

FB# 223

FB#553

①
From Sutherland Dam
Site #2 to Tunnel -

H

Preliminary Survey For
Sutherland to San Vicente
Conduit. "H" Line

7-22-27.

Van Horn.

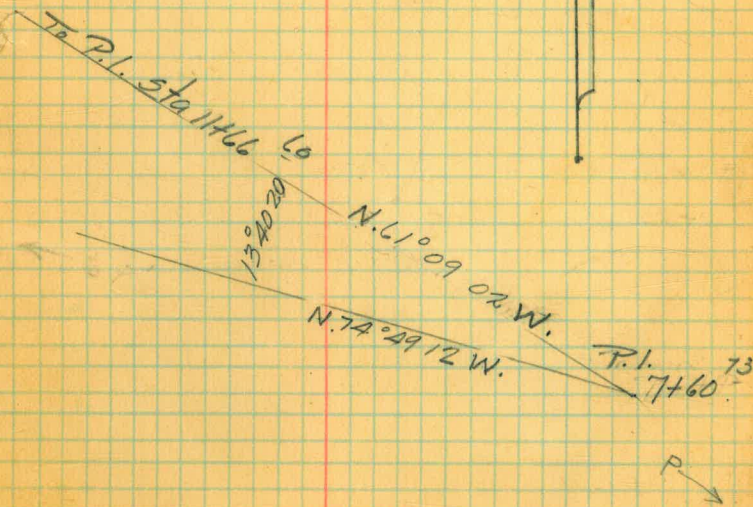
Pages 7 to 22 No good,
Line Change

(See Level notes For Profile.)

7-22-27
 Van Horn
 W.H. Simpson
 M.D. Elliot
 Jinkard
 Clear

Beginning at P.I. 7+60⁷³ South
 to San Vicente Conduit Located
 by Intersection From Primary
 triangulation 7 & 0 Respectively on
 Data obtained From the Ramona Office
 & Backsighting on Primary Point P,
 True bearing S. 74° 49' 12" E. Mag. S. 74° 00' E.,
 then angle right 13° 40' 10" to a true
 bearing of N. 61° 09' 02" W. Mag. N. 60° W.
 said bearing being the course From
 P.I. 7+60⁷³ to P.I. 11+66⁶⁰; this
 bearing N. 61° 09' 02" W is now assumed
 N. 59° 59' 40" W. For the purpose of Con-
 forming to the paper location Data
 then by semitangent a distance of 83¹³
 to an E.C. sta. 8+39⁸⁰ which is the beginning
 10+00 of this Survey designated
 +50 by the letter "H"

9+00
 +50
 +39⁸ E.C.
 +25 Δ 30° 58
 8+00 R 300
 +75 S.T. = 83.13
 +25 L = 162.2
 7+00
 6+77⁶ BC



2

(H)

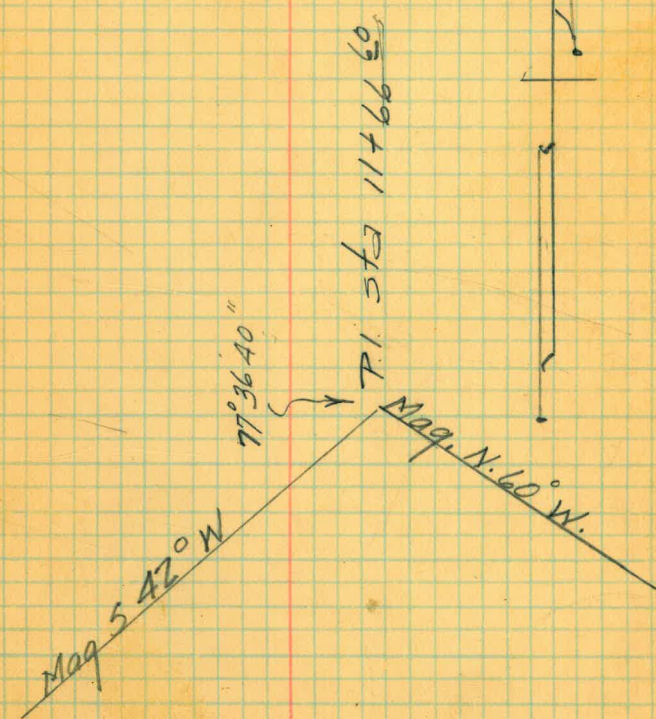
H' Line continued

7-24-27
 Van. born
 11.07.30
 P. n. Kard
 Clear

+75
 +50
 +25
 15+00
 +75
 +50
 +25
 14+00
 +75
 +50
 +25
 13+00
 +76⁷ E.C.
 +75
 +50
 +25
 12+00
 +75
 +50
 +25
 11+00
 +75
 +50
 +25
 10+05^{7L} B.C.

38°49
 38°34.
 34°59.
 31°24.
 27°49.
 24'14.
 20°40.
 17°05.
 13°30.
 9°55.
 6°20.
 2°45.

Δ 77°36'40
 R 200
 T 16084
 L 270.9

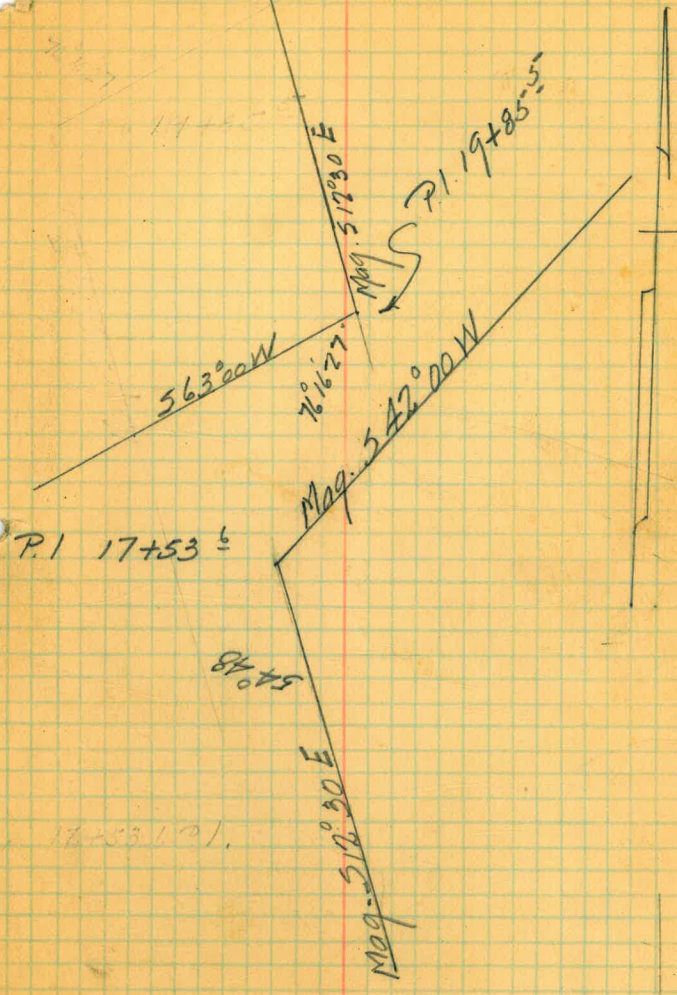


(H)

H' line continued

7-25-27
 Van Horn
 Simpson
 Ell. of
 Pinkard
 Lou
 Clear

+50			
21+00		$\Delta 76^{\circ} 16' 27''$	
+29 ^a E.C.	38° 08	R 80	.10
+25	36° 37	T 62.81	
20+00	27° 40	L 106.5	
+75	18° 43		
+50	9° 46		
+25	0° 49		
+22 ^b B.C.			
19+00			
+85 ^{od} E.C.	27° 24		
+75	26° 26		
+50	24° 02		
+25	21° 39		
18+00	19° 16	$\Delta 54^{\circ} 48' 07''$	
+75	16° 52	R.300	.006
+50	14° 31	T.155.5	
+25	13° 07	L.286.94	
17+00	9° 44		
+75	7° 21		
+50	4° 58		
+25	2° 34		
16+00	0° 11		
+98 ^{lo} B.C.			



(H)

'H' Line Con.

PI 28+46.68
B.C. " +23.30

28+00

+50

+42⁴³ E.C. 32°34'✓

Δ 65°09'02L

+25 26°20

R 80

27+00 17°23

T 51.11

+75 8°26

L 90.97

+51⁴⁶ B.C.

26+00

+54³² E.C. 38°40

Δ 77°20'38R

+50 37°07'✓

R 80

+25 28°10

T 64.03

25 19°13

L 107.99

+75 10°16

+50 1°19

+46³³ B.C.

24

+50

+43⁵⁵ E.C.

+25

+01" B.C.

Δ 30°23'32R

23+00

R 80

+50

T 21.72

22+00

L 42.44

Mag. N73°30'W

65°09'02"

7-25-27
Van Horn
Simpson
Elliot
Pin Kard
Lou

7.1.27+02 57

Mag. N8°30'W

Mag. N8°30'W

Mag. N86°00'W

77°20'38

P. I. 25+10 56.27

Mag

N86°00'W

Mag. S63°W

23.30.28

P. I. 23+22 83

(H)

'H' Line continued

7-26-27
 Van Horn,
 Simpson,
 Elliot,
 Pin Ward
 Lou
 Clear

N 69° 17' 41" 45" W
 37° 46'

M 69 N 10° 30' W

30° 35' 35"
 N 10° 30' W

P.I. 30+36.7
 M 69 N 10° 30' W
 N 08° 15' 60" W

P.I. 28+46.7
 M 69 N 73° 30' W

+50	13° 51'	
+25	12° 25 1/2'	
34+00	10° 59 1/2'	Δ 37° 46' L
+75	9° 33 1/2'	R 500
+50	8° 07 1/2'	T 171.03
+25	6° 42'	Lc. 329.58
33	5° 16'	
+75	3° 50'	
+50	2° 24'	
+25	0° 58'	
+05 1/4	B.C.	
32+00		
+50		
31+00		
+56.93	E.C.	Δ 30° 35' 35" R
+50		R 80
+25		T 21.88
+14 2/3	B.C.	L 42.70
30+00		
+77 1/2	P.O.T.	
+50		
29+00		
+18 3/8	E.C.	Δ 32° 35' 17" R
+50		R 80
		T 23.38
28+23 3/8	B.C.	L 45.5

6

(H)

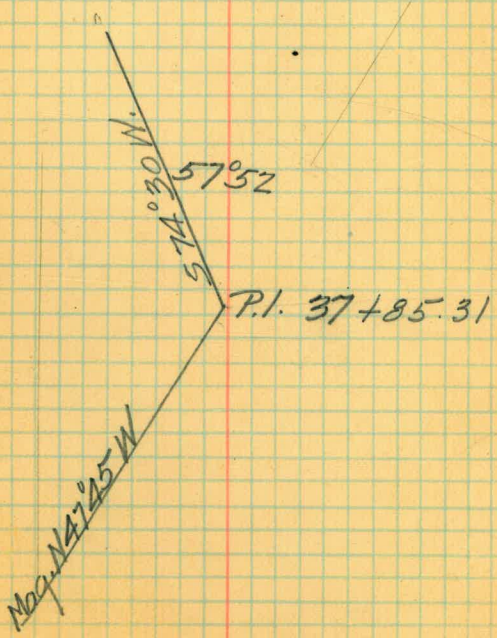
'H' Line Continued

37.81
31.32

7-27-27
Van Horn
Simpson
Mattoon
Pinkard
Lou
Clear

+50	
42+00	
+50	
41+00	
+50	
40+00	
+50	
39+00	
+76 ⁷⁴ E.C.	28°56
+75	28°41
+50	25°06
+25	21°31½
38+00	17°56½
+75	14°21½
+50	10°46½
+25	7°11½
37+00	3°37
+74 ⁷⁵ B.C.	
+50	
36+00	
+50	
+37 ⁷² E.C.	18°53
+25	18°09
35+00	16°43½
+75	15°17

Δ 57°52 L
R 200
T 110.56
L 201.99



(H)

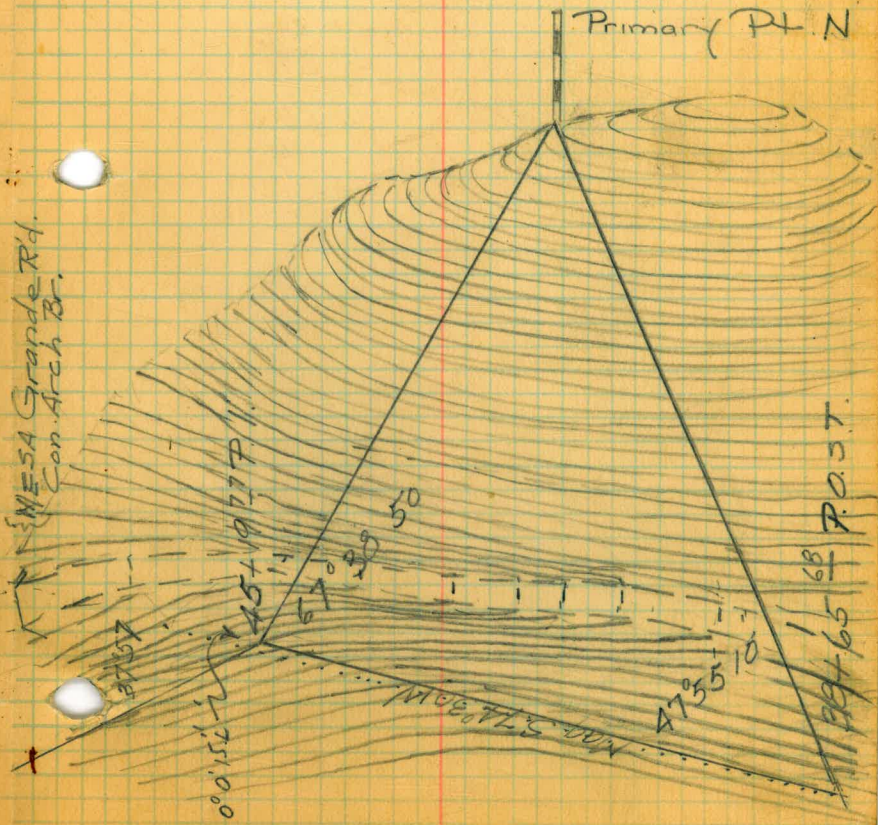
(H Line con.)

7-28-27
 Van Horn
 Simpson
 Elliot
 Pinkard
 Lov.
 Clear.

+50
 47+00
 +30
 46+00
 +83.47 E.C.
 +75 E.C. 17.46
 +50 14° 11
 +25 10° 36
 45+00 7.00
 +75 3° 26
 +51 E.C.
 +50
 +25
 44+00
 +75
 +50
 43+00

Δ 37° 57 L
 R 200
 T 68.77
 L 132.47

MESA Grande Rd.
 Con. Arch Br.



Δ 37° 57 L
 R 200
 T 68.77
 L 132.47

R.O.S.T.
 199+65

135 67 38 35
135 67 38 35
67 38 50

(H)

H' Line Cor.

+03³⁰ B.C.

57+00

+50

56+00

+50

55+00

+50

54+00

+50

53+00

+50

52+00

+50

51+00

+87⁴¹ E.C.

+50

+115²² B.C.

50+00

+50

49+00

+51¹⁴ E.C.

+25

48+00

47+73⁰² B.C.

57

58

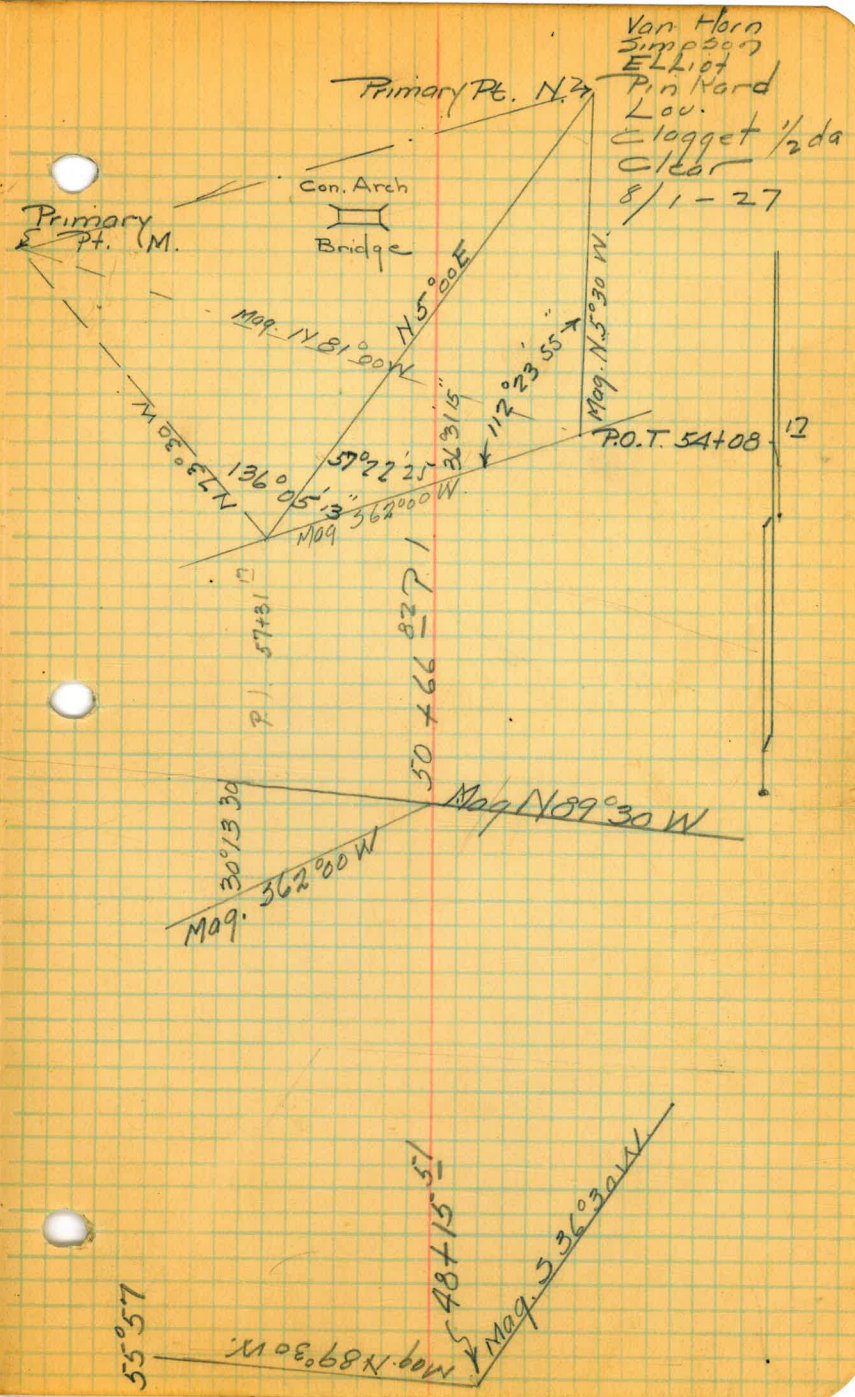
66395

26 00+ 4.2

27 00+ 4.5

Δ 30° 13 30 L
R 80
T 21.6
L 42.19

Δ 55° 57 R
R 80
T 42.49
L 78.12



55° 57

Mag. N 89° 30 W

48+15.51

Mag. S 36° 30 W

Mag. N 5° 00 W

36° 315"

112° 23 55"

Mag. N 81° 00 W

Mag. N 36° 05' 30" W

P.I. 57+31

Mag. 30° 13 30 W

Mag. N 89° 30 W

Primary Pt. N. 27

Con. Arch Bridge

Van Horn
Simpson
Elliot
Pin Hard
Lou.
Clogget 1/2 da
Clear
8/1-27

P.O.T. 54+08

12

Primary Pt. M.

9

(H)

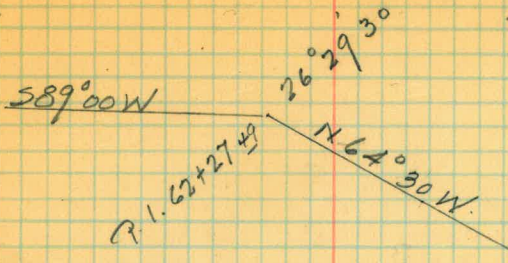
'H' Line Con.

8°57'
175'

Van Horn
Simpson
ELLIOT
Pittard
Lou Swy Gaffer
Clagget
Rauher
8/2 - 27
Clear

+50
63+00
+55⁸⁷ E.C.
+50
+25
62+00
+98⁸⁷ B.C.

Δ 26°29'30" L
R 125
T 29.42
L 57.8



+50
61+00
+50
60+00
+91⁵⁴ EC.
+75
+50
+25
59+00
+75_g
+62 B.C.

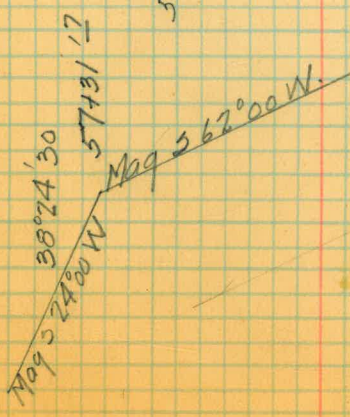
45°41 1/2
39°46 1/2
30°49 1/2
21°52 1/2
12°55 1/2
3°58 1/2

Δ 91°25' R
R 80
T 82.00
L 127.64



+50
58+00
+56⁹³ E.C.
+50
+25
57+03 B.C.

Δ 38°24' 30" L
R 80
T 27.87
L 53.63



00127
21-
635
254
03175

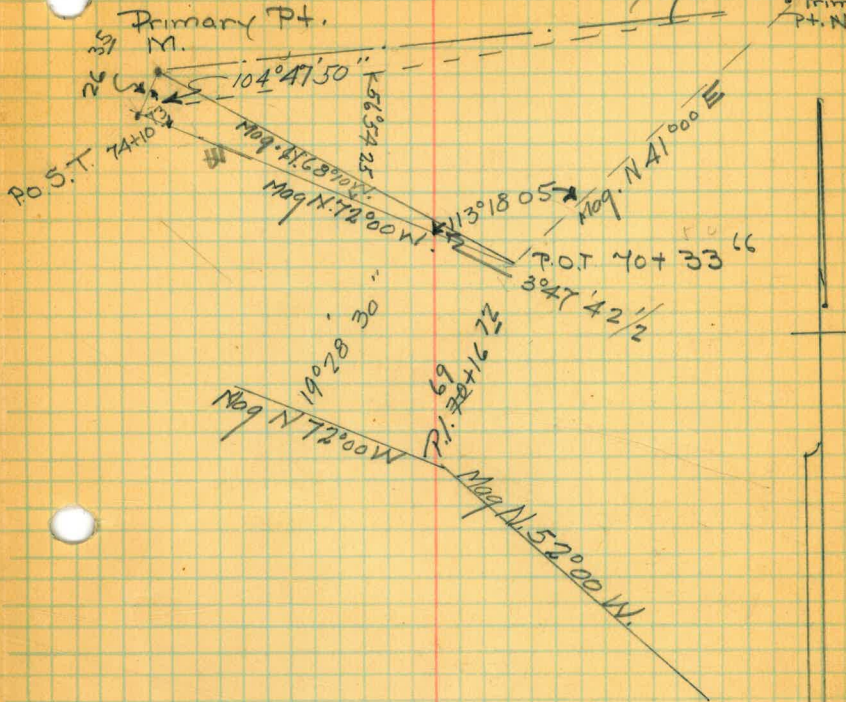
00127
03

00127
80
10160

(H)

('H' Line Con.)

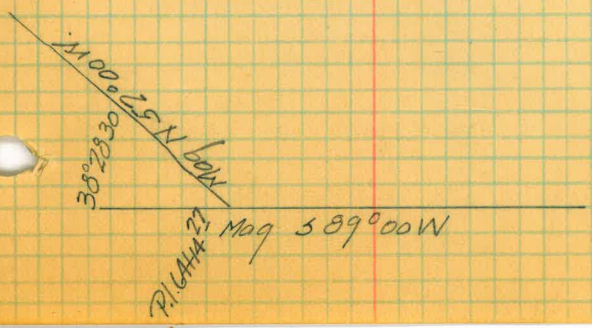
8-3-27
 Van Horn
 Simpson
 Elliott
 Pinkard
 SynyCoffee
 Primary Pt. N



- 73+00
- +50
- 72+00
- +50
- 71+00
- +50
- 70+00
- +50³⁵ E.C.
- +25
- 69+00
- +82⁴ B.C.
- +50
- 68+00
- +50
- 67+00
- +50
- 66+00
- +50
- 65+00
- +50
- +40⁰⁷ E.C.
- +25
- 64+00
- 63+86³⁵ B.C.

$\Delta 19^{\circ} 28' 30''$ L
 R 200
 T 34.32
 L 67.98

$\Delta 38^{\circ} 28' 30''$ R
 R 80
 T 27.92
 L 53.72



'H'

Solar Obs 'H' Line

Aug. 5 - 27

Van Horne

8-5-27
 Van Horn
 Simpson
 Elliot
 Pinkard
 Swycaffer
 Clear

Taken From tangent

Sta 74+28 to 81+29

Az	V.A	Time
105°03.50L	52°05	9:18:30
105°08.55	52°52	9:22:20
105°06.22	52°28 1/2	9:20:4
	Index + 02	12.6
	52°30 1/2	9:33 Mean Local
Semidia	16	4:13
	52°14.30	5:20 Hour Angle
Ref.	46	40" Hourly Change
	52°13.44	

$$Dec 17^{\circ}10.55 - 0^{\circ}3'34 = 17^{\circ}07.21''$$

$$S = \frac{1}{2} (33^{\circ}06.4 + 52^{\circ}13.7 + 72^{\circ}52.7)$$

$$S = 79^{\circ}06.4$$

$$\frac{1}{2}A_3 = \sqrt{\frac{\cos 79^{\circ}06.4 \cdot \cos 6^{\circ}13.7}{\cos 33^{\circ}06 \cdot \cos 52^{\circ}13.7}}$$

$$52^{\circ}46'11''$$

$$9.276419$$

$$9.997429$$

$$105^{\circ}32.22$$

$$19.273848$$

$$105^{\circ}06.22$$

$$0.289817$$

$$210^{\circ}38.44$$

$$2) 19.563665$$

$$330^{\circ}38.44W$$

$$9.781832 =$$

True bearing of initial tang 52°46'11"

N 61°09'02" W. assumed bearing of
 initial tangent N 59°59'40" W

$$N 61^{\circ}09'02" W -$$

$$59^{\circ}59'40"$$

$$1^{\circ}09'22"$$

$$530^{\circ}38.44 W$$

$$1^{\circ}09'22"$$

S 31°48'06" W Assumed true bearing

(H)

('H' Line continued).

8-4-77
 Van Horn
 Simpson
 Elliot
 Pinkard
 Sywcoffer
 Clear

+78⁴⁶ E.C.
 283 = 115

+50
 +25
 81+00 346 = 284
 192 = 55

+80³¹ B.C.

80+00

+50

79+00

+50

78+00

+50

77+00

+50

76+00

+50

75+00

+72⁴⁸ E.C. 37° 45'

+50 29° 42'

+25 20° 45'

74+00 11° 48'

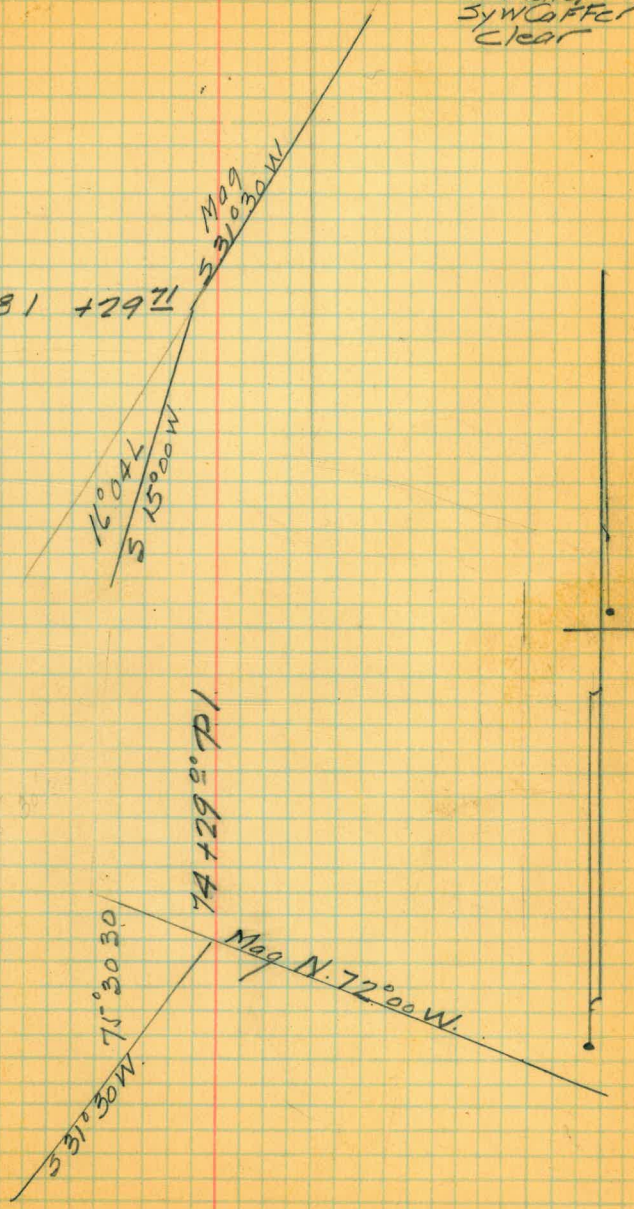
+75 2° 50' 1/2

73+67⁰⁵ B.C.

$\Delta = 16^{\circ} 04' L$
 $R = 350$
 $T = 49.40 \checkmark$
 $L = 98.15 \checkmark$

$\Delta 75^{\circ} 30' 30" L$
 $R 80$
 $T 61.95 \checkmark$
 $L 105.43 \checkmark$

7.1. 81 +29 71



(H)

'H' Line Con.

8-5-27
 Van. Horn
 Simeson
 Elliott
 Pinkard
 SwyCoffer
 Clear.

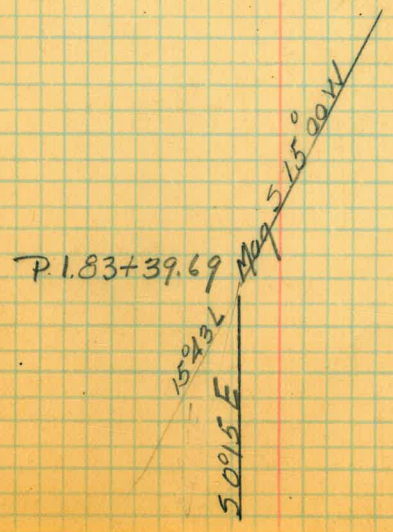
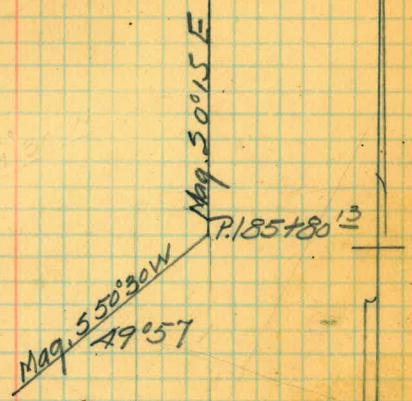
90+00
 +50
 89+00
 +50
 88+00
 +50
 87+00
 +50
 +20 ⁷³ E.C.
 20.4 = 2.08
 86+00
 +75
 40.29 = 8.5
 +50
 16.3 = 1.3
 +33 ⁵³ B.C.

Δ 49°57' R
 T 46.58
 L 87.18
 R 100

85+00
 +50
 84+00
 +87 ³⁹ E.C.
 12.2 = .23
 +75
 37.3 = 2.16
 +50
 33.5 = 1.7
 83+00
 8.6 = .11
 +91 ³⁸ B.C.

Δ 15°43' L
 R 350
 T 48.31
 L 96.01

+50
 82+00



'H'

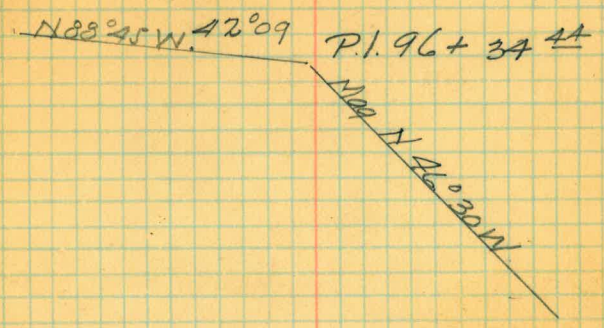
'H' Line Continued

11.0.5
9.5

8-7-27
 Van Horn
 Simpson
 Elliot
 Pinkard
 Lou
 Clear

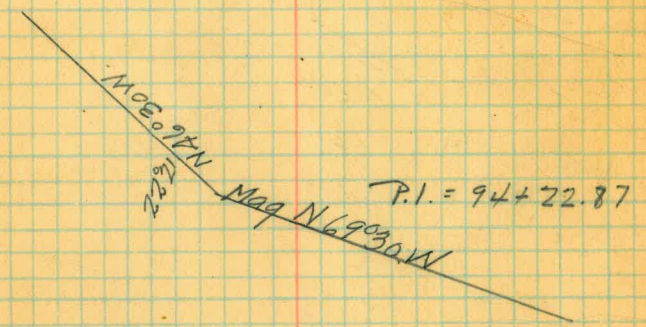
+62⁴⁶ E.C. 12⁵ out 0.97
 +50
 +25 21⁴ out 2.86
 +03⁶¹ B.C.

Δ = 4789 L
 R = 80
 T = 30.83 ✓
 L = 58⁸⁵ ✓



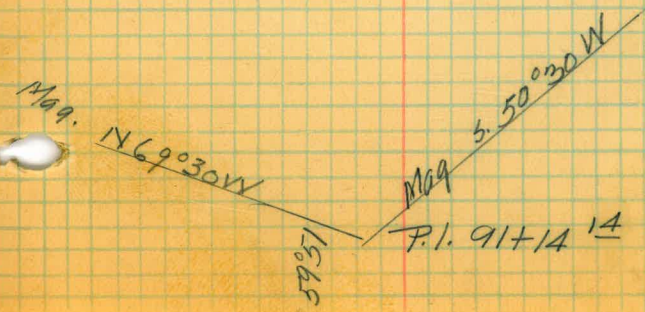
96+00
 +50
 95+00
 +80⁶² E.C. ✓
 +75 -5⁶ out 0.05
 +50 -30⁵⁶ " 1.50
 +25 -55³⁰ out 5.07
 94+00 -36³⁶ out 1.58
 +75 -11³⁹ out 0.42
 +63⁶ B.C.

Δ = 22°21' R ✓
 R = 300
 T = 59.27 ✓
 L = 117.02 ✓
 (LC = 116.29)



+50
 93+00
 +50
 92+00
 +51⁸⁶ E.C. 29°55'
 +25 20°22'
 91+00 11°25'
 +75 2°28'
 90+68⁸⁹ B.C.
 +50

Δ 59°51' R ✓
 R 80
 T 46⁰⁵ ✓
 L 83.57



'H'

(H. line. con.)

+26⁴⁶ E.C.

106+00 - 26⁵ out 4⁴

+75 4⁵ out 0²

+70⁴⁷ B.C.

+50

105+00

+53⁶⁵ E.C.
3⁵ out 0⁰

+50 28⁰¹ out 5⁷⁰

+25

104+00 30³⁵ out 7⁴

+75 6⁴ out 0²⁵

+68⁵⁵ B.C.

+50

103+00

+50

102+00

+50

101+00

+50

100+00

+50

99+00

+50

98+00

+50

97+00

$\Delta = 40^{\circ}06'$

$R = 80$

$T = 29.20$

$L = 55.99$

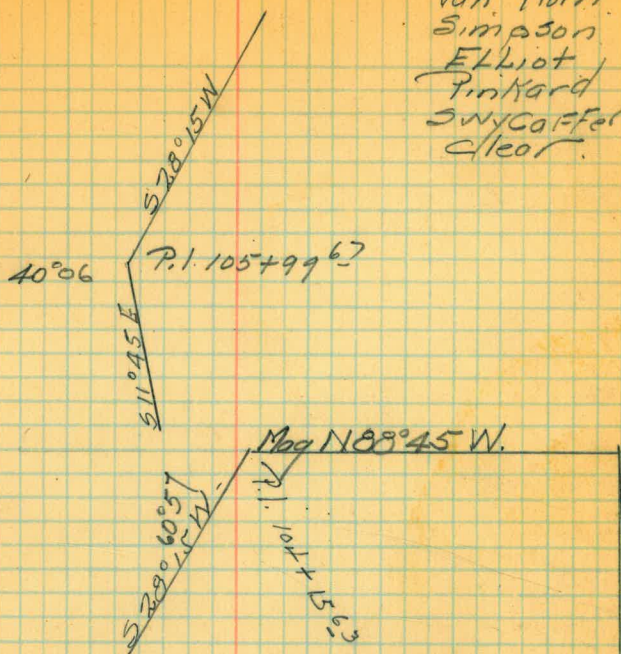
$\Delta 60^{\circ}57'$

$R 80$

$T 47.08$

$L 85.10$

0-8-27
Van Horn
Simpson
Elliot
Pinkard
Swycoffer
Clear



'H'

('H' Line Con)

+96⁴⁸ ✓
E.C.

111+00 21⁵ out 2⁹

+50 25.37 out 4¹

+24³² B.C.

114+00 19²

+50 20³ 12

113+00

+50

+44⁶⁶ ✓
E.C.

+25 19⁸⁴ out 2⁴⁸

112+00 42⁸ out 12³³

+75 60⁴⁵ out 27⁴⁵

+50 41²⁷ out 11⁴²

+25 18⁰⁸ out 2⁰⁶

+06⁸² B.C.

111+00

+50

110+00

+50

109+00

+50

108+00

+50

107+00

+50

Δ 51° 41'

R 80

T 38.75 ✓

L 72.16 ✓

Δ 98° 56'

R 80

T 93.56 ✓

L 138.14 ✓

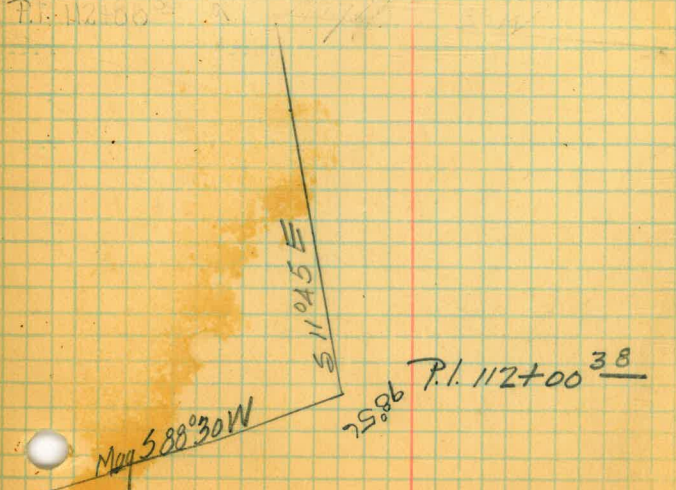
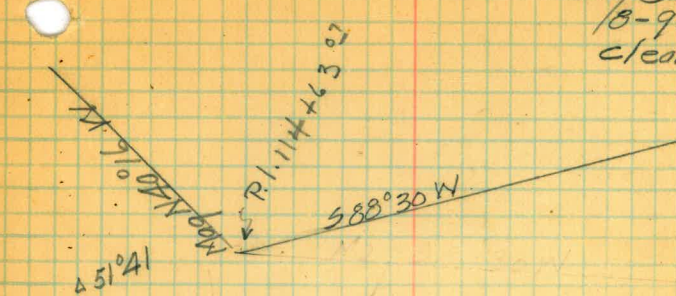
Δ 98° 56' R

R 80

T 93.56 ✓

L 138.14 ✓

Van Horn
Simpson
Eliot
Pinnard
SWY Co. F. C.
18-9-27
clear



(H)

(H Line Con)

8-9-27
 Van Horn
 Simpson
 Elliott
 Pinkard
 Clavert
 Bailey
 SWYCAFFER
 Cleor

✓
 467²¹ EC.

+50 17⁵⁷ out 1⁹⁶

+25 40²⁵ out 11²⁰

122+00 25² out 4²

+74⁸¹ B.C.

+50

121+00

+50

120+00

+50

119+00⁸⁰ ✓

+38 EC 23°51

+25 22°43

118+00 20°40

+75 18°37 1/2

+50 16°34 1/2

+25 14°32

117+00 12°29 1/2

+75 10°26 1/2

+50 8°24

+25 6°21 1/2

116+00 4°19

+75 2°16

+50 0°13 1/2

115+47⁴² B.C.

Δ 66°33 L

R 80

T 52 48 ✓

L 92 22 ✓

Δ = 47°42 L

R 350

T 154.74 ✓

L 291.38 ✓

P.I. 122+27²⁹ Mag N87°30W
 Mag 525°30W 6°32

N87°30W (Mag) 47°42
 P.I. 117+02¹⁶
 N42°16W

'H'

('H' Line Con)

19

(H)

(H Line Con)

Van Horn
Simpson
Elliot
Clover
Linkard
Barley
SW/Coffey
8/11-27
Clear

139+00

+50

138+00

+50 ✓

137+02⁴¹ E.C.

+75 27.³² out 1⁸⁸

+50 51⁸² out 6⁸²

+25 40.33 out 3⁶¹

136+00 15⁵⁸ out 0⁶¹

+84⁴³ BC

+50

135+00

+50

134+00 ✓

+98¹³ E.C.

+75 23⁰⁹ out 0⁷⁷

+50 47⁹⁶ out 3²⁰

+25 56⁰⁶ out 4⁵⁰

133+00 31²⁶ out 1⁴⁰

+75 6³ out 0²⁵

+68⁷³ BC

+50

132+00

+50

131+00

+50

$\Delta = 33.48$ L

R = 200

T = 60.76 ✓

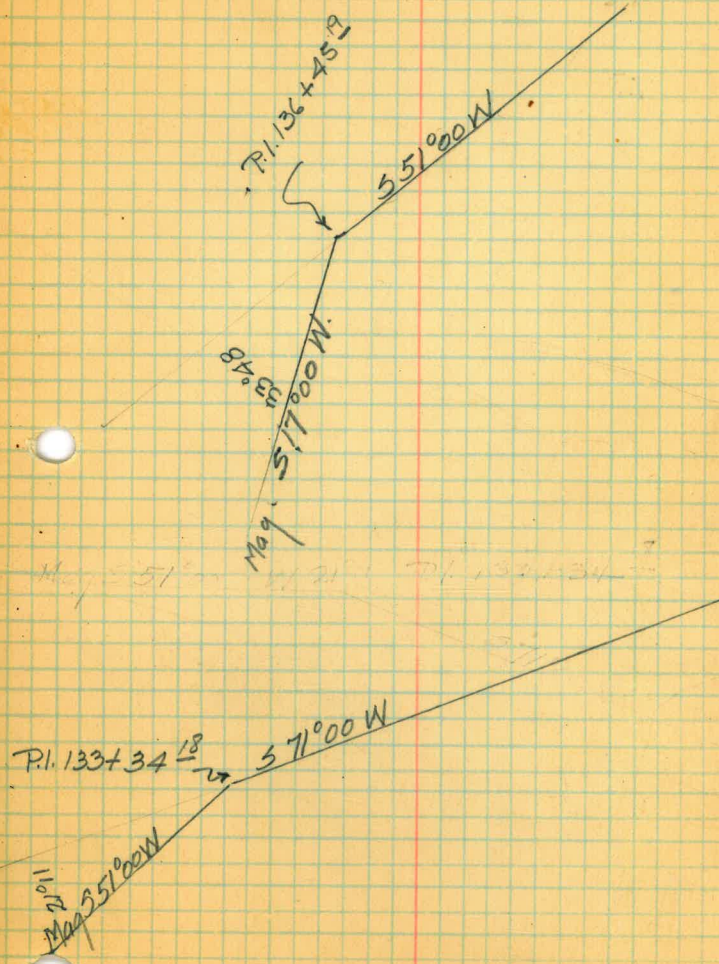
L = 117.98 ✓

$\Delta = 21.11$ L

R = 350

T = 65.45 ✓

L = 129.4 ✓



Van Horn 20
Simpson
Elliott
Clavert
Pinkard
Bailey

H'

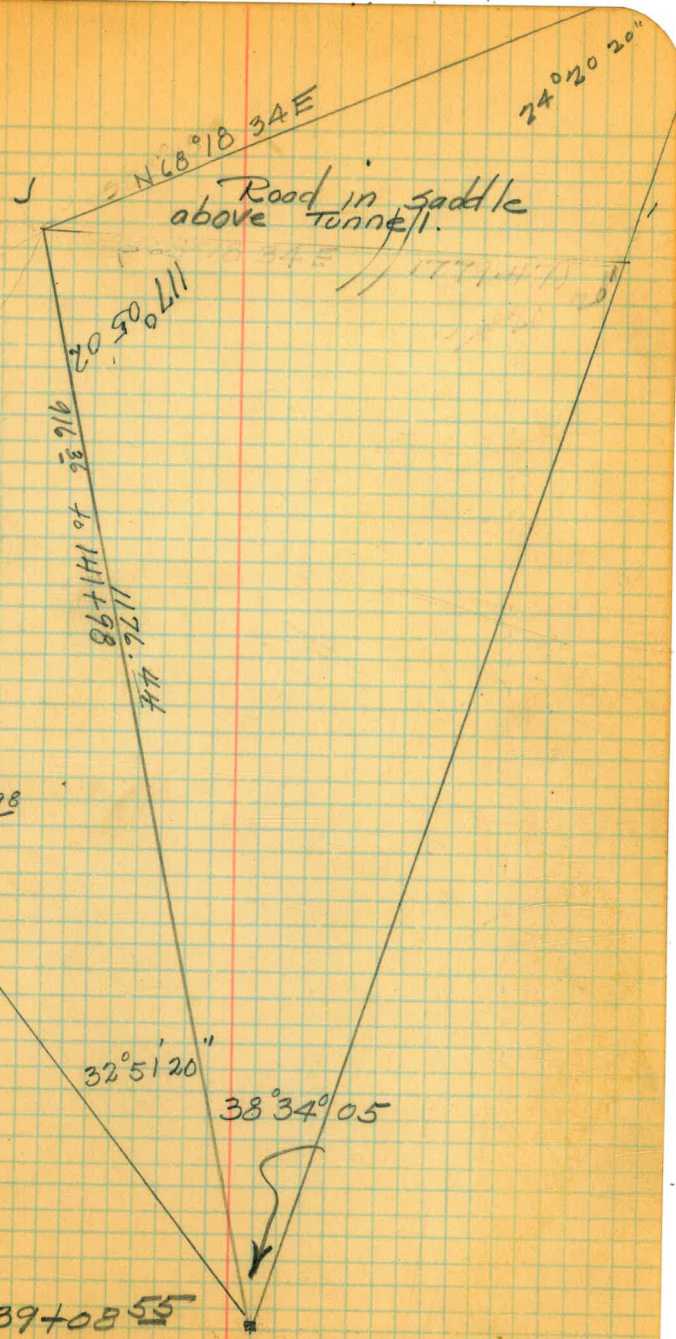
(H' Line Con)

$\begin{array}{r} 112050611 \\ \times 1234105 \\ \hline 112050611 \end{array}$

$\begin{array}{r} 325115 \\ \times 652240 \\ \hline 325120 \end{array}$

P.I. 140+37²⁸

P.O.T 139+08⁵⁵



(H)
H' Line
Solar Obs 8/16-27

Solar Obs 8/16-27

$$\cos A_3 = \frac{9.377189}{19.850607} - 19.61318^v$$

$$\cos A = .33619 - .41038$$

$$\cos A_3 = .07419$$

$$A_3 = 265^\circ 44' 40''$$

$$\begin{array}{r} 265^\circ 44' 40'' \\ 69^\circ 50' 15'' \\ \hline \end{array}$$

$$\begin{array}{r} 195^\circ 54' 25'' \\ 180 \\ \hline \end{array}$$

$$\begin{array}{r} S \quad 15^\circ 54' 25'' W \\ 1^\circ 09' 22'' \\ \hline 517^\circ 03' 47'' W \end{array}$$

Check 8/16-27

Inst. @ 139+08 ⁵⁵P.O.T.

Backsight on P.I. 136+45¹⁹

Fore sight on P.I. 140+37⁹⁸

A₃ V.A.
69°51'50" R 32°53' 3:43:20

69°48'40" R 31°32' 3:47:10



2) 139°40'30" 64°25' 7:30:30

69 50 15 32°12'30" 3:45:15

Watch slow

10

69°50'15" 32°12'30" 3:55:15

1.12 12:47

Dec. 13°58'50"

32°11'18"

3°58'02" M.L.T.

11 32
13°47'18"

$$S = \frac{1}{2} (33^\circ 06' 12'' + 32^\circ 12' 30'' + 76^\circ 12' 42'')$$

$$S = 70^\circ 45' 42''$$

$$\cos \frac{1}{2} A_3 = \sqrt{\frac{\cos 70^\circ 45' 42'' + \cos 6^\circ 27''}{\cos 33^\circ 06' 12'' + \cos 32^\circ 11' 18''}}$$

$$\frac{9.923082}{9.927525}$$

$$19.850607$$

$$\frac{132^\circ 11' 20''}{2}$$

$$264^\circ 22' 40''$$

$$69^\circ 50' 15''$$

$$194^\circ 32' 55''$$

$$1^\circ 09' 22''$$

$$195^\circ 42' 17''$$

$$\cos 70^\circ 45' 42'' = \cos 6^\circ 27''$$

$$\cos 33^\circ 06' 12'' = \cos 32^\circ 11' 18''$$

$$9.517854$$

$$9.997242$$

$$19.515096$$

$$.149393$$

$$2) 9.664489$$

$$9.832244$$

$$515^\circ 42' 17'' W$$

(H)

(H' Line Con)

61 16 10
 122 34 20
 61 17 10

Van Horn
 Simpson
 Elliot
 Clavert
 Pinkard
 Bailey
 SwyGaffer

+15¹⁰ Tunnel Portal.

145700

+50

144100

+50

143100

+55¹⁷ P.I.

+50

142100

+50

141100

+74⁴⁸ E.C.

+50 24⁵ out 3⁸

+25 30⁴³ out 5⁹⁶

140100 6¹ out 0²³

139193⁸⁹ B.C.

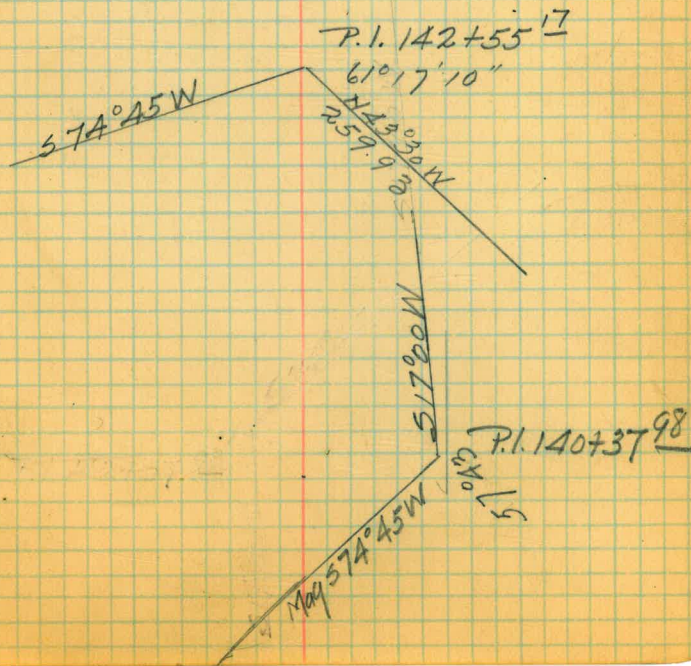
$\Delta 61^{\circ}17'10'' R$

$\Delta 57^{\circ}43' R$

R 80

T 44.09

L 80.59



Van Horn. 23
Simpson
Elliott
Chavert.
Lundy.
Mattoon.

7-17-27

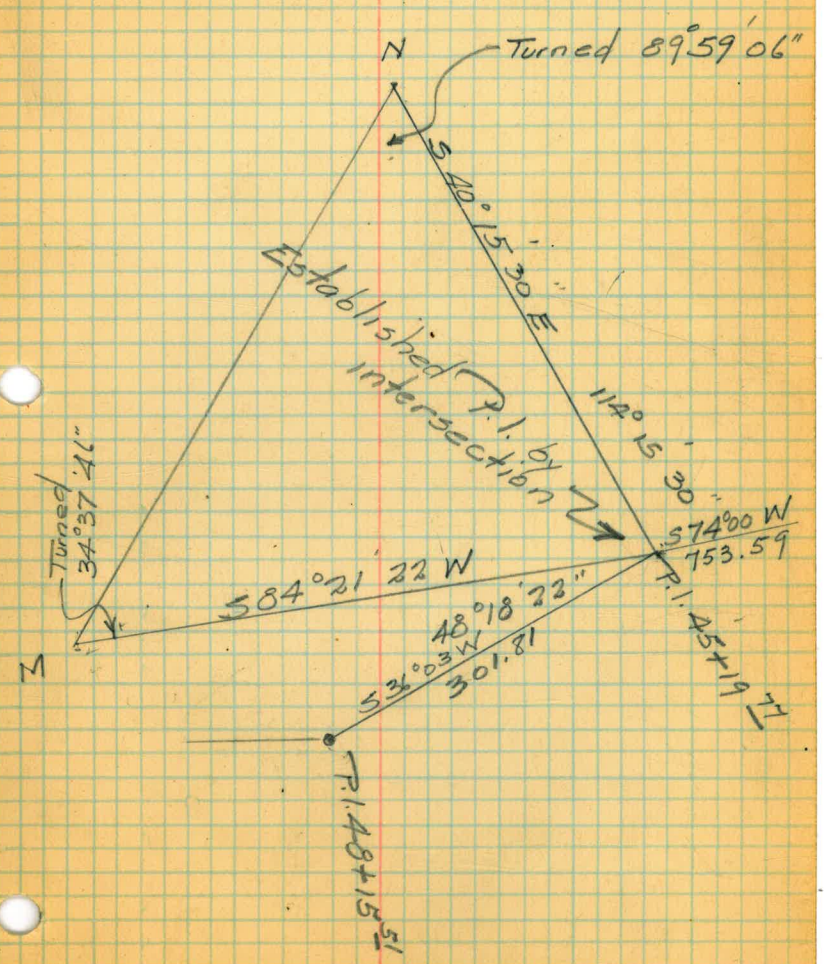
Clear

(H)

(H Line Con)

H Line Change sta 37+85 ³¹
to North Portal Tunnel #1.

47+00
 +50
 46+00 ^N
 +83 ^{E.C.} 18°58'
 +75 1745 Δ 37°56'
 +50 14°10' R 200
 +25 10°36' T 68.74 ✓
 45+00 6°51' 7°00' 45' L 132.77 ✓
 +75 3°26'
 +51° ^{BC}
 44+00
 +50
 43+00
 +50
 42+00
 +50
 41+00
 +50
 40+00
 +50
 39+00
 +50
 38+00



Van Horn.
Simpson.
Elliott.
Clavert.
Mattoon.
Lundy.
7-18-27
clear.

(H)

Line Change "H" 37+85³¹
to North Portal Tunnel #1 (can)

57+00
+50

56+00
+50

55+00
+50

54+00
+50

53+00
+50

52+00
+50

51+00
⁴²
+88 E.C.

+75

+50

²²
+46 B.C.

50+00
+50

49+00

+52¹⁴ E.C.

+25 - 26' - 42"

48+00 27' - 45"

47+00² B.C.

Δ 30°13' 30"
R 80
T 21.6
L 422

Δ = 55°57' R
R = 80
T = 42.49
L = 78.12

30°13'30"
Mag. 563°30' W.

Mag. N. 86°30' W.

55°57' R
T.P. 481.15 51

Van Horn.
Simpson. 25
Elliott
Clavert.
Lundy.
Mattoon.

7/19-27
clear

(H)
Line change H' 37+85³¹ to
North Portal. Tunnel #1

+50
 63+00 ✓
 +51⁴² E.C.
 +25 26[↓] out 2⁸
 62+00 6⁴ out 0¹⁶
 +93⁶² B.C.

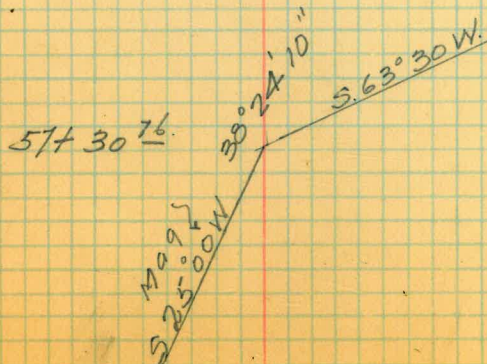
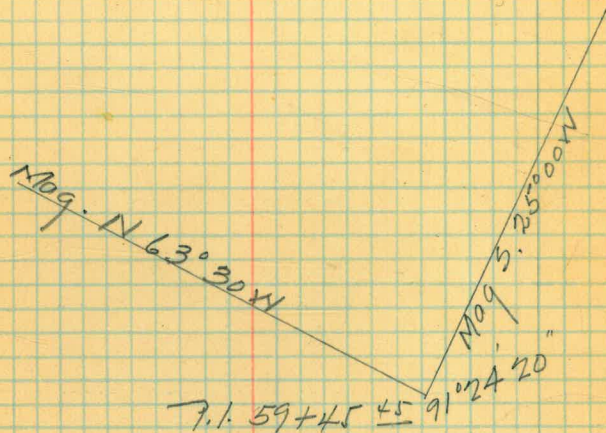
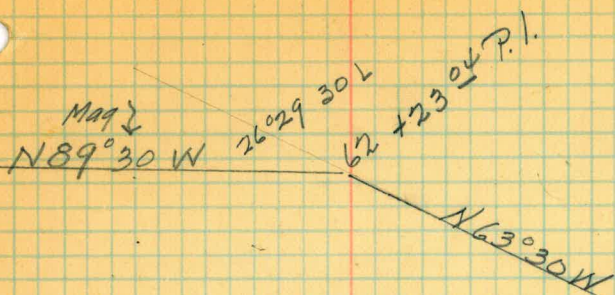
Δ 26° 29' 30" L
 R 125
 T 29.42 ✓
 L 57.80 ✓

+50
 61+00
 +50
 60+00 ✓
 +91⁰⁹ E.C. 45° 42'
 +75 39° 56'
 +50 30° 59'
 +25 22° 02'
 59+00 13° 05'
 +75 4° 08'
 +63⁴⁶ B.C.

Δ = 91° 24' 20"
 R = 80
 T = 81.99 ✓
 L = 127.63 ✓

+50
 58+00
 +56⁵² E.C.
 +50 - 65 out 0 3
 +25 22 out 3 0
 57+02⁹⁰ B.C.

Δ = 38° 24' 10"
 R = 80
 T = 27.86 ✓
 L = 53.62 ✓



Van Horn.
Simpson. 26
Ehriot.
Clavert.
Lundy.
Mattoon.
7/19-27
Clear

(H)

Line Change H' 37+85³¹
to North Portal Tunnel #1

+50

73+00

+50

72+00

+50

71+00

+50

70+00

+42¹⁹ ✓ E.C.

+25 17² out 0²

69+00⁸³ 18² out 0⁸

+81⁸³ B.C.

+50

68+00

+50

67+00

+50

66+00

+50

65+00

+35⁶² E.C.

+25 10⁶ out 0⁷

64+00 18¹ out 2⁰⁵

63+81²⁰ B.C.

$\Delta 17^{\circ} 17' 32''$ L

R 200

T 30⁴¹ ✓

L 60³⁶ ✓

$\Delta = 38^{\circ} 28' 30''$ R

R = 80

T = 27.92

L = 53.72

Map
N 68°30' W

17°17'32

P.I. 69+12²⁴

N 50°30' W

69+12²⁴

Map
N 89°30' W
P.I. 64+09³¹
38°28'30

N 89°30' W

27

Van Horn
Simpson
Elliott
Clavert
Lundy
Mattoon
7/20-27
Clear

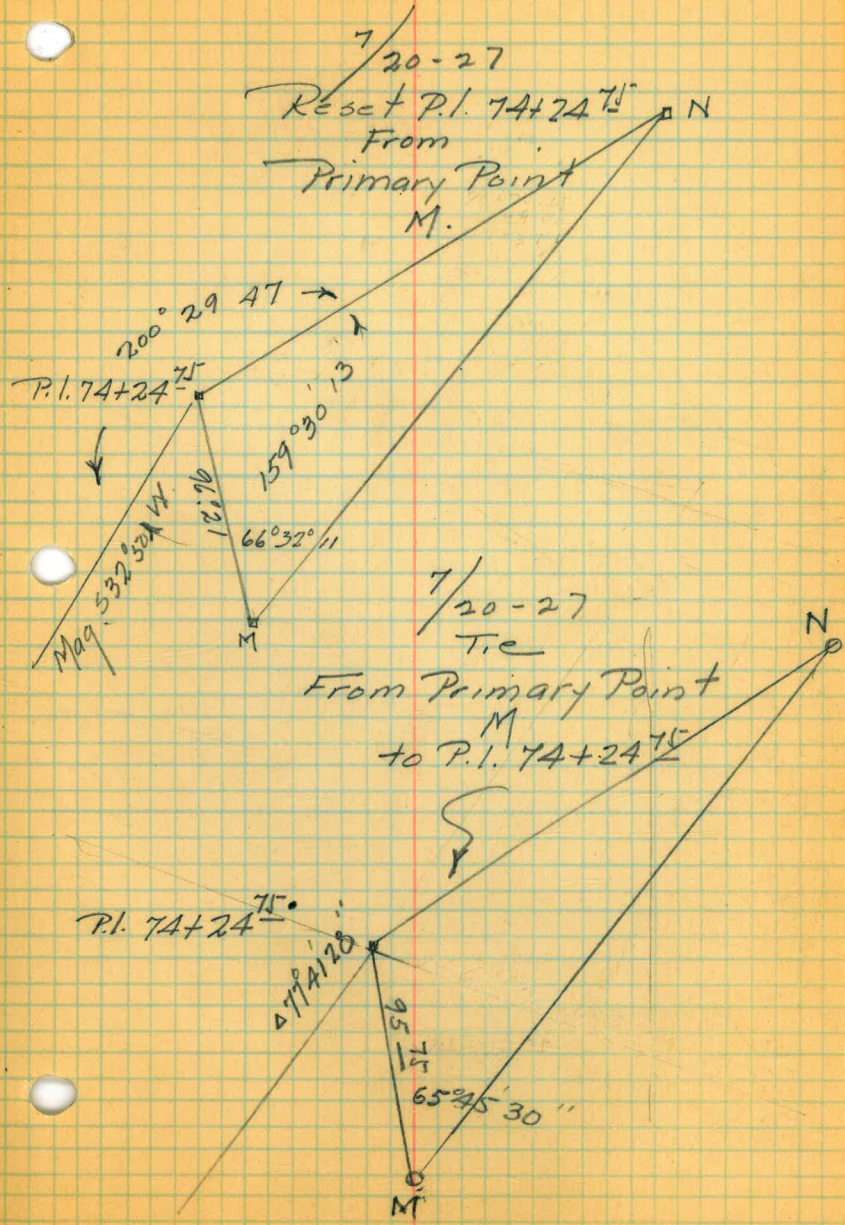
(H)

Line Change 'H' 37+85³¹
to North Portal Tunnel #1

+50
 80+00
 +50
 79+00
 +50
 78+00
 +50
 77+00
 +50
 76+00
 +50
 75+00

+68⁸⁹ E.C.
 +50 18⁶⁷ out 2²¹
 +25 41⁷⁷ out 11⁷⁶
 74+00 38²⁵ out 9⁷⁰
 +75 14⁷ out 1³⁵
 +60²⁹ B.C.

$\Delta 77^{\circ}42'47''$
 R 80
 T 64.43
 L 108.51



28

Van Horn
Simpson
Elliott
Clavert

Mattoon
7/22-27
clear.

(H)

Line Change 'H' 37+85³¹
to North Portal Tunnel #1

89+00

+50

88+00

+50

87+00

+15 ⁴⁰ E.C.

86+00 15 ³⁵ out 1.18

+75 39 ⁴ out 8 ⁰³

+50 21 ⁶⁷ out 2 ³⁷

85+28 ²² B.C.

+50

84+00

+81 ⁷⁶ E.C.

+75 68 out 0 ¹²

+50 31 ⁶⁵ " 2 ²²

+25 38 ⁹⁶ out 4 ⁴¹

83+00 14 ²⁵ out 0 ¹

82+85 ⁷⁵ B.C.

+50

82+00

+72 ³⁰ E.C.

+50 22 ³⁰ out 0 ²¹

+25 47 ¹⁵ " 3 ⁴³

81+00 25 ⁸ out 0 ¹⁵

80+74 ¹⁵ B.C.

Δ 49°57' R

R 100

T 46.58

L 87.18

Δ 15°43' L

R 350

T 48.31

L 96.01

Lc 95.71

Δ = 16°04' L

R 350

T 49.40

L 98.15

Lch. 97.82

4/07 P.I. 85+74

50°45' E

49°57'

P.I. 85+74 ⁸⁰

551°00' W

P.I. 83+34 ⁰⁵

15°43' L

MAGNETIC

511°00' W

537°50' W

P.I. 81+23 ⁵⁵

MAGNETIC
16°04' L
515°00' W

29

Van Horn
Simpson
Elliott
Clavert
SwycOFFer
Mattoon

7/23-27

(H)

Line Change H' 37+85 ³¹ to
North Portal Tunnel #1.

+51⁴⁵ ✓
E.C.

+25 26¹³ out 4³⁷

96+00⁶⁰ 7⁴ out 0³⁵

+92 B.C.

+50

95+00 ✓

+94¹¹ E.C.

+75 19¹ out 0⁶

+50 43²⁷ out 2²²

+25 47⁷ out 3²¹

94+00 22⁹ out 0⁸⁷

+77⁰⁹ B.C.

+50

93+00

+50

92+00

+50

+46³³ E.C. 29°55'¹¹/₂

+25 22°17'

91+00 13°20'

+75 4°22'

+62⁷⁶ B.C.

+50

90+00

+50

$\Delta = 42.89$ L

R = 80

T = 30.83 ✓

L = 58.85 ✓

$\Delta 22^\circ 21' R$

R 300

T 59.27 ✓

L 117.02 ✓

$\Delta 59^\circ 51' R$

R 80

T 46.05 ✓

L 83.57 ✓

Mag N 89° 15' W.

96 +23 +3 P1

N 47° 00' W

Mag N 47° 00' W

P.I. 94+36

N 63° 45' W

Mag. N 63° 45' W

S 51° 00' W

P.I. 91+00⁸¹

59° 51'

30

Van Horn
Simpson
Ewhiöt
Clavert
SWYCAFFer
Mattoon
7/24-27

(H)

Line Change 'H' 37+85³¹ to
North Portal Tunnel #1.

$\frac{15}{+25}$ E.C.
 106+00 - $\frac{25^5}{5}$ out 4^6
 $+75$ - $\frac{5^5}{5}$ out 0^3
 $+69^{\frac{46}{5}}$ B.C.

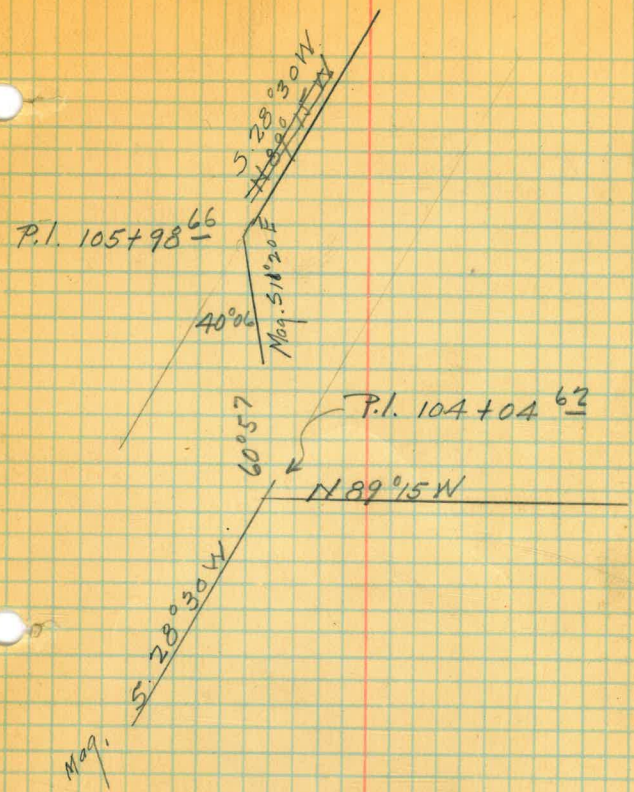
$\Delta 40^{\circ}06' L$
 $R = 80$
 $T = 29.20 \checkmark$
 $L = 55.99 \checkmark$

$+50$
 105+00

$+50$
 $\frac{64}{+42}$ E.C.
 17^5 out 2^2
 $+25$
 104+00 $\frac{40^6}{52+75} = 17^4$ out $11^{\frac{21}{5}}$
 $+57$ B.C.

$\Delta = 60^{\circ}57' L$
 $R = 80$
 $T = 47.08 \checkmark$
 $L = 85.10 \checkmark$

103+00
 $+50$
 102+00
 $+50$
 101+00
 $+50$
 100+00
 $+50$
 99+00
 $+50$
 98+00
 $+50$
 97+00



31

Van Horn.
Simpson.
Elliott.
Clavert.
SWY Caffel.
Mottson.
Clear.

7/24-27

(H)

Line Change N' 37+85³¹
to N. Portal Tunnel #1.

+95⁴³ ✓
E.C

+75 20⁴³ out 2⁶²

+50 26⁷ out 4⁴⁶

+23²⁷ B.C.

114+00

+50

113+00

+50⁹¹ ✓

+43 E.C 49°28

+25 42°43

112+00 33°45

+75 24°47

+50 15°50

+25 6°52

+05⁸¹ B.C

111+00

+50

110+00

+50

109+00

+50

108+00

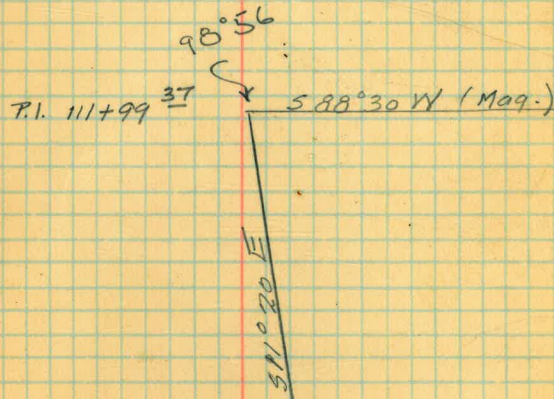
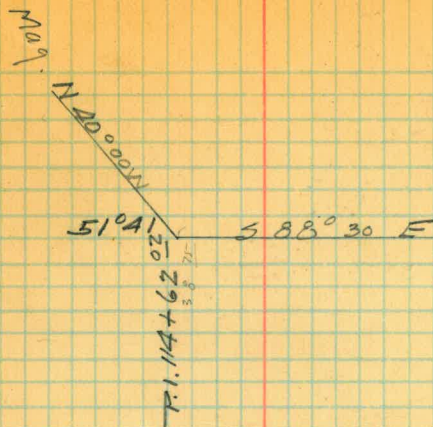
+50

107+00

+50

Δ 51°41 R
R 80
T 38.75 ✓
L 72.16

Δ 98°56 R
R 80
T 93.56 ✓
L 138.14 ✓
LC 121.605



32

Van Horn.
Simpson
Ebbiot
Clavert
SwyCoffe.
Mattoon.
7/25-27
clear

(H)

Line Change H. 37+85³¹
to N. Portal Tunnel #1.

+73⁰³

122+00

+50

121+00

+50

120+00

+50

119+00

+50 ✓

+37⁵⁴ E.C. 23°48

+25 22°46 1/2

118+00 20°43 1/2

+75 18°41

+50 16°38

+25 14°35 1/2

117+00 12°32 1/2

+75 10°29 1/2

+50 8°27

+25 6°24 1/2

116+00 4°22

+75 2°19

+50 0°16 1/2

+46⁷⁰ B.C.

115

111	13	35
222	27	20
11	17	40

A 47°36'41" L

R 350

T 154 41 ✓

L 290 84 ✓

PRIMARY L

San Diego to River.

N 9°00.6 N

93°52'45"

2/187 29'50"

60°26'40"

N

111°13'40"

E 0869

2/187 52'55"

2/187 45'50"

Mag. S. 70°00 W

B.C. 122+73⁰³ N

Mag N 87°00 W

47°36'41" N 40°00 W

P.I. 117°+01'41"

33

Van Horn.
Simpson
Elliot,
Clavert.
Swy Caffee
Mothoon
7/25-27

(H)

Line Change 'H' 37+85³¹
to N. Portal Tunnel #1.

+90⁰⁸ ✓
E.C.

+75 15¹ out 1⁴³

+50 38⁶³ out 9⁸⁸

+25 52⁴⁴ out 19⁵

128 31¹⁷ out 6³

+75 6² out 0³

+68⁰⁹ B.C.

+50

127+00 ✓

+53⁸³ E.C.

+25 m = 8⁰²

m = 12¹⁰

126+00 M = 14⁰

+75

+50 m = 12³

+25 m = 8⁴

125+00 m = 1⁸⁵

+94⁴⁶ B.C.

+50

124+00

+66⁰⁵ E.C.

+50 16⁰⁵ out 1⁶

+25 48⁶ out 16⁴⁰

123+00 26⁶¹ out 4⁵⁴

122+73⁰³ B.C.

$\Delta = 87^{\circ}22$

R = 80

T = 76⁴⁰ ✓

L = 121.99 ✓

$\Delta 40^{\circ}35$

R = 225

T = 83.19 ✓

L = 159.39 ✓

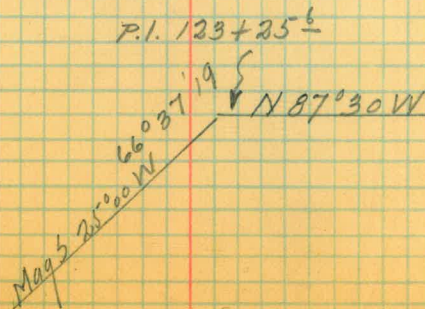
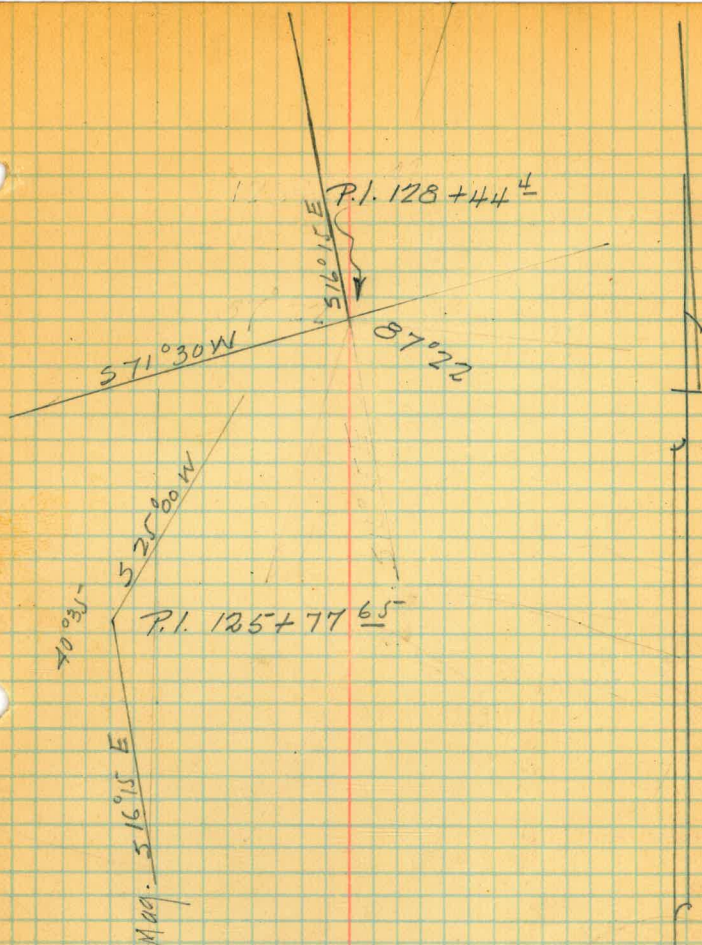
L.C. = 156⁰⁶

$\Delta 66^{\circ}37'19$

R = 80

T = 52⁵⁷

L = 93⁰²



34

Van Horn,
Simpson,
Elliott,
Clavert,
Mattoon,
SwyCaffer
7/25 - 27

(H)

Line Change H. 37+85³¹
to N. Portal Tunnel #1.

138+05⁴⁹ E.C. ✓

+75 30¹ out 2³²

+50 54⁴ out 7⁶⁵

+25 37³ out 3⁵

137 ✓ 12⁵ out 0⁴

+87⁴⁸ B.C.

+50

136

+50

135

135³⁶ ✓
+96 E.C.

+75 21⁴ out 0⁶⁵

+50 46³ out 3⁰⁶

+25 57² out 1¹⁸ 4³²

134+00 33⁰ out 1¹⁸ 4³²

+75 8 out 0³

+66⁹⁶ B.C.

+50

133+00

+50

132+00

+50

131+00

+50

130+00

+50

129+00

Δ 33°48 31 L

R 200

T 60.78 ✓

L 118.01 ✓

Δ 21°11 L

R 350

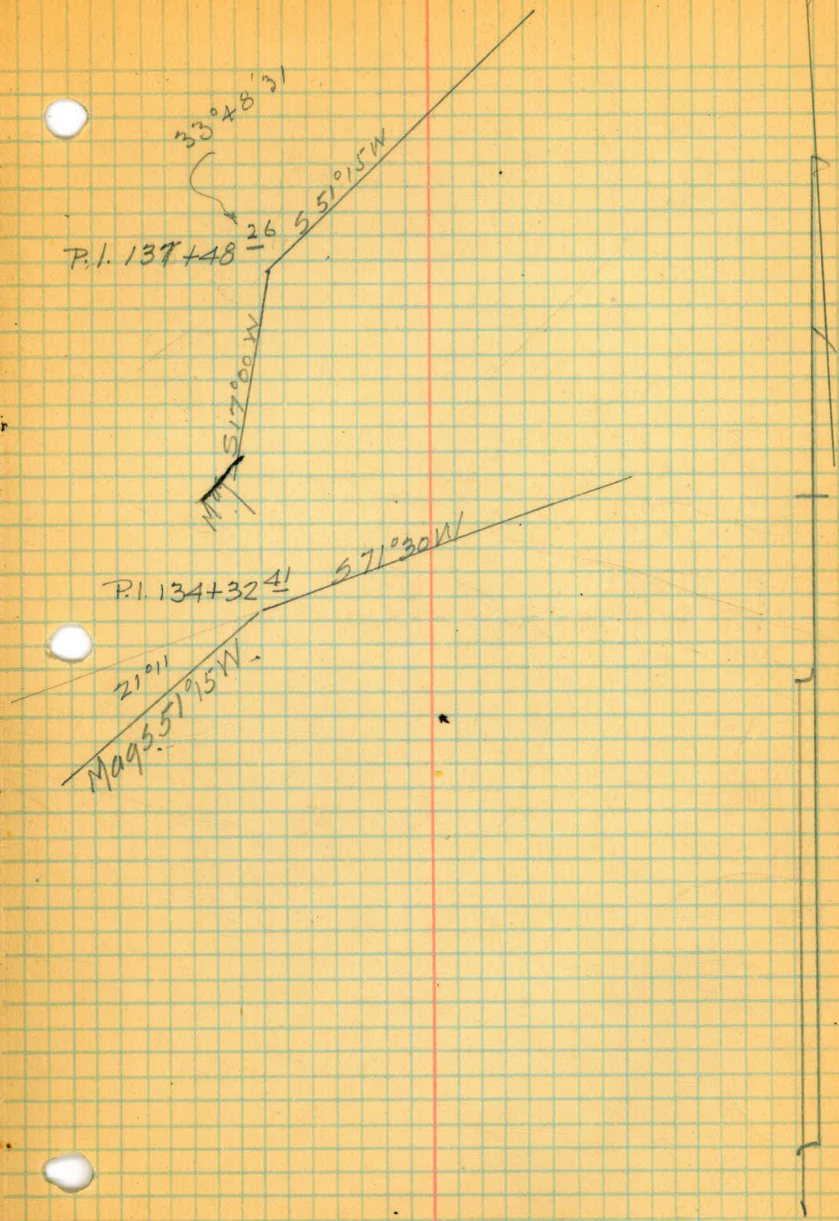
T 65.45 ✓

L 129.40 ✓

P.I. 137+48 26
33°48' 31"
551°15' W

P.I. 134+32 41
21°11'
571°30' W

Mag 551°15' W



35-

Van Horn
Simpson
Elliott
Clavert
SWyCaFFer
Mattoon
clear

8/26-27

(17)

Line Change #1 37+85³¹
to N. Portal Tunnel #1

$\frac{145+55}{147+21.02} \Delta$

+50

145

+64⁶⁴ E.C. 22°23'

+50 21°00'

+25 18°36'

144 16°12'

+75 13°49'

+50 11°25'

+25 9°04'

143 6°41'

+75 4°17'

+50 1°52'

+29⁸⁹ B.C.

142

+77⁷⁴ E.C. ✓

+50 27^I out 4⁸

+25 27³ out 5²

141+00 ✓ 2⁸ out 0⁴¹

+97⁵ B.C.

+50

140

+50

139

+50

$\Delta 44^{\circ}46'35''$

R 300

T 123.58

L 234.75

L.C. 228.52

45743.37

R 80

T 44.09 ✓

L 80.59 ✓

$\frac{143+53.47}{1+23.58}$
 $\frac{142+29.89}{2+38.75}$
 $\frac{144+6.64}{1+23.58}$

44°46'35" S 75°00' W
143+53.47 P.I.

517°00' W
Mag 5 75°00' W
5443.37 P.I. 141+41.24