

HOEBS OCD

OCT 21 2013

RECEIVED

15-41166

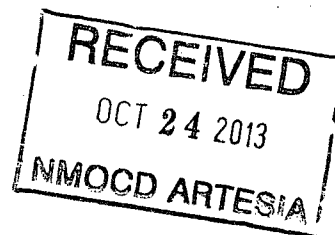
Apache Corporation

Eddy County, NM (NAD27 NME)

Crow Federal

#22H

WB1/Job #1311192



Survey: Phoenix MWD Surveys

Phoenix Final Survey Report

24 September, 2013





Phoenix Technology Services

Phoenix Final Survey Report



Company:	Apache Corporation	Local Co-ordinate Reference:	Well #22H
Project:	Eddy County, NM (NAD27-NME)	TVD Reference:	KB @ 3881.00usft (Capstar 114)
Site:	Crow Federal	MD Reference:	KB @ 3881.00usft (Capstar 114)
Well:	#22H	North Reference:	Grid
Wellbore:	WB1/Job #1311192	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	#22H		
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' 5.70786 N
		Longitude:	103° 52' 57.92823 W
		Ground Level:	3,870.00 usft

Wellbore	WB1/Job #1311192				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
			(°)	(°)	(nT)
	IGRF2010_14	09/06/13	7.50	60.66	48,733

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	89.59

Survey Program	Date	09/24/13			
From	To	Survey (Wellbore)	Tool Name	Description	
(usft)	(usft)				
100.00	400.00	Gyrodata Survey (WB1/Job #1311192)	CB-GYRO-MS	Camera based gyro multishot	
481.00	9,837.00	Phoenix MWD Surveys (WB1/Job #131119)	MWD	MWD - Standard	

Survey								
MD	Inc	Azi (azimuth)	TVD	N/S	E/W	V. Sec	DLeg	
(usft)	(°)	(°)	(usft)	(usft)	(usft)	(usft)	(°/100usft)	
481.00	0.28	74.44	480.97	0.08	4.75	4.75	0.00	
Tie-on to Gyro								
569.00	0.40	74.30	568.97	0.22	5.26	5.26	0.14	
First Phoenix MWD Survey								
655.00	0.70	97.30	654.97	0.24	6.07	6.07	0.43	
743.00	0.80	67.00	742.96	0.41	7.17	7.17	0.46	
829.00	0.90	68.90	828.95	0.89	8.35	8.35	0.12	
914.00	1.10	66.80	913.94	1.45	9.72	9.73	0.24	
1,000.00	1.50	72.20	999.92	2.12	11.55	11.57	0.49	
1,085.00	0.60	85.60	1,084.90	2.49	13.06	13.07	1.09	
1,173.00	0.20	166.90	1,172.90	2.38	13.55	13.57	0.69	



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Well:	#22H	North Reference:	Grid
Wellbore:	WB1/Job #1311192	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR/DB

Survey								
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	
1,258.00	0.10	162.80	1,257.90	2.16	13.60	13.62	0.12	
1,344.00	0.70	122.20	1,343.90	1.81	14.07	14.08	0.73	
1,429.00	0.70	263.10	1,428.89	1.47	14.00	14.01	1.55	
1,515.00	1.10	252.40	1,514.88	1.16	12.69	12.70	0.50	
1,600.00	0.90	244.70	1,599.87	0.63	11.31	11.31	0.28	
1,685.00	1.00	260.40	1,684.86	0.22	9.97	9.97	0.33	
1,771.00	1.10	260.80	1,770.84	-0.04	8.42	8.42	0.12	
1,857.00	0.90	260.60	1,856.83	-0.28	6.93	6.93	0.23	
1,942.00	0.90	251.90	1,941.82	-0.60	5.64	5.64	0.16	
2,028.00	1.10	243.90	2,027.81	-1.17	4.26	4.25	0.28	
2,113.00	1.00	264.30	2,112.79	-1.60	2.79	2.78	0.45	
2,197.00	1.00	250.40	2,196.78	-1.92	1.37	1.35	0.29	
2,283.00	0.90	266.70	2,282.77	-2.21	-0.01	-0.03	0.33	
2,368.00	1.00	273.00	2,367.76	-2.21	-1.42	-1.44	0.17	
2,454.00	1.10	264.30	2,453.74	-2.25	-2.99	-3.01	0.22	
2,541.00	1.10	265.00	2,540.73	-2.41	-4.65	-4.67	0.02	
2,627.00	0.50	317.80	2,626.72	-2.20	-5.73	-5.74	1.04	
2,713.00	0.20	42.30	2,712.72	-1.81	-5.88	-5.89	0.61	
2,798.00	0.10	357.20	2,797.72	-1.63	-5.78	-5.80	0.17	
2,884.00	0.50	348.10	2,883.72	-1.19	-5.86	-5.87	0.47	
2,971.00	0.40	349.30	2,970.71	-0.52	-6.00	-6.00	0.12	
3,056.00	0.30	310.10	3,055.71	-0.08	-6.22	-6.23	0.30	
3,141.00	0.50	14.50	3,140.71	0.42	-6.30	-6.30	0.54	
3,227.00	0.50	328.40	3,226.71	1.10	-6.40	-6.40	0.46	
3,313.00	0.30	318.20	3,312.71	1.59	-6.75	-6.74	0.25	
3,364.00	0.70	350.00	3,363.70	2.00	-6.89	-6.88	0.93	
3,441.00	0.70	333.80	3,440.70	2.88	-7.18	-7.16	0.26	
3,527.00	0.70	325.40	3,526.69	3.79	-7.71	-7.69	0.12	
3,557.00	0.70	325.00	3,556.69	4.09	-7.92	-7.89	0.02	
3,612.00	0.70	331.80	3,611.69	4.66	-8.27	-8.24	0.15	
3,654.00	0.80	315.30	3,653.68	5.09	-8.60	-8.57	0.56	
3,740.00	0.90	155.00	3,739.68	4.91	-8.74	-8.70	1.95	
3,826.00	0.60	167.10	3,825.67	3.86	-8.35	-8.33	0.39	
3,911.00	0.60	164.00	3,910.67	2.99	-8.13	-8.11	0.04	
3,996.00	0.50	139.40	3,995.66	2.28	-7.77	-7.75	0.30	
4,082.00	0.70	137.90	4,081.66	1.61	-7.17	-7.16	0.23	
4,166.00	0.50	118.60	4,165.65	1.05	-6.50	-6.50	0.34	
4,254.00	0.70	121.70	4,253.65	0.59	-5.71	-5.71	0.23	
4,339.00	0.80	126.80	4,338.64	-0.04	-4.79	-4.79	0.14	
4,425.00	0.90	127.70	4,424.63	-0.81	-3.78	-3.78	0.12	
4,510.00	0.90	128.40	4,509.62	-1.64	-2.73	-2.74	0.01	
4,574.00	1.00	128.80	4,573.61	-2.30	-1.90	-1.91	0.16	
4,600.00	0.90	130.90	4,599.61	-2.57	-1.57	-1.58	0.41	
4,642.00	3.80	98.90	4,641.57	-3.01	0.06	0.04	7.32	



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Site:	Crow Federal	MD Reference:	KB @ 3881.00usft (Capstar 114)
Well:	#22H	North Reference:	Grid
Wellbore:	VB1/Job #1311192	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR DB

Survey								
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	
4,685.00	9.30	88.60	4,684.27	-3.14	4.94	4.92	13.03	
4,728.00	14.00	83.50	4,726.38	-2.47	13.59	13.57	11.18	
4,771.00	19.20	82.80	4,767.57	-0.99	25.78	25.77	12.10	
4,814.00	23.60	85.50	4,807.60	0.57	41.38	41.39	10.48	
4,856.00	28.10	88.60	4,845.39	1.47	59.66	59.67	11.18	
4,899.00	32.80	91.00	4,882.45	1.52	81.45	81.46	11.29	
4,942.00	36.90	92.30	4,917.73	0.80	106.00	106.00	9.69	
4,985.00	42.20	91.90	4,950.87	-0.20	133.35	133.35	12.34	
5,027.00	48.10	90.50	4,980.48	-0.81	163.11	163.10	14.24	
5,070.00	53.50	89.60	5,007.65	-0.83	196.42	196.41	12.66	
5,113.00	58.20	89.30	5,031.78	-0.48	231.99	231.98	10.95	
5,155.00	63.40	89.20	5,052.26	0.00	268.64	268.63	12.38	
5,197.00	68.70	88.70	5,069.31	0.70	307.00	307.00	12.67	
5,239.00	73.40	88.70	5,082.94	1.61	346.70	346.71	11.19	
5,282.00	78.40	89.60	5,093.41	2.22	388.39	388.40	11.80	
5,325.00	83.90	90.50	5,100.03	2.18	430.86	430.87	12.96	
5,368.00	88.00	90.30	5,103.06	1.88	473.74	473.75	9.55	
5,452.00	88.30	89.60	5,105.78	1.96	557.70	557.70	0.91	
5,538.00	88.50	89.60	5,108.18	2.56	643.66	643.67	0.23	
5,623.00	88.40	89.30	5,110.48	3.37	728.63	728.63	0.37	
5,711.00	88.70	89.20	5,112.70	4.52	816.59	816.60	0.36	
5,796.00	88.80	89.20	5,114.56	5.71	901.56	901.58	0.12	
5,885.00	88.90	89.30	5,116.34	6.87	990.54	990.56	0.16	
5,972.00	90.10	89.00	5,117.10	8.16	1,077.52	1,077.56	1.42	
6,058.00	89.60	89.00	5,117.33	9.67	1,163.51	1,163.55	0.58	
6,143.00	89.50	89.00	5,118.00	11.15	1,248.50	1,248.54	0.12	
6,229.00	88.30	87.90	5,119.65	13.47	1,334.45	1,334.51	1.89	
6,314.00	89.20	90.10	5,121.50	14.96	1,419.41	1,419.48	2.80	
6,400.00	89.50	90.10	5,122.48	14.81	1,505.40	1,505.47	0.35	
6,485.00	89.20	90.00	5,123.44	14.73	1,590.39	1,590.46	0.37	
6,571.00	89.20	89.50	5,124.64	15.11	1,676.39	1,676.45	0.58	
6,656.00	89.20	89.90	5,125.83	15.55	1,761.38	1,761.44	0.47	
6,741.00	89.10	89.90	5,127.09	15.70	1,846.37	1,846.43	0.12	
6,826.00	88.80	90.10	5,128.65	15.70	1,931.35	1,931.41	0.42	
6,912.00	88.80	90.10	5,130.45	15.55	2,017.33	2,017.39	0.00	
6,999.00	88.60	90.50	5,132.42	15.10	2,104.31	2,104.36	0.51	
7,087.00	88.30	90.30	5,134.80	14.48	2,192.27	2,192.32	0.41	
7,172.00	87.90	90.60	5,137.62	13.81	2,277.22	2,277.27	0.59	
7,190.43	87.84	90.58	5,138.31	13.63	2,295.64	2,295.68	0.37	
2300' VS Crow Fed 22H								
7,194.77	87.82	90.57	5,138.47	13.58	2,299.97	2,300.01	0.37	
2300' VS Crow Fed 22H v2								
7,258.00	87.60	90.50	5,141.00	12.99	2,363.15	2,363.19	0.37	
7,344.00	87.50	90.30	5,144.67	12.39	2,449.07	2,449.10	0.26	



Phoenix Technology Services

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Well:	#22H	North Reference:	Grid
Wellbore:	WB1/Job #1311192	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR DB

Survey								
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	
7,429.00	87.10	89.70	5,148.68	12.39	2,533.98	2,534.00	0.85	
7,515.00	87.00	89.30	5,153.10	13.14	2,619.86	2,619.89	0.48	
7,600.00	88.00	88.60	5,156.81	14.70	2,704.76	2,704.80	1.44	
7,686.00	88.10	88.60	5,159.74	16.80	2,790.69	2,790.74	0.12	
7,772.00	87.90	88.50	5,162.74	18.97	2,876.61	2,876.67	0.26	
7,857.00	88.40	88.60	5,165.48	21.12	2,961.54	2,961.61	0.60	
7,943.00	88.70	89.50	5,167.66	22.55	3,047.50	3,047.58	1.10	
8,028.00	88.50	89.30	5,169.74	23.44	3,132.47	3,132.55	0.33	
8,114.00	90.00	90.00	5,170.86	23.96	3,218.45	3,218.54	1.92	
8,199.00	89.70	89.90	5,171.08	24.03	3,303.45	3,303.54	0.37	
8,285.00	89.20	89.20	5,171.91	24.71	3,389.45	3,389.54	1.00	
8,370.00	88.50	88.80	5,173.61	26.19	3,474.42	3,474.51	0.95	
8,456.00	90.00	89.60	5,174.74	27.39	3,560.40	3,560.50	1.98	
8,541.00	89.70	89.30	5,174.96	28.21	3,645.39	3,645.50	0.50	
8,627.00	89.50	89.00	5,175.56	29.49	3,731.38	3,731.50	0.42	
8,712.00	89.00	89.30	5,176.68	30.75	3,816.36	3,816.49	0.69	
8,798.00	88.70	89.00	5,178.40	32.02	3,902.34	3,902.47	0.49	
8,883.00	88.60	88.70	5,180.40	33.73	3,987.30	3,987.44	0.37	
8,972.00	88.30	88.60	5,182.81	35.82	4,076.24	4,076.39	0.36	
9,057.00	87.80	87.90	5,185.70	38.42	4,161.15	4,161.32	1.01	
9,143.00	89.70	89.60	5,187.58	40.29	4,247.10	4,247.28	2.96	
9,228.00	89.80	89.70	5,187.95	40.81	4,332.10	4,332.28	0.17	
9,314.00	89.80	90.00	5,188.25	41.04	4,418.10	4,418.28	0.35	
9,399.00	90.00	90.10	5,188.40	40.96	4,503.10	4,503.28	0.26	
9,485.00	90.10	90.10	5,188.32	40.81	4,589.10	4,589.27	0.12	
9,571.00	90.00	90.10	5,188.25	40.66	4,675.10	4,675.27	0.12	
9,656.00	90.50	89.90	5,187.88	40.66	4,760.10	4,760.27	0.63	
9,742.00	89.50	89.60	5,187.88	41.04	4,846.09	4,846.26	1.21	
9,783.00	89.50	89.60	5,188.24	41.32	4,887.09	4,887.26	0.00	
Last Phoenix MWD Survey								
9,836.50	89.50	89.60	5,188.70	41.70	4,940.59	4,940.76	0.00	
BHL v2 Crow Fed 22H								
9,836.69	89.50	89.60	5,188.71	41.70	4,940.78	4,940.95	0.00	
BHL Crow Fed 22H								
9,837.00	89.50	89.60	5,188.71	41.70	4,941.09	4,941.26	0.00	
Projection to TD - BHL v3 Crow Fed 22H								



Phoenix Technology Services

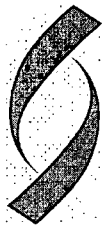
Phoenix Final Survey Report



Company:	Apache Corporation	Local Co-ordinate Reference:	Well #22H
Project:	Eddy County NM (NAD27 NME)	TVD Reference:	KB @ 3881.00usft (Capstar 114)
Site:	Crow Federal	MD Reference:	KB @ 3881.00usft (Capstar 114)
Well:	#22H	North Reference:	Grid
Wellbore:	WB1/Job #1311192	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR.DB

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
481.00	480.97	0.08	4.75	Tie-on to Gyro
569.00	568.97	0.22	5.26	First Phoenix MWD Survey
9,783.00	5,188.24	41.32	4,887.09	Last Phoenix MWD Survey
9,837.00	5,188.71	41.70	4,941.09	Projection to TD

Checked By: _____	Approved By: _____	Date: _____
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PHOENIX
TECHNOLOGY SERVICES

HOBBS OCD

October 15, 2013

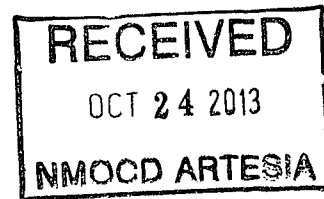
OCT 21 2013

Oil Conservation Division
State of New Mexico
1625 N. French Drive
District 1 - Hobbs
Hobbs, New Mexico 88240

RECEIVED

Attention: Regulatory Department

Re: Apache Corporation
Crow Federal #22 H
Eddy County, NM, NM
API #30-015-41166
Job No. 1311192



Enclosed please find the Survey Data Certification, and the original Plat and one copy of the Survey Report performed on the above referenced Well by Phoenix Technology Services, Inc. (P-5 No. 664171). Other information required by your office is as follows:

Name & Title of Surveyor	Drainhole Number	Surveyed Depths		Dates Performed		Type of Survey
		From	To	Start	End	
Eric Burchinal	22H	569	9,783	09/24/13	09/24/13	MWD

A certified plat on which the bottom hole location is oriented both to the surface location and to the lease lines (or unit lines in case of pooling) is attached to the survey report. If any other information is required, please contact the undersigned at the letterhead address and phone number.

Best Regards,

Sonya Thomas

Sonya
Operations Administrator

Certified mail receipt number: 7011 1570 0001 4364 9674

PHOENIX TECHNOLOGY SERVICES SURVEY DATA CERTIFICATION



PHOENIX
TECHNOLOGY SERVICES

PHOENIX JOB NUMBER 1311192

OPERATOR Apache Corporation

WELL NAME Crow Federal #22 H

COUNTY & STATE

Eddy County, NM

API WELL NUMBER 30-015-41166

PROPOSED DIRECTION 89.59

TIE-IN DATA						
MEASURED DEPTH	VERTICAL DEPTH	INCLIN	AZIMUTH	N-S COORD	E-W COORD	DATA SOURCE
481 ft	480.97 ft	0.28	74.44	0.08	4.75	GYRO

FIRST SURVEY DATE	FIRST SURVEY DEPTH	INCLIN	AZIMUTH
12-Sep-13	569 ft	0.4	74.3

SURVEY INSTRUMENT TYPE
PHOENIX MWD

LAST SURVEY DATE	LAST SURVEY DEPTH	INCLIN	AZIMUTH
24-Sep-13	9,783 ft	89.5	89.6

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
24-Sep-13	9,837 ft	89.5	89.6

Eric Burchinal

PRINT YOUR NAME ABOVE

Eric Burchinal

SIGN YOUR NAME ABOVE

MAGNETIC DECLINATION OR TOTAL GRID

TOTAL CORRECTION USED	7.26
DECLINATION OR GRID	Grid

9-24-13

TODAY'S DATE

MWD SUPERVISOR 1

Eric Burchinal

DIRECTIONAL DRILLER 1

Ken Smith

MWD SUPERVISOR 2

Brad Hill

DIRECTIONAL DRILLER 2

Brant Dublechain

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Houston, Texas 77043

(713)3370609 (Voice), (713)337-0599 (Fax)