



Company: Noble Energy

Well: Powers 21-27

API: 05-123-22261

Rig Name: Production/Lightning

Location: Weld County, Colorado

Latitude: 40.116, Longitude: -104.652

GRID North is 0.550 Degrees East of True North

VS-Azi: 0.000 Degrees



FIELD COPY ONLY (NOT DEFINITIVE)

Depth Reference : RKB = Ground Level

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyro_run01-01-de_01.ut

Minimum Curvature Method

Report Date/Time: 1/10/2013 / 15:36

Vaughn Energy Services

Henderson, CO.

Justin Williams

303-853-4976

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	****
100.000	0.860	329.924	99.996	0.649	-0.376	0.649	0.750	329.924	0.860
200.000	0.525	343.447	199.989	1.738	-0.883	1.738	1.949	333.075	0.370
300.000	0.569	354.978	299.984	2.672	-1.057	2.672	2.873	338.421	0.118
400.000	0.309	48.635	399.982	3.345	-0.897	3.345	3.463	344.980	0.459
500.000	0.440	23.554	499.980	3.875	-0.541	3.875	3.912	352.045	0.206
600.000	0.176	65.050	599.978	4.291	-0.249	4.291	4.298	356.679	0.329
700.000	0.406	343.394	699.977	4.695	-0.211	4.695	4.700	357.425	0.418
800.000	0.245	200.907	799.976	4.835	-0.389	4.835	4.851	355.404	0.618
900.000	0.531	213.017	899.974	4.247	-0.717	4.247	4.307	350.415	0.296
1000.000	0.364	268.528	999.971	3.851	-1.287	3.851	4.060	341.520	0.442
1100.000	0.421	206.737	1099.969	3.515	-1.769	3.515	3.935	333.277	0.406
1200.000	0.102	214.921	1199.968	3.114	-1.986	3.114	3.693	327.472	0.320
1300.000	0.723	240.360	1299.965	2.728	-2.585	2.728	3.759	316.546	0.632
1400.000	0.257	200.509	1399.961	2.206	-3.212	2.206	3.897	304.490	0.550
1500.000	0.687	228.627	1499.958	1.600	-3.740	1.600	4.068	293.160	0.476
1600.000	0.585	280.055	1599.953	1.293	-4.693	1.293	4.868	285.400	0.560
1700.000	0.274	244.344	1699.950	1.279	-5.411	1.279	5.560	283.294	0.397
1800.000	0.664	242.960	1799.946	0.912	-6.143	0.912	6.210	278.441	0.391
1900.000	0.832	254.809	1899.938	0.458	-7.360	0.458	7.374	273.560	0.227
2000.000	0.447	274.183	1999.931	0.296	-8.449	0.296	8.454	272.006	0.437
2100.000	0.895	268.455	2099.924	0.303	-9.618	0.303	9.623	271.807	0.453
2200.000	0.760	284.909	2199.914	0.453	-11.040	0.453	11.050	272.350	0.272
2300.000	0.593	311.943	2299.907	0.970	-12.066	0.970	12.105	274.594	0.356
2400.000	0.428	332.177	2399.903	1.646	-12.626	1.646	12.733	277.428	0.242
2500.000	0.329	190.920	2499.902	1.695	-12.855	1.695	12.966	277.509	0.716
2600.000	0.082	62.597	2599.902	1.445	-12.846	1.445	12.927	276.419	0.386
2700.000	0.217	174.017	2699.902	1.290	-12.763	1.290	12.828	275.770	0.258
2800.000	0.495	282.239	2799.900	1.193	-13.165	1.193	13.219	275.177	0.600
2900.000	0.637	270.928	2899.895	1.293	-14.144	1.293	14.203	275.225	0.180
3000.000	0.648	286.850	2999.889	1.466	-15.241	1.466	15.311	275.495	0.178
3100.000	0.790	269.825	3099.881	1.628	-16.472	1.628	16.552	275.645	0.255
3200.000	0.891	250.626	3199.871	1.368	-17.895	1.368	17.947	274.372	0.297
3300.000	0.568	247.458	3299.863	0.920	-19.086	0.920	19.109	272.760	0.325
3400.000	0.758	242.378	3399.856	0.423	-20.131	0.423	20.135	271.205	0.198

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
3500.000	1.618	233.342	3499.834	-0.726	-21.849	-0.726	21.861	268.096	0.878
3600.000	1.526	240.271	3599.796	-2.229	-24.138	-2.229	24.241	264.723	0.211
3700.000	0.749	214.695	3699.776	-3.427	-25.666	-3.427	25.894	262.394	0.910
3800.000	0.892	153.446	3799.768	-4.661	-25.690	-4.661	26.110	259.717	0.845
3900.000	1.376	122.944	3899.749	-6.010	-24.335	-6.010	25.066	256.127	0.758
4000.000	1.439	131.545	3999.718	-7.496	-22.387	-7.496	23.609	251.488	0.220
4100.000	1.188	142.573	4099.692	-9.152	-20.818	-9.152	22.741	246.269	0.355
4200.000	1.274	127.771	4199.669	-10.656	-19.309	-10.656	22.054	241.109	0.328
4300.000	1.435	144.700	4299.642	-12.358	-17.707	-12.358	21.593	235.087	0.430
4400.000	1.427	149.904	4399.611	-14.458	-16.359	-14.458	21.832	228.530	0.130
4500.000	1.443	155.850	4499.579	-16.685	-15.219	-16.685	22.583	222.370	0.150
4600.000	1.324	153.074	4599.550	-18.864	-14.181	-18.864	23.600	216.933	0.137
4700.000	1.464	143.611	4699.521	-20.923	-12.899	-20.923	24.580	211.655	0.269
4800.000	1.123	134.660	4799.495	-22.640	-11.444	-22.640	25.368	206.816	0.396
4900.000	1.009	123.195	4899.478	-23.811	-10.011	-23.811	25.830	202.803	0.241
5000.000	1.265	116.588	4999.458	-24.787	-8.288	-24.787	26.135	198.488	0.287
5100.000	1.917	113.910	5099.419	-25.959	-5.771	-25.959	26.592	192.535	0.657
5200.000	2.010	109.761	5199.361	-27.230	-2.592	-27.230	27.353	185.437	0.170
5300.000	1.211	110.664	5299.320	-28.195	0.047	-28.195	28.195	179.904	0.799
5400.000	0.951	108.937	5399.302	-28.838	1.821	-28.838	28.895	176.387	0.262
5500.000	0.662	127.480	5499.293	-29.458	3.064	-29.458	29.617	174.061	0.386
5600.000	0.720	132.079	5599.285	-30.231	3.989	-30.231	30.493	172.483	0.080
5700.000	0.635	127.972	5699.278	-30.993	4.893	-30.993	31.377	171.029	0.098
5800.000	0.527	128.011	5799.273	-31.617	5.692	-31.617	32.126	169.795	0.108
5900.000	0.651	128.829	5899.268	-32.257	6.496	-32.257	32.904	168.613	0.124
6000.000	0.673	88.550	5999.262	-32.598	7.526	-32.598	33.455	167.000	0.456
6100.000	1.341	84.915	6099.246	-32.479	9.278	-32.479	33.778	164.058	0.670
6200.000	1.641	91.262	6199.212	-32.407	11.874	-32.407	34.514	159.877	0.342
6300.000	1.179	108.365	6299.182	-32.763	14.281	-32.763	35.740	156.448	0.620
6400.000	1.052	127.639	6399.163	-33.647	15.985	-33.647	37.251	154.590	0.394
6500.000	0.955	146.707	6499.148	-34.905	17.169	-34.905	38.899	153.808	0.346
6600.000	0.999	193.231	6599.135	-36.450	17.428	-36.450	40.402	154.447	0.773
6700.000	1.895	207.492	6699.102	-38.766	16.465	-38.766	42.117	156.988	0.960
6800.000	2.694	216.870	6799.022	-42.113	14.291	-42.113	44.472	161.255	0.880
6900.000	3.409	229.873	6898.880	-45.909	10.608	-45.909	47.119	166.989	0.991
7000.000	3.741	243.722	6998.688	-49.269	5.410	-49.269	49.565	173.734	0.922
7100.000	3.094	245.201	7098.509	-51.845	0.035	-51.845	51.845	179.961	0.653
7200.000	3.634	240.078	7198.337	-54.558	-5.161	-54.558	54.802	185.404	0.617
7300.000	3.932	227.415	7298.121	-58.459	-10.432	-58.459	59.382	190.118	0.885
7400.000	3.075	221.670	7397.933	-62.782	-14.740	-62.782	64.489	193.212	0.925
7500.000	2.160	215.561	7497.828	-66.319	-17.619	-66.319	68.619	194.878	0.955
7600.000	1.197	212.170	7597.784	-68.736	-19.271	-68.736	71.387	195.661	0.967
7660.000	1.354	211.807	7657.769	-69.869	-19.978	-69.869	72.669	195.957	0.261

HORIZONTAL DISPLACEMENT IS
72.669 FEET AT 195.957 DEGREES