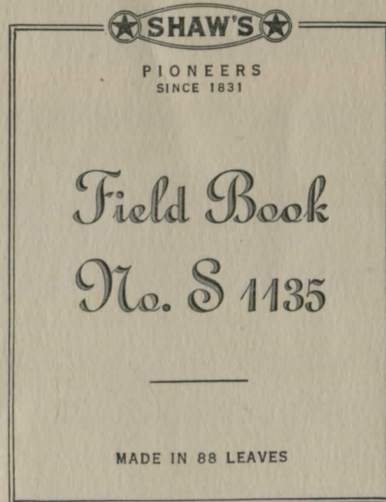


FIELD BOOK

S 1135

PLEASE RETURN TO
GEAUGA COUNTY ENGINEER
COURT HOUSE
CHARDON, O.
PHONE 250-X

Bridge Road No. 125 A
X-Sections - pg. 19-20
Slope stakes - pg. 22-23
Valley view Dr. Levels pg. 40
151



A Product of Wilson-Jones Co.
Made in U. S. A.

Please return to the
County Engineers Office
Chardon Ohio

PAPER AND LITHOGRAPHING
GUARANTEED WATERPROOF

CH #13 Sec F

Align't & topo

P₃ 25 to 27

Profile & X Sec

P₃ 28 to 31

BM # Profile

(1975) P₃ 48

Bridge Rd (TH 125) 1966 work

34

T.H. 125

Location Bridge Road
Sidestakes set 25' Pter South of E

8

7

6

5

4

3

2

1

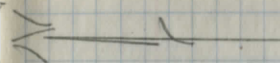
I.P. 1d. Aug 55

Sta 0+00 Beginning of Imp.

5/4/36

Raney
Strong
Dartun

Middlefield Twp.



E
60 ft. wide
Vol. D of 9 (Rd Rec.)
1842 = 60 ft.

12" CMP & CIP
45' long P.L.R.T.

SEW ck 53
CEI pole 36.82

Obs
5850.00 E

stump covered with
poison 1/4 52

BM Spike
30' Elm

43.28

30'30" 0.718

Middlefield Center
C.H. #2 (Madison Rd)

South Road
385.23

29.15

SEW N. side
CEI Guide Pole
576643

Gone
SEW
3-8" Apple

out of view
0.212

20

19

18

17

16

15

14

13

12

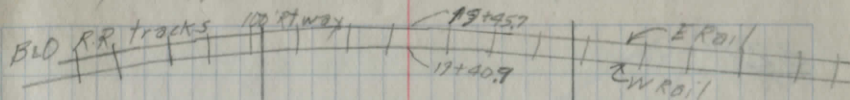
11

10

9

8

12" VSP poor condition 17+62 →
15' long Fl. Rt.



4x1 Conc. Slab Top
Poor condition.
Fl. Rt. 17+07 →

10" CMP
18' long Fl. Rt. 12+99 →

32

31

Sta 30 + 68⁹⁰ POT ^{20'}

30

pipe
set
fd 8-6-43

29

28

27

Sta 26 + 14¹³ PI Def Lt. 0° 45'

stake
set

26

25

24

23

Sta 22 + 50³⁶ POT ^{25'}

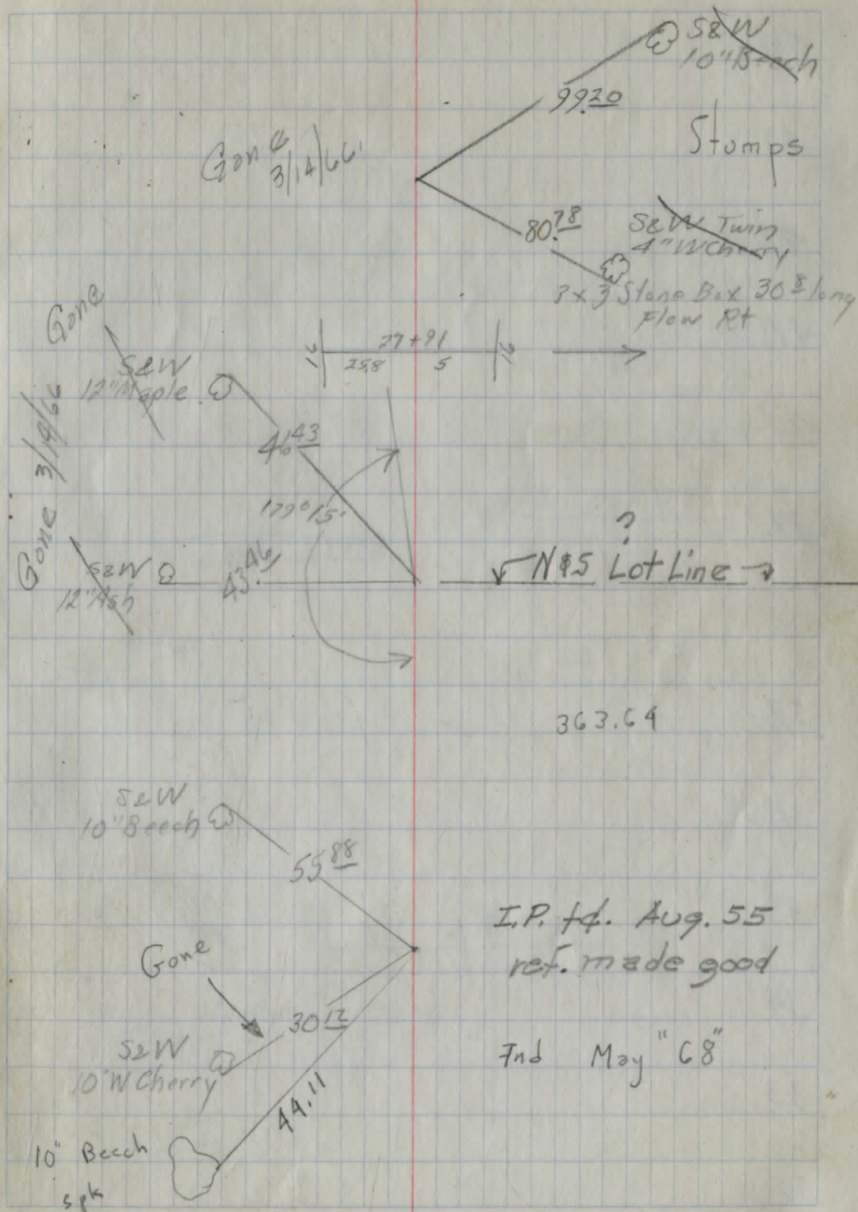
PIPE
SET

fd 8-6-43

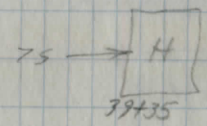
22

21

20

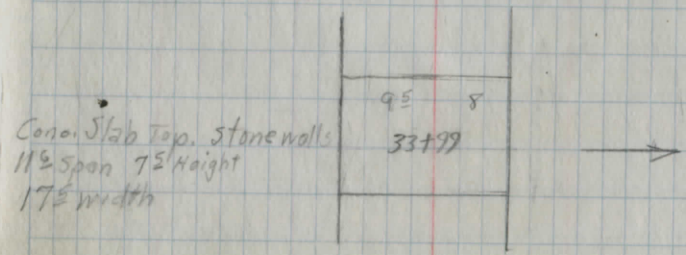
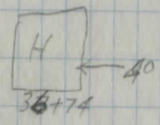


44
43
42
41
40
39
38
37
36
35
34
33
32



39+00 Drive

Drive 38+20



Cono. Slab Top. stone walls
11'5" span 7'5" height
17'5" width

56

55

54

Sta 53+57²⁵ POT

Pipe
set.

53

52

51

50

49

48

47

46

45

44

Gone
3/14/66

Ford
← 12.44 → pipe fd P.L.
Kivimäki

Drive 48+10
Appr. P.L. 48+05

68

67

66

65

64

63

62

61

60

59

58

57

56

$$\frac{60+22}{x}$$

12" Sec CIP
16" long F/RT

$$\frac{56+73}{11 \quad 5} \longrightarrow$$

79

78

77

76

75

Sta 74+46²⁰ POT

74

73

72

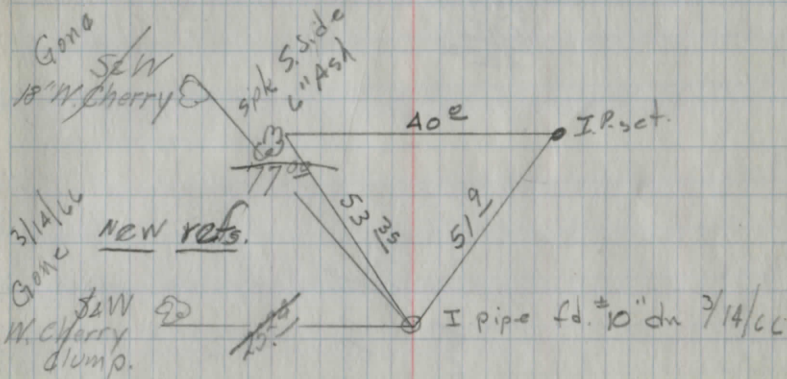
71

70

69

68

18" CI P 12' long
EI RT $\frac{77+32}{3 \quad 9} \rightarrow$



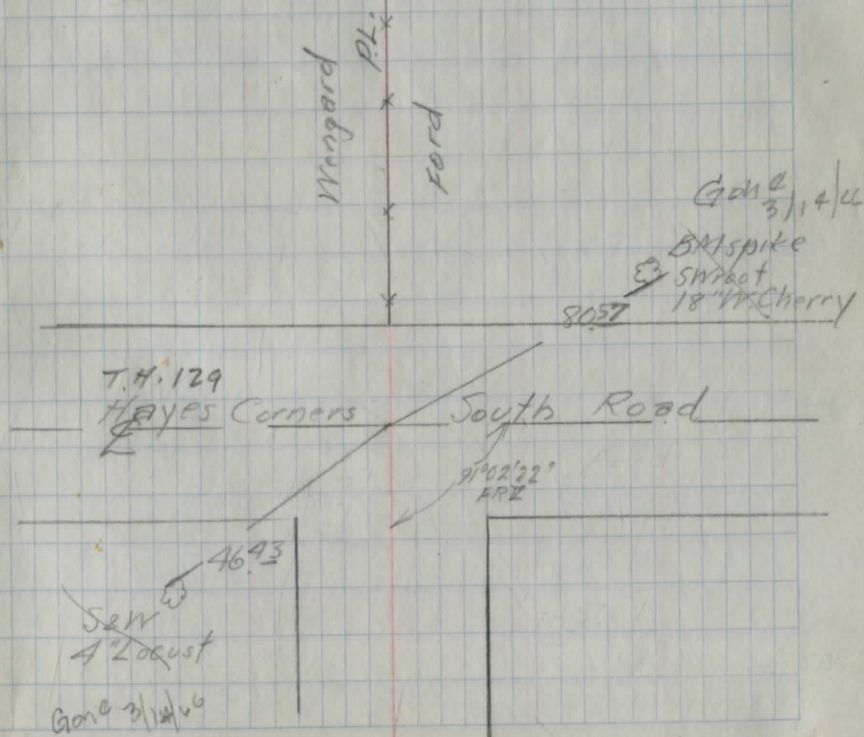
1.518 miles
 5280 / 8013.02
 528
 2733
 2640
 930
 528
 4022

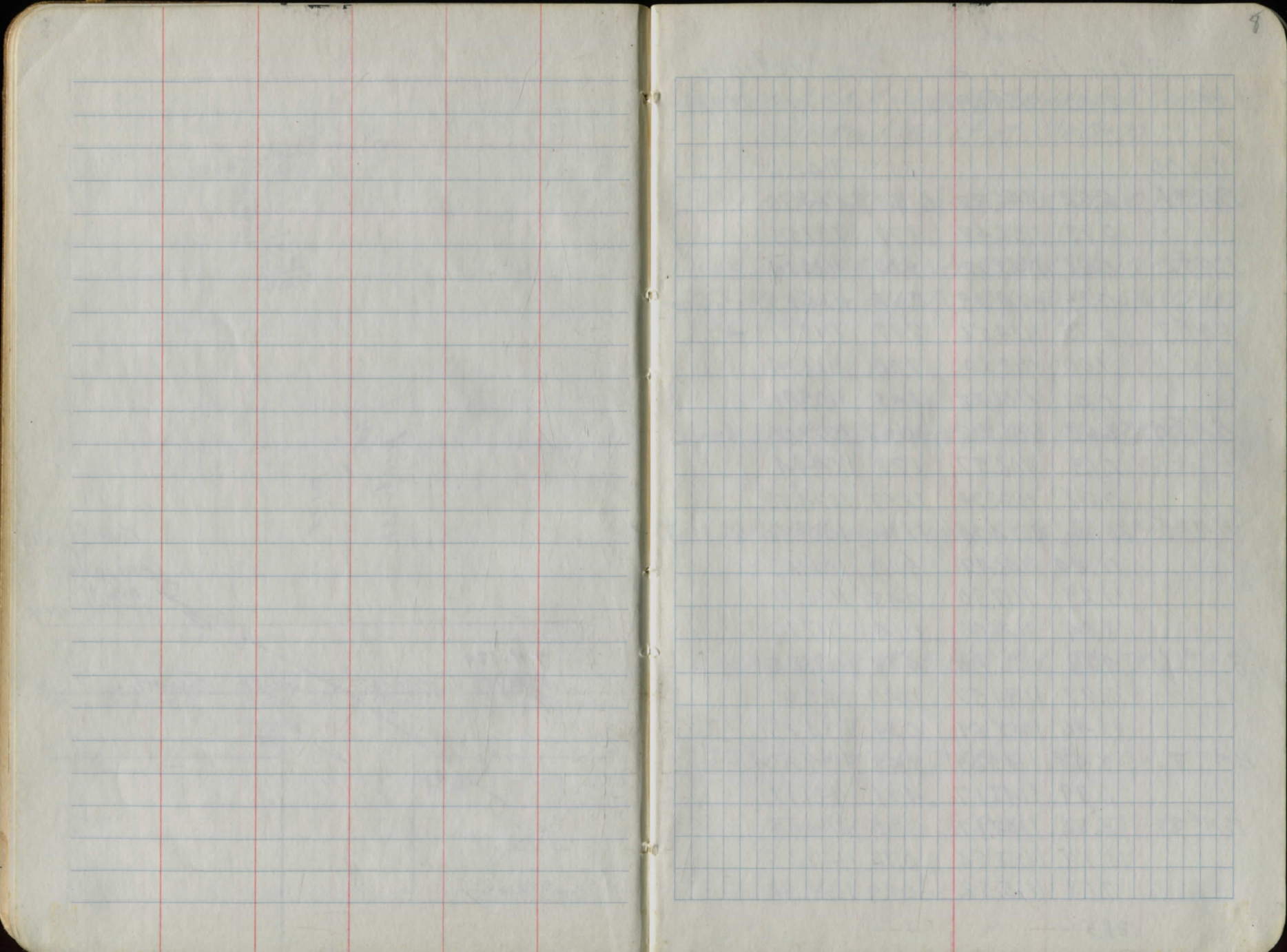
Sta 80+13.02 End of Project

Pipe
 Found

80

79





Check Levels

Profile Levels and Cross Sections

BM#	3.40	1150.69		1147.29
0+00			8.1	1142.6
BM#1	2.62	1146.32	6.99	1143.70
	0.93	1138.48	8.77	1137.55
BM#2	0.68	1129.92	9.24	1122.24
	0.73	1124.98	5.67	1124.25
BM#3	6.75	1124.56	7.17	1117.81
	1.00	1118.24	7.32	1117.24
	0.41	1106.22	12.43	1105.81
BM#4	6.62	1106.22	6.62	1099.60
	2.13	1106.57	1.78	1104.44
	0.44	1094.94	12.07	1094.50
BM#5	11.06	1094.94	11.06	1083.88
	11.84	1106.49	0.29	1094.65
	11.29	1117.30	0.48	1106.01
	8.84	1126.00	0.14	1117.16
BM#6	4.78	1126.00	4.78	1121.22
	8.97	1134.57	0.40	1125.60
	11.46	1145.69	0.34	1134.23
BM#7	8.43	1145.69	8.43	1137.26
	6.99	1148.17	4.51	1141.18
BM#8	3.82	1148.17	3.82	1144.35
	11.19	1158.54	0.82	1147.35
	7.18	1165.52	0.20	1158.34
	131.5%		113.33	

Corrected 1137.36

Spike Wroot 24" Apple 90' East Middlefield Center South Road 400' Lt of Sta 0+90

Spike Nroot 30" Elm 25' Rt of Sta 0+30

Spike Sroot 24" Hickory 75' Lt of Sta 11+50
USGS BM Bronze tablet J13-1934 40' Lt of Sta 19+80 ✓

Spike Sroot 10" Ironwood 30' Lt of Sta 27+30

Xcut SW of S Headwall Bridge 8' Rt of Sta 33+90 ✓

2 Spikes Nroot 18" Pine 40' Rt of Sta 39+75

Spike SE root 8" Elm 25' Lt of Sta 50+35

Spike NE root 24" Elm 35' Rt of Sta 58+85

		1165.52		
BM# 9	2.81	1165.52	2.81	1162.71
	6.50	1168.53	3.49	1162.03
	0.85	1157.07	12.31	1156.22
BM# 10			5.36	1151.71

Spike SWroot 18" Apple 25' Lt & Sta 69+80

Spike SWroot 18" W Cherry 80' SE of Sta 80+13
E. side of Hayes Cor. South Road.

Profile Levels.

BM#10	5.36	1157.07		1151.71
80+13			6.4	50.7
79+32			8.4	48.7
79			7.9	49.2
78			6.5	50.6
77			4.2	52.9
76			0.1	57.0
	11.60	1168.65	0.02	1157.05
75			5.8	62.9
74+46			4.0	64.7
74			4.1	64.6
73			5.3	63.4
72			6.6	62.1
	4.01	1165.66	7.00	1161.65
71			4.1	61.6
70			4.5	61.2
BM#9			2.96	1162.70 1162.71
69			4.9	60.8
68			5.4	60.3
67			6.6	59.1
	1.65	1159.22	7.39	1158.27
66			2.7	57.2
65			4.5	55.4
64			5.7	54.2

$$\frac{100}{43}$$

$$\frac{100}{79}$$

$$\frac{FI}{10.4} \quad \frac{TO}{8.8} \quad \frac{TO}{9.0} \quad \frac{FI}{10.5} \quad \frac{100}{12.2}$$

1159.92

63		7.3	52.6	
62		10.6	49.3	
	0.71	1148.68	1195	1147.97
61		24	46.3	
60		4.5	44.2	
59		5.8	42.9	
BM#8		4.35	1144.33	1144.35
58		6.4	42.3	
57		7.1	41.6	
	4.75	1146.11	7.32	1141.36
56+73		50	41.1	
56		4.8	41.3	
55		4.0	42.1	
54		4.6	41.5	
53		4.8	41.3	
52		6.4	39.7	
51		8.8	37.3	
BM#7		8.76	1137.35	1137.36
	0.71	1138.06		
50		2.3	35.8	
49		4.5	33.6	
48		5.7	32.4	
47		7.5	30.6	
46		9.0	29.1	
	2.12	1130.71	9.47	1128.59

$\frac{FI}{6.9}$	$\frac{TO}{5.9}$	$\frac{TO}{60}$	$\frac{FI}{70}$	$\frac{125}{72}$	$\frac{250}{82}$
------------------	------------------	-----------------	-----------------	------------------	------------------

1130.71

45 3.3 27.4

44 4.5 26.2

43 5.5 25.2

42 6.8 23.9

4.1 8.2 22.5

3.38 1124.48 9.62 1121.09

40 3.8 20.7

BM#6 3.24 1121.24 1121.22

3.24 1124.46

39 6.3 18.2

38 8.3 16.2

Profile Levels

BM#1	272	1146.42		1143.70	
0+18			40	42.4	
1			40	42.4	
2			46	41.8	
3			51	41.3	
4			62	40.2	
5			78	38.6	
6			87	37.7	
	145	1138.58	9.29	1137.13	
7			19	36.7	
8			34	35.2	
9			52	33.4	
10			63	32.3	
11			79	30.7	
BM#2			936	1129.22	1129.24
	088	1130.12			
12			28	27.3	
12+99			48	25.3	
13			48	25.3	
14			47	25.4	
15			35	26.6	
16			36	26.5	
	053	1127.10	3.55	1126.57	
BM#3			927	1117.83	1117.81

Spike N root 30" Elm 25' RT & Sta 0+30

FI	TD	TD	FI	100
47	40	43	53	68

Spike S root 24" Hickory 75' LT & Sta 11+50

FI	TD	TD	FI	100
64	55	58	67	74

USGS BM Bronze Tablet J13-1934 40' LT & Sta 19+80

2/11/36

BM#3 11.35 1129.16 1117.81

15 24 26.8

16 2.7 26.5

17 4.4 24.8

17+90 11.0 18.2

BM#3 1.74 1119.55 1117.81

18+30 5.6 14.0

19 7.1 12.5

19+07 6.9 12.7

19+41 2.52 17.03

19+46 2.37 17.18

19+62 2.9 16.7

20 3.0 16.6

BM#3 7.51 1125.32 1117.81

20+50 6.7 18.6

21 6.9 18.5

$\frac{25}{24} - \frac{9}{37} \frac{7}{28} \frac{4}{28} \frac{9}{28} \frac{11-12}{38} \frac{15}{29} \frac{22}{28}$

$\frac{25}{24} - \frac{11}{37} \frac{9}{30} \frac{7}{29} \frac{7}{39} \frac{9}{28} \frac{11}{26} \frac{25}{26}$

$\frac{25}{34} \frac{13}{30} \frac{10}{53} \frac{8}{48} \frac{5}{4.5} \frac{8}{55} \frac{11}{39} \frac{17}{35} \frac{25}{58}$

$\frac{25}{90} - \frac{15}{119} \frac{10}{11.5} \frac{7}{11.3} \frac{6}{85} \frac{9}{75} \frac{19-25}{75}$

$\frac{25}{43} \frac{14}{41} \frac{11}{52} \frac{9}{63} \frac{6}{56} \frac{4}{60} \frac{6}{65} \frac{9}{40} \frac{25}{34}$

$\frac{25}{7.9} - \frac{16-9}{92} \frac{4}{73} \frac{7}{7.4} \frac{13}{106} \frac{25}{11.0}$

$\frac{33}{90} \frac{F1}{103} \frac{5}{70} \frac{4}{70} \frac{F1}{11.1} \frac{80}{13.7}$ ← F1, 2x1 Box

$\frac{100}{1.25} \frac{100}{3.50}$

$\frac{30}{40} \frac{F1}{51} \frac{79}{42} \frac{1}{30} \frac{70}{29} \frac{F1}{50} \frac{10}{54} \frac{30}{65}$

$\frac{25}{1.4} \frac{7}{1.7} \frac{5}{23} \frac{3}{31} \frac{6}{26} \frac{15}{32} \frac{17}{27} \frac{25}{34}$

USGS BM Bronze Tablet 40' Ld Sta 19+80

$\frac{18}{55} \frac{12}{52} \frac{5}{58} \frac{2}{80} \frac{6}{65} \frac{14}{73} \frac{15}{67} \frac{18}{66} \frac{25}{72}$

$\frac{25}{61} - \frac{7}{65} \frac{5}{73} \frac{10}{70} \frac{12}{75} \frac{25}{84}$

112532

22		4.7	20.6	
22+60		3.8	21.5	
23		44	20.9	
24		63	19.0	
25		80	17.3	
	0.81	1117.75	8.38	1116.74
26		80	09.8	
26+55		132	1104.6	
	0.72	1105.63	12.84	1104.91
27		79	1097.7	
BM#4		603	1099.60	1099.60
	0.61	1094.22	12.02	1073.61
27+45		4.6	1089.6	
27+91		80	1086.2	
28+10		80	1086.2	
28+40		7.2	1087.0	

$$\frac{-18}{45} \quad \frac{12}{47} \quad \frac{10}{59} \quad \frac{7}{50} \quad \frac{6}{49} \quad \frac{9}{59} \quad \frac{10}{46} \quad \frac{25}{48}$$

$$\frac{25}{40} \quad \frac{13}{38} \quad \frac{11}{50} \quad \frac{8}{39} \quad \frac{5}{42} \quad \frac{8}{52} \quad \frac{10}{38} \quad \frac{25}{39}$$

$$\frac{25}{43} \quad \frac{12}{46} \quad \frac{11}{55} \quad \frac{8}{45} \quad \frac{5}{46} \quad \frac{7}{55} \quad \frac{9}{45} \quad \frac{25}{42}$$

$$\frac{25}{58} \quad \frac{-16}{58} \quad \frac{12}{69} \quad \frac{10}{69} \quad \frac{4}{64} \quad \frac{6}{71} \quad \frac{2-25}{67}$$

$$\frac{25-17}{66} \quad \frac{11}{86} \quad \frac{9}{81} \quad \frac{4}{78} \quad \frac{2}{81} \quad \frac{5}{85} \quad \frac{6}{70} \quad \frac{15}{74} \quad \frac{25}{76}$$

$$\frac{25}{73} \quad \frac{21}{74} \quad \frac{12}{77} \quad \frac{11}{75} \quad \frac{1}{78} \quad \frac{9}{72} \quad \frac{25}{78} \quad - \quad -$$

$$\frac{30}{37} \quad \frac{23}{37} \quad \frac{12}{13.2} \quad \frac{11}{12.9} \quad \frac{2}{13.7} \quad \frac{3}{13.0} \quad \frac{12}{6.5} \quad \frac{20}{73} \quad \frac{30}{85}$$

$$\frac{-31}{-22} \quad \frac{14-6}{75} \quad \frac{13}{72} \quad \frac{3}{7.9} \quad \frac{7}{6.6} \quad \frac{10}{78} \quad \frac{19}{13.0} \quad \frac{22}{15.6}$$

Spike Sroot 10" Ironwood 30' Lt & Sta 27+30

$$\frac{-25}{11.6} \quad \frac{16}{1.8} \quad \frac{3}{7.4} \quad \frac{9}{10.8} \quad \frac{21}{15.0} \quad \frac{35}{16.3} \quad -$$

$$\frac{75}{149} \quad \frac{41}{17.1} \quad \frac{26}{70} \quad \frac{26}{10.4} \quad \frac{road}{5} \quad \frac{5}{9.8} \quad \frac{5}{13.3} \quad \frac{41}{17.2} \quad \frac{100}{19.0}$$

$$\frac{40}{14.3} \quad \frac{27}{13.4} \quad \frac{14}{47} \quad \frac{5}{48} \quad \frac{4}{12.5} \quad \frac{14}{14.4} \quad \frac{25}{15.7}$$

$$\frac{38}{13.5} \quad \frac{27}{13.1} \quad \frac{13-3}{48} \quad \frac{6}{11.9} \quad \frac{12}{14.0} \quad \frac{23-}{15.5}$$

109422

29+00		0.6	1093.6
	11.26	1104.68	0.80 1093.42
29+00			
29+50		52	1099.5
30		1.0	1103.7
	7.19	1110.65	1.22 1103.46
30			
30+69		48	1105.9
31		6.8	1103.9
31+55		11.7	1099.0
	1.17	1098.95	12.87 1097.78
32+05		7.0	1092.0
	0.84	1087.78	12.01 1086.94
32+50		1.9	1085.9
33		4.6	1083.2
33+99		4.6	1083.2
BM#5	12.62	1096.50	3.89 1083.90 1083.88

$\frac{42}{10.4}$	$\frac{29}{6.1}$	$\frac{18}{10.3}$	$\frac{12}{0.4}$	$\frac{2}{1.0}$	—	—	—			
					$\frac{18}{10.3}$	$\frac{2}{56}$	$\frac{17}{54}$	$\frac{31}{2.6}$		
$\frac{30}{1.9}$	$\frac{22}{1.4}$	$\frac{13}{4.9}$	$\frac{11}{5.6}$	$\frac{1}{5.7}$	$\frac{8}{20}$	$\frac{13}{+27}$	$\frac{26}{+29}$	$\frac{35}{+37}$		
—	—	$\frac{11}{1.5}$	$\frac{10}{1.3}$	$\frac{2}{1.3}$	—	—	—			
$\frac{30}{1.6}$	$\frac{20}{7.3}$	$\frac{14}{5.5}$	$\frac{11}{10}$	$\frac{10}{10}$	$\frac{2}{0.7}$	$\frac{16}{0.1}$	$\frac{30}{+0.2}$			
—	$\frac{30}{0.0}$	$\frac{19}{0.0}$	$\frac{9}{5.5}$	$\frac{5}{5.1}$	$\frac{6}{5.6}$	$\frac{14}{0.4}$	$\frac{20}{0.2}$	$\frac{20}{0.2}$		
—	$\frac{30}{0.0}$	$\frac{17}{0.0}$	$\frac{7}{6.9}$	$\frac{6}{7.0}$	$\frac{8}{7.6}$	$\frac{18}{1.8}$	$\frac{25}{1.3}$	$\frac{35}{1.0}$		
$\frac{-18}{+0.7}$	$\frac{5}{12.0}$	$\frac{3}{11.7}$	$\frac{8}{11.8}$	$\frac{9}{12.5}$	$\frac{18}{6.7}$	$\frac{28}{7.2}$	up 11 for 10			
$\frac{35}{18.3}$	$\frac{25}{16.6}$	$\frac{15}{13.0}$	$\frac{6}{6.9}$	$\frac{7}{7.1}$	$\frac{8}{6.8}$	$\frac{21}{16.2}$	$\frac{32}{18.4}$			
$\frac{35}{8.3}$	$\frac{24}{8.3}$	$\frac{16}{7.5}$	$\frac{5}{1.7}$	$\frac{6}{1.9}$	$\frac{16}{8.5}$	$\frac{40}{7.8}$	—			
—	$\frac{31}{8.5}$	$\frac{13}{8.6}$	$\frac{5}{4.8}$	$\frac{6}{4.6}$	$\frac{13}{9.6}$	$\frac{25}{10.0}$	—			
$\frac{100}{12.3}$	$\frac{F1}{14.3}$	$\frac{T0}{6.6}$	$\frac{10}{3.8}$	$\frac{9}{5.1}$	$\frac{6}{4.5}$	$\frac{7}{3.8}$	$\frac{T0}{6.7}$	$\frac{F1}{14.3}$	$\frac{125}{13.3}$	$\frac{250}{16.0}$

X cot SW of Headwall of Bridge 8' R/L Sta 33+90

1096.50

34+50		10.5	1086.0
35		6.0	1090.5
	11.67	1107.33	0.84 1095.66
36		3.3	1104.0
	10.01	1117.04	0.30 1107.03
36+30		9.4	1107.6
37		3.5	1113.5
	7.31	1123.23	1.12 1115.92
38		6.9	1116.3
39		5.1	1118.1
BM #6		2.01	1121.22 1121.22

$\frac{37}{16.3}$	$\frac{22}{13.6}$	$\frac{19}{15.0}$	$\frac{6}{10.0}$	$\frac{5}{10.4}$	$\frac{6}{10.2}$	$\frac{15-16}{12.4}$	$\frac{20}{11.3}$	$\frac{33}{11.8}$
$\frac{31}{11.0}$	$\frac{20}{10.5}$	$\frac{10}{6.6}$	$\frac{5}{6.0}$	$\frac{11}{5.9}$	$\frac{14}{6.8}$	$\frac{21}{3.0}$	$\frac{28}{4.0}$	$\frac{37}{5.4}$
$\frac{33}{15.7}$	$\frac{21}{15.2}$	$\frac{10-8}{4.5}$	$\frac{5}{3.3}$	$\frac{8}{3.2}$	$\frac{11}{4.3}$	$\frac{14}{10.7}$	$\frac{25}{1.0}$	same as
$\frac{30}{2.4}$	$\frac{18}{2.8}$	$\frac{8}{11.0}$	$\frac{5}{9.3}$	$\frac{8}{9.6}$	$\frac{9}{10.4}$	$\frac{16-23}{4.8}$	$\frac{33}{6.6}$	
$\frac{-20}{10.2}$	$\frac{15}{0.0}$	$\frac{7-8}{5.6}$	$\frac{6}{3.6}$	$\frac{6}{3.6}$	$\frac{8.9}{4.7}$	$\frac{14}{0.3}$	$\frac{16-19}{10.2}$	$\frac{30}{1.0}$
$\frac{25}{7.3}$	$\frac{11}{6.7}$	$\frac{9.8}{8.5}$	$\frac{5}{6.9}$	$\frac{8}{6.9}$	$\frac{10}{8.9}$	$\frac{13}{7.3}$	$\frac{25}{7.7}$	
$\frac{30-12}{3.7}$	$\frac{9}{5.2}$	$\frac{7}{6.2}$	$\frac{5}{5.1}$	$\frac{8}{5.1}$	$\frac{10}{5.9}$	$\frac{13}{4.6}$	$\frac{25}{4.3}$	

25 Spites N. root 18" Pine 40' RT E Sta 39+75

X SECTIONS BRIDGE

ROAD

B.M.	5.61	1123.42		1117.81
T.P.	2.87	1124.08	2.23	1121.19
23			3.33	1120.8
24			5.0	1119.1
25			6.7	1117.4
T.P.	8.45	1120.45	12.08	1112.00
26			10.0	1110.5
T.P.	0.22	1112.22		1112.00
27			14.25	1098.0
T.P.	0.17	1099.88	12.51	1099.71
27+90	culvert		10.6	1089.3
T.P.	4.85	1095.25	9.48	1090.40
28			6.9	1088.4
	6.80	1097.20		1090.40
29			3.3	1093.7
T.P.	10.99	1107.76	0.43	1096.77
29				

N										S										
4.7	4.5	4.6	6.0	5.4	5.0	5.4	6.1	5.5	5.3	5.5										
30	24	16	13	11.5	7	4	5.5	7	10.5	30										
5.8	5.4	6.9	6.4	7.0	7.4	6.2	5.9	6.4												
30	19.5	16.5	6	4.5	6.5	9	14.5	30												
25																				
4.4	4.1	4.0	9.1	9.7	9.5	9.7	4.0	5.0												
30	27	21.5	16.5	14	6.5	2.5	9.5	30												
5.7	5.9	13.1	13.3	13.4	14.3	13.1	13.7	18.7	22.5											
30	28.5	19	16.5	7.5	3	6	11	16	30											
15.9				9.2	17.4	17.4		16.0												
26				9	4	14		15												
hdwl				travt	on barrel			hdwl												
6.2	5.0	4.8	5.3	13.1	17.0	13.8	14.2													
17.5	14.5	9	4.5	3	30	24	30													
± 7.5	4.1	2.7	4.0	3.5	3.0	3.3														
30	21	18.5	16	14	8	3.5														
tr. t																				
										1099.0										
										8.8										
										8										
										1099.6										
										8.2										
										14										
										1101.8										
										6.0										
										27										

30 3.9 1103.9

30+60 .1.9 1105.9

T.P. 6.93 1112.44 2.25 1105.51
I.P. at P.I.

31 8.5 1103.9

T.P. 1.09 1106.60 1105.51

32 13.4 1093.2

T.P. 0.15 1093.82 12.93 1093.67

T.P. 4.56 1087.97 10.41 1083.41

33 4.3 1083.7

T.P. 6.30 1089.71 1083.41

33+80 6.5 1083.2

+90⁹⁹ Bridge 58 1083.9

T.P. 13.19 1102.27 0.63 1089.08

35 11.6 1090.7

T.P. 11.27 1113.33 0.21 1102.06

36 9.3 1104.0

T.P. 8.66 1121.45 0.54 1112.79

37 8.0 1113.5

38 5.0 1116.5

+2.2 4.1 4.2 4.0 3.7 +2.6 +3.0
20.5 13.5 11.5 10 4 14 30
30

+3.0 2.6 2.5 2.4 +2.8 +3.1 +2.9
20 12 10 9 13 16 30
30

1.6 1.7 9.1 9.1 9.2 3.7 2.7 2.5
30 17 10 8 11 16 22 30

18.5 13.6 13.7 14.4 20.0 21.4
19 8 7 11.5 19 30
30

8.6 9.3 8.3 4.6 4.6 9.2 9.8 10.3
30 18 11.5 5.5 7 13 19 30

13.9 14.0 11.6 6.7 6.8 12.2 12.4
30 22 13 5 6 8 30

5.7 5.8 5.7
8 8.5
Hdwl Hdwl

4.6 5.3 13.2 12.0 11.7 13.2 8.9 8.8 9.4 10.5
30 20 10.5 8 6 15 19 21 22 30

1.0 1.3 10.1 9.8 9.7 10.5 5.1 7.5
24 19 11.5 6.5 11 13 16.5 30
30

4.4 4.9 10.5 10.3 8.5 8.4 9.0 4.4 5.5
30 14.5 11 8 6 10 12.5 16.5 31

5.5 5.1 5.9 6.7 5.6 5.4 6.3 5.5 6.7
30 17.5 9 7.5 5 8 10 12.5 30

39			3.0	1118.5
T.P.	7.03	1125.48	3.00	1118.45
40			4.9	1120.6
B.M.			4.22	1121.26 (1121.22)

38+10

36±60 Begin Lawn
 right shift const
 ± 5' 50" in front
 of house

38+10

N side

End Lawn

36+60 to 37+10

55' House

to 36+80

7 Lg trees
along bank

35±70 end fill bog cut both sides

31+70

27'

24' Map

31+55

23'

30" "

29+18

25'

14" "

29+40

24'

16' Map

29+0

ch section N side

28+70

"

"

5"

27+30

"

"

N"

27+0

"

"

S"

26+45

± 30'

2 Map

25+80

± 26'

16" Oak

B.M.	7.28	1125.09		1117.81	Grade
T.P.	0.65	1114.96	10.78	1114.31	
T.P.	0.22	1102.72	12.46	1102.50	
27					1098.0
T.P.	1.16	1091.64	12.24	1190.48	
28					1090.6
	7.86	1098.34		1190.48	
T.P.	9.32	1107.44	0.22	1098.12	
29					1094.6
T.P.	9.57	1115.07	1.94	1105.50	
30					1102.22
30+60					1103.67
		177			12.55
31					1102.28
T.P.	1.77	1107.27		1105.50	
T.P.	0.23	1094.95	12.55	1094.72	
32					1093.0
	5.11	1088.84	11.22	1083.73	
33					1084.2

U.S.G.S.

11-12-43 22
Pom. Randles

	02.72	11.75
	98.00	4.75
	4.75	F 7.00
	91.60	12.14
	90.6	1.04
	1.04	F 11.10
	98.34	12.84
	94.60	4.09
	3.74	C 8.75
	5.24	
	3.74	
	F 1.50	
	15.07	12.85
	02.22	3.60
	12.85	C 9.25
	15.07	11.40
	03.67	3.90
	11.40	C 7.50
	15.07	12.80
	2.28	3.80
	12.80	C 9.0
	94.95	8.70
	93.00	1.95
	1.95	F 6.75
	88.84	9.89
	84.30	4.64
	4.64	F 5.25

T.H. 125
Bridge Road
Final Grades

Note:
Side stakes
graded

T.P. 7.78 1098.27 0.35 1088.49

34 1083.9

35 1093.5

T.P. 12.61 1110.40 0.48 1097.79

36 1103.5

T.P. 10.11 1120.52 + 0.01 1110.41

37 1112.0

38 1116.5

T.P. 7.05 1125.35 2.22 1118.30

BM 4.11 1121.24 (1121.22)

± 7.50
4.77
F 2.73

6.90
t- 6.50
c.40

8.52
6.85
c 1.67

98.27
98.50
4.77

10.40
03.50
6.90

20.52
12.00
8.52

20.52
16.30
4.02

5.02
4.77
F 0.25 ✓

6.90
2.90
c 4.0 ✓

8.52
3.02
c 5.50 ✓

4.27
4.02
F 0.25 ✓

New References

5-24-60 CH # 13 S.R. 608 To Princeton Rd

24+ 61.57

Note 4/76 appears
dims. are reversed

96.86

SPX N.
side O.B.T.

105.93

SPX NW
side O.B.T.

96+0

95+0

94+0

93+0

92+0

91+0

90+0

89+0

88+0

87+0

86+0

	+41 ✓	10" x 16' @ 16.5' dr into field
6" Map @ 26' Ⓞ	+16 ✓	
15" Map @ 26' Ⓞ	+96 ✓	0 4" Pina @ 25'
	+86 ✓	10" x 21' RCP & corr IP @ 17' dr
15" Map @ 26' Ⓞ	+80 ✓	
12" Map @ 26.5' Ⓞ	+62 ✓	
35" Map @ 26' Ⓞ	+46 ✓	
	+99 ✓	0 CEI @ 28' (572402)
	+71 ✓	12" x 16' RCP @ 17' dr
CEI house pole @ 29' Ⓞ	+59 ✓	
28" Map @ 26' Ⓞ	+32 ✓	
28" Map @ 26' Ⓞ	+81 ✓	
8" twin Cherry @ 27' Ⓞ	+37 ✓	
	+27 ✓	0 CEI @ 28'
	+65 ✓	21' long stone culv't replace
	+53 ✓	0 CEI @ 28' (572404)
	+21 ✓	24" RCP 40' long eliminate ± 15' skew
	+78 ✓	0 CEI @ 28.5
	+5 ✓	0 CEI @ 28'
	+50 ✓	12" x 15' corr dr into field
	+30 ✓	0 CEI @ 28'

107+52.25

IP

57.95

SPK NE side
Tala Pola

4421

Spk NW side
CEI # 572394

107+0

106+0

105+0

104+0

103+0

102+0

101+0

100+50.62

179° 12' 30"

100+0

99+0

98+0

97+0

Princeton Rd

IP rd 3/59 Mon Feb
4/75

27

130
±10.5
107+20 ✓
wooden stringer bridge
replace
O CEI @ 29'

+87 ✓ O 12" poplar @ 29'

+87 ✓ O CEI @ 29'

+74 ✓ O CEI @ 29'

10" x 20' corr @ 16'

+56

+23 ✓

10" x 20' @ 17'
dr

+11 ✓ O 6" c/m @ 26'

4" Map @ 23' Ⓞ

+63

O spring ± 8'

+34 ✓ 4" pine @ 26

+22 ✓ 2" pine @ 26

CEI House Pole @ 30' O

+16 ✓

+99 ✓ CEI @ 28.5'

NE cor steel
deck

20.61

I Pin ctr bridge deck
fd 3/59

18.88

SW cor steel
deck

O CEI @ 29'

20" Hick @ 32' Ⓞ

+64 ✓

99 x 20 dr into field
10" x 16' corr @ 17'

+50 ✓

O CEI @ 29'

15" Map @ 26' Ⓞ

+99 ✓

10" Map @ 26.5' Ⓞ

+92 ✓

+74 ✓

O CEI @ 29'

X sections

	+	HI	-	elev
BM #7	0.30	1233.69		1233.39
79+0				
80+0				
TP	1.17	1224.16	10.70	1222.99
81+0				
82+0				
TP	0.13	1213.96	10.83	1213.83
83+0				
TP	0.58	1204.32	10.22	1203.74
84+0				
85+0				
86+0				
BM #8			9.95	1194.37 USA
TP	10.60	1214.30	0.58	1203.74
TP	10.63	1224.06	0.51	1213.83
TP	10.80	1233.77	1.49	1222.97
BM #7			.37	1233.40
BM #8	0.80	1195.17		1194.37
87+0				

N

E

S

X in SW cor w/cut + hdwl sta 78+45 ±18' Lt of E

29.8

3.3	3.4	5.9	5.9	4.7	3.9	4.9	5.3	3.0	1.8	2.5	Loyal
30	26	21	15	12.5	14	15.5	19.5	24	30	out	

24.1

out	8.8	8.4	11.3	10.4	9.6	10.3	10.8	5.8	6.8	out
	34	23	17	15		13	15	24	30	

19.2

out	4.0	2.8	7.4	7.0	6.1	5.0	6.0	6.4	5.5	1.7	2.9	out
	40	27	20	15	13		13	15	18	23	30	

13.3

out	8.7	8.5	13.2	11.5	10.9	11.9	12.3	7.1	8.8	out
	30	24	17	13		13	15	23	30	

07.2

	5.5	5.3	9.6	7.7	6.2	7.9	8.3	5.0	6.1	out
	30	25	18	15		14	16	22	30	

01.7

out	1.2	1.0	5.1	3.4	2.6	3.4	4.1	1.7	2.7	out
	35	25	17	15		14	16	22	30	

1197.5

out	6.3	5.7	8.8	7.9	6.8	7.7	8.5	5.6	6.8	out
	30	24	17	15		14	16	22	30	

1194.5

out	10.0	8.9	11.6	10.8	9.8	10.8	11.4	8.8	9.8	out
	30	21	16	14		15	17	23	30	

Spk. Pol. face CEZ #572407 sta 86+25 ±28' Rt of E

92.6

out	3.3	2.7	4.6	3.8	3.0	2.6	3.7	4.4	2.0	2.9	out
	30	20	16	14	7		15	17	23	30	

	+	HI	-	Elev
88+0		1195.17		
89+0				
TP	3.42	1190.94	7.65	1187.52
			5.0	1185.9
90+0				
91+0				
92+0				
93+0				
TP	2.04	1187.16	5.82	1185.12
			5.3	1181.9
94+0				
95+0				
96+0				
97+0				
TP	2.22	1183.54	5.84	1181.32

	N	E	S
out	5.5 30	4.8 22	5.9 17
	5.4 15	5.4 17	5.1 21
	5.7 25	5.2 30	5.7 33
			91.
	7.5 30	6.5 21	7.2 16
	7.0 14	6.3 10	5.8 5.8
	6.9 14	7.8 16	6.5 19
	7.4 24	7.6 30	
			87.4
FL inlet 24" Conc culvert			
In drainage culvert	4.4 30	3.4 21	4.5 17
	3.4 15	2.6 10	3.8 17
	5.1 18	5.3 21	6.3 24
	4.9 20	5.3 30	6.0 32
			87.1
out	6.0 30	5.0 25	7.2 19
	5.9 15	4.7 16	5.9 15
	7.3 19	5.5 24	6.4 30
			86.2
	7.0 30	6.3 22	7.6 16
	6.8 13	5.8 5.8	6.6 11
	7.5 17	6.5 23	4.30
			85.1
FL N and stone culvert			
	3.1 30	3.1 20	4.4 15
	3.8 13	3.0 15	3.9 18
	4.6 21	3.5 21	3.4 30
			84.2
	3.8 30	4.1 21	5.9 16
	4.4 12.5	3.9 12	5.0 17
	6.0 21	4.0 21	3.7 30
			83.3
	6.8 30	7.0 21	7.8 18
	6.7 14	6.0 13	8.4 15.5
	6.4 20.5	6.6 30	
			81.2
	6.6 30	7.0 22.5	9.8 17.5
	8.4 15	7.2 15	8.1 14
	9.6 17	7.1 21	7.4 30
			80.

	+	HI 1183.50	-	alar
98+0				
99+0				
100+0				
BM*9			4.73	1178.81 ^{USA} 1178.80
BM*9	5.20	1184.01		1178.81
TP	8.69	1189.38	3.32	1180.69
TP	7.92	1195.40	1.90	1187.48
BM*8			1.06	1194.34
BM*9	4.67	1183.47		1178.80
			3.39	1180.1
			3.37	1180.1
101+0				
101+50				
102+0				
103+0				
TP	6.35	1187.88	1.94	1181.53
104+0				

	N	E	S	
out	$\frac{3.5}{30}$	$\frac{3.3}{24}$	$\frac{6.6}{18}$	$\frac{5.5}{15}$ ^{77.3} 4.2 $\frac{5.6}{15}$ $\frac{6.8}{17}$ $\frac{2.6}{24}$ $\frac{3.6}{30}$ out
	$\frac{5.8}{30}$	$\frac{4.9}{24}$	$\frac{7.5}{18}$	$\frac{5.8}{15}$ ^{78.8} 4.7 $\frac{5.4}{14}$ $\frac{6.6}{18}$ $\frac{5.1}{23}$ $\frac{6.3}{30}$ out
	$\frac{6.1}{30}$	$\frac{6.0}{24.5}$	$\frac{7.5}{16.25}$	$\frac{4.8}{12}$ ^{79.5} 4.0 $\frac{4.7}{11}$ $\frac{7.2}{17.5}$ $\frac{6.1}{21.5}$ $\frac{6.6}{30}$ out
Vart. splk S. side 20" Hickory + Sta 99+80 32' Lt. E				
wand bridge on bit conc				
E " " " "				
out	$\frac{8.0}{20}$	$\frac{7.6}{19.5}$	$\frac{5.0}{11.5}$	$\frac{4.3}{12}$ ^{77.2} $\frac{5.0}{16}$ $\frac{6.7}{21}$ $\frac{7.5}{30}$ out
out	$\frac{6.9}{20}$	$\frac{7.5}{18}$	$\frac{5.9}{14.5}$	$\frac{5.1}{14}$ ^{78.4} $\frac{5.6}{18}$ $\frac{6.4}{24}$ $\frac{6.8}{30}$
	$\frac{6.6}{30}$	$\frac{6.9}{17.5}$	$\frac{5.5}{14}$	$\frac{4.5}{12.5}$ ^{79.} $\frac{5.4}{17.5}$ $\frac{6.0}{24}$ $\frac{5.6}{30}$ $\frac{4.8}{30}$
	$\frac{0.8}{30}$	$\frac{1.7}{21.5}$	$\frac{4.5}{17}$	$\frac{3.4}{14}$ ^{81.1} $\frac{2.4}{11}$ $\frac{3.2}{13.5}$ $\frac{3.0}{17}$ $\frac{4.0}{21}$ $\frac{1.1}{21}$ $\frac{0.2}{30}$
	$\frac{5.1}{30}$	$\frac{5.5}{19.5}$	$\frac{6.2}{16}$	$\frac{5.7}{13.5}$ ^{83.} $\frac{4.9}{10}$ $\frac{5.8}{16}$ $\frac{6.3}{21}$ $\frac{4.5}{21}$ $\frac{4.8}{30}$ out

N
d
S

+ HI - elev
1187.28

105+0

4.1	4.2	6.2	5.5	83.5	5.6	5.9	3.9	4.0	out
30	27	15.5	12.5	4.4	15	17	23	30	

106+0

4.6	4.9	6.9	6.4	82.3	6.5	7.2	6.9	6.9	out
30	20.5	15	12	5.6	14	18	21.5	30	

106+50

5.8	6.1	7.3	6.8	82.1	6.8	8.1	5.5	6.2
30	18.5	13.5	10.5	5.8	16	18	24.5	27 @ 30

107+0

6.1	5.8	7.7	5.1	83.4	5.1	7.7	5.8	6.2
30	18.5	13	7	4.5	11	17	24.5	30

4.0 1183.9

10.0 1177.9

4.5 1183.4

TP 1.79 1183.32 6.35 1181.53

BM 9 4.50 1178.82

ctr dock wooden stringer bridge

out lot fl

Int of #13 & Princeton

H. Patterson

CH #13 Chardon - Windsor

P. Young

5-18-60

Cloudy 60°

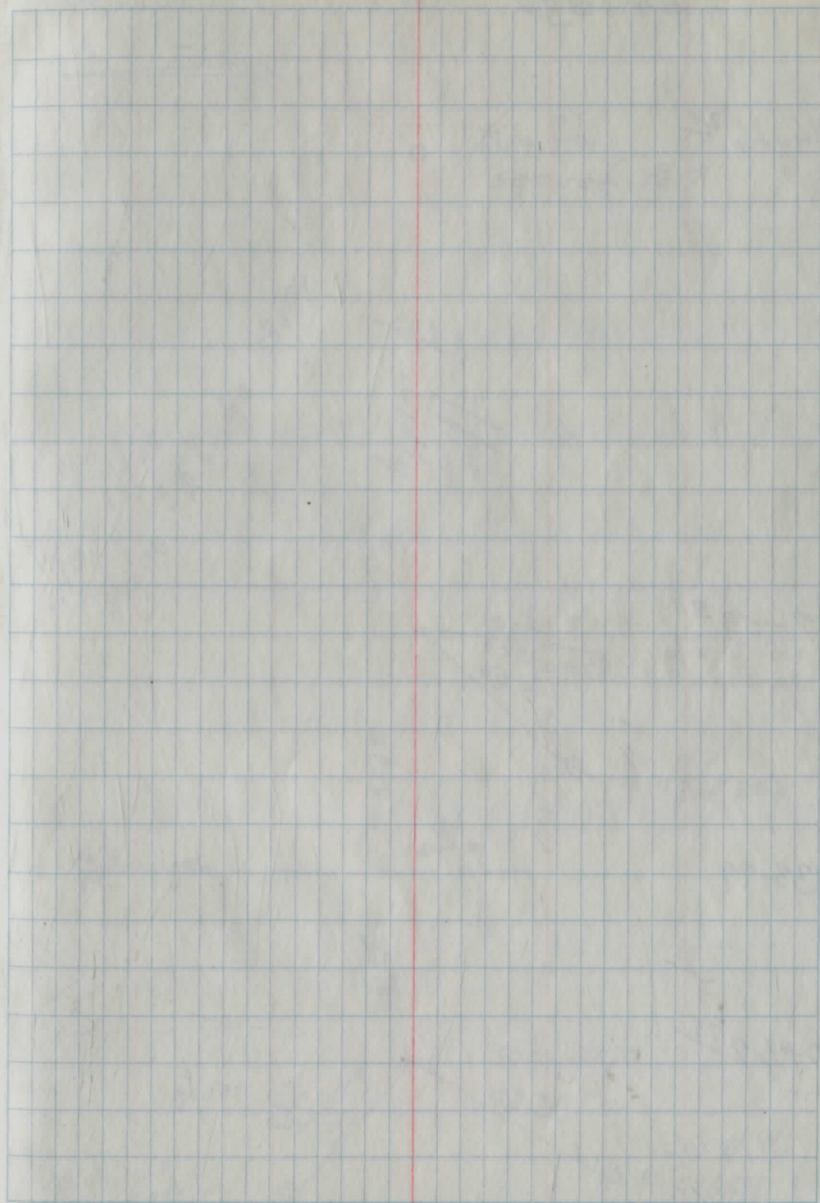
F. Dull

B.M. #9	4.77	1183.57		1178.80
T.P.	5.93	1188.68	0.82	1182.75
T.P.	2.25	1189.43	2.00	1186.68
T.P. B.M. #10	3.55	1190.23	2.75	1186.68
B.M. #10			0.13	1190.10
T.P.	4.54	1187.33	7.44	1182.79
T.P.	4.67	1185.14	6.76	1180.57
B.M. #9			6.32	1178.82

37

Vert. spk. S. Side 20" Hickory sta. 99+50 32 Lt. &

Vert. spk. W. side 30" Maple ± 450' E. Int. Princeton Rd.
20' Lt.



Bridge Rd

74+46²⁰

37+53⁰

33+99

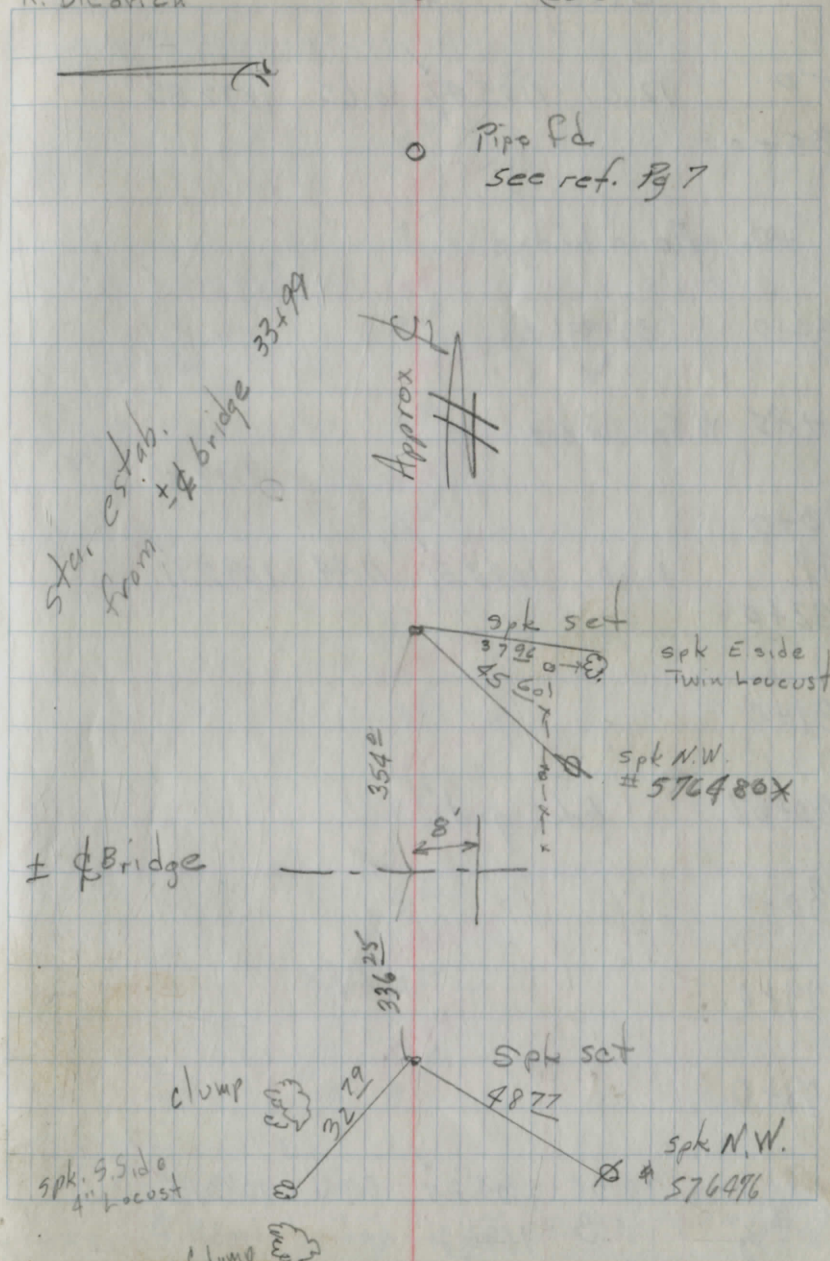
30+62⁷⁵

Davidson
Rattensen
R. Diedrich

Sunny-warm (50°)

3/14/66

34



○ Pipe Rd
See ref. Pg 7

Station estab.
from bridge 33+99

Approx

spk set
3725
45.60
spk E side
Twin locust

354'
30°
spk N.W.
576480X

± Bridge

336.25'
32.79'
spk set
48.77
spk N.W.
576496

spk. S. Side
4th locust

clump

Clump

Bridge Rd.

TP 12.61 1105.46 ✓ 0.66 1092.85 ✓
35+0

+12 E. end bridge

34+0 (33+99) &

+85 W. End bridge

33+0

I.P. 0.60 1093.51 ✓ 11.44 1092.91 ✓
32+0

31+0

30+62 brk. grad

30+0

29+0

28+0

I.P. 10.50 1104.35 ✓ 0.06 1093.85 ✓
BM # 5 10.03 1093.91
+ HI — ELEV

Davidson
Patterson
R. Dieckrich &

E Profile

3/15/66

35

N. Side bridge
bot. slab to f.l. = 7.9

S. Side bridge
bot. slab to f.l. = 8.5

1092.87 -
0.64

1085.74
7.77

1085.21 -
9.30

1084.63 -
9.88

1084.89 -
8.62

1093.54 -
10.81

1102.54 -
1.81

1103.47 -
0.88

1101.74 -
2.61

1095.03 -
9.32

1091.50 -
12.85

Trav. 12.7
30
5

X SW cor. S. Hdwl bridge Sta. 33+90 & RT (pg. 9)

Bridge Rd

T.P.		10.09	1075.21
34+0	f.l. S. Side bridge	12.7	1072.6
33+85	W. end bridge		
BM#5	1.42	1085.30	1083.88

BM#5		1.42	1083.84
T.P.	0.65	1085.26	4.09 1084.61
T.P.	0.03	1088.70	10.89 1088.67
T.P.	0.51	1099.56	12.35 1099.85
T.P.	1.31	1111.40	12.88 1110.09

41+0

40+0

39+0

38+0

T.P.	8.02	1122.97	0.95	1114.95
------	------	---------	------	---------

37+53

37+0

T.P.	11.61	1115.90	1.17	1104.29
------	-------	---------	------	---------

36+0

1105.46
HI

3/15/66

36

1074.40
1074.40
1078.80
1084.40
1084.65
1084.50
1081.70
1074.00

10.9/30
10.9/19
6.5/16
0.9/7
0.65
0.8/6.5
3.6/14
11.3/19

end wing wall
sheet pile

ck 0.04

1122.48
0.49
1120.53
2.44
1118.53
4.44
1116.57
6.40
1114.91
0.99
1114.70
4.70
1103.36
2.10

2.4/2
4.3/3.0
6.3/3.0
0.9/2
1.2/1

Bridge Rd

Bm #s 3.40 1083.89

34+12 E. End bridge

34+15

+1
34+0

1R 13.12 1087.29 6.67 1074.17

35+12 E. End bridge

34+0

1R 5.63 1080.84 1075.21

3/15/66

37

ok 0.01%

$$\begin{array}{r} 1076.29 \\ \frac{11.0}{32} \\ \hline 1080.59 \end{array}$$
 and

$$\begin{array}{r} 6.1 \\ \frac{19.0}{19.0} \\ \hline 1085.69 \end{array}$$

$$\begin{array}{r} 1085.69 \\ \frac{1.6}{8.6} \\ \hline 1075.09 \end{array}$$

$$\begin{array}{r} 1075.09 \\ \frac{12.2}{27.5} \\ \hline 1079.79 \end{array}$$

$$\begin{array}{r} 1079.79 \\ \frac{14.0}{19.0} \\ \hline \text{d stream} \end{array}$$

$$\begin{array}{r} 1082.49 \\ \frac{4.8}{12.0} \\ \hline 1085.69 \end{array}$$

$$\begin{array}{r} 1085.69 \\ \frac{1.6}{7.0} \\ \hline 1087.29 \end{array}$$

Pool x 30x60 Profile
 downstream }

$$\begin{array}{r} 1074.64 \\ \frac{1.2}{16.0} \\ \hline 1069.94 \end{array}$$

$$\begin{array}{r} 1069.94 \\ \frac{10.9}{36.0} \\ \hline 1079.79 \end{array}$$

$$\begin{array}{r} 1079.79 \\ \frac{10.9}{50.0} \\ \hline 1072.34 \end{array}$$

$$\begin{array}{r} 1072.34 \\ \frac{8.5}{70.0} \\ \hline 1022.64 \end{array}$$

$$\begin{array}{r} 1022.64 \\ \frac{8.2}{100.0} \\ \hline 1013.04 \end{array}$$

$$\begin{array}{r} 1013.04 \\ \frac{15.0}{200.0} \\ \hline 1012.54 \end{array}$$
 and pool

Bridge Rd.

T.P. 1.21 1117.87 ^{6.9}

+60 Inv. 12" conc E. end

+53 brk. grad & dr. to S.

37+0

+35 W. end (Inv) 12" conc. pipe

T.P. 10.92 1118.88 0.61 1107.86 ²

36+0

T.P. 6.89 1107.87 0.77 1100.88

35+0

T.P. 9.95 1101.85 0.60 1091.80 ⁸

35+0

34+50

T.P. 8.45 1092.80 1.14 1088.85 ^{3.9}

33+99

drainage N

T.P. 0.38 1085.89 2.88 1084.81 ¹

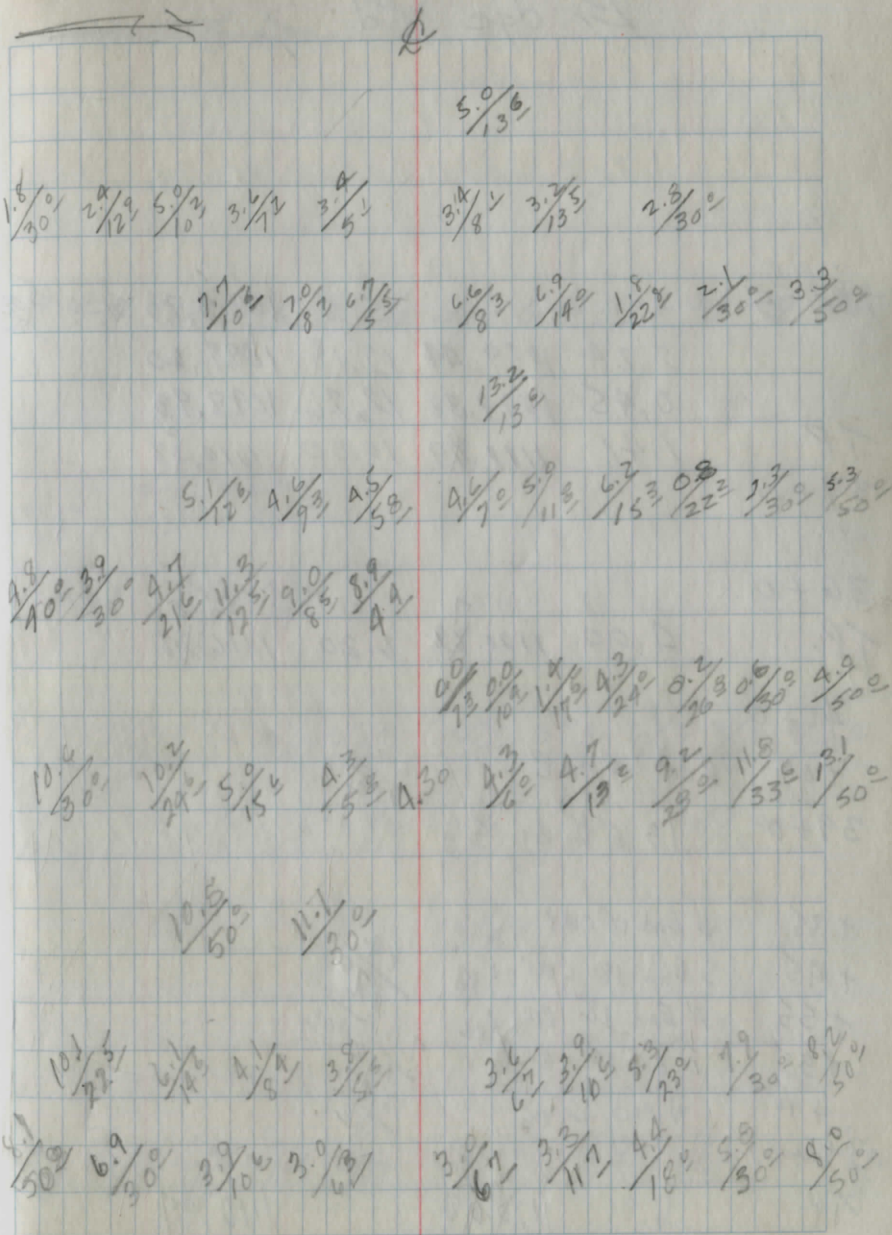
+30 (S. Side) Edge f. 1

33+0 & ftd. dr. N. Wedge f. 1 (S. Side)

TBM #5 3.71 1081.89 1083.88

4/12/66

38



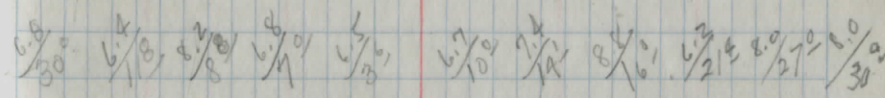
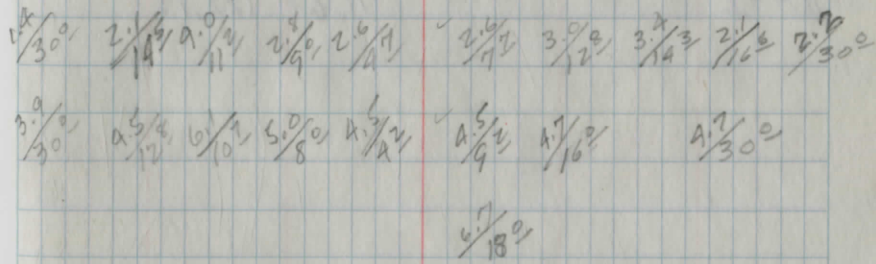
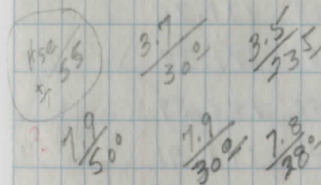
Bridge Rd

TBM #5	S. 51	1083.93	ok 0.05
	2.24	1089.44	12.18 1087.20
	0.45	1099.38	12.76 1098.93
TP	1.41	1111.89	10.50 1110.88
37+0			
36+0			
TP	4.00	1120.88	6.20 1116.88
40+0			
+07	E. end 12" CMP		$\frac{6.2}{155}$
39+0	(3' E & dr S)		
+85	W. end 12" CMP		
+45	S. End 18" CMP x'ed		$\frac{8.4}{179.6}$
+55	N. End 18" CMP x'ed		$\frac{7.1}{100}$
+35	E. end 12" CMP		$\frac{5.1}{95}$
+10	W. end 12" cmp		
38+0			
IP	6.01	1128.98	1116.97

4/12/66

39

x S.W. Cor. S. hdwl bridge Sta 33+90 - 8' RT.



9-10-60

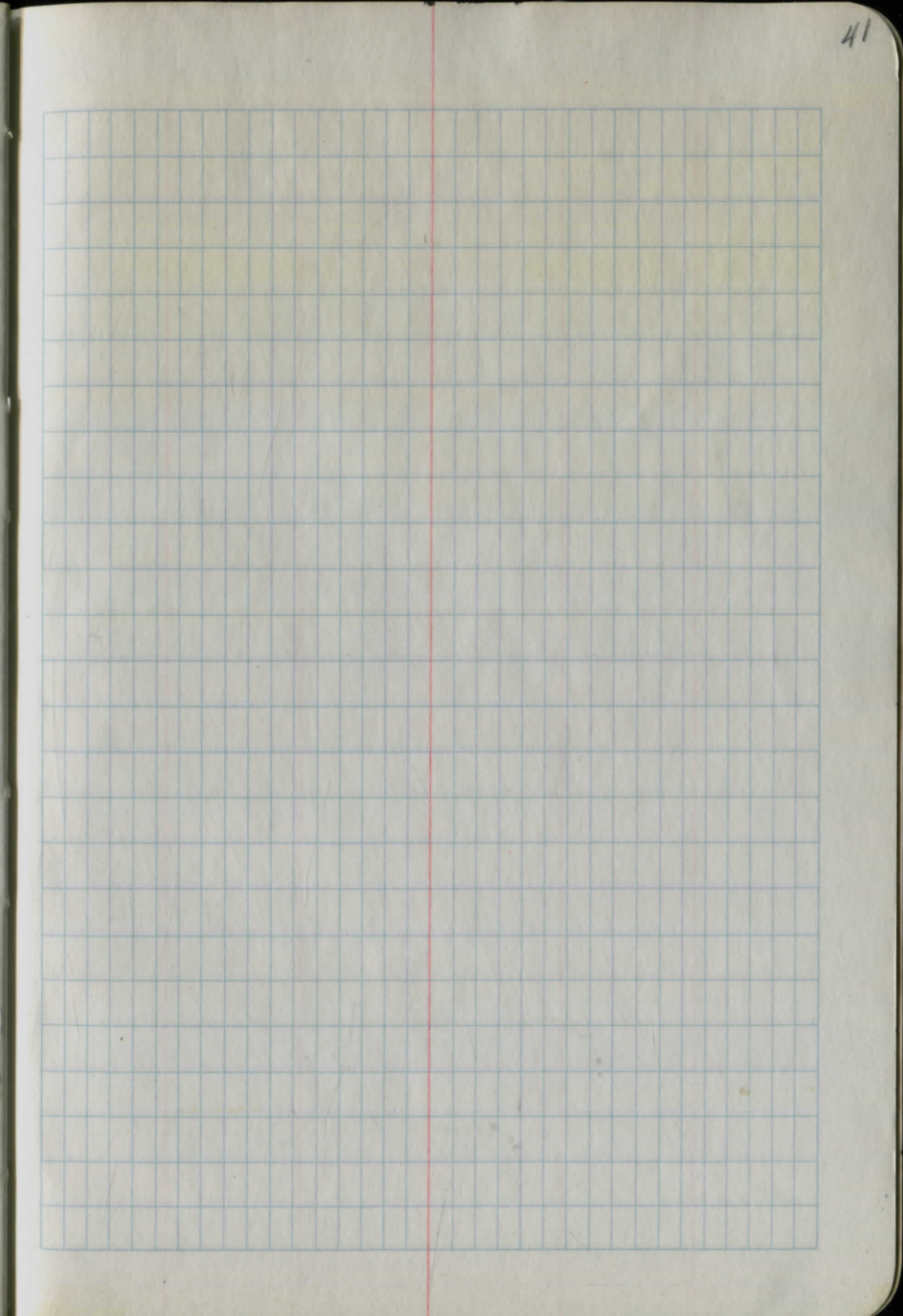
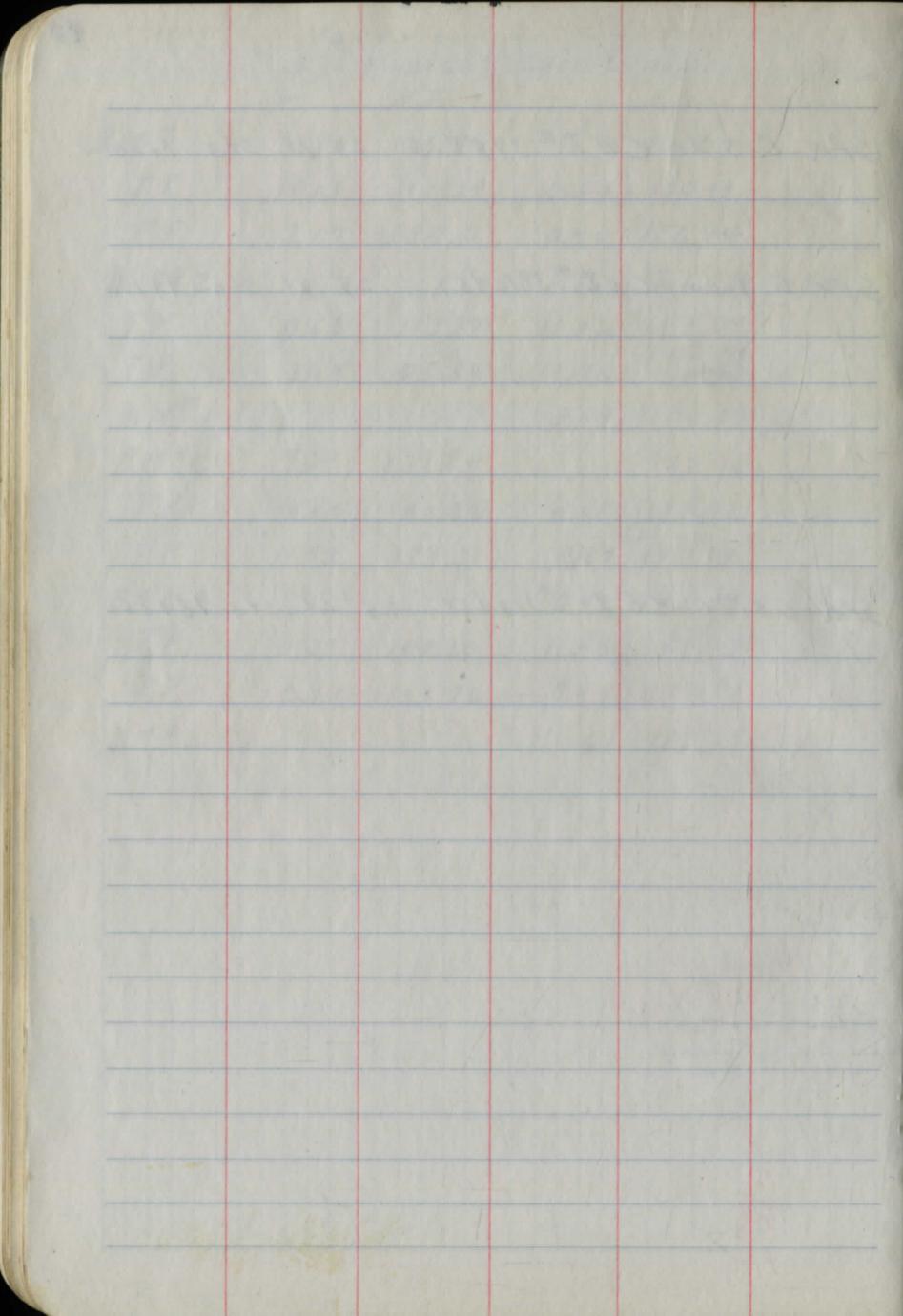
Cool Cloudy

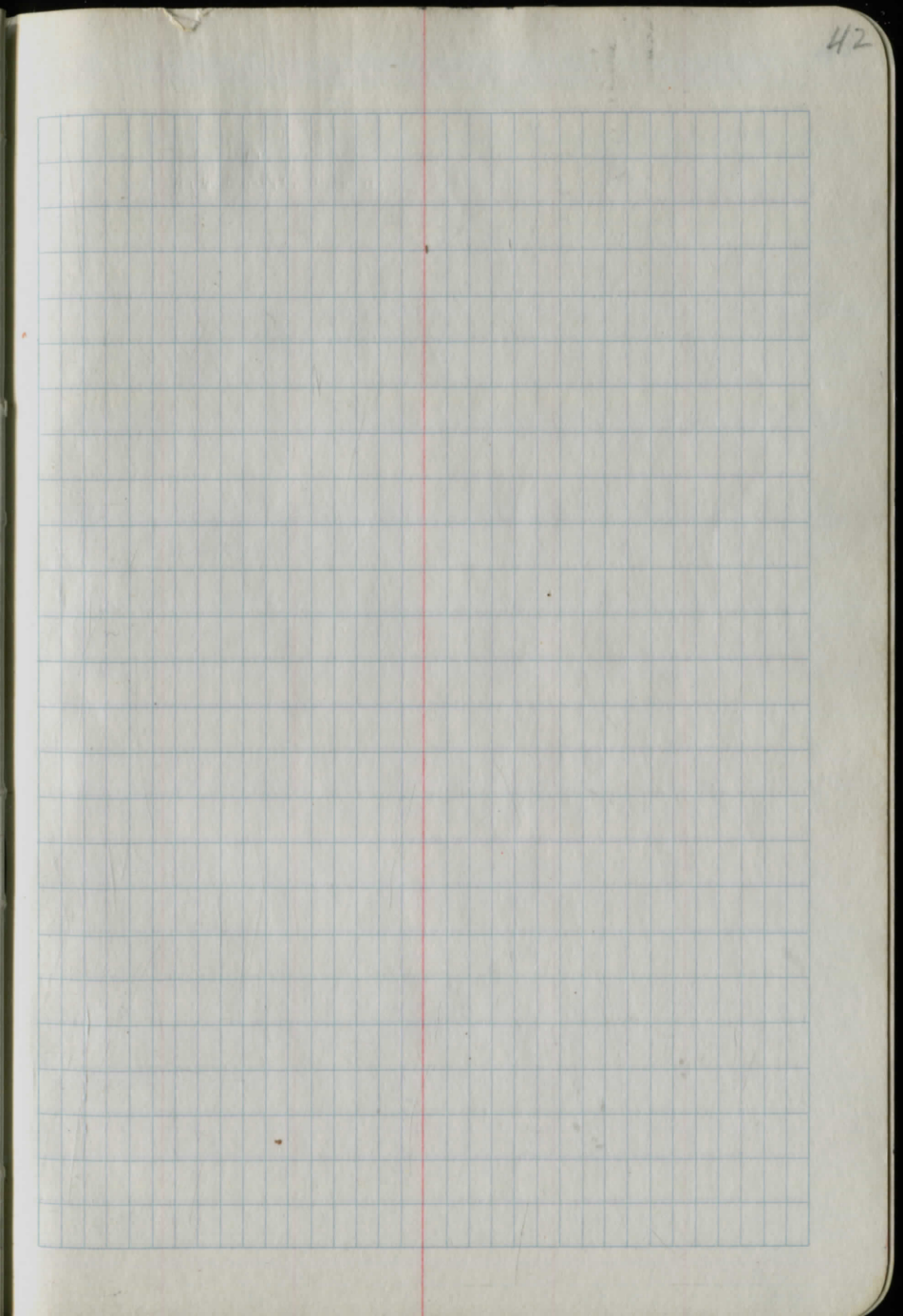
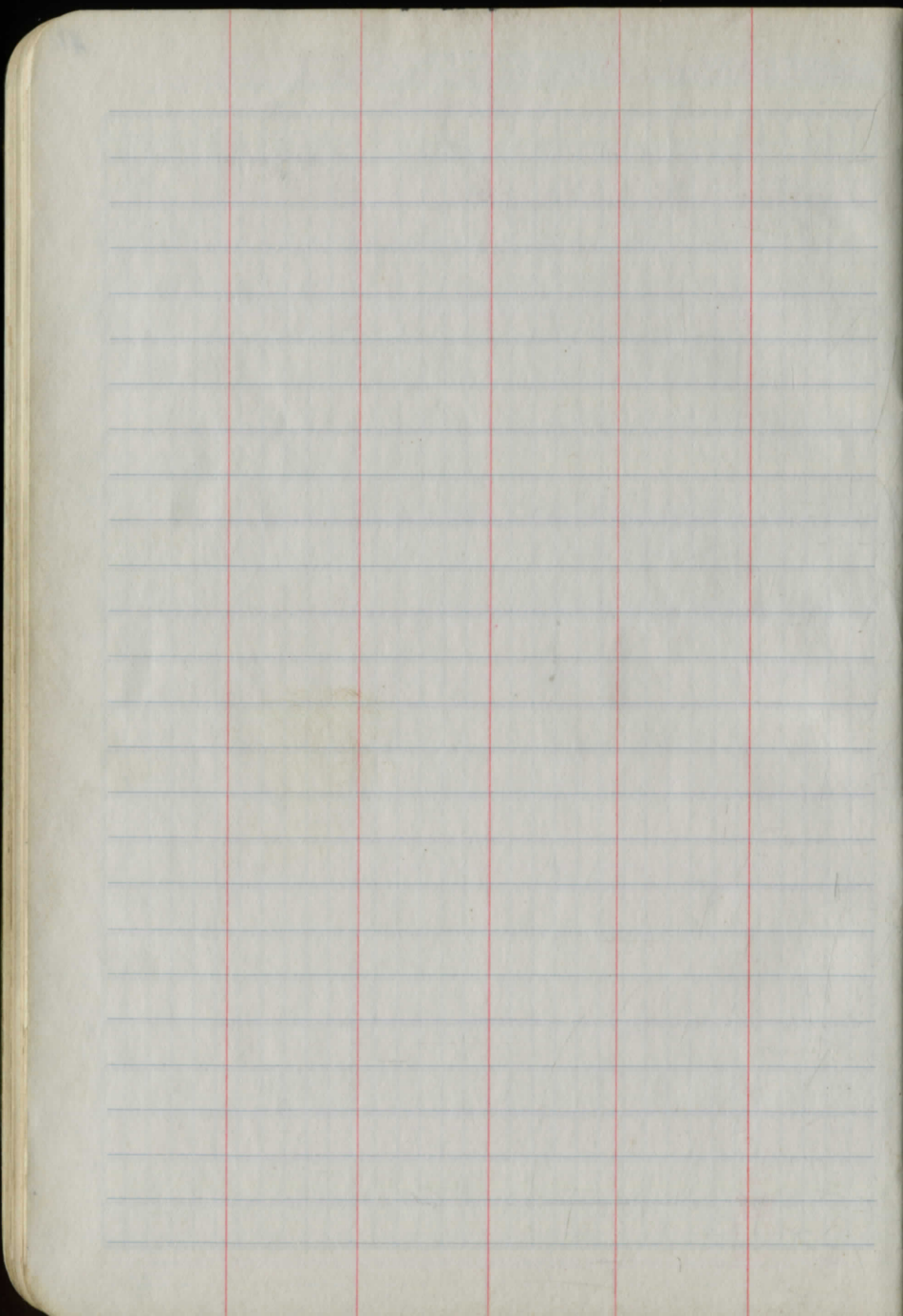
	+	H.I.	-	Elev	
BM #1	6.70	106.70		100.00	
T.P.	11.15	117.34	0.51	106.19	
T.P.	7.17	124.11	0.40	116.94	
BM #2			1.96	122.15	W3C
T.P.	0.68	113.77	11.02	113.09	
T.P.	3.15	105.59	11.36	102.41 113	
BM #1			5.59	100.00	
BM #2	9.69	131.84		122.15	
T.P.	10.50	142.26	0.08	131.76	
T.P.	11.92	153.31	0.87	141.39	
BM #3			6.42	146.89	
T.P.	0.39	142.30	11.40	141.91	
T.P.	0.93	133.76	9.47	132.83	
BM #2			11.61	122.15	

SPK E. side CEI # 395815 25' Lt. Sta. 1700

SPK E. side CEI # 381045X 25' Lt. Sta. 9+10

SPK E. side CEI # 137288 25' Lt. Sta. 18715





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Blank grid page with a vertical red margin line on the left side.

1978

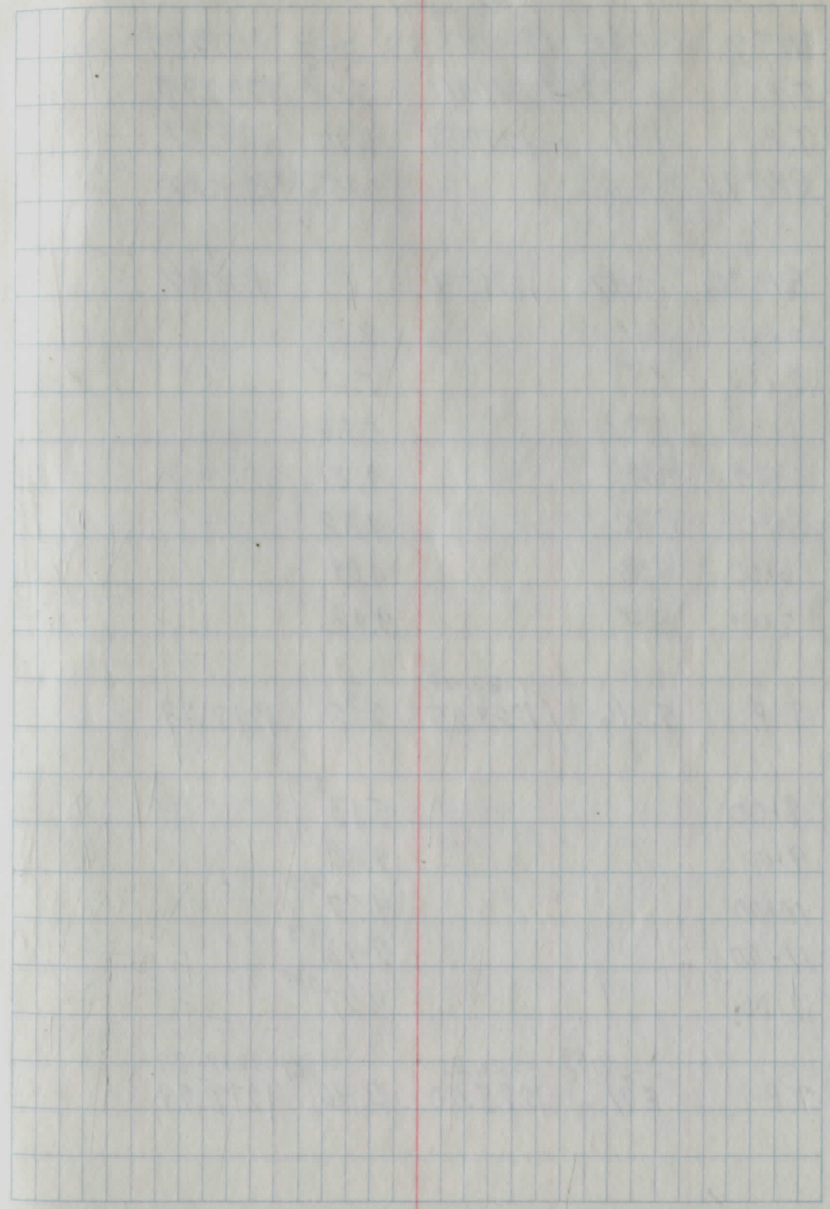
B.M. #2

	+	HI	-	ELE.
				1227.30
T.P.	0.86	1228.16	7.18	1220.98
T.P.	3.53	1224.51	3.90	1218.60
T.P.	4.01	1222.61	6.75	1215.86

Monument L #13 + 608

+60°
0+00

	#	HI	=	Elev
BM #2	1.47	1228.77		1227.30
T.P.	3.50	1226.21	6.06	1222.71
	3.82	1224.13	5.90	1220.91
	4.01	1222.64	5.50	1218.63
			6.84	1215.80



				Ele
BM #7	^{1.47} 0.86	^{1257.77} 1228.16	6.06	1227.30
T.P.	^{3.50} 3.53	1244.51	7.18	1220.98
T.P.	4.01	1222.62	5.90	1218.61
BM #1A			6.75	1215.87

B.M. #1A	5.47	1221.34		1215.87
1+00	7.20		7.00	
2+00			5.65	
3+00			5.86	
4+00			4.23	
5+00			4.02	
6+00			4.03	
7+00			3.42	

T.P.	^{5.70} 5.46	^{1223.49} 1223.25	3.55	1217.79
------	-------------------------	-------------------------------	------	---------

8+00			^{5.37} 5.13	
9+00			^{5.01} 4.82	
10+00			^{4.50} 4.27	
11+00			^{4.13} 3.96	
12+00			^{3.50} 3.27	

T.P.	^{6.39} 5.91	^{1226.21} 1225.70	^{3.67} 3.46	^{1219.82} 1219.79
------	-------------------------	-------------------------------	-------------------------	-------------------------------

Sta. 19+78 N Root 24" Maple 35' R L

N.E. corner Monument Box & 608 + #13

T.P.		P.I. 1226.21	-	F.I.E. 1219.82
1		1225.70		1219.79
13+00			5.83 ^{5.95}	
14+00			5.33 ^{5.41}	
15+00			4.46 ^{4.51}	
CULVERT			9.77 ^{9.77}	
			10.13 ^{10.13}	
16+00			4.29 ^{4.39}	
17+00			3.90 ^{4.01}	
T.P.	5.70 2.77	1227.86 1227.72 1224.55	3.92 ^{4.05}	1222.16 1221.78
18+00			4.29 ^{5.18}	
19+00			5.74 ^{4.61}	
B.M. #2			3.78 ^{1.40}	1226.46
20+00			7.64 ^{4.47}	1221.77
T.P.			7.66 ^{4.47}	1216.89

24" CULVERT CONCRETE

7-26

Set stakes N. side
£30'

Frank McGuer
would like
Bridge Rd
side staked
within one (1) mo.

From west end to
R. R. only

I think we ran £
± 12 yrs ago.

H. Peterson
L. Ballinger
7-13-75

CH #13

P.M. 4 1/2 Profile

	+	HI	-	Elev
B.M. #2	0.62	1227.92		1227.30
T.P.	3.20	1223.77	9.35	1220.57
BM #1			7.90	1215.87
0+0			8.70	1215.07
1+0			8.70	1215.07
2+0			7.30	1216.47
3+0			6.55	1217.22
4+0			5.95	1217.82
5+0			5.70	1218.07
6+0			5.70	1218.07
7+0			5.05	1218.72
8+0			4.85	1218.92
9+0			4.50	1219.27
10+0			4.00	1219.77
11+0			3.65	1220.12
12+0			2.95	1220.82
T.P.	7.35	1227.93	3.19	1220.58
13+0			6.85	1221.08
14+0			6.35	1221.58
15+0			5.55	1222.38
16+0			5.35	1222.58
17+0			4.95	1222.98
18+0			4.45	1223.48
19+0			3.90	1224.03

46

Vert. spk N. side 24" Maple 35' Rt. sta 19+7.5

spk N. side CEI # 580448 30' Rt. sta 0-30

1293.88

60+0			3.80	90.08
61+0			4.45	89.43
62+0			5.95	87.93
63+0			7.50	86.38
64+0			8.55	85.33
TBM ^A	2.86	1287.19	9.55	1284.33
65+0			3.20	83.99
66+0			4.60	82.59
67+0			7.60	79.59
68+0			12.15	75.04
T.P.	0.31	1275.52	11.98	1275.21
69+0			5.40	70.12
70+0			9.45	66.07
71+0			12.45	63.07
T.P.	0.64	1263.61	12.55	1262.97
72+0			3.70	59.91
73+0			7.70	55.91
74+0			12.75	50.86
T.P.	0.29	1251.08	12.82	1250.79
75+0			5.00	46.08
76+0			9.15	41.93
77+0			13.30	37.78
T.P.	0.57	1238.67	12.98	1238.10
78+0			4.60	34.07
79+0			8.90	29.77
T.B.M. 5	6.74	1237.49	7.92	1230.75

W. end
 Top CMP Dr. pipe House #15060 20' Lt. 5/2 64+60

Top NEX KE Hdwall



1237.49

① inlet	8.45	1229.04
② outlet	9.25	1227.74
③ outlet	9.60	1227.89
④ overflow	8.10	1229.39
⑤ inlet	9.75	1227.74
⑥ outlet	10.45	1227.04

T.M. 5 0.98 1231.73 6.74 1230.75

80+0 7.55 1224.18

81+0 12.70 1219.03

T.P. 0.73 1220.09 12.37 1219.36

82+0 7.00 1213.09

83+0 13.05 1207.04

T.P. 0.28 1207.93 12.44 1207.65

84+0 6.20 1201.73

85+0 10.45 1197.48

86+0 13.40 1194.53

T.P. 0.54 1195.20 13.27 1194.66

87+0 2.95 1192.25

88+0 4.55 1187.70

89+0 6.20 1189.00

90+0 7.10 1188.10

91+0 8.35 1186.85

92+0 9.20 1186.00

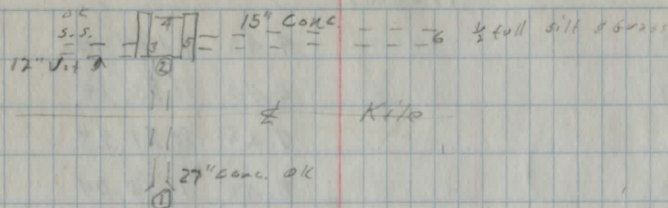
T.P. 2.59 1188.54 9.25 1185.75

93+0 40" CMP outlet 7.27 6.77 1186.77

X. Rd inlet 1187.27 3.45 1185.09

Flow S.

52



1188.54

94+0			4.40	1184.14	
95+0			5.40	1183.14	
96+0			7.25	1181.29	
97+0			8.50	1180.04	
98+0			8.95	1179.59	
99+0			9.55	1178.99	
100+0			9.15	1179.39	
T.B.M. #6	+50.62	6.44	1187.35	7.63	1180.91
101+0			7.60	1179.75	
102+0			6.90	1180.45	
103+0			5.70	1181.65	
104+0			4.45	1182.90	
105+0			4.10	1183.25	
106+0			4.50	1182.85	
107+0			4.35	1183.00	
+24	60" C.M.P. outlet	7.30	8.50	Flow S.	
	X.R.D. Culvert	1178.05	1178.85		
+35	60" C.M.P.	9.50	8.50		
	X.R.D. Culvert	1177.85	1178.85		
+59			4.20	1183.15	
108+0			4.50	1182.85	
109+0			3.90	1183.45	
110+0			2.65	1184.70	
T.B.M.	6.73	1187.65	6.43	1180.92 (0.1)	
T.P.	11.02	1178.49	0.18	1187.47	
T.P.	13.00	1210.74	0.75	1197.74	
T.P.	12.59	1223.28	0.35	1210.39	

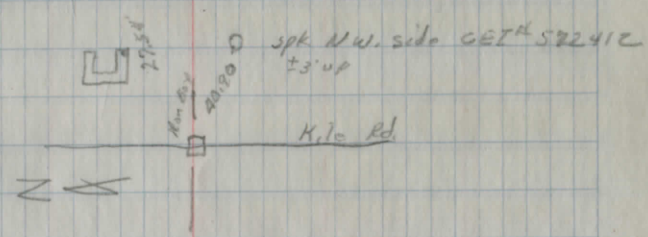
Top of NW & SW Abut. Bridge

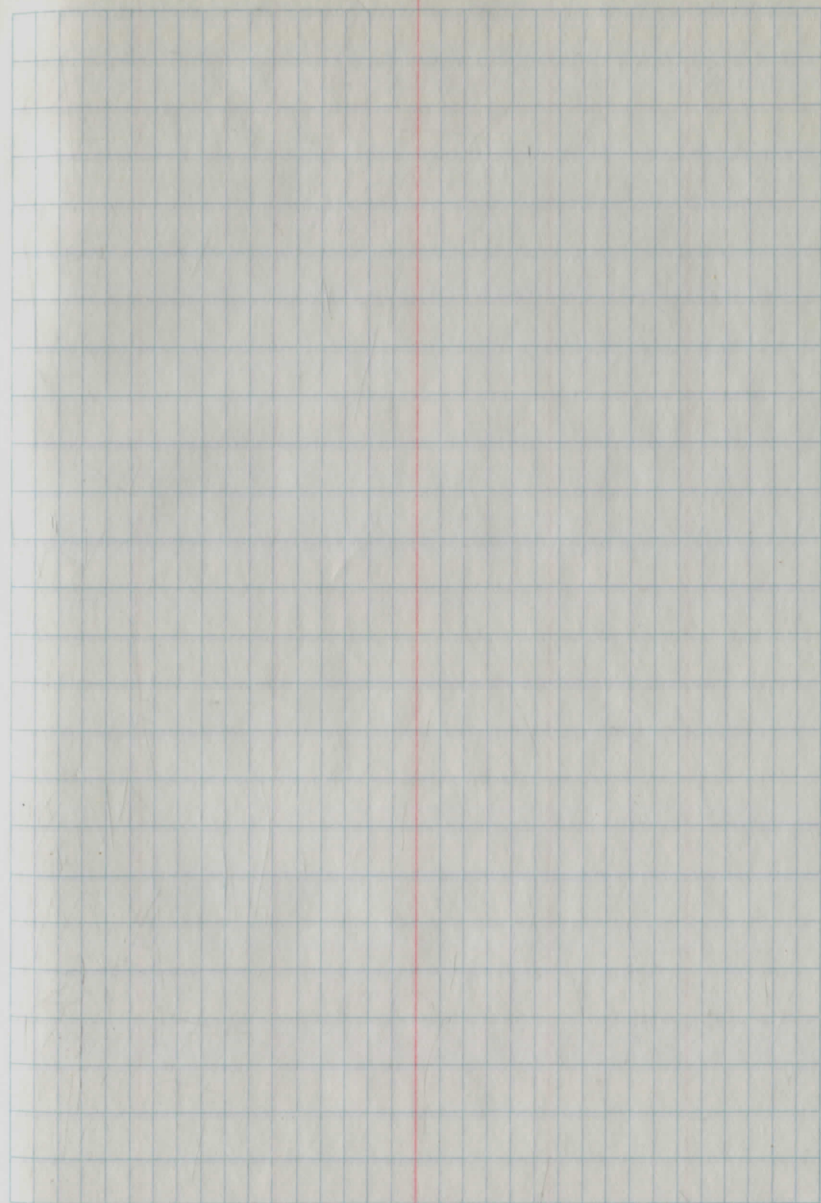
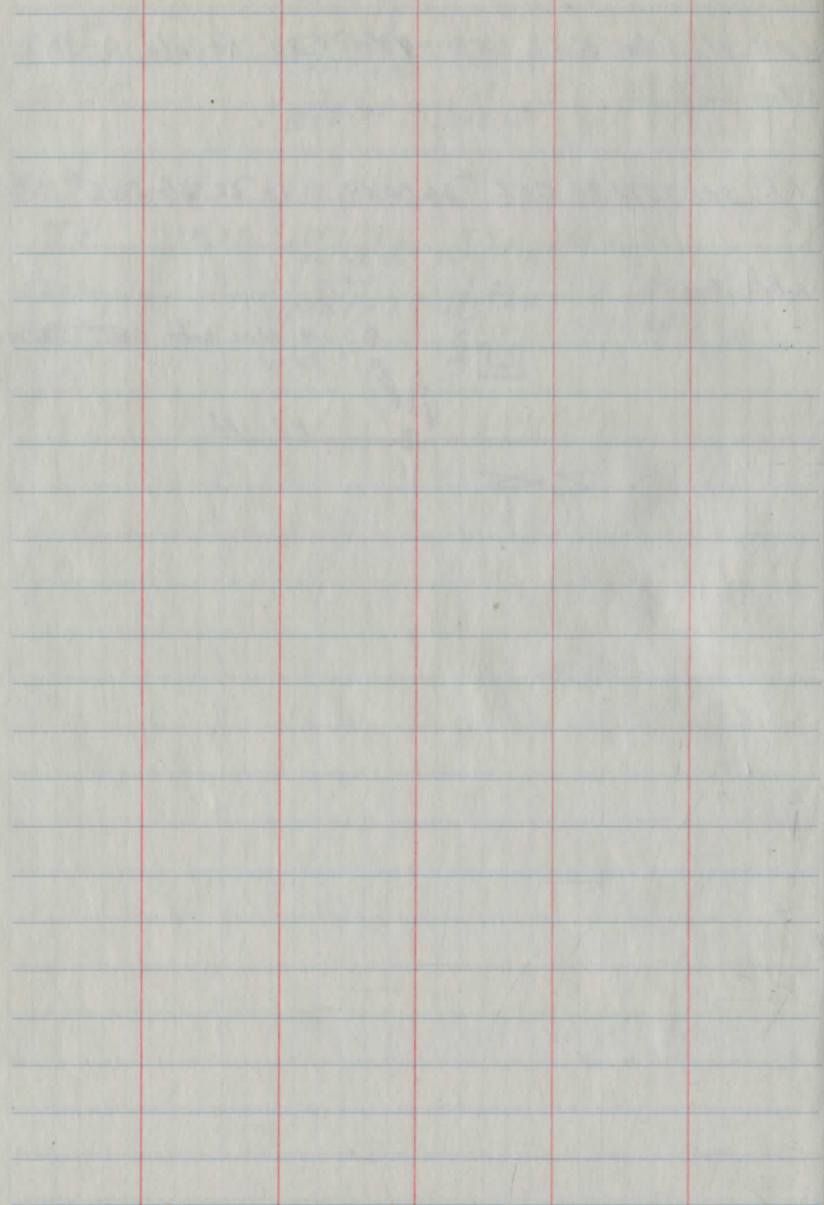
BM #1	3.61	1219.88		1215.87	
		outlet FL	inlet FL		
0+25		7.15	6.81		18" CMP
		1212.33	1212.67		
BM #3A	2.25	1291.16		1288.88	
T.P.	4.37	1289.63	5.90	1285.26	
		outlet FL	inlet FL		
52+00		8.77	8.20		12" can
BM #3A		1286.86	1281.43		(.02)
			.77	1288.86	

Spk N. side CEZ 580498 30' RT sta 0-30
 x Rd. Culvert

RR. spk S. side CEZ # 269264 30' LV. sta 56+58

x Rd. Culvert



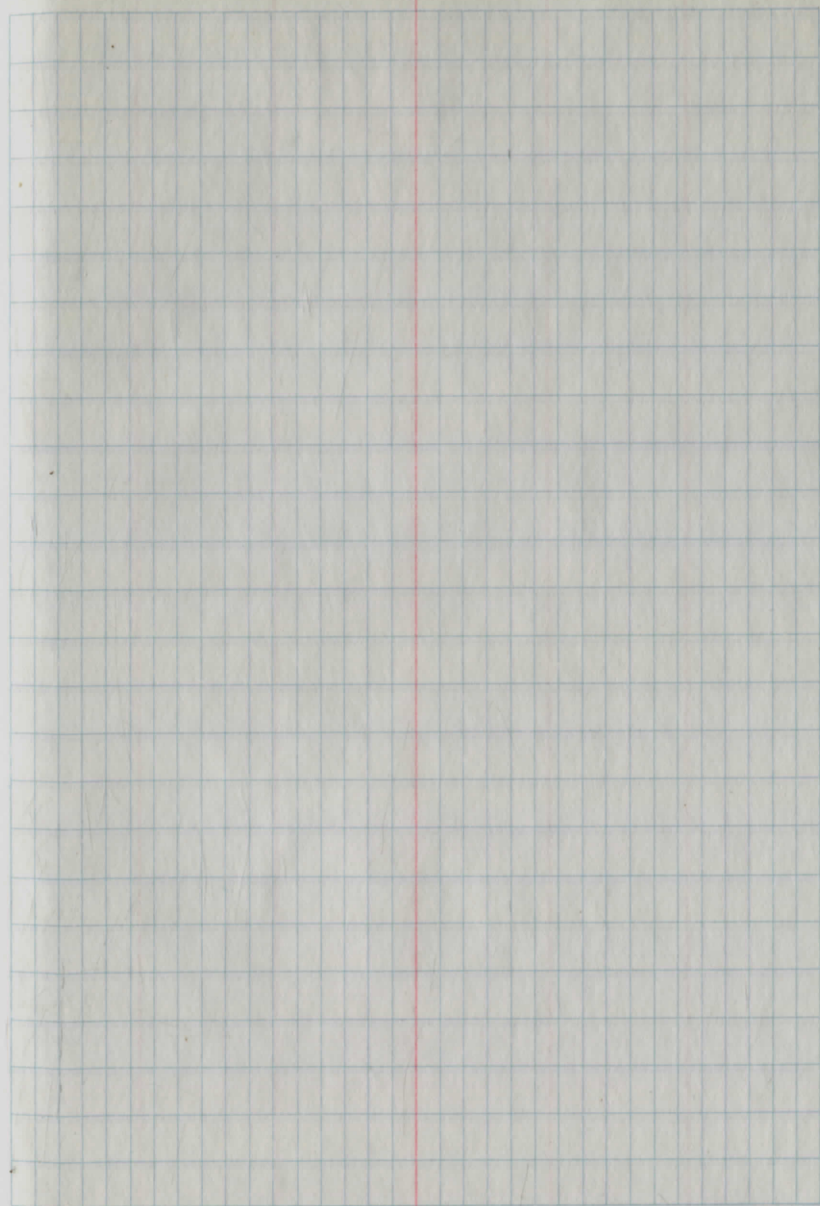


Blank lined page with horizontal blue lines and three vertical red margin lines.

Blank grid page with a grid of small squares and a vertical red margin line on the left side.

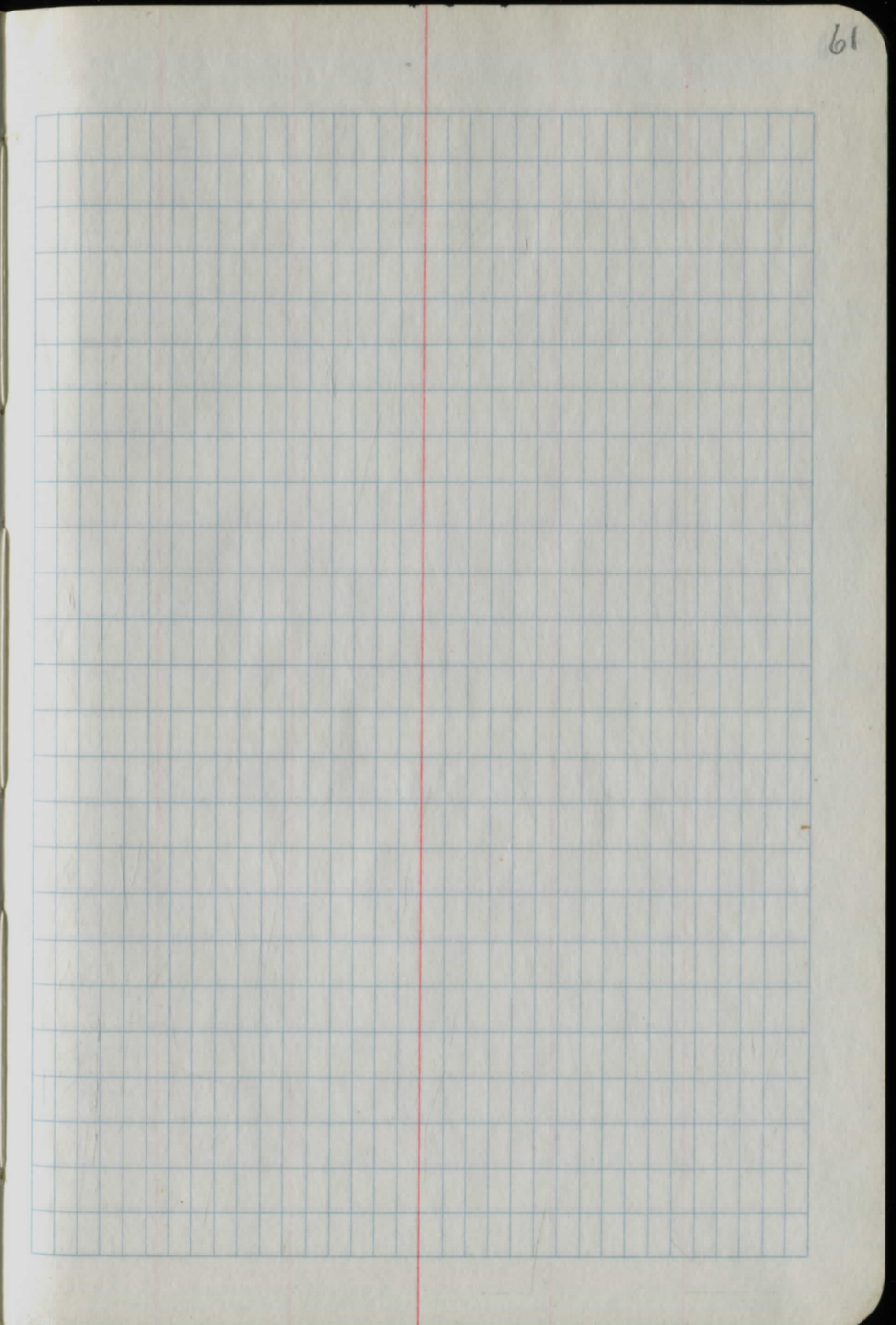
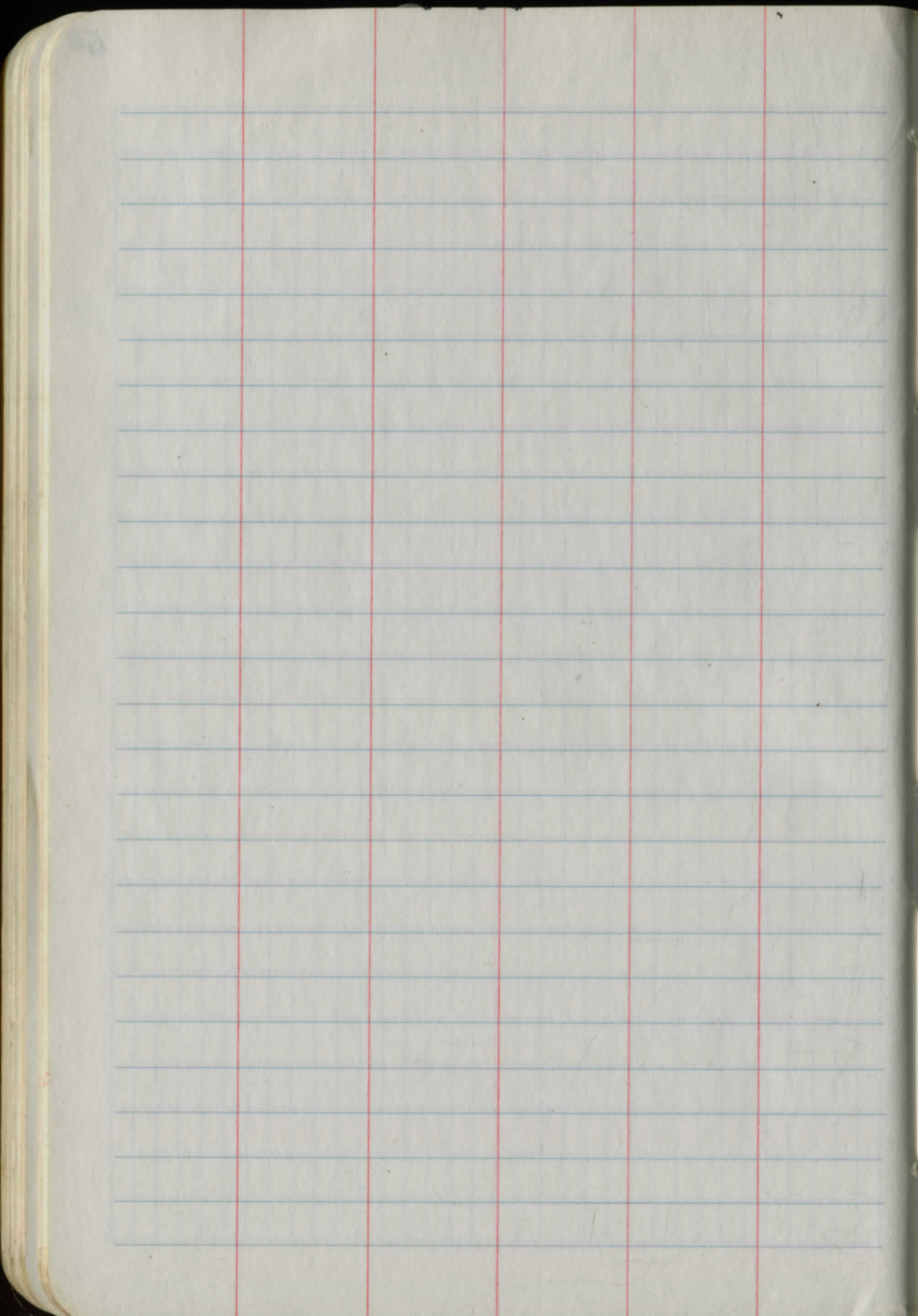
Blank lined page with horizontal blue lines and three vertical red margin lines.

Blank grid page with a grid of small blue squares and one vertical red margin line.



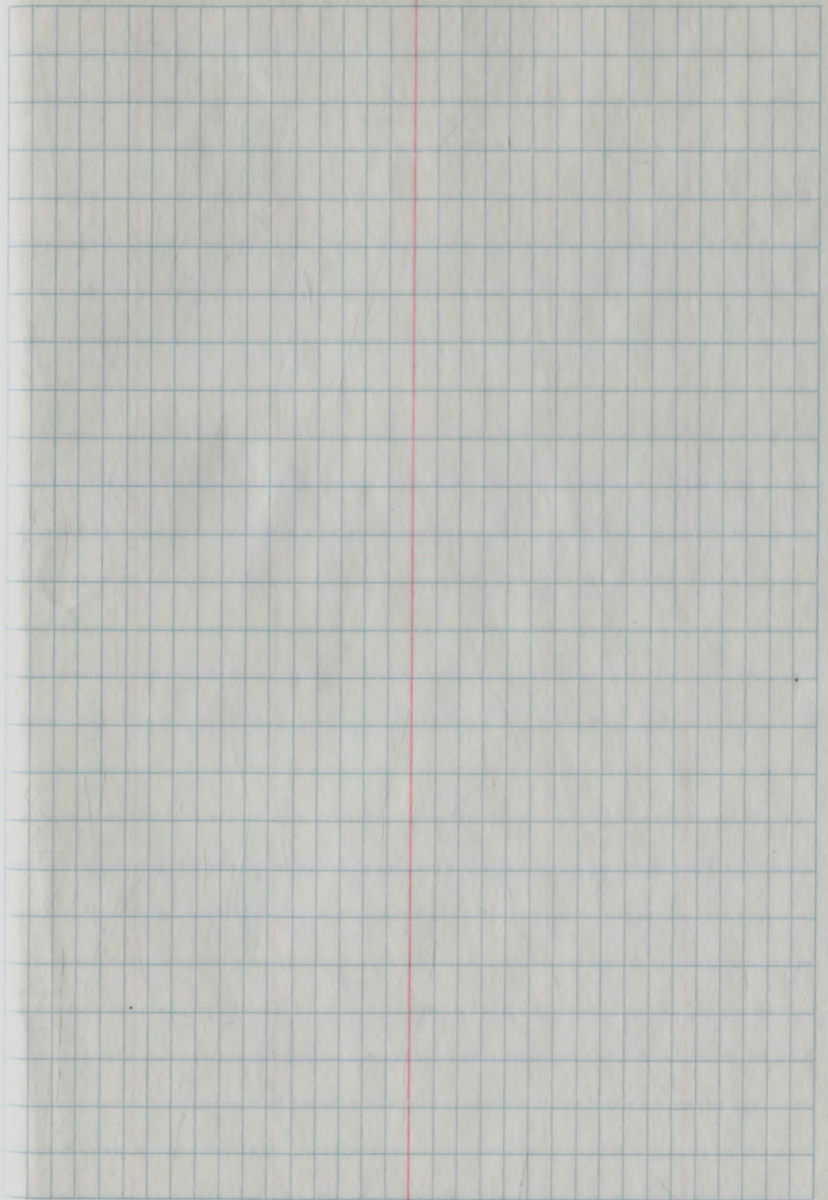
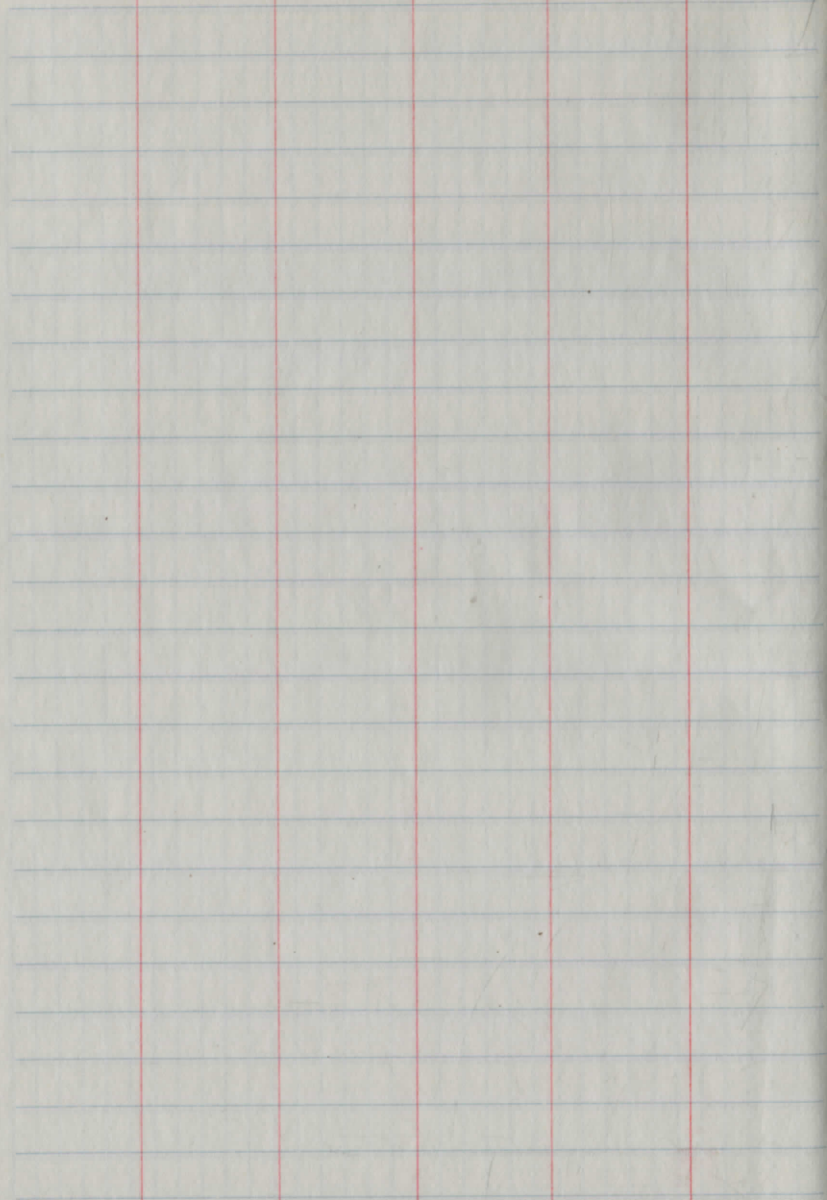
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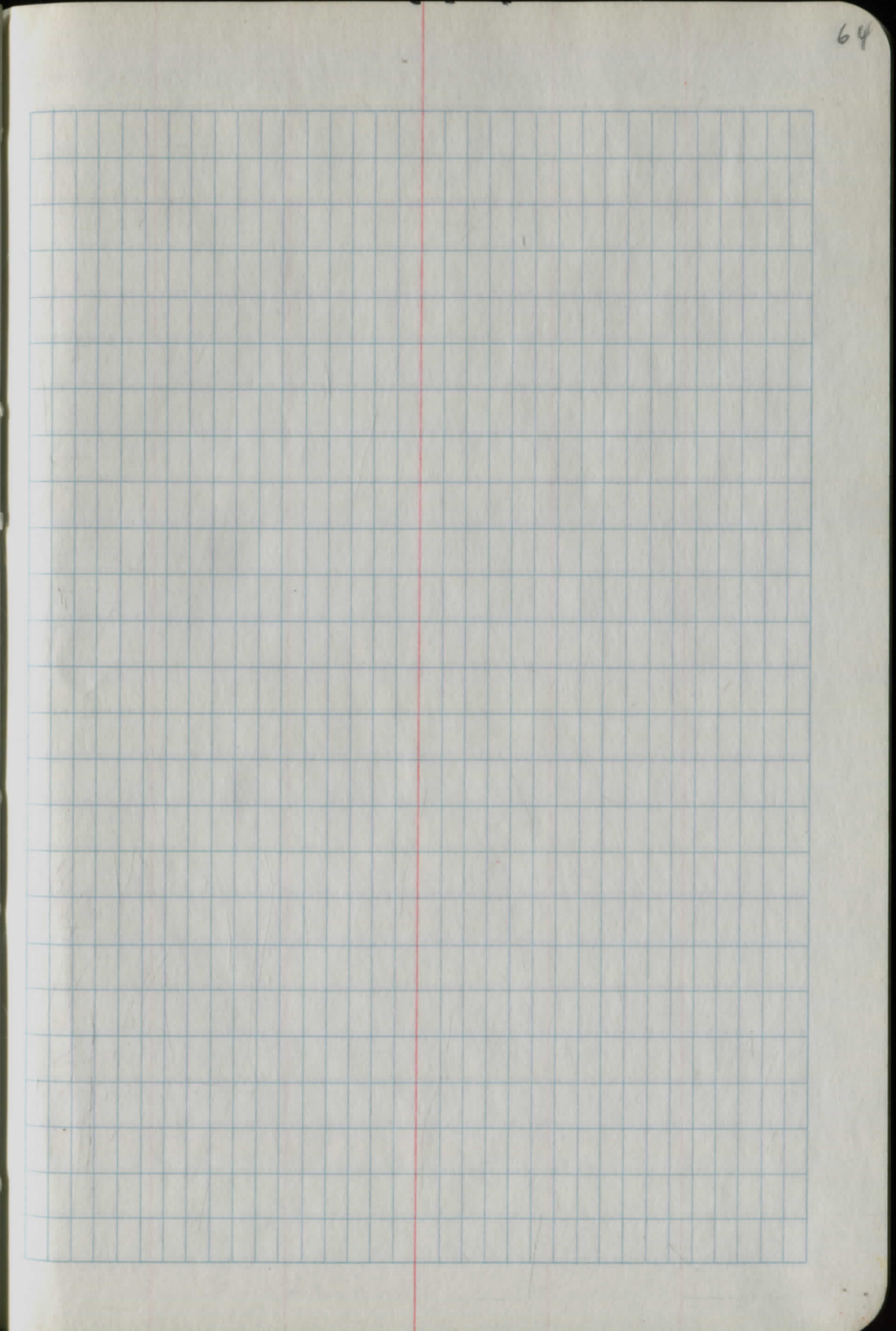
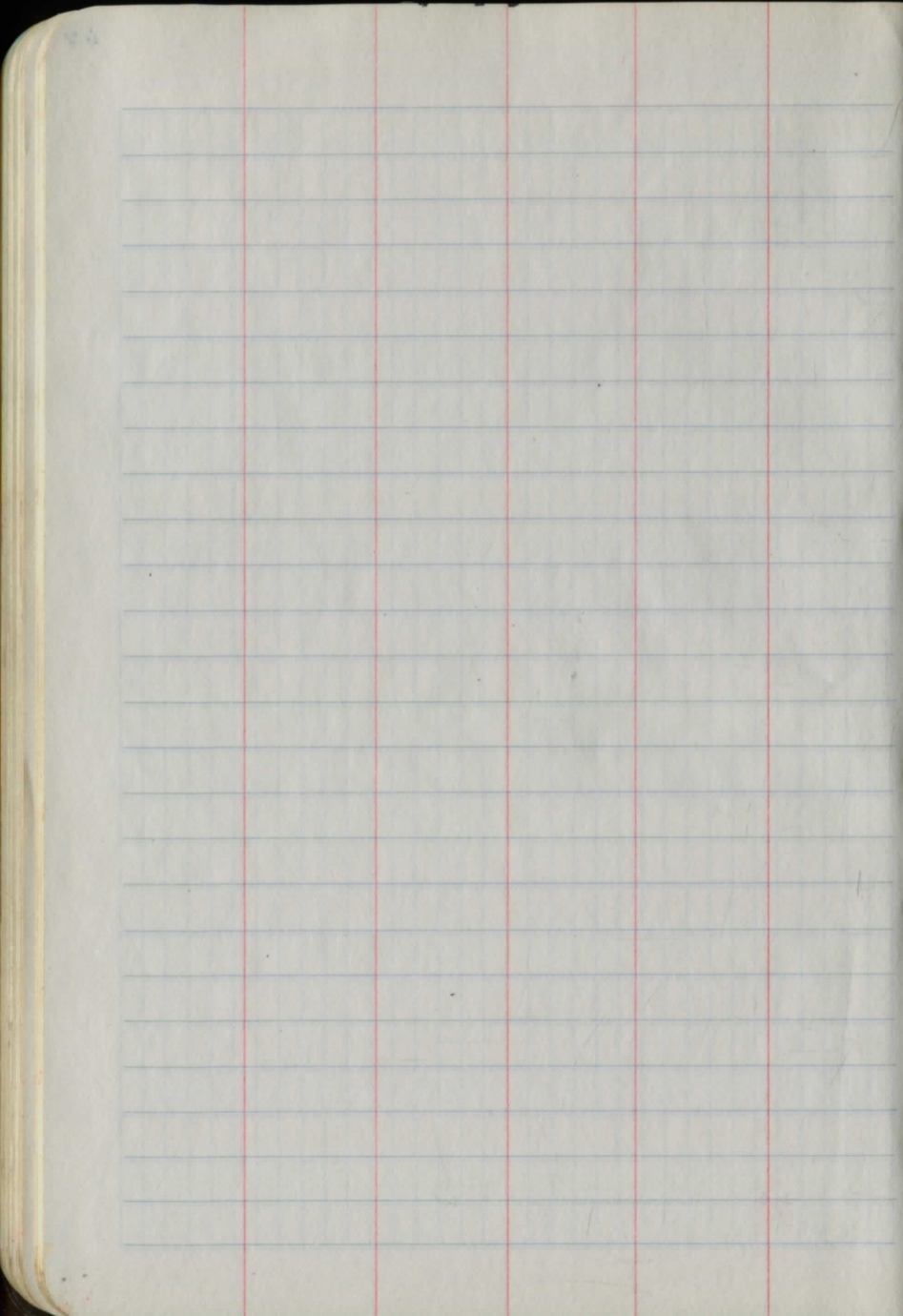
Blank grid page with a vertical red margin line.

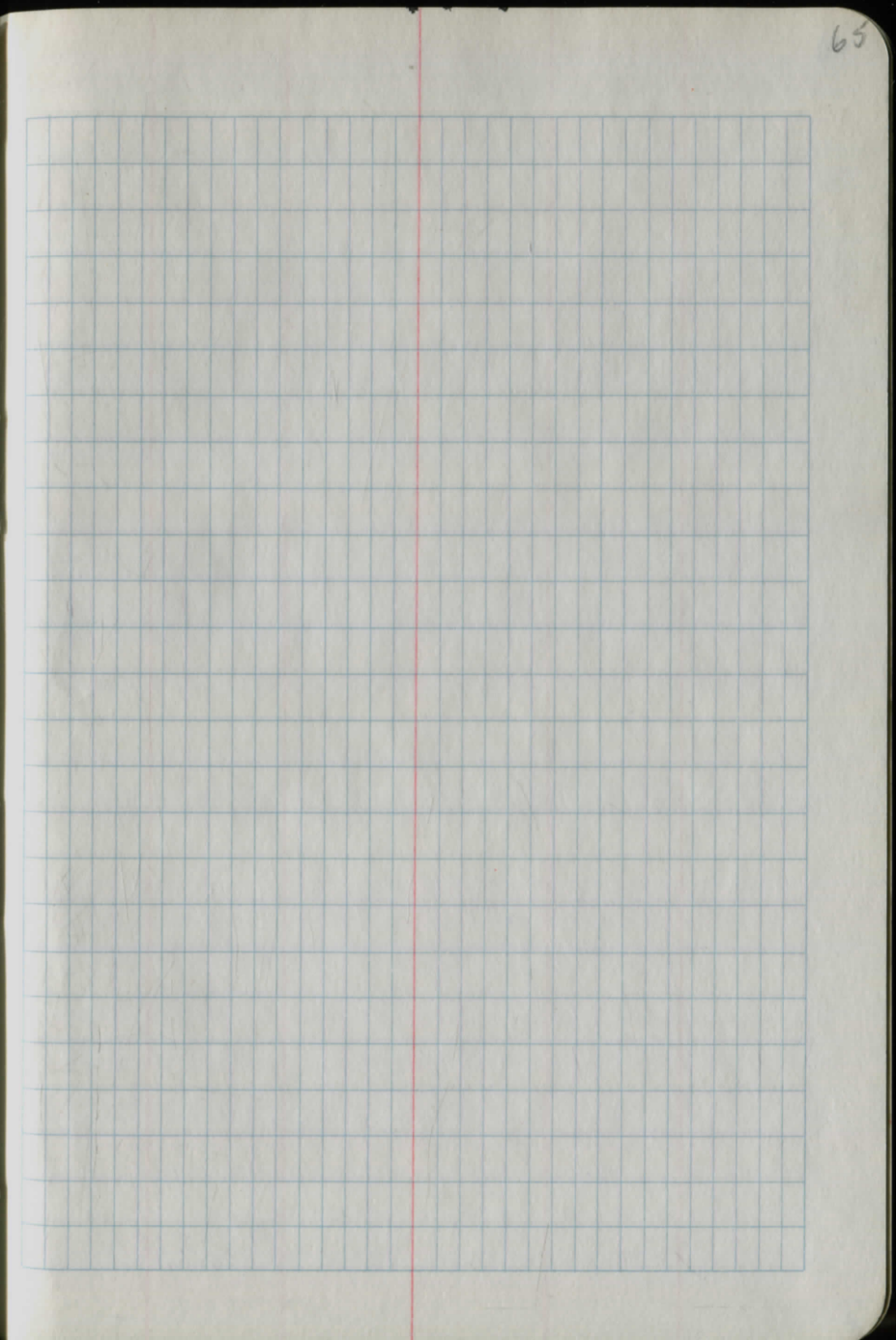
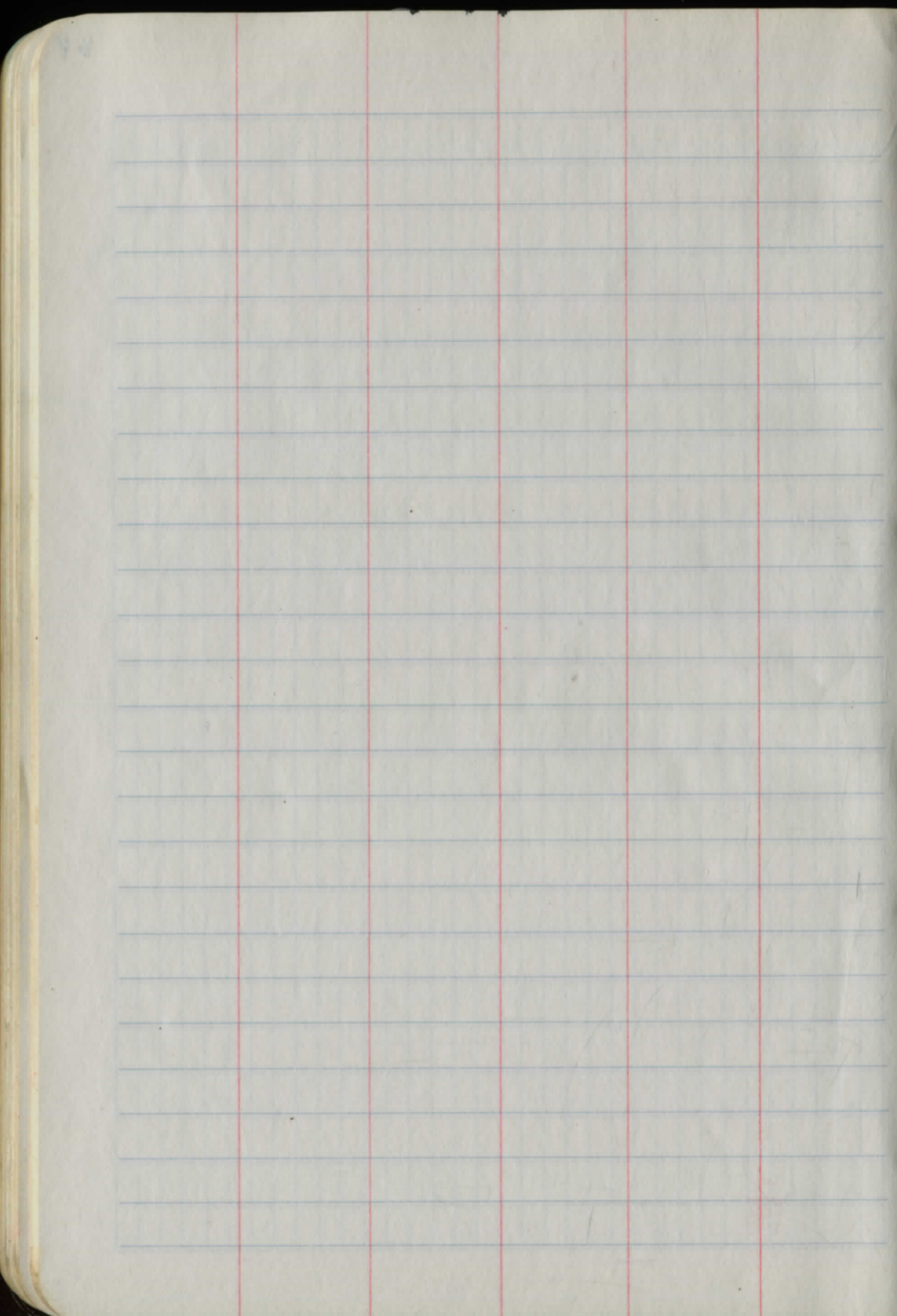


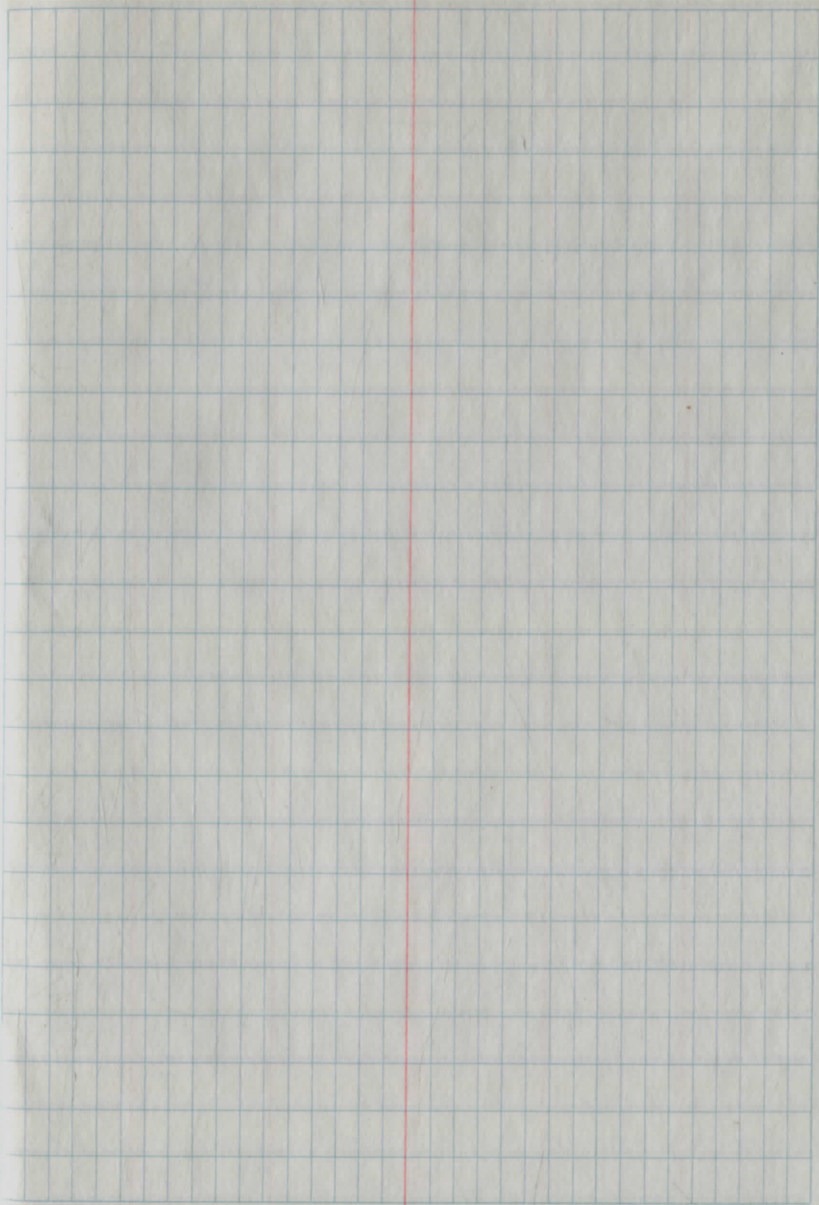
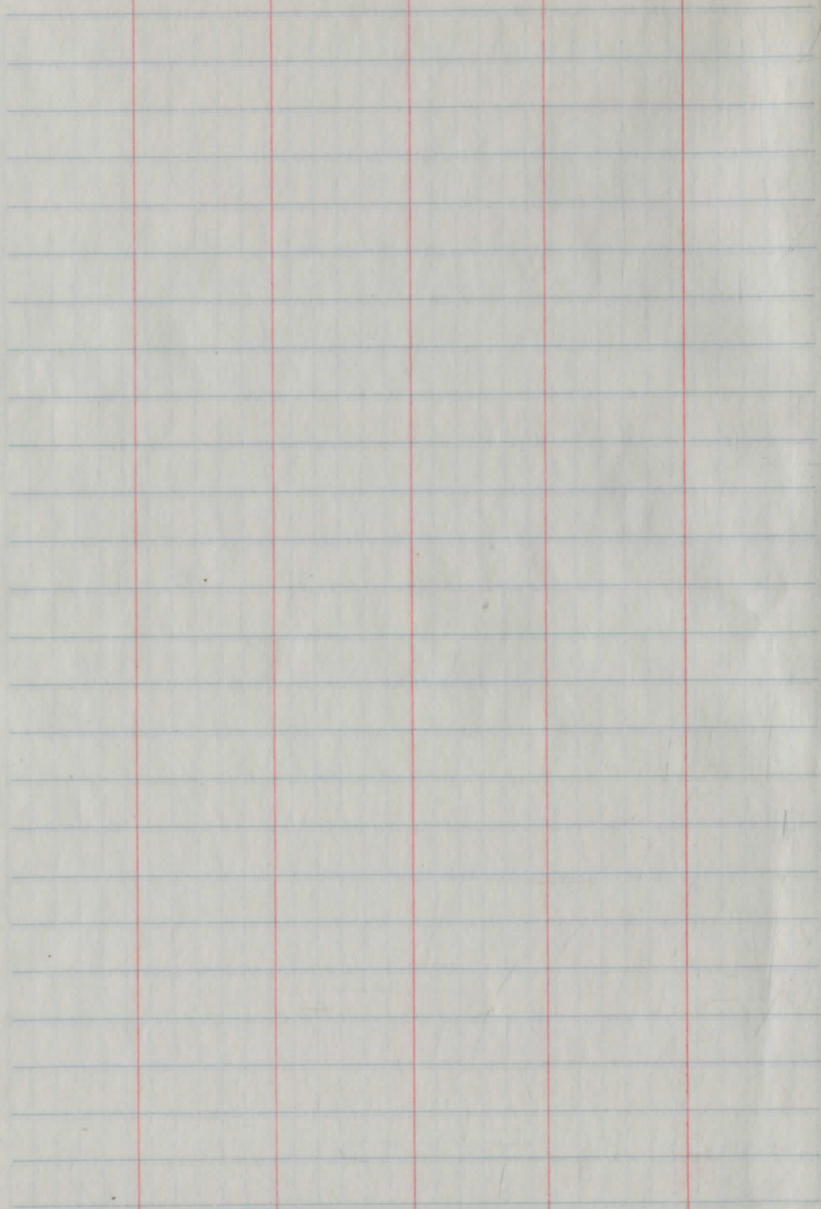
Blank lined page with horizontal blue lines and three vertical red margin lines.

Blank grid page with a blue grid pattern and one vertical red margin line.









Blank lined page with three vertical red margin lines.

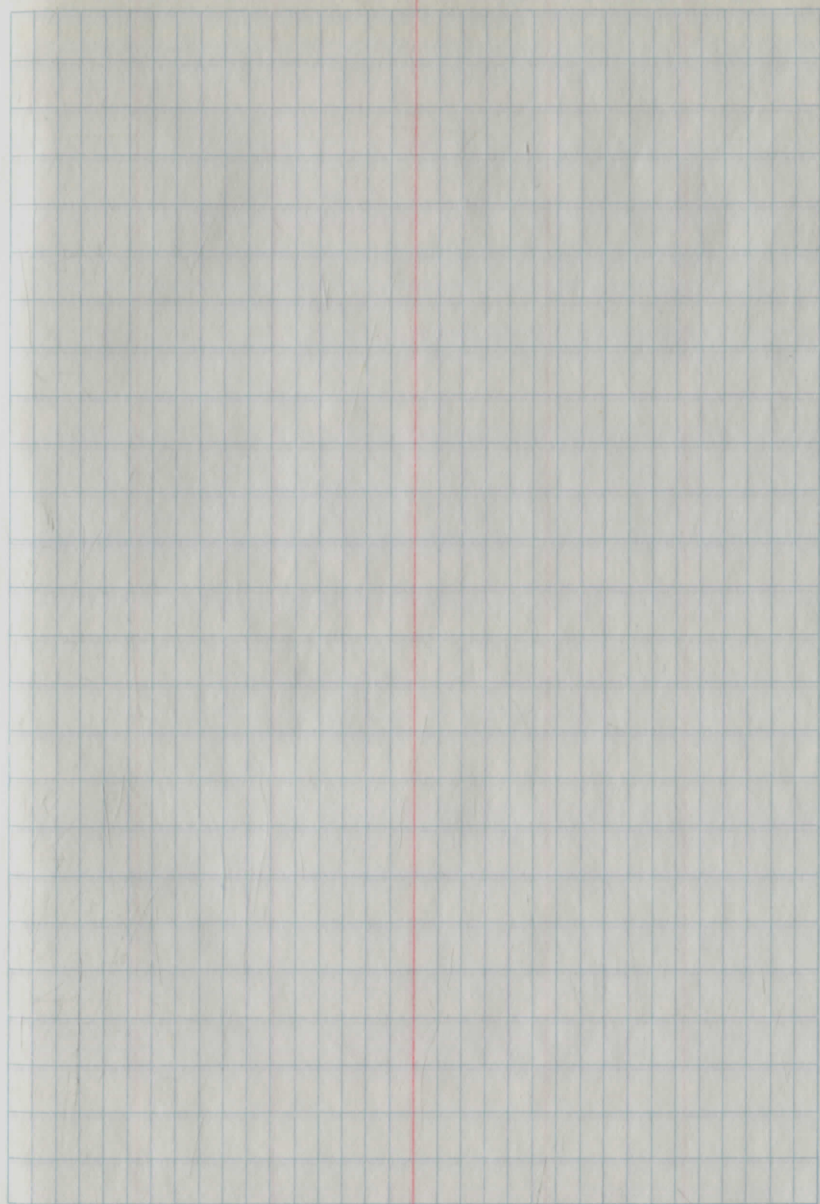
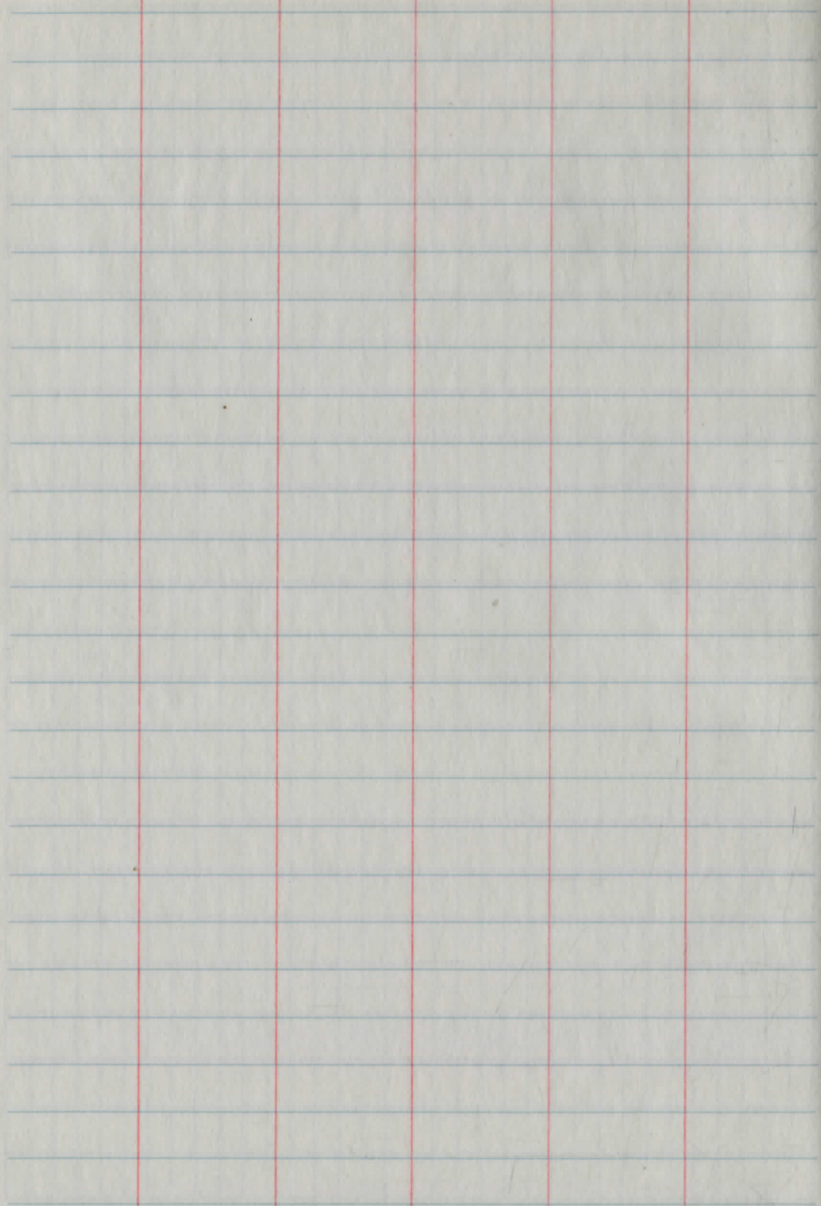
Blank grid page with a vertical red margin line.

This page is a blank ledger with horizontal blue lines and three vertical red margin lines. The margins are located approximately at the 15%, 25%, and 40% marks from the left edge. There are some faint blue smudges at the bottom left corner.

This page is a blank ledger with a grid pattern of blue lines and one vertical red margin line. The grid is approximately 20 columns wide and 25 rows high. The red margin line is located at the 15% mark from the left edge. There are some faint blue smudges at the bottom right corner.

Blank lined page with four vertical red margin lines.

Blank grid page with a single vertical red margin line.



Blank lined page with three vertical red margin lines.

Blank grid page with a vertical red margin line on the left side.

This page is a blank ledger sheet. It features a series of horizontal blue lines spaced evenly down the page. There are four vertical red lines that create five columns of varying widths. The columns are roughly in the proportions of 1:1:1:1:2 from left to right. The page is otherwise empty of any text or markings.

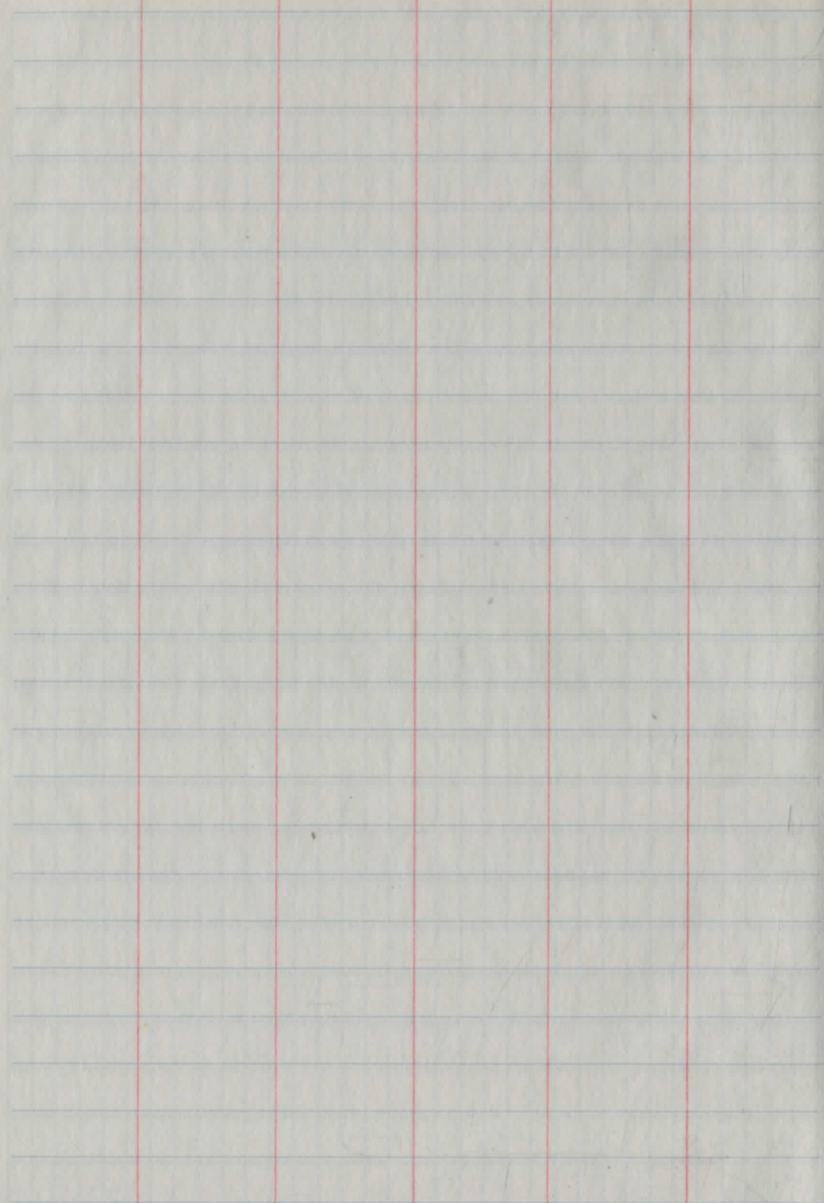
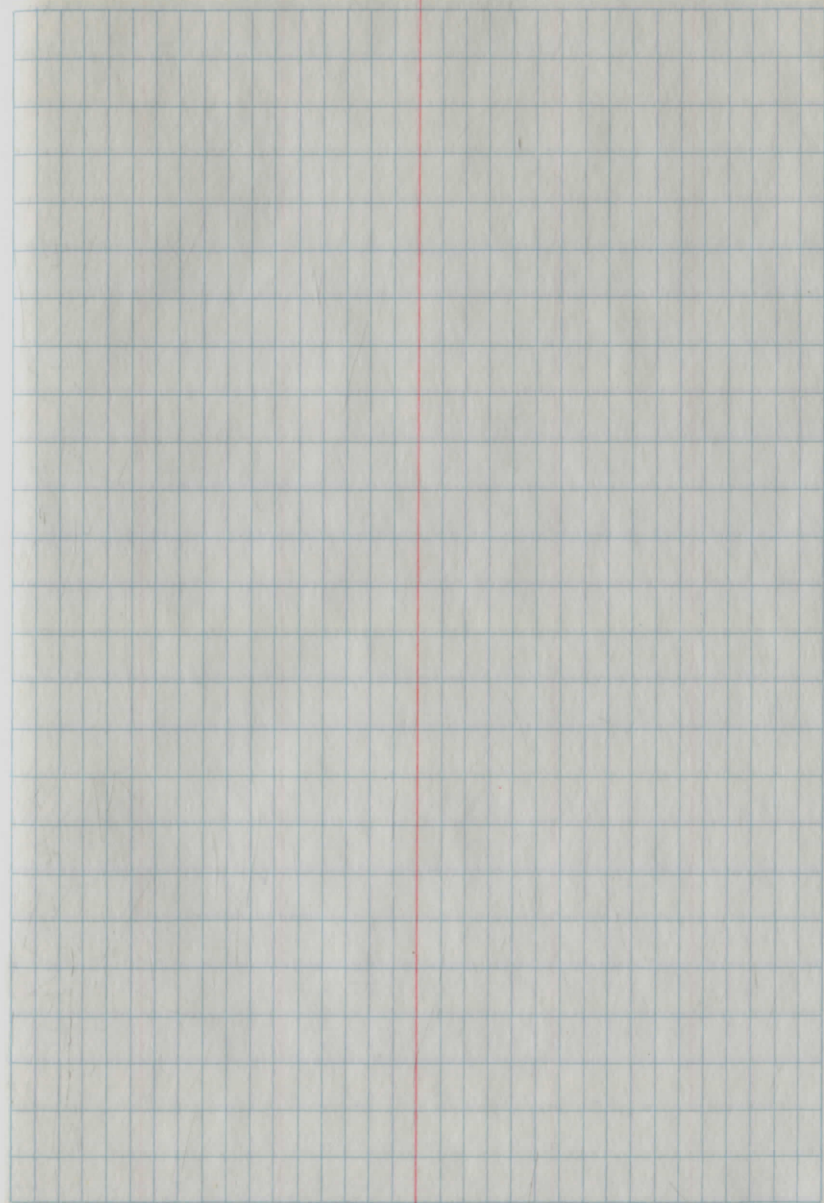
This page is a blank grid sheet. It features a single vertical red margin line on the left side. The rest of the page is covered in a blue grid pattern. The grid consists of 20 columns and 20 rows of small squares. The page is otherwise empty of any text or markings.

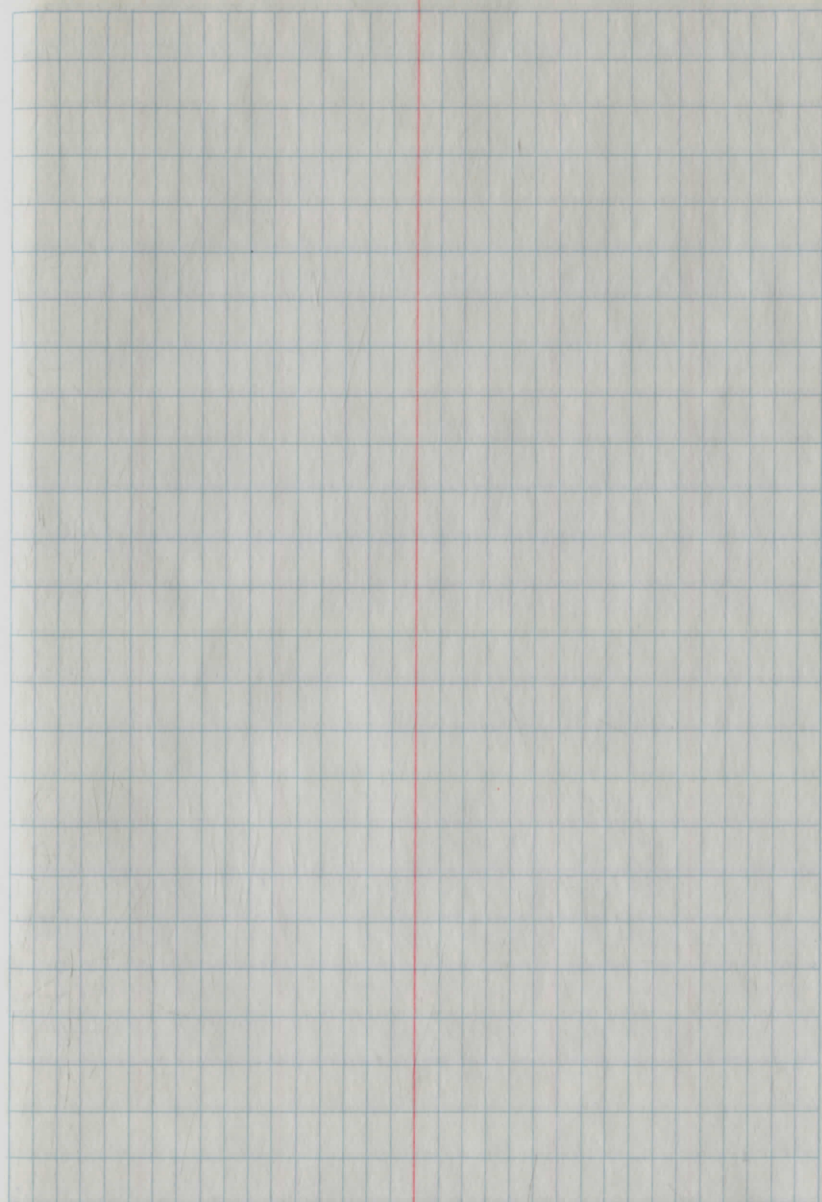
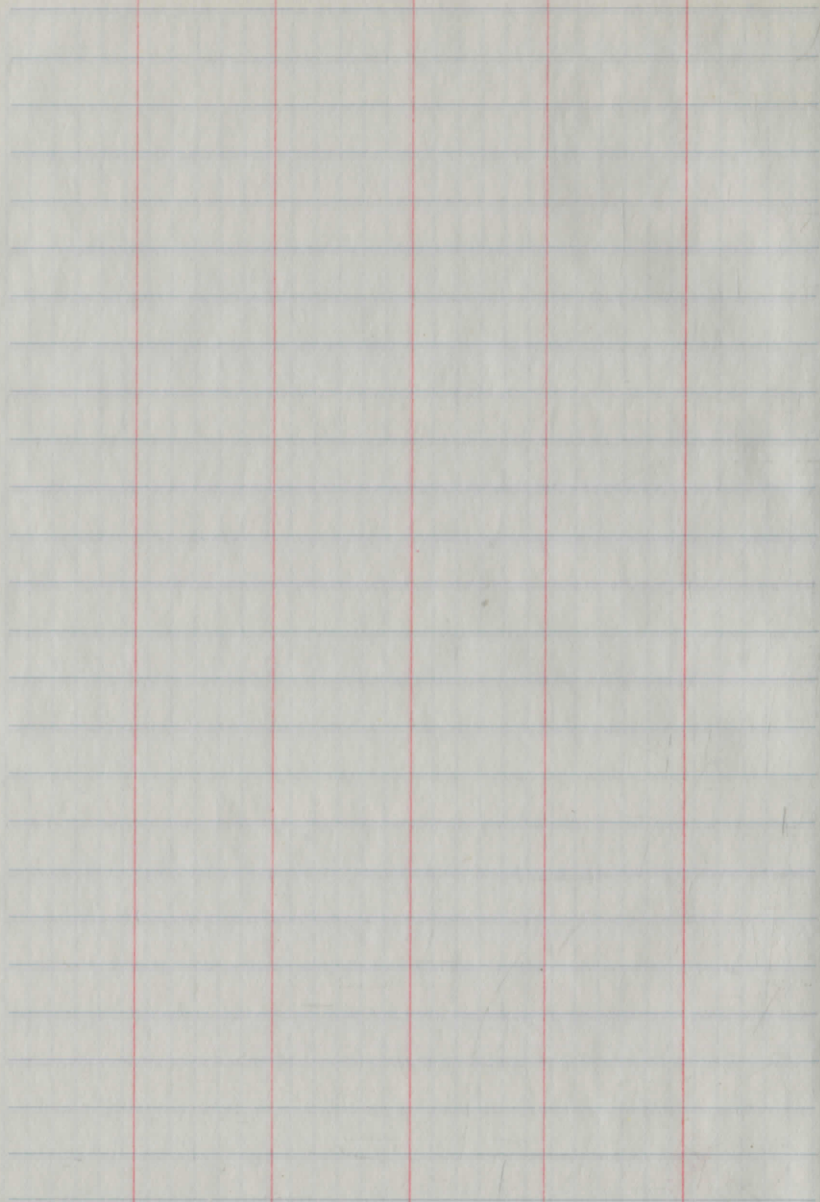
Blank lined page with horizontal blue lines and vertical red margin lines.

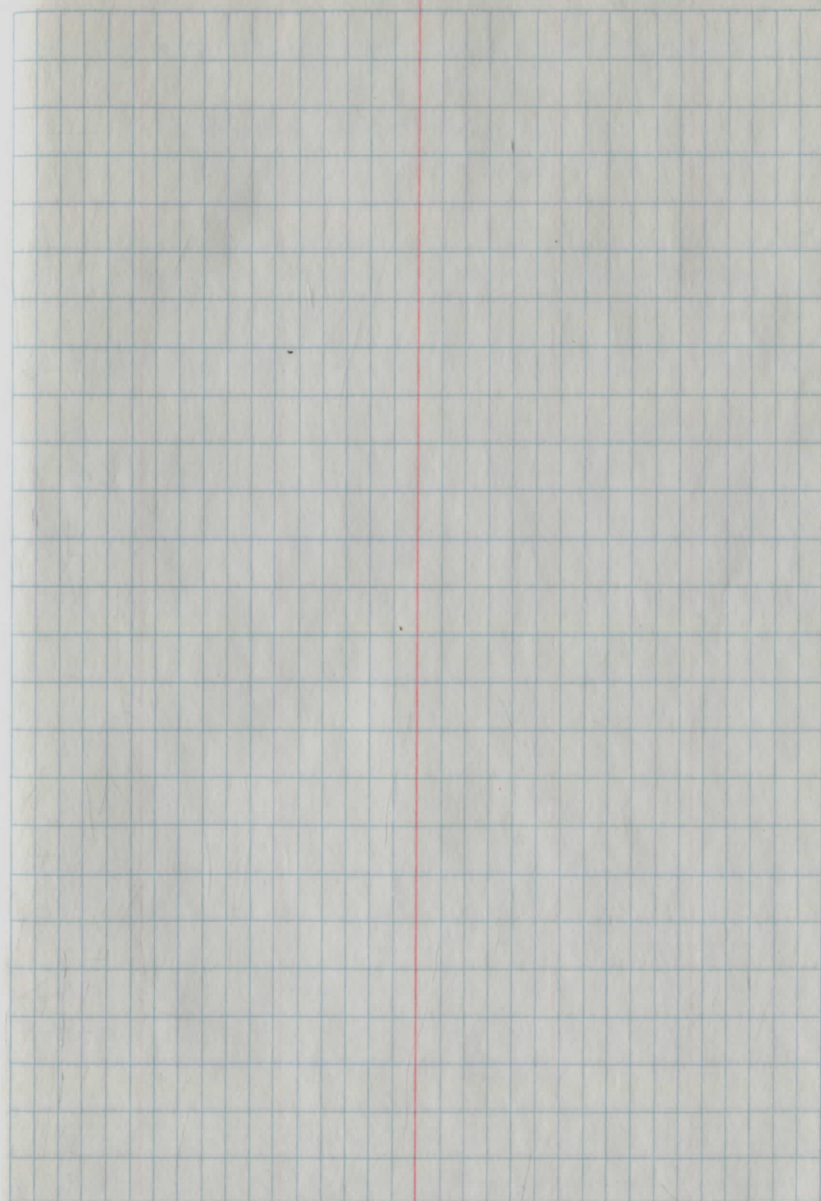
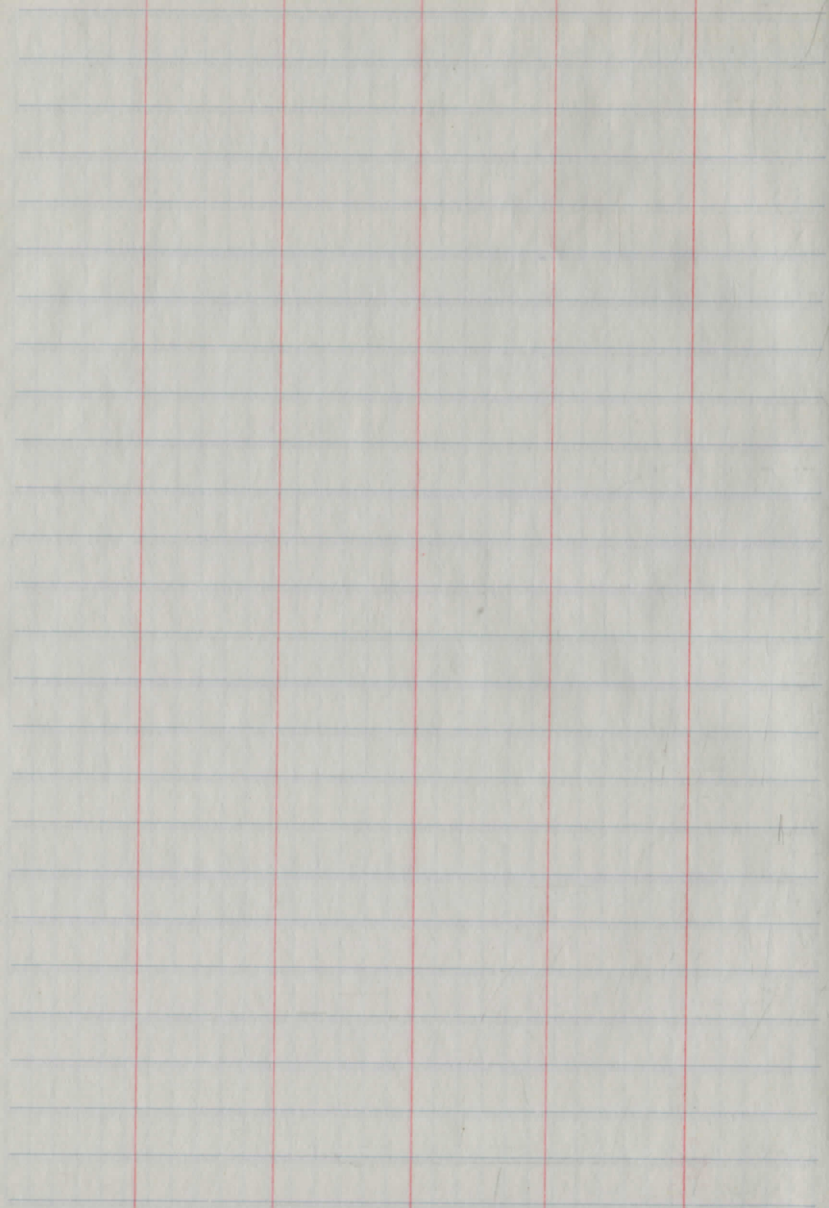
Blank grid page with a grid of blue lines and a vertical red margin line.

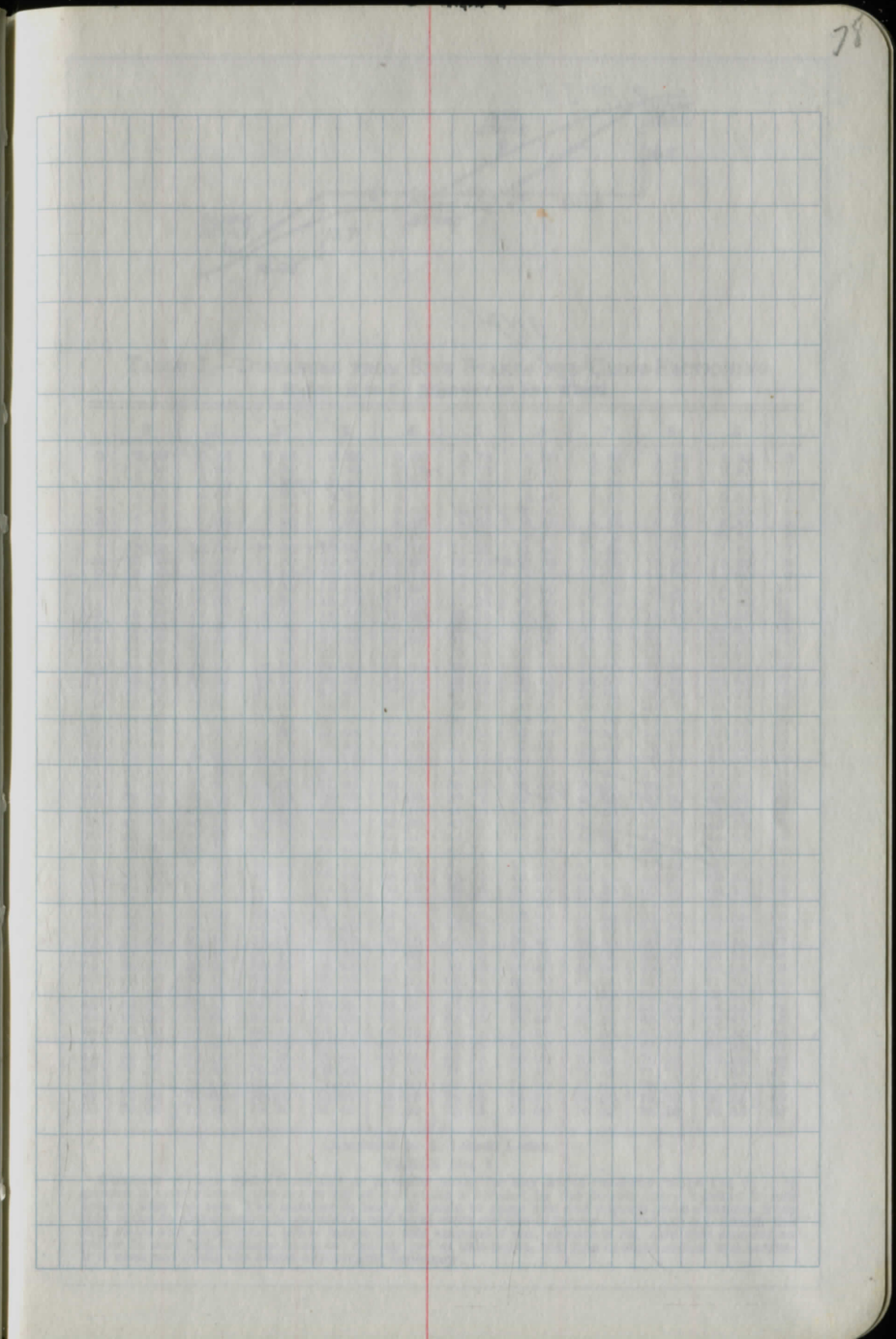
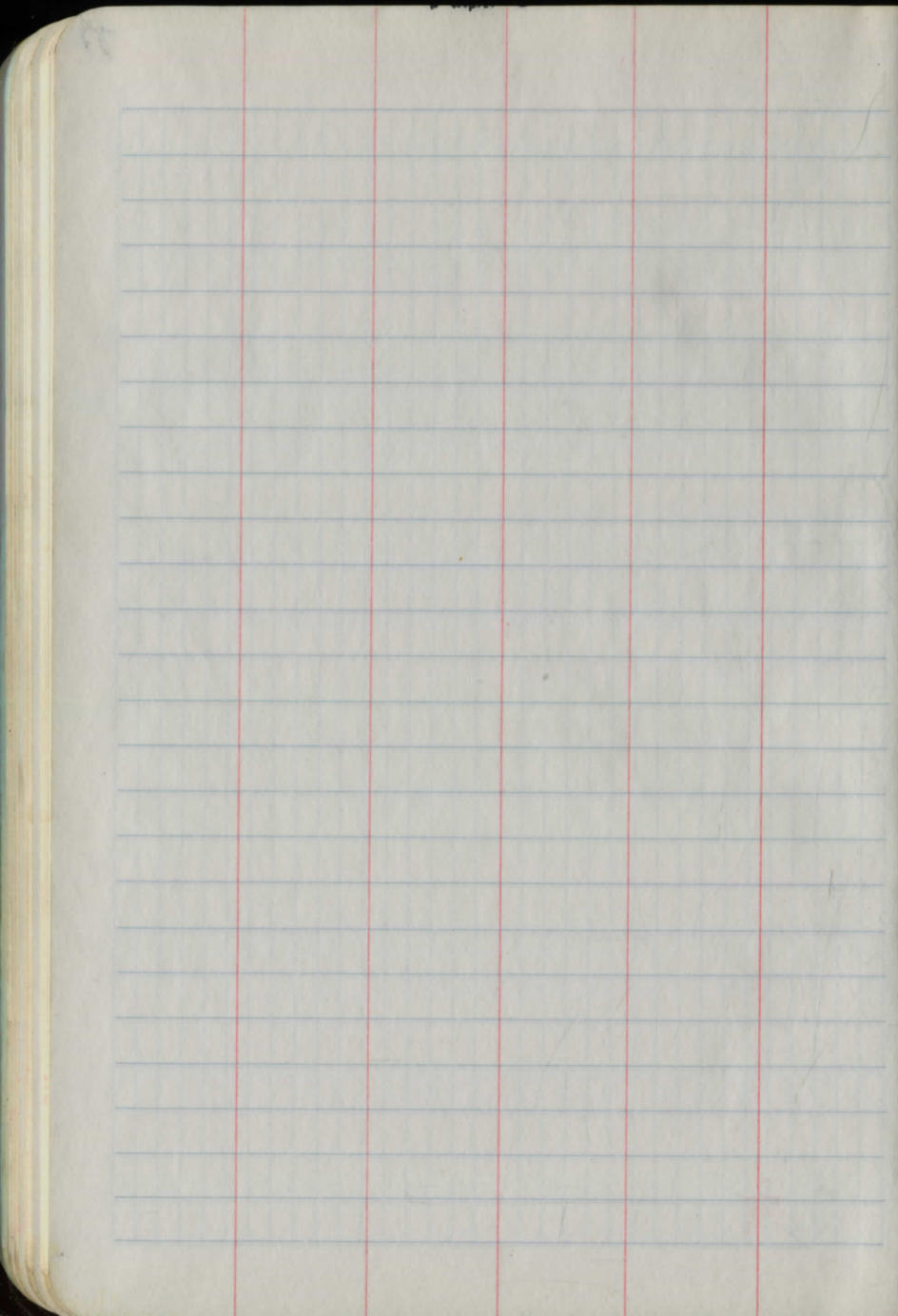
This page features horizontal blue lines for writing. It is divided into four vertical columns by three vertical red lines. The columns are of varying widths, with the two inner columns being the narrowest and the two outer columns being the widest.

This page features a blue grid pattern. A single vertical red line is positioned on the right side of the page, creating a narrow margin. The grid covers the majority of the page area.



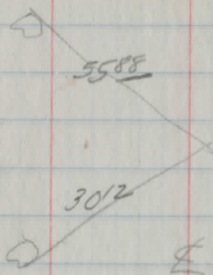






20 ±

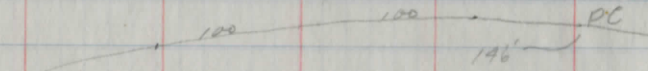
179°35'



98°42' total angle South

87°04'

97°37'



87-04

97-37

4-41 = D

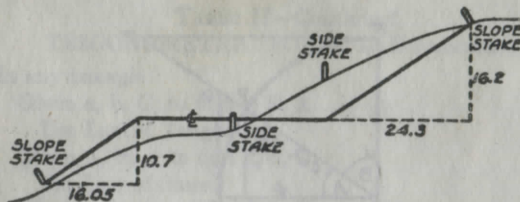
~~4-41 = D~~

TABLE I.—DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING
SLOPE 1 1/4 TO 1. ROADWAY OF ANY WIDTH

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	0.00	0.15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	0
1	1.50	1.65	1.80	1.95	2.10	2.25	2.40	2.55	2.70	2.85	1
2	3.00	3.15	3.30	3.45	3.60	3.75	3.90	4.05	4.20	4.35	2
3	4.50	4.65	4.80	4.95	5.10	5.25	5.40	5.55	5.70	5.85	3
4	6.00	6.15	6.30	6.45	6.60	6.75	6.90	7.05	7.20	7.35	4
5	7.50	7.65	7.80	7.95	8.10	8.25	8.40	8.55	8.70	8.85	5
6	9.00	9.15	9.30	9.45	9.60	9.75	9.90	10.05	10.20	10.35	6
7	10.50	10.65	10.80	10.95	11.10	11.25	11.40	11.55	11.70	11.85	7
8	12.00	12.15	12.30	12.45	12.60	12.75	12.90	13.05	13.20	13.35	8
9	13.50	13.65	13.80	13.95	14.10	14.25	14.40	14.55	14.70	14.85	9
10	15.00	15.15	15.30	15.45	15.60	15.75	15.90	16.05	16.20	16.35	10
11	16.50	16.65	16.80	16.95	17.10	17.25	17.40	17.55	17.70	17.85	11
12	18.00	18.15	18.30	18.45	18.60	18.75	18.90	19.05	19.20	19.35	12
13	19.50	19.65	19.80	19.95	20.10	20.25	20.40	20.55	20.70	20.85	13
14	21.00	21.15	21.30	21.45	21.60	21.75	21.90	22.05	22.20	22.35	14
15	22.50	22.65	22.80	22.95	23.10	23.25	23.40	23.55	23.70	23.85	15
16	24.00	24.15	24.30	24.45	24.60	24.75	24.90	25.05	25.20	25.35	16
17	25.50	25.65	25.80	25.95	26.10	26.25	26.40	26.55	26.70	26.85	17
18	27.00	27.15	27.30	27.45	27.60	27.75	27.90	28.05	28.20	28.35	18
19	28.50	28.65	28.80	28.95	29.10	29.25	29.40	29.55	29.70	29.85	19
20	30.00	30.15	30.30	30.45	30.60	30.75	30.90	31.05	31.20	31.35	20
21	31.50	31.65	31.80	31.95	32.10	32.25	32.40	32.55	32.70	32.85	21
22	33.00	33.15	33.30	33.45	33.60	33.75	33.90	34.05	34.20	34.35	22
23	34.50	34.65	34.80	34.95	35.10	35.25	35.40	35.55	35.70	35.85	23
24	36.00	36.15	36.30	36.45	36.60	36.75	36.90	37.05	37.20	37.35	24
25	37.50	37.65	37.80	37.95	38.10	38.25	38.40	38.55	38.70	38.85	25
26	39.00	39.15	39.30	39.45	39.60	39.75	39.90	40.05	40.20	40.35	26
27	40.50	40.65	40.80	40.95	41.10	41.25	41.40	41.55	41.70	41.85	27
28	42.00	42.15	42.30	42.45	42.60	42.75	42.90	43.05	43.20	43.35	28
29	43.50	43.65	43.80	43.95	44.10	44.25	44.40	44.55	44.70	44.85	29
30	45.00	45.15	45.30	45.45	45.60	45.75	45.90	46.05	46.20	46.35	30
31	46.50	46.65	46.80	46.95	47.10	47.25	47.40	47.55	47.70	47.85	31
32	48.00	48.15	48.30	48.45	48.60	48.75	48.90	49.05	49.20	49.35	32
33	49.50	49.65	49.80	49.95	50.10	50.25	50.40	50.55	50.70	50.85	33
34	51.00	51.15	51.30	51.45	51.60	51.75	51.90	52.05	52.20	52.35	34
35	52.50	52.65	52.80	52.95	53.10	53.25	53.40	53.55	53.70	53.85	35
36	54.00	54.15	54.30	54.45	54.60	54.75	54.90	55.05	55.20	55.35	36
37	55.50	55.65	55.80	55.95	56.10	56.25	56.40	56.55	56.70	56.85	37
38	57.00	57.15	57.30	57.45	57.60	57.75	57.90	58.05	58.20	58.35	38
39	58.50	58.65	58.80	58.95	59.10	59.25	59.40	59.55	59.70	59.85	39
40	60.00	60.15	60.30	60.45	60.60	60.75	60.90	61.05	61.20	61.35	40
41	61.50	61.65	61.80	61.95	62.10	62.25	62.40	62.55	62.70	62.85	41
42	63.00	63.15	63.30	63.45	63.60	63.75	63.90	64.05	64.20	64.35	42
43	64.50	64.65	64.80	64.95	65.10	65.25	65.40	65.55	65.70	65.85	43
44	66.00	66.15	66.30	66.45	66.60	66.75	66.90	67.05	67.20	67.35	44
45	67.50	67.65	67.80	67.95	68.10	68.25	68.40	68.55	68.70	68.85	45
46	69.00	69.15	69.30	69.45	69.60	69.75	69.90	70.05	70.20	70.35	46
47	70.50	70.65	70.80	70.95	71.10	71.25	71.40	71.55	71.70	71.85	47
48	72.00	72.15	72.30	72.45	72.60	72.75	72.90	73.05	73.20	73.35	48
49	73.50	73.65	73.80	73.95	74.10	74.25	74.40	74.55	74.70	74.85	49
50	75.00	75.15	75.30	75.45	75.60	75.75	75.90	76.05	76.20	76.35	50

Computed by L. Leland Locke.

TABLE No. 1

Distance of slope stake from side or shoulder stake for any width roadway, slope 1 1/4 to 1. If ground is nearly level, the cut or fill at side stake is located by the double entry method in left column and top row. The number in body of table in same row and column gives distance from side stake to slope stake. If ground is not level estimate the difference in elevation between the side stake and slope stake, lower target by this amount if cut, elevate if fill. Add this amount to cut or fill and the distance in table. Set up rod at this point, and line of sight should cut target. If it does not make the slight adjustment necessary.

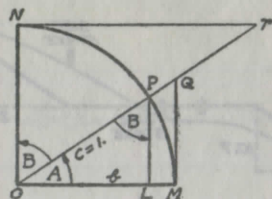


TABLE II

TRIGONOMETRIC FORMULAE

$$\angle A = \angle MOP \quad \angle B = \angle PON = \angle OPL$$

$$R = OB = c = 1$$

$$\sin A = \frac{a}{c} = \frac{a}{1} = a = \cos B = LP$$

$$\cos A = \frac{b}{c} = \frac{b}{1} = b = \sin B = OL$$

$$\tan A = \frac{a}{b} = \frac{MQ}{OM} = \frac{MQ}{1} = MQ = \cot B = MQ$$

$$\cot A = \frac{NT}{ON} = \frac{NT}{1} = NT = \tan B = NT$$

$$\sec A = \frac{OQ}{OM} = \frac{OQ}{1} = OQ = \csc B = OQ$$

$$\csc A = \frac{OT}{ON} = \frac{OT}{1} = OT = \sec B = OT$$

$$\text{vers } A = \frac{LM}{OP} = LM = \text{covers } B \#$$

$$\text{covers } A = \frac{OP - LP}{OP} = OP - LP = \text{vers } B$$

$$\text{exsec } A = PQ = \text{coexsec } B$$

$$\text{coexsec } A = PT = \text{exsec } B$$

$$\sin \frac{1}{2}A = \sqrt{\frac{1 - \cos A}{2}} \quad \cos \frac{1}{2}A = \sqrt{\frac{1 + \cos A}{2}}$$

$$\sin 2A = 2 \sin A \cos A \quad \cos 2A = \cos^2 A - \sin^2 A$$

$$\text{Law of Sines} \quad \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\text{Law of Cosines} \quad c^2 = a^2 + b^2 - 2ab \cos C$$

$$\text{Law of Tangents} \quad \frac{a+b}{a-b} = \frac{\tan \frac{1}{2}(A+B)}{\tan \frac{1}{2}(A-B)}$$

TABLE II—Continued
TRIGONOMETRIC FORMULAE (continued)

In any triangle:

Given a, b, C ; to find c, B, A .

Use Law of Tangents.

Given A, B, c ; to find a, b, C .

Use Law of Sines.

Given a, b, c ; to find A, B, C .

$$\text{Let } \frac{a+b+c}{2} = s, \sqrt{\frac{(s-a)(s-b)(s-c)}{s}} = r$$

$$\cos \frac{1}{2}A = \sqrt{\frac{s(s-a)}{bc}}$$

$$\tan \frac{1}{2}A = \frac{r}{s-a}$$

$$\tan \frac{1}{2}B = \frac{r}{s-b}$$

$$\tan \frac{1}{2}C = \frac{r}{s-c}$$

Area of a triangle:

$$\text{Area} = \frac{1}{2}ab \sin C$$

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

PRISMOIDAL FORMULA

$$\text{Vol.} = \frac{h}{6}(B+b+4M)$$

h = altitude; b, B = bases; M = midsection

TABLE III
MINUTES IN DECIMALS OF A DEGREE

1'	.0167	11'	.1833	21'	.3500	31'	.5167	41'	.6833	51'	.8500
2	.0333	12	.2000	22	.3667	32	.5333	42	.7000	52	.8667
3	.0500	13	.2167	23	.3833	33	.5500	43	.7167	53	.8833
4	.0667	14	.2333	24	.4000	34	.5667	44	.7333	54	.9000
5	.0833	15	.2500	25	.4167	35	.5833	45	.7500	55	.9167
6	.1000	16	.2667	26	.4333	36	.6000	46	.7667	56	.9333
7	.1167	17	.2833	27	.4500	37	.6167	47	.7833	57	.9500
8	.1333	18	.3000	28	.4667	38	.6333	48	.8000	58	.9667
9	.1500	19	.3167	29	.4833	39	.6500	49	.8167	59	.9833
10	.1667	20	.3333	30	.5000	40	.6667	50	.8333	60	.10000

TABLE IV
INCHES IN DECIMALS OF A FOOT

$\frac{1}{16}$	$\frac{3}{32}$	$\frac{1}{8}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{15}{16}$
.0052	.0078	.0104	.0156	.0208	.0260	.0313	.0417	.0521	.0625	.0729
1	2	3	4	5	6	7	8	9	10	11
.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167

TABLE V.—RADII, ORDINATES AND DEFLECTIONS

Deg.	Radius	Mid. Ord.	Tan. Offset	Def. for 1 Foot	Deg.	Radius	Mid. Ord.	Tan. Offset	Def. for 1 Foot	
0°	10'	34377.5	.036	.145	0.05'	7°	819.02	1.528	6.105	2.10'
	20'	17188.8	.073	.291	0.10	20'	781.84	1.600	6.395	2.20
	30'	11459.2	.109	.436	0.15	30'	764.49	1.637	6.540	2.25
	40'	8594.42	.145	.582	0.20	40'	747.89	1.673	6.685	2.30
	50'	6875.55	.182	.727	0.25					
1		5729.65	.218	.873	0.30	8	716.78	1.746	6.976	2.40
	10'	4911.15	.255	1.018	0.35	20'	688.16	1.819	7.266	2.50
	20'	4297.28	.291	1.164	0.40	30'	674.69	1.855	7.411	2.55
	30'	3819.83	.327	1.309	0.45	40'	661.74	1.892	7.556	2.60
	40'	3437.87	.364	1.454	0.50					
	50'	3125.36	.400	1.600	0.55	9	637.28	1.965	7.846	2.70
2		2864.93	.436	1.745	0.60	20'	614.56	2.037	8.136	2.80
	10'	2644.58	.473	1.891	0.65	30'	603.80	2.074	8.281	2.85
	20'	2455.70	.509	2.036	0.70	40'	593.42	2.110	8.426	2.90
	30'	2292.01	.545	2.181	0.75					
	40'	2148.79	.582	2.327	0.80	10	573.69	2.183	8.716	3.00
	50'	2022.41	.618	2.472	0.85	30'	546.44	2.292	9.150	3.15
3		1910.08	.655	2.618	0.90	40'	521.67	2.402	9.585	3.30
	10'	1809.57	.691	2.763	0.95	30'	499.06	2.511	10.02	3.45
	20'	1719.12	.727	2.908	1.00	40'	478.34	2.620	10.45	3.60
	30'	1637.28	.764	3.054	1.05	10	459.28	2.730	10.89	3.75
	40'	1562.88	.800	3.199	1.10	30'	441.68	2.839	11.32	3.90
	50'	1494.95	.836	3.345	1.15	40'	425.40	2.949	11.75	4.05
4		1432.69	.873	3.490	1.20	10	410.28	3.058	12.18	4.20
	10'	1375.40	.909	3.635	1.25	30'	396.20	3.168	12.62	4.35
	20'	1322.53	.945	3.718	1.30					
	30'	1273.57	.982	3.926	1.35	15	383.07	3.277	13.05	4.50
	40'	1228.11	1.018	4.071	1.40	30'	370.78	3.387	13.49	4.65
	50'	1185.78	1.055	4.217	1.45	40'	359.27	3.496	13.92	4.80
5		1146.28	1.091	4.362	1.50	10	348.45	3.606	14.35	4.95
	10'	1109.33	1.127	4.507	1.55	30'	338.27	3.716	14.78	5.10
	20'	1074.68	1.164	4.653	1.60	40'	319.62	3.935	15.64	5.40
	30'	1042.14	1.200	4.798	1.65	10	302.94	4.155	16.51	5.70
	40'	1011.51	1.237	4.943	1.70					
	50'	982.64	1.273	5.088	1.75	20	287.94	4.374	17.37	6.00
6		955.37	1.309	5.234	1.80	30'	274.37	4.594	18.22	6.30
	10'	929.57	1.346	5.379	1.85	40'	262.04	4.814	19.08	6.60
	20'	905.13	1.382	5.524	1.90	10	250.79	5.035	19.94	6.90
	30'	881.95	1.418	5.669	1.95	20'	240.49	5.255	20.79	7.20
	40'	859.92	1.455	5.814	2.00	30'	231.01	5.476	21.64	7.50
						40'	222.27	5.697	22.50	7.80
						50'	214.18	5.918	23.35	8.10
						20	206.68	6.139	24.19	8.40
						30'	199.70	6.360	25.04	8.70
						40'	193.18	6.583	25.88	9.00

Note. Chord Deflection = 2 times tangent deflection.

TABLE VI.—TANGENTS AND EXTERNALS TO A 1° CURVE

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
1°	50.00	.22	11°	551.70	26.50	21°	1061.9	97.57
	10'	58.34	.30	560.11	27.31		1070.6	99.16
	20'	66.67	.39	568.53	28.14		1079.2	100.75
	30'	75.01	.49	576.95	28.97		1087.8	102.35
	40'	83.34	.61	585.36	29.82		1096.4	103.97
	50'	91.68	.73	593.79	30.68		1105.1	105.60
2	100.01	.87	12	602.21	31.56	22	1113.7	107.24
	10	108.35	1.02	610.64	32.45		1122.4	108.90
	20	116.68	1.19	619.07	33.35		1131.0	110.57
	30	125.02	1.36	627.50	34.26		1139.7	112.25
	40	133.36	1.55	635.93	35.18		1148.4	113.95
	50	141.70	1.75	644.37	36.12		1157.0	115.66
3	150.04	1.96	13	652.81	37.07	23	1165.7	117.38
	10	158.38	2.19	661.25	38.03		1174.4	119.12
	20	166.72	2.43	669.70	39.01		1183.1	120.87
	30	175.06	2.67	678.15	39.99		1191.8	122.63
	40	183.40	2.93	686.60	40.99		1200.5	124.41
	50	191.74	3.21	695.06	42.00		1209.2	126.20
4	200.08	3.49	14	703.51	43.03	24	1217.9	128.00
	10	208.43	3.79	711.97	44.07		1226.6	129.82
	20	216.77	4.10	720.44	45.12		1235.3	131.65
	30	225.12	4.42	728.90	46.18		1244.0	133.50
	40	233.47	4.76	737.37	47.25		1252.8	135.35
	50	241.81	5.10	745.85	48.34		1261.5	137.23
5	250.16	5.46	15	754.32	49.44	25	1270.2	139.11
	10	258.51	5.83	762.80	50.55		1279.0	141.01
	20	266.86	6.21	771.29	51.68		1287.7	142.93
	30	275.21	6.61	779.77	52.89		1296.5	144.85
	40	283.57	7.01	788.26	53.97		1305.3	146.79
	50	291.92	7.43	796.75	55.13		1314.0	148.75
6	300.28	7.86	16	805.25	56.31	26	1322.8	150.71
	10	308.64	8.31	813.75	57.50		1331.6	152.69
	20	316.99	8.76	822.25	58.70		1340.4	154.69
	30	325.35	9.23	830.76	59.91		1349.2	156.70
	40	333.71	9.71	839.27	61.14		1358.0	158.72
	50	342.08	10.20	847.78	62.38		1366.8	160.76
7	350.44	10.71	17	856.30	63.63	27	1375.6	162.81
	10	358.81	11.22	864.82	64.90		1384.4	164.86
	20	367.17	11.75	873.35	66.18		1393.2	166.95
	30	375.54	12.29	881.88	67.47		1402.0	169.04
	40	383.91	12.85	890.41	68.77		1410.9	171.15
	50	392.28	13.41	898.95	70.09		1419.7	173.27
8	400.66	13.99	18	907.49	71.42	28	1428.6	175.41
	10	409.03	14.58	916.03	72.76		1437.4	177.55
	20	417.41	15.18	924.58	74.12		1446.3	179.72
	30	425.79	15.80	933.13	75.49		1455.1	181.89
	40	434.17	16.43	941.69	76.86		1464.0	184.08
	50	442.55	17.07	950.25	78.26		1472.9	186.29
9	450.93	17.72	19	958.81	79.67	29	1481.8	188.51
	10	459.32	18.38	967.38	81.09		1490.7	190.74
	20	467.71	19.06	975.96	82.53		1499.6	192.99
	30	476.10	19.75	984.53	83.97		1508.5	195.25
	40	484.49	20.45	993.12	85.43		1517.4	197.53
	50	492.88	21.16	1001.7	86.90		1526.3	199.82
10	501.28	21.89	20	1010.3	88.39	30	1535.3	202.12
	10	509.68	22.62	1018.9	89.89		1544.2	204.44
	20	518.08	23.38	1027.5	91.40		1553.1	206.77
	30	526.48	24.14	1036.1	92.92		1562.1	209.12
	40	534.89	24.91	1044.7	94.46		1571.0	211.48
	50	543.29	25.70	1053.3	96.01		1580.0	213.86

TABLE VI.—TANGENTS AND EXTERNALS TO A 1° CURVE

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
31°	1589.0	216.3	41°	2142.2	387.4	51°	2732.9	618.4
10'	1598.0	218.7	10'	2151.7	390.7	10'	2743.1	622.8
20	1606.9	221.1	20	2161.2	394.1	20	2753.4	627.2
30	1615.9	223.5	30	2170.8	397.4	30	2763.7	631.7
40	1624.9	226.0	40	2180.3	400.8	40	2773.9	636.2
50	1633.9	228.4	50	2189.9	404.2	50	2784.2	640.7
32°	1643.0	230.9	42°	2199.4	407.6	52°	2794.5	645.2
10	1652.0	233.4	10	2209.0	411.1	10	2804.9	649.7
20	1661.0	235.9	20	2218.6	414.5	20	2815.2	654.3
30	1670.0	238.4	30	2228.1	418.0	30	2825.6	658.8
40	1679.1	241.0	40	2237.7	421.4	40	2835.9	663.4
50	1688.1	243.5	50	2247.3	425.0	50	2846.3	668.0
33°	1697.2	246.1	43°	2257.0	428.5	53°	2856.7	672.7
10	1706.3	248.7	10	2266.6	432.0	10	2867.1	677.3
20	1715.3	251.3	20	2276.2	435.6	20	2877.5	682.0
30	1724.4	253.9	30	2285.9	439.2	30	2888.0	686.7
40	1733.5	256.5	40	2295.6	442.8	40	2898.4	691.4
50	1742.6	259.1	50	2305.2	446.4	50	2908.9	696.1
34°	1751.7	261.8	44°	2314.9	450.0	54°	2919.4	700.9
10	1760.8	264.5	10	2324.6	453.6	10	2929.9	705.7
20	1770.0	267.2	20	2334.3	457.3	20	2940.4	710.5
30	1779.1	269.9	30	2344.1	461.0	30	2951.0	715.3
40	1788.2	272.6	40	2353.8	464.6	40	2961.5	720.1
50	1797.4	275.3	50	2363.5	468.4	50	2972.1	725.0
35°	1806.6	278.1	45°	2373.3	472.1	55°	2982.7	729.9
10	1815.7	280.8	10	2383.1	475.8	10	2993.3	734.8
20	1824.9	283.6	20	2392.8	479.6	20	3003.9	739.7
30	1834.1	286.4	30	2402.6	483.3	30	3014.5	744.6
40	1843.3	289.2	40	2412.4	487.2	40	3025.2	749.6
50	1852.5	292.0	50	2422.3	491.0	50	3035.8	754.6
36°	1861.7	294.9	46°	2432.1	494.8	56°	3046.5	759.6
10	1870.9	297.7	10	2441.9	498.7	10	3057.2	764.6
20	1880.1	300.6	20	2451.8	502.5	20	3067.9	769.7
30	1889.4	303.5	30	2461.7	506.4	30	3078.7	774.7
40	1898.6	306.4	40	2471.5	510.3	40	3089.4	779.8
50	1907.9	309.3	50	2481.4	514.3	50	3100.2	784.9
37°	1917.1	312.2	47°	2491.3	518.2	57°	3110.9	790.1
10	1926.4	315.2	10	2501.2	522.2	10	3121.7	795.2
20	1935.7	318.1	20	2511.2	526.1	20	3132.6	800.4
30	1945.0	321.1	30	2521.1	530.1	30	3143.4	805.6
40	1954.3	324.1	40	2531.1	534.2	40	3154.2	810.9
50	1963.6	327.1	50	2541.0	538.2	50	3165.1	816.1
38°	1972.9	330.2	48°	2551.0	542.2	58°	3176.0	821.4
10	1982.2	333.2	10	2561.0	546.3	10	3186.9	826.7
20	1991.5	336.3	20	2571.0	550.4	20	3197.8	832.0
30	2000.9	339.3	30	2581.0	554.5	30	3208.8	837.3
40	2010.2	342.4	40	2591.0	558.6	40	3219.7	842.7
50	2019.6	345.5	50	2601.1	562.8	50	3230.7	848.1
39°	2029.0	348.6	49°	2611.2	566.9	59°	3241.7	853.5
10	2038.4	351.8	10	2621.2	571.1	10	3252.7	858.9
20	2047.8	354.9	20	2631.3	575.3	20	3263.7	864.3
30	2057.2	358.1	30	2641.4	579.5	30	3274.8	869.8
40	2066.6	361.3	40	2651.5	583.8	40	3285.8	875.3
50	2076.0	364.5	50	2661.6	588.0	50	3296.9	880.8
40°	2085.4	367.7	50°	2671.8	592.3	60°	3308.0	886.4
10	2094.9	371.0	10	2681.9	596.6	10	3319.1	892.0
20	2104.3	374.2	20	2692.1	600.9	20	3330.3	897.5
30	2113.8	377.5	30	2702.3	605.3	30	3341.4	903.2
40	2123.3	380.8	40	2712.5	609.6	40	3352.6	908.8
50	2132.7	384.1	50	2722.7	614.0	50	3363.8	914.5

TABLE VI.—TANGENTS AND EXTERNALS TO A 1° CURVE

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
51°	3375.0	920.2	71°	4086.9	1308.2	81°	4893.6	1805.3
10'	3386.3	925.9	10'	4099.5	1315.6	10'	4908.0	1814.7
20	3397.5	931.6	20	4112.1	1322.9	20	4922.5	1824.1
30	3408.8	937.3	30	4124.8	1330.3	30	4937.0	1833.6
40	3420.1	943.1	40	4137.4	1337.7	40	4951.5	1843.1
50	3431.4	948.9	50	4150.1	1345.1	50	4966.1	1852.6
52°	3442.7	954.8	72°	4162.8	1352.6	82°	4980.7	1862.2
10	3454.1	960.6	10	4175.6	1360.1	10	4995.4	1871.8
20	3465.4	966.5	20	4188.5	1367.6	20	5010.0	1881.5
30	3476.8	972.4	30	4201.2	1375.2	30	5024.8	1891.2
40	3488.3	978.3	40	4214.0	1382.8	40	5039.5	1900.9
50	3499.7	984.3	50	4226.8	1390.4	50	5054.3	1910.7
53°	3511.1	990.2	73°	4239.7	1398.0	83°	5069.2	1920.5
10	3522.6	996.2	10	4252.6	1405.7	10	5084.0	1930.4
20	3534.1	1002.3	20	4265.6	1413.5	20	5099.0	1940.3
30	3545.6	1008.3	30	4278.5	1421.2	30	5113.9	1950.3
40	3557.2	1014.4	40	4291.5	1429.0	40	5128.9	1960.2
50	3568.7	1020.5	50	4304.6	1436.8	50	5143.9	1970.3
54°	3580.3	1026.6	74°	4317.6	1444.6	84°	5159.0	1980.4
10	3591.9	1032.8	10	4330.7	1452.5	10	5174.1	1990.5
20	3603.5	1039.0	20	4343.8	1460.4	20	5189.3	2000.6
30	3615.1	1045.2	30	4356.9	1468.4	30	5204.4	2010.8
40	3626.8	1051.4	40	4370.1	1476.4	40	5219.7	2021.1
50	3638.5	1057.7	50	4383.3	1484.4	50	5234.9	2031.4
55°	3650.2	1063.9	75°	4396.5	1492.4	85°	5250.3	2041.7
10	3661.9	1070.2	10	4409.8	1500.5	10	5265.6	2052.1
20	3673.7	1076.6	20	4423.1	1508.6	20	5281.0	2062.5
30	3685.4	1082.9	30	4436.4	1516.7	30	5296.4	2073.0
40	3697.2	1089.3	40	4449.7	1524.9	40	5311.9	2083.5
50	3709.0	1095.7	50	4463.1	1533.1	50	5327.4	2094.1
56°	3720.9	1102.2	76°	4476.5	1541.4	86°	5343.0	2104.7
10	3732.7	1108.6	10	4489.9	1549.7	10	5358.6	2115.3
20	3744.6	1115.1	20	4503.4	1558.0	20	5374.2	2126.0
30	3756.5	1121.7	30	4516.9	1566.3	30	5389.9	2136.7
40	3768.5	1128.2	40	4530.4	1574.7	40	5405.6	2147.5
50	3780.4	1134.8	50	4544.0	1583.1	50	5421.4	2158.4
57°	3792.4	1141.4	77°	4557.6	1591.6	87°	5437.2	2169.2
10	3804.4	1148.0	10	4571.2	1600.1	10	5453.1	2180.2
20	3816.4	1154.7	20	4584.8	1608.6	20	5469.0	2191.1
30	3828.4	1161.3	30	4598.5	1617.1	30	5484.9	2202.2
40	3840.5	1168.1	40	4612.2	1625.7	40	5500.9	2213.2
50	3852.6	1174.8	50	4626.0	1634.4	50	5517.0	2224.3
58°	3864.7	1181.6	78°	4639.8	1643.0	88°	5533.1	2235.5
10	3876.8	1188.4	10	4653.6	1651.7	10	5549.2	2246.7
20	3889.0	1195.2	20	4667.4	1660.5	20	5565.4	2258.0
30	3901.2	1202.0	30	4681.3	1669.2	30	5581.6	2269.3
40	3913.4	1208.9	40	4695.2	1678.1	40	5597.8	2280.6
50	3925.6	1215.8	50	4709.2	1686.9	50	5614.2	2292.0
59°	3937.9	1222.7	79°	4723.2	1695.8	89°	5630.5	2303.5
10	3950.2	1229.7	10	4737.2	1704.7	10	5646.9	2315.0
20	3962.5	1236.7	20	4751.2	1713.7	20	5663.4	2326.6
30	3974.8	1243.7	30	4765.3	1722.7	30	5679.9	2338.2
40	3987.2	1250.8	40	4779.4	1731.7	40	5696.4	2349.8
50	3999.5	1257.9	50	4793.6	1740.8	50	5713.0	2361.5
60°	4011.9	1265.0	80°	4807.7	1749.9	90°	5729.7	2373.3
10	4024.4	1272.1	10	4822.0	1759.0	10	5746.3	2385.1
20	4036.8	1279.3	20	4836.2	1768.2	20	5763.1	2397.0
30	4049.3	1286.5	30	4850.5	1777.4	30	5779.9	2408.9
40	40							

TABLE VI.—TANGENTS AND EXTERNALS TO A 1° CURVE

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
91°	5830.5	2444.9	101°	6950.6	3278.1	111°	8336.7	4386.1
10'	5847.5	2457.1	10'	6971.3	3294.1	10'	8362.7	4407.6
20	5864.6	2469.3	20	6992.0	3310.1	20	8388.9	4429.2
30	5881.7	2481.5	30	7012.7	3326.1	30	8415.1	4450.9
40	5898.8	2493.8	40	7033.6	3342.3	40	8441.5	4472.7
50	5916.0	2506.1	50	7054.5	3358.5	50	8468.0	4494.6
92	5933.2	2518.5	102	7075.5	3374.9	112	8494.6	4516.6
10	5950.5	2531.0	10	7096.6	3391.2	10	8521.3	4538.8
20	5967.9	2543.5	20	7117.8	3407.7	20	8548.1	4561.1
30	5985.3	2556.0	30	7139.0	3424.3	30	8575.0	4583.4
40	6002.7	2568.6	40	7160.3	3440.9	40	8602.1	4606.0
50	6020.2	2581.3	50	7181.7	3457.6	50	8629.3	4628.6
93	6037.8	2594.0	103	7203.2	3474.4	113	8656.6	4651.3
10	6055.4	2606.8	10	7224.7	3491.3	10	8684.0	4674.2
20	6073.1	2619.7	20	7246.3	3508.2	20	8711.5	4697.2
30	6090.8	2632.6	30	7268.0	3525.2	30	8739.2	4720.3
40	6108.6	2645.5	40	7289.8	3542.4	40	8767.0	4743.6
50	6126.4	2658.5	50	7311.7	3559.6	50	8794.9	4766.9
94	6144.3	2671.6	104	7333.6	3576.8	114	8822.9	4790.4
10	6162.6	2684.7	10	7355.6	3594.2	10	8851.0	4814.1
20	6180.2	2697.9	20	7377.8	3611.7	20	8879.3	4837.8
30	6198.3	2711.2	30	7399.9	3629.2	30	8907.7	4861.7
40	6216.4	2724.5	40	7422.2	3646.8	40	8936.3	4885.7
50	6234.6	2737.9	50	7444.6	3664.5	50	8965.0	4909.9
95	6252.8	2751.3	105	7467.0	3682.3	115	8993.8	4934.1
10	6271.1	2764.8	10	7489.6	3700.2	10	9022.7	4958.6
20	6289.4	2778.3	20	7512.2	3718.2	20	9051.7	4983.1
30	6307.9	2792.0	30	7534.9	3736.2	30	9080.9	5007.8
40	6326.3	2805.6	40	7557.7	3754.4	40	9110.3	5032.6
50	6344.8	2819.4	50	7580.5	3772.6	50	9139.8	5057.6
96	6363.4	2833.2	106	7603.5	3791.0	116	9169.4	5082.7
10	6382.1	2847.0	10	7626.6	3809.4	10	9199.1	5107.9
20	6400.8	2861.0	20	7649.7	3827.9	20	9229.0	5133.3
30	6419.5	2875.0	30	7672.9	3846.5	30	9259.0	5158.8
40	6438.4	2889.0	40	7696.3	3865.2	40	9289.2	5184.5
50	6457.3	2903.1	50	7719.7	3884.0	50	9319.5	5210.3
97	6476.2	2917.3	107	7743.2	3902.9	117	9349.9	5236.2
10	6495.2	2931.6	10	7766.8	3921.9	10	9380.5	5262.3
20	6514.3	2945.9	20	7790.5	3940.9	20	9411.3	5288.6
30	6533.4	2960.3	30	7814.3	3960.1	30	9442.2	5315.0
40	6552.6	2974.7	40	7838.1	3979.4	40	9473.2	5341.5
50	6571.9	2989.2	50	7862.1	3998.7	50	9504.4	5368.2
98	6591.2	3003.8	108	7886.2	4018.2	118	9535.7	5395.1
10	6610.6	3018.4	10	7910.4	4037.8	10	9567.2	5422.1
20	6630.1	3033.1	20	7934.6	4057.4	20	9598.9	5449.2
30	6649.6	3047.9	30	7959.0	4077.2	30	9630.7	5476.5
40	6669.2	3062.8	40	7983.5	4097.1	40	9662.6	5504.0
50	6688.8	3077.7	50	8008.0	4117.0	50	9694.7	5531.7
99	6708.6	3092.7	109	8032.7	4137.1	119	9727.0	5559.4
10	6728.4	3107.7	10	8057.4	4157.3	10	9759.4	5587.4
20	6748.2	3122.9	20	8082.3	4177.5	20	9792.0	5615.5
30	6768.1	3138.1	30	8107.3	4197.9	30	9824.8	5643.8
40	6788.1	3153.3	40	8132.3	4218.4	40	9857.7	5672.3
50	6808.2	3168.7	50	8157.5	4239.0	50	9890.8	5700.9
100	6828.3	3184.1	110	8182.8	4259.7	120	9924.0	5729.7
10	6848.5	3199.6	10	8208.2	4280.5	10	9957.5	5758.6
20	6868.8	3215.1	20	8233.7	4301.4	20	9991.0	5787.7
30	6889.2	3230.8	30	8259.3	4322.4	30	10025.0	5817.0
40	6909.6	3246.5	40	8285.0	4343.6	40	10059.0	5846.5
50	6930.1	3262.3	50	8310.8	4364.8	50	10093.0	5876.1

TABLE VII.—CORRECTIONS FOR TANGENTS AND EXTERNALS

These corrections are to be added to the approximate values, found by dividing the tangent, or external, for a 1° curve (Table VI) by the degree of curve, in order to obtain the true tangents, or externals. Intermediate values may be obtained by interpolation.

FOR TANGENTS ADD

Central Angle	DEGREE OF CURVE													
	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
10°	.03	.06	.09	.13	.16	.19	.22	.25	.28	.31	.34	.38	.42	.46
15°	.04	.10	.14	.19	.24	.29	.34	.39	.45	.51	.53	.58	.63	.68
20°	.06	.13	.19	.26	.32	.39	.45	.51	.58	.65	.72	.79	.84	.90
25°	.08	.16	.24	.33	.40	.49	.58	.67	.75	.83	.90	.99	1.06	1.14
30°	.10	.19	.29	.39	.49	.59	.69	.79	.89	.99	1.09	1.20	1.29	1.39
35°	.11	.22	.34	.47	.58	.69	.70	.81	.92	1.04	1.29	1.42	1.54	1.66
40°	.13	.26	.40	.53	.67	.80	.93	1.06	1.20	1.34	1.49	1.64	1.79	1.94
45°	.15	.30	.44	.60	.76	.91	1.06	1.21	1.37	1.52	1.70	1.87	2.04	2.21
50°	.17	.34	.51	.68	.85	1.02	1.19	1.36	1.54	1.72	1.91	2.10	2.29	2.48
55°	.19	.38	.57	.76	.95	1.14	1.32	1.52	1.72	1.92	2.14	2.35	2.56	2.77
60°	.21	.42	.63	.84	1.05	1.27	1.49	1.71	1.94	2.17	2.38	2.60	2.83	3.07
65°	.23	.46	.69	.93	1.16	1.40	1.64	1.88	2.13	2.38	2.63	2.88	3.13	3.39
70°	.25	.51	.76	1.02	1.28	1.54	1.80	2.06	2.33	2.60	2.88	3.16	3.44	3.72
75°	.27	.56	.83	1.12	1.40	1.69	1.98	2.27	2.57	2.87	3.16	3.47	3.78	4.09
80°	.30	.61	.91	1.22	1.53	1.84	2.15	2.46	2.78	3.10	3.44	3.78	4.12	4.46
85°	.33	.66	1.00	1.33	1.68	2.02	2.36	2.70	3.05	3.40	3.77	4.14	4.55	4.89
90°	.36	.72	1.09	1.45	1.83	2.20	2.57	2.94	3.32	3.70	4.10	4.50	4.91	5.32
95°	.39	.79	1.19	1.55	2.00	2.40	2.80	3.20	3.61	4.02	4.40	4.98	5.38	5.83
100°	.43	.86	1.30	1.74	2.18	2.62	3.06	3.50	3.95	4.40	4.88	5.37	5.85	6.34
110°	.51	1.03	1.56	2.08	2.61	3.14	3.67	4.21	4.76	5.31	5.86	6.43	7.01	7.60
120°	.62	1.25	1.93	2.52	3.16	3.81	4.45	5.11	5.77	6.44	7.12	7.80	8.50	9.22

FOR EXTERNALS ADD

Central Angle	DEGREE OF CURVE													
	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
10°	.001	.003	.004	.006	.007	.008	.009	.011	.012	.014	.015	.017	.018	.020
15°	.003	.007	.010	.014	.018	.023	.027	.032	.036	.041	.045	.049	.053	.057
20°	.006	.011	.017	.022	.028	.034	.038	.045	.051	.057	.063	.070	.076	.083
25°	.009	.018	.027	.036	.046	.056	.065	.074	.083	.093	.103	.112	.120	.135
30°	.013	.025	.038	.051	.065	.078	.090	.103	.116	.129	.149	.170	.179	.188
35°	.018	.035	.054	.072	.086	.109	.131	.153	.175	.197	.213	.230	.247	.264
40°	.023	.046	.070	.093	.117	.141	.172	.203	.234	.265	.277	.290	.315	.341
45°	.030	.060	.093	.119	.153	.184	.216	.254	.289	.325	.351	.378	.411	.445
50°	.037	.075	.116	.151	.189	.227	.266	.305	.345	.384	.425	.467	.508	.550
55°	.046	.093	.142	.188	.236	.283	.332	.381	.429	.479	.530	.582	.641	.700
60°	.056	.112	.168	.225	.283	.340	.398	.457	.516	.575	.636	.697	.774	.851
65°	.067	.135	.204	.273	.343	.412	.483	.554	.625	.697	.771	.845	.922	1.01
70°	.080	.159	.240	.321	.403	.485	.568	.652	.735	.819	.906	.994	1.08	1.17
75°	.095	.182	.286	.383	.480	.578	.678	.777	.877	.977	1.077	1.18	1.29	1.39
80°	.110	.220	.332	.445	.558	.671	.787	.903	1.02	1.13	1.25	1.38	1.50	1.62
85°	.128	.259	.391	.524	.657	.790	.926	1.06	1.20	1.34	1.47	1.62	1.76	1.91
90°	.149	.299	.450	.603	.756	.910	1.07	1.22	1.38	1.54	1.70	1.87	2.03	2.20
95°	.174	.350	.522	.706	.885	1.06	1.25	1.43	1.62	1.80	1.99	2.18	2.38	2.58
100°	.200	.401	.604	.809	1.01	1.22	1.43	1.64	1.85	2.06	2.28	2.50	2.73	2.96
110°	.268	.536	.806	1.08	1.35	1.63	1.91	2.20	2.48	2.76	3.05	3.35	3.66	3.96
120°	.360	.721	1.08	1.45	1.82	2.19	2.57	2.95	3.33	3.72	4.11	4.50	4.91	5.32

TABLE VIII.—CORRECTIONS FOR SUB-CHORDS AND LONG CHORDS

FOR SUB-CHORDS ADD										Excess of Arc per 100 ft.	LONG CHORDS				
D	10	20	30	40	50	60	70	80	90		D	200	300	400	500
4°	.00	.00	.01	.01	.01	.01	.01	.01	.00	.02	1	199.99	299.97	399.92	499.85
5	.00	.01	.01	.02	.02	.02	.02	.01	.01	.05	2	199.97	299.88	399.70	499.39
8	.01	.02	.02	.03	.03	.03	.03	.02	.01	.08	3	199.93	299.73	399.32	498.63
10	.01	.02	.03	.04	.05	.05	.05	.04	.02	.13	4	199.88	299.51	398.78	497.57
12	.02	.04	.05	.06	.07	.07	.07	.05	.03	.18	5	199.81	299.24	398.10	496.20
14	.02	.05	.07	.08	.09	.10	.09	.07	.04	.25	6	199.73	298.90	397.26	494.53
16	.03	.06	.09	.11	.12	.12	.12	.09	.05	.33	7	199.63	298.51	396.28	492.57
18	.04	.08	.11	.14	.15	.16	.15	.12	.07	.41	8	199.51	298.05	395.14	490.31
20	.05	.10	.14	.17	.19	.20	.18	.15	.09	.51	9	199.38	297.54	393.86	487.75
22	.06	.12	.17	.21	.23	.24	.22	.18	.10	.62	10	199.24	296.96	392.42	484.90
24	.07	.14	.20	.25	.28	.28	.26	.21	.12	.74	12	198.90	295.63	389.12	478.34
26	.09	.17	.24	.29	.32	.33	.31	.25	.15	.86	14	198.51	294.06	385.22	470.65
28	.10	.19	.27	.34	.37	.38	.36	.29	.17	1.00	16	198.05	292.25	380.76	461.86
30	.11	.22	.31	.39	.43	.44	.41	.33	.19	1.15	18	197.54	290.21	375.74	452.02
32	.13	.25	.36	.44	.49	.50	.47	.38	.22	1.31	20	196.96	287.94	370.17	441.15
34	.15	.28	.40	.50	.55	.57	.53	.43	.25	1.48	22	196.32	285.44	364.06	429.30
36	.17	.32	.45	.56	.62	.64	.59	.48	.28	1.66	24	195.63	282.71	357.43	416.53
38	.18	.36	.51	.62	.70	.71	.66	.53	.31	1.86	26	194.87	279.76	350.30	402.89
40	.21	.40	.56	.69	.77	.79	.73	.59	.35	2.06	28	194.06	276.59	342.69	388.43
42	.23	.44	.62	.76	.85	.87	.81	.65	.38	2.28	30	193.18	273.20	334.61	373.20
44	.25	.48	.68	.84	.94	.96	.89	.72	.42	2.50	32	192.25	269.61	326.08	357.28
46	.27	.52	.75	.92	1.02	1.05	.98	.78	.46	2.74	34	191.26	265.81	317.12	340.73
48	.30	.57	.81	1.00	1.12	1.14	1.06	.86	.50	2.99	36	190.21	261.80	307.77	323.61
50	.32	.62	.89	1.09	1.21	1.24	1.15	.93	.55	3.24	38	189.10	257.60	298.03	305.99
52	.35	.67	.96	1.18	1.31	1.35	1.25	1.01	.59	3.52	40	187.94	253.21	287.94	287.94
54	.38	.73	1.04	1.28	1.42	1.46	1.35	1.09	.64	3.80	42	186.72	248.63	277.51	269.54
56	.41	.78	1.12	1.38	1.53	1.57	1.46	1.17	.69	4.09	44	185.44	243.87	266.78	250.85
58	.44	.84	1.20	1.48	1.65	1.69	1.57	1.26	.74	4.40	46	184.10	239.93	255.78	231.95
60	.47	.91	1.29	1.59	1.76	1.81	1.68	1.35	.80	4.72	48	182.71	233.83	244.51	212.92

NOTE.—When a chord of less than 100 ft. is used the corrections given in the above table should be added to the nominal length of chord to get the length which should be used in order that the 100 ft. points will check with those obtained by using the standard 100 ft. chord. Thus in locating a 14° curve by 25 ft. chords measure 25°.06 for each chord. Long chords are useful in passing obstacles.

TABLE IX.—MIDDLE ORDINATES FOR RAILS IN FEET

Deg. of Curve	LENGTH OF RAILS						Deg. of Curve	LENGTH OF RAILS							
	32	30	28	26	24	22		20	32	30	28	26	24	22	20
1°	.022	.020	.016	.013	.011	.009	.008	16°	.356	.313	.273	.236	.200	.170	.139
2	.045	.038	.034	.029	.025	.021	.017	17	.378	.333	.290	.252	.213	.180	.148
3	.037	.058	.051	.044	.037	.031	.026	18	.400	.351	.306	.265	.225	.190	.156
4	.089	.079	.069	.060	.050	.042	.035	19	.423	.371	.324	.280	.238	.201	.165
5	.112	.099	.086	.074	.063	.053	.044	20	.445	.392	.341	.296	.250	.212	.174
6	.134	.117	.102	.088	.076	.064	.052	21	.466	.410	.357	.309	.262	.222	.182
7	.156	.137	.120	.104	.088	.074	.061	22	.487	.430	.375	.325	.275	.233	.191
8	.179	.158	.137	.119	.100	.085	.070	23	.509	.450	.390	.338	.287	.243	.199
9	.201	.175	.153	.133	.112	.095	.078	24	.531	.469	.408	.354	.299	.253	.208
10	.223	.196	.171	.148	.125	.106	.087	25	.552	.488	.424	.367	.311	.263	.216
11	.245	.216	.188	.163	.139	.117	.096	26	.573	.506	.441	.382	.323	.274	.225
12	.268	.236	.206	.179	.151	.128	.105	27	.594	.524	.457	.396	.335	.284	.233
13	.290	.254	.222	.192	.163	.138	.113	28	.618	.545	.475	.411	.348	.294	.242
14	.312	.275	.239	.207	.175	.148	.122	29	.638	.564	.491	.424	.361	.303	.250
15	.334	.295	.257	.223	.188	.159	.131	30	.660	.583	.508	.438	.374	.313	.259

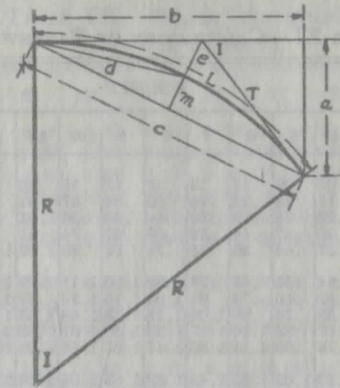


TABLE X
CURVE FORMULAE FOR SIMPLE CURVES
COMPILED BY J. CALVIN LOCKE, C.E.

- (1) $c = \sqrt{2Ra}$ (2) $c = \sqrt{a^2 + b^2}$
- (3) $c = \sqrt{2R(R - \sqrt{(R+b)(R-b)})} = \sqrt{2R(R - \sqrt{R^2 - b^2})}$
- (4) $c = 2\sqrt{m(2R - m)}$
- (5) $c = 2R \sin \frac{1}{2} I$ (6) $c = 2T \cos \frac{1}{2} I$
- (7) $e = R \operatorname{exsec} \frac{1}{2} I$
- (8) $e = R \tan \frac{1}{2} I \tan \frac{1}{4} I$ (9) $e = T \tan \frac{1}{4} I$
- (10) $b = \sqrt{a(2R - a)}$
- (11) $b = \sqrt{\left(c + \frac{c^2}{2R}\right)\left(c - \frac{c^2}{2R}\right)} = \sqrt{c^2 - \frac{c^4}{4R^2}}$
- (12) $b = R \sin I$ (13) $b = a \cot \frac{1}{2} I$
- (14) $R = \frac{a^2 + b^2}{2a} = \frac{c^2}{2a}$ (15) $R = \frac{d^2}{2m} = \frac{c^2 + 4m^2}{8m}$
- (16) $d = \sqrt{R(2R - \sqrt{(2R+c)(2R-c)})} = \sqrt{R(2R - \sqrt{4R^2 - c^2})}$
- (17) $d = \sqrt{2Rm}$ (18) $d = 2R \sin \frac{1}{4} I$ (19) $m = \frac{d^2}{2R}$
- (20) $m = R = \sqrt{\left(R + \frac{c}{2}\right)\left(R - \frac{c}{2}\right)} = R = \sqrt{R^2 - \frac{c^2}{4}}$
- (21) $m = R \operatorname{vers} \frac{1}{2} I$ (22) $m = R \sin \frac{1}{2} I \tan \frac{1}{4} I$ (23) $m = \frac{1}{2} c \tan \frac{1}{4} I$
- (24) $a = \frac{c^2}{2R}$ (25) $a = R - \sqrt{(R+b)(R-b)} = R - \sqrt{R^2 - b^2}$
- (26) $a = 2R(\sin^2 \frac{1}{2} I)^2$ (27) $a = R \operatorname{vers} I$ (28) $a = R \sin I \tan \frac{1}{2} I$
- (29) $a = b \tan \frac{1}{2} I$ (30) $a = T \sin I$ (31) $T = R \tan \frac{1}{2} I$
- (32) $I = \frac{L}{R} \times 57.295780$ (33) $R = \frac{L}{I} \times 57.295780$
- (34) $L = IR \times 0.01745329$ (35) $L = \frac{8d - c}{3}$
- (36) $\text{Area Seg.} = \frac{LR - R^2 \sin I}{2} = \frac{LR - Rb}{2}$

TABLE XI.—CALCULATION OF EARTHWORK

Width	HEIGHT														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.02	.04	.06	.07	.09	.11	.13	.15	.17	.18	.20	.22	.24	.26	.28
2	.04	.07	.11	.15	.18	.22	.26	.30	.33	.37	.41	.44	.48	.52	.56
3	.06	.11	.17	.22	.28	.33	.39	.44	.50	.56	.61	.67	.72	.78	.83
4	.07	.15	.22	.30	.37	.44	.52	.59	.67	.74	.81	.89	.96	1.04	1.11
5	.09	.19	.28	.37	.46	.56	.65	.74	.83	.93	1.02	1.11	1.20	1.30	1.39
6	.11	.22	.33	.44	.56	.67	.78	.89	1.00	1.11	1.22	1.33	1.44	1.55	1.67
7	.13	.26	.39	.52	.65	.78	.91	1.04	1.16	1.30	1.42	1.55	1.68	1.81	1.94
8	.15	.30	.44	.59	.74	.89	1.04	1.19	1.33	1.48	1.63	1.78	1.92	2.08	2.22
9	.17	.33	.50	.67	.83	1.00	1.17	1.33	1.50	1.67	1.83	2.00	2.17	2.33	2.50
10	.18	.37	.56	.74	.93	1.11	1.30	1.48	1.67	1.85	2.04	2.22	2.41	2.59	2.78
11	.20	.41	.61	.82	1.02	1.22	1.43	1.63	1.83	2.04	2.24	2.44	2.65	2.85	3.06
12	.22	.44	.67	.89	1.11	1.33	1.56	1.78	2.00	2.22	2.44	2.67	2.89	3.11	3.33
13	.24	.48	.72	.96	1.20	1.44	1.68	1.92	2.16	2.41	2.65	2.89	3.13	3.37	3.61
14	.26	.52	.78	1.04	1.30	1.55	1.81	2.08	2.35	2.59	2.85	3.11	3.37	3.63	3.89
15	.28	.56	.83	1.11	1.39	1.67	1.94	2.22	2.50	2.78	3.06	3.33	3.61	3.89	4.17
16	.30	.59	.89	1.18	1.48	1.78	2.07	2.37	2.67	2.96	3.26	3.56	3.85	4.15	4.44
17	.31	.63	.94	1.26	1.57	1.89	2.20	2.52	2.83	3.15	3.46	3.78	4.09	4.41	4.72
18	.33	.67	1.00	1.33	1.67	2.00	2.33	2.67	3.00	3.33	3.67	4.00	4.33	4.67	5.00
19	.35	.70	1.06	1.41	1.76	2.11	2.46	2.82	3.17	3.52	3.87	4.22	4.57	4.92	5.28
20	.37	.74	1.11	1.48	1.85	2.22	2.59	2.96	3.33	3.70	4.07	4.44	4.81	5.18	5.56
21	.39	.78	1.17	1.55	1.94	2.33	2.72	3.11	3.50	3.89	4.28	4.67	5.06	5.44	5.83
22	.41	.81	1.22	1.63	2.04	2.44	2.85	3.26	3.67	4.07	4.48	4.89	5.30	5.70	6.11
23	.43	.85	1.28	1.70	2.13	2.56	2.98	3.41	3.83	4.26	4.68	5.11	5.54	5.96	6.39
24	.44	.89	1.33	1.78	2.22	2.67	3.11	3.56	4.00	4.44	4.89	5.33	5.78	6.22	6.67
25	.46	.92	1.39	1.85	2.31	2.78	3.24	3.70	4.17	4.63	5.09	5.56	6.02	6.48	6.94
26	.48	.96	1.44	1.92	2.41	2.89	3.37	3.85	4.33	4.82	5.30	5.78	6.26	6.74	7.24
27	.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50
28	.52	1.04	1.55	2.07	2.59	3.11	3.63	4.15	4.67	5.18	5.70	6.22	6.74	7.26	7.78
29	.54	1.07	1.61	2.15	2.68	3.22	3.76	4.30	4.83	5.37	5.91	6.44	6.98	7.52	8.06
30	.56	1.11	1.67	2.22	2.78	3.33	3.89	4.44	5.00	5.55	6.11	6.67	7.22	7.78	8.33
31	.57	1.15	1.72	2.30	2.87	3.44	4.02	4.59	5.17	5.74	6.32	6.89	7.46	8.04	8.61
32	.59	1.18	1.78	2.37	2.96	3.56	4.15	4.74	5.33	5.92	6.52	7.11	7.70	8.30	8.89
33	.61	1.22	1.83	2.44	3.05	3.67	4.28	4.89	5.50	6.11	6.72	7.33	7.94	8.55	9.17
34	.63	1.26	1.89	2.52	3.15	3.78	4.40	5.04	5.67	6.29	6.93	7.56	8.18	8.81	9.44
35	.65	1.30	1.94	2.59	3.24	3.89	4.53	5.18	5.83	6.48	7.13	7.78	8.42	9.08	9.72
36	.67	1.33	2.00	2.67	3.33	4.00	4.66	5.33	6.00	6.67	7.33	8.00	8.67	9.33	10.00
37	.68	1.37	2.06	2.74	3.42	4.11	4.79	5.48	6.17	6.85	7.54	8.22	8.91	9.59	10.28
38	.70	1.41	2.12	2.82	3.52	4.22	4.92	5.63	6.33	7.03	7.74	8.44	9.15	9.85	10.56
39	.72	1.44	2.17	2.89	3.61	4.33	5.05	5.78	6.50	7.22	7.95	8.67	9.39	10.11	10.83
40	.74	1.48	2.22	2.96	3.70	4.44	5.18	5.92	6.67	7.41	8.15	8.89	9.63	10.37	11.11

Table gives cu. yds. in 1 ft. of a triangle of given width and height. Corrections for tenths of width are one tenth the values found under each height considering the widths from 1 to 9 as tenths and similarly the corrections for tenths of height are one tenth the figures opposite width considering the heights from 1 to 9 as tenths. Thus if $w=16.2$ and $h=5.3$, cu. yds. = $1.48 + .028 + .089 = 1.597$ cu. yds. or practically 160 cu. yds. per 100 ft. If w exceeds 40 ft., use one-half and multiply result by 2, if both w and h are large use one-half of each and multiply result by 4. Any cross-section may be divided into triangles by the following rule. To the triangle of the sum of the outside cuts (or fills) = h , and $\frac{1}{2}$ the roadbed = w , add the triangles formed by taking the distance out to each break in turn (= w 's) by the difference between the cuts (or fills) on each side of it (= h 's) always subtracting the outer from the inner.

TABLE XII. STADIA REDUCTIONS
VERTICAL HEIGHTS

Minutes	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°
0....	0.00	1.74	3.49	5.23	6.96	8.68	10.40	12.10	13.78	15.45	17.10
2....	0.06	1.80	3.55	5.28	7.02	8.74	10.45	12.15	13.84	15.51	17.16
4....	0.12	1.86	3.60	5.34	7.07	8.80	10.51	12.21	13.89	15.56	17.21
6....	0.17	1.92	3.66	5.40	7.13	8.85	10.57	12.26	13.95	15.62	17.26
8....	0.23	1.98	3.72	5.46	7.19	8.91	10.62	12.32	14.01	15.67	17.32
10....	0.29	2.04	3.78	5.52	7.25	8.97	10.68	12.38	14.06	15.73	17.37
12....	0.35	2.09	3.84	5.57	7.30	9.03	10.74	12.43	14.12	15.78	17.43
14....	0.41	2.15	3.90	5.63	7.36	9.08	10.79	12.49	14.17	15.84	17.48
16....	0.47	2.21	3.95	5.69	7.42	9.14	10.85	12.55	14.23	15.89	17.54
18....	0.52	2.27	4.01	5.75	7.48	9.20	10.91	12.60	14.28	15.95	17.59
20....	0.58	2.33	4.07	5.80	7.53	9.25	10.96	12.66	14.34	16.00	17.65
22....	0.64	2.38	4.13	5.86	7.59	9.31	11.02	12.72	14.40	16.06	17.70
24....	0.70	2.44	4.18	5.92	7.65	9.37	11.08	12.77	14.45	16.11	17.76
26....	0.76	2.50	4.24	5.98	7.71	9.43	11.13	12.83	14.51	16.17	17.81
28....	0.81	2.56	4.30	6.04	7.76	9.48	11.19	12.88	14.56	16.22	17.86
30....	0.87	2.62	4.36	6.09	7.82	9.54	11.25	12.94	14.62	16.28	17.92
32....	0.93	2.67	4.42	6.15	7.88	9.60	11.30	13.00	14.67	16.33	17.97
34....	0.99	2.73	4.48	6.21	7.94	9.65	11.36	13.05	14.73	16.39	18.03
36....	1.05	2.79	4.53	6.27	7.99	9.71	11.42	13.11	14.79	16.44	18.08
38....	1.11	2.85	4.59	6.33	8.05	9.77	11.47	13.17	14.84	16.50	18.14
40....	1.16	2.91	4.65	6.38	8.11	9.83	11.53	13.22	14.90	16.55	18.19
42....	1.22	2.97	4.71	6.44	8.17	9.88	11.59	13.28	14.95	16.61	18.24
44....	1.28	3.02	4.76	6.50	8.22	9.94	11.64	13.33	15.01	16.66	18.30
46....	1.34	3.08	4.82	6.56	8.28	10.00	11.70	13.39	15.06	16.72	18.35
48....	1.40	3.14	4.88	6.61	8.34	10.05	11.76	13.45	15.12	16.77	18.41
50....	1.45	3.20	4.94	6.67	8.40	10.11	11.81	13.50	15.17	16.83	18.46
52....	1.51	3.26	4.99	6.73	8.45	10.17	11.87	13.56	15.23	16.88	18.51
54....	1.57	3.31	5.05	6.79	8.51	10.22	11.93	13.61	15.28	16.94	18.57
56....	1.63	3.37	5.11	6.84	8.57	10.28	11.98	13.67	15.34	16.99	18.62
58....	1.69	3.43	5.17	6.90	8.63	10.34	12.04	13.73	15.40	17.05	18.68
60....	1.74	3.49	5.23	6.96	8.68	10.40	12.10	13.78	15.45	17.10	18.73

HORIZONTAL CORRECTIONS

Dist.	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°
100...	0.0	0.0	0.1	0.3	0.5	0.8	1.1	1.5	1.9	2.5	3.0
200...	0.0	0.1	0.2	0.5	1.0	1.5	2.2	3.0	3.9	4.9	6.0
300...	0.0	0.1	0.4	0.8	1.5	2.3	3.3	4.5	5.8	7.4	9.1
400...	0.0	0.1	0.5	1.1	2.0	3.0	4.4	6.0	7.8	9.8	12.1
500...	0.0	0.2	0.6	1.4	2.5	3.8	5.5	7.5	9.7	12.3	15.1
600...	0.0	0.2	0.7	1.6	2.9	4.6	6.5	8.9	11.6	14.7	18.1
700...	0.0	0.2	0.8	1.9	3.4	5.3	7.6	10.4	13.6	17.2	21.1
800...	0.0	0.2	1.0	2.2	3.9	6.1	8.7	11.9	15.5	19.6	24.2
900...	0.0	0.3	1.1	2.4	4.4	6.8	9.8	13.4	17.5	22.1	27.2
1000...	0.0	0.3	1.2	2.7	4.9	7.6	10.9	14.9	19.4	24.5	30.2

TABLE XII. STADIA REDUCTIONS
VERTICAL HEIGHTS

Minutes	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°
0	18.73	20.34	21.92	23.47	25.00	26.50	27.96	29.39	30.78	32.14
2	18.78	20.39	21.97	23.52	25.05	26.55	28.01	29.44	30.83	32.18
4	18.84	20.44	22.02	23.58	25.10	26.59	28.06	29.48	30.87	32.23
6	18.89	20.50	22.08	23.63	25.15	26.64	28.10	29.53	30.92	32.27
8	18.95	20.55	22.13	23.68	25.20	26.69	28.15	29.58	30.97	32.32
10	19.00	20.60	22.18	23.73	25.25	26.74	28.20	29.62	31.01	32.36
12	19.05	20.66	22.23	23.78	25.30	26.79	28.25	29.67	31.06	32.41
14	19.11	20.71	22.28	23.83	25.35	26.84	28.30	29.72	31.10	32.45
16	19.16	20.76	22.34	23.88	25.40	26.89	28.34	29.76	31.15	32.49
18	19.21	20.81	22.39	23.93	25.45	26.94	28.39	29.81	31.19	32.54
20	19.27	20.87	22.44	23.99	25.50	26.99	28.44	29.86	31.24	32.58
22	19.32	20.92	22.49	24.04	25.55	27.04	28.49	29.90	31.28	32.63
24	19.38	20.97	22.54	24.09	25.60	27.09	28.54	29.95	31.33	32.67
26	19.43	21.03	22.60	24.14	25.65	27.13	28.58	30.00	31.38	32.72
28	19.48	21.08	22.65	24.19	25.70	27.18	28.63	30.04	31.42	32.76
30	19.54	21.13	22.70	24.24	25.75	27.23	28.68	30.09	31.47	32.80
32	19.59	21.18	22.75	24.29	25.80	27.28	28.73	30.14	31.51	32.85
34	19.64	21.24	22.80	24.34	25.85	27.33	28.77	30.19	31.56	32.89
36	19.70	21.29	22.85	24.39	25.90	27.38	28.82	30.23	31.60	32.93
38	19.75	21.34	22.91	24.44	25.95	27.43	28.87	30.28	31.65	32.98
40	19.80	21.39	22.96	24.49	26.00	27.48	28.92	30.32	31.69	33.02
42	19.86	21.45	23.01	24.55	26.05	27.52	28.96	30.37	31.74	33.07
44	19.91	21.50	23.06	24.60	26.10	27.57	29.01	30.41	31.78	33.11
46	19.96	21.55	23.11	24.65	26.15	27.62	29.06	30.46	31.83	33.15
48	20.02	21.60	23.16	24.70	26.20	27.67	29.11	30.51	31.87	33.20
50	20.07	21.66	23.22	24.75	26.25	27.72	29.15	30.55	31.92	33.24
52	20.12	21.71	23.27	24.80	26.30	27.77	29.20	30.60	31.96	33.28
54	20.18	21.76	23.32	24.85	26.35	27.81	29.25	30.65	32.01	33.33
56	20.23	21.81	23.37	24.90	26.40	27.86	29.30	30.69	32.05	33.37
58	20.28	21.87	23.42	24.95	26.45	27.91	29.34	30.74	32.09	33.41
60	20.34	21.92	23.47	25.00	26.50	27.96	29.39	30.78	32.14	33.46

HORIZONTAL CORRECTIONS

District	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°
100	3.6	4.3	5.1	5.9	6.7	7.6	8.5	9.5	10.6	11.7
200	7.3	8.6	10.1	11.7	13.4	15.2	17.1	19.1	21.2	23.4
300	10.9	13.0	15.2	17.6	20.1	22.8	25.6	28.6	31.8	35.1
400	14.6	17.3	20.2	23.4	26.8	30.4	34.2	38.2	42.4	46.8
500	18.2	21.6	25.3	29.3	33.5	38.0	42.7	47.7	53.0	58.5
600	21.8	25.9	30.4	35.1	40.2	45.6	51.3	57.3	63.6	70.2
700	25.5	30.2	35.4	41.0	46.9	53.2	59.8	66.8	74.2	81.9
800	29.1	34.6	40.5	46.8	53.6	60.8	68.4	76.4	84.8	93.6
900	32.8	38.9	45.5	52.7	60.3	68.4	76.9	85.9	95.4	105.3
1000	36.4	43.2	50.6	58.5	67.0	76.0	85.5	95.5	106.0	117.0

TABLE XIII.—SINES, COSINES, TANGENTS, COTANGENTS

Deg.	sin 0'	tan 0'	sin 10'	tan 10'	sin 20'	tan 20'	sin 30'	tan 30'	sin 40'	tan 40'	sin 50'	tan 50'	Deg.
0	0000	0000	0029	0029	0058	0058	0087	0087	0116	0116	0145	0145	89
1	175	0175	0204	0204	0233	0233	0262	262	291	291	320	320	88
2	349	349	378	378	407	407	436	437	465	466	494	495	87
3	523	524	552	553	581	582	610	612	640	641	669	700	86
4	698	699	727	729	756	758	785	787	814	816	843	864	85
5	872	875	901	904	929	934	958	963	987	992	1016	1022	84
6	1045	1051	1074	1080	1103	1110	1132	1139	1161	1169	1190	1198	83
7	219	228	248	257	279	287	305	317	334	346	363	376	82
8	392	405	421	435	449	465	478	495	507	524	536	554	81
9	564	584	593	614	622	644	650	673	679	703	708	733	80
10	736	763	765	793	794	823	822	853	851	883	880	914	79
11	908	944	937	974	965	2004	994	2035	2022	2065	2051	2095	78
12	2079	2126	2108	2156	2136	186	2164	217	193	247	221	278	77
13	250	309	278	339	306	370	334	401	363	432	391	462	76
14	419	493	447	524	476	555	504	586	532	617	560	648	75
15	585	679	616	711	644	742	672	773	700	805	728	836	74
16	756	867	784	899	812	931	840	962	868	994	896	1026	73
17	924	3057	952	3089	939	3121	3007	3153	3035	3185	3062	217	72
18	3090	249	3118	281	3145	314	173	346	201	378	228	411	71
19	256	443	283	476	311	508	338	541	365	574	393	607	70
20	420	640	448	673	475	706	502	739	529	772	557	805	69
21	584	839	611	872	638	906	665	939	692	973	719	4006	68
22	746	4040	773	4074	800	4108	827	4142	854	4176	881	210	67
23	907	245	934	279	961	314	987	348	4014	383	4041	417	66
24	4067	452	4094	487	4120	522	4147	557	173	592	200	628	65
25	226	663	253	699	279	734	305	770	331	806	358	841	64
26	384	877	410	913	436	950	462	986	488	1022	514	1059	63
27	540	5095	566	5132	592	5169	617	5206	643	243	669	280	62
28	695	317	720	354	746	392	772	430	797	467	823	505	61
29	848	543	874	581	899	619	924	658	950	696	975	735	60
30	5000	774	5025	5812	5050	851	5075	890	5100	930	5125	969	59
31	150	6009	175	6048	200	6088	225	6128	250	6168	275	6208	58
32	299	249	324	289	348	330	3373	371	398	412	422	453	57
33	446	494	471	536	495	577	519	619	544	661	568	703	56
34	592	745	616	787	640	830	664	873	688	916	712	959	55
35	736	7002	760	7046	783	7089	807	7133	831	7177	854	7221	54
36	878	265	901	310	925	355	948	400	972	445	995	490	53
37	6018	536	6041	581	6065	627	6088	673	6111	720	6134	766	52
38	157	813	180	860	202	907	225	954	248	8002	271	8050	51
39	293	8098	316	8146	338	8195	361	8243	383	292	406	342	50
40	428	391	450	441	472	491	494	541	517	591	539	642	49
41	561	693	583	744	604	796	626	847	648	899	670	952	48
42	691	9004	713	9057	734	9110	756	9163	777	9217	799	9271	47
43	820	325	841	380	862	435	884	490	905	545	926	601	46
44	947	657	967	713	988	770	7009	827	7030	884	7050	942	45
45	7071	1.0000	7092	1.0058	7112	1.0117	133	1.0176	153	1.0235	173	1.0295	44
60'	60'	50'	50'	40'	40'	30'	30'	20'	20'	10'	10'		Deg.

9.9
3.3
13.2

66475
78752 + Mon

4.07
3.2

12.7
5.9
6.8

7880
2185.14
3.66
6.34

12.0
5.9
6.7

9.75
2.1

1.5
4.25
5.75

9.2
2.1

6.00

PLEASE RETURN TO
GEAUGA COUNTY ENGINEER
COURT HOUSE
CHARDON, O.
PHONE 250-X

100.50
7853
2197

1075.2
7853
2899
2197
702

10252
10051
701

6.5
3.9
.8
2.6

79
07
17
43
290

13.2
1

6.3
4.1
2.2

11.8
5.2
6.6

