



NM OIL CONSERVATION
ARTESIA DISTRICT
MAY 07 2015

RECEIVED

Apache Corporation

Eddy County, NM (NAD27 NME)

Crow Federal

#36H API # 30-015-42141

SL: 970' FSL & 537' FWL WL: M 03-175-31E
WB1/Job #1410979

Survey: Phoenix MWD Survey

Standard Survey Report

29 July, 2014

↓
Provide signature



Company:	Apache Corporation	Local Co-ordinate Reference:	Well #36H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3940.00usft (Capstar 114)
Site:	Crow Federal	MD Reference:	KB @ 3940.00usft (Capstar 114)
Well:	#36H	North Reference:	Grid
Wellbore:	WB1/Job #1410979	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR DB

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	#36H		
Well Position	+N/-S	0.00 usft	Northing: 676,503.80 usft
	+E/-W	0.00 usft	Easting: 644,163.70 usft
Position Uncertainty	0.00 usft	Wellhead Elevation:	usft
		Latitude:	32° 51' 32.08179 N
		Longitude:	103° 51' 49.87573 W
		Ground Level:	3,929.00 usft

Wellbore	WB1/Job #1410979				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
			(°)	(°)	(nT)
	BGGM2013	07/10/14	7.52	60.63	48,627

Design	Surveys (Capstar 114)				
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	268.92	

Survey Program	Date	07/29/14			
From	To	Survey (Wellbore)	Tool Name	Description	
(usft)	(usft)				
100.00	620.00	Gyrodata Survey (WB1/Job #1410979)	NS-GYRO-MS	North sensing gyrocompassing m/s	
735.00	11,061.00	Phoenix MWD Survey (WB1/Job #141097)	PHX+MWD+BGGM	PHX+MWD+BGGM v3: standard declination	

Survey									
Measured Depth	Inclination	Azimuth	Vertical Depth	+N/-S	+E/-W	Vertical Section	Dogleg Rate	Build Rate	Turn Rate
(usft)	(°)	(°)	(usft)	(usft)	(usft)	(usft)	(°/100usft)	(°/100usft)	(°/100usft)
620.00	0.92	89.42	619.94	-2.85	8.14	-8.08	0.00	0.00	0.00
Tie-on to Gyrodata Survey									
735.00	1.20	82.10	734.92	-2.67	10.25	-10.20	0.27	0.24	-6.37
First Phoenix MWD Survey									
864.00	1.30	83.90	863.88	-2.33	13.04	-13.00	0.08	0.08	1.40
992.00	1.10	79.20	991.86	-1.95	15.70	-15.66	0.17	-0.16	-3.67
1,120.00	0.80	343.70	1,119.85	-0.86	16.65	-16.63	1.11	-0.23	-74.61
1,248.00	1.10	343.50	1,247.83	1.18	16.05	-16.07	0.23	0.23	-0.16
1,376.00	1.50	357.20	1,375.79	4.03	15.62	-15.69	0.39	0.31	10.70

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Wellbore:	WB1/Job #1410979	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR DB

Survey										
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)	
1,505.00	2.20	3.50	1,504.73	8.19	15.69	-15.84	0.56	0.54	4.88	
1,633.00	1.70	348.30	1,632.65	12.50	15.45	-15.69	0.56	-0.39	-11.88	
1,762.00	1.50	246.80	1,761.62	13.71	13.51	-13.77	1.92	-0.16	-78.68	
1,890.00	1.90	244.00	1,889.57	12.12	10.07	-10.29	0.32	0.31	-2.19	
2,018.00	2.30	216.90	2,017.48	9.13	6.62	-6.79	0.83	0.31	-21.17	
2,146.00	2.30	209.20	2,145.38	4.84	3.82	-3.91	0.24	0.00	-6.02	
2,274.00	2.20	208.20	2,273.28	0.43	1.41	-1.42	0.08	-0.08	-0.78	
2,402.00	2.50	209.70	2,401.17	-4.16	-1.14	1.21	0.24	0.23	1.17	
2,531.00	2.00	224.70	2,530.07	-8.21	-4.11	4.27	0.60	-0.39	11.63	
2,659.00	1.20	245.70	2,658.02	-10.34	-6.91	7.10	0.76	-0.63	16.41	
2,787.00	1.40	252.30	2,785.99	-11.37	-9.62	9.83	0.19	0.16	5.16	
2,916.00	1.70	246.10	2,914.94	-12.63	-12.87	13.10	0.27	0.23	-4.81	
3,044.00	1.50	249.70	3,042.89	-13.98	-16.17	16.44	0.17	-0.16	2.81	
3,173.00	1.10	223.10	3,171.86	-15.47	-18.60	18.89	0.55	-0.31	-20.62	
3,301.00	1.20	224.40	3,299.84	-17.32	-20.38	20.70	0.08	0.08	1.02	
3,446.00	1.30	228.20	3,444.80	-19.50	-22.67	23.03	0.09	0.07	2.62	
3,588.00	1.20	236.60	3,586.77	-21.39	-25.11	25.51	0.15	-0.07	5.92	
3,716.00	1.00	184.30	3,714.75	-23.25	-26.31	26.75	0.77	-0.16	-40.86	
3,844.00	1.50	89.00	3,842.73	-24.33	-24.72	25.18	1.47	0.39	-74.45	
3,976.00	2.60	60.90	3,974.64	-22.84	-20.38	20.81	1.11	0.83	-21.29	
4,104.00	2.00	42.30	4,102.54	-19.78	-16.34	16.71	0.74	-0.47	-14.53	
4,232.00	1.80	40.00	4,230.47	-16.59	-13.54	13.85	0.17	-0.16	-1.80	
4,361.00	1.80	37.00	4,359.41	-13.42	-11.02	11.27	0.07	0.00	-2.33	
4,489.00	1.90	37.00	4,487.34	-10.12	-8.54	8.73	0.08	0.08	0.00	
4,618.00	1.40	41.00	4,616.29	-7.22	-6.21	6.35	0.40	-0.39	3.10	
4,746.00	1.50	38.20	4,744.25	-4.72	-4.15	4.24	0.10	0.08	-2.19	
4,874.00	0.60	34.40	4,872.22	-2.85	-2.74	2.79	0.70	-0.70	-2.97	
5,003.00	0.70	17.10	5,001.22	-1.54	-2.13	2.15	0.17	0.08	-13.41	
5,131.00	0.60	359.40	5,129.21	-0.13	-1.90	1.90	0.17	-0.08	-13.83	
5,221.00	0.50	353.40	5,219.20	0.73	-1.95	1.94	0.13	-0.11	-6.67	
5,299.00	1.90	272.90	5,297.19	1.14	-3.28	3.26	2.41	1.79	-103.21	
5,342.00	5.90	268.10	5,340.08	1.10	-6.20	6.18	9.33	9.30	-11.16	
5,385.00	10.70	268.10	5,382.62	0.90	-12.41	12.39	11.16	11.16	0.00	
5,428.00	15.80	268.10	5,424.46	0.57	-22.25	22.24	11.86	11.86	0.00	
5,470.00	20.90	267.40	5,464.31	0.04	-35.46	35.45	12.15	12.14	-1.67	
5,513.00	22.50	269.30	5,504.26	-0.41	-51.35	51.35	4.06	3.72	4.42	
5,556.00	25.40	270.00	5,543.55	-0.51	-68.80	68.80	6.78	6.74	1.63	
5,598.00	31.10	268.90	5,580.54	-0.72	-88.67	88.67	13.63	13.57	-2.62	
5,641.00	38.30	269.90	5,615.87	-0.96	-113.13	113.13	16.80	16.74	2.33	
5,684.00	45.80	269.20	5,647.77	-1.19	-141.91	141.91	17.48	17.44	-1.63	
5,727.00	53.70	268.50	5,675.54	-1.86	-174.70	174.70	18.41	18.37	-1.63	
5,770.00	61.60	268.70	5,698.53	-2.75	-210.99	211.00	18.38	18.37	0.47	
5,813.00	68.10	270.30	5,716.79	-3.07	-249.89	249.90	15.49	15.12	3.72	



Phoenix Technology Services

Survey Report



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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)	Build Rate (°/100usft)	Turn Rate (°/100usft)
5,858.00	72.00	271.40	5,732.14	-2.44	-292.17	292.17	8.97	8.67	2.44
5,901.00	74.50	271.30	5,744.53	-1.47	-333.33	333.30	5.82	5.81	-0.23
5,944.00	77.10	271.10	5,755.08	-0.60	-375.01	374.95	6.06	6.05	-0.47
5,987.00	81.40	270.80	5,763.10	0.10	-417.24	417.16	10.02	10.00	-0.70
6,029.00	83.60	270.50	5,768.58	0.57	-458.87	458.78	5.29	5.24	-0.71
6,073.00	86.10	269.40	5,772.53	0.53	-502.69	502.59	6.20	5.68	-2.50
6,201.00	89.20	268.60	5,777.78	-1.70	-630.54	630.46	2.50	2.42	-0.63
6,329.00	90.60	268.50	5,778.00	-4.94	-758.50	758.46	1.10	1.09	-0.08
6,461.00	90.60	268.30	5,776.62	-8.62	-890.44	890.45	0.15	0.00	-0.15
6,589.00	90.80	270.00	5,775.06	-10.52	-1,018.41	1,018.43	1.34	0.16	1.33
6,717.00	91.70	269.10	5,772.26	-11.53	-1,146.38	1,146.39	0.99	0.70	-0.70
6,846.00	91.70	270.40	5,768.44	-12.09	-1,275.32	1,275.32	1.01	0.00	1.01
6,974.00	89.20	272.20	5,767.43	-9.19	-1,403.26	1,403.19	2.41	-1.95	1.41
7,102.00	88.80	271.10	5,769.67	-5.50	-1,531.19	1,531.02	0.91	-0.31	-0.86
7,230.00	89.20	269.40	5,771.90	-4.94	-1,659.16	1,658.96	1.36	0.31	-1.33
7,362.00	89.40	268.20	5,773.51	-7.71	-1,791.12	1,790.95	0.92	0.15	-0.91
7,490.00	90.20	268.30	5,773.96	-11.61	-1,919.06	1,918.94	0.63	0.63	0.08
7,623.00	90.70	267.70	5,772.92	-16.26	-2,051.97	2,051.92	0.59	0.38	-0.45
7,751.00	91.20	268.40	5,770.79	-20.61	-2,179.88	2,179.88	0.67	0.39	0.55
7,880.00	91.10	270.30	5,768.20	-22.07	-2,308.84	2,308.85	1.47	-0.08	1.47
8,008.00	91.60	269.60	5,765.19	-22.19	-2,436.80	2,436.79	0.67	0.39	-0.55
8,136.00	90.90	270.10	5,762.40	-22.52	-2,564.77	2,564.74	0.67	-0.55	0.39
8,268.00	91.60	269.40	5,759.52	-23.10	-2,696.74	2,696.69	0.75	0.53	-0.53
8,396.00	91.40	271.30	5,756.17	-22.31	-2,824.69	2,824.60	1.49	-0.16	1.48
8,524.00	91.80	270.50	5,752.59	-20.30	-2,952.62	2,952.48	0.70	0.31	-0.63
8,655.00	90.40	271.20	5,750.08	-18.36	-3,083.58	3,083.37	1.19	-1.07	0.53
8,789.00	90.60	270.90	5,748.91	-15.91	-3,217.55	3,217.27	0.27	0.15	-0.22
8,916.00	91.10	270.50	5,747.02	-14.35	-3,344.52	3,344.20	0.50	0.39	-0.31
9,047.00	92.10	270.10	5,743.37	-13.67	-3,475.47	3,475.11	0.82	0.76	-0.31
9,175.00	90.30	269.10	5,740.68	-14.56	-3,603.43	3,603.06	1.61	-1.41	-0.78
9,303.00	90.60	269.20	5,739.68	-16.46	-3,731.41	3,731.06	0.25	0.23	0.08
9,431.00	90.00	268.90	5,739.01	-18.58	-3,859.39	3,859.06	0.52	-0.47	-0.23
9,560.00	90.30	268.00	5,738.67	-22.07	-3,988.34	3,988.05	0.74	0.23	-0.70
9,688.00	90.60	267.30	5,737.67	-27.32	-4,116.23	4,116.01	0.59	0.23	-0.55
9,817.00	90.80	268.60	5,736.09	-31.94	-4,245.14	4,244.98	1.02	0.16	1.01
9,945.00	91.70	269.20	5,733.30	-34.39	-4,373.08	4,372.95	0.84	0.70	0.47
10,073.00	91.30	269.10	5,729.95	-36.29	-4,501.02	4,500.90	0.32	-0.31	-0.08
10,201.00	91.70	269.40	5,726.60	-37.97	-4,628.97	4,628.86	0.39	0.31	0.23
10,333.00	92.40	268.60	5,721.87	-40.27	-4,760.86	4,760.77	0.81	0.53	-0.61
10,461.00	92.00	269.60	5,716.96	-42.28	-4,888.75	4,888.68	0.84	-0.31	0.78
10,590.00	91.50	269.40	5,713.02	-43.40	-5,017.68	5,017.61	0.42	-0.39	-0.16
10,718.00	91.60	268.50	5,709.56	-45.75	-5,145.61	5,145.56	0.71	0.08	-0.70
10,846.00	91.50	267.90	5,706.10	-49.77	-5,273.50	5,273.50	0.48	-0.08	-0.47
10,978.00	91.70	267.40	5,702.41	-55.18	-5,405.34	5,405.42	0.41	0.15	-0.38

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Well:	#36H	North Reference:	Grid
Wellbore:	WB1/Job #1410979	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR DB

Survey									
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)
10,991.00	91.70	267.20	5,702.03	-55.79	-5,418.32	5,418.41	1.54	0.00	-1.54
Last Phonix MWD Survey									
11,061.00	91.70	267.20	5,699.95	-59.21	-5,488.21	5,488.34	0.00	0.00	0.00
Projection to TD									

Survey Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
620.00	619.94	-2.85	8.14	Tie-on to Gyrodata Survey	
735.00	734.92	-2.67	10.25	First Phonix MWD Survey	
10,991.00	5,702.03	-55.79	-5,418.32	Last Phonix MWD Survey	
11,061.00	5,699.95	-59.21	-5,488.21	Projection to TD	

Checked By: _____	Approved By: _____	Date: _____
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