



Apache Corporation (873) *E-8-175-31E*
Eddy County, NM (NAD27 NME) *2128' FWL + 220' FWL*
NFE Federal #26H 30-015-40462
Wellbore #1 / Job #1310211

Survey: Phoenix MWD Survey

Phoenix Final Survey Report

18 March, 2013





Phoenix Technology Services
Phoenix Final Survey Report

PHOENIX
TECHNOLOGY SERVICES

Company:	Apache Corporation	Local Co-ordinate Reference:	Well #26H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RF @ 3740.00usft (Basic 44)
Site:	NFE Federal	MD Reference:	RF @ 3740.00usft (Basic 44)
Well:	#26H	North Reference:	Grid
Design:	Wellbore #1 / Job #1310211	Survey Calculation Method:	Minimum Curvature
	Surveys (Basic 44)	Database:	GCR DB
Project:	Eddy County, NM (NAD27 NME)	System Datum:	Mean Sea Level
Map System:	US State Plane 1927 (Exact solution)		
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site:	NFE Federal	Northings:	673,264.70 usft	Latitude:	32° 51' 0.490382 N
From:	Map	Eastings:	633,303.50 usft	Longitude:	103° 53' 57.349661 W
Position Uncertainty:	0.00 usft	Sid Radius:	13-3/16 "	Grid Convergence:	0.24 °

Well:	#26H	Northings:	673,329.70 usft	Latitude:	32° 51' 1.133543 N
Well Position	+N/-S	Eastings:	633,303.50 usft	Longitude:	103° 53' 57.348530 W
Position Uncertainty	0.00 usft	Wellhead Elevation:	13.00 usft	Ground Level:	9,727.00 usft

Wellbore	Wellbore #1 / Job #1310211				
Magnetics	Model Name	Sample Date	Dip Angle	Field Strength	
	IGRP2010_14	02/20/13	7.59	60.67	48.786

Design	Surveys (Basic 44)				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(usft)	(usft)	(usft)	(°)	
	0.00	0.00	0.00	89.60	

Survey Program	Date	03/18/13			
From	To	Survey (Wellbore)	Tool Name	Description	
(usft)	(usft)				
459.00	8,871.00	Phoenix MWD Survey (Wellbore #1 / Job #	MWD	MWD - Standard	



Phoenix Technology Services
Phoenix Final Survey Report



Company: Apache Corporation Project: Eddy County, NM (NAD27 NME) Site: NFE Federal Well: #26H Wellbore: Wellbore #1 / Job #1310211 Design: Surveys (Basic 44)				Local Co-ordinate Reference: TVD Reference: MD Reference: North Reference: Survey Calculation Method: Database:								Well #26H RF @ 3740.00usft (Basic 44) RF @ 3740.00usft (Basic 44) Grid Minimum Curvature GCR DB	
Survey	MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	D Leg (°/100usft)	Northing (usft)	Easting (usft)		
Phoenix First MWD Survey													
	0.00	0.00	0.00	3,740.00	0.00	0.00	0.00	0.00	0.00	673,329.70	633,303.51		
459.00	4.10	245.00	245.00	3,281.39	458.61	-6.94	-14.88	-14.93	0.89	673,322.76	633,288.62		
517.00	4.00	246.30	246.30	3,223.54	516.46	-8.63	-18.61	-18.67	0.23	673,321.07	633,284.89		
601.00	3.60	243.50	243.50	3,139.72	600.28	-10.98	-23.65	-23.73	0.52	673,318.72	633,279.85		
685.00	3.30	242.90	242.90	3,055.87	684.13	-13.28	-28.16	-28.26	0.36	673,316.44	633,275.34		
769.00	2.60	233.30	233.30	2,971.98	768.02	-15.50	-31.84	-31.95	1.02	673,314.20	633,271.66		
851.00	1.80	222.30	222.30	2,890.05	849.95	-17.56	-34.20	-34.32	1.10	673,312.14	633,269.30		
935.00	0.50	141.20	141.20	2,808.08	933.94	-18.82	-34.86	-34.99	2.13	673,310.88	633,268.64		
1,018.00	4.20	77.90	77.90	2,723.14	1,016.96	-18.47	-31.66	-31.79	4.82	673,311.23	633,271.84		
1,101.00	6.70	74.60	74.60	2,640.52	1,099.48	-16.55	-24.02	-24.13	3.03	673,313.15	633,279.48		
1,185.00	8.00	73.70	73.70	2,557.21	1,182.79	-13.60	-13.68	-13.78	1.55	673,316.10	633,288.82		
1,268.00	7.40	76.60	76.60	2,474.96	1,265.04	-10.75	-2.94	-3.02	0.86	673,318.95	633,300.58		
1,352.00	8.00	77.50	77.50	2,391.72	1,348.28	-8.23	8.03	7.97	0.73	673,321.47	633,311.53		
1,435.00	6.40	82.40	82.40	2,309.38	1,430.82	-6.36	18.25	18.21	2.06	673,323.34	633,321.75		
1,519.00	5.20	84.00	84.00	2,225.81	1,514.19	-5.35	26.68	26.84	1.44	673,324.35	633,330.1P		
1,602.00	4.50	83.70	83.70	2,143.11	1,596.89	-4.60	33.66	33.82	0.84	673,325.10	633,337.16		
1,686.00	3.90	81.60	81.60	2,059.33	1,680.67	-3.82	39.76	39.73	0.74	673,325.88	633,343.26		
1,770.00	3.00	83.10	83.10	1,975.48	1,764.52	-3.14	44.77	44.74	1.08	673,326.56	633,348.27		
1,853.00	2.80	83.30	83.30	1,892.59	1,847.41	-2.64	48.94	48.92	0.24	673,327.06	633,352.44		
1,937.00	1.80	81.40	81.40	1,808.66	1,931.34	-2.20	52.28	52.26	1.19	673,327.50	633,355.78		
2,020.00	1.10	83.40	83.40	1,725.69	2,014.31	-1.92	54.36	54.34	0.85	673,327.78	633,357.86		
2,104.00	0.20	83.30	83.30	1,641.69	2,098.31	-1.81	55.30	55.29	1.07	673,327.89	633,358.80		
2,187.00	0.10	33.60	33.60	1,558.89	2,181.31	-1.73	55.49	55.48	0.19	673,327.97	633,358.89		
2,271.00	0.50	17.90	17.90	1,474.69	2,265.31	-1.92	55.64	55.63	0.48	673,328.38	633,359.14		
2,355.00	0.30	10.70	10.70	1,390.70	2,349.30	-0.75	55.80	55.79	0.25	673,328.95	633,359.30		
2,438.00	0.70	9.30	9.30	1,307.70	2,432.30	-0.04	55.92	55.92	0.48	673,329.66	633,359.42		



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Phoenix Final Survey Report



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Project: Eddy County, NM (NAD27 NME)		TVD Reference:		RF @ 3740.00usft (Basic 44)							
Site: NFE Federal		MD Reference:		RF @ 3740.00usft (Basic 44)							
Well: #26H		North Reference:		Grid							
Wellbore: #1 / Job #1310211		Survey Calculation Method:		Minimum Curvature							
Design: Surveys (Basic 44)		Database:		GCR DB							
Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	EW (usft)	V: Sec (usft)	DLeg (1/100usft)	Northing (usft)	Easting (usft)	
2,522.00	0.80	345.30	1,223.71	2,516.29	1.03	55.85	55.85	0.39	673,330.73	633,359.37	
2,605.00	0.70	346.40	1,140.71	2,599.29	2.09	55.59	55.60	0.12	673,331.79	633,359.09	
2,689.00	0.90	332.90	1,056.72	2,683.28	3.17	55.16	55.19	0.33	673,332.87	633,358.66	
2,773.00	1.30	327.90	972.74	2,767.26	4.57	54.36	54.39	0.49	673,334.27	633,357.86	
2,856.00	1.20	318.00	889.76	2,850.24	6.01	53.28	53.32	0.29	673,335.71	633,356.78	
2,940.00	1.40	322.10	805.78	2,934.22	7.47	52.06	52.11	0.28	673,337.17	633,355.56	
3,024.00	1.40	315.50	721.80	3,018.20	9.02	50.71	50.77	0.19	673,338.72	633,354.21	
3,108.00	1.50	317.50	636.83	3,103.17	10.58	49.23	49.30	0.13	673,340.28	633,352.73	
3,192.00	1.30	332.60	553.86	3,186.14	12.21	48.08	48.14	0.50	673,341.91	633,351.56	
3,276.00	1.10	332.60	469.87	3,270.13	13.78	47.25	47.35	0.24	673,343.48	633,350.75	
3,359.00	1.30	324.50	386.89	3,353.11	15.25	46.34	46.44	0.32	673,344.95	633,349.84	
3,423.00	1.10	318.90	322.91	3,417.09	16.30	45.51	45.62	0.36	673,346.00	633,349.01	
3,540.00	1.30	331.10	205.93	3,534.07	18.31	44.13	44.26	0.28	673,348.01	633,347.63	
3,624.00	0.90	345.30	121.95	3,618.05	19.78	43.50	43.64	0.57	673,349.48	633,347.00	
3,666.00	0.70	345.80	79.95	3,660.05	20.35	43.36	43.50	0.48	673,350.05	633,346.86	
3,750.00	0.70	142.80	-4.05	3,744.05	20.44	43.54	43.68	1.63	673,350.14	633,347.07	
3,834.00	1.30	150.10	-88.03	3,828.03	19.21	44.33	44.46	0.73	673,348.91	633,347.83	
3,918.00	1.00	146.30	-172.02	3,912.02	17.77	45.21	45.33	0.37	673,347.47	633,348.71	
4,002.00	1.00	154.20	-256.00	3,996.00	16.50	45.93	46.05	0.16	673,346.20	633,349.43	
4,085.00	1.20	157.60	-338.99	4,078.99	15.04	48.58	48.69	0.25	673,344.74	633,350.08	
4,169.00	1.10	157.80	-422.97	4,162.97	13.48	47.22	47.31	0.12	673,343.18	633,350.72	
4,253.00	1.00	163.00	-506.96	4,246.96	12.04	47.74	47.82	0.16	673,341.74	633,351.24	
4,337.00	1.00	166.50	-590.94	4,330.94	10.62	48.13	48.20	0.07	673,340.32	633,351.63	
4,414.00	1.00	168.80	-667.93	4,407.93	9.31	48.41	48.48	0.05	673,339.01	633,351.91	
4,497.00	1.10	160.80	-750.92	4,490.92	7.82	48.71	48.76	0.12	673,337.52	633,352.21	
4,581.00	1.00	167.10	-834.90	4,574.90	6.31	48.03	48.07	0.13	673,336.01	633,352.53	
4,665.00	1.00	173.50	-918.89	4,658.89	4.87	49.27	49.31	0.13	673,334.57	633,352.77	



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TECHNOLOGY SERVICES

Company:	Apache Corporation	Local Co-ordinate Reference:	Well #26H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RF @ 3740.00usft (Basic 44)
Site:	NFE Federal	MD Reference:	RF @ 3740.00usft (Basic 44)
Well:	#26H	North Reference:	Gnd
Wellbore:	Wellbore #1 / Job #1310211	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Basic 44)	Database:	GCR DB

Survey	MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	D. Log (°/100usft)	Northing (usft)	Easting (usft)
	4,749.00	0.80	176.80	-1,002.88	4,742.88	3.56	49.39	49.41	0.25	673,333.26	633,352.87
	4,829.00	0.90	174.10	-1,082.87	4,822.87	2.37	49.48	49.50	0.13	673,332.07	633,352.98
	4,925.00	0.30	154.70	-1,178.87	4,918.87	1.40	49.67	49.68	0.65	673,331.10	633,353.17
	4,957.00	1.20	98.70	-1,210.86	4,950.86	1.27	50.04	50.04	3.32	673,330.97	633,353.54
	4,989.00	5.30	93.50	-1,242.81	4,982.81	1.13	51.84	51.85	12.83	673,330.83	633,355.34
	5,022.00	8.70	93.00	-1,275.55	5,015.55	0.91	55.86	55.86	10.30	673,330.61	633,359.36
	5,054.00	11.90	93.40	-1,307.03	5,047.03	0.58	61.57	61.57	10.00	673,330.28	633,365.07
	5,086.00	16.30	91.10	-1,338.08	5,078.08	0.30	69.36	69.36	13.86	673,330.00	633,372.86
	5,118.00	21.10	89.50	-1,368.37	5,108.37	0.26	79.61	79.61	15.08	673,328.96	633,383.11
	5,150.00	26.00	88.50	-1,397.69	5,137.69	0.50	92.39	92.39	15.36	673,330.20	633,395.89
	5,182.00	30.80	87.80	-1,425.83	5,165.83	1.00	107.60	107.60	15.04	673,330.70	633,411.10
	5,214.00	35.70	88.60	-1,452.58	5,192.58	1.54	125.13	125.14	15.37	673,331.24	633,428.63
	5,246.00	40.90	89.40	-1,477.69	5,217.69	1.88	144.95	144.96	16.32	673,331.58	633,448.45
	5,278.00	45.90	90.90	-1,500.93	5,240.93	1.81	166.93	166.94	15.95	673,331.51	633,470.43
	5,310.00	50.60	93.10	-1,522.24	5,262.24	0.96	190.78	190.78	15.56	673,330.66	633,494.28
	5,343.00	54.70	93.60	-1,542.25	5,282.25	-0.58	216.96	216.95	12.48	673,329.12	633,520.41
	5,375.00	59.60	93.20	-1,559.61	5,299.61	-2.17	243.79	243.77	15.35	673,327.53	633,547.29
	5,407.00	64.50	92.10	-1,574.60	5,314.60	-3.47	272.02	271.99	15.61	673,326.23	633,575.52
	5,439.00	69.80	91.40	-1,587.02	5,327.02	-4.37	301.48	301.45	16.68	673,325.33	633,604.98
	5,471.00	75.10	91.20	-1,598.67	5,336.67	-5.06	331.98	331.93	16.57	673,324.64	633,635.48
	5,503.00	80.70	91.60	-1,603.37	5,343.37	-5.82	363.24	363.19	17.54	673,323.88	633,666.74
	5,556.00	89.90	90.30	-1,607.71	5,347.71	-6.69	416.00	415.94	17.53	673,323.01	633,719.50
	5,588.00	91.30	89.30	-1,607.38	5,347.38	-6.58	448.00	447.94	5.98	673,323.12	633,751.50
	5,653.00	91.80	87.60	-1,605.62	5,345.62	-4.82	512.95	512.90	2.73	673,324.88	633,816.45
	5,749.00	90.00	89.40	-1,604.11	5,344.11	-2.31	608.89	608.86	2.65	673,327.39	633,912.39
	5,845.00	90.10	88.60	-1,604.03	5,344.03	-0.84	704.88	704.86	0.84	673,328.06	634,008.38
	5,942.00	89.80	87.90	-1,604.11	5,344.11	2.33	801.83	801.83	0.79	673,332.03	634,105.33



Phoenix Technology Services
Phoenix Final Survey Report

PHOENIX
TECHNOLOGY SERVICES

Company: Project: Site: Well: Wellbore: Design:			Apache Corporation Eddy County, NM (NAD27 NME) NFE Federal #26H Wellbore #1 / Job #1310211 Surveys (Basic 44)			Local Co-ordinate Reference: TVD Reference: MD Reference: North Reference: Survey Calculation Method: Database:					Well #26H RF @ 3740.00usft (Basic 44) RF @ 3740.00usft (Basic 44) Grid: Minimum Curvature GCR DB				
MD (usft)	Inc. (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	NIS (usft)	EW (usft)	V. Sec (usft)	DiLog (°/100usft)	Northing (usft)	Easting (usft)	Survey				
6,038.00	90.30	88.70	-1,604.03	5,344.03	5.17	897.79	897.80	0.98	673,334.87	634,201.27					
6,134.00	89.90	87.60	-1,603.86	5,343.86	8.27	993.74	993.77	1.22	673,337.97	634,297.24					
6,231.00	88.80	87.20	-1,604.96	5,344.96	12.87	1,090.63	1,090.69	1.21	673,342.37	634,394.13					
6,327.00	88.40	88.70	-1,607.31	5,347.31	16.11	1,188.54	1,186.62	1.62	673,345.81	634,490.04					
6,423.00	87.20	89.80	-1,610.99	5,350.99	17.36	1,282.45	1,282.54	1.70	673,347.06	634,585.95					
6,520.00	89.20	91.60	-1,614.04	5,354.04	18.18	1,379.39	1,379.47	2.77	673,345.88	634,682.89					
6,616.00	88.10	91.20	-1,616.30	5,356.30	13.83	1,475.33	1,475.39	1.22	673,343.53	634,778.83					
6,712.00	90.40	91.70	-1,617.56	5,357.56	11.40	1,571.29	1,571.33	2.45	673,341.10	634,874.79					
6,809.00	90.20	91.50	-1,617.05	5,357.05	8.69	1,668.25	1,668.27	0.29	673,338.39	634,971.75					
6,905.00	89.40	91.00	-1,617.38	5,357.38	6.60	1,764.22	1,764.23	0.98	673,336.30	635,067.72					
7,001.00	89.10	90.80	-1,618.64	5,358.64	5.09	1,860.20	1,860.19	0.38	673,334.79	635,163.70					
7,098.00	88.50	91.20	-1,620.67	5,360.67	3.40	1,957.17	1,957.14	0.74	673,333.10	635,260.67					
7,194.00	87.90	90.60	-1,623.69	5,363.69	1.89	2,053.11	2,053.07	0.88	673,331.59	635,356.61					
7,290.00	86.90	89.50	-1,628.04	5,368.04	1.81	2,149.00	2,148.98	1.55	673,331.51	635,452.50					
7,387.00	88.50	89.30	-1,631.93	5,371.93	2.82	2,245.92	2,245.88	1.66	673,332.52	635,548.42					
7,483.00	90.10	89.40	-1,633.11	5,373.11	3.91	2,341.90	2,341.87	1.67	673,333.61	635,645.47					
7,579.00	90.50	89.30	-1,632.60	5,372.60	5.00	2,437.89	2,437.87	0.43	673,334.70	635,741.39					
7,676.00	89.80	88.60	-1,632.35	5,372.35	6.78	2,534.88	2,534.86	1.02	673,336.48	635,838.38					
7,772.00	88.50	87.90	-1,633.77	5,373.77	9.71	2,630.82	2,630.82	1.54	673,339.41	635,934.32					
7,868.00	89.60	88.30	-1,635.37	5,375.37	12.89	2,726.75	2,726.77	1.22	673,342.59	636,030.25					
7,965.00	90.50	88.30	-1,635.28	5,375.28	15.77	2,823.71	2,823.75	0.93	673,345.47	636,127.21					
8,061.00	90.30	88.00	-1,634.61	5,374.61	18.87	2,919.65	2,919.71	0.38	673,348.57	636,223.15					
8,157.00	89.80	88.20	-1,634.63	5,374.53	22.05	3,015.60	3,015.68	0.56	673,351.75	636,319.10					
8,254.00	89.30	89.10	-1,635.29	5,375.29	24.34	3,112.57	3,112.66	1.06	673,354.04	636,416.07					
8,350.00	88.20	89.60	-1,637.38	5,377.38	25.43	3,208.54	3,208.64	1.26	673,355.13	636,512.04					
8,446.00	87.30	89.50	-1,641.15	5,381.15	26.18	3,304.46	3,304.56	0.94	673,355.88	636,607.96					
8,543.00	90.30	89.50	-1,643.18	5,383.18	27.03	3,401.42	3,401.53	3.09	673,356.73	636,704.92					



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Phoenix Final Survey Report



Company:	Apache Corporation	Local Co-ordinate Reference:	Well #26H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	RF @ 3740.00usft (Basic 44)
Site:	NFE Federal	MD Reference:	RF @ 3740.00usft (Basic 44)
Well:	#26H	North Reference:	Grid
Wellbore:	Wellbore #1 / Job #1310211	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Basic 44)	Database:	GCR DB

Survey	MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Eastings (usft)
	8,639.00	89.70	90.10	-1,643.18	5,383.18	27.36	3,497.42	3,497.53	0.88	673,357.08	636,800.97
	8,735.00	88.90	90.10	-1,644.38	5,384.36	27.19	3,593.42	3,593.52	0.83	673,358.89	636,890.92
	8,832.00	89.50	90.40	-1,645.71	5,385.71	26.77	3,690.40	3,690.50	0.69	673,350.47	636,993.90
	8,928.00	91.00	90.80	-1,645.29	5,385.29	25.76	3,786.40	3,786.48	1.62	673,355.46	637,089.90
	9,024.00	90.50	90.90	-1,644.04	5,384.04	24.34	3,882.38	3,882.45	0.53	673,354.04	637,185.88
	9,120.00	90.30	91.20	-1,643.37	5,383.37	22.58	3,978.36	3,978.42	0.38	673,352.28	637,281.86
	9,217.00	90.10	92.30	-1,643.03	5,383.03	19.62	4,075.31	4,075.35	1.15	673,349.32	637,378.81
	9,313.00	89.70	90.40	-1,643.19	5,383.19	17.36	4,171.28	4,171.30	2.02	673,347.06	637,474.78
	9,409.00	89.00	91.00	-1,644.28	5,384.28	16.18	4,267.26	4,267.27	0.96	673,345.88	637,570.76
	9,506.00	90.80	90.30	-1,644.45	5,384.45	15.08	4,364.25	4,364.25	1.99	673,344.78	637,667.75
	9,602.00	88.30	87.00	-1,645.21	5,385.21	17.34	4,460.20	4,460.22	4.31	673,347.04	637,763.70
	9,698.00	88.00	88.20	-1,648.31	5,388.31	21.36	4,556.07	4,556.10	1.29	673,351.06	637,859.57
	9,795.00	87.60	90.10	-1,652.03	5,392.03	22.80	4,652.98	4,653.03	2.00	673,352.50	637,956.48
	9,815.00	87.40	90.00	-1,652.90	5,392.90	22.78	4,672.96	4,673.01	1.12	673,352.48	637,976.46
Phoenix Last MWD Survey	9,871.00	87.40	90.00	-1,655.44	5,395.44	22.78	4,728.90	4,728.95	0.00	673,352.48	838,032.47
Projection to Bit											

Survey Annotations	Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates	Comment
	459.00	459.61	+N/S (usft) -6.94	
	9,815.00	5,392.90	+E/W (usft) -14.88	Phoenix First MWD Survey
	9,871.00	5,395.44	22.78	Phoenix Last MWD Survey
			22.78	Projection to Bit

Checked By: _____	Approved By: _____	Date: _____
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