



343 (5)

ALIGNMENT

SECTION TIE

CR 343 (N)

1974 - 1976

82 0020

Weatherproof Field Book

"Rite in the Rain" paper
32 pages

4 $\frac{5}{8}$ " x 7 $\frac{1}{4}$ "

Keuffel & Esser Co., Morristown, N.J. 07960 Made in U.S.A.

CURVE FORMULAS

$$T = R \tan \frac{1}{2} I$$

$$T = \frac{50 \tan \frac{1}{2} I}{\sin \frac{1}{2} D}$$

$$\sin \frac{1}{2} D = \frac{50}{R}$$

$$\sin \frac{1}{2} D = \frac{50 \tan \frac{1}{2} I}{T}$$

$$R = T \cot \frac{1}{2} I$$

$$R = \frac{50}{\sin \frac{1}{2} D}$$

$$E = R \operatorname{ex. sec} \frac{1}{2} I$$

$$E = T \tan \frac{1}{2} I$$

$$\text{Chord def.} = \frac{\text{chord}^2}{R}$$

$$\text{No. chords} = \frac{I}{D}$$

$$\text{Tan. def.} = \frac{1}{2} \text{ chord def.}$$

The square of any distance, divided by twice the radius, will equal the distance from tangent to curve, very nearly.

To find angle for a given distance and deflection.

Rule 1. Multiply the given distance by .01745 (def. for 1° for 1 ft.) and divide given deflection by the product.

Rule 2. Multiply given deflection by 57.3, and divide the product by the given distance.

To find deflection for a given angle and distance. Multiply the angle by .01745, and the product by the distance.

GENERAL DATA

RIGHT ANGLE TRIANGLES. Square the altitude, divide by twice the base. Add quotient to base for hypotenuse.

Given Base 100, Alt. $10.10^2 \div 200 = .5$. $100 + .5 = 100.5$ hyp.

Given Hyp. 100, Alt. $25.25^2 \div 200 = 3.125$. $100 - 3.125 = 96.875$ = Base.

Error in first example, .002; in last, .045.

To find Tons of Rail in one mile of track: multiply weight per yard by 11, and divide by 7.

LEVELING. The correction for curvature and refraction, in feet and decimals of feet is equal to $0.574d^2$, where d is the distance in miles. The correction for curvature alone is closely, $\frac{2}{3}d^2$. The combined correction is negative.

PROBABLE ERROR. If d_1, d_2, d_3, \dots etc. are the discrepancies of various results from the mean, and if $\sum d^2$ —the sum of the squares of these differences and n —the number of observations, then the probable error of the mean = $\pm 0.6745 \sqrt{\frac{\sum d^2}{n(n-1)}}$

MINUTES IN DECIMALS OF A DEGREE

1'	.0167	11'	.1833	21'	.3500	31'	.5167	41'	.6833	51'	.8500
2'	.0333	12'	.2000	22'	.3667	32'	.5333	42'	.7000	52'	.8667
3'	.0500	13'	.2167	23'	.3833	33'	.5500	43'	.7167	53'	.8833
4'	.0667	14'	.2333	24'	.4000	34'	.5667	44'	.7333	54'	.9000
5'	.0833	15'	.2500	25'	.4167	35'	.5833	45'	.7500	55'	.9167
6'	.1000	16'	.2667	26'	.4333	36'	.6000	46'	.7667	56'	.9333
7'	.1167	17'	.2833	27'	.4500	37'	.6167	47'	.7833	57'	.9500
8'	.1333	18'	.3000	28'	.4667	38'	.6333	48'	.8000	58'	.9667
9'	.1500	19'	.3167	29'	.4833	39'	.6500	49'	.8167	59'	.9833
10'	.1667	20'	.3333	30'	.5000	40'	.6667	50'	.8333	60'	1.0000

INCHES IN DECIMALS OF A FOOT

1-16	3-32	$\frac{1}{8}$	3-16	$\frac{1}{4}$	5-16	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$
.0052	.0078	.0104	.0156	.0208	.0260	.0313	.0417	.0521	.0625	.0729
1	2	3	4	5	6	7	8	9	10	11
.0833	.1367	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167

Index

10 West

Initial Centerline retrace pg 1-11
(Ends at Logan River)

Center Line retrace from 2nd South
South to U.S. 89 91

Pg 19-33

10th West U.S. 91-

H+00

10+00

9+00

8+00

7+00

6+00

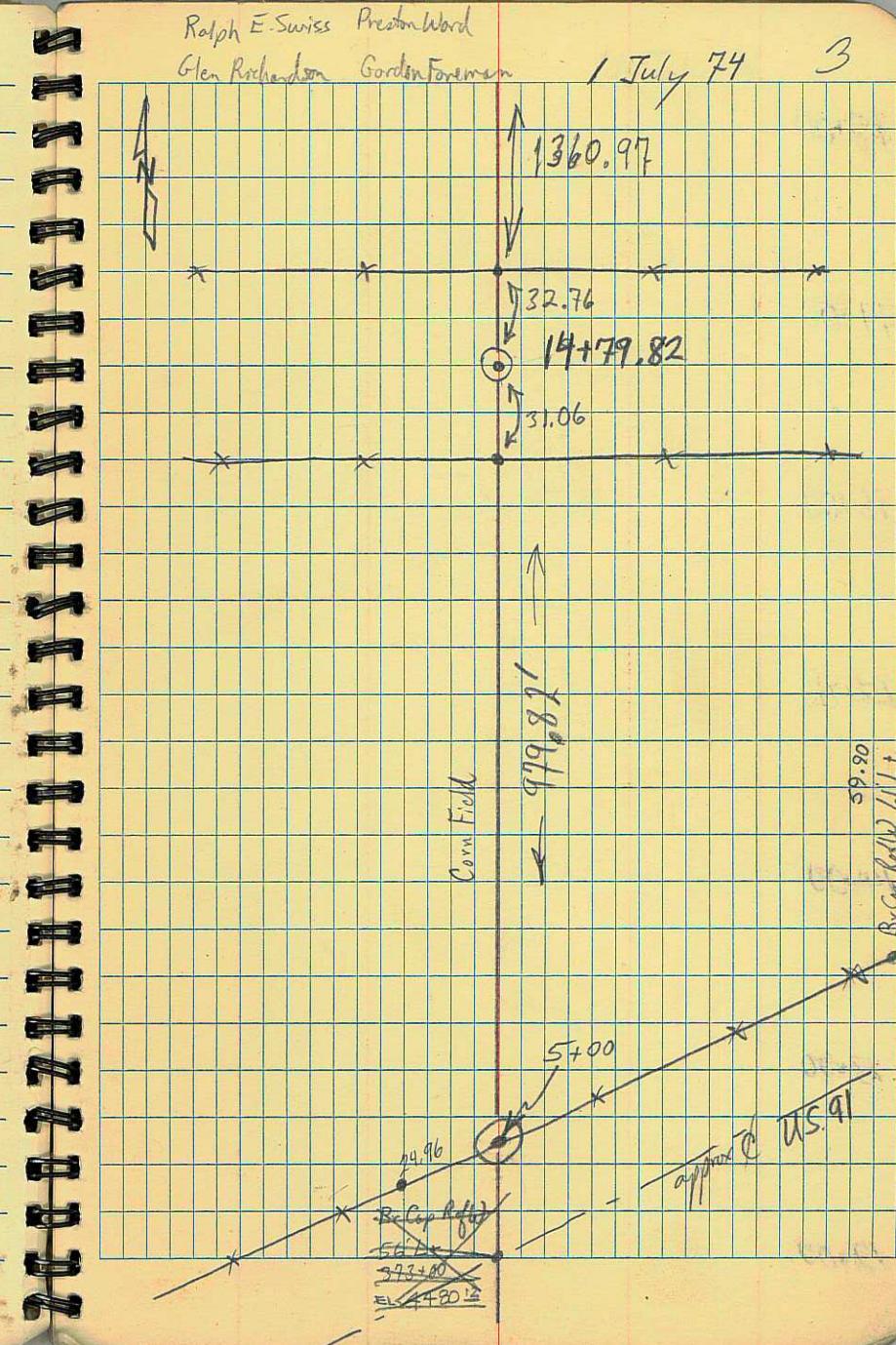
5+00

Ralph E Swiss Preston Ward

Glen Richardson Gordon Foreman

1 July 74

3



18+00

17+00

16+00

15+00

14+00

13+00

12+00

1 July 74 5

25+00

24+00

23+00

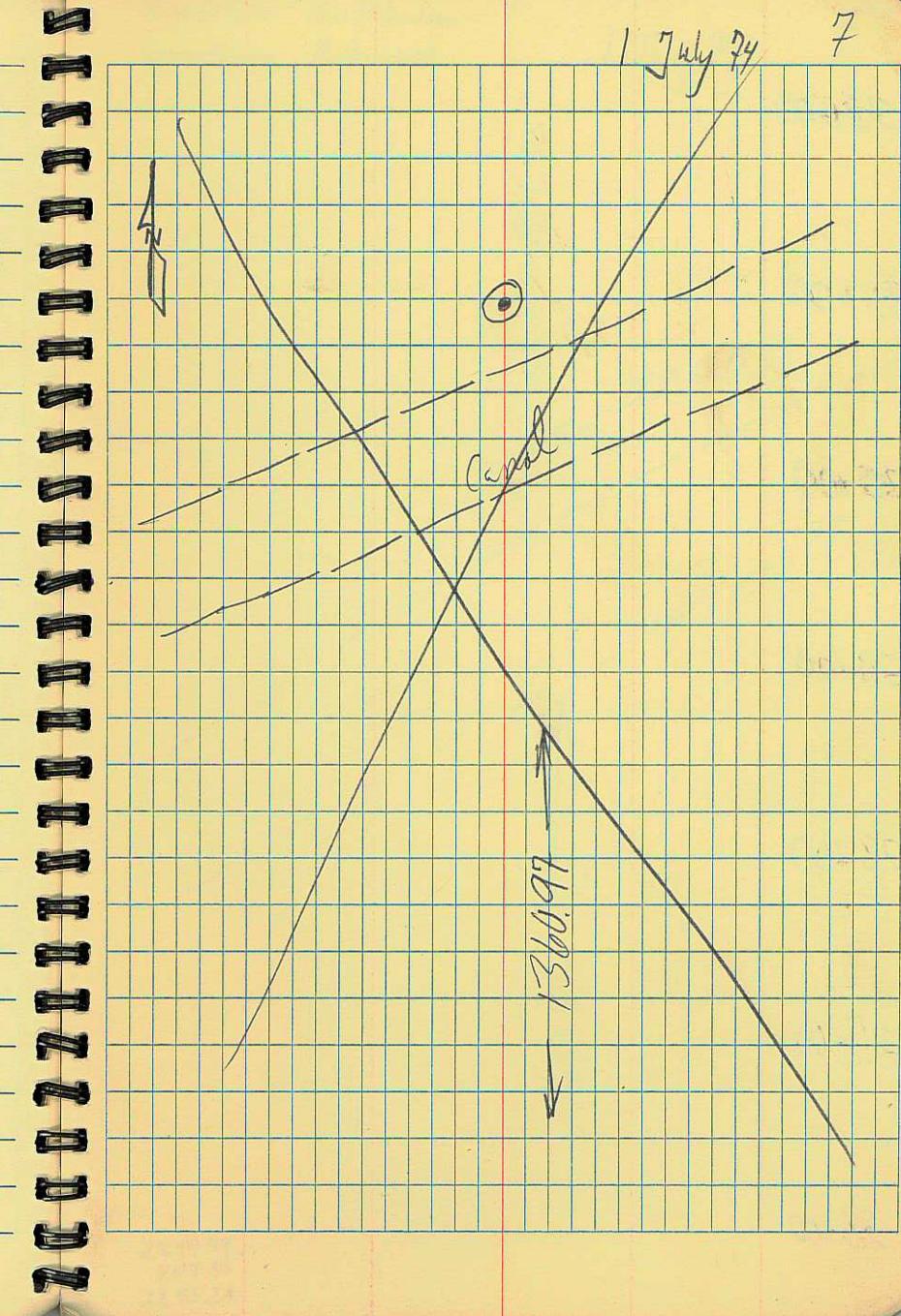
22+00

21+00

20+00

19+00

1 July 24 7



32+00

31+00

30+00

29+00

28+00

27+00

26+00

Ralph E Swiss Glen Richardson
Gordon Forman Preston Ward

1 July 74 9

804.55

28+40.79

1360.97

2840.79
804.55
3645.34

39+00

38+00

37+00

36+00

35+00

34+00

33+00

Ralph E. Swiss Glen Richardson
Preston Ward Gordon Foreman

1 July 74 11

Logan River

•X - 36+45.34 ✓

804.55

~~46+00~~

~~45+00~~

~~44+00~~

~~43+00~~

~~42+00~~

~~41+00~~

~~40+00~~

~~46 49 57 59 42 47 44~~

13

53+00

52+00

51+00

50+00

49+00

48+00

47+00

15

17

60+00

59+00

58+00

57+00

56+00

55+00

54+00

Ralph E Swiss Glenwood Richardson

Preston Ward Gordon Foreman

2nd South

10th West

2 July 74 19



Hub + Tack

Hub + Tack

R.P. Post Shiner

R.P. Post Shiner

14.8

21.7

20.00

O.P.
Road Shiner

qqq +1

R.P. Post Shiner

6th S
10th W

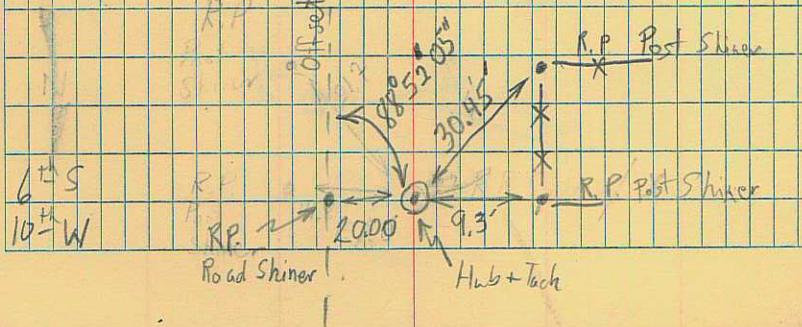
R.P.

20.00

9.3

Road Shiner

Hub + Tack



21

Road Shiner

20,000'

Hull Tack

2 July 74

Ralph E Smith

Glenwood Richardson

Preston Ward

Gordon Foreman

Z

OFF set

1401.56'

PT'

Road Head

Ralph E. Swiss | Preston Ward
Glennwood Richardson Garden Forum

327.71

327.32

404

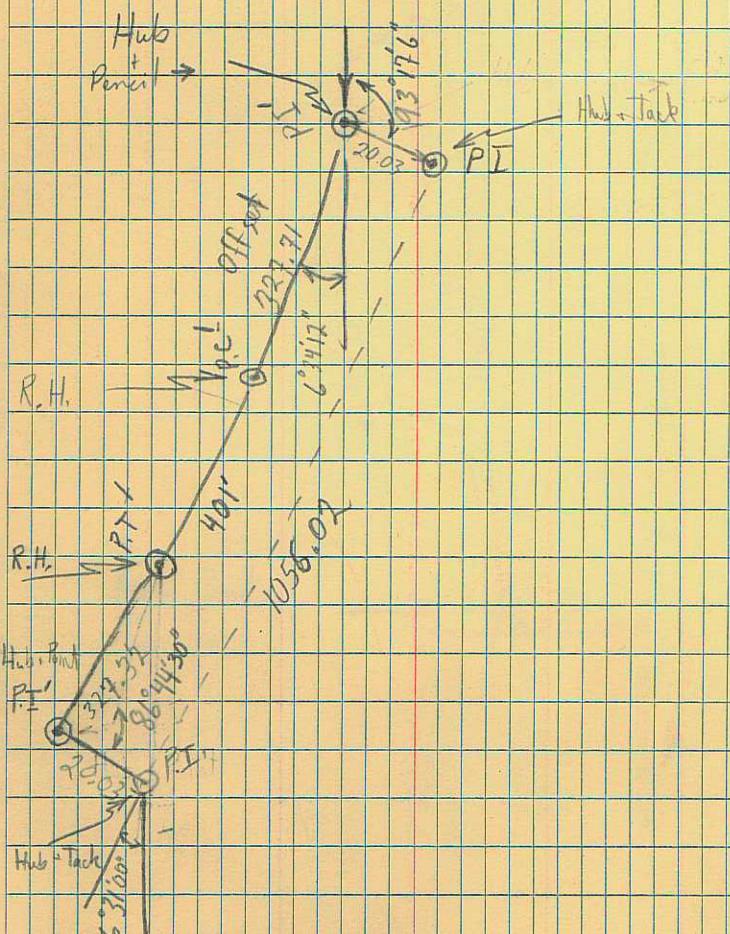
1056.03

1401.56

2 July 74

23

Read head



Ralph E. Swiss
Glenwood Richardson
Gordon P. Freeman
Preston B. Ward

PI

WS602

3 July 74

25

*Turned off $0^{\circ}55'15''$

P.I.
PC
Rod Head

$0^{\circ}41'00''$
133.89

Angle Point
Hub + Tack

55.02

10.55.98
.97
.96
.95
.94
.93
.92
.91
.90
.89

Ralph E. Swiss
Glenwood L. Richardson
Gordon P. Foreman
Preston D. Ward

1327.89 3 July 74 29

N

ST. 50+33.73 X

0°41'00"

H.T.

534.22'

2513'30"

ST. 44+79.51

H.T.

684.93

H.T.

Logan River

Ralph E. Swiss
Glenwood Richardson

Gordon H. Foreman
Preston B. Ward

3 July 74 31

684.33

37+95.18

Hole
Tie
Logan River

858.82

37+29.46

ST. 28+70.64

H+T

Canal

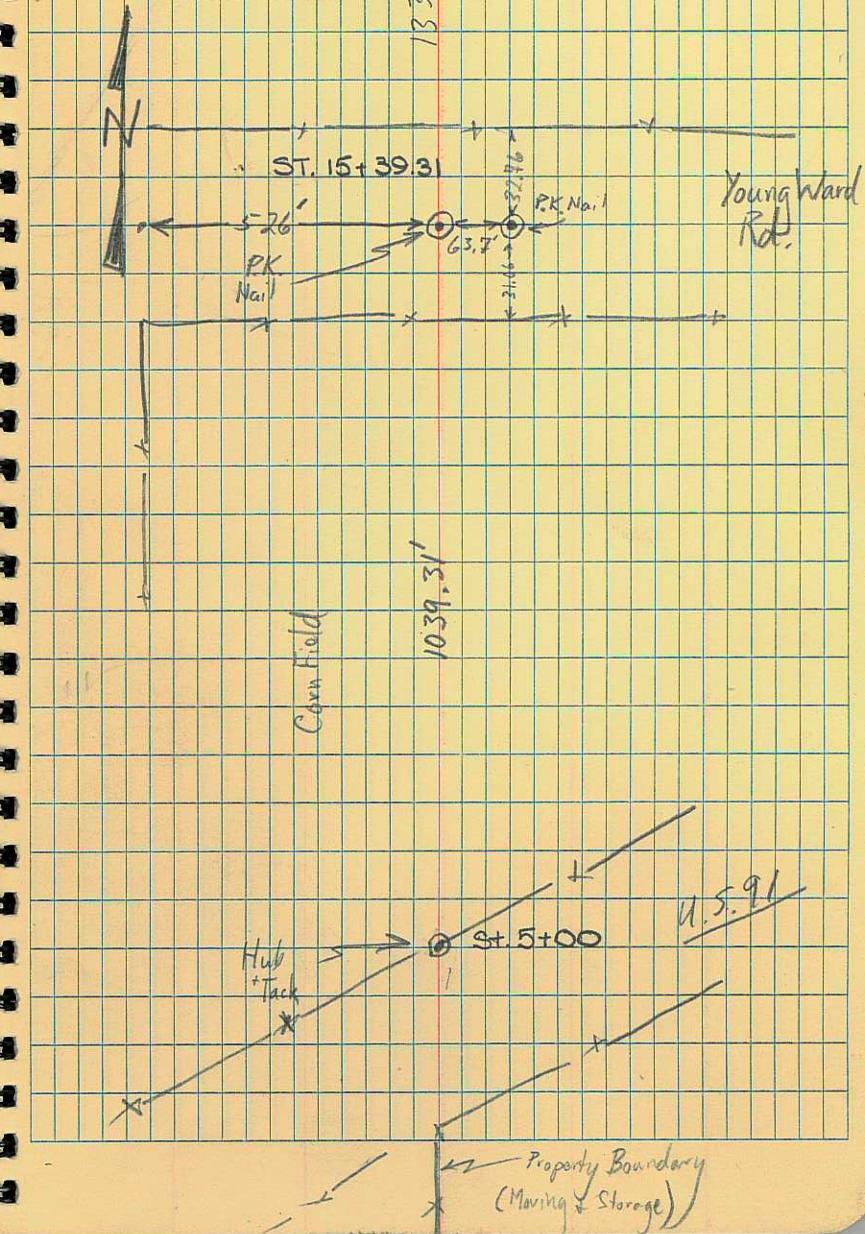
1331.33'

PK No. 1

Young Ward
Rd.

Ralph E. Swiss
Clearwood Richardson
Golden P. Foreman
Preston D. Ward

3 July 74 33



GLEN L RICHARDSON
PRESTON WARD
NEIL WILLIAMS

37

15+00

14

13

12

11

10+00

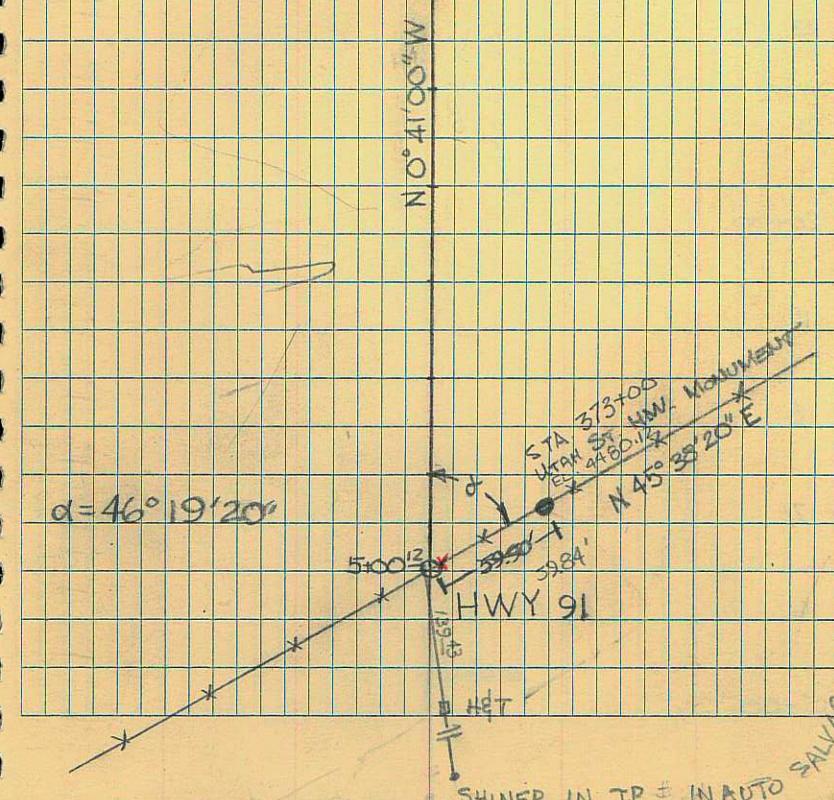
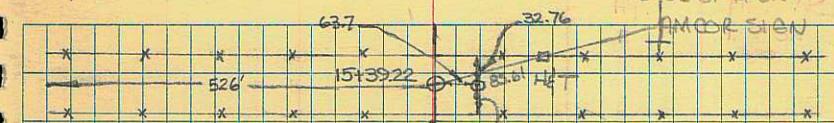
9

8

7

6

5+00



SHINER IN T.P. = IN AUTO SALVAGE YARD

26

25+00

24

23

22

21

20+00

19

18

17

16

15+00

N 0° 41' 00" W

15+39.22

37

36

35+00

34

33

32+

31

30+00

29

28

27+00

26 Cont

1
28+70 1.65
850 75
37+29 40

N 0° 41' 00" W

258.75

28+70.65

CANAL

48

X DIS.

47

42+00 EC 4° 08' 15" 288.18

46+00 EC 4° 30' 00" 288.21

45+50 2° 47' 02" 104.21

45+00 2° 04' 02" 144.91

44+50 1° 21' 02" 642.32

44+00 0° 38' 02" 44.1

43+70.30 100.75

43

42

41

40+00

39

38

37

N 7° 34' 20" E
600.0047.94 EDGE CANAL
47.80 EDGE CANAL

152

EC. 46+44.74

44.97

42.75

50

43.75

50

43.75

50

43.75

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43.75

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43.75

50

$$\Delta = 8^{\circ} 15' 20'' RT$$

$$R = 2000.00'$$

$$T = 144.34$$

$$L = 288.17$$

N 0° 41' 00" W

38+19.46 BRIDGE FOOTING

LOGAN RIVER

37+19.46 BRIDGE FOOTING

SIGHT ON NORTH EDGE OF
CIRCULAR STRUCTURE NEAR
THE SUGAR FACTORY64.51
64.29
64.00EXISTING REB 37+93.57
SHINER IN 12' WILLOW
EXISTING REB 37+29.46

61.10

4

DISTANCE

59

58

57

56

55+00

54

53

52+00 1° 37' 51" 227.52

51+50 1° 37' 51" 217.14

51+00 1° 37' 51" 187.76

50+50 1° 38' 51" 187.14

50+00 1° 38' 51" 187.41

49+50 1° 38' 51" 187.41

49+00 1° 38' 51" 187.41

48 6.21667

N 0° 22' 16" E

52+25.92 EC

50.15

49+74.55 EC

N 7° 36' 30" E

280.26

 $\Delta = \frac{1}{2} \times 125.85$
 $R = 1994.18$

T = 125.85

L = 251.37

70+00

69

68

67

66

65+00

64

63

62+72.39 BC

62

61

60+00

59

58

HGT

0° 42' 55"

$\Delta = 0^{\circ} 42' 55'' LT$

$X = 4474.42'$

$R = 4000.00'$

$T = 27.88$

$L = 55.75$

$L = 136.32$

$M = 167.00$

90°

$60^{\circ} 45'$

$60^{\circ} 30''$

$90^{\circ} 12' 30''$

$24'$

X

2047.34

89° 47' 10"

70+08.78 EC

PI

69+53.03 BC

64+53.22 EC

25.74

27.90

$11^{\circ} 50'$

63+07.52 BC

$\Delta = 29^{\circ} 05' 03'' LT$

$R = 4000.00'$

$T = 72.81'$

$L = 145.60'$

N 002 21.65'

81

80+00

79

78

77

76

75+00

74

73

72

71

70+00

EXISTING E 10th West

Garage 265 → 80+19.26

42.6 → 13.7
79+76
79+57

Silo 43 → 78+75

78+23
78+21

Trees

17² 14² 11² 9
0 0 0 0 42

Trees 0-40 76+19.5 Trees

0-0 42 75+09.50

0-0 75+64.11

LITTLE LOGAN RIVER

2² 5² 5² 6²
0 0 0 0 11
1' 1' 1' 1' 12'

N 139°29' W

Gara

21

22

23

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2220

2221

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22210

22211

22212

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2222219

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2222224

2222225

2222226

2222227

2222228

2222229

22222210

22222211

22222212

22222213

22222214

22222215

22222216

22222217

22222218

22222219

22222220

22

SOUTH ELEVATION

91

90

89

88

87

86

85+00

84

83

82

81

.09
90+28.32

600 SOUTH

HET

52-21
TO
POINT

X

N 1° 23' 30" E

11 11 81+32.74 11 11

SECTION CORNER TIES

T-WILLIAMS

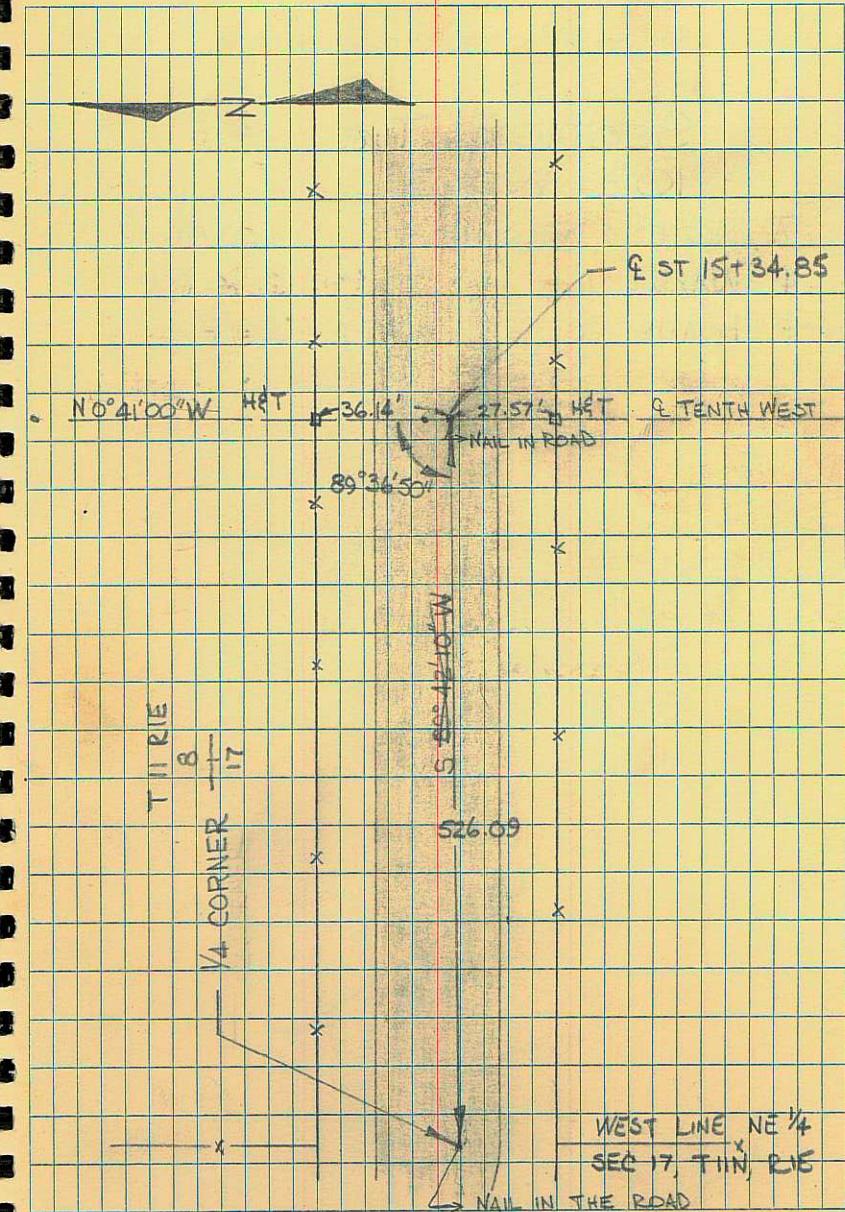
Φ-WARD

CHAIN-HOANH

DEC. 9, 1975

COLD-CLEAR

The section line was established by setting up on the corner of sections 8, 17, 7, & 18, TINN, AND RIE, and shooting through to an iron pipe on the corner of sections 9, 18, 8, & 17, TINN, RIE. The 1/4 CORNER BETWEEN SECTIONS 8 & 17 WAS SET BY INTERSECTING THE ABOVE LINE WITH A NORTH-SOUTH FENCE LINE RUNNING THROUGH THE CORNER.



SET ON PI 3, BACKSIGHT ON PI 4

SECTION TIE
10th WEST

T, NOTES: WILLIAMS

1/13/76

Φ WARD

2:30 PM

Φ HOANA

20°F

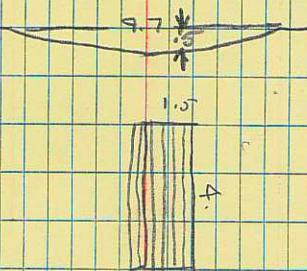
N
PI 4

116°08'10" 116°08'10"
PI 3 116°13'55" 116°13'55"
116°08'10" 116°08'10"
Rt. Prod. Corner

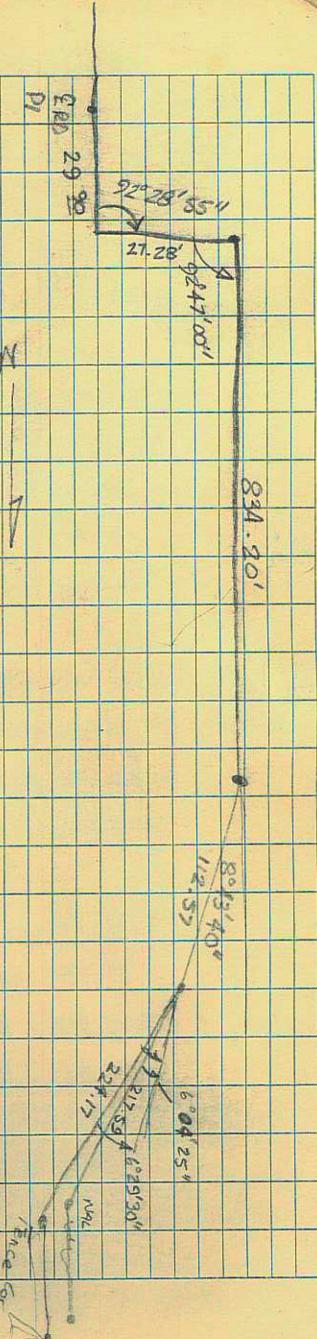
2.932.10'
89°45'00"
S? J? ?

119°51'20" 119°51'20"
150.5 150.5
90°30'20"

HIGHWAY 89 MEDIAN DETAIL



DANIEL'S PROPERTY



$$\begin{array}{r}
 28 70.64 \\
 15 39.31 \\
 + 15 39.33 \\
 \hline
 1331.33
 \end{array}
 \quad
 \begin{array}{r}
 37 + 26.46 \\
 28 + 70.64 \\
 \hline
 87 55.82
 \end{array}$$

1331.33

$$\begin{array}{r}
 62+72.02 \\
 107.74 \\
 \hline
 63+79.76 \\
 52 25.25 \\
 \hline
 1154.51 \\
 125.85 \\
 \hline
 1260.36
 \end{array}$$

$$45+02.12 \quad 43+26.20 \quad 5431.02$$

$$455.25 \quad 175.92 \quad 69+06.33$$

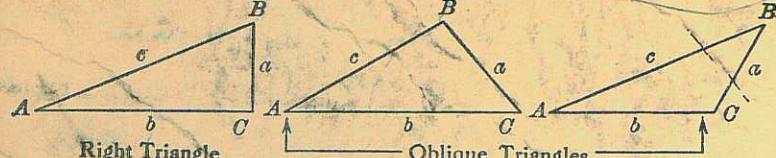
$$\begin{array}{l}
 41 \quad 171^{\circ}42'30'' \\
 \text{P1 TO P1} \\
 595.80' \\
 173^{\circ}34'60'' \\
 1280.65 \\
 \hline
 2711.43
 \end{array}$$

$$\begin{array}{l}
 1131.79 \quad \text{New to 6th} \\
 3936.05 \\
 \hline
 375.47 \quad \text{New to CITY LIMIT} \\
 8.2' \\
 100.9' \\
 1110.2' \\
 \hline
 1222.96 \quad 10th to LOGAN RIV
 \end{array}$$

$$\begin{array}{l}
 173^{\circ}47'00'' \quad 42 \\
 1280.60 \quad \text{PT to 10th S} \\
 1519.90 \quad 10th to top point
 \end{array}$$

771.42 PI TO S.B.

TRIGONOMETRIC FORMULAS



Solution of Right Triangles

For Angle A. $\sin = \frac{a}{c}$, $\cos = \frac{b}{c}$, $\tan = \frac{a}{b}$, $\cot = \frac{b}{a}$, $\sec = \frac{c}{b}$, $\cosec = \frac{c}{a}$

Given	Required
a, b	A, B, c

$$\tan A = \frac{a}{b} = \cot B, c = \sqrt{a^2 + b^2} = a \sqrt{1 + \frac{b^2}{a^2}}$$

a, c	A, B, b
--------	-----------

$$\sin A = \frac{a}{c} = \cos B, b = \sqrt{(c+a)(c-a)} = c \sqrt{1 - \frac{a^2}{c^2}}$$

A, a	B, b, c
--------	-----------

$$B=90^{\circ}-A, b = a \cot A, c = \frac{a}{\sin A}$$

A, b	B, a, c
--------	-----------

$$B=90^{\circ}-A, a = b \tan A, c = \frac{b}{\cos A}$$

A, c	B, a, b
--------	-----------

$$B=90^{\circ}-A, a = c \sin A, b = c \cos A$$

Solution of Oblique Triangles

Given	Required
A, B, a	b, c, C

$$b = \frac{a \sin B}{\sin A}, C = 180^{\circ}-(A+B), c = \frac{a \sin C}{\sin A}$$

A, a, b	B, c, C
-----------	-----------

$$\sin B = \frac{b \sin A}{a}, C = 180^{\circ}-(A+B), c = \frac{a \sin C}{\sin A}$$

a, b, C	A, B, c
-----------	-----------

$$A+B=180^{\circ}-C, \tan \frac{1}{2}(A-B) = \frac{(a-b) \tan \frac{1}{2}(A+B)}{a+b}, c = \frac{a \sin C}{\sin A}$$

a, b, c	A, B, C
-----------	-----------

$$s = \frac{a+b+c}{2}, \sin \frac{1}{2}A = \sqrt{\frac{(s-b)(s-c)}{bc}}, \sin \frac{1}{2}B = \sqrt{\frac{(s-a)(s-c)}{ac}}, C = 180^{\circ}-(A+B)$$

a, b, c	Area
-----------	------

$$s = \frac{a+b+c}{2}, \text{area} = \sqrt{s(s-a)(s-b)(s-c)}$$

A, b, c	Area
-----------	------

$$\text{area} = \frac{b c \sin A}{2}$$

A, B, C, a	Area
--------------	------

$$\text{area} = \frac{a^2 \sin B \sin C}{2 \sin A}$$

REDUCTION TO HORIZONTAL

Horizontal distance = Slope distance multiplied by the cosine of the vertical angle. Thus: slope distance = 319.4 ft. Vert. angle = $5^{\circ}10'$. Since $\cos 5^{\circ}10'=.9959$, horizontal distance = $319.4 \times .9959 = 318.09$ ft.

Horizontal distance also = Slope distance minus slope distance times $(1 - \cosine \text{ of vertical angle})$. With the same figures as in the preceding example, the following result is obtained. $\cosine 5^{\circ}10'=.9959$, $1 - .9959 = .0041$. $319.4 \times .0041 = 1.31$. $319.4 - 1.31 = 318.09$ ft.

When the rise is known, the horizontal distance is approximately the slope distance less the square of the rise divided by twice the slope distance. Thus: rise = 14 ft., slope distance = 302.6 ft. Horizontal distance = $302.6 - \frac{14 \times 14}{2 \times 302.6} = 302.6 - 0.32 = 302.28$ ft.

