



Energen Resources

Navajo Lake

Miller Mesa

Navajo Lake #102

→ Motherbore

30-045-34115

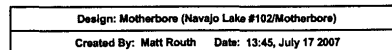
Design: Motherbore

PathFinder X&Y Report

17 July, 2007

RCVD JUL 25/07
OIL CONVE. DIV.
DIST. 3
Surface 1485/S 415/E sec 10, 32N, 01W
BHL 1030/N 921/E sec 15
MD4345 TVD 2896





Company: Energen Resources
Project: Navajo Lake
Site: Miller Mesa
Well: Navajo Lake #102
Wellbore: Motherbore
Design: Motherbore

Local Co-ordinate Reference: Well Navajo Lake #102
TVD Reference: KB @ 6197.0ft (AWS 222)
MD Reference: KB @ 6197.0ft (AWS 222)
North Reference: True
Survey Calculation Method: Minimum Curvature
Database: 200316 NWDB

Project	Navajo Lake	System Datum:	Mean Sea Level
Map System:	US State Plane 1983		
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Western Zone		

Site	Miller Mesa		
Site Position:		Northing:	2,180,551.31 ft
From:	Lat/Long	Easting:	2,838,676.43 ft
Position Uncertainty:	0.0 ft	Slot Radius:	"
		Latitude:	36° 59' 30.120 N
		Longitude:	107° 26' 15.180 W
		Grid Convergence:	0.24 °

Well	Navajo Lake #102					
Well Position	+N/-S	0.0 ft	Northing:	2,180,551.31 ft	Latitude:	36° 59' 30.120 N
	+E/-W	0.0 ft	Easting:	2,838,676.43 ft	Longitude:	107° 26' 15.180 W
Position Uncertainty		0.0 ft	Wellhead Elevation:	6,182.0 ft	Ground Level:	6,182.0 ft

Wellbore	Motherbore				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
	IGRF200510	12/12/2006	(°)	(°)	(nT)
			10.33	63.85	51,391

Design	Motherbore				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(ft)	(ft)	(ft)	(°)	
	0.0	0.0	0.0	191.38	

Survey Program	Date	07/13/2007			
From	To	Survey (Wellbore)	Tool Name	Description	
(ft)	(ft)				
440.0	4,365.0	Survey #1 (Motherbore)	Pathfinder	Pathfinder MWD	

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Survey

MD (ft)	Inc (°)	Azi (°)	TVD (ft)	TVDSS (ft)	N/S (ft)	E/W (ft)	V. Sec (ft)	DLeg (°/100ft)	Northing (ft)	Easting (ft)
0.0	0.00	0.00	0.0	-6,197.0	0.0	0.0	0.0	0.00	2,180,551.31	2,838,676.43
Drill Window										
440.0	0.00	0.00	440.0	-5,757.0	0.0	0.0	0.0	0.00	2,180,551.31	2,838,676.43
473.0	0.79	16.66	473.0	-5,724.0	0.2	0.1	-0.2	2.39	2,180,551.53	2,838,676.50
550.0	0.85	11.83	550.0	-5,647.0	1.3	0.3	-1.3	0.12	2,180,552.59	2,838,676.76
KOP @ 550' TVD										
594.0	0.88	9.36	594.0	-5,603.0	1.9	0.5	-2.0	0.12	2,180,553.25	2,838,676.88
655.0	0.79	16.39	655.0	-5,542.0	2.8	0.7	-2.9	0.22	2,180,554.11	2,838,677.07
715.0	0.88	19.82	715.0	-5,482.0	3.6	0.9	-3.7	0.17	2,180,554.94	2,838,677.34
742.0	0.97	18.68	742.0	-5,455.0	4.0	1.1	-4.2	0.34	2,180,555.36	2,838,677.48
802.0	0.09	149.55	802.0	-5,395.0	4.5	1.3	-4.6	1.72	2,180,555.80	2,838,677.67
864.0	2.99	179.87	863.9	-5,333.1	2.8	1.3	-3.0	4.70	2,180,554.14	2,838,677.70
925.0	5.63	183.56	924.8	-5,272.2	-1.8	1.1	1.5	4.35	2,180,549.56	2,838,677.54
986.0	7.83	181.01	985.3	-5,211.7	-8.9	0.8	8.6	3.64	2,180,542.42	2,838,677.31
1,047.0	10.29	182.33	1,045.6	-5,151.4	-18.5	0.5	18.0	4.05	2,180,532.82	2,838,677.05
1,106.0	12.66	185.32	1,103.4	-5,093.6	-30.2	-0.3	29.7	4.14	2,180,521.11	2,838,676.29
1,166.0	15.21	186.90	1,161.6	-5,035.4	-44.6	-1.8	44.0	4.30	2,180,506.74	2,838,674.79
1,227.0	17.76	189.27	1,220.1	-4,976.9	-61.7	-4.3	61.3	4.32	2,180,489.60	2,838,672.40
1,289.0	19.87	191.56	1,278.8	-4,918.2	-81.4	-7.9	81.3	3.61	2,180,469.93	2,838,668.85
1,350.0	22.25	190.68	1,335.7	-4,861.3	-102.9	-12.1	103.2	3.94	2,180,448.40	2,838,664.72
1,409.0	24.62	190.77	1,389.8	-4,807.2	-125.9	-16.5	126.7	4.02	2,180,425.33	2,838,660.45
1,472.0	26.20	192.44	1,446.7	-4,750.3	-152.4	-22.0	153.7	2.75	2,180,398.83	2,838,655.11
1,533.0	27.79	193.41	1,501.1	-4,695.9	-179.4	-28.2	181.4	2.70	2,180,371.82	2,838,649.03
1,595.0	29.72	194.29	1,555.5	-4,641.5	-208.3	-35.3	211.2	3.19	2,180,342.84	2,838,642.00
1,656.0	31.48	194.46	1,608.0	-4,589.0	-238.4	-43.0	242.2	2.89	2,180,312.73	2,838,634.42
1,718.0	32.36	193.49	1,660.6	-4,536.4	-270.2	-50.9	274.9	1.64	2,180,280.89	2,838,626.63
1,781.0	34.47	192.97	1,713.2	-4,483.8	-304.0	-58.9	309.6	3.38	2,180,247.08	2,838,618.84

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 North Reference: True
 Survey Calculation Method: Minimum Curvature
 Database: 200316 NWDB

Survey

MD (ft)	Inc (°)	Azi (°)	TVD (ft)	TVDSS (ft)	N/S (ft)	E/W (ft)	V. Sec (ft)	DLeg (°/100ft)	Northing (ft)	Easting (ft)
1,844.0	37.20	193.41	1,764.2	-4,432.8	-339.9	-67.3	346.5	4.35	2,180,211.14	2,838,610.57
1,905.0	39.39	193.58	1,812.1	-4,384.9	-376.6	-76.1	384.3	3.59	2,180,174.35	2,838,601.90
1,967.0	41.24	193.93	1,859.4	-4,337.6	-415.6	-85.6	424.3	3.01	2,180,135.35	2,838,592.52
2,028.0	43.53	192.61	1,904.4	-4,292.6	-455.6	-95.1	465.4	4.03	2,180,095.29	2,838,583.26
2,091.0	46.43	191.39	1,949.0	-4,248.0	-499.2	-104.3	510.0	4.80	2,180,051.70	2,838,574.20
2,153.0	48.89	191.03	1,990.7	-4,206.3	-544.1	-113.2	555.8	3.99	2,180,006.71	2,838,565.48
2,217.0	52.14	190.24	2,031.4	-4,165.6	-592.7	-122.3	605.2	5.17	2,179,958.13	2,838,556.57
2,280.0	55.31	191.12	2,068.7	-4,128.3	-642.6	-131.7	655.9	5.16	2,179,908.19	2,838,547.36
2,343.0	57.95	191.12	2,103.4	-4,093.6	-694.2	-141.9	708.5	4.19	2,179,856.53	2,838,537.43
2,406.0	61.91	190.86	2,134.9	-4,062.1	-747.7	-152.3	763.1	6.30	2,179,802.97	2,838,527.26
2,469.0	65.07	189.98	2,163.0	-4,034.0	-803.1	-162.5	819.4	5.17	2,179,747.49	2,838,517.30
2,529.0	66.04	189.80	2,187.9	-4,009.1	-857.0	-171.8	874.0	1.64	2,179,693.65	2,838,508.15
2,592.0	67.62	189.45	2,212.7	-3,984.3	-914.1	-181.5	931.9	2.56	2,179,636.50	2,838,498.70
2,635.7	68.06	189.14	2,229.1	-3,967.9	-954.0	-188.1	972.3	1.20	2,179,596.54	2,838,492.33
Build Section										
2,654.0	68.24	189.01	2,235.9	-3,961.1	-970.8	-190.7	989.3	1.20	2,179,579.75	2,838,489.72
2,717.0	68.32	189.10	2,259.3	-3,937.7	-1,028.6	-200.0	1,047.8	0.18	2,179,521.92	2,838,480.75
2,779.0	68.32	188.75	2,282.2	-3,914.8	-1,085.5	-208.9	1,105.4	0.52	2,179,464.96	2,838,472.05
2,840.0	68.32	188.92	2,304.7	-3,892.3	-1,141.5	-217.6	1,162.0	0.26	2,179,408.92	2,838,463.58
2,900.0	67.71	187.96	2,327.2	-3,869.8	-1,196.5	-225.8	1,217.6	1.80	2,179,353.85	2,838,455.64
2,962.0	67.27	187.52	2,350.9	-3,846.1	-1,253.3	-233.5	1,274.7	0.97	2,179,297.06	2,838,448.16
3,025.0	66.83	187.78	2,375.5	-3,821.5	-1,310.8	-241.2	1,332.6	0.80	2,179,239.54	2,838,440.68
3,088.0	66.39	187.52	2,400.5	-3,796.5	-1,368.1	-248.9	1,390.3	0.79	2,179,182.20	2,838,433.22
3,151.0	66.13	188.13	2,425.8	-3,771.2	-1,425.2	-256.8	1,447.9	0.98	2,179,125.03	2,838,425.60
3,214.0	66.04	187.96	2,451.4	-3,745.6	-1,482.2	-264.8	1,505.4	0.29	2,179,067.98	2,838,417.78
3,277.0	66.04	188.48	2,477.0	-3,720.0	-1,539.2	-273.0	1,562.8	0.75	2,179,010.96	2,838,409.79
3,340.0	65.69	188.92	2,502.7	-3,694.3	-1,596.1	-281.7	1,620.3	0.85	2,178,954.10	2,838,401.33

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3,402.0	66.74	189.89	2,527.7	-3,669.3	-1,652.0	-291.0	1,677.0	2.22	2,178,898.09	2,838,392.29
3,465.0	66.83	190.86	2,552.6	-3,644.4	-1,709.0	-301.4	1,734.9	1.42	2,178,841.09	2,838,382.10
3,528.0	66.74	191.65	2,577.4	-3,619.6	-1,765.8	-312.7	1,792.8	1.16	2,178,784.26	2,838,371.03
3,592.0	67.09	192.53	2,602.5	-3,594.5	-1,823.3	-325.1	1,851.6	1.38	2,178,726.64	2,838,358.94
3,654.0	67.80	192.79	2,626.3	-3,570.7	-1,879.2	-337.6	1,908.9	1.21	2,178,670.73	2,838,346.62
3,717.0	67.88	193.49	2,650.0	-3,547.0	-1,936.0	-350.9	1,967.2	1.04	2,178,613.85	2,838,333.60
3,780.0	68.85	194.29	2,673.3	-3,523.7	-1,992.9	-364.9	2,025.7	1.94	2,178,556.95	2,838,319.77
3,841.0	68.06	195.34	2,695.7	-3,501.3	-2,047.7	-379.5	2,082.3	2.06	2,178,502.04	2,838,305.49
3,904.0	68.24	194.29	2,719.1	-3,477.9	-2,104.2	-394.4	2,140.7	1.57	2,178,445.45	2,838,290.78
3,939.7	68.19	194.34	2,732.4	-3,464.6	-2,136.4	-402.6	2,173.8	0.19	2,178,413.29	2,838,282.72
Hold to Drill Window										
3,967.0	68.15	194.37	2,742.5	-3,454.5	-2,160.9	-408.9	2,199.1	0.19	2,178,388.71	2,838,276.54
4,029.0	67.80	194.81	2,765.8	-3,431.2	-2,216.5	-423.4	2,256.5	0.87	2,178,333.03	2,838,262.29
4,092.0	67.36	195.43	2,789.8	-3,407.2	-2,272.8	-438.5	2,314.6	1.15	2,178,276.75	2,838,247.33
4,154.0	67.09	196.04	2,813.8	-3,383.2	-2,327.8	-454.1	2,371.6	1.01	2,178,221.66	2,838,232.06
4,216.0	66.48	195.87	2,838.2	-3,358.8	-2,382.6	-469.7	2,428.4	1.02	2,178,166.81	2,838,216.63
4,275.4	66.83	195.52	2,861.8	-3,335.2	-2,435.1	-484.5	2,482.8	0.81	2,178,114.22	2,838,202.09
Hold to TD										
4,305.0	67.01	195.34	2,873.4	-3,323.6	-2,461.3	-491.7	2,510.0	0.81	2,178,087.97	2,838,194.96
4,365.0	67.01	195.34	2,896.8	-3,300.2	-2,514.6	-506.3	2,565.1	0.00	2,178,034.64	2,838,180.57

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Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
Build Section	0.00	0.24	2,154.0	-986.0	-181.3	2,179,564.61	2,838,499.23	36° 59' 20.371 N	107° 26' 17.415 W
- actual wellpath misses by 81.9ft at 2636.0ft MD (2229.3 TVD, -954.3 N, -188.1 E)									
- Point									
Drill Window	0.00	0.24	0.0	0.0	0.0	2,180,551.31	2,838,676.43	36° 59' 30.120 N	107° 26' 15.180 W
- actual wellpath hits target									
- Rectangle (sides W3,994.0 H1,299.0 D0.0)									
KOP @ 550' TVD	0.00	0.24	550.0	0.0	0.0	2,180,551.31	2,838,676.43	36° 59' 30.120 N	107° 26' 15.180 W
- actual wellpath misses by 1.3ft at 550.0ft MD (550.0 TVD, 1.3 N, 0.3 E)									
- Point									
Hold to Drill Window	0.00	0.24	2,727.0	-2,140.9	-393.6	2,178,408.81	2,838,291.73	36° 59' 8.951 N	107° 26' 20.032 W
- actual wellpath misses by 11.4ft at 3939.7ft MD (2732.4 TVD, -2136.4 N, -402.6 E)									
- Point									
Hold to TD	0.00	0.24	2,875.0	-2,439.3	-448.4	2,178,110.21	2,838,238.13	36° 59' 6.000 N	107° 26' 20.707 W
- actual wellpath misses by 38.6ft at 4275.5ft MD (2861.8 TVD, -2435.1 N, -484.5 E)									
- Point									

Checked By: _____ Approved By: _____ Date: _____