

Company: Anadarko Petroleum Corp.  
Lease/Well: Willard Hein Gas Unit / 1  
API#: 05-123-07624  
Rig Name: Production / V.E.S.  
State/County: Colorado / Weld County  
Latitude: 40.082, Longitude: -104.892  
Directions are relative to True North  
VS-Azi: 0.000 Degrees



FIELD COPY ONLY (NOT DEFINITIVE)

Depth Reference : RKB = Ground Level

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: hgyro-de\_01.ut  
Minimum Curvature Method  
Report Date/Time: 2/7/2014 / 18:26

Vaughn Energy Services  
Henderson CO.  
303-853-4976  
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	0.337	344.940	99.999	0.284	-0.076	0.284	0.294	344.940	0.337
200.000	0.275	309.039	199.998	0.720	-0.340	0.720	0.796	334.737	0.198
300.000	0.393	307.119	299.996	1.078	-0.800	1.078	1.342	323.424	0.118
400.000	0.424	98.107	399.995	1.233	-0.707	1.233	1.421	330.168	0.792
500.000	0.408	222.434	499.994	0.918	-0.581	0.918	1.086	327.678	0.736
600.000	0.602	238.328	599.990	0.379	-1.268	0.379	1.324	286.637	0.238
700.000	0.655	210.269	699.984	-0.391	-2.004	-0.391	2.042	258.963	0.309
800.000	0.814	221.020	799.976	-1.421	-2.759	-1.421	3.103	242.749	0.210
900.000	0.815	230.814	899.966	-2.406	-3.776	-2.406	4.478	237.493	0.139
1000.000	0.683	236.324	999.958	-3.186	-4.824	-3.186	5.781	236.553	0.151
1100.000	0.820	222.019	1099.949	-4.048	-5.799	-4.048	7.072	235.078	0.232
1200.000	0.613	226.365	1199.941	-4.950	-6.665	-4.950	8.302	233.402	0.214
1300.000	0.662	219.281	1299.935	-5.766	-7.418	-5.766	9.395	232.142	0.093
1400.000	0.735	227.050	1399.928	-6.650	-8.253	-6.650	10.599	231.140	0.119
1500.000	0.770	231.418	1499.919	-7.506	-9.248	-7.506	11.911	230.935	0.067
1600.000	0.842	236.069	1599.909	-8.335	-10.383	-8.335	13.315	231.243	0.097
1700.000	0.781	245.777	1699.899	-9.025	-11.614	-9.025	14.709	232.150	0.150
1800.000	0.836	257.136	1799.889	-9.467	-12.947	-9.467	16.039	233.824	0.169
1900.000	0.917	256.626	1899.878	-9.815	-14.436	-9.815	17.457	235.790	0.082
2000.000	0.817	267.307	1999.866	-10.033	-15.927	-10.033	18.824	237.791	0.190
2100.000	0.896	283.804	2099.855	-9.880	-17.399	-9.880	20.009	240.409	0.258
2200.000	1.008	293.138	2199.841	-9.348	-18.967	-9.348	21.145	243.762	0.191
2300.000	0.930	301.828	2299.827	-8.575	-20.465	-8.575	22.189	247.267	0.166
2400.000	1.150	320.251	2399.811	-7.375	-21.796	-7.375	23.010	251.306	0.397
2500.000	1.064	345.678	2499.793	-5.704	-22.667	-5.704	23.374	255.874	0.494
2600.000	0.974	359.396	2599.777	-3.955	-22.906	-3.955	23.245	260.204	0.259
2700.000	1.083	5.355	2699.761	-2.164	-22.827	-2.164	22.929	264.584	0.152
2800.000	1.386	13.397	2799.738	-0.047	-22.458	-0.047	22.458	269.880	0.348
2900.000	1.516	10.683	2899.706	2.429	-21.933	2.429	22.067	276.320	0.147
3000.000	1.362	10.463	2999.674	4.898	-21.472	4.898	22.023	282.849	0.154
3100.000	1.226	18.431	3099.649	7.082	-20.918	7.082	22.084	288.703	0.225
3200.000	0.851	18.279	3199.632	8.802	-20.347	8.802	22.169	293.393	0.375
3300.000	0.369	357.245	3299.626	9.829	-20.129	9.829	22.401	296.026	0.524
3400.000	0.460	16.789	3399.624	10.535	-20.029	10.535	22.630	297.745	0.167

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	0.168	331.989	3499.622	11.050	-19.981	11.050	22.833	298.942	0.361
3600.000	0.207	218.016	3599.622	11.037	-20.162	11.037	22.985	298.697	0.315
3700.000	0.357	190.720	3699.621	10.589	-20.331	10.589	22.923	297.512	0.197
3800.000	0.712	234.553	3799.616	9.923	-20.895	9.923	23.131	295.403	0.517
3900.000	1.179	261.974	3899.603	9.419	-22.420	9.419	24.318	292.788	0.638
4000.000	1.227	256.435	3999.581	9.024	-24.479	9.024	26.090	290.236	0.126
4100.000	1.302	258.226	4099.557	8.541	-26.632	8.541	27.968	287.781	0.085
4200.000	1.176	261.408	4199.533	8.156	-28.759	8.156	29.893	285.833	0.144
4300.000	1.185	269.000	4299.512	7.985	-30.807	7.985	31.825	284.531	0.157
4400.000	0.998	269.248	4399.494	7.955	-32.711	7.955	33.664	283.669	0.187
4500.000	0.339	291.734	4499.487	8.053	-33.856	8.053	34.801	283.380	0.696
4600.000	0.256	306.458	4599.485	8.296	-34.311	8.296	35.299	283.593	0.112
4700.000	0.289	285.151	4699.484	8.495	-34.734	8.495	35.758	283.743	0.106
4800.000	0.071	346.409	4799.484	8.621	-34.991	8.621	36.038	283.840	0.262
4900.000	0.123	43.325	4899.484	8.759	-34.932	8.759	36.014	284.077	0.103
5000.000	0.287	39.165	4999.483	9.032	-34.700	9.032	35.856	284.590	0.164
5100.000	0.532	66.319	5099.480	9.413	-34.117	9.413	35.391	285.424	0.306
5200.000	1.047	132.078	5199.472	8.987	-33.014	8.987	34.215	285.228	0.960
5300.000	1.497	173.563	5299.449	7.077	-32.189	7.077	32.958	282.399	0.995
5400.000	2.348	184.486	5399.393	3.737	-32.203	3.737	32.419	276.619	0.923
5500.000	2.952	198.207	5499.286	-0.751	-33.168	-0.751	33.176	268.702	0.872
5600.000	2.670	214.583	5599.167	-5.115	-35.294	-5.115	35.663	261.754	0.847
5700.000	2.319	217.068	5699.072	-8.647	-37.836	-8.647	38.812	257.127	0.367
5800.000	1.636	229.814	5799.013	-11.183	-40.146	-11.183	41.674	254.435	0.809
5900.000	1.368	231.582	5898.978	-12.845	-42.171	-12.845	44.084	253.060	0.272
6000.000	1.155	250.773	5998.955	-13.918	-44.058	-13.918	46.204	252.468	0.470
6100.000	0.951	243.996	6098.938	-14.614	-45.755	-14.614	48.032	252.287	0.238
6200.000	0.888	241.901	6198.925	-15.343	-47.185	-15.343	49.617	251.987	0.071
6300.000	1.041	241.873	6298.911	-16.137	-48.670	-16.137	51.276	251.657	0.153
6400.000	0.740	263.474	6398.899	-16.639	-50.113	-16.639	52.803	251.633	0.446
6500.000	0.630	270.034	6498.891	-16.712	-51.305	-16.712	53.958	251.958	0.135
6600.000	0.694	263.674	6598.885	-16.778	-52.456	-16.778	55.074	252.263	0.098
6700.000	0.372	268.347	6698.880	-16.854	-53.383	-16.854	55.980	252.478	0.325
6800.000	0.542	305.358	6798.877	-16.590	-54.093	-16.590	56.579	252.950	0.332
6900.000	0.132	34.476	6898.876	-16.221	-54.413	-16.221	56.779	253.400	0.556
7000.000	0.160	38.446	6998.875	-16.016	-54.261	-16.016	56.575	253.555	0.029
7100.000	0.169	228.596	7098.875	-16.005	-54.285	-16.005	56.595	253.573	0.327
7200.000	0.141	310.953	7198.875	-16.022	-54.488	-16.022	56.795	253.614	0.205
7300.000	0.232	45.543	7298.875	-15.800	-54.437	-15.800	56.684	253.815	0.281
7400.000	0.263	355.245	7398.874	-15.429	-54.312	-15.429	56.461	254.141	0.212
7500.000	0.369	356.634	7498.872	-14.878	-54.350	-14.878	56.349	254.690	0.106
7600.000	0.318	301.500	7598.871	-14.412	-54.605	-14.412	56.475	255.215	0.321
7700.000	0.110	190.745	7698.870	-14.362	-54.859	-14.362	56.708	255.330	0.371
7800.000	0.341	349.904	7798.870	-14.163	-54.929	-14.163	56.726	255.541	0.446
7900.000	0.893	36.671	7898.864	-13.246	-54.516	-13.246	56.102	256.344	0.705
7950.000	0.547	63.863	7948.860	-12.828	-54.069	-12.828	55.570	256.653	0.954
HORIZONTAL DISPLACEMENT IS 55.570 FEET AT 256.653 DEGREES									