DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

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

Attention: Mr. S. McCombie

Our File Ref.

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

Date: March 5, 1970

In reply to

Subject:

FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing at Brown's Creek
Diversion and Highway #79
Twp. of Brooke -- Co. of Lambton
District No. 1 (Chatham)
W.J. 69-F-117 -- W.P. 91-68-01

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.

A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

AGS/ldeF
Attach.

cc: Messrs. B. R. Davis
H. A. Tregaskes
D. W. Farren
W. Zondenberg
F. C. Brown
A. P. Watt (2)
J. Roy
B. A. Singh

Foundations Files
Gen. Files

TABLE OF CONTENTS

FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing at Brown's Creek
Diversion and Highway #79
Twp. of Brooke -- Co. of Lambton
District No. 1. (Chatham)
W.J. 69-F-117 -- W.P. 91-68-01

1. INTRODUCTION:

A request for a foundation investigation at the proposed crossing of Brown's Creek Diversion and Hwy. #79, was received from Mr. A. Watt in a memo dated December 2nd, 1969.

A field investigation was subsequently carried out by the Foundation Section to determine the subsoil conditions existing at the site. This report contains the results of this investigation and our recommendations pertaining to the design of the proposed structure foundations and approach embankments.

2. DESCRIPTION OF THE SITE:

The site of the proposed crossing is situated about 2 miles south of Watford on Hwy. #79. The existing bridge is a 57 foot clear span simple steel truss structure.

At this point, the Creek flows in an east to west direction through a valley about 600 feet in width and 15 - 20 feet in depth. The south banks are steeper than the north banks. The land in the immediate vicinity of the bridge is barren.

Physiographically, the site is located in the region referred to as the St. Clair Clay Plain

3. FIELD AND LABORATORY WORK

The field work at the proposed bridge site consisted of a total of three sampled boreholes and three dynamic core penetration tests, i.e. one adjacent to each borehole. The boreholes were advanced by means of a continuous flight auger and two conventional diamond drills adapted for soil sampling purposes. A driving energy of 350 ft.- lbs. per blow was used for the dynamic core penetration tests.

Disturbed samples were obtained using a 2-inch O.D. split-spoon sampler driven according to the specifications for the Standard Penetration Test. Only one undisturbed sample was obtained by means of a 2-inch I.D. Shelby tube, which was pushed into the soil manually. One bedrock sample was obtained using BXL coring equipment.

Samples were visually examined in the field and subsequently, in the laboratory, tests were carried out on selected samples to determine the following physical properties:

1. Grain-size distribution
2. Atterberg limits
3. Natural moisture content
4. Organic content
5. Bulk density

The results of field and laboratory tests are summarized in the Record of Borehole sheets, which are contained in the Appendix to the Report.

All boreholes were surveyed in the field by personnel from London Region Engineering Surveys Section. The locations and elevations of the borings are shown on Drawing No. 69-F-117A which accompanies this report.

4. SUBSOIL CONDITIONS:

4.1) General:

In general, the subsoil at the site consists of two

..... 3

layers of clayey silt to silty clay with some sand and traces of gravel, with one or more layers of silt to silty sand in between. Overburden is underlain by shale bedrock.

The boundaries between the various soil types and the bedrock are shown on the Record of Borehold sheets. The estimated stratigraphical profile shown on the Drawing #69-F-117A, is based upon this information.

From ground level downward, the various strata are described in some detail with regard to soil type and soil properties, as follows:

4.2) Silty clay to clayey silt:

This was the predominant deposit and was encountered in all boreholes. In BHs #1 and #2 it extended down to approximate elevation 727.0. This includes the fill which was probably the local material obtained from the same or similar deposits. In BH #3 it was found only down to elevation 732.6. This deposit was interrupted by a silt to silty sand deposit, below which it was intersected again in BHs #1, 2 and 3 at elevations 706.8, 718.0 and 716.1 respectively. In BH #1 it was underlain by a silt to clayey silt layer and in BHs #2 and 3 it was underlain by bedrock.

The material consists of silty clay to clayey silt with some sand and traces of gravel. In the lower deposit the proportion of sand and gravel increases with depth. Traces of organics were found in some samples near the ground surface. A plot of plasticity index versus liquid limit shows that the points fall within the CL and CI zones. The natural moisture content is, n general, close to the plastic limit. The colour of the soil was grey except near the ground surface, where it was brown. The standard penetration test results indicate that the consistency of the upper deposit ranges from firm to stiff and that the lower deposit ranges from very stiff to hard.

The test results are plotted on the Record of Borehole sheets and also on Figs. 1 and 2 of the Appendix. The physical properties of the material are as follows:

.....4

Liquid Limit	27 - 45%
Plastic Limit	16 - 24%
Moisture Content	14 - 32%

The sample with the highest Atterberg limits contained 4% organics.

The grain-size analysis indicates the following distributions:

Gravel	2 - 16%
Sand	13 - 26%
Silt	42 - 56%
Clay	16 - 28%

4.3 Silt to Silty Sand

This deposit was found sandwiched between the two silty clay to clayey silt strata described above. The total thickness of the deposit varies from 9.0 ft. in BH #2 to 20.0 ft. in BH #1.

The composition of this water deposited material varies all the way from grey silt to silty sand. In BH #1 it is essentially sandy silt while in BH #2 it is silty fine sand. In BH #3 the material is very variable at various depths, because of its being a recently deposited material. In this hole, underlying 5 ft. of clayey silt, there is a 3 ft. thick layer of silty sand with some gravel and clay and traces of organics, followed by 8 ft. of silt to sandy silt, followed by a 2 ft. clayey silt layer and 3.5 ft. of silt containing thin layers of clay and sand. This overall deposit is underlain by a clayey silt stratum.

This material is very susceptible to 'boiling' under an unbalanced hydrostatic head.

The 'N' values indicate a compact to very dense denseness. However, it is possible that because of unbalanced hydrostatic conditions created in the borehole during drilling, these 'N' values may not be very representative of the material.

..... 5

The grain-size analyses indicate the following ranges of distribution and are plotted on Fig. 3.

Gravel	0 - 14%
Sand	13 - 60%
Silt	36 - 70%
Clay	1 - 17%

4.4) Silt to clayey silt:

This deposit was intersected in BH #1. It immediately overlies the bedrock. As already mentioned, the proportion of granular material in the lower silty clay to clayey silt stratum increases with depth. Therefore, immediately above the bedrock it may be described as silt to clayey silt. The 'N' values indicate a hard consistency. The only sample from this layer has the following physical properties:

Liquid Limit	20%
Plastic Limit	15%
Moisture Content	11%

The grain-size analysis indicates the following distribution and are plotted on Fig. 4.

Gravel	16%
Sand	29%
Silt	42%
Clay	13%

4.5) Shale bedrock:

The bedrock was proven in BH #1 by obtaining a BXL core. The rock core showed the bedrock to be shale. In BH #2 weathered bedrock was recovered by a split spoon. In BH #3, the bedrock surface was assumed to be the level at which refusal to washboring was reached. The bedrock surface is relatively even and varies from elevation 679.3 to 681.5.

5. GROUNDWATER CONDITIONS:

The water level in BH #3 was observed to be at elevation 736.8, the same as the water level in the Creek. In other boreholes the water level could not be established due to short duration of the field work. However, it is estimated that water level in BHs #2 and 3 would lie between elevation

737.0 and 740.0.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to replace the existing bridge over Brown's Creek with a new one. The new structure is presently proposed to be an 80-ft. single span bridge and is located about 50 ft. south of the existing structure. For this reason the creek will be diverted about 50 ft. The proposed grade is about 8 ft. higher than the existing one, resulting in maximum approach heights of about 20 ft. above the river bed.

Subsoil at the site consists generally of deposits of firm to stiff silty clay overlying compact to very dense silty sand followed by very stiff to hard clayey silt followed by shale bedrock. Depth to bedrock is about 58 - 65 ft.

6.2) Structure Foundations:

The new structure may be founded on spread footings placed at or below elevation 727.0, assuming a net rate pressure of 2.0 t.s.f. for design purposes. This depth is considered sufficient for frost protection purposes but hydrological considerations may dictate otherwise.

As an alternative, the new structure may be founded on steel 'H' piles or precast concrete piles driven to bedrock. The capacity of piles in this case will be governed by their structural strength.

Excavations carried out for footings or pile caps below the ground water level will require a de-watering scheme to enable construction to be carried out in the dry. With regard to this matter, it is pointed out that the upper subsoil layers consist generally of fine grained granular type material which can become 'quick' under conditions of unbalanced hydrostatic heads. The following method of de-watering is recommended:

..... 7

Excavation should be carried out down to the level of the prevailing ground water. At this point, interlocking steel sheeting should be driven to a depth equal to twice the distance between the ground water level and the footing or pile cap base. Excavation and unwatering may then be proceeded with without danger of 'boiling'. It may be necessary of course to brace the sheeting laterally. Sheeting may be left in place for scour protection purposes if required.

Settlements under spread footings are anticipated to be not more than 1½ inches.

6.3) Approaches:

The proposed 8-ft. raise in grade will result in a maximum height of embankment of 20 ft. above the bottom of the creek. The shear strength of the subsoil is such that it will be able to support the approach embankments constructed with 2:1 forward and side 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, and it is recommended that this portion of the fill contain no larger grain sizes than 3 inches.

Based on past experience of structures with somewhat similar subsoil conditions, it is anticipated that maximum settlement of 2 inches will occur under the approaches.

Pile caps or spread footings should be founded at sufficient depth to ensure frost protection.

The topsoil and any organic material should be removed in accordance with the pertinent D.H.O. standards within the construction area.

7. MISCELLANEOUS:

The field work for this project was carried out during the period Dec. 18-19, 1969, under the supervision of Mr. A. Prakash, Project Foundation Engineer, who also prepared this report

..... 8

The equipment used was owned and operated by George Wimpey & Co., Ltd., and Dominion Soil Investigation Ltd.

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

March, 1970

APPENDIX I

FORM OB-MT-126 (REV 1969)

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 69-F-117 LOCATION Hwy. 79 Sta. 645 + 41 o/s 20' Rt. ORIGINATED BY AP
W P 91-68-01 BORING DATE Dec. 18 - 19, 1969 COMPILED BY AP
DATUM Geodetic BOREHOLE TYPE Bombardier Flight Auger, Cone & Core CHECKED BY

ELEV. / DEPTH	SOIL PROFILE DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT 20 40 60 80 100	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.
744.8	Ground Level										
0.0	Silty clay to clayey silt, some sand, traces of gravel Grey Stiff		1	SS	9	740					16 26 42 16 Estimated el. 737-740
			2	SS	14						
			3	SS	12						
			4	SS	15						
726.8			5	TW	PH	730				125	
18.0	Sandy silt, traces of gravel & clay Grey Compact to very dense		6	SS	20						4 23 68 5
			7	SS	47	720					
			8	SS	64						0 44 51 5
706.8						710					
38.0	Silty clay to clayey silt, some sand, traces of gravel. Grey Hard		9	SS	32						
			10	SS	33	700					
686.8						690					
58.0	Silt to clayey silt with sand & some grav. Dark Grey. Hard		11	SS	37						16 29 42 13
680.8						680					
64.0	Shale Bedrock		12	BXL	60%						
673.8						670					
71.0	End of Borehole										

20
15 ⊕ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 69-F-117 LOCATION Hwy. 79 Sta. 645 + 41 o/s 21' Lt. ORIGINATED BY AP
W.P. 91-68-01 BORING DATE Dec. 18-19, 1969 COMPILED BY AP
DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing, Augering & Cone CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT
744.0	Ground Level				
0.0	Silty clay to clayey silt, some sand, traces of gravel and organics. Brown & Grey Firm to very stiff		1	SS	16
			2	SS	19
			3	SS	8
			4	SS	22
727.0					
17.0	Silty fine sand Grey Compact		5	TW	PH
718.0					
26.0	Clayey silt, some sand, traces of gravel Grey Very stiff to hard		6	SS	27
			7	SS	43
			8	SS	57
681.5					
62.5 679.7	Shale Bedrock		9	SS	158
64.3	End of Borehole				

ELEV. SCALE: 740, 730, 720, 710, 700, 690, 680

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

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

100/9"

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.

Estimated el. 737-740

Org. 4.0%

0 60 39 1

9 13 53 25

20
15 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

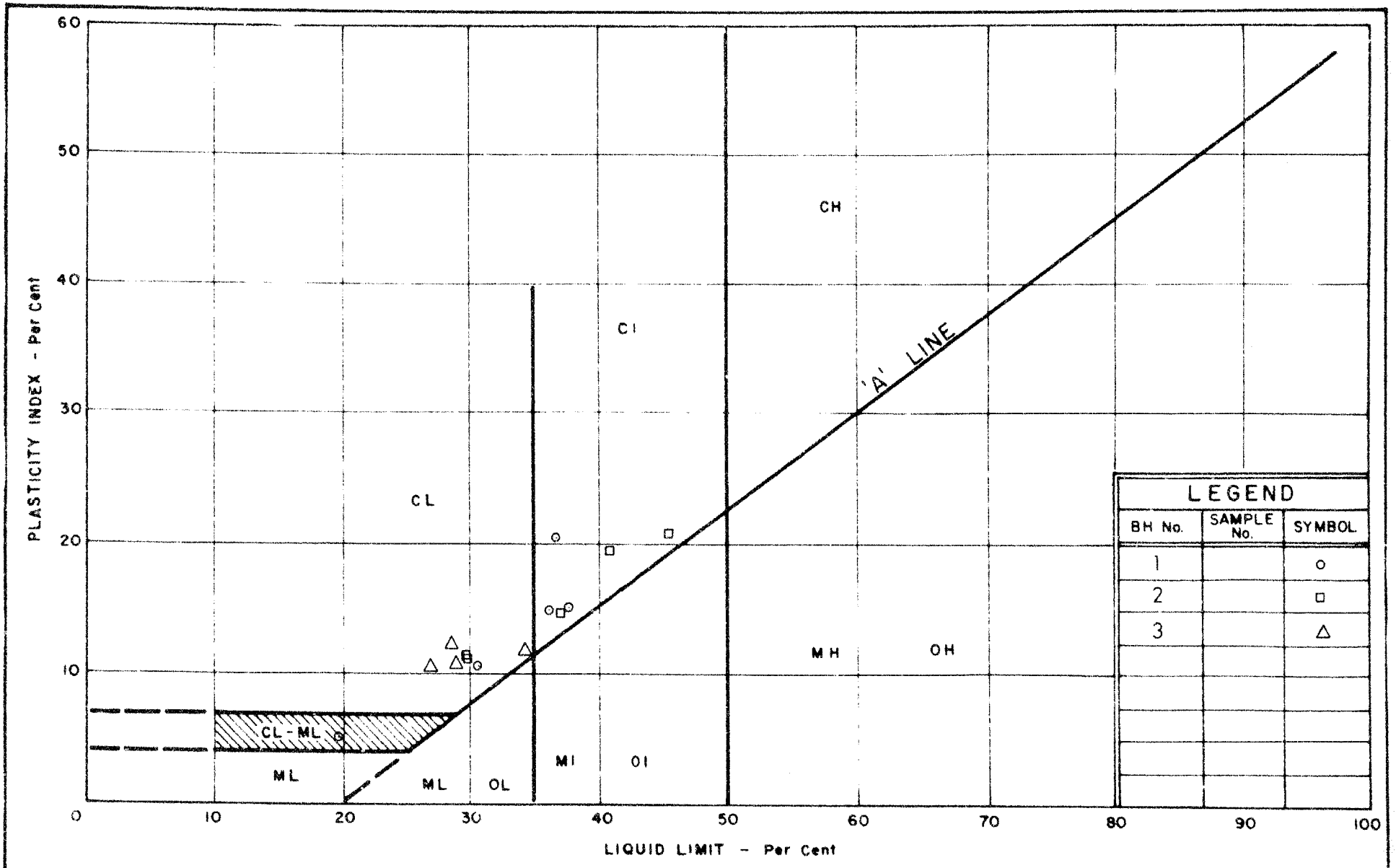
FOUNDATION SECTION

JOB 69-F-117 LOCATION Hwy. 79 Sta. 645 + 95 o/s 27' Lt. ORIGINATED BY AP
W.P. 91-68-01 BORING DATE Dec. 18 - 19, 1969 COMPILED BY AP
DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing & Cone CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	BLOWS/FOOT	ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB. VANE	LIQUID LIMIT, PLASTIC LIMIT, WATER CONTENT — WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR SA SI CL
737.6	Ground Level									
0.0	Clayey silt, some sand & traces of gravel.									▽ 736.8
732.6	Brown. Firm		1	SS	5					Org. 1.8%
5.0	Silty sand, some gravel & clay, traces of organics		2	SS	13	730				14 40 36 10
729.6	Brown. Compact.									
8.0	Silt to sandy silt, some clay Grey		3	SS	15					0 13 70 17
			4	SS	36					0 17 70 13
721.6	Compact to dense									
16.0	Clayey silt. Grey		5	SS	37	720				
719.6	Hard									
18.0	Silt, layers of clay & sand. Grey. Dense		6	SS	54					3 29 51 17
716.1			7	SS	-					
21.5			8	SS	37					2 14 56 28
						710				
	Clayey silt, some sand, traces of gravel.		9	SS	82					
	Grey					700				
	Hard		10	SS	43					
						690				
679.3			11	SS	66	680				
58.3	End of Borehole Probable Bedrock									
						670				

20
15 ⊹ 5 % STRAIN AT FAILURE
10

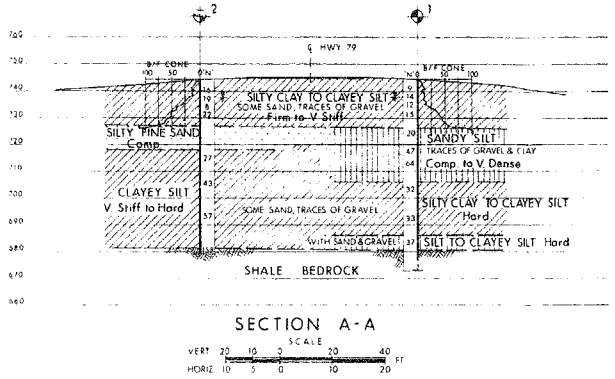
FORM OB-MT-252
REVISED JULY, [redacted]6



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

PLASTICITY CHART

W.P. No.	91 - 68 - 01
JOB No.	69 - F - 117
	FIG. 1

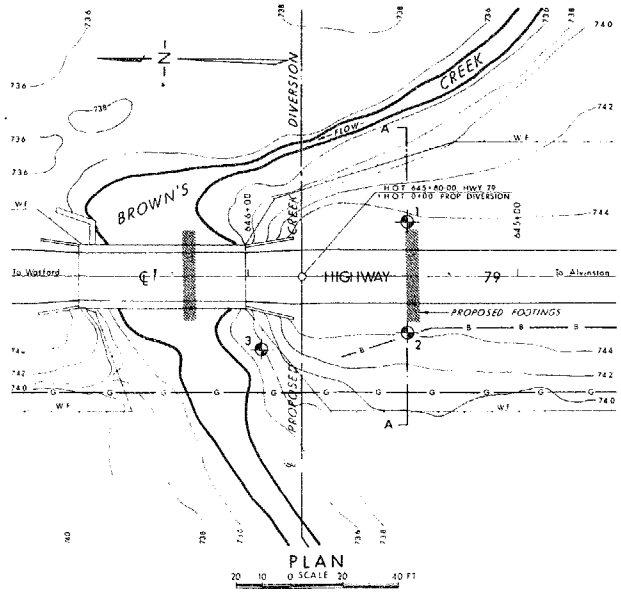


SECTION A-A

SCALE

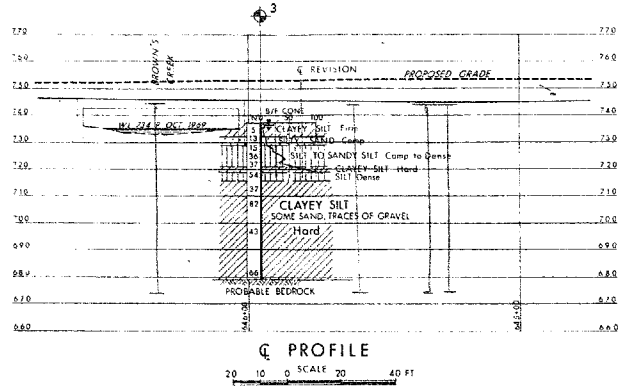
VERT 20 10 5 0 20 40 FT

HORIZ 10 5 0 10 20



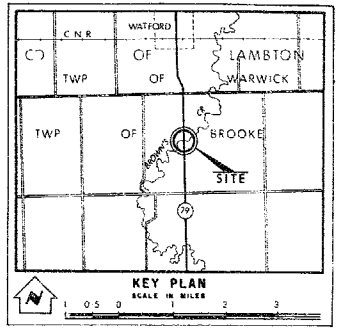
PLAN

20 10 0 SCALE 20 40 FT



℄ PROFILE

20 10 0 SCALE 20 40 FT



LEGEND

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

NO.	ELEVATION	STATION	OFFSET
1	744.8	645+41	20' RT
2	744.0	645+41	21' LT
3	737.6	645+95	27' LT

- 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	

PRINT RECORD		
NO.	FOR	DATE

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING OFFICE - FOUNDATION SECTION

BROWN'S CREEK DIVERSION

KING'S HIGHWAY NO. 79 DIST. NO. 1

CO. LAMBTON

TWP. BROOKE LOT 17 & 18 CON. 14

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD. A.P.	CHECKED PP	W.P. NO. 91-68-01	M.B.T. DRAWING NO. 69-F-117A
DRAWN S.O.	CHECKED	JOB NO. 69-F-117	
DATE 25 FEB 1970		SITE NO.	BRIDGE DRAWING NO.
APPROVED		CONT.	

REF NO. F-4860-1

SUMMARY OF PILE DRIVING RECORDS

W.O. 69-1117 W.P. 91-68-01 CONT. 71-183 DIST. 1

SITE BROWN'S CREEK & HWY # 79

DATE DRIVEN MAY 31 - JUNE 5/72 WEIGHT OF ANVIL 700 lb.

HAMMER TYPE DELMAG D22 WEIGHT 5 TON ENERGY 39000

LOCATION OF PILES	PILE				ESTIMATED TIP EL. (ft.)	DIFFERENCE Longer(+) Shorter(-) Than Estimated (ft.)	REMARKS
	TYPE	NO.	LENGTH (ft.)	TIP EL. (ft.)			
SOUTH ABUT.	12 BP 53	23	70		DRIVEN TO BEDROCK		
— " —	— " —	21	70				
NORTH ABUT.	— " —	1	70				
— " —	— " —	5	70				
SOUTH PIER	— " —	16	70				

Form OB-MT-285 OVER

DEPARTMENT OF HIGHWAYS — ONTARIO
MATERIALS & TESTING DIVISION
FOUNDATION SECTION

WP 91-60-01

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 71-183 STRUCTURE BROWN CREEK No 2

CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 70 TONS

HAMMER DETAILS: TYPE DELMAG D 22 WEIGHT 5 TONS HEIGHT OF FALL OR ENERGY 3 FEET

TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 7 m/s

PILE DETAILS H 12 - 53 LBS PER FT. STRAIGHT PILE

PILE NO. 23 LOCATION SOUTH ABUTMENT FOOTING DATE DRIVEN MAY 31/72

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
35FT	1			26	12		51	3-8		76	
	2			27	12		52	5-6		77	
	3			28	13		53	5-8		78	
	4			29	14		54	3-7		79	
	5			30	15-		55	6 4		80	
	6			31	15-		56	6 1		81	
	7			32	17		57	5 7		82	
	8		STARTED	33	18		58	5-6		83	
	9	2	AT 5-3/4 PM	34	19		59	5-4		84	
	10	3	SPLICED	35	23		60	5 3		85	
	11	3	FROM	36	23		61	5 2		86	
	12	4	60 FT TO 35	37	25		62	5-0		87	
	13	4	AM	38	29		63	5-2		88	
	14	4	FINISHED	39	30		64	5 4		89	
	15	5	6 22 PM	40	33		65	6 9		90	
	16	5-		41	34		66	9 5-		91	
	17	6	ADDED	42	39		67			92	
	18	6	35 FT.	43	38		68			93	
	19	6		44	45-		69			94	
	20	6		45	46		70			95	
	21	7		46	50		71			96	
	22	9		47	51		72			97	
	23	12		48	51		73			98	
	24	12		49	54		74			99	
	25	11		50	57		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	15					
MEASURED REBOUND IN INCHES	3/4					

FINAL LENGTH OF PILE 70 FT FINAL CUT OFF ELEVATION 714.0

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
MATERIALS & TESTING DIVISION
DEPARTMENT OF HIGHWAYS
DOWNSVIEW, ONTARIO

SIGNED C. Stevenson

NAME (PRINT) C STEVENSON

DATE MAY 31/72

ATTACH SKETCH OF PILE NUMBERING SYSTEM

Notes:-

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12¾" O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12¾" x ½" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

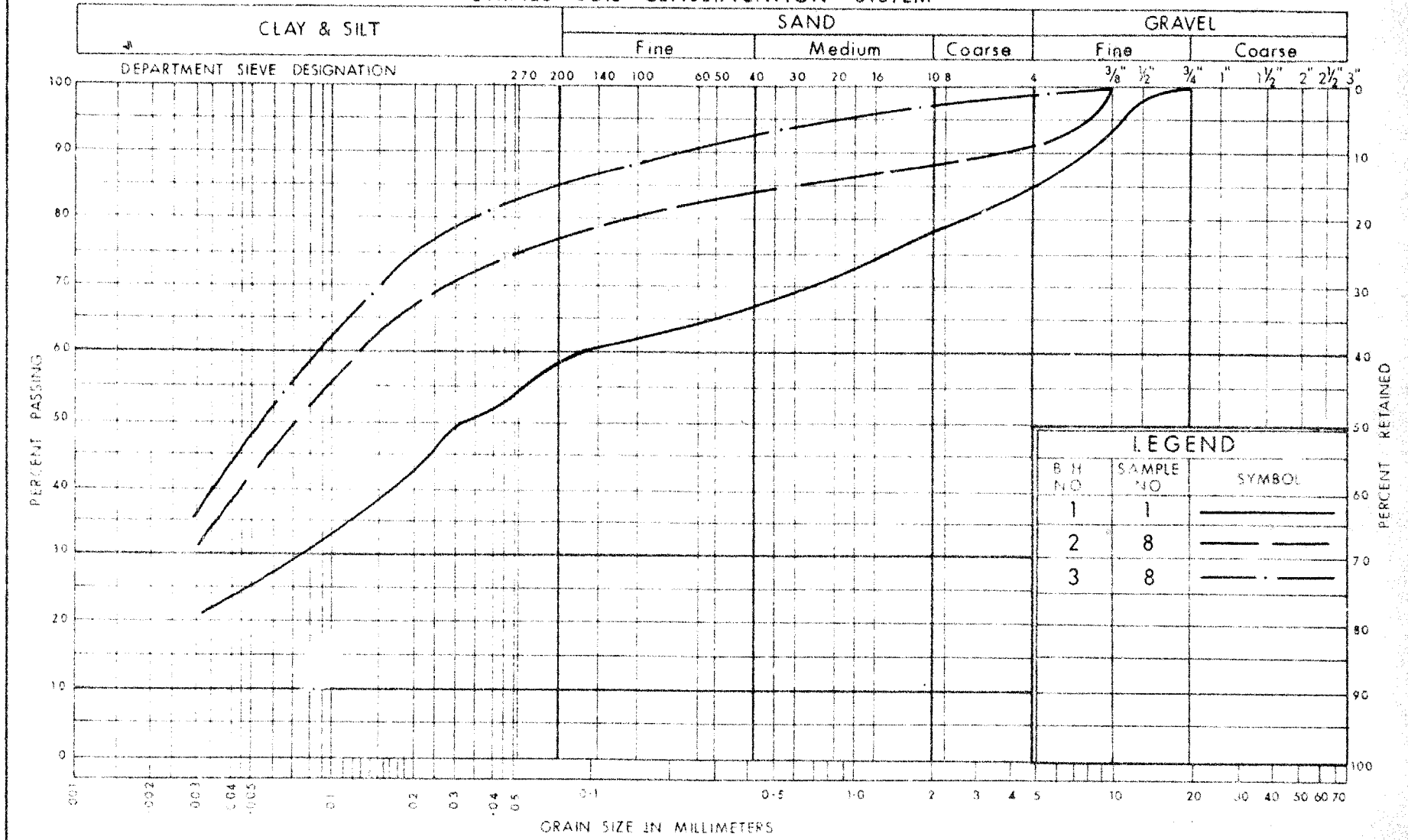
The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

FORM OB MT - 17
REV. APR 1965

UNIFIED SOIL CLASSIFICATION SYSTEM



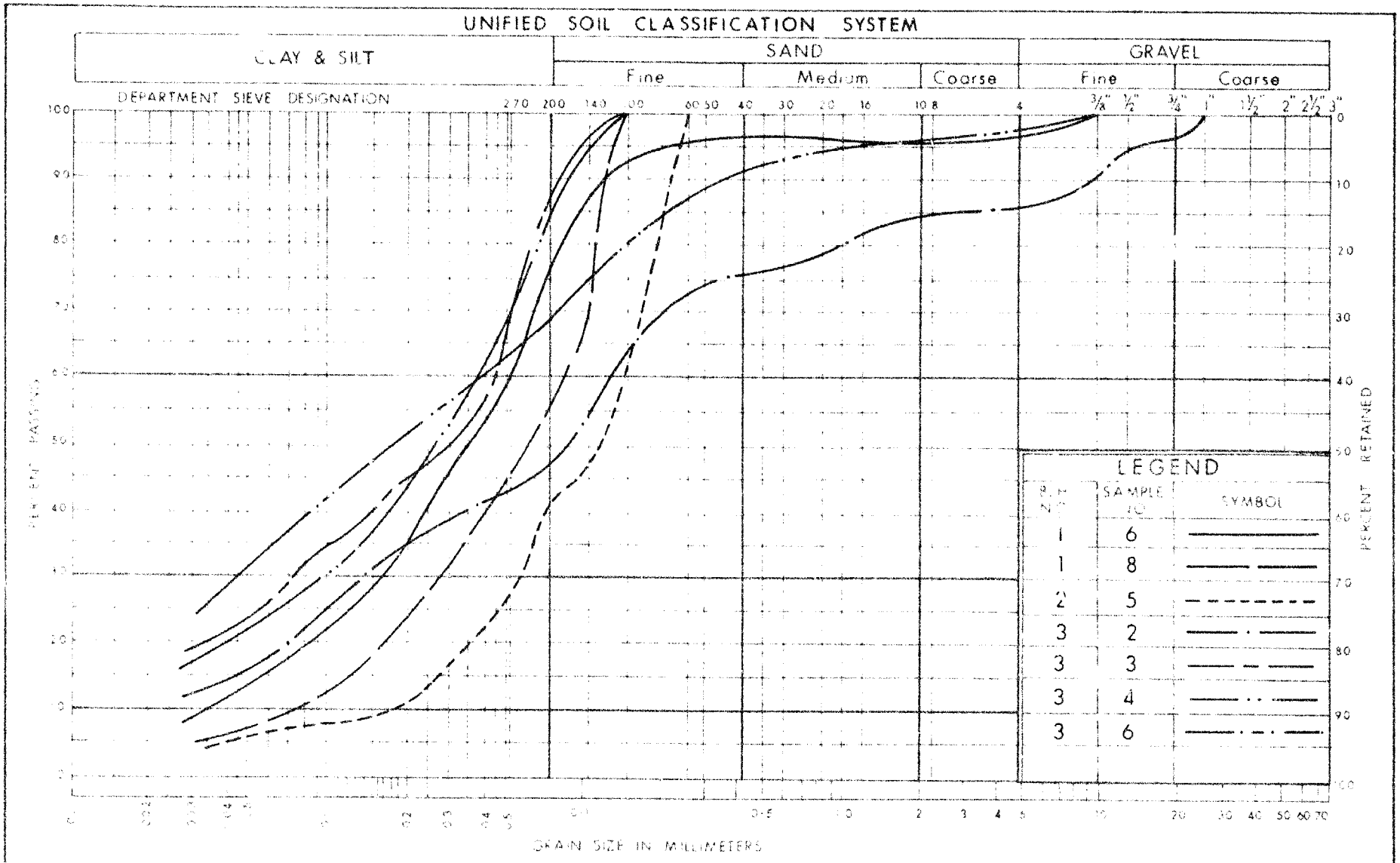
DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

GRAIN SIZE DISTRIBUTION

SILTY CLAY TO CLAYEY SILT

W.P. No. 91 - 68 - 01
JOB No. 69 - F - 117
FIG. 2

FORM 08 MT - 17
REV APR 1965



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

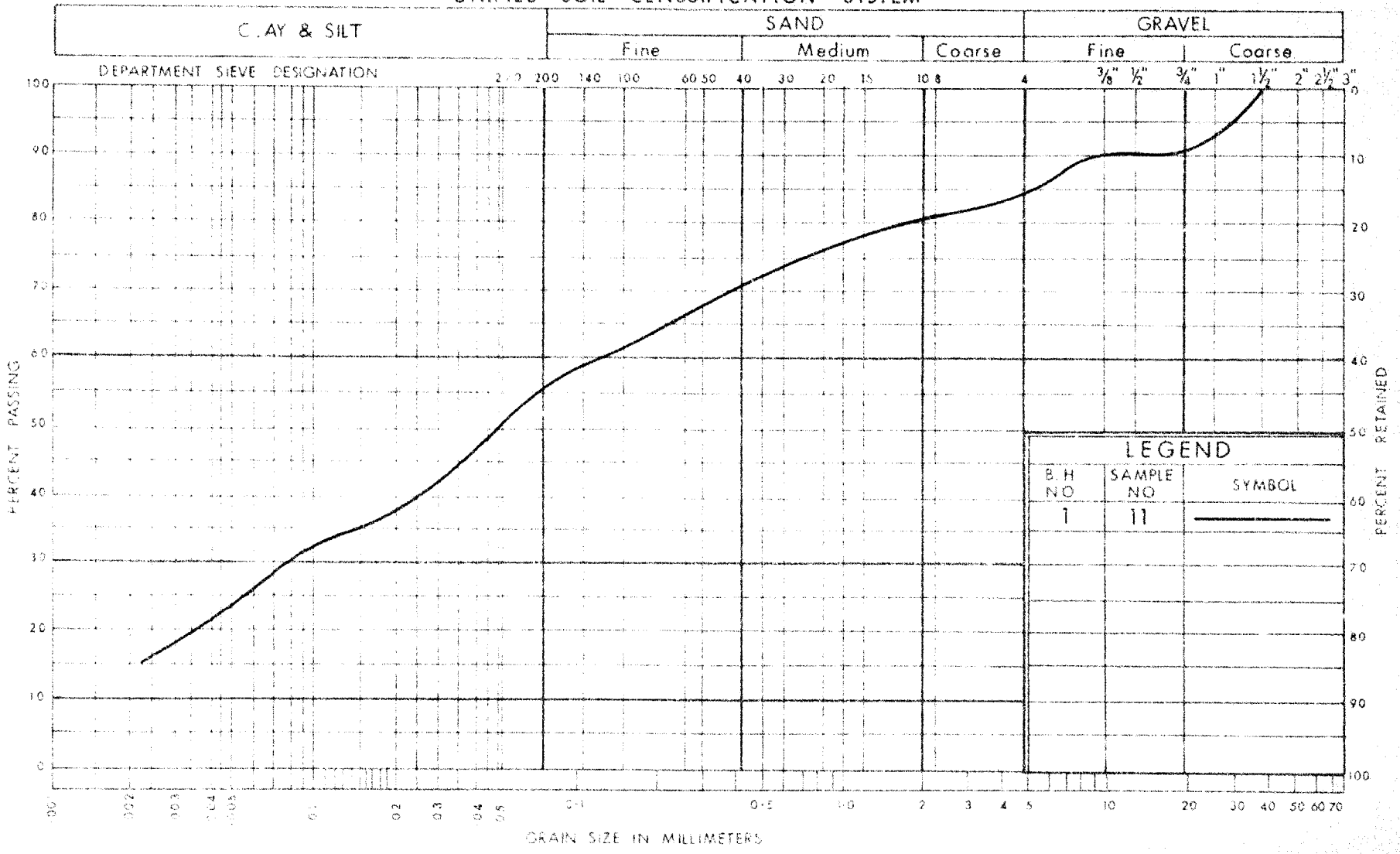
GRAIN SIZE DISTRIBUTION

SILT TO SILTY SAND

W P No.	91 - 61 - 01
JOB No.	69 - F - 117
	FIG. 3

FORM 08 MT - 17
REV. APR. 1965

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

GRAIN SIZE DISTRIBUTION

SILT TO CLAYEY SILT

W.P. No.	91 - 68 - 01
JOB No.	69 - F - 117
	FIG 4

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.
VERY SOFT	0 - 2	0 - 250
SOFT	2 - 4	250 - 500
FIRM	4 - 8	500 - 1000
STIFF	8 - 15	1000 - 2000
VERY STIFF	15 - 30	2000 - 4000
HARD	> 30	> 4000

DENSENESS	'N' BLOWS / FT.
VERY LOOSE	0 - 4
LOOSE	4 - 10
COMPACT	10 - 30
DENSE	30 - 50
VERY DENSE	> 50

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

Form OB-MT-285

OVER

DEPARTMENT OF HIGHWAYS — ONTARIO
MATERIALS & TESTING DIVISION
FOUNDATION SECTION

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 71-183 STRUCTURE BROWN CREEK NO 2.

CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 70 TONS

HAMMER DETAILS: TYPE DELMAG D22 WEIGHT 5TON HEIGHT OF FALL OR ENERGY 3900#

TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 700 LBS.

PILE DETAILS H - 12-53.63 PER F.T. · BATTER PILE 12-3

PILE NO. 21 LOCATION SOUTH ABUTMENT FOOTING DATE DRIVEN JUNE 1/72

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
35'	1			26	11		51	48		76	
	2			27	12		52	49		77	
	3			28	13		53	51		78	
	4			29	14		54	54		79	
	5			30	14		55	60		80	
	6		STARTED	31	15		56	61		81	
	7	1	PILE NO	32	20		57	62		82	
	8	2	21-11 3/4	33	21		58	64		83	
	9	2	SPACING	34	25		59	65		84	
	10	3	11" TO 12"	35	2.5		60	60		85	
	11	4	FINISHED	36	26		61	54		86	
	12	4	DRIVING	37	27		62	54		87	
	13	5	12"	38	29		63	53		88	
	14	5		39	30		64	53		89	
	15	6	ADDED	40	36		65	55		90	
	16	6	35 FT	41	35		66	57		91	
	17	6		42	36		67	71		92	
	18	7		43	36		68			93	
	19	8		44	38		69			94	
	20	8		45	40		70			95	
	21	9		46	41		71			96	
	22	10		47	42		72			97	
	23	12		48	46		73			98	
	24	13		49	46		74			99	
	25	11		50	48		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	20					
MEASURED REBOUND IN INCHES	5-11/16					

FINAL LENGTH OF PILE 70' FINAL CUT OFF ELEVATION 744.0

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
MATERIALS & TESTING DIVISION
DEPARTMENT OF HIGHWAYS
DOWNSVIEW, ONTARIO

744.0
70
674.0

SIGNED C. Stevenson

NAME (PRINT) C. STEVENSON

DATE JUNE 1/72

ATTACH SKETCH OF PILE NUMBERING SYSTEM

Notes:-

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12¾" O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12¾" x ½" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

Form OB-MT-285

OVER

DEPARTMENT OF HIGHWAYS — ONTARIO
MATERIALS & TESTING DIVISION
FOUNDATION SECTION

WP 69-F-117

BRIDGE CONSTRUCTION — PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 71-183 STRUCTURE BRIDGE STRUCTURE # 2

CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 70 TONS

HAMMER DETAILS: TYPE DELMAG D 22 WEIGHT 5 TONS HEIGHT OF FALL OR ENERGY 39 000

TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 700 LBS

PILE DETAILS H PILE 12 BP 53 VERTICAL

PILE NO. 1 LOCATION NORTH ABUTMENT DATE DRIVEN JUNE 5/72

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
35'	1			26	11		51	93		76	
	2			27	11		52	82		77	
	3		STARTED	28	12		53	84		78	
	4		SPLICING	29	13		54	86		79	
	5		ON 35'	30	14		55	83		80	
	6		AT	31	15		56	82		81	
	7		12:40	32	20		57	75		82	
	8		STARTED	33	30		58	61		83	
	9	1	DRIVING	34	32		59	59		84	
	10	1	AGAIN	35	34		60	60		85	
	11	1	AT 1:15	36	31		61	62		86	
	12	1	FINISHED	37	33		62	66		87	
	13	1	1:45 PM	38	34		63	70		88	
	14	1		39	38		64	66		89	
	15	2		40	44		65	72		90	
	16	2		41	16		66	89		91	
	17	3		42	45		67	94		92	
	18	4		43	42		68			96	
	19	4		44	47		69			94	
	20	4		45	50		70			95	
	21	5		46	54		71			96	
	22	6		47	58		72			97	
	23	7		48	64		73			98	
	24	9		49	72		74			99	
	25	10		50	73		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH,						22
MEASURED REBOUND IN INCHES	5/8					

FINAL LENGTH OF PILE 70' FINAL CUT OFF ELEVATION 743.5

REPORT TO BE SENT TO: — PRINCIPAL FOUNDATION ENGINEER
MATERIALS & TESTING DIVISION
DEPARTMENT OF HIGHWAYS
DOWNSVIEW, ONTARIO

SIGNED C. S. Stevenson

NAME (PRINT) C-S STEVENSON

DATE JUNE 5/72

ATTACH SKETCH OF PILE NUMBERING SYSTEM

743.5
70.0
673.5

DEFECTS IN NEGATIVE DUE TO CONDITION OF ORIGINAL DOCUMENT

Notes:-

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12¾" O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12¾" x ½" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

Form OE-MT-285 OVER

DEPARTMENT OF HIGHWAYS — ONTARIO
MATERIALS & TESTING DIVISION
FOUNDATION SECTION

BRIDGE CONSTRUCTION – PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 71-183 STRUCTURE BROWN CREEK NO. 2

CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 70 TONS

HAMMER DETAILS: TYPE D 22 WEIGHT 5 TONS HEIGHT OF FALL OR ENERGY 39000

TYPE OF ANVIL OR CAP DELMAG WEIGHT OF ANVIL OR CAP 701 LBS

PILE DETAILS STEEL H. PILE 12-BP53 BATTER PILE

PILE NO. 5 LOCATION NORTH ABUTMENT DATE DRIVEN JUNE 3/72

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
35FT	1			26	11		51	72		76	
	2		STARTED	27	11		52	76		77	
	3		11 35 AM	28	10		53	83		78	
	4		SPLICING	29	11		54	85		79	
	5	1	FROM	30	12		55	87		80	
	6	1	12 35 TO	31	12		56	88		81	
	7	1	12 20	32	20		57	82		82	
	8	1	FINISHED	33	21		58	82		83	
	9	1	1 PM	34	12		59	77		84	
	10	1		35	25		60	72		85	
	11	1	ADDED	36	28		61	68		86	
	12	1	35FT	37	29		62	70		87	
	13	1		38	30		63	68		88	
	14	1		39	33		64	69		89	
	15	1		40	35		65	74		90	
	16	2		41	36		66	77		91	
	17	3		42	39		67	103		92	
	18	4		43	42		68			93	
	19	4		44	50		69			94	
	20	5		45	54		70			95	
	21	6		46	54		71			96	
	22	6		47	55		72			97	
	23	7		48	54		73			98	
	24	9		49	68		74			99	
	25	11		50	43		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						20
MEASURED REBOUND IN INCHES	58					

FINAL LENGTH OF PILE 70FT. FINAL CUT OFF ELEVATION 743.5

REPORT TO BE SENT TO: – PRINCIPAL FOUNDATION ENGINEER
MATERIALS & TESTING DIVISION
DEPARTMENT OF HIGHWAYS
DOWNSVIEW, ONTARIO

743.5
70.0
673.5

SIGNED S. Stevenson
NAME (PRINT) S. STEVENSON
DATE JUNE 5/72.

DEFECTS IN NEGATIVE DUE TO CONDITION OF ORIGINAL DOCUMENT

ATTACH SKETCH OF PILE NUMBERING SYSTEM

Notes:-

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12¾" O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12¾" x ½" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

OVER

Form OB-MT-285

DEPARTMENT OF HIGHWAYS — ONTARIO
MATERIALS & TESTING DIVISION
FOUNDATION SECTION

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 71-183 STRUCTURE BROWN CREEK NO 2

CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 70 TONS

HAMMER DETAILS: TYPE DEMAG D 22 WEIGHT 5 TON HEIGHT OF FALL OR ENERGY 39000

TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 700 LBS

PILE DETAILS H 12 - 53 LB 35

PILE NO. 16 LOCATION SOUTH PIER ABUTMENT DATE DRIVEN MAY 31/72

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
35 FT	1			26	13		51	37		76	
	2			27	13		52	38		77	
	3			28	13		53	39		78	
	4			29	17		54	38		79	
	5			30	19		55	36		80	
	6		STARTED	31	24		56	36		81	
	7	1	HAMMER	32	24		57	38		82	
	8	1	NO. 16	33	26		58	46		83	
	9	1	AT 11 30 AM	34	30		59	67		84	
	10	2	STARTED	35	34		60			85	
	11	2	DRIVING	36	34		61			86	
	12	2	12 00	37	35		62			87	
	13	3	12 30 PM	38	35		63			88	
	14	4	FINISHED	39	38		64			89	
	15	5	DRIVING	40	40		65			90	
	16	8	1 00 PM	41	41		66			91	
	17	10		42	46		67			92	
	18	13	ADDED	43	47		68			93	
	19	15	3.5 FT	44	56		69			94	
	20	13		45	56		70			95	
	21	12		46	54		71			96	
	22	11		47	52		72			97	
	23	17		48	51		73			98	
	24	14		49	37		74			99	
	25	14		50	37		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	20	21	20	20	20	20
MEASURED REBOUND IN INCHES	5/8"					

FINAL LENGTH OF PILE 70 FT FINAL CUT OFF ELEVATION 744.0

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
MATERIALS & TESTING DIVISION
DEPARTMENT OF HIGHWAYS
DOWNSVIEW, ONTARIO

SIGNED _____

NAME (PRINT) _____

DATE _____

ATTACH SKETCH OF PILE NUMBERING SYSTEM

Notes:-

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12¾" O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12¾" x ½" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

TO: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107, Lab. Bldg.

FROM: C.S. Grebski,
Bridge Office

ATTENTION:

DATE: January 6, 1971

OUR FILE REF.

IN REPLY TO

SUBJECT: Brown Creek Bridge No. 2
7.8 Miles North of Hwy. 80
W.P. 91-68-01, Site No. 14-112
Highway 79, District No. 1

69-F-117

Attached herewith we are submitting the final bridge drawings which show the foundation design for this structure.

Kindly give us your comments at your earliest convenience.

C.S. Grebski,
Bridge Design Engineer

CSG:rd

Attach.

c.c. Foundation Office

The structure is supported on steel H piles driven to bedrock. Pile lengths for the abutments are 68 ft and for the piers 70 ft. It is recommended that all the piles ordered should be 70 ft long. Slopes are 2:1 OK No other comments

3 Feb 71

AKr 11/2/71

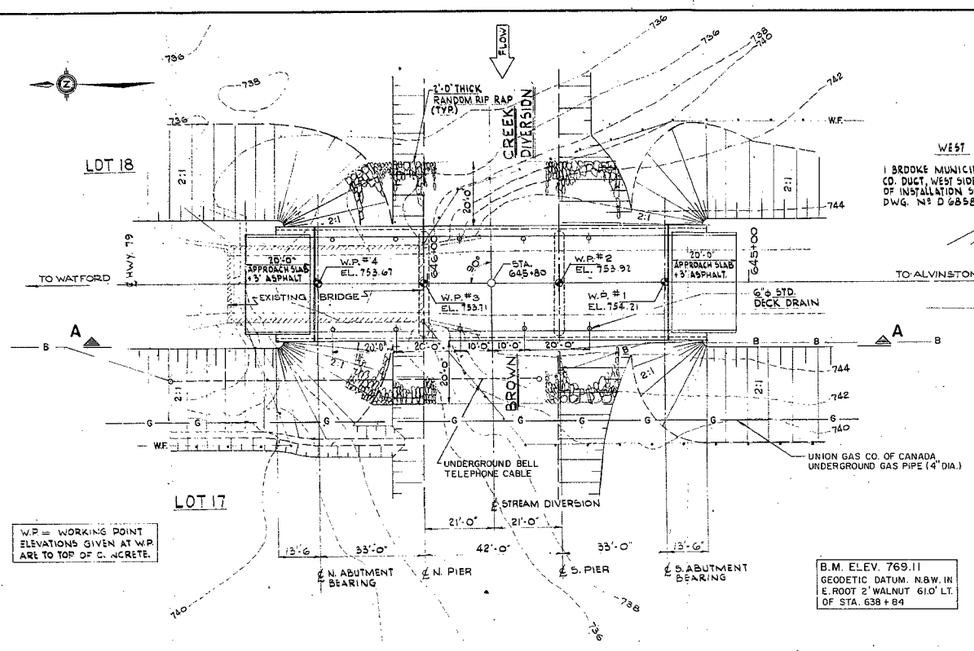
#69-F-117

W.P. 91-68-01

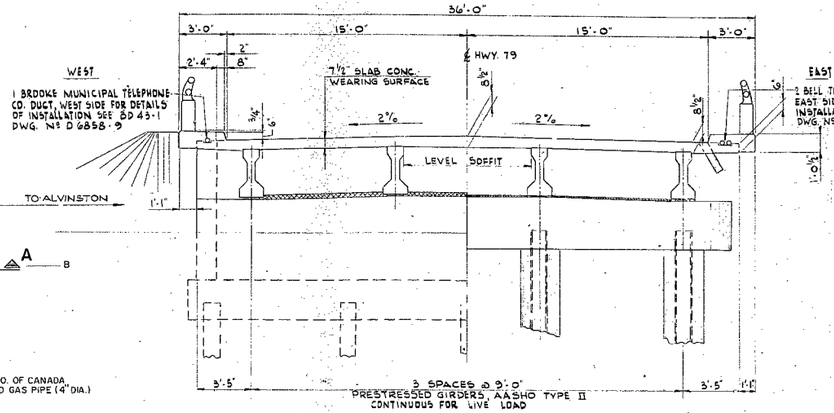
H.W.Y. #79

BROWN'S CREEK

DIVERSION.

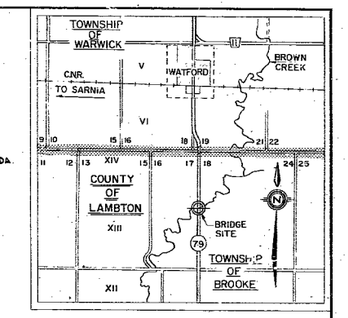


B.M. ELEV. 769.11
GEODETIC DATUM. N.B.W. IN E. ROOT 2' WALNUT 61.0' LT. OF STA. 638 + 84



DECK CROSS-SECTION

SCALE 1/4" = 1'-0"



KEY PLAN

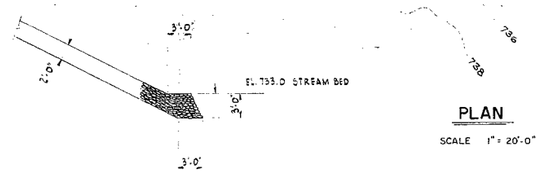
SCALE 1" = 1 MILE

NOTES

CLASS OF CONCRETE
PRESTRESSED CONCRETE GIRDERS _ _ _ 5,000 P.S.I.
DECK, CURBS ON DECK & PARAPET WALL _ 4,000 P.S.I.
ELSEWHERE _ _ _ _ _ _ _ _ _ _ 3,000 P.S.I.

CLEAR COVER ON REINFORCING STEEL
FOOTINGS & ABUTMENTS _ 3"
PIERS & CURBS _ _ _ _ 2"
DECK: TOP _ 1½", BOTTOM _ 1"
PARAPET WALLS _ _ _ _ 1½"

CONSTRUCTION NOTES
THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF ± 1/8".
NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.

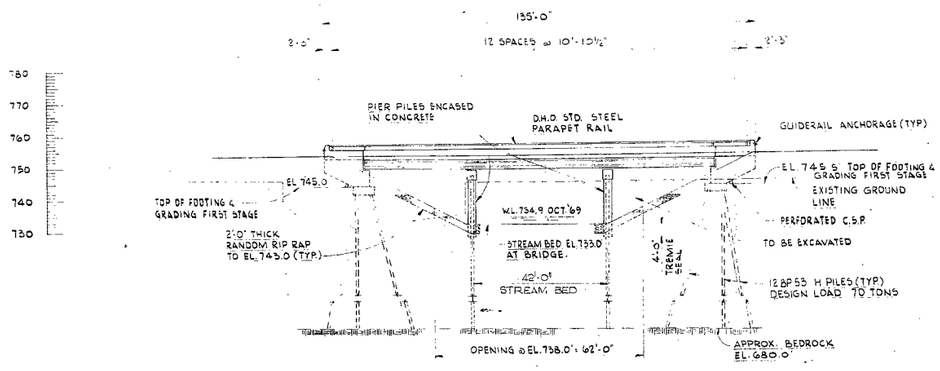


PLAN

SCALE 1" = 20'-0"

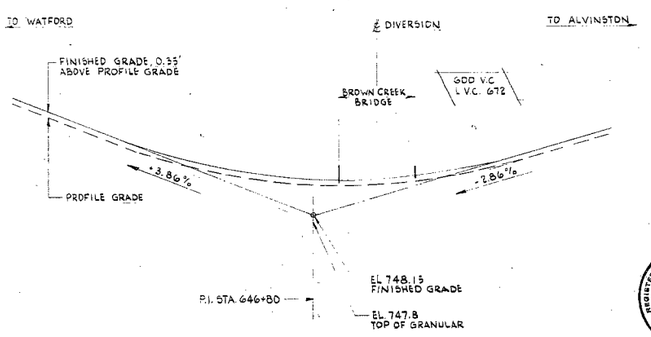
RIP RAP TOE APRON DETAIL

SCALE 1/8" = 1'-0"



ELEVATION A-A

SCALE 1" = 20'-0"



PROFILE AT CROWN OF HWY. 79

N.T.S.

LIST OF DRAWINGS

PRINT RECORD

No.	FOR	DATE

REVISIONS

DATE	BY	DESCRIPTION

69-F-117

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

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION
C.C. PARKER & ASSOCIATES LIMITED
CONSULTING ENGINEERS
HAMILTON OTTAWA

BROWN CREEK BRIDGE Nº 2

7.8 MILES NORTH OF HWY. 80

KING'S HIGHWAY No. 79 DIST. No. 1
CO. OF LAMBTON
TWP. OF BROOKE LOT 17 & 18 CON. XIV

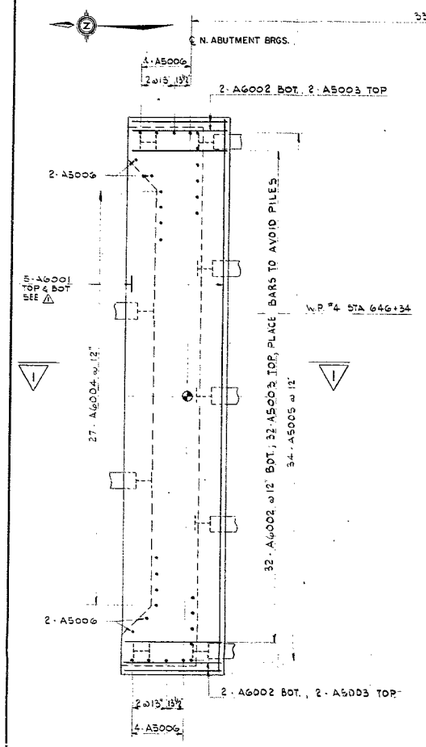
GENERAL LAYOUT

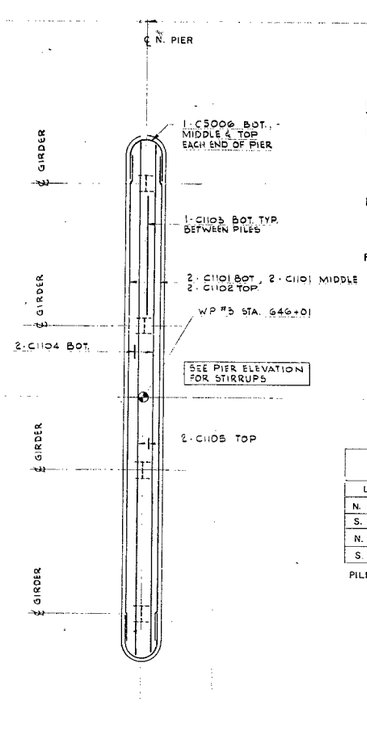
APPROVED _____ BRIDGE ENGINEER

DESIGN	K.	CHECK	
DRAWING	R.J.N.	CHECK	K.
DATE	OCT. '70	LOADING	HS 20-44

SITE No. 14-112 W.P. No. 91-68-01
CONTRACT Nos.
DRAWING No. D 6858 - 1

TRANSLAR 2M-3-69





NOTE

NORTH AND SOUTH ABUTMENT FOOTINGS ARE SIMILAR. SOUTH FOOTING SHOWING TYPICAL DIMENSIONS AND PILE LAYOUT. NORTH FOOTING SHOWING TYPICAL REINFORCING.

NORTH AND SOUTH PIERS ARE SIMILAR. SOUTH PIER SHOWING TYPICAL DIMENSIONS AND PILE LAYOUT. NORTH PIER SHOWING TYPICAL REINFORCING.

FOR PIER BEARING DETAILS SEE DRAWING D 6858-5.

PILE DATA

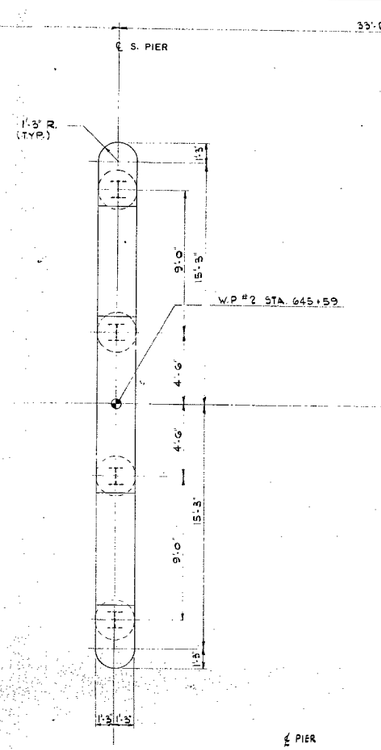
12BP53 STEEL 'H' PILES
DESIGN LOAD - 70 TONS

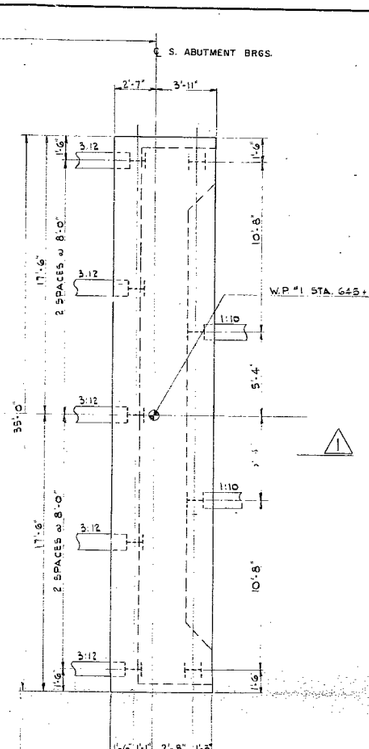
LOCATION	Nº OF PILES	LENGTH OF PILES
N. ABUTMENT	9	70 @ 68'-0"
S. ABUTMENT	9	70 @ 68'-0"
N. PIER	4	70'-0"
S. PIER	4	70'-0"

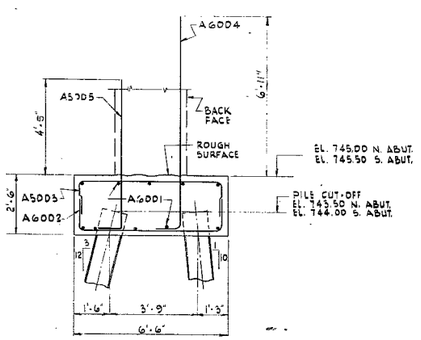
PILES TO BE DRIVEN TO BEDROCK.

PLAN

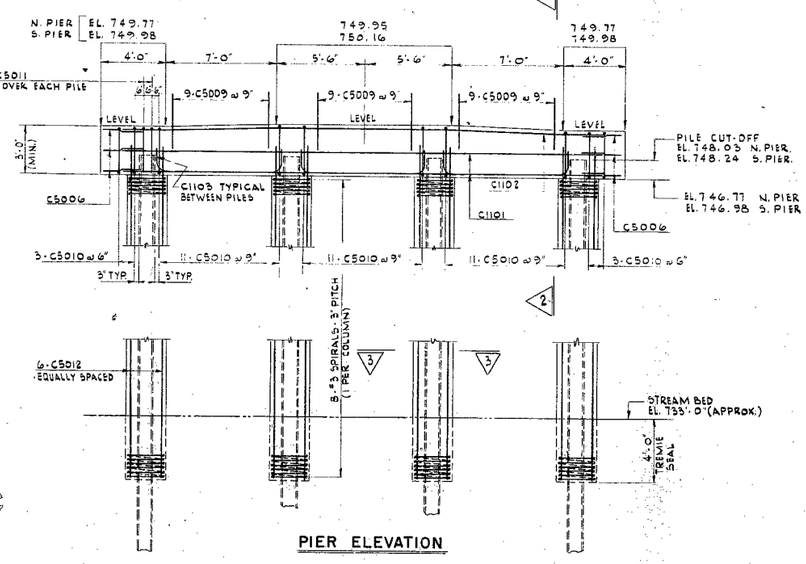
SCALE 1/4" = 1'-0"





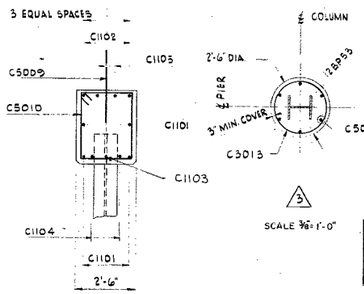


SCALE 3/8" = 1'-0"



PIER ELEVATION

SCALE 1/4" = 1'-0"



SCALE 3/8" = 1'-0"

SCALE 3/8" = 1'-0"

PRINT RECORD		
No.	FOR	DATE

REVISIONS		
DATE	BY	DESCRIPTION

69-F-117

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

C C PARKER & ASSOCIATES LIMITED
CONSULTING ENGINEERS
HAMILTON — OTTAWA

REGISTERED PROFESSIONAL ENGINEER — CIVIL — D. C. CRAMM — PROVINCE OF ONTARIO

BROWN CREEK BRIDGE Nº 2

7.8 MILES NORTH OF HWY. 80

KING'S HIGHWAY No. 79 — DIST. No. 1
CO. OF LAMBTON
TWP. OF BROOKE — LOT 17 & 18 — CON. XIV

FOUNDATION & PIER DETAILS

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

APPROVED	BRIDGE ENGINEER			SITE No. 14-112	W.P. No. 91-68-01
DESIGN	K.	CHECK		CONTRACT Nos.	
DRAWING	R.J.N.	CHECK	K.		
DATE	OCT. '70	LOADING	HS 20-44	DRAWING No.	D 6858-3