

3

298

W298

D.R. to S.D. 2nd Mile This Line

Tunnel 5 Construction

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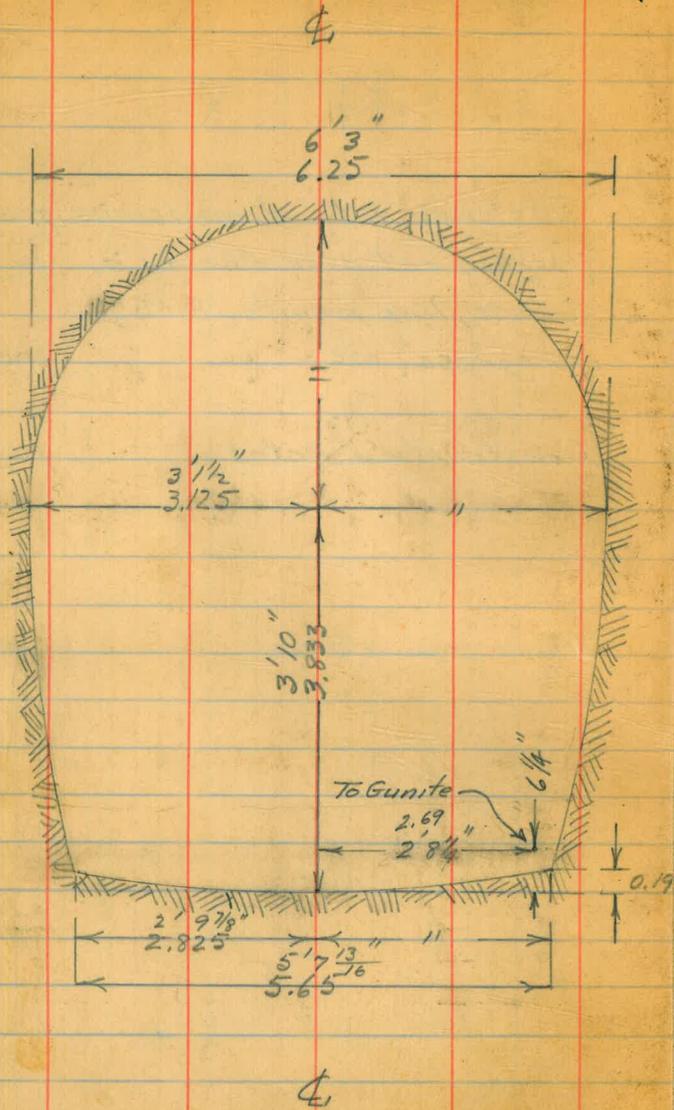
JAN 11 1965

O.R. to S.D. 2nd Main Pipe Line
Tunnel #3 Construction. 1

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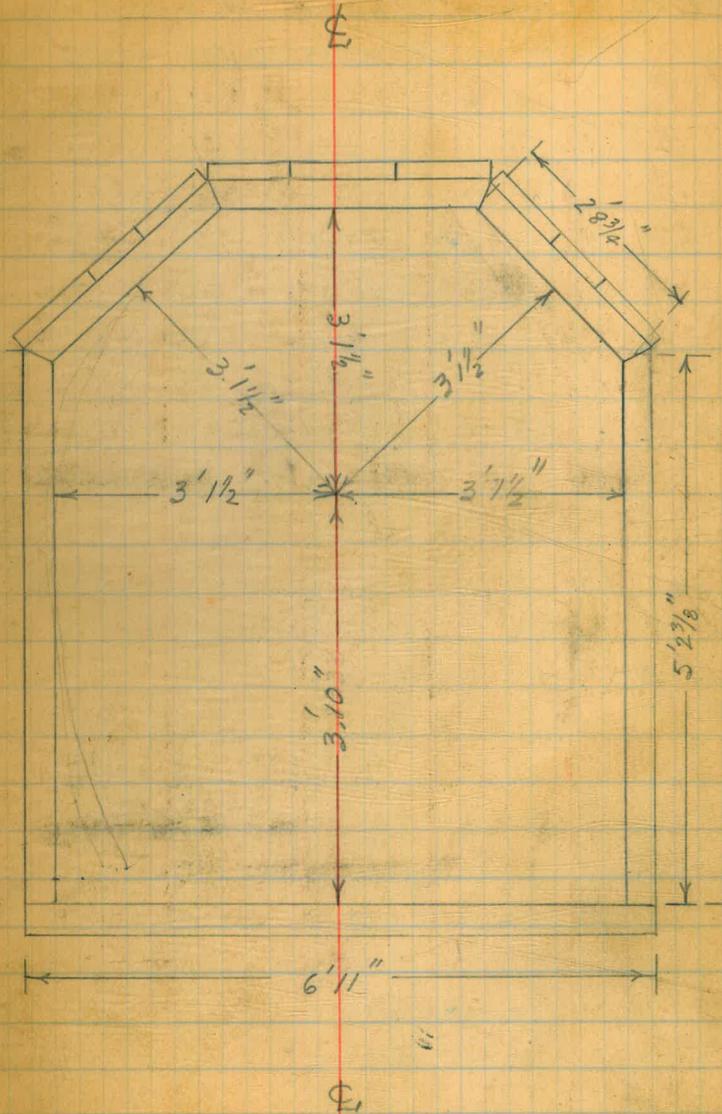
- Sketches with dimensions page 2
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Grade, line points, B.M's,
progress, etc. page 4-9
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O.R. to S.D. 2nd Main Pipe Line



Neat lines of Tunnel Excavation
Dim.

O.R. to S.D. 2nd Main Pipe Line



Timber Dimensions.

Alignment over top

3

See Otoy Res. to San Diego 2nd Main
Pipe Line Reference Point Book

Tunnel #3 Length 1892'

	Tunnel Grade Bottom	Grade Top	Ppc Grade
Entrance 205+24 ⁶⁶ 35	385.793	392.751	386.876
205+50	385.818 28 10	392.776 25 80'	386.901
206+00	385.868 18 86	392.826	386.951
+50	385.918	392.876	387.001
207	385.968	392.926	387.051
+50	386.018	392.976	387.101

+ 0.10%

Grades Calc. M.D.E.

(Set April 19, 1930)
Hub 204+01.97

Hub 204+67.62

Entrance Portal

Timbered

205+33.7

Coarse Cemented Sand

No Timber

(Set April 25, 1930)
Hub 207+26.86

4

Bore started Mar 27
(Set April 19, 1930)
Iron Pipe Plug & T.K.
B.M. Top of pipe 385.53

(Set April 25)
Iron Pipe 207+26.86
B.M. top pipe 386.01 1/2

Apr. 25 1930
Bore 207+65

	Tunnel Bottom	Grade Top	Pipe Grade
208+00	386.068	393.026	387.151

+50	386.118	393.076	387.201
-----	---------	---------	---------

209	386.168 52	393.126	387.251
-----	---------------	---------	---------

+50	386.218	393.176	387.301
-----	---------	---------	---------

210	386.268 52	393.226	387.351
-----	---------------	---------	---------

+50	386.318	393.276 13	387.401
-----	---------	---------------	---------

211	386.368	393.326	387.451
-----	---------	---------	---------

Grades Calc. M.D.E

208+198 X

Timbered

208+475 X

No Timber

Coarse Cemented band

Bore May 26, 3:22 P.M.
210+28

(Line checked July 12)
(Set June 2+3 1930)
Iron pipe 210+51.84
B.M. Top Pipe E1.386.32 1/2

April 30, 1930
Bore 208+11

Iron pin 209 +19.98
B.M. Top of pin 385.96

+ 0.10%

	Tunnel Bottom	Grade Top	Pipe Grade
211+50	386.418	393.376	387.501
212	386.468	393.426	387.551
+50	386.518	393.476	387.601
213	386.568	393.526	387.651
+50	386.618	393.576	387.701
214	386.668	393.626	387.751
+50	386.718	393.676	387.801

+ 0.10%

Grades Calc. M.R.E.



Set July 12
 B.M. Top pipe Elev 386.22
 Apr 214+50.64

	Tunnel Bottom	Grade TOP	Pipe Grade
215	386.768	393.726	387.851

+50	386.818	393.776	387.901
	386.825		

216	386.868	393.826	387.951
	386.892		

+50	386.918	393.876	388.001
-----	---------	---------	---------

217	386.968	393.926	388.051
	386.992		

+50	387.018	393.976	388.101

218	387.068	394.026	388.151
-----	---------	---------	---------

Grades Calc. W.P.E.

+ 0.10 %

219+70²

No

Quit Exit Excavation July 6, 1930
Sta 215+32

Met July 14, 1930
.005 for line .01 for Elev.

Timbered

Fine Cemented Sand

Set June 30
216+71.52 Iron Pipe
B.M. Top Elev. 386.77

217+27²

Not Timbered

217+49²

Timbered

217+76²

Not Timbered

Coarse Cemented Sand

217+10

Set June 30

216+71.52 Iron Pipe
B.M. Top Elev. 386.77

	Tunnel Bottom	Grade Top	Pipe Gr.
218+50	387.118	394.076	388.201

219	387.168	394.126	388.251
-----	---------	---------	---------

+50	387.218	394.176	388.301
-----	---------	---------	---------

220	387.268	394.226	388.351
-----	---------	---------	---------

+50	387.318	394.276	388.401
-----	---------	---------	---------

221	387.368	394.326	388.451
-----	---------	---------	---------

+50	387.418	394.376	388.501
-----	---------	---------	---------

Grades Calc. W. D. G.

+ 0.10%

Not Timbered

8

218+30²

Timbered

219+85⁰

Not timbered

219+95⁸

Timbered

220+58⁶

Not Timbered

220+77²

Timbered

220+95⁰

Not Timbered

221+29⁷

Timbered

221+67²

May 26, 1930

Bore 219+60

Pin 220+0084

B.M. Top pin 387.04

v 6-12-30

v 7-9-30

Very Fine Cemented Sand
(Air Slack on Exposure)

v 6-12-30
B.M. Top of pipe El. 387.78

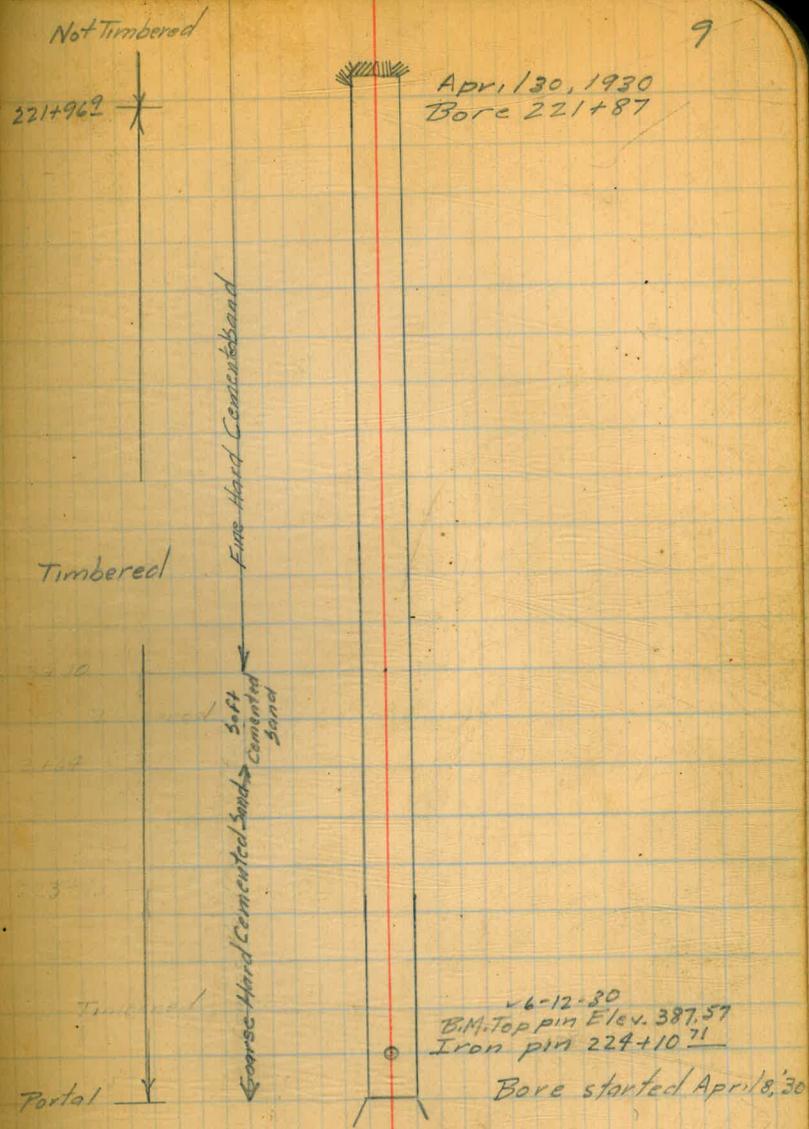
221+50⁷⁵ Iron pipe

(Set May 13, 1930)

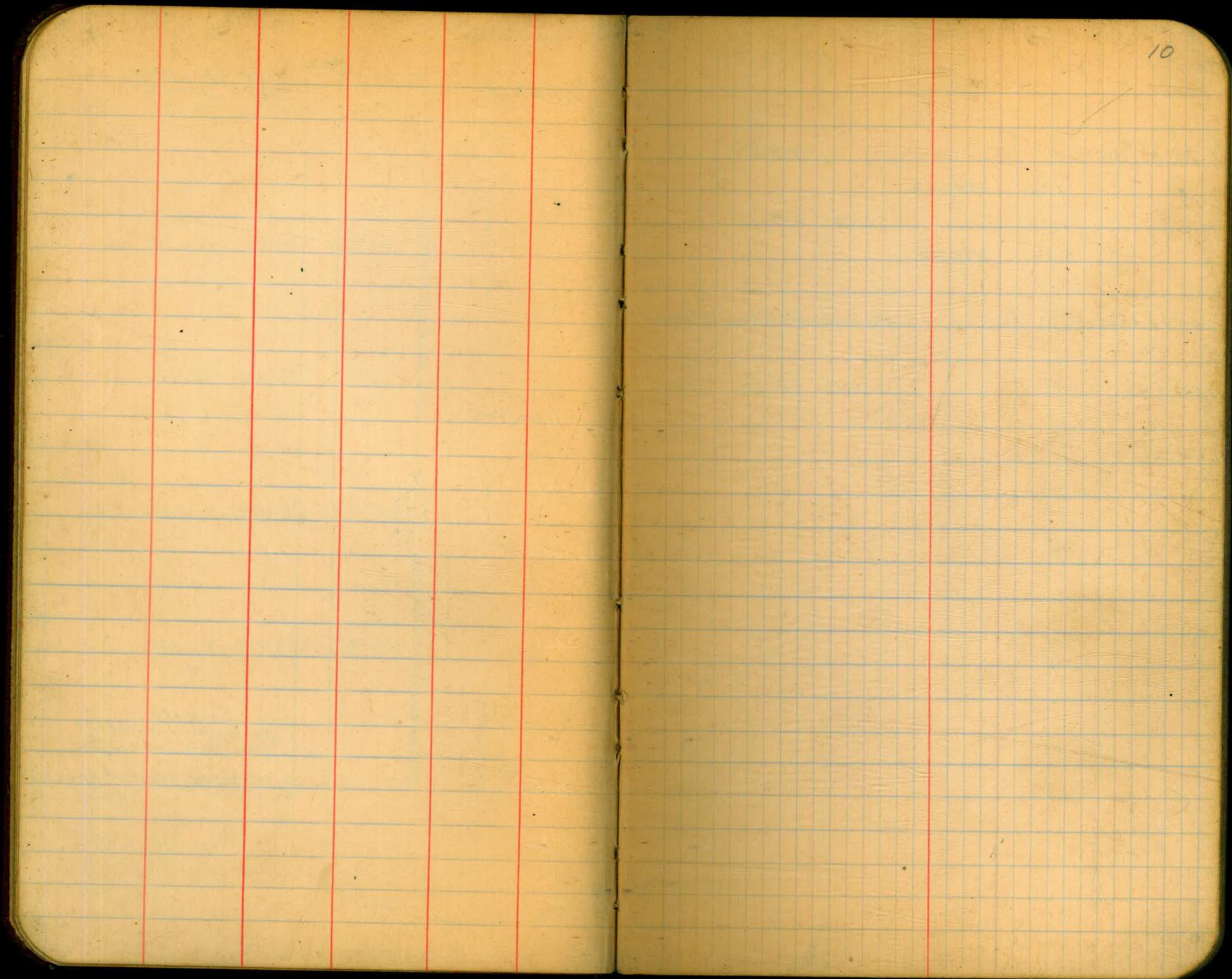
	Tunnel Bottom	Grade Top	Pipe Grade
218 222+00	387.468	394.426	388.551
	476 52		
+50	387.518	394.476	388.601
219 223	387.568 7 387.575 28	394.526	388.651
22 +50	387.618	394.576	388.701
224	387.668	394.626	388.751
2 224 +16 ⁶⁶ Exit Portal	387.687	394.645	388.770

+ 0.10%

Grades Calc. M.D.G.



B.M. Pin in bank E.I. 390.64



H. H.
Elliott
Soper

Entrance #3

Mar 28 1930

11

B. M. #40

392.47

Top of A.V. Lt. 204+56

1.76 394.23

6.08 388.15

3.78 391.93

205+24⁶⁶

^{6.76}
6.13 385.80 Bottom

Set Hub to grade Rd. Hd in top to Live

205+33

6.12 385.81 "

"

"

"

Hill
Elliott
Soper

Mar 31 1930

Entrance

12

B.M. #40			392.47		
	2.40	394.87			
T.P.			7.74	387.13	
	4.47	391.60			
205+25		+ 1.15	392.75	Top	Set Trl. Hd. to line grade
+ 37		+ 1.16	392.76	"	" "
205+45		+ 1.18	392.78	"	" "
+ 45		- 5.78	385.82	Bottom	Set Hub to grade.

Hill
Elliott's notes
Soper

April 3 1930

13

Entrance

B.M. #40

397.47

2.45 394.92

T.P.

7.06 387.86

3.20 391.06

205+25

+1.69 392.75 Tap

Check on work of Mar 31

205+72

^{6.96}
-5.22 385.84' Bottom

set hub to grade

+1.74

Hill
Elliott & notes
Soper

Entrance #3

April 5 1930

19

B.M. #40

392.47

2.11 394.58

T.P.

6.72 387.86

2.50 390.36

205+25

+2.39 392.75 Top

Check at first bent

205+85

6.96
-4.51 385.85 Bottom
+2.45

Set Red Hdl. to Grade

Elliott
Simpson
Bailey
Remmen

Entrance #3

April 9 1930

B.M. #40

392.47

1.40 393.87

T.P.

7.15 386.72

4.22 390.94

205+25

+1.81 392.75

Check

205+34^S

+1.82 392.76

206+18^E

-5.05 385.89

"

+1.91 392.85

Set hub to grade

April 10 1930.

Exit Portal

Elliott note
Simpson
Bailey
Remmen

15

B.M. #43			394.91
	1.31	396.22	
Set B.M.		5.58	390.64
	2.37	393.01	
224+08		-5.33	387.68
		+1.63	

Top A.V. 25' RT 226+64

Pipe on bank on Tunnel Line Produced

Entrance

April 12 1930

Elliott
Simpson
Bailey
Remmen

B.M. #90	1.97	393.94	392.47
T.P.		6.94	387.00
205+25	3.80	390.80	
205+25		+1.95	392.75 TOP
206+42		+2.07	392.87 TOP
"		-4.89	385.91 Bottom

Check

Set hub to grade
Bore to 206+50

Apr. 12 1930

Elliott
Simpson
Bailey
Remmen

16

Exit Portal

B.M.

390.64

2.81

393.45

229+16

^{6.92}
-5.76¹/₂ 387.68¹/₂

Bottom

"

+1.19¹/₂

Top

223+98⁵/₈

^{6.76}
-5.78 387.67

Bottom

"

+1.18

Top

223+94

^{1.92}
-5.79 387.66

Bottom

"

+1.17

Top

B.M. ⁴/₃

394.91

1.09

396.00

B.M.

5.36

390.64

check

Bore 223+90

April 15 1930

Elliott Notes
Simpson &
Bailey Remmen

17

Entrance

B.M.#

392.47

1.73 394.20

T.P.

2.17 387.03

205+25

4.03 391.06

^{3.12} +1.69 ^{3.17} 392.75

Top

-1.43 389.63

Spring line

205+75

+1.74 392.80

Top

Set Top Grade + spring line

Rd. Head

+85

+1.75 392.81

Top

set " " " " "

"

206+00

-1.40 389.66

spring line

set spring line only

+10

+1.78 392.84

Top

set spring line only

+20

+1.79 392.85

Top

set spring line only

+30

+1.80 392.86

Top

set Top Grade + spring line "

+45

+1.81 392.87

Top

set Top Grade + spring line "

+55

+1.82 392.88

Top

set Top grade + spring line "

+65

+1.83 392.89

Top

" " " " " "

+75

-5.12 385.94

Bottom

set Bottom Grade only

Hub

Bore in to about sta. 206+80

April 15 1930

Exit

Elliott
Simpson
Bailey + Remmen

18

B.M.			390.64	
	2.23	392.87	3	
223+94		+1.75	394.62	Top
+80		+1.74	394.61	"
+70		+1.73	394.60	"
+60		+1.72	394.59	"
+60		-5.24	387.63	Bottom

Check on previous work
Set Rd. Hd
"
"
Set Hub.

April 19, 1930

Entrance

Elliott, Simpson
Bailey, Remmen

Bore to 223+50 ±

B.M. #40			392.47	
	1.79	394.26		
T.P.		7.36	386.90	
	4.22	391.12		
Set B.M.		4.60	386.52	N.G.

Top of iron pipe 205+25 ±

	4.60	391.12		
205+25		+1.65	392.75	TOP 392.76
206+40		+1.75	392.87	Top
20				

Check 205+34

207+00		+1.81	392.93	Top
207+10		+1.82	392.94	Top
"		-5.14		Bottom

Spike to line + grade

Pin to grade
Bore 207+20 ±

April 19 1930

Elliott Simpson
Bailey Remmen

19

Exit

B.M.			390.64		
	2.39	393.03			
223+94		+1.59	394.62	Top	Check on previous work
223+53		+1.55	394.58	"	Set Rd. Hd. to line + grade
223+44		+1.54	394.57	"	"
+40		+1.53 1/2	394.56 1/2	"	"
+30		+1.53	394.56	"	"
+20		+1.52	394.55	"	"
223+10		+1.51	394.54	"	"
		-5.45		Bottom	Hub to grade

Timber
Timber

April 21, 1930

Elliott Simpson
Bailey Remmen

Bore to 223+06 ±

Entrance

B.M. #40			392.47		
	1.70 1/2	394.17 1/2			
T.P.		7.27 1/2	386.90		
	5.38 1/2	392.28 1/2			
B.M.		6.74 1/2	385.54 ← USE.		Pipe near entrance
B.M. #40			392.47		
	186	394.33			
T.P.		7.44	386.89		
	5.28	392.17			
B.M.		6.64	385.53	"	"

April 21, 1930

Elliott
Simpson
Bailey, Remmen.

20

Entrance #3

T.P.			386.90	
	4.26	391.16		
205+25		+ 1.59	392.75	
206+55		+ 1.72	392.88	Top
+70		+ 1.74	392.90	"
+80		+ 1.75	392.91	"
+90		+ 1.76	392.92	"
207		+ 1.77	392.93	"
+10		+ 1.78	392.94	"
+20		+ 1.79	392.95	
"		- 5.17	385.99	Bottom
+30		+ 1.80	392.96	Top
		5.16		

See previous page

Check

Check

Check

Set Rd. Hd to line, grade & spring line

"

"

"

Set pin to grade

Bore to 207+40

April 21 1930

Elliott
Simpson
Bailey
Remmen

21

Exit #3

7	B.M.			390.64	
		2.38	393.02		
20	223+44		+1.55	394.57	Top
	223+20		+1.53	394.55	"
	+10		+1.52	394.54	"
20	223+00		+1.51	394.53	"
			-5.45	387.57	Bottom
	222+90		+1.50	394.52	Top
			+5.46	387.56	Bottom

Check on previous work
Set Rd. Hd. to line + grade
" " " " " " "
set Bottom Grade (Hub) "
set Rd. Hd. to line + grade
set Bottom Grade (Hub) "

Set spring line points from 223+00 to Portal

April 22 1930

Elliott Notes
Simpson T
Bailey
Remmen

Exit

	B.M.			390.64	
		3.005	393.645		
	Set B.M.		6.075	387.57	
	B.M.*93	1.32	396.73	394.91	
	B.M.		5.59	300.64	Check

Pin in bank on tunnel line produced

Top pipe 224+10 71

April 25 1930

Elliott
Simpson
Bailey
Remmen

27

Entrance

T.P.			386.06	
	5.37	391.43		
207+20			+1.52 392.95	
+30			+1.53 392.96 Top	
+40			+1.54 392.97	
+50			+1.55 392.98	
207+60			+1.56 392.99	
"			-5.90 386.03 Bottom	
B.M. #90			392.47	
	1.98	394.45		
T.P.			7.32 397.13	
	3.76	390.89		
Set B.M.			5.36 385.53	
Set B.M.			4.88 386.01	
T.P.			4.83 386.06	

Check on previous work

Set ~~proto line~~ + grade

"

"

Set Pin for line only in top.

Set pin to grade

Bore to 207+70 ±

Top pin 205+25⁰⁸

Top pin 207+26⁸⁶

Spike

April 25 1930

Exit

Elliott
Simpson
Bailey
Remmen

23

B.M.

387.57

Top of pipe 224 + 10.21

5.68 393.25

222 + 90

+1.27 394.52 Top

Check on previous work

+ 80

+1.26 394.51 "

Set Rd. Hd. to line & grade

+ 70

+ 1.25 394.50 "

"

+ 60

+ 1.24 394.99 "

"

+ 50

^{6.96}
+ 1.23 394.98 "

Not set.

"

5.73 Bottom

Set pin to line + grade & dist. in bottom

April 28 1930

Entrance

Elliott Notes
Simpson T.
Bailey H.Ch.
Remmen R.Ch.

24

B.M.			386.01	
	5.20	391.21		
T.P			5.23	385.98
	5.45	391.43		
207+50			+1.55	392.98 Top
+60			+1.56	392.99 Top
+70			+1.57	393.00 Top
+80			+1.58	393.01 Top
+80			-5.38	386.05 Bottom

Check on previous work

set Rd. Hd. to lined grade

set Iron pin to line and grade

set Rd. Hd. to line and grade

set spike to grade

Bore 207+95±

Same Day

Exit

Same Crew

B.M.			387.57	
	5.61	393.18		
222+50			-5.66	387.52 Bottom
+40			+1.29	394.47 Top
+30			+1.28	394.46 "
+20			+1.27	394.45 "
+20			-5.69	387.49 Bottom

Check on previous work

set line & grade

"

"

Bore to 222+15±

May 1 1930

Elliott
Bailey
Chase

25

Exit

B.M.			387.57		
	5.47	393.04			
222+20			+1.41	394.45	Top
					Check on previous work
+10			+1.40	394.44	Top
					Set Rd. Hd. to line + grade.
222+00			^{6.96} +1.39	394.43	Top
"			-5.57		Bottom
					Set hub to grade
221+90			+1.38	394.42	Top
					Set Rd. Hd. to line + grade

April 2 1930
RainElliott
Bailey
Chase

Entrance

B.M.	5.19	391.20		386.01	
207+70			+1.80	393.00	Top
					Check on previous work
+80			+1.81	393.01	"
					Set Rd. Hd. to line + grade
+90			+1.82	393.02	"
					"
208			+1.83	393.03	"
			-5.13		Bottom
+10			+1.84	393.04	"
					Set Pin to grade
					Line only

April 7 1930
Cloudy - Cool

Elliott
Bailey

26

EXIT

B.M.			387.57		
	5.43	393.00			
222+00			+1.43 394.43	Top	Check
+90			+1.42 394.42	"	Check
+80			+1.41 394.41	"	Set Rd. Hd. to line + grade
+70			+1.40 394.40	"	"
+60			+1.39 394.39	"	"
221 +50			+1.38 ^{6.96} 394.38	"	"
221 +50			-5.58 387.42	Bottom	Set pin to grade

May 7 1930

Entrance

Elliott, Bailey

B.M.			386.01		
	5.51	391.52			
207+90			+1.50 393.02	Top	Set Rd Hd.
208+00			+1.51 393.03	"	"
+10			+1.52 393.04	"	"
+20			+1.53 ^{6.76} 393.05	"	"
208+30			+1.54 ^{5.43} 393.06	Bottom	Pin to grade
"			-5.42	Top	Not set (Tunnel o.k.)
					Not set
					Bore to 208+36 +

May 9, 1930

Elliott
Bailey

27

Entrance

B.M.

386.01

5.42 391.43

208+20

+1.62 393.05 Top

208+50

+^{6.96}1.65 393.08 "

"

-5.31 386.17 Bottom

Check

Set pin to line + grade

" " "

Bore to 208+55±

Same Day

Exit

Same Party

B.M.

5.19 392.76

387.57

221+50

+1.62 394.38

221+35

+^{6.96}1.60 394.36

-5.36

Check on previous work.

Bore 221+22

May 12 1930

Elliott
Bailey
Jacobson

28

Entrance

B.M.

386.01

5.46 391.47

208+50

+1.61 393.08

Top

Check on previous work

"

-5.35 386.12

Bottom

208+60

+1.62 393.09

Top

-5.34

Bottom

Set Fin to line + grade

208+75

+1.63 393.10

Top

-5.33

Bottom

Bore to 208+80+

June 3, 1930

Entrance

Elliott - Bailey

B.M. #40

1.09 393.56

392.47

Top A.V.

386.01 1/2

4.81

390.82 1/2

4.50

386.32 1/2

T.P.

6.49 1/2 387.06 1/2

2.42 389.48 1/2

Check
B.M. T.P.

3.47 386.01 1/2

Previous
386.01

Top pipe 207+26.86

4.93 390.94 1/2

4.99

Set B.M.

4.61 1/2 386.33

Top pipe 210+51.84

209

May 13 1930

Elliott
Bailey
Jacobson

27

Exit

B.M. 387.57

Top iron pipe 224+10.2'

5.36 392.93

Set B.M. TP 5.14 387.79

Top iron pipe 221+50.25

4.90 392.69

220 +80 + 1.62 394.31

+90 + 1.63 394.32

221 +00 - 5.33 + 1.67 394.33

Bottom Pin set to grade

+ 10 + 1.65 396.34

pin set to grade

+ ~~10~~ + 1.66 394.35

+ 25 + 1.67 399.36

pin set to line and grade

+ 40 + 1.68 394.37

Check on previous work

May 14 1930

Elliott
Barley
Jacobs 204

30

Entrance

B.M.			386.01
	5.34	391.35	
207+20		+ 1.60	392.95
+40		+ 1.62	392.97
+50		+ 1.63	392.98
+60		+ 1.64	392.99
+70		+ 1.65	393.00
+80		+ 1.66	393.01
+90		+ 1.67	393.02
208		+ 1.68	393.03
+10		+ 1.69	393.04
+20		+ 1.70	393.05
+35		+ 1.71	393.06
+50			
+50		+ 1.73	393.08
+65		+ 1.74	393.09
+70			
+80			
+90			
209			

Check

In
In
In
In
Set
In
In
In
Set
In
Set

Bore 209.705
2.5

May 15, 1930

Elliott
Bailey
Jacobszon

31

Entrance

B.M.			386.01
	5.94	391.45	
208+65		+1.64	393.09
+80		+1.66	393.11
+90		+1.67	393.12
209+00		+1.68 ^{6.96}	393.13
+10		+1.69	393.14

Check on previous pin
Set Rd. Hd to line + grade
"
"

Bore to 209 + 17+ 207+00

May 16

Exit

Same Crew

B.M.			387.79
	5.23	393.02	
T.P.	5.18 ^{1/2}	392.80	5.40 ^{1/2} 387.61 ^{1/2}
220+50		+1.48 ^{6.96}	394.28
+60		+1.49 ^{-5.48}	394.29
+70		+1.50	394.30
+80		+1.51	394.31
+90		+1.52	394.32
221+00		+1.53	394.33
+10		+1.54	394.34

Check on previous work
Set Rd. Hd to line + grade
"
"
"
"

May 19, 1930

Elliott
Bailey
Jacobson

32

Exit

B.M.

387.79

5.06 392.85

220+70	+ 1.45	394.30	Top
220+58 ⁵	+ 1.44	394.29	"
220+49	+ 1.43	394.28	"
220+34	+ 1.42	394.27	"
"	- 5.54 ^{1/2}		Bottom

Check on previous work
Check on previous point. Set gradeline on ^{Timbers}

Not set

Set pin to grade

May 20 1930

Entrance Same Crew

B.M. 5.27 391.28 386.01

209+00	+ 1.85	393.13	Top
+10	+ 1.86	393.14	"
+20	+ 1.87	393.15	"
+30	+ 1.88	393.16	"
+40	+ 1.89	393.17	"
+50	+ 1.90	393.18	"
+60	+ 1.91	393.19	"

Check on previous work
Set Rd. Hd. to line and grade

"

"

"

"

"

Bore 209+67 ±

5.12

May 22 1930

Elliott
Bailey
Jacobson

209+60

209+25

5.35: 1.5 = 1200 X

33

Exit.

B.M.			387.79
22	5.27	393.06	
22	220+70		+ 1.24 394.30
22	220+58		+ 1.23 394.29
2	220+49		+ 1.22 394.28
	220+45		+ 1.21 394.27
	220+36		+ 1.20 394.26 Top
	220+20		- 5.78 387.28 Bottom
	220+10		- 5.79 387.27 Bottom

Check on previous

"

"

Set Rd Hd to line & grade

" "

" "

Set hub to grade

Bore 220+03 #

Entr.

2 May 23, 1930 Same Crew

B.M. 386.01

5.06 391.07

Set B.M. 5.10 385.97

Top pipe 207+26.86
1 92.12

Top of pin 209+18.98

Same Day Entr Same Crew

B.M. 5.19 391.16 385.97

T.P. 4.99 386.17

5.16 391.33

209+60 + 1.86 393.19

+ 70 + 1.87 393.20

+ 80 + 1.88 393.21

+ 90 + 1.89 393.22

Check

Set

set

Set Bore 210+01

May 24 1930 Exit

Elliott
Bailey
Jacobson

209+19

221+00 1.70

220+50

1.65

Check

220+20

5.34

Check

220+10

5.35

Set

220+00

5.36

Set

219+90

5.37

Set

Bore 219+83

Exit

B.M.

387.79

4.39

392.18

220+00

- 4.91 387.27 Bottom

Check on previous work,

219+90

- 4.92 387.26 "

Set pin to grade

219+80

- 4.93 387.25 "

"

219+70

- 4.94 387.24 "

"

May 27, 1930

Entr.

Same Crew

B.M.

5.20

391.17

385.97

209+90

+2.05 393.22

Check

210

+2.06 393.23

+10

+2.07 393.24

Set Rd. Hd to line and grade

+20

+2.08 393.25

+30

6.96
+2.09 393.26

9.87

Bore 210+38

May 27, 1930 Exit Elliott
Bailey
Jacobs 2.04

B.M.			387.79	
	4.43	392.22		
219+80			^{6.96} +1.99 394.21	Bottom
+70			^{4.97} +1.98 394.20	"
+60			^{4.98} +1.97 394.19	"
			^{4.99}	

Check
Set
set
Bore 219+50 =

May 29, 1930 Entr

B.M.	5.47	391.44	385.97
210+30		+ 1.82	393.26
+40		+ 1.83	393.27
+50		+ 1.84	393.28

Check

Same Day Exit Same Crew

B.M.	4.61		387.79
		392.40	
220+36		+1.86	394.26 Top
220+27		+1.85	394.25 "
220+17E		+1.84	394.24 "
219+60		-5.17	387.23 Floor
+50		-5.18	387.22 "
+40		-5.19	387.21 "

Bore 210+58

Check on previous work
Set Rd. Hd. to line + grade

"
Check on previous work

Set pin to grade

"
Bore 219+29

June 2 1930		Exit	Elliott, Jacobs, Bailey	
B.M.	4.66	392.45	387.79	
220+175		+1.79	394.24	Top
220+075		+1.78	394.23	"
219+965		+1.77	394.22	"
219+90		-5.24	387.21	Bottom
+30		-5.25	387.20	
+20		-5.26	387.19	
+10		-5.27	387.18	
219+00		-5.28	387.17	

Check

Check

4.83

4.84

4.87

4.88

4.89

4.91

Bore 218+87

Same Day		Entrance	Same Crew	
B.M.	5.19	391.16	385.97	
210+90		+2.11	393.27	
+50		+2.12	393.28	
+60		+2.13	393.29	
+70		+2.14	393.30	

Check

"

Set Rd. Hd. to line + grade

"

"

Bore 210+79

Elliott
Jacobs 207
Bailey

Exit

B.M.	4.64	392.43	387.79
Set B.M.		5.39	387.04
B.M.	4.39	392.18	387.79
219+00		- 5.01	387.17
218+90		- 5.02	387.16
+70		- 5.04	387.14

June 5 1930

Entrance

Same Crew.

B.M.	5.51	391.47	385.96
210+70		+1.83	393.30
+80		+1.84	393.31
+90		+1.85	393.32
211+00		+1.86	393.33

June 7 1930

Exit

Same Crew

B.M.	5.60	392.64	387.04
219+00		- 5.47	387.17
218+80		- 5.49	387.15
+70		- 5.50	387.14
+60		- 5.51	387.13
+50		- 5.52	387.12
		1.44	

209+18.98
1+31.90
210+50.88Top pipe 221+50
" pin 220+00.84209+18.98
1-93.11
207+26.87
1 93.11

Top pipe 221+50 ±

209+19.97
1+31.90Check on previous work
Set Pin to grade

210+51.87

"

Bore 218+61 ±

Check on previous work.
Set Rd. Hd. to line + grade

"

"

Bore 211+09 ±

Check on previous work
Set pin to grade

"

"

Bore 218+27

(N.G.)

June 7, 1930		Entr.		Elliott Jacobszou Bailey
B.M.	5.43	391.76		386.33
			4.51	387.25
T.P.	9.28	391.53		
211+00			+1.80	393.33
+10			+1.81	393.34
+20			+1.82	393.35
June 9, 1930		Entr.		Same Crew
B.M.	5.39	391.72		386.33
T.P.			4.78	386.94
	4.97	391.91		
211+20			+1.44	393.35
+30			+1.45	393.36
+40			+1.46	393.37
+50			+1.47	393.38

Check

Bore 210+31

Check

set Rd. Hd to hne + grade

"

"

Bore 211+55

Elliott
Jacobson
Bailey

387.04

June 10 1930

Exit

B.M.

5.31

392.35

218+60

- 5.22

387.13

Floor

Check on previous work

+50

- 5.23

387.12

Set

+40

- 5.24

387.11

Set

+30

- 5.25

387.10

Set

Bore 218+02

June 12, 1930

Entry

Same Crew

B.M.

5.54

391.87

386.33

211+50

+ 1.51

393.38

Check on previous work

+ 60

+ 1.52

393.39

Set Rd. Hd. to line grade

+ 70

+ 1.53

393.40

"

+ 80

+ 1.54

393.41

"

Bore 211+87

Exit

B.M.

2.69

393.33

390.64

Pin in bank

Check B.M.

5.76

387.57

Previous
387.57

Top of pipe 224+10.24

5.07

392.64

Check B.M.

4.86

Use
387.79Previous
387.79

Top of pipe 221+50.75

4.67

392.45

Check B.M.

5.42

Use
387.03Previous
387.04

Top of pipe 220+00.89

B.M.

4.55

392.33

387.78

219+96.5

+ 1.90

394.23

219+85.5

+ 1.89

394.22

219+745 +1.88 394.21

219+63 +1.86 394.19
91.55

B.M. 4.60 391.63 387.03

218+30 -4.53 387.10

+20 -4.54 387.09

+10 -4.55 387.08

218+00 -4.56 387.07
6.96
2.40

Check on previous work
Set pin to grade
"
"

Bore 217+83

June 16, 1930 Entr. Same Crew

B.M. 5.58 391.91 386.33

211+70 +1.49 393.40 Roof

+80 +1.50 393.41 "

+90 +1.51 393.42 "

212+00 +1.52 393.43 "

+10 +1.53 393.44 "

Check on previous work
Set Rd. Hd. to line & grade
"
"

(Not Set)

Bore 212+16 ±

June 20, 1930 Entr. Same Crew

B.M. 5.22 391.55 386.33

212+00 +1.88 393.43

+10 +1.89 393.44

+20 +1.90 393.45

+35 +1.91 393.46

+40 +1.92 393.47

Check on previous work
(Not set top too low)
Set Rd. Hd to grade
"

(Checked on top drill hole 1" below at face 0.5 below 5 1/2 in)

Bore 212+44

Elliott
Jacobson
Bailey

June 16, 1930

Exit

B.M. 5.39 392.42

387.03

219+74^S

+1.78 394.20

Roof

Check on previous work

+63

+1.77 394.19

"

Set Nails to line + grade

+52

+1.76 394.18

"

"

+41

+1.75 394.17

"

"

+30

+1.74 394.16

"

"

+18^S

+1.72 394.14

"

"

+07^S

+1.71 394.13

"

"

217+90

-5.36 387.06

Floor

(Not set) to grade

+80

-5.37 387.05

"

Set pinto grade

+70

-~~5.38~~^{6.96} 387.04

"

"

1.58

Bore 217+61

June 20, 1930

Exit

Same Crew

B.M. 5.10 392.13

387.03

219+07

+2.00 394.13

check

218+96^S

+1.99 394.12

Set Rd. Hd. to line + grade

+86

+1.98 394.11

"

+75

+1.97 394.10

"

+63^S+~~1.96~~^{6.96} 394.09

"

+52^S

+1.95 394.08

"

+41^S

+1.94 394.07

"

B.M. 4.87 391.90

387.03

217+70

-4.86 387.04

Check on previous pirt

+60

-~~4.87~~^{6.96} 387.03

+50

-~~4.88~~^{2.07} 387.02

+40

-~~4.89~~^{6.96} 387.01Bore 217+30 (Marked 1st cut on face)

2.07

June 23, 1930

Entrance

Elliott
Jacobson
Bailey

211.70

42

B.M.	5.04 1/2	391.37	386.32 1/2
212 +35		+2.09	393.46
+93 1/2		+2.10	393.47
+50		+2.11	393.48
+60		+2.12	393.49

Check on previous work
Set Rd. Hd. to line + grade

"

"

212 +73 Bore (1° cut marked on face)

June 24, 1930

Exit

Same Crew

B.M.	5.24	392.27	387.03
217 +50		+1.71	393.98 Roof
+40		-5.26	387.01 Floor
+30		-5.27	387.00 "
+20		-5.28	386.99 "
+10		+1.67	393.94 Roof
217 +00		+1.66	393.93 "
216 +91		+1.65	393.92 "

Check on previous work

Set pin to grade

"

"

Set Rd. Hd. to line + grade

Bore "

" Bore 216 +91 (Marked 1° cut on face)

June 25, 1930

Exit

Same Crew

B.M.	2.15	392.79	390.64
223 +98 1/2		+1.83 1/2	394.62 1/2
+99		+1.83	394.62
+84 1/2		+1.82	394.61
+73 1/2		+1.81	394.60
+62 1/2		+1.80	394.59
+54		+1.79	394.58
+29 1/2		+1.76	394.55
+18 1/2		+1.75	394.54

Check on previous work

"

Set Rd. Hd. to line + grade

"

"

Check on previous work

Set Rd. Hd. to line + grade

Cont. from previous page.

392.79

223+07.		+1.74	394.53		Set Rd. Hd. to line + grade
222+96		+1.73	394.52		"
222+90		+1.72	394.51		Check on previous work
B.M.	3.87	391.44	387.57		
222+20		- 3.95	387.49	Floor	Check on previous work
+38 ⁵		- 3.93	387.51	"	set pint to grade.
+55		- 3.92	387.52	"	"
+71 ⁵		- 3.90	387.54	"	"
+88		- 3.88	387.56	"	"
223+07		+ 3.09	394.53	Top	Check on previous work
222 +05 ⁵		- 3.97	387.47	"	Set pin to grade
221 +89		- 3.98	387.45	"	"
+72 ⁵		- 4.00	387.44	"	"
221 +56		- 4.02	387.42	"	"
B.M.		3.66	387.78	Record 387.78	

Same Day	Entr	Same	Crew
4.98	391.31	31	386.33
212+60		+2.18	393.49
+70		+2.19	393.50
+80		+2.20	393.51
+90		+2.21	393.52

Check
Set Rd. Hd. to line + grade
"
"
Line 212+92
"

Top 1^o High
Bore 212+92

June 26, 1930 Exit #3

B.M.	5.19	392.22	387.03	
217+00		+1.71	393.93	Roof
216+90		+1.70 ⁶⁹⁰	393.92	"
180		+1.69	393.91	"
170		+1.68	393.90	"
			1	

Check on previous work
 Set pin in floor
 Set Rd. Hd. to line & grade
 " " "
 " " "
 Bore 216+68

June 27, 1930 Entr.

B.M.	5.16	391.49	386.33
212+80		+2.02	393.51
+90		+2.03	393.52
213+00		+2.04	393.53
+10		+2.05	393.54
+20		+2.06	393.55

222+15
 Check on previous work
 Set Rd. Hd. to line & grade
 "
 "
 "

Bore 213+21

June 28, 1930 Exit

B.M.	4.83	391.86	387.03
217+00		+2.07	393.93
216+98 ^E		+2.06	393.92
216+87 ^Z		+2.05 ⁴⁹¹	393.91
+76		+2.04	393.90
+65			
216+50		+2.02	393.88

Bore 216+50

Elliott
Bailey
Soper

June 30 1930		Exit	Elliott Bailey Soper
B.M.	4.91	391.94	387.03
Set B.M.		5.17	386.77
T.P.		4.83	387.11
	4.94	392.05	
216+60		+1.84	393.89
+50		+1.83	393.88
+40		+1.82	393.87
+30		+1.81	393.86

Top of pipe 220+00 84
Top of pipe 216+70 ± 218+85

Check on previous work
Set Rd. Hd. to line + grade
"
"

Bore 216+23

July 1 1930		Entr.	Same Crew
B.M.	5.24	391.57	386.33
213+10		+1.97	393.54
+20		+1.98	393.55
+30		+1.99	393.56
+40		+2.00	393.57
+50		+2.01	393.58
+60		+2.02	393.59
+70		+2.03	393.60

Check on previous work

Set Rd. Hd. to line +
"
"
"

Not set (02 High)

Set Rd. Hd. to line + grade

Bore 213+70

July 3, 1930		Exit	Same Crew
B.M.	5.55	392.32	386.77
T.P.	4.96	392.12	-5.16 387.16
216+40		+1.75	393.87 Roof
+30		+1.74	393.86
+20		+1.73	393.85

Check on previous work
Set Rd. Hd. to line + gr. in roof
Not set 02 High

216 + 10		+1.72	393.84
216 + 00		+1.71	393.83
215 + 90		+1.70	393.82
+ 80		+1.69	393.81

Set pint to grade in floor,
 " " "
 Set Rd. Hd. to line + grade in roof
 Bore 215 + 7 1/2

July 3, 1930	Entr	Same Crew
B.M. 5.43	391.76	386.33
5.27	392.16	4.87 386.89
213 + 40		+1.41 393.57
+ 50		+1.42 393.58
+ 60		+1.43 393.59
+ 70		+1.44 393.60
+ 80		+1.45 393.61

212 + 00
 Check on previous work
 Not Set (High)
 Not Set (High)
 Set grade on floor
 Set Rd. Hd. to line + grade
 Bore 213 + 86

July 7, 1930	Entr	Same Crew
B.M. 5.19	391.52	386.33
		4.50 1/2 387.01 1/2
4.86 1/2	391.88	
213 + 40		+1.69 393.57
+ 60		+1.71 393.59
+ 80		+1.73 393.61
214 + 00		+1.75 393.63
+ 15		+1.76 393.64
+ 25		+1.77 393.65

210 + 51
 218 + 00
 Check on previous work.
 Set Rd. Hd. to line + grade
 Check on work of July 3 1930
 Set Rd. Hd. to line + grade
 214 + 90 " " Bore
 "
 214 + 40 face

July 8, 1930

Exit

Elliott
Bailey
Soper

B.M. 5.26 392.03 386.77

216+98		+1.89	393.92	Top
217+115		-5.05	386.98	Floor
217+28		-5.04	386.99	"
217+445		-5.02	387.01	"
217+60		-5.00	387.03	"
B.M.	5.46	392.23	386.77	
216+63		-5.30	386.93	"
+38		-5.33	386.90	"
+21		-5.35	386.88	"
216+05		-5.36	386.87	"
215+88		-5.38	386.85	"
+72		-5.39	386.84	"
+55		-5.41	386.82	"

B.M. 5.26 392.03 386.77

T.P. 4.88 391.89 5.02 387.01

218+42		+2.18	399.07
218+30		+2.17	399.06
+15		+2.15	399.09
218+00		+2.14	399.03
217+90		+2.13	399.02

47

216+98
165
217+115

Check on previous work
Set pin to grade + white head to line in roof

Check on previous work
Set pin to grade + white head to line in roof

Check on previous work
Set Rd. Hd. to line + grade + spring line

Air very stale

July 9, 1930	Exit	Elliott Bailey Super
B.M. 4.31	391.88	387.57
Set B.M.	4.84	387.04
221+29 ^L	+2.48	394.36
+40 ^E	+2.49	394.37
+51 ^E	+2.50	394.38
+62 ^E	+2.51	394.39
+67 ^E	+2.52	394.40
+70	+2.52	394.41
+97 ^E	+2.54	394.42
222+08 ^E	+2.55	394.43
+19 ^E	+2.56	394.44
+30 ^E	+2.58	394.46
+41 ^E	+2.59	394.47
+52 ^E	+2.60	394.48
+63 ^E	+2.61	394.49
+74 ^E	+2.62	394.50
+85 ^E	+2.63	394.51
+96 ^E	+2.64	394.52
223+07	+2.65	394.53
+18 ^E	+2.66	394.54
B.M.	392.45	387.57

4.38 1/2 98
2.87
1.51 1/2
3.84
5.35 1/2

Top pipe 224+10⁷¹
Top pin 220+00⁸⁴
Set Rd. Hd. to line & grade
"
"
"
"
Check on previous work
Set Rd. Hd. to line & grade
"
"
"
"
"
"
"
"
Check on previous work
Check "
Check "

July 9, 1930 Exit Elliott
Bailey
Soper
B.M. 5.25 392.02 386.77

217+45	- 5.01	387.01	Floor
217+49 ⁵	+1.96	393.98	Top
160 ^E	+1.97	393.99	"
171 ^E	+1.98	394.00	"
+77 ^L	+1.98	394.00	"
+90	+2.00	394.02	"

Set Rd. Hd. to line + grade.

"

"

"

Check on previous work

July 10, 1930 Entr Same Crew
B.M. 5.19 391.52 386.33

214+25	+2.13	393.65	
+35	+2.14	393.66	
+40	+2.15	393.67	(Not Set)
+50	+2.16	393.68	
+60	+2.17	393.69	
+70	+2.18	393.70	

Check on previous work

Set Rd. Hd. to line + grade

"

"

"

"

Bore 214+75 (Marked 1² up on face)

Elliott's Notes
Bailey
Soper

50

July 11, 1930

Exit

B.M.	4.99	391.76	386.77
216+76		+2.14	393.90
216+65		+2.13	393.89
216+54		2.12	393.88

Check on previous
Set Rd. Hd. to line + grade
"

July 13

Entr

Same Crew

B.M.	4.48	390.80 $\frac{1}{2}$	386.32 $\frac{1}{2}$
Set B.M.		4.58 $\frac{1}{2}$	386.22
	4.89 $\frac{1}{2}$	391.11 $\frac{1}{2}$	
		4.78 $\frac{1}{2}$	386.33
	5.05	391.38	
214+60		+2.31	393.69
215+10		+2.36	393.74

Top pipe 210+51 $\frac{89}{4}$

Top pipe 214+50 $\frac{69}{4}$

Check on previous work
Set Rd. to line + grade

Bore 215+16

At Meeting

B.M.	4.68	391.45	386.77
B.M.		5.24	386.21

From Exit From Entr.

Top pipe 216+71 $\frac{52}{4}$

Top pipe 214+50 $\frac{69}{4}$

Elliott
Soper
Bailey

July 15, 1930

B.M.	4.97	391.19	386.22		
216 +29 [±]		+2.66	393.85	Foot	Set Rd. Hd. to line + grade
+18 [±]		+2.65	393.84	"	"
216 +07 [±]		+2.64	393.83	"	"
215 +96 [±]		+2.63	393.82	"	"
+85 [±]		+2.62	393.81	"	"
+74 [±]		+2.61	393.80	"	"
+63 [±]		+2.60	393.79	"	"
216 +54		+2.69	393.88	"	Check on previous work

B.M.	5.16	391.93	386.77		
215 +40		+1.84	393.77		Set Rd. Hd. to line + grade
+30		+1.83	393.76		"
+20		+1.82	393.75		

July 15, 1930

Elliott
Bailey
Soper

52

B.M.	4.21	390.98	386.77	
216+54		3.54	387.44	Floor at sides
+65		3.53	387.45	
+76		3.52	387.46	
+87		3.51	387.47	
+98		3.49	387.49	
217+09		3.48	387.50	

386.922
+ .52
387.442

Set

386.77
4.66
391.43
4.02

B.M. 5.29 392.06

386.77

216+98	+1.86	393.92	Roof
217+11	+1.87	393.93	
+22	+1.88	393.94	
+38	+1.90	393.96	

Check

Set

"

"

July 16 1930

Same Crew

B.M. 4.47 391.24

386.77

217+28	-3.72	387.52	
+50	-3.70	387.54	
+61	-3.69	387.55	
+71	-3.68	387.56	
216+54	-3.80	387.44	
216+43	-3.81	387.43	
216+29 ^e	-3.82	387.42	

Check

Set

Set

Set

Check

Set

Set

386.92

52

-387.02
52

July 17, 1930

B.M. 4.01 390.78

386.77

216+30	-3.36	387.42	Finish Floor	Check
+19	3.37½	387.40½		Set
216+08	3.39	387.39		||
215+96	3.40	387.38		||
+85	3.41	387.37		||
+74	3.42	387.36		||
+63	3.43	387.35		||
+52	3.43½	387.34½		||

6.96

.52

6.44

3.43

3.01 Check

386.825

.52

387.345

B.M. 5.15 391.37

386.22

214+80	-4.62	386.75	Floor	Set
214+60	-4.64	386.73		Set
214+50	-4.65	386.74		Set
215+10	+2.37	393.74	Roof	Check on previous work
215+57	-4.02	387.35	Floor at side	Check
215+45	-4.56	386.81		Set pin to grade & White Hd to line
215+28	-4.58	386.79		||
215+12	-4.60	386.77		||
214+95	-4.61	386.76		Set pin to grade

July 17, 1980

B.M.	4.14	391.18	387.04		
218+58			-3.53	387.65	Finish Floor Check on previous work
218+52			-3.54	387.64	" Set 387.12
+42			-3.55	387.63	" "
+30			-3.56	387.62	" "
+20			-3.57	387.61	" Set 2' offset to grade
+10			-3.58	387.60	" "
218+00			-3.59	387.59	" "
217+90			-3.60	387.58	" "
217+80			-3.61	387.57	" "
217+71			-3.62	387.56	" Check on previous work
B.M.	4.58	391.62		387.04	
220+54			3.78	387.84	Set 2' offset to line + grade 387.32
+70			3.76 $\frac{1}{2}$	387.85 $\frac{1}{2}$	" "
+80			3.75	387.87	" "
+90			3.74	387.88	" "
221+00			3.73	387.89	" "
+10			3.72	387.90	" "
+20			3.71	387.91	" "
+29			3.70	387.92	Set grade on timbers.
+40					
+51					

July 17, 1930

B.M. 4.58 391.62 387.04

221 +40	3.69	387.93
+51	3.68	387.94
+62	3.67	387.95
221 +67	3.66½	387.95½

July 18,

221 +80		387.97
+90		387.98
221 +97	3.89	387.99
222 +08	3.88	388.00
+20	3.87	388.01
+30	3.86	388.02
+42	3.85	388.03
+52	3.84	388.04
+63.	3.83	388.05
+74	3.82	388.06
+85	3.81	388.07
+96	3.80	388.08
223 +07	3.78½	388.07½
+18	3.77	388.11
+29	3.76	388.12
+40	3.75	388.13
+49	3.74	388.14

391.88

95½
-92½

Set Grade each side

"

"

"

387.42
<u> .52</u>
387.94

387.52
<u> .52</u>
388.04

July 18, 1930

2	223	+57	3.73 $\frac{1}{2}$	388.14 $\frac{1}{2}$
		+68	3.73	388.15
		+79	3.72	388.16
2		+90	3.71	388.17
		+99	3.70	388.18
2	224	+08	3.69	388.19
		+12	3.68	388.20
2		+16	3.67 $\frac{1}{2}$	388.20 $\frac{1}{2}$
2	B.M.	4.31	391.88	387.57

Set floor grades both sides

"

"

"

"

"

"

Set floor grade both sides

38768

.52

38820

Elliott
Bailey
Super

July 21, 1930

B.M.	6.29	392.46	386.22		
214 + 71		+1.24	393.70	Roof	Set Rd. Hd. to line + grade + spring line
182		+1.25	393.71	"	"
+93		+1.26	393.72	"	"
215 + 04		+1.27	393.73	"	"
115		+1.28	393.74	"	"
+27		+1.29	393.75	"	"
+38		+1.30	393.76	"	Set Rd. Hd. to line + grade
215 + 60		+1.33	393.79	"	Check
B.M.	4.91	391.13	386.22		
213 + 89		4.47	386.66	Floor	Set Pin to grade + white hd. to line
+73		4.49	386.64	"	"
+56		4.51	386.62	"	"
214 + 00		2.50	393.63	Roof	check on previous work
212 + 80		4.92	386.55		Set Pin to grade
213 + 40		4.86	386.61		Set Pin to grade

208+20 - +50

Elliott
Super
Bailey

59

July 23, 1930

Entr

B.M.

4.80

390.33

385.53

205+25

+2.42

392.75

Roof

Reset

205+35

+2.43

392.76

"

Check on previous work

205+40

4.00

386.33

Finish Floor

Set Pin to grade on 2' offset.

+50

3.79

386.34

"

"

385.82

52

386.34

+60

3.98

386.35

"

"

+70

3.97

386.36

"

"

+80

3.96

386.37

"

"

205+90

3.95

386.38

"

"

206+00

3.94

386.39

"

"

385.87

52

386.39

+10

3.93

386.40

"

"

+20

3.92

386.41

"

"

+30

3.91

386.42

"

"

+40

3.90

386.43

"

"

+50

3.89

386.44

"

"

+60

3.88

386.45

"

"

+70

3.87

386.46

"

"

+80

3.86

386.47

"

"

206+90

3.85

386.48

"

"

207+00

3.84

386.49

"

"

385.97

52

386.49

+10

3.83

386.50

"

+20

3.82

386.51

"

B.M.

4.32

386.01

Record
386.01 1/2

Pipe 207+26.86

207+30

3.81

386.52

+40

3.80

386.53

+50

3.79

386.54

386.02

52

Continued from preceding page

390.33

207+60		3.78	386.55	
+70		3.77	386.56	
+80		3.76	386.57	
+90		3.75	386.58	
208+00		3.74	386.59	
208+10		3.73	386.60	

B.M.	5.44	391.66	386.22	
214+00		+1.97	393.63	Top
213+36		+1.90	393.56	"
213+05		-5.09	386.57	Floor
212+86		-5.11	386.55	"

B.M.	4.87	390.83	385.96	
208+22		-4.74	386.09	
208+40		-4.72	386.11	
+50		+2.25	393.08	

Set pin to grade on 2' offset

"

"

"

"

"

386.07
52
386.59

Check on previous work

Set Rd. Hd. to line + grade

Set Pin to grade

"

Set Pin to grade

"

Checks

391.43

213 +25	+2.12	393.55
+36	+2.13	393.56
+47	+2.14	393.57
+58	+2.15	393.58
+69	+2.16	393.59
+80	+2.17	393.60
+91	+2.19	393.62
214 +00	+2.20	393.63

Set Rd. Hd. to line & grade.
 Check on previous work
 Set Rd. Hd. to line & grade
 " .12 Low
 " .13 Low
 " .11 Low
 " .15 Low
 Check on previous work

July 25, 1930

Same Crew

B. M. 4.16	390.38	386.22
214 +71	+3.32	393.70 Roof
214 +71	-3.12	387.26 Finish Fl.
+82	-3.11	387.27
+93	-3.10	387.28
215 +04	-3.09	387.29
+15	-3.08	387.30
+26	-3.07	387.31
+37	-3.05 1/2	387.32 1/2
+48	-3.04	387.34
215 +64	-3.02	387.36

Pipe 214 +50 6 1/4
 Check on previous work:
 Set Rd. Hd. each side
 "
 "
 "
 "
 "
 "
 "
 Check on previous work

386.79
 52
 387.26

 386.77
 52
 387.29

 386.82
 52
 387.34

212 +81	-1.58	391.93	393.51
212 +92			+1.59 393.52
212 +53			+1.55 393.48

Pick up
 Check
 Set

July 25, 1930

B.M.	4.27	390.49	386.22		
212 + 53			+2.99	393.48	Roof Check
212 + 53			-3.45	387.04	Fine Flr. Set grade nail both sides
+64			-3.44	387.05	"
+75			-3.42 1/2	387.06 1/2	"
+86			-3.41	387.08	"
+97			-3.40	387.09	"
213 + 08			-3.39	387.10	"
+20			-3.38	387.11	"
+31			-3.37	387.12	"
+42			-3.36	387.13	"
+52			-3.35	387.14	"
+63			-3.33 1/2	387.15 1/2	"
+80			-3.32	387.17	"
213 + 91			-3.31	387.18	"
213 + 91			+3.13	393.62	Roof Check

386.52
 52
 387.04

386.58
 52
 387.10

386.66
 52
 387.18

B.M.	4.38	390.60	386.22		
214 + 33			+3.06	393.66	Roof Check on previous work
214 + 33			-3.38	387.22	Fine Flr. set into grade 2' offset
214 + 12			-3.40	387.20	"

386.70
 52
 387.22

386.68
 52
 387.20

July 30, 1930

B.M.	4.63	390.59	388.96	
208+70		+2.51	393.10	Top
+48		+2.48	393.07	"
+37		+2.47	393.06	"
+20		+2.46	393.05	"

208+70		-3.93	386.66	Fin. Floor.
+48		-3.96	386.63	
+37		-3.97	386.62	
+20		-3.98	386.61	

July 31, 1930

B.M.	4.40 1/2	390.73	386.32 1/2	
212+53		-3.69	387.04	Fl. Grade
+40		-3.70	387.03	
+20		-3.72	387.01	
212+00		-3.74	386.99	
211+80		-3.76	386.97	
+60		-3.78	386.95	
+40		-3.80	386.93	
+20		-3.82	386.91	
211+00		-3.84	386.89	
210+90		+2.59	393.32	Roof

Check

Check on previous work
Set p into grade

check

3.76
.037
3.797
3.82

64
386.14
52
386.66
386.09
52
386.61

386.52
52
387.04
386.97
52
386.99

386.37
52
386.89

Aug 1

65

B.M.

208 +20			386.60
+37			386.62
+48			FI 386.63
		-3.39	
+60			386.65
		-3.37	
+80			386.67
		-3.35	
209 +00			386.69
		-3.33	
+20			386.71
		-3.31	
+40			^{3.15} 386.73
		-3.27	
+60			386.75
		-3.27	
+80			386.77
		-3.25	
210 +00			386.79
		-3.23	
T.P.	3.60	390.02	
+20			386.81
		-3.31	
+40			386.83
		-3.27	
+60			386.85
		-3	
+80			386.87
		-3.25	
211 +00			386.89
		-3.23	
210 +63			393.29
		+3.17	Roof
T.P.	3.70	390.12	386.32
T.P.		3.70½	386.42
B.M.	3.80	390.12½	386.32½

386.63

6.22

393.07

390.02

3.05 Check

386.11

.52

386.63

386.17

.52

386.69

386.37

.52

386.89

Check

Drain exc. Entry # 3

Aug 18, 1930

Elliott
Soper
Bailey

Grade Stake at 202+00

7.85
1.50
9.35

0+00

7.85
1.50
9.35

6.0
Cut 4.5

0+15

7.90
9.40

5.8
Cut 4.2

0+25

7.95
9.45

4.8
Cut 3.3

0+35

8.00
9.50

1.5
Cut 4.0

205+10

204+23

Drain from old
Tunnel #3

0+00

202+00

273
15
35
278

End pipe 0+35

Open ditch

original Est. of pipe
needed = 345.
Additional for old drain 275

68

$$\begin{array}{r} 205 + 10 \\ 202 + 00 \end{array}$$

310

$$\begin{array}{r} 115 \\ 3 \overline{)345} \end{array}$$

76

Bill, Post, Caps

Logging

Board

Measure

Sta	4x6	2x10	2x12
224 + 16	One set		
		3	16
+ 12 ²	"		
		3	16
+ 08 ²	"		
		3	16
+ 03 ²	"		
		4	10
223 + 99 ²	"		

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

IMPROVED TABLES

AND

INFORMATION

TABLE No. 2.

To find Tangent and External for curve of any other degree, divide by degree of curve and add correction found in column of correction. Degree of curve with a given L may be found by dividing tangent (or external), opposite L 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—Continued
TRIGONOMETRIC FORMULAE (continued)

In any triangle:

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

Use Law of Tangents.

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
$\frac{1}{8}$	.0104	.0938	.1771	.2604	.3438	.4271	.5104	.5938	.6771	.7604	.8438	.9271
$\frac{3}{16}$	.0156	.0990	.1823	.2656	.3490	.4323	.5156	.5990	.6823	.7656	.8490	.9323
$\frac{1}{4}$	.0208	.1042	.1875	.2708	.3542	.4375	.5208	.6042	.6875	.7708	.8542	.9375
$\frac{5}{16}$	.0260	.1094	.1927	.2760	.3594	.4427	.5260	.6094	.6927	.7760	.8594	.9427
$\frac{3}{8}$	.0313	.1146	.1979	.2813	.3646	.4479	.5313	.6146	.6979	.7813	.8646	.9479
$\frac{7}{16}$	.0365	.1198	.2031	.2865	.3698	.4531	.5365	.6198	.7031	.7865	.8698	.9531
$\frac{1}{2}$	.0417	.1250	.2083	.2917	.3750	.4583	.5417	.6250	.7083	.7917	.8750	.9583
$\frac{9}{16}$	.0469	.1302	.2135	.2969	.3803	.4635	.5469	.6302	.7135	.7969	.8802	.9635
$\frac{5}{8}$	.0521	.1354	.2188	.3021	.3854	.4688	.5521	.6354	.7188	.8021	.8854	.9688
$\frac{11}{16}$	.0573	.1406	.2240	.3073	.3906	.4740	.5573	.6406	.7240	.8073	.8906	.9740
$\frac{3}{4}$	.0625	.1458	.2292	.3125	.3958	.4792	.5625	.6458	.7292	.8125	.8958	.9792
$\frac{7}{8}$	.0677	.1510	.2344	.3177	.4010	.4844	.5677	.6510	.7344	.8177	.9010	.9844
$\frac{15}{16}$	.0729	.1563	.2396	.3229	.4063	.4896	.5729	.6563	.7396	.8229	.9063	.9896
$\frac{1}{1}$	.0781	.1615	.2448	.3281	.4115	.4948	.5781	.6615	.7448	.8281	.9115	.9948
	.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	×.00019	= miles
Lineal yards	×.0006	= miles
Square inches	×.007	= square feet
Square feet	×.111	= square yards
Square yards	×.0002067	= acres
Acres	×4840	= square yards
Cubic inches	×.00058	= cubic feet
Cubic feet	×.03704	= cubic yards
Links	×.22	= yards
Links	×.66	= feet
Feet	×1.5	= links
360° = 21600' = 1296000"		
Radius = arc of 57.2957790°		
Arc of 1° (radius = 1) = .017453292		
Arc of 1' (radius = 1) = .000290888		
Arc of 1" (radius = 1) = .000004848		

$$\pi = 3.141592654 \quad \sqrt{\frac{1}{4}} = 0.564190$$

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

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

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

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

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

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

Curvature in feet = 0.667 (Dist. in miles)²

Difference between arc and chord length, 0.05 feet in 11½ miles

$$\text{Probable error of a single observation} = 0.6754 \sqrt{\frac{Mv^2}{n-1}}$$

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.

Horizontal Distance = R - R sin² a + C cos a

Vertical Distance = R ½ sin 2 a + C sin a

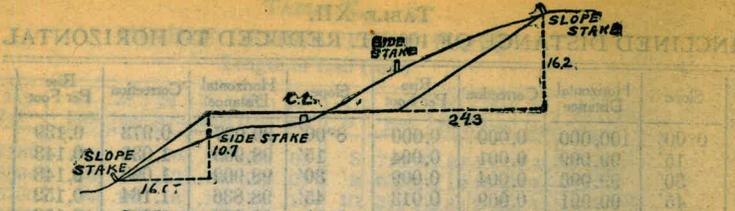
R = Reading × $\frac{\text{distance from Object glass to cross hairs}}{\text{distance between cross hairs}}$

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

a = angle of elevation for mid Reading

6 11 1/2
2 1/2
6' 9 1/4"

Area (30)



DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

SLOPE 1 1/4 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
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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
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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.

220+00.84
3+29.32
216+71.52

751
101866
76966

210+51.84
3+98.80
214+50.64

11200
3.7
535/1800
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195

To find

3 Portal to 220+36 to

205+7 205+25 08
+ 35 57.46

206+18 209+67 62

20.7
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6. 11 1/2
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385.918
225
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291.5
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229+1866
205+2466
.1894.00
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1.894

215 386.876
214+75 1.894
388.770

388.75
1.08
387.67
6.96
394.63
393.45
+1.18

229+10.71
1 35.71
222+75.00

204+01.47
.1 23.81
205+25.08

.3333
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12926
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2 1.13805286
.07

32
215+16

16 1/2

4

.02539
1

206+25
17

206+42

219+50.69
220.69

216+71.29
82