



Job Number: SVGJ-150352  
 Company: PDC  
 Lease/Well: Culbreath 23-21  
 Location: Weld County, CO  
 Rig Name: MS Energy Wireline  
 RKB: 0'  
 G.L. or M.S.L.: GL

State/Country: Colorado/USA  
 Declination: 8.4°  
 Grid: East To True North  
 File name: S:\2015SU~1\PDC\GJ\CULBRE~1\2321.SVY  
 Date/Time: 29-Dec-15 / 11:02  
 Curve Name: Surface - 6850' M.D. (Rate Gyro)

### MS Survey

WINSERVE SURVEY CALCULATIONS  
 Minimum Curvature Method  
 Vertical Section Plane .00  
 Vertical Section Referenced to Wellhead  
 Rectangular Coordinates Referenced to Wellhead

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	C L O S U R E		Dogleg Severity Deg/100
							Distance FT	Direction Deg	
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
100.00	.67	250.63	100.00	-.19	-.55	-.19	.58	250.63	.67
200.00	.54	239.89	199.99	-.62	-1.51	-.62	1.63	247.55	.17
300.00	.46	239.51	299.99	-1.06	-2.26	-1.06	2.50	244.83	.08
400.00	.45	238.10	399.99	-1.48	-2.94	-1.48	3.29	243.38	.02
500.00	.48	227.97	499.98	-1.96	-3.59	-1.96	4.09	241.31	.09
600.00	.44	238.33	599.98	-2.45	-4.23	-2.45	4.88	239.94	.09
700.00	.51	232.44	699.98	-2.92	-4.91	-2.92	5.71	239.25	.09
800.00	.49	232.29	799.97	-3.45	-5.60	-3.45	6.58	238.34	.02
900.00	.47	255.20	899.97	-3.82	-6.33	-3.82	7.39	238.91	.19
1000.00	.55	270.85	999.96	-3.92	-7.21	-3.92	8.20	241.49	.16
1100.00	.60	277.93	1099.96	-3.84	-8.21	-3.84	9.06	244.95	.09
1200.00	.66	282.37	1199.95	-3.64	-9.29	-3.64	9.98	248.60	.08

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	C L O S U R E		Dogleg Severity Deg/100
							Distance FT	Direction Deg	
1300.00	.80	313.61	1299.95	-3.04	-10.36	-3.04	10.79	253.66	.42
1400.00	.79	327.34	1399.94	-1.97	-11.23	-1.97	11.41	260.04	.19
1500.00	.73	338.38	1499.93	-.80	-11.84	-.80	11.87	266.13	.16
1600.00	.69	340.20	1599.92	.36	-12.28	.36	12.28	271.67	.05
1700.00	.68	341.42	1699.91	1.49	-12.67	1.49	12.76	276.69	.02
1800.00	.61	341.14	1799.91	2.55	-13.03	2.55	13.28	281.08	.07
1900.00	.63	345.07	1899.90	3.59	-13.35	3.59	13.82	285.05	.05
2000.00	.64	347.02	1999.89	4.66	-13.61	4.66	14.39	288.91	.02
2100.00	.73	345.82	2099.89	5.83	-13.90	5.83	15.07	292.75	.09
2200.00	.74	347.18	2199.88	7.07	-14.19	7.07	15.86	296.49	.02
2300.00	.78	4.14	2299.87	8.38	-14.29	8.38	16.57	300.39	.23
2400.00	.88	11.85	2399.86	9.81	-14.08	9.81	17.16	304.87	.15
2500.00	1.00	20.85	2499.85	11.38	-13.61	11.38	17.74	309.89	.19
2600.00	.97	22.51	2599.83	12.98	-12.98	12.98	18.35	314.99	.04
2700.00	.86	28.90	2699.82	14.41	-12.29	14.41	18.94	319.54	.15
2800.00	.72	37.39	2799.81	15.57	-11.55	15.57	19.39	323.44	.18
2900.00	.65	40.63	2899.80	16.50	-10.80	16.50	19.72	326.80	.08
3000.00	.70	35.39	2999.79	17.43	-10.07	17.43	20.13	329.97	.08
3100.00	.68	27.95	3099.79	18.45	-9.44	18.45	20.73	332.90	.09
3200.00	.66	30.94	3199.78	19.47	-8.87	19.47	21.39	335.51	.04
3300.00	.77	31.76	3299.77	20.53	-8.22	20.53	22.12	338.19	.11
3400.00	.90	27.06	3399.76	21.81	-7.51	21.81	23.06	341.00	.15
3500.00	1.42	14.67	3499.74	23.70	-6.84	23.70	24.67	343.91	.57
3600.00	1.71	9.23	3599.70	26.38	-6.28	26.38	27.11	346.60	.33
3700.00	1.83	9.62	3699.66	29.42	-5.78	29.42	29.98	348.89	.12
3800.00	1.87	359.32	3799.60	32.63	-5.53	32.63	33.09	350.38	.33
3900.00	1.89	359.57	3899.55	35.91	-5.56	35.91	36.34	351.20	.02
4000.00	1.69	1.84	3999.50	39.03	-5.53	39.03	39.42	351.94	.21
4100.00	1.57	1.06	4099.46	41.87	-5.45	41.87	42.23	352.58	.12
4200.00	1.53	353.41	4199.43	44.57	-5.58	44.57	44.92	352.86	.21
4300.00	1.17	353.53	4299.40	46.91	-5.85	46.91	47.27	352.89	.36
4400.00	1.53	338.65	4399.37	49.17	-6.45	49.17	49.59	352.53	.50
4500.00	1.68	336.16	4499.33	51.75	-7.53	51.75	52.30	351.72	.17
4600.00	2.04	340.26	4599.28	54.77	-8.72	54.77	55.46	350.95	.38

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	True Vertical Depth	N-S FT	E-W FT	Vertical Section FT	C L O S U R E		Dogleg Severity Deg/100
							Distance FT	Direction Deg	
4700.00	2.26	323.94	4699.21	58.04	-10.48	58.04	58.98	349.76	.65
4800.00	2.77	326.30	4799.11	61.64	-12.99	61.64	63.00	348.10	.52
4900.00	3.17	334.36	4898.98	66.15	-15.52	66.15	67.94	346.79	.58
5000.00	2.60	333.22	4998.85	70.66	-17.74	70.66	72.86	345.91	.57
5100.00	2.42	327.41	5098.75	74.47	-19.90	74.47	77.08	345.04	.31
5200.00	1.70	313.99	5198.69	77.28	-22.10	77.28	80.38	344.04	.86
5300.00	1.34	301.14	5298.65	78.91	-24.17	78.91	82.53	342.97	.49
5400.00	1.26	276.37	5398.63	79.64	-26.27	79.64	83.86	341.75	.56
5500.00	1.72	270.52	5498.60	79.77	-28.86	79.77	84.83	340.11	.48
5600.00	1.73	257.47	5598.55	79.46	-31.83	79.46	85.60	338.17	.39
5700.00	1.98	250.08	5698.50	78.54	-34.93	78.54	85.96	336.02	.35
5800.00	1.43	238.74	5798.45	77.31	-37.62	77.31	85.98	334.05	.64
5900.00	1.16	230.53	5898.43	76.02	-39.47	76.02	85.65	332.56	.33
6000.00	.25	273.72	5998.42	75.39	-40.47	75.39	85.56	331.77	.99
6100.00	.16	355.97	6098.42	75.54	-40.70	75.54	85.81	331.69	.28
6200.00	.50	28.97	6198.42	76.06	-40.50	76.06	86.17	331.97	.38
6300.00	.57	62.07	6298.41	76.68	-39.84	76.68	86.41	332.54	.31
6400.00	.25	268.83	6398.41	76.90	-39.62	76.90	86.51	332.74	.80
6500.00	.12	207.33	6498.41	76.81	-39.89	76.81	86.55	332.56	.22
6600.00	.26	140.84	6598.41	76.54	-39.79	76.54	86.27	332.53	.24
6700.00	.43	165.00	6698.41	76.00	-39.55	76.00	85.68	332.51	.22
6800.00	.42	158.99	6798.41	75.30	-39.33	75.30	84.95	332.42	.05
Last Survey Depth Recorded									
6850.00	.35	176.06	6848.41	74.97	-39.25	74.97	84.62	332.37	.27