67-F-230M

BRIDGE 3-2

S. CASTOR RIVER

OSGOODE MOUNTAIN

TOWNLINE ROAD

67-F-2304

ENGINEERING REPORT

F O R

BRIDGE ~~N~~ 3-2

BRIDGE OVER SOUTH CASTOR RIVER

OSGOODE MOUNTAIN TOWNLINE ROAD

COUNTY OF CARLETON

M. M. DILLON LIMITED

LONDON OTTAWA TORONTO WINDSOR

****

ENGINEERING REPORT FOR BRIDGE 31-2

OVER SOUTH CASTOR RIVER

A. SUMMARY

We recommend that the present steel pony truss bridge be demolished and replaced with a concrete structure. The existing bridge is deficient both structurally and from a roadway width standpoint. The new bridge is estimated to cost $42,000.00. Preliminary plans are included with this report.

B. GENERAL

The owner of the bridge is the County of Carleton. The bridge is located on the Osgoode-Mountain Townline, approximately 1¼ miles west of the junction with Highway 31, and about 30 miles south of the centre of Ottawa. Exact location is Lot 44, Con. VI, Osgoode Township. The bridge crosses the South Castor River.

C. EXISTING STRUCTURE

1. Structural

The existing bridge is a 50' - 6" span steel pony truss with a timber deck. The floor system would not appear capable of carrying any high loading. The condition of the abutments cannot be commented on as they are not visible.

2. Geometric Standards

No traffic measurements were made when data was collected for the County Roads Needs Study in 1964, but our A.A.D.T. estimate is 125. The County has no intention at the moment of increasing the traffic capacity of the road. The bridge has a roadway only 15' - 6" wide.

3. Hydrological

Extensive flood plains surround the road in both directions. The country side is very flat. Thus, it would appear that when the river rises above the level of the banks there would be no great increase in depth of water due to the large reservoir created by the flooded plains.

The lower chord of the existing truss is about one foot above the level of the river banks, and is covered by water at times of flood. The road to either side of the bridge is at the same level approximately, and therefore floods also.

Timber cribs infilled with earth and boulders exist in front of each abutment under the bridge, considerably reducing the waterway under the bridge.

The drainage area for the bridge is measured to be 48.6 square miles.

D. PROPOSED STRUCTURE

1. Structural and Geometric

Our proposals for the bridge are shown on the enclosed drawing No. 1 from which it will be seen that the deck is to be raised about five feet, while the span has been increased to fifty-three feet, six inches. Precast pre-stressed A.A.S.H.O.II beams are proposed for the deck, with a composite concrete slab. Reinforced concrete abutments are suggested.

Butts, Ross and Associates have carried out a soils investigation, and recommend spread footings about ten feet below the existing bridge deck. We have located footings below the river bed to prevent any possibility of scour under them. The alternative of piles about forty-six feet long does not appear to be warranted here. Piles would probably obviate any settlement of the foundations but, considering the road in question, it would not appear to be serious if small settlement did occur. A copy of the report is enclosed.

The traffic capacity of the bridge itself will be increased due to the greater width.

2. Hydrological

The drainage area above the structure is 48.6 square miles. We propose a waterway area of 500 square feet at the structure. This will be achieved by clearing the channel as shown on the drawings.

A bridge carrying Highway 31 over the South Castor River is located about one mile downstream from the proposed structure and has a waterway area of approximately 550 square feet.

3. Estimated Cost

We estimate that the structure will cost $42,000. - including engineering costs, road work, demolition of the old structure and construction of the new bridge.

This report is respectfully submitted.

V. J. Bromley, P. Eng.,
Project Manager.

/ss
July 20, 1967

E. O. BUTTS, D.L.C. Hons., P.ENG.
W. M. ROSS, B.Sc., P.ENG.
R. H. MAGWOOD, B.Sc., P.ENG.

BUTTS, ROSS & MAGWOOD LTD.
CONSULTING CIVIL ENGINEERS
1489D MERIVALE RD.
OTTAWA 5, CANADA
224-1414

MEMBER OF:
A.C.I.
E.I.C.
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A.C.E.C.

REPORT
OF A
SITE INVESTIGATION
BRIDGE NO. 31-2, SOUTHCASTOR RIVER
OSGOODE TWP. LOT 44, CONCESSION VI

SUMMARY

A design loading of 2,000 lbs/sq.ft. can be used for spread footings from 5 feet to 10 feet below the existing bridge deck.

An alternative to spread footings would be to use piling. Pile lengths would be approximately 46 feet below the existing bridge deck.

INTRODUCTION

This investigation was requested by V.J. Bromley,P.Eng., of M.M. Dillon Limited. The purpose of the investigation was to determine sub-surface soil conditions for a proposed replacement bridge on the South Castor River, Osgood Township, Lot 44, Concession VI.

METHOD OF DRILLING

A trailer mounted diamond drill was used throughout the investigation. Bx casing was driven to sampling depths and on to refusal. The casing was cleaned with high pressure water before each sampling operation. Bedrock was drilled with use of an AXT corebit and barrel.

METHOD OF SAMPLING

Thin walled open sampling tubes were used in the cohesive strata to recover undisturbed samples for laboratory testing. The granular layers were sampled with the use of split spoon samplers for obtaining penetration data and recovering samples for identification. Samples of bedrock were recovered with an AXT corebit and barrel.

LABORATORY TESTING

A total of 9 unconfined compresssive strength tests were performed on the undisturbed samples recovered from the clay layer. The purpose of these tests was to determine bearing values and to study the characteristics of the soils encountered.

SOIL DESCRIPTION

Below the road granular was a stiff to firm strata of clay with small amounts of silt. This layer extended to 17'-9" in borehole No. 1 and 19' in borehole No. 2. A firm to soft laminated clay and silt was then found to a depth of 25'. Compact sand and silt with lesser amounts of gravel and clay was then encountered to refusal depth. Refusai was met in boulders at 34'-8" and 30'-2" in boreholes 1 and 2 respectively. Bedrock was proven at 42'-3" in borehole No. 1A. Limestone was struck from 42'-3" to 43'-3" after which shale was found to the maximum depth drilled.

RECOMMENDATIONS

For spread footings, set from 5 feet to 10 feet below the existing bridge deck, a loading of 2000 lbs/sq.ft. can be used.

An alternative to spread footings would be to set the bridge on piles. An approximate pile length would be 46 feet below the existing bridge deck.

All of which is respectfully submitted.

E. O. Butts, P.Eng.

March 23rd, 1967.
Ottawa, Ontario.

WO/ms

BUTTS ROSS & ASSOCIATES
TESTING LABORATORY

The abbreviations commonly used on the borehole logs and in the text of the report are as follows:

SAMPLE TYPES

A S - Auger Sample	S S - Split Spoon
F S - Foil Sample	T O - Thin-walled, Open
R C - Rock Core	T P - Thin-walled, Piston
S T - Slotted Tube	W S - Wash Sample

PENETRATION RESISTANCES

Dynamic Penetration Resistance - The energy required to drive a 2 inch diameter, 60 degree cone attached to the end of the drilling rods into the ground: expressed in blows per foot, as in standard penetration.

Standard Penetration Resistance - The number of blows by a 140 pound hammer dropped 30 inches required to drive a 2 inch split spoon sampler one foot into the ground.

Sampler advanced by static weight - weight, hammer - Wh
Sampler advanced by pressure - pressure, hydraulic - Ph
Sampler advanced by pressure - pressur , monual - Pm

SOIL DESCRIPTION

The terminology for the descriptions of the relative density of cohesionless soils and the consistency of cohesive soils is as follows:

Relative Density	Blows/ft.	Consistency	c, lbs/sq. ft.
Very Loose	0 to 4	Very Soft	Less than 250
Loose	4 to 10	Soft	250 to 500
Compact	10 to 30	Firm	500 to 1,000
Dense	30 to 50	Stiff	1,000 to 2,000
Very Dense	over 50	Very Stiff	2,000 to 4,000
		Hard	over 4,000


Organic material


Clay


Silt


Sand


Gravel

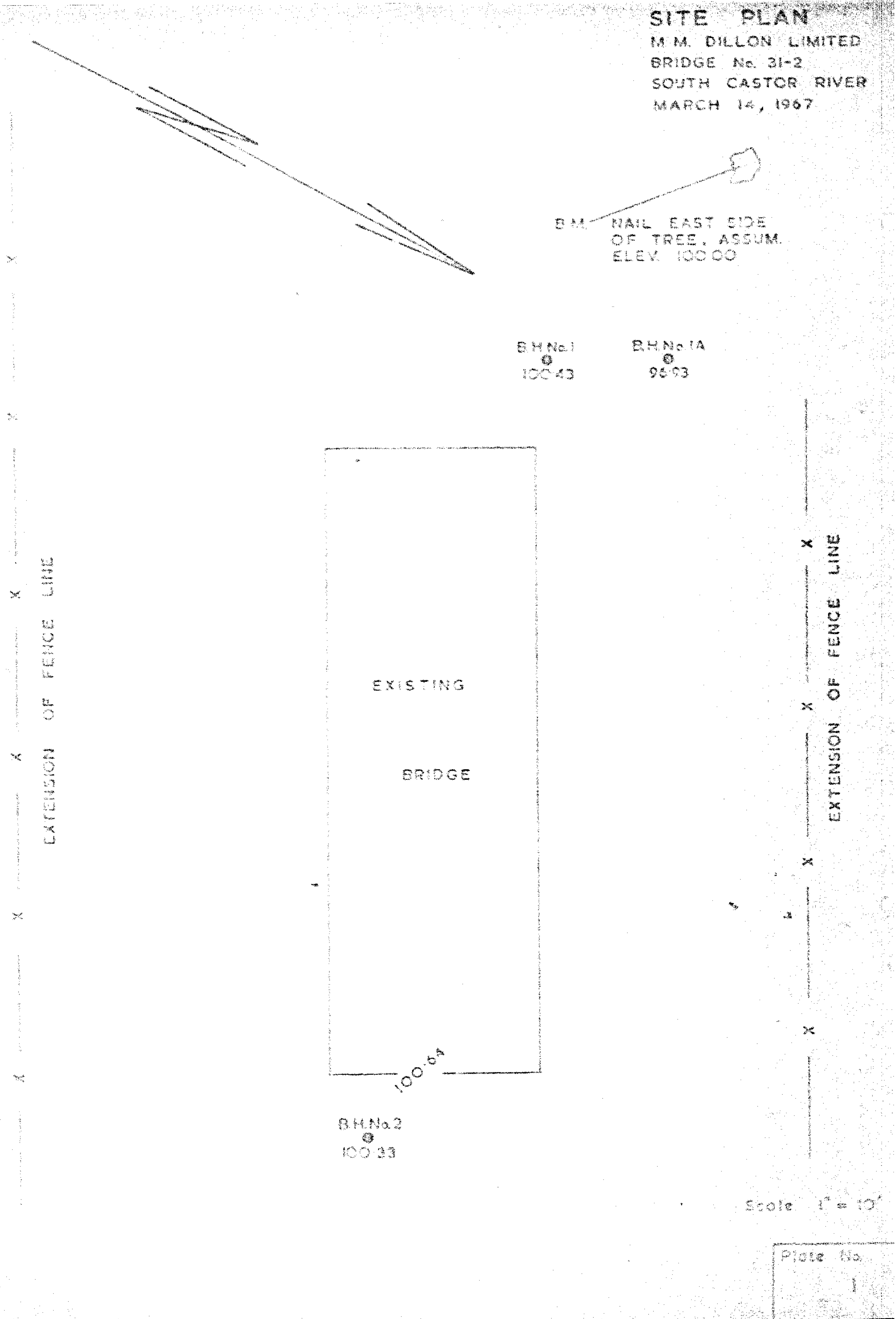

Bedrock

Trace	0 to 10%
Some	10 to 20%
Sandy, Silty, etc.	20 to 35%
And	35 to 50%

(+) or (-) sign indicates upper or lower limits within the range

SOIL TESTS & PROPERTIES

A.L. - Atterberg Limits	K - Coefficient of Permeability
C - Consolidation	MC - Moisture Content
S - Drained Triaxial	L L - Liquid Limit
V - Field Vane Test	P L - Plastic Limit
H. - Hydrometer Analysis	P I - Plastic Index
L P - Laboratory Permeability	U W - Unit Weight
F P - Field Permeability	Und. - Undisturbed Shear Strength tons/sq. ft.
Q - Undrained Triaxial	Rem - Remoulded Shear Strength tons/sq. ft.
U/C - Unconfined Compressive Strength ton/sq.ft.	Sen - Sensitivity und/rem
	G - Specific Gravity
	e - Void Ratio
	c - Undrained Shear Strength (1/2 Compressive Strength)


SITE PLAN
M.M. DILLON LIMITED
BRIDGE No. 31-2
SOUTH CASTOR RIVER
MARCH 14, 1967
B.M. NAIL EAST SIDE
OF TREE, ASSUM.
ELEV. 100.00
B.H.No.1
100.43
B.H.No.1A
96.93
EXTENSION OF FENCE LINE
EXISTING
BRIDGE
EXTENSION OF FENCE LINE
100.64
B.H.No.2
100.33
Scale 1" = 10'
Plate No.
1

BURNS, ROSS & ASSOCIATES, LTD.
CONSULTING CIVIL ENGINEERS — OTTAWA, ONTARIO

BOREHOLE NO. 1
DRILLING DATE March 3, 1967
TESTING DATE March 10, 1967

CLIENT M.M. Dillon Limited
LOCATION South Castor River

REMARKS

BOREHOLE ELEVATION 100.43

PENETRATION DATA	HAMMER	DROP
CASING		
CONE		
SAMPLER	140 lbs.	30 ins.

DEPTHS MEASURED FROM GROUND LEVEL

Depth	Blows/ft	Cone Penetration Blows/Foot	Description and Remarks	Sample Type	Sample Blows/ft	W.C.	L.L.	P.L.	P.I.	U/C	Vane T.S.	Vane S.S.	Vane Sens.	U.W.	Water Table Date	Water Table Tons
			Sand and gravel													
2'																
				SS	10											
			Stiff gray & brown clay, some silt.	T02						1.46					W.L.	0'2"
			Firm to stiff gray clay, some (+) silt, fissured.	T03						.99						
12' 6"																
			Firm gray clay, some silt, fissured	SS	2					.76						
17' 9"				T05						.82						
			Firm layers of gray & brown clay & silt gray layers 2" thick br. layers 1/2" to 1" thick.	T06						.72						
24' 0"				SS	10											
			Compact gray F. to C. sand and silt, some gravel, trace clay													
				SS	31											

Symbols

M.C. = Moisture content
L.L. = Liquid limit
P.L. = Plastic limit
P.I. = Plasticity index
U/C = Unconfined compressive strength tons sq/ft
U.W. = Unit weight
und. = Undisturbed shear strength Tons/sq ft
rem. = Remoulded " " "
sen. = Sensitivity = und / rem

F. = fine
C. = coarse

Plate No. 2

BUTTS, ROSS & ASSOCIATES * LTD.
CONSULTING CIVIL ENGINEERS — OTTAWA, ONTARIO

BOREHOLE ANALYSIS
BOREHOLE NO. 1
DRILLING DATE March 9, 1967
TESTING DATE

CLIENT M.M. Dillon Limited.
LOCATION South Castor River

REMARKS

BOREHOLE ELEVATION

PENETRATION DATA	HAMMER	DROP
CASING		
CONE		
SAMPLER		

DEPTHS MEASURED FROM GROUND LEVEL

Depth	Blows/ft	Case Penetration Blows/Foot	Description and Remarks	Sample Type No.	Sample Blows/ft	M.C.	L.L.	P.L.	P.I.	U.C.	Vane und.	Vane rem.	Vane sen.	U.W.	Water Table Date / Time
34'8"			Dense grey silty F. to C. sand & gravel trace (+) clay.												
			Refusal 34'8"												

Symbols

M.C. = Moisture content
L.L. = Liquid limit
P.L. = Plastic limit
P.I. = Plasticity index
U/C = Unconfined compressive strength tons sq/ft
U.W. = Unit weight
und. = Undisturbed shear strength Tons/sq ft
rem. = Remoulded " " "
sen. = Sensitivity - $\frac{\text{und}}{\text{rem}}$

F. = fine
C. = coarse

Plate No.

BUTTS, ROSS & ASSOCIATES LTD.
CONSULTING CIVIL ENGINEERS — OTTAWA, ONTARIO

BOREHOLE ANALYSIS
BOREHOLE NO. 2
DRILLING DATE March 9, 196
TESTING DATE March 10, 196

CLIENT M.M. Dillon Limited.
LOCATION South Castor River.

REMARKS

BOREHOLE ELEVATION 100.33

PENETRATION DATA	HAMMER	DROP
CASING		
CONE		"
SAMPLER	140 lbs	30 ins.

DEPTHS MEASURED FROM GROUND LEVEL

Depth	Casing	Core Penetration Blows/Foot	Description and Remarks	Sample No.	Sample Blows/ft	W.C.	L.L.	P.L.	P.I.	U.C.	Vane sat.	Vane rem.	Vane sen.	U.W.	Water Table Date / Time
			Sand and gravel occasional boulders												
4'			Stiff grey brown clay, some(+) silt.	1S1	9										
				1D2											
9'			Stiff gray clay some silt.	1D3						1.74					
14'			Firm to soft gray clay, some silt.	1D4						.54					
										.54					
19'			Firm to soft layers of gray and brown silt and clay.	1D5						.51					
			Gray layers 1 1/2" to 2" thick, br. layers 1/2" to 1" thick.	1S6	27										
25'			Compact gray F. to C. sand and silt, some(+) gravel, trace clay.												
30'			Refusal 30'2"												

Symbols

W.C. = Moisture content
L.L. = Liquid limit
P.L. = Plastic limit
P.I. = Plasticity index
U/C = Unconfined compressive strength tons sq/ft
U.W. = Unit weight
und. = Undisturbed shear strength Tons/sq ft
rem. = Remoulded " " "
sen. = Sensitivity = und/rem

F. = fine
C. = coarse

Plate No. 4

BUTTS, ROSS & ASSOCIATES LTD.
CONSULTING CIVIL ENGINEERS — OTTAWA, ONTARIO

BOREHOLE ANALYSIS
BOREHOLE NO. 1A
DRILLING DATE Mar. 21/67
TESTING DATE

CLIENT M.M. DILLON LTD.
LOCATION South Castor River

REMARKS

BOREHOLE ELEVATION 96.93

PENETRATION DATA	HAMMER	DROP
CASING		
CONE		
SAMPLER		

DEPTHS MEASURED FROM GROUND LEVEL

Depth	Blows/ft	Cone Penetration Blows/Foot	Description and Remarks	Sample Type No.	Sample Blows/ft	MC	LL	PL	PI	UC	Vane Und	Vane rem	Vane sen.	UW		Water Table Date & Time
			Firm to stiff clay													
15'6"			Clay and silt													
23'			Compact to dense glacial till													

Symbols

MC = Moisture content
LL = Liquid limit
PL = Plastic limit
PI = Plasticity index
U/C = Unconfined compressive strength tons sq/ft
UW = Unit weight
Und = Undisturbed shear strength Tons/sq ft
rem = Remoulded " "
sen = Sensitivity = $\frac{\text{Und}}{\text{rem}}$

Plate No. 5

BUTTS, ROSS & ASSOCIATES LTD.
CONSULTING CIVIL ENGINEERS — OTTAWA, ONTARIO

BOREHOLE ANALYSIS
BOREHOLE NO. 1A
DRILLING DATE Mar. 22/6
TESTING DATE

CLIENT M.M. DILLON LTD.
LOCATION South Castor River

REMARKS

BOREHOLE ELEVATION

PENETRATION DATA	HAMMER	DROP
CASING		
CONE		
SAMPLER		

DEPTHS MEASURED FROM GROUND LEVEL

Depth	Blows/ft	Cone Penetration Blows/Foot	Description and Remarks	Sample Type No.	Sample Blows/ft	M.C.	L.L.	P.L.	P.I.	U.C.	Vane und.	Vane rem.	Vane sen.	U.W.		Water Tal Date & Time
34"			Very dense glacial till.													
42'3"			Cored 5'3" (42'3" to 47'6") Recovered 4'8" Red rock is limestone changing to shale at 43'3"													
47'6"																

Symbols

M.C. = Moisture content
L.L. = Liquid limit
P.L. = Plastic limit
P.I. = Plasticity index
U/C = Unconfined compressive strength tons sq/ft
U.W. = Unit weight
und. = Undisturbed shear strength Tons/sq ft
rem. = Remoulded " " "
sen. = Sensitivity - $\frac{\text{und}}{\text{rem}}$

Plate No. 6

E. O. BUTTS, D.L.C. HONS., P.ENG.
W. M. ROSS, B.SC., P.ENG.
R. H. MAGWOOD, B.SC., P.ENG.

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OTTAWA 5, CANADA
224-1414

MEMBER OF:
A.[illegible]
E.I.C.
A.S.T.M.
A.C.E.C.

8th June 1967.

M.M. Dillon Limited,
280 Metcalfe Street,
Ottawa, Ontario.

Attention: Mr. W. Irwin, ~~P.Eng~~.

Dear Sir,

Re: South Castor River Bridge.

This is to confirm our conversation today. If the foundations are set at about 15' below the present roadway (85'±) I would recommend that a design loading of not more than 1500 lbs/sq.ft. be allowed in footing design.

Yours truly,

E.O. Butts, P.Eng.,
Butts, Ross & Magwood Ltd.

EOB/gef.