cc: GEN. FILES

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

W.P. 34-63.

To: Mr. B. R. Davis,
Bridge Engineer,
Bridge Division.

Attention: Mr. S. McCombie

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

Date: December 16, 1966

Our File Ref.

In reply to: JAN - 4 1967

Subject:

FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing at York River and
Hwy. #500, County of Hastings, Twp.
of Dungannon, Lot 12, Con. II
District No. 10 (Bancroft)
W.J. 66-F-97 -- W.P. 34-63

Attached, we are forwarding to you, our detailed foundation investigation report on the subsoil conditions existing at the above structure site. A geologist's report on the condition of the bedrock at the site is included in the appendix to this report.

We believe that you will find the factual data and recommendations contained therein, adequate for your design requirements. Should additional information be required, please feel free to contact our Office.

A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

AGS/MdeF
Attach.
cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
S. J. Markiewicz
G. Scott
J. E. Callaghan
J. E. Gruspier
~~A. Watt~~ B. A. SINGH
Foundations Office
Gen. Files

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FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing at York River and
Hwy. #500, County of Hastings, Twp.
of Dungannon, Lot 12, Con. II
District No. 10 (Bancroft)
W.J. 66-F-97 -- W.P. 34-63

1. INTRODUCTION:

A request to carry out a foundation investigation for the proposed new bridge to carry Hwy. #503 over York River, was received from Mr. G. Scott, Regional Bridge Location Engineer, in a memo dated October 24, 1966.

An investigation was subsequently carried out by this Section to determine the subsoil conditions existing at the site of the proposed bridge.

This report contains the results of our field and laboratory investigation, together with our recommendations for the foundations of the new structure.

2. DESCRIPTION OF SITE:

The site is located in the County of Hastings, Twp. of Dungannon, Lot 12, Con. II, approximately 3 miles East of Bancroft.

It is located in the Canadian Shield physiographic region. The underlying meta-igneous and metamorphic bedrock is exposed in high, almost barren ridges. The soils are generally silty sands and uniform fine sands which have been deposited as glacial Kame moraines and modified in the lower areas due to fluvial action.

The site is about 100 feet north of the confluence of Egan Creek and York River. At this point, York River is bounded in the east by a high, rocky ridge which runs in a N.E.-S.W.

cont'd. /2 ...

2. DESCRIPTION OF SITE:

direction, and about 500 ft. north of the proposed site, it is intersected by another rocky ridge which runs in an E.-W. direction.

The area south of these two ridges drains through the junction between them. The east bank of the river is a rocky promentory of gneiss bedrock offshooting from the eastern ridge. It is well wooded with lumber. The west bank of the river is the flood plain of York River and Egan Creek. It is generally flat, but low, rocky ridges protrude in places above ground surface. This area is well wooded with mixed bush.

3. FIELD AND LABORATORY WORK:

Five sampled boreholes and sixteen dynamic cone penetration tests were carried out using conventional diamond drilling equipment adapted for soil sampling purposes. A driving energy of 350 ft.-lbs. per blow was used for the dynamic cone penetration tests.

Samples were obtained initially, using a 2-inch O.D. split-spoon sampler driven according to the specification for the Standard Penetration Test. However, due to difficulties experienced in obtaining a good sample, a 2-inch O.D. slotted tube sampler was then used in place of the split-spoon. AXT rock core samples were obtained to prove bedrock.

Samples were visually examined in the field and subsequently in the laboratory. Grain-size distribution curves were carried out on selected samples.

The results of the laboratory and field tests are summarized in the Record of Borehole sheets which are contained in the appendix to the report.

The locations and elevations of the boreholes are given on Dwg. No. 66-F-97A, which is also contained in the appendix to this report.

cont'd. /3 ...

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

The borehole elevations were obtained by the Bancroft District Office of the D.H.O.

4. SUBSOIL CONDITIONS:

4.1) General:

The subsoil conditions over the site consist essentially of alluvial deposits overlying an irregular bedrock surface.

The surficial deposit is a very loose, fine sand which extends from ground surface to approximately El. 986.0. Below this is a heterogeneous mixture of layers of silty sand, silt, sand and gravel which are loose to compact, but generally compact. From approximately El. 950 down to bedrock, boulders occur.

The boundaries between the different deposits are shown on the attached Record of Borehole sheets. The estimated stratigraphical profiles shown on Drawing No. 66-F-97A, are based upon this information.

From ground level downwards, the different soil deposits are described as follows:

4.2) Fine Sand:

This deposit occurred in all boreholes from ground surface to approximately El. 986. It is a very loose, fine sand. In places it is a silty, fine sand.

Within the river, it contains some pieces of well-decayed wood up to 1/2 inch maximum size. The average grain-size distribution was found to be gravel 0%, sand 98%, silt and clay 2%.

cont'd. /4 ...

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

4.3) Layers of Silty Sand, Silt, Sand and Gravel:

Underlying the fine sand deposit, there are layers of silty sand, silt, sand and gravel which vary in thickness from 3 inches to 2 feet thick, and are loose to compact, but generally compact. In borehole #9, boulders up to 2 feet in diameter were found below El. 950.0 down to bedrock at El. 940.4. Below El. 953, coarse sand with gravel layers occur which are generally compact.

4.4) Bedrock:

The bedrock was proven to a depth of approximately 5 feet in all boreholes, except in borehole #2 where it was proven to a depth of 10 feet. Bedrock was found to be sound Biotite gneiss in all boreholes, except borehole No's 3 & 9. In borehole #3, bedrock was found to be calcitic marble followed by dolomitic marble, and in borehole #9, the bedrock was calcitic marble. Marble is commonly found interbedded with gneiss in the Bancroft area.

The bedrock surface was found to be very irregular, and slopes from east to west at 1 in 1.4 down to approximately El. 945. On the east bank of the river, rock was exposed in many places and where it was not exposed, it was covered by a shallow layer of humus and fine sand. Bedrock was proven at the east abutment and at points 15 feet and 30 feet behind the east abutments by digging down to it. The locations and elevations of these points are shown on Drawing No. 66-F-97A.

The bedrock appears to dip into the east river bank at a slope of approximately 45°.

On the west river bank, low rocky ridges about 3 to 4 feet high, were observed protruding through the sandy ground surface at Sta. 15+00 and at Sta. 13+00.

cont'd. /5 ...

5. GROUNDWATER:

Groundwater level was observed only in borehole #3. This was found to correspond with the river level which fluctuated from day to day. At the commencement of the investigation, the river level was found to be at El. 1005.8. After a week of rain and snow, this level rose to El. 1007.2 and then dropped to a level of 1005.9 by the end of the week.

6. DISCUSSION AND RECOMMENDATIONS:

It is proposed to construct a new bridge to carry Hwy. #500 over York River. The presently proposed bridge is a four-span structure (40'-30'-30'-40') with an approach fill on the west bank of the river which is approximately 13 feet above ground level.

The east bank of the river is a rocky ridge which is covered with a shallow deposit of fine sand. Elsewhere, the bedrock surface slopes to the west so that the river bed and the west river bank consist of very loose to compact alluvial deposits overlying an irregular bedrock surface.

It is therefore recommended that the east abutment be supported on spread footings founded on bedrock. A safe bearing pressure of 10 tons/ft.^{2} may be used for design purposes.

The east pier is situated over a very irregular bedrock surface which varies from 8 to 16 feet below the river bed. Due to the problems involved in dewatering and rock excavation, a spread footing foundation is considered to be unsuitable. Instead, the pier should be supported on 18-24 inch diameter caissons drilled at least five feet into the bedrock. Such caissons would each be capable of supporting a load of 120 tons. The same procedure could be followed for the centre pier.

The remaining pier and west abutment may be supported either on large diameter steel tube piles end-bearing on bedrock, or on the bouldery stratum immediately above it, or they may be supported on steel H-piles driven to bedrock. The maximum

cont'd. /6 ...

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

allowable loads for the particular pile section adopted, may be assumed for design purposes.

In view of the fact that the installation of concrete caissons on the sloping bedrock surface may be expensive, it is suggested that consideration be given to designing the spans of the bridge so that piers would not be required between Sta. 16+50 and the east abutment where the rock surface is sloping steeply.

Pile caps should be founded at sufficient depth to ensure frost protection. In the event that pile caps are founded below the groundwater level, a dewatering scheme will be necessary to ensure that the concrete can be poured in the dry. The fine sand subsoil is highly susceptible to boiling. This problem may be overcome by driving sheeting to a depth below the bottom of the excavation equal to the hydraulic head above it.

No stability problems are anticipated for the construction of the approach embankments.

The approach fills should be rip-rapped to the high water level as a protection against scour.

7. SUMMARY:

A foundation investigation of a proposed new structure at Hwy. #500 and York River is reported.

Subsoil conditions at this site consist of very loose to compact alluvial deposits which overlie a sloping bedrock surface. Bedrock is exposed on the east bank of the river and then slopes steeply to the west at approximately 1 in 1.4 to El. 945 and then more gen'ly to the west.

cont'd. /7 ...

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

It is recommended that the east abutment be founded directly on bedrock and that the west pier and abutment should be supported on end-bearing piles founded on bedrock, or on the bouldery stratum immediately overlying it. East of Sta. 16+50 where the bedrock slopes steeply, it is recommended that the central and east piers be supported on large diameter caissons drilled into the bedrock. As this procedure is feasible but probably costly, it is recommended that consideration should be given to redesigning the spans of the structure such that these two piers may be omitted.

Procedures for construction and dewatering have been outlined in this report.

No stability problems are anticipated for the construction of the approach embankments.

8. MISCELLANEOUS:

The field work for this project was carried out during the period November 7 - 25, 1966, under the supervision of Mr. A. C. Calder, Project Foundation Engineer, who also prepared this report.

The equipment used was owned and operated by F. E. Johnston Drilling Company Ltd.

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

December 1966

APPENDIX I

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. K. Selby,
Foundation Engineer.

From: Mr. K. Ingham.

Date: December 28, 1966.

Our File Ref.

In reply to:

Subject: Re: Foundations for Bridge over the York River at Bancroft

The bedrock in the vicinity of Bancroft is primarily of metamorphic origin, with gneiss, syeno-gneiss and metasyenite predominating. These rocks are characterized by a relative absence of quartz; feldspar being the principal mineral with subordinate biotite mica and hornblende. The variety nepheline syenite is sometimes present, which consists mainly of feldspar and nepheline. Metasediments such as marble and quartzite are less common but occasionally occur interstratisfied with the gneissic rocks.

The bedrock intersected in drill holes along the proposed bridge alignment appears to be essentially gneissic and the cores are briefly described as follows.

Hole No. 1 - Coarse grained biotite gneiss, 20 to 30% biotite, occasional feldspar and horneblende metacrysts. Visual weathering in the upper 1.0 ft., probably incipient weathering down to 2.0 ft.

Hole No. 2 - Coarse grained horneblende biotite gneiss, 20 to 25% hornblende and biotite. Occasional feldspathic patches with large horneblende metacrysts. Incipient weathering down to 3.0 ft.

Hole No. 3 - 0 - 1.0 ft. coarse grained calcitic marble. Rest of the hole medium to coarse grained dolomitic marble with zones rich in biotite.

Hole No. 8 - 0 - 3.0 ft. coarse grained biotite gneiss. 3.0 - 4.0 medium to fine grained hornblende biotite gneiss.

Hole No. 9 - 0 - 1.0 ft. medium to fine grained hornblende biotite gneiss, thin film of chlorite along vertical fissure. Shows moderate weathering (probably a boulder). 1.0 - 5.0 ft., calcitic marble with disseminated phlogopite mica.

It is reasonably certain that bedrock has been intersected in all of the drill holes examined. Hole No. 9 is a probable exception, the top 1.0 ft. of which may be a boulder. Occasional high angle fissures are present but do not appear to constitute a problem.

.....page 2

The unconfined compressive strength of typical fresh syeno-gneiss encountered in the drilling can be expected to vary from 15,000 p.s.i. to 25,000 p.s.i., i.e., the biotite rich sections close to 15,000 p.s.i., but the majority in the range 20,000 p.s.i. to 25,000 p.s.i. The upper 1.0 ft. of weathered gneiss will probably have values in the range 5,000 p.s.i. to 10,000 p.s.i. The value for most the marble should be in the range 15,000 p.s.i. to 20,000 p.s.i. with exception of the upper 1.0 ft. of coarse grained marble in hole No. 3 which should be closer to 10,000 p.s.i.

The abrasiveness of the different rock types can be gauged approximately from typical values obtained for rocks of similar composition by means of A.S.T.M. test method C241 (Abrasion Resistance of Stone). The gneiss would probably have a value of 70 to 80 depending upon biotite content and the marbles approximately 20 to 25.

The best measure of friability would be A.S.T.M. method C131 (Los Angeles Abrasion Test). A similar value of approximately 40 to 45 per cent loss could be anticipated for both the gneiss and the marble.

Thus the syeno-gneisses and marbles encountered in the exploratory drilling have somewhat similar strengths and are both moderately friable. The friability would appear to be advantageous to the percussion drilling of the proposed large diameter foundation borings. The greater abrasiveness of the gneiss (3 to 4 times that of the marble) will probably be the most noticeable feature in practical terms. However, this should not cause any special problems other than in the rate of drilling these two rock types. Using the churn drill it should be found that the rate of drilling in the marble will be increased by a factor of 2. Using the air-hammer percussion drill the effects of abrasion would be less marked and approximately equal rates of drilling might be anticipated.

K. W. Ingham

K. Ingham,
Geologist.

KI:sm

c.c. A. Calder

FORM DB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy.500; Sta. 17+48 o/s 15.5' Rt. ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 8, 1966 COMPILED BY ACC
DATUM Geodetic BOREHOLE TYPE Washboring BX Casing CHECKED BY

SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w — WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE				
1011.4	GROUND LEVEL									
0.0	Fine Sand with a trace of gravel. Loose					1010				
1006.4				RC	AXT 60%RC					
5.0	Bedrock-Gneiss (Sound)			RC	AXT. 100%RC	1000				
999.7										
11.7	End of borehole					990				

FORM 08-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy. 500; Sta. 17-53.5; 15' Lt. ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 10, 1966 COMPILED BY ACC
DATUM Geodetic BOREHOLE TYPE Washboring BX & AX Casing CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT					
1013.3	GROUND LEVEL									
0.0 / 1010.6	Silty Sand with a trace of gravel. Loose					1010				
2.7 / 1001.0	Bedrock-Gneiss (Sound)			RC	AXT 100% RC.					
12.3						1000				
						990				

FORM 08-MT-126
66-4846

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy. 500; Sta. 16 + 10 17' Lt. ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 14, 1966 COMPILED BY ACC
DATUM Geodetic BOREHOLE TYPE Washboring, NX, BX & AX Casing; Cone CHECKED BY

ELEV. / DEPTH	SOIL PROFILE: DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (20 40 60 80 100) / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT %	BULK DENSITY P.C.F.	REMARKS
1010.7	GROUND LEVEL					1010				
0.0	Fine sand and silty sand. Very loose		1	SS	2					Gr.0% Sa.79% Si.&Cl.21%
			2	SS	1					
			3	SS	2	1000				Gr.0% Sa. 90% Si.&Cl.10%
995.7			4	SS	4					
15.0	Fine sand with trace of gravel. Loose		5	SS	5					
			6	SS	5	990				Gr. 3% Sa. 96% Si. &Cl.1%
985.7			8	ST	9					
25.0	Sand with a trace of gravel. Loose		9	ST	7	980				Gr. 2% Sa.97% Si.&Cl. 1%
979.7										
31.0	Silty sand with a trace of clay. Loose		10	SS	9					Gr. 4% Sa.93% Si.&Cl.3%
972.7										
38.0	Silt with a trace of clay. Loose		11	ST	5	970				
			12	ST	8					
961.7										
959.7	Fine sand - loose		13	ST	9	960				
51.0	Coarse sand with gravel layers Compact to very dense.		14	SS	11					
			15	ST	24	950				Blows too low due to boiling.
944.0			16	ST	60/2"					
66.7	Bedrock - Gneiss (Sound)			RC	AXT 100% RC	940				
938.3										
72.4	End of Borehole									

FORM 08-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy. 500; Sta. 16 +10, 1' Rt. ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 17, 1966 COMPILED BY Acc
DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration Test CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	BLOWS / FOOT
1010.9					
0.0					
948.9	Hammer Bouncing				
62.0	End of cone test Probable Bedrock				

ELEV. SCALE: 1010, 1000, 990, 980, 970, 960, 950

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100
SHEAR STRENGTH P.S.F.

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT %

BULK DENSITY γ P.C.F.

REMARKS

FORM DB-MT-126
66-4545

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 66-F-97 LOCATION YORK RIVER & HWY 500; Sta. 16+07 17' Rt. ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 17, 1966 COMPILED BY ACC
DATUM Geodetic BOREHOLE TYPE Dynamic cone penetration test. CHECKED BY AR

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE: BLOWS / FOOT (20 40 60 80 100) / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
1010.6	GROUND LEVEL									
0.0						1010				
						1000				
						990				
						980				
						970				
						960				
						950				
948.2	Hammer Bouncing									
62.4	End of Cone Test Probable Bedrock									

FORM DB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy. 500; St. 15 + 80, 17' Rt. ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 17, 1966 COMPILED BY ACC
DATUM geodetic BOREHOLE TYPE Dynamic Cone Penetration Test CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / FOOT	ELEV. SCALE
1010.4	Ground Level					1010
0.0						
						1000
						990
						980
						970
						960
954.1	Hammer Bouncing					
56.3	End of cone test Probable Bedrock					

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100
SHEAR STRENGTH P.S.F.

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT %

BULK DENSITY P.C.F.

REMARKS

FORM GS-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 7

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy. 500; Sta. 15+81.5 17' Lt. ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 17, 1966 COMPILED BY ACC
DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration Test CHECKED BY

SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE				
1011.6	Ground Level					1010				
						1000				
						990				
						980				
						970				
						960				
953.2										
58.4	End of cone test Probable Bedrock									

FORM OB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 8

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy. 500; Sta. 17 + 10; 17' Lt. ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 18, 1966 COMPILED BY ACC
DATUM Geodetic BOREHOLE TYPE Washboring, NX, BX & AX casing CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
EL.EV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT					
1006.7	Water Level									
0.0						1000				
995.7										
11.0	Fine sand with some decayed wood. Very loose to compact		1	ST	1					
			2	ST	18	990				Gr.0%, Sa98% Si&Cl. 2%
986.3										
20.4	Sand with a trace of gravel. Compact.		3	ST	20					
983.9										
22.8	Bedrock - Gneiss (Sound)			RC	AXT 100% Rc.	980				Gr.6%, Sa93% Si.&Cl. 1%
979.5										
27.2	End of borehole									
						970				

FORM SUBMITTED

66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 9

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy. 500, Sta. 16 + 50, 17' Rt. ORIGINATED BY ACC

W.P. 34-63 BORING DATE November 21, 1966 COMPILED BY ACC

DATUM Geodetic BOREHOLE TYPE Washboring, NX, BX & AX Casing CHECKED BY

SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE				
1006.7	Water Level									
0.0 / 1002.2										
4.5	Fine sand Very loose		1	ST	3	1000				
			2	ST	2					Gr.0%, Sa.99% Si.&Cl. 1%
			3	ST	3	990				
985.0			4	ST	3					
21.7	Layers of Silty sand Sand with a trace of gravel and silt. Compact		5	ST	11	980				
			6	ST	10					Gr.1% Sa. 89% Si.&Cl. 10%
			7	ST	8	970				Blows too low due to boiling
			8	ST	19	960				
950.2										
56.5 / 948.3	Boulder					950				
58.4	Layers of silty sand. Sand and silt containing boulders									
940.4						940				
66.3	Bedrock Calcitic Marble Sound			RC	AXT 100% RC					
935.4										
71.3	End of borehole					930				

FORM CB-MT-126
65-4546

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 10

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy.500;Sta. 16+57 15' Rt. ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 24, 966 COMPILED BY ACC
DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration test CHECKED BY

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L — PLASTIC LIMIT w_P — WATER CONTENT w — WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
1006.7	Water Level									
1002.7	Ground Level									
4.0						1000				
						990				
						980				
						970				
						960				
						950				
947.1								50/4"		
59.6	End of cone test									

FORM 08-MT-126
65-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 10

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy.500;Sta. 16+57 15' Rt. ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 24, 966 COMPILED BY ACC
DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration test CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w — WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
1006.7	Water Level									
1002.7	Ground Level					1000				
4.0						990				
						980				
						970				
						960				
						950				
947.1								50/4"		
59.6	End of cone test									

FORM OB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 11

FOUNDATION SECTION

JOB 66-F-97
W.P. 34-63
DATUM Geodetic

LOCATION York River & Hwy.500, Sta. 16+80 17' Rt.
BORING DATE November 24, 1966
BOREHOLE TYPE Dynamic Cone Penetration test

ORIGINATED BY ACC
COMPILED BY ACC
CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT
1006.7	Water Levl				
997.0	Ground Level				
9.7					
965.7	Hammer Bouncing				
41.0	End of cone test Probable Bedrock				

ELEV. SCALE: 1000, 990, 980, 970

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT: 20, 40, 60, 80, 100
SHEAR STRENGTH P.S.F.

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P — w — w_L
WATER CONTENT %

BULK DENSITY γ P.C.F.

REMARKS

FORM OB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 12

FOUNDATION SECTION

JOB 66-F-97
W.P. 34-63
DATUM Geodetic

LOCATION York River & Hwy. 500; Sta. 17+05 17' Rt.
BORING DATE November 24, 1966
BOREHOLE TYPE Dynamic Cone Penetration test

ORIGINATED BY ACC
COMPILED BY ACC
CHECKED BY MK

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
1006.7	Water Level					1000				
991.8	Ground Level									
14.9						990				
						980				
976.9	Hammer Bouncing									
29.8	End of cone test Probable Bedrock					970				

FORM OB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 13

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy. 500, Sta. 17+15 18' Rt. ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 24, 1966 COMPILED BY ACC
DATUM Geodetic BOREHOLE TYPE Dynamic cone penetration test CHECKED BY

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
1006.7	Water Level					1000				
991.0	Ground Level									
15.7						990				
987.7	Hammer Bouncing									
19.0	End of cone test Probable Bedrock					980				

FORM 08-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 14

FOUNDATION SECTION

JOB 66-F-97
W.P. 34-63
DATUM Geodetic
LOCATION York River & Hwy. 500: Sta. 17 + 15, 17' Lt.
BORING DATE November 24, 1966
BOREHOLE TYPE Dynamic cone penetration test
ORIGINATED BY ACC
COMPILED BY ACC
CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT
1006.?	Water Level				
995.0	Ground Level				
11.7					
979.1	Hammer Bouncing				
27.6	End of cone test Probable Bedrock				

ELEV. SCALE: 1000, 990, 980, 970

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100
SHEAR STRENGTH P.S.F.

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT %

BULK DENSITY γ P.C.F.

REMARKS

FORM DB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 15

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy.500, Sta. 17+05, 17' Lt. ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 24, 1966 COMPILED BY ACC
DATUM Geodetic BOREHOLE TYPE Dynamic cone penetration b test CHECKED BY AR.

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / w_P w w_L / WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
1006.7	Water Level									
						1000				
994.5	GROUND LEVEL									
12.2						990				
981.2	Hammer Bouncing									
25.5	End of cone test					980				
	Probable Bedrock									
						970				

FORM DB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 16

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy. 500, Sta. 16+80; 17' Lt. ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 24, 1966 COMPILED BY ACC
DATUM Geodetic BOREHOLE TYPE Dynamic cone penetration test CHECKED BY

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE
1006.7	Water Level					
998.0	Ground Level					1000
8.7						990
						980
						970
967.2	Hammer Bouncing					
39.5	End of cone test Probable Bedrock					960

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100
SHEAR STRENGTH P.S.F.

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT %

BULK DENSITY P.C.F.

REMARKS

FORM DB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 17

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy. 500, Sta. 16+55 17' Lt. ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 24, 1966 COMPILED BY ACC
DATUM Geodetic BOREHOLE TYPE Dynamic cone penetration test CHECKED BY

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE
1006.7	Water Level					
1000.8	GROUND LEVEL					1000
5.9						
						990
						980
						970
						960
						950
946.5	Hammer Bouncing					
60.2	End of cone test. Probable Bedrock					940

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100
SHEAR STRENGTH P.S.F.

LIQUID LIMIT ——— w_L
PLASTIC LIMIT ——— w_P
WATER CONTENT ——— w
w_P w w_L
WATER CONTENT %

BULK DENSITY γ P.C.F.

REMARKS

FORM 08-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 18

FOUNDATION SECTION

JOB 66-F-97
W.P. 34-63
DATUM Geodetic

LOCATION York River & Hwy. 500, Sta. 16+80, on ℄
BORING DATE November 25, 1966
BOREHOLE TYPE Dynamic cone penetration test

ORIGINATED BY ACC
COMPILED BY ACC
CHECKED BY

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
1006.7	Water Level									
998.1	Ground Level					1000				
8.6										
						990				
						980				
						970				
966.2	Hammer Bouncing									
40.5	End of cone test Probable Bedrock					960				

FORM OB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 19

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy.500, Sta. 17+05 on ℄ ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 25, 1966 COMPILED BY ACC
DATUM Geodetic BOREHOLE TYPE Dynamic cone penetration test CHECKED BY

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F.	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w / w_P w w_L / WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
1006.7	Water Level									
993.9	Ground Level					1000				
12.8						990				
979.3						980	120/7"			
27.4	End of cone test Probable Bedrock					970				

FORM OB-MT-126
66-4546

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 20

FOUNDATION SECTION

JOB 66-F-97 LOCATION York River & Hwy. 500, Ch 17+15 on ℄ ORIGINATED BY ACC
W.P. 34-63 BORING DATE November 25, 1966 COMPILED BY ACC
DATUM Geodetic BOREHOLE TYPE Dynamic cone penetration test CHECKED BY

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE
1006.7	Water Level					
						1000
992.4	Ground Level					
14.3						990
982.8	Hammer bouncing					
23.9	End of cone test Probable Bedrock					980

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100
SHEAR STRENGTH P.S.F.

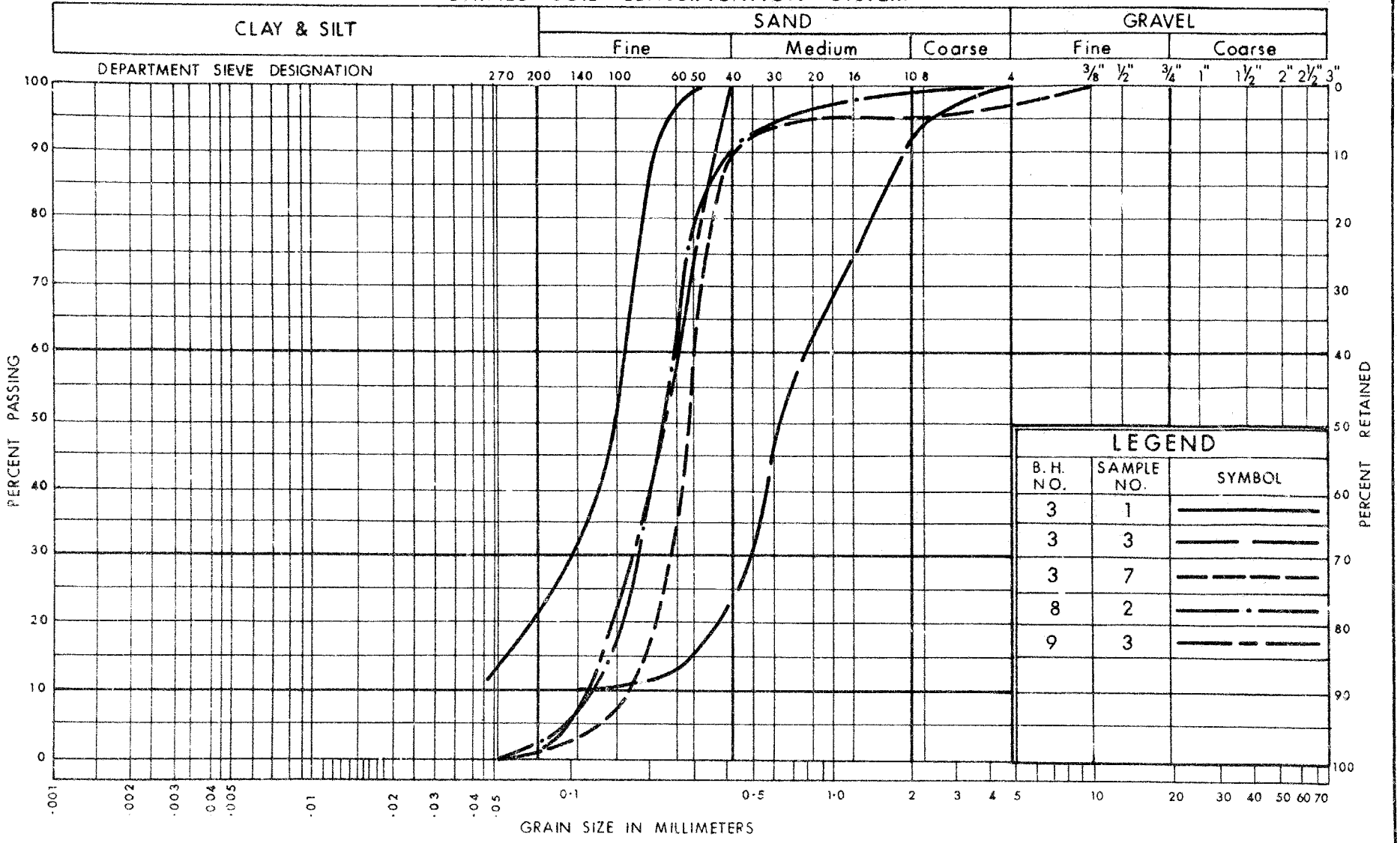
LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT %

BULK DENSITY γ P.C.F.

REMARKS

FORM OB MT - 17
REV. APR. 1963
65-414

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION
ONTARIO

GRAIN SIZE DISTRIBUTION
FINE SAND

W.P. No. 34 - 63
JOB No. 66 - F - 97

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

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

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

DESCRIPTION OF SOIL

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

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

TYPE OF SAMPLE

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

SOIL TESTS

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

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

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

GENERAL

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

STRESS AND STRAIN

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

EARTH PRESSURE

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

FOUNDATIONS

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

SLOPES

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

cc: Foundations Office (Rm. 110)

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

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

March 16, 1967

York River Bridge --
W.P. 34-63, W.J. 66-F-97, Site 11-25,
Sec. Hwy. #500, District #10 (Bancroft).

We have reviewed Preliminary Plan #D-6153-P for the above mentioned structure.

We note that the designer has complied with recommendations which are contained in our foundation report.

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

KGS/MdeF

cc: Messrs. S. McCombie
G. Scott

Foundations Files
Gen. Files

FILE 66-F-97

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. G. Stermac,
Principal Foundation Engineer,
Administration Building,
DOWNSVIEW, Ontario.

From: Bridge Division,
KINGSTON, Ontario.

Date: March 14, 1967.

Our File Ref.

In reply to

Subject: W.P. 34-63, Site 11-25, York River Bridge,
Sec. Hwy. 500, District 10

Herewith please find print of Preliminary Plan D-6153-P. May we have such comments as you wish to make.

J. A. Fisher
For: G. Scott
REGIONAL BRIDGE LOCATION ENG.

GS/hl

Enc.

Department of Highways Ontario

Copy for the information of
Mr. A. Stermac, Principal Foundation Engineer,
Room 107, Lab. Building

Mr. G. Scott,
Regional Bridge Location Engineer,
Kingston Regional Office

Bridge Division,
Downsview, Ontario

March 10, 1967

York River Bridge
W.P. 34-63, Site 11-25
Sec. Hwy. No. 500
District No. 10

Attached herewith are prints of the Preliminary Bridge Plan Drawing D-6153-P for the above-mentioned structure.

The estimated cost of the proposed structure is $102,000. This cost includes tender, materials, engineering and sundry construction.

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

C.S. Grebski,
Bridge Design Engineer

CSG:rd

Attach.

c.c. R. Forrest
E. Cross
S. McCombie
A. Stermac

cc: Foundations (Rm. 110)

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

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

March 1, 1967

Your Memo -- Feb. 23/67

York River Bridge,
Sec. Hwy. 500, Line D,
W.P. 34-63, District #10.

66-F-97

With reference to your memo of February 23, 1967, and the subsequent discussion of February 27, regarding the above subject, we wish to make the following comments:

It was agreed that any additional information regarding the bedrock elevations at the West abutment and Pier #1 would not materially change or influence the present design. No further field work will, therefore, be undertaken.

We have advised you that our Engineer has, during the time of the field investigation, inspected the area upstream as well as downstream of the site, and has found no outcrops of rock. Since rock is outcropping on the east bank of the chosen site, it would appear that this may be the best site. Based on this evidence, we feel that finding a more favourable crossing within the immediate proximity, is quite remote and we, therefore, do not intend to carry out any additional investigation.

AGS/EdeF

A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. S. McCombie
G. Scott

Foundations Files
Gen. Files

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

I: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107,
Lab. Building

FROM: Bridge Division,
Downsview, Ontario

DATE: February 23, 1967

UR FILE REF.

IN REPLY TO

SUBJECT: York River Bridge
Sec. Hwy. 500, Line D
W.P. 34-63, District 10

Attached herewith are three Preliminary Plans of the proposed structure at this site.

As discussed we require extra boreholes at the West Abutment and Pier #1 in order to determine the location of the rock.

At the same time we would like boreholes on a new proposed line 100 feet downstream in order to assess if a better location can be found for this bridge.

As this structure is on the 1967 Construction Program we require this information as soon as possible.

C.S. Grebski,
Bridge Design Engineer

CSG:rd

Attach.

c.c. S. McCombie
G. Scott
R. Forrest

Hwy. 401 & Keele St.
Downsview, Ontario

Materials and Testing Division

January 20, 1967

Johnston Drilling Co.Ltd.
378 Bering Street
Toronto, Ontario

<u>Attention: Mr. F. Blackburn</u>

Dear Sir:

This is to confirm our request of November 4, 1966, for the supply of one Diamond Drill together with <u>all necessary</u> equipment, as specified under the terms of our Contract Agreement, at Bancroft, Ontario, on November 8, 1966.

This project bears job number 66-F-97.

Yours truly,

MD:mt

~~M. Devata,~~
Supervising Foundation Engr.
for: A. G. Stermac, Principal Foundation Engr.

cc: E. Kaminga

Foundations Office
General Files

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

Mr. A. Stermac

66-F-11

66 F 97

Materials and Testing Division,
Downsview, Ontario,
January 5, 1967.

Mr. R. Beards,
c/o Room 669,
601 Booth Street,
Ottawa 4, Ontario.

Dear Ron:

Further to our telephone conversation of December 28, 1966, I am pleased to send you a few examples of our foundation reports.

You indicated you would look at these reports and determine the information that you must have from them, along with the rock cores. You will note that each report has an attachment containing a key plan of the area, and also a detailed plan showing the location of the bore holes along with the stratigraphy. The log of the bore holes is contained in the report.

As these reports are from my permanent file, I would ask that they be returned to me with your comments as to what information you would like to have with the cores.

Yours sincerely,

AR

A. Rutka,
Materials & Testing Engineer.

aR:pa
Encls.
c.c. A. Stermac.

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

66-F-91

To: Mr. A. Stermac,
Principal Foundation Engineer,
DOWNSVIEW, Ontario.

From: Mr. G. Scott,
Regional Bridge Location Engineer,
KINGSTON, Ontario.

Date: October 24, 1966.

Our File Ref.

In reply to:

34-63

Subject: York River, W.P. 29-63, Site #11-25, Hwy. #500,
District #10, Bancroft

Enclosed herewith please find two copies of plan E-4612-1 on which we have marked in red proposed locations for two structures, 16 + 80 and 19 + 80.

We understand that the scheduling program requires that these be issued to you at this time, however, would point out that we have not been able to make the necessary investigations to give you full requirements.

We will be pleased if you will make the necessary foundation investigations at these sites, and receiving your report in due course.

J. A. Fisher,
FOR: G. Scott,
REGIONAL BRIDGE LOCATION ENGINEER

JKF/GS/mjh
Encl.
c.c. S. McCombie

DOMINION SOIL INVESTIGATION LIMITED
77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 421-2367

ANCH
369 QUEENS AVENUE
LONDON, ONTARIO
TELEPHONE GE. 3-3851

FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66856

June 1, 1966.

Our Ref: 6-5-39
Your Ref: W.J. 66-F-97

Department of Highways, Ontario,
Materials & Testing Division,
Hwy. 401 and Keele Street,
DOWNSVIEW, Ontario.

Attention: Mr. K. Selby, P. Eng.

Re: Soil Investigation for Q.E.W. & Hwy. 27
Interchange, Retaining Walls No. 7 & 15

Dear Sirs:

We are pleased to submit herewith eleven (11) copies of the records of Boreholes Nos. 37, 38, 40, 41 and 42 put down at the proposed locations of the retaining walls No. 7 and 15.

As shown on the borehole logs, the site at these locations is underlain by a generally shallow stratum (1.5 to 11.0 ft.) of organic topsoil and/or fill, followed by very dense, predominantly fine-grained, cohesionless deposits. The shale bedrock was encountered at Elevation 362± ft.

The observed ground water level ranges between Elevations 377 ft. and 379.8 ft.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,

I. P. Lieszkowszky, P. Eng.,
Project Engineer.

IPL/jvm
Encls.

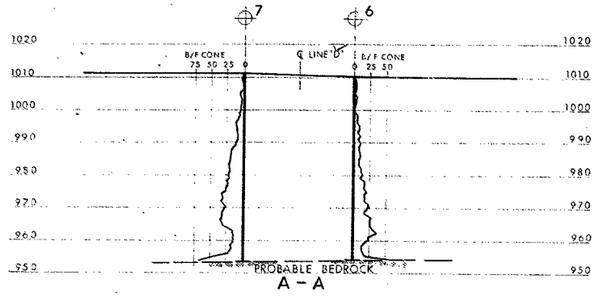
#66-F-97

W.P. # 34-63

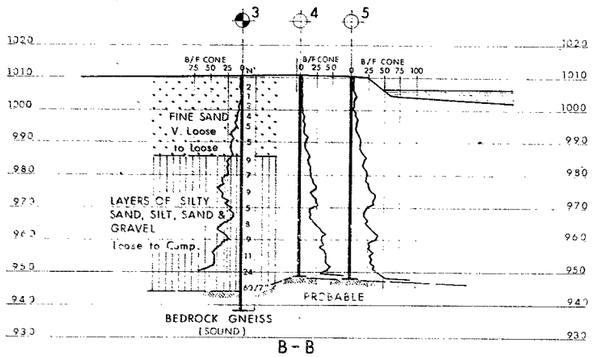
Hwy. # 500

Crossing

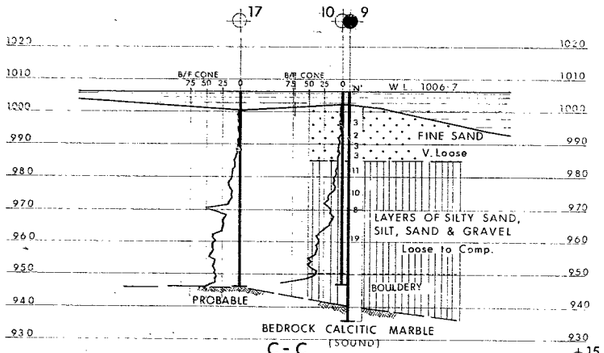
York River



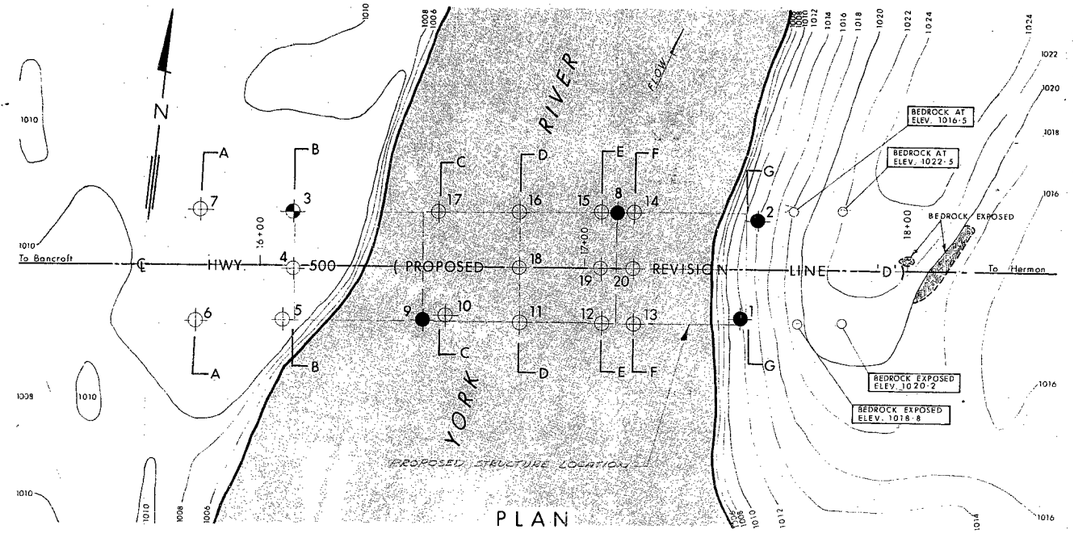
A - A



B - B



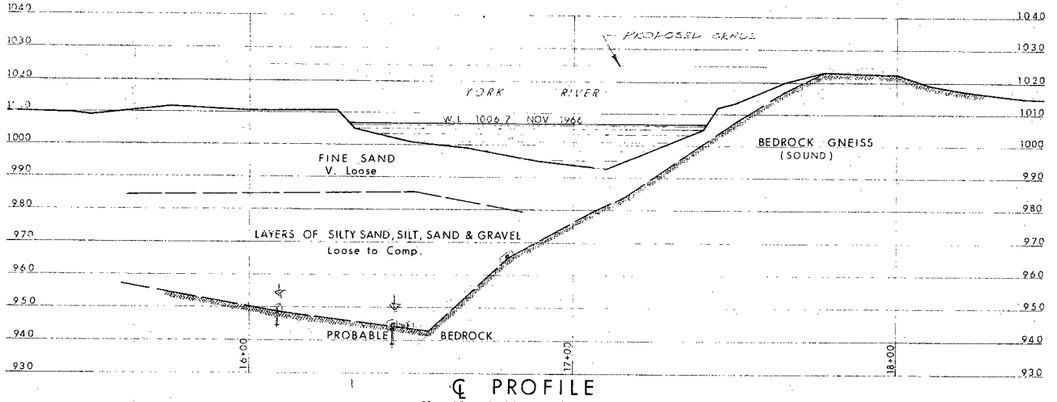
C - C



PLAN

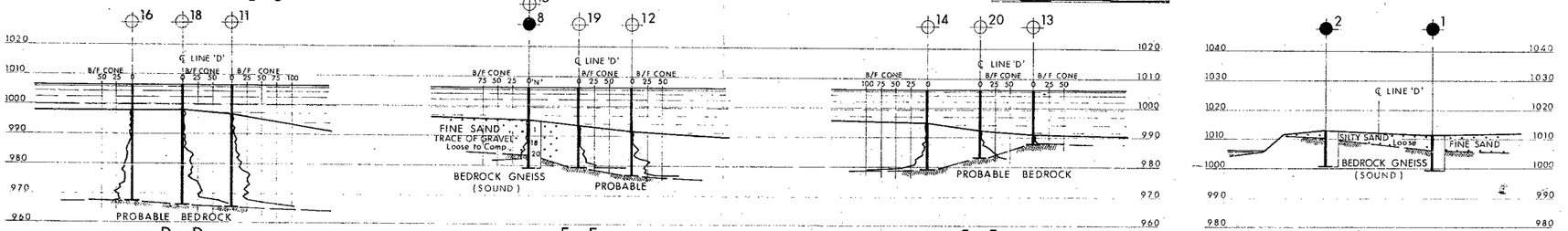
SCALE

20 10 0 20 40 FT.



℄ PROFILE

20 10 0 SCALE 20 40 FT.

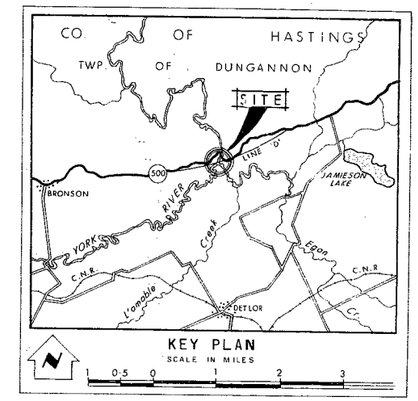


D - D E - E F - F G - G

SECTIONS

SCALE

20 10 0 20 40 FT.



KEY PLAN

SCALE IN MILES

1 0·5 0 1 2 3

LEGEND

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

NO.	ELEVATION	STATION	OFFSET
1	1011·4	17+48	15·5' RT.
2	1013·3	17+53·5	15 ' LT.
3	1010·7	16+10	17 ' LT.
4	1010·9	16+10	1 ' RT.
5	1010·6	16+07	17 ' RT.
6	1010·4	15+80	17 ' RT.
7	1011·6	15+81·5	17 ' LT.
8	995·7	17+10	17 ' LT.
9	1002·2	16+50	17 ' RT.
10	1002·7	16+57	15 ' RT.
11	997·0	16+80	17 ' RT.
12	991·8	17+05	17 ' RT.
13	991·0	17+15	18 ' RT.
14	995·0	17+15	17 ' LT.
15	994·5	17+05	17 ' LT.
16	998·0	16+80	17 ' LT.
17	1000·6	16+55	17 ' LT.
18	998·1	16+80	℄
19	993·9	17+05	℄
20	992·4	17+15	℄

- 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

REVISIONS		
DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION - FOUNDATION SECTION

YORK RIVER

KING'S HIGHWAY NO. 500 REV'N. LINE 'D' DIST. NO. 10

CO. HASTINGS

TWP. DUNGANNON LOT 12 CON. II

BORE HOLE LOCATIONS & SOIL STRATA

SUBM'D A.C.C.	CHECKED A.F.F.	W.P. NO. 34-63	S.B.T. DRAWING NO. 66-F-97A
DRAWN S.O.	CHECKED	JOB NO. 66-F-97	
DATE 15 DEC. 1966		SITE NO.	BRIDGE DRAWING NO.
APPROVED		CONT. NO.	

REF. NO. E-4612-1