

Mr. A. M. Toye,
Bridge Engineer,
Bridge Division.

Attention: Mr. S. McCombie

23-67-30
Mr. A. G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.

May 1, 1963

D.H.C. FOUNDATION INVESTIGATION REPORT --
Proposed Lynn River Bridge, Hwy. #6,
Town of Port Dover, Dist. #4, Hamilton.
W.J. 63-F-10 -- W.P. 50-62

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

We believe you will find the factual data and
recommendations contained therein, adequate for your future
design work. However, should additional information be
required, please feel free to call on our Office.

KYL/Wdef
Attach.

cc: Messrs. A. M. Toye (2)
H. D. McMillan
H. A. Tregaskes
G. K. Hunter (2)
R. G. Burnfield
H. Greenland
T. J. Kovich
A. Watt

KYL
K. Y. Lo,
SUPERVISING FOUNDATION ENGR.
For:
A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

Foundations Office
Gen. Files

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FOUNDATION INVESTIGATION

For

Proposed Lynn River Bridge, Hwy. #6,
Town of Port Dover, Dist. #4, Hamilton.

W.J. 63-F-10 -- W.P. 50-62

1. INTRODUCTION:

A request dated December 17, 1962, for a foundation investigation at the site of the proposed new bridge over the Lynn River in the Town of Port Dover (Scheme #2), was received from the Bridge Location Section.

A field investigation was carried out by this Section during December, 1962, and January and also at the beginning of March, 1963, to determine subsoil conditions at the site of the proposed structure. Presented in this report are the results of this investigation, together with recommendations pertaining to the design of structure foundations and approach embankments.

2. DESCRIPTION OF SITE:

The proposed structure site is located in the Town of Port Dover, approximately 140' north of the existing three-span structure which carries Hwy. #6 across the Lynn River. The site is located within the Norfolk Sand Plain physiographic region of Southern Ontario. The bedrock encountered is from the Delaware Formation. The topography of the area is generally undulating. The area is built up and at present, fishing tugs are moored at the proposed bridge location.

cont'd. /2 ...

3. FIELD INVESTIGATION PROCEDURE:

A total of 19 boreholes and 9 dynamic cone penetration tests was carried out during the course of the field investigation. Boring was achieved by means of conventional diamond drilling equipment adapted for soil sampling purposes. Rock core samples were obtained by means of an AXT core barrel. Undisturbed soil samples were obtained by means of 2-inch I.D. Shelby tubes, which were pushed manually into the soil. Disturbed samples were recovered by means of a standard 2" O.D. split-spoon sampler.

The locations and elevations of all boreholes are shown on Drawing No. 63-F-10A, which accompanies this report. All elevations are referred to a G.B.M. located in the deck of the existing structure.

4. LABORATORY TESTS:

Samples were visually examined and identified in the field as well as in the laboratory. Tests were carried out on various representative samples to determine the natural moisture contents and Atterberg Limits. Tests were also made on undisturbed cohesive samples to define the unconfined shear strength and density of the samples.

The results of these tests, together with the dynamic cone penetration results, are plotted on the attached borehole logs contained in the Appendix of this report.

cont'd. /3 ...

5. SUBSOIL CONDITIONS:

5.1) General:

The subsoil conditions at the site were found to vary considerably. The various soils encountered during the investigation are described under the following separate headings:

5.2) Silty Sand with Traces of Organics:

A stratum of silty sand with organics was encountered in all borings carried out on the east side of the river. This deposit was found immediately below the ground surface and ranges in thickness from 3 ft. to 4 ft. The relative density of the overall deposit may be described as loose.

5.3) Fill Material (Mixture of Silty Clay, Sand and Silt with Organics):

A stratum of fill material consisting of silty clay, sand and silt with traces of organics, was found immediately below the ground surface or below the topsoil in all the boreholes on the west side. The deposit averages 3 ft. to 4 ft. in thickness except in B.H. #16 where it is 7 ft.

5.4) Silty Clay to Clayey Silt:

This material was observed at varying depths and with varying thickness over the entire area of the site. The maximum thickness of this stratum encountered was on the east bank of the river where it underlies the silty sand deposit and extends to bedrock for an average depth of 18 ft. On the west bank of the river, the deposit occurred irregularly, both as regards stratigraphical position and thickness. Here, the maximum and minimum

cont'd. /4 ...

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

5.4) Silty Clay to Clayey Silt: (cont'd.) ...

thickness observed were 7 ft. and 3 ft., respectively. Between Station 338+90 and 339+60, two distinct layers of this deposit, were encountered, separated by organic clayey-silt, 3 ft. to 4 ft. thick.

Comparative laboratory results of Atterberg Limits, moisture contents and bulk densities for the silty clay and clayey silt portions, are given below:

Clayey Silt -

Liquid Limit	36% - 47%
Plastic Limit	16% - 25%
Moisture Content	20% - 42%
Bulk Density	110 p.c.f. - 126 p.c.f.

Silty Clay -

Liquid Limit	26% - 31%
Plastic Limit	15% - 21%
Moisture Content	20% - 30%
Bulk Density	119 p.c.f.

The Shear Strength and 'N' values for this deposit were determined to be as follows:

Shear Strength -

	<u>West Side</u>	<u>East Side</u>
a) In-situ Vane	300 - 950 p.s.f.	700 - 1900 p.s.f.
b) Unconfined Compression	250 p.s.f.	750 - 1250 p.s.f.
<u>'N' values</u>	2 - 10	5 - 14

Based on these values, the stratum is generally soft to firm on the west side and firm to stiff on the east side.

cont'd. /5 ...

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

5.5) Organic Clay or Silt with Sand (Muck):

This deposit was encountered in all borings carried out on the west bank of the river only, and immediately underlies the fill material in B.H.'s #15, 18 & 19, and the silty clay in B.H.'s #1, 2, 13, 16, 17, 20 & 21. The thickness of the deposit varies from 15 ft. at the river's edge to about 3 ft. some hundred feet to the west. The thickness at locations farther to the west increases somewhat irregularly, to a maximum of about 12 ft. within the limits of the investigation. The material may be described as organic clay or silt containing varying amounts of sand with a consistency ranging from very soft to stiff.

Tests carried out in the field and laboratory indicated the following physical properties:

Liquid Limit	59% - 116% (air-dry) 45% - 62% (oven-dry)
Plastic Limit	49% - 81% (air-dry) 26% - 51% (oven-dry)
Moisture Content	63% - 115%
Bulk Density	95 p.c.f. - 120 p.c.f.
Standard Penetration	2 - 7 blows/ft.
Unconfined Compression	440 p.s.f. - 1200 p.s.f.
Field Vanes	170 p.s.f. - 308 p.s.f.

5.6) Sand:

A thin layer of sand was encountered in all the boreholes carried out on the west side of the river. The deposit is underlain by the Limestone bedrock and averages 2 ft. to 3 ft. in thickness.

The relative density of this deposit, as ascertained from Standard Penetration tests, may be described as varying from very loose to loose.

cont'd. /6 ...

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

5.7) Heterogeneous Mixture of Clayey Silt, Sand and Gravel:

A stratum consisting of clayey silt, sand and gravel was found in B.H.'s #9 & #10, immediately above the bedrock. The thickness of the deposit varies from 2 ft. to 3 ft.

The Liquid Limit for this layer ranged from 17% to 21% - (average 19%), the Plastic Limit ranged from 11% to 14% - (average 12%), and the Moisture Content ranged from 8% to 16% - (average 12%).

Standard Penetration values (N) ranging from 11 to 25 blows/ft. were obtained in this deposit. These indicated that the relative density of this deposit is compact.

5.8) Limestone Bedrock:

The bedrock at this site has quite uniform characteristics and is classified as a bluish-grey dolomitic limestone with some chert. The limestone rock is of fine granulated material. It is bedded horizontally and varies very little in elevation. Its surface elevation ranges from 557 to 559 over most of the site, and is 562 at the east end (B.H. #11). The bedrock, although somewhat fissured, is quite sound, giving good recovery (average 88%) in all boreholes.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct a new high level bridge at this site to replace the existing draw bridge. The new centre line is located some 140 ft. north of the present one. The new bridge will be approximately 140 ft. long with three spans of 40 ft.,

cont'd. /7 ...

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

6.1) General: (cont'd.) ...

60 ft., and 40 ft. About 25 ft. of clearance will be provided over the navigable waterway. It is understood that perched abutments are proposed for this structure.

6.2) Structure Foundations:

a) Abutments - It is recommended that the abutments be supported on end-bearing piles driven to refusal on bedrock. A safe design load of 70 tons/pile may be used for 12 BP 7 $\frac{1}{2}$ H-piles. For the west abutment, piles should be driven through the fill material as described in Section "West Approach". It is recommended that the piles should be designed with a batter so as to resist any induced lateral thrust.

b) Piers - In view of the shallow overburden of the pier locations, it is recommended that spread footings founded on bedrock be used. A design load of 20 tons/sq.ft. may be used. A dewatering scheme will be necessary for the construction of the footings, as the water level is some 12 ft. to 14 ft. above the bedrock.

c) West Approach - With regard to the proposed west approach embankment, it is recommended that all organic clay-silt (muck) within the limits of the fill for a distance of about 60 ft. behind the abutment, be removed and replaced with suitable material. This is particularly important at the abutment location and should be completed as outlined above, before driving any piles. Analyses have been carried out to determine the stability of fill sections between Station 339+40 and Station 341+00, ranging in height from

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

6.2) Structure Foundations: (cont'd.) ...

c) West Approach - (cont'd.) ...

9 ft. to 18 ft. with top embankment width of 44 ft. and side slopes of 2 horizontal to 1 vertical. On the basis of this analysis, it was concluded that counterbalancing berms would be required for fills exceeding 9 ft. in height for embankment stability. The required height and length of the berms are given on Dwg. 63-F-10(B). The embankment, including the berms, should be considered as a composite section and constructed simultaneously. Elsewhere, the embankment may be constructed according to standard D.H.O. procedures using 2:1 slopes. It is expected that some differential settlements will occur because of the variable compressible nature and extent as well as thickness of the muck deposit. To remove all the organic materials beyond 60 ft. behind the abutment would involve a very costly excavation operation and, therefore, it is recommended that final paving of the embankment be delayed for a period of one year so as to minimize future maintenance problems.

d) East Approach - At the east approach of the structure no stability problems are anticipated provided standard 2:1 slopes are used for the embankment.

7. SUMMARY:

It is proposed to build a new bridge at the crossing of Hwy. #6 and the Lynn River in the Village of Port Dover.

Subsoil at the site consists of various heterogeneous deposits of sand, clay, and muck which are underlain by limestone bedrock.

cont'd. /9 ...

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

Recommendations pertaining to the structure foundations and approach embankments are as follows:

- 1) The abutments should be supported on H-piles driven to bedrock.
- 2) The piers should be supported on spread footings founded on bedrock with a design load of 20 t.s.f.
- 3) The organic clay-silt deposits should be removed within a distance of 60 ft. behind the west abutment at the west approach embankment and replaced with suitable fill. This operation should be carried out before driving any piles.
- 4) Berms are required for fills exceeding 9 ft. in height between Station 339+40 and Station 341+00. The length and height of berms are indicated on Dwg. 63-F-10(B).
- 5) For the remainder of the west approach where organic deposits exist, it is recommended that final paving be delayed for a period of one year, to minimize future maintenance problems.

8. MISCELLANEOUS:

The field work, partly performed in January, and partly in March 1963, together with the preparation of this report, was undertaken by Mr. R. Magi, Project Foundation Engr. The investigation was carried out under the general supervision of Mr. M. Devata, Senior Foundation Engr., who also reviewed this report.

Equipment was owned and operated by Dominion Soil Investigation, Ltd. of Toronto.

April 1963

APPENDIX I.

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL. THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS:-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

SOIL TESTS

Q _u	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Q _{cu}	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q _d	DRAINED TRIAXIAL	S	SENSITIVITY

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_p	PLASTIC LIMIT
I_p	PLASTICITY INDEX
s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I_C	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
C_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
T_v	TIME FACTOR = $\frac{C_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_s	SENSITIVITY

GENERAL

π	-3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
$\bar{\sigma}$	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

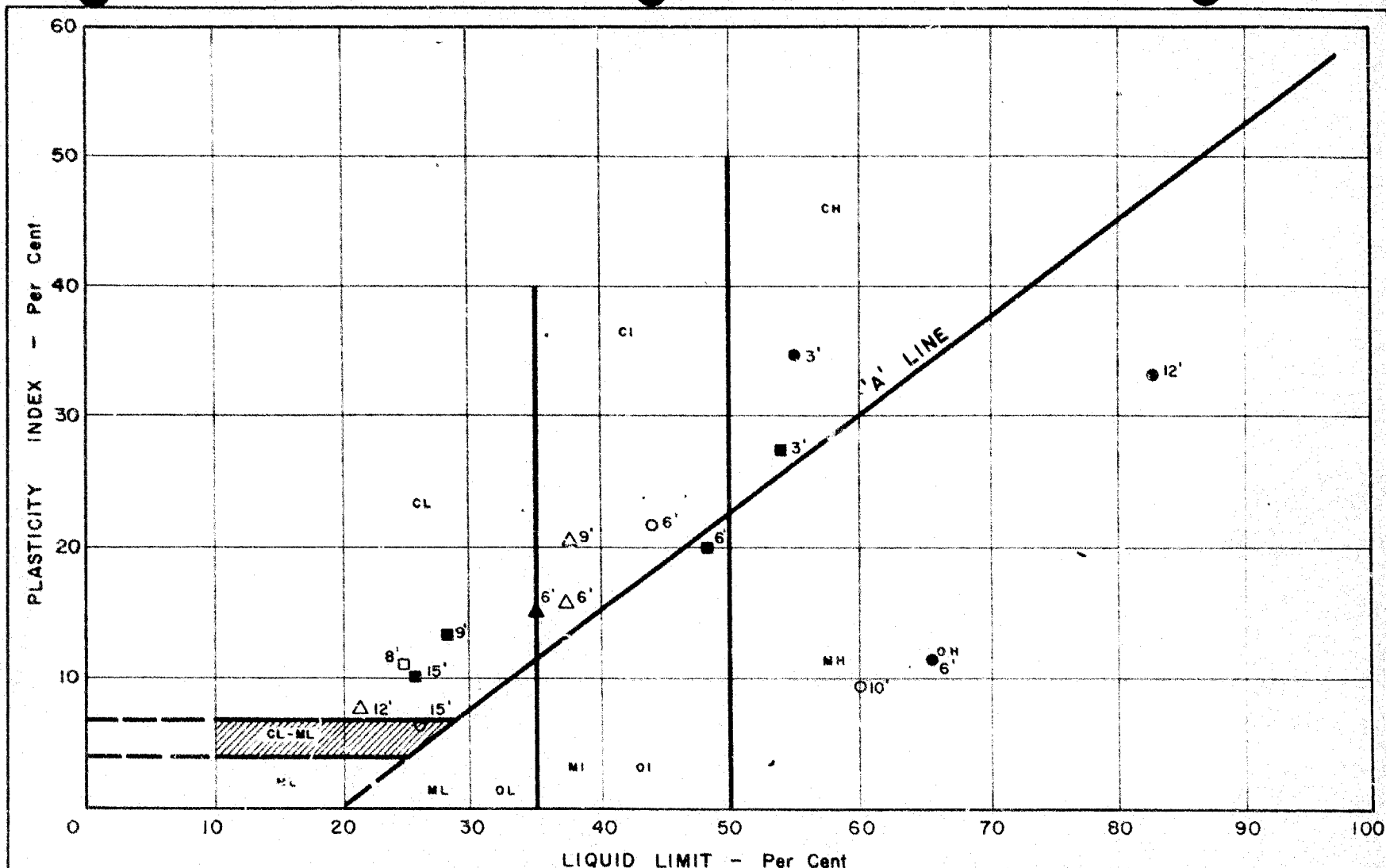
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL



NOTES

- | | |
|--------------|--------------|
| ● B.H. NO. 1 | ▲ B.H. NO. 8 |
| ○ B.H. NO. 2 | △ B.H. NO. 9 |
| ■ B.H. NO. 3 | |
| □ B.H. NO. 7 | |

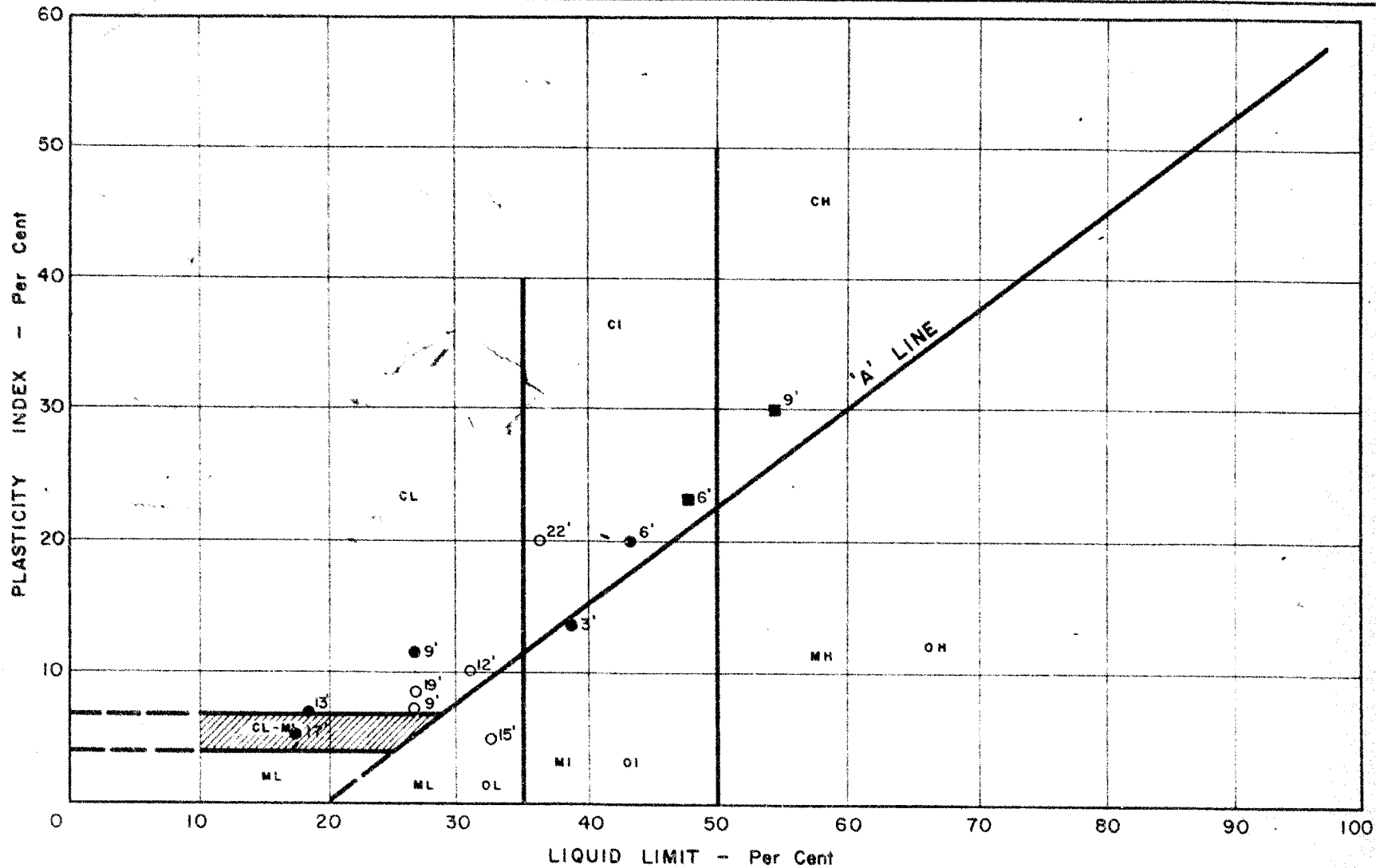
DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & RESEARCH DIVISION

PLASTICITY CHART

Job No. **63-F-10** W.P. No. **50-62**

Location PORT DOVER



NOTES ● B.H. NO. 10

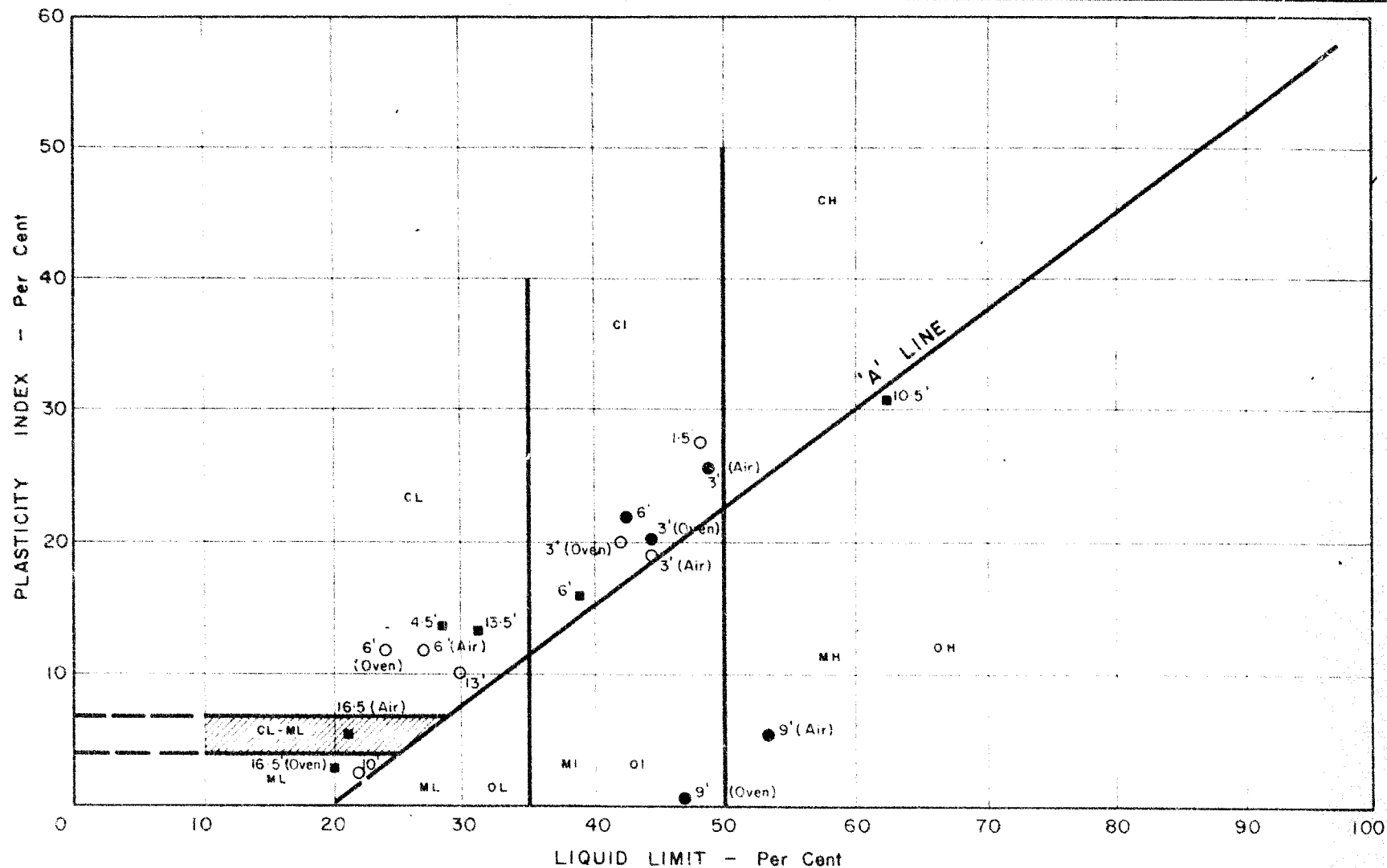
○ B.H. NO. 11

■ B.H. NO. 13

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION
PLASTICITY CHART

Job No. 63-F-10 W.P. No. 50-62

Location PORT DOVER

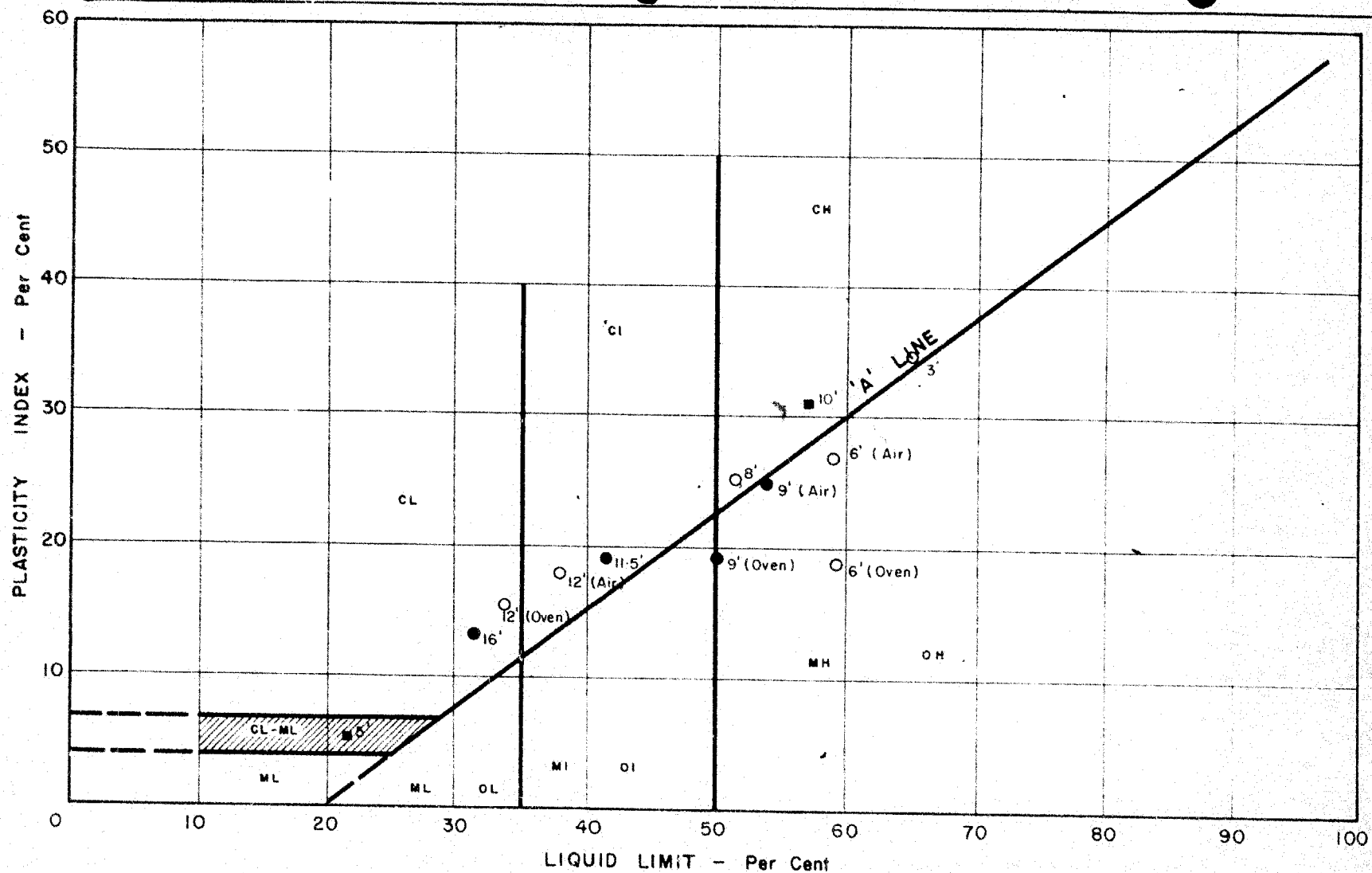


NOTES

- - Bore Hole No. 14
- - " " " 15
- - " " " 16

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION
PLASTICITY CHART

Job No. 63-F-10 W.P. No. 50-62
Location PORT DOVER

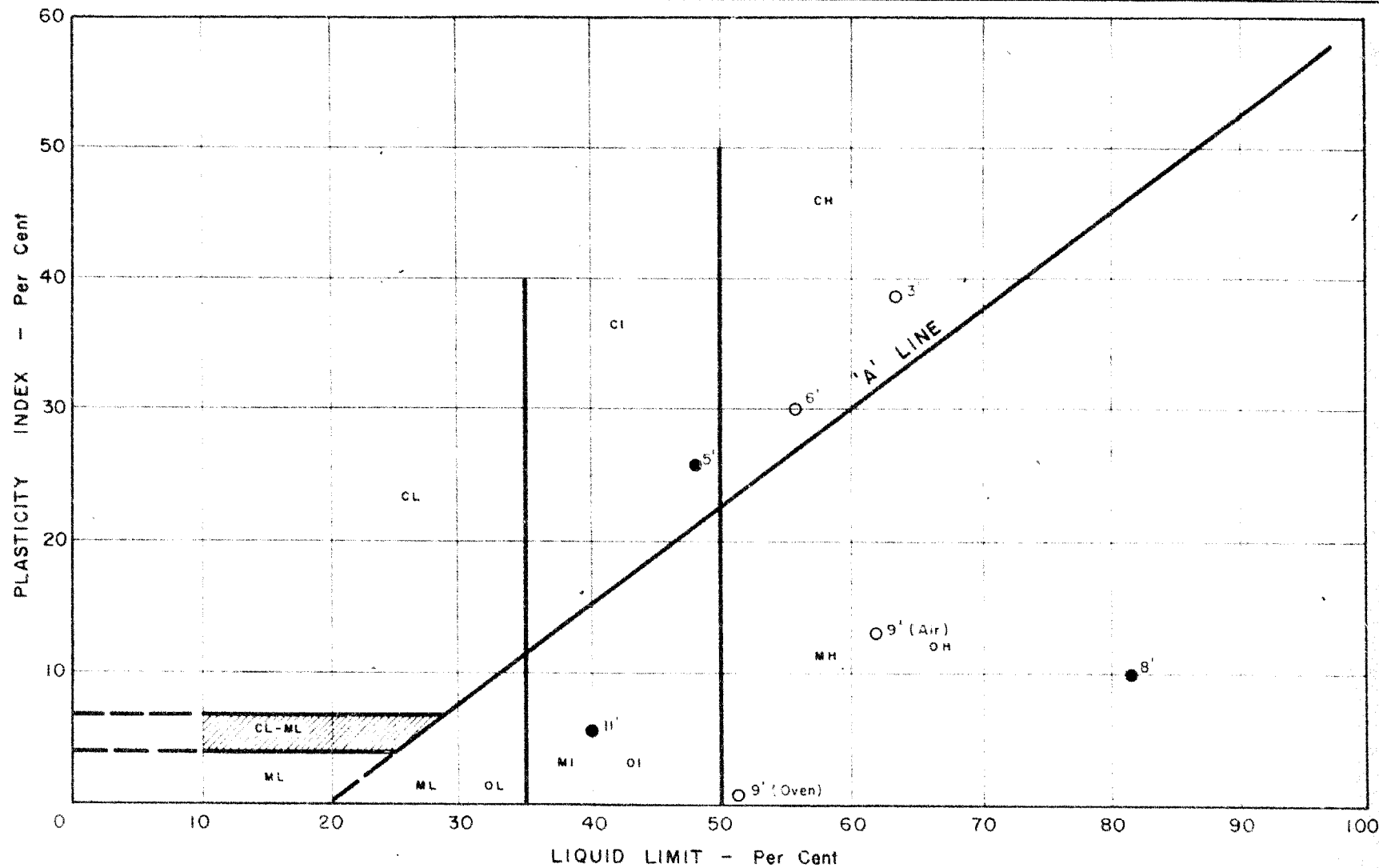


NOTES

- - Bore Hole No. 17
- - " " " 18
- - " " " 19

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION
PLASTICITY CHART

Job No. 63-F-10 W.P. No. 50-62
Location PORT DOVER



NOTES

● - Bore Hole No. 20

○ - " " " 21

 DEPARTMENT OF HIGHWAYS - ONTARIO
 MATERIALS & RESEARCH DIVISION
 PLASTICITY CHART

Job No. 63-F-10

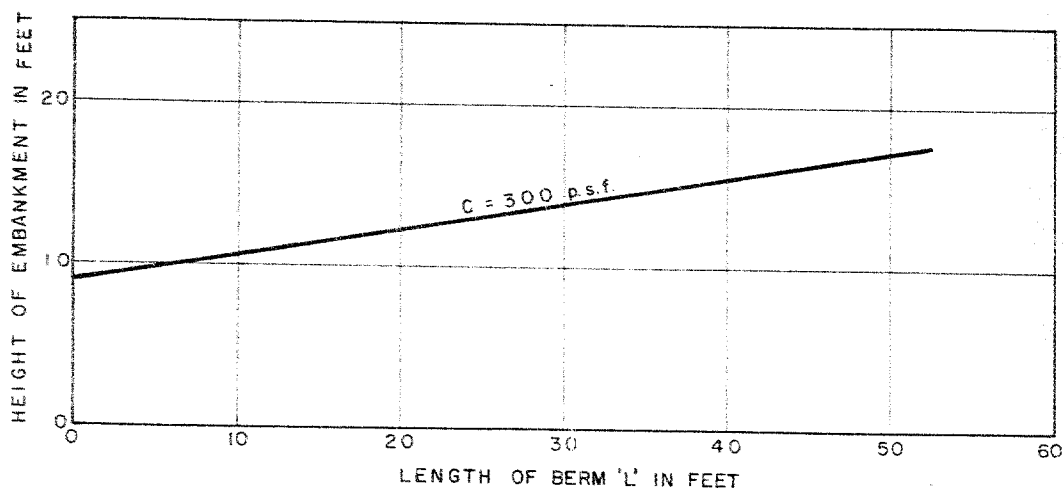
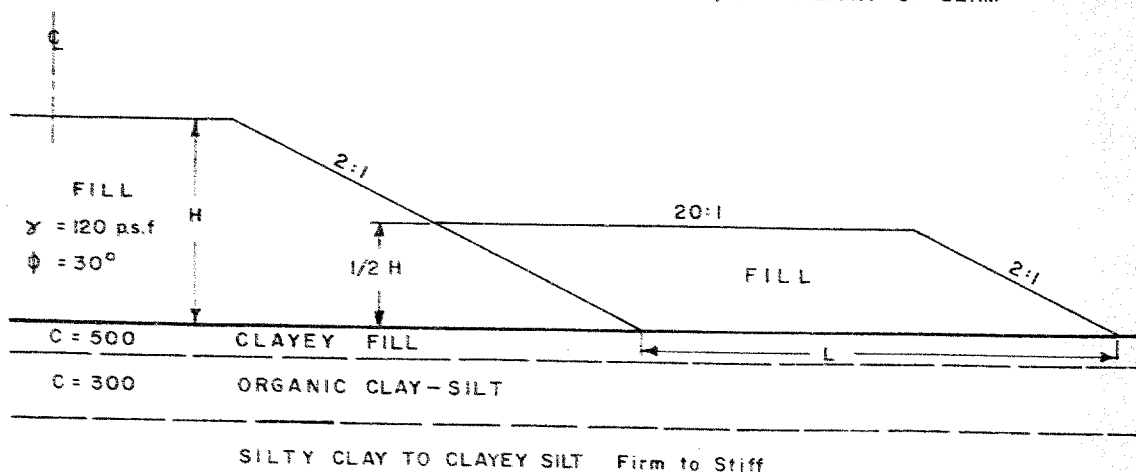
W.P. No. 50-62

Location PORT DOVER

L = LENGTH OF BERM

H = HEIGHT OF APPROACH FILL

$\frac{1}{2} H$ = HEIGHT OF BERM



(BASED ON FACTOR OF SAFETY 1.3)

ORIGINATED R. MAGI

DRAWN D. MUMFORD

CHECKED *H.S.*

APPROVED *M. Swartz*

DATE 7 MAY 1963

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & RESEARCH SECTION

FILL STABILITY FOR HIGHWAY NO. 6
WEST APPROACH STA. 339+40 to 341+00

PORT DOVER

SCALE

W. P. NO. 50 - 62

JOB NO. 63-F-10

DWG. NO. 63-F-10 B

Toronto Regional Road Design Office,
Central Building, Downsview, Ontario.
August 27, 1965.

Memorandum for:

Mr. H. Mosher,
Asst. Scheduling Supervisor,
Scheduling Section,
Admin Bldg.

Re: W.P.50-62. Highway 6. Lynn River
Structure and Approaches in Fort
Dover. District 4, Hamilton.


Following a field inspection of the site by Mr. G.M. Hunter and the writer, we wish to bring to your attention certain points in connection with this project.

1. As pointed out in the Functional Planning Report, the recommended scheme is entirely dependent on the removal of the C.N.R. spur lines in the area. We understand that a C.N.R. approval has not been received to date. We assume that the Functional Planning Section will continue their work to obtain the approval. In the meantime, it may be advisable to hold the final design of the bridge and to postpone the preparation of the contract drawings.
2. The Foundation Investigation Report recommends delaying for one year the final paving on the west approach to the structure, where uneven settlements are expected due to the nature of the subsoil. We believe that this could be best achieved by calling first a contract for the work of structure, grading of approaches (between Grand St. and St. Patrick St.), and granular backfill to structure, in 1966. Completion of the project would be done under a second contract, which could be combined with the paving contract on the section of Highway 6 from the east limits of Fort Dover north-easterly (in 1967). The same section is scheduled for a grading and granular base contract in 1966, under W.P.164-61.

May we have your comments please.

JCC:SC

c.c. R. Burnfield.
F. DeVisser.
A. Sternac. ✓


J. G. CHALMERS.
Project Design Engineer,
for.
G. E. HUNTER.
Senior Project Design Engineer.

MEMORANDUM

To: Mr. A. Stermac
Principal Foundations Engineer
Lab. Eldg.

FROM: F. DeVisser

DATE: October 8, 1963

OUR FILE REF.

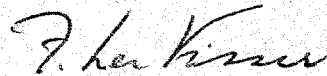
IN REPLY TO

SUBJECT: W.P. 50-62
Lynn River at Port Dover
Hwy 6 and 24 District 4

Enclosed please find one print of preliminary
plan D5314-P2 for the subject structure.

Would you please let me have your comments.

FDeV/kd



F. DeVisser
Bridge Location Eng.

Copy for the information of

Mr. A. Stermac, Principal Foundation Engineer,
Room 107, Lab. Building

Mr. A. Watt,
Regional Bridge Location Engineer,
London Regional Office,
London, Ontario

Bridge Division,
Downsview, Ontario

April 28, 1967

Lynn River Bridge in Port Dover
W.P. 50-62, Site No. 20-89
Hrys. 6 & 24, District No. 2

Attached herewith are prints of the Preliminary Bridge Plan Drawing D5314-F1 for the above-mentioned structure. The cost of the structure will be available shortly.

Any comments or revisions you may have should be submitted within three weeks.

CSG:rd

C.S. Grebaki,
Bridge Design Engineer

Attach.

c.c. S. McCombie
A. Stermac
R. Forrest
E. Cross

Mr. C. S. Grebski,
Bridge Design Engineer,
Bridge Division,
Admin. Bldg.

Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

May 25, 1967

Lynn River Bridge in Port Dover,
W.P. 50-62, Site No. 20-30,
Rwy. 6 & 24, District #2 (London).

We have reviewed the Preliminary Bridge Plan Drawing No. D 5314-F1 for the above mentioned structure, and submit the following:

1) Regarding the structure foundations, the designer appears to have complied with our recommendations.

2) In our Foundation Report (W.J. 63-F-10), it was recommended that all the organic clay - silt within the limits of the fill for a distance of about 60 ft. behind the west abutment, be removed and replaced with suitable material. It was also recommended that berms be constructed for fills exceeding 9 ft. in height for embankment stability between Sta. 339+40 and Sta. 341+00. We presume that these details will be incorporated in the road design drawings prepared by the Regional Road Design Section.

MD/WdeF

cc: Messrs. S. McCosbie
A. Gater
A. P. Watt
J. Roy

Foundations Files
Gen. Files

M. Devata
M. Devata,
SUPERVISING FOUNDATION ENGR.
For:
A. C. Sternac,
PRINCIPAL FOUNDATION ENGR.

Department of Highways Ontario

Copy for the information of

Mr. A. Stermac,

Principal Foundation Engineer

Mr. A.P. Watt,

Reg. Bridge Location Engineer,
London Regional Office,
London, Ontario

Bridge Division,
Downsview, Ontario

June 30, 1967

W.P. 50-62, Site 20-80
Lynn River Bridge in Port Dover
Highway 6, District No. 2

We will increase the bottom of channel width to 70 feet provided the Foundation Section is satisfied with the stability of the slopes. The new slopes will be $1\frac{1}{2}$ to one above the water line and 2:1 below.

This project is due for completion within the next few days; please do not request any more changes.

BSR:rd

B.S. Richardson,
Regional Bridge Project Engineer

c.c. A. Stermac

J. Harris

R. Forrest

A. Kelly

Would you let me know if this is O.K?

B.S.R.

*OK with us! By phone June 30/67
Afternoon*

Re: Investigation
of Structure
Foundations At
Lynn River BR.
Port Dover

Mr. H. C. Dernier,
District Engineer,
District #2 (LONDON).

Foundation Section,
Materials & Testing Office,
Room 107, Lab. Bldg.

Mr. H. Greenly,
Construction Engineer

December 20, 1968

Your Memo -- Dec. 18/68

Re: Contract 68-30, Investigation
of Structure Foundations at
Lynn River Bridge, Port Dover.

10-6-1

63-F-10

Attached to your memo of December 18, 1968, was the invoice for \$245.00 submitted by McLean-Foster Construction Limited, for moving the drilling rig at the above mentioned site.

This work was indeed carried out for us - i.e., for the Foundation Section when we were checking the rock conditions within the footing excavations. However, this work was carried out upon the request by the District, and we would therefore think that this payment should be made by the District out of funds available in the contract for such contingencies.

This procedure has always been followed in the past when this Section carried out additional investigations during the execution of the contract.

We are therefore returning the above mentioned invoice which we have signed, acknowledging that the work was carried out.

AGS/MdeF

A. G. Sternac
A. G. Sternac
PRINCIPAL FOUNDATION ENGINEER

cc: Foundations Files ✓

Gen. Files

MEMORANDUM

To: Mr. A. G. Stermac,
Principal Foundation Engineer,
DOWNSVIEW.

FROM: Mr. H. H. Greenly,
Construction Engineer,
LONDON.

ATTENTION:

DATE: December 18, 1968.

OUR FILE REF.

IN REPLY TO

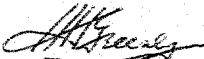
SUBJECT:

: Contract 68-30, Investigation
of Structure Foundations at
Lynn River Bridge, Port Dover.

Enclosed is an invoice from McLean-Foster Construction Limited for moving machinery for Master Soils Investigations Limited, the company hired by your section to investigate the abutment foundations. Since your Supervisor negotiated with the Contractor for these moves, I assume you want this invoice.

We note that this invoice had been received by Section 75 on December 17; I assume this is not your section.

HHG/jw
Encl.


H. H. Greenly,
Construction Engineer.
for
H. C. Dernier,
District Engineer.

McLEAN-FOSTER CONSTRUCTION LIMITED

CONCRETE STRUCTURES AND CULVERTS

Queen St. West

Phone 284-2580

St. Marys

Dec. 16

1948

NOTE & FILE	
DISCUSS WITH ME	
PLEASE ANSWER	
NOTE & RETURN TO ME	
INVESTIGATE & REPORT	
TAKE APPROPRIATE ACTION	
SHOW ME REPLY BEFORE MAILING	

Accounting Department,
Department of Highways,
Downsview, Ont.

ATTN: MR. H.C. DERNIER

ATTENTION: Mr. Conking

RE: Contract No. 68-30
Rock Drilling

Dear Sir:

Below is our invoice for work performed, moving machinery for Master Soils Investigations Ltd. while they were investigating the rock at the above project. Each move was based on a flat rate of \$35.00 per move.

Nov. 6	1 move
7	1 move
8	2 moves
11	1 move
13	1 move
15	1 move
<hr/>	
7 moves @ \$35.00	

\$245.00

Yours sincerely,

Robert M. Taylor
Robert M. Taylor
im

Agstomare
PRINCIPAL FOUNDATION ENGINEER

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

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 63-P-10 LOCATION Port Dover ORIGINATED BY R.M.
 W.P. 50-62 BORING DATE Jan. 23, 1963. COMPILED BY R.M.
 DATUM 573.6 BOREHOLE TYPE Washboring CHECKED BY G.M.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		0	10	20	30	40	w_p	w	w_L		
573.6	Groundlevel															
572.6	Topsoil															
570.6	Silty clay, sand and silt with organics. (Fill Material)															
568.6	Silty clay and clayey silt. Soft to Firm.		1	SS	5	570										
565.0	Organic clay-silt containing pockets of silt and sand.		2	SS	3											
	Soft		3	SS	2											
			4	SS	2	560										
			5	SS	2											
558.6	Sand -															
557.5	Very loose.															
556.1	Bluish grey Fine granular Limestone Bedrock		6	RC												
552.5	End of borehole.					550										
21.1																

Refusal

AXT core
barrel
Rec. #962

FOUNDATION SECTION

JOB 63-F-10	LOCATION Port Dover	ORIGINATED BY R.M.
W.P. 50-62	BORING DATE Jan. 25, 1963.	COMPILED BY R.M.
DATUM 575.3	BOREHOLE TYPE Washboring	CHECKED BY G.M.

SOIL PROFILE			SAMPLES	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIMIT LIQUID ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W	BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER TYPE	BLOWS / FOOT		P.C.F.	
575.3	Groundlevel						
574.3	Topsoil						
1	Silty clay, sand and silt with organics.		1 SS 5				
570.3							
5.0	Silty clay		2 SS 2				
567.3	Soft						
8.0							
	Organic clay - silt with sand (Muck).		3 SS 2				
	Soft		4 SS 2				
559.2							
16.0	Sand		5 SS 6				
557.4	Loose to comp.		6 SS 22				
17.9	End of borehole. (Bedrock)						

FOUNDATION SECTION

CHECKED BY

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 63-F-10 LOCATION Port Dover ORIGINATED BY R.M.
W.P. 50-62 BORING DATE Jan. 28, 1963. COMPILED BY R.M.
DATUM 578.0 BOREHOLE TYPE Cone Penetration CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT	0	10	20	30	40		
578.0	Groundlevel					580								
577.0	Topsoil													
569.0	Probably silty clay.													
569.0														
558.7	Probably clayey silt.													
558.7														
19.3	End of borehole. (Bedrock)													

Refusal

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 63-F-10 LOCATION Port Dover ORIGINATED BY R.M.
W.P. 50-62 BORING DATE Jan. 29, 1963. COMPILED BY R.M.
DATUM 570.1 BOREHOLE TYPE Washboring CHECKED BY /

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT — WL	PLASTIC LIMIT — WP	WATER CONTENT — W	BULK DENSITY P C F	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.	WP	W	WL		
570.1 0	Water					570						
560.9 9.2	Fine to med. sand with organics.		1	CS		560						Sample rec'd from EX casing.
558.3 11.8	Bluish grey Fine granulated Limestone Bedrock		2	RC								AXT core barrel Rec.=73%
553.8 16.3	End of borehole.					550						

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 63-F-10 LOCATION Port Dover ORIGINATED BY R.M.
W.P. 50-62 BORING DATE Jan. 29, 1963. COMPILED BY R.M.
DATUM 570.1 BOREHOLE TYPE Washboring. CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — WL			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT — WP	WATER CONTENT — W	WATER CONTENT %		
								WP — W — WL		25 50 75	P.C.F.	
570.1 0	Water				570							
561.0 9.1	Fine to med. sand with org. ics.		1	CS	560							Sample rec'd from BX casing.
558.1 12.0	Bluish grey fine granulated Limestone Bedrock		2	KC								AXT core barrel Rec. = 86%
553.1 17.0	End of borehole.				550							

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 8

FOUNDATION SECTION

JOB 63-F-10 LOCATION Port Dover ORIGINATED BY R.M.
W. 50-62 BORING DATE Jan. 30, 1963. COMPILED BY R.M.
DATUM 570.1 BOREHOLE TYPE Washboring CHECKED BY

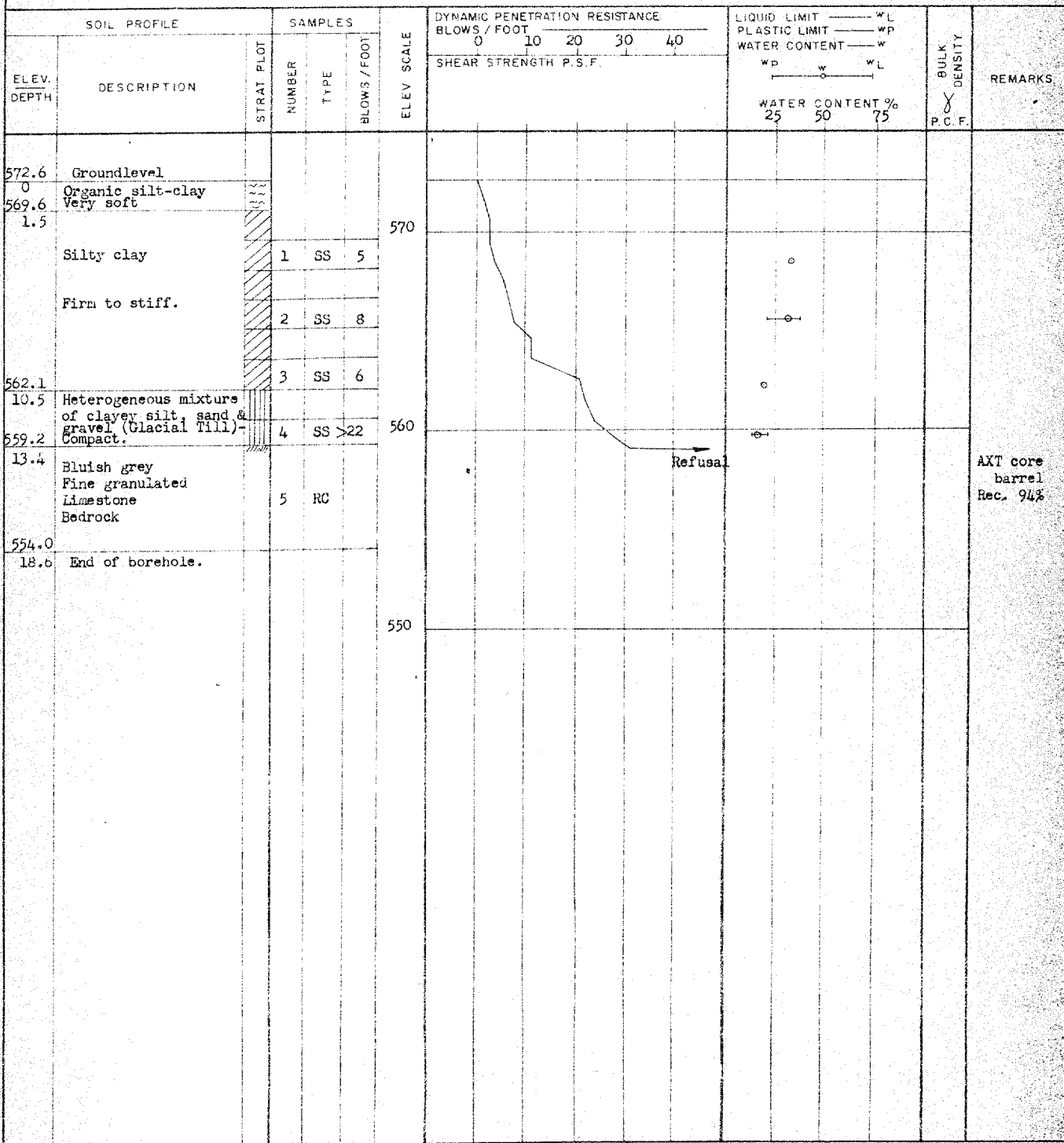
SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.			WP	W	WL		
570.1 0	Water					570								
564.4 5.7	Silty clay Stiff		1	CS		560								Samples recovered from BX casing.
			2	SS										
559.4 10.7	Bluish grey fine granulated Limestone Bedrock		3	RC										AXI cora barrel Rec. 85%
553.4 16.7	End of borehole. (Bedrock)					550								

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 9

FOUNDATION SECTION

JOB 63-F-10 LOCATION Port Dover ORIGINATED BY R.M.
W P 50-62 BORING DATE Jan. 31, 1963. COMPILED BY R.M.
DATE 572.6 BOREHOLE TYPE Washboring CHECKED BY

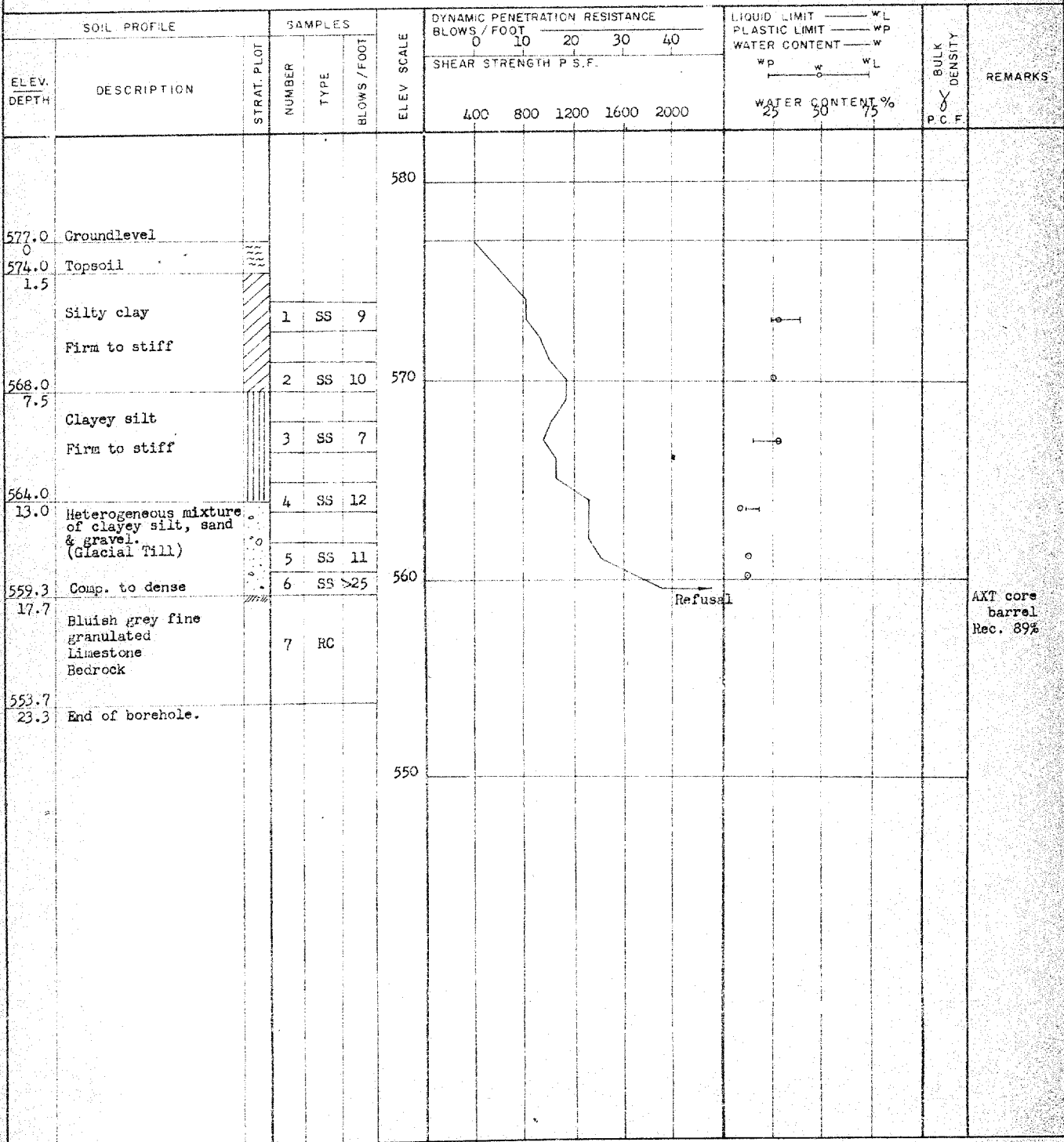


DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 10

FOUNDATION SECTION

JOB 63-F-10 LOCATION Port Dover ORIGINATED BY R.M.
W.P. 50-62 BORING DATE Feb. 1, 1963. COMPILED BY R.M.
DATUM 577.0 BOREHOLE TYPE Washboring CHECKED BY [Signature]

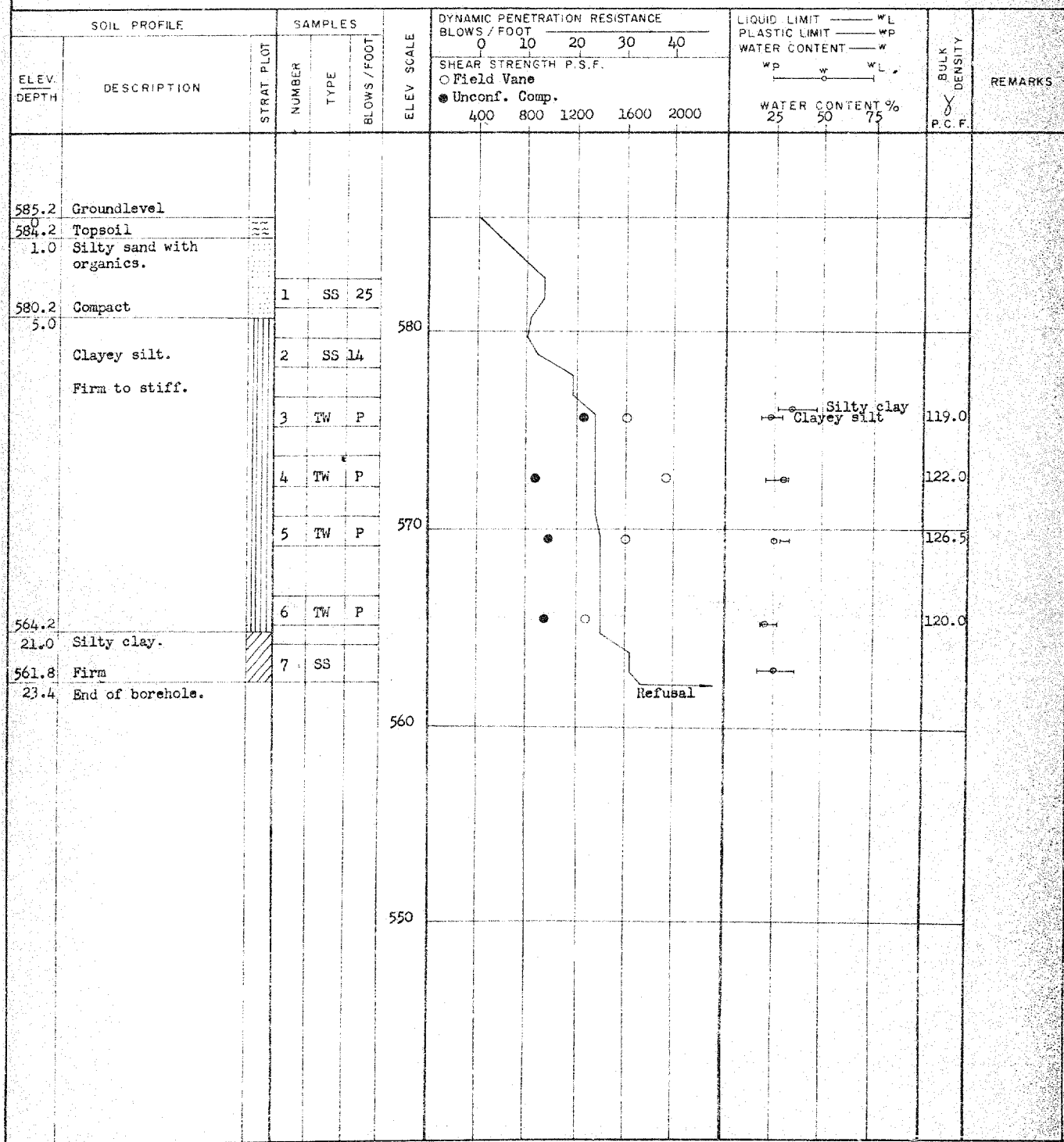


DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 11

FOUNDATION SECTION

JOB 63-F-10 LOCATION Port Dover ORIGINATED BY R.M.
 W.P. 50-62 BORING DATE Feb. 5, 1963. COMPILED BY R.M.
 DATUM 585.2 BOREHOLE TYPE Auger Boring. CHECKED BY



RECORD OF BOREHOLE NO. 12

FOUNDATION SECTION

JOB 63-F-10

LOCATION Port Dover

ORIGINATED BY R.M.

W P 50-62

BORING DATE Feb. 5, 1963.

COMPILED BY R.M.

DATUM 574.3

BOREHOLE TYPE Cone Penetration

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 13

FOUNDATION LOCATION

JOB 63-P-10 LOCATION Port Dover ORIGINATED BY R.M.
 W. P. 50-62 BORING DATE Feb. 5, 1963. COMPILED BY R.M.
 DATUM 574.5 BOREHOLE TYPE Auger Boring. CHECKED BY G.M.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.					WP	W	WL		
							0 10 20 30 40 400 800 1200 1600 2000					25 50 75 WATER CONTENT %				
574.5	Groundlevel															
573.5	Topsoil															
1.0	Silty clay, sand and silt with organics.															
571.5			1	SS	10	570										
3.0	Clayey silt to silty clay.															
	Soft to firm.		2	TW	P											
			3	TW	P											
563.5																
11.0	Organic clay-silt pockets of silt and sand.		4	TW	P											
559.5	Very loose.					560										
15.0	Silt		5	TW	P											
557.5	Loose															
17.0	Fine to med. sand - very loose to loose.		6	SS												
556.6	End of borehole.															
17.9	(Bedrock)															
						550										

ORIGINATED BY R.M.

COMPILED BY R.M.

CHECKED BY

Gravel	2%
Sand	83%
Si&Cl	15%

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 16

FOUNDATION SECTION

JOB 62-F-10 LOCATION Port Dover ORIGINATED BY R.M.
W.P. 50-62 BORING DATE Mar. 1, 1963. COMPILED BY R.M.
DATUM 578.7 BOREHOLE TYPE Casing & Auger. CHECKED BY T. M.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT WL PLASTIC LIMIT WP WATER CONTENT W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F. O Field Vane					WP X WL				
							400	800	1200	1600	2000	WATER CONTENT % 25 50 75				
578.7	Groundlevel															
577.7	Topsoil		1	SS												
1	Silty clay, silt and sand with organics.		2	SS												
	(Fill Material)		3	SS	9	575										
572.7			4	SS	5											
6.0	Silty clay to clayey silt.		5	SS	11											
						570										
567.7	Stiff		6	SS	5											
11.0	Organic clay - silt with sand (Muck)															
565.7	Firm		7	TW	P	565										
13.0	Silty clay to clayey silt.															
	Firm		8	TW	P											
560.7	Loose to dense															
18.0	Sand, borehole.		9	SS	26	560										
556.5	Loose to dense		10	SS	>15											
22.2	End of borehole.					555										

Org. Cont.
1.98%

(Air)
(Oven)

RECORD OF BOREHOLE NO. 17

FOUNDATION SECTION

JOB 63-F-10

LOCATION Port Dover

ORIGINATED BY R.M.

W P. 50-62

BORING DATE Mar. 1, 1963.

COMPILED BY R.M.

DATUM 576.5

BOREHOLE TYPE Casing & Auger

CHECKED BY

SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT ——— W _L PLASTIC LIMIT ——— W _P WATER CONTENT ——— W		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F. ○ Field Vane ● Unconfined Comp.			
							400 800 1200 1600 2000			
576.5	Groundlevel									
575.5	Topsoil					575				
1	Silty clay, silt and sand with organics. (Fill Material)									
571.5										
5.0	Silty clay to clayey silt.					570				
567.5	Firm									
9.0	Organic clay - silt with sand (Muck,		1	GS		565			Oven Air	Org. Cont. 5.42
563.5	Firm		2	GS						Org. Cont. 3.94
13.0	Silty clay to clayey silt									
559.0	Firm		3	GS		560				
17.5	End of borehole.									

FOUNDATION SECTION

JOB 63-F-10

LOCATION Port Dover

ORIGINATED BY R.M.

W. P. 50-62

BORING DATE Mar. 4, 1963.

COMPILED BY R.M.

DATUM 576.9

BOREHOLE TYPE Casing & Auger.

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	Liquid Limit ——— WL Plastic Limit ——— WP Water Content ——— W	BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	SHEAR STRENGTH P.S.F.			
						O Field Vane	wp w wl — ----- ----- 20 40 60%	PCCF	
576.9	Groundlevel								
578.9	Topsoil								
1	Silty clay, silt and sand with organics.	/ \							
573.9	(Fill Material)	/ \							
3.0	Organic clay - silt with sand. (Muck)		1	SS	4				
	Soft		2	GS			Air Oven		
			3	TW	P				
561.9		/ \							
12.0	Silty clay to clayey silt.	/ \	4	TW	P				
561.9	Firm,	/ \	5	SS	14				
15.0	End of borehole.								

JOB <u>63-F-10</u>	LOCATION <u>Port Dover</u>	ORIGINATED BY <u>R.M.</u>
W.P. <u>50-62</u>	BORING DATE <u>Mar. 5, 1963.</u>	COMPILED BY <u>R.M.</u>
DATUM <u>573.5</u>	BOREHOLE TYPE <u>Casing & Auger.</u>	CHECKED BY _____

[illegible]

file 980

Mr. A. McKim,
Bridge Control Engineer,
Bridge Control Section,
Admin. Bldg.

Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

November 22, 1963

Lynn River Bridge at Port Dover
Rmys. 6 & 24 (Rev'n.) County of Norfolk
N.P. 50-67 - Cont. 53-30 - N.J. 53-7-10
and N.J. 53-7-24

As requested by you, we have recently carried out a number of borings at the above mentioned site where the construction of Lynn River Bridge is at present underway. During the excavation for the west abutment footing, the contractor expressed the opinion that the upper portion of the bedrock was generally in a poor condition and possibly, inadequate to support the abutment footing. The contractor had based this opinion upon the performance of pneumatic drills used to shatter the rock surface to the design elevation and difficulties he had encountered in dewatering the excavation.

The results of 6 borings carried out within the excavation confirmed the results of our original foundation investigation. Within the upper 12 inches of the limestone bedrock, slight weathering is evident in the vertical joints and the horizontal bedding planes. This rock, however, is perfectly competent to carry the design loads, and in consequence, we see no reason to modify our original recommendations.

We have also carried out 2 borings at the location of the east abutment footing, construction of which had not commenced. The results of these borings also confirmed the results of our original foundation investigation and, therefore, it is not necessary to excavate below the design elevation of the east abutment footing.

Attached to this memo, for your information, is a copy of a memo from Dr. A. W. Ingham, Geologist of Materials and Testing Division, in which he describes the rock core samples obtained. In addition, water samples obtained from the boreholes in the west abutment excavation have been tested for their sulphide and sulphate contents. The results of these chemical analyses are enclosed with our memo.

Mr. A. McKim,
Bridge Control Engineer,
Bridge Control Section,
Admin. Bldg.

2.

November 22, 1968

Lynn River Bridge - Port Dover

If you have any further queries regarding the above mentioned project pertaining to structure foundations, please contact our office.

AD/AdEF

cc: Messrs. C. S. Grebski
B. E. Greenly
H. A. Tregaskes
D. M. Hopper

M. Devata

M. Devata,
SUPERVISING FOUNDATION ENGR.
For:
A. G. Sternac,
PRINCIPAL FOUNDATION ENGR.

Foundation Files
Gen. Files

MEMORANDUM

To: Mr. N. Devata,
Foundations Engineer.

FROM: K. W. Ingham

DATE: November 18, 1968

Our File Ref.

IN REPLY TO

SUBJECT: Lyn River Bridge Foundation at Port Dover

The cores recovered from holes drilled at the corners and along the sides of the proposed west abutment footing are mainly limestone typical of the upper member of the Delaware formation. Examination of the rock exposed in the dewatered excavation indicates that it is also Delaware limestone.

The limestone is reasonably fresh with incipient weathering confined to horizontal bedding planes and vertical joint planes in the upper 1.0 ft. The Delaware limestone tends to break into thin wavy beds usually separated by black carbonaceous shale seams and contains irregular nodules of white chalky chert. A shale seam, relatively thick in some places, underlines the top bed in the excavation and is prominent in the cores and the material being chipped out. Minor enlargement of some of the bedding and joint planes in the upper 2.0 ft. - 3.0 ft. is normal for this formation and do not constitute intra-lithic voids of any considerable extent. The chert nodules and in some cases the limestone associated with them have a splintery fracture accounting for the bubbly nature of some of the rock during excavation.

Thus the conditions encountered in the rock excavation are typical for this type of limestone. The bedrock is quite competent to support the proposed foundation pressures and it is not necessary to excavate below the design elevation for the footing.

Water entering the excavation is heavily mineralized, containing iron and hydrogen sulphide and would appear to be ground water, at least in part, due to the hydrostatic head in the area.

RWL:mv

K. W. Ingham per Mr.
K. W. Ingham,
Geologist.

MEMORANDUM

To: Mr. M. Devata,
Supervising Foundation Engineer.

From: Chemical Section,
Materials & Testing Division.

ATTENTION:

DATE: November 14, 1968.

OUR FILE REF: 11-7-5

IN REPLY TO

SUBJECT:

Water Sample

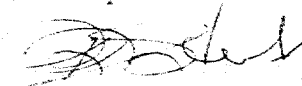
At your request a sample of water received on November 12, 1968, has been tested for its sulphide and sulphate contents. The test results and sample description were as follows:

<u>Sample Description</u>	<u>ppm Sulphide (S²⁻)</u>	<u>ppm Sulphate (SO₄²⁻)</u>
Job No. 68-F-84	Nil	344
B.H. No. 1		
Sample No. 1		
Sampling Date Nov. 8/68		
Sample of water flowing out of bore hole		

As I verbally explained to you, sulphides should, preferably, be tested on the site due to the fact that hydrogen sulphide is a gas and, therefore, tends to escape from the sample container. Also, the minimum limit of chemical detectability is only 0.1 - 0.2 ppm H₂S. Our sense of smell is many times more sensitive, so that it is quite possible that a chemical test would show negative results although the human nose would detect a distinct odour of sulphide.

A.C. Duter,
Principal Chemical Engineer.

Per.


R. Sterk,
Chemical Engineer.

RDC

cc. Files.

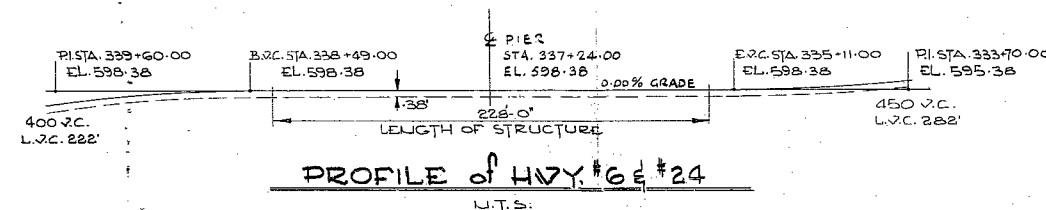
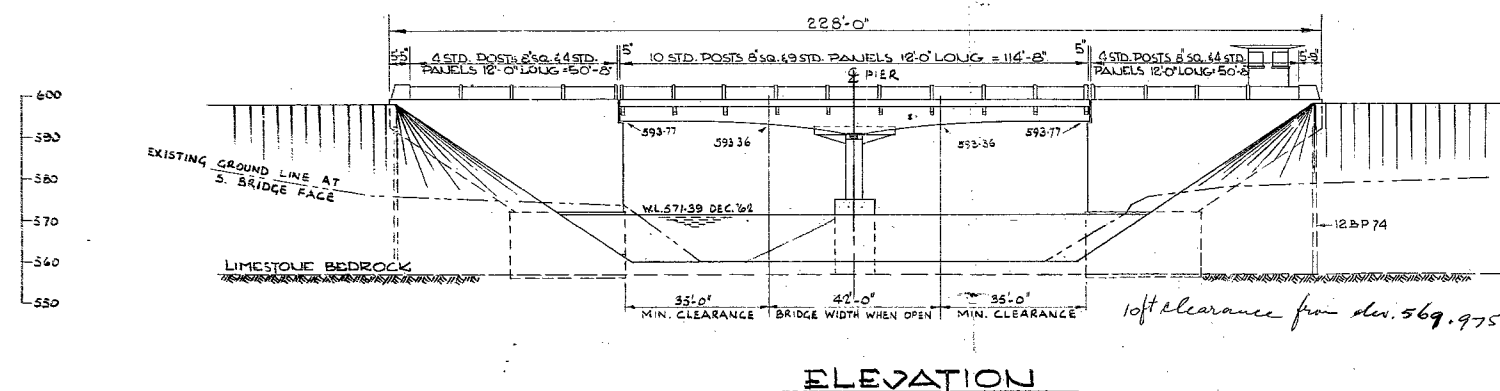
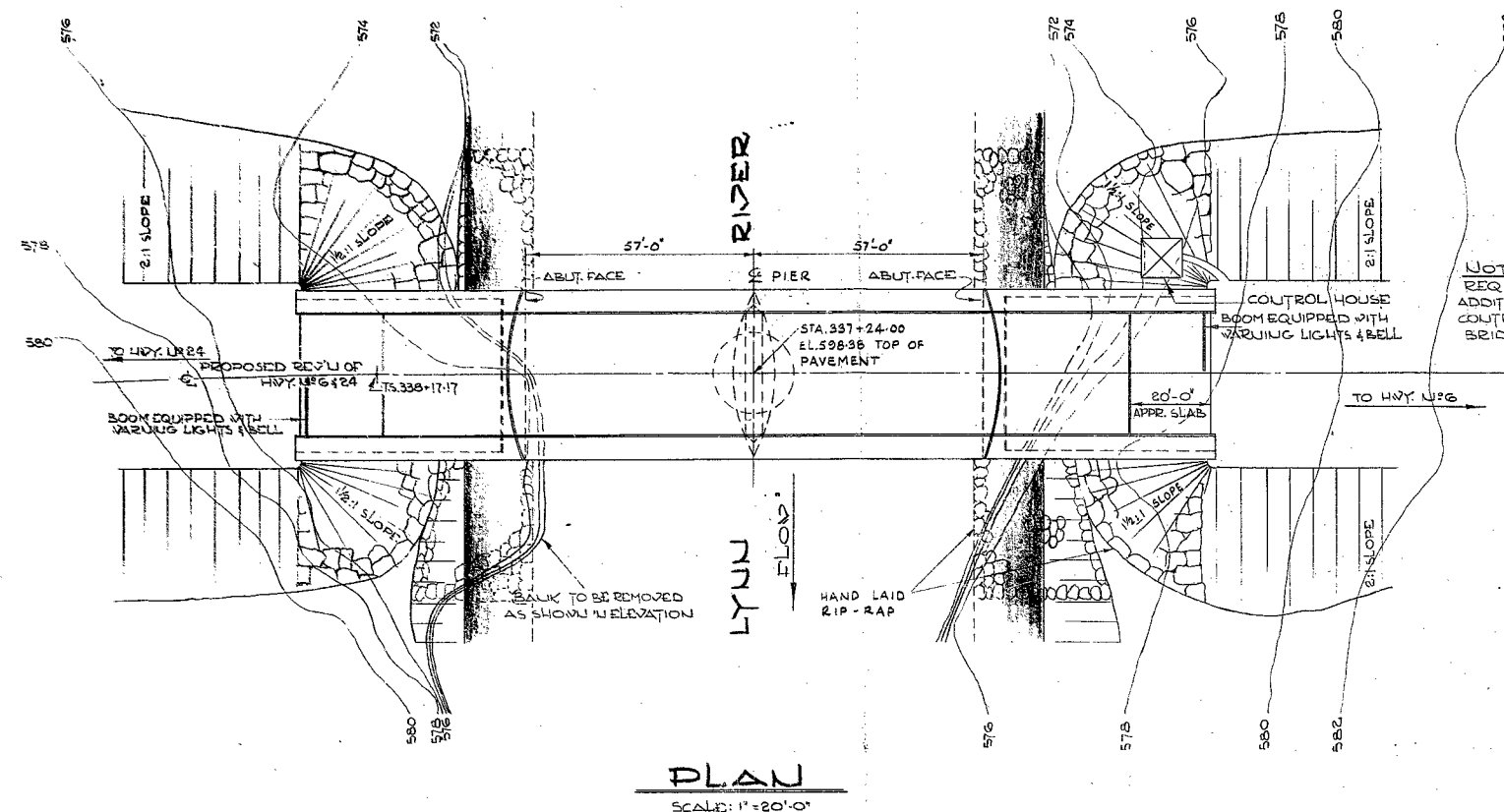
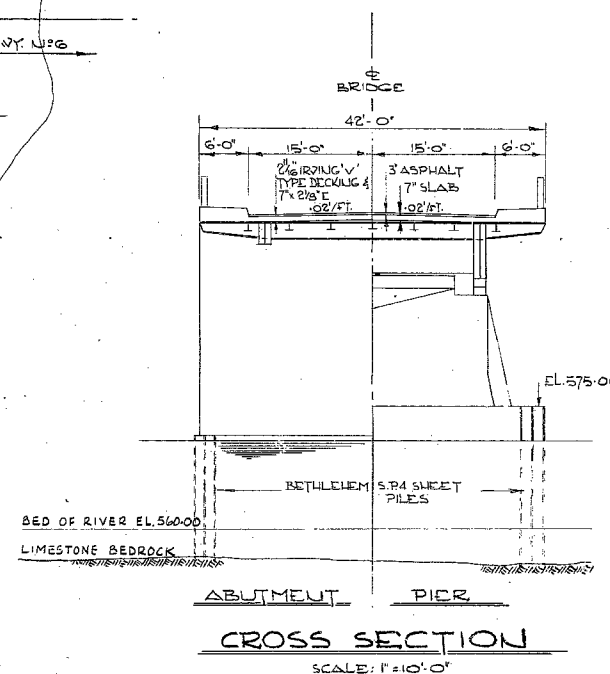
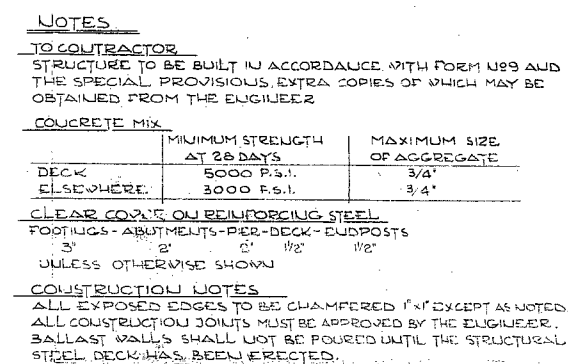
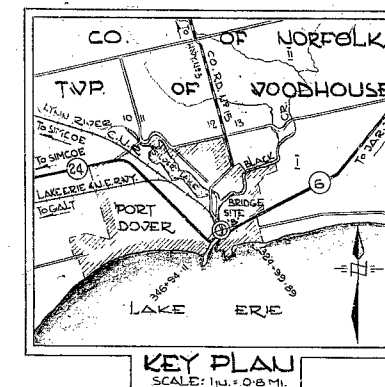
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63-F-10

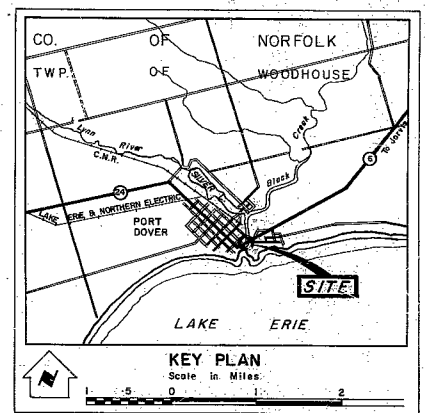
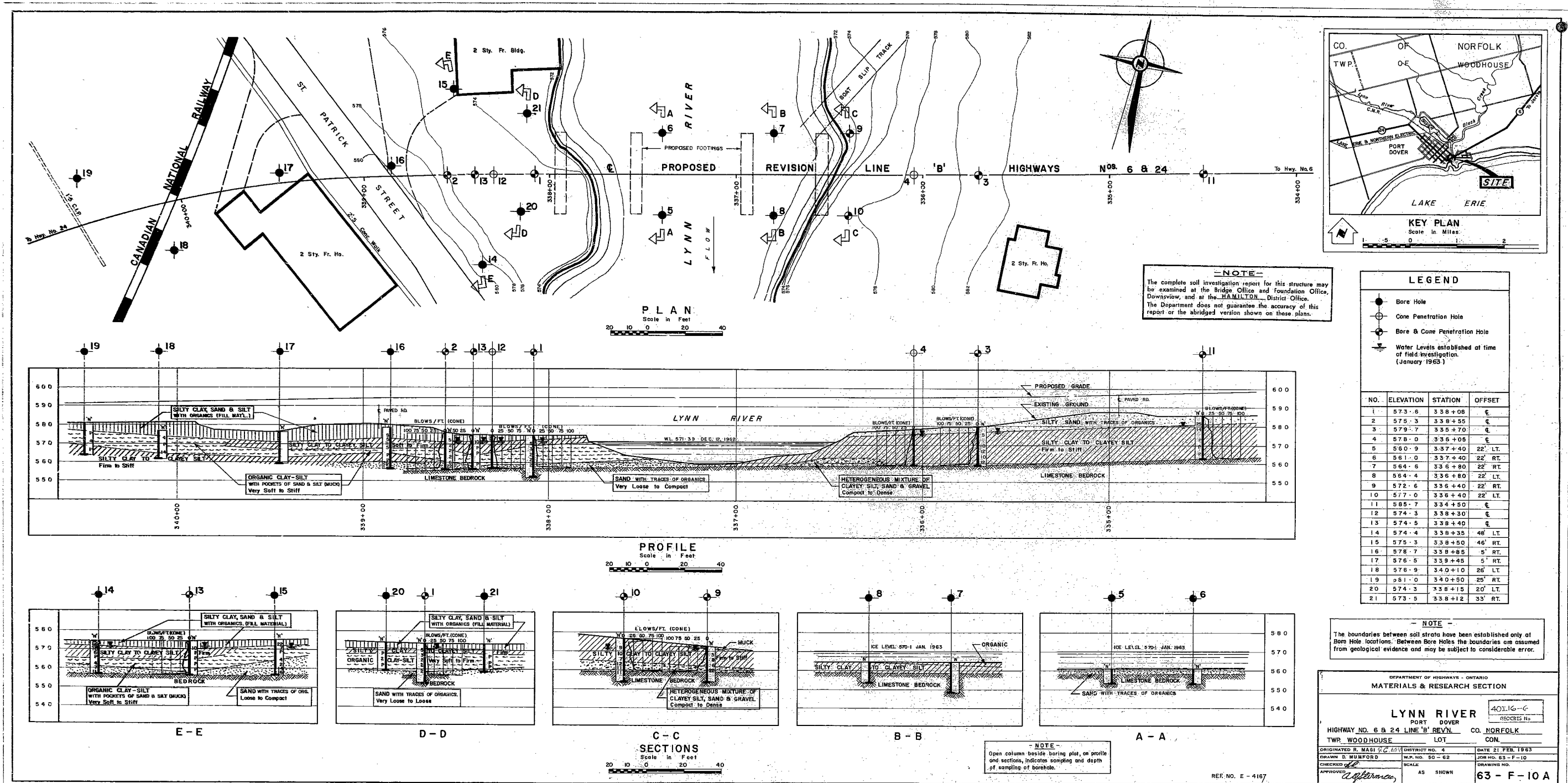
W.P. [#]50-62

HWY [#]6824 [#]

LYNN RIVER

[illegible][illegible]

DEPARTMENT OF HIGHWAYS ONTARIO BRIDGE DIVISION									
<h1 style="text-align: center;">LYNN RIVER BRIDGE</h1>									
KING'S HIGHWAY No. 6 & 24 PROP. REV.						DIST. No. 4			
CO. NORFOLK				TOWN of PORT DUFFER					
TWP. WOODHOUSE				LOT 1		CON.			
<h2 style="text-align: center;">PRELIMINARY PLAN</h2>									
APPROVED _____ BRIDGE ENGINEER					SITE No. _____		W.P. No. 50-G		
DESIGN	B.S.R.	CHECK	M.S.		CONTRACT				
DRAWING	E.A.	CHECK	M.S.		Nos.				
DATE	E. LADING		4-20 5-10		DRAWING No.	D-5314-P2			



NOTE
The complete soil investigation report for this structure may be examined at the Bridge Office and Foundation Office, Downsview, and at the HAMILTON District Office. The Department does not guarantee the accuracy of this report or the abridged version shown on these plans.

LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation (January 1963)		

NO.	ELEVATION	STATION	OFFSET
1	573.6	338+08	£
2	575.3	338+55	£
3	579.7	335+70	£
4	578.0	336+05	£
5	560.9	337+40	22' LT.
6	561.0	337+40	22' RT.
7	564.6	336+80	22' RT.
8	564.4	336+80	22' LT.
9	572.6	336+40	22' RT.
10	577.0	336+40	22' LT.
11	585.7	334+50	£
12	574.3	338+30	£
13	574.5	338+40	£
14	574.4	338+35	48' LT.
15	575.3	338+50	46' RT.
16	578.7	338+85	5' RT.
17	576.5	339+45	5' RT.
18	576.9	340+10	26' LT.
19	581.0	340+50	25' RT.
20	574.3	338+15	20' LT.
21	573.5	338+12	33' RT.

NOTE
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH SECTION

LYNN RIVER
PORT DOVER
HIGHWAY NO. 6 & 24 LINE 'B' REVN. CO. NORFOLK
TWP. WOODHOUSE LOT CON.

40116-C
RECORDS No.

ORIGINATED BY: MASI
DRAWN BY: H. H. H. H.
CHECKED BY: [Signature]
APPROVED BY: [Signature]

DISTRICT NO. 4
JOB NO. 50-62
SCALE: AS SHOWN
DATE: 21 FEB. 1963
JOB NO. 63-F-10
DRAWING NO. 63-F-10 A