

DIRECTIONAL SURVEY CALCULATION

MINIMUM CURVATURE METHOD

Well Name		Target Direction		Slot	N / S	E / W	Hole Size	Calculation by		Date
Unruh 2629 1-17H		1.45		Coordinate						2/26/13
Job Number		Type of Survey		Tie-in Point				Directional Co.		
0										
Measured Depth	Hole Angle	Hole Direction	Course Length	True Vertical Depth	Vertical Section	Total Coordinate		Dogleg Severity	Build Up %/100 ft	Walk/ %/100 ft
						N + / S -	E + / W -			
0	0	0	0	0.00	0.00			<< TIE-IN POINT >>		
0	0	0		0.00	0.00	0.00	0.00			
1621	2	350	1621	1,620.81	20.81	20.91	-3.61	0.09	0.09	21.60
1908	2	18	287	1,907.71	28.34	28.42	-3.01	0.26	0.03	-115.75
2386	1	9	478	2,385.61	38.04	38.06	-0.41	0.17	-0.17	-1.80
2864	1	8	478	2,863.56	44.24	44.25	0.53	0.02	-0.02	-0.36
3340	1	354	476	3,339.52	50.84	50.85	0.55	0.06	0.04	72.82
3529	1	351	189	3,528.50	53.61	53.62	0.18	0.06	-0.05	-2.01
3622	1	339	93	3,621.49	54.85	54.87	-0.16	0.18	0.00	-12.69
3716	1	348	94	3,715.48	56.17	56.20	-0.55	0.18	0.11	9.89
3810	1	351	94	3,809.47	57.61	57.65	-0.82	0.05	0.00	2.87
3905	1	347	95	3,904.45	59.15	59.20	-1.13	0.12	0.11	-3.47
4000	1	336	95	3,999.44	60.86	60.92	-1.70	0.31	0.21	-11.58
4063	2	331	63	4,062.42	62.21	62.29	-2.40	0.67	0.63	-9.21
4095	3	349	32	4,094.39	63.44	63.53	-2.78	5.19	4.69	57.50
4127	6	357	32	4,126.30	65.81	65.91	-3.04	7.70	7.50	24.06
4158	8	359	31	4,157.09	69.34	69.44	-3.16	6.83	6.77	7.74
4189	10	359	31	4,187.74	74.00	74.10	-3.22	6.77	6.77	0.32
4221	12	359	32	4,219.18	79.94	80.05	-3.32	6.25	6.25	-0.62
4253	14	1	32	4,250.40	86.94	87.05	-3.32	6.08	5.94	#####
4284	16	3	31	4,280.39	94.78	94.89	-3.08	6.90	6.77	5.16
4315	18	3	31	4,310.08	103.71	103.81	-2.61	6.83	6.77	2.90
4347	19	2	32	4,340.41	113.89	113.98	-2.16	4.98	4.69	-5.31
4378	21	0	31	4,369.52	124.54	124.63	-2.00	5.46	5.16	-5.16
4411	23	360	33	4,400.14	136.84	136.94	-2.03	6.08	6.06	1,089.70
4443	24	1	32	4,429.48	149.62	149.72	-1.93	4.42	4.06	#####
4475	26	1	32	4,458.44	163.22	163.32	-1.73	5.97	5.94	-1.56
4508	29	1	33	4,487.74	178.41	178.50	-1.51	7.91	7.88	1.52
4539	31	2	31	4,514.68	193.74	193.83	-1.11	6.23	6.13	2.26
4571	33	3	32	4,541.89	210.58	210.65	-0.43	7.37	7.19	3.13
4603	35	2	32	4,568.40	228.49	228.56	0.30	7.36	7.19	-2.81
4634	38	2	31	4,593.35	246.88	246.94	0.84	7.78	7.74	-1.29
4666	40	0	32	4,618.36	266.85	266.90	1.11	6.82	6.25	-4.38
4699	42	2	33	4,643.30	288.45	288.50	1.48	8.57	7.88	5.15
4730	44	3	31	4,665.86	309.70	309.75	2.28	7.26	7.10	2.26
4762	46	3	32	4,688.39	332.42	332.45	3.33	5.35	5.31	0.94
4794	46	3	32	4,710.59	355.46	355.46	4.50	0.55	-0.31	0.63
4826	46	3	32	4,732.88	378.41	378.38	5.72	0.96	-0.94	0.31
4858	45	3	32	4,755.31	401.22	401.17	6.93	1.27	-1.25	-0.31
4890	45	2	32	4,777.86	423.92	423.86	7.98	1.67	-0.62	-2.19
4921	45	3	31	4,799.69	445.94	445.85	8.92	1.19	0.97	0.97
4953	47	3	32	4,821.77	469.08	468.98	9.95	5.94	5.94	-0.31
4984	51	3	31	4,842.13	492.45	492.33	10.99	10.65	10.65	0.32
5016	53	2	32	4,861.85	517.65	517.51	11.94	8.72	8.44	-2.81
5047	56	1	31	4,879.72	542.98	542.83	12.62	9.71	9.68	-0.97
5080	59	1	33	4,897.28	570.91	570.76	13.18	9.48	9.39	-1.52
5112	62	0	32	4,912.86	598.85	598.71	13.47	9.21	9.06	-1.88
5144	66	0	32	4,926.89	627.61	627.46	13.59	10.63	10.63	-0.31
5175	69	1	31	4,938.72	656.25	656.10	13.97	12.38	11.94	3.55
5207	72	1	32	4,949.30	686.45	686.30	14.61	8.15	8.12	-0.63
5239	74	2	32	4,958.65	717.05	716.89	15.33	6.43	6.25	1.56
5271	78	1	32	4,966.50	748.06	747.90	16.11	11.29	11.25	-0.94
5303	81	2	32	4,972.39	779.51	779.33	17.02	11.45	11.25	2.19
5335	83	2	32	4,976.68	811.22	811.02	18.04	6.94	6.88	-0.94
5358	85	2	23	4,979.10	834.09	833.88	18.86	5.66	4.78	3.04
5389	87	2	31	4,981.34	865.00	864.77	20.13	8.72	8.71	-0.32
5421	90	3	32	4,982.12	896.98	896.72	21.61	9.02	8.75	2.19
5517	92	4	96	4,980.62	992.92	992.55	27.05	1.95	1.88	0.52

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Unruh 2629 1-17H		1.45		Coordinate						2/26/13
Job Number		Type of Survey		Tie-in Point				Directional Co.		
0										
Measured Depth	Hole Angle	Hole Direction	Course Length	True Vertical Depth	Vertical Section	Total Coordinate		Dogleg Severity	Build Up /100 ft	Walk/ /100 ft
						N + / S -	E + / W -			
0	0	0	0	0.00	0.00			<< TIE-IN POINT >>		
5549	92	4	32	4,979.44	1,024.87	1,024.46	29.11	2.25	1.88	1.25
5580	91	3	31	4,978.42	1,055.83	1,055.38	31.08	3.61	-3.23	-1.61
5613	91	3	33	4,977.73	1,088.81	1,088.33	32.90	1.94	-1.21	-1.52
5644	91	2	31	4,977.10	1,119.80	1,119.29	34.33	1.88	0.97	-1.61
5676	90	3	32	4,976.85	1,151.79	1,151.25	35.89	5.87	-5.31	2.50
5708	90	3	32	4,977.08	1,183.77	1,183.20	37.68	0.00	0.00	0.00
5739	90	4	31	4,977.26	1,214.75	1,214.14	39.52	1.33	0.32	1.29
5770	90	4	31	4,977.45	1,245.73	1,245.08	41.49	0.46	-0.32	0.32
5802	90	4	32	4,977.71	1,277.70	1,277.01	43.53	0.44	-0.31	-0.31
5834	89	4	32	4,978.04	1,309.68	1,308.95	45.57	0.70	-0.63	0.31
5866	89	3	32	4,978.60	1,341.65	1,340.88	47.52	2.25	-1.87	-1.25
5898	89	2	32	4,979.32	1,373.63	1,372.83	49.11	2.81	0.00	-2.81
5931	89	2	33	4,980.07	1,406.62	1,405.80	50.26	2.42	0.00	-2.42
5963	89	2	32	4,980.83	1,438.61	1,437.78	51.13	0.44	-0.31	-0.31
5995	89	1	32	4,981.39	1,470.61	1,469.77	51.91	2.58	2.50	-0.63
6027	90	1	32	4,981.69	1,502.61	1,501.76	52.47	1.90	0.31	-1.88
6058	90	0	31	4,981.88	1,533.60	1,532.76	52.76	1.37	0.97	-0.97
6089	90	1	31	4,981.88	1,564.60	1,563.76	53.14	2.33	1.29	1.94
6121	91	1	32	4,981.69	1,596.60	1,595.75	53.78	1.33	0.94	0.94
6152	91	1	31	4,981.31	1,627.60	1,626.74	54.49	1.29	1.29	0.00
6183	91	2	31	4,980.69	1,658.59	1,657.72	55.43	3.32	1.61	2.90
6215	91	1	32	4,979.93	1,690.58	1,689.69	56.41	2.83	-0.31	-2.81
6247	90	0	32	4,979.71	1,722.58	1,721.69	56.86	6.43	-5.62	-3.13
6278	90	360	31	4,979.98	1,753.56	1,752.69	56.88	1.61	0.00	1,159.68
6309	90	360	31	4,980.20	1,784.55	1,783.69	56.80	0.72	0.65	0.32
6341	89	360	32	4,980.45	1,816.54	1,815.69	56.78	0.99	-0.94	0.31
6373	89	360	32	4,980.84	1,848.53	1,847.68	56.78	0.62	-0.63	0.00
6404	89	0	31	4,981.27	1,879.52	1,878.68	56.86	0.97	0.00	#####
6436	89	360	32	4,981.80	1,911.50	1,910.68	56.91	1.56	-0.94	1,123.75
6468	89	360	32	4,982.47	1,943.48	1,942.67	56.86	0.62	-0.63	0.00
6500	88	360	32	4,983.31	1,975.46	1,974.66	56.77	1.29	-1.25	-0.31
6531	89	359	31	4,984.09	2,006.43	2,005.65	56.53	2.28	1.61	-1.61
6563	89	360	32	4,984.76	2,038.41	2,037.64	56.25	1.25	0.00	1.25
6594	89	360	31	4,985.47	2,069.39	2,068.63	56.12	0.72	-0.65	0.32
6626	89	360	32	4,986.19	2,101.37	2,100.62	56.00	0.62	0.63	0.00
6658	89	0	32	4,986.84	2,133.35	2,132.61	56.03	1.59	0.31	#####
6690	90	1	32	4,987.25	2,165.34	2,164.61	56.34	2.69	2.19	1.56
6721	92	3	31	4,986.93	2,196.34	2,195.59	57.26	8.68	6.45	5.81
6753	92	3	32	4,985.92	2,228.31	2,227.54	58.79	1.56	1.25	0.94
6785	91	3	32	4,985.00	2,260.29	2,259.48	60.49	2.38	-2.19	0.94
6817	91	3	32	4,984.36	2,292.27	2,291.43	62.20	1.33	-0.94	-0.94
6850	90	3	33	4,983.96	2,325.26	2,324.38	63.84	1.84	-1.82	-0.30
6881	90	4	31	4,983.85	2,356.24	2,355.33	65.62	3.47	-1.29	3.23
6913	90	5	32	4,983.91	2,388.20	2,387.25	67.97	2.58	-0.63	2.50
6944	90	4	31	4,983.96	2,419.16	2,418.15	70.37	1.16	0.65	-0.97
6976	90	3	32	4,984.04	2,451.13	2,450.09	72.41	4.17	-0.94	-4.06
7007	90	2	31	4,984.23	2,482.13	2,481.06	73.68	4.21	-0.32	-4.19
7039	91	2	32	4,984.06	2,514.13	2,513.05	74.60	4.39	4.38	-0.31
7070	90	2	31	4,983.69	2,545.12	2,544.03	75.49	1.96	-1.94	0.32
7103	90	2	33	4,983.57	2,578.12	2,577.02	76.41	1.36	-1.21	-0.61
7134	90	2	31	4,983.63	2,609.12	2,608.01	77.25	0.72	-0.65	0.32
7166	90	0	32	4,983.63	2,641.12	2,640.00	77.81	3.95	1.25	-3.75
7198	90	0	32	4,983.46	2,673.12	2,672.00	78.03	0.62	0.63	0.00
7230	91	0	32	4,983.21	2,705.11	2,704.00	78.20	0.70	0.31	-0.63
7261	91	1	31	4,982.94	2,736.10	2,735.00	78.45	1.61	0.00	1.61
7293	90	0	32	4,982.71	2,768.10	2,766.99	78.73	1.40	-0.63	-1.25
7325	90	1	32	4,982.57	2,800.09	2,798.99	78.98	0.99	-0.31	0.94

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						N + / S -	E + / W -				
0	0	0	0	0.00	0.00			<< TIE-IN POINT >>			
7357	90	0	32	4,982.49	2,832.09	2,830.99	79.23	0.99	-0.31	-0.94	
7389	90	0	32	4,982.38	2,864.08	2,862.99	79.37	0.70	0.63	-0.31	
7420	91	360	31	4,982.16	2,895.07	2,893.99	79.31	2.04	0.65	1,159.35	
7451	90	360	31	4,982.00	2,926.06	2,924.99	79.20	1.82	-1.29	1.29	
7483	90	0	32	4,981.89	2,958.05	2,956.99	79.29	1.13	0.63	#####	
7515	91	1	32	4,981.66	2,990.04	2,988.99	79.57	1.40	0.63	1.25	
7546	90	1	31	4,981.50	3,021.04	3,019.98	80.05	1.82	-1.29	1.29	
7578	90	1	32	4,981.50	3,053.04	3,051.98	80.56	1.40	-0.62	-1.25	
7610	90	1	32	4,981.53	3,085.04	3,083.97	80.98	0.44	0.31	0.31	
7641	90	1	31	4,981.50	3,116.04	3,114.97	81.52	1.33	0.32	1.29	
7673	91	2	32	4,981.33	3,148.03	3,146.96	82.47	3.37	1.25	3.13	
7705	91	2	32	4,981.03	3,180.03	3,178.93	83.64	0.70	0.31	-0.63	
7736	91	2	31	4,980.51	3,211.02	3,209.91	84.67	2.35	2.26	-0.65	
7768	91	2	32	4,979.87	3,243.02	3,241.89	85.70	0.99	-0.94	0.31	
7800	91	2	32	4,979.31	3,275.01	3,273.86	86.87	1.25	0.00	1.25	
7863	89	1	63	4,979.48	3,338.00	3,336.83	88.80	4.05	-3.65	-1.75	
7895	89	360	32	4,980.23	3,369.99	3,368.82	89.10	4.07	-0.31	1,120.94	
7926	91	1	31	4,980.37	3,400.98	3,399.81	89.27	7.86	7.42	#####	
7959	92	360	33	4,979.45	3,433.96	3,432.80	89.44	4.89	4.24	1,088.48	
7990	92	358	31	4,978.31	3,464.91	3,463.77	88.95	5.32	-1.29	-5.16	
8022	92	358	32	4,977.28	3,496.85	3,495.74	88.03	0.44	-0.31	0.31	
8053	92	359	31	4,976.25	3,527.79	3,526.71	87.19	0.72	0.65	0.32	
8085	92	358	32	4,975.16	3,559.72	3,558.68	86.24	1.29	-0.31	-1.25	
8116	92	358	31	4,974.19	3,590.66	3,589.65	85.30	1.16	-0.65	0.97	
8148	92	359	32	4,973.24	3,622.61	3,621.63	84.54	1.56	0.00	1.56	
8179	92	359	31	4,972.21	3,653.56	3,652.61	83.98	1.33	1.29	0.32	
8211	92	359	32	4,970.95	3,685.51	3,684.58	83.36	1.13	0.94	-0.62	
8243	93	358	32	4,969.58	3,717.43	3,716.53	82.53	1.90	0.31	-1.88	
8275	91	358	32	4,968.52	3,749.36	3,748.50	81.44	3.87	-3.75	-0.94	
8306	91	358	31	4,967.87	3,780.29	3,779.47	80.22	1.16	-0.65	-0.97	
8338	91	358	32	4,967.29	3,812.21	3,811.43	78.91	0.44	-0.31	0.31	
8370	90	358	32	4,967.04	3,844.15	3,843.41	77.74	3.66	-3.44	1.25	
8402	90	358	32	4,967.12	3,876.10	3,875.40	76.70	0.44	-0.31	0.31	
8433	90	358	31	4,967.26	3,907.04	3,906.38	75.68	0.72	-0.32	-0.65	
8465	90	358	32	4,967.34	3,938.99	3,938.36	74.59	0.99	0.94	0.31	
8496	90	359	31	4,967.37	3,969.95	3,969.35	73.80	2.92	-0.32	2.90	
8528	90	360	32	4,967.45	4,001.93	4,001.35	73.52	3.14	-0.31	3.13	
8560	90	360	32	4,967.53	4,033.92	4,033.35	73.47	0.70	0.31	-0.62	
8591	90	360	31	4,967.59	4,064.91	4,064.35	73.41	0.65	0.00	0.65	
8623	90	360	32	4,967.64	4,096.89	4,096.35	73.33	0.94	0.00	-0.94	
8654	90	360	31	4,967.72	4,127.88	4,127.35	73.11	0.72	-0.32	-0.65	
8686	90	359	32	4,967.89	4,159.85	4,159.34	72.72	1.40	-0.63	-1.25	
8718	90	359	32	4,968.14	4,191.82	4,191.34	72.14	0.99	-0.31	-0.94	
8749	91	359	31	4,968.14	4,222.79	4,222.33	71.62	3.61	3.23	1.61	
8781	91	360	32	4,967.64	4,254.77	4,254.33	71.37	2.95	2.50	1.56	
8812	91	0	31	4,966.96	4,285.76	4,285.32	71.37	1.33	-0.32	#####	
8845	91	360	33	4,966.30	4,318.74	4,318.31	71.37	1.25	-0.30	1,089.70	
8876	91	360	31	4,965.79	4,349.72	4,349.31	71.23	1.02	-0.97	-0.32	
8908	91	0	32	4,965.31	4,381.71	4,381.30	71.21	1.59	0.31	#####	
8939	91	1	31	4,964.94	4,412.70	4,412.30	71.61	3.78	-1.29	3.55	
8971	91	2	32	4,964.66	4,444.70	4,444.28	72.53	2.19	0.00	2.19	
9003	90	2	32	4,964.40	4,476.70	4,476.26	73.71	0.70	-0.31	0.63	
9034	91	2	31	4,964.13	4,507.69	4,507.24	74.90	0.65	0.65	0.00	
9066	91	2	32	4,963.80	4,539.69	4,539.21	76.10	0.31	0.00	-0.31	
9097	91	2	31	4,963.45	4,570.68	4,570.19	77.29	0.72	0.32	0.65	
9130	91	2	33	4,962.99	4,603.68	4,603.16	78.44	1.92	0.61	-1.82	
9161	91	2	31	4,962.47	4,634.67	4,634.15	79.36	0.32	0.32	0.00	

