WATERVILLE

195 6 16

WATERVILLE - KENNEBEC COUNTY

58-05

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ROUTE I-95

TRAFTON ROAD STRUCTURE 58-5

58/5

Please Reply to:

Soils Laboratory
El Lord Hall
U of Maine
Orono, Maine

April 28, 1958

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

Re: Trafton Road Structure

Dear Mr. Daggett:

We are enclosing six (6) copies of the report entitled "Subsurface Investigation for Trafton Road Structure, Interstate Highway Project, Waterville, Maine," dated April 1958.

Very truly yours,

Frederick M. Boyce, Jr.
Soils Laboratory

FMB:ac

Encl.

SUBSURFACE INVESTIGATION FOR

TRAFTON ROAD STRUCTURE

INTERSTATE HIGHWAY PROJECT

WATERVILLE, MAINE

State Highway Commission

Soils Division

April 1958

INDEX

SUBSURFACE INVESTIGATION FOR

TRAFTON ROAD STRUCTURE

INTERSTATE HIGHWAY PROJECT

WATERVILLE, MAINE

INTRODUCTION

The subsurface conditions at the site of the proposed bridge structure to carry the Trafton Road traffic over the Interstate Highway has been investigated by means of nine (9) core borings, six (6) test pits, and five (5) rod soundings. These explorations were made in April 1958. The location of these explorations, together with the resulting soils profile, is shown on Sheet 1, and profiles along both sides of the roadway at a distance of fifteen (15) feet from centerline are shown on Sheet 2. The transverse sections are shown on Sheet 3, boring notes on Sheet 4, while the boring logs are shown on Sheets 5 and 6. Design data for spread footings are shown on Sheets 7 and 8. The proposed crossing is 1.2 miles west along the Trafton Road from the Route 104, the River Road, so called; or one quarter ($\frac{1}{4}$) of a mile west of the intersection of Kight Rod Road and Trafton Road.

GENERAL CONDITIONS

A shallow ledge surface similarly encountered at the Lyons and Town Farm crossing was also found beneath this proposed site. The ledge surface dips gradually to the east from a depth of near seven (7) feet below Abutment No. 1 to fifteen (15) feet below the surface at Abutment No. 2. The ledge was also noted to have the same vertical cleavage planes. Due to unusually poor ledge recovery at the proposed sites of Piers 1, 2, and 3, a back hoe

was used to augment the wash borings in determining the ledge surface and also the quality of the ledge. This back hoe was able to dig three (3) feet into the ledge surface on the north side of Trafton Road at Pier No. 1, but found the ledge very firm and solid at the southern end of the same pier. Due to the high cleavage angles, it is recommended that the footings be set in the ledge. The ledge surface should be able to support ten to twenty (10-20) tons per square feet in bearing, but only after the rotten ledge is removed. The lower value should be used in end bearing piles due to the high cleavage angle.

The overburden is predominantely granular with high amounts of silt content near the surface and a few scattered boulders with depth. If piles are used, wooden piles are not recommended due to the fluctuation of the ground water table.

SUBSTRUCTURE REPORT

Abutment No. 1 and Western Approach Fill. Borings 6 and 7 (Sheet 6) and the transverse section on Sheet 3 show the underlying soils at the proposed site of Abutment No. 1. While spread footings placed five (5) feet below the surface could be used, it would take but another three (3) feet to place the structure directly on the ledge surface. If, however, the fill is constructed before the abutment is built, then piles would be recommended. It is believed piles should be able to be driven through the fill and to the ledge surface. The approach fill should be adequately supported by the existing soils, however, good compaction in the fill is a necessity.

Pier No. 1. Boring 1 (Sheet 5) and the transverse sections on Sheet 3 show the existing soils at the proposed site of Pier No. 1. Since a poor recovery of ledge was made on Boring No. 1, a back hoe was used to dig a test pit.

The results of the test pit showed the ledge to be firm and solid at the south end of the pier and but four (4) feet below the surface. At the north end the ledge surface was noted six (6) feet below the surface and the back hoe was able to dig an additional four (4) feet into the ledge with little trouble. It is recommended that Pier No. 1 be supported on a firm ledge. This will probably entail removing at least three (3) feet of poor ledge on the north side and six (6) feet of sound ledge on the south end. This latter should be removed to provide a level surface and to prevent shearing of the ledge. If piles are used it is believed that they can be driven to the ledge surface.

Pier No. 2. Boring 2 (Sheet 5) and the transverse profile (Sheet 3) show the underlying soils at the proposed location of Pier No. 2. It is recommended that this pier be supported directly on ledge, six (6) feet below the surface. Test pits were made at either end of the pier. The observation of the ledge confirmed the high cleavage angle. It is recommended that two (2) feet of this ledge be removed before the footing is placed. If piles are used, it is believed they will be able to penetrate below elevation 202.

Pier No. 3. Boring 3 (Sheet 5) and the transverse profile (Sheet 3) show the underlying soils at the proposed site of Pier No. 3. A rod sounding was made at the opposite end of the pier to determine any dipping in the ledge surface. It is recommended that Pier No. 3 be supported directly on ledge. The ledge recovery on this boring was unusually low. No drops indicating fractures in the ledge were noted. An examination of the cores indicated that the low recovery was due to turning and wearing inside the core barrel during drilling which usually occurs with a soft rock. The tests pits showed the high cleavage angles in the ledge. It is recommended that the top two (2) feet of ledge be removed before the footing is placed. The overburden

is granular with small boulders appearing with depth. If piles are used, it is believed that they will be stopped at elevation 197.

Pier No. 4. Boring 4 (Sheet 5) and the transverse section (Sheet 3) show the underlying soils conditions at Pier No. 4. A rod sounding was made at the opposite end of the pier to determine any dipping in the ledge surface. Since the ledge surface was noted thirteen (13) feet below the surface, spread footings might be more economical. A graph has been prepared (Sheet 7) relating the width of footing to design pressure when the footing is placed five (5) feet below the surface. If piles are used, it is believed they will be able to be driven to elevation 192.

Pier No. 5. Boring 5 (Sheet 5) and the transverse section (Sheet 3) show the underlying soils conditions at Pier No. 5. Ledge was noted twelve (12) feet below the surface at the northern end of the pier and a rod sounding at the south end encountered a refusal (believed to be ledge) eleven and one half (11½) feet below the surface. If spread footings are used they should be placed on or in the sand and gravel seven (7) feet below the surface. A graph (Sheet 8) has been drawn relating the width of footing to design pressures. If piles are used, it is believed they can be driven to the ledge surface (elevation 187).

Abutment No. 2 and Eastern Fill. Borings 8 and 9 (Sheet 6) and the transverse section (Sheet 3) show the existing soils under the proposed location of Abutment No. 2. The ledge surface was encountered approximately fifteen (15) feet below the ground surface. Since the underlying soils are in a medium to dense density, spread footings could be used. Design data is shown on Sheet 8. If the abutment is to be constructed after the fill is completed, then piles are recommended. It is believed that piles may be stopped in the vicinity of elevation 190, but with jetting, they may be able to reach the

ledge surface, five to seven (5-7) feet deeper. The existing granular soils should adequately support the proposed fill behind the embankment. Good compaction is a necessity.

SUMMARY

Because of the shallow depth to ledge, it is recommended that Abutment No. 1, and Piers 1, 2, and 3 be supported directly on the ledge. Since the cleavage angle is high, and the top surface is cracked, it is recommended that the top two (2) feet of ledge be removed before the footings are placed. Bearing pressures of the ledge should be between ten (10) and twenty (20) tons per square foot.

Spread footings are recommended on Piers 4 and 5 and Abutment No. 2. The design data for these footings is shown on Sheets 7 and 8.

If the fills are completed before the abutments are constructed, piles are recommended. Piles could be used on the piers. The depth to which it is believed piles can be driven is as follows:

Substructure	North End	South End
Abutment 1	206 (Ledge)	203
Pier 1	201 (Ledge)	205 (Ledge)
Pier 2	202 (Ledge)	198 (Ledge)
Pier 3	197	197 (Ledge)
Pier 4	192	192
Pier 5	187 (Ledge)	187 (Ledge)
Abutment 2	190	190

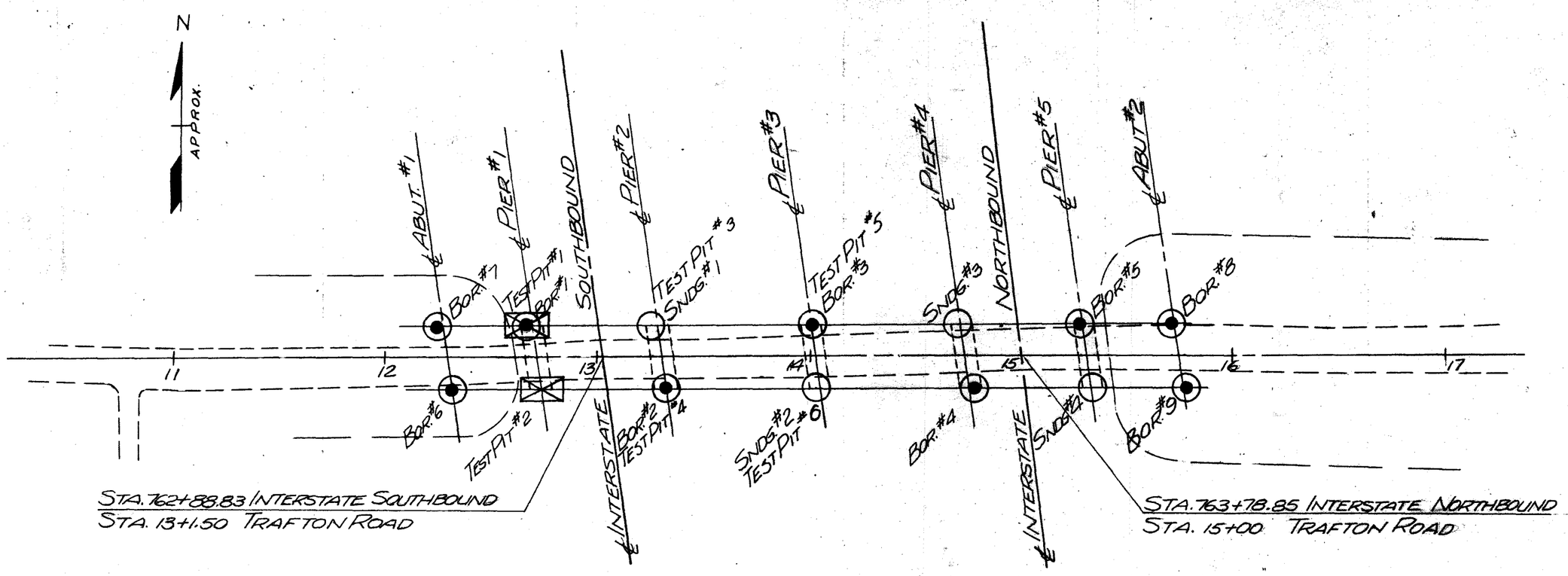
Due to the normal fluctuation of the ground water table, wooden piles are not recommended.

Good compaction in the fills is a necessity.

Report Prepared by Fred M Boyd Jr

Report Approved by Wm. R. Gorrill

William R. Gorrill
Soils Engineer



Maine State Highway Commission

PLAN & PROFILE

WATERVILLE INTERSTATE

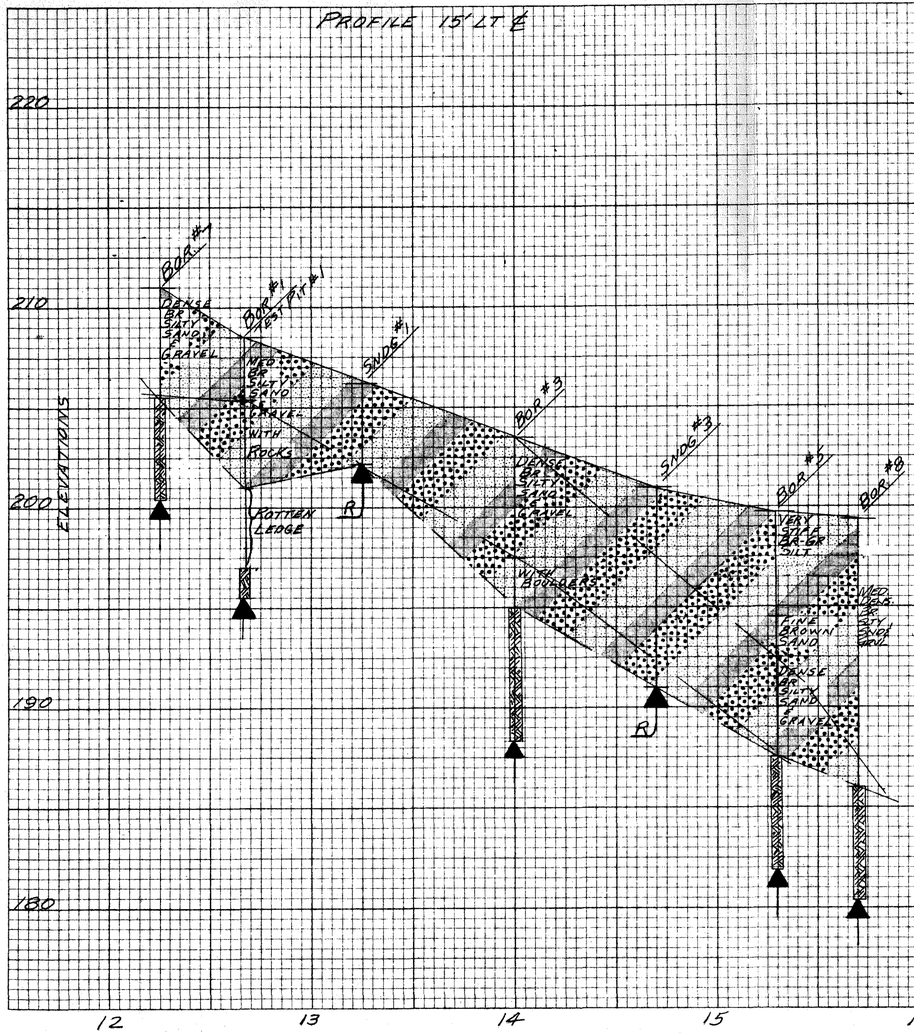
TRAFTON ROAD STRUCTURE

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

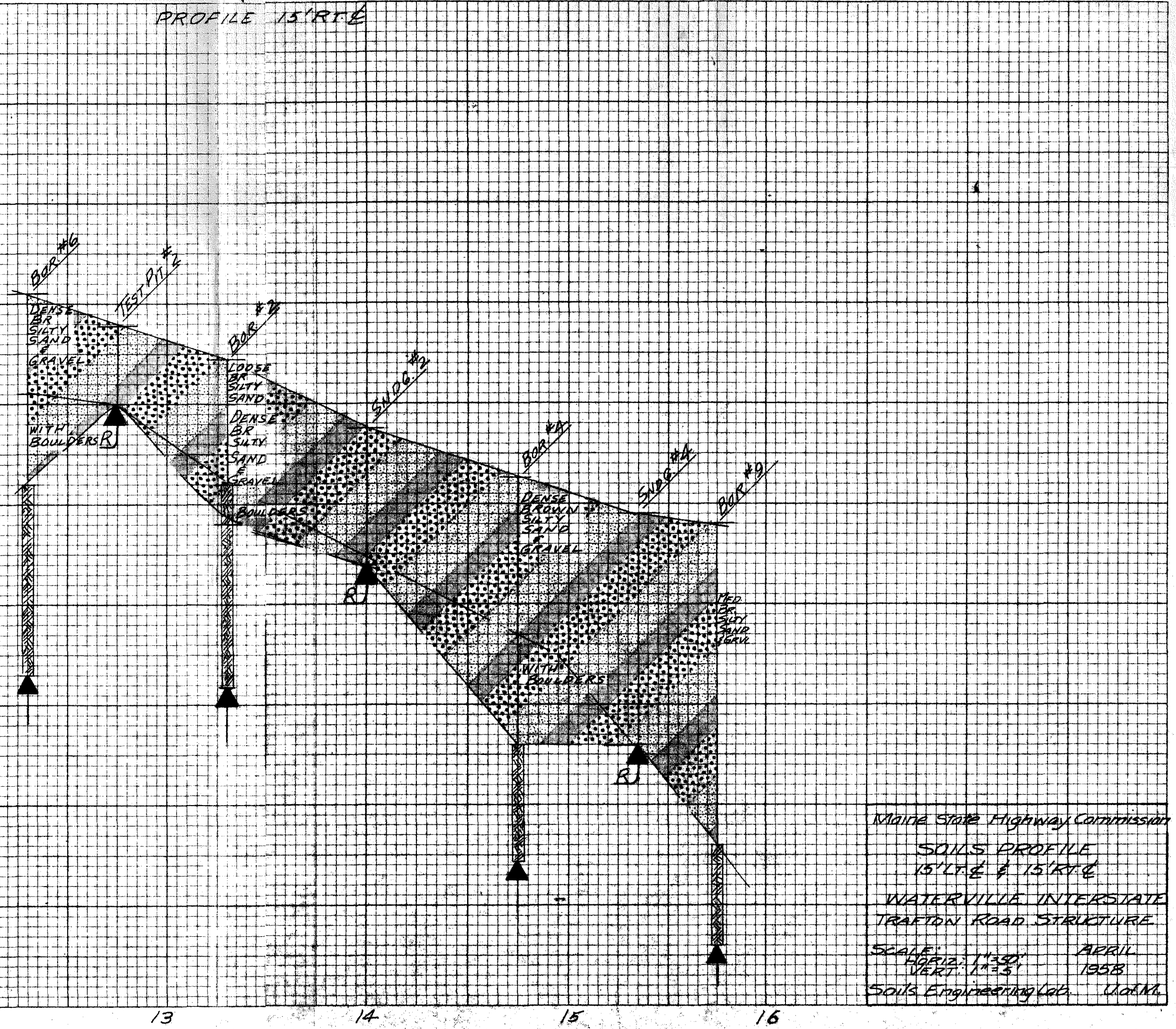
APRIL 1958

Soils Engineering Lab. U. of M.

PROFILE 15' LT ℄



PROFILE 15' RT ℄



Maine State Highway Commission

SOILS PROFILE
15' LT ℄ & 15' RT ℄

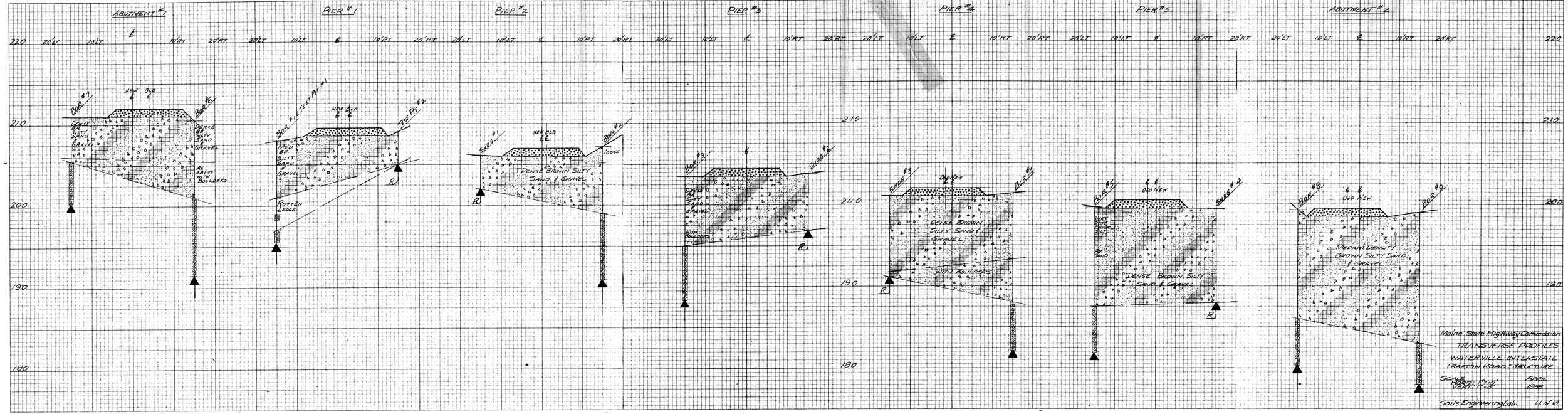
WATERVILLE INTERSTATE
TRAFTON ROAD STRUCTURE

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

APRIL
1958

Soils Engineering Lab. U. of M.

SHEET #3



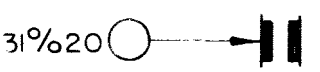
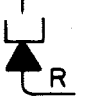
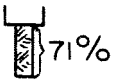
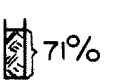
Maine State Highway Commission
TRANSVERSE PROFILES
WATERVILLE INTERSTATE
TRAFFIC Road STRUCTURE

SCALE HORIZ. 1"=10'
VERT. 1"=5'

APPD. 1958

Soils Engineering Lab. U.M.M.

KEUFFEL & ESSER CO
MADE IN U.S.A.
NO. 3400 10 DIVISIONS DRAWN PAPER
10 X 10 PER INCH

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:		

DRIVING RESISTANCE (BLOWS/FT.)

BORING NO.1 (2½" CASING)
STA. 12+67 15'Lt ℄

EL 208.25'

205

200

10

MEDIUM DENSITY BROWN SILTY SAND & GRAVEL

ROTTEN LEDGE 189 197

68%

100%

LEDGE; WELL FRACTURED CALCAREOUS PHILLITE; STEEPLY INCLINED

195.47'

BORING NO.2 (2½" CASING)
STA. 13+32 15'Rt ℄

EL. 207.20'

205

200

195

10

LOOSE BROWN SILTY SAND

DENSE BROWN SILTY SAND & GRAVEL

372 300

ROCKS 96% SAME WITH BOULDERS

27%

92%

85%

65%

LEDGE; CALCAREOUS PHILLITE; STEEPLY LINEATED

190.87'

BORING NO.3 (2½" CASING)
STA. 13+99 15'Lt ℄

EL. 203.45'

200

195

10

DENSE BROWN SILTY SAND & GRAVEL

SAME WITH BOULDERS 348 401

20%

33%

50%

LEDGE; WEATHERED CALCAREOUS PHILLITE; STEEPLY INCLINED

190

185.30'

DRIVING RESISTANCE (BLOWS/FT.)

BORING NO.4 (2½" CASING)
STA. 12+75 13'Rt ℄

EL 201.36'

200

195

10

DENSE BROWN SILTY SAND & GRAVEL

20

SAME WITH BOULDERS 96" 40%

LEDGE; PHILLITE; STEEPLY INCLINED

41%

192.19'

BORING NO.5 (2½" CASING)
STA. 13+28 15'Lt ℄

EL 199.20'

195

190

185

10

VERY STIFF BROWNISH GRAY SILT

FINE BROWN SAND

DENSE BROWN SILTY SAND & GRAVEL

10

90%

90%

LEDGE; CALCAREOUS PHILLITE STEEPLY INCLINED

181.87'

Maine State Highway Commission
DETAILED SOIL STRATIFICATION
CONSISTENCY DATA
BORING NOS. 1, 2, 3, 4, & 5
WATERVILLE INTERSTATE
TRAFFION ROAD STRUCTURE
SCALE: 1"=6' APRIL, 1958
Soils Engineering Lab.

SHEET # 5

DRIVING RESISTANCE
(BLOWS/FT.)

BORING NO. 6 (2½" CASING)
STA. 12+31 15' RT. ℄

EL. 210.55'

0 10 40 60

DENSE BROWN SILTY SAND & GRAVEL

205 — 10

SAME WITH BOULDERS

100
155
205

200 — 66%

144%

30%

LEDGE; PHILLITE; STEEPLY INCLINED

195 — 86%

76%

191.55'

DRIVING RESISTANCE
(BLOWS/FT.)

BORING NO. 8 (2½" CASING)
STA. 15+70 15' LT. ℄

EL. 199.38'

0 20 40 60

195 — 10

MEDIUM DENSITY BROWN SILTY SAND & GRAVEL

50
114
112

190 — 20

81
82

185 — 24%

LEDGE; FRACTURED CALCAREOUS PHILLITE; STEEPLY INCLINED

30%

182.30'

BORING NO. 7 (2½" CASING)
STA. 12+25 15' LT. ℄

EL. 211.04'

0 20 40 60

210

DENSE BROWN SILTY SAND & GRAVEL

225 — 10

80%

70%

LEDGE; CALCAREOUS PHILLITE; STEEPLY INCLINED

90%

220.37'

BORING NO. 9 (2½" CASING)
STA. 15+76 15' RT. ℄

EL. 194.28'

0 20 40 60

195

10

MEDIUM DENSITY BROWN SILTY SAND & GRAVEL

81
101
86
95

190

20

185

30 — 18+

LEDGE; FRACTURED CALCAREOUS PHILLITE; STEEPLY INCLINED

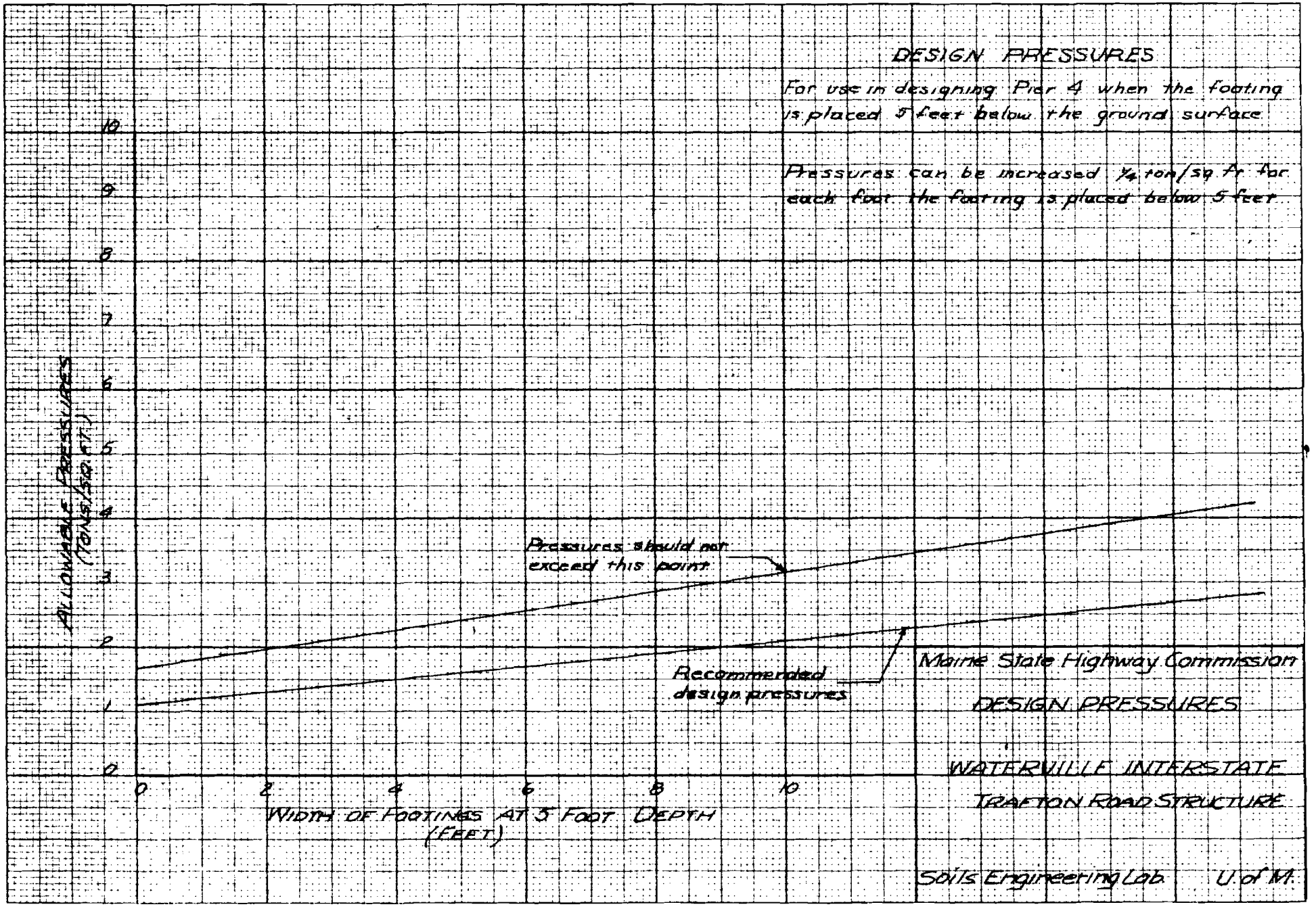
38%

190

182.09'

Maine State Highway Commission
DETAILED SOIL STRATIFICATION
&
CONSISTENCY DATA
BORING NOS. 6, 7, 8, & 9
WATERVILLE INTERSTATE
TRAFTON ROAD STRUCTURE
SCALE: 1"=6' APRIL 1959
Soils Engineering Lab U. of M.

SHEET #9



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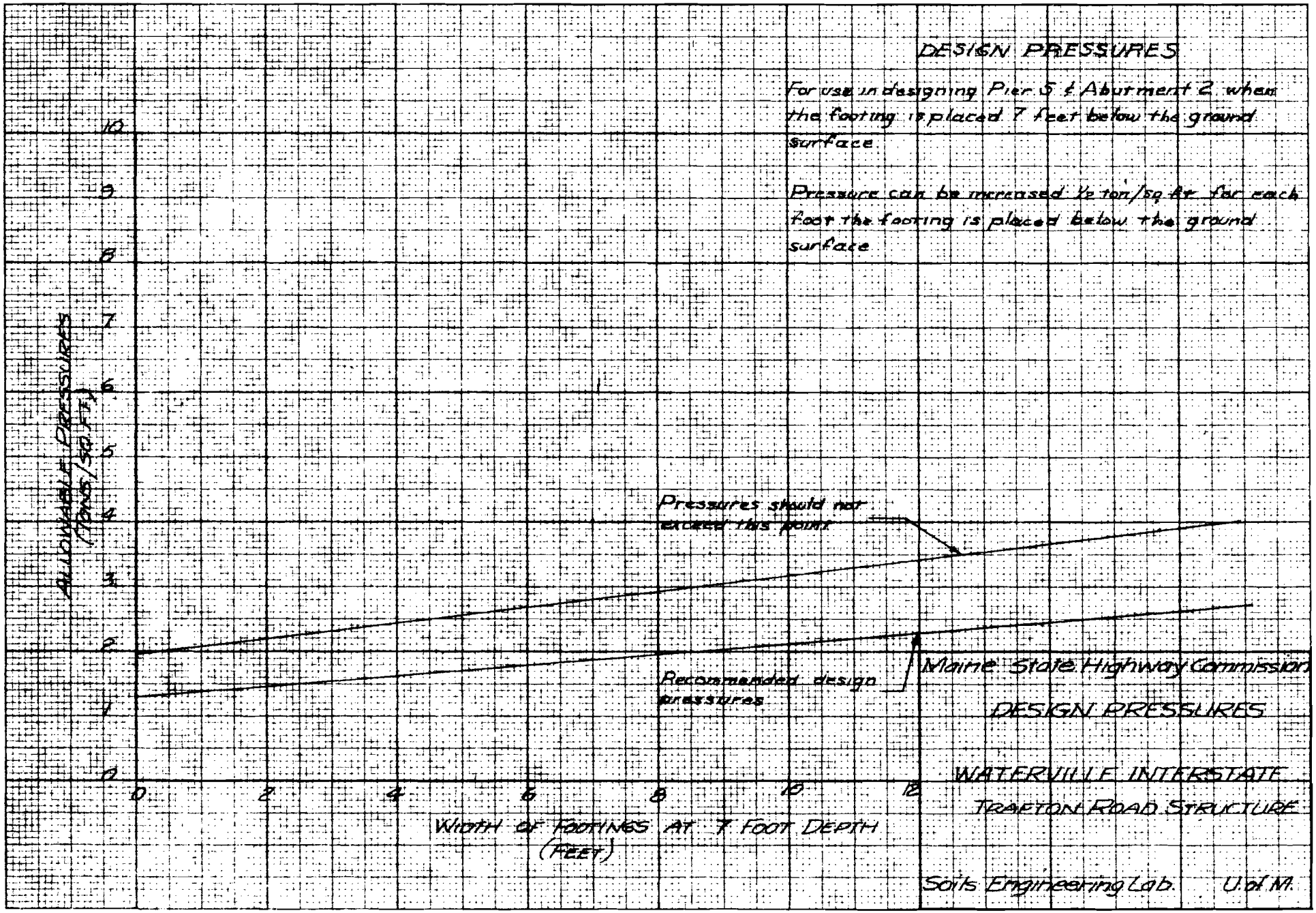

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