

55-F-223C

Hwy. 401

Inoquois, Morrisburg,

Cornwall

UNIVERSAL
GEOTECHNIQUE

LIMITED



55-F223 C

REPORT

on

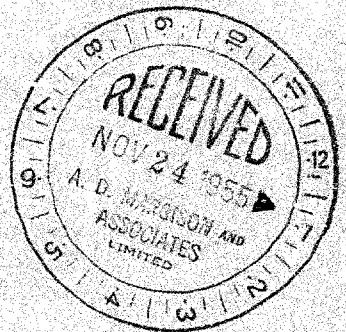
SUBSURFACE EXPLORATION

for

BRIDGE SITES ON THE HIGHWAY 401

Iroquois, Morrisburg, Cornwall

Ontario



2924 Bloor Street West,
Toronto 18, Ontario.

Report
on
Subsurface Exploration
for
Bridge Sites on the Highway 401
Iroquois, Morrisburg, Cornwall
Ontario

Introduction

The proposed route of Highway 401 between Iroquois, Morrisburg and Cornwall intersects various secondary roads, and bridges are being planned for these intersections. Our Report No.T.125/55 gave the results of subsurface exploration carried out in August of 1955 at three of the proposed bridge sites. This report gives details of rather subsurface exploration at Sites Nos. 3 to 12 inclusive.

The work was performed in accordance with instructions received from A. D. Margison & Associates Ltd. of Toronto, acting on behalf of the Department of Highways, Province of Ontario, and liaison was maintained throughout the progress of the work with Mr. P. H. Davies, Resident Engineer.

The Sites

The sites are located to the Northwest of Highway No.2, certain locations being on the existing County Roads, whilst others are in fields either adjacent or at some distance from the highways.

Access to Site No.5 was particularly difficult, due to its distance from the highway and the extremely soft nature of the surface soil, which precluded transportation of the equipment by truck; to expedite removal of the drill and equipment from this site, it was necessary to use a team of horses. On other sites it was necessary to cut access to the borehole locations through undergrowth and brushwood.

Water supply for drilling and boring operations was generally obtained by carting from creeks in the surrounding district.

Subsurface Exploration

The subsurface exploration described in this report was carried out between the 2nd of October and 15th November, 1955, by means of exploratory boreholes located in the positions shown on the plans accompanying this report.

-2-

The depth to which boreholes were taken was decided by the Resident Engineer as the progress of boring continued.

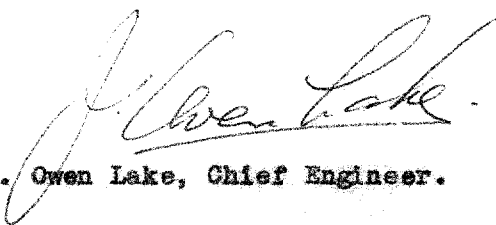
Exploration commenced at Site No.3, where previously only Boreholes 1 and 2 had been completed. Thereafter, exploration at Sites Nos.4 to 12 inclusive was carried out in numerical order.

Soil samples were obtained at approximately every five feet of depth and where noticeable changes of strata occurred, and state of compaction and consistency was determined by the standard penetration test. (The standard penetration test, as referred to in this report, involves the recording of the number of blows of a 140-lb. hammer, falling 30 inches that are required to drive a 2" diameter, split-barrel sampler one foot into the soil at the bottom of the borehole, after an initial penetration of six inches has been obtained).

Typical glacial deposits were encountered at all sites and full details of the various strata encountered during the boring operations are given on the borehole logs forming part of this report.

Rock was encountered in Boreholes Nos.1 and 4 on Site No.10, at approximately 29 feet below ground surface and four-foot rock cores were obtained from each of these boreholes.

Universal GEOTECHNIQUE Limited,



JOL/ms

J. Owen Lake, Chief Engineer.

Report No. T.129/55

19 November, 1955.

SITE No. 3 (402 + 75)

County Road.

BH.1 BH.2

25' 25'

North
lane

100'
Mall

Centre line of
New Highway 401.

South
lane

109'

109'

BH.3

BH.4

Scale 1" to 50'

Proposed location of boreholes shown thus ○

Actual location of boreholes shown thus o

PROJECT Highway 401 - Morrisburg.

TITLE Borehole location plan.

Dwg. No. 1..... T129/55

DRG. NO. 3..... ORDER NO. T125/55



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SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 -- Morrisburg ORDER NO T129/55
 CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates, Ltd.)
 BOREHOLE NO BH.3 (402+75) DIAMETER 2 1/2" CASING 2 1/2"
 BOREHOLE LOCATION See Loc. Plan INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	ELEVATION	TESTING SAMPLE	DEPTH	TEST	REMARKS
			zero		Standard Penetration Test
Firm, partly decayed vegetation and loam	III VII	• 1	2'-6"	21	
Loose to firm, reddish-brown fine SAND	III VII	• 2	2'-6"	12	
Firm brown & grey silty fine SAND with fine and coarse gravel	X X	• 3	5'-0" 6'-0"	19	Groundwater Table
Stiff grey slightly sandy SILT with a little coarse gravel	X X	• 4	5'-0"	35	(High figure, due to gravel content)
Hard, dry, friable mixed grey and brown organic SILT and fine SAND with pockets of PEAT	X X	• 5	11'-0"	60	(6")
Firm, grey CLAY till with considerable coarse gravel	X X	• 6		61	(9")
Stiff grey CLAY till	X X	• 7		34	
			28'-0"	38	End of boring.

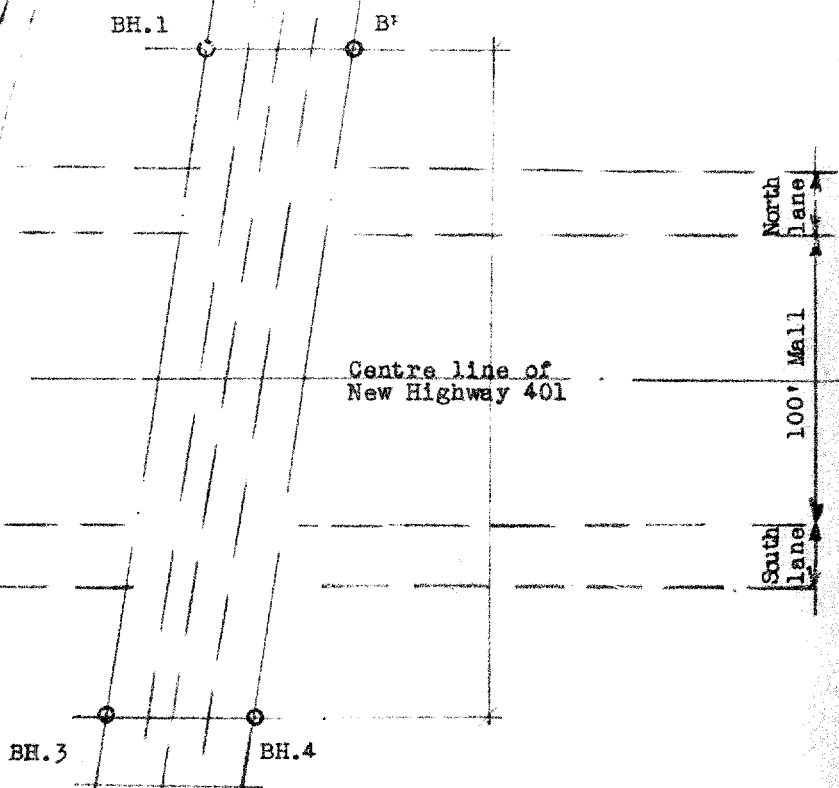
SOIL MECHANICS LABORATORY

BOREHOLE LOGPROJECT Highway 401 - Morrisburg ORDER NO T129/55CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)BOREHOLE NO BH.4 (402+75) DIAMETER 2½" CASING 2½"BOREHOLE LOCATION See loc. plan INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	ELEVATION	DEPTH	REMARKS
Soft, partly decayed vegetation and loam		zero	Standard Penetration Test
		1'-6"	14
Firm, light brown fine sand			16
Ditto			28
Very stiff, grey sandy CLAY till		6'-4"	62
Ditto			60
Firm, grey sandy CLAY till			58
Ditto			39
Firm to stiff grey CLAY till		26'-0"	35 End of boring.

SCALE = 1" to 5' • DISTURBED SAMPLE

■ UNDISTURBED SAMPLE



Williamsburg Top #2

Scale 1" to 50'

Location of boreholes shown thus

PROJECT Highway 401 - Morrisburg.

TITLE Borehole location plan.

DRG. NO. 2 ORDER NO. T129/55



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SOIL MECHANICS LABORATORY

BOREHOLE LOGPROJECT Highway 401 - MorrisburgORDER NO T129/55CLIENT Dept. of Highways, Ontario

(A. D. Margison & Associates Ltd.)

BOREHOLE NO BF.1 (94+65)DIAMETER 2 1/2"CASING 2 1/2"BOREHOLE LOCATION See loc. plan

INCLINATION

BEARING

DESCRIPTION OF STRATA	DEPTH (ft)	TEST	STANDARD PENETRATION TEST	REMARKS
			zero	
Soft, black PEAT	• 1	2'-3"	4	Ground-water Table
Firm grey organic silty CLAY	• 2	2'-3"	9	
		4'-6"		
Firm to stiff grey CLAY till	• 3		11	
Ditto	• 4		13	
Hard, grey CLAY till	• 5		30	
Stiff, grey CLAY till	• 6		23	
Firm, grey sandy CLAY till becoming softer with depth	• 7		18	
Soft to firm grey CLAY till	• 8		14	
Soft, grey sandy CLAY till	• 9		9	
Ditto	• 10		7	
Ditto	• 11	42'-0"	6	End of boring.

SCALE - 1" to 5' • DISTURBED SAMPLE

■ UNDISTURBED SAMPLE

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - Morrisburg ORDER NO T129/55CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)BOREHOLE NO BH.2 (94+65) DIAMETER 2 1/2" CASING 2 1/2"BOREHOLE LOCATION See loc. plan INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	ELEVATION	DEPTH	AMOUNT	TEST	REMARKS
		zero		Standard Penetration	
				Test	
Very soft, black PEAT		• 1	2'-6"	3	Ground-water Table
Soft, grey organic SILT		• 2		6	
Very stiff, dark grey, slightly organic CLAY till		• 3		29	
Soft ditto		• 4		13	
Very stiff to hard, grey CLAY till		• 5		33	
Very stiff, grey CLAY till		• 6		29	
Soft to grey CLAY till		• 7		9	
Firm, grey CLAY till		• 8		12	
Soft, grey CLAY till		• 9		5	
Ditto		• 10		9	
Ditto		• 11		8	
Ditto		• 12		10	
		50'-0"			

SCALE 1" to 5' • DISTURBED SAMPLE

■ UNDISTURBED SAMPLE

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - Morrisburg ORDER NO T129/55CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)BOREHOLE NO BH.2 (24+65) DIAMETER 2 1/2" CASING 2 1/2"

BOREHOLE LOCATION _____ INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	DEPTH (FEET)	REMARKS
Soft grey sandy CLAY till	12	
Soft to firm, sandy CLAY till	14	
Firm to stiff, grey CLAY till	18	
Ditto	21	
Stiff, grey CLAY till	29	End of boring.

SCALE - 1" to 5' • DISTURBED SAMPLE

■ UNDISTURBED SAMPLE

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SOIL MECHANICS LABORATORY

BOREHOLE LOGPROJECT Highway 401 - Morrisburg. ORDER NO. T129/55CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)BOREHOLE NO. BH.3 (94-65) DIAMETER 2½" CASING 2½"BOREHOLE LOCATION See loc. plan INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	ELEVATION	LOG	SAMPLE	DEPTH	PERCENTAGE	REMARKS
Very soft, partly decayed vegetation and peat		///	• 1	zero		Standard Penetration Test 2
Soft to firm grey varved CLAY with sand lenses		///	• 2	2'-0"		Ground Water Table
Very stiff grey CLAY till		///	• 3	4'-6"		6
Hard grey CLAY till		///	• 4			28
Stiff grey CLAY till; slightly organic		///	• 5			42
Soft grey CLAY till; slightly organic		///	• 6			24
Stiff grey CLAY till		///	• 7			10
Firm grey sandy CLAY till		///	• 8			18
Ditto		///	• 9			11
Soft to firm grey CLAY till		///	• 10			24
Ditto		///	• 11			11
Soft grey CLAY till		///	• 12			12
		///		50'-0"		14

SCALE = 1" to 5' • DISTURBED SAMPLE

• UNDISTURBED SAMPLE

FORM G-1-A (Rev. 6-54)
UNIVERSITY OF TORONTO

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - Morrisburg ORDER NO T129/55CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)BOREHOLE NO BH.3 (94+65) DIAMETER 2 1/2" CASING 2 1/2"

BOREHOLE LOCATION _____ INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	ELEVATION	DEPTH	DEPTH	DEPTH	REMARKS
Soft to firm grey CLAY till		50'-0"			
		•13			26
Soft grey CLAY till		•14			17
Soft grey CLAY till, with thin layers of gravel		•15			18
Firm grey CLAY till, with thin layers of gravel		•16			26
Firm grey sandy CLAY till with considerable gravel		•17	72'-0"		36 End of boring.

FORM 3-14, 600-4-54
(UNIVERSAL LTD.)

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - Morrisburg, ORDER NO. TL29/55CLIENT Dept. of Highways, Ontario (A. D. Lergison & Associates Ltd.)BOREHOLE NO. BL.4 (94+65) DIAMETER 2½" CASING 2½"

BOREHOLE LOCATION _____ INCLINATION _____ BEARING _____

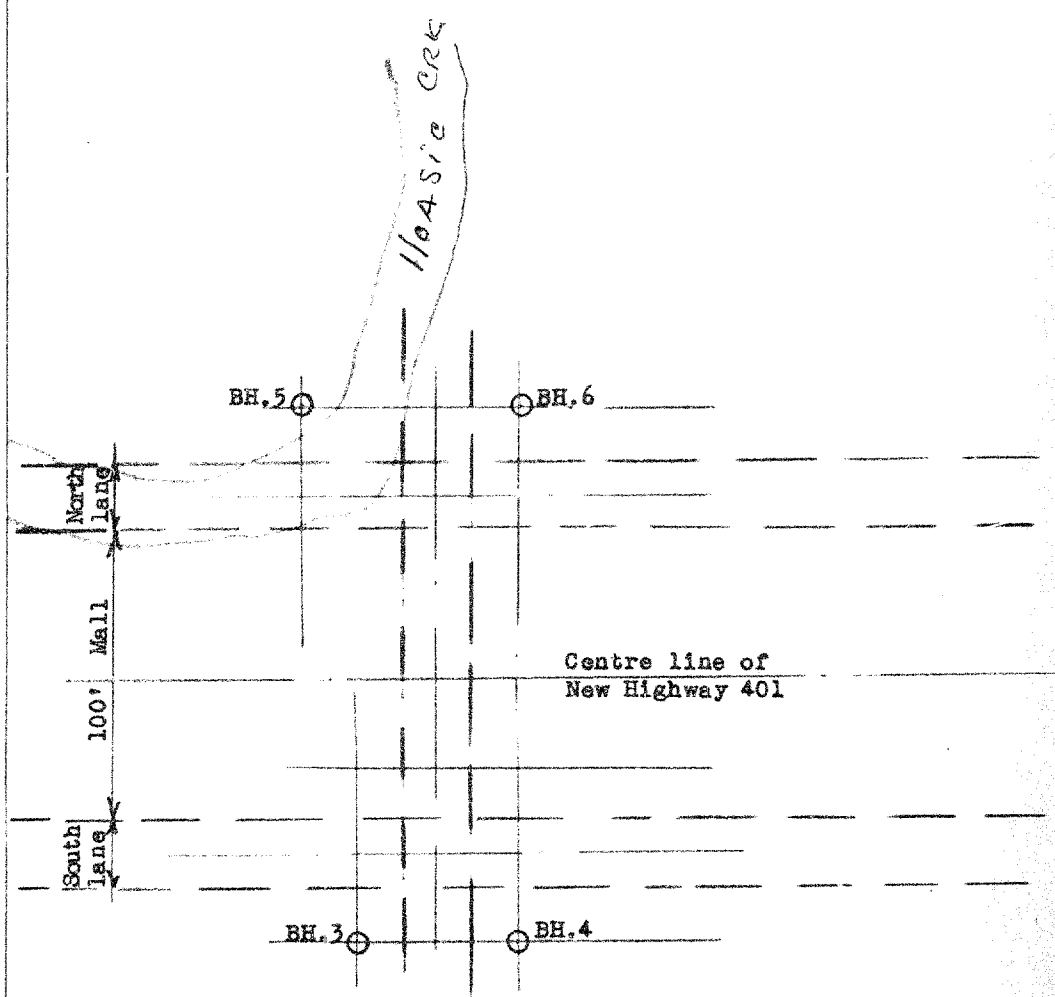
DESCRIPTION OF STRATA	ELEVATION	LOG	DEPTH	THICKNESS	REMARKS
Soft black partly decayed vegetation and loam		V/V	• 1	zero	Standard Penetration Test 3
		V/V		2'-3"	Ground-water Table
Firm grey-brown silty till		X/V	• 2		8
Very stiff, blue-grey CLAY till		—/—	• 3		26
Very stiff to hard blue-grey CLAY till, slightly organic		—/—	• 4		48
Firm to stiff blue-grey CLAY till		—/—	• 5		24
Soft grey CLAY till, slightly sandy		—/—	• 6		12
Soft to firm, grey CLAY till		—/—	• 7		21
Ditto		—/—	• 8		19
Ditto		—/—	• 9		18
Ditto		—/—	• 10		19
Ditto		—/—	• 11	42'-0"	16 End of boring.

SCALE - 1" to 5' • DISTURBED SAMPLE

■ UNDISTURBED SAMPLE

Site No.5 (189440)

*Williamsburg
#4.*



Scale - 1" to 50'

Location of boreholes shown thus ○

Williamsburg Top 3c #4

PROJECT Highway 401 - Morrisburg.
TITLE Borehole location plan.
DRG. NO. 3 ORDER NO. T.129/55



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BOREHOLE LOG

Williamsburg
#4PROJECT Highway 401 - Morrisburg.ORDER NO T129/55CLIENT Dept. of Highways, Ontario. (A.D. Margison & Associates Ltd.)BOREHOLE No BH. 3 (132+40)DIAMETER 2 1/2"CASING 2 1/2"BOREHOLE LOCATION See loc: plan.INCLINATION Vertical.

BEARING

DESCRIPTION OF STRATA	DEPTH (FEET)	DEPTH (METERS)	DEPTH (FEET)	DEPTH (METERS)	REMARKS
Soft dark brown topsoil.	0	0	zero.	1'-6"	Standard Penetration Test.
Very soft plastic grey CLAY.	1	0.3	1'-6"	3	Groundwater table; 23rd. Oct. 1955.
do. do.	2	0.6		5	
do. do.	3	0.9		4	
do. do.	4	1.2	11'-6"	6	
do. do.	5	1.5	13'-0"	4	
Soft grey sandy-TILL	6	1.8		7	
do. do.	7	2.1		12	
Soft to firm do. do.	8	2.4	24'-0"	14	Slight trace of artesian pressure at lower levels.
Soft to firm grey TILL	9	2.7		16	
do. do.	10	3.0		59	
Very stiff grey gravelly TILL.	11	3.3	37'-0"	60(8")	
Hard grey TILL.	12	3.6	41'-0"		End of Boring.

SCALE = 1" to 5' • DISTURBED SAMPLE

■ UNDISTURBED SAMPLE

SOIL MECHANICS LABORATORY

BOREHOLE LOG

Williamsburg
#4

PROJECT: Highway 401 - Morrisburg. ORDER NO. T129/55

CLIENT Dept. of Highways, Ontario. (A.D. Margison & Associates Ltd.)

BOREHOLE NO. BH.4 (189+40) DIAMETER 2 1/2" CASING 2 1/2"

BOREHOLE LOCATION See loc: plan. INCLINATION Vertical BEARING

DESCRIPTION OF STRATA	ELEVATION	DEPTH	DIAMETER	STANDARD PENETRATION	REMARKS
Soft organic topsoil & brown peat.		zero			
		2'-0"	5		Standard Penetration Test.
Loose grey fine SAND with thin layers of soft grey CLAY.		2'-0"	5		Groundwater table; at surface
Soft grey sandy CLAY		2'-8"	6		22nd.Oct.1955
		4'-8"	7		
Soft to firm grey sandy-CLAY changing to soft grey sandy TILL.			9		Boulder.
			7		
Soft grey sandy- TILL.			8		
do. do.			8		
		32'-4"			
do. do.			11		
Soft to firm grey sandy-TILL			14		
do. do.			18		
Very stiff gravelly TILL.		37'-0"	55		
do. do.		40'-0"	60(6")		
					End of Boring.

SCALE = 1" to 5' • DISTURBED SAMPLE

■ UNDISTURBED SAMPLE

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SOIL MECHANICS LABORATORY

BOREHOLE LOG*Williamsburg
#4*PROJECT Highway 401 - Morrisburg.ORDER NO T129/55CLIENT Dept. of Highways, Ontario. (A.D. Margison & Associates Ltd.)BOREHOLE NO BH.5(189+40)DIAMETER 2½"CASING 2½"BOREHOLE LOCATION See loc. plan.INCLINATION Vertical.

BEARING _____

FORM G-4 (506-614)
ENHANCED EDITION

DESCRIPTION OF STRATA	ELEVATION	DEPTH	THICKNESS	REMARKS
				Standard Penetration Test.
Soft brown LOAM - topsoil		• 1	zero	5
Soft grey SILT with a little fine sand.		• 2	2'-6"	7
		• 3	2'-1"	3
Soft grey plastic CLAY with thin silt layers, changing to soft grey sandy clay TILL.		• 4		7
		• 5		3
Soft grey sandy clay TILL.		• 6		6
Firm grey sandy clay TILL.		• 7		17
		• 8	29'-11"	11
Soft to firm grey sandy clay TILL with increasing gravel content.		• 9		11
do. do.		• 10	34'-6"	41
Firm to dense grey silty fine SAND.		• 11	36'-4"	60 (9")
Hard grey sandy TILL.			7'-8"	
			44'-0"	
Very dense dark grey fine SAND.		• 12		60 (6")
			50'-0"	

SCALE - 1" to 5' • DISTURBED SAMPLE

■ UNDISTURBED SAMPLE

UNIVERSAL

GEOTECHNIQUE

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SOIL MECHANICS LABORATORY

BOREHOLE LOG*Williamsburg #4*PROJECT Highway 401 - Morrisburg.ORDER NO. T129/55CLIENT Dept. of Highways, Ontario. (A.D. Margison & Associates Ltd.)BOREHOLE NO. BH.5 (189+40)DIAMETER 2 1/8"CASING 2 1/8"BOREHOLE LOCATION See loc. plan.INCLINATION Vertical.

BEARING _____

FORM G-1 (500-6-54)
UNIVERSITY OF TORONTO

DESCRIPTION OF STRATA	ELEVATION	DEPTH	THICKNESS	REMARKS
Dense grey silty fine SAND with traces of organic matter.		50'-0"		60 (8")
Dense dark grey to black medium SAND.				60
Dense black fine to medium SAND.				60 (11"↓)
do. do.		67'-0"		60 (Wash sample) End of Boring.

SOIL MECHANICS LABORATORY

BOREHOLE LOG

Williamsburg
#4

PROJECT Highway 401 - Morrisburg.

ORDER NO. T129/55

CLIENT Dept. of Highways, Ontario. (A.D. Margison & Associates Ltd.)

BOREHOLE NO BH. 6 (189+40)

DIAMETER 2½"

CASING 2½"

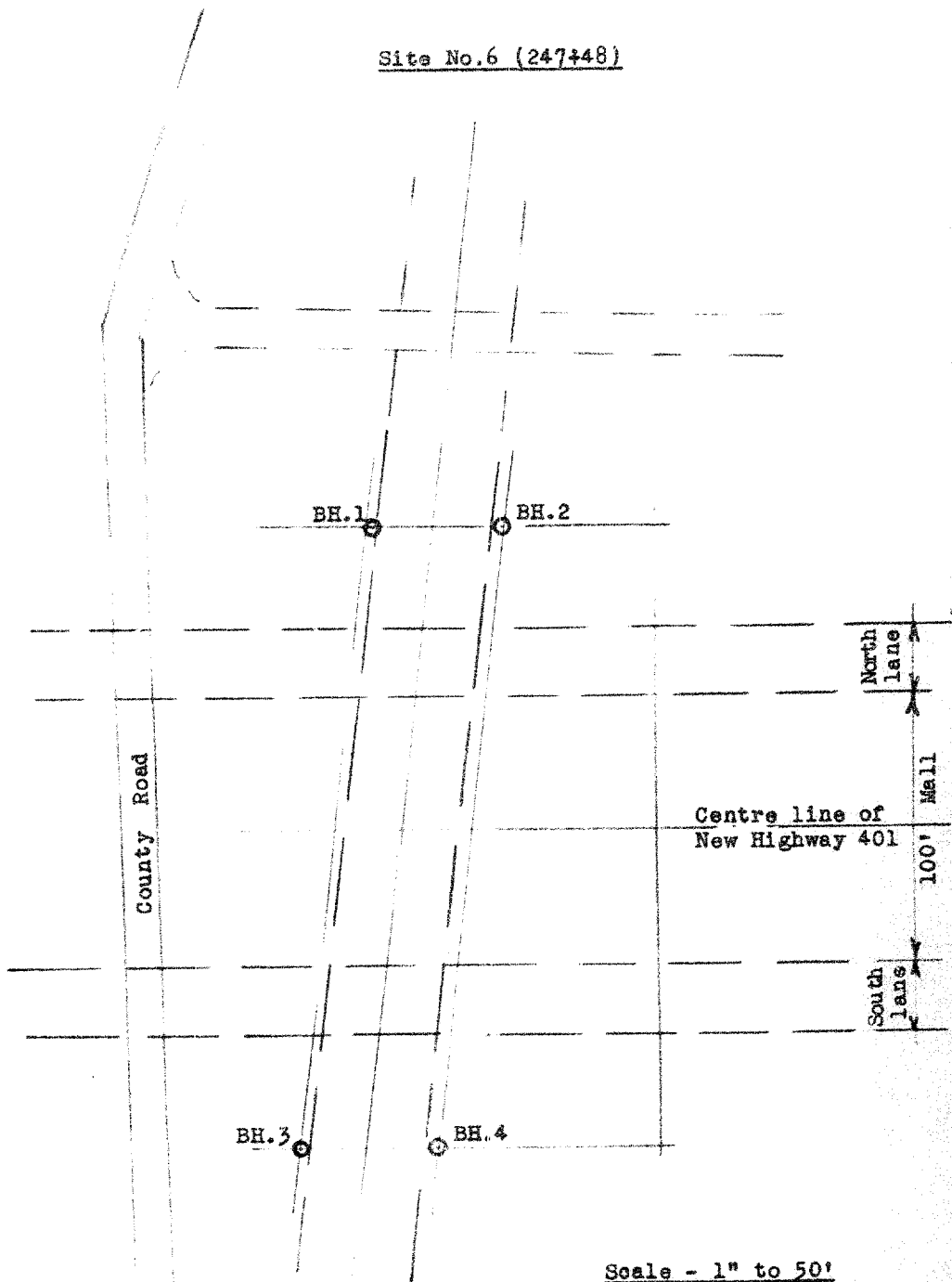
BOREHOLE LOCATION See loc: plan.

INCLINATION Vertical.

BEARING

DESCRIPTION OF STRATA	DEPTH (ft)	TIME (min)	SMALL (min)	DEVELOP (min)	REMARKS
				zero	Standard Penetration Test.
Soft dark brown LOAM.	• 1	X	X		6
		X	X	3'-6"	3'-6"
Soft grey plastic silty-CLAY changing to soft grey sandy CLAY TILL	• 2	X	X		5
		X	X		
Soft grey sandy-clay TILL.	• 3	X	X		4
		X	X		
Firm to stiff grey clay TILL	• 4	X	X		26
		X	X	22'-6"	
Soft to firm grey clay TILL.	• 5	X	X		19
		X	X		
Soft grey sandy clay TILL	• 6	X	X	26'-0"	11
		X	X		
do. do.	• 7	X	X	9'-0"	11
		X	X		
Firm grey very gravelly TILL with soft clay matrix.	• 8	X	X	35'-0"	41
	• 9	X	X		60(7")
Very dense grey silty fine to medium SAND.		X	X	38'-0"	
		X	X		End of boring.

Site No.6 (247+48)



Location of boreholes shown thus ○

PROJECT Highway 401 - Morrisburg.

TITLE Borehole location plan.

DRG. NO. 4 ORDER NO. T.129/55



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SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - Morrisburg ORDER NO. T129/55
 CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)
 BOREHOLE NO BH.1 and BH.2 DIAMETER 2½" CASING 2½"
 BOREHOLE LOCATION (247+48) INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	DEPTH (ft)	DEPTH (m)	TEST	REMARKS
BH.1				Standard Penetration Test
Dark brown topsoil	• 1	zero	11	
Firm, light brown TILL	• 2	1'-0"	21	
		3'-0"		
Hard, light brown sandy TILL	• 3		65	
	• 4		80	(3")
	• 5	5'-6"	85	(3") End boring.
BH.2				
Dark brown topsoil	• 1	zero	13	
Very stiff light brown TILL, becoming hard with considerable rock fragments	• 2	1'-0"	36	
	• 3		68	
Very dense dark brown silty SAND with broken rock, becoming very dense grey fine SAND with medium to coarse gravel	• 4	6'-0"	60	(4")
	• 5		49	(5")
	• 6	14'-6"	34	(6")
				Drilling between 6'-0" and 14'-0" End of boring.

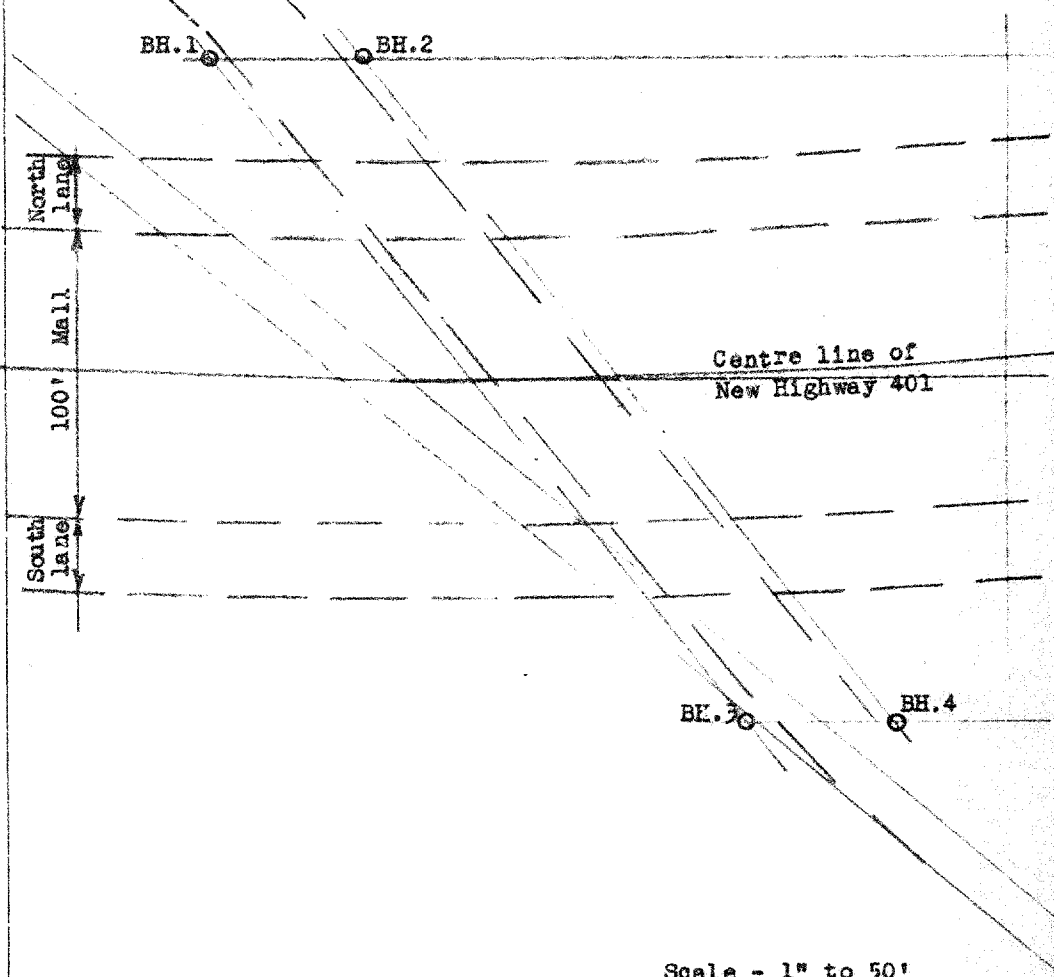
SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - Morrisburg ORDER NO. T129/55
 CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)
 BOREHOLE NO. BH.3 and BH.4 DIAMETER 2 1/2" CASING 2 1/2"
 BOREHOLE LOCATION (247+48) INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	ELEVATION	DEPTH	THICKNESS	REMARKS
BH.3 Dark brown organic topsoil		• 1 zero	2'-0"	Standard Penetration Test 7
Hard, light-grey silty TILL, Changing to soft to firm light brown silty TILL, with considerable rock fragments; changing to		• 2 • 3	48 60 (4")	Ground-water Table
dark brown, fine to medium silty SAND		• 4 14'-3"	30 (3")	End of boring.
BH.4 Dark brown, silty LOAM -- topsoil		• 1 zero	1'-9"	Ground-water Table
Firm light brown TILL, becoming hard		• 2 • 3	46 21 (3")	End of boring.

Site No.7 (447)



Location of boreholes shown thus ○

WILLIAMS BORG Twp #9.

PROJECT	Highway 401 - Morrisburg.
TITLE	Borehole location plan.
DRG. NO.	5
ORDER NO.	T.129/55



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SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - Morrisburg ORDER N. T129/55CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)BOREHOLE NO BH.1 and BH.2 DIAMETER 2½" CASING 2½"BOREHOLE LOCATION (447) INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	ELEVATION	ZONE	DEPTH	TEST	REMARKS
BH.1					Standard Penetration Test
Dark brown LOAM-topsoil		✓✓	• 1 zero	7	Ground-water Table
		✓			
		✓			
Firm, brown silty TILL, becoming hard		—	• 2 2'-6"	24	
		—	• 3	60	
		—			
Hard brown very sandy clay TILL, changing		—	• 4	37(3")	
		—			
to dense, dark brown clayey medium SAND with coarse gravel		—	• 5 14'-6"	34	End of boring
		—			
BH.2					
Dark brown LOAM		✓✓	• 1 zero	6	Ground-water Table
Firm to stiff brownish-grey CLAY with silt and fine SAND, becoming hard, grey silty clay TILL		—	• 2 1'-2"	27	
		—	• 3	29	
		—	• 4 5'-6"	41(4")	End boring

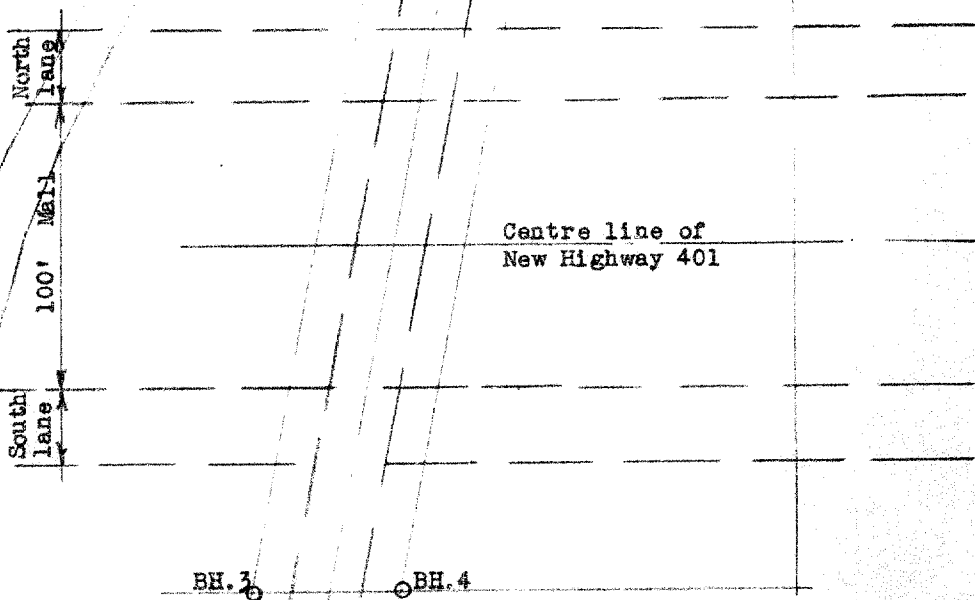
SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - Morrisburg ORDER NO. T129/55CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)BOREHOLE NO. BH.3 and BH.4 DIAMETER 2½" CASING 2½"BOREHOLE LOCATION (447) INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	ELEVATION	DEPTH	THICKNESS	REMARKS
BH.3				Standard Penetration Test
Dark Brown LOAM		• 1 zero	12	Ground-water Table
Soft, light brown silty sandy TILL, becoming firmer		• 2 1'-2"	29	
		• 3	60	
Stiff mixed grey and brown sandy TILL		• 4	36(6")	
Dense, light brown clayey sand & gravel		• 5 15'-0"	60	End of boring
BH.4				
Brown LOAM - topsoil		• 1 zero	13	Ground-water Table
Stiff, brown sandy TILL, changing to		• 2 1'-0"	31	
wet, grey-brown sandy TILL		• 3 6'-0"	60	End of boring

Site No.8 (51+15)



Scale - 1" to 50'

Location of boreholes shown thus O

PROJECT Highway 401 - Morrisburg

TITLE Borehole location plan

DRG No. 6 ORDER NO T.129/55



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SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - Morrisburg ORDER NO. T129/55CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates, Ltd.)BOREHOLE NO. BH.1 and BH.2 DIAMETER 2½" CASING 2½"BOREHOLE LOCATION (51+15) INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	ELEVATION	LOGGING	SAMPLE	DEPTH	THICKNESS	REMARKS
BH.1						Standard Penetration Test
Dark brown topsoil			• 1	zero		
				1'-0"		12
Light brown, silty Till,			• 2			38
becoming stiff			• 3	5'-0"		49(6")
						End of boring
BH.2						
Dark brown topsoil			• 1	zero		9
				1'-5"		36
Firm, light brown silty TILL,			• 2			
becoming hard			• 3			46(6")
Hard, light brown silty TILL, with considerable broken rock			• 4			41(6")
Ditto			• 5	15'-6"		39(6")
						End of boring

SOIL MECHANICS LABORATORY

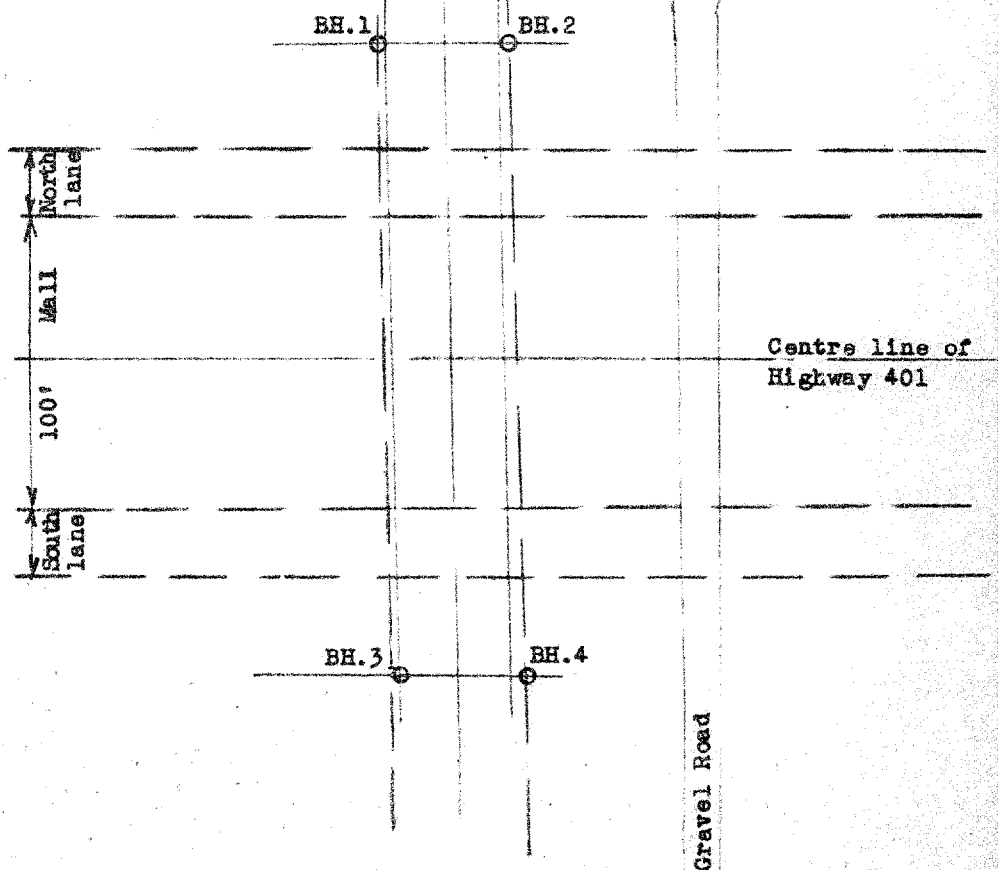
BOREHOLE LOG

PROJECT Highway 401 - Morrisburg ORDER NO T129/55CLIENT Dept. of Highways, Ontario (As D. Margison & Associates Ltd.)BOREHOLE NO BH.3 and BH.4 DIAMETER 2 1/2" CASING 2 1/2"BOREHOLE LOCATION (51+15) INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	LOCATION	DEPTH (FEET)	DEPTH (METERS)	REMARKS
BH.3				Standard Penetration Test
Dark brown topsoil	✓	• 1	zero	9
Firm, light brown silty clay TILL, becoming silty light brown TILL	X	• 2	1'-4"	49
	X	• 3		60(7")
	X			
Hard, light brown TILL	X	• 4		33(4")
	X			
Hard, light brown TILL with considerable rock fragments	X	• 5	15'-5"	31(5") End boring
BH.4				
Dark brown topsoil	✓	• 1	zero	11
Firm, light brown silty CLAY, becoming hard, grey-brown sandy TILL	X	• 2		31
	X	• 3	5'-0"	45(7") End boring

FORM G-1A (Rev. 8-64)
UNIVERSAL

Site No.9 (162+84)



Scale - 1" to 50'

Location of boreholes shown thus ○

PROJECT Highway 401 - Morrisburg

TITLE Borehole location plan

DRG. No. 7 ORDER NO. T.129/55



UNIVERSAL
GEOTECHNIQUE
LIMITED

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - MorrisburgORDER NO. T129/55CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)BOREHOLE NO. BH.1 and BH.2



DIAMETER _____

CASING _____

BOREHOLE LOCATION (162+84)

INCLINATION _____

BEARING _____

DESCRIPTION OF STRATA	ELEVATION	DEPTH	DIAMETER	REMARKS
<u>BH.1</u>				Standard Penetration Test
Dark brown topsoil		• 1 zero 1'-0"		36
Hard, light brown silty TILL		• 2		58
Ditto		• 3		65
		• 4 6'-0"		End of boring
<u>BH.2</u>				
Dark brown topsoil		• 1 zero 1'-0"	1'-0"	7
Firm, grey-brown TILL, becoming very stiff, light brown clay TILL		• 2		33
		• 3		60
Hard, light brown clay TILL		• 4		41(5")
Ditto		• 5 15'-3"		31(3") End of boring

SCALE - 1" to 5' • DISTURBED SAMPLE

■ UNDISTURBED SAMPLE

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - Morrisburg ORDER NO. T129/55

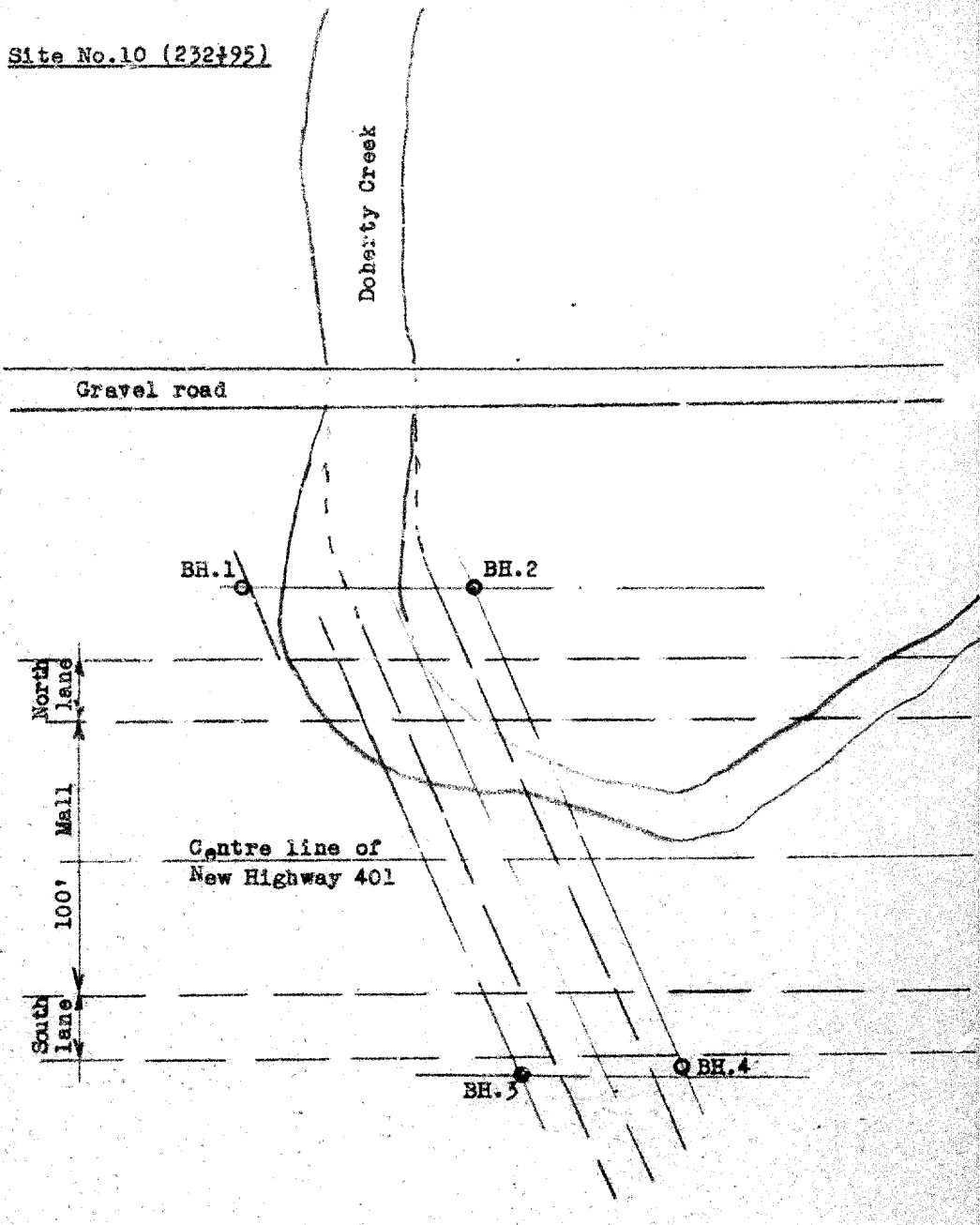
CLIENT Dept. of Highways, Ontario (A. D. Margison, & Associates Ltd.)

BOREHOLE NO BH.3 and BH.4 DIAMETER 2 1/2" CASING 2 1/2"

BOREHOLE LOCATION (162484) INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	TEST NO.	DEPTH (ft)	DEPTH (m)	TEST	REMARKS
<u>BH.3</u>					Standard Penetration Test
Dark brown topsoil	1	zero	1'-0"	6	
Soft to firm grey CLAY, changing to hard, light grey-brown TILL	2			31	Ground-water TABLE
	3			60	
Very stiff to hard, light brown silty TILL	4			36(5")	
Ditto	5	15'-8"		39(8")	End of boring
<u>BH.4</u>					
Dark brown topsoil	1	zero	1'-2"	8	
Stiff, light grey CLAY, changing to very stiff, light brown silty TILL	2			29	Ground-water Table
	3			65	
	4	6'-0"		50(6")	End boring

Site No.10 (232+95)



Scale - 1" to 50'

Location of boreholes shown thus ○

Doherty Cr. Hooper Cr.

O = NARRUCK Top #

SEE BA-978-A.

PROJECT Highway 401 - Morrisburg

TITLE Borehole location plan

DRG. NO. 8

ORDER NO. T.129/55



UNIVERSAL
GEOTECHNIQUE
LIMITED

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - Morrisburg ORDER NO. TL29/55
 CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)
 BOREHOLE NO. BH.1 DIAMETER 2½" CASING 2½"
 BOREHOLE LOCATION (232+95) INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	DEPTH (ft)	DEPTH (m)	TEST	REMARKS
Dark brown topsoil	• 1	zero	2'-0"	Standard Penetration Test 6
Clayey SAND with gravel	• 2	2'-0"	0'-7"	Ground-water Table
Firm, grey clay TILL	• 3			16
Firm to stiff, grey clay TILL	• 4			19
Soft, grey sandy clay TILL	• 5			14
Firm, grey sandy clay TILL with large pieces of broken rock	• 6			39
Soft to firm, grey sandy clay TILL	• 7	26'-0"		15
Soft grey plastic CLAY with a trace of sand		29'-0"		8
Rock core		33'-4"		Artesian pressure at this level, causing a free flow, rising 1 foot above ground surface

See BA 978A.


SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - MorrisburgORDER NO T129/55CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)BOREHOLE NO BH.2DIAMETER 2½"CASING 2½"BOREHOLE LOCATION (232+95)

INCLINATION

BEARING






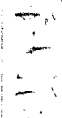

DESCRIPTION OF STRATA	DEPTH	DIAMETER	REMARKS
	zero		Standard Penetration Test
Brown topsoil	• 1	2'-0"	6  Ground-water Table
Firm, brown silty fine SAND	• 2	2'-2"	15
Firm, grey TILL	• 3	4'-2"	13
Ditto	• 4		15
Ditto	• 5		21
Soft grey silty sandy TILL	• 6		11
Ditto	• 7		10
Ditto	• 8		7
	29'-4"		Artesian pressure at 27'-6"
			Refusal condition

See BA 978 A.

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - Morrisburg ORDER NO. T129/55CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)BOREHOLE NO. BH.3 DIAMETER 2½" CASING 2½"BOREHOLE LOCATION (232+95) INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	ELEVATION	LOGGING	AMPL.	DEPTH	DIAMETER	REMARKS
				zero		Standard Penetration Test
Brown, silty topsoil			• 1	2'-6"	11	Ground-water Table
Hard, light brown clay TILL			• 2	2'-6"	34	
Ditto			• 3		45	
Soft, grey silty clay TILL			• 4	10'-6"	13	
Soft, grey sandy clay TILL			• 5		31	
Stiff, grey sandy clay TILL			• 6		18	
Soft, plastic grey CLAY			• 7	28'-6"	11	Artesian pressure at this level--- similar to BH.1. Refusal condition at 28'-6"

See BA 978 A.

SOIL MECHANICS LABORATORY

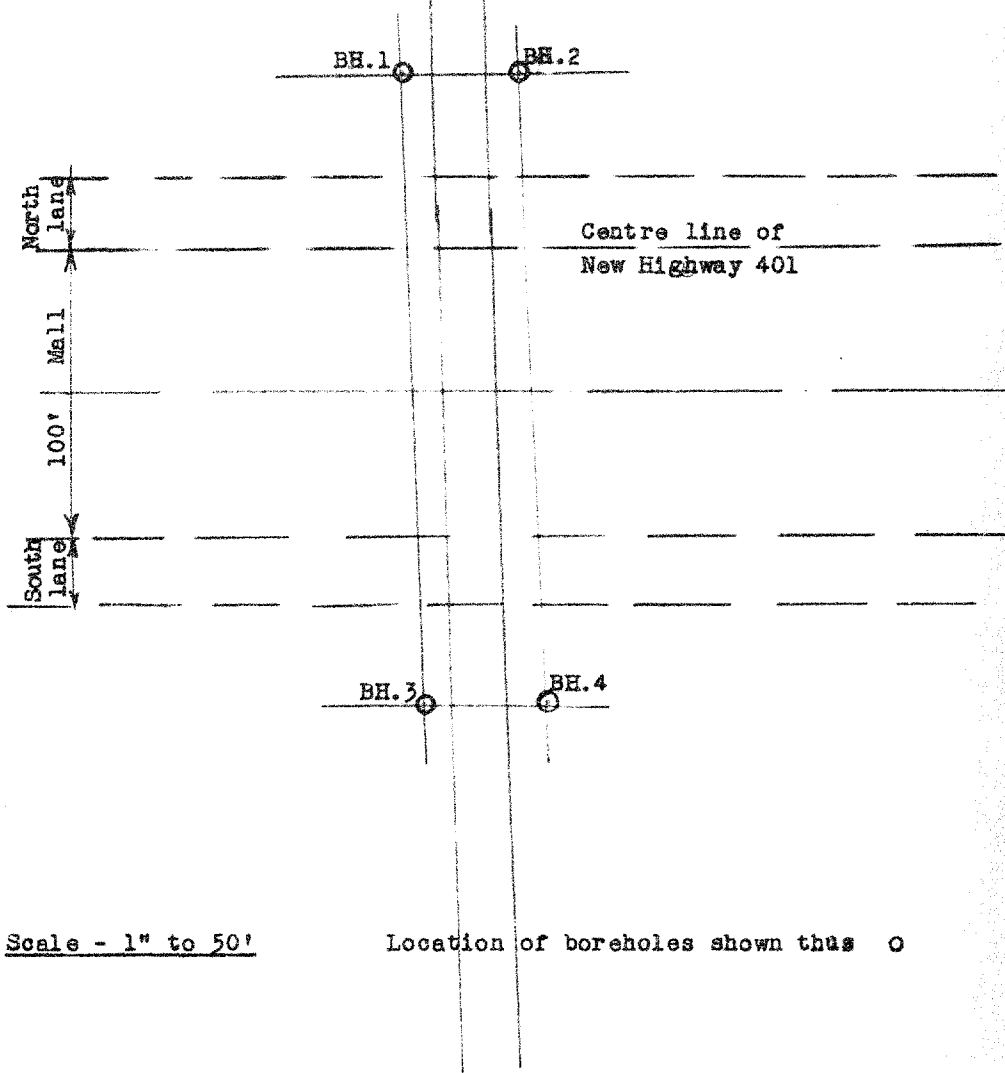
BOREHOLE LOG

PROJECT Highway 401 - Marrisburg ORDER NO T129/55CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)BOREHOLE NO BH.4 DIAMETER 2 1/2" CASING 2 1/2"BOREHOLE LOCATION (232+95) INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	ELEVATION	LOG	SAMPLE	DEPTH	THICKNESS	REMARKS
				zero		Standard Penetration Test
Brown clay LOAM		///	• 1	2'-0"	2'-0"	11
Hard, brown silty sandy TILL			• 2			36
Ditto			• 3			40(6")
Hard, brown silty sandy TILL - organic in parts			• 4			38(6")
				9'-0"		
Soft, grey sandy clay TILL			• 5			13
Ditto			• 6			9
Soft to very soft, grey silty TILL			• 7			11
Ditto			• 8			8
				29'-3"		
Rock core				33'-9"		

See BA 978A

Site No.11 (401+17.29)



PROJECT Highway 401 - Morrisburg
TITLE Borehole location plan
DRG. NO. 9 ORDER NO. T.129/55



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LIMITED

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - MorrisburgORDER NO T129/55CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)BOREHOLE NO BH.1DIAMETER 2 1/2"CASING 2 1/2"BOREHOLE LOCATION (401-17.29)

INCLINATION _____

BEARING _____

DESCRIPTION OF STRATA	ELEVATION	DEPTH	TESTS	REMARKS
Topsoil		• 1	zero	Standard Penetration Test
Firm, brown sandy TILL		• 2	1'-0"	24
Dense, brown sandy TILL		• 3		45
Dense, brown very sandy TILL becoming very dense		• 4		59
		• 5		65
			13'-0"	
Dense, grey sandy TILL		• 6		38
Firm to dense, grey sandy TILL		• 7	20'-0"	31
				End of boring

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - MorrisburgORDER NO. T129/55CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)BOREHOLE NO. BH.2DIAMETER 2 1/2"CASING 2 1/2"BOREHOLE LOCATION (401+17.29)

INCLINATION _____

BEARING _____

DESCRIPTION OF STRATA	DEPTH (FEET)	DEPTH (METERS)	DEPTH (FEET)	DEPTH (METERS)	REMARKS
					Standard Penetration Test
			zero		
Dark brown topsoil	1	0.3	2'-6"	0.8	Ground-water Table
Firm, light brown sandy CLAY, with pockets of brown fine sand & silt	2	0.6	2'-6"	0.8	
Hard, grey-brown silty clay TILL	3	0.9	11'-8"	3.6	
Hard, light brown sandy TILL with increasing rock fragments	4	1.2		3.7	
	5	1.5		4.6	
Stiff, grey sandy clay TILL	6	1.8	14'-2"	4.3	
	7	2.1		6.4	
Firm, grey sandy clay TILL	8	2.4		7.3	
Very stiff ditto	9	2.7	25'-0"	7.6	End of boring
Ditto					

SCALE 1" to 5' • DISTURBED SAMPLE

• UNDISTURBED SAMPLE

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - MorrisburgORDER NO T129/55CLIENT Dept. of Highways, Ontario

(A. D. Margison & Associates Ltd.)

BOREHOLE NO BH.3DIAMETER 2 1/2"CASING 2 1/2"BOREHOLE LOCATION (401+17.29)

INCLINATION _____

BEARING _____

DESCRIPTION OF STRATA	ELEVATION	LOG NO.	SAMPLE	DEPTH	THICKNESS	REMARKS
Standard Penetration						
Topsoil			• 1	zero	0'-4" Test	Ground-water Table
Firm, brown very sandy TILL, becoming dense			• 2	0-4"	26 55	
					10'-11"	
Dense, very sandy TILL			• 3		51	
			• 4		48	
Stiff, grey, very sandy TILL			• 5	11'-3"	29	
Stiff, grey sandy TILL			• 6		23	
Grey silty fine to medium SAND with a trace of coarse sand			• 7		32	
Very stiff, grey sandy TILL			• 8	25'-0"		End of boring

SCALE - 1" to 5' • DISTURBED SAMPLE

• UNDISTURBED SAMPLE

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - MorrisburgORDER NO. T129/55CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)BOREHOLE NO. BH.4DIAMETER 2½"CASING 2½"BOREHOLE LOCATION (401+17.29)

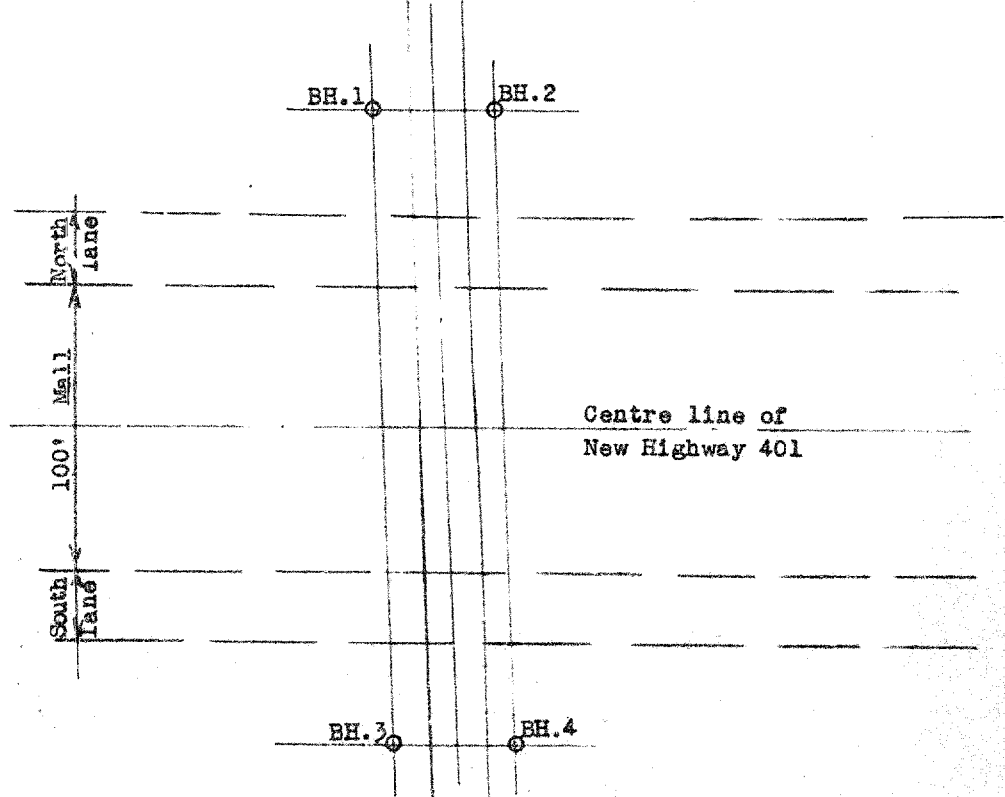
INCLINATION

BEARING

DESCRIPTION OF STRATA	DEPTH (FEET)	TIME (MIN)	WATER	TEMPERATURE (°F)	REMARKS
Dark brown, silty organic topsoil	• 1	zero	1'-0"	Test	Standard Penetration
Firm, fine brown sandy TILL	• 2	1'-0"		22	Ground-water Table
Hard, fine brown sandy TILL	• 3			51	
DITTO	• 4		14'-4"	65	
DITTO	• 5			64	
DITTO	• 6	15'-4"		60	
Stiff, grey sandy TILL	• 7			38	
Ditto	• 8	20'-0"		32	End of boring.

FORM G-3 505-54
LINDSAY, STUBBS & CO.

Site No.12 (101+95.00)



Scale - 1" to 50'

Location of boreholes shown thus ○

PROJECT Highway 401 - Morrisburg
TITLE Borehole location plan
DRG. No. 10 ORDER No. T.129/55



UNIVERSAL
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SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - Morrisburg ORDER NO. T129/55
 CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)
 BOREHOLE NO BH.1 DIAMETER 2 1/8" CASING 2 1/8"
 BOREHOLE LOCATION (101+95.00) INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	ELEVATION	LOGGING	SAMPLE	DEPTH	DEPTH IN FEET	REMARKS
						Standard Penetration
Brown peaty topsoil		W	• 1	zero	2'-0"	Test 3
		W		2'-0"		Ground-water Table
Firm, brown clayey fine to medium SAND, with gravel.		W	• 2		2'-0"	45
Stiff brown sandy TILL		W	• 3	4'-0"		43
		W			10'-6"	
Soft, grey-brown, very sandy TILL		W	• 4			42
		W		14'-6"		
Firm, fine silty SAND, with fine to medium gravel		X	• 5			41
		X				
Ditto		X	• 6			43
		X				
Firm, grey silty fine SAND, with fine gravel		X	• 7	26'-0"		47
						End of boring

FORM G.T.A. 500-6-54
 UNIVERSAL GEOTECHNIQUE LTD.

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - Morrisburg ORDER NO. T129/55
 CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)
 BOREHOLE NO. BH.2 DIAMETER 2 1/2" CASING 2 1/2"
 BOREHOLE LOCATION (107+95.00) INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	ELEVATION	LOG NO.	SAMPLE	DEPTH	THICKNESS	REMARKS
Standard Penetration Test						
Black, clayey PEAT		VII	• 1	zero	1'-6"	4
				1'-6"		
Firm, fine to coarse gravel with fine to coarse brown silty sand, changing to Firm, brown slightly sandy CLAY with gravel			• 2			45
			• 3			38
Stiff, dark grey, very sandy TILL			• 4	7'-2"		29
				10'-7"		
Firm, fine, grey silty SAND, with fine gravel			• 5			32
			• 6			45
Ditto						
			• 7			48
Firm to dense, grey silty SAND, with fine gravel & a trace of clay, changing to soft, grey clay TILL, with considerable gravel			• 8	25'-0"		60
						End of boring

FORM G-1A 500-G-84
(UNIVERSAL)

SCALE = 1" to 5' • DISTURBED SAMPLE

■ UNDISTURBED SAMPLE

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - Morrisburg ORDER NO. T129/55
 CLIENT Dept. of Highways, Ontario (A. D. Margison & Associates Ltd.)
 BOREHOLE NO. BH.3 DIAMETER 2 1/2" CASING 2 1/2"
 BOREHOLE LOCATION (101+95.00) INCLINATION _____ BEARING _____

DESCRIPTION OF STRATA	ELEVATION	LOG NO.	SAMPLE	DEPTH	THICKNESS	REMARKS
Black, clayey PEAT			• 1	zero	1'-8"	Standard Penetration Test
Very stiff, dark grey CLAY			• 2	1'-8"	31	Ground-water Table
Stiff, grey CLAY with some sand, changing to			• 3		11'-6"	29
Firm, clay TILL, with coarse gravel			• 4		13'-2"	33
Firm, fine grey silty SAND, with fine to medium gravel			• 5			44
Firm, fine grey silty SAND, with fine gravel			• 6			49
Dense, fine grey silty SAND, with fine to coarse gravel			• 7	26'-0"	52	End of boring

FORM G-1A 200-6-54
 LIMITED LIABILITY CO.

SOIL MECHANICS LABORATORY

BOREHOLE LOG

PROJECT Highway 401 - MorrisburgORDER NO. 7129/55CLIENT Dept. of Highways, Ontario

(A. D. Margison & Associates Ltd.)

BOREHOLE NO. BH.4DIAMETER 2 1/2"CASING 2 1/2"BOREHOLE LOCATION (101+95.00)

INCLINATION _____

BEARING _____

FORM G-1A 900-6-54
1-10-55 (REV.)

DESCRIPTION OF STRATA	ELEVATION	DEPTH	DIAMETER	REMARKS
Dark brown clayey PEAT		zero	1'-6"	Standard Penetration Test
Firm, dark brown peaty CLAY		1'-6"	2'-0"	21
		3'-6"		
Stiff, grey, very sandy TILL				29
Stiff, grey, sandy silty TILL, with medium gravel				31
Very stiff grey clay TILL				33
Stiff grey sandy TILL				42
Ditto				48
Stiff grey sandy TILL, with medium gravel, becoming very sandy with coarse gravel				46
				48
		25'-0"		End of boring

SCALE = 1" to 5' • DISTURBED SAMPLE

• UNDISTURBED SAMPLE