



# **Anadarko Petroleum Corporation**

**Riverbend**

**Riverbend 14 Pad**

**Riverbend 05-13 (111418) - Slot 05-13**

**05-13**

**Survey: 05-13**

## **Survey Report - Geographic**

**31 January, 2012**

# ARK Directional Services

## Survey Report - Geographic

<b>Company:</b>	Anadarko Petroleum Corporation	<b>Local Co-ordinate Reference:</b>	Well Riverbend 05-13 (111418) - Slot 05-13
<b>Project:</b>	Riverbend	<b>TVD Reference:</b>	KB @ 4968.00ft (Original Well Elev)
<b>Site:</b>	Riverbend 14 Pad	<b>MD Reference:</b>	KB @ 4968.00ft (Original Well Elev)
<b>Well:</b>	Riverbend 05-13 (111418)	<b>North Reference:</b>	True
<b>Wellbore:</b>	05-13	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	05-13	<b>Database:</b>	EDM5000

<b>Project</b>	Riverbend		
<b>Map System:</b>	Universal Transverse Mercator	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	NAD83 Colorado - HARN		
<b>Map Zone:</b>	Zone 13N (108 W to 102 W)		

Site	Riverbend 14 Pad				
Site Position:		Northing:	14,547,138.00 usft	Latitude:	40.055934°N
From:	Lat/Long	Easting:	1,683,122.87 usft	Longitude:	104.847381°W
Position Uncertainty:	0.00 ft	Slot Radius:	13.20 in	Grid Convergence:	0.10 °

Well	Riverbend 05-13 (111418) - Slot 05-13					
Well Position	+N/-S	0.00 ft	Northing:	14,547,078.00 usft	Latitude:	40.055769°N
	+E/-W	0.00 ft	Easting:	1,683,123.13 usft	Longitude:	104.847381°W
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	4,953.00 ft

<b>Wellbore</b>	05-13				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	02/22/12	8.79	66.73	52,867

<b>Survey Program</b>	<b>Date</b>	01/28/12			
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
133.00	8,235.00	05-13 (05-13)	MWD	MWD - Standard	

<b>Survey</b>									
<b>Measured Depth (ft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Map Northing (usft)</b>	<b>Map Easting (usft)</b>	<b>Latitude</b>	<b>Longitude</b>
0.00	0.00	0.00							
133.00	0.22	105.37	133.00	-0.07	0.25	14,547,077.93	1,683,123.38	40.055769°N	104.847380°W
226.00	1.58	161.49	225.99	-1.33	0.83	14,547,076.67	1,683,123.96	40.055766°N	104.847378°W
318.00	3.38	159.07	317.90	-5.07	2.20	14,547,072.94	1,683,125.34	40.055755°N	104.847373°W
395.00	5.10	160.08	394.68	-10.41	4.17	14,547,067.60	1,683,127.32	40.055741°N	104.847366°W
483.00	6.28	162.37	482.25	-18.67	6.96	14,547,059.34	1,683,130.13	40.055718°N	104.847356°W
571.00	7.60	161.36	569.60	-28.77	10.28	14,547,049.25	1,683,133.46	40.055690°N	104.847344°W
659.00	8.76	159.38	656.70	-40.56	14.50	14,547,037.47	1,683,137.70	40.055658°N	104.847329°W
748.00	9.58	163.16	744.57	-53.99	19.03	14,547,024.05	1,683,142.26	40.055621°N	104.847313°W
837.00	10.50	164.08	832.20	-68.88	23.40	14,547,009.17	1,683,146.65	40.055580°N	104.847297°W
959.00	10.50	164.08	952.16	-90.26	29.50	14,546,987.80	1,683,152.79	40.055521°N	104.847275°W
1,027.00	10.90	164.08	1,018.98	-102.40	32.97	14,546,975.66	1,683,156.27	40.055488°N	104.847263°W
1,116.00	10.68	164.79	1,106.40	-118.45	37.44	14,546,959.62	1,683,160.77	40.055444°N	104.847247°W
1,205.00	12.61	163.47	1,193.57	-135.72	42.37	14,546,942.35	1,683,165.73	40.055397°N	104.847229°W
1,292.00	12.22	162.90	1,278.53	-153.63	47.78	14,546,924.46	1,683,171.17	40.055347°N	104.847210°W
1,382.00	11.82	161.67	1,366.56	-171.48	53.47	14,546,906.62	1,683,176.90	40.055298°N	104.847190°W
1,470.00	11.69	161.27	1,452.72	-188.48	59.17	14,546,889.63	1,683,182.63	40.055252°N	104.847169°W
1,561.00	11.51	159.78	1,541.86	-205.73	65.27	14,546,872.39	1,683,188.76	40.055204°N	104.847147°W
1,652.00	13.71	163.69	1,630.66	-224.60	71.44	14,546,853.53	1,683,194.95	40.055153°N	104.847125°W
1,740.00	14.02	162.98	1,716.09	-244.80	77.49	14,546,833.33	1,683,201.04	40.055097°N	104.847104°W
1,829.00	13.49	161.27	1,802.54	-264.94	83.98	14,546,813.21	1,683,207.56	40.055042°N	104.847081°W

# ARK Directional Services

## Survey Report - Geographic

<b>Company:</b>	Anadarko Petroleum Corporation	<b>Local Co-ordinate Reference:</b>	Well Riverbend 05-13 (111418) - Slot 05-13
<b>Project:</b>	Riverbend	<b>TVD Reference:</b>	KB @ 4968.00ft (Original Well Elev)
<b>Site:</b>	Riverbend 14 Pad	<b>MD Reference:</b>	KB @ 4968.00ft (Original Well Elev)
<b>Well:</b>	Riverbend 05-13 (111418)	<b>North Reference:</b>	True
<b>Wellbore:</b>	05-13	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	05-13	<b>Database:</b>	EDM5000

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
1,917.00	13.01	159.78	1,888.20	-283.96	90.69	14,546,794.20	1,683,214.31	40.054990°N	104.847057°W
2,004.00	12.30	158.90	1,973.09	-301.79	97.42	14,546,776.38	1,683,221.06	40.054941°N	104.847033°W
2,093.00	13.18	159.69	2,059.89	-320.15	104.35	14,546,758.03	1,683,228.03	40.054890°N	104.847008°W
2,184.00	13.01	159.29	2,148.53	-339.46	111.57	14,546,738.73	1,683,235.29	40.054837°N	104.846982°W
2,271.00	12.61	157.36	2,233.36	-357.39	118.69	14,546,720.82	1,683,242.44	40.054788°N	104.846957°W
2,361.00	13.80	162.19	2,320.98	-376.68	125.76	14,546,701.54	1,683,249.54	40.054735°N	104.846931°W
2,451.00	13.01	160.79	2,408.53	-396.46	132.37	14,546,681.77	1,683,256.19	40.054681°N	104.846908°W
2,539.00	12.61	159.69	2,494.34	-414.82	138.97	14,546,663.42	1,683,262.81	40.054630°N	104.846884°W
2,626.00	13.01	160.70	2,579.18	-432.97	145.50	14,546,645.28	1,683,269.37	40.054580°N	104.846861°W
2,714.00	13.40	165.09	2,664.85	-452.18	151.40	14,546,626.09	1,683,275.31	40.054528°N	104.846840°W
2,803.00	12.70	163.47	2,751.55	-471.52	156.84	14,546,606.75	1,683,280.78	40.054474°N	104.846820°W
2,892.00	14.28	166.59	2,838.09	-491.58	162.16	14,546,586.70	1,683,286.14	40.054419°N	104.846801°W
2,981.00	13.80	164.96	2,924.44	-512.51	167.46	14,546,565.78	1,683,291.48	40.054362°N	104.846782°W
3,070.00	14.41	166.28	3,010.75	-533.52	172.85	14,546,544.78	1,683,296.89	40.054304°N	104.846763°W
3,160.00	13.01	166.76	3,098.19	-554.26	177.82	14,546,524.05	1,683,301.90	40.054247°N	104.846745°W
3,248.00	13.49	165.58	3,183.84	-573.84	182.65	14,546,504.48	1,683,306.76	40.054193°N	104.846728°W
3,339.00	14.28	164.96	3,272.18	-594.96	188.20	14,546,483.37	1,683,312.35	40.054135°N	104.846708°W
3,426.00	14.90	164.48	3,356.38	-616.10	193.98	14,546,462.24	1,683,318.17	40.054077°N	104.846688°W
3,514.00	13.71	164.26	3,441.65	-637.04	199.84	14,546,441.31	1,683,324.06	40.054020°N	104.846667°W
3,602.00	13.80	163.29	3,527.12	-657.13	205.68	14,546,421.23	1,683,329.94	40.053965°N	104.846646°W
3,691.00	14.59	162.06	3,613.41	-677.96	212.19	14,546,400.41	1,683,336.48	40.053908°N	104.846622°W
3,781.00	12.39	162.06	3,700.92	-697.93	218.65	14,546,380.45	1,683,342.98	40.053853°N	104.846599°W
3,871.00	14.11	160.87	3,788.52	-717.48	225.22	14,546,360.91	1,683,349.59	40.053799°N	104.846576°W
3,960.00	15.29	162.37	3,874.60	-738.92	232.33	14,546,339.48	1,683,356.73	40.053740°N	104.846550°W
4,051.00	14.90	159.86	3,962.47	-761.34	240.00	14,546,317.08	1,683,364.43	40.053679°N	104.846523°W
4,140.00	13.89	161.36	4,048.67	-782.20	247.35	14,546,296.23	1,683,371.82	40.053621°N	104.846497°W
4,230.00	14.59	164.79	4,135.91	-803.38	253.78	14,546,275.06	1,683,378.29	40.053563°N	104.846474°W
4,320.00	14.50	164.87	4,223.02	-825.19	259.69	14,546,253.26	1,683,384.24	40.053503°N	104.846453°W
4,409.00	14.90	166.37	4,309.11	-847.07	265.30	14,546,231.39	1,683,389.88	40.053443°N	104.846433°W
4,498.00	13.80	166.90	4,395.33	-868.53	270.40	14,546,209.94	1,683,395.02	40.053384°N	104.846414°W
4,589.00	13.80	163.38	4,483.70	-889.50	275.96	14,546,188.98	1,683,400.62	40.053327°N	104.846395°W
4,677.00	14.11	158.68	4,569.11	-909.55	282.87	14,546,168.94	1,683,407.56	40.053272°N	104.846370°W
4,765.00	14.19	164.08	4,654.44	-929.92	289.72	14,546,148.59	1,683,414.45	40.053216°N	104.846345°W
4,854.00	15.12	164.17	4,740.55	-951.57	295.88	14,546,126.94	1,683,420.65	40.053156°N	104.846323°W
4,944.00	15.21	165.40	4,827.41	-974.29	302.06	14,546,104.23	1,683,426.86	40.053094°N	104.846301°W
5,032.00	14.28	162.68	4,912.52	-995.82	308.20	14,546,082.71	1,683,433.04	40.053035°N	104.846279°W
5,122.00	11.69	158.68	5,000.21	-1,014.92	314.82	14,546,063.63	1,683,439.69	40.052982°N	104.846256°W
5,212.00	9.32	156.88	5,088.69	-1,030.12	321.00	14,546,048.44	1,683,445.90	40.052940°N	104.846234°W
5,299.00	5.80	159.07	5,174.92	-1,040.70	325.34	14,546,037.86	1,683,450.25	40.052911°N	104.846218°W
5,387.00	3.60	145.58	5,262.63	-1,047.14	328.49	14,546,031.43	1,683,453.42	40.052894°N	104.846207°W
5,476.00	3.21	146.07	5,351.47	-1,051.51	331.46	14,546,027.06	1,683,456.39	40.052882°N	104.846196°W
5,566.00	1.80	171.29	5,441.38	-1,055.00	333.08	14,546,023.58	1,683,458.02	40.052872°N	104.846190°W
5,656.00	1.49	180.08	5,531.35	-1,057.57	333.29	14,546,021.01	1,683,458.24	40.052865°N	104.846190°W
5,746.00	0.40	295.57	5,621.34	-1,058.60	333.01	14,546,019.98	1,683,457.95	40.052862°N	104.846191°W
5,881.00	0.09	205.70	5,756.34	-1,058.49	332.54	14,546,020.08	1,683,457.48	40.052863°N	104.846192°W
6,014.00	0.79	125.28	5,889.33	-1,059.12	333.24	14,546,019.46	1,683,458.19	40.052861°N	104.846190°W
6,148.00	1.19	129.28	6,023.31	-1,060.53	335.07	14,546,018.05	1,683,460.02	40.052857°N	104.846183°W
6,282.00	1.01	108.27	6,157.29	-1,061.78	337.27	14,546,016.80	1,683,462.22	40.052854°N	104.846175°W
6,414.00	1.19	120.80	6,289.26	-1,062.85	339.55	14,546,015.74	1,683,464.50	40.052851°N	104.846167°W
6,549.00	1.19	126.07	6,424.23	-1,064.39	341.89	14,546,014.20	1,683,466.84	40.052846°N	104.846159°W
6,683.00	1.01	127.30	6,558.21	-1,065.93	343.95	14,546,012.67	1,683,468.91	40.052842°N	104.846152°W
6,775.62	1.01	132.23	6,650.82	-1,066.97	345.21	14,546,011.63	1,683,470.17	40.052839°N	104.846147°W
05-13 BH - 05-13 Legal Window									
6,816.00	1.01	134.38	6,691.19	-1,067.46	345.72	14,546,011.14	1,683,470.68	40.052838°N	104.846145°W
6,950.00	1.01	146.28	6,825.17	-1,069.26	347.22	14,546,009.34	1,683,472.19	40.052833°N	104.846140°W

# ARK Directional Services

## Survey Report - Geographic

<b>Company:</b>	Anadarko Petroleum Corporation	<b>Local Co-ordinate Reference:</b>	Well Riverbend 05-13 (111418) - Slot 05-13
<b>Project:</b>	Riverbend	<b>TVD Reference:</b>	KB @ 4968.00ft (Original Well Elev)
<b>Site:</b>	Riverbend 14 Pad	<b>MD Reference:</b>	KB @ 4968.00ft (Original Well Elev)
<b>Well:</b>	Riverbend 05-13 (111418)	<b>North Reference:</b>	True
<b>Wellbore:</b>	05-13	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	05-13	<b>Database:</b>	EDM5000

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
7,083.00	1.01	146.68	6,958.15	-1,071.22	348.52	14,546,007.38	1,683,473.48	40.052828°N	104.846135°W	
7,215.00	1.01	134.38	7,090.13	-1,073.00	349.99	14,546,005.60	1,683,474.96	40.052823°N	104.846130°W	
7,350.00	1.32	119.87	7,225.10	-1,074.61	352.19	14,546,004.00	1,683,477.16	40.052818°N	104.846122°W	
7,484.00	2.29	124.27	7,359.03	-1,076.89	355.74	14,546,001.73	1,683,480.71	40.052812°N	104.846109°W	
7,619.00	2.02	123.48	7,493.93	-1,079.72	359.95	14,545,998.90	1,683,484.93	40.052804°N	104.846094°W	
7,751.00	1.32	101.68	7,625.88	-1,081.31	363.38	14,545,997.32	1,683,488.36	40.052800°N	104.846082°W	
7,885.00	0.79	94.30	7,759.86	-1,081.69	365.81	14,545,996.94	1,683,490.80	40.052799°N	104.846073°W	
8,152.00	0.62	29.48	8,026.84	-1,080.57	368.36	14,545,998.06	1,683,493.34	40.052802°N	104.846064°W	
8,191.00	0.70	26.67	8,065.84	-1,080.18	368.57	14,545,998.46	1,683,493.55	40.052803°N	104.846064°W	
8,235.00	0.70	26.67	8,109.83	-1,079.70	368.81	14,545,998.94	1,683,493.79	40.052804°N	104.846063°W	
Proj to TD at 8235 MD/8110 TVD										

Survey Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
8,235.00	8,109.83	-1,079.70	368.81	Proj to TD at 8235 MD/8110 TVD	

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_