

DIRECTIONAL SURVEY CALCULATION

MINIMUM CURVATURE METHOD

Well Name		Target Direction		Slot Coordinate		N / S		E / W		Hole Size		Calculation by		Date	
Bones 2821 1-11H		358.75												9/26/12	
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 >>				
1058	0	357	1058	1,058.00	1.85	1.84	-0.08	0.02	0.02	33.78					
1305	0	351	247	1,305.00	2.92	2.91	-0.20	0.04	0.04	-2.47					
1812	0	318	507	1,811.99	4.57	4.55	-0.70	0.04	-0.04	-6.63					
2292	1	11	480	2,291.99	6.93	6.92	-0.60	0.09	0.08	-64.00					
2769	0	354	477	2,768.97	10.22	10.21	-0.36	0.05	-0.04	71.93					
3250	0	67	481	3,249.97	11.63	11.63	-0.11	0.06	-0.04	-59.58					
3726	0	245	476	3,725.97	11.27	11.26	-0.86	0.08	0.04	37.33					
4012	0	128	286	4,011.97	10.81	10.78	-1.34	0.12	-0.07	-40.87					
4108	1	347	96	4,107.96	11.66	11.63	-1.48	1.23	1.04	228.02					
4140	3	340	32	4,139.94	12.64	12.61	-1.80	4.73	4.69	-21.25					
4172	5	339	32	4,171.88	14.59	14.54	-2.53	6.88	6.88	-2.81					
4204	7	339	32	4,203.71	17.61	17.53	-3.69	5.94	5.94	-0.62					
4236	8	347	32	4,235.45	21.57	21.46	-4.89	5.38	4.38	24.38					
4267	10	345	31	4,266.06	26.34	26.21	-6.11	6.52	6.45	-6.13					
4298	12	345	31	4,296.48	32.08	31.92	-7.65	5.81	5.81	1.29					
4330	14	348	32	4,327.64	39.19	39.00	-9.35	8.01	7.81	7.81					
4362	17	349	32	4,358.48	47.61	47.38	-11.05	7.04	6.88	5.62					
4393	18	351	31	4,388.05	56.80	56.54	-12.60	5.78	5.48	6.13					
4425	21	353	32	4,418.18	67.49	67.20	-14.08	8.58	8.44	4.69					
4457	24	355	32	4,447.80	79.56	79.25	-15.36	8.20	7.81	6.56					
4488	26	356	31	4,475.95	92.52	92.18	-16.40	8.18	8.06	3.23					
4520	29	357	32	4,504.40	107.15	106.80	-17.31	7.94	7.81	3.13					
4551	31	358	31	4,531.32	122.51	122.14	-18.06	7.80	7.74	1.94					
4583	33	359	32	4,558.50	139.39	139.02	-18.63	6.21	5.94	3.44					
4615	35	360	32	4,585.06	157.24	156.86	-18.86	7.24	6.88	4.06					
4647	38	0	32	4,610.83	176.20	175.83	-18.84	8.46	8.44	#####					
4678	40	1	31	4,634.99	195.61	195.25	-18.72	7.12	7.10	0.97					
4710	42	1	32	4,659.08	216.66	216.30	-18.52	7.82	7.81	0.31					
4741	44	2	31	4,681.66	237.88	237.54	-18.13	5.83	5.48	2.90					
4773	46	2	32	4,704.31	260.45	260.14	-17.41	5.48	5.31	1.88					
4805	48	2	32	4,726.13	283.81	283.52	-16.56	7.50	7.50	0.00					
4836	49	2	31	4,746.57	307.08	306.81	-15.68	3.56	3.55	0.32					
4868	50	2	32	4,767.35	331.37	331.13	-14.81	1.44	1.25	-0.94					
4900	50	2	32	4,788.01	355.78	355.56	-14.02	0.67	0.62	-0.31					
4932	50	2	32	4,808.62	380.22	380.02	-13.25	0.00	0.00	0.00					
4963	50	2	31	4,828.61	403.88	403.71	-12.49	0.41	-0.32	0.32					
4996	50	2	33	4,849.87	429.09	428.94	-11.67	0.65	0.61	-0.30					
5026	51	2	30	4,868.93	452.22	452.09	-10.99	3.70	3.67	-0.67					
5058	54	1	32	4,888.45	477.55	477.43	-10.35	8.16	8.13	-0.94					
5090	57	0	32	4,906.66	503.83	503.74	-9.98	10.32	10.00	-3.13					
5122	60	359	32	4,923.36	531.12	531.03	-10.18	10.97	10.31	1,120.63					
5153	64	359	31	4,937.89	558.50	558.40	-10.78	11.97	11.94	-0.97					
5185	67	359	32	4,951.10	587.64	587.53	-11.49	10.62	10.63	0.00					
5217	70	359	32	4,962.70	617.46	617.34	-12.19	9.07	9.06	0.31					
5248	73	359	31	4,972.38	646.91	646.78	-12.91	10.34	10.32	-0.65					
5280	77	359	32	4,980.55	677.84	677.70	-13.70	11.25	11.25	0.31					
5311	80	358	31	4,986.73	708.21	708.06	-14.68	10.09	9.68	-2.90					
5343	82	358	32	4,991.63	739.83	739.66	-15.81	7.66	7.50	1.56					
5374	85	358	31	4,995.00	770.64	770.46	-16.86	8.76	8.71	-0.97					
5406	87	358	32	4,997.18	802.56	802.36	-18.03	6.25	6.25	0.00					
5441	89	357	35	4,998.34	837.53	837.30	-19.55	6.15	5.71	-2.29					
5505	90	358	64	4,998.68	901.51	901.23	-22.57	1.98	1.88	0.62					
5537	90	357	32	4,998.51	933.50	933.20	-23.99	0.31	0.00	-0.31					
5600	90	357	63	4,998.23	996.48	996.13	-26.90	0.22	-0.16	-0.16					
5632	90	357	32	4,998.07	1,028.47	1,028.09	-28.49	1.13	0.63	-0.94					
5695	91	356	63	4,997.57	1,091.43	1,090.98	-32.12	0.97	0.16	-0.95					
5727	91	356	32	4,997.26	1,123.39	1,122.91	-34.27	1.59	0.31	-1.56					

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Bones 2821 1-11H		358.75	Coordinate					9/26/12			
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 >>	
5790	90	356	63	4,997.10	1,186.32	1,185.76	-38.61	1.51	-1.43	0.48	
5822	90	356	32	4,997.29	1,218.29	1,217.69	-40.79	0.70	-0.31	-0.62	
5885	88	358	63	4,998.67	1,281.23	1,280.57	-44.36	3.60	-2.70	2.38	
5917	88	358	32	4,999.79	1,313.20	1,312.52	-45.70	0.88	0.62	0.62	
5980	87	359	63	5,002.37	1,376.15	1,375.44	-47.29	3.05	-1.43	2.70	
6011	87	359	31	5,003.86	1,407.11	1,406.40	-47.69	1.02	0.32	-0.97	
6075	88	1	64	5,006.31	1,471.05	1,470.35	-47.81	2.95	1.56	-560.00	
6106	88	1	31	5,007.21	1,502.01	1,501.34	-47.40	0.46	0.32	0.32	
6169	90	2	63	5,008.25	1,564.93	1,564.30	-45.75	3.03	2.06	2.22	
6201	91	3	32	5,008.14	1,596.86	1,596.27	-44.35	3.64	3.13	1.88	
6265	93	5	64	5,006.30	1,660.56	1,660.08	-39.89	4.78	2.97	3.75	
6297	93	5	32	5,004.84	1,692.33	1,691.93	-37.08	0.94	0.00	-0.94	
6359	93	5	62	5,002.03	1,753.91	1,753.63	-31.74	0.16	0.00	0.16	
6392	93	5	33	5,000.56	1,786.68	1,786.47	-28.86	0.30	-0.30	0.00	
6455	93	3	63	4,997.38	1,849.33	1,849.24	-24.53	3.56	1.27	-3.33	
6486	94	3	31	4,995.48	1,880.19	1,880.14	-22.91	1.44	1.29	0.65	
6550	94	1	64	4,991.13	1,943.93	1,943.95	-20.62	3.33	0.62	-3.28	
6581	94	1	31	4,988.91	1,974.83	1,974.86	-20.17	0.97	0.00	-0.97	
6645	94	359	64	4,984.56	2,038.67	2,038.71	-20.44	3.03	-0.62	559.53	
6676	94	359	31	4,982.56	2,069.61	2,069.64	-21.06	0.32	0.00	0.32	
6740	93	358	64	4,979.04	2,133.51	2,133.52	-22.79	2.22	-1.72	-1.41	
6772	92	357	32	4,977.68	2,165.47	2,165.46	-24.22	3.56	-0.94	-3.44	
6834	91	357	62	4,975.73	2,227.41	2,227.33	-27.62	1.62	-1.61	-0.16	
6867	91	356	33	4,975.01	2,260.37	2,260.26	-29.69	2.44	-0.30	-2.42	
6898	89	356	31	4,974.87	2,291.33	2,291.18	-31.88	6.14	-6.13	-0.32	
6961	88	356	63	4,976.63	2,354.23	2,354.00	-36.22	2.90	-2.86	0.48	
6993	88	357	32	4,977.80	2,386.18	2,385.92	-38.23	2.79	2.50	1.25	
7024	89	357	31	4,978.62	2,417.15	2,416.85	-40.07	1.29	1.29	0.00	
7056	89	356	32	4,979.23	2,449.12	2,448.79	-42.02	1.40	1.25	-0.63	
7088	88	356	32	4,980.10	2,481.08	2,480.71	-44.08	4.11	-4.06	-0.62	
7151	88	355	63	4,982.29	2,543.95	2,543.50	-48.75	1.56	0.63	-1.43	
7214	89	355	63	4,983.83	2,606.82	2,606.27	-53.86	1.28	1.27	0.16	
7246	90	355	32	4,984.25	2,638.76	2,638.16	-56.48	1.68	1.56	-0.62	
7277	89	356	31	4,984.55	2,669.71	2,669.06	-58.91	1.96	-0.32	1.94	
7309	90	356	32	4,984.66	2,701.67	2,700.98	-61.25	2.50	2.50	0.00	
7341	89	355	32	4,984.86	2,733.62	2,732.88	-63.76	3.92	-3.44	-1.88	
7404	87	355	63	4,987.06	2,796.45	2,795.60	-69.14	3.51	-3.49	-0.32	
7436	87	355	32	4,988.87	2,828.33	2,827.43	-71.90	0.99	-0.94	0.31	
7468	87	357	32	4,990.66	2,860.24	2,859.31	-74.01	6.98	1.25	6.87	
7500	87	358	32	4,992.22	2,892.20	2,891.24	-75.38	2.00	1.25	1.56	
7531	87	358	31	4,993.63	2,923.16	2,922.19	-76.57	0.00	0.00	0.00	
7563	88	359	32	4,994.80	2,955.14	2,954.15	-77.55	4.20	3.13	2.81	
7594	90	359	31	4,995.34	2,986.13	2,985.14	-78.09	4.33	3.87	1.94	
7626	89	359	32	4,995.62	3,018.13	3,017.14	-78.48	0.62	-0.62	0.00	
7657	91	360	31	4,995.56	3,049.13	3,048.13	-78.75	4.70	4.52	1.29	
7689	91	359	32	4,995.09	3,081.12	3,080.13	-79.03	1.29	0.31	-1.25	
7721	91	359	32	4,994.61	3,113.12	3,112.12	-79.42	0.31	-0.31	0.00	
7784	92	359	63	4,993.24	3,176.10	3,175.10	-80.41	1.56	1.43	-0.63	
7815	92	360	31	4,992.38	3,207.08	3,206.09	-80.79	2.66	-0.65	2.58	
7879	90	359	64	4,991.31	3,271.07	3,270.07	-81.29	1.78	-1.72	-0.47	
7910	90	359	31	4,991.12	3,302.07	3,301.07	-81.83	2.60	-0.32	-2.58	
7973	91	359	63	4,990.68	3,365.07	3,364.05	-83.26	0.45	0.32	0.32	
8005	90	359	32	4,990.49	3,397.07	3,396.04	-83.93	0.94	-0.94	0.00	
8068	90	358	63	4,990.21	3,460.06	3,459.02	-85.52	0.81	0.16	-0.79	
8100	90	358	32	4,990.10	3,492.06	3,491.01	-86.47	0.62	-0.63	0.00	
8163	90	358	63	4,989.94	3,555.06	3,553.98	-88.40	0.22	0.16	-0.16	
8194	90	358	31	4,989.86	3,586.06	3,584.96	-89.32	0.72	-0.32	0.65	

