

# **Energen Resources**

**Tiffany**

**Navajo Lake 32-5**

**Navajo Lake 32-5 #21-2**

**Wellbore #1**

**Plan: Design #1**

## **APD Report**

**15 July, 2011**

**Energen**  
APD Report

<b>Company:</b>	Energen Resources	<b>Local Co-ordinate Reference:</b>	Site Navajo Lake 32-5
<b>Project:</b>	Tiffany	<b>TVD Reference:</b>	WELL @ 6157.0usft (Original Well Elev)
<b>Site:</b>	Navajo Lake 32-5	<b>MD Reference:</b>	WELL @ 6157.0usft (Original Well Elev)
<b>Well:</b>	Navajo Lake 32-5 #21-2	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Design #1	<b>Database:</b>	EDM 5000.1 Single User Db

<b>Project</b>	Tiffany		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	New Mexico Central Zone		

<b>Site</b>	Navajo Lake 32-5		
<b>Site Position:</b>		<b>Northing:</b>	2,189,007.22 usft
<b>From:</b>	Lat/Long	<b>Easting:</b>	1,300,332.09 usft
<b>Position Uncertainty:</b>	0.0 usft	<b>Slot Radius:</b>	13-3/16 "
		<b>Latitude:</b>	37° 0' 35.892 N
		<b>Longitude:</b>	107° 24' 53.244 W
		<b>Grid Convergence:</b>	-0.70 °

Well		Navajo Lake 32-5 #21-2				
Well Position	+N/-S	0.0 usft	Northing:	2,189,007.22 usft	Latitude:	37° 0' 35.892 N
	+E/-W	0.0 usft	Easting:	1,300,332.09 usft	Longitude:	107° 24' 53.244 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	6,139.0 usft

<b>Wellbore</b>	Wellbore #1				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF200510	5/4/2011	9.78	63.78	50,984

<b>Design</b>	Design #1			
<b>Audit Notes:</b>				
<b>Version:</b>	<b>Phase:</b>	PROTOTYPE	<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>
	0.0	0.0	0.0	113.73

<b>Survey Tool Program</b>	<b>Date</b>	7/15/2011		
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>
0.0	9,206.5	Design #1 (Wellbore #1)	MWD	MWD - Standard

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<b>Well:</b>	Navajo Lake 32-5 #21-2	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Design #1	<b>Database:</b>	EDM 5000.1 Single User Db

**Planned Survey**

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00
500.0	0.00	0.00	500.0	0.0	0.0	0.0	0.00
<b>9 5/8"</b>							
600.0	0.00	0.00	600.0	0.0	0.0	0.0	0.00
612.0	0.34	145.61	612.0	0.0	0.0	0.0	2.84
<b>Nacimiento</b>							
700.0	2.84	145.61	700.0	2.1	-2.0	1.4	2.84
800.0	5.68	145.61	799.7	8.4	-8.2	5.6	2.84
900.0	8.52	145.61	898.9	18.9	-18.4	12.6	2.84
1,000.0	11.36	145.61	997.4	33.5	-32.6	22.3	2.84
1,100.0	14.19	145.61	1,094.9	52.3	-50.8	34.8	2.84
1,200.0	17.03	145.61	1,191.2	75.2	-73.1	50.0	2.84
1,300.0	19.87	145.61	1,286.1	102.0	-99.2	67.9	2.84
1,400.0	22.71	145.61	1,379.2	132.9	-129.1	88.4	2.84
1,500.0	25.55	145.61	1,470.5	167.6	-162.9	111.5	2.84
1,600.0	28.39	145.61	1,559.6	206.1	-200.3	137.1	2.84
1,700.0	31.23	145.61	1,646.3	248.3	-241.3	165.2	2.84
1,800.0	34.07	145.61	1,730.5	294.1	-285.8	195.6	2.84
1,888.8	36.59	145.61	1,803.0	337.7	-328.2	224.6	2.84
<b>Ojo Alamo</b>							
1,900.0	36.90	145.61	1,812.0	343.4	-333.7	228.4	2.84
2,000.0	39.74	145.61	1,890.4	396.0	-384.9	263.4	2.84
2,041.5	40.92	145.61	1,922.0	418.8	-407.0	278.6	2.84
<b>Kirtland</b>							
2,100.0	42.58	145.61	1,965.7	451.9	-439.2	300.6	2.84
2,200.0	45.42	145.61	2,037.6	510.9	-496.5	339.8	2.84
2,300.0	48.26	145.61	2,106.0	572.8	-556.7	381.0	2.84
2,400.0	51.10	145.61	2,170.7	637.6	-619.6	424.1	2.84

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<b>Well:</b>	Navajo Lake 32-5 #21-2	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Design #1	<b>Database:</b>	EDM 5000.1 Single User Db

Planned Survey							
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)
2,500.0	53.94	145.61	2,231.5	705.0	-685.1	468.9	2.84
2,600.0	56.78	145.61	2,288.4	774.8	-753.0	515.4	2.84
2,700.0	59.62	145.61	2,341.1	847.0	-823.1	563.4	2.84
2,800.0	62.45	145.61	2,389.5	921.3	-895.3	612.8	2.84
2,900.0	65.29	145.61	2,433.5	997.5	-969.4	663.5	2.84
2,994.5	67.98	145.61	2,471.0	1,071.1	-1,041.0	712.5	2.84
Fruitland							
3,000.0	68.13	145.61	2,473.1	1,075.5	-1,045.2	715.4	2.84
3,100.0	70.97	145.61	2,508.0	1,155.0	-1,122.5	768.3	2.84
3,200.0	73.81	145.61	2,538.2	1,236.0	-1,201.1	822.1	2.84
3,300.0	76.65	145.61	2,563.7	1,318.1	-1,280.9	876.7	2.84
3,400.0	79.49	145.61	2,584.4	1,401.1	-1,361.6	932.0	2.84
3,500.0	82.33	145.61	2,600.2	1,485.0	-1,443.1	987.8	2.84
3,600.0	85.17	145.61	2,611.1	1,569.4	-1,525.1	1,043.9	2.84
3,698.4	87.96	145.61	2,617.0	1,652.8	-1,606.2	1,099.4	2.84
Coal Top							
3,700.0	87.96	145.54	2,617.1	1,654.1	-1,607.5	1,100.3	4.46
3,769.2	88.07	142.46	2,619.5	1,713.8	-1,663.4	1,140.9	4.46
21-2 EP							
3,800.0	88.12	141.08	2,620.5	1,741.0	-1,687.6	1,160.0	4.46
3,900.0	88.28	136.62	2,623.6	1,831.5	-1,762.9	1,225.7	4.46
4,000.0	88.45	132.16	2,626.5	1,925.0	-1,832.8	1,297.1	4.46
4,100.0	88.64	127.71	2,629.0	2,021.0	-1,896.9	1,373.8	4.46
4,200.0	88.83	123.25	2,631.2	2,118.8	-1,954.9	1,455.2	4.46
4,227.0	88.88	122.05	2,631.8	2,145.5	-1,969.5	1,477.9	4.46
7"							
4,227.4	88.89	122.03	2,631.8	2,145.9	-1,969.7	1,478.3	4.46
21-2 CP							

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Planned Survey							
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)
4,300.0	89.03	118.79	2,633.1	2,218.0	-2,006.5	1,540.8	4.46
4,400.0	89.24	114.34	2,634.6	2,317.8	-2,051.2	1,630.2	4.46
4,500.0	89.45	109.88	2,635.8	2,417.7	-2,088.8	1,722.8	4.46
4,600.0	89.66	105.43	2,636.5	2,517.1	-2,119.1	1,818.1	4.46
4,700.0	89.88	100.97	2,636.9	2,615.4	-2,141.9	1,915.4	4.46
4,757.7	90.00	98.40	2,637.0	2,671.4	-2,151.6	1,972.3	4.46
Coal Base							
4,800.0	90.00	98.40	2,637.0	2,712.2	-2,157.8	2,014.2	0.00
4,900.0	90.00	98.40	2,637.0	2,808.6	-2,172.4	2,113.1	0.00
5,000.0	90.00	98.40	2,637.0	2,905.1	-2,187.0	2,212.0	0.00
5,100.0	90.00	98.40	2,637.0	3,001.5	-2,201.6	2,310.9	0.00
5,200.0	90.00	98.40	2,637.0	3,098.0	-2,216.2	2,409.9	0.00
5,300.0	90.00	98.40	2,637.0	3,194.4	-2,230.9	2,508.8	0.00
5,400.0	90.00	98.40	2,637.0	3,290.9	-2,245.5	2,607.7	0.00
5,500.0	90.00	98.40	2,637.0	3,387.3	-2,260.1	2,706.7	0.00
5,600.0	90.00	98.40	2,637.0	3,483.7	-2,274.7	2,805.6	0.00
5,700.0	90.00	98.40	2,637.0	3,580.2	-2,289.3	2,904.5	0.00
5,800.0	90.00	98.40	2,637.0	3,676.6	-2,303.9	3,003.4	0.00
5,900.0	90.00	98.40	2,637.0	3,773.1	-2,318.5	3,102.4	0.00
6,000.0	90.00	98.40	2,637.0	3,869.5	-2,333.1	3,201.3	0.00
6,100.0	90.00	98.40	2,637.0	3,966.0	-2,347.7	3,300.2	0.00
6,200.0	90.00	98.40	2,637.0	4,062.4	-2,362.3	3,399.1	0.00
6,300.0	90.00	98.40	2,637.0	4,158.8	-2,376.9	3,498.1	0.00
6,400.0	90.00	98.40	2,637.0	4,255.3	-2,391.5	3,597.0	0.00
6,500.0	90.00	98.40	2,637.0	4,351.7	-2,406.2	3,695.9	0.00
6,600.0	90.00	98.40	2,637.0	4,448.2	-2,420.8	3,794.9	0.00
6,700.0	90.00	98.40	2,637.0	4,544.6	-2,435.4	3,893.8	0.00

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Planned Survey								
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6,800.0	90.00	98.40	2,637.0	4,641.1	-2,450.0	3,992.7	0.00	
6,900.0	90.00	98.40	2,637.0	4,737.5	-2,464.6	4,091.6	0.00	
7,000.0	90.00	98.40	2,637.0	4,833.9	-2,479.2	4,190.6	0.00	
7,100.0	90.00	98.40	2,637.0	4,930.4	-2,493.8	4,289.5	0.00	
7,200.0	90.00	98.40	2,637.0	5,026.8	-2,508.4	4,388.4	0.00	
7,300.0	90.00	98.40	2,637.0	5,123.3	-2,523.0	4,487.3	0.00	
7,400.0	90.00	98.40	2,637.0	5,219.7	-2,537.6	4,586.3	0.00	
7,500.0	90.00	98.40	2,637.0	5,316.2	-2,552.2	4,685.2	0.00	
7,600.0	90.00	98.40	2,637.0	5,412.6	-2,566.8	4,784.1	0.00	
7,700.0	90.00	98.40	2,637.0	5,509.0	-2,581.5	4,883.1	0.00	
7,800.0	90.00	98.40	2,637.0	5,605.5	-2,596.1	4,982.0	0.00	
7,900.0	90.00	98.40	2,637.0	5,701.9	-2,610.7	5,080.9	0.00	
8,000.0	90.00	98.40	2,637.0	5,798.4	-2,625.3	5,179.8	0.00	
8,100.0	90.00	98.40	2,637.0	5,894.8	-2,639.9	5,278.8	0.00	
8,200.0	90.00	98.40	2,637.0	5,991.3	-2,654.5	5,377.7	0.00	
8,300.0	90.00	98.40	2,637.0	6,087.7	-2,669.1	5,476.6	0.00	
8,400.0	90.00	98.40	2,637.0	6,184.1	-2,683.7	5,575.5	0.00	
8,500.0	90.00	98.40	2,637.0	6,280.6	-2,698.3	5,674.5	0.00	
8,600.0	90.00	98.40	2,637.0	6,377.0	-2,712.9	5,773.4	0.00	
8,700.0	90.00	98.40	2,637.0	6,473.5	-2,727.5	5,872.3	0.00	
8,800.0	90.00	98.40	2,637.0	6,569.9	-2,742.1	5,971.3	0.00	
8,900.0	90.00	98.40	2,637.0	6,666.3	-2,756.8	6,070.2	0.00	
9,000.0	90.00	98.40	2,637.0	6,762.8	-2,771.4	6,169.1	0.00	
9,100.0	90.00	98.40	2,637.0	6,859.2	-2,786.0	6,268.0	0.00	
9,200.0	90.00	98.40	2,637.0	6,955.7	-2,800.6	6,367.0	0.00	
9,206.0	90.00	98.40	2,637.0	6,961.5	-2,801.5	6,372.9	0.00	
4 1/2"								

**Energen**  
APD Report

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Planned Survey							
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	DLeg (°/100usft)
9,206.5	90.00	98.40	2,637.0	6,962.0	-2,801.5	6,373.4	0.00
21-2 BHL							

Casing Points					
Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")	
9,206.0	2,637.0	4 1/2"	4-1/2	6-1/4	
500.0	500.0	9 5/8"	9-5/8	12-1/4	
4,227.0	2,631.8	7"	7	8-3/4	

Formations						
Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)	
2,041.5	1,922.0	Kirtland	shale	0.00		
2,041.5	1,922.0	Kirtland	Shale	0.00		
612.0	612.0	Nacimient	shale	0.00		
612.0	612.0	Nacimient	Shale	0.00		
4,757.7	2,637.0	Coal Base	coal	0.00		
4,757.7	2,637.0	Coal Base	Coal	0.00		
3,698.4	2,617.0	Coal Top	coal	0.00		
3,698.4	2,617.0	Coal Top	Coal	0.00		
1,888.8	1,803.0	Ojo Alamo	sandstone	0.00		
1,888.8	1,803.0	Ojo Alamo	Sandstone	0.00		
2,994.5	2,471.0	Fruitland	sandstone	0.00		
2,994.5	2,471.0	Fruitland	Sandstone	0.00		

Checked By: _____	Approved By: _____	Date: _____
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