

#67-F-20

W.P. #252-66

Hwy #416

RIDEAU

RIVER

MEMORANDUM

W.P. 252-66.

To: Mr. J. L. Forster,
Regional Functional Planning Engr.,
Functional Planning Division,
Regional Office,
KINGSTON, Ont.

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

DATE: April 4, 1967

OUR FILE REF.

IN REPLY TO:

APR 12 1967

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
The Proposed Rideau River Bridge
At the Crossing of Proposed Hwy. #416
District #9 (Ottawa)
W.J. 67-P-20 -- W.P. 252-66

Attached, we are forwarding to you, the foundation investigation report for the mentioned crossing.

The report is of a somewhat preliminary nature and more work will have to be carried out if and when more design details become available.

The main result of this investigation is the indication that there is basically no major difference in the soil conditions along the alternate lines.

We believe that the information contained in this report will be sufficient for you to continue the design work. Should additional information be required, please do not hesitate to contact this Office.

AGS/WdeF

Attach.

cc: Messrs. J. L. Forster (5)

C. R. Robertson

G. Scott

J. E. Gruspier

B. A. Singh

Foundations Files

Gen. Files

A. G. Sternac
A. G. Sternac
PRINCIPAL FOUNDATION ENGINEER

TABLE OF CONTENTS

1. INTRODUCTION.
 2. DESCRIPTION OF THE SITE.
 3. FIELD AND LABORATORY INVESTIGATION PROCEDURE.
 4. SOIL CONDITIONS:
 - 4.1) General.
 - 4.2) East Side.
 - 4.3) West Side.
 5. DISCUSSION AND RECOMMENDATIONS.
 - 5.1) Footings.
 - 5.2) Approach Fills.
 6. MISCELLANEOUS.
-

FOUNDATION INVESTIGATION REPORT
For
The Proposed Rideau River Bridge
At the Crossing of Proposed Hwy. #416
District #9 (Ottawa)
W.J. 67-P-20 -- W.P. 252-66

1. INTRODUCTION:

A foundation investigation at the site of the proposed Hwy. #416 and the Rideau River crossing, was requested by Mr. J. L. Forster, Regional Functional Planning Engineer, in a memo dated February 23, 1967.

At this time, a preliminary investigation only, was suggested in order to establish the feasibility of the proposed alternate crossings, from the foundations point of view.

Accordingly, field and laboratory investigations were carried out, the results of which are presented in this report.

2. DESCRIPTION OF THE SITE:

The proposed crossing is situated some 5 miles north of Kemptville at the Rideau River and canal. Two lines were to be considered by the foundation investigations. The alternate alignments have a common point at the approx. location of the future east abutment; line #2 crossing the river near right angle, while line #1 crosses with a skew.

The east side of the river is generally flat; the river bank is partially built up with summer cottages; farther back, the area consists mainly of farmlands. The west bank of the river rises from the beach, reaching some 10 - 15 ft. higher elevations than the ice level of the river. At this bank, large size boulders (up to 20 ft. diam.) are exposed on the ground, near the beach area.

cont'd. /2 ...

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

Although the site lies within the physiographic region known as the "Edwardsburg Land Plain", the subsoil bears rather the characteristics of the neighbouring "North Cower Drumlin Field" region. The clay and silt soils were likely deposited by the Champlain Sea.

3. FIELD AND LABORATORY INVESTIGATION PROCEDURE:

Some 6 sampled boreholes and 4 dynamic cone penetration tests were carried out during the field investigation. The borings were performed by three conventional diamond drill rigs, adapted for soil sampling purposes. Standard penetration tests in granular and gravelly soils, and field vane shear tests in cohesive soils were undertaken according to conventional methods. Relatively undisturbed samples were recovered by means of thin-walled Shelby tube samplers.

Due to the fairly strong thaw period just prior to the field work, no boreholes were placed on the ice near the current of the Canal.

The locations and elevations of the boreholes, together with the estimated soil profiles along the two proposed lines, are presented on Drawing #67-F-20A.

Soil samples were visually examined and identified upon recovery and again in the laboratory. Unconfined compression and quick triaxial shear tests were carried out on undisturbed cohesive samples. Further tests of moisture and organic contents, Atterberg limits, and grain-size analyses, were performed on representative specimens.

The results of field and laboratory tests are plotted on the borehole sheets accompanying this report.

cont'd. /3 ...

4. SOIL CONDITIONS:

4.1) General:

Soil conditions at the east and west side of the river differ greatly. The transition zone could not be established due to the unsafe ice conditions on the canal. At the east side of the river (boreholes #3 and 4) underneath a 50 - 60 ft. thick deposit of silty clay to clay, a gravelly sand layer lies. At the west side, however, a very dense glacial deposit with an excessive amount of oversized boulders was found right from ground level.

A brief description of the soils, separated into east and west sides, is given below:

4.2) East Side:

Two boreholes and one dynamic cone penetration test were carried out at this side. Right below the river bed a 9 - 10 ft. thick layer of soft, highly organic muck was found, underlain by a deposit of silty clay to clay. On the river bank the organic soil is missing, and the silty clay to clay deposit was encountered from ground elevation, extending to a depth of 52 ft. (El. 229.5 ft.).

Shear strength values of the silty clay to clay, obtained by field vane tests, ranged from 600 p.s.f. to 1200 p.s.f.; values of the laboratory tests, however, were generally much lower. The latter discrepancy was attributed to the very sensitive nature of the deposit. The consistency of the in situ soil, therefore, may be taken to be firm to stiff. The liquid limit values of the samples vary between 41 and 56%, whereas values of plastic limits vary between 21 and 25%.

Between El. 218 and 229 ft., a very dense heterogeneous glacial till underlies the clay stratum. The gravelly sand till is granular by nature having, however, quite a substantial percent of fine-grained particles.

cont'd. /4 ...

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

4.3) West Side:

At the west side of the river, along both lines from ground elevation, extending to the bottom of the holes (36 - 41 ft.), a dense to very dense heterogeneous glacial till was encountered. The till contains a large amount of boulders of various sizes. Due to the large boulders, diamond core drilling had to be carried out in order to lower the boreholes. Some fine binders within the deposit were occasionally also observed, giving the stratum some plasticity.

On account of the very difficult drilling in the bouldery material, boreholes were terminated in relatively shallow depths.

5. DISCUSSION AND RECOMMENDATIONS:

Two lines, numbered 1 and 2, are being considered at the Rideau River crossing of the proposed Hwy. #416. The limited scale foundation investigation, discussed herein, indicates no major difference in the soil conditions along the alternate lines.

No details of the proposed bridge are yet known; consequently only very general recommendations as to the foundations can be given.

5.1) Footings:

The observed, fairly thick (approx. 50 ft.) firm to stiff clay deposit at the east side of the crossing, appears to have insufficient strength to support the structure economically on spread footings. The east abutment and the piers between Sta. 7+00 and 9+50, along both lines, should therefore be supported on piles. In order to develop adequate end-bearing properties, piles should be driven below el. 218 - 220 ft. By using 12-3/4" steel tubular piles driven to the specified elevation, a safe load of 70 T/pile may be assumed for design purposes.

cont'd. /5 ...

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

5.1) Footings: (cont'd.) ...

At the west side, between Sta. 19+00 and 23+00, along line 1, and between Sta. 14+00 and 19+00, along line 2, the very dense bouldery till was encountered right below the ground level. Spread footings are suggested within the above stations, placing the footings as high as frost or scour penetration permits. The allowable bearing capacity of the bouldery till may be taken to be 3 t.s.f. Due to the permeable nature of the subsoil, a dewatering scheme will be necessary. It must be borne in mind, however, that both driving sheet piles or sinking wellpoints, appear to be very problematic on account of the large size boulders.

5.2) Approach Fills:

No stability problems are foreseen on the west side, for the approach fill within the investigated length, provided 2 horizontal to 1 vertical slopes are constructed.

At the east side, it is estimated that a 20 - 22 ft. high embankment will be stable. Higher fills will likely require berms in order to maintain stability.

It is emphasized that recommendations given above, are conditional only. After design details become available, additional field investigation will be necessary for the final foundation report.

6. MISCELLANEOUS:

The field work, performed during the period March 13 - 17, 1967, was supervised by Mr. A. K. Barsvary and Mr. H. Szymanski. Equipment used was owned and operated by Johnston Drilling Co. Ltd., and Canadian Longyear Co. Ltd. This report was prepared by Mr. A. K. Barsvary, Senior Foundation Engineer, and reviewed by Mr. K. G. Selby, Supervising Foundation Engineer.

April 1967

APPENDIX I

UNITED STATES DEPARTMENT OF AGRICULTURE

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 67-F-20 LOCATION Line #2 Sta. 15 + 85.7 ORIGINATED BY AKB

W. P. 252-66 BORING DATE March 14, 1967 COMPILED BY AKE

DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing CHECKED BY WJL

[illegible]

FOUNDATION SECTION

ORIGINATED BY AKB

COMPILED BY AKB

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO. 2A

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 67-F-20

LOCATION Line #1, Sta. 19 + 00 ±

ORIGINATED BY AKB

W. P. 252-66

BORING DATE March 15, 1967

COMPILED BY AKB

DATUM Geodetic

BORF HOLE TYPE Washboring, BX Casing

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT ——— W _L PLASTIC LIMIT ——— W _P WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	SHEAR STRENGTH P.S.F.			W _P W W _L 20 40 60 WATER CONTENT %				
280.0	ICE LEVEL												
0.0	Ice & Water												
277.0													
3.0	Muck												
274.0													
6.0	Boulder, gravel and sand.												
	Very dense.		1	SS	90								
			2	SS	45								
			3	SS	27								
			4	SS	59/28								
244.0													
36.0	End of Borehole												

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 67-F-20 LOCATION Line #1, Sta. 9 + 20 E ORIGINATED BY AKB
W.P. 2 52-66 BORING DATE March 16 & 15, 1967 COMPILED BY AKB
DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing CHECKED BY LL

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	WP	WL	W		
280.0	ICE LEVEL															
0.0	Ice & Water															
274.0																
6.0	Organic Muck		1	SS	0	270										
265.0			2	SS	12											
15.0	Silty clay to clay					260										
	Firm		3	TW	PM											
						250										
			4	TW	PM											
			5	TW	PM	240										
233.5																
46.5	End of Borehole					230										
	Probable silty clay to clay					220										
218.0																
62.0	Gravelly sand															
215.3	Very Dense															
64.7	End of Cone Test					210										

Rate of Strain %
15
5
10

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-20

LOCATION Line #2, Sta. 14 + 06 P

ORIGINATED BY AKB

W.P. 252-66

BORING DATE March 16 & 17, 1967

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Washboring, NX Casing

CHECKED BY *AKB*

FOUNDATION SECTION

RECORD OF BOREHOLE NO. 6

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE						LIQUID LIMIT — w _L				BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT						PLASTIC LIMIT — w _p					
						SHEAR STRENGTH P.S.F.						WATER CONTENT — w						
													w _p	w	w _L			
													WATER CONTENT %					
278.5	ICE LEVEL																	
0.0																		
	Ice & Water																	
268.5						270												
10.0	Organic Muck																	
265.0																		
13.5	Boulders, gravel and sand with some silt.		1	SS	35	260												
			2A	SS	36													
	Dense to very dense.		2	SS	24	250												
			3	SS	26													
			4	SS	83	240												
237.0																		
			5	SS	100/13"													
41.5	End of Borehole					230												

Gr. 43, Sa. 42
Sl. & Cl. 15

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
WS	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 SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT 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_c	COEFFICIENT OF CONSOLIDATION
C_α	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
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE OR FRICTION
μ	COEFFICIENT OF FRICTION
S	SENSITIVITY

GENERAL

π	$= 3.1416$
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e \sigma$ OR $\ln \sigma$	NATURAL LOGARITHM OF σ
$\log_{10} \sigma$ OR $\log \sigma$	LOGARITHM OF σ 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

z	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SURFACES 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

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. Sternac,
Principal Foundation Engineer,
Material & Testing Division,
Downsview

From: Functional Planning Division,
Kingston

23
Date: February 17, 1967

Our File Ref.

IN REPLY TO

Subject:

W.P. 252-66, Prop. Hwy. 416
Kemptville to Ottawa, District
9 - Ottawa

Enclosed please find two photo prints and one photo mosaic print of the proposed Rideau River crossing within the limits of the above project. At this time a preliminary foundation investigation of this crossing is requested to establish the feasibility of such crossing for the final location of the highway alignment.

Spacing of boreholes is optional depending on type of river bed encountered. Engineering Surveys could be contacted for tying the line on the ground.



J.L. Forster,
Regional Functional Planning Engineer.

BK/r1
Att'd.

cc: G. Scott
A.G. Boucher

401 & Keele Street
Downsview, Ontario

Materials and Testing Division

March 31, 1967

Johnston Drilling Co. Ltd.
722 Denison Street
Toronto, Ontario

Dear Sirs:

This is to confirm our request of March 9, 1967 for the supply of 2 Diamond Drills together with all necessary equipment, as specified under the terms of our Contract Agreement, at Kemptville, Ontario, at 3 p.m., Monday, March 13, 1967.

This project bears Job Number 67-F-20.

Yours truly,

[Handwritten signature]

AS:mt

K. Selby
Supervising Foundation Engineer
for: A. G. Sternac
Principal Foundation Engineer

cc: H. Konings
H. Gyzanski

Foundation Files
General Files

MEMORANDUM

Mr. A. Stermac,
Principal Foundation Engineer,
Materials & Testing Division,
Downsview, Ontario.

FROM: Functional Planning Division
Kingston.

DATE: March 23, 1967.

Attn: Mr. K. Selby

File #

IN REPLY TO

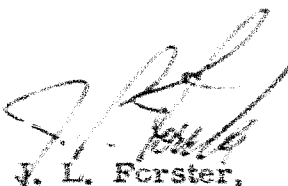
SUBJECT:

W.P. 252-66, Prop. Hwy. 416, Kemptville to Ottawa,
District 9, Ottawa

Enclosed please find one photomosaic, one photo print and the profile print of the proposed Rideau River crossings within the limits of the above project as per your request. The photomosaic is the best plan we have at present for this area.

As the High Water Level is not known at this time, a 33' clearance has been assumed from the water level indicated by Engineering Surveys when they recently ran these lines. A 10' thickness has been assumed for the deck. Hence, the grades shown on these crossings represent the maximum anticipated.

The attached "Recommended Design Standards" indicates the cross-section of the approaches for Stage 1 (Two lanes) and Stage 3 (Four lanes divided).



J. L. Forster,
Regional Functional Planning Engineer

BK/mjh
c.c. G. Scott
A. G. Boucher

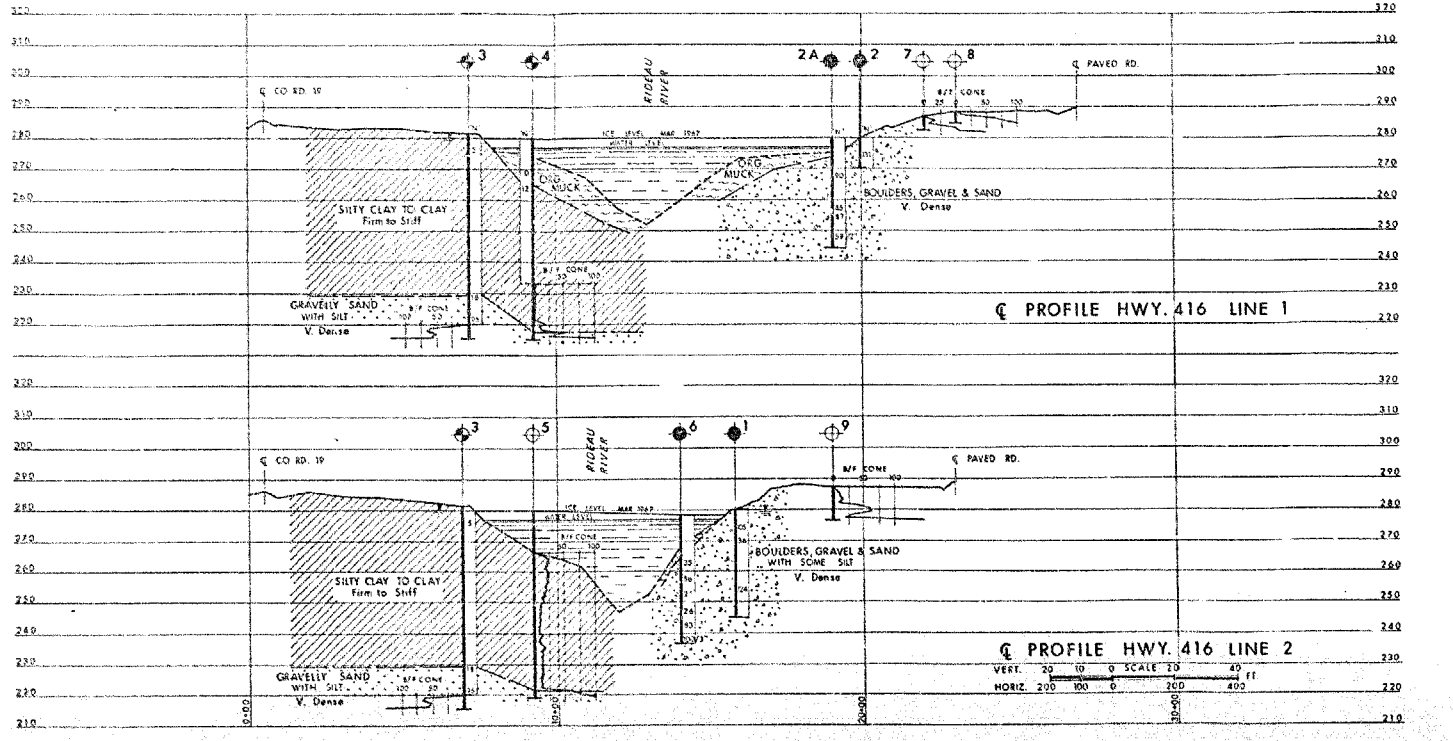
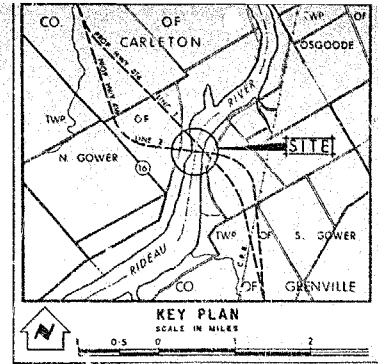
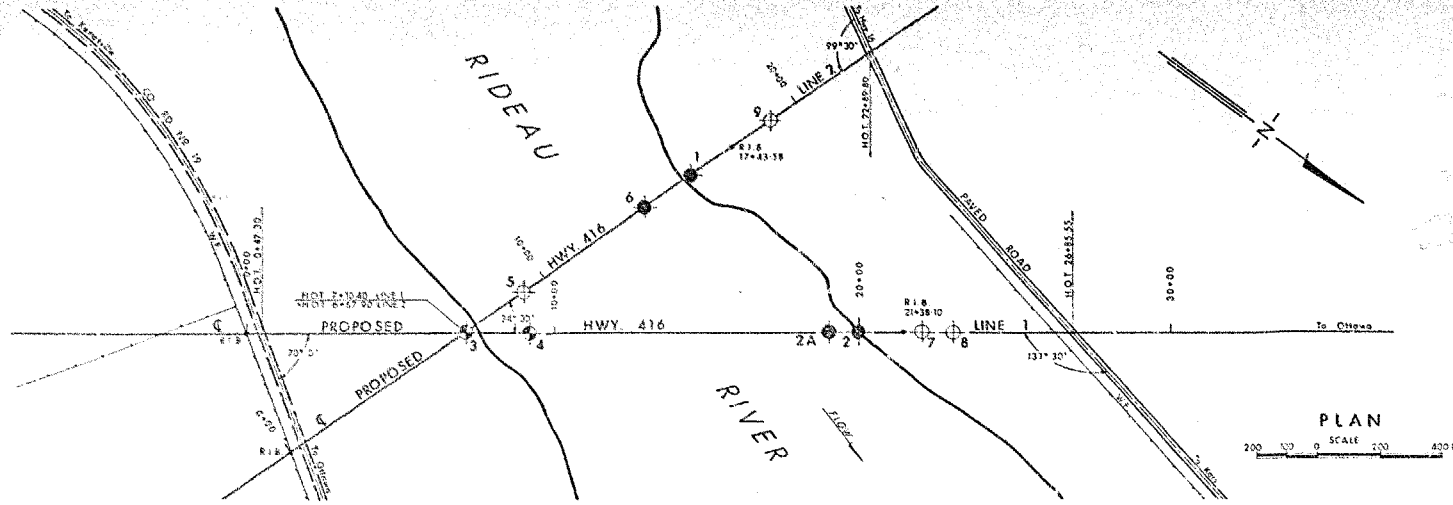
7. RECOMMENDED DESIGN STANDARDS

The following table presents the recommended design standards for Stages 1 and 3. Stage 2 will have the same standards as Stage 1 and is an extension of Stage 1 beyond the limits of this project.

	<u>Stage 1</u>	<u>Stage 3</u>
Summer Average Daily Traffic	5400 vpd (a)	6900 vpd (1985) (b)
Design Hour Volume	730 vph (a)	700 vph (b)
Highway Classification	Arterial	Freeway
Design Speed	80 mph (c)	80 mph
Min. Stopping Sight Distance	750'	750'
Equivalent Vertical Curve - Crest	1200'	1200'
Equivalent Vertical Curve - Sag	800'	800'
Grades Maximum	3%	3%
Curvature Maximum	2°	2°
Pavement Width	24'	2-24'
Shoulder Width	10' Rt. & Lt.	10' Rt. 6' Lt.
Shoulder Rounding	3'	3'
Median Width	Nil	100' min.
Right-of-Way Width	324' min.	324' min.
Right-of-Way to be cleared (total clearing)	120' max. (d)	120' max. each roadway

(a) For this stage these are the maximums attainable at level of Service "B". When these volumes are reached, Stage 3 should be undertaken.

(b) 1985 S.A.D.T. and D.H.V. are expected volumes with the freeway completed.



LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation, MAR. 1967		

NO.	ELEVATION	STATION	OFFSET
1	280.5	15+85	C LINE 2
2	280.0	19+96	C LINE 1
2A	280.0	19+00	C LINE 1
3	281.5	7+10	C LINE 1
4	280.0	9+20	C LINE 1
5	280.0	9+20	C LINE 2
6	278.5	14+06	C LINE 2
7	287.0	22+00	C LINE 1
8	288.3	23+00	C LINE 1
9	287.9	19+00	C LINE 2

- NOTE -
 The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

REVISIONS	DATE	BY	DESCRIPTION

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

RIDEAU RIVER

KING'S HIGHWAY NO. PROP. 416 LINES 1&2 DIST. NO. 9
 CO. CARLETON & GRENVILLE
 TWP. N. GOWER & S. GOWER LOT CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUBD. A.B.	CHECKED	W.P. NO. 252-66	D.B.T. DRAWING NO.
DRAWN S.O.	CHECKED	JOB NO. 67-F-20	67-F-20 A
DATE 6 APRIL 1967	SITE NO.	SP. NO.	SP. NO.
APPROVED	SP. NO.	SP. NO.	SP. NO.