

#59-F-52
W.P.# 24-59
Hwy. #401
CROSSING
REV. CTY. RD.
CON. #2
2 MILES N. OF
BRIGHTON

Mr. J. L. Keen,
Sr. Engineer, Bridge Division.

Materials & Research Section.

(Foundations Office)

Attention: Mr. K. G. Bassi.

Re: Brighton Twp. Br. #5 - W.P. 24-59,
Br. #401, District #7.

May 19, 1961.

REVIEW OF PRELIMINARY PLAN

by: Foundations Office.

In reply to your memo of May 12th, 1961, we submit the following comments:-

- (1) We do not anticipate any significant differential settlements to occur after completion of the bridge structure.
- (2) We are of the opinion that the abutments can be supported on spread footings. A field investigation carried out on May 17th, 1961, indicated that the existing fill at the location of the North Abutment is in a very dense state of compaction below about elev. 655.0'. A safe load of 2.0 T.S.F. may be used. Prior to placing concrete, it must be ensured that the fill is completed to such a stage that the lower forward and side edges of the concrete footing are not less than 10.0' from the edge of the slope. Any new fill placed to achieve this should consist of granular material compacted to 100% Proctor density in layers not exceeding 6" in thickness.
- (3) The South Abutment will be placed in the side of an existing cut slope. At this location, all topsoil (about 12") should be removed from the area where fill is to be placed. Excavation should be carried out to a depth of 3.0' below the bottom of the proposed footing. Granular fill may then be placed to achieve the conditions outlined previously in the case of the North Abutment. A safe load of 2.0 T.S.F. may be used.
- (4) The pier footing elevations shown on the preliminary bridge plan are satisfactory to us.

L. G. Soderman,
PRINCIPAL FOUNDATION ENGR.
Per:

KGS/MdeF
cc: Foundations Office
Gen. Files.

(K. G. Selby, *K. G. Selby*
PROJECT FOUNDATION ENGR.)

Bridge Division,
May 12, 1961.

MEMORANDUM TO:

Mr. L. G. Soderman,
Principal Soils &
Foundation Engineer,
Department of Highways,
Room 107 Lab. Bldg.,
Downsview, Ontario.

Att.: Mr. A. Sternac

RE: Brighton Twp. Br. #5 - W.P. 24-59,
Hwy. #401, Dist. #7.

Enclosed herewith please find tentative preliminary plan D 4840-P1 for the above crossing. The superstructure of the bridge is simply supported for dead loads, but is made continuous for superimposed loads by providing additional reinforcement in the deck over the piers. We have assumed that there will be no differential settlement of the substructure. Could you please review the original soil report to cover the following points:-

1. Do you expect any differential settlement of the substructure?
2. Can the abutments be supported on spread footings?
3. If you feel that the abutments should be supported on piles:-
 - (a) the type of piles.
 - (b) the design load / pile.
 - (c) the approx. pile tip elevation.
4. Are the pier footing elevations (based on 3 ft. deep footings) ~~satisfactory~~ satisfactory to you?

KGB:go

K. G. Bassi,
for J. L. Keen,
Sr. Engineer.

Mr. A. M. Toye,

April 7, 1961.

Bridge Engineer.

Re: Brighton Twp. Br. #5,

Materials & Research Section.

Hwy. 401 - District #7.

(Foundations Office)

Attention: Mr. F. De Visser.

We have received your letter dated April 4th, 1961, and below are given the answers to your questions:-

1. The allowable bearing value for the Centre Pier:

No borehole was put down at this location, but from the boreholes on the north and south side, it can be assumed with a high degree of probability, that the soil stratification is, for practical purposes, identical. Consequently, spread footings, 6 - 10 ft. in width, at least 5 ft. below ground surface, and with a safe load of 2.5 T/sq.ft., can be used.

2. Recommendations for the Abutment Footings:

The approach fills have been in place for some two years and most of the settlements have taken place. It is understood that the structure will be partly continuous (semi-continuous in your letter), and it is assumed that the end or approach spans will be simply supported.

It is recommended that spread footings be used for the abutments with a safe load of 2 T/sq.ft. The edge of the footing should be at least 10 ft. from the embankment slope, and the overburden at least 5 ft. in depth.

3. Since the design of the bridge will most likely be semi-continuous (partly-continuous?) - whether the bearing values for the two outer piers should be altered:

The subsoil conditions have been established as relatively uniform, and no indications for non-uniform settlements were found. Consequently, spread footings with approx. equal bearing values, should be used for the three piers.

AGS/MdeF
cc: Foundations Office
Gen. Files.

L. G. Soderman,
PRINCIPAL FOUNDATION ENGR.
Per: *A. G. Stermac*

(A. G. Stermac,
SUPERVISING FOUNDATION ENGR.)

Kris

Department of Highways

COPY

For the Information of:

~~Mr. J. Keen,~~
~~Sr. Engineer,~~
Bridge Division,
Department of Highways,
Downsview, Ontario.

Bridge Division,
April 4th, 1961.

MEMORANDUM TO:

Mr. L. G. Soderman,
Principal Soils & Foundations Engineer,
Department of Highways,
Room 107,
Downsview, Ontario.

Attention: Mr. A. Stermac
Foundation Office Engineer

RE: Brighton Twp. Br. #5,
Hwy. 401 - District #7.

In October, 1959, we received your soils report F-59-52 which contains all necessary information for a rigid frame structure.

We are now re-designing this structure, and the design will utilize open type abutments and a centre pier. The two centre spans will be approx 70' - 0", the approach spans approx. 50' - 0". You are no doubt aware that the approach fill has been in place for some two years.

Would you please let us know -

- (1) The allowable bearing value for the centre pier.
- (2) Your recommendations for the abutment footings.
- (3) Since the design of the bridge will most likely be semi-continuous, whether the bearing values for the two outer piers should be altered.

FdeV/eh
c.c. J. Keen

F. DeVisser,
Bridge Location Engineer.

OVER

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 13, 1961.

MEMORANDUM TO:

Mr. B. Davis,
Bridge Design Engineer,
Department of Highways,
Downsview, Ontario.

BRIDGE AT City Rd #26 to Highway 401
RE: W.P. 24-59
Brighton Twp. Br. #5
Hwy. 401 District #7

1.5 MI. E. OF HWY 30

Under separate cover we have sent the following
plans and reports regarding the above noted underpass
to Mr. J. Keen.

Site Plan	E 3660-1
Location Plan	F 3005-6
Location profiles	F 3005-8
	F 3005-12
Soils report	BA 951
Revised cross-section	

Please arrange to have this structure re-designed.

The drawing number is D #837. *4840*

Preliminary drawings should be ready in four weeks
and the final tracings completed December 27, 1961.

F. DeVisser

FDeV/bm

F. DeVisser,
Bridge Location Engineer.

cc. J. Keen
cc. I. Campbell
cc. R. Fitzgibbon

FILED

El. Hwy 421

POSTAL ADDRESS
DEPARTMENT OF HIGHWAYS
PARLIAMENT BUILDING
TORONTO 2, ONTARIO



ONTARIO
DEPARTMENT OF HIGHWAYS

11.
E. Bound Lane

Rt
W. B. B. Lane

OFFICE LOCATION
DOWNVIEW AVE.
NEAR BY
TORONTO, ONTARIO

Sta. 183 + 00
183 + 67.52
184 + 00
185 +

640.06
Bridge Division
February 13 1961
641.43
642.79
640.2
641.5

639.79
640.95
641.37
642.88

MEMORANDUM TO:

Mr. E. Davis,
Bridge Design Engineer,
Department of Highways,
Downsview, Ontario.

RE: W.P. 24-29
Brighton Twp. Br. #5
Hwy. 401 District #1

Under separate cover we have sent the following
plans and reports regarding the above noted underpass
to Mr. J. Keen.

- Site Plan
- Location Plan
- Location profiles
- Soils report
- Revised cross-section
- BA 251
- W 3005-12
- W 3005-8
- W 3005-6
- W 3005-1

Please arrange to have this structure re-designed.
The drawing number is D 4837.
Preliminary drawings should be ready in four weeks

and the final tracings completed December 27, 1961.

F. DeVisscher,
Bridge Location Engineer.

cc. J. Keen
cc. I. Campbell
cc. R. Fitzgibbon

Department of Highways
COPY
For the information of

Mr. J. Keen,
Senior Engineer,
Department of Highways,
Downsview, Ontario

Bridge Division,
June 2, 1961.

The Bell Telephone Company
of Canada,
393 University Ave.,
Toronto, Ontario.

Attention: Mr. H. M. Morris,
Outside plant engineering and
construction manager

RE: W.P. 24-59
County Rd. #26 Underpass
1.3 mi. east of Hwy. 30
Hwy. 401 - District 7

Gentlemen:

We are re-designing the above noted structure.
In this new design we will incorporate two 4" ϕ ducts
in each curb, as was done in the original design.

Two prints of the final drawing of the general
lay-out will be forwarded to you.

We trust this will meet with your approval.

Yours truly,

F. D.

FDeV/et

F. DeVisser, P. Eng.
Bridge Location Engineer.

cc. J. Keen
cc. R. Fitzgibbon



ONTARIO
DEPARTMENT OF HIGHWAYS

Memo to Mr. A. M. Toye, Date October 20, 1959.
Bridge Engineer. Subject Re: FOUNDATION REPORT - D.H.O.
 From Materials & Research Section. W.J. F-59-52 : W.P. 24-59.
Attention: Mr. S. McCombie.

Hwy. 401 Line 'E' & County Rd. Revision Crossing,
 Lot 34, Con. II, Twp. of Brighton,
 Approx. 2 Miles North of Brighton.

Enclosed herewith is our Foundation Report showing the subsoil conditions existing at the above noted site. Reference to the contents of the report shows that subsoil at the site consists of a stratum of dense fine sand interbedded with thin bands of clay silt and clay. This stratum of dense fine sand was explored to a depth of 42 ft. below the existing ground surface.

Recommendations pertinent to the foundation design are as follows:-

1. Strength and compressibility characteristics are such that spread footings are recommended at Elev. 632' (7' to 8' below existing ground surface) or below. At this elevation for footings of 6' to 10' in width, a safe allowable footing pressure of 2 1/2 t.s.f. is recommended. This value of bearing capacity is dependent upon a minimum depth of surcharge of 5 ft. above the base of the footings. Maximum settlement consequent upon application of this bearing pressure will be of the order of one inch.
2. No excessive seepage problems are anticipated during footing excavations.
3. The subsoil can safely support the proposed embankment loading. The approach fill on the North side of existing Hwy. 401 was already in place and appears to be performing satisfactorily.

AKL/MdeF

Encl.

cc: Messrs. A. M. Toye

H. A. Tregaskes

D. G. Ramsay

D. W. Farren

H. D. Duff

P. Arkema

A. Watt

Foundation Section.

Gen. Files.

L. G. Soderman,

PRINCIPAL SOILS & FOUNDATIONS ENGR.

per:

AKLoh

(A. K. Loh,
 Project Foundation Engr.)

FOUNDATION REPORT

on

Hwy. 401 Line 'E' & County Rd. Revision Crossing,
Lot 34, Con. II, Twp. of Brighton,
Approx. 2 Miles North of Brighton.

Plan No: F-3005-6

Profile No: F-3005-8

Chainage: Sta. 183+70.71.

Distribution:

Mr. A. M. Toye,
Bridge Engineer. (2)

Mr. H. A. Tregaskes,
Construction Engineer. (1)

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

Mr. D. W. Farren,
Sr. Project Design Engr. (1)

Mr. H. D. Duff,
District Engr.; Port Hope. (1)

Mr. P. Arkema,
Regional Soils Engr. (1)

Mr. A. Watt,
Ontario Water Resources Commission. (1)

Foundation Section (1)

Gen. Files (1)

W.J. F-59-52.

W.P. 24-59.

INTRODUCTION:

Presented in this report are the results of a subsoil investigation carried out at a structure location approximately 2 miles north of Brighton where existing Hwy. 401 line 'E' underpasses the proposed County Road Revision, Lot 34, Con. II, Twp. of Brighton (Sta. 183+70.71, Profile No. F-3005-8). This report contains field and laboratory findings and recommendations for the foundation of the proposed structure.

Field work commenced on June 1, 1959 and was completed on June 6, 1959.

DESCRIPTION OF THE SITE AND ITS GEOLOGY:

The site is drumlinized. The existing Hwy. 401 cuts through a drumlin at the crossing site. Apart from a few bushes, there is little vegetation in and around the site. At the time of the investigation, the approach fill on the north side of existing Hwy. 401 was already in place.

The crossing site under consideration, is located on the Iroquois Plain which was inundated by glacial Lake Iroquois in late Pleistocene times. As may be expected, the great variety of geological deposits and drainage conditions on the old lake bottom has given rise to a great variety of soils. At this site, the shoreline deposit of fine sand was found to exist in a dense state to the depth where the boreholes terminated. Lacustrine deposits of clay and silt existing in thin bands, were found present in the dense sand.

FIELD WORK:

The field work associated with this investigation, consisted of 4 sampled boreholes with dynamic cone penetration test adjacent to each hole. The investigation was carried out by a standard diamond drill adapted for soil sampling. Boreholes were advanced by conventional wash boring procedures and samples were recovered at depths required. A 2" O.D. split-barrelled spoon sampler was used to recover samples in the sandy subsoil. The dimensions of this spoon sampler and the energy used in driving it conform to the requirements of the Standard Penetration Test. Upon recovery, samples were visually examined and identified and placed in moisture proof containers for transport to our laboratory.

Upon receipt in the laboratory, samples were visually examined and identified. Routine tests were carried out on selected representative samples. Results of field and laboratory tests have been presented in the borehole logs and summarized in Table No. I. The location plan and subsoil profile are presented in Drawing No. F-59-52A.

SUBSOIL CONDITIONS:

Reference to the borehole logs shows that the subsoil at the site consists of a stratum of dense fine sand interbedded with thin bands of clay silt and clay. In the course of the investigation, the dense sand stratum was explored to a depth of 42 ft. below the existing ground surface (i.e., Elev. 598').

In borings 1, 3 & 4, immediately underneath the ground surface, the stratum of dense fine sand was encountered. In the

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

upper 6' to 8' of the dense sand stratum the bands of clay silt and clay, up to 6 inches in thickness, were encountered frequently. Below this upper portion of the dense sand, the bands of clay silt and clay of the order of one inch in thickness, were encountered occasionally, only. In general, the sand is fine-grained and exists in a dense to very dense state of packing. A minimum 'N' value (Standard Penetration resistance expressed in blows per foot) of 21 was recorded during the sampling operations. Moisture content ranged from 11% to 21%.

In Boring 2, underneath the ground surface, an 8-ft. thick layer of dense clay silt and silty clay was intersected before the stratum of dense fine sand was encountered. An average 'N' value of 35 was obtained in the dense clay silt and silty clay. The unit weight and moisture content of the clay silt and silty clay were found to be 137.5 p.c.f. and 20%, respectively. The dense fine sand encountered in this boring was found to be of similar deposit and formation as that encountered in Borings 1, 3 & 4.

Results of field and laboratory tests have been summarized in Table No. I and are included in this report under Appendix I.

WATER CONDITIONS:

Field measurements carried out during the exploration programme indicate that the ground water table at the site is at approximately Elev. 606'. No artesian water conditions were encountered. During the investigation, after the casings were withdrawn from the ground, each of the boreholes stayed open without cave-ins. It appears that no shoring or pumping operations are necessary during footing excavations.

cont'd. /4 ...

FOUNDATION CONSIDERATIONS:

The dense fine sand is competent to provide adequate foundation support for the proposed structure. Subsoil conditions are such that spread footing support can be obtained in the dense sand at Elev. 632' or below. At this elevation or below, for footings of 6' to 10' in width, a bearing pressure of 2 1/2 t.s.f. can be used for spread footing design. This value of bearing capacity is dependent upon a minimum depth of surcharge of 5 ft. above the base of the footings and incorporates a factor of safety of 3. Maximum settlement consequent upon application of this bearing pressure will be of the order of one inch. Footings founded at Elev. 632' are believed to have sufficient protection against frost action.

No excessive seepage problems are anticipated during footing excavations.

Under the proposed grade line the maximum height of fill is approximately 22 ft. The subsoil can safely support this embankment loading. At the time of the investigation the approach fill up to a height of approximately 20 ft. was already in place and appears to be performing satisfactorily.

CONCLUSIONS & RECOMMENDATIONS:

- (1) The site is underlain by a stratum of dense fine sand interbedded with thin bands of clay silt and clay.

cont'd. /5 ...

CONCLUSIONS & RECOMMENDATIONS: (cont'd.) ...

- (2) Subsoil conditions are such that spread footing support can be obtained in the dense sand at Elev. 632' (7' to 8' below ground surface) or below. At this elevation or below, for footings of 6' to 10' in width, an allowable bearing pressure of 2 1/2 t.s.f. can be used in spread footing design. This value of bearing capacity is dependent upon a minimum depth of surcharge of 5 ft. above the base of the footings. Maximum settlement consequent upon application of this bearing pressure will be of the order of one inch. Footings founded at Elev. 632' are believed to have adequate protection against frost action.
- (3) No serious ground water problems are anticipated during footing excavations.
- (4) The subsoil can safely support the proposed embankment loading. The approach fill on the north side of existing Hwy. 401 was already in place and appears to be performing satisfactorily.

AKGL
A. K. Loh,
Project Foundation Engr.

APPENDIX I.

Table No. 1

SUMMARY OF FIELD & LABORATORY TESTS

JOB F 59-52W.P. 24-59

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH psi	UNIT WEIGHT pcf	REMARKS
1	S1	3' - 4.6'	Dense dry brown clean fine sand	34	3.0	-	-	-	-	
	S2	6' - 7.5'	Dense grey clay silt: 6' to 7'	40	17.1	-	-	-	-	
			Dense fine sand : 7' to 7.5'							
	S3	10' - 11.5'	Dense fine clean sand	39	-	-	-	-	-	
	S4	13' - 14.5'	Dense fine sand with clay band from 14' to 14.5'	54	-	-	-	-	-	
	S5	16' - 17.5'	Dense fine sand	60	15.1	-	-	-	-	
	S6	20' - 21.5'	Dense fine sand	101	15.7	-	-	-	-	
	S7	30' - 31.5'	Dense fine sand	36	18.5	-	-	-	-	
	S8	40' - 41.5'	Dense fine sand	>100	-	-	-	-	-	
2	S1	3' - 4.6'	Dense clay silt	29	20.3	-	-	-	-	
	S2	6' - 7.5'	Dense clay silt	40	21.2	-	-	-	137.5	
	S3	10' - 11.5'	Dense fine sand with traces of clay and clay silt	70	15.6	-	-	-	-	
	S4	13' - 14.5'	Dense fine sand, some gravel	56	13.3	-	-	-	-	
	S5	16' - 17.5'	Dense fine sand with traces of clay silt and sand.	46	12.1	-	-	-	-	
	S6	20' - 21.5'	Dense fine sand with traces of clay.	66	17.3	-	-	-	-	
	S7	30' - 31.5'	Dense fine sand	60	11.7	-	-	-	-	
	S8	40' - 41.5'	Dense fine sand with bands of clay silt	78	19.2	-	-	-	-	
3	S1	3' - 4.5'	Dense dry fine sand	23	8.1	-	-	-	-	
	S2	6' - 7.5'	Dense fine sand with bands of clay silt & clay	28	25.2	-	-	-	-	
	S3	10' - 11.5'	Dense fine sand, some gravel	78	9.7	-	-	-	-	
	S4	15' - 16.5'	Dense fine sand.	82	14.7	-	-	-	-	
	S5	20' - 21.5'	Dense fine sand.	140	13.1	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS



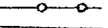

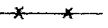

JOB F 59-52
W.P. 24-59

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	3' - 4.5'	Dense dry fine sand	21	6.2	-	-	-	-	
	S2	6' - 7.5'	Dense fine sand with bands of clay & clay silt	21	12.6	-	-	-	-	
	S3	10'-11.5'	Dense fine sand with bands of clay & clay silt	29	12.6	-	-	-	-	
	S4	15'-16.5'	Dense fine sand with bands of clay & clay silt.	37	12.6	-	-	-	-	
	S5	20'-21.5'	Dense fine sand	48	10.6	-	-	-	-	
			S- DENOTES SPLIT SPOON SAMPLE							






DEPARTMENT OF HIGHWAYS - ONTARIO

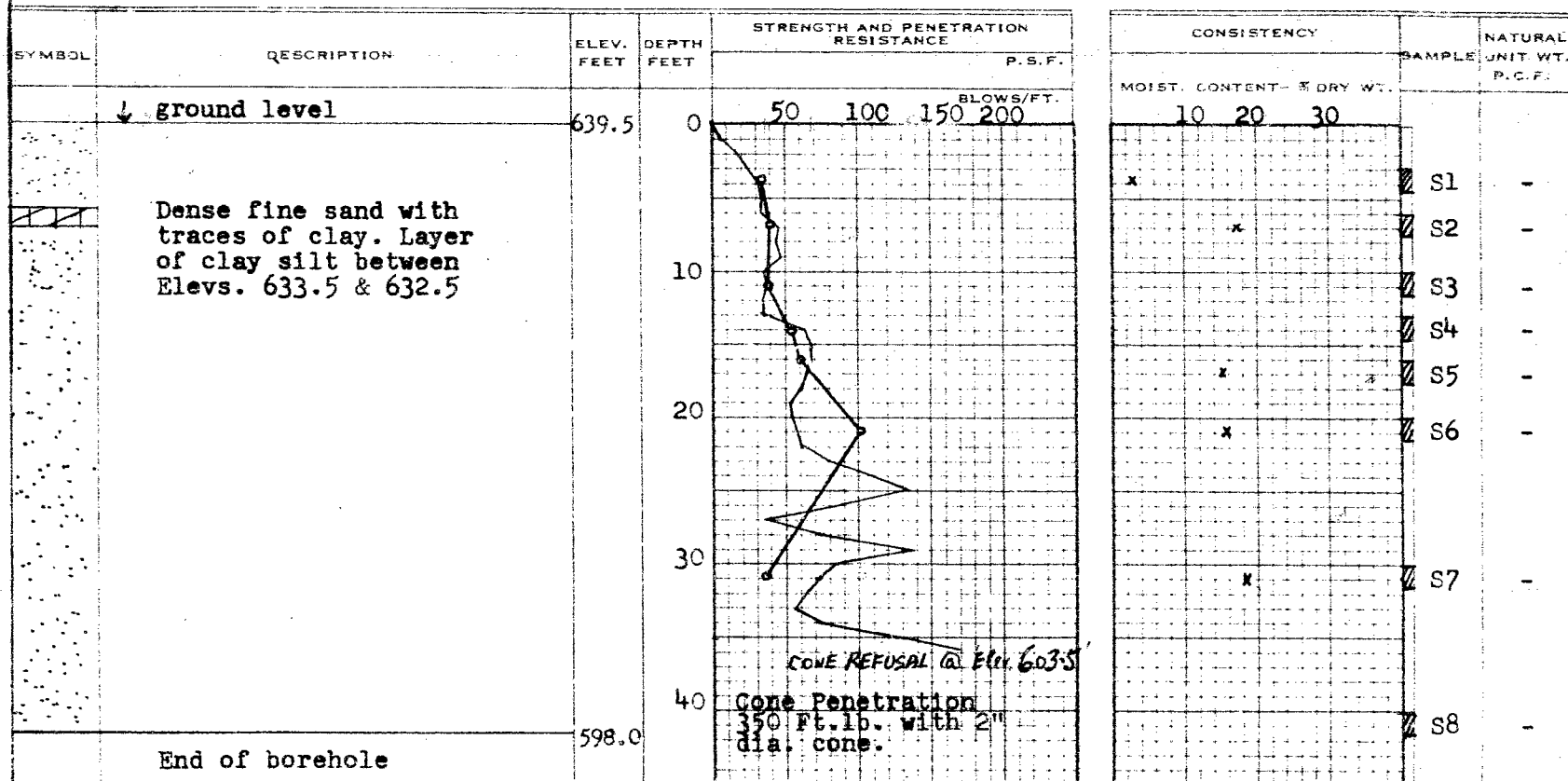
MATERIALS AND RESEARCH SECTION

W.P. 24-59 BORE HOLE NO. 1
 JOB F 59-52 STATION See Drawing
 DATUM Elev. 640' COMPILED BY BK
 BORING DATE June 2/59 CHECKED BY AL

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

LEGEND

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



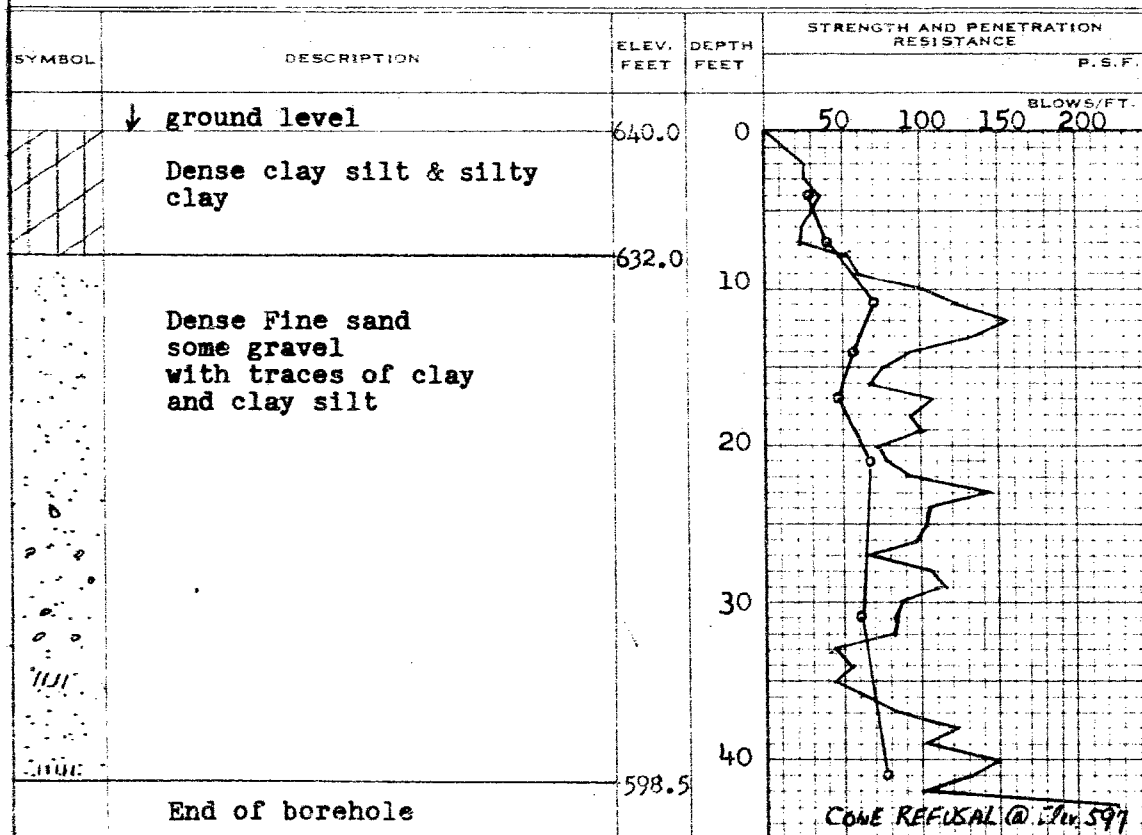
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 24-59 BORE HOLE NO. 2
 JOB F 59-52 STATION See Drawing
 DATUM Elev. 640' COMPILED BY BK
 BORING DATE June 2/59 CHECKED BY AL

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

LEGEND

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



CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.			
10 20 30			
		S1	-
		S2	137.5
		S3	-
		S4	-
		S5	-
		S6	-
		S7	-

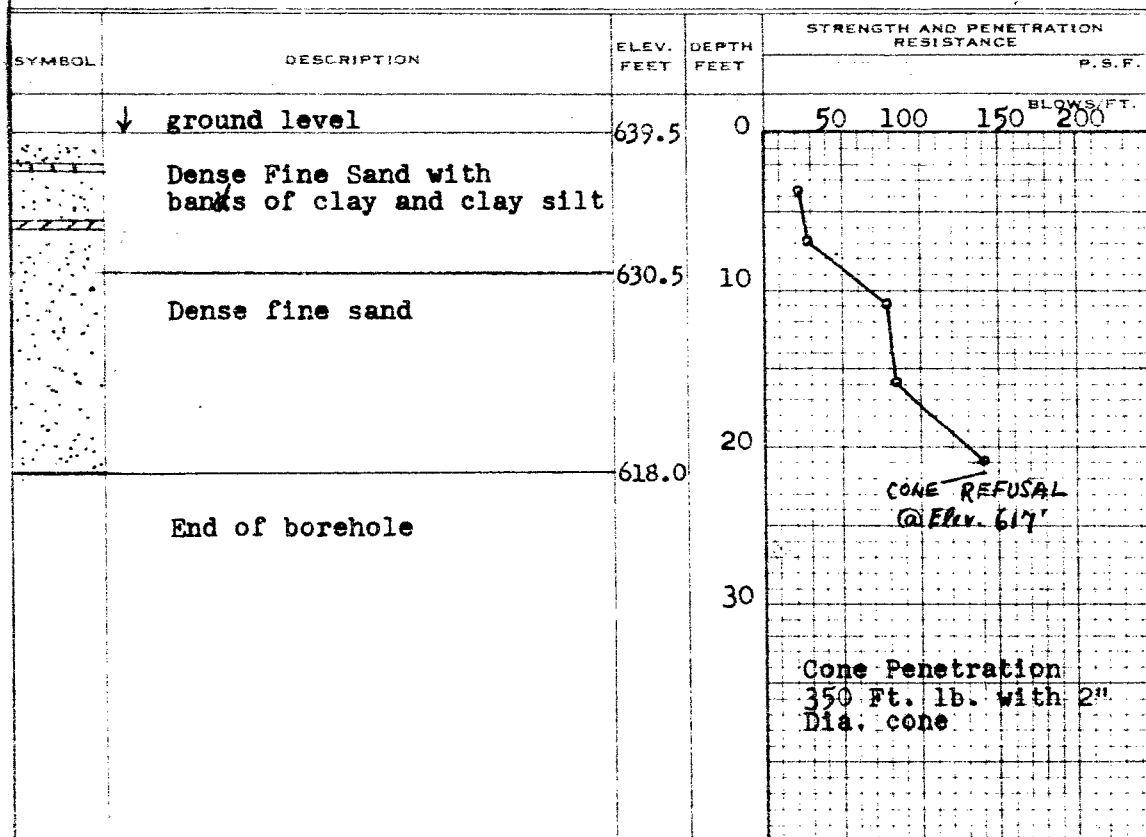
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 24-59 BORE HOLE NO. 3
JOB F 59-52 STATION See Drawing
DATE Elev. 640' COMPILED BY BK
BORING DATE June 3/59 CHECKED BY AL

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 LI
LIQUID LIMIT X
PLASTIC LIMIT



CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.			
10 20 30			
		S1	-
		S2	-
		S3	-
		S4	-
		S5	-

B.H. # 3

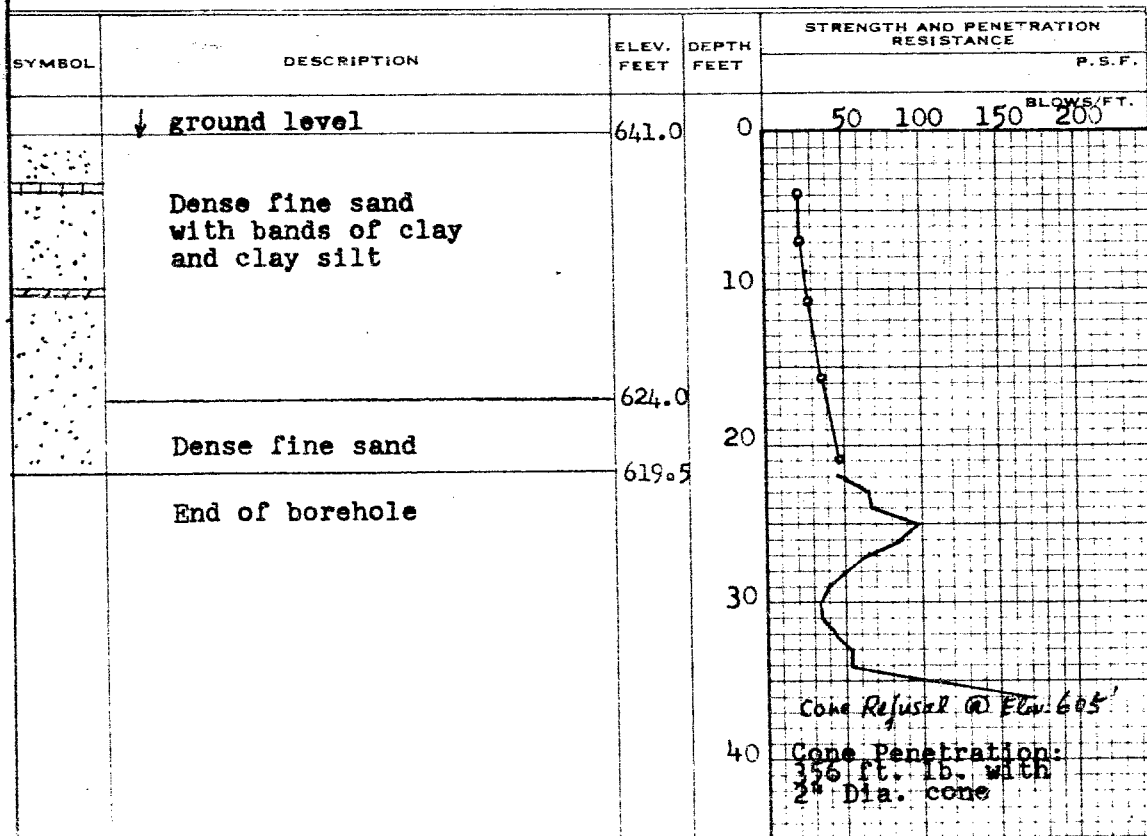
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 24-59 BORE HOLE NO. 4
 JOB F 59-52 STATION See Drawing
 DATUM Elev. 640' COMPILED BY BK
 BORING DATE June 3/59 CHECKED BY AL

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

LEGEND

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



CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.			
10 20 30			
		S1	-
		S2	-
		S3	-
		S4	-
		S5	-