SIDNEY - KENNEBEC COUNTY

SOILS REPORT

I-95-6(14)

DRUMMOND ROAD STRUCTURE

58-14

Please Reply to:

Soils Laboratory
B1 Lord Hall
U of Maine
Orono, Maine

March 28, 1958

Mr. Vaughan H. Daggett
Chief Engineer
State Highway Commission
Augusta, Maine

Re: Augusta Interstate - Drummond Road Structure

Dear Mr. Daggett:

We are enclosing six (6) copies of the report entitled "Subsurface Investigation for Drummond Road Structure, Interstate Highway Project in Sidney, Maine," dated March 1958.

Very truly yours,

Frederick H. Boyce, Jr.
Soils Laboratory

FHBiac

Encl.

SUBSURFACE INVESTIGATION FOR DRUMMOND ROAD STRUCTURE INTERSTATE HIGHWAY PROJECT IN SIDNEY, MAINE

State Highway Commission

Soils Division

March 1958

INDEX

SUBSURFACE INVESTIGATION FOR
DRUMMOND ROAD STRUCTURE
INTERSTATE HIGHWAY PROJECT IN
SIDNEY, MAINE

INTRODUCTION

The subsurface investigation at the site of the proposed Drummond Road Structure for the Interstate Highway has been completed by means of seven (7) core borings and three (3) rod soundings. These borings were made during the last week of February, 1958. The location of these borings, together with the resulting soils profile is shown on Sheet No. 1. Transverse sections under each Abutment and Pier are shown on Sheet No. 2. The boring detail sheets for these seven (7) borings are shown on Sheets 5-8 inclusive.

GENERAL CONDITIONS

The ledge surface was found within five (5) feet at the surface of Abutment No. 1, and dips gradually to twenty-five (25) feet below the surface under Abutment No. 2. The overburden is divided into three (3) soils. The top and thickest layer is a weathered silty clay. Due to weathering (or drying out) the material is stiff and appears brownish gray in color. A layer of brown silty sand and gray stony silty sand complete the soils with the brown silty sand layer becoming thicker in the same direction as the ledge dips.

Because the weathered clay will consolidate slightly under additional loading, and also because of the proximity to a good ledge surface, it is recommended that the bridge structure be supported directly on ledge or at

the deeper location by end bearing piles.

DETAILED CONDITIONS

Western Approach.

The proposed fill section on the approach ramp at the western end of the Drummond Structure begins rising from the existing ground at Station 5 + 25 and rises to the top of Abutment No. 1 at Station 8 + 34.21. A maximum fill of seventeen (17) feet along centerline is proposed. Borings 6 and 7 at the site of the proposed embankment found the ledge surface five to six (5-6) feet below the ground surface with the overburden a firm brown silt. The silt is dry and should adequately support the proposed embankment. No shear or settlement difficulties are expected from the underlying soils. Due to the large height of fill, good compaction on the fill is a necessity to avoid the bump between the flexible fill and the rigid bridge abutment.

Abutment No. 1

Borings 6 and 7 (Detailed Sheet No. 8) and the transverse profile sheet No. 2 show the underlying soil conditions at Abutment No. 1. Since ledge is shallow at this point, it is believed the abutment can be supported directly on the ledge surface. If the structure is not placed directly on ledge surface, it is believed steel piles can be driven through the compacted fill to the ledge surface. Since frictional resistance will be high in driving piles through the fill, any reduction in height of the approach fill before the piles are placed would insure the ability to drive piles to the ledge surface. Jetting may be an assistance in driving the piles through the fill.

Piers 1 and 2.

Borings 1 and 2 (Detailed Sheets 5 and 6) were made at alternate ends of Piers 1 and 2. Since the ledge surface was found seven and one half (7½) and nine (9) feet below the surface, rod soundings were made at the remaining alternate ends to show the transverse profile of the ledge surface, as shown on Sheet 2. Since a footing should be placed five (5) feet below the existing ground surface in order to avoid frost action, and also since the footings are usually three (3) feet thick, this would place the bottom of the footing at, or near the ledge surface. It is recommended that these two piers be supported directly on bedrock. Excavation in these sections should encounter a weathered silt with the bottom two (2) feet granular. Since the ground water table follows the ledge surface in this section, and the silt is fairly impermeable, water seepage will cause minor difficulties, easily overcome by a standard water pump.

Pier No. 3.

Boring No. 3 (Detail Sheet No. 5) and a rod sounding were made at opposite ends of this pier location. The ledge surface, as noted on Sheet No. 2, was encountered almost fifteen (15) feet below the ground surface. The top eleven (11) feet of this overburden is a stiff weathered clay, which under a spread footing pressure of two tons per square foot (2.0 tons/sq. ft.), would consolidate almost two (2) inches. It is therefore recommended that this structure be supported by end bearing (steel or concrete) piles. Because of the normal fluctuation of the ground water table, wooden piles are not recommended.

Abutment No. 2.

Borings 4 and 5 (Detail Sheets 6 and 7) were made at opposite ends of the proposed location of Abutment No. 2. As can be seen from the transverse

profile (Sheet 2), the ledge surface was found twenty-seven (27) feet below the ground surface. The overburden consists of a seventeen (17) foot layer of medium to stiff consistent gray weathered silty clay. Underlying this silty clay is a ten (10) foot deposit of granular soil, the top six (6) feet are in a loose density. Since a nineteen (19) foot fill is proposed behind this abutment, and this will necessitate driving any piles through the embankment, some difficulty may be met in driving the piles to the ledge surface. It is believed, however, that piles can be driven through the silty clay in which case they should be continued through the loose brown sand. Jetting may be required. Since the frictional resistance in driving will be high, it is recommended that steel piles be used. Spread footings placed five (5) feet below the ground line with a unit pressure of 3.0 tons per square foot would cause settlement of over two (2) inches.

Eastern Approach Fill

The eastern approach fill begins at Station 15 + 75 and continues to the Abutment No. 2 at Station 10 + 79.05 where a maximum fill of nineteen (19) feet is proposed. The underlying soils are medium to stiff weathered silty clays and should adequately support the proposed fills with three (3) inches of settlement expected during the construction season. Good compaction in the fill is a necessity.

SUMMARY

Since the ledge surface was found between five (5) and nine (9) feet below the surface at Abutment No. 1, and Piers 1 and 2, it is recommended that these three (3) structures be supported directly on the firm durable ledge. At Pier No. 3 and Abutment No. 4, the ledge dips more than fifteen (15) feet below the surface. The overburden is a weathered clay which would

consolidate two (2) inches under a spread footing pressure of two (2) tons per square foot. End bearing piles are recommended for these two (2) structures. Because of the normal fluctuation of the ground water table, wooden piles are not recommended.

The existing soils should adequately support the proposed fills. Approximately three (3) inches of settlement during the construction season is expected on the eastern fill. Good compaction in the fills is a necessity.

Report Prepared By Fred M Boyce Jr

Report Approved By William R. Gorrill

William R. Gorrill
Soils Engineer

PLAN | SURVEYED: | PLOTTED: | ALIGNMENT CHECKED: | R.O.W. CHECKED: | NOTE BOOK | NO. | BY | DATE

APPROX.

℄ BEARING ABUT. #1 STA. 8+34.21

℄ PIER #1 STA. 8+84.63

℄ PIER #2 STA. 9+56.63

℄ INTERSTATE (N. BOUND) 661

℄ PIER #3 STA. 10+29.63

℄ BEARING ABUT. #2 STA. 10+79.05

APPROX. TOE OF SLOPE

BOR. #7 · BOR. #1 · #2 · BOR. #3 · BOR. #5

6 · 7 · ℄ DRUMMOND ROAD · 8 · 9 · 10 · 11 · 12 · 13

BOR. #6 · #1 · BOR. #2 · #3 · BOR. #4

STA. 10+00 DRUMMOND ROAD
STA. 660+13.62 INTERSTATE (N.B.)

WASH BORING ◉
SOUNDING ○

ABUT. #1 · PIER #1 · PIER #2 · PIER #3 · ABUT. #2 · GRADE LINE

EL. 171.44 · GROUND LINE

STIFF GRAY TO BROWN SILT EVIDENCE OF WEATHERING

LOOSE BROWN SILTY SAND

STIFF BROWNISH GRAY SILTY CLAY EVIDENCE OF WEATHERING

MEDIUM DENSITY BROWN SAND

MEDIUM DENSITY GRAY SAND WITH TRACE OF GRAVEL

ELEVATIONS: 185 · 180 · 175 · 170 · 165 · 160 · 155 · 150 · 145 · 140 · 135

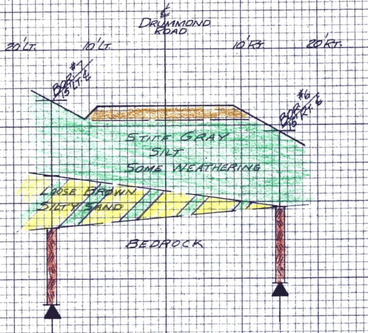
6+00 · 6+50 · 7+00 · 7+50 · 8+00 · 8+50 · 9+00 · 9+50 · 10+00 · 10+50 · 11+00 · 11+50 · 12+00 · 12+50 · 13+00

MAINE STATE HIGHWAY COMMISSION
PLAN & PROFILE
SIDNEY INTERSTATE
DRUMMOND ROAD STRUCTURE
SCALE: PLAN: 1"=30'
PROFILE: H. 1"=30'
V. 1"=5'
MAR 1958
Sale & Engineering Co. U. of M.

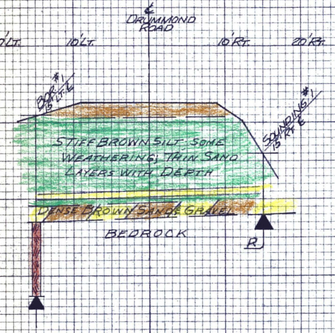
PLATE 1 - PLAN - PROFILE O. P. R. & R. E. STANDARD
KEUFFEL & ESSER CO., NEW YORK.

K & E CO. NO. 345-1 MADE IN U. S. A. 19784

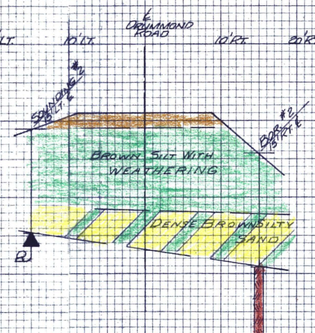
ABUTMENT #1



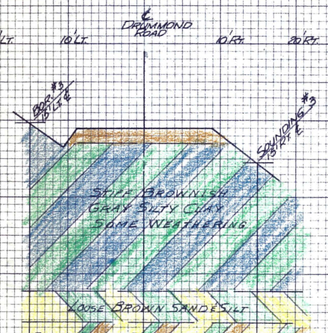
PIER #1



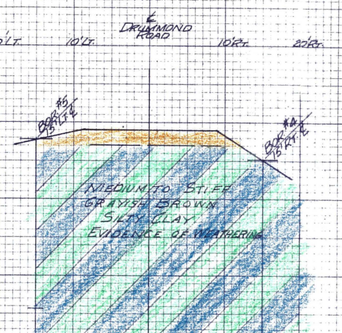
PIER #2



PIER #3



ABUTMENT #2



ELEVATIONS 175 170 165 160 155 150 145 140

Maine State Highway Commission

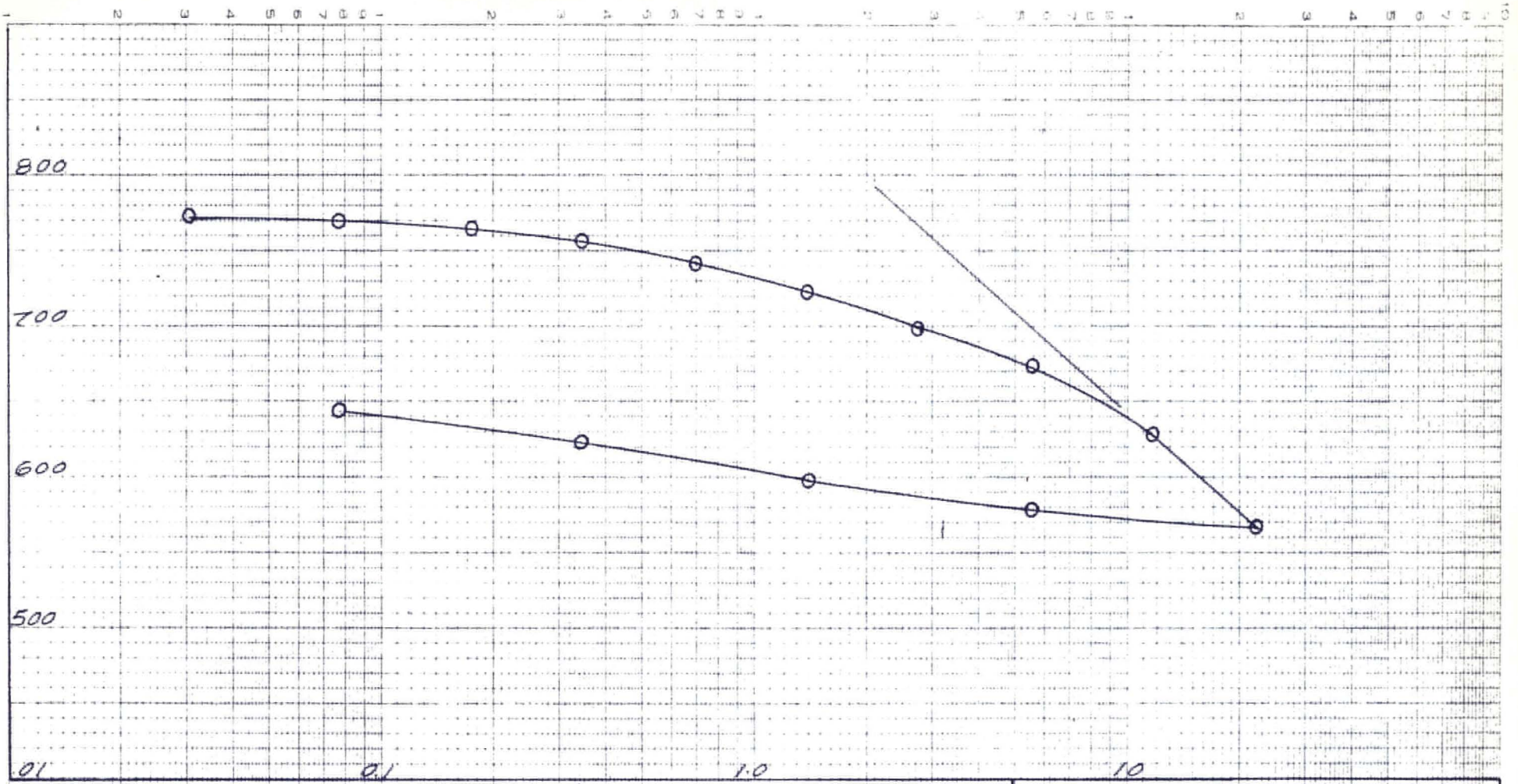
TRANSVERSE PROFILES

SIDNEY INTERSTATE

DRUMMOND ROAD STRUCTURE

SCALE: HORIZ. 1"=10' VERT. 1"=5' | MAR 1958

Soils Engineering Lab. U. of M.

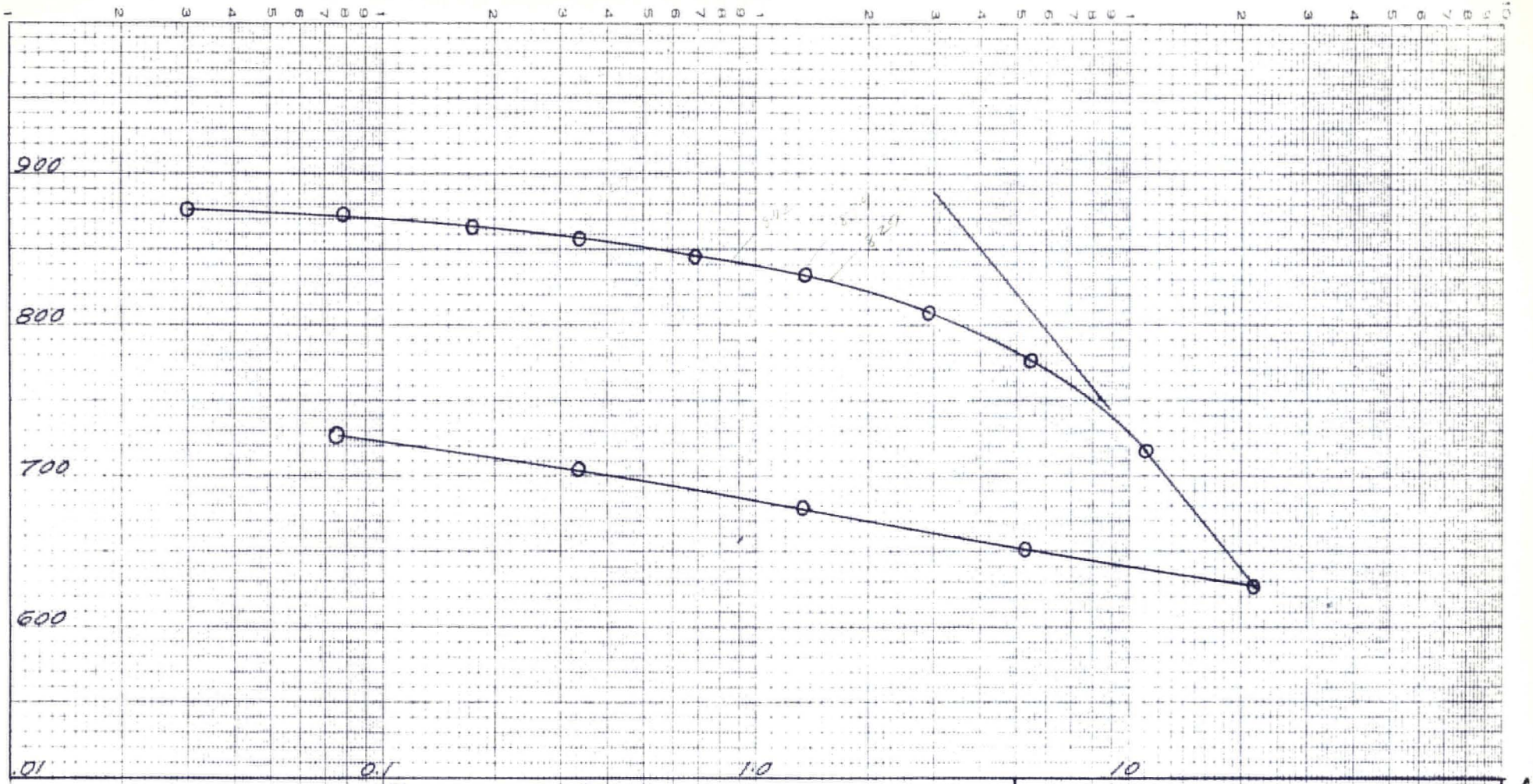


PRESSURE (TONS/SQ.FT.)

Elevation of Sample 155.96'
Thickness of Mineral Matter .4905"
Sample Drained Top & Bottom
Estimated Effective Pressures
a. Existing Overburden .73 TONS/SQ.FT.
b. Preconsolidation Load
1. Apparent Limits 2.10 T/SF to 11.2 T/SF
2. Probable Value 4.65 TONS/SQ. FT.

Maine State Highway Commission
PRESSURE-VOID RATIO DIAGRAM
SIDNEY INTERSTATE
DRUMMOND ROAD STRUCTURE
BORING No. 4 SAMPLE 2U
Soils Engineering Lab U of M

Sheet No. 3



Elevation of Sample 162.26'
Thickness of Mineral Matter .4688"
Sample Drained Top & Bottom
Estimated Effective Pressures
a. Existing Overburden .41 TONS/SQ.FT.
b. Preconsolidation Load
1. Apparent Limits 4.30 T/sf to 9.40 T/sf
2. Probable Value 5.50 TONS/SQ.FT.

Maine State Highway Commission
PRESSURE - VOID RATIO DIAGRAM
SIDNEY INTERSTATE
DRUMMOND ROAD STRUCTURE
BORING No. 5 SAMPLE / U
Soils Engineering Lab. U. of M.

Sheet No. 4

DRIVING RESISTANCE (BLOWS/FT.)

VANE SHEAR STRENGTH (TONS/SQ.FT.)

WATER CONTENT (PERCENT)

BORING NO.1 (2½" CASING)
STA. 8+84.63 15' Lt. ℄

EL. 170.5' 0 20 40 0.4 0.8 20 40

STIFF BROWN SILT WITH EVIDENCE OF WEATHERING; THIN SAND LAYERS APPEARING WITH DEPTH

165 IC 9/9"

DENSE BROWN SAND & GRAVEL

83% LEDGE ~ PHILLITE; VERY HARD

160 75%

168.84'

BORING NO.2 (2½" CASING)
STA. 9+56.63 15' Rt. ℄

EL. 167.86 0 20 40 0.4 0.8 20 40

STIFF BROWN SILT WITH EVIDENCE OF WEATHERING

165

DENSE BROWN SILTY SAND

10 95 74/6"

160

55% LEDGE ~ DIABASE DIKE HARD & SLIGHTLY WEATHERED

155.36' 92%

BORING NO.3 (2½" CASING)
STA. 10+28.63 15' Lt. ℄

EL. 169.84' 0 20 40 0.4 0.8 20 40

STIFF BROWNISH GRAY SILTY CLAY WITH EVIDENCE OF WEATHERING

165 IC

160 2C

LOOSE BROWN SAND & SILT

DENSE BROWN SILTY STONY SAND 87%

155

72% LEDGE ~ HARD PHILLITE

150.17'

Maine State Highway Commission

DETAILED SOIL STRATIFICATION & CONSISTENCY DATA

BORINGS NO. 1, 2, & 3
SIDNEY INTERSTATE
DRUMMOND ROAD STRUCTURE
SCALE: 1" = 5' MAR. 1958
Soils Engineering Lab. U. of M.

SHEET NO. 5

DRIVING RESISTANCE (BLOWS/FT.)

VANE SHEAR STRENGTH (TONS/SQ. FT.)

WATER CONTENT (PERCENT)

BORING NO. 4 (4"℄2½" CASING)
STA. 10+79.05 15' RT. ℄

EL. 167.63' 0 20 40 0.4 0.8 20 40

165

STIFF SILTY CLAY WITH EVIDENCE OF WEATHERING BECOMING SOFTER WITH DEPTH; THIN SAND LAYERS AT BOTTOM 68

1U

160

1.24

2U

155

1D

150

MEDIUM DENSITY BROWN SAND 87 90 96

2D

145

MEDIUM DENSITY GRAY GRAVELY SILTY SAND 70 106

3D 9⅞" 281

140

91% LEDGE; HARD PHILLITE WITH THIN CALCITE STREAKS

76%

137.38'

Maine State Highway Commission
DETAILED SOIL STRATIFICATION
℄
CONSISTENCY DATA
BORING NO. 4
SIDNEY INTERSTATE
DRUMMOND ROAD STRUCTURE
Scale 1"=5' MAR. 1958
Soils Engineering Lab. U. of M.

SHEET NO. 6

DRIVING RESISTANCE (BLOWS/FT.)

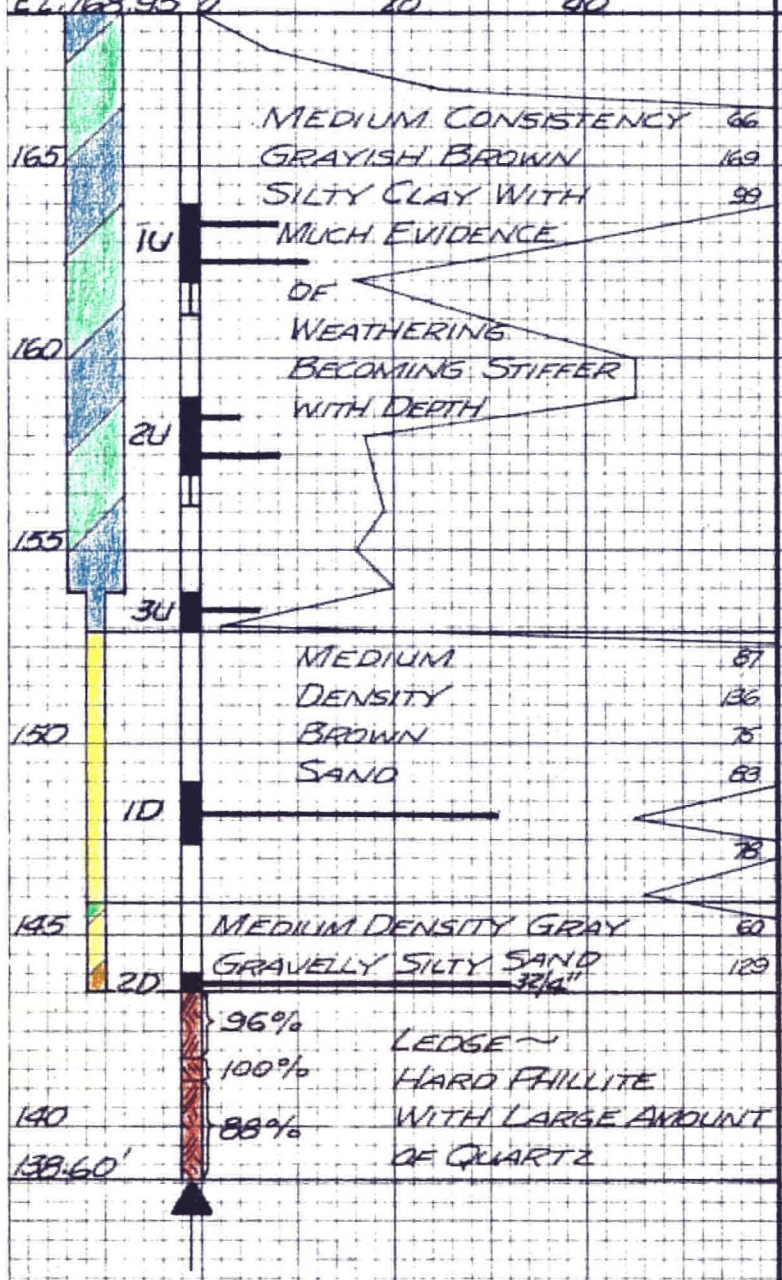
VANE SHEAR STRENGTH (TONS/SQ.FT.)

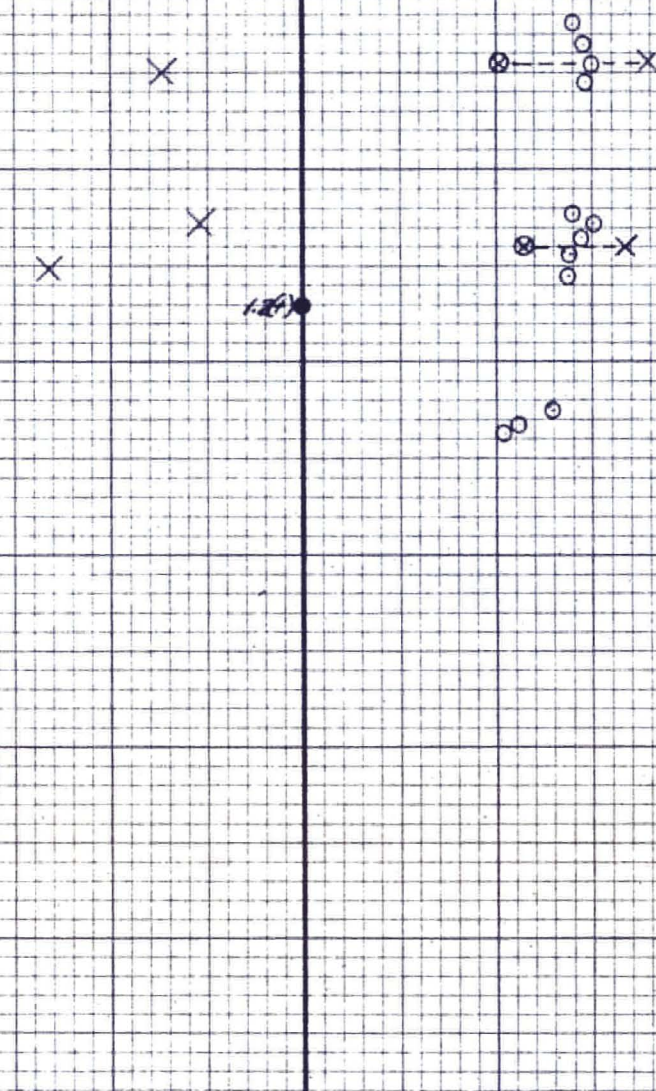
WATER CONTENT (PERCENT)

BORING NO.5 (4"&2½" CASING)
STA. 10+79.05 15' LT. ℄

EL. 168.93'

0 20 40 0.4 0.8 20 40





Maine State Highway Commission

DETAILED SOIL STRATIFICATION & CONSISTENCY DATA BORING NO. 5

SIDNEY INTERSTATE
DRUMMOND ROAD STRUCTURE
SCALE: 1"=5' MAR. 1958
Soils Engineering Lab. U. of M.

SHEET NO. 7

DRIVING RESISTANCE (BLOWS/FT.)

VANE SHEAR STRENGTH (TONS/SQ.FT.)

WATER CONTENT (PERCENT)

BORING NO. 6 (2½" CASING)
STA. 8+34.21 15' RT. ℄

EL. 169.59'

0 20 40 | 0.4 0.8 | 20 40

STIFF GRAY SILT WITH EVIDENCE OF WEATHERING

165

80%

LEDGE ~ VERY HARD PHILLITE

80%

159.59'

BORING NO. 7 (2½" CASING)
STA. 8+34.21 15' LT. ℄

EL. 171.73'

0 20 40 | 0.4 0.8 | 20 40

170

STIFF GRAY SILT WITH EVIDENCE OF WEATHERING

10

165

LOOSE BROWN SILTY SAND

LEDGE ~ PHILLITE

43%

160

158.40'

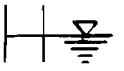
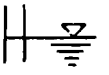
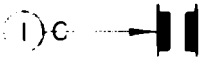
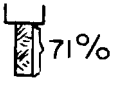
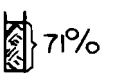
Maine State Highway Commission

DETAILED SOIL STRATIFICATION & CONSISTENCY DATA

BORING NOS. 6 & 7
SIDNEY INTERSTATE
DRUMMOND ROAD STRUCTURE
SCALE: 1"=5' MAR. 1958
Soils Engineering Lab. U. of M.

SHEET NO 8

BORING NOTES

		LOG SHEETS	DETAIL SHEETS
1.	All samples and vanes are made ahead of casing.		
2.	Scales and casing size as noted on drawings.		
3.	Ground water table indicated thus:		
4.	Number of blows of 275# hammer falling 18 inches required to drive extra heavy casing one foot thus:		
5.	Location and designation of "dry" samples taken in S&H sampler #1290s indicated thus:		
6.	Location and designation of "dry" samples taken in 2" O.D. 16 ga. seamless tubing indicated thus:		
7.	Location and designation of "dry" samples taken in 3½" O.D. 16 ga. seamless tubing indicated thus:		
8.	Location and designation of wash samples indicated thus:		
9.	Unsuccessful attempts to secure dry sample indicated thus, followed by type of sampler:		
10.	Location of field vane test indicated thus:		
11.	Number of blows of 275# hammer falling 15" required to drive spoon or tubing one foot indicated thus:		
12.	Sampling spoon or seamless tubing driven by static weight of drill rods and 275# hammer indicated thus:		
13.	3½" O.D. "dry" samples taken with piston sampler.		
14.	Natural water contents, given as percent of dry weight are indicated thus:		Graphical
15.	Bottom of boring indicated thus:		
16.	Refusal of drill rods or casing indicated thus:		
17.	Percent recovery of rock core by diamond bit thus:		

SHEAR AND WATER CONTENT NOTES

Shear Notes:

1. Field vane shear strengths indicated thus:	●
2. Laboratory vane shear strengths indicated thus:	x
3. One half unconfined compressive strengths indicated thus:	o
4. Strengths beyond range of plot indicated at right edge of plot by numerical values and symbols thus:	1.62●
5. Field vane shear strengths in excess of capacity of equipment indicated thus:	—●→
6. Laboratory vane shear strengths in excess of capacity of equipment (1.0 T/sf) indicated thus:	—x→
7. Field vane shear strengths in excess of capacity of equipment and beyond range of plot indicated at right edge of plot thus:	1.50(+)●
8. Laboratory vane shear strength in excess of capacity of equipment (1.0T/sf) and beyond range of plot indicated at right edge of plot thus:	1.00 (+)x

Water Content Notes:

1. Natural water contents, given as percent of dry weight, are indicated thus:	o
2. Plastic and liquid limits are indicated thus:	⊗ — — —x
3. Ignition losses are given as percent of dry weight.	