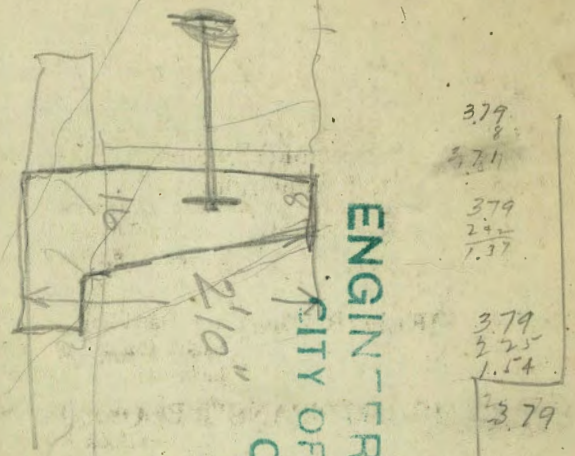


PAGE

TRAIL 2+61.00 "D" Line To Flying Cage 77

SERVICE ROAD TO FLYING CAGE from "D" Line 76

"S" Road (from Alameda St. to "A" Line { Z.00 BK 6-P.40

1

San Diego Zoo Notes

LEVELS

	Book	Pages	Book	Pages
"A" Line levels	1468	35 to 3	& 1514	5
"B" Line Levels	1514	10 – 11		
"D" " Levels	1514	1 – 4		
"E" " "	1514	6 – 7		
"F" " "	1514	12 – 15		
"G" " "	1514	16		
Service Road 11th St. entrance to Zoo Hospital	1514	17 – 18		
"I" Line Levels	1514	19		
"J" " "	1514	20		
K " "	1514	21		
"L" " "	1514	21		
"M" " "	1514	25		
"N" " "	1514	26		
"O" " "	1514	28		
Levels 24" Drain	1514	32 – 37		
Fernery	1514	40		
Retaining Wall	1514	41 – 42		
N'ly entrance to Zoo	1468	– 38		
"P" Line	1468	– 70		
"Q" "	1468	71		
"R" "	1468	72		

6-23-37
We want Book ~~1444~~
" 1517

S.D. Zoo Notes.

1

Alignment

	Book	Pages
"A" Line	1468	25 – 32
"B" Line	1468	54 – 56
D "	1468	39 – 47 (Peas ✓)
E "	1468 –	48 – 50
F "	1468	57 – 64
G "	1468	42 & 58
Service Rd. 11th St. to Hosp.	1468	65 – 68
" " Back of Grottoes	1468	51 – 53
"I" Line	1468	68
"J" "	1468	69
K "	1514 –	22 } Changed 1/6/38 see Zoo BK 6 – P. 4-5
L "	1514 –	22 }
M "	1514 –	24
N "	1514 –	24
O "	1514 –	27
24" Drain	Loose leaf notes.	
Fernery	1514 –	39
Retaining Wall	1514 –	42
N'ly Ent. to Zoo	1468 –	32
"P" Line	1468 –	70
"Q" "	1468 –	71
R "	1468 –	32
Zoo Boundary Survey	1468 –	73 – 75
Service Rd. to flying Cage	1468 –	76
Trail – "D" Line to Flying Cage.	1468 –	77
"T" Line – Rear Deer Mesa	1514 –	29 – 31

See Pg. 0

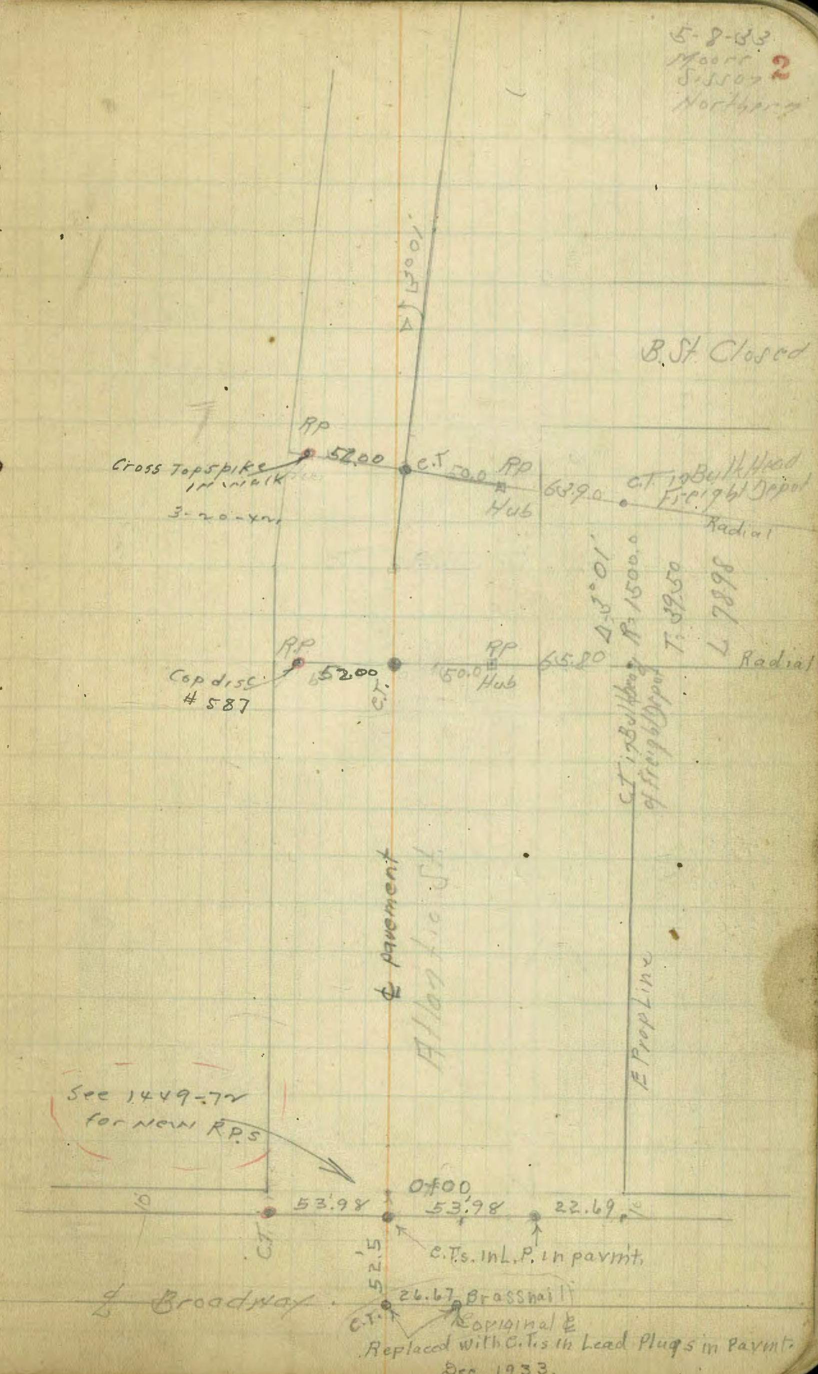
Atlantic St. Fin
Broadway to Horasthy

6+37 46 E.C

= 5+58 48 B.C.

0+00

5-8-33
Moore
Sisson
Northern



14+49 65 POT. ℄ Ash St

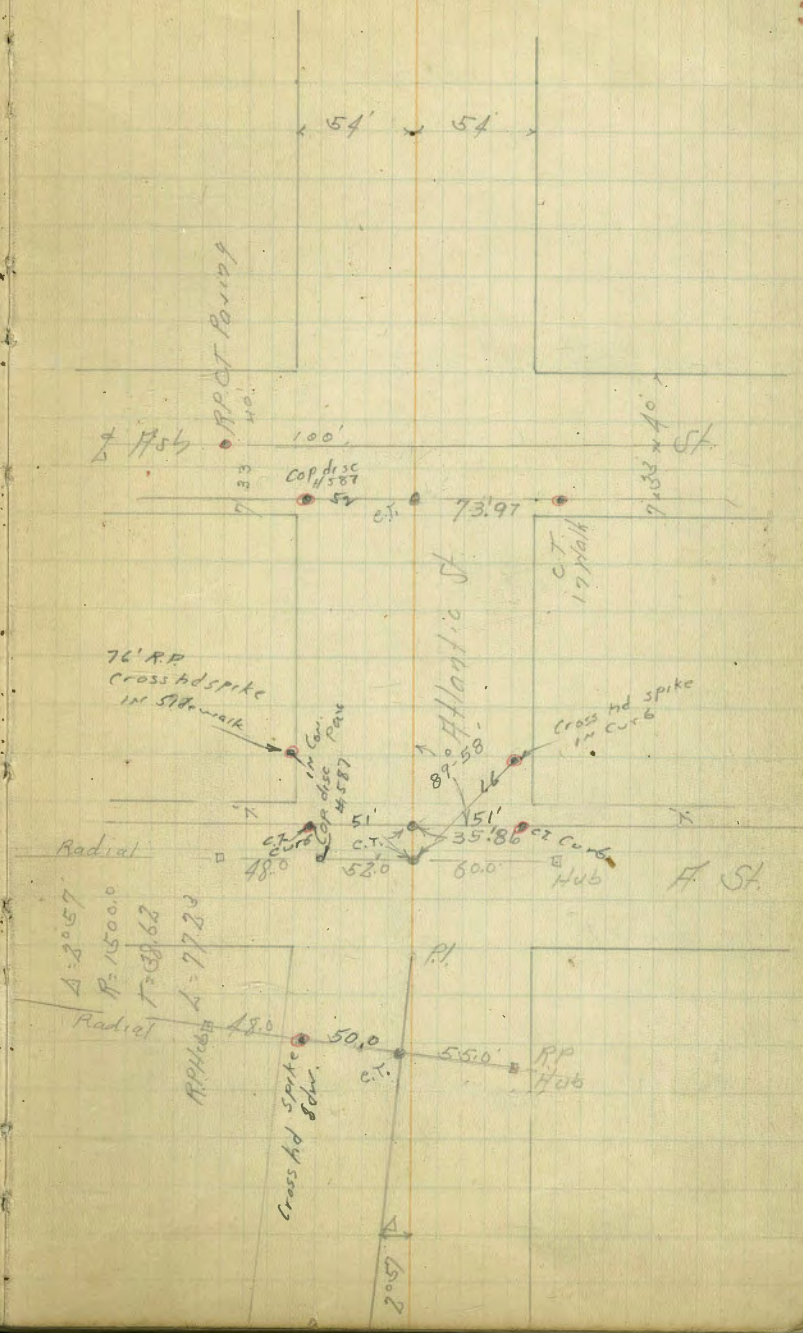
14+16 65 S.T. Line Ash St.

11+09 75 N. Line A. St.

11+02 75 N.T. Line A. St.

10+66 89 E.C.

9+89 66 B.C.

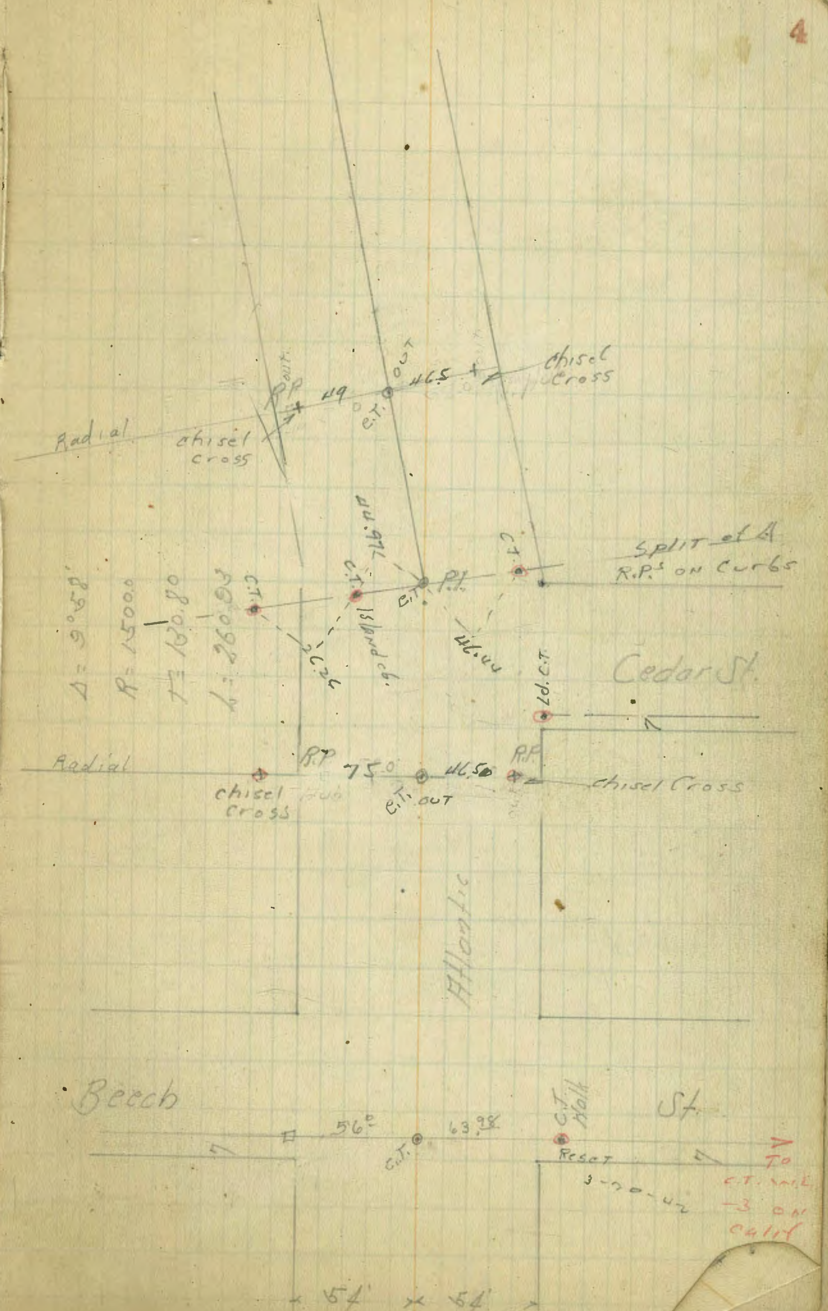


9° 58
118
4 59

23+75 13 E.C.

21+14 20 B.C.

17+96 76 S.T. Line Beech



32+88.66 E.C.

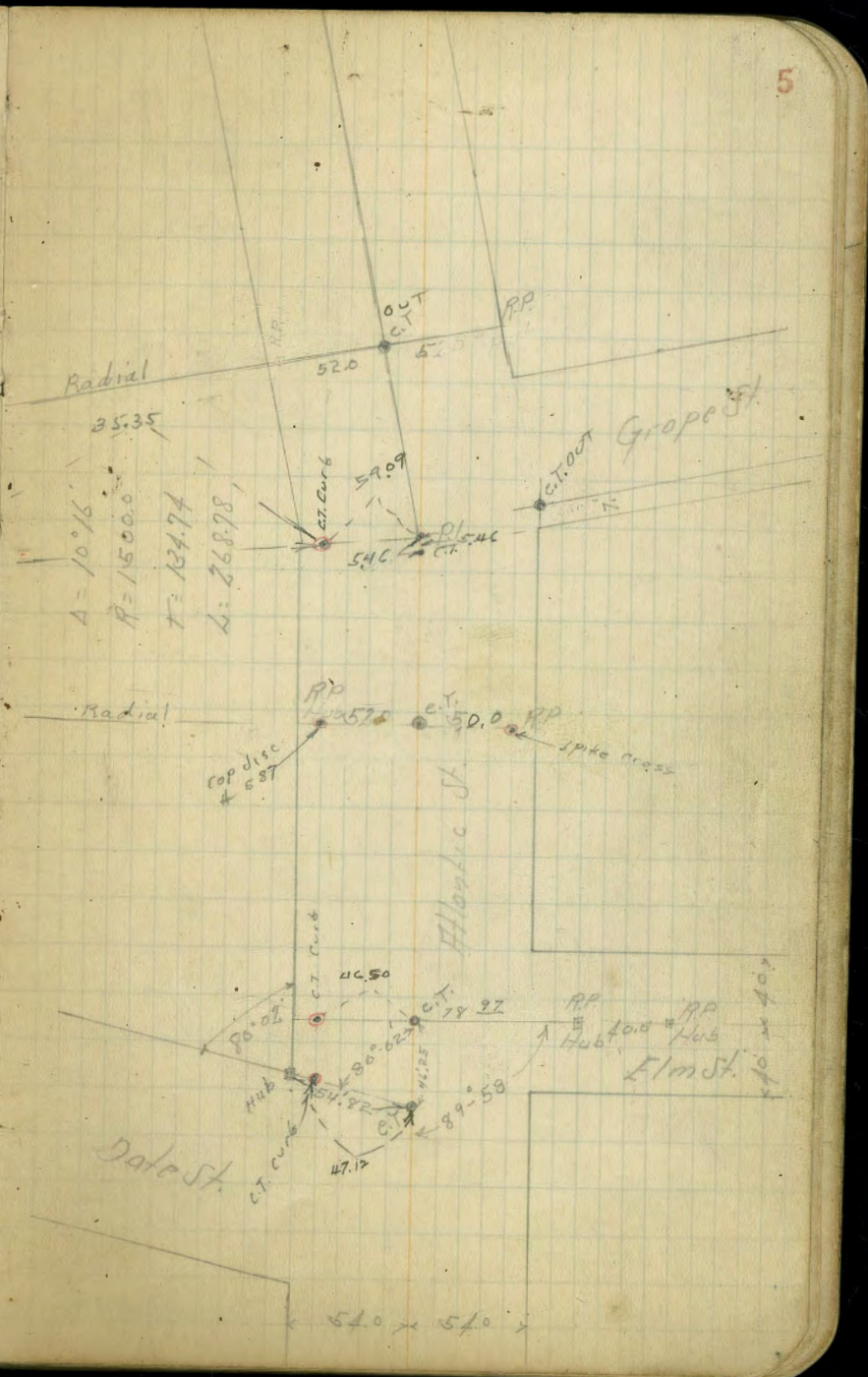
Split of Angle

C.T. Curve

30+19.88 B.C.

27+00.67 ℄ Elm St.

26+54.42 N. Line Date Produced to ℄ Atlantic



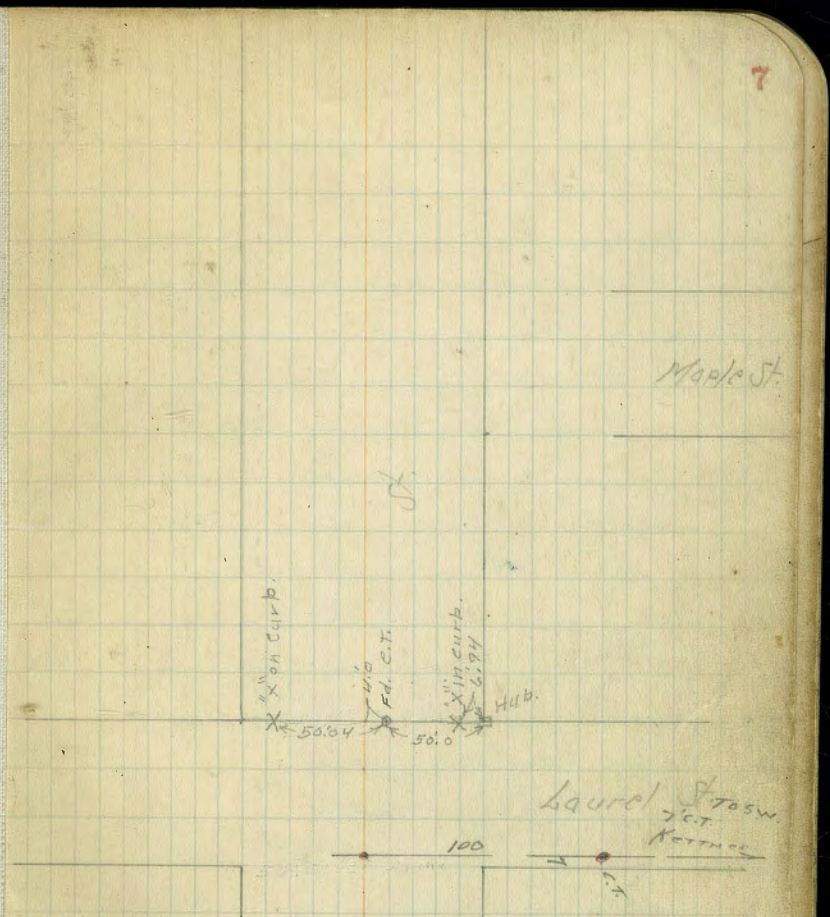
437+63.58 N.7.' Line Juniper

397+17.37 P.O.T.

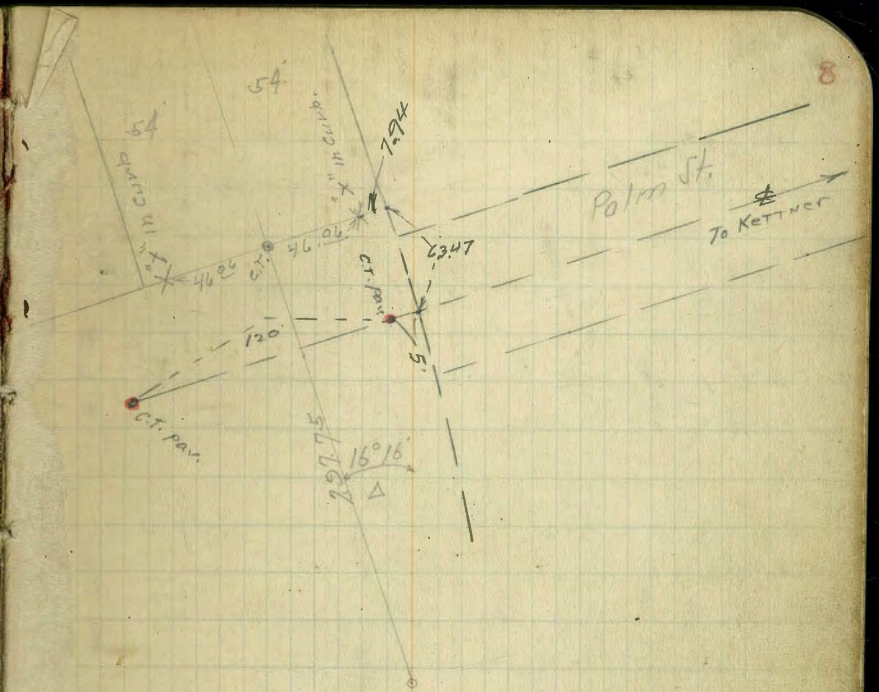
35+37.03 S.7.' Line

51+31.83 N. line Laurel St.

50+51.83 S. line Laurel St



63+79 05 E.C.



57+87 53 B.C.

83+08.95 P.C. — E.P. Curb — 46.93 — C.T. — 46.47 — C.T. Curb — Radial

114.84

Blk. Cor Hub. Harbor Engineer

82+59.47 N. Line Thorn — C.T. — 54.00

Thorn St

151.074

Sassafras St

To Ket.

60' — Rd. C.T.

77+98.96 S. Line Sassafras — C.T. — 54.00 — Blk. Cor Hub. Harbor Engineer

300.022

74+98.30 N. Line Spruce — C.T. — 54.00 — Hub. Harbor.

Spruce St

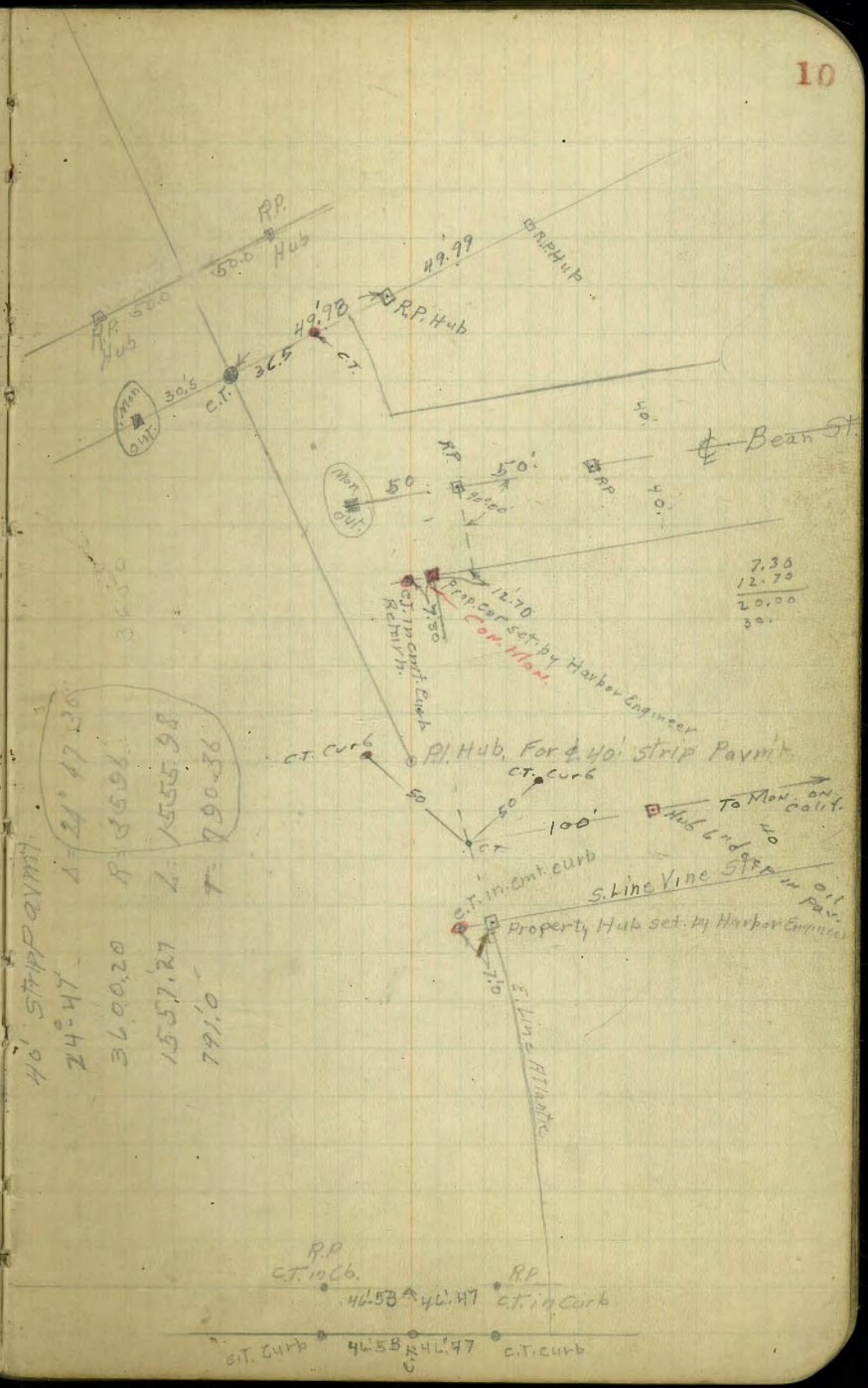
98+74 88 E.C. & 40' Strip Pavment.

98+65 67 E.C. Property Lines

99+ℓ 5.76
98+ℓ 5.09
80.07

83+17 61 BC & 40' Pavmt Strip

89+08 15 B.C. Property Lines

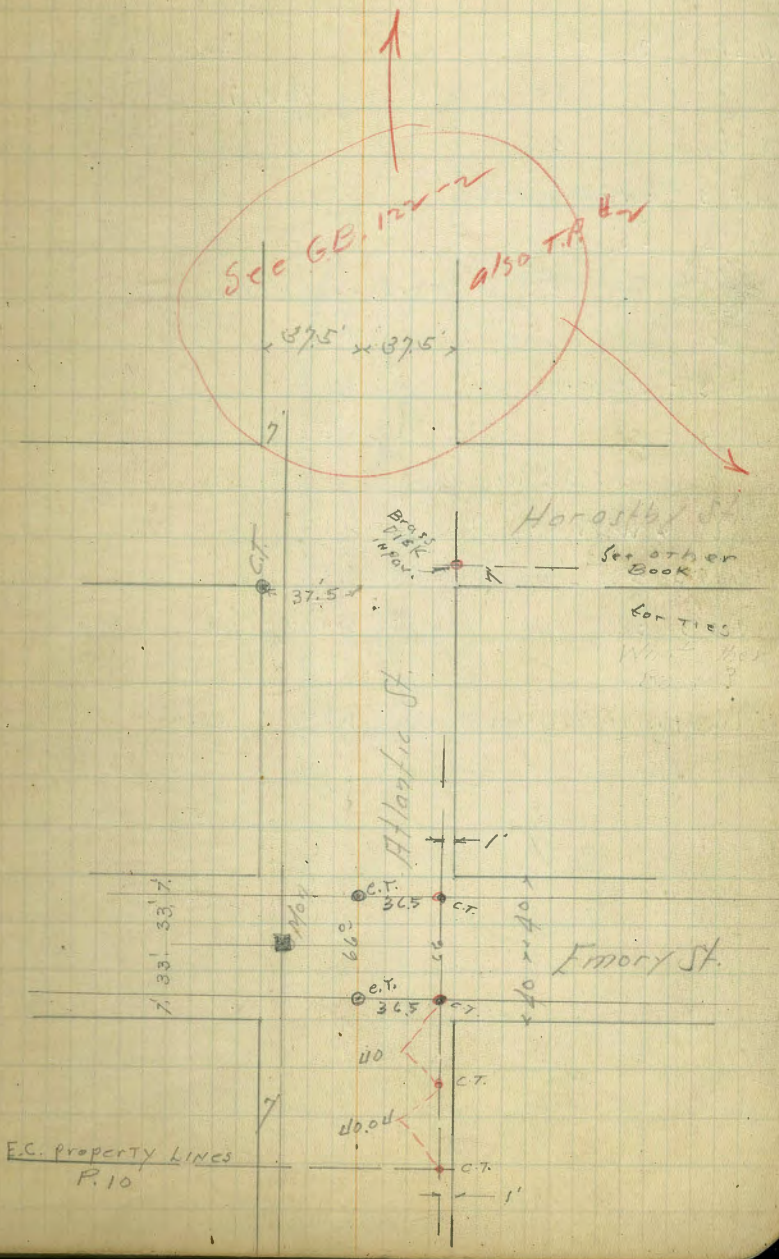


Atlantic St. Ties
Broadway to Horastby

11.

103+17 43

99+45 76 = S.T. Line Emory St.

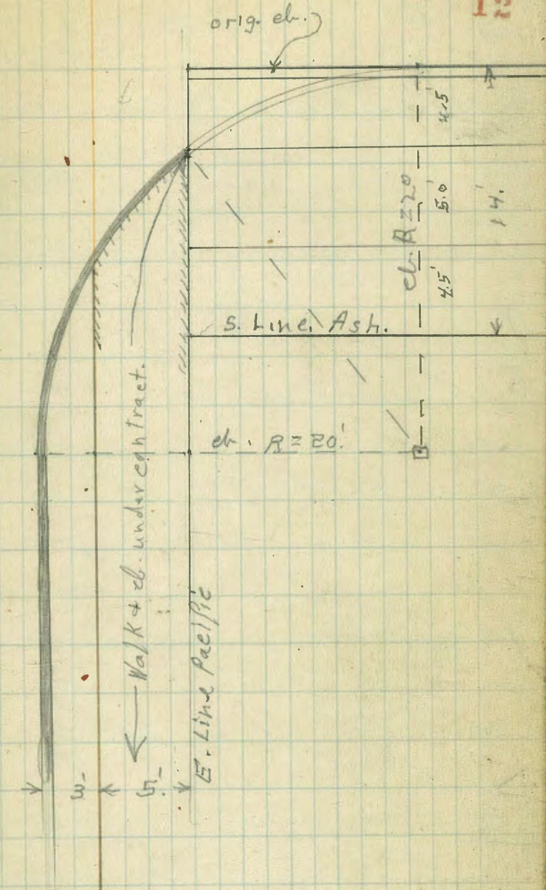


8-18-34
Muller
Walker
Bloor

Levels S. E. Pacific & Ash

BM.B.P.	3.37	9.21	5.84	S. cb. Ash. 49' E. of Pacific
	50' E. of E. Line Pacific			
S. G		4.44		
S. cb		3.93		
+4.5 S	= N walk	3.89		
+9.5 S	= S. "	3.77		
	25' E. of E. Line Pacific			
S. G		5.17		
S. cb		4.73		
+4.5' S	= N. walk	4.68		
+9.5 S	= S. "	4.51		
	E. Line Pacific			
S. cb	+ W. End. + Pav.	5.63	8	
+4.5' S	= N. walk. W. End.	5.55		
+9.5' S	= S " " "	5.41		
E. Line Pacific	E. End New. cb.	4.95	4.26	

5.46
49
4.97
4.24



Location & Levels on Existing 54" Con. Pipe drain. B.M. "B" on Pacific at Thorne USC&GS

Brass disc
Calv. Headwall 3.007 17.426

20.538 = Mean Sea Level
6.119
14.419 = City

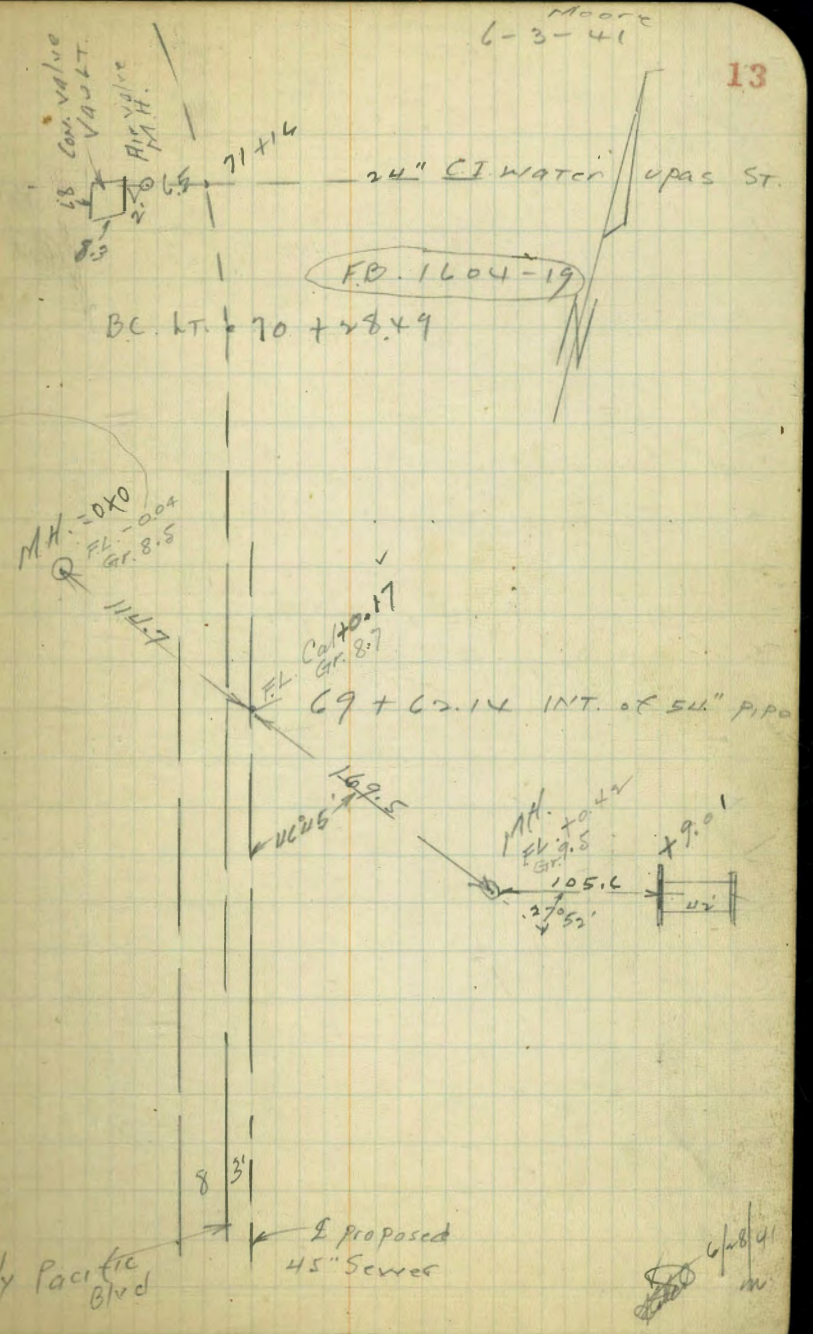
Sta. 69+62.14 Int. 54" drain

M.H. in Pacific = 0+0	8.93	8.496 ✓	Pav. Rim
" " "	17.47	-0.04 ✓	F.L. 54"
1+14.7 = Int. 45" Sewer	8.73	8.70 ✓	ground on Pav.
2+84.2 M.H. Δ = 7°52' Lt.	7.92	9.51 ✓	Rim
" " "	17.01	+0.42 ✓	F.L.
3+89.8 W end P.R. Culv	3.00	14.43 ✓	Top Head wall
" " " "	8.42	9.01 ✓	F.L.
4+31.8 E " "	7.46	9.97 ✓	F.L.

71+16 Int. 24" water

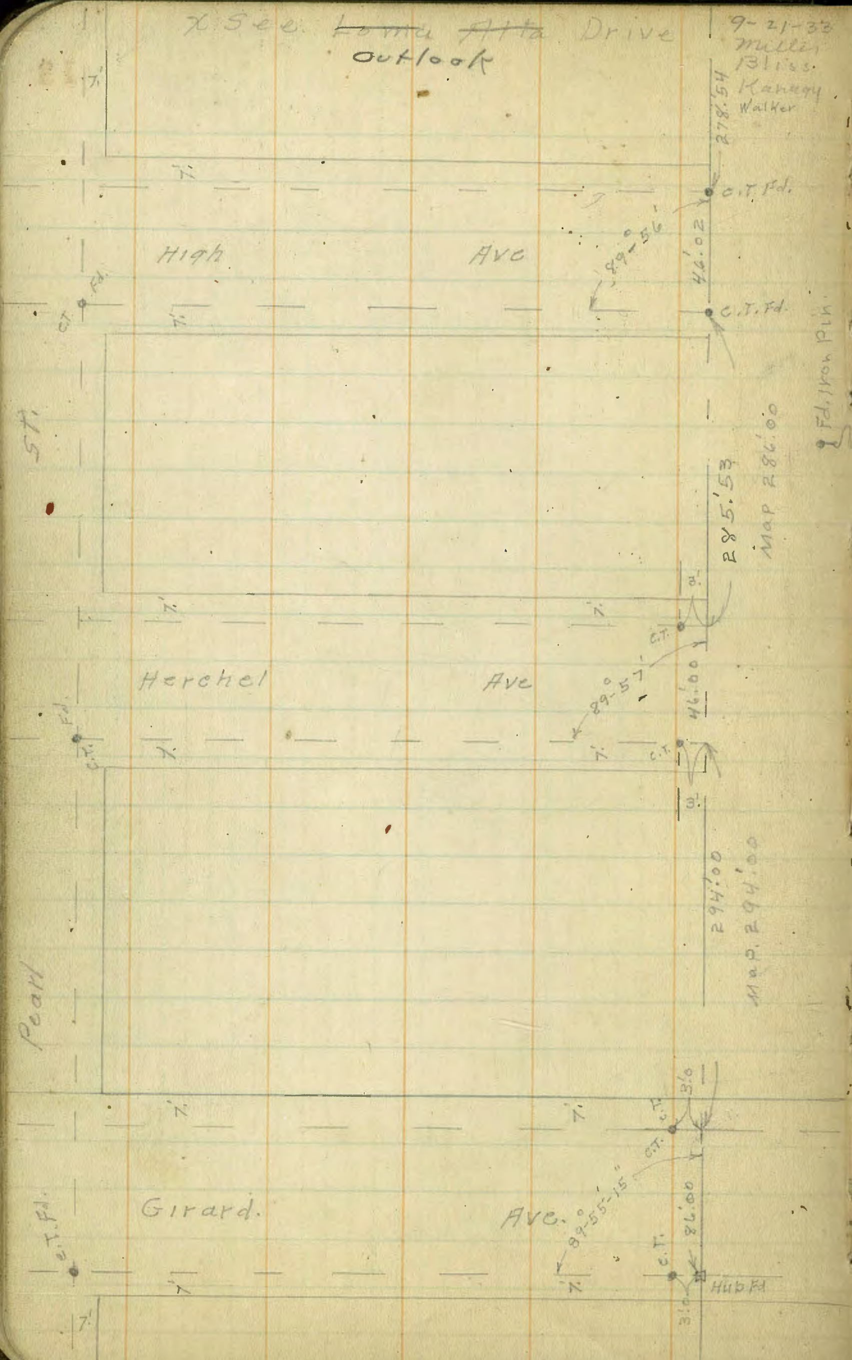
Rim M.H. Valve Vault	8.36	9.07 ✓	
Bot " "	15.56	1.87 ✓	
Rim Air Valve M.H.	8.33	9.10 ✓	
Top 24" water pipe	11.38	6.05 ✓	

6-3-41 Moore

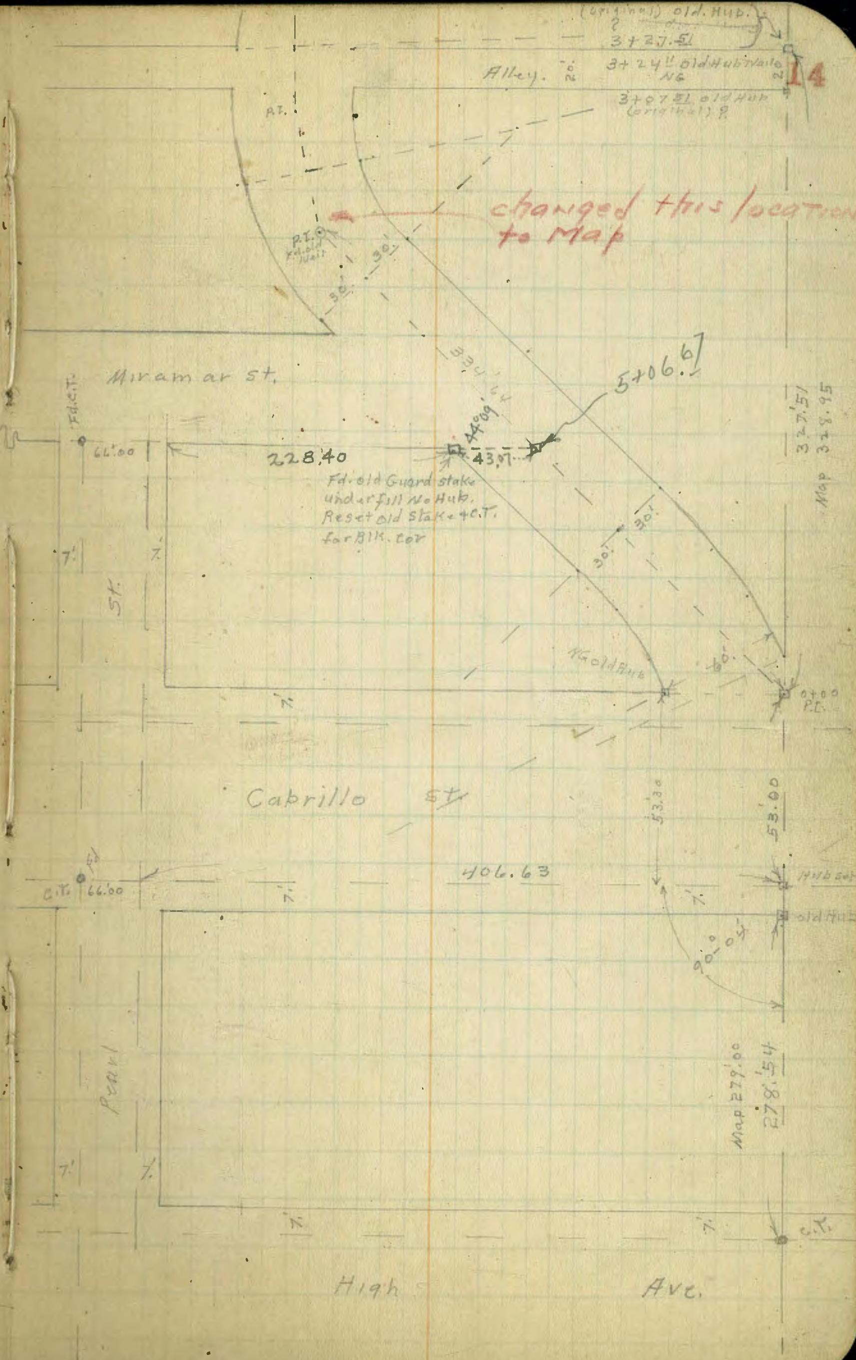


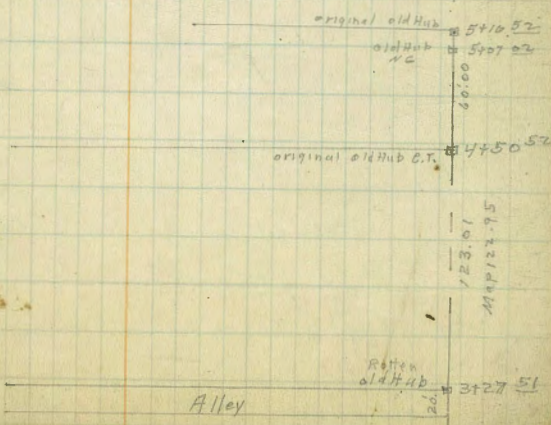
X See ~~Loma Alta~~ Drive
outlook

9-21-33
Miller
Bliss
Kanagy
Walker



14




original old Hub
5+16.52
old Hub NC
5+07.02
90.00
original old Hub E.T.
4+50.52
123.01
Map 127.95
Rotten old Hub
3+27.51
20
Alley

Outlook

Survey Loma Drive

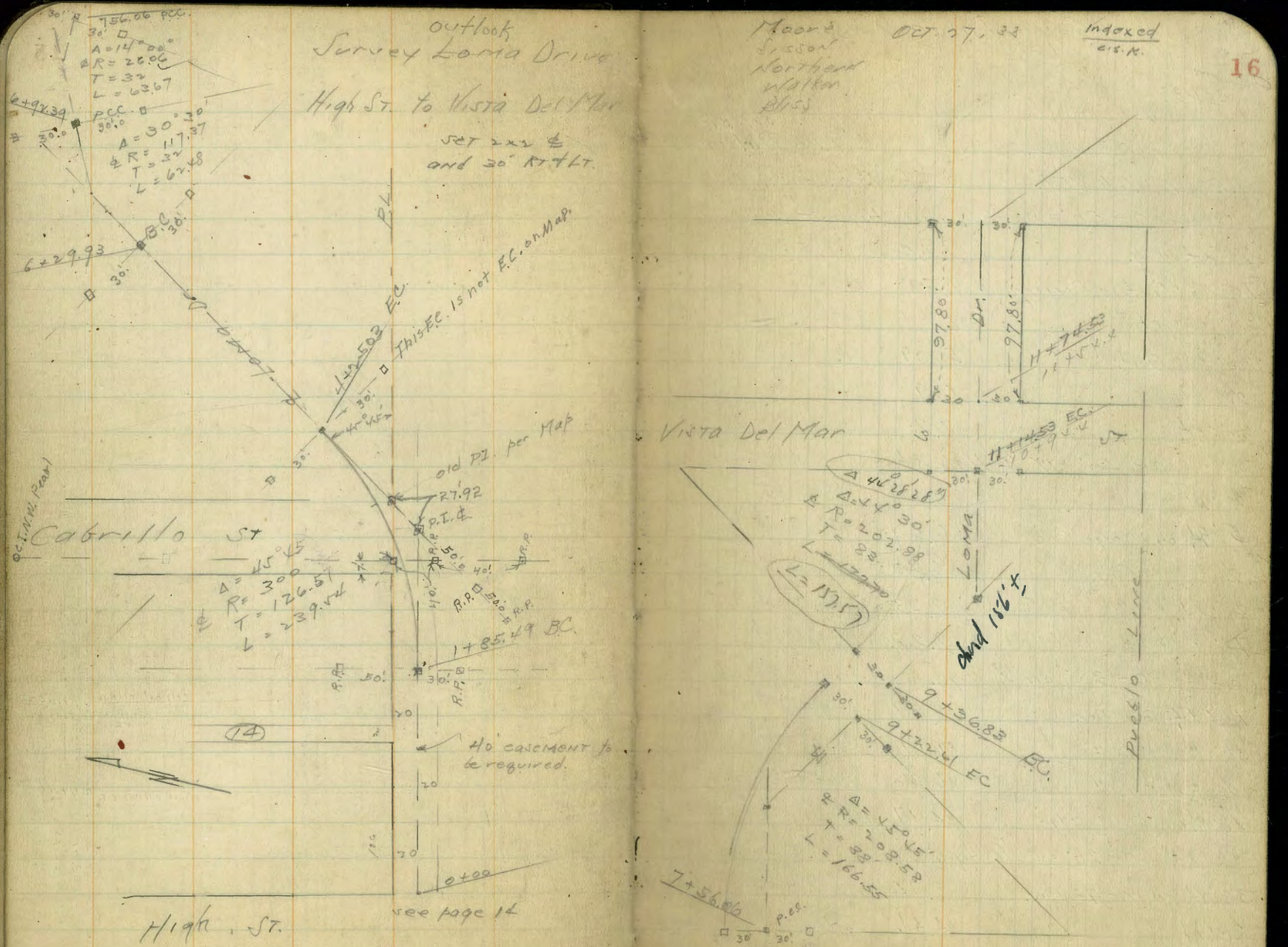
High St. to Vista Del Mar

Set 2x2 ℄ and 30' R + Lt.

Moore
Sisson
Norther
Walker
Bliss

Oct 27, 33

Indexed
E.S.K.



Walker
Bliss
Kanady
10-31-33

Lomo Drive X-Section
Outlook

151.08

	12.03	139.21	127.18	T.W. & P. Pav't + High St.
T.P.	12.61	151.08	0.74	138.47
0-50' = West cb Line High St.				
70' Lt. on cb.			9.24	141.84 ✓
70' " " Gut. on Paving			9.85	141.23 ✓
20' " " cb.			7.61	143.47 ✓
20' " " Gut. " "			8.09	142.99 ✓
℄			6.9	144.18 ✓
20' Rt.			7.2	143.9 ✓
0-40' = W ¼ High St.				
20' Rt.			5.1	146.0 ✓
5' Rt. on W edge Pav.			6.00	145.08 ✓
℄ " Pav.			6.40	144.68 ✓
20' Lt. " "			7.63	143.45 ✓
70' " " "			9.22	141.86 ✓
0-30' on ℄ High.				
70' Lt. on Pav.			8.89	142.19 ✓
50' " " "			7.19	143.89 ✓
℄ on "			6.20	144.88 ✓
40' Rt. " " edge			4.17	146.91 ✓
0-20' = E ¼ High				
38' Rt. on W edge Pav.			2.74	148.34 ✓
20' Rt. " "			4.46	146.62 ✓
℄ " "			6.05	145.03 ✓
20' Lt. " "			7.11	143.97 ✓

151.08

151.08

70' Lt. on Pav.	8.72	142.36 ✓
0-10' = E. cb. High St.		
70' Lt. on Gut. on Pav.	8.77	142.31 ✓
70' " " cb.	8.16	142.92 ✓
20' " " Gut. " "	7.15	143.93 ✓
20' " " cb.	6.53	144.55 ✓
℄	4.5	146.58 ✓
21 Rt. = E edge Paving	4.37	146.71 ✓
53' Rt. = W " "	1.12	149.96 ✓
0+00 = E. Line High St. see sketch Page 16		
37.5' Rt. = E. edge Pav.	2.40	148.68 ✓
60' Rt. on "	0.39	150.69 ✓
30' Rt.	1.5	149.58 ✓
20' Rt.	1.4	149.68 ✓
15' Rt.	2.6	148.48 ✓
℄	3.3	147.78 ✓
15' Lt.	3.9	147.18 ✓
20' Lt.	3.9	147.18 ✓
T.P. 12.76	163.46	0.38 150.70
0+50	163.46	
20' Lt.	12.2	151.26 ✓
15' Lt.	12.2	151.26 ✓
℄	11.5	151.96 ✓
15' Rt.	11.3	152.16 ✓
20' Rt.	9.8	153.66 ✓
1+00		

16346

163.5

163.46

1+00			
20' Rt.		5.1	158.4 ✓
15' Rt		5.5	158.0 ✓
14' Rt.		6.8	156.7 ✓
℄		6.8	156.7 ✓
15' Rt.		7.6	155.9 ✓
20' Lt.		7.9	155.6 ✓
1+50			
20' Lt.		3.8	159.7 ✓
15' Lt.		3.5	160.0 ✓
℄		2.9	160.7 ✓
13' Rt.		2.8	160.7 ✓
15' Rt.		0.8	162.7 ✓
20' Rt.		+0.3	163.8 ✓
TP 12.87	175.65	0.68	162.78

1+85.49 = B.C. Lt. 175.65

20' Rt.		9.2	166.5 ✓
15' Rt.		9.9	165.8 ✓
12' Rt.		12.5	163.2 ✓
℄ on Hub.		12.40	163.25 ✓
15' Lt.		13.3	162.4 ✓
20' Lt.		13.1	162.6 ✓
2+00			
20' Lt.		12.0	163.7 ✓
15' Lt.		11.8	163.9 ✓
℄		11.1	164.6 ✓

175.65

175.7

12' Rt.		10.8	164.9 ✓
15' Rt.		8.5	167.2 ✓
20' Rt.		7.9	167.8 ✓
2+50			
20' Rt.		7.2	168.5 ✓
15' Rt.		7.0	168.7 ✓
℄		7.7	168.0 ✓
15' Lt.		8.7	167.0 ✓
20' Lt.		8.9	166.8 ✓
3+00			
30' Lt.		8.1	167.6 ✓
15' Lt.		6.6	169.1 ✓
℄		5.5	170.2 ✓
15' Rt.		3.2	172.5 ✓
30' Rt.		+1.2	177.1 ✓
T.P. 12.69	187.84	0.50	175.15

187.84

3+50			
30' Rt.		+6.0	193.8 ✓
15' Rt.		+0.6	188.4 ✓
12' Rt.		2.0	185.8 ✓
℄		3.0	184.8 ✓
15' Lt.		9.7	178.1 ✓
30' Lt.		13.3	174.5 ✓
40' Lt.		16.0	171.8 ✓
4+00			
40' Lt.		5.0	184.8 ✓

187.84

200.43

30' Lt.		2.0	185.8 ✓
T.P.	12.66 200.43	0.07	187.77
15' Lt.		12.1	188.3 ✓
13' Lt.		10.6	189.8 ✓
5' Lt.		11.4	189.0 ✓
℄		8.4	192.0 ✓
15' Rt.		3.0	197.4 ✓
30' Rt.		+1.7	201.1 ✓
4+25.03 = E.G.			
30' Rt.		+5.6	206.0 ✓
15' Rt.		+0.4	200.8 ✓
℄ on Hub.		4.91	195.72 ✓
6' Lt.		8.5	191.9 ✓
15' Lt.		8.3	192.1 ✓
18' Lt.		10.7	189.7 ✓
30' Lt.		18.5	186.9 ✓
40' Lt.		16.3	188.1 ✓
4+50			
40' Lt.		13.7	186.7 ✓
30' Lt.		10.2	190.2 ✓
20' Lt.		7.6	192.8 ✓
16' Lt.		5.4	195.0 ✓
9' Lt.		5.7	194.7 ✓
℄		2.3	198.1 ✓
15' Rt.		+3.0	203.4 ✓
30' Rt.		+8.6	209.0 ✓

200.43

19

5+00

200.43

30' Rt.		+17.0	217.4 ✓
15' Rt.		+11.3	211.7 ✓
℄		+6.5	206.9 ✓
15' Lt.		+1.4	201.8 ✓
25' Lt.		+0.2	200.6 ✓
30' Lt.		2.6	197.8 ✓
40' Lt.		6.6	193.8 ✓
T.P.	12.42 212.65	0.20	200.23
5+50		212.65	
40' Lt.		8.0	204.65 ✓
33' Lt.		4.6	208.0 ✓
25' Lt.		4.8	207.8 ✓
23' Lt.		2.6	210.0 ✓
T.P.	12.77 224.80	0.67	212.03
		224.8	
15' Lt.		12.4	212.4 ✓
℄		8.3	216.5 ✓
15' Rt.		3.1	221.7 ✓
30' Rt.		+2.9	227.7 ✓
6+00			
30' Rt.		+10.5	235.3 ✓
15' Rt.		+4.9	229.7 ✓
℄		0.5	224.3 ✓
15' Lt.		5.4	219.4 ✓
25' Lt.		8.3	216.5 ✓
28' Lt.		11.0	213.8 ✓
40' Lt.		12.0	212.8 ✓

224.80

224.8

6+29.93 = B.C. Rt.

40' Lt.		11.6	r13.2 ✓
35' Lt.		8.4	r16.4 ✓
30' Lt. on Hub.		8.60	r16.20 ✓
26' Lt.		8.4	r16.4 ✓
24' Lt.		6.4	r18.4 ✓
15' Lt.		2.5	r22.3 ✓
T.P.	12.86	237.37	0.29 224.51

237.4

℄	10.1	r27.3 ✓
15' Rt.	4.1	r33.3 ✓
30' Rt.	+1.5	r38.9 ✓

6+50.75 = Part 1

30' Rt.	+3.0	r40.4 ✓
15' Rt.	2.6	r34.8 ✓
℄	7.9	r29.5 ✓
15' Lt.	14.0	r23.4 ✓
20' Lt.	16.4	r21.0 ✓
22' Lt.	18.4	r19.0 ✓
30' Lt.	19.0	r18.4 ✓
40' Lt.	23.0	r14.4 ✓

6+71.57 = Part 2

45' Lt.	23.8	r13.6 ✓
30' Lt.	17.2	r20.2 ✓
22' Lt.	16.6	r20.8 ✓
18' Lt.	14.3	r23.1 ✓
15' Lt.	13.3	r24.1 ✓

237.37

237.4

℄	6.3	r31.1 ✓
15' Rt.	1.0	r36.4 ✓
30' Rt.	+4.7	r42.1 ✓

6+92.39 = P.C.C.

30' Rt.	+6.7	r44.1 ✓
15' Rt.	+1.2	r38.6 ✓
℄	4.5	r33.9 ✓
15' Lt.	10.2	r27.2 ✓
20' Lt.	13.7	r23.7 ✓
30' Lt.	15.0	r22.4 ✓
50' Lt.	23.8	r13.6 ✓

7+13.61 = Part 1

50' Lt.	22.0	r15.4 ✓
30' Lt.	14.2	r23.2 ✓
25' Lt.	11.7	r25.7 ✓
20' Lt.	11.2	r26.0 ✓
17' Lt.	8.8	r28.6 ✓
℄	2.8	r34.6 ✓
15' Rt.	+3.0	r40.4 ✓
30' Rt.	+8.5	r45.9 ✓

7+34.83 = Part 2

30' Rt.	+10.0	r47.4 ✓
15' Rt.	+5.5	r42.9 ✓
℄	+0.6	r38.0 ✓
14' Lt.	5.3	r32.1 ✓
16' Lt.	7.7	r30 ✓
25' Lt.	8.2	r29.2 ✓

237.37

237.37

30' Lt.		11.4	r46.0 ✓
50' Lt.		20.0	r17.4 ✓
	7+56.06 = P.C.C.		
50' Lt.		17.3	r70.1 ✓
30' Lt.		10.1	r77.3 ✓
18' Lt.		4.0	r33.4 ✓
10' Lt.		3.6	r33.8 ✓
℄		+2.1	r39.5 ✓
15' Rt.		+8.2	r45.6 ✓
30' Rt.		+13.3	r50.7 ✓
T.P. 12.46	249.70	0.13	237.24
	7+97.69	249.70	
30' Rt.		+7.0	r56.7 ✓
15' Rt.		+1.2	r50.9 ✓
℄		3.5	r46.2 ✓
5' Lt.		5.4	r44.3 ✓
7' Lt.		7.9	r41.8 ✓
15' Lt.		8.1	r41.6 ✓
30' Lt.		15.7	r34.0 ✓
50' Lt.		24.4	r25.3 ✓
	8+39.33		
50' Lt.		17.5	r32.2 ✓
40' Lt.		11.6	r38.1 ✓
30' Lt.		6.6	r43.1 ✓
18' Lt.		0.3	r49.4 ✓
10' Lt.		0.0	249.7 ✓

249.70

262.22

T.P. 12.76	262.22	0.24	249.46
℄		7.2	r55.0 ✓
15' Rt.		3.0	r59.2 ✓
30' Rt.		0.6	r61.6 ✓
	8+80.97		
30' Rt.		+2.4	r64.6 ✓
15' Rt.		2.8	r59.4 ✓
3' Rt.		7.6	r54.6 ✓
℄		7.5	r54.7 ✓
5' Lt.		7.2	r55.0 ✓
15' Lt.		12.3	r49.9 ✓
30' Lt.		18.0	r44.2 ✓
50' Lt.		26.8	r35.4 ✓
	9+22.61 = P.C.		
50' Lt.		23.0	r39.2 ✓
30' Lt.		15.1	r47.1 ✓
15' Lt.		9.9	r52.3 ✓
℄ on Hub.		5.29	r56.93 ✓
4' Rt.		3.3	r58.92 ✓
11' Rt.		2.9	r59.3 ✓
15' Rt.		0.5	r61.7 ✓
30' Rt.		+5.6	r67.8 ✓
	9+36.83 = B.C. Lt.		
30' Rt.		+6.9	r69.1 ✓
15' Rt.		+0.7	r62.9 ✓
13' Rt.		1.5	r60.7 ✓

262.22

		262.2	
5' Rt.		1.2	r61.0 ✓
℄		3.3	r58.9 ✓
15' Lt.		8.1	r54.1 ✓
30' Lt.		13.7	r48.5 ✓
50' Lt.		22.3	r39.9 ✓
	~~9+81.25~~	9+76.22	
50' Lt.		14.7	r47.5 ✓
30' Lt.		9.3	r52.9 ✓
15' Lt.		5.6	r56.6 ✓
T.P.	13.18 275.26	0.14	262.08
		275.3	
℄		14.5	r60.8 ✓
11' Rt.		10.2	r65.1 ✓
18' Rt.		10.2	r65.1 ✓
20' Rt.		8.1	r67.2 ✓
30' Rt.		3.8	r71.5 ✓
	~~10+25.61~~	10+15.61	
30' Rt.		4.6	r70.7 ✓
15' Rt.		7.0	r68.3 ✓
℄		10.5	r64.8 ✓
30' Lt.		16.7	r58.6 ✓
40' Lt.		16.4	r58.9 ✓
	~~10+70.10~~	10+55.00	
40' Lt.		3.4	r71.9 ✓
30' Lt.		4.1	r71.2 ✓
15' Lt.		4.6	r70.7 ✓
10' Lt.		6.1	r69.2 ✓

275.26

		275.26	
℄		1.7	r73.6 ✓
T.P. 12.32	287.44	0.14	275.12
		287.44	
15' Rt.		10.2	r77.24 ✓
24' Rt.		9.5	r77.94 ✓
26' Rt.		8.2	r79.2 ✓
30' Rt.		7.4	r80.0 ✓
	~~11+44.53~~	10+94.40 = E.C.	
30' Rt. on Hub.		3.69	r83.75 ✓
15' Rt.		5.3	r82.1 ✓
℄ on Hub.		6.64	r80.80 ✓
15' Lt.		6.8	r80.6 ✓
30' Lt. on Hub.		6.39	r81.05 ✓
T.P. 11.16	297.86	0.74	286.70
	~~11+44.53~~	11+24.40 = ℄ Vista Del Mar	
		297.86	
30' Lt.		8.2	r89.66 ✓
15' Lt.		9.4	r88.46 ✓
℄		10.0	r87.86 ✓
15' Rt.		10.5	r87.36 ✓
30' Rt.		10.8	r87.06 ✓
	~~11+79.12~~	11+54.40 = E.L. Vista Del Mar.	
130' Rt.		6.4	r91.46 ✓
30' Rt.		7.8	r90.06 ✓
15' Rt.		7.8	r90.06 ✓
℄		6.4	r91.46 ✓
15' Lt.		5.6	r92.26 ✓
30' Lt.		5.1	r92.76 ✓

29786

			~~297.9~~	
130' Lt.			3.9	r94.0 ✓
	12+0r.87 ~~12+23~~			
80' Lt.			1.6	r96.3 ✓
30' Lt.			2.6	r95.3 ✓
15' Lt.			3.5	r94.4 ✓
℄			4.1	r93.8 ✓
15' Rt.			4.4	r93.5 ✓
30' Rt.			4.6	r93.3 ✓
80' Rt.			4.3	r93.6 ✓
	12+5r.20 ~~12+72.33~~			
80' Rt.			1.8	r96.1 ✓
30' Rt.			2.2	r95.7 ✓
15' Rt.			2.0	r95.9 ✓
℄			1.4	r96.5 ✓
15' Lt.			1.6	r96.3 ✓
30' Lt.			1.0	r96.9 ✓
80' Lt.			+0.3	r98.2 ✓
T.P.	0.35	285.71	12.50	285.36
T.P.	0.24	273.37	12.58	273.13
T.P.	0.29	261.18	12.48	260.89
T.P.	0.05	248.35	12.88	248.30
T.P.	0.24	235.76	12.83	235.52
T.P.	0.51	223.61	12.66	223.10
T.P.	0.09	211.00	12.70	210.91
T.P.	0.50	198.43	13.07	197.93
T.P.	0.28	185.73	12.98	185.45

185.73

T.P. 1.72	175.03	12.42	173.31
T.P. 0.05	162.44	12.64	162.39
T.P. 0.47	150.18	12.73	149.71
T.P. 1.01	138.16	13.03	137.15
Chk. on S.W. B.P. Pearl + High st.		11.00	127.16
			127.18 = B.M. Page 17
			0.02 = Error.

Change of Align. of Outlook Dr.
at S'ly end of Cabrillo Ave.
La Jolla

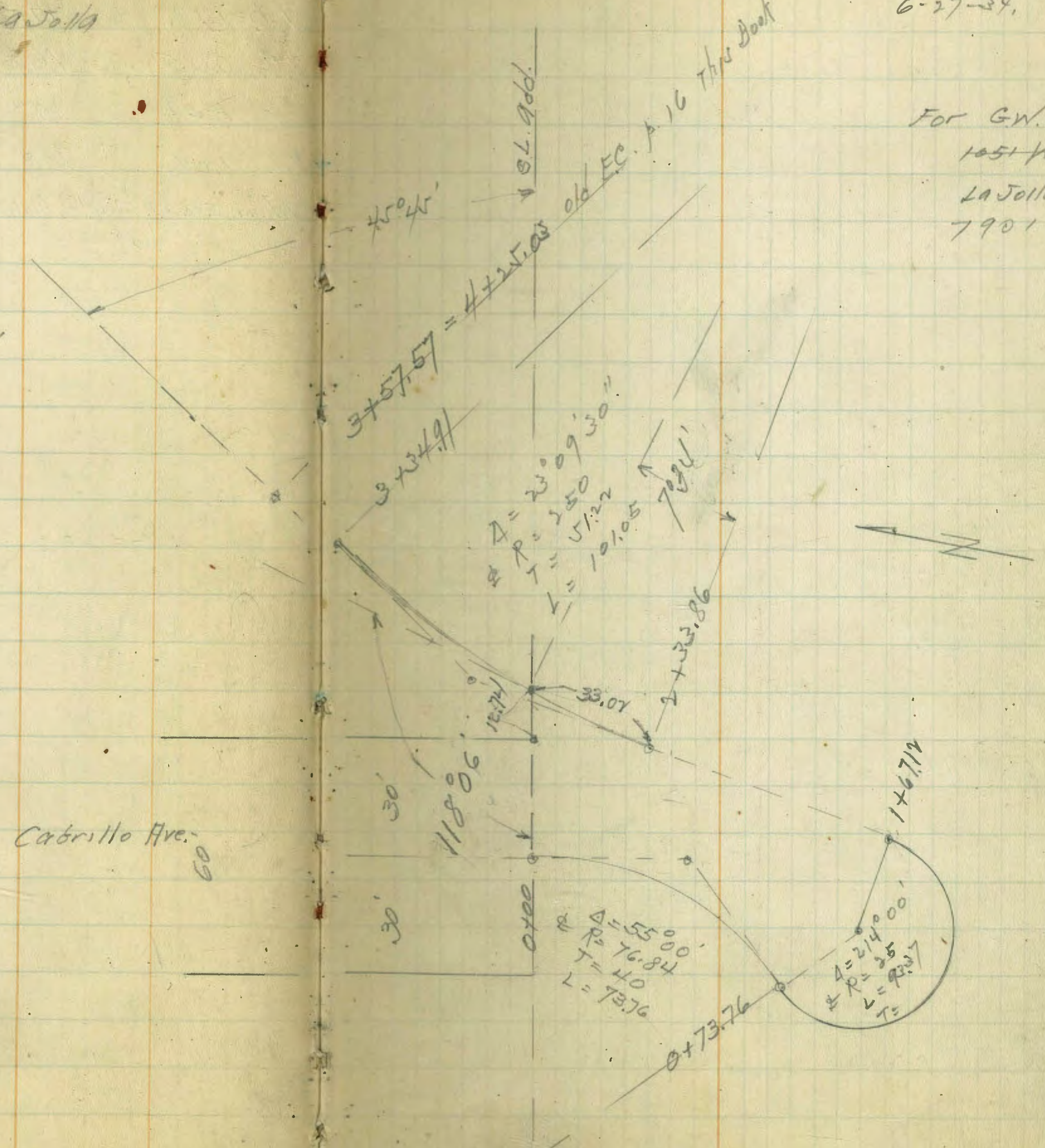
0+00 = ℄ Cabrillo + S.L. Add. = B.C.			
0 + 18.44	ch. 18.39	6°52'30"	
0 + 36.88		13°45'	
0 + 55.32		20°37'30"	
0 + 73.76 = PRC		27°30'	
0 + 97.10	ch. 22.50		26°45'
1 + 20.44			53°30'
1 + 43.78			80°15'
1 + 67.12 = E.C.			107°00'
2 + 00			
2 + 33.86 = B.C.			
2 + 59.12	ch 25.25	2°53'41"	
2 + 84.38		5°47'22"	
3 + 09.64		8°41'03"	
3 + 34.91 = E.C.		11°34'45"	

3+57.57 = old E.C.
4+25.03 p 16 This Book

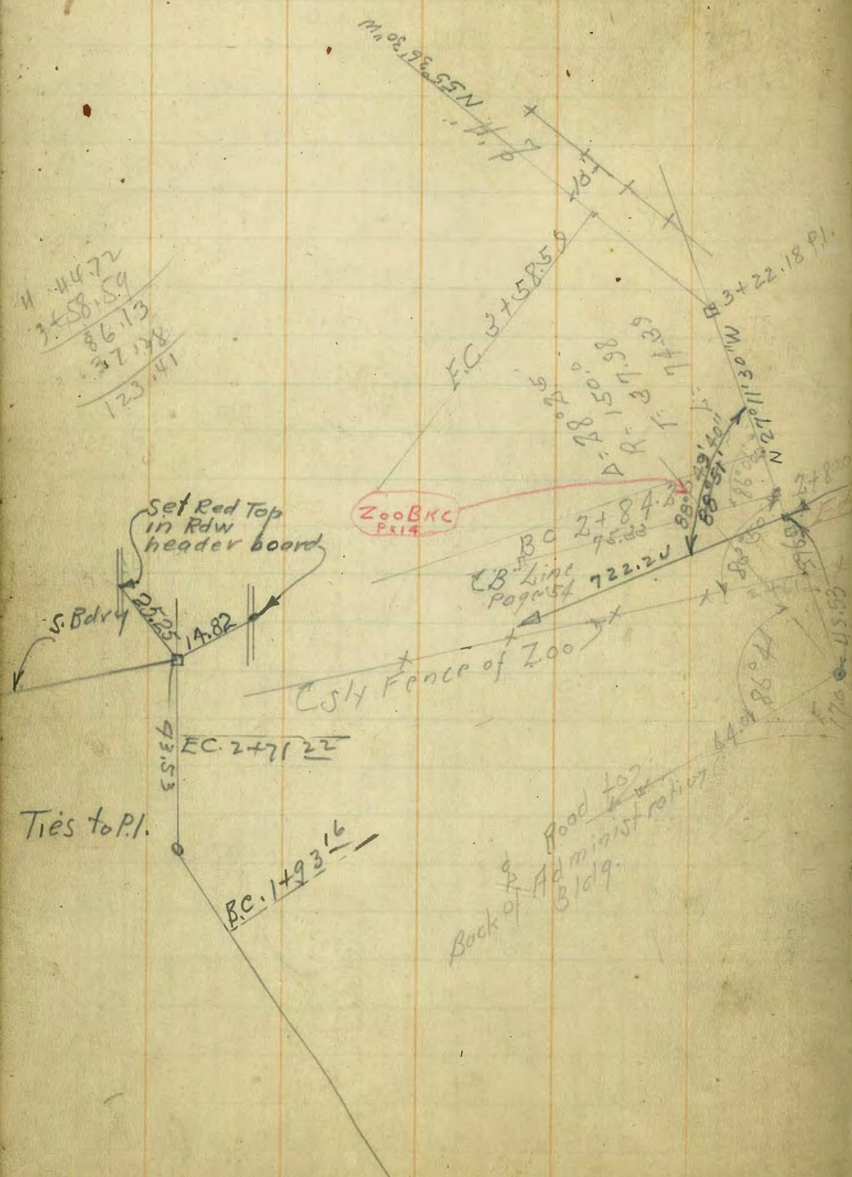
Indexed
C.S.K.

Moore
Sisson
Northern
6-27-34.

For G.W. Pardee
~~1051 Wall St.~~
La Jolla 2313
7901 H

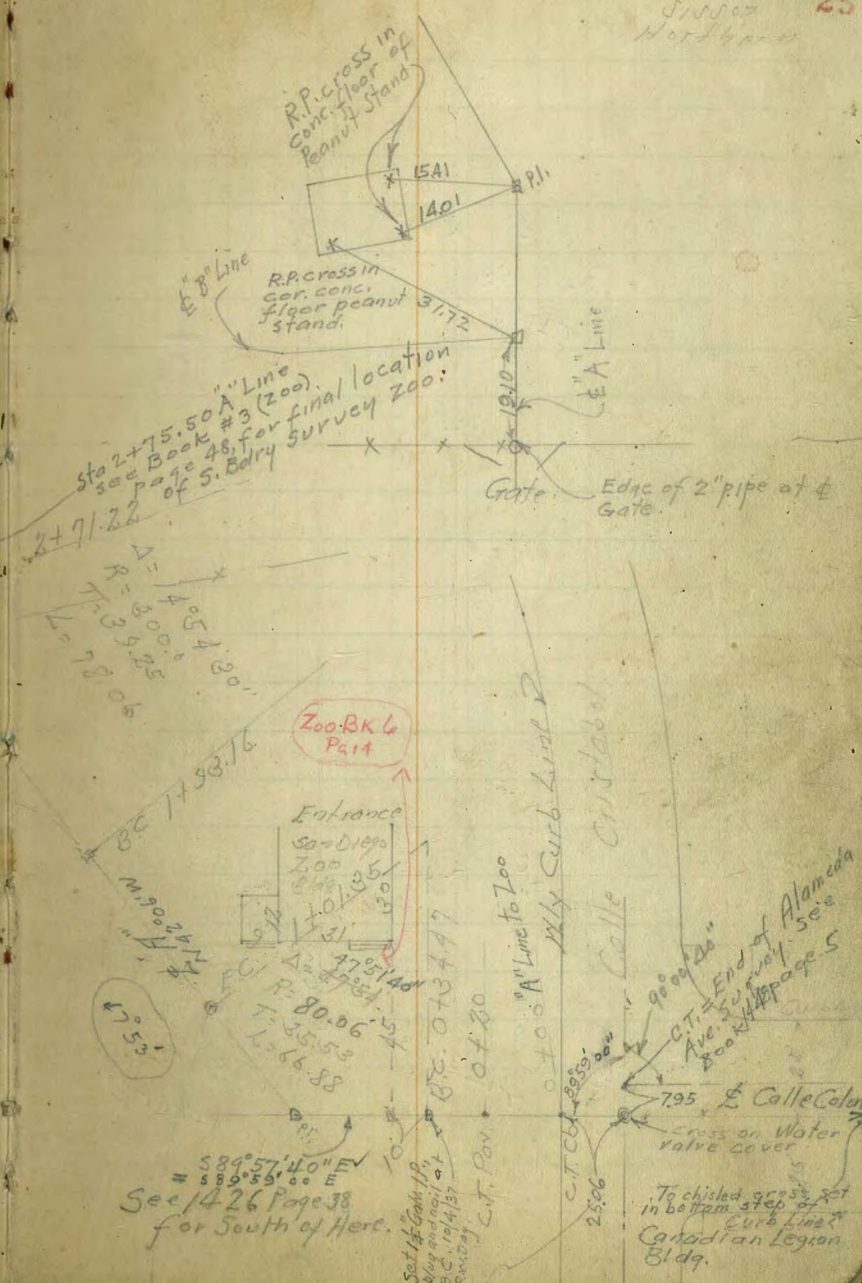


Alignment of Roads
San Diego Zoo Balboa Park

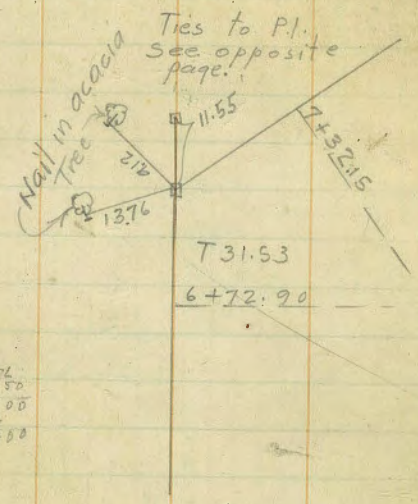


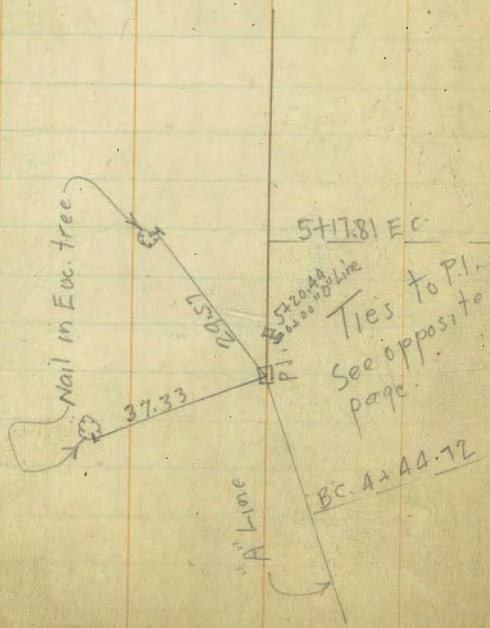
indexed - c.s.k.

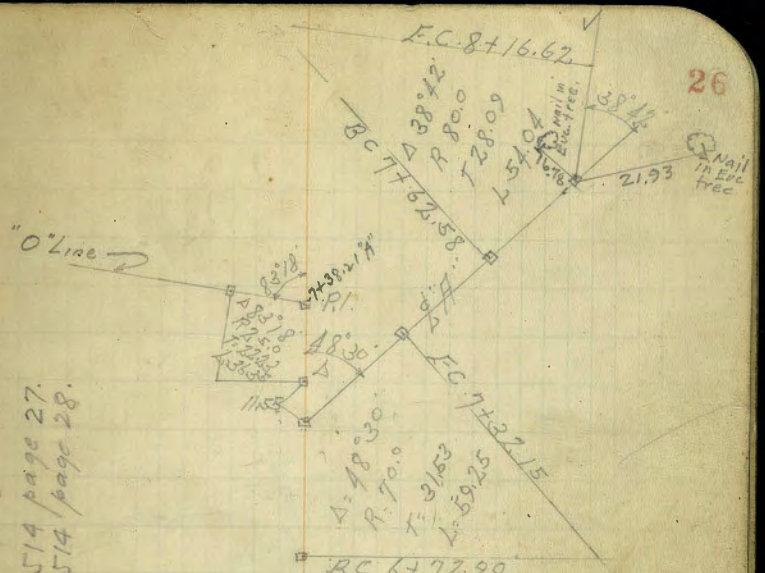
Sept. 5. 34
Moore
Sissor
Northrop



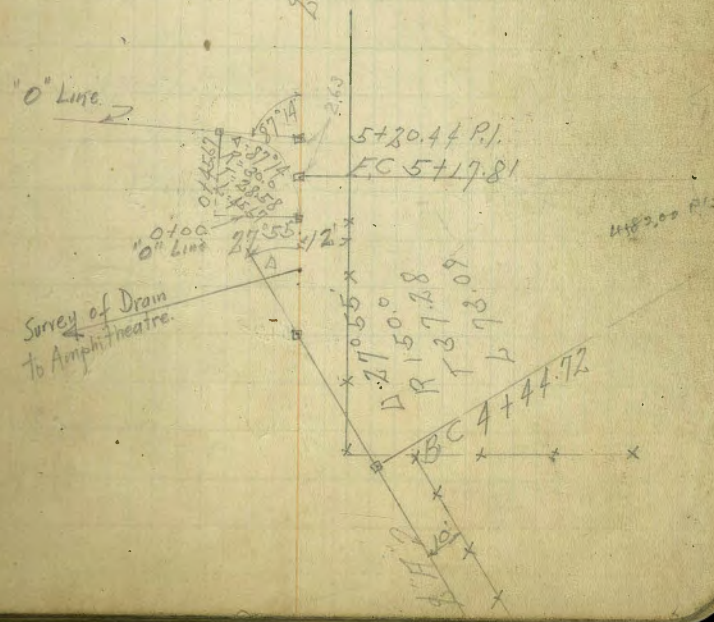
"H" Line



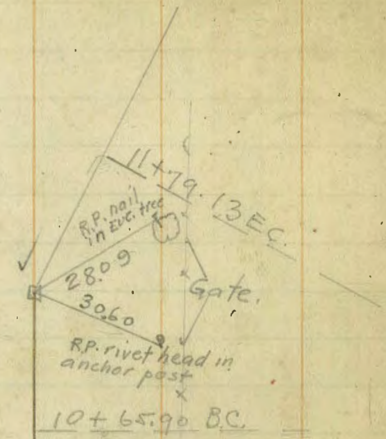




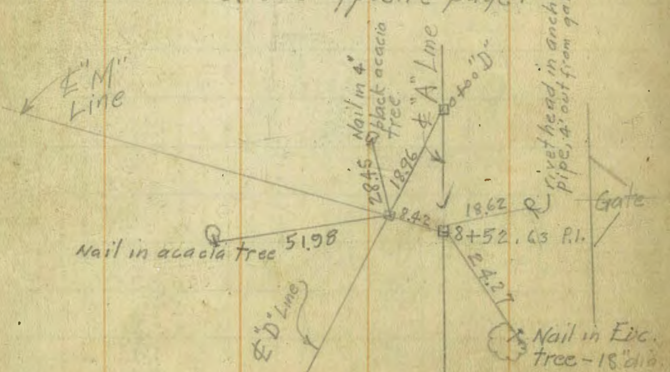
For alignment of "0" line
See Book 1514 page 27.
For Levels 1514 page 28.

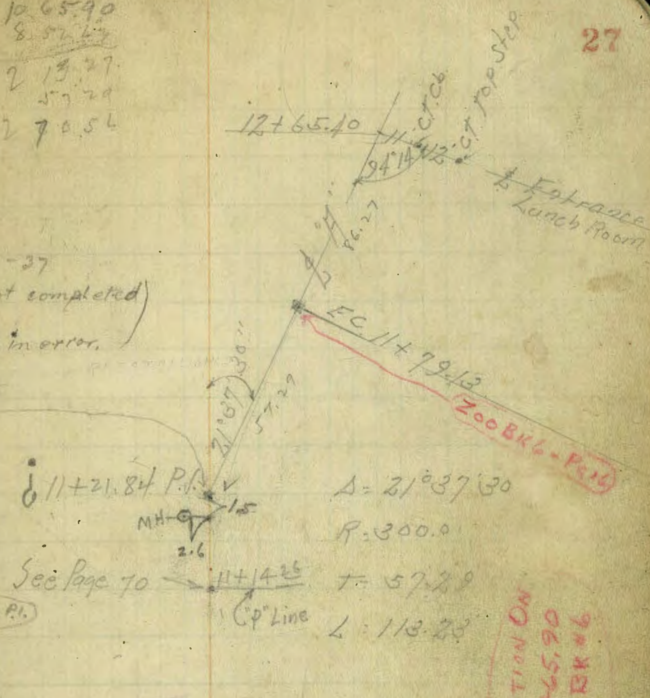


"A" Line



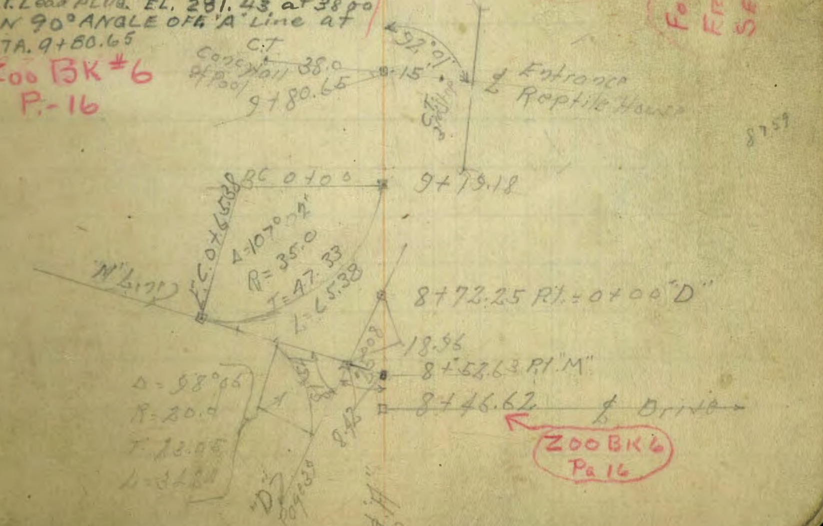
Ties To P.I.'s. See opposite page.





12-2-37
(Correction not completed)
(This is is in error.)

6-23-37
This 38' C.T. was destroyed
We Reestablished it on Con. Wall,
C.T. Lead PLUG. EL. 281.43 at 38.00
ON 90° ANGLE OFF "A" Line at
STA. 9+80.65
Zoo BK #6
P.-16



"A" Line

5
13)69
65

5
60)330
300
30

1° 55'
4
6 - 330
5 - 30
11 - 30
12 - 7
1 - 45

12+76.34
12+65.40
10.94
24.11
35.05

16+53.87
15+98.78
55.09
30 .35
85 .44

16+53.87
15+98.78
55.09

12+76.34
12+65.40
10.94

15+29.49
13+24.34
205.15

13° 15'
60
780
15
69.3) 795.0 (11.5
693
1020
693
3270
3465

69.3

115
60
1° 55'

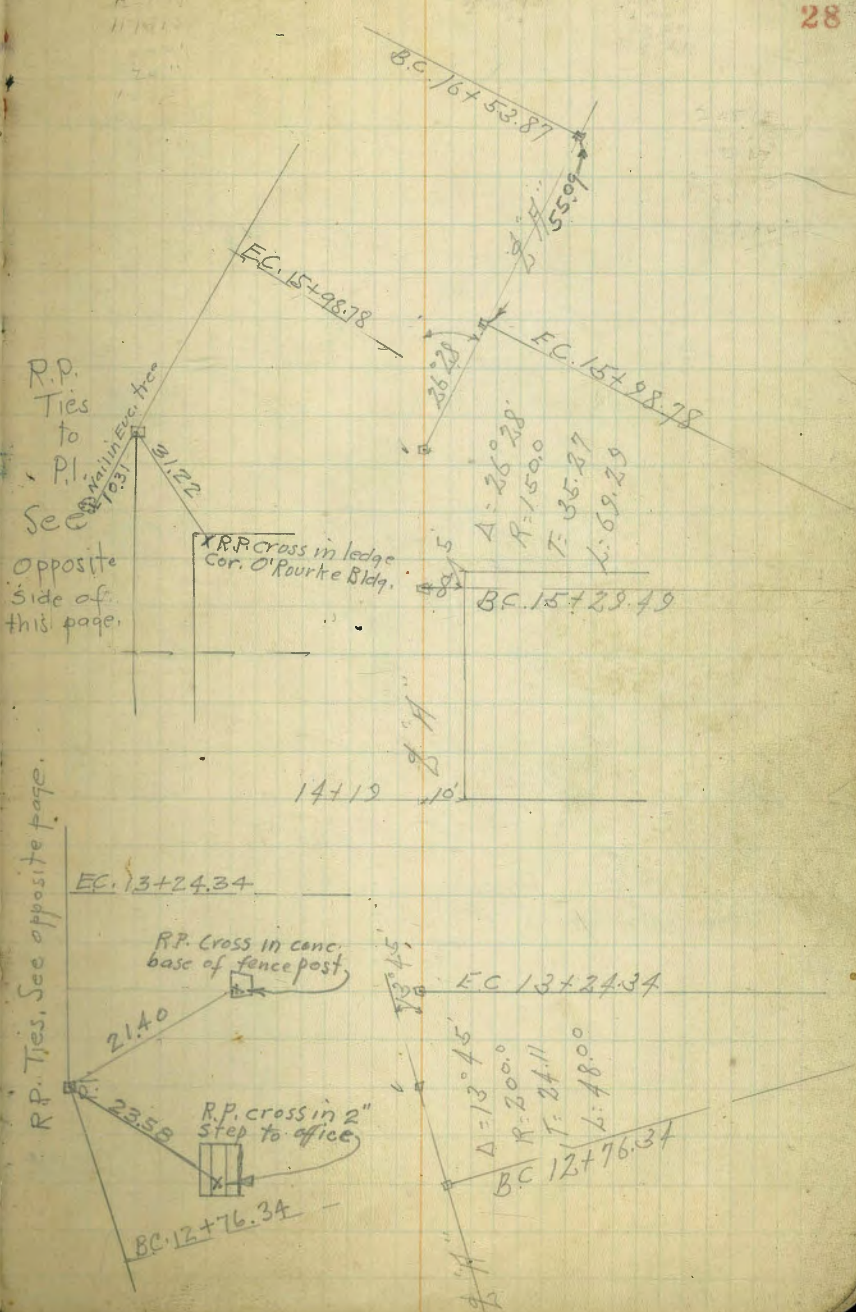
115
60
1° - 55'

11.5
9.3
345
1035
106.95
60
1° - 46'

11 - 30
1 - 46
13 - 16

1° 55'
1° 55'
110
3 60
- 50
1 55
105
5 60
45
1 55
100
7 40
1 55
9 35
1 50
11 30
1 - 47
13 - 27

1° 55'
3° 50'
5° 45'
7° 40'
9° 35'
11° 30'



"A" Line

18+87.96
18+80.70
7.26

18+80.70
17+10.07
70.63
30.35
100.98

20+00.84
19+74.48
26.36

18+84.45
7.26
18+77.19

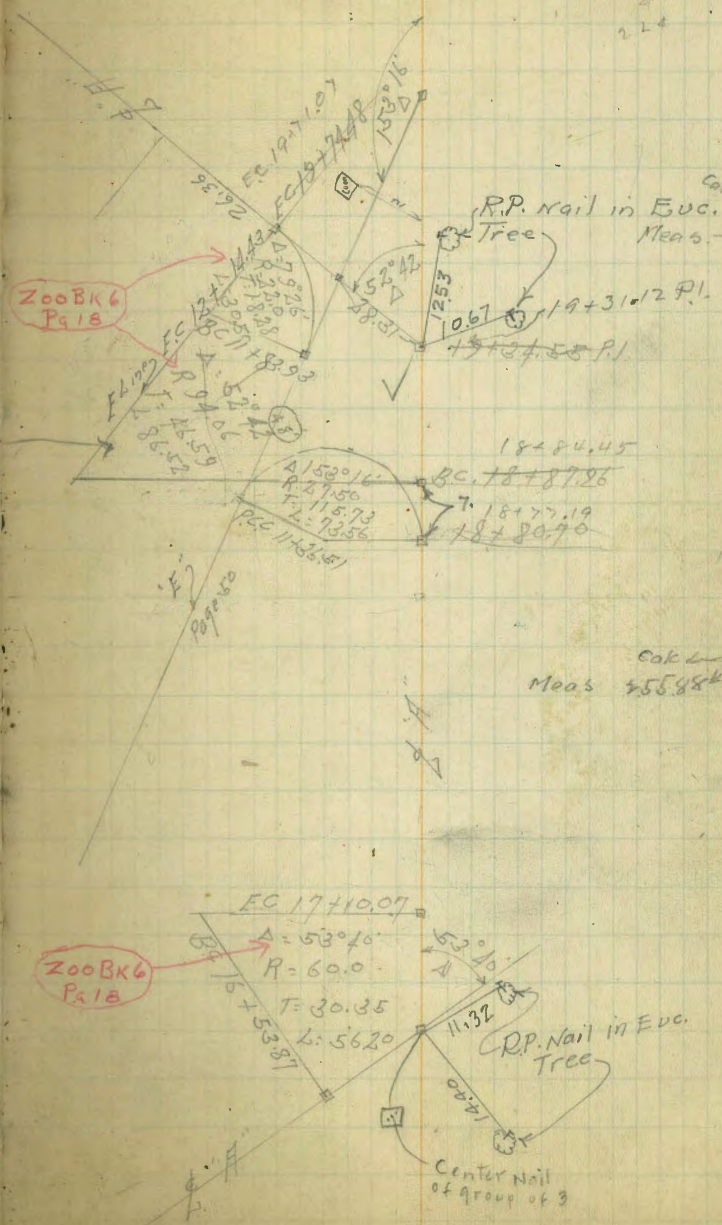
20 50.73
19+74.48
76.25

Now
Δ 52°47'
R 94.06
T 46.47
L 86.62

165387
159478
5509

35.27
30.35
55.09
120.71

205073
197448
7625
2923
4659
Calc → 143.07
Meas. → 142.16



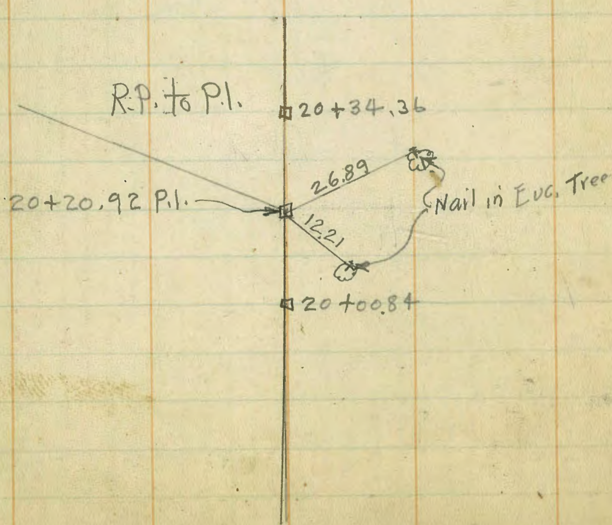
177.96
171.07
177.89
177.89
30.35
46.59
Calc → 254.83
Meas 255.88

"A" Line

21+49.00
20 86.33
56.67

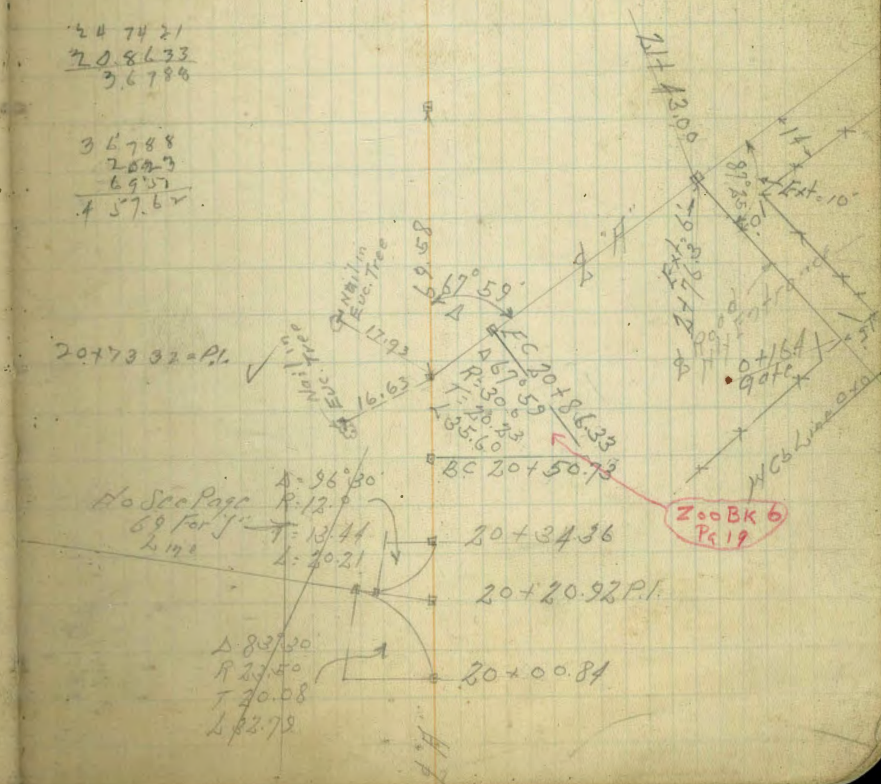
20 23
56 67
76.90

20+50.73
20+20.92
29.81



24 74 21
20 86 33
3 67 88

3 67 88
20.23
69.57
.4 57.62



H Line

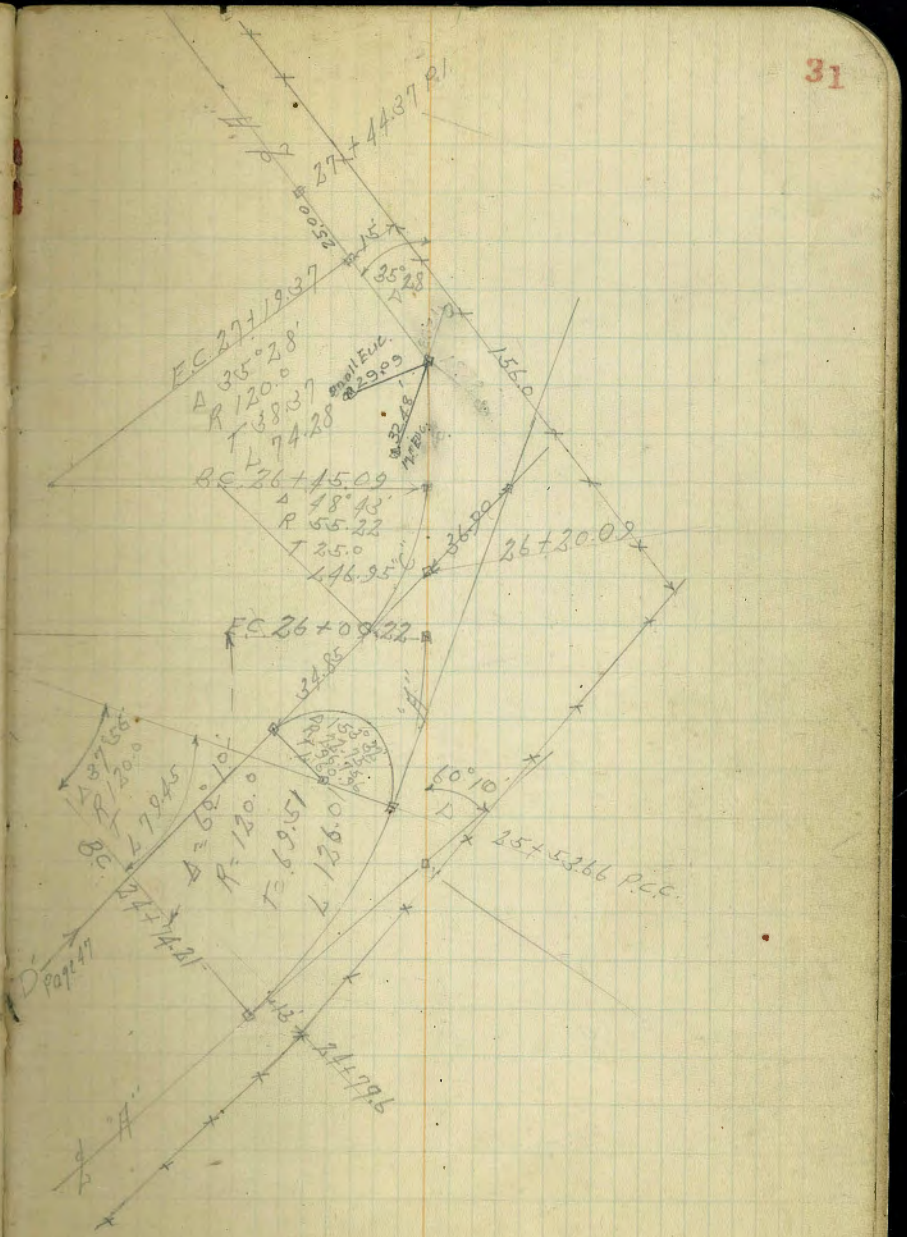
59.85
36.90
96.75

24+74.21
1 26.01
26.00.22

27+19.37

38.37
25.00
63.37

387.58
20.23
69.51
477.62



Zoo BK 6 Pg 21

Zoo B. 6 - P. 10

Richmond Ct.

Upon St.

Note: Sec 1414 Page 54 Miller

R.P. to P.I. 1486

Hay and Storage Barn

Log Road

Log Residence

"R" Line

"R" 12-17-31

"R" Line

(P.I.)

(P.I.) 27+44.37

R.P. Nail in Acacia Tree

R.P. Nail in Acacia Tree.

"R" Line E.C. 27+19.37

BC. 29+52.10

BC. 29+52.10

BC 7+05.91

27+30.57

BC 27+08.53

5+18

5+35

5+65

5+70

5+64

9+90

11+35

11+82.5

12+88.5

13+00

13+36

13+38

13+50

13+52

13+55

13+60

13+70

13+80

14+00

14+10

14+20

14+30

14+40

14+50

14+60

14+70

14+80

14+90

15+00

15+10

15+20

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69+30

69+40

69+50

69+60

69+70

69+80

69+90

70+00

70+10

70+20

70+30

70+40

70+50

70+60

70+70

70+80

70+90

71+00

71+10

71+20

71+30

71+40

71+50

71+60

71+70

71+80

71+90

72+00

72+10

72+20

72+30

72+40

72+50

72+60

72+70

72+80

72+90

73+00

73+10

73+20

73+30

73+40

73+50

73+60

73+70

73+80

73+90

74+00

74+10

74+20

74+30

74+40

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74+70

74+80

74+90

75+00

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75+70

75+80

75+90

76+00

76+10

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76+30

76+40

76+50

76+60

76+70

76+80

76+90

77+00

77+10

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77+60

77+70

77+80

77+90

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98+80

98+90

99+00

99+10

99+20

99+30

99+40

99+50

99+60

99+70

99+80

99+90

100+00

Levels Roads San Diego Zoo

"A" Line

BM	10.25	294.20		283.95	N.E. BP Laurel + Park Rd
TP	1.69	291.77	4.12	290.08	
TP	2.54	287.45	6.86	284.91	00 C.T. 0+20
		0+0 = W Cb.			
℄	Gutter		3.77	283.68	
	Top Cb		3.16	284.29	
		0+23			
℄	= W/ Black Pot		2.47	284.98	
		0+34.47 = BC.			
℄	on Hub		2.45	285.00	
		0+67.91			
℄			3.3	284.15	
		1+01.35 = EC.			
℄	on Hub		4.46	282.99	
		1+47			
℄			6.2	281.25	
		1+93.16 BC.			
℄	on Hub		7.52	279.93	
		2+32.19			
℄			8.1	279.35	
TP	5.10	284.71 ✓	7.84	279.61	
		2+71.22 EC.			
℄			5.1	279.61	
		2+80			
℄	on Hub		4.84	279.87	

Sept 7-34.

284.71

2+84.20 BC.

℄	on Hub	4.69	280.02
	3+21.4		
℄		4.8	279.91
	3+58.59 EC.		
℄	on Hub	5.10	279.61
	4+0		
℄		5.7	279.01
	4+14.72 B.C.		
℄		7.1	277.61
	4+81.5		
℄		7.2	277.51
TP	7.11 284.57	7.35	277.46
	5+17.81 EC.		
℄	E. Hub	7.09	277.48
	2' Rt = Top Grating FL. 2' Below 8" Pipe	7.16	277.41
	5+50		
℄		6.3	278.27
	6+0		
℄		4.8	279.77
	6+50		
℄		4.5	280.07
	6+72.90 BC.		
℄	on Hub	4.72	279.85

"A" Line

		284.57			
7+03					
℄			5.0	279.57	
7+32.15 E.C.					
℄ on Hub			4.95	279.62	
7+62.58 B.C.					
℄			5.06	279.51	
7+89.6					
℄			5.1	279.47	
8+16.62 E.C.					
℄			4.61	279.96	
TP	5.48	285.44	4.61	279.96	
8+72.25 = 0+0 "℄C"					
℄ on Hub			4.68	280.76	✓
9+19.18 = 0+0 "D"					
℄ on Hub			3.74	281.70	
9+80.65					
℄			3.8	281.64	
BM			4.01	281.43	C.T. Cone. wall of Pool 38 Lt 9+80.65
10+20					
℄			4.1	281.34	
10+65.90 B.C.					
℄ on Hub			6.34	279.10	
11+22.5					
℄			9.2	276.24	
11+46.5					
℄			9.1	276.34	

		285.44		
11+79.13 E.C.				
℄ on Hub			8.30	277.14
12+0				
℄			7.8	277.64
12+50				
℄			7.6	277.84
12+76.34 B.C.			—	
℄			7.64	277.80
13+0				
℄			7.8	277.64
TP	2.96	280.65	7.75	277.69
13+24.34 E.C.			—	
℄			3.3	277.35
14+0				
℄			5.1	275.55
12' Rt. Top Sump 2' Below FL. 16" Culv. 26' Long.			5.58	275.07
14+50				
℄			5.1	275.55
15+0				
℄			5.1	275.55
15+22.49 B.C.				
℄			5.2	275.45
15+64.14				
℄			4.9	275.75

"H" Line

280.65

15+98.78 EC

℄ on Hub 4.29 276.36

16+58.87 BC

℄ 3.05 277.60

16+82

℄ 2.2 278.35

17+10.07 EC

℄ 1.6 279.05

TP 10.06 289.81 1.40 279.25

17+50

℄ 2.5 279.81

17+75

℄ 8.2 281.11

18+0

℄ 6.6 ~~5.4~~ 282.71

18+25

℄ 6.0 ~~2.9~~ 283.31

18+50

℄ 4.6 ~~3.9~~ 284.71

18+80.78 CH 3.2 286.11

18+87.96 BC

℄ 3.2 286.11

19+28

℄ 3.9 285.41

19+74.48 EC

℄ on Hub 2.6 286.71 X

289.81

20+50.73 BC

℄ 3.30 286.01

20+66

℄ 3.4 285.91

20+86.33 EC

℄ on Hub 3.71 285.60

TP 4.22 289.82 3.71 285.60

21+18.00

℄ on Hub 4.93 284.89

22+0

℄ 4.7 285.1 X

+50

℄ 3.8 286.0

23+0

℄ 4.2 285.6

+50

℄ 4.9 284.9

24+0

℄ 5.6 284.2

+50

℄ 6.1 283.7

24+74.21 BC

℄ on Hub 6.28 283.54

25+35

℄ 6.8 283.0

TP 7.89 281.93

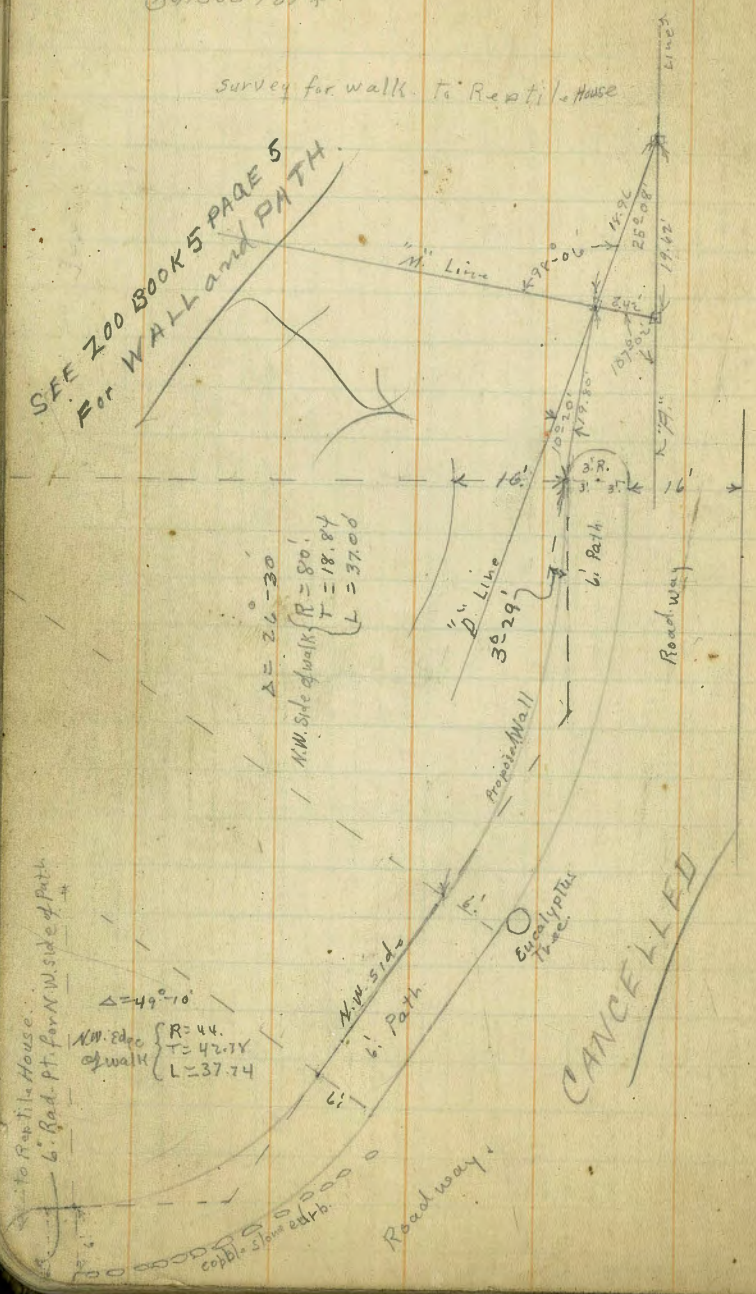
Conf 1514 Page 5

℄ Levels Hly Entrance to Zoo

Page 30

	10.17	295.06		284.89	0 7 Hub 21+43 Page 37
0+0	N Cb Top		4.30	290.76	
+16.4	Fence		4.1	291.0	
+50			4.4	290.7	
1+0			4.8	290.3	
+50			6.5	288.6	
2+0			7.7	287.4	
+50			9.5	285.6	
2+76.3	= 21+43.0 Main Road		10.17		

"D" Line
Alignment of Roads San Diego Zoo
Balboa Park



10-1-87
Moore
Sisson
Northern

39

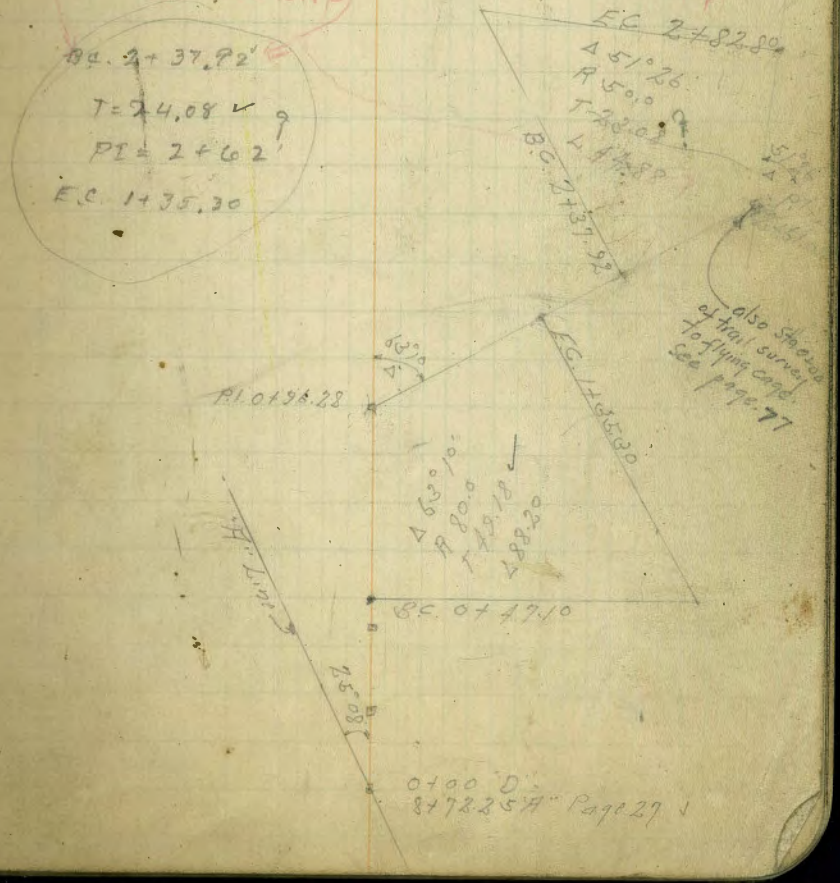
CORRECT
SEE ZOO BK 6

Bc. 2+37.82

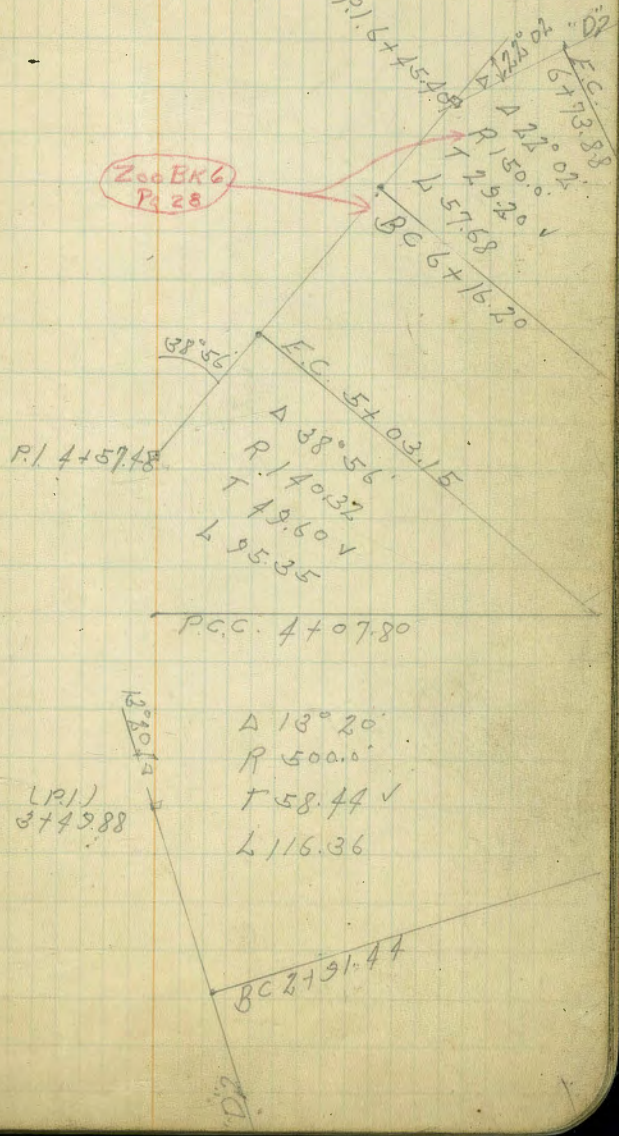
T=24.08

PI = 2+62

E.C. 1+35.20

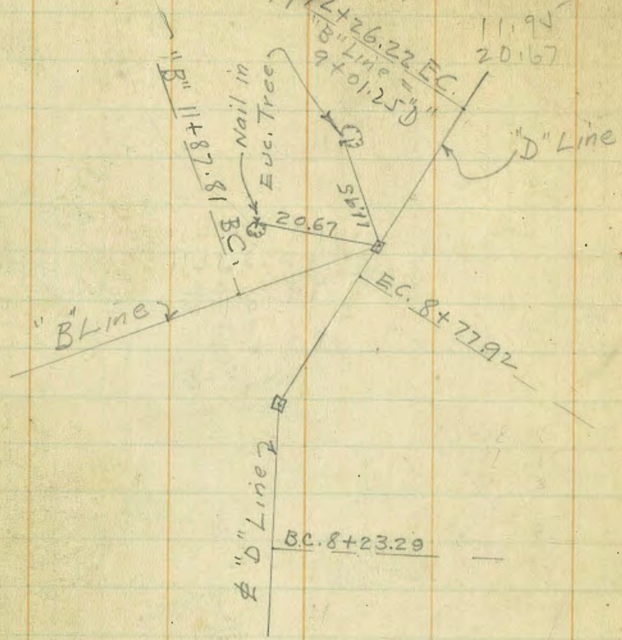


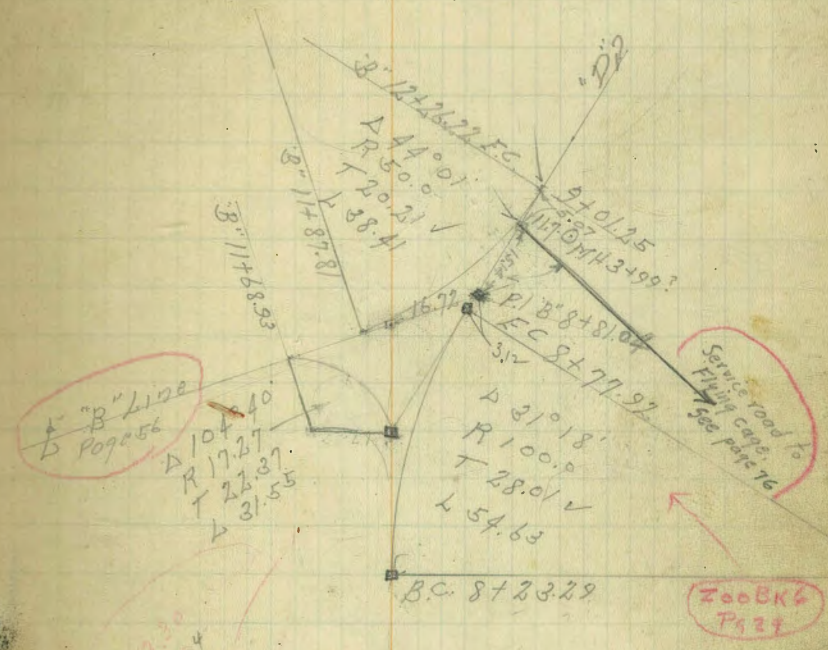
D" Line

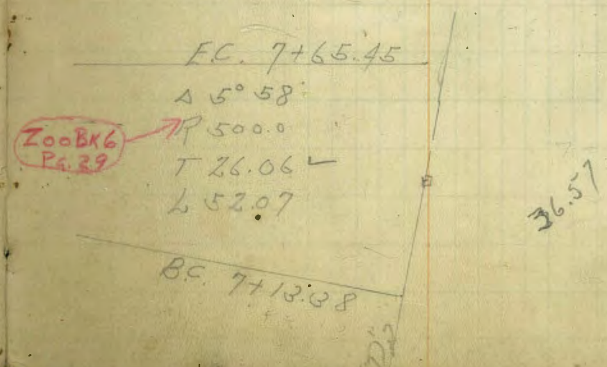

P.I. 6+45.48
Δ 12° 02'
E.C. 6+73.88
Δ 22° 02'
R 150.0'
T 29.20 ✓
L 57.68
BC 6+16.20
See Bk 6 Pg 28
38° 56'
E.C. 5+03.15
Δ 38° 56'
R 140.32'
T 49.60 ✓
L 95.35
P.I. 4+57.48
P.C.C. 4+07.80
12° 10' 14"
Δ 18° 20'
R 500.0'
T 58.44 ✓
L 116.36
L.P.I. 3+49.88
BC 2+91.44
D"

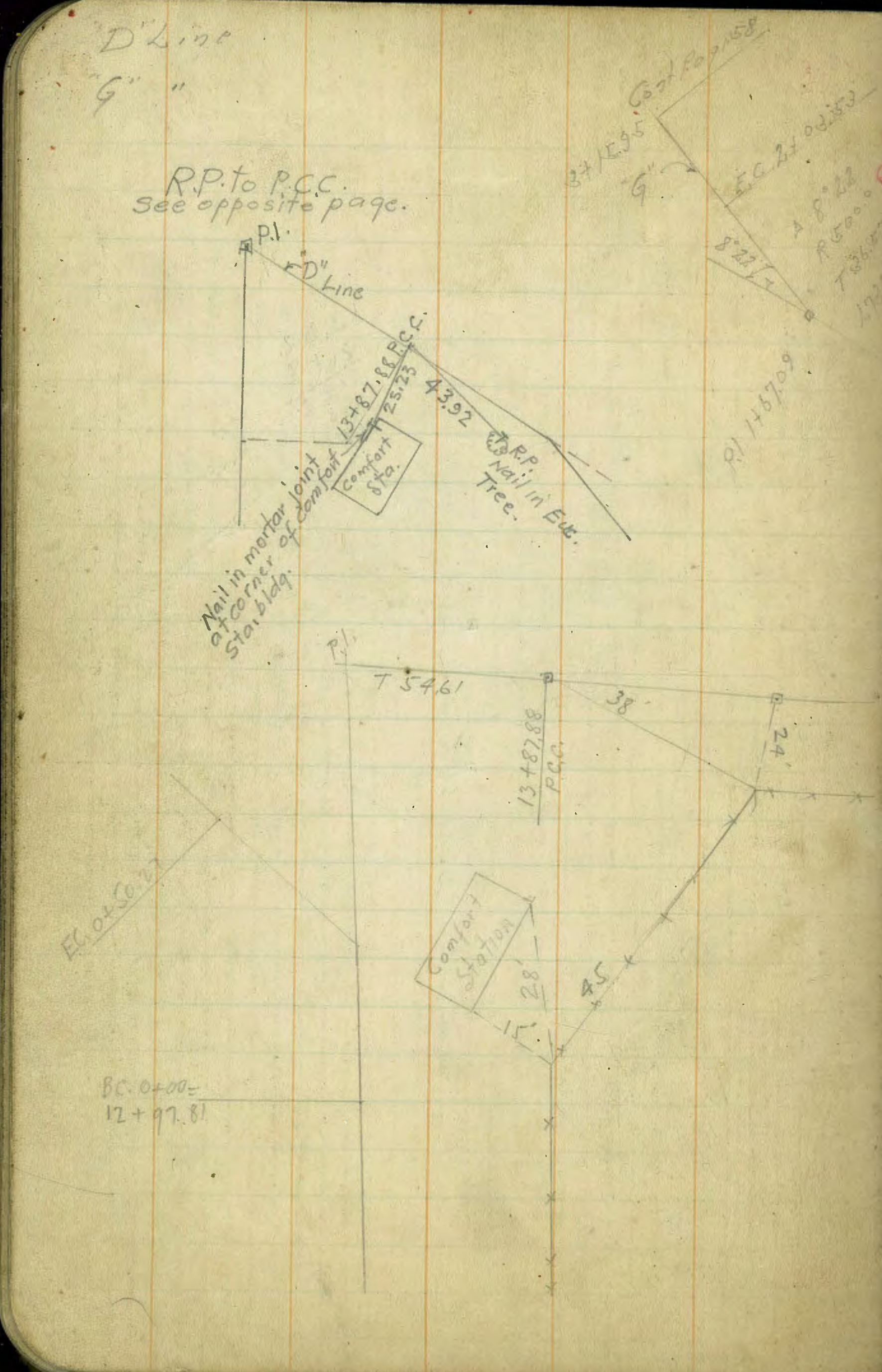
"D" Line

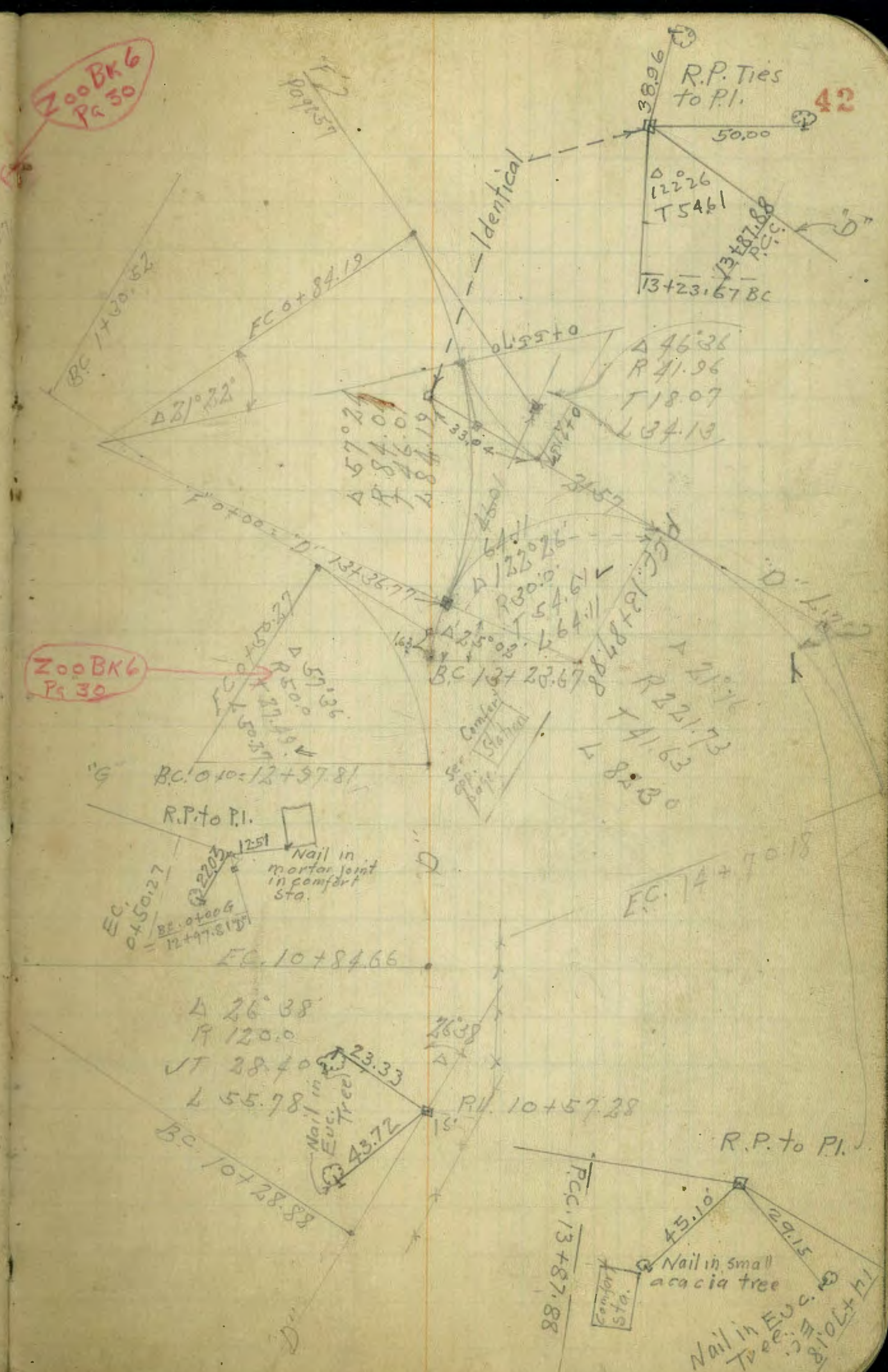
R.P. to P.I.
see opposite page.








"D" Line
"G" "
R.P. to P.C.C.
See opposite page.
P.I.
"D" Line
13+87.88 P.C.C.
25.23
43.92
R.P. Nail in Euc. Tree.
Comfort Sta.
Nail in mortar joint at corner of comfort sta. bldg.
P.I.
T 54.61
13+87.88 P.C.C.
38
24'
Comfort Station
28'
15'
45
E.C. 0+50.27
B.C. 0+00 = 12+97.81
P.I. 1+67.09
B.C. 1+30.52
8°22'
E.C. 2+04.83
Δ 8°22'
R 500.0
T 36.57
3+13.95
"G"

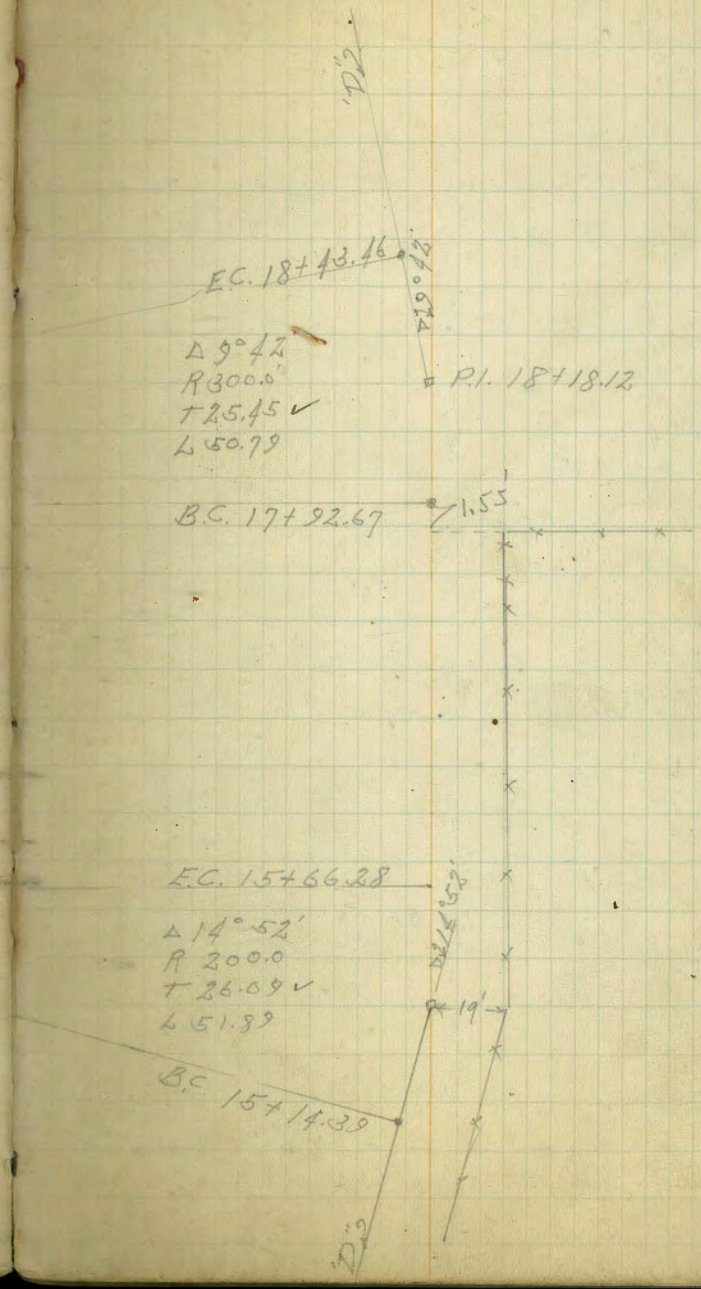

Zoo Bk 6 Pg 30
R.P. Ties to P.I.
38.96
50.00
Δ 12°26'
T 54.61
13+87.88 P.C.C.
"D"
13+23.67 B.C.
Identical
E.C. 0+84.19
Δ 21°22'
Δ 57°27'
Δ 46°36'
R 41.96
T 18.07
L 34.13
33.0
31.57
Δ 122°26'
R 30.0
T 54.61
L 64.11
"F" 0+00 = "D" 13+36.77
B.C. 13+23.67
Δ 25°08'
"D" Line
Δ 21°16'
R 221.73
T 41.63
L 82.30
Zoo Bk 6 Pg 30
Δ 57°36'
R 50.0
"G"
B.C. 0+00 = 12+97.81
Comfort Station see opp. page
R.P. to P.I.
12.51
Nail in mortar joint in comfort sta.
E.C. 0+50.27
B.C. 0+00 G = 12+97.81 "D"
E.C. 14+70.18
E.C. 10+84.66
Δ 26°38'
R 120.0
T 28.40
L 55.78
26°38'
23.33
Nail in Euc. Tree
43.72
P.I. 10+57.28
B.C. 10+28.88
"D"
R.P. to P.I.
P.C.C. 13+87.88
45.10
29.15
Nail in small acacia tree
Comfort Sta.
Nail in Euc. Tree
14+01.31

D'Line

15+14.39
14+70.18
44.21
26.09
70.30

17+92.67
15+66.28
2+26.39

25.45
1.55
27.00

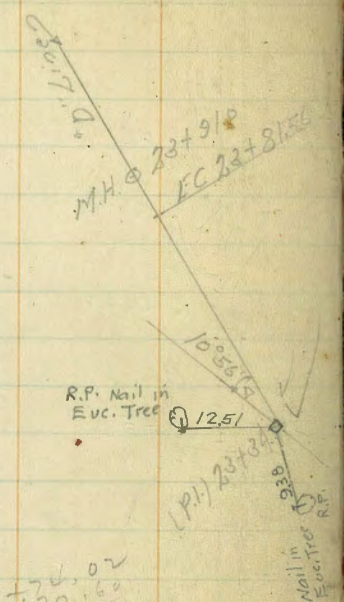


"D" Line

100.00
81.56
18.44

d	s	2R	ch.
1-22	.02385	1000	23.85
2-44	.04769		47.69
4-06	.07150		71.50
5-28	.09527		95.27

36.78
3.42
40.20



20+96.02
20+70.60
5.42

20+70.60
18+43.46
2+27.14

20+70.60
23.88
20+94.48

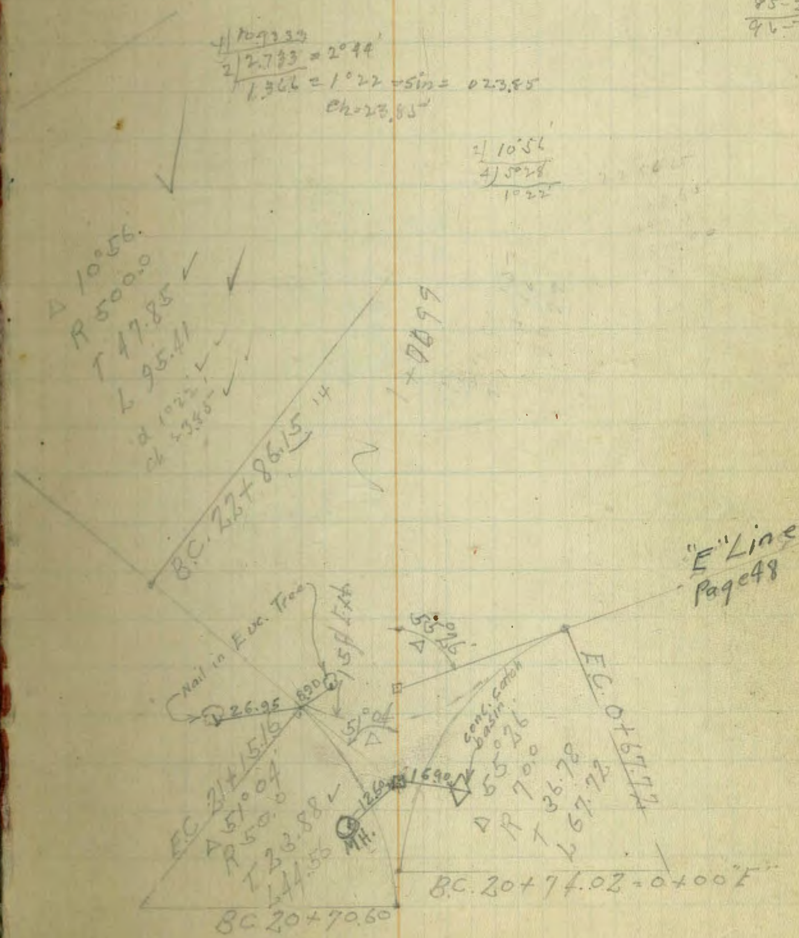
22+86.15
21+15.16
1 71.00
47.85
2 18.85

21+15.16
70.12
6 44.48
41.63
C+86.61

4/10.93.33
2/2.733 = 2°44'
1.366 = 1°22' = sin = .02385
ch = 23.85

2/10°56'
4/5°28'
1°22'

10°56'
85-30
96-26



"D"

"D" Line

26+16.25
46.65
26+62.90

26+16.25
43.04
26+59.29

26+16.25
25+72.91
43.34
46.65
26.74
116.73

26.74

25+19.74
23+81.56
1 38.18
26.74
164.92

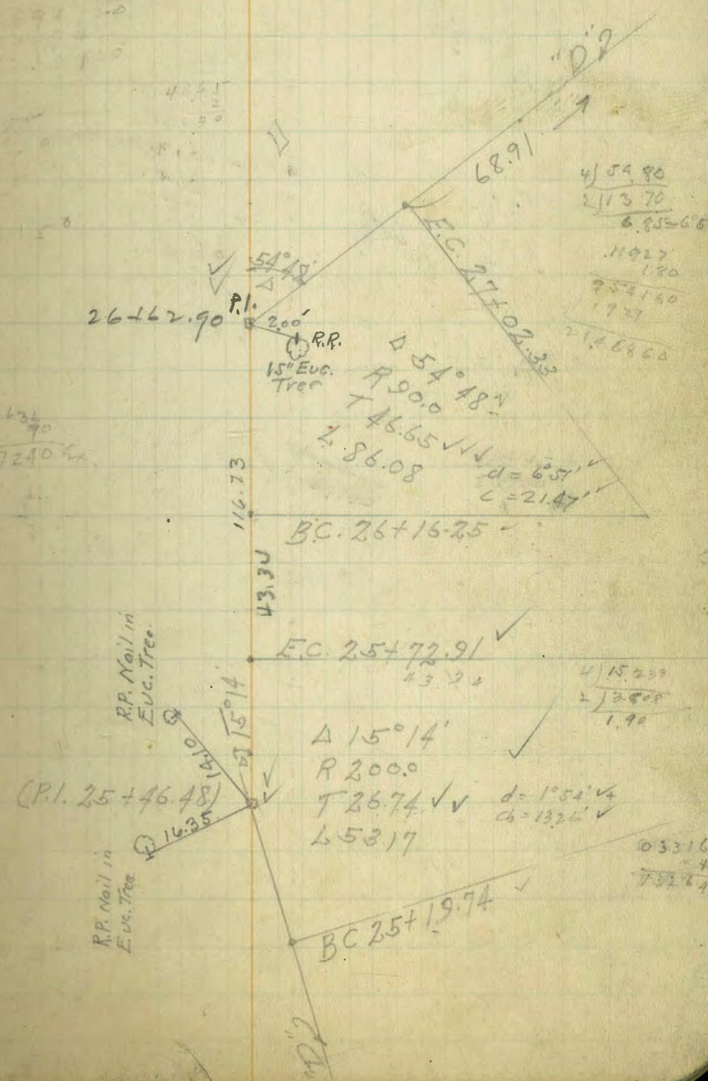
d = 1°54 - Sin .03316
400
Ch = 13.26400

.00890
200
17.8000

d	s	2R	ch
1 54	.03316	400	13.264
3 48	.06627		26.508
5 42	.09934		39.728
7 34	.13251		53.016

Sin 27°24 = .46020
2 R 180°
368160
46020
L.C. 8283600

71 24
27.02 33
70.91
46.65
60.00
177.06



4) 54.80
2) 13.70
6.85 = 6°51'

.11927
180

4) 15.229
2) 3.808
1.90

.03316
4
.13264

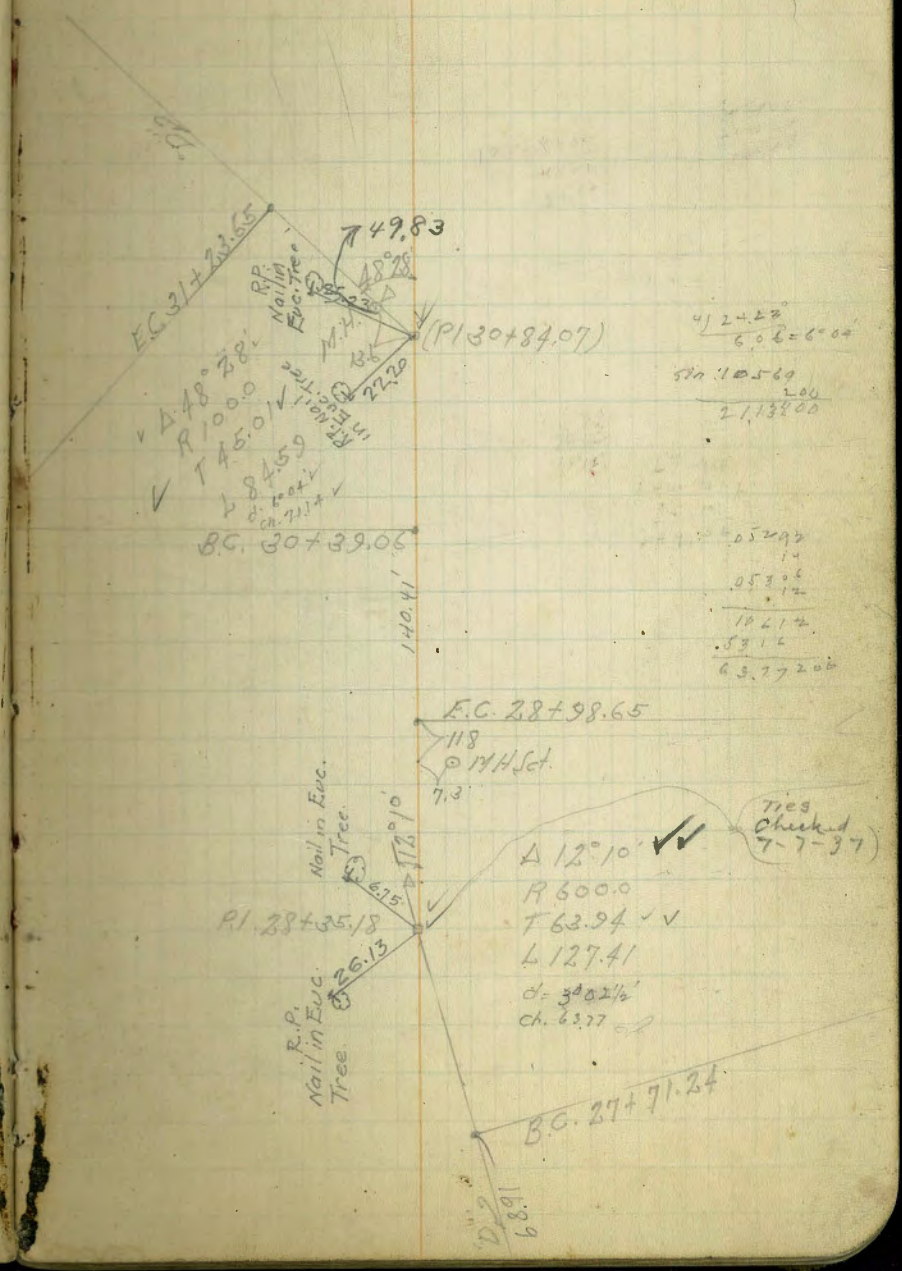
"D" Line

33+13.01
31+23.65
1 89.36
3 1.27
220.63

27+71.24
27+02.53
68.91
46.65
63.94
179.50

1812

46



"D" Line

20.13
11.55
8.19

20.13
8.19

33+75.32
20.6
33+54.7

34+49.17
33+75.32
73.85

25.00
34.85
59.85

35+96.77
35+24.63
72.14

37+35.33
37+00.48
34.85

37+00.48
36+41.54
58.94

31.2365
33.1701
1.9336

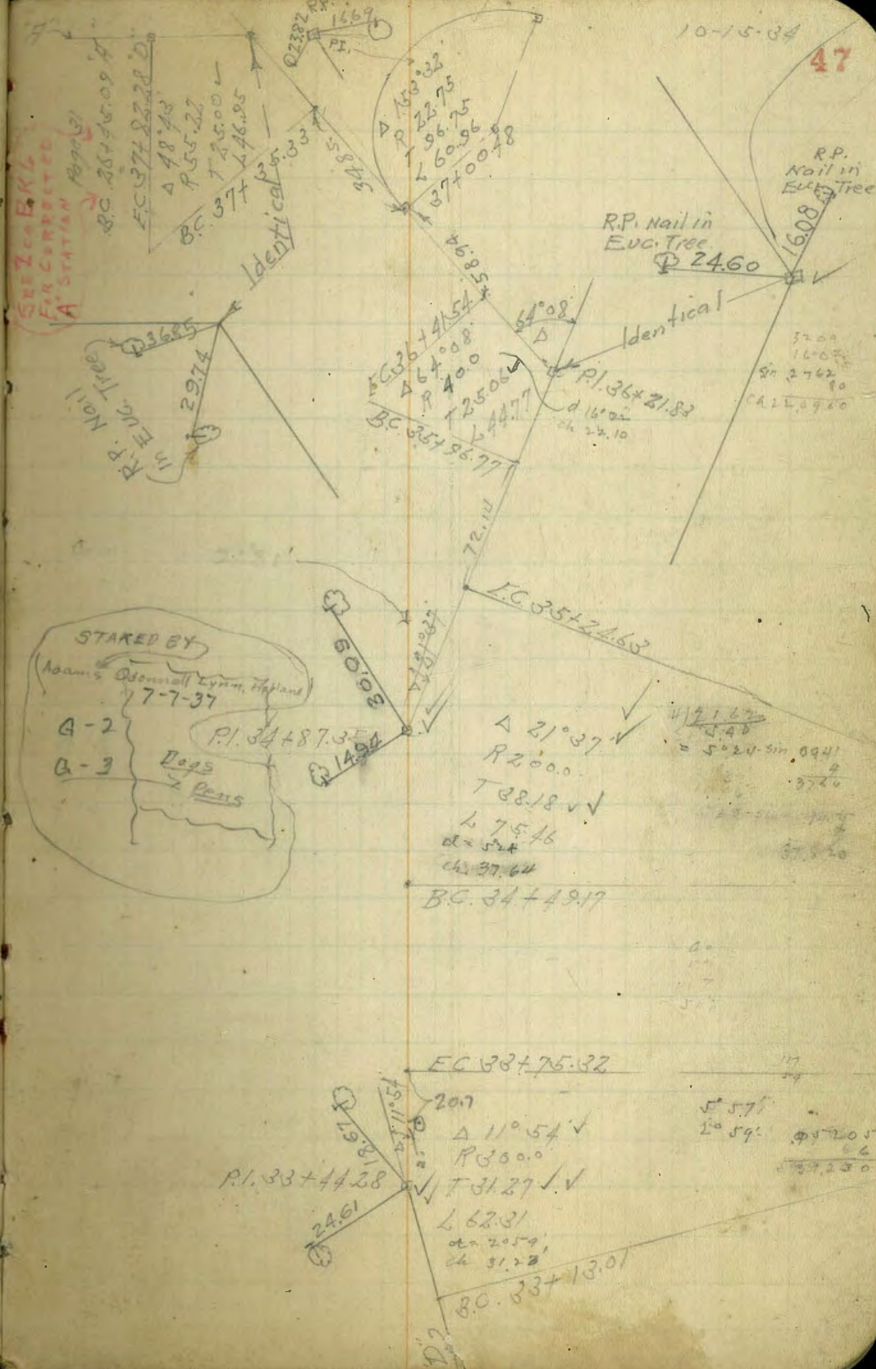
45.07
31.27
184.36
265.64

63.94
31.27
414.36
509.57

34+49.17
33+75.32
73.85

38.18
31.27
73.85
143.30

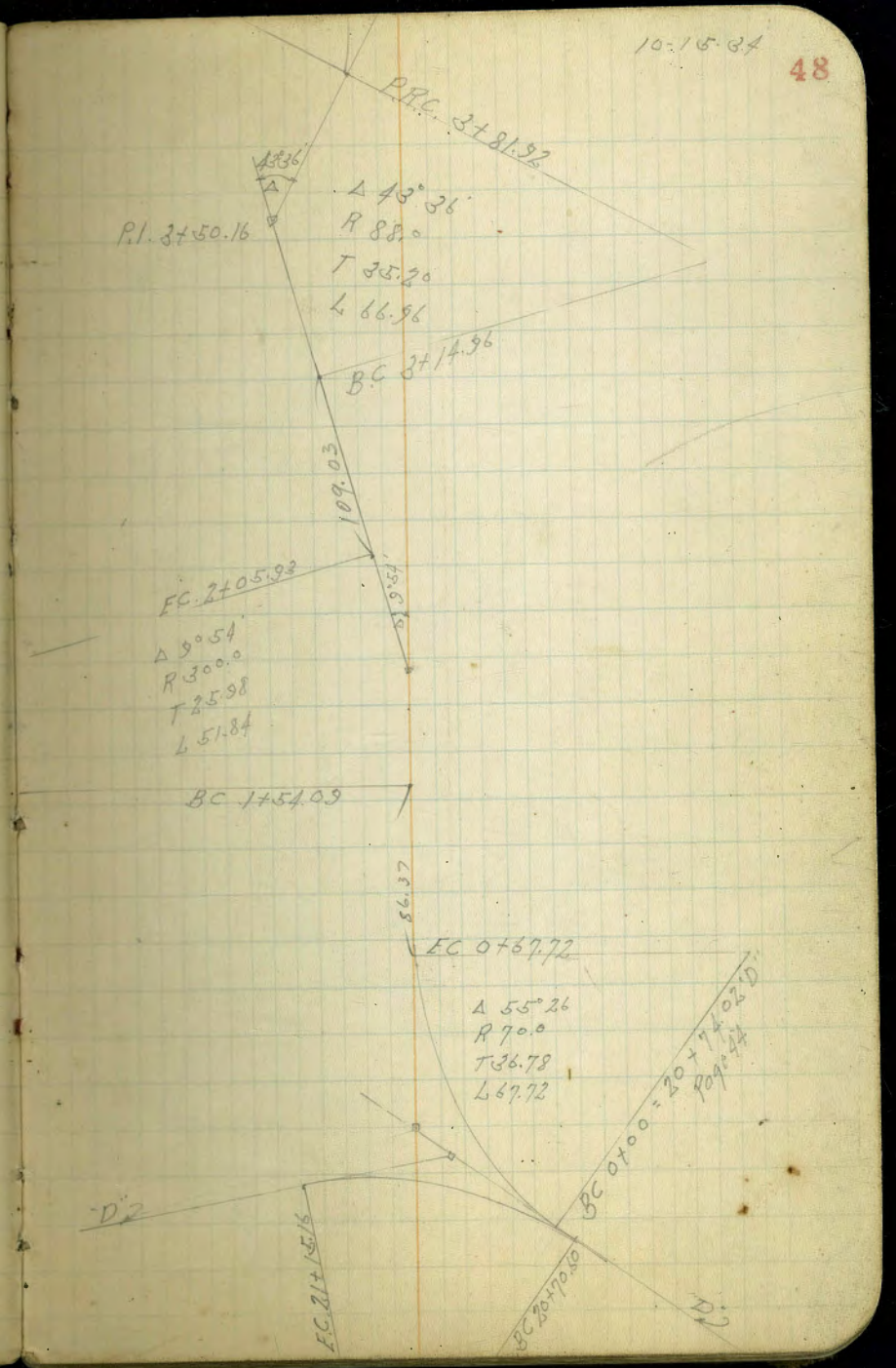
58.94
34.85
25.00
118.79



See Z to E K L For Corrected "A" Station Pages
B.C. 35+96.77
E.C. 37+35.33
Δ 48°48'
R 55.22
B.C. 37+00.48
Identical
Δ 53°32'
R 22.75
T 96.75
L 60.96
37+00.48
R.P. Nail in Euc. Tree
24.60
16.08
R.P. Nail in Euc. Tree
E.C. 36+41.54
Δ 64°08'
R 40.0
T 25.06
L 44.77
64°08'
P.I. 36+21.83
Identical
R.P. Nail in Euc. Tree
29.74
72.14
E.C. 35+24.63
STAKED BY
Adams O'Donnell Lynn, Hyland
7-7-37
G-2
G-3
Dogs
Pens
P.I. 34+87.35
30.09
14.94
Δ 21°37'
R 200.0
T 38.18
L 75.46
B.C. 34+49.17
E.C. 33+75.32
20.7
Δ 11°54'
R 300.0
T 31.27
L 62.31
P.I. 33+44.28
18.67
24.61
B.C. 33+13.01

E. Line
S. Day
Ritchie
Kurth

10-16-84



1+54.09
0 6 7.72
8 6.37
2 5.98
3 6.78
1 4 9.13

3+14.96
2+05.93
1 09.03
3 5.20
2 5.98
1 7 0.21

"E" Line

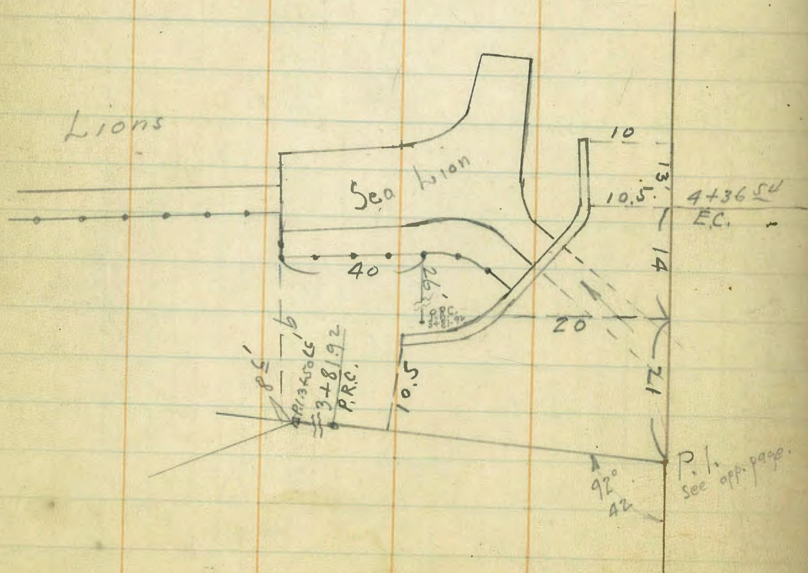
7+25.34
6+04.20
1.21.14
69.26
75.82
2 66.22

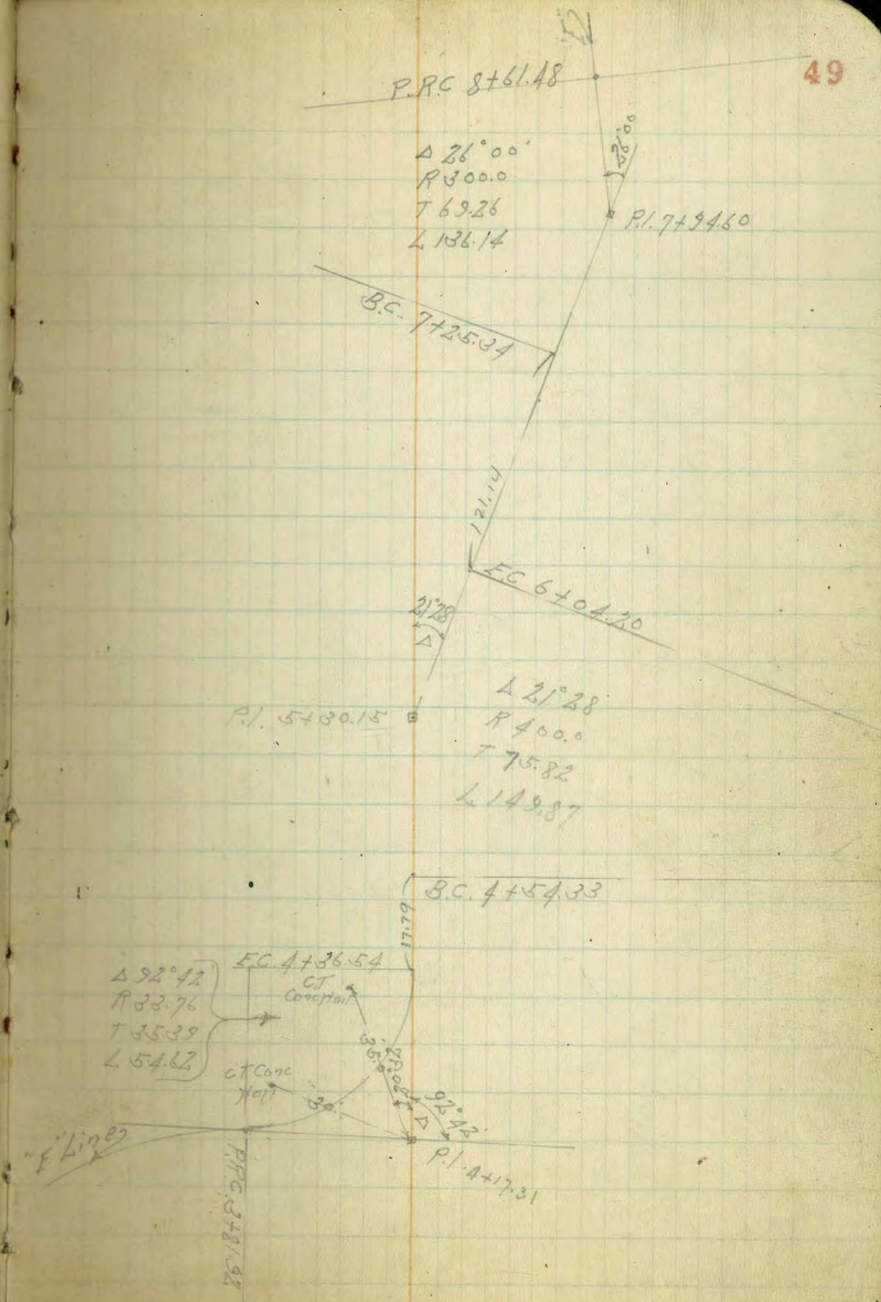
35.39
17.79
75.82
129.00

4+54.33
4+36.54
17.79

53.18

Lions



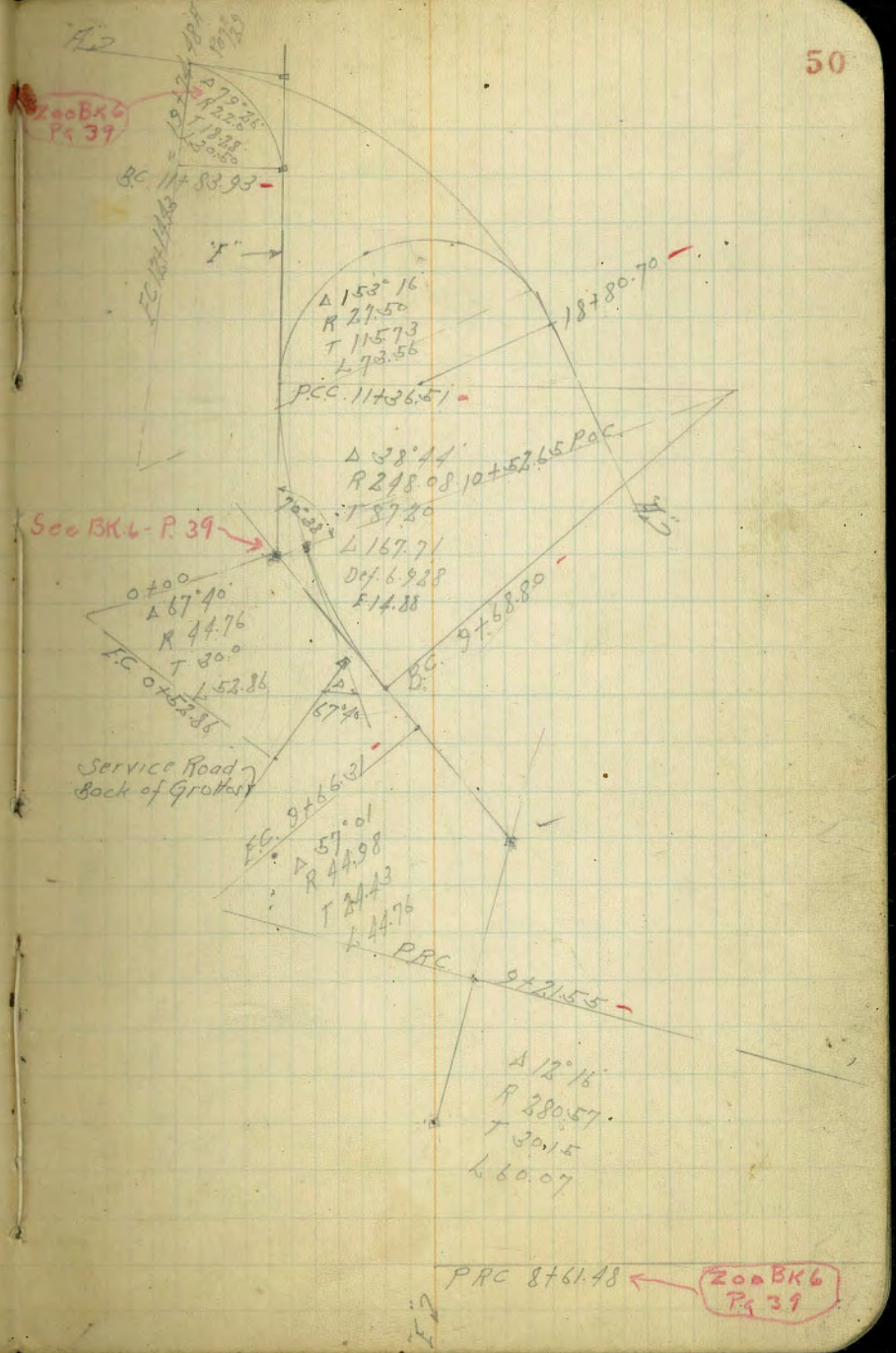


"E" Line

69.76
30.15
99.41

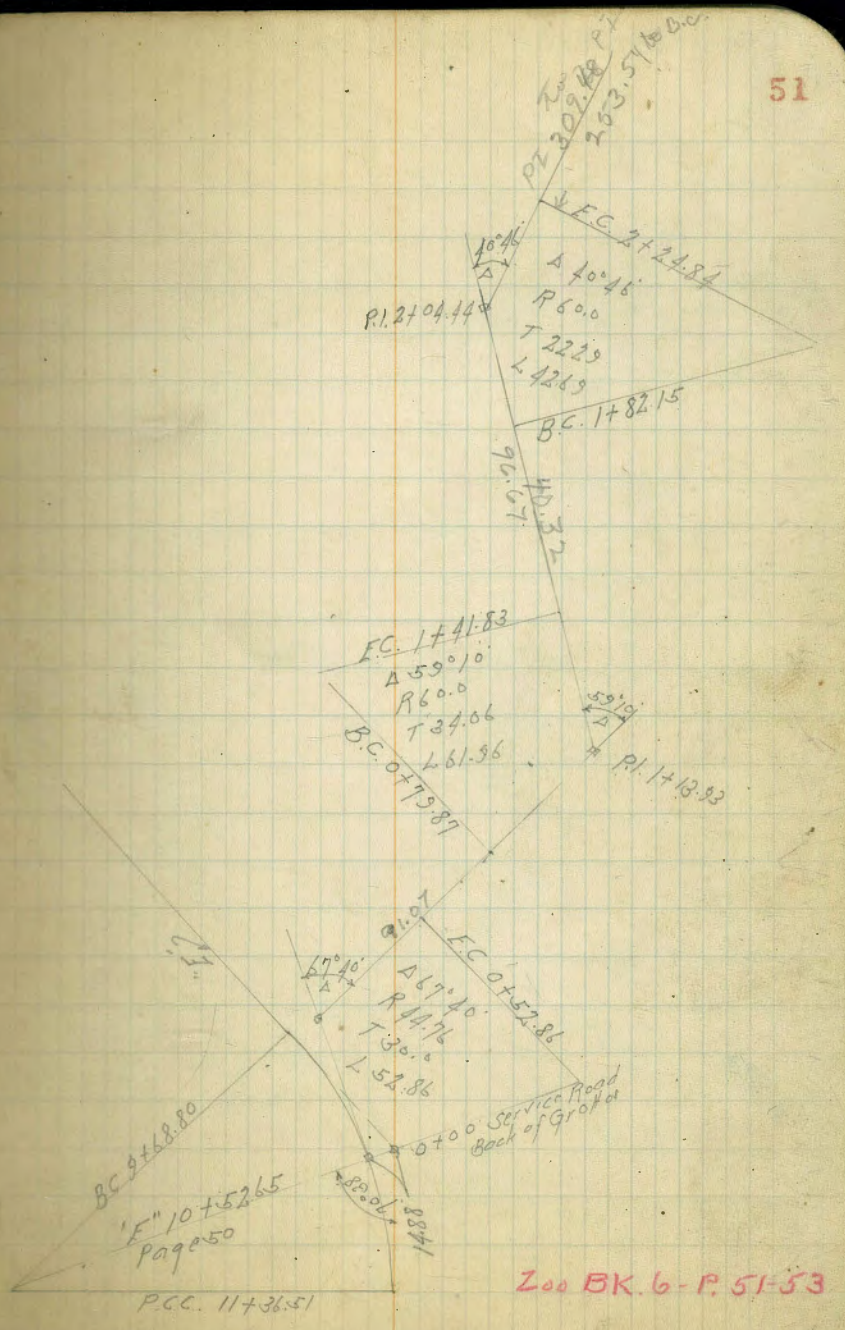
30.15
24.43
54.58

9+68.80
9+66.31
2.49
24.43

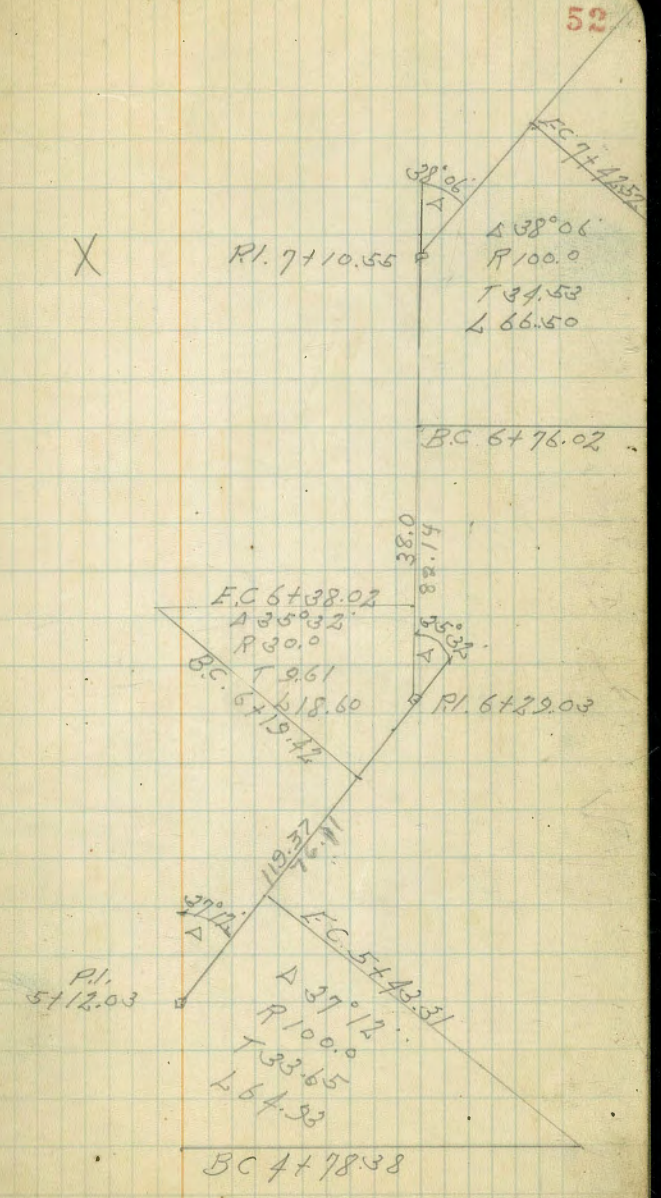


Service Road Back of Grothos

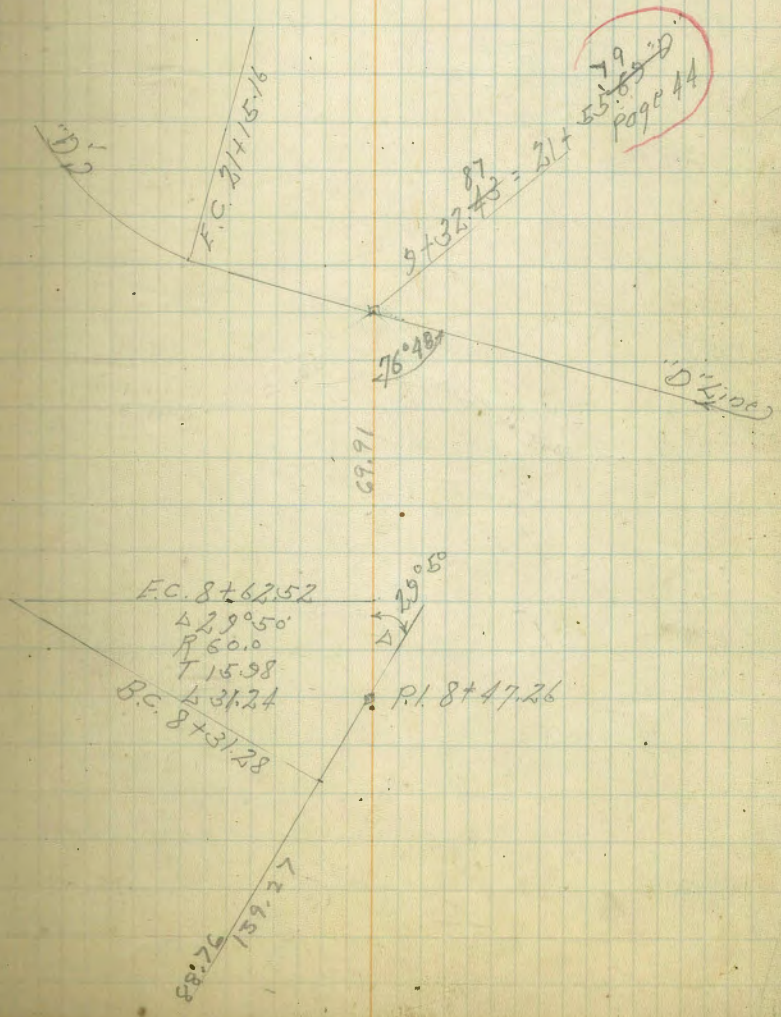
10' Wide



Service Road Back of Gro Hos



Service Road Back of Grothos

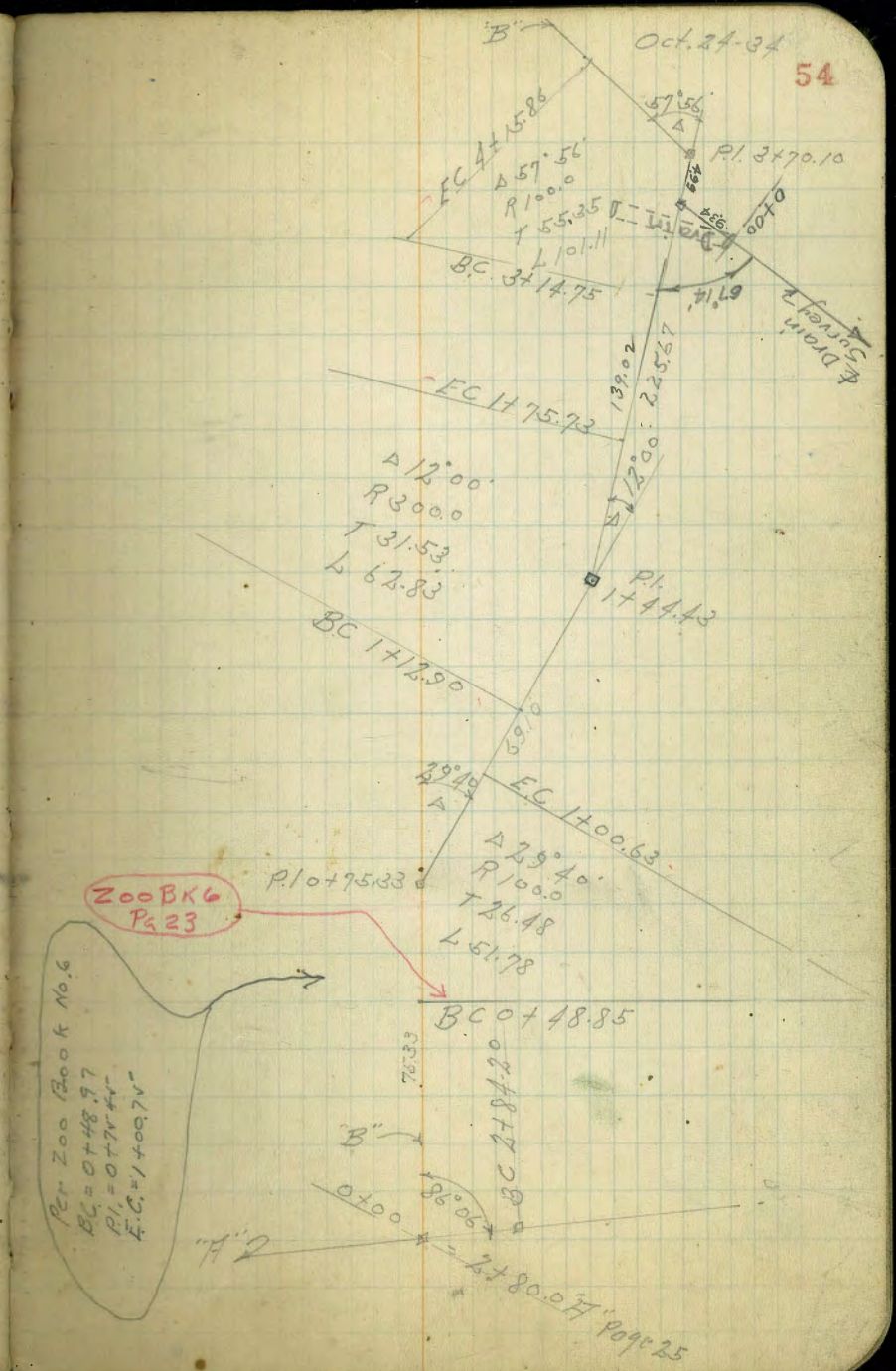


"B" Line

10' Wide

3+14.75
1+75.73
1+39.02
31.53
170.55

Oct. 24-34



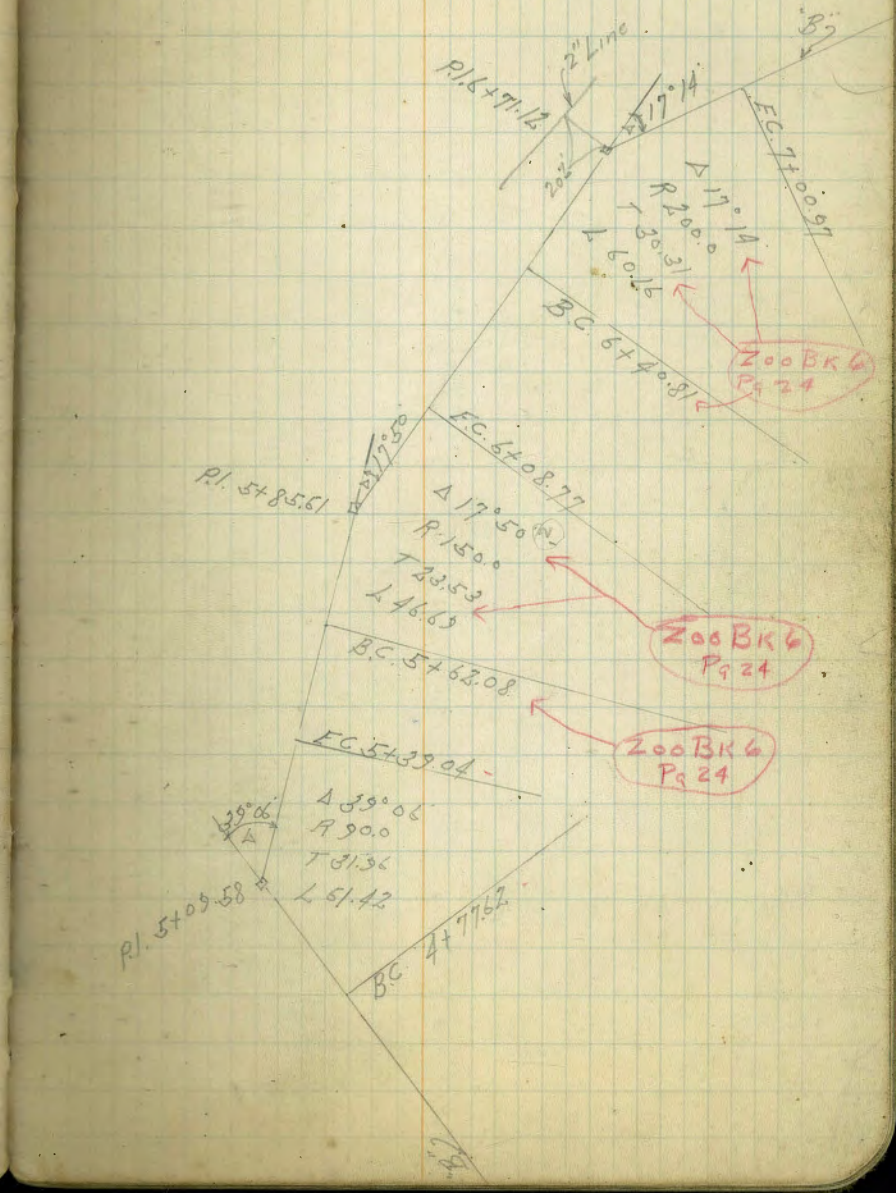
B Line

6+10.81
6+08.77
32.04
30.31
23.53
85.88

90.31
85.88
4.43

23.53
23.04
31.96
78.53

5+62.08
5+39.04
23.04

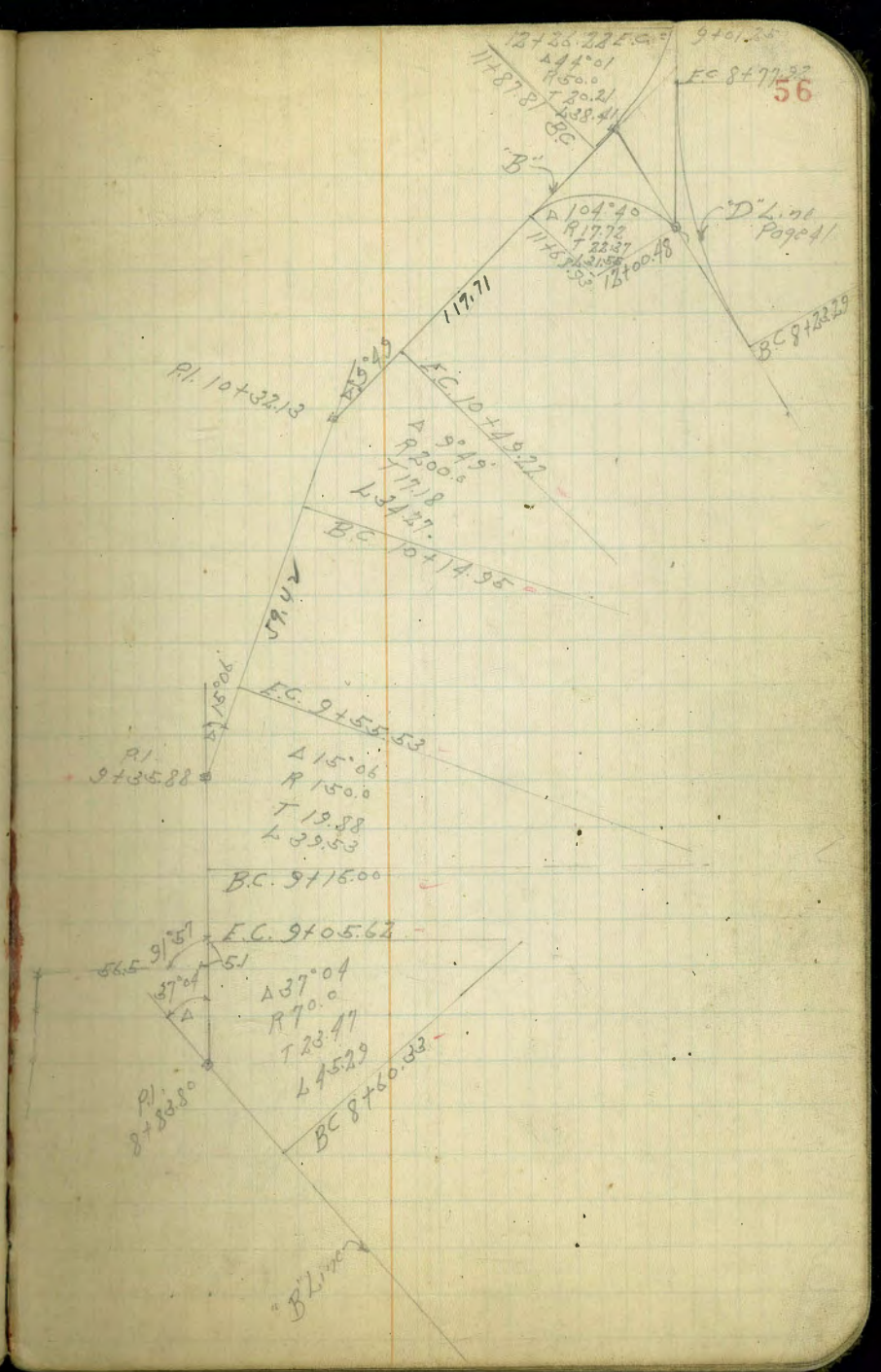


"B" Line

11+68.93	10+14.95	9+16.00
10+49.22	9+55.53	9+05.62
1 19.71	59.42	10.38
	17.18	19.88
	19.88	23.47
	96.48	53.73

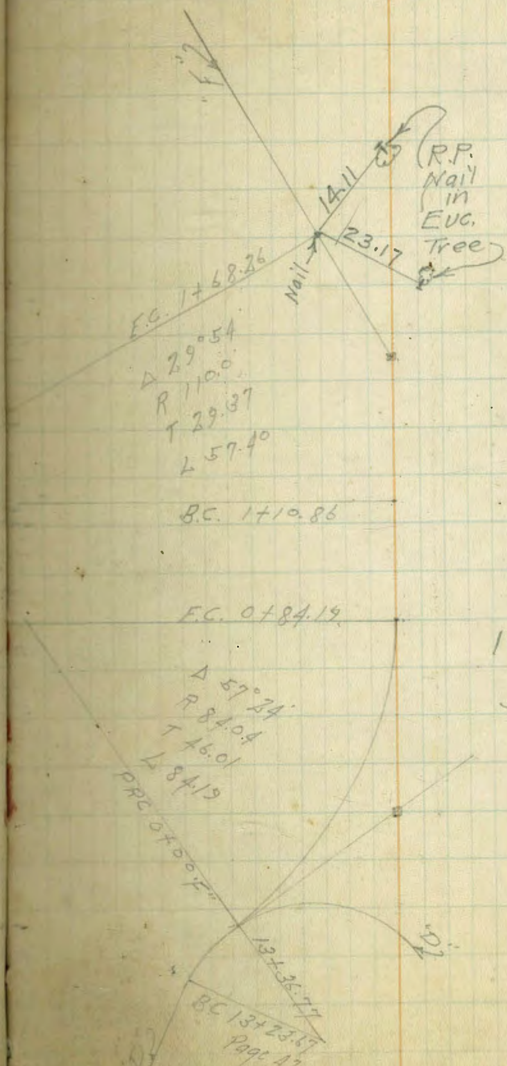
23.47

8+60.33	
7+00.97	
1 59.36	
23.47	
30.31	
2 13.14	



"F" Line
Double Hatle Cassowary Pos to Deer Meso

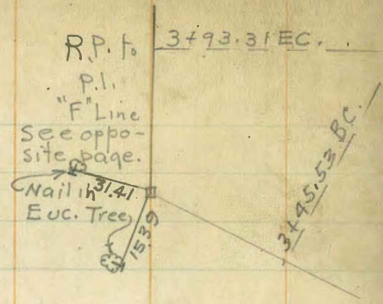
75
68.26
6.74



29.37
26.67
46.01
102.05

1+10.86
84.19
26.67

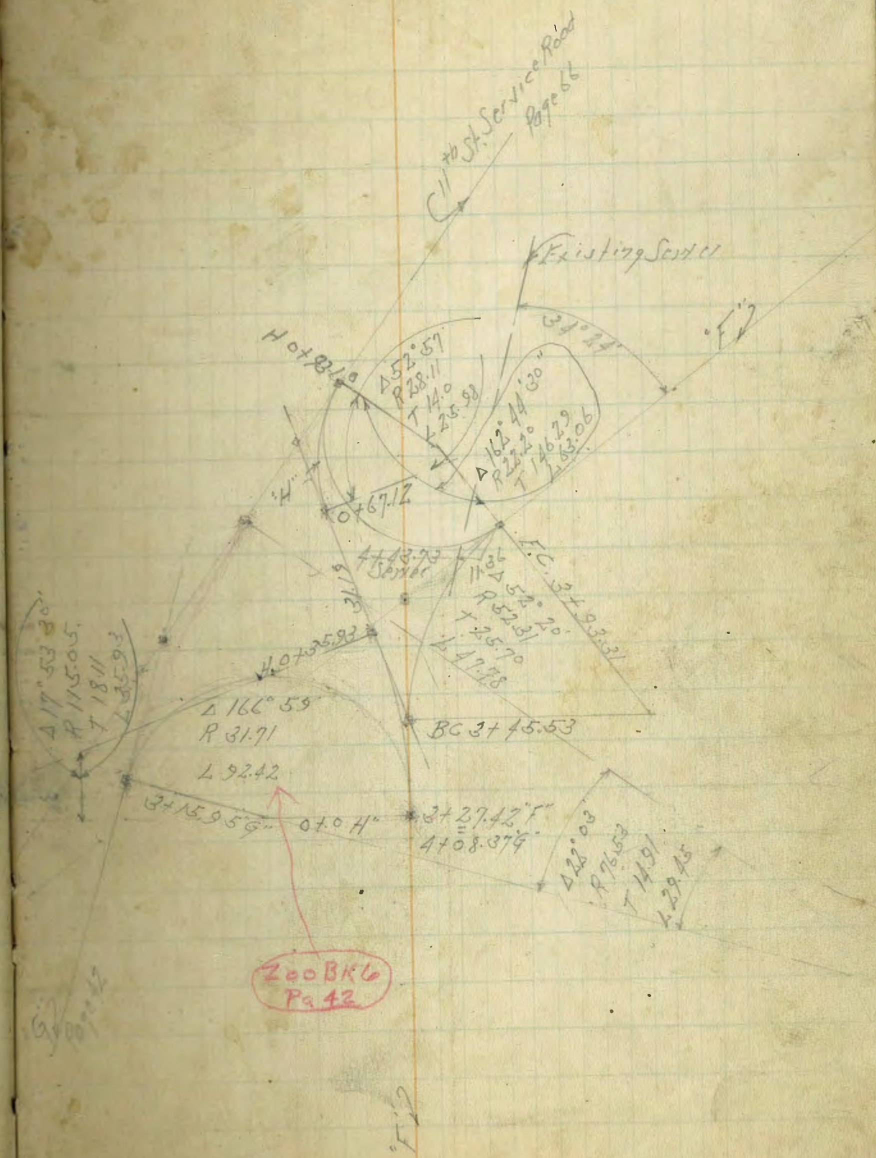
"F" Line
"H" "



3+45.53
1+68.26
1 77.27
29.37
2 06.64

29.37
6.64
22.73

32.742
18.11
34.553



"F" Line

10+97.45
10+53.05
44.40

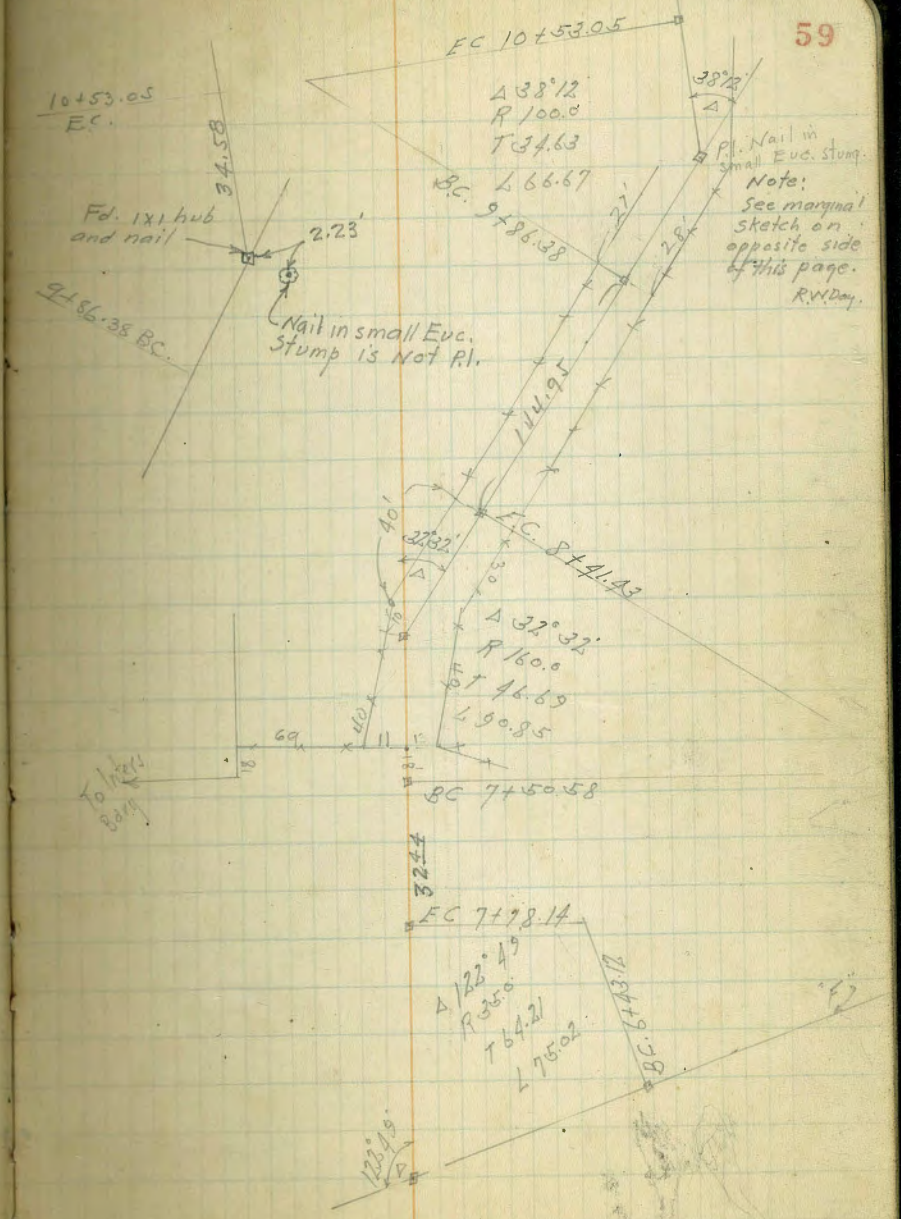
9+86.38
8+41.43
1+44.95

6+43.12
3+93.31
2+49.81

7+50.58
7+18.14
32.44

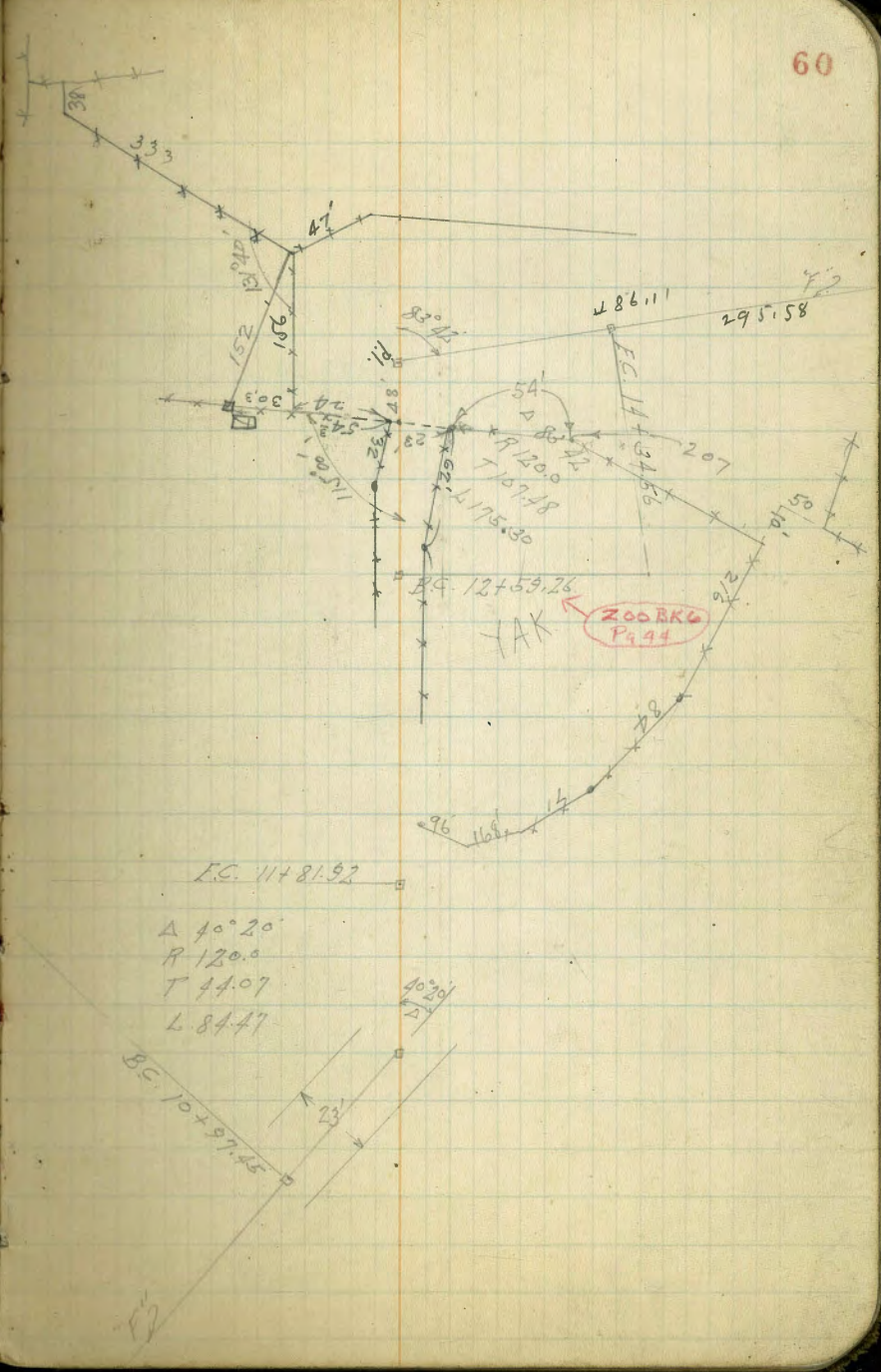
7+50.58
7+18.14
32.44

9+86.38
8+41.43
1 44.95



"F" Line

12+59.26
11+81.92
77.34
107.68
44.07
228.89



"F" Line

23+13.02
22+53.94
59.08

14+346

21+82.53
20+77.72
1+04.81

20+77.72
13
20+90.72

19+41.00
17.10
19+58.10

11-1-34 61

E.C. 22+53.94

Δ 16°22
R 250.0
T 35.95
L 71.41

P.I. 22+18.48

B.C. 21+82.53

E.C. 20+77.72

Δ 31°20
R 250.0
T 70.12
L 136.72

B.C. 19+41.00

31°20 Δ

19+58.10 "F" Line

17.10

Road to W. Side Deer pens.

See Book 1517
Page 9
Also Book 1514
Page 29 for copy of
original survey.

BK - 1514 - P. 29
200 BK #6 - P. 45

E.C. 18+87.57

Δ 45°06
R 200.0
T 88.05
L 157.43

B.C. 17+30.14

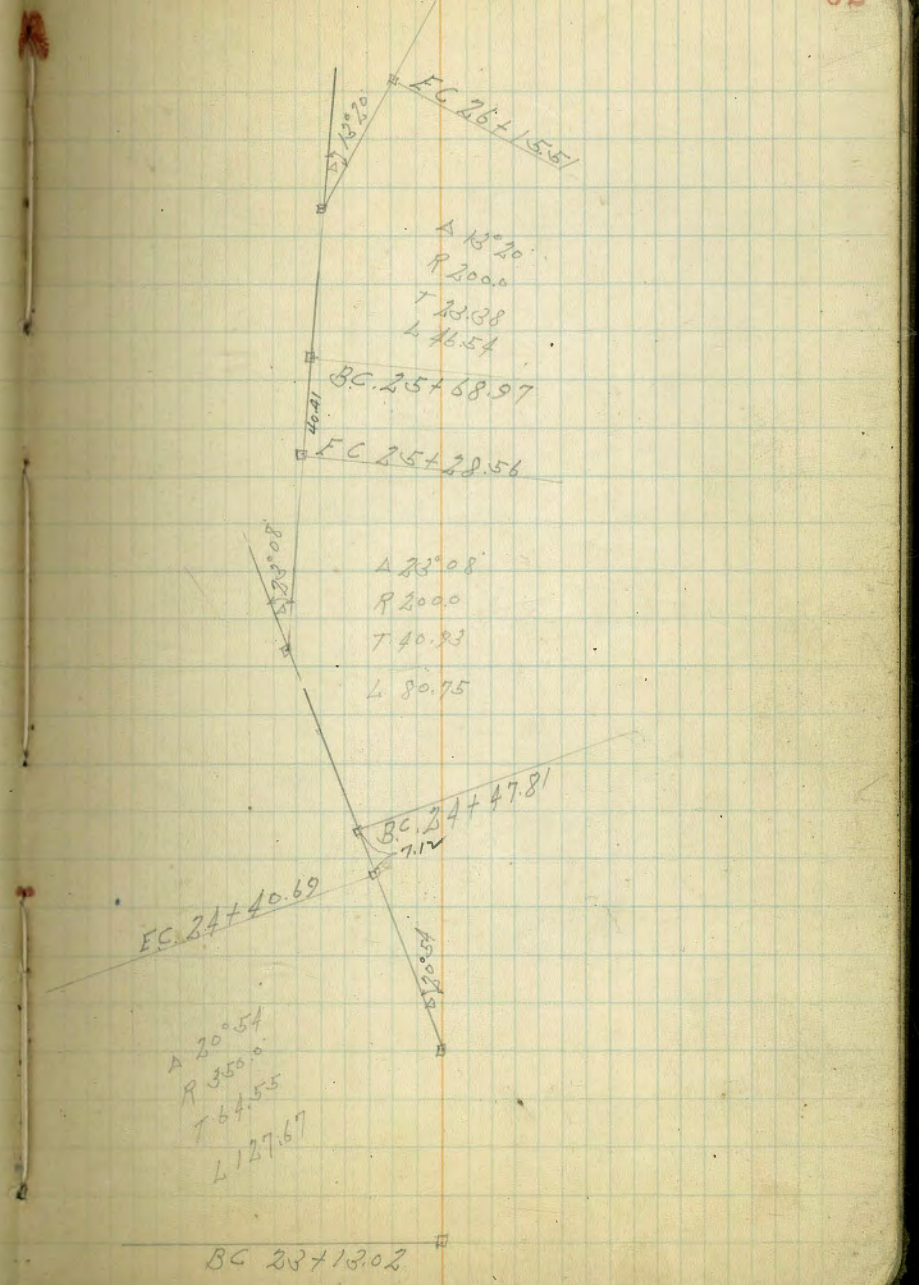
45°06 Δ

P.I. 18+12.19

"F" 296.58
486.11

F Line

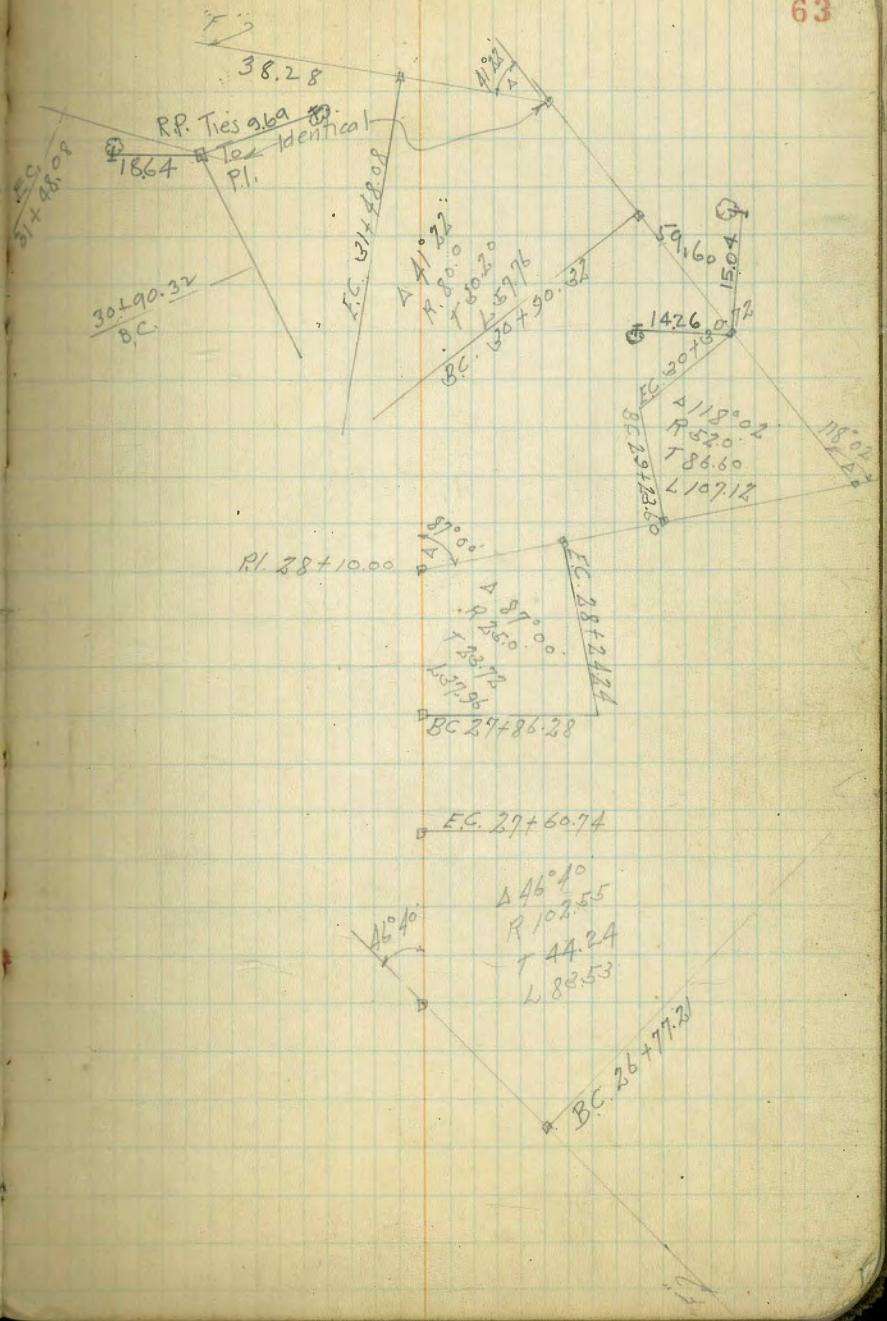
26+77.21
.26+15.51
61.70

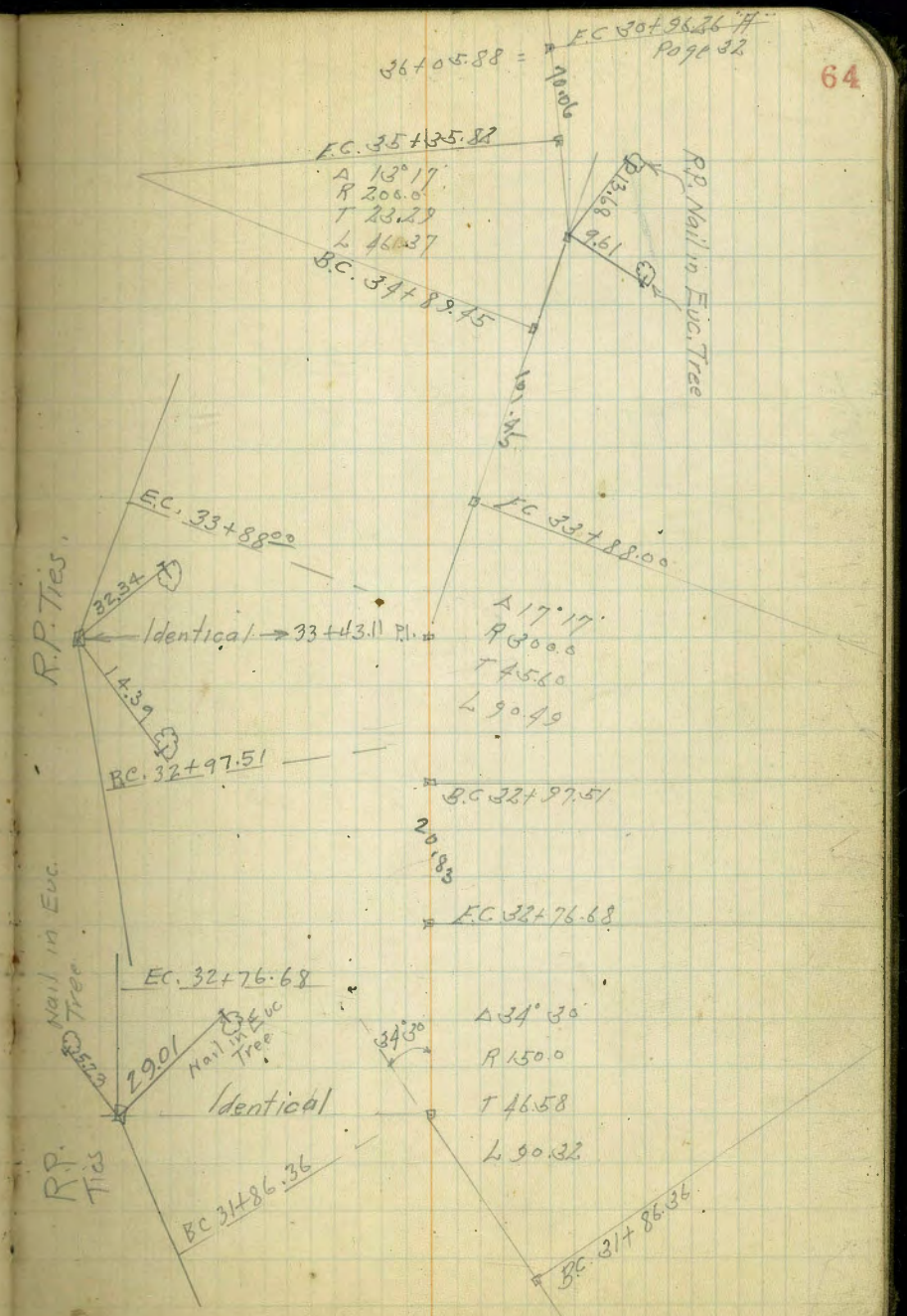


"F" Line

27+86.28
27+60.74
25.54

31+86.36
31+48.08
38.28




36+05.88 = E.C. 30+98.36 "H"
Page 32
E.C. 35+35.83
Δ 13°17'
R 200.0
T 23.79
L 46.37
B.C. 34+88.45
R.P. Nail in Euc. Tree
E.C. 33+88.00
R.P. Ties
32.34
Identical → 33+43.11 P.I.
14.39
B.C. 32+97.51
Δ 17°17'
R 600.0
T 45.60
L 90.49
E.C. 32+76.68
Nail in Euc. Tree
29.01
Identical
R.P. Ties
B.C. 31+86.36
Δ 34°30'
R 150.0
T 46.58
L 90.32

Service Road
11th St S.W. Entrance of Zoo to Zoo Hospital

1+05.98
72.72
1+78.70 ✓

36.77
1+05.98
1+42.75
36.77
1+79.52

1+42.75
36.36
1+79.11

2+33.97
1+78.70
55.27 ✓

1+42.75
64.34
2+07.09

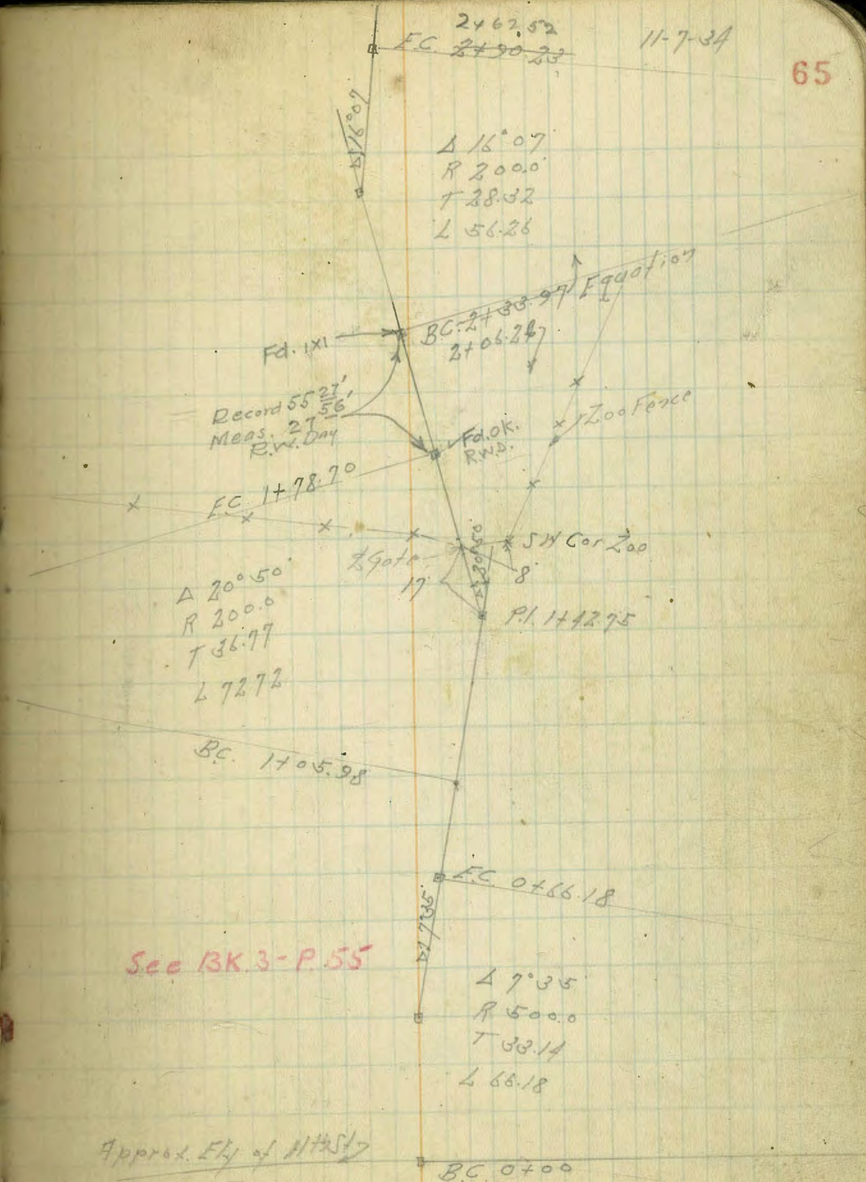
64.34

1+05.98
0+66.18
39.80

36.77
98.32

33.14
36.77
39.80
1+09.71 P.I. to P.I.

11-7-34



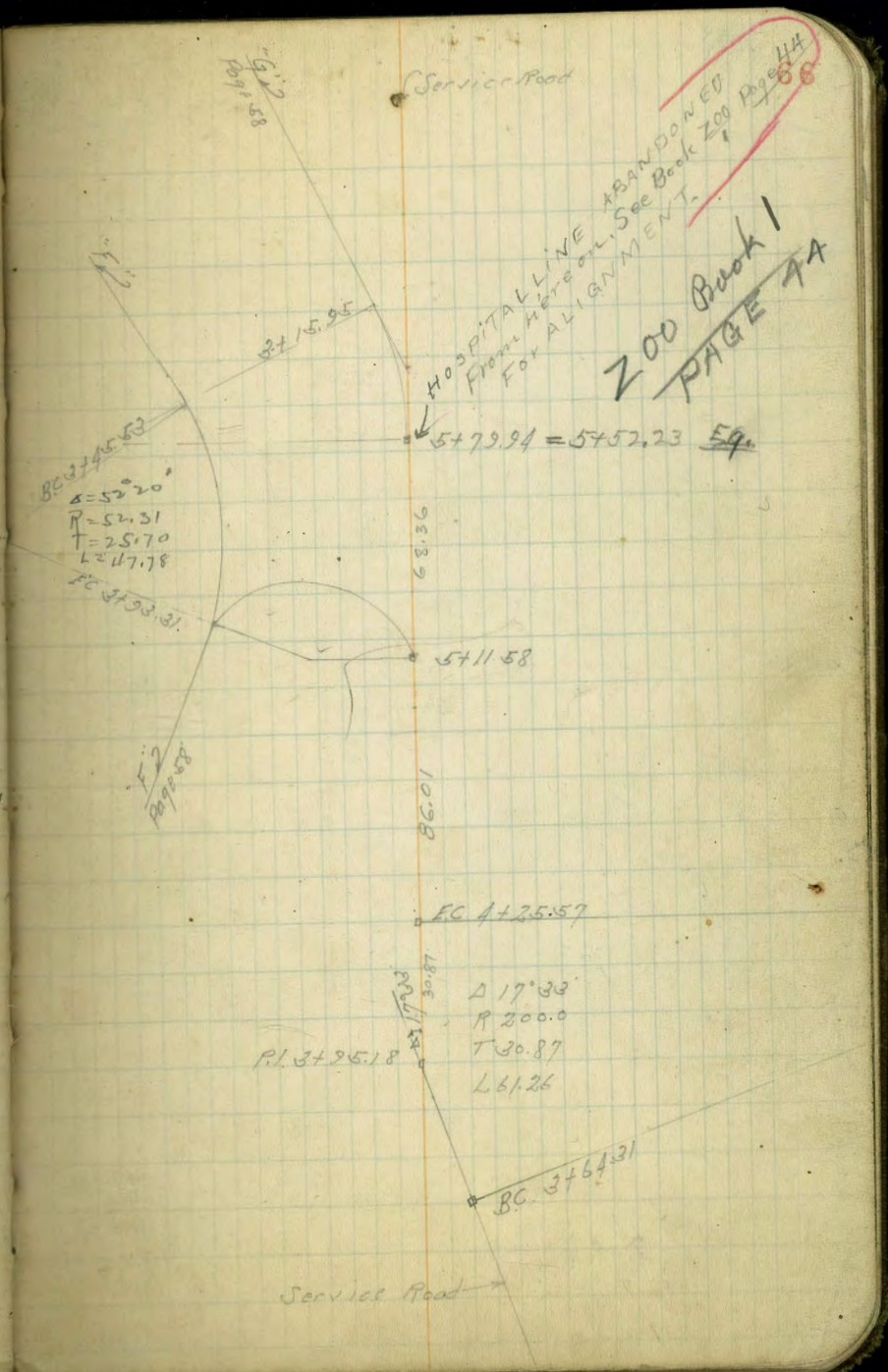
See BK. 3 - P. 55

Service Road
11th St to Zoo Hospital

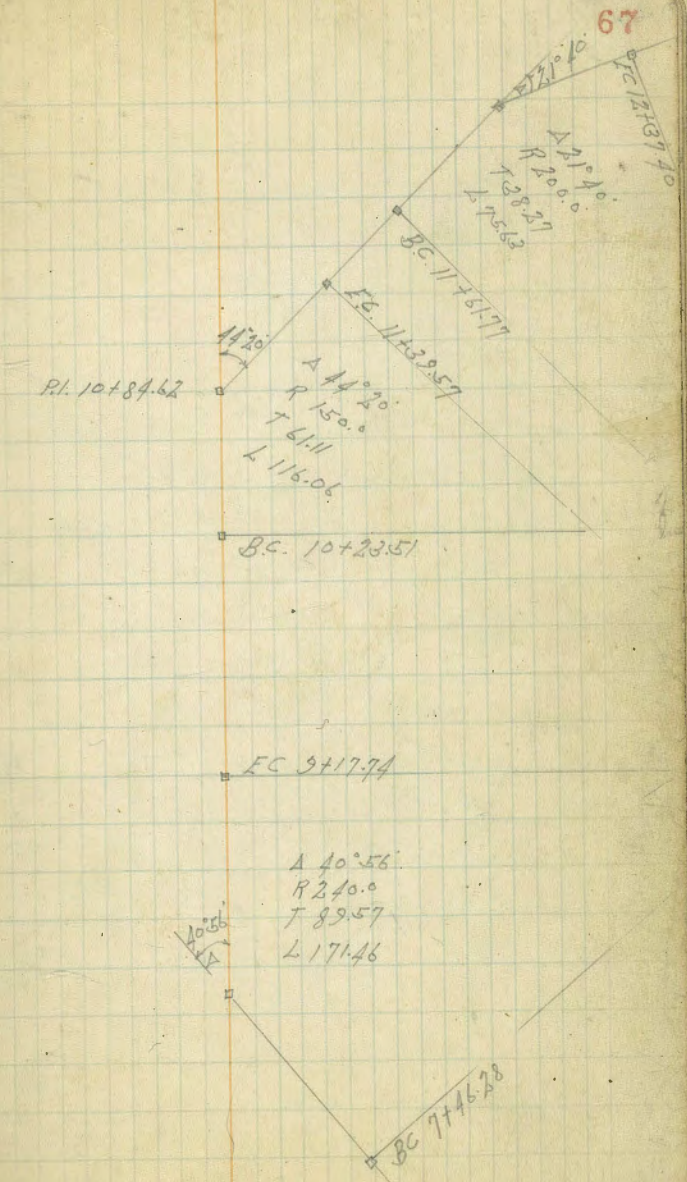
5+11.58
4+25.57
86.01

5+79.94
5+11.58
68.36

3+64.31
2+90.23
74.08

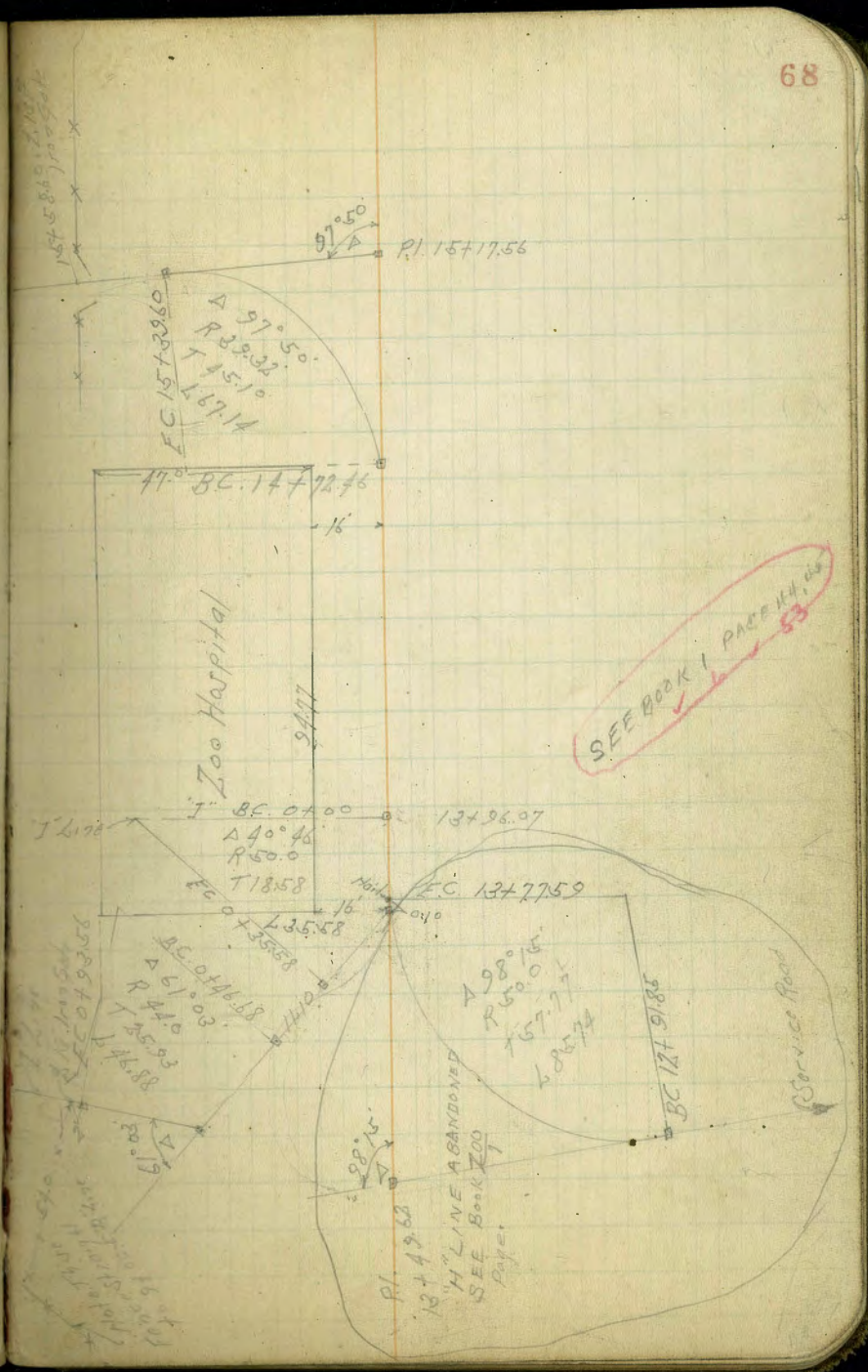


Service Road
11+50 to Zoo Hospital



Service Road
11+53 St. to Zoo Hospital
I" Line

14+72.46
13+96.07
76.39



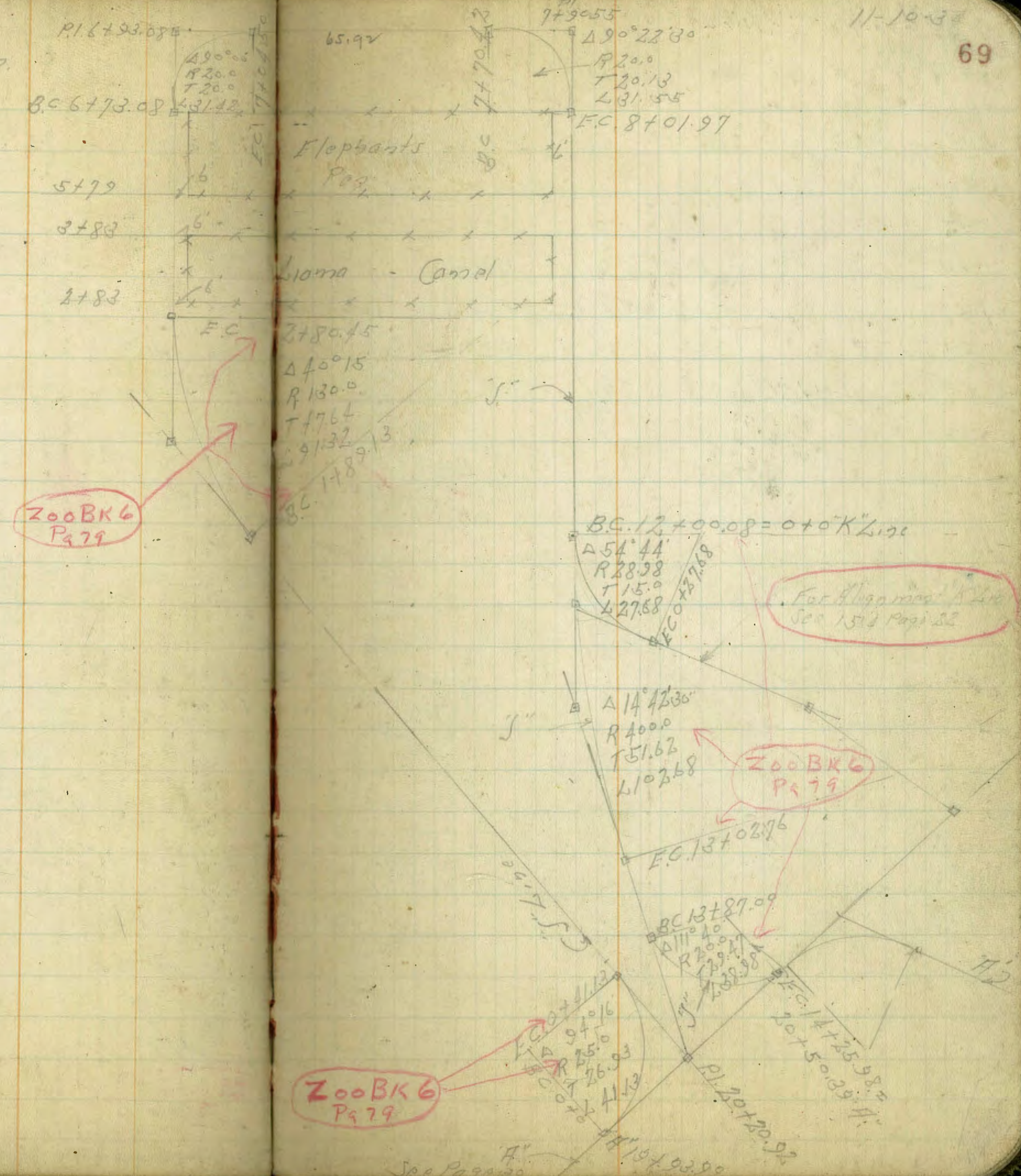
"J" Line =
"A" Line Around Elephants Pen.
"K" Line

6+73.08
5+79
94.08

7+70.42
7+04.50
65.92
20.00
20.13
106.05
12.00
94.05

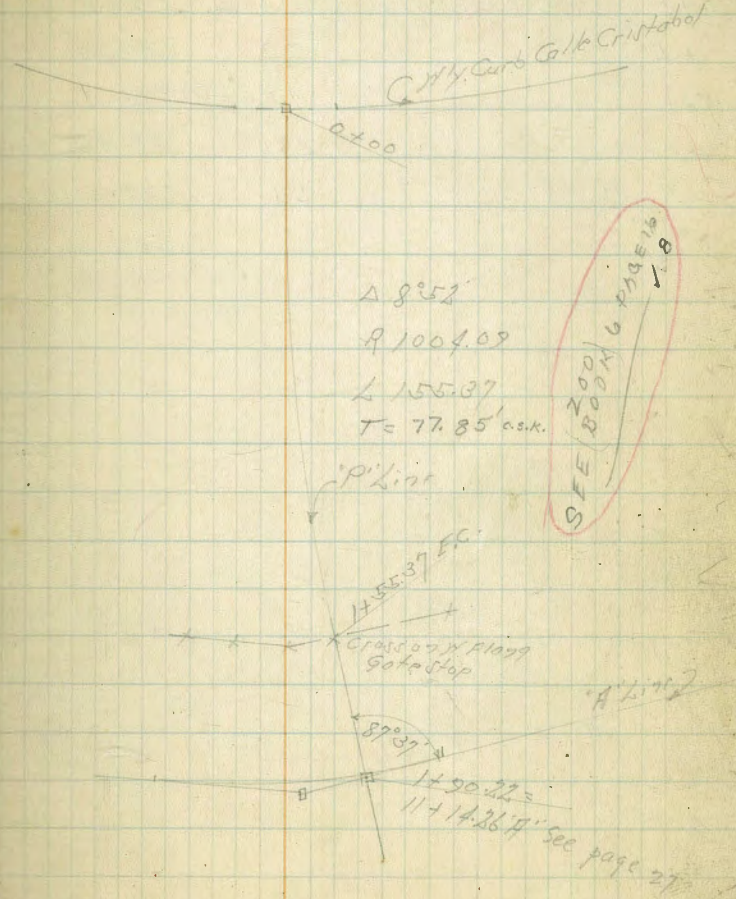
0° 22' 30"

11-10-3


P.I. 6+93.08
B.C. 6+73.08
Δ 90°00
R 20.0
T 20.0
L 31.42
E.C. 7+04.50
65.92
P.I. 7+90.55
Δ 90°22'30"
R 20.0
T 20.13
L 31.55
B.C. 7+70.42
E.C. 8+01.97
Elephants Pen
5+79
3+83
2+83
Llama - Camel
E.C. 2+80.45
Δ 40°15
R 130.0
T 47.64
L 91.32
B.C. 1+89.13
Zoo BK 6 Pg 79
"J"
B.C. 12+00.08 = 0+0 "K" Line
Δ 54°44'
R 28.98
T 15.0
L 27.68
E.C. 0+27.68
For Alignment "K" Line See 153 Page 82
Δ 14°42'30"
R 400.0
T 51.62
L 102.68
Zoo BK 6 Pg 79
E.C. 13+02.76
B.C. 13+87.09
Δ 111°40
R 25.0
T 37.17
L 48.38
E.C. 14+35.98 = 20+50.89 "A"
P.I. 20+20.92
"A"
"J"
E.C. 0+41.13
Δ 94°16
R 25.0
T 26.93
L 41.13
Zoo BK 6 Pg 79
"A" 19+93.9
See Page 90

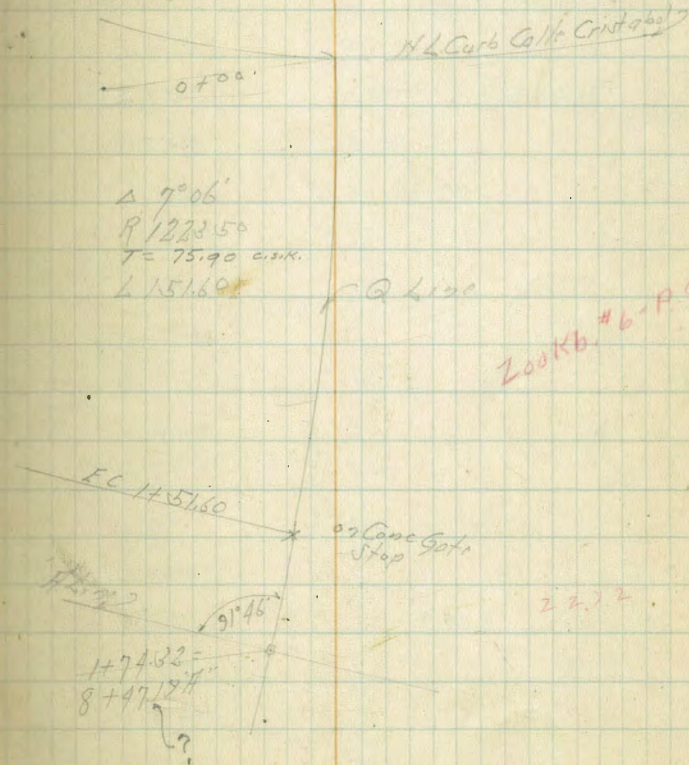
Levels "P" Line

BM	2.27	283.70		281.43	CT 38' Lt 9+80
0+0 = N Cb. Calle Cristobal			0.0	283.7	
+50			2.0	281.7	
1+0			4.4	279.3	
+55.37			6.70	277.0	on Cross Iron Gate Stop
+90.22 = 11+14.26 "A"			7.7	276.0	



℄ Levels "Q" Line

BM	4.22	285.65		281.43	C.T. 38 ℄ 9+80 "A"
0+0	= N Cb Calle Cristobal		1.4	284.2	
+50			2.7	282.9	
1+0			4.1	281.5	
+51.60	E.C.		4.85	280.80	on Cone Gate Stop
+74.32	= 8+47.19 "A"		5.1	280.5	



℄ Levels "R" Line

For Alignment See Page 32

BM	6.01	286.70		280.69	Mark Conc Post N.E. Cor. Deer Pens 1514-5
0+00 = BC = 27+19.37 A"			1.8	284.9	
Cent Curve			1.8	284.9	
+45.83 EC			1.8	284.9	
1+0			1.9	284.8	
+50			3.1	283.6	
2+0			4.5	282.2	
TP	0.07	282.78	3.99	282.71	
+08.92 BC			0.7	282.1	
Cent Curve			1.2	281.6	
+64.95 EC			1.8	281.0	
3+12.13 = BC			3.5	279.3	
Part 1			4.2	278.6	
" 2			4.8	278.0	
" 3			4.8	278.0	
4+25.07 EC = Part 4			3.96	278.82	on Stub
TP	7.90	286.72	3.96	278.82	
+50			7.5	279.2	
5+0			6.6	280.1	
+50			5.8	280.9	
+67.26 B.C			5.7	281.0	
Cent Curve			5.8	280.9	
6+08.21 EC			5.3	281.4	
+50			4.4	282.3	
7+0			2.5	284.2	

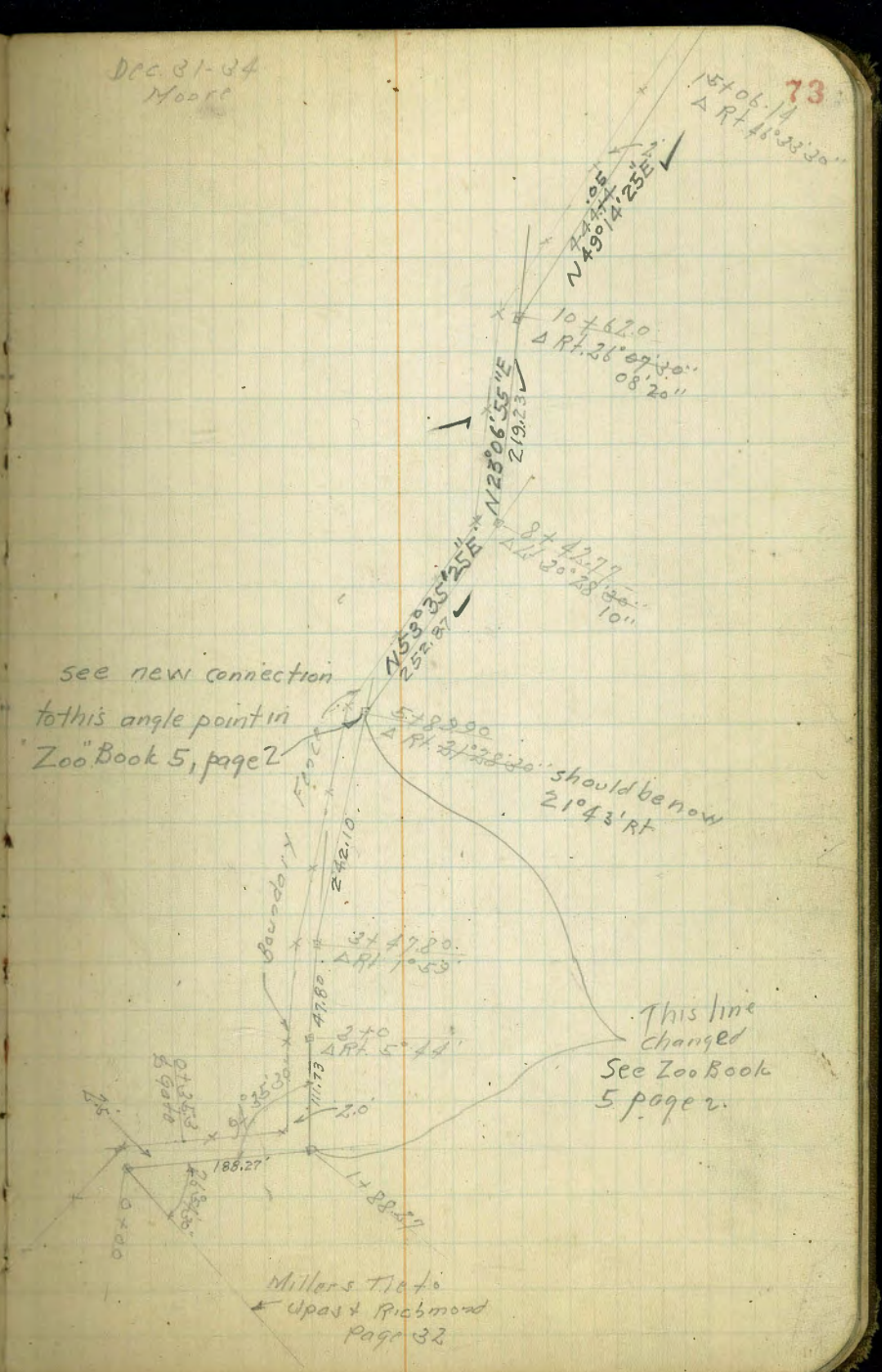
Dec. 17-34
Moore
Sisson

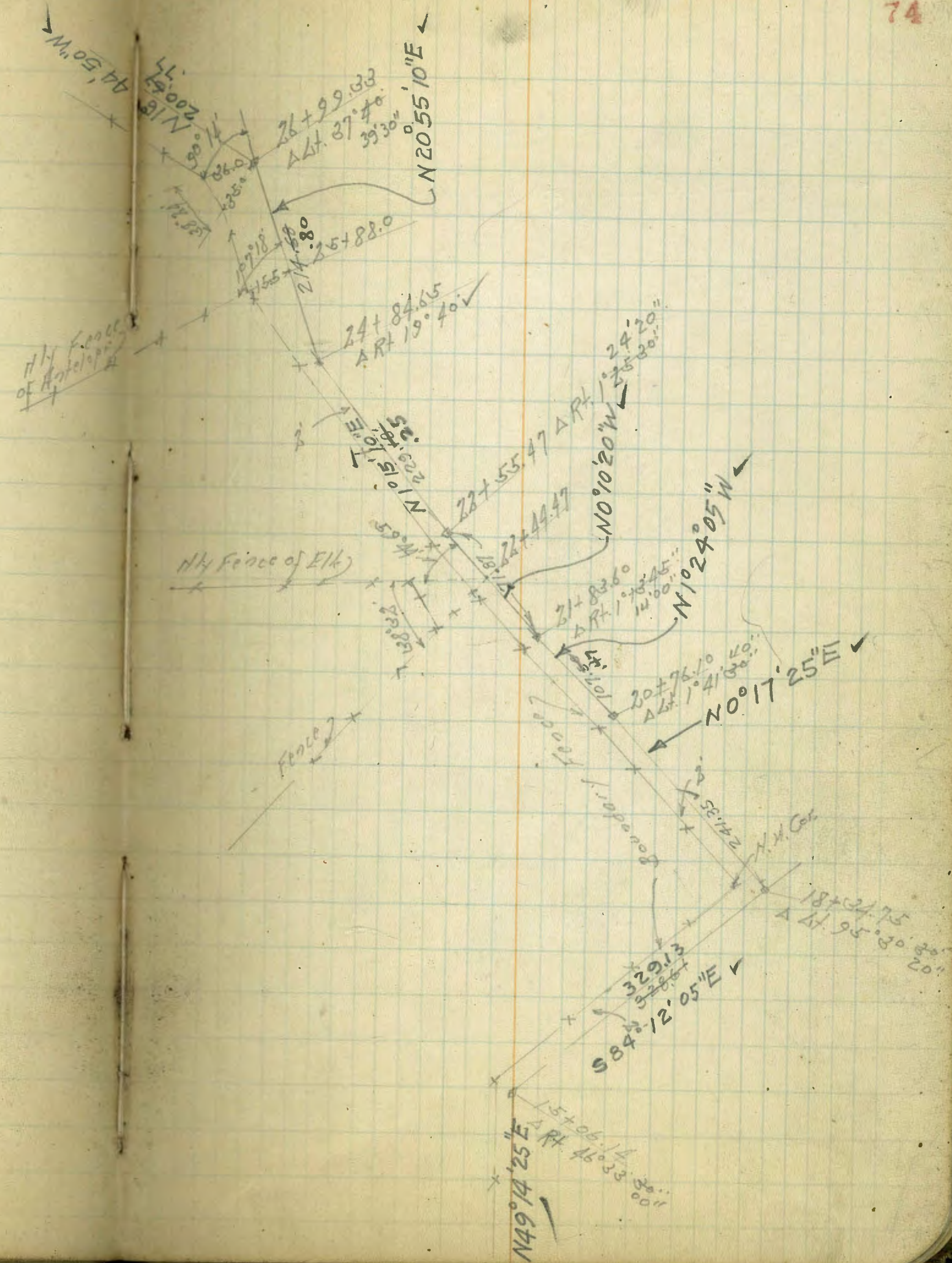
286.72

7+05.91 B.C.	2.4	284.3	
Center Curve	2.1	284.6	
7+54.57 EC	1.7	285.0	
+56.54 BC	1.6	285.1	
Cent Curve	2.3	284.4	
8+10.28 EC = 27+90.57 A	2.3	284.4	
BM	6.04		280.68 N.E. Cor. Deer Pens

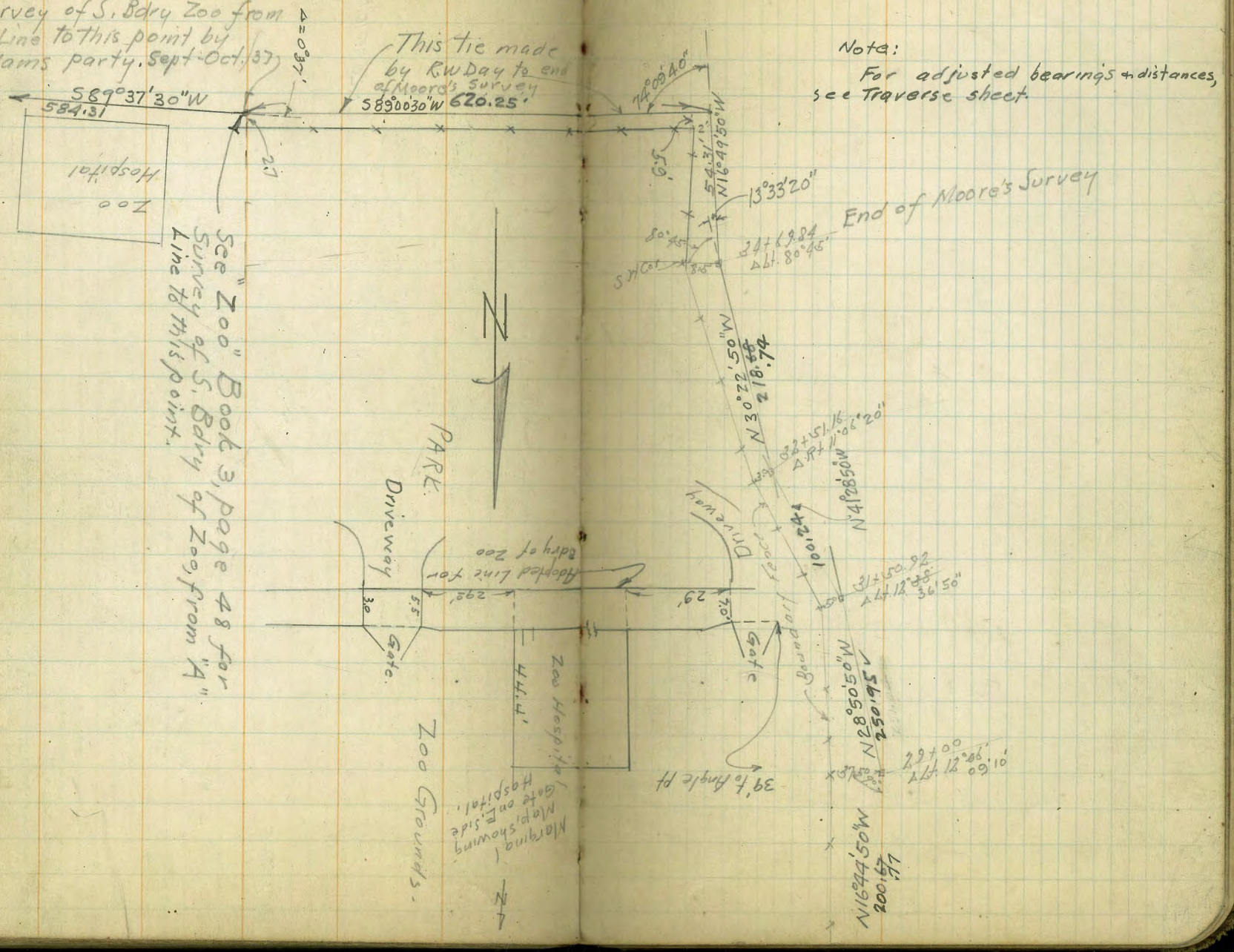
Boundary Fence
San Diego Zoo

Dec 31-34
Moore

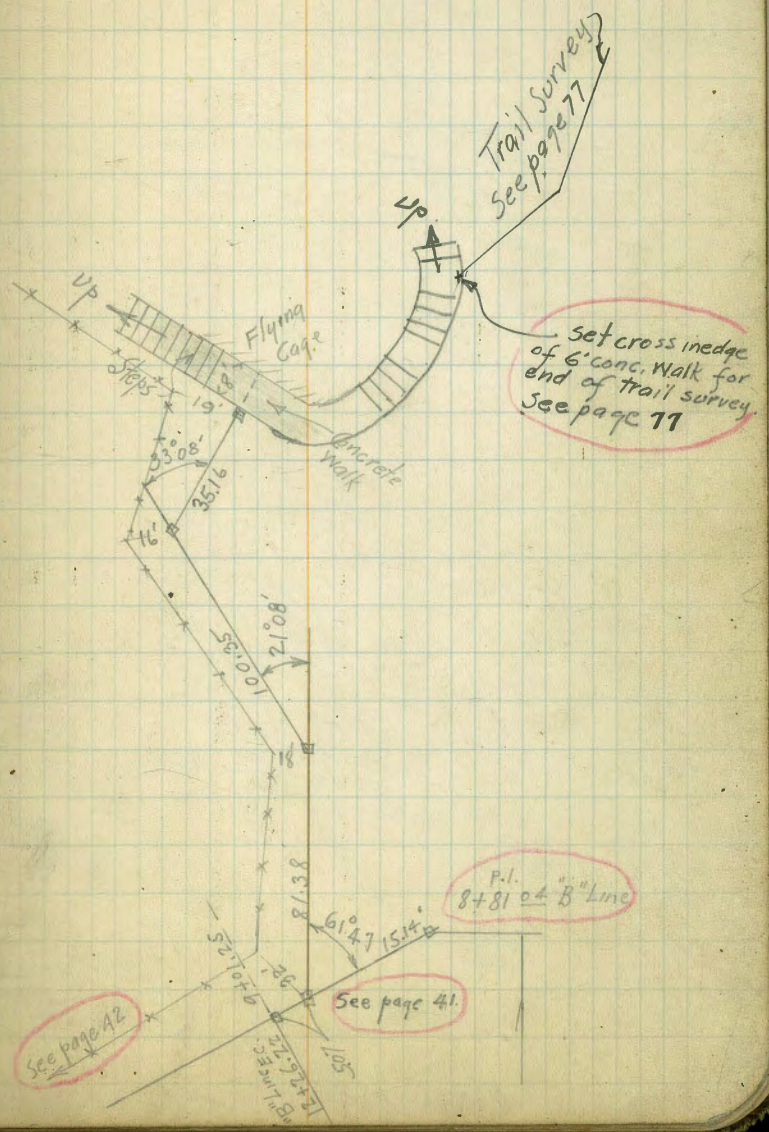



N20°55'10"E
26+99.33
Δ Lt. 37°40'
25+88.0
24+84.65
Δ Rt. 19°40'
Hly Fence of Antelope
N1°15'10"E
22+55.47
Δ Rt. 1°
N0°10'20"W
22+44.47
N1°24'05"W
Hly Fence of Elk
21+83.60
Δ Rt. 1°
20+76.10
Δ Lt. 1°41'
N0°17'25"E
Fence
H.W. Cor.
18+34.75
Δ Lt. 95°
329.13
S84°12'05"E
15+06.14
Δ Rt. 45°33'
N49°14'25"E
44°50'W

Survey of S. Bdry Zoo from "A" Line to this point by Adams party. Sept-Oct. 37



FEB. 24th 1935
DAY
KURTH

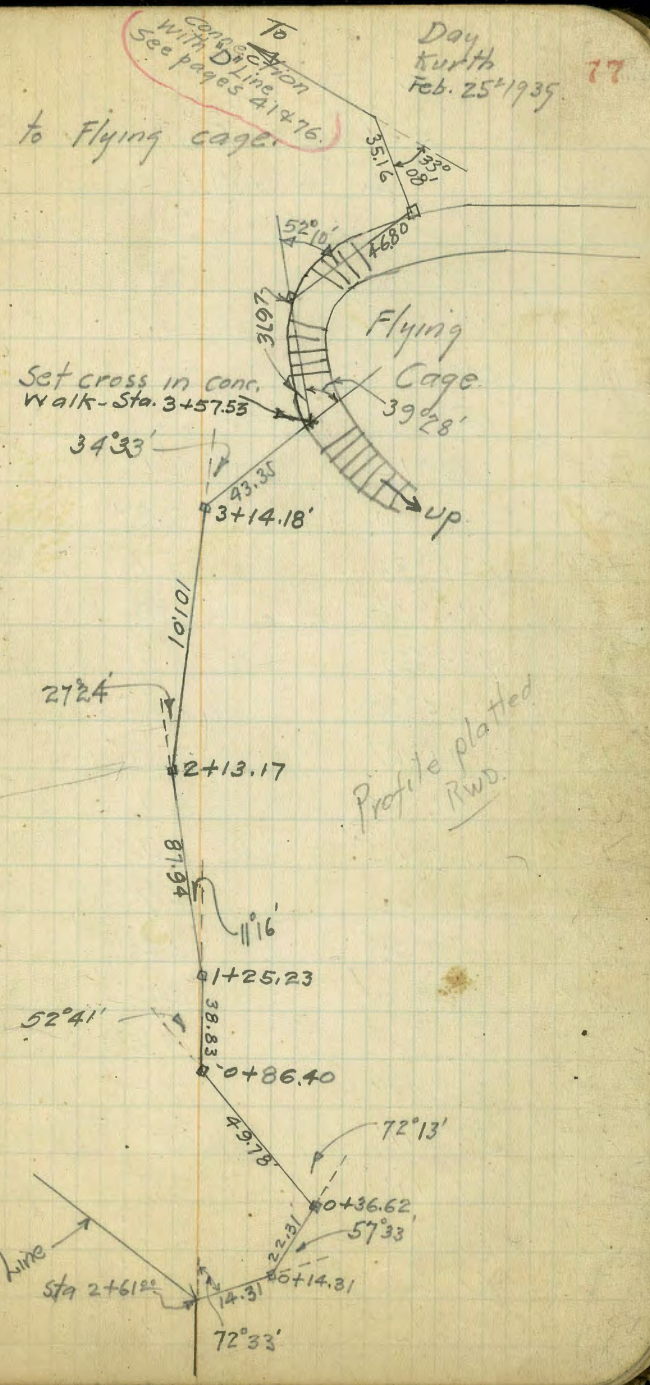


Survey of trail from Sta. 2+61.2 of "D" Line to Flying cage.

SEE PAGE 76

Day
Kurth
Feb. 25th 1935

To connection with "D" Line. See pages 41 & 76.



5-12-31

Stadia Location Trees

Bet. Sta. 26+6290 And 28+6895

Pages 44-48

Azimuth from 26+6290 Right.

△ = 28+35.18

	Az	Vert ∠	Sta	Horiz.
18"	157°30'		52'	
6"	151°37		44'	
12"	148°41		55'	
16"	147°35'		66	
18"	138°14		61	
18"	138°00		52'	
18"	127°33		57'	
8"	112°06		27'	
8"	104°25		34'	
18"	104°25		20'	
16"	71°07		22'	
12"	47°40		27'	
10"	38°12'		34'	
8"	50°00		47'	
18"	40°05		44	
18"	28°10		44'	
18"	23°31'		55	
6"	37°25'		75	
10"	34°11'		80'	
6"	31°17'		75'	
8"	25°50'		72'	
8"	17°26'		104'	
16"	14°15'		97'	

Size	Az.	Vert.	Stadia	Horiz.
18"	8°07'		113'	
8"	8°41		124'	
18"	8°41		133	
16"	12°08'		130	
18"	11°30'		140'	
18"	8°30'		146'	
15"	5°31'	3°20'	153'	
10"	4°40'		180	
10"	7°12'		174'	
10"	9°32'		167	
15"	10°36'		176	
4"	1°00		166	
10"	1°32'		151	
6"	2°52'		133'	
18"	4°44'		75'	
8"	7°09'		53'	
10"	8°39		27	
10"	118°29'		7'	
18"	162°12'		16'	
15"	171°32'		30'	
12"	178°09'		40'	

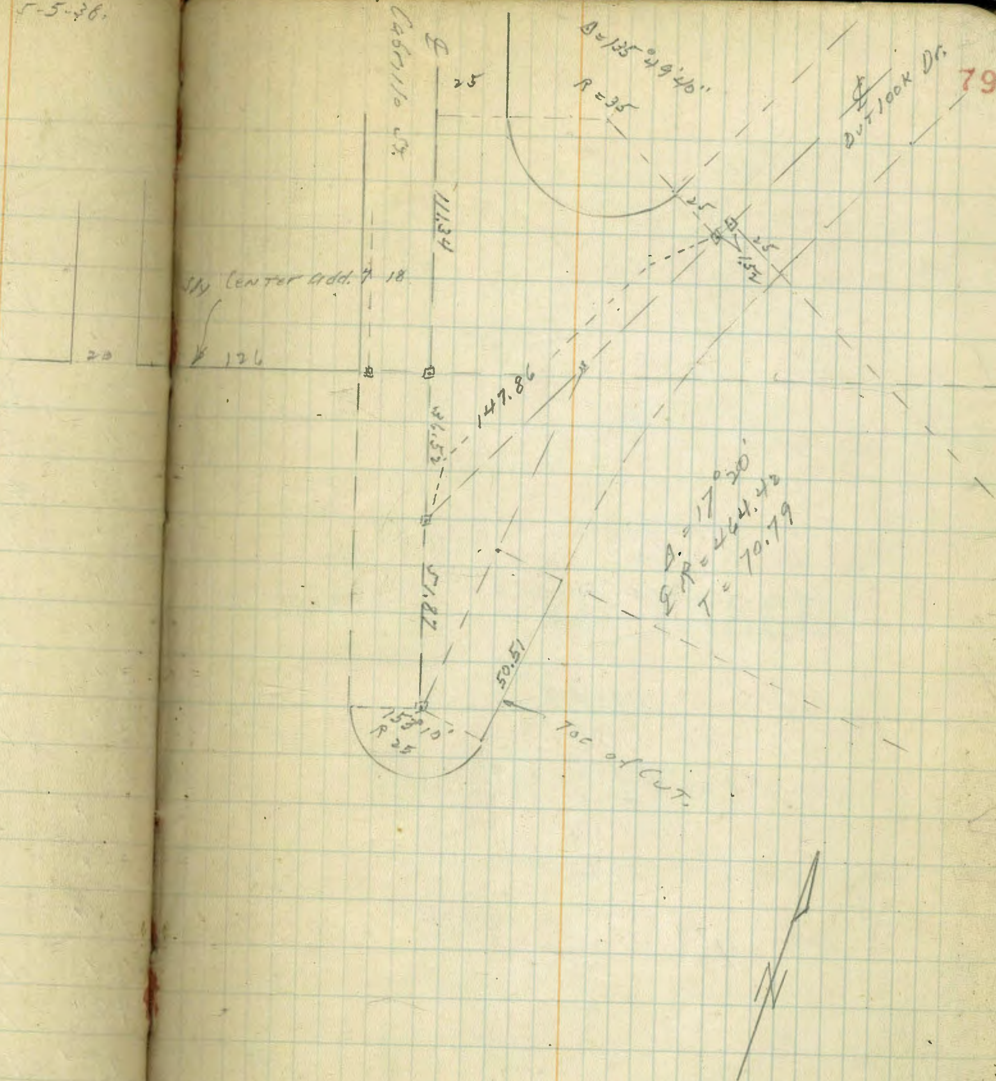
indexed
C.S.K.

Moore

5-5-36.

Proposed Opening of
Int. Sec. of Cabrillo + Outlook Dr.
according to Mr Pardy of La Jolla

See p 16



IMPROVED TABLES

AND

INFORMATION

DIRECTIONS FOR USE OF TABLES

TABLE No. 1.

Distance of slope stake from side or shoulder stake for any width roadway, slope 1½ to 1. If ground is nearly level, the cut or fill at side stake is located by the double entry method in left column and top row. The number in body of table in same row and column gives distance from side stake to slope stake. If ground is not level estimate the difference in elevation between the side stake and slope stake, lower target by this amount if cut, elevate if fill. Add this amount to cut or fill and find distance in table. Set up rod at this point, and line of sight should cut target. If it does not make the slight adjustment necessary.

TABLE No. 9.

To find Tangent and External for curve of any other degree, divide by degree of curve and add correction found in column of corrections.

Degree of curve with a given I may be found by dividing tangent, (or external), opposite I by given tangent, (or external).

The distance from a point on the tangent to the curve is very nearly the square of the tangent length divided by twice the radius.

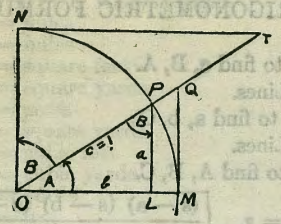


TABLE II

TRIGONOMETRIC FORMULÆ.

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

$R = OB = c = 1$

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

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

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

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

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

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

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

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

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

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

$\sin \tfrac{1}{2} A = \sqrt{\frac{1 - \text{Cos } A}{2}} \qquad \cos \tfrac{1}{2} A = \sqrt{\frac{1 + \text{Cos } A}{2}}$

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

Law of Lines $\frac{\sin A}{a} = \frac{\sin B}{B} = \frac{\sin C}{C}$

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

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

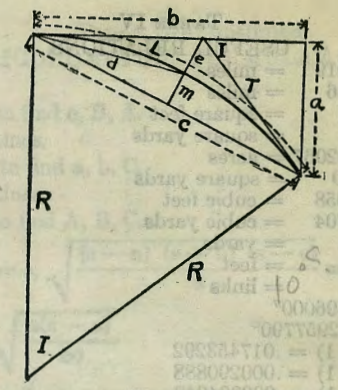


Table V

CURVE FORMULAE FOR SIMPLE CURVES

Compiled by J. Calvin Locke, C.E.

(1) $c = \sqrt{2Ra}$ (2) $c = \sqrt{a^2+b^2}$

(3) $c = \sqrt{2R\,(R-\sqrt{(R+b)\,(R-b)}} = \sqrt{2R(R-\sqrt{R^2-b^2})}$

(4) $c = 2\sqrt{m\,(2R-m)}$

(5) $c = 2R \sin \frac{1}{2} I$ (6) $c = 2T \cos \frac{1}{2} I$

(7) $e = R \operatorname{exsec} \frac{1}{2} I$

(8) $e = R \tan \frac{1}{2} I \tan \frac{1}{4} I$ (9) $e = T \tan \frac{1}{4} I$

(10) $b = \sqrt{a\,(2R-a)}$

(11) $b = \sqrt{\left(c+\frac{c^2}{2R}\right)\left(c-\frac{c^2}{2R}\right)} = \sqrt{c^2-\frac{c^4}{4R^2}}$

(12) $b = R \sin I$ (13) $b = a \cot \frac{1}{2} I$

(14) $R = \frac{a^2+b^2}{2a} = \frac{c^2}{2a}$ (15) $R = \frac{d^2}{2m} = \frac{c^2+4m^2}{8m}$

(16) $d = \sqrt{R\,(2R-\sqrt{(2R+c)\,(2R-c)}} = \sqrt{R(2R-\sqrt{4R^2-c^2})}$

(17) $d = \sqrt{2Rm}$ (18) $d = 2R \sin \frac{1}{4} I$ (19) $m = \frac{d^2}{2R}$

(20) $m = R \mp \sqrt{\left(R+\frac{c}{2}\right)\left(R-\frac{c}{2}\right)} = R \mp \sqrt{R^2-\frac{c^2}{4}}$

(21) $m = R \operatorname{vers} \frac{1}{2} I$ (22) $m = R \sin \frac{1}{2} I \tan \frac{1}{4} I$ (23) $m = \frac{1}{2} c \tan \frac{1}{4} I$

(24) $a = \frac{c^2}{2R}$ (25) $a = R - \sqrt{(R+b)\,(R-b)} = R - \sqrt{R^2-b^2}$

(26) $a = 2R\,(\sin^2 \frac{1}{2} I)^2$ (27) $a = R \operatorname{vers} I$ (28) $a = R \sin I \tan \frac{1}{2}$

(29) $a = b \tan \frac{1}{2} I$ (30) $a = T \sin I$ (31) $T = R \tan \frac{1}{2} I$

(32) $I = \frac{L}{R} \times 57.295780$ (33) $R = \frac{L}{I} \times 57.295780$

(34) $L = IR \times 0.01745329$ (35) $L = \frac{8d-c}{3}$

(36) Area Seg. $= \frac{LR - R^2 \operatorname{Sin} I}{2} = \frac{LR - Rb}{2}$

Table VI

SINES, COSINES, TANGENTS, COTANGENTS

deg.	sin 0′	tan 0′	sin 10′	tan 10′	sin 20′	tan 20′	sin 30′	tan 30′	sin 40′	tan 40′	sin 50′	tan 50′	deg.
0	0000	0000	0029	0029	0058	0058	0087	0087	0116	0116	0145	0145	89
1	175	0375	0204	0204	0233	0233	0262	262	291	291	320	320	88
2	349	349	378	378	407	407	436	437	465	466	494	495	87
3	523	524	552	553	581	582	610	612	640	641	669	706	86
4	698	699	727	729	756	758	785	787	814	816	843	864	85
5	872	875	901	904	929	934	958	963	987	992	1016	1022	84
6	1045	1051	1074	1080	1103	1110	1132	1139	1161	1169	190	198	83
7	219	228	248	257	279	287	305	317	334	346	363	376	82
8	392	405	421	435	449	465	478	495	507	524	536	554	81
9	564	584	593	614	622	644	650	673	679	703	708	733	80
10	736	763	765	793	794	823	822	853	851	883	880	914	79
11	908	944	937	974	965	2004	994	2035	2022	2065	2051	2095	78
12	2079	2126	2108	2156	2136	186	2164	217	193	247	221	278	77
13	250	309	278	339	306	370	334	401	363	432	391	462	76
14	419	493	447	524	476	555	504	586	532	617	560	648	75
15	588	679	616	711	644	742	672	773	700	805	728	836	74
16	756	867	784	899	812	931	840	962	868	994	896	3026	73
17	924	3057	952	3089	939	3121	3007	3153	3035	3185	3062	217	72
18	3090	249	3118	281	3145	314	173	346	201	378	228	411	71
19	256	443	283	476	311	508	338	541	365	574	393	607	70
20	420	640	448	673	475	706	502	739	529	772	557	805	69
21	584	839	611	872	638	906	665	939	692	973	719	4006	68
22	746	4040	773	4074	800	4108	827	4142	854	4176	881	210	67
23	907	245	934	279	961	314	987	348	4014	383	4041	417	66
24	4067	452	4094	487	4120	522	4147	557	173	592	200	628	65
25	226	663	253	699	279	734	305	770	331	806	358	841	64
26	384	877	410	913	436	950	4462	986	488	5022	514	5059	63
27	540	5095	566	5132	592	5169	617	5206	643	243	669	280	62
28	695	317	720	354	746	392	772	430	797	467	823	505	61
29	848	543	874	581	899	619	924	658	950	696	975	735	60
30	5000	774	5025	5812	5050	851	5075	890	5100	930	5125	969	59
31	150	6009	175	6048	200	6088	225	6128	250	6168	275	6208	58
32	299	249	324	289	348	330	5373	371	398	412	422	453	57
33	446	494	471	536	495	577	519	619	544	661	568	703	56
34	592	745	616	787	640	830	664	873	688	916	712	959	55
35	736	7002	760	7046	783	7089	807	7133	831	7177	854	7221	54
36	878	265	901	310	925	355	948	400	972	445	995	490	53
37	6018	536	6041	581	6065	627	6088	673	6111	720	6134	766	52
38	157	813	180	860	202	907	225	954	248	8002	271	8050	51
39	293	8098	316	8146	338	8195	361	8243	383	292	406	342	50
40	428	391	450	441	472	491	494	541	517	591	539	642	49
41	561	693	583	744	604	796	626	847	648	899	670	952	48
42	691	9004	713	9057	734	9110	756	9163	777	9217	799	9271	47
43	820	325	841	380	862	435	884	490	905	545	926	601	46
44	947	657	967	713	988	770	7009	827	7030	884	7050	942	45
45	7071	1.0000	7092	1.0058	7112	1.0117	133	1.0176	153	1.0235	173	1.0295	44
deg.	60′ cos	60′ cot	50′ cos	50′ cot	40′ cos	40′ cot	30′ cos	30′ cot	20′ cos	20 cot	10′ cos	10′ cot	deg.

Table IX. TANGENTS AND EXTERNALS TO A 1° CURVE

I	T	E	I=10°	I	T	E	I=20°	I	T	E	I=30°
1°	50.00	.218	+	11°	551.70	26.500	+	21°	1061.9	97.577	+
10′	58.34	.297	5° C.	10′	560.11	27.313	5° C	10′	1070.6	99.155	5° C
20′	66.67	.388	T	20′	568.53	28.137	T	20′	1079.2	100.75	T
30′	75.01	.491	.03	30′	576.95	28.974	.06	30′	1087.8	102.35	.21
40′	83.34	.606	E	40′	585.36	29.824	E	40′	1096.4	103.97	.10
50′	91.68	.733	.001	50′	593.79	30.686	.006	50′	1105.1	105.60	E
2°	100.01	.873		12°	602.21	31.561		22°	1113.7	107.24	.013
10′	108.35	1.024		10′	610.64	32.447		10′	1122.4	108.90	
20′	116.68	1.188		20′	619.07	33.347		20′	1131.0	110.57	
30′	125.02	1.364		30′	627.50	34.259		30′	1139.7	112.25	
40′	133.36	1.552		40′	635.93	35.183		40′	1148.4	113.95	
50′	141.70	1.752		50′	644.37	36.120		50′	1157.0	115.66	
3°	150.04	1.964	10° C.	13°	652.81	37.070	10° C.	23°	1165.7	117.38	10° C.
10′	158.38	2.188	T	10′	661.25	38.031	T	10′	1174.4	119.12	T
20′	166.72	2.425	.06	20′	669.70	39.006	.13	20′	1183.1	120.87	.19
30′	175.06	2.674	E	30′	678.15	39.993	E	30′	1191.8	122.63	E
40′	183.40	2.934	.003	40′	686.60	40.992	.011	40′	1200.5	124.41	.025
50′	191.74	3.207		50′	695.06	42.004		50′	1209.2	126.20	
4°	200.08	3.492		14°	703.51	43.029		24°	1217.9	128.00	
10′	208.43	3.790		10′	711.97	44.066		10′	1226.6	129.82	
20′	216.77	4.099		20′	720.44	45.116		20′	1235.3	131.65	
30′	225.12	4.421		30′	728.90	46.178		30′	1244.0	133.50	
40′	233.47	4.755		40′	737.37	47.253		40′	1252.8	135.35	
50′	241.81	5.100	15° C.	50′	745.85	48.341	15° C.	50′	1261.5	137.23	15° C.
5°	250.16	5.459	T	15°	754.32	49.441	T	25°	1270.2	139.11	T
10′	258.51	5.829	.09	10′	762.80	50.554	.19	10′	1279.0	141.01	.29
20′	266.86	6.211	E	20′	771.29	51.679	E	20′	1287.7	142.93	E
30′	275.21	6.606	.004	30′	779.77	52.818	.017	30′	1296.5	144.85	.038
40′	283.57	7.013		40′	788.26	53.969		40′	1305.3	146.79	
50′	291.92	7.432		50′	796.75	55.132		50′	1314.0	148.75	
6°	300.28	7.863		16°	805.25	56.309		26°	1322.8	150.71	
10′	308.64	8.307		10′	813.75	57.498		10′	1331.6	152.69	
20′	316.99	8.762		20′	822.25	58.699		20′	1340.4	154.69	
30′	325.35	9.230		30′	830.76	59.914		30′	1349.2	156.70	
40′	333.71	9.710	20° C.	40′	839.27	61.141	20° C.	40′	1358.0	158.72	20° C.
50′	342.08	10.202	T	50′	847.78	62.381	T	50′	1366.8	160.76	T
7°	350.44	10.707	.13	17°	856.30	63.634	.26	27°	1375.6	162.81	.39
10′	358.81	11.224	E	10′	864.82	64.900	E	10′	1384.4	164.86	E
20′	367.17	11.753	.006	20′	873.35	66.178	.022	20′	1393.2	166.95	.051
30′	375.54	12.294		30′	881.88	67.470		30′	1402.0	169.04	
40′	383.91	12.847		40′	890.41	68.774		40′	1410.9	171.15	
50′	392.28	13.413		50′	898.95	70.091		50′	1419.7	173.27	
8°	400.66	13.991		18°	907.49	71.421		28°	1428.6	175.41	
10′	409.03	14.582	25° C.	10′	916.03	72.764	25° C.	10′	1437.4	177.55	25° C.
20′	417.41	15.184	T	20′	924.58	74.119	T	20′	1446 3	179.72	T
30′	425.79	15.799	.16	30′	933.13	75.488	.32	30′	1455.1	181.89	.49
40′	434.17	16.426	E	40′	941.69	76.869	E	40′	1464.0	184.08	E
50′	442.55	17.065	.007	50′	950.25	78.264	.028	50′	1472.9	186.29	.065
9°	450.93	17.717		19°	958.81	79.671		29°	1481.8	188.51	
10′	459.32	18.381		10′	967.38	81.092		10′	1490.7	190.74	
20′	467.71	19.058		20′	975.96	82.525		20′	1499.6	192.99	
30′	476.10	19.746		30′	984.53	83.972		30′	1508.5	195.25	
40′	484.49	20.447		40′	993.12	85.431		40′	1517.4	197 53	
50′	492.88	21.161		50′	1001.7	86.904		50′	1526.3	199.82	
10°	501.28	21.887	30° C.	20°	1010.3	88.389	30° C.	30°	1535.3	202.12	30° C.
10′	509.68	22.624	T	10′	1018.9	89.888	T	10′	1544.2	204.44	T
20′	518.08	23.375	.19	20′	1027.5	91.399	.39	20′	1553.1	206.77	.59
30′	526.48	24.138	E	30′	1036.1	92.924	E	30′	1562.1	209.12	E
40′	534.89	24.913	.008	40′	1044.7	94.462	.034	40′	1571.0	211.48	.078
50′	543.29	25.700		50′	1053.3	96.013		50′	1580.0	213.86	

T = R tan ½ I E = R exsec ½ I

Table IX. TANGENTS AND EXTERNALS TO A 1° CURVE

I	T	E	I=40°	I	T	E	I=50°	I	T	E	I=60°
31°	1589.0	216.3	+	41°	2142.2	387.4	+	51°	2732.9	618.4	+
10′	1598.0	218.7	5° C.	10′	2151.7	390.7	5° C.	10′	2743.1	622.8	5° C.
20′	1606.9	221.1	T	20′	2161.2	394.1	T	20′	2753.4	627.2	T
30′	1615.9	223.5	.13	30′	2170.8	397.4	.17	30′	2763.7	631.7	.21
40′	1624.9	226.0	E	40′	2180.3	400.8	E	40′	2773.9	636.2	E
50′	1633.9	228.4	.023	50′	2189.9	404.2	.037	50′	2784.2	640.7	.056
32°	1643.0	230.9		42°	2199.4	407.6		52°	2794.o	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	10° C.	43°	2257.0	428.5	10° C.	53°	2856.7	672.7	10° C.
10′	1706.3	248.7	T	10′	2266.6	432.0	T	10′	2867.1	677.3	T
20′	1715.3	251.3	.26	20′	2276.2	435.6	.34	20′	2877.5	682.0	.42
30′	1724.4	253.9	E	30′	2285.9	439.2	E	30′	2888.0	686.7	E
40′	1733.5	256.5	.046	40′	2295.6	442.8	.075	40′	2898.4	691.4	.112
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	15° C.	50′	2363.5	468.4	15° C.	50′	2972.1	725.0	15° C.
35°	1806.6	278.1	T	45°	2373.3	472.1	T	55°	2982.7	729.9	T
10′	1815.7	280.8	.40	10′	2383.1	475.8	.51	10′	2993.3	734.8	.63
20′	1824.9	283.6	E	20′	2392.8	479.6	E	20′	3003.9	739.7	E
30′	1834.1	286.4	.070	30′	2402.6	483.4	.116	30′	3014.5	744.6	.168
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	20° C.	40′	2471.5	510.3	20° C.	40′	3089.4	779.8	20° C.
50′	1907.9	309.3	T	50′	2481.4	514.3	T	50′	3100.2	784.9	T
37°	1917.1	312.2	.53	47°	2491.3	518.2	.68	57°	3110.9	790.1	.84
10′	1926.4	315.2	E	10′	2501.2	522.2	E	10′	3121.7	795.2	E
20′	1935.7	318.1	.093	20′	2511.2	526.1	.151	20′	3132.6	800.4	.225
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	25° C.	10′	2561.0	546.3	25° C.	10′	3186.9	826.7	25° C.
20′	1991.5	336.3	T	20′	2571.0	550.4	T	20′	3197.8	832.0	T
30′	2000.9	339.3	.67	30′	2581.0	554.5	.85	30′	3208.8	837.3	1.05
40′	2010.2	342.4	E	40′	2591.0	558.6	E	40′	3219.7	842.7	E
50′	2019.6	345.5	.117	50′	2601.1	562.8	.189	50′	3230.7	848.1	.283
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	30° C.	50°	2671.8	592.3	30° C.	60°	3308.0	886.4	30° C.
10′	2094.9	371.0	T	10′	2681.9	596.6	T	10′	3319.1	892.0	T
20′	2104.3	374.2	.80	20′	2692.1	600.9	1.02	20′	3330.3	897.5	1.27
30′	2113.8	377.5	E	30′	2702.3	605.3	E	30′	3341.4	903.2	E
40′	2123.3	380.8	.141	40′	2712.5	609.6	.227	40′	3352.6	908.8	.340
50′	2132.7	384.1		50′	2722.7	614.0		50′	3363.8	914.5	

T = R tan ½ I E = R exsec ½ I

19+41.00
18+87.57
53.43

TABLE IX. TANGENTS AND EXTERNALS TO A 1° CURVE

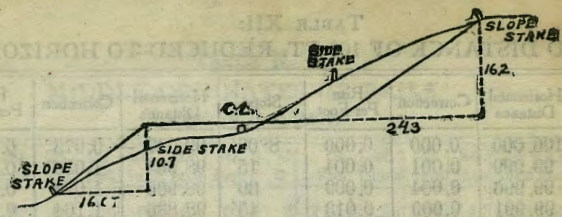
I	T	E	I=70°	I	T	E	I=80°	I	T	E	I=90°
61°	3375.0	920.2	+	71°	4086.9	1308.2	+	81°	4893.6	1805.3	+
10′	3386.3	925.9	5° C.	10′	4099.5	1315.6	5° C.	10′	4908.0	1814.7	5° C.
20′	3397.5	931.6	T	20′	4112.1	1322.9	T	20′	4922.5	1824.1	T
30′	3408.8	937.3	.25	30′	4124.8	1330.3	.30	30′	4937.0	1833.6	.36
40′	3420.1	943.1	E	40′	4137.4	1337.7	E	40′	4951.5	1843.1	E
50′	3431.4	948.9		50′	4150.1	1345.1		50′	4966.1	1852.6	
62°	3442.7	954.8	.080	72°	4162.8	1352.6	.110	82°	4980.7	1862.2	.149
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	10° C.	73°	4239.7	1398.0	10° C.	83°	5069.2	1920.5	10° C.
10′	3522.6	996.2	T	10′	4252.6	1405.7	T	10′	5084.0	1930.4	T
20′	3534.1	1002.3	.51	20′	4265.6	1413.5	.61	20′	5099.0	1940.3	.72
30′	3545.6	1008.3	E	30′	4278.5	1421.2	E	30′	5113.9	1950.3	E
40′	3557.2	1014.4	.159	40′	4291.5	1429.0	.220	40′	5128.9	1960.2	.299
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	15° C.	50′	4383.3	1484.4	15° C.	50′	5234.9	2031.4	15° C.
65°	3650.2	1063.9	T	75°	4396.5	1492.4	T	85°	5250.3	2041.7	T
10′	3661.9	1070.2	.76	10′	4409.8	1500.5	.91	10′	5265.6	2052.1	1.09
20′	3673.7	1076.6	E	20′	4423.1	1508.6	E	20′	5281.0	2062.5	E
30′	3685.4	1082.9	.240	30′	4436.4	1516.7	.332	30′	5296.4	2073.0	.450
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	20° C.	40′	4530.4	1574.7	20° C.	40′	5405.6	2147.5	20° C.
50′	3780.4	1134.8	T	50′	4544.0	1583.1	T	50′	5421.4	2158.4	T
67°	3792.4	1141.4	1.02	77°	4557.6	1591.6	1.22	87°	5437.2	2169.2	1.45
10′	3804.4	1148.0	E	10′	4571.2	1600.1	E	10′	5453.1	2180.2	E
20′	3816.4	1154.7	.321	20′	4584.8	1608.6	.445	20′	5469.0	2191.1	.603
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	25° C.	20′	4667.4	1660.5	25° C.	20′	5565.4	2258.0	25° C.
30′	3901.2	1202.0	T	30′	4681.3	1669.2	T	30′	5581.6	2269.3	T
40′	3913.4	1208.9	1.28	40′	4695.2	1678.1	1.53	40′	5597.8	2280.6	1.83
50′	3925.6	1215.8	E	50′	4709.2	1686.9	E	50′	5614.2	2292.0	E
69°	3937.9	1222.7	.403	79°	4723.2	1695.8	.558	89°	5630.5	2303.5	.756
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	30° C.	80°	4807.7	1749.9	30° C.	90°	5729.7	2373.3	30° C.
10′	4024.4	1272.1	T	10′	4822.0	1759.0	T	10′	5746.3	2385.1	T
20′	4036.8	1279.3	1.54	20′	4836.2	1768.2	1.84	20′	5763.1	2397.0	2.20
30′	4049.3	1286.5	E	30′	4850.5	1777.4	E	30′	5779.9	2408.9	E
40′	4061.8	1293.6	.485	40′	4864.8	1786.7	.671	40′	5796.7	2420.9	.910
50′	4074.4	1300.9		50′	4879.2	1796.0		50′	5813.6	2432.9	

T = R tan ½ I E = R exsec ½ I

TABLE IX. TANGENTS AND EXTERNALS TO A 1° CURVE

I	T	E	I=100°	I	T	E	I=110°	I	T	E	I=120°
91°	5830.5	2444.9	+	101°	6950.6	3278.1	+	111°	8336.7	4386.1	+
10′	5847.5	2457.1	5° C.	10′	6971.3	3294.1	5° C.	10′	8362.7	4407.6	5° C.
20′	5864.6	2469.3	T	20′	6992.0	3310.1	T	20′	8388.9	4429.2	T
30′	5881.7	2481.5	.43	30′	7012.7	3326.1	.51	30′	8415.1	4450.9	.62
40′	5898.8	2493.8	E	40′	7033.6	3342.3	E	40′	8441.5	4472.7	E
50′	5916.0	2506.1		50′	7054.5	3358.5		50′	8468.0	4494.6	
92°	5933.2	2518.5	.200	102°	7075.5	3374.9	.268	112°	8494.6	4516.6	.360
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	10° C.	103°	7203.2	3474.4	10° C.	113°	8656.6	4651.3	10° C.
10′	6055.4	2606.8	T	10′	7224.7	3491.3	T	10′	8684.0	4674.2	T
20′	6073.1	2619.7	.86	20′	7246.3	3508.2	.103	20′	8711.5	4697.2	1.25
30′	6090.8	2632.6	E	30′	7268.0	3525.2	E	30′	8739.2	4720.3	E
40′	6108.6	2645.5	.401	40′	7289.8	3542.4	.536	40′	8767.0	4743.6	.721
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′	6162.2	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	15° C.	50′	7444.6	3664.5	15° C.	50′	8965.0	4909.9	15° C.
95°	6252.8	2751.3	T	105°	7467.0	3682.3	T	115°	8993.8	4934.1	T
10′	6271.1	2764.8	1.30	10′	7489.6	3700.2	1.56	10′	9022.7	4958.6	1.93
20′	6289.4	2778.3	E	20′	7512.2	3718.2	E	20′	9051.7	4983.1	E
30′	6307.9	2792.0	.604	30′	7534.9	3736.2	.806	30′	9080.9	5007.8	1.09
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	20° C.	40′	7696.3	3865.2	20° C.	40′	9289.2	5184.5	20° C.
50′	6457.3	2903.1	T	50′	7719.7	3884.0	T	50′	9319.5	5210.3	T
97°	6476.2	2917.3	1.74	107°	7743.2	3902.9	2.08	117°	9349.9	5236.2	2.52
10′	6495.2	2931.6	E	10′	7766.8	3921.9	E	10′	9380.5	5262.3	E
20′	6514.3	2945.9	.809	20′	7790.5	3940.9	1.08	20′	9411.3	5288.6	1.46
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	25° C.	20′	7934.6	4057.4	25° C.	20′	9598.9	5449.2	25° C
30′	6649.6	3047.9	T	30′	7959.0	4077.2	T	30′	9630.7	5476.5	T
40′	6669.2	3062.8	2.18	40′	7983.5	4097.1	2.61	40′	9662.6	5504.0	3.16
50′	6688.8	3077.7	E	50′	8008.0	4117.0	E	50′	9694.7	5531.7	E
99°	6708.6	3092.7	1.02	109°	8032.7	4137.1	1.36	119°	9727.0	5559.4	1.83
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	30° C.	110°	8182.8	4259.7	30° C.	120°	9924.0	5729.7	30° C
10′	6848.5	3199.6	T	10′	8208.2	4280.5	T	10′	9957.5	5758.6	
20′	6868.8	3215.1	2.62	20′	8233.7	4301.4	3.14	20′	9991.0	5787.7	3.81
30′	6889.2	3230.8	E	30′	8259.3	4322.4	E	30′	10025.0	5817.0	E
40′	6909.6	3246.5	1.22	40′	8285.0	4343.6	1.63	40′	10059.0	5846.5	2.20
50′	6930.1	3262.3		50′	8310.8	4364.8		50′	10093.0	5876.1	

T = R tan ½ I E = R exsec ½ I



DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING.

SLOPE 1½ TO 1. ROADWAY OF ANY WIDTH.

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	0 00	0 15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	0
1	1.50	1 65	1 80	1.95	2.10	2.25	2.40	2.55	2.70	2.85	1
2	3.00	3.15	3.30	3 45	3.60	3 75	3.90	4.05	4.20	4 35	2
3	4.50	4 65	4.80	4.95	5 10	5 25	5 40	5.55	5.70	5.85	3
4	6.00	6 15	6.30	6.45	6.60	6.75	6.90	7.05	7.20	7.35	4
5	7 50	7.65	7.80	7.95	8.10	8.25	8.40	8.55	8.70	8.85	5
6	9 00	9 15	9.30	9.45	9.60	9.75	9.90	10.05	10.20	10.35	6
7	10.50	10 65	10.80	10.95	11.10	11.25	11.40	11.55	11 70	11.85	7
8	12.00	12 15	12.30	12.45	12.60	12.75	12.90	13.05	13.20	13.35	8
9	13 50	13 65	13 80	13 95	14.10	14.25	14.40	14 55	14.70	14.85	9
10	15.00	15 15	15 30	15 45	15.60	15.75	15.90	16.05	16.20	16 35	10
11	16 50	16 65	16 80	16.95	17 10	17.25	17.40	17.55	17.70	17.85	11
12	18 00	18.15	18.30	18 45	18.60	18 75	18.90	19.05	19.20	19 35	12
13	19 50	19 65	19.80	19.95	20.10	20.25	20 40	20.55	20.70	20.85	13
14	21.00	21 15	21.30	21.45	21 60	21.75	21.90	22 05	22 20	22 35	14
15	22 50	22 65	22 80	22 95	23.10	23.25	23.40	23.55	23.70	23.85	15
16	24.00	24 15	24 30	24 45	24.60	24.75	24 90	25 05	25.20	25.35	16
17	25.50	25 65	25.80	25 95	26.10	26 25	26 40	26.55	26.70	26.85	17
18	27.00	27 15	27.30	27 45	27.60	27.75	27.90	28.05	28 20	28.35	18
19	28 50	28 65	28 80	28.95	29.10	29.25	29.40	29.55	29.70	29.85	19
20	30 00	30 15	30.30	30.45	30.60	30.75	30.90	31.05	31.20	31.35	20
21	31 50	31 65	31.80	31.95	32 10	32 25	32.40	32.55	32 70	32 85	21
22	33 00	33 15	33 30	33 45	33.60	33 75	33.90	34.05	34.20	34.35	22
23	34 50	34 65	34.80	34.95	35.10	35 25	35 40	35.55	35.70	35 85	23
24	36.00	36 15	36.30	36 45	36.60	36.75	36.90	37.05	37 20	37.35	24
25	37.50	37.65	37 80	37.95	38.10	38.25	38.40	38.55	38.70	38.85	25
26	39 00	39 15	39.30	39 45	39 60	39.75	39.90	40.05	40.20	40.35	26
27	40 50	40 65	40 80	40.95	41.10	41.25	41 40	41.55	41.70	41.85	27
28	42 00	42 15	42.30	42.45	42.60	42 75	42.90	43.05	43.20	43.35	28
29	43 50	43 65	43.80	43 95	44.10	44 25	44 40	44.55	44.70	44 85	29
30	45 00	45 15	45.30	45 45	45.60	45.75	45 90	46.05	46 20	46.35	30
31	46.50	46.65	46.80	46 95	47.10	47.25	47.40	47.55	47.70	47.85	31
32	48 00	48.15	48.30	48 45	48.60	48 75	48.90	49.05	49 20	49.35	32
33	49.50	49 65	49.80	49.95	50.10	50.25	50.40	50.55	50.70	50.85	33
34	51 00	51.15	51.30	51.45	51.60	51.75	51 90	52.05	52.20	52.35	34
35	52 50	52.65	52.80	52.95	53.10	53.25	53.40	53.55	53.70	53.85	35
36	54 00	54 15	54.30	54 45	54.60	54.75	54.90	55.05	55.20	55.35	36
37	55 50	55 65	55.80	55.95	56.10	56.25	56.40	56.55	56.70	56.85	37
38	57.00	57.15	57.30	57 45	57.60	57 75	57.90	58.05	58.20	58 35	38
39	58 50	58.65	58 80	58 95	59.10	59 25	59.40	59 55	59.70	59.85	39
40	60 00	60 15	60 30	60 45	60 60	60.75	60 90	61.05	61 20	61.35	40
41	61.50	61 65	61 80	61 95	62 10	62 25	62.40	62 55	62 70	62.85	41
42	63 00	63.15	63 30	63 45	63 60	63 75	63 90	64 05	64 20	64.35	42
43	64.50	64 65	64 80	64.95	65.10	65 25	65 40	65.55	65.70	65.85	43
44	66 00	66 15	66 30	66.45	66.60	66 75	66 90	67.05	67.20	67.35	44
45	67 50	67 65	67 80	67.95	68.10	68.25	68.40	68.55	68.70	68.85	45
46	69 00	69 15	69 30	69.45	69.60	69.75	69.90	70.05	70.20	70.35	46
47	70 50	70 65	70 80	70 95	71.10	71.25	71 40	71.55	71.70	71.85	47
48	72.00	72 15	72.30	72.45	72.60	72.75	72.90	73 05	73.20	73 35	48
49	73 50	73 65	73.80	73.95	74.10	74.25	74.40	74.55	74.70	74.85	49
50	75.00	75.15	75.30	75.45	75.60	75.75	75.90	76.05	76.20	76.35	50

Computed by L. Leland Locke.