



30-015-41944

Apache Corporation

Eddy County, NM (NAD27 NME)

Crow Federal

#25H

WB1/Job #1311118

Design: Surveys (Capstar 114)

Standard Survey Report

27 March, 2014

NM OIL CONSERVATION
ARTESIA DISTRICT

JAN 16 2015

RECEIVED



Company:	Apache Corporation	Local Co-ordinate Reference:	Well #25H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3951.00usft (Capstar 114)
Site:	Crow Federal	MD Reference:	KB @ 3951.00usft (Capstar 114)
Well:	#25H	North Reference:	Grid
Wellbore:	WB1/Job #1311118	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	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	#25H				
Well Position	+N/-S	0.00 usft	Northing:	673,884.50 usft	Latitude: 32° 51' 5.96596 N
	+E/-W	0.00 usft	Easting:	648,591.70 usft	Longitude: 103° 50' 58.10569 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level: 3,940.00 usft

Wellbore	WB1/Job #1311118				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010_14	03/12/14	7.42	60.65	48,685

Design	Surveys (Capstar 114)				
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 03/27/14				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.00	724.00	Gyrodata Gyro Survey (WB1/Job #131111	CB-GYRO-MS	Camera based gyro multishot	
853.00	9,720.00	Phoenix MWD Survey (WB1/Job #1311118	MWD	MWD - Standard	

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)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
100.00	0.46	276.67	100.00	0.05	-0.40	0.40	0.46	0.46	0.00	
300.00	0.68	281.27	299.99	0.37	-2.36	2.36	0.11	0.11	2.30	
400.00	0.82	276.64	399.98	0.57	-3.65	3.65	0.15	0.14	-4.63	
500.00	0.75	272.60	499.97	0.68	-5.02	5.01	0.09	-0.07	-4.04	
600.00	0.83	286.85	599.96	0.92	-6.36	6.36	0.21	0.08	14.25	
668.00	0.51	302.42	667.96	1.23	-7.09	7.08	0.54	-0.47	22.90	
724.00	0.57	305.44	723.95	1.52	-7.53	7.52	0.11	0.10	5.38	
First Pheonix MWD Survey										
853.00	0.70	310.50	852.95	2.40	-8.65	8.63	0.11	0.10	3.93	

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Well:	#25H	North Reference:	Grid
Wellbore:	WB1/Job #1311118	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)
981.00	0.80	315.30	980.94	3.55	-9.87	9.84	0.09	0.08	3.75
1,109.00	0.80	326.10	1,108.92	4.92	-11.00	10.96	0.12	0.00	8.44
1,238.00	0.20	3.30	1,237.92	5.89	-11.48	11.44	0.51	-0.47	28.84
1,366.00	0.20	348.40	1,365.92	6.34	-11.52	11.47	0.04	0.00	-11.64
1,494.00	0.30	102.40	1,493.92	6.48	-11.23	11.19	0.33	0.08	89.06
1,622.00	0.60	104.60	1,621.91	6.24	-10.26	10.22	0.23	0.23	1.72
1,751.00	1.10	137.50	1,750.90	5.16	-8.77	8.73	0.53	0.39	25.50
1,879.00	1.10	142.00	1,878.87	3.29	-7.18	7.16	0.07	0.00	3.52
2,007.00	1.20	158.70	2,006.85	1.07	-5.94	5.93	0.27	0.08	13.05
2,135.00	0.80	152.40	2,134.83	-0.97	-5.04	5.04	0.32	-0.31	-4.92
2,264.00	0.80	162.20	2,263.82	-2.63	-4.35	4.36	0.11	0.00	7.60
2,392.00	0.70	168.40	2,391.81	-4.24	-3.91	3.94	0.10	-0.08	4.84
2,520.00	0.60	173.40	2,519.80	-5.68	-3.68	3.72	0.09	-0.08	3.91
2,649.00	0.50	185.40	2,648.79	-6.91	-3.66	3.70	0.12	-0.08	9.30
2,777.00	0.40	206.60	2,776.79	-7.86	-3.91	3.96	0.15	-0.08	16.56
2,905.00	0.50	214.60	2,904.78	-8.72	-4.43	4.49	0.09	0.08	6.25
3,034.00	0.40	196.70	3,033.78	-9.62	-4.87	4.94	0.13	-0.08	-13.88
3,162.00	0.40	187.40	3,161.78	-10.49	-5.06	5.13	0.05	0.00	-7.27
3,290.00	0.20	108.90	3,289.78	-11.00	-4.91	4.98	0.32	-0.16	-61.33
3,446.00	0.40	107.10	3,445.77	-11.25	-4.13	4.21	0.13	0.13	-1.15
3,585.00	0.50	60.40	3,584.77	-11.09	-3.14	3.21	0.26	0.07	-33.60
3,713.00	2.40	16.00	3,712.73	-8.24	-1.91	1.97	1.62	1.48	-34.69
3,841.00	2.30	12.70	3,840.62	-3.16	-0.61	0.63	0.13	-0.08	-2.58
3,972.00	0.30	17.80	3,971.58	-0.27	0.07	-0.07	1.53	-1.53	3.89
4,104.00	0.40	31.80	4,103.57	0.45	0.42	-0.42	0.10	0.08	10.61
4,232.00	0.40	50.80	4,231.57	1.11	1.00	-1.01	0.10	0.00	14.84
4,360.00	0.30	71.40	4,359.57	1.50	1.67	-1.68	0.12	-0.08	16.09
4,489.00	0.40	64.30	4,488.57	1.81	2.39	-2.40	0.08	0.08	-5.50
4,617.00	0.50	61.70	4,616.56	2.26	3.29	-3.30	0.08	0.08	-2.03
4,745.00	1.00	305.40	4,744.56	3.18	2.87	-2.89	1.02	0.39	-90.86
4,870.00	1.10	298.70	4,869.54	4.38	0.93	-0.96	0.13	0.08	-5.36
4,962.00	8.40	266.80	4,961.16	4.43	-6.57	6.54	8.14	7.93	-34.67
5,005.00	15.60	266.20	5,003.20	3.87	-15.48	15.46	16.75	16.74	-1.40
5,051.00	22.50	267.30	5,046.65	3.05	-30.47	30.44	15.02	15.00	2.39
5,093.00	26.70	268.70	5,084.83	2.46	-47.93	47.92	10.10	10.00	3.33
5,136.00	31.30	269.30	5,122.43	2.10	-68.77	68.76	10.72	10.70	1.40
5,179.00	35.70	269.20	5,158.28	1.79	-92.50	92.48	10.23	10.23	-0.23
5,221.00	39.40	268.30	5,191.57	1.22	-118.08	118.07	8.91	8.81	-2.14
5,264.00	44.00	267.40	5,223.67	0.14	-146.66	146.66	10.79	10.70	-2.09
5,307.00	48.90	267.90	5,253.29	-1.13	-177.79	177.79	11.43	11.40	1.16
5,349.00	52.10	266.90	5,280.00	-2.61	-210.16	210.17	7.84	7.62	-2.38
5,392.00	56.10	266.20	5,305.21	-4.71	-244.92	244.95	9.40	9.30	-1.63
5,435.00	61.00	266.30	5,327.64	-7.11	-281.51	281.56	11.40	11.40	0.23

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Site: Crow Federal	MD Reference: KB @ 3951.00usft (Capstar 114)	
Well: #25H	North Reference: Grid	
Wellbore: WB1/Job #1311118	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)
5,478.00	65.10	266.50	5,347.12	-9.51	-319.76	319.82	9.54	9.53	0.47
5,521.00	69.20	266.60	5,363.81	-11.90	-359.31	359.38	9.54	9.53	0.23
5,564.00	74.00	266.40	5,377.38	-14.39	-400.02	400.11	11.17	11.16	-0.47
5,606.00	78.90	266.70	5,387.22	-16.84	-440.76	440.87	11.69	11.67	0.71
5,649.00	81.90	269.00	5,394.39	-18.43	-483.12	483.24	8.75	6.98	5.35
5,692.00	84.40	270.40	5,399.52	-18.65	-525.81	525.93	6.65	5.81	3.26
5,734.00	87.70	271.70	5,402.41	-17.88	-567.70	567.81	8.44	7.86	3.10
5,777.00	89.40	272.10	5,403.50	-16.46	-610.66	610.76	4.06	3.95	0.93
5,908.00	90.60	271.70	5,403.50	-12.12	-741.58	741.65	0.97	0.92	-0.31
6,036.00	91.30	271.50	5,401.38	-8.54	-869.52	869.55	0.57	0.55	-0.16
6,165.00	92.10	270.70	5,397.55	-6.07	-998.43	998.45	0.88	0.62	-0.62
6,293.00	91.80	270.80	5,393.20	-4.39	-1,126.35	1,126.35	0.25	-0.23	0.08
6,420.00	92.20	270.10	5,388.76	-3.39	-1,253.27	1,253.26	0.63	0.31	-0.55
6,549.00	91.90	270.30	5,384.15	-2.94	-1,382.18	1,382.17	0.28	-0.23	0.16
6,677.00	92.60	269.90	5,379.12	-2.72	-1,510.08	1,510.07	0.63	0.55	-0.31
6,805.00	92.20	269.80	5,373.76	-3.06	-1,637.97	1,637.95	0.32	-0.31	-0.08
6,932.00	92.70	269.50	5,368.33	-3.83	-1,764.85	1,764.84	0.46	0.39	-0.24
7,060.00	91.90	268.90	5,363.20	-5.62	-1,892.73	1,892.73	0.78	-0.63	-0.47
7,192.00	91.00	269.70	5,359.86	-7.23	-2,024.68	2,024.68	0.91	-0.68	0.61
7,320.00	91.70	270.40	5,356.84	-7.12	-2,152.64	2,152.64	0.77	0.55	0.55
7,452.00	91.90	269.90	5,352.70	-6.77	-2,284.58	2,284.57	0.41	0.15	-0.38
7,580.00	92.10	268.60	5,348.23	-8.45	-2,412.48	2,412.49	1.03	0.16	-1.02
7,708.00	92.10	268.50	5,343.54	-11.68	-2,540.36	2,540.38	0.08	0.00	-0.08
7,836.00	92.00	268.60	5,338.96	-14.92	-2,668.23	2,668.27	0.11	-0.08	0.08
7,965.00	91.30	268.70	5,335.24	-17.96	-2,797.14	2,797.20	0.55	-0.54	0.08
8,093.00	90.80	269.00	5,332.90	-20.53	-2,925.10	2,925.17	0.46	-0.39	0.23
8,221.00	90.30	268.70	5,331.67	-23.10	-3,053.06	3,053.15	0.46	-0.39	-0.23
8,350.00	89.70	268.40	5,331.67	-26.36	-3,182.02	3,182.13	0.52	-0.47	-0.23
8,478.00	90.10	269.60	5,331.89	-28.59	-3,310.00	3,310.12	0.99	0.31	0.94
8,606.00	90.10	269.90	5,331.67	-29.15	-3,438.00	3,438.12	0.23	0.00	0.23
8,735.00	90.60	269.50	5,330.88	-29.83	-3,566.99	3,567.11	0.50	0.39	-0.31
8,863.00	90.60	269.50	5,329.54	-30.94	-3,694.98	3,695.11	0.00	0.00	0.00
8,991.00	90.40	268.90	5,328.43	-32.73	-3,822.96	3,823.10	0.49	-0.16	-0.47
9,120.00	90.60	268.70	5,327.30	-35.43	-3,951.93	3,952.08	0.22	0.16	-0.16
9,248.00	90.90	270.20	5,325.62	-36.66	-4,079.91	4,080.06	1.19	0.23	1.17
9,376.00	90.70	270.10	5,323.84	-36.33	-4,207.90	4,208.05	0.17	-0.16	-0.08
9,505.00	90.50	269.60	5,322.49	-36.66	-4,336.89	4,337.04	0.42	-0.16	-0.39
9,633.00	90.20	269.10	5,321.70	-38.12	-4,464.88	4,465.03	0.46	-0.23	-0.39
Last Phoenix MWD Survey									
9,720.00	89.80	268.80	5,321.70	-39.71	-4,551.86	4,552.03	0.57	-0.46	-0.34
Projection to Bit									



Phoenix Technology Services

Survey Report



Company:	Apache Corporation	Local Co-ordinate Reference:	Well #25H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3951.00usft (Capstar 114)
Site:	Crow Federal	MD Reference:	KB @ 3951.00usft (Capstar 114)
Well:	#25H	North Reference:	Grid
Wellbore:	WB1/Job #1311118	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Capstar 114)	Database:	GCR DB

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
724.00	723.95	1.52	-7.53	First Pheonix MWD Survey
9,633.00	5,321.70	-38.12	-4,464.88	Last Pheonix MWD Survey
9,720.00	5,321.70	-39.71	-4,551.86	Projection to Bit

Checked By: _____ Approved By: _____ Date: _____

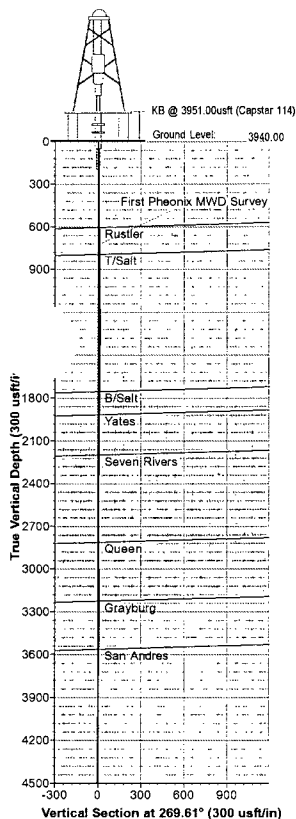
Project: Eddy County, NM (NAD27 NME)
Site: Crow Federal
Well: #25H
Wellbore: WB1/Job #1311118
Design: Plan #2 09-17-13
Rig: Capstar 114



PHOENIX
TECHNOLOGY SERVICES



Azimuths to Grid North
True North: -0.28°
Magnetic North: 7.16°
Magnetic Field
Strength: 48685.0nT
Dip Angle: 60.65°
Date: 03/12/2014
Model: IGRF2010_14



WELL DETAILS											
	+N/-S	+E/-W	Northing	Ground Level	3940.00	Latitude	Longitude				
	0.00	0.00	673884.50	Easting	648591.70	32° 51' 5.96596 N	103° 50' 58.10569 W				

SECTION DETAILS											
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Target	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
2	4922.75	0.00	0.00	4922.75	0.00	0.00	0.00	0.00	0.00		KOP Start Build 12.00
3	5685.88	91.58	269.51	5400.00	-3.34	-490.61	12.00	269.61	490.62		LP Start 1810.08 hold at 5685.88 MD
4	7495.96	91.58	269.61	5350.00	-15.66	-2299.95	0.00	0.00	2300.00	MP-Crow Fed #25H	Start DLS 2.00 TFO 179.79
5	7513.45	91.23	269.61	5349.57	-15.77	-2317.43	2.00	179.79	2317.48		Start 2303.56 hold at 7513.44 MD
6	9817.00	91.23	269.61	5300.00	-31.40	-4620.40	0.00	0.00	4620.51	PBHL-Crow Fed #25H	TD at 9817.00

DESIGN TARGET DETAILS											
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape			
PBHL-Crow Fed #25H	5300.00	-31.40	-4620.40	673853.10	643971.30	32° 51' 5.86145 N	103° 51' 52.26924 W	Point			
MP-Crow Fed #25H	5350.00	-15.66	-2299.95	673868.84	646291.75	32° 51' 5.91450 N	103° 51' 25.06727 W	Point			
									plan hits target center		
									plan hits target center		

PROJECT DETAILS: Eddy County, NM (NAD27 NME)

Geodetic System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001
System Datum: Mean Sea Level

SITE DETAILS: Crow Federal

Site Centre Northing: 671130.90
Easting: 643906.80
Positional Uncertainty: 0.00
Convergence: 0.25
Local North: Grid

FORMATION TOP DETAILS

TVDPath	MDPath	Formation	DipAngle	DipDir
605.00	605.00	Rustler	-1.58	269.61
795.00	795.00	T/Salt	-1.58	269.61
1756.00	1756.00	B/Salt	-1.58	269.61
1918.00	1918.00	Yates	-1.58	269.61
2200.00	2200.00	Seven Rivers	-1.58	269.61
2813.00	2813.00	Queen	-1.58	269.61
3228.00	3228.00	Grayburg	-1.58	269.61
3563.00	3563.00	San Andres	-1.58	269.61
5028.68	5027.52	Glorieta	-1.58	269.61
5107.97	5112.96	(Yates) Paddock	-1.58	269.61

Map System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone Name: New Mexico East 3001
Local Origin: Well #25H, Grid North
Latitude: 32° 51' 5.96596 N
Longitude: 103° 50' 58.10569 W
Grid East: 648591.70
Grid North: 673884.50
Scale Factor: 1.000
Geomagnetic Model: IGRF2010_14
Sample Date: 12-Mar-14
Magnetic Declination: 7.42°
Dip Angle from Horizontal: 60.65°
Magnetic Field Strength: 48685

To convert a Magnetic Direction to a Grid Direction, Add 7.16°
To convert a Magnetic Direction to a True Direction, Add 7.42° East
To convert a True Direction to a Grid Direction, Subtract 0.26°

LEGEND

- #25H, WB1/Job #1311118, Surveys (Capstar 114) V0
- #27H, WB1/Job #1311120, Plan #4 03-27-14 V0
- #26H, WB1/Job #1311119, Plan #1 08-27-13 V0
- Plan #2 09-17-13

