

23-64-88.

Mr. A. M. Teye,
Bridge Engineer.
Materials & Research Division,
(Foundation Section)

November 2, 1961.

D.H.O. FOUNDATION INVESTIGATION
REPORT.
W.J. 61-P-68 -- W.P. 209-61.

Attention: Mr. S. McCombie.

Re: Lancaster Twp. Tr. #16, Twp. Rd.,
2.0 Miles West of Quebec Boundary,
Rwy. #401 -- District #9.

Attached, we are forwarding to you, our detailed
foundation report on the subsoil conditions existing at the
above site.

We believe you will find that the conclusions and
recommendations summarized in the report, are self-explanatory
and should prove adequate for your future design work.

If clarification, or additional information is
required, please do not hesitate to contact our Office.

AGS/4407

Attach.

cc: Messrs.

A. M. Teye (2)
H. A. Tremblay
B. D. McMillan
J. Ford
L. E. Walker
A. E. Crispier
J. J. Kovich
J. Roy
J. S. Leint
J. Laroche
J. Goff
Foundations Office
Gen. Files.

Alfama
A. G. Sternac,
PRINCIPAL FOUNDATION ENGINEER

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-

FOUNDATION INVESTIGATION

at

Lancaster Twp. Br. #16, Twp. 8d.,
2.0 Miles West of Quebec Boundary,
Hwy. #401 -- District #9.

M.J. 61-F-68 ---- W.P. 709-61

1. INTRODUCTION:

It is proposed to extend the limited access Hwy. 401 up to the Quebec border. Several locations were considered initially, but finally, Line 'C' of the proposed Hwy. 401 was adopted. The Centre Line of the proposed Hwy. 401 (Line 'C') is located approximately 700 ft. to the north of the existing Hwy. No. 2.

Approximately 2 miles west of the Quebec border, the relocated (Line 'A') township road crosses the proposed Hwy. 401 (Line 'C'). At this location, an underpass structure should carry the township road over Hwy. 401. A field investigation was carried out by the Foundation Section at this site, in order to determine the subsoil conditions.

The results of this investigation, together with the recommendation regarding the design and construction of the footings are presented in this report.

2. DESCRIPTION OF SITE & GEOLOGY:

The site of the proposed crossing is in a very flat lowland plain which extends about eight miles back from the St. Lawrence River. The area is underlain by limestone bedrock at an undetermined depth. During glacial times, the bedrock surface was covered with a variable thickness of till. This till is composed mainly of sand and gravel with many large boulders. After the glaciers retreated, the area was inundated

2. DESCRIPTION OF SITE & GEOLOGY: (cont'd.) ...

by the Chasplain Sea and, in this marine environment, the till was buried beneath deposits of fine sand, silt and clay. Subsequent uplift has resulted in the present non-marine environment. Weathering and desiccation have developed a stiff crust about 6 ft. thick on the marine deposit.

3. FIELD & LABORATORY WORK:

Field work consisted of seven sampled boreholes and five dynamic cone penetration tests. Samples were recovered at required depths, by means of a 2-inch I.D. Shelby tube and by a 2-inch O.D. split spoon sampler. The dimensions of this spoon sampler and the energy used in driving it, conform to the requirements of the Standard Penetration Test. In-situ vane tests were carried out wherever possible, in order to determine the shear strength of the cohesive deposits.

Drawing No. 61-F-66A shows the borehole locations, their respective elevations and the estimated subsoil stratigraphy.

Samples were visually examined and identified in the field before being transported to the laboratory. Tests were carried out in the laboratory on a selection of both disturbed and undisturbed samples to determine:-

- a) Natural Moisture Contents.
- b) Bulk Density.
- c) Grain Size Distribution Curves.
- d) Atterberg Limits.
- e) Undrained Shear Strengths.
- f) Consolidation Curves.

Laboratory and field test results have been summarized and are included under Appendix I of this report.

cont'd. /3

4. SUBSOIL CONDITIONS:

4.1) General:

The stratigraphy of the subsoil at the site was found to be generally uniform. Detailed descriptions of various types encountered in each boring, are shown in Appendix I of this report. The estimated stratigraphical profile of Drawing No. 61-7-68A is based upon this information.

The subsoil consists of the following strata:-

- i) Clay Crust.
- ii) Sensitive Leda Clay.
- iii) Gravel with Matrix of Cohesive Silty Sand.

4.2) Clay Crust:

This is the stiff weathered and deaerated crust of the marine deposit. The crust extends to a depth of approximately 6 ft. below the natural ground. The transition to the underlying deposit is at a uniform elevation, 153.0'.

Within this layer, the crust has the following average properties:-

Liquid Limit	=	62%
Plastic Limit	=	27%
Moisture Content	=	41%
Bulk Density	=	115 p.c.f.

The above Atterberg Limits indicate the clay crust is generally of high plasticity. Triaxial tests carried out on two samples indicate the average shear strength is in the order of 1200 p.s.f. The Standard Penetration values obtained in this stratum ranged from 7 to 23 blows/ft. These, together with the shear strength obtained in the laboratory, indicate the consistency of the material to be stiff.

cont'd. /4 ...

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.3) Sensitive Leda Clay:

Immediately below the desiccated crust, the non-oxidized stratum of clay was encountered. The sensitive clay extends to a maximum depth of approx. 22 ft. in B.H. #4 and a minimum depth of approx. 4 ft. in B.H. #3.

Atterberg Limit determinations of the non-oxidized clay stratum indicate that liquid limit ranges from 38% to 80%, whereas the plastic limit ranges from 19% to 23%. The results of the Atterberg limits are plotted on the Casagrande Plasticity Chart and indicate that the stratum is predominantly an inorganic clay of intermediate to high plasticity.

Wet unit weight determinations on samples from the stratum gave values ranging from 98 to 109.0 p.s.f. with the corresponding natural moisture contents ranging from 40% to 70%.

The shear strengths obtained in the laboratory agrees closely with the in-situ vane test results. The stress-strain characteristics of the sensitive clay are plotted and appended in Appendix I of this report. The results indicate that some of the samples failed at a high failure strain and this can be attributed to the sample disturbance.

The maximum sensitivity of this clay indicated by field vane tests was 18.0. This seems rather a low value in view of the fact that the sensitivity of Leda clay is usually higher, even as high as 100.

The shear strength varies randomly throughout the depth of this stratum with a maximum value of 900 p.s.f. to a minimum value

cont'd. /5 ...

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.3) Sensitive Leda Clay: (cont'd.) ...

of 275 p.s.f. From the results of the triaxial tests, together with the in-situ vane tests, it can be concluded that the consistency of this stratum ranges from soft to med. stiff.

4.4) Gravel with Matrix of Cohesive Silty Sand:

Immediately below the sensitive Leda clay and above the stratum of gravel with a matrix of cohesive silty sand, a very thin layer approx. 6 to 12 inches of soft cohesive silt was observed in all the borings.

The deposit of gravel with a matrix of cohesive silty sand was found in all the borings and extends to a maximum depth of 25 ft. in B.H. #3.

The Standard Penetration resistances obtained in this stratum ranged from 11 to 66 blows/ft. which indicates the relative density of this material to vary from med. dense to very dense.

4.5) Boulders of Limestone & Shale:

This deposit was observed in B.H. #3 & #4, where borings were advanced 6 ft. in this stratum which was so dense that diamond drilling had to be carried out. In B.H. #1, 2, 5, 6 & 7, the upper contact of this layer was assumed to be at the elevation where refusal of the casing (driven with a 350-lb. hammer) occurred.

5. GROUND WATER CONDITIONS:

Ground water observations carried out during the time of the investigation, indicate that the ground water is approx. 4.0 ft. below the existing ground level. The exact water levels observed at the time of investigation, are shown on the borehole logs (Appendix I).

cont'd. /c ...

6. FOUNDATION CONSIDERATIONS:

6.1) Structure:

It is proposed to construct an underpass at the intersection of proposed Hwy. 401 and relocated gravel road. At the structure location the proposed grade of relocated gravel road will be at elev. 182.0' which will be approximately 23 ft. above the existing ground elevation.

The strength and compressibility of the soft to med. stiff sensitive clay is such that very low safe bearing loads have to be used and non-uniform settlements can be expected. Therefore, it is recommended that the structure be founded on small displacement steel 'H' piles driven to practical refusal at the contact of boulders of limestone and shale.

6.2) Approach Fills:

The proposed grade of the relocated gravel road will be at approx. elev. 182.0' - i.e., the height of approach fill will be in the order of 23 ft.

The critical condition for stability of an embankment on soft to med. stiff clays, generally occurs during or immediately after construction. Since it is probable that negligible consolidation of the clay would take place during construction, the $\phi = 0$ method of stability analysis would be applicable. In this method of analysis, stability is governed by the applied loads and by the stress-strain and undrained shear strength properties of the foundation and embankment soils.

The stress-strain characteristics of the clay stratum are such that little or no shear strength of the fill would be mobilized.

cont'd. /7 ...

6. FOUNDATION CONSIDERATIONS: (cont'd.) ...

6.2) Approach Fills: (cont'd.) ...

Therefore, for design purposes, the strength in the fill has been neglected.

Analyses have been carried out to determine the stability of fill sections ranging in height from 4 ft. to 23 ft. with top embankment width of 40 ft. and side slopes of 2 horizontal to 1 vertical. On the basis of these analyses, it was concluded that for embankment stability, berms would be required for fills above 15 ft. in height. The required height and length of the berms are given on Eng. No. 61-7-68B.

Based on the consolidation tests, and assuming an average depth of the compressible layer of 20 ft., it is estimated for the 23-ft. high embankment, the maximum consolidation settlement would be in the order of 24 inches. Therefore, it is recommended that approach fills including the berms, should be constructed and left in place for a period not less than 12 months prior to the construction of the structure.

7. SUMMARY:

The stratification of the subsoil is quite uniform. The site is underlain by a deposit of soft to stiff marine clay, followed by med. dense to very dense gravel, overlying boulders of limestone and shale.

It is recommended that the structure be founded on small displacement steel 'H' piles driven to practical refusal at the contact of boulders of limestone and shale.

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

Berms are required for approach fills exceeding 15 ft. in height and the length and height of berms should be as indicated on Dwg. 61-F-63B.

The estimated settlements for a 23-ft. high approach fill will be in the order of 24 inches. Therefore, it is recommended that the approach fills including the berms, should be constructed at least 12 months prior to the construction of the structure.

8. MISCELLANEOUS:

The field work was carried out during the period of July 18th to July 20th, 1961, by the Johnston skid-mounted core drill and penndrill, under the supervision of M. Devata and I. Kolubec.

October 1961 REPORT PREPARED BY:

.....*M. Devata*.....
M. Devata,
SR. PROJECT FOUNDATION ENGR.

REPORT APPROVED BY:

.....*A. G. Sternsac*.....
A. G. Sternsac,
PRINCIPAL FOUNDATION ENGR.

APPENDIX I.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-68

W.P. 209-61

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'	Oxidized stiff brown silty clay of high compressibility.	13	35.1	26.0	68.5	-	111.3	
	S2	4.5'-6.0'	Stiff grey brown clay of high compressibility.	16	42.1	24.8	71.9	-	-	
	S3	6'-7.5'	" " "	10	48.8	22.0	76.5	-	107.6	
	T4	8'-9.5'	Very sensitive grey clay of high compressibility, Med. stiff.	-	-	-	-	TR=825	-	
	VANE	11'		Pushed	49.6	20.1	59.9	V=924	107.8	
				-	-	-	-	500	-	Sens: 12.5
	T5	13'-14.5'	13'-13.5' sensitive - Med. stiff g grey clay.	-	40.6	-	-	TR=522	-	
				Pushed	25.6	19.5	21.4	V=181	120.1	
	VANE	15.2'	13.5-14' soft cohesive silt grey	-	-	-	-	480	-	Sens: 16.0
2	S6	18'-19.5'	Gravel with matrix of cohesive silty sand. Med. dense.	15	9.3	-	-	-	-	
	S7	23'-24.5'	" " "	13	5.5	-	-	-	-	
	S8	28'-29.5'	Dense angular gravel with matrix of cohesive silty sand.	34	5.5	-	-	-	-	
	S9	33'-34.5'	V. dense " " " "	70	6.4	-	-	-	-	
	S1	3'-4.5'	3-4.0 Med. dense grey silty sand with some fine gravel.	23	7.0	-	-	-	-	
			4-4.5 oxidized stiff clay.							

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-68

W.P. 209-61

SOLE 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	S2	6'-7.5'	Soft grey brown clay of high compressibility.	4	66.7	23.8	77.5	-	-	
	T3	8'-9.5'		Pushed	-	-	-	-	-	
	T4	11'-12.5'	" " "	Pushed	61.2	24.2	58.1	TR=376 V=340	97.0	
	VANE	14'		-	-	-	-	880	-	Sens: 11.0
	T5	15'-16.5'	15-16 sensitive soft grey clay of med. compressibility 16'-16.5' soft cohesive silt.	Pushed	40.1 27.2	19.6 18.1	47.4 22.6	TR=300 V=176	- 121.0	
	S6	20'-21.5'	Grey angular gravel with matrix of cohesive silty sand-Dense.	30	12.8	-	-	-	-	
	S7	25'-26.5'	" " " " - Med. dense.	20	37.8	-	-	-	-	
	S8	29'-30.2'	" " " " - Very dense.	78	5.8	-	-	-	-	
3	S1	1'-4.5'	Oxidized stiff brown clay of high compressibility.	10	42.5	26.7	68.3	-	106.6	
	T2	6'-7.5'	Very sensitive med. stiff clay of high sensitivity.	Pushed	60.5	27.1	73.4	TR=930 V=1100	- 108.0	
	VANE	9'		-	-	-	-	320	-	Sens: 16.0

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-68

W.P. 209-61

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
3	S3	10'-11.5'	Grey angular gravel with matrix of cohesive silty sand-Dense.	35	10.3	-	-	-	-	
	S4	15'-16.5'	" " - Med. dense.	29	6.3	-	-	-	-	
	S5	20'-21.5'	Grey cohesive silty sand with angular gravel - Med. dense.	11	5.2	-	-	-	-	
	S6	25'-26.5'	" " "	21	-	-	-	-	-	
4	S1	3'-4.5'	Oxidized stiff brown clay of high compressibility.	10	39.5	28.4	68.4	-	119.7	
	T2	6'-7.5'	Greyish brown med. stiff clay of high compressibility.	-	-	-	-	TR=1175	-	
				Pried	56.8	25.2	78.6	V=1150	104.1	
	VANE	9'		-	-	-	-	1760	-	Sens: 11.0
	T3	10'-11.5'	Sensitive soft stiff grey clay of med. compressibility.	-	-	-	-	TR=634	104.1	
				Pushed	47.8	20.6	47.2	V=346		
	VANE	13'		-	-	-	-	600	-	Sens: 15.0
	T4	15'-16.5'	Very sensitive med. stiff grey clay.	-	-	-	-	TR=579	-	
				Pushed	67.1	24.8	57.1	V=710	100.2	
	VANE	18'		-	-	-	-	480	-	Sens: 24.0

W.P. 209-61

SOLE 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	T5	20'-21.5'	Grey brown med. stiff clay of high compressibility with traces of fine to med. gravel.	-	-	-	-	TR=609	-	Sens: 18.0
	VANE	23'		Pushed	67.7	25.3	75.5	V=616	98.2	
	T6	25'-26.5'	25'-26' sensitive grey soft clay of med. compressibility 26'-26.5' soft cohesive silt	-	37.8	18.6	38.8	TR=402	-	
	VANE	28'		Pushed	24.3	17.4	20.6	V=275	120.8	
	S7	30'-31.5'	Grey angular gravel with matrix of cohesive silty sand-Med. dense.	-	-	-	-	360	-	
	S8	35'-36.5'	" " " Very dense.	18	10.8	-	-	-	-	
5	S1	3'-4.5'	Oxidized stiff grey brown clay of high compressibility.	72	8.1	-	-	-	-	Sens: 9.0
	T2	6'-7.5'	Med. stiff grey brown clay of high compressibility.	-	-	-	-	TR=1120	-	
	VANE	9'		Pushed	65.2	29.7	76.1	V=1400	100.0	
	T3	10'-11.5'	Sensitive med. stiff grey clay of med. compressibility.	-	-	-	-	TR=675	-	
	VANE	13'		Pushed	50.6	19.5	49.3	V=759	107.1	
				-	-	-	-	600	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-68

W.P. 209-61

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
	T4	15'-16.5'	Sensitive med. stiff grey clay of high compressibility.	-	-	-	-	TR=535	-	
				Pushed	70.6	28.2	80.1	V=825	99.7	
	VANE	18'		-	-	-	-	720	-	Sens: 14.4
	T5	20'-21.5'	" " "	Pushed	69.2	26.6	65.5	-	-	
	VANE	23'		-	-	-	-	640	-	Sens: 14.2
	T6	25'-26.5'	25-25.5 Grey sensitive soft clay 25.5-26.5 Angular gravel with matrix of cohesive silty sand.	Pushed	-	-	-	-	-	
	S7	30'-31.5'	Grey angular gravel with matrix of cohesive silty sand-Med. dense.	24	10.0	-	-	-	-	
	S8	35'-36.5'	" " " - Very dense.	86	6.0	-	-	-	-	
6	S1	5'-6.5'	Stiff brown clay of high compressibility.	7	56.8	28.3	76.6	-	-	
	T2	10'-11.5'	Sensitive med. stiff grey clay of med. compressibility.	-	-	-	-	TR=750	-	
				Pushed	43.6	19.6	42.5	V=868	109.4	
	VANE	13'		-	-	-	-	720	-	Sens: 14.4
	A3	15'	" " "	-	45.0	21.4	45.1	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-68

W.P. 209-61

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	VANE	11.5'		-	-	-	-	520	-	Sens: 13.0
	VANE	16.5'		-	-	-	-	480	-	Sens: 16.0
			S denotes split spoon sample T " shelby tube sample TR " triaxial compression test V " Lab vane test							

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 209-61

BORE HOLE NO. 1

JOB 61-F-68

STATION 10+62 (20' Lt.)

DATUM 159+5'

COMPILED BY B.K.

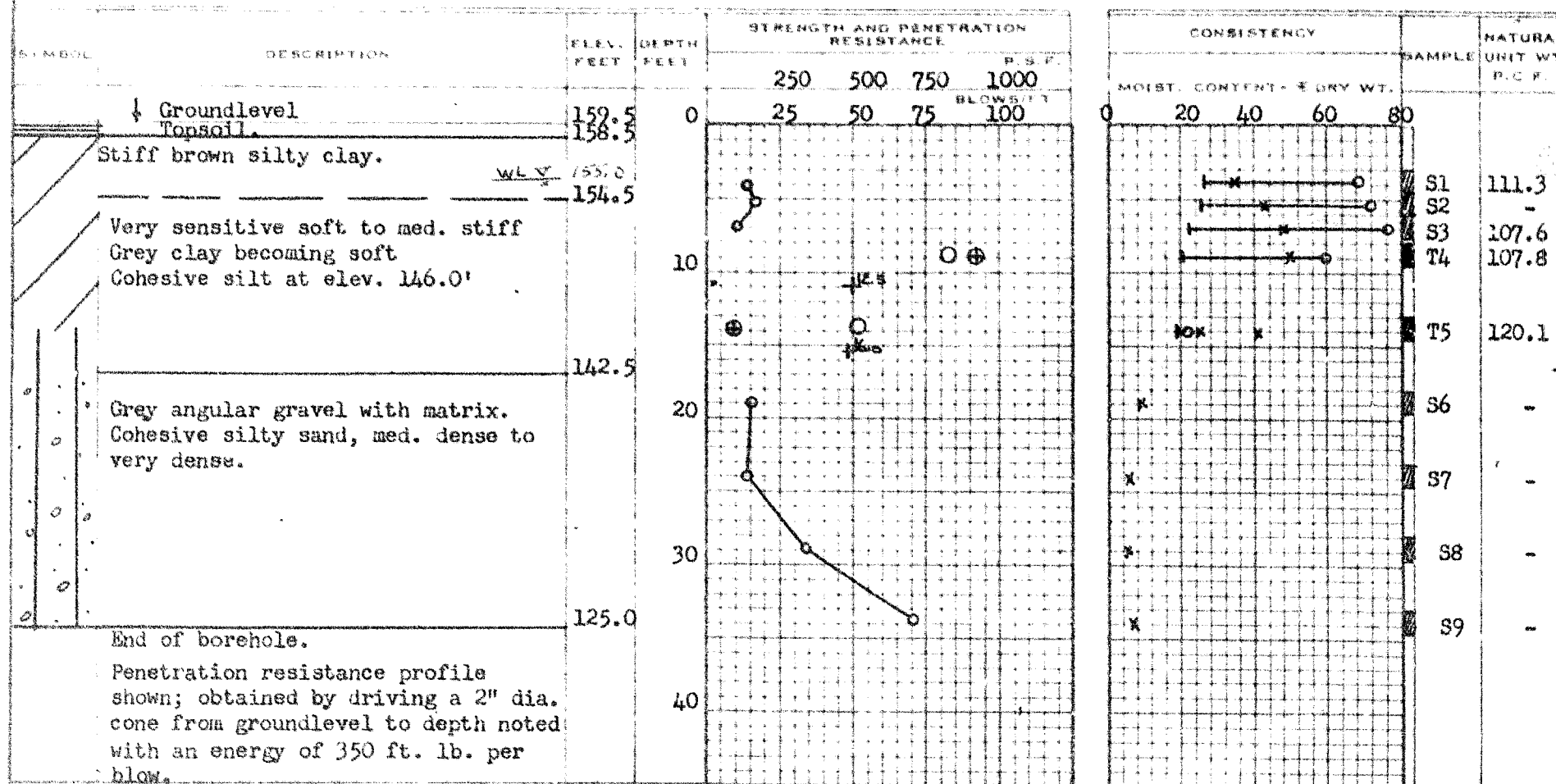
BORING DATE July 19/61.

CHECKED BY M.D.

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

LEGEND

Lab. name - - - - -
1/20" CONFINED COMPRESSION (Q_u)
VANE TEST (C) AND SENSITIVITY (S)
NATURAL MOISTURE AND
LIQUIDITY INDEX
LIQUID LIMIT
PLASTIC LIMIT



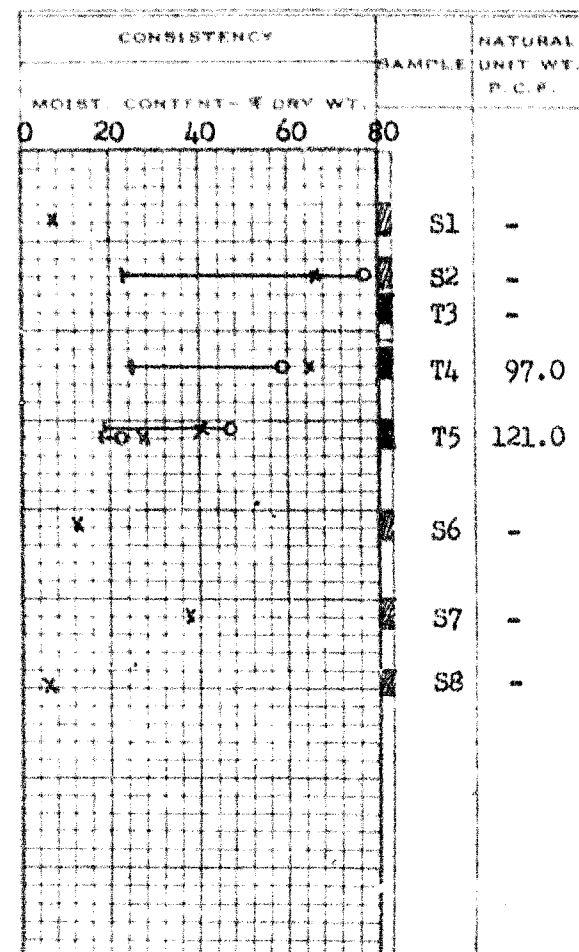
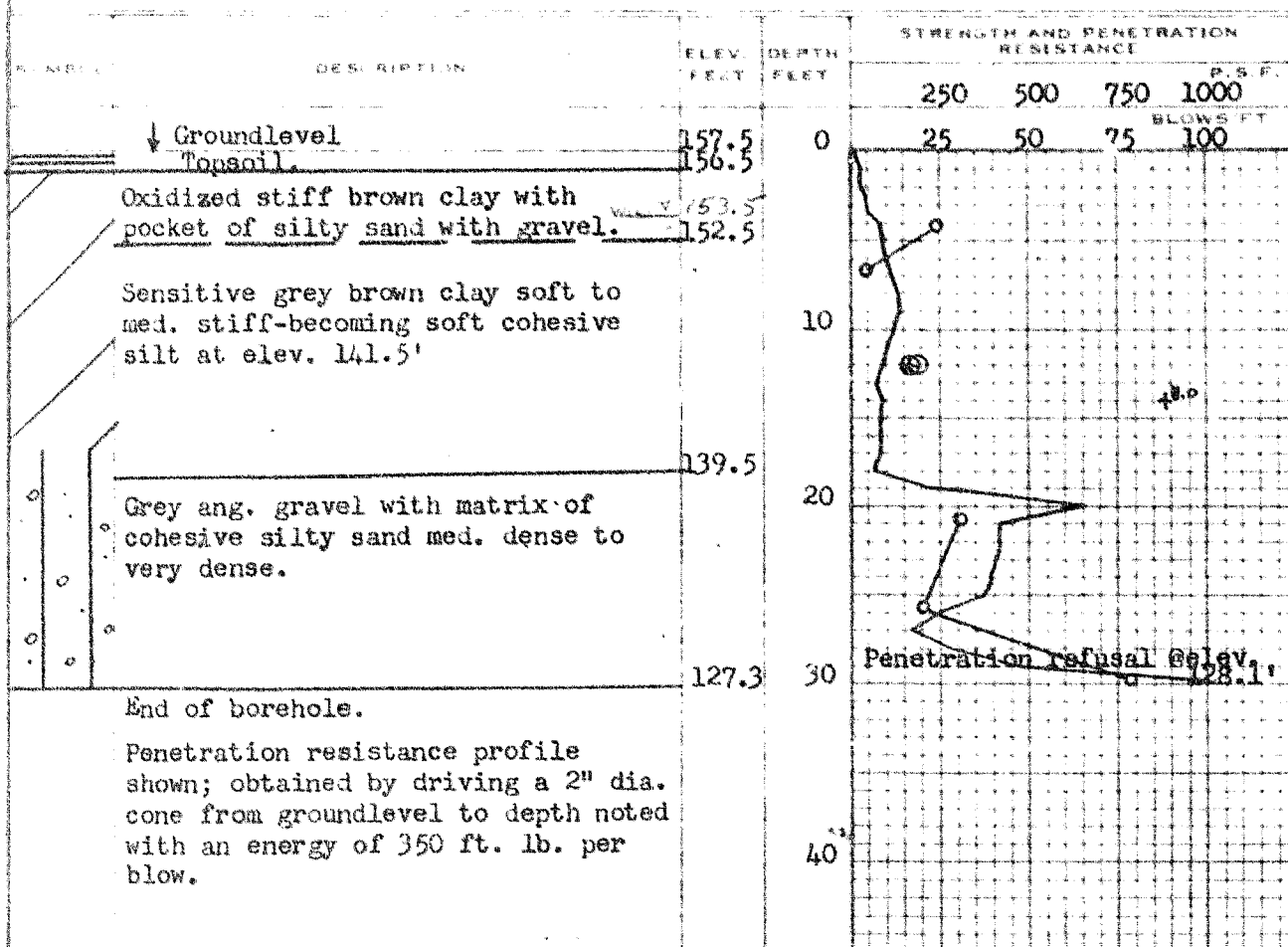
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 209-61 BORE HOLE NO. 2
 JOB 61-F-68 STATION 10+12 (20' Rt.)
 DATUM 157.5' COMPILED BY B.K.
 BORING DATE July 20/61. CHECKED BY H.D.

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
 PLASTIC LIMIT



OFFICE REPORT ON SOIL EXPLORATION

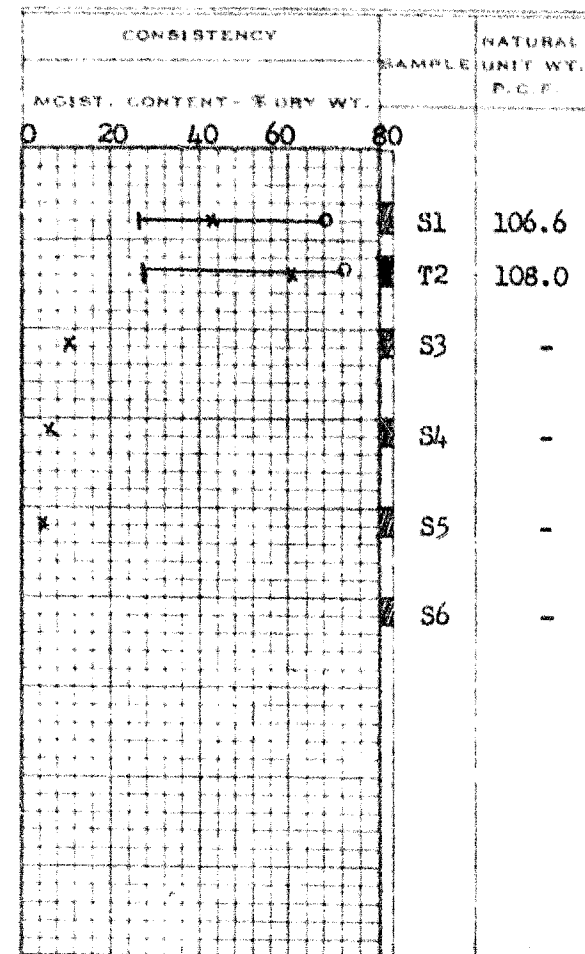
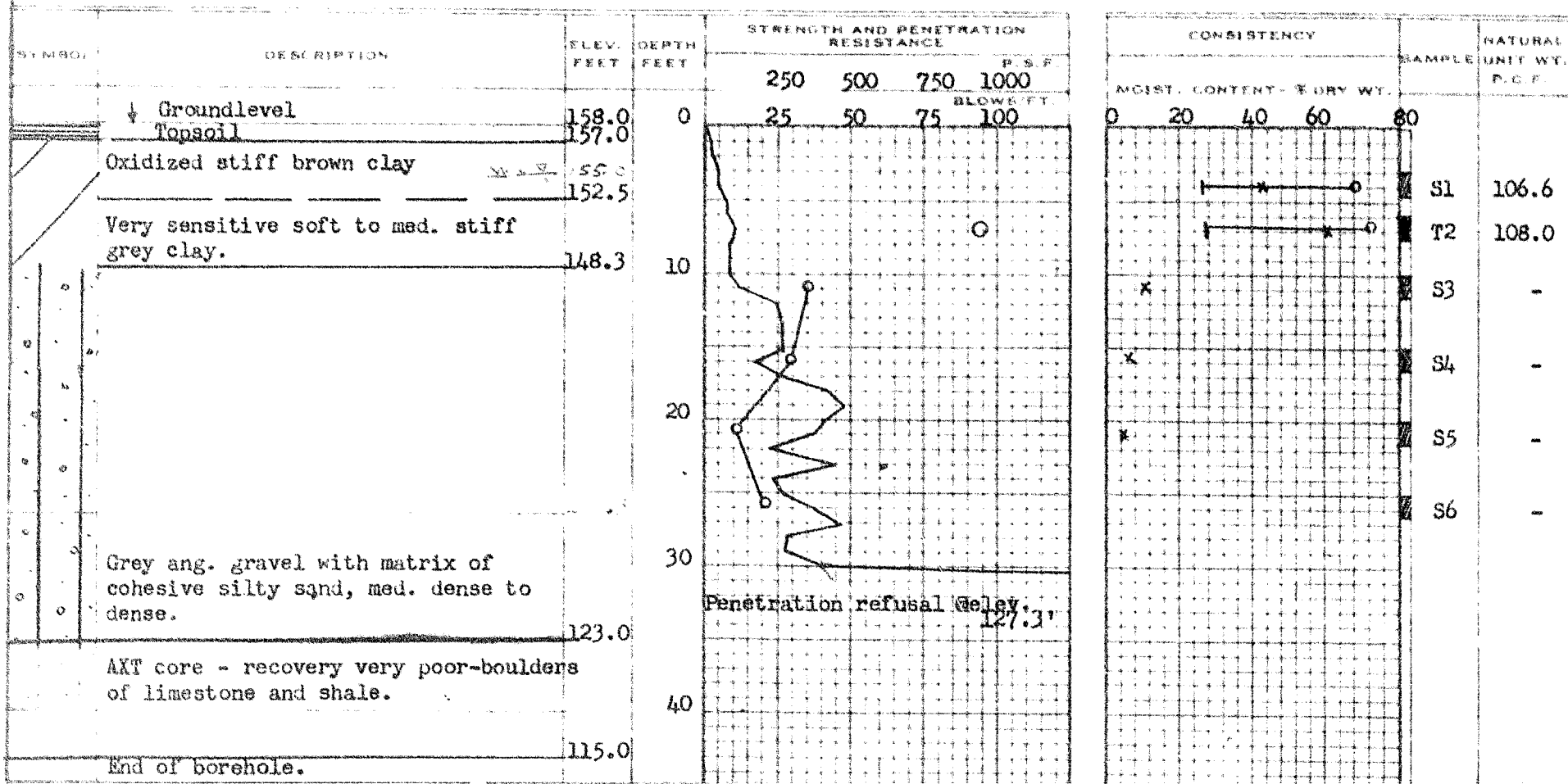
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 209-61 BORE HOLE NO. 3
 JOB 61-F-68 STATION 9+32 (20' Lt.)
 DATUM 158.0' COMPILED BY B.K.
 BORING DATE Jul. 19/61. CHECKED BY M.D.

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 —
 PLASTIC LIMIT —



OFFICE REPORT ON SOIL EXPLORATION

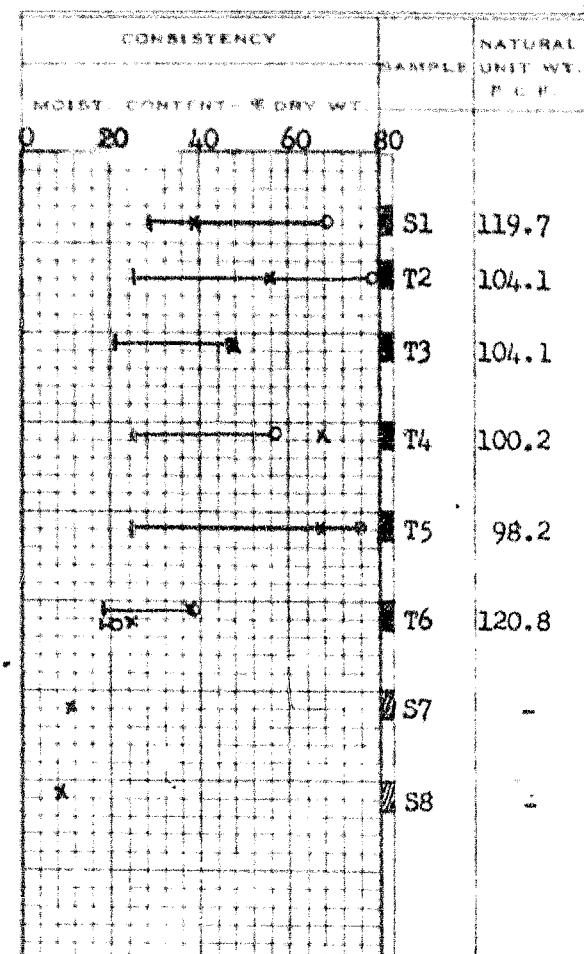
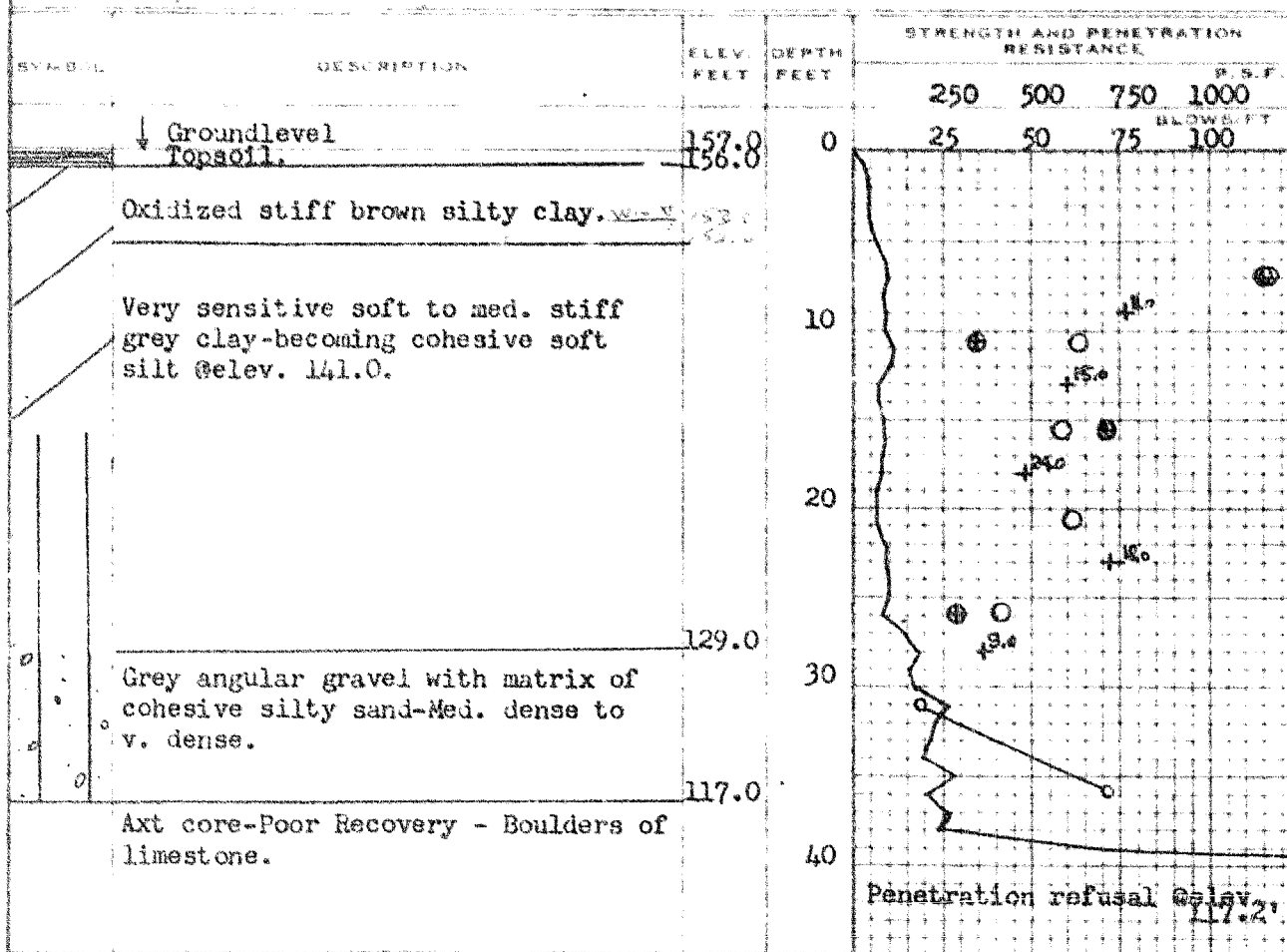
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 209-61 BORE HOLE NO. 4
 JOB 61-F-68 STATION 8+53 (20' Rt.)
 DATUM 157.0' COMPILED BY B.K.
 BORING DATE Jul. 19/61. CHECKED BY M.D.

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 X
 LIQUID LIMIT -
 PLASTIC LIMIT -



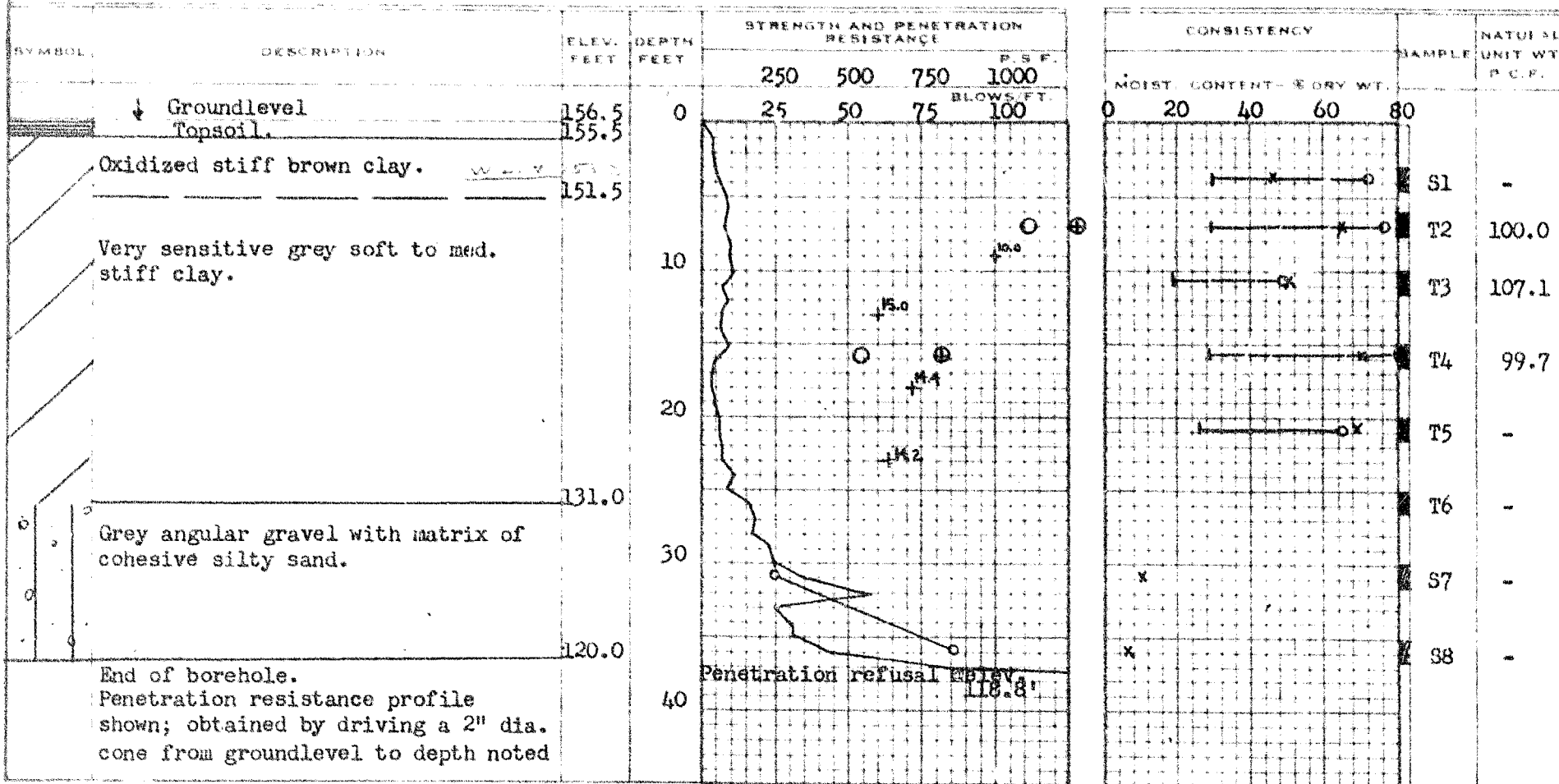
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 209-61 BORE HOLE NO. 5
JOB 61-F-68 STATION 8+00 (20' Lt.)
DATUM 156.5' COMPILED BY B.K.
BORING DATE Jul. 20/61. CHECKED BY M.D.

2" DIA. SPIT 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 X
PLASTIC LIMIT



DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 209-61 BORE HOLE NO. 6
JOB 61-F-68 STATION 7+25 E
DATUM 156.0' COMPILED BY B.K.
BORING DATE Jul. 20/61. CHECKED BY M.D.

[illegible]

LEGEND

1/2 UNCONFINED COMPRESSION (Qu)	0
VANE TEST (C) AND SENSITIVITY (S)	+%
NATURAL MOISTURE AND	
LIQUIDITY INDEX	11
LIQUID LIMIT	X
PLASTIC LIMIT	

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE			
				250	500	750	1000
				P.S.F. BLOWS/FT.			
↓	Ground level	156.0	0	25	50	75	100
	Topsail	155.0					
	Oxidized stiff brown clay. <i>W.L. V</i>	151.0					
	Very sensitive soft to med. stiff grey clay.		10				
		136.0	20				
	Angular grey gravel with matrix of cohesive silty sand.						
			30				
		120.0	40				
	End of borehole.						

CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.P.			
MOIST CONTENT	W DRY WT.					
0	20	40	60	80		
					S1	-
					T2	109.4
					A3	-

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

CURRY HILL ROAD

W P 208-61 BORE HOLE NO. 7

JOB 61-F-68 STATION 1140 (28' E)

DATUM 156.5' COMPILED BY B.K.

LOGGING DATE Jul. 18/61. CHECKED BY H.S. M.D.

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

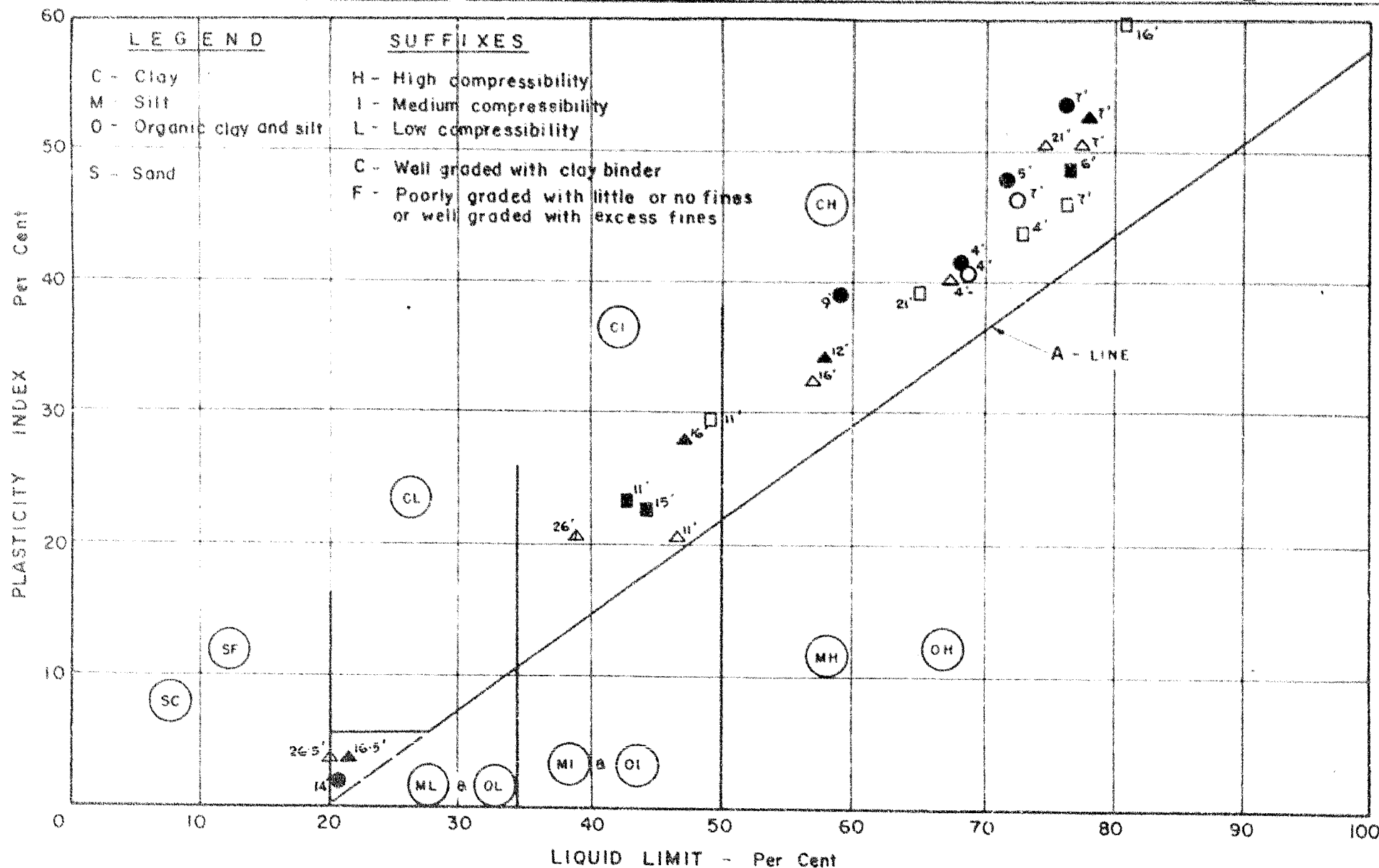
LEGEND

1/2 UNCONFINED COMPRESSION (QU) _____	0
VANE TEST (C) AND SENSITIVITY (S) _____	+8
NATURAL MOISTURE AND	
LIQUIDITY INDEX _____	X
LIQUID LIMIT _____	
PLASTIC LIMIT _____	

DEPTH FEET	ELEV. FEET	DESCRIPTION	STRENGTH AND PENETRATION RESISTANCE			
			250	500	750	1000
0	156.5	↓ Groundlevel	25	50	75	100
	155.5	Topsoil				
	153.5	Oxidized stiff brown clay. <i>W.L.W.</i>				
	151.5					
10		Very sensitive soft to med. stiff grey clay.				
20	137.5					
		Grey angular gravel with matrix of cohesive silty sand.				
30	126.5					
40		End of borehole.				

Penetration resistance profile shown; obtained by driving a 2" dia. cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow.

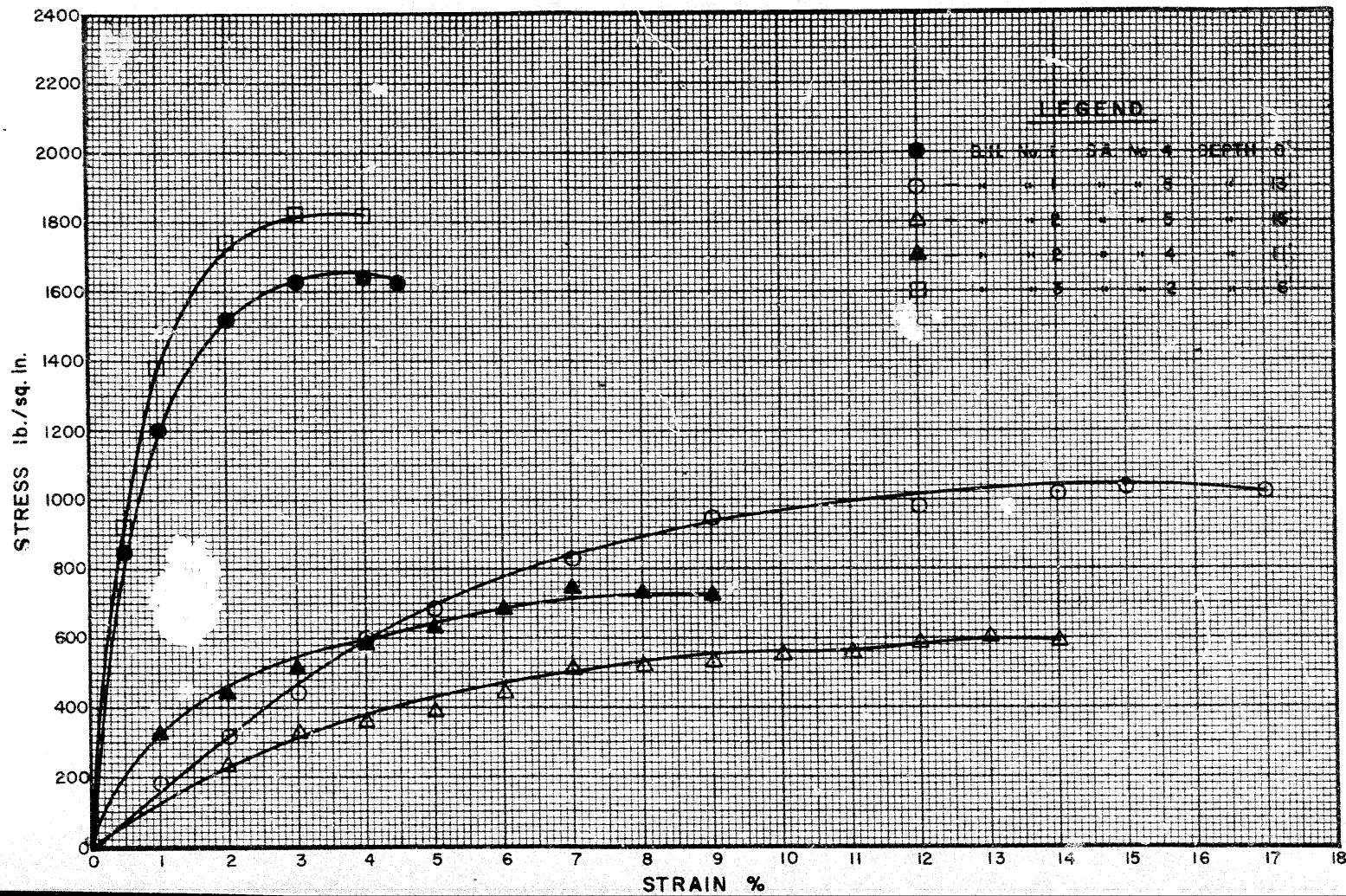
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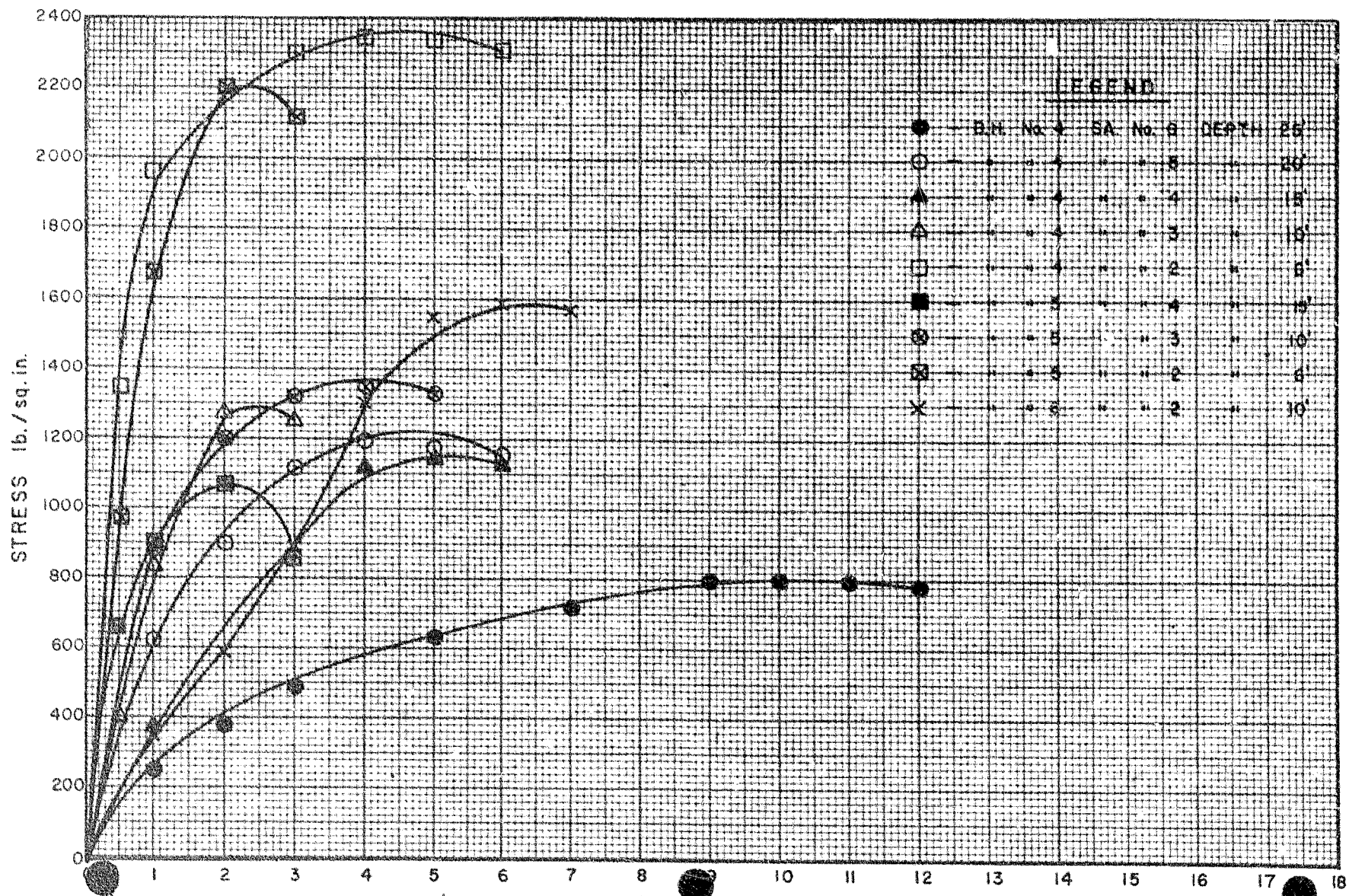


NOTES

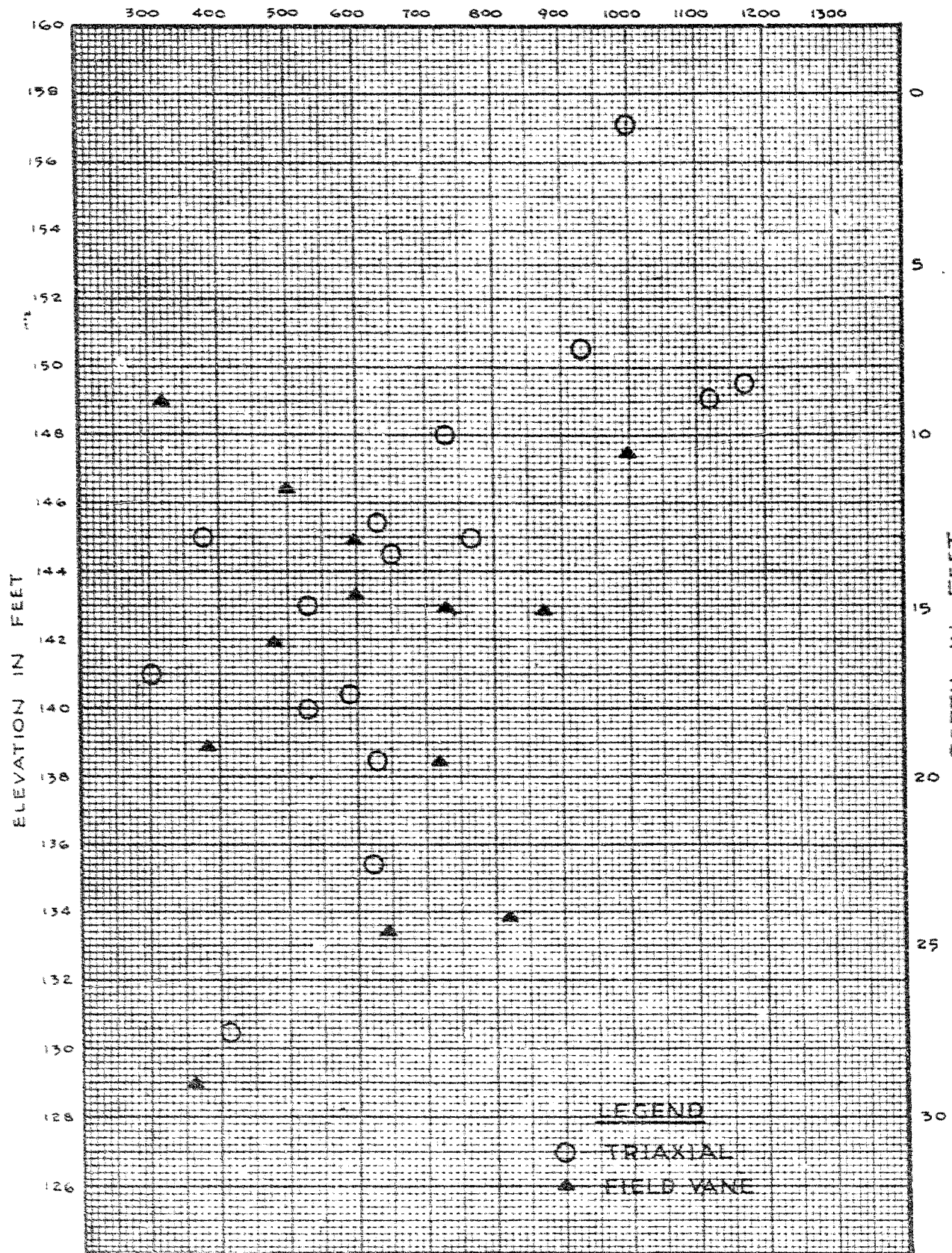
● - BOREHOLE NO 1	□ - BOREHOLE NO 5
▲ - " " 2	■ - " " 6
○ - " " 3	
△ - " " 4	

DEPARTMENT OF HIGHWAYS - ONTARIO
 MATERIALS & RESEARCH SECTION
 PLASTICITY CHART
 Job No. 61-F-68 W.P. No. 209-61
 Location _____

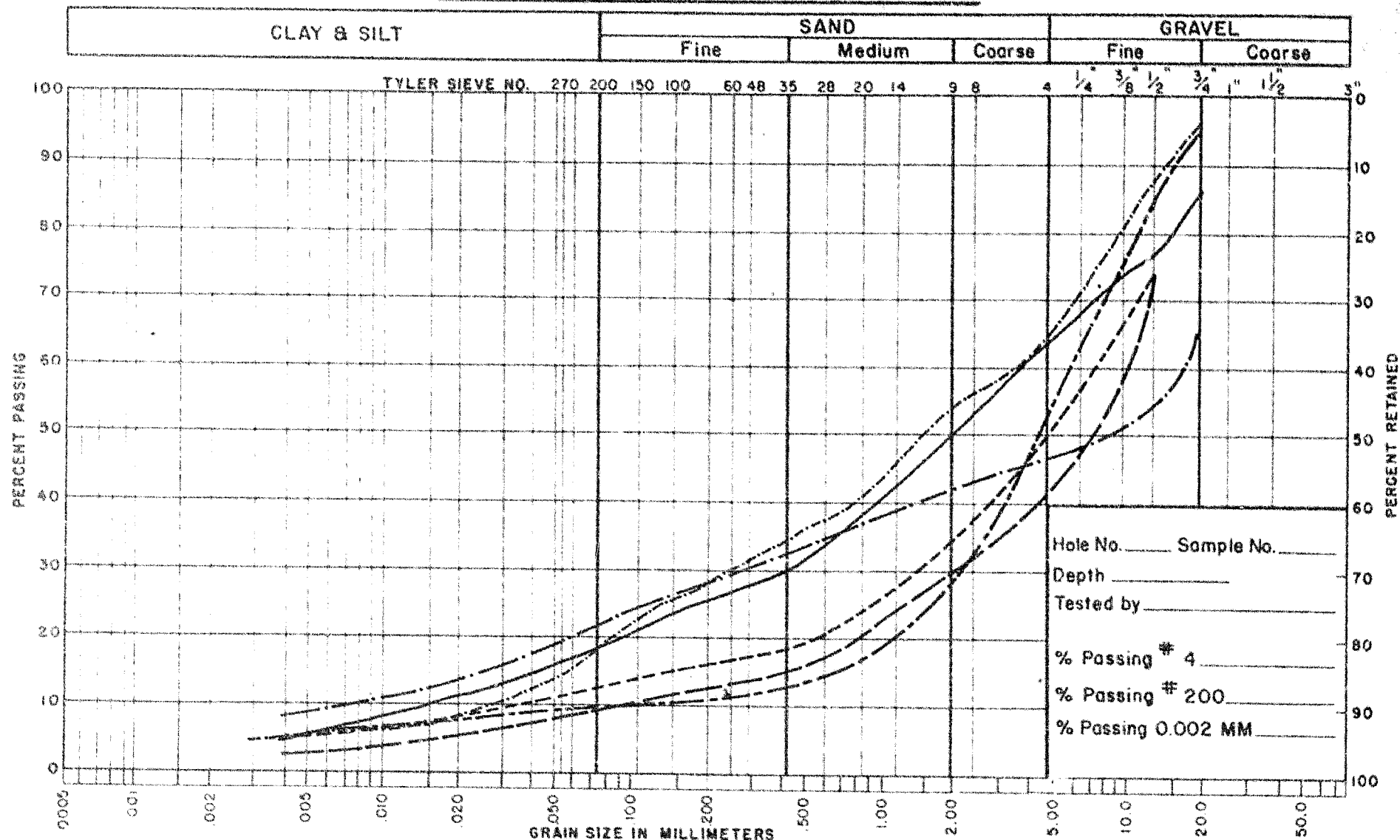




SHEAR STRENGTH P.S.F.



UNIFIED SOIL CLASSIFICATION SYSTEM



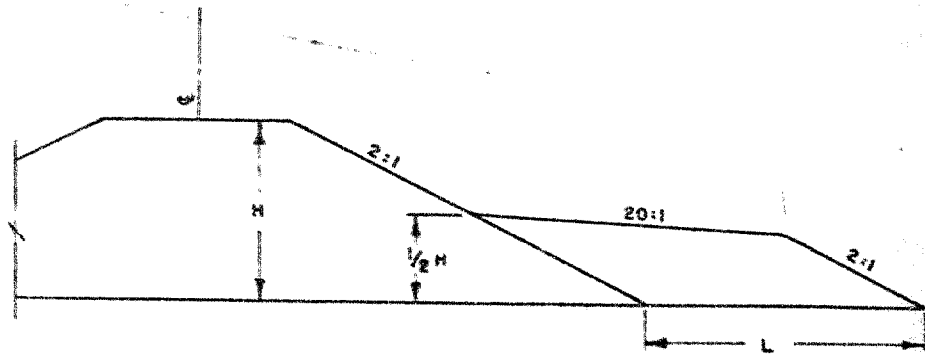
HOLE NO.	SAMPLE NO.	DEPTH	HOLE NO.	SAMPLE NO.	DEPTH
3	4	15'-16.5'	4	7	30'-31.5'
3	5	20'-21.5'	5	7	30'-31.5'
1	6	18'-19.5'			
1	9	33'-34.5'			

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH SECTION
GRAIN SIZE DISTRIBUTION

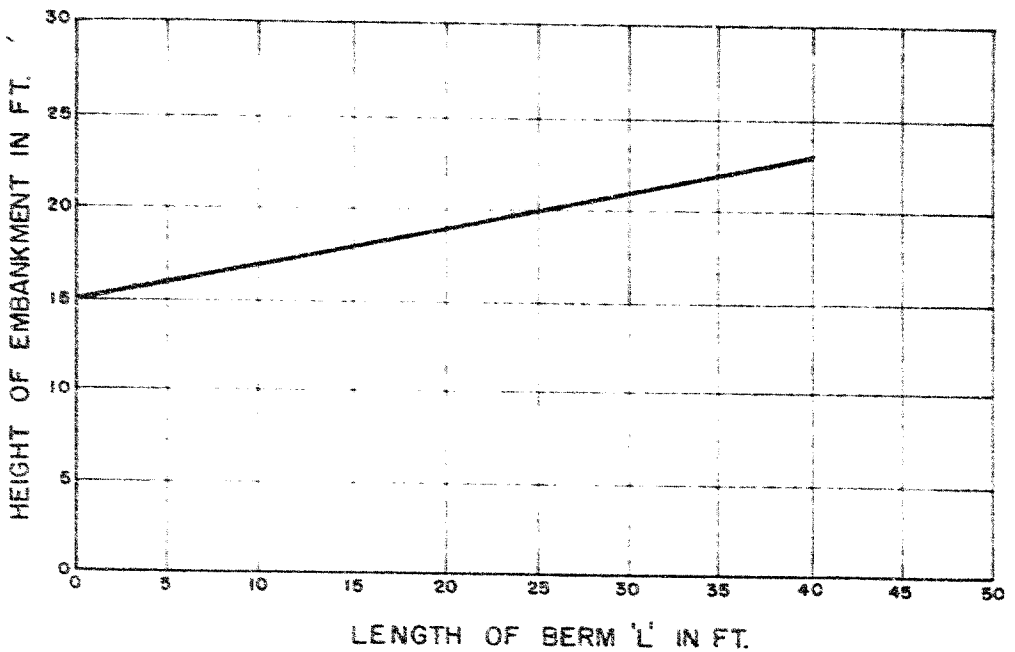
Job No. 61-F-68 W.P. No. 209-61
Location _____

LEGEND

L = LENGTH OF BERM
H = HEIGHT OF APPROACH FILL
 $\frac{1}{2}H$ = HEIGHT OF THE BERM



RECOMMENDED BERM SECTION



ORIGINATED M. DEVATA
DRAWN D. MUMFORD
CHECKED *AK*
APPROVED *[Signature]*
DATE 31 OCT. 1961

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH SECTION

FILL STABILITY
FOR
LANCASTER TOWNSHIP ROAD

SCALE

W. P. NO. 209-61

JOB NO. 61-F-68

DWG. NO. 61-F-68B

OFFICE LOCATION -
DOWNSVIEW AVE.,
KEELE ST. - HIGHWAY 401
TORONTO, ONTARIO.



ONTARIO

DEPARTMENT OF HIGHWAYS

POSTAL ADDRESS -
DEPARTMENT OF HIGHWAYS
PARLIAMENT BUILDINGS,
TORONTO 5, ONTARIO.

Bridge Division,
December 21, 1961.

MEMORANDUM TO:

Mr. A. G. Stermac,
Principal Foundation Eng.,
Department of Highways,
Room 107, Lab. Bldg.,
DOWNSVIEW, Ontario.

Murphy Dec 22, 1961
agf

RE: W.P. 209-61
Hwy. No. 401 @ Curry Hill Rd.
2.0 mi. West of Quebec Bdry.
District No. 9

Enclosed find one copy of the Preliminary Plan
for the above structure.

The designer appears to have complied with the
requirements of the foundation report but the fill
height exceeds that of 23' as suggested in the founda-
tion report as the maximum probable fill.

Would you kindly let us have any comments you
wish to make on this proposal.

It is assumed that you will want to instrument
the fills of this structure. We will advise you as
soon as possible of the probable time of the placing
of the fills.

JBC/ea
cc. D. Smith

J. B. Curtis,
Bridge Location Engineer.

Charlie Quick
B A H S H L E
LA 347-247

HWY. #401 & CURRY HILL RD.

LANCASTER TWP. BRIDGE #16.

W.J. 62-F-83.

July 18th, 1962.

W.P. 209-61.

- INSTRUMENTATION OF APPROACHES -

An instrumentation programme has been initiated at the above-mentioned structure approach fill. A foundation report was prepared by this Office (61-F-68). Settlements of up to 2.0' have been predicted. Seven settlement plates were installed at Sta. 12+20, Curry Hill Rd., on June 27th, 1962. This location is on the south approach some 180' behind the proposed bridge abutment. When the fill is completed, steel pipes will be drilled down to a contact with each plate. Present indications are that the approach fills will be completed by late fall of 1962.

K. G. Selby,
SR. FOUNDATION ENGINEER

#

61-F-68

#

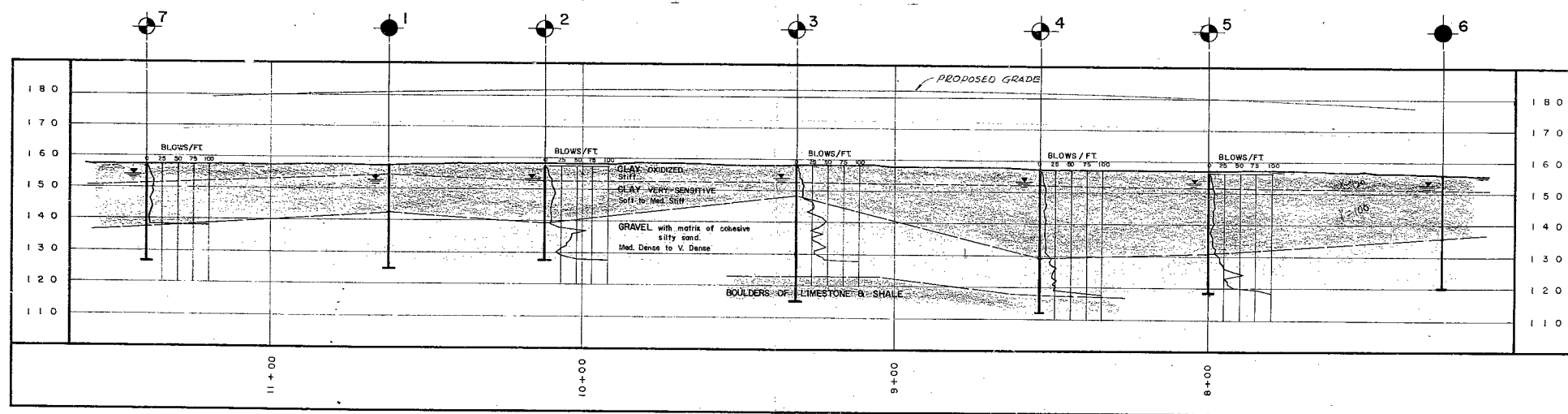
W.P. 209-61

#

HWY 401

LANCASTER

TWP. ROAD

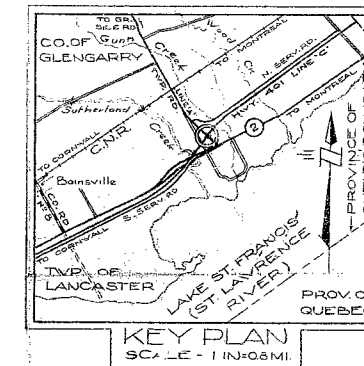
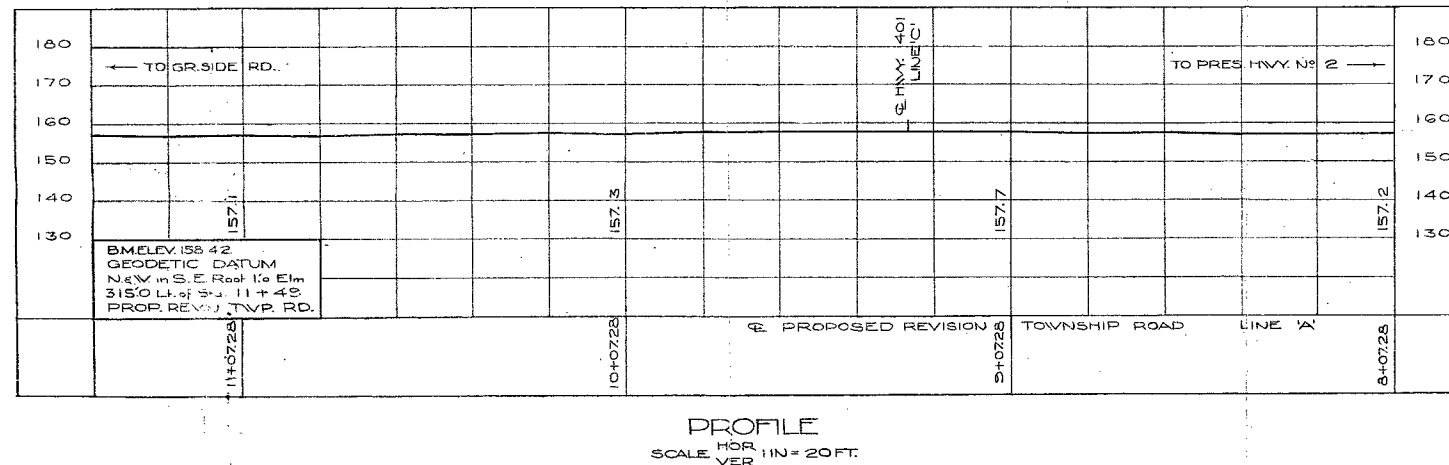


DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS & RESEARCH SECTION			
LANCASTER TOWNSHIP ROAD PROPOSED REVISION LINE 'A', LOT 9, CON. I. AND HIGHWAY NO. 401 LINE 'C'			
ORIGINATED BY DRAWN BY CHECKED BY APPROVED	DISTRICT NO. W/F NO. SCALE 1 inch = 20 feet	DATE 29 SEPT 1961 JOB NO. 61-F-68 DRAWING NO. 61 - F - 68A	

This engineering plan view shows the intersection of a proposed revision township road with existing infrastructure. The main horizontal road is labeled "PROPOSED REVISION TOWNSHIP ROAD". It intersects with a vertical road labeled "E OF PROP HIGHWAY N°401 LINE 'C'". To the right, another vertical road is shown as "TO PRES HWY. N°2".

The plan includes several key features and dimensions:

- Proposed Road Dimensions:** A width of 36' is indicated for the proposed road section.
- Intersection Details:** The intersection with Highway N°401 is marked with stationing points 9+00 and 10+00. A curve with a radius of 88'11" is shown at this junction.
- Tangent Distances:** Horizontal distances of 50', 80', and 80' are marked along the proposed road alignment.
- Spiral Data:** Located in the lower right, it provides technical details for the curve:
 - $\Delta = 32^\circ 07' 30''$
 - $\Delta_c = 23^\circ 52' 30''$
 - $D = 3^\circ 00'$ RT.
 - $R = 1209.86$
 - $L = 795.83$
 - $E_s = 79.33$
 - SPIRAL DATA**
 - $\theta_s = 4^\circ 07' 30''$
 - $L_s = 275.00$
 - $T_s = 687.85$
- Other Labels:** The plan also mentions "TO GR. SIDE RD.", "TO LANCASTER", and "TO QUEBEC BOUNDARY". Stationing markers like 367+00 and 368+00 are present near the intersection.
- Scale and Title:** The title is "PLAN" and the scale is "SCALE - 1 IN = 20 FT."



Res sent to Smith
10.6.61

T-22 2.0 mi west of Quebec
209-61

DEPARTMENT OF HIGHWAYS - ONTARIO PLANNING & DESIGN BRANCH	
DISTRICT NO.	
PROPOSED CROSSING AT PROP. TWP. ROAD - LINE 'A' AND THE KING'S HIGHWAY NO. 401 PROPOSED LINE 'C' LOT 9 CON. 1 TOWNSHIP OF LANCASTER COUNTY OF GLEN GARRY	
BRIDGE	SITE
SURVEY BY Chief of Party - J. TONDEUR Supervisor - A. BOUCHER	APPROVED <i>Director of Planning & Design</i>
DRAWN BY Draftsman - P. RAVLOVICH Supervisor - J. UNDERDOWN	SCALE AS SHOWN DATE OF SURVEY MAY 1961 DATE OF PLAN MAY 1961
CHECKED BY Draftsman - A. AUGULIS Supervisor - R. PLEASANCE	NO. <u>34-G-17</u> FILE NO. PLAN E-4006-1

14-1-68
Dear Sir,
L-2-4963
Kingston
Re: special tax
Regional and General
1529