

SUPPLEMENTARY
FOUNDATION INVESTIGATION REPORT
For

Q.E.W. and Hwy. #27 Interchange,
Twp. of Stoblooke, County of York,
District #6 (Toronto).
W.P. 275-64-1 and W.P. 275-64-4
W.J. 65-P-104

INTRODUCTION:

Since the original foundation investigation report for the above mentioned interchange was prepared, we have received the preliminary plans for the individual structures involved which show the exact locations of each. We have reviewed these plans with respect to the available soil information, and as a result of this review, we arranged for more borings to be carried out in the field to obtain additional information.

Field work, laboratory work, and the preparation of the Record of Borehole sheets, for the additional borings, were undertaken by Dominion Soil Investigation Ltd. at our request and according to a program decided upon by us.

The following pages contain a description of the subsoil conditions prevailing at each structure location, together with our final recommendations for the structure foundations.

This report was prepared by Mr. A. Barsvary, Senior Foundation Engineer, under the general supervision of Mr. K. G. Selby, Supervising Foundation Engineer.

STRUCTURE #7 - W.P. 238-61-5 -

1. Soil Conditions:

A total of eight boreholes was drilled along the length of the proposed bridge. Boreholes #10, 13 and 17 were carried out under the supervision of the Foundation Section as part of the preliminary foundation study; boreholes #98, 120, 109, 108, and 107, were undertaken by Dominion Soil Investigation Ltd.

Borehole #17 was located on the existing 10 - 14 ft. high Hwy. #27 embankment. The fill material is classified as clayey silt with some sand, gravel and organic matter.

Below the highway fill in hole #17, and as the uppermost stratum in all the rest of the borings, a layer of sand with some silt was encountered, having a loose to dense relative density. The thickness of the sand varies between 2 ft. and 5 ft. Underlying the sand stratum, the glacial till deposit was revealed. The heterogeneous till may be classified to be clayey silt and sandy silt containing also, a various amount of weathered shale and cemented silts. The cohesive part of the layer has a "hard" consistency, and the granular portion exhibits a "very dense" relative density. At certain locations along the proposed bridge the stratum consists almost entirely of broken and weathered shale. Sound shale bedrock with intermittent limestone bands, was proved along the whole length of the site. The upper surface of the bedrock varies between el. 355 - 365 ft.

The groundwater level was established within the sand layer, between el. 363 and 369 ft.

The locations and elevations of the boreholes as well as the stratigraphical profile projected to control Line E - N, are shown on attached Drawing 65-F-104G.

cont'd. /10...

STRUCTURE #7 - W.P. 238-61-5 - (cont'd.) ...

2. Recommendations:

2.1) According to the preliminary plan, Bridge #7 is designed to be an eleven-span structure, with perched abutments, having an overall length of 1,245 ft.

The proposed grade of Hwy. #27 north- and south-bound lanes below the south side of Bridge #7 will be 4 - 5 ft. deeper than the upper surface of the bedrock. Pier No's 1, 2 and 3, therefore, will necessarily be supported within the bedrock.

2.2) The rest of the piers may either be supported on sound bedrock, or within the hard and very dense glacial deposit, or weathered shale bedrock. In both cases, spread footings are recommended for all piers.

The estimated elevations of the bottom of spread footings on sound rock and also within the glacial till or weathered rock, are tabulated as follows:

No. of Pier	-- ELEVATION OF BOTTOM OF FOOTINGS -- (Ft.)	
	On Bedrock	Within Glacial Till or Weathered Shale
1	358.0 or below	Not Applicable
2	347.5 " "	" "
3	354.0 " "	" "
4	357.5 " "	363.0 or below
5	355.5 " "	362.0 " "
6	360.0 " "	363.5 " "
7	361.5 " "	364.0 " "
8	361.0 " "	366.0 " "
9	364.0 " "	368.0 " "
10	364.0 " "	368.0 " "

cont'd. /11...

STRUCTURE #7 - W.P. 238-61-5 - (cont'd.) ...

2. Recommendations: (cont'd.) ...

2.2) (cont'd.) ...

The finished ground levels should be a minimum of 5 ft. higher than the bottom of footings around the piers supported on overburden, and 4 ft. higher than the bottom of the footings founded within the bedrock.

A permissible bearing pressure of 10.0 t.s.f. may be employed on footings supported on sound rock, and 4.0 t.s.f. for the ones within the glacial till or weathered shale.

2.3) The perched abutments may be founded either on steel H-piles driven to bedrock, or on spread footings placed on sound rock. The upper surface of sound bedrock is estimated to be at el. 358.5 ft. at the location of the south abutment, and at el. 365 ft. at the north abutment. A safe design load of 70 T/pile is recommended for 12 BP 53 H-piles driven to bedrock, and 10 t.s.f. on the spread footings on sound shale.

2.4) It is believed that even in placing some of the footings within the sandy silt glacial till, "boiling" of the excavation floors will not occur due to the very dense nature and the gravel and clay content of the subsoil. Therefore, no major dewatering problems are anticipated.

DEPARTMENT OF HIGHWAYS - ONYSAID

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 10

FOUNDATION SECTION

JOB 65-F-104

LOCATION 178,867 N 209,520 E

ORIGINATED BY P. Mc

W. P. 275-64-1

BORING DATE Oct. 4, 1965.

COMPILED BY H.S.

DATUM G.S.C.

BOREHOLE TYPE Washboring - BX Casing.

CHECKED BY *HL*

SOIL PROFILE		SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		25	50	75	100	125	WP	W	WL		
368.9	Groundlevel														
367.9	Topsoil														
1.0	Silty Sand														
363.9	Dense		1	SS	48										
5.0	Clayey silt with sand and gravel (Glacial Till) Very dense.		2	SS	75										
358.9	Shaley limestone with intermittent limestone.		3	RC	76%										
10.0			4	RC	89%										
352.7															
16.2	End of borehole.														

Refusal at 8.1'

Blocked dry
1.3'Gr16%Sa65%
Si&Cl 19%

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 13

FOUNDATION SECTION

JOB 65-F-104LOCATION 179,225 N 208,969 EORIGINATED BY P.McW.P. 275-64-1BORING DATE Sept. 28, 1965.COMPILED BY H.S.DATUM G.S.C.BOREHOLE TYPE Washboring - NX Casing.CHECKED BY HL

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — WL			BULK DENSITY	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	25	50	75	100	125	PLASTIC LIMIT — WP	WATER CONTENT — W		
368.6	Groundlevel															
	Topsoil															
0.2	Sand															
364.8	Loose to compact.															
3.8	Weathered shale.		1	SS	30											
362.6					for 3"											
6.0	Shaley limestone.			RC		360										
354.0																
14.6	End of borehole.					350										

Refusal at 3.7'

O

Blocked dry
2.6'

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 17

FOUNDATION SECTION

JOB 65-F-104LOCATION 179,502 N 208,862 EORIGINATED BY P. McW P 27-84-1BORING DATE Sept. 30, 1965COMPILED BY H.S.DATUM G.S.C.BOREHOLE TYPE Washboring - BX Casing.CHECKED BY SK

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS / FOOT		25	50	75	100	125	WP	W	WL		
382.5	Groundlevel															
0																
	Clayey silt with sand some gravel & organics @ El 371.5 (Fill)		1A 1B	SS	5	380										
	Loose		2	SS	6											
			3	SS	11											
371.5																
11.0	Silty sand															
369.3	Compact		4	SS	20	370										
13.2	Clayey silt with sand & fragments of shale & limestone. (Glacial Till)															
364.5	V. dense.		5	HC	65%											
18.0																
	Shaley limestone with intermittent limestone.		6	HC	100%	360										
375.5																
25.0	End of borehole.					350										

▼ G.W.L.
13.5'

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

BA 2377

To: Mr. B. R. Davis,
Bridge Engineer,
Bridge Division.
Attention: Mr. S. McCombie

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

Date: August 18, 1966

Our File Ref.

In Reply To

Subject:

FOUNDATION INVESTIGATION REPORT
For

Q.E.W. and Hwy. #27 Interchange,
Twp. of Etobicoke, County of York,
District #6 (Toronto).

W.J. 65-F-104 -- W.P. 275-64-1

Struct #7 W.P. 238-61-5, Struct #10 W.P. 34-65-2

Enclosed, please find the results of our final
foundation investigations for Structures No's 7 and 10.

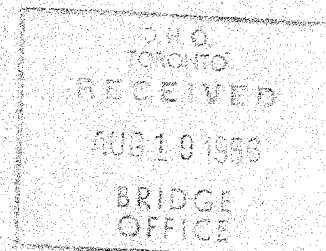
Please attach these to your copy(s) of
Foundation Report #65-F-104.

AGS/MdeF
Attach.

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

cc: Messrs. B. R. Davis (2) ✓
H. A. Tregaskes
D. W. Farren
G. K. Hunter (2)
F. Allen
T. J. Kovich
W. S. Melinyshyn
A. Watt

Foundations Office
Gen. Files



STRUCTURE #7 - W.P. 238-61-5 -

1. Soil Conditions:

A total of eight boreholes was drilled along the length of the proposed bridge. Boreholes #10, 13 and 17 were carried out under the supervision of the Foundation Section as part of the preliminary foundation study; boreholes #98, 120, 109, 108, and 107, were undertaken by Dominion Soil Investigation Ltd.

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cont'd. /? ...

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6	360.0 " "	363.5 " "
7	361.5 " "	364.0 " "
8	361.0 " "	366.0 " "
9	364.0 " "	368.0 " "
10	364.0 " "	368.0 " "

cont'd. /8 ...

STRUCTURE #7 - W.P. 238-61-5 - (cont'd.) ...

2. Recommendations: (cont'd.) ...

2.2) (cont'd.) ...

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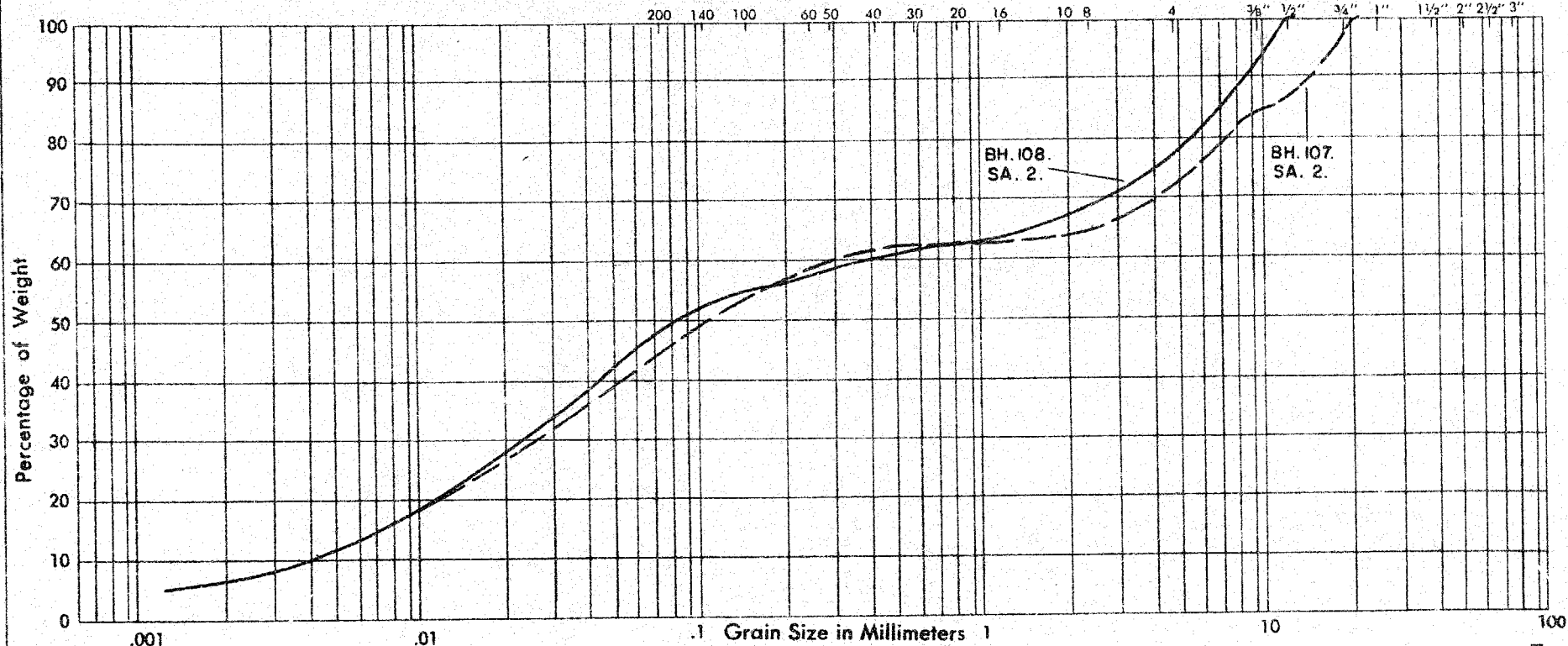
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-18
YOUR REF. No. W.P. 238-61-5

UNIFIED SOIL CLASSIFICATION
SYSTEM

SILT AND CLAY	SAND			GRAVEL	
	FINE	MEDIUM	COARSE	FINE	COARSE



PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE

COEFFICIENT OF UNIFORMITY

LOCATION: BRIDGE No. 7.

COEFFICIENT OF CURVATURE

BOREHOLE NO.: 107 ; 108

SAMPLE NO.: 2 2

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

Classification of Sample and Group Symbol:
GRAVELLY, SANDY SILT
with a trace of CLAY

PLASTIC PROPERTIES:

LIQUID LIMITED % =
PLASTIC LIMIT % =
PLASTICITY INDEX % =
MOISTURE CONTENT % =
ACTIVITY =

Enclosure No.

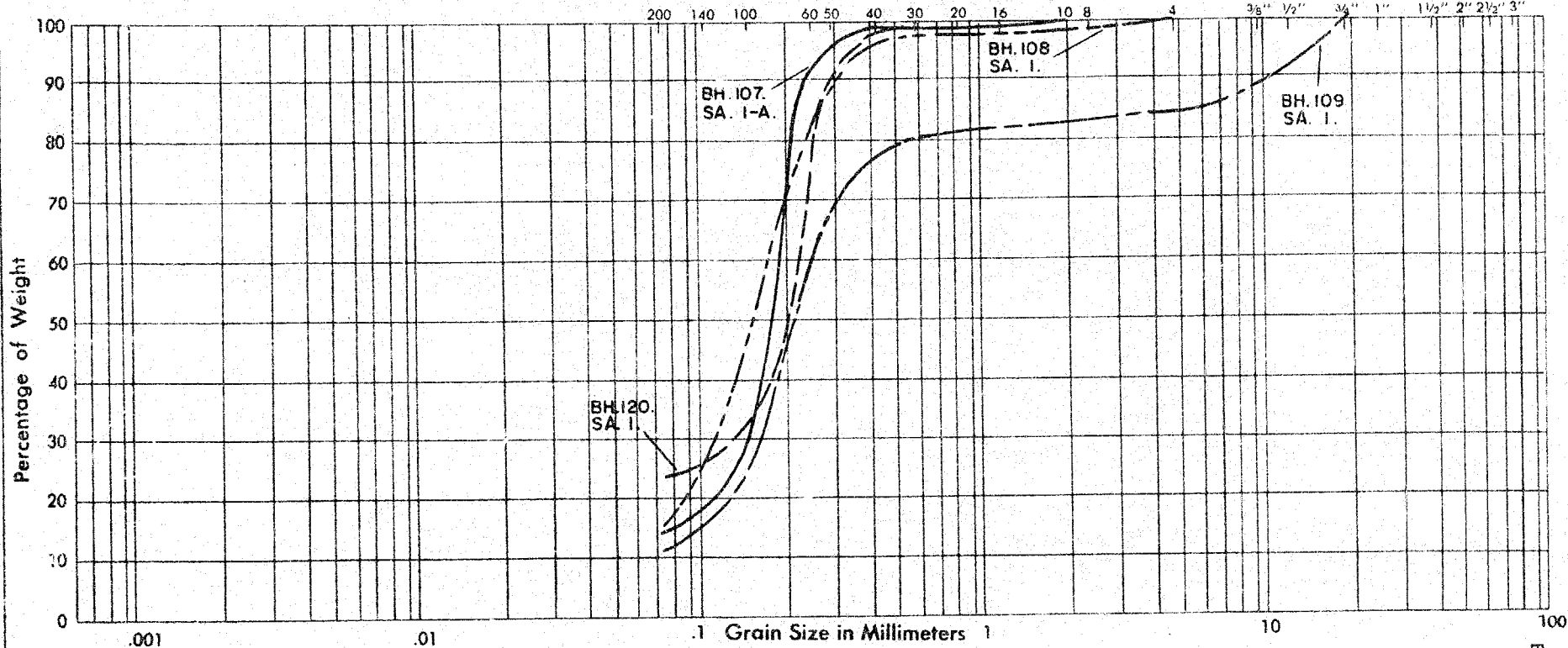
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SYSTEM

SILT AND CLAY	SAND			GRAVEL	
	FINE	MEDIUM	COARSE	FINE	COARSE



PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE

LOCATION: BRIDGE No. 7.

BOREHOLE NO.: 107 ; 108 ; 109 ; 120

SAMPLE NO.: 1-A 1 1 1

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMITED % ==

PLASTIC LIMIT % ==

PLASTICITY INDEX % ==

MOISTURE CONTENT % ==

ACTIVITY ==

Classification of Sample and Group Symbol:

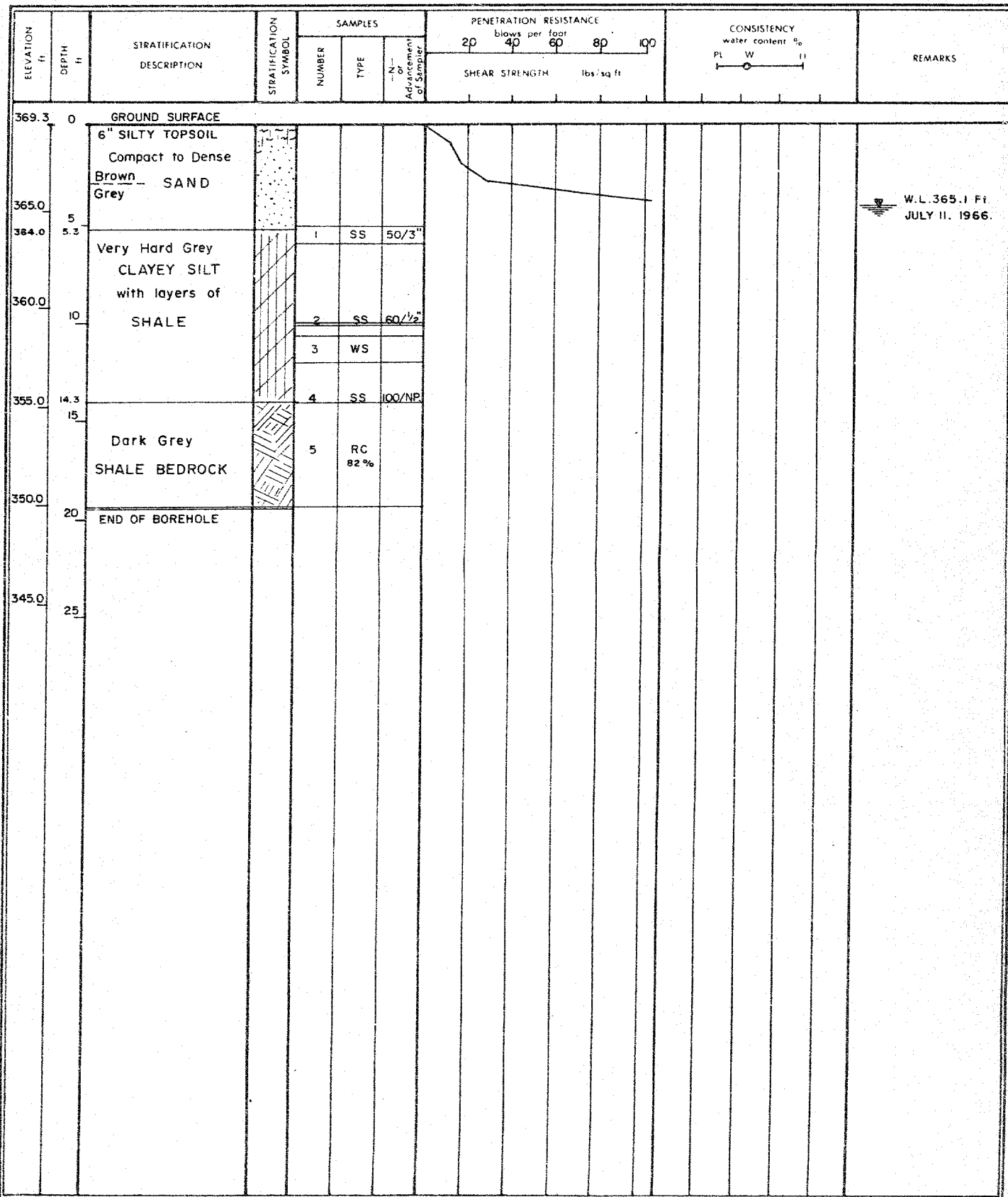
FINE SAND
with some SILT

Enclosure No.

CLIENT: D. H. O.
 PROJECT: BRIDGE No. 7, Q.E.W. & HWY. 27.
 LOCATION: 178,948 N ; 209,285 E
 DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 2 3/8"
 DATE: JULY 8, 1966.
 W.P. 238-61-5

ENCLOSURE NO.



CLIENT: D.H.O.
 PROJECT: BRIDGE No. 7, Q.E.W. & HWY. 27.
 LOCATION: 179,640 N ; 208,799 E
 DATUM ELEVATION: G.S.C.

METHOD OF BORING: AUGERING
 DIAMETER OF BOREHOLE: 4"
 DATE: JULY 6, 1966.
 W.P. 238-61-5

ENCLOSURE NO

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot		CONSISTENCY water content %		REMARKS
				NUMBER	TYPE	N ₆₀ or Adjusted of Sampler	20	40	60	80	
374.9	0	GROUND SURFACE									
372.9	2.0	Dark Brown SILTY TOPSOIL									W.L. 373.4 Ft. JULY 7, 1966.
370.0	5	Compact to Dense Brown FINE SAND with some SILT		1	SS	31					So. 85 % ; Si. 15 %
368.6	6.3	Very Dense Grey GRAVELLY SANDY SILT with a trace of CLAY (GLACIAL TILL)		2	SS	43/3"					Gr 28 % ; So. 27 % Si 37 % ; Cl. 8 %
365.0	10	Grey SHALEY LIMESTONE BEDROCK		3	RC	62 %					
360.0	15			4	RC	90 %					
		END OF BOREHOLE									
355.0	20										

GEOTECHNICAL DATA SHEET FOR BOREHOLE 108

OUR REFERENCE NO. 6-6-18

CLIENT: D. H. O.
 PROJECT: BRIDGE No. 7, Q. E. W. & HWY. 27.
 LOCATION: 179,390 N ; 208,914 E
 DATUM ELEVATION: G. S. C.

METHOD OF BORING: AUGERING
 DIAMETER OF BOREHOLE: 4"
 DATE: JULY 6, 1966.
 W. P. 238-61-5

ENCLOSURE NO.

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE		CONSISTENCY		REMARKS
				NUMBER	TYPE	N or Advancement of Sample	blows per foot	lb/sq ft	water content %	PL W LI	
370.2	0	GROUND SURFACE									
		6" TOPSOIL									
		Loose Brown FINE SAND with some SILT		1	AS						
367.2	3.0	Very Dense Grey SANDY SILT with some GRAVEL and a trace of CLAY (GLACIAL TILL)		2	SS	80/6"					
365.0	5			3	SS	100/5"					
361.2	9	Grey SHALE BEDROCK with LIMESTONE BANDS		4	RC	62%					
360.0	10			5	RC	63%					
355.0	15										
350.0	20	END OF BOREHOLE									

W.L. 369.0 Ft.
 JULY 7, 1966.
 Sa. 83 % ; Si. 17 %
 Gr. 22 % ; Sa. 30 %
 Si. 41 % ; Cl. 7 %

VERTICAL SCALE: 1 IN TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: V. G. H. CHD

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 109 .

OUR REFERENCE NO 6-6-18

CLIENT: D.H.O.
PROJECT: BRIDGE No. 7, Q.E.W. & HWY. 27.
LOCATION: 179,102 N , 209,102 E
DATUM ELEVATION G.S.C.

METHOD OF BORING: AUGERING
DIAMETER OF BOREHOLE: 4"
DATE: JULY 8, 1966.
W.P. 238-61-5

ENCLOSURE NO

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content % PL W LI	REMARKS
				NUMBER	TYPE	Advancement of Sampler	20	40	60	80	100		
367.9	0	GROUND SURFACE											
365.0		Loose Brown SAND with some SILT and GRAVEL		1	SS	6							Gr. 15 % Sa. 73 % ; Si. 12 % W.L. 363.2 Ft. JULY 11, 1966.
362.4	5.5	Very Dense Grey SILT (CEMENTED) with numerous SHALE FRAGMENTS		2	SS	90							
360.0				3	SS	50/3"							
	10			4	SS	50/1 1/2"							
355.0	12.6			5	SS	60/1"							
	15	Grey SHALE BEDROCK		6	R	100 %							
350.0				7	RC	93 %							
	20	END OF BOREHOLE											
345.0													
	25												

VERTICAL SCALE: 1 IN TO 5 FT

DOMINION SOIL INVESTIGATION LIMITED

MADE: V. G. H. CH'D.

CLIENT D. H. O.
 PROJECT BRIDGE No. 7. Q.E.W. & HWY. 27.
 LOCATION 179,025 N ; 209,178 E
 DATUM ELEVATION G. S. C.

METHOD OF BORING WASHBORING
 DIAMETER OF BOREHOLE 2 3/8"
 DATE JULY 9, 1966.
 W. P. 238-61-5

ENCLOSURE NO

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot		CONSISTENCY water content %		REMARKS
				NUMBER	TYPE	N or Advancement of Sampler	20	40	60	80	
368.3	0	GROUND SURFACE									
365.0	4.3	Dense Brown FINE SAND with some SILT		1	SS	69					
364.0	5	Grey Weathered BROKEN SHALE		2	SS	100/4"					
360.0				3	SS	100/1 1/2"					
358.3	10			4	SS	100/NP					
355.0	15	Dark Grey SHALES BEDROCK		5	RC	80 %					
350.0	20			6	RC	83 %					
345.0	25	END OF BOREHOLE									

HOLE DRY
 CAVE-IN
 EL. 365.5 Ft.
 JULY 11, 1966.
 Sa. 85 % ; Si. 15 %

DOMINION SOIL INVESTIGATION LIMITED
77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 421-2567

BRANCH
369 QUEENS AVENUE
LONDON, ONTARIO
TELEPHONE GE. 3-3851



FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66896

July 27, 1966.

Our Ref. 6-6-18
Your Ref. W.P. 238-61-5

Mr. A. G. Stermac,
Principal Foundation Engineer,
Materials & Testing Division,
Department of Highways,
Downsview Avenue,
Downsview, Ontario.

Attention: Mr. K. Selby, P. Eng.

Re: Soil Investigation for Q.E.W. and Hwy. # 27
Interchange, Bridge No. 7.

Dear Sirs:

We are forwarding you herewith the results of the borings and laboratory tests performed in connection with the above project.

Five boreholes (boreholes No. 98, 107, 108, 109, and 120) were put down in addition to those carried out earlier by yourself (boreholes 10, 13, and 17). We trust that the information contained on these borehole logs is sufficient for your purpose.

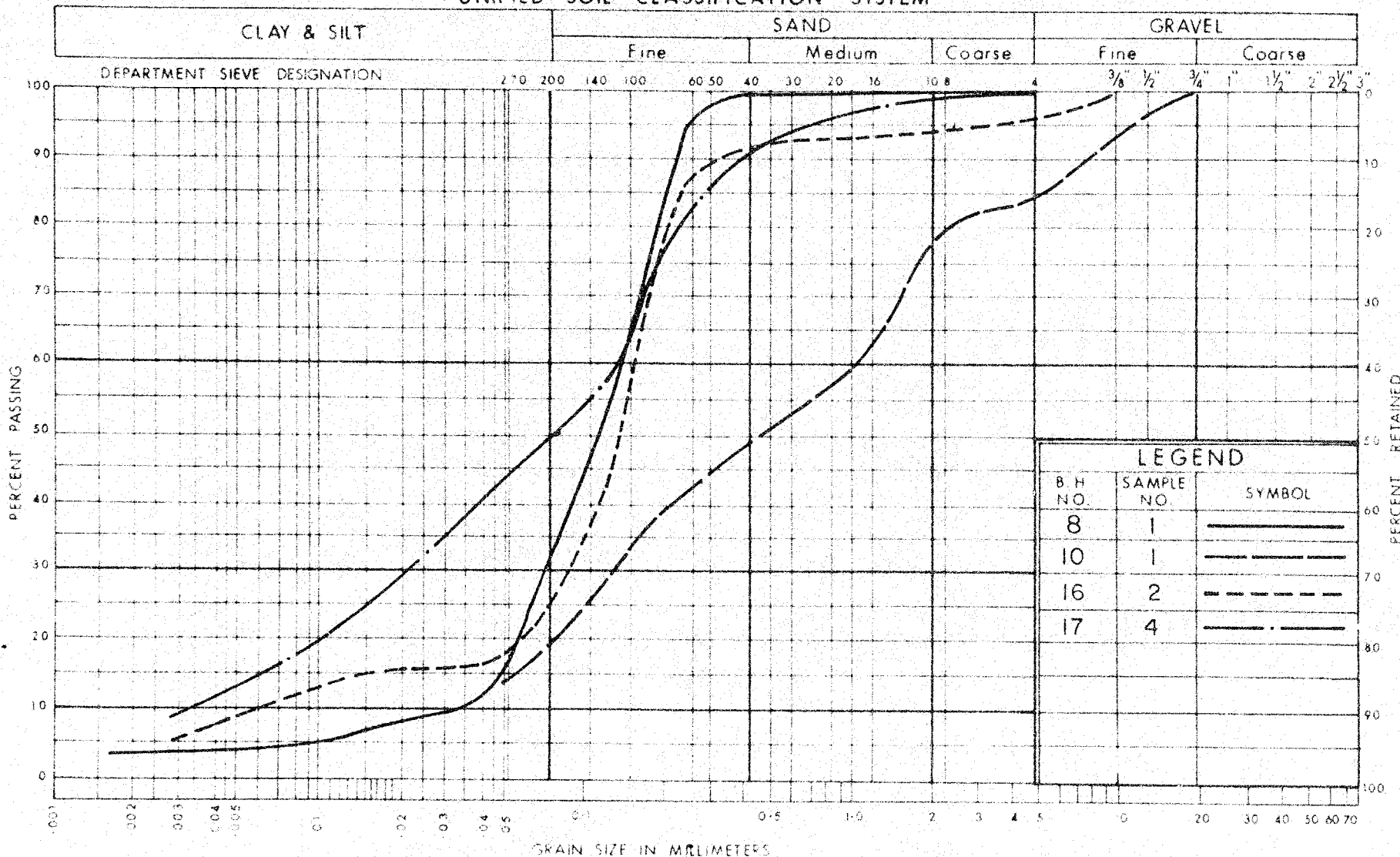
Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,

I. P. Lieszkowszky
I. P. Lieszkowszky, P. Eng.,
Project Engineer.

IPL/ds

UNIFIED SOIL CLASSIFICATION SYSTEM



GRAIN SIZE DISTRIBUTION
SILTY SAND to SANDY SILT



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

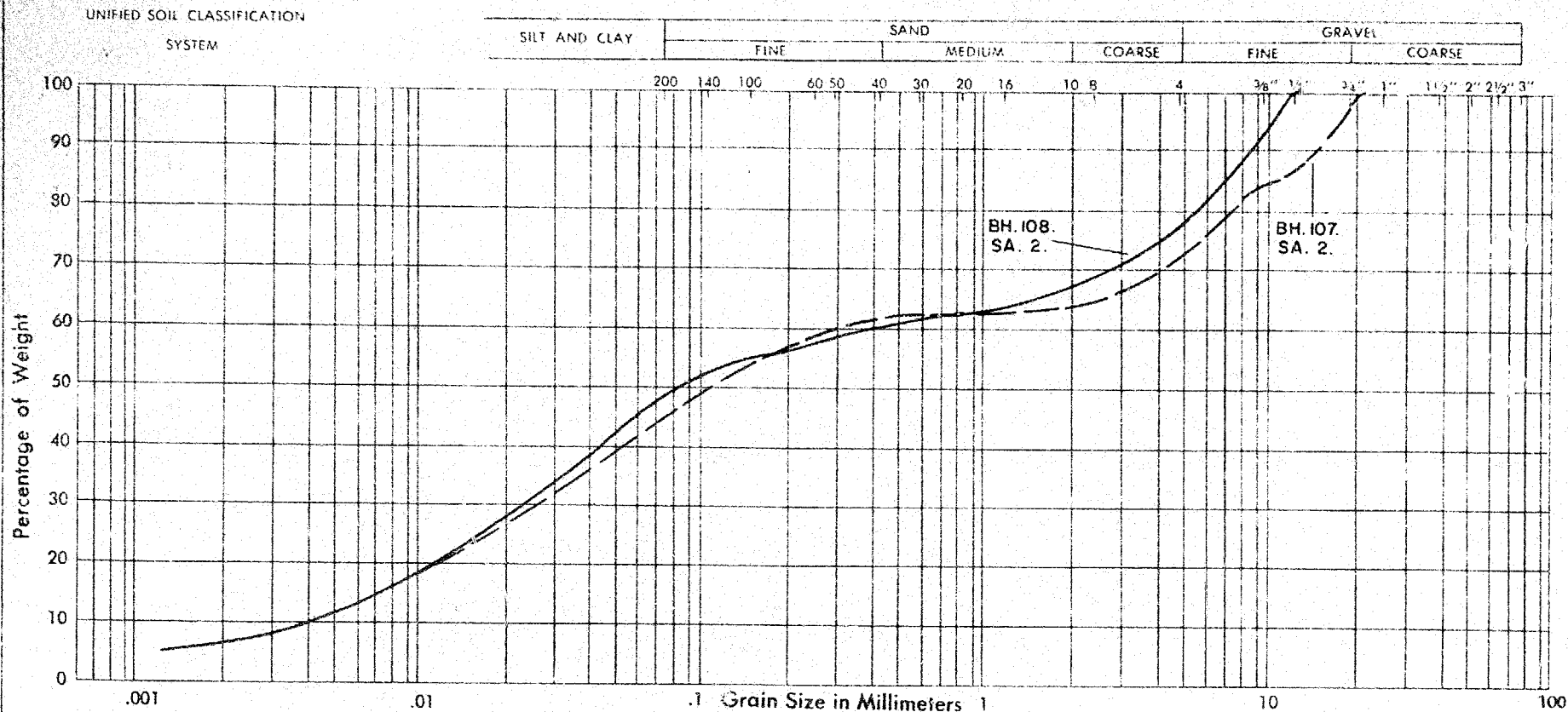
W.P. No.

JOB No. 65-F-104

DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-18
YOUR REF. No. W.P. 238-61-5



PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE

LOCATION: BRIDGE No. 7.

BOREHOLE NO.: 107 ; 108

SAMPLE NO.: 2 2

DEPTH OF SAMPLE

ELEVATION OF SAMPLE

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMIT °

PLASTIC LIMIT °

PLASTICITY INDEX °

MOISTURE CONTENT °

ACTIVITY °

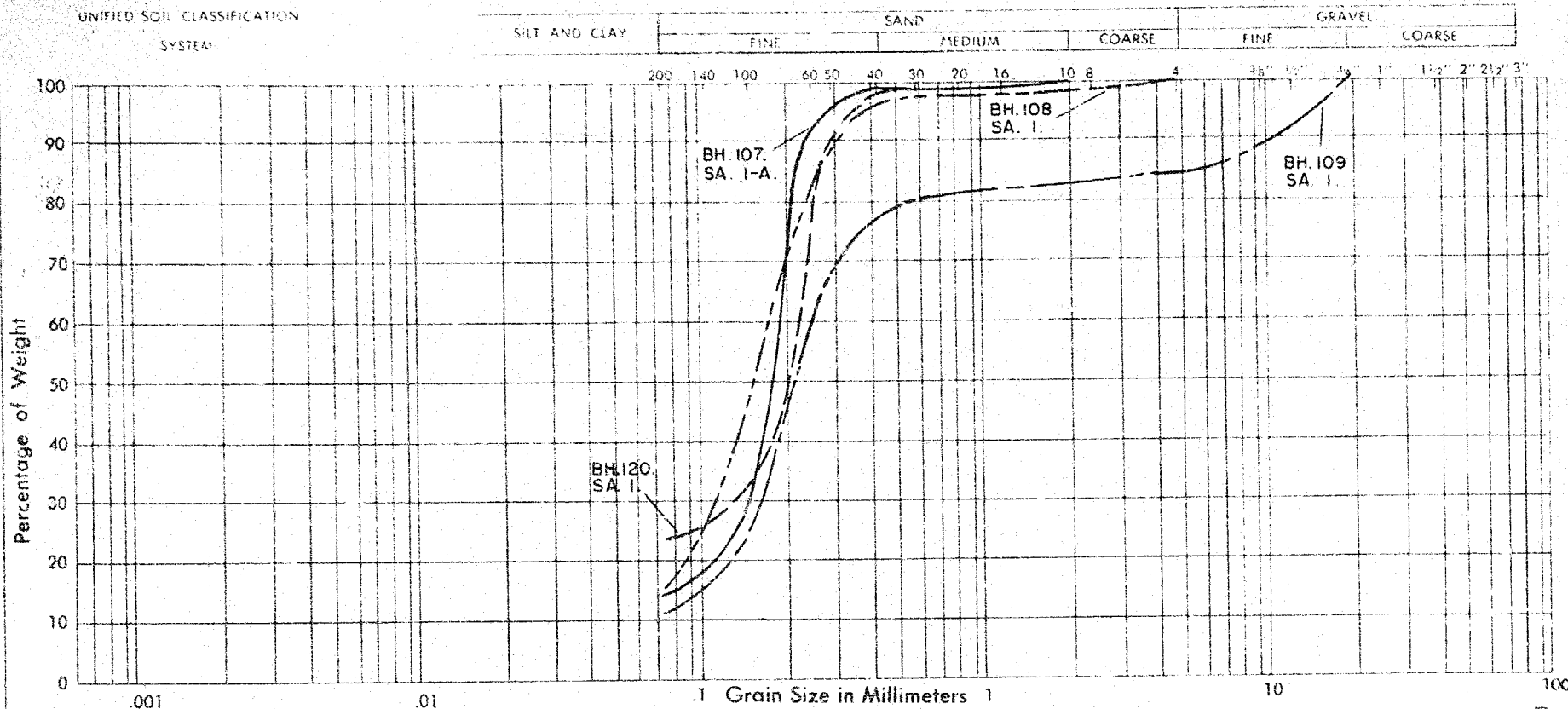
Classification of Sample and Group Symbol:
GRAVELLY, SANDY SILT
with a trace of CLAY

Enclosure No.

DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-18
YOUR REF. No. W.P. 238-61-5



PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE

LOCATION: BRIDGE No. 7.

BORHOLE NO.: 107 ; 108 ; 109 ; 120

SAMPLE NO.: 1-A 1 1 1

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

Classification of Sample and Group Symbol:

FINE SAND
with some SILT

PLASTIC PROPERTIES:

LIQUID LIMIT %

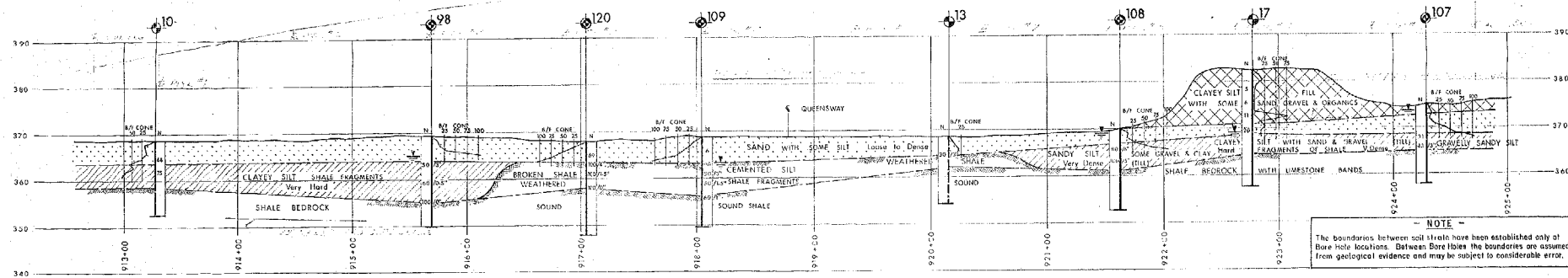
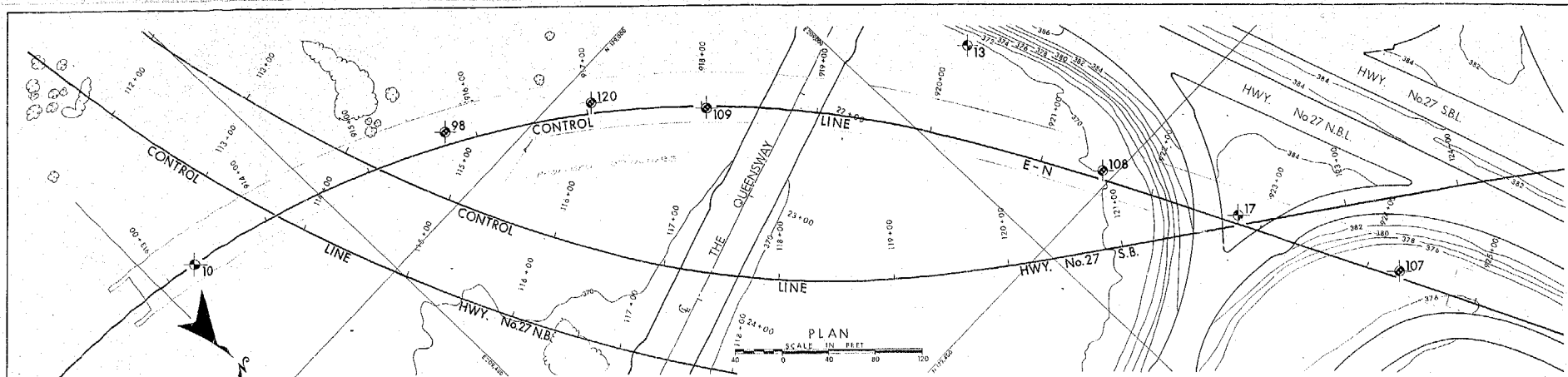
PLASTIC LIMIT %

PLASTICITY INDEX %

MOISTURE CONTENT %

ACTIVITY


Enclosure No.





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.

[illegible]

LEGEND

 Bore & Cone Penetration Hole

 Bore & Cone (Dom. Soil Ltd.)

 Water Levels established at time of field investigation

No.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
10	366.9	178,667	209,520
13	368.6	179,725	208,969
17	382.5	178,502	208,862
96*	369.3	178,748	209,285
107*	374.9	179,640	208,799
98*	370.2	179,370	208,614
109*	364.9	179,002	209,102
110*	366.3	179,025	209,176

DATE	BY	REVISION
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS & TESTING, UPPSALA - FOUNDATION SECTION		
BRIDGE No.7 TURNING ROAD E-N OVER HWY.27 & QUEENSWAY KING'S HIGHWAY NO. Q.E.W. & HWY.No.27 INTER. DIST. NO. 6 CD. YORK METRO TORONTO TWP. ETOBICOKE LOT CON.		
SORE HOLE LOCATION & SOIL STRATA		
SOUND N.S. CHECKED - ✓	WR NO. 230-61-5	H.W.T. DRAWING NO. 65-F-104G
DRIVEN UN. CHECKED - ✓	JOB NO. 63-F-104	
DATE 3 AUG.64		BRIDGE DRAWING NO.
APPROVED <i>W. Williams</i>	TEST NO.	

