 TO - THIN WALLED OPEN RC - ROCK CORE - LOST

