



NM OIL CONSERVATION
ARTESIA DISTRICT

APR 25 2016

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Apache Corporation (873)

Eddy County, NM (NAD27 NME)

NFE-Federal 30-015-42901

I-6-175-31E 2025' FSL + 200' FEL

#44H

Cedar Lake Federal CA #641H

OH / Job #1513794

Survey: Phoenix MWD Survey

Standard Survey Report

12 July, 2015



Survey Report

Company: Apache Corporation
 Project: Eddy County, NM (NAD27 NME)
 Site: NFE Federal
 Well: #41H
 Wellbore: OH / Job #1513794
 Design: Surveys (Capstar 119)

Local Co-ordinate Reference: Well #41H
 TVD Reference: KB @ 3769.00usft (Capstar 119)
 MD Reference: KB @ 3769.00usft (Capstar 119)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Database: Compass 5000 GCR

Project	Eddy County, NM (NAD27 NME)		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site	NFE Federal				
Site Position:		Northing:	673,264.70 usft	Latitude:	32° 51' 0.49036 N
From:	Map	Easting:	633,303.50 usft	Longitude:	103° 53' 57.34966 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.24 °

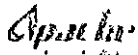
Well	#41H					
Well Position	+N/-S	0.00 usft	Northing:	677,478.30 usft	Latitude:	32° 51' 42.20235 N
	+E/-W	0.00 usft	Easting:	632,859.60 usft	Longitude:	103° 54' 2.35078 W
Position Uncertainty	0.00 usft	Wellhead Elevation:	usft	Ground Level:	3,758.00 usft	

Wellbore	OH / Job #1513794				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	6/30/2015	7.65	60.80	48,556

Design	Surveys (Capstar 119)				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	89.59	

Survey Program	Date 7/12/2015				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
75.87	4,336.67	Phoenix Gyro Survey (OH / Job #1513794)	PHX_SPT_GTD	PHX Continuous north-seeking gyro	
4,367.00	9,845.00	Phoenix MWD Survey (OH / Job #1513794)	PHX+MWD+HDGM	PHX+MWD+HDGM	

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
4,336.67	0.54	279.46	4,336.44	23.62	-27.58	-27.41	0.00	0.00	0.00	
Tie-on to Phoenix Gyro Survey										
4,367.00	0.30	357.90	4,366.76	23.72	-27.73	-27.56	1.86	-0.79	258.82	
First Phoenix MWD Survey										
4,410.00	3.00	83.30	4,409.74	23.96	-26.81	-26.44	6.96	6.28	198.80	
4,453.00	7.60	77.40	4,452.55	24.72	-22.72	-22.54	10.76	10.70	-13.72	
4,495.00	12.70	75.70	4,493.88	26.46	-15.53	-15.34	12.16	12.14	-4.05	
4,538.00	18.20	74.70	4,535.31	29.40	-4.46	-4.25	12.81	12.79	-2.33	
4,581.00	23.70	78.40	4,575.45	32.92	10.49	10.73	13.15	12.79	8.60	



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Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Buld Rate (°/100usft)	Turn Rate (°/100usft)
4,623.00	29.00	83.10	4,613.08	35.84	28.88	29.14	13.55	12.62	11.19
4,666.00	33.20	88.20	4,649.90	37.46	51.01	51.28	11.52	9.77	11.86
4,708.00	38.20	91.70	4,684.00	37.44	75.50	75.77	12.86	11.90	8.33
4,751.00	42.50	94.10	4,716.76	36.01	103.29	103.55	10.63	10.00	5.58
4,794.00	47.00	96.80	4,747.30	33.10	133.41	133.65	11.36	10.47	6.28
4,836.00	52.10	97.00	4,774.54	29.26	165.13	165.34	12.15	12.14	0.48
4,879.00	56.00	97.50	4,799.77	24.87	199.66	199.83	9.12	9.07	1.16
4,921.00	61.70	96.40	4,821.49	20.53	235.32	235.46	13.75	13.57	-2.62
4,964.00	67.30	94.60	4,840.00	16.83	273.94	274.05	13.56	13.02	-4.19
5,006.00	73.20	92.20	4,854.19	14.50	313.38	313.47	15.04	14.05	-5.71
5,049.00	77.80	91.70	4,864.95	13.08	354.97	355.06	10.76	10.70	-1.16
5,076.00	79.90	91.30	4,870.17	12.39	381.45	381.53	7.91	7.78	-1.48
5,119.00	84.70	90.50	4,875.93	11.72	424.05	424.12	11.31	11.16	-1.86
5,161.00	86.60	90.50	4,879.12	11.36	465.92	465.99	4.52	4.52	0.00
5,289.00	87.40	90.10	4,885.81	10.69	593.74	593.81	0.70	0.63	-0.31
5,417.00	88.10	89.70	4,890.84	10.91	721.64	721.70	0.63	0.55	-0.31
5,544.00	89.30	89.10	4,893.72	12.24	848.60	848.67	1.06	0.94	-0.47
5,672.00	90.40	89.20	4,894.06	14.14	976.59	976.66	0.86	0.86	0.08
5,800.00	89.40	89.90	4,894.28	15.15	1,104.58	1,104.66	0.95	-0.78	0.55
5,927.00	90.30	90.70	4,894.61	14.48	1,231.57	1,231.65	0.95	0.71	0.63
6,055.00	89.10	90.00	4,895.28	13.70	1,359.57	1,359.63	1.09	-0.94	-0.55
6,183.00	88.70	89.20	4,897.74	14.59	1,487.54	1,487.61	0.70	-0.31	-0.63
6,311.00	90.20	89.30	4,898.97	16.27	1,615.52	1,615.59	1.17	1.17	0.08
6,438.00	88.30	89.40	4,900.63	17.71	1,742.49	1,742.58	1.50	-1.50	0.08
6,566.00	88.70	89.20	4,903.98	19.27	1,870.44	1,870.53	0.35	0.31	-0.16
6,694.00	88.40	90.80	4,907.22	19.27	1,998.39	1,998.48	1.27	-0.23	1.25
6,822.00	88.80	90.90	4,910.35	17.37	2,126.34	2,126.41	0.32	0.31	0.08
6,949.00	89.10	90.90	4,912.68	15.38	2,253.31	2,253.36	0.24	0.24	0.00
7,077.00	88.40	90.00	4,915.47	14.37	2,381.27	2,381.31	0.89	-0.55	-0.70
7,205.00	88.30	89.20	4,919.15	15.27	2,509.21	2,509.26	0.63	-0.08	-0.63
7,333.00	88.70	89.30	4,922.50	16.94	2,637.16	2,637.21	0.32	0.31	0.08
7,460.00	89.30	89.00	4,924.72	18.83	2,764.12	2,764.19	0.53	0.47	-0.24
7,588.00	87.50	89.70	4,928.29	20.28	2,892.06	2,892.13	1.51	-1.41	0.55
7,716.00	87.70	89.60	4,933.65	21.06	3,019.94	3,020.02	0.17	0.16	-0.08
7,844.00	87.80	89.20	4,938.68	22.40	3,147.84	3,147.92	0.32	0.08	-0.31
7,972.00	88.00	89.40	4,943.37	23.96	3,275.74	3,275.83	0.22	0.16	0.16
8,100.00	88.30	89.30	4,947.50	25.41	3,403.67	3,403.76	0.25	0.23	-0.08
8,228.00	88.90	89.60	4,950.63	26.64	3,531.62	3,531.72	0.52	0.47	0.23
8,355.00	89.50	89.90	4,952.40	27.19	3,658.61	3,658.71	0.53	0.47	0.24
8,483.00	89.50	89.80	4,953.52	27.53	3,786.60	3,786.70	0.08	0.00	-0.08
8,611.00	89.40	90.00	4,954.75	27.75	3,914.60	3,914.69	0.17	-0.08	0.16
8,739.00	89.60	90.00	4,955.87	27.75	4,042.59	4,042.69	0.16	0.16	0.00
8,866.00	89.20	90.00	4,957.20	27.75	4,169.58	4,169.68	0.31	-0.31	0.00



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8,994.00	88.90	89.90	4,959.32	27.86	4,297.57	4,297.66	0.25	-0.23	-0.08
9,122.00	89.10	89.80	4,961.55	28.20	4,425.55	4,425.63	0.17	0.16	-0.08
9,249.00	88.80	89.60	4,963.88	28.86	4,552.52	4,552.61	0.28	-0.24	-0.16
9,377.00	88.60	89.50	4,966.78	29.87	4,680.49	4,680.58	0.17	-0.16	-0.08
9,505.00	88.60	89.20	4,969.91	31.32	4,808.44	4,808.54	0.23	0.00	-0.23
9,633.00	88.90	89.20	4,972.70	33.11	4,936.40	4,936.51	0.23	0.23	0.00
9,774.00	88.50	88.80	4,975.90	35.57	5,077.34	5,077.46	0.40	-0.28	-0.28
Final Phoenix MWD Survey									
9,845.00	88.50	88.80	4,977.76	37.05	5,148.30	5,148.43	0.00	0.00	0.00
Projection to TD									

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
4,336.67	4,336.44	23.62	-27.58	Tie-on to Phoenix Gyro Survey
4,367.00	4,366.76	23.72	-27.73	First Phoenix MWD Survey
9,774.00	4,975.90	35.57	5,077.34	Final Phoenix MWD Survey
9,845.00	4,977.76	37.05	5,148.30	Projection to TD

Checked By: _____ Approved By: _____ Date: _____

Phoenix Technology Services
SURVEY DATA CERTIFICATION



PHOENIX JOB NUMBER 1513794

OPERATOR Apache

WELL NAME NFE Federal #41H Cedar Lake Federal CH #641H

COUNTY & STATE Eddy County, NM

API WELL NUMBER 30-015-42901

PROPOSED DIRECTION 89.59

TIE-IN DATA						
MEASURED DEPTH	VERTICAL DEPTH	INCLIN	AZIMUTH	N-S COORD	E-W COORD	DATA SOURCE
4,336.67 ft	4,336.44 ft	0.54	279.46	23.62 ft	-27.58 ft	Gyro

FIRST SURVEY DATE	FIRST SURVEY DEPTH	INCLIN	AZIMUTH
7-Jul-15	4,367.00 ft	0.30	357.90

SURVEY INSTRUMENT TYPE
Phoenix MWD

LAST SURVEY DATE	LAST SURVEY DEPTH	INCLIN	AZIMUTH
11-Jul-15	9,774.00 ft	88.50	88.80

TO THE BEST OF MY KNOWLEDGE I CERTIFY THIS SURVEY DATA TO BE TRUE AND CORRECT.

PROJECTED TD SURVEY DATE	PROJECTED TD SURVEY DEPTH	INCLIN	AZIMUTH
11-Jul-15	9,845.00 ft	88.50	88.80

Mike Miller

PRINT YOUR NAME ABOVE

Mike Miller

SIGN YOUR NAME ABOVE

MAGNETIC DECLINATION OR TOTAL GRID

TOTAL CORRECTION USED	7.41
DECLINATION OR GRID	GRID

12-Jul-15

TODAY'S DATE

MWD SUPERVISOR 1 Mike Miller
MWD SUPERVISOR 2 Bruce Manser

DIRECTIONAL DRILLER 1 Steven Hawkins
DIRECTIONAL DRILLER 2 Brant Duplechain