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G.I.-30 SEPT. 1976

GEOCRES No. 41J-3

DIST. 18 REGION

W.P. No.

CONT. No.

W. O. No. 70-11037

STR. SITE No.

HWY. No. Twp Rd

LOCATION Proposed Crossing
At Bolton River Diversion
No. 4 Twp Rd

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

(RM. 110 LAB. BLDG.)

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

41 J - 3
GEOCRES No.

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

Attention: Mr. S. McCombie

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

Date: July 2, 1970

Our File Ref.

In reply to JUL 13 1970

Subject:

Dist 18

FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing at Bolton River
Diversion and Township Road
Lots 3 and 4, Concession VI
Twp. of Bright, District of Algoma
District No. 18 (Sault Ste. Marie)
W.O. 70-11037 -- W.P. (Nil)

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/MdeF
Attach.
cc: Messrs. B. R. Davis
H. A. Tregaskes
D. W. Farren
H. W. Hurrell
R. G. Gascoyne
J. P. Marcolin
K. L. Kleinsteiber
S. B. Davidson (2)
R. Morgenroth
B. A. Singh

Foundations Files ✓
Gen. Files

TABLE OF CONTENTS

FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing at Bolton River
Diversion and Township Road
Lots 3 and 4, Concession VI
Twp. of Bright, District of Algoma
District No. 18 (Sault Ste. Marie)
W.O. 70-11037 -- W.P. (Nil)

1. INTRODUCTION

A request for a foundation investigation at the crossing of diverted Bolton River and Bright Township road was received from Mr. R. Morgenroth, Regional Materials Engineer in a memo dated April 15, 1970.

A field investigation was subsequently carried out by the Foundation Section to determine the subsoil conditions exisitng at the site. This report contains the results of this investigation and our recommendations pertaining to the design of the proposed structure foundations, approaches and new channel for Bolton River.

2. DESCRIPTION OF THE SITE

The site of the proposed crossing is situated about 2.0 miles south of Iron Bridge. The area in the immediate vicinity is flat and consists of cultivated land.

At this place the Bolton River meanders, forming a clockwise or left-handed loop. It is proposed to make a cut-off channel for the loop by diverting the river and

..... 2

2. DESCRIPTION OF THE SITE: (cont'd.)...

locating the new structure about 200 ft. to the south of the existing structure.

The existing structure is a 3-span, 60ft. long reinforced concrete bridge. It is in a very dilapidated condition and the weight limit on the bridge is restricted to 5 tons.

Bedrock outcrops can be seen about 1,000 ft. west of the site.

3. FIELD AND LABORATORY WORK:

The field work at the proposed site consisted of a total of two sampled boreholes and two dynamic cone penetration tests. The boreholes were advanced using bombardier mounted continous flight augers. Disturbed samples were obtained using a 2-inch O.D. split spoon sampler driven according to the specifications for the Standard Penetratration Test. Undisturbed samples were recorded using 2-inch I.D. Shelby tubes which were pushed into the soil either manually or hydraulically. Wherever possible, field vane tests were carried out at elevations 12 inches below samples depths.

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3. FIELD AND LABORATORY WORK: (cont'd.)...

Dynamic cone penetration tests were carried out adjacent to each borehole. Driving energy to advance the cone was 350 ft.--lbs. per blow.

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. Bulk Density
5. Organic Content
6. Unconfined Shear Strength

The results of the field and laboratory tests are summarized in the Record of Borehole sheets and in Figure 1, which are contained in the Appendix to the report.

4. SUBSOIL CONDTIONS:

4.1) General:

In general the subsoil at the site is relatively uniform. An upper layer of clayey silt to organic silt is followed by a silt to clayey silt stratum; this in turn is underlain by a silty clay to clay deposit followed by very dense silty sand to sandy silt, or in the instances where refusal was encountered; either boulders or bedrock.

..... 4

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

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

The boundaries between various soil types are shown on the Record of Borehole sheets. The estimated stratigraphical profile shown on Drawing 70-11037A is based upon this information.

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

4.2) Clayey Silt to Organic Silt:

This material was found in both boreholes from ground level downwards to a depth of 9.0 ft. The composition of the material varies from clayey silt, to organic silt, with varying amounts of sand and occasional layers of organics.

The single grain size analysis shows the following distribution (Fig. 3), sand 14%, silt 81%, clay 5%.

Because of the presence of organics, the Atterberg limits are, in general, high and depend upon the amounts of organics. The range was as follows: (fig. 2)

	with organics	inorganic
Liquid limit %	78 - 194	40
Plastic limit %	28 - 115	27
Moisture content %	70 - 182	40

..... 5

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

4.2) Clayey Silt to Organic Silt: (cont'd)...

The shear strength as determined for the field vane varies from 720 to 1200 p.s.f. and the unconfined shear strength as determined from the laboratory tests is about 500 p.s.f. indicating a soft to firm consistency.

4.3) Silt to Clayey Silt:

This stratum commencing at a depth of 9.0 ft. extended to a depth of 28.0 to 30.5 ft. The material consists of silt to clayey silt with occasional layers of sand. In general, the fine grain content increase with depth resulting in greater plasticity with depth. In the upper portion the material is non-plastic to very slightly plastic, and mostly consists of silt. This material is likely to boil under unbalanced hydrostatic head.

Because of the presence of silt and sand it was not possible to turn the field vane in this material. Shelby tubes were pushed hydraulically in it. These unconfined compression tests show shear strength values of 340, 1970 and 2130 p.s.f. N-values range from 8 to 38 blows per foot. Based on above it is inferred that the consistency varies from soft to hard.

Physical properties of the material are as follows: (Fig. 2)

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

4.3) Silt to Clayey Silt: (cont'd.)...

Liquid Limit	%	23 - 40
Plastic Limit	%	18 - 23
Plasticity index	%	3 - 17
Moisture Content	%	20 - 38
Bulk Density	p.c.f.	114 - 129

The grain size analyses indicate the following distributions (Fig. 3).

Sand	%	1 - 95
Silt and Clay	%	5 - 99

4.4) Silty Clay to Clay:

This deposit underlying the silt to clayey silt stratum was 34.5 - 36.0 ft. in thickness. In borehole 1 this was underlain by probable boulders or bedrock and the borehole was terminated at this point. In borehole 2 the deposit is underlain by a silty sand to sandy silt layer. The material consists of soft to stiff silty clay to clay with traces of sand.

Physical properties of the overall deposit, as determined from field and laboratory tests, are as follows. (Fig. 2)

..... 7

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

4.4) Silty Clay to Clay: (cont'd.)...

Liquid limit	%	42-59
Plastic limit	%	22-23
Plasticity index	%	20-36
Moisture content	%	19-53
Bulk density	p.c.f.	105-111
Field vane shear strength	p.s.f.	500-1360
Unconfined shear strength	p.s.f.	340-1230

Single grain size analysis indicates the following distribution (Fig. 3), sand 2%, silt 49%, clay 49%.

4.5) Silty Sand to Sandy Silt:

This layer was encountered only in borehole 2 which was terminated when refusal was met after 5.0 ft. into this layer. It was probably underlain by boulders. The material consists of very dense silty sand to sandy silt with some clay. Only one sample was taken in this layer. N-values were 95 blows for 6 inches. Grain size analysis indicates the following distribution: (Fig. 3), sand 28%, silt 55%, clay 17%.

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5. GROUNDWATER LEVEL:

The following water levels were recorded in the field at the time of investigation.

BH #1	El. 191.0
BH #2	El. 190.7
River	El. 190.2

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct a new bridge to carry Bright township road over the Bolton River. For this purpose the river will be permanently diverted so as to cross the road some 200 ft. south of the existing structure. Thus a new channel about 12 ft deept will have to be constructed in addition to the new bridge

As described earlier the subsoil consists of 9.0 ft. of soft to firm clayey silt to organic silt, followed by 19.0 to 20.5 ft. of soft to hard silt to clayey silt, followed by 34.5 to 36.0 ft. of soft to stiff silty clay to clay, followed by very dense silty sand to sandy silt and/or probably boulders or bedrock.

6.2) Foundations:

It is recommended that the new structure be supported on piled foundations. The piles may be end bearing or friction type.

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

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

In the case of end bearing piles, such as steel H-piles, it is estimated that the maximum allowable load for the particular section will be achieved if driven to refusal to elevations 125-130±. The single piles should be utilized as vertical columns, in which event, no dewatering scheme will be necessary. The portion projecting above the river bed to the bearing level may be encased in concrete for aesthetic or other reasons.

For friction piles treated No. 1$\frac{1}{4}$ timber piles are considered to be most suitable; the safe load carrying capacity may be determined by assuming 0.5 tons per ft. of penetration into the original ground.

Pile caps should be provided with a minimum of 5 ft. cover for frost protection.

6.3) Approaches, Excavation and Dewatering:

It is recommended that soft organic silt present at this site should be removed for a distance of at least 25 ft. behind each abutment, and replaced with suitable granular fill. Outside of these limits the excavation of organic material should be as recommended by the Regional Materials Engineer, Thunder Bay.

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

6.3) Approaches, Excavation and Dewatering: (cont'd.)...

For the proposed cut-off channel it is recommended that 2:1 side slopes be constructed. The slopes should be protected against scour by means of rip-rap upto H.W.L.

If it is decided to use single piles as vertical columns, no dewatering cheme will be necessary, but if pile caps are to be constructed below water level, a dewatering scheme will be necessary, so that concrete may be poured in the dry.

It should be kept in mind that the underlying silt to clayey silt deposit is likely to 'boil' under unbalanced hydrostatic head conditions; thus a dewatering scheme which will prevent this from happening will be required.

Since no grade raise is indicated, no settlements under the approaches are anticipated.

7. MISCELLANEOUS:

The field work for this project was carried out during the period May 14-15, 1970, under the supervision of Mr. A. Prakash, Project Foundation Engineer, who also prepared this report.

The equipment was owned and operated by Dominion Soil Investigation Ltd.

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7. MISCELLANEOUS: (cont'd.)...

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

July 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 70-11037 LOCATION Bolton River, STA 4 + 37 o/s 21' Lt. ORIGINATED BY A.P.
W.P. Municipal BORING DATE May 14, 1970 COMPILED BY G.C.
DATUM Geodetic BOREHOLE TYPE Bombardier Flight Auger, and Cone CHECKED BY

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
195.0	Ground Level							
0.0	Clayey silt to organic silt with some sand--soft to firm		1	SS	2	190	77	El. 191 Org. 7.24% LL 194% P.L. 115% WC 182%
	~~organics~~		2	TW	PM			0 95 (5)
186.0			3	TW	PH			
9.05	~~sand~~		4	SS	28			0 1 (99)
	~~sand~~ silt to clayey silt, Occ. sand layers		5	TW	PH	180	129	
	soft to very stiff		6	SS	19			
167.0			7	TW	PH	170	114	
28.0			8	SS	3			
	silty clay to clay traces of sand		9	TW	PM	160	105	0 2 49 49
	soft to stiff					150		
			10	TW	PM	140	111	
131.0			11	SS	60/6"			Refusal to Augering
64.0	End of borehole probable boulders or bedrock							

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

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
500 1000 1500 2000 2500

+S 4.5
+S 4.9
+S 5.8
+S 3.1
+S 4.3
+S 5.2

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT % 20 40 60

Hammer bouncing

20
15 ◇ 5 % STRAIN AT FAILURE
10

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 70-11037 LOCATION Bolton River, STA 5 + 19 o/s 18' RT ORIGINATED BY A.P.
W.P. Municipal BORING DATE May 14-15, 1970 COMPILED BY G. C.
DATUM Geodetic BOREHOLE TYPE Bombardier Flight Auger, and cone CHECKED BY

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT
195.2	Ground Level				
0.0	Clayey silt to organic silt with some sand		1	SS	2
186.2	soft to firm		2	TW	PM
9.0	silt to clayey silt occ. sand layers firm to hard		3	SS	22
			4	SS	24
			5	SS	38
			6	TW	PH
164.7			7	SS	8
			8	TW	PM
80.5	silty clay to clay-- traces of sand soft to stiff		9	AS	
130.2					
65.0	silty sand to sandy silt, some clay		10	SS	95/6"
125.2	V. Dense				
70.0	End of borehole probably boulders				

ELEV. SCALE: 190, 180, 170, 160, 150, 140, 130

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT
20 40 60 80 100
SHEAR STRENGTH P.S.F.
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
500 1000 1500 2000 2500
+S 7.2
+S 4.3
+S 5.7

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT %
20 40 60

BULK DENSITY γ P.C.F.
95
121
110

REMARKS
E1.190.7
0 14 81 5
0 5 51 44
0 28 55 17
Refusal to Augering

20
15 ⊹ 5 % STRAIN AT FAILURE
10

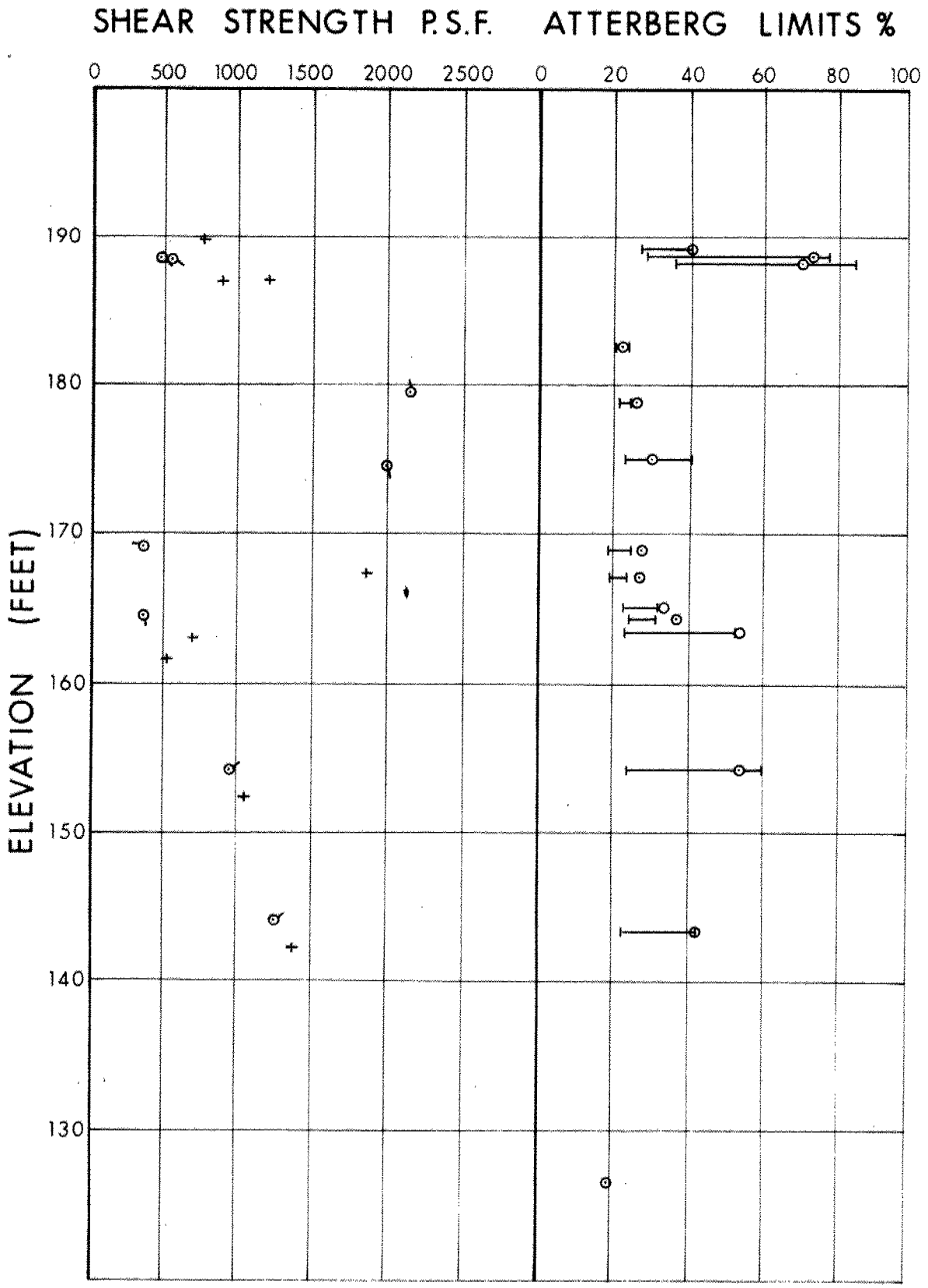
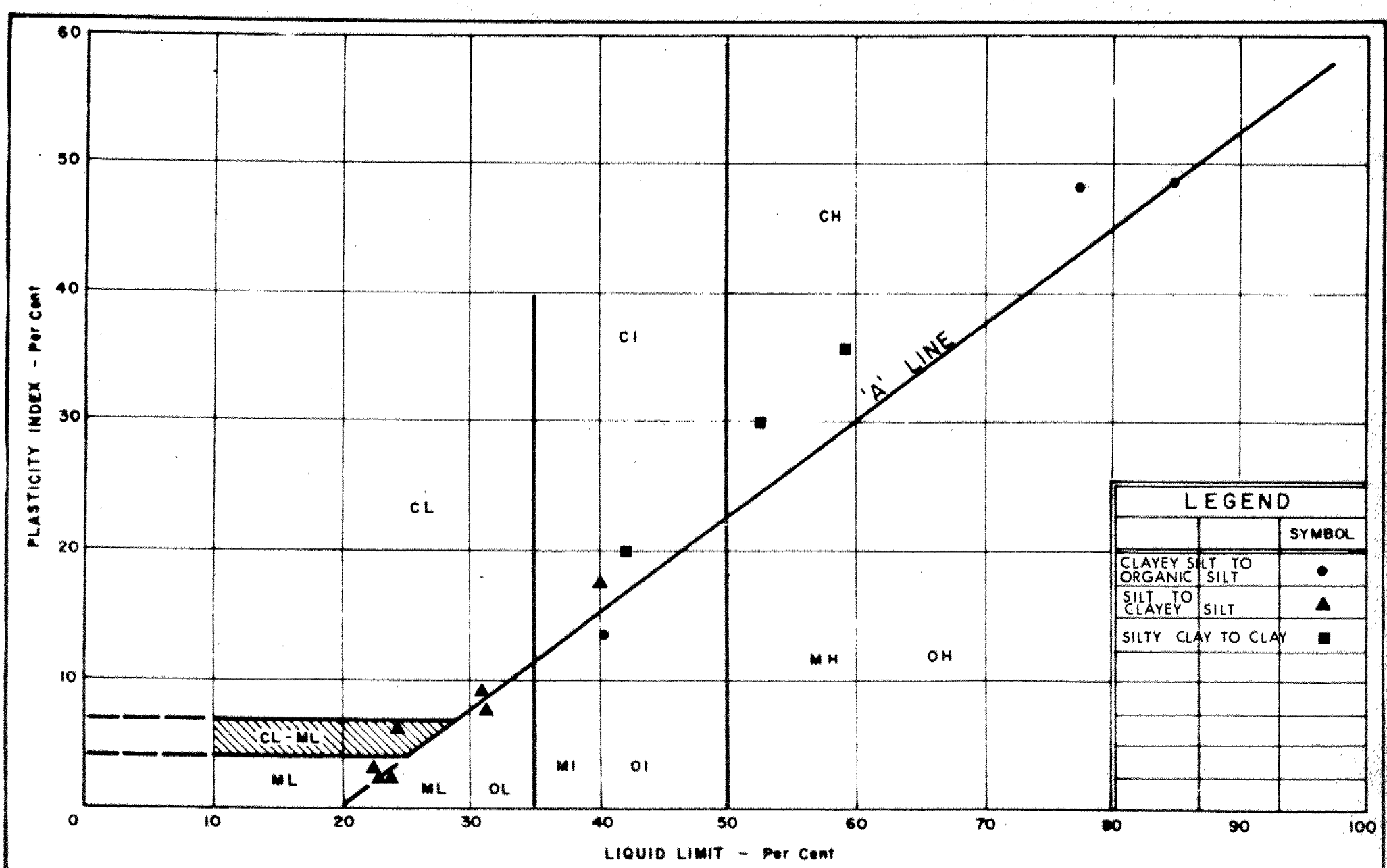


FIG. No. 1

JOB No. 70 - 11037

FORM OB-MT-252
REVISED JU[illegible] 1966



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

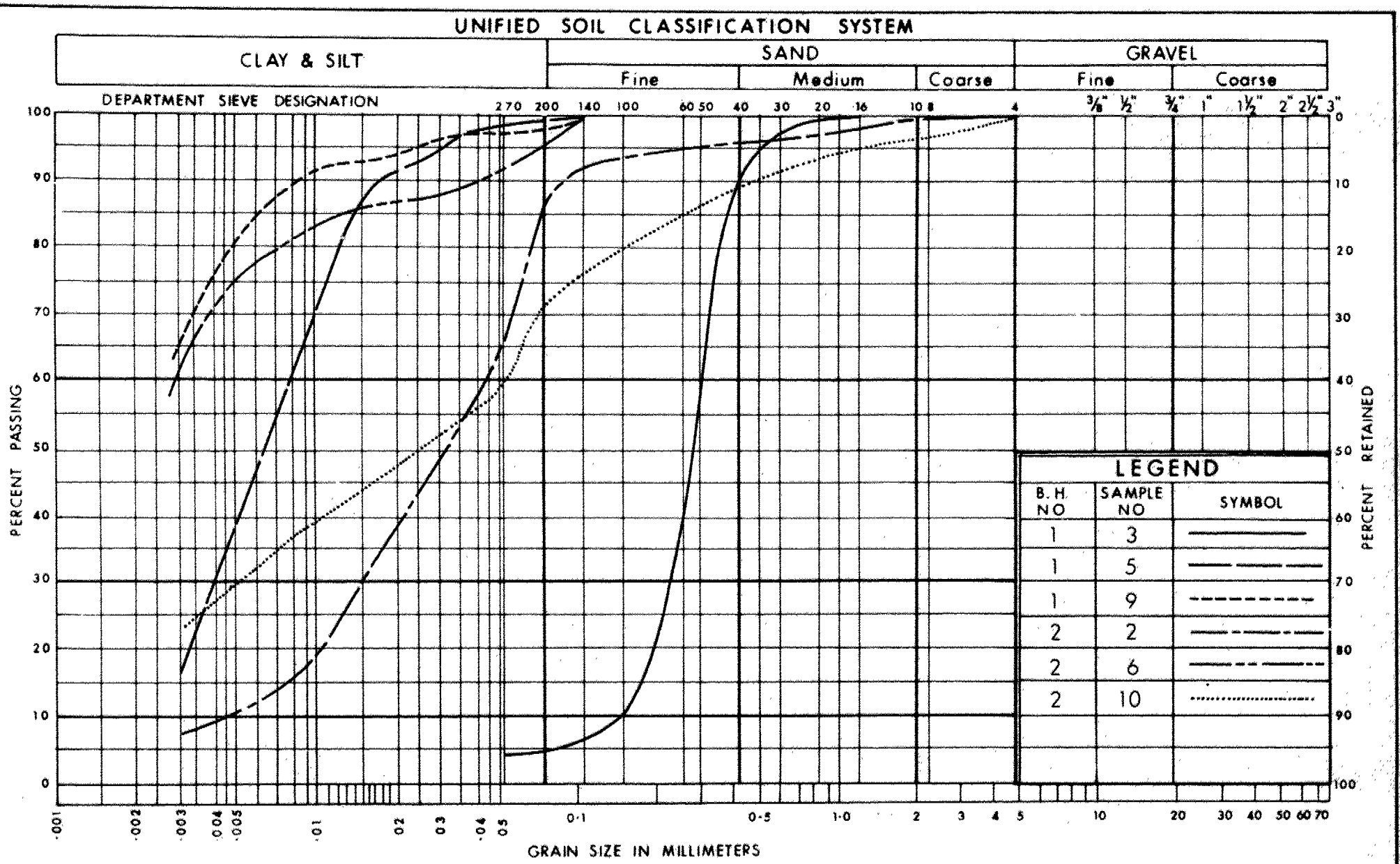
PLASTICITY CHART

W.P. No.

JOB No. 70 - 11037

FIG. No. 2

FORM 08 MT - 17
REV. APR. 1965



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

GRAIN SIZE DISTRIBUTION

W.P. No.

JOB No: 70 - 11037

FIG. No. 3

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

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

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

DESCRIPTION OF SOIL

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

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

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

SOIL TESTS

Qu	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_P	PLASTIC LIMIT
I_P	PLASTICITY INDEX
s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX $= \frac{w - w_P}{I_P}$
I_C	CONSISTENCY INDEX $= \frac{w_L - w}{I_P}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX $= \frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE $= \frac{-\Delta e}{(1+e)\Delta\sigma'}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX $= \frac{\Delta e}{\Delta \log_{10} \sigma'}$
T_v	TIME FACTOR $= \frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	= 3·1416
e	BASE OF NATURAL LOGARITHMS 2·7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
σ'	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ε	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNGS MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

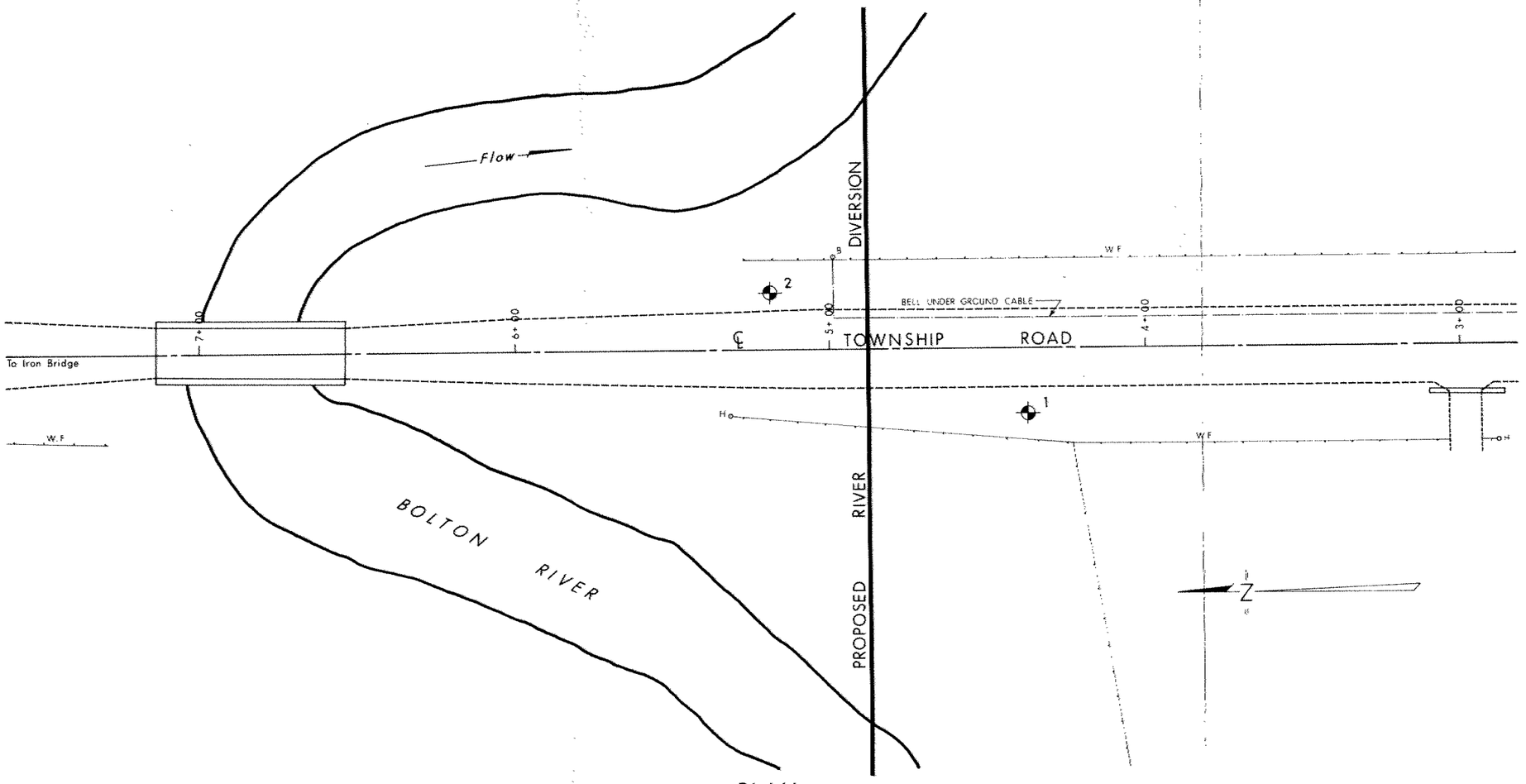
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_o	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

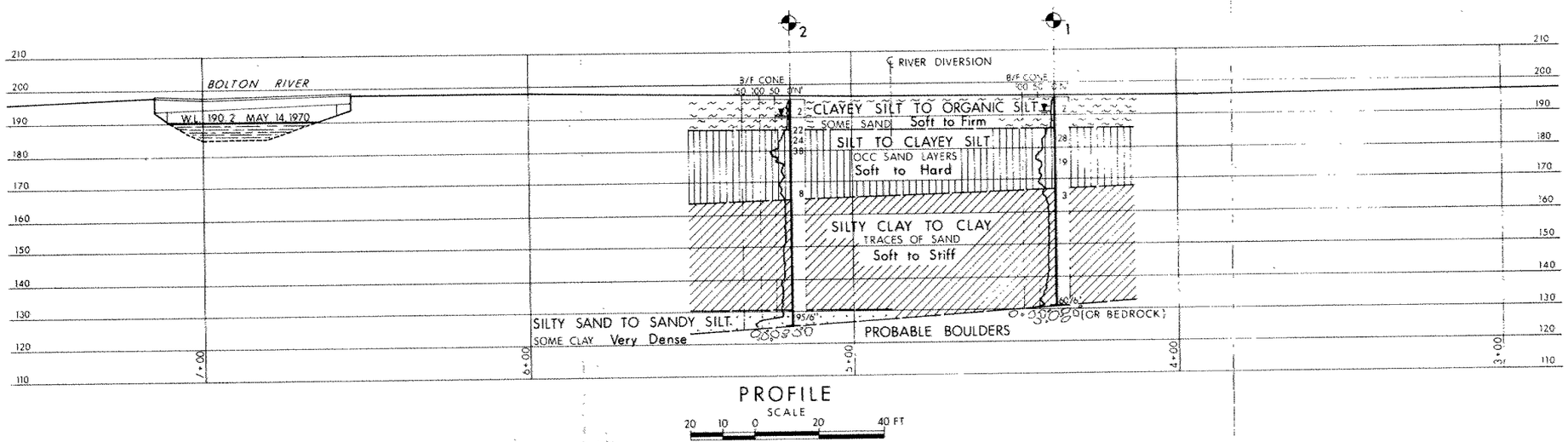
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

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



PLAN
SCALE
20 10 0 20 40 FT



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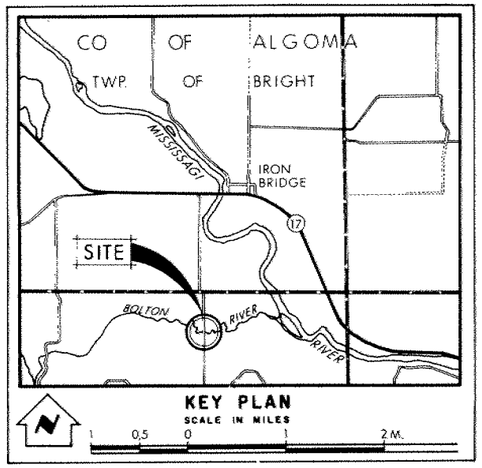

LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation. MAY, 1970

NO.	ELEVATION	STATION	OFFSET
1	195.0	4 + 37	21'LT
2	195.2	5 + 19	18'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	BY	DESCRIPTION

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

BOLTON RIVER

~~KING'S HIGHWAY NO.~~ TWP. ROAD DIST. NO. 18
CO. ALGOMA
TWP. BRIGHT LOT 3 & 4 CON. 6

BORE HOLE LOCATIONS & SOIL STRATA

SUBM'D. A P	CHECKED	W.P. NO.	M.&T. DRAWING NO. 70 - 11037 A
DRAWN S R.	CHECKED	JOB NO. 70 - 11037	
DATE JUNE 25, 1970		SITE NO	BRIDGE DRAWING NO.
APPROVED (PRINCIPAL FOUNDATION ENGINEER)		CONT. NO.	

cc/ FOUNDATIONS (RMI 110)

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To:	Mr. P. P. Davis, Bridge Engineer, Bridge Office, Admin. Bldg.	**From:**	Foundation Section, Materials & Testing Office, Room 107, Lab. Bldg.
Attention:	Mr. S. McCombie.	**Date:**	June 1, 1970.
Our File Ref.		**In reply to**	

Subject: Re: Bolton River Bridge - Twp. Road between Lots 3 & 4 CON. 6
Twp. of Bright Dist. of Algoma
W.J. 70-11037

We have recently completed the fieldwork phase of the foundation investigation for the above-mentioned proposed structure. Since we understand that the project is somewhat urgent, we have prepared a brief preliminary report giving a description of the subsoil and recommendations pertaining to foundations, in order that the structural design can proceed without further delay. This report is as follows:-

Subsoil Conditions:-

Two borings numbered 1 & 2 were carried out at Station 4 + 37 21 ft. left and Station 5 + 19 18 ft. right respectively. The borings revealed the following stratigraphy:-

9 to 10.5 ft. of soft to stiff clayey silt with sand, followed by 12 to 21 ft. of firm to hard clayey silt to silt, followed by 35 to 42 ft. of very soft to stiff clayey silt to silty clay, followed by very dense sand. Groundwater in the boreholes was observed at el. 190.5± which was approximately the same level as in the river at the time.

Recommendations:-

It is proposed to construct a new bridge to cross Bolton River at this site. For this purpose the river will be permanently diverted so as to cross the twp. road some 200 ft. south of the existing structure. Thus a new channel some 35 ft. wide and about 12 ft. deep will have to be constructed in addition to the new bridge.

For the new structure it is recommended that a piled foundation be constructed. The piles may be friction or end bearing. For friction piles treated No. 14 timber piles are considered to be the most suitable and the supporting capacity

/may be determined

may be determined by assuming 0.5 tons per ft. of penetration into original ground. In the case of end bearing piles such as steel 'H' piles, the maximum allowable load for the particular pile used will be achieved by driving to el. 125-130±

For the new channel it is recommended that 2:1 side slopes be constructed. Slopes should be protected up to H.W.L. by means of riprap.

Our complete report will be forwarded to you at an early date.

K. G. Selby,
SUPERVISING FOUNDATION ENGR.
For:
A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

KGS/hrd

cc: Messrs. District Mun.Eng. (J.P.Marcolin)
K.Kleinsteiber,
S.B.Davidson,
General Files,
Foundation Files.