

Company: Noble Energy

Lease/Well: Lorenz F / 22-19

API: 05-123-21727

Rig Name: Production / Lightning Wireline

State/County: Colorado / Weld

Latitude: 40.388, Longitude: -104.654

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_ed.ut

Minimum Curvature Method

Report Date/Time: 3/14/2012 / 13:16

Vaughn Energy Services

Henderson Colorado

866-835-8333

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	0.278	257.640	100.000	-0.052	-0.237	-0.052	0.242	257.640	0.278
200.000	0.240	8.191	199.999	0.103	-0.444	0.103	0.455	283.102	0.426
300.000	0.427	14.205	299.997	0.671	-0.322	0.671	0.744	334.338	0.190
400.000	0.850	72.935	399.992	1.249	0.478	1.249	1.338	20.924	0.726
500.000	1.510	100.944	499.971	1.217	2.480	1.217	2.763	63.864	0.858
600.000	1.955	95.016	599.925	0.818	5.473	0.818	5.533	81.502	0.479
700.000	2.104	100.320	699.862	0.340	8.978	0.340	8.984	87.833	0.240
800.000	1.926	96.260	799.800	-0.173	12.455	-0.173	12.456	90.794	0.228
900.000	1.894	90.258	899.745	-0.363	15.778	-0.363	15.782	91.319	0.202
1000.000	1.871	90.639	999.691	-0.389	19.063	-0.389	19.067	91.169	0.026
1100.000	1.559	86.840	1099.646	-0.332	22.054	-0.332	22.056	90.863	0.332
1200.000	1.280	83.343	1199.615	-0.128	24.522	-0.128	24.522	90.298	0.292
1300.000	1.386	67.456	1299.589	0.466	26.748	0.466	26.752	89.003	0.383
1400.000	0.810	58.521	1399.570	1.298	28.468	1.298	28.497	87.389	0.600
1500.000	0.202	96.035	1499.566	1.649	29.245	1.649	29.292	86.774	0.661
1600.000	0.251	185.263	1599.565	1.412	29.401	1.412	29.434	87.250	0.320
1700.000	0.547	181.510	1699.563	0.717	29.368	0.717	29.377	88.601	0.297
1800.000	1.240	162.168	1799.550	-0.790	29.687	-0.790	29.697	91.524	0.747
1900.000	1.317	157.799	1899.525	-2.884	30.452	-2.884	30.589	95.410	0.124
2000.000	1.012	119.422	1999.506	-4.381	31.655	-4.381	31.957	97.880	0.818
2100.000	0.916	113.720	2099.492	-5.137	33.156	-5.137	33.552	98.806	0.135
2200.000	0.781	149.462	2199.481	-6.045	34.234	-6.045	34.764	100.015	0.536
2300.000	1.076	184.929	2299.469	-7.569	34.500	-7.569	35.321	102.373	0.632
2400.000	1.401	203.199	2399.446	-9.628	33.938	-9.628	35.277	105.838	0.507
2500.000	1.458	207.463	2499.415	-11.880	32.870	-11.880	34.951	109.871	0.120
2600.000	1.446	211.193	2599.383	-14.088	31.630	-14.088	34.625	114.009	0.095
2700.000	1.464	217.273	2699.350	-16.184	30.203	-16.184	34.265	118.184	0.155
2800.000	1.330	213.300	2799.321	-18.170	28.792	-18.170	34.046	122.255	0.165
2900.000	1.171	211.797	2899.297	-20.008	27.617	-20.008	34.103	125.923	0.162
3000.000	1.001	224.012	2999.279	-21.505	26.471	-21.505	34.106	129.090	0.287
3100.000	0.747	218.203	3099.267	-22.646	25.461	-22.646	34.075	131.651	0.268
3200.000	0.802	197.445	3199.258	-23.826	24.848	-23.826	34.425	133.798	0.284
3300.000	0.473	208.331	3299.252	-24.857	24.442	-24.857	34.861	135.483	0.349
3400.000	0.912	201.504	3399.245	-25.962	23.954	-25.962	35.324	137.303	0.446

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	0.995	170.427	3499.231	-27.558	23.807	-27.558	36.417	139.177	0.517
3600.000	0.657	184.201	3599.221	-28.986	23.909	-28.986	37.574	140.482	0.389
3700.000	1.122	179.541	3699.209	-30.537	23.875	-30.537	38.762	141.980	0.470
3800.000	1.124	176.477	3799.189	-32.495	23.943	-32.495	40.363	143.616	0.060
3900.000	0.934	168.434	3899.173	-34.272	24.167	-34.272	41.936	144.811	0.238
4000.000	0.888	169.994	3999.161	-35.834	24.465	-35.834	43.389	145.677	0.053
4100.000	0.570	174.856	4099.152	-37.092	24.644	-37.092	44.532	146.400	0.324
4200.000	0.560	211.148	4199.148	-38.005	24.436	-38.005	45.183	147.261	0.352
4300.000	0.818	240.110	4299.141	-38.779	23.564	-38.779	45.377	148.715	0.426
4400.000	0.809	227.711	4399.131	-39.610	22.422	-39.610	45.516	150.487	0.176
4500.000	0.866	237.035	4499.120	-40.497	21.266	-40.497	45.741	152.295	0.147
4600.000	1.061	214.193	4599.106	-41.673	20.112	-41.673	46.273	154.238	0.427
4700.000	1.359	191.843	4699.085	-43.600	19.348	-43.600	47.700	156.070	0.553
4800.000	1.635	172.745	4799.051	-46.176	19.285	-46.176	50.041	157.333	0.566
4900.000	1.700	166.443	4899.009	-49.033	19.813	-49.033	52.885	157.998	0.194
5000.000	1.415	165.728	4998.972	-51.672	20.465	-51.672	55.577	158.394	0.285
5100.000	0.872	161.988	5098.951	-53.592	21.005	-53.592	57.562	158.598	0.548
5200.000	0.857	140.564	5198.940	-54.894	21.715	-54.894	59.033	158.417	0.322
5300.000	0.786	150.889	5298.930	-56.071	22.524	-56.071	60.425	158.115	0.164
5400.000	0.686	146.728	5398.922	-57.170	23.186	-57.170	61.693	157.925	0.113
5500.000	0.329	138.946	5498.918	-57.887	23.702	-57.887	62.551	157.733	0.363
5600.000	0.323	85.712	5598.916	-58.082	24.172	-58.082	62.911	157.404	0.292
5700.000	0.536	95.348	5698.913	-58.105	24.918	-58.105	63.222	156.788	0.224
5800.000	0.679	84.285	5798.908	-58.089	25.974	-58.089	63.632	155.909	0.185
5900.000	0.826	95.248	5898.899	-58.096	27.282	-58.096	64.183	154.845	0.205
6000.000	0.738	96.405	5998.890	-58.234	28.639	-58.234	64.895	153.812	0.090
6100.000	1.036	94.604	6098.878	-58.378	30.180	-58.378	65.718	152.662	0.299
6200.000	1.085	88.895	6198.861	-58.432	32.028	-58.432	66.634	151.272	0.117
6300.000	1.234	88.954	6298.840	-58.395	34.051	-58.395	67.597	149.753	0.149
6400.000	0.991	98.845	6398.821	-58.508	35.983	-58.508	68.687	148.408	0.309
6500.000	1.045	106.470	6498.806	-58.900	37.713	-58.900	69.938	147.369	0.146
6600.000	0.819	116.609	6598.792	-59.478	39.226	-59.478	71.249	146.595	0.279
6700.000	0.847	89.584	6698.782	-59.793	40.604	-59.793	72.277	145.820	0.390
6800.000	0.887	115.731	6798.771	-60.124	42.041	-60.124	73.364	145.037	0.394
6900.000	0.666	119.299	6898.762	-60.744	43.245	-60.744	74.566	144.552	0.226
6970.000	0.542	111.885	6968.758	-61.067	43.907	-61.067	75.213	144.284	0.209
HORIZONTAL DISPLACEMENT IS 75.213 FEET AT 144.284 DEGREES									