

Company: Anadarko Petroleum Corp.

Well: HSR-Heintzelman 16-32

API: 05-123-19165

Rig Name: Production/Warrior

Location: Weld County, Colorado

Latitude: 40.176, Longitude: -104.905

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: hagro-de_01.ut

Minimum Curvature Method

Report Date/Time: 1/22/2014 / 09:33

Vaughn Energy Services

Henderson, CO.

Justin Williams

303-853-4976

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	0.283	258.853	100.000	-0.048	-0.243	-0.048	0.247	258.853	0.283
200.000	0.221	228.272	199.999	-0.224	-0.629	-0.224	0.668	250.411	0.146
300.000	0.218	241.854	299.998	-0.442	-0.941	-0.442	1.039	244.838	0.052
400.000	0.220	241.903	399.997	-0.622	-1.278	-0.622	1.421	244.042	0.003
500.000	0.313	283.386	499.996	-0.649	-1.713	-0.649	1.832	249.234	0.208
600.000	0.393	284.862	599.994	-0.498	-2.310	-0.498	2.363	257.826	0.081
700.000	0.435	278.826	699.992	-0.352	-3.017	-0.352	3.038	263.345	0.061
800.000	0.562	285.073	799.988	-0.166	-3.866	-0.166	3.870	267.539	0.138
900.000	0.588	281.396	899.983	0.063	-4.843	0.063	4.844	270.744	0.045
1000.000	0.720	281.205	999.976	0.286	-5.963	0.286	5.970	272.750	0.132
1100.000	0.911	284.335	1099.966	0.605	-7.349	0.605	7.374	274.709	0.195
1200.000	1.099	274.395	1199.951	0.876	-9.076	0.876	9.118	275.511	0.256
1300.000	1.235	275.196	1299.930	1.047	-11.105	1.047	11.154	275.384	0.136
1400.000	1.385	276.200	1399.904	1.275	-13.379	1.275	13.440	275.442	0.152
1500.000	1.603	280.900	1499.870	1.670	-15.954	1.670	16.041	275.975	0.250
1600.000	1.717	287.057	1599.828	2.374	-18.760	2.374	18.909	277.211	0.212
1700.000	1.805	292.089	1699.781	3.405	-21.651	3.405	21.918	278.939	0.178
1800.000	1.804	299.695	1799.731	4.777	-24.478	4.777	24.940	281.044	0.239
1900.000	1.859	300.358	1899.680	6.377	-27.245	6.377	27.981	283.173	0.059
2000.000	1.810	294.763	1999.629	7.858	-30.078	7.858	31.087	284.641	0.186
2100.000	1.573	281.571	2099.586	8.794	-32.856	8.794	34.013	284.985	0.454
2200.000	0.706	280.654	2199.565	9.184	-34.807	9.184	35.998	284.781	0.867
2300.000	0.308	317.574	2299.561	9.496	-35.594	9.496	36.839	284.938	0.496
2400.000	0.287	344.030	2399.560	9.936	-35.845	9.936	37.196	285.493	0.138
2500.000	0.299	344.926	2499.559	10.430	-35.982	10.430	37.463	286.165	0.013
2600.000	0.438	325.490	2599.557	10.997	-36.266	10.997	37.897	286.869	0.185
2700.000	0.816	307.468	2699.550	11.745	-37.048	11.745	38.865	287.590	0.421
2800.000	0.953	297.246	2799.539	12.559	-38.352	12.559	40.356	288.132	0.209
2900.000	1.005	298.916	2899.524	13.364	-39.859	13.364	42.040	288.535	0.059
3000.000	0.931	298.067	2999.510	14.170	-41.344	14.170	43.705	288.918	0.076
3100.000	0.904	289.646	3099.497	14.817	-42.804	14.817	45.296	289.094	0.137
3200.000	0.796	301.086	3199.486	15.441	-44.141	15.441	46.764	289.281	0.201
3300.000	0.769	294.063	3299.477	16.073	-45.349	16.073	48.113	289.516	0.100
3400.000	0.548	307.180	3399.470	16.636	-46.343	16.636	49.238	289.747	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
3500.000	0.339	317.614	3499.467	17.144	-46.923	17.144	49.957	290.070	0.224
3600.000	0.368	330.394	3599.465	17.641	-47.281	17.641	50.465	290.461	0.084
3700.000	1.174	325.656	3699.455	18.767	-48.018	18.767	51.555	291.347	0.808
3800.000	1.222	325.937	3799.433	20.497	-49.194	20.497	53.293	292.619	0.048
3900.000	1.485	313.615	3899.406	22.274	-50.729	22.274	55.403	293.705	0.390
4000.000	1.506	305.227	3999.372	23.925	-52.740	23.925	57.913	294.401	0.220
4100.000	1.507	310.226	4099.337	25.532	-54.817	25.532	60.471	294.975	0.131
4200.000	1.406	321.282	4199.305	27.338	-56.588	27.338	62.846	295.786	0.298
4300.000	1.504	318.037	4299.273	29.271	-58.233	29.271	65.176	296.687	0.128
4400.000	1.528	323.168	4399.238	31.314	-59.909	31.314	67.600	297.596	0.138
4500.000	1.509	319.406	4499.203	33.381	-61.566	33.381	70.033	298.467	0.101
4600.000	1.286	324.602	4599.173	35.296	-63.072	35.296	72.277	299.232	0.257
4700.000	1.118	316.668	4699.151	36.919	-64.392	36.919	74.225	299.828	0.236
4800.000	1.151	316.834	4799.131	38.362	-65.748	38.362	76.121	300.262	0.034
4900.000	1.053	304.274	4899.113	39.612	-67.195	39.612	78.002	300.520	0.260
5000.000	0.805	292.185	4999.100	40.395	-68.604	40.395	79.613	300.490	0.315
5100.000	0.794	285.383	5099.090	40.844	-69.923	40.844	80.978	300.290	0.095
5200.000	0.702	302.149	5199.082	41.354	-71.110	41.354	82.260	300.180	0.237
5300.000	0.724	280.738	5299.074	41.797	-72.250	41.797	83.469	300.050	0.266
5400.000	0.689	306.509	5399.067	42.273	-73.353	42.273	84.662	299.954	0.317
5500.000	0.704	273.693	5499.060	42.670	-74.449	42.670	85.810	299.819	0.394
5600.000	0.833	273.894	5599.051	42.759	-75.787	42.759	87.017	299.431	0.129
5700.000	0.257	301.596	5699.046	42.925	-76.703	42.925	87.897	299.233	0.617
5800.000	0.622	171.003	5799.044	42.507	-76.809	42.507	87.786	298.961	0.813
5900.000	0.597	122.782	5899.039	41.688	-76.286	41.688	86.934	298.656	0.499
6000.000	0.792	117.100	5999.032	41.091	-75.232	41.091	85.723	298.643	0.206
6100.000	0.853	105.340	6099.022	40.580	-73.899	40.580	84.308	298.772	0.179
6200.000	1.047	115.548	6199.008	39.989	-72.357	39.989	82.672	298.928	0.257
6300.000	1.143	133.455	6298.990	38.909	-70.809	38.909	80.795	298.788	0.354
6400.000	0.796	114.007	6398.976	37.940	-69.450	37.940	79.137	298.647	0.473
6500.000	1.103	151.757	6498.963	36.809	-68.360	36.809	77.640	298.301	0.679
6600.000	0.663	120.042	6598.951	35.672	-67.403	35.672	76.261	297.889	0.642
6700.000	0.623	107.239	6698.945	35.221	-66.383	35.221	75.148	297.949	0.149
6800.000	0.417	124.246	6798.941	34.855	-65.563	34.855	74.252	297.996	0.255
6900.000	0.584	140.828	6898.937	34.255	-64.940	34.255	73.420	297.811	0.220
7000.000	0.926	138.023	6998.928	33.259	-64.077	33.259	72.195	297.431	0.343
7100.000	0.832	148.641	7098.917	32.039	-63.159	32.039	70.821	296.897	0.188
7200.000	1.419	110.599	7198.898	30.983	-61.622	30.983	68.973	296.693	0.920
7300.000	1.900	109.137	7298.856	30.004	-58.896	30.004	66.099	296.996	0.483
HORIZONTAL DISPLACEMENT IS 66.099 FEET AT 296.996 DEGREES									