

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: May 7, 1969

OUR FILE REF:

IN REPLY TO

MAY 22 1969

SUBJECT:

FOUNDATION INVESTIGATION REPORT  
For  
Q.E.W. and Maple Ave., Grimsby, Ont.  
Twp. of Grimsby -- County of Lincoln  
District No. 4 (Hamilton)  
W.J. 69-F-10 -- W.P. 369-65-1

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 feel free to contact our Office.

AGS/MdeF  
Attach.

cc: Messrs. B. R. Davis (2)  
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D. W. Farren  
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Foundations Files  
Gen. Files

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# FOUNDATION INVESTIGATION REPORT

For

Q.E.W. and Maple Ave., Grimsby, Ont.

Twp. of Grimsby -- County of Lincoln

District No. 4 (Hamilton)

W.J. 69-F-10 -- W.P. 369-65-1

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## 1. INTRODUCTION:

The Foundation Section was requested to carry out a subsurface investigation for the above proposed crossing. The request was contained in a memo from the Bridge Office - (Mr. W. S. Melinyshyn, Regional Bridge Location Engineer), dated February 18, 1969. Subsequently, an investigation was carried out by this Section at the above site in order to determine the sub-soil conditions. This report contains the results of the investigation, together with our recommendations for the design of foundations for the proposed structure as well as the stability of the approaches.

## 2. DESCRIPTION OF THE SITE AND GEOLOGY:

The site is located at the existing Maple Avenue and Q.E.W. crossing in the Town of Grimsby. At this crossing, the Q.E.W. is located in a cut having a maximum height of about 14 ft. above the existing Q.E.W. grade. The ground surface slopes down towards the west across the site; generally wet conditions prevail in the low-lying areas.

The general area lies within the Niagara Fruit Belt which forms a portion of the Iroquois Plain Physiographic Region. According to available information, the area was inundated by Lake Iroquois during the Pleistocene Period. The overburden generally consists of cohesive glacial till overlying Queenston shale bedrock of the Ordovician Period.

### 3. FIELD AND LABORATORY WORK:

A total of 7 boreholes, each accompanied by a dynamic cone penetration test, was carried out at the site by means of a standard diamond drill rig adapted for soil sampling purposes. Soil samples were obtained at required depths by means of a 2-inch O.D. split-spoon sampler which was hammered into the soil in accordance with the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone tests. Bedrock was proven in 6 boreholes by core drilling in BXL size.

Surveying was carried out by the personnel from the Central Region Engineering Surveys Section. The elevations given in this report are referenced to Geodetic datum. The locations and elevations of all the boreholes are shown on Drawing 69-F-10A, together with the estimated stratigraphical profile and sections across the site.

All samples were subjected to a careful visual examination in the field and subsequently in the laboratory. Following this examination, tests were carried out on selected samples to determine the following physical properties:

Natural Moisture Contents  
Atterberg Limits  
Grain-Size Distributions

The results of these tests are plotted on the individual Record of Borelog sheets and are summarized on the Figures in the Appendix to this report.

### 4. SUBSOIL CONDITIONS:

#### 4.1) General:

The site is overlain by a hard cohesive glacial till deposit which is underlain by shale bedrock at depths of 28 to 58 ft. below the ground surface. A deposit of fill material was encountered above the glacial till stratum along the shoulders of

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

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

the existing roadways. The various soil strata encountered at the site, are described in detail below:

4.2) Fill Material:

Fill material was encountered at Boreholes 4 and 7 to depths of about 7 ft. below the ground surface. At Borehole 4, the fill material consists of a silty sand with organics containing traces of clay. At Borehole 7, the fill consists of a clayey silt with some sand and traces of organic matter. On the basis of Standard Penetration Resistance 'N' values - (7 blows/ft. at B.H. 4 and 15 blows/ft. at B.H. 7), the fill is considered to be loose at Borehole 4 and stiff at Borehole 7.

4.3) Clayey Silt with some Sand and Traces of Gravel - (Glacial Till):

A deposit of clayey silt with some sand and traces of gravel (glacial till) was encountered below the fill material at Boreholes 4 and 7 and below a surficial layer of topsoil at the other borehole locations. The thickness of the glacial till varied from 28 ft. at Borehole 8 to 51 ft. at Boreholes 4 and 7. The upper 8 to 18 ft. of the deposit is desiccated and contains occasional fissures, except at B.H.'s 4 and 8. At Borehole 8, the upper 5 ft. of the deposit was found to contain traces of organic matter. Below elev. 232 to elev. 237, the glacial till deposit contains shale fragments, giving the appearance of weathered shale. This zone probably, however, represents a transition zone between the glacial till deposit and the underlying weathered shale bedrock. At Borehole 4, the glacial till was found to contain sand seams up to 12 inches in thickness between elevations 249 and 242, whereas at Borehole 5, occasional silt seams up to 2 inches in thickness were encountered between about elevations 235 and 232. These sand and silt seams were found to be water bearing.

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

4.3) Clayey Silt with some Sand and Traces of Gravel - (Glacial Till): (cont'd.) ...

The physical properties of the glacial till deposit, as determined from field and laboratory tests, are summarized on the Table below, as well as on the Figures in the Appendix to this report.

	<u>Range</u>	<u>Average</u>
Natural Moisture Content (W) - %	- 9 - 17	12
Liquid Limit (W <sub>L</sub> ) - %	- 24 - 37	27
Plastic Limit (W <sub>p</sub> ) - %	- 14 - 20	16
Grain-Size Distribution:		
% Gravel	- 1 - 10	7
% Sand	- 15 - 30	23
% Silt & Clay	- 65 - 84	70
Standard Penetration Resistance -		
'N' Values - Blows/ft.	- 35 - 160	-

The Atterberg limits, plotted on the Plasticity Chart, Figure 2 of the Appendix, indicate the soil to be an inorganic clayey silt of low plasticity. The gradation range of the soil is shown by the shaded curve on Figure 1 of the Appendix.

A tendency for the 'N' values to increase with depth was observed at all the borehole locations. On the basis of the 'N' values observed, it is estimated that the consistency of the cohesive glacial till is generally hard.

4.4) Bedrock:

A red shale bedrock with occasional grey mottling was encountered beneath the glacial till deposit; the surface of the bedrock was encountered between elevations 227 and 230 across the site. In all boreholes the upper 2 to 5 ft. of the bedrock was

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

4.4) Bedrock: (cont'd.) ...

found to be in a fractured and generally weathered condition. Core recoveries in the sound bedrock were 100%.

5. GROUNDWATER CONDITIONS:

Water level observations were carried out in the open boreholes upon completion of the field work. In addition, Boreholes 4 to 8 inclusive, were pumped out, in order to observe the rate of rise of water level in the boreholes. These observations are summarized in the following Table:

Borehole No.	Stabilized Water Level Elev.	P U M P I N G     T E S T S		
		Pumped Level	Time for Stabilization (hrs.)	Re-stabilized Water Level
1	262.0			
2	261.2			
4	273.0	227.0	3 days	271.0
5	260.2	252.7	5 "	260.3
6	262.7	248.7	4 "	261.7
7	266.0	238.2	5 "	268.2
8	260.3	240.3	1 day	259.8

These observations indicate that the sand and silt seams encountered in the lower portion of the glacial till deposit are water bearing. It is also concluded that the upper weathered portion of the shale bedrock is also water bearing.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to replace the existing structure at the crossing of Maple Avenue and the Q.E.W. with a new 4-span - (45'-77'-77'-66') structure in order to accommodate the Maple Avenue

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

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

re-alignment. The proposed structure will be some 90 ft. wide. The profile grade of Maple Avenue Revision will be such that fill heights will range from about 40 ft. at the south approach to only a few ft. at the north approach.

The subsoil conditions at the site consist of a cohesive glacial till deposit of hard consistency and 28 to 51 ft. in thickness, overlying a shale bedrock. Some fill material is present, adjacent to existing roadways, to depths of up to about 7 ft. below the ground surface.

6.2) Structure Foundations:

The subsoil conditions at the site are favourable for the support of the proposed structure foundations on spread footings.

In the case of the proposed piers, it is recommended that the spread footings be located at or below elevation 266. An allowable safe bearing pressure of 4 t.s.f. may be used for the design of the pier footings.

At the north approach, it is recommended that the abutment also be supported on spread footings located within the glacial till deposit at as high an elevation as possible. A safe allowable bearing pressure of 4 t.s.f. may be used for the design of this abutment footing.

In view of the proposed grade and the existing geometry of the ground surface at the south approach, the south abutment will be located within the approach fill. Two alternative schemes can be used for the support of the south abutment:

(a) The south abutment may be supported on spread footings located within the approach fill and designed for a safe allowable bearing pressure of 2 t.s.f. The fill material below the footings should consist of well-compacted G.B.C. 'A' material and should extend to a horizontal distance of at least 10 ft. from



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

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

(a) (cont'd.) ...

the footing edges in the plane of the footing top. This portion of the fill should be constructed with side slopes no steeper than 2:1. The remainder of the fill should be completed to about profile grade for at least a distance of 50 ft. behind the abutments before re-excavating for the footings.

(b) Alternatively, the south abutment may be supported on end-bearing piles driven to practical refusal within the weathered portion of the shale bedrock. The piles can be designed for the full capacity of the pile section chosen - for example, 12 BP 74 steel H-piles may be designed for 90 tons/pile. Care should be taken to ensure that no bouldery fill is placed in the area through which piles have to be driven.

It is recommended that all footings and pile caps be provided with a minimum of 4 ft. of soil cover for frost protection.

No major dewatering problems are anticipated during construction of the footings in view of the relatively impermeable nature of the cohesive subsoil. Any minor seepage into excavations can be handled by ordinary pumping methods.

6.3) Approaches:

The cuts for the north approach will be carried out within the competent glacial till deposit. No stability problems are anticipated with standard 2:1 slopes. No major stability problems are anticipated along the south approach, where the fill heights will be of the order of 40 ft. It is recommended that any organic soil located within the plan limits of the approach fill be sub-excavated, and the excavation so formed, backfilled with suitable granular material, in order to avoid excessive settlements.

7. MISCELLANEOUS:

The field work was undertaken by Mr. V. Korlu, Project Foundation Engineer, during the period February 27 - March 12, 1969.

Equipment used was owned and operated by Dominion Soil Investigation Limited.

This report was prepared by Mr. C. Mirza, Project Foundation Engineer.

The entire project was under the general supervision of Mr. M. Devata, Supervising Foundation Engineer, who also reviewed the report.

May 1969

APPENDIX I

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 69-F-10

LOCATION Sta. 28 + 84 ½ Maple Ave. Rev'n. o/s 43.5' Rt.

ORIGINATED BY VK

W.P. 369-65-1

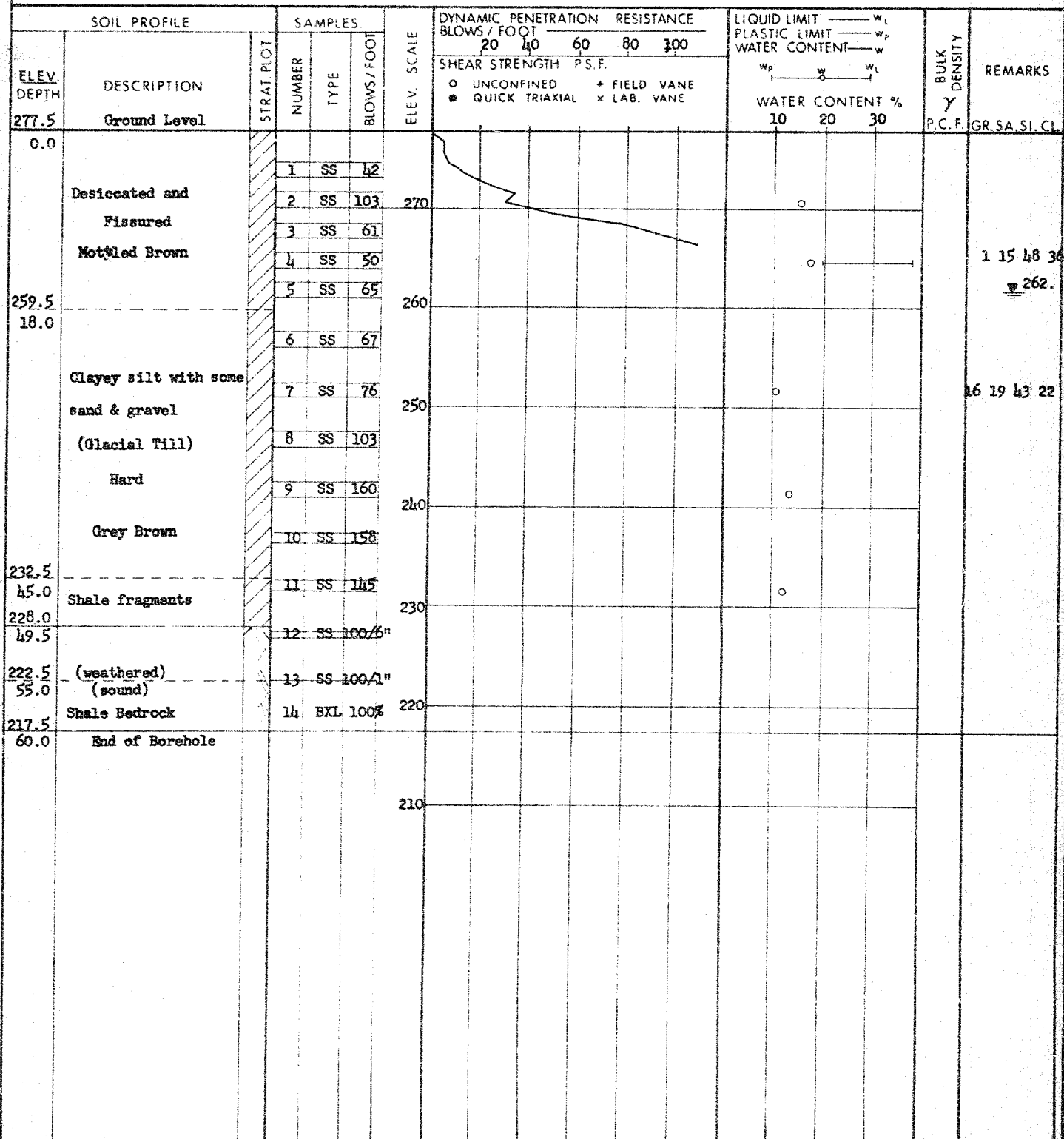
BORING DATE Feb. 27, 1969

COMPILED BY WH

DATUM Geodetic

BOREHOLE TYPE Washboring NX Casing Cane

CHECKED BY



DEPARTMENT OF HIGHWAYS - ONTARIO		<b>RECORD OF BOREHOLE No. 2</b>		FOUNDATION SECTION	
MATERIALS & TESTING OFFICE					
JOB 69-F-10	LOCATION Sta. 29 + 28 @ Maple Ave. Rev'n. o/s 43.5' Rt.	ORIGINATED BY		VK	
W.P. 369-65-1	BORING DATE March 3, 1969	COMPILED BY		WH	
DATUM Geodetic	BOREHOLE TYPE Washboring, NX Casing, Cone	CHECKED BY		AK.	

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$		BULK DENSITY $\gamma$ P.C.F.	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS / FOOT	20	40	60			80	100
269.7	Ground Level												
0.0	Desiccated Brown  Clayey silt with some sand & trace gravel  (Glacial Till)  Hard  Grey Brown		1	SS	105								
			2	SS	56								
259.7			3	SS	46	260							5 21 53 21 261.2
10.0			4	SS	70								
			5	SS	81								
			6	SS	72	250							1 30 53 16
			7	SS	95								
			8	SS	62	240							
			9	SS	85								
229.7					10	SS	100/6"	230					
40.0	(weathered)												
224.7	(sound)												
45.0	Shale Bedrock		11	BXL	100%	220							
			12	BXL	100%								
215.7													
54.0	End of Borehole					210							

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 4

FOUNDATION SECTION

JOB 69-F-10 LOCATION Sta. 29 + 11.0 Maple Ave. Rev'n. o/s 56' Lt. ORIGINATED BY VK  
 W.P. 369-65-1 BORING DATE March 12, 1969 COMPILED BY WH  
 DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing: Cone CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$		BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT		20 40 60 80 100	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE	WATER CONTENT % 10 20 30			
287.0	Ground Level										
0.0	Fill Material										
280.0	Silty sand, trace clay & organics.	1	SS	7							
7.0	Loose	2	SS	70	280						
		3	SS	82							
	Clayey silt with some sand & trace gravel (Glacial Till)	4	SS	70							
		5	SS	53	270						
		6	SS	35							
	Hard	7	SS	46	260						
	Grey Brown	8	SS	57							
		9	SS	54	250						
249.0											
38.0	occ. sand seams up to 12" in thickness	10	SS	72							
242.5											
44.5	Glacial Till with shale fragments	11	SS	95	240						
		12	SS	117							
	Reddish-grey	13	SS	53	230						
228.8											
226.8	(weathered)	14	SS	100/2"							
60.2	Sound										
222.8	Shale Bedrock	15	BXL	100%							
65.0	End of Borehole				220						

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 5

FOUNDATION SECTION

JOB 69-F-10

LOCATION Sta. 30 + 07 @ Maple Ave. Rev'n. o/s 43.5' Rt.

ORIGINATED BY VK

W.P. 369-65-1

BORING DATE March 5, 1969

COMPILED BY WH

DATUM Geodetic

BOREHOLE TYPE Washboring - NX Casing; Cone

CHECKED BY

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLT.	SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — W <sub>L</sub> PLASTIC LIMIT — W <sub>P</sub> WATER CONTENT — W			BULK DENSITY Y P.C.F.	REMARKS
			NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W <sub>p</sub>	W	W <sub>L</sub>		
268.7	Ground Level															
0.0	Desiccated		1	SS	67											
260.7	Brown		2	SS	69											
8.0			3	SS	42	260										
			4	SS	48											
	Clayey silt		5	SS	36											
	with some sand and		6	SS	54	250										
	trace gravel		7	SS	75											
	(Glacial Till)		8	SS	60	240										
	Hard		9	SS	129											
234.7			10	SS	100 2"	230										
34.0	occ. silt seams up to															
231.7	2" thick															
37.0																
228.7																
40.0	Weathered Shale															
223.6	Red		11	SS	100 4 1/2"											
45.1	End of Borehole					220										
	Probable Bedrock															Practical refusal to tricone bit.

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 69-F-10 LOCATION Sta. 30 + 85 @ Maple Ave. Rev'n. o/s 43.5' Rt. ORIGINATED BY VK  
W.P. 369-65-1 BORING DATE March 5, 1969 COMPILED BY WH  
DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing; Cone CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$			BULK DENSITY $\gamma$ P.C.F.	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F.					WATER CONTENT %					
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE					$w_p$ — $w$ — $w_L$					
268.7	Ground Level																
0.0	Desiccated		1	SS	70												
	Mottled		2	SS	68												
	Brown		3	SS	58												
254.7			4	SS	60												
14.0	Clayey silt		5	SS	49												
	with some sand and		6	SS	54												
	trace gravel		7	SS	64												
	(Glacial Till)		8	SS	44												
	Hard		9	SS	110												
234.7	Grey - Brown																
34.0	with shale fragments																
230.0	(weathered)																
228.7																	
40.0	Shale Bedrock		10	BXL	100%												
	Sound		11	BXL	100%												
218.7																	
50.0	End of Borehole																



DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 69-F-10

LOCATION Sta. 30 + 86 1/2 Maple Ave. Rev'n. o/s 45' Lt.

ORIGINATED BY VK

W.P. 369-65-1

BORING DATE March 10, 1969

COMPILED BY WH

DATUM Geodetic

BOREHOLE TYPE Washboring, NX Casing; Cone

CHECKED BY

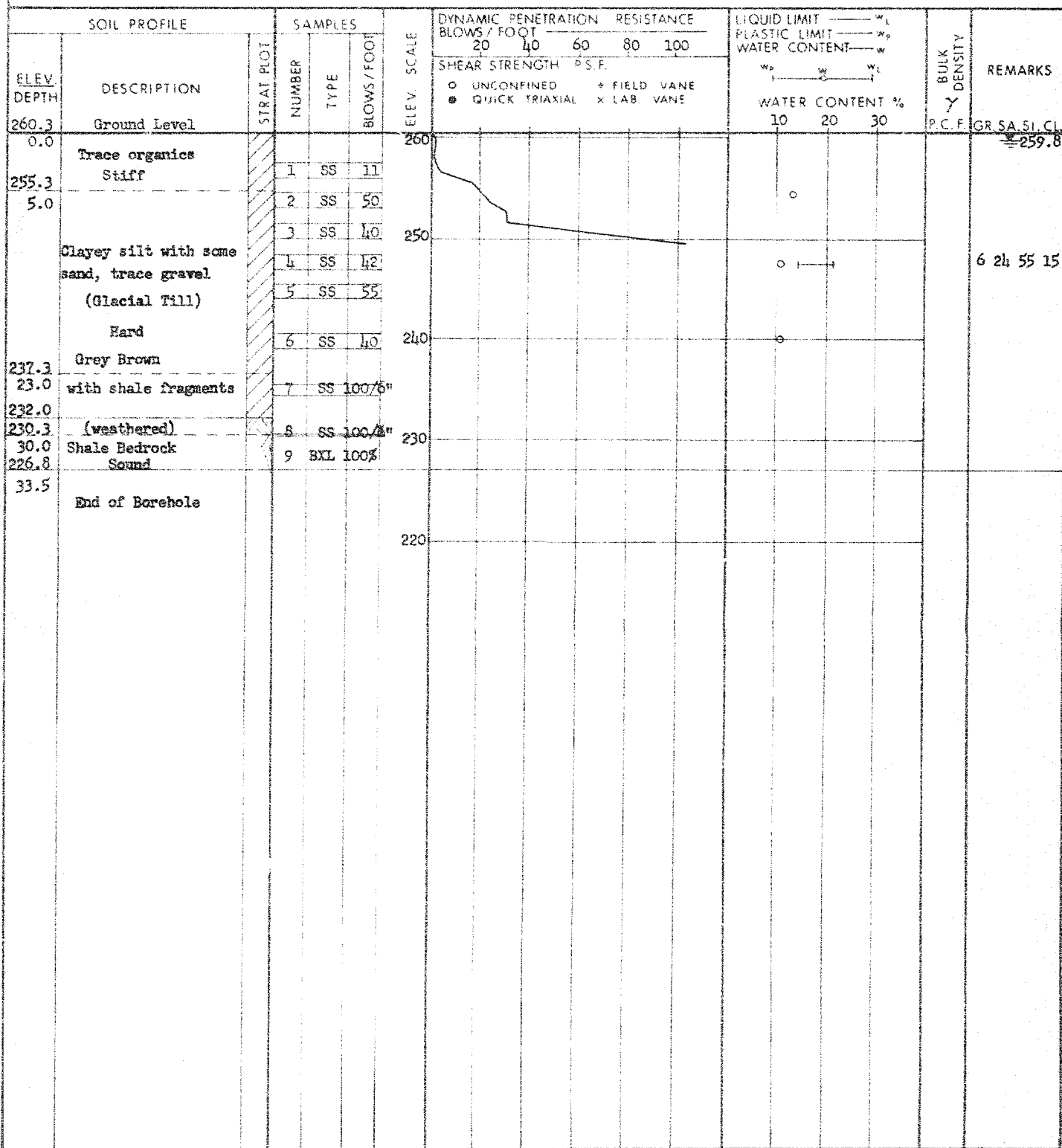
SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$			BULK DENSITY $\gamma$	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.				WATER CONTENT %				
							○ UNCONFINED		+ FIELD VANE		$w_p$ — $w$ — $w_L$				
						● QUICK TRIAXIAL		x LAB. VANE							
288.2	Ground Level														
0.0	Clayey silt with some sand, trace organics (Fill Material) Very stiff		1	SS	15										
281.7			2	SS	38										
6.5	Desiccated Mottled Brown		3	SS	53	280									
			4	SS	97										
272.2			5	SS	67										
16.0	Clayey silt with some sand & trace of gravel (Glacial Till)		6	SS	67	270									
			7	SS	59	260									
			8	SS	48										
	Hard Grey Brown		9	SS	63	250									
			10	SS	67										
			11	SS	107	240									
			12	SS	106										
235.2	with shale fragments		13	SS	136/10"	230									
53.0	(weathered)														
230.0															
228.2															
60.0	Shale Bedrock Sound		14	BXL	100%										
223.2															
65.0	End of Borehole					220									

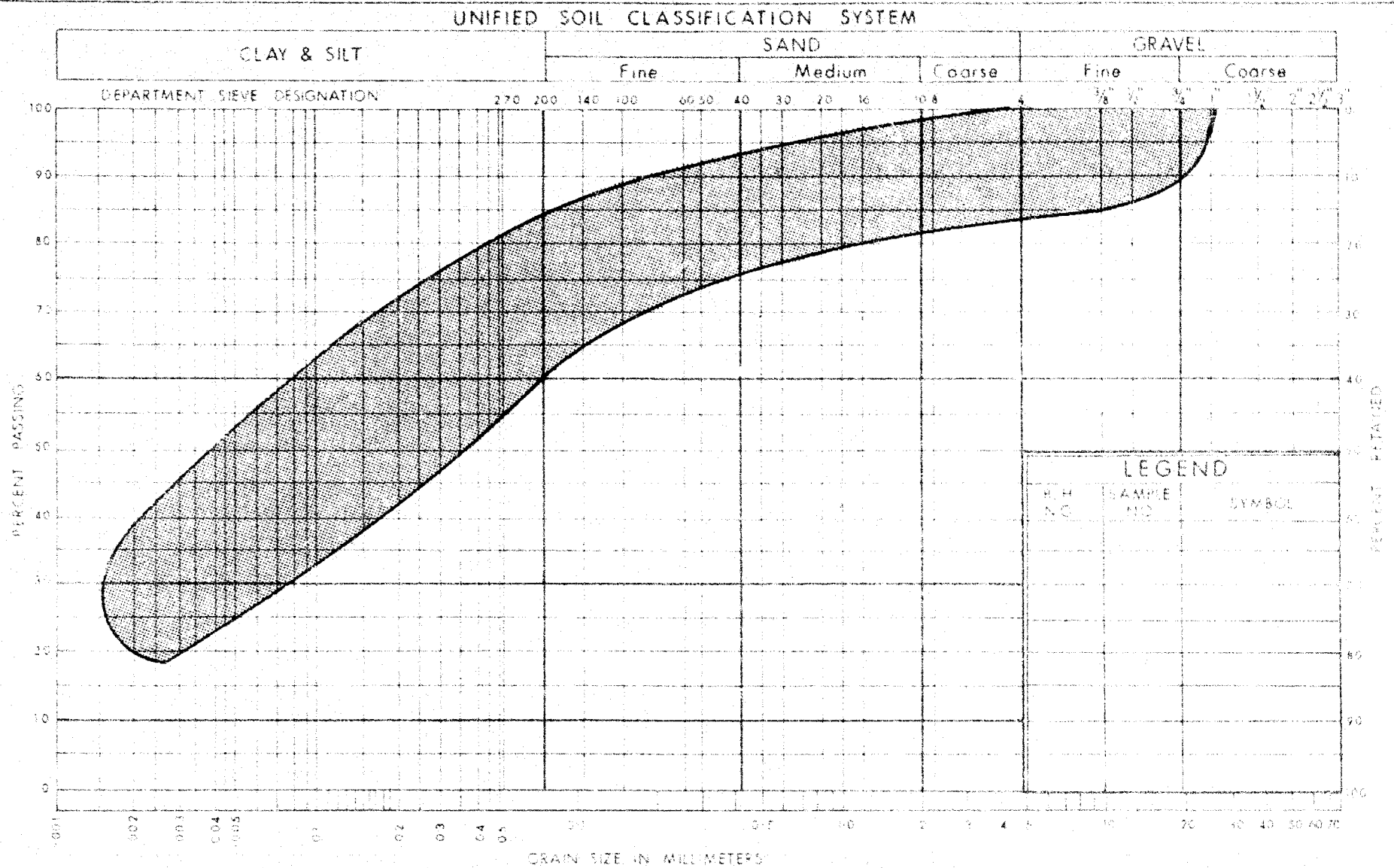
DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

JOB 69-F-10 LOCATION Sta. 31 + 51 @ Maple Ave. Rev'n. o/s 43.5' Rt. ORIGINATED BY VK  
 W.P. 369-65-1 BORING DATE March 7, 1969 COMPILED BY VK  
 DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing, Cone CHECKED BY





DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

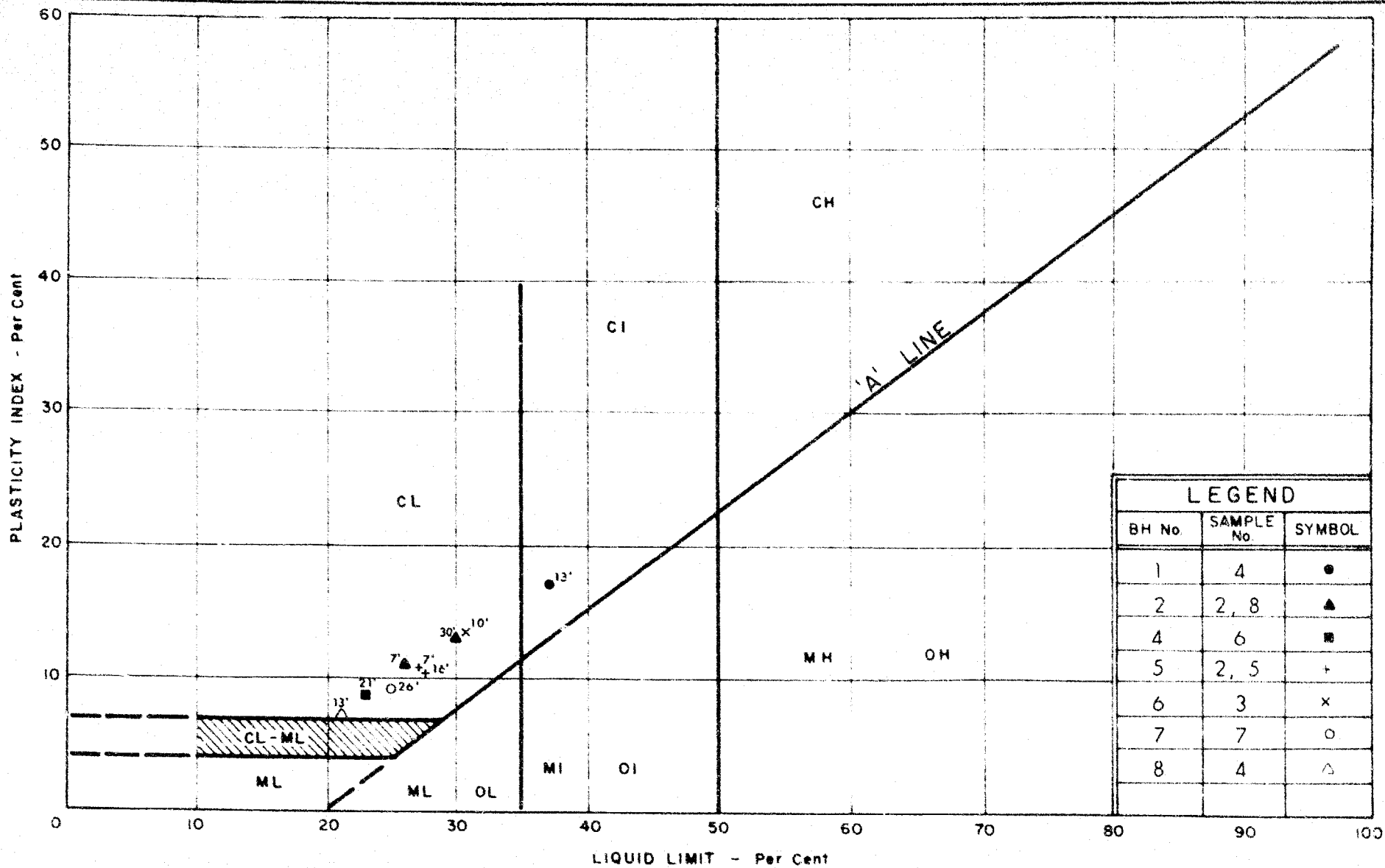
# GRAIN SIZE DISTRIBUTION

## GLACIAL TILL

WP No. 369 - 65 - 1

JOB No. 69 - F - 10

FIG. 1



DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

# PLASTICITY CHART

GLACIAL TILL

WP No. 369 - 65 - 1

JOB No. 69 - F - 10

FIG. 2

## ABBREVIATIONS USED IN THIS REPORT

### PENETRATION RESISTANCE

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

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

### DESCRIPTION OF SOIL

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

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

### TYPE OF SAMPLE

SS	SPLIT SPOON	TW	THINWALL OPEN
WS	WASHED SAMPLE	TP	THINWALL PISTON
SB	SCRAPER BUCKET SAMPLE	OS	OESTERBERG SAMPLE
AS	AUGER SAMPLE	FS	FOIL SAMPLE
CS	CHUNK SAMPLE	RC	ROCK CORE
ST	SLOTTED TUBE SAMPLE		
	P-H		SAMPLE ADVANCED HYDRAULICALLY
	P-M		SAMPLE ADVANCED MANUALLY

### SOIL TESTS

CU	UNCONFINED COMPRESSION	LV	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	FV	FIELD VANE
QCU	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
CD	DRAINED TRIAXIAL	S	SENSITIVITY

## ABBREVIATIONS USED IN THIS REPORT

### SOIL PROPERTIES

$\gamma$	UNIT WEIGHT OF SOIL (BULK DENSITY)
$\gamma_s$	UNIT WEIGHT OF SOLID PARTICLES
$\gamma_w$	UNIT WEIGHT OF WATER
$\gamma_d$	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
$\gamma'$	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
$\tau$	SHEAR STRENGTH
c	EFFECTIVE COHESION INTERCEPT
$\phi$	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
$c_u$	APPARENT COHESION
$\phi_u$	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
$\mu$	COEFFICIENT OF FRICTION
S	SENSITIVITY

### GENERAL

$\pi$	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
$\sigma$	NORMAL STRESS
$\bar{\sigma}$	NORMAL EFFECTIVE STRESS ( $\bar{\sigma}$ IS ALSO USED)
$\tau$	SHEAR STRESS
$\epsilon$	LINEAR STRAIN
$\gamma$	SHEAR STRAIN
$\nu$	POISSON'S RATIO ( $\mu$ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
$\eta$	COEFFICIENT OF VISCOSITY

### EARTH PRESSURE

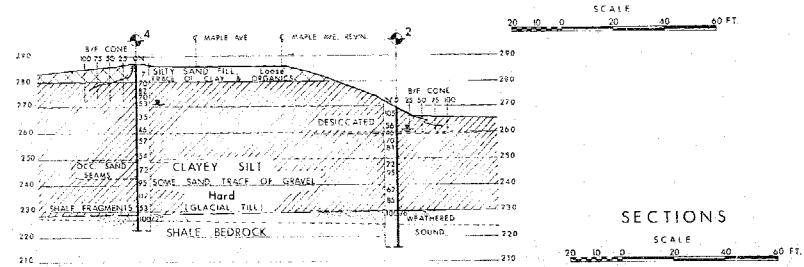
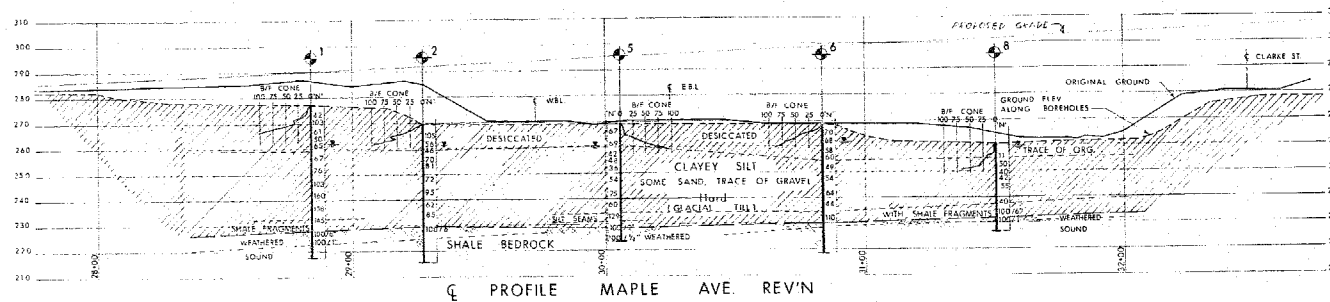
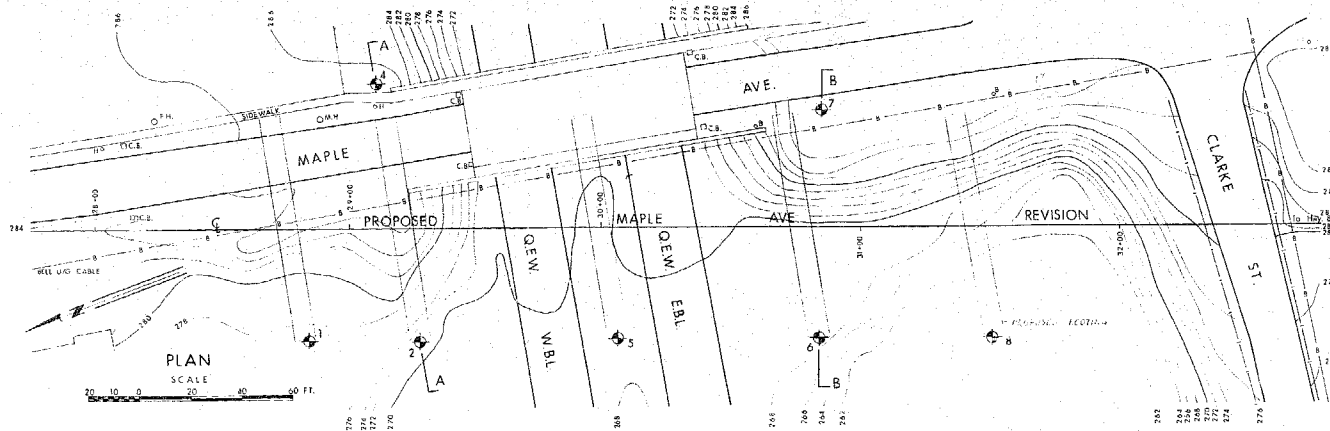
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
$\delta$	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
$K_0$	COEFFICIENT OF EARTH PRESSURE AT REST

### FOUNDATIONS

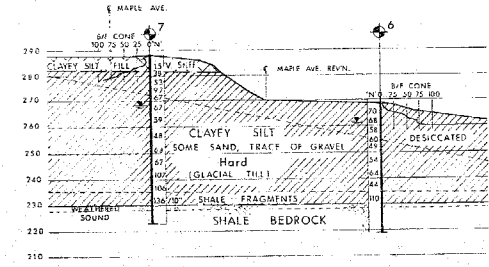
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC IN THE FORMULA FOR BEARING CAPACITY
$k_s$	MODULUS OF SUBGRADE REACTION

### SLOPES

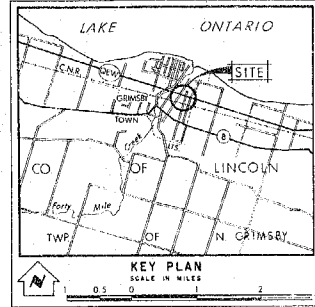
H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
$\beta$	ANGLE OF SLOPE TO HORIZONTAL



A - A



B - B



LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation, MAR 1969		

NO.	ELEVATION	STATION	OFFSET
1	277.5	78+84	43.5' RT.
2	269.7	29+28	43.5' RT.
3	DELETED		
4	287.0	79+11	56' LT.
5	268.6	30+07	43.5' RT.
6	268.7	30+85	43.5' RT.
7	268.2	30+86	45' LT.
8	260.3	31+51	43.5' RT.

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

REVISIONS	DATE	DESCRIPTION

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

**MAPLE AVE. REVISION**

KING'S HIGHWAY NO. Q.E.W. DIST. NO. 4  
CO. LINCOLN TOWN OF GRIMSBY  
TWP. N. GRIMSBY LOT 8 CON. 1

**BORE HOLE LOCATIONS & SOIL STRATA**

SUBNO. V.N. CHECKED *[initials]* W.P. NO. 369-65-1 M.B.T. DRAWING NO.  
DRAWN A.N. CHECKED *[initials]* JOB NO. 0-9-F-10 69-F-10A  
DATE MAY 14, 1969 SITE NO. BRIDGE DRAWING NO.  
APPROVED *[initials]* CONT. NO.





76-117 FIELD RECONNAISSANCE REPORT  
REQUIRED BY FOUNDATION SECTION  
FOR

69-F-10  
MAPLE AVE / Q.E.W.  
FF-69  
SEPT. 1968

W.P. NO. 369-65-1 HIGHWAY NO. Q.E.W. DISTRICT 4 SITE PLAN NO. E4919-1 PROFILE NO. \_\_\_\_\_  
RIVER CROSSING ☐ GRADE SEPERATION ☒ R.R.X. ☐ OTHER (SPECIFY) \_\_\_\_\_  
ALTERNATE SCHEME (IF ANY) \_\_\_\_\_

EXISTING SITE CONDITIONS

DESCRIPTION:

TOPOGRAPHY: HILLY ☐ ROLLING ☐ VALLEY ☐ GULLIED ☒ FLAT ☐  
VEGETATION: TREES ☐ BRUSH ☐ GRASS ☒ SWAMP ☐ FARM CROPS ☐ CLEARED ☐  
SNOW COVER: 0"-6" ☒ 6"-12" ☐ >12" ☐  
ROCK OUTCROP (SPECIFY LOCATIONS) NONE OBSERVED

UNDERGROUND UTILITIES:

UTILITY COMPANY

TELEPHONE NO. FOR DEFINITE LOCATION

1. HYDRO - CENTRE MEDIAN LIGHT STANDARDS
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

EXISTING STRUCTURE(S):

FOUNDATIONS: SPREAD FOUNDATIONS ☒ SIZE 4'6" x 2' x 44' ELEVATION(S) 268.18 TOP OF FOOTING  
PILES ☐ TYPE \_\_\_\_\_ LENGTH(S) \_\_\_\_\_  
DESIGN LOAD 20 T.S.F. \_\_\_\_\_ TONS/PILE  
CONDITION OF STRUCTURE Good

APPROACHES: CUT ☒ FILL ☐ SIDE SLOPES 1:1 APPROX.  
BERMS YES ☐ NO ☒

OTHER OBSERVATIONS (USE BACK OF SHEET TO DESCRIBE ANY FAILURES IN AREA, PAST PERFORMANCE OF EXISTING APPROACHES & STRUCTURE, ETC.)

ACCESSIBILITY

IS STRUCTURE LOCATED ON D.H.O. RIGHT OF WAY? YES ☐ NO ☐ IF NO, PARTIAL?  
HAS PERMISSION BEEN OBTAINED TO ENTER PROPERTY? YES ☐ NO ☒ IF NO, \_\_\_\_\_  
PROPERTY OWNER(S):

NAME

ADDRESS

TELEPHONE NO.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

WHO WILL OBTAIN NECESSARY PERMISSION? FOUNDATION SECTION

HAS SITE BEEN SURVEYED & STAKED? YES ☒ NO ☐ IF YES, DATE OF MOST RECENT SURVEY SEPT. '67

WILL CLEARING BE NECESSARY TO ENTER SITE AREA? YES ☐ NO ☒

IS SITE ACCESSIBLE TO WHEELED VEHICLES? YES ☒ NO ☐

IF RIVER CROSSING:

WILL A RAFT BE NECESSARY? YES ☐ NO ☐ IF YES, GIVE MAX. DEPTH OF WATER \_\_\_\_\_ FT.  
CURRENT: SWIFT ☐ MODERATE ☐ SLOW ☐

DRILLING OPERATIONS

NEAREST SOURCE OF WATER (GIVE HAULING DISTANCE, IF KNOWN) 150' OFF N.E. CORNER OF MAPLE  
ADDITIONAL INVESTIGATION REQUIRED FOR THE FOLLOWING PURPOSES: AVE & Q.E.W. BRIDGE. HYDRANT

ALTERNATE SCHEME: YES ☐ NO ☒ IF YES, SPECIFY \_\_\_\_\_

HYDROLOGIC REASONS: YES ☐ NO ☒ IF YES, SPECIFY (SCOUR, ETC.) \_\_\_\_\_

REMARKS

NEAREST AVAILABLE ACCOMODATION: Grimsby

OTHER COMMENTS: \_\_\_\_\_

DATE FEB. 1969

REGIONAL BRIDGE LOCATION ENGINEER

# VISUAL CLASSIFICATION SHEET

PROJECT <u>69-F-10</u>		SITE <u>QEW-McPHE AVE</u>		BOREHOLE No. <u>1</u>		GROUND ELEVATION <u>277.5</u>										
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DILATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL		
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL											SAND	SILT & CLAY
1	3-4½	¼"	sub-angular	Tr	15	85		shiny	none	High	Earthy	Mottled Brown	No	42	clayey silt with some sand, Tr. Gravel Tr. organic as coatings along fissures	CL
2	6-7½	¼"	"	5	15	80		"	"	"	"	"	strong	103	clayey silt with some sand Tr. Gravel Till-like Texture, but stratif. appearance	CL
3	9-10½	½"	angular	Tr	15	85		"	"	"	"	"	"	61	clayey silt with some sand, Tr. Gravel Till-like texture	CL
4	12-13½	#4 USS	sub-angular	0	15	85		"	"	"	"	"	"	50	- - -	CL
5	15-16½	#4 USS	"	Tr	10	90		"	"	"	"	Brown	"	65	- - -	CL
6	20-21½	#4 USS	"	0	15	85		"	"	Med	"	Grey Brown	"	67	- - -	CL
7	25-26½	1"	"	10	20	70		"	"	"	"	"	"	76	clayey silt with some sand, occ. gravel sizes Till-like texture	CL
8	30-31½	#4 USS	"	Tr	15	85		"	"	"	"	"	"	103	- - - occ. Red shale inclusions	CL
9	35-36½	#4 USS	"	Tr	15	85		"	"	"	"	"	"	160	- - -	

NOTES:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

DEPARTMENT OF HIGHWAYS — ONTARIO  
MATERIALS AND TESTING DIVISION

# VISUAL CLASSIFICATION SHEET

PROJECT <u>69-F-10</u> SITE <u>QEW - Maple Ave</u> BOREHOLE No. <u>1</u> GROUND ELEVATION <u>277.5</u>																	
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			GRAVEL	SAND	SILT & CLAY	DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE													
10	40-41½	#4 USS	sub angular	Tr	15	85		shiny	none		High-Med	Earthy	Grey Brown	strong	158	clayey silt with some sand - Glacial Till	CL
11	45-46½	¼"	"	Tr	15	85		"	"		High	"	" change to Red	"	145	- " - change to weathered shaley glacial Till	CL
12	50-50½		angular										Red with green		100/6	weathered shale - sand seams?	CL - CI

NOTES:- VISUAL CLASSIFICATION MUST BY CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

# VISUAL CLASSIFICATION SHEET

PROJECT 69-F-10 SITE QEW-Maple Ave BOREHOLE No. 2 GROUND ELEVATION 269.7

SAMPLE NO.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	3-4½	½"	sub-angular	5	15	80		shiny	none	High	Earthy	Brown	Strong	105	clayey silt with some sand, Tr. Gravel. Glacial Fissured, Root fragment. Till	CL
2	6-7½	#4 USS	"	0	15	85		"	"	"	"	Dark Brown	"	56	clayey silt with some sand - Glacial Till	CL
3	9-10½	¾"	angular	Tr	15	85		"	"	"	"	Brown	"	46	- " -	CL
4	12-13½	1"	sub-angular	Tr	15	85		"	"	Med-High	"	Grey Brown	"	70	- " -	CL
5	15-16½	¾"	"	5	15	80		"	"	Med	"	"	"	81	- " - occ. gravel	CL
6	20-21½	1"	angular	Tr	20	80		"	"	"	"	"	"	72	- " - with 3" thick f. sand seam	CL
7	25-26½	#4 USS	sub angular	0	15	85		"	"	High	"	"	"	95	- " - occ. sand Pocket (1"φ)	CL
8	30-31½	#10 USS	"	0	5	95		"	"	Med	"	"	"	62	clayey silt Tr sand occ. small shale frags	CL
9	35-36½	½"	angular	Tr	15	85		"	"	Med-High	"	"	"	85	clayey silt with some sand, Tr. Gravel Glacial Till	CL

10 40-40½  
NOTES:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.  
Red " 100/6" weathered shale glacial Till CI

REMARKS:-

DEPARTMENT OF HIGHWAYS — ONTARIO  
MATERIALS AND TESTING DIVISION

# VISUAL CLASSIFICATION SHEET

PROJECT <u>69-F-10</u>		SITE <u>GEW-Maple Ave</u>		BOREHOLE No. <u>4</u>		GROUND ELEVATION <u>287.0</u>										
SAMPLE NO.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL		
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	3-4 1/2	#20 USS	angular	0	50	50		dull	slow	low	Earthy	Brown	No	7	silty fine- med sand with some clay. Topsoil?	SM
2	6-7 1/2	10" 8	sub- angular	5	15	80		shiny	none	High	"	Mottled Brown	Strong	70	clayey silt with some sand Tr. Gravel, - Glacial Till	CL
3	9-10 1/2	"	"	5	15	80		"	"	"	"	"	"	82	"	CL
4	12-13 1/2	#4 USS	"	Tr	15	85		"	"	"	"	"	"	70	"	CL
5	15-16 1/2	"	"	Tr	10- 15	90 85		"	"	"	"	Brown	"	53	"	CL
6	20-21 1/2	"	"	Tr	15	85		"	"	"	"	Grey Brown	"	35	"	CL
7	25-26 1/2	2" 8	sub- rounded	3	12	85		"	"	"	"	"	"	46	"	CL
8	30-31 1/2	#4 USS	sub- angular	Tr	15	85		"	"	"	"	"	"	57	" occ. shale fragments	CL
9	35-36 1/2	2" 8	"	Tr	15	85		"	"	"	"	"	"	54	"	CL

NOTES:- VISUAL CLASSIFICATION MUST BY CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

# VISUAL CLASSIFICATION SHEET

[illegible]

REMARKS:—

DEPARTMENT OF HIGHWAYS — ONTARIO  
MATERIALS AND TESTING DIVISION

# VISUAL CLASSIFICATION SHEET

PROJECT <u>69-F-10</u> SITE <u>QEW-Maple Ave</u> BOREHOLE No. <u>5</u> GROUND ELEVATION <u>268.7</u>																
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL		
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	3-4 1/2	1/2"	sub-angular	5	20	75		shiny	none	High	Earthy	Brown	strong	67	clayey silt with some sand, Tr Gravel glacial Till	CL
2	6-7 1/2	1/4"	"	Tr	20	80		"	"	"	"	"	69	" - " - Fissured	CL	
3	9-10 1/2	1/2"	"	in sample as whole	25	30	45	"	"	"	"	Grey Brown	"	42	" - " - vcc. Gravel.	CL
4	12-13 1/2	1"	"	5	25	70		"	"	"	"	"	48	"	CL	
5	15-16 1/2	1"	"	10	20	70		"	"	Med	"	"	36	"	CL	
6	20-21 1/2	1"	"	10	20	70		"	"	High	"	"	54	"	CL	
7	25-26 1/2	1/2"	"	5	15	80		"	"	"	"	"	75	"	CL	
8	30-31 1/2	1/4"	angular	5	15	80		"	"	"	"	"	60	"	CL	
9	35-36 1/2	1/4"	"	Tr	15	85		shiny	none	High	"	"	129	" - " - WITH SILT SEAMS	CL	
10	40-41 1/2	3/4"	subangular			100		dull	Quick	"	"	Grey	"	WEATHERED STATE	ML	

NOTES:- VISUAL CLASSIFICATION MUST BY CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

# VISUAL CLASSIFICATION SHEET

PROJECT <u>69-F-10</u> SITE <u>QEW- Maple Ave</u> BOREHOLE No. <u>6</u> GROUND ELEVATION <u>268.7</u>																
SAMPLE NO.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL		
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL											SAND	SILT & CLAY
1	3-4½	#4 USS	sub-rounded	Tr	15	85		shiny	None	High	Earthy	Mottled Brown	Strong	70	clayey silt with some sand & Tr. Gravel - occ. shale fragments - glacial Till	CL
2	6-7½	½"	sub-angular	Tr	15	85		"	"	"	"	Brown	"	68	clayey silt with some sand & Tr. gravel - glacial Till - fissures	CL
3	9-10½	¼"	"	Tr	20	80		"	"	"	"	Grey Brown	"	58	- " -	CL
4	12-13½	¼"	"	Tr	20	80		"	"	"	"	Brown	"	60	- " -	CL
5	15-16½	¾"	"	10	15	75		"	"	Med	"	Grey Brown	"	49	- " - occ. shale fragments	CL
6	20-21½	#4 USS	"	5	15	80		"	"	Med-High	"	"	"	54	- " - - " -	CL
7	25-26½	1"	"	20	20	60		"	"	high	"	"	"	64	- " - ½ shale pieces	CL
8	30-31½	¼"	"	Tr	20	80		"	"	Med	"	"	"	44	- " - ½ occ. shale fragments	CL
9	35-36½	¼"	"	10	20	70		"	"	High	"	Red	"	110	shaley glacial Till	CL CI

NOTES:- VISUAL CLASSIFICATION MUST BY CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-



DEPARTMENT OF HIGHWAYS — ONTARIO  
MATERIALS AND TESTING DIVISION

# VISUAL CLASSIFICATION SHEET

PROJECT 69-F-10 SITE QEW- Maple Ave BOREHOLE No. 7 GROUND ELEVATION 288.2

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE	GRAVEL	SAND	SILT & CLAY									
1	3-4½	¼"	sub-angular	5	10	85		shiny	none	med	Earthy	Brown	weak	15	clayey silt with Tr. sand & gravel, Tr. org. matter, sand seam(?) glacial till fill	CL
2	6-7½	#4 USS	"	Tr	15	85		"	"	"	"	"	strong	38	clayey silt with some sand, Tr. Gravel- glacial Till	CL
3	9-10½	½"	"	Tr	15	85		"	"	High	"	Mottled Brown	"	53	- " - fissured	CL
4	12-13½	¾"	angular	70	10	20		"	"	"	"	Brown	"	97	- " - with gravel	CL
5	15-16½	¾"	sub-angular	Tr	10	90		"	"	"	"	"	"	67	- " -	CL
6	20-21½	½"	"	3	15	82		"	"	"	"	Grey Browns	"	59	- " -	CL
7	25-26½	1"	"	6	19	75		"	"	"	"	"	"	48	- " -	CL
8	30-31½	¾"	"	5	15	80		"	"	med	"	"	"	63	- " - acc. shale fragment	CL
9	35-36½	¾"	"	5	15	80		"	"	"	"	"	"	67	- " -	CL

NOTES:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

# VISUAL CLASSIFICATION SHEET

PROJECT 69-F-10 SITE QEW- Maple Ave BOREHOLE No. 7 GROUND ELEVATION 288.2

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
10	40-41 1/2	#4 USS	sub-angular	5	15	80		shiny	none	med	Earthy	Grey-Brown	strong	67	clayey silt with some sand & Tr Gravel - Glacial Till	CL
11	45-46 1/2	#4 USS	"	5	15	80		"	"	High	"	"	"	107	- " -	CL
12	50-51 1/2	#4 USS	sub-rounded	15	15	70		"	"	"	"	"	"	106	- " - some gravel	CL
13	55-56 1/2	1" USS	angular	55	25	40		"	"	"	"	Red	"	130/10	Boundary - shaley Till with weathered shale. Glacial Till has shale incorp. into its texture	CL, CI

NOTES:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

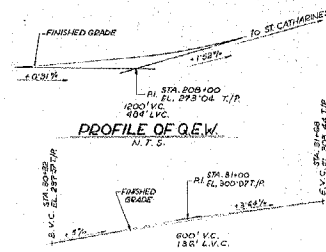
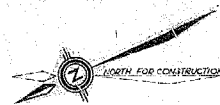
REMARKS:-

# VISUAL CLASSIFICATION SHEET

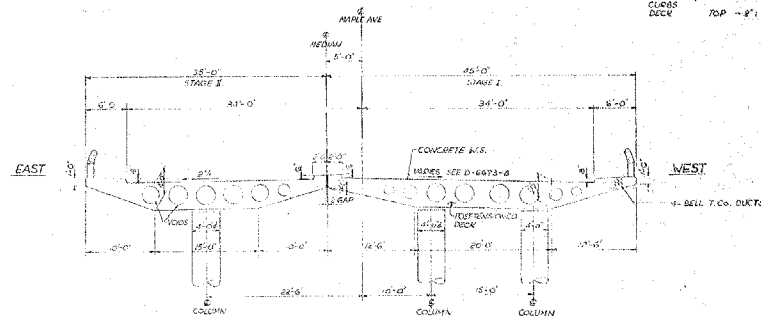
PROJECT <u>69-F-10</u> SITE <u>QEW-Maple Ave</u> BOREHOLE No. <u>8</u> GROUND ELEVATION <u>260.3</u>																
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL		
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL											SAND	SILT & CLAY
1	3-4½	½"	sub-angular	20	10	70		shiny	none	Low	org-Earthy	Black mott. Brown	No	11	Topsoil → clayey silt with some sd gr - Till	CL
2	6-7½	¼"	sub-rounded	10	15	75		"	"	High	Earthy	Mottled Brown	strong	50	clayey silt with some sand & gravel - Glacial Till (Fissured)	CL
3	9-10½	½"	sub-angular	5	15	80		"	"	"	"	Grey Brown	"	40	- " -	CL
4	12-13½	1"	"	10	10	80		"	"	med	"	"	"	42	- " -	CL
5	15-16½	¾"	"	5	15	80		dull-shiny	"	High	"	"	"	55	- " - occ shale fragments	CL
6	20-21½	¾"	"	5	10	85		shiny	"	Med	"	"	"	40	- " - - " -	CL
7	25-26½	1"	sub-rounded	25	75	60		"	"	-	"	Red	"	100/6"	- " - shaley glacial Till	CI. CL
8	30-31½	#4 US	"	75	25	75		"	"	"	"	"	"		weathered shale	CI

NOTES:- VISUAL CLASSIFICATION MUST BY CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

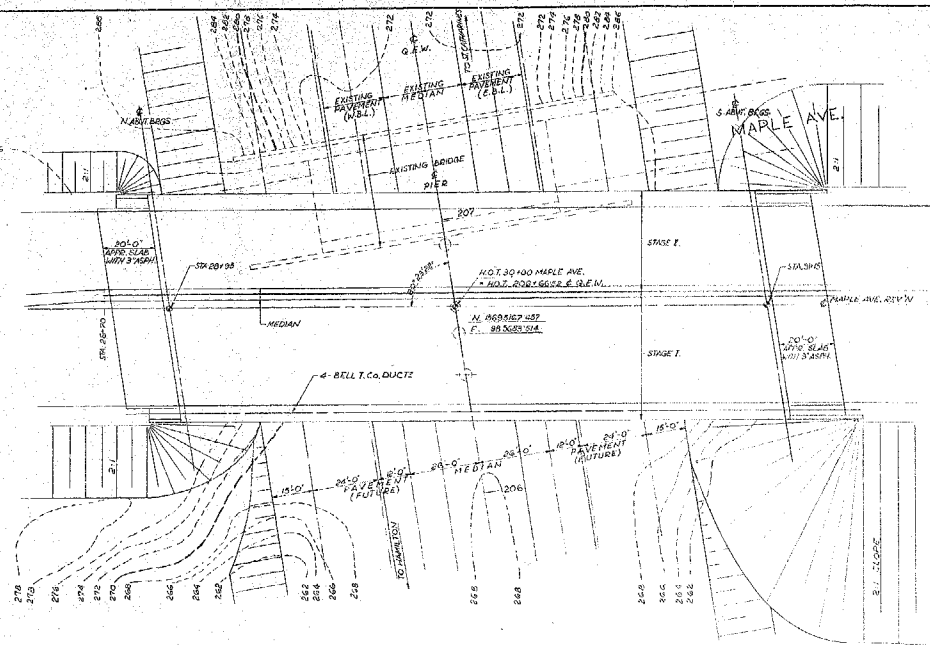


PROFILE OF MAPLE AVE. REV'D  
N.T.S.

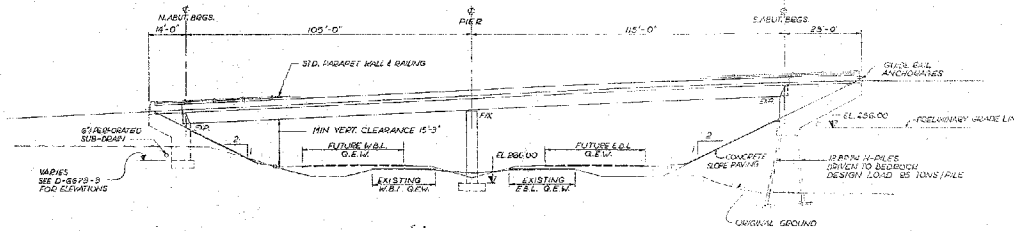


DECK SECTION  
SCALE 1/8" = 1'-0"

- LIST OF DRAWINGS**
- D-6673-1: GENERAL DRAWING
  - D-6673-2: BENT HOLE LOCATIONS & SOIL SHEETS
  - D-6673-3: FOOTING DETAILS (STAGE I)
  - D-6673-4: FOOTING DETAILS (STAGE II)
  - D-6673-5: N. ABUTMENT & RETAINING WALLS
  - D-6673-6: S. ABUTMENT & RETAINING WALLS
  - D-6673-7: PIER DETAILS
  - D-6673-8: DECK JOINTS AND ELEVATIONS
  - D-6673-9: DECK REINFORCING (STAGE I)
  - D-6673-10: DECK REINFORCING (STAGE II)
  - D-6673-11: CABLE DETAILS
  - D-6673-12: BRACKET WALL DETAILS
  - D-6673-13: STANDARD STEEL SHEET PILE
  - D-6673-14: APPROXIMATE SLABS
  - D-6673-15: DETAILS OF CONC. SLOPE PAVING
  - D-6673-16: STANDARD DETAILS



PLAN  
SCALE 1" = 20'-0"



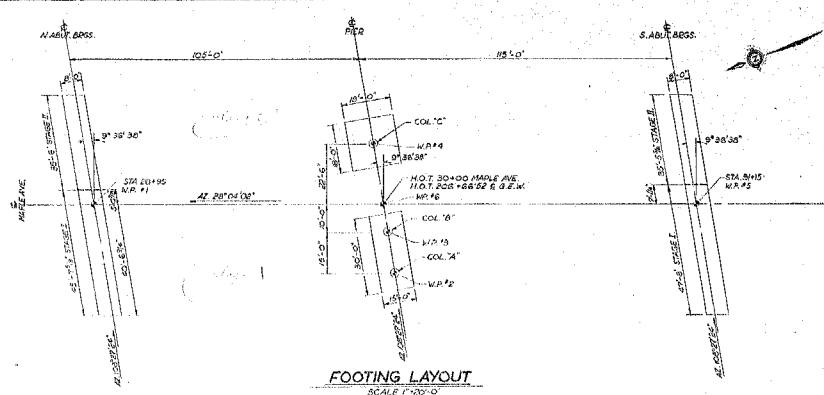
ELEVATION  
SCALE 1" = 20'-0"

B.M. 262.03  
CUT CROSS ON S.E. COR. OF 4"X4" CONC. CURB  
88' RT. OF S.W. COR. OF (G.E.W.)  
ON 1 RT. OF S.W. 33.150

REVISION	DATE	DESCRIPTION
1		
2		
3		
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9		
10		

DEPARTMENT OF HIGHWAYS, ONTARIO	
BRIDGE DIVISION	
89 F-10	
MAPLE AVE. UNDERPASS	
TOWN OF GRIMSBY	
ENG'S HIGHWAY No. G.E.W.	DIST. No. 4
CO. LINCOLN	
TWP. TOW. OF GRIMSBY	LOT 5 CON. 1
GENERAL DRAWING	
APPROVED	DATE 10-15-75
DESIGN	CONTRACT No.
DRAWING	NO. D-6673-1

FOR REDUCED PLAN  
10 11 12 13  
1" = 20' ON ORIGINAL PLAN



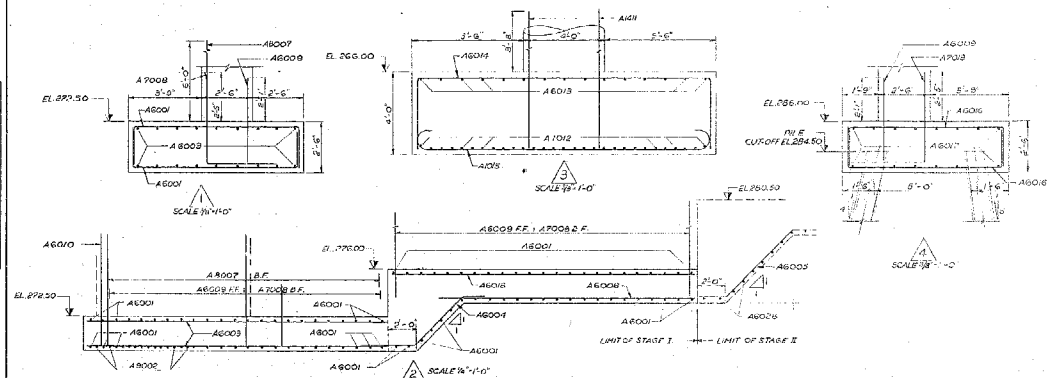
**FOOTING LAYOUT**  
SCALE 1"=20'-0"

DESCRIPTION	CO-ORDINATES	
	NORTH	EAST
W.P. #1	15 695 260.100	985 782.817
#2	15 695 173.485	985 660.463
#3	15 695 170.660	985 673.894
#4	15 695 160.893	985 700.160
#5	15 695 045.982	985 620.408
#6	15 695 187.459	985 658.514

FILE DATA				
LOCATION	STAGE	NO OF FILES	CUT OFF EL	LENGTH
S. ABUTMENT	1	14	244.50	53'-0"
	2	9	243.50	53'-0"

DESIGN & CONSTRUCTION DESIGN LOAD ON PILES

NOTE  
N. ABUT. & PIER FOOTINGS TO BE CAST ON UNDISTURBED SOIL



REVISIONS	DATE	BY	DESCRIPTION
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DEPARTMENT OF HIGHWAYS, ONTARIO  
BRIDGE DIVISION

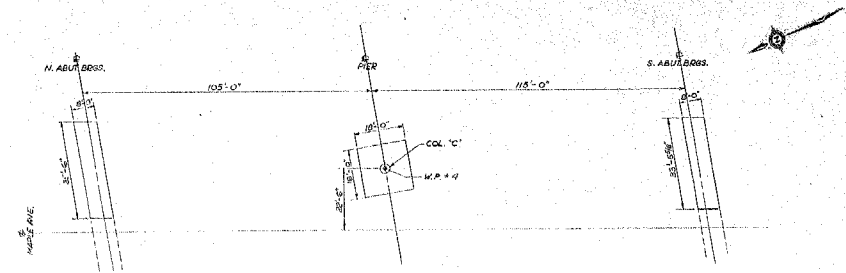
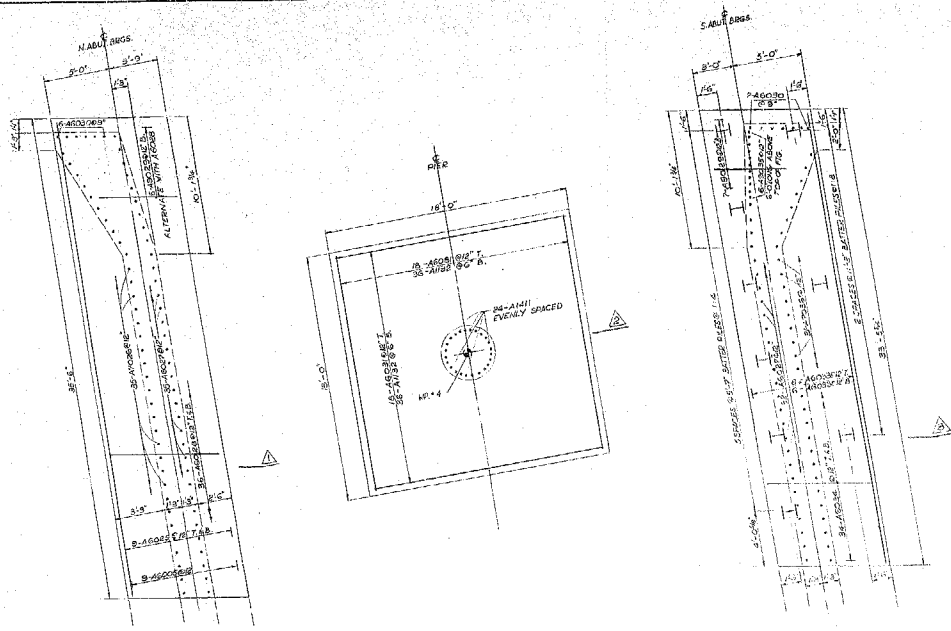
MAPLE AVE. UNDERPASS  
TOWN OF GRIMSBY

KING'S HIGHWAY No. G.E.W. DIST. No. 4  
CO. LINCOLN  
TWP. TOWN OF GRIMSBY LOT 8 CON. 1

FOOTING DETAILS (STAGE I.)

APPROVED _____				SITE No. 13-15		W.P. No. 369-65-	
INSUR. ENGINEER _____				CONTRACT No. _____			
DESIGN	R. H.	CHECK	D. R. G.				
DRAWING	A. H.	CHECK	R. H.	DRAWING No. D-6673-3			
DATE	MAY 17 1966						

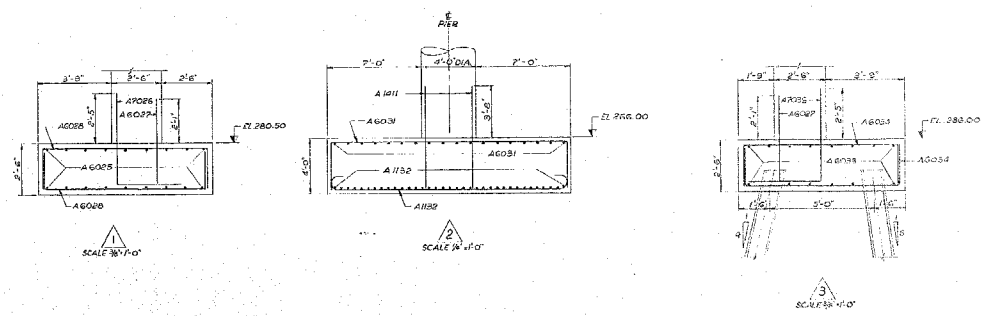




**FOOTING LAYOUT  
STAGE II**  
SCALE 1" = 20'-0"

NOTE  
FOR FURTHER INFORMATION SEE D-6673-3

**REINFORCING OF FOOTINGS  
STAGE II**  
SCALE 1/4" = 1'-0"



REVISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO			
BRIDGE DIVISION			
68-10-10			
<b>MAPLE AVE UNDERPASS</b>			
TOWN OF GAINSBURY			
KING'S HIGHWAY No. 9, E. W.		DIST. No. 4	
C.O. LIAISON		CON. I	
TWP. TOWN OF GAINSBURY		LOT 5	
<b>FOOTING DETAILS (STAGE II)</b>			
DESIGN		CONTRACT	
DRAWING		DRAWING	
DATE		LOADING	



FOR REDUCED PLAN  
USE SCALE BELOW

