

Company: Noble Energy

Lease/Well: Rein / 1-8

API: 05-123-17425

Rig Name: Production / Lightning Wireline

State/County: Colorado / Weld County

Latitude: 40.343, Longitude: -104.491

GRID North is 0.650 Degrees East of True North

VS-Azi: 0.000 Degrees



FIELD COPY ONLY (NOT DEFINITIVE)

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyro\_run01-01\_ed.ut

Minimum Curvature Method

Report Date/Time: 10/12/2011 / 13:26

Vaughn Energy Services

Henderson Colorado

866-835-8333

RKB = Ground Level

Norman Cowan

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	0.275	312.569	100.000	0.162	-0.177	0.162	0.240	312.569	0.275
200.000	0.221	309.057	199.999	0.446	-0.503	0.446	0.672	311.563	0.056
300.000	0.294	39.145	299.998	0.766	-0.491	0.766	0.910	327.346	0.368
400.000	0.212	67.859	399.997	1.035	-0.158	1.035	1.047	351.340	0.148
500.000	0.138	314.252	499.997	1.189	-0.072	1.189	1.191	356.530	0.296
600.000	0.154	316.127	599.996	1.369	-0.251	1.369	1.392	349.604	0.017
700.000	0.104	35.797	699.996	1.539	-0.291	1.539	1.567	349.285	0.169
800.000	0.063	153.387	799.996	1.563	-0.214	1.563	1.578	352.220	0.144
900.000	0.089	87.906	899.996	1.517	-0.111	1.517	1.521	355.798	0.085
1000.000	0.222	109.598	999.996	1.454	0.148	1.454	1.462	5.820	0.143
1100.000	0.208	143.797	1099.995	1.243	0.438	1.243	1.318	19.416	0.127
1200.000	0.219	175.006	1199.994	0.906	0.562	0.906	1.066	31.818	0.115
1300.000	0.279	149.382	1299.994	0.506	0.703	0.506	0.866	54.236	0.125
1400.000	0.188	132.912	1399.993	0.185	0.947	0.185	0.965	78.966	0.112
1500.000	0.118	168.597	1499.992	-0.028	1.088	-0.028	1.088	91.475	0.115
1600.000	0.223	129.349	1599.992	-0.253	1.259	-0.253	1.284	101.344	0.152
1700.000	0.287	293.794	1699.992	-0.275	1.181	-0.275	1.213	103.123	0.505
1800.000	0.739	273.941	1799.987	-0.130	0.309	-0.130	0.335	112.832	0.479
1900.000	0.813	264.256	1899.978	-0.157	-1.040	-0.157	1.052	261.426	0.151
2000.000	0.833	294.441	1999.968	0.073	-2.408	0.073	2.409	271.731	0.429
2100.000	0.516	264.038	2099.962	0.327	-3.517	0.327	3.532	275.307	0.467
2200.000	0.315	303.031	2199.959	0.430	-4.195	0.430	4.217	275.851	0.336
2300.000	0.096	254.695	2299.958	0.558	-4.507	0.558	4.541	277.054	0.261
2400.000	0.140	61.234	2399.958	0.594	-4.481	0.594	4.520	277.553	0.235
2500.000	0.060	38.010	2499.958	0.694	-4.341	0.694	4.397	279.085	0.088
2600.000	0.149	44.387	2599.958	0.829	-4.218	0.829	4.299	281.114	0.090
2700.000	0.213	76.175	2699.958	0.966	-3.947	0.966	4.063	283.754	0.116
2800.000	0.102	75.374	2799.957	1.033	-3.680	1.033	3.822	285.679	0.110
2900.000	0.291	61.246	2899.957	1.178	-3.371	1.178	3.571	289.260	0.194
3000.000	0.254	334.794	2999.956	1.500	-3.242	1.500	3.573	294.833	0.374
3100.000	0.458	357.608	3099.954	2.100	-3.353	2.100	3.957	302.057	0.245
3200.000	0.597	19.390	3199.950	2.990	-3.197	2.990	4.378	313.088	0.241
3300.000	1.315	21.849	3299.935	4.547	-2.597	4.547	5.236	330.264	0.719
3400.000	1.832	359.957	3399.898	7.210	-2.171	7.210	7.530	343.240	0.784

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	2.034	340.424	3499.842	10.481	-2.767	10.481	10.840	345.210	0.685
3600.000	2.249	341.814	3599.772	14.017	-3.974	14.017	14.570	344.170	0.220
3700.000	2.407	357.856	3699.691	17.980	-4.665	17.980	18.575	345.454	0.668
3800.000	2.386	339.059	3799.605	22.023	-5.488	22.023	22.697	346.008	0.783
3900.000	2.663	349.183	3899.508	26.250	-6.668	26.250	27.083	345.747	0.524
4000.000	2.966	341.142	3999.388	30.980	-7.940	30.980	31.982	345.624	0.497
4100.000	3.303	353.872	4099.239	36.292	-9.084	36.292	37.412	345.948	0.771
4200.000	3.739	0.327	4199.051	42.417	-9.373	42.417	43.440	347.540	0.589
4300.000	4.064	346.397	4298.821	49.122	-10.188	49.122	50.167	348.283	0.999
4400.000	4.513	347.356	4398.541	56.405	-11.882	56.405	57.643	348.104	0.455
4500.000	4.831	341.660	4498.209	64.241	-14.068	64.241	65.763	347.647	0.562
4600.000	4.419	338.312	4597.883	71.817	-16.817	71.817	73.760	346.821	0.493
4700.000	3.600	332.799	4697.638	78.189	-19.676	78.189	80.627	345.875	0.904
4800.000	2.678	330.522	4797.487	83.015	-22.260	83.015	85.948	344.989	0.930
4900.000	1.793	334.380	4897.410	86.459	-24.086	86.459	89.752	344.433	0.898
5000.000	1.407	331.230	4997.371	88.946	-25.354	88.946	92.489	344.090	0.395
5100.000	0.657	323.751	5097.354	90.485	-26.284	90.485	94.225	343.803	0.761
5200.000	0.610	318.451	5197.348	91.345	-26.975	91.345	95.245	343.547	0.075
5300.000	0.351	33.825	5297.345	91.998	-27.158	91.998	95.923	343.553	0.622
5400.000	0.618	110.265	5397.342	92.066	-26.481	92.066	95.798	343.953	0.635
5500.000	0.611	70.738	5497.337	92.055	-25.471	92.055	95.514	344.533	0.416
5600.000	0.802	86.922	5597.329	92.268	-24.269	92.268	95.406	345.264	0.274
5700.000	1.067	115.592	5697.316	91.904	-22.730	91.904	94.673	346.108	0.529
5800.000	1.365	101.540	5797.294	91.263	-20.723	91.263	93.586	347.207	0.419
5900.000	1.408	79.728	5897.265	91.244	-18.348	91.244	93.070	348.630	0.526
6000.000	1.650	96.212	5997.230	91.307	-15.708	91.307	92.648	350.239	0.499
6100.000	0.870	124.130	6097.206	90.726	-13.649	90.726	91.747	351.445	0.971
6200.000	1.067	162.385	6197.193	89.412	-12.739	89.412	90.315	351.892	0.661
6300.000	0.629	138.698	6297.182	88.112	-12.094	88.112	88.938	352.184	0.552
6400.000	1.012	81.620	6397.173	87.828	-10.858	87.828	88.497	352.952	0.853
6500.000	1.543	55.932	6497.149	88.711	-8.869	88.711	89.154	354.291	0.769
6600.000	1.469	36.844	6597.115	90.491	-6.985	90.491	90.761	355.586	0.505
HORIZONTAL DISPLACEMENT IS 90.761 FEET AT 355.586 DEGREES									