

## DEPARTMENT OF HIGHWAYS ONTARIO

## MEMORANDUM

To: Mr. A. M. Toye,  
Bridge Engineer,  
Bridge Division.

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

Attention: Mr. S. McCombie

DATE: April 26, 1965

OUR FILE REF.

IN REPLY TO

SUBJECT:

## FOUNDATION INVESTIGATION REPORT

For

Sec. Hwy. #523 Line 'A' and Moore Ck.  
District of Nipissing, Twp. of Lyell,  
District #10 (Bancroft)

W.J. 65-F-22      --      W.P. 256-62

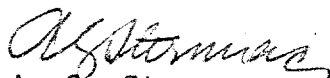
Attached, we are forwarding to you, our detailed foundation investigation report on the existing subsoil conditions at the above structure site.

We believe that the factual data and recommendations contained therein, will be adequate for your design requirements.

Should additional information be required, please do not hesitate to contact our Office.

AGS/MdeF  
Attach.

cc: Messrs. A. M. Toye (2)  
H. A. Tregaskes  
H. D. McMillan  
J. Ford  
J. E. Callaghan  
J. E. Gruspier  
A. Watt  
Foundations Office  
Gen. Files

  
A. G. Stermac,  
PRINCIPAL FOUNDATION ENGINEER

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# FOUNDATION INVESTIGATION REPORT

for

Sec. Hwy. #523 Line "A" and Moore Creek  
District of Nipissing, Twp. of Lyell  
Distr. #10

W.J. 65-F-22

W.P. 256-62

## 1. INTRODUCTION:

A request to carry out a Foundation Investigation at Sec. Hwy. #523 Line "A" and Moore Creek, was received from the Regional Bridge Location Engineer, Mr. A. P. Watt, Dated December 8th, 1964.

It is proposed to erect a new bridge to carry Sec. Hwy. #523 Line "A" over Moore Creek. The site is located in the district of Nipissing, Twp. of Lyell, approximately 17 miles west of the Village of Barry's Bay. At this location the chainage of Sec. Hwy. #523 Line "A" is 24 + 72 to 25 + 80.

In order to determine the soil properties and decide on the type of foundation, an investigation was carried out by this section. Results and the discussion of the field and laboratory investigation as well as conclusions and recommendations for the future design work are contained in the following paragraphs of this report.

## 2. DESCRIPTION OF SITE:

The site of the proposed bridge is located in the District of Nipissing, Twp. of Lyell, approximately 17 miles west of the Village of Barry's Bay. The surrounding area is generally flat terrain, apart from an outcrop of bedrock about 30 feet high at the southern end.

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

It should be noted that the area surrounding Moore Creek is used as a water storage area for the Bark Lake Hydro Electric Station, and the depth of the water may vary considerably.

3. FIELD AND LABORATORY WORK:

In order to obtain sufficient information on the type of properties of the subsoil, nine sampled boreholes and four dynamic cone penetration tests, were carried out at this site.

Split-Spoon samples were taken at various depth intervals: Samples recovered in the Split Spoon were used to determine the following physical properties:

1. Natural Moisture Content.
2. Grain Size Distribution.

Results of these laboratory tests are summarized in Appendix 1 of this report.

4. SUBSOIL CONDITIONS:

The stratigraphy of the soil at the site was found to be generally uniform. A detailed description of various soil types encountered during the investigation, is shown in the Appendix I of this report, and is also given in subsequent paragraphs. The estimated stratigraphical profile, shown on Dwg. No. 65-F-22A, is based upon this information.

4.1) Sandy silt to silty sand, loose to very dense:

This layer, which extends to the depth investigated in BH #1,2,3 and 4 and down to bedrock in BH #5,6,7,8 and 9 was found immediately below the muck in BH #1,2,3,4,5 and 6 and at the surface in BH #7,8 and 9. Frequent boulders of the size from 6" to 1'-3"  $\varnothing$  were encountered in BH #5,6,7 and 8.

cont'd. /3 ...

4.1) Sandy silt to silty sand, loose to very dense:(cont'd.) ...

The whole stratum may be classified as loose to very dense with an average "N" value of 18 blows/foot. "N" values varied from 1 blow/foot to 78 blows/foot.

Grain size distribution curves indicated that this layer is composed of 58% sand, 38% silt and the rest of 4% is gravel. The average moisture content in this layer was found to be 24%, ranging from 10.5% to 48.9%.

4.2) Granite Bedrock:

Sound blue granite bedrock was encountered beneath the overburden in BH #5,6,7,8 and 9. Five to seven feet of bedrock was taken in the above mentioned boreholes. As can be seen on Dwg. No. 65-F-22A the bedrock has a steep slope from south towards North.

5. GROUND WATER CONDITIONS:

The Moore Creek and surrounding area ice elevations, of February 2nd, 1965 varied from El 1007.5 to 1011.5 respectively.

Hydrostatic pressure was encountered in all boreholes, except BH #7,8 and 9.

6. DISCUSSION AND RECOMMENDATIONS:

As can be seen from the previously described soil stratigraphy, the soil consists of sandy silt to silty sand, with frequent boulders at the southern part at the site, followed by granite bedrock. The investigation has revealed that within the upper 20 feet of the deposit the properties are such that adequate support for spread footings could not be obtained, except for the south abutment and pier, which should be formed

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

on bedrock. A design load up to 50 tons/sq. ft. may be used.

The rest of the structure (north abutment and pier) should be supported on steel "H" piles. It is estimated that in the area of BH #4 the piles will reach practical refusal at or below El. 955.0, within two or three feet. A design load of 50 tons/pile may be used.

In the vicinity of BH #5 the piles should be driven to bedrock. In this case, the maximum allowable load for the particular section adopted may be used. Due to the sloping nature of bedrock, a construction procedure should be followed which will ensure an adequate key into the bedrock.

For "H" steel piles, Oslo Points may be fitted, and the driving procedure as outlined in report No. 61-F-117, W.P. 89-61 should be followed.

If pile caps are formed below the water level, it will be necessary to use sheet piling in a dewatering scheme. These should be driven to a depth below the pile cap bottom equal to the height of water above it. Soffits of concrete pier caps, should be formed either on a granular pad or a suitable concrete working slab. All materials of organic nature should be removed below the pier caps.

The D.H.O. Hydrological section indicated that no scour may be anticipated, but the north abutment should be protected by Rip-Rap against water damage.

cont'd. /5 ...

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

It is further estimated that the major part of settlement in the sandy-silt to silty sand deposit will take place during the construction of the north approach fill, but it will take some time till the final settlement is reached. Therefore it is suggested that a certain amount of time is allowed to elapse before final paving.

7. SUMMARY:

The stratification of the subsoil at the site is relatively uniform: Sandy silt to silty sand, followed by blue granite bedrock. The bedrock has a steep slope from south towards north.

A three-span structure is proposed for the Moore Creek and Sec. Hwy. #523. It is recommended to place the south abutment and pier on bedrock and support the rest of the structure on Steel "H" piles. These should be keyed into bedrock as outlined in Section No. 6. If a dewatering scheme is necessary, recommendations in the body of the report should be followed. Organic material should be removed at pilecap locations, prior to construction and replaced with suitable fill if necessary.

No scour is expected, but the northern abutment should be protected by Rip-Rap against water damage. Due to final settlements a certain amount of time to be allowed to elapse before final paving of the north approach fill.

8. MISCELLANEOUS:

The field work, performed during the period from February 1st to February 28th, 1965, together with the preparation of this report, was undertaken by Mr. W.W. Kulmatickas,

cont'd. /6 ...

8. MISCELLANEOUS: (Cont'd.)

Proj. Foundation Engineer. The investigation was carried out under the general supervision of Mr. K.G. Selby, Senior Foundation Engineer.

The surveying was done by a survey group from the Kingston Regional Office.



APPENDIX I.

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING DIVISION  
JOB 65-f-22  
W.P. 256-62  
DATUM 1010.7

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

LOCATION Moore Crk & Sec Hwy 523 Revised Line "A" Ch23/50  
BORING DATE Feb1-7, 1965 27'-0" Lt.  
BOREHOLE TYPE Washboring - BK Casing.

ORIGINATED BY W.W.K.  
COMPILED BY W.W.K.  
CHECKED BY K.G.S.

SOIL PROFILE		STRAT. PLT	SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — WL			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION		NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT — WP	WATER CONTENT — W	WATER CONTENT %		
1010.7	Ice level					1010							
1008.6	Ice												
1005.9	Water												
1005.9	Muck		1	SS	3								
4.8			2	SS	9	1000							
	Sandy silt to silty sand.		3	SS	10								
			4	SS	5	990							
	Loose to very dense.		5	SS	11	980							
			6	SS	23	970							
			7	SS	20	960							
			8	SS	51	950							
949.2													
61.8	End of borehole.					940							

DEPARTMENT OF HIGHWAYS - ONTARIO

# RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 65-F-22

LOCATION Moore Crk & Sec Hwy 523 Revised Line "A" Ch24/20-

ORIGINATED BY W.W.K.

W.P. 256-62

BORING DATE Feb. 7<sup>th</sup>, 1965

10'-0" Lt.

COMPILED BY W.W.K.

DATUM 1011.0

BOREHOLE TYPE Washboring - BX Casing.

CHECKED BY K.G.S.


SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE			LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT	SHEAR STRENGTH P.S.F.	W.P.	W	W.L.		
1011.0	Ice level					1010							
1008.8	Ice												
1008.0	Water												
1006.4	Muck												
4.6			1	SS	3								
			2	SS	7	1000							
			3	SS	10								
						990							
	Sandy silt to silty sand.		4	SS	17								
						980							
	Loose to very dense.		5	SS	14								
						970							
			6	SS	12								
						960							
			7	SS	39								
						950							
944.5			8	SS	59								
66.5	End of borehole.					940							

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING DIVISION  
JOB 65-F-22  
W.P. 256-62  
DATUM 1011.5

# RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

LOCATION Moore Crk & Sec Hwy 523 Revised Line "A" Ch24.50 on 6  
BORING DATE Feb. 8&9, 1965  
BOREHOLE TYPE Washboring - BX Casin.  
ORIGINATED BY W.W.K.  
COMPILED BY W.W.K.  
CHECKED BY K.G.S.

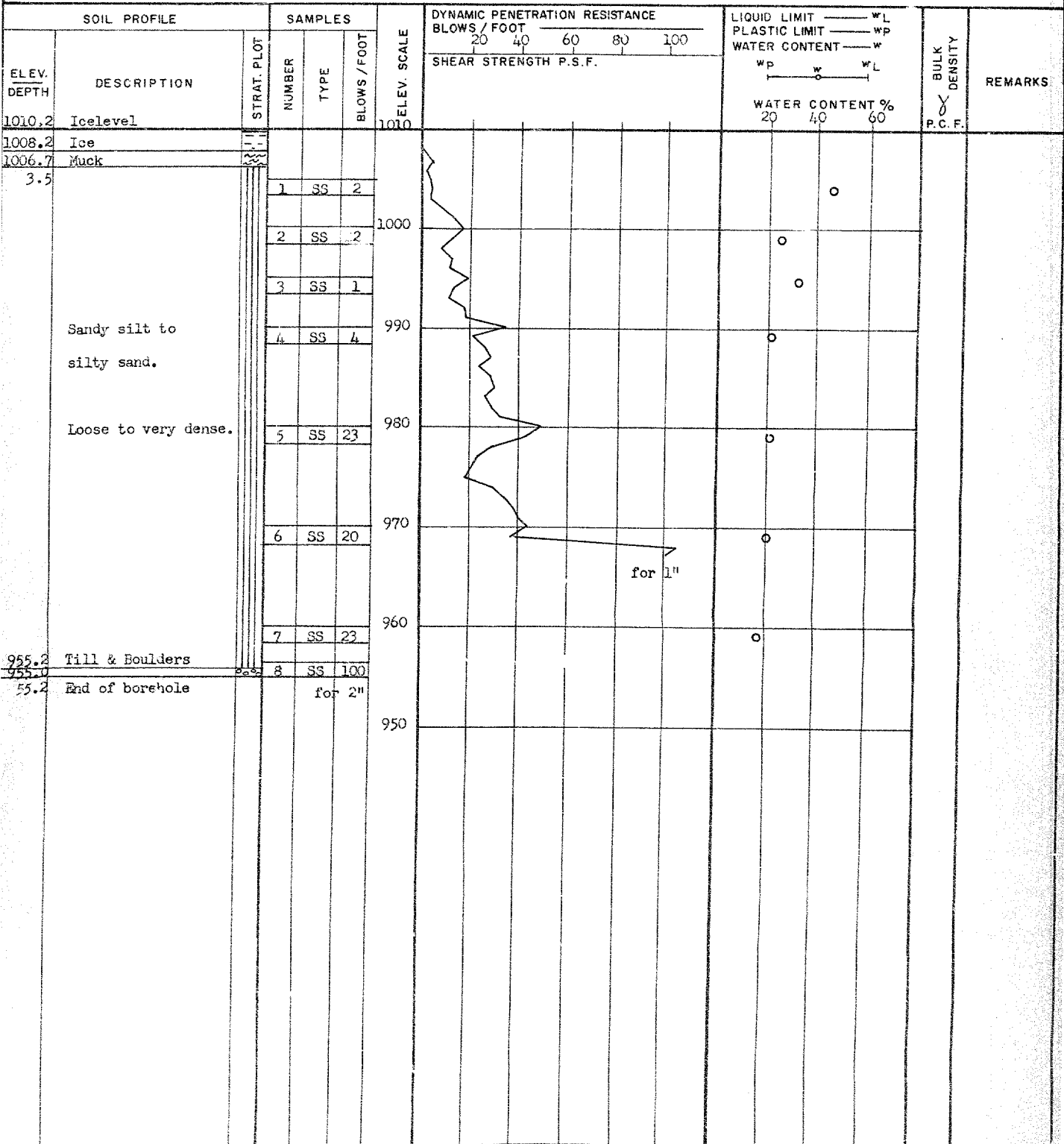
SOIL PROFILE		STRAT. PLOT	SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION		NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.		WP — W — WL			
1011.5	Icelevel					1010						
1009.2	Ice											
1008.2	Water											
1006.7	Muck		1	SS	13							
4.8	Sandy silt to silty sand.		2	SS	2	1000						
			3	SS	6							
			4	SS	10	990						
			5	SS	12	980						
	Loose to very dense.	6	SS	17	970							
		7	SS	17	960							
		8	SS	57	950							
950.0	End of borehole.											
61.8						940						

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING DIVISION  
JOB 65-F-22  
W.P. 256-62  
DATUM 1010.2

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

LOCATION Moore Crk & Sec Hwy 523 Revised Line "A" Ch24/72 on E  
BORING DATE Feb. 9&10, 1965  
BOREHOLE TYPE Washboring - BX Casing  
ORIGINATED BY W.W.K.  
COMPILED BY W.W.K.  
CHECKED BY K.G.S.



## MATERIALS &amp; TESTING DIVISION

## RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 65-F-22LOCATION Moore Crk & Sec Hwy 523 Revised Line "A" Ch 25/00 on EORIGINATED BY W.W.K.W.P. 256-62BORING DATE Feb. 11-24, 1965COMPILED BY W.W.K.DATUM 1007.5BOREHOLE TYPE Washboring BX CasingCHECKED BY K.G.S.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE				LIQUID LIMIT ——— $w_L$			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.				PLASTIC LIMIT ——— $w_p$	WATER CONTENT ——— $w$		
							20 40 60 80 100								
1007.5	Ice level														
1005.5	Ice														
1003.5	Water														
1002.5	Muck														
5.5	Sandy silt to silty sand. Loose to very dense.  Frequent boulders.		1	SS	1	1000									
			2	SS	4										
			3	SS	11	990									
			4	SS	105										
			for 3"												
			5	SS	34	980									
			6	SS	78										
972.8															
34.7	Granite Bedrock					970									
966.3															
41.2	End of borehole.					960									

DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS &amp; TESTING DIVISION

## RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 65-F-22LOCATION Moore Crk & Sec Hwy 523 Revised Line "A" Ch25/26 on EORIGINATED BY W.W.K.W.P. 256-62BORING DATE Feb. 24&25, 1965COMPILED BY W.W.K.DATUM 1007.5BOREHOLE TYPE Washboring BX Casing.CHECKED BY K.G.S.

## SOIL PROFILE

## SAMPLES

## DYNAMIC PENETRATION RESISTANCE

BLOWS / FOOT

20 40 60 80 100

SHEAR STRENGTH P.S.F.

LIQUID LIMIT ——— WL

PLASTIC LIMIT ——— WP

WATER CONTENT ——— W

WP ——— W ——— WL  
 ————

WATER CONTENT %  
 20 40 60

BULK  
DENSITY  
Y  
P.C.F.

REMARKS

ELEV.  
DEPTH

DESCRIPTION

STRAT. PLOT

NUMBER

TYPE

BLOWS / FOOT

ELEV. SCALE

1000

990

980

1007.5 Ice level

1006.0 Ice

1004.5 Water

1004.5 Muck

3.0 Sandy silt to silty  
sand.  
Compact.  
Frequent boulders.

995.4

12.1 Granite Bedrock

989.9

17.6 End of borehole.

1 SS 20

2 SS 16

o

o

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS &amp; TESTING DIVISION

## RECORD OF BOREHOLE NO. 7

FOUNDATION SECTION

JOB 65-F-22LOCATION Moore Crk & Sec Hwy 523 Revised Line "A" Ch 25+52 on EORIGINATED BY W.W.K.W.P. 256-62BORING DATE Feb. 24, 1965.COMPILED BY W.W.K.DATUM 1009.8BOREHOLE TYPE BX Casing RunCHECKED BY K.G.S.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE						LIQUID LIMIT ——— W <sub>L</sub> PLASTIC LIMIT ——— W <sub>P</sub> WATER CONTENT ——— W <div><div>W<sub>P</sub></div><div>W</div><div>W<sub>L</sub></div></div> WATER CONTENT %			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.										
1009.8	Groundlevel																
0.0	Sandy silt to silty sand. Compact.																
1002.0	Frequent Boulders.																
7.8	Granite Bedrock					1000											
997.0																	
12.8	End of borehole.					990											

WL

El. 1007.5

Observed in casing.

▼ WL  
El 1007.5  
Observed  
in casing.



DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS &amp; TESTING DIVISION

JOB 65-F-22

W. P. 256-62

DATUM 1025.3

LOCATION Moore Crk & Sec Hwy 523 Revised Line "A" Ch25/80 on E

BORING DATE Feb. 27, 1965

BOREHOLE TYPE EX Casing Run

FOUNDATION SECTION

ORIGINATED BY W.W.K.

COMPILED BY W.W.K.

CHECKED BY \_\_\_\_\_ K.G.S.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT _____	Liquid Limit ——— WL Plastic Limit ——— WP Water Content ——— W	BULK DENSITY  P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.	<div style="text-align: center;">           wp      w      wl  </div> WATER CONTENT %		
1025.3	Groundlevel									
	Sandy silt to silty sand. Compact									
1021.1	Frequent boulders									
4.2	Granite Bedrock					1020				
1015.4										
9.9	End of borehole					1010				

CHECKED BY \_\_\_\_\_ K.G.S.

RECORD OF BOREHOLE NO. 9

SOIL PROFILE			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 $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.	w <sub>p</sub>	w	w <sub>L</sub>	WATER CONTENT %		
1036.1	Groundlevel												
1034.6	Topsoil												
1.5	Granite Bedrock												
1029.6						1030							
6.5	End of borehole.					1020							

# 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

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

$\gamma$	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
$\tau_f$	SHEAR STRENGTH
$c'$	EFFECTIVE COHESION
$\phi'$	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
$c_u$	APPARENT COHESION
$\phi_u$	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
$\mu$	COEFFICIENT OF FRICTION
$S_f$	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
$\sigma'$	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
$K_o$	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
$\beta$	ANGLE OF SLOPE TO HORIZONTAL

Mr. S. McCombie,  
Bridge Planning Engr.,  
Bridge Division.

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

Attention: Mr. A. P. Watt

October 27, 1965

Moore Creek Bridge - Sec. Hwy. 523, District No. 10,  
W.P. 256-62 -- Site No. 43 s 155 -- W.J. 65-F-22.

We have reviewed Preliminary Plan No. D-5731-P2 for the above-mentioned structure, and submit the following comments:

The designer appears to have followed in general, the recommendations given in our Foundation Report and in subsequent discussions with Mr. J. Keen. We note, however, that he has omitted to specify that the steel H-piles be fitted with Oslo Points.

*K. G. Selby*

KGS/MdeP

K. G. Selby,  
SENIOR FOUNDATION ENGINEER  
For:  
A. G. Stermac,  
PRINCIPAL FOUNDATION ENGINEER

cc: Foundations Office ✓  
Gen. Files

## MEMORANDUM

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

FROM: Bridge Division,  
Downsview, Ontario.

DATE: October 22, 1965.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 256-62, Site No. 43 s 155,  
Moore Creek Bridge,  
1 mile south of Madawaska,  
Sec. Hwy. 523, District No. 10.

Enclosed please find two copies of the revised preliminary plan D 5731-P2 for the above structure. This drawing supersedes the preliminary plan D 5731-P1 (3 span design) which may now be considered as an abandoned scheme.

Would you kindly review the bridge foundations proposed and inform us if they are satisfactory.

An early reply would be appreciated.



APW/ag

A. P. Watt,  
Regional Bridge Location Engineer.

Mr. A. P. Watt,  
Regional Bridge Location Engr.,  
Bridge Division.

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

August 27, 1965

Moore Creek - District 10  
W.P. 256-62 - W.J. 65-F-22

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With reference to your verbal enquiry, "Is the penetration of piles at the East pier sufficient?" - we would like to submit the following comments and recommendations for your consideration:

The subsoil conditions are described in detail in the Foundation Report W.J. 65-F-22. According to this information, bedrock was found only on the east side, and it was dipping quite steeply in the westerly direction. The extent of bedrock inclination in the north-south direction, was not established.

At the proposed East pier location, the overburden is only about 7 ft. thick, consisting of sandy silt to silty sand, both very scour-susceptible materials.

Because of the dipping bedrock surface, Oslo points are recommended for the H-piles. The use of these points should enable the keying of the piles into the rock for a distance of approximately 4 inches.

Being advised that the flow of water of the Moore Creek is very slow, we felt that with some additional rip-rapping, the suggested procedure would be satisfactory. However, when the whole problem was re-appraised and reconsidered, we now feel that it would be advisable to use another approach that would constitute a more definite solution.

It is recommended that the piles be keyed into the bedrock 3 - 4 feet. This can be achieved by churn drilling holes in bedrock into which piles are lowered and the holes grouted. We would recommend this procedure at the East pier location only, because adequate overburden exists in other places. However, because of the sloping bedrock surface, Oslo points should be used at the West pier location.

AGS/MdeF

cc: Foundations Office ✓  
Gen. Files

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

Depa. ment of Highways Ontario

Copy for the information of

Mr. A. G. Stermac, Principal Foundation Engineer,  
~~Room 107, Lab. Bldg.~~

Mr. C. S. Grebski,  
Bridge Design Engineer,  
Admin. Bldg.

Bridge Division,  
Downsview, Ontario.

August 31, 1965.

W.P. 256-62 - Site No. 43 S 155,  
Moore Creek Bridge,  
1 Mile South of Madawaska,  
Sec. Highway 523 - District No. 10.

With reference to the above structure please find attached copies of memorandums received from Mr. J. E. Callaghan, District Engineer, Bancroft and Mr. A. G. Stermac, Principal Foundation Engineer.

Upon considering these memorandums, would you kindly issue another preliminary plan showing the changes made.



APW/lm

cc. J. E. Callaghan  
A. G. Stermac

A. P. Watt,  
Regional Bridge Location Engineer.



## MEMORANDUM

To: Mr. A. Watt,  
Bridge Locations Engineer,  
Bridge Location,  
Department of Highways,  
Downsview, Ont.

FROM: District #10 - Bancroft.

DATE: August 23rd, 1965.

OUR FILE REF.

IN REPLY TO

SUBJECT:

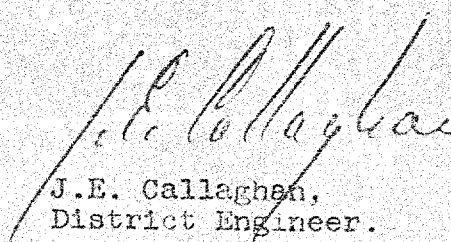
Re: Moore Creek Bridge - Sec. Highway #523 -  
WP.256-62

We have examined Drawing No. D-5731-P1. The only comment we have to make is as follows:

We wish to be definitely assured that the penetration indicated for the piles of the east pier is sufficient - this may require further investigation.

Other than the foregoing point we have no comments to make.

JEC:GJ

  
J.E. Callaghan,  
District Engineer.

## MEMORANDUM

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

FROM: Bridge Division,  
Downsview, Ontario.

DATE: August 11, 1965.

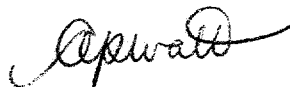
OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 256-62, Site No. 43 S 155,  
Moore Creek Bridge, 1 mile south of  
Madawaska, Sec. Hwy. 523, Dist. 10.

Enclosed please find one copy of the preliminary  
plan D 5731-P1 for the above structure.

Would you kindly review the bridge foundations pro-  
posed and inform us if they are satisfactory.



APW/ag

A. P. Watt,  
Regional Bridge Location Engineer.

Mr. A. Rutka,  
Materials & Testing Engr.,  
Room 102, Lab. Bldg.

Foundation Section,  
Room 107, Lab. Bldg.

April 2, 1965

Your Memo -- April 1, 1965

Foundation Investigation 65-F-22, Barry's Bay, Ontario.

With reference to your memo of April 1st, 1965, regarding the above-mentioned investigation, I would like to make the following comments:

Whatever decision I make, and I would like to point this out and emphasize it, it is always intended to be in the best interest of the Department.

In your mentioned memo you state that the procedure I followed was highly irregular. This, of course, comes to me as a great surprise because:

(a) you never mentioned this when we discussed the invoice for this service; and

(b) this arrangement is not without precedent.

The way I understand the present policies of the Department regarding private Consultants is that we should hire them for the work that cannot be done for one reason or another by our own staff. It is also, I believe, the policy of the Department not to become self-sufficient to the extent as to be able to dispense entirely with the services of private industry.

When Mr. Kulmatickas advised us that he would be unable to return to the site, a replacement had to be arranged for. Because of the fact that all the project engineers were away and the two senior engineers were busy on very urgent assignments, I decided that the best solution would be to hire a Consultant to carry out the job. More so, because at that time, it was quite uncertain when Mr. Kulmatickas would be able to return again to the site. This arrangement did not seem to me to be any different in principle from any other that we are entering into practically every day.

Also, in my opinion, the decision I made did not contravene any regulation or policy that I was aware of at that time. Since you seem to think differently, I would greatly appreciate it if you

Mr. A. Rutka  
Materials & Testing Engr.

- 2 -

April 2, 1965

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could give me some definite instructions concerning this matter since I can foresee that something like that could happen again.

AGS/MdeF

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

cc: Mr. N. D. Smith

Foundations Office ✓  
Gen. Files

MEMORANDUM

TO: Mr. A. Stermac,  
Principal Foundation Engineer.

FROM: Mr. A. Rutka,  
Materials & Testing Engr.

DATE: April 1, 1965.

OUR FILE REF.

IN REPLY TO

SUBJECT: Foundation Investigation 65-F-22, Barrys Bay, Ontario.

I have approved of the invoice submitted by Dominion Soils Investigation Limited and their Engineer, who was used in the absence of our own Engineer, Mr. Kulmattickas, due to the latter's illness.

This procedure is highly irregular, and I would suggest that in future you not request a consulting engineer to take over the duties of our Project Foundation Engineer, but instead, have one of your Senior Foundation Engineers fill in if another Project Foundation Engineer is not available.



AR/pa  
c.c. D. Smith.

A. Rutka,  
Materials & Testing Engineer.

## MEMORANDUM

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

FROM: Bridge Division,  
Downsview, Ontario.

DATE: December 8, 1964.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 256-62 Site #43-S155  
Moore Creek Bridge  
Secondary Highway 523  
District #10

Would you kindly arrange to have a foundation investigation conducted at the above location. I have enclosed one copy of the site plan E 4600-1 with the probable footing locations marked in red.

Would you also have an additional borings made at the points indicated by a red circle to allow flexibility in the final location of the structure should the foundation investigation prove it advantageous.

Pedrock will likely be at or near the surface at some locations.



APW/es

A. P. Watt,  
Regional Bridge Location Engineer.

cc. N. D. Smith  
cc. R. Fitzgibbon

20 01 0:54

B

65-F-22

00054

BANC DOWN 2 JAN 29/65 10:00A VR

D M BEWS MAINT ENGR

FOUNDATION SECTION WILL COMMENCE FIELD WORK FOR MOORE CREEK BRIDGE

HWY 523, W P 256-62, ON MONDAY FEB 1ST 1965

K G SELBY FOR A G STERMACK MATLS & TEST G DIV

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02/15/65

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KING DOWN 1 JAN 23/65 13:30A VR

J GROSPER RES MAINTS ENGR

FOUNDATION SECTION WILL COMMENCE FIELD WORK FOR MOORE CREEK BRIDGE

HWY 523 \* F 255-62 ON MONDAY FEB 1ST 1965

K G SELBY, SR MAINTS ENGR FOR A G STERNAC PRIN FOUNDING ENGR

MATERIALS AND TESTING DIV

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DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

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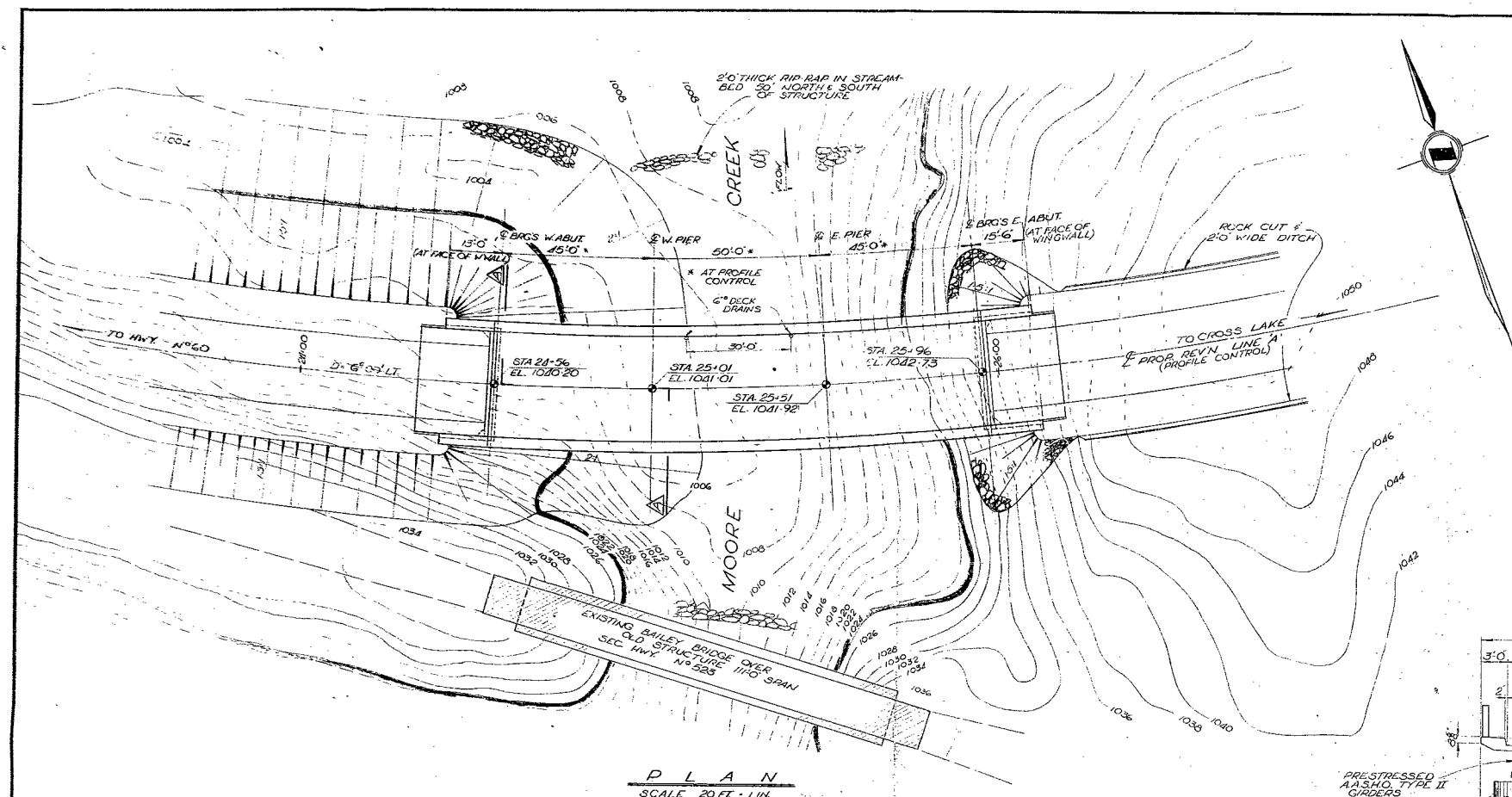
#65-F-22

W.P. #256-62

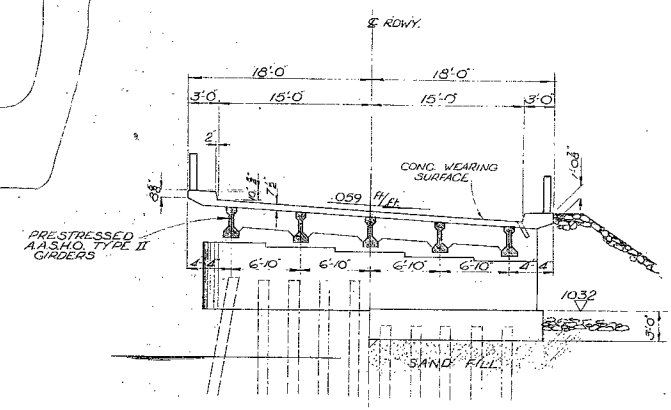
SEC. Hwy. #523

ε' MOORE CR.

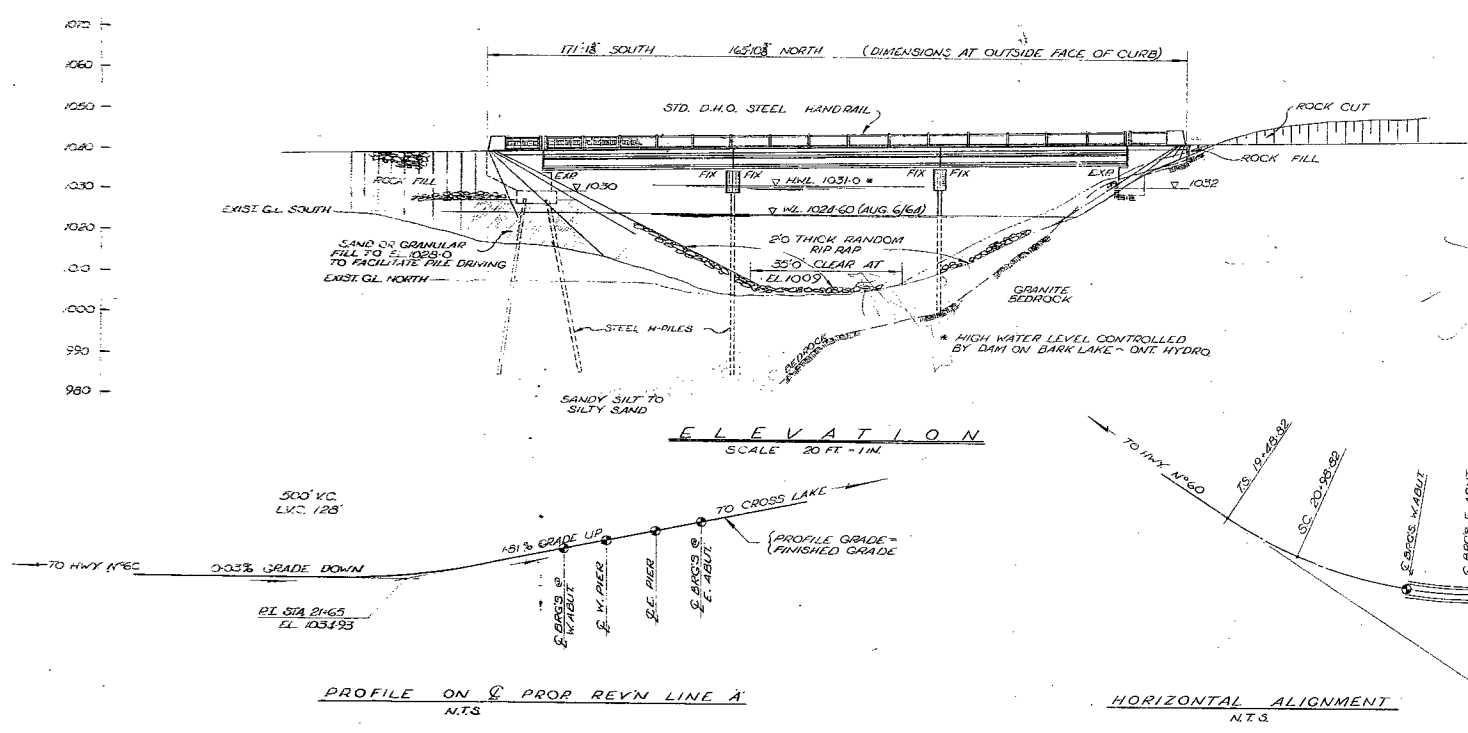




PLAN  
SCALE 20 FT = 1 IN.



A-A  
SCALE 1/4" = 1 FT.

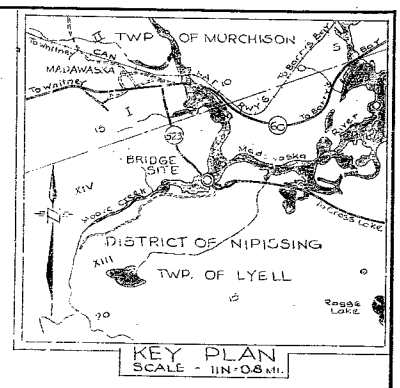


ELEVATION  
SCALE 20 FT = 1 IN.

HORIZONTAL ALIGNMENT  
N.T.S.

CURVE DATA  
Δ = 72°01'  
Lc = 634.07'  
D = 6°00' LT  
R = 554.93'  
LC = 1051.94'  
ES = 227.53'  
SPIRAL DATA  
SS = 4°30'  
LS = 120°00'  
TS = 770.99'

REFERENCE PLANS  
SITE PLAN E 1600-1  
COMPOSITE PLAN B 808-9



KEY PLAN  
SCALE - 1 IN = 0.5 MI.

G.B.M. N° EL 1038-17  
Hydro-Electric Power Commission Bench mark of Madawaska, established in 1942. Highway bridge over Madawaska River, one-quarter of a mile east of station. Bolt set vertically in top of curb of northeast corner of Southwest ruling post publication N° 19 "MADAWASKA"

REVISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO BRIDGE DIVISION			
MOORE CREEK BRIDGE 1 MI. SOUTH OF MADAWASKA			
KING'S HIGHWAY No. SEC. HWY N° 523		DIST. No. 10	
CO. DIST. OF NIPISSING		TWP. LYELL LOT 16615 CON. XIV	
PRELIMINARY			
APPROVED		SITE No. 43 S 155 W.F. No. 256-62	
DESIGN	CHECK	CONTRACT	No.
DRAWING	CHECK	DRAWING	No.
DATE	LOADING	D-5731-PI	

