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Attention: Mr. S. McCombie.

July 19, 1960.

D.H.O. FOUNDATION INVESTIGATION

W.J. 60-F-6.

-- Chedoke Expressway --

Re: Proposed Aberdeen Avenue Interchange,  
Hwy. #403, Hamilton, Ont., District #4,  
W.P. 182-60 - Struct. for Ramps 'B' & 'C'  
W.P. 266-60 - Struct. for Ramp 'D', and -  
W.P. 140-57-1 -- Grading Work.

This memo accompanies our detailed soils and foundation report for the structure and ramps at the Aberdeen Avenue Interchange.

Upon completion of your review of the data presented in this report, we would be pleased to discuss any details with you that require clarification or substantiation.

*for* *L. G. Soderman (only)*

LGS/MdeF  
Attach.

L. G. Soderman,  
PRINCIPAL FOUNDATIONS ENGINEER

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7. SUMMARY.

# FOUNDATION INVESTIGATION

For

Proposed Aberdeen Avenue Interchange,  
Hwy. #403, Hamilton, Ont., District #4,  
W.P. 182-60 - Struct. for Ramps 'B' & 'C'  
W.P. 266-60 - Struct. for Ramp 'D', and -  
W.P. 140-57-1 -- Grading work.

W.J. 60-F-6.

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## 1. INTRODUCTION:

The following investigation was carried out during the period February to May, 1960. Part of the investigation was done using Department of Highways' equipment, and part using equipment hired from Johnston Drilling Company, Ottawa.

The site is located at the western extremity of Aberdeen Avenue in Hamilton, Ontario, and at present, forms part of Ainslie Wood Park, owned by the City of Hamilton.

The line of the proposed Chadoke Expressway crosses this area, and at the above site, it is proposed to construct an interchange to connect Aberdeen Avenue and Main Street, to the main lanes of the Expressway. This involves the construction of two underpasses and eight interchange legs.

A total of sixteen borings were carried out, the purpose of which was to determine:-

(1) The subsoil conditions existing at the site of the structure for Ramps 'B' and 'C'; also, the structure for Ramp 'D'.

(2) The stability of the proposed 40' high embankment from Station 8+00 to Station 10+00 on Ramp 'D'.

(3) The stability of the proposed earth cut for the W.B.L. of the Expressway from Station 471+00 to Station 477+00.

cont'd. /2 ...

## 2. DESCRIPTION OF THE SITE:

### 2.1 Topography:

The terrain in this area is rough, undulating ground covered with deciduous trees some thirty to forty feet high. It consists, in the main, of a narrow, steep-sided valley varying in width from 400' to 900', and in height, from 40' to 50'. Contained in this valley, is an elevated plateau roughly 50' high, 300' wide, and 800' long. The centre line of the proposed Chedoke Expressway follows this valley and skirts the South side of this plateau. The two proposed structures will span the gap between the plateau and the South side of the valley.

An open storm sewer some eight feet wide and one foot deep, flows down the valley close to the North side. At the location of the two proposed structures, the valley bottom is wet and swampy; elsewhere, it is mainly dry.

### 2.2 Geology:

The site forms part of the Lake Iroquois Plain. The most recent deposits consist of a gray till which is almost free of stones and well sorted. The present surface is probably largely due to stream erosion. The Western part of the site contains deposits of an older till, reddish in colour, which was derived from the soft, red Queenston shale which underlies the Hamilton area.

## 3. FIELD INVESTIGATION PROCEDURE:

A total of sixteen borings were carried out using conventional diamond drilling equipment adapted for soil sampling purposes. The holes were cased to ten feet below Ground Level with AX pipe, and from then on, no casing was used until the boring reached the dense till material. From this point on, AX casing was drilled down to the various sampling intervals.

Samples were recovered in the disturbed state using a 2-inch U.S. Split Spoon.

### 3. FIELD INVESTIGATION PROCEDURE: (cont'd.) ...

Undisturbed samples were recovered using a 2-inch I.D. Shelby Tube. The split spoon samplers were driven into the soil with an energy of 350 foot lbs. per blow. In all cases, the Shelby Tubes were pushed by hand.

In B.H. #5, some difficulty was experienced in obtaining Shelby Tube samples owing to the very soft nature of the clay. To overcome this, a new hole (#5-a), was bored adjacent to #5, and undisturbed samples were recovered using an Osterburg Sampler.

Wherever possible, In-Situ Vane Tests were carried out to determine the shear strength of the clay deposits at elevations 12" below the bottom of the various sample depths.

Dynamic cone penetration tests were carried out adjacent to each hole prior to boring operations. Driving energy to advance the cone was 350 foot lbs. per blow.

Water level observations were taken in each hole as the work progressed and the water level recorded at the end of boring, and also, some fourteen days later.

The locations and elevations of the boreholes shown on the Site Plans, Drawings #60-F-6A, 60-F-6B, and 60-F-6C, which form part of this report, were established by a Department of Highways' Survey Crew.

### 4. LABORATORY INVESTIGATIONS:

Tests were carried out in the laboratory on a selection of both disturbed, and undisturbed samples to determine:-

- (1) Atterberg Limits.
- (2) Natural Moisture Contents.
- (3) Bulk Density.

cont'd. /A ...

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4. LABORATORY INVESTIGATIONS: (cont'd.) ...

Undrained Triaxial Compression Tests and Consolidation Tests were carried out on a selection of the undisturbed samples to determine:-

- (1) Undrained Shear Strength at Overburden Pressure.
- (2) Consolidation Properties of the soft clay layers.

Consolidated Undrained Triaxial Compression Tests were carried out on certain samples to determine the values of  $C'$  and  $\phi'$  for the clay material.

Complete results of all laboratory tests are shown in Appendix #1 of this report.

5. DESCRIPTION OF SOIL TYPES AND SOIL CONDITIONS:

5.1 General:

Detailed descriptions of the various soil types encountered in each boring are shown in Appendix #1 of this report. The estimated stratigraphical profiles of Drawings 60-F-6A, 60-F-6B, and 60-F-6C, are based upon this information.

From Ground Level downward, the various soil types are as follows:-

5.2 Brown, Oxidized, Silty Clay:

This material extends from Ground Level and varies in depth from El. 291.0' in B.H. #10, to El. 271.0' in B.H. #2. The consistency of this layer varies from medium-stiff to very stiff. Fine to medium gravel is contained within this deposit, together with thin seams of fine, brown sand, and some seams of coarse silt. Values of some of the physical properties of this material are as follows:-

Undrained Shear Strength .....	2000 - 3000	p.s.f.
Liquid Limit .....	35.0 - 40.0	% Dry Wt.
Plastic Limit .....	20.0 - 25.0	% Dry Wt.
Natural Moisture .....	20.0 - 22.0	% Dry Wt.
Bulk Density .....	125.0-135.0	p.c.f.
Penetration Resistance .....	Approx. 5-10	blows/ft.

cont/ 5 ...

5. DESCRIPTION OF SOIL TYPES AND SOIL CONDITIONS: (cont'd.) ...

5.3 Grey, Silty Clay:

This material immediately underlies the oxidized layers and is part of the same original deposit. It varies in thickness from about 100.0' in B.H. #12, to about 15.0' in B.H. #3. It contains, in varying amounts, fine sand and fine gravel. The upper parts of this layer have, in some locations, become desiccated and as a consequence, have a higher shear strength than the lower parts of the stratum. In general, the consistency of this deposit varies from soft to medium. Values of some of the physical properties are as follows:-

Undrained Shear Strength	....	500 - 1000	p.s.f.
Liquid Limit	.....	25.0 - 30.0	% Dry Wt.
Plastic Limit	.....	15.0 - 18.0	% Dry Wt.
Natural Moisture	.....	17.0 - 25.0	% Dry Wt.
Bulk Density	.....	120.0-130.0	p.c.f.
Penetration Resistance	.....	Approx. 1 - 2	blows/ft.

5.4 Red, Glacial Clay Till:

This deposit is a heterogeneous mixture of red, silty clay, fine to coarse grey sand, fragments of grey shale, and fine to coarse gravel. Some boulders 6" - 9" are present, also pockets of sand and gravel, and pockets of sand and silt in seams. It covers most of the area west of Station 480+00, but was not observed in B.H. #6 and B.H. #9. Values of some of the physical properties of this material are as follows:-

Natural Moisture	.....	9.0 - 10.0	% Dry Wt.
Bulk Density	.....	135 - 145	p.c.f.
Penetration Resistance	.....	70 - 100	blows/ft.

cont'd. /6 ...

5. DESCRIPTION OF SOIL TYPES AND SOIL CONDITIONS: (cont'd.)...

5.5 Dense, Sandy Silt:

This material immediately underlies the red, glacial till and covers most of the site West of Station 480+00, but was not observed in B.H.'s. #7, #8, #1. In general, it consists of red or brown, coarse silt containing some fine, brown sand. Pockets of sand and gravel are also present. Values of some of the physical properties of this material are as follows:-

Natural Moisture	.....	12.0 - 13.0	% Dry Wt.
Bulk Density	.....	135 - 145	p.c.f.
Penetration Resistance..		70 - 100	blows/ft.

5.6 Bedrock:

Bedrock consisting of red shale containing layers of grey shale 2" to 3" thick, was proved by taking 5.0' sample cores. Elevations of bedrock in Boreholes #9 and #11 were assumed.

5.7 Ground Water Conditions:

Because of the nature of the boring operations, and the impermeability of the clay layers, the water table in the high ground on the sides of the valley could not accurately be established. Water levels were taken some fourteen days after boring was completed and these are shown in Appendix #1 of this report. In the bottom of the valley, however, the ground is saturated to within a few inches of the surface; consequently, the elevation of the water in a small creek which flows through the area is assumed to be the water table in that location.

Artesian water exists at bedrock elevation over most of the site East of Station 480+00. The actual head of this water is known to be in excess of twenty feet above ground level at Station 8+30, Ramp 'D'. This, in all probability, accounts for the low shear strength of the lower clay layers. The presence of this artesian head, however, is not likely to cause any construction problems, as no excavations to bedrock will occur.

Shallow excavations in the upper clay layers should present no significant dewatering problems owing to the impermeability of the material.

cont'd. /7 ...



## 6. CONCLUSIONS AND RECOMMENDATIONS:

Proposed construction in this area involves the erection of two structures, together with interchange legs:- Ramps 'A', 'B', 'C', 'D', 'E', & 'F', connecting Aberdeen Avenue and Main Street with the main lanes of the Expressway. Particular problems dealt with by this report, are discussed under the appropriate headings:-

### 6.1 Structure for Ramps 'B' & 'C' Structure for Ramp 'D'.

At these locations the subsoil consists mostly of soft-medium grey silty clay which overlies dense deposits of glacial till. The shear strength of the clay is variable over the site, from 500 p.s.f. to 3000 p.s.f. Safe bearing capacities calculated for proposed footings, are, in most cases, less than 1 t.s.f. Spread footings, constructed in this material, would be subjected to substantial differential settlements.

In view of this fact, it is suggested that the footings be supported on piles. If 'H' piles are used, they would be driven to bedrock. A working load of 60 tons per pile would be suitable in this case. If displacement piles are used, they would be expected to attain practical refusal within a distance equal to eight times the pile diameter, below the surface of the dense till or silt material shown on Drawing #60-F-6A. It is recommended that these be driven to a set of 7 blows per inch, using a hammer producing 22,500 ft. lbs. per blow, ensuring that the preceding three feet are in excess of 50 blows/ft.

### 6.2 Proposed 40' High Embankment at Sta. B+50, Ramp 'D'.

At this location, the subsoil consists mostly of soft clay having a shear strength of 500 - 650 p.s.f. in the zones in which slip failures are most likely to occur. Calculations show that the proposed 40' high embankment with 2:1 side slopes would not be stable. In view of this fact, it is proposed to construct berms to stabilize the embankment. The dimensions of these berms are shown on Drawing #60-V-6B of this report.

6. CONCLUSIONS AND RECOMMENDATIONS: (cont'd.) ...

6.2 Proposed 40' High Embankment at Sta. 8+50, Ramp 'D': (cont'd.) ...

For design purposes, the following assumptions have been made:-

(1) For Earth Fill -  $C = 1000$  p.s.f.  
 $\phi = 0^\circ$

(2) For Granular Fill -  $C = 0$   
 $\phi = 30^\circ$

In either case, it is emphasized that the fill material must be well compacted, and strict control must be maintained throughout construction to achieve this. It is also emphasized that the berms must be constructed at the same time as the embankment, to prevent unstable conditions from arising.

6.3 Proposed Earth Cut for Ramp 'E' & W.B.L. -

(Sta. 471+00 - 477+00 Approx.)

At this location, it is proposed to excavate the existing side of the ravine to form the roadbed for the W.B.L. and Ramp 'E'. The maximum depth of excavation would be in the order of 45.0'. Between Sta. 472+50 and Sta. 475+00, the situation is complicated by the existence of buildings belonging to Hillfield College School. The most critical location is between Stations 473+30, W.B.L., and 473+50, W.B.L. Here, the average slope of the existing ground is 1 1/2:1. Near the bottom of the slope the gradient is about 2:1, and it is proposed to excavate some eight feet of this material for the proposed roadbed. This would make the whole slope 1 1/2:1.

Subsoil at this site consists of silty clay containing thin seams of fine sand or silt. The upper layers have become desiccated, and have a consequent higher shear strength than the lower layers. At El. 320.0' the shear strength is 2500 p.s.f. This decreases with depth to 700 p.s.f. at El. 280.0' from which it increases with depth, to 1000 p.s.f. at El. 250.0'.

(cont'd.) /? ...

6. CONCLUSIONS AND RECOMMENDATIONS: (cont'd.) ...

6.3 Proposed Earth Cut for Ramp 'E' @ W.B.L. -

(Sta. 471+00 - 477+00 Approx.) - (cont'd.) ...

A total stress analysis of a section with slopes of 1½:1, indicates that this section has a safety factor of approximately 1.17. This is considered low. However, on the long-term basis, an effective stress analysis shows that this would increase to about 1.25. This probably accounts for the fact that the existing slope is stable. Between Stations 473+30 and 473+80, W.B.L., it is suggested that a retaining wall be constructed at the edge of the roadbed to maintain the present ground profile. Safe bearing capacities for the footings of this wall would be 0.75 tons per sq. foot.

For the remainder of the excavation, it is proposed to construct side slopes of 2:1. A total stress analysis of this slope shows that the safety factor is about 1.2. This is considered suitable.

7. SUMMARY:

With regard to the discussion in the preceding section of this report, the following recommendations are made:-

1. The footings for the two proposed Underpasses at Aberdeen Interchange should be supported on piles. If 'H' piles are used, these should be driven to bedrock. A working load of 60 tons per pile, would be suitable. If tube (displacement) piles are used, these would be expected to attain practical refusal within a distance equal to eight diameters below the top of the dense till or silt layers shown on Drawing #60-P-6A. In this case, piles should be driven to a set of 7 blows per inch, using a hammer producing 22,500 ft. lbs. per blow, ensuring that the preceding three feet are in excess of 50 blows per foot. In the case of tube piles a working load of 60 tons per pile, would be suitable.

cont'd. /10 ...

7. SUMMARY: (cont'd.) ...

2. The proposed 40' high embankment on Ramp 'D' at Station F 70, will be unstable unless berms are constructed. Drawing #60-F-65 shows, in detail, the suggested dimensions and layout of these berms.
3. The earth cut for Ramp 'E' and the W.B.L. of the Expressway at Sta. 471+00 - 477+00 (W.B.L.), should be constructed with a side slope not steeper than 2:1. Between Stations 473+30 and 473+80, where it is necessary to maintain a minimum distance from Hillfield College School, this should be achieved by constructing a retaining wall at the edge of the proposed roadbed to maintain the existing ground profile of the slope along this section. Safe bearing capacity for the footings of this wall, would be 0.75 tons/sq.ft.

July, 1960.

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APPENDIX I.

## SUMMARY OF FIELD &amp; LABORATORY TESTS

JOB 60-F-6

W.P. 182-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
1	S1	3'-4.5'	Stiff brown Oxidized silty clay.	10	26.4	25.3	44.3	-	-	100% Recovery
	T12	3'-4.5'	Stiff brown Oxidized silty clay.	P	25.6	-	-	1715	118.0	
	S2	6'-7.5'	Stiff brown Oxidized silty clay.	10	24.1	-	-	-	-	
	T13	6'-7.5'	Stiff brown Oxidized silty clay.	P	24.8	-	-	1915	124.0	
	T3	10'-11.5'	Stiff brown Oxidized silty clay.	P	18.2	15.7	26.7	-	-	
	T4	15'-16.5'	Medium grey silty clay.	P	18.5	-	-	1845	130.0	
	T5	20'-21.5'	Medium grey silty clay.	P	23.2	15.6	29.3	1455	123.0	
	VANE	23'		-	-	-	-	1120	-	
	S6	25'-26.5'	Stiff grey clayey silt.	24	18.4	18.1	25.0	-	-	
	S7	30'-31.5'	Stiff grey clayey silt.	17	15.7	-	-	-	-	
	S8	35'-36.5'	Stiff grey clayey silt.	40	10.9	-	-	-	-	
	S9	38'-39.5'	Stiff grey clayey silt.	98	6.8	-	-	-	134.0	
	S10	41.7'-42.5'	Red clay mixed with sand, and gravel (Glacial Till).	>61	-	-	-	-	-	100% Recovery
	S11	50'-51'	Red clay mixed with sand, and gravel (Glacial Till).	120	-	-	-	-	-	
	RC14	55'-60.0'	Pink shale.	-	-	-	-	-	-	

# SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-6

W.P. 182-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
2	T1	3'-4.5'	Stiff brown Oxidized silty clay.	P	20.8	20.5	41.4	3040	130.0	100% Recovery
	T2	6'-7.5'	Stiff grey clayey silt with gravel	24	17.2	-	-	-	-	
	T3	10'-11.5'	Stiff grey clayey silt with gravel	P	16.9	16.5	27.5	3355	134.0	
	S4	15'-16.5'	Stiff grey clayey silt with gravel	17	17.9	-	-	-	-	
	S5	20'-21.5'	Stiff grey clayey silt with gravel	28	11.3	-	-	-	-	
	S6	25'-26.3'	Very stiff red clay with sand, and gravel (Glacial Till)	68	7.2	-	-	-	-	
	S7	30'-31.5'	Stiff grey-brown coarse silt with fine-medium gravel.	73	12.5	-	-	-	-	
	S8	35'-36.5'	Stiff grey-brown coarse silt with fine-medium gravel.	61	-	-	-	-	-	
	RC9	40'-45'	Pink shale.	-	-	-	-	-	-	
3	S1	3'-4.5'	Stiff grey silty clay with gravel.	18	15.5	-	-	-	-	Sens: 1.9
	T2	6'-7.5'	Medium grey silty clay.	P	20.4	16.8	25.9	-	-	
	VANE	9'	Medium grey silty clay.	-	-	-	-	1200	-	
	T3	10'-11.5'	Medium grey silty clay.	P	20.7	-	-	1600	131.0	
	T4	15'-16.3'	Stiff grey silty clay.	P	19.8	17.0	28.7	2535	133.0	
	S5	19.5'-21'	Red clay with sand and gravel (Glacial Till).	83	11.3	-	-	-	-	

# SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-P-6

W.P. 182-60

OLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
	RC6	30.5'-35.5'	Pink shale.	-	-	-	-	-	-	90% Recovery.
										W.P. 266-60
4	T1	3'-5'	Brown Oxidized silty clay.	P	22.0	15.8	25.7	1075	127.5	
	VANE	6.5'	Brown Oxidized silty clay.	-	-	-	-	1040	-	Sens: 10.4
	T2	7'-8.5'	Stiff grey silty clay.	P	-	20.5	36.5	-	-	
	T3	10'-10.5'	Stiff grey silty clay.	P	-	-	-	-	-	
	S4	15'-16.5'	Stiff grey silty clay.	11	20.7	17.3	32.3	-	-	
	T5	20'-21.5'	Medium grey silty clay.	P	25.5	17.7	31.4	682	120.0	
	VANE	23'	Medium grey silty clay.	-	-	-	-	800	-	Sens: 6.7
	T6	25'-26.5'	Medium grey silty clay.	P	24.0	-	-	793	125.5	
	VANE	28'	Medium grey silty clay.	-	-	-	-	880	-	Sens: 7.3
	T7	30'-31.5'	Medium grey silty clay.	P	25.0	18.1	29.0	596	127.0	
	VANE	33'	Medium grey silty clay.	-	-	-	-	800	-	Sens: 3.3
	T8	35'-36.3'	Stiff grey silty clay with gravel	P	17.6	-	-	-	137.0	
	T9	40'-40.7'	Stiff grey silty clay with gravel	P	12.2	-	-	-	-	
	S10	45'-46.5'	Stiff clayey silt.	16	20.3	-	-	-	-	



# SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-6

W.P. 266-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
4	S11	50'-51.5'	Stiff brown silt with gravel.	24	11.4	-	-	-	-	
	S12	55'-56'	Red clay with sand and gravel (Glacial Till).	78	-	-	-	-	-	
	S13	60'-60.7'	Red clay with sand and gravel (Glacial Till)	>125	-	-	-	-	-	
	S14	70'-71.2'	Red clay with sand and gravel (Glacial Till).	61	8.4	-	-	-	-	
	S15	75'-76.5'	Dense Pink silt.	70	11.1	-	-	-	-	
	S16	80'-80.7'	Dense grey brown silt.	>97	12.9	-	-	-	-	
	S17	85'-85.7'	Dense grey brown silt.	>84	7.4	-	-	-	-	
	RC18	89'-94'	Pink shale.	-	-	-	-	-	-	
5	S1	3'-4.5'	Loose fine-medium gravel and sand.	P	17.4	-	-	-	-	
	VANE	6'	Soft grey silty clay.	-	-	-	-	1880	-	Sens: 2.0
	T2	6'-7.5'	Soft grey silty clay.	P	19.9	-	-	-	-	
	VANE	9'	Soft grey silty clay.	-	-	-	-	920	-	Sens: 2.1
	T3	11.5'-13'	Soft grey silty clay.	P	22.2	-	-	-	-	
	VANE	14.5'	Soft grey silty clay.	-	-	-	-	920	-	Sens: 2.1
	T4	15'-16.5'	Soft grey silty clay.	P	-	-	-	-	-	
	VANE	18'	Soft grey silty clay.	-	-	-	-	600	-	Sens: 2.7

Cont. P. 5.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-6

W.P. 266-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
5	S5	19.5'-21.0'	Fine - coarse sand and gravel.	42	6.3	-	-	-	-	100% recovery
	S6	25'-26.5'	Red silty clay with sand and gravel	85	6.1	-	-	-	-	
	S7	30'-30.7'	Red silty clay with sand and gravel	> 100	8.2	-	-	-	-	
	S8	35'-36'	Dense grey brown silt.	75	17.1	-	-	-	-	
	S9	40'-41'	Dense grey brown silt.	91	13.6	-	-	-	-	
	S10	45'-46'	Dense grey brown silt.	71	13.5	-	-	-	-	
	S11	50'-50.3'	Dense grey brown silt.	> 60	-	-	-	-	-	
	RC12	50.3'-55.3'	Pink shale.	-	-	-	-	-	-	
5A	T1A	4'-5.5'	Soft grey silty clay.	P	17.0	14.5	25.2	1782	135.0	
	T2A	7'-9.5'	Soft grey silty clay.	P	28.0	17.1	32.0	392	123.0	
	T3A	10'-12.5'	Soft grey silty clay.	P	23.4	17.8	30.9	-	126.0	
	T4A	13'-15.5'	Soft grey silty clay.	P	23.9	17.0	31.0	-	127.0	
	T5A	16'-18.5'	Soft grey silty clay.	P	23.2	17.0	27.5	280	125.0	
6	T1	3'-4.5'	Grey-brown silty clay.	P	26.6	17.3	30.9	790	124.0	Sens: 5.8
	VANE	6'	Grey silty clay.	-	-	-	-	920	-	
	S2	6'-7.5'	Grey silty clay.	P	20.9	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-6

W.P. 266-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
6	VANE	9'	Grey silty clay.	-	-	-	-	800	-	Sens: 3.3
	T3	10'-11.5'	Medium grey silty clay.	P	24.4	17.0	31.9	805	125.0	
	VANE	13'	Medium grey silty clay.	-	-	-	-	840	-	Sens: 2.1
	T4	15'-16.5'	Stiff grey silty clay.	P	19.5	16.2	27.6	1483	133.0	
	T5	20'-21.5'	Stiff grey silty clay.	18	7.0	-	-	-	145.0	
	T6	25'-26.0	Stiff grey silty clay.	44	-	13.0	21.0	-	-	
	S7	26'-27.5'	Stiff grey sandy silt.	48	13.1	-	-	-	-	
	S8	29.2-29.7'	Stiff grey sandy silt.	>100	-	-	-	-	-	
	S9	35'-36.5'	Dense silt.	94	12.7	-	-	-	-	
	RC10	38.7-43.7'	Pink shale.	-	-	-	-	-	-	100% recovery
										W.P. 182-60
7	T1	3'-3.5'	Brown Oxidized silty clay.	P	-	-	-	-	-	
	T2	6'-7'	Brown Oxidized silty clay.	P	21.5	-	-	-	125.0	
	S3	9'-10.5'	Fine brown silty sand.	26	20.7	-	-	-	-	
	S4	15'-17'	Brown Oxidized silty clay.	16	24.5	17.8	28.7	-	-	
	S5	20'-21.5'	Brown Oxidized silty clay.	19	20.3	-	-	-	-	

## SUMMARY OF FIELD &amp; LABORATORY TESTS

JOB 60-F-6

W.P. 182-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
7	S6	25'-26.5'	Brown Oxidized silty clay.	25	19.0	-	-	-	-	
	T7	30'-31'	Brown sandy silt.	P	18.2	-	-	-	134.0	
	S8	35'-36.5'	Stiff grey silt with gravel.	41	19.6	-	-	-	-	
	S9	40'-41.5'	Medium grey silty clay.	10	20.9	14.2	29.2	-	-	
	VANE	43'	Medium grey silty clay.	-	-	-	-	1280	-	Sens: 1.8
	T10	45'-46.5'	Medium grey silty clay.	P	23.9	-	-	915	127.0	
	VANE	48'	Medium grey silty clay.	-	-	-	-	800	-	Sens: 5.0
	T11	50'-51.5'	Medium grey silty clay.	P	27.2	17.0	30.6	720	125.0	
	VANE	53'	Medium grey silty clay.	-	-	-	-	720	-	Sens: 2.2
	T12	55'-56.5'	Medium grey silty clay.	P	22.7	-	-	545	130.0	
	VANE	58'	Medium grey silty clay.	-	-	-	-	880	-	Sens: 1.4
	S13	60'-61.5'	Stiff grey silty clay.	32	17.1	-	-	-	136.0	
	S14	65'-66.5'	Stiff grey silty clay.	54	21.9	-	-	-	-	
	S15	70'-71.5'	Grey-brown silty sand.	46	13.4	-	-	-	-	
	S16	75'-76.5'	Grey-brown silty sand.	>72	8.9	-	-	-	-	
	S17	80'-81.1'	Dense fine red sand.	>67	21.3	-	-	-	-	
	S18	90'-91.5'	Dense fine red sand.	30	-	-	-	-	-	
	S19	95'-96.5'	Stiff red silty clay with sand and gravel (Glacial Till)	> 61	-	-	-	-	-	Cont. P. 8.

# SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-6  
W.P. 182-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
7	RC20	107'-112'	Pink shale.	-	-	-	-	-	-	100% recovery
8	T1	3'-4.5'	Brown Oxidized silty clay.	P	20.8	22.9	40.4	-	-	
	VANE	6'	Brown Oxidized silty clay.	-	-	-	-	>2000	-	Sens: -
	T2	6'-7.5'	Brown Oxidized silty clay.	P	20.4	19.9	29.7	-	129.0	
	T3	10'-11.5'	Medium grey silty clay.	P	23.2	-	-	-	127.0	
	VANE	13'	Medium grey silty clay.	-	-	-	-	>2000	-	Sens: -
	T4	15'-16.5'	Medium grey silty clay.	P	21.6	25.3	32.1	865	123.0	
	VANE	18'	Medium grey silty clay.	-	-	-	-	880	-	Sens: 5.5
	T5	20'-21.5'	Medium grey silty clay.	P	35.4	19.2	36.9	830	119.0	
	VANE	23'	Medium grey silty clay.	-	-	-	-	880	-	Sens: 3.7
	T6	25'-26.5'	Medium grey silty clay.	P	22.3	-	-	-	129.0	
	VANE	28'	Medium grey silty clay.	-	-	-	-	>2000	-	Sens: -
	T7	30'-31.5'	Medium grey silty clay.	P	21.2	17.0	32.0	3130	135.0	
	S8	35'-36.5'	Stiff grey clayey silt.	39	12.6	-	-	-	-	
	S9	40'-41'	Grey-brown silt.	70	12.0	-	-	-	-	
	S10	45'-46.5'	Grey-brown silt.	69	11.6	-	-	-	145.0	
	RC11	50'-55'	Pink shale.	-	-	-	-	-	-	100% recovery

# SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-6  
W.P. 266-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
9	S1	5'-6.5'	Brown Oxidized silty clay.	14	-	-	-	-	-	
	S2	10'-11.5'	Brown Oxidized silty clay.	27	20.2	-	-	-	-	
	S3	15'-16.5'	Brown Oxidized silty clay.	31	-	-	-	-	-	
	S4	20'-21.5'	Brown Oxidized silty clay.	25	17.9	-	-	-	-	
	S5	25'-26.5'	Soft grey silty clay.	P	-	17.9	33.8	-	-	
	S6	30'-31.5'	Soft grey silty clay.	P	23.2	-	-	-	-	
	S7	35'-36.5'	Soft grey silty clay.	P	-	16.9	29.5	-	-	
	S8	40'-41.5'	Soft grey silty clay.	7	24.2	-	-	-	-	
	S9	45'-46.5'	Dense grey sand silt.	105	11.4	-	-	-	130.0	
	S10	50'-50.5'	Fine-medium gravel contains some clayey silt.	>86	-	-	-	-	-	
	S11	55'-56.0'	Fine-medium gravel contains some clayey silt.	91	10.7	-	-	-	-	
10	S1	5'-6.5'	Stiff Brown sandy clay.	P	-	-	-	-	-	
	S2	10'-11.5'	Stiff Brown sandy clay.	15	-	-	-	-	-	
	S3	15'-16.5'	Stiff Brown sandy clay.	21	-	-	-	-	-	
	S4	20'-21.5'	Stiff grey brown silty clay.	39	-	-	-	-	-	
	S5	25'-26.5'	Stiff grey brown silty clay.	20	-	-	-	-	-	

# SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-6

W.P. 266-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
10	S6	30'-31.5'	Stiff grey silty clay.	28	-	-	-	-	-	
	S7	35'-36.5'	Stiff grey silty clay.	32	-	-	-	-	-	
	S8	40'-41.5'	Soft grey silty clay.	6	-	-	-	-	-	
	S9	45'-46.5'	Soft grey silty clay.	3	-	-	-	-	-	
	S10	50'-51.5'	Soft grey silty clay.	P	-	-	-	-	-	
	S11	55'-56.5'	Soft grey silty clay.	P	-	-	-	-	-	
	S12	60'-61.5'	Stiff grey silty clay.	24	-	-	-	-	-	
	S13	65'-66.5'	Stiff grey silty clay.	38	-	-	-	-	-	
	S14	73'-73.3'	Red silty clay cont. sand and gravel (Glacial Till).	>150	-	-	-	-	-	
11	S1	5'-6.5'	Medium dense sandy silt.	P	-	-	-	-	-	
	S2	10'-11.5'	Medium dense sandy silt.	32	-	-	-	-	-	
	S3	15'-16.5'	Medium dense sandy silt.	29	-	-	-	-	-	
	S4	20'-21.5'	Medium dense sandy silt.	26	-	-	-	-	-	
	S5	25'-26.5'	Stiff brown Oxidized clayey silt.	30	-	-	-	-	-	
	S6	30'-31.5'	Stiff brown Oxidized clayey silt.	28	-	-	-	-	-	
	S7	35'-36.5'	Stiff grey silty clay.	21	-	-	-	-	-	
	S8	40'-41.5'	Stiff grey silty clay.	43	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-6

W.P. 140-57-1

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
11	S9	45'-46.5'	Medium soft grey silty clay.	5	-	-	-	-	-	
	S10	50'-51.5'	Medium soft grey silty clay.	P	-	-	-	-	-	
12	S1	3'-4.5'	Ashes, sand and gravel.	4	-	-	-	-	-	
	S2	6'-7.5'	Very stiff brown Oxidized silty clay.	30	13.5	-	-	-	-	
	S3	10'-11.5'	Very stiff brown Oxidized silty clay.	29	-	-	-	-	-	
	S4	15'-16.5'	Very stiff brown Oxidized silty clay.	32	20.0	-	-	-	-	
	S5	20'-21.5'	Very stiff brown Oxidized silty clay.	41	-	-	-	-	-	
	S6	25'-26.5'	Very stiff brown Oxidized silty clay.	40	19.3	-	-	-	-	
	S7	30'-31.5'	Stiff grey-brown clayey silt.	23	-	-	-	-	-	
	S8	35'-36.5'	Stiff grey-brown clayey silt.	17	-	-	-	-	-	
	S9	40'-41.5'	Stiff grey-brown clayey silt.	25	-	-	-	-	-	
	T10	45'-46.5'	Soft-medium grey silty clay.	P	22.7	16.1	27.8	-	-	
	VANE	48'	Soft-medium grey silty clay.	-	-	-	-	1280	-	Sens: 1.6
	T11	50'-51.5'	Soft-medium grey silty clay.	P	24.5	-	-	780	121	
	VANE	53'	Soft-medium grey silty clay.	-	-	-	-	880	-	Sens: 2.0 Cont. P. 12.



## SUMMARY OF FIELD &amp; LABORATORY TESTS

JOB 60-F-6

W.P. 140-57-1

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
12	T12	55'-56.5'	Soft-medium grey silty clay.	P P	25.0	16.8	30.0	450	125.0	
	VANE	58'	Soft-medium grey silty clay.	-	-	-	-	880	-	Sens: 2.4
	T13	60'-61.5'	Soft-medium grey silty clay.	P	-	-	-	-	-	
	VANE	63'	Soft-medium grey silty clay.	-	-	-	-	1040	-	Sens: 5.2
	T14	65'-66.5'	Soft-medium grey silty clay.	P	30.0	18.1	29.6	-	-	
	VANE	68'	Soft-medium grey silty clay.	-	-	-	-	720	-	Sens: 2.3
	T15	70'-71.5'	Soft-medium grey silty clay.	P	-	-	-	-	-	
	VANE	73'	Soft-medium grey silty clay.	-	-	-	-	960	-	Sens: 2.4
	T16	75'-76.5'	Soft-medium grey silty clay.	P	-	-	-	-	-	
	VANE	78'	Soft-medium grey silty clay.	-	-	-	-	840	-	Sens: 2.6
	T17	80'-81.5'	Soft-medium grey silty clay.	P	-	-	-	-	-	
	VANE	83'	Soft-medium grey silty clay.	-	-	-	-	1760	-	Sens: 1.5
	T18	85'-86.5'	Stiff grey silty clay.	P	-	-	-	-	-	
	S19	90'-91.5'	Stiff grey silty clay.	41	-	-	-	-	-	
	S20	100'-101.5'	Stiff grey silty clay.	19	-	-	-	-	-	
13	S1	5'-6.5'	Stiff brown Oxidized sandy clay.	11	-	-	-	-	-	
	S2	10'-11.5'	Stiff grey silty clay.	14	-	-	-	-	-	

Cont. P. 13.

## SUMMARY OF FIELD &amp; LABORATORY TESTS

JOB 60-F-6  
W.P. 140-57-1

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
13	T3	15'-16.5'	Soft-medium grey silty clay.	P	22.7	15.8	28.6	785	124	
	VANE	18'	Soft-medium grey silty clay.	-	-	-	-	1200	-	Sens: 2.0
	T4	20'-21.5'	Soft-medium grey silty clay.	P	-	-	-	-	-	
	VANE	23'	Soft-medium grey silty clay.	-	-	-	-	880	-	Sens: 2.8
	T5	25'-26.5'	Soft-medium grey silty clay.	P	26.5	16.8	30.8	750	125	
	VANE	28'	Soft-medium grey silty clay.	-	-	-	-	800	-	Sens: 3.3
	T6	30'-31.5'	Soft-medium grey silty clay.	P	-	-	-	-	-	
	VANE	33'	Soft-medium grey silty clay.	-	-	-	-	520	-	Sens: 2.6
	T7	35'-36.5'	Soft-medium grey silty clay.	P	32.4	18.3	30.9	600	124	
	VANE	38'	Soft-medium grey silty clay.	-	-	-	-	680	-	Sens: 3.4
	T8	40'-41.5'	Soft-medium grey silty clay.	P	-	-	-	-	-	
	VANE	43'	Soft-medium grey silty clay.	-	-	-	-	840	-	Sens: 2.6
	T9	45'-46.5'	Soft-medium grey silty clay.	P	-	-	-	1220	-	
	VANE	48'	Soft-medium grey silty clay.	-	-	-	-	1280	-	Sens: 1.4
14	S1	5'-6.5'	Stiff brown Oxidized silty clay.	10	-	-	-	-	-	
	S2	10'-11.5'	Stiff grey silty clay.	26	-	-	-	-	-	
	S3	15'-16.5'	Stiff grey silty clay.	9	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-6  
W.P. 140-57-1

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
14	T4	20'-21.5'	Soft-medium grey silty clay.	P	26.5	16.6	31.5	1000	125	
	VANE	23'	Soft-medium grey silty clay.	-	-	-	-	840	-	Sens: 2.6
	T5	25'-26.5'	Soft-medium grey silty clay.	P	-	-	-	-	-	
	VANE	28'	Soft-medium grey silty clay.	-	-	-	-	920	-	Sens: 2.9
	T6	30'-31.5'	Soft-medium grey silty clay.	P	-	17.9	37.2	-	-	
	VANE	33'	Soft-medium grey silty clay.	-	-	-	-	800	-	Sens: 5.0
	T7	35'-36.5'	Soft-medium grey silty clay.	P	28.7	18.7	34.8	-	127	
	VANE	38'	Soft-medium grey silty clay.	-	-	-	-	760	-	Sens: 3.8
	T8	40'-41.5'	Soft-medium grey silty clay.	P	28.5	17.8	29.4	-	-	
	VANE	43'	Soft-medium grey silty clay.	-	-	-	-	840	-	Sens: 3.0
	T9	45.5'-47'	Soft-medium grey silty clay.	P	-	-	-	-	-	
15	S1	5'-6.5'	Stiff brown Oxidized silty clay.	18	-	-	-	-	-	
	T2	10'-11.5'	Stiff brown Oxidized silty clay.	12-8"	25.0	19.0	29.5	2200	128	
	S3	15'-16.5'	Stiff brown Oxidized silty clay.	26	-	-	-	-	-	
	T4	20'-21.5'	Stiff brown Oxidized silty clay.	26	20.0	16.0	23.2	3360	129	
	S5	25'-26.5'	Stiff brown Oxidized silty clay.	30	-	-	-	-	-	
	T6	30'-31.5'	Stiff grey silty clay.	15	18.9 22.1	16.9	30.9	1380	121	

Cont. P. 15

# SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-6

W.P. 140-57-1

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
15	S7	35'-36.5'	Stiff grey silty clay.	17	-	-	-	-	-	
	S8	40'-41.5'	Stiff grey silty clay.	26	-	-	-	-	-	
	T9	45'-46.5'	Soft-medium grey silty clay.	P	27.4	16.9	35.1	700	121	
	VANE	43'	Soft-medium grey silty clay.	-	-	-	-	1040	-	Sens: 2.4
	T10	50'-51.5'	Soft-medium grey silty clay.	P	27.7	-	-	590	117	
	VANE	53'	Soft-medium grey silty clay.	-	-	-	-	1280	-	Sens: 2.5
	T11	55'-56.5'	Soft-medium grey silty clay.	P	24.0	16.3	34.3	-	130	
	VANE	58'	Soft-medium grey silty clay.	-	-	-	-	960	-	Sens: 4.0
	T12	60'-61.5'	Soft-medium grey silty clay.	P	-	-	-	-	-	
	VANE	63'	Soft-medium grey silty clay.	-	-	-	-	920	-	Sens: 2.9
	T13	65'-66.5'	Soft-medium grey silty clay.	P	-	-	-	-	-	
	VANE	68'	Soft-medium grey silty clay.	-	-	-	-	800	-	Sens: 2.2
	T14	70'-71.5'	Soft-medium grey silty clay.	P	26.0	17.6	28.7	-	-	
	VANE	73'	Soft-medium grey silty clay.	-	-	-	-	1280	-	Sens: 4.6
	T15	75'-76.5'	Soft-medium grey silty clay.	P	-	-	-	-	-	
	VANE	78'	Soft-medium grey silty clay.	-	-	-	-	1600	-	Sens: 1.3
16	S1	3'-4.5'	Soft red clay with gravel.	P	-	-	-	-	-	Cont. P. 16.

## SUMMARY OF FIELD &amp; LABORATORY TESTS

JOB 60-F-6

W.P. K40-57-1

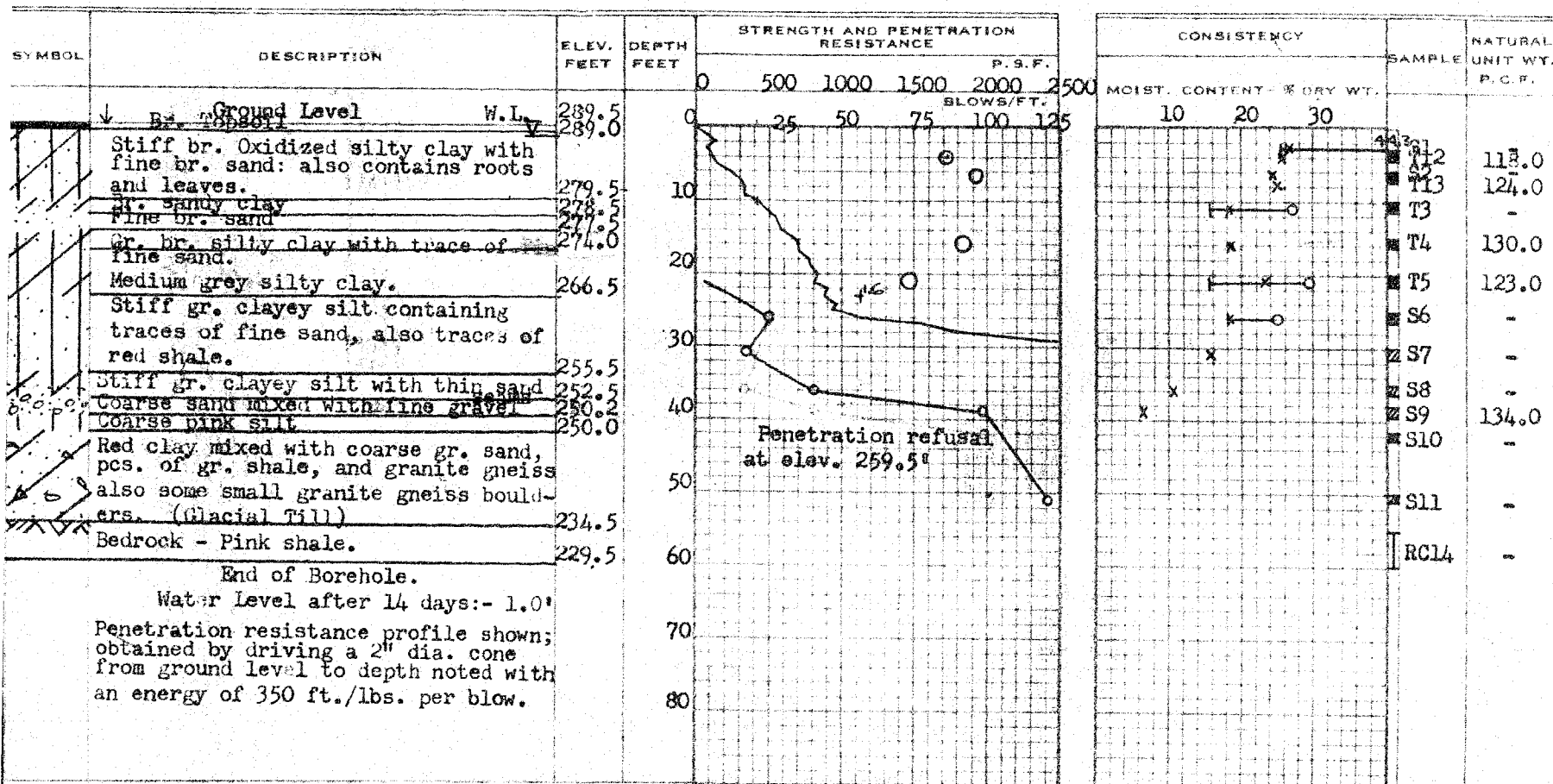
HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
16	VANE	6'	Soft-medium grey silty clay.	-	-	-	-	880	-	Sens: 5.9
	T2	6'-7.5'	Soft-medium grey silty clay.	P	-	-	-	-	-	
	VANE	9'	Soft-medium grey silty clay.	-	-	-	-	560	-	Sens: 4.7
	T3	10'-11.5'	Soft-medium grey silty clay.	P	28.2	16.2	27.7	410	126	
	VANE	13'	Soft-medium grey silty clay.	-	-	-	-	520	-	Sens: 2.9
	T4	15'-16.5'	Soft-medium grey silty clay.	P	-	-	-	-	-	
	VANE	18'	Soft-medium grey silty clay.	-	-	-	-	680	-	Sens: 1.7
	T5	20'-21.5'	Soft-medium grey silty clay.	P	20.5	-	-	1290	133	
	S6	25'-26.5'	Stiff grey silty clay with gravel.	17	-	-	-	-	-	
	S7	30'-31.5'	Stiff grey silty clay with gravel.	23	-	-	-	-	-	
	S8	35'-36.5'	Stiff grey silty clay with gravel.	33	-	-	-	-	-	
	S9	40'-41.5'	Soft-medium grey silty clay.	7	-	-	-	-	-	
	VANE	43'	Soft-medium grey silty clay.	-	-	-	-	860	-	Sens: 2.2
	T10	45'-46.5'	Soft-medium grey silty clay.	P	-	-	-	-	-	
	VANE	48'	Soft-medium grey silty clay.	-	-	-	-	880	-	Sens: 3.4
	RC11	49.5'-54.5'	Pink Shale.	-	-	-	-	-	-	
S denotes split spoon sa. T denotes Shelby tube sa. RC denotes rock core sa.										

# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 182-60 BORE HOLE NO. 1  
JOB 60-F-6 STATION 12+80 19.0' Left  
DATUM G. S. C. COMPILED BY B.K.  
BORING DATE 17/2/60 CHECKED BY K.G.C.

## LEGEND

1/2 UNCONFINED COMPRESSION (Qu) O  
VANE TEST (C) AND SENSITIVITY (S) +  
NATURAL MOISTURE AND LIQUIDITY INDEX X  
LIQUID LIMIT -  
PLASTIC LIMIT -



# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W.P. 182-60 BORE HOLE NO. 2

JOB 60-F-6 STATION 13+41 Ramp 'C' 9' Lt

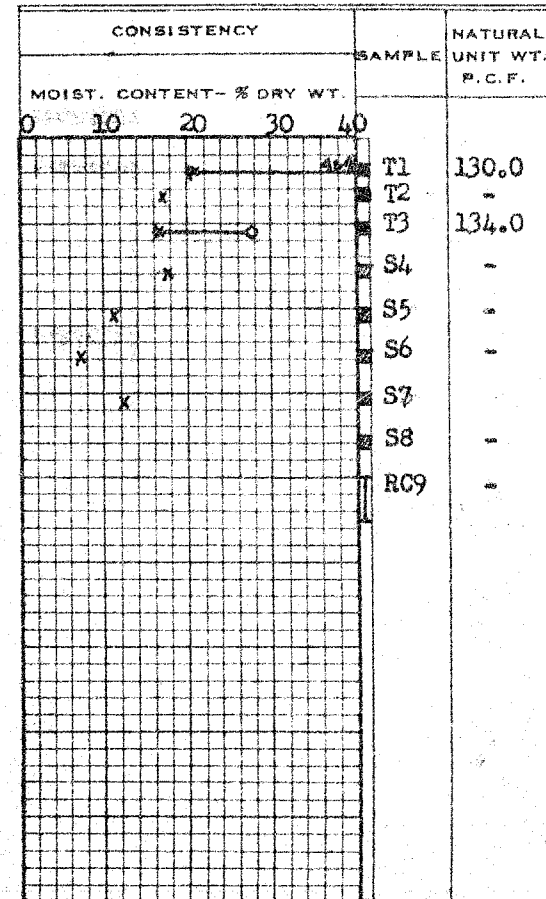
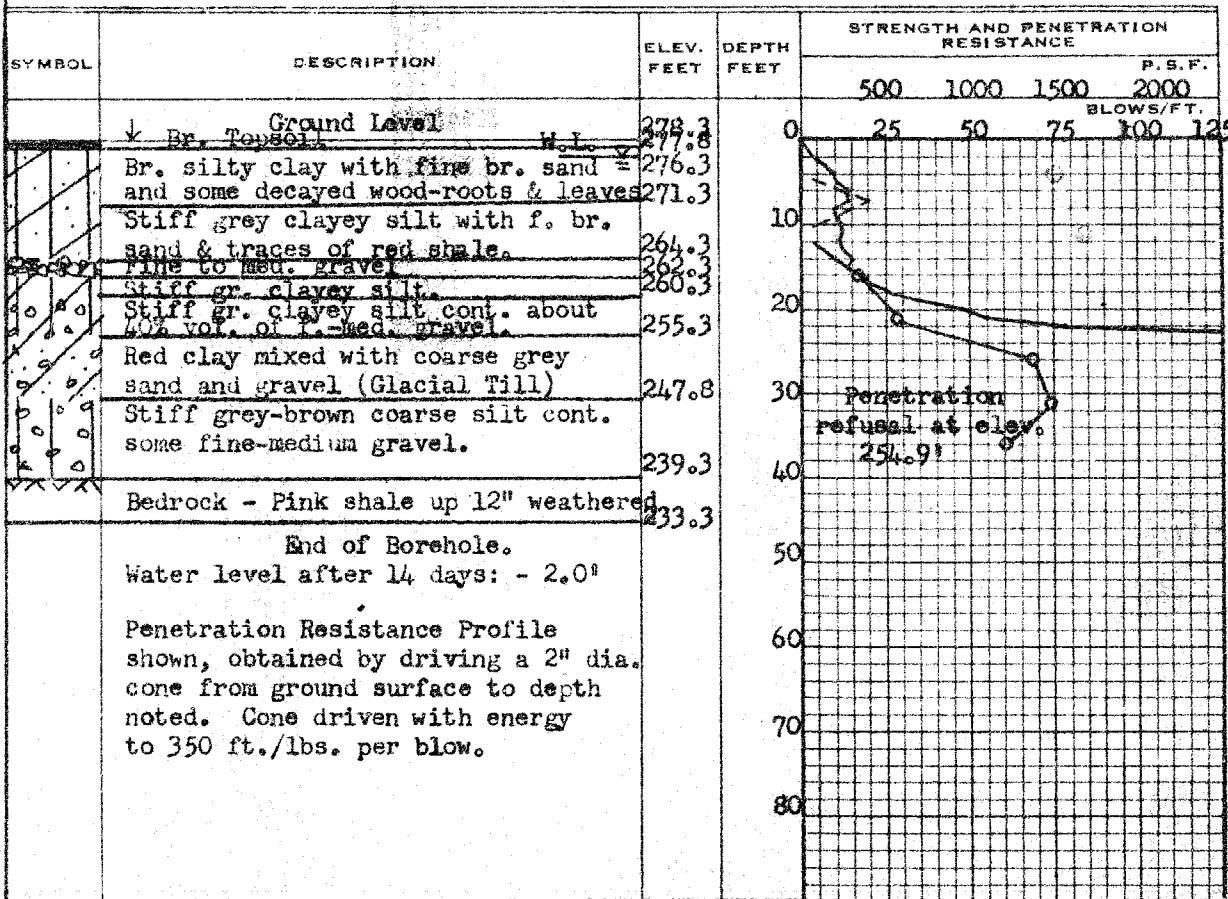
DATUM G. S. C. COMPILED BY B. K.

BORING DATE 24/2/60 CHECKED BY K. G. S.

2" DIA. SPLIT TUBE  
 2" SHELBY TUBE  
 2" SPLIT TUBE  
 2" DIA. CONE  
 2" SHELBY  
 CASING

## LEGEND

1/2 UNCONFINED COMPRESSION ( $Q_u$ )  
 VANE TEST (C) AND SENSITIVITY (S)  
 NATURAL MOISTURE AND LIQUIDITY INDEX  
 LIQUID LIMIT  
 PLASTIC LIMIT



# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W.P. 182-60

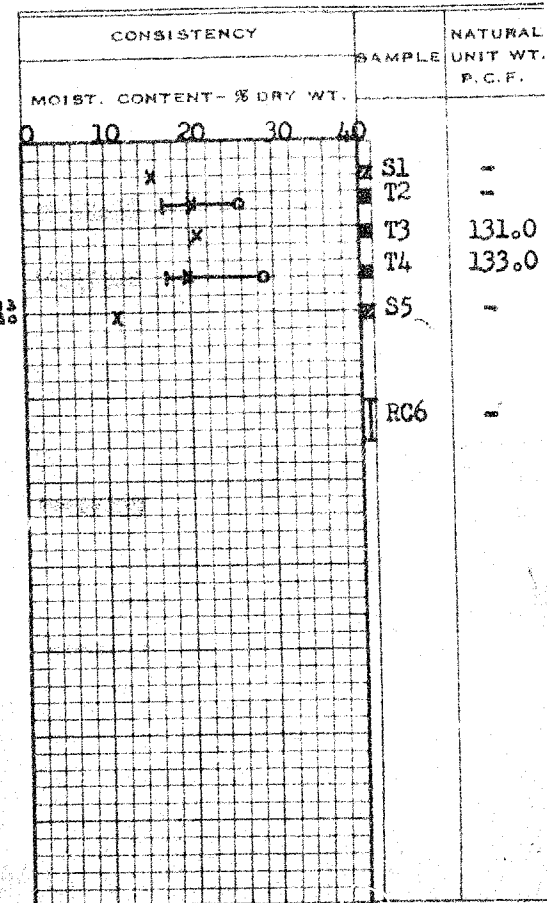
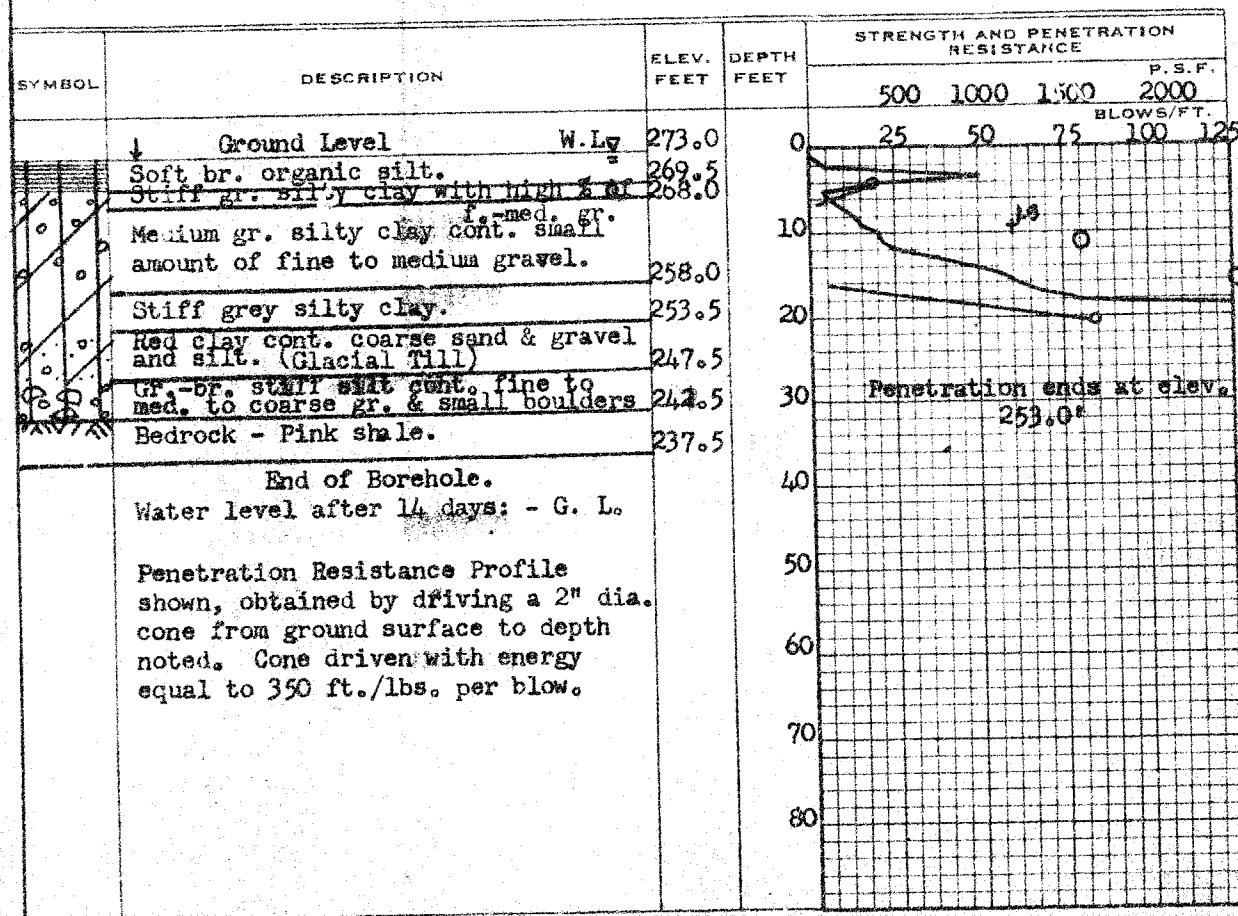
BORE HOLE NO. 3

JOB 60-F-6

STATION 14/41 Ramp 'C' 19.0'DATUM G. S. C.COMPILED BY B. K.BORING DATE 1/3/60CHECKED BY K. G. S.

## LEGEND

1/2 UNCONFINED COMPRESSION ( $Q_u$ ) —  $\bigcirc$   
 VANE TEST (C) AND SENSITIVITY (S) —  $+$   
 NATURAL MOISTURE AND LIQUIDITY INDEX —  $\times$   
 LIQUID LIMIT —  $\rightarrow$   
 PLASTIC LIMIT —  $\leftarrow$





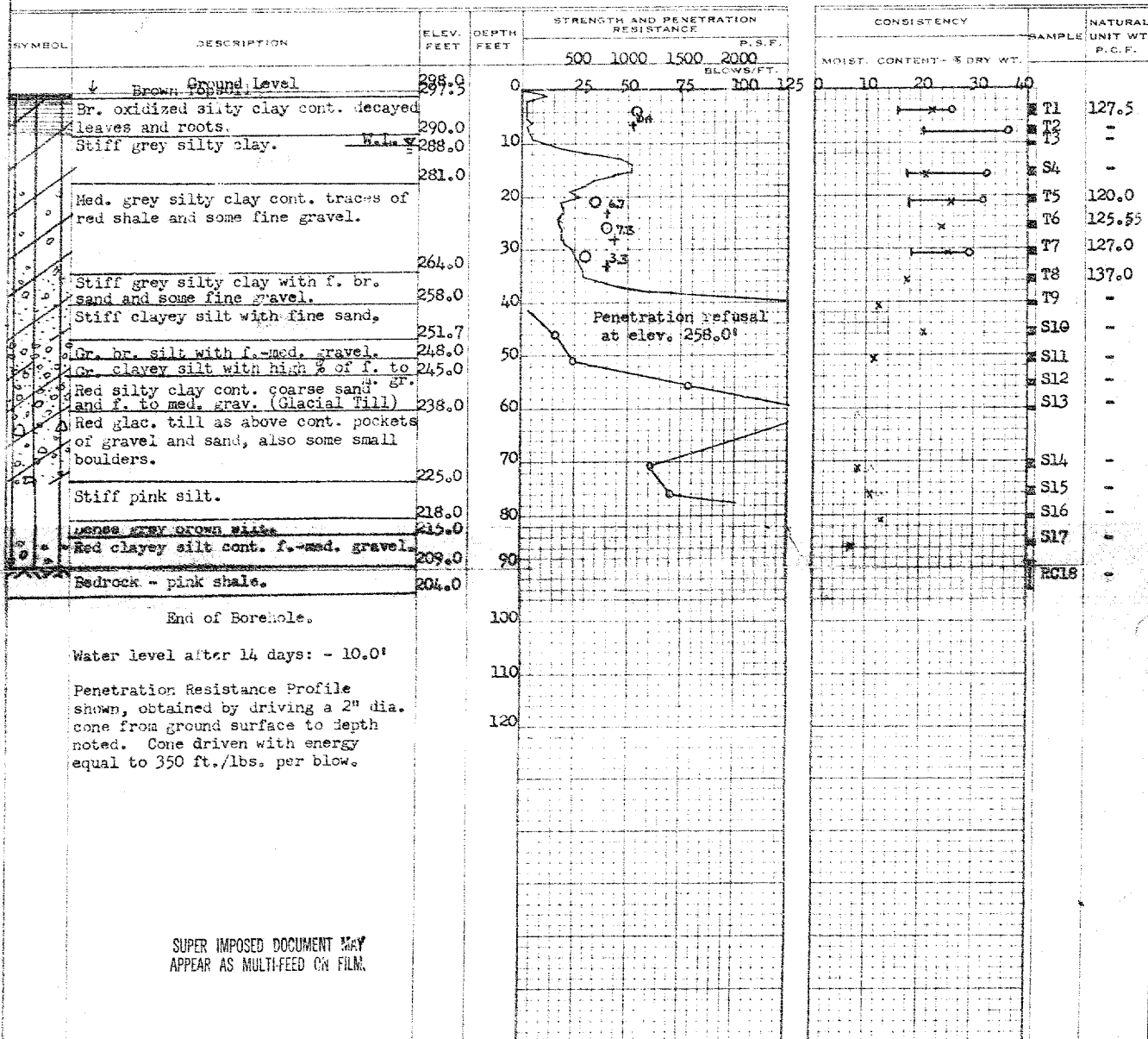
# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W.P. 266-60 BORE HOLE NO. 4  
 JOB 60-F-6 STATION 13/16 Ramp D 15' Lt  
 DATUM G. S. C. COMPILED BY B. K.  
 BORING DATE 2/3/60 CHECKED BY K. G. S.

### LEGEND

1/2 UNCONFINED COMPRESSION ( $Q_u$ ) — O  
 VANE TEST ( $C$ ) AND SENSITIVITY ( $S$ ) — +  
 NATURAL MOISTURE AND LIQUIDITY INDEX — X  
 LIQUID LIMIT — —  
 PLASTIC LIMIT — —



SUPER IMPOSED DOCUMENT MAY  
 APPEAR AS MULTI-FEED ON FILM.

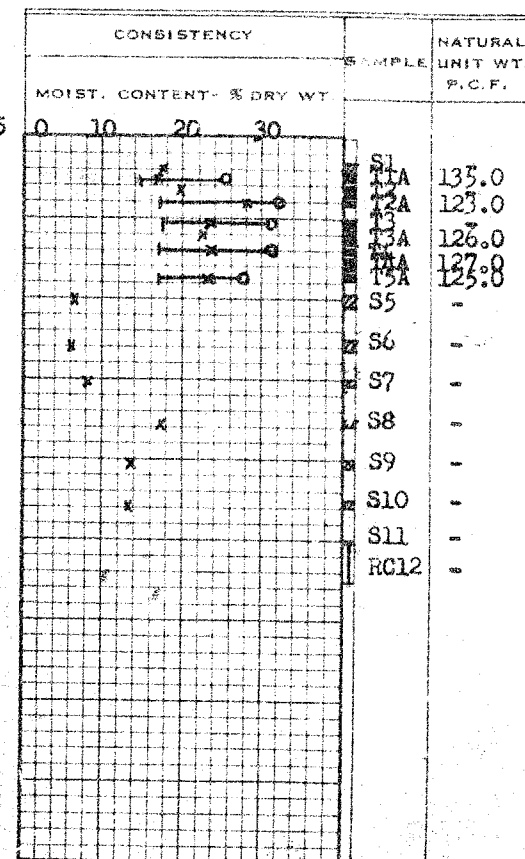
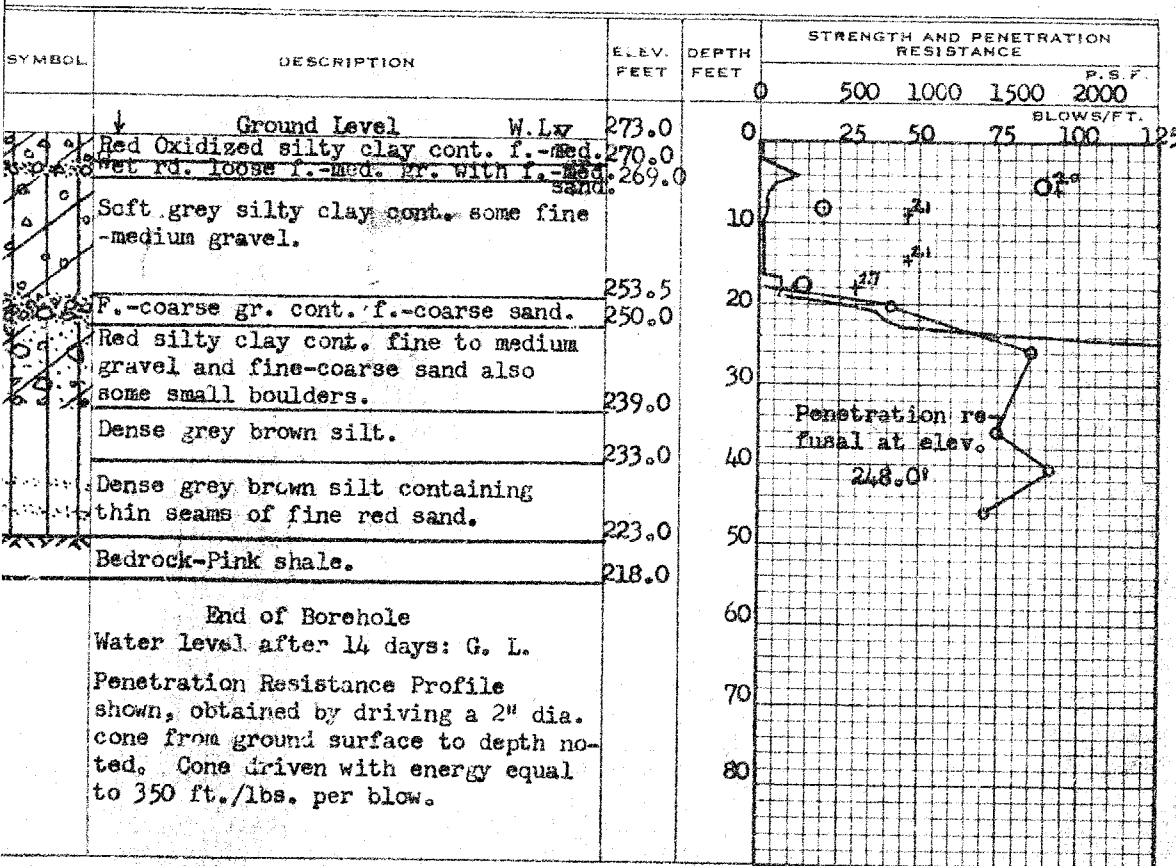
# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 266-60 BORE HOLE NO. 5  
JOB 60-P-6 STATION 12+19 Ramp 'D' 7' Lt  
DATUM G. S. C. COMPILED BY B. K.  
BORING DATE 10/3/60 CHECKED BY K. G. S.

2" DIA. SPLIT TUBE  
2" SHELBY TUBE  
2" SPLIT TUBE  
2" DIA. CONE  
2" SHELBY  
CASING

## LEGEND

1/2 UNCONFINED COMPRESSION ( $Q_u$ ) O  
VANE TEST (C) AND SENSITIVITY (S) +  
NATURAL MOISTURE AND LIQUIDITY INDEX X  
LIQUID LIMIT O  
PLASTIC LIMIT —



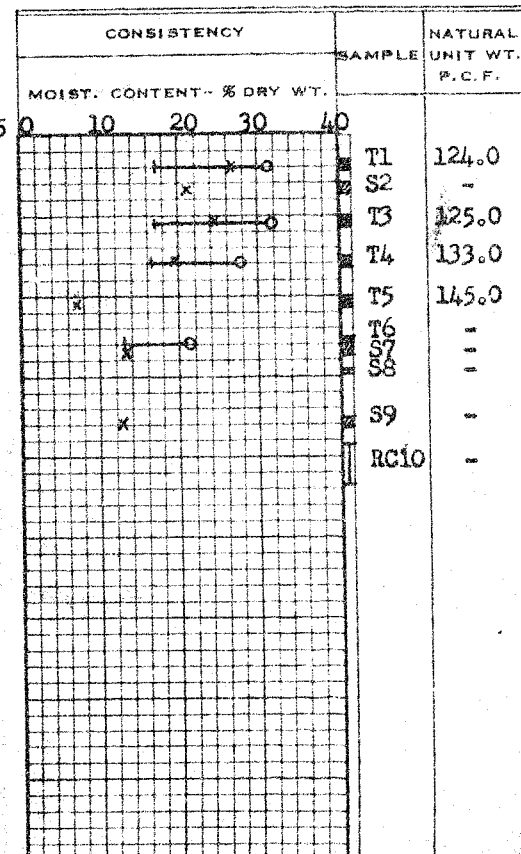
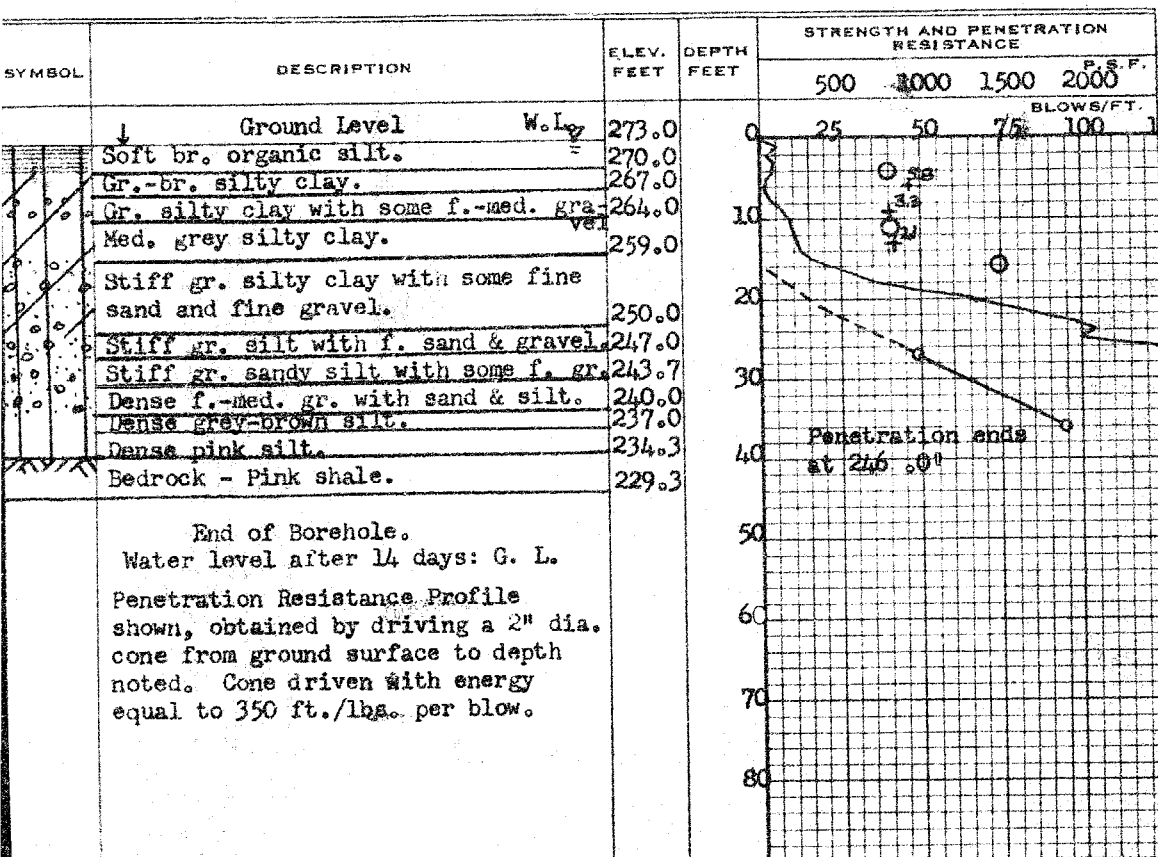
# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 266-60 BORE HOLE NO. 6  
JOB 60-F-6 STATION STA. 11+28 Ramp 'D' 15' Ls.  
DATUM G. S. C. COMPILED BY B. K.  
BORING DATE 8/3/60 CHECKED BY K. G. S.

2" DIA. SPLIT TUBE  
2" SHELBY TUBE  
2" SPLIT TUBE  
2" DIA. CONE  
2" SHELBY  
CASING

## LEGEND

1/2 UNCONFINED COMPRESSION (Qu) O  
VANE TEST (C) AND SENSITIVITY (S) +  
NATURAL MOISTURE AND LI  
LIQUIDITY INDEX X  
LIQUID LIMIT  
PLASTIC LIMIT

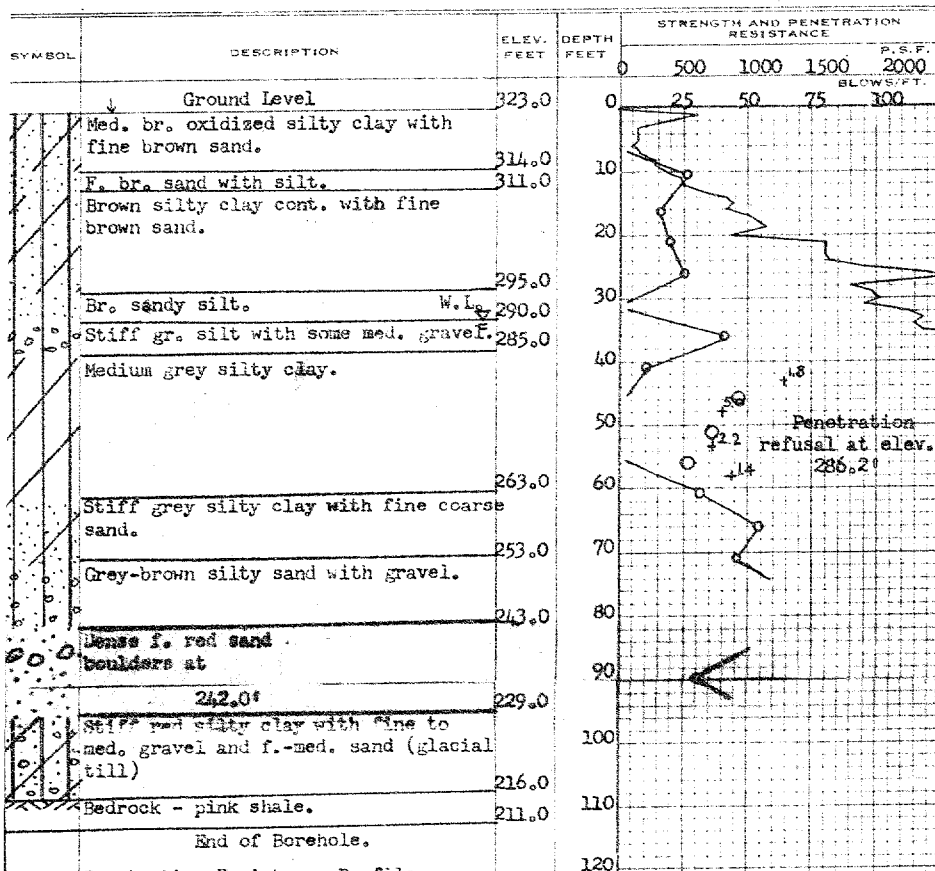


DEPARTMENT OF HIGHWAYS - ONTARIO  
 MATERIALS AND RESEARCH SECTION

 W.P. 182-60 BORE HOLE NO. 7  
 JOB 60-F-6 STATION 11+80 at Ramps B & C  
 DATUM G. S. C. COMPILED BY B. K.  
 BORING DATE 11/3/60 CHECKED BY K. G. S.

 2" DIA. SPLIT TUBE  
 2" SHELBY TUBE  
 2" SPLIT TUBE  
 2" DIA. CONE  
 2" SHELBY  
 CASING

## LEGEND

 1/2 UNCONFINED COMPRESSION ( $Q_u$ )  
 VANE TEST (C) AND SENSITIVITY (S)  
 NATURAL MOISTURE AND LIQUIDITY INDEX  
 LIQUID LIMIT  
 PLASTIC LIMIT


CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT	W. DRY WT.		
		T1	-
		T2	125.0
		S3	-
		S4	-
		S5	-
		S6	-
		T7	134.0
		S8	-
		S9	-
		T10	127.0
		T11	125.0
		T12	130.0
		S13	136.0
		S14	-
		S15	-
		S16	-
		S17	-
		S18	-
		S19	-
		RC20	-

 End of Borehole.  
 Penetration Resistance Profile shown, obtained by driving a 2" dia. cone from ground surface to depth noted. Cone driven with energy equal to 350 ft./lbs. per blow.

# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W.P. 182-6 BORE HOLE NO. 8

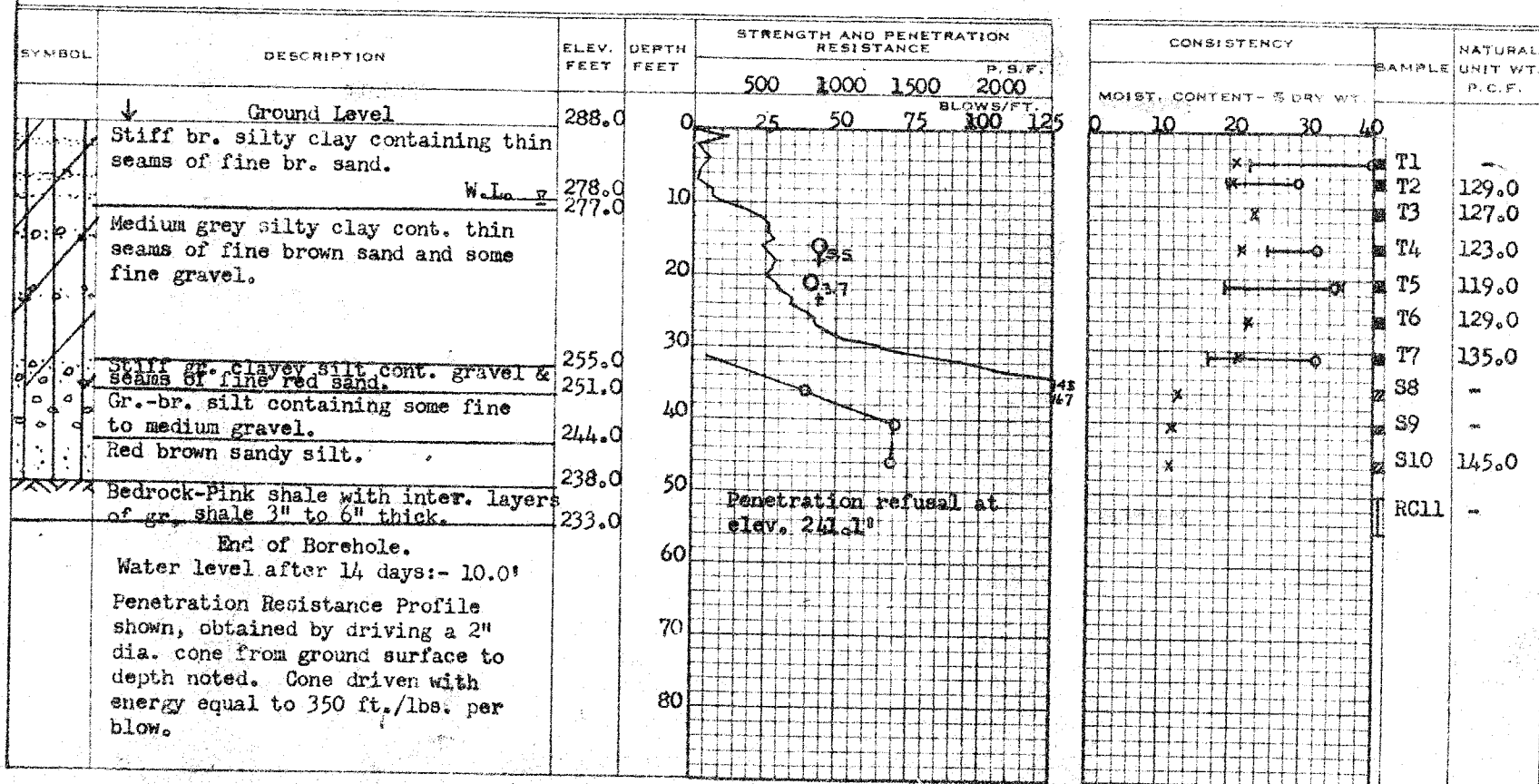
JOB 60-F-6 STATION 14+75.2 B &amp; C 20' Rt.

DATUM G. S. C. COMPILED BY B. K.

BORING DATE 15/3/60 CHECKED BY K. G. S.

## LEGEND

1/2 UNCONFINED COMPRESSION ( $Q_u$ ) — O  
 VANE TEST (C) AND SENSITIVITY (S) — +  
 NATURAL MOISTURE AND LIQUIDITY INDEX — LI  
 LIQUID LIMIT — X  
 PLASTIC LIMIT — P



# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 266-60 BORE HOLE NO. 9

JOB 60-F-6 STATION 10+70 & Ramp 'D'

DATUM G. S. C. COMPILED BY B. K.

BORING DATE 28/3/60 CHECKED BY K. G. S.

2" DIA. SPLIT TUBE \_\_\_\_\_

2" SHELBY TUBE \_\_\_\_\_

2" SPLIT TUBE \_\_\_\_\_

2" DIA. CONE \_\_\_\_\_

2" SHELBY \_\_\_\_\_

CASING \_\_\_\_\_

## LEGEND

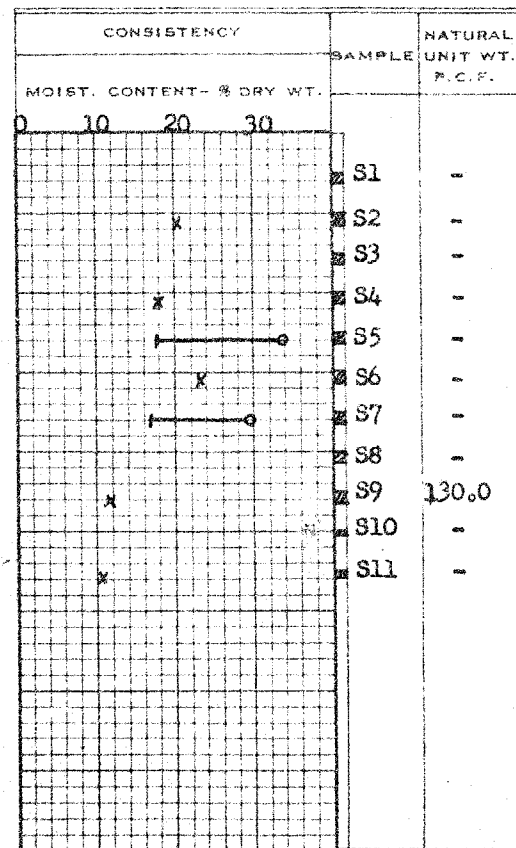
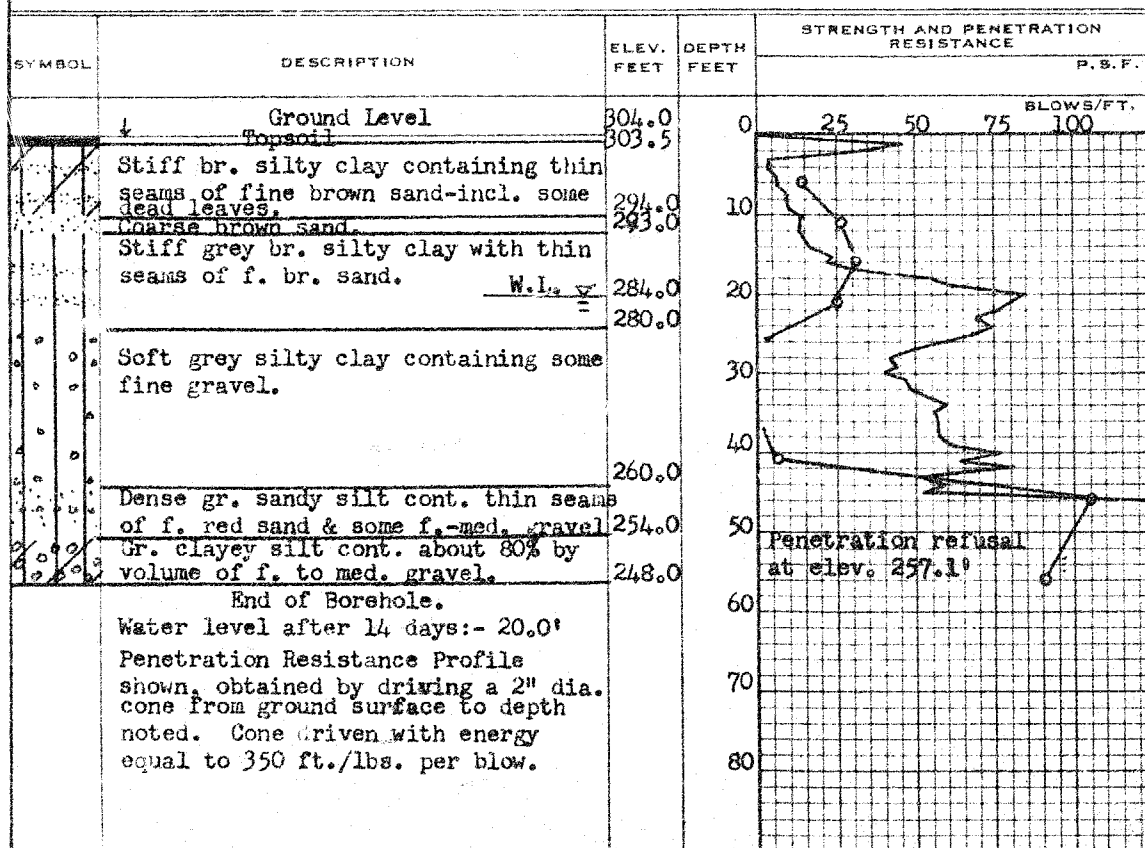
1/2 UNCONFINED COMPRESSION ( $Q_u$ ) \_\_\_\_\_  $\bigcirc$

VANE TEST (C) AND SENSITIVITY (S) \_\_\_\_\_  $+$

NATURAL MOISTURE AND LIQUIDITY INDEX \_\_\_\_\_  $\times$

LIQUID LIMIT \_\_\_\_\_  $\bigcirc$

PLASTIC LIMIT \_\_\_\_\_  $+$



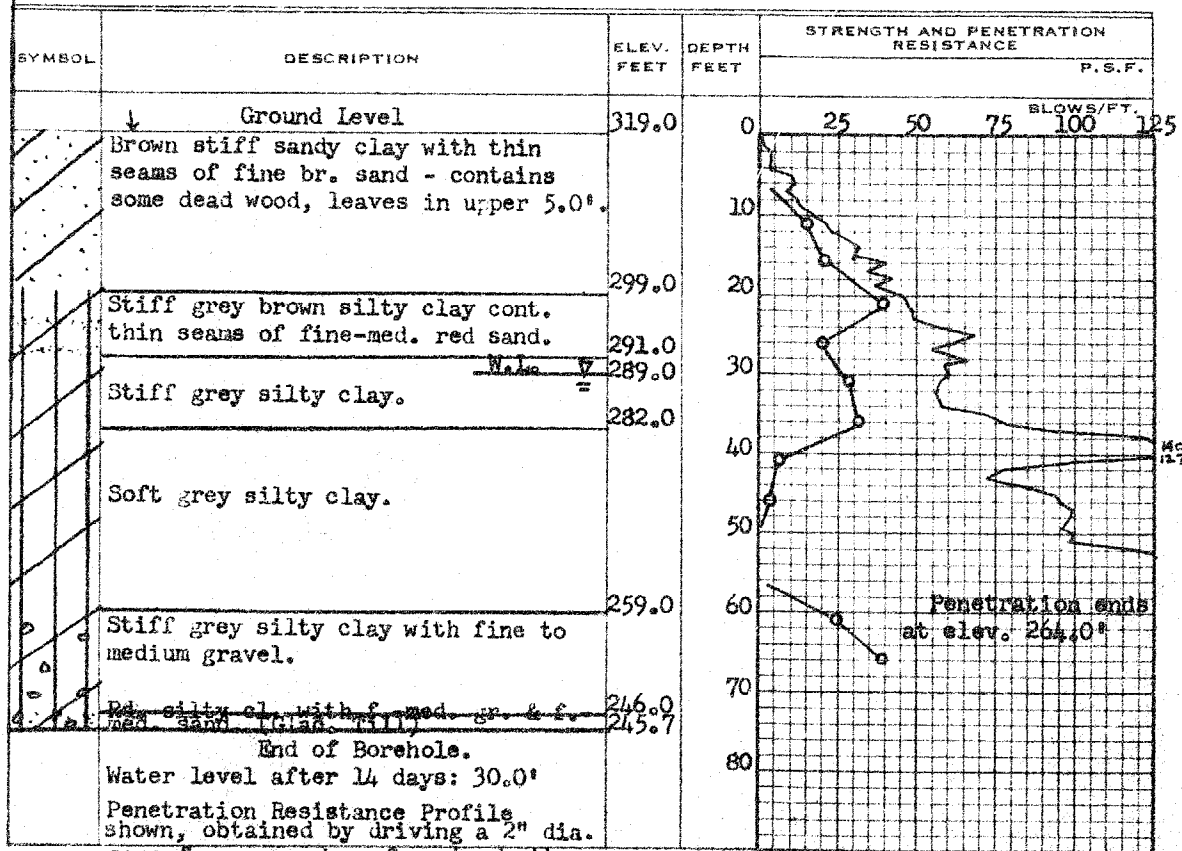
# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 266-60 BORE HOLE NO. 10  
JOB 60-F-6 STATION 13+60 & Ramp 'D'  
DATUM G. S. C. COMPILED BY B. K.  
BORING DATE 8/4/60 CHECKED BY K. G. S.

2" DIA. SPLIT TUBE  
2" SHELBY TUBE  
2" SPLIT TUBE  
2" DIA. CONE  
2" SHELBY  
CASING

## LEGEND

1/2 UNCONFINED COMPRESSION ( $Q_u$ )  
VANE TEST (C) AND SENSITIVITY (S)  
NATURAL MOISTURE AND LIQUIDITY INDEX  
LIQUID LIMIT  
PLASTIC LIMIT



CONSISTENCY	SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.		
	S1	
	S2	
	S3	
	S4	
	S5	
	S6	
	S7	
	S8	
	S9	
	S10	
	S11	
	S12	
	S13	
	S14	

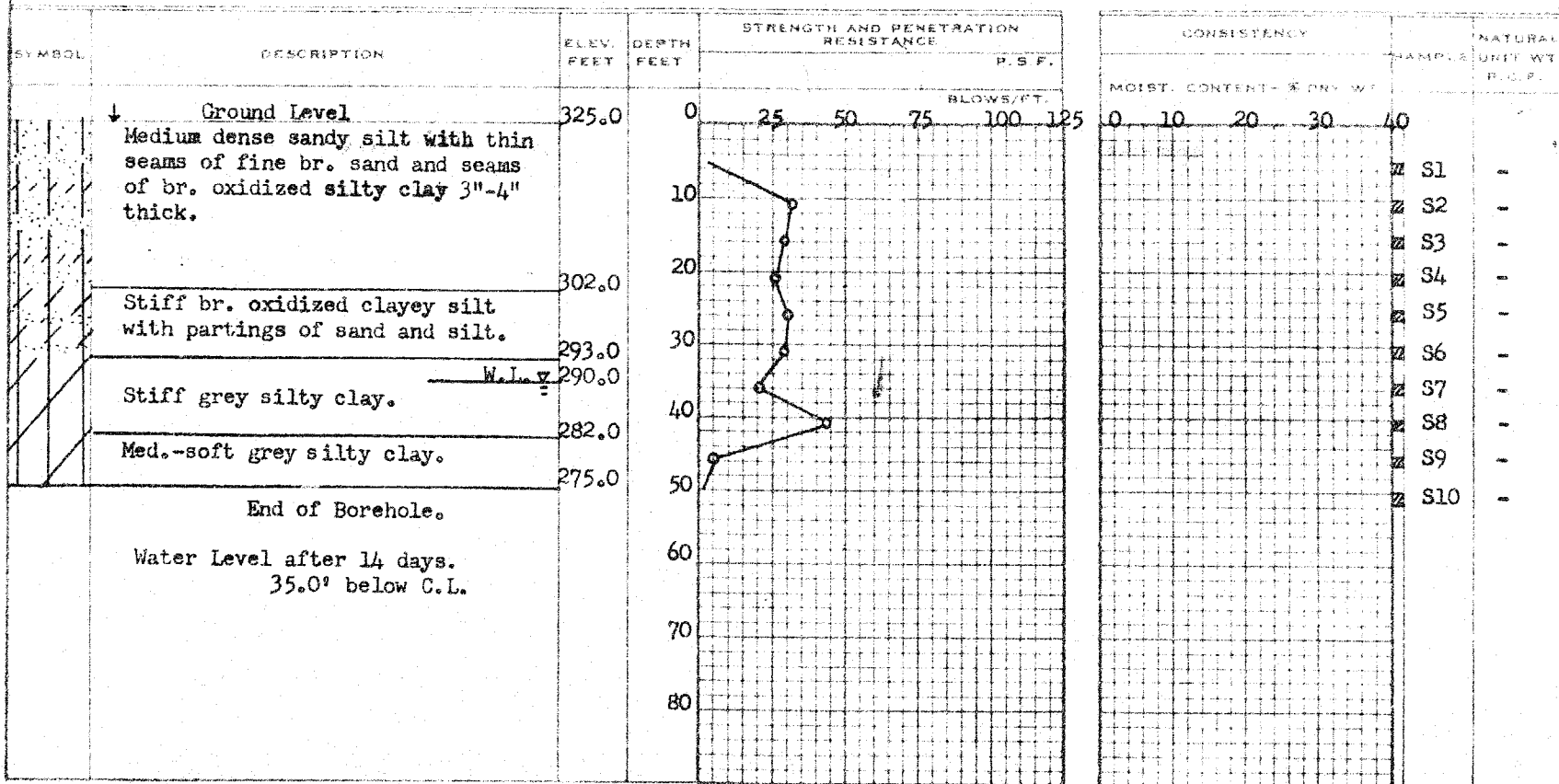
# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 140-57-1 BORE HOLE NO. 11  
JOB 60-F-6 STATION 225+50 & Ramp 'C'  
DATUM G. S. C. COMPILED BY B. K.  
BORING DATE Mar. 31/60 CHECKED BY K. G. S.

2" DIA. SPLIT TUBE  
2" SHELBY TUBE  
2" SPLIT TUBE  
2" DIA. CONE  
2" SHELBY  
CASING

## LEGEND

1/2 UNCONFINED COMPRESSION (QU) O  
VANE TEST (C) AND SENSITIVITY (S) +  
NATURAL MOISTURE AND LIQUIDITY INDEX U  
LIQUID LIMIT Y  
PLASTIC LIMIT \*





## DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

\* F 140-57-1

BORE HOLE NO. 12

JOB 60-F-6

STATION 473+10 ± W.B.L. 110'

DATUM G. S. C.

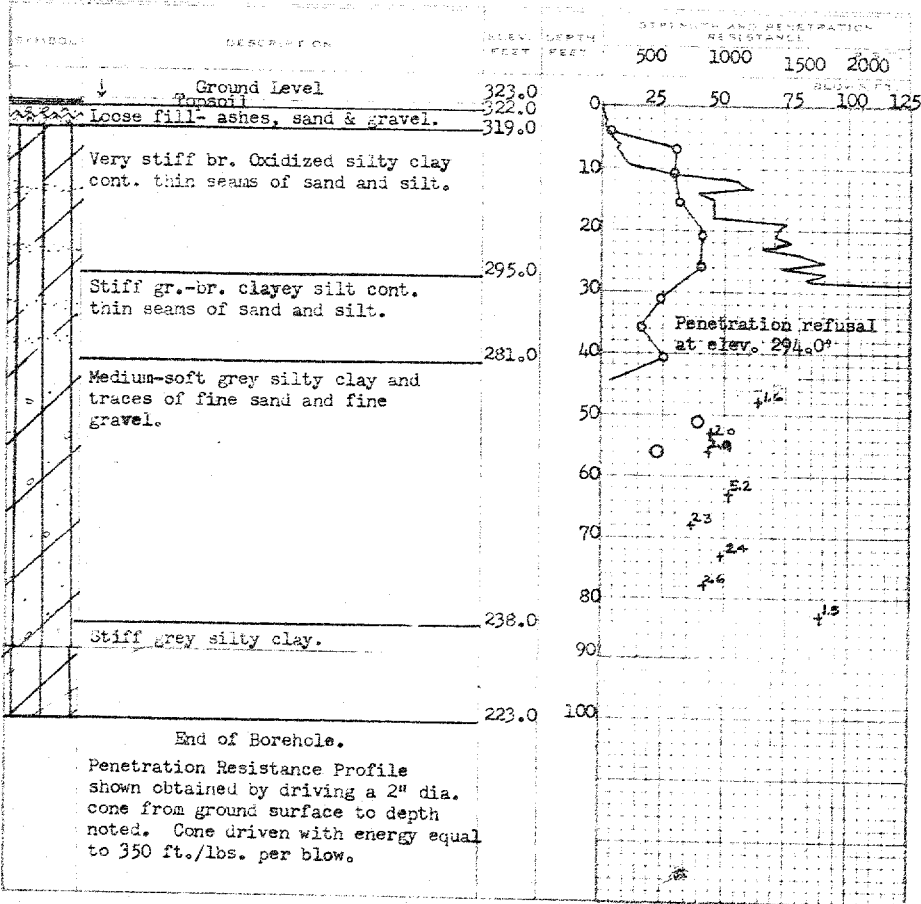
COMPILED BY B. K.

BORING DATE May 17/60

CHECKED BY K. G. S.

## LEGEND

WET OR DRY COMPRESSION (G<sub>u</sub>)  
 VANE TESTS AND PENETRATION  
 NATURAL MOISTURE AND  
 LIQUIDITY INDEX  
 PLASTIC LIMIT



DEPTH FEET	CONSISTENCY	NATURAL MOISTURE PERCENT	LIQUIDITY INDEX	PLASTIC LIMIT
10				
20				
30				
40				
50				
60				
70				
80				
90				
100				
110				
120				
130				
140				
150				
160				
170				
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3670				

# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W.P. 140-57-1

BORE HOLE NO. 13

JOB 60-F-6

STATION 473/25 A.W.B.L. 55' Rt

DATUM G. S. C.

COMPILED BY B. K.

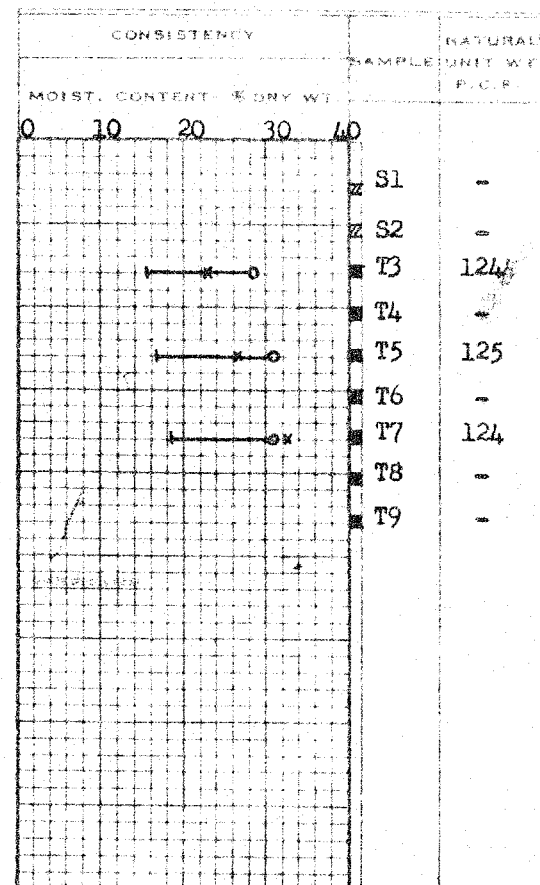
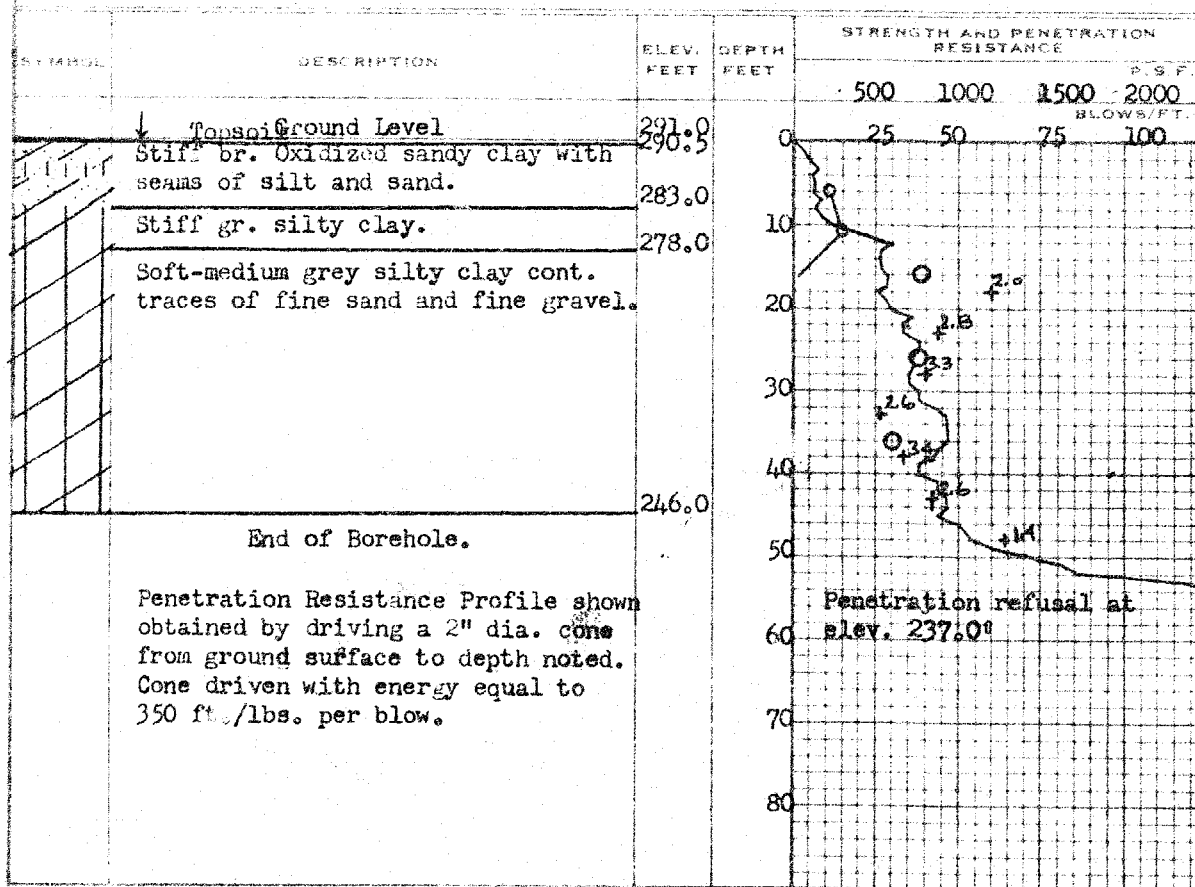
BORING DATE May 25/60

CHECKED BY K. G. S.

2" DIA. SPLIT TUBE  
 2" SHELBY TUBE  
 2" SPLIT TUBE  
 2" DIA. CONE  
 2" SHELBY  
 CASING

## LEGEND

1/2 UNCONFINED COMPRESSION (QU) O  
 VANE TEST (C) AND SENSITIVITY (S) V  
 NATURAL MOISTURE AND LIQUIDITY INDEX H  
 LIQUID LIMIT X  
 PLASTIC LIMIT P



# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W.P. 140-57-1

BORE HOLE NO. 14

JOB 60-F-6

STATION 476+45 W.B.L. 95' Rt 2" DIA. SPLIT TUBE

DATUM G. S. C.

COMPILED BY B.K.

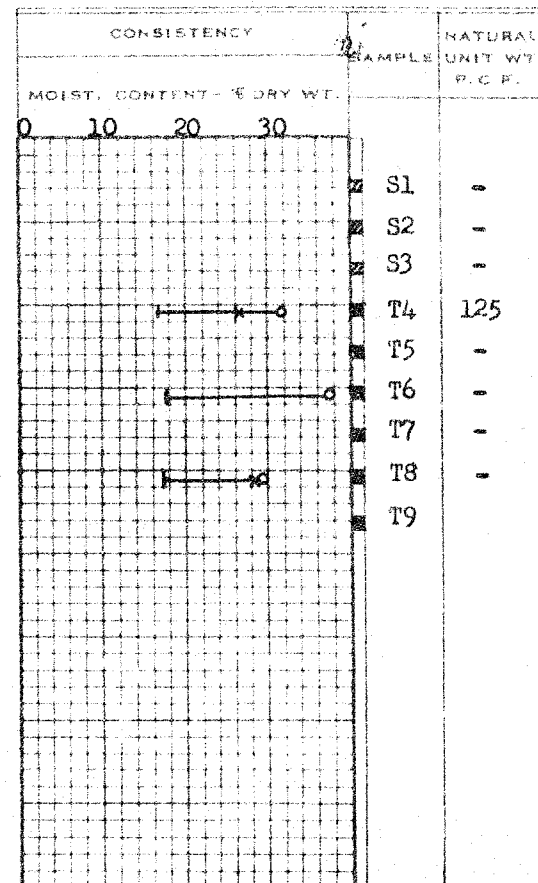
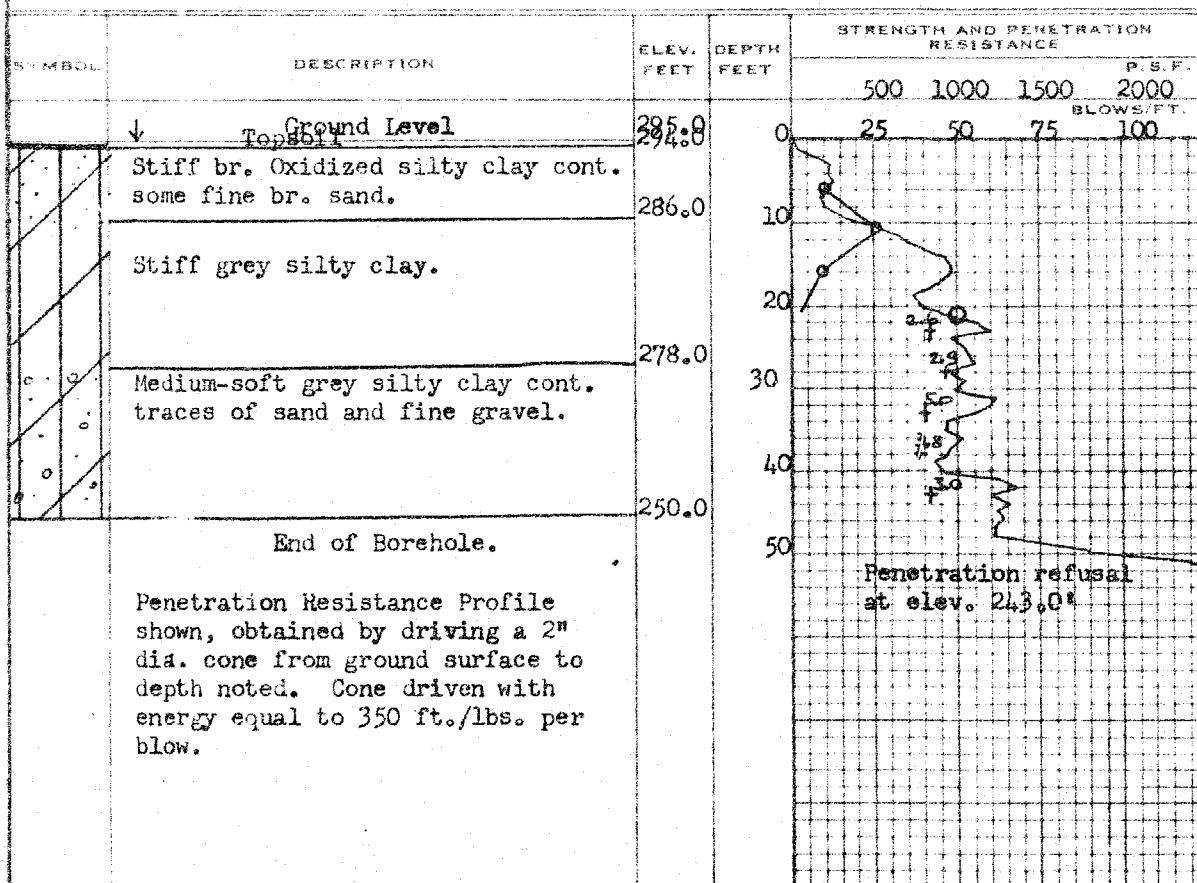
BORING DATE May 26/60

CHECKED BY K. G. S.

2" SHELBY TUBE  
2" SPLIT TUBE  
2" DIA. CONE  
2" SHELBY  
CASING

## LEGEND

1/2 UNCONFINED COMPRESSION ( $Q_u$ ) O  
VANE TEST (C) AND SENSITIVITY (S) +  
NATURAL MOISTURE AND LIQUIDITY INDEX LI  
LIQUID LIMIT X  
PLASTIC LIMIT



# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 140-57-1

BORE HOLE NO. 15

JOB 60-P-6

STATION 476+20 R.W.B.L. 155' Rt.

DATUM G. S. C.

COMPILED BY B. K.

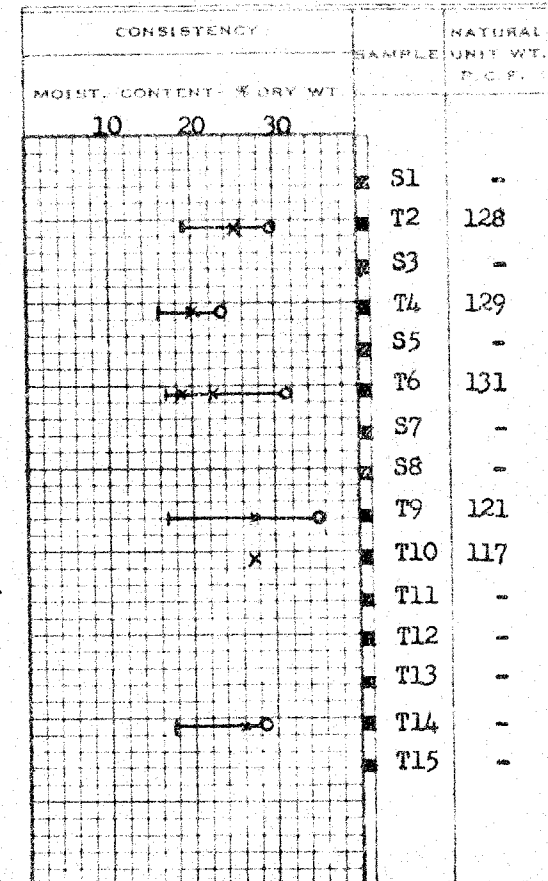
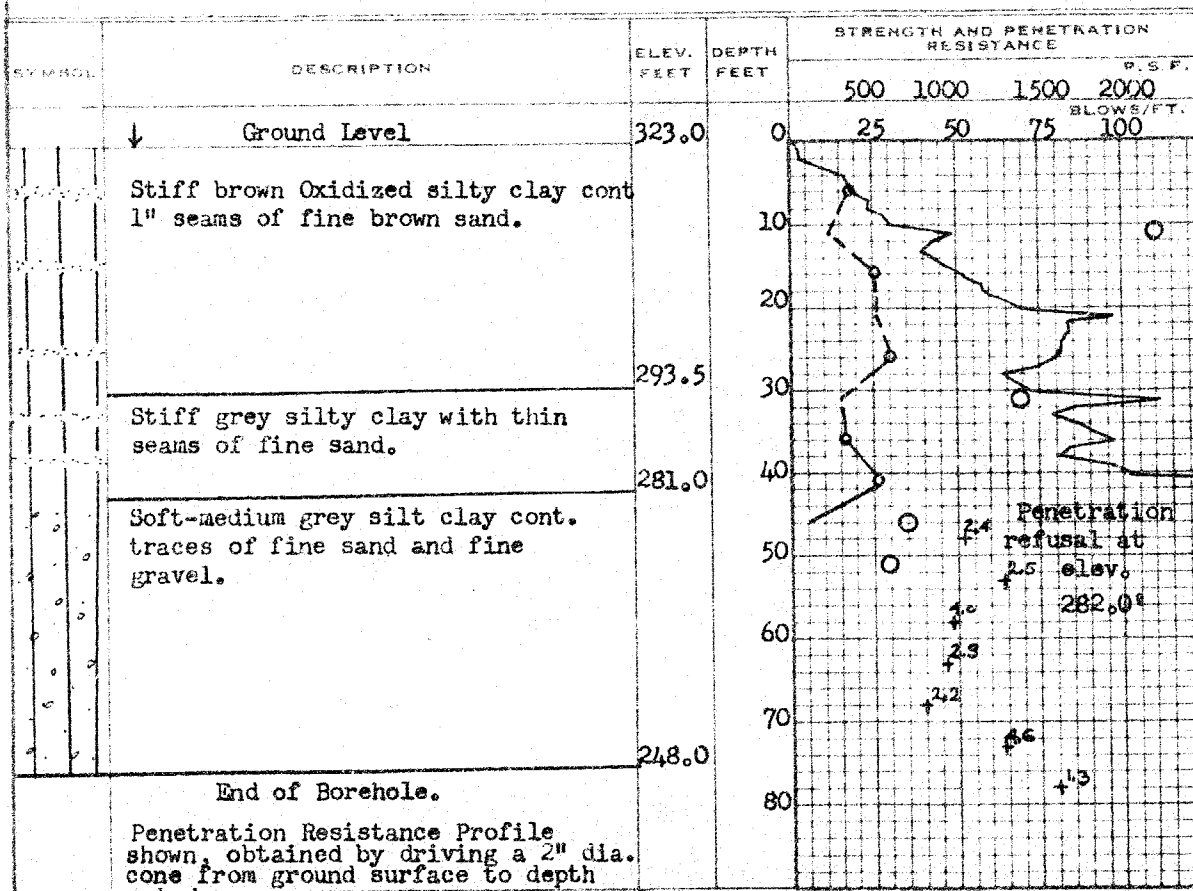
BORING DATE May 30/60

CHECKED BY K. G. S.

2" DIA. SPLIT TUBE  
2" SHELBY TUBE  
2" SPLIT TUBE  
2" DIA. CONE  
2" SHELBY  
CASING

## LEGEND

1/2 UNCONFINED COMPRESSION ( $Q_u$ ) — O  
VANE TEST (C) AND SENSITIVITY (S) — +  
NATURAL MOISTURE AND LIQUIDITY INDEX — LI  
LIQUID LIMIT — X  
PLASTIC LIMIT —



# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 140-57-1 BORE HOLE NO. 16

JOB 60-F-6 STATION 8+35 Ramp 'D' 20' Rt

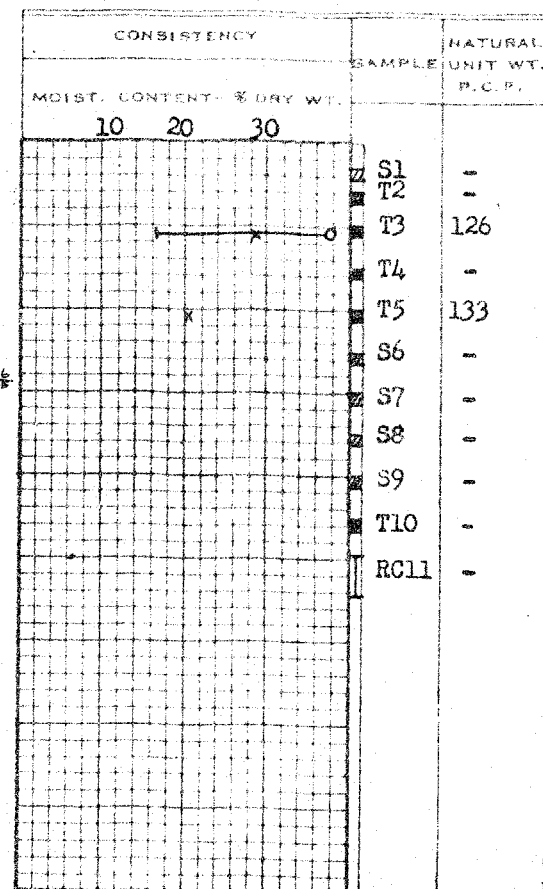
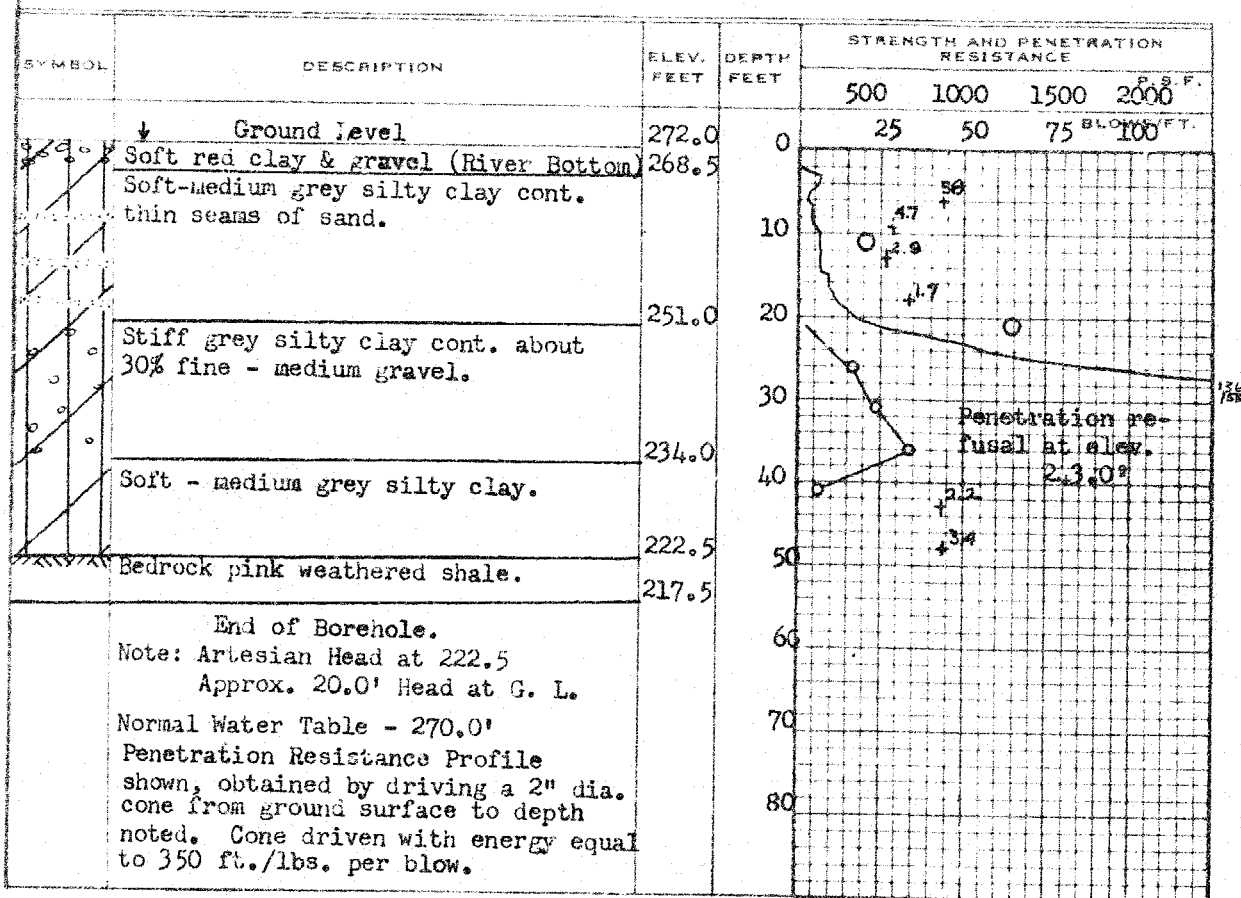
DATUM G. S. C. COMPILED BY B. K.

BORING DATE Apr. 14/60 CHECKED BY K. G. S.

2" DIA. SPLIT TUBE  
2" SHELBY TUBE  
2" SPLIT TUBE  
2" DIA. CONE  
2" SHELBY  
CASING

## LEGEND

1/2 UNCONFINED COMPRESSION (Qu)  $\bigcirc$   
VANE TEST (C) AND SENSITIVITY (S)  $\times$   
NATURAL MOISTURE AND LIQUIDITY INDEX  $\Delta$   
LIQUID LIMIT  $\bigcirc$   
PLASTIC LIMIT  $\times$



# CONSOLIDATION TESTS

60-F-6

BOREHOLE 2

SAMPLE 3

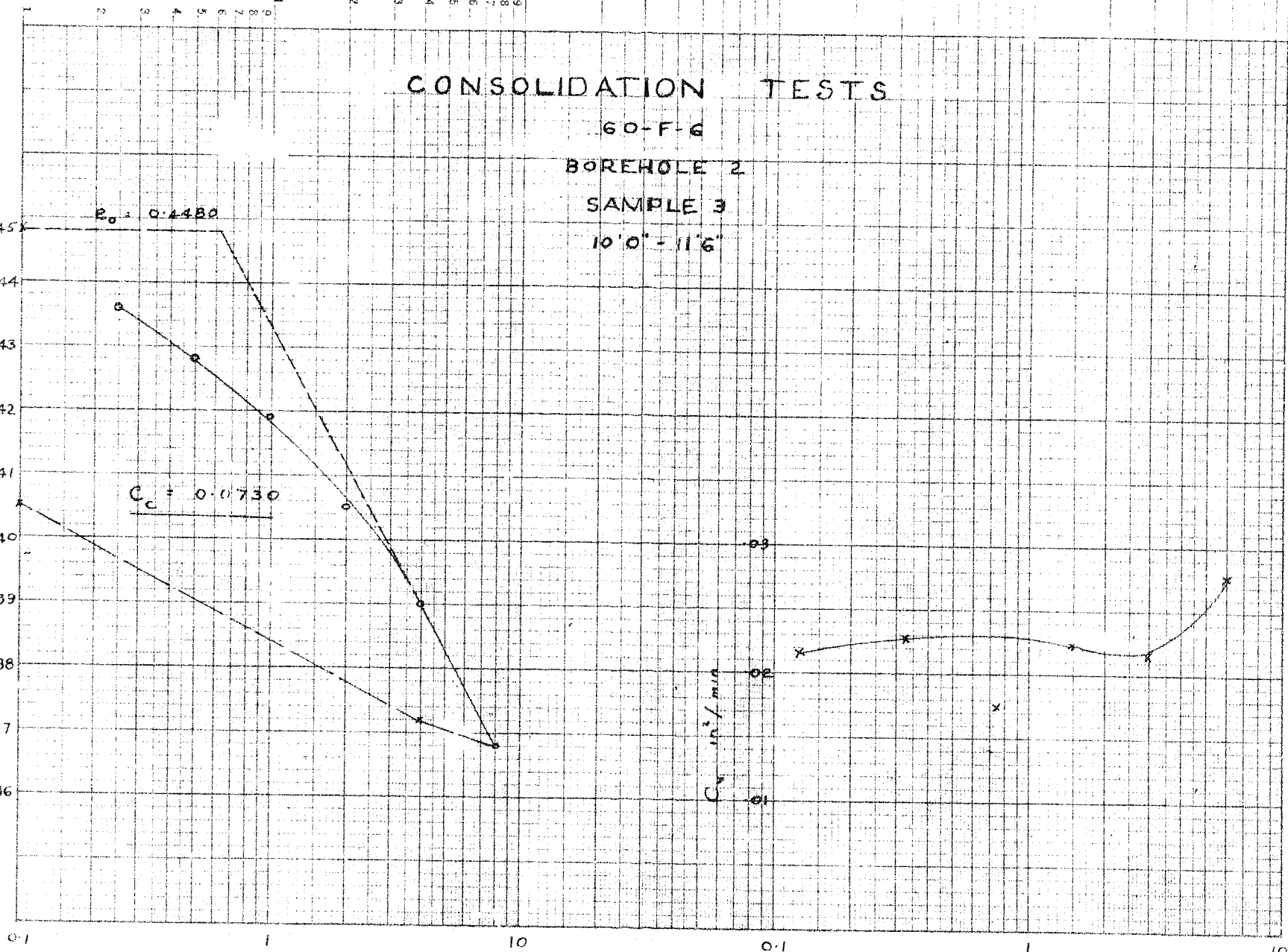
10'0" - 11'6"

VOID RATIO  $e$

$e_0 = 0.4480$

$C_c = 0.0730$

$C_v$  in  $\frac{1}{\text{min}}$



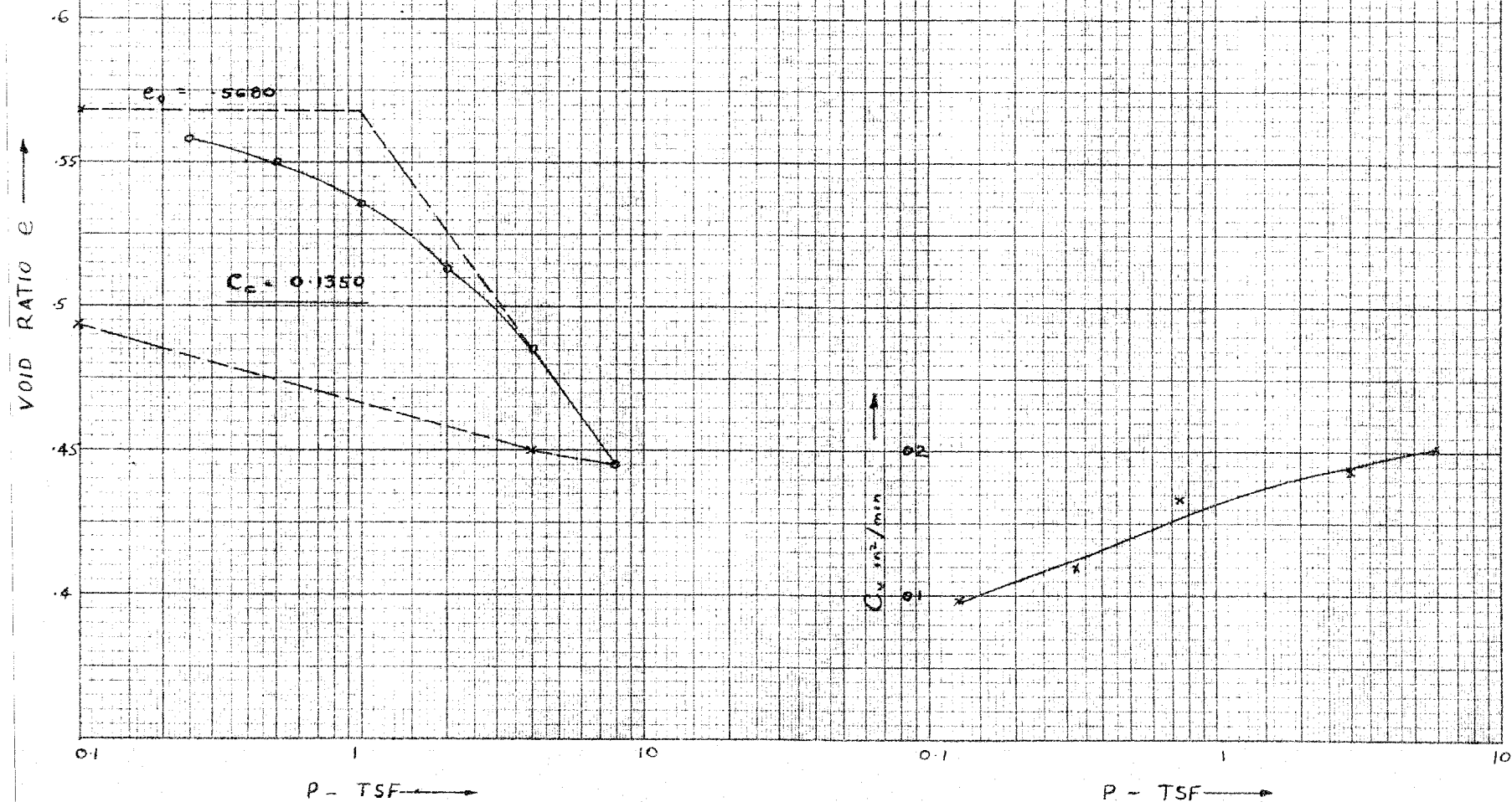
# CONSOLIDATION TESTS

60-F-6

BOREHOLE 3

SAMPLE 3

10'0" - 11'6"





# CONSOLIDATION TESTS

60-F-6

BOREHOLE 4

SAMPLE 5

20'0" - 21'6"

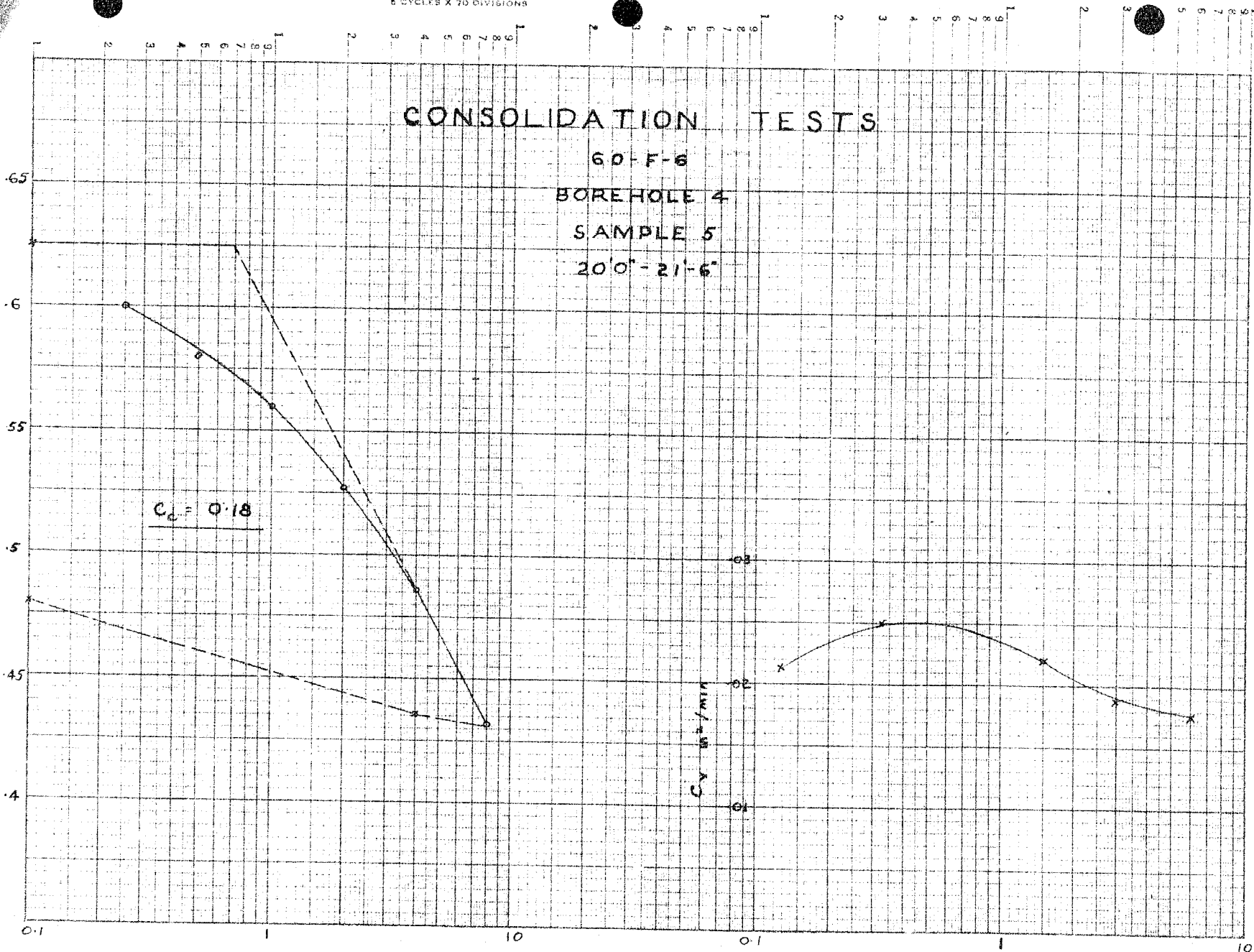
$C_c = 0.18$

VOID RATIO  $e$

$C_v$   $\frac{in^2}{min}$

P - T.S.F. →

P - T.S.F. →

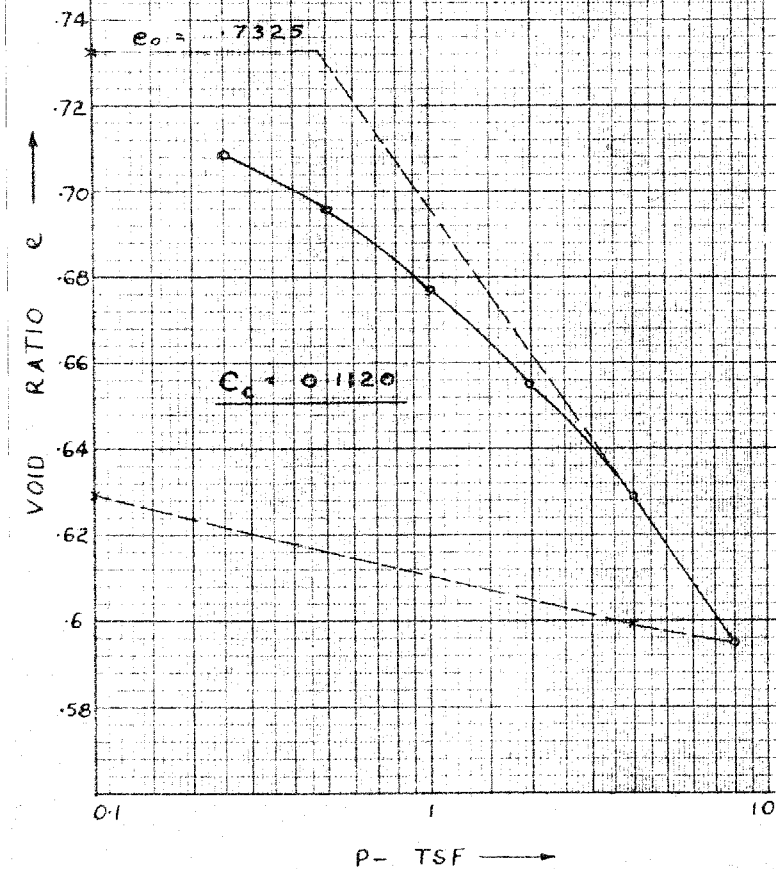




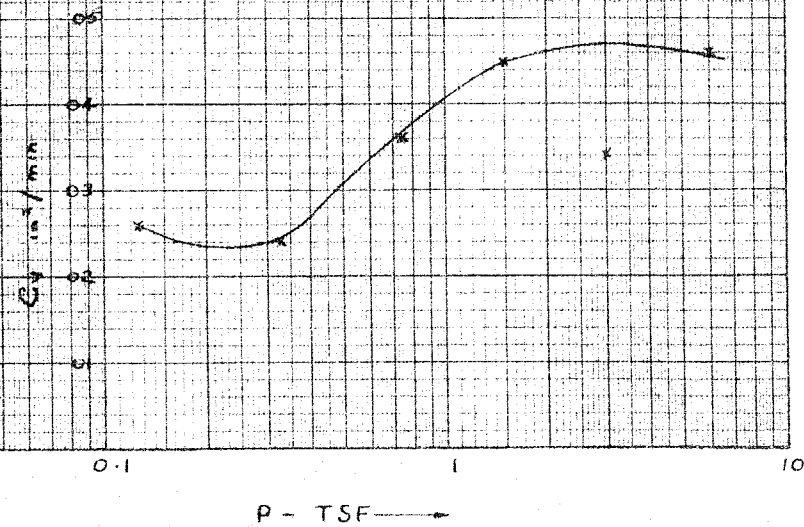


# CONSOLIDATION TESTS

60-F-6  
BOREHOLE 4  
SAMPLE 7  
30'0"-30'6"



$C_u$  in./min





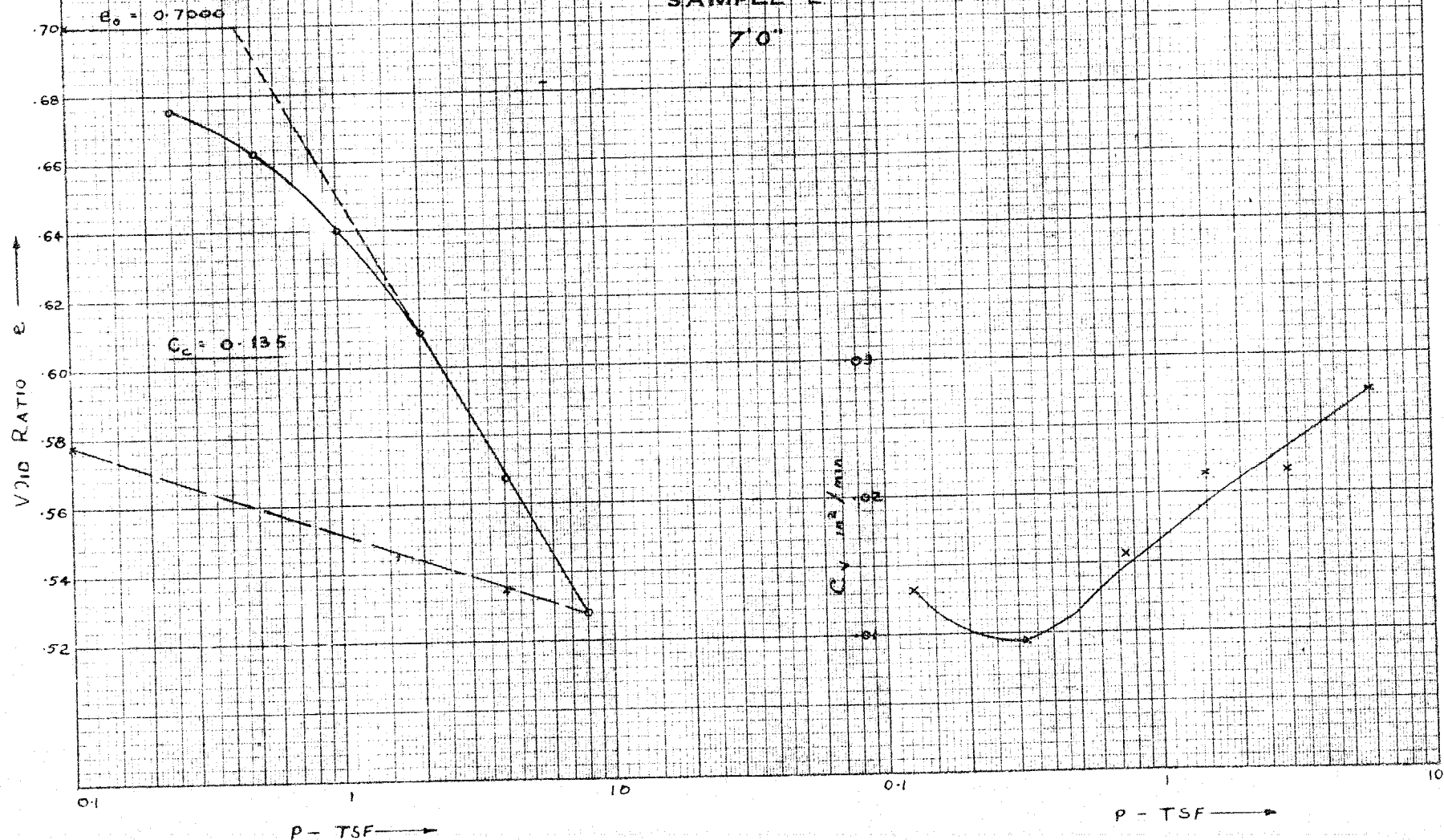
# CONSOLIDATION TESTS

60-F-6

BOREHOLE 5A

SAMPLE 2

7'0"



# CONSOLIDATION TESTS

60-F-6  
 BOREHOLE 7  
 SAMPLE 10  
 45' 0"

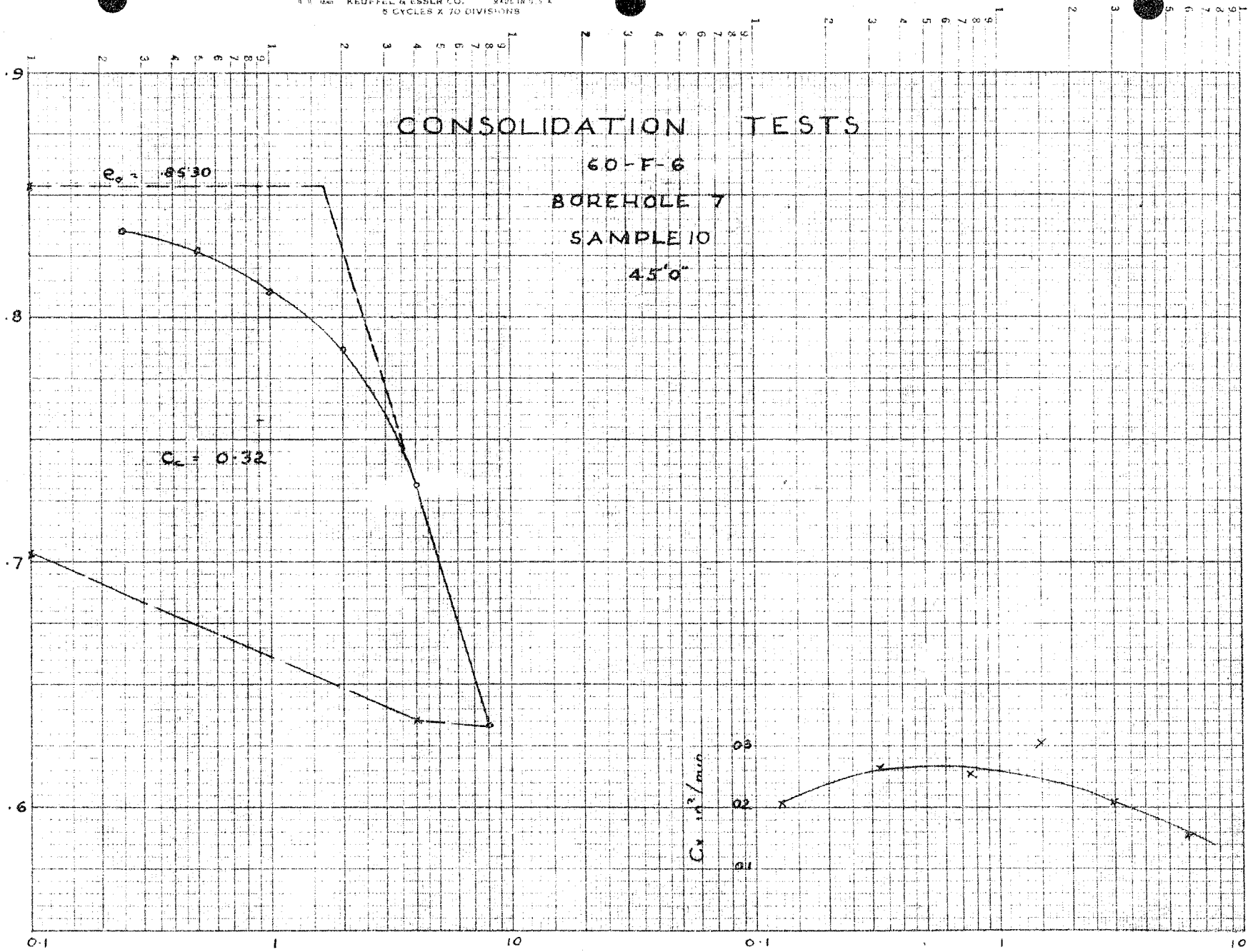
VOID RATIO  $e$

$C_c = 0.32$

$e_{s1} = 0.530$

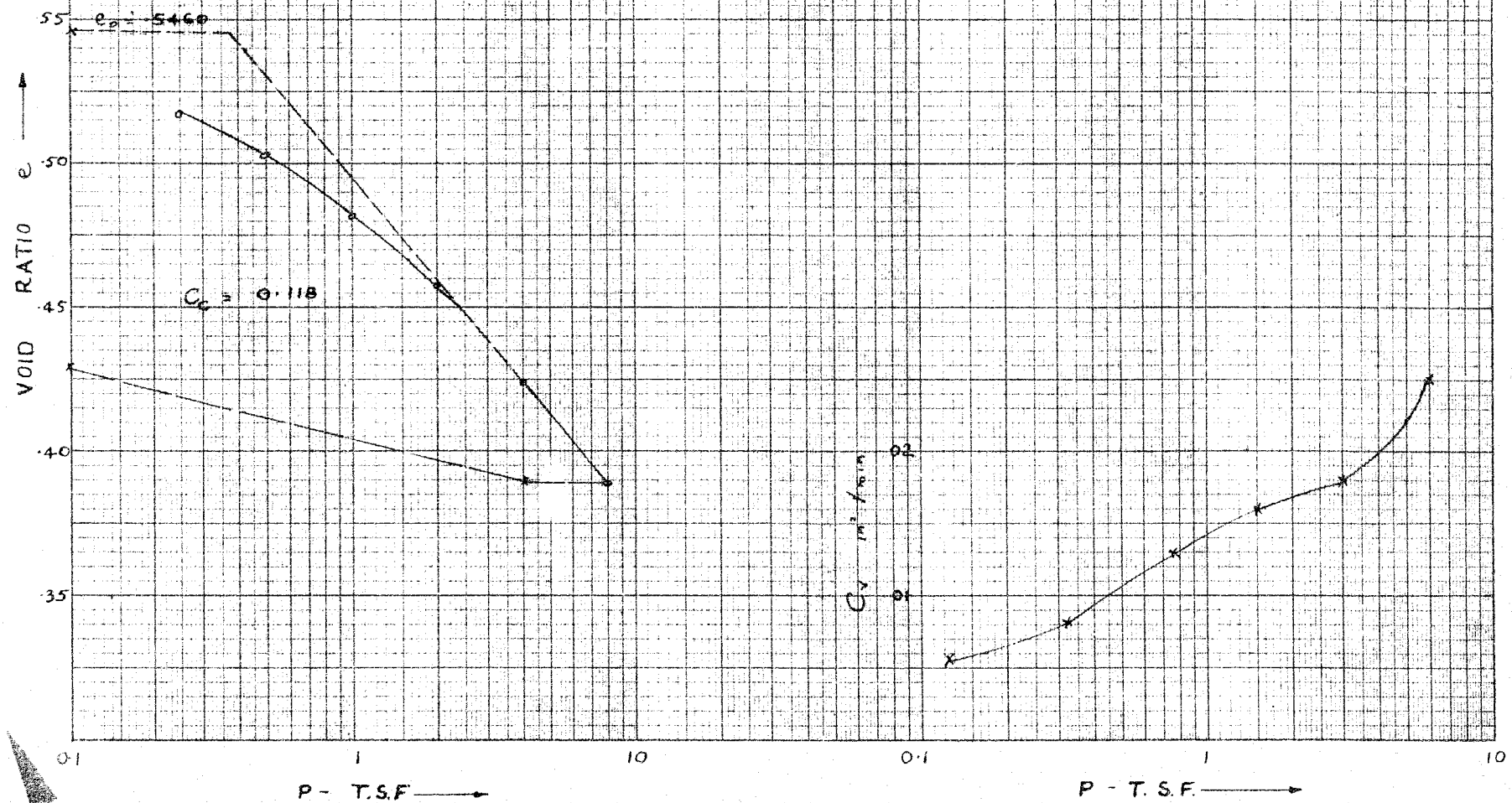
$C_v \cdot 10^3 / \text{min}$

P - T.S.F. →



# CONSOLIDATION TESTS

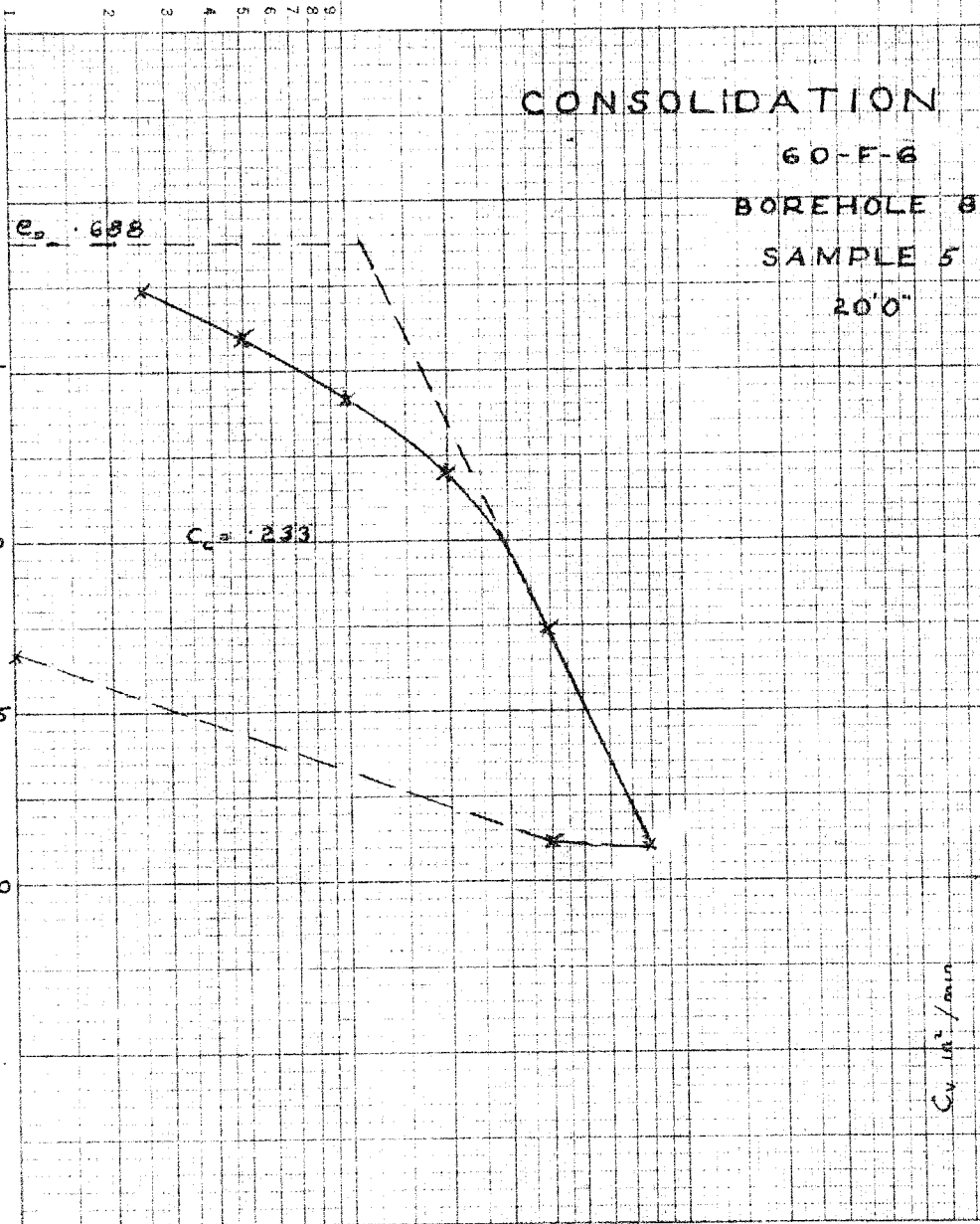
60-F-6  
BOREHOLE 7  
SAMPLE 12  
55'0"



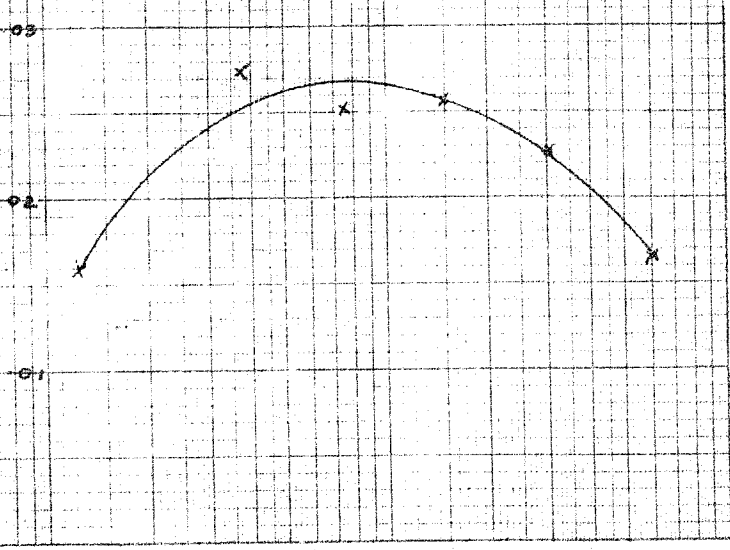
# CONSOLIDATION TESTS

60-F-6  
 BOREHOLE 8  
 SAMPLE 5  
 20'0"

VOID RATIO  $e$



$C_u = 0.001$



$P - T.S.F. \rightarrow$

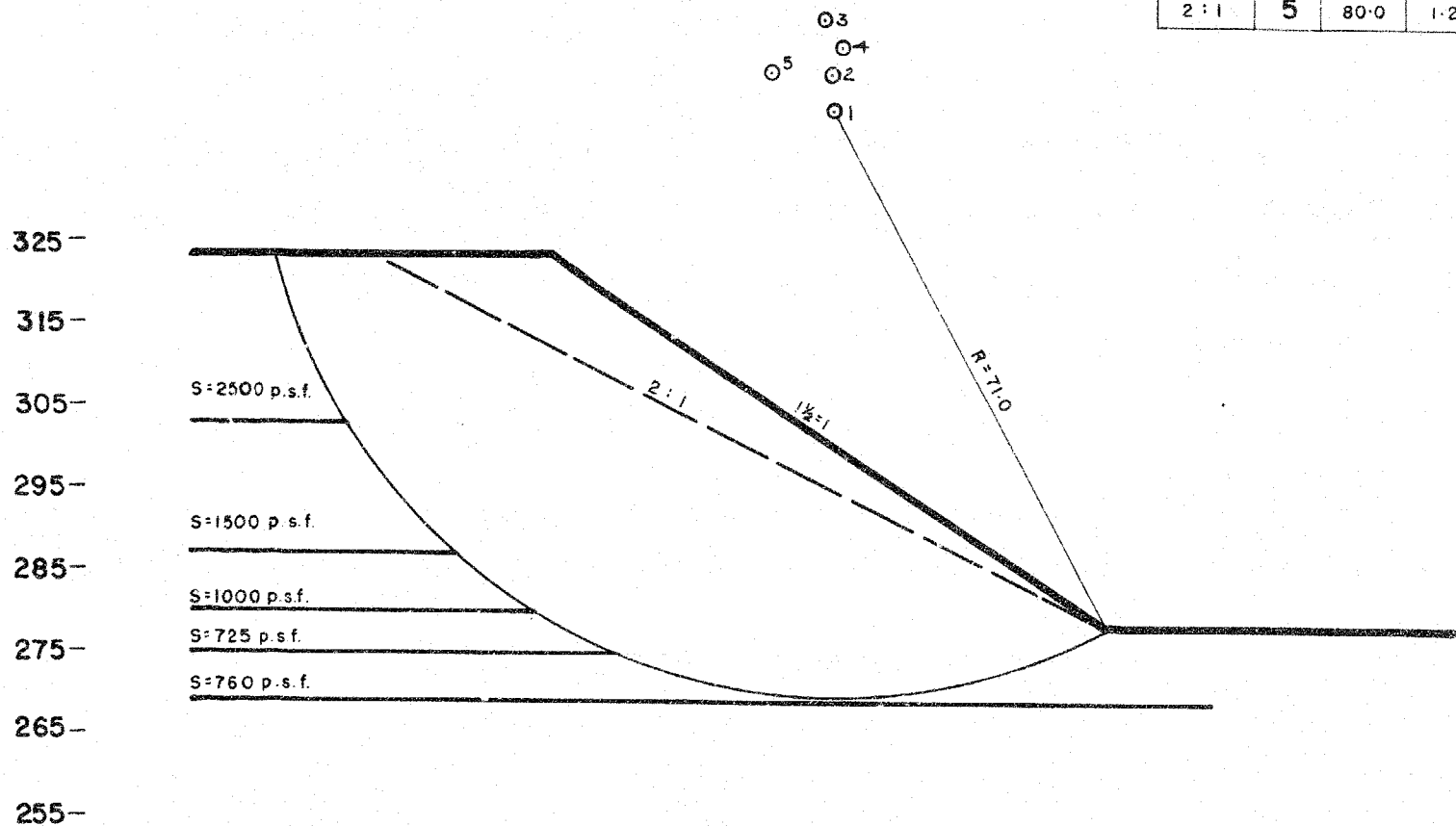
$P - T.S.F. \rightarrow$

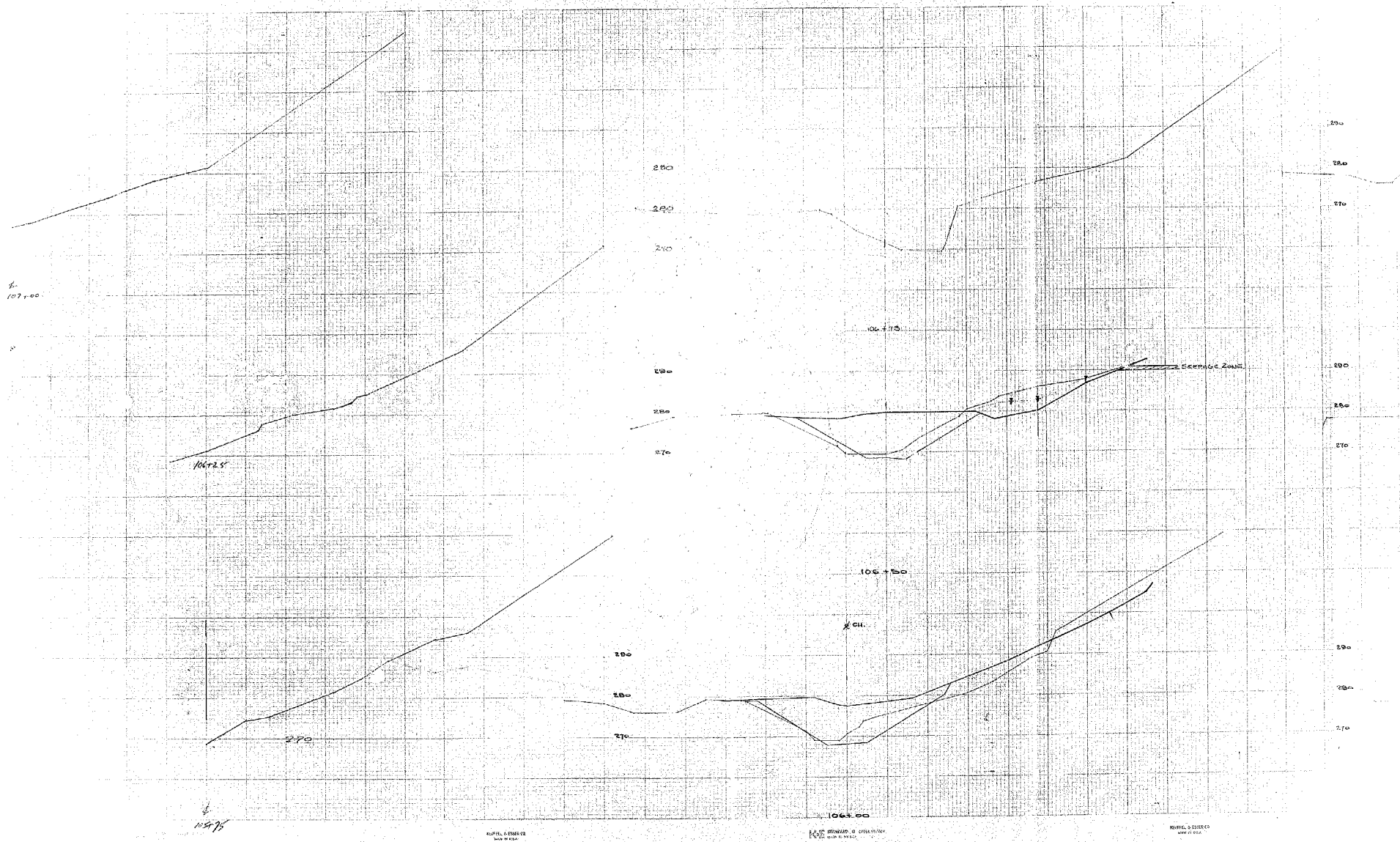
# STABILITY ANALYSIS

EARTH CUT AT STA. 472+50 @ W.B.L.

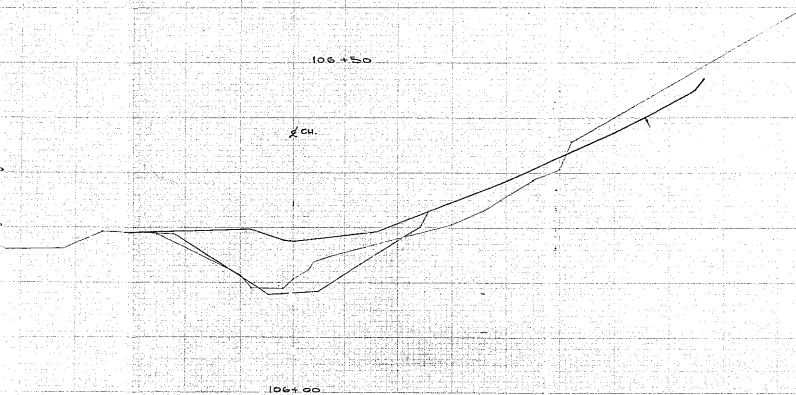
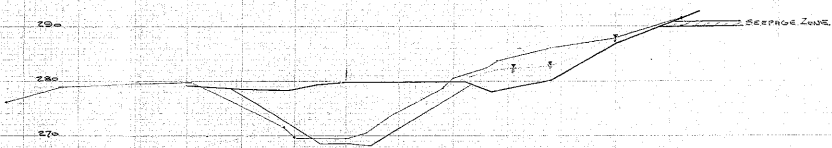
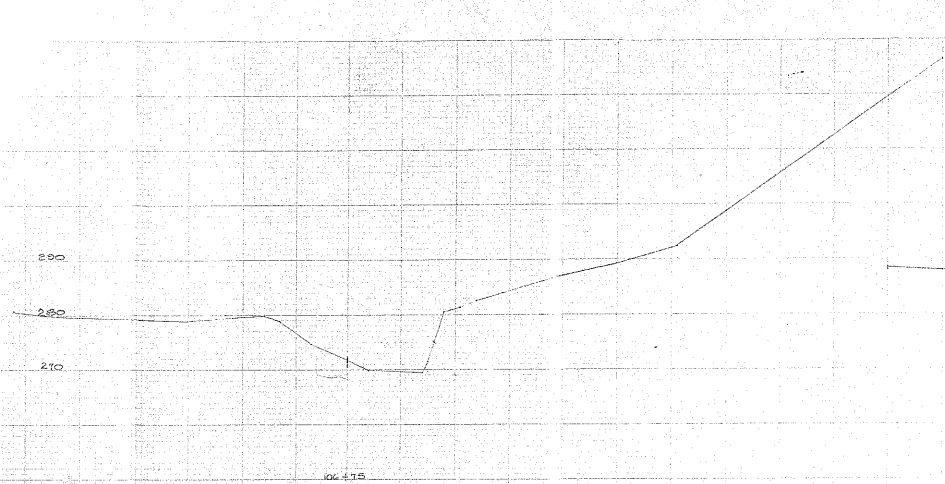
JOB 60-F-6

Slope	Ct	R	F.S.
1 1/2 : 1	1	71.0	1.2
1 1/2 : 1	2	75.0	1.17
1 1/2 : 1	3	82.5	1.25
1 1/2 : 1	4	77.5	1.175
2 : 1	5	80.0	1.20



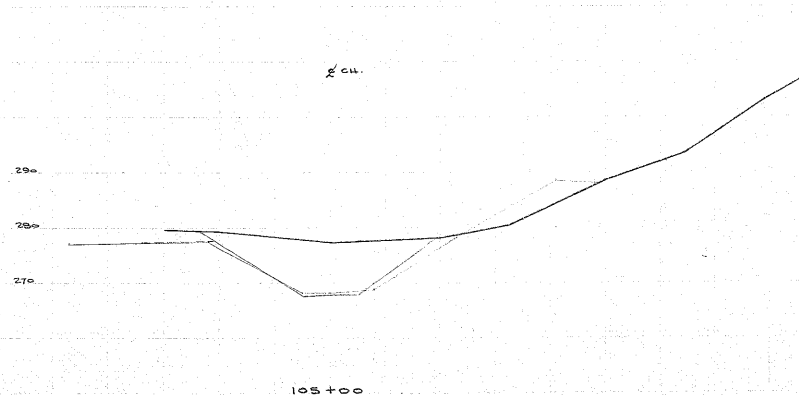
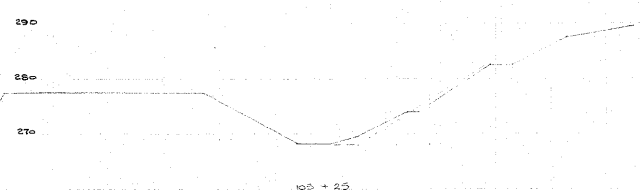
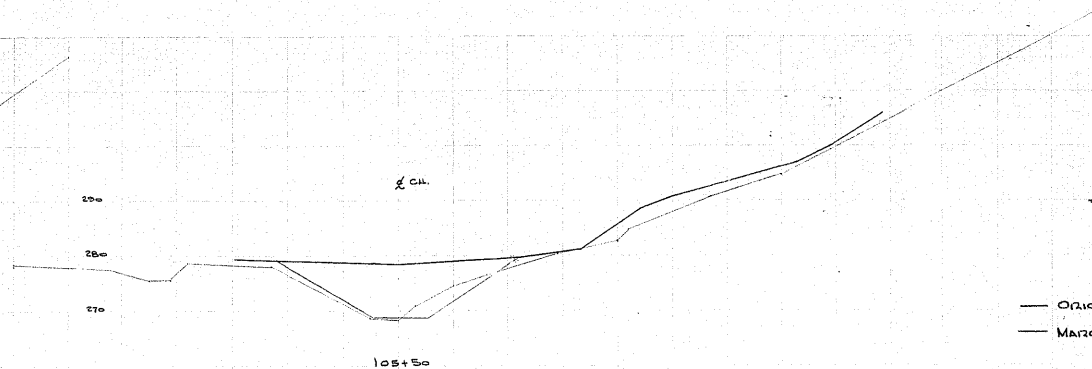






106+00

106+50



105+00

105+50

CONTRACT 65-116  
ABANDON INTER.

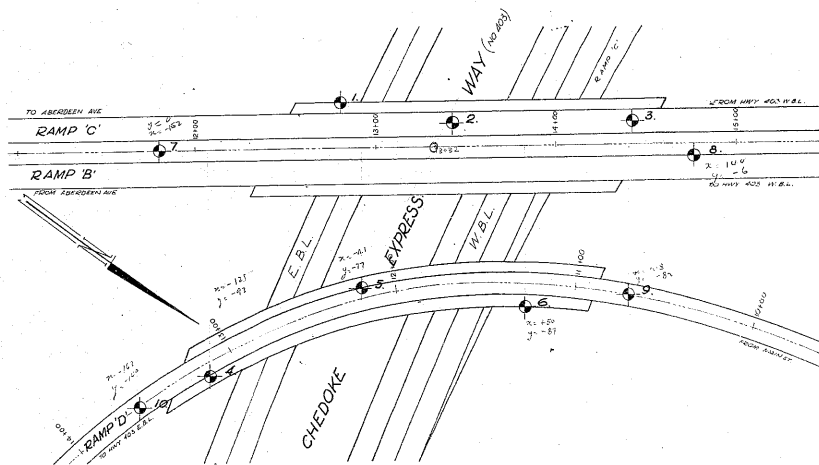
— ORIG. CONTRACT SECTIONS.  
— MARCH PROGRESS SECTIONS.

WF 266-60  
60-F-6

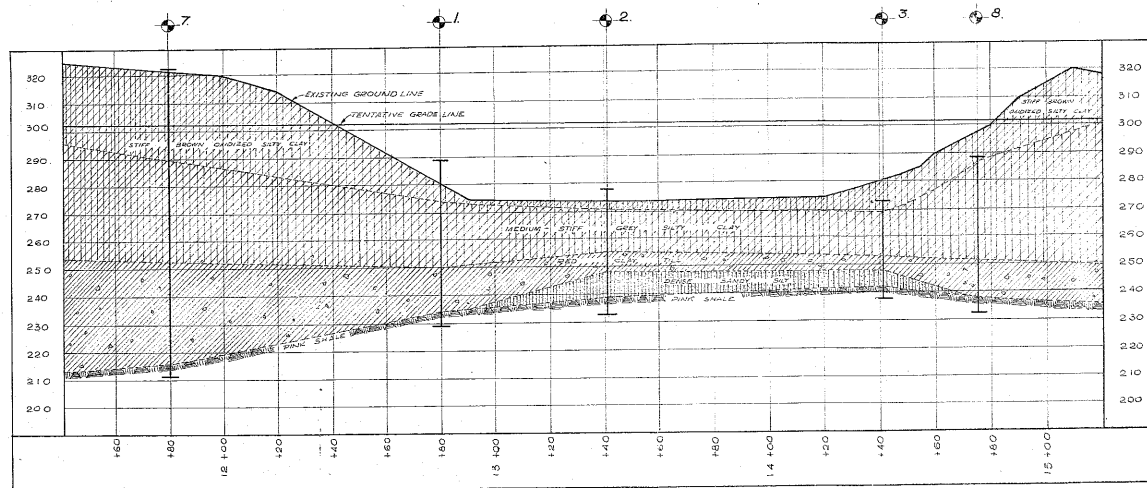
5-1-09

106+00

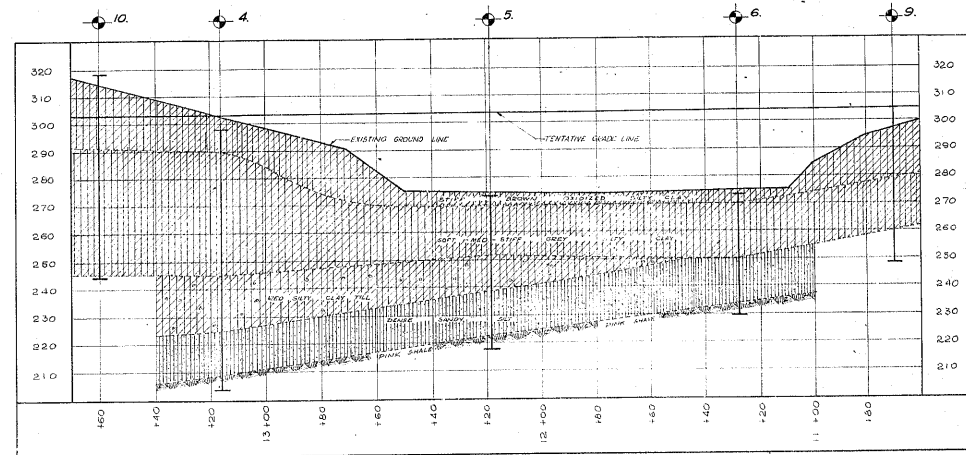




PLAN  
SCALE 1" = 30'

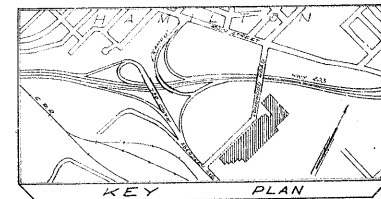


PROFILE  
SCALE 1" = 20'



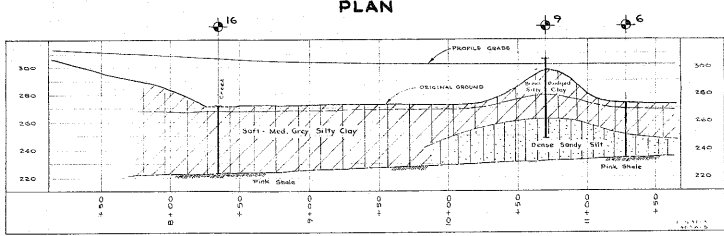
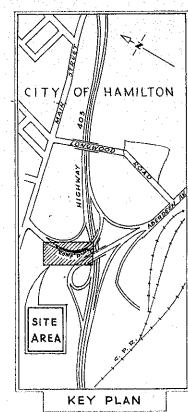
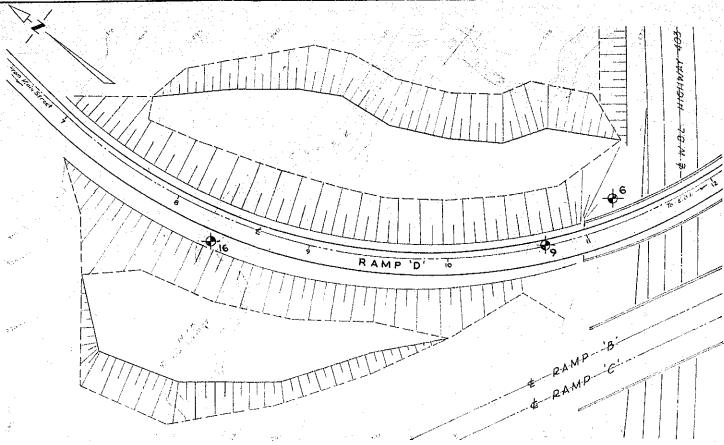
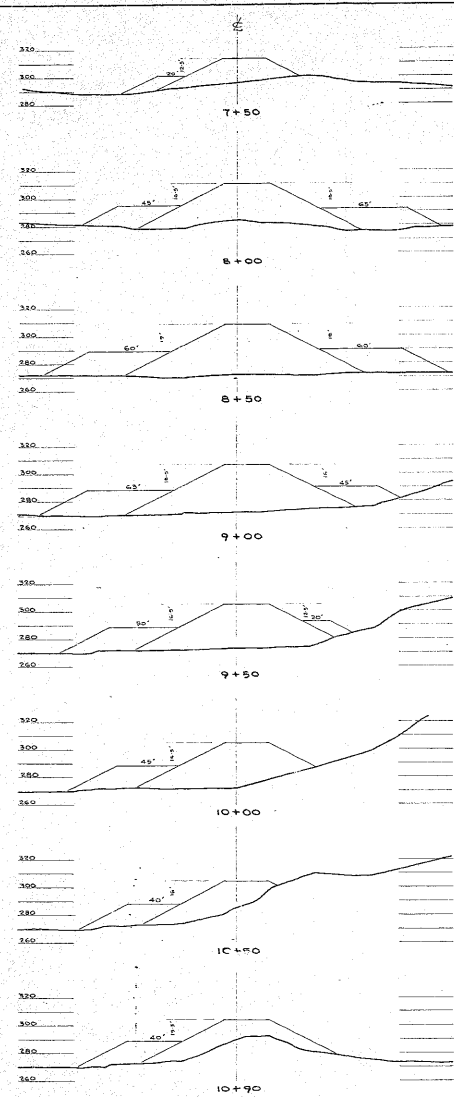
PROFILE  
SCALE 1" = 20'

LEGEND			
BORE & PENETRATION HOLE			
HOLE NO.	ELEVATION	STATION	DISTANCE FROM E
1	289.5	12+80	RAMP C & B 0.5' LT.
2	278.3	13+41	RAMP C & B 12' LT.
3	273.0	14+41	RAMP C & B 12' LT.
4	298.0	13+16	RAMP D 6' LT.
5	273.0	12+19	RAMP D 6' LT.
6	273.0	11+28	RAMP D 18' LT.
7	323.0	11+60	RAMP C & B 5'
8	266.0	14+75	RAMP C & B 10' LT.
9	304.0	13+70	RAMP D 5'
10	315.0	13+60	RAMP D 5'

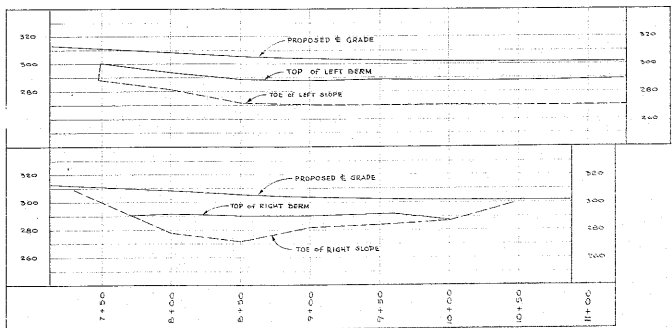


NOTE  
THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT BORE HOLE LOCATIONS. BETWEEN BORE HOLES THE BOUNDARIES ARE INFERRED FROM GEOLOGICAL EVIDENCE AND MAY BE SUBJECT TO CONSIDERABLE ERROR.

DEPARTMENT OF HIGHWAYS - ONTARIO			
MATERIALS & RESEARCH SECTION			
ABERDEEN UNDERPASS RAMPS B, C & D			
SHOWING POSITIONS & ELEVATIONS OF HOLES			
HWY. 403	DISTRICT 4	CITY HAMILTON	COUNTY HENTWORTH
PROJECT HAMILTON	DESIGNED BY T. GORDON	CHECKED BY J. H. 60	DATE 20-APR-60
SCALE AS SHOWN	APPROVED BY J. H. 60	60-F-6A	



LEGEND			
Bore & Penetration Hole			
HOLE ELEVATION	STATION	DISTANCE FROM	
6	275.0	11+28	18' LT.
9	304.0	10+10	(Approx) R.
16	272.0	8+35	50' RT.



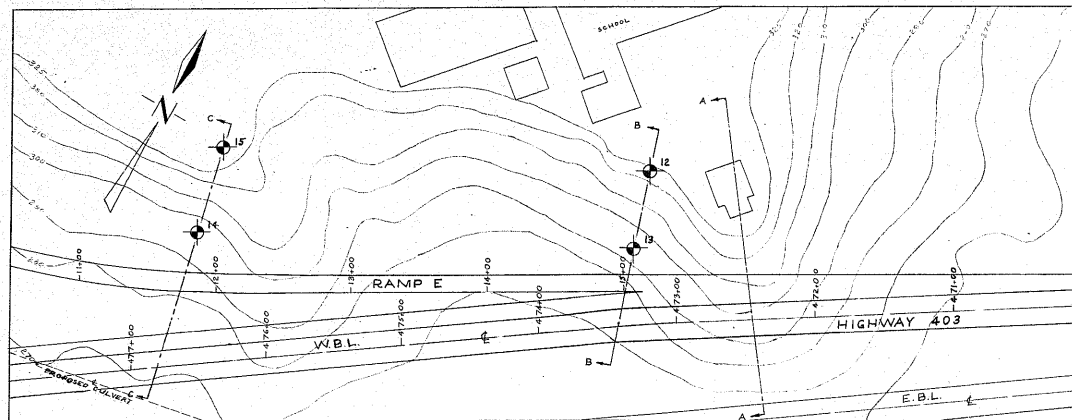
NOTE  
THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY BY BORE HOLE LOCATIONS. BETWEEN BORE HOLES THE BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE AND MAY BE SUBJECT TO CONSIDERABLE ERROR.

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATCHLINES AS SHOWN IN SECTION

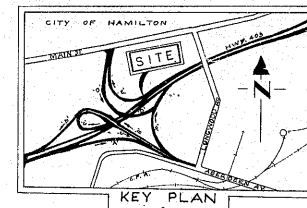
**RAMP 'D' BERMS  
ABERDEEN INTERCHANGE**

SHOWING POSITIONS & ELEVATIONS OF HOLES

PROJ. 403	DISTRICT 4	LOT 1	COUNTY WENTWORTH
LOCATION HAMILTON			
DESIGNED BY H. E. L.	CHECKED BY [initials]	M.P. 40-57-1	
DATE 5 July 1960	APPROVED BY [initials]	PROJECT NO. 60-F-6 B	
SCALE 1 inch = 50 feet			



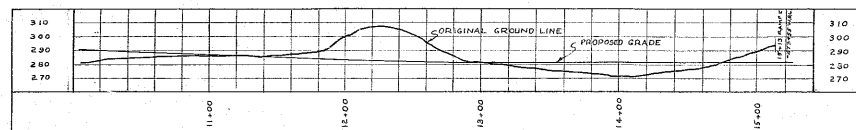
PLAN



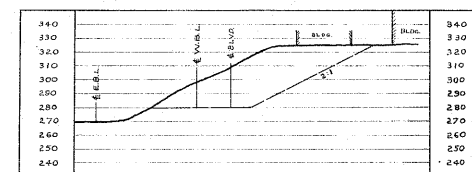
### LEGEND

BORE & PENETRATION HOLES

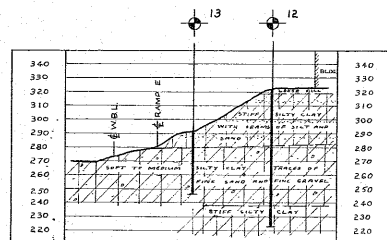
HOLE	ELEVATION	STATION	DISTANCE FROM E
12	323.0	473+10	110' RT
13	291.0	473+25	55' RT
14	289.0	476+20	155' RT
15	383.0	476+45	35' RT



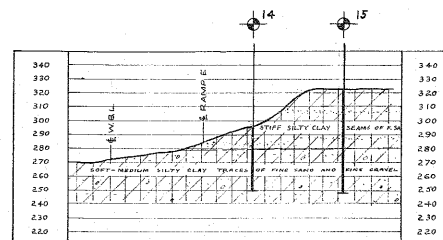
RAMP E PROFILE



A-A



B-B



C-C

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  
NATURAL & RESEARCH SECTION

### ABERDEEN INTERCHANGE EARTH CUT AT RAMP "E" & W.B.L.

SHOWING POSITIONS & ELEVATIONS OF HOLES

HWY. 403	DISTRICT 4	COUNTY WENTWORTH
TOWNSHIP	LOT	CON.
LOCATION HAMILTON	DESIGNED BY: D.A.M.	W.P. 140-57-1
DATE 8 JULY 1960	APPROVED BY: [Signature]	60-F-6C
SCALE 1" = 40'		