



COMPANY/RIG: Noble Energy/Production/CoreTech
WELL/API: Larsen 1/05-123-12989
DECLINATION: 8.04
TD AS DRILLED: 7011
COUNTY/STATE: Weld/Colorado
VS-Azi: 0.000 Degrees
Latitude: 40.44765, Longitude: -104.56706
Grid North = True North -0.60 degs (NAD 27)
Grid Correction Applied = -0.60 degs



DEPTH REFERENCE : RKB = GL Elevation = 4651

DRILLOG MS GYRO SURVEY CALCULATIONS

Filename: msgyrosurvey.ut

Minimum Curvature Method

Report Date/Time: 1/23/2018 / 15:33

LAT & LONG OBTAINED BY HANDHELD GPS AT WELLHEAD

NORTH REFERENCE: GRID

HENDERSON, COLORADO

303-853-4976

JUSTIN WILLIAMS / Larsen 1

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	0.604	309.810	99.998	0.337	-0.405	0.337	0.527	309.810	0.604
200.000	0.181	36.042	199.996	0.802	-0.717	0.802	1.076	318.222	0.619
300.000	0.221	87.719	299.996	0.937	-0.431	0.937	1.032	335.301	0.179
400.000	0.430	139.507	399.994	0.660	0.005	0.660	0.660	0.443	0.341
500.000	0.510	76.047	499.991	0.482	0.681	0.482	0.834	54.694	0.499
600.000	0.566	87.469	599.987	0.611	1.607	0.611	1.719	69.165	0.121
700.000	0.550	136.146	699.983	0.287	2.433	0.287	2.450	83.271	0.460
800.000	0.324	97.767	799.980	-0.097	3.045	-0.097	3.047	91.830	0.358
900.000	0.330	115.682	899.978	-0.260	3.585	-0.260	3.594	94.156	0.102
1000.000	0.641	129.504	999.975	-0.741	4.276	-0.741	4.340	99.836	0.330
1100.000	0.700	168.243	1099.968	-1.695	4.833	-1.695	5.121	109.332	0.448
1200.000	0.429	200.823	1199.964	-2.643	4.824	-2.643	5.501	118.719	0.410
1300.000	0.394	188.640	1299.961	-3.333	4.640	-3.333	5.712	125.690	0.094
1400.000	0.272	234.034	1399.959	-3.811	4.396	-3.811	5.818	130.925	0.280
1500.000	0.451	247.303	1499.957	-4.103	3.841	-4.103	5.620	136.886	0.197
1600.000	0.302	282.070	1599.955	-4.199	3.220	-4.199	5.292	142.518	0.266

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
1700.000	0.207	305.115	1699.954	-4.040	2.815	-4.040	4.924	145.137	0.137
1800.000	0.395	336.164	1799.953	-3.621	2.527	-3.621	4.416	145.086	0.242
1900.000	0.703	328.865	1899.948	-2.780	2.071	-2.780	3.467	143.322	0.315
2000.000	0.702	303.470	1999.941	-1.918	1.243	-1.918	2.285	147.055	0.309
2100.000	0.918	333.174	2099.931	-0.865	0.370	-0.865	0.941	156.827	0.465
2200.000	1.333	323.816	2199.912	0.788	-0.678	0.788	1.039	319.309	0.453
2300.000	1.278	331.018	2299.886	2.702	-1.904	2.702	3.306	324.824	0.173
2400.000	1.186	326.008	2399.863	4.536	-3.023	4.536	5.451	326.314	0.142
2500.000	1.143	351.401	2499.843	6.380	-3.751	6.380	7.401	329.548	0.514
2600.000	0.875	340.430	2599.828	8.086	-4.156	8.086	9.091	332.798	0.330
2700.000	1.106	1.064	2699.813	9.771	-4.394	9.771	10.713	335.787	0.421
2800.000	1.144	7.419	2799.794	11.726	-4.247	11.726	12.471	340.090	0.130
2900.000	0.684	356.460	2899.781	13.311	-4.155	13.311	13.945	342.665	0.490
3000.000	0.839	13.272	2999.772	14.619	-4.024	14.619	15.163	344.611	0.270
3100.000	0.652	5.427	3099.764	15.898	-3.802	15.898	16.347	346.551	0.212
3200.000	0.760	341.700	3199.756	17.094	-3.956	17.094	17.546	346.969	0.309
3300.000	0.801	318.735	3299.747	18.249	-4.625	18.249	18.826	345.778	0.313
3400.000	0.845	328.250	3399.737	19.401	-5.474	19.401	20.158	344.243	0.143
3500.000	1.056	333.158	3499.723	20.849	-6.278	20.849	21.774	343.243	0.226
3600.000	0.897	338.425	3599.709	22.399	-6.981	22.399	23.462	342.688	0.183
3700.000	0.847	326.636	3699.697	23.744	-7.676	23.744	24.953	342.086	0.186
3800.000	1.010	339.430	3799.684	25.186	-8.392	25.186	26.547	341.573	0.263
3900.000	0.980	350.908	3899.669	26.856	-8.837	26.856	28.272	341.787	0.201
4000.000	1.031	355.019	3999.654	28.596	-9.050	28.596	29.994	342.439	0.089
4100.000	0.980	355.481	4099.638	30.345	-9.195	30.345	31.708	343.142	0.051
4200.000	0.834	341.180	4199.626	31.887	-9.497	31.887	33.271	343.414	0.268
4300.000	1.329	355.222	4299.608	33.732	-9.829	33.732	35.135	343.755	0.558
4400.000	1.242	345.540	4399.583	35.937	-10.196	35.937	37.355	344.160	0.234
4500.000	1.003	351.966	4499.564	37.853	-10.589	37.853	39.306	344.372	0.269
4600.000	1.610	346.496	4599.537	40.085	-11.039	40.085	41.578	344.603	0.619
4700.000	2.435	357.373	4699.474	43.573	-11.465	43.573	45.056	345.259	0.906
4800.000	1.707	4.003	4799.408	47.181	-11.458	47.181	48.553	346.350	0.765
4900.000	0.940	359.557	4899.381	49.488	-11.360	49.488	50.775	347.071	0.774
5000.000	0.922	347.379	4999.368	51.093	-11.542	51.093	52.380	347.270	0.198
5100.000	0.701	24.834	5099.359	52.433	-11.461	52.433	53.671	347.670	0.561
5200.000	0.481	86.998	5199.354	53.009	-10.785	53.009	54.095	348.500	0.638
5300.000	0.571	127.894	5299.350	52.726	-9.972	52.726	53.660	349.290	0.377
5400.000	0.952	133.896	5399.341	51.844	-8.981	51.844	52.616	350.172	0.389
5500.000	1.171	156.807	5499.324	50.329	-7.980	50.329	50.957	350.990	0.473

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
5600.000	1.147	169.286	5599.304	48.406	-7.392	48.406	48.967	351.318	0.253
5700.000	0.291	214.382	5699.296	47.213	-7.349	47.213	47.782	351.153	0.964
5800.000	0.640	312.825	5799.293	47.383	-7.902	47.383	48.038	350.532	0.741
5900.000	0.998	306.654	5899.283	48.283	-9.011	48.283	49.116	349.429	0.368
6000.000	0.671	327.493	5999.273	49.296	-10.024	49.296	50.305	348.506	0.441
6100.000	0.776	353.223	6099.265	50.462	-10.418	50.462	51.527	348.335	0.338
6200.000	0.716	354.329	6199.256	51.757	-10.560	51.757	52.823	348.468	0.061
6300.000	0.565	327.651	6299.250	52.796	-10.885	52.796	53.906	348.350	0.330
6400.000	0.415	339.295	6399.247	53.551	-11.277	53.551	54.726	348.108	0.179
6500.000	0.332	311.354	6499.245	54.082	-11.623	54.082	55.316	347.871	0.198
6600.000	0.303	321.777	6599.243	54.481	-12.003	54.481	55.787	347.575	0.064
6700.000	0.078	318.040	6699.242	54.739	-12.213	54.739	56.085	347.423	0.225
6800.000	0.451	330.635	6799.241	55.133	-12.451	55.133	56.521	347.274	0.375