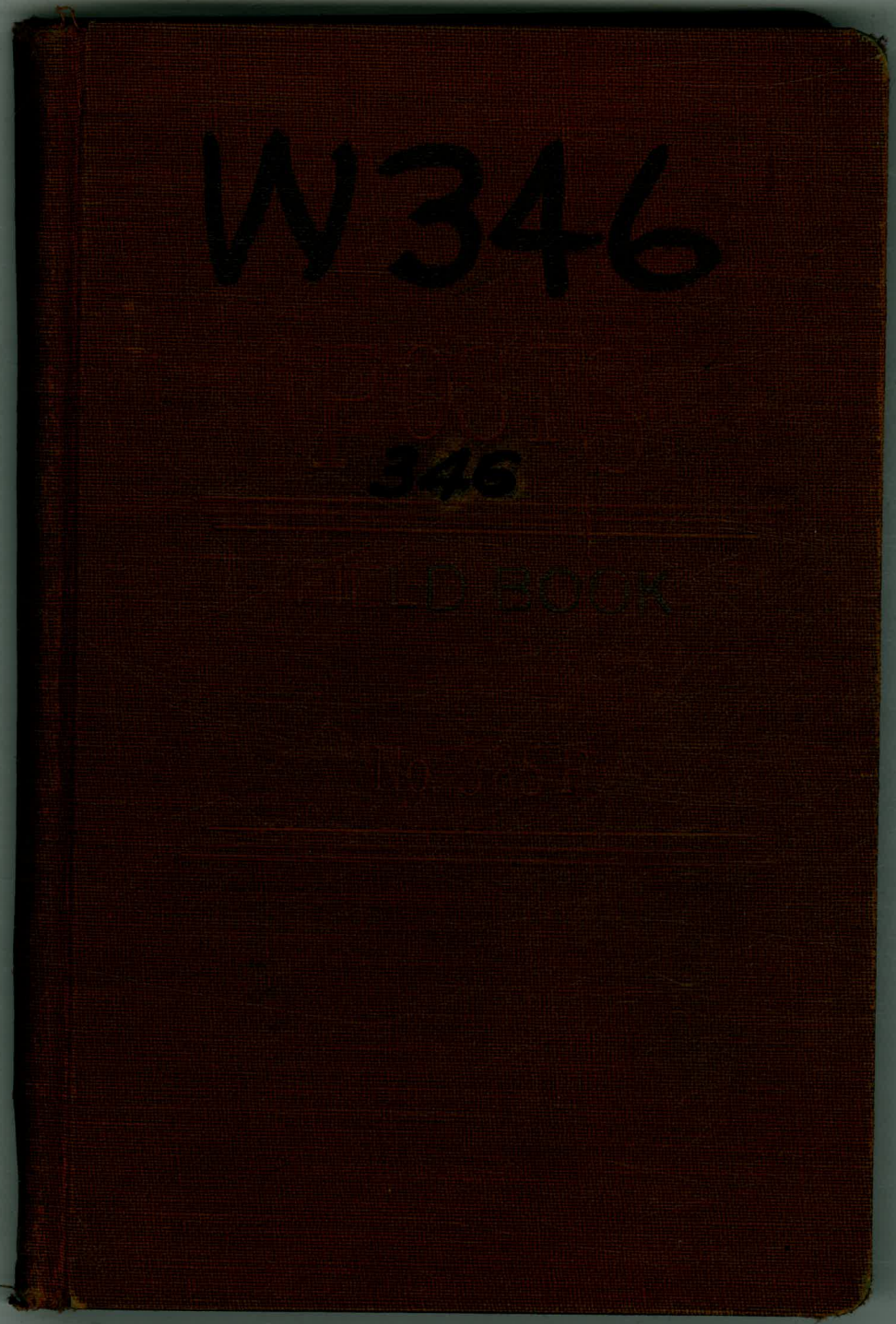

W346
346

346

346

Tables for Excavations and Embankments.

Distances from Centre of Roadway for Cross Sectioning.

Roadway 22 feet wide. Side Slopes 1 to 1.

For Single Track Excavation.

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9	0
1	12,0	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9	1
2	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	2
3	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	3
4	15.0	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	4
5	16.0	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9	5
6	17.0	17.1	17.2	17.3	17.4	17.5	17.6	17.7	17.8	17.9	6
7	18.0	18.1	18.2	18.3	18.4	18.5	18.6	18.7	18.8	18.9	7
8	19.0	19.1	19.2	19.3	19.4	19.5	19.6	19.7	19.8	19.9	8
9	20.0	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	9
10	21.0	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.8	21.9	10
11	22.0	22.1	22.2	22.3	22.4	22.5	22.6	22.7	22.8	22.9	11
12	23.0	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8	23.9	12
13	24.0	24.1	24.2	24.3	24.4	24.5	24.6	24.7	24.8	24.9	13
14	25.0	25.1	25.2	25.3	25.4	25.5	25.6	25.7	25.8	25.9	14
15	26.0	26.1	26.2	26.3	26.4	26.5	26.6	26.7	26.8	26.9	15
16	27.0	27.1	27.2	27.3	27.4	27.5	27.6	27.7	27.8	27.9	16
17	28.0	28.1	28.2	28.3	28.4	28.5	28.6	28.7	28.8	28.9	17
18	29.0	29.1	29.2	29.3	29.4	29.5	29.6	29.7	29.8	29.9	18
19	30.0	30.1	30.2	30.3	30.4	30.5	30.6	30.7	30.8	30.9	19
20	31.0	31.1	31.2	31.3	31.4	31.5	31.6	31.7	31.8	31.9	20
21	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.8	32.9	21
22	33.0	33.1	33.2	33.3	33.4	33.5	33.6	33.7	33.8	33.9	22
23	34.0	34.1	34.2	34.3	34.4	34.5	34.6	34.7	34.8	34.9	23
24	35.0	35.1	35.2	35.3	35.4	35.5	35.6	35.7	35.8	35.9	24
25	36.0	36.1	36.2	36.3	36.4	36.5	36.6	36.7	36.8	36.9	25
26	37.0	37.1	37.2	37.3	37.4	37.5	37.6	37.7	37.8	37.9	26
27	38.0	38.1	38.2	38.3	38.4	38.5	38.6	38.7	38.8	38.9	27
28	39.0	39.1	39.2	39.3	39.4	39.5	39.6	39.7	39.8	39.9	28
29	40.0	40.1	40.2	40.3	40.4	40.5	40.6	40.7	40.8	40.9	29
30	41.0	41.1	41.2	41.3	41.4	41.5	41.6	41.7	41.8	41.9	30
31	42.0	42.1	42.2	42.3	42.4	42.5	42.6	42.7	42.8	42.9	31
32	43.0	43.1	43.2	43.3	43.4	43.5	43.6	43.7	43.8	43.9	32
33	44.0	44.1	44.2	44.3	44.4	44.5	44.6	44.7	44.8	44.9	33
34	45.0	45.1	45.2	45.3	45.4	45.5	45.6	45.7	45.8	45.9	34
35	46.0	46.1	46.2	46.3	46.4	46.5	46.6	46.7	46.8	46.9	35
36	47.0	47.1	47.2	47.3	47.4	47.5	47.6	47.7	47.8	47.9	36
37	48.0	48.1	48.2	48.3	48.4	48.5	48.6	48.7	48.8	48.9	37
38	49.0	49.1	49.2	49.3	49.4	49.5	49.6	49.7	49.8	49.9	38
39	50.0	50.1	50.2	50.3	50.4	50.5	50.6	50.7	50.8	50.9	39
40	51.0	51.1	51.2	51.3	51.4	51.5	51.6	51.7	51.8	51.9	40

Index

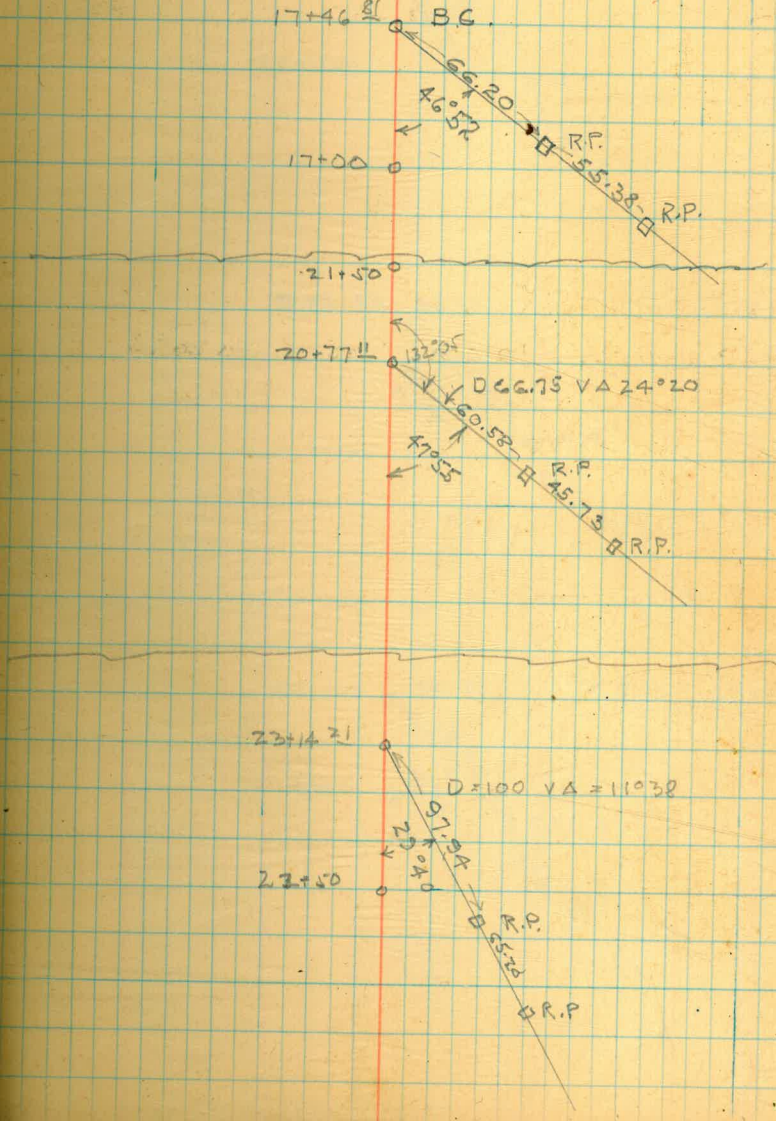
El Monte to Dam

County Road Survey R.P.s

A 17+46.81 B.C. 133°68 Rt 66.20 Rwd hub

A 20+77.11 E.C. 132°05 Rt 66.75 VΔ 24°50

A 23+14.21 P.I. 150°20 Rt 100.00 V-Δ-11°38



R P 5 contin.

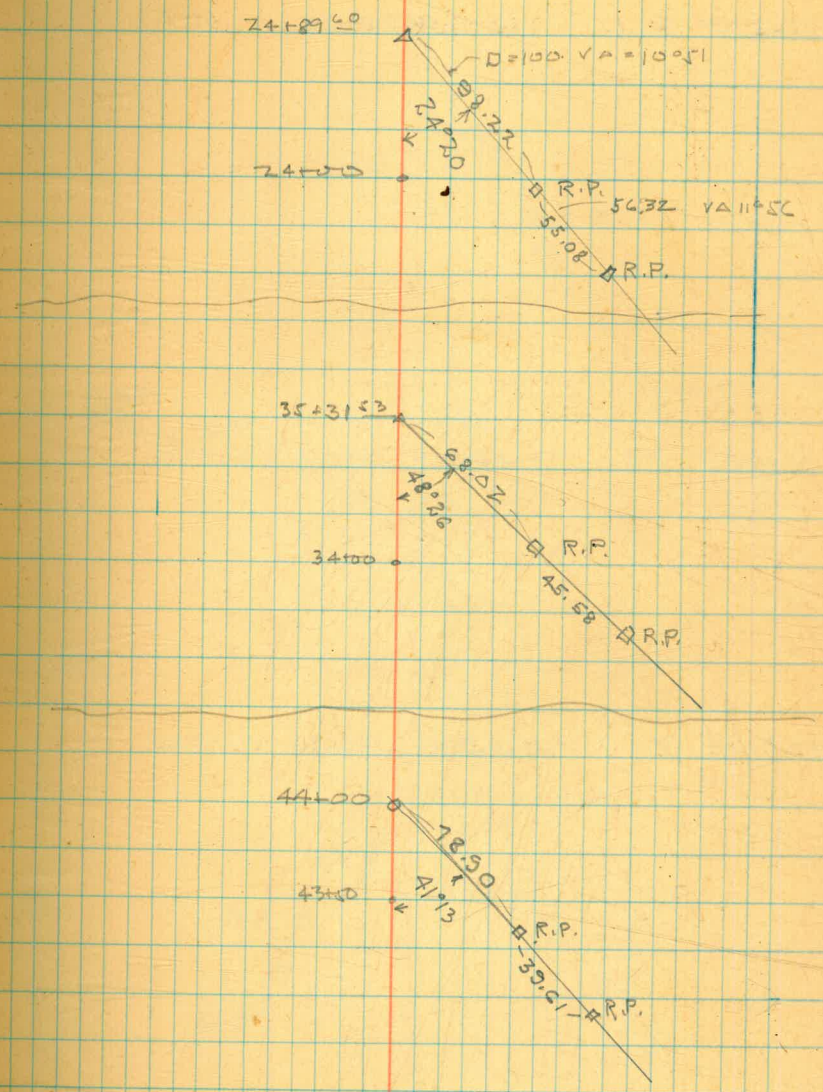
A 24+89.60 P.I. T55-40 Rt 100 VΔ 10°51

A 35+81.53 P.I. 131.34 68.02 Rt

A 44+00 P.O.T. 138-47

April 27-32

P.O.C



R P's contin.

A 63+50.00 P.I. 140-05 Rt 69.34

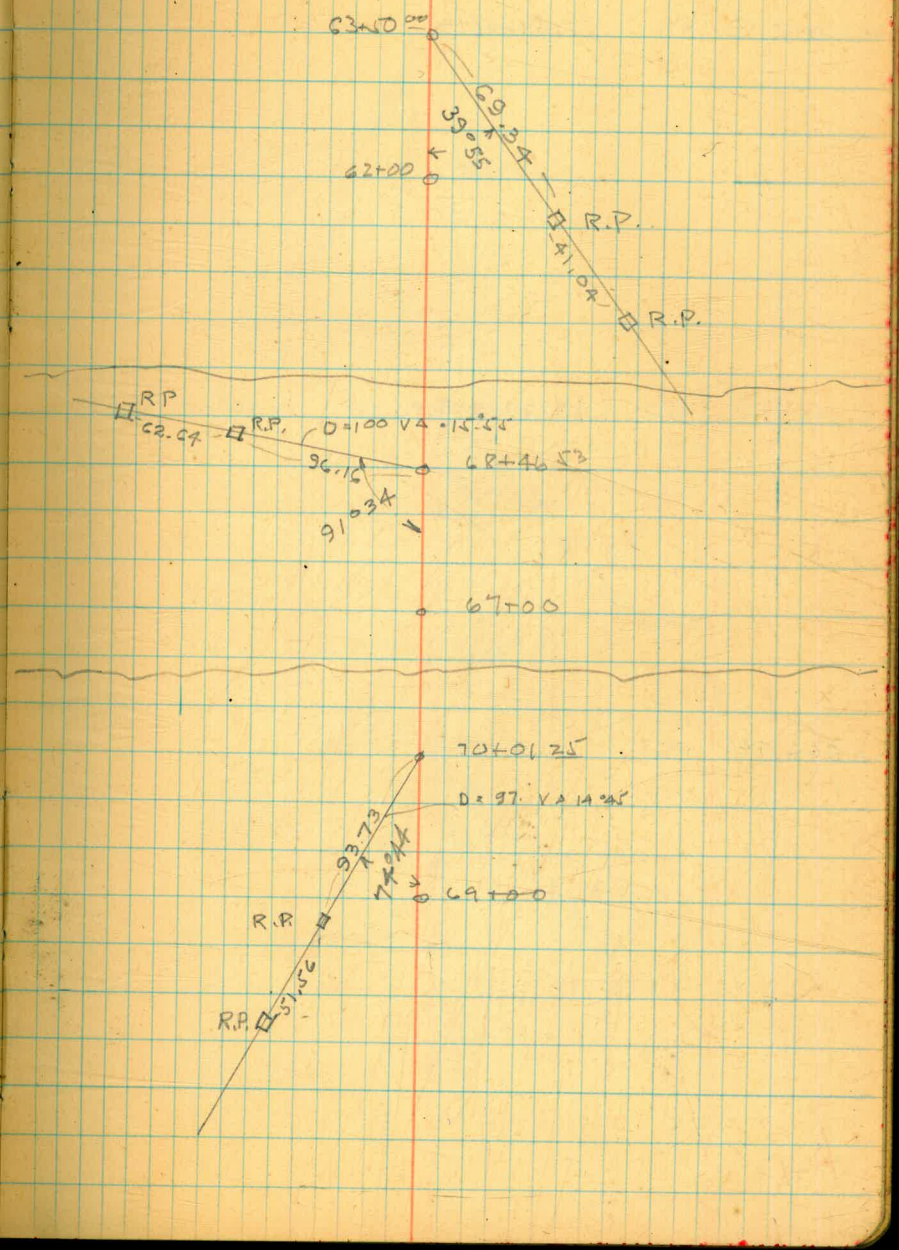
A 68+46.53 P.I. 88-26 Lt 100.00 V Δ 15°55

A 70+01.25 P.I. 105-16 97.00 V Δ 14°45

April 27-32

P.O.C

4



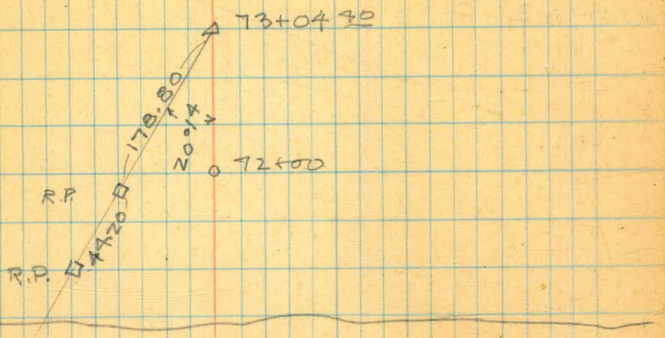
April 27 – 32

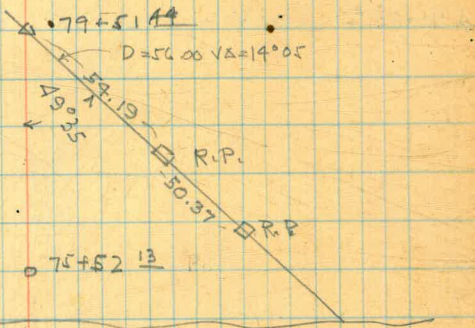
P.O.C.

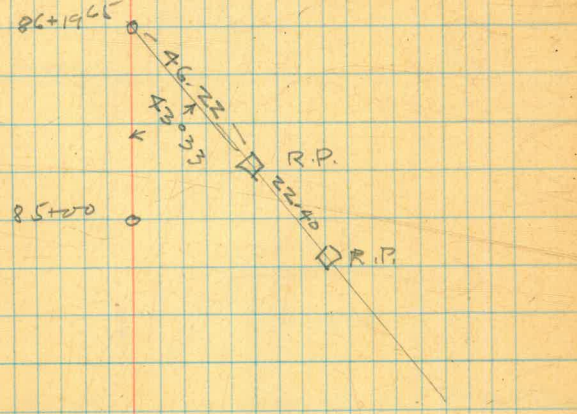
A 73+04.40 P.I. 159-46 Lt

A 79+51.44 P.I. 130-25 Rt 56.00 Δ 14° 05

A 86+19.65 P.I. 136-27 Rt







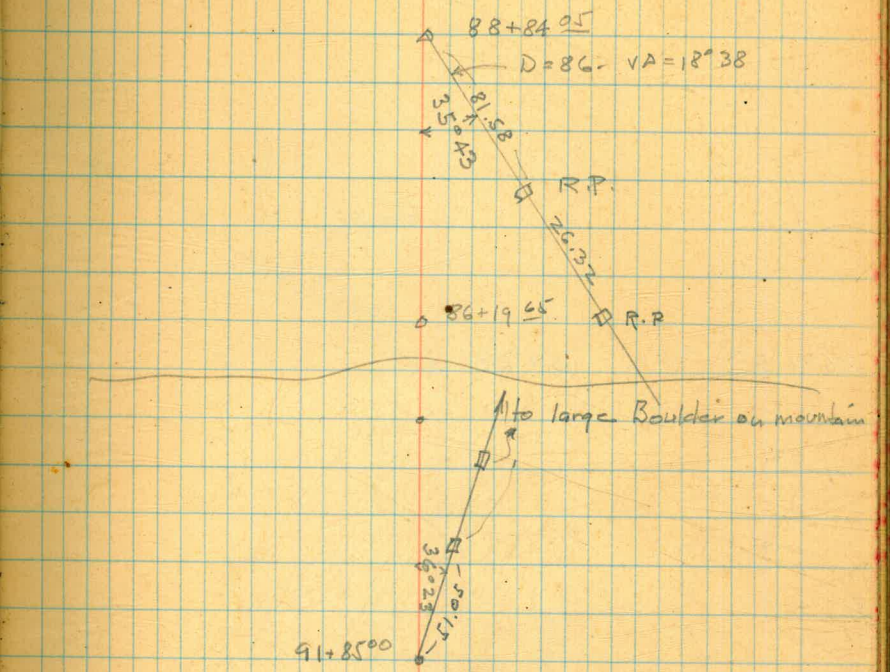
R P's contin.

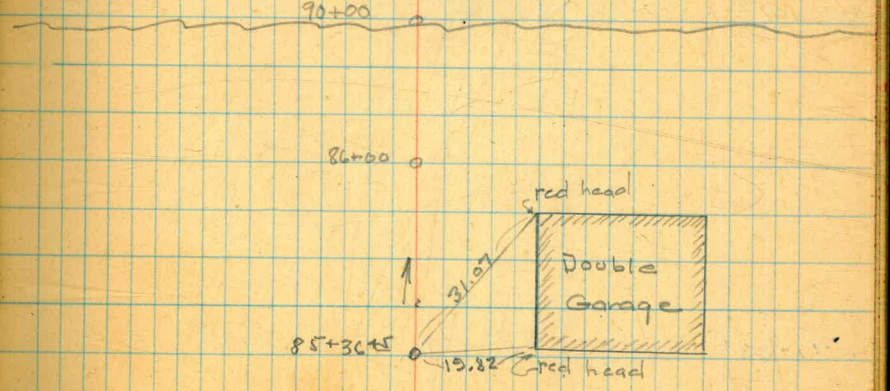
A 88+84.05 P.I. 86.00 VA 18°38

A 91+85.00 end of line 36°23 Rt 52.0 VA 11°11

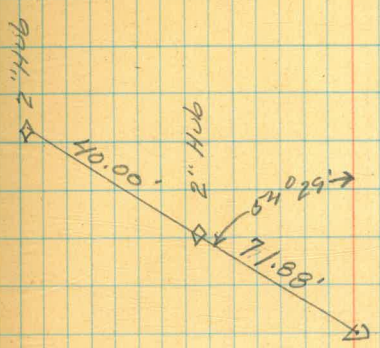
A 85+36.45 B.C.

April 27-32
P.O.G.

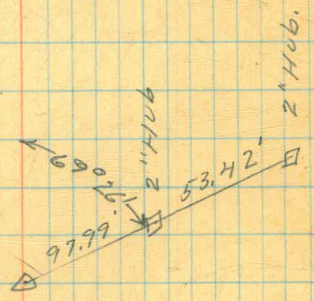




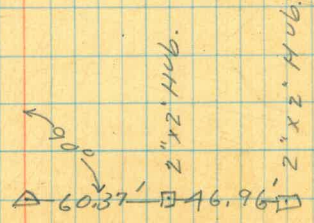
April 28
Bonham
Soper
Ramman.



△59+18.67 P.I. 54°29 Lt.



△54+01 40 P.I. 69°26' Rt. V.A. 11°30' 100.00 = 97.99



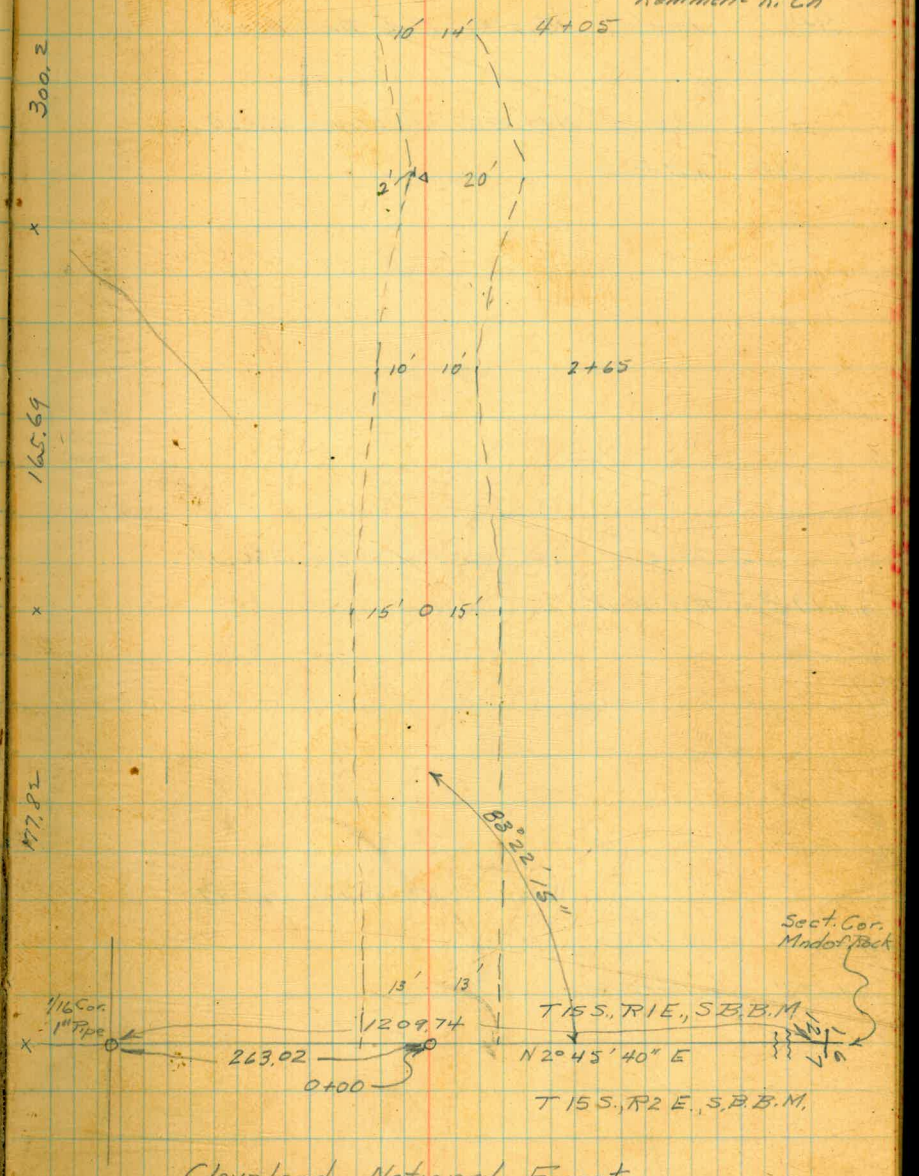
A49+55 45 P.O.T. 90° Rt. 60.37'

Location of Road as Built
El Capitan to El Monte Park.

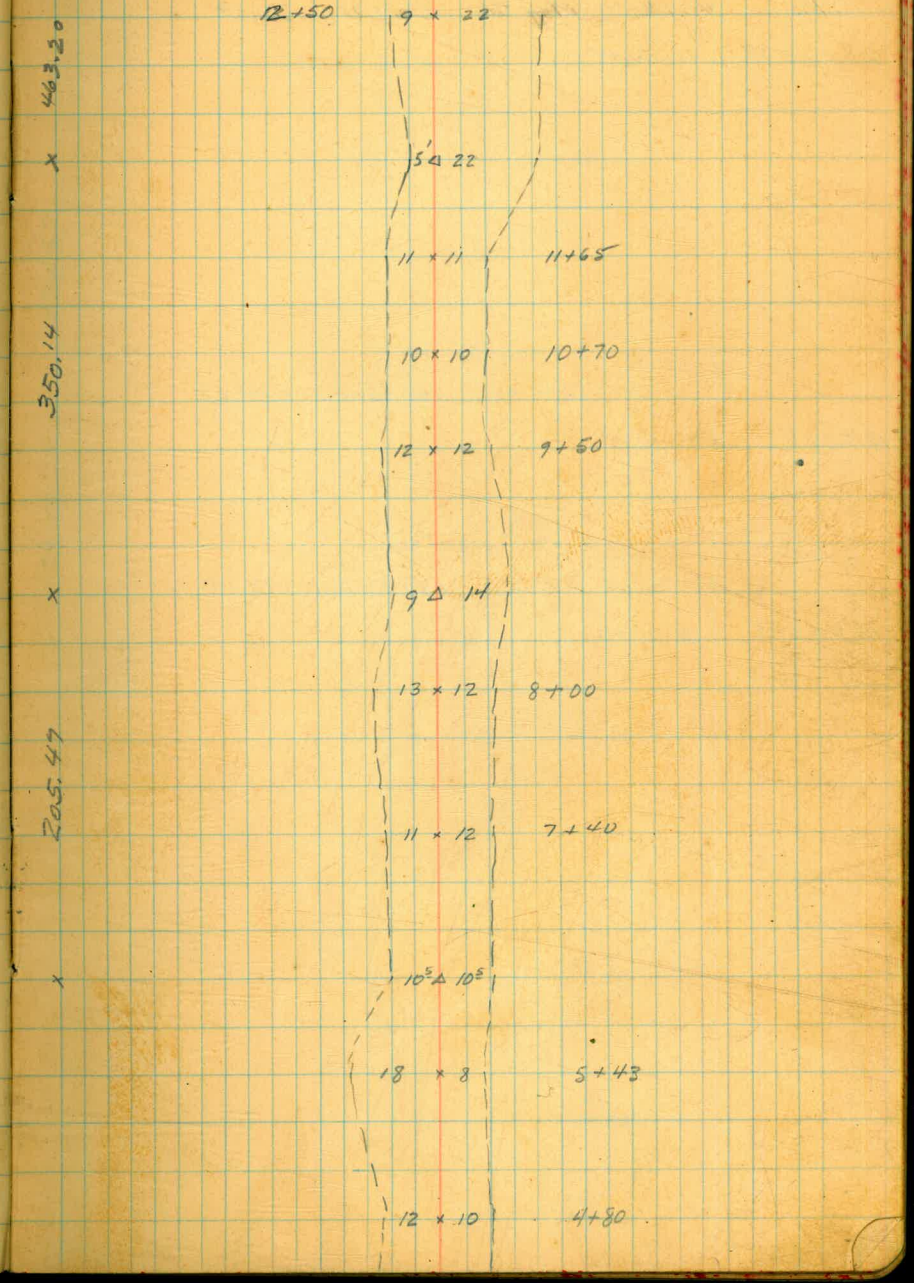
Sta.	Angle	Mag. Br.	Calc. Br.	Dist.
		N67-40 W	N67-36-20 W	300.20
	26-55-15			
	83-50-30			
3+43.5'	R. 26-55-15			
		S84-30 W	S85-28-25 W	165.69
	13-55-4			
	27-50			
1+77.82	L. 13-55-0			
		N81-0 W	N80-36-35 W	
	83-22-10			
	166-44-30			
0+00	L. 83-22-15			
		N2-45 E	N2°-45-40 E	

Aug 1 - 1932

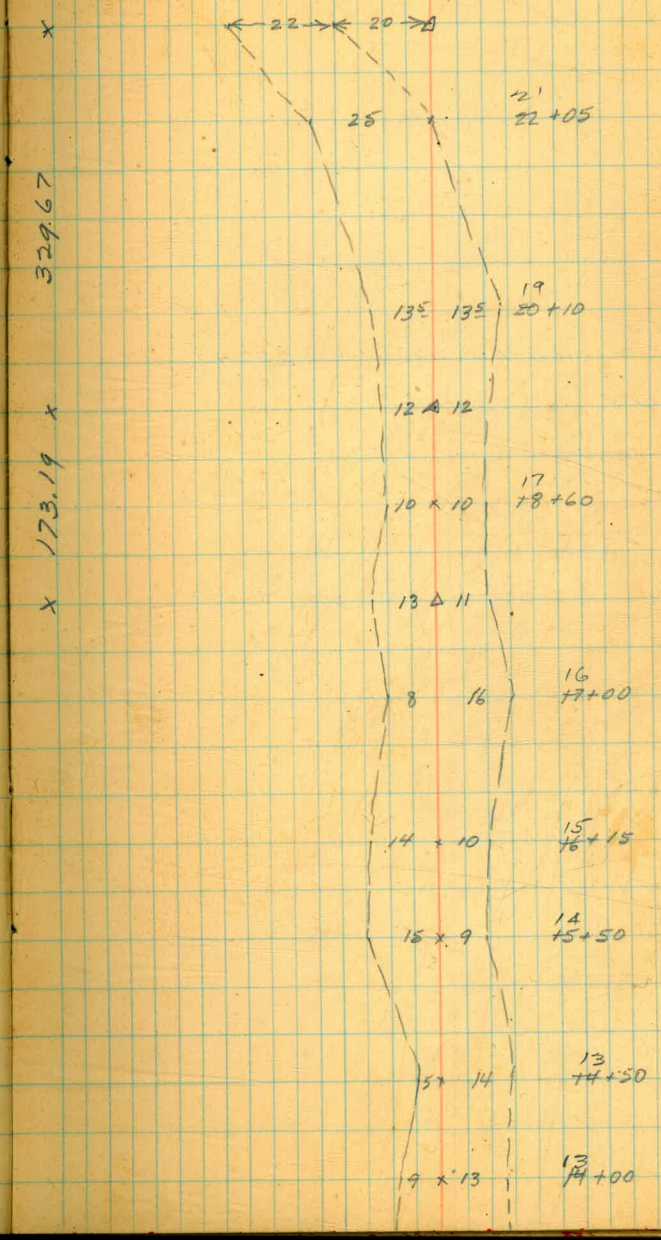
Elliott - Notes 9
Simpson - T
Soper - Mdl. Ch.
Kammen - R. Ch



Sta.	Angle	Mag. Br.	Cak. Br.	Dist
	21-55-10			
	43-50-30	N44-15W	N42-03-40W	463.20
11+99.32	R.21-55-15			
	14-44-15			
	29-28-25	N65-15W	N63-58-55W	350.14
8+49.18	R.14-44-15			
		N80-W	N78-43-10W	205.47
	11-07			
	22-13-40			
6+43.71	L.11-06-50			



Sta.	40-24-30 80-48-45	Mag. Br.	Calc. Br.	Dist.
21+65.38	L. 40-24-25			
	8-44-45			
	27-29-50	N48-45W	N48-40-05W	329.67
18+35.71	R. 8-44-55			
	15-21-15			
	30-42-45	N57-45W	N57-25-00W	173.19
16+62.52	L. 15-21-20			



Sta.	Angle	Mag. Br.	Calc. Br.	Dist
	31-14-0			
	62-28-0	N88-0W	N87-21-45W	259.40
26+94.13	R.31-14-0			
		S60-15W	S61-24-15W	142.07
	29-31-20			
	59-02-30			
25+52.06	L.29-31-15			
		N89-15W	N89-04-30W	386.68

10 × 11 — 28 — ~~29~~+95

10 × 11 — 27 — ~~28~~+95

13 × 12 — 27 — ~~28~~+44

54 Δ 18

11 × 11 — 25 — 26+60

Shields Place

9 × 14 — 25 — 26+12

14 Δ 20

Start Aug 2 - 1932
End Aug 1 - 1932

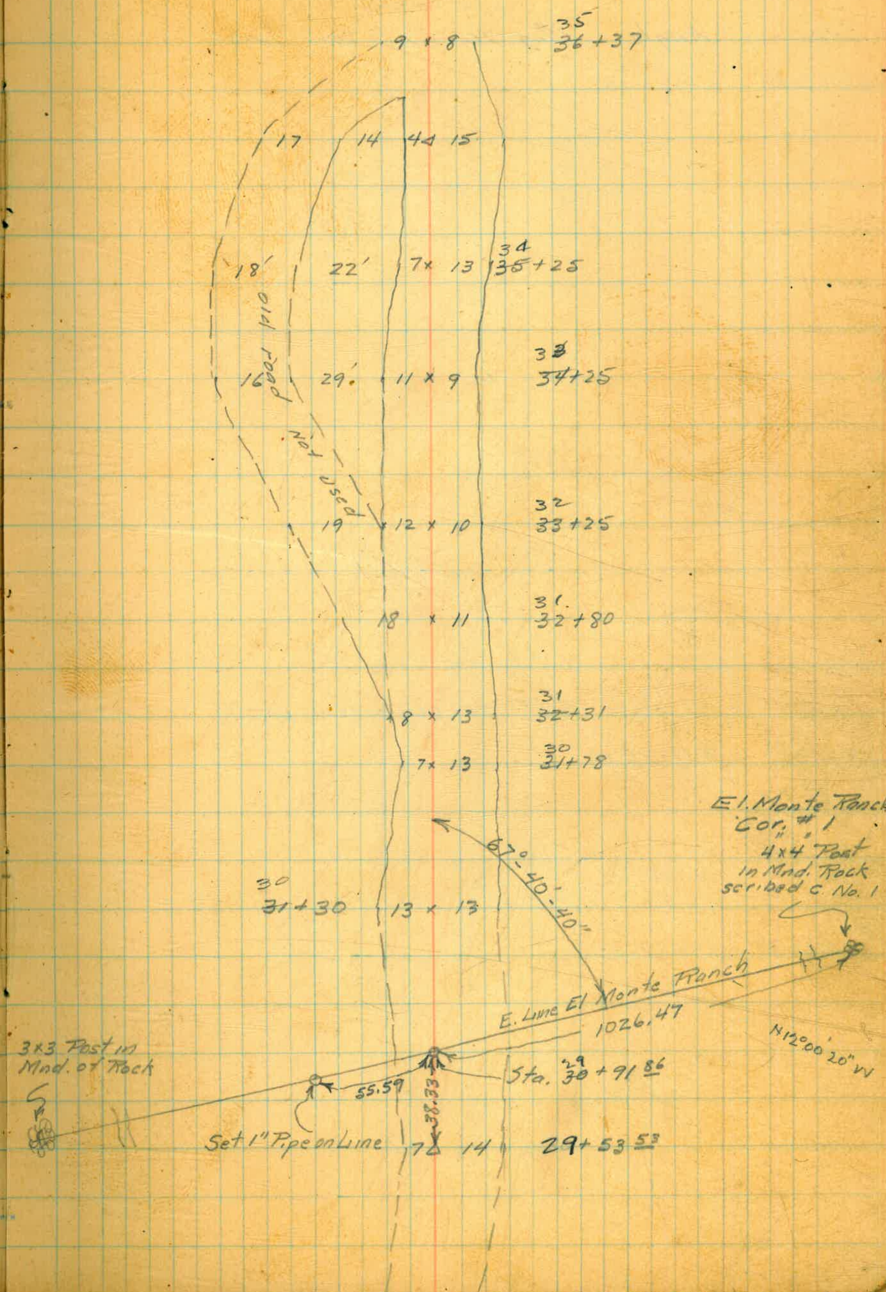
10 × 12 — 24 — 25+65

10 × 12 — 23 — 24+10

12 × 9 — 22 — ~~23~~+65

23 × — 22 — ~~23~~+25

Sta.	Angle	Mag. Br.	Calc. Br.	Dist.
	15-31-30 31-02-45	N64-30W	N64-09-35W	197.63
34+62 14	R 15-31-25			
	7-40-50 15-21-30	N80-18W	N79-41-0W	508.61
29+53 53	R 7+40-45			

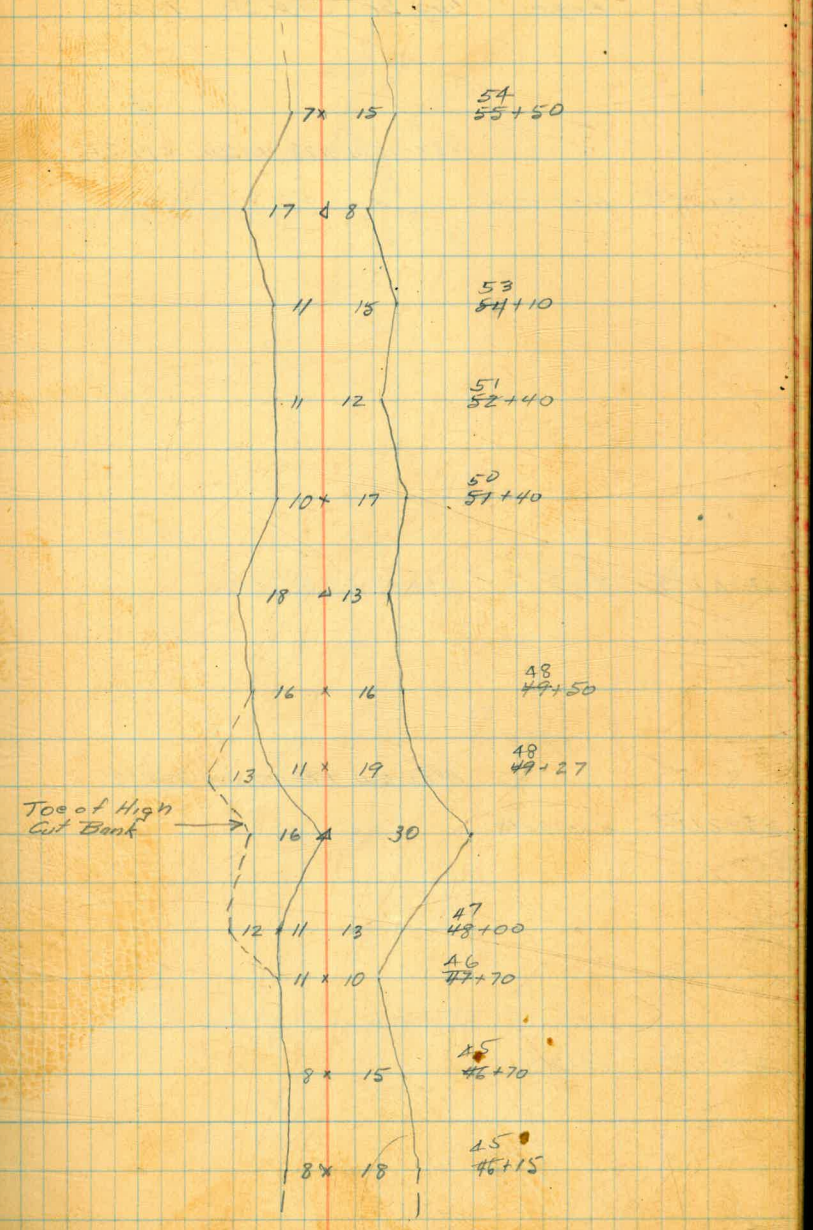


Elliott - Notes
Simpson - T
Soper - Hd. Ch
Remmen - R. Ch

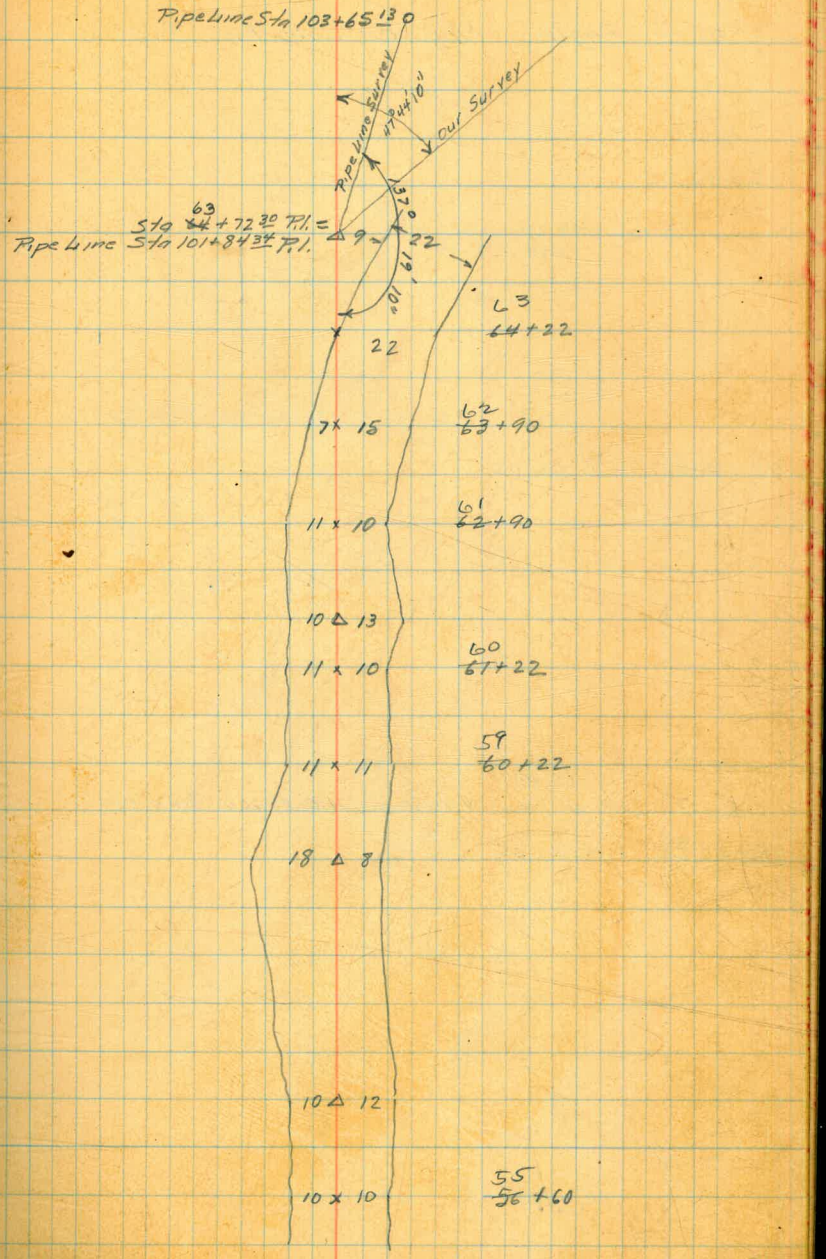
Sta.	Angle	Mag. Br.	Calc. Br.	Dist
	7-47-15 15-34-45			
44+71.38	L 7-47-20			
	17-25-15 34-50-20	N62-15W	N61-36-55W	601.36
38+70.07	R 17-25-10			
	14-52-30 29-45-0	N79-45W	N79-02-05W	2 10.25
36+59.77	L 14-52-30			

13 A 7
20 8 44 45+15
14 x 13 #1+70 43
20 x 14 42 #3+70
16 x 22 41 #2+35
10 x 19 40 41+70
14 x 12 39 40+70
20 x 8 39 40+10
9 x 10
10 12 37 38+10
15 Δ 8
10 x 9 36+17

Sta	Angle	Mag. Br.	Calc. Br.	Dist
	25-40-15			
	51-20-10	N 79-30 W	N 79-19-55 W	235.47
53+80.99	L 25-40-05			
	10-49-15			
	21-38-45	N 54 W	N 53-39-50 W	438.88
49+42.11	L 10-49-20			
	26-33-40			
	53-07-30	N 42-45 W	N 42-50-30 W	159.51
47+82.60	R 26-33-45			
		N 69-20 W	N 69-24-15 W	311.22

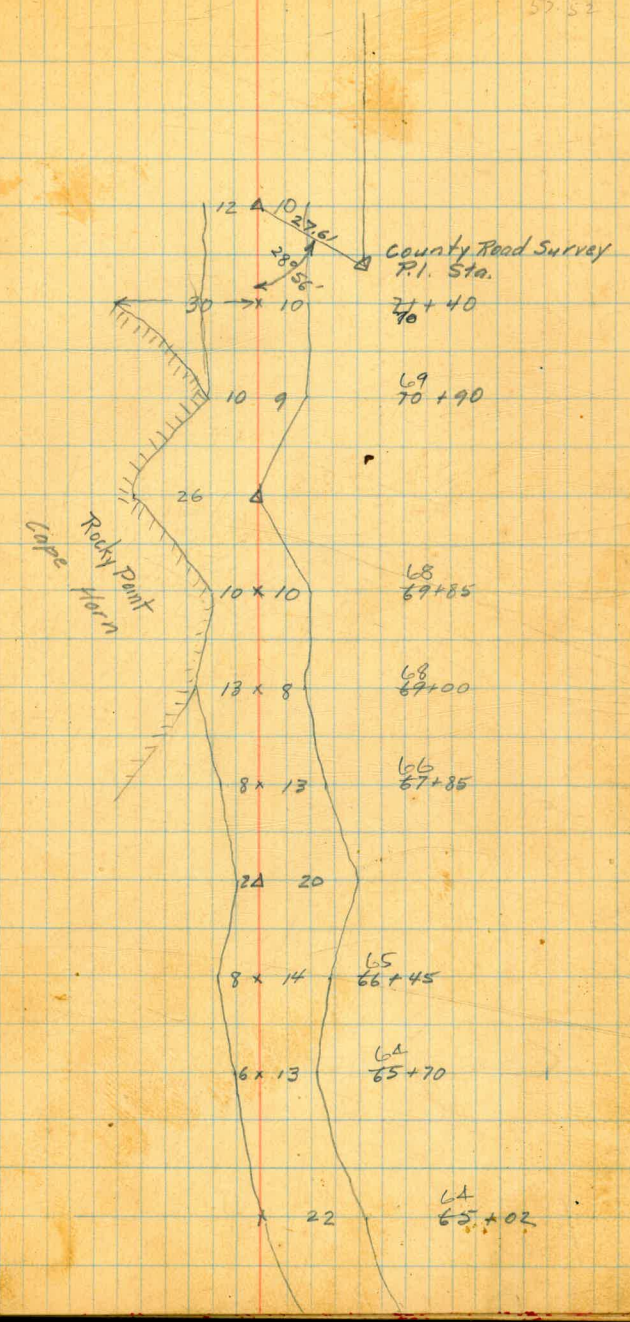


Sta.	Angle	Mag. Br.	Calc. Br.	Dist.
	47-14-20			
	95-28-20	N28-15W	N28-43 55W	214.22
63+72 30	PI 47-44-10			
				284.82
	5-42-40			
60+87 48	11-25-10 PI 5-42-50	N 74-45 W	N76-28-05W	
	8-26-15			
	16-52-20	N82-0W	N82-10-55W	265.98
58+21 50	48-26-10			
	5-35-10			
	11-10-20	N74-0W	N73-44-45W	205.04
56+16 46	PI 5-35-10			



28-56
57-52

Sta.	Angle	Mag. Br.	Calc. Br.	Dist.
72+85.25				
	75-36-30			
	151-13-20	S 86-40 W	N 86-20-00 W	345.70
69+39.55	4.75-36-40			
	18-00-40			
	36-01-15	N 10-0 W	N 10-43-20 W	353.03
66+86.52	R 18-00-35			



Profile Levels, Road Survey
West Line Section 7 To ElMonte
Park.

Simpson
Osborne.

Sept. 2nd, 1932

B.M. #6				539.69
	8.26	547.95		
0+00			5.2	42.8
1+00			4.4	43.6
2+00			3.9	44.1
3+00			5.2	42.8
4+00			3.7	44.3
5+00			5.4	42.6
6+00			8.0	40.0
7+00			10.2	37.8
8+00			11.6	36.4
T.P.			8.26	539.69
	1.26	540.95		
9+00			5.0	36.0
10+00			5.0	36.0

		540.95		
11+00			4.2	537.8
12+00			6.6	35.4
T.P			6.37	534.58
	1.40	535.98		
13+00			2.3	33.7
14+00			3.6	32.4
15+00			4.8	31.2
16+00			4.8	31.2
17+00			4.5	31.5
T.P.			4.46	531.52
	4.81	536.33		
18+00			4.8	31.5
19+00			5.1	31.2
20+00			4.6	31.7

		536.33		
21+00			3.5	32.8
22+00			2.6	33.7
T.P.			2.47	533.86
	12.20	546.06		
23+00			11.2	34.9
24+00			9.6	36.5
25+00			5.5	40.6
26+00			2.9	43.2
27+00			2.0	44.1
T.P.			1.29	544.77
	4.42	549.19		
28+00			3.9	45.3
29+00			5.2	44.0
			0.73	548.46 = check on B.M. #8 El. 548.43.
30+00			11.0	38.2
T.P.			11.83	537.36
	0.37	537.73		

		537.73		
31+0.0			5.6	532.1
32+00			9.8	27.9
33+00			11.0	26.7
34+00			9.1	28.6
35+00			6.9	30.8
36+00			7.7	30.0
37+00			9.7	28.0
T.P.			11.96	525.77
	2.24	528.01		
38+00			3.5	24.5
39+00			4.7	23.3
40+00			4.7	23.3
41+00			4.5	23.5
42+00			3.8	24.2

		528.01		
43+00			2.6	25.4
T.P.			2.62	525.39
	7.59	532.98		
44+00			6.8	26.2
45+00			6.2	26.8
46+00			3.5	29.5
T.P.			0.50	532.48
	11.86	544.34		
47+00			9.8	34.5
48+00			5.8	38.5
49+00			3.5	40.8
+30			3.4	40.9
50+00			7.7	36.6
T.P.			12.13	532.21
	0.61	532.82		
51+00			1.5	31.3
52			5.9	26.9

		532.82		
53+00			8.5	24.3
54+00			10.6	22.2
T.P.			10.60	522.22
	7.11	529.33		
55+00			7.4	21.9
56+00			4.1	25.2
57+00			3.1	26.2
58+00			4.8	24.5
T.P.			4.81	524.52
	0.17	524.69		
59+00			1.8	22.9
60+00			4.5	20.2
61+00			7.1	17.6
62+00			7.9	16.8
63+00			8.5	16.2

		524.69		
T.P.			8.60	516.09
	5.73	521.82		
64+00			5.4	16.4
65+00			6.7	15.1
66+00			9.6	12.2
67+00			10.5	11.3
T.P.			10.57	511.25
	2.84	514.09		
68+00			3.4	10.7
69+00			4.9	09.2
+50			5.1	09.0
70+00			4.9	09.2
71+00			3.8	10.3
T.P.			3.78	510.31
	4.22	514.53		
B.M.			0.10	514.43

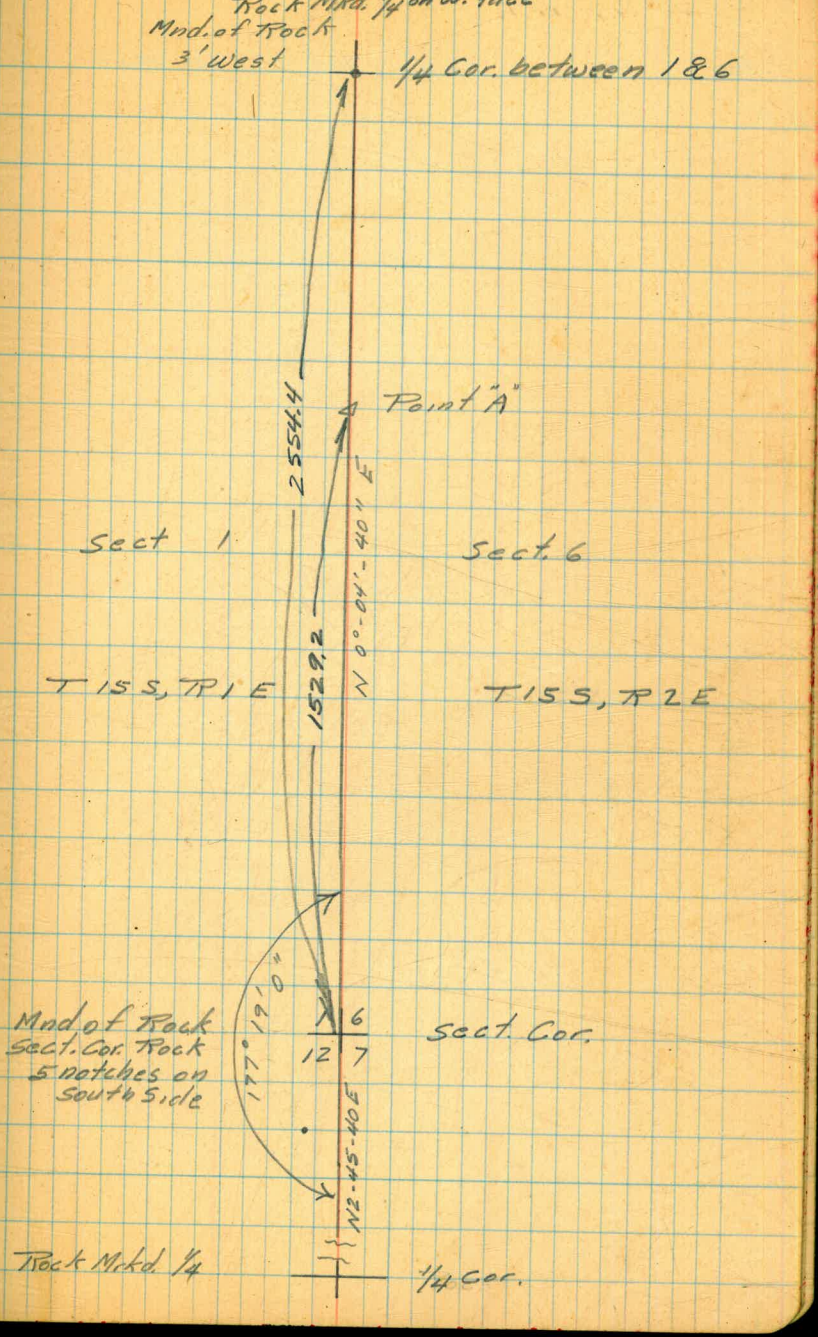
& Read at Cape Horn

= check on B.M. #12 El. 514.43 (61 Rt. Sta. 110+28)
Pipe Line Survey

El. Capitan Dam - Stadia Survey of Quarry.

Lt 2°41
15°22

179-60
2 40
177.19



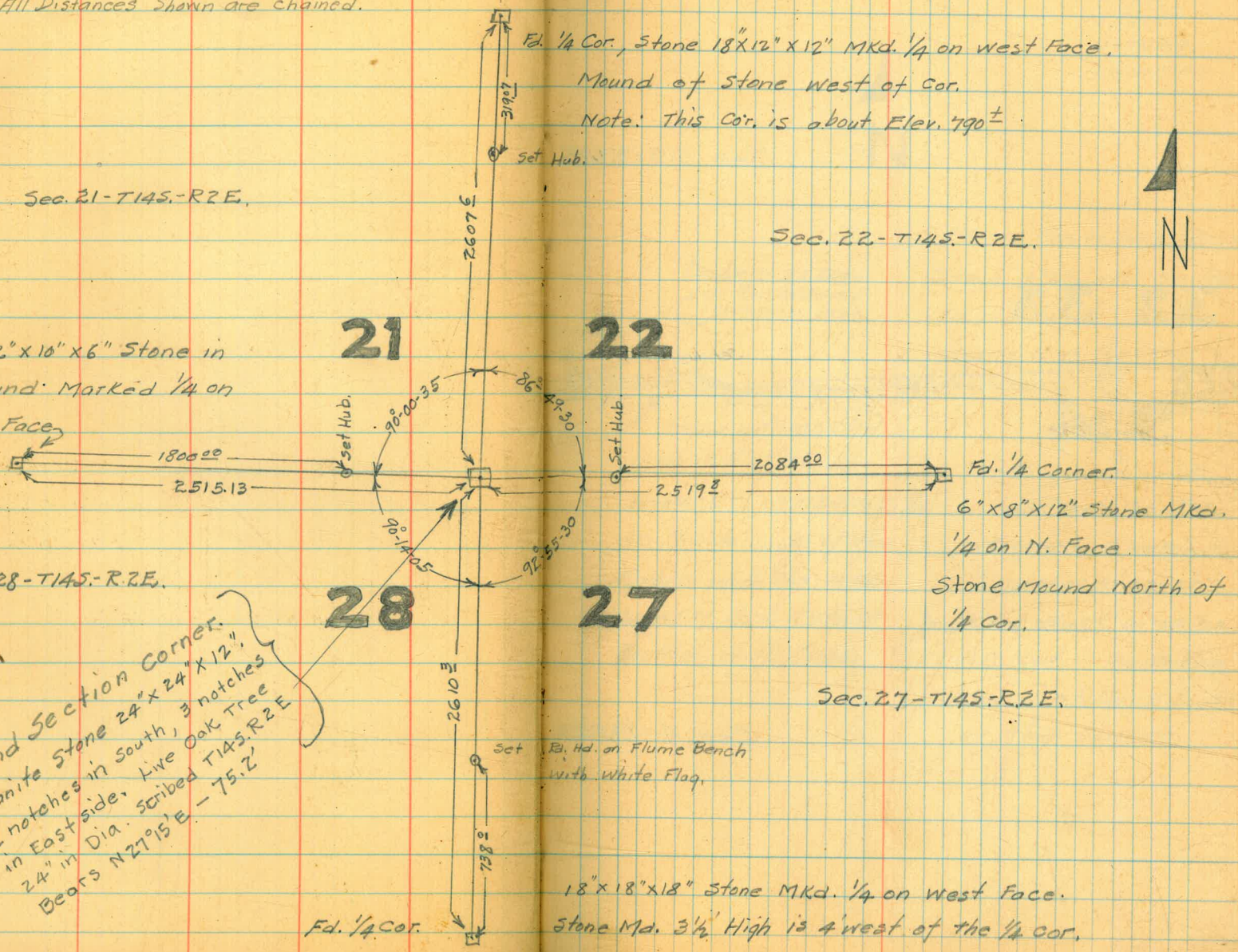
Sta	Hor L	Rod	Vert. L	Hor. Dist
ΔA				

Section Line Surveys in upper Part of Basin For Setting Witness Corners.

Dec. 1934 - Jan. - 1935.

Simpson - Soper Remmen.

All Distances Shown are chained.



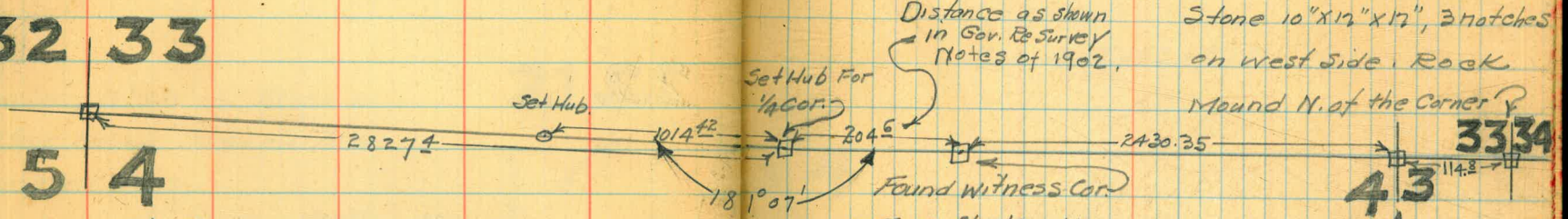
Section Line Surveys For Setting Water Line.

Witness Corners above the High 29

Dec. 27-29.-1934

Simpson
Soper
Isbell
Salgado
Remmen.

Sec. 33-T14S., R2E.



Found Section Cor. 18" Live Oak Tree Scribed on N.W., N.E., and S.W. Mound of Rocks at Foot of Tree.

Found Witness Cor. cross on 5'X5' Boulder Boulder 6'X6'X5' MKd. W.C. 1/4 on N. Side, South of the Rock with the cross. Mound of Rock North of Boulder with Cross.

Found Cor. to Secs. 33-34 Stone 10"X12"X17", 3 notches on west side. Rock Mound N. of the Corner

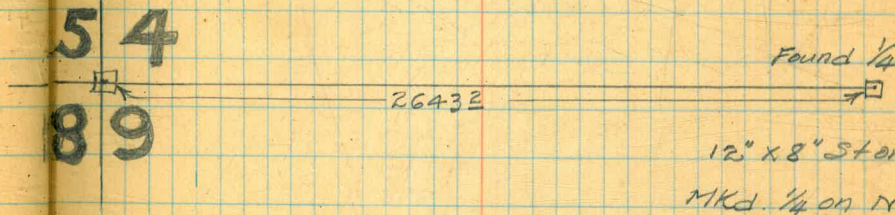
Found C.C. Cor. Stone 10"X12"X12", 3 notches in west and East sides. C.C. cut in South side. Mound of Rock South of the corner.

Sec. 4-T15S.- R.2E.

Section Line Surveys For Setting Witness Corners Above the High Water Line 30

Dec. 26-1934. Simpson - Soper
Isbell - Remmen
Salgado.

Sec. 4 T. 15S. - R2E.



Sec. 9. T. 15S. - R2E.

Profile of Proposed 6% Road Location
From South end of Dam, West to Co. Road.

Feb. 15-1935.
Simpson
Soper
Remmen

7.7

B.M.	4.86	774.53		769.67	= Spike in South end of Corewall N2998 E5000.
0+00 =	N2998 (Dam coord.) E5000		4.2		
+11			4.6		
+30			10.7		
+66			12.2		
1+13.5			11.5		
+50			10.6		
+74.4			13.5		
T.P.			12.89	761.64	
	1.62	763.26			
+93			7.4		
2+25			10.2		= on Flume Bench
3+04.2			10.6		" "
+54			18.8		
+70.2			14.2		= on Large Sloping Rock.
T.P.			10.11	753.15	
	3.70	756.85			
4+02			19.6		= under- neath Flume Trestle.
			3.4		= Flow Line of Flume at ℄ crossing.
4+30			11.0		
+39.4			11.8		
+74			11.3		
Set B.M.			4.70	752.15	High Point of Rock at outside edge of Flume Bench 25' Left of Sta. 5+60±
T.P.			12.63	744.22	

Feb. 18-1935.
Simpson
Soper
Remmen.

T.P.				744.22	
	0.66	744.88			
5+20.02			5.2		
+43			8.0		
+63.91			8.4		
+90			8.3		
6+00			10.2		
T.P.			12.83	732.05	
	1.62	733.67			
+24			4.3		
+50			1.2		
+68			1.6		
7+00			6.7		
+17			12.4		
+33			7.7		
T.P.			7.14	726.53	
	2.55	729.08			
+72			10.2		
8+00			9.2		
+50			12.0		
9+00			11.9		
+40			5.7		
B.M. & T.P.			9.38	719.70	Point on Large Boulder 25' Right of Sta. 9+50

				719.70	
	3.67	723.37			
9+67			0.8		
+98			12.1		
10+07			0.0		on large Boulder.
+15			5.1		
+47			4.4		
+85			15.3		
T.P.			12.91	710.46	
	0.38	710.84			
11+10			19.8		
+30			13.8		
+81.30			10.5		
12+20			14.3		
T.P.			12.69	698.15	
	3.80	701.95			
+76			14.4		
13+20			12.2		
T.P.			12.70	689.25	
	0.28	689.53			
+50			1.6		
+86			8.1		
14+20.0			3.9		
+70			9.7		
T.P.			12.97	676.56	
	0.07	676.63			

	676.63				
15+02		8.8			
+22		2.5			
Set B.M.		7.99	668.64	Point on	Large Boulder 83' Rt. of Sta. 15+35.
15+47.39		2.9			
+85		1.0			
16+00.61		4.2			
T.P.		10.25	666.38		
	1.21	667.59			
16+16		+0.8			
+60		8.7			
+69.34		+0.7			

Cross-section at P.I. on
The split of the Angle

	Lf.	℄	Rt.			
16+69.34	+9.9	8.7	12.2	20.8	21.8	
	15	10	20	40	60	

17+20	5.0		
+50	7.6		
+65.04	6.8		
18+15	12.8		
T.P.	13.02	654.57	

Road Location North Side of Reservoir
Feb. 25-1935.

N 49°15 E

2+71.52 → 15°43' Rt.

109.47'

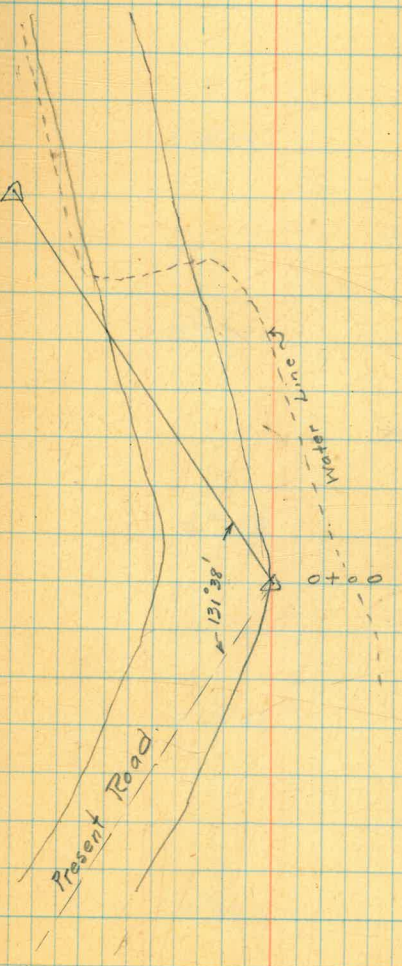
N 33°20 E.

1+62.05 28°55'
57°50' Lf.
28°55'

162.05'

0+00

2/25/35
Converse
Simpson
Soper
Remmen



Sta.	Angle		Mag. Bear.
150.43			N 69° 15' E
11+55.44	27° 39'	Lf.	
369.00			S 82° 45' E
7+86.44	25° 50'	Rt.	
192.30			N 71° 15' E
5+94.14	10° 32'	Rt.	
94.10			N 61° E
5+00.04	56° 49'	Rt.	
147.30			N 3° 40' E
3+52.74	45° 27'	Lf.	
81.37			N 49° 15' E

Sta.	Angle		Mag. Bear.
			N17°50'E
130.92			
18+93.52	45°21'	Lf.	
			N63°40'E
116.77			
17+76.75	24°30'	Lf.	
			N87°45'E
97.63			
16+79.12	19°54'	Lf.	
			S72°50'E
83.67			
15+91.45	8°19'30"	Rt.	
			S81°0'E
78.08			
15+13.37	35°20'	Rt.	
			N64°15'E
70.40			
14+42.97	18°40'	Lf.	
			N83°0'E
137.08			
13+05.89	13°59'30"	Rt.	
			N69°15'E

Sta.	Angle		Mag. Bear.
93.72			
			N33°45'E.
25+77.62'	54°35'	Lf.	
88.99			
			N88°20'E
24+88.63'	41°32'30" (?)	Rt.	
210.77			
			N47°10'E.
22+77.86'	7°50'	Lf.	
124.05			
			N55°15'E
21+53.81'	9°27'	Lf.	
129.39			
			N65°0'E
20+24.44'	46°40'	Rt.	
			N17°50'E

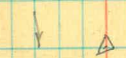
Road Location, North side of Reservoir Cont'd.

Sta:	Angle		Mag. Bear.
			N 23° 0' E
167.49			
39+96.00	3°35'	Lf.	
			N 26° 50' E
386.00			
36+10.00	1°29'	Lf.	
			N 28° 10' E
330.75			
32+79.25	22°34'	Rt.	
			N 5° 45' E
87.25			
31+92.00	17°55'15"	Lf.	
			N 23° 30' E
394.47			
27+97.53	6° 15'	Rt.	
			N 17° 0' E
126.19			
26+71.34	16°50'	Lf.	
			N 33° 45' E

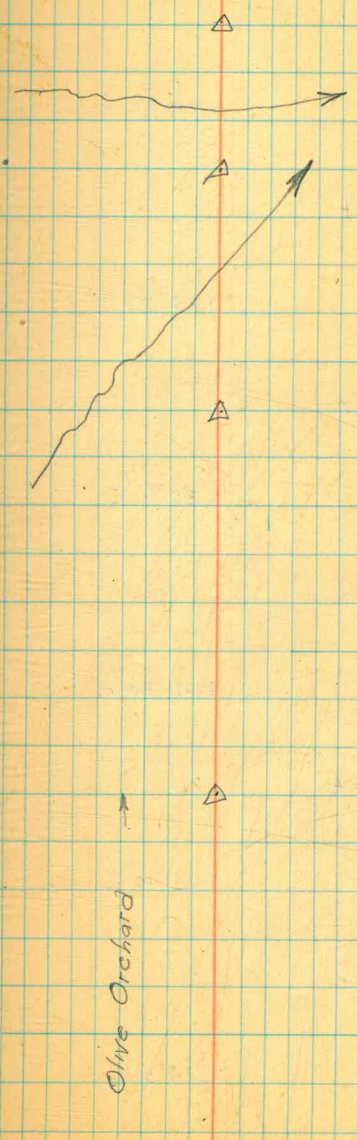
Feb. 26-1935
Converse
Simpson
Soper
Remmen.

46

Olive Orchard.



Sta.	Angle		Mag. Bear.
			S 84°30' E
46+46.19	33°45'	Rt.	
91.28			N 62°30' E
45+54.91	44°01'	Lf.	
96.09			S 73°40' E
44+58.82	67°50'	Rt.	
42.39			N 38°30' E
44+16.43	43°12'30"	Rt.	
65.92			N 4°40' W
43+51.19	2°57'	Rt.	
187.70			N 7°30' W
41+63.49	30°20'30"	Lf.	
			N 23°0' E.



Sta.	Angle		Mag. Bear.
			N60°15'E
60+98.67	17°37'	Lf.	
718.67			N77°30'E
58+80.00	14°18'	Rt.	
717.90			N63°50'E
51+62.10	36°18'	Lf.	
81.61			S80°0'E
50+80.49	37°09'	Lf.	
113.41			S42°20'E
49+67.08	45°17'30"	Rt.	
168.51			S88°10'E
47+98.57	4°24'	Lf.	
157.38			S84°30'E

Sta.	Angle		Mag. Bear.
			S 78°30' E.
71 + 81.41	1°31'	Rt.	
363.10			S 80°10' E.
68 + 18.31	26°45'	Rt.	
198.78			N 73°0' E.
66 + 19.53	27°52'	Lf.	
221.81			S 79°15' E
63 + 97.72	34°36'30"	Rt.	
104.31			N 66°10' E
62 + 93.41	24°25'	Rt.	
102.52			N 41°45' E
61 + 90.89	18°21'	Lf.	
97.32			N 60°15' E.

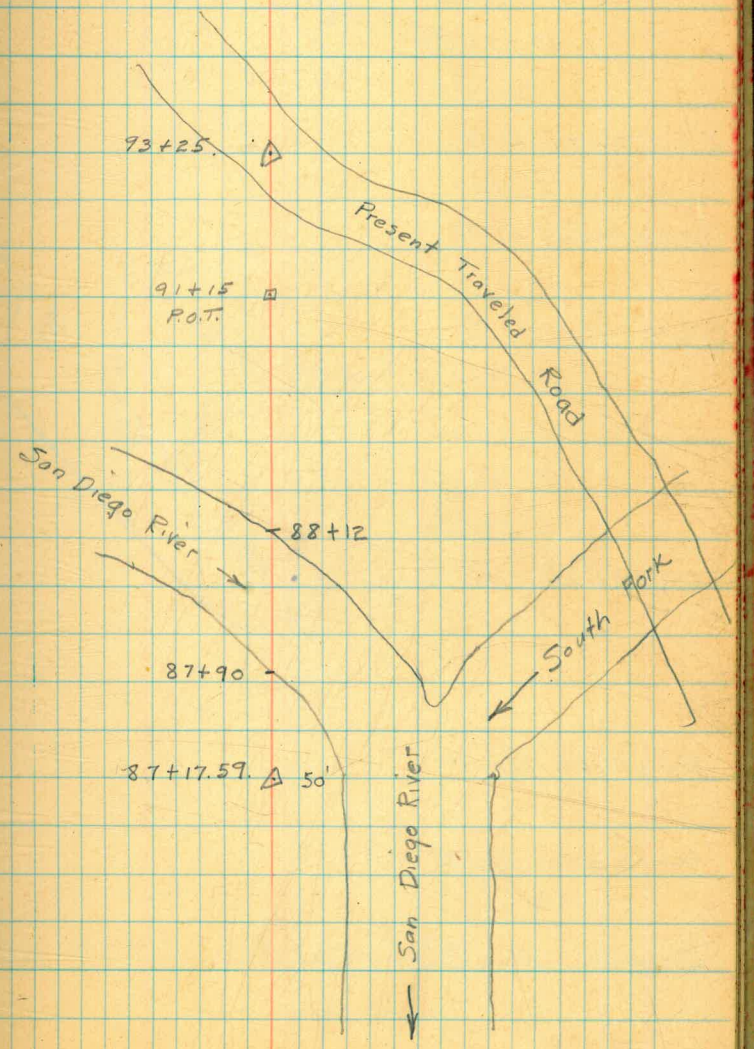
Sta.	Angle		Mag. Bear.
			N6°45'E
85+02.00	12°52'	Rt.	
100.11			N6°10'W
84+01.89	37°37'30"	Lf.	
148.09			N32°20'E
82+53.80	18°04'30"	Lf.	
84.33			N49°40'E
81+69.47	21°56'	Lf.	
153.10			N72°0'E
80+16.37	23°44'	Lf.	
507.69			S84°30'E
75+08.68	5°49'	Lf.	
327.27			S78°30'E

△ Cross on Large Boulder.

Feb. 26-1935.

57

Sta.	Angle	Mag. Bear.
94+25 = intersection with Present Traveled Road		
210.0		
92+15 = P.O.T.		
397.41		
		N 31°30' E
88+17.59	36°15' Rt.	
148.76		N 4°10' W.
86+68.83	10°56' Lt.	
166.83		N 6°45' E.



County alignment from
El Monte Park to Dam.

325+53.71 E.C.

Δ 16°17' L

R. 1500

T 214.59

L 426.36

321+27.41 B.C.

~~L 185~~

~~314+86.22 B.C.~~

Note
For alignment from
Sta. 294+41.92 see
page 57

316+71.88 E.C.

Δ 7°05'30" R

R. 1500

T. 92.94

L. 185.66

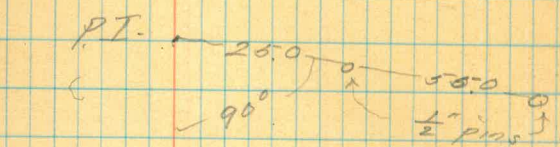
314+86.22 B.C.

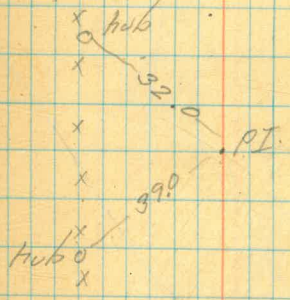
See book 317

8+67.00 P.O.T.

7+13.66 P.O.T.

0+00 ℄ Main + Woodside drive





⊙ Fd stone mon 1' below surface

cont. from page 52

341+22.12 E.C.
Δ 16°43' R
R 500.0
T 215.94
L 407.68
337+14.14 B.C.

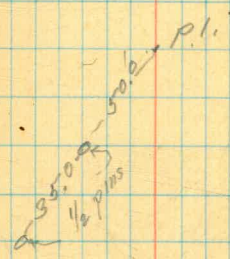
336+30.00 P.O.T.

334+65.65 P.O.T.

330+95.78 Inter-sec. El Monte Ranch line

330+67.15 E.C.
Δ 12°58' L
R 1000
T 113.64
L 226.31
328+40.84 B.C.

Sa book 317



79° 22'

330+95.78

90°

P.I. — 40.0 — 52.0 —

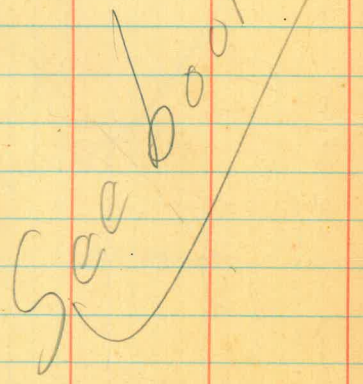
cont. from page 53

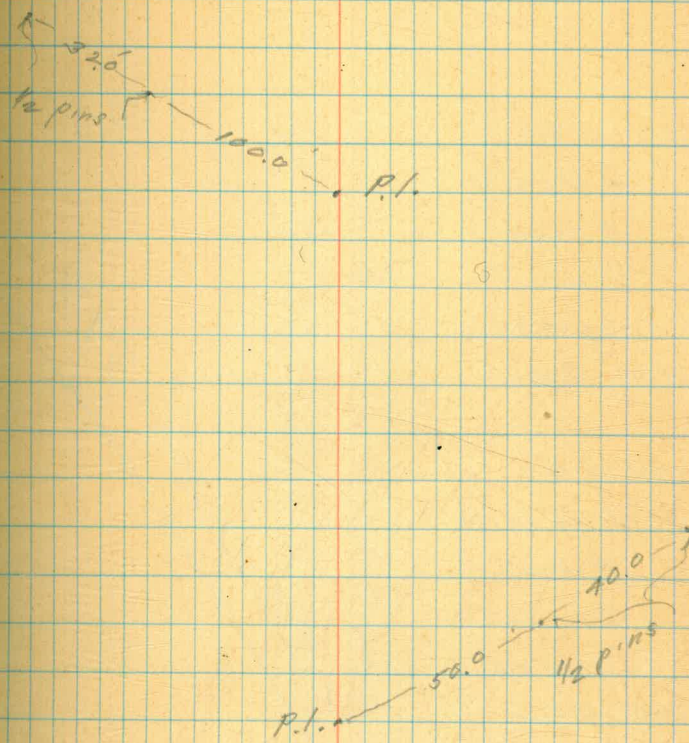
355+26.28 E.C.
Δ 14°31' L
R. 600.00
T. 75.81
L. 152.02
353+77.26 R.C.

352+17.16 E.C.
Δ 8°11'30" L
R 1774.25
T 127.05
L 253.67
349+63.49 P.C.C.
Δ 18°26'36" L
R. 1000.0
T 162.34
L 321.81
346+41.68 R.C.

344+89.18 P.O.T.

342+73.80 P.O.T.





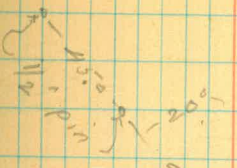
cont. from page 54

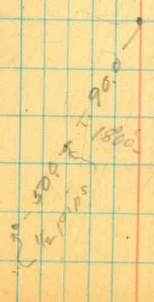
Sidebook 317

369+43.10 E.C.
Δ 7°55' L
R. 1500.
T. 103.79
L 207.06
367+35.81 B.C.

366+07.18 E.C.
Δ 20°12' L
R 100.0
T 71.26
L 141.02
364+66.16 B.C.

362+76.07 E.C.
~~364+41.81~~
Δ 34°30 R
R. 150.0
T 139.73
L 270.96
360+05.11 B.C.





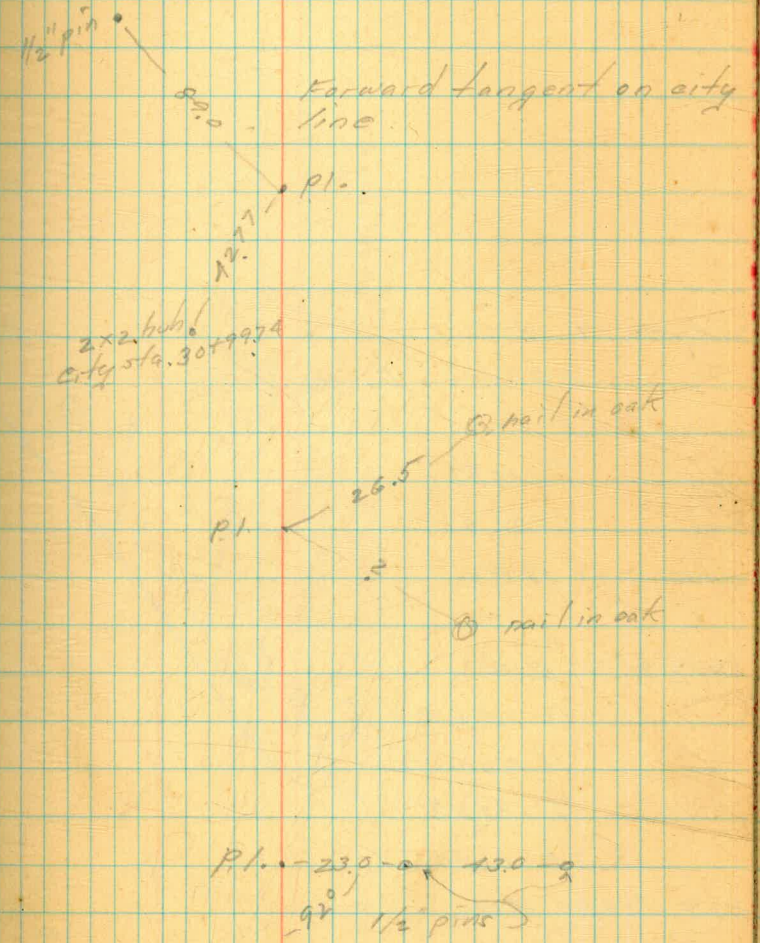
cont from page 55

378+61.72 E.C.
Δ 21°50' R
R. 500.0
T. 96.11
L. 190.53
376+71.19 B.C.

376+05.08 E.C.
Δ 19°45' L
R. 600.0
T 104.95
L 206.82
373+98.26 B.C.

373+63.33 E.C.
Δ 6°00' R
R. 2000.
T. 104.82
L 209.44
371+53.89 B.C.

See book 31 7



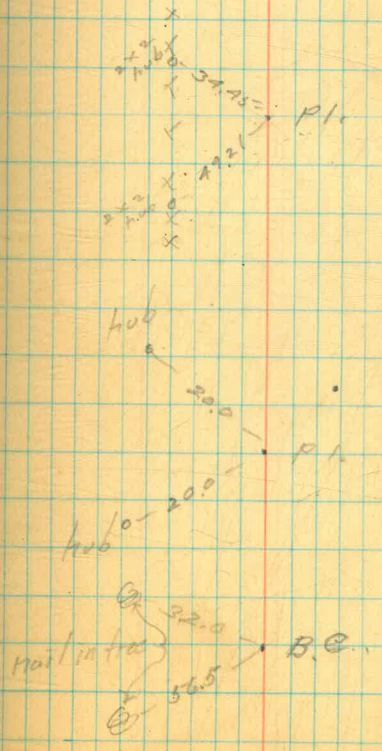
cont. from page 56

311+10.39 E.C.
Δ 21°40'30" L
R. 600.0
T. 114.86
L 226.98
312+13.11 P.C.

310+91.10 E.C.
Δ 10°00 R
R. 1600.0
T. 131.23
L 261.80
308+29.30 P.C.

304+23.72 P.O.T.
294+11.92 E.C. preceding curve.

See book 317



Feb. 23. 1935.
Converse
Simpson
Soper
Remmen.

Survey for 3" water main from Prison Camp to City Camp.

11+48.38 20°24'45" R.

140.38

S.69°39'30" W

10+08.0 18°27'30" L.

216.5

S.88°07' W

7+91.5 16°52' R

264.5

S.71°15' W

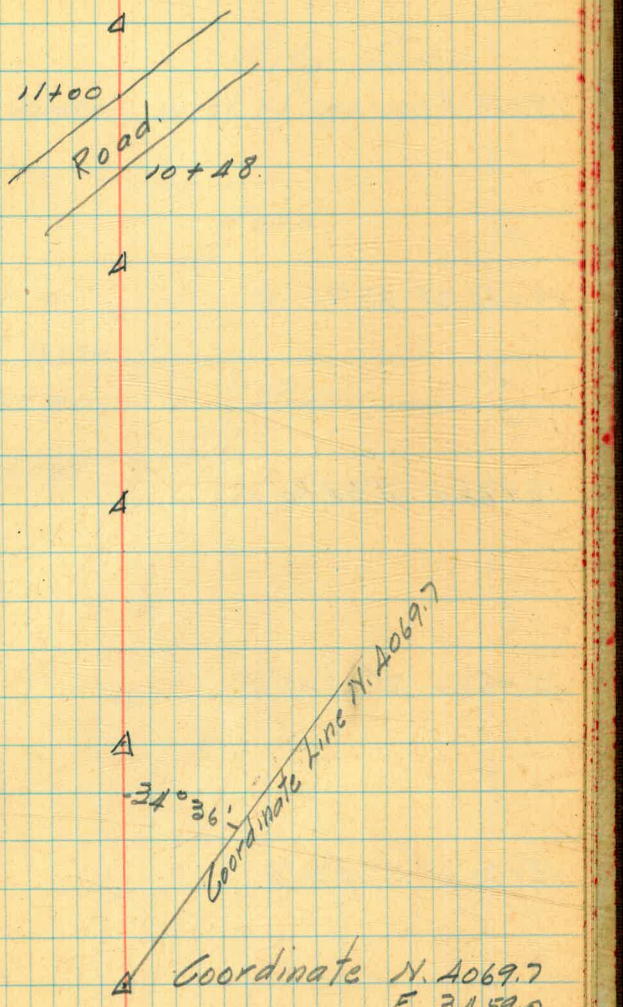
5+27.0 15°51' R

527.0

S.55°24' W

0+00 34°36' L.

West.



Tee in Prison Camp 2"
Line above Cook House.

19+16.1

160.12

17+56.28 27°05' R.

131.28

16+25.0 18°31'30" L.

162.4

14+62.6 21°44'45" L.

92.6

13+70.0 16°18'30" L.

221.62

11+48.38

S.60°31'30"W ✓

S.33°26'30"W ✓

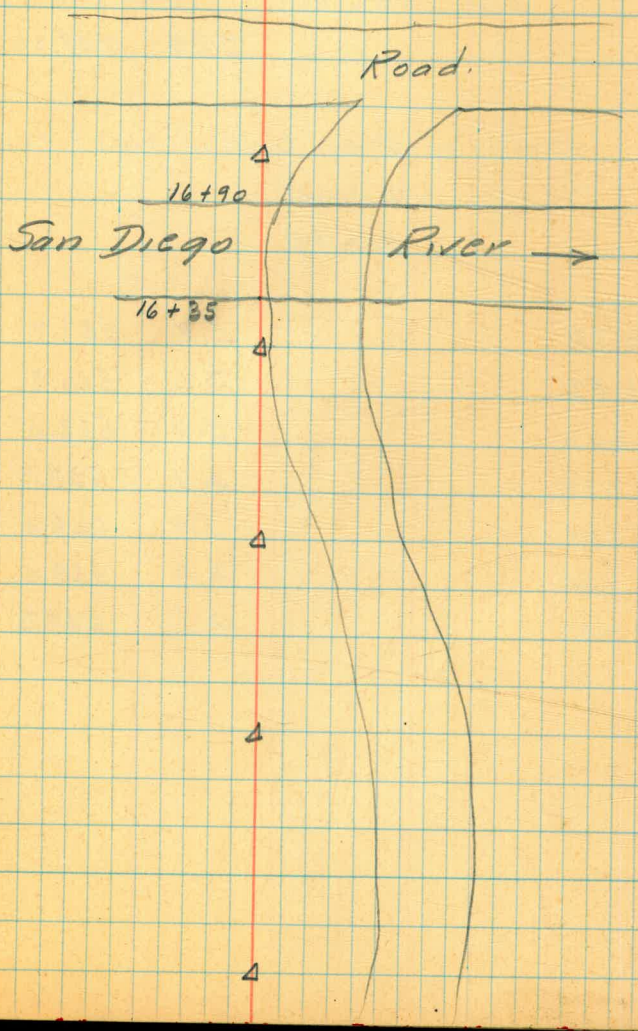
S.52°01' W ✓

S.73°45'45"W ✓

N.89°55'45"W. ✓

City Camp.

2" Fire Hydrant ○ west of garage.



B.M.			563.65	
	0.96	564.61		
T.P.			10.03	554.58
	7.19	556.77		
B.M.			8.36	548.41 Set B.M.
	4.58	552.99		
			3.79	549.20

Profile of Ramp Left in West end of Tunnel.

552.99

9+72	5.8	547.2
+82	5.2	547.8
10+00	5.0	548.0
+50	4.7	548.3
11+00	5.0	548.0
+50	5.0	548.0
12+00	4.7	548.3

549.2,

71

549.20
542.67
6.53

167
6.68

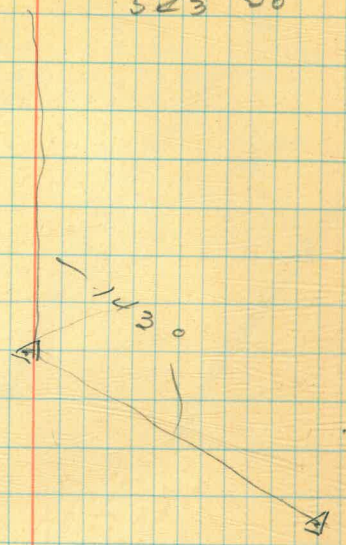
11+72.7
-280
8,927

2nd. on Ladder rung at Tunnel outlet Portal

Sta.	Hor ∠	Rod	Vert ∠	Hor. Dist.
ΔA				
1	00			
2	44-15			
3				
4				
5				
B	96-30			
ΔB				
A	263-30			
B1				
2				
3				
4				
5				
C				
ΔC				
B				
C1				
2				
3				

360
96-30
263 30

640
96 30
563 30



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56
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48495
54.1944

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45375
63525
54450
54450
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22528
45056
39424
50688
55.083488

96.63
97
67641
86967
93.7311
72+18.83
85.57
73+04.40

94.76
86
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75808
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9810
52
1962
4905
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1386
2944
3082+8

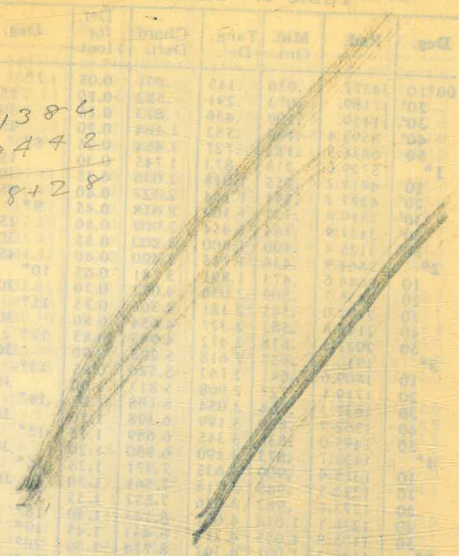


Table V. – Natural Sines, Cosines, Tangents and Cotangents

	Sine	Cos.	Tan.	Cot.	
20°	.3420	.9397	.3640	2.7475	70°
10′	.3448	.9387	.3673	2.7228	50′
20′	.3475	.9377	.3706	2.6985	40′
30	.3502	.9367	.3739	2.6746	30
40′	.3529	.9356	.3772	2.6511	20′
50′	.3556	.9346	.3805	2.6279	10′
21°	.3584	.9336	.3839	2.6051	69°
10′	.3614	.9325	.3872	2.5826	50′
20′	.3638	.9315	.3906	2.5605	40′
30′	.3665	.9304	.3939	2.5386	30′
40′	.3692	.9293	.3973	2.5172	20′
50′	3719	.9283	.4006	2.4960	10′
22°	.3746	.9272	.4040	2.4751	68°
10′	.3776	.9261	.4074	2.4545	50′
20′	.3800	.9250	.4108	2.3342	40′
30′	.3827	.9239	.4142	2.4142	30′
40′	.3854	.9228	.4176	2.3945	20′
50′	.3880	.9216	.4210	2.3750	10′
23°	.3907	.9205	.4245	2.3558	67°
10′	.3934	.9194	.4279	2.3369	50′
20′	.3961	.9182	.4314	2.3183	40′
30′	.3988	.9171	.4348	2.2998	30′
40′	.4014	.9159	.4383	2.2817	20′
50′	4041	9147	.4418	2.2637	10′
24°	.4067	.9136	.4452	2.2460	66°
10′	.4094	.9124	.4487	2.2286	50′
20′	.4120	.9111	.4522	2.2113	40′
30′	.4147	9100	.4557	2.1943	30′
40′	.4173	.9088	.4592	2.1775	40′
50′	.4200	9075	.4628	2.1609	10′
25°	.4226	9063	.4663	2.1445	65°
10′	4252	.9050	.4698	2.1283	50′
20′	.4279	9038	.4734	2.1123	40′
30′	.4305	.9026	.4770	2.0965	30′
40′	.4331	.9013	.4806	2.0809	20′
50′	.4358	9000	4841	2.0655	10′
26°	.4384	.8988	.4877	2.0503	64°
10′	.4410	.8975	.4913	2.0353	50′
20′	.4436	.8962	.4950	2.0204	40′
30′	.4462	8949	.4986	2.0057	30′
40′	.4488	.8936	.5022	1.9912	20′
50′	.4514	8293	.5059	1.9768	10′
27°	.4540	.8910	.5095	1.9626	63°
10′	.4566	.8897	.5132	1.9486	50′
20′	.4592	.8884	.5169	1.9347	40′
30′	.4618	.8870	.5206	1.9210	30′
40′	.4643	.8857	.5243	1.9074	20′
50′	4669	.8843	.5280	1.8940	10′
28°	.4695	.8830	.5317	1.8807	62°
10′	.4720	.8816	.5355	1.8676	50′
20′	.4746	.8802	.5392	1.8546	40′
30′	.4772	.8788	.5430	1.8418	30′
40′	4797	.8774	.5467	1.8291	20′
50′	.4823	.8760	.5505	1.8165	10′
29°	.4848	.8746	.5543	1.8040	61°
10′	.4874	.8732	.5581	1.7917	50′
20′	.4899	.8718	.5619	1.7796	40′
30′	.4924	.8704	.5658	1.7675	30′
40′	.4950	.8689	.5696	1.7556	20′
50′	.4975	.8675	.5735	1.7438	10′
30°	.5000	.8660	.5774	1.7320	60°
	Cos.	Sine	Cot.	Tan.	

	Sine	Cos.	Tan.	Cot.	
30°	.5000	.8660	.5774	1.7320	60°
10′	.5025	.8646	.5812	1.7205	50′
20′	.5050	.8631	.5851	1.7090	40′
30′	.5075	.8616	.5891	1 6977	30′
40′	.5100	.8610	.5930	1.6864	20′
50′	.5125	.8587	.5969	1.6753	10′
31°	.5150	.8572	.6009	1.6643	59°
10′	.5175	.8557	.6048	1.6534	50′
20′	.5200	.8542	.6088	1.6426	40′
30′	.5225	.8526	.6128	1.6318	30′
40′	.5250	.8511	.6168	1.6212	20′
50′	.5275	.8495	.6208	1.6107	10′
32°	.5299	.8480	.6249	1.6003	58°
10′	.5326	.8463	.6289	1.5900	50′
20′	.5350	.8448	.6330	1.5798	40′
30′	.5373	.8434	.6371	1.5697	30′
40′	.5397	.8418	.6112	1.5597	20′
50′	.5422	.8402	.6453	1.5497	10′
33°	.5446	.8387	.6494	1.5399	57°
10′	.5471	.8371	.6536	1.5301	50′
20′	.5495	.8355	.6577	1.5204	40′
30′	.5519	.8339	.6619	1.5108	30′
40′	.5544	.8323	.6661	1.5013	20′
50′	.5568	.8307	.6703	1.4919	10′
34°	.5592	.8290	.6745	1.4826	56°
10′	.5616	.8274	.6788	1.4733	50′
20′	.5640	.8258	.6830	1.4641	40′
30′	.5664	.8241	.6873	1.4550	30′
40′	.5688	.8225	.6916	1.4460	20′
50′	.5712	.8208	.6959	1.4370	10′
35°	.5736	.8192	.7002	1.4281	55°
10′	.5760	.8175	.7046	1.4193	50′
20′	.5783	.8158	.7089	1.4106	40′
30′	.5807	.8141	.7133	1.4020	30′
40′	.5831	.8124	.7177	1.3934	20′
50′	.5854	.8107	.7221	1.3848	10′
36°	.5878	.8090	.7265	1.3764	54°
10′	.5901	.8073	.7310	1.3680	50′
20′	.5925	.8056	.7355	1.3597	40′
30′	.5948	.8039	.7400	1.3514	30′
40′	.5972	.8021	.7445	1.3432	20′
50′	.5995	.8004	.7490	1.3351	10′
37°	.6018	.7986	.7536	1.3270	53°
10′	.6041	.7969	.7581	1.3190	50′
20′	.6065	.7951	.7627	1.3111	40′
30′	.6088	.7935	.7673	1.3032	30′
40′	.6111	.7916	.7720	1.2954	20′
50′	.6134	.7898	.7766	1.2876	10′
38°	.6157	.7880	.7813	1.2799	52°
10′	.6180	.7862	.7860	1.2723	50′
20′	.6202	.7844	.7907	1.2647	40′
30′	.6225	.7826	.7954	1.2572	30′
40′	.6248	.7808	.8002	1.2497	20′
50′	.6271	.7790	.8050	1.2423	10′
39°	.6293	.7772	.8098	1.2349	51°
10′	.6316	.7753	.8146	1.2276	50′
20′	.6338	.7735	.8195	1.2203	40′
30′	.6361	.7716	.8243	1.2131	30′
40′	.6383	.7698	.8292	1.2059	20′
50′	.6406	.7679	.8341	1.1988	10′
40°	.6428	.7660	.8391	1.1918	50°
	Cos.	Sine	Cot.	Tan.	

Table V.

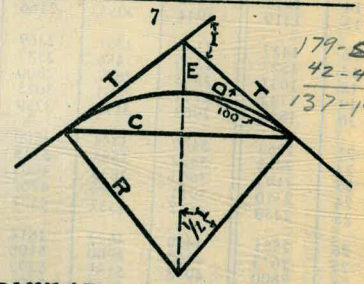
	Sine	Cos.	Tan.	Cot.	
40°	.6428	.7660	.8391	1.1918	50°
10′	.6450	.7642	.8441	1.1847	50′
20′	.6472	.7623	.8491	1.1778	40′
30′	.6494	.7604	.8541	1.1708	30′
40′	.6517	.7585	.8591	1.1640	20′
50′	.6539	.7566	.8642	1.1572	10′
41°	.6561	.7547	.8693	1.1504	49°
10′	.6582	.7528	.8744	1.1436	50′
20′	.6604	.7509	.8795	1.1369	40′
30′	.6626	.7490	.8847	1.1303	30′
40′	.6648	.7470	.8899	1.1237	20′
50′	.6670	.7451	.8952	1.1171	10′
42°	.6691	.7431	.9004	1.1106	48°
10′	.6713	.7412	.9057	1.1041	50′
20′	.6734	.7392	.9110	1.0977	40′
30′	.6756	.7373	.9163	1.0913	30′
40′	.6773	.7353	.9217	1.0850	20′
50′	.6799	.7333	.9271	1.0786	10′
43°	.6820	.7313	.9325	1.0724	47°
10′	.6841	.7293	.9380	1.0661	50′
20′	.6862	.7273	.9435	1.0600	40′
30′	.6884	.7253	.9490	1.0538	30′
40′	.6905	.7233	.9545	1.0477	20′
50′	.6926	.7213	.9600	1.0416	10′
44°	.6947	.7193	.9657	1.0355	46°
10′	.6968	.7173	.9713	1.0295	50′
20′	.6988	.7153	.9770	1.0235	40′
30′	.7009	.7132	.9827	1.0176	30′
40′	.7030	.7112	.9884	1.0117	20′
50′	.7050	.7092	.9942	1.0058	10′
45°	.7071	.7071	1.0000	1.0000	45°
	Cos.	Sine	Cot.	Tan.	

Table VI.

MIDDLE ORDINATES FOR RAILS

Curve	Lgth. of Rails 33′	30′	20′	Curve	Lgth. of Rails 33′	30′	20′
1°				13	3¾	3	1¾
2°				14	4	3¼	...
3°				15	4¼	3½	1¾
4°	1¼	1		16	4½	3¾	1¾
5°	1¼	1¼		17	4¾	4	1¾
6°	1½	1¼		18	5¼	4¼	1⅞
7°	2	1½		20	5¾	4¾	2
8°	2¼	1¾		22	6¼	5¼	2¼
9°	2½	2	1″	24	7¼	6	2¾
10°	2¾	2¼	1″	26	6¾	5⅝	2½
11°	3¼	2½	1¼	28	7¾	6½	2¾
12	3¾	2¾	1¼	30	8½	7	3¼

Weight of Rails per mile of single track = weight per yd. x 11



179-59-60
42-40-50
137-19-10

CURVE FORMULAE.

Let:- R—Radius. T—Tangent I—Intersection Angle. E—External. D—Def. Angle for 100° Chord. C—Long chord for Total I.

Then ÷ $\frac{R = 50}{\text{Sin. D}}$

$R = Tx.\ Cot.\ \frac{1}{2}I$

$T = Rx.\ tan,\ \frac{1}{2}I$

$T = 50x.\ tan,\ \frac{1}{2}I$

$\frac{\text{Sin. D} = 50}{R}$

$E = Rx.\ Ext.\ Sec.\ \frac{1}{2}I$

$E = Tx.\ tan,\ \frac{1}{4}I$

$C = Sin.\ \frac{1}{2}I \times 2R$

For approximate check on transit work and to run simple curves in roughly by tangent or chord deflection:—

Sine 1° for 1 ft. = .0175 = 1.75 per 100′

Given degree of curve and line of tangent

Offset from tan produced to any given point on curve

$$= \frac{.0175 \times \text{degree of curve} \times \text{given distance in ft.}}{2}$$

Given degree of curve and line of chord

Offset from chord produced to any given point on curve

$$= \frac{.0175 \times \text{degree} \times (\text{length of chord} -|- \text{given distance})}{2}$$

To find Middle ordinate for any curve

Middle ordinate of 1° curve for 100 ft. = .22′

Middle ordinate for any given degree of curve for 100 ft. = .22 × given degree of curve.

Middle ordinate for any given length of chord varies as the sq. of the lgth.

A rt. angle offset may be obtained from any point on a line, remembering that the sides of art. angle triangle are in the ratio of 3, 4 and 5.

Table VII. Excavation and Embankments, Cu. Yds. per 100 ft.

Slope	¼ to 1	1 to 1			1½ to 1				All Slopes 1 Ft. Base
		BASE			BASE				
Depth	20′	20	22	24	14	16	20	24	
1	75	78	85	93	57	65	80	94	3.7
2	152	163	178	193	126	141	170	200	7.4
3	230	256	278	300	206	228	272	316	11.1
4	311	356	385	414	296	326	385	444	14.8
5	393	463	500	537	398	435	509	583	18.5
6	477	578	622	666	511	556	644	733	22.2
7	564	700	752	804	635	687	791	894	25.9
8	652	830	889	948	770	830	948	1067	29.6
9	742	967	1033	1100	917	983	1116	1250	33.3
10	833	1111	1185	1259	1074	1148	1296	1444	37.0
11	926	1263	1344	1425	1243	1324	1487	1650	40.7
12	1022	1422	1511	1600	1422	1511	1689	1867	44.4
13	1119	1589	1685	1781	1613	1709	1902	2094	48.1
14	1219	1763	1867	1970	1815	1919	2126	2333	51.8
15	1319	1944	2055	2166	2028	2139	2361	2583	55.5
16	1422	2133	2251	2369	2252	2370	2607	2844	59.2
17	1527	2330	2456	2582	2487	2613	2865	3117	62.9
18	1633	2533	2667	2800	2733	2867	3133	3400	66.6
19	1742	2744	2885	3025	2991	3131	3413	3694	70.3
20	1852	2963	3111	3259	3259	3407	3704	4000	74.0
21	1963	3189	3344	3500	3539	3694	4005	4317	77.7
22	2078	3422	3585	3748	3830	3993	4318	4644	81.4
23	2193	3663	3833	4003	4131	4302	4642	4983	85.1
24	2310	3911	4089	4267	4444	4622	4978	5333	88.8
25	2430	4167	4352	4537	4769	4954	5324	5694	92.5
26	2551	4430	4622	4814	5104	5296	5681	6067	96.2
27	2675	4700	4900	5100	5450	5650	6050	6450	100.0
28	2800	4978	5185	5392	5807	6015	6430	6844	103.6
29	2926	5263	5477	5691	6176	6391	6820	7250	107.3
30	3055	5556	5778	6000	6556	6778	7222	7667	111.0
31	3185	5856	6085	6314	6946	7176	7635	8094	114.7
32	3318	6163	6399	6635	7348	7585	8059	8533	118.4
33	3452	6478	6722	6966	7761	8006	8494	8983	122.1
34	3589	6800	7052	7304	8185	8437	8941	9444	125.8
35	3727	7130	7389	7648	8620	8880	9398	9917	129.5
36	3866	7467	7733	8000	9067	9338	9867	10400	133.2
37	4008	7811	8084	8358	9524	9798	10346	10894	136.9
38	4051	8163	8444	8725	9993	10274	10837	11400	140.6
39	4296	8522	8811	9100	10472	10761	11339	11917	144.3
40	4444	8889	9185	9481	10963	11259	11852	12444	148.0
41	4593	9263	9567	9871	11465	17969	12376	12983	151.7
42	4744	9644	9955	10266	11978	12289	12911	13533	155.4
43	4897	10033	10351	10669	12502	12820	13457	14094	159.1
44	5052	10430	10756	11084	13037	13363	14015	14667	162.8
45	5208	10833	11166	11499	13583	13917	14583	15250	166.5
46	5366	11244	11584	11924	14141	14481	15163	15844	170.2
47	5527	11663	12011	12359	14709	15057	15754	16450	173.9
48	5688	12089	12444	12799	15289	15644	16356	17067	177.6
49	5853	12522	12884	13246	15880	16243	16968	17694	181.3
50	6018	12963	13333	13703	16481	16853	17592	18333	185.0
52	6355	13867	14251	14635	17719	18104	18874	19644	192.4
54	6700	14800	15200	15600	19000	19400	20200	21000	200.0
56	7051	15763	16177	16591	20326	20741	21570	22400	207.2
58	7410	16756	17186	17516	21696	22126	22985	23844	214.6
60	7777	17778	18222	18666	23111	23555	24444	25333	222.0
70	9722	23332	23850	24368	30852	31370	32407	33444	259.0
80	11852	29629	30221	30813	39704	40296	41480	42667	296.0
90	14167	36666	37333	38000	49667	50333	51665	53000	333.0
100	16667	44444	45184	45924	60741	61481	62962	64444	370.0

Tables for Excavations and Embankments.

Distances from Edge of Roadway for Cross-Sectioning.

Any Roadway. Side Slopes 1½ to 1.

Half the width of roadway to be added to table to find distance from centre line.

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	0
1	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	1
2	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	2
3	4.5	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7	5.9	3
4	6.0	6.2	6.3	6.5	6.6	6.8	6.9	7.1	7.2	7.4	4
5	7.5	7.7	7.8	8.0	8.1	8.3	8.4	8.6	8.7	8.9	5
6	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4	6
7	10.5	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	7
8	12.0	12.2	12.3	12.5	12.6	12.8	12.9	13.1	13.2	13.4	8
9	13.5	13.7	13.8	14.0	14.1	14.3	14.4	14.6	14.7	14.9	9
10	15.0	15.2	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	10
11	16.5	16.7	16.8	17.0	17.1	17.3	17.4	17.6	17.7	17.9	11
12	18.0	18.2	18.3	18.5	18.6	18.8	18.9	19.1	19.2	19.4	12
13	19.5	19.7	19.8	20.0	20.1	20.3	20.4	20.6	20.7	20.9	13
14	21.0	21.2	21.3	21.5	21.6	21.8	21.9	22.1	22.2	22.4	14
15	22.5	22.7	22.8	23.0	23.1	23.3	23.4	23.6	23.7	23.9	15
16	24.0	24.2	24.3	24.5	24.6	24.8	24.9	25.1	25.2	25.4	16
17	25.5	25.7	25.8	26.0	26.1	26.3	26.4	26.6	26.7	26.9	17
18	27.0	27.2	27.3	27.5	27.6	27.8	27.9	28.1	28.2	28.4	18
19	28.5	28.7	28.8	29.0	29.1	29.3	29.4	29.6	29.7	29.9	19
20	30.0	30.2	30.3	30.5	30.6	30.8	30.9	31.1	31.2	31.4	20
21	31.5	31.7	31.8	32.0	32.1	32.3	32.4	32.6	32.7	32.9	21
22	33.0	33.2	33.3	33.5	33.6	33.8	33.9	34.1	34.2	34.4	22
23	34.5	34.7	34.8	35.0	35.1	35.3	35.4	35.6	35.7	35.9	23
24	36.0	36.2	36.3	36.5	36.6	36.8	36.9	37.1	37.2	37.4	24
25	37.5	37.7	37.8	38.0	38.1	38.3	38.4	38.6	38.7	38.9	25
26	39.0	39.2	39.3	39.5	39.6	39.8	39.9	40.1	40.2	40.4	26
27	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.6	41.7	41.9	27
28	42.0	42.2	42.3	42.5	42.6	42.8	42.9	43.1	43.2	43.4	28
29	43.5	43.7	43.8	44.0	44.1	44.3	44.4	44.6	44.7	44.9	29
30	45.0	45.2	45.3	45.5	45.6	45.8	45.9	46.1	46.2	46.4	30
31	46.5	46.7	46.8	47.0	47.1	47.3	47.4	47.6	47.7	47.9	31
32	48.0	48.2	48.3	48.5	48.6	48.8	48.9	49.1	49.2	49.4	32
33	49.5	49.7	49.8	50.0	50.1	50.3	50.4	50.6	50.7	50.9	33
34	51.0	51.2	51.3	51.5	51.6	51.8	51.9	52.1	52.2	52.4	34
35	52.5	52.7	52.8	53.0	53.1	53.3	53.4	53.6	53.7	53.9	35
36	54.0	54.2	54.3	54.5	54.6	54.8	54.9	55.1	55.2	55.4	36
37	55.5	55.7	55.8	56.0	56.1	56.3	56.4	56.6	56.7	56.9	37
38	57.0	57.2	57.3	57.5	57.6	57.8	57.9	58.1	58.2	58.4	38
39	58.5	58.7	58.8	59.0	59.1	59.3	59.4	59.6	59.7	59.9	39
40	60.0	60.2	60.3	60.5	60.6	60.8	60.9	61.1	61.2	61.4	40

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