BOOK No. 4

GRADE

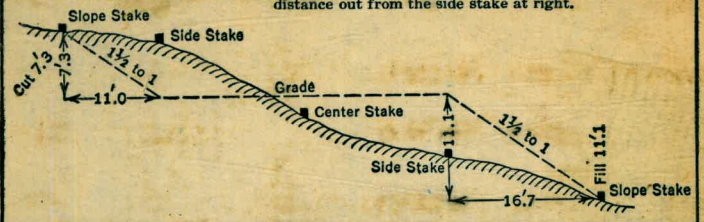
W 838-A

E. C. I.

DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

Roadway of any Width. Side Slopes 1½ to 1.

In the figure below: opposite 7 under "Cut or Fill" and under .3 read 11.0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under .1 read 16.7, the distance out from the side stake at right.



Cut or Fill	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	Cut or Fill
	Distance out from Side or Shoulder Stake										
0	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	0
1	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	1
2	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	2
3	4.5	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7	5.9	3
4	6.0	6.2	6.3	6.5	6.6	6.8	6.9	7.1	7.2	7.4	4
5	7.5	7.7	7.8	8.0	8.1	8.3	8.4	8.6	8.7	8.9	5
6	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4	6
7	10.5	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	7
8	12.0	12.2	12.3	12.5	12.6	12.8	12.9	13.1	13.2	13.4	8
9	13.5	13.7	13.8	14.0	14.1	14.3	14.4	14.6	14.7	14.9	9
10	15.0	15.2	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	10
11	16.5	16.7	16.8	17.0	17.1	17.3	17.4	17.6	17.7	17.9	11
12	18.0	18.2	18.3	18.5	18.6	18.8	18.9	19.1	19.2	19.4	12
13	19.5	19.7	19.8	20.0	20.1	20.3	20.4	20.6	20.7	20.9	13
14	21.0	21.2	21.3	21.5	21.6	21.8	21.9	22.1	22.2	22.4	14
15	22.5	22.7	22.8	23.0	23.1	23.3	23.4	23.6	23.7	23.9	15
16	24.0	24.2	24.3	24.5	24.6	24.8	24.9	25.1	25.2	25.4	16
17	25.5	25.7	25.8	26.0	26.1	26.3	26.4	26.6	26.7	26.9	17
18	27.0	27.2	27.3	27.5	27.6	27.8	27.9	28.1	28.2	28.4	18
19	28.5	28.7	28.8	29.0	29.1	29.3	29.4	29.6	29.7	29.9	19
20	30.0	30.2	30.3	30.5	30.6	30.8	30.9	31.1	31.2	31.4	20
21	31.5	31.7	31.8	32.0	32.1	32.3	32.4	32.6	32.7	32.9	21
22	33.0	33.2	33.3	33.5	33.6	33.8	33.9	34.1	34.2	34.4	22
23	34.5	34.7	34.8	35.0	35.1	35.3	35.4	35.6	35.7	35.9	23
24	36.0	36.2	36.3	36.5	36.6	36.8	36.9	37.1	37.2	37.4	24
25	37.5	37.7	37.8	38.0	38.1	38.3	38.4	38.6	38.7	38.9	25
26	39.0	39.2	39.3	39.5	39.6	39.8	39.9	40.1	40.2	40.4	26
27	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.6	41.7	41.9	27
28	42.0	42.2	42.3	42.5	42.6	42.8	42.9	43.1	43.2	43.4	28
29	43.5	43.7	43.8	44.0	44.1	44.3	44.4	44.6	44.7	44.9	29
30	45.0	45.2	45.3	45.5	45.6	45.8	45.9	46.1	46.2	46.4	30
31	46.5	46.7	46.8	47.0	47.1	47.3	47.4	47.6	47.7	47.9	31
32	48.0	48.2	48.3	48.5	48.6	48.8	48.9	49.1	49.2	49.4	32
33	49.5	49.7	49.8	50.0	50.1	50.3	50.4	50.6	50.7	50.9	33
34	51.0	51.2	51.3	51.5	51.6	51.8	51.9	52.1	52.2	52.4	34
35	52.5	52.7	52.8	53.0	53.1	53.3	53.4	53.6	53.7	53.9	35
36	54.0	54.2	54.3	54.5	54.6	54.8	54.9	55.1	55.2	55.4	36
37	55.5	55.7	55.8	56.0	56.1	56.3	56.4	56.6	56.7	56.9	37
38	57.0	57.2	57.3	57.5	57.6	57.8	57.9	58.1	58.2	58.4	38
39	58.5	58.7	58.8	59.0	59.1	59.3	59.4	59.6	59.7	59.9	39
40	60.0	60.2	60.3	60.5	60.6	60.8	60.9	61.1	61.2	61.4	40

KEUFFEL & ESSER CO., N. Y.

STA.	P. I. ELEV	SLOPE	BOTT. PIPE	+5.9 2' ABOVE TOP PIPE	GROUND ELEV	BENCH CUT		
0+20	INVERT 1939.7		1939.5'	1945.40'				
0+00		-.0014	1939.47'	1945.37'	1942.8		0+00	4" A.V.A.
+16			1939.45'	1945.35'	1953.4	8.0		
+50	INVERT. 1939.6		1939.4'	1945.30'	1956.0	10.7		
+58		-.244	1937.44'	1942.34'	1956.1	12.8		
+84			1931.10'	1937.00	1938.8	1.8		
1+00	1927.2		1927.20	1933.10	1935.7	2.6	1+05	4" B.O. TYPE B. PREC. M.H.
+50			1927.47	1933.37	1934.3	0.9		
+88			1927.67	1933.57	1938.5	4.9		
2+00		+.0053	1927.73	1933.63	1937.3	3.7		
2+20			1927.84	1933.74	1937.9	4.2		
EQ. 2+51.49 AH = 2+51.23 BK	1928.0		1928.0	1933.90	1936.8	2.9		
3+00			1928.27	1934.17	1934.9	0.7		
3+50		+.0057 .0054	1928.56	1934.46	1935.3	0.8		
3+56	1928.6		1928.60	1934.50	—	—		
4+00			1928.86	1934.76	1935.7	0.9		
4+50		+.0058	1929.15	1935.05	1935.7	0.7		
4+74			1929.29	1935.19	1936.2	1.0		

+5.9
2' ABOVE

STA	P.I. ELEV.	SLOPE	BOTT. PIPE	TOP PIPE	GROUND ELEV.	BENCH CUT				
5+00		+.0258	1929.44'	1935.34	1935.9	0 6				
5+27	1929.6		1929.60	1935.50						
5+42		.0054	1929.66	1935.56	1935.5	0				
5+99		+.0041	1929.90	1935.86	1934.9	/	5°			
6+00	1929.9		1929.90	1935.80						
6+08		+.0344	1931.85	1937.75	1938.8	1 0				
6+25	1936.0		1936.00	1941.90			6+30	4" A.V.A STL. COVER	1948 0 0	12'
6+48			1935.97	1941.87	1949.9	8 0				
6+79			1935.95	1941.85	1943.7	1 8				
7+02			1935.93	1941.83	1946.1	4 3				
7+44		-.00085	1935.89	1941.79	1946.9	5 1				
7+53			1935.89	1941.79	1948.6	6 8				
8+22			1935.83	1941.73	1949.2	7 5				
EQ 8+61.23 AH ~~8+61.20 BK~~ 8+60.85 BK	1935.8		1935.80	1941.70	1946.9	5 2				
8+87			1935.71	1941.61	1936.7		1 0			
9+00		-.0034	1935.67	1941.57	1936.5		0 8			
9+50			1935.50	1941.40	1934.7					
10+00			1935.33	1941.23	1935.6		0 3			

+5.9
2' ABOVE

STA	P.I. ELEV.	SLOPE	BOTT. PIPE	TOP PIPE	GROUND ELEV.	BENCH CUT			
10+50		-.0234	1935.16	1941.06	1940.8		5 6/8		
EQ 10+96.09 BK 10+96.65 AH	1935.0		1935.00	1940.9	1944.7		3 8/8		
11+50		-.0619	1931.70	1937.62	1938.0		0 4/8		
12+00	1928.6		1928.60	1934.50	1930.9		2 3/8		
12+50		-.02100	~~1927.56~~ 1928.44	1933.46 ~~1934.34~~	1934.5		0 2/8		
13+00	1926.5		~~1926.50~~ ~~1928.27~~	1932.4 ~~1934.17~~	1928.5		0 2/8		
13+19		-.0033	~~1926.41~~ ~~1928.21~~	~~1932.31~~ ~~1934.11~~	1928.3		0 1/8		
13+22.93	1928.2		~~1926.38~~ ~~1928.20~~	~~1932.28~~ ~~1934.10~~					
13+46			~~1926.26~~ ~~1928.15~~	~~1932.16~~ ~~1934.05~~	1926.8				
13+86		-.005256	~~1926.05~~ ~~1928.07~~	~~1931.95~~ ~~1933.97~~	1929.7		1 6/8	13+50	PIER 1.5'
14+19		-.0019	~~1925.88~~ ~~1927.81~~	~~1931.78~~ ~~1933.71~~	1930.2		2 4/8		
14+25	1928.0		~~1925.85~~ ~~1927.8~~	~~1931.75~~ 1933.7					
14+36			~~1925.79~~ ~~1927.85~~	~~1931.69~~ 1933.75	1926.4				
14+96		-.0134	~~1925.49~~ ~~1927.05~~	~~1931.38~~ 1932.95	1925.1			14+60 14+90	CONC. 1.5' PIERS. 2.0'
15+09.28 ~~15+37.88~~	1925.4 ~~1926.5~~		~~1925.40~~ ~~1926.50~~	~~1931.30~~ 1932.40					
15+50			~~1925.17~~ 1926.32	~~1931.07~~ 1932.22	1931.5		4 8/8	15+60	M.A.
16+00		-.014	~~1924.89~~ 1925.62	~~1930.79~~ 1931.52	1931.4		5 8/8		
16+50		-.00563	~~1924.60~~ ~~1924.92~~	~~1930.50~~ 1930.82	1930.5		5 6/8		

STA	P.I. ELEV.	SLOPE	BOTT PIPE	+5.9 2' ABOVE TOP PIPE	GROUND ELEV.	BENCH CUT					
16+87	1924.4		1924.40	1930.30							
17+00		-.0036	1924.35	1930.25	1931.3	1 0					
17+50			1924.17	1930.07	1930.5	0 4					
17+98.90	1924.0		1924.00	1929.90	1932.5	2 6					
18+50		-.002	1923.90	1929.80	1932.3	2 5					
19+00			1923.80	1929.70	1930.5	0 8					
19+50			1923.70	1929.60	1929.7	0 1					
20+00	1923.6		1923.60	1929.50	1929.8	0 3					
20+50		-.001	1923.55	1929.45	1930.1	0 6					
21+00			1923.50	1929.40	1929.6	0 2					
21+50			1923.45	1929.35	1930.6	1 2					
21+96	1923.4		1923.40	1929.30	1931.0	1 7					
22+50		-.0009	1923.35	1929.25	1931.9	2 6					
23+01.64	1923.3		1923.30	1929.20	1929.4	0 2					
23+50		-.0369	1921.53	1927.43	1926.5		5 0				
23+67	1920.9		1920.90	1926.80							
23+86		-.009	1920.89	1926.79	1923.4		2 5				
24+00			1920.87	1926.77	1920.5						

STA	P. I. ELEV.	SLOPE	BOTT. PIPE	+5.9 2' ABOVE TOP PIPE	GROUND ELEV.	BENCH CUT
24+12			1920.86'	1926.76	1909.6	
24+25			1920.85'	1926.75	1908.0	
24+54		-.0210	1920.82'	1926.72	1919.0	
25+00			1920.77'	1926.67	1922.6	
25+14.54	1920.7		1920.70'	1926.60	1927.2	0-6
26+00			1920.66'	1926.56	1926.0	
26+50		-.0012	1920.60	1926.50	1922.3	
27+00			1920.54	1926.44	1924.9	
27+36.15	1920.5		1920.50'	1926.40	1926.1	
27+61		.000	1920.50'	1926.40	1927.4	1-0
27+70	1920.5		1920.50'	1926.40		
28+00		-.1167	1916.91	1922.81	1922.9	0-1
28+41.14	1912.0		1912.00'	1917.90	1915.9	
28+54	1908.0		1908.30 ~~1908.00~~'	1914.2 ~~1913.90~~	1913.2	C 1-0
29+00	1880.0	-.0344.85 -28.76	1895.07 ~~1880.00~~	1901.0 ~~1885.90~~	1897.4 ~~1886.1~~	C 3-6
29+50	1866.0		1880.69 ~~1866.0~~	1886.6 ~~1871.90~~	1882.4 ~~1871.8~~	0-3
30+08	1864.0		1864.0'	1869.90	1870.2	0-3
30+57		-.1154	1858.36'	1864.26	1856.3	-

1-8			
5-3			
1-7	26+50	PIER	3'
4-4			
5-6			
		4'-A.V.A. STL. COVER	
3-9	27+65		1928.5

(FIELD ELEV.)

SEE PG. 433

24+20 24+48	(2) PIERS	12' 4.5'

STA	P.I. ELEV.	SLOPE	BOTT PIPE	+5.9 2' ABOVE TOP PIPE	GROUND ELEV	BENCH CUT
30+75		-.0150	1856.29	1862.19	1856.0	
30+86.25	1855.0		1855.0	1860.90	1859.5	4 5
31+07			1854.96	1860.86	1858.3	3 3
31+20		-.0023	1854.93	1860.83	1853.3	
31+40			1854.88	1860.78	1850.9	
31+75	1854.8		1854.80	1860.70		
32+00	1855.0	0°-03' -.0009	1855.00	1860.90	1861.3	0 4
32+15	1862.9	9°57' .1555	1862.90	1868.80		
32+50			1862.91	1868.81	1869.7	0 9
33+00		+.001	1862.96	1868.86	1873.3	4 4
33+50	1863.0		1863.00	1868.90	1867.8	5 2
33+61			1864.33	1870.23	1870.8	0 6
34+00			1869.06	1874.96	1875.1	0 1
34+26		+.1612	1872.21	1878.11	1880.3	2 2
34+28.39	1872.5		1872.50	1878.40		
34+45			1875.12	1881.02	1882.0	1 2
34+98		+.1578	1883.48	1889.38	1898.3	8 9
35+00	1883.8		1883.80	1889.70		

31+20	(2) PIERS	2'	
31+50		4'	
31+75	6" B.O TYPE B-1		
31+95	M.H.		

STA	P.I. ELEV.	SLOPE	BOTT PIPE	+5.9 2' ABOVE TOP PIPE	GROUND ELEV.	BENCH CUT
35+50			1883.85	1889.75	1894.2	4 4/4
36+06.11	1883.9	+.0009	1883.90	1889.80	1893.8	4 0
36+50			1883.99	1889.89	1890.9	1 0
36+58	1884.0	+.022	1884.00	1889.90		
36+75	1889.9	.34705	1889.90	1895.80		
36+86			1891.11	1897.01	1905.3	4 2/4
37+04		+.1088	1893.08	1898.98	1898.3	5 2/4
37+36	1896.6		1896.60	1902.50		
37+50		+.028	1896.99	1902.89	1903.3	0 4/4
37+86.26	1898.0		1898.00	1903.90	1904.2	0 3/4
38+50	1900.0	.0313	1900.00	1905.90	1906.9	1 0
39+00			1900.04	1905.94	1906.4	0 5/4
39+50		+.0006	1900.08	1905.98	1907.6	1 6/4
39+80.43	1900.1		1900.10	1906.00		
40+00			1900.12	1906.02	1910.8	4 8/4
40+50			1900.18	1906.08	1910.7	4 6/4
41+00		+.0012	1900.24	1906.14	1908.8	2 7/4
41+50			1900.30	1906.20	1906.6	0 4/4

STA	P.I. ELEV.	SLOPE	BOTT PIPE	+ 5.9 2' ABOVE TOP PIPE	GROUND ELEV	BENCH CUT
42+00			1900.36	1906.26	1905.1	
42+50		+.0012	1900.42	1906.32	1904.8	
43+00			1900.48	1906.38	1906.2	
43+10.97	1900.5		1900.50 ✓	1906.40	1907.1	0 7
43+17		+.4920	1903.47	1909.37	1913.8	4 4
43+38	1913.8		1913.80 ✓	1919.70		
43+50		+.1000	1915.00	1920.90	1920.8	5 8
44+00	1920.0	1043'	1920.00	1925.90	1925.0	5 0
44+40	1919.6	-.0150 0532'	1919.60 ✓	1925.50		
44+50			1917.36	1923.26	1923.0	5 6
45+00			1906.16	1912.06	1913.1	1 0
45+18		-.224	1902.13	1908.03	1910.0	2 0
45+40	1897.2		1897.20 ✓	1903.10	1902.5	5 3
46+00		-.02	1896.00	1901.90	1901.8	5 8
46+50	1895.0		1895.00 ✓	1900.90	1900.2	5 2
47+00	1890.0	-.1000	1890.00	1895.90	1895.6	5 4
47+50			1885.50	1891.40	1892.7	1 3
48+00	1881.0	-.09	1881.00 ✓	1886.90	1887.1	0 2

44+05 2-4" AVA 9 M.H. STL. 1927 0 0

+5.9
2' ABOVE

STA.	P.I. ELEV.	SLOPE	BOTT PIPE	TOP PIPE	GROUND ELEV.	BENCH CUT				
48+50		-.05	1878.50	1884.40	1876.4			48+28 48+60	2 PIERS	1' 2.5'
49+00	1876.0		1876.00	1881.90	1880.7		4 7			
49+63			1867.22	1873.12	1875.2	2 1				
49+92			1863.18	1869.08	1864.2		1 0			
50+00		-.139	1862.07	1867.97	1862.0		0 1	50+08	PIER	2.5'
50+12			1860.40	1866.30	1863.4		3 0			
50+48	1855.4		1855.40	1861.30	1862.2	0 9				
51+00		-.249	1842.45	1848.35	1848.0		5 5			
51+50	1830.0		1830.00	1835.90	1836.9	1 0				
52+00		-.07	1826.50	1832.40	1831.5		5 0			
52+50	1823.0		1823.00	1828.90	1829.5	0 6				
53+00	1817.0	-.120	1817.00	1822.90	1822.5		5 5			
53+50		-.3077	1801.62	1807.52	1810.7	3 7				
53+65	1797.0		1797.00	1802.90	—	—				
53+97			1797.14	1803.04	1784.6	—		53+96 54+28	2 PIERS	13' 11'
54+05		+.0043	1797.17	1803.07	1776.9	—				
54+50			1797.37	1803.27	1796.8	—				
54+75			1797.47	1803.37	1800.6	—				

STA	P.I. ELEV.	SLOPE	BOTT PIPE	+ 5.9 2' ABOVE TOP PIPE	GROUND ELEV.	BENCH CUT
55+00			1797.58	1803.48	1803.5	0
55+50		+.0043	1797.80	1803.70	1804.5	0 8
56+00	1798.0		1798.00	1803.90	1800.6	— 2 6
56+50			1788.33	1794.23	1791.8	— 3 5
57+00		-.1933	1778.67	1784.57	1782.8	— 4 1
57+50	1769.0		1769.00	1774.90	1774.2	5 2
58+00	1757.0	-.240	1757.00	1762.90	1762.4	5 4
58+50		-.07	1753.50	1759.40	1759.0	5 5
59+00	1750.0		1750.00	1755.90	1755.2	5 2
59+30		-.1974	1744.08	1749.98	1749.9	5 8
59+38	1742.5		1742.50	1748.40	—	
59+50		-.0136	1742.34	1748.24	1739.7	
59+60	1742.2		1742.20	1748.10	1729.7	
59+80		0.00	1742.20	1748.10	1740.4	
60+00	1742.2		1742.20	1748.10	1743.6	1 4
60+50	1742.0		1742.00	1747.90	1747.0	5 0
61+10		-.05	1739.00	1744.90	1743.5	4 5
61+50	1737.0		1737.00	1742.90	1742.8	5 8

59+60 (1) PIER 10'

STA	P.I. ELEV	SLOPE	BOTT PIPE	+5.9 2' ABOVE TOP PIPE	GROUND ELEV.	BENCH CUT				
62+00		-.1579	1729.11	1735.01	1735.0	0°		62+00	M.H.	
62+45	1722.0		1722.00	1727.90	—					
62+62	1715.1		1715.10	1721.00	1730.8	9 8/8				
62+73		-.0013	1715.08	1720.98	1721.6	0 6/8				
63+00			1715.05	1720.95	1723.0	2°				
63+36	1715.0		1715.00 ✓	1720.90	—			63+36	8" B.O. "B" PREC. M.H.	
63+42		+.0188	1715.29	1721.19	1724.0	2 8/8				
63+77	1717.0		1717.00	1722.90	1725.0	2 1/8				
63+86		+.6087	1722.48	1728.38	1731.4	3°				
64+00	1731.0		1731.00	1736.90	—					
64+34		+.3091	1741.51	1747.41	1747.6	0 2/8				
64+77	1754.8		1754.80	1760.70	1759.8		5°			
65+35	1765.0		1765.00	1770.90	1770.8		5 8/8			
65+75	1770.0		1770.00	1775.90	1775.8		5 8/8			
66+37			1770.15	1776.05	1777.3	1 3/8				
66+80		+.0021	1770.25	1776.15	1763.1	—		66+60	(3)	6'
66+99			1770.30	1776.20	1760.3			66+92	PIERS	12'
67+14			1770.34	1776.24	1769.4			67+25		3'

STA	P.I. ELEV.	SLOPE	BOTT PIPE	+5.9 2' ABOVE TOP PIPE	GROUND ELEV.	BENCH CUT				
67+50		+.0241	1770.42	1776.32	1774.2		3 8			
67+85	1770.5		1770.50	1776.40						
68+00			1771.88	1777.78	1778.0	0 2				
68+67			1778.05	1783.95	1785.2	1 2				
69+00		+.0920	1781.08	1786.98	1782.2		1 1	69+20 69+50	(2) PIERS	6' 11'
69+50			1785.68	1791.58	1778.3					
69+65			1787.07	1792.97	1781.3					
69+86	1789.0		1789.00	1794.90	1799.6	4 7				
70+55		+.0545	1792.76	1798.66	1788.7			70+45	PIER	5'
70+87	1794.5		1794.50	1800.40						
71+00		+.5988	1802.16	1808.06	1808.0		5 8			
71+50	1831.6		1831.60	1837.50	1837.6	0 1				
72+00	1862.5		1862.50	1868.40	1867.9		5 4			
72+50	1884.5		1884.50	1890.40	1890.5	0 1				
72+88		+.3900	1895.52	1901.42	1901.3		5 8			
73+00	1899.0		1899.00	1904.90	1907.4	2 5				
73+50		+.0108	1899.54	1905.44	1909.1	3 7				
73+70			1899.76	1905.66	1909.7	4 0				

STA	P.I. ELEV	SLOPE	BOTT PIPE	+5.9 2' ABOVE TOP PIPE	GROUND ELEV	BENCH CUT
73+93	1900.0		1900.00'	1905.90	1905.3	5
74+50	1907.0		1907.00'	1912.90	1912.2	5
75+00	1911.0		1911.00'	1916.90	1915.9	4
75+22			1911.16	1917.06	1917.6	
75+48		+.0073	1911.35	1917.25	1916.5	
75+65			1911.47	1917.37	1920.9	
75+95.66	1911.7		1911.70'	1917.60	1918.7	
76+53	1912.0	+.0070	1912.00'	1917.90	1917.2	
77+00			1894.23	1900.13	1900.6	
77+35	1881.0	-.3780	1881.00'	1886.90	1886.7	
77+50		-.4255	1874.61	1880.51	1878.2	
77+82	1861.0		1861.00'	1866.90	1866.6	
77+96			1858.94	1864.84	1857.2	
78+22		-.1470	1855.12	1861.02	1859.3	
78+50	1851.0		1851.00'	1856.90	1855.6	
79+00	1838.0		1838.00'	1843.90	1843.0	
79+50		-.3353	1821.24	1827.14	1826.0	
79+68	1815.2		1815.20'	1821.10	1820.7	

mark.
838-A-
Sutherland-Sandiuski
Conduit Sec 1-
Established grades

STA	P.I. ELEV	SLOPE	BOTT PIPE	+5.9 2' ABOVE TOP PIPE	GROUND ELEV	BENCH CUT				
73+93	1900.0		1900.00'	1905.90	1905.3		5 3/5			
74+50	1907.0		1907.00'	1912.90	1912.2		5 7/5			
75+00	1911.0		1911.00'	1916.90	1915.9		4 9/5			
75+22			1911.16	1917.06	1917.6	0 5/5				
75+48		-.0073	1911.35	1917.25	1916.5		5 1/5			
75+65			1911.47	1917.37	1920.9	3 5/5				
76+25.66	1911.7		1911.70'	1917.60	1918.7	1 1/5				
76+53	1912.0	-.0070	1912.00'	1917.90	1917.2		5 2/5	76+48	(2) 4" P.V.C. ∄ M.H. S.A.G.	1920.0'
77+00		-.3780	1894.23	1900.13	1900.6	0 4/5				
77+35	1881.0		1881.00'	1886.90	1886.7		5 7/5			
77+50		-.1255	1874.61	1880.51	1878.2		3 6/5			
77+82	1861.0		1861.00'	1866.90	1866.6		5 6/5			
77+96		-.1470	1858.94	1864.84	1857.2					
78+22			1855.12	1861.02	1859.3		4 2/5			
78+50	1851.0		1851.00'	1856.90	1855.6		4 6/5			
79+00	1838.0		1838.00'	1843.90	1843.0		5 0/5			
79+50		-.3353	1821.24	1827.14	1826.0		4 8/5			
79+68	1815.2		1815.20'	1821.10	1820.7		5 5/5			

+ 5.9

STA	P.I. ELEV	SLOPE	BOTT PIPE	2' ABOVE TOP PIPE	GROUND ELEV	BENCH CUT
79+92	1801.5		1801.50	1807.40	1813.2	5 8
80+02		-.0395	1801.11	1807.11	1808.6	1 5
80+30	1800.0		1800.00	1805.90	1809.7	3 8
80+34		-.3861	1798.42	1804.32	1804.2	5 8
80+81	1779.8		1779.80	1785.70		
80+92	1776.0		1776.00	1781.90	1781.4	5 4
81+38	1742.6		1742.60	1748.50	1750.6	2 1
81+50		-.0419	1742.10	1748.00	1747.4	5 3
81+78			1740.92	1746.82	1751.3	4 5
82+00	1740.0		1740.00	1745.90	1750.0	4 L
82+14			1739.40	1745.30	1746.3	1 0
82+44		-.0427	1738.12	1744.02	1733.1	
83+00			1735.73	1741.63	1745.2	3 6
83+10	1735.3		1735.30	1741.20		
83+50		-.2833	1723.97	1729.87	1730.7	0 8
84+00	1709.8		1709.80	1715.70	1715.1	5 3
84+50	1698.0	-.2535	1698.00	1703.90	1702.7	4 7
86+00			1685.33	1691.23	1691.7	0 5

82+48 PIER 6'

81 .
28.62
52 38

80 of 81.00
81 28.62
52.38

STA	P.I. ELEV	SLOPE	BOTT PIPE	+ 5.9 2' ABOVE TOP PIPE	GROUND ELEV	BENCH CUT	BOTTOM OF DITCH			
85+23		-.2535	1679.50	1685.40	1687.5	2 ±				
85+36	1676.2		1676.20	1682.10	1681.2	—	5 ±			
85+50			1674.79	1680.69	1681.7	1 ±				
85+86			1671.17	1677.07	1674.6	—	3 ¼			
86+04		-.1006	1669.36	1675.26	1664.5					
86+20			1667.75	1673.65	1669.1		1 ¼	86+18	(1) PIER	3'
86+50			1664.73	1670.63	1671.0	0 ¼		86+50	M.H	
87+00	1659.7		1659.70	1665.60	1663.1		3 ¼			
87+23			1650.01	1655.91	1659.5		3 ⅙			
87+37		-.1214	1644.11	1650.01	1654.7	4 ⅞				
87+42	1642.0		1642.00	1647.90	—					
87+77			1641.68	1647.58	1626.1			87+63 87+92	(2) PIERS	9' 10.5'
88+30			1641.19	1647.09	1651.6	4 ⅝				
88+47			1641.03	1646.93	1652.9	6 ±				
88+65		-.0098	1640.87	1646.77	1648.6	1 ⅜		88+87 89+17	(2) PIERS	9' 6'
89+02			1640.53	1646.43	1623.3			89+16	6" B.O. "B-1"	
89+06			1640.49	1646.39	1636.2					
89+16	1640.4		1640.40	1646.30	—					

STA	P.I. ELEV	SLOPE	BOTT PIPE	+ 5.9 2' ABOVE TOP PIPE	GROUND ELEV	BENCH CUT	BOTTOM OF DITCH
89+39		+.0013	1640.43	1646.33	1650.5	4 2	
89+93	1640.5	+.0013	1640.50	1646.40	—		
90+00	1660.5	+.0013	1660.50	1666.40	1666.7	0 3	
90+50		+.0013	1669.35	1675.25	1675.7	0 4	
91+00		+.0013	1678.19	1684.09	1684.4	0 4	
91+50		+.0013	1687.04	1692.94	1692.5	—	5 5
92+00		+.0013	1695.88	1701.78	1702.4	0 6	
92+50		+.1769	1704.73	1710.63	1711.8	1 2	
92+80		+.1769	1710.03	1715.93	1714.5	—	4 5
93+00		+.1769	1713.57	1719.47	1720.3	0 8	
93+20	1717.1	+.1769	1717.10	1723.00	—	—	
93+50		+.2221	1723.76	1729.66	1729.4	—	5 6
93+88	1732.2	+.2221	1732.20	1738.10	1737.5	—	5 3
94+20		+.2221	1734.95	1740.85	1741.7	0 8	
94+46		+.0859	1737.19	1743.09	1741.2	—	4 0
94+52	1737.7	+.0859	1737.70	1743.60	—	—	
95+00	1758.0	+.0859	1758.00	1763.90	1763.5	—	5 5
95+27		+.1364	1761.68	1767.58	1769.6	2 0	

+ 5.9
2' ABOVE

STA	P.I. ELEV	SLOPE	BOTT PIPE	TOP PIPE	GROUND ELEV	BENCH CUT	BOTTOM OF DITCH			
95+33	1762.5		1762.50'	1768.40	1768.0	-	5 5/8			
95+68	1781.5		1781.50	1787.40	1787.4	0 0				
96+00	1789.5		1789.50'	1795.40	1795.3	-	5 8/8			
96+50		+.3472	1806.86	1812.76	1812.8	0 0				
96+72	1814.5		1814.50'	1820.40	1820.6	0 2/8				
97+00	1817.5		1817.50'	1823.40	1823.3	-	5 8/8			
97+10		+.4500	1822.00	1827.90	1830.0	2 1/8				
97+50	1840.0		1840.00'	1845.90	1847.1	1 2/8				
97+88			1852.73	1858.63	1859.4	0 8/8				
98+23		+.3350	1864.46	1870.36	1869.5	0 9/8				
98+50	1873.5		1873.50'	1879.40	1879.0	-	5 5/8			
99+00	1887.0		1887.00	1892.90	1892.3	-	5 3/8			
99+50		+.2045	1897.23	1903.13	1902.9	-	5 1/8			
99+86.06	1904.6		1904.60'	1910.50	1910.8	0 3/8		99+91	2-4" AVA M.H. STL. COV	1917.0
100+41			1904.47	1910.37	1915.4	5 0/8				
100+59		-.0023	1904.43	1910.33	1912.5	2 2/8				
100+72	1904.4		1904.40'	1910.30	—					
100+80		-.30	1902.00	1907.90	1907.9	0 0				

STA	P.I. ELEV.	SLOPE	BOTT PIPE	+ 5.9 2' ABOVE. TOP PIPE	GROUND ELEV	BENCH CUT	BOTTOM OF DITCH			
101+00		-.3000	1896.00	1901.90	1902.3	0 4				
101+50	1881.0		1881.00	1886.90	1886.9	0 0				
101+75	1870.0		1870.00	1875.90	—	—	—			
102+00			1867.75	1873.65	1863.8			102+04	PIER	3'
102+40		-.0903	1864.13	1870.03	1870.2	0 2				
102+79			1860.61	1866.51	1866.4	—	5 8			
102+88	1859.8		1859.80	1865.70	—	—				
103+26		-.3425	1846.78	1852.68	1854.8	2 1				
103+50			1838.56	1844.46	1844.5	0 0				
103+75	1830.0		1830.00	1835.90	—	—	—			
104+00	1821.0		1821.00	1826.90	1826.6		5 6			
104+62.5	1802.0		1802.00	1807.90	1807.6		5 6			
105+00		-.6644	1777.09	1782.99	1783.0	0 0				
105+06	1773.1		1773.10	1779.00	—					
105+38		-.0029	1773.01	1778.91	1769.5					
105+40	1773.0		1773.00	1778.90	—			105+40	4" B.O. BOTTOM OUTLET B-1	
105+64		+.0020	1773.05	1778.95	1774.2		1 2	105+50	PIER	2'
105+90	1773.1		1773.10	1779.00	—					

+ 5.9

STA	P.I. ELEV	SLOPE	BOTT PIPE	2' ABOVE TOP PIPE	GROUND ELEV	BENCH CUT				
106+00			1774.21	1780.11	1793.3	13				
106+50			1779.78	1785.68	1785.8	0				
107+00		+.1113	1785.34	1791.24	1790.3		5			
107+50	1790.9		1790.90	1796.80	1794.9		4			
108+00		+.0440	1793.10	1798.00	1797.6		4			
108+50			1795.30	1801.20	1799.7		4			
109+00	1797.5		1797.50	1803.40	1804.3	1				
109+67	1827.0	+.3750	1827.00	1832.90	1832.2		5			
110+00	1837.0		1837.00	1842.90						
110+20		+.3056	1843.11	1849.01	1848.9		5			
110+36	1848.0		1848.00	1853.90						
110+50		+.4766	1854.67	1860.57	1861.0	0				
111+00	1878.5		1878.50	1884.40	1884.2		5			
111+41	1900.5	-.3856	~~1893.3~~ ~~1900.50~~	~~1899.22~~ ~~1906.40~~	~~1901.8~~ ~~1907.5~~	2.6 1		4" AVAZ M.H. STL. GV.	111+45	1908.0
111+57	1900.5	-.0016	~~1900.5~~ ~~1900.48~~	~~1906.4~~ ~~1906.38~~	~~1908.9~~ ~~1910.0~~	2.5 3.6	NOTE PI CHANGED —			
112+04.32	1900.4		1900.40	1906.30	1910.4	4				
112+50		-.0016	1900.33	1906.23	1908.5	2.3				
113+13			1900.23	1906.13	1901.4		1		113+00 113+30	(2) PIERS 1' 1'

STA	P.I. ELEV	SLOPE	BOTT PIPE	+5.9 2' ABOVE TOP PIPE	GROUND ELEV	BENCH CUT	BOTT DITCH			
113+50		-.0016	1900.17	1906.07	1904.4	-	4 2/3			
EQ 113+90.22 AH 113+94.85 BK	1900.1		1900.10	1906.00	1906.1	0 1/3				
114+00	1900.0		1900.00	1905.90	-	-				
114+34		-.1991	1893.91	1899.81	1901.0	.1 2/3				
114+67	1888.0		1888.00	1893.90	1893.8		5 8/3			
115+17	1871.5		1871.50	1877.40	1878.2	0 8/3				
115+50			1871.46	1877.36	1877.6	0 2/3				
116+00		-.0013	1871.39	1877.29	1879.5	2 2/3				
116+50			1871.33	1877.23	1881.2	4 0/3				
116+70	1871.3		1871.30	1877.20	1878.9	1 7/3				
117+13		-.09355	1867.28	1873.18	1859.2			117+00	PIER	3.5'
117+42.69	1864.5		1864.50	1870.40	1870.4	0 0/3				
118+00		-.0052	1864.20	1870.10	1868.4		4 2/3			
118+38.02	1864.0		1864.00	1869.90	1868.5		4 5/3			
119+00	1859.0		1859.00	1864.90	1866.8		1 9/3	119+00	4" B.O. "B" PRE. CA. M.H.	
119+61	1862.5		1862.50	1868.40	1870.4	2 0/3				
120+00		+.0017	1862.57	1868.47	1868.5	0 0/3				
120+50			1862.65	1868.55	1868.5		5 8/3			

STA	R.I. ELEV	SLOPE	BOTT PIPE	+5.9 2' ABOVE TOP PIPE	GROUND ELEV.	BENCH CUT			
120+81		+.0017	1862.70	1868.60	1870.2	1 6			
121+33			1862.79	1868.69	1869.0	0 3			
121+36	1862.8		1862.80	1868.70		—			
122+00	1879.0	14°13'	1879.00	1884.90	1884.7		5 7		
122+58.94	1884.0	4°58'	1884.00	1889.90	1891.1	1 2			
123+00	1886.5	30°29'	1886.50	1892.40	1892.8	0 4			
123+68.70	1886.6		1886.60	1892.50	1892.6	0 1			
124+00			1886.65	1892.55	1894.2	1 6			
124+50			1886.74	1892.64	1895.2	2 6			
124+66		+.0017	1886.77	1892.67	1897.7		1 0		
124+86	1886.8		1886.80	1892.70	1894.8	2 1			
125+50	1894.5	0°52'	1894.50	1900.40	1903.8	3 4			
125+95.14	1894.6	-.0277	1894.60	1900.50	1908.5	8 0			
126+35	1894.5		1894.50	1900.40	—	—		126+30	4" A.V.A.M.H. STL. COVER 1903.0
126+64		13°	1887.81	1893.71	1896.7	3 0			
127+00	1879.5	-.2308	1879.50	1885.40	1885.0		5 5		
127+18	1870.0	27°49'	1870.00	1875.90	1875.6		5 6		
127+38		-.0277	1865.73	1871.63	1860.7				
		-.2138							

STA	P.I. ELEV	SLOPE	BOTT PIPE	+5.9 2' ABOVE TOP PIPE	GROUND ELEV	BENCH CUT
EQ 127+66.81 AH. 127+67.14 BK	1859.5	-.2138	1859.50	1865.40	1867.1	1 7
127+89		-.0023	1859.45	1865.35	1864.0	4 5
128+10	1859.4		1859.40	1865.30		
128+35		+.0017	1859.44	1865.34	1845.5	0 2
128+68	1859.5		1859.50	1865.40		
128+75		+.4063	1862.34	1868.24	1871.0	2 8
129+00	1872.5		1872.50	1878.40	1877.0	4 5
129+50	1875.9		1875.90	1881.80	1882.8	1 0
130+00			1883.38	1889.28	1889.5	0 2
130+19		+.1496	1886.22	1892.12	1894.2	2 1
130+25.53	1887.2		1887.20	1893.10		
EQ 130+25.63 BK 143+00 AH	1887.2		1887.20	1893.10		
143+25	1891.0		1891.00	1896.90	1896.4	5 4
143+42		+.0724	1892.23	1898.13	1888.7	
143+69.19	INV. 1894.4 1894.2		1894.20	1900.10	1899.1	4 9
	TUNNEL					
172+50.5	INV. 1893.0 1892.76		1892.76	1898.66		
177+60	1890.0	-.0054	1890.00	1895.90		

128+10	4" B.O. "B-1"		
128+16 128+42	(2) PIERS	8' 10.5'	
177+50	4" AVA. M.H. STR. GOV.	1898 0	

STA	P.I. ELEV.	SLOPE	BOTT. PIPE	+5.9 2' ABOVE TOP PIPE	GROUND ELEV	BENCH CUT
178+00			1886.26	1892.16	1895.0	2 8
178+35	1883.0	-.0933	1883.00	1888.90		
178+50			1876.44	1882.34	1883.8	1 5
178+75	1865.5	-.4375	1865.50	1871.40		
179+07			1865.46	1871.36	1853.9	
179+45			1865.41	1871.31	1851.6	
179+78			1865.36	1871.26	1864.9	
179+84			1865.35	1871.25	1860.3	
180+25		-.0013	1865.30	1871.20	1872.5	1 3
180+50			1865.27	1871.17	1874.4	3 2
181+00	1865.2		1865.20	1871.10	1874.9	3 8

179+18	(2)	12.5
179+48	PIERS	12.5

VERT ✗ HORIZ ✗

MINUS

0+20	1939.5		
0+00	1939.47		
		-.0014	
0+25	1939.44		
	P.I.		
0+50	1939.40		12°43'56" L
		-.2440	
0+75	1933.30		
	P.I.		
1+00	1927.2		
		+.00540	
1+25	1927.33		
1+50	1927.47		
		+.00540	
1+75	1927.60	+.00053	
	1927.74		
2+00	1927.73		

	1927.87		
2+25	1927.86		
	1928.01	+.0053	
2+50	1928.00		
F.C.	P.I.		
2+51.49 AH	1928.0		38°20'40" R
2+51.23 BK			
2+75	1928.14		
3+00	1928.28		
		+.00540	
	1928.41	+.00058	
3+25	1928.43		
	1928.55		
3+50	1928.57		
	P.I.		
3+56	1928.6		
3+56.08			12°52'48" L
	1928.68		
3+75	1928.71		
		+.00058	
	1928.82		
4+00	1928.86		

4+25	1928.95 1929.00		
4+50	1929.09 1929.15		
4+75	1929.22 1929.29	+.0058	
5+00	1929.36 1929.44		
5+25	1929.49 1929.58	+.0540	
	P.I.		
5+27	1929.6		
5+30.62		21°05'34"R	
5+50	1929.63 1929.69		
5+75	1929.76 1929.80	+.0041	
	P.I.		
6+00	1929.9		
6+25	1936.0	+.2440	

6+50	1935.98	
6+75	1935.96	
7+00	1935.94	
7+25	1935.92	
7+50	1935.90	-.0008
7+75	1935.87	
8+00	1935.85	
8+25	1935.83	
8+50	1935.81	
E.R.	P.I.	
8+61.23 AH	1935.8	
8+67.20 EK		
8+60.85 BK		

E.Q.	P.I.		
8+61.23 AH	1935.8		
8+67.20 BK			
8+62.18		52°50'30"L	
8+75	1935.75		
9+00	1935.67		
9+25	1935.58		
9+50	1935.50		
		-.0034	
9+75	1935.41		
10+00	1935.33		
10+25	1935.24		
10+50	1935.16		
10+75	1935.07		

EQ	P.I.		
10+96.09 BK	1935-		3°20'30"L
10+96.65 AH			
11+00	1934.79		
11+25	1933.24	-.06193	
11+50	1931.70		
11+75	1930.15		
	P.I.		
12+00	1928.6		
12+25	1928.52		
12+50	1928.44	-.00325	
12+75	1928.36		
13+00	1928.27		34°10'00L

	P.I.	
13+22.93	1928.2	X
13+25	1928.20	
13+50	1928.15	
		-.00196
13+75	1928.10	
14+00	1928.05	
	P.I.	
14+25	1928.-	X
14+50	1927.67	
14+75	1927.34	
		-0.01329
15+00	1927.0	
15+09.28		27°38'30"R
15+25	1926.67	

E.Q.		
15+37.83 BK	P.I.	
15+37.83 PH	1926.50	X
15+50	1926.33	
15+75	1925.98	
16+00	1925.62	
		-0.01408
16+25	1925.27	
16+50	1924.92	
16+75	1924.57	
	P.I	
16+87	1924.4-	X
17+00	1924.35	
		-0.00357
17+25	1924.26	

17+50	1924.17		
17+75	1924.08		
17+98.9	P.I. 1924.0	37°02'30"L	
18+00	1924.0		
18+25	1923.95		
18+50	1923.90		
18+75	1923.85		
19+00	1923.80	-0.00199	
19+25	1923.75		
19+50	1923.70		
19+75	1923.65		
20+00	P.I. 1923.60		
20+25	1923.57		
20+50	1923.55		
20+75	1923.52		
21+00	1923.50	-0.00102	
21+25	1923.47		
21+50	1923.45		
21+75	1923.42		
21+96	P.I. 1923.40	44°19'30"L	

	P.I.		
21+96	1923.40	44°14'30"L	
22+00	1923.40		
22+25	1923.37		
22+50	1923.35		-0.00075
22+75	1923.33		
23+00	1923.30		
	P.I		
23+01.64	1923.3	23°17'30"L	
23+25	1922.44		
23+50	1921.52		-0.03672
	P.I.		
23+67	1920.9		

23+75	1920.89		
24+00	1920.87		
24+25	1920.84		
24+50	1920.82		
24+75	1920.79		-0.00075
25+00	1920.77		
25+25	1920.75		
25+50	1920.72		
	P.I.		
25+74.54	1920.7	1°25'00"L	
25+75	1920.69		-0.00124

					BOTT. PIPE	+59	
26+00	1920.66				28+25	1913.92	
					P.I.		
26+25	1920.63				28+41.14	1912.0 ✓	X 1917? 30°09'30" R
26+50	1920.60						
26+75	1920.57	-0.00124			28+50	1909.23	-0.31104
					P.I.		
27+00	1920.54				28+54	1908.00 ✓	X 1913? u/c
27+25	1920.51				28+75	1901.30 1895.22	-0.60869
	P.I.						
27+36.15	1920.5	X 1926.4	14°19'30"L		29+00	~~P.I. 1890.0~~ 1893.34	X ~~1885.9~~ 1899.2 -.31875
27+50	1920.50	0.00	26.4		29+25	1885.37 1873.0	0.28060
	P.I.					P.I.	
27+70	1920.5	X	26.4		29+50	~~1866.0~~ 1877.4	X 1871.9 1883.3
27+75	1919.70				29+75	~~1865.14~~ 1871.62	
		-0.11948					-0.03446
28+00	1916.91		22.8		30+00	~~1864.27~~ 1865.84	-.23103

	P.I.			
30+08	1864.0 ✓		1869.2	dc
30+25	1862.04			
30+50	1859.16		1865	
		−0.11502		
30+75	1856.28			
	P.I.			
30+86.25	1855.0 ✓		1860.9	38°1400"R
31+00	1854.98		1860.9	
31+25	1854.92			
+30	1854.91	−0.00225	1860.8	
31+50	1854.86			
	P.I.			
31+75	1854.8		1860.7	
		+0.00800		
	P.I.			
32+00	1855.0		1860.9	

32+25	1859.39			
		+0.17556		
	P.I.			
32+45	1862.9 ✓		1868.8	
32+50	1862.90			
32+75	1862.92			
		+0.00095		
33+00	1862.95		1868.9	
33+25	1862.97			
	P.I.			
33+50	1863.00 ✓		1868.9	
33+75	1866.03			
34+00	1869.06		1875	
		+0.12119		
34+25	1872.09			

	P.I.			
34+28.39	1872.5	1878.4	25°57'15"R	
34+50	1875.90	1881.8		
34+75	1879.85			+0.15780
	P.I.			
35+00	1883.8	1889.7		
35+25	1883.82			
35+50	1883.85	1889.8		
35+75	1883.87			+0.00094
36+00	1883.90			
	P.I.			
36+06.71	1883.9	1889.8	45°06'15"R	
36+25	1883.93			

36+50	1883.98			+0.00195
	P.I			
36+58	1884.0	1889.9		
	P.I.			+.28814
36+75	1889.9	1895.8		
37+00	1892.64	1898.5		
37+25	1895.39			+.10984
	P.I.			
37+36	1896.6	1902.5		
37+50	1896.99			+.02785"3"
37+75	1897.69			
	P.I			
37+86.26	1898.0	1903.9	21°08'00"L	
38+00	1898.43			+.03138

38+25	1898.21	+1.08135	
P.I.			
38+50	1900.0	1905.9	
38+75	1900.01		
39+00	1900.03	1905.95	
39+25	1900.05	+1.00076	
39+50	1900.07	1906.00	
39+75	1900.09		
P.I			
39+80.43	1900.1	1906.00	12°27'30" L
40+00	1900.12		
40+25	1900.15	+1.0012 1906.00	

40+50	1900.18		
40+75	1900.21		
41+00	1900.24	1906.1	
41+25	1900.27		
41+50	1900.30		
41+75	1900.33	+1.001 N	
42+00	1900.36	1906.3	
42+25	1900.39		
42+50	1900.42		
42+75	1900.45		

43+00	1900.48	+.0012	1906.4	
P.I.				
43+10.97	1900.5	X	1906.4	52°55'30"
43+25	1907.40	+.49259		
P.I.				
43+38	1913.8	X	1919.7	
43+50	1915.00			
43+75	1917.50	+.10000		
P.I.				
44+00	1920.0	X	1925.9	
44+25	1919.75	-.01000		
P.I.				
44+40	1919.6	X	1925.5	
44+50	1917.36			

44+75	1911.76			
45+00	1906.16	-.22400	1912.1	
45+25	1900.56			
P.I.				
45+40	1897.2	X	1903.1	
45+50	1897.0			
45+75	1896.50			
46+00	1896.0	-.02000	1901.9	
46+25	1895.50			
P.I.				
46+50	1895.0	X	1900.9	
46+75	1892.5	-.10000		

	P.I.		
47+00	1890.0	X	1895.9
47+25	1887.75		
47+50	1885.50	.09000	
47+75	1883.25		
	P.I.		
48+00	1881.0	X	1886.9
48+25	1879.75		
48+50	1878.50	.05000	
48+75	1877.25		
	P.I.		
49+00	1876.0	X	1881.9
49+25	1872.52		
49+50	1869.04		
49+75	1865.56		
50+00	1862.08	.13918	1868.0
50+25	1858.60		
	P.I.		
50+48	1855.4	X	1861.3
50+50	1854.90		
50+75	1848.68		
51+00	1842.45	.24902	1848.4
51+25	1836.23		
	P.I.		
51+50	1830.0	X	1835.9

	P.I.		
51+50	1830.0	x	1835.9
51+75	1828.25		
52+00	1826.50	-.07000	1832.4
52+25	1824.75		
	P.I		
52+50	1823.0	x	1828.9
52+75	1820.0	-1.2000	
	P.I.		
53+00	1817.0	x	1822.9
53+25	1809.31		
53+50	1801.62	-.30769	
	P.I.		
53+65	1797.0	x	1802.9

53+75	1796.96		
54+00	1796.85		1802.8
54+25	1796.75		
54+50	1796.63		
	P.O.T. 54+50.73		
54+75	1796.53	-.00426	
55+00	1796.43		1802.3
55+25	1796.32		
	P.O.T. 55+34.16		
55+50	1796.21		
55+75	1796.12		
	P.I.		
56+00	1796.0	x	1801.9

1801.6
1797

	P.I.		
56+00	1796.0	X	1801.9
56+25	1791.50		
56+50	1787.00		1792.9
56+75	1782.50	-.18000	
57+00	1778.00		1783.9
57+25	1773.50		
	P.I.		
57+50	1769.0	X	1774.9
57+75	1763.0	-.24000	
	P.I.		
58+00	1757.0	X	1762.9
58+25	1755.25		

58+50	1753.50		1759.4
58+75	1751.75	-.07000	
P.O.T.			
58+86.43			
	P.I.		
59+00	1750.0	X	1755.9
59+25	1745.07	-.19737	
	P.I.		
59+38	1742.5	X	1748.4
59+50	1742.44		
59+75	1742.32	-.00484	
	P.I.		
60+00	1742.2	X	1748.1
60+25	1742.10	-.00400	
	P.I.		
60+50	1742.0	X	1747.9

	P.I.		
60+50	1742.0	X 1747.9	
60+75	1740.75		
P.O.T. 60+86.29			
61+00	1739.50		−.05000
61+25	1738.25		
	P.I.		
61+50	1737.0	X 1742.9	
61+75	1733.05		
62+00	1729.10	1735.0	−.15789
P.O.T. 62+17.90			
62+25	1725.16		
	P.I.		
62+45	1722.0	X 1727.9	
62+50	1719.97		−.40588

	P.I.		
62+62	1715.1	X 1721.0	
62+75	1715.02		
63+00	1715.05		−.00135
63+25	1715.08		
	P.I.		
63+36	1715.0	X 1720.9	
63+50	1715.68		
63+75	1716.90		+.04878
	P.I		
63+77	1717.0	X 1722.9	+.60870
	P.I.		
64+00	1731.0	X 1736.9	
64+25	1738.73		+.30909 +.27272
P.O.T. 64+34.51			

1729.1
1722
7.1

*

64+50	1744.64 ~~1746.45~~		
		+.30909	
64+75	1754.18	+.27272	
	P.I.		
64+77	1752.0 ~~1754.8~~ X	~~1760.7~~ ✓	
65+00	1755.52 ~~1758.84~~	~~1764.7~~	
		+.17586	
65+25	~~1763.24~~		
	P.I.		
65+35	~~1765.0~~ X	~~1770.9~~	
65+50	1763.17 ~~1766.67~~	+.12500 +.15306	
	P.I.		
65+75	1767.0 ✓ ~~1770.0~~ X	~~1775.9~~	
66+00	1767.42 ~~1770.06~~	~~1776.0~~	
		+.00238	
66+25	~~1770.12~~	+.01667	

66+50	1768.25 1770.18	1776.1	
66+75	~~1770.24~~		
67+00	1769.08 1770.30	1776.2	
		+.00238	+.01667
67+25	1770.36		
67+50	1769.91 1770.42	1776.3	
67+75	~~1770.48~~		
	P.I.		
67+85	1770.6 X	1776.4	
68+00	1771.38 ~~1771.88~~	1777.8	
		+.09204 ✓	+.05882
68+25	1774.18		
68+50	1774.31 ~~1776.48~~		

68+75	1778.78		
68+88	~~1779.98~~	X	~~1785 9~~
	~~1780.46~~		~~1786 4~~
69+00	~~1781.08~~		~~1787 0~~
	1777.24		
69+25		+.09204	
	~~1785.47~~		
69+50	~~1785.69~~		~~1788 4~~
	1780.17		
69+75		~~+.04824~~ +.05862	
	~~P.I~~		
69+86	~~1789.0~~	X	~~1797 9~~
	~~1783.92~~		~~1789.8~~
	~~1784.48~~		~~1791 4~~
70+00	~~1789.76~~		~~1795 7~~
	1783.10		
70+25			
	1786.03	+.05446	
	~~1786.49~~		
70+50	~~1792.49~~		~~1792 4~~
+55	~~1786.69~~		~~1798 6~~
	P.I		
70+75	1787.5	X	1793 4

	~~P.I.~~		
70+87	1794.5	X	1800 4
71+00	1802.16	+.08885	1808 1
71+25			
	P.I		
71+50	1831.6	X	1837 5
71+75	1846.9	+.08819	
	P.I		
72+00	~~1868.5~~	X	~~1868 4~~
	1858.0		
72+25	1873.5	+.04000	
	P.I.		
72+50	~~1884.5~~	X	~~1890 4~~
	1881.5	+.02500	
73+00	1899.0	X	1904 9
73+25	1899.27	+.01025	

73+50	1899.54				
		+.01025			
73+75	1899.81				
	P.I.				
73+93	1900.0	X	1905.9		
74+00	1900.86		1906.4		
		+.12807			
74+25	1903.93				
	P.I.				
74+50	1907.0	X	1912.9		
		+.08000			
74+75	1909.0				
	P.I.				
75+00	1911.0	X	1916.9		
		+.00732			
75+25	1911.18				
75+50	1911.37				
75+75	1911.55				
		+.00732			
75+95.66	1911.7	X	1917.6	22°01'15" Lt.	
76+00	1911.72				
		+.00523			
76+25	1911.85				
76+50	1911.98				
	P.I.				
76+53	1912.0	X	1917.9		
76+75	1903.68				
		-.37805			
77+00	1899.23		1900.1		
77+25	1884.78				
	P.I.				
77+35	1881.0	X	1886.9		

	P.I.		
77+35	1881.0		
		-.42553	
77+50	1874.62		
77+75	1863.98		
	P.I.		
77+82	1861.0	1866.9	
78+00	1858.35	1864.3	
		-.14706	
78+25	1854.68		
	P.I		
78+50	1851.0	1856.9	
		-.26000	
78+75	1844.50		
	P.I.		
79+00	1838.0	1843.9	
		-.33529	
79+25	1829.62		

		-.33529	
79+50	1821.23		
	P.I.		
79+68	1815.2	1821.1	
		-.57083	
79+75	1811.20		
	P.I.		
79+92	1801.5	1807.4	
80+00	1801.18	1807.1	
		-.03947	
80+25	1800.20		
80+30	1800.0	1805.9	
80+50	1792.08		
		-.39607	
80+75	1782.18		
	P.I.		
80+81	1779.8		

	P.I.	
80+81	1779.8	
		-.34545
	P.I	
80+92	1776.0	
81+00	1770.19	
81+25	1752.04	-.72609
	P.I	
81+38	1742.6	
81+50	1742.10	
81+75	1741.05	-.041935
	P.I	
82+00	1740.0	
82+25	1738.93	
82+50	1737.86	-0.04273

82+75	1736.80	
83+00	1735.73	-.04273
	P.I	
83+10	1735.3	
83+25	1731.05	
83+50	1723.97	
83+75	1716.88	-.28333
	P.I	
84+00	1709.8	
84+25	1703.90	-.23600
	P.I.	
84+50	1698.0	
84+75	1691.66	

85+00	1685.33	
85+25	1678.99	-.25349
P.I. 85+36	1676.2	
85+50	1674.79	
85+75	1672.28	
86+00	1669.76	
86+25	1667.25	-.10061
86+50	1664.73	
86+75	1662.22	
P.I. 87+00	1659.7	

87+25	1649.16	-.42143
P.I. 87+42	1642.0	
87+50	1641.92	
87+75	1641.69	
88+00	1641.46	
88+25	1641.23	
88+50	1641.00	-.00915
88+75	1640.78	
89+00	1640.55	
P.I. 89+16	1640.4	

	P.I	
89+16	1640.4	
89+25	1640.45	+.00538
	P.I.	
89+33	1640.5	
89+50	1645.57	
89+75	1653.04	+.29851
	P.I	
90+00	1660.5	
90+25	1664.92	
90+50	1669.34	
90+75	1673.77	
91+00	1678.19	
91+25	1682.61	
91+50	1687.03	
91+75	1691.45	
92+00	1695.88	
92+25	1700.30	+.17688
92+50	1704.72	
92+75	1709.14	
93+00	1713.56	
	P.I.	
93+20	1717.1	
93+25	1718.21	+.22206

93+50	1723.76	
93+75	1729.31	+.22206
P.I.		
93+88	1732.2	
94+00	1733.23	
94+25	1735.38	+.08594
94+50	1737.53	+.08594
P.I.		
94+52	1737.7	
94+75	1747.43	+.42292
P.I.		
95+00	1758.0	+.42292
95+25	1761.41	+.13636

P.I.		
95+33	1762.5	
95+50	1771.73	+.54286
P.I.		
95+68	1781.5	+.54286
95+75	1783.25	+.25000
P.I.		
96+00	1789.5	+.25000
96+25	1798.18	+.34722
96+50	1806.86	+.34722
P.I.		
96+72	1814.5	+.10714
96+75	1814.82	+.10714
P.I.		
97+00	1817.5	

	P.I		
97+00	1817.5	X	
97+25	1828.75	+.45000	
	P.I.		
97+50	1840.0	X	
97+75	1848.38		
98+00	1856.75	+.33500	
98+25	1865.13		
	P.I		
98+50	1873.5	X	
98+75	1880.25	+.27000	
	P.I.		
99+00	1887.0	X	
99+25	1892.11		

99+50	1897.23		
99+75	1902.34	+.20451	
	P.I.		
99+8606	1904.6	X	3°42'-00" L
100+00	1904.57		
100+25	1904.50		
100+50	1904.45	-.00233	
	P.I		
100+72	1904.4	X	
100+75	1903.12		
101+00	1895.74	-.29487	
101+25	1888.37		

	P.I	
101+50	1881.0	-.44000
	P.I.	
101+75	1870.0	
102+00	1867.74	
102+25	1865.49	
102+50	1863.23	-.09026
102+75	1860.97	
	P.I.	
102+88	1859.8	
103+00	1855.69	
103+25	1847.13	-.34253
103+50	1838.56	

	P.I.	
103+75	1830.0	-.3600
	P.I.	
104+00	1821.0	
104+25	1813.40	
104+50	1805.80	-.30400
	P.I.	
104+62.5	1802.0	
104+75	1793.70	-.66437
105+00	1777.09	
	P.I.	
105+06	1773.1	
105+25	1773.04	-.00294
	P.I.	
105+40	1773.0	

	P.I.	
105+40	1773.0	
105+50	1773.02	
105+75	1773.07	+.00200
	P.I.	
105+90	1773.1	
106+00	1774.21	
106+25	1776.99	
106+50	1779.78	
106+75	1782.56	+.11125
107+00	1785.34	
107+25	1788.12	

	P.I	
107+50	1790.9	
107+75	1792.0	
108+00	1793.10	
108+25	1794.20	
108+50	1795.30	+.04400
108+75	1796.40	
	P.I.	
109+00	1797.5	
109+25	1808.51	
109+50	1819.52	+.44050
	P.I.	
109+67	1827.0	

	P.I.		
109+67	1827.0		
		t. 30303	
109+75			
	P.I.		
110+00	1837.0	2°48'07" R	
		t. 30555	
110+25			
	P.I.		
110+36	1848.0		
110+50			
		t. 47656	
110+75			
	P.I.		
111+00	1878.5		
		t. 53659	
111+25			
	P.I.		
111+41	1900.5		

	P.I.		
111+41	1900.5		
111+50	1900.48		
111+75			
112+00	1900.38		
112+01	~~P.I.~~		25°16' LT.
112+04.56	~~1900.4~~ 1900.38		~~30°08'27" L~~
112+25		-.00193	
112+50	1900.29		
112+75		-.00158	
113+00	1900.19		
113+25			

113+50 1900.10

-.00150

113+75

-.00193

EQ. P.I.

~~113+90.22 AH~~ 1900.1 X ~~7°03'40"L~~

~~113+94.85 BK~~

P.I.

114+00 1900.0 X

114+15 AH 1897.40 9°10'LT

114+14.35 BK

114+25

-.17610 -.18085

114+50 1891.07

P.I.

114+67 1888.0 X

114+75

-.33000

115+00

P.I.

115+17 1871.5 X

115+25

115+50

115+75

116+00

-.00131

116+25

116+50

P.I.

116+70 1871.3 X

116+75

117+00

-.09353

117+25

	P.I.		
117+42.69	1864.5 X		23°34'00" R
117+50	1864.46		
117+75			
		-.00524	
118+00	1864.20		
118+25			
	P.I.		
118+38.02	1864.0 X		21°11'15" R
118+50			
		-.08067	
118+75			
	P.I		
119+00	1859.0 X		
		+.04918	
119+25			

119+50			
	P.I.		
119+61	1862.5 X		
119+75			
120+00	1862.57		
120+25			
120+50	1862.66		
		+.00172	
120+75			
121+00	1862.75		
121+25			
	P.I.		
121+35	1862.8 V		

	P.I.		
121+35	1862.8		
	↑		
121+50	1866.54		
		+.24923	
121+75			
	P.I.		
122+00	1879.0	X	
122+25			
122+50			
	P.I.		
122+58.94	1884.0	X	18°52'00"L
122+75			
	P.I.		
123+00	1886.5	X	
		+.00145	
123+25			

123+50	1886.6		
	P.I.		
123+68.70	1886.6	X	9°31'31"L
123+75			
124+00	1886.65		
124+25		+.00170	
124+50	1886.73		
124+75			
	P.I.		
124+86	1886.8	X	
125+00	1888.48		
		+.12031	
125+25			

	P.I.		
125+50	1894.5		
125+75			
	P.I.		
125+95.14	1894.6	4°41'26" L	
126+00			
126+25			
	P.I.		
126+35	1894.5		
126+50	1891.04		
126+75			
	P.I.		
127+00	1879.5		
	P.I.		
127+18	1870.0		

-.23077

	P.I.		
127+18	1870.0		
127+25			
127+50			
E.Q.	P.I.		
127+67.14 BK 127+66.81 AH.	1859.5		3°59'57" R
127+75			
128+00			
	P.I		
128+10	1859.4		
128+25			
128+50			
	P.I.		
128+68	1859.5		

	P.I.
128+68	1859.5
128+75	
	P.I.
129+00	1872.5
129+25	
	P.I.
129+50	1875.9
129+75	
130+00	1883.38
	+14.96
130+25	
EQ.	P.I.
130+25.53 BK 143+00.00 AH	1887.2
	P.I.
143+25	1891.0

	P.I.
143+25	1891.0
143+50	
	P.I.
143+69.19	1894.2
143+75	
144+00	
144+26.5	
144+40	

TUNNEL

South Side of Tunnel

172+32.00			
172+40	1893.0		
172+42.50			
172+50	1892.94		
172+50.5			3°42'30" L
172+74.40		C- 7.13	
172+75	1892.57		
173+00			
173+25		0.004	
173+50			
173+75		C- 9.17	
174+00			
174+25		C 5.93	
174+50			
174+75		C- 7.18	
175+00			
175+25		C- 3.91	
175+50			
175+75			
176+00			
176+25		C- 8.43	
176+50			
176+75		C- 7.30	
177+00			

177+22.40		C-	
~~177+25~~	1890.22	6.80	
177+54.40			
177+50	1890.03		
	P.I.		
177+60	~~1890.0~~ X		~~0°04'15"R~~
177+86.07	1857.57		
~~177+75~~			
~~178+00~~			
178+17.93	1884.60		
~~178+25~~		C 5 83	
178+33.01	1883.19	C 4 57	
	P.I.		
~~178+35~~	~~1883.0~~ X		
178+35.0	1882.0	VPI	C ~~4 57~~
~~178+50~~			
178+36.82	1882.20		C 4 72
	P.I.		
~~178+75~~	~~1865.5~~ X		
178+66.15	1869.37		C 6 17
179+00			

179+25		
178+75.0	1865.50	
~~179+50~~		
178+77.50	1865.48	
~~179+25~~		
179+07	1865.44	PIER
180+00		
180+25		
180+50		
180+75		
181+00	1865.2 X	END OF LINE

0+00	TO	27	LAY AHD
27+00	TO	30	- LAY BK
30	TO	76+53	- LAY AHD
76+53	TO	89+16	- LAY BK
89+16	TO	100	- LAY AHD
100	TO	105+40	- LAY BK
105+40	TO	END	- LAY AHD

27

76

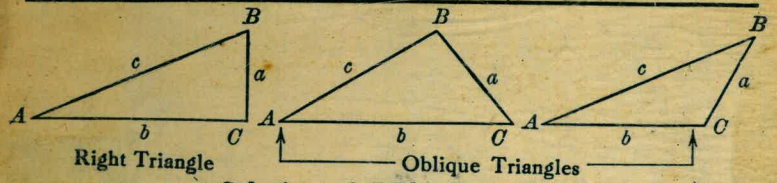
100

Tunnel

Changes -

EQ. AT 110 SEE ALIGNMENT

GR. CHANGE AT 111+41 & 111+57



Right Triangle — Oblique Triangles

Solution of Right Triangles

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

Given	Required	
a, b	A, B, c	$\tan A = \frac{a}{b} = \cot B$, $c = \sqrt{a^2 + b^2} = a\sqrt{1 + \frac{b^2}{a^2}}$
a, c	A, B, b	$\sin A = \frac{a}{c} = \cos B$, $b = \sqrt{(c+a)(c-a)} = c\sqrt{1 - \frac{a^2}{c^2}}$
A, a	B, b, c	$B = 90° - A$, $b = a \cot A$, $c = \frac{a}{\sin A}$.
A, b	B, a, c	$B = 90° - A$, $a = b \tan A$, $c = \frac{b}{\cos A}$.
A, c	B, a, b	$B = 90° - A$, $a = c \sin A$, $b = c \cos A$,

Solution of Oblique Triangles

Given	Required	
A, B, a	b, c, C	$b = \frac{a \sin B}{\sin A}$, $C = 180° - (A + B)$, $c = \frac{a \sin C}{\sin A}$
A, a, b	B, c, C	$\sin B = \frac{b \sin A}{a}$, $C = 180° - (A + B)$, $c = \frac{a \sin C}{\sin A}$
a, b, C	A, B, c	$A + B = 180° - C$, $\tan \frac{1}{2}(A - B) = \frac{(a-b)\tan \frac{1}{2}(A+B)}{a+b}$, $c = \frac{a \sin C}{\sin A}$
a, b, c	A, B, C	$s = \frac{a+b+c}{2}$, $\sin \frac{1}{2}A = \sqrt{\frac{(s-b)(s-c)}{bc}}$, $\sin \frac{1}{2}B = \sqrt{\frac{(s-a)(s-c)}{ac}}$, $C = 180° - (A+B)$
a, b, c	Area	$s = \frac{a+b+c}{2}$, area $= \sqrt{s(s-a)(s-b)(s-c)}$
A, b, c	Area	area $= \frac{b\,c \sin A}{2}$
A, B, C, a	Area	area $= \frac{a^2 \sin B \sin C}{2 \sin A}$

REDUCTION TO HORIZONTAL

Horizontal distance = Slope distance multiplied by the cosine of the vertical angle. Thus: slope distance = 319.4 ft. Vert. angle = 5° 10′. From Table, Page IX. cos 5° 10′ = .9959. Horizontal distance = 319.4 × .9959 = 318.09 ft.

Horizontal distance also = Slope distance minus slope distance times (1 − cosine of vertical angle) With the same figures as in the preceding example, the following result is obtained. Cosine 5° 10′ = .9959. 1 − .9959 = .0041. 319.4 × .0041 = 1.31. 319.4 − 1.31 = 318.09 ft.

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

MADE IN U. S. A.