

Company: Anadarko Petroleum Corp.

Lease/Well: Speicher / 41-15

API: 05-123-23540

Rig Name: Production / Lightning Wireline

State/County: Colorado / Weld

Latitude: 40.491, Longitude: -104.529

GRID North is 0.630 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: 3/2/2012 / 12:09

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	2.083	296.624	99.978	0.815	-1.625	0.815	1.818	296.624	2.083
200.000	1.051	311.521	199.940	2.237	-3.936	2.237	4.528	299.610	1.101
300.000	0.518	324.465	299.930	3.213	-4.886	3.213	5.848	303.330	0.558
400.000	0.703	354.556	399.924	4.192	-5.207	4.192	6.685	308.836	0.364
500.000	0.473	334.824	499.919	5.176	-5.441	5.176	7.510	313.572	0.304
600.000	0.603	336.964	599.915	6.034	-5.822	6.034	8.385	316.023	0.132
700.000	0.696	4.222	699.909	7.124	-5.984	7.124	9.303	319.972	0.319
800.000	0.603	340.794	799.902	8.227	-6.112	8.227	10.249	323.389	0.279
900.000	0.576	343.522	899.897	9.206	-6.428	9.206	11.228	325.076	0.039
1000.000	0.864	1.549	999.889	10.441	-6.550	10.441	12.326	327.900	0.363
1100.000	0.931	359.027	1099.877	12.007	-6.543	12.007	13.675	331.412	0.077
1200.000	0.794	339.580	1199.866	13.469	-6.799	13.469	15.087	333.216	0.321
1300.000	0.748	337.052	1299.857	14.719	-7.295	14.719	16.428	333.636	0.057
1400.000	0.722	334.626	1399.848	15.889	-7.819	15.889	17.709	333.797	0.041
1500.000	0.547	326.224	1499.842	16.855	-8.355	16.855	18.812	333.633	0.197
1600.000	0.259	1.204	1599.840	17.478	-8.616	17.478	19.486	333.759	0.367
1700.000	0.258	39.611	1699.839	17.877	-8.467	17.877	19.781	334.656	0.170
1800.000	0.422	68.732	1799.837	18.184	-7.980	18.184	19.858	336.305	0.233
1900.000	0.499	133.821	1899.835	18.016	-7.323	18.016	19.448	337.880	0.500
2000.000	1.052	182.128	1999.826	16.798	-7.043	16.798	18.214	337.252	0.811
2100.000	1.562	177.841	2099.800	14.518	-7.026	14.518	16.129	334.177	0.519
2200.000	1.618	169.803	2199.761	11.767	-6.725	11.767	13.553	330.254	0.230
2300.000	2.105	161.330	2299.708	8.638	-5.887	8.638	10.453	325.726	0.558
2400.000	2.325	159.809	2399.634	4.994	-4.598	4.994	6.789	317.360	0.228
2500.000	2.347	160.324	2499.550	1.162	-3.209	1.162	3.413	289.904	0.030
2600.000	2.631	155.700	2599.456	-2.858	-1.575	-2.858	3.263	208.860	0.348
2700.000	2.464	153.922	2699.357	-6.880	0.314	-6.880	6.887	177.384	0.185
2800.000	2.066	150.475	2799.279	-10.380	2.148	-10.380	10.600	168.309	0.420
2900.000	1.981	153.219	2899.217	-13.491	3.815	-13.491	14.020	164.210	0.129
3000.000	1.721	151.653	2999.164	-16.356	5.307	-16.356	17.195	162.024	0.265
3100.000	1.780	154.293	3099.118	-19.077	6.694	-19.077	20.217	160.666	0.100
3200.000	1.179	144.725	3199.084	-21.316	7.961	-21.316	22.754	159.520	0.648
3300.000	0.786	144.465	3299.069	-22.714	8.954	-22.714	24.415	158.486	0.393
3400.000	0.058	66.983	3399.066	-23.252	9.399	-23.252	25.080	157.991	0.775

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	0.265	299.717	3499.066	-23.118	9.244	-23.118	24.897	158.205	0.303
3600.000	0.922	350.601	3599.060	-22.209	8.912	-22.209	23.930	158.136	0.783
3700.000	1.079	337.115	3699.045	-20.547	8.414	-20.547	22.204	157.731	0.282
3800.000	0.890	355.132	3799.030	-18.906	7.982	-18.906	20.522	157.111	0.360
3900.000	1.063	344.770	3899.016	-17.237	7.673	-17.237	18.868	156.005	0.247
4000.000	1.119	346.205	3998.998	-15.394	7.196	-15.394	16.993	154.946	0.062
4100.000	0.940	343.253	4098.982	-13.660	6.727	-13.660	15.227	153.783	0.187
4200.000	0.977	1.571	4198.968	-12.023	6.514	-12.023	13.674	151.550	0.307
4300.000	1.041	358.566	4298.952	-10.262	6.515	-10.262	12.155	147.591	0.083
4400.000	1.085	357.439	4398.935	-8.408	6.450	-8.408	10.597	142.509	0.049
4500.000	1.281	352.694	4498.914	-6.354	6.265	-6.354	8.923	135.401	0.219
4600.000	1.435	348.984	4598.886	-4.016	5.884	-4.016	7.124	124.316	0.177
4700.000	1.583	347.962	4698.851	-1.436	5.356	-1.436	5.546	105.008	0.151
4800.000	1.364	325.432	4798.819	0.896	4.393	0.896	4.483	78.477	0.615
4900.000	1.251	314.696	4898.793	2.644	2.941	2.644	3.955	48.048	0.269
5000.000	1.207	308.545	4998.770	4.068	1.341	4.068	4.283	18.248	0.139
5100.000	1.116	274.716	5098.751	4.804	-0.453	4.804	4.826	354.617	0.681
5200.000	1.534	242.215	5198.725	4.261	-2.607	4.261	4.995	328.536	0.843
5300.000	2.097	216.447	5298.676	2.165	-4.878	2.165	5.337	293.931	0.978
5400.000	1.934	209.699	5398.614	-0.772	-6.801	-0.772	6.845	263.520	0.288
5500.000	1.985	203.347	5498.556	-3.828	-8.323	-3.828	9.162	245.301	0.223
5600.000	2.439	206.019	5598.481	-7.330	-9.943	-7.330	12.353	233.601	0.466
5700.000	2.116	184.340	5698.404	-11.083	-11.016	-11.083	15.627	224.826	0.913
5800.000	1.856	201.457	5798.345	-14.431	-11.748	-14.431	18.609	219.149	0.644
5900.000	1.951	176.805	5898.291	-17.638	-12.246	-17.638	21.472	214.772	0.818
6000.000	2.010	179.650	5998.231	-21.091	-12.140	-21.091	24.335	209.926	0.115
6100.000	2.173	167.646	6098.165	-24.697	-11.724	-24.697	27.338	205.395	0.466
6200.000	2.389	173.339	6198.086	-28.619	-11.077	-28.619	30.688	201.158	0.313
6300.000	2.574	168.823	6297.992	-32.892	-10.400	-32.892	34.497	197.545	0.269
6400.000	2.847	166.447	6397.880	-37.510	-9.382	-37.510	38.665	194.043	0.295
6500.000	3.253	170.174	6497.739	-42.719	-8.316	-42.719	43.521	191.016	0.452
6600.000	3.811	165.912	6597.548	-48.738	-7.023	-48.738	49.241	188.200	0.616
6700.000	4.395	161.256	6697.292	-55.589	-4.983	-55.589	55.812	185.122	0.672
6800.000	4.601	157.588	6796.984	-62.925	-2.223	-62.925	62.965	182.023	0.354
6900.000	5.689	156.523	6896.580	-71.180	1.282	-71.180	71.192	178.969	1.092

<div> HORIZONTAL DISPLACEMENT IS  71.192 FEET AT 178.969 DEGREES </div>
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