

FINAL CROSS-SECTIONS

24-52

"11"

LAKE DEMONTREVILLE ROAD

ENGINEERS

FIELD BOOK

No. 10403

EUGENE DIETZGEN CO.

DRAWING MATERIALS, MATHEMATICAL and
SURVEYING INSTRUMENTS

Chicago New York San Francisco New Orleans Pittsburg Toronto

Distances from Center of Roadway for Cross-Sectioning
Roadway 16 feet wide. Side Slopes 1 on 1.
For Single Track Embankment.

H	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	H
0	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	0
1	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	1
2	10.0	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9	2
3	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9	3
4	12.0	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9	4
5	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	5
6	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	6
7	15.0	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	7
8	16.0	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9	8
9	17.0	17.1	17.2	17.3	17.4	17.5	17.6	17.7	17.8	17.9	9
10	18.0	18.1	18.2	18.3	18.4	18.5	18.6	18.7	18.8	18.9	10
11	19.0	19.1	19.2	19.3	19.4	19.5	19.6	19.7	19.8	19.9	11
12	20.0	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	12
13	21.0	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.8	21.9	13
14	22.0	22.1	22.2	22.3	22.4	22.5	22.6	22.7	22.8	22.9	14
15	23.0	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8	23.9	15
16	24.0	24.1	24.2	24.3	24.4	24.5	24.6	24.7	24.8	24.9	16
17	25.0	25.1	25.2	25.3	25.4	25.5	25.6	25.7	25.8	25.9	17
18	26.0	26.1	26.2	26.3	26.4	26.5	26.6	26.7	26.8	26.9	18
19	27.0	27.1	27.2	27.3	27.4	27.5	27.6	27.7	27.8	27.9	19
20	28.0	28.1	28.2	28.3	28.4	28.5	28.6	28.7	28.8	28.9	20
21	29.0	29.1	29.2	29.3	29.4	29.5	29.6	29.7	29.8	29.9	21
22	30.0	30.1	30.2	30.3	30.4	30.5	30.6	30.7	30.8	30.9	22
23	31.0	31.1	31.2	31.3	31.4	31.5	31.6	31.7	31.8	31.9	23
24	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.8	32.9	24
25	33.0	33.1	33.2	33.3	33.4	33.5	33.6	33.7	33.8	33.9	25
26	34.0	34.1	34.2	34.3	34.4	34.5	34.6	34.7	34.8	34.9	26
27	35.0	35.1	35.2	35.3	35.4	35.5	35.6	35.7	35.8	35.9	27
28	36.0	36.1	36.2	36.3	36.4	36.5	36.6	36.7	36.8	36.9	28
29	37.0	37.1	37.2	37.3	37.4	37.5	37.6	37.7	37.8	37.9	29
30	38.0	38.1	38.2	38.3	38.4	38.5	38.6	38.7	38.8	38.9	30
31	39.0	39.1	39.2	39.3	39.4	39.5	39.6	39.7	39.8	39.9	31
32	40.0	40.1	40.2	40.3	40.4	40.5	40.6	40.7	40.8	40.9	32
33	41.0	41.1	41.2	41.3	41.4	41.5	41.6	41.7	41.8	41.9	33
34	42.0	42.1	42.2	42.3	42.4	42.5	42.6	42.7	42.8	42.9	34
35	43.0	43.1	43.2	43.3	43.4	43.5	43.6	43.7	43.8	43.9	35
36	44.0	44.1	44.2	44.3	44.4	44.5	44.6	44.7	44.8	44.9	36
37	45.0	45.1	45.2	45.3	45.4	45.5	45.6	45.7	45.8	45.9	37
38	46.0	46.1	46.2	46.3	46.4	46.5	46.6	46.7	46.8	46.9	38
39	47.0	47.1	47.2	47.3	47.4	47.5	47.6	47.7	47.8	47.9	39
40	48.0	48.1	48.2	48.3	48.4	48.5	48.6	48.7	48.8	48.9	40

Example—If point is 22.6 ft. above grade, how far should it be from center line to be a slope stake point? Ans. from Table 30.6. For same slopes but other widths of roadbed, correct above figures by one-half difference in width of roadbed; thus in example above, for 20 ft. roadbed distance will be $30.6 + (20 - 16) \div 2$ or 2 ft. added to $30.6 = 32.6$. For slopes of 1 on $1\frac{1}{2}$ see inside of back cover.

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Proj 2452

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Sta.	Sta.	Description.	Page	Page
0+00	200+91	Final X-sections.	3	35
1+06	200+30	" Culverts & Driveways	37	41
0+00	200+	" Art. Topography	42	75
		Traverse of Gravel Pit		76

Proj 2452

Final

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	5.35	996.50	✓		991.17 ✓
0+00				5.0	991.5 ✓
0+28				5.2	991.3 ✓
0+35				5.1	991.4 ✓
0+50				5.0	991.5 ✓
1+00				5.1	991.4 ✓
1+39				5.1	991.4 ✓
2+00				5.3	991.2 ✓
3+00				5.6	990.9 ✓
4+00				6.0	990.5 ✓
5+00				6.1	990.4 ✓
T.P.	5.83	996.35	✓	6.10	990.42 ✓
6+00			✓		

Inst. W.A.C. Lt. Σ 47.
 Rod. Wilkersons Parsons
 Chain. Frank. Oct. 4/1924

Left

C L

Right

r.r. spike in T.P. N.W. cor. Co Rd "C" (Lake Imp. S.M.)

$$\frac{51}{33}$$

$$\frac{50}{6.1}$$

$$\frac{51}{23}$$

$$\frac{67}{32} \quad \frac{65}{27} \quad \frac{67}{26} \quad \frac{60}{21} \quad \frac{54}{13}$$

$$\frac{52}{5.1} \quad \frac{56}{11} \quad \frac{66}{21} \quad \frac{67}{33}$$

$$\frac{54}{33} \quad \frac{54}{30} \quad \frac{62}{29} \quad \frac{65}{27} \quad \frac{71}{26} \quad \frac{68}{21} \quad \frac{55}{14}$$

$$\frac{51}{5.1} \quad \frac{58}{10} \quad \frac{65}{16} \quad \frac{68}{21} \quad \frac{64}{22} \quad \frac{58}{24} \quad \frac{54}{27} \quad \frac{50}{33}$$

5.1

$$\frac{43}{33} \quad \frac{42}{30} \quad \frac{58}{27} \quad \frac{64}{26} \quad \frac{62}{19} \quad \frac{53}{13}$$

$$\frac{50}{10} \quad \frac{58}{18} \quad \frac{65}{20} \quad \frac{64}{24} \quad \frac{27}{24} \quad \frac{27}{33}$$

5.2

$$\frac{53}{33} \quad \frac{45}{30} \quad \frac{47}{25} \quad \frac{61}{24} \quad \frac{67}{23} \quad \frac{62}{17} \quad \frac{56}{12}$$

$$\frac{51}{12} \quad \frac{57}{16} \quad \frac{63}{20} \quad \frac{64}{24} \quad \frac{17}{24} \quad \frac{17}{33}$$

5.2

$$\frac{14}{33} \quad \frac{14}{32} \quad \frac{61}{22} \quad \frac{61}{17} \quad \frac{55}{14}$$

$$\frac{51}{14} \quad \frac{53}{18} \quad \frac{65}{21} \quad \frac{66}{25} \quad \frac{71}{33}$$

5.3

$$\frac{30}{33} \quad \frac{36}{28} \quad \frac{47}{26} \quad \frac{50}{24} \quad \frac{70}{23} \quad \frac{67}{18} \quad \frac{58}{14}$$

$$\frac{53}{13} \quad \frac{55}{16} \quad \frac{62}{21} \quad \frac{73}{23} \quad \frac{45}{23} \quad \frac{40}{33}$$

5.7

$$\frac{64}{33} \quad \frac{61}{25} \quad \frac{66}{24} \quad \frac{76}{22} \quad \frac{73}{17} \quad \frac{76}{15}$$

$$\frac{56}{12} \quad \frac{54}{18} \quad \frac{74}{18} \quad \frac{77}{19} \quad \frac{69}{20} \quad \frac{67}{28} \quad \frac{55}{33}$$

5.9

$$\frac{80}{33} \quad \frac{80}{22} \quad \frac{77}{16} \quad \frac{63}{13}$$

$$\frac{60}{12} \quad \frac{57}{16} \quad \frac{76}{16} \quad \frac{79}{19} \quad \frac{72}{20} \quad \frac{67}{33}$$

6.1

$$\frac{90}{33} \quad \frac{86}{24} \quad \frac{83}{20} \quad \frac{77}{18} \quad \frac{76}{15} \quad \frac{61}{13}$$

$$\frac{59}{13} \quad \frac{78}{17} \quad \frac{80}{26} \quad \frac{80}{33}$$

5.7

$$\frac{100}{33} \quad \frac{75}{25} \quad \frac{89}{18} \quad \frac{60}{14}$$

$$\frac{58}{13} \quad \frac{78}{17} \quad \frac{80}{20} \quad \frac{80}{33}$$

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		996.25			
7+00			5.7	990.6	✓
7+25			5.5	990.8	✓
7+40			5.3	991.0	✓
7+82			4.7	991.6	✓
8+00			4.7	991.6	✓
8+27			5.1	991.2	✓
8+50			5.7	990.6	✓
9+00			6.9	989.4	✓
10+00			7.9	988.4	✓
10+70			7.7	988.6	✓
11+00			7.9	988.4	✓
B.M.	2.75	993.14	5.86		990.39

Inst.
 Rod
 Chain.

Left

CL

Right

(5.1)

$\frac{96}{33}$ $\frac{100}{27}$ $\frac{95}{23}$ $\frac{88}{21}$ $\frac{85}{18}$ $\frac{56}{14}$

$\frac{57}{13}$ $\frac{51}{13}$ $\frac{9.4}{19}$ $\frac{9.3}{21}$ $\frac{9.2}{33}$

(5.0)

$\frac{92}{35}$ $\frac{92}{24}$ $\frac{92}{17}$ $\frac{56}{12}$

$\frac{55}{13}$ $\frac{5.5}{13}$ $\frac{7.8}{17}$ $\frac{8.6}{19}$ $\frac{8.0}{22}$ $\frac{7.2}{25}$ $\frac{6.4}{27}$ $\frac{5.6}{30}$ $\frac{5.6}{33}$

(4.9)

$\frac{98}{33}$ $\frac{98}{27}$ $\frac{9.4}{17}$ $\frac{56}{12}$

$\frac{52}{13}$ $\frac{5.3}{13}$ $\frac{6.6}{16}$ $\frac{6.8}{18}$ $\frac{5.6}{20}$ $\frac{5.5}{28}$ $\frac{5.5}{33}$

(5.0)

$\frac{58}{33}$ $\frac{57}{19}$ $\frac{65}{17}$ $\frac{61}{14}$ $\frac{49}{11}$

$\frac{47}{7}$ $\frac{4.6}{7}$ $\frac{5.0}{12}$ $\frac{5.5}{33}$

(5.1)

$\frac{62}{33}$ $\frac{62}{30}$ $\frac{55}{18}$ $\frac{54}{13}$ $\frac{48}{12}$ $\frac{47}{5}$

$\frac{47}{10}$ $\frac{4.8}{10}$ $\frac{6.3}{10}$ $\frac{6.6}{18}$ $\frac{5.7}{19}$ $\frac{5.2}{26}$ $\frac{6.4}{30}$ $\frac{6.9}{33}$

(5.3)

$\frac{52}{33}$ $\frac{52}{27}$ $\frac{57}{18}$ $\frac{61}{17}$ $\frac{61}{15}$ $\frac{50}{12}$

$\frac{51}{12}$ $\frac{5.1}{12}$ $\frac{8.5}{16}$ $\frac{8.8}{21}$ $\frac{8.8}{23}$

(5.6)

$\frac{55}{33}$ $\frac{59}{20}$ $\frac{7.6}{18}$ $\frac{7.3}{15}$ $\frac{5.6}{12}$

$\frac{57}{13}$ $\frac{5.9}{13}$ $\frac{9.0}{18}$ $\frac{9.5}{33}$

(6.5)

$\frac{9.6}{33}$ $\frac{8.6}{16}$ $\frac{6.9}{13}$

$\frac{6.9}{13}$ $\frac{6.6}{13}$ $\frac{9.4}{18}$ $\frac{9.4}{33}$

(8.1)

$\frac{10.4}{33}$ $\frac{10.4}{24}$ $\frac{9.6}{16}$ $\frac{7.7}{12}$

$\frac{7.7}{12}$ $\frac{8.2}{12}$ $\frac{9.8}{16}$ $\frac{9.8}{22}$ $\frac{9.8}{33}$

(8.6)

$\frac{8.5}{33}$ $\frac{8.5}{24}$ $\frac{8.2}{21}$ $\frac{9.3}{20}$ $\frac{9.3}{14}$ $\frac{7.9}{11}$

$\frac{7.7}{12}$ $\frac{8.2}{12}$ $\frac{9.8}{17}$ $\frac{9.7}{19}$ $\frac{8.9}{20}$ $\frac{8.8}{23}$ $\frac{7.8}{33}$

(8.7)

$\frac{8.5}{33}$ $\frac{7.6}{28}$ $\frac{8.0}{20}$ $\frac{10.0}{17}$ $\frac{9.8}{14}$ $\frac{8.2}{12}$

$\frac{7.9}{13}$ $\frac{8.1}{13}$ $\frac{9.9}{16}$ $\frac{9.7}{20}$ $\frac{8.6}{21}$ $\frac{5.6}{23}$ $\frac{8.0}{28}$ $\frac{5.3}{33}$

Spoke in Cor Sign Board 50' Lt. 10+90

Cross Sections

Sta.	B. S.	H. I.	I. S.	Grade	Gr. R.
		993.14			
11+60				4.9	988.2 ✓
12+00				4.7	988.4 ✓
12+32				4.6	988.5 ✓
13+00				4.9	988.2 ✓
14+00				5.6	987.5 ✓
15+00				5.9	987.2 ✓ ✓
T.P.	4.52	991.46		6.20	986.94 ✓
16+00				4.5	987.0 ✓
17+00				5.2	986.3 ✓
17+60				5.9	985.6 ✓
18+00				6.5	985.0 ✓
19+00				7.1	983.4 ✓
T.P.	5.23	987.39		9.30	982.16 ✓

Inst
Re
Chan.

Left						U L	Right						
$\frac{26}{33}$	$\frac{5.6}{31}$	$\frac{5.8}{19}$	$\frac{6.7}{18}$	$\frac{6.7}{15}$	$\frac{4.9}{12}$	$\frac{5.6}{4.9}$	$\frac{5.0}{13}$	$\frac{6.7}{16}$	$\frac{6.6}{19}$	$\frac{5.0}{21}$	$\frac{4.9}{23}$	$\frac{4.1}{26}$	$\frac{99.5.0}{35}$
$\frac{26}{33}$	$\frac{4.3}{26}$	$\frac{4.2}{20}$	$\frac{6.5}{18}$	$\frac{6.5}{15}$	$\frac{5.0}{12}$	$\frac{5.6}{4.7}$	$\frac{4.8}{13}$	$\frac{6.4}{16}$	$\frac{6.4}{19}$	$\frac{4.0}{21}$	$\frac{4.8}{28}$	$\frac{1.4}{26}$	
$\frac{5.2}{33}$	$\frac{5.2}{24}$	$\frac{5.0}{20}$	$\frac{6.4}{18}$	$\frac{6.3}{15}$	$\frac{4.7}{12}$	$\frac{5.6}{4.6}$	$\frac{4.6}{13}$	$\frac{6.2}{16}$	$\frac{6.3}{20}$	$\frac{5.3}{22}$	$\frac{4.9}{24}$	$\frac{4.9}{33}$	
$\frac{7.1}{33}$	$\frac{7.1}{22}$	$\frac{6.6}{21}$	$\frac{6.6}{18}$	$\frac{7.0}{15}$	$\frac{4.8}{12}$	$\frac{5.7}{4.9}$	$\frac{5.0}{12}$	$\frac{6.4}{15}$	$\frac{6.5}{20}$	$\frac{5.9}{21}$	$\frac{6.6}{24}$	$\frac{5.6}{33}$	
		$\frac{7.8}{33}$	$\frac{7.8}{22}$	$\frac{7.3}{14}$	$\frac{5.6}{12}$	$\frac{5.6}{5.6}$	$\frac{5.7}{13}$	$\frac{7.0}{16}$	$\frac{7.4}{19}$	$\frac{6.2}{21}$	$\frac{6.0}{25}$	$\frac{6.0}{33}$	
	$\frac{8.2}{33}$	$\frac{8.2}{21}$	$\frac{7.8}{14}$	$\frac{6.0}{12}$		$\frac{5.9}{5.9}$	$\frac{6.0}{13}$	$\frac{7.4}{17}$	$\frac{7.7}{18}$	$\frac{7.2}{20}$	$\frac{7.3}{26}$	$\frac{7.3}{33}$	
top R+ End CUL. 14480						$\frac{4.4}{4.5}$	$\frac{4.4}{13}$	$\frac{6.0}{15}$	$\frac{6.0}{19}$	$\frac{2.8}{23}$	$\frac{2.7}{24}$	$\frac{2.7}{33}$	
$\frac{4.1}{26}$	$\frac{4.4}{21}$	$\frac{6.2}{18}$	$\frac{6.4}{15}$	$\frac{5.4}{13}$		$\frac{5.0}{5.2}$	$\frac{5.5}{12}$	$\frac{6.9}{15}$	$\frac{7.1}{18}$	$\frac{5.7}{19}$	$\frac{5.0}{21}$	$\frac{2.6}{22}$	$\frac{4.6}{27}$
$\frac{5.9}{33}$	$\frac{5.4}{28}$	$\frac{4.9}{21}$	$\frac{8.2}{17}$	$\frac{8.0}{15}$	$\frac{6.2}{12}$	$\frac{5.9}{5.9}$	$\frac{5.8}{12}$	$\frac{7.8}{15}$	$\frac{7.7}{18}$	$\frac{6.2}{20}$	$\frac{6.0}{21}$	$\frac{4.0}{24}$	$\frac{3.6}{26}$
	$\frac{7.7}{33}$	$\frac{7.2}{20}$	$\frac{7.1}{18}$	$\frac{8.9}{16}$	$\frac{6.9}{12}$	$\frac{6.5}{6.5}$	$\frac{6.5}{12}$	$\frac{8.0}{15}$	$\frac{8.1}{18}$	$\frac{7.2}{19}$	$\frac{6.9}{29}$	$\frac{4.4}{27}$	$\frac{4.4}{33}$
		$\frac{1.2}{33}$	$\frac{1.2}{20}$	$\frac{8.3}{14}$		$\frac{8.1}{8.1}$	$\frac{8.3}{13}$	$\frac{10.4}{16}$	$\frac{10.2}{19}$	$\frac{7.1}{20}$	$\frac{9.3}{25}$	$\frac{8.9}{27}$	$\frac{8.9}{33}$

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		987.39			
20+00				4.8	982.6 ✓
21+00				4.6	982.8 ✓
22+00				3.5	983.9 ✓
B.S.	5.52	990.24	2.57		984.82 ✓
22+54					
23+00				5.0	985.3 ✓
23+50				4.2	986.1 ✓
24+00				3.0	987.2 ✓
24+17				2.7	987.6 ✓
T.F.	16.86	999.42	1.78		988.56 ✓
24+76				10.2	989.2 ✓
25+00				9.4	990.0 ✓
25+80				7.3	992.1 ✓

Inst.
 Rod
 Chain.

MEASUREMENTS OF DISTANCES

Left

C L

Right

$\begin{array}{r} 91 \\ 33 \end{array}$ $\begin{array}{r} 91 \\ 19 \end{array}$ $\begin{array}{r} 48 \\ 13 \end{array}$ $\begin{array}{r} 48 \\ 48 \end{array}$ $\begin{array}{r} 48 \\ 13 \end{array}$ $\begin{array}{r} 63 \\ 15 \end{array}$ $\begin{array}{r} 75 \\ 20 \end{array}$ $\begin{array}{r} 43 \\ 21 \end{array}$ $\begin{array}{r} 49 \\ 26 \end{array}$ $\begin{array}{r} 67 \\ 33 \end{array}$

(47)

$\begin{array}{r} 94 \\ 53 \end{array}$ $\begin{array}{r} 80 \\ 17 \end{array}$ $\begin{array}{r} 48 \\ 12 \end{array}$ $\begin{array}{r} 46 \\ 46 \end{array}$ $\begin{array}{r} 47 \\ 13 \end{array}$ $\begin{array}{r} 68 \\ 17 \end{array}$ $\begin{array}{r} 68 \\ 19 \end{array}$ $\begin{array}{r} 59 \\ 20 \end{array}$ $\begin{array}{r} 55 \\ 33 \end{array}$

(47)

$\begin{array}{r} 47 \\ 33 \end{array}$ $\begin{array}{r} 47 \\ 20 \end{array}$ $\begin{array}{r} 51 \\ 19 \end{array}$ $\begin{array}{r} 52 \\ 15 \end{array}$ $\begin{array}{r} 30 \\ 12 \end{array}$ $\begin{array}{r} 35 \\ 35 \end{array}$ $\begin{array}{r} 36 \\ 13 \end{array}$ $\begin{array}{r} 49 \\ 16 \end{array}$ $\begin{array}{r} 41 \\ 20 \end{array}$ $\begin{array}{r} 41 \\ 21 \end{array}$ $\begin{array}{r} 38 \\ 21 \end{array}$ $\begin{array}{r} 34 \\ 27 \end{array}$ $\begin{array}{r} 34 \\ 33 \end{array}$

(58)

r.r. spike 36" COH 60' Lt. 22+00

Oct. 6, 1924

o.o. ditch Lt. & RT.

$\begin{array}{r} 93 \\ 26 \end{array}$ $\begin{array}{r} 91 \\ 20 \\ \times \end{array}$ $\begin{array}{r} 44 \\ 13 \end{array}$ $\begin{array}{r} 50 \\ 50 \end{array}$ $\begin{array}{r} 52 \\ 15 \end{array}$ $\begin{array}{r} 82 \\ 20 \\ \times \end{array}$ $\begin{array}{r} 98 \\ 24 \end{array}$ $\begin{array}{r} 93 \\ 27 \end{array}$

(51)

$\begin{array}{r} 92 \\ 27 \end{array}$ $\begin{array}{r} 66 \\ 19 \\ \times \end{array}$ $\begin{array}{r} 42 \\ 12 \end{array}$ $\begin{array}{r} 42 \\ 42 \end{array}$ $\begin{array}{r} 46 \\ 12 \end{array}$ $\begin{array}{r} 37 \\ 19 \\ \times \end{array}$ $\begin{array}{r} 93 \\ 25 \end{array}$

(41)

$\begin{array}{r} 62 \\ 24 \end{array}$ $\begin{array}{r} 53 \\ 20 \end{array}$ $\begin{array}{r} 51 \\ 16 \end{array}$ $\begin{array}{r} 30 \\ 12 \end{array}$ $\begin{array}{r} 30 \\ 30 \end{array}$ $\begin{array}{r} 34 \\ 14 \end{array}$ $\begin{array}{r} 46 \\ 16 \end{array}$ $\begin{array}{r} 52 \\ 19 \end{array}$ $\begin{array}{r} 50 \\ 20 \end{array}$ $\begin{array}{r} 45 \\ 21 \end{array}$ $\begin{array}{r} 61 \\ 22 \end{array}$ $\begin{array}{r} 61 \\ 26 \end{array}$

(29)

$\begin{array}{r} 23 \\ 25 \end{array}$ $\begin{array}{r} 23 \\ 21 \end{array}$ $\begin{array}{r} 45 \\ 17 \end{array}$ $\begin{array}{r} 44 \\ 14 \end{array}$ $\begin{array}{r} 26 \\ 12 \end{array}$ $\begin{array}{r} 27 \\ 27 \end{array}$ $\begin{array}{r} 29 \\ 13 \end{array}$ $\begin{array}{r} 45 \\ 16 \end{array}$ $\begin{array}{r} 48 \\ 19 \end{array}$ $\begin{array}{r} 52 \\ 20 \end{array}$ $\begin{array}{r} 59 \\ 26 \end{array}$

(25)

$\begin{array}{r} 43 \\ 32 \end{array}$ $\begin{array}{r} 43 \\ 26 \end{array}$ $\begin{array}{r} 47 \\ 20 \end{array}$ $\begin{array}{r} 47 \\ 15 \end{array}$ $\begin{array}{r} 10.4 \\ 12 \end{array}$ $\begin{array}{r} 10.2 \\ 13 \end{array}$ $\begin{array}{r} 18 \\ 16 \end{array}$ $\begin{array}{r} 15 \\ 20 \end{array}$ $\begin{array}{r} 29 \\ 29 \end{array}$ $\begin{array}{r} 41 \\ 33 \end{array}$

(104)

$\begin{array}{r} 40 \\ 33 \end{array}$ $\begin{array}{r} 43 \\ 26 \end{array}$ $\begin{array}{r} 41 \\ 21 \end{array}$ $\begin{array}{r} 40 \\ 16 \end{array}$ $\begin{array}{r} 26 \\ 12 \end{array}$ $\begin{array}{r} 27 \\ 13 \end{array}$ $\begin{array}{r} 27 \\ 13 \end{array}$ $\begin{array}{r} 14 \\ 16 \end{array}$ $\begin{array}{r} 42 \\ 20 \end{array}$ $\begin{array}{r} 38 \\ 28 \end{array}$ $\begin{array}{r} 31 \\ 33 \end{array}$

(95)

$\begin{array}{r} 48 \\ 30 \end{array}$ $\begin{array}{r} 51 \\ 23 \end{array}$ $\begin{array}{r} 74 \\ 20 \end{array}$ $\begin{array}{r} 74 \\ 15 \end{array}$ $\begin{array}{r} 23 \\ 13 \end{array}$ $\begin{array}{r} 25 \\ 13 \end{array}$ $\begin{array}{r} 25 \\ 13 \end{array}$ $\begin{array}{r} 28 \\ 16 \end{array}$ $\begin{array}{r} 43 \\ 20 \end{array}$ $\begin{array}{r} 72 \\ 21 \end{array}$ $\begin{array}{r} 76 \\ 27 \end{array}$

(76)

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		999.42			
26+00			6.7	992.7	
26+50			5.8	993.6	
B.M.	6.25	1000.99	4.68		994.74
27+00			6.3	994.7	
27+100			4.2	996.8	
29+00			1.8	999.2	
T.P.	9.96	1009.39	1.56		999.43
29+64			2.4	1001.0	
30+00			7.2	1001.6	
30+40			7.0	1002.4	
31+00			5.3	1004.1	
32+00			2.0	1007.4	
T.P.	10.55	1017.98	1.96		1007.43
33+00			7.4	1010.6	

Inst.
 Rod
 Chain

Left

C L

Right

6.2 7.0 6.6 6.7 6.8 6.2 8.2 7.5 7.2
 33 21 13 12 16 20 21 33

7.1

4.5 10.9 5.9 7.2 6.1 7.8 7.7 7.0 6.7 5.9
 23 19 13 13 16 20 21 24 30

6.0

(+73 = 0.0 ditch Lt.)

R.R. spike 30 Maple Rt. sta. 26+70

6.9 7.6 2.5 3.1 6.4 6.3 6.4 8.0 8.2 6.6 6.0 5.2
 29 21 19 15 11 13 16 19 21 21 28

6.4

4.5 4.1 6.7 6.4 4.2 4.2 3.9 5.3 5.5 2.8 2.2 1.4
 30 21 19 15 11 13 16 19 22 26 28

4.2

(+55 = 0.0 ditch Lt.)

6.2 5.6 1.9 1.8 1.9 3.4 3.6 2.0 1.2
 27 18 12 1.3 16 19 20 28

2.0

14.6 13.8 2.6 1.8 2.5 10.4 10.8 10.1 9.5
 29 19 11 13 16 20 21 29

7.0

0.0046

12.0 12.1 15.0 15.0 7.8 7.1 7.1 10.9 11.2 10.3 10.7
 33 27 24 21 13 14 19 22 24 30

7.9

7.4 7.5 10.2 10.4 9.5 6.9 7.0 10.4 10.8 10.3 10.1
 33 21 20 18 16 12 15 19 22 24 33

6.4

4.7 5.5 7.7 7.8 5.6 5.3 5.5 7.2 7.5 7.2 6.9
 33 22 19 16 12 14 17 20 22 30

4.9

0.4 0.6 4.0 3.8 2.3 2.0 2.3 3.6 3.9 2.3 2.3
 27 22 19 16 13 13 15 18 19 27

1.6

5.1 5.7 8.6 8.6 2.1 7.4 7.5 8.2 9.2 7.5 7.6
 33 22 18 15 12 12 15 18 20 20 26

6.9

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
------	-------	-------	-------	-------	--------

1017.98 ✓

34+00				4.0	1014.0 ✓
-------	--	--	--	-----	----------

34+50				7.7	1015.3 ✓
-------	--	--	--	-----	----------

T.P.	6.53	1022.81 ✓	17.0		1016.28 ✓
------	------	-----------	------	--	-----------

35+00				5.9	1016.9 ✓
-------	--	--	--	-----	----------

36+00				4.8	1012.0 ✓
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36+60				5.2	1017.6 ✓
-------	--	--	--	-----	----------

37+00				6.3	1016.5 ✓
-------	--	--	--	-----	----------

37+60				8.7	1014.1 ✓
-------	--	--	--	-----	----------

T.P.	2.13	1015.09 ✓	9.85		1012.96 ✓
------	------	-----------	------	--	-----------

38+00				2.2	1012.9 ✓
-------	--	--	--	-----	----------

38+64				4.5	1010.6 ✓
-------	--	--	--	-----	----------

39+00				5.6	1009.5 ✓
-------	--	--	--	-----	----------

39+66				7.2	1007.8 ✓
-------	--	--	--	-----	----------

Inst.
 Rod.
 Chain.

Left

C L

Right

$\frac{45}{33}$
 $\frac{40}{20}$
 $\frac{60}{18}$

$\frac{58}{15}$
 $\frac{42}{12}$

$\frac{40}{10}$

$\frac{40}{13}$

$\frac{61}{16}$

$\frac{65}{19}$

$\frac{58}{20}$

$\frac{66}{26}$

3.6

$\frac{10}{33}$

$\frac{08}{20}$

$\frac{39}{18}$

$\frac{36}{15}$

$\frac{25}{12}$

$\frac{27}{12}$

$\frac{44}{10}$

$\frac{45}{18}$

$\frac{31}{19}$

$\frac{9.4}{27}$

2.0

$\frac{58}{33}$

$\frac{40}{21}$

$\frac{76}{18}$

$\frac{76}{15}$

$\frac{59}{12}$

$\frac{61}{13}$

$\frac{7.6}{15}$

$\frac{7.8}{18}$

$\frac{5.6}{20}$

$\frac{5.6}{27}$

5.5

$\frac{5.3}{33}$

$\frac{4.6}{26}$

$\frac{42}{21}$

$\frac{6.4}{19}$

$\frac{59}{15}$

$\frac{46}{12}$

$\frac{47}{13}$

$\frac{6.2}{16}$

$\frac{6.5}{19}$

$\frac{4.0}{21}$

$\frac{4.0}{28}$

4.7

$\frac{5.6}{30}$

$\frac{45}{20}$

$\frac{67}{19}$

$\frac{66}{15}$

$\frac{53}{13}$

$\frac{53}{14}$

$\frac{6.4}{16}$

$\frac{6.4}{19}$

$\frac{2.9}{22}$

$\frac{2.3}{27}$

5.3

$\frac{8.0}{30}$

$\frac{65}{21}$

$\frac{80}{18}$

$\frac{77}{15}$

$\frac{60}{12}$

$\frac{64}{13}$

$\frac{7.9}{16}$

$\frac{7.7}{19}$

$\frac{3.9}{22}$

$\frac{2.7}{27}$

6.3

$\frac{132}{29}$

$\frac{119}{22}$

$\frac{132}{21}$

$\frac{115}{17}$

$\frac{89}{13}$

$\frac{89}{14}$

$\frac{10.3}{17}$

$\frac{10.6}{20}$

$\frac{8.3}{23}$

$\frac{6.8}{27}$

$\frac{61}{30}$

8.2

574

North 90. E. 47.

$\frac{120}{37}$

$\frac{108}{28}$

$\frac{2.4}{14}$

$\frac{202}{12}$

$\frac{2.5}{16}$

$\frac{4.5}{18}$

$\frac{4.6}{19}$

$\frac{4.0}{24}$

$\frac{13}{27}$

1.9

$\frac{135}{33}$

$\frac{120}{24}$

$\frac{47}{12}$

$\frac{45}{13}$

$\frac{6.6}{17}$

$\frac{6.7}{19}$

$\frac{5.9}{20}$

$\frac{5.7}{25}$

$\frac{4.9}{30}$

4.2

$\frac{37}{33}$

$\frac{25}{23}$

$\frac{25}{20}$

$\frac{59}{13}$

$\frac{56}{12}$

$\frac{5.5}{15}$

$\frac{6.7}{18}$

$\frac{7.0}{20}$

$\frac{6.4}{20}$

$\frac{6.2}{33}$

5.5

$\frac{74}{33}$

$\frac{70}{23}$

$\frac{28}{21}$

$\frac{9.7}{17}$

$\frac{75}{13}$

$\frac{75}{12}$

$\frac{3.8}{16}$

$\frac{9.0}{19}$

$\frac{7.1}{21}$

$\frac{7.3}{24}$

$\frac{7.0}{27}$

7.9

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		1015.09			
40+00				8.2	1006.9 ✓
40+65				9.7	1005.4 ✓
41+00				10.2	1004.9 994.9 ✓
41+66				11.2	1003.9 993.9 ✓
T.P.	4.97	1008.06	12.00		1003.89 ✓
42+00					
B.M.					
43+00					
45					
44+00					
461					
45+00					
435					

Inst.....
 Rod.....
 Chain.....

87.06
 2.41
 2.65

Left					CL	Right										
$\frac{59}{33}$	$\frac{50}{25}$	$\frac{10.1}{19}$	$\frac{9.9}{16}$	$\frac{8.3}{13}$	89 $\frac{8.2}{13}$	9.4	$\frac{9.4}{19}$	$\frac{7.1}{21}$	$\frac{7.4}{24}$	$\frac{4.9}{30.2}$						
$\frac{13.7}{33}$	$\frac{11.5}{22}$	$\frac{11.9}{19}$	$\frac{11.2}{15}$	$\frac{9.8}{13}$	10.6 $\frac{9.7}{13}$	$\frac{12.8}{16}$	$\frac{10.9}{18}$	$\frac{8.6}{21}$	$\frac{8.2}{28.24}$	$\frac{3.7}{27}$						
405 00 ditch Left					11.1 $\frac{10.4}{13}$	$\frac{11.5}{15}$	$\frac{11.6}{19}$	$\frac{10.2}{21}$	$\frac{10.1}{24}$	$\frac{9.1}{25}$	$\frac{4.6}{30}$					
Rock Pile					11.6 $\frac{13.5}{33}$	$\frac{13.1}{16}$	$\frac{11.2}{13}$	$\frac{11.2}{20}$	$\frac{12.7}{25}$	$\frac{8.5}{31}$	$\frac{8.5}{33}$					
Nail in T.P. 17. 41463					4.6 $\frac{4.7}{4.7}$	$\frac{6.6}{13.0}$	$\frac{6.9}{16.5}$	$\frac{6.4}{21.5}$	$\frac{6.5}{22.2}$	$\frac{4.8}{26.0}$	$\frac{4.7}{31.8}$	03.4				
Nails T.P. 17. 516 43435					4.7 $\frac{5.6}{33.0}$	$\frac{5.1}{15.6}$	$\frac{5.2}{13.6}$	$\frac{4.7}{11.5}$	$\frac{5.0}{13.0}$	$\frac{6.8}{15.5}$	$\frac{6.9}{19.8}$	$\frac{6.0}{20.4}$	$\frac{6.3}{25.0}$	$\frac{4.6}{33.0}$	03.3	
					4.7 $\frac{6.1}{33.0}$	$\frac{6.3}{19.1}$	$\frac{7.1}{18.2}$	$\frac{7.0}{16.2}$	$\frac{4.7}{12.4}$	$\frac{4.9}{13.4}$	$\frac{6.6}{16.2}$	$\frac{7.1}{19.3}$	$\frac{5.8}{20.4}$	$\frac{5.7}{33.0}$	03.2	
					4.8 $\frac{7.8}{33.0}$	$\frac{8.3}{18.3}$	$\frac{4.7}{12.7}$	$\frac{5.0}{13.4}$	$\frac{6.6}{16.1}$	$\frac{6.8}{19.4}$	$\frac{5.6}{20.8}$	$\frac{5.2}{33.0}$		03.2		
					5.3 $\frac{12.9}{33.0}$	$\frac{11.9}{30.4}$	$\frac{11.1}{26.8}$	$\frac{10.7}{22.0}$	$\frac{5.2}{11.0}$	$\frac{5.0}{14.0}$	$\frac{6.6}{16.4}$	$\frac{6.8}{18.4}$	$\frac{6.5}{20.2}$	$\frac{5.2}{21.4}$	$\frac{3.0}{33.0}$	03.1
					5.6 $\frac{14.0}{33.0}$	$\frac{13.3}{31.4}$	$\frac{11.6}{22.7}$	$\frac{5.6}{14.0}$	$\frac{5.1}{13.8}$	$\frac{6.6}{16.1}$	$\frac{6.9}{19.8}$	$\frac{5.8}{20.7}$	$\frac{4.6}{23.4}$	$\frac{3.9}{33.0}$		02.9
					5.9 $\frac{13.8}{33.0}$	$\frac{12.7}{31.8}$	$\frac{11.9}{22.8}$	$\frac{5.9}{13.8}$	$\frac{5.4}{13.5}$	$\frac{7.1}{16.0}$	$\frac{7.2}{19.8}$	$\frac{5.8}{21.0}$	$\frac{4.4}{23.0}$	$\frac{4.0}{33.0}$		02.7

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		1008.06			
46+00					
+50					
47+00					
+55					
48+00					
T.P.	2.40	1003.63	6.83	1001.23	
+80					
49+00					
T.P.	0.15	992.70	11.08	992.55	
50+00					
51+00					
+15.5					
B.M.	3.73	986.14	10.29	982.41	
52+00					

Rec. Austin
 Inst. G.P.A.S.
 Rod. Bentley
 Chain McPherson

10-11-24

Left

C L

Right

7.8	6.4	7.9	8.8	8.6	6.6	6.9	6.5	8.1	7.8	7.1	3.6	2.4	01.8
33.0	23.6	21.6	20.7	16.7	12.0	6.3	13.6	16.0	19.0	20.9	23.7	33.0	

9.5	8.2	10.1	10.0	7.7	7.9	7.4	9.0	9.0	2.6	0.6	01.0
33.0	23.3	21.8	17.6	13.1	7.1	13.0	15.8	19.0	25.9	33.0	

10.7	9.2	11.1	11.0	8.7	9.8	8.5	10.1	10.1	3.7	2.6	99.7
33.0	23.4	21.4	17.3	12.8	8.4	13.0	15.5	19.4	25.6	33.0	

9.9	8.3	12.5	12.3	10.2	10.2	10.1	11.7	11.8	4.2	2.4	96.2
33.0	24.6	21.0	17.7	13.3	9.9	12.4	15.7	20.2	26.0	33.0	

10.3	9.2	13.5	13.5	11.6	11.7	11.5	13.5	13.4	4.3	2.8	96.6
33.0	25.0	20.3	17.0	13.5	11.5	12.0	15.0	18.5	27.2	33.0	

8.3	6.5	9.4	10.3	10.5	8.0	7.8	8.0	10.1	10.1	2.5	0.5	95.5
33.0	24.3	22.0	20.2	17.3	13.1	8.1	12.0	15.5	19.7	26.3	33.0	

16.1	14.2	11.1	10.1	13.5	12.4	12.2	9.5	7.9	93.3
33.0	21.0	13.6	10.3	11.7	14.4	18.2	21.7	33.0	

8.7	7.4	3.4	3.0	3.7	6.0	6.0	3.8	2.6	89.1
33.0	19.9	14.0	8.5	10.9	13.6	18.1	20.0	33.0	

9.0	8.5	9.1	8.8	6.9	7.1	7.0	8.7	8.9	5.7	5.8	85.8
33.0	21.0	20.0	16.7	14.0	6.9	11.0	13.7	17.4	28.5	33.0	

10.5	10.0	10.3	10.1	8.0	8.4	8.2	10.3	10.4	7.9	7.5	84.9
33.0	21.2	20.0	17.0	13.5	7.8	11.1	14.1	17.9	20.0	33.0	

5.3	4.7	4.8	4.7	2.5	3.0	2.6	4.5	4.5	4.3	4.9	83.6
33.0	29.5	18.9	16.6	13.5	2.5	11.3	11.2	18.4	18.4	33.0	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		986.14 ✓			
52+50					
53+00					
54+00					
55+00					
T.P.	9.43	988.14 ✓	6.73	979.41 ✓	
56+00					
+60					
57+00					
+42					
58+00					
+50					
T.P.	2.11	980.35 ✓	10.60		978.24 ✓
59+00					

Rec Austin
 Inst. Crane
 Rod.
 Chain.

Left		G L					Right				
6.7	5.9	5.1	5.1	3.2	3.5	7.2	5.9	6.6	82.5		
33.0	22.5	20.0	17.7	15.1	3.2	7.8	17.5	33.0			
6.0	5.6	4.4	3.6	3.8	7.8	4.0	7.3	7.9	82.3		
33.0	27.0	17.0	15.4	3.8	3.8	12.0	17.6	33.0			
5.4	6.8	7.4	5.9	5.5	4.4	4.7	4.8	8.1	81.4		
33.0	29.0	20.8	18.4	16.3	14.6	4.7	12.1	17.7	33.0		
8.0	7.2	5.2	5.0	5.0	5.0	8.5	8.5	8.5	81.0		
33.0	16.6	13.9	5.1	5.1	5.1	7.1	17.9	33.0			
Nail in T.P. R.H. Sta 55+30					5.3	8.1	7.2	11.2	11.2	81.0	
82	24	9.5	9.1	9.9	8.3	8.1	7.2	11.2	11.2		
33	24	26	19	15.8	14.3	13.5	14	33	33		
(56+00 = 0.0 cut Lt)					4.7	8.1	9.1	9.6	8.0	7.9	
5.6	5.1	9.6	9.8	8.1	8.7	8.1	14	76.5	28	31.7	3.3
35	33	30	76	12.5	8.7	14	76.5	28	31.7	3.3	
4.8	4.8	9.6	9.3	8.5	8.5	8.6	9.9	10.0	3.4	3.4	
23	32.6	28.5	15	12.7	8.5	13.7	16	29	29	34	
4.8	10.0	10.2	9.5	9.8	9.2	8.8	10.2	10.6	2.5	2.5	
53	29	19	15	12.5	8.5	13.5	16.5	27	27	35	
12	16	10.7	10.7	9.9	9.1	7.3	7.6	11.1	11.6	7.5	
38	34	76	18.6	14.7	12.6	7.3	14	16.7	39	33	
9.0	4.5	12.7	12.0	11.3	10.4	10.0	10.4	11.7	12.5	12.0	
37	34	27	25	15	12.5	13	13	15.5	25	25.5	
(58+00 = 0.0 cut Rt.)					2.2	2.5	5.8	7.1	7.1	3.3	
7.3	2.3	4.1	4.1	2.6	2.3	2.5	5.8	7.1	7.1	3.3	
33	32	29	18.8	13.5	2.3	12.7	21	33	33	33	
(59+40 = 0.0 cut Lt.)											

W.H.C.
 Wikhusen
 Fensons
 Frank E. 1924

82.5

82.3

81.4

81.0

Oct. 20-
 1924
 80.7

80.6

80.3

80.3

79.8

79.8

78.1

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		980.35			
60+00					
61+00					
62+00					
63+00					
64+00					
65+00					
7.0	2.80	978.02	5.13		975.27
66+00					
67+00					
68+00					
69+00					
70+00					

Inst. W.H.C.
 Rod. Wolfschussen Percons
 Chain. Funk, Soukup.

Left

C L

Right

(59+80=20 Ditch Lt.)

7.4 7.2 3.8
 33 19.5 14

37

3.8 5.3 5.0 6.7 7.5 7.6
 12 15 15.6 20 28 33

76.7

8.0 8.0 4.7
 25 19 13.5

44

4.8 6.7 6.7 5.8 7.9 7.4 7.4
 11.5 16.5 17 18 23 29 33

76.0

(61+80=20 Ditch Lt.)

5.5 5.9 7.8 7.8 5.6
 33 20 18 16 12

52

5.0 6.4 7.1 5.7 6.8 7.1
 13 18 17.5 18.7 21 33

75.2

(62+80=20 Ditch Lt.)

8.1 8.0 5.6
 33 13.5 12

57

5.8 6.5 7.0 6.1 8.0 7.8
 13 15.7 18 19 26 33

75.1
~~75.4~~

7.6 8.2 6.8
 33 16 13

60

6.2 6.7 7.6 6.5 7.3 6.7
 14 15.5 20 21 25 33

74.4

7.1 7.7 8.0 6.5
 33 28 16 12.5

61

6.2 6.9 7.8 6.7 7.6 7.6
 14 16 23 25 33

74.3

nail in P.P. Rt. 66+00

5.5 5.5 5.3 3.8
 33 25 15 12

35

3.7 4.5 4.7 3.3 4.0 4.9 5.6
 14 16 20 21.7 25 28. 33

74.5

Oct. 21, 1924

2.4 3.1 4.0
 33 20.5 13.8

44

4.2 5.4 5.7 5.2 5.3 5.5
 14 18 22 23.6 27 33

73.6

2.6 2.6 4.8
 33 18 12

46

4.6 5.9 5.7 8.4 8.4
 13 15 18 22.5 33

73.4

2.4 2.4 5.2
 33 17 11

48

4.6 7.5 7.4 8.9
 14 18 22.5 22.5

73.2

5.5 5.3
 33 12

52

5.3 7.1 8.3 8.3
 14 17 24 33

72.8

..... Cross Sections

Sta.	B. S.	H. I.		Gr. R.
		978.02		
70+75				
71+00				
B.M.			4.46	973.56 ✓
72+00				
T.P.	2.06	972.13 ✓	7.95	970.07 ✓
73+00				
74+00				
+40.				
75+00				
76+00				
77+00				
78+00				
B.M.	8.94	977.45 ✓	3.62	968.51 ✓
79+00				

Inst.
 Rod
 Chain.

RECORDED - CALCULATED - CORRECTED

Left

L

Right

70+10 = 00 ditch Lt.

6.0

70+40

23	2.8	7.3	8.5	8.2	6.1
33	7.2	17	16	14.1	11.6

4.0	6.1	7.8	8.2	7.5	7.1
13	16.7	20.6	21.	22.	

72.0

6.2

3.5	5.5	9.2	8.4	6.4
33	28.7	15.6	14.7	12.0

6.4	6.3	5.1	8.5	7.5	7.5
13.7	16	14.8	21	20	30

71.6

R.R. Spike 15' oak Rt Sta

71+0.5

4.7	8.2	2.8	5.5	8.1
33	13.6	18	15	12.5

7.8	2.9	9.5	8.9	8.3	8.8
12	15	19	20	23	23

70.2

3.1

5.8	5.4	4.5	5.0	5.0	3.1
28	21	19	17.7	15.7	12.7

3.2	2.1	5.2	5.2	5.6	5.0
11.7	15	16	17	17.5	23

68.5

4.1

5.7	4.9	5.6	5.3	4.1
33	17	18	18.5	12

3.7	2.9	5.7	5.7	2.9	2.2
12	16	20.5	22	23	

68.4

4.4

5.1	4.1	6.0	5.7	4.1
33	19	17.5	15	12

4.1	3.9	5.2	5.6	0.8	0.2
10.5	16.1	22	24	23	

68.0

4.5

5.0	4.9	6.3	5.7	6.5	6.2	5.0
33	22.5	21	19	18	15	12

4.7	4.8	6.8	6.8	3.7	3.7
12.5	16	20	22	23	

67.4

4.8

7.8	7.3	7.0	7.2	7.0	5.2
33	25	13.4	17.7	16	12

5.3	5.7	7.5	7.9	6.3	6.2
11	14.6	18	17.5	23	

66.8

5.1

7.9	7.9	6.9	7.6	6.9	5.4
33	27	17.8	17	16	13

5.1	5.1	7.2	7.7	6.4	6.2
11.8	15	18.5	20	23	

67.0

5.0

1.3	5.8	6.4	6.1	4.9
3.3	19	18	16	12

4.5	4.3	6.5	6.9	5.2	4.8
12	16	20	21	23	

67.2

R.R. Spike in P.P. Lt Sta 78+6.3

2.1	9.4	9.9	9.7	8.3	9.2
33	20	29.4	16.5	13	

5.4	8.7	9.8	10.0	7.5	5.9
11.3	14.8	19.7	22.	23	

69.3

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
			977.45		
80+00					
81+00					
82+00					
83+00					
T.P.	11.33	988.23		0.50	976.95
84+00					
+70					
85+00					
T.P.	11.28	998.91		1.25	987.03
85+70					
86+00					
86+40					
87+00					
T.P.	5.10	1002.82		1.19	997.72

Inst.
 Rod.
 Chain:

Left

C L

Right

$\frac{47}{33}$	$\frac{47}{30}$	$\frac{5.2}{20.7}$	$\frac{7.1}{18.7}$	$\frac{2.0}{16.5}$	$\frac{5.9}{13}$	6.0	$\frac{6.0}{12}$	$\frac{6.9}{15}$	$\frac{7.0}{18.7}$	$\frac{4.1}{21}$	$\frac{3.3}{33}$	71.5
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6.1

$\frac{42}{33}$	$\frac{42}{28}$	$\frac{4.6}{19}$	$\frac{6.3}{18.5}$	$\frac{5.8}{12}$	$\frac{4.7}{12}$	4.0	$\frac{4.0}{13}$	$\frac{5.6}{14.7}$	$\frac{6.0}{18.6}$	$\frac{1.8}{21.5}$	$\frac{2.8}{33}$	73.1
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4.0

$\frac{42}{33}$	$\frac{42}{25}$	$\frac{3.0}{20}$	$\frac{5.0}{18.5}$	$\frac{4.6}{15}$	$\frac{3.2}{12}$	2.9	$\frac{3.0}{12.6}$	$\frac{4.0}{15}$	$\frac{4.0}{20}$	$\frac{4.4}{22}$	$\frac{1.0}{33}$	74.6
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2.6

$\frac{41}{33}$	$\frac{41}{29}$	$\frac{3.2}{17}$	$\frac{4.0}{13}$	0.6	$\frac{0.7}{12.7}$	$\frac{5.2}{19}$	$\frac{6.0}{21}$	toater		76.9
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1.9

$\frac{10.4}{33}$	$\frac{10.2}{19}$	$\frac{10.8}{19}$	$\frac{10.8}{14.6}$	$\frac{8.2}{11}$	8.0	$\frac{8.2}{13}$	$\frac{11.6}{18}$	$\frac{12.9}{33}$	80.3
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8.6

$\frac{4.6}{33}$	$\frac{4.8}{19.6}$	$\frac{6.4}{18}$	$\frac{6.4}{14}$	$\frac{4.6}{12}$	4.0	$\frac{4.6}{14}$	$\frac{7.2}{18.6}$	$\frac{8.0}{28}$	84.0
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4.1

$\frac{2.6}{33}$	$\frac{3.1}{19.5}$	$\frac{4.6}{18}$	$\frac{4.6}{16}$	$\frac{2.7}{12}$	2.9	$\frac{2.7}{14.5}$	$\frac{6.2}{20}$	$\frac{7.1}{33}$	85.4
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2.9

$\frac{8.7}{33}$	$\frac{8.7}{21}$	$\frac{10.5}{19}$	$\frac{10.4}{16}$	$\frac{9.2}{13}$	9.1	$\frac{9.2}{13.7}$	$\frac{10.1}{15}$	$\frac{10.9}{19}$	$\frac{10.2}{20}$	$\frac{10.2}{24.5}$	$\frac{9.4}{33}$	$\frac{9.4}{23}$	89.8
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9.2

$\frac{5.5}{33}$	$\frac{5.8}{22}$	$\frac{9.1}{19}$	$\frac{9.0}{16}$	$\frac{7.3}{12.6}$	7.1	$\frac{7.1}{13}$	$\frac{8.3}{15}$	$\frac{8.9}{18.5}$	$\frac{7.9}{19}$	$\frac{7.3}{22.6}$	$\frac{11.4}{28}$	$\frac{11.4}{33}$	91.8
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7.3

$\frac{1.7}{33}$	$\frac{2.3}{22}$	$\frac{6.0}{18}$	$\frac{5.9}{14.4}$	$\frac{4.6}{16}$	$\frac{4.0}{16}$	$\frac{4.9}{13.4}$	$\frac{5.8}{16}$	$\frac{6.3}{19}$	$\frac{6.0}{19.7}$	$\frac{2.3}{33}$	94.3
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4.9

$\frac{5.0}{25}$	$\frac{6.6}{21.5}$	$\frac{3.6}{20}$	$\frac{3.6}{15.6}$	$\frac{2.1}{12}$	4.9	$\frac{4.9}{15}$	$\frac{5.1}{19.7}$	$\frac{4.4}{29}$	$\frac{2.1}{32}$	$\frac{2.8}{33}$	97.0
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1.7

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		1002.82			
87+10					
87+64					
88+00					
88+67					
89+00					
90+00					
T.P.	1.11	✓ 992.56	11.37		✓ 991.45
91+00					
91+56					
92+00					
T.P.	1.06	✓ 982.59	11.02		✓ 981.53
92+50					
93+00					
T.P.	1.44	✓ 971.41	12.62		✓ 969.97

Inst.
 Rod.
 Chain.

.....

Left

G L

Right

5.3

$\frac{33}{33}$ 40 7.0 6.8 5.7
 $\frac{33}{33}$ 22 20 16 13

$\frac{5.1}{5.1}$ 5.2 5.6 6.6
 7 7.6 3.3

97.3

4.4

2.6 4.0 4.0 3.0
 $\frac{33}{33}$ 22 20 16 14
 2.25 1m

$\frac{4.2}{4.2}$ 4.2 5.2 7.9 8.4
 7.4 7.6 2.4 3.3

98.5

4.4

6.9 4.0 4.5 6.6 4.2 4.9
 $\frac{33}{33}$ 24 22 20 17 17

$\frac{4.5}{4.5}$ 4.7 7.1 8.6 8.9
 13 17 22 3.3

98.3

5.9

3.4 4.5 8.2 3.1 4.9
 $\frac{33}{33}$ 21 19 15 13

$\frac{6.7}{6.7}$ 6.5 7.3 7.8 8.2 7.7 9.2
 12.6 14.4 16 19 2.4 3.3

96.1

7.2

4.5 6.0 9.5 9.0 7.9
 $\frac{33}{33}$ 21 18.5 15 12

$\frac{7.7}{7.7}$ 7.5 8.4 8.9 10.1 9.4 8.4
 12 15 19 21 2.6 3.3

95.1

11.0

11.0 11.8 13.3 12.1 12.0
 $\frac{33}{33}$ 20 18 15 12.6

$\frac{11.4}{11.4}$ 11.7 12.1 13.1 11.7 11.7
 14. 13.7 17 19 3.3

91.4

top stake 90 + 40 11' 4 1/2

5.8

2.5 3.8 7.9 7.6 5.8
 $\frac{33}{33}$ 27.5 18 14 11

$\frac{5.5}{5.5}$ 5.5 6.8 7.0 8.2 8.2
 13 16 20 23 3.3

87.1

9.2

2.6 3.5 11.3 10.5 9.3
 $\frac{33}{33}$ 29 20 14 12

$\frac{8.9}{8.9}$ 8.9 10.2 10.5 4.8 5.1
 13.5 16 19.4 24.5 3.3

83.7

12.2

6.7 7.4 13.4 13.4 4.6
 $\frac{33}{33}$ 26 19 13 12

$\frac{11.4}{11.4}$ 11.7 13.3 13.3 9.2 9.8
 13.5 16 20 24 3.3

81.2

5.5

6.1 6.1 5.8 6.8 6.6 5.5
 $\frac{33}{33}$ 28 23 20 15 12

$\frac{4.9}{4.9}$ 5.3 6.6 6.9 3.7 3.2 3.2
 12 14 18 21 2.8 3.3

77.7

8.9

9.4 10.8 10.3 9.7 8.1
 $\frac{33}{33}$ 26 19 14 14

$\frac{8.0}{8.0}$ 8.5 10.1 10.6 9.7 8.2 8.2
 12 14 18 19 2.5 3.3

74.2

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		971.41	✓		
93+64					
94+00					
94+65.5					
T.P.	0.39	960.62	✓	11.18	960.23 ✓
95+00					
B.M.				7.59	953.03 ✓
95+50					
96+00					
96+39.46					
96+84.46					
97+00					
97+40.34 = } 96+94.48 }					
97+00					
T.P.	1.80	951.52	✓	11.90	948.72 ✓

Inst.
 Rod.
 Chain.

Left

C L

Right

4.0 33	4.3 26	4.6 24	5.5 15	2.2 12	2.0 14	3.0 14	3.2 20	2.2 21	2.1 26	2.1 33	70.0
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2.0

6.5 33	6.5 27	7.3 24	6.2 22	6.0 20	6.4 19	6.0 15	4.6 13	4.4 12	6.4 15	6.6 19	4.2 23	4.1 33	67.0
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4.5

12.0 33	12.2 24	10.8 19	9.0 16	9.0 13	7.3 13	12.2 18	12.1 19	11.2 22	11.1 30	11.1 37	62.4
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8.9

3.8 33	2.7 26	3.3 23	3.6 19	4.0 16	9.7 16	1.2 16	5.6 24	5.3 25	5.0 27	4.8 33	58.9
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0.4

Sp. in 16" Oak Rt. Sta 95+40

4.2 33	4.5 26	5.8 23	5.5 20	3.6 18	3.7 18	4.4 20	5.0 33	6.2 44			56.9
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3.5

5.1 33	5.5 28	7.9 15	7.6 21	6.6 18	6.0 18	6.0 10.6	8.1 15	8.6 19	7.4 21	7.9 33	54.6
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6.1

5.4 33	5.7 26	9.1 23	8.6 19	3.9 17	7.1 17	7.3 10.5	9.2 19.7	8.5 18.5	7.3 20.5	7.6 33	53.5
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7.8

5.7 33	5.8 26	10.5 21	10.4 18	8.9 14.5	8.8 14.5	8.9 13	10.5 16	10.8 20	7.2 22.8	7.4 33	51.8
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9.5

5.7 33	6.0 26	10.9 21	10.7 17.4	9.2 14	9.2 14	9.4 13	10.0 16.5	11.2 20.4	7.5 23.5	7.5 33	51.4
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9.8

7.2 33	7.5 25	12.0 19	11.9 15.4	10.6 12.5	11.0 12.5	11.0 13	12.5 16	12.8 17	8.5 23	8.4 33	49.6
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10.9

7.6 33	7.8 24.5	12.3 19	12.1 15.4	10.8 12.5	11.1 12.5	11.2 12.5	12.8 16	12.8 19.5	8.7 23	8.6 33	49.6
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10.9

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		951.52			
98+00					
99+00					
99+50					
100+00					
B.M.	6.01	946.82	10.71		940.21 ✓
100+50					
100+77.56					
101+00					
101+50					
102+00					
102+22.56					
102+78.56					

Inst.
 Rod.
 Chain.

Left

C L

Right

43 52 66 67 50
 33 21 19.5 18 11.5

416

50 54 72 75 62 62
 13 16 19.5 21.4 33

46.5

73 77 84 88 73
 33 30.4 18.5 15 12

72

73 73 92 96 85 9.8
 17.5 16.3 19.8 22 33

44.2

83 93 102 101 84
 33 30 18 15.7 12.5

84

83 10.6 112 10.2 11.0 11.0
 12 15.5 19.4 21 19 33

43.4

104 94 98 112 107 92
 33 26 20 18 15 11.5

93

90 85 124 126
 12.4 18 26

42.5

R.P. spike in 14" tree 221 ft 100 + 12.

38 57 73 72 53
 33 22 19 15 11

51

49 45 88 93 93
 14 20 25 33

41.9

34 47 74 72 55
 23 22 19.5 14 11

52

48 88 93 93
 14.5 20 25 33

41.8

24 54 73 72 58
 33 21 18 13.7 11

53

44 92 105 10.5
 13.7 20 30 33

41.5

53 18 78 74 62
 33 22 16.7 13 12

53

49 80 100
 14 18 24

41.2

94.9 79 78 63
 26.5 18.5 15.5 12.6

52

48 62 87 13.3
 12.7 15.5 21 30

41.4

94.2 26 78 60
 26.2 18.5 16 12

54

49 62 131 13.1
 13 15 25 33

41.2

94.0 75 78 55
 29.6 20 16.5 13

56

52 69 110 12.0
 15 17 22 30

41.1

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
			92 946.83		
103+00					
103+24.62					
T.P.	468	946.38	✓	523	41.59
103+50					
104+00					
104+50					
105+00					
105+44.63					
106+00					
106+50					
107+00					
T.P.	472	942.35	✓	937.63	✓
107+50					
B.M.			4.00	938.35	✓

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		942.35 ✓			
108+00					
108+50					
109+00					
109+76 ²¹	P.C.				
110+00					
110+50					
T.P.	457	744.57 ✓	7.35	941.06 ✓	
111+00					
111+31.76					
111+76 ²⁰					
112+00					
112+20 ⁹⁷	Equation				

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
			944.57 ✓		
112+50					
T.P.	6.33		944.70 ✓	6.20	
113+00					
113+50					
114+00					
114+39.5					
114+83.7					
T.P.	0.24		938.61 ✓	6.22	
115+00					
115+50					
116+00					
116+25.37					
117+00					

W. H. O.

Rod. Milwaukee Persons

Chain. Franke South 30

Oct 31, 1924

20

Left

C L

Right

35	5.2	7.7	7.8	4.6	5.1	5.9	11.3	12.8
33	205	181	14	10	20	15	21.7	33

39.5-

938.37 ✓

0.8	2.3	7.2	7.0	4.7	5.3	5.7	9.4	12.0	12.2
3.3	26	20	16	12	12	12	16.5	29	35

39.2

13.5

40.5

946.2	947.2	6.6	6.5	4.5	5.2	6.0	8.5	8.2	2.5	9.8	10.5	11.1
33	27.8	18	14.6	12	12	12	16	18	19	23	27	33

39.5

+4.0

946.7	948.7	6.9	6.9	5.5	6.2	6.6	8.1	7.9	6.3	6.5	9.8	11.0	12.0
33	31	19	15	12	12	12	13.5	16	18	21	25	30	33

38.5

+1.8

946.0	946.0	8.2	7.9	6.6	6.9	6.6	7.4	2.7	4.7	9.6	10.6	11.6
33	24	18.7	15	12	10	10	13.5	17	23	26	29	33

37.8

48	33	2.1	9.4	9.4	8.2	7.8	2.5	9.3	9.6	5.8	2.2	11.2
33	29	23.7	16	13	11	11.5	14	17.5	20.6	26	33	33

36.9

938.37 ✓

3.1	1.7	5.5	4.1	3.8	3.1	2.6	2.1	1.5	5.8	4.0	1.2	2.1	3.1	4.3	4.8
33	25	21	20	16.8	13.5	11	11.5	14.8	18.4	21	22	26.6	29	33	33

36.5

12.5 = 0.0 Ditch L & R

7.3	2.4	3.4	2.1	2.2	2.0	2.6	3.9
33	3.4	13	13	15	22	26	33

35.5

0.4	9.4	4.6	3.8	3.0	2.2	9.0	7.3
33	21.6	11	14.7	22	26	33	33

34.8

10.1	7.3	4.7	4.5	3.8	9.0	3.2	9.4
33	22	15.5	15.5	22	25	33	33

34.1

10.3	8.8	5.0	3.5	5.3	10.1	10.3	10.3
33	19.6	13	14.1	14.1	21.5	24	33

33.1

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
			938.61		
118+00					
118+50					
119+00					
119+50					
119+75					
120+00					
120+50					
B.M.	4.98		938.07	5.46	
121+00					
121+50					
122+00					
122+50					
123+00					

Inst.
 Rod.
 Chain.

Left

C L

Right

$\frac{108}{33}$ $\frac{108}{17.7}$ $\frac{60}{11}$

6.0 **(5.9)** $\frac{6.1}{13}$ $\frac{9.1}{18}$ $\frac{9.2}{24}$ $\frac{9.2}{33}$

31.6

$\frac{105}{33}$ $\frac{101}{15.6}$ $\frac{65}{10}$

6.4 **(6.6)** $\frac{6.6}{13.6}$ $\frac{9.4}{17.}$ $\frac{9.8}{23}$ $\frac{9.8}{33}$

32.2

118+85 = 200 Ditch Lt.

$\frac{82}{33}$ $\frac{87}{17.8}$ $\frac{81}{17}$ $\frac{89}{13.7}$ $\frac{67}{10}$

6.7 **(7.2)** $\frac{6.8}{23}$ $\frac{9.0}{18}$ $\frac{9.3}{24}$ $\frac{9.3}{33}$

31.9

$\frac{7.5}{33}$ $\frac{7.3}{20.3}$ $\frac{8.7}{17.8}$ $\frac{8.7}{14.7}$ $\frac{6.8}{11}$

6.8 **(7.5)** $\frac{7.0}{12}$ $\frac{9.4}{15}$ $\frac{9.8}{23}$ $\frac{9.8}{33}$

31.8

$\frac{30}{29}$ $\frac{6.0}{25}$ $\frac{7.5}{20}$ $\frac{8.8}{18}$ $\frac{8.7}{13.5}$ $\frac{7.0}{11.4}$

6.9 **(7.6)** $\frac{6.9}{11.8}$ $\frac{9.0}{15}$ $\frac{9.7}{23}$ $\frac{9.8}{33}$

31.7

$\frac{90}{30}$ $\frac{95}{26.7}$ $\frac{87}{19}$ $\frac{82}{14}$ $\frac{70}{11.6}$

6.8 **(7.6)** $\frac{7.0}{11.4}$ $\frac{8.8}{14.3}$ $\frac{9.5}{24}$ $\frac{9.5}{33}$

31.8

20.0 x 120+18 = 200 out Lt.

$\frac{93.8}{33}$ $\frac{0.6}{30}$ $\frac{82}{21.8}$ $\frac{80}{16.7}$ $\frac{64}{14}$

6.0 **(7.5)** $\frac{7.2}{11.2}$ $\frac{8.0}{13.6}$ $\frac{9.6}{21}$ $\frac{9.6}{33}$

31.7

933.09 - correct Elev.

933.15 nail in 8" Pop. Rt. sta 12170

$\frac{72}{33}$ $\frac{72}{29}$ $\frac{71}{20}$ $\frac{61}{12.4}$ $\frac{57}{14.5}$

6.5 **(6.8)** $\frac{6.8}{13.3}$ $\frac{8.7}{15.8}$ $\frac{9.0}{21.5}$ $\frac{9.5}{33}$

31.6

$\frac{46}{23}$ $\frac{53}{17}$ $\frac{52}{16}$

6.4 **(6.5)** $\frac{4.4}{11.5}$ $\frac{9.0}{15}$ $\frac{9.4}{21}$ $\frac{9.7}{33}$

31.7

$\frac{7.5}{33}$ $\frac{7.5}{19.4}$ $\frac{83}{18.7}$ $\frac{83}{15.7}$ $\frac{56}{11.6}$

6.3 **(6.3)** $\frac{6.6}{13}$ $\frac{8.3}{15.4}$ $\frac{8.1}{21}$ $\frac{7.7}{33}$

31.8

$\frac{60}{33}$ $\frac{61}{21}$ $\frac{81}{18}$ $\frac{80}{15}$ $\frac{57}{12}$

6.7 **(6.1)** $\frac{6.7}{13}$ $\frac{8.0}{15.3}$ $\frac{8.6}{19}$ $\frac{9.6}{33}$

31.9

$\frac{6.5}{33}$ $\frac{44}{26}$ $\frac{52}{25}$ $\frac{57}{21.5}$ $\frac{71}{14.5}$ $\frac{72}{14.6}$ $\frac{52}{12}$

6.4 **(6.0)** $\frac{6.6}{13.4}$ $\frac{8.7}{16.6}$ $\frac{8.1}{22}$ $\frac{9.7}{33}$

32.1

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		938.07			
123+52.13					
124+00					
124+50					
125+00					
125+50					
125+78.6					
B.M.	4.53	940.91	1.69		
126+00					
126+50					
127+00					
127+50					
128+00					
128+50					

In t.
 Rod.
 Chain.

Left

C L
 5.9

Right

$\begin{array}{r} 20 \\ 30 \end{array} \begin{array}{r} 12 \\ 286 \end{array} \begin{array}{r} 40 \\ 285 \end{array} \begin{array}{r} 47 \\ 275 \end{array} \begin{array}{r} 8.1 \\ 30 \end{array} \begin{array}{r} 7.0 \\ 15 \end{array} \begin{array}{r} 5.4 \\ 12 \end{array}$

$\begin{array}{r} 57 \\ 6.2 \\ 11.6 \end{array} \begin{array}{r} 8.2 \\ 15 \end{array} \begin{array}{r} 8.8 \\ 19 \end{array} \begin{array}{r} 9.7 \\ 33 \end{array}$

32.1

$\begin{array}{r} 20 \\ 29.7 \end{array} \begin{array}{r} 40 \\ 23 \end{array} \begin{array}{r} 7.5 \\ 1.8 \end{array} \begin{array}{r} 7.5 \\ 14 \end{array} \begin{array}{r} 5.7 \\ 11.7 \end{array}$

$\begin{array}{r} 57 \\ 6.1 \\ 13 \end{array} \begin{array}{r} 7.6 \\ 15 \end{array} \begin{array}{r} 8.2 \\ 19 \end{array} \begin{array}{r} 9.5 \\ 33 \end{array}$

32.4

$\begin{array}{r} 2.0 \\ 25.5 \end{array} \begin{array}{r} 7.0 \\ 19.7 \end{array} \begin{array}{r} 7.2 \\ 15.5 \end{array} \begin{array}{r} 5.6 \\ 12.6 \end{array}$

$\begin{array}{r} 58 \\ 5.9 \\ 7.3 \end{array} \begin{array}{r} 8.0 \\ 16.5 \end{array} \begin{array}{r} 9.6 \\ 33 \end{array}$

32.3

$\begin{array}{r} 2.0 \\ 29 \end{array} \begin{array}{r} 3.8 \\ 21.5 \end{array} \begin{array}{r} 7.3 \\ 19 \end{array} \begin{array}{r} 7.3 \\ 15 \end{array} \begin{array}{r} 5.7 \\ 12.4 \end{array}$

$\begin{array}{r} 58 \\ 5.6 \\ 13 \end{array} \begin{array}{r} 8.8 \\ 17.5 \end{array} \begin{array}{r} 9.8 \\ 33 \end{array}$

32.8

$\begin{array}{r} 3.8 \\ 28 \end{array} \begin{array}{r} 4.5 \\ 22 \end{array} \begin{array}{r} 7.2 \\ 19 \end{array} \begin{array}{r} 7.3 \\ 15 \end{array} \begin{array}{r} 5.3 \\ 12.6 \end{array}$

$\begin{array}{r} 58 \\ 5.8 \\ 13 \end{array} \begin{array}{r} 7.8 \\ 15.7 \end{array} \begin{array}{r} 8.6 \\ 23 \end{array} \begin{array}{r} 9.5 \\ 33 \end{array}$

32.8

$\begin{array}{r} 4.1 \\ 32 \end{array} \begin{array}{r} 4.7 \\ 26 \end{array} \begin{array}{r} 4.8 \\ 20 \end{array} \begin{array}{r} 7.0 \\ 14.7 \end{array} \begin{array}{r} 7.3 \\ 15.4 \end{array} \begin{array}{r} 4.9 \\ 12 \end{array}$

$\begin{array}{r} 57 \\ 6.0 \\ 14 \end{array} \begin{array}{r} 8.6 \\ 18 \end{array} \begin{array}{r} 8.5 \\ 26 \end{array} \begin{array}{r} 9.1 \\ 33 \end{array}$

32.7

936.38 ✓ + 20.6 = 8'00" 32.4 26.127 + 40

$\begin{array}{r} 10.4 \\ 33 \end{array} \begin{array}{r} 4.0 \\ 27 \end{array} \begin{array}{r} 3.5 \\ 25 \end{array} \begin{array}{r} 8.4 \\ 20 \end{array} \begin{array}{r} 10.0 \\ 18 \end{array} \begin{array}{r} 10.3 \\ 15.6 \end{array} \begin{array}{r} 7.8 \\ 13 \end{array}$

$\begin{array}{r} 84 \\ 8.5 \\ 13 \end{array} \begin{array}{r} 8.5 \\ 15 \end{array} \begin{array}{r} 11.3 \\ 27.5 \end{array} \begin{array}{r} 11.7 \\ 33 \end{array}$

32.1

$\begin{array}{r} 7.9 \\ 33 \end{array} \begin{array}{r} 7.9 \\ 24 \end{array} \begin{array}{r} 10.5 \\ 21 \end{array} \begin{array}{r} 10.5 \\ 17 \end{array} \begin{array}{r} 7.9 \\ 12 \end{array}$

$\begin{array}{r} 85 \\ 8.6 \\ 13 \end{array} \begin{array}{r} 10.9 \\ 18 \end{array} \begin{array}{r} 12.1 \\ 29 \end{array} \begin{array}{r} 12.3 \\ 33 \end{array}$

32.4

$\begin{array}{r} 8.8 \\ 33 \end{array} \begin{array}{r} 7.2 \\ 21.5 \end{array} \begin{array}{r} 9.7 \\ 18 \end{array} \begin{array}{r} 9.8 \\ 15 \end{array} \begin{array}{r} 7.8 \\ 12 \end{array}$

$\begin{array}{r} 84 \\ 9.1 \\ 13 \end{array} \begin{array}{r} 10.8 \\ 17 \end{array} \begin{array}{r} 12.4 \\ 20 \end{array} \begin{array}{r} 12.7 \\ 24.5 \end{array} \begin{array}{r} 11.7 \\ 27 \end{array} \begin{array}{r} 11.8 \\ 33 \end{array}$

32.5

$\begin{array}{r} 9.1 \\ 33 \end{array} \begin{array}{r} 7.3 \\ 20 \end{array} \begin{array}{r} 9.6 \\ 17.5 \end{array} \begin{array}{r} 9.6 \\ 14.4 \end{array} \begin{array}{r} 7.5 \\ 11 \end{array}$

$\begin{array}{r} 82 \\ 9.3 \\ 16 \end{array} \begin{array}{r} 10.3 \\ 18.5 \end{array} \begin{array}{r} 11.4 \\ 26 \end{array} \begin{array}{r} 11.8 \\ 33 \end{array}$

32.7

$\begin{array}{r} 7.2 \\ 33 \end{array} \begin{array}{r} 6.7 \\ 22 \end{array} \begin{array}{r} 9.7 \\ 19 \end{array} \begin{array}{r} 9.7 \\ 15 \end{array} \begin{array}{r} 7.5 \\ 12 \end{array}$

$\begin{array}{r} 81 \\ 9.3 \\ 16 \end{array} \begin{array}{r} 10.6 \\ 19 \end{array} \begin{array}{r} 11.8 \\ 33 \end{array}$

32.8

$\begin{array}{r} 5.3 \\ 33 \end{array} \begin{array}{r} 5.9 \\ 23 \end{array} \begin{array}{r} 9.4 \\ 18.5 \end{array} \begin{array}{r} 9.5 \\ 14.5 \end{array} \begin{array}{r} 7.6 \\ 12 \end{array}$

$\begin{array}{r} 81 \\ 9.3 \\ 15 \end{array} \begin{array}{r} 11.0 \\ 18 \end{array} \begin{array}{r} 12.4 \\ 33 \end{array}$

32.8

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
			940.91 ✓		
129+00					
129+56.56					
130+00					
130+50					
131+00					
T.P.	6.55		939.55 ✓	7.91	
131+50					
132+00					
132+50					
133+00					
133+60					
134+00					
134+50					

Inst.
 Rod.
 Chain.

Left

G L

Right

$\frac{21}{33}$ $\frac{48}{27}$ $\frac{10.0}{19}$ $\frac{10.0}{17}$ $\frac{7.4}{11}$

$\frac{8.2}{13}$ $\frac{11.0}{17}$ $\frac{12.6}{33}$

32.7

+1.0
 $\frac{94.4}{30}$ $\frac{10.0}{20.4}$ $\frac{10.1}{18.5}$ $\frac{7.8}{12}$

$\frac{8.1}{12}$ $\frac{8.6}{12}$ $\frac{10.8}{16}$ $\frac{13.2}{33}$

32.7

+7.4
 $\frac{94.8}{35.5}$ $\frac{0.0}{31.6}$ $\frac{7.8}{25}$ $\frac{7.7}{21}$ $\frac{7.7}{16}$ $\frac{7.7}{12}$

$\frac{8.1}{12}$ $\frac{9.0}{12}$ $\frac{11.3}{16.5}$ $\frac{13.3}{33}$

32.6

+8.6
 $\frac{94.9}{36}$ $\frac{4.4}{32.5}$ $\frac{8.0}{29}$ $\frac{8.4}{19}$ $\frac{10.0}{15.5}$ $\frac{7.8}{12}$

$\frac{8.0}{14}$ $\frac{8.5}{14}$ $\frac{11.6}{19}$ $\frac{12.3}{33}$

32.6

+3.8
 $\frac{94.5}{32.0}$ $\frac{2.7}{26}$ $\frac{9.9}{18}$ $\frac{9.9}{14}$ $\frac{6.1}{12}$

$\frac{8.0}{14}$ $\frac{8.9}{14}$ $\frac{11.4}{18}$ $\frac{12.7}{33}$

32.6

933.00 ✓

$\frac{8.0}{29}$ $\frac{8.0}{24}$ $\frac{8.6}{19}$ $\frac{8.3}{14.4}$ $\frac{6.5}{7.2}$

$\frac{7.1}{7.4}$ $\frac{7.3}{7.4}$ $\frac{10.4}{19}$ $\frac{11.1}{33}$

32.5

$\frac{1.7}{33}$ $\frac{4.4}{22}$ $\frac{8.7}{18.5}$ $\frac{8.5}{15}$ $\frac{6.4}{12}$

$\frac{6.9}{14}$ $\frac{7.1}{14}$ $\frac{10.7}{19}$ $\frac{11.4}{33}$

32.7

$\frac{1.6}{36}$ $\frac{4.2}{34}$ $\frac{4.1}{27.5}$ $\frac{3.8}{17}$ $\frac{8.5}{17}$ $\frac{8.5}{14}$ $\frac{6.2}{10}$

$\frac{6.5}{15}$ $\frac{6.9}{15}$ $\frac{10.0}{19}$ $\frac{11.5}{33}$

33.1

$\frac{2.6}{34.5}$ $\frac{4.6}{33}$ $\frac{5.1}{21}$ $\frac{8.6}{17}$ $\frac{8.6}{14}$ $\frac{5.7}{10}$

$\frac{6.0}{13}$ $\frac{6.4}{13}$ $\frac{8.1}{15.5}$ $\frac{10.4}{33}$

33.6

$\frac{1.4}{33}$ $\frac{2.5}{27}$ $\frac{5.5}{24}$ $\frac{4.1}{12}$

$\frac{5.3}{13}$ $\frac{5.9}{13}$ $\frac{7.3}{15}$ $\frac{8.9}{33}$

34.3

$\frac{9.0}{33}$ $\frac{4.4}{21}$ $\frac{6.3}{19}$ $\frac{6.3}{14.4}$ $\frac{4.0}{11}$

$\frac{4.6}{14}$ $\frac{5.5}{14}$ $\frac{7.3}{17}$ $\frac{8.5}{33}$

35.0

$\frac{4.1}{33}$ $\frac{4.1}{20}$ $\frac{6.0}{17}$ $\frac{6.6}{15.5}$ $\frac{2.6}{10}$

$\frac{3.3}{14}$ $\frac{4.5}{14}$ $\frac{5.7}{17}$ $\frac{6.3}{33}$

36.3

Extra wide for Perm Entane

Sta.	B. S.	H. I.	Cross Sections		Gr. R.
			F. S.	Grade	
		939.55			
T.P.	7.89	945.54		2.90	
135+00					
135+50					
136+00					
T.P.	6.66	950.00		2.20	
136+50					
137+00					
137+55					
138+00					
138+60					
139+00					
139+60					
140+00					

W.H.C. 21
A. Wischusen persons.
Chain. Franke. Soukup.

Nov. 3, 1924

Left

C L

Right

935.65

5.0 4.2 10.2 10.2 2.9
3.3 7.3 18.7 14.5 7.0

7.5 (7.9)

2.4 7.2 11.2
7.5 7.8 3.3

38.

1.6 2.2 8.2 2.1 4.9
3.3 7.4 16. 10.4 7.0

5.7 (5.7)

6.3 9.6
7.5 3.3

39.8

70.3

945.8
2.2
9.3 11.6 5.8 5.8 2.0
7.5 7.2 17 15 12

3.7 (3.5)

4.2 5.9 5.9 3.5 6.0
12 13 17 20 3.3

55+70- auditab Rt.

41.8

943.34

700
End only 4th. 136+30

1.6 1.8 7.5 7.7 5.6
3.3 2.8 18.4 15.6 12

6.4 (6.1)

6.6 5.1 8.2 6.0 7.7
12 14.5 17.6 20 33

43.6

+1.2

1.5 1.2 6.5 6.4 4.7
3.6 1.8 15.7 12

5.0 (4.8)

5.2 6.7 6.6 2.7 4.0 7.0
12 14 16.8 22 28 33

45.0

+4.1

954.1 3 4.8 4.7 3.5
3.3 28.6 20 18 15 12

3.2 (4.7)

4.1 5.5 5.7 1.5 6.2
11.5 14 17 22.8 3.3

46.2

48.7

953.7 60 7.8 4.8 3.1
3.3 28.4 22.6 17.4 7.5 6.6

4.0 (4.1)

4.4 5.8 6.0 4.4 7.2 11.6
12 15 17 20 28 33

46.0

3.1

4.2 6.8 6.6 4.8
3.3 21 19 13.8 11.3

5.0 (4.7)

5.3 6.0 11.9 15.7
12 18 28 33

44.9

8.5

7.6 8.4 8.2 5.9
3.3 19 17.0 14.9 10.0

4.2 (5.9)

6.5 7.0 7.4 17.7
15 19.0 22 33

43.8

8.2

8.7 8.7 9.9 7.0
3.3 18.0 16.7 12.4 9.6

7.6 (7.7)

2.7 9.7 16.8
15 18.5 28

42.4

8.4

9.3 10.0 10.4 6.5
3.3 20.5 18 12 10

8.4 (8.7)

2.7 17.0
14.7 17

41.6

Cross Sections

Sta. B. S. H. I. F. S. Grade Gr. R.

950.00

140+40

141+00

141+50

T.P.

5.43

948.86

6.57

142+00

142+64.7

143+00

143+70.4

144+00

144+50

T.P.

8.68

946.57

10.97

144+85.05

144+85.4

EQ.

145+00

145+76.2

Inst.
 Rod.
 Chain.

Left					CL	Right				
$\frac{21}{33}$	$\frac{82}{22}$	$\frac{111}{18}$	$\frac{112}{146}$	$\frac{9.5}{12.7}$	$\frac{9.2}{9.6}$	$\frac{94}{14.5}$	$\frac{12.5}{18.6}$	$\frac{14.5}{23}$	40.8	
$\frac{44}{33}$	$\frac{54}{25}$	$\frac{122}{174}$	$\frac{121}{15}$	$\frac{11.0}{12.4}$	$\frac{10.2}{10.5}$	$\frac{101}{12}$	$\frac{13.8}{26}$	39.8		
$\frac{50}{33}$	$\frac{62}{24}$	$\frac{127}{17}$	$\frac{130}{14.5}$	$\frac{12.2}{17.4}$	$\frac{10.8}{10.9}$	$\frac{122}{12}$	$\frac{12.7}{25}$	39.2		
94343 ✓					top close stake 24 142400 ✓					
$\frac{44}{33}$	$\frac{59}{24.7}$	$\frac{124}{16}$	$\frac{122}{13}$	$\frac{11}{10.6}$	$\frac{10.2}{10.0}$	$\frac{74}{15}$	$\frac{11.4}{18.4}$	$\frac{12.6}{23}$	$\frac{12.8}{33}$	38.7
$\frac{46}{33}$	$\frac{62}{28}$	$\frac{122}{17.8}$	$\frac{120}{15.6}$	$\frac{10.9}{13}$	$\frac{10.9}{10.4}$	$\frac{100}{14}$	$\frac{14.9}{21.5}$	$\frac{15.2}{25}$	38.0	
$\frac{56}{33}$	$\frac{62}{24}$	$\frac{124}{15.7}$	$\frac{124}{12.3}$	$\frac{10.0}{9.5}$	$\frac{10.9}{10.5}$	$\frac{10.5}{12.7}$	$\frac{16.4}{22.7}$	$\frac{16.9}{29}$	38.0	
$\frac{57}{33}$	$\frac{74}{23.7}$	$\frac{125}{17}$	$\frac{124}{14}$	$\frac{10.2}{10.5}$	$\frac{10.9}{10.9}$	$\frac{11.2}{12.5}$	$\frac{15.4}{20.7}$	$\frac{16.4}{33}$	38.0	
$\frac{59}{33}$	$\frac{71}{24}$	$\frac{127}{16}$	$\frac{124}{12.8}$	$\frac{10.5}{9.6}$	$\frac{11.0}{11.0}$	$\frac{11.7}{13}$	$\frac{15.4}{19}$	$\frac{15.8}{24}$	37.7	
$\frac{65}{33}$	$\frac{69}{24.6}$	$\frac{127}{27}$	$\frac{125}{15}$	$\frac{10.7}{11.5}$	$\frac{11.0}{11.3}$	$\frac{12}{13}$	$\frac{15.4}{18.7}$	$\frac{16.9}{33}$	37.9	
937.29 ✓										
$\frac{48}{33}$	$\frac{54}{25}$	$\frac{103}{20}$	$\frac{102}{16}$	$\frac{8.0}{10.3}$	$\frac{9.5}{9.0}$	$\frac{9.5}{18.4}$	$\frac{12.6}{18.5}$	$\frac{13.4}{23}$	38.1	
$\frac{49}{33}$	$\frac{55}{25}$	$\frac{103}{19}$	$\frac{101}{16}$	$\frac{8.2}{12.6}$	$\frac{9.0}{9.0}$	$\frac{9.2}{13}$	$\frac{13.0}{19}$	$\frac{13.5}{26}$	38.1	
$\frac{52}{33}$	$\frac{52}{24.7}$	$\frac{99}{18}$	$\frac{9.7}{14.7}$	$\frac{7.9}{11}$	$\frac{7.9}{7.9}$	$\frac{7.8}{13.3}$	$\frac{11.6}{19.6}$	$\frac{13.4}{28}$	38.7	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
146+00		946.57	✓		
146+67.3					
147+00			✓		
T.P.	8.95	955.11		0.41	
147+50					
148+00					
148+29.4					
148+50			✓		
T.P.	11.51	965.49		1.13	
148+65			✓		
B.M.	6.84	965.46		6.84	
149+00					
149+63.98			✓		
T.P.	5.25	974.02		0.29	
150+00					
150+50					

1 b.....
Red.....
Chain.....

Left

C L

Right

$\frac{4.2}{33}$ $\frac{5.1}{21.8}$ $\frac{9.4}{17}$ $\frac{9.2}{14}$ $\frac{7.5}{10}$

(7.3)

X
 $\frac{7.2}{14.5}$ $\frac{11.7}{21.6}$ $\frac{12.2}{27}$

39.4

$\frac{8.0}{33}$ $\frac{7.6}{23}$ $\frac{9.0}{29.5}$ $\frac{8.9}{18}$ $\frac{5.6}{12}$

(4.9)

X
 $\frac{4.1}{1.5}$ $\frac{13.4}{27.5}$ $\frac{14.0}{33}$

41.7

$\frac{13.5}{33}$ $\frac{4.5}{29}$ $\frac{9.2}{24}$ $\frac{4.7}{14.5}$

(3.4)

X
 $\frac{2.5}{1.5}$ $\frac{7.7}{22}$ $\frac{9.3}{33}$

43.3

946.16 ✓

$\frac{12.2}{33}$ $\frac{4.9}{19}$ $\frac{12.4}{17.4}$ $\frac{12.2}{13.5}$ $\frac{10.2}{12}$

(9.1)

X
 $\frac{2.2}{1.5}$ $\frac{14.0}{2.3}$ $\frac{16.0}{33}$

44.1

$\frac{7.8}{33}$ $\frac{6.3}{19.4}$ $\frac{9.0}{17}$ $\frac{9.0}{15}$ $\frac{6.6}{11}$

(5.8)

$\frac{5.1}{12}$ $\frac{9.1}{16}$ $\frac{9.2}{17.4}$ $\frac{7.4}{20.4}$ $\frac{9.6}{33}$

49.4

$\frac{3.8}{33}$ $\frac{2.3}{21.7}$ $\frac{6.2}{17.4}$ $\frac{6.0}{14.5}$ $\frac{4.4}{11.7}$

(3.5)

$\frac{3.6}{10.8}$ $\frac{6.5}{13.5}$ $\frac{6.0}{17}$ $\frac{3.1}{20}$ $\frac{4.6}{33}$

51.5

$\frac{1.7}{33}$ $\frac{2.1}{22}$ $\frac{4.3}{17.4}$ $\frac{4.1}{14.4}$ $\frac{2.4}{11.8}$

(1.9)

$\frac{1.0}{11.6}$ $\frac{3.9}{16}$ $\frac{4.2}{17.8}$ $\frac{1.0}{22.8}$ $\frac{2.4}{33}$

53.2

953.98 ✓

$\frac{10.2}{33}$ $\frac{9.1}{21.6}$ $\frac{13.0}{17.5}$ $\frac{13.0}{14.0}$ $\frac{11.3}{11}$

(11.1)

$\frac{10.5}{12.5}$ $\frac{12.6}{16}$ $\frac{12.6}{18.4}$ $\frac{9.3}{22.5}$ $\frac{9.6}{33}$

54.3

958.62 - Corrected

958.65 - R.R spike to 10' oak 25' 149100

$\frac{2.5}{33}$ $\frac{6.2}{21}$ $\frac{10.2}{16}$ $\frac{10.0}{18}$ $\frac{5.0}{9.2}$

(8.1)

$\frac{2.7}{14.5}$ $\frac{7.9}{16}$ $\frac{10.0}{17.5}$ $\frac{2.1}{22}$ $\frac{6.4}{33}$

57.2

$\frac{4.6}{33}$ $\frac{3.0}{19.7}$ $\frac{5.3}{18}$ $\frac{5.2}{14}$ $\frac{3.6}{10}$

(2.9)

$\frac{2.8}{12}$ $\frac{4.0}{15}$ $\frac{4.7}{18.4}$ $\frac{3.0}{20}$ $\frac{1.8}{28}$ $\frac{1.3}{33}$

62.3

965.17 ✓

$\frac{3.7}{33}$ $\frac{3.1}{21}$ $\frac{10.2}{16}$ $\frac{10.2}{13}$ $\frac{9.6}{10.4}$

(9.1)

$\frac{9.6}{12}$ $\frac{9.3}{15}$ $\frac{10.8}{18}$ $\frac{10.9}{21}$ $\frac{10.8}{27}$ $\frac{7.5}{33}$ $\frac{6.8}{33}$

64.4

$\frac{3.7}{33}$ $\frac{4.0}{24}$ $\frac{9.5}{18}$ $\frac{9.3}{14.5}$ $\frac{7.7}{12}$

(6.8)

$\frac{7.2}{13}$ $\frac{8.6}{15.5}$ $\frac{8.8}{19}$ $\frac{6.8}{21}$ $\frac{3.2}{33}$

66.7

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		974.02 ✓			
151+00					
151+37					
152+00					
152+60					
153+00					
T.P.	2.30	980.68 ✓		1.64	
153+50					
154+00					
154+50					
155+00					
155+50					
156+00					

In
 Rod
 Chain

Left

C L

Right

$\frac{2.1}{33}$	$\frac{2.9}{23}$	$\frac{7.4}{18}$	$\frac{7.2}{14}$	$\frac{5.7}{11.5}$	$\frac{5.7}{5.9}$	$\frac{5.7}{12}$	$\frac{7.6}{15}$	$\frac{8.0}{19}$	$\frac{6.7}{20.5}$	$\frac{7.0}{33}$	68.1
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$\frac{2.2}{33}$	$\frac{3.0}{20.6}$	$\frac{7.0}{17}$	$\frac{6.8}{15}$	$\frac{5.2}{13}$	$\frac{5.2}{5.0}$	$\frac{5.4}{12}$	$\frac{7.2}{15}$	$\frac{7.5}{19}$	$\frac{5.8}{21}$	$\frac{6.5}{33}$	68.8
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$\frac{2.8}{33}$	$\frac{3.4}{21}$	$\frac{5.6}{18.5}$	$\frac{5.7}{12}$	$\frac{4.2}{12}$	$\frac{4.3}{4.1}$	$\frac{4.4}{11.5}$	$\frac{6.2}{14}$	$\frac{6.7}{19}$	$\frac{5.1}{20.5}$	$\frac{5.8}{33}$	69.7
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$\frac{2.6}{33}$	$\frac{3.4}{21}$	$\frac{5.0}{19}$	$\frac{5.0}{15}$	$\frac{3.5}{12}$	$\frac{3.3}{3.3}$	$\frac{3.6}{12}$	$\frac{4.3}{33}$	(152+30 = 0.0 Ditch Rt.)				70.6
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$\frac{4.0}{33}$	$\frac{2.3}{20}$	$\frac{4.4}{18}$	$\frac{4.3}{10}$	$\frac{4.6}{12}$	$\frac{2.7}{2.7}$	$\frac{3.3}{12}$	$\frac{4.4}{14}$	$\frac{4.5}{18}$	$\frac{3.4}{19}$	$\frac{3.4}{33}$	71.2
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973.38 ✓

$\frac{6.5}{33}$	$\frac{6.8}{21}$	$\frac{9.7}{18}$	$\frac{8.5}{14}$	$\frac{3.5}{12}$	$\frac{2.6}{2.6}$	$\frac{3.8}{12}$	$\frac{10.1}{16}$	$\frac{10.5}{20}$	$\frac{7.9}{22.5}$	$\frac{8.5}{33}$	72.1
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$\frac{3.0}{33}$	$\frac{2.7}{26}$	$\frac{8.9}{18.5}$	$\frac{8.7}{15}$	$\frac{7.7}{12}$	$\frac{2.8}{2.8}$	$\frac{7.9}{12}$	$\frac{9.1}{15}$	$\frac{9.2}{19}$	$\frac{4.8}{23}$	$\frac{5.1}{33}$	72.9
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$\frac{5.0}{32}$	$\frac{7.6}{24}$	$\frac{8.8}{17}$	$\frac{8.7}{15.5}$	$\frac{7.5}{11}$	$\frac{7.2}{7.2}$	$\frac{7.9}{12}$	$\frac{9.2}{14}$	$\frac{9.3}{17}$	$\frac{1.0}{26}$	$\frac{1.3}{33}$	73.5
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$\frac{2.8}{33}$	$\frac{7.1}{21}$	$\frac{8.1}{17.5}$	$\frac{8.9}{14.5}$	$\frac{7.2}{12}$	$\frac{7.1}{7.1}$	$\frac{7.3}{12}$	$\frac{9.0}{14}$	$\frac{9.3}{18.5}$	$\frac{1.6}{27}$	$\frac{1.3}{33}$	73.6
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0 ditch	$\frac{13.0}{33}$	$\frac{9.6}{21}$	$\frac{9.0}{18}$	$\frac{8.9}{15}$	$\frac{7.4}{12}$	$\frac{7.2}{7.2}$	$\frac{9.6}{15.5}$	$\frac{9.7}{18}$	$\frac{4.1}{23.5}$	$\frac{4.2}{33}$	73.4
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	$\frac{13.4}{76}$	$\frac{13.0}{21}$	$\frac{8.0}{13}$	$\frac{2.7}{2.7}$	$\frac{7.9}{7.9}$	$\frac{8.0}{12}$	$\frac{10.7}{16}$	$\frac{10.7}{19}$	$\frac{9.3}{20}$	$\frac{7.9}{33}$	73.0
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..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		980.68 ✓			
156+55					
157+00					
B.M.	8.70	977.31	12.07		
157+60					
158+00					
158+60					
159+00					
159+50					
160+50					
T.P.	6.32	979.65 ✓	3.98		
160+00					
161+00					
161+50					
162+00					

Inst. W.H.C.
 Rod. Milshusen. Parsons
 Chain. Frank Soukup.

Nov 5, 1924

Left					C L		Right (150+115 0.0 ditch)						
150 53	150 23	23 13	82 1	86 14	13.2 21.7	13.0 33						72.5	
17.3 33	17.9 20	8.5 13	82 3	8.3 13.5	14.2 22.4	14.3 33						72.4	
968.61 ✓												72.4	
Nail in 15" oak 75' Pt. 157+80												72.4	
65 33	70 26	69 20.6	7.2 17	5.0 13	48 13	48 13	5.1 13	2.3 20.3	9.3 33			72.4	
60 33	57 21.4	7.3 19	7.3 16	4.8 12	49 12	48 12	5.2 16	7.6 19	2.6 21	2.6 33	+80 = 0.0 ditch. Rt.		72.4
2.1 33	2.1 23	6.8 18.6	6.7 13.4	5.2 12.5	48 12	47 12	4.6 15	6.4 18	6.5 25.2	978.4 33	978.4 33	72.4	
7.2 33	7.2 29	5.9 20	2.4 18	7.3 16	5.1 12.6	4.7 12.3	4.1 8.7	6.7 12.3	7.0 17.7	778.1		72.6	
+20 = 0.0 ditch LT												72.7	
10.0 33	10.0 19.7	5.5 12	46 12	46 12.5	3.6 19	8.0 29	7.4 33	7.4 33	0.0 ditch. Rt.		72.7		
10.0 33	9.5 20	5.7 13.7	46 12	46 13.5	3.4 18.4	7.4 24	7.2 33	7.2 33			72.7		
973.33 ✓												72.7	
8.0 33	8.0 19.6	8.9 18	8.1 15.5	7.1 12.4	6.9 12.4	6.9 15.7	8.6 17.5	8.6 17.6	6.6 20.5	6.4 27	6.4 33	72.7	
8.6 33	8.6 25	8.5 18.8	9.2 18	9.0 16	7.1 12	6.6 12	6.1 16	8.7 18.7	7.4 20.6	6.7 33	73.0		
8.3 33	7.0 19	9.4 17.4	9.0 16	6.8 12	6.4 12	5.8 12	8.4 17.4	8.5 19	0.1 20.3	5.9 26	5.2 33	73.2	
8.0 33	8.3 20	9.4 18.2	9.0 16.5	6.3 12	6.0 12	6.0 17.	8.5 16	8.1 18.7	7.0 19.6	5.8 33	73.6		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		979.65	✓		
162150					
163100					
163155					
T.P.	9.76	987.48	✓	1.93	
164100					
164150					
E.M.	4.73	987.48	✓	4.73	
165100					
165150					
T.P.	6.26	992.68	✓	1.06	
166100					
166150					
167100					
167150					
168100					

In
Rod.....
Chain.....

Left

G L

Right

12.3 53	10.7 20.4	5.7 13.6	5.4 11	6.5	5.6 11	8.5 6	8.6 17.8	5.9 21	5.2 33	74.2			
12.2 53	11.0 22	4.8 13.5	4.7 12	5.6	5.0 12	10.5 20	11.5 33			74.9 = 0.0 pitch. Rt.			
+40 = 0.0 pitch. 4.													
5.0 33	5.4 9.8	6.4 18.3	6.4 16.6	3.3 11.6	3.0 11	3.7 11	6.0 15.4	6.1 17.7	3.7 20	2.6 33	76.1		
977.72 ✓	4.0 33	14.0 26	10.6 22	12.1 19	11.8 15.3	9.4 11	9.8 12	18.4 12	12.0 15	11.7 18.3	3.9 25.2	3.9 33	77.7
75	5.8 33	6.3 21.8	9.1 19	8.9 13.6	7.0 9.6	7.4	8.2 12	9.0 14.6	9.0 18	6.4 21	6.8 33	80.1	
987.76	R.R. 50. 10 in 16" hook Lt. str. 16475												
5.0 33	4.7 26	5.3 20.6	7.1 18.6	6.7 14.4	4.9 11.5	5.5	6.4 11.5	7.4 18.5	7.6 18	6.0 20	6.2 33	82.0	
2.4 33	2.2 22	4.6 18.7	4.6 15	3.1 12	3.4	3.2	4.2 12	5.0 13.7	5.0 17.7	2.9 20.3	3.0 33	84.1	
986.42 ✓	5.0 33	5.4 20.3	8.2 19	8.1 16	6.3 12.5	6.7	7.1 12	7.9 14	8.2 17.5	4.7 21.5	4.5 33	85.8	
4.2 33	4.3 21.7	6.5 19	6.2 15	5.0 12.7	5.4	5.7	5.5 12.4	6.5 15	6.4 19	2.9 23	3.0 33	87.2	
5.3 33	5.3 21	6.7 19.7	6.3 15	5.0 12	5.1	5.0	5.2 13	6.2 15.5	6.2 18.7	3.1 23	3.1 33	87.4	
4.4 33	4.2 22	6.4 18.6	6.4 15	5.0 12	5.0	4.9	5.2 12	6.4 15	6.3 18	2.6 21.7	2.0 33	87.7	
5.3 33	5.3 21	7.4 17.7	7.2 14.7	5.5 12	5.3	5.1	5.3 12	6.3 14.5	6.9 18	4.5 21.5	3.2 33	87.4	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		992.68 ✓			
168+25.7					
169+00					
169+27.4					
T.P.	137	988.74 ✓	581	986.87 ✓	
170+00					
170+50					
171+00					
171+49.7					
172+00					
172+24.07					
173+00					
173+50					

In.

Rod.

Chain.

Left

C L

Right

6.2	6.2	7.7	7.8	5.7	5.5	5.5	6.6	6.7	4.6	4.1	87.2
$\frac{33}{1}$	$\frac{24}{10}$	$\frac{16}{15}$	$\frac{15}{15}$	$\frac{110}{15}$	$\frac{110}{15}$	$\frac{12}{12}$	$\frac{14}{14}$	$\frac{78}{78}$	$\frac{21.6}{21.6}$	$\frac{33}{33}$	

7.2	7.1	8.7	8.3	7.0	6.2	5.7	7.5	7.5	5.1	4.9	86.5
$\frac{33}{33}$	$\frac{20}{20}$	$\frac{15}{15}$	$\frac{14}{14}$	$\frac{11}{11}$	$\frac{00}{00}$	$\frac{12}{12}$	$\frac{15}{15}$	$\frac{19}{19}$	$\frac{21}{21}$	$\frac{33}{33}$	

7.6	7.4	8.1	8.7	7.3	6.3	5.4	7.2	7.5	5.5	5.0	86.4
$\frac{33}{33}$	$\frac{21}{21}$	$\frac{18.7}{18.7}$	$\frac{15.7}{15.7}$	$\frac{12}{12}$	$\frac{11}{11}$	$\frac{12}{12}$	$\frac{15}{15}$	$\frac{18}{18}$	$\frac{20}{20}$	$\frac{33}{33}$	

7.6	7.5	5.7	4.7	3.6	2.2	1.5	3.5	3.8	1.3	1.3	85.8
$\frac{33}{33}$	$\frac{20}{20}$	$\frac{18}{18}$	$\frac{15.7}{15.7}$	$\frac{12.6}{12.6}$	$\frac{11}{11}$	$\frac{15}{15}$	$\frac{16}{16}$	$\frac{19}{19}$	$\frac{21}{21}$	$\frac{33}{33}$	

3.9	4.1	3.9	5.3	5.0	3.8	2.7	4.0	4.2	2.3	2.8	85.5
$\frac{33}{33}$	$\frac{23}{23}$	$\frac{19.6}{19.6}$	$\frac{18}{18}$	$\frac{15}{15}$	$\frac{12}{12}$	$\frac{11}{11}$	$\frac{12}{12}$	$\frac{17}{17}$	$\frac{19}{19}$	$\frac{21}{21}$	

4.7	4.3	5.9	5.5	4.3	3.2	2.5	5.0	5.3	3.0	3.0	85.0
$\frac{22}{22}$	$\frac{20}{20}$	$\frac{18}{18}$	$\frac{16}{16}$	$\frac{13}{13}$	$\frac{11}{11}$	$\frac{11}{11}$	$\frac{14.6}{14.6}$	$\frac{17.8}{17.8}$	$\frac{20}{20}$	$\frac{33}{33}$	

5.3	5.6	5.0	6.4	6.0	4.8	4.0	3.6	5.7	6.0	4.1	84.2
$\frac{33}{33}$	$\frac{23}{23}$	$\frac{19.7}{19.7}$	$\frac{18.5}{18.5}$	$\frac{15.4}{15.4}$	$\frac{13.7}{13.7}$	$\frac{10}{10}$	$\frac{14}{14}$	$\frac{17.6}{17.6}$	$\frac{20}{20}$	$\frac{23}{23}$	

6.8	6.8	6.3	7.3	7.0	5.3	4.7	4.5	6.8	7.0	4.6	83.5
$\frac{33}{33}$	$\frac{14}{14}$	$\frac{19.3}{19.3}$	$\frac{17.6}{17.6}$	$\frac{15}{15}$	$\frac{13}{13}$	$\frac{11}{11}$	$\frac{12}{12}$	$\frac{15.6}{15.6}$	$\frac{18.3}{18.3}$	$\frac{21}{21}$	

7.1	7.1	6.7	7.6	7.2	5.3	4.1	4.8	7.1	4.7	4.2	83.2
$\frac{33}{33}$	$\frac{23}{23}$	$\frac{19}{19}$	$\frac{17}{17}$	$\frac{14}{14}$	$\frac{10}{10}$	$\frac{11}{11}$	$\frac{12}{12}$	$\frac{16}{16}$	$\frac{19}{19}$	$\frac{21}{21}$	

00 ditch	8.0	7.9	7.7	5.5	5.7	5.4	6.9	7.6	5.1	4.4	82.5
	$\frac{33}{33}$	$\frac{21}{21}$	$\frac{15}{15}$	$\frac{70}{70}$	$\frac{11}{11}$	$\frac{13}{13}$	$\frac{16}{16}$	$\frac{19}{19}$	$\frac{51.4}{51.4}$	$\frac{33}{33}$	

9.0	8.0	5.1	5.6	7.0	4.6	6.0	5.3	82.6
$\frac{33}{33}$	$\frac{170}{170}$	$\frac{12}{12}$	$\frac{13}{13}$	$\frac{16}{16}$	$\frac{19}{19}$	$\frac{21}{21}$	$\frac{33}{33}$	

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		988.74 ✓			
174+00					
174+00	2.25	990.90 ✓	3.58	992.66 ✓	
175+00					
175+57.25					
176+00					
176+54.33 =					
176+13.05					
T.P.	10.98	999.70 ✓		2.18	
177+00					
177+50					
178+00					
179+00					
T.P.	5.03	1003.99 ✓		0.74	
180+00					

Inst. W.H.C.
 Rod. M. Johnson Persons Nov. 7, 1924
 Chain hookup

Left

C L

Right

(5.6)

82.8

83	83	49	54	5.6	7.5	7.6	6.7	6.6
33	19	14	—	14	15	18	19.7	33

✓ corrected

987.65 RR Spike 17 24" 27 covered 11.579 175+00

110	103	67	75	21	104	110	94	94
33	25.6	19	—	14	17	20.4	22	33

(7.9)

83.4

(7.1)

97	97	49	56	6.6	7.3	9.7	9.9	9.3	9.4
33	37	24	18.4	—	12	16.2	19	20	33

84.3

(6.0)

81	81	78	74	5.3	5.6	8.2	8.4	8.6
33	25	40	16.6	12	14	17.6	20.8	22.9

85.3

(4.7)

39	4.4	5.7	5.7	4.1	4.1	7.2	7.3	6.5	6.7
33	22	18.2	15.5	12	12.6	11.8	20.4	22	33

86.7

(2.9)

90	93	40	42	2.6	2.6	4.2	4.5	3.8	4.0
33	24	19	15.6	12	12.6	16.8	19.5	21	33

88.3

988.72 ✓

(8.4)

4.1	4.7	20	9.2	13	13	7.5	9.2	8.2	8.0
33	24.2	14.5	15.7	12.6	12	12.9	17.3	20.0	33

91.4

(6.3)

29	3.6	7.5	7.5	6.4	6.6	8.5	8.7	6.7	7.4
33	24.3	19.5	14.7	12	12	15.5	18.2	20.2	33

93.3

(7.3)

2.1	3.4	6.5	6.7	5.0	5.4	7.3	7.5	6.3	7.1
33	22.6	19	16	19.3	12	15.4	18.6	20	33

94.5

(3.0)

4.0	1.0	4.5	4.6	2.6	2.9	3.2	5.4	4.5	5.4
33	22	18.9	16	12	—	12	15	18.2	19.6

96.8

998.96 ✓

(5.1)

1.4	2.6	6.2	5.7	4.5	4.6	5.2	6.9	7.2	6.4
33	24	19.2	19	12	—	12	15	18.5	20

99.4

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Cor. R.
		1003.99 ✓			
180+60					
181+00					
181+50					
182+00					
182+50					
183+00					
T.P.	3.39	995.57 ✓		11.81	
183+50					
184+00					
184+30					
T.P.	2.99	992.34 ✓		6.22	
184+55					
185+00					

Inst.
Rod.
Chain.

Nov 7, 1924

Left

G L

Right

$\frac{0.8}{33}$	$\frac{13}{25}$	$\frac{9.6}{18.2}$	$\frac{4.4}{14.4}$	$\frac{3.5}{12}$	$\frac{3.8}{33}$	$\frac{2.4}{12}$	$\frac{5.5}{15.6}$	$\frac{5.6}{19}$	$\frac{4.9}{21.2}$	$\frac{5.2}{33}$	00.7
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$\frac{1.7}{33}$	$\frac{2.8}{22.}$	$\frac{4.6}{19}$	$\frac{4.7}{16}$	$\frac{3.1}{12.2}$	$\frac{3.3}{33}$	$\frac{3.2}{12}$	$\frac{5.0}{15}$	$\frac{5.1}{17.2}$	$\frac{4.5}{19}$	$\frac{4.8}{33}$	00.9
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$\frac{2.1}{33}$	$\frac{1.6}{23}$	$\frac{4.7}{18.8}$	$\frac{4.7}{16.2}$	$\frac{3.4}{12.2}$	$\frac{3.6}{33}$	$\frac{3.5}{12}$	$\frac{4.9}{15}$	$\frac{4.9}{18.3}$	$\frac{2.8}{22.}$	$\frac{2.9}{33}$	00.8
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$\frac{2.0}{33}$	$\frac{1.9}{23.2}$	$\frac{5.2}{18.5}$	$\frac{5.0}{15.8}$	$\frac{4.0}{12.6}$	$\frac{4.6}{33}$	$\frac{4.2}{12}$	$\frac{6.1}{15.7}$	$\frac{6.1}{19}$	$\frac{1.6}{22.6}$	$\frac{1.9}{33}$	99.9
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$\frac{2.6}{33}$	$\frac{3.3}{24.5}$	$\frac{7.3}{18.6}$	$\frac{7.5}{15.7}$	$\frac{6.2}{12}$	$\frac{6.6}{33}$	$\frac{6.5}{12}$	$\frac{8.6}{15.8}$	$\frac{8.6}{18.5}$	$\frac{1.6}{26}$	$\frac{1.6}{33}$	97.9
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$\frac{8.2}{33}$	$\frac{7.6}{23.5}$	$\frac{10.5}{18}$	$\frac{10.4}{16.}$	$\frac{8.5}{12.3}$	$\frac{9.0}{33}$	$\frac{8.9}{12}$	$\frac{10.9}{15}$	$\frac{11.0}{17.7}$	$\frac{4.6}{24.7}$	$\frac{3.8}{33}$	95.0
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992.18 ✓

$\frac{4.6}{33.0}$	$\frac{4.4}{20.6}$	$\frac{5.8}{18.7}$	$\frac{5.7}{15.6}$	$\frac{7.9}{10}$	$\frac{3.0}{33}$	$\frac{2.9}{12}$	$\frac{4.6}{14.4}$	$\frac{4.5}{16.7}$	$\frac{1.6}{21}$	$\frac{0.7}{33}$	92.4
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$\frac{2.0}{33}$	$\frac{2.4}{25}$	$\frac{7.5}{18}$	$\frac{7.7}{16}$	$\frac{5.1}{11}$	$\frac{5.4}{33}$	$\frac{5.0}{12}$	$\frac{7.2}{16.3}$	$\frac{8.0}{19.6}$	$\frac{6.9}{20}$	$\frac{6.9}{33}$	90.4
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$\frac{13.2}{33}$	$\frac{11.0}{22.7}$	$\frac{8.6}{21}$	$\frac{9.5}{17.7}$	$\frac{6.0}{12}$	$\frac{6.6}{33}$	$\frac{5.9}{12}$	$\frac{8.8}{17.2}$	$\frac{8.9}{20.4}$	$\frac{2.2}{33}$	89.6
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989.35 ✓

	$\frac{19.7}{40}$	$\frac{17.1}{36}$	$\frac{3.8}{12}$	$\frac{3.8}{33}$	$\frac{4.1}{33}$	$\frac{3.5}{13.6}$	$\frac{6.8}{18.7}$	$\frac{6.9}{33}$	89.0
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	$\frac{20.0}{45}$	$\frac{14.2}{38}$	$\frac{3.8}{12.7}$	$\frac{3.7}{33}$	$\frac{4.9}{33}$	$\frac{3.7}{12}$	$\frac{2.0}{10.}$	$\frac{10.0}{33}$	88.6
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..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
185+50		992.34 ✓			
186+00					
186+50					
B.M.	7.72	998.12 ✓	1.94		
187+00					
187+30					
187+50					
188+00					
T.P.	10.47	1004.31 ✓	4.28		
188+60					
189+00					
189+57					
190+00					
190+55					

Inst.
 Rod.
 Chain.

Left

G L

Right

152
33

115
23

42
12

39 (4.9)

3.1
12

2.0

10.4

3.3

88.4

161
23

140
266

42
126

33 (3.9)

2.2
13

5.8

6.3

2.5
23

89.0

133
23

12.3
31

10.0
256

3.0
14.4

2.4 (2.4)

1.7
12.8

4.0
16.7

2.7
18.6

3.3
20.4

3.7
3.3

89.9

99 0.40 ✓ - R.R. stake in T.P. ^{10'} Rt. Sta. 106 + 75

152
33

13.1
25.6

72
125

67 (6.7)

5.7
16.6

5.3
22

8.4
25.

5.8
29

6.7
23

91.4

136
33

109
20

62
11.

5.7 (5.8)

5.3
14.2

2.5
18

7.7
21

4.3
25

4.7
33

92.4

132
33

95
20

60
133

5.2 (5.2)

4.8
12

6.8
15.1

6.8
19.6

3.4
24

3.7
27

9.7
30

9.7
33

93.1

9.3
33

6.5
23.7

4.0
16

3.2 (3.7)

3.1
12

4.8
15

4.9
18

5.0
23.

+ 5.3
100.2
27

+ 5.3
100.9
33

94.9

993.84 - Top stamo 2. 188 + 18

136
33

12.2
12.5

8.6
13

4.2 (4.3)

2.4
12.5

11.0
18

11.0
23

96.1

9.4
33

9.2
17

5.8
14

7.7
12.

7.2 (7.4)

2.0
12

9.1
15.6

9.2
19.4

5.7
14.5

9.1
33

97.0

3.1
33

3.3
23

7.7
12.5

7.9
14.5

5.1
12.

6.3 (6.3)

6.3
11

8.1
15

8.2
17.3

4.3
21

4.5
33

98.1

9.1
33

9.5
25

7.0
13.5

7.2
12.6

5.6
12

5.3 (5.7)

5.6
12

2.0
14

2.2
17.7

9.8
26.5

9.4
26.6

9.0
33

99.0

1.9
33

9.6
25.3

6.7
14.5

6.5
15.7

4.8
12.5

5.1 (5.1)

5.0
12

6.1
14.6

6.0
19.5

5.7
25

+ 4.3
110.33
25

110.33
25

99.2

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
191+00		1004.31			
191+57					
192+00					
192+65					
193+00					
T.P.	3.76	1002.75		5.32	
194+00					
194+54					
195+00					
195+50					
195+85					
196+00					
197+00					

Inst.
 Rod.
 Chain.

Left

C L

Right

$\frac{24}{33}$	$\frac{24}{33}$	$\frac{6.8}{18}$	$\frac{6.5}{15.3}$	$\frac{4.5}{12}$	$\frac{4.9}{12}$	$\frac{4.3}{12}$	$\frac{6.5}{18}$	$\frac{6.4}{18.6}$	$\frac{+4.3}{103.6}$	$\frac{79}{79}$	99.5
$\frac{8.2}{33}$	$\frac{5.9}{18.4}$	$\frac{6.7}{17.5}$	$\frac{6.7}{17}$	$\frac{5.0}{12.5}$	$\frac{4.9}{11}$	$\frac{5.0}{11}$	$\frac{6.6}{13.5}$	$\frac{2.8}{17}$	$\frac{4.8}{21}$	$\frac{4.7}{33}$	99.4
		$\frac{10.0}{33}$	$\frac{2.9}{18}$	$\frac{5.0}{12}$	$\frac{5.1}{12}$	$\frac{4.7}{12}$	$\frac{10.1}{30.4}$		$\frac{11.9}{33}$		99.5
		$\frac{9.6}{33}$	$\frac{5.1}{17}$	$\frac{5.1}{10.6}$	$\frac{5.5}{12}$	$\frac{5.1}{12}$	$\frac{8.1}{18}$		$\frac{8.3}{33}$	(0.00000)	99.5
	$\frac{10.1}{33}$	$\frac{8.4}{18}$	$\frac{6.0}{10.5}$	$\frac{5.4}{12.5}$	$\frac{5.7}{11.7}$	$\frac{5.4}{11.7}$	$\frac{7.7}{15.6}$	$\frac{7.6}{18}$	$\frac{6.0}{21}$	$\frac{6.5}{33}$	99.3
99.8.99 ✓		$\frac{1.0}{33}$	$\frac{5.3}{18.8}$	$\frac{4.7}{13.8}$	$\frac{4.8}{12}$	$\frac{4.6}{12}$	$\frac{6.8}{18.8}$	$\frac{6.7}{18}$	$\frac{4.9}{21.5}$	$\frac{4.3}{33}$	98.2
		$\frac{13.4}{33}$	$\frac{11.8}{23}$	$\frac{5.7}{13}$	$\frac{5.1}{12}$	$\frac{5.0}{12}$	$\frac{7.6}{16}$	$\frac{7.5}{18.7}$	$\frac{5.3}{20.6}$	$\frac{4.1}{33}$	97.9
	$\frac{4.6}{33}$	$\frac{13.0}{30}$	$\frac{11.7}{25}$	$\frac{11.2}{21.5}$	$\frac{5.1}{12}$	$\frac{5.1}{12}$	$\frac{7.4}{12.5}$	$\frac{7.4}{19}$	$\frac{0.8}{26.3}$	$\frac{0.8}{33}$	97.9
	$\frac{8.1}{33}$	$\frac{7.0}{19}$	$\frac{5.8}{14}$	$\frac{5.0}{12.5}$	$\frac{5.7}{12.5}$	$\frac{5.0}{12.5}$	$\frac{6.7}{16}$	$\frac{6.7}{17.3}$	$\frac{+4.1}{1006.9}$	$\frac{1006.9}{28.7}$	97.9
		$\frac{10.5}{33}$	$\frac{9.4}{17}$	$\frac{5.0}{12}$	$\frac{5.7}{13}$	$\frac{5.2}{13}$	$\frac{7.0}{16}$	$\frac{6.8}{18}$	$\frac{0.6}{24}$	$\frac{0.6}{33}$	97.6
		$\frac{11.8}{33}$	$\frac{10.8}{19}$	$\frac{5.0}{14}$	$\frac{5.7}{15.7}$	$\frac{5.7}{15.7}$	$\frac{6.7}{15.8}$	$\frac{6.7}{18.7}$	$\frac{4.5}{22}$	$\frac{2.7}{33}$	97.5
		$\frac{10.6}{33}$	$\frac{11.0}{18}$	$\frac{6.2}{14}$	$\frac{6.0}{12.5}$	$\frac{5.9}{12.5}$	$\frac{7.3}{16}$	$\frac{7.5}{23.5}$	$\frac{4.0}{20}$	$\frac{3.4}{33}$	96.8

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
197+60		1002.75	✓		
198+00			✓		
T.P.	7.80	1003.80		6.75	
198+50					
199+00					
199+45					
199+77					
200+00					
200+48					
200+80					
200+91					
B.M.				9.31	

Inet. W.H.C.
 Rod Wilshusen-Persons
 Chain. Soukup

Finis
 Nov. 7, 1924.

35

Left

C L

Right

55	21	85	83	86	65	7.0	65	82	83	11	92	96.3
33	20	18	14	11			12	15	19	267	53	

53	43	88	84	20	68	7.2	69	82	83	55	97	91	96.0
33	21	187	105	12			12	14	185	206	30	33	

996.00 ✓

63	85	98	97	82	82	8.2	82	97	98	32	19	19	95.7
33	194	18	15	126			12	15	185	247	31	33	

61	51	100	98	84	82	8.8	82	96	99	107.2	134	95.5
33	24	187	105	127			12	145	19	325		

43	49	98	97	89	85	9.1	85	108	108	106	109	95.3
33	24	19	15	14			12	15	19	21	33	

73	92	101	109	92	87	9.3	86	125	123	95.1
33	24	227	105	106			12	184	33	

122	116	119	115	92	88	9.4	90	128	124	95.0
33	275	267	23	19			13	19	33	

133	121	115	108	97	95	9.7	93	118	113	94.3
33	41	354	34	16			15	196	33	

	122	104	94	82	9.9	17	33	93.4
	33							

Same as original.

904 49 ✓

R.R. spike in T.R. RT Sta. 200 + 58

st.
od.
hain.

Left

C L

Right

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
------	-------	-------	-------	-------	--------

Final, Culverts + Driveways.

Station	Description.	Size	Length	Kind
(1+07) 4+66	Walk Left.	10"	10'	C.M.
✓ 1+45	F. Ent. Right	10"	16'	C.M.
✓ 2+17	F. Ent. Left.	12"	16'	C.M.
(2+28) 2+25	F. Ent. Right	12"	18'	C.M.
(7+08) 7+06	Cross Drain	18"	38'	C.M.
(4+62) 4+66	F. Ent. Right			
(14+84) 4+88	Cross Drain	18"	30'	C.M.
(16+76) 16+82	F. Ent. Left	12"	22'	C.M.
✓ 19+72	F. Ent. Left			
(19+91) 19+98	Cross Drain	18"	36'	C.M.
✓ 21+48	Drive to Sch. Ho. Rt.	12"	24'	C.M.

Inst. W.H.G.
Rod. Wilkinson Persons Nov. 8, 1924
Chain. Soukup

Left

C L

Right

Embankment

$$2' \times 8' \times 10' = 6 \text{ cu. yds.}$$

$$3' \times 14' \times 9' = 14 \text{ " "}$$

$$2' \times 14' \times 9' = 9 \text{ " "}$$

$$3' \times 15' \times 9' = 15 \text{ " "}$$

$$15' \times 18' \times 12' = 12 \text{ cu. yds.}$$

$$2' \times 18' \times 8' = 11 \text{ cu. yds.}$$

$$2.5' \times 15' \times 26' = 36 \text{ " "}$$

$$2' \times 22' \times 8' = 13 \text{ cu. yds.}$$

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
✓ 22+69	Road	Left.			
(22+91) 22+89	Cross Drain		24"	44'	C.M.
(25+39) 25+36	Walk	Left	12"	8'	C.M.
(25+98) 25+96	Road	Right	12"	22'	C.M.
(26+69) 26+67	Walk	Left	12"	8'	C.M.
(30+07) 30+09	Cross Drain		24"	42'	C.M.
(32+58) 32+60	F. Ent.	Right	12"	22'	C.M.
(38+77) 38+73	F. Ent.	Right	12"	22'	C.M.
41+66	Cross Drain		18"	38'	C.M.
41+90	F. Ent.	Left			
(43+05) 43+22	F. Ent.	Right	12"	22'	C.M.
50+36	F. Ent.	Right	12"	20'	C.M.

Inst.....

Rod.....

Chain.....

Left

C L

Right

$$1' \times 20' \times 28' = 21 - \text{cu. yds.}$$

$$5' \times 7' \times 10' = 8 - \text{cu. yds.}$$

No Blading

$$1.5' \times 7' \times 5' = 2 - \text{Cu. yds.}$$

$$1.5' \times 21' \times 8' = 9 - \text{cu. yds.}$$

$$1.5' \times 21' \times 11' = 13 - \text{Cu. yds.}$$

$$1.0' \times 26' \times 22' = 21 - \text{cu. yds.}$$

$$2' \times 21' \times 7' = 11 - \text{cu. yds.}$$

$$2' \times 18' \times 10' = 13 - \text{cu. yds.}$$

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
(52473) 53+69		Cross Drain	18"	36'	C.M.
(64466) 65+68		F. Ent. Left.	10"	28'	C.M.
		Remained as original			
67+30		F. Ent. Left	12"	23'	C.M.
(68407) 68+10		Cross Drain	18"	42'	C.M.
70+00		F. Ent. Left.			
76+71	77+22	Cross Drain	18"	34'	C.M.
74+52 8+68	78+56	Double F. Ent. Left	12"	42'	C.M.
87+65		F. Ent. Left	None		
90+47		F. Ent. Left	12"	16'	C.M.
100+14		Cross Drain	18"	38'	C.M.
101+12	100	F. Ent. Right	None		
103+88		Cross Drain	15"	43'	Vit. T. I. e
108+44 108 +25		Cross Drain	18"	38'	C.M.

Inst.
Rod.
Chain.

39

Left

C L

Right

$$2' \times 25' \times 10' = 19 \text{ - cu. yds.}$$

$$1.5' \times 20' \times 8' = 9 \text{ - cu. yds.}$$

$$1.0' \times 12' \times 6' = 3 \text{ - cu. yds.}$$

$$1.0' \times 40' \times 6' = 9 \text{ - cu. yds.}$$

$$1.0' \times 25' \times 6' = 6 \text{ - cu. yds.}$$

$$1.5' \times 14' \times 8' = 6 \text{ - cu. yds.}$$

$$3' \times 15' \times 18' = 29 \text{ - cu. yds.}$$

Sta.	B. S.	H. I.	Cross sections			
			F. S.	Grade	Gr. R.	
11753/17754				24"	38'	C.M.
✓ 121798				18"	34'	C.M.
✓ 126135				24"	34'	C.M.
12654/26156				12"	22'	C.M.
13457 2 52				24"	32'	C.M.
13413/26110				18"	40'	C.M.
✓ 146137				12"	22'	C.M.
146177 146173				24"	58'	C.M.
✓ 148192				10"	10'	Vit.
15148 15145				18"	18'	C.M.
✓ 152160				12"	60'	C.M.
159173				24"	40'	C.M.

Inst. *W.H.C.*
Rod. *Wilshusen*
Chain. *Pelsons*

Nov. 12, 1924

Left

C L

Right

$$2' \times 20' \times 12' = 18 - \text{cu. yds.}$$

Included in field

$$2' \times 20' \times 7' = 10 - \text{cu. yds.}$$

$$3' \times 6' \times 6' = 4 - \text{cu. yds.}$$

$$2' \times 17' \times 6' = 8 - \text{cu. yds.}$$

No grading

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
------	-------	-------	-------	-------	--------

166+59	F. ENT.	Left			
--------	---------	------	--	--	--

166+69	F. ENT.	Right			
--------	---------	-------	--	--	--

170+56	F. ENT.	Right	12"	29'	C.M.
--------	---------	-------	-----	-----	------

174+49	Cross Drain		24"	40'	C.M.
--------	-------------	--	-----	-----	------

174+79	F. ENT.	Left			
--------	---------	------	--	--	--

181+29	F. Ent	Right			
--------	--------	-------	--	--	--

¹⁸⁶⁺⁷⁷ 186 +72	F. Ent.	Right			
---	---------	-------	--	--	--

¹⁸⁷⁺⁰ 187 +00	Cross	Drain	24"	40'	C.M.
--	-------	-------	-----	-----	------

200+30	Cross	Drain	24"	56'	C.M.
--------	-------	-------	-----	-----	------

Inst.
Rod.
Chain.

Left

C L

Right

$$2' \times 17' \times 8' =$$

10 cu. yds.

$$15' \times 22' \times 9' =$$

11-cu. yds. ^{Exc.} $1' \times 21' \times 10' = 8\text{-cu. yds.}$

$$5' \times 26' \times 10' =$$

19-cu. yds.

$$2' \times 22' \times 38' =$$

62 cu. yds.

$$2' \times 22' \times 6' =$$

10 cu. yds.

$$15' \times 30' \times 50' =$$

83 cu. yds.

Art. Topography.

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
5+00					
4+00					
3+00					
	+22	F. ENT RT.			
	+17	F. ENT LT.			
2+00					
1+00					
0+00	N 1017	E CO. LINE			
-1+00					

Inst. W.A.C.
 Rod. Wilshusen
 Chain. Peters

Nov. 12, 1924

Left

C L

Right

+147-7" P.P. 25'
 +25-2" Oak 27'

+45-P.P. 20'

Pasture

Pasture

+17-P.P. 27'

+46-F.P. 27'
 12" x 16" C.M.

+38-F. Cor. 27'

30' 12" x 18" C.M.

+107-10" Oak 28'

+771-P.P. 26'

30' 10" x 16" C.M.

+452-F. Ent

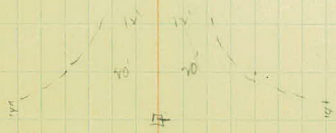
+107-9" Walk 10" x 10" C.M. -
 22'

+167-10" Tree 23'

+156-8" Tree 23'

+126-10" Tree 23'

+40-P.P. 28'



+120 Jr. Ref. Sq 27'

+124-8" Oak 20'

+125-10" Oak 18'

+129-3" Oak 29'

+126-T.P. B.M. 26'

+132-12" Oak 24'

+133 Hyd. 22'

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
11700					
10700					
9700					
8700	L. 5 ⁰⁰ R.R.				
708	B. cut. 12" x 326				
7400					
6700					
5700					

Inst.
Rod. 11+9 T.P. 21
Chain.

11+48 T.P. 21' 43

Left

G L

Right

+21 T.P. 21'

+11 F. Cor.

+80-809 F. 28'

T.P. 20

+87-7 P. 22'

+61-845 F. 42'

+48 E.F. 58'

+62 F. Cor. 60'

+37-7 P. 8 F. Cor. 23'

+13- Wood Gate

+92 T.P. 21' & Fence

+10- 20' Oak 30'

cut.

+93- R.P. 22'

+10- F. Cor. 25'

+94 F. Cor. 48'

+13- P.P. 23'

+97- R.P. 21' 89' 22'

+59- P. 4 F. 41'

+18 E.F. 30'

+99- T.P. 20'
+93 R.P. 27'

+14- F. Cor. 29'

+99- R.P. 22'

173'

22'

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
18+00					

17+00

+76 R. FEET LT.

16+00

15+00

+84 E. CULVERT 30' CM.

+62 R. FEET LT.

14+00

13+00

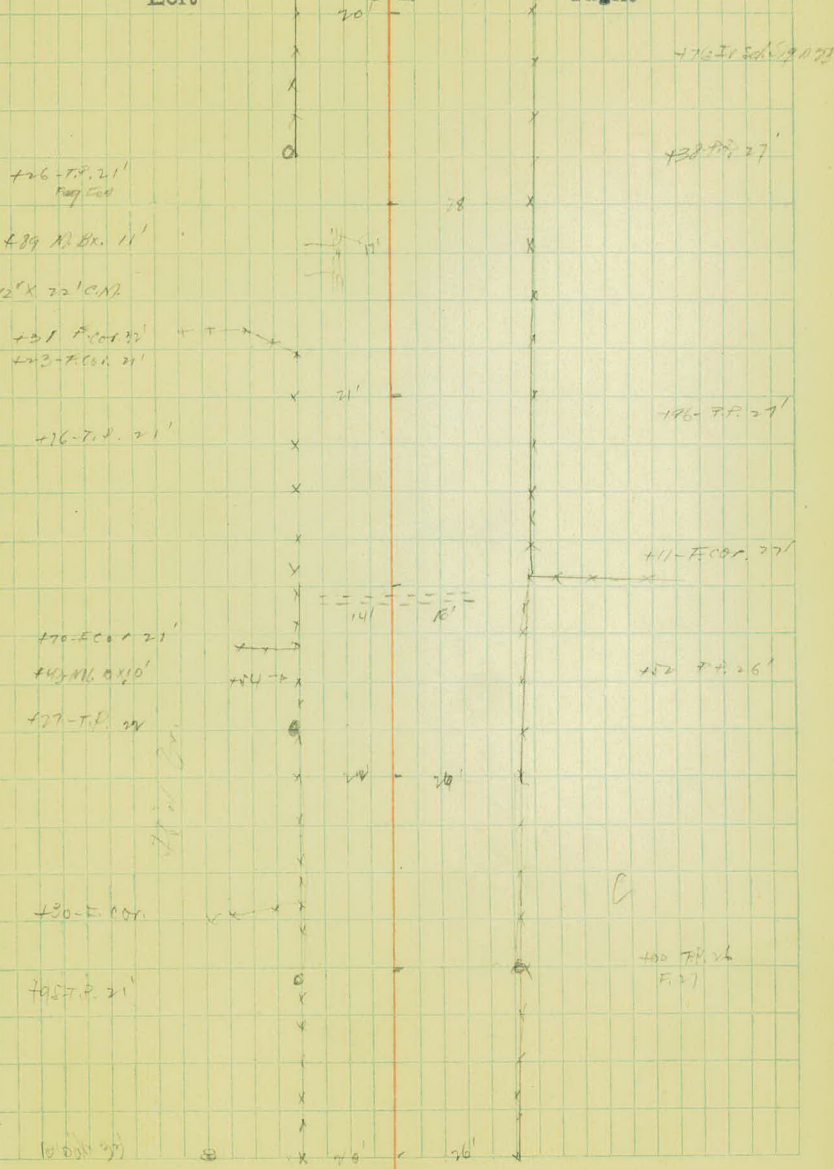
12+00

Inst.
 Rod.
 Chain.

Left

G L

Right



Cross Sections

Sta. B. S. H. I. F. S. Grade Gr. R.

24700

23700

+91 R. CUT. 24" X 44' C.M.

+69 R. FEET. LT.

22700

+48 R. DRIVE TO SCHOOL

21700

20700

+98 R. CUT. 18" X 36.6' C.M.

+72 R. FEET. LT.

19700

18700

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
------	-------	-------	-------	-------	--------

30+00

29+00

28+00

27+00

169 to walk rt

26+00

198 to F. ENT. RT. & Lt.

139 to walk.

25+00

24+00

Inst.
Rod.
Chain.

Left

C L

Right

Noted Ditch

+36 - P.P. 26'

+87 - T.P. 27'

C

+82 - P.P. 29'

+85 - T.P. 27'

+71 - M.B.X. 11'

19'

12" x 2' C.M.

+83 - T.P. 26'

+88 - P.P. 27'

+81 - M.B.X. 11'

+82 - P.P. 26'

+82 - M.B.X. 12'

14'

12" x 22' C.M.

+82 - F.C. 29'

12" x 8' C.M.

18'

+32 - M.B.X. 31'

Posthole

+65 - M.B.X. 10 21'

F 33'

+27 - T.P. 28'

+80 - P.P. 32'

+82 - M.B.X. 31'

+30 - F.C. 25'

+02 - M.B.X. 11'

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. 'R.
36700					
35700					
34400					
33600					
418	R. F. ENT. RD.				
32400					
31400					
407	CONV. 21" X 42 CM.				
30700					

Inst.
Rod.
Chain.

Left

C L

Right

+13 T.P. 27'

+20 P.P. 28'

27'

+49 X.P.P. 27'

CU

+05 P.P. 27'

+60 T.P. 29'

+58 X.P.P. 29'

27'

+14 P.P. 27'

CU

12" X 2' C.M.

13'

+30 F.C.M. 26'

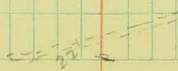
+07 P.P. 30'
+02 T.P. 29'

+11 P.P. 26'

+01 P.P. 29'

+45 T.P. 26'

+06 C.M. 27'



Sta.	Cross Sections			Grade	Gr. R.
	B. S.	H. I.	F. S.		
42+00					
	+90 - 2 F Ent Lt.				
	+66	2 Cu N	18" X 39' C. M		
41+00					
40+00					
39+00					
	+77 2 F Ent Rt.				
38+00					
37+00					
36+00					

Inst.
Rod.
Chain.

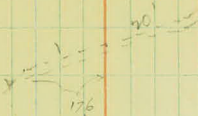
Left

C L

Right

144 T.P. 24'

E. C. 1/4, 158



1102 P.P. 29'

146 T.P. 28'

C 1/4 N

+66-P.P. 29

114 T.P. 28'

C 1/4 N

12" x 22' C.M.

47-P.P. 28'
77 End fence

170 T.P. 29'



475-P.P. 28'
Fence

137 T.P. 28'

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
------	-------	-------	-------	-------	--------

48+00

47+00

46+00

45+00

44+00

LW & F. ENTRY

43+00

42+00

Inst.
Rod.
Chain.

Left

C L

Right

+43 } Force 35'
7 P

+91 P.P. 29'

+16 } Force 32'
7 P

+35 P.P. 29'

+75 } Force 29'
7 P

C 4 1/2'

+96 P.P. 29'

+45 - E Cor. 26'

+39 - T.R. 26'

+02 - E Cor. 33'

12' x 22' C.N.I.

+16 - 3" Tree 17'

+70 - 4" Tree 17'

+54 - 4" Tree 17'

+37 - 4" Tree 17'

+21 - 6" Tree 17'

421 N. 2 x 12'

+42 P.P. 29'

4 1/2'



5400

5300

+73 4 Cuts. 18x37' a.m.

5200

5100

136 R.F. Ent. Rt.

5000

4900

4800

6040

5940

5840

5740

5640

5540

5440

+39-T.P. 38'

Marsh

+37-Foot. Log
(28-34)

+81-P.P. 33'

+05-T.P. 40'

F. 37.

+52-P.P. 25'

+79-T.P. 40'

Timber

+28-P.P. 27'

Fence 37'

54/4

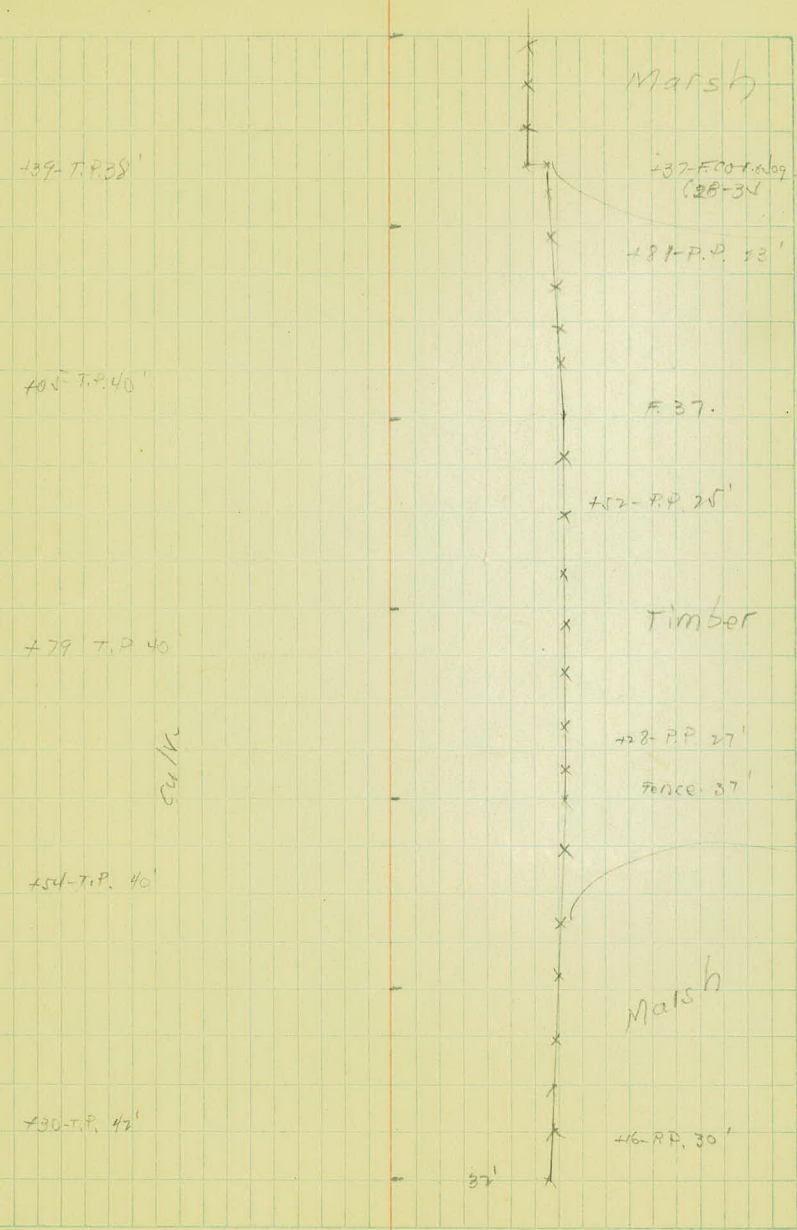
+54-T.P. 40'

Marsh

+30-T.P. 42'

+16-P.P. 30'

37'



66+00

65+00

64+00.

63+00

62+00

766 L. F. ENT Lt.

61+00

60+00

+114 F. 001 33'

+89 T.P. 34'

Mars b.

Fos
+60 T.P. 34'

+13 T.P. Feb. 25'

+23 W. D. 10'
+77 F. 001 37'
12" x 28' - CIVI.

+74 T.P. 36'

Camp

16

Mars b.

+40-36' W. 1/38'

Feb. 36'

+13 P.P. 23'

+33-4-8" W. 1/33

Mars b.

+03-9-25'
F. 34

+10-10" W. 1/33'

Ti

Fence 31'

+03-10" W. 1/24'
+4 P.P. 23'

Mars b.

+03-P.P. 26'
Feb 30'

72+00

71+00

70+00 R.F. ENT. LT.

69+00

+01 L. cutr. 18" x 40.6 G.M.

68+00

+30 L.F. ENT.

67+00

66+00

Feb. 33'

+21-T.P. 38'

F

+16-F. Cor 30'

Meadow

+51-T.P. 34'

+40-10" Tree 26'

+15-M. Ex. 11'

+17-6" B x 22"

E. Wood

+18-T.P. 34'



MATS

+79-T.P.

+06-M. B. 2 1/2'

+22-T.P. 35'

+27 P. 28'

+27 P. 24'

Cult.

+61 DUMP

+34-24" 22'

+17-B.P. 24'

MATS

+21 P. R

+21 P. R 25'

240

291



12" x 25' c.m.

Feb 40'

MATS

+03-PP 24'

78400

77400

771 2 cuts. 18" X 34' CM

76400

75700

74400

73400

72400

84

83

82

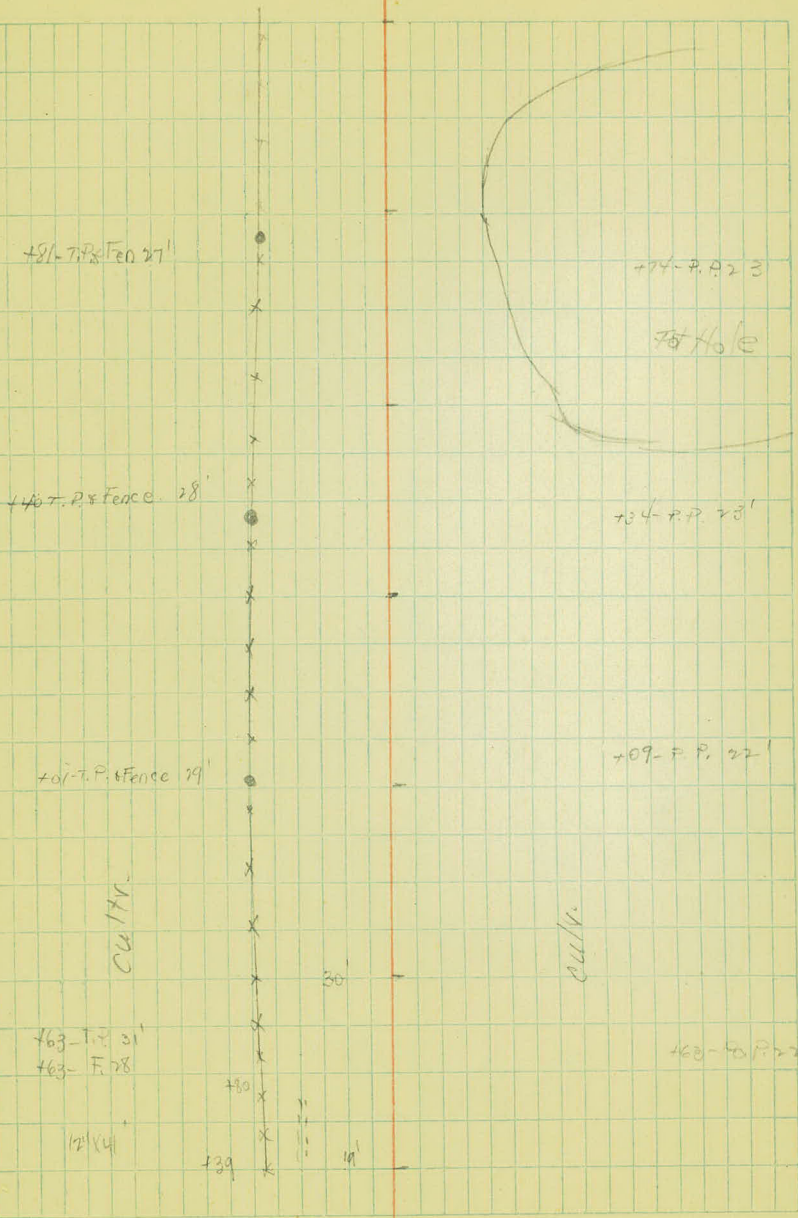
81

80

79

467 - R.F. ENT LT
472 - R.F. ENT RT

78



90.

89

88

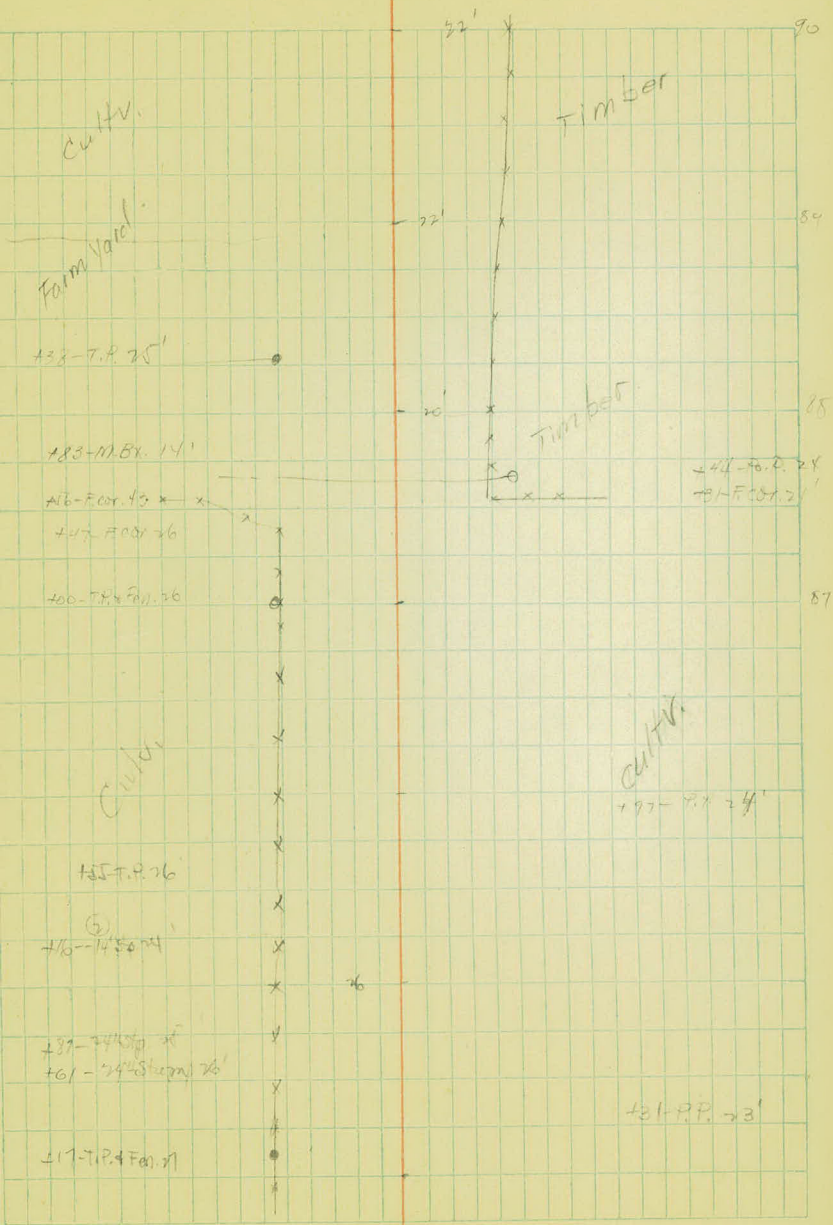
+65 to F. Ent. Lt

87

86

85

84



Cultiv.

Farm Yard

Timber

438-T.P. 25'

483-M.Bx. 14'

416-Fer. 15'

447-Fer. 26'

400-T.P. 26'

Cultiv.

455-T.P. 26'

416-14' 50' 14'

487-24' 10' 24'
461-24' 10' 24'

417-T.P. 4 Fer. 27'

Timber

441-Fer. 24'
481-Fer. 21'

Cultiv.

497-24' 24'

431-P.P. 23'

90

84

88

87

76

96

95

94

93

92

91

+47 RFE. LT.

90

101

714 2 cu/1, 12" X 38' C.M.

100

99

9800

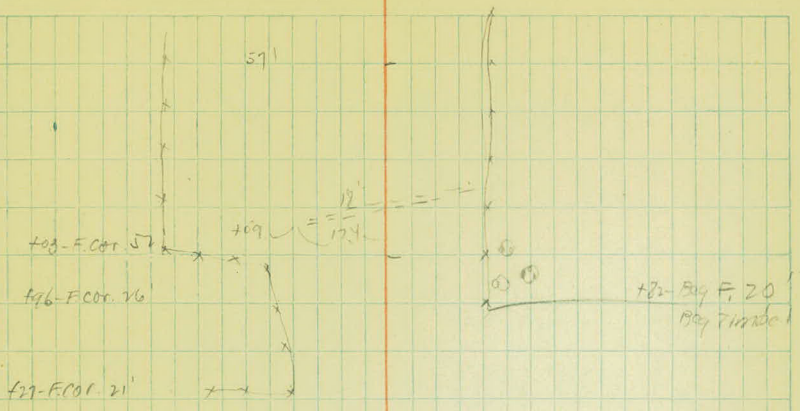
97100

96+94.48

Eq. 97+40.34

97

96



cutty

97+00
 96+94.58
 97+46.34

cutty

cutty

107

106

105

104

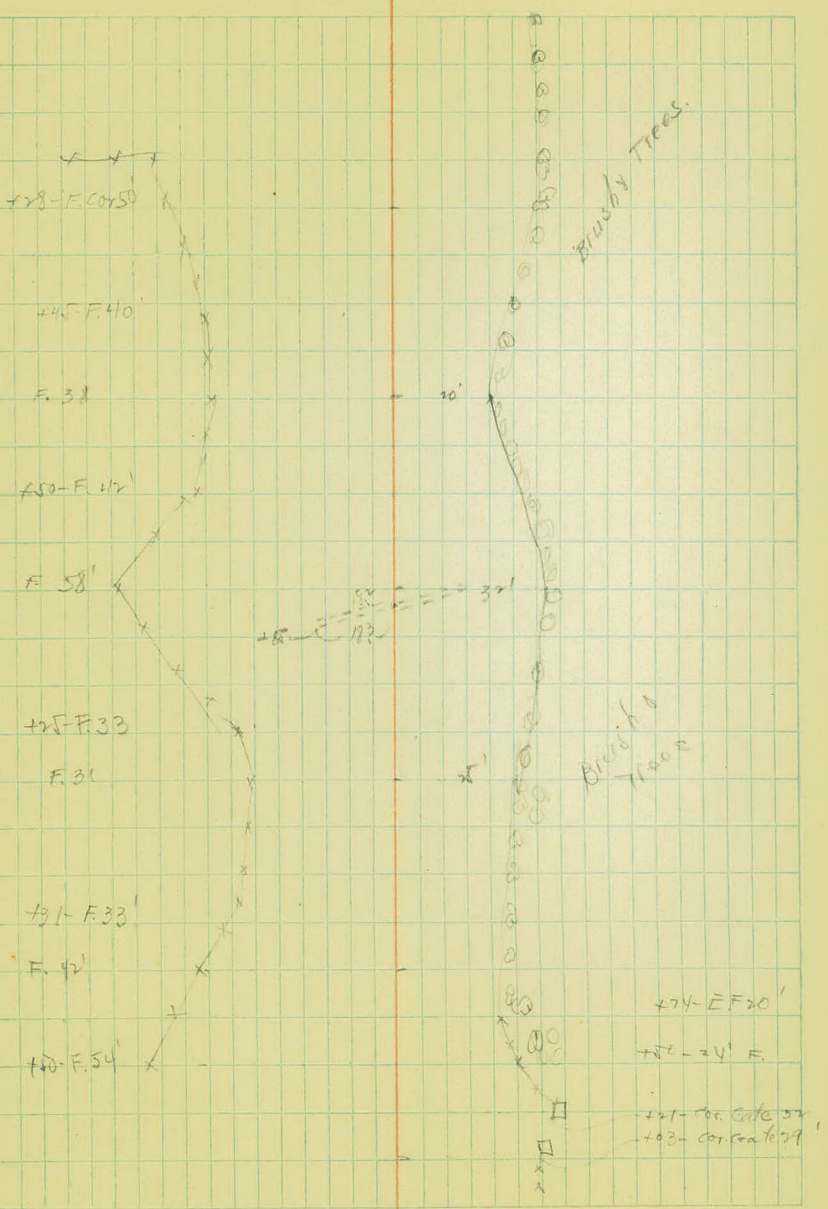
+ 28 2 Cult. 15" X 44' Vit.

103

102

+ 12 - 2 F. EDT. RT.

101



+28-F. Cor 50'

+45-F. 40'

F. 31'

+50-F. 42'

F. 58'

+25-F. 33'

F. 31'

+31-F. 33'

F. 42'

+40-F. 54'

Brushy Trees.

32'
112'

Bridle Traces

+74-EF 20'

+72-24' E.

+71-Cor. Gate 32'
+93-Cor. Gate 79'

113

112

111

110

109

124 2 culy. 18" x 38' C.M.

108

107

Timber

Timber

25'

24'

24'

26'

26'

20'

26'



Bushy Trees,

119

128

+53 E cu/v. 24" x 38' c.M

117

116

115

114

113

473-F. 26

Mush

TR

24'

19.5

22

22'

27'

5'

25 F. 22'

Bushy Trees

Ent. 450-F. X



125

124

123

122

+98 - R. Calv. 18" x 34" C.M.

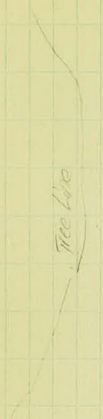
+44 Q. F. Ent. Lt.

121

120

119

+27-24" Oak 76'



+10-F. 20

+65-F. 16'

F. 18

+75-F. 16'

+50-F. 14

+25-F. 70

F. 14

+10-F. 71

F. 21



+30-F. 50'

F. 36

+38-F. 23

23

131

130

129

128

127

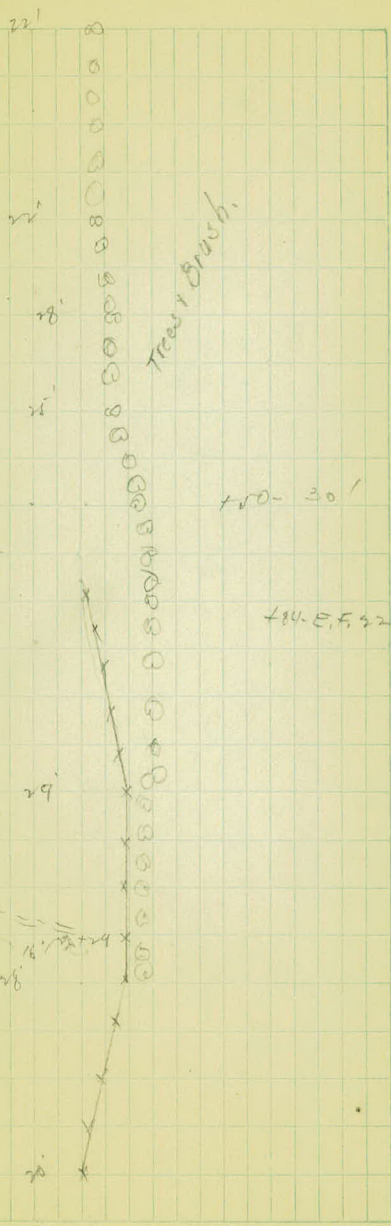
154 - ϕ P. Ent ct.

+35 R. Cuki. 24" x 24' c.M.

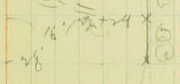
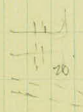
126

125

Timber



12" X 22.5 C.M.



16'

20'

137

+12 - 2

136

135

+57 - 2 culv. 24" X 32' C.M

134

+81 - 2 F, ED + L.

133

132

131

143

142

141

140

139

138

137

149

#12 - R. Walk Pt.

148

147

+77 - R. Cultr. 24' x 57' - CM

+37 - R. F. Ent H

146

145

144

143

155

154

153

160 C.E. Ent. Rt.

152

148 N.F. Ent. Lt

151

150

149

465-Beg Timber D. 0.000

Cultivated

481 E. Willows 19

408 E. F. 33

12" X 61' C.M.

426 E. Cor. 22

Timber

Acche

F. Straight E. 40 E.

nick Pillars

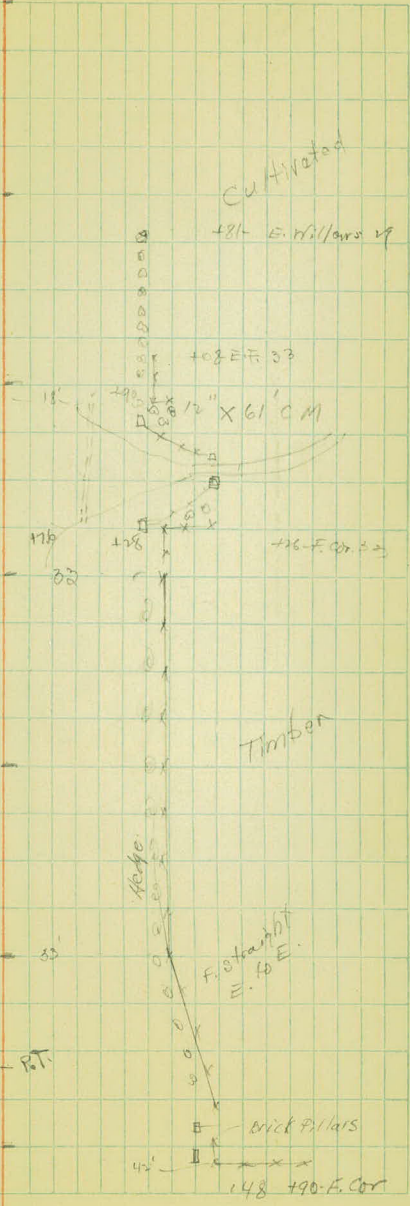
148 490-E. Cor

Cultivated

8" X 8" C.M.
432 E. Cor 11

Timber

P.T.



161

160

73 - 2 cu ft $\approx 4'' \times 41'' \text{ cm}$

159

158

157

156

155

Timber

20

39'

41

203-F. Cor. 22'

18'

Timber

East

101-F. Cor.

20

34'

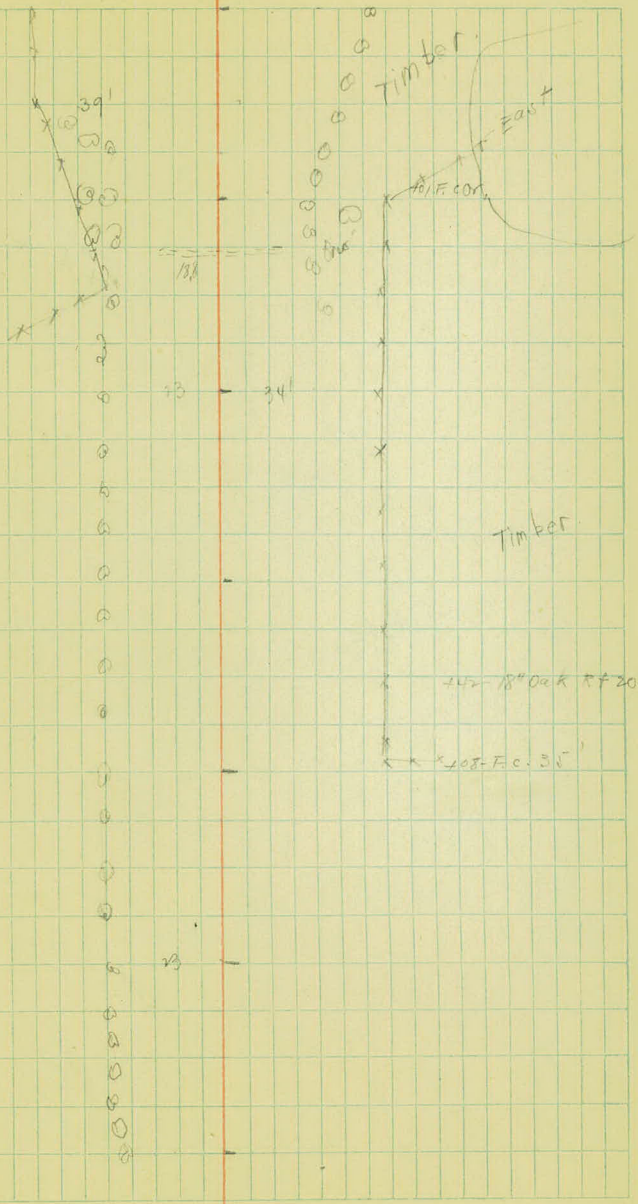
Timber

142-18" Oak R#20'

105-F. C. 35'

Timber

20



167

468 R. F. ENT. RT.

419 L. F. ENT. L.

166

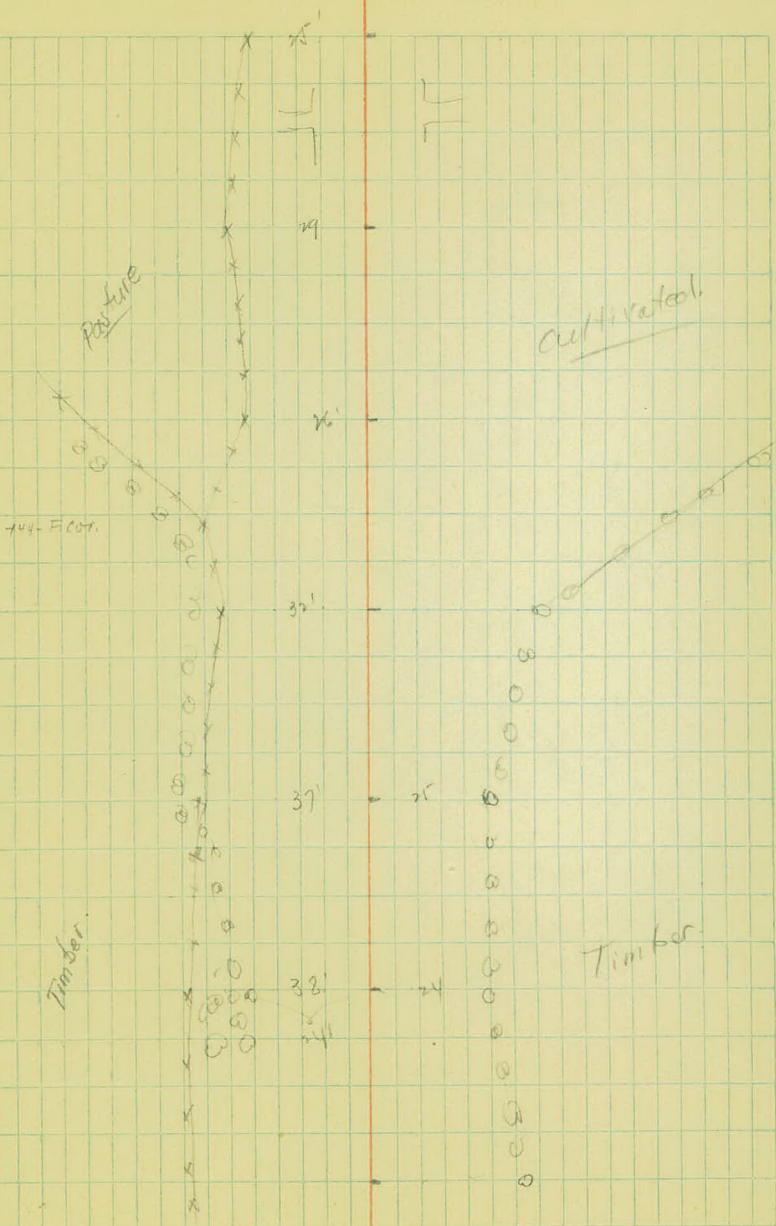
165

164

163

162

161



173

172

171

+56-8 F.E.O.T. R+

170

169

168

167

Pasture

Cultivator

+27-FA 23'

+11-FA 22'

40

31

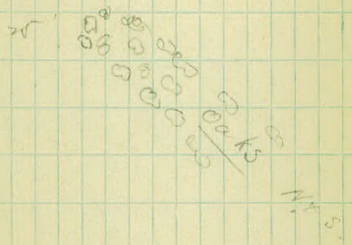
30

Pasture

29

25'

12" x 29' CM
4' 11'

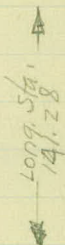


11

178

177

$$Eq. = \begin{cases} +13.05 \\ +54.33 \end{cases}$$



176

175

179- R. F. Ent Lt

+49- R cutk 24" x 46" o.M.

174

173

Timber

cultivated

178

177

176

100 F. Fence

150 F. 17

F. 37

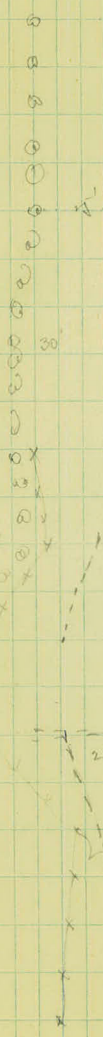
171 F. Cor. 60

170 F. Cor. 54

173-11.5 x .17

Pasture

cultivated



30'

+13.24
+14

24

177

184

183

182

429 FEET RT.

181

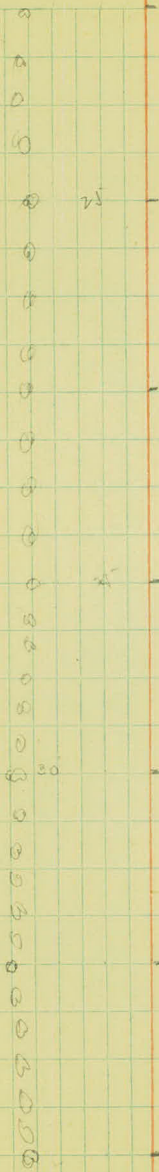
180

179

178

Timber

Cultivated



190

189

188

103 R. Cult. 24" x 40"

187

177 - G. F. ENT. RT.

186

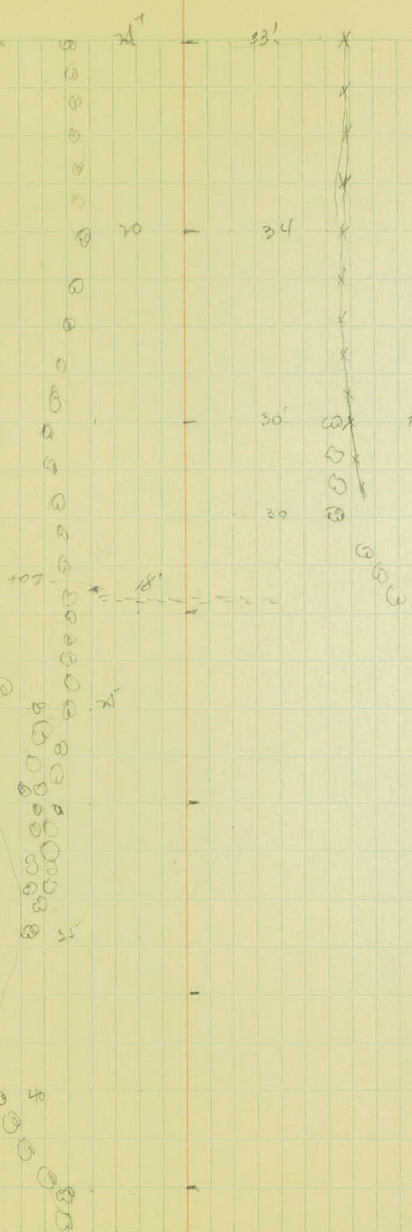
185

184

Timber

+90-T.P. 21'
Timber

+175-MEX. 14'



196

195

194

193

192

191

190

201

+856 - End of Project

+80 & Long Lake Road

+30 2 cur. 24' x 24' C.M.

200

199

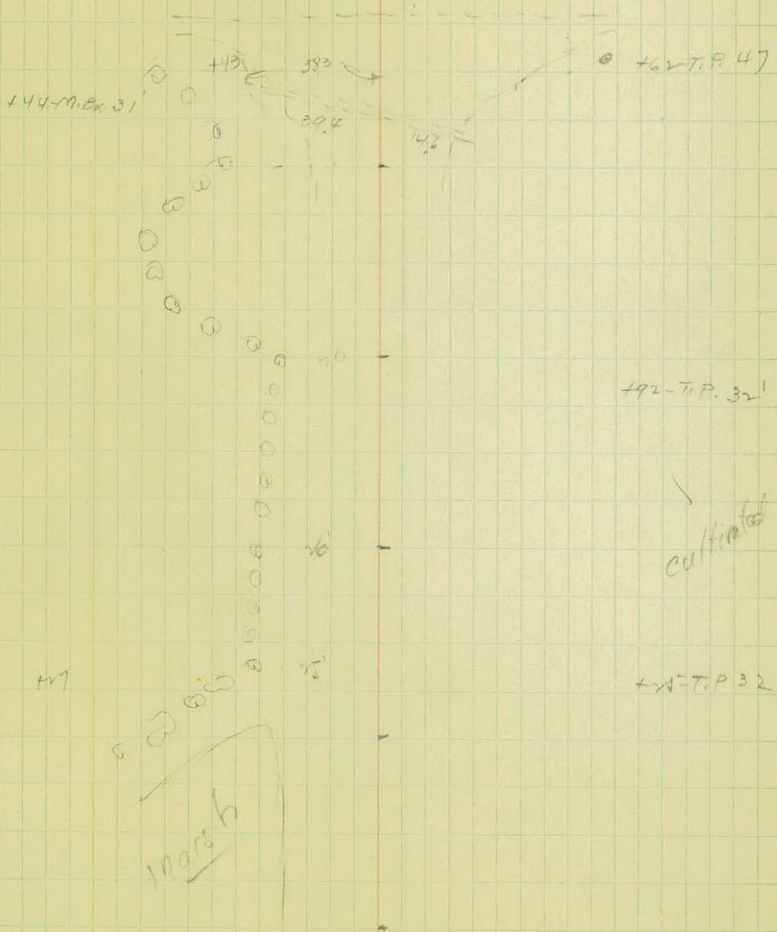
198

197

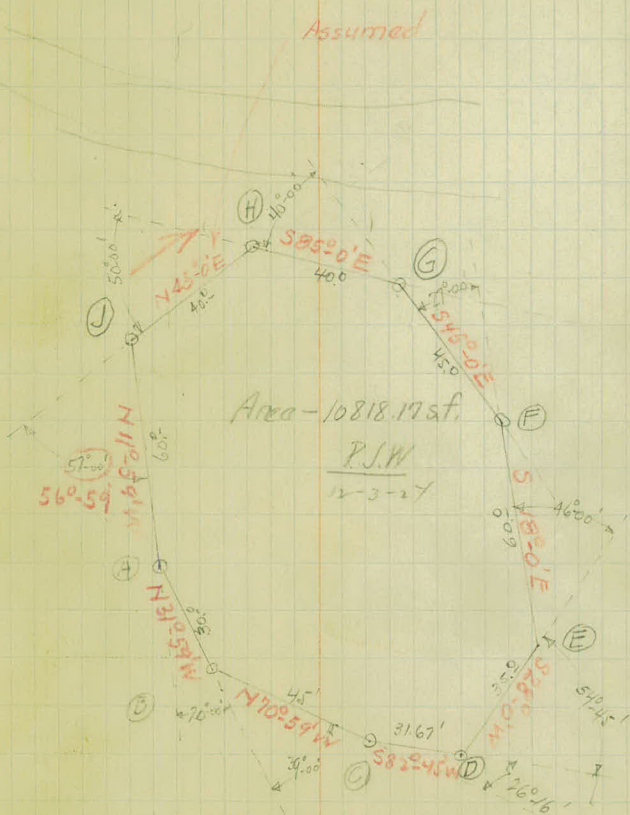
196

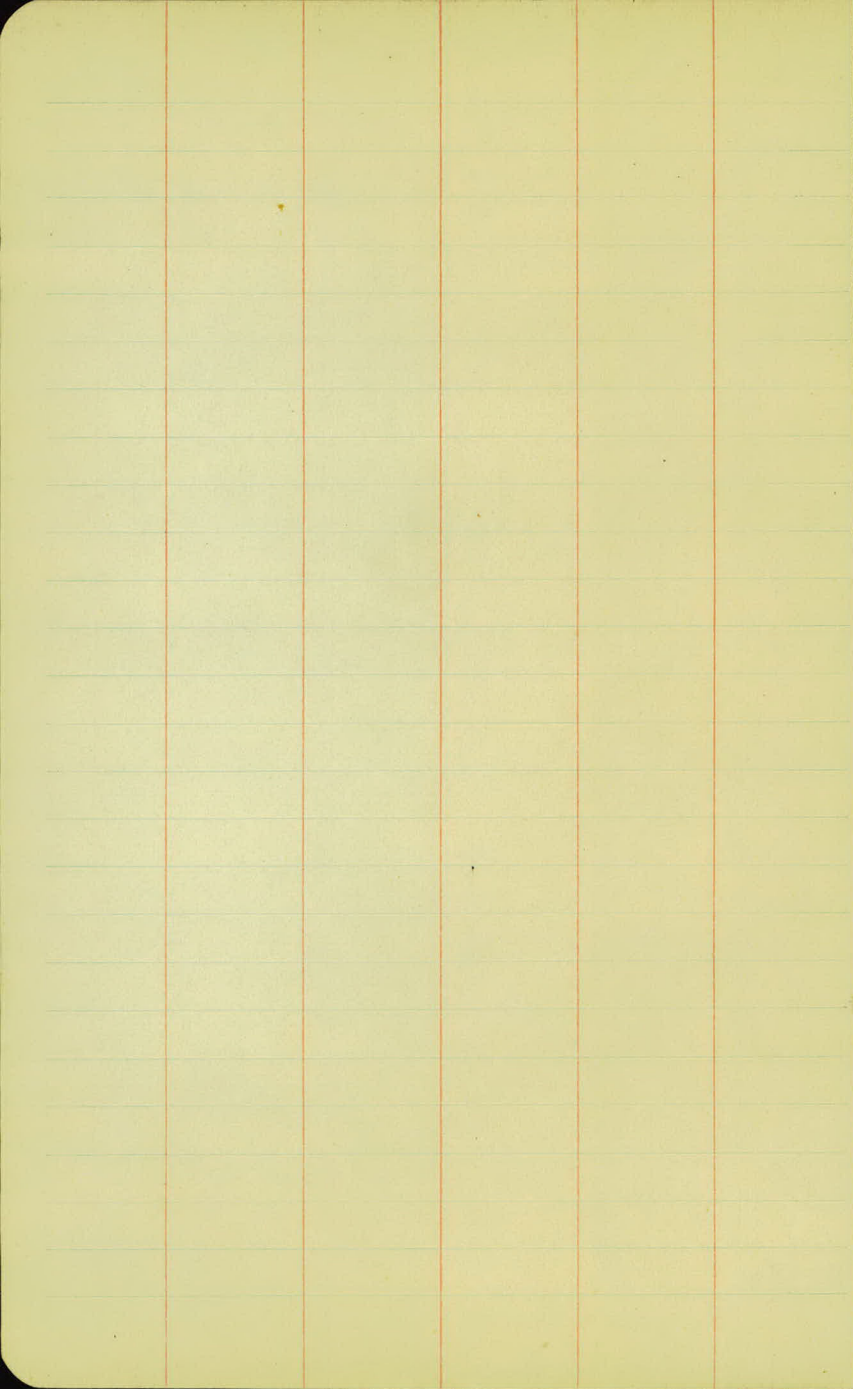
Finished Nov 18, 1924

W.H.C.
Wilshear
Persons
Frank
Soukup



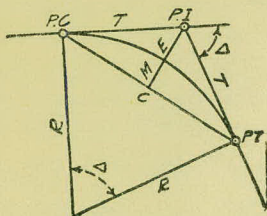
Traverse of Gravel Pit.





DIETZGEN'S RAILROAD CURVE AND REDUCTION TABLES

Copyright, 1914, by Eugene Dietzgen Co., New York City



CURVE FORMULAS

Radius= $R = \frac{50}{\sin. D/2}$ (1) Degree of Curve= D and $\sin. \frac{D}{2} = \frac{50}{R}$ (2)

Tangent= $T = R \tan \frac{\Delta}{2}$ (3) Length of Curve= $L = 100 \frac{\Delta}{D}$ (4)

Middle ordinate= $M = R(1 - \cos. \frac{\Delta}{2})$ (5) $= R \text{vers} \frac{\Delta}{2}$ (6)

External= $E = T \tan \frac{\Delta}{4}$ (7) $= R \div \cos. \frac{\Delta}{2} - R$ (8) $= R \text{exsec} \frac{\Delta}{2}$ (9)

Long Chord= $C = 2 R \sin. \frac{\Delta}{2}$ (10) $\Delta = \text{Central Angle}$

EXPLANATION AND USE OF TABLES

Stations.—Given P. I.=Sta. 161+60.35 to find Sta. of P. C. and P. T. $\Delta=62^\circ 10'$ $D=8^\circ 20'$. From Table IV for 1° curve $T=3454.1$ and $\div 8\frac{1}{3}=414.49$ ft. From Table V correction=.36 or $T=414.85$ ft. P. C.=Sta. P.I.— $T=157+45.50$. Also from (4) $L=746.00$ and P. T.=Sta. P. C. + $L=164+91.50$.

Offsets.—Tangent offsets vary (approximately) directly with D and with square of the distance. Thus tangent offset for Sta. 158 on above curve is 2.16 ft. found as follows. From Table III tangent offset for 100 ft.=7.27 ft. Distance=158—Sta. P. C.=54.50, hence offset= $7.27 (54.50 \div 100)^2=2.16$ ft. Also square of any distance divided by twice the radius equals (approximately) the distance from tangent to curve. Thus $(54.50)^2 \div (2 \times 688.26)=2.16$ ft.

Deflections.—Deflection angle= $\frac{1}{2} D$ for 100 ft., $\frac{1}{4} D$ for 50 ft., etc. For c ft.=(in minutes) $.3 \times C \times D^\circ$ or=defl. for 1 ft. from Table III $\times C$. For Sta. 158 of above curve= $.3 \times 54.5 \times 8\frac{1}{3}=136.2'$ or $2^\circ 16.2'$, or= $2.50 \times 54.5=136.2'$ from Table III. For Sta. 159 deflection angle= $2^\circ 16.2' + 8^\circ 20' \div 2=6^\circ 26.2'$, etc.

Externals.—May be found in similar manner to tangents. Thus E for curve above is 91.37. For from Table IV for 1° curve $E=960.6$ for $8^\circ 20'=960.6 \div 8\frac{1}{3}=91.27$ and from Table V correction=.10 or $E=91.37$ ft. Or suppose $\Delta=32^\circ$ and E is measured and found to be 42 ft. What is D ? From Table IV $E=230.9$ and $\div 42=5.5$ or $D=5^\circ 30'$.

TABLE I.—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	1.0000

TABLE II.—INCHES IN DECIMALS OF A FOOT.

1-16	3-32	1/8	3-16	1/4	5-16	3/8	1/2	5/8	3/4	7/8
.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 III.—RADI, 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
					20	614.56	2.037	8.136	2.80
2	2864.93	.436	1.745	0.60	30	603.80	2.074	8.281	2.85
10	2644.58	.473	1.891	0.65	40	593.42	2.110	8.426	2.90
20	2455.70	.509	2.036	0.70					
30	2292.01	.545	2.181	0.75	10	573.69	2.183	8.716	3.00
40	2148.79	.582	2.327	0.80	30	546.44	2.292	9.150	3.15
50	2022.41	.618	2.472	0.85	11	521.67	2.402	9.585	3.30
					30	499.06	2.511	10.02	3.45
3	1910.08	.655	2.618	0.90	12	478.34	2.620	10.45	3.60
10	1809.57	.691	2.763	0.95	30	459.28	2.730	10.89	3.75
20	1719.12	.727	2.908	1.00	13	441.68	2.839	11.32	3.90
30	1637.28	.764	3.054	1.05	30	425.40	2.949	11.75	4.05
40	1562.88	.800	3.199	1.10	14	410.28	3.058	12.18	4.20
50	1494.95	.836	3.345	1.15	30	396.20	3.168	12.62	4.35
4	1432.69	.873	3.490	1.20	15	383.07	3.277	13.05	4.50
10	1375.40	.909	3.635	1.25	30	370.78	3.387	13.49	4.65
20	1322.53	.945	3.718	1.30	16	359.27	3.496	13.92	4.80
30	1273.57	.982	3.926	1.35	30	348.45	3.606	14.35	4.95
40	1228.11	1.018	4.071	1.40	17	338.27	3.716	14.78	5.10
50	1185.78	1.055	4.217	1.45	18	319.62	3.935	15.64	5.40
					19	302.94	4.155	16.51	5.70
5	1146.28	1.091	4.382	1.50	20	287.94	4.374	17.37	6.00
10	1109.33	1.127	4.507	1.55	21	274.37	4.594	18.22	6.30
20	1074.68	1.164	4.653	1.60	22	262.04	4.814	19.08	6.60
30	1042.14	1.200	4.798	1.65	23	250.79	5.035	19.94	6.90
40	1011.51	1.237	4.943	1.70	24	240.49	5.255	20.79	7.20
50	982.64	1.273	5.088	1.75					
					25	231.01	5.476	21.64	7.50
6	955.37	1.309	5.234	1.80	26	222.27	5.697	22.50	7.80
10	929.57	1.346	5.379	1.85	27	214.18	5.918	23.35	8.10
20	905.13	1.382	5.524	1.90	28	206.68	6.139	24.19	8.40
30	881.95	1.418	5.669	1.95	29	199.70	6.360	25.04	8.70
40	859.92	1.455	5.814	2.00	30	193.18	6.583	25.88	9.00

Note. Chord Deflection=2 times tangent deflection.

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

TABLE IV.—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	483.8	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 IV.—TANGENTS AND EXTERNALS TO A 1° CURVE.

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
61°	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
62	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
63	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
64	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
65	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
66	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
67	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
68	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
69	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
70	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	4061.8	1293.6	40	4864.8	1786.7	40	5796.7	2420.9
50	4074.4	1300.9	50	4879.2	1796.0	50	5813.6	2432.9

TABLE IV.—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	4651.8
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 V.—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 IV) 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	.79	.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	.029	.032	.035	.039	.043	.047	.051
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	.106	.120	.127	.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	.420	.470	.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	.266	.353	.440	.528	.618	.707	.797	.877	.971	1.07	1.18	1.29
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 VI.--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
6	.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	3.83	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 VII.—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

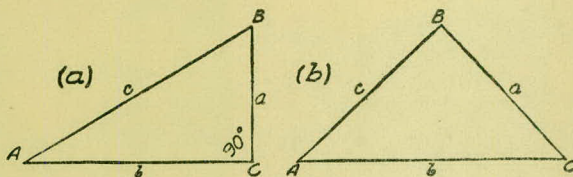
SLOPE REDUCTIONS.

When distances are measured on a slope they may be reduced to the equivalent horizontal distance by the following approximate rule:— subtract from the slope distance the square of the rise divided by twice the slope distance. Thus for a slope distance of 250.3 ft. and a rise of 15 ft. correction = $15^2 \div 2 \times 250.3 = .45$ (by slide rule) or horizontal distance = $250.3 - .45 = 249.85$. When vertical angle = V. A. is measured horizontal distance = slope distance — slope distance (1 — Cos. V. A.). Thus for slope distance of 248.7 ft. and V. A. of $4^\circ 20'$ from Table VIII Cos = .99714 and correction = $1 - .99714 = .00286$ per foot or total of $.286 \times 2\frac{1}{2}$ (near enough) = .57 and horizontal distance = $248.7 - .57 = 248.13$ ft.

See fig. (a).

TRIGONOMETRICAL FORMULAS.

$$\begin{aligned} \sin. & A = \frac{a}{c} \\ \cos. & A = \frac{b}{c} \\ \tan. & A = \frac{a}{b} \\ \cot. & A = \frac{b}{a} \\ \sec. & A = \frac{c}{b} \\ \text{cosec.} & A = \frac{c}{a} \end{aligned}$$



FORMULA FOR SOLVING TRIANGLES.

Given	Sought.	Right triangles. See fig. (a).
a, c	A, B, b	$\sin. A = \frac{a}{c}, \cos. B = \frac{a}{c}, b = \sqrt{(c+a)(c-a)}$
a, b	A, B, c	$\tan. A = \frac{a}{b}, \cot. B = \frac{a}{b}, c = \sqrt{a^2 + b^2}$
A, a	B, b, c	$B = 90^\circ - A, b = a \cot. A, c = \frac{a}{\sin. A}$
A, b	B, a, c	$B = 90^\circ - A, a = b \tan. A, c = \frac{b}{\cos. A}$
A, c	B, a, b	$B = 90^\circ - A, a = c \sin. A, b = c \cos. A$
Given	Sought.	Oblique triangles. See fig. (b).
A, B, a	b	$b = \frac{a \sin. B}{\sin. A}$
A, a, b	B	$\sin. B = \frac{b \sin. A}{a}$
a, b, C	$A - B$	$\tan. \frac{1}{2}(A - B) = \frac{(a - b) \tan. \frac{1}{2}(A + B)}{a + b}$
a, b, c	A	$\left\{ \begin{array}{l} \text{If } s = \frac{1}{2}(a + b + c), \sin. \frac{1}{2} A = \sqrt{\frac{(s-b)(s-c)}{bc}} \\ \cos. \frac{1}{2} A = \sqrt{\frac{s(s-a)}{bc}}, \tan. \frac{1}{2} A = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}, \\ \sin. A = \frac{2\sqrt{s(s-a)(s-b)(s-c)}}{bc} \end{array} \right.$
A, B, C, a	area	$\text{area} = \frac{a^2 \sin. B \sin. C}{2 \sin. A}$
A, b, c	area	$\text{area} = \frac{1}{2} bc \sin. A$
a, b, c	area	$s = \frac{1}{2}(a + b + c), \text{area} = \sqrt{s(s-a)(s-b)(s-c)}$

TABLE VIII.—NATURAL TRIGONOMETRICAL FUNCTIONS.

Angle	Sine.	Tan.	Cotg.	Cosin.		Angle	Sine.	Tan.	Cotg.	Cosin.	
<i>or</i> 0	0	0	∞	1	90	<i>or</i> 8	.1392	.1405	7.115	.99027	82
10	.0029	.0029	343.8	I	50	10	.1421	.1435	6.968	.98986	50
20	.0058	.0058	171.9	.99998	40	20	.1449	.1465	6.827	.98944	40
30	.0087	.0087	114.6	.99996	30	30	.1478	.1495	6.691	.98902	30
40	.0116	.0116	85.94	.99993	20	40	.1507	.1524	6.561	.98858	20
50	.0145	.0145	68.75	.99989	10	50	.1536	.1554	6.435	.98814	10
1	.0175	.0175	57.29	.99985	89	9	.1564	.1584	6.314	.98769	81
10	.0204	.0204	49.10	.99979	50	10	.1593	.1614	6.197	.98723	50
20	.0233	.0233	42.96	.99973	40	20	.1622	.1644	6.084	.98676	40
30	.0262	.0262	38.19	.99966	30	30	.1650	.1673	5.976	.98629	30
40	.0291	.0291	34.37	.99958	20	40	.1679	.1703	5.871	.98580	20
50	.0320	.0320	31.24	.99949	10	50	.1708	.1733	5.769	.98531	10
2	.0349	.0349	28.64	.99939	88	10	.1736	.1763	5.671	.98481	80
10	.0378	.0378	26.43	.99929	50	10	.1765	.1793	5.576	.98430	50
20	.0407	.0407	24.54	.99917	40	20	.1794	.1823	5.485	.98378	40
30	.0436	.0437	22.90	.99905	30	30	.1822	.1853	5.396	.98325	30
40	.0465	.0466	21.47	.99892	20	40	.1851	.1883	5.309	.98272	20
50	.0494	.0495	20.21	.99878	10	50	.1880	.1914	5.226	.98218	10
3	.0523	.0524	19.08	.99863	87	11	.1908	.1944	5.145	.98163	79
10	.0552	.0553	18.07	.99847	50	10	.1937	.1974	5.066	.98107	50
20	.0581	.0582	17.17	.99831	40	20	.1965	.2004	4.989	.98050	40
30	.0610	.0612	16.35	.99813	30	30	.1994	.2035	4.915	.97992	30
40	.0640	.0641	15.60	.99795	20	40	.2022	.2065	4.843	.97934	20
50	.0669	.0670	14.92	.99776	10	50	.2051	.2095	4.773	.97875	10
4	.0698	.0699	14.30	.99756	86	12	.2079	.2126	4.705	.97815	78
10	.0727	.0729	13.73	.99736	50	10	.2108	.2156	4.638	.97754	50
20	.0756	.0758	13.20	.99714	40	20	.2136	.2186	4.574	.97692	40
30	.0785	.0787	12.71	.99692	30	30	.2164	.2217	4.511	.97630	30
40	.0814	.0816	12.25	.99668	20	40	.2193	.2247	4.449	.97566	20
50	.0843	.0846	11.83	.99644	10	50	.2221	.2278	4.390	.97502	10
5	.0872	.0875	11.43	.99619	85	13	.2250	.2309	4.331	.97437	77
10	.0901	.0904	11.06	.99594	50	10	.2278	.2339	4.275	.97371	50
20	.0929	.0934	10.71	.99567	40	20	.2306	.2370	4.219	.97304	40
30	.0958	.0963	10.39	.99540	30	30	.2334	.2401	4.165	.97237	30
40	.0987	.0992	10.08	.99511	20	40	.2363	.2432	4.113	.97169	20
50	.1016	.1022	9.788	.99482	10	50	.2391	.2462	4.061	.97100	10
6	.1045	.1051	9.514	.99452	84	14	.2419	.2493	4.011	.97030	76
10	.1074	.1080	9.255	.99421	50	10	.2447	.2524	3.962	.96959	50
20	.1103	.1110	9.010	.99390	40	20	.2476	.2555	3.914	.96887	40
30	.1132	.1139	8.777	.99357	30	30	.2504	.2586	3.867	.96815	30
40	.1161	.1169	8.556	.99324	20	40	.2532	.2617	3.821	.96742	20
50	.1190	.1198	8.345	.99290	10	50	.2560	.2648	3.776	.96667	10
7	.1219	.1228	8.144	.99255	83	15	.2588	.2679	3.732	.96593	75
10	.1248	.1257	7.953	.99219	50	10	.2616	.2711	3.689	.96517	50
20	.1276	.1287	7.770	.99182	40	20	.2644	.2742	3.647	.96440	40
30	.1305	.1317	7.596	.99144	30	30	.2672	.2773	3.606	.96363	30
40	.1334	.1346	7.429	.99106	20	40	.2700	.2805	3.566	.96285	20
50	.1363	.1376	7.269	.99067	10	50	.2728	.2836	3.526	.96206	10
					82						74
	Cosin.	Cotg.	Tan.	Sine.	Angle.		Cosin.	Cotg.	Tan.	Sine.	Angle.

TABLE VIII.—NATURAL TRIGONOMETRICAL FUNCTIONS.

Angle	Sine.	Tan.	Cotg.	Cosin.	Angle	Sine.	Tan.	Cotg.	Cosin.		
<i>or</i> 16	.2756	.2867	3.487	.96126	74	.4067	.4452	2.246	.91355		
10	.2784	.2899	3.450	.96046	50	10	.4094	.4487	2.229		
20	.2812	.2931	3.412	.95964	40	20	.4120	.4522	2.211		
30	.2840	.2962	3.376	.95882	30	30	.4147	.4557	2.194		
40	.2868	.2994	3.340	.95799	20	40	.4173	.4592	2.177		
50	.2896	.3026	3.305	.95715	10	50	.4200	.4628	2.161		
17	.2924	.3057	3.271	.95615	73	25	.4226	.4663	2.145		
10	.2952	.3089	3.237	.95545	50	10	.4253	.4699	2.128		
20	.2979	.3121	3.204	.95459	40	20	.4279	.4734	2.112		
30	.3007	.3153	3.172	.95372	30	30	.4305	.4770	2.097		
40	.3035	.3185	3.140	.95284	20	40	.4331	.4806	2.081		
50	.3062	.3217	3.108	.95195	10	50	.4358	.4841	2.066		
18	.3090	.3249	3.078	.95106	72	26	.4384	.4877	2.050		
10	.3118	.3281	3.048	.95015	50	10	.4410	.4913	2.035		
20	.3145	.3314	3.018	.94924	40	20	.4436	.4950	2.020		
30	.3173	.3346	2.989	.94832	30	30	.4462	.4986	2.006		
40	.3201	.3378	2.960	.94740	20	40	.4488	.5022	1.991		
50	.3228	.3411	2.932	.94646	10	50	.4514	.5059	1.977		
19	.3256	.3443	2.904	.94552	71	27	.4540	.5095	1.963		
10	.3283	.3476	2.877	.94457	50	10	.4566	.5132	1.949		
20	.3311	.3508	2.850	.94361	40	20	.4592	.5169	1.935		
30	.3338	.3541	2.824	.94264	30	30	.4617	.5206	1.921		
40	.3365	.3574	2.798	.94167	20	40	.4643	.5243	1.907		
50	.3393	.3607	2.773	.94068	10	50	.4669	.5280	1.894		
20	.3420	.3640	2.747	.93969	70	28	.4695	.5317	1.881		
10	.3448	.3673	2.723	.93869	50	10	.4720	.5354	1.868		
20	.3475	.3706	2.669	.93769	40	20	.4746	.5392	1.855		
30	.3502	.3739	2.675	.93667	30	30	.4772	.5430	1.842		
40	.3529	.3772	2.651	.93565	20	40	.4797	.5467	1.829		
50	.3557	.3805	2.628	.93462	10	50	.4823	.5505	1.816		
21	.3584	.3839	2.605	.93358	69	29	.4848	.5543	1.804		
10	.3611	.3872	2.583	.93253	50	10	.4874	.5581	1.792		
20	.3638	.3906	2.560	.93148	40	20	.4899	.5619	1.780		
30	.3665	.3939	2.539	.93042	30	30	.4924	.5658	1.767		
40	.3692	.3973	2.517	.92935	20	40	.4950	.5696	1.756		
50	.3719	.4006	2.496	.92827	10	50	.4975	.5735	1.744		
22	.3746	.4040	2.475	.92718	68	30	.5000	.5774	1.732		
10	.3773	.4074	2.455	.92609	50	10	.5025	.5812	1.720		
20	.3800	.4108	2.434	.92499	40	20	.5050	.5851	1.709		
30	.3827	.4142	2.414	.92388	30	30	.5075	.5890	1.698		
40	.3854	.4176	2.394	.92276	20	40	.5100	.5930	1.686		
50	.3881	.4210	2.375	.92164	10	50	.5125	.5969	1.675		
23	.3907	.4245	2.356	.92050	67	31	.5150	.6009	1.664		
10	.3934	.4279	2.337	.91936	50	10	.5175	.6048	1.653		
20	.3961	.4314	2.318	.91822	40	20	.5200	.6088	1.643		
30	.3987	.4348	2.300	.91706	30	30	.5225	.6128	1.632		
40	.4014	.4383	2.282	.91590	20	40	.5250	.6168	1.621		
50	.4041	.4417	2.264	.91472	10	50	.5275	.6208	1.611		
				66					58		
	Cosin.	Cotg.	Tan.	Sine.	Angle.		Cosin.	Cotg.	Tan.	Sine.	Angle.

TABLE VIII.—NATURAL TRIGONOMETRICAL FUNCTIONS.

Angle	Sine.	Tan.	Cotg.	Cosin.		Angle	Sine.	Tan.	Cotg.	Cosin.	
<i>or</i>						<i>or</i>					
32	.5299	.6249	1.600	.84805	58	30	.6225	.7954	1.257	.78261	30
10	.5324	.6289	1.590	.84650	50	40	.6248	.8002	1.250	.78079	20
20	.5348	.6330	1.580	.84495	40	50	.6271	.8050	1.242	.77897	10
30	.5373	.6371	1.570	.84339	30	39	.6293	.8098	1.235	.77715	51
40	.5398	.6412	1.560	.84182	20	10	.6316	.8146	1.228	.77531	50
50	.5422	.6453	1.550	.84025	10	20	.6338	.8195	1.220	.77347	40
33	.5446	.6494	1.540	.83867	57	30	.6361	.8243	1.213	.77162	30
10	.5471	.6536	1.530	.83708	50	40	.6383	.8292	1.206	.76977	20
20	.5495	.6577	1.520	.83549	40	50	.6406	.8342	1.199	.76791	10
30	.5519	.6619	1.511	.83389	30	40	.6428	.8391	1.192	.76604	50
40	.5544	.6661	1.501	.83228	20	10	.6450	.8441	1.185	.76417	50
50	.5568	.6703	1.492	.83066	10	20	.6472	.8491	1.178	.76229	40
34	.5592	.6745	1.483	.82904	56	30	.6494	.8541	1.171	.76041	30
10	.5616	.6787	1.473	.82741	50	40	.6517	.8591	1.164	.75851	20
20	.5640	.6830	1.464	.82577	40	50	.6539	.8642	1.157	.75661	10
30	.5664	.6873	1.455	.82413	30	41	.6561	.8693	1.150	.75471	49
40	.5688	.6916	1.446	.82248	20	10	.6583	.8744	1.144	.75280	50
50	.5712	.6959	1.437	.82082	10	20	.6604	.8796	1.137	.75088	40
35	.5736	.7002	1.428	.81915	55	30	.6626	.8847	1.130	.74896	30
10	.5760	.7046	1.419	.81748	50	40	.6648	.8899	1.124	.74703	20
20	.5783	.7089	1.411	.81580	40	50	.6670	.8952	1.117	.74509	10
30	.5807	.7133	1.402	.81412	30	42	.6691	.9004	1.111	.74314	48
40	.5831	.7177	1.393	.81242	20	10	.6713	.9057	1.104	.74120	50
50	.5854	.7221	1.385	.81072	10	20	.6734	.9110	1.098	.73924	40
36	.5878	.7265	1.376	.80902	54	30	.6756	.9163	1.091	.73728	30
10	.5901	.7310	1.368	.80730	50	40	.6777	.9217	1.085	.73531	20
20	.5925	.7355	1.360	.80558	40	50	.6799	.9271	1.079	.73333	10
30	.5948	.7400	1.351	.80386	30	43	.6820	.9325	1.072	.73135	47
40	.5972	.7445	1.343	.80212	20	10	.6841	.9380	1.066	.72937	50
50	.5995	.7490	1.335	.80038	10	20	.6862	.9435	1.060	.72737	40
37	.6018	.7536	1.327	.79864	53	30	.6884	.9490	1.054	.72537	30
10	.6041	.7581	1.319	.79688	50	40	.6905	.9545	1.048	.72337	20
20	.6065	.7627	1.311	.79512	40	50	.6926	.9601	1.042	.72136	10
30	.6088	.7673	1.303	.79335	30	44	.6947	.9657	1.036	.71934	46
40	.6111	.7720	1.295	.79158	20	10	.6967	.9713	1.030	.71732	50
50	.6134	.7766	1.288	.78980	10	20	.6988	.9770	1.024	.71529	40
38	.6157	.7813	1.280	.78801	52	30	.7009	.9827	1.018	.71325	30
10	.6180	.7860	1.272	.78622	50	40	.7030	.9884	1.012	.71121	20
20	.6202	.7907	1.265	.78442	40	50	.7050	.9942	1.006	.70916	10
							.7071	1.	1.	.70711	45
											<i>or</i>
	Cosin.	Cotg.	Tan.	Sine.	Angle.		Cosin.	Cotg.	Tan.	Sine.	Angle.

TABLE IX.—CALCULATION OF EARTHWORK.

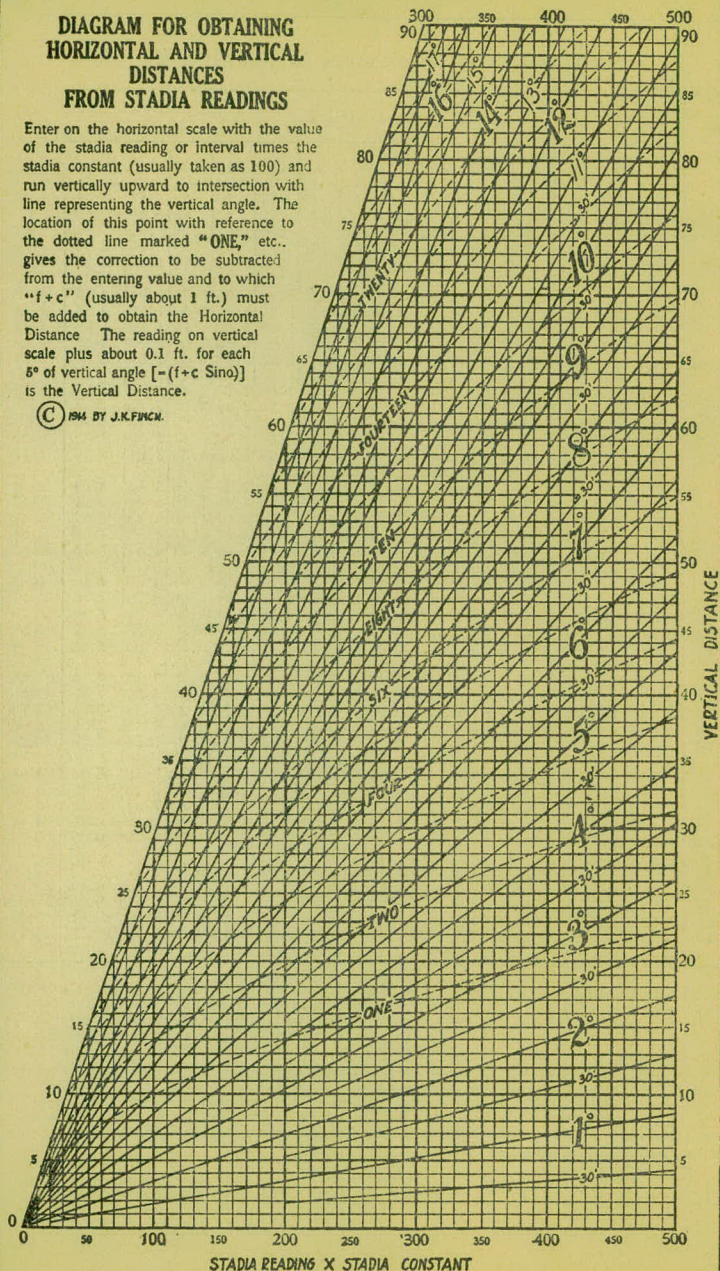
Width	HEIGHT														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.02	.04	.06	.07	.09	.11	.13	.15	.17	.18	.20	.22	.24	.26	.28
2	.04	.07	.11	.15	.19	.22	.26	.30	.33	.37	.41	.44	.48	.52	.56
3	.06	.11	.17	.22	.28	.33	.39	.44	.50	.56	.61	.67	.72	.78	.83
4	.07	.15	.22	.30	.37	.44	.52	.59	.67	.74	.81	.89	.96	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	2.33	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	2.76	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	2.98	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	2.11	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.

DIAGRAM FOR OBTAINING HORIZONTAL AND VERTICAL DISTANCES FROM STADIA READINGS

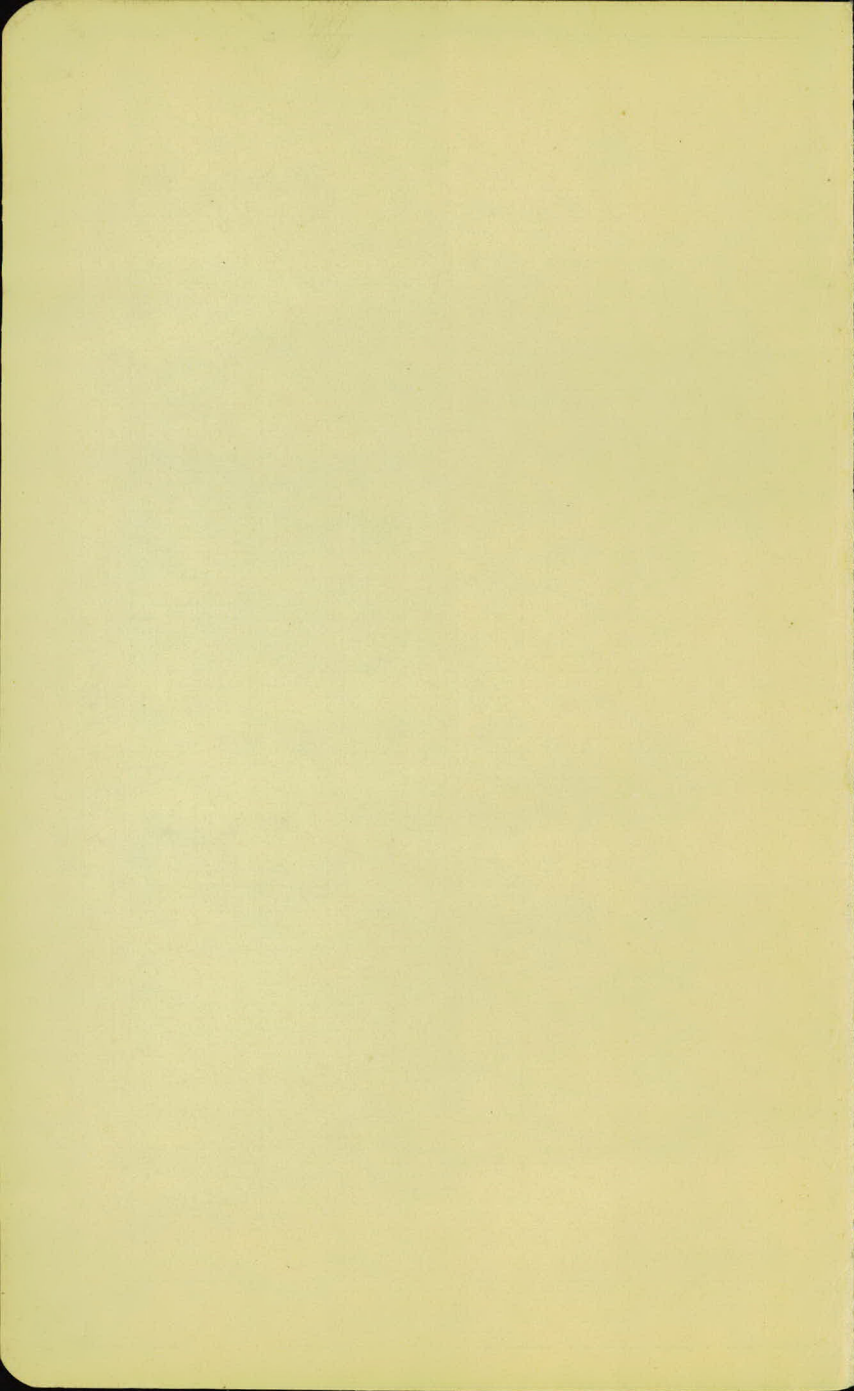
Enter on the horizontal scale with the value of the stadia reading or interval times the stadia constant (usually taken as 100) and run vertically upward to intersection with line representing the vertical angle. The location of this point with reference to the dotted line marked "ONE," etc., gives the correction to be subtracted from the entering value and to which " $f+c$ " (usually about 1 ft.) must be added to obtain the Horizontal Distance. The reading on vertical scale plus about 0.1 ft. for each 5° of vertical angle [$=(f+c \sin \alpha)$] is the Vertical Distance.

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STADIA READING X STADIA CONSTANT



6/1002
33
700

U2462

2695
7933
48

40235
31
75.85

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

Roadway 16 feet wide. Side Slopes 1 on 1½.
For Single Track Embankment.

H	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	II
0	8.0	8.2	8.3	8.5	8.6	8.8	8.9	9.1	9.2	9.4	0
1	9.5	9.7	9.8	10.0	10.1	10.3	10.4	10.6	10.7	10.9	1
2	11.0	11.2	11.3	11.5	11.6	11.8	11.9	12.1	12.2	12.4	2
3	12.5	12.7	12.8	13.0	13.1	13.3	13.4	13.6	13.7	13.9	3
4	14.0	14.2	14.3	14.5	14.6	14.8	14.9	15.1	15.2	15.4	4
5	15.5	15.7	15.8	16.0	16.1	16.3	16.4	16.6	16.7	16.9	5
6	17.0	17.2	17.3	17.5	17.6	17.8	17.9	18.1	18.2	18.4	6
7	18.5	18.7	18.8	19.0	19.1	19.3	19.4	19.6	19.7	19.9	7
8	20.0	20.2	20.3	20.5	20.6	20.8	20.9	21.1	21.2	21.4	8
9	21.5	21.7	21.8	22.0	22.1	22.3	22.4	22.6	22.7	22.9	9
10	23.0	23.2	23.3	23.5	23.6	23.8	23.9	24.1	24.2	24.4	10
11	24.5	24.7	24.8	25.0	25.1	25.3	25.4	25.6	25.7	25.9	11
12	26.0	26.2	26.3	26.5	26.6	26.8	26.9	27.1	27.2	27.4	12
13	27.5	27.7	27.8	28.0	28.1	28.3	28.4	28.6	28.7	28.9	13
14	29.0	29.2	29.3	29.5	29.6	29.8	29.9	30.1	30.2	30.4	14
15	30.5	30.7	30.8	31.0	31.1	31.3	31.4	31.6	31.7	31.9	15
16	32.0	32.2	32.3	32.5	32.6	32.8	32.9	33.1	33.2	33.4	16
17	33.5	33.7	33.8	34.0	34.1	34.3	34.4	34.6	34.7	34.9	17
18	35.0	35.2	35.3	35.5	35.6	35.8	35.9	36.1	36.2	36.4	18
19	36.5	36.7	36.8	37.0	37.1	37.3	37.4	37.6	37.7	37.9	19
20	38.0	38.2	38.3	38.5	38.6	38.8	38.9	39.1	39.2	39.4	20
21	39.5	39.7	39.8	40.0	40.1	40.3	40.4	40.6	40.7	40.9	21
22	41.0	41.2	41.3	41.5	41.6	41.8	41.9	42.1	42.2	42.4	22
23	42.5	42.7	42.8	43.0	43.1	43.3	43.4	43.6	43.7	43.9	23
24	44.0	44.2	44.3	44.5	44.6	44.8	44.9	45.1	45.2	45.4	24
25	45.5	45.7	45.8	46.0	46.1	46.3	46.4	46.6	46.7	46.9	25
26	47.0	47.2	47.3	47.5	47.6	47.8	47.9	48.1	48.2	48.4	26
27	48.5	48.7	48.8	49.0	49.1	49.3	49.4	49.6	49.7	49.9	27
28	50.0	50.2	50.3	50.5	50.6	50.8	50.9	51.1	51.2	51.4	28
29	51.5	51.7	51.8	52.0	52.1	52.3	52.4	52.6	52.7	52.9	29
30	53.0	53.2	53.3	53.5	53.6	53.8	53.9	54.1	54.2	54.4	30
31	54.5	54.7	54.8	55.0	55.1	55.3	55.4	55.6	55.7	55.9	31
32	56.0	56.2	56.3	56.5	56.6	56.8	56.9	57.1	57.2	57.4	32
33	57.5	57.7	57.8	58.0	58.1	58.3	58.4	58.6	58.7	58.9	33
34	59.0	59.2	59.3	59.5	59.6	59.8	59.9	60.1	60.2	60.4	34
35	60.5	60.7	60.8	61.0	61.1	61.3	61.4	61.6	61.7	61.9	35
36	62.0	62.2	62.3	62.5	62.6	62.8	62.9	63.1	63.2	63.4	36
37	63.5	63.7	63.8	64.0	64.1	64.3	64.4	64.6	64.7	64.9	37
38	65.0	65.2	65.3	65.5	65.6	65.8	65.9	66.1	66.2	66.4	38
39	66.5	66.7	66.8	67.0	67.1	67.3	67.4	67.6	67.7	67.9	39
40	68.0	68.2	68.3	68.5	68.6	68.8	68.9	69.1	69.2	69.4	40

Example—If point is 22.6 ft. above grade, how far should it be from center line to be a slope stake point? Ans. from Table 41.9. For same slopes but other widths of roadbed correct above figures by one-half difference in width of roadbed; thus in example above for 20 ft. roadbed distance will be $41.9 + (20 - 16) \div 2$ or 2 ft. added to 41.9 = 43.9. For slopes of 1 on 1 see inside of front cover.