



Company/Rig: Noble Energy Inc/Production  
WELL/API#: Howard A 27-16/05-123-22856  
DECLINATION: 8.23 Degrees  
TD AS DRILLED: 7015'  
COUNTY/STATE: Weld/Colorado  
VS-Azi: 0.000 Degrees  
Latitude: 40.45146, Longitude: -104.52866  
Grid North = True North -0.63 degs (NAD 27)  
Grid Correction Applied = -0.63 degs



DEPTH REFERENCE : RKB=GL/Elevation=4670'

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyro\_run01-01-de\_01.ut

Minimum Curvature Method

Report Date/Time: 2/22/2016 / 11:05

Lat/Long Obtained By Handheld GPS at Wellhead

North Reference: Grid

Denver, Colorado

303-853-4976

Surveyor: Jason Kinchelow / Howard A 27-16

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	0.344	7.568	99.999	0.297	0.040	0.297	0.300	7.568	0.344
200.000	0.383	9.033	199.997	0.925	0.132	0.925	0.935	8.092	0.040
300.000	0.226	334.533	299.996	1.434	0.099	1.434	1.437	3.965	0.235
400.000	0.135	126.323	399.996	1.542	0.109	1.542	1.546	4.063	0.350
500.000	0.192	6.820	499.996	1.638	0.224	1.638	1.653	7.794	0.284
600.000	0.198	69.101	599.995	1.866	0.405	1.866	1.909	12.252	0.201
700.000	0.173	151.582	699.995	1.795	0.638	1.795	1.905	19.574	0.245
800.000	0.161	136.042	799.994	1.560	0.808	1.560	1.757	27.364	0.047
900.000	0.272	294.585	899.994	1.558	0.690	1.558	1.704	23.884	0.426
1000.000	0.333	336.357	999.993	1.923	0.358	1.923	1.956	10.535	0.223
1100.000	0.393	337.367	1099.991	2.506	0.109	2.506	2.508	2.490	0.060
1200.000	0.127	310.784	1199.990	2.895	-0.107	2.895	2.897	357.884	0.285
1300.000	0.156	16.086	1299.989	3.098	-0.153	3.098	3.102	357.172	0.155
1400.000	0.167	341.548	1399.989	3.367	-0.161	3.367	3.371	357.257	0.096
1500.000	0.059	49.020	1499.989	3.539	-0.168	3.539	3.543	357.275	0.154
1600.000	0.079	269.489	1599.989	3.572	-0.198	3.572	3.578	356.826	0.129
1700.000	0.229	180.083	1699.989	3.372	-0.267	3.372	3.382	355.473	0.242
1800.000	0.285	176.529	1799.987	2.923	-0.252	2.923	2.934	355.069	0.058

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
1900.000	0.502	223.801	1899.985	2.359	-0.540	2.359	2.420	347.102	0.373
2000.000	0.629	270.167	1999.981	2.045	-1.392	2.045	2.474	325.747	0.460
2100.000	1.031	296.979	2099.971	2.454	-2.743	2.454	3.681	311.820	0.549
2200.000	1.345	297.748	2199.949	3.409	-4.583	3.409	5.712	306.640	0.314
2300.000	1.675	290.011	2299.914	4.455	-6.995	4.455	8.294	302.494	0.387
2400.000	1.280	283.108	2399.881	5.209	-9.456	5.209	10.796	298.847	0.432
2500.000	1.338	283.947	2499.855	5.743	-11.677	5.743	13.013	296.191	0.061
2600.000	1.163	286.805	2599.831	6.318	-13.781	6.318	15.160	294.630	0.186
2700.000	1.029	285.686	2699.813	6.854	-15.617	6.854	17.055	293.696	0.135
2800.000	1.001	290.260	2799.797	7.400	-17.302	7.400	18.818	293.156	0.086
2900.000	0.795	283.933	2899.785	7.869	-18.794	7.869	20.375	292.719	0.229
3000.000	0.731	299.516	2999.776	8.350	-20.022	8.350	21.694	292.639	0.216
3100.000	0.585	272.299	3099.769	8.685	-21.087	8.685	22.806	292.385	0.341
3200.000	0.423	193.969	3199.767	8.347	-21.687	8.347	23.238	291.051	0.649
3300.000	1.203	151.588	3299.756	7.065	-21.277	7.065	22.419	288.370	0.935
3400.000	2.127	149.597	3399.713	4.541	-19.838	4.541	20.351	282.894	0.926
3500.000	2.963	140.417	3499.614	0.949	-17.252	0.949	17.278	273.148	0.928
3600.000	3.330	153.053	3599.464	-3.633	-14.288	-3.633	14.743	255.736	0.782
3700.000	3.576	139.385	3699.284	-8.589	-10.942	-8.589	13.910	231.870	0.857
3800.000	3.010	140.932	3799.119	-12.995	-7.257	-12.995	14.884	209.182	0.573
3900.000	3.170	136.842	3898.974	-17.050	-3.711	-17.050	17.449	192.279	0.272
4000.000	2.842	134.466	3998.836	-20.804	-0.050	-20.804	20.804	180.138	0.351
4100.000	2.534	120.823	4098.727	-23.674	3.618	-23.674	23.948	171.312	0.708
4200.000	2.446	101.189	4198.634	-25.221	7.610	-25.221	26.344	163.209	0.853
4300.000	2.635	81.887	4298.538	-25.310	11.979	-25.310	28.002	154.672	0.872
4400.000	2.901	68.960	4398.422	-24.077	16.616	-24.077	29.254	145.390	0.677
4500.000	3.057	57.565	4498.288	-21.739	21.228	-21.739	30.385	135.681	0.611
4600.000	3.371	51.485	4598.130	-18.478	25.779	-18.478	31.717	125.632	0.464
4700.000	3.473	55.844	4697.952	-14.947	30.586	-14.947	34.043	116.044	0.279
4800.000	3.235	42.360	4797.782	-11.161	34.993	-11.161	36.730	107.690	0.822
4900.000	2.881	45.834	4897.640	-7.325	38.697	-7.325	39.385	100.719	0.399
5000.000	2.763	47.503	4997.519	-3.946	42.277	-3.946	42.461	95.332	0.144
5100.000	2.480	49.247	5097.414	-0.905	45.693	-0.905	45.702	91.135	0.294
5200.000	2.223	46.396	5197.330	1.844	48.736	1.844	48.771	87.833	0.282
5300.000	1.429	41.569	5297.278	4.115	50.969	4.115	51.134	85.384	0.808
5400.000	0.849	17.911	5397.259	5.754	52.024	5.754	52.341	83.689	0.735
5500.000	0.659	334.190	5497.251	6.977	52.002	6.977	52.467	82.359	0.589
5600.000	0.757	324.637	5597.243	8.033	51.369	8.033	51.993	81.112	0.153
5700.000	0.877	329.086	5697.233	9.229	50.593	9.229	51.428	79.662	0.136
5800.000	0.738	325.434	5797.223	10.416	49.835	10.416	50.911	78.195	0.148

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
5900.000	0.650	349.043	5897.216	11.503	49.361	11.503	50.684	76.882	0.297
6000.000	0.809	330.954	5997.208	12.677	48.911	12.677	50.527	75.469	0.278
6100.000	0.811	343.929	6097.198	13.975	48.372	13.975	50.350	73.886	0.183
6200.000	1.001	353.501	6197.185	15.523	48.077	15.523	50.521	72.106	0.242
6300.000	0.739	340.078	6297.174	16.997	47.758	16.997	50.693	70.409	0.330
6400.000	0.281	358.825	6397.170	17.849	47.534	17.849	50.774	69.419	0.482
6500.000	0.332	0.506	6497.168	18.384	47.531	18.384	50.962	68.855	0.052
6600.000	0.291	20.769	6597.167	18.911	47.624	18.911	51.241	68.343	0.117
6700.000	0.195	341.192	6697.166	19.309	47.659	19.309	51.422	67.945	0.187
6750.000	0.564	346.827	6747.165	19.628	47.575	19.628	51.465	67.580	0.741