38

HACKENSACK-LONGVILLE ROAD

138

TRANSIT BOOK No 1

FIELD BOOK

361

138

$-\frac{4.0}{33}$ $-\frac{3.8}{33}$

$+\frac{1.2}{5}$ $+\frac{2.8}{33}$ $+\frac{0.2}{25}$ $-\frac{0.3}{33}$

= 135.5.37 original El. .03 Error

$-\frac{3.2}{30}$ $-\frac{3.0}{33}$ $-\frac{2.1}{15}$ $-\frac{3.4}{33}$ $-\frac{2.1}{33}$

$+\frac{1.3}{10}$ $+\frac{0.4}{33}$ $+\frac{2.8}{30}$ L $+\frac{1.5}{8}$ L $+\frac{0.6}{33}$ L L

$+\frac{0.6}{33}$ $\frac{20}{20}$ $\frac{1}{16}$ $-\frac{2.0}{12}$ $+\frac{4.0}{33}$ $+\frac{1.4}{20}$

Alignment

Webb Lake Revision

288+10
1 54
289+6[illegible]

P.C. 288+10.3			Δ 37°09' R
+50			D ~~18°C~~ 24° ✓
289			T = 80.8 ✓
+50			Lc = 154.[illegible] ✓
P.T. +65.1			P.I. = 288+91.1
			80.8
290			
291			
292			
293			
294			
295			
296			
+58.4	P.O.T.		
297			
298			
P.C. +39.2			
299			
+50			Δ 79°44' L ✓
300			18°6 ✓
+50			P.I. = 301+06.1 ✓
301			T = 266.9 ✓
+50			Lc = 443.0 ✓
302			
+50			
P.T. +82.2			

= 304+70.7 original Stationing

Curve data checked -[illegible]

Computed by C.G.W.
No Eq. given by G.W.

May 1-20
G.W.
O.R.
R.P.
LEFAX FILING INDEX

79.2
13.3
65.9

(1)

May 1, 20
G.W.
O.P.
R.P.

LEFAX FILING INDEX

Old T.P. spin pipestump on line.

Sta.	+S	H.I.	−S	Rod	Elv.	L	₵	R
Start on B.M.					1369.15			
	11.88	1381.03	1.04		1379.99			
288	5.12	1385.11						
P.C.+10.3				3.3	81.8	−2.0/33		+2.6/33
+50				3.5	81.6	−1.7/33		+1.9/33
289				3.0	82.1	−1.8/33		+2.0/33
P.T.+65.1				6.2	78.9	L −1.3/27		+3.5/33
290				4.6	80.5	L −2.7/20		+3.0/33
291				6.1	79.0	−2.8/33		+4.0/33
292				9.0	76.1	−2.2/33		+3.3/33
T.P.	2.14	1379.17	8.08		1377.03			
293				6.5	72.7	−7.0/33		+4.2/33
294				13.3	65.9	−3.8/33		+5.0/33
+35				14.9	64.3	18" pipe L −2.1/27		+5.2/33
295				10.5	68.7	−2.8/33 −1.2/22		+1.8/33
+45				7.8	71.4	−2.6/33		+1.7/33
296				8.9	70.3	−4.2/33		+2.0/33
+55				10.5	68.7	−11.3/33 −2.1/15		+4.0/33
T.P.	3.28	1372.41	10.04		1369.13			
+80				2.5	69.9	−20.1/33 −19.4/28 −13.7/21 −6.9/9		+1.5/9 +2.2/33
297				5.2	67.2	−18.7/33 −15.6/19 −13.2/18 −7.7/10		+4.6/7 +6.4/33
T.P.	3.12	1362.86	12.67		1359.74			
+75				7.0	55.9	−7.2/33 −5.0/4		+7.1/10 +19.1/33
+80				11.2	51.7	−2.2/33		+9.0/6 +22.8/33
298				12.1	50.8	−2.0/33		₵/8 +12.3/20 +24.0/33
TP	9.34	1356.56	10.70		1352.16			
+39 3 P.C.				3.8	53.7	−3.0/33 −1.5/2		₵/11 +4.0/20 +11.3/33
299				3.0	53.5	−3.7/33 −3.2/22		+3.4/33

St.						
3	+50		1356.50		2.7	53.8
	300				2.9	53.6
2	B.M.			1.10		1355.40
P.C.	+50				3.5	53.0
+	301				4.6	51.9
28	+50				5.9	50.6
P.T.	302				8.0	48.5
29	+35				10.9	45.6
29	P.T.+82				11.0	45.5
29						
T.						
29						
29						
+						
29						
+						
29						
+						
T.						
+						
29						
T.						
+7						
+						
29						
TP						
+3						
28						

KEUFFEL & ESSER CO.

DRAWING MATERIALS
AND
SURVEYING INSTRUMENTS.

NEW YORK.

CHICAGO. ST. LOUIS. SAN FRANCISCO. MONTREAL.

Tables for Excavations and Embankments.

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.
ROADWAY 18 FEET WIDE. SIDE SLOPES 1 TO 1.
FOR SINGLE TRACK EXCAVATION.

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

Calculated by Julien A. Hall, M. Am. Soc. C. E.

FOR KEITH'S RAILROAD CURVE TABLES SEE END OF BOOK.

Curve on "E" Line.
Δ 41°50'
D = 26°
T = 84.9
Lc = 160.9
P.I = 387+57.6
T. = 84.9
~~P.C.~~ 386+72.7
Lc 1+60.9
P.T. 388+33.6

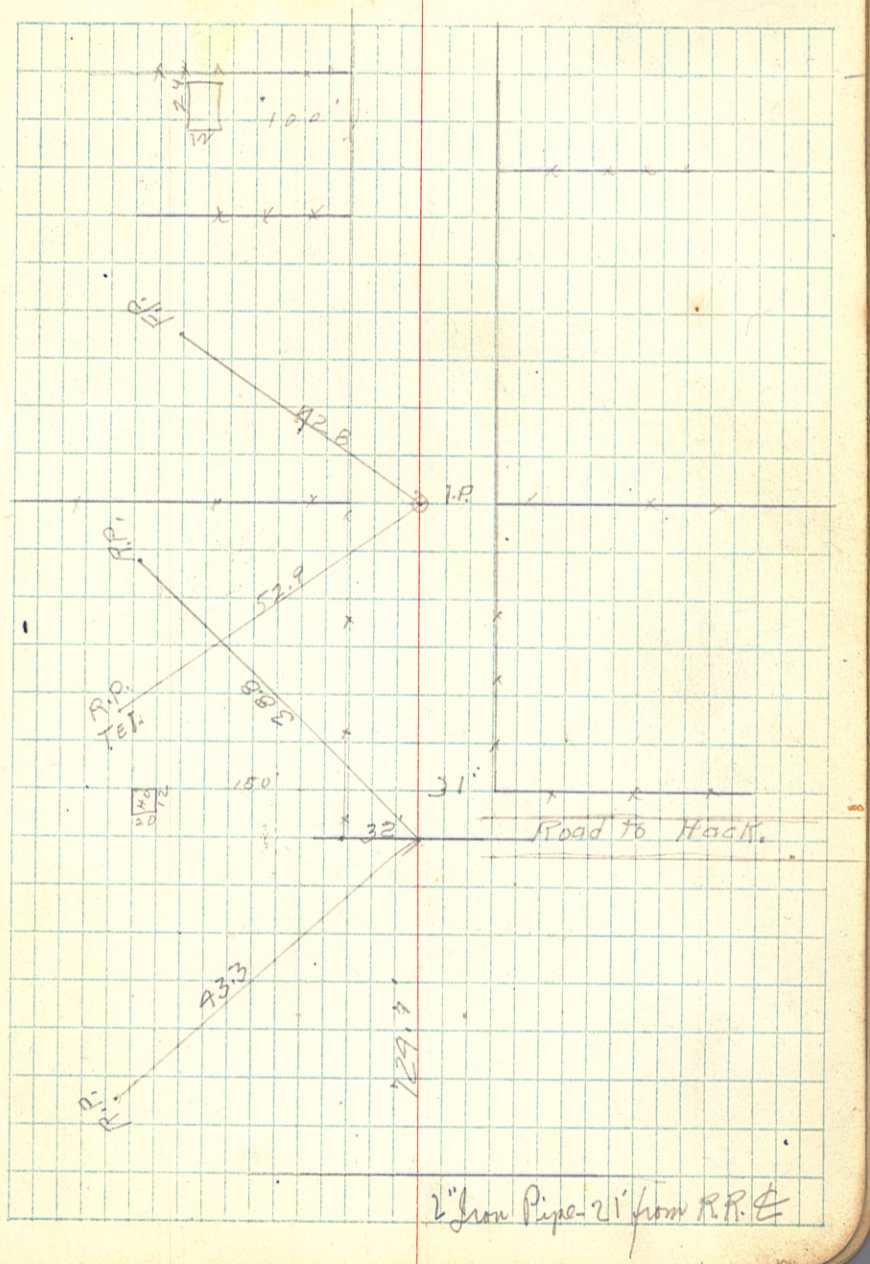
84.2
26) 2189.9
208
109
104
59
52
7
849

1.6099
26) 41.8333
26
158
156
233
208
253
234

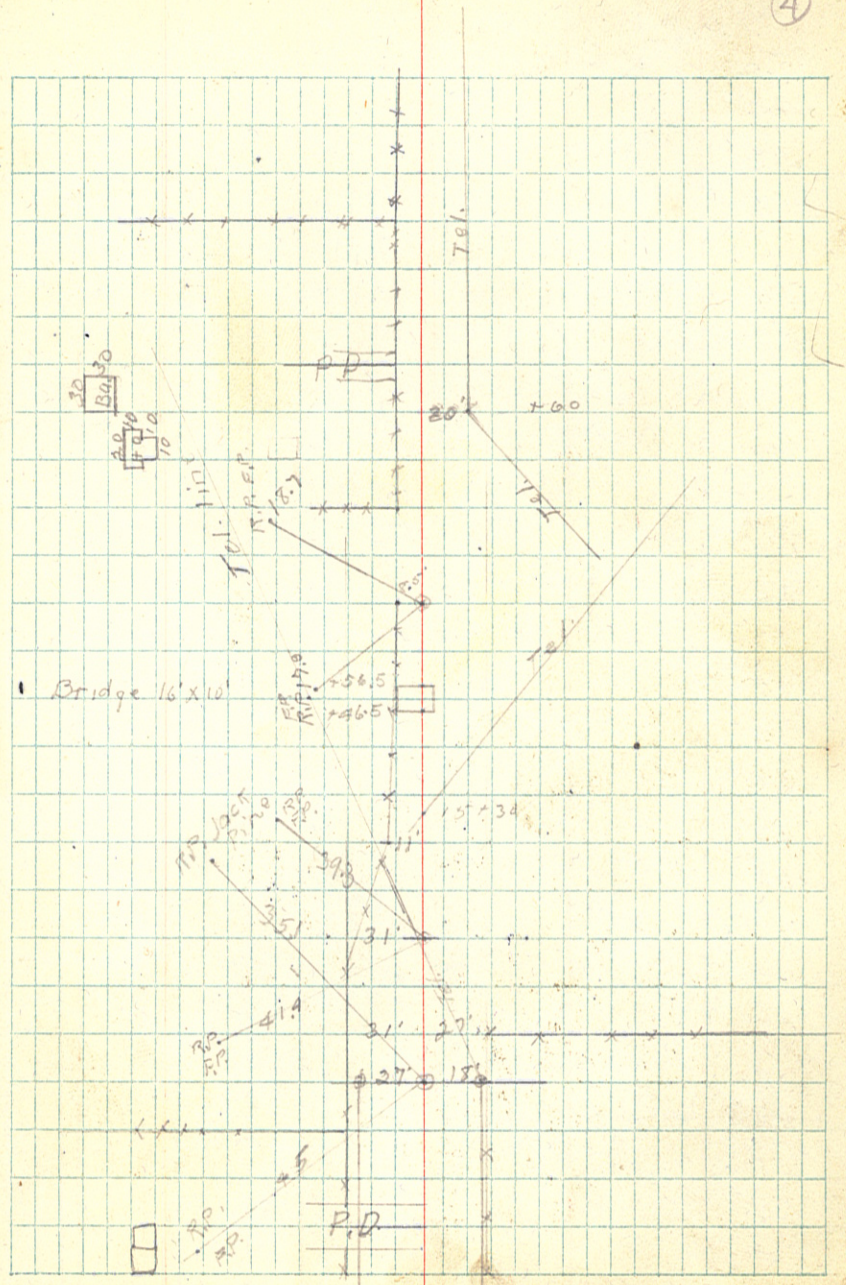
"E" Line See X sec. Book

Sta.	△	Mag. Bear.
+08		
11		
+30		
+20		
10		
9		
8		
7		
6		
+97.7		
5		
4		
3		
2		
1		
0+38		
0+00		N61°30'E

S 1/4 cor. Sec. 18 N81° E



Sta.	△	Mag. bear	
24			
23			
+95			
22			
21			
+20			
20			
+50			
+18			
19			
+64.2	1349'R	N66°45'E	
18			
+51.5			18+64.2 center of bridge
17			14+66.0
16			3 98.2
+08			
15			P.I. 14+66.2
+66.2	29°29'L	N52°30'E	20°C
14			T = 758
+02			Lc = 147.4
13	P.O.T.		P.C. = 13+90.2
+20			P.T. = 15+37.6
12			
11+95			

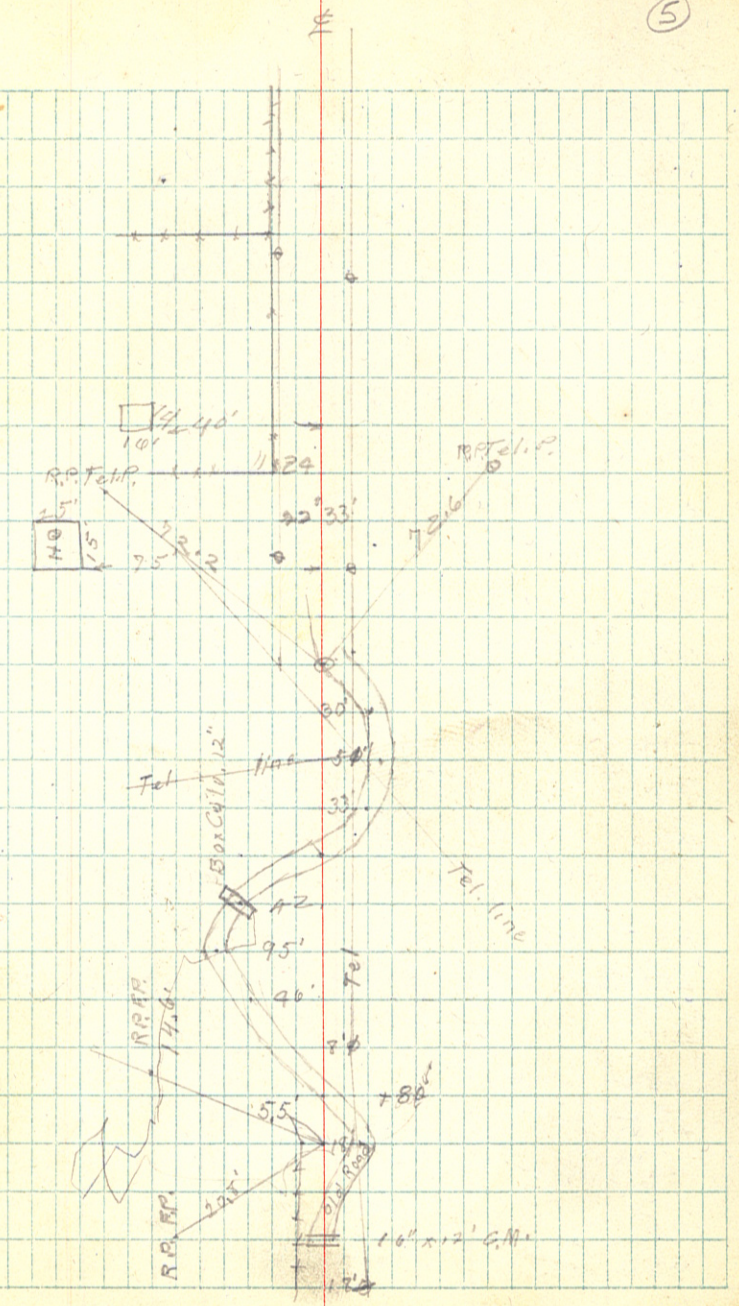


Sta.	Δ	Mag bear
44		
43		
42		
41		
40		
39		
38		
+34		
37		
+33		
36		
+53.4	30°06' L	N81°30'E
35		
34		
33		
32		
31		
30		
29		
+08		
28		
+22	44°59' R	S68°30'E
27		
26		
25		

Hours

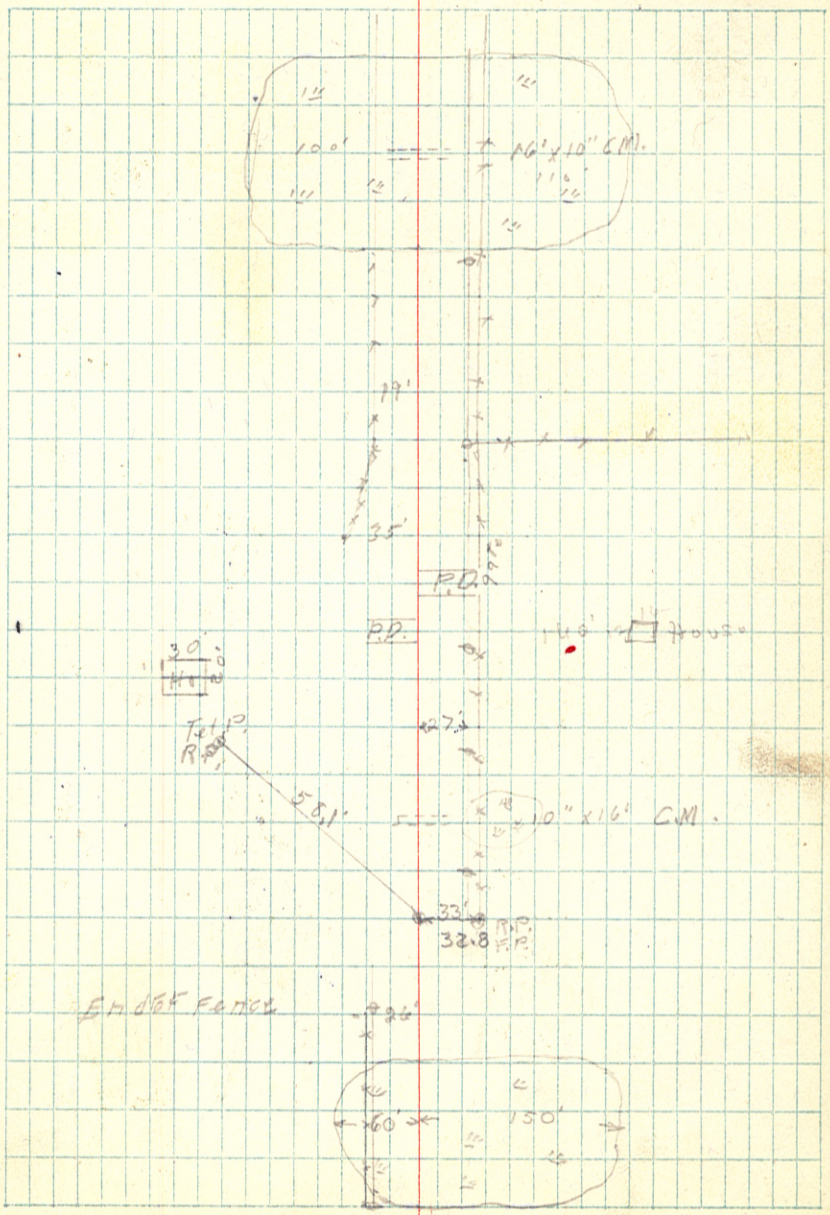
35+53.4
27+22
8 31.4

27+22
18+64.2
8 57.8



Sta	△	Mag. bear.
59		
58		
+06		
57		
56		
55		
54		
53		
+34		
53		
52		
51		
+91		
+14		
50		
99		
+91		
98		
+53.5	N80°30'E	S ¼ Cor 17
47		
+82		
+75		
96		
45		
+50		

47+53.5
35+53.4
,2 0°'



66+33.7
3+27.8
69+61.5

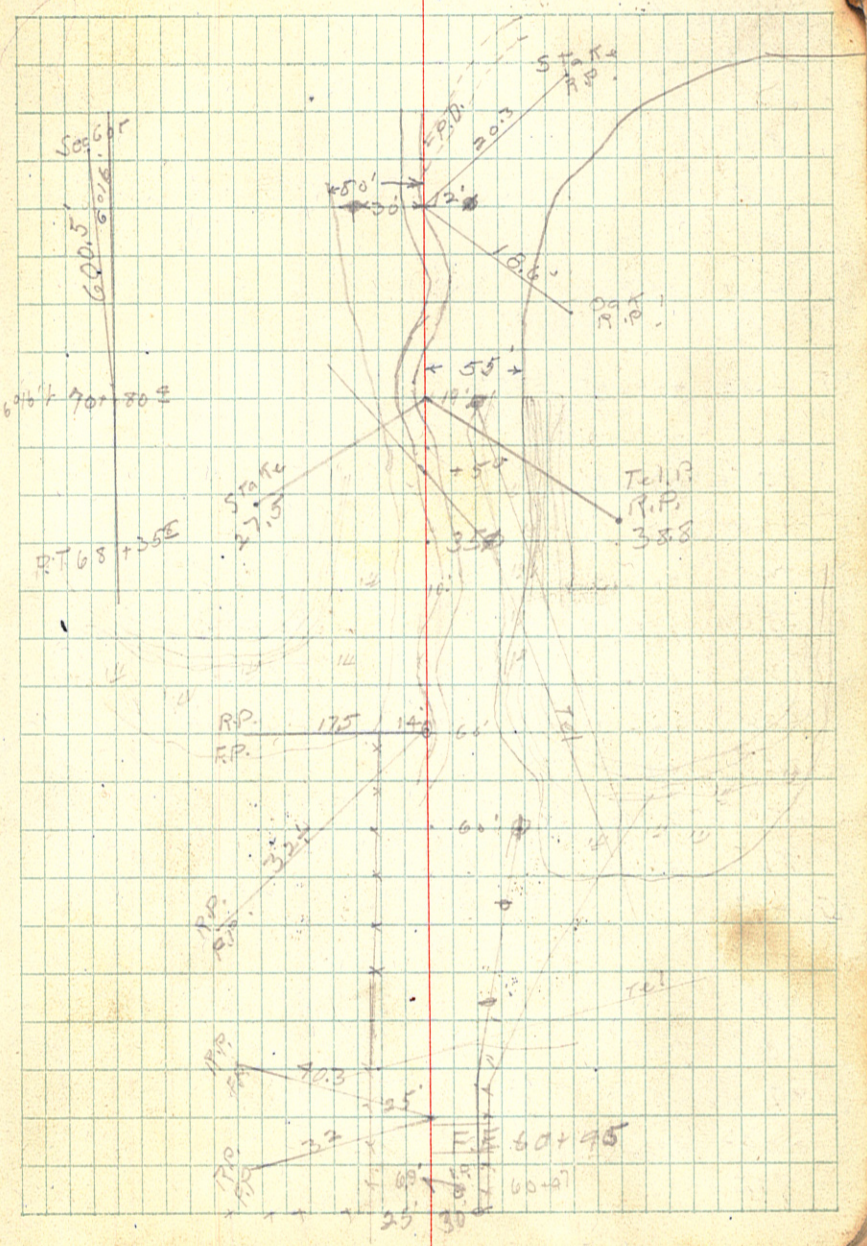
Sta.	Δ	Mag. bear.
75		
74		
+30		
+142	15°53'L	N67°30'E
73		
72		
71		
+80.4	28°26'L	N83°15'E = Dc. = 13°
70		
69		
+70		
+58.2		S68°30'E
+35.8	42°23'	✓
68	37°32'	✓
+50	35°32'	✓
67	31°32'	✓
+50	27°32'	✓
66	23°32'	✓
+50	19°32'	✓
65	15°32'	✓
+50	11°32'	✓
64	7°32'	✓
+5.2	3°52'	✓
PC +05.2		
63		
62		
61		
+86.4	54°54'L	N27°E
60		
59+33		

66+33.7
3+27.8
69+61.5

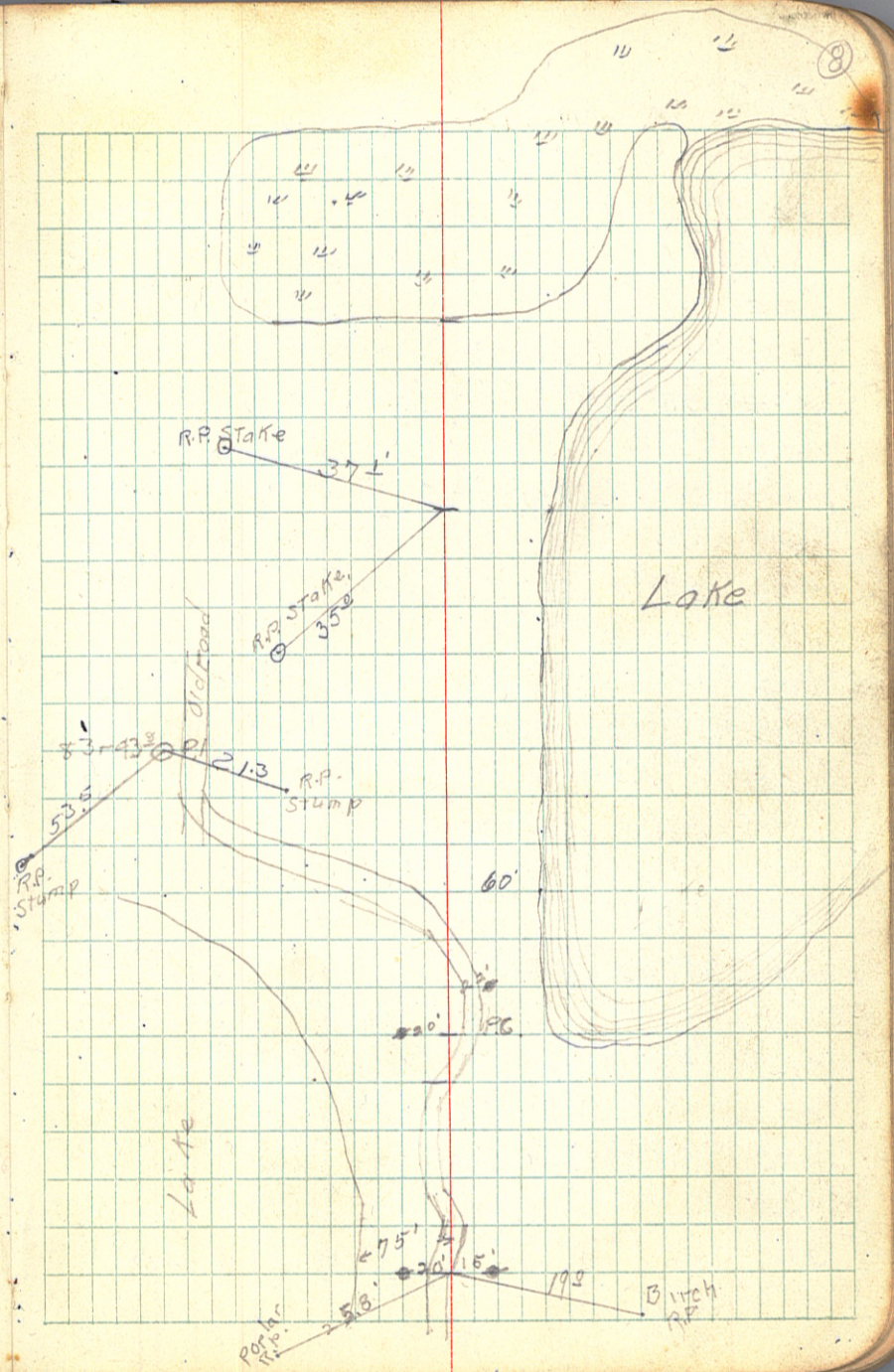
Enter Brush (Light)

Revised Line

P.I. = 66+33.7
T = 3+27.8
P.C. 63+05.9
Lc = 5+29.9
P.T. = 68+35.8
D 16°
Δ 84°47'R.

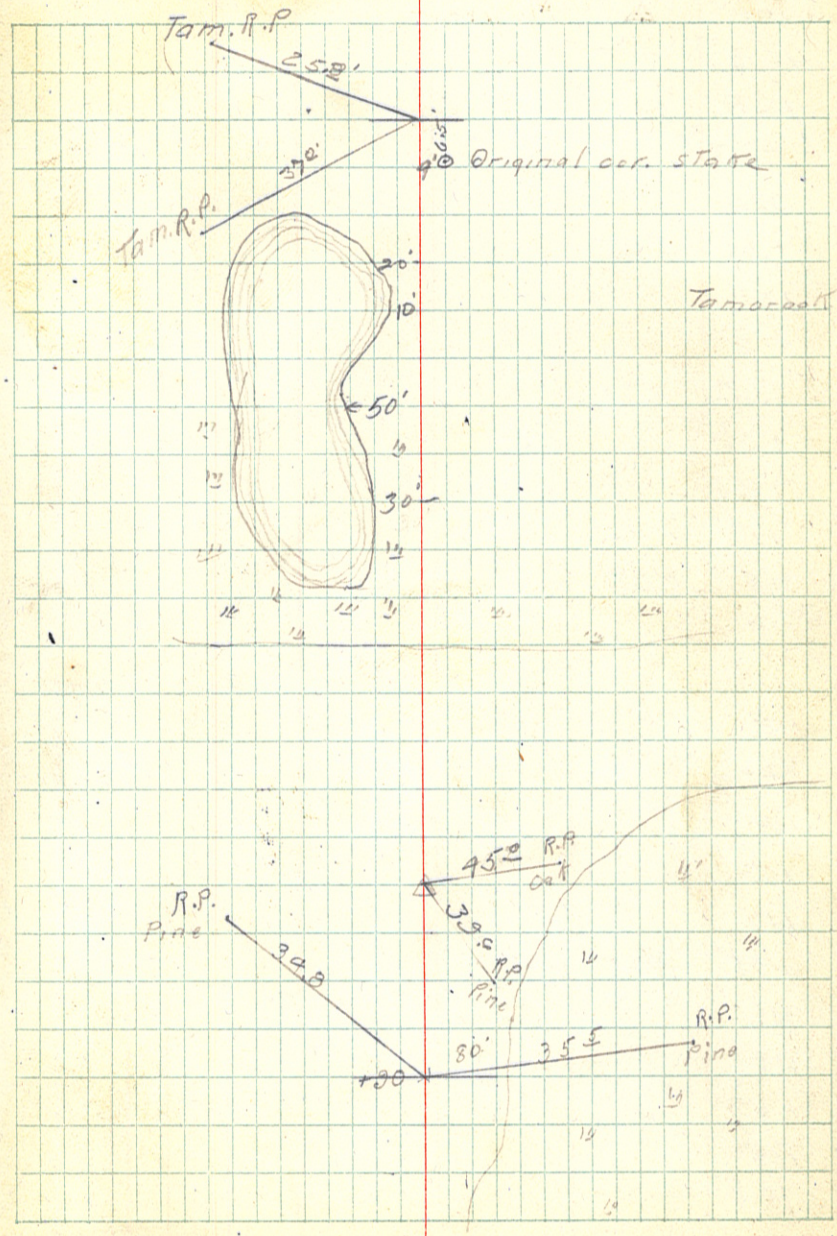


Sta	Δ	Mag. bear	
+76			
90			
89			
88			Edge of swamp
87			
+42	P.O.T.	118°20' R To	Sec. Cor
86			
P.T. +78.6	32°-2'	S65°E	
+50	30°-19'		
85	27°-19'		
+50	24°-19'		
84	21°-19'		12°C
+50	18°-19'		Le 5:33
83	15°-19'		T 2:32
+50	12°-19'		Δ 64°04' R.
82	9°-19'		
+50	6°-19'		
81	3°-19'		
P.C. +44.2			
80			
79			
78			
77			
+04.2	16°04'L	N51°E	
76			

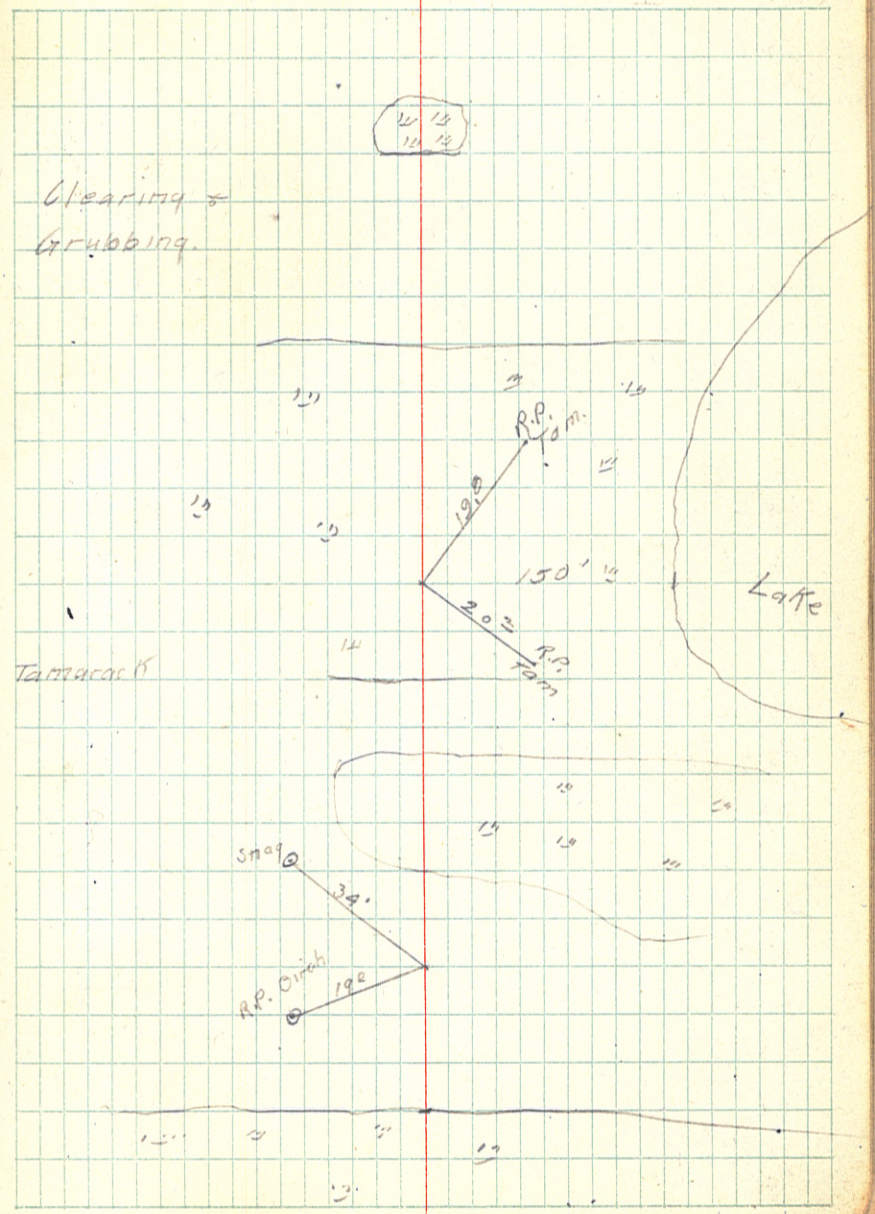


Note:- to Hit the next sec. Cor. an angle of 0°28' to R. showed be turned. ~~which~~

Sta.	Δ	Mag. bear.	
107			
+42.2	15' R	N80°30'E	S 1/4 Cor. Sec. 16
106			106+42.2 / 104+38.8 / 1 / 63.4
105			
+78.8	}	N80°E	
104	38°55'R.		104+78.8 / 102+88.5 / 1 / 90.3
103			
+88.5	95°55'L	N41°15'E	
102			102+88.5 / 101+46 / 1 / 62.5
+46	57° R	S42°30E	
101			
100			
99			101+46 / 94+68.8 / 6 / 77.2 Brush & swamp.
98			
97	P.O.T.	N80°40'E	
96			
95			
+68.8	34°29'L	N81E.	
94			
93			94+68.8 / 85+78.6 / 8 / 90.2
92			
+90	P.O.T.	S64°30'E	
+10			
91	P.O.T.		Clearing & Grubbing



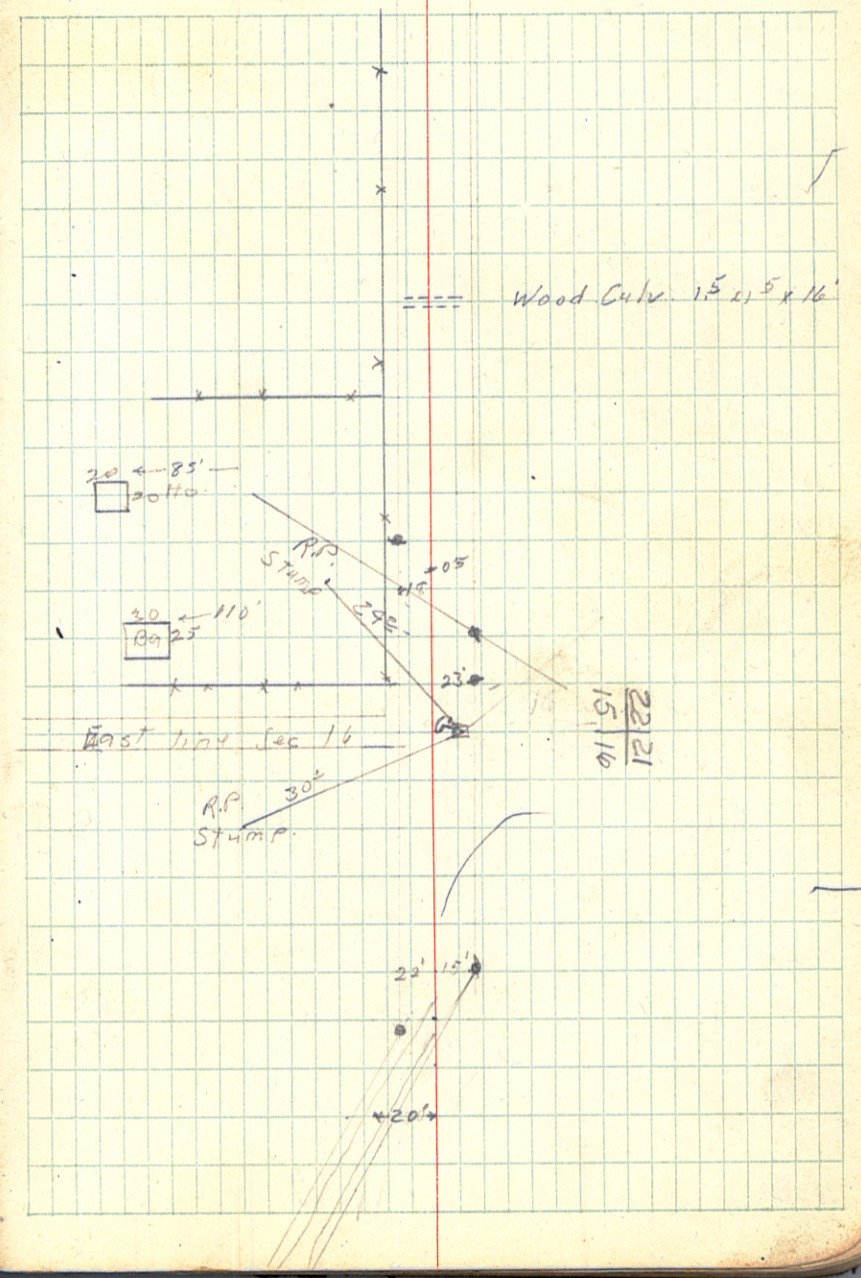
Sta.	△	Mag. bear.	
126			
125			
+33			
124			
+61½	P.O.T.		
123			
+65			Leave Swamp
122			
121			
120			
119			
118	P.O.T.		
117			
116			Enter Swamp
115			
+20			Leave Swamp.
114			
113			Enter Swamp
112			
+95°	P.O.T.	N80°30'E	
111			
110			
+67			Leave Swamp.
109			
108			



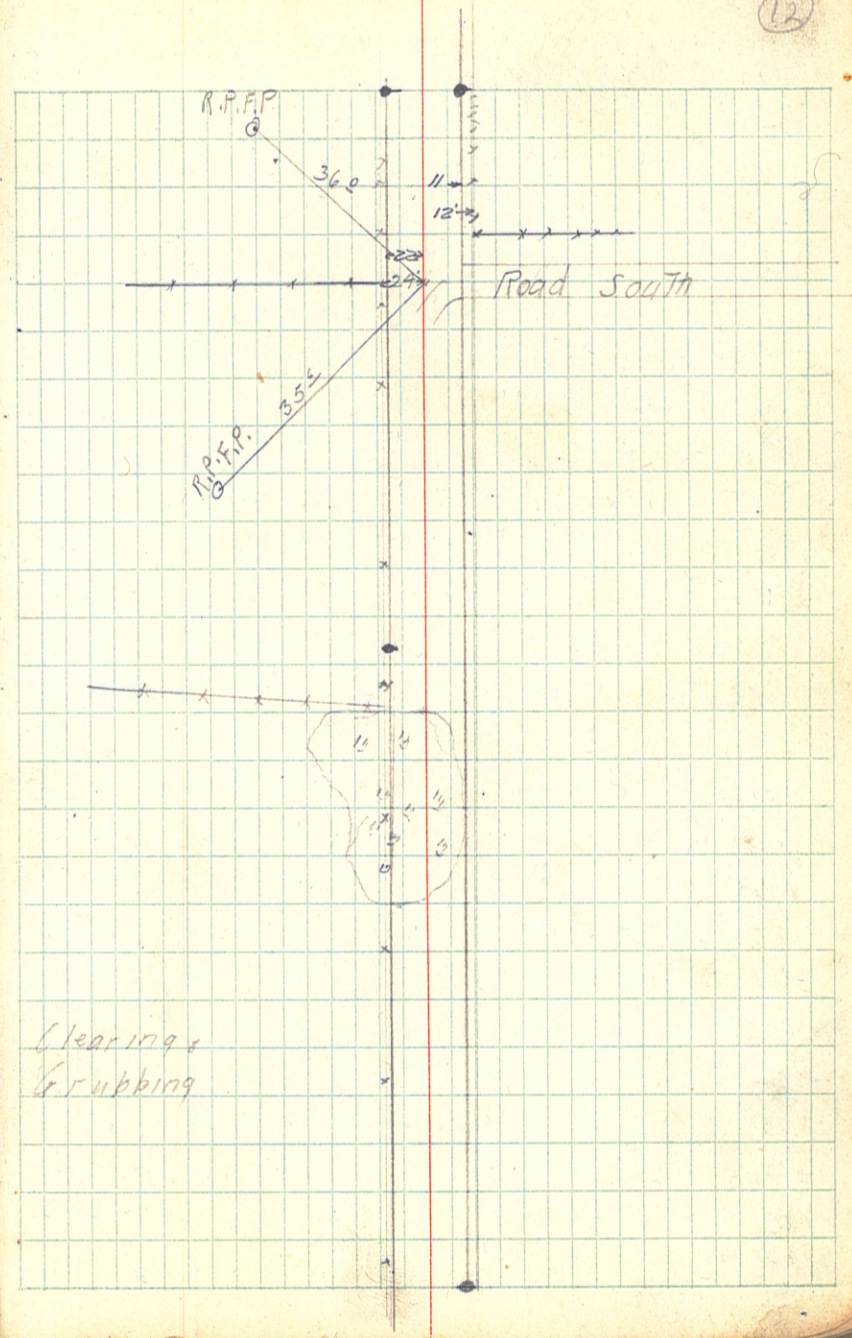
Sta.	M△	Mag. bear.	
141			
140			
139			
138			
137			
+71			shovel be. 137+71.
136			
+24			
136			
+05			
135			
+36			PD-L
134			
133			Brush 10' R.
+76 ±	07'	L N90°30'E	B.S. on True S line Sec. 16
32			
31			
30			
29			
+38			
+31.5	P.O.T.		
+19			
28			
+28.3			
127			

132+76.0
128+31.5
4+44.5
86.0

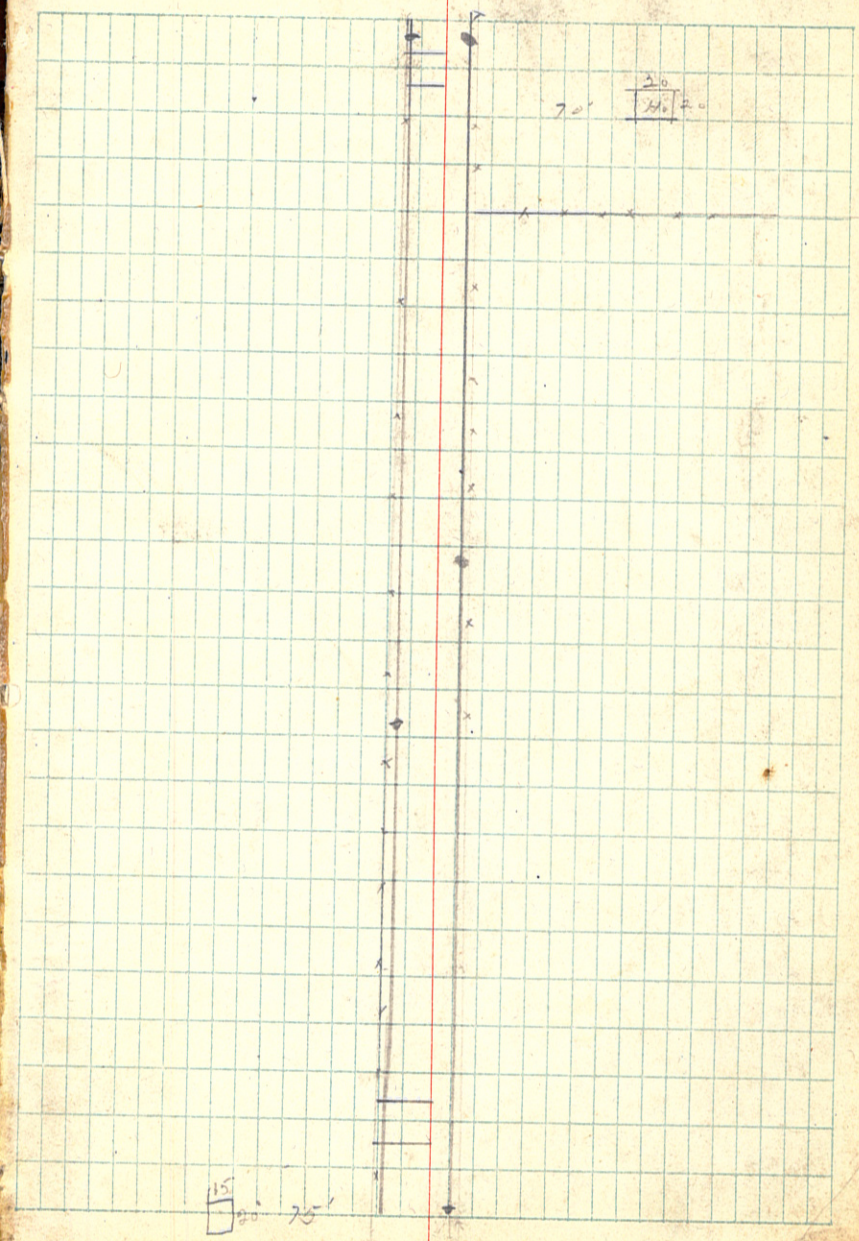
128+31.5
106+42.2
21 89.3



Sta	△	Mag. bear		
161				
160				
+85				
+15.1	0°02'L	N80°45'E	I.P. S¼ Cor. Sec. 15	
159				
158				
157				
156				
155			159+15.7	
154			132+76.0	
153			26 39.7	
152				
+20				
151				
150				
149				
+60				
148				
147				
+46			P.D.L.	Clearing & Grubbing
146				
145				
144				
143				
142				



Sta.	△	Mag. Bear.	
+33			P.D.
+06			
180			
+82°			
179			
178			
177			
176			
175			
174			
173			~~T.H. of C & G~~
+78°			
172			
171			
170			
169			
168			End of C & G
167			
166			
165			
164			
163			
+21			P.D. +2
162			
+78			



Sta.					
30					
31			P.I. = 33+92.1		
32				Δ 34° 12'	
33				T = 88.6	
P.C. +03.5		✓		L c = 171.0	
	2°09'				
+25		✓		D'c = 20° Lt.	
	4°39'	✓			
+50	7°09'				
+75		✓			
	9°39'				
34		✓			
	12°09'				
+25		✓			
	14°39'	✓			
+50	17°06'				
P.T. +74.5					
= +80.7					
= 35+19.9 original L-Line					

LEFAX. PHILADELPHIA, PA.

16

	+S	H.I.	-S	Rod	El
Start on BM.		1394.23			
1	1.05	1395.28			1394.23
13+63.9				3.4	91.9
14				5.4	89.9
+50				8.4	86.9
15				10.0	85.3
TP.	4.25	1390.11	9.45		1385.83
+50				3.9	86.2
+63.9				3.7	86.4
16				4.3	85.8
+25				6.1	84.0
+60				12.0	78.1
17				13.3	76.8
TP.	10.09	1387.27	12.93		1377.18
18				11.0	76.3
19				10.5	76.8
20				9.8	77.5
21				10.0	77.3
22				8.6	78.7
TP.	7.85	1387.32	7.80		1379.47
23				8.0	79.3
24				6.0	81.3
+00				5.7	
+50				2.8	
AD				6.4	
TP.	3.92	1385.99	5.25		1382.07

8599

+20.9			3.9	82.1
+50			5.5	80.5
26			7.6	78.4
+50			9.5	76.5
26			9.8	76.2
+50			9.5	76.5
27			7.0	79.0
+25			4.5	81.5
+50			3.7	82.3
28			4.2	81.8
+50			5.0	81.0
+65			6.8	80.2
29			7.9	78.1
+25			9.8	76.2
+45.9			10.2	75.8
30			10.1	75.9
+60			9.6	76.4
31			8.3	77.7
32			2.2	83.8
T.P.	3.55	387.96	1.58	1384.41
	1.74	87.00	2.70	85.26
			3.4	83.6
			2.6	84.4
			5.2	81.8
			5.2	81.8
			5.1	81.9
			4.9	82.1
			4.6	82.4
			4.8	82.2

9-7-20
S.W.
R.P.
B.W.

P.I. = 551+51.5

B.C. = 550+20.3 = 0°00'
+50 = 2°58'
+75 = 5°28'
551 = 7°58'
+25 = 10°28'
+50 = 12°58'
+75 = 15°28'
552 = 17°58'
+25 = 20°28'
+50 = 22°58'
E.C. +66.3 = 24°36'
= 82.7

T. = 131.2
Δ = 49°12' L
L = 246'

25
6.02
6)150.0
120
30

20 28
2 30
22 58
1 38
23 96
= 24°36'

49
24°
16.3
6
97.8
6 0
1°38

72
.32
5.00
20.3
29.7
6.02
6)178.2
120
58

2 58
2 30
4 88
= 5°28'
2 30
7 58
2 30
9 88
= 10°28'
2 30
12 58
2 30
14 88
= 15°28
2 30
17 58
2 30
19 88
= 20°28

LEFAX FILING INDEX

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LEFAX, PHILADELPHIA, PA.

Revision
Sta. 14 To 35

P.C. 13+63.9	1°50'	1°48'
14	4°20'	4°18'
+50	6°50	6°48'
15	9°20	9°18'
+50		10°00'
P.T. +63.9		

D = 10
P.I. = 14+65
Δ = 20° L
T = 101.1
Lc = 200'
P.C. = 13+

16
17
18
19
20
21
22
23
24

+10.9 P.C.	1°57'
+50	4°27'
25	6°57'
+50	9°27'
26	11°57'
+50	14°27'
27	16°57'
+50	19°27'
28	21°57'
+50	24°27'
29	26°45'
+45.9 PT.	

P.I. STA. 27+00
Δ 53°30' R
T = 289.1
Lc = 535.0
D = 10°

DB4 Book 138

LEFAX FILING IN

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LEFAX, PHILADELPHIA, PA.

16

~~Ditch - 30 30+~~

Ditch = 31 sta long.

Lt.	&	Rt
-4.2	-1.9	-3.6 = Sta

P.I. = 60+86.1

B.C. = 59+82.4 = 0°00'
60 = 2°33' ✓
+25 = 6°10½' ✓
+50 = 9°48' ✓
+75 = 13°25½' ✓
61 = 17°03' ✓
+25 = 20°40½' ✓
+50 = 24°18' ✓

E.C. = 61+71.7 = 27°27'
= 61+89.8 =

(Δ = 54°54'
D. = 29°
T. = 103.7)

100.0
82.4
17.6 17.6
8.7
1232
1408
153122
60)153
120
33

17°03'
3 37½
20 40½
3 37½
23 78
24 18'
3 09
27°27'

2°33'
3 37½
5 70½
= 6°10½
3 37½
9°48'
3 37½
12 85½
= 13°25½
3 37½
16 63
= 17°03

21.7
8.7
151 9
1736
60)188.7 (3°09
180
9

Revised Alignment

South side Webb L.

Computed in office by:-
C.W.

→ = 304+70.9 Original Line.

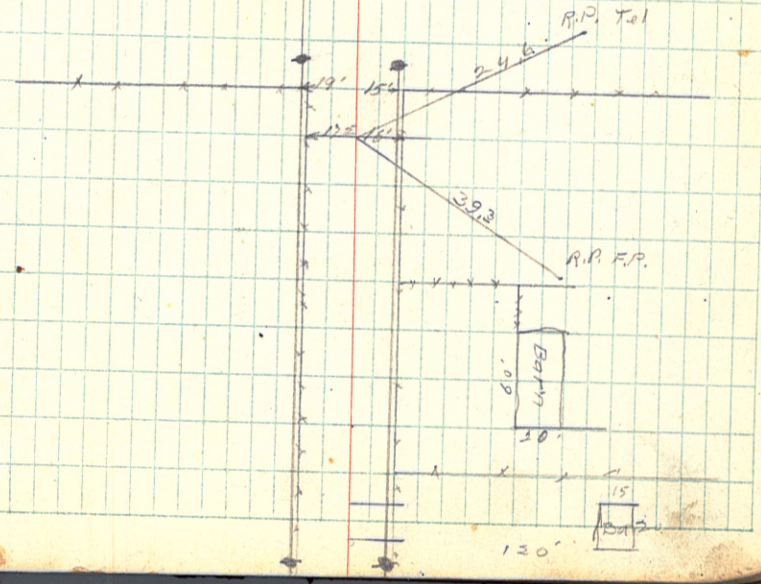
+80.7	P.T.	Δ 79°46' Lt.
303		D 18°
302		P.I. 302+04.7
301		T. 267.1
300		Lc 443.1
		R = 318
+37.6	P.C.	
299		
298		
297		
296		
+80	P.T.	
+50		Δ 52°54' Lt.
295		D = 28°
+50		P.I. 294+93.9
294		T. 102.8
+91.1	P.C.	Lc 188.9
+90.3	P.T.	R 204
+50		Δ 90°00 Rt.
293		D = 30°
+50		P.I. 292+83.5
292		T. 193.2
+50		Lc. 300.0
291		R. 193'
290+90.3	P.C.	

Sta.	△	Mag. bear.
200		
9		
8		
7		
6		
5		
4		
3		
2		
1		
190		
9		
8		
7		
6		
+95		
+53.7	43° R	N81°E
185		
184		
+81		
183		
182		
181		
+54		
+48		

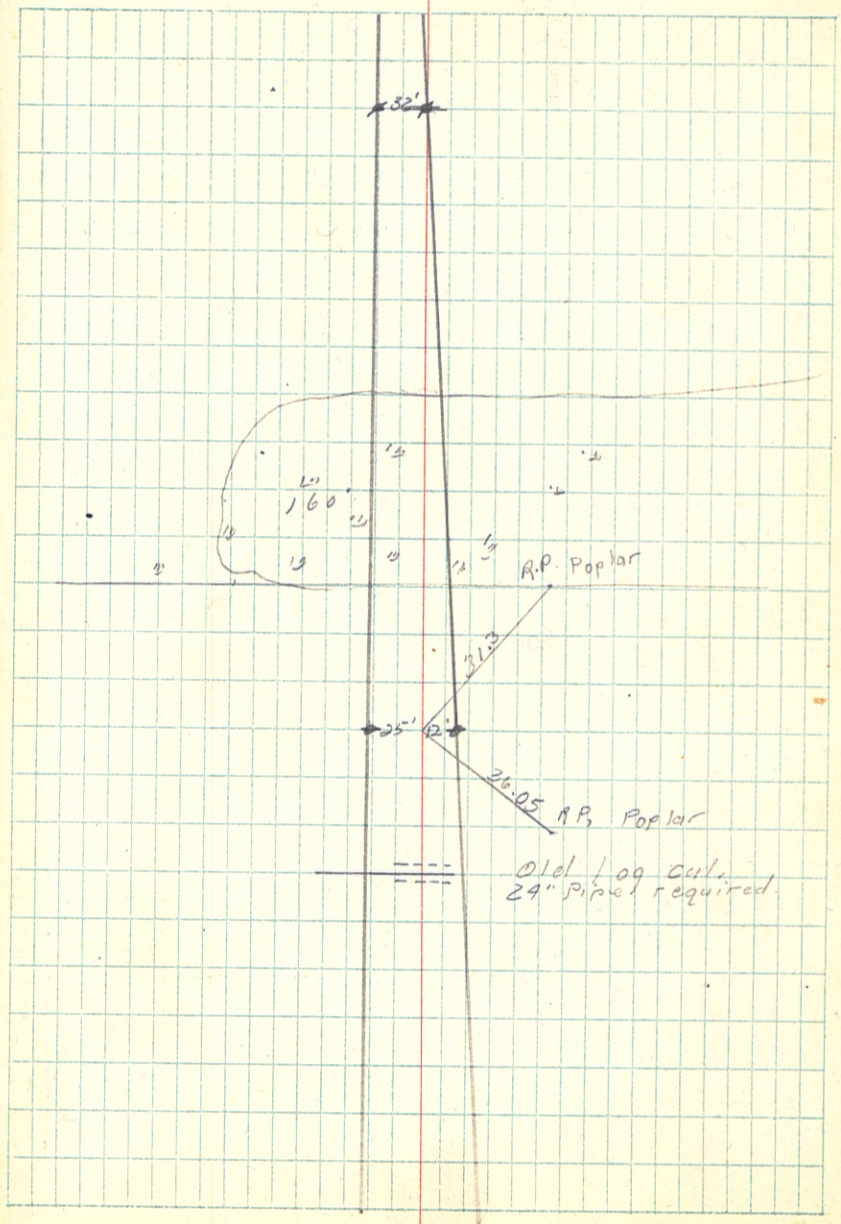
Deg. 6 & 6

Sec. Cor 14 | 23
15 | 22

185+53.7
159+15.7
26 38.0



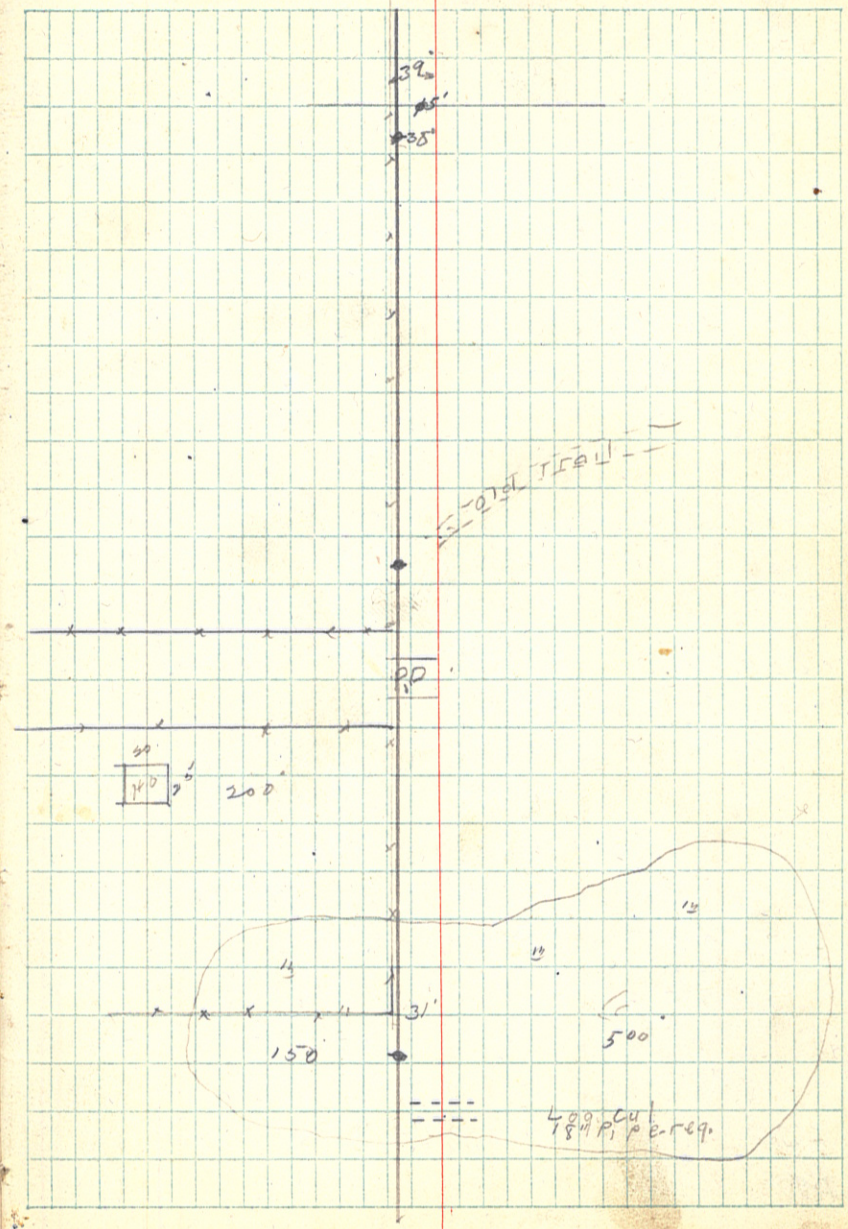
Sta.	△	Mag. bear.	
222			
+32.3	P.O.T.		Old road 20' L
21			
220			
9			
8			
7			
+20			Edge of swamp
6			
5			
4			
3			Enter Swamp
2			
1			
210	P.O.T.		
9			
8			
+96			
7			
6			
5			
4			
3			
2			
1			



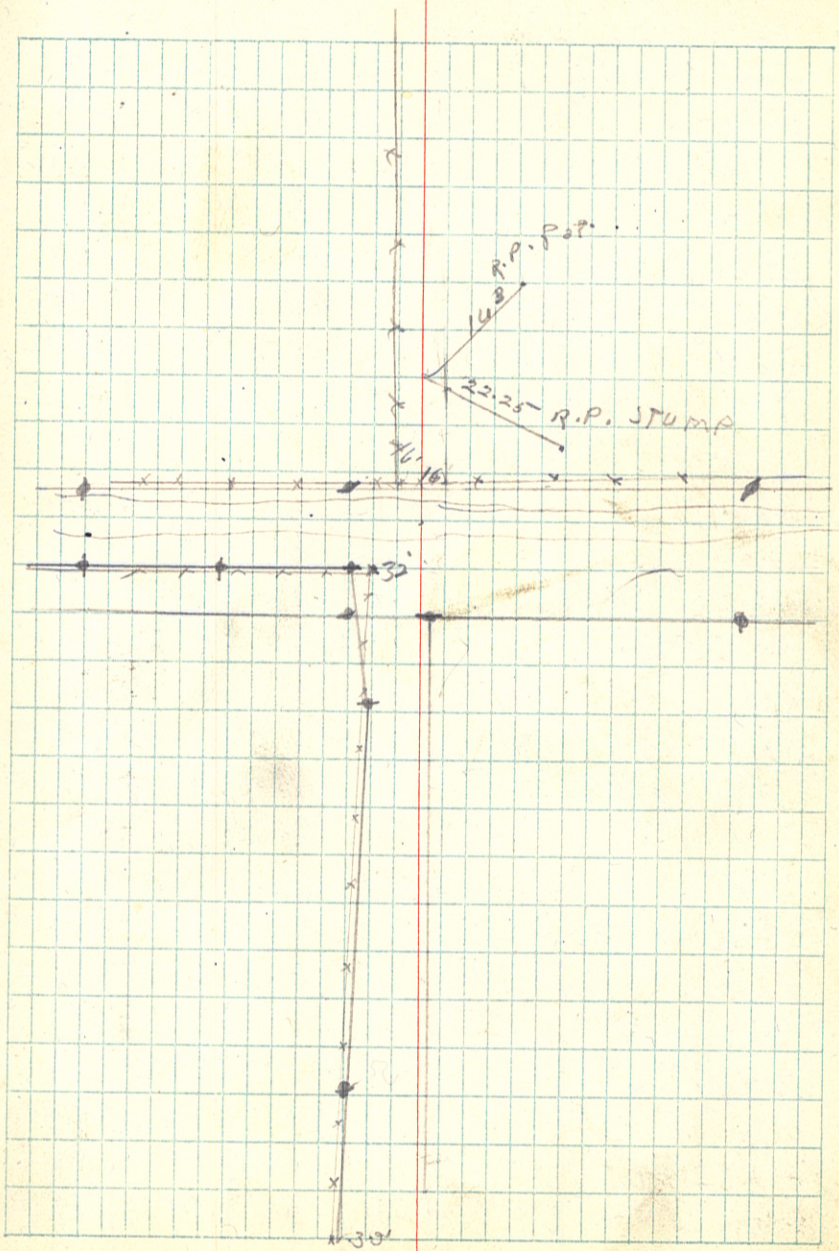
Sta.	△	Mag. bear.	
232			To hit next Sec. Cor. Turn angle of 0°26'L.
+60.2	25'L	N81°30E	Sec. Cor
8			
7			
6			
5			
4			
3			
2			
1			
+48			
230			
+30			
+15			
229			
+52			
228			
227			
+70			Leave Swamp
226			
+50			
225			
+66			
224			Enter Swamp
223			

238+60.2
185+53.7
53 06.5

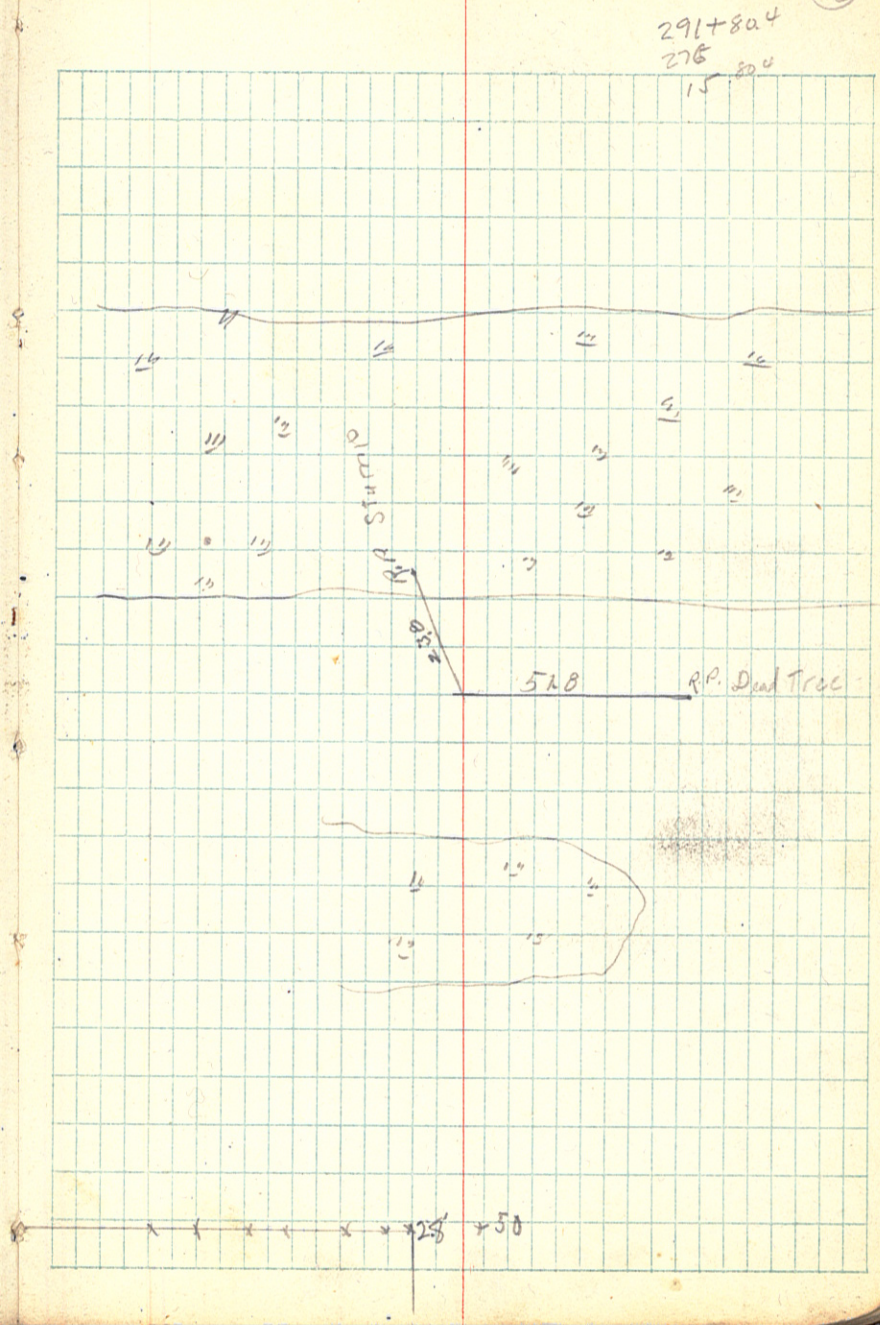
NW | NE
SW | SE



Sta.	△	Mag. bear.	
260			
9			
8			
7			
6			
5			
+34	P.O.T.		
4			
3			
252 +19			
+82			
+76			
1			
250			
9			
8			18" Pipe Req.
7			
6			
5			
4			
3			
2			
1			
+56			
240			



Sta.	△	Mag. bear.
280		
9		
8		
7		
276		
275		
274		
273		
272		
271		
+45		
270		
+139	B.O.T.	
269		
268		
+80		
267		
266		
+545	P.O.T.	
265		
264		
263		
262		
+533	P.O.T.	
261		



Sta.	∠	Mag. bear.
9		
+50		
8		
7		
6		
5		
4		
3		
2		
+80±	90°38′	N8°30′W
1		
290		
9		
8		
7		
6		
+30		
5		
+70		
4		
3		
2		
1		
+48±		

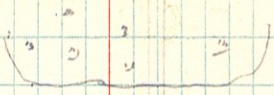
This angle is evidently wrong, I believe it should be 89°38′ N

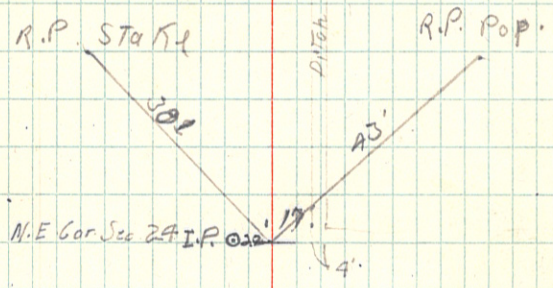
Sec cor.

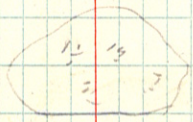
13	18
24	19

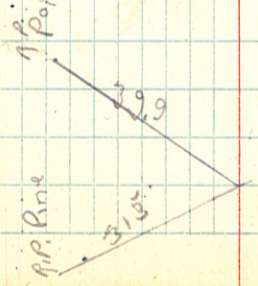
291+80.4
238+60.2
53 19.7

291+80.4
252+12.9
39 67.5









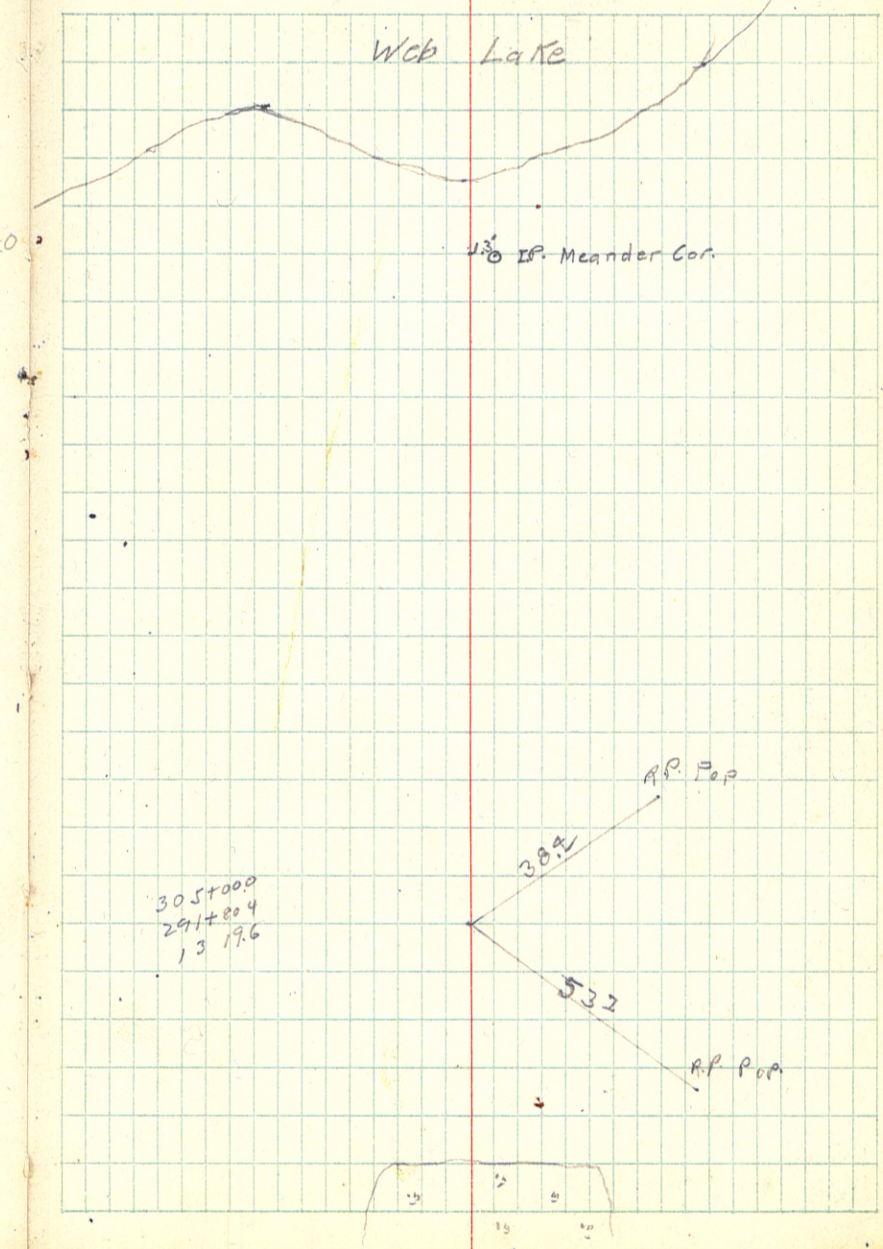
Sta.	△	Mag. bear
+41.5	R	M.C. W ¼ cor. Sec 18 T140
7		
6		
5		
4		
-57.2	P.O.T.	
3		
2		
1		
310		
9		
8		
7		
6		
5	P.O.T.	
4		
3		
2		
1		
+80		
300		

317+41.5
305
12 41.5

316+73.9

1/16 Cor

305+00.9
291+80.4
13 19.6

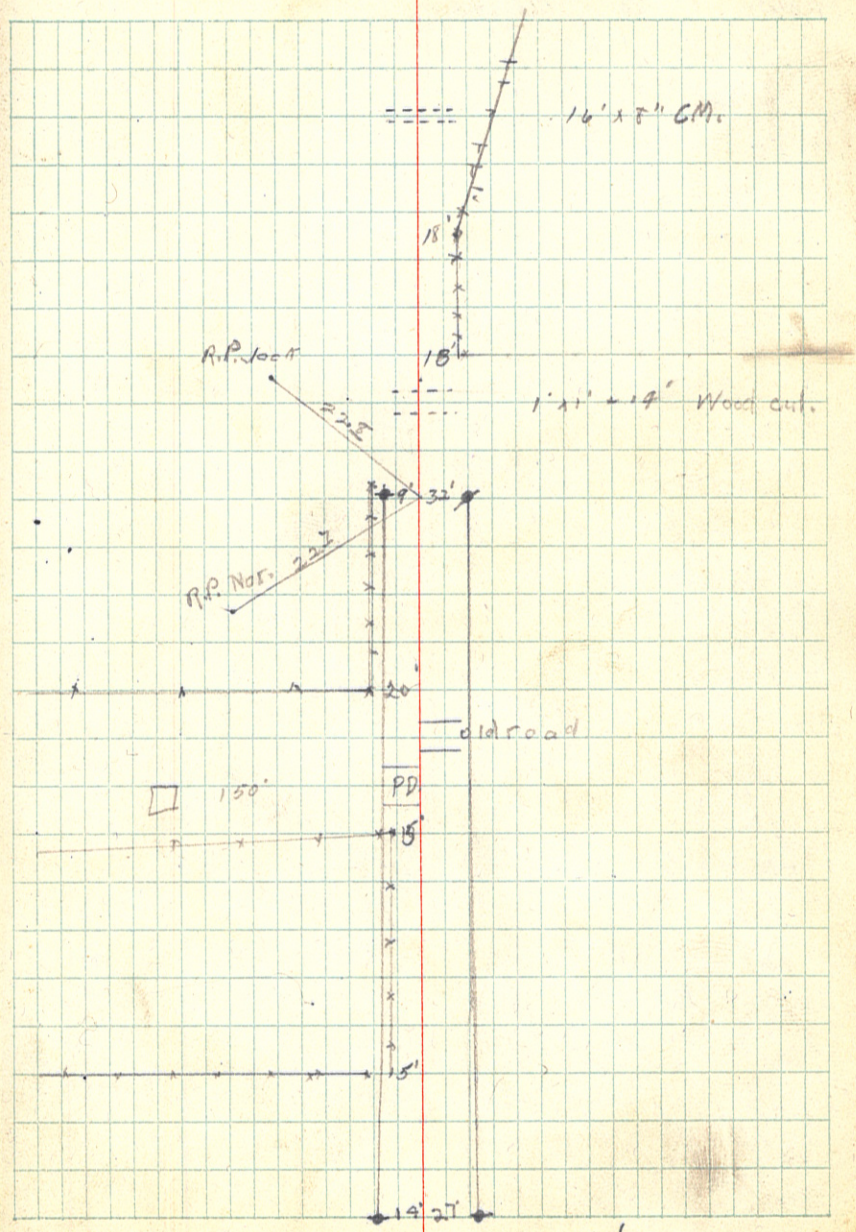


Transit Line Notes.

Sta.	△	Mag. bear.
101		
+86		
100		
99		
98 +50		
97		
+65		
96		
95		
+62	34°10' R	N86°30'E (Pwr in a 22° c. E> 12)
94		
93		
~~92~~		
91		
90		
+35		
+10		
~~89~~		
88		
87		
86		
+13		
85		
84		
83+43.9=00+0	1°14'R	N52°30'E (1°C)

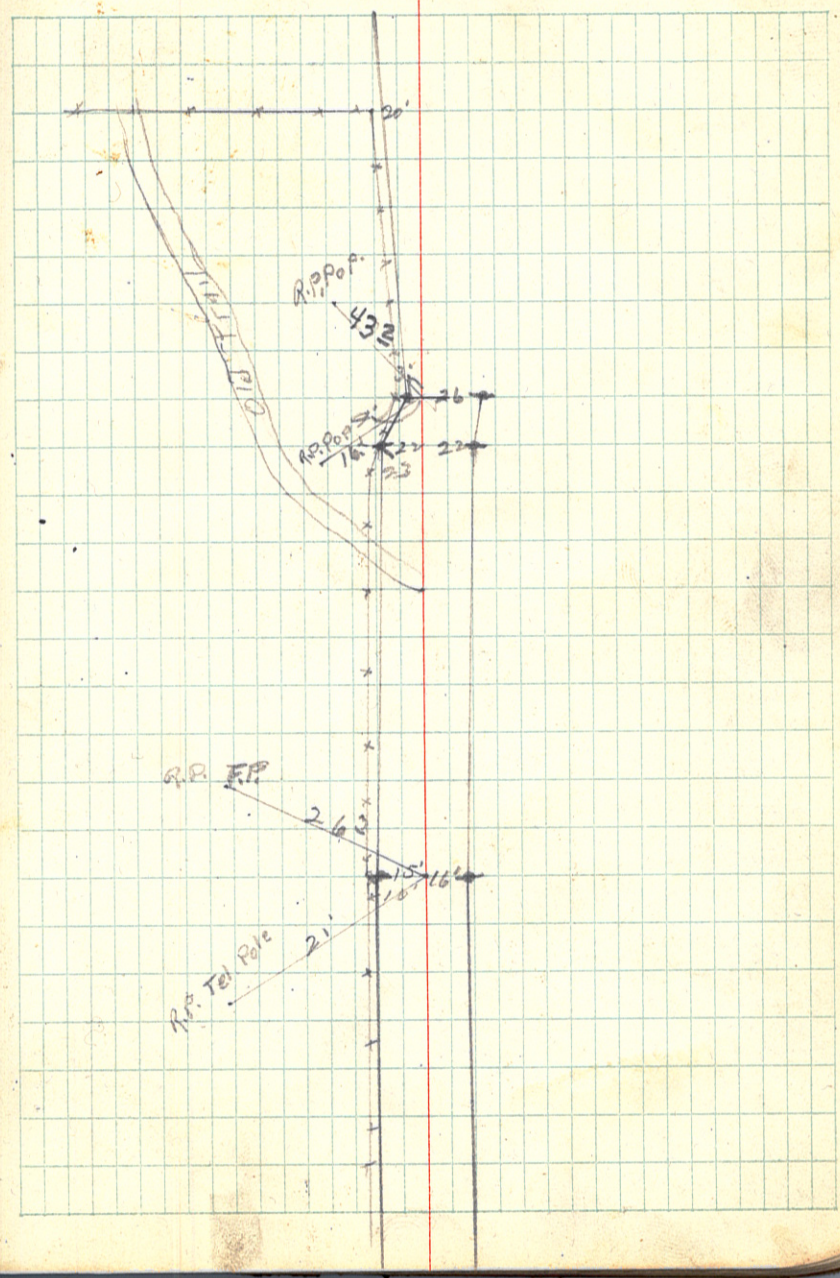
94+62
83+43.9
11 18.1

"A" Line. Alternate Location.

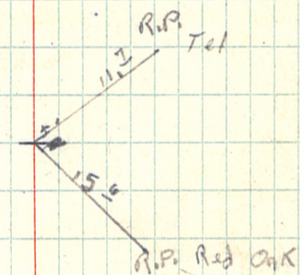


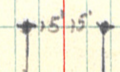
Sta.	Δ	Mag. bear.
122		
+20		
121		
120		
9		
8		
7		
+38.2	36°52'R.	S 56°40'E (Put in a 24°C) E-13
116		
115		
114		
+50		
113		
112		
111		
110		
109		
+06.2		
108		
107		
106		
105		
104		
103		
102		

116+38.7
94+620
21 767



STa.	Δ	Mag. bear.			
+ 15.7	42°20' L		{Put in a 26°C.		
131					
130					
129					
128			131 + 15.7 116 + 38.7 14 77.0		
127					
126					
125					
124	P.O.T.				
123					





"B" Line Alternate Location

Sta.	△	Mag. bear.
+64 = 35+53		
33		
+71		
32	+42 = 1/16 Cor. est. 8/1/19	
31		
30		
+78		
29		
28		
27		
26		
25		
24		
23		
+67		
22		
+61		
21		
20		
+21	0°34'L	N82°E
19		
18		
17		
16	+50	
15		
00+0 = Ar 66°		N82°30'E

33+64.5
14+66
18 98

33+65
32+43
1 22

19+21.1
14+66
4 55

Sec. Cor.

17	20
18	19

34'L

32.4°
19.2
13

(25)

Old Road

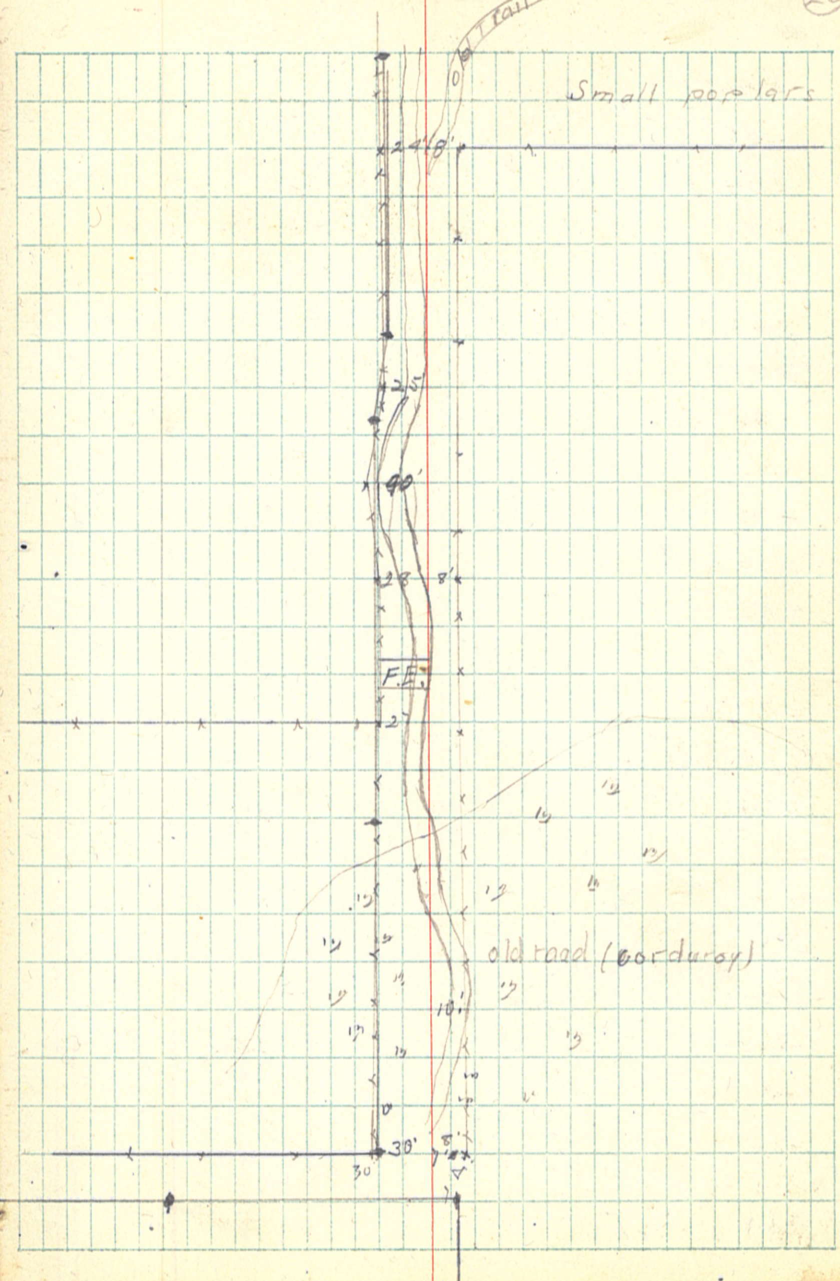
+37

Transit Notes

Station	Notes
266	
+60	
265	
264	
263	
262	
+80	
+60	Leave Swamp
261	
+48	Edge of swamp
260	
259	
+18	
+10	
258	
+60	Leave swamp
257	
256	
255	
254	
+56	Edge of swamp
253	
+46	C+G light
+43	

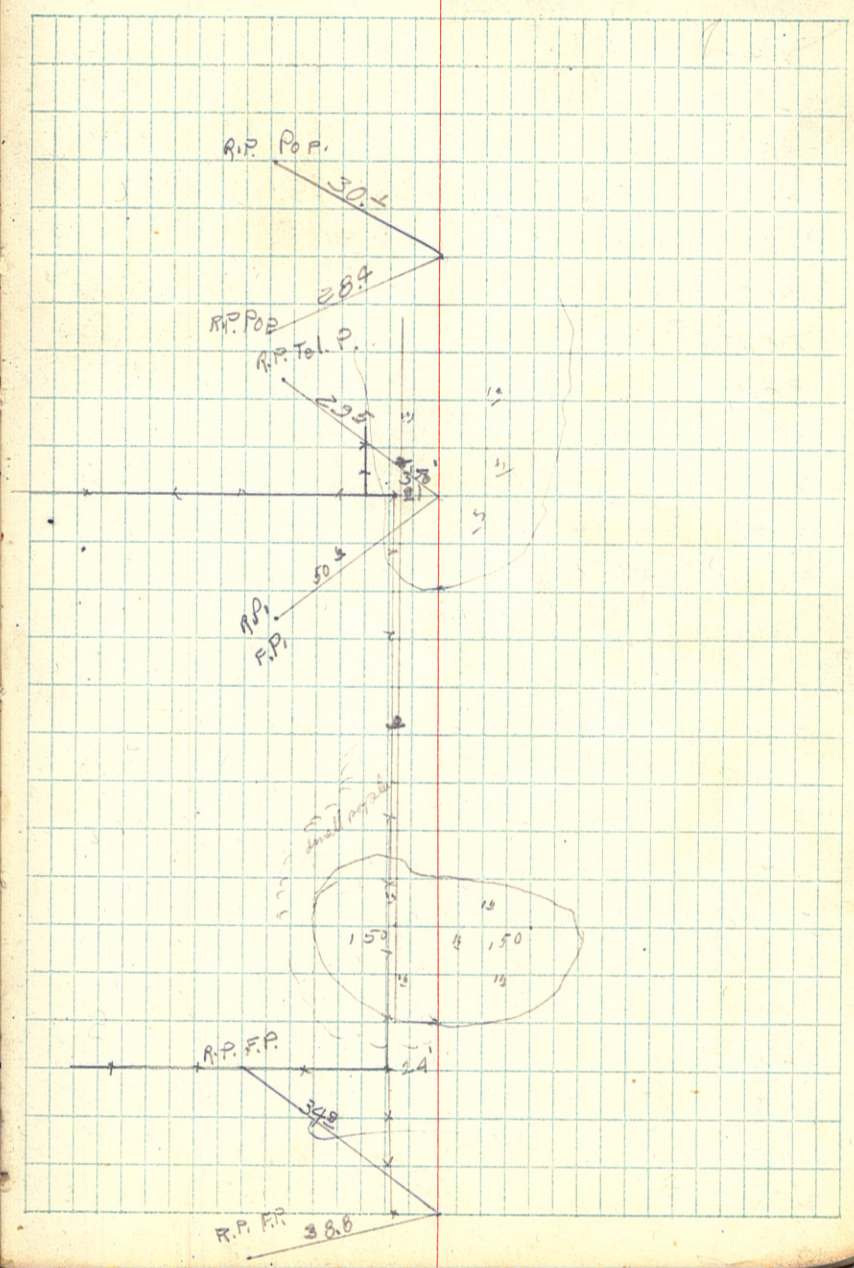
oor D = 252+29 89°40'L N 8°30'W

"C" Line Alternate Location



Sta.	△	Mag. bear	
286			
285			
284			
283			
+63	P.O.T.		
282			
281			
280			
279			C+G (med)
+73		90° R N81°30E	
278			
+87			Edge of swamp.
277			
276			
275			
274			
273			
+85			Leave swamp
272			
271			
270			Edge of swamp.
+30			
269			
268			
267	P.O.T.		

278+73.2
252+12.9
26 60.3



Sta.	Δ	Mag. bear
+50	29°05'	
303	24°35'	
+50	20°05'	
302	15°35'	
+50	11°05'	
301	6°35'	
+50	2°05'	
+26.9	P.C.	
300		
299		
+53±	P.O.T.	
297		
297		
296		
+60±	51°40' L	S60°30'E
295		
294		
293		
+83±	90° R	S8°45'E
292		
291		
290	P.O.T.	
289		
288		
287		

303+00.0
295+60.3
7 39.7

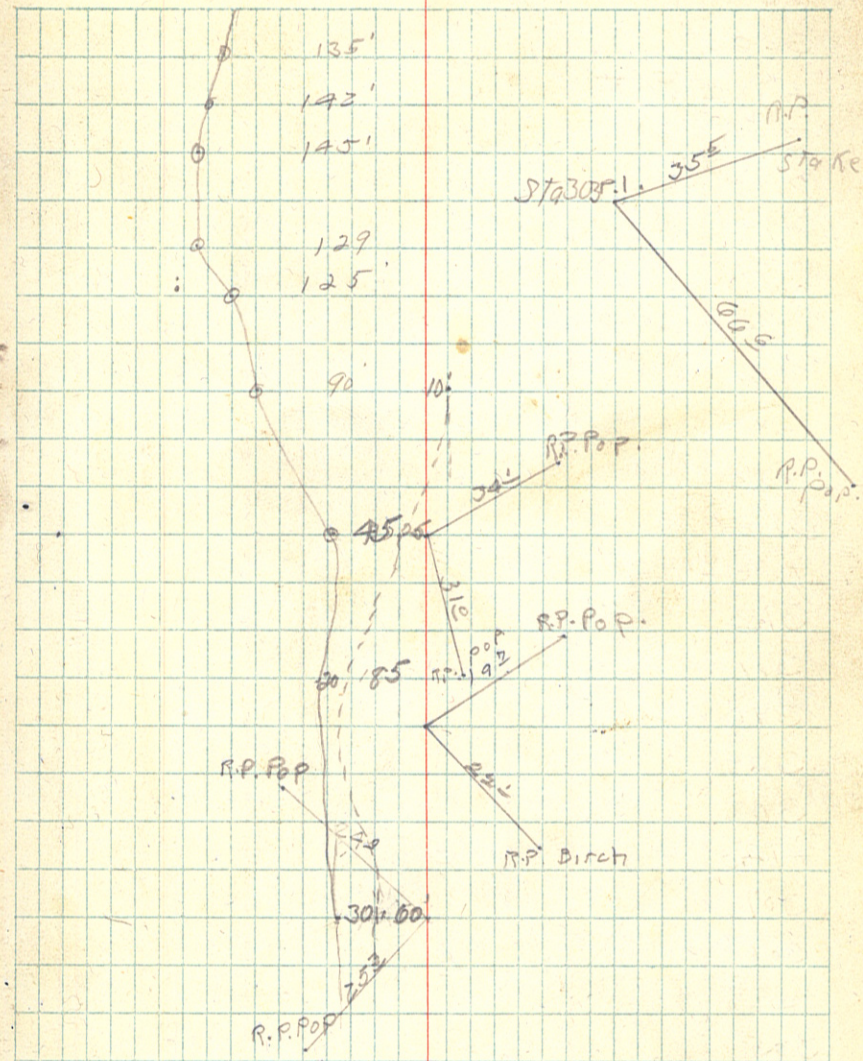
18°C. L.
Δ = 81°00' L.

P.I. = 303+00.0
T = 2+73.1
P.C. 300+26.9
Lc = 4+50.0
P.T. = 304+76.9

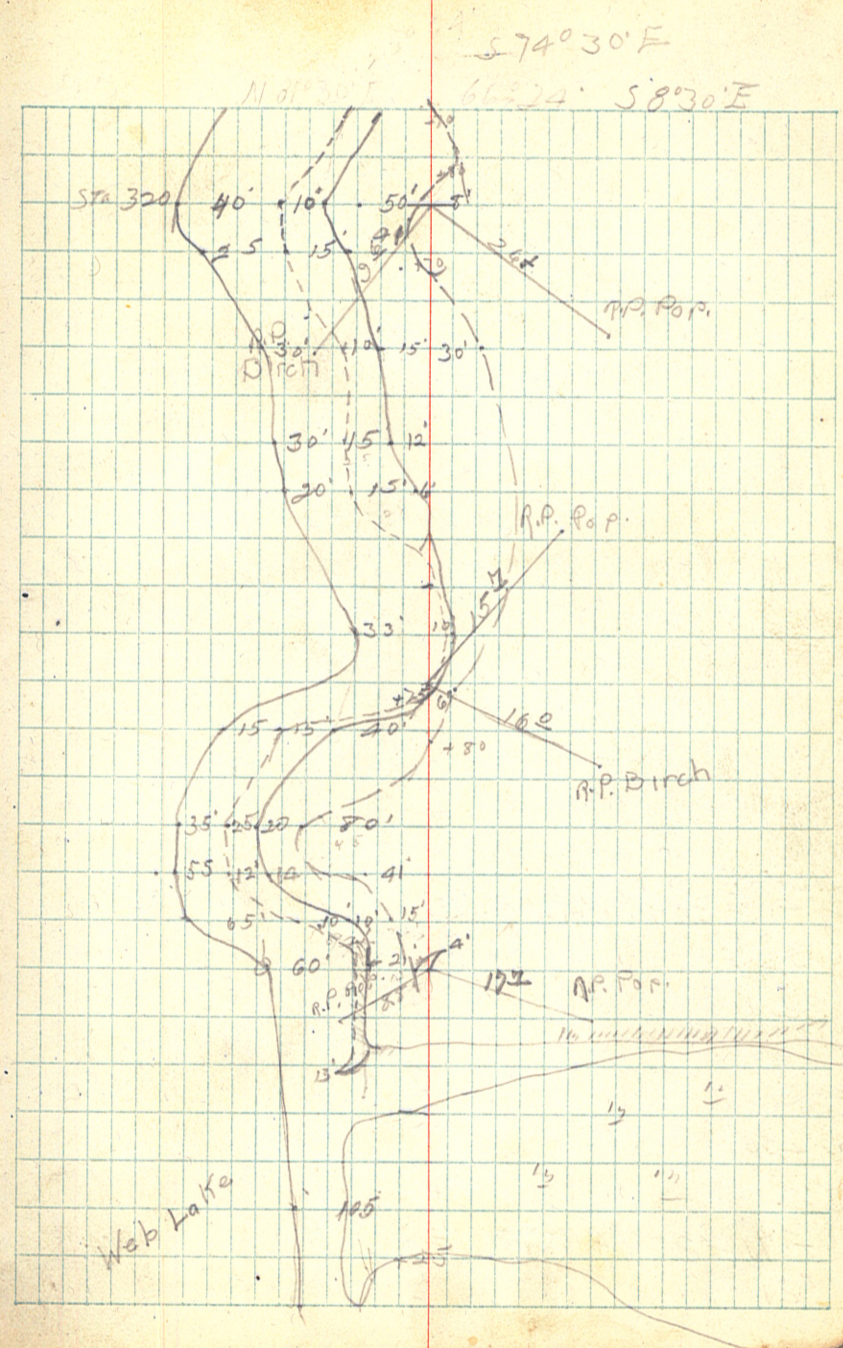
300+26.9
295+60.3
+ 66.6

295+60.3
292+83.5
2 76.8

292+83.5
278+73.2
14 10.3



Sta					
320					
+36.9	P.Q.T.				
319					
318					
317					
316					
315					
314					
+90					Follow edge of bank
+32					
313					
+93.6	42°32' R	N81°30'E			
312					
311			312+93.6 304+76.9		
310			8 16.7		
309			273.1 1089.8		
308					
+14.8	P.Q.T.	N39° E			
307					
306					
+60					
305		N38° E			
+76.9	P.T.	40°30'			
+50		38°05'	48" Pipe Req.		
304		33°35'			



=316+73.8
+14.2 66°24'R. S8°30'E
325
324
+30
323
+50
322
+71.6 23°54'R S74°30'E
321

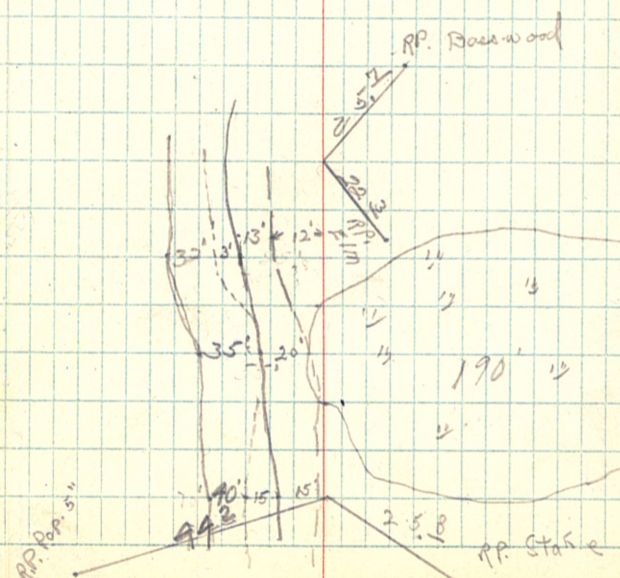
325+14.0
321+71.6
3 42.4

~~325+14.0~~
~~316+73.8~~
~~8 40.2~~

321+71.6
312+93.6
8 78.0

325+14.0
316+73.8
8 40.2

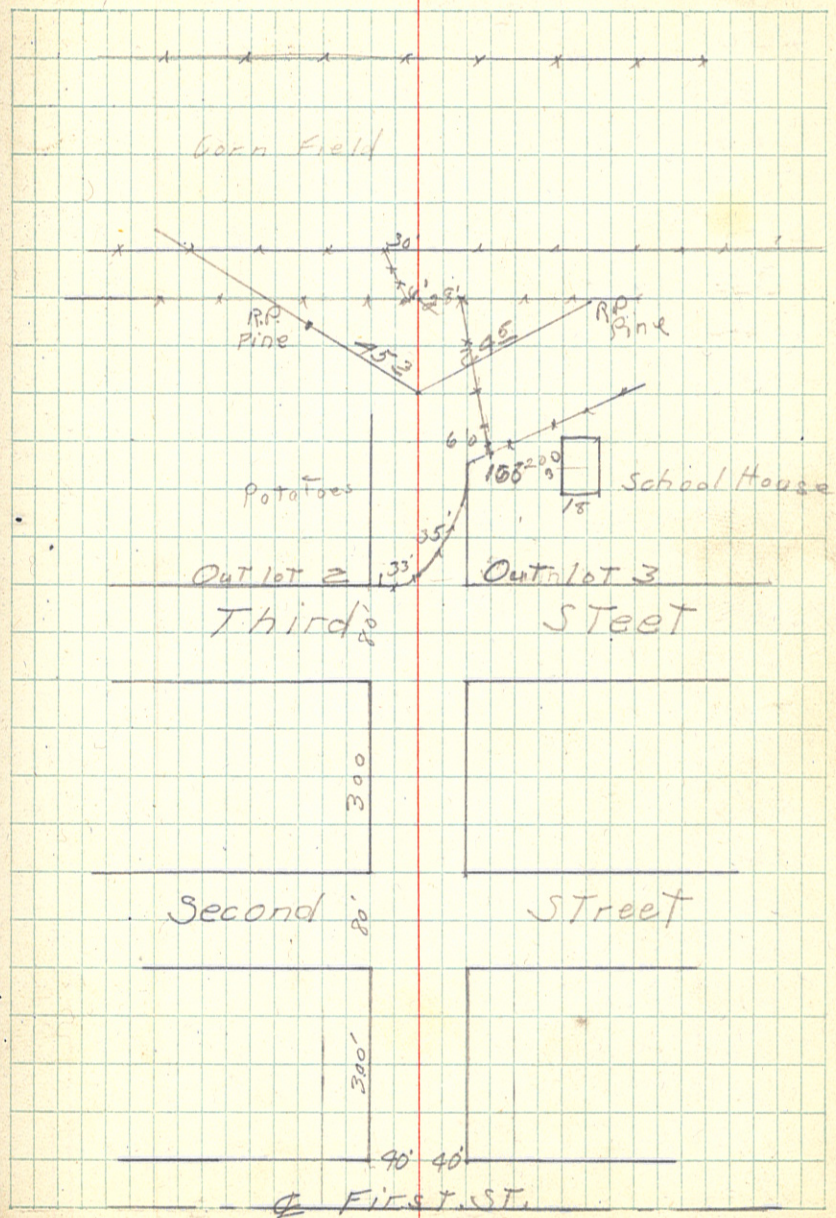
316+73.8
291+80.4
24 93.4



Transit Notes

Sta.	A	Mag. bear.
17		
16		
15		
14		
+93		
+~~48~~		
13		
12	P.O.T.	
11		
10		
9		
8		
+20		
7		
6		
5		
4+20		
4		
3+40		
3		
2		
1		
0+40		
0+00		S86° 30' E

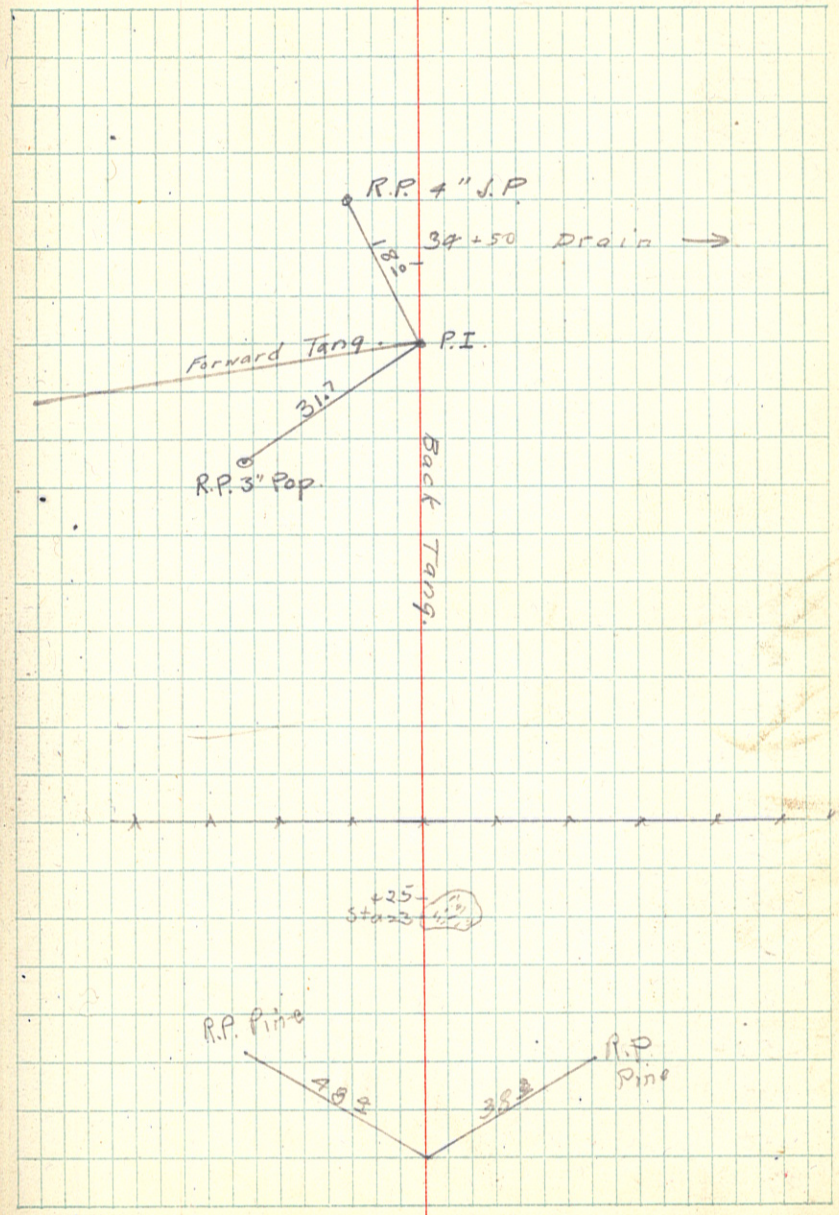
"D" Line Location



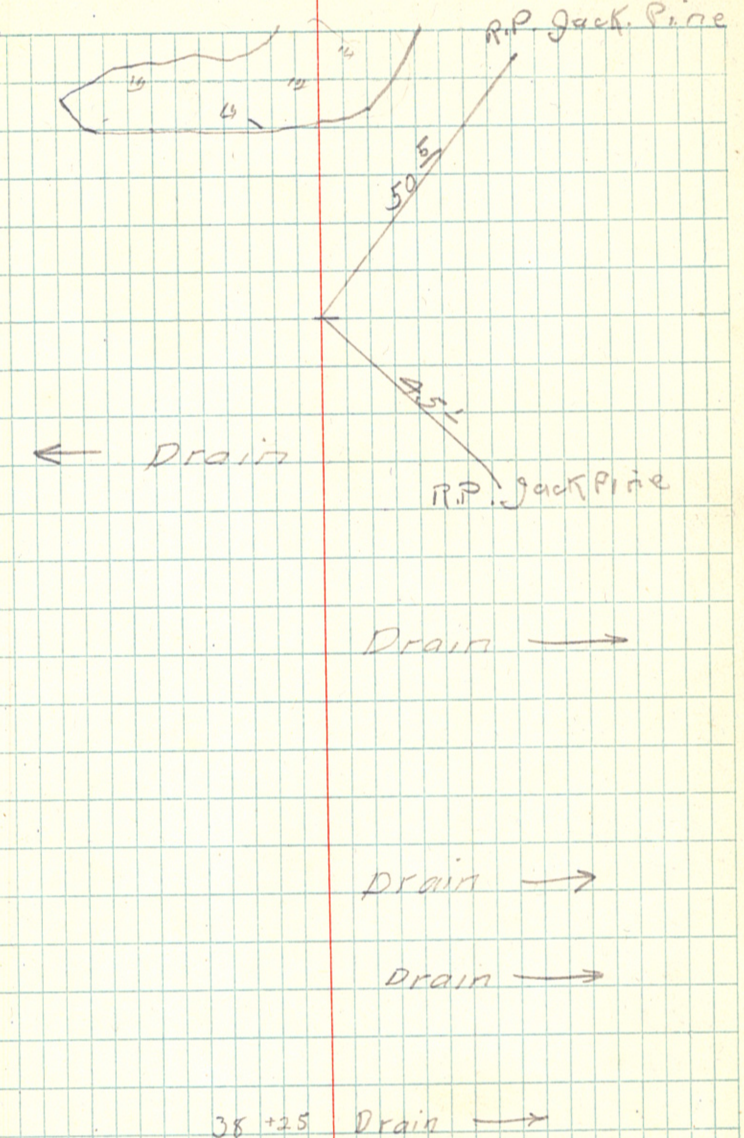
Sta.	Δ	Mag bear
+50	30°29'	
36	25°29'	
+50	20°29'	
35	15°29'	
+50	10°29'	
34	5°29'	
P.C. +45±		
33		
32		
31		
30	P.O.T. S80°40'E	
29		
28		
27		
26		
25		
+09		
24		
23		
22		
21	P.O.T.	
20		
19		
+62.3	P.O.T.	
18		

P.I. 36+94.5
Δ = 101° 01' L.
D. 20° L
T = 349.4
Lc = 505.1

6 x 6



Sta.	Δ	Mag. bear	
54			
53			
+50			End of C & G
52			
51			
+36²	P.O.T.		
50			
49			
+70			
48			
47			
46			
+65			
45			
44			
+35²	P.O.T.	N8°20'W	
43			
42			
41			
40			
39			
P.T. +50²	50°30'30"		
38	45°29'		
+50	40°29		
37			
	35°29'		



88°37' R.

+323 = 32+42° — B line

62

61

60

59

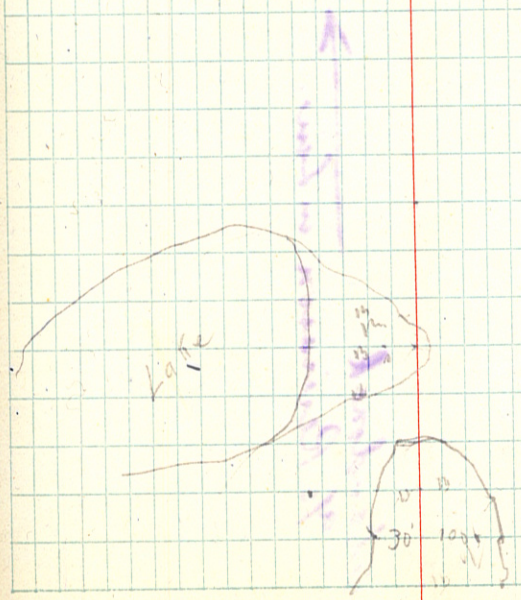
58

57

56

55

62+32.3
38+50.2
23 82.1
3 49.4
27 31.5



Sept. 11.

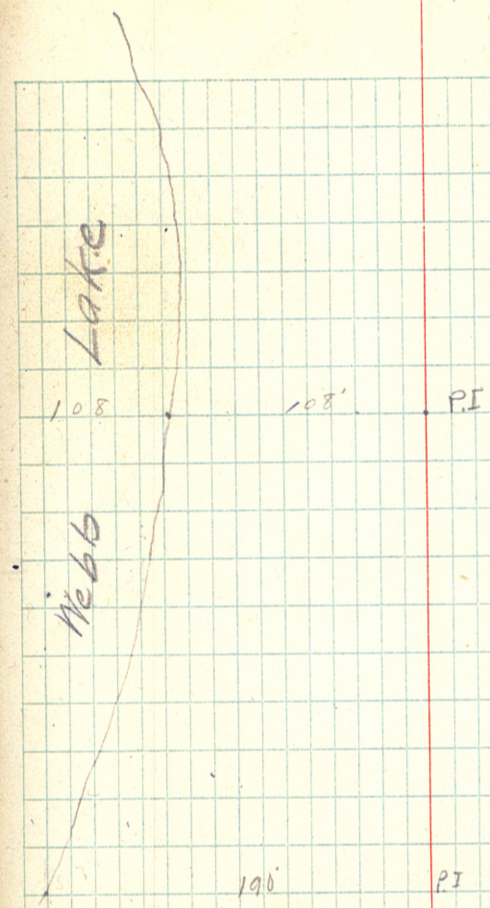
Sta.	Δ	Mag. bear.
334		
333		
332		
+98½	P.T. 18° 33'	S89°30'E
+75	15° 47'	
+50	12° 47'	
+25	9° 47	
331	6° .47'	
+75	3°47'	
+43⁵	P.C.	
330		
329		
+46⁵	P.T.	N53°-30'E 30°-23'
+25		27°19'
328		23°-41'
+75		20°-03
+50		16°-25'
+25		12°-47'
327		9°-9'
+75		5°-31'
+50		1°-53'
+37⁰	P.C.	
326		
325+14⁰	P.O.T.	S65°40'E

~~Standard~~ ~~of Revision in Line~~ →

24°C R
Δ 37°-06'
T = 81.6' 7.2
Lc = 154.6
P.I. = 331+25.1
328+46.5
= 78.6

29°C. L
Δ = 60°46'
T = 117.1
Lc = 209.5
P.I. = 327+54½
325+14
= 40.1

330+43.5
81.6
331+25.1



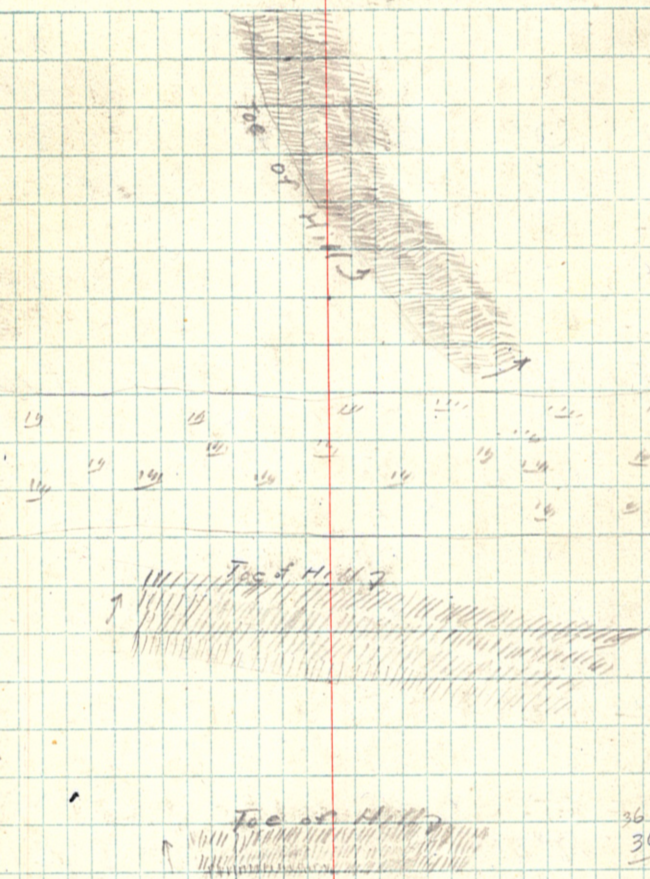
Henry 6+6

330+43.5
81.6
25.1

Sta.	Δ	Mag bear			
355					
354					
353					
352					
351					
350					
349					
348					
+07.5	P.O.T.				
347					
346					
345					
+13.4					
344					
343					
+50.9				1/16 Cor. Sec 18 T140 R29	4' to L of ℄
342					
341					
340			342+50.9 331+98.1 10 52.8	Heavy Gr G	
339					
+98.8	P.O.T.				
338					
337					
336					
335					

Pop. B.T. 35.7' South
Pop. B.T. 41.4 N.W

Sta.	Δ	Mag. bear.	
366			29° C. L
+17.3	P.T.		Δ 36°
	18° 00'		T = 78.2
365	15° 55		Lc = 150'
+75	12° 55		
+50			
	9° 55		P.I. 364+95.5
+25	6° 55		360 09.4
364	3° 55'		+ 361
+67.3	P.C.		leave swamp
363			
362			
+50			enter swamp
+10			
361			28° C
+75			Δ 43° R
+09.4	P.T.	S 46°-45' E	Lc = 153.6'
	21° 30'		T = 81.4'
360	20° 11'		P.I. = 359+37.2
+75	16° 41'		
+50	13° 11'		
+25	9° 41'		
359	6° 11'		359+37.2
+75	2° 41'		342+50.9
+55.8	P.C.		16 86.3
358			
+72.7	P.O.T.	S 89° 30' E	
357			
356			



363+67.3
360+09.4
3 57.9

78.2
357.9
81.4
517.5

Sta.	Δ	Mag bear.	
375			
374			
+42.7	⊙	Brick hub	
373			
P.T.+94.7			
+75			26°C.L.
+50			Δ39-46
+25			T 80.4
372			Lc 152.9
+75			P.I. 372+22.2
+50		N76°-15'E	
P.C.+41.8			372+22.2 369+83.4 2 38.8
371			
+90			
+48.0	P.O.T.		
370			
+83.4	P.T.		
+50	9°30'		8°C
369	8°10'		Δ 19° R
+50	6°10'		T= 120'
368	4°10'	S63°40'E	Lc= 237.5
	2°10'		
+45.0	P.C.		P.I. 368+65.0
+44	P.O.T.		365+17.3 3 48.6
367			
+10			

372+07.4
372+94.7

12.726) 39.766 (152.9
26
137
130
76
52
246
234

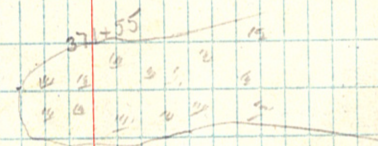
2.4

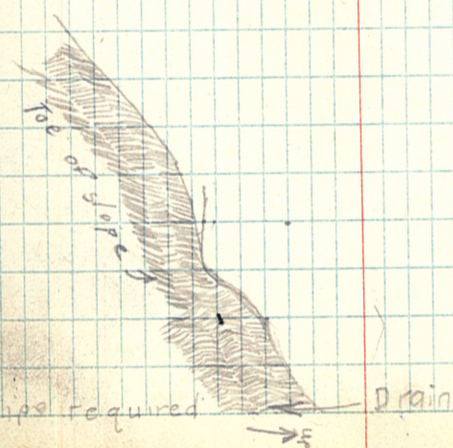
60)46.0(.7
420
40

372+22.2
80.4
371+41.8
1+52.9
372+94.7

371+41.8
369+83.4
1 58.4

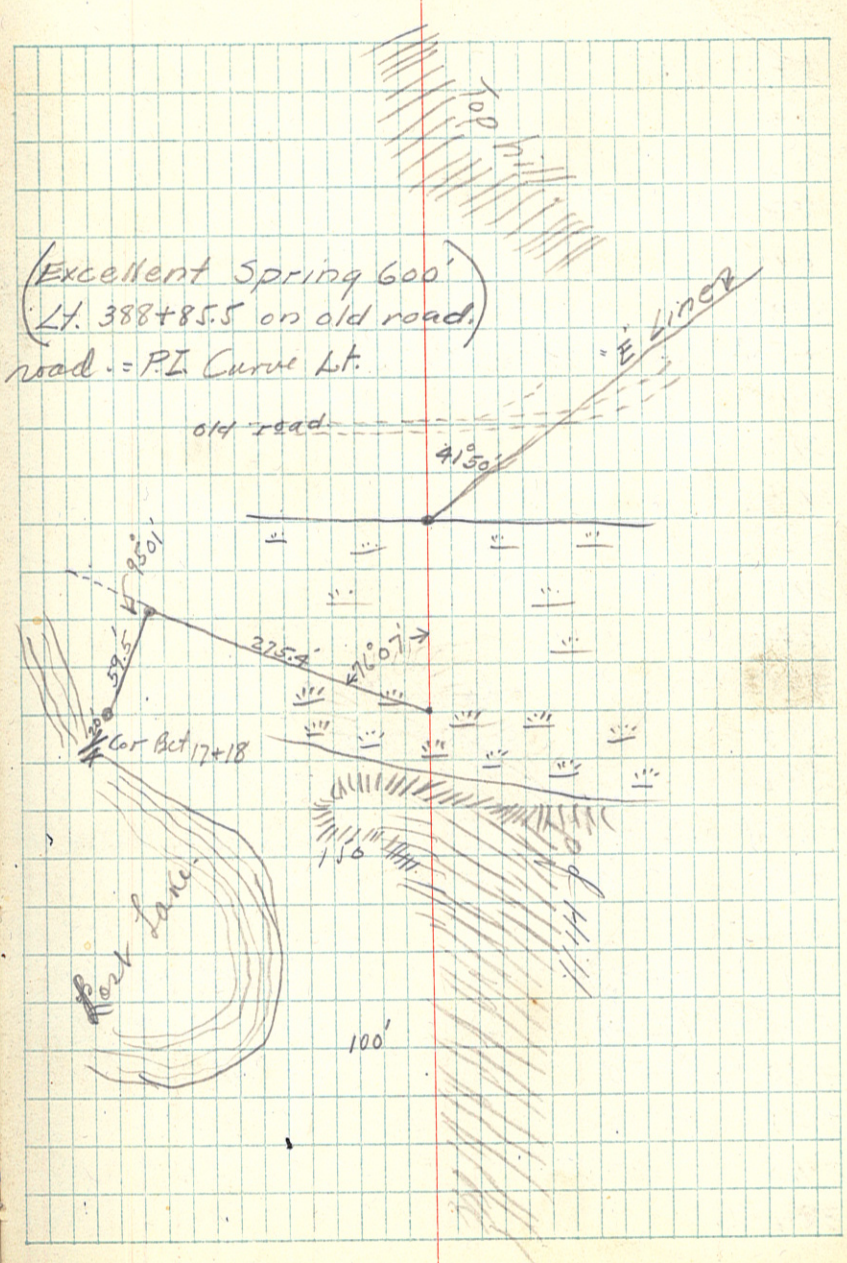
80.4
158.4
120
358.8





DB4 Book 138

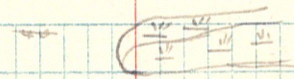
P.T. + 58.1	19°53'		P.I. = 388+85.5
+25	15°35'		Δ = 39°47' L.
389	12°20'		D = 26° L.
+75	9°05'	388+85.5 / 372+94.7 / 15 9°0.8	T = 80.4'
+50	5°50'		L = 153.0
+25	2°35'		Def. 78 per ft.
P.C 388+05.1			
+85.5	△	39°47' L. Brick hub in east edge of road. = P.I. Curve Lt.	
+80			
388			
+57.6	⊙	Birch hub	
387			
386			
385			
+19	⊙	Birch hub	384+19.0 / 372+94.7 / 11+24.3
384			
383			
+13.8	⊙	Birch hub on ridge.	
382			
381			
380			
+67.5	⊙	Stump.	
379			
378			
377			
376			

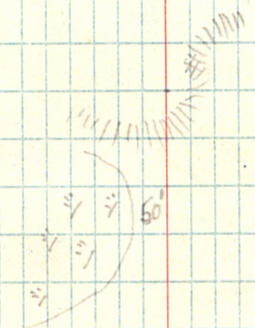


Continued after "E" Alignment

405		
+45.2	⊙	Pop hub
04		
03		
02		
01		
400		
+83.0	⊙	Pop. hub.
399		
398		
397		
396		
395		393+98.4 391+70.9 2 27.5
394		
+98.4	⊙	Intx with "E" Line. = N 89°30'E. Var. 8°30'
393		
392		
P.T+70.9	26°22'	On True 1/4 line.
+50	23°20'	
+25	19°43'	
391	16°05'	P.I. 390+88.0
+75	12°28'	Δ= 52°43' R.
+50	8°50'	D= 29° R.
+25	5°13' ✓	T= 98.9
390	1°35' ✓	Lc= 181.8'
P.C. 389+89.1		

52°43' R   55   (40)





Sta. 395+10.4 E. Line

Horsts chaining.

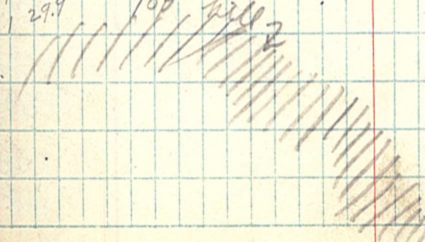
= 735.3' East of 1/4 Cor. between 17+18

20.9
8.7
14.63
16.72
181.83
18.2
3°02
23 20
26°22
52°44'

1°35'
3°38
4°73'
5°13'
3°37
8°50'
3 38
11°88
12°28
3 37
15°65
16°05
3 38
19 43
3 37
22°80
23°20'
3 38
26°58

390+88.0
389+58.1
1 29.9

Top hill



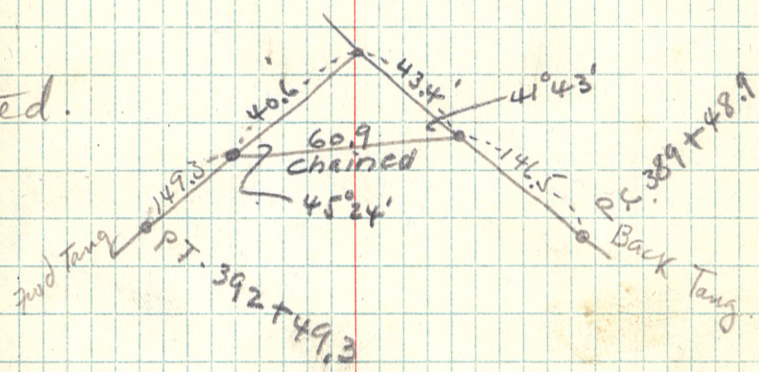
ALIGNMENT "E" Line

next page for Connecting Curve Line.

+10⁴	Δ 58°07'R.		= 393+98.4 Main Line.
395			
394			Δ 87°07'L
393			D = 29° C.L.
P.T.+49³		Curve backed	P.I. = 391+38.8 Computed.
392	7°09'	in from P.T.	T = 1+89.9
+50	14°24'	a/c Porr side	P.C. 389+48.9
391	21°39'	hill location	Lc = 3+00.4
+50	28°54'	of P.C.	P.T. 392+49.3
		Def 7°15' per 50'	
390			
P.C. 389+48.9			

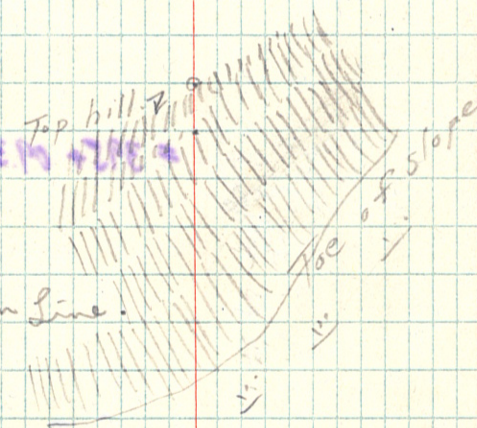
58°07'R

S 62 E
87°07'
41°43
45°24



391+38.8
388+33.6
3 05.2

+56.3	Δ 45°24'L. Pop Hub.		
391			
+95.4	Δ 41°43'L. Poplar Hub		
390		S 62° E. Var. 8°30'	
+98⁶	⊙	Birch hub	
389			Δ 41°50'R.
P.T.+33.6		Curve run	D = 26°R.
388	4°22'	in from P.T.	P.I. 387+57.6 = 387+57.6 Main Line.
+75	7°37'	a/c soft place	T. 84.9
+50	10°52'	at P.C.	P.C. 386+72.7
+25	14°07'		Lc = 1+60.9
387	17°22'		P.T. 388+33.6
386+72.7 P.C.	20°55'		Def 7.8' per ft.



386+72.7
372+94.7
13 78.0

387+57.6
372+94.7
14 62.9

P.T.+99.9	29°04'	= 395+09.3 "A" Line
+75	25°26	Δ 58°07'R
+50	21°49'	D= 29° C.R.
+25	18°12	P.I. 395+10.4
395	14°34'	T. ± 1+10.9
+75	10°57'	P.C. 393+99.5
+50	7°19'	Lc 2+00.4
394+25	3°41'	P.T. 395+99.9
P.C. 393+99.5		

"E" Line

393+98.4
1 10.9
395+09.3

109.78
29) 3183.60
29
283
261
226
203
230

109.8
1.1
110.9

2.0040
29) 58.1167
58
116
116
7

18°14'
3 38
21 52
3 38
24 90
25 30
3 38
28°68
29°08'

3°41'
3 38
6°79
7°19'

3°42'
3°38'
6 80
7°20
3 38
10°58
3 38
13 96
14 36
3 38
17 74
18°14'

21°49
3 38
24 87
25 27
3 37
28 64
29°04

P.T. 454.4	23°25'		
+25	19°09'		P.I. 411+79.4
412	15°32'		Δ = 46°50' L.
+75	11°54'		D = 29°
+50	8°17'		T = 86.5
+25	4°39'		Lc = 161.5
411	1°02'		
P.C. 410+92.9			

Backed up to sta. 411 +79.4
Where I turned on Δ of 46°50' L.

+57.4		Edge Water Cur Lake West side	
417			
416			
415			
414			
+70.9	⊙	Dead Alder Stub.	
413			
412			
411			
410			
409			
408			
407			
+29.8	⊙	Birch Stub.	
406			

417+57.4
393+98.4
23 59.0

411+79.4
393+98.4
17 81.0

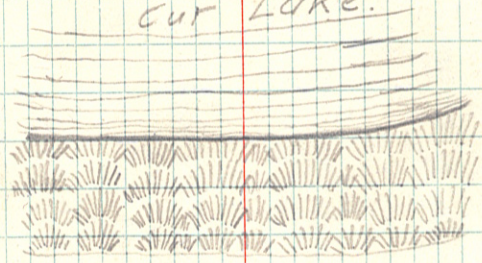
406+29.8
391+70.9
14 58.9
7 35.3
21 94.2

46°50' 413+70.9
391+70.9
22.00
7 35.3
29 35.3

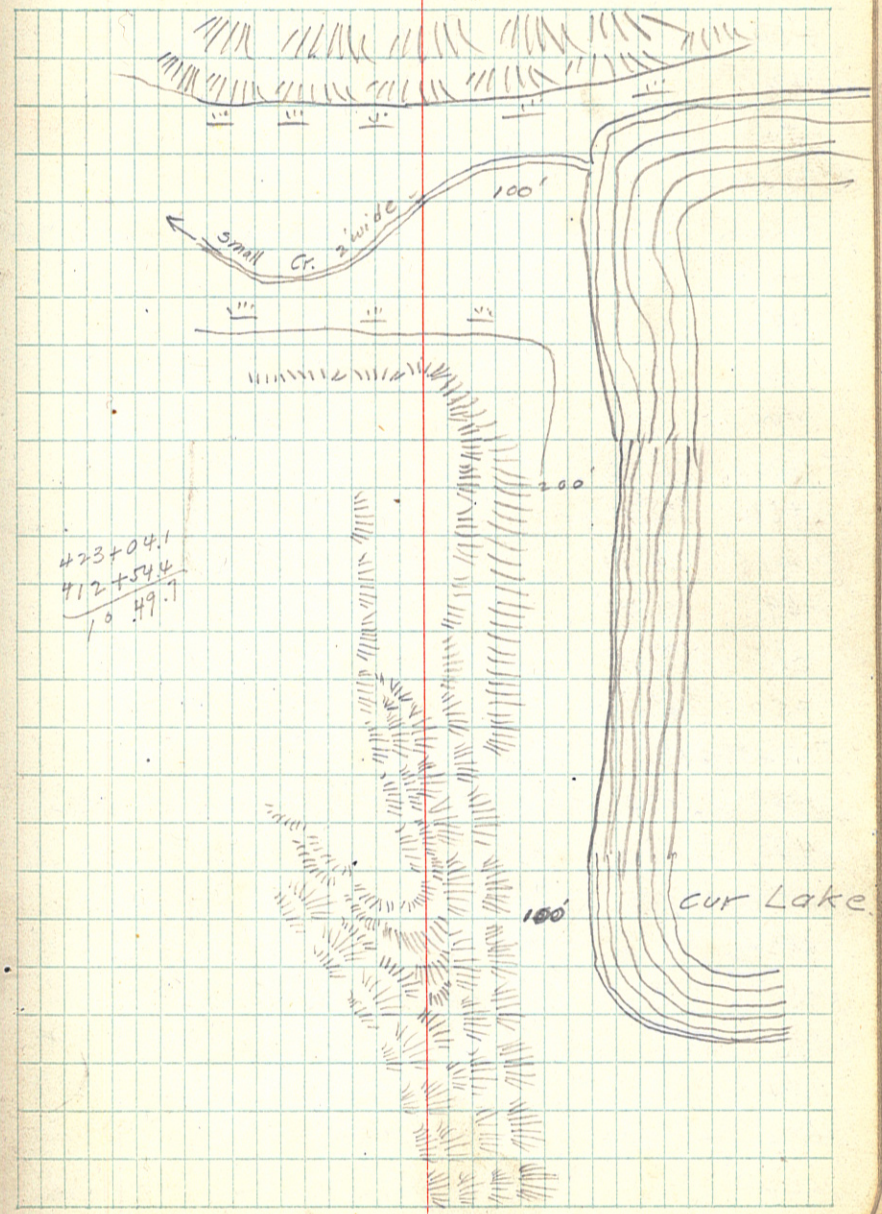
413+70.9
3+86.5
417+57.4

411+79.4
412+27

Cur Lake.



430		
+50		Leave swamp.
429		
+50		
428		
427		
426		enter swamp
425		
P.T. +52.4	29°51'	Basswood hub.
424	25°08'	PI 423+04.1
+50	20°38'	Δ 59°42' R.
423	16°08'	D = 18°C. R.
+50	11°38'	T = 183.4
422	7°08'	L = 331.7
+50	2°38'	Def 5.4' per ft.
P.C. +20.7	18°C. R.	chord length 50.15'
421		
420		
419	⊙	Birch hub. on side Hill.
418		
417		N 42°30' E. Var. 8°30'
416		
415+00	⊙	Poplar hub.
414		
413		

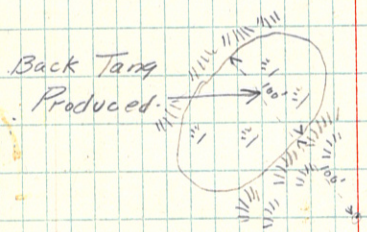


443	19°06'	
+50	21°06'	
442	23°06'	
+50	25°06'	
P.C. 441+00.3		
+26.5	⊙	P.O.S.T. Pop hub 4' sw. Large W. Pine.
443		
442		
441		
440		
P.T. +70.1	20°50'	
+50	18°01'	
+25	14°31'	
439	11°01'	
+75	7°31'	
+50	4°01'	
P.C. 438+21.3		
439	△ 41°40' R.	Backed up + put in curve
438		
437		
436		
+44.5	⊙	Basswood hub.
435		
434		
433		
432		
431		

P.I. 439+00
△ = 41°40' R.
D = 28°
T = 78.7
L = 148.8
Deg per ft: 8.4'
Chord length: 25.23'

439+00.0
424+52.4
14 47.6

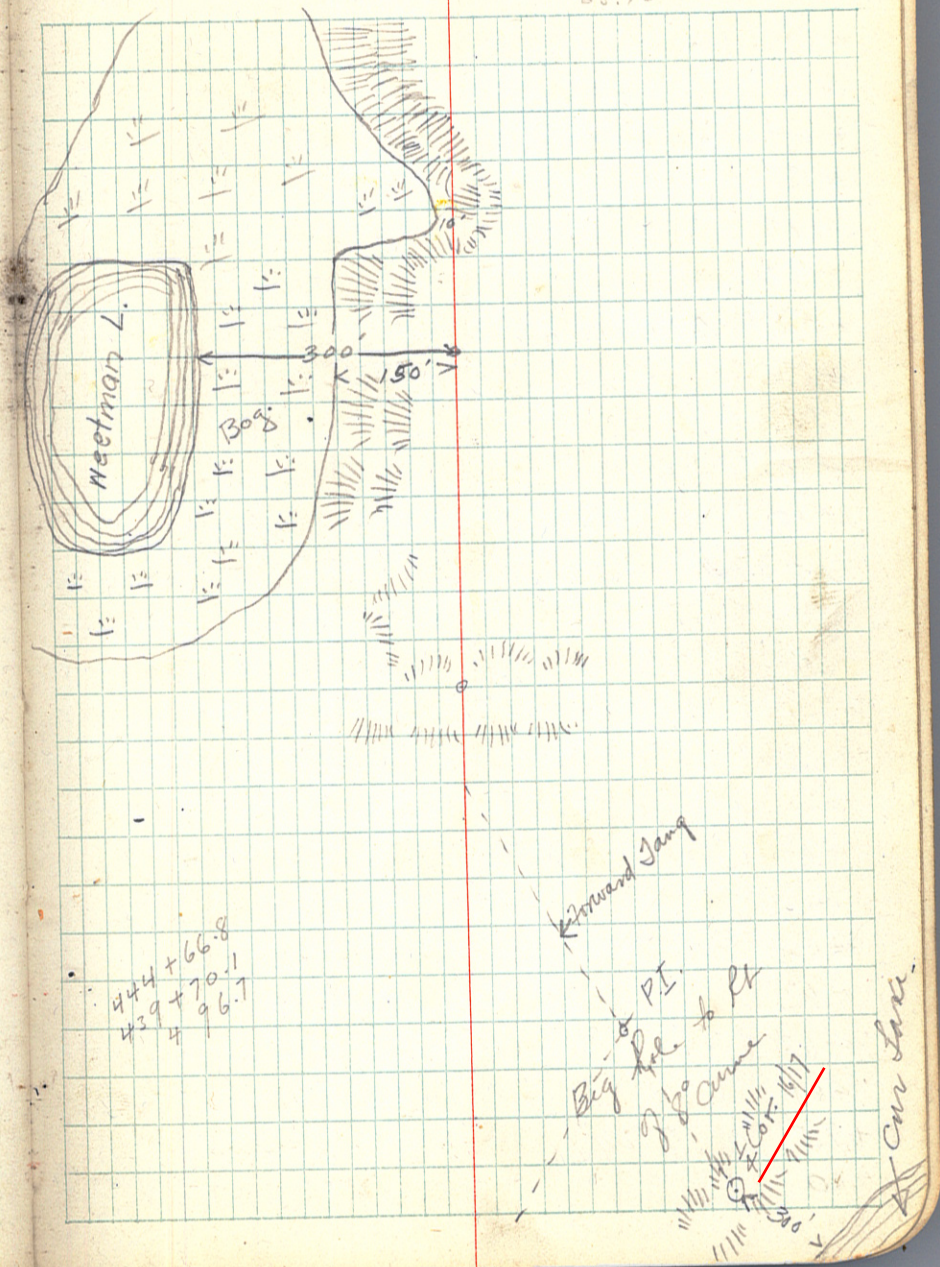
435 +44.5 54° 10' L 41°40' 16.8 (45)



After Turning Sat 439 I went to ¼ stake between Sec. 17+16 which sets on East side of Cur Lake and using Var 8°30' started a line east at N 89°45' E. for the ¼ of Sec. 16. This Intersected our line at sta. 444+66.8. Cor. is a fresh pop. stake set by Horst. Def. ∠ at Intx = 54°10' L.
Cor. sets west of P.I. in line with Forward Tang. 14Gr2'

460			
459			
458		Top slope	
457			
456			
455	⊙	Pop. hub. near large W. Pine	
454			
453			
452			
451			
450	△	17°00' R. 573° E.	8° C. R Ext. 8' approx Tan. 107 "
449		450+00.0 447+77.4 22.6	
+29.5	⊙	Pop. hub. on ridge.	
448			
P.T. +77.4		Bass wood Hub	
+50	1°06'	curve backed in a/c	
447	3°06'	good observation from P.T.	
+50	5°06'		
446	7°06'		
+50	9°06'		
445	11°06'		
+50	13°06'		
444	15°06'		
+50	17°06'		

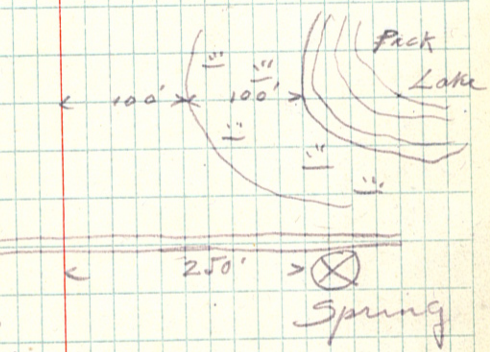
P.I. 444+66.8
Δ 54°10' L
D = 8° C. L
Ext. ~~88~~ (approx)
T. 366.5'
L = 677.1
Def. per pt. = 2.4'
Chord length = 50.03'
2°00' per 50'



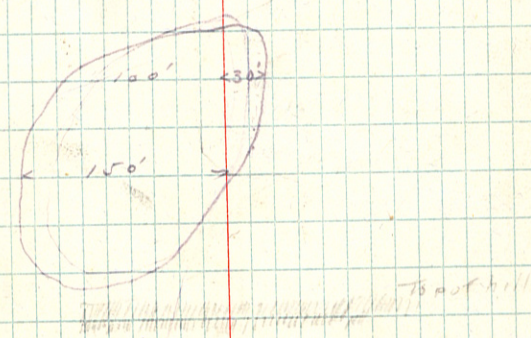
472 + 58.9 Δ 9°50' R
+75 + 44.5 Δ 55°14' R E 37'

478
477
476
+44.5 Δ 55°14' R. Ext. = 37'
475 — 475+44.5 / 472+58.9 / 2 85.6
474
473
+58.9 Δ 9°50' R
472 — 472+58.9 / 469+25.7 / 3 33.2 — E=37.0'
471
470 — 4°C L
+40 — Δ 12°30'
+25.7 Δ 12°30' L N 87°30' E — T = 156.9
469 — Lc = 312.5
468 — 469+25.7 / 460+75 / 8 50.7
+15
467
466
+10
465
464
463
462
461
+75 Δ 7°00' L. — 2°C. L. / E. 5.3 / T. 175 (approx)
460

Borrow Pit

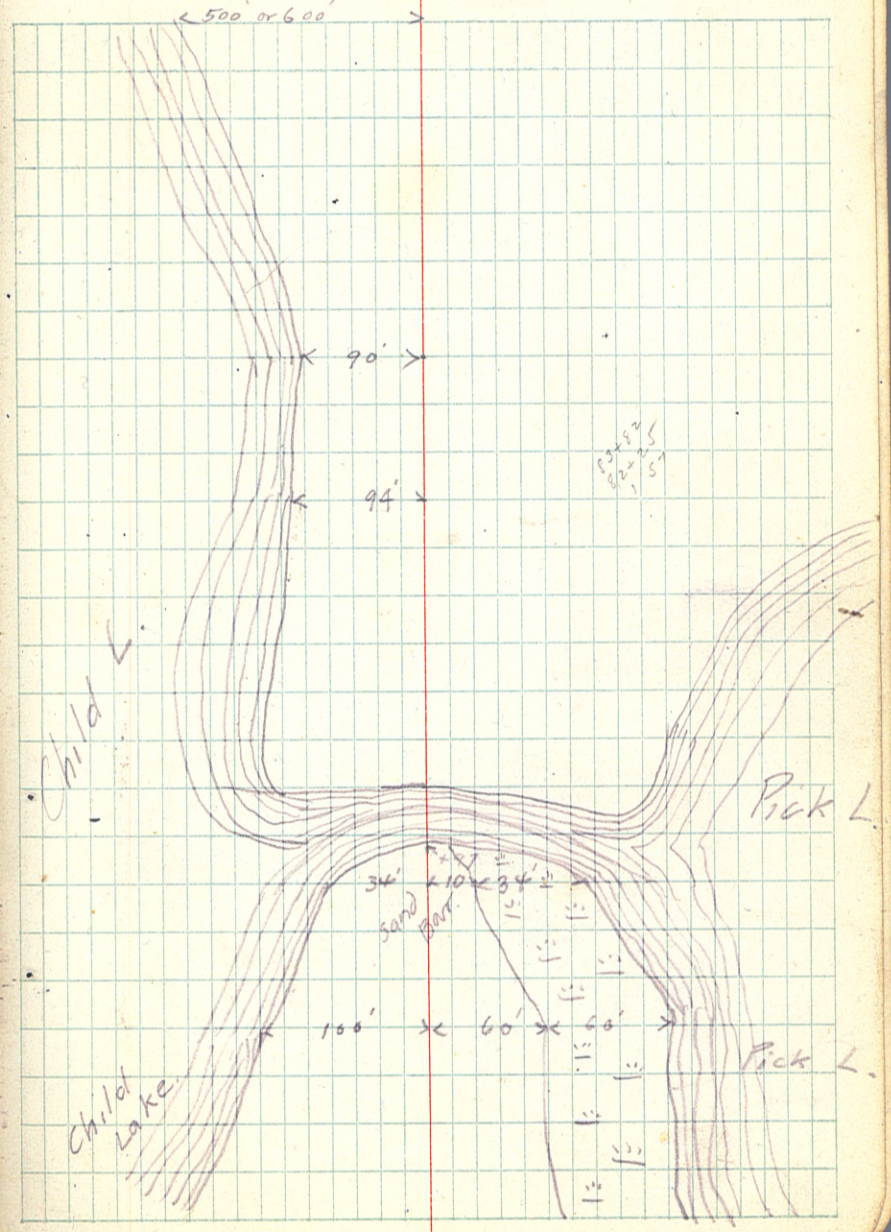


allow 500 c.y. here for grading Co. Road to Highway King grade.



498
497
496
495
494
493
492
+50.5 ⊙ Old Pop hub. N82°E Var 8°30'
491
490
489
488
+77.5 △ 43°27' L. } double Ditx for Curve.
487
+32.5 △ 45°29' L. Pop hub on Sand Knoll.
486
+70 486+32.5
485 483+81.8
250.7
484
+81.8 △ 18°30' R.
483
+25 ⊙ Basswood hub squared.
482
481 483+81.8
480 475+445
8 37
479

487+77.5
486+32.5
1 45.0



500+17.3

+49.2 Δ 65° 40' R 538° E.

516

515

514

516+49.2
510+80.6
5 68.7

513

512

511

+80.5 Δ 48°10' R. N 76°15' E ✓

510+80.5
509+17.6
1 62.9

510

+17.6 30°-04 R N25°20'E ✓

509+18
507+55
1 63

509

508

+55.1 24°-45' L N1°30'W ✓

507+55
506+11
1 44

507

+11.2 94°34' L N22°50'E ✓

506+11
504+22
1 89

506

505

+21.7 6°-52' R N47°30'E ✓

504+22
502+69
1 53

504

503

+69.3 5°-02' R N42°-30'E ✓

502+69.3
499+02.5
3 66.8

502

501

~~+113~~ ~~Δ~~

500 ~~+02.5~~ ~~47°-1~~ N35°-30'E

+99

499+02.5
487+77.5
11 25.0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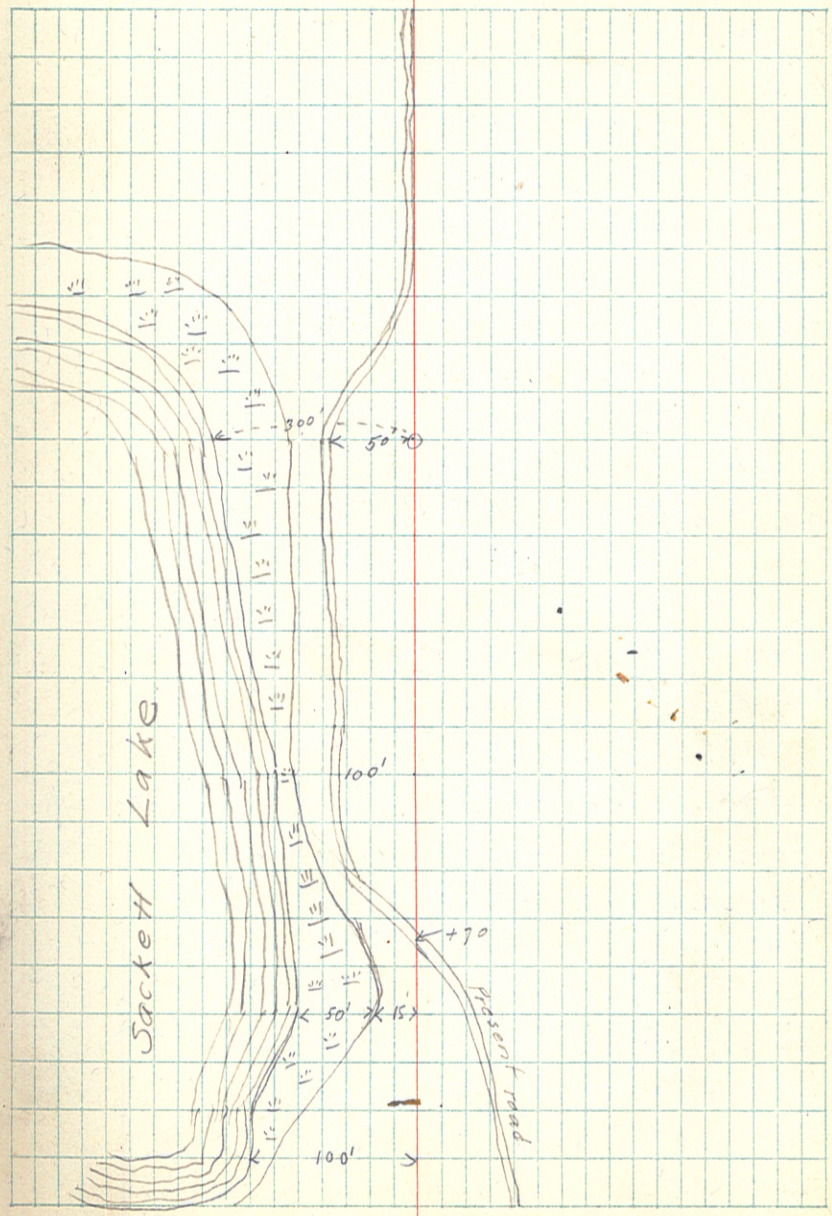
INSURANCE
ARVID STARK, Agent
Walker, Minn.

+21 ⊙
538
537
536
535
534
533
532
531
+39.2 △ 38°00' L. N65°45'E. Pop Hub.
530
529
528
527
526
525
524
523
+31.8 △ 38°30' L. V S76°10'E.
522
521
+50
520
519
518
517

530+39.2
522+31.8
8 07.4

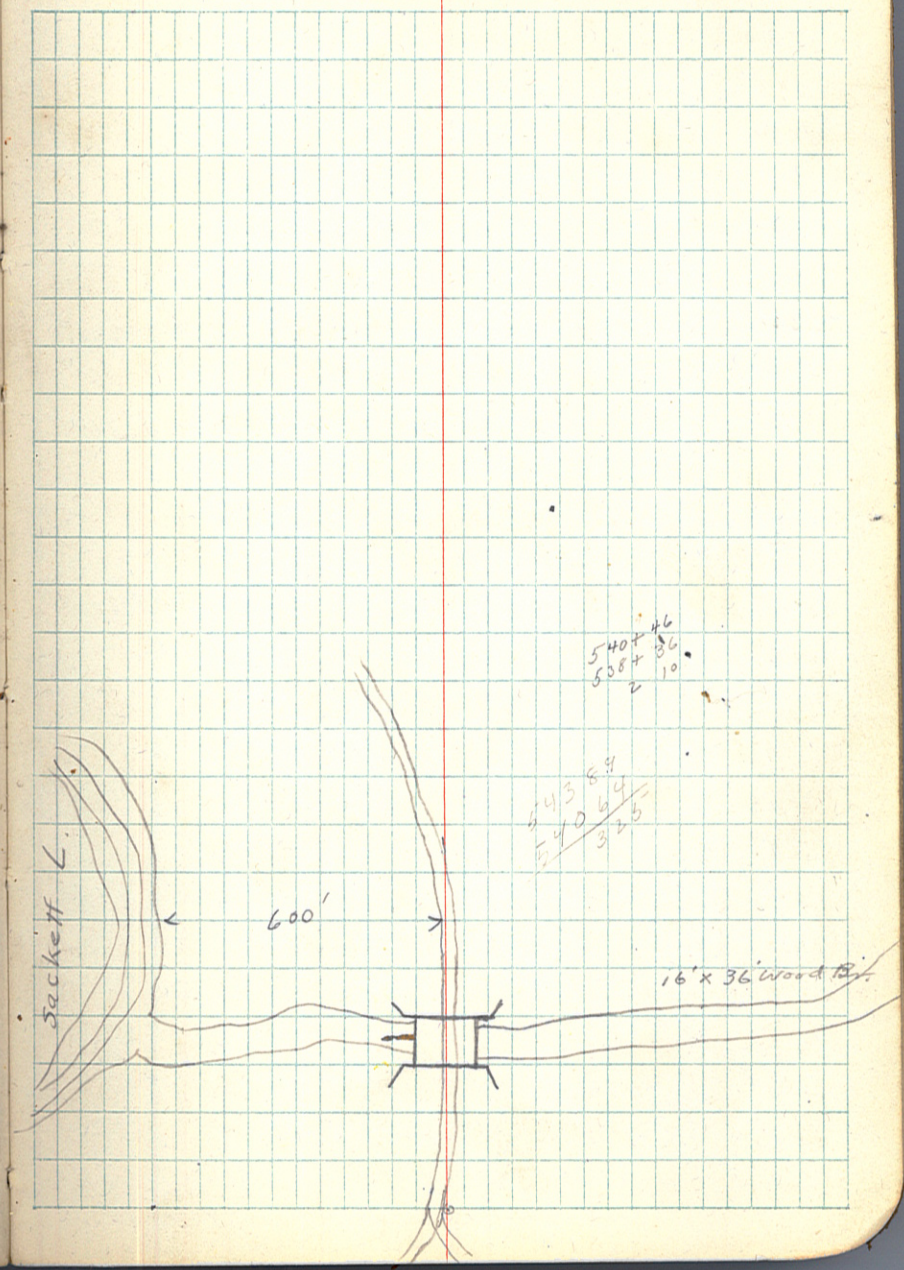
522+31.8
516+49.2
5 82.6



558
557
556
+34.1 ⊙ Pop hub.
555
554
553
552
551
407.6 ⊙ Barn wood Hub
550
549
548
547
546
545
544
+89.4 △ 6°45' R. n 36°30' E. Var 8°30'
543
542
541
+64
+28
540
539
+36½ △ - 35°47' L. N 29° 45' E.

543+89.4
538+36.1
5 53.3

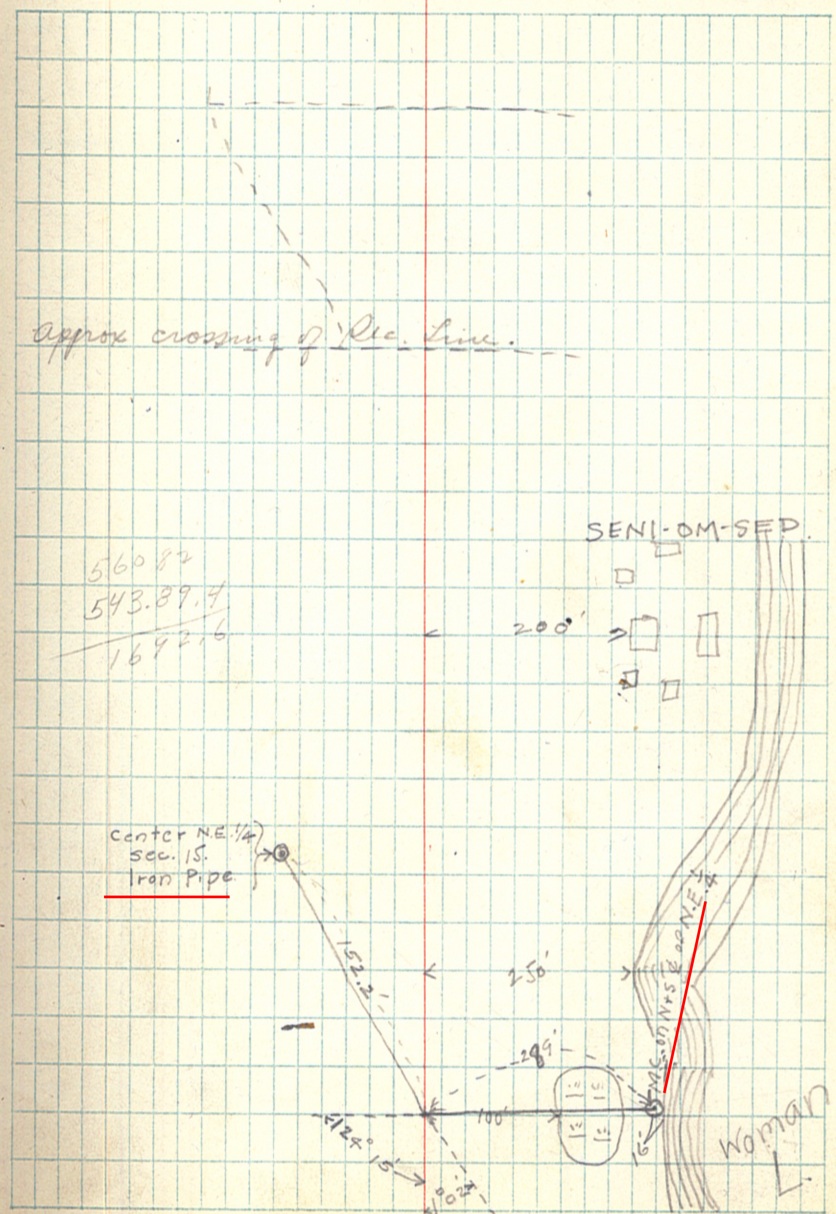
538+36.1
530+39.2
7 96.9



120.0
30.9
89.1

581		
580		
579	⊙	Birch hub in old Trail.
578		
577		
576		
575		
+89½	⊙	Birch hub in old N+S trail.
574		
573		N 79°30' E Var 8°30'
572		
571		
570		
+67	⊙	Pop. Hub — 574+89 / 560+82 / 14 07
569		
568		569+67 / 560+82 / 8 85
567		
566		
565		
564		
563	⊙	N.P. Hub
562		
561		
+82	△	43°20 R.
560		560+82.0 / 543+89.4 / 16 92.6
559		

N 36°30' E
43 00
N 79 50 E



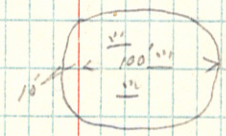
602
601
600
+26.3 ⊙ Pop Hub to eliminate 2 small ⊡ ahead.
599
+22.5 △ 68°26'∠(68°38'4) . N19°W. Var. 8°30'
598
597
596
595
594 △ 30°00'∠. Pop hub
593
592
+50
591
590
589
588
587 △ 0°10'∠.
586
585
584
+57.4 ⊙ Pop Hub
583
+33.6 ⊙ Pop Hub.
582

587+00.0
560+87
26 18

601
590
7

6 400

Woman Lake = 1100' East of 594 on back Traverse produced.



99	1' Muck	3' Clay	Blue Clay & Gravel at 4'
100	8' Muck	4' Clay	" at 12'
101	5' Muck	11' Clay	
101+46	40' Muck		No. Bot
102+46	26' Muck	14' Clay	No. Bot.
102+885	6' Muck	6' Clay	
104	22' Muck	5' Clay	Gravel at 27'
104+788	24 Muck	16' Clay	No. bot
106	6' "		Gra. at. 6'
107	6' "	2' Clay.	
108	5' "	8' Clay	
109	5' "	5' Clay	
+67	1' "	1 Loose Sand	Com. Gra. at 2'
113+20	1.5' Peat	2.5' Clay	Com. Clay at 4'
113+60	3' "	2' Loose Sand	Com. " at 6' (Blue)
114	2' "	3' Clay	" Sand at 5'
+20	1' "	1' "	Gravel at 2'
116	2' Muck	1' Clay	Com. Sand. 3'
117	7' Muck	5' "	" " at 12'
118	4' "	2' Clay	" " at 6'
119	6' "	12' Clay	Blue. Clay 18'
120	5' "	10' Clay	" " at 15'
121	4' "	9' "	Com. Sand at 13'
122	4' "	4' "	Gra. at 8'
+60	2' "		" " 2'

124+30	3' Muck	Com. Sand at 3'
+55	2' "	" " at 2'
125	1.5' "	" " at 2'

C-Line

Sta. 304+20	8'	loose sand, Gravel at 8'
Sta. 304+50	13'	" " Gravel at 13'
322+30	3' Muck	Gravel at 3'
323	3' "	" "
323+40	2' "	" "
277+30	1' Peat 2' Black loam	Com. Sand at 3'
279	3' Peat	Com. Sand at 3'
278+75 = 15'L	3' Peat 2' Clay	Com Sand at 3'
272+50	1' muck	Gravel at 2'
272	2' "	" "
271	4' "	" "
270+25	2' "	" "
261+50	4' "	Comp. Sand
261	4' "	" "
260+35	1' "	" "
255	15' "	

Soundings "D" Line

53	3' Muck To Gravel
+50	4' " " "
54	3' " " "
55	1' " " "
56	6' " " "
57	2' " " "
58	

B line

29+78	1' Muck 2' Loose Sand Gravel at 3'
29	6' " 3' " " " " 9'
27	6' " 2' ~~Blue~~ Clay " " 8'
25	7' " 7' Soft "
23	3' " " " 3'
21	6' " " " 6'
19	10' " 6' Soft Clay.
17	6' " 1' " " " " 7'
15	1' " 4' Loose Sand " " 5'

Revised line

66	1' Muck 3' Clay Gravel at 4.

Original line

88+50	3' Muck To Gra.
89	6' " " "
90	8' " " "
+50	2' " " "

℄

276
1.5 Peat
Gravel

275
7' Muck
3' Comp. Sand
10' ± gray

274
15' Muck
12.5 FT. Clay
Blue Clay
30'

D5L	D4L	D3L	D2L	D1L	C/L	D1R	D2R	D3R	D4R	D5R
10' Muck 5' Sand 14.5 FT. Clay ?	19' Muck 10.5 FT Clay ?	17' Muck 10' Soft Clay 30' ± Blue Clay	20' Muck 6' Soft Clay Blue Clay 25'	20' Muck 8' Soft Clay Blue Clay Coarse Sand 28'	28' Muck 3' Sand Blue Clay + C. Sand 25'	24' Muck 4' Soft clay Blue clay 28'	25' Muck 4' Soft Clay. Blue Clay 29'	25' Muck 7' Sand Clay 32' Blue Clay	16' Muck 9 Soft Clay 25' Gravel	19' Muck 6' Soft Clay 19' To Gravel

272
12' Muck
2' Sand
2' Soft Clay
Blue Clay
17'

271
5' Muck
2' Sand
1' ± Gravel

270+95
4' Peat
Blue Clay

℄

L R

276 G

275 F

274 E

273 D

272 C

271 B

270+95 A

Gravel Pits

Sta. 13
72

+ 76 ⊙
610
609
+ 56+ Δ 0°10' L. (Eliminated in office on plans. Brick Hub
608
607
606
605
604
+ 86.3 Δ 0°15' L. (Eliminated in office on plans.
603

608+86.4
603+86.3
+ 70.1

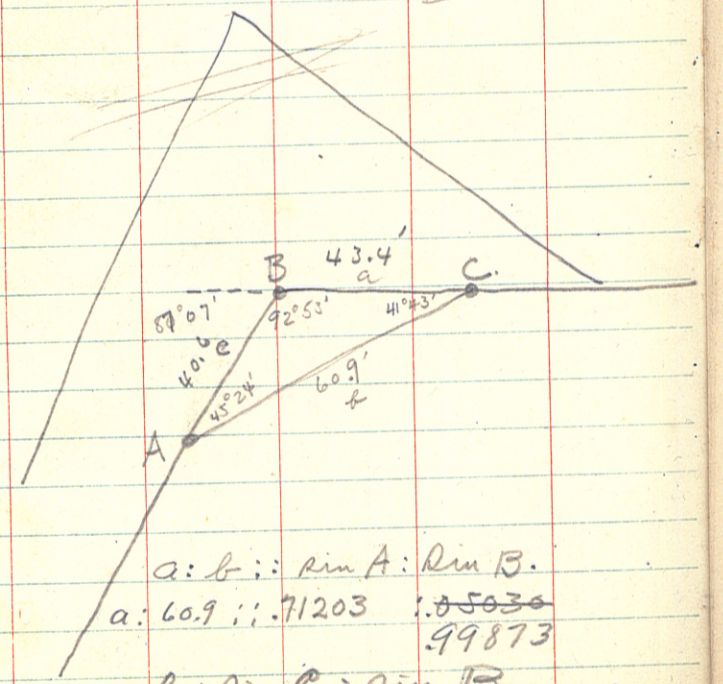
608+86.3
598+22.5
563.8

Expenses

1 pail	.35
1 cup	.10
Spikes	.15
Tacks	.10
candles	.10
2 Axehandles	.30
	1.70

391+56.3
390+95.4
60.9

179 6°
87°07'
92°53'



a : b :: Sin A : Sin B.
a : 60.9 :: .71203 : .99873
c : b : Sin C : Sin B.
c : b : .66545 : .99873

KEITH'S RAILROAD CURVE TABLES.

Published by KEUFFEL & ESSER CO., New York.

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HOW TO USE KEITH'S TABLES.

EXAMPLE.

Wanted a Curve with an Ext. of about 12 ft. Angle of Intersection or I. P. = 23° 20′ to the R. at Station 542+72.

Ext. in Tab. IV opposite 23° 20′ = 120.87
120.87 ÷ 12 = 10.07. Say a 10° Curve.

Tan. in Tab. IV opp. 23° 20′ = 1183.1
1183.1 ÷ 10 = 118.31.

Tab. V correction for A. 23° 20′ for a 10° Cur. = 0.16
118.31 + 0.16 = 118.47 = corrected Tangent.

(If corrected Ext. is required find in same way)
Ang. 23° 20′ = 23.33° ÷ 10 = 2.3333 = L. C.

2° 19½′ = def. for sta.	542	I. P. = sta.	542+72
4° 49½′ = " " "	+50	Tan. =	1.18.47
7° 19½′ = " " "	543	B. C. = sta.	541+53.53
9° 49½′ = " " "	+50	L. C. =	2.33.33
11° 40′ = " " "	543+	E. C. = Sta.	543+86.86
	86.86		

100 − 53.53 = 46.47 × 3′ (def. for 1 ft. of 10° Cur.) = 139.41′ = 2° 19½″ = def. for sta. 542.

Def. for 50 ft. = 2° 30′ for a 10° Curve.

Def. for 36.86 ft. = 1° 50½′ for a 10° Curve.

(These tables are published in Field Books of KEUFFEL & ESSER Co., New York, N. Y.)

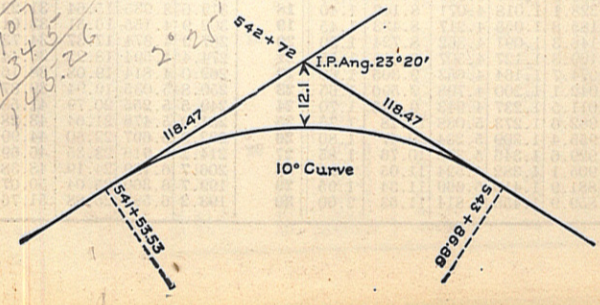


TABLE IV. — Tangents and Externals to a 1° Curve.

Angle	Tangent	External	Angle	Tangent	External	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.

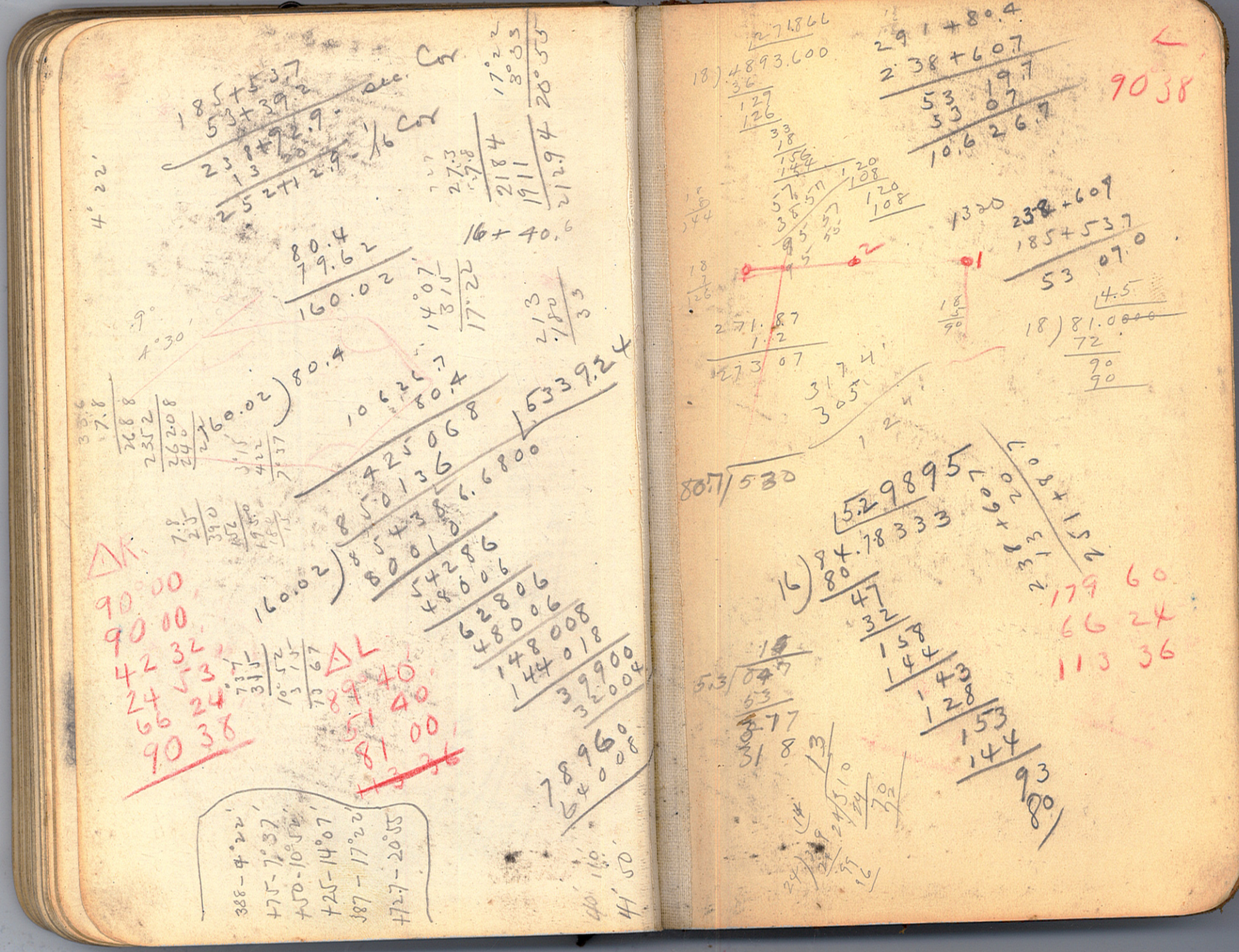
Angle	Tangent	External	Angle	Tangent	External	Angle	Tangent	External
61°	3375.0	920.2	71°	4086.9	1308.2	81°	4893.6	1805.3
10′	3386.3	925.9	10′	4099.5	1315.6	10′	4908.0	1814.7
20	3397.5	931.6	20	4112.1	1322.9	20	4922.5	1824.1
30	3408.8	937.3	30	4124.8	1330.3	30	4937.0	1833.6
40	3420.1	943.1	40	4137.4	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

Natural Tangents.

Deg.	0′	10′	20′	30′	40′	50′	Deg.	Deg.	0′	10′	20′	30′	40′	50′	Deg.
0	0000	0029	0058	0087	0116	0145	89	40	8391	8441	8491	8541	8591	8642	49
1	0175	0204	0233	0262	0291	0320	88	41	8693	8744	8796	8847	8899	8952	48
2	0349	0378	0407	0437	0466	0495	87	42	9004	9057	9110	9163	9217	9271	47
3	0524	0553	0582	0612	0641	0670	86	43	9325	9380	9435	9490	9545	9601	46
4	0699	0729	0758	0787	0816	0846	85	44	9657	9713	9770	9827	9884	9942	45
5	0875	0904	0934	0963	0992	1022	84	45	1.0000	1.0058	1.0117	1.0176	1.0235	1.0295	44
6	1051	1080	1110	1139	1169	1198	83	46	1.0355	1.0416	1.0477	1.0533	1.0599	1.0661	43
7	1228	1257	1287	1317	1346	1376	82	47	1.0724	1.0786	1.0850	1.0913	1.0977	1.1041	42
8	1405	1435	1465	1495	1524	1554	81	48	1.1106	1.1171	1.1237	1.1303	1.1369	1.1436	41
9	1584	1614	1644	1673	1703	1733	80	49	1.1504	1.1571	1.1640	1.1708	1.1778	1.1847	40
10	1763	1793	1823	1853	1883	1914	79	50	1.1918	1.1988	1.2059	1.2131	1.2203	1.2276	39
11	1944	1974	2004	2035	2065	2095	78	51	1.2349	1.2423	1.2497	1.2572	1.2647	1.2723	38
12	2126	2156	2186	2217	2247	2278	77	52	1.2799	1.2876	1.2954	1.3032	1.3111	1.3190	37
13	2309	2339	2370	2401	2432	2462	76	53	1.3270	1.3351	1.3432	1.3514	1.3597	1.3680	36
14	2493	2524	2555	2586	2617	2648	75	54	1.3764	1.3848	1.3934	1.4019	1.4106	1.4193	35
15	2679	2711	2742	2773	2805	2836	74	55	1.4281	1.4370	1.4460	1.4550	1.4641	1.4733	34
16	2867	2899	2931	2962	2994	3026	73	56	1.4826	1.4919	1.5013	1.5108	1.5204	1.5301	33
17	3057	3089	3121	3153	3185	3217	72	57	1.5399	1.5497	1.5597	1.5697	1.5798	1.5900	32
18	3249	3281	3314	3346	3378	3411	71	58	1.6003	1.6107	1.6212	1.6319	1.6426	1.6534	31
19	3443	3476	3508	3541	3574	3607	70	59	1.6643	1.6753	1.6864	1.6977	1.7090	1.7205	30
20	3640	3673	3706	3739	3772	3805	69	60	1.7321	1.7437	1.7556	1.7675	1.7797	1.7917	29
21	3839	3872	3906	3939	3973	4006	68	61	1.8040	1.8165	1.8291	1.8418	1.8546	1.8676	28
22	4040	4074	4108	4142	4176	4210	67	62	1.8807	1.8940	1.9074	1.9210	1.9347	1.9486	27
23	4245	4279	4314	4348	4383	4417	66	63	1.9626	1.9768	1.9912	2.0057	2.0204	2.0353	26
24	4452	4487	4522	4557	4592	4628	65	64	2.0503	2.0655	2.0809	2.0965	2.1123	2.1283	25
25	4663	4699	4734	4770	4806	4841	64	65	2.1445	2.1609	2.1775	2.1943	2.2113	2.2286	24
26	4877	4913	4950	4986	5022	5059	63	66	2.2460	2.2637	2.2817	2.2998	2.3183	2.3369	23
27	5095	5132	5169	5206	5243	5280	62	67	2.3559	2.3750	2.3945	2.4142	2.4342	2.4545	22
28	5317	5354	5392	5430	5467	5505	61	68	2.4751	2.4960	2.5172	2.5386	2.5605	2.5826	21
29	5543	5581	5619	5658	5696	5735	60	69	2.6051	2.6279	2.6511	2.6746	2.6985	2.7228	20
30	5774	5812	5851	5890	5930	5969	59	70	2.7475	2.7725	2.7980	2.8239	2.8502	2.8770	19
31	6009	6048	6088	6128	6168	6208	58	71	2.9042	2.9319	2.9600	2.9887	3.0178	3.0475	18
32	6249	6289	6330	6371	6412	6453	57	72	3.0777	3.1084	3.1397	3.1716	3.2041	3.2371	17
33	6494	6536	6577	6619	6661	6703	56	73	3.2709	3.3052	3.3402	3.3759	3.4124	3.4495	16
34	6745	6787	6830	6873	6916	6959	55	74	3.4874	3.5261	3.5656	3.6059	3.6470	3.6891	15
35	7002	7046	7089	7133	7177	7221	54	75	3.7321	3.7760	3.8208	3.8657	3.9136	3.9617	14
36	7265	7310	7355	7400	7445	7490	53	76	4.0108	4.0611	4.1126	4.1653	4.2193	4.2747	13
37	7536	7581	7627	7673	7720	7766	52	77	4.3315	4.3897	4.4494	4.5107	4.5736	4.6382	12
38	7813	7860	7907	7954	8002	8050	51	78	4.7046	4.7729	4.8430	4.9152	4.9894	5.0658	11
39	8098	8146	8195	8243	8292	8342	50	79	5.1446	5.2257	5.3093	5.3955	5.4845	5.5764	10
Deg.	60′	50′	40′	30′	20′	10′	Deg.	Deg.	60′	50′	40′	30′	20′	10′	Deg.

Deg.	0′	10′	20′	30′	40′	50′	Deg.
80	5.6713	5.7694	5.8708	5.9758	6.0844	6.1970	9
81	6.3138	6.4348	6.5606	6.6912	6.8269	6.9682	8
82	7.1154	7.2687	7.4287	7.5958	7.7704	7.9530	7
83	8.1443	8.3450	8.5555	8.7769	9.0098	9.2553	6
84	9.5144	9.7882	10.078	10.385	10.711	11.059	5
85	11.430	11.826	12.250	12.706	13.197	13.727	4
86	14.300	14.924	15.605	16.350	17.169	18.075	3
87	19.081	20.206	21.470	22.903	24.542	26.432	2
88	28.636	31.242	34.368	38.189	42.964	49.104	1
89	57.290	68.750	85.940	114.588	171.885	343.77	0
Deg.	60′	50′	40′	30′	20′	10′	Deg.

Natural Cotangents.



4° 22'

185 + 53.7
53 + 39.2
23 8 + 92.9 - sec Cor
25 2 + 1 2.9 - 1/16 Cor

80.4
79.62
160.02

16 + 40.6

14° 07'
3° 15'
17° 22'

17° 22'
3° 33'
20° 55'

160.02) 80.4

10 6 2 6 7
80.4
425068
8501 36
539.24

160.02) 85 438 6.6800

ΔK.
90 00
90 00
42 32
24 53
66 24
90 38

ΔL
89 40
51 40
81 00
~~13 36~~

388 - 4° 22'
475 - 7° 37'
450 - 10° 55'
425 - 14° 07'
387 - 17° 22'
472.7 - 20° 55'

18) 4893.600
271.866

291 + 80.4
238 + 60.7
53 19.7
53 07
10.6 26.7

9038

238 + 60.9
185 + 53.7
53 07.0

18) 81.0000
4.5
72
90
90

271.87
1.2
273 07

317.4
305
1 2 4

80.7 / 530

16) 84.78333
5.29895
80
47
32
158
144
143
128
153
144
93
80

179 60
66 24
113 36

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

ROADWAY 14 FEET WIDE. SIDE SLOPES 1½ TO 1.

FOR SINGLE TRACK EMBANKMENT.

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	7.0	7.2	7.3	7.5	7.6	7.8	7.9	8.1	8.2	8.4	0
1	8.5	8.7	8.8	9.0	9.1	9.3	9.4	9.6	9.7	9.9	1
2	10.0	10.2	10.3	10.5	10.6	10.8	10.9	11.1	11.2	11.4	2
3	11.5	11.7	11.8	12.0	12.1	12.3	12.4	12.6	12.7	12.9	3
4	13.0	13.2	13.3	13.5	13.6	13.8	13.9	14.1	14.2	14.4	4
5	14.5	14.7	14.8	15.0	15.1	15.3	15.4	15.6	15.7	15.9	5
6	16.0	16.2	16.3	16.5	16.6	16.8	16.9	17.1	17.2	17.4	6
7	17.5	17.7	17.8	18.0	18.1	18.3	18.4	18.6	18.7	18.9	7
8	19.0	19.2	19.3	19.5	19.6	19.8	19.9	20.1	20.2	20.4	8
9	20.5	20.7	20.8	21.0	21.1	21.3	21.4	21.6	21.7	21.9	9
10	22.0	22.2	22.3	22.5	22.6	22.8	22.9	23.1	23.2	23.4	10
11	23.5	23.7	23.8	24.0	24.1	24.3	24.4	24.6	24.7	24.9	11
12	25.0	25.2	25.3	25.5	25.6	25.8	25.9	26.1	26.2	26.4	12
13	26.5	26.7	26.8	27.0	27.1	27.3	27.4	27.6	27.7	27.9	13
14	28.0	28.2	28.3	28.5	28.6	28.8	28.9	29.1	29.2	29.4	14
15	29.5	29.7	29.8	30.0	30.1	30.3	30.4	30.6	30.7	30.9	15
16	31.0	31.2	31.3	31.5	31.6	31.8	31.9	32.1	32.2	32.4	16
17	32.5	32.7	32.8	33.0	33.1	33.3	33.4	33.6	33.7	33.9	17
18	34.0	34.2	34.3	34.5	34.6	34.8	34.9	35.1	35.2	35.4	18
19	35.5	35.7	35.8	36.0	36.1	36.3	36.4	36.6	36.7	36.9	19
20	37.0	37.2	37.3	37.5	37.6	37.8	37.9	38.1	38.2	38.4	20
21	38.5	38.7	38.8	39.0	39.1	39.3	39.4	39.6	39.7	39.9	21
22	40.0	40.2	40.3	40.5	40.6	40.8	40.9	41.1	41.2	41.4	22
23	41.5	41.7	41.8	42.0	42.1	42.3	42.4	42.6	42.7	42.9	23
24	43.0	43.2	43.3	43.5	43.6	43.8	43.9	44.1	44.2	44.4	24
25	44.5	44.7	44.8	45.0	45.1	45.3	45.4	45.6	45.7	45.9	25
26	46.0	46.2	46.3	46.5	46.6	46.8	46.9	47.1	47.2	47.4	26
27	47.5	47.7	47.8	48.0	48.1	48.3	48.4	48.6	48.7	48.9	27
28	49.0	49.2	49.3	49.5	49.6	49.8	49.9	50.1	50.2	50.4	28
29	50.5	50.7	50.8	51.0	51.1	51.3	51.4	51.6	51.7	51.9	29
30	52.0	52.2	52.3	52.5	52.6	52.8	52.9	53.1	53.2	53.4	30
31	53.5	53.7	53.8	54.0	54.1	54.3	54.4	54.6	54.7	54.9	31
32	55.0	55.2	55.3	55.5	55.6	55.8	55.9	56.1	56.2	56.4	32
33	56.5	56.7	56.8	57.0	57.1	57.3	57.4	57.6	57.7	57.9	33
34	58.0	58.2	58.3	58.5	58.6	58.8	58.9	59.1	59.2	59.4	34
35	59.5	59.7	59.8	60.0	60.1	60.3	60.4	60.6	60.7	60.9	35
36	61.0	61.2	61.3	61.5	61.6	61.8	61.9	62.1	62.2	62.4	36

Calculated by Julien A. Hall, M. Am. Soc. C. E.