



Company: Noble Energy
Well: LHI No. 31-23
API: 05-123-19905
Rig Name: Production/Lightning Wireline
State/County: Colorado/ Weld
Latitude: 40.303, Longitude: -104.856
GRID North is 0.420 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_ed.ut

Minimum Curvature Method

Report Date/Time: 7/20/2012 / 15:24

Vaughn Energy Services
Henderson, Colorado
866-835-8333
Jason Kinchelow

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	0.347	20.889	99.999	0.283	0.108	0.283	0.303	20.889	0.347
200.000	0.281	266.599	199.999	0.552	-0.029	0.552	0.553	357.041	0.529
300.000	0.285	250.615	299.997	0.455	-0.508	0.455	0.682	311.864	0.079
400.000	0.311	222.022	399.996	0.171	-0.923	0.171	0.939	280.490	0.149
500.000	0.161	106.621	499.996	-0.071	-0.970	-0.071	0.973	265.840	0.407
600.000	0.341	314.119	599.995	0.097	-1.050	0.097	1.054	275.260	0.490
700.000	0.285	201.232	699.994	0.072	-1.353	0.072	1.355	273.057	0.523
800.000	0.331	287.805	799.993	-0.071	-1.718	-0.071	1.720	267.628	0.423
900.000	0.204	8.342	899.992	0.193	-1.967	0.193	1.977	275.615	0.359
1000.000	0.251	130.631	999.992	0.227	-1.775	0.227	1.790	277.298	0.399
1100.000	0.410	259.349	1099.991	0.019	-1.961	0.019	1.961	270.552	0.599
1200.000	0.144	306.504	1199.990	0.028	-2.414	0.028	2.414	270.653	0.329
1300.000	0.199	236.731	1299.990	0.007	-2.659	0.007	2.659	270.154	0.201
1400.000	0.621	255.019	1399.987	-0.228	-3.328	-0.228	3.336	266.079	0.437
1500.000	0.649	284.537	1499.981	-0.226	-4.400	-0.226	4.405	267.058	0.325
1600.000	0.527	304.501	1599.976	0.176	-5.327	0.176	5.329	271.897	0.236
1700.000	0.678	290.486	1699.970	0.644	-6.260	0.644	6.293	275.873	0.210
1800.000	0.226	287.126	1799.967	0.909	-7.003	0.909	7.062	277.398	0.452
1900.000	0.329	245.700	1899.966	0.849	-7.454	0.849	7.502	276.500	0.219
2000.000	0.951	288.009	1999.960	0.988	-8.505	0.988	8.562	276.624	0.741
2100.000	0.839	271.142	2099.948	1.259	-10.025	1.259	10.104	277.156	0.285
2200.000	1.432	290.899	2199.928	1.719	-11.924	1.719	12.048	278.203	0.702
2300.000	0.916	289.956	2299.907	2.438	-13.843	2.438	14.056	279.987	0.516
2400.000	1.098	262.747	2399.892	2.590	-15.545	2.590	15.759	279.458	0.506
2500.000	1.362	299.648	2499.870	3.056	-17.528	3.056	17.793	279.892	0.818
2600.000	1.308	279.325	2599.843	3.829	-19.687	3.829	20.056	281.007	0.474
2700.000	0.756	289.477	2699.827	4.234	-21.435	4.234	21.849	281.174	0.579
2800.000	0.746	273.690	2799.818	4.496	-22.706	4.496	23.147	281.200	0.206
2900.000	0.732	262.991	2899.810	4.460	-23.989	4.460	24.400	280.531	0.138
3000.000	1.226	275.361	2999.795	4.482	-25.689	4.482	26.077	279.896	0.535
3100.000	1.208	276.079	3099.773	4.693	-27.802	4.693	28.195	279.582	0.024
3200.000	1.177	291.684	3199.751	5.184	-29.804	5.184	30.252	279.868	0.325
3300.000	0.760	320.110	3299.737	6.073	-31.184	6.073	31.770	281.020	0.624
3400.000	0.636	352.099	3399.730	7.132	-31.686	7.132	32.479	282.685	0.403

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	0.717	355.693	3499.723	8.305	-31.809	8.305	32.876	284.633	0.091
3600.000	0.964	28.740	3599.713	9.666	-31.452	9.666	32.904	287.084	0.533
3700.000	0.917	354.850	3699.700	11.201	-31.120	11.201	33.074	289.795	0.550
3800.000	1.171	351.039	3799.684	13.008	-31.351	13.008	33.942	292.534	0.263
3900.000	0.858	351.867	3899.668	14.759	-31.616	14.759	34.891	295.024	0.313
4000.000	1.505	12.119	3999.647	16.784	-31.446	16.784	35.645	298.090	0.760
4100.000	0.662	9.709	4099.628	18.637	-31.073	18.637	36.234	300.955	0.843
4200.000	0.511	306.144	4199.623	19.470	-31.336	19.470	36.892	301.854	0.631
4300.000	1.437	312.611	4299.608	20.582	-32.619	20.582	38.569	302.251	0.931
4400.000	1.482	299.618	4399.576	22.070	-34.666	22.070	41.095	302.483	0.333
4500.000	1.886	322.100	4499.533	24.008	-36.801	24.008	43.940	303.119	0.767
4600.000	1.569	335.492	4599.488	26.552	-38.380	26.552	46.670	304.676	0.512
4700.000	1.299	10.735	4699.459	28.911	-38.737	28.911	48.336	306.736	0.905
4800.000	1.329	39.236	4799.434	30.923	-37.792	30.923	48.831	309.291	0.647
4900.000	1.293	359.381	4899.409	32.950	-37.071	32.950	49.598	311.631	0.894
5000.000	1.214	356.346	4999.385	35.135	-37.151	35.135	51.134	313.403	0.103
5100.000	0.687	41.156	5099.373	36.644	-36.824	36.644	51.950	314.860	0.874
5200.000	0.891	350.217	5199.364	37.862	-36.562	37.862	52.633	316.001	0.703
5300.000	0.844	58.768	5299.355	39.010	-36.064	39.010	53.127	317.247	0.978
5400.000	0.616	80.368	5399.347	39.482	-34.905	39.482	52.699	318.521	0.353
5500.000	0.843	73.065	5499.339	39.786	-33.671	39.786	52.122	319.759	0.245
5600.000	0.117	166.859	5599.335	39.901	-32.943	39.901	51.743	320.456	0.859
5700.000	0.815	348.860	5699.332	40.499	-33.058	40.499	52.278	320.777	0.932
5800.000	0.647	331.938	5799.324	41.695	-33.461	41.695	53.461	321.253	0.272
5900.000	0.640	318.780	5899.318	42.613	-34.094	42.613	54.573	321.337	0.148
6000.000	1.188	299.430	5999.305	43.542	-35.365	43.542	56.095	320.917	0.622
6100.000	0.879	303.064	6099.289	44.470	-36.911	44.470	57.793	320.307	0.316
6200.000	0.736	311.942	6199.279	45.318	-38.031	45.318	59.162	319.996	0.190
6300.000	1.026	309.447	6299.267	46.316	-39.200	46.316	60.678	319.757	0.292
6400.000	0.504	343.608	6399.258	47.306	-40.015	47.306	61.961	319.773	0.671
6500.000	0.655	10.848	6499.253	48.290	-40.032	48.290	62.725	320.342	0.310
6600.000	1.431	32.975	6599.236	49.900	-39.244	49.900	63.483	321.816	0.860
6700.000	1.530	12.281	6699.204	52.252	-38.281	52.252	64.774	323.773	0.541
6800.000	2.248	24.629	6799.149	55.339	-37.180	55.339	66.668	326.105	0.821
6900.000	2.110	16.352	6899.077	58.887	-35.844	58.887	68.939	328.672	0.343
7000.000	1.774	31.809	6999.020	61.969	-34.510	61.969	70.931	330.887	0.619
7100.000	1.375	65.375	7098.984	63.785	-32.603	63.785	71.634	332.926	0.986
7200.000	2.035	78.454	7198.940	64.640	-29.773	64.640	71.167	335.269	0.762
7245.000	1.738	81.432	7243.915	64.902	-28.315	64.902	70.809	336.429	0.695
HORIZONTAL DISPLACEMENT IS 70.809 FEET AT 336.429 DEGREES									