

375



FIELD BOOK

No. 3851

BLACK HAWK COUNTY
ENGINEER'S OFFICE
COURT HOUSE
WATERLOO, IOWA

375

A

~~X-SECTIONS Co "H" From STA 385+00 To 450+00~~

~~X-SECTION Co. Rd "H" From STA 485+00 To 515+00~~

Page

Description

4-10 "X" Sections Co. Rd. "H" Sta 385+00 to 419+00

12-13 Co. Rd "H" N. WATERLOO AIRPORT
BENCH LEVELS N 32-90-13

15-16 ELK RUN CREEK N 34-89-12
PROP. BRIDGE REPLACEMENT SURVEY

17- TIES FOR CORNERS N $\frac{1}{4}$ COR 33-89-12
E NE COR 33-89-12

18 ROAD PROFILE N-34-89-12

25-27 PROFILE Co Rd "E" STA 440+00 to 461+00

29 PROFILE Co Rd "H" 1m. east of
Co Rd "E"

45-47 BORROW PIT NW COR 32-90-12

48-49 BORROW PIT SW 26-90-12

51-58 ELK RUN BRIDGE CROSS
SECTIONS.

59-61 STADIA ELK RUN BRIDGE

63-68 BENCH LEVELS N 22-89-12
ELK RUN

69-71 CROSS-SECTIONS N. OF N.E. 1/4 22-89-12

72-77 TOPOG N 1/4 COR. 22-89-12

X-SEC Co ROAD "H" STA 385+00 TO 450+00

7.81 1006.44 6.54 998.80

394+00

7.22 1005.34 1.45 998.12

393+00

~~7.22 1005.34 1.45 998.12~~

392+00

391+00

390+00

389+00

7.42 999.57 1.10 992.15

388+0

~~7.42 999.57 1.10 992.15~~

+45

R.O.P. 15" X 20' Field Ent. N.

387+00

386+00

385+00

B.M. 6.08 993.25

987.17

VALUES IN POWER POLE 50' S

$$\begin{array}{cccccccccccc} 15\frac{3}{4} & 13\frac{3}{4} & 12\frac{3}{4} & 13\frac{3}{4} & 13\frac{3}{4} & 13\frac{3}{4} & 5\frac{3}{4} & 11\frac{3}{4} & 5\frac{3}{4} & 6\frac{3}{4} & 11\frac{3}{4} & 10\frac{3}{4} & 9\frac{3}{4} & 7\frac{3}{4} \\ 100 & 50 & 32 & 30 & 25 & 15 & 11 & 5.4 & 11 & 17 & 26 & 34 & 54 & 100 \end{array}$$

$$- \frac{9\frac{3}{4}}{100} \frac{8\frac{3}{4}}{50} \frac{8\frac{3}{4}}{25} \frac{2\frac{3}{4}}{16} \frac{1\frac{3}{4}}{11} \frac{1\frac{3}{4}}{11} \frac{1\frac{3}{4}}{11} \frac{1\frac{3}{4}}{17} \frac{1\frac{3}{4}}{26} \frac{1\frac{3}{4}}{34} \frac{1\frac{3}{4}}{54} \frac{1\frac{3}{4}}{100}$$

$$- \frac{8\frac{3}{4}}{100} \frac{7\frac{3}{4}}{50} \frac{8\frac{3}{4}}{25} \frac{8\frac{3}{4}}{14} \frac{8\frac{3}{4}}{30} \frac{3\frac{3}{4}}{26} \frac{2\frac{3}{4}}{17} \frac{2\frac{3}{4}}{11} \frac{2\frac{3}{4}}{2.4} \frac{2\frac{3}{4}}{11} \frac{3\frac{3}{4}}{17} \frac{7\frac{3}{4}}{26} \frac{8\frac{3}{4}}{34} \frac{7\frac{3}{4}}{43} \frac{4\frac{3}{4}}{50} \frac{3\frac{3}{4}}{100}$$

$$\frac{7\frac{3}{4}}{100} \frac{6\frac{3}{4}}{50} \frac{2\frac{3}{4}}{25} \frac{8\frac{3}{4}}{14} \frac{8\frac{3}{4}}{30} \frac{1\frac{3}{4}}{26} \frac{1\frac{3}{4}}{18} \frac{1\frac{3}{4}}{11} \frac{3\frac{3}{4}}{3.5} \frac{3\frac{3}{4}}{11} \frac{4\frac{3}{4}}{17} \frac{8\frac{3}{4}}{26} \frac{9\frac{3}{4}}{34} \frac{7\frac{3}{4}}{43} \frac{5\frac{3}{4}}{50} \frac{5\frac{3}{4}}{100}$$

$$\frac{7\frac{3}{4}}{100} \frac{7\frac{3}{4}}{50} \frac{9\frac{3}{4}}{25} \frac{10\frac{3}{4}}{14} \frac{10\frac{3}{4}}{30} \frac{5\frac{3}{4}}{26} \frac{5\frac{3}{4}}{18} \frac{5\frac{3}{4}}{11} \frac{4\frac{3}{4}}{4.8} \frac{5\frac{3}{4}}{11} \frac{5\frac{3}{4}}{18} \frac{9\frac{3}{4}}{26} \frac{9\frac{3}{4}}{34} \frac{7\frac{3}{4}}{43} \frac{6\frac{3}{4}}{50} \frac{6\frac{3}{4}}{100}$$

$$\frac{9\frac{3}{4}}{100} \frac{9\frac{3}{4}}{50} \frac{10\frac{3}{4}}{25} \frac{11\frac{3}{4}}{14} \frac{10\frac{3}{4}}{30} \frac{7\frac{3}{4}}{26} \frac{6\frac{3}{4}}{18} \frac{1\frac{3}{4}}{11} \frac{1\frac{3}{4}}{6.0} \frac{6\frac{3}{4}}{11} \frac{7\frac{3}{4}}{18} \frac{10\frac{3}{4}}{26} \frac{10\frac{3}{4}}{35} \frac{10\frac{3}{4}}{42} \frac{8\frac{3}{4}}{50} \frac{7\frac{3}{4}}{100}$$

$$\frac{5\frac{3}{4}}{100} \frac{4\frac{3}{4}}{50} \frac{5\frac{3}{4}}{25} \frac{6\frac{3}{4}}{14} \frac{6\frac{3}{4}}{30} \frac{2\frac{3}{4}}{26} \frac{1\frac{3}{4}}{18} \frac{1\frac{3}{4}}{11} \frac{1\frac{3}{4}}{1.0} \frac{1\frac{3}{4}}{11} \frac{1\frac{3}{4}}{18} \frac{5\frac{3}{4}}{26} \frac{5\frac{3}{4}}{35} \frac{4\frac{3}{4}}{45} \frac{3\frac{3}{4}}{50} \frac{1\frac{3}{4}}{100}$$

$$\frac{6\frac{3}{4}}{100} \frac{4\frac{3}{4}}{50} \frac{6\frac{3}{4}}{25} \frac{7\frac{3}{4}}{14} \frac{7\frac{3}{4}}{30} \frac{3\frac{3}{4}}{26} \frac{2\frac{3}{4}}{19} \frac{2\frac{3}{4}}{11} \frac{2\frac{3}{4}}{2.4} \frac{2\frac{3}{4}}{11} \frac{3\frac{3}{4}}{18} \frac{6\frac{3}{4}}{25} \frac{7\frac{3}{4}}{35} \frac{6\frac{3}{4}}{37} \frac{4\frac{3}{4}}{45} \frac{2\frac{3}{4}}{50} \frac{2\frac{3}{4}}{100}$$

$$\frac{7\frac{3}{4}}{100} \frac{7\frac{3}{4}}{50} \frac{8\frac{3}{4}}{25} \frac{8\frac{3}{4}}{14} \frac{8\frac{3}{4}}{30} \frac{8\frac{3}{4}}{26} \frac{4\frac{3}{4}}{18} \frac{4\frac{3}{4}}{11} \frac{4\frac{3}{4}}{1.0} \frac{3\frac{3}{4}}{11} \frac{4\frac{3}{4}}{18} \frac{7\frac{3}{4}}{26} \frac{7\frac{3}{4}}{35} \frac{5\frac{3}{4}}{45} \frac{4\frac{3}{4}}{50} \frac{4\frac{3}{4}}{100}$$

$$\frac{9\frac{3}{4}}{100} \frac{8\frac{3}{4}}{50} \frac{9\frac{3}{4}}{25} \frac{9\frac{3}{4}}{14} \frac{9\frac{3}{4}}{30} \frac{5\frac{3}{4}}{26} \frac{4\frac{3}{4}}{18} \frac{4\frac{3}{4}}{11} \frac{4\frac{3}{4}}{1.0} \frac{4\frac{3}{4}}{11} \frac{5\frac{3}{4}}{18} \frac{9\frac{3}{4}}{26} \frac{8\frac{3}{4}}{35} \frac{6\frac{3}{4}}{40} \frac{5\frac{3}{4}}{50} \frac{5\frac{3}{4}}{100}$$

(X) IN HdW Old HdW S. 382

+25 shoulder

+20 toe of Fourslope

52

+15 toe of Backslope

397+04 Top of Backslope

2.95 1005.33 4.26 1002.38

24

~~396+65 2.95 1005.33 4.26 1002.38~~

396+00

395+00

1006.64

$$\frac{90}{200} \frac{40}{100} \frac{40}{34} \frac{32}{11}$$

$$\frac{141}{200} \frac{85}{100} \frac{20}{46} \frac{30}{30} \frac{36}{17} \frac{33}{11} \frac{32}{11} \frac{36}{50} \frac{32}{100} \frac{32}{200}$$

$$\frac{143}{200} \frac{92}{100} \frac{22}{46} \frac{36}{17} \frac{33}{11} \frac{32}{11} \frac{29}{11} \frac{35}{38} \frac{43}{53} \frac{40}{100} \frac{18}{125}$$

$$\frac{30}{11} \frac{29}{30} \frac{35}{43} \frac{46}{100} \frac{36}{175}$$

$$\frac{82}{160} \frac{65}{140} \frac{98}{130}$$

$$\frac{107}{118} \frac{93}{100} \frac{29}{74} \frac{53}{32} \frac{52}{43} \frac{36}{17} \frac{33}{11} \frac{29}{11} \frac{28}{11} \frac{31}{22} \frac{42}{38} \frac{40}{38} \frac{-13}{50} \frac{-03}{100}$$

$$\frac{72}{102} \frac{62}{93} \frac{-12}{100}$$

$$\frac{102}{77} \frac{83}{31} \frac{89}{29} \frac{82}{25} \frac{50}{17} \frac{42}{11} \frac{42}{11} \frac{43}{11} \frac{42}{19} \frac{73}{27} \frac{70}{33} \frac{-00}{80}$$

$$\frac{72}{50} \frac{102}{100}$$

RT

LT

$$\frac{03}{94} \frac{22}{48} \frac{28}{34} \frac{92}{30} \frac{50}{17} \frac{44}{11} \frac{44}{11} \frac{48}{11} \frac{55}{14} \frac{101}{25} \frac{103}{31} \frac{94}{33} \frac{92}{42}$$

$$\frac{113}{100} \frac{124}{50} \frac{119}{32} \frac{128}{27} \frac{62}{17} \frac{52}{14} \frac{54}{11} \frac{67}{14} \frac{104}{26} \frac{160}{41} \frac{86}{48} \frac{56}{100}$$

399400

398400

BM 5.20 999.91 10.62 999.71

+70 Top of BACK slope

+64 TOE BACK slope

+56 TOE OF FOUR SLOPE

+48 shoulder

+36.1 Q

1005.33

6

$\frac{72}{16} \frac{72}{51} \frac{82}{100}$

$\frac{72}{95} \frac{92}{39} \frac{92}{29} \frac{92}{25} \frac{52}{16} \frac{42}{11} \frac{42}{32} \frac{42}{11} \frac{52}{17} \frac{102}{27} \frac{102}{32} \frac{92}{33} \frac{92}{72}$
House

$\frac{12}{100}$

$\frac{12}{100} \frac{12}{79} \frac{32}{31} \frac{32}{24} \frac{12}{11} \frac{02}{11} \frac{02}{01} \frac{02}{11} \frac{08}{19} \frac{42}{28} \frac{42}{32} \frac{32}{36} \frac{32}{43} \frac{12}{51}$

Spike in Power Pole LT STA 399±

$\frac{52}{100} \frac{45}{80} \frac{61}{72} \frac{60}{29} \frac{18}{22} \frac{42}{11} \frac{01.0}{43} \frac{42}{11} \frac{42}{21} \frac{72}{28} \frac{50}{67} \frac{32}{100}$

$\frac{142}{200} \frac{82}{100} \frac{54}{36} \frac{48}{37} \frac{43}{11} \frac{01.3}{72} \frac{42}{11} \frac{42}{22} \frac{24}{28} \frac{52}{100} \frac{24}{200}$

$\frac{142}{200} \frac{84}{100} \frac{54}{75} \frac{42}{34} \frac{42}{11} \frac{01.4}{32} \frac{38}{11} \frac{41}{29} \frac{41}{38} \frac{50}{17} \frac{42}{100} \frac{72}{200}$

$\frac{94}{200} \frac{58}{100} \frac{40}{40} \frac{38}{11} \frac{01.6}{32} \frac{32}{11} \frac{38}{50} \frac{34}{100} \frac{35}{200}$

$\frac{132}{300} \frac{84}{200} \frac{42}{100} \frac{32}{30} \frac{01.9}{34} \frac{34}{11} \frac{34}{50} \frac{25}{100} \frac{22}{200} \frac{51}{300} \frac{84}{400} \frac{112}{500}$

404+00 ~~0.80~~ 978.89 9.10 978.09

0.80 978.89 9.10 978.09

403+00

402+00

401+00 ~~0.36~~ 987.19 13.08 986.83

0.36 987.19 13.08 986.83

400+00

+20 Entrance P.R. 36' X 15" RCP +20

999.91

1° 0°
50 100

7

$\frac{6^1}{100} \frac{4^2}{50} \frac{5^3}{36} \frac{5^8}{33} \frac{5^8}{27} \frac{1^2}{18} \frac{0^8}{11} \frac{0^3}{0^6} \frac{0^8}{11} \frac{1^4}{18} \frac{6^1}{28} \frac{6^2}{31} \frac{6^1}{34} \frac{5^2}{36} \frac{5^2}{43}$

$\frac{7^2}{100}$

$\frac{12^1}{100} \frac{10^8}{50} \frac{11^1}{36} \frac{11^8}{33} \frac{11^8}{27} \frac{7^4}{17} \frac{6^2}{11} \frac{6^2}{6^5} \frac{6^8}{11} \frac{7^2}{19} \frac{11^2}{27} \frac{13^0}{34} \frac{11^1}{34} \frac{10^3}{43} \frac{7^2}{50}$

$\frac{8^0}{43} \frac{6^2}{43} \frac{6^1}{100}$

$\frac{10^1}{100} \frac{8^6}{50} \frac{9^1}{36} \frac{9^3}{27} \frac{4^7}{16} \frac{9^8}{11} \frac{3^4}{3^4} \frac{3^2}{11} \frac{4^3}{16} \frac{9^4}{28} \frac{10^2}{31} \frac{9^8}{33} \frac{0^1}{33}$

$\frac{3^0}{50} \frac{4^2}{100}$

$\frac{5^4}{100} \frac{5^2}{37} \frac{6^4}{37} \frac{5^2}{25} \frac{1^2}{16} \frac{0^1}{11} \frac{0^2}{0^2} \frac{0^0}{11} \frac{1^2}{16} \frac{6^2}{26} \frac{6^4}{39} \frac{5^8}{37} \frac{5^2}{45}$

$\frac{13^3}{50} \frac{13^2}{100}$

$\frac{14^1}{100} \frac{14^1}{48} \frac{15^3}{32} \frac{14^8}{26} \frac{9^3}{16} \frac{8^4}{11} \frac{9^6}{8^3} \frac{8^4}{11} \frac{9^1}{16} \frac{14^4}{26} \frac{15^1}{33} \frac{14^2}{36} \frac{14^0}{46}$

410+00

409+00

408+00

2.52 973.87 7.54 971.35
~~407+00 2.52 973.87 7.54 971.35~~

406+00

405+00

978.89

 $\frac{12^2}{100}$

$\frac{8^2}{50} \frac{10^2}{42} \frac{11^2}{36} \frac{11^2}{39} \frac{11^2}{36} \frac{7^2}{18} \frac{6^2}{11} \frac{6^2}{5} \frac{6^2}{11} \frac{7^2}{18} \frac{10^2}{24} \frac{11^2}{31} \frac{10^2}{34} \frac{3^2}{58} \frac{3^2}{100}$

$\frac{13^2}{100} \frac{9^2}{50} \frac{10^2}{36} \frac{11^2}{32} \frac{10^2}{27} \frac{5^2}{17} \frac{5^2}{11} \frac{4^2}{12} \frac{4^2}{11} \frac{5^2}{18} \frac{9^2}{25} \frac{8^2}{34} \frac{8^2}{36} \frac{9^2}{50} \frac{4^2}{100}$

$\frac{12^2}{100} \frac{11^2}{50} \frac{11^2}{31} \frac{11^2}{27} \frac{5^2}{17} \frac{3^2}{11} \frac{70.5}{31} \frac{3^2}{11} \frac{4^2}{18} \frac{8^2}{27} \frac{8^2}{33} \frac{7^2}{36} \frac{7^2}{50} \frac{6^2}{100}$

$\frac{14^2}{100} \frac{13^2}{50} \frac{13^2}{35} \frac{14^2}{34} \frac{14^2}{28} \frac{8^2}{16} \frac{2^2}{11} \frac{71.7}{7^2} \frac{7^2}{11} \frac{8^2}{17} \frac{12^2}{24} \frac{12^2}{31} \frac{11^2}{36} \frac{11^2}{50} \frac{10^2}{100}$

 $\frac{8^2}{50} \frac{2^2}{100}$

$\frac{12^2}{100} \frac{10^2}{50} \frac{10^2}{34} \frac{11^2}{32} \frac{11^2}{27} \frac{6^2}{17} \frac{5^2}{11} \frac{13.6}{5^2} \frac{5^2}{11} \frac{6^2}{17} \frac{10^2}{28} \frac{10^2}{32} \frac{9^2}{36} \frac{9^2}{75}$

 $\frac{3^2}{100}$

$\frac{8^2}{100} \frac{6^2}{50} \frac{7^2}{35} \frac{8^2}{32} \frac{8^2}{24} \frac{1^2}{17} \frac{3^2}{11} \frac{76.0}{2^2} \frac{3^2}{11} \frac{4^2}{20} \frac{2^2}{27} \frac{8^2}{31} \frac{7^2}{35} \frac{7^2}{42} \frac{4^2}{50}$

~~715+00 1.25 950.63 12.30 949.38~~

1.25 950.63 12.30 949.38

714+00

713+00

~~712+00 0.47 961.68 12.66 961.21~~

0.47 961.68 12.66 961.21

6" TILE

711+00

973.87

$$\frac{2^3}{100}$$

$$\frac{7^3}{100} \frac{6^2}{50} \frac{7^3}{35} \frac{8^2}{33} \frac{8^1}{27} \frac{2^0}{17} \frac{1^2}{11} \frac{49.7}{0^2} \frac{1^2}{11} \frac{1^8}{16} \frac{5^2}{27} \frac{5^5}{39} \frac{4^2}{35} \frac{4^1}{50}$$

$$\frac{8^4}{50} \frac{6^2}{100}$$

$$\frac{14^2}{100} \frac{13^3}{50} \frac{13^5}{45} \frac{15^3}{33} \frac{15^2}{27} \frac{9^5}{17} \frac{8^1}{11} \frac{53.3}{8^1} \frac{8^4}{11} \frac{9^3}{17} \frac{13^7}{26} \frac{14^7}{31} \frac{13^7}{34} \frac{13^0}{36}$$

$$\frac{10^0}{100} \frac{1^2}{100}$$

$$\frac{7^4}{50} \frac{8^8}{43} \frac{9^4}{34} \frac{10^2}{31} \frac{10^0}{26} \frac{5^2}{17} \frac{1^8}{11} \frac{51.3}{4^1} \frac{4^2}{11} \frac{5^4}{17} \frac{10^1}{28} \frac{11^5}{29} \frac{10^0}{36} \frac{8^2}{37} \frac{2^2}{50}$$

$$\frac{3^4}{36} - \frac{4^1}{50} - \frac{7^2}{100}$$

$$\frac{4^6}{100} \frac{1^5}{50} \frac{3^2}{42} \frac{4^7}{35} \frac{6^0}{31} \frac{5^0}{26} \frac{1^2}{17} \frac{0^5}{11} \frac{61.4}{0^3} \frac{0^2}{11} \frac{1^3}{17} \frac{5^2}{26} \frac{8^2}{28} \frac{8^0}{30} \frac{5^7}{32} \frac{4^2}{35}$$

FL 12" outlet South Foreclops

$$\frac{12^8}{100} \frac{9^6}{50} \frac{12^3}{41} \frac{12^0}{35} \frac{14}{32} \frac{13^3}{26} \frac{10^1}{17} \frac{9^3}{11} \frac{64.9}{9^0} \frac{9^2}{11} \frac{10^3}{20} \frac{14^2}{28} \frac{13^7}{39} \frac{12^1}{36} \frac{5^7}{50} \frac{6^1}{100}$$

419+00

$$\begin{array}{cccccccccccccccc} 10' & 10' & 10' & 10' & 11' & 2' & 5' & 46.0 & 6' & 6' & 12' & 12' & 11' & 11' & 12' \\ 100 & 50 & 41 & 32 & 27 & 17 & 11 & 5 & 11 & 12 & 27 & 34 & 36 & 50 & 100 \end{array}$$

418+00

$$\begin{array}{cccccccccccccccc} 10' & 10' & 11' & 11' & 6' & 5' & 45.4 & 5' & 6' & 11' & 11' & 10' & 11' & 11' \\ 100 & 50 & 41 & 37 & 16 & 11 & 5 & 11 & 18 & 28 & 34 & 36 & 50 & 100 \end{array}$$

BM

7.40 913.23 942.92

South Hdw Culvert STA 417+49

417+00

$$\begin{array}{cccccccccccccccc} 10' & 10' & 10' & 12' & 11' & 5' & 47 & 46.2 & 4' & 5' & 10' & 11' & 9' & 8' & 8' \\ 100 & 18 & 42 & 50 & 26 & 13 & 11 & 4 & 11 & 16 & 26 & 32 & 53 & 50 & 100 \end{array}$$

416+00

$$\begin{array}{cccccccccccccccc} 9' & 9' & 10' & 9' & 3' & 3' & 41.3 & 3' & 4' & 8' & 8' & 8' & 7' & 7' \\ 100 & 50 & 37 & 16 & 11 & 3 & 11 & 17 & 23 & 34 & 36 & 51 & 100 \end{array}$$

950.63

BENCH LEVELS N. Sec. 32-90-13

SHOFF T^M
McCord \$

12

+ 37.47 - 29.62 + 7.85

BM

3.21 883.00 882.79

2.18 884.12 °

9.29 886.30 0.03 877.01

4.84 877.04 6.43 872.20

4.15 878.43 6.28 874.48

3.45 880.76 4.75 877.31

7.30 882.06 3.38 874.76

4.14 878.14 5.54 874.00

BM

4.30 879.54 875.24 875.24

BRICE & PETRIE BM
COUN BM

24" MAPLE TREE 120' N. of NE Cor 31-90-13
(EAST SIDE of ROAD 30')

+

41

-

51

BENCH LEVELS (CONT.)

+ 36.88

- 29.06

7.82

9.95

BM

4.51 884.16

5.69 888.73 0.54 883.04

10.28 883.58 3.65 873.30

4.44 876.95 5.89 872.51

4.24 878.40 5.68 874.16

3.14 879.84 5.75 876.70

5.83 882.45 2.32 876.62

5.07 878.94 5.23 873.89

BM

3.88 879.12 875.24 875.24

COUN. BM

BRICE'S PET. BM

BS

HI

FS

Elev.

ELK RUN CREEK

STADIA SURVEY of PROP. BRIDGE
REPLACEMENT APPROX. 0.45 MI EAST
OF THE N.W. COR. SEC. 34-89-12

EXISTING BRIDGE:

- (1) WIDTH - (BETWEEN RAILING) 15.7'
- (2) LENGTH - (SINGLE SPAN) 80.0'
- (3) LOW TRUSS STEEL I BEAM
- (4) CONC. FLOOR, ABUTS., & WINGS
- (5) DIST. SURFACE of ROAD & to
BOTTOM OF STREAM 12.0'
- (6) BOTTOM OF BEAM to # 9.8'

NE ABUTMENT CRACKED

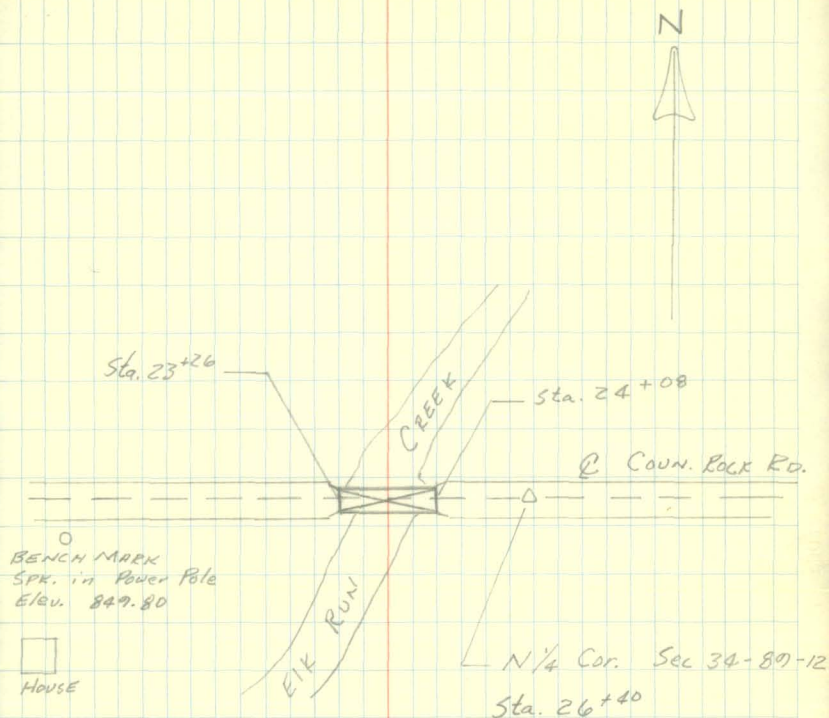
D.A. = 23,460 Ac. (office info.)

Hi WATER Elev. = 850.55'

EXIST. BRIDGE FLOOR Elev. = 851.00'

SHOFF
McCord

15



BENCH LEVELS

NW COR 34-89-12, EAST 0.45 MI.

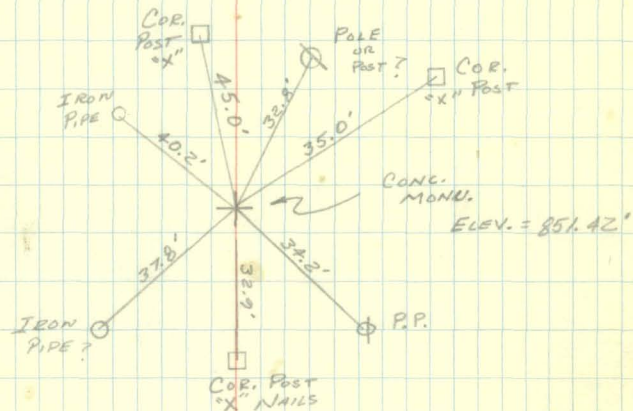
Hi WATER			4.50	850.55	
TBM #1	5.25	855.05		849.80	
BM #1			1.69	857.21	857.20
	7.08	858.90	4.20	851.82	
	5.36	856.02	4.24	850.66	
TBM #1	5.10	854.90		849.80	849.80
TBM #1			5.45	849.80	849.80
	4.82	855.25	5.59	850.43	
	4.21	856.02	7.15	851.81	
BM #1	1.76	858.96		857.20	857.20

SPK. in Power Pole - 33' Rt. Sta. 18+60

T 89 N, R 12 W, INTERSECTION of Sec.
27, 28, 33, & 34; 19' N. - 16' W. -
"D" ON CONC. CULVERT

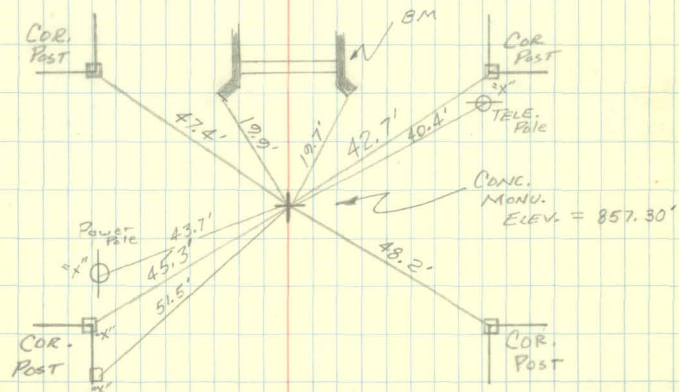
COR. TIES

SEC. 34-89-12

N $\frac{1}{4}$ COR.

SEC. 33-89-12

N.E. COR.



ROAD PROFILE N 34-89-12

STA.

23+0		3.50		
22+0		5.20		
21+0		5.50		
20+0		4.50		
19+0		3.80		
18+0		3.90		
17+0		3.85		
16+0		3.40		
15+0		3.45		
14+0		3.35	850.60	
TBM #1	4.15	853.95	849.80	849.80

SHOFF
McCord

E

18

850.45

848.75

848.45

849.45

850.15

850.05

850.10

850.55

850.5

850.6

SPK in Power Pole Rt. 33' Sta. 18+60

C

32 ⁺⁰			4.6	
31 ⁺⁰			4.85	
30 ⁺⁰			5.15	
29 ⁺⁰			5.05	
28 ⁺⁰			4.95	
27 ⁺⁰			4.9	
T.P.	5.12	857.28	1.79	852.16
26 ⁺⁰			1.8	
25 ⁺⁰			2.7	
24 ⁺⁰			2.25	
TOP WATER			13.3	840.65
TBM#2			3.28	850.67

853.95

852.7
852.43
852.13
852.23
852.33
852.4
Sta. 26 ⁺⁰ & Nail
852.15
851.25
Sta. 24 ⁺⁰ (BRIDGE Floor) 851.00

TOP of ICE (ELEV. for CREEK PROFILE)

X" END S.W. WING WALL BRIDGE

STA.

E

35+0

4.55

852.73

34+0

4.5

852.8

33+0

4.5

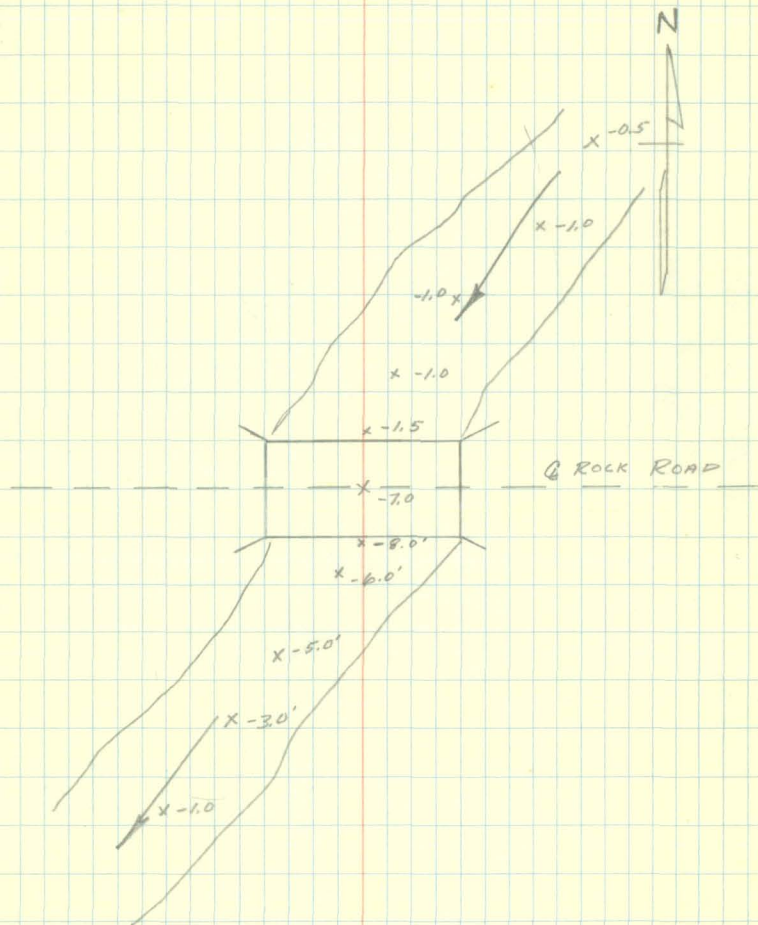
852.8

857.28

EIK RUN CREEK PROFILE & STEAM

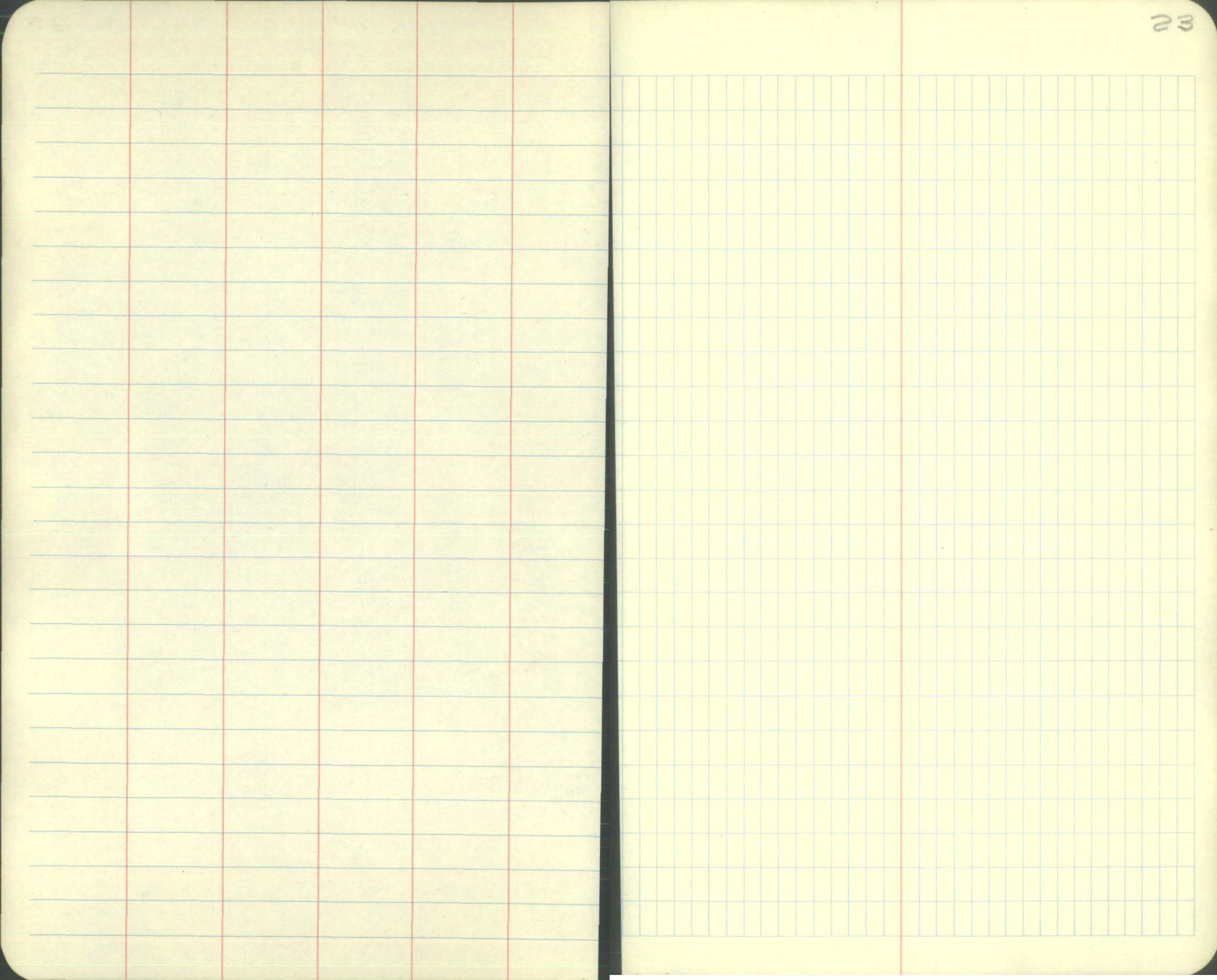
21

200'	840.1
100'	839.5
50'	839.5
25'	839.5
Edge of Bridge	839.1
℄ ℄	833.5
Edge of Bridge	832.5
25'	834.5
50'	835.5
DNST.	
100'	
DOWNSTR.	837.6
200'	
DOWNSTREAM	839.6



TOP WATER 13.3 840.65
TBM #1 4.15 853.95 849.80

TOP WATER Elev.
SPK. in PP Rt. 33' Sta. 18+60



PROFILE ON Co. RD. "E"
STA. 440+0 to 461+0

SHOFF A V
McCord \$

25

447+0 0.25

948.38

448+0 2.25

946.38

447+0 3.85

944.78

446+0 4.80

943.83

445+0 5.25

943.38

444+0 5.45

943.18

443+0 5.40

943.23

442+0 5.50

943.13

441+0 5.60

943.03

440+0 5.90

942.73

TP 1.01 948.63 11.02 947.62

TP 9.37 958.64 0.19 949.27

BM#1 7.28 949.46 942.18

Q

BM #1	4.88	942.16	942.18
-------	------	--------	--------

458 ⁺⁰	5.80		
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457 ⁺⁰	4.60		
-------------------	------	--	--

TP	3.40	947.04	14.53	943.64
----	------	--------	-------	--------

456 ⁺⁰	13.50		
-------------------	-------	--	--

455 ⁺⁰	10.35		
-------------------	-------	--	--

454 ⁺⁰	7.10		
-------------------	------	--	--

453 ⁺⁰	4.75		
-------------------	------	--	--

452 ⁺⁰	4.25		
-------------------	------	--	--

451 ⁺⁰	5.30		
-------------------	------	--	--

450 ⁺⁰	7.30		
-------------------	------	--	--

TP	9.91	958.17	0.37	948.26
----	------	--------	------	--------

		948.63	
--	--	--------	--

Q

941.24

942.44

944.67

947.82

951.07

953.42

953.02

952.87

950.87

Q

461⁺⁰

5.9

460⁺⁰

6.3

459⁺⁰

6.4

947.04

E

941.14

940.74

940.64

E

B.M.

128

B.M.^{#2}

4.52 959.16

SPIKE IN POWER POLE 50' NORTH
STA 485±

TBM 1.49 963.68 5.55 962.19

TBM 9.27 967.79 1.06 958.47

TBM 3.31 959.53 2.54 956.22

B.M.^{#1} 1.78^{#1} 969.76 ~~2.54~~ 956.22 / 961.9 TOP REF. PIN S.E. INTERSECTION

PROFILE ON COUNTY RD. "H"

486

485

BM #2

484

483

482

TP

481

480

479

BM #2

1.16

959.15

959.16

11.57

960.31

0.36

948.74

3.72

949.10

14.04

945.38

0.26

959.42

959.16

959.16

FEB. '69
COLD WINDY

Row Lt.

58.1
2.2

58.8
1.5

53.8
6.5

44.0
5.1

35.7
13.4

①

57.8
2.5

56.4
3.9

52.2
8.1

49.4
10.9

46.5
2.6

42.9
6.2

39.4
9.7

SHOFF T.D.
MCCORD

30

R.O.W. Pt
52.9
7.4

53.3
7.0

51.9
8.4

45.0
4.1

35.5
13.6

Spk in PP 50' N. 485⁺⁰

SPK in PP 50' NORTH STA. 485⁺

494

493

492

491

490

489

TP 9.28 968.72 0.87 959.44
488

487

960.31

62.6

6.1

65.2

3.5

66.1

2.6

64.2

4.5

61.1

7.6

58.6

10.1

58.2

2.1

58.0

2.3

61.9

6.8

63.4

5.3

63.8

4.9

63.4

5.3

62.3

6.4

60.6

8.1

59.6

0.7

58.8

1.5

60.4

8.3

62.2

6.5

63.1

5.6

62.3

6.4

59.8

8.9

55.6

13.1

54.3

6.0

~~53.3~~
~~58.5~~

7.0

L. R. O. W.

C

32
R. L. R. O. W.

502

55.1
9.059.1
5.554.6
10.0

501

54.0
10.657.0
7.651.9
12.7

500

51.2
13.455.6
9.050.4
14.2

499

52.0
12.654.7
9.949.1
15.5

498

50.6
14.054.9
9.748.4
16.2

497

51.6
13.056.0
8.651.0
13.6

TP 7.28 964.55 11.45 957.27

496

56.7
56.7
12.057.6
11.154.7
14.0

495

60.1
8.659.7
9.058.1
~~49.5~~
10.6

968.72

510

TP 0.50 952.61 14.80 952.11

509

508

507

506

505

TP 2.62 966.91 0.24 964.31 964.29

504

BM^{#1}
503

2.54 962.01 961.98

964.55

49.1
3.549.6
17.353.9
13.058.5
8.463.4
3.566.7
0.265.1
+0.6CONC. REF. MONU. RT. 40'
SE QUAD. NE COR 33-90-12 61.9
4.0 60.149.6
53.2
13.756.9
10.060.5
6.463.4
3.564.9
2.069.4
0.4

2.7

49.6
17.355.5
11.460.4
6.565.6
1.366.2
0.762.6
1.958.4
6.2

BM #1

5.23 961.98 961.98

CONC. MONU. 39-90-12 (NE COR)

TP 14.79 967.21 0.19 952.42

515

514

513

512

511

952.61

37.8
14.836.1
16.539.1
13.541.9
10.739.3
13.341.1
11.543.3
9.345.6
7.033.6
10.035.3
17.338.8
13.8

C₀ "H"

STA 479+00 to STA 515+00

W
T

= CHARGE

I = 540 ft
I = MEAD

36

3-9-69

483

482

481 → 7.80 955.21 0.30 947.41

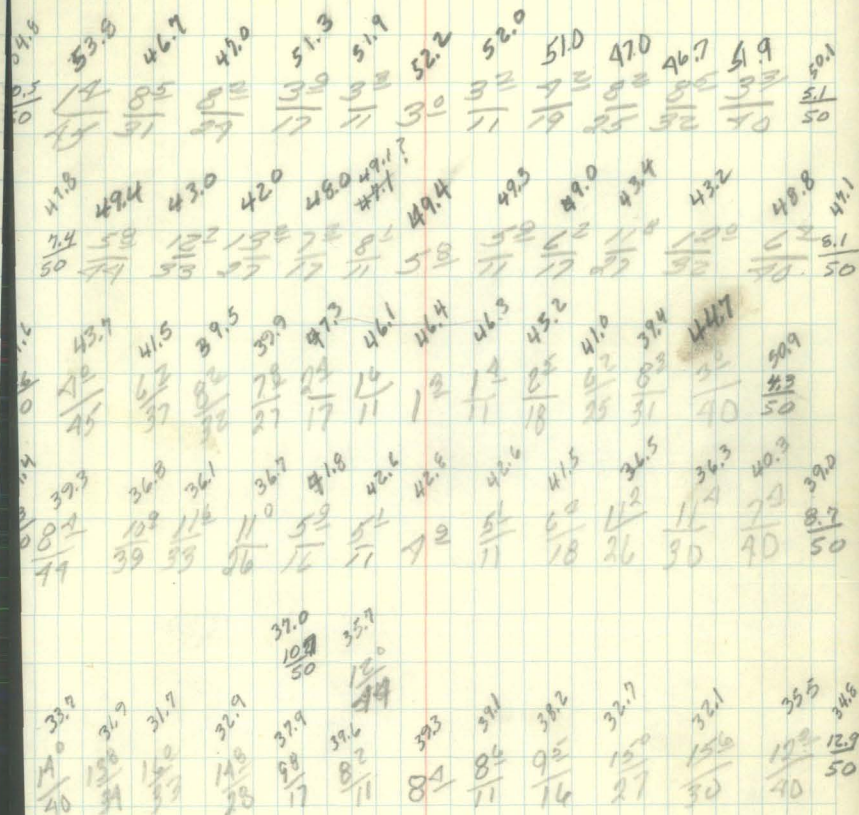
480

479

T.B.M. 2.79 947.71 1446 947.92

B.M. 0.22 959.38 959.16 959.16

SPIKE IN POWER POLE N STA. 485.5



490

6.06 968.43 1.93 962.37

489

488

START. Construction.

487

5.25 964.30 2.36 959.05

486

485

484 6.60 961.41 0.40 951.81

955.21

W =
A = CLARKE1 SHOFF
1 MCCORD

37

3-8-69

61.1	58.7	56.9	61.2	62.0	62.2	61.9	61.0	57.7	57.2	59.7	59.3
38	34	24	31	23	21	22	33	64	21	16	5.0
38	34	24	17	11	21	11	18	23	26	33	50

58.9	58.1	54.9	56.2	59.7	60.4	60.6	60.3	59.7	59.1	55.7	56.9
5.4	62	97	81	16	32	60.6	60.3	59.7	59.1	55.7	56.9
50	38	32	29	16	11	32	11	18	26	37	50

58.3	57.8	55.1	55.8	54.9	58.8	59.4	59.6	59.2	58.0	53.7	54.2	52.1
6.0	63	92	95	91	55	49	42	51	62	106	101	11.8
50	40	33	26	23	17	11	42	11	18	27	38	50

57.7	53.9	54.5	58.0	58.6	58.7	58.4	57.7	54.0	53.5	52.1
3.6	52	72	42	31	28	32	32	72	72	9.3
50	40	31	25	19	21	22	11	16	27	40

57.7	52.7	52.9	56.9	57.4	57.7	52.5	57.1	52.9	52.9	51.0
5.2	52	82	76	46	38	32	32	43	82	10.4
50	40	30	29	18	11	32	11	17	31	50

57.8	50.8	52.4	55.5	56.2	56.4	56.1	55.3	51.7	51.1	53.6	52.9
2.5	46	10	92	59	52	52	61	92	102	78	8.5
50	40	28	22	16	11	52	11	17	26	32	40

54.6	50.0	48.5	53.4	54.2	54.4	54.2	53.5	49.7	49.5	54.2	53.2
1.9	46	62	16	10	08	10	12	54	52	12	2.0
50	40	29	14	16	11	11	17	25	30	40	50

497

496

(CHECK 24' LEFT.)

495

494

2.60 963.03 8.00 960.13

493

492

491

968.43



CHARGE

1 Short

1 MEDIO

38

3-11-69

51.7	51.0	50.0	55.0	55.7	55.8	55.6	54.6	50.5	50.8	49.9
11.3	12.3	13.0	8.0	7.2	7.2	7.2	8.9	12.5	12.3	14.0
50	40	26	76	71	72	71	76	23	30	50

57.2	57.8	52.5	54.2	56.9	57.5	57.5	57.1	56.5	52.5	51.8	53.5	53.7
5.6	3.2	10.2	8.2	6.1	5.5	5.5	5.5	4.5	10.5	11.5	8.5	9.3
50	70	22	24	15	71	55	71	74	22	26	31	50

Right SIDE

Left SIDE

58.6	58.3	55.2	55.8	58.8	59.3	59.5	59.1	59.0	55.0	55.5	60.3	60.1
4.4	4.2	7.8	7.2	4.2	3.2	3.5	3.2	4.2	8.2	8.5	8.2	2.9
50	30	26	23	76	71	35	71	76	23	29	30	50

62.3	58.4	56.9	60.8	61.4	61.6	61.3	60.5	58.2	57.7	60.9	59.3
6.1	10.0	11.5	7.6	7.0	6.8	7.1	7.2	10.2	10.2	7.5	9.1
40	23	23	76	71	68	71	72	21	27	30	50

64.5	67.7	62.2	57.4	62.5	63.2	63.2	63.0	62.1	59.4	61.4	62.2	61.6
3.6	3.2	6.6	11.0	5.2	5.2	5.2	5.4	6.2	9.0	6.8	6.2	6.6
50	40	34	27	76	71	52	71	78	24	29	33	40

65.3	65.7	60.6	59.0	63.1	62.8	63.8	63.6	63.0	59.8	60.5	63.3	62.1
3.1	2.2	7.8	9.1	5.0	4.6	4.6	4.8	5.1	8.5	7.2	5.1	5.2
50	39	31	26	76	71	74	71	76	23	27	33	40

62.9	64.1	59.9	58.5	62.8	62.2	63.4	63.6	62.6	59.5	59.6	62.9	62.1
4.5	4.8	8.5	9.9	5.6	5.6	5.2	5.2	5.8	8.2	8.2	6.0	6.3
50	40	32	26	76	71	52	71	76	22	26	33	40

139.6

503

502

501

500

499

498

B.M. 9.24 959.44 12.83 950.20
963.83

70.9
-30

3.11.69

70.8	67.4	64.1	63.2	62.9	63.0	62.6	60.3	58.3	55.9
72	72	72	72	72	72	72	72	72	72
300	200	100	50	25	12	6	3	1	0.5

61.1	60.7	58.5	56.8	61.0	61.7	61.9	61.5	60.7	56.0	58.3	52.3
72	72	72	72	72	72	72	72	72	72	72	72
40	35	28	20	11	6	6	11	15	28	53	10.6

57.2	57.0	52.1	52.7	58.3	58.8	59.0	58.8	57.9	53.5	53.7	54.1	52.0
72	72	72	72	72	72	72	72	72	72	72	72	72
40	32	25	16	11	0.4	0.6	11	16	25	30	32	5

55.0	55.1	49.6	50.2	55.8	56.8	57.0	56.7	55.0	50.9	51.8	52.3
4.4	4.4	9.8	9.2	9.9	9.6	9.4	9.7	9.8	8.5	7.6	9.1
40	32	25	17	11	11	11	16	21	31	31	50

54.2	53.8	48.8	48.8	54.3	55.3	55.1	55.2	54.1	49.3	49.9	49.2
5.2	5.6	10.6	10.6	5.1	5.2	4.0	4.2	5.3	10.1	9.5	10.2
40	32	26	17	11	11	11	17	25	30	30	50

52.9	52.1	48.5	48.8	54.1	54.6	54.7	54.6	53.4	48.3	48.7	47.1
6.5	7.2	10.9	10.6	5.2	4.8	4.2	4.8	6.0	11.1	10.7	11.7
50	37	32	25	17	11	12	11	16	25	31	50

52.3	50.5	48.4	54.3	54.8	54.9	54.5	53.3	48.3	47.9	47.5
8.6	8.2	11.2	5.1	4.6	4.5	4.2	6.1	11.1	11.2	11.9
50	40	25	17	11	11	11	17	25	32	50

to Pot Collect Hdw. S. STA 497+

3-12-69

509

508

0.42 957.16 11.39 956.74

507

B.M. 6.11 968.13 7.15 962.02

506

505

B.M. 7.15 969.17 5.84 960.02 961.98

504

967.86

49.1	45.7	45.7	52.3	53.0	53.2	52.9	51.7	47.2	48.2	50.1
81	115	20	70	72	70	73	55	100	90	71
50	38	24	15	11	10	11	17	24	35	50
55.1	48.0	46.5	55.9	56.7	57.0	56.8	56.0	49.8	50.0	53.9
15	92	107	17	05	05	04	72	72	72	33
50	35	26	16	11	05	11	17	25	37	50
59.6	53.3	54.5	59.1	60.3	60.5	60.2	58.6	56.1	54.5	60.9
95	148	136	90	78	76	79	95	121	135	72
50	38	26	18	11	76	11	20	26	35	50

CONCRETE REL. MON. SE CORNER
NE COR 33-20-12

63.4	60.8	58.0	56.8	62.3	63.1	63.5	63.1	62.5	59.9	65.4	65.4	65.0
58	89	112	122	60	61	57	61	67	90	36	38	412
50	44	36	27	18	11	5	11	15	19	33	40	50
66.7	62.9	59.9	59.2	64.0	64.8	65.0	64.8	64.5	62.1	66.1	66.0	64.0
25	6	93	100	52	44	42	41	47	71	31	32	32
50	46	34	27	17	11	42	11	16	20	32	40	50

65.1	53.7	57.9	62.9	63.9	64.2	63.8	63.0	61.1	59.8	62.2	62.1	22.1
48	92	100	50	40	47	41	40	48	81	63	54	58
50	38	24	18	11	37	11	17	21	28	33	40	50

519

513

512

511

510

1.86 94732 1170 94546

957.14

41

3-12-69

36.4	34.3	32.5	38.1	39.0	39.1	38.7	38.0	33.1	33.1	33.2
$\frac{100}{50}$	$\frac{130}{39}$	$\frac{128}{26}$	$\frac{92}{16}$	$\frac{83}{11}$	$\frac{82}{11}$	$\frac{86}{11}$	$\frac{93}{16}$	$\frac{192}{26}$	$\frac{192}{36}$	$\frac{192}{36}$
39.0	37.8	35.0	40.3	40.8	41.1	40.6	39.9	35.1	34.5	35.6
$\frac{83}{50}$	$\frac{95}{37}$	$\frac{128}{26}$	$\frac{70}{17}$	$\frac{65}{11}$	$\frac{62}{11}$	$\frac{62}{11}$	$\frac{72}{16}$	$\frac{102}{25}$	$\frac{102}{32}$	$\frac{112}{39}$
42.5	37.5	37.0	42.5	43.0	43.2	42.8	42.1	37.3	32.1	32.0
$\frac{18}{50}$	$\frac{98}{38}$	$\frac{103}{25}$	$\frac{43}{14}$	$\frac{43}{11}$	$\frac{41}{11}$	$\frac{42}{11}$	$\frac{52}{17}$	$\frac{100}{27}$	$\frac{102}{33}$	$\frac{98}{39}$
44.8	43.6	39.9	38.4	44.4	45.2	45.6	45.6	44.2	40.9	41.0
$\frac{120}{50}$	$\frac{37}{34}$	$\frac{71}{35}$	$\frac{86}{24}$	$\frac{20}{17}$	$\frac{21}{11}$	$\frac{17}{11}$	$\frac{19}{11}$	$\frac{31}{20}$	$\frac{61}{27}$	$\frac{63}{35}$
46.0	43.2	41.5	48.2	48.9	49.2	49.8	45.5	43.7	43.4	44.1
$\frac{112}{50}$	$\frac{140}{40}$	$\frac{157}{24}$	$\frac{90}{16}$	$\frac{83}{11}$	$\frac{80}{11}$	$\frac{83}{11}$	$\frac{92}{16}$	$\frac{135}{25}$	$\frac{138}{33}$	$\frac{131}{36}$

M-CLARKE

$$A = \text{Shoff}$$
$$I = M^2 c^2 R D$$

42

3-12-69

B.M. #1

5.70	962.15	961.98
------	--------	--------

TBM	9.75	967.75	0.49	958.00
-----	------	--------	------	--------

TBM	11.83	958.79	0.66	946.66
-----	-------	--------	------	--------

515

94732

NECOR 33-90-12

$\frac{146}{36}$	$\frac{155}{33}$	$\frac{164}{26}$	$\frac{170}{14}$	$\frac{182}{11}$	$\frac{190}{11}$	$\frac{202}{17}$	$\frac{210}{26}$	$\frac{220}{33}$	$\frac{230}{40}$
32.7	31.8	30.9	30.3	34.1	34.3	36.1	31.4	31.3	31.5

R.C.B. Sta 497+65
Co. Rd. "H"

30" x 36" RCB

3.0' CONC. APRONS

44.0' Hdwl. to Hdwl.

21.0' Lt. of C

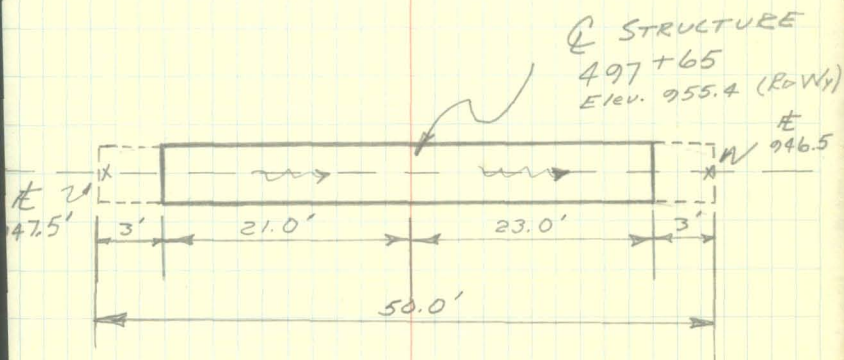
23.0' Rt. of C

SHOFF
McCORD

43



C
Co. Rd. "H"



BELCOW PIT NW COR 32-90-12

X: CLARKE
K: STOFF

I: MCARD
I: CHRISTENSEN

45

3-13-69

BM 11.33 957.59 1.99 946.26

2+00

150

1+00

SPIKE IN TREE STUMP STA 1+00

100 OUT

47.7	7.6	8.3	47.2	46.2	5.0	13.7
01	82	-05	04	16	28	41
86	56	100	100	200	250	300

44.9	50	53	46.3	46.7	45.7	4.5	30	1.3
39	28	25	15	11	21	33	48	65
86	23	45	79	100	150	200	250	300

1.1	39.2							
67	82							
250	300							
42.0	42.7	41.8	42.9	42.7	43.3	5.1	2.3	42.9
58	51	60	49	51	45	27	35	49
14	19	18	23	38	81	100	150	200

BASE LINE IS FENCE LINE RUNNING

EAST-WEST SOUTH ROW LINE OF CO. RD. 14

WITH STA. RUNNING EAST FROM POWER POLE.

BM 10.07 (947.75) 7.09 937.68

202 944.72 0.34 935.70

BM 7.22 936.04 928.82 928.82

SPIKE IN POWER POLE SW COR. NE 31-90-12

E. NW 800 South intersection NW-32-90-12

3-13-69

BM 826 946.27

0.51 954.53 18.58 954.02

8+00

700

600

500

400

11.73 966.60 2.72 954.87

300

957.59

SPRING IN SWAMP 140 51.1 51.8 140

53.9 55.1 56.8 58.7 60.8 62.9 64.6

12.7	1.0	2.8	7.2	5.8	3.7	2.2
56	50	100	150	200	250	300

55.7 57.1 59.1 61.1 62.9 64.1 64.6

10.9	9.5	7.5	5.5	3.7	2.0	2.1
56	50	100	150	200	250	300

56.1 57.8 60.1 61.9 63.0 62.7 61.4

18.2	8.8	6.5	4.7	3.5	3.0	5.3
56	50	100	150	200	250	300

54.9 56.4 58.4 59.4 9.5 58.7 57.0

11.7	10.2	8.2	7.2	7.1	7.2	3.3
56	50	100	150	200	250	300

52.9 54.2 55.5 55.5 55.2 54.5 53.6

4.7	4.3	4.1	2.1	2.4	3.1	4.0
56	50	100	150	200	250	300

50.3 50.9 51.7 11.6 50.5 49.2 49.1

4.4	4.8	5.2	6.2	7.1	8.2	9.5
56	50	100	150	200	250	300

BORROW PIT SW-26-90-12

3+00

5.27 965.41 13.66 960.14

2+00

1+00

0+00 = 503+67.6

B.M. 11.82 973.80 961.98 961.93

~ BASE LINE IS FENCE LINE RUNNING
EAST-WEST ON NORTH SIDE Co. Rd. "H"
STA GOES WEST TO EAST.

1 = CLARKE

π = SHORT

1 McCord

1 CHRISTENSEN

48

3-13-69

60.1	59.5	59.8	60.7	63.2	63.9	62.6	60.8	58.3
13°	14°	14°	13°	10°	9°	11°	13°	13°
32	30	30	350	300	250	300	350	300

64.8	64.6	64.9	65.4	66.6	67.1	65.1	62.1	60.6
9°	9°	9°	8°	7°	6°	8°	11°	13°
32	30	30	350	300	250	300	350	300

66.6	67.2	68.3	69.3	69.9	70.1	67.8	66.0	64.0
7°	6°	5°	4°	3°	3°	6°	7°	9°
32	30	30	350	200	350	300	350	300

64.9	65.6	67.2	69.0	70.3	70.8	70.1	68.9	67.2
8°	8°	6°	7°	3°	3°	3°	7°	6°
32	30	30	350	200	250	300	350	300

CONCRETE MONUMENT REF SE QUADR.
NE-35-90-12

3-13-69

BM 10.30 961.97 961.98

8.45 972.27 1.59 963.82

5+00

4+00

96541

CONCRETE Ref. mom. SE Q140.

NEW COR-35-90-12

50.4	51.4	51.9	54.4	57.0	58.5	56.2	54.2	52.4
150	140	135	110	87	79	72	112	130
B.L	50	100	150	200	250	300	350	400

55.0	55.2	55.9	57.4	59.8	60.9	59.3	57.5	56.0
104	102	95	80	56	45	61	79	97
B.L	50	100	150	200	250	300	350	400

EIK RUN CREEK BRIDGE

ROADWAY CROSS SECTIONS

SHOFF T 
MCCORD 
LAMB. TAPE

51

18+0

17+85 DR Rt
No PIPE

17+0

16+0

15+60 DR. Rt.
CEPC 15"

15+0

14+0

TBM #1

5.23

855.03

849.80

48.1 48.5 45.0 43.5 46.1 48.4 50.0 49.3 46.3 46.0 47.7 46.7
6.9 6.5 10.0 11.5 8.9 5.6 5.0 5.7 8.7 9.0 7.3 8.3
50 36 30 27 20 14 5.0 14 21 28 32 50
f Row

48.5 48.9 45.8 46.6 49.1 50.0 49.1 46.2 46.4 48.3 48.4
6.5 6.1 9.2 8.4 5.9 5.0 5.9 8.8 8.6 6.7 6.6
50 34 26 21 15 5.0 14 20 26 31 50
f

48.7 48.9 46.2 47.3 49.8 50.4 49.7 47.2 46.8 48.8 48.8
6.3 6.1 8.8 7.7 5.2 5.3 7.8 8.2 6.2 6.2 Ho.
50 35 27 20 15 4.6 12 18 24 32 50 100'
f Row

48.7 49.0 47.6 47.2 47.6 49.7 50.4 49.5 47.2 47.2 48.7 48.1
6.3 6.0 7.4 7.8 7.4 5.3 5.8 7.8 7.8 6.3 6.9
50 35 31 26 21 16 4.6 12 18 26 31 50
f

48.8 49.0 49.8 47.3 47.6 49.8 50.5 49.8 47.3 46.9 47.3 48.8 48.4
6.8 7.2 7.7 7.4 5.2 5.2 7.7 8.1 7.7 6.2 6.6
35 31 27 21 14 4.5 12 19 23 26 31 50
f

SPK. in PP Rt. 33' Sta. 18+60

24+25

23+0

22+0

21+0

20+0

TP (BM #1) 3.06 852.85 5.24 849.79

19+0

18+85 DR. Rt.

15' CMP 10' CONC PIPE
(POOR CONDITION)

855.03

41.0 45.3 48.2 51.0 51.1 50.9 50.5 46.1 45.4 44.7
11.9 7.6 4.7 1.9 2.0 2.4 6.8 7.5 8.2
25 20 14 10 8 12 21 33 50
Edge Water f

46.0 45.6 44.3 41.8 40.4 49.7 50.4 49.9 44.4 44.9 45.6 41.9
6.9 7.2 8.6 11.1 8.5 3.2 3.0 6.5 8.0 7.3 11.0
50 34 26 23 18 10 2.5 11 22 28 32 50
f Edge Water

48.6 48.4 44.1 43.9 47.8 48.7 48.3 47.4 47.0 41.7
4.3 4.5 8.8 9.0 5.1 4.6 5.5 5.9 6.2
50 34 25 20 12 4.2 10 15 32 50
Row

45.9 43.9 42.4 43.7 47.5 48.4 43.1 46.7 46.2 47.2 44.7 43.4
7.0 9.0 10.5 9.2 5.4 4.8 6.2 6.7 5.7 8.2 9.5
50 33 25 18 12 4.5 9 12 15 19 32 50
f

48.2 47.3 44.8 44.0 44.5 48.3 49.4 48.7 46.6 44.2 42.0 42.3
4.7 5.6 8.1 8.9 8.4 4.6 4.2 6.3 8.7 10.9 10.6
50 33 27 23 20 14 3.5 9 24 31 36 50
f

(TBM #1)

45.5 45.0 43.5 44.2 48.8 50.2 48.6 45.9 45.6 50.0 49.1
9.5 10.0 11.5 10.8 6.2 6.4 9.1 9.4 5.0 5.9 4.0
50 34 24 20 13 4.8 15 24 31 38 50 100'
f

↑
30+0

29+0

28+0

27+0

Sta. 26+35 DRIVE Rt. 48" RCP
DRIVE Lt. 30" RCP

26+0

25+0

TP 5.39 856.56 1.68 851.17

852.85

50.0 50.4 47.5 48.6 51.4 52.1 51.1 48.4 48.1 49.7 49.1
6.6 6.2 9.1 8.0 5.2 5.5 8.2 8.5 6.9 7.5
50 33 26 18 13 4.5 14 20 28 33 50
f f

50.1 50.3 47.7 48.5 51.2 52.2 51.3 48.4 48.0 49.9 49.4
6.5 6.3 8.9 8.1 5.4 5.3 8.2 8.6 6.7 7.2
50 32 24 18 12 4.4 15 21 30 35 50
f f

49.9 49.6 47.6 48.6 51.2 52.3 51.2 48.2 47.7 49.9 49.0
6.7 7.0 9.0 8.0 5.2 5.4 8.4 8.9 6.7 7.6
50 32 25 20 12 4.3 15 21 29 34 50
f f

51.1 51.1 47.0 48.1 51.6 52.3 51.4 47.9 47.0 48.4 51.1 50.2
5.5 5.5 9.6 8.5 5.0 5.2 8.7 9.6 8.2 5.5 6.4
50 32 23 18 12 4.3 14 20 25 29 33 50
f f

52.2 46.8 45.5 43.8 45.8 51.8 52.1 51.4 47.0 47.2 51.5 51.1
4.4 9.8 11.1 12.8 10.8 4.8 5.2 9.6 9.4 5.0 5.5
0 40 34 28 22 16 4.5 11 19 28 41 50
f f

45.1 44.1 45.5 50.7 51.2 50.6 46.5 47.1 51.1
11.2 12.5 11.1 5.9 6.4 10.1 9.5 5.5
50 27 20 12 5.4 11 20 36 50

E NAIL Sta. 25+0

31 ± 0

850.65

850,67

856, 56

[illegible]

ELK RUN CREEK

CHANNEL RELOCATION

CROSS SECTIONS @
Rt. X'S TO BASE LINE

Lt.

BASE LINE

←

LAND

Rt.

SHOFF & D
McCORD &
LAND &
Rt.

55

BORROW
AREA

Sta 22+50

x 6+00

x 5+00

x 4+00

x 3+00

x 2+00

x 1+00

x +50

24+08

23+22

N/4 34-89-12

26+90

TBM #2

TP 5.00 852.79 4.12 847.79

2+50

2+00

1+50

1+00

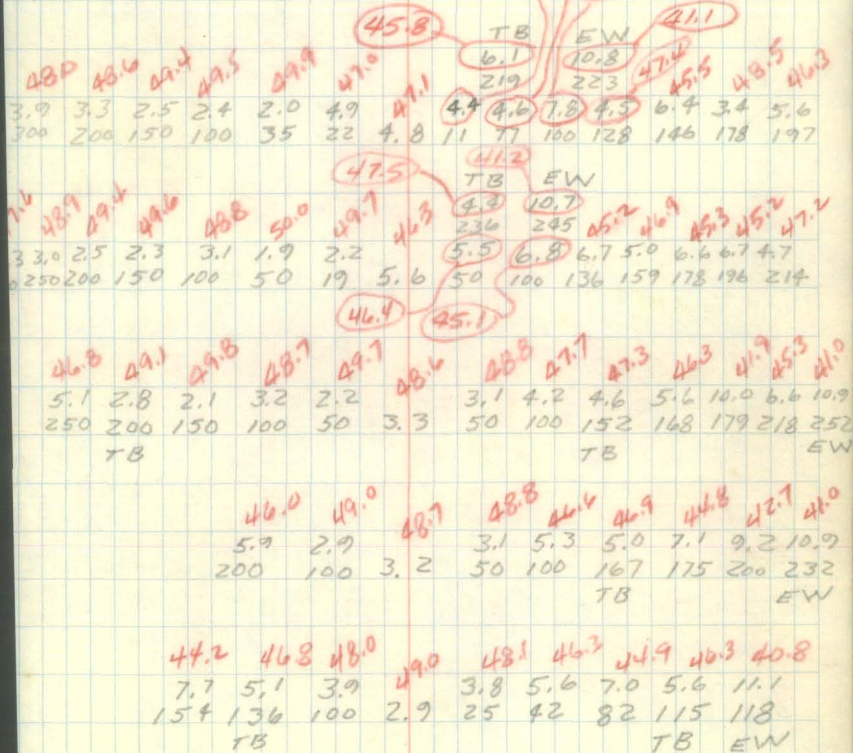
50' LL

22+50

TBM#2 1.24 856.91 850.67

22+50
Lt. BASE LINE Rt. 56

TOP IRON PIN @ STA. 2+50



TBM#2

2.10

850.69

6+0

5+0

4+50

4+0

3+50

3+0

852.79

Lt.

X" SW Wing Wall

BASE LINE

Rt.

57

48.2 47.7 48.6 48.2 41.0
 4.6 31 54 76 84
 TB EW

48.2 46.5 47.5 47.3 41.5
 4.6 29 52 61 64
 TB EW

48.8 47.9 48.1 48.7 41.4
 4.0 50 77 83 98
 TB EW

44.1 45.6 47.4 48.3 48.0 40.5
 8.7 25 40 63 115 122
 TB EW

42.2 TB EW 41.0
 10.6 11.8
 192 198
 47.9 4.7 6.7 6.2 7.4 9.7
 4.9 50 100 140 155 173

43.3 43.2 43.3 44.0 42.4 41.4
 9.5 50 100 142 206 214
 TB EW

STADIA SURVEY of PROP. BRIDGE REPLACEMENT EIK RUN CREEK

59

Inst. @ Sta. 22+50

BACKSIGHT - I.P. @ N $\frac{1}{4}$ COR 34-89-12
(ALL X'S TO RIGHT)

HI = 854.56'

SHOT	HORZ. X	VERT. X	ROD READING	Elev.	HORZ. DIS
BM	12°56'	0°00'	3.89	850.67	-
1	130°46'	"	13.15 9.80	841.41	670'
2	129°49'	"	11.55 8.25	843.01	660'
3	126°48'	"	11.71 8.78 5.82	845.78	589'
4	126°50'	"	14.28 11.68	840.28	520'
5	122°25'	"	10.75 8.65 6.55	845.91	420'
6	118°41'	"	14.25 12.65	840.31	320'
7	106°35'	"	9.33 8.22 7.09	846.34	224'
8	95°35'	"	14.54 13.80 13.05	840.76	149'
9	63°40'	"	6.72 6.10 5.46	848.46	126'
10	58°30'	"	14.45 13.90 13.35	840.66	110'
11	11°40'	"	10.35 9.72 9.07	844.84	128'
12	11°40'	"	14.47 13.90 13.25	840.66	122'
13	4°30'	"	14.55 14.40 13.45	840.56	110'
14	122°0'	"	18.90 17.20	835.66	340'
15	131°19'	"	10.90 8.25 5.60	846.31	530'
16	128°18'	"	14.51 11.85	840.05	532'
17	128°20'	"	10.98 9.17 7.45	845.31	345'
18	118°10'	"	15.10 13.90 12.70	840.66	240'
OVER					

DESCRIPTION

TBM #2 - "X" END WING WALL SW COR. BRIDGE

Edge Water

TOP BANK

TB

EW

TB

EW

TB

EW

TB

EW

TB

EW

@ E @ BRIDGE

@ E Downstream

TB

EW

TB

EW

SHOT	Horz. $\angle$	Vert. $\angle$	ROD READING	Elev.	HORZ. DIST	DESCRIPTION
19	119°45'	0°00'	7.54 6.85 6.15	847.71	139'	TB
20	108°25'	"	19.45 13.90 13.30	840.66	115'	EW
21	42°38'	"	7.68 7.42 7.16	847.14	52'	TB
22	28°18'	"	14.16 13.85 13.55	840.71	61'	EW
23	347°2'	"	14.55 14.10 13.65	840.46	90'	EW
24	335°25'	"	8.70 8.04 7.40	846.52	130'	TB
25	324°20'	"	10.95 9.50 8.00	845.06	295'	TB
26	311°10'	"	15.00 13.35 11.65	841.21	335'	EW
27	286°30'	"	9.00 7.00 5.00	847.56	400'	TB
28	280°49'	"	8.00 5.75 3.55	848.81	445'	TB
29	276°15'	"	10.45 7.80 5.10	846.76	535'	TB
30	276°25'	"	13.05 m. 10.40 L.	841.51	530'	EW
31	277°30'	"	8.40 5.30 2.20	849.26	620'	TB
32	352°40'	"	14.70 13.60 12.50	840.96	220'	EW
33	345°22'	"	9.52 8.18 6.78	846.38	274'	TB
34	331°00'	"	13.61 11.75	840.95	368'	EW - @ STREAM EAST
35	333°30'	"	14.00 11.80	840.56	440'	@ STREAM "
36	300°05'	"	9.00 6.80 4.60	847.76	440'	TB
37	286°20'	"	8.98 6.42 3.88	848.14	510'	TB
38	280°18'	"	15.40 12.90 10.40	841.66	500'	EW

Inst. @ Sta 5 + 0

BACK SIGHT ON Sta 22 + 50
(ALL $\angle$'s to RIGHT)

$$H/I = 853.09$$

HI = 853.09

	Horz. &	Vert. &	Rod READING	Elev.	Horz. Dist.	DESCRIPTION
39	240°21'	0°00'	^{4.00} 3.12 2.27	849.97	173'	TB
40	205°35'	"	^{4.50} 4.10 2.70	848.99	180'	TB
41	193°58'	"	^{8.00} 5.80 3.60	847.29	440'	TB
42	193°44'	"	^{12.88} 10.67 8.48	842.42	440'	EW
43	185°30'	"	^{12.80} 10.85 8.90	842.24	390'	EW EAST (LAST SHOT EAST)
44	188°18'	"	^{13.70} 11.45 9.20	841.64	450'	Q & R
45	183°00'	"	^{7.15} 5.00 -	848.09	430'	TB
46	180°42'	"	^{4.10} 2.42 -	850.67	336'	TB
47	192°55'	"	^{4.25} 3.15 2.05	849.94	220'	TB
48	213°20'	"	^{4.44} 3.80 3.15	853.09	129'	TB
49	224°42'	"	^{12.20} 11.35 10.53	841.74	167'	TB EW
50	261°40'	"	^{6.75} 6.45 6.15	846.64	60'	TB
51	261°58'	"	^{11.91} 11.60 11.30	853.09	61'	EW

TBM 0°00 5.30 847.79

Top Iron Pin - Sta. 2⁺⁵⁰↓
TBM 5.30 853.09 847.79

BENCH LEVELS

BM 9.97 875.85 865.88 865.88 X N.W. wing old BRIDGE

T.P. 6.31 879.65 2.51 873.39

BM 7.48 872.12

USGS #275 39' South STA 79+52

T.P. 6.38 880.69 5.34 874.31

T.P. 8.56 887.57 1.68 879.01

BM 5.39 882.18

Coluget Hdw. South East Intersection
with ARMOR Rd.

BM 3.21 889.72 6.06 881.51 881.57 X Hdw North East Intersection
with ARMOR Rd

BM. 8.16 ^{876.56} ~~886.56~~ 876.65 P-11 US. 65. 90' South East of Intersection
of RR & ARMOR Rd
(500'± South Intersection
East Side of Road)

N 1/4 Cor
Sec. 22-89-12 0900

B.M.	Bearing	Dist.	Red	
			5.98	865.68 865.88
1	18°00	110'	3.0	
2	42°00	180'	2.90	868.96
3	48°20	170'	3.3	
4	178°00	130'	5.6	66.3
5	184°20'	130'	5.6	66.3
6	182°20	200	5.4	66.5
7	178°20	200'	5.3	66.6
8	52°40	190'	3.4	
9	168°40	110'	13.8	
	170°20	120'	9.7	
	170°40	140'	13.1	
	171°20	280'	9.9	
	155°40'	240'	13.6	
	170°00	200'	13.6	
	145°00	260'	15.4	856.5
	155°40	260'	12.0	
	131°40	260'	10.9	
	139°40	280'	12.9	
	123°00	340'	15.4	856.4
	122°00	390'	10.6	
	112°20	350'	9.3	
	116°20	470'	9.4	

X in N.W. King River Bridge

Fence Cor. E & N.

S.W. Cor. Garage and Hi Water 1968

S.E. " "

N.W. Cor of Bridge floor

S.W. " " " "

S.E. " " " "

N.E. " " " "

N.E. Cor Garage

R.B. & N. Road ditch

Top L. Bank & R. side

R. Bank

Fence Cor N. E & W

Lower R. Bank

T.B.L.

H

T.B.L.

T.B.R.

T.B.L.

H

T.B.L.

T.B.R. High

T.B.L.

H.I. 871.86
 $\pi @ 91+00$ Cont

115°00'	400'	12.8	
110°20'	470'	15.3	856.6
103°40'	510'	9.4	
110°00'	580	14.0	
106°20'	500'	11.9	
117°20'	630'	11.2	
108°00'	560'	15.3	856.6
100°40'	550	9.4	
140°40'	660'	6.6	
112°40'	280	10.1	
103°00'	140'	11.6	
154°00'	600'	4.7	
154°20'	450	9.4	
174°40'	410'	8.2	
78°20'	350'	6.1	
91°00'	460'	8.2	
83°00'	500'	3.4	

A 106°52' 655' 10.16 861.70

B.M. 1.74 867.62 865.88

A 5.92 861.70

$\pi @ "A"$ 5.25 H.I. 866.95 861.70

91+00 0°00' 650+

1 217°00' 70' 4.2

2 223°00' 110' 6.2

3 237°00' 120' 10.2 856.7

T.B.R.

TL

T.B.R. High

T.B.R.

T.B.R.

Fence

TL

T.B.R. High

Fence Cor. N.S.E.

T.B.R. High

Fence & N.W. Cor. Barn

Fence Cor E & S. N.W. Cor. of Pine Grove

Fence Cor N, Edw S.W. " " "

Fence Line N & S

Fence Line N & S

X on N.W. Wing

T.B.R.

" & N.S. Fence

TL

T @ A Cont. HI 967.0			
4	327°00'	450'	4.6
5	265°20'	150'	10.2
6	244°40'	70'	7.7
7	256°40'	270'	7.6
8	236°20'	300'	5.3
9	232°20'	370'	10.1
10	269°20'	120'	9.9
11	212°00'	510'	10.0'
12	271°20'	200'	3.7
13	206°40'	500'	5.6
14	257°40'	330'	4.3
15	195°40'	500'	9.9
16	264°40'	330'	2.3
17	191°40'	470'	3.6
18	241°00'	320'	7.7
19	182°20'	560'	9.5
20	230°00'	440'	2.1
21	176°20'	690'	9.6
22	234°20'	480'	+2.2
23	172°00'	620'	2.7
24	236°00'	530'	+5.2
25	169°40'	680'	2.3
26	224°40'	540'	+1.7
27	174°20'	770'	+7.4
28	214°00'	540'	6.3

Fence P.I.
Water edge Rt. sloping bank

T.B.L.	7.7	8.0
T.B.R.	2	4.1
T.B.R.	15.4	39

Edge of water Left 8.0

⚡

T.B.L.

T.B.R.

T.B.L.

T.B.R.

Fence line Two Rows of Pines East

T.B.R.

T.B.L. Low

⚡

T.B.L.

⚡

Fence Cor E. & S.

T.B.R.

Fence Cor. N. S. W

R.R. R.O.W. Fence

T.B.L.

Gen. R.R. Bridge

T.B.L.

5.3
2
- 10.6
5.4

66

$\angle @$ A Cont. Vert.

29	162°40	610'	5.5	
30	191°40	510	6.9	
31	143°40	530'	5.0	+ 2°30"
32	187°40	690'	3.2	
33	120°00	310'	0.1	

N 1/4 Sec.
22-89-12 $\angle @$ 91°00 H.I. = 871.86
0°00'

B.M. 5.98 865.88

1	197°00'	120'	9.4	
2	189°00	220'	9.0	
3	199°40	140'	15.3	
4	230°00'	260'	9.7	
5	194°40 189°	200'	13.6	
6	223°40	380'	16.6	855.3
7	209°00	280'	8.5	
8	210°40	430'	9.2	
9	224°00	280'	15.1	
10	207°40	450'	16.4	855.5
11	204°00	390'	13.0	
12	218°40	480'	9.5	
13	206°00	520'	10.4	
14	236°40	490'	17.2	854.7
15	215°00	560'	10.0	
16	248°20	500'	9.7	

R.R. ROW

T.B.L.

Fence Cor. Fence South & R.R. ROW.

T.B.L.

Fence N.S.

N.W. Wing of Bridge
ROW
R.W.F. & Top Rt. Bank
" T.B.L.

Waterlevel Nov. 25, 1969

T.B.R.

T.B.L. Lower

FL

T.B.L. High bank

T.B.R.

FB Water Line Left

~~T.B.R. Lower~~ FL

T.B.L. Lower

T.B.R.

T.B.L.

FL

T.B.L.

T.B.R.

Λ
T@ 91100 Cont. HI = 871.86

17	212°20'	640'	1.2	
18	216°20'	650'	1.9	
19	228°20'	570'	2.3	
20	261°00'	560	17.4	854.5
21	275°20'	460?	10.9	
22	262°40'	510'	10.5	
23	242°40'	510	17.1	854.8
24	273°40'	550	10.7	
25	286°40'	460	11.2	
26	286°00'	480	17.5	854.4
27	278°40'	540'	7.1	
28	294°40'	580'	10.6	
29	303°20'	680'	7.1	
30				
31	299°20'	770	10.6	
32	303°00'	560	5.9	
33	283°40'	390'	8.3	
34	280°00'	290'	8.4	
35	282°00'	130'	7.3	
36	263°00'	160'	10.3	
37	231°00'	620'	4.4	
38	323°20'	490'	3.1	
39	223°20'	710'	0.5	
40	214°00'	610'	2.1	
41	184°40'	500'	0.9	

West Pier 7' West of old Bridge
68

N.W. Cor. Barn

S.W. " "

T.B.L

— H

T.B.R R

T.B.R R

H

T.B.L

T.B.R.

H

T.B.R.

T.B.L

T.B.R ~~clark~~

T.B.L.

T.B.L

Toe of slope

Fence Cor E. & S.

" " N & W

" " W & E & N

Fence

88

87+00

± Nail

87

86+00

1.36

572.08

6.12

870.72

86

87+00

85

86+00

15" X 24'

84

85+00

83

84+00

82

83+00

81

82+00

80

81+00

80+00

B.M

467

876.84

872.17

2.5

2.7

3.2

6.0

5.8

3.1

69.3

2.8

3.3

6.6

6.5

3.1

3.2

3.4

75

50

28

21

16

14

12

21

27

34

50

75

10.1

10.5

66.7

11.1

10.1

10.7

10.3

6.7

6.2

10.5

10.3

6.1

6.3

6.5

50

28

22

17

9

6.1

13

20

25

36

50

6.1

5.9

9.4

8.5

5.4

11.9

5.5

9.0

9.7

6.2

6.3

43

29

23

15

9

5.0

14

21

27

35

50

6.1

6.7

15

8.4

8.3

5.6

12.1

5.5

8.7

9.3

6.4

6.4

50

28

20

28

35

50

Outlet
East

Entr. Pipe
into West

6.5

7.8

8.0

5.1

12.1

4.7

4.9

7.7

9.2

8.4

7.0

50

28

17

11

4.7

12

18

24

29

34

72.5

4.3

73.0

3.8

73.1

3.7

73.6

3.2

70

95
96100

94
95400

93
94+00

92 + 50

~~92 + 15~~
~~93 + 15~~~~874 - 0.2~~

B.17.	8.29	874.17	6.20	865.88	865.88
-------	------	--------	------	--------	--------

91
16
22+00

90
9400

89
~~90~~ + 00

872.09

$\frac{2.8}{25}$	$\frac{2.4}{50}$	$\frac{2.6}{39}$	$\frac{2.5}{37}$	$\frac{2.5}{29}$	$\frac{11.2}{22}$	$\frac{11.8}{18}$	$\frac{6.5}{11}$	$\frac{6.5}{5.9}$	$\frac{6.5}{13}$	$\frac{9.1}{22}$	$\frac{9.5}{27}$	$\frac{3.3}{36}$	$\frac{3.0}{40}$	$\frac{2.8}{49}$	$\frac{2.8}{75}$
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[illegible][illegible]

$\frac{12.5}{75}$	$\frac{11.8}{56}$	$\frac{11.8}{39}$	$\frac{11.7}{36}$	$\frac{15.9}{28}$	$\frac{14.2}{18}$	$\frac{8.7}{7}$	$\frac{6.9}{83}$	$\frac{8.6}{12}$	$\frac{12.2}{22}$	$\frac{12.1}{29}$	$\frac{11.2}{34}$	$\frac{11.0}{50}$	$\frac{11.0}{75}$
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<u>15.1</u>	<u>15.5</u>	<u>15.2</u>	<u>17.5</u>	<u>15.3</u>	<u>7.9</u>									
64	50	32	27	20	6	7	7	13	21	33	50	75		
River	Bank									F				

on N. 1st wing

10.7 10.7 11.7 13.7 14.6 6.4 6.4 10.1 11.4 8.9 8.4 8.5 9.1
 7.5 5.0 2.5 2.4 1.6 7 6.0 7 2.1 2.4 3.1 3.6 5.0 7.5
 Top of Fan

$\frac{95}{75}$	$\frac{8.7}{50}$	$\frac{8.2}{34}$	$\frac{10.4}{27}$	$\frac{9.3}{16}$	$\frac{6.4}{10}$	$\frac{6.5}{5}$	$\frac{6.1}{13}$	$\frac{9.4}{19}$	$\frac{10.6}{25}$	$\frac{9.5}{29}$	$\frac{8.8}{34}$	$\frac{8.5}{50}$	$\frac{9.0}{75}$
-----------------	------------------	------------------	-------------------	------------------	------------------	-----------------	------------------	------------------	-------------------	------------------	------------------	------------------	------------------

<u>3.2</u>	<u>3.3</u>	<u>3.4</u>	<u>3.5</u>	<u>3.6</u>	<u>3.7</u>	<u>3.8</u>	<u>3.9</u>	<u>4.0</u>	<u>4.1</u>	<u>4.2</u>	<u>4.3</u>	<u>4.4</u>	<u>4.5</u>	<u>4.6</u>	<u>4.7</u>	<u>4.8</u>	<u>4.9</u>	<u>5.0</u>
75	50	32	23	18	14	11	9	7	6	5	4	3	2	1	0	0	0	0

B.M.

8.29

B.M.

2.42

101
~~100~~100
~~101~~99
~~100~~98
~~99~~97
~~98~~96
~~97~~

874.17

+ in N.W. Wing

Spk in Transformer Pole

33' Lt of Sta 97+00

72.4
1.872.4
1.873.1
1.172.9
1.372.6
1.5

2.3	2.4	2.6	5.3	5.2	2.8	71.9	2.9	4.2	5.0	3.4	2.3	3.2	3.1
75	50	33	24	18	11	2.3	13	24	31	39	47	54	76
						Top							
						Bank							

83+0

+84 12" X 24' R.P. (6000)

82+0

+61 15" X 30' R.C.P. (HALF FULL DIRT)

81+0

15" X 30' R.C.P. (HALF FULL DIRT)

80+0

+52 N40E. SEC 22-89-12

12" X 20' R.C.P. (6000)

79+0

78+0

72

+89

DRIVE

+61

DRIVE

GAR

H.O.

TREES

+91 Field cut



S.W.D

80+0

87+0

86+0

+12

85+0

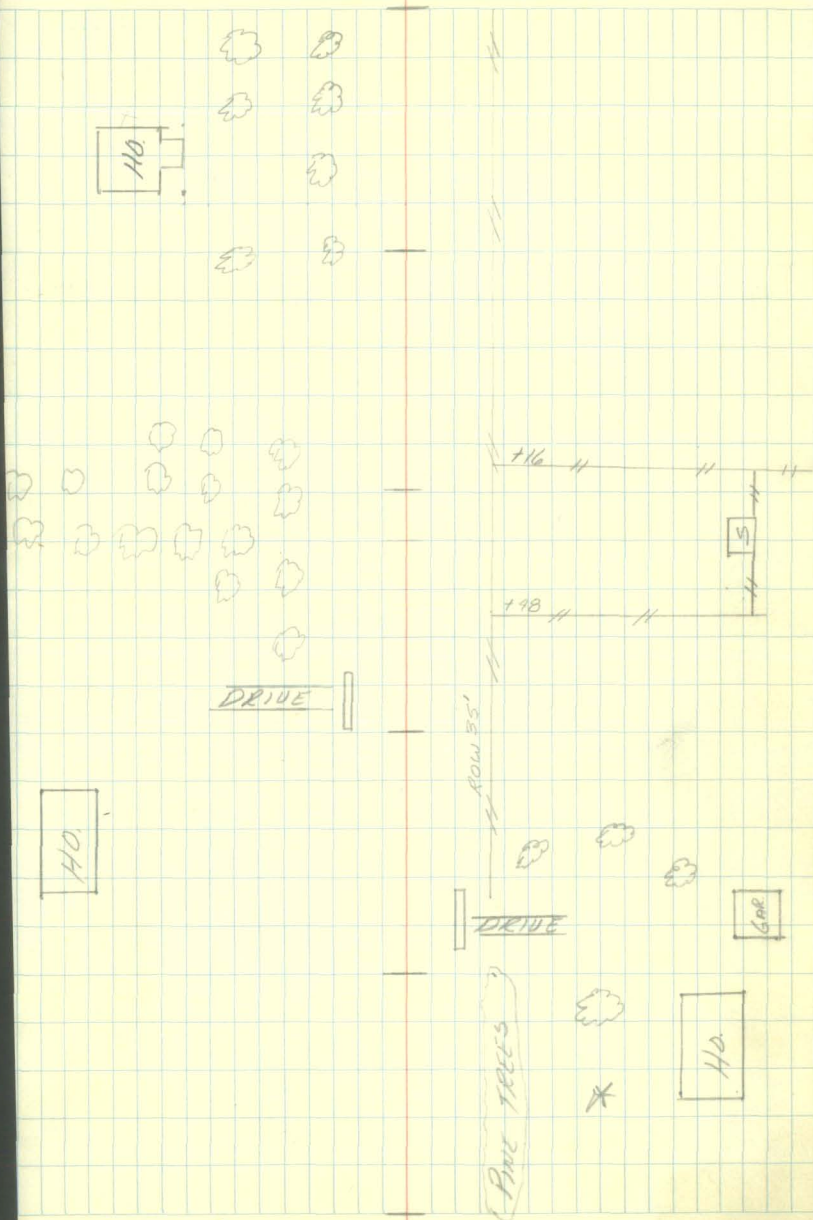
15" X 24' (6000)

+21

84+0

15" X 16' (6000)

83+0



93+0

92+0
+99

EXISTING TRUSS BRIDGE

+29

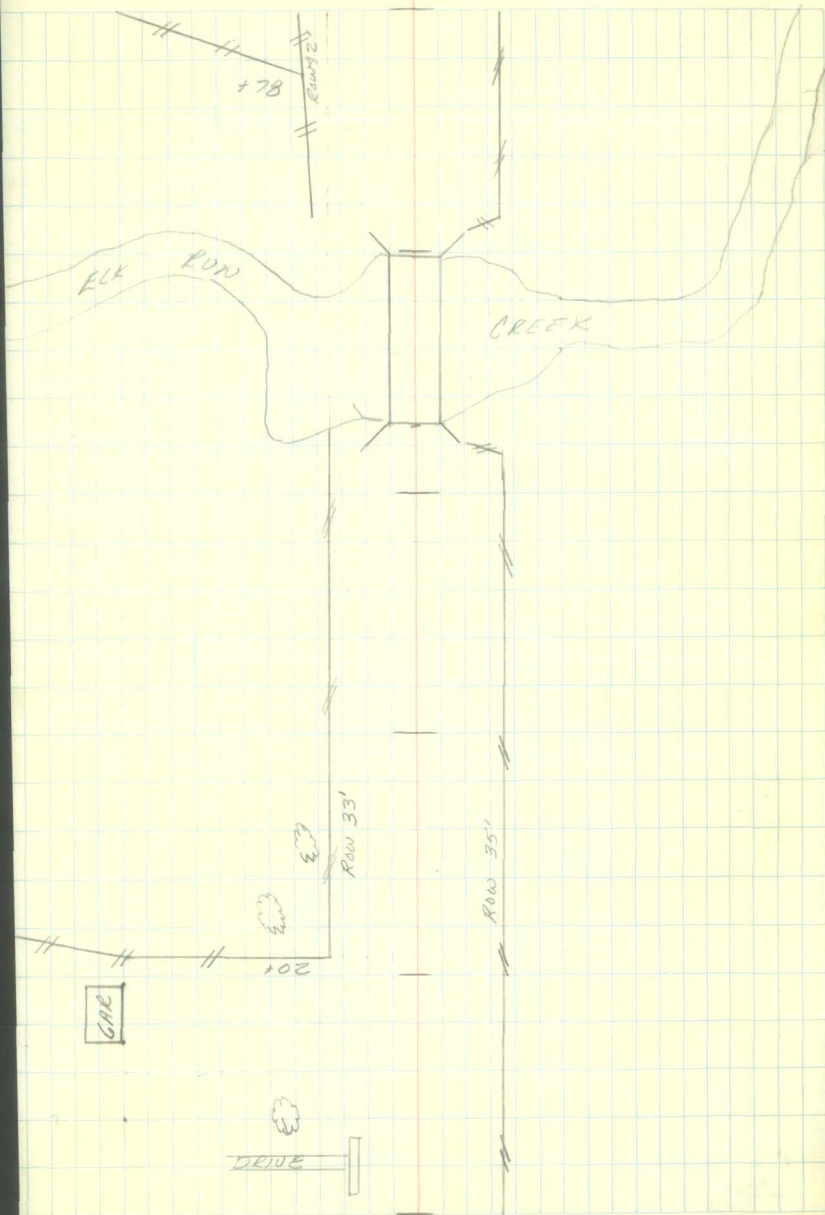
91+0

90+0

89+0

+21 15" X 24' (600D)

88+0



99¹⁰

98¹⁰

97¹⁰

96¹⁰

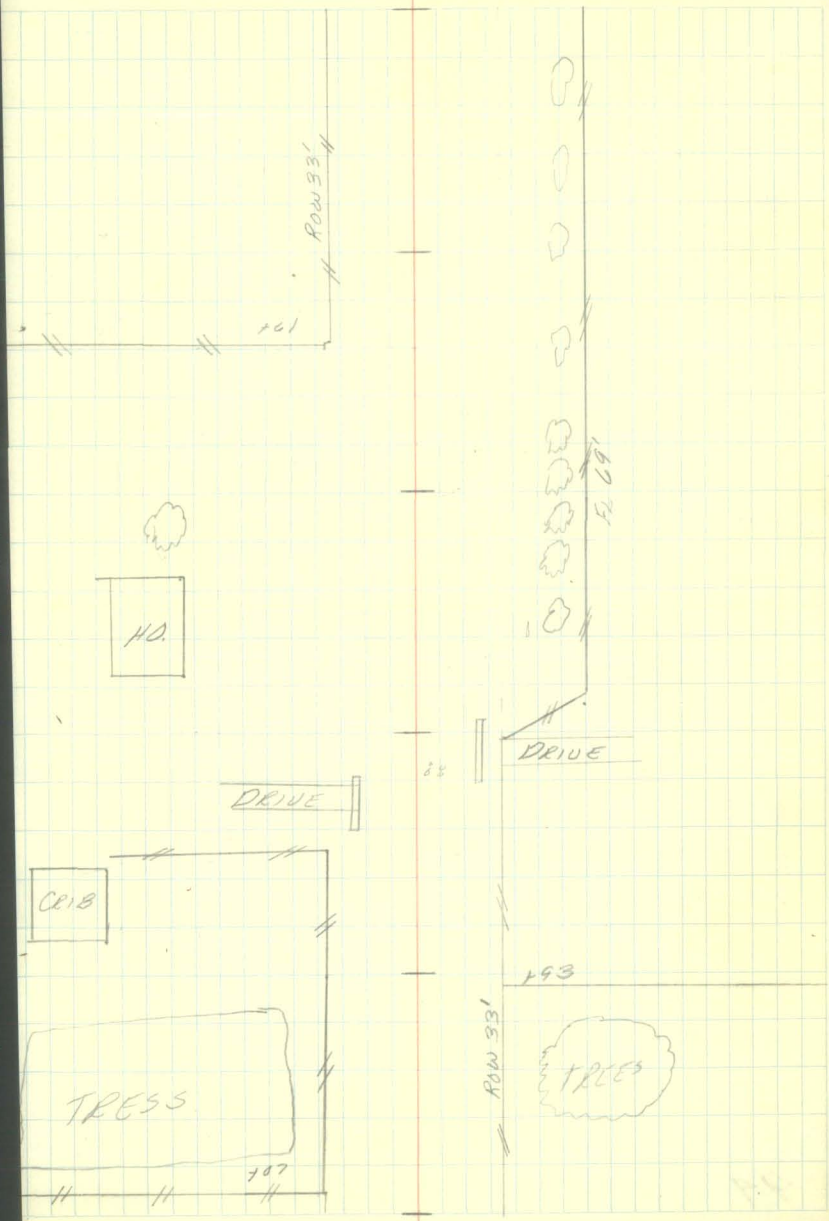
+88 ft. 15" X 24' (Full part)

+75 ft. 15" X 36' (Full part)

95¹⁰

94

75



104⁺⁰

103⁺⁰

102⁺⁰

101⁺⁰

100⁺⁰

+09 DEAD FILL

99⁺⁰

76

FIELD CUT
+02'

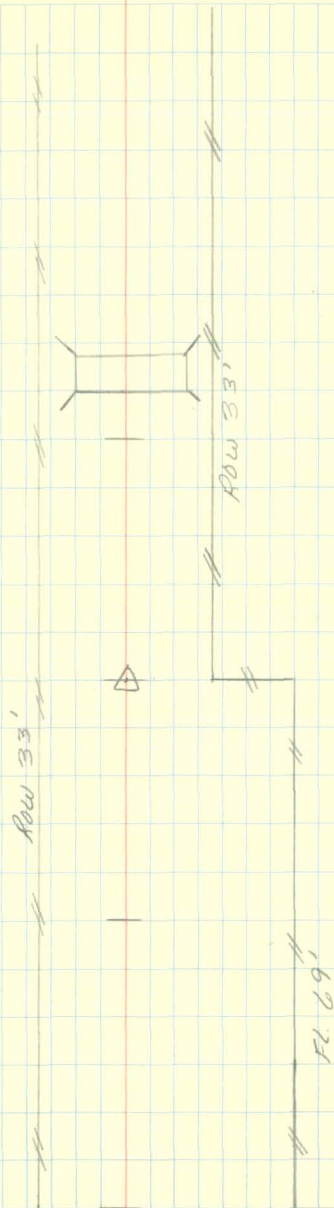
+20' Box Culvert 4'x3'

107+0

106+0

105+0

104+0



IMPROVED TABLES AND INFORMATION

80

HORIZONTAL STADIA CORRECTIONS

2°—00' — 0.1	21°—00' — 12.8	33°—00' — 29.7
3°—00' — 0.3	21°—30' — 13.4	33°—15' — 30.1
4°—00' — 0.5	22°—00' — 14.0	33°—30' — 30.5
5°—00' — 0.8	22°—30' — 14.7	33°—45' — 30.9
6°—00' — 1.1	23°—00' — 15.3	34°—00' — 31.3
7°—00' — 1.5	23°—30' — 15.9	34°—15' — 31.7
8°—00' — 1.9	24°—00' — 16.5	34°—30' — 32.1
9°—00' — 2.5	24°—30' — 17.2	34°—45' — 32.5
10°—00' — 3.0	25°—00' — 17.9	35°—00' — 32.9
10°—30' — 3.3	25°—30' — 18.6	35°—15' — 33.3
11°—00' — 3.6	26°—00' — 19.2	35°—30' — 33.7
11°—30' — 4.0	26°—30' — 19.9	35°—45' — 34.1
12°—00' — 4.3	27°—00' — 20.6	36°—00' — 34.6
12°—30' — 4.7	27°—30' — 21.3	36°—15' — 35.0
13°—00' — 5.1	28°—00' — 22.0	36°—30' — 35.4
13°—30' — 5.5	28°—30' — 22.8	36°—45' — 35.8
14°—00' — 5.9	29°—00' — 23.5	37°—00' — 36.2
14°—30' — 6.3	29°—30' — 24.3	37°—15' — 36.6
15°—00' — 6.7	30°—00' — 25.0	37°—30' — 37.1
15°—30' — 7.2	30°—15' — 25.4	37°—45' — 37.5
16°—00' — 7.6	30°—30' — 25.8	38°—00' — 37.9
16°—30' — 8.1	30°—45' — 26.2	38°—15' — 38.3
17°—00' — 8.5	31°—00' — 26.5	38°—30' — 38.7
17°—30' — 9.0	31°—15' — 26.9	38°—45' — 39.1
18°—00' — 9.5	31°—30' — 27.3	39°—00' — 39.6
18°—30' — 10.1	31°—45' — 27.7	39°—15' — 40.0
19°—00' — 10.6	32°—00' — 28.1	39°—30' — 40.5
19°—30' — 11.2	32°—15' — 28.5	
20°—00' — 11.7	32°—30' — 28.9	
20°—30' — 12.3	32°—45' — 29.3	

Chains to Feet

1	66
2	132
3	198
4	264
5	330
6	396
7	462
8	528
9	594
10	660

Feet to Chains

100	1.515
200	3.030
300	4.545
400	6.060
500	7.575
600	9.090
700	10.606
800	12.121
900	13.636
1,000	15.151

DIRECTIONS FOR USE OF TABLES

TABLE No. 1.

Distance of slope stake from side or shoulder stake for any width roadway, slope $1\frac{1}{2}$ 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.

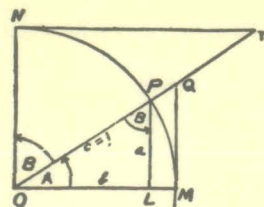


TABLE II
TRIGONOMETRIC FORMULÆ.

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

$$R = OP = c = 1$$

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

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

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

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

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

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

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

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

$$\begin{aligned}\text{exsec } A &= PQ = \text{coexsec } B \\ \text{coexsec } A &= PT = \text{exsec } B\end{aligned}$$

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

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

Law of Sines $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

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

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

TABLE II—Continued
TRIGONOMETRIC FORMULAE (continued)

In any triangle:

Given a, b, C; to find c, B, A.

Use Law of Sines.

Given A, B, c; to find a, b, C.

Use Law of Sines.

Given a, b, c; to find A, B, C.

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

$$\cos \frac{1}{2} A = \sqrt{\frac{s(s-a)}{bc}}$$

$$\tan \frac{1}{2} A = \frac{r}{s-a}$$

$$\tan \frac{1}{2} B = \frac{r}{s-b}$$

$$\tan \frac{1}{2} C = \frac{r}{s-c}$$

Area of a triangle:

$$\text{Area} = \frac{1}{2} ab \sin C$$

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

PRISMOIDAL FORMULA.

$$\text{Vol.} = \frac{h}{6} (B+b+4M)$$

h = altitude; b, B = bases; M = midsection

TABLE III
INCHES AND FRACTIONS OF AN INCH IN DECIMALS OF A FOOT

	0	1	2	3	4	5	6	7	8	9	10	11	
$\frac{1}{16}$	.0052	.0885	.1719	.2552	.3385	.4219	.5052	.5885	.6719	.7552	.8385	.9219	$\frac{1}{16}$
$\frac{1}{8}$	.0104	.0938	.1771	.2604	.3438	.4271	.5104	.5938	.6771	.7604	.8438	.9271	$\frac{1}{8}$
$\frac{3}{16}$	.0156	.0990	.1823	.2656	.3490	.4323	.5156	.5990	.6823	.7656	.8490	.9323	$\frac{3}{16}$
$\frac{1}{4}$	.0208	.1042	.1875	.2708	.3542	.4375	.5208	.6042	.6875	.7708	.8542	.9375	$\frac{1}{4}$
$\frac{5}{16}$	.0260	.1094	.1927	.2760	.3594	.4427	.5260	.6094	.6927	.7760	.8594	.9427	$\frac{5}{16}$
$\frac{3}{8}$	.0313	.1146	.1979	.2813	.3646	.4479	.5313	.6146	.6979	.7813	.8646	.9479	$\frac{3}{8}$
$\frac{7}{16}$	.0365	.1198	.2031	.2865	.3698	.4531	.5365	.6198	.7031	.7865	.8698	.9531	$\frac{7}{16}$
$\frac{1}{2}$	.0417	.1250	.2083	.2917	.3750	.4583	.5417	.6250	.7083	.7917	.8750	.9583	$\frac{1}{2}$
$\frac{9}{16}$	.0469	.1302	.2135	.2969	.3803	.4635	.5469	.6302	.7135	.7969	.8802	.9635	$\frac{9}{16}$
$\frac{5}{8}$	.0521	.1354	.2188	.3021	.3854	.4688	.5521	.6354	.7188	.8021	.8854	.9688	$\frac{5}{8}$
$\frac{11}{16}$	.0573	.1406	.2240	.3073	.3906	.4740	.5573	.6406	.7240	.8073	.8906	.9740	$\frac{11}{16}$
$\frac{3}{4}$	.0625	.1458	.2292	.3125	.3958	.4792	.5625	.6458	.7292	.8125	.8958	.9792	$\frac{3}{4}$
$\frac{7}{8}$	.0677	.1510	.2344	.3177	.4010	.4844	.5677	.6510	.7344	.8177	.9010	.9844	$\frac{7}{8}$
$\frac{15}{16}$	.0729	.1563	.2396	.3229	.4063	.4896	.5729	.6563	.7396	.8229	.9063	.9896	$\frac{15}{16}$
1	.0781	.1615	.2448	.3281	.4115	.4948	.5781	.6615	.7448	.8281	.9115	.9948	1
	.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167	1.000	
	0	1	2	3	4	5	6	7	8	9	10	11	

TABLE IV
USEFUL RELATIONS.

Lineal feet	$\times .00019$	= miles
Lineal yards	$\times .0006$	= miles
Square inches	$\times .007$	= square feet
Square feet	$\times .111$	= square yards
Square yards	$\times .0002067$	= acres
Acres	$\times 4840$	= square yards
Cubic inches	$\times .00058$	= cubic feet
Cubic feet	$\times .03704$	= cubic yards
Links	$\times .22$	= yards
Links	$\times .66$	= feet
Feet	$\times 1.5$	= links

$$360^\circ = 21600' = 1296000''$$

$$\text{Radius} = \text{arc of } 57.2957790^\circ$$

$$\text{Arc of } 1^\circ (\text{radius} = 1) = .017453292$$

$$\text{Arc of } 1' (\text{radius} = 1) = .000290888$$

$$\text{Arc of } 1'' (\text{radius} = 1) = .000004848$$

$$\pi = 3.141592654 \quad \sqrt{\frac{1}{\pi}} = 0.564190$$

$$\frac{\pi}{4} = 0.785398163 \quad \sqrt[3]{\frac{6}{\pi}} = 1.240700982$$

$$\frac{\pi}{6} = 0.523598776 \quad \pi^2 = 9.869604401$$

$$\sqrt{\frac{4}{\pi}} = 1.128379167 \quad \frac{1}{\pi^2} = 0.101321184$$

$$\frac{\pi}{6} = 0.523598776 \quad \sqrt{\pi} = 1.772453851$$

$$\frac{4\pi}{3} = 4.188790205 \quad \frac{1}{\pi} = 0.3183099$$

Curvature of Earth's surface = about 0.7 feet in 1 mile

Curvature in feet = $0.667 (\text{Dist. in miles})^2$

Difference between arc and chord length, 0.05 feet in $11\frac{1}{2}$ miles

$$\text{Probable error of a single observation} = 0.6754 \sqrt{\frac{M}{n-1}}$$

Error in chaining of 0.01 feet in 100 feet:

Due to—

1. Length of tape error of 0.01 feet
2. Alignment. One end 1.4 feet out of line
3. Sag of tape at centre of 0.61 feet.
4. Temperature difference of 15°
5. Difference of pull of 15 lbs.

STADIA REDUCTION FORMULAE

$$\text{Horizontal Distance} = R - R \sin^2 a + C \cos a$$

$$\text{Vertical Distance} = R \frac{1}{2} \sin 2a + C \sin a$$

$$R = \text{Reading} \times \frac{\text{distance from Object glass to cross hairs}}{\text{distance between cross hairs}}$$

C = distance from Object glass to cross hairs + distance from Object glass to center of instrument.

a = angle of elevation for mid Reading

TABLE VI (continued)
SINES, COSINES, TANGENTS, COTANGENTS (continued)

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
46	7193	1.0355	7214	1.0416	7234	1.0477	7254	1.0533	7274	1.0599	7294	1.0661	43
47	314	.0724	333	.0786	353	.0850	373	.0913	392	.0977	412	.1041	42
48	431	.1106	451	.1171	470	.1237	490	.1303	509	.1369	528	.1436	41
49	547	.1504	566	.1571	585	.1640	604	.1708	623	.1778	642	.1847	40
50	660	.1918	7679	1.1988	7698	1.2059	7716	1.2131	7735	1.2203	7753	1.2276	39
51	771	.2349	790	.2423	808	.2497	826	.2572	844	.2647	862	.2723	38
52	880	.2799	898	.2876	916	.2954	934	.3032	951	.3111	969	.3190	37
53	986	.3270	9004	.3351	8021	.3452	8039	.3514	8056	.3597	8073	.3680	36
54	8090	.3764	107	.3848	124	.3934	141	.4019	158	.4106	175	.4193	35
55	192	.4281	208	.4370	225	.4460	241	.4550	258	.4641	274	.4733	34
56	290	.4826	307	.4919	323	.5013	339	.5108	355	.5204	371	.5301	33
57	387	.5399	403	.5497	418	.5597	434	.5697	450	.5798	465	.5900	32
58	480	.6003	496	.6107	511	.6212	526	.6319	542	.6426	557	.6534	31
59	572	.6643	587	.6753	601	.6864	616	.6977	631	.7090	646	.7205	30
60	660	1.7321	8675	1.7437	8689	1.7556	8704	1.7675	8718	1.7797	8732	1.7917	29
61	746	.8040	760	.8165	774	.8291	788	.8418	802	.8546	816	.8676	28
62	829	.8807	843	.8940	857	.9074	870	.9210	884	.9347	897	.9486	27
63	910	.9626	923	.9768	936	.9912	949	2.0057	962	2.0204	975	2.0353	26
64	988	2.0503	9001	2.0655	9013	2.0809	9026	.0965	9038	.1123	9051	.1283	25
65	9063	.1445	075	.1609	088	.1775	100	.1943	112	.2113	124	.2286	24
66	135	.2460	147	.2637	159	.2817	171	.2998	182	.3183	194	.3369	23
67	205	.3559	216	.3750	228	.3945	239	.4142	250	.4342	261	.4545	22
68	272	.4751	283	.4960	293	.5172	304	.5386	315	.5605	325	.5826	21
69	336	.6051	346	.6279	356	.6511	367	.6746	377	.6985	387	.7228	20
70	397	2.7475	9407	2.7725	9417	2.7980	9426	2.8239	9436	2.8502	9446	2.8770	19
71	455	.9042	465	.9319	474	.9600	483	.9887	492	3.0178	502	3.0475	18
72	511	3.0777	520	3.1084	528	3.1397	537	3.1716	546	.2041	555	.2371	17
73	563	.2709	572	.3052	580	.3402	588	.3759	596	.4124	605	.4495	16
74	613	.4874	621	.5261	628	.5656	636	.6059	644	.6470	652	.6891	15
75	659	.7321	667	.7760	674	.8208	681	.8657	689	.9136	696	.9617	14
76	703	4.0108	710	4.0611	717	4.1126	724	4.1653	730	4.2193	737	4.2747	13
77	744	.3315	750	.3897	757	.4494	763	.5107	769	.5736	775	.6382	12
78	781	.7046	787	.7729	793	.8430	799	.9152	805	.9894	811	5.0658	11
79	816	.1446	822	5.2257	827	5.3093	833	5.3955	838	5.4845	843	5.5764	10
80	9848	5.6713	9853	5.7694	9858	5.8708	9863	5.9758	9868	6.0844	9872	6.1970	9
81	877	6.3138	881	6.4348	886	6.5606	890	6.6912	894	.8269	899	.9682	8
82	903	7.1154	907	7.2687	911	7.4287	914	7.5958	918	7.7704	922	7.9530	7
83	925	8.1443	929	8.3450	932	8.5555	936	8.7769	939	9.0098	942	9.2553	6
84	945	9.5144	948	9.7882	951	10.078	954	10.385	957	10.711	959	11.059	5
85	962	11.430	964	11.826	967	12.250	969	12.706	971	13.197	974	13.727	4
86	976	14.300	978	14.924	980	15.605	981	16.350	983	17.169	985	18.075	3
87	986	19.081	988	20.206	989	21.470	990	22.903	992	24.542	993	26.432	2
88	994	28.636	995	31.242	996	34.368	997	38.189	997	42.964	998	49.104	1
89	9998	57.290	9999	68.750	9999	85.940	9999	114.58	1.000	171.88	1.000	343.77	0
90	60'	60'	cos	50'	cos	40'	cos	30'	cos	20'	cos	10'	cos

TABLE VII
RODS IN FEET, 10THS AND 100THS OF FEET

Rods	Feet	Rods	Feet	Rods	Feet	Rods	Feet	Rods	Feet
1	16.50	21	346.50	41	676.50	61	1006.50	81	1336.50
2	33.00	22	363.00	42	693.00	62	1023.00	82	1353.00
3	49.50	23	379.50	43	709.50	63	1039.50	83	1369.50
4	66.00	24	396.00	44	726.00	64	1056.00	84	1386.00
5	82.50	25	412.50	45	742.50	65	1072.50	85	1402.50
6	99.00	26	429.00	46	759.00	66	1089.00	86	1419.00
7	115.50	27	445.50	47	775.50	67	1105.50	87	1435.50
8	132.00	28	462.00	48	792.00	68	1122.00	88	1452.00
9	148.50	29	478.50	49	808.50	69	1138.50	89	1468.50
10	165.00	30	495.00	50	825.00	70	1155.00	90	1485.00
11	181.50	31	511.50	51	841.50	71	1171.50	91	1501.50
12	198.00	32	528.00	52	858.00	72	1188.00	92	1518.00
13	214.50	33	544.50	53	874.50	73	1204.50	93	1534.50
14	231.00	34	561.00	54	891.00	74	1221.00	94	1551.00
15	247.50	35	577.50	55	907.50	75	1237.50	95	1567.50
16	264.00	36	594.00	56	924.00	76	1254.00	96	1584.00
17	280.50	37	610.50	57	940.50	77	1270.50	97	1600.50
18	297.00	38	627.00	58	957.00	78	1287.00	98	1617.00
19	313.50	39	643.50	59	973.50	79	1303.50	99	1633.50
20	330.00	40	660.00	60	990.00	80	1320.00	100	1650.00

TABLE VIII
LINKS IN FEET, 10THS AND 100THS OF FEET

Links	Feet	Links	Feet	Links	Feet	Links	Feet	Links	Feet	Links	Feet
1	0.66	18	11.88	35	23.10	52	34.32	69	45.54	86	56.76
2	1.32	19	12.54	36	23.76	53	34.98	70	46.20	87	57.42
3	1.98	20	13.20	37	24.42	54	35.64	71	46.86	88	58.08
4	2.64	21	13.86	38	25.08	55	36.30	72	47.52	89	58.74
5	3.30	22	14.52	39	25.74	56	36.96	73	48.18	90	59.40
6	3.96	23	15.18	40	26.40	57	37.62	74	48.84	91	60.06
7	4.62	24	15.84	41	27.06	58	38.28	75	49.50	92	60.72
8	5.28	25	16.50	42	27.72	59	38.94	76	50.16	93	61.38
9	5.94	26	17.16	43	28.38	60	39.60	77	50.82	94	62.04
10	6.60	27	17.82	44	29.04	61	40.26	78	51.48	95	62.70
11	7.26	28	18.48	45	29.70	62	40.92	79	52.14	96	63.36
12	7.92	29	19.14	46	30.36	63	41.58	80	52.80	97	64.02
13	8.58	30	19.80	47	31.02	64	42.24	81	53.46	98	64.68
14	9.24	31	20.46	48	31.68	65	42.90	82	54.12	99	65.34
15	9.90	32	21.12	49	32.34	66	43.56	83	54.78	100	66.00
16	10.56	33	21.78	50	33.00	67	44.22	84	55.44	101	66.66
17	11.22	34	22.44	51	33.66	68	44.88	85	56.10	102	67.32

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		20'	568.53	28.137		20'	1079.2	100.75	
30'	75.01	.491	T	30'	576.95	28.974	T	30'	1087.8	102.35	T
40'	83.34	.606	.03	40'	585.36	29.824	.06	40'	1096.4	103.97	.10
50'	91.68	.733	E	50'	593.79	30.686	E	50'	1105.1	105.60	E
2°	100.01	.873	.001	12°	602.21	31.561	.006	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		50'	745.85	48.341		50'	1261.5	137.23	
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		40'	839.27	61.141		40'	1358.0	158.72	
50'	342.08	10.202		50'	847.78	62.381		50'	1366.8	160.76	
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		10'	916.03	72.764		10'	1437.4	177.55	
20'	417.41	15.184		20'	924.58	74.119		20'	1446.3	179.72	
30'	425.79	15.799		30'	933.13	75.488		30'	1455.1	181.89	
40'	434.17	16.426		40'	941.69	76.869	.32	40'	1464.0	184.08	.49
50'	442.55	17.065		50'	950.25	78.264	E	50'	1472.9	186.29	E
9°	450.93	17.717	.007	19°	958.81	79.671	.028	29°	1481.8	188.51	.065
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		20°	1010.3	88.389		30°	1535.3	202.12	
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		40'	1044.7	94.462		40'	1571.0	211.48	
50'	543.29	25.700	.008	50'	1053.3	96.013	.034	50'	1580.0	213.86	.078

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°	2794.0	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		50'	2363.5	468.4		50'	2972.1	725.0	
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		40'	2471.5	510.3		40'	3089.4	779.8	
50'	1907.9	309.3		50'	2481.4	514.3		50'	3100.2	784.9	
37°	1917.1	312.2	.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		10'	2561.0	546.3		10'	3186.9	826.7	
20'	1991.5	336.3		20'	2571.0	550.4		20'	3197.8	832.0	
30'	2000.9	339.3		30'	2581.0	554.5		30'	3208.8	837.3	
40'	2010.2	342.4		40'	2591.0	558.6		40'	3219.7	842.7	
50'	2019.6	345.5		50'	2601.1	562.8		50'	3230.7	848.1	
39°	2029.0	348.6	.117	49°	2611.2	566.9	.189	59°	3241.7	853.5	.283
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	583.0		40'	3285.8	875.3	
50'	2076.0	364.5		50'	2661.6	588.0		50'	3296.9	880.8	
40°	2085.4	367.7		50'	2671.8	592.3		60°	3308.0	886.4	
10'	2094.9	371.0	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'	3352.8	908.8	.340
50'	2132.7	384.1		50'	2722.7	614.0		50'	3363.8	914.5	

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	+ 5° C. T 25 E	71°	4086.9	1308.2	+ 5° C. T 30 E	81°	4893.6	1805.3	+ 5° C. T 36 E
10'	3386.3	925.9		10'	4099.5	1315.6		10'	4908.0	1814.7	
20'	3397.5	931.6		20'	4112.1	1322.9		20'	4922.5	1824.1	
30'	3408.8	937.3		30'	4124.8	1330.3		30'	4937.0	1833.6	
40'	3420.1	943.1		40'	4137.4	1337.7		40'	4951.5	1843.1	
50'	3431.4	948.9		50'	4150.1	1345.1		50'	4966.1	1852.6	
62°	3442.7	954.8	.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. T 51 E .159	73°	4239.7	1398.0	10° C. T 61 E .220	83°	5069.2	1920.5	10° C. T 72 E .299
10'	3522.6	996.2		10'	4252.6	1405.7		10'	5084.0	1930.4	
20'	3534.1	1002.3		20'	4265.6	1413.5		20'	5099.0	1940.3	
30'	3545.6	1008.3		30'	4278.5	1421.2		30'	5113.9	1950.3	
40'	3557.2	1014.4		40'	4291.5	1429.0		40'	5128.9	1960.2	
50'	3568.7	1020.5		50'	4304.6	1436.8		50'	5143.9	1970.3	
64°	3580.3	1026.6	15° C. T .76 .240	74°	4317.6	1444.6	15° C. T .91 .332	84°	5159.0	1980.4	15° C. T 1.09 .450
10'	3591.9	1032.8		10'	4330.7	1452.5		10'	5174.1	1990.5	
20'	3603.5	1039.0		20'	4343.8	1460.4		20'	5189.3	2000.6	
30'	3615.1	1045.2		30'	4356.9	1468.4		30'	5204.4	2010.8	
40'	3626.8	1051.4		40'	4370.1	1476.4		40'	5219.7	2021.1	
50'	3638.5	1057.7		50'	4383.3	1484.4		50'	5234.9	2031.4	
65°	3650.2	1063.9	20° C. T 1.02 .321	75°	4396.5	1492.4	20° C. T 1.22 .445	85°	5250.3	2041.7	20° C. T 1.45 .603
10'	3661.9	1070.2		10'	4409.8	1500.5		10'	5265.6	2052.1	
20'	3673.7	1076.6		20'	4423.1	1508.6		20'	5281.0	2062.5	
30'	3685.4	1082.9		30'	4436.4	1516.7		30'	5296.4	2073.0	
40'	3697.2	1089.3		40'	4449.7	1524.9		40'	5311.9	2083.5	
50'	3709.0	1095.7		50'	4463.1	1533.1		50'	5327.4	2094.1	
66°	3720.9	1102.2	25° C. T 1.28 .403	76°	4476.5	1541.4	25° C. T 1.53 .558	86°	5343.0	2104.7	25° C. T 1.83 .756
10'	3732.7	1108.6		10'	4489.9	1549.7		10'	5358.6	2115.3	
20'	3744.6	1115.1		20'	4503.4	1558.0		20'	5374.2	2126.0	
30'	3756.5	1121.7		30'	4516.9	1566.3		30'	5389.9	2136.7	
40'	3768.5	1128.2		40'	4530.4	1574.7		40'	5405.6	2147.5	
50'	3780.4	1134.8		50'	4544.0	1583.1		50'	5421.4	2158.4	
67°	3792.4	1141.4	30° C. T 1.54 .485	77°	4557.6	1591.6	30° C. T 1.84 .671	87°	5437.2	2169.2	30° C. T 2.20 .910
10'	3804.4	1148.0		10'	4571.2	1600.1		10'	5453.1	2180.2	
20'	3816.4	1154.7		20'	4584.8	1608.6		20'	5469.0	2191.1	
30'	3828.4	1161.3		30'	4598.5	1617.1		30'	5484.9	2202.2	
40'	3840.5	1168.1		40'	4612.2	1625.7		40'	5500.9	2213.2	
50'	3852.6	1174.8		50'	4626.0	1634.4		50'	5517.0	2224.3	
68°	3864.7	1181.6	35° C. T 1.83 .558	78°	4639.8	1643.0	35° C. T 2.18 .756	88°	5533.1	2235.5	35° C. T 2.62 .910
10'	3876.8	1188.4		10'	4653.6	1651.7		10'	5549.2	2246.7	
20'	3889.0	1195.2		20'	4667.4	1660.5		20'	5565.4	2258.0	
30'	3901.2	1202.0		30'	4681.3	1669.2		30'	5581.6	2269.3	
40'	3913.4	1208.9		40'	4695.2	1678.1		40'	5597.8	2280.6	
50'	3925.6	1215.8		50'	4709.2	1686.9		50'	5614.2	2292.0	
69°	3937.9	1222.7	40° C. T 2.14 .910	79°	4723.2	1695.8	40° C. T 2.44 .910	89°	5630.5	2303.5	40° C. T 2.84 .910
10'	3950.2	1229.7		10'	4737.2	1704.7		10'	5646.8	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	45° C. T 2.44 .910	80°	4807.7	1749.9	45° C. T 2.74 .910	90°	5729.7	2373.3	45° C. T 3.14 .910
10'	4024.4	1272.1		10'	4822.0	1759.0		10'	5746.3	2385.1	
20'	4036.8	1279.3		20'	4836.2	1768.2		20'	5763.3	2397.0	
30'	4049.3	1286.5		30'	4850.5	1777.4		30'	5779.9	2408.9	
40'	4061.8	1293.6		40'	4864.8	1786.7		40'	5796.7	2420.9	
50'	4074.4	1300.9		50'	4879.2	1796.0		50'	5813.6	2432.9	

$$T = R \tan \frac{1}{2} I \quad E = R \operatorname{exsec} \frac{1}{2} I$$

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	+ 5° C. T .43 E .200	101°	6950.6	3278.1	+ 5° C. T .51 E .268	111°	8336.7	4386.1	+ 5° C. T .62 E .360
10'	5847.5	2457.1		10'	6971.3	3294.1		10'	8362.7	4407.6	
20'	5864.6	2469.3		20'	6992.0	3310.1		20'	8388.9	4429.2	
30'	5881.7	2481.5		30'	7012.7	3326.1		30'	8415.1	4450.9	
40'	5898.8	2493.8		40'	7033.6	3342.3		40'	8441.5	4472.7	
50'	5916.0	2506.1		50'	7054.5	3358.5		50'	8468.0	4494.6	
92°	5933.2	2518.5	10° C. T .86 E .401	102°	7075.5	3374.9	10° C. T .103 E .536	112°	8494.6	4516.6	10° C. T 1.25 E .721
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	15° C. T .130 E .604	103°	7203.2	3474.4	15° C. T 1.56 E .806	113°	8656.6	4651.3	15° C. T 1.93 E 1.09
10'	6055.4	2606.8		10'	7224.7	3491.3		10'	8684.0	4674.2	
20'	6073.1	2619.7		20'	7246.3	3508.2		20'	8711.5	4697.2	
30'	6090.8	2632.6		30'	7268.0	3525.2		30'	8739.2	4720.3	
40'	6108.6	2645.5		40'	7289.8	3542.4		40'	8767.0	4743.6	
50'	6126.4	2658.5		50'	7311.7	3559.6		50'	8794.9	4766.9	
94°	6144.3	2671.6	20° C. T 1.74 E .809	104°	7333.6	3576.8	20° C. T 2.08 E 1.08	114°	8822.9	4790.4	20° C. T 2.52 E 1.46
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		50'	7444.6	3664.5		50'	8965.0	4909.9	
95°	6252.8	2751.3	25° C. T 2.18 E 1.02	105°	7467.0	3682.3	25° C. T 2.61 E 1.36	115°	8993.8	4934.1	25° C. T 3.16 E 1.83
10'	6271.1	2764.8		10'	7489.6	3700.2		10'	9022.7	4958.6	
20'	6289.4	2778.3		20'	7512.2	3718.2		20'	9051.7	4983.1	
30'	6307.9	2792.0		30'	7534.9	3736.2		30'	9080.9	5007.8	
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	30° C. T 2.44 E 1.22	106°	7603.5	3791.0	30° C. T 3.14 E 1.63	116°	9169.4	5082.7	30° C. T 3.81 E 2.20
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		40'	7696.3	3865.2		40'	9289.2	5184.5	
50'	6457.3	2903.1		50'	7719.7	3884.0		50'	9319.5	5210.3	
97°	6476.2	2917.3	30° C. T 2.44 E 1.22	107°	7743.2	3902.9	30° C. T 3.14 E 1.63	117°	9349.9	5236.2	30° C. T 3.81 E 2.20
10'	6495.2	2931.6		10'	7766.8	3921.9		10'	9380.5	5262.3	
20'	6514.3	2945.9		20'	7790.5	3940.9		20'	9411.3	5288.6	
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	30° C. T 2.44 E 1.22	108°	7886.2	4018.2	30° C. T 3.14 E 1.63	118°	9535.7	5395.1	30° C. T 3.81 E 2.20
10'	6610.6	3018.4		10'	7910.4	4037.8		10'	9567.2	5422.1	
20'	6630.1	3033.1		20'	7934.6	4057.4		20'	9598.9	5449.2	
30'	6649.6	3047.9		30'	7959.0	4077.2		30'	9630.7	5476.5	
40'	6669.2	3062.8		40'	7983.5	4097.1		40'	9662.6	5504.0	
50'	6688.8	3077.7		50'	8008.0	4117.0		50'	9694.7	5531.7	
99°	6708.6	3092.7	30° C. T 2.44 E 1.22	109°	8032.7	4137.1	30° C. T 3.14 E 1.63	119°	9727.0	5559.4	30° C. T 3.81 E 2.20
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. T 2.44 E 1.22	110°	8182.8	4259.7	30° C. T 3.14 E 1.63	120°	9924.0	5729.7	30° C. T 3.81 E 2.20
10'	6848.5	3199.6		10'	8208.2	4280.5		10'	9957.5	5758.6	
20'	6868.8	3215.1		20'	8233.7	4301.4		20'	9991.0	5787.7	
30'	6889.2	3230.8		30'	8259.3	4322.4		30'	10025.0	5817.0	
40'	6909.6	3246.5		40'	8285.0	4343.6		40'	10059.0	5846.5	
50'	6930.1	3262.3		50'	8310.8	4364.8		50'	10093.0	5876.1	

TABLE X.
MIDDLE ORDINATES OF RAILS
Length of Rail (feet)

C o /	R Feet	30 Inch	28 Inch	26 Inch	24 Inch	22 Inch	20 Inch	C o	R Feet	30 Inch	28 Inch	26 Inch	24 Inch	22 Inch	20 Inch
0-20	17189	.08	.07	.06	.05	.04	.03	8	716.8	1.88	1.64	1.42	1.20	1.01	.84
0-40	8594	.16	.14	.12	.10	.08	.07	9	637.3	2.12	1.84	1.60	1.35	1.14	.94
1-0	5730	.24	.20	.18	.15	.13	.10	10	573.7	2.36	2.05	1.78	1.50	1.27	1.04
1-20	4297	.31	.27	.23	.20	.17	.13	11	521.7	2.59	2.26	1.95	1.65	1.39	1.15
1-40	3438	.39	.34	.29	.25	.21	.17	12	478.3	3.83	2.47	2.15	1.81	1.54	1.26
2-0	2865	.47	.41	.35	.30	.25	.20	13	441.7	3.05	2.66	2.30	1.96	1.66	1.36
2-20	2456	.55	.48	.41	.35	.29	.23	14	410.3	3.30	2.87	2.48	2.10	1.78	1.46
2-40	2149	.63	.55	.47	.40	.33	.27	15	383.1	3.54	3.08	2.68	2.26	1.91	1.57
3-0	1910	.71	.62	.53	.45	.38	.31	16	359.3	3.76	3.28	2.83	2.40	2.04	1.67
3-20	1719	.78	.68	.59	.50	.42	.35	17	338.3	4.00	3.48	3.02	2.57	2.16	1.78
3-40	1563	.86	.75	.65	.55	.46	.38	18	319.6	4.21	3.67	3.18	2.70	2.28	1.87
4-0	1433	.94	.82	.71	.60	.50	.42	19	302.9	4.45	3.89	3.36	2.86	2.41	1.98
4-20	1323	1.02	.89	.77	.65	.55	.45	20	287.9	4.70	4.09	3.55	3.00	2.54	2.09
4-40	1228	1.10	.96	.83	.70	.59	.48	22	262.0	5.16	4.44	3.84	3.30	2.80	2.29
5	1146	1.18	1.03	.89	.75	.63	.52	24	240.5	5.64	4.92	4.20	3.59	3.04	2.50
6	955.3	1.41	1.23	1.06	.90	.76	.62	26	222.3	6.07	5.29	4.58	3.88	3.29	2.70
7	819.0	1.65	1.44	1.24	1.05	.89	.73								

TABLE XI.
SHORT RADIUS CURVES

Radius Feet	Chord Feet	Central Angle	Deflection Angle	Deflection for 1 Foot
35	10	16-26	8-13	49.3
45	10	12-46	6-23	38.3
50	15	17-16	8-38	34.5
60	15	14-22	7-11	28.8
75	15	11-30	5-45	23.0
100	20	11-30	5-45	17.3
120	20	9-34	4-47	14.3
150	20	7-39	3-49	11.5
190	25	7-32	3-46	9.15
200	25	7-10	3-35	8.6
225	25	6-25	3-12	7.7
240	25	5-58	2-59	7.2
250	25	5-44	2-52	6.9
275	25	5-12	2-36	6.2
288	50	9-58	4-59	6.0
300	50	9-32	4-46	5.7
350	50	8-12	4-06	4.9
376	50	7-40	3-50	4.6
400	50	7-10	3-35	4.3
410	50	7-00	3-30	4.2

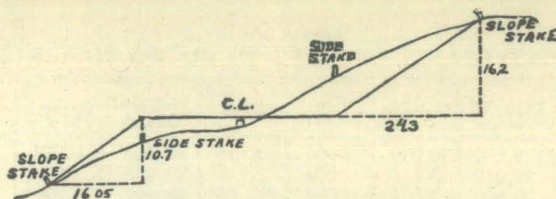
To find length of curve divide angle from P. C. to P. T. by central angle of chord, and multiply by length of chord.

TABLE XII.
INCLINED DISTANCE OF 100 FT. REDUCED TO HORIZONTAL

Slope	Horizontal Distance	Correction	Rise Per Foot	Slope	Horizontal Distance	Correction	Rise Per Foot
0°00'	100.000	0.000	0.000	8°00'	99.027	0.973	0.139
15'	99.999	0.001	0.004	15'	98.965	1.035	0.143
30'	99.996	0.004	0.009	30'	98.902	1.098	0.148
45'	99.991	0.009	0.013	45'	98.836	1.164	0.152
1 00	99.985	0.015	0.017	9 00	98.769	1.231	0.156
15	99.976	0.024	0.022	15	98.700	1.300	0.161
30	99.966	0.034	0.026	30	98.629	1.371	0.165
45	99.953	0.047	0.031	45	98.556	1.444	0.169
2 00	99.939	0.061	0.035	10 00	98.481	1.519	0.174
15	99.923	0.077	0.039	15	98.404	1.596	0.178
30	99.905	0.095	0.044	30	98.325	1.675	0.182
45	99.885	0.115	0.048	45	98.245	1.755	0.187
3 00	99.863	0.137	0.052	11 00	98.163	1.837	0.191
15	99.839	0.161	0.057	15	98.079	1.921	0.195
30	99.813	0.187	0.061	30	97.992	2.008	0.199
45	99.786	0.214	0.065	45	97.905	2.095	0.204
4 00	99.756	0.244	0.070	12 00	97.815	2.185	0.208
15	99.725	0.275	0.074	15	97.723	2.277	0.212
30	99.692	0.308	0.078	30	97.630	2.370	0.216
45	99.657	0.343	0.083	45	97.534	2.466	0.221
5 00	99.619	0.381	0.087	13 00	97.437	2.563	0.225
15	99.580	0.420	0.092	15	97.338	2.662	0.229
30	99.540	0.460	0.096	30	97.237	2.763	0.233
45	99.497	0.503	0.100	45	97.134	2.866	0.238
6 00	99.452	0.548	0.105	14 00	97.030	2.970	0.242
15	99.406	0.594	0.109	15	96.923	3.077	0.246
30	99.357	0.643	0.113	30	96.815	3.185	0.250
45	99.307	0.693	0.118	45	96.705	3.295	0.255
7 00	99.255	0.745	0.122	15 00	96.593	3.407	0.259
15	99.200	0.800	0.126	15	96.479	3.521	0.263
30	99.144	0.856	0.131	30	96.363	3.637	0.267
45	99.087	0.913	0.135	45	96.246	3.754	0.271

TABLE XIII.
MINUTES IN DECIMALS OF A DEGREE.

0 30"	.00833	10 30"	.17500	20 30"	.34167	30 30"	.50833	40 30"	.67500	50 30"	.84167
1 00	.01667	11 00	.18333	21 00	.35000	31 00	.51667	41 00	.68333	51 00	.85000
30	.02500	30	.19167	30	.35833	30	.52500	30	.69167	30	.85833
2 00	.03333	12 00	.20000	22 00	.36667	32 00	.53333	42 00	.70000	52 00	.86667
30	.04167	30	.20833	30	.37500	30	.54167	30	.70833	30	.87500
3 00	.05000	13 00	.21667	23 00	.38333	33 00	.55000	43 00	.71667	53 00	.88333
30	.05833	30	.22500	30	.39167	30	.55833	30	.72500	30	.89167
4 00	.06667	14 00	.23333	24 00	.40000	34 00	.56667	44 00	.73333	54 00	.90000
30	.07500	30	.24167	30	.40833	30	.57500	30	.74167	30	.90833
5 00	.08333	15 00	.25000	25 00	.41667	35 00	.58333	45 00	.75000	55 00	.91667
30	.09167	30	.25833	30	.42500	30	.59167	30	.75833	30	.92500
6 00	.10000	16 00	.26667	26 00	.43333	36 00	.60000	46 00	.76667	56 00	.93333
30	.10833	30	.27500	30	.44167	30	.60833	30	.77500	30	.94167
7 00	.11667	17 00	.28333	27 00	.45000	37 00	.61667	47 00	.78333	57 00	.95000
30	.12500	30	.29167	30	.45833	30	.62500	30	.79167	30	.95833
8 00	.13333	18 00	.30000	28 00	.46667	38 00	.63333	48 00	.80000	58 00	.96667
30	.14167	30	.30833	30	.47500	30	.64167	30	.80833	30	.97500
9 00	.15000	19 00	.31667	29 00	.48333	39 00	.65000	49 00	.81667	59 00	.98333
30	.15833	30	.32500	30	.49167	30	.65833	30	.82500	30	.99167
10 00	.16667	20 00	.33333	30 00	.50000	40 00	.66667	50 00	.83333	60 00	1.00000



DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING.

SLOPE $1\frac{1}{2}$ 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.

$$\frac{52}{100} = 0.7$$

$$\frac{46}{50} = 13$$

$$\begin{array}{r} 9.14 \\ 47.68 \\ 4.88 \\ \hline 42.16 \end{array}$$

$$\begin{array}{r} 45.25 \\ 5.45 \\ \hline 49.80 \end{array}$$

$$\begin{array}{r} 88.73 \\ 9.95 \\ \hline 878.78 \end{array}$$

$$\begin{array}{r} 879.84 \\ 5.68 \\ \hline 874.16 \end{array}$$

$$\begin{array}{r} 874.16 \\ 4.24 \\ \hline 878.40 \end{array}$$

$$\begin{array}{r} 878.40 \\ 5.89 \\ \hline 872.51 \end{array}$$

$$\begin{array}{r} 872.51 \\ 4.44 \\ \hline 876.95 \end{array}$$

$$\begin{array}{r} 876.95 \\ 3.45 \\ \hline 873.50 \end{array}$$

$$\begin{array}{r} 873.50 \\ 10.28 \\ \hline 883.58 \end{array}$$

$$\begin{array}{r} 883.58 \\ 5.4 \\ \hline 883.04 \end{array}$$

$$\begin{array}{r} 883.04 \\ 5.69 \\ \hline 888.73 \end{array}$$

$$\begin{array}{r} 888.73 \\ 4.57 \\ \hline 884.16 \end{array}$$

E EAST STAKE 5.00
West 11 9.65

92+29

99.5

BLACK HAWK COUNTY
ENGINEER'S OFFICE
COURT HOUSE
WATERLOO, IOWA

$$\begin{array}{r} 92 \\ 52 \\ \hline 72 \end{array}$$

$$\begin{array}{r} 58.96 \\ 7.15 \\ \hline 51.81 \end{array}$$

$$\begin{array}{r} 88.873 \\ 5.00 \\ \hline 883.73 \end{array}$$

$$\begin{array}{r} 878.14 \\ 3.38 \\ \hline 874.76 \end{array}$$

$$\begin{array}{r} 874.76 \\ 7.30 \\ \hline 867.46 \end{array}$$

$$\begin{array}{r} 867.46 \\ 4.75 \\ \hline 872.21 \end{array}$$

$$\begin{array}{r} 872.21 \\ 3.45 \\ \hline 875.66 \end{array}$$

$$\begin{array}{r} 875.66 \\ 6.28 \\ \hline 881.94 \end{array}$$

$$\begin{array}{r} 881.94 \\ 4.15 \\ \hline 877.79 \end{array}$$

$$\begin{array}{r} 877.79 \\ 6.43 \\ \hline 884.22 \end{array}$$

$$\begin{array}{r} 884.22 \\ 4.84 \\ \hline 889.06 \end{array}$$

$$\begin{array}{r} 889.06 \\ 1.84 \\ \hline 890.90 \end{array}$$

$$\begin{array}{r} 88.873 \\ 5.00 \\ \hline 883.73 \end{array}$$

$$\begin{array}{r} 878.14 \\ 3.38 \\ \hline 874.76 \end{array}$$

$$\begin{array}{r} 874.76 \\ 7.30 \\ \hline 867.46 \end{array}$$

$$\begin{array}{r} 867.46 \\ 4.75 \\ \hline 872.21 \end{array}$$

$$\begin{array}{r} 872.21 \\ 3.45 \\ \hline 875.66 \end{array}$$

$$\begin{array}{r} 875.66 \\ 6.28 \\ \hline 881.94 \end{array}$$

$$\begin{array}{r} 881.94 \\ 4.15 \\ \hline 877.79 \end{array}$$

$$\begin{array}{r} 877.79 \\ 6.43 \\ \hline 884.22 \end{array}$$

$$\begin{array}{r} 884.22 \\ 4.84 \\ \hline 889.06 \end{array}$$

$$\begin{array}{r} 889.06 \\ 1.84 \\ \hline 890.90 \end{array}$$

2.48

0.50

86.30

3.19

83.29

8.01

77.27

75.24

7.62

63.06

875.24

13.91

889.66

875.24

7.85

883.09

64.6

1.5

$$\begin{array}{r} 878.94 \\ 2.32 \\ \hline 876.62 \end{array}$$

$$\begin{array}{r} 876.62 \\ 5.83 \\ \hline 882.45 \end{array}$$

$$\begin{array}{r} 882.45 \\ 5.75 \\ \hline 876.70 \end{array}$$

$$\begin{array}{r} 876.70 \\ 3.14 \\ \hline 879.84 \end{array}$$

transit