SIDNEY - KENNEBEC COUNTY

SOILS REPORT

I-95-6(12)

DENSMORE ROAD STRUCTURE

58-13

Please Reply to:

Soils Laboratory
Bl Lord Hall
U of Maine
Orono, Maine

May 1, 1958

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

Re: Densmore Road Structure

Dear Mr. Daggett:

Enclosed please find six (6) copies of the report entitled "Subsurface Investigation for Densmore Road Structure, Interstate Highway Project, Sidney, Maine" dated May 1958.

Very truly yours,

Frederick M. Boyce, Jr.
Soils Laboratory

FMB:ac

Encl.

SUBSURFACE INVESTIGATION FOR
DENSMORE ROAD STRUCTURE
INTERSTATE HIGHWAY PROJECT
SIDNEY, MAINE

State Highway Commission

Soils Division

May 1958

INDEX

TEXT	PAGE
Introduction	1
General Conditions	1
Substructure Report	2
Western Approach	2
Abutment 1	2
Pier 1	3
Pier 2	3
Pier 3	3
Pier 4	4
Pier 5	4
Abutment 2	4
Eastern Approach	5
Summary	5

ILLUSTRATIONS	SHEET NO.
Plan and Profile (Entire Area)	1
Plan and Profile (Bridge Area)	2
Profiles 15' Left and 15' Right of Centerline	3
Transverse Section	4
Boring Notes	5 & 6
Boring Detail Sheets	
Borings 1, 2, 3	7
4, 5, 6	8
7, 8	9
9, 10	10
11	11
12, 13	12
14, 15	13
16	14

SUBSURFACE INVESTIGATION FOR

DENSMORE ROAD STRUCTURE

INTERSTATE HIGHWAY PROJECT

SIDNEY, MAINE

INTRODUCTION

The subsurface conditions at the site of the proposed bridge structure to carry the Densmore Road traffic over the Interstate Highway has been investigated by means of twelve (12) core borings and six (6) rod soundings. These explorations were made in February 1958. A plan and profile, including the limits of the approach fills, is shown on Sheet 1, while a detailed plan showing the location of the field explorations and the resulting soils profile is shown on Sheet 2. Profiles fifteen (15) feet left and fifteen (15) feet right of centerline are shown on Sheet 3 and the resulting transverse sections are shown on Sheet 4. Boring notes are shown on Sheets 5 and 6 with the boring details shown on Sheets 7 to 14 inclusive. The proposed crossing is one (1) mile west along the Densmore Road from Route 104 (the River Road, so called) and is three quarters (3/4) of a mile east along the Densmore Road from Sidney Corner.

GENERAL CONDITIONS

Ledge outcrops were noted along the northbound lane while an indication of a swamp showed on the surface at the southbound lane. The field explorations were begun in February before the definite locations of the substructures were determined. As a result, the core borings were supplemented by a rod sounding crew. As can be seen on Sheet 1, the ledge surface

dips quite steeply on the western end. This ledge dips in the opposite direction of the other Interstate bridge locations and is easily explained by looking at the overall profile where the ledge can be seen dipping at the eastern end too, thus completing the hump or fold similarly described at the Lyons Road Structure. The poor recovery of the ledge cores was due to the high angle of foliation of the ledge and grinding up during drilling due to the softness of the ledge. Bearing values for the ledge would be ten to twenty (10-20) tons per square foot.

In the swamp section, the underlying soils were found to be very stiff weathered silty clays. If piles are used, wooden piles are not recommended due to the normal fluctuation of the ground water table.

SUBSTRUCTURE REPORT

Western Approach

Auger borings indicate the existing soils along the proposed western approach to be firm weathered silty clays. These firm clays should adequately support the proposed embankments. Good compaction in the fills is a necessity.

Abutment No. 1

Borings 15 and 16 (Sheets 13 and 14) and the transverse section (Sheet 4) show the existing soils at the proposed site of Abutment No. 1. The ledge surface was noted seventeen (17) feet below the surface with the overburden a weathered clay. Since this clay will consolidate over an inch with a unit pressure of two (2) tons per square foot, it is recommended that the structure be supported by piles. It is believed that with jetting the

piles could be driven to the ledge surface (elevation 226-230). If the fill is completed before the abutment is constructed, frictional piles are recommended. It is believed piles driven through the fill may be stopped at elevation 240 and possibly with jetting they might reach the ledge surface.

Pier No. 1

Borings 13 and 14 (Sheets 12 and 13) and the transverse section (Sheet 4) show the underlying conditions at the proposed location of Pier No. 1. Since the overburden is stiff clay and will undergo consolidation, and the ledge surface is fourteen (14) feet below the surface, piles are recommended. It is believed that piles can be driven to ledge on the north end to elevation 231.5 and possibly to ledge on the south end with jetting at elevation 232.5.

Pier No. 2

Borings 11 and 12 (Sheets 11 and 12) and the transverse section (Sheet 4) show the underlying soils at Pier No. 2. Since the overburden is the stiff weathered silty clay and will consolidate, and the ledge surface is sixteen (16) feet below the surface, piles are recommended. It is believed piles can be driven to elevation 237.

Pier No. 3

Borings 7, 8, 9, and 10 (Sheets 9 and 10) and the transverse section (Sheet 4) show the underlying soils in the vicinity of the proposed location of Pier No. 3. These borings were not made on the proposed pier location as the location had not been established at the time the borings were made. The plan showing the fixed location was followed up in the field by two (2)

rod soundings (Soundings 1 and 2), but the location of this pier has since been changed; approximately five (5) feet to the east. The data obtained has been interpolated to show the soils profile at Pier 3 as shown on Sheet 4. Since the ledge surface is but eight (8) feet below the surface, it is recommended that the pier be supported directly on the bedrock. If piles are used, it is believed they can be driven to the ledge surface.

Pier No. 4

Borings 5 and 6 (Sheet 8) were made three (3) feet east of the proposed location of Pier No. 4. A rod sounding crew found ledge outcrops at the proposed location and the boring data has been used to draw up the transverse profile (Sheet 4). It is recommended that the pier be supported directly on the ledge. As can be seen on the profile fifteen (15) feet either side of centerline (Sheet 3) the ledge sticks up in a pinnacle at this location. It is recommended that five (5) feet of the ledge be removed before the pier is placed to minimize any shearing in the ledge.

Pier No. 5

Borings 2 and 3 (Sheet 7) and the transverse section (Sheet 4) show the underlying soils at the proposed site of Pier No. 5. Since the ledge surface was from five to seven (5-7) feet below the ground, it is recommended that Pier 5 be supported directly on the ledge surface.

Abutment No. 2

Borings 1 and 4 (Sheets 7 and 8) were made three (3) feet east of the proposed site of Abutment No. 2. Two (2) soundings were made at the proposed location and the resulting section was drawn using the information from the borings. Since the ledge surface was but two to three (2-3) feet below the surface, it is recommended that Abutment No. 2 be supported

directly on bedrock. If the fill is completed before the abutment is constructed, piles are recommended. It is believed piles can be driven to the ledge surface.

Eastern Approach Fill

This shallow ledge surface with granular cover should adequately support the proposed embankment. Good compaction in the fills is a necessity. Beyond Station 19 the proposed centerline eliminates a sharp curve, but in doing so, crosses a ledge knoll. Ledge excavation should be anticipated.

SUMMARY

Because the overburden will consolidate more than an inch with a unit pressure of two (2) tons per square foot, and also because the ledge surface is ten (10) feet or more below the surface, piles are recommended at the following:

Abutment 1	Elevation 240
Pier 1	232
Pier 2	237

It is recommended that Piers 3, 4, 5, and Abutment 2 be placed directly on the shallow ledge surface. Since Pier 4 is located on a ledge pinnacle, it is recommended that five (5) feet of the ledge be removed before the footings are placed. Bearing values of the ledge should be between ten (10) and twenty (20) tons per square foot. The lower value should be used on end bearing piles.

If the fills are completed before the abutments are constructed, piles

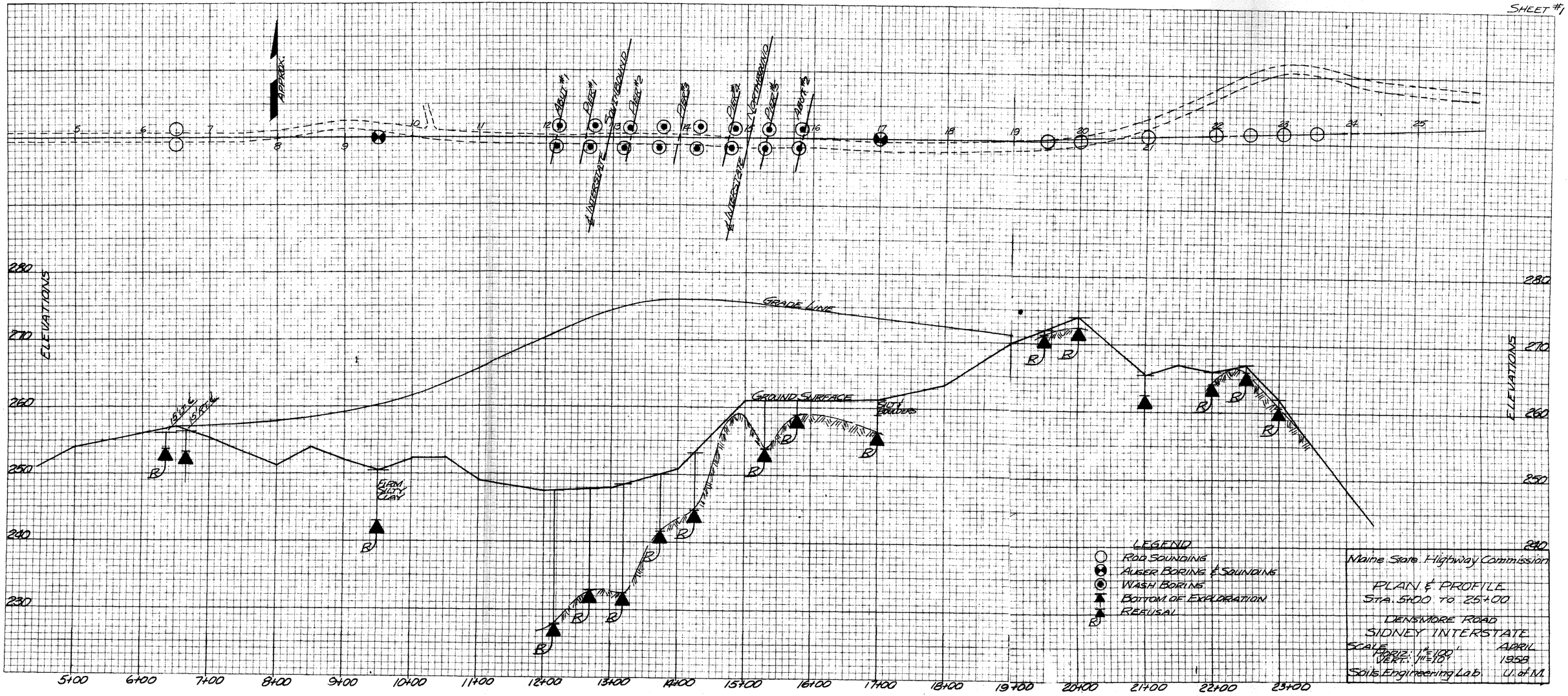
are recommended. It is believed that piles can be driven through the fill and to the ledge surface on Abutment 2. Because of the normal fluctuation of the ground water table, wooden piles are not recommended.

The existing soils under the approach fills should adequately support the proposed embankment. Some ledge excavation should be anticipated beyond Station 19 + 0. Good compaction in the approach fills is a necessity.

Report Prepared by Fred M. Boyce Jr.

Report Approved by William R. Gorrill

William R. Gorrill
Soils Engineer



LEGEND

- Rod Sounding
- Auger Boring & Sounding
- Wash Boring
- Bottom of Exploration
- Refusal

Maine State Highway Commission

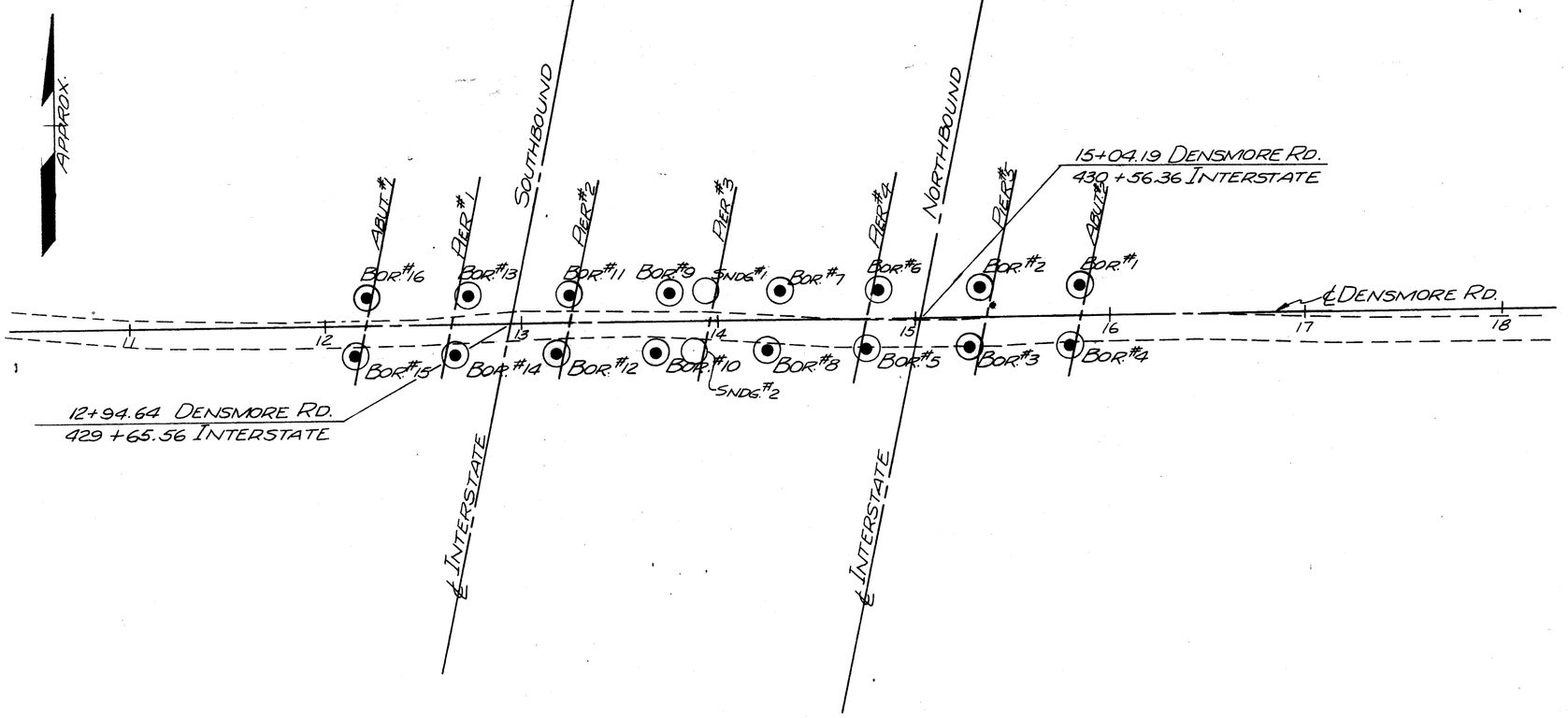
PLAN & PROFILE
STA. 5+00 TO 25+00
LIENSMORE ROAD
SIDNEY INTERSTATE

Scale: Horiz. 1" = 100'
Vert. 1" = 10'

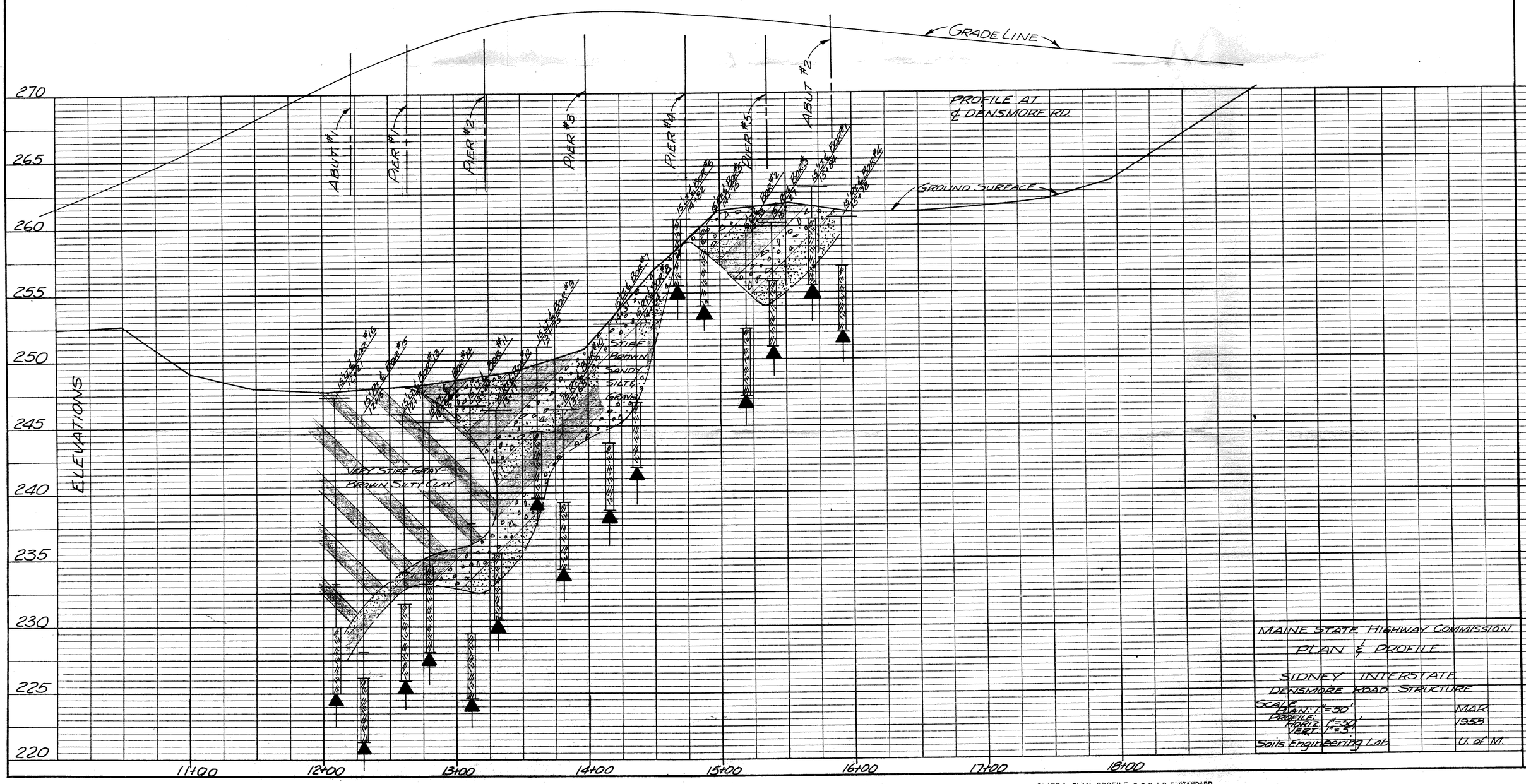
April 1958

Soils Engineering Lab. U. of M.

PLAN | SURVEYED | BY | DATE
NOTE BOOK | PLOTTED
NO. | ALIGNMENT CHECKED
RT. OF WAY CHECKED

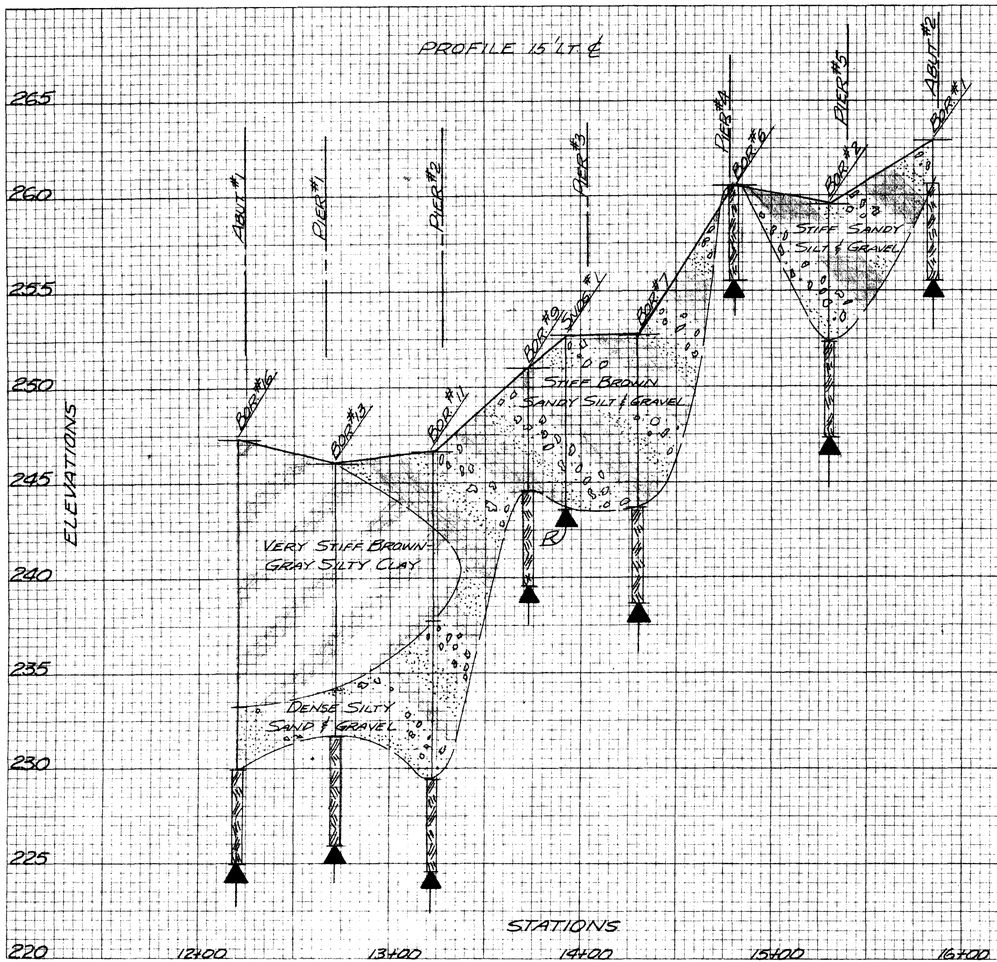


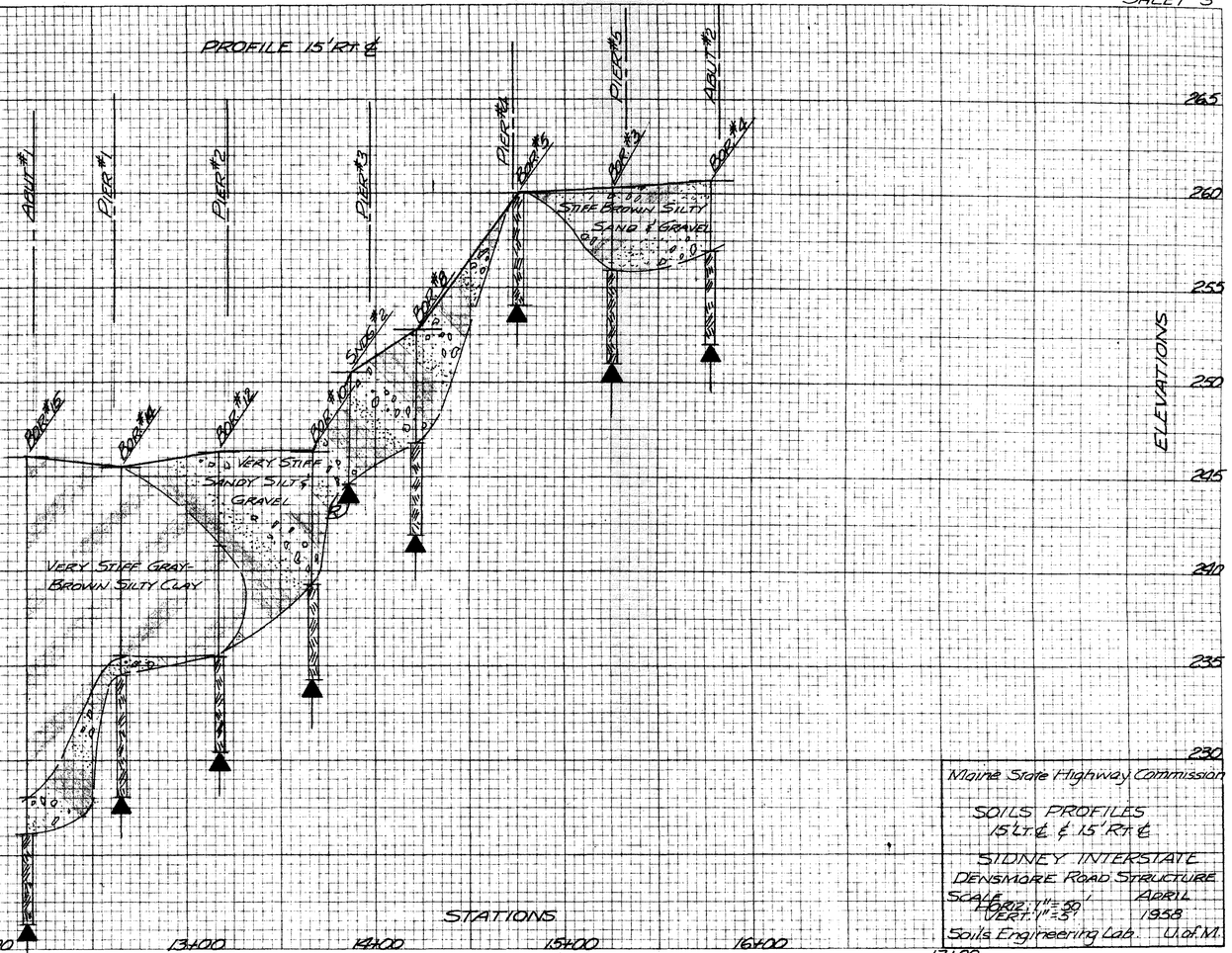
PLAN
SCALE: 1"=50'



MAINE STATE HIGHWAY COMMISSION
PLAN & PROFILE
SIDNEY INTERSTATE
DENSMORE ROAD STRUCTURE
SCALE PLAN: 1"=50'
PROFILE: HORIZ. 1"=50' VERT. 1"=5'
MAR 1953
Soils Engineering Lab U. of M.

PLATE 1 - PLAN - PROFILE O. P. R. & R. E. STANDARD





Maine State Highway Commission

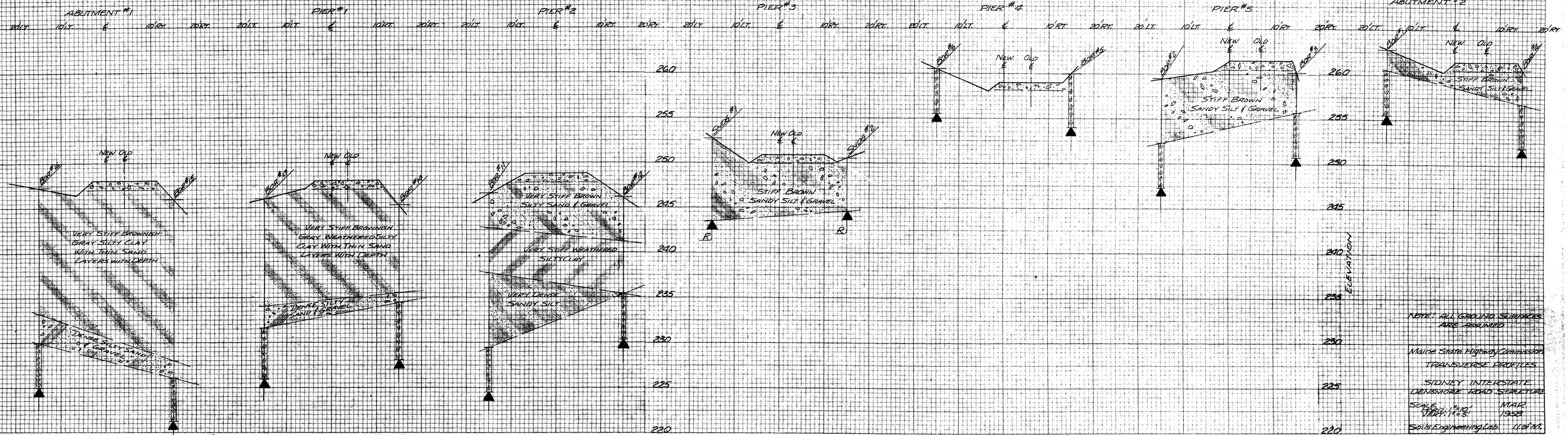
SOILS PROFILES
15' Lt. ℄ & 15' Rt. ℄

SIDNEY INTERSTATE
DENSMORE ROAD STRUCTURE

SCALE HORIZ. 1" = 50'
VERT. 1" = 5'

APRIL 1958

Soils Engineering Lab. U. of M.



NOTE: ALL GROUND SURFACES ARE ASSUMED

Maine State Highway Commission

TRANSVERSE PROFILES

SIDNEY INTERSTATE

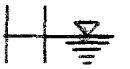
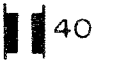
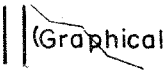
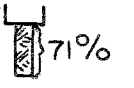
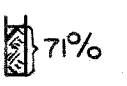
DENSMORE ROAD STRUCTURE

Scale: 1"=10' MAR.

Vert. 1"=5' 1958

Soils Engineering Lab. U. of M.

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.

DRIVING RESISTANCE (BLOWS/F.T.) | VANE SHEAR STRENGTH (TONS/SQ.F.T.) | WATER CONTENT (PERCENT)

BORING NO. 1 (2½" CASING)
STA. 15+84 15' LT. ℄

E. 262.91' 20 40 .4 .8 20 40

STIFF BROWN SANDY SILT & GRAVEL
100
200/12"

255

10%

LEDGE; SERICITE PHILLITE; STEEPLY LINEATED

BORING NO. 2 (2½" CASING)
STA. 15+33 15' LT. ℄

E. 259.48' 20 40

STIFF BROWN SANDY SILT & GRAVEL
131
68
151
300/3"

255

ID

250

25%

LEDGE; SERICITE PHILLITE; STEEPLY LINEATED

BORING NO. 3 (2½" CASING)
STA. 15+27 15' RT. ℄

E. 260.21' 20 40

STIFF BROWN SANDY SILT & GRAVEL
150
200/6"

Me

15%

LEDGE; FRACTURED SERICITE PHILLITE STEEPLY LINEATED

MAINE STATE HIGHWAY COMMISSION
DETAILED SOIL STRATIFICATION & CONSISTENCY DATA
BORINGS NO. 1, 2, 3
SIDNEY INTERSTATE
DENSMORE ROAD STRUCTURE
SCALE: 1"=5' JAN, 1958
SOILS ENGINEERING LAB U OF M.

SHEET #7

DRIVING RESISTANCE (BLOWS/FT.) | VANE SHEAR STRENGTH (TONS/SQ.FT.) | WATER CONTENT (PERCENT)

BORING NO. 4 (2½" CASING)
STA. 15+78 15' RT. ℄

EL. 260.66' 20 40 | 0.4 0.8 | 20 40

STIFF BROWN SANDY SILT & GRAVEL

14 1/8"

LEDGE;

255 ± 51% SERICITE PHILLITE; STEEPLY LINEATED

BORING NO. 5 (2½" CASING)
STA. 14+75 15' RT. ℄

EL. 259.90' 20 40 | 0.9 0.8 | 20 40

75% LEDGE;
25% FRACTURED
SERICITE
PHILLITE;
255 50% STEEPLY LINEATED

BORING NO. 6 (2½" CASING)
STA. 14+82 15' LT. ℄

EL. 260.55' 20 40 | 0.9 0.8 | 20 40

25% LEDGE; FRACTURED
34.5% SERICITE PHILLITE;
75% STEEPLY LINEATED

MAINE STATE HIGHWAY COMMISSION
DETAILED SOIL STRATIFICATION
&
CONSISTENCY DATA
BORINGS NO. 4, 5, 6
SIDNEY INTERSTATE
DENSMORE ROAD STRUCTURE
SCALE: 1"=5' JAN. 1958
SOILS ENGINEERING LAB U. OF M.

SHEET #8

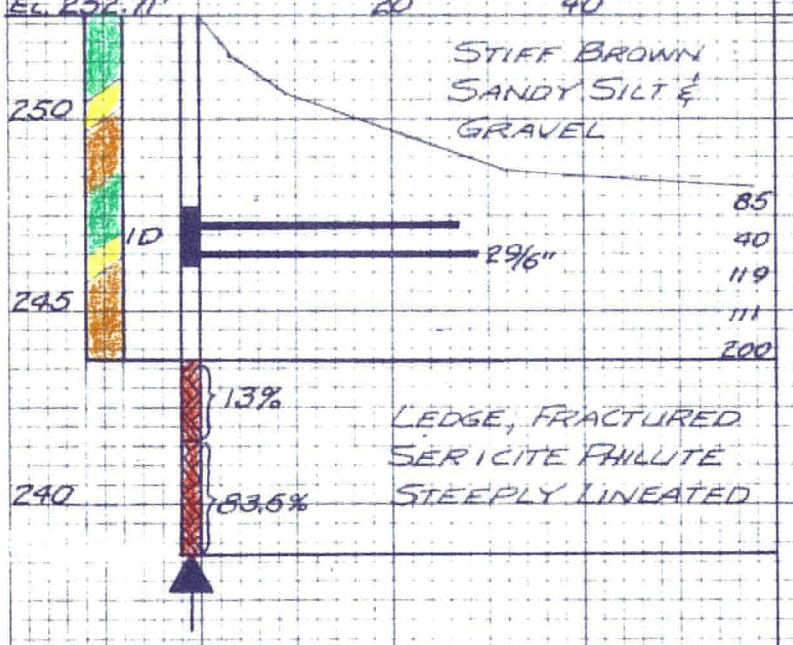
DRIVING RESISTANCE (BLOWS/FT.)

VANE SHEAR STRENGTH (TONS/SQ.FT.)

WATER CONTENT (PERCENT)

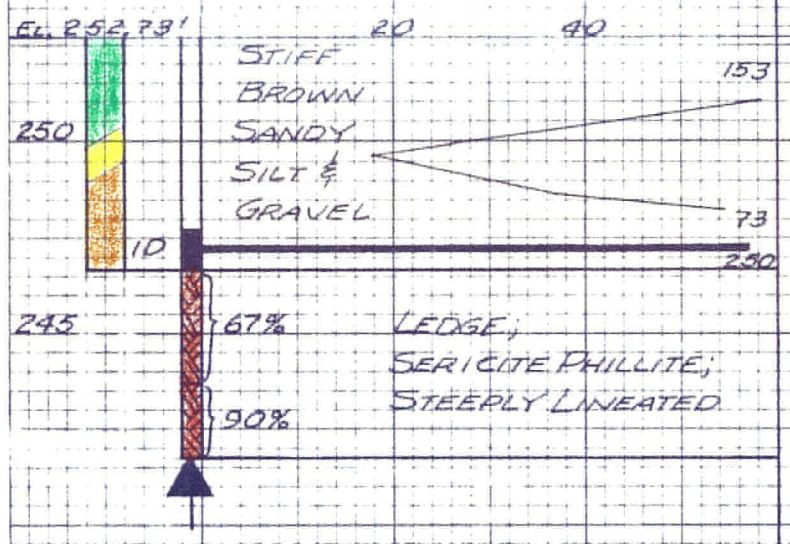
BORING NO. 7 ($2\frac{1}{2}$" CASING)
STA. 14+31 15' LT. ℄

El. 252.71'



BORING NO. 8 ($2\frac{1}{2}$" CASING)
STA. 14+29 15' RT. ℄

El. 252.73'



MAINE STATE HIGHWAY COMMISSION
DETAILED SOIL STRATIFICATION
&
CONSISTENCY DATA
BORINGS NO. 7, 8

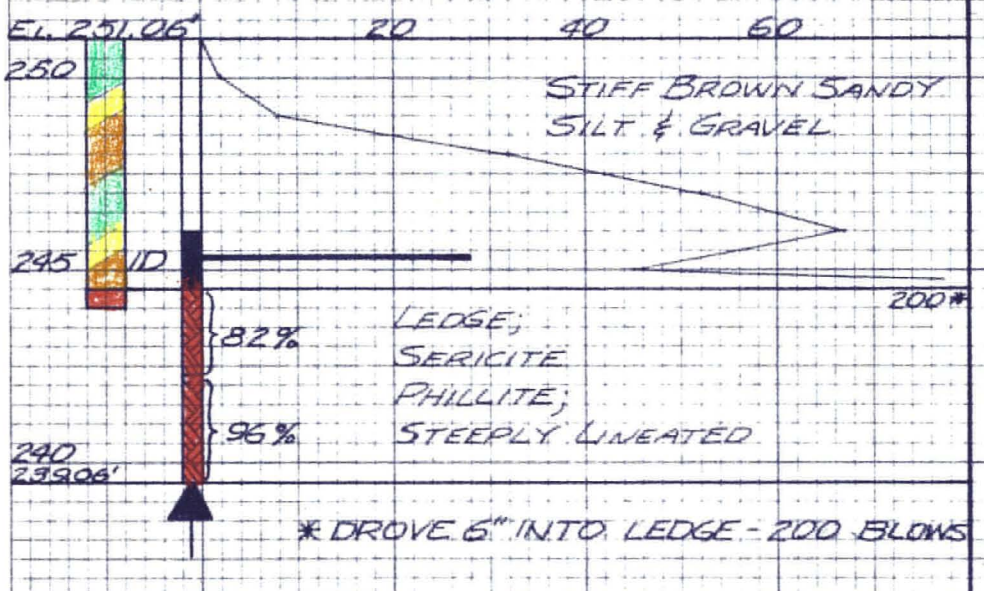
SIDNEY INTERSTATE
DENSMORE ROAD STRUCTURE

SCALE: 1"=5' JAN, 1958
SOILS ENGINEERING LAB U. OF M.

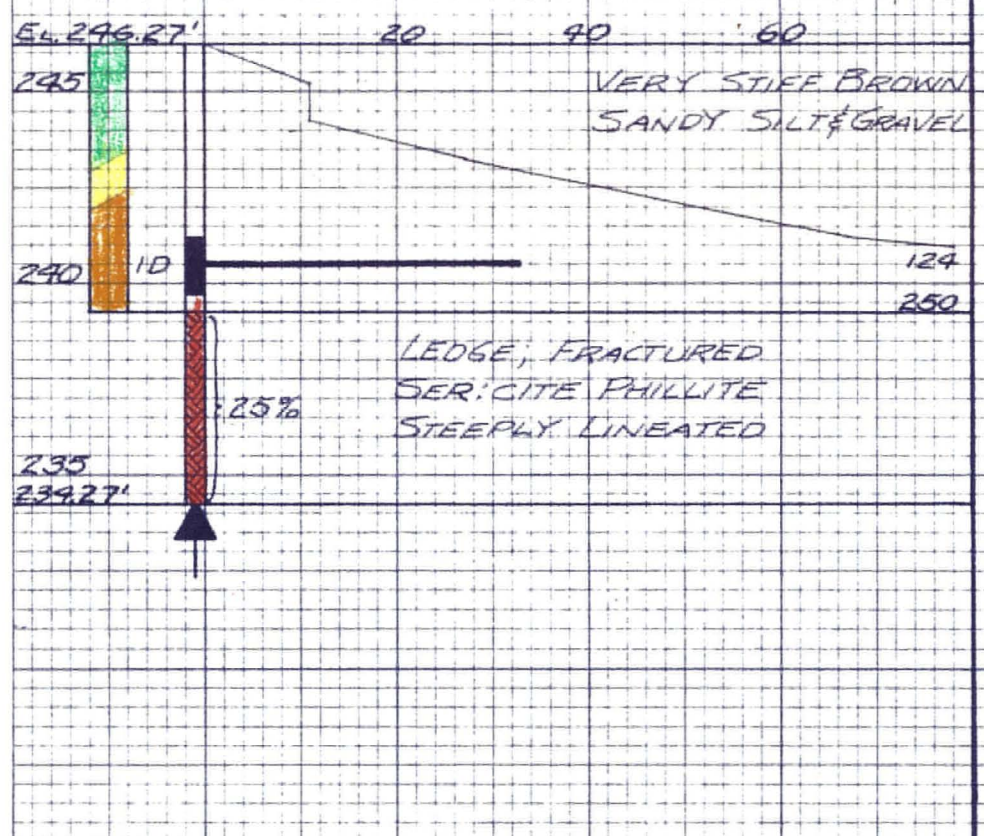
SHEET #9

DRIVING RESISTANCE
(BLOWS/F.T.)

BORING NO 9 ($2\frac{1}{2}$" CASING)
STA. 13+76 15' LT. ℄



BORING NO. 10 ($2\frac{1}{2}$" CASING)
STA. 13+68 15' RT. ℄



MAINE STATE HIGHWAY COMMISSION
BORING LOGS
BORING NOS 9,10
SIDNEY INTERSTATE
DENSMORE ROAD STRUCTURE
SCALE: 1"=5'
SOILS ENGINEERING LAB U. OF M.

SHEET #10

DRIVING RESISTANCE (BLOWS/FT.)

BORING NO. 11 4"ℓ & 2½"ℓ CASING)
STA. 13+24 15'LT. ℄

VANE SHEAR STRENGTH (TONS/SQ.FT.)

WATER CONTENT (PERCENT)

El. 246.63'

20 40

0.4 0.8

20 40

245

VERY STIFF BROWN SANDY SILT & GRAVEL

74

1U 15/9"

240

2U

VERY STIFF WEATHERED SILTY CLAY

90

162

500

235 1D 99/6"

300

VERY DENSE GRAYISH BROWN SANDY SILT

247

107

119

70

120

2D

230

450/3"

LEDGE; FRACTURED SERICITE PHILLITE STEEPLY LINEATED

55%

225

229.38

MAINE STATE HIGHWAY COMMISSION
DETAILED SOIL STRATIFICATION & CONSISTENCY DATA
BORING NO. 11
SIDNEY INTERSTATE
DENSMORE ROAD STRUCTURE
SCALE: 1"=5'
SOILS ENGINEERING LAB U OF M.

SHEET #11

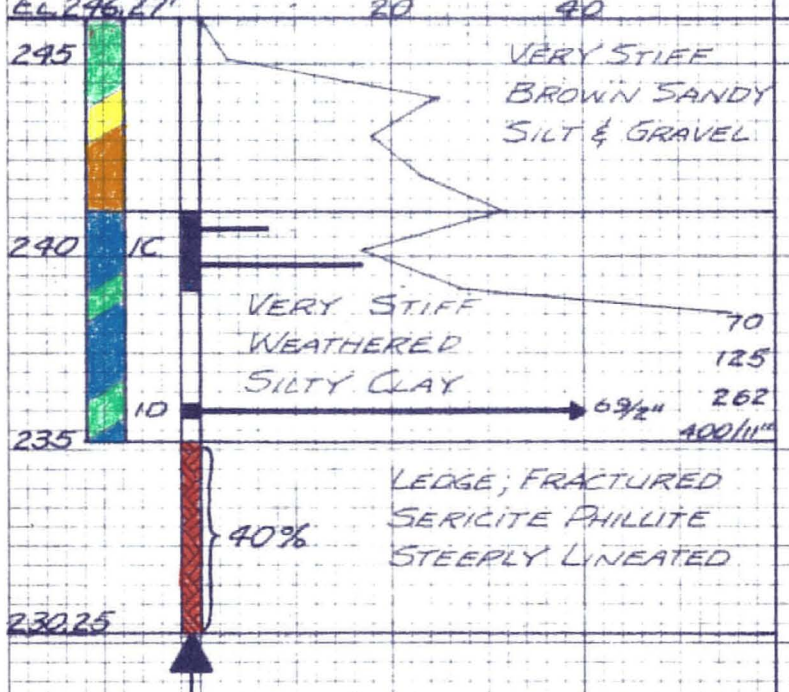
DRIVING RESISTANCE (BLOWS/FT.)

VANE SHEAR STRENGTH (TONS/SQ.FT.)

WATER CONTENT (PERCENT)

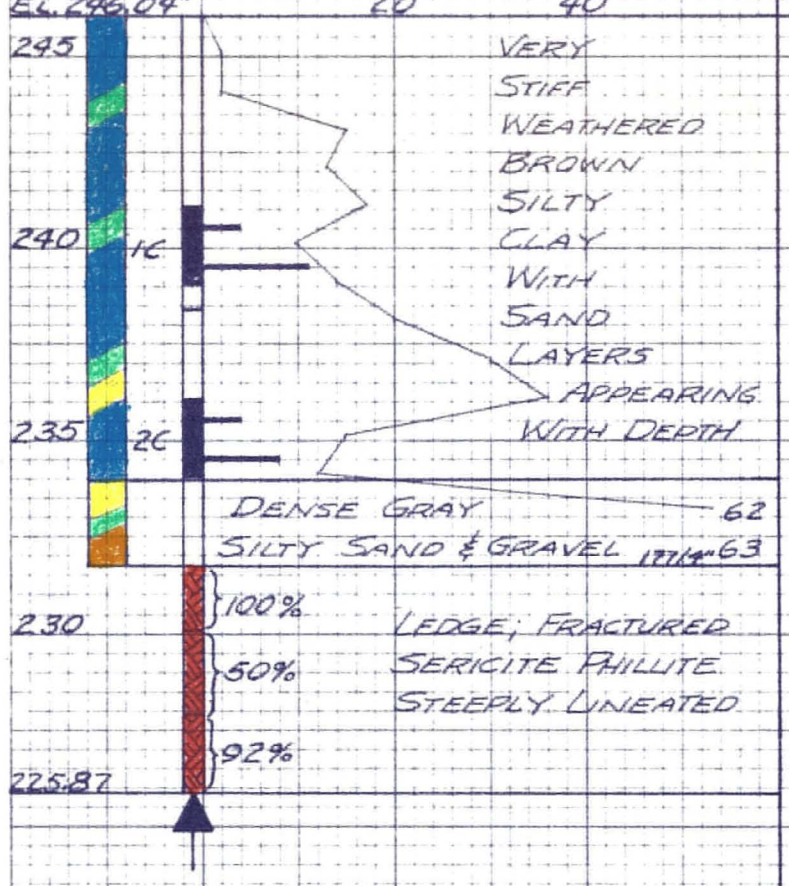
BORING NO. 12 ($2\frac{1}{2}$" CASING)
STA. 13+17 15' RT. ℄

El. 246.27'



BORING NO. 13 ($2\frac{1}{2}$" CASING)
STA. 12+72 15' LT. ℄

El. 246.09'



MAINE STATE HIGHWAY COMMISSION
DETAILED SOIL STRATIFICATION
&
CONSISTENCY DATA

BORINGS NO. 12 & 13
SIDNEY INTERSTATE
DENSMORE ROAD STRUCTURE

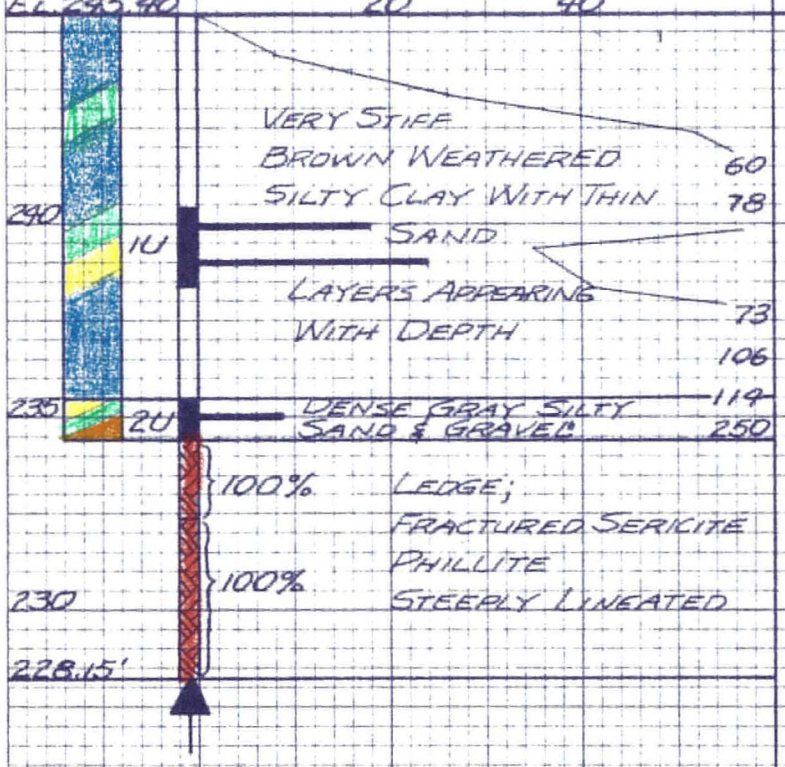
SCALE: 1" = 5'
SOILS ENGINEERING LAB U. OF M.

SHEET #12

DRIVING RESISTANCE (BLOWS/F.T.) | VANE SHEAR STRENGTH (TONS/SQ.F.T.) | WATER CONTENT (PERCENT)

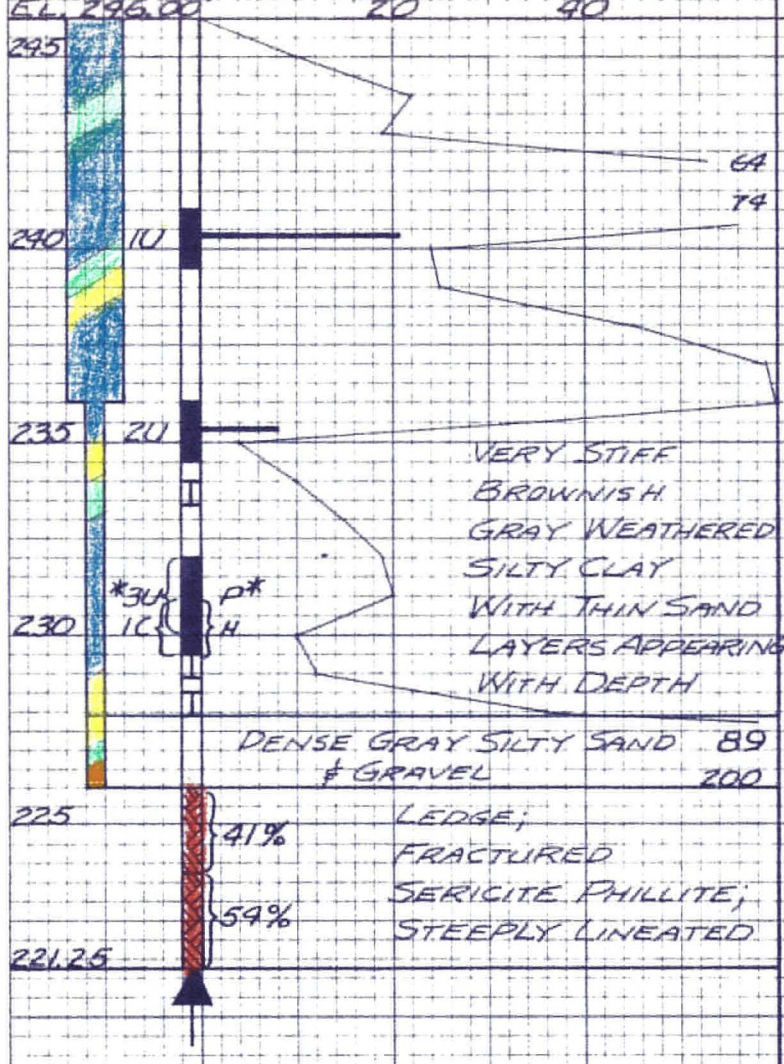
BORING NO. 14 (4"CASING)
STA. 12+66 15' RT. ℄

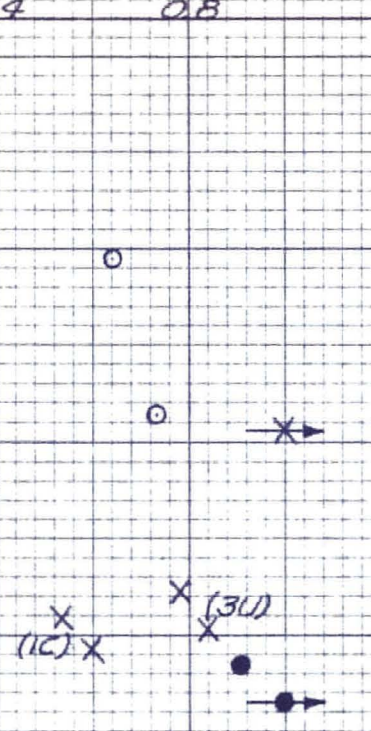
EL. 295.90 — 20 — 40 — 0.4 — 0.8 — 20 — 40

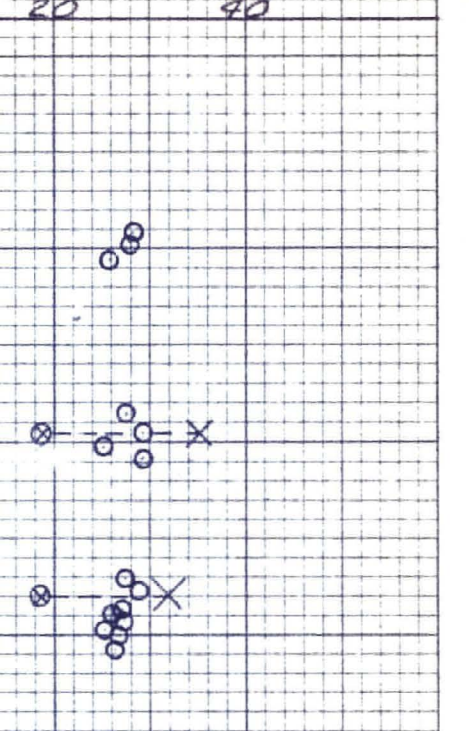


BORING NO. 15 (4"&2½"CASING)
STA. 12+15 15' RT. ℄

EL. 296.00' — 20 — 40 — 0.4 — 0.8 — 20 — 40







*SAMPLE 3U TAKEN IN AN ADJACENT HOLE.

MAINE STATE HIGHWAY COMMISSION
DETAILED SOIL STRATIFICATION & CONSISTENCY DATA
BORINGS NO. 14 & 15
SIDNEY INTERSTATE
DENSMORE ROAD STRUCTURE
SCALE: 1" = 5'
SOILS ENGINEERING LAB U OF M

SHEET #13

DRIVING RESISTANCE
(BLOWS/FT.)

VANE SHEAR STRENGTH
(TONS/SQ.FT.)

WATER CONTENT
(PERCENT)

BORING NO. 16 (4" CASING)
STA. 12+21 15' LT. ℄

El. 247.26'

20 40 0.4 0.8 20 40

245

240

235

230

225

1U

2U

1D

75

70

89

107

65

59

81

204

179

130/4

27%

VERY STIFF
BROWNISH GRAY
WEATHERED
SILTY CLAY
WITH THIN
SAND LAYERS
APPEARING WITH DEPTH

DENSE BROWNISH GRAY
SILTY SAND & GRAVEL

LEDGE; FRACTURED
SERICITE PHILLITE
STEEPLY BEDDED

MAINE STATE HIGHWAY COMMISSION
DETAILED SOIL STRATIFICATION
&
CONSISTENCY DATA
BORING NO. 16.
SIDNEY INTERSTATE
DENSMORE ROAD STRUCTURE
SCALE: 1"=5'
SOILS ENGINEERING LAB U. OF M.

SHEET #14