

Apache Corporation

Eddy County, NM (NAD27 NME)

Crow Federal - API-3001542142
#37H

WB1/Job #1410976 M-Sec.3 T17S R31E 995 FSL 525 FWL

Survey: Phoenix MWD Survey

Survey Report

08 July, 2014

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NM OIL CONSERVATION
ARTESIA DISTRICT

Survey Report

Company:	Apache Corporation	Local Co-ordinate Reference:	Well #37H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3941.00usft (Capstar 114)
Site:	Crow Federal	MD Reference:	KB @ 3941.00usft (Capstar 114)
Well:	#37H	North Reference:	Grid
Wellbore:	WB1/Job #1410976	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR DB v5000

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	Crow Federal		
Site Position:		Northing:	671,130.90 usft
From:	Map	Easting:	643,906.80 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 50' 38.92796 N
		Longitude:	103° 51' 53.16689 W
		Grid Convergence:	0.25 °

Well	#37H		
Well Position	+N/-S	0.00 usft	Northing:
	+E/-W	0.00 usft	Easting:
Position Uncertainty	0.00 usft		Wellhead Elevation:
			usft
			Latitude:
			32° 51' 32.32873 N
			Longitude:
			103° 51' 50.02332 W
			Ground Level:
			3,930.00usft

Wellbore	WB1/Job #1410976		
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010-14	06/09/14	7.40	60.65	48,663

Design	Surveys (Capstar 114)		
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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	89.61

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Survey Program		Date	07/08/14		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.00	560.00	Gyrodata Gyro Survey (WB1/Job #141097	CB-GYRO-MS	Camera based gyro multishot	
739.00	10,009.00	Phoenix MWD Survey (WB1/Job #141097	PHX+MWD+BGGM	PHX+MWD+BGGM v3:standard declination	

Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)
560.00	0.80	101.82	-3,381.04	559.96	-2.62	5.93	5.91	0.00	676,526.08	644,156.93
Tie-on to Gyrodata Gyro Survey										
739.00	0.70	45.20	-3,202.05	738.95	-2.11	7.93	7.91	0.40	676,526.59	644,158.93
First Phoenix Survey										
871.00	0.90	16.90	-3,070.07	870.93	-0.55	8.80	8.80	0.33	676,528.15	644,159.80
999.00	1.00	24.70	-2,942.08	998.92	1.43	9.56	9.57	0.13	676,530.13	644,160.56
1,127.00	1.20	36.20	-2,814.11	1,126.89	3.53	10.82	10.84	0.23	676,532.23	644,161.82
1,256.00	0.50	45.20	-2,685.12	1,255.88	5.01	12.02	12.05	0.55	676,533.71	644,163.02
1,384.00	1.20	35.40	-2,557.14	1,383.86	6.50	13.19	13.23	0.56	676,535.20	644,164.19
1,513.00	1.20	62.40	-2,428.16	1,512.84	8.23	15.17	15.22	0.43	676,536.93	644,166.17
1,641.00	1.40	94.30	-2,300.19	1,640.81	8.73	17.92	17.98	0.58	676,537.43	644,168.92
1,769.00	1.50	105.40	-2,172.24	1,768.76	8.17	21.09	21.15	0.23	676,536.87	644,172.09
1,898.00	0.50	110.40	-2,043.26	1,897.74	7.52	23.25	23.30	0.78	676,536.22	644,174.25
2,026.00	0.60	256.00	-1,915.26	2,025.74	7.17	23.12	23.17	0.82	676,535.87	644,174.12
2,154.00	0.70	255.40	-1,787.27	2,153.73	6.81	21.71	21.76	0.08	676,535.51	644,172.71
2,282.00	1.10	282.00	-1,659.28	2,281.72	6.87	19.75	19.80	0.44	676,535.57	644,170.75
2,411.00	1.20	285.70	-1,530.31	2,410.69	7.49	17.24	17.29	0.10	676,536.19	644,168.24
2,539.00	1.30	284.30	-1,402.34	2,538.66	8.21	14.55	14.60	0.08	676,536.91	644,165.55
2,667.00	1.10	273.10	-1,274.37	2,666.63	8.64	11.91	11.97	0.24	676,537.34	644,162.91
2,796.00	1.30	286.80	-1,145.40	2,795.60	9.13	9.27	9.34	0.27	676,537.83	644,160.27
2,924.00	0.90	282.50	-1,017.42	2,923.58	9.76	6.90	6.97	0.32	676,538.46	644,157.90
3,052.00	1.40	276.50	-889.45	3,051.55	10.16	4.37	4.44	0.40	676,538.86	644,155.37

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Site:	Crow Federal	MD Reference:	KB @ 3941.00usft (Capstar 114)
Well:	#37H	North Reference:	Grid
Wellbore:	WB1/Job #1410976	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR DB v5000

Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)
3,181.00	1.30	275.00	-760.48	3,180.52	10.46	1.34	1.42	0.08	676,539.16	644,152.34
3,309.00	0.70	261.90	-632.50	3,308.50	10.48	-0.88	-0.81	0.50	676,539.18	644,150.12
3,457.00	0.60	299.40	-484.51	3,456.49	10.73	-2.45	-2.37	0.29	676,539.43	644,148.55
3,556.00	0.70	307.60	-385.52	3,555.48	11.36	-3.38	-3.30	0.14	676,540.06	644,147.62
3,687.00	0.50	325.00	-254.52	3,686.48	12.31	-4.34	-4.26	0.20	676,541.01	644,146.66
3,816.00	0.20	334.80	-125.53	3,815.47	12.98	-4.76	-4.67	0.24	676,541.68	644,146.24
3,944.00	0.30	123.70	2.47	3,943.47	12.99	-4.57	-4.49	0.38	676,541.69	644,146.43
4,072.00	0.50	110.20	130.47	4,071.47	12.62	-3.77	-3.69	0.17	676,541.32	644,147.23
4,200.00	0.40	93.60	258.47	4,199.47	12.39	-2.80	-2.72	0.13	676,541.09	644,148.20
4,329.00	0.60	132.90	387.46	4,328.46	11.91	-1.86	-1.78	0.30	676,540.61	644,149.14
4,457.00	0.80	141.40	515.45	4,456.45	10.75	-0.81	-0.74	0.18	676,539.45	644,150.19
4,585.00	0.80	146.10	643.44	4,584.44	9.31	0.25	0.31	0.05	676,538.01	644,151.25
4,714.00	0.90	144.30	772.43	4,713.43	7.74	1.34	1.39	0.08	676,536.44	644,152.34
4,842.00	0.90	144.80	900.41	4,841.41	6.10	2.51	2.55	0.01	676,534.80	644,153.51
4,970.00	1.00	137.00	1,028.39	4,969.39	4.47	3.85	3.88	0.13	676,533.17	644,154.85
5,098.00	0.80	143.60	1,156.38	5,097.38	2.93	5.14	5.16	0.18	676,531.63	644,156.14
5,244.00	0.70	154.90	1,302.36	5,243.36	1.30	6.12	6.13	0.12	676,530.00	644,157.12
5,347.00	4.80	95.50	1,405.23	5,346.23	0.32	10.68	10.68	4.35	676,529.02	644,161.68
5,390.00	8.80	90.40	1,447.92	5,388.92	0.12	15.76	15.76	9.40	676,528.82	644,166.76
5,433.00	13.60	86.10	1,490.09	5,431.09	0.44	24.10	24.10	11.32	676,529.14	644,175.10
5,468.00	15.40	92.10	1,523.98	5,464.98	0.55	32.85	32.86	6.69	676,529.25	644,183.85
5,518.00	19.00	94.30	1,571.73	5,512.73	-0.30	47.61	47.61	7.32	676,528.40	644,198.61
5,561.00	24.10	92.00	1,611.71	5,552.71	-1.13	63.37	63.36	12.02	676,527.57	644,214.37
5,604.00	30.60	89.10	1,649.89	5,590.89	-1.27	83.11	83.10	15.43	676,527.43	644,234.11
5,647.00	37.20	88.70	1,685.56	5,626.56	-0.80	107.08	107.07	15.36	676,527.90	644,258.08
5,690.00	43.60	89.90	1,718.29	5,659.29	-0.48	134.93	134.92	14.99	676,528.22	644,285.93
5,732.00	50.40	91.30	1,746.92	5,687.92	-0.82	165.62	165.61	16.37	676,527.88	644,316.62

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Well:	#37H	North Reference:	Grid
Wellbore:	WB1/Job #1410976	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR DB v5000

Survey

MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)
5,775.00	56.80	92.60	1,772.42	5,713.42	-2.01	200.19	200.18	15.08	676,526.69	644,351.19
5,818.00	63.50	92.80	1,793.81	5,734.81	-3.77	237.43	237.40	15.59	676,524.93	644,388.43
5,861.00	70.60	92.60	1,810.57	5,751.57	-5.63	276.95	276.91	16.52	676,523.07	644,427.95
5,904.00	77.80	92.60	1,822.27	5,763.27	-7.51	318.26	318.20	16.74	676,521.19	644,469.26
5,946.00	84.60	92.50	1,828.69	5,769.69	-9.36	359.70	359.63	16.19	676,519.34	644,510.70
5,989.00	87.20	92.00	1,831.76	5,772.76	-11.04	402.55	402.47	6.16	676,517.66	644,553.55
6,032.00	86.80	91.70	1,834.01	5,775.01	-12.43	445.47	445.38	1.16	676,516.27	644,596.47
6,117.00	87.60	92.10	1,838.17	5,779.17	-15.24	530.32	530.21	1.05	676,513.46	644,681.32
6,245.00	88.60	92.40	1,842.41	5,783.41	-20.26	658.15	658.00	0.82	676,508.44	644,809.15
6,374.00	89.10	91.40	1,845.00	5,786.00	-24.54	787.05	786.87	0.87	676,504.16	644,938.05
6,502.00	89.30	89.10	1,846.79	5,787.79	-25.10	915.03	914.84	1.80	676,503.60	645,066.03
6,629.00	88.90	88.20	1,848.78	5,789.78	-22.11	1,041.98	1,041.80	0.78	676,506.59	645,192.98
6,758.00	88.60	88.00	1,851.60	5,792.60	-17.83	1,170.88	1,170.73	0.28	676,510.87	645,321.88
6,886.00	88.20	87.70	1,855.17	5,796.17	-13.03	1,298.74	1,298.62	0.39	676,515.67	645,449.74
7,017.00	88.30	88.30	1,859.17	5,800.17	-8.46	1,429.59	1,429.50	0.46	676,520.24	645,580.59
7,148.00	88.30	87.80	1,863.06	5,804.06	-4.00	1,560.46	1,560.40	0.38	676,524.70	645,711.46
7,276.00	88.50	87.90	1,866.63	5,807.63	0.80	1,688.32	1,688.29	0.17	676,529.50	645,839.32
7,405.00	87.90	88.20	1,870.68	5,811.68	5.18	1,817.18	1,817.17	0.52	676,533.88	645,968.18
7,533.00	87.50	88.20	1,875.82	5,816.82	9.20	1,945.01	1,945.03	0.31	676,537.90	646,096.01
7,661.00	86.10	89.00	1,882.96	5,823.96	12.32	2,072.77	2,072.81	1.26	676,541.02	646,223.77
7,789.00	86.90	90.60	1,890.78	5,831.78	12.77	2,200.53	2,200.56	1.40	676,541.47	646,351.53
7,918.00	88.20	91.00	1,896.29	5,837.29	10.97	2,329.39	2,329.42	1.05	676,539.67	646,480.39
8,046.00	88.50	90.50	1,899.98	5,840.98	9.29	2,457.33	2,457.34	0.46	676,537.99	646,608.33
8,174.00	89.50	89.80	1,902.21	5,843.21	8.96	2,585.31	2,585.31	0.95	676,537.66	646,736.31
8,303.00	89.10	88.90	1,903.79	5,844.79	10.42	2,714.29	2,714.30	0.76	676,539.12	646,865.29
8,431.00	89.40	89.00	1,905.47	5,846.47	12.77	2,842.26	2,842.28	0.25	676,541.47	646,993.26
8,559.00	89.10	88.40	1,907.14	5,848.14	15.67	2,970.21	2,970.25	0.52	676,544.37	647,121.21

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Well:	#37H	North Reference:	Grid
Wellbore:	WB1/Job #1410976	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR DB v5000

Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)
8,688.00	89.50	88.00	1,908.72	5,849.72	19.72	3,099.14	3,099.20	0.44	676,548.42	647,250.14
8,819.00	90.10	88.80	1,909.17	5,850.17	23.38	3,230.08	3,230.17	0.76	676,552.08	647,381.08
8,947.00	89.00	87.80	1,910.18	5,851.18	27.18	3,358.02	3,358.13	1.16	676,555.88	647,509.02
9,076.00	86.90	89.50	1,914.79	5,855.79	30.22	3,486.89	3,487.01	2.09	676,558.92	647,637.89
9,207.00	87.10	90.90	1,921.65	5,862.65	29.76	3,617.71	3,617.82	1.08	676,558.46	647,768.71
9,336.00	88.80	90.80	1,926.26	5,867.26	27.85	3,746.60	3,746.71	1.32	676,556.55	647,897.60
9,464.00	90.10	90.90	1,927.49	5,868.49	25.95	3,874.58	3,874.67	1.02	676,554.65	648,025.58
9,595.00	90.10	90.50	1,927.26	5,868.26	24.35	4,005.57	4,005.64	0.31	676,553.05	648,156.57
9,724.00	89.60	90.20	1,927.60	5,868.60	23.56	4,134.57	4,134.63	0.45	676,552.26	648,285.57
9,852.00	89.40	90.30	1,928.72	5,869.72	23.00	4,262.56	4,262.62	0.17	676,551.70	648,413.56
9,940.00	89.80	91.00	1,929.33	5,870.33	22.00	4,350.55	4,350.60	0.92	676,550.70	648,501.55
Final Phoenix Survey										
10,009.00	89.80	91.00	1,929.57	5,870.57	20.80	4,419.54	4,419.58	0.00	676,549.50	648,570.54
Projection to TD										

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
560.00	559.95	-2.62	5.93	Tie-on to Gyrodata Gyro Survey
739.00	738.94	-2.11	7.93	First Phoenix Survey
9,940.00	5,870.33	22.00	4,350.55	Final Phoenix Survey
10,009.00	5,870.57	20.80	4,419.54	Projection to TD