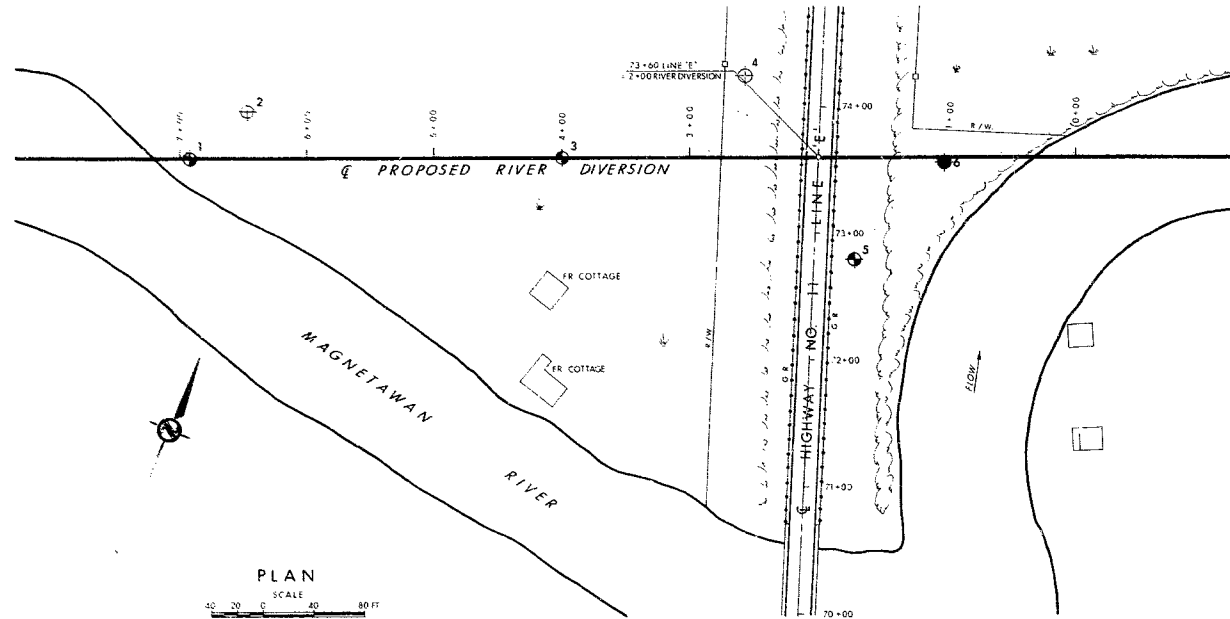


CONT. 72-69

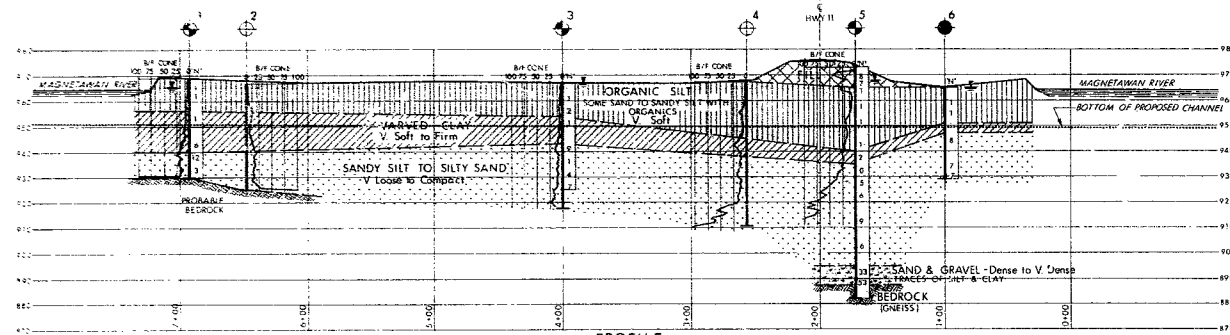
HWY. 11 AT

KATRINE

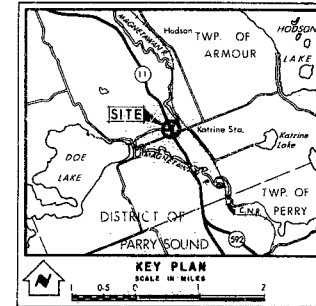
31E-36



PLAN
SCALE
0 20 40 80 FT



PROFILE
HORIZ SCALE 40 20 0 20 40 FT
VERT SCALE 20 0 20 40 FT



LEGEND			
●	Bore Hole		
⊕	Cone Penetration Hole		
⊗	Bore & Cone Penetration Hole		
—	Water Levels established at time of field investigation APRIL, 1970.		
NO.	ELEVATION	STATION	OFFSET
1	969.1	70+92	25' E
2	966.7	70+47	38' RT
3	966.6	4+00	1' E
4	967.6	7+58	65' RT
5	973.3	1+70	80' LT
6	965.0	1+00	3' 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.

DATE	BY	DESCRIPTION

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

MAGNETAWAN RIVER

KING'S HIGHWAY NO. 11 LINE 'E' DIST. NO. 11
DIST. PARRY SOUND
TWP. ARMOUR LOT 10 CON. III

BORE HOLE LOCATIONS & SOIL STRATA

DRAWN G.A. CHECKED E.D. DATE MAY 15, 1970. SITE NO. 70-11026A
APPROVED [Signature] CONTRACT NO. 70-11026A
BORE HOLE NO. 70-11026A

GEORES NO 31E-36

MEMORANDUM

To: Mr. T. G. Smith,
Regional Functional Planning
Engineer, North Bay.

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

ATTENTION:

DATE: June 9, 1970.

OUR FILE REF.

IN REPLY TO

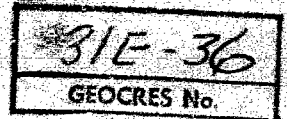
JUN 22 1970

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For

Replacement of Magnetawan River Bridge
on Hwy. #11 at Katrine
District No. 11 (Huntsville)
W.O. 70-11026 -- W.P. 249-66-00

CONT. 72-69



Attached, we are forwarding to you the results of a foundation investigation carried out for the above-mentioned project. The investigation was originally requested in a memo dated March 18, 1970, from Mr. E. R. Saint to Mr. A. G. Stermac.

We believe the information contained in our report will be sufficient for your present purposes, though additional borings will probably be necessary when the project reaches the design stage.

Should further information be required, please contact this Office.

AGS/hrd
attach.

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

cc: Messrs. T. G. Smith
H. A. Tregaskes
G. E. French
W. Wigle
I. C. Campbell
H. McArthur
B. R. Davis
J. McAllister
E. R. Saint
B. A. Singh

Foundation Files ✓
General Files

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FOUNDATION INVESTIGATION REPORT
For
Replacement of Magnetawan River Bridge
on Hwy. #11 at Katrine
District No. 11 (Huntsville)
W.J. 70-11026 -- W.O. 249-66-00

1. INTRODUCTION:

A request for a foundation investigation at the above-mentioned site was contained in a memo from T. G. Smith, Regional Functional Planning Engineer to E. R. Saint, Regional Materials Engineer dated March 10th, 1970. The purpose of this investigation was to obtain information relating to the technical feasibility and cost of the project to be incorporated in a functional planning report.

Accordingly a foundation investigation was carried out by this Section to determine the subsoil conditions existing at the site of the proposed new bridge structure and river diversion. Presented in this report are the results of this investigation together with recommendations relating to the foundation design of the structure and the slope stability of the proposed diversion channel and structure approaches.

2. DESCRIPTION OF THE SITE:

The site is located some 350 ft. north of the existing crossing of Hwy. #11 and the Magnetawan River at Katrine, Ontario. At this location the Magnetawan River flows in a west to east direction and is about 100 feet wide and about 15 ft. in depth. In the immediate area of the site the surrounding terrain is generally flat and swampy. Existing Hwy. #11 is built on an embankment some 8 to 10 ft. high above original ground.

3. FIELD AND LABORATORY INVESTIGATION:

Four boreholes and five dynamic cone penetration tests were carried out along the proposed alignment. Three of the boreholes were terminated at relatively shallow depths while the remaining one, located in the vicinity of the proposed structure, was advanced to practical refusal and cored using a EX core barrel.

The borings were undertaken using a diamond drill rig adapted for soil sampling purposes. Undisturbed samples were recovered using 2" I.D. Shelby tubes which were pushed manually into the soil. Disturbed samples were recovered using split-spoon samplers which were driven into the soil according to the requirements of the Standard Penetration Test. Where possible Field vane tests were carried out in cohesive soils.

Samples were visually examined in the laboratory to determine moisture contents, Atterberg Limits, grain size distribution, unconfined shear strength and organic contents. The results of these tests are compiled on the borelog sheets accompanying this report.

4. SUBSOIL CONDITIONS:

4.1) General:

The subsoil at the site consists of, from ground level down, Organic Silt to Silty Sand with Organics, Varved Clay, Sand to Silty Fine Sand followed by Gneiss bedrock. One borehole only was undertaken through the Fill and in this location it consisted of Fine Sand. A more detailed description of the soil strata from ground level down is given below:

4.2) Fill Material - Fine Sand with traces of Gravel and Silt:

One borehole only was undertaken through the Highway #11 Fill i.e. No. 5. The embankment has a height of 8 feet, and 'N' values as obtained from standard penetration tests ranged from 7 blows/ft. to 8 blows/ft. and hence the consistency is estimated to be 'compact'.

Laboratory tests gave the following results:-

Moisture content %	13.3 - 19.4
Grain size analysis %	Gra. 9; Sa. 82; Sl. & Cl. 9.

4.3) Organic Silt to Silty Sand with Organics:

This was found in all boreholes as the surface deposit and ranged in thickness from 13 to 27 feet. The material contained varying amounts of organics, the latter causing the description of the deposit to range from 'non-plastic' to 'highly plastic'.

Atterberg Limits performed in the plastic portions of the deposit gave the following results:-

	Air Dried	Oven Dried
Liquid Limit %	25 - 69	25 - 44
Plastic Limit %	22 - 44	23 - 34
Moisture Content %	31 - 50	

Other laboratory tests gave the following results:-

Grain size distribution %	So 87	Si and Cl 13
Organic content %	0.7 - 3.4	
Density p.c.f.	96 - 117.5 (mean 110)	
Unconfined shear strength p.s.f.	300 - 1,355	

Field vane tests gave shear strengths ranging from 700 p.s.f. to 1400 p.s.f. and sensitivity from 1.5 to 7.2.

'N' values as obtained from Standard Penetration Tests were only between 1 and 2 blows/ft., but the Field vanes indicate a consistency from 'very soft to firm'.

4.4) Varved Clay:

This material was found in all boreholes underlying the Organic Silt with Sand to Silty Sand with Organics. The deposit consists of alternate layers of Silty Clay and Silt up to 1" in thickness and the complete stratum varied in thickness from 14 feet - borehole no. 1 to 4 feet - borehole no. 6. 'N' values ranged from 1 blow/ft. to 6 blows/ft. indicating a consistency of very soft to firm. Atterberg Limit tests gave the following results on the different portions of the stratum:

	Silty Clay	Silt
Moisture Content %	67 - 70	31 - 35
Liquid Limit %	48 - 51	28
Plastic Limit	25 - 30	24

Grain size analysis showed the material consisted solely of Silt and Clay.

Other laboratory tests gave the following results:-

Density p.c.f.	116
Unconfined shear strength p.s.f.	750 - 900

Field vane tests gave shear strengths from 900 p.s.f. to 1200 p.s.f. and sensitivity from 7.5 to 11.

4.5) Sand to Silty Sand:

This material was found in all boreholes underlaying the stratum of varved clay. Boreholes were terminated in this layer apart from borehole 5 in which the stratum extended to a thickness of 40 feet. 'N' values varied from 1 blow/ft. to 12 blows/ft., indicating a consistency of 'very loose' to 'compact' though generally 'loose'.

Laboratory tests gave the following results:-

Grain size distribution %	Sa. 55 - 93; Si. and Cl. 7 - 45
Moisture content %	23 - 30

4.6) Gravel and Sand with traces of Silt and Clay:

This deposit was found in borehole no. 5 only underneath the Sandy Silt to Silty Sand stratum and has a thickness of some 9 feet. 'N' values ranged from 33 blows/ft. to 53 blows/ft., indicating the material to be dense to very dense.

Laboratory tests gave the following results:-

Grain size distribution %	Gra. 50; Sa. 39; Si. and Cl. 11
Moisture content %	6.6

4.7) Gneiss Bedrock:

Bedrock was proved in borehole no. 5 only and was found to be at an elevation of 886.3; it consists of sound gneiss bedrock. The behaviour of the cones in boreholes #1 and #2 indicate that the slope of the bedrock is rising in an East-West direction.

5. GROUNDWATER CONDITIONS:

Groundwater elevations as observed in the boreholes at the end of operations were as follows:-

1. 965.8 ft. 3. 966.8 ft. 5. 961.3 ft. 6. 965.0 ft.

6. DISCUSSION AND RECOMMENDATIONS:

As mentioned earlier in the report it is proposed to relocate the Magnetawan River some 350 feet North of its present crossing with Hwy. #11 at Katrine. The diversion channel will be 700 feet in length and have a bed 40 feet wide lying 20 feet below existing ground level. A new structure will be required at the crossing of highway no. 11 and the existing road grade will

be raised by some 10 feet. The subsoil consists of, from ground level downwards, Organic Silt to Silty Sand with Organics, Varved Clay, Sand to Silty Fine Sand, Gravel and Sand with traces of Silt and Clay and finally Gneiss bedrock.

Occasional boulders were noticed lying along the toe of the highway fill on the West side; these appear to originate from the highway Fill, though no boulders were encountered in borehole #5. Apart from the possibility of boulders in the fill no problems are anticipated with regard to excavation for the proposed diversion.

Mr. T. G. Smith, Regional Functional Planning Engineer, has indicated that the grade of highway #11 may be raised to a maximum of 10 feet above the existing fill height. If this is the case then no problems are anticipated with regard to the side slopes of the proposed fill provided standard 2:1 slopes are adopted, the shear strength of the subsoil being adequate to support fills of up to 10 feet. In the case of the forward slope to the proposed structure stability analyses were carried out by an electronic computer using the circular arc criterion. Strength parameters of the subsoil were expressed in terms of total stresses. The results of the calculations indicated that no stability problems will be encountered if the raise in grade is 6 feet or less. Should the grade be raised more than 6 feet then berms will be required ranging in length from zero for a 6 feet raise in grade to 30 feet for a 10 feet raise in grade. Fig. 1 of the Appendix shows a section through the forward slope together with a graph of Proposed Raise in Grade versus Berm Length. It should be noted that 'Berm Length' refers to the distance from the point where the 2:1 forward slope cuts the top of the existing fill to the toe of the proposed fill.

The existing river banks appear stable with an average slope of 2:1 and it is recommended that this gradient be adopted for the side slopes to the proposed diversion. Some sloughing will occur but this is to be expected with material of this nature.

Settlements are expected to be in the range of $1\frac{1}{2}$ to 2 feet for a 10 ft. grade raise. No detailed settlement analysis has been made but this will be necessary at the time of the final

investigati When the exact location and structural details are known.

Regarding foundations for the proposed structure, end bearing piles are recommended driven down to bedrock. In the case of steel H piles the design load of the pile will depend on the particular section chosen and may be the maximum allowable.

7. MISCELLANEOUS:

The field work was carried out during the period April 13 to 22, 1970, under the supervision of Mr. G. Allen, Project Foundation Engineer, who also prepared this report.

The drilling equipment was owned and operated by Johnston Drilling Co., Ltd.

Mr. K. G. Selby, Supervising Foundation Engineer, reviewed the report.

June, 1970.

APPENDIX I

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No.1

FOUNDATION SECTION

JOB 70-11026 LOCATION Sta. 6 + 32 on E ORIGINATED BY GA
 W.P. 249-66-00 BORING DATE April 20 & 22, 1970 COMPILED BY GA
 DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing CHECKED BY LL

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS				
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					SHEAR STRENGTH P.S.F.					WATER CONTENT %			
							20	40	60	80	100	UNCONFINED		FIELD VANE			w_p — w — w_L			
												○	+	×						
							1000	2000					15	30	45		GR. SA. SI. CL.			
969.1	Ground Level																			
0.0	Organic silt, some sand to silty sand with organics		1	SS	1															
	Very soft to stiff		2	SS	1															
956.0			3	TW	PM															
13.1	Varved Clay		4	SS	1															
	Very soft to firm		5	TW	PM															
940.0			6	SS	6															
29.1	Sandy silt to silty fine sand.		7	SS	12															
	Very loose to compact		8	SS	3															
929.9																				
39.2	Bit bouncing at 39.2 possibly bedrock																			
	End of Borehole																			

FOUNDATION SECTION

JOB <u>70-11026</u>	LOCATION <u>Sta. 6 + 47 o/s 38' Rt.</u>	ORIGINATED BY <u>GA</u>
W.P. <u>249-66-00</u>	BORING DATE <u>April 22, 1970</u>	COMPILED BY <u>GA</u>
DATUM <u>Geodetic</u>	BOREHOLE TYPE <u>Cone Penetration Test</u>	CHECKED BY <u>[Signature]</u>

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 70-11026 LOCATION Sta. 4 + 00 on Ø ORIGINATED BY GA
 W.P. 249-66-00 BORING DATE April 17, 1970 COMPILED BY CA
 DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing CHECKED BY SR

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS					
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT					SHEAR STRENGTH P.S.F.					WATER CONTENT %				
							20	40	60	80	100	UNCONFINED		FIELD VANE			w_p — w — w_L				
											QUICK TRIAXIAL		LAB. VANE		1000 2000			15 30 45			
966.8	Ground Level																				
0.0	Organic silt with sand to silty sand with organics		1	SS	1																
	Very soft		2	SS	2																
954.0	Varved Clay		3	SS	1																
12.8	Very soft to firm		4	TW	PM																
943.0	Sand		5	SS	9																
23.8	Silty fine sand		6	SS	1																
	Very loose to loose		7	SS	4																
925.3			8	SS	7																
41.5	End of Borehole																				
916.8																					
49.0	End of Cone Test																				

FOUNDATION SECTION

ORIGINATED BY GA

COMPILED BY QA

CHECKED BY _____

20
15 — 5 % STRAIN AT FAILURE
10

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 5

FOUNDATION SECTION

JOB 70-11026

LOCATION

Sta. 1 + 70 o/s 80/ Lt.

ORIGINATED BY GA

W.P. 249-66-00

BORING DATE

April 13, 14, 15, 16, 1970

COMPILED BY GA

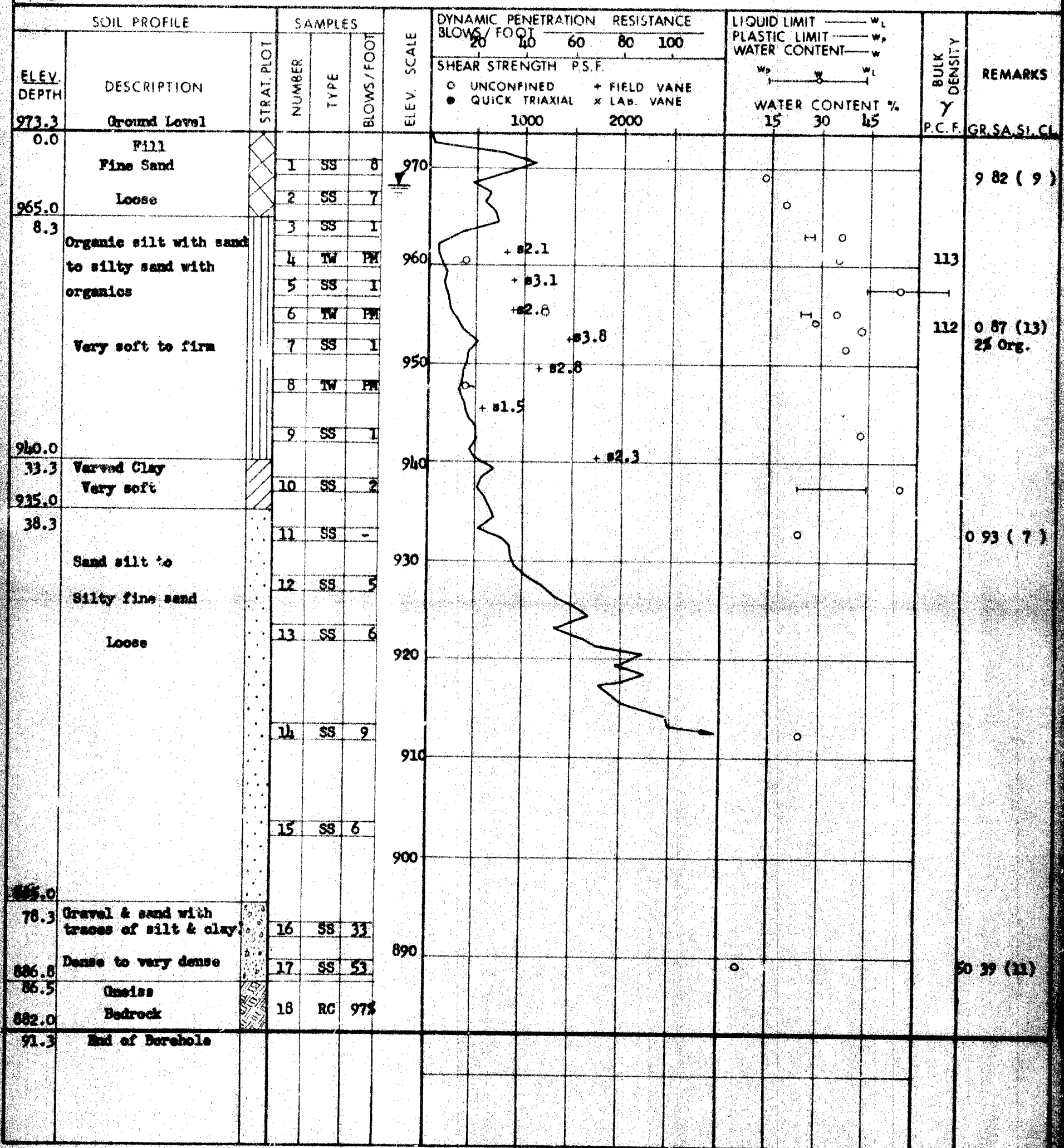
DATUM Geodetic

BOREHOLE TYPE

Washboring, NX, BX Casing

CHECKED BY

JR



DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No.6

FOUNDATION SECTION

JOB 70-11026 LOCATION Sta. 1 + 00 o/s 3' Lt.

ORIGINATED BY GA

W.P. 24 9-66-00 BORING DATE April 16, 1970

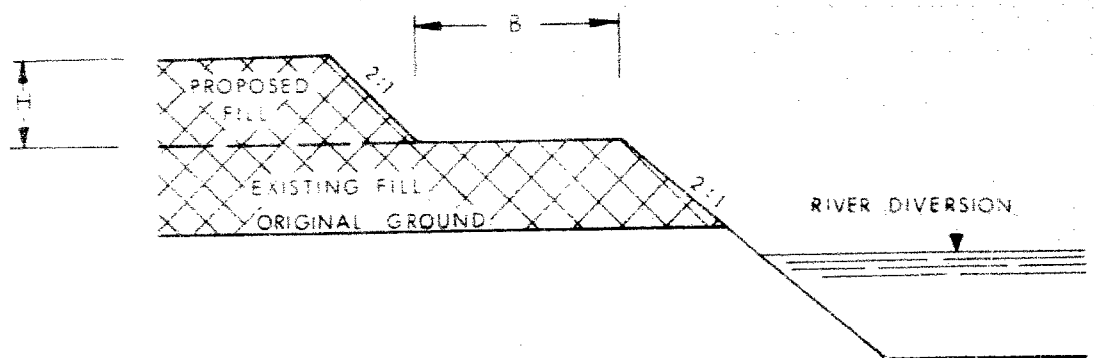
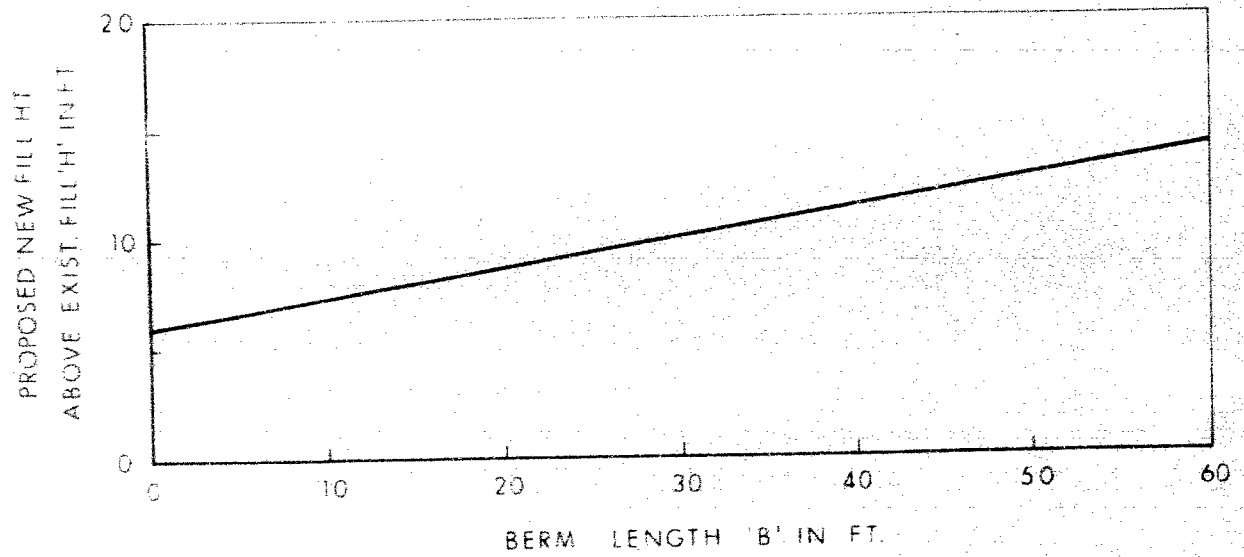
COMPILED BY GA

DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing

CHECKED BY *JK*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE				LIQUID LIMIT — w_L			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT				PLASTIC LIMIT — w_p				
							SHEAR STRENGTH P.S.F.				WATER CONTENT %				
965.0	Ground Level														
0.0	Organic silt, with sand to silty sand, with organics.														
	Very soft to firm		1	SS	1	960									
951.0			2	SS	1										
14.0	Varved Clay														
947.0	Soft		3	SS	-	950									
18.0	Sandy silt to silty fine sand.		4	SS	8										
			5	SS	1	940									
	Loose to very loose.		6	SS	7										
929.0			7	SS	7	930									
36.0	End of Borehole														

HEIGHT OF FILL VS. LONGITUDINAL BERM LENGTH



SECTION THROUGH FORWARD SLOPE

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

Q _u	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Q _{cu}	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q _d	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_r	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
T_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_i	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
$\bar{\sigma}$	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 (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

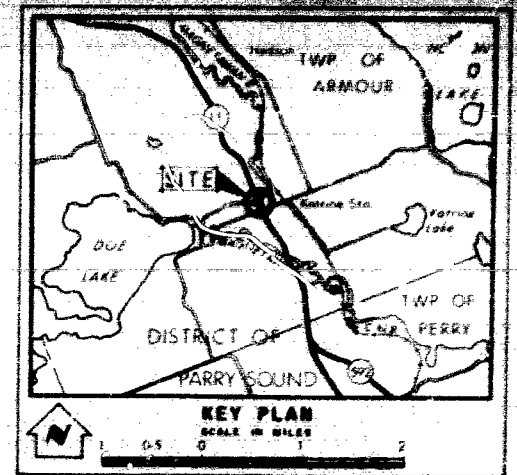
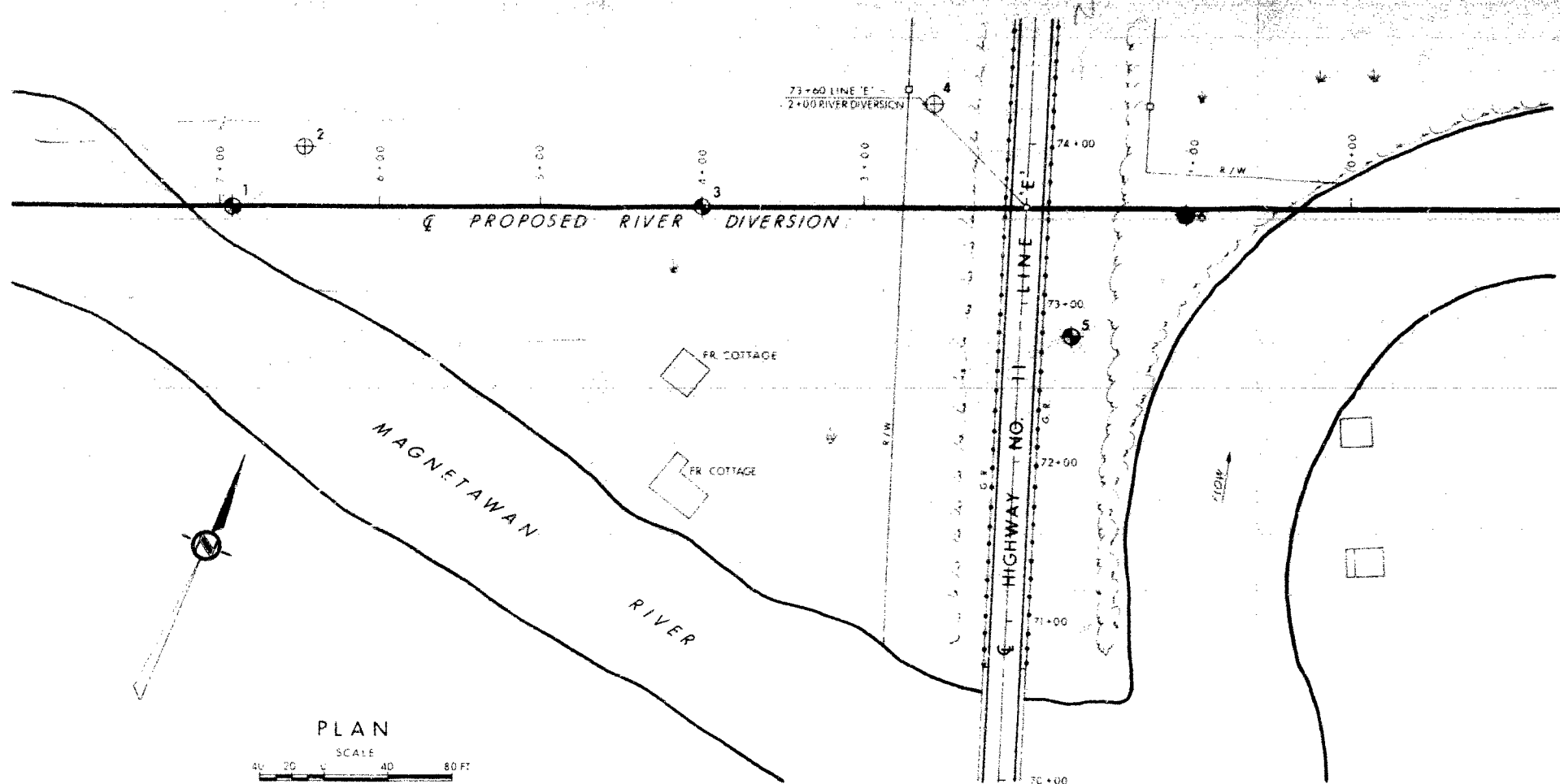
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

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

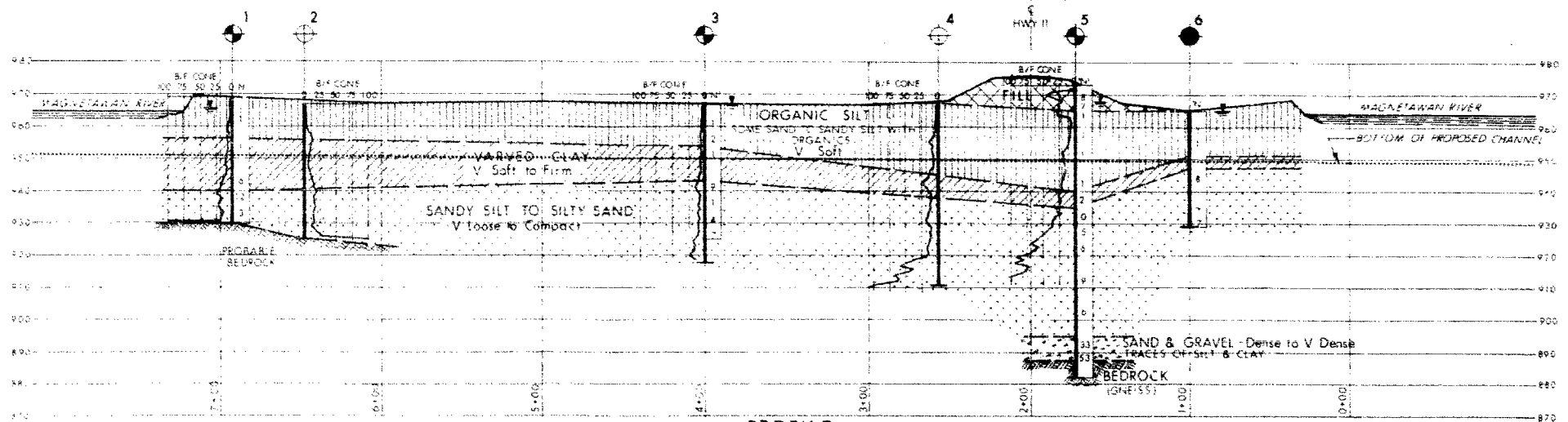
SLOPES

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



LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation, APRIL, 1970		
NO.	ELEVATION	STATION	OFFSET
1	969.1	6+92	4'
2	966.7	6+47	38' 4"
3	966.8	6+00	4'
4	967.6	2+08	65' 4"
5	973.3	1+70	80' 1"
6	965.0	1+00	31' 1"

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.



PRINT RECORD		
NO.	FOR	DATE

DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS - ONTARIO			
MATERIALS & TESTING OFFICE - FOUNDATION SECTION			
MAGNETAWAN RIVER			
KING'S HIGHWAY NO. 11 LINE 'E'		DIST. NO. 11	
DIST. PARRY SOUND		TWP. ARMOUR	
LOT 10		CON. III	
BORE HOLE LOCATIONS & SOIL STRATA			
SHOWN G.A. CHECKED	REP. NO. 249-66-00	M.B.T. DRAWING NO.	
DRAWN E.D. CHECKED	JOB NO. 70-11026	70-11026A	
DATE MAY 15, 1970	SITE NO.	GRADE DRAWING NO.	
APPROVED	CONT. NO.		

REF NO. 1-B-501

~~XXXXXXXXXXXXXXXXXXXX~~

MEMORANDUM

TO: C. S. Grebski,
Structural Design Engineer,
Design Services Branch,
West Bldg., Downsview.

FROM: Foundations Office,
Design Services Branch,
Central Bldg., Downsview.

ATTENTION:

DATE: November 15, 1971.

OUR FILE REF.

IN REPLY TO

DEC 1 1971

SUBJECT: Magnetawan River Bridge on Hwy. #11 at
Katrine, W.O. 71-11047, W.P. 249-66-00.
District #11, Hunterville.

Further to our memo of September 14, 1971, we enclose Drwg. No. 70-11026B and Borehole Logs No.'s 7 to 14 which cover the additional work done in July of this year for the above-mentioned project.

The additional boreholes were undertaken in the vicinity of the proposed structure - i.e. No. 7 to No. 10 - and in the vicinity of the river crossing - i.e. No. 11 to No. 14.

The subsoil in the immediate area of the proposed bridge consists of 9 to 25 feet of firm/loose organic silt with sand to silty sand with organics overlying 0 to 5 feet of firm varved clay, 7 to 9 feet of loose silt with seams of clay and very loose silty sand to sandy silt in that order.

The surficial deposit of organic silt to silty sand was found to be basically granular with layers of organics throughout.

Underlying the silty sand to sandy silt stratum is a shallow layer of sand with gravel and some silt overlying either boulders or bedrock. The bedrock consists of sound granite gneiss and varies in elevation from 336.3 in Borehole No. 5 to elevation 914.4 in Borehole No. 7. The general ground elevation in the area is approx. 966.0.

The subsoil in the vicinity of the existing river crossing consists basically of granular materials, i.e. silts and sands as shown in Drwg. 70-11026B spent from an 11 foot stratum of firm to stiff varved clay in the south bank between elevations 946.0 to 957.5 where the general ground elevation is approx. 975.0.

November 15, 1971.

The surficial layer of silt and sand in the river bed though was found to contain sufficient layers of organics within a depth of 7 feet to cause problems at the time of placing fill in the river and this was dealt with in our previous memo of September 14, 1971.

Other recommendations concerning the structure foundations and stability of the new cut slopes were also included in our memo of September 14, 1971.

This memo and enclosures together with our previous memo dated September 14, 1971, should be attached to your copy of Foundation Report 70-11026.

K. G. Selby

KGS/ao
Attach.

K. G. Selby,
SUPERVISING FOUNDATION ENGINEER.

cc: Messrs. E. R. Davis
J. McAllister
A. Rutka
D. W. Farren
H. McArthur
R. S. Chapman
B. J. Giroux
R. Northwood
G. A. Wrona
B. A. Singh

Foundations Files
Documents

MEMORANDUM

TO: C. S. Grebski,
Structural Design Engineer,
Structural Design Section,
Design Services Branch,
West Bldg., Downsview.

FROM: Foundations Office,
Design Services Branch,
Central Bldg., Downsview.

ATTENTION: West Bldg., Downsview.

DATE: September 14, 1971.

OUR FILE REF.

IN REPLY TO

SUBJECT: Magnetawan River Bridge on Hwy. #11 at
Katrine, W.O. 71-11047, W.P. 249-66-00,
District #11, Huntsville.

Following your memo of July 1971 we have reviewed the final bridge drawings in the light of the recent foundation investigation (i.e., W.O. 71-11047) completed at the site. Our comments are as follows:

1. The variation in the surface of the bedrock necessitates the pile lengths to be revised as below:

South Abutment	83 ft.
South Pier	60 ft.
North Pier	50 ft.
North Abutment	65 ft.

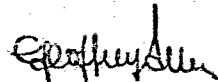
2. Extensive settlements due to a raise in grade are not now anticipated as the subsoil is generally granular in nature, but it is recommended that final paving be delayed as long as possible due to the presence of occasional organic seams.
3. Excavations for the new channel and for the pier pile caps will be carried out below the ground water level in granular type soil (silt and sand with organics) which is highly susceptible to conditions of unbalanced hydrostatic head. The excavation bases are likely to 'boil' under such conditions; therefore, a dewatering scheme will be necessary in order to ensure that concrete may be placed in dry stable conditions. Stable dry conditions can be achieved by excavating within steel sheet cofferdams driven to a depth below an excavation base equal to the height of the prevailing groundwater level above it. It is also recommended that a granular pad of minimum thickness 12 inches be placed underneath the pile caps.

As an alternative to an expensive dewatering scheme it is suggested that the possibility of designing the piers as a row of columns consisting of steel H piles driven to bedrock, capped at underside of deck level, be considered. These piles may be encased in concrete down to about 4 feet below stream bed level if desired.

September 14, 1971.

4. Regarding the stability of the fill which will be placed within the river bed at the site of the existing structure we would like to point out that up to seven feet of very soft organic soil is likely to be encountered. We therefore suggest the following construction procedure:

- (a) All fill placed under water on the river bed must consist of suitable granular type borrow within the area bounded by the intersection of 2:1 slopes from edge of shoulder down to the bed of the river.
- (b) Fill should be placed starting from the west limit and proceeding towards the east so as to displace any soft soil away from the front of the fill as it advances. If a mud wave forms in front of the fill it should be excavated and be disposed of downstream east of the east limit.
- (c) Outside of the limits referred to in (a) the excavated material from the new diversion may be dumped as required.



KGS/GA/ao

cc: Messrs. B.R. Davis
H. MacArthur
R.S. Chapman
R. Northwood
J. Harris
A. Radkowski

G. Allen,
Project Foundation Engineer,
For:
K. G. Selby,
Supervising Foundation Eng.

Foundations Files
Documents

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 71-11047

LOCATION Sta. 17h + 63 @ Hwy. 11 o/s 20.5' Lt.

ORIGINATED BY GA

W.P. 249-66

BORING DATE June 22 & 23, 1971

COMPILED BY GA

DATUM Geodetic

BOREHOLE TYPE Washboring NX & BX Casing, BX Core

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.		WATER CONTENT % w_p ——— w ——— w_L 15 ——— 30 ——— 45				
							○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB. VANE					
975.4	Top of Fill						1000	2000					GR. SA. SI. CL.
0.0	Fill Material												
	Sand with some gravel		1	SS	22	970							
			2	SS	9								
964.5			3	SS	22								966.4
10.9	Organic silt with some sand to sandy silt with organics.		4	SS	1	960		>+2000					4.9% org.
			5	SS	2								
955.4	Firm - Loose		6	SS	10		+sl. 5				76%		
20.0	Silt (1 - 2') with seams of clay (1/8")		7	SS	2								
			8	SS	7	950							
947.4	Loose		9	SW	PM						omp	122	0 0 93 7
28.0			10	SS	7								
	Silty sand to sandy silt.		11	SS	4	940							
	Loose to Compact		12	SS	5								
			13	SS	5	930							
			14	SS	13								
921.0													
54.4	Sand with gravel and trace of silt.		15	SS	44	920							27 58 (15)
916.1	Dense												
914.4	Boulders		16	BX	10%								
61.0	Sound Granite Gneiss		17	BX	97%	910							
907.9													
67.5	End of Borehole												

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

JOB 71-11047 LOCATION Sta. 174 + 35 @ Hwy. 11 o/s 25' Rt.

ORIGINATED BY GA

W.P. 249-46

BORING DATE June 28 29, and July 2 & 6, 1971

COMPILED BY GA

DATUM Geodetic

BOREHOLE TYPE Washboring NX, BX Casing, BX Core

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE				LIQUID LIMIT — w_L			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	BLOWS/FOOT	RESISTANCE	RESISTANCE	PLASTIC LIMIT — w_p	WATER CONTENT — w	WATER CONTENT %		
975.2														
0.0	Fill													
	Sand with some gravel													
965.2														
10.0	Organic silt with some sand to silty sand with organics.		1	SS	2									
955.2	Firm - Loose		2	SS	2									
20.0	Var. clay with 1/8" seams of clay (1/8")		3	SS	4									
951.2	Firm		4	SS	-									
24.0	Silt with thin seams of clay (1/8")		5	SS	-									
942.0	Loose		6	TW	1 1/2"									
33.2			7	SS	2									
	Silty sand to sandy silt.													
	Very Loose to Loose.													
903.2														
72.0	Sound Granite Gneiss		8	BX	100%									
898.0														
77.2	End of Borehole													

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 9

FOUNDATION SECTION

JOB 73-11047 LOCATION Sta. 173 + 35 @ Hwy. 11 o/s 25' Lt. ORIGINATED BY GA

W.P. 242-66 BORING DATE June 23, 24 & 28, 1973 COMPILED BY GA

DATUM Geodetic BOREHOLE TYPE Washboring, NX, BX Casing, BX Core CHECKED BY







SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w _L PLASTIC LIMIT — w _p WATER CONTENT — w			BULK DENSITY Y P.C.F.	REMARKS			
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					w _p — w — w _L							
							20 40 60 80 100												
							SHEAR STRENGTH P.S.F.												
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE							WATER CONTENT %					
							1000 2000							15 30 45					
974.9	Top of Fill														GR SA, SL, CL				
0.0	Fill Material																		
	Sand with some gravel																		
963.9	Compact		1	SS	11 1/2														
11.0	Organic silt with some sand to silty sand with organics.		2	SS	7														
		3	SS	2											0 12 79 9				
955.0	Firm-Loose	4	SS	-															
19.9	Varved clay, silt with irregular seams of clay (1/8").	5	SS	1															
24.9	Loose	6	SS	-															
25.0	Silt (1/2" to 2") with seams of clay (1/8")	7	TW	FM											113.9				
943.0	Loose	8	TW	FM/12"											120				
31.9		9	SS	7											0 27 (73)				
	Silty sand to sandy silt.	10	SS	1															
		11	SS	2															
	Very Loose to Loose	12	SS	1															
		13	SS	1															
904.1		14	SS	100/5"															
70.8	Boulders	15	BX																
898.6		16	BX																
76.3	End of Borehole																		

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 10

FOUNDATION SECTION

JOB 71-11047 LOCATION Sta. 173 + 27 @ Hwy. 11 o/s 25' Rt. ORIGINATED BY GA
 W.P. 242-66 BORING DATE June 29 & 30, 1971 COMPILED BY GA
 DATUM Geodetic BOREHOLE TYPE Washboring, NY Casing CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— w_L			BULK DENSITY	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT					PLASTIC LIMIT ——— w_p				
							20 40 60 80 100					WATER CONTENT ——— w				
							SHEAR STRENGTH P.S.F.					w_p ——— w ——— w_L				
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE					WATER CONTENT % 15 30 45			P.C.F.	GR. SA. SI. CL.
973.0																
0.0	Fill					970										966.5
	Sand with some gravel															
263.0																
10.0	Organic silt with some sand to silty sand with organics		1	SS	3	960										4.0% Org.
			2	SS	1											
			3	SS	1											
	Firm - Loose		4	SS	1	950										0.72 (28) 1.4% org.
949.0																
24.0	Silt with seams of clay (1/8")		5	SS	8											
			6	TW	FM/12"	940									120	
940.0	Loose															
33.0			7	SS	L											0.78 (22)
	Silty sand to sandy silt.					930										
	Loose					920										
					910											
901.0																
72.0	End of Borehole		8	SS	5	900										
892.1																
80.6	End of Cone Test															

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 11

FOUNDATION SECTION

JOB 73-110b7 LOCATION Sta. 171 + 46 @ Hwy. 11 o/s 51' Rt.
 W.P. 240-66 BORING DATE June 30, 1971
 DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing

ORIGINATED BY GA
 COMPILED BY GA
 CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE		20	40	60	80	100	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE				
965.6	Ground Level														
0.0	Sand with some silt and organics. Very Loose		1	SS	2										GR SA, SL, CL
			2	SS	2										0.75 (25) 1.6% org.
			3	SS	2										1.6% Org.
			4	SS	2										
949.9			5	SS	2										
15.7	Silt with irregular seams of clay (1/8")		6	SW	1 1/4"										
944.6	Loose														
21.0	Silty sand to sandy silt. Very Loose to Loose		7	SS	4										
			8	SS	7										
			9	SS	7										
924.1			10	SS	1										
41.5	End of Borehole														
910.6															
55.0	End of Cone Test														

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 12

FOUNDATION SECTION

JOB 71-11047 LOCATION Sta. 169 + 38 @ Hwy. 11 o/s 140' Lt.

ORIGINATED BY GA

W.P. 240-66 BORING DATE June 30, 1971

COMPILED BY GA

DATUM Geodetic BOREHOLE TYPE Washboring

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE			LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV SCALE	BLOWS / FOOT 20 40 60 80 100	SHEAR STRENGTH P.S.F. 1000 2000	RESISTANCE	WATER CONTENT % 15 30 45			
974.7	Ground Level												
0.0	Fine medium sand with some silt.		1	SS	17	970							
	Compact		2	SS	17								
963.7			3	SS	12								
11.0	Silt with traces of sand.		4	SS	7	960							
957.5	Loose		5	SS	7								
17.2	Varved clay Firm to Stiff		6	SS	2								
	(Clayey silt seams 1/4" to 1/2")		7	TW	PM	950		+s8.0 q				106	
	Silty Clay seams 1/8" to 1/4")		8	TN	PM			+s2.8 p				111	
946.0			9	TW	PM			+s8.0 q				114.5	0.99 1
28.7			10	SS	8								
	Silty sand to sandy silt.		11	SS	11	940							
	Loose to Compact		12	SS	7								
			13	SS	4	930							
						920							
918.2			14	SS	6								
56.5	End of Borehole												
909.9													
64.8	End of Cone Test												

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 13

FOUNDATION SECTION

JOB 71-11047

W.P. 280-66

DATUM Geodetic

LOCATION Sta. 170 + 00 E Hwy. 11 o/s 35' Lt.

BORING DATE July 9, 1971

BOREHOLE TYPE Washboring, NY Casing

ORIGINATED BY GA

COMPILED BY GA

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS / FOOT	SHEAR STRENGTH P.S.F.		WATER CONTENT % w_p ——— w ——— w_L 15 30 45				
964.9							<input type="radio"/> UNCONFINED + FIELD VANE <input checked="" type="radio"/> QUICK TRIAXIAL x LAB. VANE						
0.0	Water				960								
951.2													
10.7	Silt, sand and organics mixture.		1	SS	1	950					75% ϕ	3.5% Org.	
			2	SS	1								62%
946.4	Very Loose		3	SS	1								ϕ
10.5	Silt with irregular seams of clay (1/8")		4	SS	2	940							
941.7	Loose		5	SS	2								
23.2	Silty sand to sandy silt.		6	SS	15								
932.2	Loose		7	SS	2							0.18 (82)	
32.7	End of Borehole												

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 14

FOUNDATION SECTION

JOB 71-710M7 LOCATION Sta. 17C + 30 p Hwy. 11 o/s 37' Rt. ORIGINATED BY GA
 W.P. 210-66 BORING DATE July 12, 1971 COMPILED BY GA
 DATUM Geodetic BOREHOLE TYPE Washboring, NY Casing CHECKED BY LL

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F. GR. SA. SI. CL	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					SHEAR STRENGTH P.S.F.					WATER CONTENT % 15 20 45
							20	40	60	80	100	O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE					
964.9						960											
0.0	Water					950											
939.9						940											
25.0	Silty sand to sandy silt.		1	SS	1												
			2	SS	3												
	Very Loose		3	SS	4	930											
924.4			4	SS	2												
40.5	End of Borehole																

MEMORANDUM

To: Mr. A. G. Stermac
Principal Foundations Engr.
Foundations Sect'n. Downsview

FROM: Materials & Testing
Northern Region

ATTENTION:

DATE: September 30, 1970

OUR FILE REF.

IN REPLY TO

SUBJECT:

W.P. 249-66, Hwy. 11, Magnetewan
Ri. Br. & approaches at Katrine

The Functional Review of this project was attended by the undersigned a short time ago. It became evident, after looking at the site and reviewing the preliminary Foundations report, that a potential failure area could occur under the existing structure when it was backfilled.

On September 29 the attached field information was obtained. This, I feel, confirms my suspicions. Would you please review the data and, if you consider that it is a problem, include the area along with your final bridge site investigation.


E. R. Saint
Reg. Materials Engineer

ERS/gm

W.P. 249 - 66

MAGNETEWAN R. @ KATRINE

Measurements made from top of existing bridge deck.

STATION 70+37 13' LT C/L Bore Hole #1

0	-	11½'	Air
11½'	-	24½'	H ₂ O
24½'	-	32'	Soft Org. Silt
32'	-	N.F.P.	Firm bottom

VANE TEST (Pushed)

<u>Depth</u>	<u>Undist. Shear Stress lb/sq.ft.</u>	<u>Rem. Shear Stress lb/sq.ft.</u>	<u>Sensitivity</u>
25' - 26'	270	81	3.34
27' - 28'	378	135	2.80
29' - 30'	378	189	2.0
31' - 32'	837	135	6.2
32' - 33'	972	162	6.0

STATION 70+24 11' LT C/L Bore Hole #2

0	-	11	Air
11	-	25	H ₂ O
25	-	35	Soft Mat'l
35	-	N.F.P.	Firm bottom

VANE TEST (Pushed)

<u>Depth</u>	<u>Undist. Shear Stress lb/sq.ft.</u>	<u>Rem. Shear Stress lb/sq.ft.</u>	<u>Sensitivity</u>
26' - 27'	243	54	4.5
28' - 29'	513	54	9.5
30' - 31'	297	108	2.75
32' - 33'	1350	189	7.15
34' - 35'	918	162	5.66
35' - 36'	1134	162	7.0

Cont'd...

STATION 70+62 11' LT C/L Bore Hole #3

0 - 11' Air
 11' - 18' H₂O
 18' - 37' Soft Mat'l

VANE TEST (Pushed)

<u>Depth</u>	<u>Undist. Shear Stress lb/sq.ft.</u>	<u>Rem. Shear Stress lb/sq.ft.</u>	<u>Sensitivity</u>
18' - 19'	189	27	7.0
20' - 21'	351	54	6.5
22' - 23'	594	108	5.5
24' - 25'	540	108	5.0
26' - 27'	837	135	6.2
28' - 29'	1242	135	9.21
30' - 31'	972	108	9.0
32' - 33'	1134	108	10.5
34' - 35'	1215	135	9.0
36' - 37'	756	216	3.5

MEMORANDUM

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

FROM: C. S. Grebski,
Bridge Office.

ATTENTION:

DATE: July 12, 1971.

OUR FILE REF.

IN REPLY TO

SUBJECT: Magnetawan River Bridge
at Katrine,
W.P. 249-66-02, Site #44-123,
Highway #11, District #11.

70-11026

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.

for *Walton L.*
C. S. Grebski,
Bridge Design Engineer.

CSG/mh
ENCL*
cc: Foundation Office.

Nov 15, 71
MR

Department of Highways Ontario

Copy for the information of

Mr. A. Stermac

Mr. J. C. McAllister,

Regional Bridge Planning Supervisor,
North Bay Regional Office.

Bridge Office, Downsview.

May 5, 1971.

Magnetewan River Bridge
At Katrine,
W.P. #249-66, Site No. 44-123,
Highway #11, District No. 11.

70-11-026

Attached herewith are prints of the Preliminary Bridge Plan Drawing D-7032-P1 for the above-mentioned structure.

The estimated cost of the proposed structure is \$150,000.00 which includes tender, materials, engineering and sundry construction.

Any comments or revisions you may have should be submitted within three weeks.

C. S. Grabski,
Bridge Design Engineer.

CSG/mh

ENCL⁴

cc: B. Davis,
A. Stermac (2)
J. Anderson
R. Murphy.

Comments to be given later when Foundation Investigation is completed (End of June)

128
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. R. S. Chapman,
District Engineer,
District 11, Huntsville.

FROM: Materials & Testing Office,
Northern Region.

ATTENTION: Mr. W. D. Ham

DATE: 20 October 1972

OUR FILE REF.

IN REPLY TO

SUBJECT:

Contract 72-69, Highway 11
Magnetawan River Bridge at Katrine
District 11 - Huntsville

At the request of your office, Mr. J. McAllister and I visited the above project on October 19th, 1972. Excavation for the new river channel is in progress at the site of the new structure and the silty soil is sloughing and boiling below the water table. After discussion with the Project Supervisor, Mr. D. Corbett, and Mr. Schantz of E & E Seegmiller Limited, the following construction sequence was recommended by our office to prevent further soil disturbance by boiling.

- 1) Excavate the new channel in the vicinity of the bridge in the dry to the maximum depth possible before sloughing of the side slopes occurs. From examination of the excavation open at present, it appears that serious sloughing starts to occur between elevation 960.0 and 955.0.
- 2) Drive the steel H piles for the structure. At this stage it may be possible to place the Granular "A" blanket and rip-rap on the exposed slopes.
- 3) Allow water into the excavation to the level at which sloughing starts to occur. This will balance the hydrostatic pressure and prevent boiling and sloughing for the remainder of the excavation.
- 4) Excavate the remaining material under water and place the remaining granular blanket and rip-rap under water.
- 5) After construction of the structure, a similar procedure to the above should be carried out to prevent boiling during excavation of the remainder of the new channel.

Mr. McAllister's remarks concerning cut off elevations for the steel H piles will be covered in a separate letter from his office.

R. P. Northwood

RPN/bn

R. P. Northwood,
Senior Soils Engineer.

c.c. - Mr. J. C. McAllister
- Mr. K. Selby
- Mr. J. Buckle

- Mr. J. E. Grusper
- Mr. A. Rutka
- Mr. G. A. Wrong

6

HAMMER TYPE 3-12 WEIGHT 138 T ENERGY 22,600 FT LBS

[illegible]

OVER:

Form OR-ML-2/5
300 Pads — 61-6025

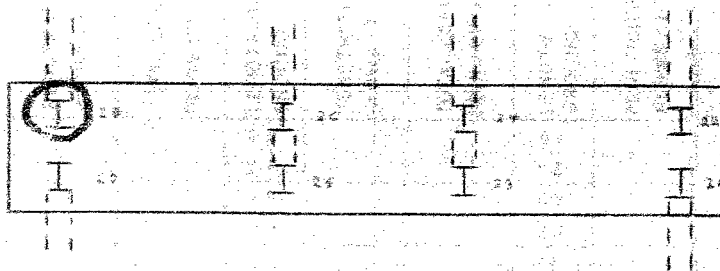
W. J. H. 10-1-26 107-5
G. ALLAN
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION
FOUNDATION SECTION

249-56-01 402
107-71-01 402 43

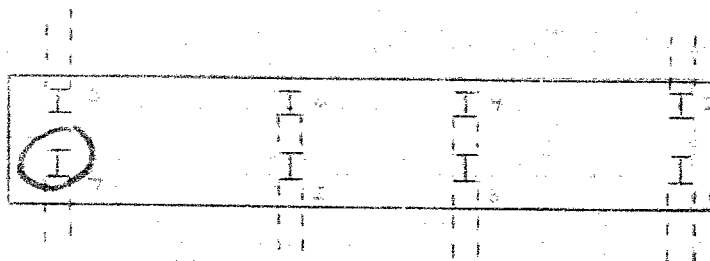
BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 11 CONTRACT NO. 72-69 STRUCTURE MAGNETAWAN RIVER BRIDGE
CONTRACTOR E & E STEAMER DESIGN LOAD OF PILE DRIVEN TO ROCK
HAMMER DETAILS: TYPE DISMPS D-12 WEIGHT 1385 HEIGHT OF FALL OR ENERGY 22,600
TYPE OF ANVIL OR CAP DELMING H PINE WEIGHT OF ANVIL OR CAP _____
PILE DETAILS A PILE 17" DIAMETER 12' 6" LONG 107-71-01 402 43

PILE NUMBERING SYSTEM SKETCH



71-4047



REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
MATERIALS & RESEARCH DIVISION
DEPARTMENT OF HIGHWAYS
PARLIAMENT BUILDINGS
TORONTO, ONTARIO

SIGNED [Signature]
NAME (PRINT) HARVEY J. [Name]
DATE Dec 8/72

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. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " 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

1.8 BATER
etc. 7.77

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 11 CONTRACT NO. 72-69 STRUCTURE MAGNETAWAN RIVER BRIDGE
 CONTRACTOR E.F. SCHILLER DESIGN LOAD OF PILE DRIVEN TO ROCK
 HAMMER DETAILS: TYPE DELMAG D-12 WEIGHT 138 TON HEIGHT OF FALL OR ENERGY 22,660
 TYPE OF ANVIL OR CAP DELMAG H-PILE WEIGHT OF ANVIL OR CAP 1.8 BATER
 PILE DETAILS H-12 12 x 12 H-31
 PILE NO. 7 LOCATION SOUTH ABUTMENT DATE DRIVEN NOV. 1, 1972

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.
50' 8"	1	A	26	2	71' 8"	51	33	91'	76	67	
A	2	1 Blow	27	10	A	52	37	A	77	79	
	3	V	28	14		53	38	A	78	114	
	4	A	29	16		54	39	V	79	150	
	5	23.000	30	17		55	41	91'	80	180	
	6	V	31	15		56	42		81		
	7	1	32	15		57	48		82		
	8	2	33	13		58	32		83		
	9	2	34	12		59	35		84		
	10	2	35	11		60	44		85		
	11	3	36	12		61	50		86		
	12	3	37	10		62	50		87		
	13	4	38	8		63	62		88		
	14	4	39	10		64	67		89		
	15	1	40	11		65	71		90		
	16	3	41	13	V	66	77		91		
	17	4	42	14	71' 8"	67	82		92		
	18	4	43	16	91'	68	90		93		
	19	6	44	12	A	69	94		94		
	20	6	45	25		70	95		95		
	21	6	46	27		71	96		96		
	22	7	47	31		72	97		97		
	23	6	48	22		73	97		98		
V	24	3	49	25	V	74	98		99		
91' 8"	25	5	50	28	91'	75	99		100		

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE <u>71' 8"</u>	FINAL CUT OFF ELEVATION <u>970.0</u>					

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
 MATERIALS & RESEARCH DIVISION
 DEPARTMENT OF HIGHWAYS
 PARLIAMENT BUILDINGS
 TORONTO, ONTARIO

SIGNED Harvey J. Rickard
 NAME (PRINT) HARVEY J. RICKARD
 DATE NOV. 1, 1972

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. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " 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.

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 11 CONTRACT NO. 72-69 STRUCTURE MAGNETIC RIVER BRIDGE
 CONTRACTOR E. F. JEFFERSON DESIGN LOAD OF PILE DRIVEN TO REF.
 HAMMER DETAILS: TYPE DELTA 2-12 WEIGHT 1.35 TON HEIGHT OF FALL OR ENERGY 22,600
 TYPE OF ANVIL OR CAP DELTA 4-H-1 WEIGHT OF ANVIL OR CAP _____
 PILE DETAILS PILE 12" HP 74 VERTICAL
 PILE NO. 12 LOCATION SOUTH PIER DATE DRIVEN OCT. 30/72

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.
45.2	1	26	45.2	26	9	55.8	51	12		76	
	2			27	9		52	14		77	
	3			28	9		53	16		78	
	4			29	8		54	16		79	
	5			30	8		55	23		80	
	6			31	7		56	29		81	
	7			32	4		57	34		82	
	8			33	2		58	40		83	
	9			34	4		59	44		84	
	10			35	13		60	51		85	
	11			36	16		61	60		86	
	12			37	16	55.8	62	71		87	
	13			38	7		63	88		88	
	14			39	13		64	96		89	
	15			40	15	55.8	65	Ref.		90	
	16			41	15		66			91	
	17			42	14		67			92	
	18			43	15		68			93	
	19			44	14		69			94	
	20			45	14		70			95	
	21			46	12		71			96	
	22			47	11		72			97	
	23			48	12		73			98	
	24			49	12		74			99	
	25			50	5		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	65'					FINAL CUT OFF ELEVATION 962.0

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
 MATERIALS & RESEARCH DIVISION
 DEPARTMENT OF HIGHWAYS
 PARLIAMENT BUILDINGS
 TORONTO, ONTARIO

SIGNED [Signature]
 NAME (PRINT) Harvey R. [Name]
 DATE OCT. 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. 12 $\frac{3}{4}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{3}{4}$ " x $\frac{1}{2}$ " 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.

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. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " 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
MATERIALS & RESEARCH DIVISION
FOUNDATION SECTION

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 11 CONTRACT NO. 72-69 STRUCTURE 3 MAGNETRON RIVER BRIDGE
CONTRACTOR E. E. SEESMILLER DESIGN LOAD OF PILE 2500
HAMMER DETAILS: TYPE DELMAG D-12 WEIGHT 123,000 HEIGHT OF FALL OR ENERGY 22,600
TYPE OF ANVIL OR CAP DELMAG H-PILE WEIGHT OF ANVIL OR CAP _____
PILE DETAILS H-PILE 12" HP 53 11.8 BATTER
PILE NO. 28 LOCATION NORTH ABUT. DATE DRIVEN OCT. 26, 1972

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.
50	1	50	50	26	14	69	51	118		76	
50	2	102	50	27	14	5	52	135		77	
	3			28	16		53	160		78	
	4			29	17		54	177		79	
	5			30	19		55	243		80	
	6			31	22		56	556		81	
	7			32	23	69	57	Rock		82	
	8			33	25		58			83	
	9			34	29		59			84	
	10			35	30		60			85	
	11			36	32		61			86	
	12			37	36		62			87	
	13			38	41		63			88	
	14			39	44		64			89	
	15			40	47		65			90	
	16			41	43		66			91	
	17			42	40		67			92	
	18			43	44		68			93	
	19			44	47		69			94	
	20			45	51		70			95	
	21		50	46	53		71			96	
	22		50	47	57		72			97	
	23		50	48	56		73			98	
50	24		50	49	58		74			99	
50	25		50	50	60		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	34.11'			FINAL CUT OFF ELEVATION 979.0		

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
MATERIALS & RESEARCH DIVISION
DEPARTMENT OF HIGHWAYS
PARLIAMENT BUILDINGS
TORONTO, ONTARIO

SIGNED Harvey T. Rickards
NAME (PRINT) HARVEY T. RICKARDS

DATE Oct. 20, 1972

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. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " steel plate shoe.

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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.

72-60

MEMORANDUM

TO: Mr. E. R. Saint,
Regional Materials Engineer,
North Bay, Ontario.

FROM: Functional Planning,
North Bay, Ontario.

ATTENTION:

DATE: March 10, 1970.

OUR FILE REF.

IN REPLY TO

SUBJECT: W. P. 249-66-00, Highway 11 - Katrine,
Replacement of Magnetawan River Bridge,
District 11, Huntsville

Further to our recent conversation regarding possible realignment of the Magnetawan River in the vicinity of this project, herewith please find three copies of a "B" plan showing the following:-

1. Approximate centre line and excavation limits of proposed river diversion.
2. Suggested bore hole locations.
3. Tentative cross section of diversion channel.

As you are aware, the feasibility of this scheme depends on the absence of rock in the diversion channel, and we, therefore, request your assistance in arranging for the necessary foundation investigation by Foundation Office. We would also appreciate Foundation Office's advice regarding the desirable angle of channel side slope, and any other comment which you or they feel may be pertinent.

The number and location of bore holes indicated on the plan are tentative only, and may of course be altered at your direction. However, you will note that bore hole Nos. 4 and 5 are intended to cover the foundation condition at the proposed bridge site, although I wish to make it clear that there has been no opportunity yet to determine the size and type of the new structure, and the suggested location may prove to be in error. The cost of two additional bore holes is, however, small, and it would be desirable to pick up this data when the equipment is on site.

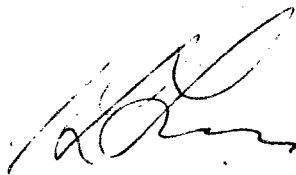
Cont'd.....2

Mr. E. R. Saint

- 2 -

March 10, 1970.

The centre line of the river diversion will be staked by Engineering Surveys in a few days.



W. L. LEES,
PROJECT PLANNING ENGINEER,
FOR:
T. G. SMITH,
REG. FUNCTIONAL PLANNING ENGINEER.

WLL/TGS/db

c. c. - J. C. McAllister
C. G. Campbell

DUE DATE

MAY 20/70

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. Stermac
Principal Foundations Eng.
Materials & Testing Office
Downsview

FROM: Materials & Testing Office
Northern Region

DATE: March 18, 1970

ATTENTION:

IN REPLY TO

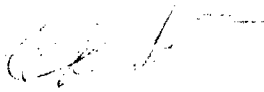
OUR FILE REF.

SUBJECT:

Re: W.P. 249-66-00 Hwy. #11 Replacement
of Magnetawan River Bridge at Katrine

Attached is a request from Functional Planning for a feasibility study of this site and foundation investigation if the diversion is practical.

Two prints of the plan are attached for your use.


E.R. Saint
Regional Materials Engineer

ERS/ef
c.c. File

MEMORANDUM

TO: Mr. T. Stermac,
Principal Foundations Engineer,
Downsview, Ontario.

FROM: Functional Planning,
North Bay, Ontario.

ATTENTION:

DATE: March 26, 1970.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 249-66-00, Magnetawan River Bridge
Katrine-Hwy. 11, District 11, Huntsville.

I understand that you have received our request (via Mr. E.R. Saint)
for a foundation investigation to determine the feasibility of rechanneling
the Magnetawan River in connection with replacement of the Hwy. 11
structure.

Herewith please find copies of Engineering Surveys notes listing
elevation along the proposed river diversion alignment which may be of
assistance to your field engineer.

W. L. LEES,
PROJECT PLANNING ENGINEER,
FOR:
T. G. SMITH,
REG. FUNCTIONAL PLANNING ENGINEER.

WLL/TGS/db

c.c. - E. R. Saint

ontario hydro

ontario hydro

590 graham drive, box 1060
north bay, ontario
telephone 472-8000
northeastern region

September 22, 1971

address reply attention of

Mr. G. Allan
c/o Foundation Engineering Department
Room #107, Laboratory Building
Department of Transportation & Communications
DOWNSVIEW, Ontario

Dear Sir:

Maximum Elevations -
Nipissing Generating Station Forebay -
South River Storage System.

Some time ago you requested some information re above.

In searching our records back to 1952 we find the follow-

i :-

<u>Date.</u>	<u>Maximum Elevations.</u>
May 12/52	769.6
June 30/57	769.8(*)
Nov. 16/59	769.5
Apr. 29/61	769.5

* - Maximum 19-year period.

Should further data be required do not hesitate to advise.

Yours truly,



S. L. Bull
Operating Supt.
Northeastern Region

SLB:ac

71 69

MEMORANDUM

To: Mr. A. G. Stermac,
Principal Foundation Engineer,
Downsview.

FROM: Bridge Planning,
North Bay.

ATTENTION:

DATE: May 6, 1971.

OUR FILE REF.

IN REPLY TO

SUBJECT:

Re: W. P. 24-69-01 Site 44-18
South River Bridge at Nipissing
Sec. Rd. #654 District # 13

W. P. 249-66 Site 44-123
Magnetewan River at Katrine
Hwy. #11 District # 11

Attached are two prints of preliminary plans D-7040-PI and D-7032-PI for each of the above structures. Further foundation investigation is required at both crossings.

76-11046 1) South River at Nipissing: A total of four further boreholes is required; two holes at each pier to determine the location of bedrock.

71-11047 2) Magnetewan River: A total of twelve boreholes has been suggested by the designer. I think only those boreholes on either side of Hwy. #11 should be considered. These should be adequate to give accurate bedrock locations.

I have discussed, with Mr. Saint, the stability problem in filling the existing crossing at Katrine and am forwarding, with this letter, a plan and profile showing the location of the boreholes he has suggested.

I would suggest that the South River work be done first as the location of the structure may depend on the location of the bedrock at the site.

JCMcA/bn
encl.

c. c. - E. Saint

J. C. McAllister
J. C. McAllister,
Regional Bridge
Planning Supervisor.

DEPARTMENT OF HIGHWAYS — ONTARIO
MATERIALS AND TESTING OFFICE
VISUAL CLASSIFICATION SHEET

PROJECT 71-11047 SITE Katrine BOREHOLE No. 1 GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE										
				GRAVEL	SAND	SILT & CLAY								
1	3.0 4.5	#10		-	98	2			Quick	Brown	No	22	Fine to Med. Sand (dry) (FILL)	●
2	6.0 7.5											9	as above	
3	9.0 10.5	1"		7	90	3				"	"	22	F.M. Sand with traces of Silt & Gravel (FILL)	
4	12.0 13.5	20		—	8	92			Quick	Earthy Grey		3	Silt with some organic & trace sand (roots thro' out sample)	
5	15.0 16.5	10			3	97			"	"	"	2	Silt w/ slight trace of roots	
6	18.0 19.5											18		●
7	21.0 22.5	1"		10	10	80						2	Silt w/ traces of Clay & some Gravel (very porous & heavy)	
8	24.0 26.5	300		—		100						?	Silt traces Clay	
10	30.0 31.5				30	70						7	Sandy Silt (dried out - was soft)	

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

REMARKS:-

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND TESTING OFFICE
VISUAL CLASSIFICATION SHEET

PROJECT 71-11085 SITE Katrine BOREHOLE No. 1 (cont) GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
11	35.0 36.5													4	Sandy Silt (loose and weak)	●
12	40.0 41.5													10	as above - Poor improv.	
13	45.0 46.5													5	" "	
14	50.0 51.5					100								13		
15	54.5 56.0													44	Granular Till	
																●

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

REMARKS:-

DEPARTMENT OF HIGHWAYS — ONTARIO
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PROJECT 71-11047 SITE Katrine BOREHOLE No. 2 GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE										
				GRAVEL SAND SILT & CLAY										
1	12.0 13.5	100		— 5 95			Quick			Grey		2	Silt. w/ sl. trace of Organics	TL
2	15.0 16.5	100		— 5 95			Quick			Dark Grey		2	Silt. with Organics throughout	
3	18.0 19.5	100		— 92 8			"			Grey		4	Fine to Med Sand, sl. trace of Organics	
4	21.0 22.5											1	Mat. described - U. clay Dark refractive	
5	25.0 26.5											1	" " " "	
7	35.0 36.5			50 40								3	Silty U.F. Sand (U. poor refractive)	

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REMARKS:-

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PROJECT 71-11047 SITE Katrine BOREHOLE No. 3 GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE										
				GRAVEL	SAND	SILT & CLAY								
1	9.0 10.5			3	90	7				Brown		14	F.M. Sand traces Silt & Gravel (Fill)	●
2	12.0 13.5			—	5	35			Quick	Earthy Grey		6	Silt	ML
3	15.0 16.5								Flow Quick	Dark Grey		2	Organic Silt to Silt with Organics throughout	
4	18.0 19.5			—	30	10				Grey		—	F.M. Sand traces of Silt	
*5	21.0 22.5											1	Disturbed V. Clay	
*6	25.0 26.5											—	V. Clay Silt to 2" Clay 3"	●
9	35.0 36.5											7	Sandy Silt (dried out was sand)	
10	40.0 41.5											1		
13	70.0 70.9											>100		

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

REMARKS:—

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PROJECT 71-11047 SITE Katrine BOREHOLE No. 4 GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	12.0 13.5				100			Quick			Grey		3	Silt with traces of Sand.	●	
2	15.0 16.5				70	30		Quick		Earthy	Dark Grey		1	Organic Silt to Silt with organics throughout.		
3	18.0 19.5							"			Grey		1	F-M Sand traces Silt		
4	21.0 22.5				80	20					Grey		1	" " traces organics occ. Silt seams		
5	25.0 26.5												8			
7	35.0 36.5												4		●	
8	40.0 41.5												5			

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

REMARKS:-

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PROJECT 71-11047 SITE Katrine BOREHOLE No. 5 GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	3.0 4.5	#100			65	35			Quick		Organic	Grey D Grey		2	Silty Fine Sand w. some Organics (due out - was sat'd)	●
2	6.0 7.5										Earthy			2	as above	
3	9.0 10.5	#40			75	25								2	F.M Sa w. tr. Org.	
4	12.0 13.5				60	40								2	Silty F.M Sand with traces Organics	
5	15.0 16.5													2	Ungraded material Silty & Clay mainly Silty	
7	18.0 19.5	#200			20	80								4	Silty with traces Sand	●
8	25.0 26.5													9	as above	
9	30.0 31.5	#			65	35								7	Silty U.F. Sand (sat'd)	
10	40.0 41.5													1	Silty/Fine Sand. (sat'd)	

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

REMARKS:-

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PROJECT 71-11047 SITE Katrine BOREHOLE No. 6 GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	30 4.5	#40	—	95	5			Quick			Light Brown		17	F.M. Sand (dry)		
2	60 7.5				90	10							17	" " (wet)		
3	90 10.5	#8									Rust brown		12	" " (sat'd)		
4	120 13.5				10	90		Quick			Grey		7	Silt.		
5	150 16.5												7	as above.		
6	180 19.5												2	U. material - Silty Clay		
10	300 31.5													U. material Silt, m. Clay		
11	350 36.5				10	90								Silt		
13	450 46.5	#200			60	40								Si F Sand		
14	550 56.5	#100			60	40										

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

REMARKS:—

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PROJECT 71-11047 SITE Katrine BOREHOLE No. 7 GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	12.0 13.5				30	70			Quick		<u>Org.</u>	Dark Grey		1	Silt Sand & Organics mixture (pieces wood)	●
2	15.0 16.5										<u>Org.</u>			1	as above	
3	18.0 19.5										<u>Org.</u>			1	as above	
4	21.0 22.5													9	Silt	
5	24.0 25.5													9	Silt traces Clay & Sand.	
6	27.0 28.5				70	30								15	Silly F.M Sand	●
7	32.0 33.5				30	70								9	Sandy Silt (Sat'd)	

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

REMARKS:—

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PROJECT 71-11047 SITE Katrine BOREHOLE No. 8 GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
2	30.0 31.5	#100			10	40					Slightly Organic			3	Silt/F. Sand sl. r. Organic (sat'd)	●
3	35.0 36.5	#100			"	"								4	" V " "	
4	40.0 41.5	#100			"	"								2	" V " "	
																●

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

REMARKS:—

DEPARTMENT OF HIGHWAYS — ONTARIO
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PROJECT <u>70-F-26</u>		SITE <u>Katrine</u>		BOREHOLE No. <u>1</u>		GROUND ELEVATION <u>969.1</u>										
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DILATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	3.0 4.5	#100	—	—	45	55	—	—	Quick	—	Earthy	Light Brown	None	1	Sandy Silt with traces of Org.	ML
2	6.0 7.5	1/4"	Ang.	1	40	59	—	—	Quick	—	"	L. Br to Grey	None	1	Sandy Silt with traces of Gravel	ML
4	15.0 16.5	#100	—	—	2	98	—	—	Quick	—	"	Grey	"	1	Silty Clay but dilatant / passes Org. Silt but no odour	ML/C
6	25.0 26.5	#100	—	—	—	—	—	—	Slow to Quick	—	"	Grey	—	6	Silt with layers of Silty Clay	ML/C
7	30.0 31.5	#100	—	—	2	98	—	—	Quick	—	"	Grey	—	12	Silt, traces of Sand	ML
8	35.0 36.5	#100	—	—	25	95	—	—	"	—	"	Grey	None	3	Sandy Silt " (Loose)	ML

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

REMARKS:—

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PROJECT <u>70-F-26</u>		SITE <u>Katrine</u>		BOREHOLE No. <u>5 (2)</u>		GROUND ELEVATION _____										
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DILATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL		
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL											SAND	SILT & CLAY
1	3.0 4.5	1/2"	Sub Ang	1	94	5			Quick		Earthy	Light Brown	None	8	Fine Sand, silty Gravel	
2	6.0 7.5	1/4"	Sub Ang	+	90	10			"		"	"	"	7	As above	
3	9.0 10.5			—	60	40			"			Dark Brown		21	Silty Sand & Gravel	
5	15.0 16.5	"	—	—	65	35			"		"	Dark Grey		1	as above	
7	21.0 22.5				"	"			"		"	"		1	as above.	
9	30.0 31.5				"	"			"		"	"		1	Silty Clay as above	
10	35.0 36.5				15	85								2	Clayey Silt w some Sand	CL
11	40.0 41.5				5	95						Grey		—	Fine Sand	
14	60.0 61.5				5	95						Grey		9	as above	

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REMARKS:—

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PROJECT <u>70-11026</u>		SITE <u>Katrine</u>		BOREHOLE No. <u>S (II)</u>		GROUND ELEVATION _____										
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DILATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL		
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL											SAND	SILT & CLAY
16	80.2 81.5				60	40		Quick		Earthy	Grey		33	Silty Fine Sand		
17	84.0 85.5	1"	Sub Ang		60	40		"		"	Brown		53	Gravel with sand Sand (poorly graded)		

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REMARKS:-

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PROJECT <u>70-F-26</u>		SITE <u>Katrine</u>		BOREHOLE No. <u>6</u>		GROUND ELEVATION _____										
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	5.0 6.5													1		
2	10.0 11.5							Quick			Org.			1	Silty fine sand & organics	
3	15.0 16.5															
4	20.0 21.5				2	98		Quick			Earthy Grey	None		8	Silty, traces clay	
5	25.0 26.5				55	45		"			"	"		1	Silty fine sand	
6	30.0 31.5							"			"	"		7	as above	
7	34.5 36.0													7		

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REMARKS:-

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PROJECT Katrine 70-F-26 SITE _____ BOREHOLE No. 3 GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	5.0 6.5	#100	—	—	8	92	—	Shiny	Quick	—	Org.	Blue-Light Brown	None	1	Organic Silt, traces of Organics (plastic)	OL
2	10.0 11.5	#100	—	—	95	5	—	"	—	—	Org.	Dark Grey	None	2	OL Fine Sand with Organics	
3	15.0 16.5	#100	—	—	10	90	—	Shiny	Quick	—	?	Light Grey	"	1	Possibly Organic Si Clay - dilatant, u. plastic	Z
5	25.0 26.5						—	—	Quick	—		Grey	"	9	Sandy Silt	ML
6	30.0 31.5	100	—	—	12	88	—	—	Quick	—	Earthy	Grey	"	1	Sandy Silt	ML
7	35.0 36.5	100	—	—	15	85	—	"	—	—	"	"	"	4	" "	ML
8	40.0 41.5	#100		—	97	3		"			"	"	"	7	Fine Sand	ML

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

REMARKS:-

