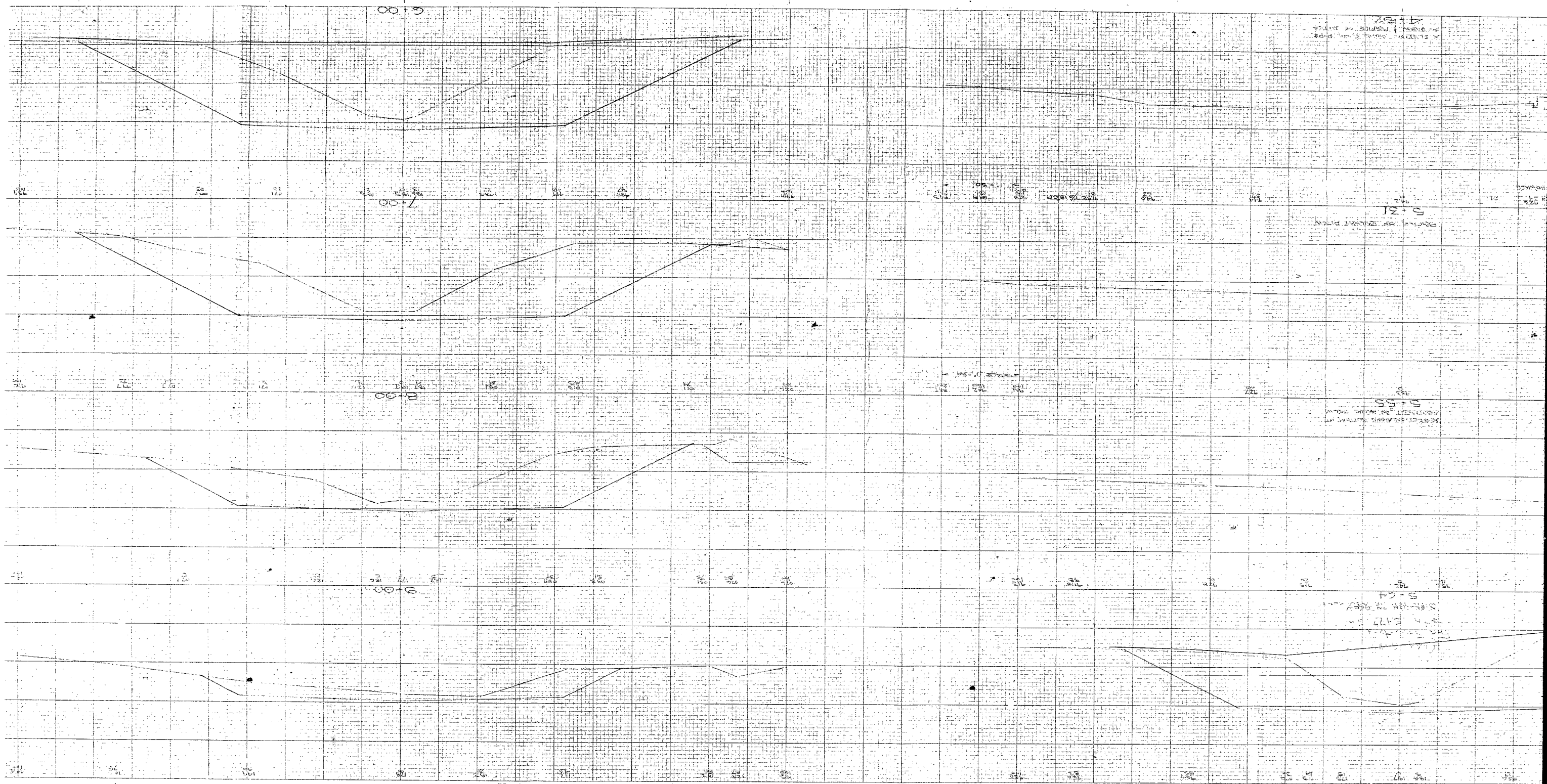
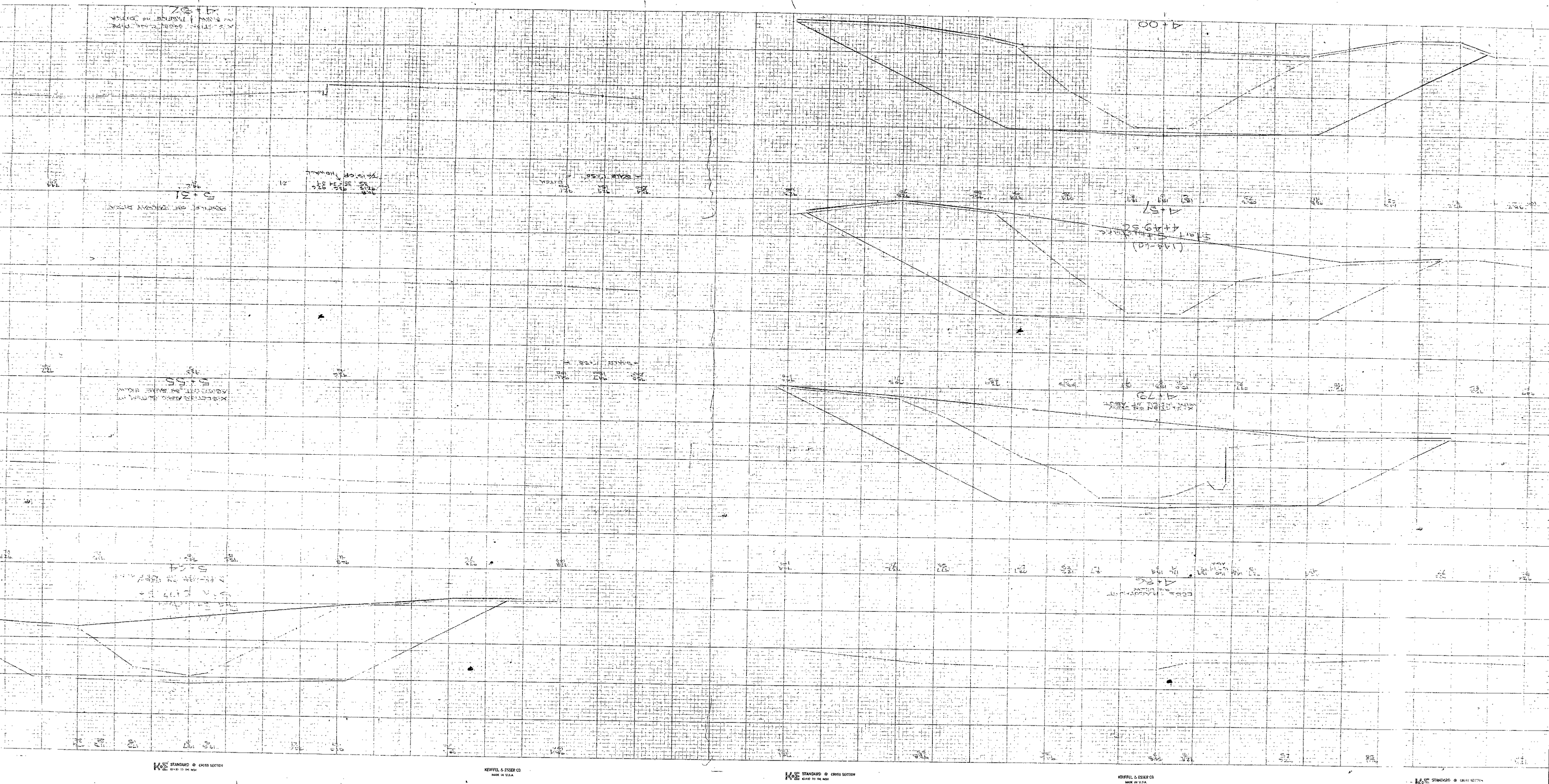


61-F-90

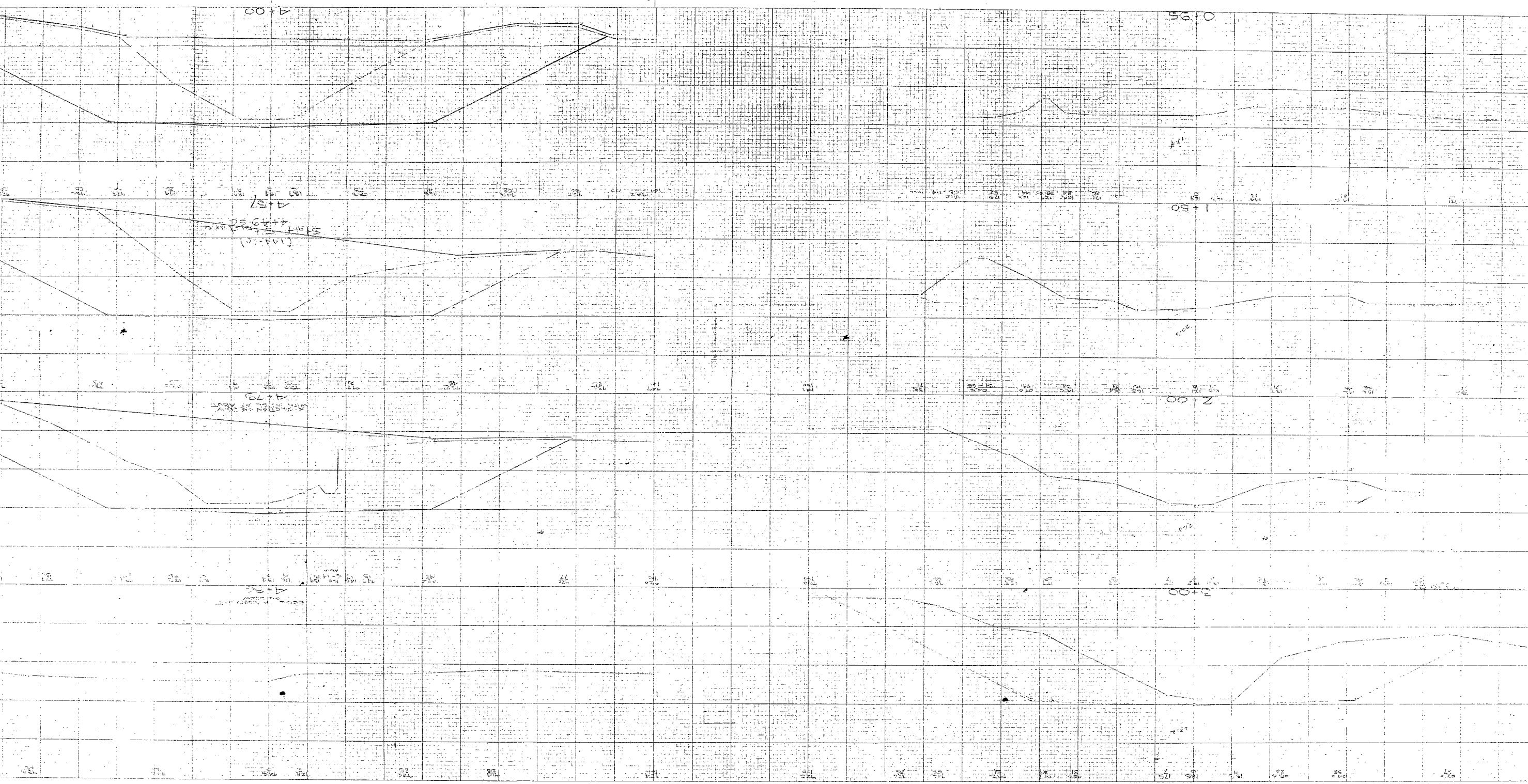
W.P. 144-60
Hwy #403
TORONTO
HAMILTON
BUFFALO
RAILWAY



SOME DEFECTS IN NEGATIVE DUE
TO CONDITION OF ORIGINAL DOCUMENTS



SOME DEFECTS IN NEGATIVE DUE
TO CONDITION OF ORIGINAL DOCUMENTS



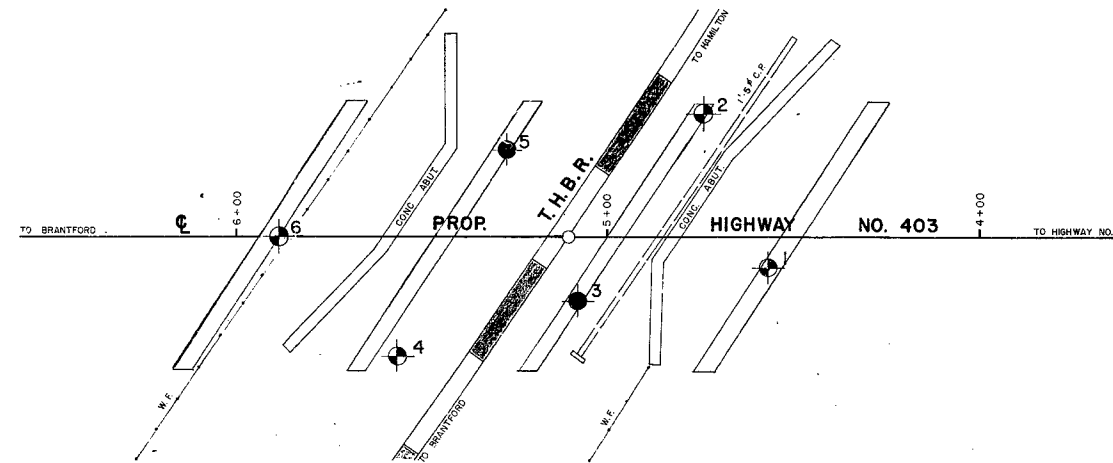
KEUFFEL & ESSER CO.
MADE IN U.S.A.

KE STANDARD CROSS SECTION
MADE IN U.S.A.

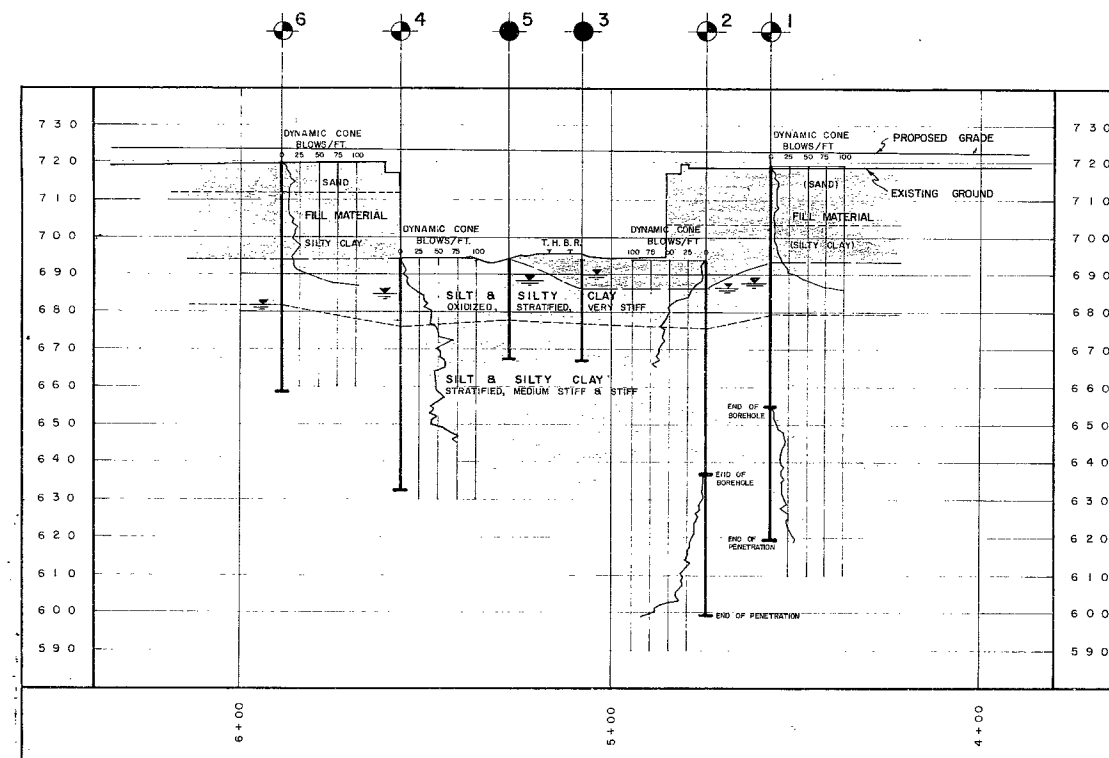
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MADE IN U.S.A.

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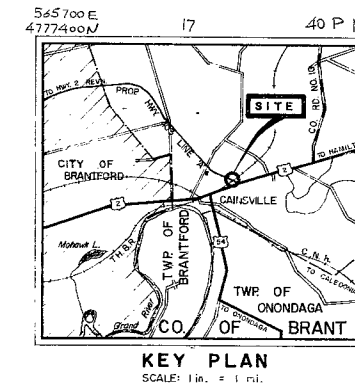
SOME DEFECTS IN NEGATIVE DUE
TO CONDITION OF ORIGINAL DOCUMENTS



PLAN



PROFILE



LEGEND

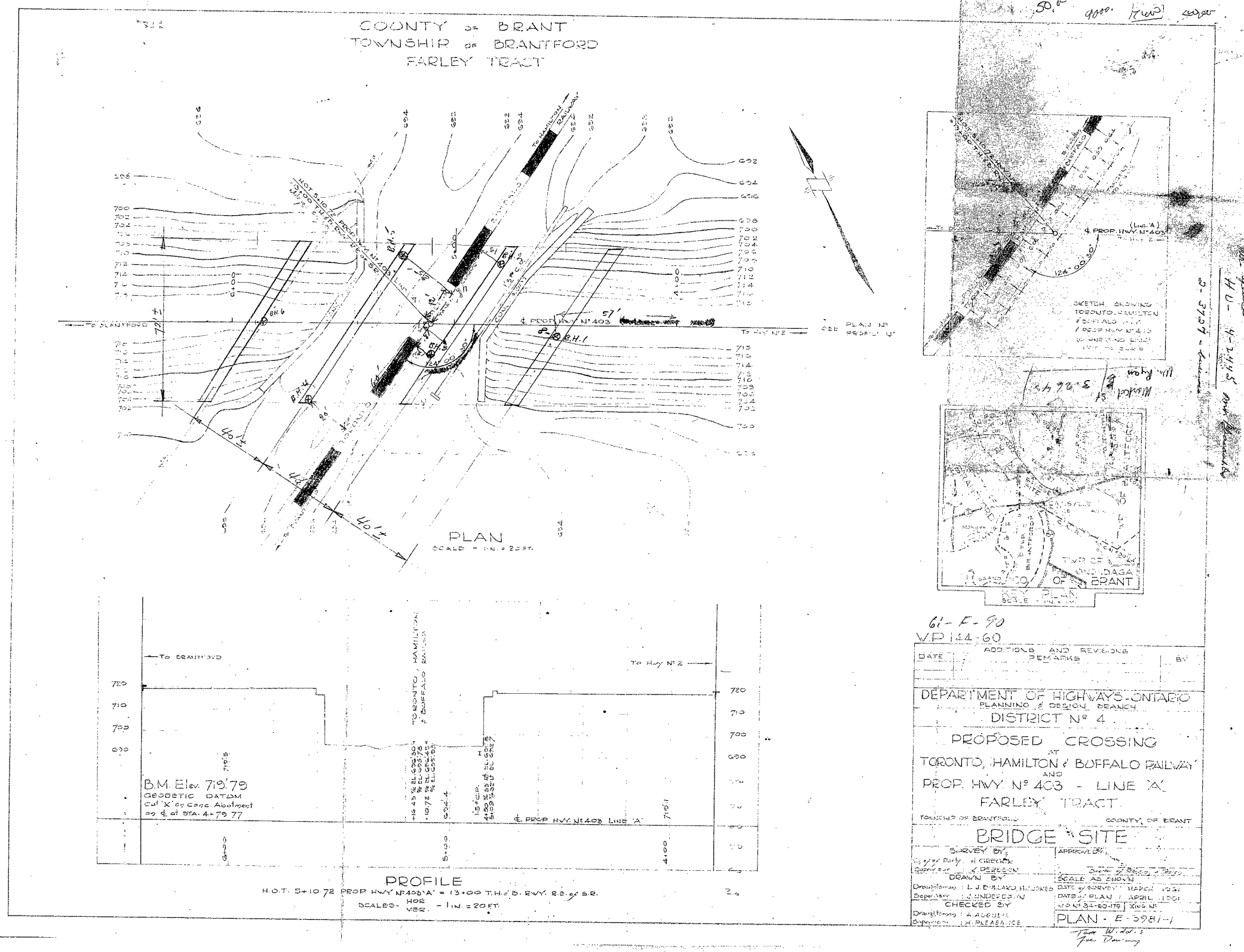
- BORE & PENETRATION HOLE
- BORE HOLE
- WATER LEVELS established at time of field investigation, SEPT. 21, 1961

HOLE	ELEVATION	STATION	OFFSET
1	719.5	4+57	8' LT.
2	694.0	4+74	33' RT.
3	694.0	5+08	17' LT.
4	694.0	5+56	32' LT.
5	694.0	5+27	23' RT.
6	720.0	5+88	CL

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

DEPARTMENT OF HIGHWAYS - ONTARIO		
MATERIALS & RESEARCH SECTION		
TORONTO, HAMILTON & BUFFALO RAILWAY		
AND		
PROPOSED HIGHWAY NO. 403		
LINE 'A'		
ORIGINATED V. KORLI	DISTRICT NO. 4	DATE 15 OCT. 1961
DRAWN D. MUMFORD	W.P. NO. 144-60	JOB NO. 61-F-90
CHECKED [Signature]	SCALE	DRAWING NO.
APPROVED [Signature]	1 inch = 20 feet	61-F-90A

REF. NO. E-3981-1



SOME DEFECTS IN NEGATIVE DUE
TO CONDITION OF ORIGINAL DOCUMENTS



ONTARIO

DEPARTMENT OF HIGHWAYS

luty
Get all necessary information
and see me about it
before you phone.

Thank you

Feb 28, 1962

WJS

Memo to Mr. M. Devata Date February 26, 1962
Sr. Foundation Project Engr. Subject W.P. 144-60 - Hwy. #402
 From J.A. Knowles, Pro.Design Engr. Overhead at T.H. & B. Railway

Attached is a print of the cross sections of Highway #403 at this structure. Please contact me by telephone regarding the elevation to which the old fill should be excavated at each section.

Shirley Lapp

for

J.A. Knowles,
Project Design Engineer.

JAK-nc

Contacted the Regional office and suggested that they should remove the existing fill 50 ft behind ~~each~~ the proposed abutments. and

M. Devata

March 1st 1962

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,
February 2, 1962.

MEMORANDUM TO:

Mr. A. G. Stermac,
Principal Foundation Engineer,
Department of Highways,
Room 107, Lab. Building,
Downsview, Ontario.

harty
Feb 5, 1962
24

RE: W.P. 144-60
T. H. & B. Railway
Overhead 0.1 miles
North of Hwy #2 at
East end of Brantford
By-pass Hwy #403
District #4

Enclosed please find one print of
preliminary plan D 4998-P1 for the subject
structure.

Would you please let us have your
comments.

F. DeVisser

FDDeV/zf

F. DeVisser,
Bridge Location Engineer.

Prop'd Design

Spread footings

East Pier @ elev. 685.0'

Safe load 2 T.S.F.

Problem Raise elevations

Approx Depth of Fill Material

Min.^m Max.^m

BH #2 687.5' 686'

BH #3 687.5' 687'

The max^m elevation the
footings may be raised
and still be natural ground
material is 686.0'.

Dec 28th 1961

Mr. Jim Keen of the Bridge office requested the foundation section to estimate the length of the piles for the abutments foundation. This information was required in order to determine the cost of piled foundation and spread footings on the compacted granular fill.

This section reviewed the sub-soil condition and estimated that the approx length of piles ^{should} ~~be~~ be 60 ft. This information was given to Jim Keen on the phone and also mentioned that a pile loading test should be carried out in order to determine the exact length of the piles.

M. Devata
Dec 29th 1962

Length of pile 60 ft
Ultimate load 60 T / pile
with $A.S = 2$ $q_a = 30 \text{ T/pile}$

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,
August 4, 1961.

MEMORANDUM TO:

Mr. K. Selby,
Supervising Foundation Eng.,
Department of Highways,
Room 110, Lab. Bldg.,
Downsview, Ontario.

RE: W.P. 144-60
T.H. & B. Rly Subway
0.1 mi. north of Hwy. #2
at east end of Brantford
Hwy. 403 District 4

Attached please find sketch of footing layout for the above noted structure. Please arrange for a foundation investigation to be carried out.

F. DeVisser

FDeV/et

F. DeVisser,
Bridge Location Engineer.

cc. N. D. Smith

Note - Mr. N. D. Smith agreed to carry out this investigation.
M. Devata Aug 29/61



Memo to Mr. A. M. Toye, **Date** December 13, 1961.
Bridge Engineer.
From Materials & Research Division, **Subject** D.H.O. FOUNDATION INVESTIGATION
(Foundation Section). REPORT.
W.J. 61-F-90 -- W.P. 144-60.

Attention: Mr. S. McCombie.

Re: Toronto, Hamilton & Buffalo Railway and
Proposed Hwy. 403 (Line 'A'), Twp. of
Onondaga, County of Brant, District #4.

Attached, we are forwarding to you, our detailed foundation report on the subsoil conditions existing at the above-mentioned structure location.

We believe that the conclusions and recommendations contained therein, should prove adequate for your future design work.

If further information is required, please do not hesitate to contact our Office.

AGS/MdeF
Attach.

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
H. D. McMillan
A. Gater (Pre-engineering handled
by London Region)
J. C. Thatcher
T. J. Kovich
J. Roy
J. E. Gruspier
E. R. Saint
F. Norman
A. Watt
Foundations Office ✓
Gen. Files.

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2. DESCRIPTION OF SITE & GEOLOGY
3. DESCRIPTION OF FIELD & LABORATORY WORK
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 - 4.3 Stratified Clayey Silt & Silty Clay
5. GROUND WATER CONDITIONS
6. DISCUSSION & RECOMMENDATIONS
7. SUMMARY
8. MISCELLANEOUS

FOUNDATION INVESTIGATION

For

Toronto, Hamilton & Buffalo Railway and
Proposed Hwy. 403 (Line 'A'), Twp. of
Onondaga, County of Brant, District #4.
W.J. 61-F-90 -- W.P. 144-60.

1. INTRODUCTION:

It is proposed to construct an overhead, at the crossing of the T.H. & B. Railway and proposed Hwy. #403 (Line A), in Cainsville, east of Brantford City. At this location the abutments for a single span overhead bridge were constructed some 25 years ago. The remainder of this bridge, however, was never completed and the original project was abandoned. These existing abutments will be removed and a 3-span structure, some 85 ft. wide and 130' long, will be constructed to carry Hwy. #403.

An investigation was carried out by this section to determine the subsoil conditions at the proposed structure location. Results and the discussions of the field investigation, together with conclusions and recommendations are presented in this report.

2. DESCRIPTION OF SITE & GEOLOGY:

The topography of the area is generally undulating

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

and consists mostly of cultivated farm lands. The site is in the physiographic region referred to as "Haldimand Clay Plain".

3. DESCRIPTION OF FIELD & LABORATORY WORK:

Field work consisted of Six Sampled boreholes and four dynamic cone penetration tests. The exploration programme was carried out by a standard coredrill machine adapted for Soil Sampling. Conventional wash boring procedure was followed. Samples were recovered at required depths, by means of 2 inch I.D. Shelby tube sampler and by a 2 inch O.D. Split Spoon sampler. The dimensions of the spoon sampler and the energy used in driving it, confirm 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-90-A 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.

Cont'd. /2 ...

3. DESCRIPTION OF FIELD & LABORATORY WORK: (Cont'd.)...

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

- a) Natural moisture content
- b) Bulk density
- c) Grain size distribution
- d) Atterberg Limits
- e) Undrained shear strength
- f) Consolidation curves

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

4. SUBSOIL CONDITIONS:

4.1 General.

The stratigraphy of the subsoil at the site was found to be generally uniform. Detailed description of various types encountered in each boring, are shown in Appendix I of this report. The estimated stratigraphical profile of Drawing 61-F-90A is based upon this information.

The subsoil consists of the following strata:

- i) Fill material
- ii) Stratified layers of clayey silt & silty clay

Cont'd. /4 ...

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

4.2 Fill material.

This material was observed in B.H. #1, 2, 3 & 6 at the location of the 25 ft. high approach fills of the abandoned structure and also at the T.H. & B Railway embankment. Two boreholes (B.H. #1 & 6) carried out on these approach fills indicated that the top portion mainly consists of granular fill material whereas the bottom portion generally consists of clayey fill material.

The granular fill material extends from Elev. 720.0 to approx. Elev. 712.0 at the East approach and to Elev. 703.0 at the West approach. This material is in a medium dense state of compaction.

The cohesive clayey fill was encountered below the granular fill material in B.H. #1 & 6 and below the present ground surface in B.H. #2 & 3. This material extends to a maximum depth of 18 ft. in B.H. #6 and a minimum depth of 8 ft. in B.H. #3. The consistency of the clayey fill material is stiff to very stiff, with an average 'N' value of 12 blows/ft. Recovery of Shelby tube samples from this material was possible in only a few instances, and undrained triaxial tests carried out on such samples indicated a shear strength of about 1500 p.s.f. Tests carried out on samples

Cont'd. /5 ...

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

4.2 Fill material.

from cohesive portions, gave an average bulk density of 123 p.c.f., an average moisture content of 28%, and liquid plastic limits averaging 41% and 22% respectively.

4.3 Stratified clayey silt & Silty clay.

The stratum of stratified clayey silt and silty clay was encountered beneath the fill material in B.H. #1, 2, 3 & 6 and immediately below the natural ground surface in B.H. #4 & 5. The depth of this stratum was not determined at the time of the investigation.

The individual layers vary widely in composition, but are composed predominantly of either silty clay or clayey silt. Throughout the stratum occasional dark grey subrounded to subangular particles up to about $\frac{3}{4}$ inch in size were found. Occasional pockets of fine sand and silt were, also observed. Generally the individual layers vary randomly and widely in thickness from 1/8 inch to a foot or more.

The upper portion of this stratum i.e. the top 10 to 18 ft., is desiccated and the transition to the underlying undesiccated layer is at approx. elev. 681.0 to elev. 677.0. Atterberg limit determinations were carried

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

4.3 Stratified clayey silt & silty clay.

out on the bulk samples of the crust and gave the following average properties.

Liquid Limit	40%
Plastic Limit	22%
Moisture Content	26%
Bulk density	125 p.c.f.

The above Atterberg limits indicate that the desiccated crust is generally of intermediate plasticity. Triaxial tests carried out on three of the samples indicate the average shear strength is in the order of 2400 p.s.f. The Standard Penetration values obtained in this stratum ranged from 8 to 28 blows/ft. These together, indicate the consistency of the material to be stiff to very stiff.

Immediately below the oxidized layer, the non-oxidized portion of the cohesive deposit was encountered. This was marked by a definite change in colour from brown to grey-brown. Generally, the clay is of intermediate to high plasticity, whereas the silt is of low plasticity.

The shear strength varies randomly throughout the depth of this stratum with a maximum value of 1910 p.s.f. to a minimum value of 640 p.s.f. The Standard Penetration Tests obtained ranged from 6 blows/ft. to 28 blows/ft. The results

cont'd. /7 ...

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

4.3 Stratified clayey silt & Silty clay.

of the triaxial tests, together with standard penetration results indicate that the consistency of the cohesive non-oxidized deposit varies from medium stiff to stiff.

The wet unit weight of the stratified clayey silt and silty clay varies from 120 p.c.f. to 129.0 p.c.f. The average moisture content of the clay layers is 43% and of the silt layers is 24%. The liquid and plastic limits of clay layers vary from 34% to 63% and 19% to 22% respectively. In the case of the clayey silt layers the limits are 20% to 27% and 16% to 22% respectively.

5. GROUND WATER CONDITIONS:

The water level observations carried out during the time of the investigation, indicated that the water level was at approx. elev. 685.0. The exact depths at which the water level was observed in each boring are shown on the borehole logs appended in Appendix I of this report.

6. DISCUSSION AND RECOMMENDATIONS:

Pier footings

The proposed overhead which will carry the future Hwy. 403 over the T.H. & B. Railway lines, is conceived as a 3-span structure. At the chosen location the subsoil

6. DISCUSSION AND RECOMMENDATIONS: (Cont'd.) ...

Pier footings

conditions are generally uniform. The relative uniformity of the subsoil and the presence of a pre-consolidated zone 9 to 18 ft. deep, with higher shear strengths than the underlying soil, indicates that spread footings should be considered for the foundations of the structure. In order to confine the major effects of the induced stresses caused by the structural load to the top layers of the soil, the footings should be placed as high in this layer as frost conditions will allow. It is recommended to use a safe bearing load of 2 t.s.f. for footing design with a minimum width of footing 6 ft. to 7 ft. The approx. elevations for footings at the pier location are given below:-

East Pier	Elev. 685.0
West Pier	Elev. 688.0

Abutment footings

Because of the subsoil conditions at this site, spread footings placed on well compacted approach fills, seem to be the best solution. The use of piles does not seem to be warranted because the bearing properties of the subsoil become more unfavourable with depth. It is very doubtful whether

cont'd. /10 ...

6. DISCUSSION AND RECOMMENDATIONS: (Cont'd.) ...

Abutment footings

enough bearing capacity would be obtained from piles driven only into the upper desiccated layer considering that additional negative friction due to the settlement of the fill, would be acting on the piles. Thus, the primary object - i.e., the elimination of settlements, would not be achieved. Piles would therefore, have to be driven deeper and because of the decreasing bearing properties with depth, it may become necessary to use very long piles. It is therefore, recommended that spread footings with 1.75 T/sq.ft. be placed on well-compacted fill. The material for the fill could be any acceptable inorganic soil, and should be compacted to 100% density according to the present D.H.O. practice. However, we would recommend that for a certain portion of the fill, below and adjacent to the abutment footing, granular material should be used. This recommendation is based on the fact that good compaction is more easily achieved by using granular material, this being much less susceptible to atmospheric influences and changes. It is also recommended that an additional portion of the approach fill be built at the same time thus applying all the stresses that will influence the settlement of the abutment footing. The recommended construction arrangement is shown on the attached drawing No. 61-F-90B. On this drawing the end slopes on both sides of the approach fill portion are shown as 2:1. ✓ If necessary, they can be changed and the slope in front of the abutment footing can be made steeper - i.e., $1\frac{1}{2}$:1, and the one in the back, flatter, so as to enable easier movements of the construction machinery.

cont'd. /10 ...

6. DISCUSSION AND RECOMMENDATIONS: (Cont'd.) ...

Abutment footings

In order to achieve as equal and as favourable conditions as possible, it is recommended that the existing approach fill be removed for the distance of approx. 50 ft. behind the new abutment locations. The removal of the existing fill should correspond to the placement of compacted new approach fill as indicated on Drawing No. 61-F-90B.

Construction Sequence

Because of the compressible nature of the subsoil, some settlements can be expected. The irregular stratification and the presence of a stiffer upper crust makes the prediction of the magnitude of settlements and especially, of differential settlements, rather uncertain. It is therefore recommended that the Contract be written in a way which would enable stage construction - i.e., provisions should be made to allow for a period of approx. 6 months to elapse between completion of the approach fills and beginning of bridge construction. The installation of settlement plates is recommended. This would possibly enable the above-mentioned period of stage construction to be shortened. The Foundation Section would be responsible for the installation and reading of these plates.

cont'd. /11 ...

6. DISCUSSION AND RECOMMENDATIONS: (Contd.) ...

Dewatering

No major dewatering problems during excavation, are anticipated because of the low permeability of the clayey subsoil. The quantity of inflow should be small and therefore easily handled by low-capacity pumps.

Embankment stability

The proposed embankment at the approaches will be approx. 30 ft. high. No approach fill problems are anticipated provided that the side slopes are 2 horizontal to 1 vertical.

Structure details

Due to the presence of compressible layers of clay in the subsoil, some settlements of the footings are to be expected. It is very difficult to estimate the probable differential settlements because of the stratified nature of the subsoil. In view of the fact that some settlements are anticipated, it is recommended that a simply supported structure be designed.

7. SUMMARY:

The subsoil generally consists of stratified clayey silt and silty clay.

The strength and compressibility characteristics of the stiff clay crust is such that spread footing support can be obtained at the following recommended elevations:

West Pier	Elev. 688.0
East Pier	Elev. 685.0

cont'd. /12 ...

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

Permissible loading at the base of the footings for the piers, typically 6 ft. to 7 ft. wide, should not be greater than 2.0 t.s.f.

Spread footings placed on the compacted fill, using a safe load of 1.75 T/sq.ft., are recommended for the abutments. Construction as described in the previous paragraphs and graphically presented on drawing No. 61-F-90B, is recommended.

Because of the relatively low permeability of the subsoil, no serious dewatering problems are anticipated. Normal sump pumping is expected to be adequate.

No stability problems are expected in connection with the approach fills.

Because of the compressible nature of the subsoil, it is recommended that a simply-supported structure be designed.

8. MISCELLANEOUS:

Field work was commenced on Sept. 11/61 and was completed Sept. 21/61, using D.H.O. equipment. Field work was supervised by Mr. V. Korlu of the Foundation Section, Department of Highways, Ontario.

December 1961. REPORT PREPARED BY: *B. M. S. ...*
for V. Korlu,
PROJECT FOUNDATION ENGINEER

REPORT APPROVED BY: *M. Devata*
M. Devata,
SR. PROJECT FOUNDATION ENGINEER

APPENDIX I.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-90W.P. 144-60

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	5'-6.5'	Fill Material (sand with some gravel med. dense)	20	-	-	-	-	-	
	S2	10'-11.5'	" " " "	16	-	-	-	-	-	
	S3	15'-16.5'	Fill Material (silty clay, with gravel - stiff)	14	-	-	-	-	-	
	T4	20'-21.5'	" " " "	13	28.0	23.1	41.9	1620	123.3	
	S4A	21.5'-23'	" " " "	8	-	-	-	-	-	
	S5	25'-26.0' 26-26.5	Clayey silt, silty clay (oxidized), stratified - stiff grey brown.	8	-	-	-	-	-	
	T5A	26.5'-28'	Silt, silty clay stratified, (oxidized) - v. stiff.	18	22.9	22.7	44.1	3100	127.0	
	S6	30'-31.5'	" " " "	28	-	-	-	-	-	
	S7	35'-36.5'	" " " "	21	-	-	-	-	-	
	S8	40'-41.5'	Clayey silt, silty clay, stratified with occasional seams of sand - stiff - grey.	10	-	-	-	-	-	
	T9	45'-46.5'	" " " "	15	45.6 23.9	-	-	-	-	
	T10	50'-51.5'	Clayey silt, silty clay-stratified	Pushed	43.1 27.1	- 20.0	- 28.9	915	123.9	
	S11	55'-56.5'	Clayey silt, silty clay, stratified stiff - grey.	8	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-90W.P. 144-60

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	SL2	60'-61.5'	Clayey silt, silty clay - stratified. Med. stiff - grey.	6	-	-	-	-	-	
2	S1	5'-6.5'	Fill Material (silty clay with gravel).	11	-	-	-	-	-	
	S2	9'-10.5'	Clayey silt, silty clay (oxidized) stratified v. stiff, brown.	23	-	-	-	-	-	
	T3	15'-16.5'	" " " "	19	32.4	21.8	37.0	820	123.0	This sample is disturbed.
	S4	20'-21.5'	Clayey silt, silty clay, stratified. Stiff, grey.	13	-	-	-	-	-	
	T5	25'-26.5'	Clayey silt, silty clay, stratified. Med. stiff, grey.	Pushed	45.3 27.7 26.7	- 19.6 -	- 27.0 -	-	-	
	VANE	28'		-	-	-	-	720	-	Sens: 2.5
	S6	30'-31.5'	Clayey silt, silty clay, stratified Med. stiff, grey.	6	-	-	-	-	-	
	VANE	33'		-	-	-	-	1200	-	Sens: 3.8
	T7	35'-36.5'	Clayey silt, silty clay - stratified. Med. stiff, grey.	Pushed	41.0 26.7	22.2 22.3	44.0 28.0	775 -	119.9 -	
	S8	40'-41.5'	" " " "	9						

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-90W.P. 144-60

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	VANE	43'		-	-	-	-	1040	-	Sens:
	T9	45'-46.0	Clayey silt, silty clay - stratified. Stiff, grey.	40	-	-	-	-	-	
	S10	46.0-47.5	Silty fine sand.	23	-	-	-	-	-	
	S11	55'-56.5'	Clayey silt, silty clay - stratified. Stiff - grey.	11	-	-	-	-	-	
3	S1	5'-6.5'	Fill Material (silty clay with gravel).	5	-	-	-	-	-	
	T2	8'-9.5'	Clayey silt, silty clay - (oxidized) v. stiff - brown.	28	23.7	22.6	36.5	2900	125.7	
	S3	9.5'-11'	Clayey silt, silty clay - stratified with thin seams of fine sand. V. stiff - brown.	16	-	-	-	-	-	
	S4	15'-16.5'	" " " " Stiff - brown.	9	38.0 24.8	21.5 -	47.1 -	1140	120.2	
	S5	16.5'-18'	Clayey silt, silty clay - stratified. Stiff - grey.	14	-	-	-	-	-	
	T6	24'-25.5'	" " " " Med. stiff - grey.	Pushed	-	-	-	-	-	
	VANE	27'		-	-	-	-	960	-	Sens: 3.0

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-90W.P. 144-60

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	S1	5'-6.5'	Clayey silt, silty clay - (oxidized) stratified v. stiff-brown.	17	-	-	-	-	-	
	S2	9'-10.5'	" " " "	24	-	-	-	-	-	
	T3	10.5'-12'	" " " "	17	29.0	21.3	42.5	2280	122.0	
	T4	15'-16.5'	Clayey silt, silty clay - (oxidized) stratified stiff-brown.	Pushed	30.4	19.5	41.9	870	121.3	
	VANE	18'		-	-	-	-	1920	-	Sens: 4.6
	S5	20'-21.5'	Clayey silt, silty clay - stratified - stiff grey.	10	-	-	-	-	-	
	T6	25'-26.5'	" " " " Med. stiff - grey.	- Pushed	26.6 47.5 29.0	19.6 - 19.2	27.3 - 28.5	- 640 -	- - 123.9	
	S7	30'-31.5'	" " " " Med. stiff - grey.	6	-	-	-	-	-	
	VANE	31.5'		-	-	-	-	960	-	Sens: 3.0
	T8	35'-36.5'	Clayey silt, silty clay - stratified - Med. stiff, grey.	Pushed	45.0 24.8	24.0 19.4	54.7 25.8	- 770	124.7 -	
	VANE	40'		-	-	-	-	2000	-	Sens: 2.5

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-90W.P. 144-60

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	T9	45'-46.5'	Clayey silt, silty clay - stratified - Med. stiff, grey.	4	51.3 22.4 21.0	27.0 16.3 -	63.9 23.2 -	- - -	- - -	
	S10	50'-51.5'	" " " "	10	-	-	-	-	-	
	T11	60'-61.5'	" " " "	Pushed	42.7 22.9	22.2 17.5	46.6 20.8	V=2350	-	
5	S1	5'-6.5'	Clayey silt, silty clay - (oxidized) stratified v. stiff - brown.	22	-	-	-	-	-	
	S2	9'-10.5'	" " " "	17	-	-	-	-	-	
	S3	15'-16.0' 16'-16.5'	" " " " Silty clay - v. stiff - brown.	16	-	-	-	-	-	
	T4	20'-21.5'	Clayey silt and silty clay - stratified v. stiff - grey.	21	22.9	-	-	1910	129.0	
	S5	25'-26.5'	Clayey silt and silty clay - stratified. Med. stiff - grey.	5	-	-	-	-	-	
6	S1	5'-6.5'	Fill Material. (Silty sand with gravel- med. dense)	25	-	-	-	-	-	
	S2	10'-11.5'	Fill Material. (Silty clay with some gravel v. stiff).	19	-	-	-	-	-	

JOB 61-F-90

W.P. 144-60

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	S3	15'-16.5'	Fill Material. (Silty clay with some gravel v. stiff)	20	-	-	-	-	-	
	S4	20'-21.5'	" " " "	45	-	-	-	-	-	
	S5	25'-26.5'	" " " "	28	-	-	-	-	-	
	S6	30'-31.5'	Clayey silt, silty clay - (oxidized) stratified - v. stiff - brown.	27	-	-	-	-	-	
	S7	35'-36.5'	" " " "	26	-	-	-	-	-	
	S8	40'-41.5'	Clayey silt, silty clay - stratified with thin seams of fine sand. Stiff - grey.	10	-	-	-	-	-	
	T9	50'-51.5'	" " " "	Pushed	-	-	-	-	-	
	T10	60'-61.5'	" " " "	Pushed	43.5 29.4 25.7	- 19.8 19.4	- 34.7 26.9	- 945	- 124.9	
			S denotes split spoon sample. T " shelly tube sample.							

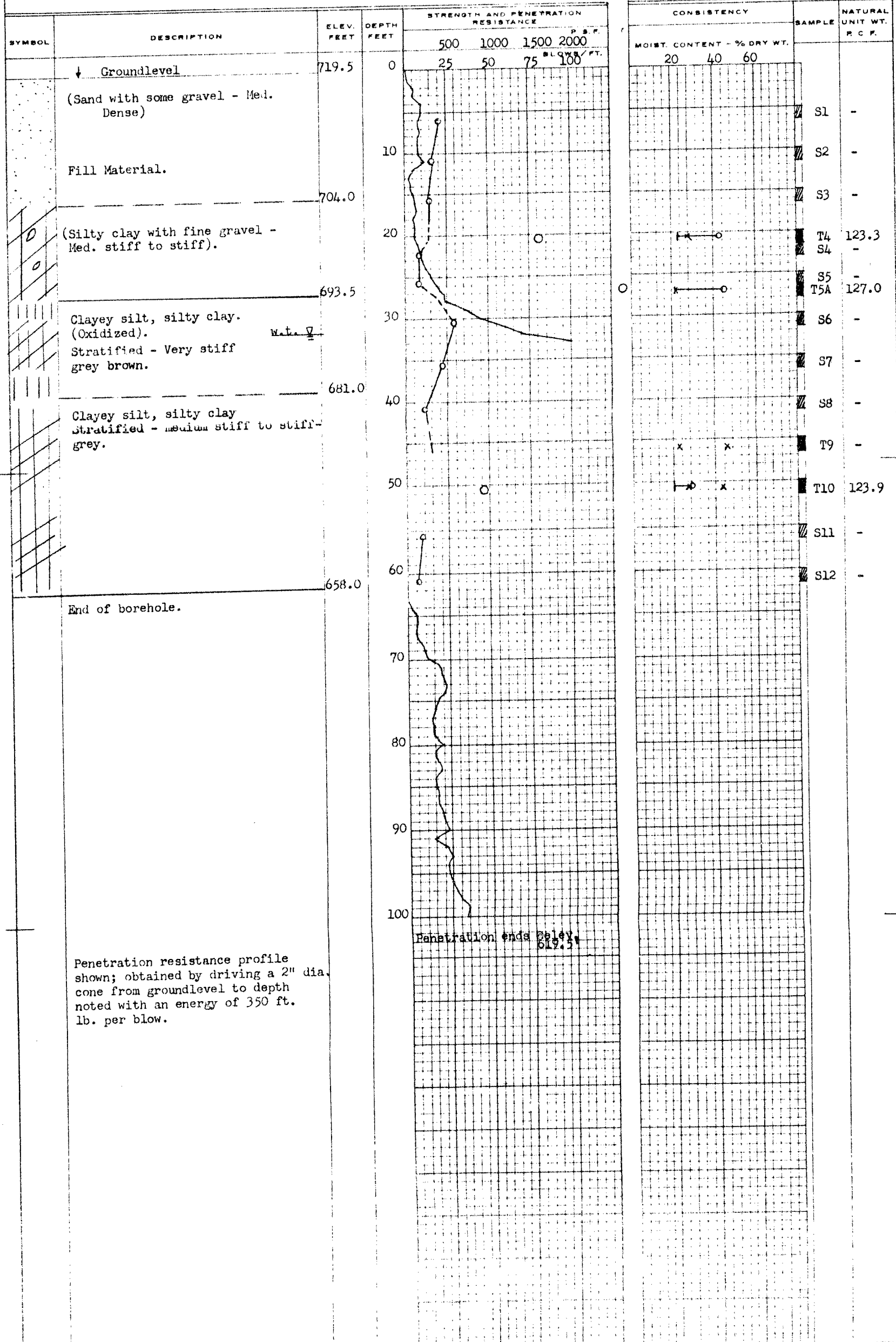
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 144-60 BORE HOLE NO. 1
JOB 61-F-90 STATION 4+57 (8' Lt.)
DATUM 719.5' COMPILED BY B.K.
BORING DATE Sept. 11/61. CHECKED BY V.K.

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) +s
NATURAL MOISTURE AND LIQUIDITY INDEX LI
LIQUID LIMIT X
PLASTIC LIMIT -



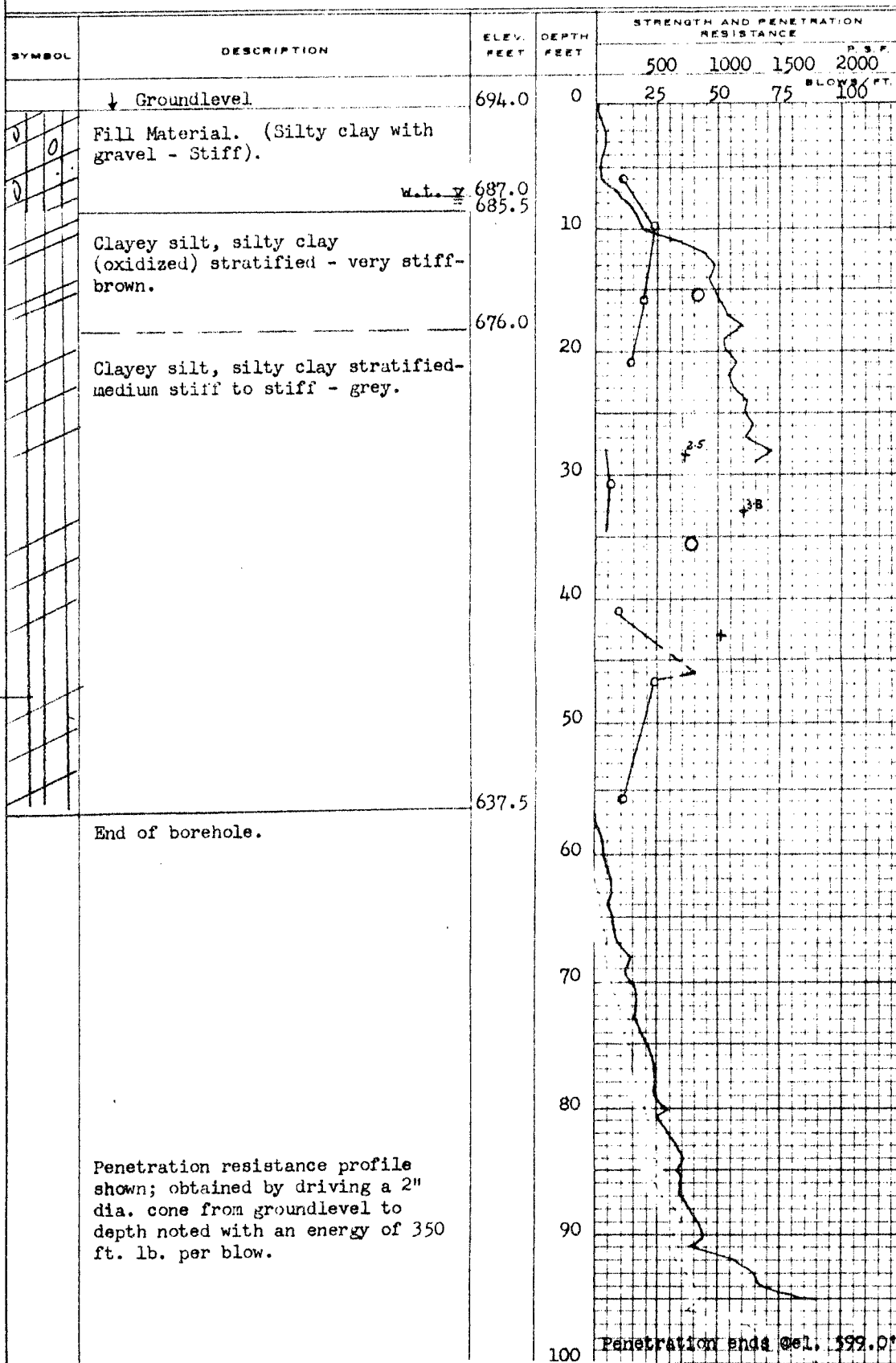
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 144-60 BORE HOLE NO. 2
 JOB 61-F-90 STATION 4+74 (33' Rt.)
 DATUM 694.0' COMPILED BY B.K.
 BORING DATE Sept. 18/61. CHECKED BY V.K.

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) +S
 NATURAL MOISTURE AND LIQUIDITY INDEX L
 LIQUID LIMIT X
 PLASTIC LIMIT -X



CONSISTENCY			SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.				
20	40	60		
			S1	-
			S2	-
			T3	123.0
			S4	-
			T5	-
			S6	-
			T7	119.9
			S8	-
			T9	-
			S10	-
			S11	-

DEPARTMENT OF HIGHWAYS - ONTARIO

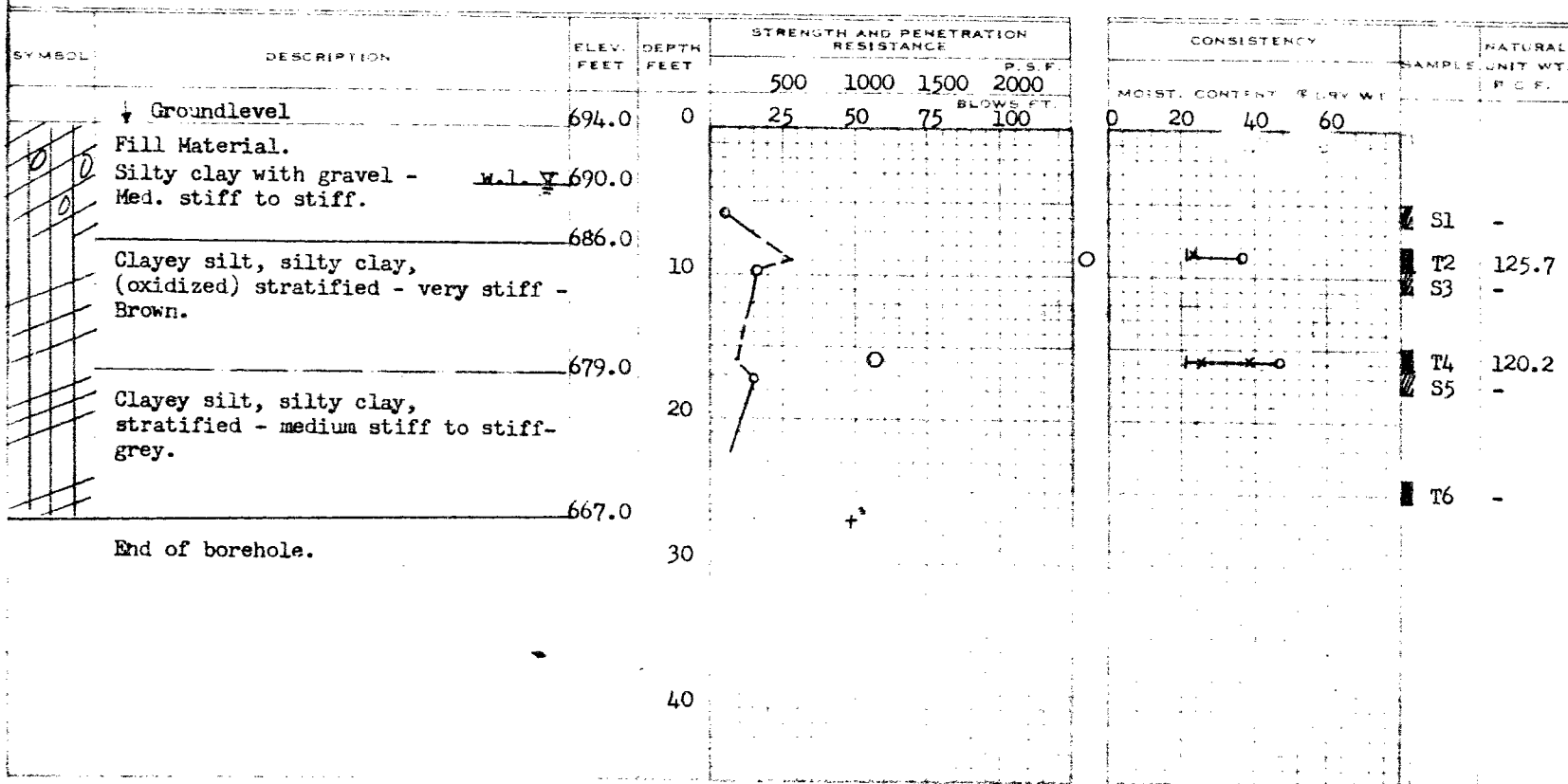
MATERIALS AND RESEARCH SECTION

W.P. 144-60 BORE HOLE NO. 3
 JOB 61-F-90 STATION 5408 (17' It.)
 DATUM 694.0' COMPILED BY B.K.
 BORING DATE Sept. 15/61. CHECKED BY V.K.

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

LEGEND

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

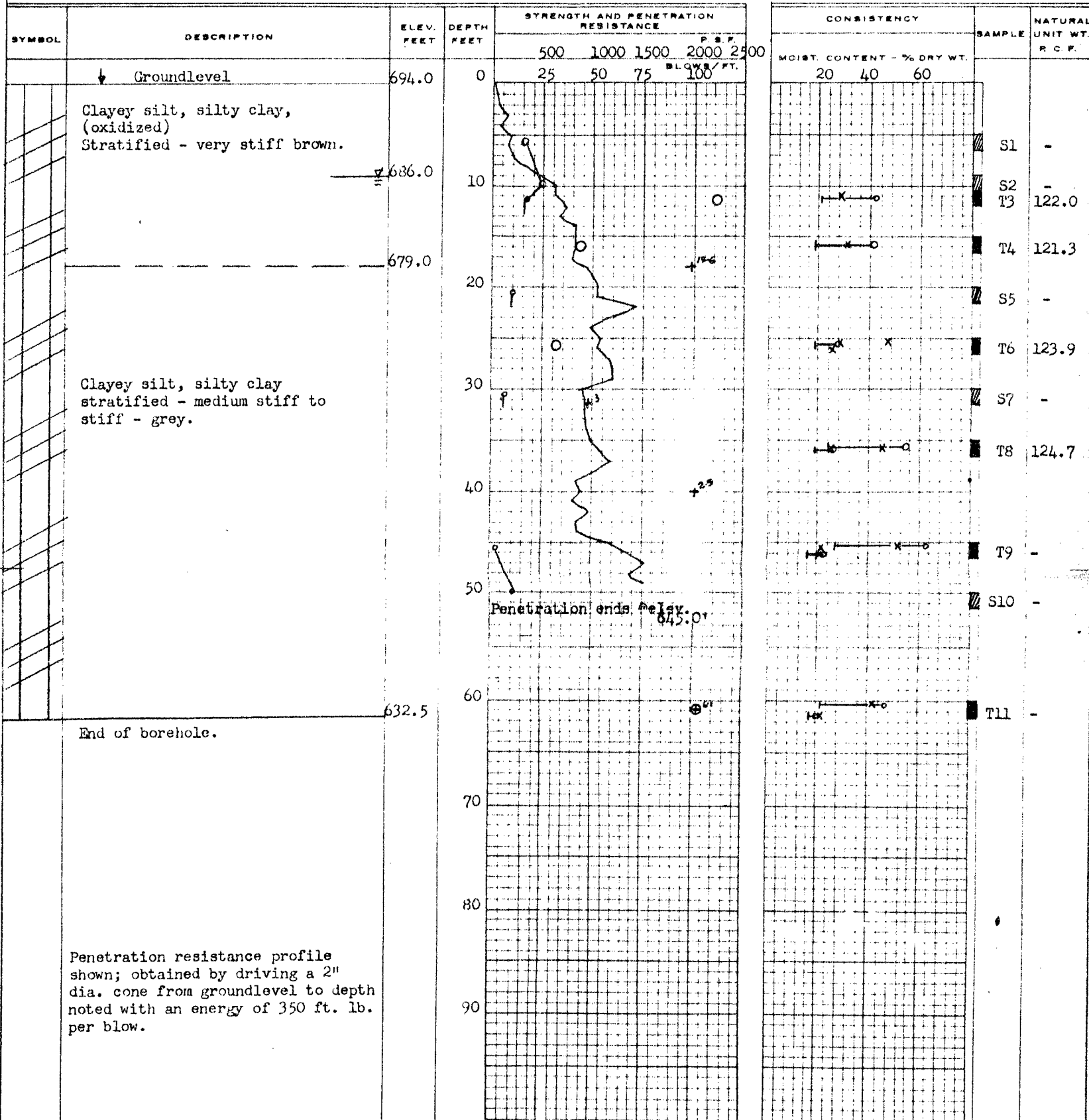


DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 144-60 BORE HOLE NO. 4
 JOB 61-F-90 STATION 5+56 (32' Lt.)
 DATUM 694.0' COMPILED BY B.K.
 BORING DATE Sept. 18/61. CHECKED BY V.K.

LEGEND

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



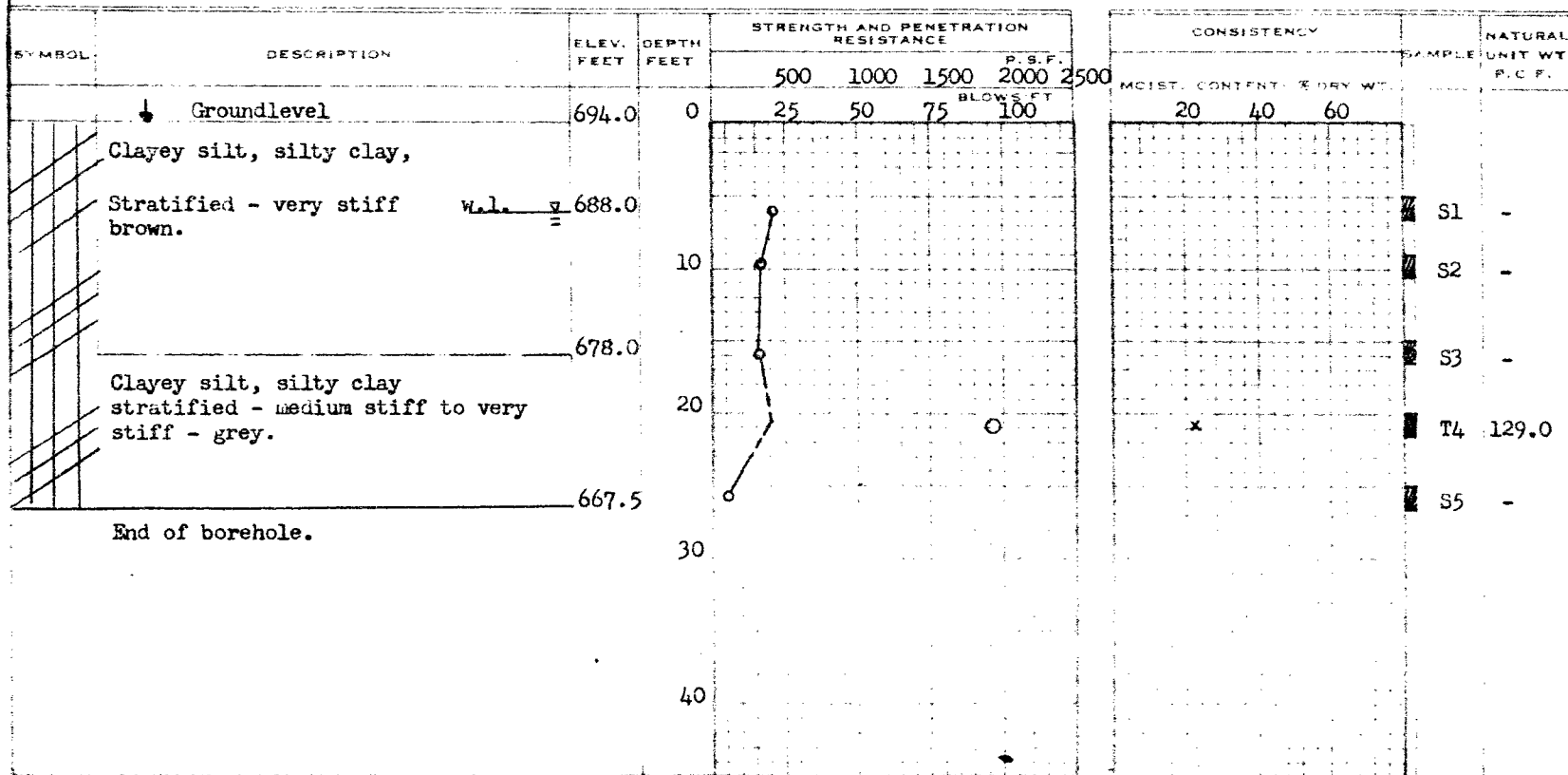
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 144-60 BORE HOLE NO. 5
JOB 61-F-90 STATION 5+27 (23' Rt.)
DATUM 694.0' COMPILED BY B.K.
BORING DATE Sept. 19/61. CHECKED BY V.K.

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) $+$
NATURAL MOISTURE AND LIQUIDITY INDEX \times
LIQUID LIMIT \bigcirc
PLASTIC LIMIT \bigcirc



DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 144-60 BORE HOLE NO. 6
JOB 61-F-90 STATION 5488 (E)
DATUM 720.0' COMPILED BY B.K.
BORING DATE Sept. 20/61. CHECKED BY V.K.

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)---	+ ^s
NATURAL MOISTURE AND	LI
LIQUIDITY INDEX -----	X
LIQUID LIMIT -----	○
PLASTIC LIMIT -----	⊥

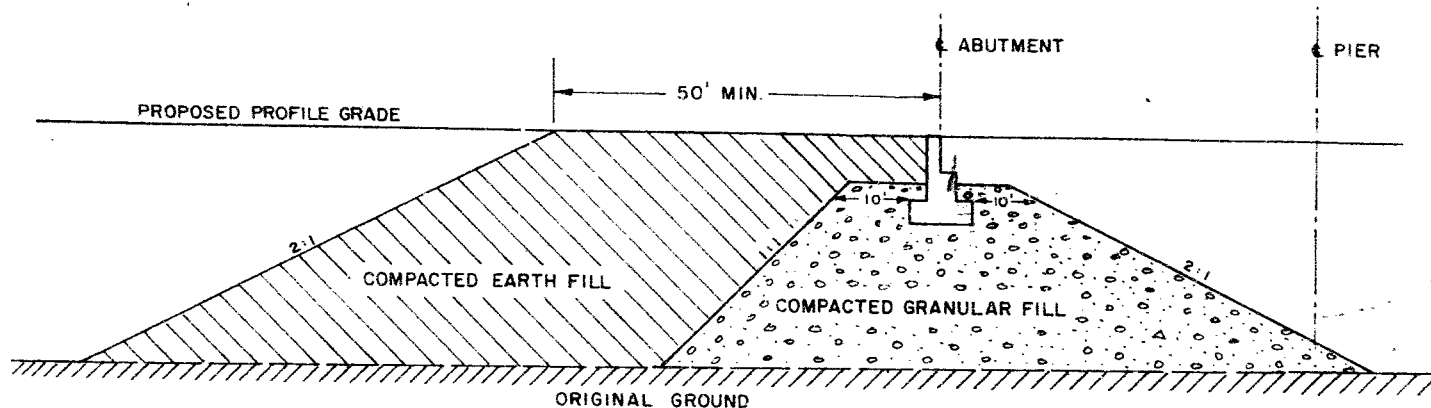
SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE			
				500	1000	1500	2000
				P.S.F.			
				BLOWS/FT			
	↓ Groundlevel	720.0	0	25	50	75	100
○	Fill Material. (Silty Sand with gravel) Med. dense.	712.0	10				
○	Fill Material. Silty clay with gravel - v. stiff)	696.0	20				
○	Clayey silt, silty clay (oxidized) Stratified - very stiff - brown.	682.0	30				
○	Clayey silt, silty clay stratified- medium stiff to very stiff - grey.	638.5	40				
	End of borehole.		50				
	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.		60				
			70				
			80				
			90				

CONSISTENCY			SAMPLE	NATURAL UNIT WT. P. C. F.
MOIST. CONTENT - % DRY WT.				
20	40	60		
			S1	-
			S2	-
			S3	-
			S4	-
			S5	-
			S6	-
			S7	-
			S8	-
			T9	
			T10	124.9

ORIGINATED M. Devito
 DRAWN H. D. Reed
 CHECKED *[Signature]*
 APPROVED *[Signature]*
 DATE 7 December 1961

DEPARTMENT OF HIGHWAYS - ONTARIO
 MATERIALS & RESEARCH SECTION
 APPROACH FILL DETAILS
 HIGHWAY NO. 403
 over
 TORONTO, HAMILTON & BUFFALO Rwy.

SCALE 1 inch = 20 feet
 W. P. NO. 144 - 60
 JOB NO. 61 - F - 90
 DWG. NO. 61 - F - 90 B



NOTES

- 1 - Structural details and elevations of footings should be as per Bridge Office drawings.
- 2 - All topsoil should be removed prior to placing the granular fill.
- 3 - Embankment should be constructed with granular fill and earth fill material as shown on above drawing.
- 4 - The granular fill and earth fill should be placed simultaneously and compacted as per current D.H.O. methods.
- 5 - Settlement plates (not shown on this drawing) will be placed by the Foundation Section in order to determine the time when the abutments may be constructed.

A. Stermac

Mr. J. Regan,
Construction Supervisor,
Hamilton District.

Materials & Research Division.

October 8th, 1963.

Hwy. #403, Cont. #63-03, Gravel Fill Foundation
under T.H. & B. and C.N.R. O'head Abutment.

This memo refers to discussions in the field with you on the morning of October 3rd, 1963, and with Mr. Tansley later that day.

Compaction check results are much too uneven. The percent Proctor compaction fluctuates between 100% and 90%, with an average to-date of just over 95%.

The specified compaction for these fills which will carry bridge abutments is 100%.

It appears to me that an improvement will not be achieved until fill operations are organized in such a manner that each layer is spread and rolled in its entirety before trucks dump further gravel for the next layer.

RS/hl

c.c. J. Tansley;
A. Stermac, ✓
T.J. Kovich,
Files.

R. Schonfeld

R. Schonfeld,
For: T.J. Kovich,
Regional Materials Engineer.

Mr. Stermac contacted R. Borton and re pointed out again strongly about the compaction operation is carried out at the above mentioned job. He also mentioned that Mr. Levata was here on 8th Oct/63 and observed that the compaction operation is going at a very rapid rate.

*Mr. Levata
Oct 14/63.*