



PHOENIX
TECHNOLOGY SERVICES

NM OIL CONSERVATION
ARTESIA DISTRICT

SEP 29 2016

RECEIVED

December 10, 2015

Oil Conservation Division
State of New Mexico
811 S. First St.
Artesia, New Mexico 88210

Dear District 2 - Artesia

30-015-43408

Attention: Regulatory Department

Re: Apache Corporation
~~Crow Federal #47H~~
Eddy County, NM
API #30-015-43408
Job No. 1514595

Cedar Lake Federal CA # 147H

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	Drain Hole Number	Surveyed Depths		Dates Performed		Type of Survey
		From	To	Start	End	
Mike Miller	47H	5,245	10,124	11/14/15	11/20/15	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,

Claudia Carreon

Claudia Carreon
Operations Administrator

Certified mail receipt number: 7015 0640 0000 9907 5210

Phoenix Technology Services
SURVEY DATA CERTIFICATION



PHOENIX JOB NUMBER

1514595

OPERATOR

Apache

WELL NAME

Crow Federal #47H

COUNTY & STATE

Eddy County, NM

API WELL NUMBER

30-015-43408

PROPOSED DIRECTION

269.61

TIE-IN DATA						
MEASURED	VERTICAL			N-S	E-W	DATA
DEPTH	DEPTH	INCLIN	AZIMUTH	COORD	COORD	SOURCE
5,207. ft	5,206.37 ft	0.25	318.72	-19.09 ft	11.96 ft	Gyro

FIRST	FIRST		
SURVEY	SURVEY		
DATE	DEPTH	INCLIN	AZIMUTH
14-Nov-15	5,245.00 ft	0.20	321.60

SURVEY INSTRUMENT
TYPE
Phoenix MWD

LAST	LAST		
SURVEY	SURVEY		
DATE	DEPTH	INCLIN	AZIMUTH
20-Nov-15	10,124.00 ft	90.90	268.80

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

PROJECTED	PROJECTED		
TD SURVEY	TD SURVEY		
DATE	DEPTH	INCLIN	AZIMUTH
20-Nov-15	10,199.00 ft	90.90	268.80

Mike Miller

PRINT YOUR NAME ABOVE

Mike Miller

SIGN YOUR NAME ABOVE

MAGNETIC DECLINATION OR TOTAL GRID

TOTAL CORRECTION USED	
	7.27
DECLINATION OR GRID	GRID

11/20/2015

TODAY'S DATE

MWD SUPERVISOR 1

Mike Miller

DIRECTIONAL DRILLER 1

Steven Hawkins

MWD SUPERVISOR 2

Bill Oehlert

DIRECTIONAL DRILLER 2

Michael Crall

12329 Cutten Rd., Houston, Texas 777066 (713)337-0600 (Voice), (713)337-0599 (Fax)



NM OIL CONSERVATION

ARTESIA DISTRICT

SEP 29 2016

RECEIVED

Apache Corporation

Eddy County, NM (NAD27 NME)

Crow Federal

#47H

OH / Job #1514595

Survey: Phoenix MWD Surveys

Standard Survey Report

21 November, 2015





Phoenix Technology Services LP

Survey Report



Company:	Apache Corporation	Local Co-ordinate Reference:	Well #47H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3957.00usft (Capstar 119)
Site:	Crow Federal	MD Reference:	KB @ 3957.00usft (Capstar 119)
Well:	#47H	North Reference:	Grid
Wellbore:	OH / Job #1514595	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 119)	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	Crow Federal		
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Site Position:		Northing:	671,130.90 usft	Latitude:	32° 50' 38.92796 N
From:	Map	Easting:	643,906.80 usft	Longitude:	103° 51' 53.16689 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.25 °

Well	#47H					
Well Position	+N/-S	0.00 usft	Northing:	675,049.10 usft	Latitude:	32° 51' 17.49000 N
	+E/-W	0.00 usft	Easting:	648,585.30 usft	Longitude:	103° 50' 58.11817 W
Position Uncertainty	0.00 usft	Wellhead Elevation:	usft	Ground Level:	3,946.00 usft	

Wellbore	OH / Job #1514595				
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	11/9/2015	7.53	60.83	48,583

Design	Surveys (Capstar 119)				
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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	269.61

Survey Program	Date	11/21/2015			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
82.00	5,207.00	Scientific Gyros (OH / Job #1514595)	NS-GYRO-MS	North sensing gyrocompassing m/s	
5,245.00	10,199.00	Phoenix MWD Surveys (OH / Job #1514595)	PHX+MWD+HDGM	PHX+OWSG MWD + HDGM	

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)
	5,207.00	0.25	318.72	5,206.37	-19.09	11.96	-11.83	0.00	0.00	0.00
Tie In to Scientific Gyros										
	5,245.00	0.20	321.60	5,244.37	-18.98	11.86	-11.73	0.13	-0.13	7.58
First Phoenix MWD Survey										
	5,287.00	3.30	274.00	5,286.34	-18.83	10.61	-10.48	7.54	7.38	-113.33
	5,330.00	8.40	273.90	5,329.10	-18.53	6.24	-6.12	11.86	11.86	-0.23
	5,373.00	12.80	279.60	5,371.36	-17.53	-1.59	1.71	10.51	10.23	13.26
	5,415.00	16.20	280.20	5,412.02	-15.71	-11.95	12.06	8.10	8.10	1.43
	5,458.00	20.80	279.50	5,452.78	-13.39	-25.39	25.48	10.71	10.70	-1.63



Phoenix Technology Services LP

Survey Report



Company:	Apache Corporation	Local Co-ordinate Reference:	Well #47H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3957.00usft (Capstar 119)
Site:	Crow Federal	MD Reference:	KB @ 3957.00usft (Capstar 119)
Well:	#47H	North Reference:	Grid
Wellbore:	OH / Job #1514595	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 119)	Database:	Compass 5000 GCR

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)
5,500.00	26.10	279.90	5,491.30	-10.57	-41.86	41.93	12.62	12.62	0.95
5,543.00	29.70	278.50	5,529.30	-7.36	-61.72	61.77	8.51	8.37	-3.26
5,585.00	34.20	275.90	5,564.93	-4.61	-83.76	83.79	11.20	10.71	-6.19
5,628.00	38.30	271.90	5,599.60	-2.93	-109.12	109.13	11.00	9.53	-9.30
5,671.00	42.90	271.80	5,632.24	-2.02	-137.08	137.09	10.70	10.70	-0.23
5,713.00	46.80	272.30	5,662.01	-0.96	-166.67	166.67	9.32	9.29	1.19
5,756.00	52.10	272.30	5,689.96	0.35	-199.31	199.30	12.33	12.33	0.00
5,798.00	57.80	271.50	5,714.07	1.48	-233.66	233.64	13.66	13.57	-1.90
5,841.00	63.60	270.60	5,735.10	2.16	-271.13	271.11	13.61	13.49	-2.09
5,884.00	69.60	270.60	5,752.17	2.57	-310.58	310.55	13.95	13.95	0.00
5,926.00	75.70	270.50	5,764.69	2.96	-350.65	350.62	14.53	14.52	-0.24
5,970.00	82.00	269.80	5,773.19	3.07	-393.79	393.76	14.40	14.32	-1.59
6,013.00	85.40	270.60	5,777.91	3.22	-436.53	436.49	8.12	7.91	1.86
6,056.00	85.80	270.70	5,781.21	3.70	-479.40	479.36	0.96	0.93	0.23
6,183.00	87.80	271.40	5,788.30	6.03	-606.17	606.11	1.67	1.57	0.55
6,311.00	89.90	271.30	5,790.87	9.04	-734.10	734.02	1.64	1.64	-0.08
6,438.00	93.80	270.10	5,786.77	10.59	-861.00	860.91	3.21	3.07	-0.94
6,566.00	93.90	268.50	5,778.17	9.03	-988.70	988.61	1.25	0.08	-1.25
6,694.00	93.20	269.00	5,770.25	6.25	-1,116.42	1,116.35	0.67	-0.55	0.39
6,822.00	92.50	269.50	5,763.88	4.57	-1,244.25	1,244.19	0.67	-0.55	0.39
6,949.00	91.10	267.00	5,759.90	0.70	-1,371.11	1,371.08	2.26	-1.10	-1.97
7,077.00	91.10	267.30	5,757.44	-5.67	-1,498.93	1,498.94	0.23	0.00	0.23
7,205.00	91.20	267.30	5,754.87	-11.69	-1,626.76	1,626.81	0.08	0.08	0.00
7,331.00	90.10	268.90	5,753.44	-15.87	-1,752.68	1,752.75	1.54	-0.87	1.27
7,459.00	90.50	269.30	5,752.77	-17.88	-1,880.66	1,880.74	0.44	0.31	0.31
7,587.00	90.70	270.00	5,751.43	-18.66	-2,008.65	2,008.73	0.57	0.16	0.55
7,714.00	90.60	270.80	5,749.99	-17.78	-2,135.64	2,135.71	0.63	-0.08	0.63
7,842.00	90.80	271.50	5,748.42	-15.21	-2,263.60	2,263.65	0.57	0.16	0.55
7,970.00	88.40	269.40	5,749.32	-14.20	-2,391.58	2,391.62	2.49	-1.88	-1.64
8,097.00	88.00	269.60	5,753.31	-15.31	-2,518.51	2,518.56	0.35	-0.31	0.16
8,225.00	89.50	269.90	5,756.10	-15.87	-2,646.48	2,646.52	1.20	1.17	0.23
8,353.00	89.50	270.10	5,757.22	-15.87	-2,774.47	2,774.52	0.16	0.00	0.16
8,481.00	90.90	270.10	5,756.77	-15.65	-2,902.47	2,902.51	1.09	1.09	0.00
8,608.00	90.80	270.10	5,754.89	-15.42	-3,029.45	3,029.49	0.08	-0.08	0.00
8,736.00	91.20	271.40	5,752.65	-13.75	-3,157.42	3,157.44	1.06	0.31	1.02
8,864.00	89.50	270.20	5,751.87	-11.96	-3,285.40	3,285.40	1.63	-1.33	-0.94
8,991.00	90.50	269.40	5,751.87	-12.41	-3,412.39	3,412.40	1.01	0.79	-0.63
9,119.00	90.20	269.10	5,751.09	-14.08	-3,540.38	3,540.39	0.33	-0.23	-0.23
9,247.00	91.10	269.90	5,749.64	-15.20	-3,668.37	3,668.38	0.94	0.70	0.63
9,375.00	92.50	270.10	5,745.62	-15.20	-3,796.30	3,796.31	1.10	1.09	0.16
9,502.00	92.60	270.20	5,739.96	-14.87	-3,923.17	3,923.18	0.11	0.08	0.08
9,630.00	92.20	269.00	5,734.60	-15.76	-4,051.05	4,051.07	0.99	-0.31	-0.94
9,757.00	92.00	268.30	5,729.95	-18.75	-4,177.93	4,177.96	0.57	-0.16	-0.55



Phoenix Technology Services LP

Survey Report



Company:	Apache Corporation	Local Co-ordinate Reference:	Well #47H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3957.00usft (Capstar 119)
Site:	Crow Federal	MD Reference:	KB @ 3957.00usft (Capstar 119)
Well:	#47H	North Reference:	Grid
Wellbore:	OH / Job #1514595	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 119)	Database:	Compass 5000 GCR

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)	
9,885.00	91.40	268.50	5,726.15	-22.32	-4,305.83	4,305.88	0.49	-0.47	0.16	
10,012.00	91.10	268.80	5,723.38	-25.31	-4,432.76	4,432.83	0.33	-0.24	0.24	
10,124.00	90.90	268.80	5,721.43	-27.66	-4,544.72	4,544.80	0.18	-0.18	0.00	
Final Phoenix MWD Survey										
10,199.00	90.90	268.80	5,720.25	-29.23	-4,619.69	4,619.78	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	
5,207.00	5,206.37	-19.09	11.96	Tie In to Scientific Gyros	
5,245.00	5,244.37	-18.98	11.86	First Phoenix MWD Survey	
10,124.00	5,721.43	-27.66	-4,544.72	Final Phoenix MWD Survey	
10,199.00	5,720.25	-29.23	-4,619.69	Projection to TD	



PHOENIX
TECHNOLOGY SERVICES

NM OIL CONSERVATION
ARTESIA DISTRICT

SEP 29 2016

RECEIVED

December 10, 2015

Apache Corporation
Attention: Regulatory Department
303 Veterans Airpark Lane, Suite 3000,
Midland, TX 79705

Re: Apache Corporation
Crow Federal #47H
Eddy County, NM
API #30-015-43408
Job No. 1514595

Dear Regulatory Department;

Phoenix Technology Services, Inc. has filed the Survey Data Certification, Surveys, and Lease Plat for the above referenced well with the State of New Mexico Oil Conservation Division – District 2 via certified mail. A copy of the filing is attached for your records.

Name of Surveyor	Drain Hole Number	Surveyed Depths		Dates Performed		Type of Survey
		From	To	Start	End	
Mike Miller	47H	5,245	10,124	11/14/15	11/20/15	MWD

Thank you for the opportunity to be of service. Please contact me if you have any questions or require additional information.

Best Regards,

Claudia Carreon

Claudia Carreon
Operations Administrator

Phoenix Technology Services
Design Report 21-Nov-2015 07:37:49

Apache Corporation

Crow Federal #47H
Eddy County, NM (NAD27 NME)
OH / Job #1514595
Surveys (Capstar 119)

Surface Loc.:
Northing: (Y) 675049.10
Easting: (X) 648585.30
KB Elev: 3957.00'
GL Elev: 3946.00'

Survey Type Information:
H 82.00 - 5207.00 SCIENTIFIC GYROS : NS-GYRO-MS
H 5245.00 - 10199.00 PHOENIX MWD SURVEYS : PHX+MWD+HDGM

Measured Depth (ft)	Incl.	Azim.	Sub-Sea Depth (ft)	Vertical Depth (ft)	Local Coord (+N/-S) (ft)	UTM Coord (+E/-W) (ft)	Northings (ft)	Eastings (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Annotation
0	0	0	-3957	0	0	0	675049.1	648585.3	0	0	
82	0.53	99.29	-3875	82	-0.06	0.37	675049	648585.7	-0.37	0.65	
173	1.01	113.34	-3784.01	172.99	-0.45	1.53	675048.7	648586.8	-1.52	0.56	
260	1.37	121.78	-3697.03	259.97	-1.3	3.11	675047.8	648588.4	-3.11	0.46	
350	1.48	138.99	-3607.06	349.94	-2.74	4.79	675046.4	648590.1	-4.77	0.49	
437	1.64	153	-3520.09	436.91	-4.7	6.09	675044.4	648591.4	-6.06	0.47	
523	1.85	159.2	-3434.13	522.87	-7.09	7.15	675042	648592.5	-7.1	0.33	
693	1.73	173.68	-3264.21	692.79	-12.21	8.4	675036.9	648593.7	-8.32	0.27	
778	1.37	184.06	-3179.24	777.76	-14.5	8.47	675034.6	648593.8	-8.37	0.54	
864	1.13	181.91	-3093.26	863.74	-16.37	8.37	675032.7	648593.7	-8.26	0.28	
949	0.96	170.43	-3008.28	948.72	-17.91	8.46	675031.2	648593.8	-8.34	0.32	
1034	0.92	167.55	-2923.29	1033.71	-19.28	8.73	675029.8	648594	-8.6	0.07	
1119	0.81	156.53	-2838.3	1118.7	-20.5	9.11	675028.6	648594.4	-8.97	0.23	
1204	0.72	164.04	-2753.3	1203.7	-21.56	9.5	675027.5	648594.8	-9.35	0.16	
1289	0.71	139.91	-2668.31	1288.69	-22.48	9.99	675026.6	648595.3	-9.83	0.35	
1375	0.92	100.78	-2582.32	1374.68	-23.01	11.01	675026.1	648596.3	-10.85	0.68	
1460	1.3	91.99	-2497.33	1459.67	-23.18	12.64	675025.9	648597.9	-12.48	0.49	
1545	1.52	91.93	-2412.36	1544.64	-23.25	14.73	675025.9	648600	-14.57	0.26	
1630	1.41	97.22	-2327.39	1629.61	-23.42	16.9	675025.7	648602.2	-16.74	0.2	
1715	1.77	99.93	-2242.42	1714.58	-23.77	19.23	675025.3	648604.5	-19.06	0.43	
1800	1.62	103.75	-2157.46	1799.54	-24.29	21.69	675024.8	648607	-21.52	0.22	
1886	1.34	101.58	-2071.49	1885.51	-24.78	23.85	675024.3	648609.2	-23.68	0.33	
1971	1.24	105.16	-1986.51	1970.49	-25.22	25.71	675023.9	648611	-25.54	0.15	
2056	0.95	98.9	-1901.52	2055.48	-25.57	27.3	675023.5	648612.6	-27.12	0.37	
2141	0.67	100.33	-1816.53	2140.47	-25.76	28.48	675023.3	648613.8	-28.31	0.33	
2226	0.45	103.99	-1731.54	2225.46	-25.93	29.29	675023.2	648614.6	-29.12	0.26	
2311	0.23	113.33	-1646.54	2310.46	-26.08	29.78	675023	648615.1	-29.6	0.27	
2397	0.11	94.44	-1560.54	2396.46	-26.16	30.02	675022.9	648615.3	-29.84	0.15	
2482	0.08	325.4	-1475.54	2481.46	-26.12	30.06	675023	648615.4	-29.89	0.2	
2567	0.23	281.69	-1390.54	2566.46	-26.03	29.86	675023.1	648615.2	-29.69	0.21	
2737	0.43	280.1	-1220.54	2736.46	-25.85	28.9	675023.3	648614.2	-28.72	0.12	
2822	0.46	278.38	-1135.54	2821.46	-25.74	28.25	675023.4	648613.6	-28.07	0.04	
2908	0.57	280.96	-1049.55	2907.45	-25.61	27.49	675023.5	648612.8	-27.31	0.13	
3078	0.64	272.51	-879.56	3077.44	-25.41	25.71	675023.7	648611	-25.54	0.07	
3163	0.66	279.68	-794.56	3162.44	-25.31	24.75	675023.8	648610.1	-24.58	0.1	
3248	0.69	283.13	-709.57	3247.43	-25.11	23.77	675024	648609.1	-23.6	0.06	
3333	0.68	283.34	-624.57	3332.43	-24.88	22.78	675024.2	648608.1	-22.61	0.01	
3419	0.69	282.85	-538.58	3418.42	-24.64	21.78	675024.5	648607.1	-21.61	0.01	
3504	0.57	282.95	-453.59	3503.41	-24.44	20.87	675024.7	648606.2	-20.7	0.14	
3674	0.41	295.14	-283.59	3673.41	-23.99	19.49	675025.1	648604.8	-19.33	0.11	

3759	0.43	296.7	-198.59	3758.41	-23.71	18.93	675025.4	648604.2	-18.77	0.03
3844	0.53	278.11	-113.6	3843.4	-23.52	18.26	675025.6	648603.6	-18.1	0.22
3930	0.47	277.13	-27.6	3929.4	-23.42	17.52	675025.7	648602.8	-17.36	0.07
4015	0.47	275.48	57.4	4014.4	-23.34	16.82	675025.8	648602.1	-16.66	0.02
4100	0.51	285.3	142.39	4099.39	-23.21	16.11	675025.9	648601.4	-15.95	0.11
4185	0.64	282.72	227.39	4184.39	-23	15.28	675026.1	648600.6	-15.13	0.16
4270	0.64	285.05	312.38	4269.38	-22.77	14.36	675026.3	648599.7	-14.21	0.03
4355	0.49	281.83	397.38	4354.38	-22.58	13.55	675026.5	648598.9	-13.39	0.18
4441	0.43	286.44	483.38	4440.38	-22.41	12.88	675026.7	648598.2	-12.73	0.08
4526	0.38	300.3	568.37	4525.37	-22.18	12.33	675026.9	648597.6	-12.18	0.13
4611	0.29	326.62	653.37	4610.37	-21.86	11.97	675027.2	648597.3	-11.82	0.21
4696	0.33	1.77	738.37	4695.37	-21.43	11.86	675027.7	648597.2	-11.71	0.22
4781	0.29	350.73	823.37	4780.37	-20.97	11.83	675028.1	648597.1	-11.69	0.08
4866	0.36	8.61	908.37	4865.37	-20.5	11.84	675028.6	648597.1	-11.7	0.14
4952	0.32	27.11	994.37	4951.37	-20.02	11.99	675029.1	648597.3	-11.85	0.14
5037	0.2	48.32	1079.37	5036.37	-19.71	12.2	675029.4	648597.5	-12.07	0.18
5122	0.3	326.61	1164.37	5121.37	-19.42	12.19	675029.7	648597.5	-12.06	0.39
5207	0.25	318.72	1249.37	5206.37	-19.1	11.95	675030	648597.3	-11.82	0.07 Tie In to Scientific Gyros
5245	0.2	321.6	1287.37	5244.37	-18.98	11.85	675030.1	648597.2	-11.72	0.13 First Phoenix MWD Survey
5287	3.3	274	1329.34	5286.34	-18.84	10.6	675030.3	648595.9	-10.47	7.54
5330	8.4	273.9	1372.1	5329.1	-18.54	6.23	675030.6	648591.5	-6.1	11.86
5373	12.8	279.6	1414.36	5371.36	-17.53	-1.61	675031.6	648583.7	1.72	10.51
5415	16.2	280.2	1455.02	5412.02	-15.72	-11.96	675033.4	648573.3	12.07	8.1
5458	20.8	279.5	1495.78	5452.78	-13.4	-25.4	675035.7	648559.9	25.49	10.71
5500	26.1	279.9	1534.3	5491.3	-10.57	-41.87	675038.5	648543.4	41.94	12.62
5543	29.7	278.5	1572.3	5529.3	-7.37	-61.73	675041.7	648523.6	61.78	8.51
5585	34.2	275.9	1607.93	5564.93	-4.62	-83.77	675044.5	648501.5	83.8	11.2
5628	38.3	271.9	1642.6	5599.6	-2.93	-109.13	675046.2	648476.2	109.15	11
5671	42.9	271.8	1675.24	5632.24	-2.03	-137.09	675047.1	648448.2	137.1	10.7
5713	46.8	272.3	1705.01	5662.01	-0.97	-166.68	675048.1	648418.6	166.69	9.32
5756	52.1	272.3	1732.96	5689.96	0.34	-199.32	675049.4	648386	199.31	12.33
5798	57.8	271.5	1757.07	5714.07	1.47	-233.67	675050.6	648351.6	233.65	13.66
5841	63.6	270.6	1778.1	5735.1	2.15	-271.15	675051.3	648314.2	271.13	13.61
5884	69.6	270.6	1795.17	5752.17	2.56	-310.59	675051.7	648274.7	310.56	13.95
5926	75.7	270.5	1807.69	5764.69	2.95	-350.66	675052.1	648234.6	350.63	14.53
5970	82	269.8	1816.19	5773.19	3.06	-393.8	675052.2	648191.5	393.77	14.4
6013	85.4	270.6	1820.91	5777.91	3.21	-436.54	675052.3	648148.8	436.51	8.12
6056	85.8	270.7	1824.21	5781.21	3.7	-479.41	675052.8	648105.9	479.37	0.96
6183	87.8	271.4	1831.3	5788.3	6.02	-606.18	675055.1	647979.1	606.13	1.67
6311	89.9	271.3	1833.87	5790.87	9.03	-734.11	675058.1	647851.2	734.04	1.64
6438	93.8	270.1	1829.77	5786.77	10.59	-861.01	675059.7	647724.3	860.92	3.21
6566	93.9	268.5	1821.17	5778.17	9.03	-988.71	675058.1	647596.6	988.62	1.25
6694	93.2	269	1813.25	5770.25	6.24	-1116.43	675055.3	647468.9	1116.36	0.67
6822	92.5	269.5	1806.88	5763.88	4.57	-1244.26	675053.7	647341	1244.2	0.67
6949	91.1	267	1802.9	5759.9	0.69	-1371.13	675049.8	647214.2	1371.09	2.26
7077	91.1	267.3	1800.44	5757.44	-5.67	-1498.94	675043.4	647086.4	1498.95	0.23
7205	91.2	267.3	1797.87	5754.87	-11.7	-1626.78	675037.4	646958.5	1626.82	0.08
7331	90.1	268.9	1796.44	5753.44	-15.88	-1752.69	675033.2	646832.6	1752.76	1.54
7459	90.5	269.3	1795.77	5752.77	-17.89	-1880.67	675031.2	646704.6	1880.75	0.44
7587	90.7	270	1794.43	5751.43	-18.67	-2008.66	675030.4	646576.6	2008.74	0.57
7714	90.6	270.8	1792.99	5749.99	-17.78	-2135.65	675031.3	646449.7	2135.72	0.63
7842	90.8	271.5	1791.42	5748.42	-15.22	-2263.62	675033.9	646321.7	2263.67	0.57
7970	88.4	269.4	1792.32	5749.32	-14.21	-2391.59	675034.9	646193.7	2391.63	2.49
8097	88	269.6	1796.31	5753.31	-15.32	-2518.52	675033.8	646066.8	2518.57	0.35
8225	89.5	269.9	1799.1	5756.1	-15.88	-2646.49	675033.2	645938.8	2646.54	1.2
8353	89.5	270.1	1800.22	5757.22	-15.88	-2774.48	675033.2	645810.8	2774.53	0.16
8481	90.9	270.1	1799.77	5756.77	-15.65	-2902.48	675033.5	645682.8	2902.52	1.09
8608	90.8	270.1	1797.89	5754.89	-15.43	-3029.47	675033.7	645555.8	3029.5	0.08
8736	91.2	271.4	1795.65	5752.65	-13.76	-3157.43	675035.3	645427.9	3157.45	1.06
8864	89.5	270.2	1794.87	5751.87	-11.97	-3285.41	675037.1	645299.9	3285.42	1.63
8991	90.5	269.4	1794.87	5751.87	-12.41	-3412.41	675036.7	645172.9	3412.41	1.01
9119	90.2	269.1	1794.09	5751.09	-14.09	-3540.39	675035	645044.9	3540.41	0.33
9247	91.1	269.9	1792.64	5749.64	-15.21	-3668.38	675033.9	644916.9	3668.4	0.94
9375	92.5	270.1	1788.62	5745.62	-15.21	-3796.31	675033.9	644789	3796.33	1.1
9502	92.6	270.2	1782.96	5739.96	-14.87	-3923.18	675034.2	644662.1	3923.2	0.11

9630	92.2	269	1777.6	5734.6	-15.77	-4051.07	675033.3	644534.2	4051.08	0.99
9757	92	268.3	1772.95	5729.95	-18.76	-4177.95	675030.3	644407.4	4177.98	0.57
9885	91.4	268.5	1769.15	5726.15	-22.33	-4305.84	675026.8	644279.5	4305.89	0.49
10012	91.1	268.8	1766.38	5723.38	-25.32	-4432.77	675023.8	644152.5	4432.84	0.33
10124	90.9	268.8	1764.43	5721.43	-27.67	-4544.73	675021.4	644040.6	4544.81	0.18
10199	90.9	268.8	1763.25	5720.25	-29.24	-4619.71	675019.9	643965.6	4619.8	Final Phoenix MWD Survey 0 Projection to TD

All data are in feet unless otherwise stated. Directions and coordinates are relative to Grid North.

Vertical depths are relative to KB. Northings and Eastings are relative to Well.

The Dogleg Severity is in Degrees per 100 feet.

Vertical Section is from Slot and calculated along an Azimuth of 269.610° (Grid).

Coordinate System is NAD 1927 (NADCON CONUS) US State Plane 1927 (Exact solution), New Mexico East 3001.

Grid Convergence at Surface is 0.263°.

Based upon Minimum Curvature type calculations, at a Measured Depth of 10199.00ft.,

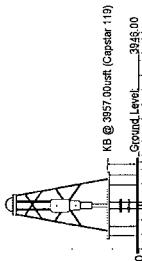
the Bottom Hole Displacement is 4619.80ft., in the Direction of 269.610° (Grid).



Project: Eddy County, NM (NAD27 NME)
Site: Crow Federal
Well: #47H
Wellbore: OH / Job #1514595
Design: Plan #3 11-14-15
Rig: Capstar 119



Azimuths to Grid North
True North: -0.26°
Magnetic North: 7.27°
Magnetic Field
Strength: 48592.6 nT
Dip Angle: 60.83°
Declination: 10.25°
Model: HDGM



WELL DETAILS

	+N-S	+E-W	North	East	Ground Level
	0.00	0.00	675049.10	32° 51' 17.49000 N	3946.00
				103° 50' 58.11817 W	64595.30

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N-S	+E-W	Dleg	Trace	Vsect	Target	Annotation
1	5207.00	0.25	316.72	5206.37	-19.09	11.96	0.00	0.00	-11.83		Tie in to Scientific Gyros
2	5206.65	0.25	316.72	5206.01	-18.79	11.70	0.00	0.00	-11.57		KOP: Begin 127100' Build & Turn
3	5206.30	0.25	316.72	5205.65	-18.49	11.43	0.00	0.00	-11.31		LP: Hold 90.93° Inc & Begin 37100' Turn
4	5205.95	0.25	316.72	5205.30	-18.19	11.17	0.00	0.00	-11.05		
5	10202.53	90.93	289.61	5707.00	-31.30	-4620.20	0.00	0.00	4620.31	BHL (Crow Fed #47H) V2	TD at 10202.53

DESIGN TARGET DETAILS

Name	TVD	+N-S	+E-W	North	East	Longitude	Shape
BHL (Crow Fed #47H) V2	5707.00	-31.30	-4620.20	675047.80	643955.10	32° 51' 17.39648 N	103° 51' 52.28132 W
Point 1st target center						32° 51' 17.39648 N	103° 51' 52.28132 W
Point missus target center by 0.14m at 8103.91usft MD (5740.90 TVD, -16.99 N, -2521.90 E)						32° 51' 17.39648 N	103° 51' 52.28132 W

FORMATION TOP DETAILS

TVDPath	MDPath	Formation	DipAngle	DipDir
5598.43	5625.27	Blinbery	-0.93	289.61

LEGEND

- #1, OH, Inc Surveys VO
- #26H, WB1/Job #131119, Surveys (Capstar 114) VO
- #47H, OH / Job #1514595, Surveys (Capstar 119) VO
- #49H, WB1, Plan #2 02-11-15 VO
- #48H, OH, Plan #2 06-03-15 VO
- #51H, OH / 1514486, Surveys (Capstar 114) VO
- #50H, OH / Job #1514409, Surveys (Capstar 114) VO
- #27H, WB1/Job #131120, Plan #6 04-02-14 VO
- #46H, WB1, Plan #1 03-17-15 VO
- 3, OH, OH Surveys VO
- 24, OH, OH Surveys VO
- Plan #3 11-14-15

To convert a Magnetic Direction to a Grid Direction, Add 7.27°
To convert a Magnetic Direction to a True Direction, Add 7.53° East
To convert a True Direction to a Grid Direction, Subtract 0.26°

Map System: US State Plane 1927 (East solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone Name: New Mexico East 3001
Local Origin: Well #47H, Grid North
Latitude: 32° 51' 17.49000 N
Longitude: 103° 50' 58.11817 W
Grid East: 64595.30
Grid North: 675049.10
Scale Factor: 1.000

Geomagnetic Model: IUGM
Sample Date: 09-Nov-15
Magnetic Declination: 7.53°
Dip Angle from Horizontal: 60.83°
Magnetic Field Strength: 48593

