

N.P. 58 - 58

HWY. 401

BRIDGE #3

CRAMAHE TWP.

31C-52

PRESIDENT
J. OWEN LAKE, P. ENG.
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UNIVERSAL
GEOTECHNIQUE
LIMITED



2924 BLOOR STREET WEST • TORONTO 18, ONTARIO, CANADA

24th April, 1958.

Ontario Department of Highways,
280 Davenport Road,
Toronto, Ontario.

Attention: Mr. J. C. McAllister

BRIDGE N°3 - CRAMAHE TOWNSHIP

Highway 401, District N° 7

W.P. 58-58

Gentlemen:

Four copies of our Report on the soil investigation carried out at the above-mentioned site are forwarded herewith and we trust that if we can be of further service you will not hesitate to inform us.

Yours truly,
Universal GEOTECHNIQUE Limited,

L. Baskin.

lb/sg
Encls.

BA 729



58-F-215C

REPORT

on

SUBSURFACE EXPLORATION

for

PROPOSED BRIDGE N° 3

TOWNSHIP OF CRAMAHE

COUNTY OF NORTHUMBERLAND

ONTARIO

2924 Bloor Street West,
Toronto 18, Ontario.

REPORT

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PROPOSED BRIDGE N° 3

TOWNSHIP OF CRAMAHE

COUNTY OF NORTHUMBERLAND

ONTARIO

INTRODUCTION

The Department of Highways of the Province of Ontario are planning a proposed bridge in connection with Highway N° 401 approximately 1-1/2 miles to the North of Colborne.

To determine the subsurface conditions for purposes of engineering design the DHO authorized Universal GEOTECHNIQUE Limited to proceed with subsurface exploration of the proposed site and this Report contains the results of the investigation.

AVAILABLE INFORMATION

DHO plan E-3376-1 indicated tentatively chosen locations for four exploratory boreholes.

THE SITE

The site of the proposed crossing is at the road allowance between lots 28 and 29 and the proposed King's Highway N° 401 on concession 3 in the Township of Cramahe.

SUBSURFACE EXPLORATION

Subsurface exploration was carried out during the period 24th to the 29th of March, 1958, and comprised a total of four exploratory boreholes located in positions as shown on the plan accompanying this Report. The proposed locations of the boreholes were staked and the ground surface elevations for the boreholes obtained by a DHO Survey Crew.

Soil samples were obtained generally at intervals of about 5 feet but where noticeable changes of strata occurred the depths of such changes were recorded and where necessary additional samples were obtained.

The state of compaction of essentially cohesionless soil and the consistency of cohesive soil were determined by the standard penetration test taken during the operation of soil sampling. (The standard penetration test, as referred to in this Report, involves the recording of the number of blows (N) of a 140 lb. hammer falling 30 inches that are required to drive a 2 inch diameter split barrel sampler 1 foot into the soil at the bottom of the borehole).

Visual examination and classification of all samples was carried out in the laboratory and the descriptions of the soil obtained from such examination together with the results of the standard penetration tests are given on the borehole logs which, together with a location plan and borehole section A-A', form part of this Report.

Subsurface conditions given in this Report are those indicated by material encountered in the boreholes. The accuracy of extrapolation to obtain the soil profile should be associated directly with the geological conditions and inversely with the spacing of the boreholes.

GEOLOGICAL FEATURES

The site is situated within the Lake Iroquois Sand Plain and some distance South of a shorecliff. Throughout the County drumlins exist which have been modified by wave action during the Lake Iroquois period but the terrain at the bridge site is not in the immediate vicinity of these drumlins.

From the information derived from the boreholes the strata down to the explored depth can be classified as follows:

(a) SANDS

The site is covered by generally fine to medium sand which exhibits iron staining and varies from a loose to dense state of compaction. It is of lacustrine origin and is the product of deposition in rather shallow water.

(b) SILTS, CLAYEY SILTS & SILTY CLAYS

These deposits are also of lacustrine origin but were deposited in deeper water and are probably contemporaneous with the drumlin erosion that occurred in front of the shorecliffs and beaches of Lake Iroquois.

(c) SANDY TILL

The site is underlain by a brownish-grey till predominantly of sand and gravel.

During the period of exploration surface water from melting snow covered the site but no definite water table could be established within the depth of exploration.

LABORATORY TESTS

A few tests for correlation purposes were carried out on certain samples and the results are as follows:

Borehole N°	Sample N°	Depth Below Ground Surface	Natural Moisture Content %	Unconfined Compression Strength lbs./sq.ft.
BH.2	3	7' to 8'	14.2 14.3	
	4	9' to 10'	15.2 14.2	8,700
	5	11' to 12'	16.5 19.0	7,400

DISCUSSION

The results of the subsurface exploration have disclosed lacustrine deposits overlying a sandy till.

It will be observed that the upper stratum of sand exists in a generally dense state below a depth of 5 feet except in the vicinity of borehole BH.1 where this deposit was loose throughout its full depth. It would, therefore, appear that spread footings could be founded in the vicinity of boreholes BH.1 and 2 at an elevation of 548 and in the vicinity of boreholes BH.3 and 4 at an elevation of 552 and designed for a bearing pressure of 3 tons/sq.ft. This assumes that the finished construction will allow such footings to be at a minimum depth of 5 feet below grade. If, however, for practical reasons the design requires the footings to be at a slightly lower elevation the above-mentioned design figure for bearing capacity would still be applicable.

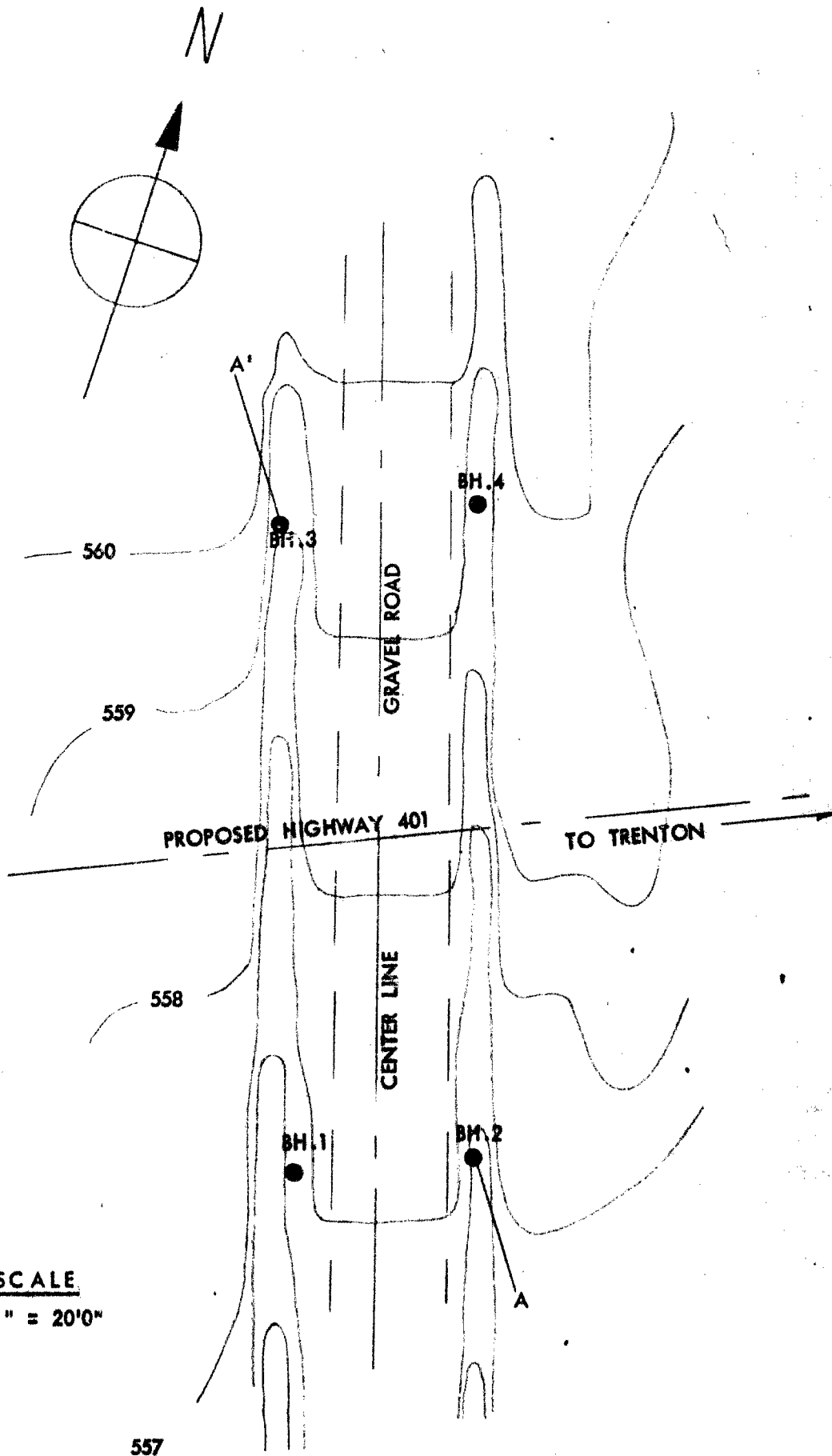
CONCLUSIONS

From the aforementioned discussion the soil conditions at the site are quite suitable for the support of the bridge on spread footings and no difficulties of construction need be anticipated. Care should, however, be taken to avoid softening, during excavation, of the silts and silty clays if the spread footings are founded directly on such material. In their undisturbed state these silts and silty clays have a low natural moisture content.

Universal GEOTECHNIQUE Limited,



L. Baskin, P.Eng.
Engineering Geologist.



This sketch is reproduced from information given on D.H.O. plan E-3376-1 dated January, 1958.

PROJECT Bridge No. 3, Cranbury Twp., Hwy. 401
District No. 7 W.P. 58-58
 TITLE Borehole Location Plan
 DRG. NO. 1 ORDER NO. T. 301/58

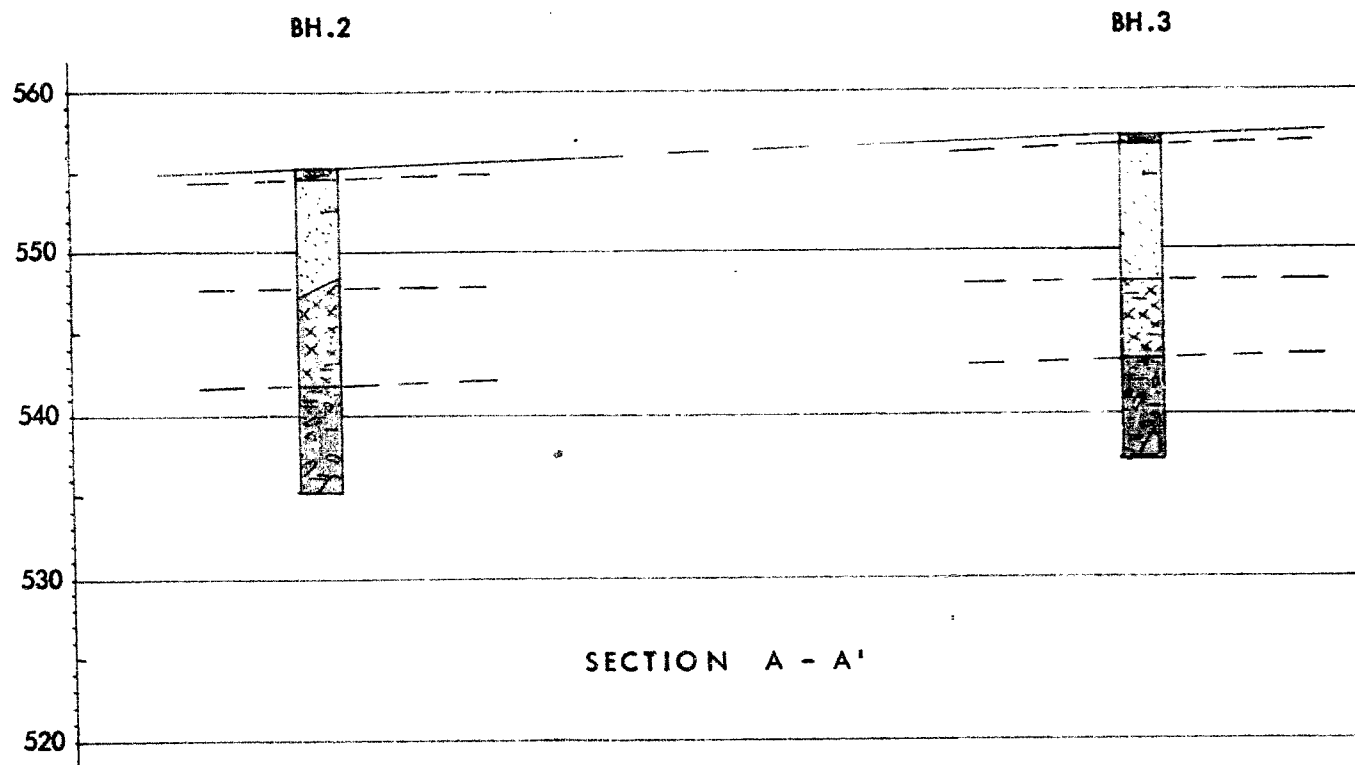


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PROJECT Bridge No. 3, Camanche Jct., Hwy. 401
 TITLE Borehole Section
 DISTRICT NO. W.P. 58-58
 DRG. NO. 2 ORDER NO. T. 301/58



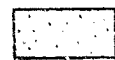
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LEGEND



TOP SOIL



SAND



SILTS, CLAYEY SILTS, SILTY CLAYS



SANDY TILL

SCALE

Horizontal - 1" = 20'0"

Vertical - 1" = 10'0"

SOIL MECHANICS LABORATORY

BOREHOLE LOGPROJECT Bridge No. 3 Cramah Twp., Hwy. 401, District No. 7 ORDER NO. T. 301/58
W.P. 58-58CLIENT Department of Highways, Ontario.BOREHOLE NO. BH. 1 DIAMETER 2-1/2" CASING 2-1/2"BOREHOLE LOCATION See plan INCLINATION Vertical BEARING ---

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAMPLE	DEPTH	THICKNESS	N	REMARKS
Top Soil.	+ 556.0			Zero			
Loose brown generally fine to medium iron stained SAND. Some gravel. Traces of organic matter.		● 1		0'6"		5	Damp. Low dry strength.
Loose brown generally fine to medium SAND. Slight iron staining.		● 2				4	Wet. Low dry strength.
Dense brown sandy clayey SILT with occasional fine subangular gravel.		● 3		7'3"		43	Damp. Medium to high dry strength.
Very dense brownish grey somewhat clayey SAND with fine to medium subangular gravel.		● 4				89	Damp. Medium to high dry strength.
do		● 5				85(6")	do
do		● 6				103	do
Gravel fine to large.				25'0"			
				End of Borehole			

SCALE: 1" = 5'0" ● DISTURBED SAMPLE

■ UNDISTURBED SAMPLE

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Bridge No. 3 Cramohe Twp., Hwy. 401, District No. 7 ORDER NO. T. 301/58
 CLIENT Department of Highways, Ontario. W.P. 58-58

BOREHOLE NO. BH. 2 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See plan INCLINATION Vertical BEARING ---

FORM G-1A 500
 UNITED STATES OF AMERICA

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAMPLE	DEPTH	THICKNESS	N	REMARKS
Top Soil.	555.4			Zero			
Loose brown generally fine to medium SAND, iron stained. Some organic matter.			• 1	0'6"		5	Damp. Low dry strength.
Firm to dense brown fine silty SAND.			• 2			30	do
do			• 3			37	Damp. Low to medium dry strength.
Dense brown somewhat sandy SILT.			• 4			52	do
do			• 5			50	Damp. Medium dry strength.
Dense brown slightly clayey SILT with occasional fine gravel.			• 6	13'6"		53(9")	Damp. Medium to high dry strength.
Dense brownish grey clayey, SAND with fine to medium subangular gravel.			• 7			68	Damp. Medium dry strength.
Dense brownish grey somewhat clayey SAND with fine to large subangular gravel.			• 8	20'0"		85	do
do							
				End of Borehole			

SCALE: 1" = 5'0" * DISTURBED SAMPLE

■ UNDISTURBED SAMPLE

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Bridge No. 3 Cramahe Twp., Hwy. 401, District No. 7 ORDER NO T. 301/58
W.P. 58-58

CLIENT Department of Highways, Ontario.

BOREHOLE NO BH. 3 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See plan INCLINATION Vertical BEARING ---

DESCRIPTION OF STRATA	ELEVATION	DEPTH	DEPTH	DEPTH	DEPTH	REMARKS
Top Soil.	557.1	Zero	0'6"			
Loose brown fine to medium iron stained SAND with traces of organic matter.		• 1			6	Damp. Low dry strength.
Dense brown fine to medium somewhat iron stained SAND.		• 2			33	do
Dense brown somewhat clayey sandy SILT with pockets of coarse sand and fine gravel.		• 3	9'0"		53	Damp. Medium to high dry strength.
Very dense brownish grey clayey SAND with fine to medium subangular gravel.		• 4	13'9"		57(6')	do
do Gravel fine to large.		• 5	20'0"		81	do
End of Borehole						

SCALE: 1" = 5'0" • DISTURBED SAMPLE

■ UNDISTURBED SAMPLE

SOIL MECHANICS LABORATORY

BOREHOLE LOGPROJECT Bridge No. 3, Cramahe Twp., Hwy. 401, District No. 7 ORDER NO. I. 301/58
W.P. 58-58CLIENT Department of Highways, Ontario.BOREHOLE NO. BH. 4 DIAMETER 2-1/2" CASING 2-1/2"BOREHOLE LOCATION See plan INCLINATION Vertical BEARING ---

DESCRIPTION OF STRATA	ELEVATION	DEPTH	THICKNESS	N	REMARKS
Top Soil.	558.0	Zero			
Loose brown fine to coarse SAND with some gravel and traces of organic matter. Iron stained.		0'6"		8	Damp. Low dry strength.
Dense brown fine to coarse SAND.				32	do
Hard brownish grey sandy silty CLAY with fine to medium subangular gravel.		9'3"		49	Damp. High dry strength.
Dense brownish grey clayey SAND with fine to large subangular gravel.		14'0" 14'6"		48(6")	Damp. Medium to high dry strength.
		End of Borehole			Refusal conditions presumed boulder.

SCALE: 1" = 5'0" • DISTURBED SAMPLE

■ UNDISTURBED SAMPLE