DOCUMENT. MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 30M12-104

DIST. 6 REGION

W.P. No. 48-71~20/21
(formerly 402-65-00)

CONT. No. 80-76

W. O. No.

STR. SITE No. 37-319

HWY. No. 427

LOCATION Hwy 427 Overpass
SBL & NBL at
Dixon Rd.

No OF PAGES -

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

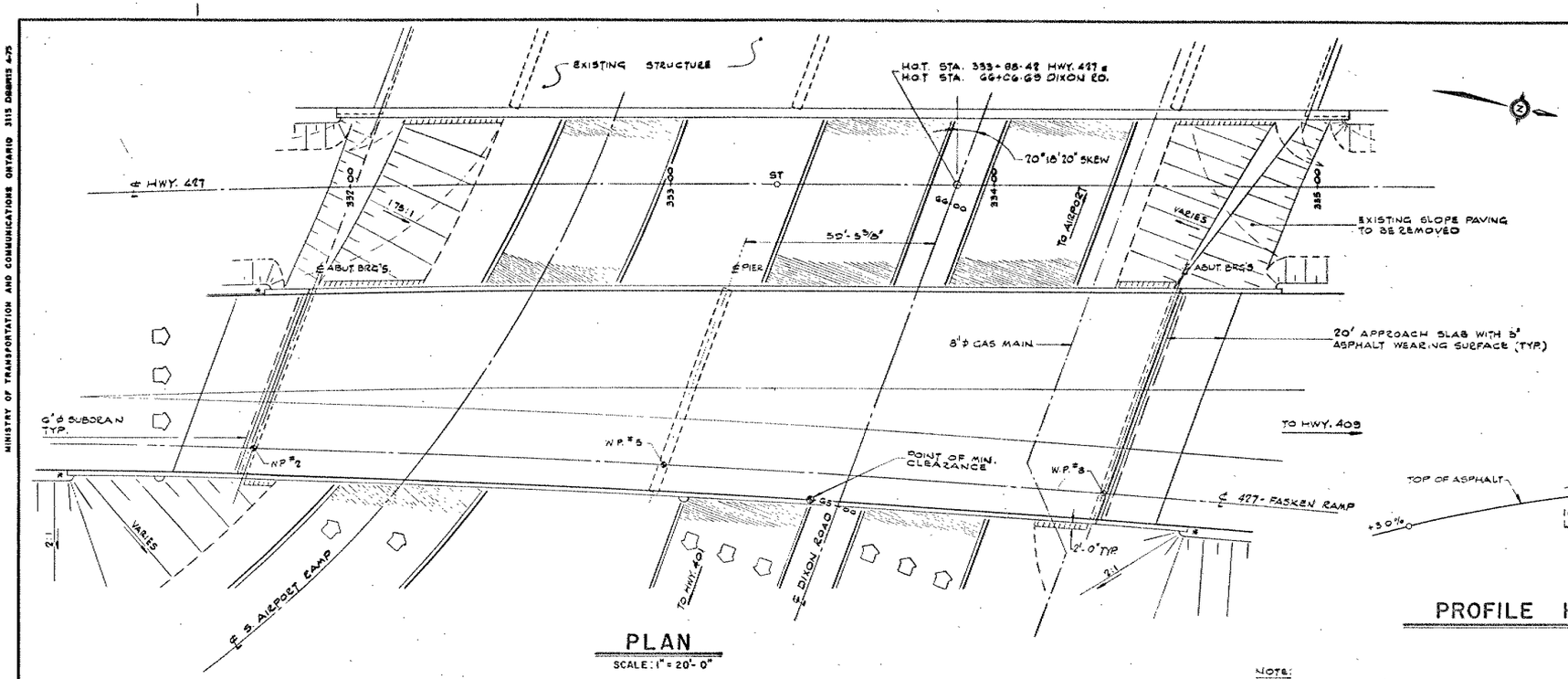
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO 3115 DOWNS 4-75

DIST. Nº 6
CONT No
WP No 48-71-21

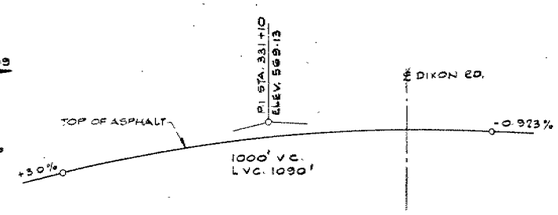
HWY. 427 OVERPASS N.B.L. AT DIXON ROAD
GENERAL ARRANGEMENT

SHEET

McCORMICK RANKIN
CONSULTING ENGINEERS

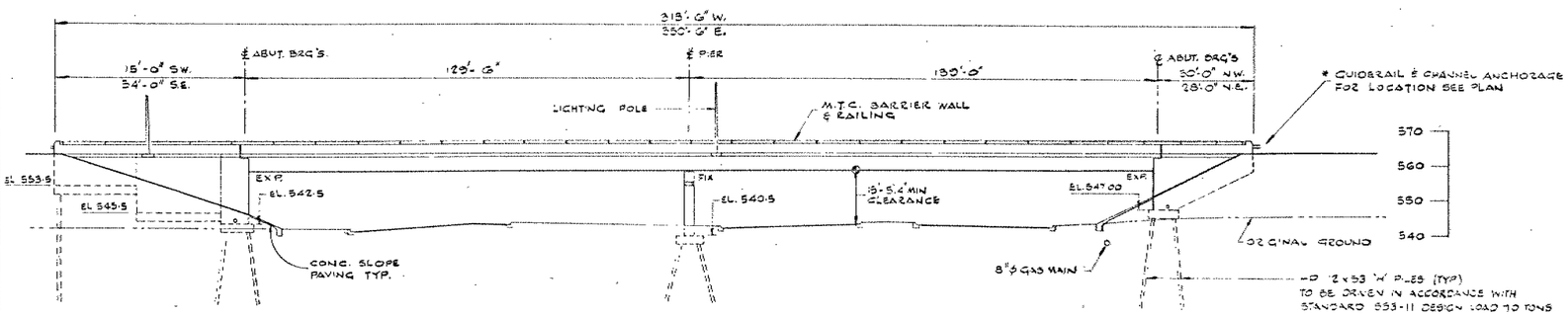


PLAN
SCALE: 1" = 20'-0"

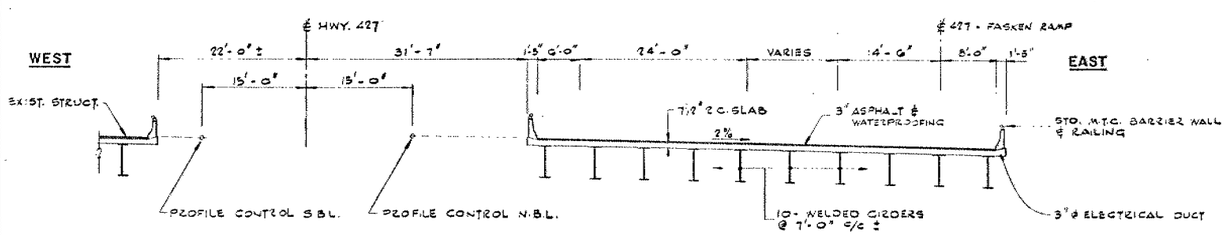


PROFILE HWY. 427 (N.B.L.)

NOTE:
SPANS MEASURED ALONG ℄ TANGENT HWY. 427



ELEVATION
SCALE: 1" = 20'-0"



SECTION
SCALE: 1" = 10'-0"

B.M. ELEV. 543.55

PLATE N MOST NORTH WESTERLY CONCRETE SUPPORT COLUMN OF CONCRETE BRIDGE AT INDIAN LINE (PROP. HWY. 427) & DIXON ROAD 74' LEFT OF STA. 334+60 ℄ PROP. HWY. 427.

GENERAL NOTES:

CLASS OF CONCRETE

DECK & BARRIER WALLS	- 4,000 PSI.
ABUTMENTS & FOOTINGS	- 3,000 PSI.
REMAINDER AS NOTED	

CLEAR COVER ON REINFORCING STEEL

FOOTINGS & ABUTMENTS		- 3"
DECK	TOP	- 2"
	BOT.	- 1"

BARRIER WALL 1½" EXCEPT AS NOTED.
APPROACH SLAB 2"
REMAINDER AS NOTED

REINFORCING STEEL SHALL BE C.S.A. G30.12M SERIES, GRADE 400 MPA OR AS NOTED. REINF. BARS WITH THE DESIGNATION 'C' AT THE END OF BAR MARKS SHALL BE COATED BARS.

TO ACHIEVE THE MIN. CLEAR COVER OF 2" SPECIFIED, THE TOP LAYER OF DECK RE-BARS SHALL BE PLACED PRIOR TO CONCRETING, WITH A CLEAR COVER OF 2½" ± ½" TOLERANCE.

CONSTRUCTION NOTES

THE CONTRACTOR SHALL FINISH THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS TO A TOLERANCE OF ⅛" ±.

NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.

LIST OF DRAWINGS

1. GENERAL ARRANGEMENT
2. BOREHOLE LOCATIONS & SOIL STRATA
3. FOUNDATION DETAILS
4. NORTH ABUTMENT
5. NORTH ABUTMENT WINGWALLS
6. SOUTH ABUTMENT & WINGWALLS
7. RETAINING WALL DETAILS
9. PIER DETAILS
9. BEARING DETAILS
10. GIRDER DETAILS I
11. GIRDER DETAILS II
12. DECK DIM. & SCREED ELEVATIONS
13. DECK REINFORCING
14. WEST BARRIER WALL
15. EAST BARRIER WALL
16. STEEL RAILING (SINGLE TUBE)
17. 20 FT. APPROACH SLAB
18. DETAILS OF CONCRETE SLOPE PAVING
19. AS CONSTRUCTED ELEV. & DIM.
20 STANDARDS
21. STANDARDS
22. STANDARDS
23. EMBEDDED WORK

CONCRETE QUANTITIES

(FOR LUMP SUM CONCRETE TENDER ITEMS)

CONCRETE IN PIER, ABUTS, WINGWALLS & RET. WALL	380 C.Y.
CONCRETE IN DECK	440 C.Y.
CONCRETE IN BARRIER WALLS	42 C.Y.
CONCRETE IN APPROACH SLABS	76 C.Y.
CONCRETE IN SLOPE PAVING	56 C.Y.

STRUCTURAL STEEL QUANTITY

336 TONS.

RECEIVED
FEB 09 1979
SOIL MECHANICS
MINISTRY OF TRANSPORTATION & COMMUNICATIONS

REGISTERED PROFESSIONAL ENGINEER R. SKELTON PROVINCE OF ONTARIO

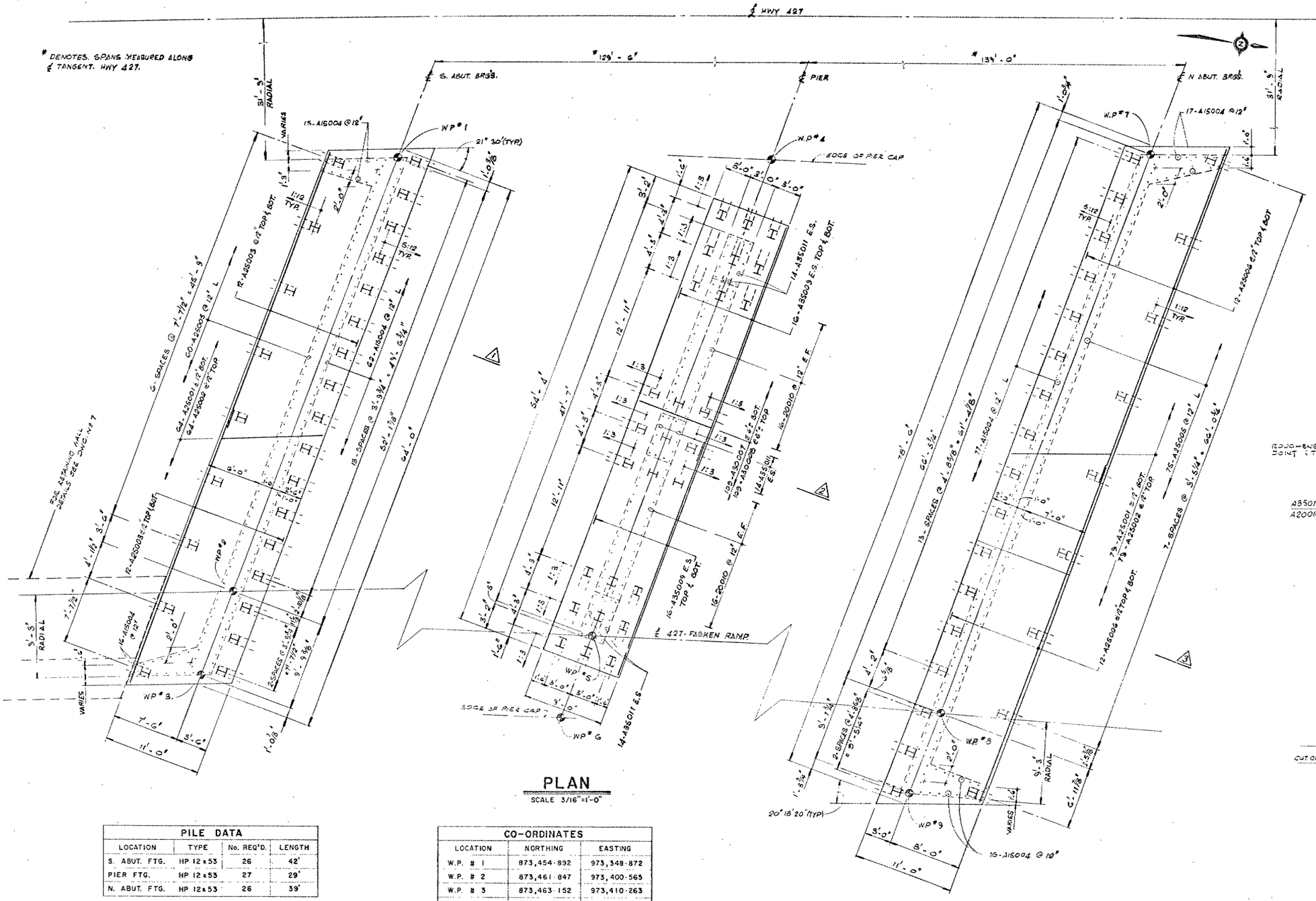
REGISTERED PROFESSIONAL ENGINEER J. W. TUCK PROVINCE OF ONTARIO

FOR REDUCED PLAN
USE SCALE BELOW
0 1 2 3
← 3 INCHES ON ORIGINAL PLAN →

REVISIONS			
DATE	BY	DESCRIPTION	
DESIGN R.S.	CHECK J.W.T.	LOADING HS 20-44	DATE DEC. '78
DRAWING B.A.	CHECK J.W.T.	SITE No 37-319	DWG 1

TRANSLAR 500-6-78

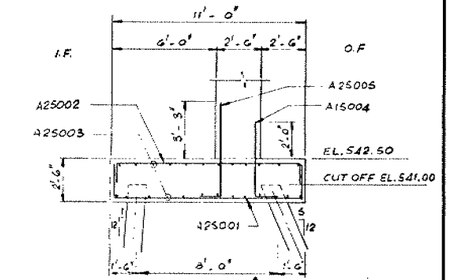
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO 3115 08R15 4-75



PLAN
SCALE 3/16"=1'-0"

PILE DATA			
LOCATION	TYPE	No. REQ'D.	LENGTH
S. ABUT. FTG.	HP 12x53	26	42'
PIER FTG.	HP 12x53	27	29'
N. ABUT. FTG.	HP 12x53	26	39'

CO-ORDINATES		
LOCATION	NORTHING	EASTING
W.P. # 1	873,454·892	973,348·872
W.P. # 2	873,461·847	973,400·565
W.P. # 3	873,463·152	973,410·263
W.P. # 4	873,569·230	973,287·866
W.P. # 5	873,576·832	973,344·360
W.P. # 6	873,578·144	973,354·112
W.P. # 7	873,691·828	973,221·435
W.P. # 8	873,700·693	973,287·317
W.P. # 9	873,701·979	973,296·873



SECTION 1
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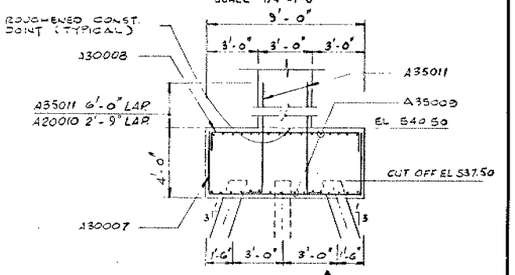

SECTION 2
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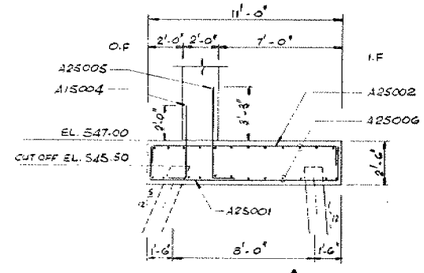


SECTION 3
SCALE 1/4"=1'-0"

DIST. No 6
CONT No
WP No 48-71-21

HWY. 427 OVERPASS N.B.L. AT DIXON ROAD
FOUNDATION DETAILS

SHEET

McCORMICK RANKIN
CONSULTING ENGINEERS

REGISTERED PROFESSIONAL ENGINEER R. SKELTON PROVINCE OF ONTARIO

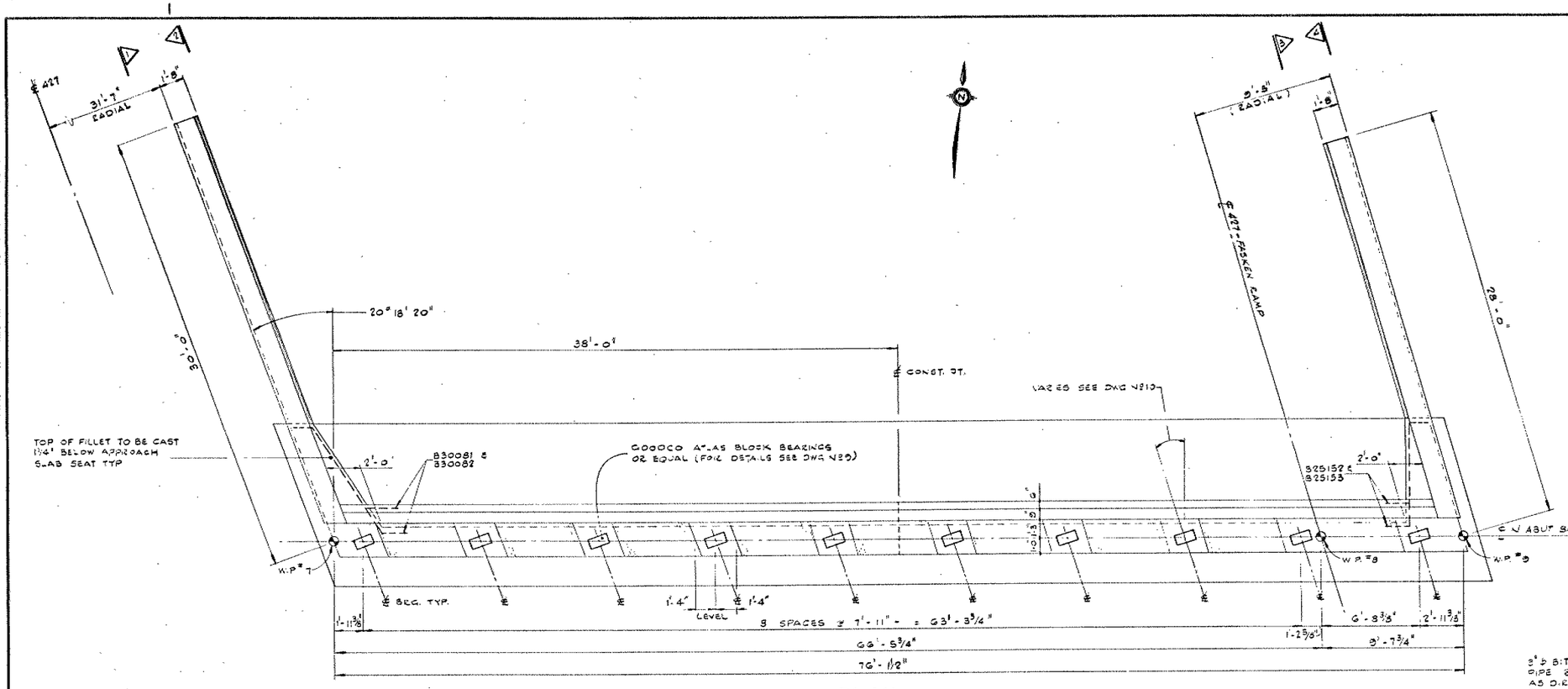
REGISTERED PROFESSIONAL ENGINEER J. W. TUCK PROVINCE OF ONTARIO

FOR REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN

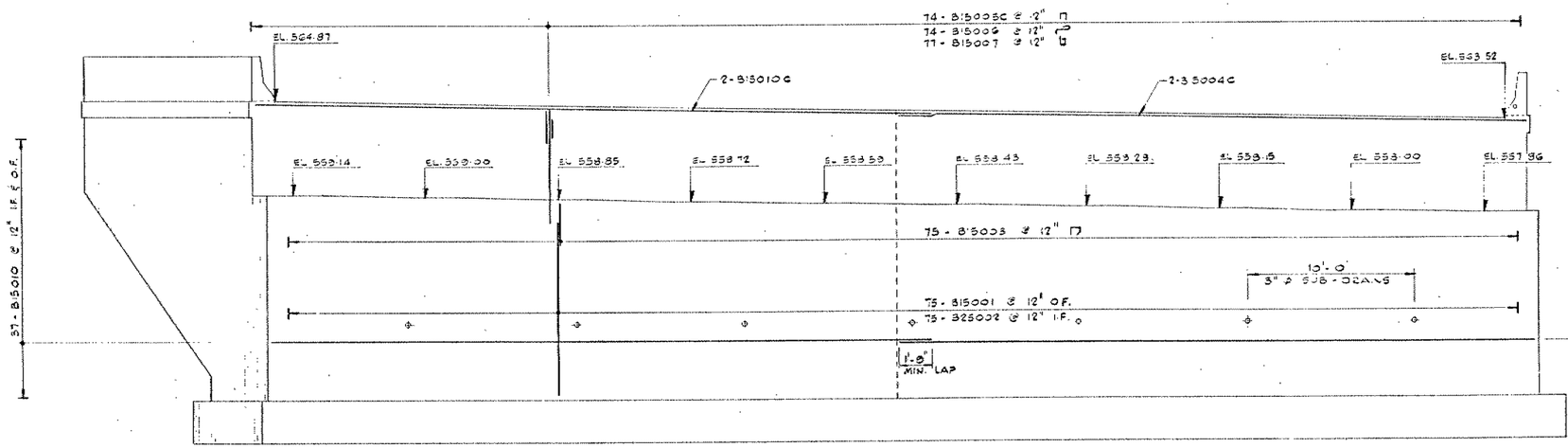
REVISIONS			
DATE	BY	DESCRIPTION	
DESIGN R.S.	CHECK J.W.T.	LOADING HS 20-44	DATE DEC. 78
DRAWING B.A.	CHECK J.W.T.	SITE No 37-319	DWG 3

TRANSLAR 300-7-78

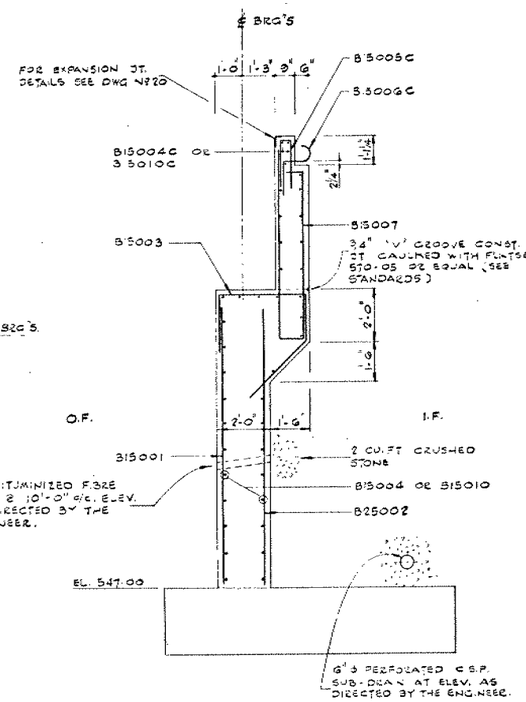
DIST. No 6 CONT No WP No 48-71-21	
HWY. 427 OVERPASS N.B.L. AT DIXON ROAD NORTH ABUTMENT	SHEET
McCORMICK RANKIN CONSULTING ENGINEERS	



PLAN
SCALE 1/4"=1'-0"



ELEVATION
SCALE 1/4"=1'-0"



TYPICAL SECTION
SCALE: 3/8"=1'-0"

NOTE: B008 & B009 DELETED.
FOR SECTIONS 1 TO 4 SEE DWG. N° 5.

R. SKELTON — REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

J. W. TUCK — REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

FOR REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN

REVISIONS	DATE	BY	DESCRIPTION

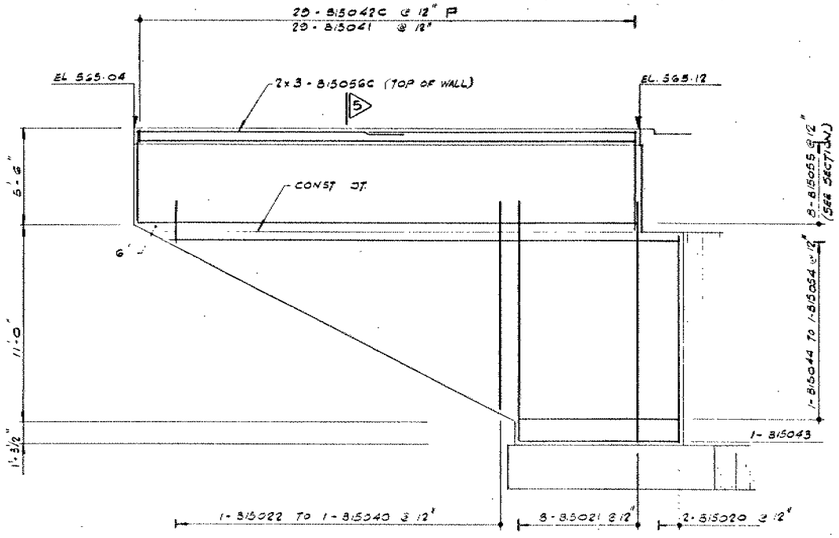
DESIGN	R.S.	CHECK J.W.T.	LOADING	HS 20-44	DATE DEC. 78
DRAWING	B.A.	CHECK J.W.T.	SITE No	37-319	DWG 4

DIST. No 6
CONT No
WP No 48-71-21

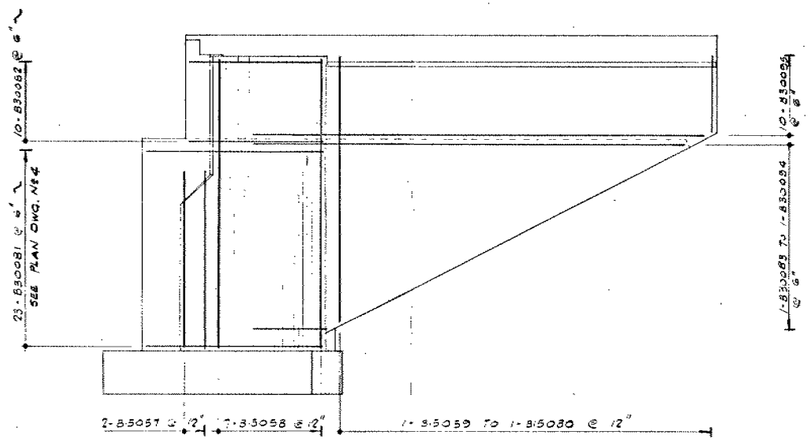
HWY. 427 OVERPASS N.B.L.
AT DIXON ROAD
NORTH ABUTMENT WINGWALLS

SHEET

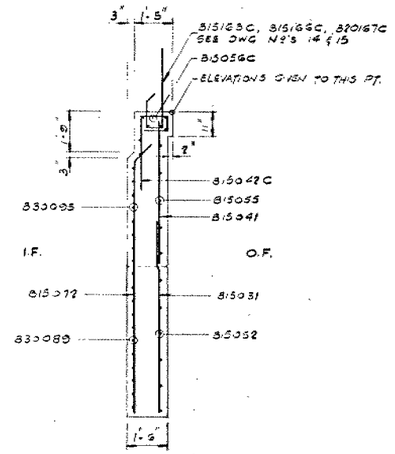
McCORMICK RANKIN
CONSULTING ENGINEERS



SECTION 1
SCALE 1/4"=1'-0"



SECTION 2
SCALE 1/4"=1'-0"



SECTION 5
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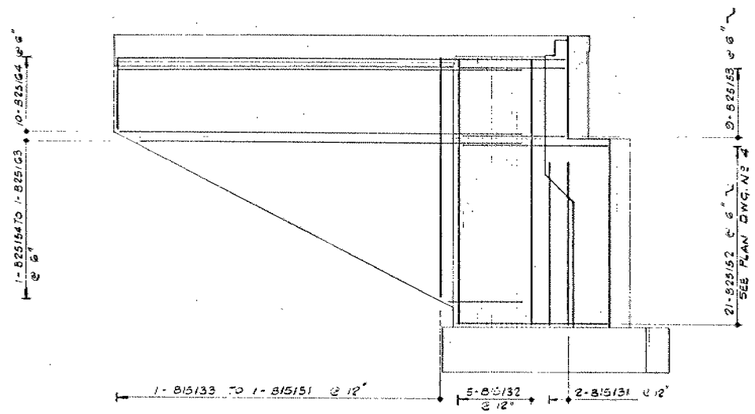
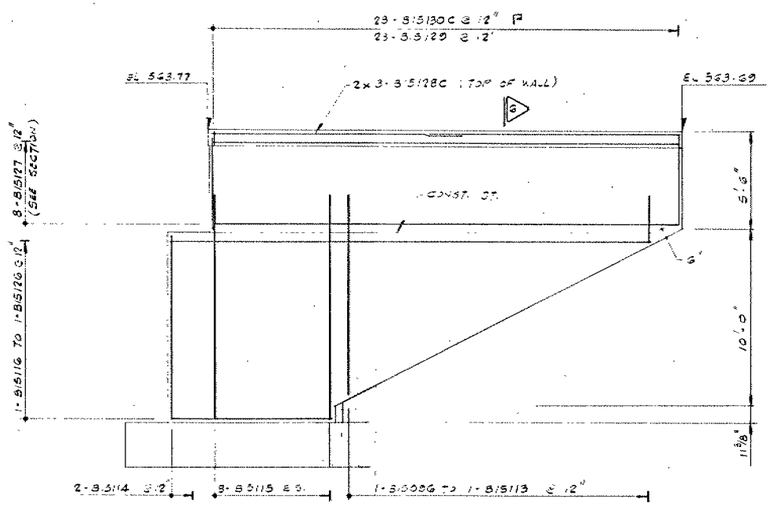
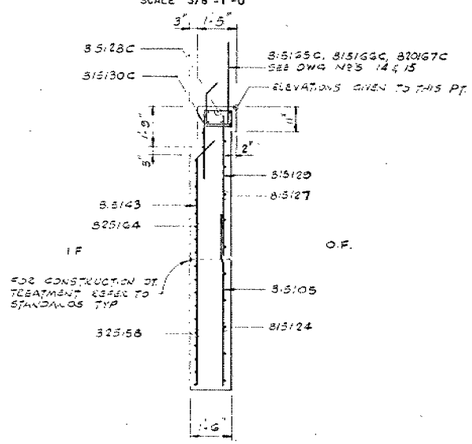


SECTION 3
SCALE 1/4"=1'-0"



SECTION 4
SCALE 1/4"=1'-0"



SECTION 6
SCALE 3/8"=1'-0"

REGISTERED PROFESSIONAL ENGINEER R. SKELTON PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER J. W. TUCK PROVINCE OF ONTARIO

FOR REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN

REVISIONS					
DATE	BY	DESCRIPTION			
DESIGN R.S.	CHECK J.W.T.	LOADING HS 20-44	DATE DEC. 78		
DRAWING B.A.	CHECK J.W.T.	SITE No 37-319	DWG 5		

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO:	Mr. G.C.E. Burkhardt, (2) Regional Structural Planning Engineer, Central Region, Toronto.	FROM:	Soil Mechanics Section, Geotechnical Office, West Building, Downsview.
ATTENTION:		DATE:	September 5th, 1974.
OUR FILE REF.		IN REPLY TO	

SUBJECT:

30M12-104
GEOCRES No.

FOUNDATION INVESTIGATION REPORT

For

The Proposed Structure Widening
Hwy. #427 Overpass at Dixon Rd.
Site #37-319; Borough of Etobicoke.
District #6, Toronto.

W.P. ~~402-65-00~~ W.O. Nil.
48-71-21 (W.E.)

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

We believe that the factual data and recommendations contained therein will prove adequate for your design requirements. Should additional information be required, please do not hesitate to contact our Office.

P. Devata

For M. Devata,
Supervising Engineer.

KGS/mj
c.c. E.J. Orr
B.R. Davis
R.S. Pillar
H. Greenland
B.J. Giroux
D. Gunter
G.A. Wrong
P. Lewycky
Files
Documents

TABLE OF CONTENTS

FOUNDATION INVESTIGATION REPORT

For
The Proposed Structure Widening
Hwy. #427 Overpass at Dixon Rd.
Site #37-319;Borough of Etobicoke.
District #6, Toronto.

W.P. ~~402-65-00~~ W.O. Nil.

1. INTRODUCTION:

The Soil Mechanics Section was requested to carry out a subsurface investigation at the site of the abovementioned structure. The request was contained in a memo from Mr. G.C.E. Burkhardt, Regional Structural Planning Engineer, Central Region, dated June 13th, 1974. Subsequently, a foundation investigation was carried out by this Section to determine the subsoil, bedrock and groundwater conditions at the site.

This report contains the results of our field and laboratory investigation, together with our recommendations pertaining to design and construction of the structure foundations as well as the stability considerations associated with the approach fills.

2. DESCRIPTION OF SITE AND GEOLOGY:

The site is located at the crossing of Hwy. #427 and Dixon Road, in the City of Mississauga. The surrounding terrain is flat to gently undulating. Toronto International Airport lies southwest from the site. The rest of the area in the vicinity of the site is being utilized for commercial purposes.

The site is located in the physiographical region known as the "Peel Plain". The general elevation in this region is from 500 to 750 feet above sea level, and there is a gradual and fairly uniform slope toward Lake Ontario. The characteristic deposit in this area is a ground moraine laid down during the Wisconsin glacial age. Deposits of silt and sand are often found interbedded within the till.

continued . . . /2

3. FIELD AND LABORATORY INVESTIGATIONS:

Six boreholes accompanied by dynamic cone penetration tests were put down during the course of field investigation. The borings were advanced by means of a continuous flight auger machine adapted for soil sampling purposes (C.M.E.55).

Samples of the overburden were obtained at required depths by means of a 2" O.D. split-spoon sampler. The sampler was driven into the soil with a driving energy in accordance with the specifications for Standard Penetration Test. The same method was used to advance the cone penetration tests. Bedrock was proven at three boring locations by obtaining BXL size rock core samples. The groundwater conditions were observed by recording the water levels in the open boreholes during the course of the field investigation.

The soil, bedrock, and groundwater conditions encountered in the borings are presented on the Record of Borehole Sheets. All boreholes were surveyed in the field by Construction Personnel from District #6. Elevations are referenced to a Geodetic Datum. The boring locations and elevations are shown on Drawing No. 4026500-A.

All samples were subjected to careful inspection and classification both in the field and in the laboratory. Following this examination, various laboratory tests were carried out on representative samples to determine the physical properties of the overburden, namely:

Natural Moisture Contents
Atterberg Limits
Grain-size Distributions

...../3

The results of the laboratory testing are plotted on Record of Borehole Sheets, contained in the Appendix of this Report.

4. SOIL TYPES AND SOIL CONDITIONS:

4.1) General.

The predominant stratum encountered at the site is very stiff to hard hetrogeneous mixture of clayey silt, sand and gravel (glacial till). This deposit is overlain by fill material of up to 7 ft. (2.1 m). Occasional sandy silt layers were encountered within the till material in B.H.'s No. 7, 9 & 10, which were also terminated in the Glacial Till zone. In B.H.'s #6, 8 and 11, the glacial till layer is followed by a deposit of sandy silt to silty sand, with traces of clay and gravel.

The overburden is followed by grey weathered shale bedrock.

The boundaries of the various deposits as determined in the boreholes are shown on the Record of Borehole Sheets. The stratigraphical sections, as shown on Drawing No. 4026500A, have been inferred from this data. From ground surface downward, the soil types and bedrock are described in the subsections to follow:

4.2) Fill Material.

Fill material was encountered at all boring locations. Its depth ranges from 4.0 ft. (1.2 m) at B.H.#11 to 7.0 ft. (2.1 m) at B.H.#7 below ground level. The material consists of clayey silt with sand, traces of gravel and organics. The consistency is estimated to range from firm to very stiff.

4.3) Glacial Till.

This deposit was encountered under the fill material. The thickness of the deposit ranges from 27.1 ft. (8.3 m) at B.H.#11 to more than 32.0 ft. (9.8 m) at B.H.#10. This layer is composed of a hetrogeneous mixture of clayey silt with sand and gravel. Occasional sandy silt layers were also encountered within the deposit. The glacial till stratum has a hardened crust to about elev. 525, and it is brown in colour. The remainder of the deposit is grey coloured.

..... /4

Based on Standard Penetration Test results only, the undrained shear strength of the crust is estimated to be 3000 p.s.f. and greater. The consistency of the grey portion of the deposit ranges from very stiff to hard.

Atterberg Limit tests were carried out on some representative samples. The results, which are plotted on the Record of Borehole Sheets and on the Plasticity Chart (Fig. 1), are summarized below in tabulated form.

		Range	Average
Liquid Limit (W_L)	%	12-27	22
Plastic Limit (W_p)	%	10-19	14
Natural Moisture Content (W)	%	8-14.5	10

Based on these values, this deposit is inorganic and of low plasticity.

Grain-size distribution tests were performed on the samples obtained from this deposit. The results are summarized on Fig. #2 in an envelope form.

4.4) Sandy Silt to Silty Sand, Traces of Clay and Gravel.

In B.H.'s #6 and 8, the glacial till layer is underlain by a very dense sandy silt to silty sand with traces of clay and gravel. The thickness ranges from 12.3 feet (3.7 m) at B.H.#8 to 16.8 feet (5.1 m) at B.H.#6.

4.5) Bedrock.

Bedrock was proven at three boring locations by obtaining BXL size rock core samples. A detailed study of the rock core samples performed by Mrs. Z. Koniuszy, Aggregates Evaluation Engineer (Geologist) is included in the Appendix. The bedrock is composed of grey weathered shale, with layers of shaley, silty, grey limestone. The elevations of the bedrock surface locations are as follows:

..... /5

B.H.#	Elev.
6	486.3
8	491.2
11	492.1

5. GROUNDWATER CONDITIONS:

The following groundwater levels were observed during the field investigation:

B.H.#	Elev.
6	535.7
7	539.5
8	534.9
9	535.0
10	535.3
11	534.1

6. DISCUSSIONS AND RECOMMENDATIONS:

6.1) General:

It is proposed to widen the Hwy. #427 overpass structure at Dixon Road. The existing bridge will also be raised to conform with the new profile. The proposal calls for jacking the existing steel beams in conjunction with some asphalt padding so as to achieve the "final" pavement deck elevations.

The existing structure is a 4-span (42'±, 88'±, 118'±, 42'±) (12.8 m±, 26.8 m±, 36.0m±, 12.8 m±) overpass structure (refer to preliminary bridge plan BS 48-71-03-1). The footing location of the existing and proposed structure are shown on Drawing No. 4026500-A.

The subsoil and groundwater conditions, encountered in the area under investigation, have been discussed previously in this Report in Sections 4 & 5.

..... /6

6.2) Structure Foundations.

6.2.1) Piers.

The crust of the glacial till is competent material for spread footing type foundations at the following elevations:

Pier 'B'	Elev. 532
Pier 'C'	Elev. 533
Pier 'D'	Elev. 529

A minimum of 4 feet (1.2 m) of earth cover should be provided above the base of the footing for frost protection purposes. Footings so founded may be designed using an allowable bearing pressure of 3.0 t.s.f. (287.3 kPa).

The glacial till subsoil will settle due to the footing pressure. Since the till is highly preconsolidated, this settlement will be of a recompression nature; i.e., take place during or immediately following the construction period. This settlement will not exceed 1 inch, provided the foundation soil is not softened by the construction operations or uncontrolled surface runoff. Therefore, it is recommended that the base of footing excavation be protected with a working mat of lean concrete as soon as the footing level is reached.

The base of the footing excavation will be located below the groundwater level observed during the period of field investigation. The excavations will be carried out in the relatively impervious glacial till. No major dewatering problems are therefore anticipated. Any minor inflow could be controlled using conventional techniques such as pumping from sumps.

..... /7

6.2.2) Abutments.

The abutments may be supported on spread footings placed on well compacted, suitable granular material within the approach fills. A safe design load of 2.0 t.s.f. (191.5 kPa) may be assumed. The granular material should consist of Granular 'A' and should be fully compacted according to current M.T.C. standards. A detailed construction scheme is outlined on Figure #3 of the Appendix.

As an alternative, the abutments may be constructed within the approach fills and supported on end-bearing piles driven into the competent glacial till deposit. For estimating purposes the piles can be designed for the maximum allowable load for the particular steel section chosen.

6.3) Approach Fills:

The undrained shear strength of the subsoil is such that it will be able to safely support the 22 ft. (6.7 m) high approach embankments constructed with 2:1 slopes. The fill should consist of well compacted acceptable material. Care should be taken to ensure that no bouldery fill is placed within the approaches through which piles have to be driven.

The cohesive glacial till will settle due to the fill loading. This settlement is estimated to be minor in magnitude (approx. 1 inch), and will occur during or immediately following the fill placement.

The topsoil and any soft surficial material should be removed in accordance with pertinent M.T.C. standards within the construction area.

A construction joint should be provided between the existing and new portion of the structure.

..... /8

7. MISCELLANEOUS:

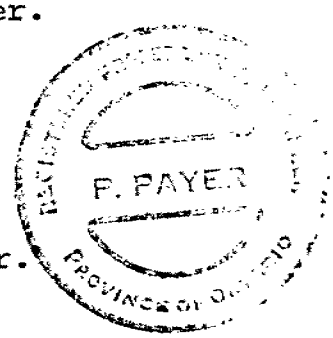
This project was carried out between June 27th and July 10th, 1974 under the supervision of Mr. H. Shah, Project Engineer.

The drilling equipment used was owned and operated by P.V.K. and Sons Drilling Co. Ltd., Burford, Ontario.

This report was prepared by Mr. H. Shah, Project Engineer and was reviewed by Mr. P. Payer, Senior Engineer.

H. Shah,
Project Engineer.

P. Payer,
Senior Engineer.



HS/mj
September 1974.

APPENDIX I

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 6

JOB -- LOCATION Co-ords. 15,873,442 N; 973,4048 ORIGINATED BY HS

W.P. ~~402-65-00~~ 48-71-21 BORING DATE July 8 & 9, 1974 COMPILED BY PP

DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY [illegible]

m.	ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT (0.3 m)	ft/m ELEV. SCALE
165.0	541.3	Ground Level					
0.0	0.0	Clayey silt with some sand, traces of gravel & organics Fill		1	SS	8	540 / 164.3
163.5	536.3			2	SS	25	
1.5	5.0	Wet. Mixture of clayey silt sand & gravel V. Stiff to Hard Glacial Till Brown		3	SS	25	
				4	SS	22	530 / 161.5
				5	SS	48	
				6	SS	32	
				7	SS	22	
		Grey		8	SS	24	520 / 158.5
				9	SS	20	
				10	SS	45	
				11	SS	59	
				12	SS	87	510 / 155.4
				13	SS	190	
154.0	505.3						
11.0	36.0	Sandy Silt to silty sand with traces of clay & gravel Grey V. Dense		~~14~~	~~SS~~	~~127~~	" 500 / 152.4
				~~15~~	~~SS~~	~~180~~	1" 490
148.9	488.5			~~16~~	~~SS~~	~~204~~	149.4
~~16.2~~ 18.2	~~53.2~~ 59.8	Transition Zone		~~17~~	~~SS~~	~~60/3~~"	
146.2	486.3			18	RC	62%	
16.8	55.0	Weathered Shale Bedrock Grey		19	RC	Rec.	
				20	BXL	64%	480
				21			
		Sound		22	BXL	90%	146.3
145.7	477.9						
19.3	63.4	End of Borehole					470 / 143.3

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m) — 20 40 60 80 100

SHEAR STRENGTH P.S.F. — ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE

LIQUID LIMIT W_L — PLASTIC LIMIT W_P — WATER CONTENT W — W_P W W_L

WATER CONTENT % — 10 20 30

BULK DENSITY γ P.C.F.

REMARKS	GR	SA	SI	CL
	6	24	56	14
▼ 535.7' 163.3				
	4	29	55	12
	3	39	52	6
	7	38	46	9

15 20 5 10 % STRAIN AT FAILURE

OFFICE REPORT OF SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 7

JOB -- LOCATION Co-ords; 15,873,492 N; 973,288 E. ORIGINATED BY BS

W.P ~~402-65-00~~ 48-71-4 BORING DATE July 5-8, 1974 COMPILED BY PP

DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY TP

m.	ELEV / DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT (0.3 m)	ELEV. SCALE ft/m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m) 20 40 60 80 100	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w — WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR SA SI CL
165.2	541.9	Ground Level						SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE			
0.0	0.0	Clayey silt with sand, traces of gravel & organics V. Stiff to Stiff (Fill)		1	SS	10	540 164.6				▼ 539.5 164.4
163.1	534.9			2	SS	9					
2.1	7.0	Het. Mixture of clayey silt sand & gravel Brown / Grey V. stiff to hard Glacial Till		3	SS	20					4 26 53 17
				4	SS	61	530				
				5	SS	66	161.5	100/11"			5 27 50 18
				6	SS	43					
				7	SS	31					
				8	SS	30	520				
		occasional sandy silt layers		9	SS	73	158.5				
				10	SS	126					
				11	SS	100/6"					24 22 40 14
							510				
				12	SS	100/5"	155.4				
53.6	503.9			13	SS	100/6"					
11.6	38.0	End of Borehole					500 152.4				

OFFICE REPORT OF SOIL EXPLORATION

20 15 ◇ 5 10 % STRAIN AT FAILURE

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 8

JOB -- LOCATION Co-ords; 15,873,579 N; 973,329 E ORIGINATED BY HS

W.P. 402-65-00 43-71-21 BORING DATE July 3-5, 1974 COMPILED BY [illegible]

DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY [illegible]

m.	ELEV. / DEPTH ft.	SOIL PROFILE — DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT (0.3 m)	ELEV. SCALE ft/m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m) 20 40 60 80 100 — SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	LIQUID LIMIT W_L — PLASTIC LIMIT W_P — WATER CONTENT W — WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR SA SI CL
164.7	540.3	Ground Level									
0.0	0.0	Clayey silt with some sand, traces of gravel & organics Firm Fill		1	SS	6	164.0				
162.7	533.8			2	SS	7					534.9 / 163.1
2.0	6.5	Het. Mixture of clayey silt sand & gravel Brown / Grey V. Stiff to Hard Glacial Till		3	SS	55	530				
				4	SS	44	161.5	100/11"			
				5	SS	64					7 24 55 14
				6	SS	35					
				7	SS	25	520				
				8	SS	32	158.5				
				9	SS	173					
				10	SS	100/4"	510				6 41 48 5
154.1	505.6			11	SS	133	155.4				
10.6	34.7	Sandy Silt to Silty Sand with traces of clay & gravel Grey V. Dense		12	SS	100/3"	500				
				13	SS	100/6"	152.4				2 68 (10)
150.4	493.3										
14.3	47[illegible]	Transition Zone		14	SS	100/2"	490				
149.7				15	SS	100/4"					
15.0	49.1	Weathered Shale Grey Bedrock		16 17	RC BXL	Rec 66%	149.4				
				18	RC BXL	Rec 59%					
146.8	481.6	Sound		19	RC BXL	Rec 100%	480				
17.9	58.7	End of Borehole					146.3				

OFFICE REPORT OF SOIL EXPLORATION

15 20 10 5 % STRAIN AT FAILURE

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 9

JOB -- LOCATION Co-ords. 15,873,665 N; 973,179 E ORIGINATED BY HS

W.P. ~~462-65-00~~ 48-71-2 BORING DATE June 27, 1974 COMPILED BY HS

DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY AP

m.	ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT (m)	ELEV. SCALE ft/m	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT (0.3 m) 20 40 60 80 100	SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w	WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
165.2	542.0	Ground Level											
0.0	0.0	Clayey silt with some sand, traces of gravel & organics		1	SS	6	540						
							164.6						
163.2	535.5	Firm Fill		2	SS	9							0 16 59 25
													535.0
2.0	6.5	Het. Mixture of Clayey silt Sand & Gravel V. Stiff to Hard Brown Grey Glacial Till		3	SS	34							163.1
				4	SS	37	530						7 22 50 21
				5	SS	101	161.5	100/6"					
				6	SS	52							
				7	SS	25							3 26 56 15
				8	SS	22	520						
		occasional sandy silt layers					158.5						
				9	SS	72							6 32 47 15
				10	SS	100/3½"							
							510						
				11	SS	154	155.4						6 32 51 11
153.9	503.5			12	SS	115/6"							
11.7	30.5	End of Borehole					500						
							152.4						

15 20 10 5 % STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE Nº 10

JOB -- LOCATION Co-ords. 15,873,680 N; 973,274 E. ORIGINATED BY HS

W.P. ~~402-65-00~~ 48-11-21 BORING DATE July 3, 1974 COMPILED BY HS

DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY AF

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m) 20 40 60 80 100	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w	BULK DENSITY	REMARKS
m. / ELEV. DEPTH ft.	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS/FOOT (0.3 m)		SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	WATER CONTENT % 10 20 30	γ P.C.F.	GR SA SI CL
163.4 / 536.1	Ground Level									▽ 163.2
0.0 / 0.0	Clayey silt with some sand, traces of Gravel & organics		1	SS	12					
			2	SS	11	530				
161.4 / 529.6	Stiff (Fill)					161.5				
2.0 / 6.5	Het. Mixture of Clayey silt Brown sand & gravel Grey		3	SS	71		100/9"			
			4	SS	90					5 28 51 16
			5	SS	23					2 22 49 27
	V. Stiff to Hard Glacial Till		6	SS	37	520				
			7	SS	17	158.5				3 35 49 13
			8	SS	124					
			9	SS	122					
	occasional sandy silt layers					510				
			10	SS	100/5"	153.4				16 31 43 10
			11	SS	100/5"	500				
						152.4				
151.5 / 497.1			12	SS	146					24 14 52 20
11.9 / 39.0	End of Borehole									
						490				
						149.4				

20
15 ◇ 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON ... EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 11

JOB -- LOCATION Co-ords. 15,873,719 N; 973,253 E ORIGINATED BY HS

W.P. ~~402-65-00~~ 43-11-21 BORING DATE June 26, July 2, 1974. COMPILED BY HS

DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY AP

m.	ELEV. / DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE ft/m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w — WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR SA SI CL
163.4	536.1	Ground Level										
0.0	0.0	Clayey silt with sand, traces of gravel		1	SS	10						533.7 ▽ 162.8 3 29 52 16
162.2	532.1	Organics - firm Fill										
1.2	4.0	Het. Mixture of Clayey Silt Sand & Gravel Brown / Grey V. Stiff to Hard Glacial Till		2	SS	35	530					
				3	SS	75	161.5	100/6"				
				4	SS	91						
				5	SS	39						5 30 46 19
				6	SS	25	520					1 23 61 15
				7	SS	26	158.5					
				8	SS	125						4 31 48 17
				9	SS	125/6"	510					
				10	SS	106/3/4"	155.4					
153.4	505.0											
9.5	31.1	Sandy Silt with Gravel & some clay Grey V. Dense		11	SS	106/3½"	500					
				12	SS	106/3"	152.4					33 23 32 12
150.6	494.1											
156.6	512.1	Transition Zone		13	SS	152/8"	490					
13.4	44.0	Weathered Shale Bedrock Grey		14	BXL	30%						
				15	BXL	23%	149.4					
				16	RC BXL	Rec 40%						
				17	BXL	Rec	480					
		Bedrock		18	BXL	96%	146.3					
145.1	476.1	Sound		19	BXL	100%						
18.3	60.0	End of Borehole					470					
							143.3					

15 20 10 5 % STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

FORM OB-MT-113
JANUARY 1970

DEPARTMENT OF HIGHWAYS ONTARIO

DIAMOND DRILL RECORD

HOLE NO. 5, 6, & 8 SHEET NO. 1

PROPERTY W. P. 400-65-03
LOCATION W. P. 402-65-00
LATITUDE
DEPARTURE
BEARING

DIP
90°

TOTAL FOOTAGE

ELEV. COLLAR
DATUM
DATE STARTED
DATE COMPLETED
DRILLED BY
LOGGED BY Z. Koniuszy

FOOTAGE FROM	FOOTAGE TO	FORMATION	SAMPLE NUMBER			REMARKS
		Hole #5 - W. P. 400-65-03				
42'	45'8"	Shale, grey, soft (ground) with 2" layer of grey silty limestone				
45'8"	48'8"	2" of ground shale with broken particles of silty, grey limestone, 2" of silty limestone, grey, medium hard				lost core
		Hole #6 - W. P. 402-65-00				
5'5"	65'5"	Shale, grey, medium to soft with few very thin lenses of shaly limestone				core broken, partially ground
		Hole #8 - W. P. 402-65-00				
42'8"	49'8"	Shale, grey, soft (ground)				
49'8"	49'10"	Limestone - silty grey medium hard				
49'10"	55'10"	Shale, grey, medium to soft with few very thin lenses of shaly limestone				core broken, partially ground
55'10"	56'7"	Limestone, shaly, silty, grey, medium hard				
56'7"	58'8"	Shale, grey, medium hard				

DATE OF EXAMINATION July 22, 1974

Z. Koniuszy

FORM OB-MT-113
JANUARY 1970

DEPARTMENT OF HIGHWAYS ONTARIO

DIAMOND DRILL RECORD

HOLE NO. 11 SHEET NO. 2

PROPERTY
LOCATION
LATITUDE
DEPARTURE
BEARING

DIP

TOTAL FOOTAGE

ELEV. COLLAR
DATUM
DATE STARTED
DATE COMPLETED
DRILLED BY
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	FORMATION	SAMPLE NUMBER			REMARKS
		Hole #11 - W.P. 402-65-00				
44'5"	47'0"	Shale, grey, medium to soft				core ground, missing
47'0"	47'6"	Limestone - silty, shaly in places, grey, medium hard				core broken
47'6"	48'8"	Shale, grey, medium hard				core broken
48'8"	48'10"	Limestone - silty, shaly, grey, medium hard				
48'10"	53'9"	Shale, grey, medium hard				core broken
53'9"	53'11"	Limestone, silty, grey, medium hard				
53'11"	56'8"	Shale, dark grey, medium hard				core broken
56'8"	57'0"	Limestone, silty, shaly, grey, medium hard				core broken
57'0"	60'0"	Shale, dark grey, medium to soft				core broken, partially ground

DATE OF EXAMINATION July 22, 1974

Z. Konluszy

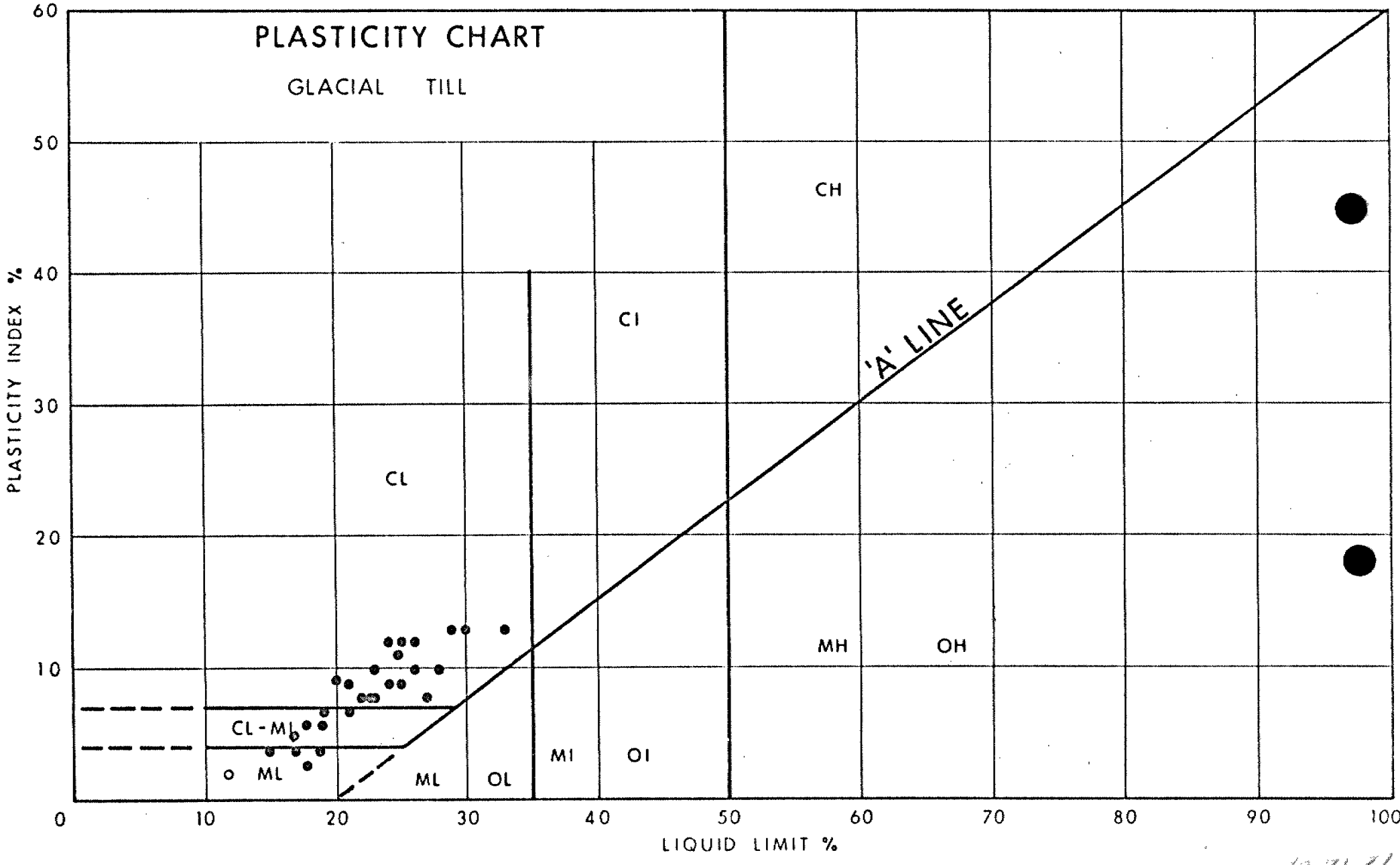


FIG. 1

W.P. 402-65-00

GRAIN SIZE DISTRIBUTION

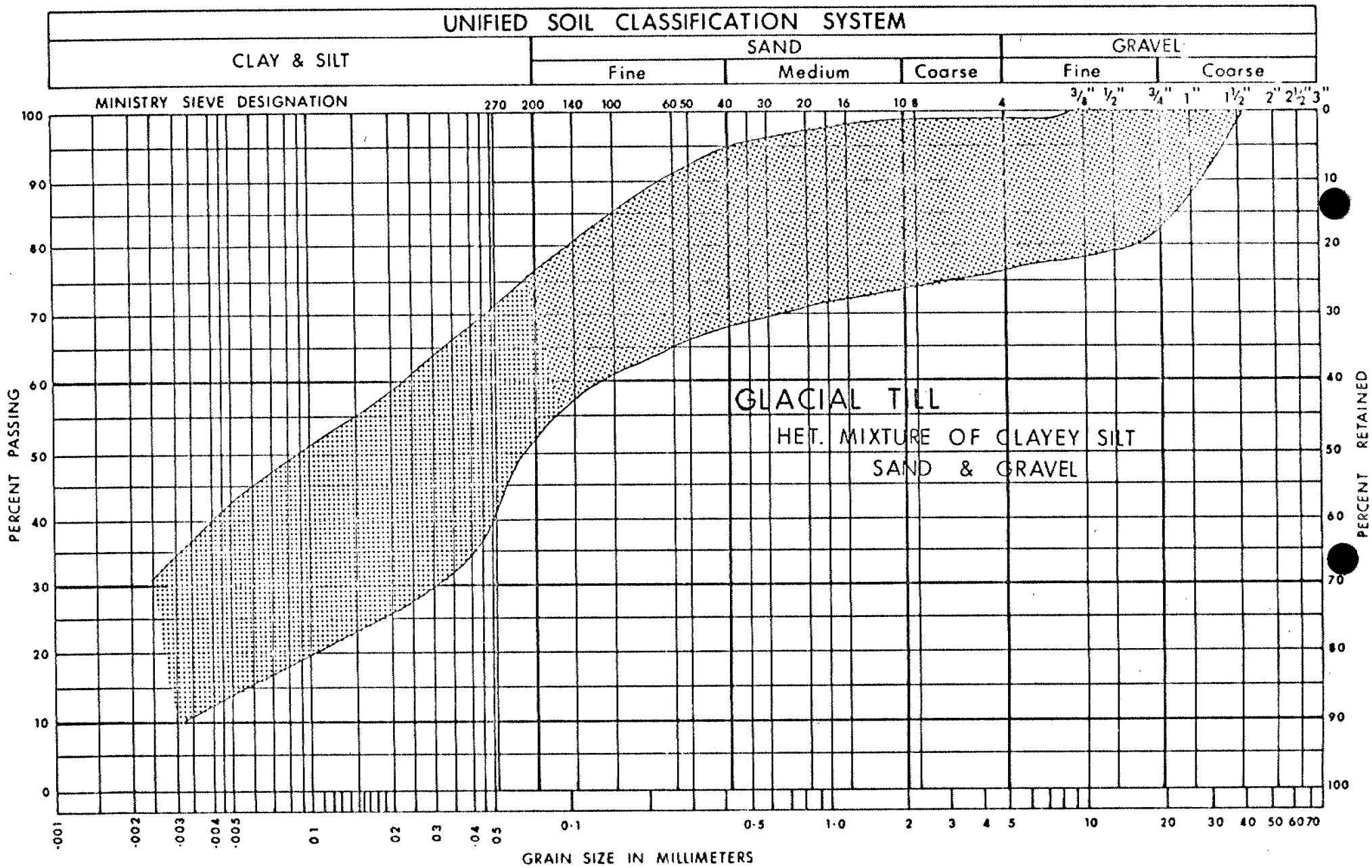
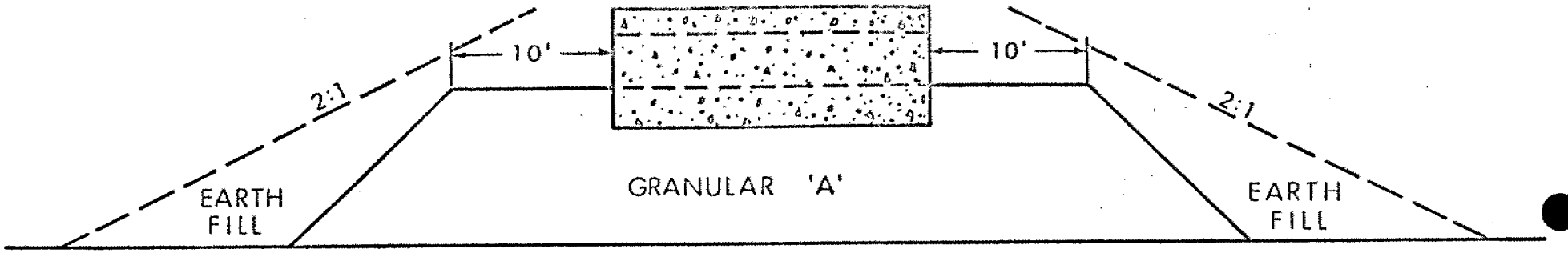


FIG. 2

43-71-2

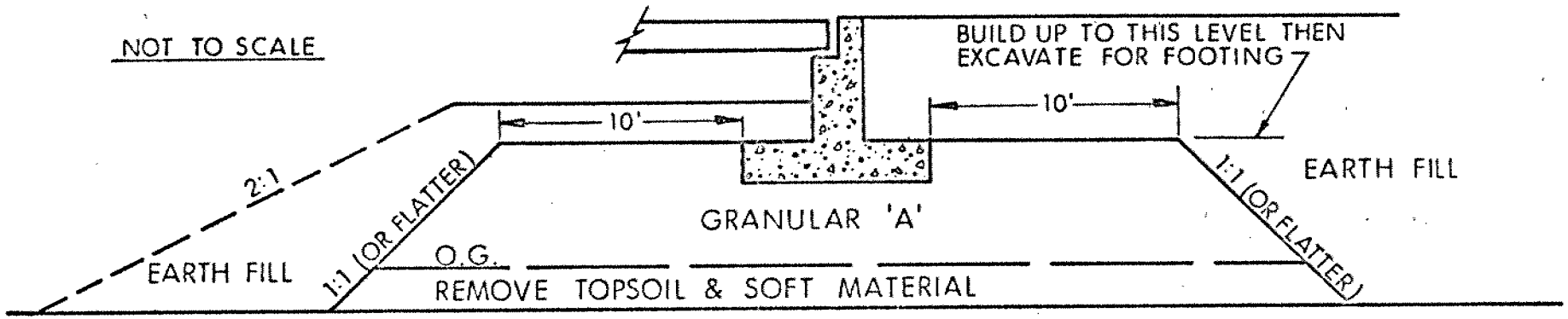
WP 402-45-00

ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



X - SECTION

NOT TO SCALE



LONGITUDINAL SECTION

NOTES

1 - REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A'.

2 - PLACE GRANULAR 'A' TO TOP OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M.T.C. STANDARDS.

3 - EXCAVATE COMPACTED GRANULAR 'A' MATERIAL FOR FOOTING.

43-71-21

FIG. 3

W. P. ~~402-65-00~~

FD-9a (Rev Jan

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

PENETRATION RESISTANCE

'N' STANDARD PENETRATION RESISTANCE - 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 :-

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

TERMS TO BE USED IN DESCRIBING SOILS:-

TRACE < 10% , SOME 10-25% , WITH 25-40% , > 40% SILTY, SANDY, GRAVELLY, CLAYEY ETC.

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.T.	SLOTTED TUBE SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

U	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
UU	UNCONSOLIDATED UNDRAINED TRIAXIAL	F.V.	FIELD VANE
CIU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

ABBREVIATIONS & SYMBOLS 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
w_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 INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$
μ	COEFFICIENT OF FRICTION
S_t	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
σ'	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 (YOUNGS MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

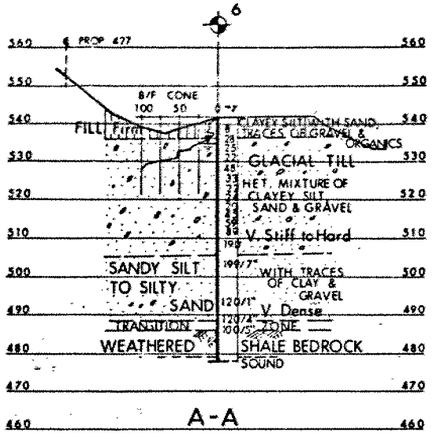
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_o	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

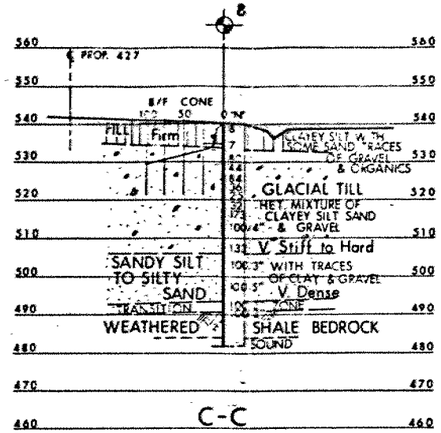
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

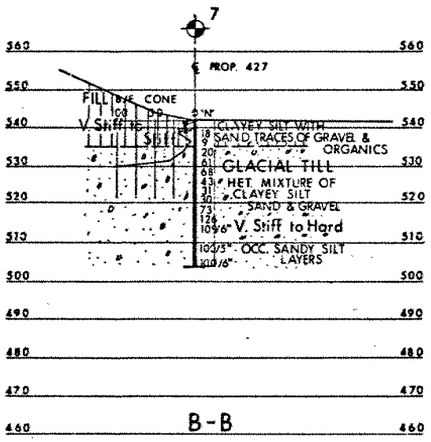
H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL



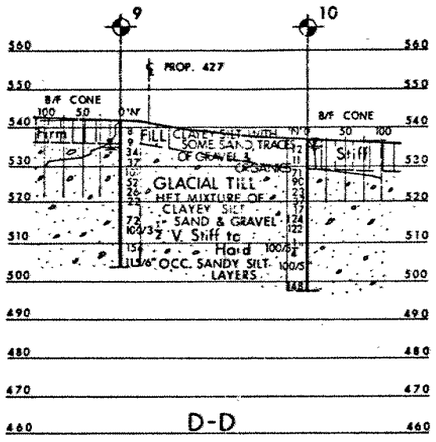
A-A



C-C



B-B



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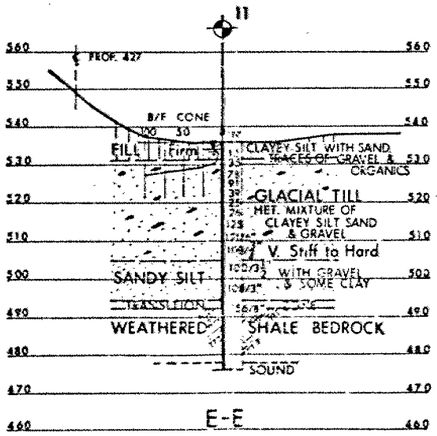
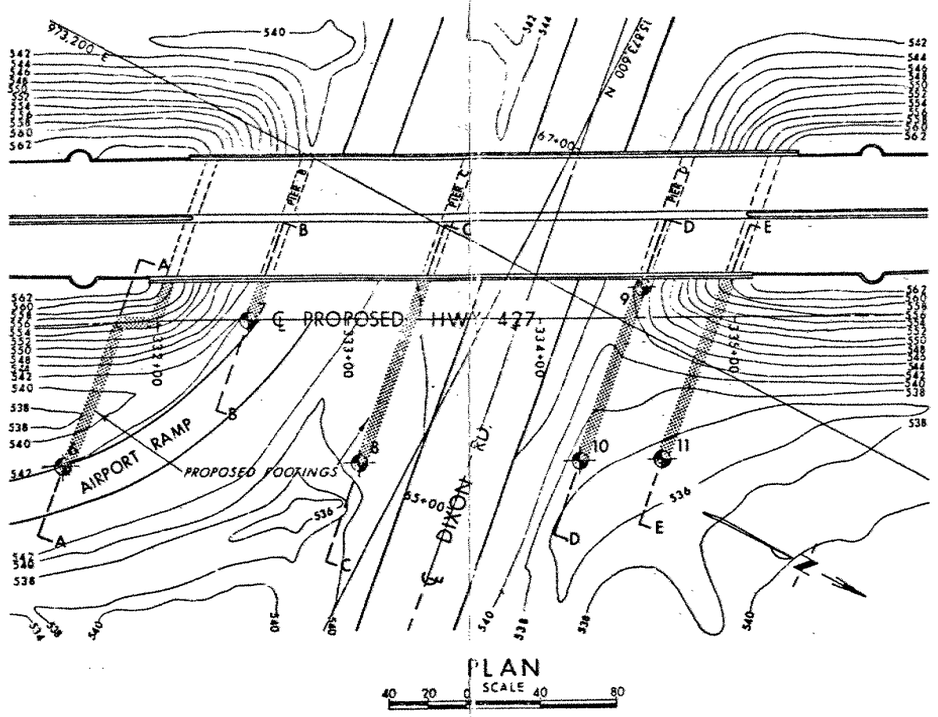


E-E

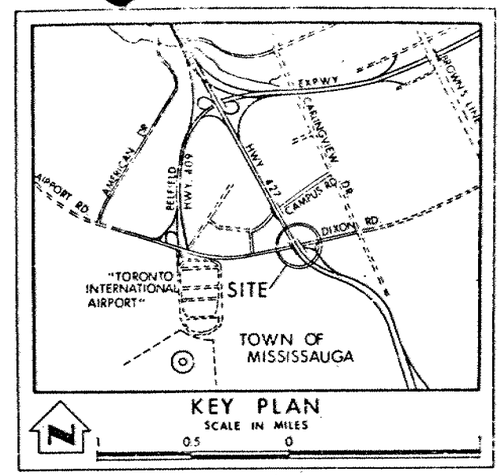
SECTIONS

HORZ. 40 20 0 SCALE 40 80 FT.
VERT. 20 10 0 20 40



PLAN

SCALE 40 20 0 40 80

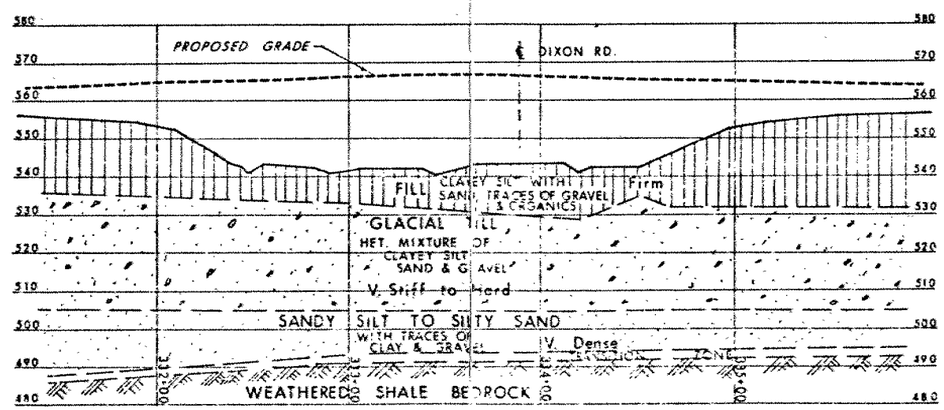


KEY PLAN
SCALE IN MILES

LEGEND

- Bore Hole
- Cone Penetration Test
- Bore Hole & Cone Test
- Water Levels established at time of field investigation. JULY 1974.

NO.	ELEVATION	CO-ORDINATES NORTH	EAST
6	541.3	15,873,442	973,404
7	541.9	15,873,492	973,288
8	540.3	15,873,579	973,329
9	542.0	15,873,665	973,179
10	536.1	15,873,680	973,274
11	536.1	15,873,719	973,253



℄ PROFILE-HWY 427

HORZ 40 20 0 SCALE 40 80 FT.
VERT. 20 10 0 20 40

NOTE:
The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the TORONTO District Office.

REF NO
McCORMICK, RANKIN & ASSOC.
BS 48-71-03-1

— NOTE —
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence

REVISIONS			
DATE	BY	DESCRIPTION	

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
ENGINEERING SERVICES BRANCH — GEOTECHNICAL OFFICE

DIXON ROAD

HIGHWAY NO 427 DIST NO 6
CO. PEEL
TOWN OF MISSISSAUGA LOT CON

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD M S	CHECKED	W P NO 402-65-00	DRAWING NO 4026500-A
DRAWN A.P	CHECKED	W O NO 48-71-21	
DATE 19 AUG. 1974		SITE NO	BRIDGE DRAWING NO 48 71 21-A
APPROVED		CONT NO	

Ministry of Transportation and Communications
Ontario

Memorandum

To: G.C.E. Burkhardt, Head
Structural Section
Central Region
3501 Dufferin St., Downsview

From: Soil Mechanics Section
Engineering Materials Office
3rd Floor, Central Building

Attention: Mr. Pilgrim

Date: 78 04 19

Our File Ref.

In Reply to

Subject:

Re: Dixon Road Interchange Overpass at Hwy. 427
i) New Structure (N.B. Lanes), W.P. 48-71-21, Site 37-319
ii) Existing Structure (S.B. Lanes) W.P. 402-65-00,Site 37-319
District 6, Toronto

This section carried out a foundation investigation for the widening of the existing structure to accomodate future southbound and northbound traffic lanes. A detailed Foundation Investigation Report was submitted under W.P. 402-65-00 dated 74-09-05. According to your recent memorandum the concepts for this interchange have been modified and the new concept will be as follows:

The existing bridge will not be widened but it is still proposed to jack up and modify the structure to meet the required grade revisions. This structure will then be used as southbound lane structure and the work will be carried out under W.P. 402-65-00. A new structure will be built to the east of the existing structure to serve northbound traffic and the new Fasken Ramp S-E & W. The work for the new structure will be carried out under W.P. 48-71-21. It is also understood that both N.B. lanes and S.B. lanes structures will be widened on the inside lanes at a later date. In the light of the above, we have reviewed the subsoil, bedrock and ground water conditions and submit the following comments:

NEW STRUCTURE (Northbound Lanes) W.P. 48-71-21, Site #37-319

A total of six boreholes (B.H. #6,7,8,9,10,11) were carried out in this area. The predominant stratum encountered at this site is a very stiff to hard glacial till (het. mixture of clayey silt, sand and gravel with occasional layers of sandy silt). The glacial till is followed by a deposit of sandy silt to silty sand which in turn is followed by shale bedrock. In certain locations the glacial till is overlain by fill material. The detailed subsurface conditions are described in our original Foundation Report under W.P. 402-65-00.

Structure Foundations:

The glacial till deposit is competent to provide spread footing type of foundations at the following elevations:

South Abutment	(ref. B.H. #6 and #7)	elev. 532.0 or below
South Pier	(ref. B.H. #7 and #8)	elev. 531.0 or below
North Pier	(ref. B.H. #9 and #10)	elev. 529.0 or below
North Abutment	(ref. B.H. #11)	elev. 529.0 or below

cont'd.....

The future widening can also be carried out at the above elevations provided the base material was not disturbed during the time of construction of this new structure.

Alternatively, if perched abutments are contemplated they can be supported on spread footings placed on well compacted granular 'A' material with an allowable load of 2.5 t.s.f. This alternative was discussed in detail on page #7 of our Foundation Report under W.P. 402-65-00. This same report also covers the dewatering requirements and the stability of the approach fills which will be still applicable for the new concept.

This section will submit a new subsurface drawing for the revised conditions of the proposed new structure (N.B Lanes) under W.P. 48-71-21. It should be noted that this memorandum together with our previous Foundation Report and along with revised drawing will cover the needs for the design requirements of this new structure. In view of this we feel that there is no need for a Final Report on this project.

EXISTING STRUCTURE (Southbound Lanes), W.P. 402-65-00, Site 37-319

The new proposals are such that no widening will be carried out for the existing structure. The new grades will be achieved by jacking operations with some asphalt padding. In view of this no report will be required for the existing structure since no foundation work will be involved. However, this section will prepare a subsurface drawing so that the factual information can be of some value to the contractor for any temporary work to be performed during the modification operation of the existing structure.

Should you require further clarification on the proposed works of these two structures, please contact us.

M. Devata

M. Devata
Supervising Engineer

MD/ig

cc: G.C.E. Burkhardt
R.D. Gunter
M.R. Ernesaks
D.E. Thrasher
C. Grebski
G.A. Wrong
B.J. Giroux
R.S. Pillar
Files

48-71-21
Site 37-319

Mr. M. Devata,
Supervising Engineer,
Soils Mechanics Section,
West Building, Downsview

G.C.E. Burkhardt,
Structural Section,
Central Region

1978-01-03

RE: Dixon Road Interchange Overpass at Hwy. 427,
Existing Str. (S.B. Lanes) W.P. 402-65-00,
Site 37-319, New Str. (N.B. Lanes) W.P. 48-71-21,
Site 37-319, District 6, Toronto

Further to your recommendations contained in Foundation Investigation Report of 1974-09-05 under W.P. 402-65-00, attached please find two Preliminary Bridge Site Plans and Profiles B.S. 48-71-03-01 showing the latest highway and structure alingment.

It is still proposed to jack up and modify the existing structure, which will then be used by southbound traffic. However, there will be no widening of the existing structure as indicated previously for northbound traffic. Instead, a new structure will be built to the east of the existing structure to serve northbound traffic and the new Fasken Ramp S-E&W. Future widening is anticipated on the inside lanes of both structures as shown.

W.P. 402-65-00 is now being used for the jacking and modification of the existing structure. All work for the new structure will come under W.P. 48-71-21.

In light of the above, kindly review the above mentioned report and let us have your recommendations and report for the new structure. No report is required for the existing structure since no foundation work will be involved. Preliminary recommendations will be adequate, so that this office can issue the structure for design. A final report should be available after the Preliminary Drawings have been issued.

.....2

The present scheduling calls reports by the following dates:

Preliminary Report by:	1978-04-05
Final Report by:	1978-07-12

KP:gj
Attach.

K. Pilgrim,
Senior Structural Engineer,
for:
G.C.E. Burkhardt,
Head, Structural Section

c.c. R. Fitzgibbon
J. Anderson

Mr. M. Devata,
Supervising Engineer,
Soils Mechanics Section,
West Building, Downsview

G.C.E. Burkhardt,
Structural Section,
Central Region

1978-01-03

RE: Renforth Drive Overpass at Hwy. 427,
Bridge #30, W.P. 400-65-03, Site 37-823,
District 6, Toronto

Further to your Foundation Report (W.O. 69-F-28 of 1969-09-10), and addendum of 1974-08-08, attached please find two Preliminary Bridge Site Plans and Profiles for the above structure showing probable footing locations.

Two structural alternatives are possible at this location. A two span concept with centre pier can be used with pre-stressed A.A.S.H.T.O. girders and concrete slab, or a single span structure using pre-stressed concrete boxes could also be feasible. In both cases, closed type abutments will be used. This is now possible, due to a reduction in the overall structure length. Retaining wall footings are also shown, as these were part of the design drawings of October, 1969.

Kindly review the above mentioned report, and let us have your recommendations. These may be preliminary at this stage, so that we can issue the structure for design. A final report should be available after the preliminary drawings have been issued.

The present scheduling calls for reports by the following dates:

Preliminary Report by:	1978-04-26
Final Report by:	1978-07-26

KP:gj
Attach.

K. Pilgrim,
Senior Structural Engineer,
for:
G.C.E. Burkhardt,
Head, Structural Section

c.c. R. Fitzgibbon
J. Anderson

37-823 is a site map of 400-427 IC.
Not on Metro Toronto map. Use 37-823
for this structure.

Ministry of Transportation and Communications
Ontario

Memorandum

To: Mr. G. C. E. Burkhardt
Structural Section
Central Region
3501 Dufferin St., Downsview

From: Soil Mechanics Section
Engineering Materials Office
3rd Floor, Central Building

Attention: Mr. K. Pilgrim

Date: 78 04 14

Our File Ref.

In Reply to

Subject: Re: Renforth Drive Overpass at Hwy. 427
Bridge #30, W.P. 400-65-03, Site 37-823
District 6, Toronto

Further to your request we have reviewed the subsurface conditions contained in our Foundation Report (W.O. 69-F-28 of 1969-09-10), and addendum of 1974-08-08 and submit the following comments:

It is understood that two structural alternatives are possible at this location. A two span concept with centre pier can be used with pre-stressed A.A.S.H.T.O. girders and concrete slab, or a single span structure using pre-stressed concrete boxes could also be feasible. In both cases, closed type abutments will be used.

A total of 8 sampled boreholes were carried out in the two investigations. The subsoil conditions were found to be generally uniform over the site. The pier and the closed type abutments may be supported on spread footings located at or below elevation 517. An allowable bearing pressure up to 3.5 t.s.f. may be used for design purposes. In all cases footings should be provided with a minimum earth cover of 4 ft. for frost protection purposes.

The footing excavation, in part, will be carried into the sandy silt to silty sand zone which is highly susceptible to conditions of unbalanced hydrostatic head and is likely to 'boil' under such conditions. To prevent boiling of the foundation base material it will be necessary to provide an adequate dewatering scheme.

The granular backfill behind the abutments should be provided with adequate drainage. The coefficient of lateral earth pressure for the granular backfill may be taken as 0.33 and 0.50 for the 'active' (K_a) and 'at rest' (K_o) conditions respectively. Where the abutments are constructed within the glacial zone, it is recommended that a value of 2500 p.s.f. be used in the computation to determine the sliding resistance between the concrete base of the footing and the underlying cohesive type material. For computation of sliding resistance for abutments located within the sandy silt deposit a value of 0.6 may be used in computing frictional resistance between the rough concrete base and the granular subsoil.

cont'd.....

The proposed embankments can be constructed to the required heights without the dangers of failure utilizing 2:1 standard slopes. It should be noted that a pipeline (Imperial Oil) is located immediately adjacent to the east corner of the north abutment. Care should be exercised during construction to ensure the intactness of the pipeline.

This memorandum should be read in conjunction with our original Foundation Report and subsequent addendum. The factual data and other recommendations contained in our Foundation Report and addendum are still applicable. In view of this we are not issuing any final foundation report since all the pertinent information is already contained in our previous reports together with this memorandum. Any modifications or updating of the factual data will be incorporated in the contract report for this project.

M. Devata
Supervising Engineer

MD/ig

cc: G.C.E. Burkhardt
R.D. Gunter
M.R. Ernesaks
D.E. Thrasher

C. Crebski
G.A. Wrong
B.J. Giroux
R.S. Pillar

R. Hore

Files

Mr. W.L. Lin
Design Engineer, Central Section
Structural Office
2nd Floor, West Building

Soil Mechanics Section
Engineering Materials Office
Room 315, Central Building

78 08 29

Re: Hwy. 427 Overpass S.B.L. at Dixon Road
W.P. 48-71-20, Site 37-319
District 6, Toronto

We have reviewed the Preliminary Bridge Plan Drawing 37-319-P1 for the above mentioned structure. Considering no changes are contemplated for the substructure and only minimal change in design loading is anticipated, we find the design acceptable from a soil mechanics point of view.

TK.

T. Kazmierowski
Project Engineer

TK/gs

cc: Files

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 30M12-104

DIST. 6 REGION

W.P. No. 48-71-20
(formerly 402-85-00)

CONT. No. 81-46

W. O. No.

STR. SITE No. 37-319

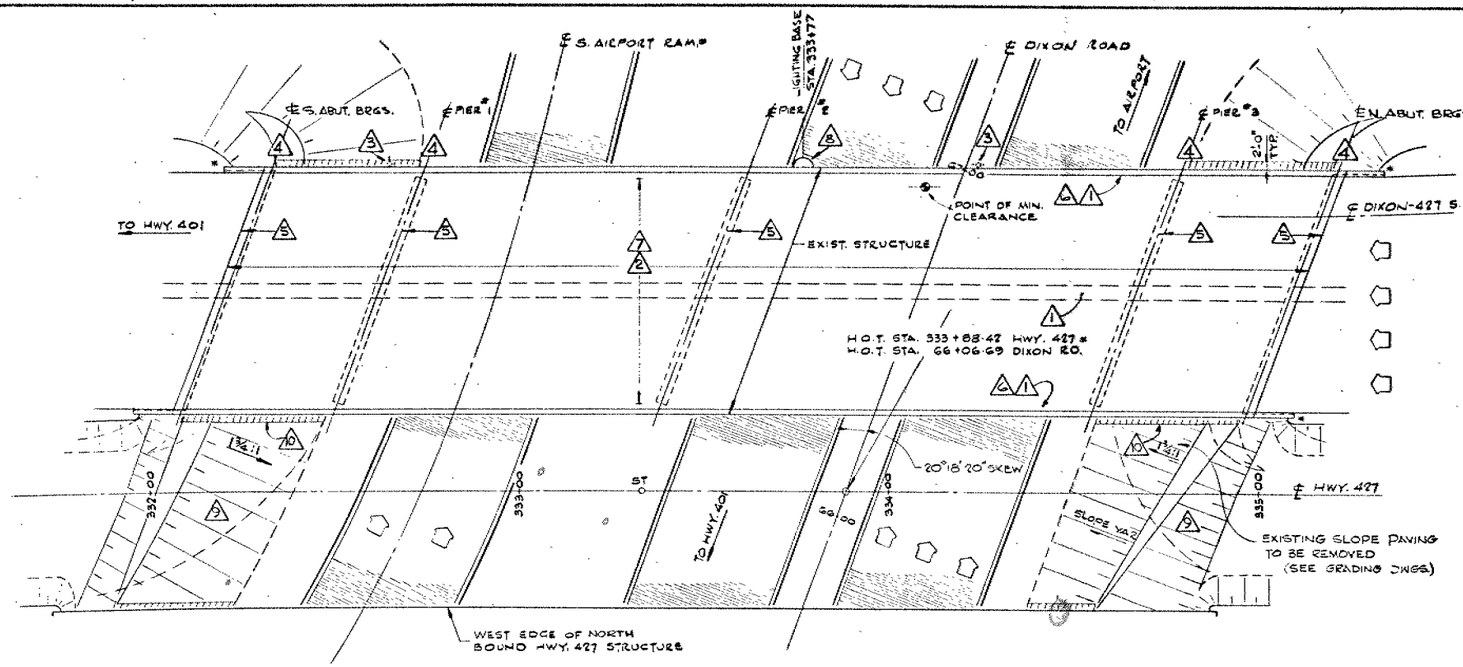
HWY. No. 427

LOCATION Hwy 427 Overpass
Dixon Rd.

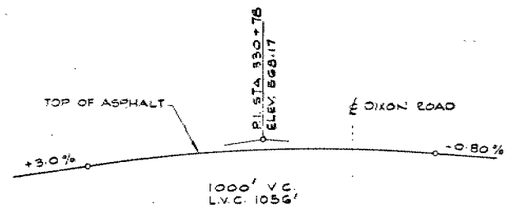
No OF PAGES - —

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

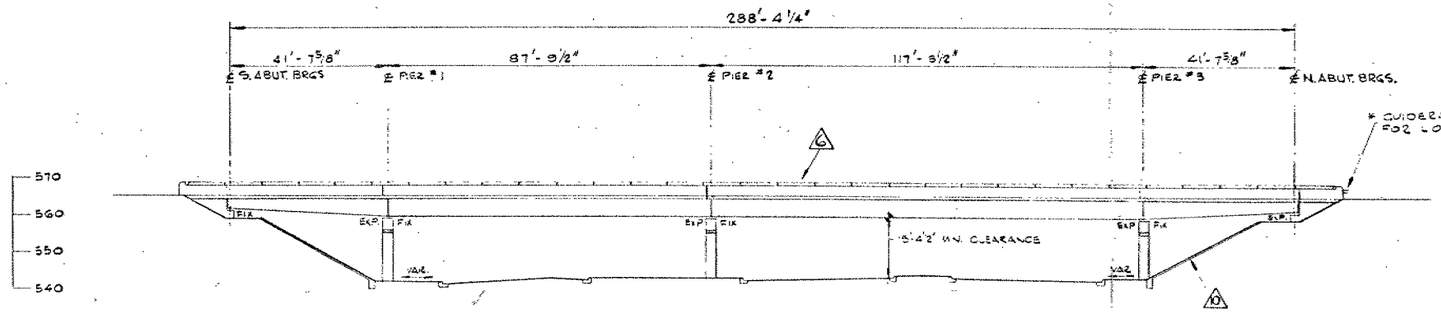
REMARKS:



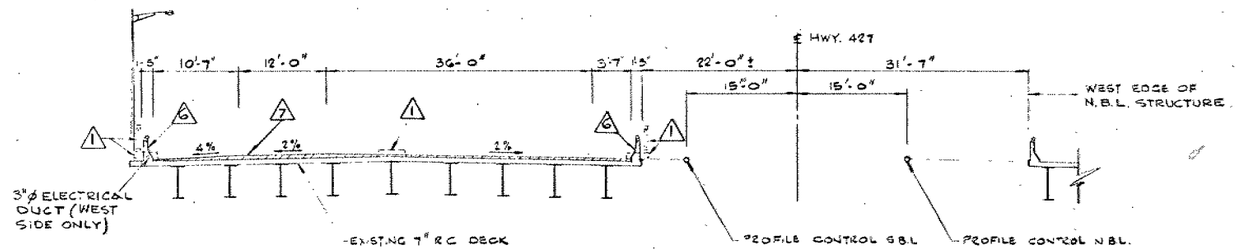
PLAN
SCALE: 1" = 20'-0"



PROFILE HWY. 427 (S.B.L.)
N.T.S.



ELEVATION
SCALE: 1" = 20'-0"



SECTION
SCALE: 1" = 10'-0"

CONCRETE QUANTITIES
(FOR LUMP SUM TENDER ITEMS)
CONCRETE IN BARRIER WALLS 52 C.Y.
CONCRETE IN SLOPE PAVING 37 C.Y.

DIST.	№ 6
CONT No	81-46
WP	No 48-71-20
HWY. 427 OVERPASS S.B.L. AT DIXON ROAD GENERAL ARRANGEMENT	SHEET

McCORMICK RANKIN
CONSULTING ENGINEERS

JACKING OF EXISTING DECK ONLY

B.M. ELEV. 543.55

PLATE IN MOST NORTH WESTERLY CONCRETE SUPPORT COLUMN OF CONCRETE BRIDGE AT INDIAN LINE (PROP. HWY. 427) & DIXON ROAD 74' LEFT OF STA. 334+60 ℄ PROP. HWY. 427.

WORK TO BE DONE
1. EXISTING MEDIAN, HANDRAILS, END POSTS & CURBS TO BE REMOVED.
2. EXISTING ASPHALT WEARING SURFACE TO BE REMOVED.
3. EXISTING LIGHT STANDARDS TO BE REMOVED.
4. STRUCTURE TO BE JACKED, BEARINGS REPLACED & SHIM PLATES INSTALLED.
5. INSTALL NEW EXPANSION JOINTS.
6. INSTALL NEW BARRIER WALL & RAILING.
7. STRUCTURE TO BE SANDBLASTED, WATERPROOFED & PAVED.
8. NEW LIGHT STANDARD TO BE INSTALLED.
9. REMOVE EXISTING SLOPE PAVING
10. CONCRETE SLOPE PAVING.

GENERAL NOTES
1. FOR DETAILS OF EXISTING BRIDGE, REFER TO EXISTING BRIDGE DRAWINGS.
2. ALL DIMENSIONS TO BE VERIFIED IN THE FIELD.
3. ALL GIRDERS IN A PARTICULAR SPAN TO BE JACKED SIMULTANEOUSLY (±1/8") AT ONE END.
4. CLASS OF CONCRETE
   BARRIER WALLS 4000 P.S.I.
   SLOPE PAVING 3000 P.S.I.
5. REINFORCING STEEL SHALL CONFORM TO C.S.A. G30.12M SERIES, GRADE 400 W R. REINFORCING BARS WITH THE DESIGNATION 'C' AT THE END OF BAR MARKS SHALL BE COATED BARS

LIST OF DRAWINGS

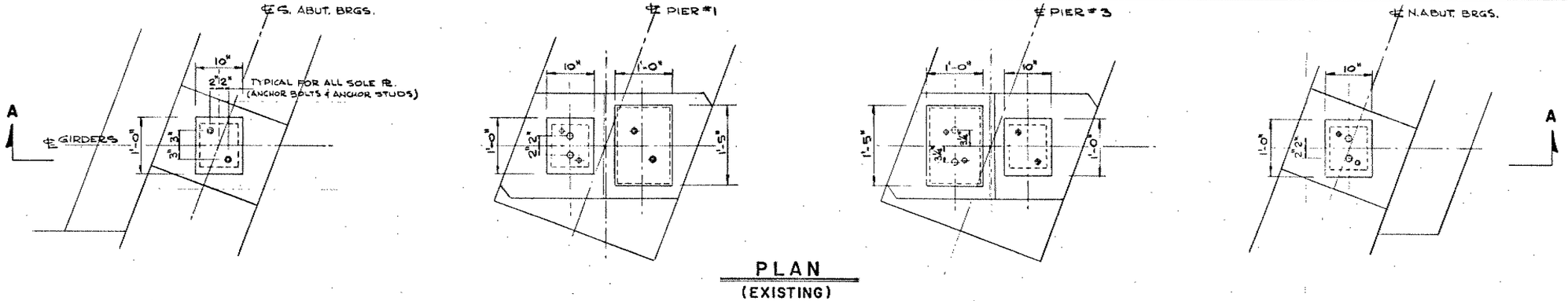
REGISTERED PROFESSIONAL ENGINEER R. SKELTON PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER J. W. TUCK PROVINCE OF ONTARIO

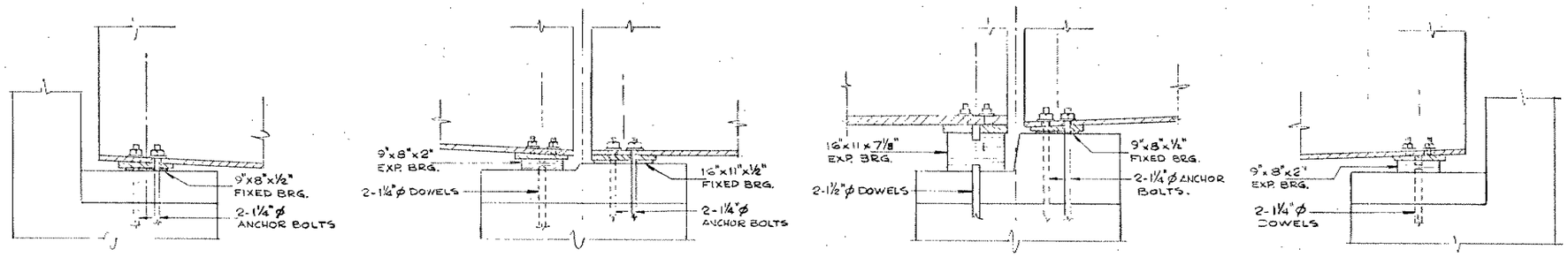
FOR REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN

REVISIONS			
DATE	BY	DESCRIPTION	
DESIGN R.S.	CHECK J.W.T.	LOADING EXISTING	DATE DEC. '78
DRAWING S.A.	CHECK J.W.T.	SITE No 37-319	DWG 1

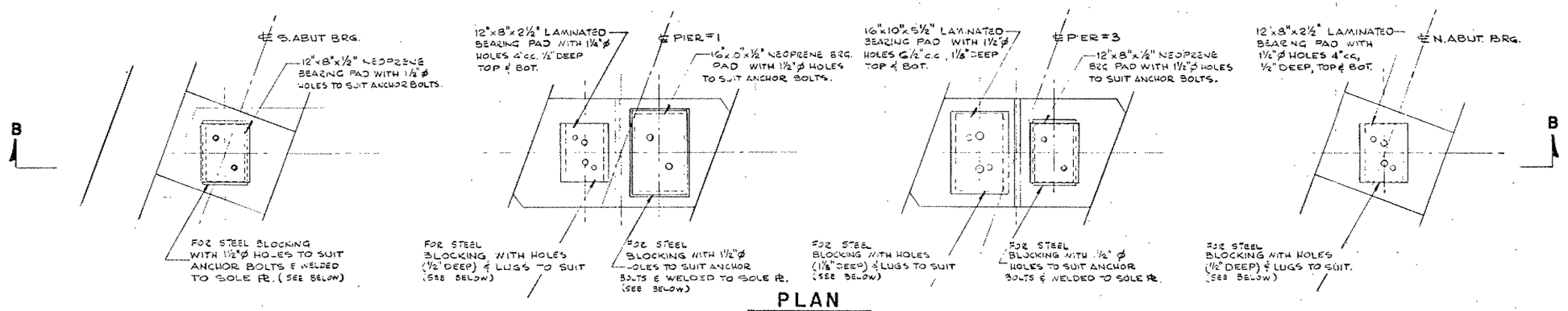
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO 3115 08881 4-75



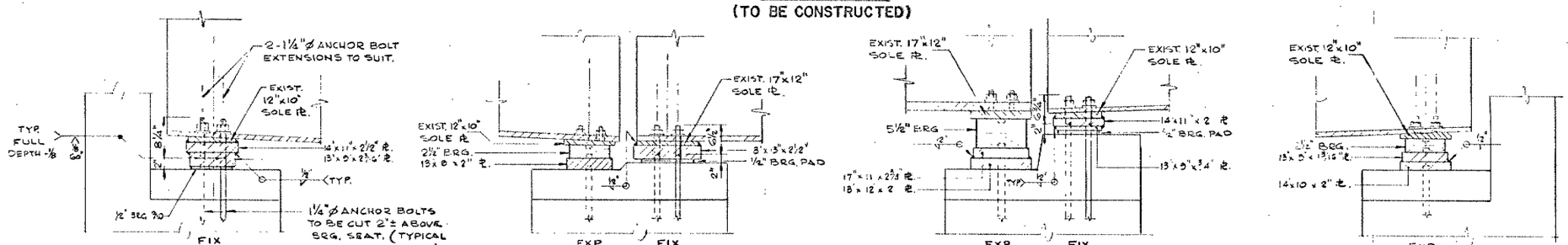
PLAN
(EXISTING)



SECTION 'A-A'



PLAN
(TO BE CONSTRUCTED)



SECTION 'B-B'

JACKING HEIGHTS				
℄ S. ABUT BRGS	℄ PIER #1	℄ PIER #2	℄ PIER #3	℄ N. ABUT. BRGS.
0.39'	0.21'	-	0.23'	0.32'

NOTES:

1. FOR GENERAL NOTES REFER TO BEARING DETAILS II DWG № 3.
2. FOR ALTERNATIVE BLOCKING DETAIL REFER TO DETAIL 'A' DWG. № 3

DIST. No. 6
CONT No
WP No 48-71-20

HWY. 427 OVERPASS S.B.L. AT DIXON ROAD
BEARING DETAILS I

SHEET

McCORMICK RANKIN
CONSULTING ENGINEERS

REGISTERED PROFESSIONAL ENGINEER R. SKELTON PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER J. W. TUCK PROVINCE OF ONTARIO

FOR REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN

SCALE 1" = 1'-0"

REVISIONS			
DATE	BY	DESCRIPTION	
DESIGN R.S.	CHECK J.W.T.	LOADING EXISTING	DATE DEC.'78
DRAWING W.C.D.	CHECK J.W.T.	SITE № 37-319	DWG 2

AD TRANSLAR 200-7-78

Mr. C.S. Grebski
Head, Central Section
Structural Office
2nd Floor, West Building

Mr. W. Lin

Soil Mechanics Section
Engineering Materials Office
Room 315, Central Building

78 09 29

Re: Hwy. 427 Overpass SBL at Dixon Road
W.P. 48-71-20, Site 37-319
District 6, Toronto

We have reviewed the Preliminary Bridge Plan Drawing (37-319-P3) for this project. The contemplated modifications to the superstructure as shown in the design drawing, consist of removal of the median, jacking the bridge deck and placing shim plates and resurfacing the roadway.

It was ascertained from your office that these modifications will impose only minimal, if any, additional loadings to the foundations. In view of this, the proposed modifications are satisfactory.

B. Ly
Senior Engineer

For: M. Devata
Supervising Engineer

BL/MD/gs

cc: G.C.E. Burkhardt
D. MacDonald
Files

Mr. C.S. Grebski
Head, Central Section
Structural Office
2nd Floor, West Building

Mr. W. Lin

Soil Mechanics Section
Engineering Materials Office
Room 315, Central Building

78 09 28

Re: Hwy. 427 Overpass NBL at Dixon Road
W.P. 48-71-21, Site 37-319
District 6, Toronto

We have reviewed the Preliminary Bridge Plan Drawing 37-319-P3 for this project. Our comments are as follows.

1. It should be noted that the slopes between the NBL and the SBL structures should be 2:1. However, if slightly steeper slopes are adopted, they must be protected from surficial erosion.

2. Reference should be made to the memorandum from this Office dated 75 01 22 for the design of the piled foundations.

B. Ly
Senior Engineer

For: M. Devata
Supervising Engineer

BL/MD/gs

cc: G.C.E. Burkhardt
Files ✓

Ministry of Transportation and Communications
Ontario

Memorandum

To: G.C.E. Burkhardt, Head
Structural Section
Central Region
3501 Dufferin St., Downsview

From: Soil Mechanics Section
Engineering Materials Office
3rd Floor, Central Building

Attention: Mr. Pilgrim

Date: 78 04 19

Our File Ref.

In Reply to

Subject: Re: Dixon Road Interchange Overpass at Hwy. 427
i) New Structure (N.B. Lanes), W.P. 48-71-21, Site 37-319
ii) Existing Structure (S.B. Lanes) W.P. 48-71-20 ,Site 37-319
District 6, Toronto

This section carried out a foundation investigation for the widening of the existing structure to accomodate future southbound and northbound traffic lanes. A detailed Foundation Investigation Report was submitted under W.P. 402-65-00 dated 74-09-05. According to your recent memorandum the concepts for this interchange have been modified and the new concept will be as follows:

The existing bridge will not be widened but it is still proposed to jack up and modify the structure to meet the required grade revisions. This structure will then be used as southbound lane structure and the work will be carried out under W.P. 402-65-00. A new structure will be built to the east of the existing structure to serve northbound traffic and the new Fasken Ramp S-E & W. The work for the new structure will be carried out under W.P. 48-71-21. It is also understood that both N.B. lanes and S.B. lanes structures will be widened on the inside lanes at a later date. In the light of the above, we have reviewed the subsoil, bedrock and ground water conditions and submit the following comments:

NEW STRUCTURE (Northbound Lanes) W.P. 48-71-21, Site #37-319

A total of six boreholes (B.H. #6,7,8,9,10,11) were carried out in this area. The predominant stratum encountered at this site is a very stiff to hard glacial till (het. mixture of clayey silt, sand and gravel with occasional layers of sandy silt). The glacial till is followed by a deposit of sandy silt to silty sand which in turn is followed by shale bedrock. In certain locations the glacial till is overlain by fill material. The detailed subsurface conditions are described in our original Foundation Report under W.P. 402-65-00.

Structure Foundations:

The glacial till deposit is competent to provide spread footing type of foundations at the following elevations:

South Abutment	(ref. B.H. #6 and #7)	elev. 532.0 or below
South Pier	(ref. B.H. #7 and #8)	elev. 531.0 or below
North Pier	(ref. B.H. #9 and #10)	elev. 529.0 or below
North Abutment	(ref. B.H. #11)	elev. 529.0 or below

cont'd.....

The future widening can also be carried out at the above elevations provided the base material was not disturbed during the time of construction of this new structure.

Alternatively, if perched abutments are contemplated they can be supported on spread footings placed on well compacted granular 'A' material with an allowable load of 2.5 t.s.f. This alternative was discussed in detail on page #7 of our Foundation Report under W.P. 402-65-00. This same report also covers the dewatering requirements and the stability of the approach fills which will be still applicable for the new concept.

This section will submit a new subsurface drawing for the revised conditions of the proposed new structure (N.B Lanes) under W.P. 48-71-21. It should be noted that this memorandum together with our previous Foundation Report and along with revised drawing will cover the needs for the design requirements of this new structure. In view of this we feel that there is no need for a Final Report on this project.

EXISTING STRUCTURE (Southbound Lanes), W.P. 48-71-20, Site 37-319

The new proposals are such that no widening will be carried out for the existing structure. The new grades will be achieved by jacking operations with some asphalt padding. In view of this no report will be required for the existing structure since no foundation work will be involved. However, this section will prepare a subsurface drawing so that the factual information can be of some value to the contractor for any temporary work to be performed during the modification operation of the existing structure.

Should you require further clarification on the proposed works of these two structures, please contact us.

M. Devata

M. Devata
Supervising Engineer

MD/ig

cc: G.C.E. Burkhardt
R.D. Gunter
M.R. Ernesaks
D.E. Thrasher
C. Grebski
G.A. Wrong
B.J. Giroux
R.S. Pillar
Files

Mr. C.S. Grabski,
Structural Design Engineer,
Structural Office,
West Bldg., Downsview.

Soil Mechanics Section,
Geotechnical Office,
West Bldg., Downsview.

January 22nd, 1975.

RE: Hwy. 427 Overpass Widening at Dixon Road,
District #6, Toronto,
W.P. 402-65-00, Site #37-319.

After the submission of your Preliminary Bridge Plan Drawings 37-319 P_1 and P_2 for the abovementioned Structure, a meeting was held at your office on January 16th, 1975 to discuss the use of pile foundations for the piers instead of spread footings recommended in our foundation report. You have indicated various reasons for this alternative and these have been summarized in a memo of January 17th, 1975, by Mr. W. Lin, Regional Structural Design Engineer. Since the piers will have to be supported on piles, our recommendations are as follows:

The extensions for Piers #1, 2 & 3 be supported on end bearing piles driven into the hard glacial till deposit, and the piles can be designed for the maximum allowable load for the particular steel section chosen. The pile driving during construction should be controlled by Hiley Formula as per current M.T.C. methods to obtain the desired loads. For estimating pile lengths, the following tip elevations may be used.

	Estimated Tip Elev.
Pier #1(Refer B.H.#7)	515 - 510
Pier #2(Refer B.H.#8)	510
Pier #3(Refer B.H.#9 & #10)	510 - 505

The pier caps should be located at an elevation so that they will have a minimum earth cover of 4 ft. to the underside of the footing for frost protection requirements.

M. Devata,
Supervising Engineer.

MD/ma
c.c. W. Lin
G.C.E. Burkhardt
Files
Documents

Ministry of Transportation and Communications
Ontario

Memorandum

To: Mr. C. Mirza,
Head,
Soils Mechanics Section,
West Building, Downsview.

Attention: Mr. M. Devata

From: Structural Office,
West Building, Downsview.

Date: January 17th, 1975.

Our File Ref.

In Reply to

Subject: Highway 427 Over Dixon Road,
W. P. 402-65-00, Site 37-319
District 6.

In preparing the preliminary design of the above structure, we found that it is more economical to use pile foundation for the piers than to use spread footing recommended in the soil investigation report for the following reason.

1. The recommended footing elevation is approximately 10 ft. below the existing roadway and located fairly close to the driving lanes. As the traffic on Dixon Road will be maintained during construction an extensive roadway protection will be required.

2. The allowable soil pressure is 3 tons per square foot. The size of footings will be much larger with spread footing design.

3. The pier foundation of the existing structure is on spread footing located at an elevation approximately five feet above the footing elevation recommended for the new widening. With piles, expensive underpinning work can be avoided.

We believe that the pile alternative is justified based on our preliminary cost comparison.

WL/cf

W. Lin,
Regional Structural Design Engineer.

Files

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. G.C.E. Burkhardt, (2)
Regional Structural Planning Engineer,
Central Region,
ATTENTION: 3501 Dufferin St., Downsview
M.D. Bendayan

FROM: Soil Mechanics Section,
Geotechnical Office,
West Building, Downsview.

DATE: August 14, 1974.

OUR FILE REF.

IN REPLY TO

SUBJECT:

PRELIMINARY
FOUNDATION INVESTIGATION REPORT
For

The Proposed Structure Widening
Hwy. #427 Overpass at Dixon Rd.
Site #37-319; Borough of Etobicoke
District #6 (Toronto)

W.P. 402-65-00 W.O. NIL.

1. INTRODUCTION:

A request to carry out a Foundation Investigation for the proposed widening of Hwy. #427 overpass structure at Dixon Rd. was contained in a memorandum from Mr. G.C.E. Burkhardt, Regional Structural Planning Engineer (Central Region), dated June 13, 1974.

The existing structure is a 4 span (42'±, 88'±, 118'±, 42'±) overpass structure. (Refer to Preliminary Bridge Site Plan BS 48-71-03-1) The footing location of the existing and proposed structure are shown on the accompanying layout plan.

Due to the urgency of this project, we have been requested to submit our written recommendations as soon as the field work has been completed. This report, therefore, provides preliminary information on the subsoil conditions, as well as recommendations pertaining to foundation design and stability of the approach fills.

2. SUBSOIL CONDITIONS:

Six boreholes were put down during the course of the field investigations. A brief review of the subsoil conditions encountered are presented in the following paragraphs.

..... /2

Up to 22 ft. of fills will be required along the approaches. Fills of this height will be inherently stable provided 2:1 slopes are employed and the fill is properly compacted.

No major settlement problems are anticipated.

A construction joint should be provided between the existing and the new part of the structure.

The complete Foundation Report for this project will be forwarded to you as soon as possible. If you have any further queries, please contact our office.

P. Payer,
Senior Engineer.

PP/rb

c.c. E.J. Orr
B.R. Davis
R.S. Pillar
H. Greenland
B.J. Giroux
D. Gunter
G.A. Wrong
P. Lewycky

Files
Documents

GROUNDWATER CONDITIONS:

The following groundwater levels were observed during the field investigation:

BH #	6	ELEVATION:	535.7'
	7		539.5'
	8		534.9'
	9		535.0'
	10		535.3'
	11		534.1'

RECOMMENDATIONS:

It is proposed to widen the four-span overpass structure at the crossing of Hwy. #427 and Dixon Rd. The approach fills will be in the order of 22 ft.

The hard crust appears to be favourable for spread footing type foundations at the following elevations:

Pier 'B':	Elevation:	532
Pier 'C':	Elevation:	533
Pier 'D':	Elevation:	532 - 529

A minimum of 4 feet of earth cover should be provided above the base of footing for frost protection purposes. Footings so founded may be designed using an allowable bearing. value of 3 t.s.f.

The hard crust is susceptible to softening on contact with water, therefore it is recommended that the base of footing excavations be protected by concrete working slab immediately on exposure.

The abutments may be supported on spread footings placed on well compacted, suitable granular material within the approach fills. A safe design load of 2.0 t.s.f. may be assumed.

As an alternative, the abutments may be supported on end-bearing H piles. The maximum allowable load for the particular steel section may be assumed for design purposes.

..... /4

FILL MATERIAL:

This deposit was encountered in all of the borings from ground level to a maximum depth of 7.0 ft. (BH #7). The material consists of clayey silt with sand, traces of gravel and organics. The consistency is estimated to range from firm to very stiff.

GLACIAL TILL:

This is the main deposit over the site area and was intersected under the fill material. The lower boundary varies between elev. 499 and elev. 486. The material in the deposit consists of heterogeneous mixture of clayey silt with sand and gravel.

The glacial till stratum has a hardened crust to about elev. 525 and it is brown in colour. The remainder of the deposit is grey.

Based on the Standard Penetration Test Results only, the undrained shear strength of the crust is estimated to be in the order of 3000 p.s.f. to 8000 p.s.f. The consistency of the grey portion of the deposit ranges somewhat randomly from very stiff to hard.

SILTY SAND TO SANDY SILT:

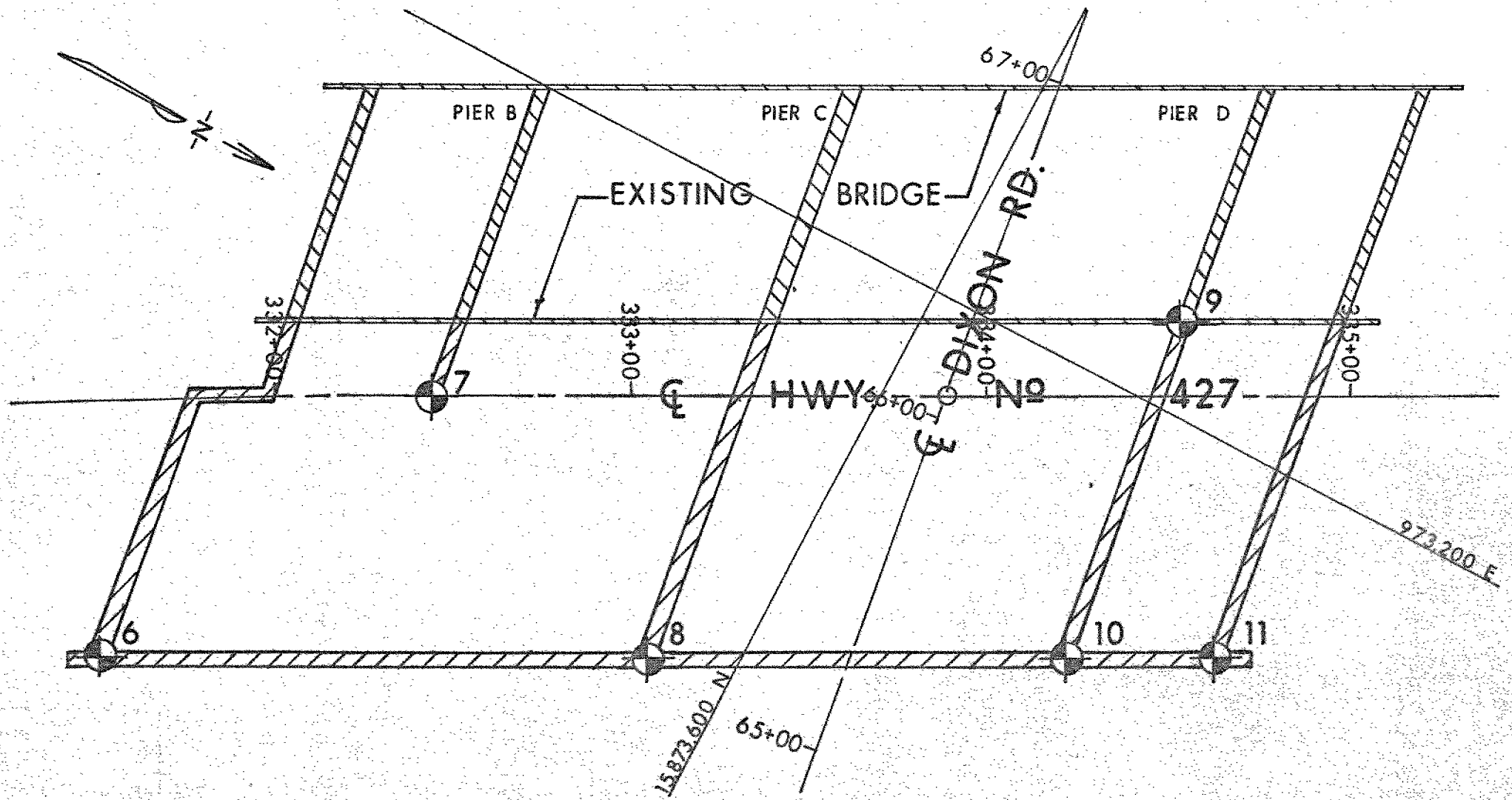
The glacial till sheet is underlain by a very dense silty sand to sandy silt with traces of clay and gravel.

SHALE BEDROCK:

The overburden is underlain by bedrock which was proven at three borehole locations. Based on the data obtained it is estimated that the surface of the bedrock across the site varies randomly between elevations 486 and 491.

The bedrock is composed of grey weathered shale.

..... /3



BORE HOLE	ELEVATION
6	541.3
7	541.9
8	540.3
9	542.0
10	536.7
11	536.1

LAYOUT PLAN

SCALE
1"=40'

LEGEND

- BORE HOLE & CONE TEST
- PROPOSED STRUCTURE
- EXISTING STRUCTURE

W.P.: 402-65-00

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 30M11-48
30M12-104

DIST. 6 REGION

W.P. No. 400-65-03

CONT. No. 81-46

W. O. No.

STR. SITE No. 37-823

HWY. No. 427

LOCATION Renforth Dr. Interchge
Overpass, Bridge #30

No OF PAGES - —

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

INDEX

NOTE: For purposes of the contract these reports supercede all other foundation reports prepared by or for the Ministry in connection with the above mentioned reports.

EXPLANATION OF TERMS USED IN REPORT

'N' VALUE: AN INDICATOR OF SUBSOIL QUALITY. IT IS OBTAINED FROM THE STANDARD PENETRATION TEST (CSA STD. A119.1). SPT 'N' VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 2 INCH O.D. SPLIT-BARREL SAMPLER TO PENETRATE 12 INCHES INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WEIGHING 140 POUNDS, FALLING FREELY A DISTANCE OF 30 INCHES. FOR PENETRATIONS OF LESS THAN 12 INCHES 'N' VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. 'N' VALUES CORRECTED FOR OVERBURDEN PRESSURE ARE DENOTED THUS $\overline{N}$.

DYNAMIC CONE PENETRATION TEST (CSA STD. A119.3): CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (2" O.D. 60 CONE ANGLE) DRIVEN BY 350 FT-LB IMPACTS ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 12 INCH ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOIL QUALITY: SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSITY.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH AS FOLLOWS:

S_u (PSF)	0 - 250	250 - 500	500 - 1000	1000 - 2000	2000 - 4000	> 4000
	VERY SOFT	*SOFT*	*FIRM*	*STIFF*	*VERY STIFF*	*HARD*

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF SPT 'N' VALUES AS FOLLOWS:

'N' (BLOW/FT)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	*LOOSE*	*COMPACT*	*DENSE*	*VERY DENSE*

ROCK QUALITY: ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND/OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH DRILLED IN THAT CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE NATURALLY FRACTURED CORE PIECES, 4"+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	*POOR*	*FAIR*	*GOOD*	*EXCELLENT*

JOINTING AND BEDDING:

SPACING	2"	2" - 12"	1' - 3'	3' - 10'	> 10'
JOINTING	*VERY CLOSE*	*CLOSE*	*MOD. CLOSE*	*WIDE*	*VERY WIDE*
BEDDING	*VERY THIN*	*THIN*	*MEDIUM*	*THICK*	*VERY THICK*

ABBREVIATIONS & SYMBOLS

LABORATORY TESTING

TRIAXIAL TESTS ARE DESCRIBED IN TERMS OF WHETHER THEY ARE CONSOLIDATED (C) OR NOT (U) ISOTROPICALLY (I) OR NOT (A) AND SHEARED DRAINED (D) OR UNDRAINED (U) WITH PORE PRESSURE MEASUREMENTS (BAR OVER SYMBOLS) EG. $\overline{CIU}$ = CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL WITH PORE PRESSURE MEASUREMENT

UNLESS OTHERWISE SPECIFIED IN REPORT ALL TESTS ARE IN COMPRESSION

FIELD SAMPLING

S S	SPLIT SPOON
W S	WASH SAMPLE
S T	SLOTTED TUBE SAMPLE
B S	BLOCK SAMPLE
C S	CHUNK SAMPLE
T W	THINWALL OPEN
T P	THINWALL PISTON
O S	OSTERBERG SAMPLE
F S	FOIL SAMPLE
R C	ROCK CORE
P H	T.W. ADVANCED HYDRAULICALLY
P M	T.W. ADVANCED MANUALLY

EARTH PRESSURE TERMS

μ	COEFFICIENT OF FRICTION
δ	ANGLE OF WALL FRICTION
k_o	COEFFICIENT OF EARTH PRESSURE AT REST
k_A	COEFFICIENT OF ACTIVE EARTH PRESSURE
k_p	COEFFICIENT OF PASSIVE EARTH PRESSURE
i	ANGLE OF INCLINATION OF SURCHARGE
ω	SLOPE ANGLE-BACKFACE OF WALL
β	ANGLE OF SLOPE
N_γ, N_q, N_c	BEARING CAPACITY FACTORS
D_f	DEPTH OF FOOTING
B,L	FOOTING DIMENSIONS

INDEX PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G_s	SPECIFIC GRAVITY OF SOLIDS
e	VOIDS RATIO
e_o	INITIAL VOIDS RATIO
e_{max}	e IN LOOSEST STATE
e_{min}	e IN DENSEST STATE
D_r	RELATIVE DENSITY = $\frac{e_{max} - e}{e_{max} - e_{min}}$
n	POROSITY
w	WATER CONTENT
w_L	LIQUID LIMIT
w_P	PLASTIC LIMIT
w_S	SHRINKAGE LIMIT
I_p	PLASTICITY INDEX = $w_L - w_p$
I_L	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I_c	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
A_c	ACTIVITY = $\frac{I_p \text{ of soil}}{\%\text{ finer than } 2\mu m \text{ Soil Fraction}}$
Om	ORGANIC MATTER CONTENT
S_r	DEGREE OF SATURATION
S	SENSITIVITY = $\frac{S_u \text{ (undisturbed)}}{S_u \text{ (remoulded)}}$

STRENGTH PARAMETERS

ϕ	ANGLE OF SHEARING RESISTANCE
τ_f	PEAK SHEAR STRENGTH
τ_R	RESIDUAL SHEAR STRENGTH
c	COHESION INTERCEPT
$\sigma_1, \sigma_2, \sigma_3$	NORMAL PRINCIPAL STRESSES
u	PORE WATER PRESSURE
u_e	EXCESS u
r_u	PORE PRESSURE RATIO
q_u	UNCONFINED COMPRESSIVE STRENGTH
s_u	UNDRAINED SHEAR STRENGTH
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO
E	MODULUS OF ELASTICITY
G	MODULUS OF SHEAR DEFORMATION
k_s	MODULUS OF SUBGRADE REACTION
m,n	STABILITY COEFFICIENTS
A,B	PORE PRESSURE COEFFICIENTS

NOTE: EFFECTIVE STRESS PARAMETERS ARE DENOTED BY USE OF APOSTROPHE ABOVE THE SYMBOL, THUS: ϕ' = EFFECTIVE ANGLE OF SHEARING RESISTANCE; σ' = EFFECTIVE NORMAL STRESS

HYDRAULIC TERMS

h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
j	SEEPAGE FORCE PER UNIT VOLUME
η	COEFFICIENT OF VISCOSITY
k	COEFFICIENT OF HYDRAULIC CONDUCTIVITY
k_h	k IN HORIZONTAL DIRECTION
k_v	k IN VERTICAL DIRECTION
m_v	COEFFICIENT OF VOLUME CHANGE
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX
C_r	RECOMPRESSION INDEX
d	DRAINAGE PATH DISTANCE
T_v	TIME FACTOR
U	DEGREE OF CONSOLIDATION
OCR	OVERCONSOLIDATION RATIO

FOUNDATION INVESTIGATION REPORT
For
Highway 427 Overpass at Renforth Drive
W.P. 400-65-03, Site 37-823
Highway 427, District 6, Toronto

INTRODUCTION

This report contains the results of a foundation investigation carried out for the above listed site. Fieldwork consisted of 8 sampled boreholes advanced with a continuous flight auger. The first 6 boreholes were advanced April 9th to 21st, 1974 with 2 extra boreholes advanced July 11th to 15th, 1974. Bedrock was proven through the recovery of BXL size rock core.

SITE DESCRIPTION

The site is located on Highway 427 north of the existing Renforth Drive Overpass. Toronto International Airport lies immediately to the west with the area to the east developed commercially. The terrain is flat as might be expected in the physiographic region known as the "Peel Plain". Existing Highway 427 in this area runs on a fill approximately 20 feet in height.

SUBSURFACE CONDITIONS

Subsoil General

The existing road fill is up to 22 feet in height and consists of clayey silt with sand and a trace of gravel. It is underlain by a 20 to 30 foot thick deposit of glacial origin which overlies shale bedrock. The glacial deposit may be divided into 3 units. The upper cohesive unit consists of 5 to 10 feet of very stiff to hard clayey silt. It is underlain by up to 22 feet of sandy silt to silty sand which is in turn underlain by a second cohesive unit consisting of 8 to 18 feet of hard clayey silt to silty clay.

Reference should be made to the Record of Borehole Sheets which are contained in the Report Appendix. They show the boundaries between soil types as well as a summary of all field and laboratory tests performed. Reference should also be made to Contract Drawing No. 37-823-2 which shows the location and elevation of all borings together with sections showing the inferred subsoil stratigraphy.

Fill Material

The fill consists of clayey silt with sand and a trace of gravel. Standard Penetration Test 'N' values ranged from 15 to 43 indicating a very stiff to hard consistency. Moisture content ranged from 13 to 20 percent.

Clayey Silt With Sand Trace of Gravel

The upper 5 to 11 feet of subsoil consists of clayey silt with sand and a trace of gravel. Standard Penetration 'N' values range from 13 to in excess of 100 blows per foot indicating a very stiff to hard consistency. Typical grain size distribution curves for the deposit are shown in Figure 3 with results for Atterberg Limit Tests shown in Figure 4.

Sandy Silt, Traces of Clay and Gravel

This non-cohesive stratum varied in thickness from 22 feet to 0 in the south east corner where it was not encountered. Standard Penetration Test 'N' values are generally in excess of 100 blows per foot indicating a very dense deposit. Typical grain size distribution curves are shown in Figure 5.

Clayey Silt to Silty Clay, Some Sand, Trace of Gravel

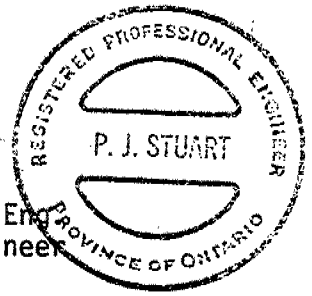
This deposit overlies the bedrock and varies in thickness up to 18 feet. Standard Penetration Test 'N' values vary from 36 to in excess of 100 blows per foot indicating a hard consistency. The deposit contains varying amounts of shale with the lower 2 to 5 feet being predominantly shale. Typical grain size distribution curves for the material are shown in Figure 1 with the results of Atterberg Limit Tests shown as Figure 2.

Bedrock

Shale bedrock was encountered at elevations from 493 to 500.

Groundwater Conditions

Water levels were recorded in the open boreholes following completion of fieldwork. Water levels varied between 523 and 525 following the fieldwork carried out in April but had decreased to 521 and 522 when the boreholes were advanced in July.



P.J. Stuart, P. Eng.
Foundations Engineer

M. Devata, P. Eng.
Sr. Foundations Engineer

APPENDIX

RECORD OF BOREHOLE No. 1

[redacted]

W.P. 400-65-03 LOCATION Co-ord. 870,047 N; 975,368 E. ORIGINATED BY GA

DATUM Geodetic BORING DATE April 21, 1969 COMPILED BY GA

BOREHOLE TYPE Auger CHECKED BY [redacted]

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT — SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w — WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
523.2										
0.0	Clayey silt with sand, traces of gravel,		1	SS	13	520				
515.0			2	SS	90					2 31 59 8
8.2	Sandy silt with traces of clay,		3	SS	50/3¾"					
			4	SS	81/6"	510				
507.7	Very dense.		5	SS	82/6"					3 29 63 5
15.5	End of Borehole									

[redacted]

RECORD OF BOREHOLE No. 2

[redacted]

LOCATION Co-ord. 870,082 N; 975,485 E. ORIGINATED BY GA

W.P. 400-65-03 BORING DATE April 10, 11 & 14, 1969 COMPILED BY GA

DATUM Geodetic BOREHOLE TYPE CHECKED BY UK

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w — WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR SA SI CL
541.7	Ground Level									
0.0	Clayey silt with some sand, traces gravel (Fill) Very stiff to hard		1	SS	40	540				
			2	SS	43					
						530				
			3	SS	29					4 20 51 25
523.2	O.G.									▼ 524.5
18.5	Clayey silt with sand, traces gravel. Very stiff to hard		4	SS	27					
516.5			5	SS	50	520				
25.2	Sandy silt, traces gravel & clay. Very dense		6	SS	102/9"					
			7	SS	93/6"					
			8	SS	21/2"					3 14 49 14
						510				
			9	SS	115					
504.7			10	SS	24					
37.0	Clayey silt-silty clay with some sand, traces of gravel. Hard		11	SS	76					1 6 50 43
			12	SS	135	500				
496.7			13	SS	60/3"					
495.8	Weathered Shale		14	SS	bouncing					
46.7	Probably bedrock End of Borehole									

RECORD OF BOREHOLE No. 3

[redacted]

LOCATION Co-ord. 870,098 N; 975,612 E. ORIGINATED BY GA

W.P. 400-65-03 BORING DATE April 14, 15, 1969 COMPILED BY GA

DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

ELEV / DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE
525.1	Ground Level					
0.0	Clayey silt with sand, traces of gravel,		1	SS	30	
519.1	Hard					520
6.0			2	SS	110/9"	
			3	SS	75/4"	
			4	SS	100/3"	
	Silty sand, traces of gravel & clay		5	SS	100/2"	510
			6	SS	70/2"	
	Very dense		7	SS	50	500
497.1						
28.0	Clayey silt-silty clay with some sand, traces of gravel,		8	SS	100/3"	
490.0	Hard					
35.0	Weathered		9	SS	70/3"	490
485.3	Shale		10	SS	bouncing	
39.8	Probably Bedrock					
	End of Borehole					

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT — w_L
PLASTIC LIMIT — w_P
WATER CONTENT — w

w_P w w_L

WATER CONTENT %
10 20 30

BULK DENSITY γ P.C.F

REMARKS
GR. SA. SI. CL.

3 23 52 22

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

10

RECORD OF BOREHOLE No 4

W.P. 400-65-03
DATUM Geodetic

LOCATION Co-ords. 870,015 N; 975,436 E.
BORING DATE July 11-12, 1974
BOREHOLE TYPE Auger & Cone Penetration

ORIGINATED BY HS
COMPILED BY HS
CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
543.8	Ground Level									
0.0	Clayey silt with sand and traces of gravel Firm to V. stiff (Fill Material)		1	SS	6	540				
			2	SS	13					2 26 56 16
			3	SS	13					
			4	SS	20					
			5	SS	14	530				2 22 52 24
			6	SS	21					
			7	SS	20		100/10"			W.L. EL. 522.6'
521.8			8	SS	21					
22.0	Clayey silt (Glacial Till)		9	SS	25	520				
516.8			10	SS	26					6 29 54 11
27.0	Sandy silt, traces of clay & gravel V. Dense		11	SS	100/2"					3 33 56 8
			12	SS	100/4"					
509.8			13	SS	100/2"	510				
34.0	Clayey silt with gravel and some sand (Glacial Till) Hard		14	SS	86					
			15	SS	109	500				24 14 47 15
492.8			16	SS	100/2"					
51.0	Weathered Shale Bedrock		17	SS	100/1"	490				
486.0			18	SS	100/3"					
57.8	End of Borehole					480				

20
15 ✧ 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

RECORD OF BOREHOLE No 5

11

W.P. 400-65-03
DATUM Geodetic
LOCATION Co-ords. 870,051 N; 975,562 E.
BORING DATE July 15, 1974
BOREHOLE TYPE Auger & Cone Penetration
ORIGINATED BY HS
COMPILED BY AP
CHECKED BY

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (20 40 60 80 100) / SHEAR STRENGTH P.S.F. (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w (w_P w w_L) / WATER CONTENT % (10 20 30)	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
542.5	Ground Level									
0.0	Clayey silt with sand and traces of gravel Firm to Hard (Fill Material)		1	SS	5	540				
			2	SS	24					5 30 48 17
			3	SS	22					
			4	SS	27	530				
			5	SS	35					2 25 56 17
			6	SS	38					
521.7			7	SS	24					
20.8	Clayey silt with sand and trace of gravel (Glacial Till) Hard		8	SS	37	520	100/11"			W.L. EL. 520.5'
515.5			9	SS	56					
			10	SS	141					
27.0	Silty sand, traces of clay & gravel Very Dense		11	SS	100/4"					8 55(37)
507.5			12	SS	100/3"	510				
35.0	Clayey silt with some sand & trace of gravel (Glacial Till) Hard		13	SS	81					
499.5			14	SS	100/6"	500				
43.0	Weathered Shale Bedrock		15	BXL	55%					9 13 45 32
495.8			16	BXL	33%					
46.7	End of Borehole					490				

20
15 ✧ 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No. 6

12

LOCATION Co-ords, 869,950 N; 975,382 E. ORIGINATED BY GA

W.P. 400-65-03 BORING DATE April 17, 21, 1969 COMPILED BY GA

DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT; SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB. VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
523.5	Ground Level									
0.0	Clayey silt with sand, traces gravel		1	SS	24	520				11 26 45 18
	Very stiff to hard		2	SS	38					
512.5			3	SS	50/2"					
11.0	Sandy silt with traces of gravel and clay,		4	SS	50/3"	510				1 26 69 4
			5	SS	80/4½"					
			6	SS	60/4½"					
	Very dense		7	SS	75/6"					
			8	SS	70/4"	500				
493.3										
492.7	Weathered Shale		9	SS	70/2"					
30.8	Auger grinding Possibly Bedrock					490				
	End of Borehole									

RECORD OF BOREHOLE No. 7

LOCATION Co-ord. 869,983 N; 975,516 E. ORIGINATED BY GA

W.P. 400-65-03 BORING DATE April 9 & 10, 1969 COMPILED BY GA

DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
542.0	Ground Level					
0.0	Clayey silt with sand & some gravel (Fill) Very Stiff		1	SS	15	540
			2	SS	24	
			3	SS	25	530
			4	SS	33	
523.5			5	SS	21	
19.5	Clayey silt with sand & traces gravel. Hard		6	SS	36	520
			7	SS	51	
			8	SS	70/3"	
			9	SS	70/2½"	
509.2			10	SS	bouncing	510
32.8	End of Borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — 20 40 60 80 100

SHEAR STRENGTH P.S.F

o UNCONFINED + FIELD VANE

● QUICK TRIAXIAL × LAB. VANE

100/10"

LIQUID LIMIT —— w_L

PLASTIC LIMIT —— w_p

WATER CONTENT —— w

w_p w w_L

WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.

REMARKS	GR. SA. SI. CL.
	2 25 51 22
▼522.8	
	2 43 45 10

RECORD OF BOREHOLE No. 8

LOCATION Co-ord. 870,022 N; 975,619 E
ORIGINATED BY GA
W.P. 400-65-03
BORING DATE April 16, 1969
COMPILED BY GA
DATUM Geodetic
BOREHOLE TYPE Auger
CHECKED BY HK

ELEV / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE
529.9	Ground Level					
0.0	Clayey silt with sand & some gravel (Fill)					
523.4	Stiff		1	SS	14	
6.5	Clayey silt with sand & traces of gravel		2	SS	40	520
			3	SS	117/7½"	
513.4	Hard		4	SS	56	
16.5	Clayey silty-silty clay with some sand and gravel.		5	SS	57	510
			6	SS	77	
			7	SS	71	
	Hard					
			8	SS	103	500
494.9						
35.0			9	SS	72/1½"	
491.4	Weathered Shale		10	SS	bouncing	
38.5	Possibly Bedrock End of Borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

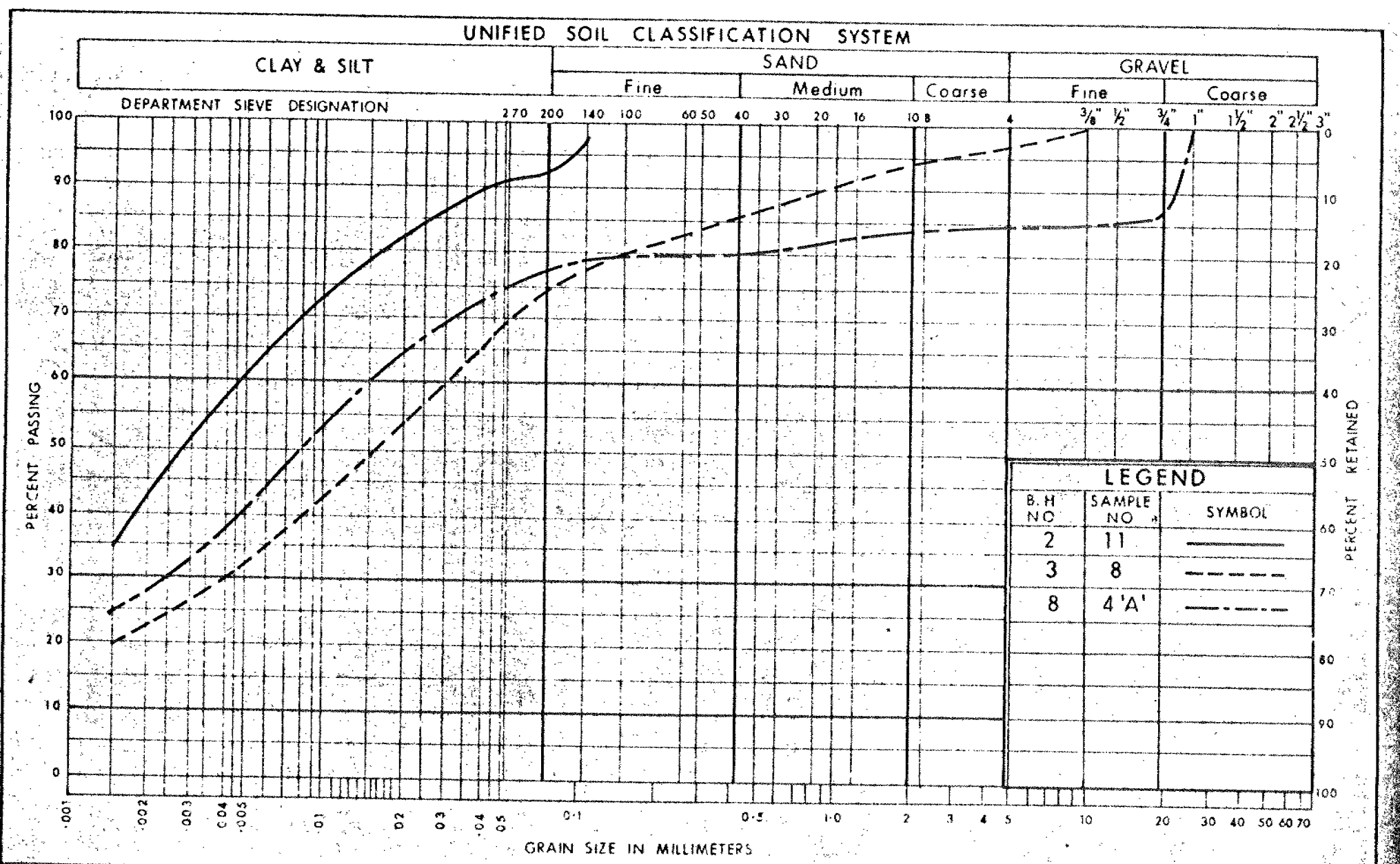
LIQUID LIMIT w_L
PLASTIC LIMIT w_p
WATER CONTENT w
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.

REMARKS

▼ 524.6

GR	SA	SI	CL
3	26	61	10
6	11	58	25
15	7	51	27



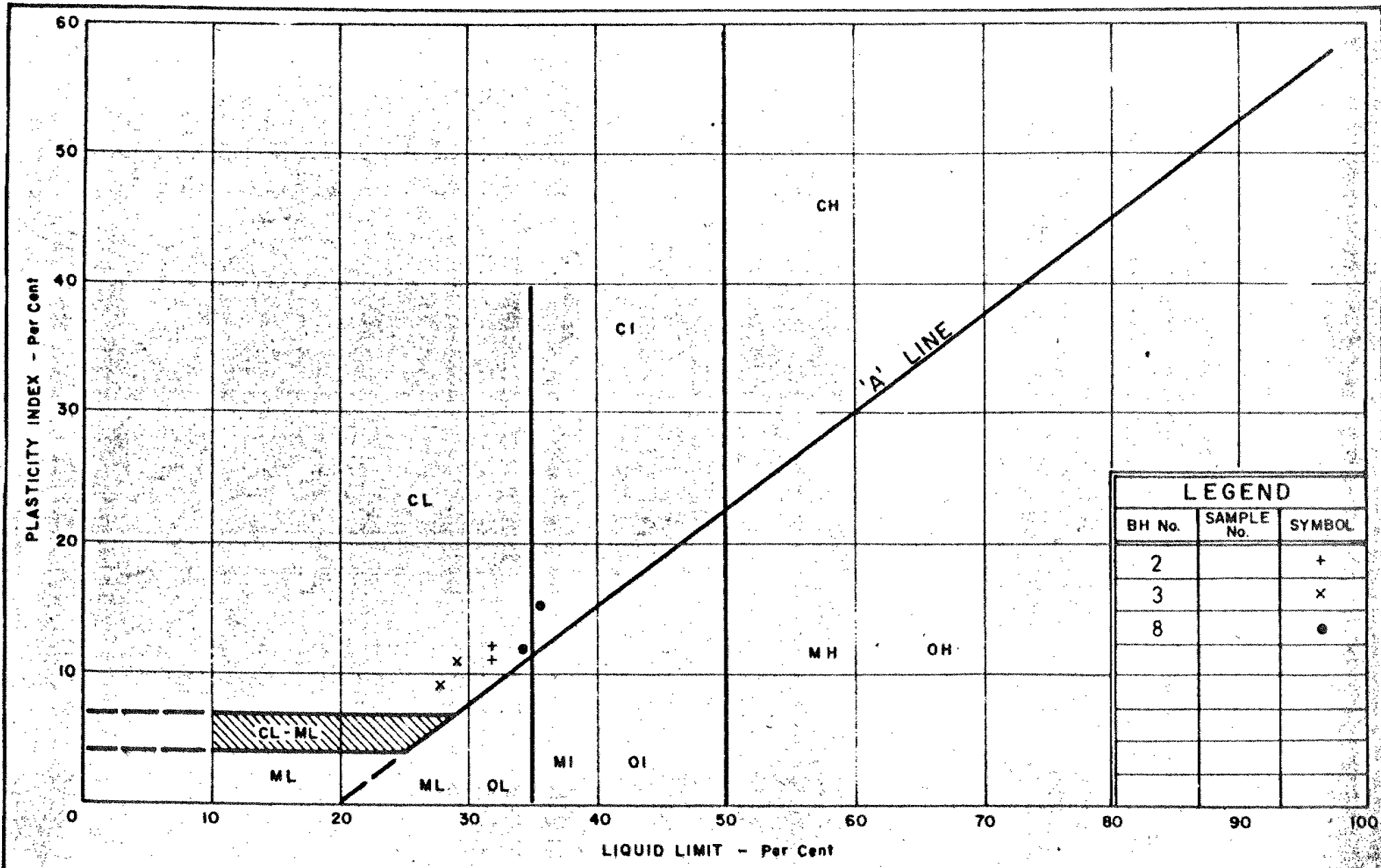
GRAIN SIZE DISTRIBUTION
CLAYEY SILT — SILTY CLAY

W.P. No. 400 - 65 - 03

JOB No.

FIGURE 1

15

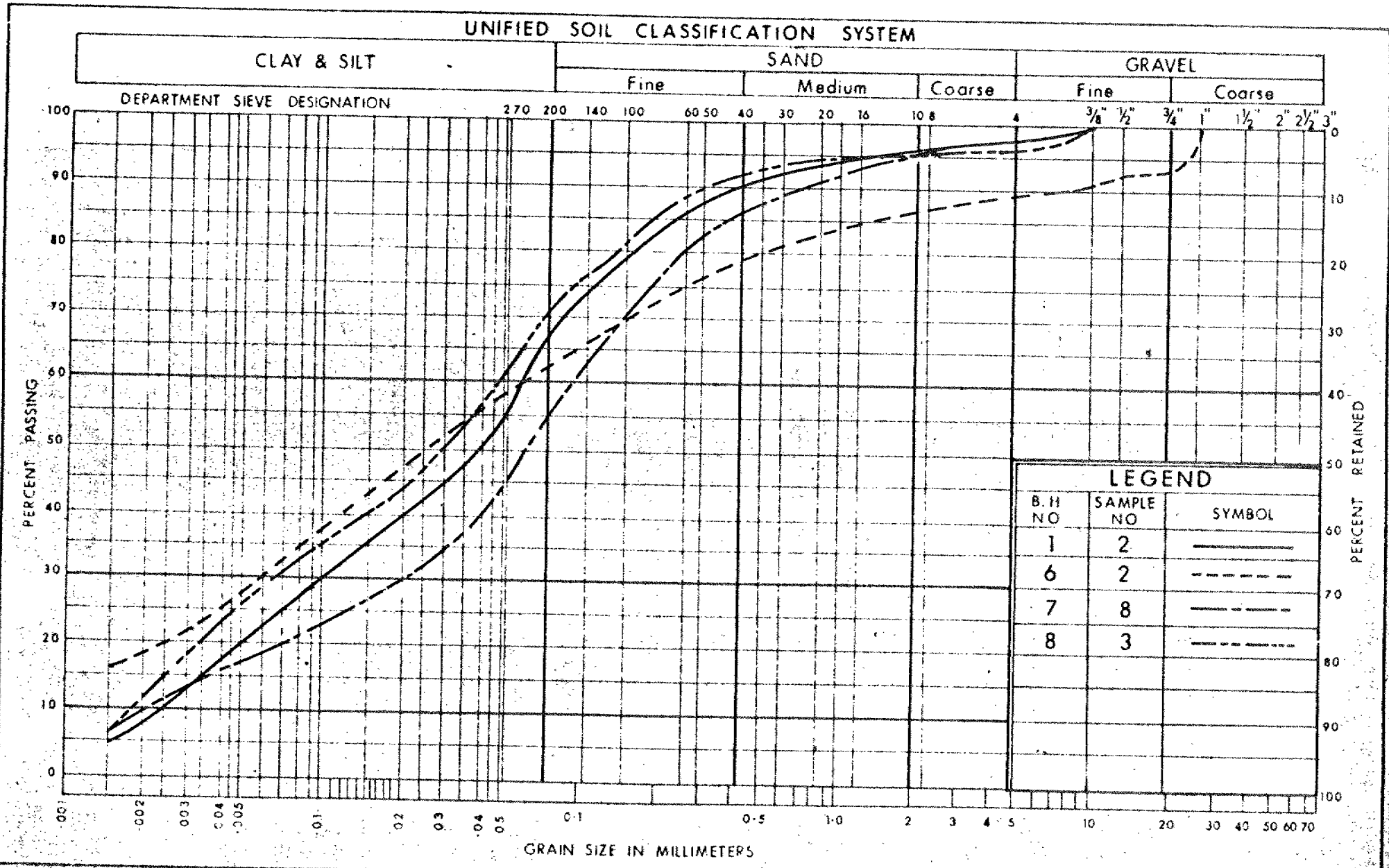


PLASTICITY CHART
CLAYEY SILT - SILTY CLAY

W.P. No. 400-65-03

JOB No.

FIGURE 2



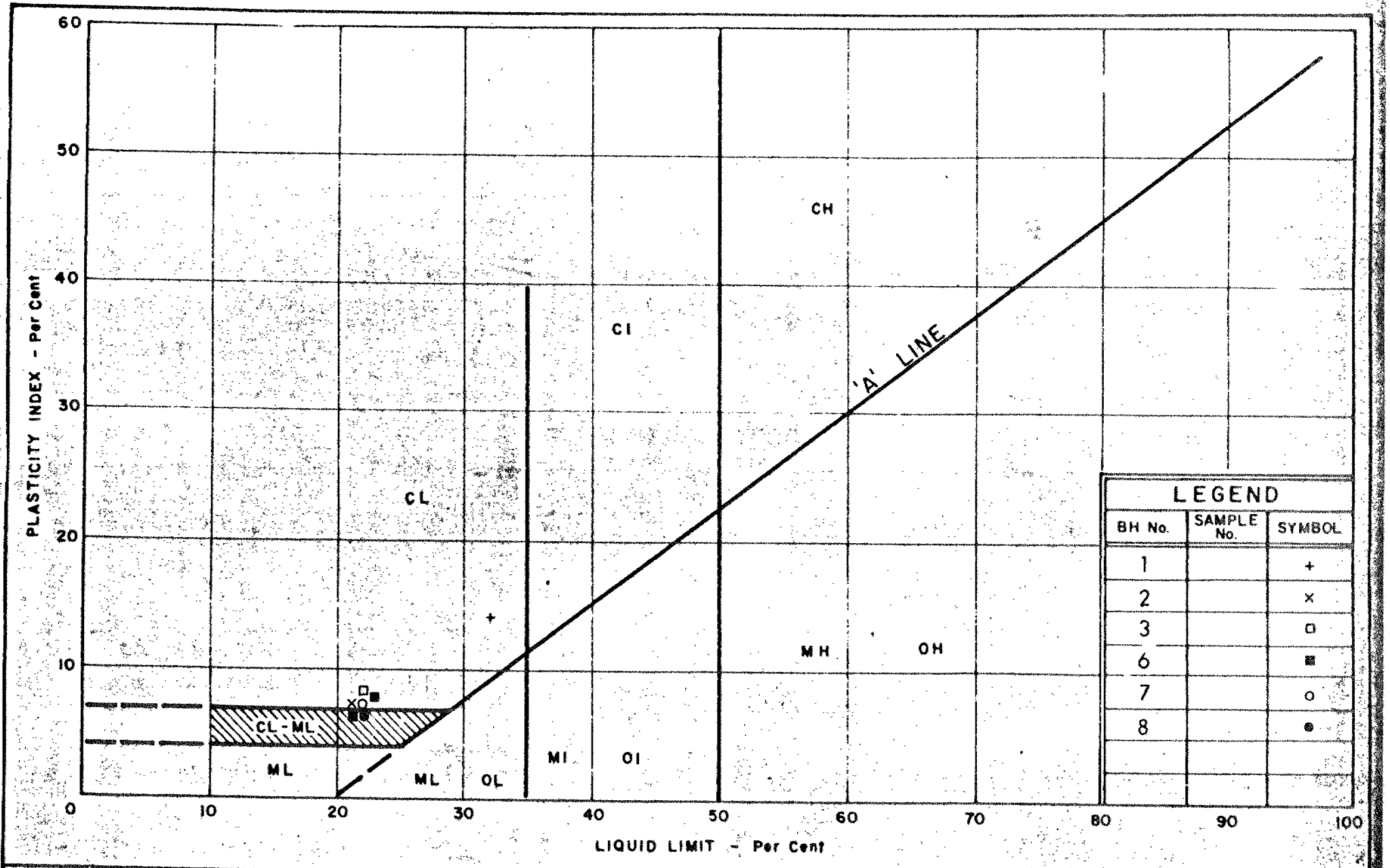
GRAIN SIZE DISTRIBUTION

CLAYEY SILT

WP No. 400 - 65 - 03

JOB No.

FIGURE 3

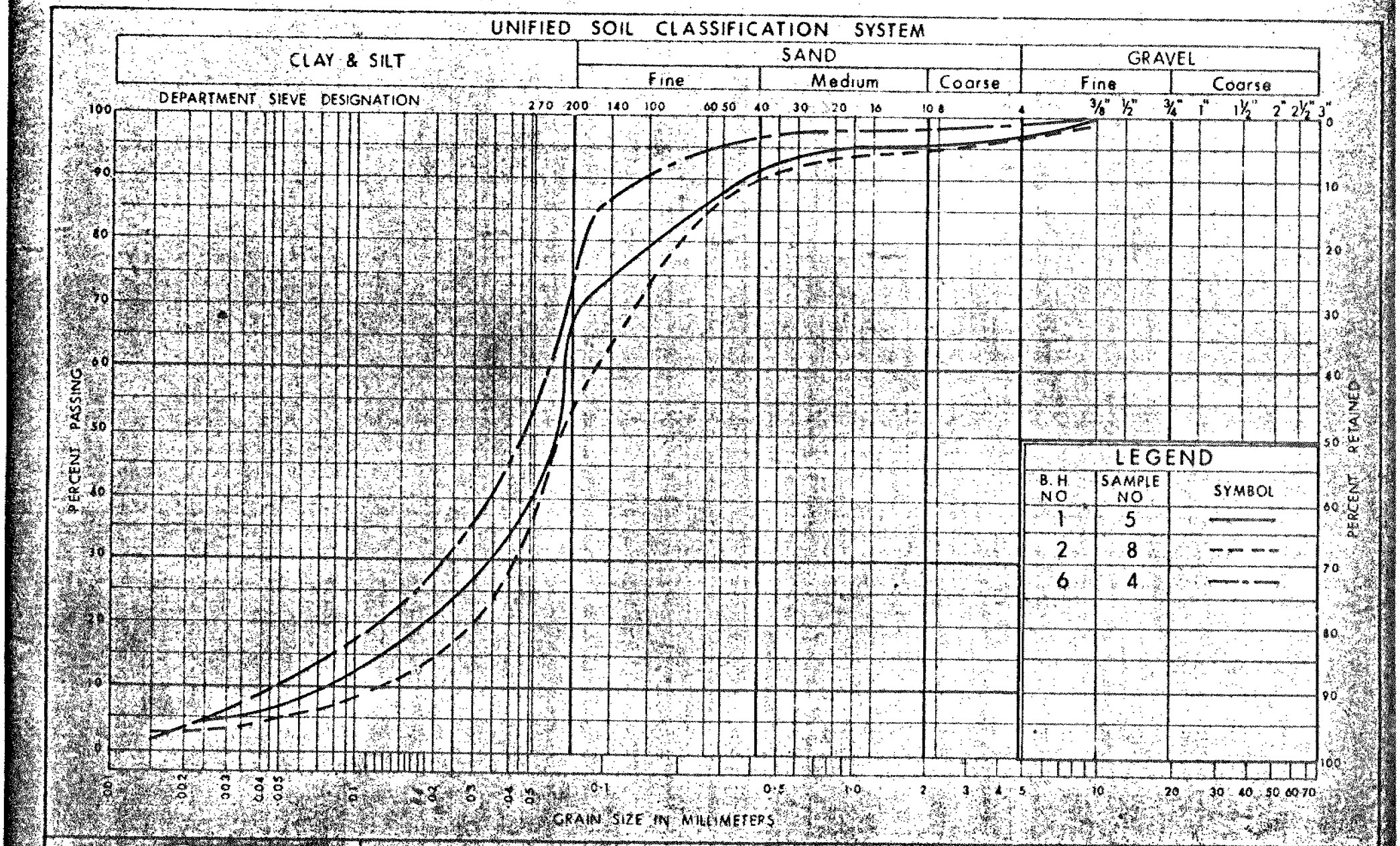


PLASTICITY CHART
CLAYEY SILT WITH SAND TRACES OF GRAVEL

W.P. No. 400-65-03

JOB No.

FIGURE 4



GRAIN SIZE DISTRIBUTION
SANDY SILT

W.P No. 400-65-03

JOB No. [redacted]

FIGURE 5

FOUNDATION INVESTIGATION REPORT
For
Highway 427 Overpass at Dixon Road
W.P. 48-71-20/21, Site 37-319
Highway 427, District 6, Toronto

INTRODUCTION

This report contains the results of a foundation investigation at the above listed site. Fieldwork consisted of 6 sampled boreholes advanced during the period June 27th to July 9th, 1974 employing continuous flight augers. Bedrock was proven by the recovery of BXL size rock cores from 3 of the boreholes.

SITE DESCRIPTION

The site is located at the intersection of Highway 427 and Dixon Road in the City of Mississauga. This area is flat to gently undulating. Toronto International Airport lies to the south west with the remainder of the area employed for commercial or light industrial uses.

Physiographically this area is part of the region known as the "Peel Plain". Characteristically it is a ground moraine with deposits of silt and sand interbedded in the glacial till.

SUBSURFACE CONDITIONS

Subsoil General

Subsoil consists of up to 7 feet of fill underlain by a heterogeneous mixture of clayey silt sand and gravel (glacial till) about 30 feet in thickness. This deposit is in turn underlain by about 15 feet of dense sandy silt to silty sand which overlies grey shale bedrock.

Reference should be made to the Record of Borehole Sheets which show the boundaries between soil types as well as a summary of all field and laboratory tests performed. Reference should also be made to Contract Drawing Nos. 37-319-2/3 which show the location and elevation of all borings together with sections and a profile showing inferred subsoil stratigraphy.

Fill Material

Fill material ranging in depth from 4 to 7 feet was encountered at all boring locations. It consists of clayey silt with sand, traces of gravel and organics and has a consistency estimated to range from firm to very stiff.

Glacial Till

Underlying the fill is a glacial till deposit consisting of a heterogeneous mixture of clayey silt, sand and gravel. Occasional sandy silt layers are also found within the deposit. The consistency is very stiff to hard with Standard Penetration 'N' values ranging from 20 to in excess of 100 blows per foot. Results of Atterberg Limit Tests are presented in Figure 1 of the Appendix. They indicate the deposit is inorganic and of low plasticity. Typical grain size distribution curves are shown as an envelope in Figure 2.

Sandy Silt to Silty Sand

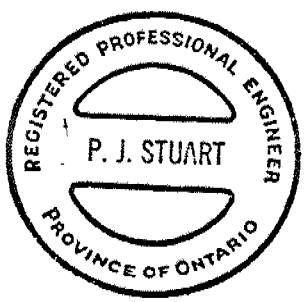
The cohesive glacial till layer is underlain by 12 to 15 feet of very dense sandy silt to silty sand. Standard Penetration 'N' values in this layer are in excess of 100 blows per foot.

Bedrock

Bedrock was encountered at elevations from 486 to 492 with the rock surface elevation increasing to the north. Detailed descriptions of the core samples are given on the Diamond Drill Record Sheets located in the Appendix.

Groundwater Conditions

Groundwater levels were observed in the open boreholes during the period of the field investigation. They varied from 534 to 539 some 1 to 7 feet below the ground surface.



P.J. Stuart, P. Eng.
Foundations Engineer

M. Devata, P. Eng.
Sr. Foundations Engineer

APPENDIX

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

RECORD OF BOREHOLE Nº 6

W.P. 48-71-20 & 21
DATUM Geodetic
LOCATION Co-ords. 15,873,442 N; 973,404E
BORING DATE July 8 & 9, 1974
BOREHOLE TYPE Cont. Flight Auger
ORIGINATED BY HS
COMPILED BY PP
CHECKED BY AP

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
541.3	Ground Level					
0.0	Clayey silt with some sand, traces of gravel & organics Fill		1	SS	8	540
536.3						
5.0	Het. Mixture of clayey silt sand & gravel V. Stiff to Hard Glacial Till Brown		2	SS	28	
			3	SS	25	
			4	SS	22	530
			5	SS	48	
			6	SS	33	
			7	SS	22	
	Grey		8	SS	24	520
			9	SS	20	
			10	SS	45	
			11	SS	59	
			12	SS	89	510
505.3			13	SS	190	
36.0	Sandy Silt to silty sand with traces of clay & gravel Grey V. Dense		14	SS	199/7"	500
			15	SS	120/1"	490
488.5						
52.8			16	SS	120/4"	
486.3	Transition Zone		17	SS	100/5"	
55.0	Weathered Shale Bedrock Grey		18	RC BXL	62%	
			19	RC	Rec.	
			20	BXL	64%	480
			21			
477.9	Sound		22	RC BXL	90%	
63.4	End of Borehole					470

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100
SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE

LIQUID LIMIT W_L
PLASTIC LIMIT W_P
WATER CONTENT W
W_P W W_L
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.

REMARKS	GR.	SA.	SI.	CL.
	6	24	56	14
▽ 535.7'				
	4	29	55	12
	3	39	52	6
	7	38	46	9

20
15 ◇ 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

RECORD OF BOREHOLE Nº 7

W.P. 48-71-20 & 21 | LOCATION Co-ords; 15,873,492 N; 973,288 E. | ORIGINATED BY HS
DATUM Geodetic | BORING DATE July 5-8, 1974 | COMPILED BY PP
BOREHOLE TYPE Cont. Flight Auger | CHECKED BY AP

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT (20 40 60 80 100); SHEAR STRENGTH P.S.F. (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	LIQUID LIMIT W_L, PLASTIC LIMIT W_P, WATER CONTENT W, WATER CONTENT % (10 20 30)	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
541.9	Ground Level									
0.0	Clayey silt with sand, traces of gravel & organics V. Stiff to Stiff (Fill)		1	SS	18	540				539.5
534.9			2	SS	9					
7.0	Het. Mixture of clayey silt sand & gravel V. stiff to hard Glacial Till Brown Grey		3	SS	20					4 26 53 17
			4	SS	61	530				
			5	SS	68		100/11"			5 27 50 18
			6	SS	43					
			7	SS	31					
			8	SS	30	520				
	occasional sandy silt layers		9	SS	73					
			10	SS	126					
			11	SS	109/6"					24 22 40 14
						510				
			12	SS	100/5"					
503.9			13	SS	100/6"					
38.0	End of Borehole					500				

OFFICE REPORT ON SOIL EXPLORATION

20
15 ◇ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

RECORD OF BOREHOLE Nº 8

W.P. 48-71-20 & 21 | LOCATION Co-ords: 15,873,579 N; 973,329 E | ORIGINATED BY HS
DATUM Geodetic | BORING DATE July 3-5, 1974 | COMPILED BY PP
BOREHOLE TYPE Cont. Flight Auger | CHECKED BY NP

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
540.3	Ground Level					540
0.0	Clayey silt with some sand, traces of gravel & organics Firm Fill		1	SS	8	
533.8			2	SS	7	
6.5	Het. Mixture of clayey silt sand & gravel Brown / Grey V. Stiff to Hard Glacial Till		3	SS	80	530
			4	SS	44	
			5	SS	84	
			6	SS	36	
			7	SS	25	520
			8	SS	32	
			9	SS	173	
			10	SS	100/4"	510
505.6			11	SS	133	
34.7	Sandy Silt to Silty Sand with traces of clay & gravel Grey V. Dense		12	SS	100/3"	500
			13	SS	100/5"	
493.3						
491.2	Transition Zone		14	SS	100/2"	
			15	SS	100/3"	490
49.1	Weathered Shale Grey Bedrock		16	RC BXL	Rec 66%	
			17			
			18	RC BXL	Rec 59%	
481.6	Sound		19	RC BXL	Rec 100%	
58.7	End of Borehole					480

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — 20 40 60 80 100
SHEAR STRENGTH P.S.F. — ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE
100/11"

LIQUID LIMIT W_L — PLASTIC LIMIT W_P — WATER CONTENT W — W_P W W_L
WATER CONTENT % — 10 20 30

BULK DENSITY γ P.C.F.

REMARKS — GR. SA. SI. CL.

534.9

7 24 55 14

6 41 48 5

2 88 (10)

15 20 10 5 % STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

RECORD OF BOREHOLE No 9

W.P. 48-71-20 & 21
DATUM Geodetic

LOCATION Co-ords. 15,873,665 N; 973,179 E
BORING DATE June 27, 1974
BOREHOLE TYPE Cont. Flight Auger

ORIGINATED BY HS
COMPILED BY HS
CHECKED BY AP

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (20 40 60 80 100) / SHEAR STRENGTH P.S.F. (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	LIQUID LIMIT w_L / PLASTIC LIMIT w_p / WATER CONTENT w (w_p w w_L) / WATER CONTENT % (10 20 30)	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
542.0	Ground Level									
0.0	Clayey silt with some sand, traces of gravel & organics		1	SS	8	540				
			2	SS	9					0 16 59 25
535.5	Firm Fill									535.0
6.5	Het. Mixture of Clayey silt Sand & Gravel V. Stiff to Hard Brown Glacial Till Grey		3	SS	31					
			4	SS	37	530				7 22 50 21
			5	SS	101		100/6"			
			6	SS	52					
			7	SS	26					
			8	SS	22	520				3 26 56 15
	occasional sandy silt layers		9	SS	72					6 32 47 15
			10	SS	100/3½"					
						510				
			11	SS	154					6 32 51 11
503.5			12	SS	175/6"					
38.5	End of Borehole					500				

15 ◇ 5 % STRAIN AT FAILURE (20 / 10)

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

RECORD OF BOREHOLE Nº 10

W.P. 48-71-20 & 21 | LOCATION Co-ords. 15,873,680 N; 973,274 E. | ORIGINATED BY HS

DATUM Geodetic | BORING DATE July 3, 1974 | COMPILED BY HS

BOREHOLE TYPE Cont. Flight Auger | CHECKED BY AP

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W	WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
536.1	Ground Level											
0.0	Clayey silt with some sand, traces of Gravel & organics Stiff (Fill)		1	SS	12							
529.6			2	SS	11	530						
6.5	Het. Mixture of Clayey silt sand & gravel Brown / Grey V. Stiff to Hard Glacial Till occasional sandy silt layers		3	SS	71							
			4	SS	90		100/9"					
			5	SS	23							5 28 51 16
			6	SS	37	520						2 22 49 27
			7	SS	17							
			8	SS	124							
			9	SS	122							3 35 49 13
						510						
			10	SS	100/5½"							16 31 43 10
			11	SS	100/5"	500						
497.1			12	SS	146							
39.0	End of Borehole											14 14 52 20
						490						

15 20 10 5 % STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

RECORD OF BOREHOLE No 11

W.P. 48-71-20 & 21 | LOCATION Co-ords. 15,873,719 N; 973,253 E | ORIGINATED BY HS
DATUM Geodetic | BORING DATE June 28, July 2, 1974. | COMPILED BY HS
BOREHOLE TYPE Cont. Flight Auger | CHECKED BY AP

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT; SHEAR STRENGTH P.S.F. (○ UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE)	LIQUID LIMIT W_L, PLASTIC LIMIT W_P, WATER CONTENT W, WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
536.1	Ground Level									
0.0 / 532.1	Clayey silt with sand, traces of gravel Organics - Firm Fill		1	SS	10					▼ 534.1
4.0	Het. Mixture of Clayey Silt Sand & Gravel Brown		2	SS	35	530				3 29 52 16
			3	SS	78		100/6"			
			4	SS	91					
			5	SS	39					5 30 46 19
	Grey		6	SS	25	520				1 23 61 15
	V. Stiff to Hard		7	SS	26					
			8	SS	125					4 31 48 17
	Glacial Till		9	SS	121/6"	510				
505.0			10	SS	100/3/4"					
31.1	Sandy Silt with Gravel & some clay Grey		11	SS	100/3½"	500				
	V. Dense		12	SS	100/3"					33 23 32 12
494.1										
492.7	Transition Zone		13	SS	156/8"					
44.0	Weathered Shale Bedrock Grey		14	RC BXL	Rec 30%	490				
			15	RC BXL	Rec 63%					
			16	RC BXL	Rec 40%					
			17	RC BXL	Rec 91%	480				
	Bedrock		18	RC BXL	Rec 58%					
476.1	Sound		19	RC BXL	Rec 100%					
60.0	End of Borehole					470				

15 20 10 ◇ 5 % STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

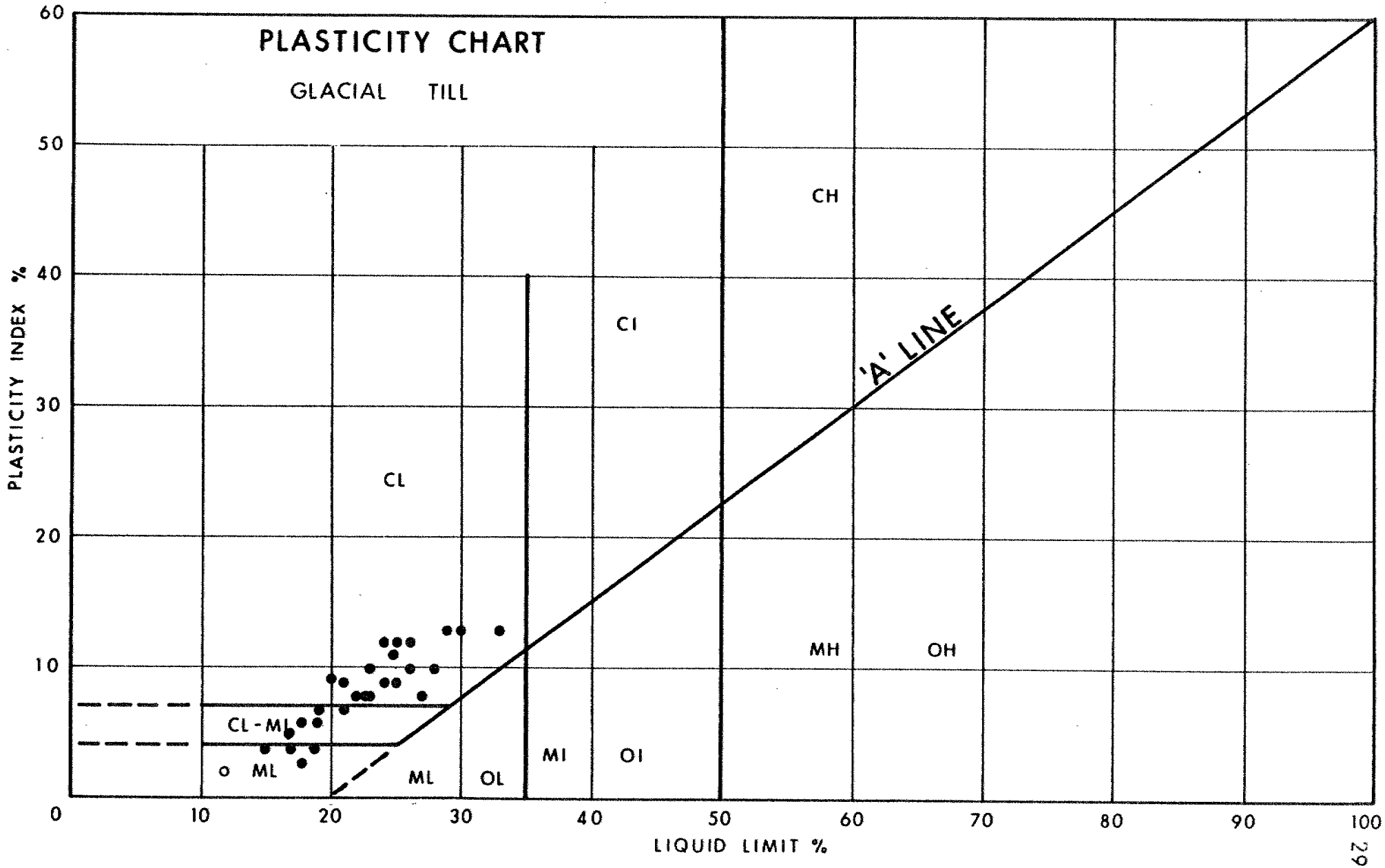


FIG. 1

W.P. 48-71-20&21

GRAIN SIZE DISTRIBUTION

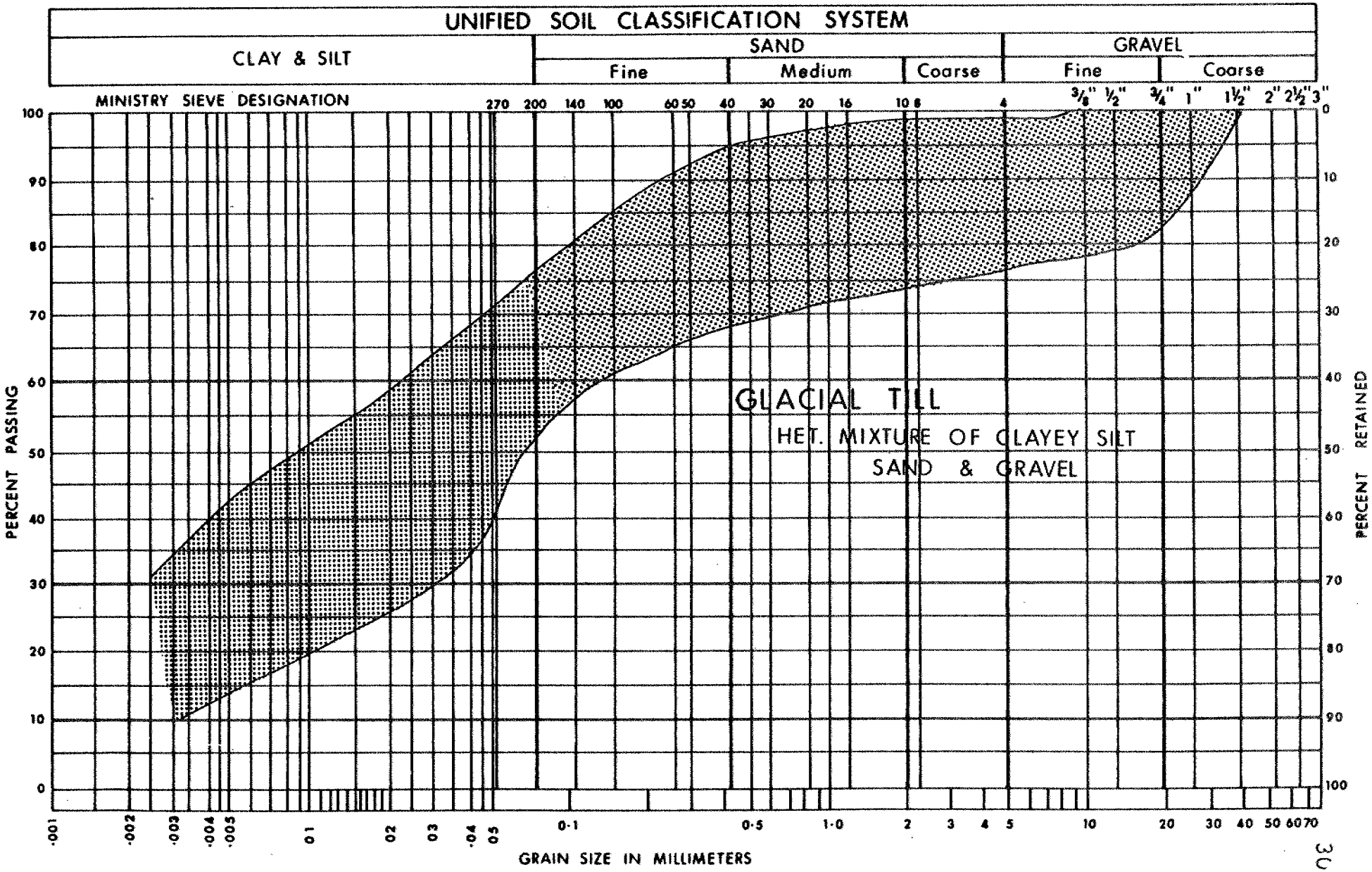


FIG. 2

W.P. 48-71-20&21

FORM OB-MT-113
JANUARY 1970

DEPARTMENT OF HIGHWAYS ONTARIO

DIAMOND DRILL RECORD

HOLE NO. 6, &8 SHEET NO. 1

PROPERTY
LOCATION
LATITUDE
DEPARTURE
BEARING

DIP
90°

TOTAL FOOTAGE

ELEV. COLLAR 31'
DATUM
DATE STARTED
DATE COMPLETED
DRILLED BY
LOGGED BY Z. Koniuszy

FOOTAGE FROM	FOOTAGE TO	FORMATION	SAMPLE NUMBER			REMARKS
		Hole #6 -				
54'5"	63'5"	Shale, grey, medium to soft with few very thin lenses of shaly limestone				core broken, partially ground
		Hole #8				
49'2"	49'8"	Shale, grey, soft -ground				
49'8"	49'10"	Limestone - silty grey medium hard				
49'10"	55'10"	Shale, grey, medium to soft with few very thin lenses of shaly limestone				core broken, partially ground
55'10"	56'7"	Limestone, shaly, silty, grey, medium hard				
56'7"	58'8"	Shale, grey, medium hard				

DATE OF EXAMINATION July 22, 1974

Z. Koniuszy

FORM OB-MT-113
JANUARY 1970

DEPARTMENT OF HIGHWAYS ONTARIO

DIAMOND DRILL RECORD

HOLE NO. 11 SHEET NO. 2

32

DIP

PROPERTY
LOCATION
LATITUDE
DEPARTURE
BEARING
TOTAL FOOTAGE

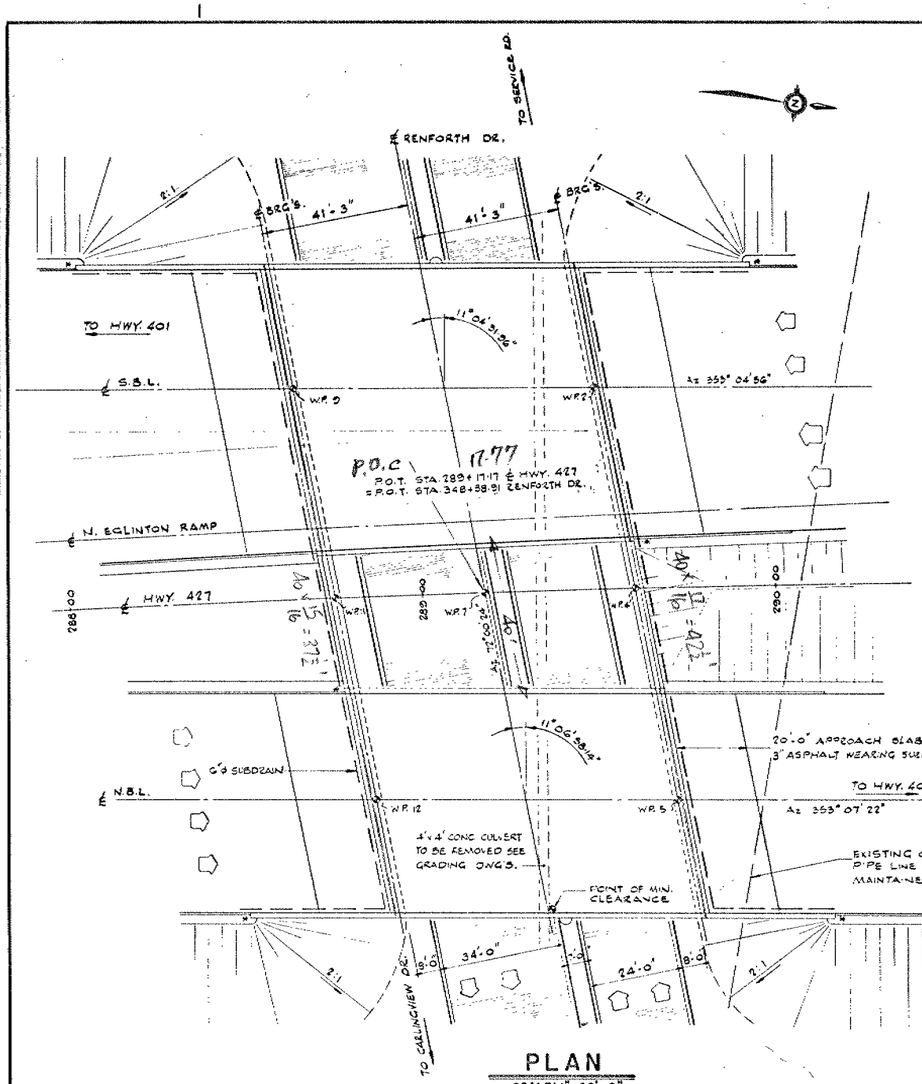
ELEV. COLLAR
DATUM
DATE STARTED
DATE COMPLETED
DRILLED BY
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	FORMATION	SAMPLE NUMBER			REMARKS
		Hole #11 -				
44'5"	47'0"	Shale, grey, medium to soft				core ground, missing
47'0"	47'6"	Limestone - silty, shaly in places, grey, medium hard				core broken
47'6"	48'8"	Shale, grey, medium hard				core broken
48'8"	48'10"	Limestone - silty, shaly, grey, medium hard				
48'10"	53'9"	Shale, grey, medium hard				core broken
53'9"	53'11"	Limestone, silty, grey, medium hard				
53'11"	56'8"	Shale, dark grey, medium hard				core broken
56'8"	57'0"	Limestone, silty, shaly, grey, medium hard				core broken
57'0"	60'0"	Shale, dark grey, medium to soft				core broken, partially ground

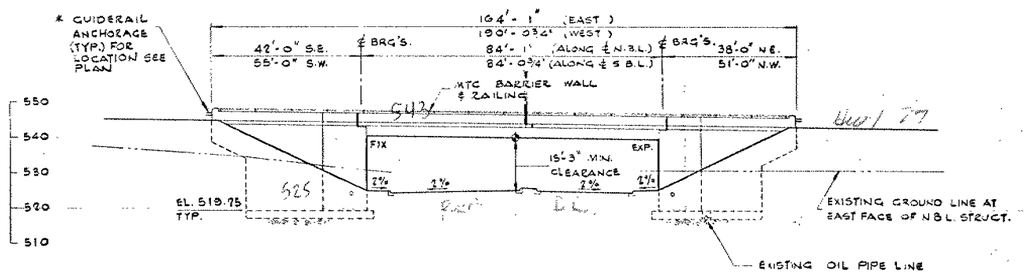
DATE OF EXAMINATION July 22, 1974

Z. Koniuszy

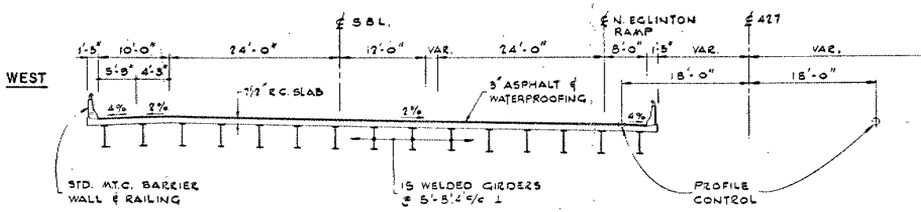
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO 3118 DGBRIS 4-75



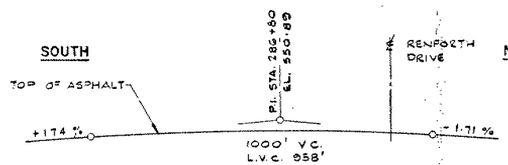
PLAN
SCALE: 1" = 20'-0"



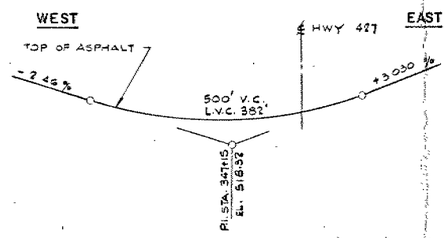
ELEVATION
SCALE: 1" = 20'-0"



SECTION
SCALE: 1" = 10'-0"



PROFILE OF HWY. 427
N.T.S.



PROFILE OF RENFORTH DR.
N.T.S.

RECEIVED
FEB 09 1979
SOIL MECHANICS
MINISTRY OF TRANSPORTATION & COMMUNICATIONS

REGISTERED PROFESSIONAL ENGINEER
R. SKELTON
PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER
J. W. TUCK
PROVINCE OF ONTARIO

DIST. № 6
CONT No
WP No 400-65-03

SHEET

HWY. 427 OVERPASS AT RENFORTH DRIVE
GENERAL ARRANGEMENT

McCORMICK RANKIN
CONSULTING ENGINEERS

LIST OF DRAWINGS

1 GENERAL ARRANGEMENT
2 BOREHOLE LOCATIONS & SOIL STRATA
3 FOUNDATION DETAILS
4 ABUTMENT DETAILS I
5 ABUTMENT DETAILS II
6 RETAINING WALL DETAILS
7 BEARING DETAILS
8 GIRDER DETAILS I
9 GIRDER DETAILS II
10 DECK D.M. & REINF. (S.B.L.)
11 DECK D.M. & REINF. (N.B.L.)
12 BARRIER WALLS 1 & 4
13 BARRIER WALLS 2 & 3
14 STEEL RAILING (SINGLE TUBE)
15 20 FT APPROACH SLAB
16 AS CONSTRUCTED ELEV. & DIM.
17 STANDARDS
18 STANDARDS
19 STANDARDS
20 EMBEDDED WORK

CONCRETE QUANTITIES
(FOR LUMP SUM CONCRETE TENDER ITEMS)

	N.B. STRUCTURE	S.B. STRUCTURE
CONC IN ABUT'S, WINGWALLS, & RET. WALLS	536 CY.	490 CY.
CONC IN DECK	118 CY.	188 CY.
CONC IN BARRIER WALLS	16 CY.	18 CY.
CONC IN APPROACH SLABS	106 CY.	78 CY.

STRUCTURAL STEEL QUANTITY

71.4 TONS. | 69.1 TONS.

GEODETIC B.M. TT-502 ELEV. 521.36
PLATE IN WEST END OF CONCRETE CULVERT UNDER T-B AIRPORT EXPRESSWAY 2400' NORTH OF SERVICE ROAD UNDERPASS STA. 306+70 ℄ OF PROPOSED HWY. 427.

GENERAL NOTES:

CLASS OF CONCRETE
DECK & BARRIER WALLS - 4,000 PSI.
ABUTMENTS & FOOTINGS - 3,000 PSI.
REMAINDER AS NOTED

CLEAR COVER ON REINFORCING STEEL
FOOTINGS & ABUTMENTS - 3"
DECK TOP - 2"
BOT. - 1"
BARRIER WALL 1½" EXCEPT AS NOTED.
APPROACH SLAB 2".
REMAINDER AS NOTED

REINFORCING STEEL SHALL BE C.S.A. G30.12 M SERES GRADE 400 MPA OR AS NOTED. REINF. BARS WITH THE DESIGNATION 'C' AT THE END OF BAR MARKS SHALL BE COATED BARS.

TO ACHIEVE THE MIN. CLEAR COVER OF 2" SPECIFIED, THE TOP LAYER OF DECK RE-BARS SHALL BE PLACED PRIOR TO CONCRETING, WITH A CLEAR COVER OF 2½" ± ½" TOLERANCE.

CONSTRUCTION NOTES
THE CONTRACTOR SHALL FINISH THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS TO A TOLERANCE OF ⅛" ±.

NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.

FOR LOCATION OF EXISTING BRIDGE & CONSTRUCTION SEQUENCE SEE GRADING DWG'S.

FOR REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN

REVISIONS			
DATE	BY	DESCRIPTION	
DESIGN R.S.	CHECK J.W.T.	LOADING HS-20-44	DATE DEC.78
DRAWING B.A.	CHECK J.W.T.	SITE No 37-823	DWG 1

TRANSLAN 300-6-78

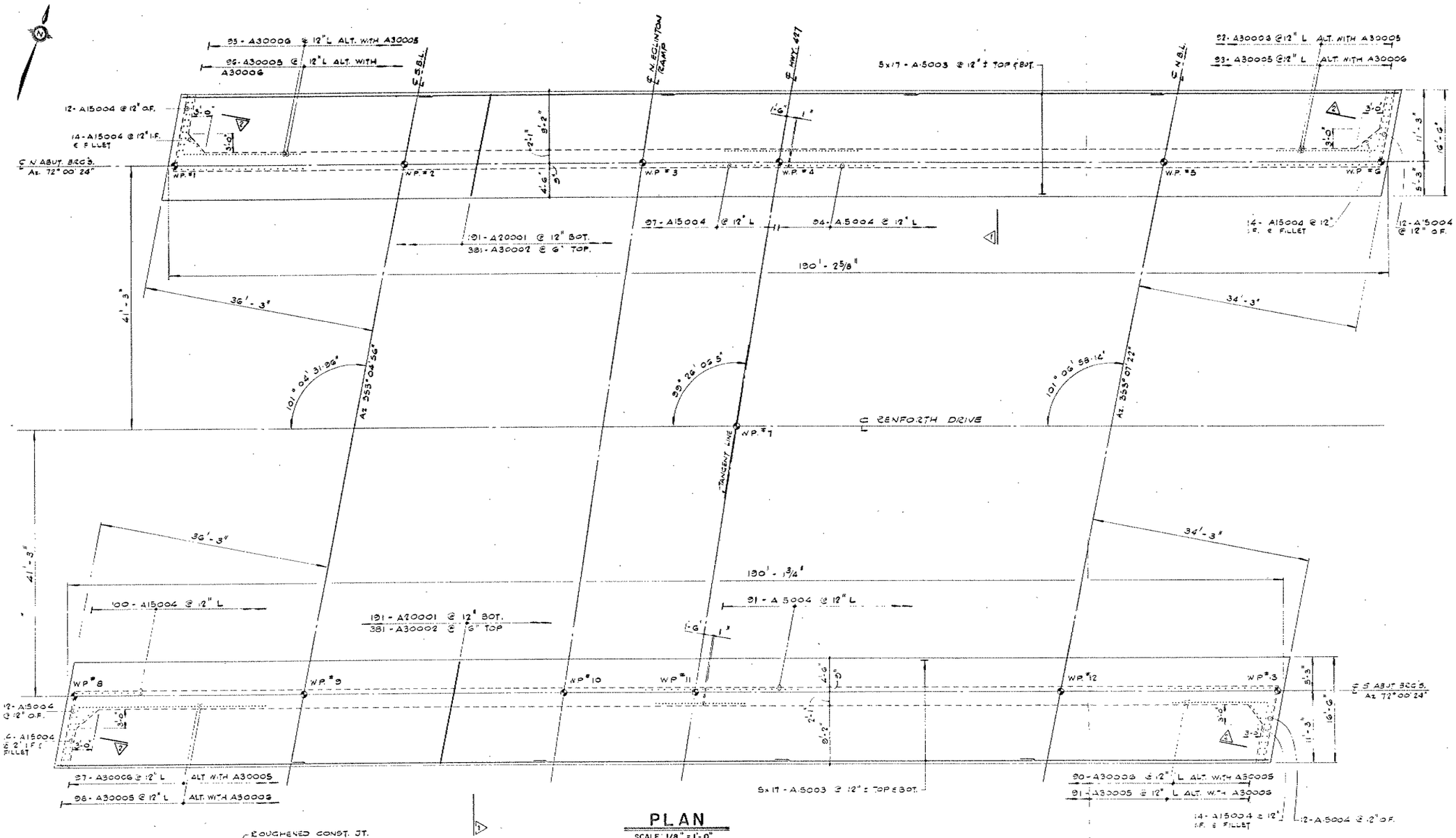
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO 3115 DBRTS 4-75

DIST. No 6
CONT No
WP No 400-65-03

SHEET

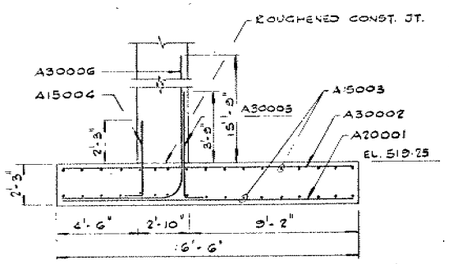
HWY. 427 OVERPASS AT RENFORTH DRIVE
FOUNDATION DETAILS

McCORMICK RANKIN
CONSULTING ENGINEERS



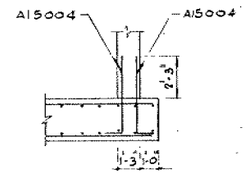
CO-ORDINATES

W.P. No	NORTHING	EASTING
W.P. # 1	870,048.555	975,410.705
W.P. # 2	870,053.651	975,444.868
W.P. # 3	870,071.180	975,480.364
W.P. # 4	870,077.853	975,500.312
W.P. # 5	870,086.218	975,557.456
W.P. # 6	870,106.686	975,589.686
W.P. # 7	870,036.491	975,507.097
W.P. # 8	869,963.102	975,420.831
W.P. # 9	869,970.197	975,454.593
W.P. # 10	869,988.824	975,493.871
W.P. # 11	869,995.176	975,513.428
W.P. # 12	870,012.741	975,561.510
W.P. # 13	870,023.209	975,593.740



SECTION 1
SCALE: 1/4" = 1'-0"

PLAN
SCALE: 1/8" = 1'-0"



SECTION 2
SCALE: 1/4" = 1'-0"

R. SKELTON — REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

J. W. TUCK — REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

FOR REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN

REVISIONS			
DATE	BY	DESCRIPTION	
DESIGN R.S.	CHECK J.W.T.	LOADING HS 20-44	DATE DEC. 78
DRAWING M.B.	CHECK J.W.T.	SITE No 37-823	DWG 3

RJ TRANSLAR 100-6-78

CONT 81-46

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. G.C.E. Burkhardt, (2)
Reg. Structural Planning Eng.,
Central Region, Toronto.

FROM: Soil Mechanics Section,
Geotechnical Office,
West Building, Downsview.

ATTENTION:

DATE: August 8th, 1974.

OUR FILE REF.

IN REPLY TO 30M11-48

SUBJECT: Addendum to the Foundation Investigation Report
For
The Proposed Renforth Drive Overpass,
Bridge No. 30, Hwy. #427, Site No. 37-823,
District #6, Toronto, W.O.69-F-28, W.P. 400-65-03.

The Soil Mechanics Section was requested by the Regional Structural Planning Office to carry out additional foundation investigation at the abovementioned structure location.

Since the issue of our Foundation Report (W.O. 69-F-28, dated September 10th, 1969) the original scheme for Bridge #30 has been altered. It is now proposed to construct a two-span structure with closed type abutments and a centre pier located within the median of Renforth Drive.

A field investigation, consisting of two sampled boreholes was subsequently carried out by this Section. These borings revealed similar subsoil conditions to those encountered in the previous investigations.

The subsoil at the site was found to consist of a firm to hard clayey silt with sand and trace of gravel fill material, the thickness of which varies from 21 ft. (6.40 m) to 22 ft. (6.71 m). The fill material is underlain by a 5 ft. (1.52 m) to 7 ft. (2.13 m) thick very stiff to hard clayey silt with sand and trace of gravel (glacial till) deposit. This cohesive till is followed by a 7 ft. (2.13 m) to 8 ft. (2.44 m) thick very dense sandy silt to silty sand with some clay and trace of gravel stratum. The elevation of the upper boundary of this deposit varies between elev. 515.5 (157.12 m) and elev. 516.8 (157.52 m) and the lower boundary from elev. 507.5 (154.69 m) to elev. 509.8 (155.39 m).

This granular deposit is underlain by a lower, hard cohesive glacial till stratum whose thickness varies from 8 ft. (2.44 m) to 17 ft. (5.18 m). This overburden sequence is followed by weathered shale bedrock.

..... /2

Mr. G.C.E. Burkhardt - RE: Addendum to Foundation Investigation Report, W.O. 69-F-28.

The boundaries of the various deposits as determined in the boreholes are shown on the accompanying Record of Borehole Sheets. The stratigraphical sections shown on the revised Drawing No. 69-F-28A have been inferred from this data.

The observed groundwater level was found to vary between elev. 521.5 (158.95 m) and elev. 522.6 (159.29 m) in Boreholes #5 and #4 respectively.

A review of the encountered subsoil conditions indicates that the recommendations of the original Foundation Report (W.O. 68-F-29), in general are still applicable. The pier and the closed type abutments may be supported on spread footing type foundations located at or below elev. 517 (157.58 m). The footings should be placed on undisturbed soil or on a working mat of lean concrete. An allowable bearing value of 3.5 t.s.f. (325 kPa) may be used for design purposes.

All footings should be provided with at least 4 ft. (1.22 m) of earth cover for adequate frost protection.

The footing excavations, in part, will be carried into the sandy silt to silty sand zone which is highly susceptible to conditions of unbalanced hydrostatic head and is likely to 'boil' under such conditions. To prevent boiling and thus ensure the soil underlying the footings is undisturbed it will be necessary to provide an adequate dewatering scheme.

As an alternative to spread footing type foundations, the proposed abutments and pier may be supported on end-bearing piles driven into the lower competent glacial till deposit. For estimating purposes the pile tips can be designed for the ultimate capacity of the pile section chosen; e.g. 12 BP 74 Steel H Piles could be designed for 95 tons/pile (845.5 kN).

If the abutments and pier are supported on spread footing type foundations the subsoil will settle due to the induced footing pressure and will take place during or immediately following the construction period. It is estimated that this settlement will not exceed 1 inch, providing the foundation soil is not softened or loosened by the construction operations or uncontrolled surface runoff.

..... /3

Mr. G.C.E. Burkhardt - RE: Addendum to Foundation Investigation Report, W.O. 69-F-28.

The granular backfill behind the wall should be provided with adequate drainage. The coefficients of lateral earth pressure for the granular backfill may be taken as 0.30 and 0.50 for the 'active' (Ka) and 'at rest' (Ko) conditions respectively.

Where the spread footings of the abutments are placed within the glacial till zone it is recommended that a value of 2,500 p.s.f. be used in the computations to determine the sliding resistance between the concrete base of the footing and the underlying cohesive type material.

For computation of sliding resistance for abutments founded on spread footings within the sandy silt deposit a friction coefficient of 0.40 may be assumed to apply between the bases of footing and underlying foundation soil.

A review of the subsoil and groundwater conditions indicates that the proposed fills could be constructed to the required heights (about 26 ft.) (7.92 m) without the danger of base failure. Fills of this height will be stable provided 2:1 slopes are employed and the fill material is properly compacted.

It should be noted that a pipeline (Imperial Oil) is located immediately adjacent to the east corner of the north abutment and crosses the proposed NE wingwall. Care should be taken during construction to ensure the intactness of the pipeline.

..... /4

Mr. G.C.E. Burkhardt - RE: Addendum to Foundation Investigation Report, W.O. 69-F-28.

Please attach the supplementary Record of Borehole Sheets (Numbered 4 and 5) and replace original Foundation Report Drawing 68-F-29A with the revised Drawing.

If further information is required, please contact our Office.

P. Payer,
Senior Engineer,
For: M. Devata,
Supervising Engineer.

PP/mj

c.c. E.J. Orr
B.R. Davis
R.S. Pillar
H. Greenland
B.J. Giroux
D. Gunter
G.A. Wrong
P. Lewycky

Files
Documents

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE Nº 4

JOB 69-F-28 — LOCATION Co-ords. 870,015 N; 975,436 E. — ORIGINATED BY HS

W.P. 400-65-03 — BORING DATE July 11-12, 1974 — COMPILED BY HS

DATUM Geodetic — BOREHOLE TYPE Auger & Cone Penetration — CHECKED BY GP

OFFICE REPORT OF SOIL EXPLORATION

m.	ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT (0.3 m)	ELEV. SCALE ft/m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m) 20 40 60 80 100; SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_P W W_L WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
165.75	543.8	Ground Level									
0.0	0.0	Clayey silt with sand and traces of gravel Firm to V. stiff (Fill Material)		1	SS	6	540				
				2	SS	13	164.52				2 26 56 16
				3	SS	13					
				4	SS	20					
				5	SS	14	530				2 22 52 24
				6	SS	21	161.54				
				7	SS	20		100/10"			W.L. EL. 522.6' 159.29
159.04	521.8			8	SS	21					
6.71	22.0	Clayey silt (Glacial Till)		9	SS	25	520				
157.52	516.8			10	SS	26	158.50				6 29 54 11
8.23	27.0	Sandy silt, traces of clay & gravel V. Dense		11	SS	100/2"					
				12	SS	100/4"					3 33 56 8
155.39	509.8			13	SS	100/2¼"	510				
10.36	34.0	Clayey silt with gravel and some sand (Glacial Till) Hard		14	SS	86	155.45				
				15	SS	109	500				24 14 47 15
				16	SS	100/9"	152.40				
150.21	492.8			17	SS	100/1"	490				
15.54	51.0	Weathered Shale Bedrock		18	SS	100/3"	149.35				
148.13	486.0										
17.62	57.8	End of Borehole					480 146.30				

20 15 5 10 % STRAIN AT FAILURE

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 5

JOB 69-F-28 — LOCATION Co-ords. 870,051 N; 975,562 E. — ORIGINATED BY HS

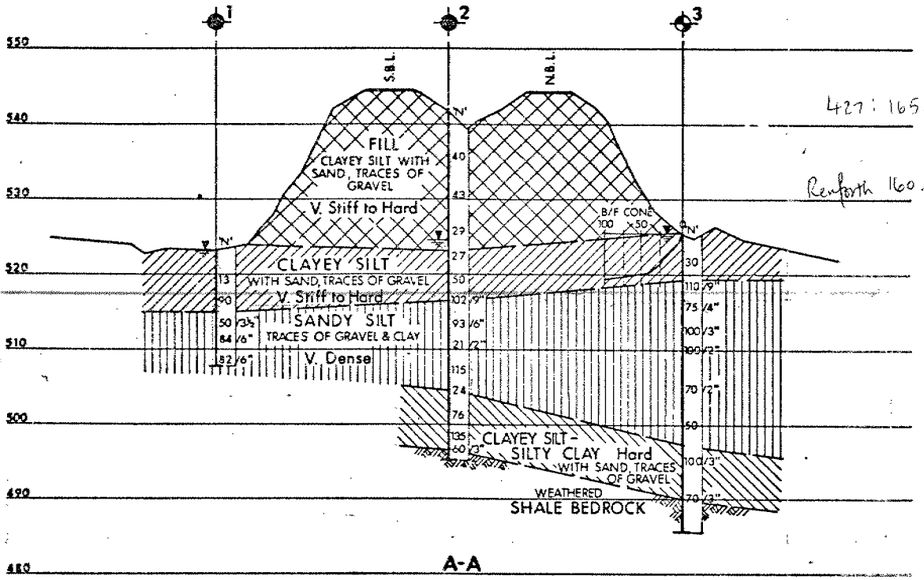
W.P. 400-65-03 — BORING DATE July 15, 1974 — COMPILED BY AP

DATUM Geodetic — BOREHOLE TYPE Auger & Cone Penetration — CHECKED BY

m.	ELEV / DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT (0.3 m)	ft/m ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE (0.3 m) BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w — WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL
165.3	542.5	Ground Level						SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE			
0.0	0.0	Clayey silt with sand and traces of gravel Firm to Hard (Fill Material)		1	SS	5	540				
				2	SS	24	164.58				5 30 48 17
				3	SS	22					
				4	SS	27	530				
				5	SS	35	161.54				2 25 56 17
				6	SS	38					
				7	SS	24					
159.01	521.7			8	SS	37	520	100/11"			W.L. EL. 520.5'
6.34	20.8	Clayey silt with sand and trace of gravel (Glacial Till) Hard		9	SS	56	158.50				158.65
157.12	515.5			10	SS	141					
8.23	27.0	Silty sand, traces of clay & gravel Very Dense		11	SS	100/4"					8 55(37)
154.69	507.5			12	SS	100/3"	510				
10.67	35.0	Clayey silt with some sand & trace of gravel (Glacial Till) Hard		13	SS	81	155.45				
152.25	499.5			14	SS	100/4"	500				9 13 45 32
13.11	43.0	Weathered Shale Bedrock		15	BXL	55%	152.40				
151.12	495.8			16	BXL	33%					
14.23	45.7	End of Borehole					490				
							149.35				

OFFICE REPORT OF SOIL EXPLORATION

20
15 ◇ 5 % STRAIN AT FAILURE
10

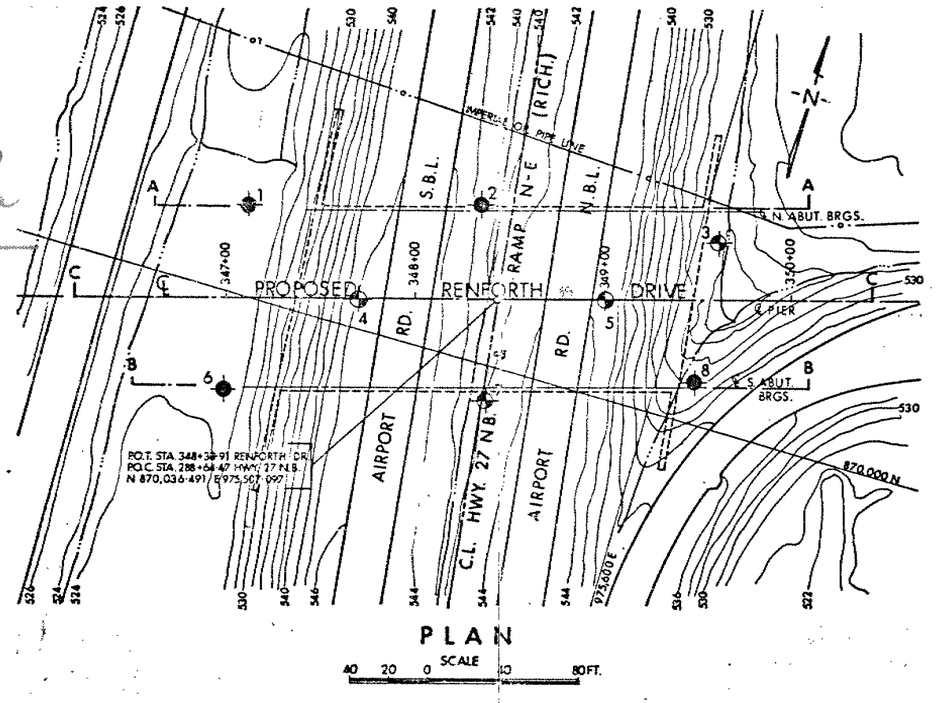


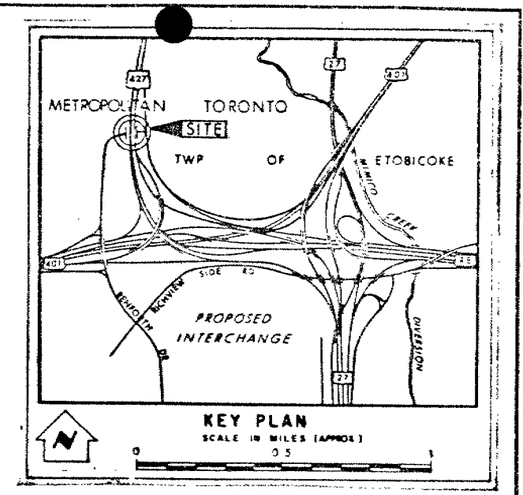
427 : 165.5

Renforth 160.

(79 02 09)
Etg. Base

158.9





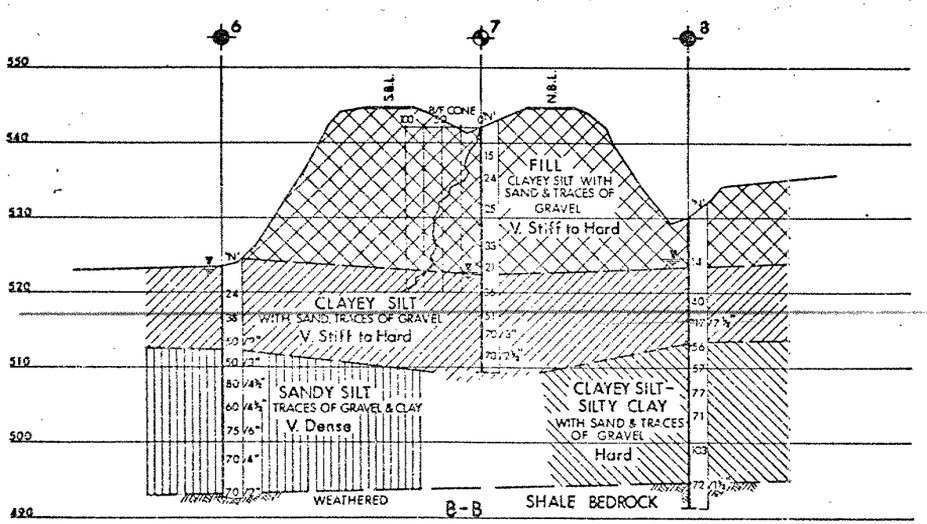
LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation. APRIL 1969

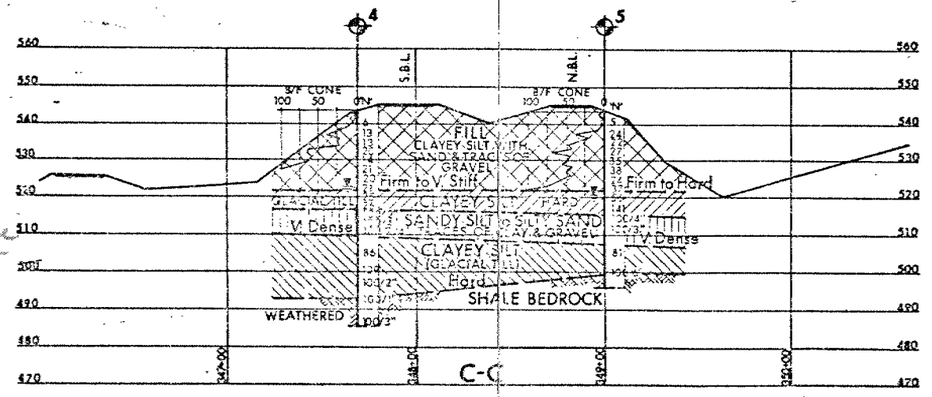
NO.	ELEVATION	CO-ORDINATES NORTH	CO-ORDINATES EAST
1	523·2	870,047	975,368
2	541·7	870,082	975,485
3	525·1	870,098	975,612
6	523·5	869,950	975,382
7	542·0	869,983	975,516
8	529·9	870,022	975,619
4	543·8	870,015	975,436
5	542·5	870,051	975,562

– 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.



(79 02 09)
Etg. Base



SECTIONS

SCALE
VERT. 10 5 0 10 20 FT.
HORIZ. 40 20 0 40 80

SECTION

SCALE
HORIZ. 40 20 0 40 80 FT.
VERT. 20 10 0 20 40

NOTE: The complete soil investigation report for this structure may be examined at the Bridge Office and Foundation Office, Downsview, and at the Toronto District Office.

REF. NO. D-6243-P1

REVISIONS		
DATE	BY	DESCRIPTION
JULY 74	A.F.	9 H's 4 & 5 & SECTION C-C ADDED

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE - FOUNDATION SECTION

BRIDGE Nº 30
RENFORTH DRIVE UNDER AIRPORT ROAD

KING'S HIGHWAY NO. 401 & 27 INTERCHANGE DIST. NO. 6
CO. YORK METRO TORONTO
TWP. ETOBICOKE LOT CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD. A.G.	CHECKED	W.P. NO. 400-65-3	M.B.T. DRAWING NO. 69-F-28A
DRAWN S.O.	CHECKED	JOB NO. 69-F-28	
DATE 14 AUG 1969		SITE NO 37-823	BRIDGE DRAWING NO. D-6243-2
APPROVED		CONT. NO.	

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. D. R. Davis,
Bridge Engineer,
Bridge Office,
Admin. Bldg.

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

Attention: Mr. S. McCombie

Date: August 29, 1969

Our File Ref:

In reply to

SEP 10 1969

Subject:

FOUNDATION INVESTIGATION REPORT
For
Bridge No. 30
Airport Expressway (Future Hwy. #27)
Site 37-823
District No. 6 (Toronto)
W.J. 69-F-28 -- W.P. 400-65-3

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

We believe that the factual data and recommendations contained therein, will prove adequate for your design requirements. Should additional information be required, please do not hesitate to contact our Office.

A.G. Sternac
PRINCIPAL FOUNDATION ENGINEER

AGS/mdeF
Attach.
cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
C. K. Hunter (2)
F. C. Allen
W. S. Melinyshyn
T. J. Kovich
B. A. Singh

Foundations Files
Gen. Files

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FOUNDATION INVESTIGATION REPORT
For
Bridge No. 30
Airport Expressway (Future Hwy. #27)
Site 37-823
District No. 6 (Toronto)
W.J. 69-F-28 -- W.P. 400-65-3

1. INTRODUCTION:

A request for a foundation investigation at the site of the above mentioned structure was received from Mr. W.S. Melinyshyn, Regional Bridge Location Engineer dated December 3rd, 1968.

A field investigation was subsequently carried bout by this section to determine the subsoil conditions existing at the location of the proposed structure. Presented in this report are the results of this investigation, together with recommendations for the future structure foundations.

2. DESCRIPTION OF THE SITE:

The site is located on the Airport Expressway, 1/2 mile north of Highway #401.

The area to the West is Toronto Airport and to the East consists of industrial buildings.

The topography is flat.

3. FIELD INVESTIGATION PROCEDURE:

A total of six boreholes and two dynamic cone penetration tests was carried out during the course of the field work.

Boring was achieved by means of a Diamond Drill adapted for soil sampling purposes. Samples were recovered using a 2-inch O.D. split-spoon sampler driven according to the specifications of the Standard Penetration Test.

4. LABORATORY TESTS:

Laboratory tests were carried out on selected samples to determine Atterberg limits, natural moisture contents and grain size distribution.

cont'd./2...

5. SOIL TYPES & SOIL CONDITIONS:

5.1) General:

Subsoil at the site consists of a layer of clayey silt overlying a layer of sandy silt and lastly clayey silt-silty clay .

Overlying the original subsoil deposits is the existing Airport Expressway embankment made up of clayey silt.

5.2) Fill Material:

A total of 2 boreholes were undertaken through this material namely BHs 2 & 7.

The material consists of brown clayey silt with some sand and traces of gravel. 'N' values obtained from standard penetration tests ranged from 15 to 43 blows/ft.

The consistency is estimated to range from very soft to hard physical properties of the deposit, as obtained from laboratory tests, are summarized as follows:-

Liquid Limit	26%
Plastic Limit	15%
Moisture Content	13% - 20%

The average grain-size distribution was found to be gravel 3%, sand 23%, silt 51%, clay 23%

5.3) Clayey Silt With Sand & Traces of Gravel:

This material was found in all borings underlying the top soil in a layer ranging from 6' - 1¼' thick. 'N' values ranged from 13 to more than 100 blows/ft. Apart from the top 3 ft. the consistency can be taken as hard.

Physical properties determined from laboratory tests are summarized as follows:-

Liquid Limit	21 - 22%
Plastic Limit	13 - 16%
Moisture Content	5 - 21% (mainly 5%-12%)

Average grain size distribution was found to be gravel 5% sand 31%, silt 52%, clay 12%.

cont'd./3

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

5.4 Sandy Silt with traces of Clay & Gravel:

This material was found in B.H.'s 1, 2, 3, 6 and has a maximum thickness of 22 ft. diminishing apparently to zero.

Apart from one 'N' value of 50 blows/ft. the remainder were all over 100 blows/ft. indicating a very dense material.

Physical properties of the deposit are as follows:-

Moisture content 5% - 21%

Average grain size distribution was found to be:- Gravel 3%, Sand 33%, Silt 60%, Clay 4%.

5.5 Clayey Silt - silty Clay with some sand, traces of gravel:

This material was found in B.H.'s 2, 3 and 8 and ranged from 10 - 22 Ft. in thickness. The deposit contained pieces of shale and in fact the lower region of the material ranging from 2 - 5 ft. thickness can be considered as weathered shale. Underlying this layer is probably bedrock although no coring was undertaken.

The 'N' values ranged from 36 to over 100 blows/ft. and the consistency can be taken as hard.

Physical properties as determined from laboratory tests can be summarized as follows:-

Liquid Limit	28% - 35%
Plastic Limit	18% - 21%
Moisture Content	5% - 17%

The grain-size distribution was found to be as follows:-

Gravel	1% - 15%
Sand	6% - 23%
Silt	50% - 58%
Clay	22% - 43%

6. GROUND WATER LEVELS:

The water levels in the boreholes at the completion of field operations were found to be as follows:-

cont'd./4

6. GROUND WATER LEVELS: (cont'd.)...

B.H.	#1	El	523.2
	#2	El	524.5
	#3	El	525.1
	#6	El	523.5
	#7	El	524.6
	#8	El	524.6

It will be noticed that the water levels are at or just below existing original ground level. The measurements were taken in April when the water would be at its highest level.

7. DISCUSSION & RECOMMENDATIONS:

It is proposed to realign and widen the Airport Expressway at this location, this would involve construction of a new bridge over Renforth Drive.

As mentioned earlier in the report the subsoil at the site initially consists of a layer of clayey silt overlying a layer of very dense and sandy silt; the upper boundary of the latter varies and has a maximum elevation of 519.0, below elevation 518.0. Safe net bearing pressures of 3.5 tons per square foot are recommended, provided the footings are placed on undisturbed soil or on a suitable concrete working slab.

The silty subsoil is highly susceptible to conditions of unbalanced hydrostatic head and is likely to 'boil' under such conditions. To prevent boiling and thus ensure the soil underlying the footings is undisturbed it will be necessary to provide a dewatering scheme. Should interlocking steel piles be used they must be driven to a depth below the footing (D) equal to 0.7 x the height of the prevailing ground water level above it (DW) ie D = 0.7 x DW, where DW refers to the height of the ground water at the time of construction.

cont'd./5

7. DISCUSSION & RECOMMENDATIONS: (cont'd.)

An alternative to spread footings would be the use of end bearing piles, driven into the very hard glacial till layer. In this case the maximum load for the pile can be assumed for design purposes and it is estimated that this will be reached between elevations 495 - 500; this will apply to all footings.

8. MISCELLANEOUS:

The field work for this project was carried out between April 9th to 21st, 1969.

Equipment used was owned by Canadian Longyear Ltd.

Supervision of the field work was carried out by Mr. G. Allen, Project Foundation Engineer.

This report was written by Mr. G. Allen and reviewed by Mr. K. Selby, Supervising Foundation Engineer.

September, 1969

APPENDIX I.

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 69-F-28 LOCATION Co-ord. 870,047 N; 975,368 E. ORIGINATED BY GA
W.P 400-65-3 BORING DATE April 21, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

ELEV / DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT — SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE	LIQUID LIMIT w_L — PLASTIC LIMIT w_p — WATER CONTENT w — WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F	REMARKS GR SA SI CL
523.2										
0.0	Clayey silt with sand, traces of gravel.		1	SS	13	520				
515.0			2	SS	90					2 31 59 8
8.2	Sandy silt with traces of clay.		3	SS	50/3½"					
			4	SS	81/6"	510				
507.7	Very dense.		5	SS	82/6"					3 29 63 5
15.5	End of Borehole									

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 69-F-28 LOCATION Co-ord. 870,082 N; 975,485 E. ORIGINATED BY GA
W.P. 400-65-3 BORING DATE April 10, 11 & 14, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE
541.7	Ground Level					
0.0	Clayey silt with some sand, traces gravel (Fill) Very stiff to hard		1	SS	40	540
			2	SS	43	
			3	SS	29	530
523.2	O.G.		4	SS	27	
18.5	Clayey silt with sand, traces gravel. Very stiff to hard		5	SS	50	
516.5			6	SS	102/9"	520
25.2	Sandy silt, traces gravel & clay.		7	SS	93/6"	
			8	SS	21/2"	
	Very dense		9	SS	115	510
504.7			10	SS	24	
37.0	Clayey silt-silty clay with some sand, traces of gravel. Hard		11	SS	76	
			12	SS	135	500
496.7			13	SS	60/3"	
45.0	Weathered Shale		14	SS	bouncing	
495.0						
46.7	Probably bedrock End of Borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH PSF
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT w_L
PLASTIC LIMIT w_p
WATER CONTENT w
w_p — w — w_L
WATER CONTENT %
10 20 30

BULK DENSITY γ PCF

REMARKS
GR SA SI C

4 20 51 25
▼ 524.5

3 44 49 4

1 6 50 43

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 69-F-28 LOCATION Co-ord. 870,098 N; 975,612 E. ORIGINATED BY GA
W.P. 400-6543 BORING DATE April 14, 15, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV SCALE
525.1	Ground Level					
0.0	Clayey silt with sand, traces of gravel. Hard		1	SS	30	
519.1			2	SS	110/9"	520
6.0	Silty sand, traces of gravel & clay. Very dense		3	SS	75/4"	
			4	SS	100/3"	
			5	SS	100/2"	510
				S	100/	
			6	SS	70/2"	
				S	70/	
			7	SS	50	500
497.1				S	50/	
28.0	Clayey silt-silty clay with some sand, traces of gravel. Hard		8	SS	100/3"	
490.0				S	100/	
35.0	Weathered Shale		9	SS	70/3"	490
485.3			10	SS	bouncing	
39.8	Probably Bedrock End of Borehole			S	bou	

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — 20 40 60 80 100
SHEAR STRENGTH PSF
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_p
WATER CONTENT —— w
w_p w w_L
WATER CONTENT %
10 20 30

BULK DENSITY γ P.C.F

REMARKS

GR SA SI CL

3 23 52 22

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 69-F-28 LOCATION Co-ords. 869,950 N; 975,382 E. ORIGINATED BY GA
W P 400-65-3 BORING DATE April 17, 21, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

ELEV / DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — SHEAR STRENGTH PSF: ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE	LIQUID LIMIT w_L — PLASTIC LIMIT w_P — WATER CONTENT w — WATER CONTENT % (10 20 30)	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
523.5	Ground Level									
0.0	Clayey silt with sand, traces gravel		1	SS	24	520				11 26 45 18
			2	SS	38					
	Very stiff to hard		3	SS	50/2"					
512.5										
11.0	Sandy silt with traces of gravel and clay.		4	SS	50/3"	510				1 26 69 4
			5	SS	80/1½"					
			6	SS	60/1½"					
	Very dense		7	SS	75/6"					
			8	SS	70/4"	500				
493.3										
492.7	Weathered Shale		9	SS	70/2"					
30.8	Auger grinding Possibly Bedrock					490				
	End of Borehole									

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB	69-F-28	LOCATION	Co-ord. 869,983 N; 975,516 E.	ORIGINATED BY	GA
W.P.	400-65-3	BORING DATE	April 9 & 10, 1969	COMPILED BY	GA
DATUM	Geodetic	BOREHOLE TYPE	Auger	CHECKED BY	

ELEV / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV SCALE
542.0	Ground Level					
0.0	Clayey silt with sand & some gravel (Fill) Very Stiff		1	SS	15	540
			2	SS	24	
			3	SS	25	530
			4	SS	33	
523.5			5	SS	21	
19.5	Clayey silt with sand & traces gravel. Hard		6	SS	36	520
			7	SS	51	
			8	SS	70/3"	
			9	SS	70/2½"	510
509.2			10	SS	bouncing	
32.8	End of Borehole					

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE

100/10"

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_p
WATER CONTENT —— w

WATER CONTENT %
10 20 30

BULK DENSITY γ P.C.F.

REMARKS	GR. SA. SI. CL.
	2 25 51 22
▼522.8	
	2 43 45 10

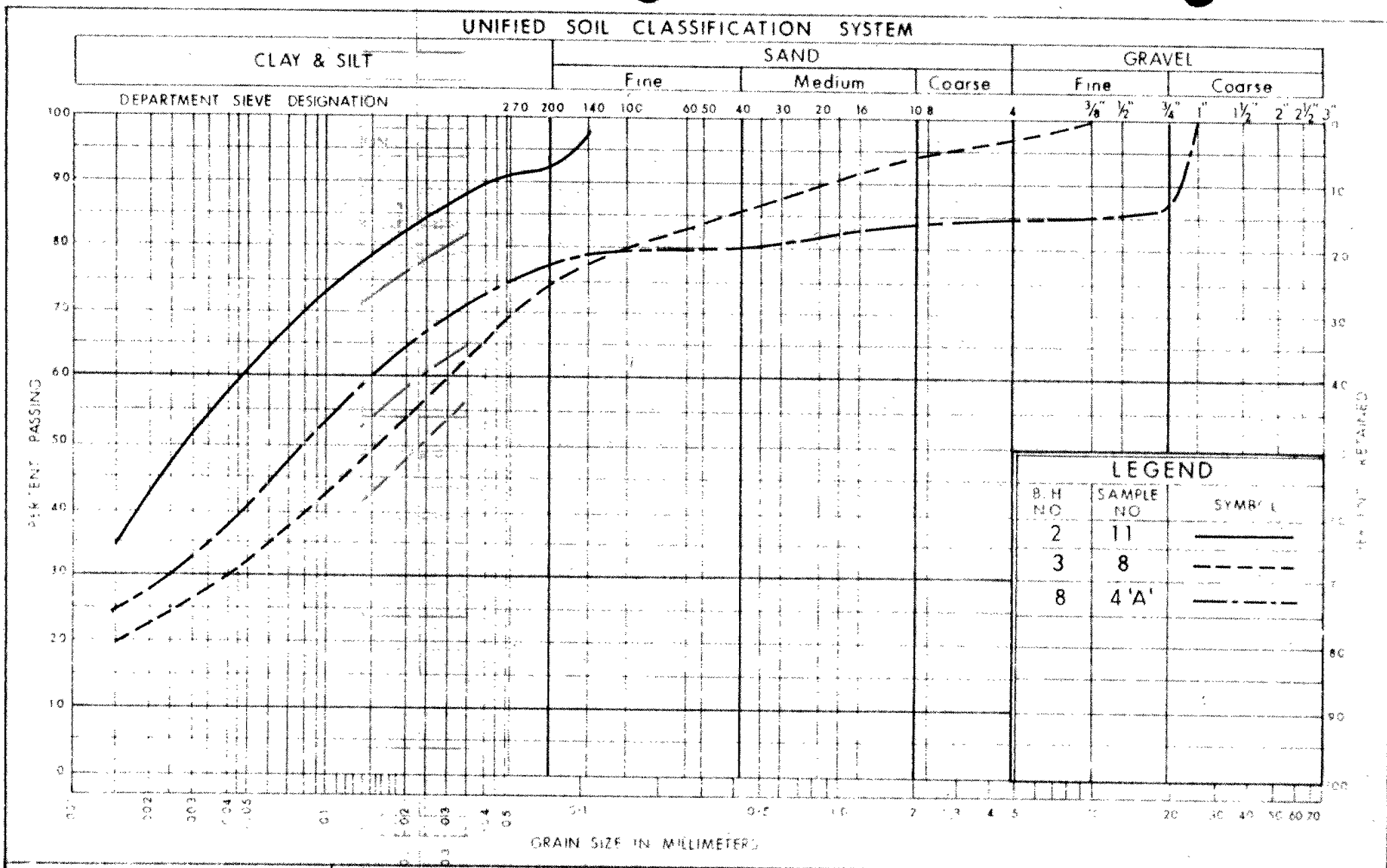
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

JOB 69-F-28 LOCATION Co-ord. 870,022 N; 975,619 E ORIGINATED BY GA
W.P. 400-65-3 BORING DATE April 16, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY AL

SOIL PROFILE ELEV / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE	LIQUID LIMIT w_L — PLASTIC LIMIT w_p — WATER CONTENT w — WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
529.9	Ground Level									
0.0	Clayey silt with sand & some gravel (Fill)									
523.4	Stiff		1	SS	14					▼ 524.6
6.5	Clayey silt with sand & traces of gravel		2	SS	40	520				
			3	SS	117/7½"					3 26 61 10
513.4	Hard		4	SS	56					
16.5	Clayey silty-silty clay with some sand and gravel.		5	SS	57	510				6 11 58 25
			6	SS	77					
			7	SS	71					
	Hard		8	SS	103	500				15 7 51 27
494.9			9	SS	72/1½"					
35.0	Weathered Shale		10	SS	bouncing					
491.4										
38.5	Possibly Bedrock End of Borehole									



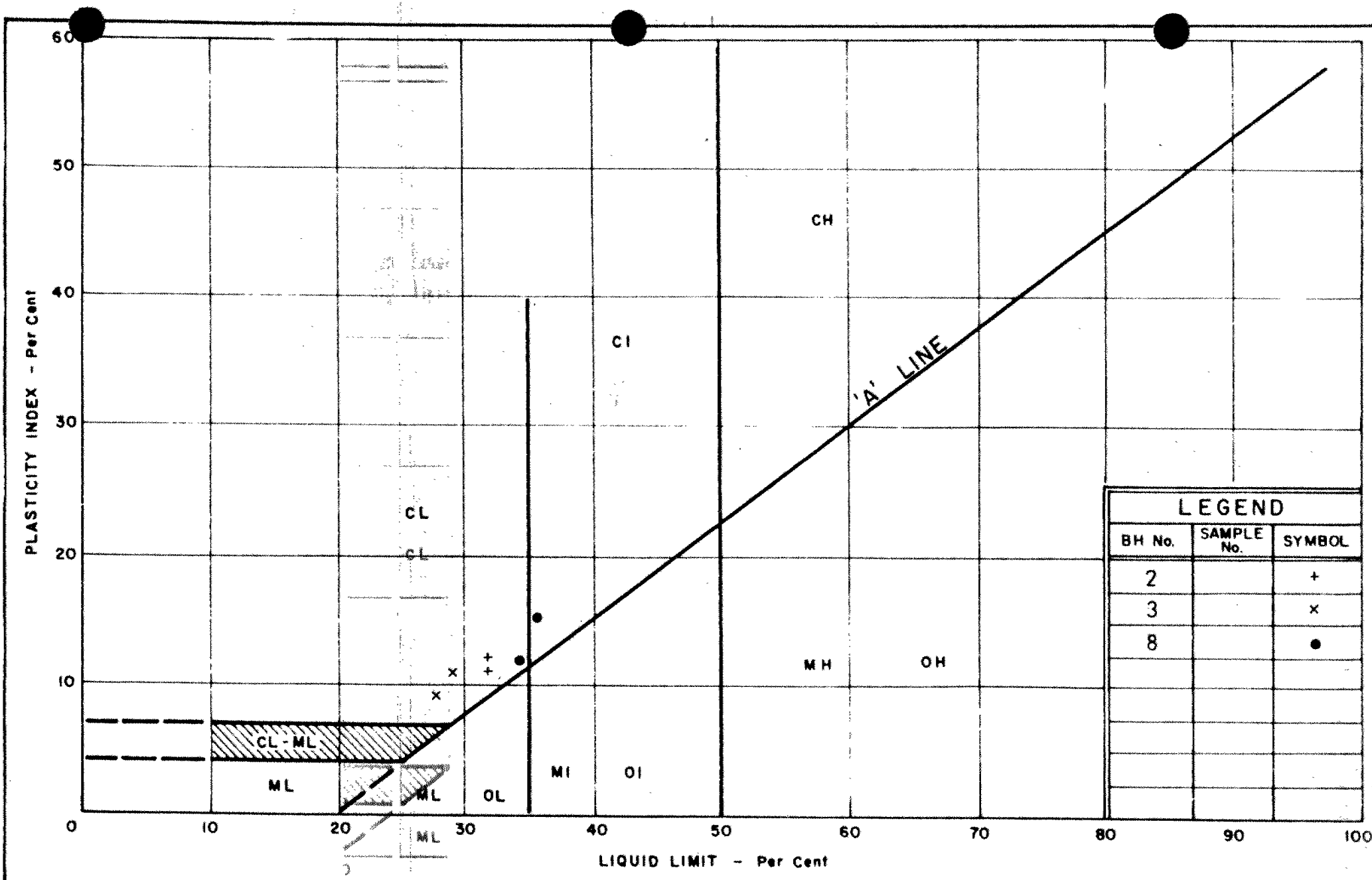
DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

GRAIN SIZE DISTRIBUTION
CLAYEY SILT — SILTY CLAY

WP No 400 - 65 - 3

JOB No 69 - F - 28

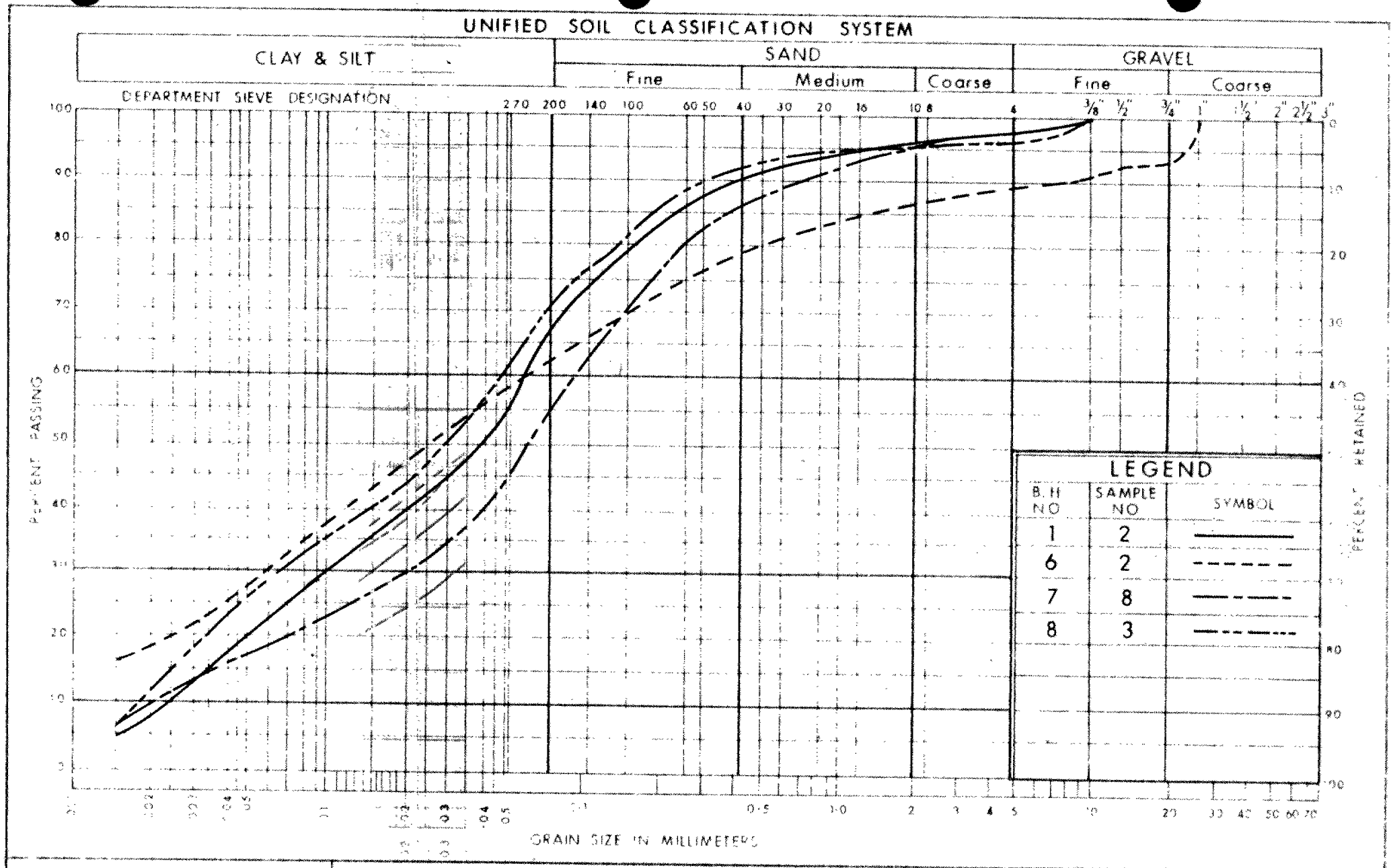
FIGURE 1



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

PLASTICITY CHART
CLAYEY SILT - SILTY CLAY

W.P. No. 400-65-3
JOB No. 65-F-28
FIGURE 2



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

GRAIN SIZE DISTRIBUTION

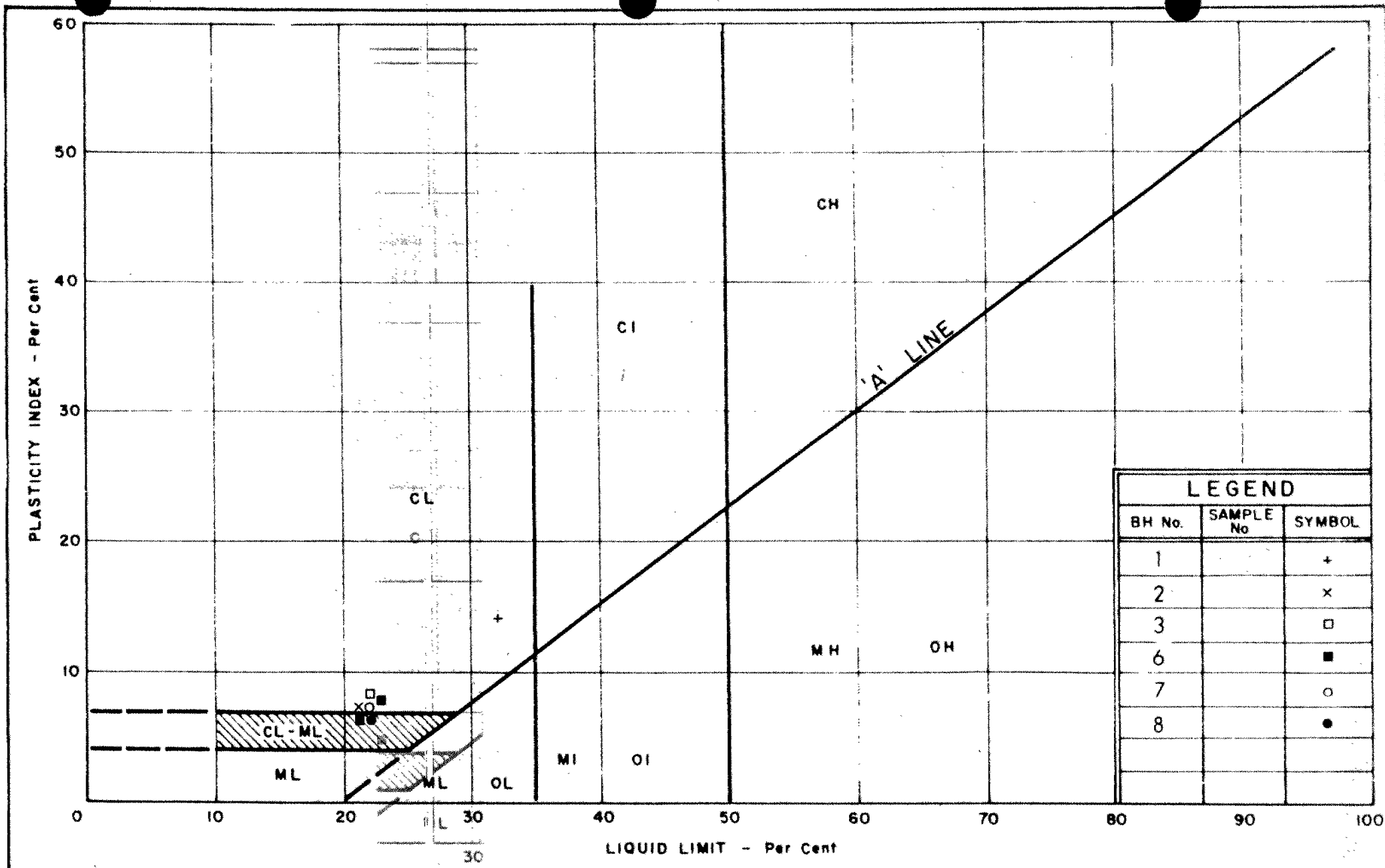
G

CLAYEY SILT

W.P. No. 400-65-3

JOB No 69-F-28

FIGURE 3



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

PLASTICITY CHART

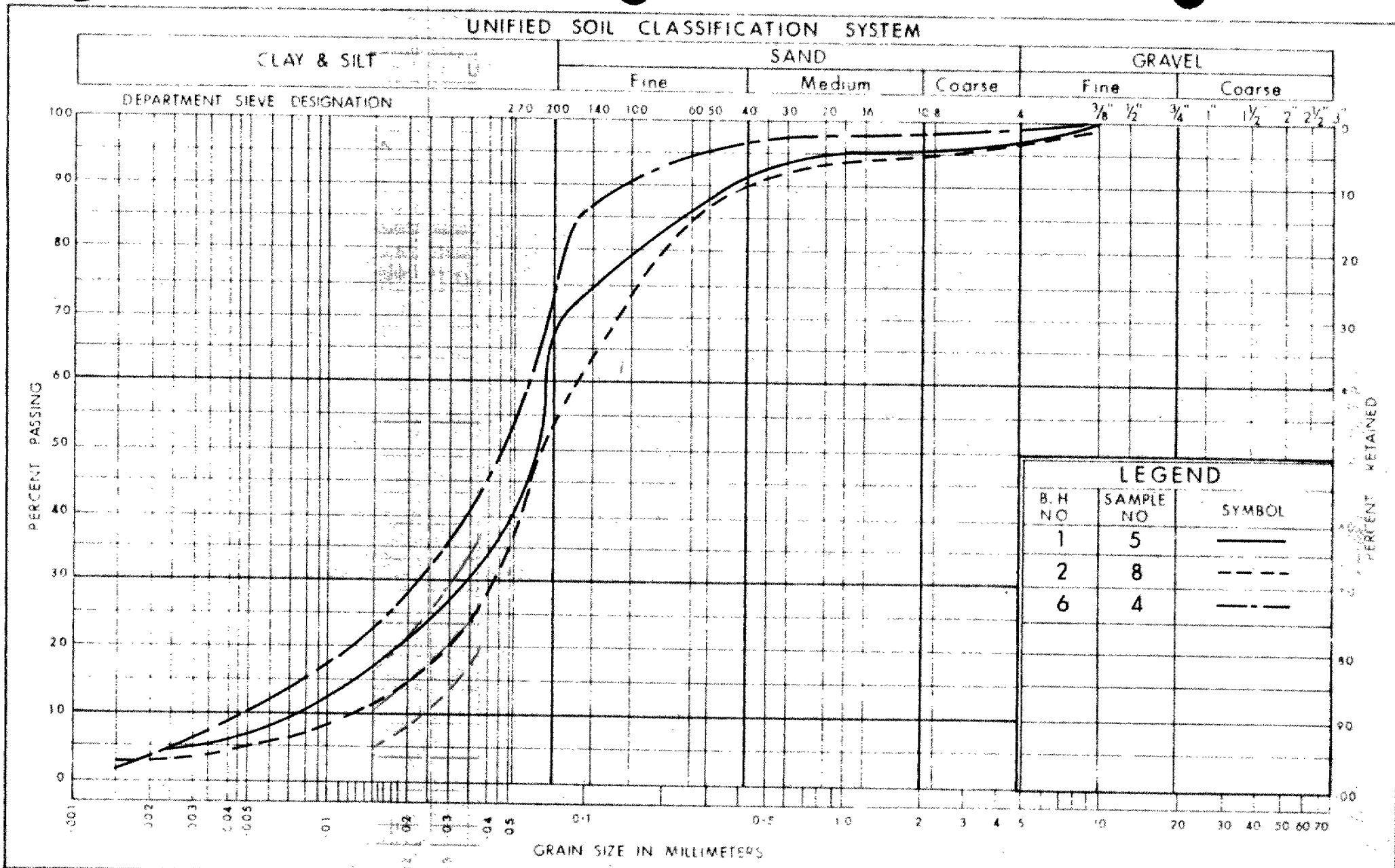
CLAYEY SILT WITH SAND TRACES OF GRAVEL

LAYEY

W.P. No. 400 - 65 - 3

JOB No. 65 - F - 28

FIGURE 4



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

GRAIN SIZE DISTRIBUTION
SANDY SILT

WP No. 400-65-8

JOB No. 69-F-28

FIGURE 5

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 :-

CONSISTENCY	'N' BLOWS / FT.	c LB. / SQ. FT.	DENSENESS	'N' BLOWS / FT.
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

Qu	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	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 INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$
μ	COEFFICIENT OF FRICTION
S_t	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
σ'	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 (YOUNGS MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

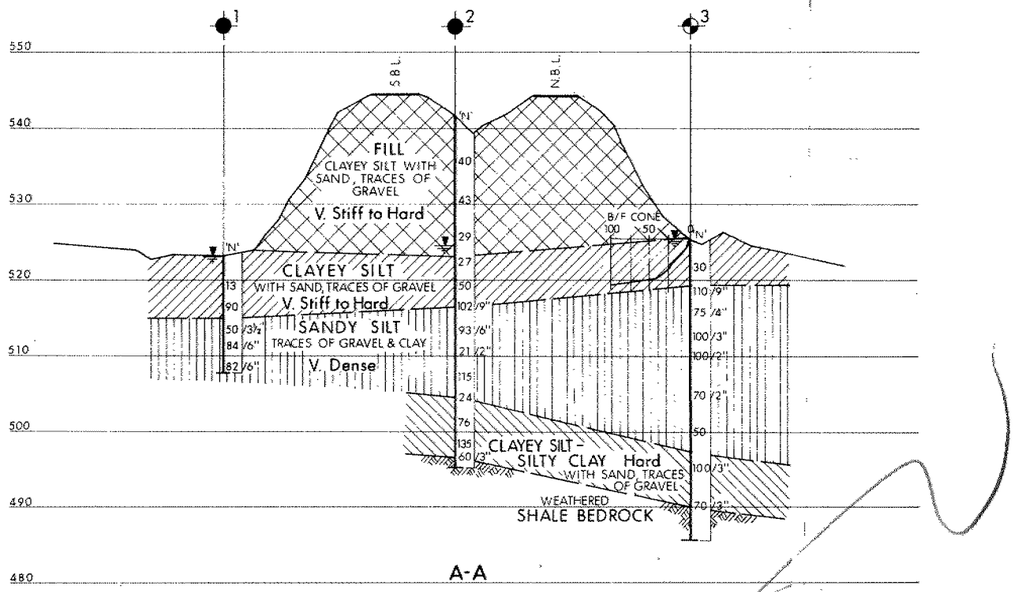
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_o	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

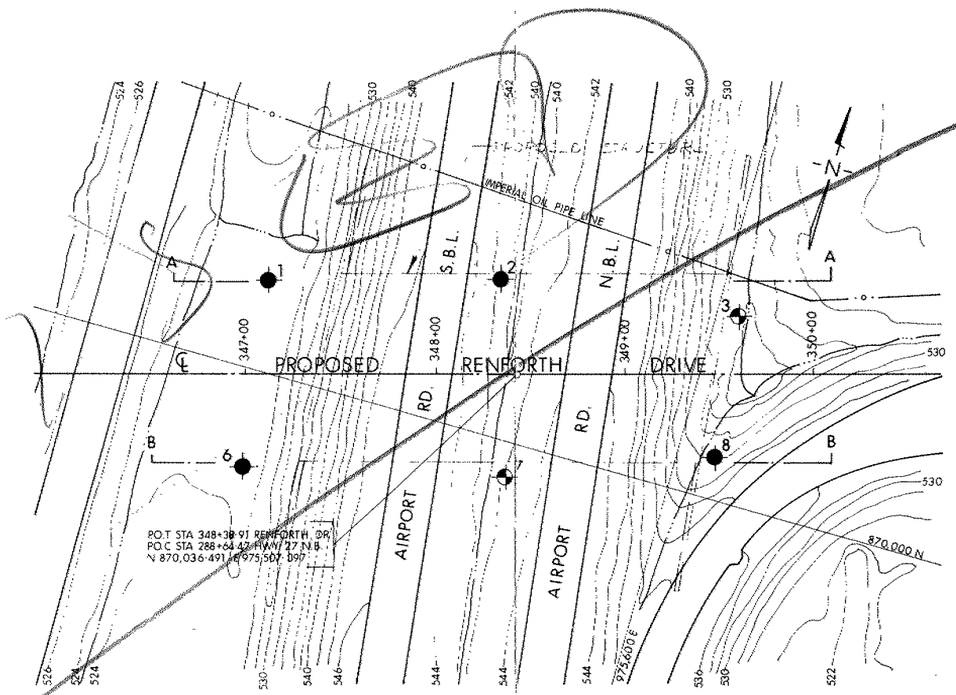
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY. DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

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

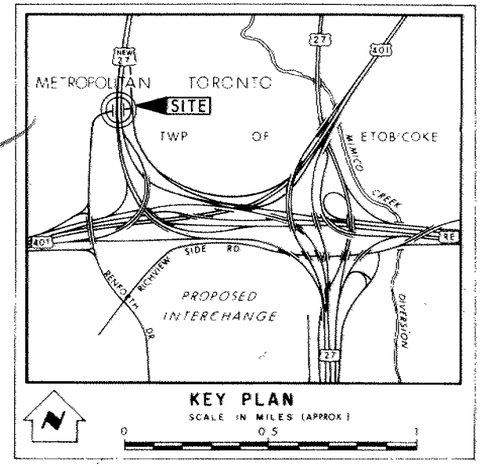


A-A



PLAN

SCALE 40 20 0 40 80FT



KEY PLAN

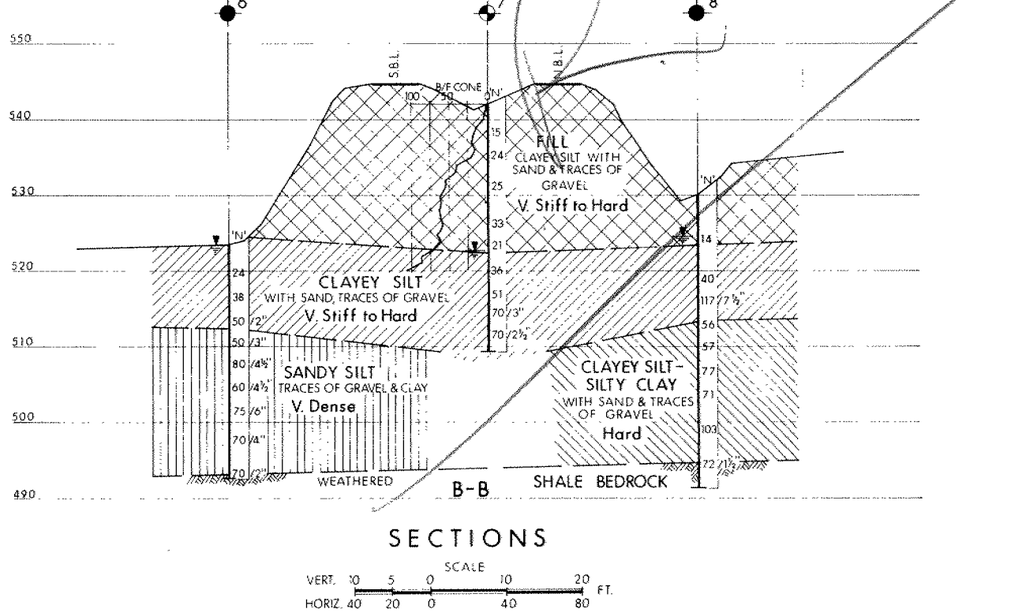
SCALE IN MILES (APPROX.)

0 0.5 1

LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation. APRIL 1969

NO.	ELEVATION	CO-ORDINATES NORTH	CO-ORDINATES EAST
1	523·2	870,047	975,368
2	541·7	870,082	975,485
3	525·1	870,098	975,612
6	523·5	869,950	975,382
7	542·0	869,983	975,516
8	529·9	870,022	975,619

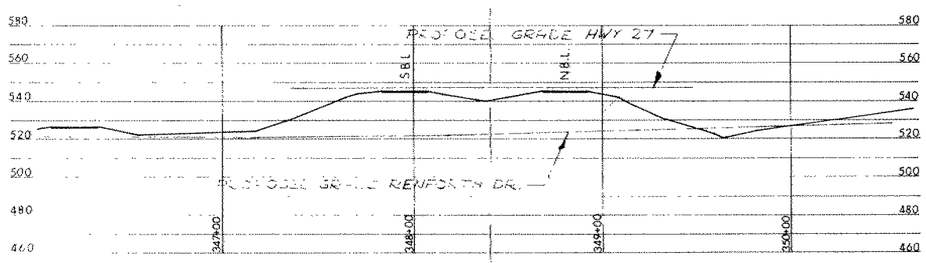


SECTIONS

SCALE

VERT. 10 5 0 10 20 FT.

HORIZ. 40 20 0 40 80



℄ PROFILE

SCALE 40 20 0 40 80 FT.

— 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.

REVISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING OFFICE - FOUNDATION SECTION

BRIDGE Nº 30

RENFORTH DRIVE UNDER AIRPORT ROAD

KING'S HIGHWAY NO. 401 & 27 INTERCHANGE DIST. NO. 6

CO. YORK METRO. TORONTO

TWP. ETOBICOKE LOT CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUBM'D. A.G.	CHECKED.	W.P. NO. 400-65-3	M.S.T. DRAWING NO. 69-F-28A
DRAWN S.O.	CHECKED.	JOB NO. 69-F-28	
DATE 14 AUG. 1969		SITE NO	BRIDGE DRAWING NO.
APPROVED (PRINCIPAL FOUNDATION ENGINEER)		CONT. NO.	

REF. NO. D-6243-P1

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. G.C.E. Burkhardt, (2)
Reg. Structural Planning Eng.,
Central Region, Toronto.

FROM: Soil Mechanics Section,
Geotechnical Office,
West Building, Downsview.

ATTENTION:

DATE: August 8th, 1974,

OUR FILE REF.

IN REPLY TO

SUBJECT: Addendum to the Foundation Investigation Report
For
The Proposed Renforth Drive Overpass,
Bridge No. 30, Hwy. #427, Site No. 37-823,
District #6, Toronto, W.O.69-F-28, W.P. 400-65-03.

The Soil Mechanics Section was requested by the Regional Structural Planning Office to carry out additional foundation investigation at the abovementioned structure location.

Since the issue of our Foundation Report (W.O. 69-F-28, dated September 10th, 1969) the original scheme for Bridge #30 has been altered. It is now proposed to construct a two-span structure with closed type abutments and a centre pier located within the median of Renforth Drive.

A field investigation, consisting of two sampled boreholes was subsequently carried out by this Section. These borings revealed similar subsoil conditions to those encountered in the previous investigations.

The subsoil at the site was found to consist of a firm to hard clayey silt with sand and trace of gravel fill material, the thickness of which varies from 21 ft. (6.40 m) to 22 ft. (6.71 m). The fill material is underlain by a 5 ft. (1.52 m) to 7 ft. (2.13 m) thick very stiff to hard clayey silt with sand and trace of gravel (glacial till) deposit. This cohesive till is followed by a 7 ft. (2.13 m) to 8 ft. (2.44 m) thick very dense sandy silt to silty sand with some clay and trace of gravel stratum. The elevation of the upper boundary of this deposit varies between elev. 515.5 (157.12 m) and elev. 516.8 (157.52 m) and the lower boundary from elev. 507.5 (154.69 m) to elev. 509.8 (155.39 m).

This granular deposit is underlain by a lower, hard cohesive glacial till stratum whose thickness varies from 8 ft. (2.44 m) to 17 ft. (5.18 m). This overburden sequence is followed by weathered shale bedrock.

..... /2

DWG NO 37-823-3

Mr. G.C.E. Burkhardt - RE: Addendum to Foundation Investigation Report, W.O. 69-F-28.

The boundaries of the various deposits as determined in the boreholes are shown on the accompanying Record of Borehole Sheets. The stratigraphical sections shown on the revised Drawing No. 69-F-28A have been inferred from this data.

The observed groundwater level was found to vary between elev. 521.5 (158.95 m) and elev. 522.6 (159.29 m) in Boreholes #5 and #4 respectively.

A review of the encountered subsoil conditions indicates that the recommendations of the original Foundation Report (W.O. 68-F-29), in general are still applicable. The pier and the closed type abutments may be supported on spread footing type foundations located at or below elev. 517 (157.58 m). The footings should be placed on undisturbed soil or on a working mat of lean concrete. An allowable bearing value of 3.5 t.s.f. (325 kPa) may be used for design purposes.

All footings should be provided with at least 4 ft. (1.22 m) of earth cover for adequate frost protection.

The footing excavations, in part, will be carried into the sandy silt to silty sand zone which is highly susceptible to conditions of unbalanced hydrostatic head and is likely to 'boil' under such conditions. To prevent boiling and thus ensure the soil underlying the footings is undisturbed it will be necessary to provide an adequate dewatering scheme.

As an alternative to spread footing type foundations, the proposed abutments and pier may be supported on end-bearing piles driven into the lower competent glacial till deposit. For estimating purposes the pile tips can be designed for the ultimate capacity of the pile section chosen; e.g. 12 BP 74 Steel H Piles could be designed for 95 tons/pile (845.5 kN).

If the abutments and pier are supported on spread footing type foundations the subsoil will settle due to the induced footing pressure and will take place during or immediately following the construction period. It is estimated that this settlement will not exceed 1 inch, providing the foundation soil is not softened or loosened by the construction operations or uncontrolled surface runoff.

..... /3

Mr. G.C.E. Burkhardt - RE: Addendum to Foundation Investigation Report, W.O. 69-F-28.

The granular backfill behind the wall should be provided with adequate drainage. The coefficients of lateral earth pressure for the granular backfill may be taken as 0.30 and 0.50 for the 'active' (Ka) and 'at rest' (Ko) conditions respectively.

Where the spread footings of the abutments are placed within the glacial till zone it is recommended that a value of 2,500 p.s.f. be used in the computations to determine the sliding resistance between the concrete base of the footing and the underlying cohesive type material.

For computation of sliding resistance for abutments founded on spread footings within the sandy silt deposit a friction coefficient of 0.40 may be assumed to apply between the bases of footing and underlying foundation soil.

A review of the subsoil and groundwater conditions indicates that the proposed fills could be constructed to the required heights (about 26 ft.) (7.92 m) without the danger of base failure. Fills of this height will be stable provided 2:1 slopes are employed and the fill material is properly compacted.

It should be noted that a pipeline (Imperial Oil) is located immediately adjacent to the east corner of the north abutment and crosses the proposed NE wingwall. Care should be taken during construction to ensure the intactness of the pipeline.

As an alternative to spread footing typ[illegible] proposed abutments and pier [illegible] driven into the lower competent glacial till d[illegible] estimating purposes the pile tips can be design[illegible]

..... /4

Mr. G.C.E. Burkhardt - RE: Addendum to Foundation Investigation Report, W.O. 69-F-28.

Please attach the supplementary Record of Borehole Sheets (Numbered 4 and 5) and replace original Foundation Report Drawing 68-F-29A with the revised Drawing.

If further information is required, please contact our Office.

P. Payer,
Senior Engineer,
For: M. Devata,
Supervising Engineer.

P. PAYER

PP/mj

c.c. E.J. Orr
B.R. Davis
R.S. Pillar
H. Greenland
B.J. Giroux
D. Gunter
G.A. Wrong
P. Lewycky

Files
Documents

ISTRY OF TRANSPORTATION AND COM NICATIONS–ONTARIO

DESIGN SERVICES BRANCH

FOUNDATIONS OFFIC

RECORD OF BOREHOLE No 4

JOB 69-F-28 LOCATION Co-ords. 870,015 N; 975,436 E. ORIGINATED BY HS

W.P. 400-65-03 BORING DATE July 11-12, 1974 COMPILED BY HS

DATUM Geodetic BOREHOLE TYPE Auger & Cone Penetration CHECKED BY GP

OFFICE REPORT O OIL EXPLORATION

m.	ELEV. / DEPTH ft.	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT (0.3 m)	ELEV. SCALE ft/m
165.75	543.8	Ground Level					
0.0	0.0	Clayey silt with sand and traces of gravel Firm to V. stiff (Fill Material)		1	SS	6	540
				2	SS	13	164.52
				3	SS	13	
				4	SS	20	
				5	SS	14	530
				6	SS	21	161.5
				7	SS	20	
159.04	521.8			8	SS	21	
6.71	22.0	Clayey silt (Glacial Till)		9	SS	25	520
157.52	516.8			10	SS	28	158.50
8.23	27.0	Sandy silt, traces of clay & gravel V. Dense		12	SS	100/4"	
				13	SS	100/4"	510
155.39	509.8						
10.36	34.0	Clayey silt with gravel and some sand (Glacial Till) Hard		14	SS	86	155.45
				15	SS	109	500
				16	SS	100/2"	152.40
150.21	492.8						
15.54	51.0	weathered Shale Bedrock		17	SS	100/1"	490
				18	SS	100/4"	149.35
148.13	486.0						
17.62	57.6	End of Borehole					Piezometer 480 146.30

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m) 20 40 60 80 100

SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE

100/10"

LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w w_P w w_L

WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F

REMARK GR. SA. SI.
2 26 56
2 22 52
W.L. EL. 522.6' 159.29
6 29 54
3 33 56
24 14 47

20 15 ◇ 5 10 % STRAIN AT FAILURE

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

DESIGN SERVICES BRANCH

FOUNDATIONS OFFIC

RECORD OF BOREHOLE No 5

JOB 69-F-28 LOCATION Co-ords. 870,051 N; 975,562 E. ORIGINATED BY HS

W.P. 400-65-03 BORING DATE July 15, 1974 COMPILED BY AP

DATUM Geodetic BOREHOLE TYPE Auger & Cone Penetration CHECKED BY GP

m.	ELEV. / DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT (0.3 m)	ELEV. SCALE ft/m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m) 20 40 60 80 100 / SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w / WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI.
165.3	542.5	Ground Level									
0.0	0.0	Clayey silt with sand and traces of gravel Firm to Hard (Fill Material)		1	SS	5	540				
				2	SS	24	164.59				5 30 48
				3	SS	22					
				4	SS	27	530				
				5	SS	35	161.54				2 25 56
				6	SS	38					
				7	SS	24					
159.01	521.7			8	SS	37	520	100/11"			W.L. EL. 520.5'
6.34	20.8	Clayey silt with sand and trace of gravel (Glacial Till) Hard		9	SS	56	158.50				158.65
157.12	515.5			10	SS	141					
8.23	27.0	Silty sand, traces of clay & gravel Very Dense		11	SS	100/4"	4"				8 55 (37)
154.63	507.5			12	SS	100/6"	510				
10.51	35.0	Clayey silt with some sand & trace of gravel (Glacial Till) Hard		13	SS	81	155.45				
152.25	499.5			14	SS	100/4"	500				9 13 45
13.11	43.0	Weathered Shale Bedrock		15	BXL	55%	152.40				
151.12	495.8			16	BXL	33%					
14.23	46.7	End of Borehole					490				
							149.35				

OFFICE REPORT O OIL EXPLORATION

20
15 ◇ 5 % STRAIN AT FAILURE
10

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. B. R. Davis,
Bridge Engineer,
Bridge Office,
Admin. Bldg.

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

Attention: Mr. S. McCombie

Date: August 29, 1969

Our File Ref:

In reply to SEP 10 1969

Subject:

FOUNDATION INVESTIGATION REPORT
For
Bridge No. 30
Airport Expressway (Future Hwy. #27)
Site 37-823
District No. 6 (Toronto)
W.J. 69-F-28 -- W.P. 400-65-3

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

We believe that the factual data and recommendations contained therein, will prove adequate for your design requirements. Should additional information be required, please do not hesitate to contact our Office.

A. G. Sterman
PRINCIPAL FOUNDATION ENGINEER

AGS/MdeF
Attach.
cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
C. K. Hunter (2)
F. C. Allen
W. S. Melnyshyn
T. J. Kovich
B. A. Singh
Foundations Files ✓
Gen. Files

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FOUNDATION INVESTIGATION REPORT
For
Bridge No. 30
Airport Expressway (Future Hwy. #27)
Site 37-823
District No. 6 (Toronto)
W.J. 69-F-28 -- W.P. 400-65-3

1. INTRODUCTION:

A request for a foundation investigation at the site of the above mentioned structure was received from Mr. W.S. Melinyshyn, Regional Bridge Location Engineer dated December 3rd, 1968.

A field investigation was subsequently carried bout by this section to determine the subsoil conditions existing at the location of the proposed structure. Presented in this report are the results of this investigation, together with recommendations for the future structure foundations.

2. DESCRIPTION OF THE SITE:

The site is located on the Airport Expressway, 1/2 mile north of Highway #401.

The area to the West is Toronto Airport and to the East consists of industrial buildings.

The topography is flat.

3. FIELD INVESTIGATION PROCEDURE:

A total of six boreholes and two dynamic cone penetration tests was carried out during the course of the field work.

Boring was achieved by means of a Diamond Drill adapted for soil sampling purposes. Samples were recovered using a 2-inch O.D. split-spoon sampler driven according to the specifications of the Standard Penetration Test.

4. LABORATORY TESTS:

Laboratory tests were carried out on selected samples to determine Atterberg limits, natural moisture contents and grain size distribution.

cont'd./2...

5. SOIL TYPES & SOIL CONDITIONS:

5.1) General:

Subsoil at the site consists of a layer of clayey silt overlying a layer of sandy silt and lastly clayey silt-silty clay .

Overlying the original subsoil deposits is the existing Airport Expressway embankment made up of clayey silt.

5.2) Fill Material:

A total of 2 boreholes were undertaken through this material namely BHs 2 & 7.

The material consists of brown clayey silt with some sand and traces of gravel. 'N' values obtained from standard penetration tests ranged from 15 to 43 blows/ft.

The consistency is estimated to range from very soft to hard physical properties of the deposit, as obtained from laboratory tests, are summarized as follows;-

Liquid Limit	26%
Plastic Limit	15%
Moisture Content	13% - 20%

The average grain-size distribution was found to be gravel 3%, sand 23%, silt 51%, clay 23%

5.3) Clayey Silt With Sand & Traces of Gravel:

This material was found in all borings underlying the top soil in a layer ranging from 6' - 14' thick. 'N' values ranged from 13 to more than 100 blows/ft. Apart from the top 3 ft. the consistency can be taken as hard.

Physical properties determined from laboratory tests are summarized as follows:-

Liquid Limit	21 - 22%
Plastic Limit	13 - 16%
Moisture Content	5 - 21% (mainly 9%-12%)

Average grain size distribution was found to be gravel 5% sand 31%, silt 52%, clay 12%.

cont'd./3

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

5.4 Sandy Silt with traces of Clay & Gravel:

This material was found in B.H.'s 1, 2, 3, 6 and has a maximum thickness of 22 ft. diminishing apparently to zero.

Apart from one 'N' value of 50 blows/ft. the remainder were all over 100 blows/ft. indicating a very dense material.

Physical properties of the deposit are as follows:-

Moisture content 5% - 21%

Average grain size distribution was found to be:- Gravel 3%, Sand 33%, Silt 60%, Clay 4%.

5.5 Clayey Silt - silty Clay with some sand, traces of gravel:

This material was found in B.H.'s 2, 3 and 8 and ranged from 10 - 22 Ft. in thickness. The deposit contained pieces of shale and in fact the lower region of the material ranging from 2 - 5 ft. thickness can be considered as weathered shale. Underlying this layer is probably bedrock although no coring was undertaken.

The 'N' values ranged from 36 to over 100 blows/ft. and the consistency can be taken as hard.

Physical properties as determined from laboratory tests can be summarized as follows:-

Liquid Limit	28% - 35%
Plastic Limit	18% - 21%
Moisture Content	5% - 17%

The grain-size distribution was found to be as follows:-

Gravel	1% - 15%
Sand	6% - 23%
Silt	50% - 58%
Clay	22% - 43%

6. GROUND WATER LEVELS:

The water levels in the boreholes at the completion of field operations were found to be as follows:-

cont'd./4

6. GROUND WATER LEVELS: (cont'd.)...

B.H.	#1	El 523.2
	#2	El 524.5
	#3	El 525.1
	#6	El 523.5
	#7	El 524.6
	#8	El 524.6

It will be noticed that the water levels are at or just below existing original ground level. The measurements were taken in April when the water would be at its highest level.

7. DISCUSSION & RECOMMENDATIONS:

It is proposed to realign and widen the Airport Expressway at this location, this would involve construction of a new bridge over Renforth Drive.

As mentioned earlier in the report the subsoil at the site initially consists of a layer of clayey silt overlying a layer of very dense and sandy silt; the upper boundary of the latter varies and has a maximum elevation of 519.0, below elevation 518.0. Safe net bearing pressures of 3.5 tons per square foot are recommended, provided the footings are placed on undisturbed soil or on a suitable concrete working slab.

The silty subsoil is highly susceptible to conditions of unbalanced hydrostatic head and is likely to 'boil' under such conditions. To prevent boiling and thus ensure the soil underlying the footings is undisturbed it will be necessary to provide a dewatering scheme. Should interlocking steel piles be used they must be driven to a depth below the footing (D) equal to 0.7 x the height of the prevailing ground water level above it (DW) ie D = 0.7 x DW, where DW refers to the height of the ground water at the time of construction.

cont'd./5

7. DISCUSSION & RECOMMENDATIONS: (cont'd.)

An alternative to spread footings would be the use of end bearing piles, driven into the very hard glacial till layer. In this case the maximum load for the pile can be assumed for design purposes and it is estimated that this will be reached between elevations 495 - 500; this will apply to all footings.

8. MISCELLANEOUS:

The field work for this project was carried out between April 9th to 21st, 1969.

Equipment used was owned by Canadian Longyear Ltd.

Supervision of the field work was carried out by Mr. G. Allen, Project Foundation Engineer.

This report was written by Mr. G. Allen and reviewed by Mr. K. Selby, Supervising Foundation Engineer.

September, 1969

on undisturbed soil or

of unbalanced hydrostati

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 69-F-28 LOCATION Co-ord. 870,047 N; 975,368 E. ORIGINATED BY GA
W.P 400-65-3 BORING DATE April 21, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT; SHEAR STRENGTH P.S.F. (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB. VANE)	LIQUID LIMIT w_L, PLASTIC LIMIT w_P, WATER CONTENT w; WATER CONTENT % (10 20 30)	BULK DENSITY γ P.C.F	REMARKS GR. SA. SI. CL.
523.2										
0.0	Clayey silt with sand, traces of gravel.		1	SS	13	520				
515.0			2	SS	90					2 31 59 8
8.2	Sandy silt with traces of clay.		3	SS	50/3½"					
			4	SS	81/6"	510				
507.7	Very dense.		5	SS	82/6"					3 29 63 5
15.5	End of Borehole									

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 69-F-28 LOCATION Co-ord. 870,082 N; 975,485 E. ORIGINATED BY GA
W.P. 400-65-3 BORING DATE April 10, 11 & 14, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE
541.7	Ground Level					
0.0	Clayey silt with some sand, traces gravel (Fill) Very stiff to hard		1	SS	40	540
				SS	40	
			2	SS	43	
				SS	43	530
			3	SS	29	
523.2	G.S.		4	SS	27	
18.5	Clayey silt with sand, traces gravel. Very stiff to hard		5	SS	50	520
516.5			6	SS	10"/9"	
25.2	Sandy silt, traces gravel & clay.		7	SS	9"/6"	
			8	SS	21/2"	
			9	SS	115	510
504.7	Very dense		10	SS	124	
37.0	Clayey silt-silty clay with some sand, traces of gravel. Hard		11	SS	76	
			12	SS	135	500
496.7			13	SS	60/3"	
45.0	Weathered Shale		14	SS	bouncing	
495.8				SS	60/	
46.7	Probably bedrock					
	End of Borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH PSF
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT w_L
PLASTIC LIMIT w_p
WATER CONTENT w
w_p w w_L
WATER CONTENT %
10 20 30

BULK DENSITY γ P.C.F.

REMARKS

GR. SA. SI. CL.

4 20 51 25
▼ 524.5

3 44 49 4

1 6 50 43

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 69-F-28 LOCATION Co-ord. 870,098 N; 975,612 E. ORIGINATED BY GA
W.P. 400-65-3 BORING DATE April 14, 15, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE
525.1	Ground Level					
0.0	Clayey silt with sand, traces of gravel. Hard		1	SS	30	
519.1			2	SS	110/9"	520
6.0			3	SS	75/4"	
			4	SS	100/3"	
	Silty sand, traces of gravel & clay		5	SS	100/2"	510
			6	SS	70/2"	
	Very dense		7	SS	50	500
497.1						
28.0	Clayey silt-silty clay with some sand, traces of gravel.		8	SS	100/3"	
490.0	Hard		9	SS	70/3"	490
35.0	Weathered Shale		10	SS	bouncing	
485.3						
39.8	Probably Bedrock End of Borehole					

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT — 20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE

LIQUID LIMIT — w_L
PLASTIC LIMIT — w_P
WATER CONTENT — w
w_P w w_L
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F

REMARKS

GR. SA. SI. CL.
3 23 52 22

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 69-F-28 LOCATION Co-ords. 869,950 N; 975,382 E. ORIGINATED BY GA
W.P. 400-65-3 BORING DATE April 17, 21, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT / SHEAR STRENGTH PSF (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE)	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w — WATER CONTENT % (10 20 30)	BULK DENSITY γ PCF	REMARKS GR SA SI CL
523.5	Ground Level									
0.0	Clayey silt with sand, traces gravel		1	SS	24	520				
			2	SS	38					11 26 45 18
	Very stiff to hard		3	SS	50/2"					
512.5										
11.0	Sandy silt with traces of gravel and clay.		4	SS	50/3"	510				1 26 69 4
			5	SS	80/4½"					
			6	SS	60/4½"					
	Very dense		7	SS	75/6"					
			8	SS	70/4"	500				
493.3										
492.7	Weathered Shale		9	SS	70/2"					
30.8	Auger grinding Possibly Bedrock					490				
	End of Borehole									

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 69-F-28 LOCATION Co-ord. 869,983 N; 975,516 E. ORIGINATED BY GA
W P 400-65-3 BORING DATE April 9 & 10, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

ELEV / DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV SCALE
542.0	Ground Level					
0.0	Clayey silt with sand & some gravel (Fill) Very Stiff		1	SS	15	540
			2	SS	24	
			3	SS	25	530
			4	SS	33	
523.5			5	SS	21	
19.5	Clayey silt with sand & traces gravel. Hard		6	SS	36	520
			7	SS	51	
			8	SS	70/3"	
			9	SS	70/2½"	510
509.2			10	SS	bouncing	
32.8	End of Borehole					

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100

SHEAR STRENGTH P S F
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

100/10"

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_p
WATER CONTENT —— w

WATER CONTENT %
10 20 30

BULK DENSITY γ P.C.F

REMA

GR. SA. SI. CL.

2 25 51 22

▼522.8

2 43 45 10

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

JOB 69-F-28 LOCATION Co-ord. 870,022 N; 975,619 E ORIGINATED BY GA
W.P. 400-65-3 BORING DATE April 16, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY AK

ELEV / DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
529.9	Ground Level					
0.0	Clayey silt with sand & some gravel (Fill)					
523.4	Stiff		1	SS	14	
6.5	Clayey silt with sand & traces of gravel		2	SS	40	520
			3	SS	117/7½"	
513.4	Hard		4	SS	56	
16.5	Clayey silty-silty clay with some sand and gravel.		5	SS	57	510
			6	SS	77	
			7	SS	71	
	Hard		8	SS	103	500
494.9			9	SS	72/1½"	
35.0			10	SS	bouncing	
491.4	Weathered Shale					
38.5	Possibly Bedrock End of Borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

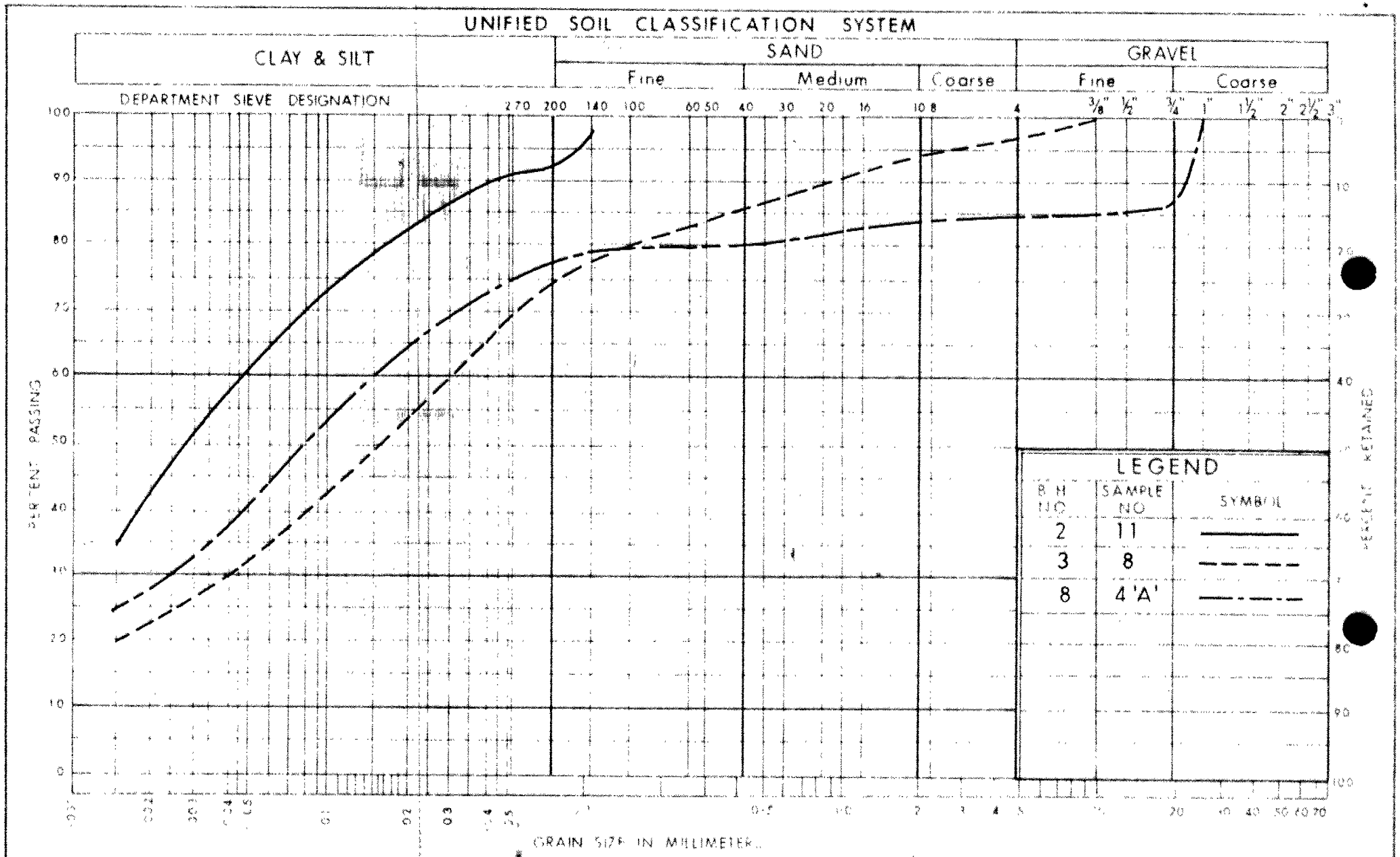
LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_p
WATER CONTENT —— w
w_p w w_L
WATER CONTENT %
10 20 30

BULK DENSITY γ P.C.F

REMARKS

▼ 524.6

GR. SA. SI. CL.
3 26 61 10
6 11 58 25
15 7 51 27



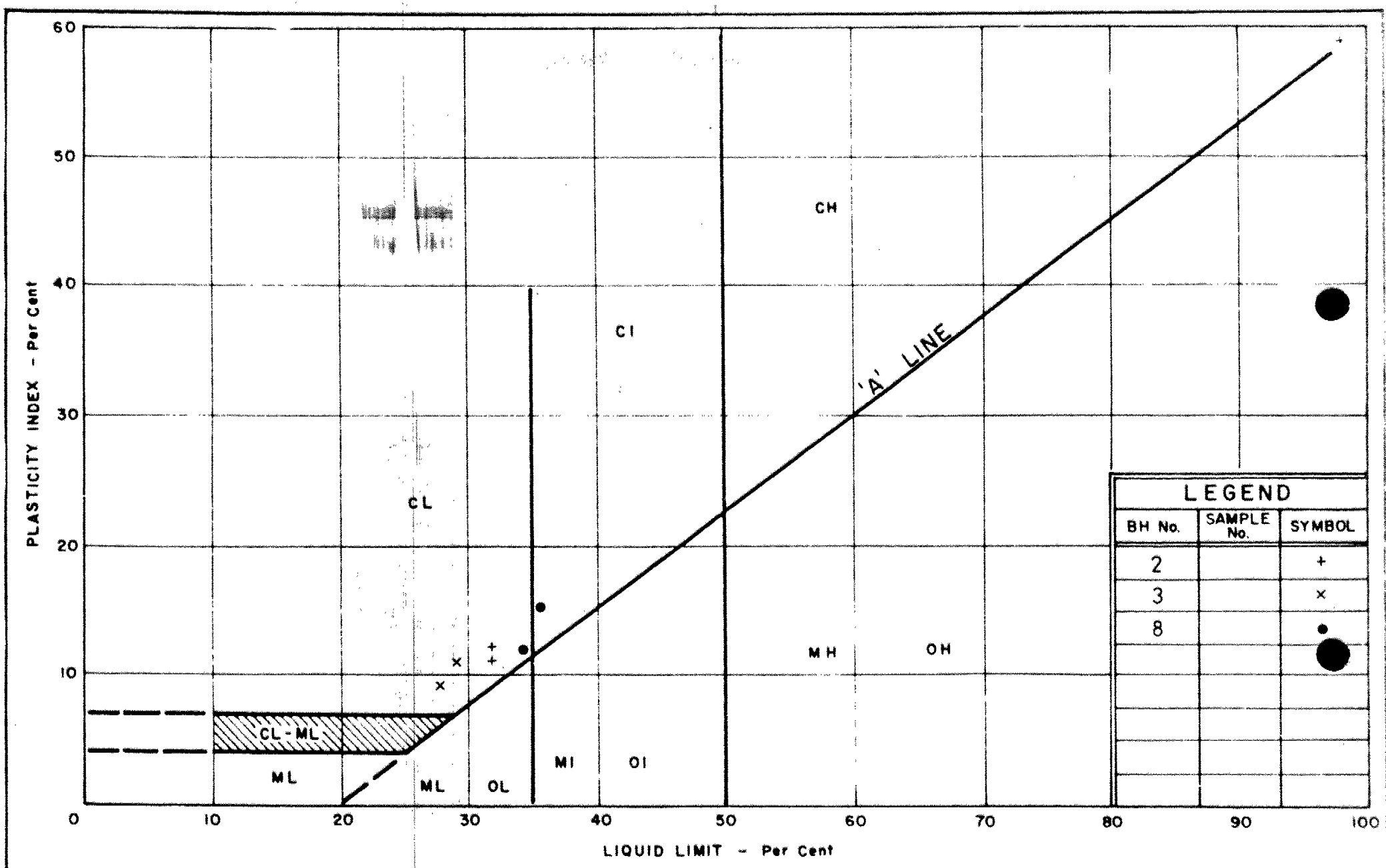
DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

GRAIN SIZE DISTRIBUTION
CLAYEY SILT — SILTY CLAY

W P No 400 - 65 - 3

JOB No 69 - F - 28

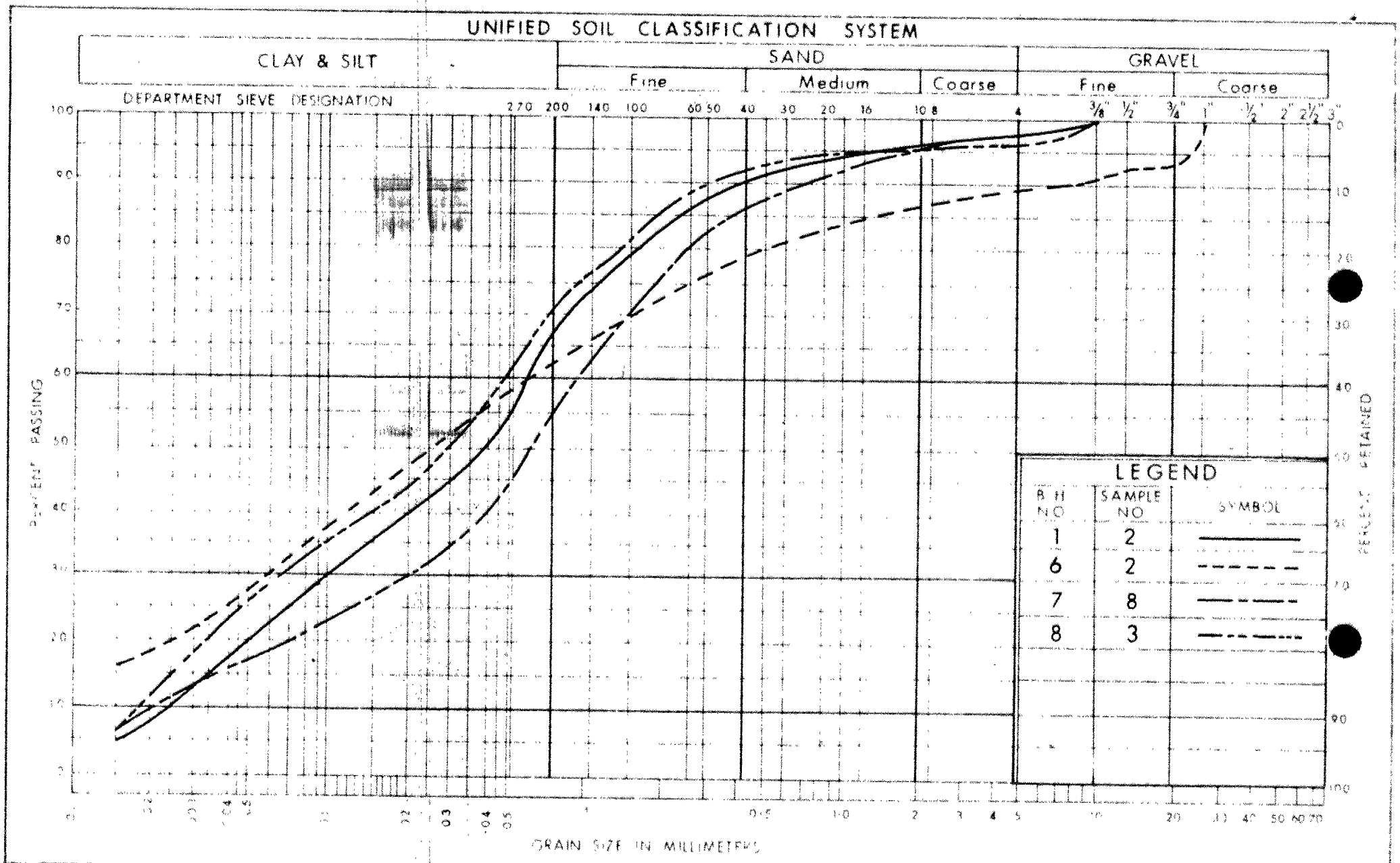
FIGURE 1



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

PLASTICITY CHART
CLAYEY SILT - SILTY CLAY

W.P. No. 400-65-3
JOB No. 65-F-28
FIGURE 2



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

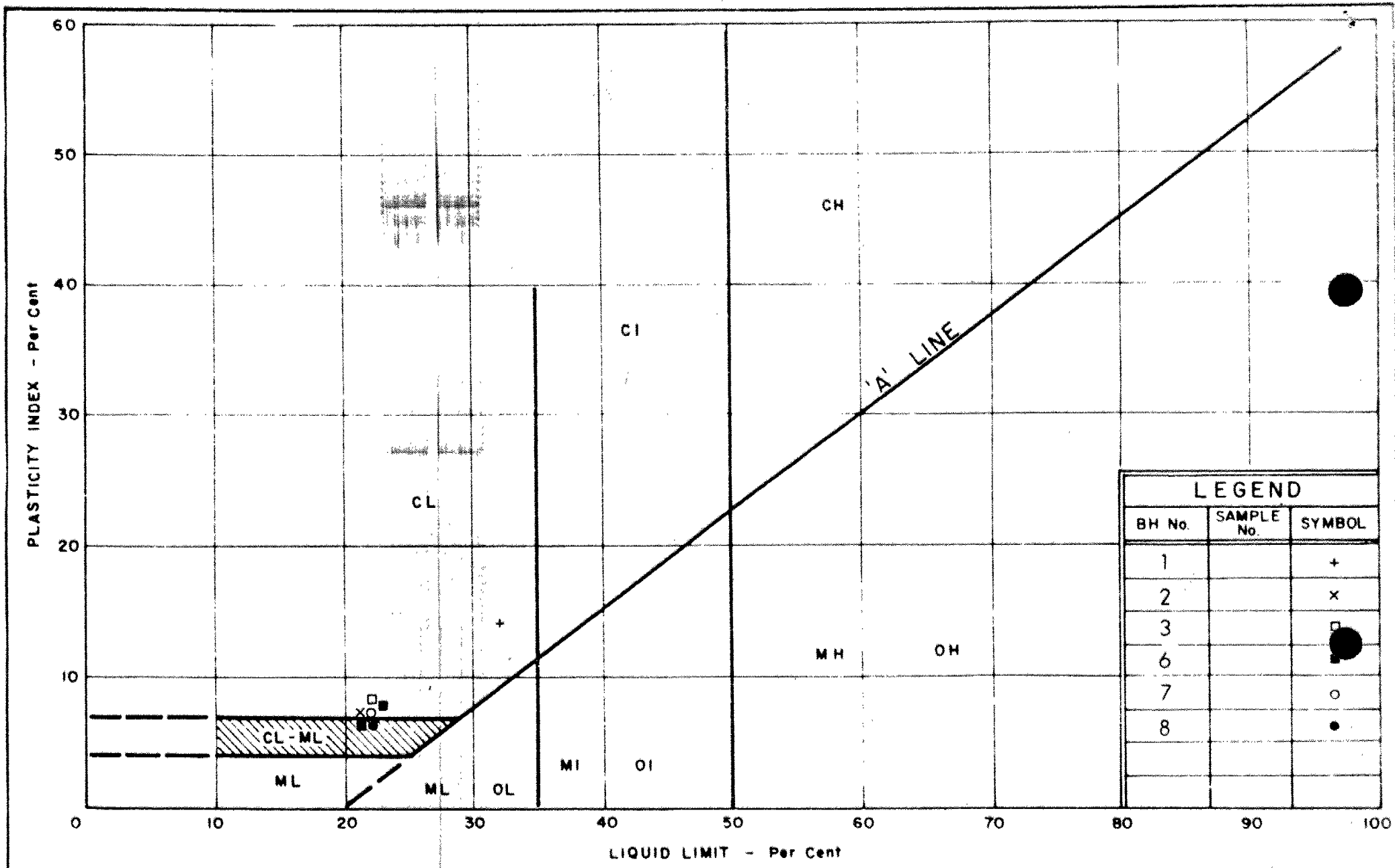
GRAIN SIZE DISTRIBUTION

CLAYEY SILT

W P No. 400 - 65 - 3

JOB No. 69 - F - 28

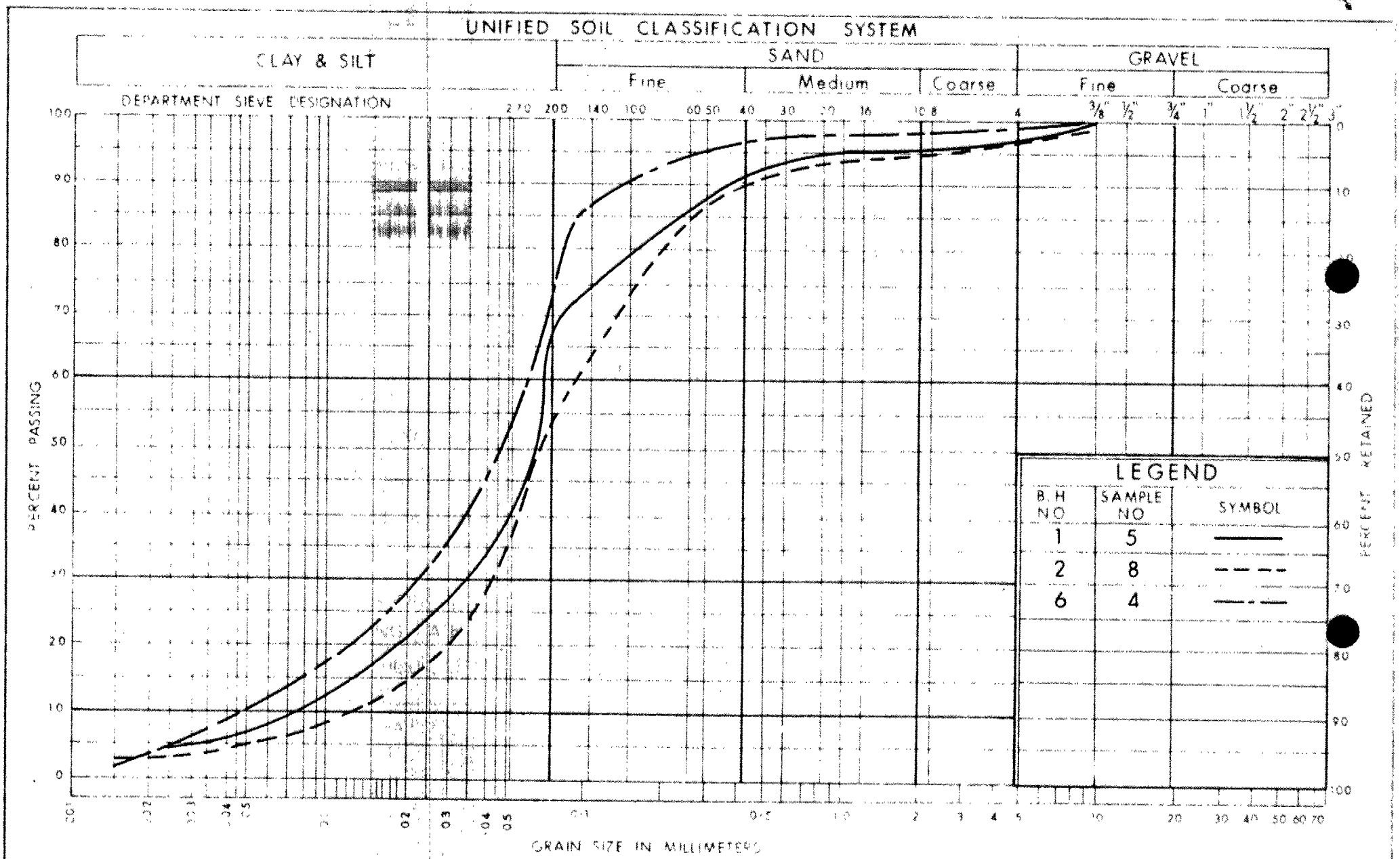
FIGURE 3



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

PLASTICITY CHART
CLAYEY SILT WITH SAND TRACES OF GRAVEL

W.P. No. 400 - 65 - 3
JOB No. 65 - F - 28
FIGURE 4



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION.

GRAIN SIZE DISTRIBUTION
SANDY SILT

W P No. 400-65-8

JOB No. 69-F-28

FIGURE 5

Mr. W.L. Lin
Design Engineer, Central Section
Structural Office
2nd Floor, West Building

Soil Mechanics Section
Engineering Materials Office
Room 315, Central Building

78 08 16

Re: Hwy. 427 Overpass at Renforth Drive
W.P. 400-65-03, Site 37-823
District 6, Toronto

We have reviewed the Preliminary Bridge Plan Drawing 37-823-P1 for the above mentioned structure and our comments are as follows:

1. We have noted the change in span length, angle of skew and profile grades. No problems are anticipated with these changes and we feel that the factual data and other recommendations contained in our Foundation Report, addendum, and memorandum dated 78 04 14 are still valid and applicable.

2. The footing excavation, in part, will be carried into the sandy silt to silty sand stratum which, when exposed to conditions of unbalanced hydrostatic head, is highly susceptible to 'boil'. To prevent boiling of the foundation base material, it will be necessary to provide a positive dewatering scheme.

3. Footings should be placed on undisturbed native soil. However, if construction site conditions will not readily allow this, the footings may be placed on a working mat of lean concrete or a well compacted pad of Granular 'A' material.

4. With specific reference to drawing details the point of centreline intersection should read:

   P.O.C. Sta. 289+17.77 ℄ Hwy. 427 not
   P.O.T. Sta. 289+17.17 ℄ Hwy. 427

T. Kazmierowski
Project Engineer

TK/gs

cc: Files

Ministry of Transportation and Communications
Ontario

Memorandum

To: Mr. G. C. E. Burkhardt
Structural Section
Central Region
3501 Dufferin St., Downsview

Attention: Mr. K. Pilgrim

Our File Ref.

From: Soil Mechanics Section
Engineering Materils Office
3rd Floor, Central Building

Date: 78 04 14

In Reply to

Subject: Re: Renforth Drive Overpass at Hwy. 427
Bridge #30, W.P. 400-65-03, Site 37-823
District 6, Toronto

Further to your request we have reviewed the subsurface conditions contained in our Foundation Report (W.O. 69-F-28 of 1969-09-10), and addendum of 1974-08-08 and submit the following comments:

It is understood that two structural alternatives are possible at this location. A two span concept with centre pier can be used with pre-stressed A.A.S.H.T.O. girders and concrete slab, or a single span structure using pre-stressed concrete boxes could also be feasible. In both cases, closed type abutments will be used.

A total of 8 sampled boreholes were carried out in the two investigations. The subsoil conditions were found to be generally uniform over the site. The pier and the closed type abutments may be supported on spread footings located at or below elevation 517. An allowable bearing pressure up to 3.5 t.s.f. may be used for design purposes. In all cases footings should be provided with a minimum earth cover of 4 ft. for frost protection purposes.

The footing excavation, in part, will be carried into the sandy silt to silty sand zone which is highly susceptible to conditions of unbalanced hydrostatic head and is likely to 'boil' under such conditions. To prevent boiling of the foundation base material it will be necessary to provide an adequate dewatering scheme.

The granular backfill behind the abutments should be provided with adequate drainage. The coefficient of lateral earth pressure for the granular backfill may be taken as 0.33 and 0.50 for the 'active' (K_a) and 'at rest' (K_o) conditions respectively. Where the abutments are constructed within the glacial zone, it is recommended that a value of 2500 p.s.f. be used in the computation to determine the sliding resistance between the concrete base of the footing and the underlying cohesive type material. For computation of sliding resistance for abutments located within the sandy silt deposit a value of 0.6 may be used in computing frictional resistance between the rough concrete base and the granular subsoil.

cont'd.....

The proposed embankments can be constructed to the required heights without the dangers of failure utilizing 2:1 standard slopes. It should be noted that a pipeline (Imperial Oil) is located immediately adjacent to the east corner of the north abutment. Care should be exercised during construction to ensure the intactness of the pipeline.

This memorandum should be read in conjunction with our original Foundation Report and subsequent addendum. The factual data and other recommendations contained in our Foundation Report and addendum are still applicable. In view of this we are not issuing any final foundation report since all the pertinent information is already contained in our previous reports together with this memorandum. Any modifications or updating of the factual data will be incorporated in the contract report for this project.

M. Devata
Supervising Engineer

MD/ig

cc: G.C.E. Burkhardt
R.D. Gunter
M.R. Ernesaks
D.E. Thrasher

C. Grebski
G.A. Wrong
B.J. Giroux
R.S. Pillar

R. Hore

Files

Mr. C.S. Grebski,
Structural Design Engineer,
West Bldg., Downsview.

Soil Mechanics Section,
Geotechnical Office,
West Bldg., Downsview.

January 20th, 1975.

RE: Review of Revised Preliminary Plan,
Hwy. 427, Overpass at Renforth Drive,
District #6, Toronto,
W.P. 400-65-03, Site 37-823.

The footing excavation for the north abutment will be at elev. 515.5-516.5 which is some 8-9 ft. below the observed groundwater level. The material at this depth consists of a very dense sandy silt with traces of gravel and clay. This type of subsoil is highly susceptible to conditions of unbalanced hydrostatic head and is likely to 'boil'. The footing excavation for the south abutment is at elevations 513.5 (SW) and 516.5 (SE), and is located in a very stiff to hard clayey silt stratum with sand and traces of gravel, and which is about 2 to 3 ft. above the upper boundary of the sandy silt zone.

In order to prevent boiling or heaving of the foundation subsoil, a dewatering scheme will be necessary. One method of achieving this is by driving interlocking steel sheeting to a minimum depth below the excavation bottom equal to the height of the prevailing water head above the footing level.

H. Shah,
Project Engineer,
For: M. Devata,
Supervising Engineer.

HS/ma
c.c. D.A. MacDonald
Files
Record Services

Mr. C. S. Grebski
Structural Design Engineer
West Building, Downsview, Ont.

Soil Mechanics Section
Geotechnical Office
West Building, Downsview, Ont.

January 3nd, 1975

Re : Preliminary Plan
Hwy. # 427 Overpass at Renforth Drive
W.P. 400-65-03, Site No. 37-823 Hwy. # 427
District # 6

We have reviewed the preliminary plan (P1) for the above project and our comments are as follows :

(a) The base of the abutment footings will be located some 10 - 12 ft. below the observed groundwater level at elev. 514. At this level, the encountered subsoil type is a very dense sandy silt with traces of gravel and clay at the location of the south abutment foundation. This type of subsoil is highly susceptible to conditions of unbalanced hydrostatic head and is likely to 'boil' under such conditions. The footing base of the north abutment is located within the very stiff to hard clayey silt with sand and traces of gravel, which is only about 1 - 2 ft. above the upper boundary of the silty sand subsoil.

Consequently, to prevent boiling or heave and thus ensure the soil underlying the footings is undisturbed it will be necessary to provide a dewatering scheme.

(b) The footings should be placed on undisturbed soil or on a working mat of lean concrete.

P. Payer
P. Payer
Senior Engineer

M. Devata
Supervising Engineer

FP:jw

cc. D. A. MacDonald (Dist. # 6)
Files
Documents

Dwg. thrown away
Jan 16/75