CONDUIT
SUTHERLAND PAMO
to
SAN VICENTE RES

DIETZGEN
TRADE MARK

ENGINEERS'
FIELD BOOK #1
No. 404

W179

EUGENE DIETZGEN CO.

DRAWING MATERIALS, MATHEMATICAL and SURVEYING INSTRUMENTS

Chicago New York San Francisco New Orleans Pittsburg Toronto

Distances from Center of Roadway for Cross-Sectioning
Roadway 16 feet wide. Side Slopes 1 on 1.
For Single Track Embankment.

H	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	H
0	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	0
1	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	1
2	10.0	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9	2
3	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9	3
4	12.0	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9	4
5	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	5
6	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	6
7	15.0	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	7
8	16.0	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9	8
9	17.0	17.1	17.2	17.3	17.4	17.5	17.6	17.7	17.8	17.9	9
10	18.0	18.1	18.2	18.3	18.4	18.5	18.6	18.7	18.8	18.9	10
11	19.0	19.1	19.2	19.3	19.4	19.5	19.6	19.7	19.8	19.9	11
12	20.0	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	12
13	21.0	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.8	21.9	13
14	22.0	22.1	22.2	22.3	22.4	22.5	22.6	22.7	22.8	22.9	14
15	23.0	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8	23.9	15
16	24.0	24.1	24.2	24.3	24.4	24.5	24.6	24.7	24.8	24.9	16
17	25.0	25.1	25.2	25.3	25.4	25.5	25.6	25.7	25.8	25.9	17
18	26.0	26.1	26.2	26.3	26.4	26.5	26.6	26.7	26.8	26.9	18
19	27.0	27.1	27.2	27.3	27.4	27.5	27.6	27.7	27.8	27.9	19
20	28.0	28.1	28.2	28.3	28.4	28.5	28.6	28.7	28.8	28.9	20
21	29.0	29.1	29.2	29.3	29.4	29.5	29.6	29.7	29.8	29.9	21
22	30.0	30.1	30.2	30.3	30.4	30.5	30.6	30.7	30.8	30.9	22
23	31.0	31.1	31.2	31.3	31.4	31.5	31.6	31.7	31.8	31.9	23
24	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.8	32.9	24
25	33.0	33.1	33.2	33.3	33.4	33.5	33.6	33.7	33.8	33.9	25
26	34.0	34.1	34.2	34.3	34.4	34.5	34.6	34.7	34.8	34.9	26
27	35.0	35.1	35.2	35.3	35.4	35.5	35.6	35.7	35.8	35.9	27
28	36.0	36.1	36.2	36.3	36.4	36.5	36.6	36.7	36.8	36.9	28
29	37.0	37.1	37.2	37.3	37.4	37.5	37.6	37.7	37.8	37.9	29
30	38.0	38.1	38.2	38.3	38.4	38.5	38.6	38.7	38.8	38.9	30
31	39.0	39.1	39.2	39.3	39.4	39.5	39.6	39.7	39.8	39.9	31
32	40.0	40.1	40.2	40.3	40.4	40.5	40.6	40.7	40.8	40.9	32
33	41.0	41.1	41.2	41.3	41.4	41.5	41.6	41.7	41.8	41.9	33
34	42.0	42.1	42.2	42.3	42.4	42.5	42.6	42.7	42.8	42.9	34
35	43.0	43.1	43.2	43.3	43.4	43.5	43.6	43.7	43.8	43.9	35
36	44.0	44.1	44.2	44.3	44.4	44.5	44.6	44.7	44.8	44.9	36
37	45.0	45.1	45.2	45.3	45.4	45.5	45.6	45.7	45.8	45.9	37
38	46.0	46.1	46.2	46.3	46.4	46.5	46.6	46.7	46.8	46.9	38
39	47.0	47.1	47.2	47.3	47.4	47.5	47.6	47.7	47.8	47.9	39
40	48.0	48.1	48.2	48.3	48.4	48.5	48.6	48.7	48.8	48.9	40

Example—If point is 22.6 ft. above grade, how far should it be from center line to be a slope stake point? Ans. from Table 30.6. For same slopes but other widths of roadbed, correct above figures by one-half difference in width of roadbed; thus in example above, for 20 ft. roadbed distance will be 30.6+(20—16)÷2 or 2 ft. added to 30.6 =32.6. For slopes of 1 on 1½ see inside of back cover.

Book # 179

Index

1-9-74
Williams
VanHorn
Thompson
Mansfield
Stout
clear

Roden Dam Site

Cg	Obs Dist Inst on	V.A. S. Axis	Diff Elev Point	Elev	Hor Dist 825°	Elev
2°00	4.68	0°0			460°	
5°15	5.80	+3°10	+32°		579 2/3	857°
1°45	5.75	+2°40	+26 7/10		574 8/10	851 7/10
7°45	5.70	+2°45	+27 3/10		568 8/10	852 3/10
16°08	6.00	-0°10	-1.7		601°	823 3/10
359°43	6.63	+1°43	+19.9		663 4/10	844.9
24°57	6.05	-3°30	-36.9		603 7/10	798.1
349°25	6.55	+0°47	+9°		655 9/10	834°
27°44	6.03	-4°40	-49°		600°	776°
343°27	6.29	0°0			630°	825°
30°36	6.05	-6°10	-64 6/10		599°	760 4/10
340°00	5.90	-1°22	-14.1		590 7/10	810.9
34°05	6.10	-8°15	-86.6		598.7	738 4/10
334°35	6.77	-3°23	-39.9		675.7	785.1
44°00	4.60	-15°26	-118.2		428.8	706.8
329°35	5.75	-15°53	-151.6		532.2	673.4
45°17	3.88	-18°56	-119.4		347.6	705.6
323°40	5.65	-9°22	-90.8		551.1	734.2
35°05	3.30	-23°45	-122.0		277.9	703.0
12°45	3.03	-27°20	-124.0		240.0	701.0
305°48	4.93	-15°50	-130.0		457.3	695°
340°58	3.87	-9°45	-64.7		377.1	760.3

Cg of Axis N 2°E on Mag N 14°W

H.I. 5 1/10

N. Axis point

R, Reading 5.1 center xhair

Toe of S1

Toe of S1

edg of River

Az	Obs. Dist	V.A.	Diff Elev	Hor. Dist	Elev
353°00	4.85	-1°55'	-16.2	485.5	808.8
356°03	5.05	+0°30	-4.4	506.0	820.6
22°16	4.11	-5°39	-40.3	408.2	784.7
2°20	4.17	-3°12	-23.3	416.7	801.7
17°57	4.40	-3°08	-24.0	439.8	801.0
2°24	3.60	-7°10	-44.6	355.4	780.4
17°57	4.42	-3°05	-23.7	441.8	801.3
2°24	3.61	-7°14	-45.1	356.4	779.9
2°05	3.33	-13°50	-77.4	314.8	747.6
13°55'	4.57	-1°13	-9.7	457.8	815.3
2°38	3.17	-19°50	-101.5'	281.5	723.5'
11°25'	5.05'	+0°25	+3.7	506.0	828.7
9°21	5.43	+1°45	+16.6	543.5'	841.6
2°00	2.83	-29°24	-121.5'	216.1	703.5'
	Inst on north Axis			Elev	825.0
182°00	4.68	0°00		469.0	825.0
146°41	4.73	-15°02	-118.7	442.3	706.3
233°02	4.50	-17°47	-131.1	409.6	639.9
182°30	7.25	+10°22	+128.4	702.7	953.4
224°22	5.67	-2°45	-27.2	566.8	797.8
149°58	5.59	-4°17	-41.6	557.0	783.4
182°48	5.74	+8°15	+81.6	564.0	906.6
219°30	6.50	+2°57	+33.4	649.4	858.4

H.I. 5'-1"

on Rock in stream

H.I. 5.0

edg Cr

" "

edg Road

edg of Rd @ Bend

Inst on North Axis (Con) . 825.0

az	Ob. Dist	V.A.	Diff Elev	Hor. D.	Elev.
163°45	6.10	+4°45	+50.3	607.0	875.3
182°29	5.22	+4°10	+37.9	520.2	862.9
226°50	7.15	+5°51	+72.5	708.6	897.5
167°37	6.50	+7°30	+84.1	639.9	909.1
182°30	4.33	-4.05	-31.1	431.7	793.9
171°23	6.90	+10°20	+121.1	668.8	946.1
212°34	7.70	+7°52	+104.4	776.7	929.4
179°50	3.95	-10°40	-71.7	381.5	753.3
178°40	2.70	-27°40	-111.7	212.6	713.3
183°55	3.50	-23°00	-125.9	297.6	699.1

Inst on A, Elev 857.0

az	Ob. Dist	V.A.	Diff Elev	Hor. D.	Elev.
325°32	.85	-7°40	-11.2	84.5	845.8
311°35	1.98	-5°00	-17.0	197.5	840.0
338°17	3.03	-0°38	-3.4	304.0	853.6
281°37	2.13	-7°04	-26.0	210.9	831.0
338°20	4.50	+2°05	+16.3	450.5	873.3
268°40	2.63	-9°35	-43.2	256.8	813.8
347°15	4.01	+1°26	+10.0	401.8	867.0
354°41	4.20	+1°54	+13.9	420.6	870.9
358°36	3.70	-0°37	-4.0	371.0	853.0
347°37	5.24	+6°50	+62.0	517.6	517.6
5°36	3.40	-4°30	-26.6	338.9	830.4

Toe sl.

edg Cr.

1/10-24
Party same
clear

H.I. 6.0 on Top Rock Knoll North Side Dam Axis

A_2 on Knoll in Saddle N. Side Dam

on sidehill N. of Saddle

on point back of Dam site

near top of large Knoll 500' N of Dam

Inst on 61, Con. Elev 857.0

Az	Ob. Dist	V.A.	Diff Elev	Hor Dist	Elev	
12°50	3.10	-9°12	-58.9	303.1	798.1	
344°47	5.27	+6°30	+59.3	521.2	916.3	
355°52	2.43	-9°05	-37.9	238.0	819.1	
337°08	5.20	+3°30	+31.7	519.1	888.7	
347°10	3.20	-2°05	-11.6	320.6	845.4	
342°40	3.88	+0°47	+5.3	389.0	862.3	
333°28	5.05	+1°28	+13.1	505.7	870.1	
341°00	4.70	+3°40	+30.0	469.1	887.0	
356°32	6.53	+5°07	+58.0	649.0	915.0	
326°25	4.73	-1°52	-15.4	473.5	841.6	
319°50	4.73	-4°08	-34.0	471.7	823.0	
327°50	6.13	-1°00	-10.7	613.8	846.3	
0°50	5.70	+3°40	+36.4	568.7	893.4	
322°33	5.70	-2°34	-25.5	569.2	831.5	
7°22	5.45	-0°56	-8.9	546.0	848.1	
315°10	5.50	-5°10	-49.3	546.5	807.7	
13°03	6.70	-2°10	-25.3	670.0	831.7	
302°00	6.70	-6°28	-75.0	662.8	782.0	
18°02	6.50	-4°13	-47.7	647.6	809.3	
307°00	6.70	-4°15	-49.5	667.5	807.5	
25°33	6.70	-7°22	-85.2	660.1	771.8	
311°02	6.63	-2°34	-29.7	662.7	827.3	
30°45	6.50	-10°00	-111.1	630.4	745.9	

H.I. 6.0

one dg. 3m. Canyon.

near top of large Knoll heavy Granite Bldrs

Bottom of 3m. Canyon

3m. br. of draw

" " " "

A 4 on Ridge of large Knoll N of Dam

Bottom of 3m. Draw

" " Back of large Knoll

on ridge of large Knoll

Bot. in back of large Knoll

Bottom in back of large Knoll

on ridge in back of Draw

on ridge in back of Draw

on side of large Knoll

on Knoll in back of draw

Toe of 51

Inst on A_1 Con Elev 857.0

A_3	Ob. Dist	V.A.	Diff Elev	Hor. Dist	Elev	
317°00	6.50	-1°00	-11.3	650.8	845.7	on knoll in bott of draw
323°55	6.95	-0°00		696.0	857.0	Break in Sl. on knoll
327°55	7.30	+1°30	+19.1	730.5	876.1	" " " " "
332°20	7.90	+4°05	+56.1	787.2	913.1	
330°10	2.21	-5°37	-21.5	219.0	835.5	Low point of Saddle

Inst on A_2 Elev 853.6

A_3	Ob. Dist	V.A.	Diff Elev.	Hor Dist	Elev.	
162°50	.90	-12°10	-18.7	87.0	834.9	H.I. 5.0
110°50	1.22	-18°15	-36.6	111.1	817.0	in Saddle
216°20	1.10	-14°00	-26.1	104.4	827.5	Bot Draw N. of Dam
101°50	1.57	-17°50	-46.1	143.1	807.5	
235°20	1.53	-14°20	-36.9	144.6	816.7	Bot W draw
99°05	1.80	-18°20	-54.0	163.1	799.6	" E "
237°40	2.12	-14°30	-51.6	199.7	802.0	" W "
143°05	3.18	-3°00	-16.7	318.1	836.9	
95°45	2.50	-17°30	-72.0	228.3	781.6	
128°25	3.15	-7°27	-40.6	310.9	813.0	
93°10	3.04	-17°20	-86.7	278.0	766.9	Bot E draw
244°45	4.78	-13°35	-109.4	452.8	744.2	" W "
93°15	3.00	-17°20	-85.6	274.3	768.0	" E "
119°10	3.70	-10°10	-64.5	359.5	787.1	
244°36	5.80	-13°40	-133.4	548.5	720.2	Bot W "

Inst on A_2 Con					853.6	
a_z	Ob. Dist	V.A	Diff Elev	Hor. Dist	Elev	
91°35	3.80	-16°00	-101.0	352.0	752.6	Bot E draw
109°40	4.23	-13°00	-92.9	402.6	760.7	
235°30	4.65	-11°00	-87.3	440.0	766.3	
229°40	4.25	-11°25	-82.7	409.6	770.9	Br in 51
219°40	3.00	-8°20	-43.2	294.7	810.4	on 51
201°00	2.45	-5°00	-21.4	244.1	832.2	
183°00	1.73	-4°05	-12.4	173.2	841.2	

Additional Topography Roden Canyon Dam Site

Inst on A_1 Elev				857.0		H.I. 5.0
5°15						To S. Axis
245°50	9.61	-2°50	-47.4	958.6	809.6	edg Rd.
215°00	6.61	-5°10	-59.3	658.0	797.7	" "
208°25	6.31	-5°20	-58.4	625.5	798.6	" "
196°00	5.71	-6°10	-61.0	564.0	796.0	" "
183°40	5.51	-6°40	-63.5	543.6	793.5	" "
166°50	5.91	-7°00	-71.5	582.2	785.5	" "
154°10	6.61	-6°40	-76.5	652.1	780.5	" "
141°30	6.71	-7°00	-81.0	661.0	776.0	" "
135°35	6.61	-7°25	-84.5	650.2	772.5	" "
131°40	6.81	-7°20	-86.3	670.0	770.7	" "
128°20	7.66	-6°50	-90.5	755.2	766.5	" " @ Center of Big Draw

2/24-24
Williams
Van Horn
Stout
Clear

Inst on Q, Con Elev 875±

Az	Ob. Dist	V.A.	Diff. Elev	Hor. Dist	Elev.
125°20	7.66	-6°35	-87±	756±	769
122°05	7.71	-6°50	-91.2	760±	765±
115°50	7.16	-7°05	-87.7	705±	769
102°05	7.31	-7°05	-89.5	720.1	767±
89°20	8.16	-5°50	-82.5	807.5	774±
85°10	8.51	-5°15	-77.5	844.1	779.5
79°05	8.76	-4°45	-72.3	870.2	784.7
73°15	8.91	-4°15	-65.8	886.3	791.2
68°40	8.91	-3°55	-60.8	887.0	796.2
58°35	9.71	-3°00	-50.7	968.3	806.3
54°50	10.51	-2°20	-42.8	1049.2	814.2
67°35	10.86	+0°45	+14.2	1085.9	871.2
74°45	11.26	+1°35	+31.1	1125.2	888.1
80°50	11.16	+2°00	+38.9	1114.7	895.9
84.55	11.51	+2°20	+46.8	1149.1	903.8
90°30	12.46	+2°40	+57.9	1243.3	914.9
96°00	11.61	+3°10	+64.0	1157.4	921±
102°50	11.01	+3°55	+74.9	1096.0	931
109°15	11.31	+4°10	+82±	1125±	939±
117°25	12.45	+3°15	+70±	1241.2	927±
119°00	13.31	+3°10	+73.4	1326.9	930.4
122.05	14.01	+3°10	+77.3	1396.7	934.3
125°25	13.41	+3°10	+74.0	1336.9	931±

14.1. 5±

edg Road at N edg of Big Draw.
edg R'd
" "
" "
" "
" "
" " @ branch to Jones' Ranch
" "
" "
" "
" @ Bend to San Isabel Canyon
1st Br. on ridge @ Bend
2nd " " " " "

11.5 m. Dr.
Ridge between 5 m. Draws
in 5 m. Draw

on Ridge at Bend into large draw
in Slope of draw
in branch of draw
" " " "
Ridge between Draws { Draws Join / ½ between this / point & Road.

Inst on G_1 Con Elev 857.0

G_3	Obs. Dist	V.A.	Diff Elev	Hor Dist	Elev
133°00	14.61	+3°10	+80.6	1455.5	937.6
136°10	13.40	+3°20	+77.9	1335.5	934.9
142°10	12.21	+3°20	+70.8	1217.0	927.8
150°00	10.81	+2°50	+53.4	1078.4	910.4
130°20					
151°50	10.21	+3°15	+57.8	1017.8	914.8
155°05	9.21	+3°00	+48.1	918.5	905.1
160°05	8.40	+3°05	+45.1	837.7	902.1
166°00	8.01	+3°00	+41.8	798.8	898.8
175°30	6.96	+3°35	+44.0	693.4	901.0
183°45	6.56	+2°35	+29.5	654.8	886.5
191°15	6.61	+1°55	+22.1	660.3	879.1
202°15	6.91	+1°40	+20.1	690.4	877.1
214°30	7.71	+1°25	+19.0	770.6	876.1
221°50	8.57	+1°40	+25.0	856.1	882.0
228°55	9.00	+0°20	+5.2	900.0	862.2
236°35	9.50	−0°50	−13.8	949.8	843.2
242°50	9.65	−2°00	−33.7	963.8	823.3
253°10	9.40	−4°40	−76.2	933.8	780.8
257°55	9.60	−5°10	−86.1	952.2	770.9
266°15	9.90	−7°15	−123.9	974.6	733.1
267°55	10.00	−7°45	−133.6	982.2	723.4
B_1 122°15	1.12	−16°34	−30.6	102.9	826.4
B_2 266°33	2.65	−9°43	−44.08	257.5	812.9

H.I. 5.0

Channel of Main Draw

Small Ridge

" "

" "

Intercepts draw 50' W. Main draw.

Beginning of Round Point

on E St of Draw.

Depression in Point

on Round Point

" " " @ Bend to draw

" "

" "

" "

Top of Ridge

" " "

" " "

" " "

" " "

" " "

" " "

" " "

Inst on B_2 Elev 812.9

Starting from $A_1 - B_2$ produced θ_3 266°33

θ_3	Obs. Dist	V.A.	Diff Elev	Hor Dist	Elev.
276°45	7.10	-10°40	-129.5	685.7	683.4
276°05	7.91	-9°10	-124.3	771.0	688.6
286°45	8.81	-9°00	-136.0	859.5	676.9
286°20	6.31	-12°00	-128.3	603.7	684.6
238°00	4.91	-15°10	-123.9	457.3	689.0
210°05	4.26	-17°20	-121.2	388.2	691.7
182°30	4.21	-16°40	-115.7	386.4	697.2

Inst on N. Axis Elev 825.0

Starting from S. Axis θ_3 182°00

218°25	4.21	-18°50	-128.6	377.1	696.4
192°20	3.57	-22°30	-126.3	304.8	698.7
166°25	3.81	-19°40	-120.7	337.8	704.3
155°30	4.00	-19°00	-123.1	357.6	701.9

Inst on B_1 Elev 826.4

Starting from $A_1 - B_1$ Produced θ_3 122°15'

170°10	4.36	-17°15	-123.5	398.1	702.9
157°55	5.01	-14°00	-117.6	471.6	708.8
133°45	4.81	-14°35	-117.2	450.8	709.2
125°30	4.91	-13°00	-107.6	466.2	718.8
107°50	5.40	-11°45	-107.7	518.0	718.7

H.I. 5.0

Edg Cr.

Toc. 51 & edg Cr.

H_2O level main channel

Toc 51

" "

" "

" "

H.I. 5.0

Toc of 51 & check Reading

Toc 51.

" "

Toc 51 & H_2O Level

H.I. 5.0

Toc 51.

" "

" " 50' W. mouth Draw

on Rock E Bank of Draw

Toc 51

Inst on B, Con Elev 826.4

Az	Obs Dist	V.A.	Diff Elev	Hor Dist	Elev
88°55	5.71	-10°50	-105.4	550.7	721.0
76°20	6.06	-10°10	-105.3	587.1	721.1
58°25	6.01	-10°40	-109.3	580.4	717.1
45°35	6.70	-9°35	-110.0	651.7	716.4
36°25	7.41	-9°10	-116.5	722.2	709.9
44°00	8.85	-2°50	-43.7	882.8	782.7
57°20	7.10	-5°20	-65.7	703.9	760.7
55°45	5.25	-13°30	-119.1	496.4	707.3
77°55	5.00	-14°30	-121.2	468.7	705.2
105°50	4.61	-16°10	-123.3	425.3	703.1
128°35	4.15	-18°15	-123.5	374.6	702.9
194°50					

H.I. 5°

Toe 31

" "

" "

" "

Toe 31 & edg Cr.

Br. in 31 on Bend (steeper to Cr.)

@ Bcc Hucs

edg Cr on Sand Bank { channel turns sharply N. for 50' then continues W.

" " " " "

on Sand Bank slightly higher than channel Edg Cr.

3' Axis

Conduit Roden Dam to San Vicente Dam

1/9-24

Williams
Van Horn
Thomesen
Mansfield
Stout
Clear

Sta	+	HI	−	Elev	Gr. Rod	Grade
0+00				800.00		800.00
TP	11.22	799.32		788.10		
2+40 TP	+9.77	808.82	-0.27	799.05		799.76
5+00				800.8	8.82	799.50
8+47.2				Set to Gr.	9.67	799.15
TP	+0.35	804.28		803.93		

Established by line of levels from U.S.G.S Bench 0.2 mi. S. of Forks of Road Pamo Grade F.O.7

C 1.3

On Rock Established by line of levels from U.S. G.S Bench

Siphon #1 sta 8+47.2 to sta 13+27

Inst on 13+27 Elev. 800.73

Sta	Ob Dist	V.A.	Diff Elev	Hor Dist	Elev
8+47.2	4.80				
8+86.1	4.40	-0°45		440.9	794.76
9+48.5	3.80	-4°40		378.5	769.83
10+06.6	3.30	-10°20		320.37	742.31
10+79.3	2.80	-20°10		247.7	709.78
11+80.7	1.68	-21°35		146.3	736.60
12+34.5	1.04	-20°30		92.25	766.27
12+83.26	.48	-19°20		43.74	785.41
13+27					800.73

note change of Siphon made a grade equation of .13 which was disregarded

98.3' / 98.43 = cut 2.1 Mag N 84° W

stadia Dist across Siphon 480.00'

1.5' per 1000'

Edg Bank Cr Bed 15' lower & 25' ahead

Rod off 11.3

7/11-24
Party same
Clear

Sta	+	⊼	−	Elev.	Gr Rod
13+27		804.28		800.73	
TP	+5.10	805.00	-4.38	799.90	
14+30				799.2	
TP	+3.50	803.40	-5.10	799.90	
16+90				798.76	
18+57				795.09	
20+57				792.57	
22+44				788.87	
TP	+12.73	804.49	-11.54	791.86	
23+30				792.12	
24+56				798.18	

Siphon #2

Sta 24+56 to 33+96

Inst on Sta 24+56 Elev 798.18

Sta	Hor. Dist	V.A.	Diff Elev	Hor Dist	Elev.
25+45.6	.93	-12°30		89.65	778.51
26+22	1.75	-13°35		166.0	756.7
25+66	2.30	-13°20		109.8	738.6
27+45	3.05	-13°30		289.4	729.9
28+20	3.70	-8°00		363.8	747.4
28+69.5	4.17	-6°10		413.5	753.7
29+12.2	4.60	-5°50		456.2	757.9
29+43.6	4.92	-6°15		487.6	745.2
33+96					

Grade
98.3 =
98.43

798.2 C 1.9

797.96 C 8.8
797.79 F 2.7
797.59 F 5.9
797.37 F 8.5
Correct elevs Run from U.S.G.S. Bench 791.76
797.32 F 5.2
797.18 C 1.9

H.I 5.2
Sta dia Dist across Siphon 946
1.5' per 1000'
Rod of 8.9
Rod of 13.9 Bot Draw
Ridge between Draws

Inst on 24+56 Elev 798.18 | H.I. 5.2

33+11.8	8.55	0°30		855.8	790.9	
30+49.4	6.00	-6°00		593.4	736.0	in draw.
32+66.8	8.10	-1°08		810.8	782.4	
31+13.8	6.60	-4°00		657.8	752.5	
32+21.2	7.65	-1°55		765.2	772.8	
33+96	9.40	-0°0		940	795.77	

Sta	+	⊼	-	Elev	Gr Rod	Grade	
TP 24+56	5.09	803.26		798.17			
TP 33+96	+8.43	804.32	-7.37	795.89		795.78	Co [illegible]
35+00				Set to Gr.	8.63	795.67	
36+00				" "	8.73	795.57	
TP 37+50	+5.90	801.35	-8.87	795.45	8.87	795.42	
39+00				set to Gr.	6.06	795.27	
41+00				793.37		795.07	Fl [illegible]
43+00				794.17		794.87	Fo [illegible]
TP 44+00	+10.75	805.55	-6.55	794.80	6.56	794.77	
45+35				set to Gr	10.91	794.64	
46+75				" "	11.03	794.50	
48+75				" "	11.23	794.30	no transit point established,
50+75				" "	[illegible]	794.10	{ set by Locke level
52+75				" "		793.90	
TP			-0.57	804.98			20' S. of Sta 52+00 on Rock
	+4.09	809.07					

1/12-24
Party Same
clear

Sta	+	↑	−	Elev.	Gr. Rod
		809.07			
TP	+2.34	799.88	-11.53	797.54	
53+75				Set to Gr	6.06
54+25					6.11
TP 56+00	+7.25	800.83	-6.30	793.58	6.29
57+00				Set to Gr	7.36
58+75				" " "	7.51
60+50				" " "	7.69
62+00				" " "	7.84
63+00	+13.00	805.90	-7.93	792.90	7.94
64+00				Set to Gr.	13.11
66+00				" " "	13.31
68+00				" " "	13.51
70+00				" " "	13.71
71+00				" " "	
72+00				" " "	
73+00				" " "	
74+00				" " "	
75+00				" " "	14.21
76+00				" " "	14.31
77+50	+9.37	802.27	-13.0	792.90	
78+90				Set to Gr	10.98
TP 79+50			-11.04	791.23	
	+10.72	801.95			

Grade

Party same clear.

5' left of Sta 53+75

793.80
793.75
793.57
793.47
793.30
793.12
792.97
792.87
792.77
792.57
792.37
792.17
792.07 in canyon set with hole level to Grade
791.97 " " " " "
791.87 " " " " "
791.77 " " " " "
791.67 " " " " "
791.57 " " " " "
791.43 Cut 15
791.29
791.23

Sta	+	⊼	−	Elev	Gr. Rod	Grade
		801.95				
80+25				Set to Gr.	10.79	791.16
82+25				" " "	10.99	790.96
84+25				" " "	11.19	790.76
86+25				" " "	11.39	790.56
87+00				" " "	11.47	790.48
88+50				" " "	11.62	790.33
89+50				" " "	11.72	790.23
90+50				" " "	11.82	790.13
TP 91+00	+11.57	801.65	-11.87	790.08		790.08
93+00				Set to Gr.	11.77	789.88
95+00			-5.60	796.05		789.68 C 6.4
97+00				Set to Gr.	12.17	789.48
97+50				" " "	12.22	789.43
99+50				" " "	12.42	789.23
100+50				" " "	12.52	789.13
102+50				" " "	12.72	788.93
TP 103+50	+12.06	800.89	-12.82	788.83		788.83
105+50				Set to Gr.	12.26	788.63
107+50				" " "	12.46	788.43
109+50				" " "	12.66	788.23
TP 111+00	+9.72	797.80	-12.81	788.08		788.08
112+50				" "	9.87	787.93

Sta	+	℄	−	Elev.	Gr. Rod	Grade
		797.80				
113				Set to Gr.	9.92	787.88
+50	+9.41	800.19	-7.02	790.78	9.97	787.83 on Rock above Grade
115+50				Set to Gr	12.56	787.63
117+00				" "	12.71	787.48
118+00				" "	12.81	787.38
120+00				" "	13.01	787.18
120+50				" "	13.06	787.13
121+00				" "	13.11	787.08
122+00				" "	13.21	786.98
124+00				" "	13.41	786.78
125+75				" "	13.59	786.60
TP 126+25	+10.30	797.49	-13.00	787.19	13.64	786.55
127+25				Set to Gr	11.04	786.45
128+50				" " "	11.16	786.33
129+25				" " "	11.24	786.25
130+00				" " "	11.31	786.18
131+50				" " "	11.46	786.03
TP 133+50	+12.03	797.86	-11.66	785.83		785.83
134+50				Set to Gr	12.13	785.73
135+50				" " "	12.23	785.63
137+50				" " "	12.43	785.43
139+50				" " "	12.63	785.23
141+50				" " "	12.83	785.03

1/15-23
Party same
Clear

Sta	+	π	−	Elev	Gr. Rod	Grade
TP143	+11.92	796.80	-12.98	784.88		784.88
145				set to Gr	12.12	784.68
147				" " "	12.32	784.48
149				" " "	12.52	784.28
150				" " "	12.62	784.18
TP152	+7.31	791.29	-12.82	783.98		783.98
153				Set to Gr	7.41	783.88
155				" " "	7.61	783.68
157				" " "	7.81	783.48
159				" " "	8.01	783.28 Set to Grade With hook Level
160				" " "	8.11	783.18
161				" " "	8.21	783.08
TP163	+11.10	793.98	- 8.41	782.88		782.88
165				set to Gr	11.70	782.28
167				" " "	11.50	782.48
168				" " "	11.60	782.38
TP169	+11.45	793.72	-11.71	782.27		782.28
170				set to Gr	11.54	782.18
TP171	+10.93	793.02	-11.63	782.09		782.08
173				set to Gr	11.14	781.88
175				" " "	11.34	781.68
TP176	+ 9.86	791.44	-11.44	781.58		781.58
+50				set to Gr	9.91	781.53

Sta	+	H	−	Elev	Gr. Red	Grade	
177		791.44			9.96	781.48	
TP 179	+9.72	791.00	-10.16	781.28		781.28	
180				set to Gr	9.82	781.18	
181				" " "	9.92	781.08	
TP 183	+10.43	791.29	-10.14	780.86		780.88	
185				" " "	10.61	780.68	
187				" " "	10.81	780.48	
189				" " "	11.01	780.28	
191				" " "	11.21	780.08	
191+90				" " "	9.68	779.99	
TP 192	+9.59	789.67	-11.21	780.08			
193+50				set to Gr	9.84	779.83	
TP 195			-11.69	777.98		779.68	F1 7
TP 196	+12.83	792.44	-10.06	779.61		779.58	
198				set to Gr	13.06	779.38	
+40				" "	13.11	779.33	
TP +90	+7.63	787.25	-12.82	779.62		779.28	Co 3
199+48				set to Gr	8.03	779.23	
TP 201+50			-3.32	783.93		779.03	C4 9
TP	+10.43	788.79	-8.89	778.36			
203+43			-8.42	780.37		778.83	C1 6
205+43			-8.62	780.17		778.64	C1 5
207+43			-8.82	779.97		778.44	C1 5
208+18			-8.89	779.90		778.37	C1 5

7/16-24
Party same
Windy in P.M.

Sta	+	H.I.	−	Elev	Cor. Rod
209+50				Set to Gr	−10.56
211+50				" " "	−10.75
213+50				" " "	−10.95
215+00				" " "	−11.10
217+00				" " "	−11.30
219+00			−10.50	778.29	
221+00			−10.70	778.09	
222+75			−10.87	777.92	
224+75			−11.07	777.72	
TP 226	+8.76	786.28	−11.27	777.52	
227				Set to Gr.	9.80
+75				" " "	9.87
229+75				" " "	10.07
230+50				" " "	10.15
232+50				" " "	10.35
234+50				" " "	10.55
TP 236	+6.00	785.33	−6.95	779.33	
238				Set to Gr	9.95
240+50				" " "	10.20
241+50				" " "	10.30
TP 242+25	+5.77	780.73	−10.37	774.96	
243+75				" " "	5.92
245+75				" " "	6.12
247+75				" " "	6.32

Gr
778.24
778.04
777.84
777.69
777.49
777.29 C 1
777.09 C 1
776.92 C 1
776.72
776.59 C 0
776.48
776.41
776.21
776.13
775.93
775.73
775.58 C 3
775.38
775.13
775.03
774.96
774.81
774.61
774.41

Sta	+	⊼	−	Elev.	Gr Rod	Grade
		780.73				
249+25				Set to Gr	6.47	774.26
250+00				" " "	6.54	774.18
252+00				" " "	6.75	773.98
254+00				" " "	6.95	773.78
255				" " "	7.05	773.68
TP256	+5.98	779.56	-7.15	773.58		773.58
257				Set to Gr	6.08	773.48
TP258	+10.57	783.95	-6.18	773.38		773.38
259				Set to Gr	10.67	773.28
261				" " "	10.87	773.08
262				" " "	10.97	772.98
263				" " "	11.07	772.88
264+50				" " "	11.22	772.73
266+50				" " "	11.42	772.53
267+50				" " "	11.52	772.43
TP268	+8.22	780.60	-11.57	772.38		772.38
269				Set to Gr	8.32	772.28
+50				" " "	8.37	772.23
271+50				" " "	8.57	772.03
273				" " "	8.72	771.88
274				" " "	8.82	771.78
276				" " "	9.02	771.58
277				" " "	9.12	771.48

1/16-24

Sta	+	⊼	−	Elev	Gr Rod	Grade
278				Set to Gr	9.22	771.38
℞ 279	+6.74	778.02	−9.32	771.28		771.28
281				Set to Gr	6.94	771.08
+50				" " "	6.99	771.03
283+50				" " "	7.19	770.83
284+25				" " "	7.26	770.76
285+00				" " "	7.34	770.68
286+00				" " "	7.44	770.58
288+00				" " "	7.64	770.38
289+00				" " "	7.74	770.28
℞ 290+00	+9.66	779.84	−7.84	770.18		770.18
291+00				Set to Gr	9.76	770.08
292				" " "	9.86	769.78
℞ +50	+10.15	780.08	−9.91	769.93		769.93
293				Set to Gr	10.20	769.88
294				" " "	10.30	769.78
295				" " "	10.40	769.68
296				" " "	10.50	769.58
297				" " "	10.60	769.48
298				" " "	10.70	769.38
℞ 299	+10.49	779.77	−10.80	769.28		769.28
300				Set to Gr	10.59	769.18
301				" " "	10.69	769.08

Sta	+	℄	−	Elev.	Gr. Rod
302+50		779.77		set to Gr.	10.84
303+50				" " "	10.94
305+50				" " "	11.14
TP306+50	+9.38	777.91	-11.24	768.53	
307+50				set to Gr	9.48
309+25				" " "	9.68
310+25				" " "	9.78
312+25				" " "	9.98
TP313+25	+11.45	779.31	-10.05	767.86	
314				set to Gr	11.52
315				" " "	11.62
TP +75	+9.11	775.38	-13.04	766.27	
317+75				set to Gr	7.97
TP318+52	+7.57	774.92	-8.03	767.35	
320+50				set to Gr	7.79
322+50				" "	7.99
324+50				" " "	8.19
326+00				" "	8.34
TP327	+11.77	778.25	-8.44	766.48	
328				set to Gr	11.87
330				" " "	12.07
331+50				" " "	12.22
TP332+50	+12.17	778.09	-12.33	765.92	
333+60					-12.27

768.93
768.83
768.63
768.53
768.43
768.26
768.16
767.96
767.86
767.79
767.69
767.41
767.33
767.13
766.93
766.73
766.58
766.48
766.38
766.18
766.03
765.93
765.82

11-24
Party some
clear

Sta	+	778.09	−	Elev	Gr. Rod
334+50				set to Gr.	12.37
TP	+2.57	775.83	−4.83	773.26	
336+35				set to Gr	10.27

Siphon #3 sta 336+35 to 340+32

Inst at 336+35 Elev 765.55

Sta	Ob. Dist	V.A.	Diff Elev	Hor Dist	Elev
340+05 3	3.70	-2°30	-16.12	370.3	749.43
339+77 2	3.45	-6°00	-35.97	342.2	729.58
339+43	3.15	-9°15	-50.14	308.0	715.41
337+18 8	.93	-19°20	-29.3	83.8	736.25
339+00	2.94	-18°45	-89.8	264.9	673.3
337+70 7	1.50	-18°45	-45.95	135.7	719.6
338+08 7	1.93	-18°45	-59.1	173.7	705.0

Sta	+	775.83	−	Elev	Gr. Rod
TP 340+32	+9.64	774.73	-10.74	765.09	
341+50				set to Gr	9.90
343+50				" " "	10.10
345+50				" " "	10.30
347+50				" " "	10.50
TP	+2.78	773.23	-4.28	770.45	
349				set Gr	9.15
350+60				" "	9.31
TP 352+60	+11.76	775.47	-9.52	763.71	
353+60					11.85

75.83
10.27
65.56

26

Grade

765.73

765.55

H.I 4.60 Mag. 3°28'15 W.

Stadia Dist across Siphon 397 2

1.15' per 1000'

Rod at 7 9

Rod at 6 6 Bot of Cr 40' lower with H.I.

665 2

764.95 Cut 0 1

764.83

764.63

764.43

764.23

on Rock 30' L of 347+50

764.08

763.92

763.72

763.62

Sta	+	775.47	−	Elev	Gr. Rod
354+50				set to Gr	11.94
TP 355+50	+8.59	772.02	-12.04	763.43	
356+50				set to Gr.	8.69
357					8.74
TP +50	+11.80	774.53	-8.79	763.23	
359+50				set to Gr.	11.50
360				" " "	11.55
361+50				" " "	11.70
363				" " "	11.85
365				" " "	12.05
367				" " "	12.25
369				" " "	12.45
TP 370+50	+3.53	765.46	-12.60	761.93	

Siphon #4 Sta 370+50 to 398+50

Inst on Sta 370+50 Elev. 761.93

Sta	Ob. dist	V.A.	Diff Elev	Hor. Dist	Elev.
372+01.5	1.63	-16°15	-44.0	151.5	710.93
373+16	2.85	-15°20	-72.8	266.0	689.13
374+02	3.77	-15°05	-95.0	352.0	666.93
374+25	4.00	-14°50	-99.0	375.0	657.93
376+52	6.40	-14°20	-154.0	602.0	601.93
376+88	6.80	-11°50	-168.0	638.0	590.93
386+23	14.70	-14°55'	-365.6	1373.0	395.7
388+71.6	18.90	-11°05'	-356.6	1821.6	406.8

Gracie

763.53
763.43
763.33
763.28
763.23
763.03
762.98
762.83
762.68
762.48
762.28
762.08
761.93

Mag 567°40' W

H.I 3.0 Stadia Dist across 2800.0

1.5' per 1000'

Rod at 12.0

Rod 10.0
" 11.0
" 8.0
" 4-45'
" 3-55'

Inst on 388+71.6 Elev 406.83

Sta	Ob. Dist	V.A	Diff Elev	Hor Dist	
391+25.6	2.54	+2°35'	+11.5	254.0	418.3
392+80.6	4.20	+9°30	+68.4	409.0	475.2
393+25.6	4.80	+12°40	+103.0	458.0	509.8
395+32.6	7.40	+19°05	+230.0	661.0	636.8
398+51.6	11.10	+20°04	+358	980.0	764.8
					759.25

Sta	+	π	−	Elev	Gr. Rod
		765.46			
TP	+0.84	765.80	−0.50	764.96	
398+51	+11.60	770.85	−6.55	759.25	
400+50				Set to Gr	13.32
402+50				" " "	13.52
404+50				" " "	13.72
TR 405	+5.75	768.39	−8.21	762.64	11.30
406+50				Set to Gr	11.46
TP 407+50	+7.76	767.43	−8.72	759.67	11.56
408					10.65
410				" " "	10.85
411+80				" " "	11.03
413+50				" " "	11.20
TP 414	+12.16	768.34	−11.25	756.18	
415				Set to Gr	12.26

1/18-24 Williams Van Horn Mansfield Stout Clear. 30

H.I 5°

Dist to bank main channel from Sta 7

Rod 5° is 60' Feet.

" " Dist to toe 51. from Sta 7 = 334'

" " " " S. Bank Main channel

" " From Sta 7+15 32°

" " Crest of Point in bottom in front of House 13.70 higher than channel. Main Channel 5° lower than Valley Bed.

On top of large Rock near sta 398+50

757.73 Cut 1.5'

757.53

757.33

757.13

757.08 on Rock 10' E. Sta 405

756.93

756.83 on Rock on ℄ 407+66

756.78

756.58

756.40

756.23

756.18

756.08

3½	+	768.34	−	Elev	Gr. Rod
416+50				Set to Gr.	12.41
417+50				" " "	12.51
419+25				" " "	12.67
TP 419+50	+12.17	767.80	-12.71	755.63	
420			-12.22	756.08	
TP 420+50	+12.48	768.01	-12.27	755.53	
421+50			-12.58	756.43	
TP 423+50	+10.60	765.82	-12.79	755.22	
424+50	1			Set to Gr.	-10.70
426				" " "	-10.85
427+50				" " "	-10.99
TP 428	+5.77	760.55	-11.04	754.78	
429				Set to Gr.	- 5.87
430				" " "	- 5.97
431				" " "	- 6.07
433				" " "	- 6.27
TP 434	+11.36	765.54	- 6.37	754.18	
434+50				Set to Gr	-11.41
436+50				" " "	-11.61
438+50				" " "	-11.81
440				" " "	-11.96
441			-	" " "	-12.06
TP +75	+9.89	763.28	- 12.15	753.39	

Grade	
755.93	
755.83	
755.65	
755.63	
755.58	Cut 0 ±
755.53	
755.43	Cut 1 ±
755.23	
755.13	
754.98	
754.83	
754.78	
754.68	
754.58	
754.48	
754.28	
754.18	
754.13	
753.93	
753.73	
753.58	
753.48	
753.41	

Sta	+	763.28	−	Elev	Gr. Rod
442+25				set to Gr.	9.92
443+25				" " "	10.02
444+25				" " "	10.12
445+75				" " "	10.27
TP 446+75	+9.68	762.59	−10.37	752.91	
448+75				set to Gr.	9.88
TP 449+50	+10.41	763.05	−9.95	752.64	
450+50				set to Gr.	10.51
451+50				" " "	10.61
TP 452	+7.02	762.71	−7.36	755.69	
453+25				set to Gr.	10.45
454+50				" " "	10.57
455+25				" " "	10.65
456+25				" " "	10.75
TP 457+50	+9.01	760.84	−10.88	751.83	
458+50				set to Gr.	9.11
459+20				" " "	9.18
461+20				" " "	9.38
462+70				" " "	9.53
464+50				" " "	9.71
465+25				" " "	9.79
TP 465+95	+6.55	757.53	−9.86	750.98	
467					6.65

1 / 21-24

Williams
Brackett
Mansfield
Stout
Thompson
Clear

Grade		
753.36		
753.26		
753.16		
753.01		
752.91		
752.71		
752.64		
752.54		
752.44		
752.39	C O 3	
752.26		
752.14		
752.06		
751.96		
751.83		
751.73		
751.66		
751.46		
751.31	F O 1	
751.13		
751.05		
750.98		
750.88		

Sta	+	757.53	−	Elev	Gr. Rod
TP 467+40	12.34	763.18	6.69	750.84	
468+40				set to Gr	12.44
469					12.50
471					12.70
473					12.90
474					13.00
476					13.2
477					13.3
TP 478	+1.90	758.94	−6.14	757.04	
+50				set to Gr	9.21
480+50				" " "	9.41
481+50				" " "	9.51
482+50				" " "	9.61
TP 483+50	+2.67	753.95	−7.66	757.28	9.71
484+50				set to Gr	9.82
485+50				" " "	9.92
486+75				" " "	5.05
TP 487+50	+9.82	758.65	−5.72	748.83	
489				set to Gr	9.97
490+50				" " "	10.12
TP 491+70	+9.25	757.66	−10.24	748.41	
492+15				set to Gr	9.29
493				" " "	9.38

Gr
750.84
750.74
750.68
750.48
750.28
750.18
749.98
749.88
70' Right of Sta 478 on Rock
749.73
749.53
749.43
749.33
749.23 on Rock 7' ahead of 483+50
749.13 C/ 3
749.03
748.90
748.83
748.68
748.53
748.41
748.37
748.28

Sta.	+	757.66	−	Elev.	Gr. Rod	Grade
494				Set to Gr.	9.48	748.18 Cut 1.7
496				" " "	9.68	747.98
TP 497	+ 3.12	751.00	− 9.78	747.88		747.88
498					3.22	747.78
TP +50	+ 11.07	758.80	− 3.27	747.73	" "	747.73
499+50				Set to Gr	11.17	747.63
500+70				" " "	11.29	747.51
501+50				" " "	11.37	747.43
502+25				" " "	11.44	747.36
502+75				" " "	11.49	747.31
504+75				" " "	11.69	747.11
506+75				" " "	11.89	746.91
TP 507	+ 8.19	755.07	− 11.92	746.88		746.88
509					− 8.39	746.68
+75					8.46	746.68
510+75					8.56	746.61
512+75					8.76	746.51
514+75					8.96	746.31
515+75					9.06	746.11
516+75					9.16	746.01
TP	+ 10.88	765.35	− 0.60	754.47		7' Left of Sta 516+75
517			− 11.30	754.05		745.88 C.8' Beginning of Tunnel
+50			− 8.5	756.8		745.83

Sta	+	⊼	−	Elev
518		765.35	5.2	760.1
+50			2.8	762.5
519			1.4	763.9
+50			2.8	762.5
520			5.6	759.7
+50			7.7	757.6
521			9.7	755.6
TP +50	0.42	753.01	12.76	752.59
522			3.0	750.00
+50			4.7	748.30
523			6.3	746.70
+30			7.76	745.25
TP +50	+1.80	746.46	8.35	744.66
524			3.60	742.7
526			9.8	736.7
TP +60	+0.96	734.90	12.52	733.94
528	+1.1		4.3	730.6
530			5.8	729.1
TP 532	+1.07	733.01	2.96	731.94
534			11.0	722.0
+75			11.6	721.4
536			3.9	729.1
TP +40	+11.10	743.29	0.82	732.19

745.78	
745.73	
745.6	High Point
745.63	
745.57	
745.53	
745.48	
745.43	
745.38	
745.33	
745.28	
745.25	Grade point
745.23	
745.18	Beginning of Siphon #5

3+2	+	743.29	−	Elev	Gr. Rod
537			4.0	739.3	
+30			2.7	740.6	
538			10.1	733.2	
+60			12.8	730.5	
539+30			1.2	742.1	
540	+6.18	748.36	1.11	742.18	
+50			2.4	746.0	
541+35			4.2	744.2	
+80			1.8	746.6	
542			3.4	745.0	
+60			15.2	733.2	
544			16.3	732.1	
545+20			19.5	728.9	
546			7.2	741.2	
+50			3.0	745.4	
TP +80	+1.88	746.64	3.60	744.76	
547			4.9	741.7	
+50			11.1	735.5	
TP	+0.96	737.30	10.30	736.34	
548			11.3	736.00	
TP	+0.79	725.31	12.78	724.52	
+50			7.10	718.2	
549			13.1	712.2	
TP	+0.57	713.68	12.20	713.11	

Grade

Top 3+2 547+50.

Top of Rock 3' Lt 548 548+05

on top of 549

Sta	+	713.68	−	Elev	
549					
+50			-7.2	706.5	
550			-12.0	701.7	
+50			-11.4	702.3	
TP	+12.36	724.95	-1.09	712.59	
552			-2.6	722.3	
TP	+12.36	736.96	-0.35	724.60	
	+11.91	748.26	-0.61	736.35	
+50			-10.7	737.6	
+64.3			-5.94	742.32	5.94
553			-5.98		5.98
+50					6.03
554+45					6.13
TP	+10.84	753.78	5.32	742.94	
555+20					11.72
TP 556+20	+9.02	750.98	-11.82	741.96	
557+20					9.12
558+20					9.22
559	+9.39	751.07	-9.30	741.68	
560					9.49
561					9.59
TP 562	+11.97	753.35	-9.69	741.38	
+50					12.02
TP 563+80	+12.09	753.29	-12.15	741.20	

Hub @ about 550+50

360+18' Rt

742.32 End of Siphon #5

742.38

742.23

742.13

on rock @ 554+48

742.06

741.96

741.86 Elev?

741.76

741.68

741.58

741.48

741.38

741.33

741.20

		753.29			
564+60					12.17
566+60					12.37
TP 568+40	+12.22	752.96	-12.55	740.74	
569+70			-13.00	739.96	
TP 570+70			-8.72	744.24	
TP	+11.03	767.81	-0.24	756.78	
TP	+11.06	778.86	-0.01	767.80	
572+68.3			-8.58	770.28	

Tunnel ±2

Sta 572+68.3 to 627+00.8

Inst on sta 583+78.2 Elev 1006.24

Sta	Obs. Dist	V.A.	Hor. Dist	Diff. Elev	Elev
572+68.3	11.6	-12°00	1109.9	-235.94	770.30
577+81.5	6.26	-12°32	596.7	-132.59	873.6
579+92.1	4.40	-20°32	386.1	-144.54	861.7
581+35.8	2.94	-24°26	242.4	-111.84	890.4
583+29.4	0.56	-21°00	48.8	-18.74	987.5
584+04.0	0.26	+5°40'	25.75	+2.56	1008.8

Inst on 584+04.0 Elev 1008.8

587+40	3.52	-12°44	336.0	-76.0	932.8
588+46	4.56	-10°36	442.0	-82.8	926.0
588+98	5.10	-10°38	494.0	-92.8	916.0
591+63.1	7.76	-8°30	760.0	-113.7	895.3

"Y" Levels over Tunnel

			±	Elev	T
744.12					
740.92		Sta 572+68.3	-8.58	770.28	778.86
740.74		TP	+1.24	777.62	
740.61	Fill 0.6		+12.87		790.49
740.51	Cut 3.7	TP	-2.05	788.44	
on Rock	@ 571+10		+11.50		799.94
" "	" 571+30	TP	-1.66	798.28	
			+12.43		810.71
		TP	-0.84	809.87	
			+12.01		821.88
		TP	-0.97	820.91	
			+12.84		833.75
		TP	-0.92	832.83	
H.I 5°			+12.03		844.86
		TP	-1.24	843.62	
	Mag. 5 11°50 W		+12.76		856.38
	Dist Thru Tunnel	TP	-2.37	854.01	
			+11.66		865.67
	Grade on Tunnel	TP	-1.50	864.17	
			+10.03		874.20
Radial 9°		TP	-0.48	873.72	
			+12.20		885.92
		TP	-0.23	885.69	
			+11.94		897.63
H.I 5°		TP	-0.08	897.55	
			+11.86		909.41
		TP	-0.0	909.41	
			+11.93		921.34
		TP	-0.00	921.34	
			+12.63		933.97

Inst on 591+63.1 Elev 895.3

Sta	Ob. Dist	V.A.	Hor. Dist	Diff Elev	Elev.
596+66.2	5.08	-6°18'	503.1	-55.5	839.8
603+34.8	11.76	-3°58	1171.7	-81.2	814.1
607+52.6	15.90	-1°02'	1590.6	-28.6	866.7

Inst on 607+52.6 Elev 866.7

614+28.3	6.84	-6°46'	675.7	-80.2	786.5
615+89.7	8.40	-3°20	837.1	-48.7	818.0

Inst on 615+89.7 Elev 818.0

618+91.4	3.08	-8°58	301.7	-47.5	770.5
621+85.2	6.00	-5°37	595.5	-58.5	759.5
623+98.7	8.08	-0°43	809.0	-10.0	808.2

Inst on 623+98.7 Elev 808.2

627+00.8	3.20	-13°36	302.1	-73.12	735.68

Sta	+	T	−	Elev	Gr. Rod
		748.65			
628+00				set to Gr.	11.87
630+00					12.07
TP 631	+10.29	746.77	-12.17	736.48	
632+25					10.41
633+50					10.52

		Rod	Elev	↑
H.I. 5.0	TP	-0.0	933.97	933.97
		+12.31		946.28
	TP	-0.0	946.28	
		+12.86		959.14
	TP	-0.0	959.14	
		+11.94		971.08
	TP	-0.0	971.08	
H.I. 5.0		+13.06		984.14
	TP	-0.0	984.14	
		+13.00		997.14
	TP	-0.0	997.14	
		+12.1		1009.25
	TP	-3.66	1005.59	
		+4.91		1010.50
	TP	-11.96	998.54	
		+0.70		999.24
	TP	-12.78	986.46	
		+1.00		987.46
1/26-24. Party same	TP	-12.85	974.61	
		+0.68		975.29
Grade 736.89 (Swing East 374.40)				
*Grade at adjusted S. Portal of Tunnel which is 374.4 East on Meins. Location	TP	-12.82	962.47	
		+0.21		962.68
Grade	TP	-12.53	950.15	
		+(-0.10)		950.05
736.78	TP	-12.92	937.13	
		+0.86		937.99
736.58	TP	-13.00	924.99	
736.48		+2.27		927.26
736.36	TP	-12.50	914.76	
736.23		+0.12		914.88
	TP	-13.00	901.88	
		+4.45		906.33

Sta	+	HI	−	Elev	Gr. Rod	Grade
634+50		746.77		Set to Gr.	10.64	736.13
636+50					10.84	735.93
TP 637	+11.14	747.02	−10.89	735.88		735.88
638					11.24	735.78
640					11.44	735.58
642					11.64	735.38
643					11.74	735.28
644+50					11.89	735.13
646+50					12.09	734.93
648+50					12.29	734.73
650+50					12.49	734.53
652+50					12.69	734.33
TP 654	+7.84	742.02	−12.84	734.18		734.18
656					−8.04	733.98
657					8.14	733.88

Siphon #6.

Sta 657+00 to 674+20

inst. on △ 657+00 Elev 733.88

Sta.	Ob. Dist	V.A	Hor Dist	Diff Elev	Elev.
659+98.7	3.0	−3°53	298.7	−20.34	713.54

Inst on △ 659+98.7 Elev 713.54

Sta.	Ob. Dist	V.A	Hor Dist	Diff Elev	Elev.
663+25 2	3.5	−15°24	326.5	−89.9	623.64
674+07 7	14.08	+0°10	1409.0	+4.12	717.66

1/27-24

Party same

clear

"Y" Levels over Tunnel #2 Continued (40)

	Rod	Elev	HI
			906.33
TP	−12.68	893.65	
	+7.08		900.73
TP	−12.11	888.67	
	+1.02		889.64
TP	−12.80	876.84	
	+0.69		877.53
TP	−12.63	864.90	
	+5.54		870.44
TP	−1.44	869.00	
	+12.05		881.05
TP	−4.89	876.16	
	+2.36		878.52
TP	−10.42	868.10	
	+1.76		869.86
TP	−12.76	857.10	
	+0.46		857.56
TP	−12.72	844.84	
	+1.24		846.08
TP	−12.27	833.81	
	+0.0		833.81
TP	−12.0	821.81	
	+1.66		823.47
TP	−12.83	810.64	
	+4.69		815.33
TP	−12.78	802.55	
	+0.29		802.84
TP	−12.88	789.96	
	+0.47		790.43
TP	−13.06	777.37	
	+0.03		777.40

H.I. 5.0

Stadia Dist across Siphon 1720'

1.5' per 1000'

H.I. 5.0

Inst on 659+98[7] Elev 713.54 (Con)

Sta	ob. Dist	V.A.	Hor Dist	Diff Elev	Elev
664+92[7]	5.12	-11°10	494[0]	-97.4	616.14
672+52[1]	12.54	-2°04	1253.4	-45.2	668.34
666+08	6.32	-11°16	609.3	-121.3	592.34
671+51[7]	11.56	-3°14	1153.0	-65.3	648.14
667+78	8.06	-10°40	779.4	-146.8	566.74
668+82[3]	9.00	-8°06	883.6	-125.6	587.94
668+13	8.42	-10°44	814.3	-153.3	560.24

H.I. 5°

Gr Bed

Sta	+	742.02	-	Elev.	Gr. Rod	Grade
674+20	+9.22	743.10	-8.14	733.88		731.30 C. 2
675				set to Gr	11.88	731.22
676+25				" " "	12.00	731.10
677+75				" " "	12.15	730.95
679+25				" " "	12.30	730.80
680				" " "	12.37	730.73
682				" " "	12.57	730.53
TP +50	+10.43	740.91	-12.62	730.48		
683				set to Gr	10.48	730.43
685				" " "	10.68	730.23
687				" " "	10.88	730.03
689				" " "	11.08	729.83
690				" " "	11.18	729.73

"Y" Levels over Tunnel #2

	Rod	Elev	777.40
TP	-12.45	764.95	
	+0.22		765.17
TP	-12.74	752.43	
	+0.53		752.96
TP	-12.94	740.02	
	+0.62		740.64
TP	-2.96	737.68	
	+10.97		748.65
	-11.76	736.89	

→ Grade @ adjusted S. Portal sta 626+92[0]

1/30-24

Party same

Clear.

Possible Tunnel Portal to be run later.

Sta	+	π	−	Elev.	Gr. Rod
		740.91		Set to Gr	
691				" "	11.28
TP 692	+12.70	742.23	-11.38	729.53	
+50				Set to Gr	12.75
693				" " "	12.80
695	+10.70	739.93	-13.00	729.23	
696+75				Set to Gr	10.87
698+75					11.07
700+75					11.27
702+75					11.47
704+40					11.64
TP 705	+10.15	738.38	-11.70	728.23	
707					10.35
709					10.55
711					10.75
712					10.85
713					10.95
714+10					11.06
715					11.15
717					11.35
718+25					11.47
720+00					11.65
TP 721+00	+11.02	737.65	-11.75	726.63	
722+15			-11.23	726.42	

Grade	
729.63	
729.48	
729.43	
729.23	
729.06	
728.86	
728.66	
728.46	
728.29	
728.23	
728.03	
727.83	Possible Tunnel outlet to be run later.
727.63	
727.53	
727.43	
727.32	
727.23	
727.03	
726.91	
726.73	
726.63	
726.51	Fill 0+

Siphon #7 sta 722+15 to 727+67

Inst on ▵ 722+15 Elev 726.42

Sta	ob. Dist	V.A.	Hor. D.	Diff Elev	Elev
722+53.3	0.44	-21°29	38.3	-15.02	711.51
	Inst on ▵ 722+53.3 Elev 711.51				
723+86	1.65	-26°41	132.8	-66.5	645.0
725+13.2	3.06	-22°45	259.9	-109.7	601.8
725+89.4	3.52	-12°49	336.1	-76.3	635.2
727+25.3	4.71	-0°0	471	00	645.2

Sta	+	↑	−	Elev	Gr Rod
		735.51			
727+67			5.20	730.31	
729				set to Gr.	9.96
730				" " "	10.06
732				" " "	10.26
TP 732+75	+11.55	736.86	-10.70	725.31	
733+75					11.78
734+75					11.88
736+50					12.06
TP 738	+10.14	734.79	-12.71	724.65	
+50					10.19
740					10.34

Grade	
725.68	cut 4.6
725.51	
725.45	
725.26	
725.10	
725.08	
724.98	
724.80	
724.65	
724.60	
724.45	

Sta	+	734.79	—	Elev	Gr. Rod
742			-11.60	723.19	
744				Set to Gr	10.74
745				" " "	10.84
PI +50	+8.25'	732.15'	-10.89	723.90	
747				Set to Gr	8.40
+75'				" " "	8.48
749+25'				" " "	8.63
PI 750	+11.17	734.60	-8.72	723.43	
751+75'				Set to Gr	11.32
753+25'				" " "	11.47
755+25'				" " "	11.67
PI 756	+7.95'	730.81	-11.74	722.86	
757+25'				Set to Gr	8.08
PI 758+25'	+3.91	733.52	-1.20	729.61	8.18
760				Set to Gr.	11.07
762				" " "	11.27
764				" " "	11.47
765+50				" " "	11.62
PI 767	+10.57	732.32	-11.77	721.75'	
769					10.77
+50					10.82

Grade

724.25' Fill 1½ on Rock

724.05'
723.95'
723.90
723.75'
723.67
723.52
723.45'
723.28
721.13
722.93
722.86
722.73
720.63
722.45'
722.25'
722.05'
721.90
721.75'
721.55'
721.51

Siphon #8

Sta 769+50 to 780+00

Inst on △ 769+50 Elev 721.5

Sta	Ob. Dist	V.A	Horiz	Diff Elev	Elev
771+47.7	200' Sl. chained	-8°45			691.48
771+97.7	50 Hor. chained			-1.7	689.4

Inst on 771+97.7 Elev 689.4

Sta	Ob. Dist	V.A.	Horiz	Diff Elev	Elev
774+52.4	2.82	-18°35	254.7	-85.5	603.9
775+26.8	3.60	-17°28	329.1	-103.3	586.1
776+99.9	5.08	-6°47	502.2	-37.6	629.8
778+58.7	6.60	-0°41	661.0	-7.9	681.5
778+75.6	6.78	+2°21	677.7	+27.8	717.2

Sta	+	732.32	−	Elev.	Gr. Rod
TP 780	+6.70	728.04	10.98	721.34	

Siphon #9

Sta 780+00 to 787+63

Inst on △ 780+00 Elev 721.34

Sta	Ob. Dist	V.A.	Hor. Dist	Diff Elev	Elev
781+38.5	1.41	-7°41	138.5	-18.8	702.5
783+33.5	3.35	-5°07	333.5	-29.8	691.5
785+72.3	5.72	-2°00	572.3	-20.0	701.3
786+84.9	6.84	-0°44	684.9	8.8	712.5

H.I. 4.7

Stadia Dist across Siphon 1050'

1.5 per 1000'

H.I. 5.3

toe of Sl.

Bot Cr.

Grade

719.97 Cut 1.4

+1.5°

Sta	+	H.I. 728.04	−	Elev	Gr. Rod
TP 787+63	+8.96	728.88	-8.12	719.92	
789+63				Set to Gr	+10.30
791+63				" " "	-10.50
793				" " "	-10.64
795				" " "	-10.84
797				" " "	-11.04
799				" " "	-11.24
801				" " "	-11.44
TP 803	+10.60	727.84	-11.64	717.24	
805				Set to Gr	-10.80
807				" " "	-11.00
809				" " "	-11.20
TP 811	+10.18	726.62	-11.40	716.44	
813				Set to Gr	-10.38
815				" " "	-10.58
TP 817	+11.55	727.39	-10.78	715.84	
819			-9.76	717.63	
820+50			-8.34	719.05	
822+50			-5.05	722.34	
TP	+12.10	739.10	-0.39	727.00	
824+70			-11.88	727.22	
825			-7.69	731.41	

Profile over Tunnel #3

Grade

718.78 Cut 1' End of Siphon #3
718.58
718.38
718.24
718.04
717.84
717.64
717.44
717.24
717.04
716.84
716.64
716.44
716.24
716.04
715.84
715.64 C 2 0
715.49 C 3 5
715.29 C 7 0
30' N of 823+50
715.07 C 12 1/2 Portal of Tunnel #3
715.06

Jan 31-24
Party same
clear

Profile over Tunnel #3 Con.

Sta	+	739.10	−	Elev	Gr. Rod
TP 826+50	12.64	751.45	-0.29	738.81	
827			-11.45	740.00	
829			-3.74	747.71	
TP	+10.26	761.23	-0.48	750.97	
831			-9.10	752.13	
833			-3.65	757.58	
TP	+12.17	773.07	-0.33	760.90	
835			-9.80	763.27	
836			-10.90	762.17	
837			-8.60	764.47	
TP 839	+11.05	784.10	-0.02	773.05	
841			-9.1	775.00	
843			-6.7	777.4	
845			-4.5	779.6	
847			-2.9	781.2	
TP 849	+13.11	795.99	-1.22	782.88	
851			-10.10	785.89	
853			-5.80	790.19	
855			-1.80	794.19	
+50	+11.68	807.53	-0.14	795.85	
857			-8.40	799.13	
859			-4.80	802.73	
+60			-3.60	803.93	

Grade

Levels from Sta 859+60 to Adjusted South Portal of Tunnel # 3

		Rod	H.I.	Elev
30' L of P Sta 830+25			807.53	
	TP	-13.01		794.52
		+0.84	795.36	
	TP	-12.89		782.47
834+15		+0.56	783.03	
	TP	-13.00		770.03
		+0.28	770.31	
	TP	-13.00		757.31
		+0.24	757.55	
	TP	-12.96		744.59
		+0.30	744.89	
	TP	-12.90		731.99
		+0.47	732.46	
	TP	-13.00		719.46
		+2.87	722.33	

Tunnel # 3 Line Change

Inst at sta	859+60	Orig Line Elev			803.93
Sta	Dist	V.A.	Hor. Dist	Diff Elev	Elev.
859+68	1.74	Defl left	90°	−1°	802.93
	Inst on Δ 859+68 Elev				802.93
864+61.5	4.92	+1°58	491.4	+16.91	819.84
	Inst on Δ 864+61.5 Elev				819.84
870+60	6.06	−5°34	601.4	−58.48	761.4
871+24.2	6.70	−6°02	663.7	−70.1	749.74
873+53.2	9.00	−5°36	892.7	−87.5	732.34
876+79.5	12.24	−4°04	1219.0	−86.7	733.14
878+70.4	14.25	−3°47	1419.9	−93.9	725.94
	Inst on Δ 878+70.4 Elev 725.94				
879+78	.98	−9°25	96.4	−15.82	709.94
Sta	+	T	−	Elev	Gr. Rod
879+78		722.33		Set to Gr	−10.01
881+78				" " "	−10.21
R883	+7.04	719.02	−10.35	712.00	
885			−6.80	712.22	
887				Set to Gr.	7.42
889					7.62

31-24
Party Same
Clear

H.I. 5°

note Defl. 87°09' R.

H.I. 5°

High Point

H.I. 5°

Bed of Draw

" "

712.32
Grade
712.32
712.12
712.00
711.80 Co.4
711.60
711.40

Sta	+	π	−	Elev	Gr. Rod
891		719.02			7.82
TP893	9.99	720.99	-8.02	711.00	
895				Set to Gr.	10.19
897				" " "	10.39
898				" " "	10.49
899				" " "	10.59
TP900	+10.40	720.70	-10.69	710.30	
902				Set to Gr.	10.60
904				" " "	10.80
906				" " "	11.00
908			-11.75	708.95	
910	+10.36	719.66	-11.40	709.30	
912	+			Set to Gr	10.56
+50			-7.20	712.46	
914				Set to Gr	10.76
915				" " "	10.86
916+50				" " "	11.01
918+50				" " "	11.21
919+50				" " "	11.31
TP921	+11.82	720.02	-11.46	708.20	
922					11.92
923					12.02
924					12.12

Grade

711.20
711.00
710.80
710.60
710.50
710.40

710.10
709.90
709.70 Beginning of Peach Orchard
709.50 Fill 0.6
709.30
709.10
709.05 Cut 3 ±
708.90
708.80
708.65
708.45
708.35
708.20
708.10
708.00
707.90

2/1-24
Party same
∴ Clear

Sta	+	720.02	−	Elev	Gr. Rod	Grade
926				Set to Gr	12.32	707.70
927				" " "	12.42	707.60
928+50				" " "	12.57	707.45
930				" " "	12.72	707.30
931+50				" " "	12.87	707.15
TP 933	+11.00	718.00	-13.02	707.0		707.00
934				Set to Gr	11.10	706.90
935				" " "	11.20	706.80
936				" " "	11.30	706.70
937+20				" " "	11.42	706.58
938+50				" " "	11.55	706.45
TP 940	+11.14	717.44	-11.70	706.30		706.30
941+20				Set to Gr	11.26	706.18
942+50				" " "	11.39	706.05
943+50				" " "	11.49	705.95
945				" " "	11.64	705.80
TP 946	+7.93	713.60	-11.77	705.67		705.70
947+50				Set to Gr	8.05	705.58
948+50				" " "	8.15	705.48
950				" " "	8.30	705.30
TP 951	+10.77	715.97	-8.40	705.20		705.20
953				Set to Gr	10.97	705.00
954+60					11.13	704.84

Sta	+	715.97	−	Elev	Gr. Rod
956			10.40	705.57	
957				Set to Gr	11.37
959				" " "	11.57
960+50				" " "	11.72
TP961	+6.13	712.76	-9.34	706.63	
962+50				Set to Gr.	8.71

Siphon #10

Sta 962+50 to 971+80

Inst on △ 962+50 Elev 704.05

Sta	Obs. Dist	V.A.	Hor. Dist	Diff Elev	Elev
963+66[3]	1.21	-12°35	116.3	-25.9	678.15
966+43[4]	4.03	-9°28	393.4	-65.5	638.5
968+32[5]	5.95	-8°46	580	-89.8	614.25
970+12[6]	7.70	-6°00	760	-80	623.95
971+20	8.70	-2°02	868	-31	673.05

Sta	+	712.76	−	Elev	Gr Rod
TP971+80	+7.73	711.78	-8.71	704.05	
TP973+50	+10.86	713.34	-9.30	702.48	
974+30				set to Grade	10.90
TP975+50	+10.57	712.85	-11.06	702.28	
976+50				set to Grade	10.67
977+60					10.78

Grade

704.70 Co 2

704.6

704.4

704.25

704.20 Cut 2

704.05

7/2-24 Party same clear.

Stadia Dist across Siphon 930'

1.5 per 1000'

H.I. 5.2

Grade

702.6 C 1 End of Siphon #10

702.48

702.40

702.28

702.18

702.07 Back in Rock 40'± of line

Sta	+	π	−	Elev	Gr. Rod
		712.85			
TP 978+50	+10.60	712.58	-10.87	701.98	
980+50				set to Gr	-10.80
982				" " "	-10.95
TP +50	+11.25	712.83	-11.00	701.58	
984+50				Set to Gr	11.45
986				" " "	11.60
π +50	+11.31	712.49	-11.65	701.18	

Tunnel # 4

Sta	Ob. Dist	V.A.	Hor. Dist	Diff Elev	Elev.
	986+50 to 1003+43				
	Inst on 986+50 Elev. 701.18				
986+83.4	0.39.5	+2°49'45"	33.4	+15.42	716.60
	Inst on 986+83.4 Elev 716.60				
989+81.8	3.08	+9°20	298.4	+49.22	765.82
	Inst on 989+81.8 Elev 765.82				
991+43.6	1.62	+4°22	161.8	+12.35	778.17
	Inst on 991+43.6 Elev 778.17				
994+53.4	3.08	-10°32	309.8	-8.32	769.8

"Y" Levels over Tunnel # 4

Grade		Rod	π	Elev
	TP 986+50	+11.31	712.49	701.18
	TP 986+70	- 1.14		711.35
		+12.07	723.42	
701.98				
	TP	- 0.46		722.96
		+12.23	735.19	
701.78				
	TP	- 0.34		734.85
		+12.36	747.21	
701.63				
	TP	- 0.08		747.13
		+12.30	759.43	
701.58				
	TP	- 0.69		758.74
		+12.71	771.45	
701.38				
	TP	- 0.94		770.51
		+8.54	779.05	
701.23				
701.18				

Dist thru Tunnel 1693'

0.6' per 1000' TP 850 - 10.77 768.28

H.I. 5°

	+ 0.46	768.74	
TP	- 13.02		755.72
	+ 1.06	756.78	
TP	- 12.99		743.79
	+ 0.47	744.26	
TP	- 12.63		731.63
	+ 0.07	731.70	
TP	- 13.03		716.67
	+ 0.48	717.15	
TP	- 12.51		706.64
	+ 4.32	710.96	

Elev Y' Levels 716.67

H.I. 5°

Elev Y' Levels 765.30

H.I. 5°

"Y" Levels 769.35

Inst on △ 994+53.4 Elev 769.8

Sta	Ob. Dist	V.∠.	Hor. Dist	Diff Elev	Elev.
996+97½	2.43	−2°06	243.9	−8.78	761.0

H.I. 5⁰
"Y" Levels 760.64

Inst on △ 996+97½ Elev 761⁰

1001+45.9	4.50	−3°48	448.8	−29.7	731.30

H.I. 5⁰
"Y" Levels 731.50

Inst on △ 1001+45.9 Elev 731.30

1003+43	2.00	−8°02	197.1	−27.8	703.5

H.I. 5⁰
"Y" Levels 703.96
Grade 700.33 Cut 3⁶

Sta	+	HI 710.96	−	Elev.	Gr Rod	Grade
1005				Set to Gr	10.79	700.17
1007				" " "	10.99	699.97
1008+75				" " "	11.16	699.80
TP 1010	+11.77	711.43	−11.30	699.66	"	699.67
1011				Set to Gr	11.86	699.57
TP 1013	+11.57	710.94	−12.06	699.37		
1014				Set to Gr	11.67	699.27
1015				" " "	11.77	699.17
TP 1016	+12.27	711.34	−11.87	699.07	11.87	699.07
1017+35			14.3	697.0		698.93
1017+40			−"	Set to Gr	12.41	698.93

F. 1 9

Thru Cut sta 1017+40 to 1024+00

TP			−0.04	Set to Gr	711.30
	+11.96	723.26			

2/4 – 24
Williams
Van Horn
Brackett
Thompson
Stout
Mansfield
Windy in P.M.

Sta	+	723.76	−	Elev.	Gr Rod
1018+35			-7.42	715.84	7.42
TP	+12.29	735.53	-10.02	723.24	
1019+35			-10.90	724.63	11.02
1020+35			-1.75	733.78	
1021+35			-6.75	728.78	
TP	+0.47	723.01	-12.99	722.54	
1022+35			-3.25	719.76	
1023+35			-11.10	711.91	
1023+85	End of Thru cut in small				
TP	+1.04	711.04	-13.01	710.00	
1024			-8.57	702.47	
TP	+4.66	702.70	-13.00	698.04	
1026					4.63
1029					4.93
TP1031	+8.55	706.12	-5.13	697.57	
1033				Set to Gr	8.75
1034+50			-8.25	697.87	"
1035+75				Set to Gr	9.03
1037				" " "	9.15
1038+75				" " "	9.32
TP1040	+11.33	708.00	-9.45	696.67	
1041					11.43
1042					11.53
TP	+5.29	701.70	-11.59	696.41	

Grade		
698.53	cut	17 0
698.73	cut	25 9
698.63	"	35 1
698.53	"	30. 3
698.43	"	21.3
698.33	"	13.58
Canyon		
698.27	"	4.20
698.07		
697.77		
697.57		
697.37		
697.27	cut 0 6	
697.07		
696.97		
696.79		
696.67		
696.57		
696.47		

7/4-24
Party same
Clear

Sta	+	701.70	−	Elev	Gr. Rod	Grade
1044+25					5.45	696.25
1046					5.63	696.07
1048					5.83	695.87
1050					6.03	695.67
+75					6.10	695.60
TP 1052	+11.35	706.77	−6.28	695.42		695.42
1054					−11.50	695.27
1055+50					−11.65	695.12
TP	+11.55	705.31	−13.01	693.76		
1056+20					−10.26	695.05
1057					−10.34	694.97
TP 1058+40	+10.13	705.04	−10.40	694.91		694.83
+90					10.26	694.78

Siphon # 11

Sta 1058+90 to 1094+68.7

Inston △ 1058+90 Elev 694.78

Stadia Dist across Siphon 3578.7

Δ 1.5° Grade on Siphon 1.5' per 100'

Sta	Ob. Dist	V.A.	Hor. Dist	Diff. Elev	Elev
1060+04.5	1.28	−19°45	114.5	40.7	654.1
1061+54.8	2.90	−17°35	264.8	83.8	611.0
1062+80.3	4.22	−16°10	390.3	113.1	581.7
1067+98.7	9.28	−8°32	908.7	136.3	558.5
1074+36.5	15.60	−5°37	1546.5	152.0	542.8

Inst on 1058+90 (Con.) Elev 694.78

Sta	Ob. Dist	V.A.	Hor Dist	Diff Elev	Elev
1076+58.4	17.80	-4°56	1768.4	152.6	542.2
1080+44	21.60	-3°13	2154.0	121.1	573.7
1084+99.2	26.10	-1°30	2609.2	-68.4	626.4

Inst on 1084+99.2 Elev 626.4

1086+91.5	1.92	+3°38	192.3	+12.20	638.6

Inst on 1084+99.2 Elev 638.6

1088+42.3	1.50	-2°22	150.8	-6.2	632.4
1090+19.6	3.20	-3°04	328.1	-17.52	621.1
1093+17.1	6.25	+0°55	626.0	+10.0	648.6
1094+69	7.80	+3°58	777.5	+54.0	692.6

Sta	+	698.63	−	Elev	Gr. Rod
1094+68.7			-6.8	691.83	
1095+50				set to Gr.	-9.30
TP 1096+50	+8.37	697.60	-9.40	689.23	
1098				set to Gr	-8.52
TP 1099+50	+9.78	698.74	-8.64	688.96	
1101+50				set to Gr	-10.01
1103				" " "	10.16
+50				" " "	10.21
1104+50	+8.88	697.29	-10.33	688.41	

"Y" Levels across Siphon

Sta	Rod		Elev.
TP 1058+40	- 10.40		694.91
	+ 10.13	705.04	
TP	- 10.26		694.78
	+ 5.85	700.63	
TP	- 5.85		694.78
	+ 3.85	698.63	

H.I. 5.9

Grade	
689.41	C 2± End of Siphon ±11
689.33	
689.23	
689.08	
688.93	
688.73	
688.58	
688.53	
688.43	

Sta	+	697.29	−	Elev	Gr. Rod
1105+30			−2.60	694.69	
TP	+11.81	708.62	−0.48	696.81	
+80			−11.23	697.39	
1106+10			−6.9	701.72	

Tunnel #5

Sta 1106+10 to 1200+65.7

Inst on 1105+80 Elev 697.39

Sta	Ob. Dist	V.A.	Hor Dist	Diff Elev	Elev
1107+50.6	2.09	+22°48	178.6	+75.03	772.42
	Inst on Δ 1107+50.6 Elev 772.42				
1108+20.1	0.67	+17°28	61.5	+19.34	791.77
	Inst on 1108+20.1 Elev 791.77				
1109+90.8	1.80	+13.50	170.70	+42.02	833.79
	Inst on 1109+90.8 Elev 833.79				
1111+23.8	1.34	+6°59	133.0	+16.20	849.99
	Inst 1111+23.8 Elev 849.99				
1112+11.8	0.87	+1°18	87.96	+2.0	851.99
	Inst 1112+11.8 Elev 851.99				
1113+73.6	1.65	−9°42	161.3	−27.5	824.49

"Y" Levels over Tunnel # 5

Grade			Rod	HI	Elev
188.35	C 6.4			708.62	
		TP	−0.01		708.61
			+12.04	720.65	
188.27	C 9.1	TP	−0.19		720.46
188.24	C 13.5		Tunnel Portal		
			+12.95	733.41	
		TP	−0.0		733.41
			+12.43	745.84	
H.I. 5°			−0.52		745.32
			+12.96	758.28	
		TP	−0.0		758.28
H.I. 5°			+12.29	770.57	
		TP	−0.0		770.57
			+11.86	782.43	
		TP	−0.0		782.43
H.I. 5°			+12.87	795.30	
		TP	0.0		795.30
			+12.62	807.92	
		TP	−0.03		807.89
H.I. 5°			+10.89	818.78	
	Sta 8		−3.10		815.68
		TP	−0.0		818.78
			+12.38	831.16	
H.I. 5°		TP	−0.0		831.16
			+12.25	843.41	
		TP	−0.0		843.41
H.I. 5°			+13.10	856.51	
		TP	−0.0		856.51
			+13.02	869.53	

Mag S 59°30' E
− 12°07 = S 47°23 E True

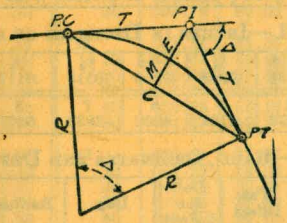
Dist thru Tunnel 9445.7

0.5' per 1000'

1200+65.7 Δ S 71°33 E
swing 4° Rt
S 67°00 E True

Stone is 165° N 40°30 E of 1200+65.7

DIETZGEN'S RAILROAD CURVE AND REDUCTION TABLES



CURVE FORMULAS

Radius=R=$\frac{50}{\text{sin. } D/2}$ (1) Degree of Curve=D and sin. $\frac{D}{2}=\frac{50}{R}$ (2)

Tangent=T=Rtan$\frac{\Delta}{2}$ (3) Length of Curve=L=100$\frac{\Delta}{D}$ (4)

Middle ordinate=M= R(1—cos. $\frac{\Delta}{2}$) (5) =Rvers $\frac{\Delta}{2}$ (6)

External=E=Ttan$\frac{\Delta}{4}$ (7) =R÷cos.$\frac{\Delta}{2}$—R (8)=Rexsec$\frac{\Delta}{2}$ (9)

Long Chord=C=2 R sin.$\frac{\Delta}{2}$ (10) Δ=Central Angle

EXPLANATION AND USE OF TABLES

Stations.—Given P. I.=Sta. 161 +60.35 to find Sta. of P. C. and P. T. Δ=62° 10′ D=8° 20′. From Table IV for 1° curve T=3454.1 and ÷8⅓=414.49 ft. From Table V correction=.36 or T=414.85 ft. P. C.=Sta. P.I.—T=157 +45.50. Also from (4) L=746.00 and P. T.=Sta. P. C. +L=164 +91.50.

Offsets.—Tangent offsets vary (approximately) directly with D and with square of the distance. Thus tangent offset for Sta. 158 on above curve is 2.16 ft. found as follows. From Table III tangent offset for 100 ft.=7.27 ft. Distance=158—Sta. P. C.=54.50, hence offset=7.27 (54.50÷100)²=2.16 ft. Also square of any distance divided by twice the radius equals (approximately) the distance from tangent to curve. Thus (54.50)²÷(2 x 688.26)=2.16 ft.

Deflections.—Deflection angle=½ D for 100 ft., ¼ D for 50 ft., etc. For c ft.=(in minutes) .3 x C x D° or=defl. for 1 ft. from Table III x C. For Sta. 158 of above curve=.3 x 54.5 x 8⅓=136.2′ or 2° 16.2′, or=2.50 x 54.5=136.2′ from Table III. For Sta. 159 deflection angle=2° 16.2′ +8° 20′÷2=6° 26.2′, etc.

Externals.—May be found in similar manner to tangents. Thus E for curve above is 91.37. For from Table IV for 1° curve E=960.6 for 8° 20′=960.6÷8⅓=91.27 and from Table V correction=.10 or E=91.37 ft. Or suppose Δ=32° and E is measured and found to be 42 ft. What is D? From Table IV E=230.9 and÷42=5.5 or D=5° 30′.

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

Roadway 16 feet wide. Side Slopes 1 on 1½.

For Single Track Embankment.

H	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	H
0	8.0	8.2	8.3	8.5	8.6	8.8	8.9	9.1	9.2	9.4	0
1	9.5	9.7	9.8	10.0	10.1	10.3	10.4	10.6	10.7	10.9	1
2	11.0	11.2	11.3	11.5	11.6	11.8	11.9	12.1	12.2	12.4	2
3	12.5	12.7	12.8	13.0	13.1	13.3	13.4	13.6	13.7	13.9	3
4	14.0	14.2	14.3	14.5	14.6	14.8	14.9	15.1	15.2	15.4	4
5	15.5	15.7	15.8	16.0	16.1	16.3	16.4	16.6	16.7	16.9	5
6	17.0	17.2	17.3	17.5	17.6	17.8	17.9	18.1	18.2	18.4	6
7	18.5	18.7	18.8	19.0	19.1	19.3	19.4	19.6	19.7	19.9	7
8	20.0	20.2	20.3	20.5	20.6	20.8	20.9	21.1	21.2	21.4	8
9	21.5	21.7	21.8	22.0	22.1	22.3	22.4	22.6	22.7	22.9	9
10	23.0	23.2	23.3	23.5	23.6	23.8	23.9	24.1	24.2	24.4	10
11	24.5	24.7	24.8	25.0	25.1	25.3	25.4	25.6	25.7	25.9	11
12	26.0	25.2	26.3	26.5	26.6	26.8	26.9	27.1	27.2	27.4	12
13	27.5	27.7	27.8	28.0	28.1	28.3	28.4	28.6	28.7	28.9	13
14	29.0	29.2	29.3	29.5	29.6	29.8	29.9	30.1	30.2	30.4	14
15	30.5	30.7	30.8	31.0	31.1	31.3	31.4	31.6	31.7	31.9	15
16	32.0	32.2	32.3	32.5	32.6	32.8	32.9	33.1	33.2	33.4	16
17	33.5	33.7	33.8	34.0	34.1	34.3	34.4	34.6	34.7	34.9	17
18	35.0	35.2	35.3	35.5	35.6	35.8	35.9	36.1	36.2	36.4	18
19	36.5	36.7	36.8	37.0	37.1	37.3	37.4	37.6	37.7	37.9	19
20	38.0	38.2	38.3	38.5	38.6	38.8	38.9	39.1	39.2	39.4	20
21	39.5	39.7	39.8	40.0	40.1	40.3	40.4	40.6	40.7	40.9	21
22	41.0	41.2	41.3	41.5	41.6	41.8	41.9	42.1	42.2	42.4	22
23	42.5	42.7	42.8	43.0	43.1	43.3	43.4	43.6	43.7	43.9	23
24	44.0	44.2	44.3	44.5	44.6	44.8	44.9	45.1	45.2	45.4	24
25	45.5	45.7	45.8	46.0	46.1	46.3	46.4	46.6	46.7	46.9	25
26	47.0	47.2	47.3	47.5	47.6	47.8	47.9	48.1	48.2	48.4	26
27	48.5	48.7	48.8	49.0	49.1	49.3	49.4	49.6	49.7	49.9	27
28	50.0	50.2	50.3	50.5	50.6	50.8	50.9	51.1	51.2	51.4	28
29	51.5	51.7	51.8	52.0	52.1	52.3	52.4	52.6	52.7	52.9	29
30	53.0	53.2	53.3	53.5	53.6	53.8	53.9	54.1	54.2	54.4	30
31	54.5	54.7	54.8	55.0	55.1	55.3	55.4	55.6	55.7	55.9	31
32	56.0	56.2	56.3	56.5	56.6	56.8	56.9	57.1	57.2	57.4	32
33	57.5	57.7	57.8	58.0	58.1	58.3	58.4	58.6	58.7	58.9	33
34	59.0	59.2	59.3	59.5	59.6	59.8	59.9	60.1	60.2	60.4	34
35	60.5	60.7	60.8	61.0	61.1	61.3	61.4	61.6	61.7	61.9	35
36	62.0	62.2	62.3	62.5	62.6	62.8	62.9	63.1	63.2	63.4	36
37	63.5	63.7	63.8	64.0	64.1	64.3	64.4	64.6	64.7	64.9	37
38	65.0	65.2	65.3	65.5	65.6	65.8	65.9	66.1	66.2	66.4	38
39	66.5	66.7	66.8	67.0	67.1	67.3	67.4	67.6	67.7	67.9	39
40	68.0	68.2	68.3	68.5	68.6	68.8	68.9	69.1	69.2	69.4	40

Example—If point is 22.6 ft. above grade, how far should it be from center line to be a slope stake point? Ans. from Table 41.9. For same slopes but other widths of roadbed correct above figures by one-half difference in width of roadbed; thus in example above for 20 ft. roadbed distance will be 41.9+(20—16)÷2 or 2 ft. added to 41.9 =43.9. For slopes of 1 on 1 see inside of front cover.

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