



NM OIL CONSERVATION
ARTESIA DISTRICT
AUG 11 2017

RECEIVED

Apache Corporation

Eddy County, NM (NAD27 NME)
Hummingbird Federal Com
#17H

30-015-43482

OH / Job #61125

Survey: Phoenix MWD Surveys

Standard Survey Report

17 May, 2017

Please provide signature
page for directional survey





Phoenix Technology Services LP

Survey Report



Company: Apache Corporation
Project: Eddy County, NM (NAD27 NME)
Site: Hummingbird Federal Com
Well: #17H
Wellbore: OH / Job #61125
Design: Surveys (Trinidad 436)

Local Co-ordinate Reference: Well #17H
TVD Reference: GL + KB @ 4054.50usft (Trinidad 436)
MD Reference: GL + KB @ 4054.50usft (Trinidad 436)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
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		Hummingbird Federal Com				
Site Position:		Northing:	677,262.80 usft	Latitude:	32° 51' 39.07462 N	
From:	Map	Easting:	655,481.80 usft	Longitude:	103° 49' 37.14798 W	
Position Uncertainty:		0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.27 °

Well	#17H					
Well Position	+N/-S	0.00 usft	Northing:	680,451.80 usft	Latitude:	32° 52' 10.68724 N
	+E/-W	0.00 usft	Easting:	654,264.80 usft	Longitude:	103° 49' 51.23757 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	4,038.00 usft

Wellbore	OH / Job #61125				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	5/26/2017	7.33	60.83	48,430

Design	Surveys (Trinidad 436)				
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	89.57	

Survey Program	Date 5/17/2017				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
78.82	5,139.00	Phoenix Gyro Surveys (OH / Job #61125)	PHX_SPT_GTD	PHX Continuous north-seeking gyro	
5,139.00	10,429.00	Phoenix MWD Surveys (OH / Job #61125)	MWD+HDGM	OWSG Rev.2 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)
5,139.00	1.00	265.35	5,138.32	-11.46	26.18	26.10	0.00	0.00	0.00
Tie In									
5,249.00	1.09	241.49	5,248.31	-12.04	24.31	24.22	0.40	0.08	-21.69
First Phoenix Survey									
5,311.00	0.77	180.09	5,310.30	-12.73	23.79	23.69	1.59	-0.52	-99.03
5,374.00	8.93	106.11	5,373.04	-14.52	28.49	28.39	13.89	12.95	-117.43
5,437.00	17.47	96.50	5,434.32	-16.95	42.61	42.49	13.95	13.56	-15.25
5,501.00	25.58	90.14	5,493.82	-18.07	66.02	65.88	13.17	12.67	-9.94
5,563.00	33.66	88.33	5,547.67	-17.60	96.63	96.50	13.11	13.03	-2.92



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Survey Report

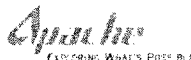


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Survey

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)
5,626.00	39.01	87.18	5,598.40	-16.12	133.91	133.79	8.56	8.49	-1.83
5,690.00	43.82	86.49	5,646.39	-13.77	176.17	176.06	7.55	7.52	-1.08
5,753.00	44.49	86.94	5,691.58	-11.26	219.98	219.89	1.17	1.06	0.71
5,816.00	46.38	89.48	5,735.79	-9.87	264.84	264.76	4.15	3.00	4.03
5,880.00	53.93	91.34	5,776.77	-10.27	313.94	313.85	12.01	11.80	2.91
5,943.00	63.37	89.62	5,809.51	-10.68	367.67	367.58	15.16	14.98	-2.73
6,006.00	67.68	87.53	5,835.61	-9.23	424.98	424.89	7.48	6.84	-3.32
6,070.00	76.17	84.05	5,855.46	-4.73	485.58	485.53	14.23	13.27	-5.44
6,132.00	85.60	84.72	5,865.27	1.25	546.44	546.43	15.25	15.21	1.08
6,195.00	87.23	85.88	5,869.21	6.40	609.10	609.13	3.17	2.59	1.84
6,258.00	88.51	87.16	5,871.55	10.22	671.94	671.99	2.87	2.03	2.03
6,321.00	88.32	88.10	5,873.29	12.83	734.86	734.93	1.52	-0.30	1.49
6,383.00	89.24	89.07	5,874.61	14.36	796.82	796.91	2.16	1.48	1.56
6,445.00	90.31	89.42	5,874.85	15.18	858.82	858.91	1.82	1.73	0.56
6,508.00	91.18	90.02	5,874.03	15.48	921.81	921.90	1.68	1.38	0.95
6,571.00	90.70	90.98	5,873.00	14.93	984.80	984.88	1.70	-0.76	1.52
6,633.00	89.97	90.98	5,872.64	13.87	1,046.79	1,046.86	1.18	-1.18	0.00
6,696.00	88.69	90.17	5,873.37	13.24	1,109.78	1,109.85	2.40	-2.03	-1.29
6,758.00	87.34	89.60	5,875.52	13.37	1,171.74	1,171.81	2.36	-2.18	-0.92
6,820.00	87.01	89.14	5,878.58	14.05	1,233.66	1,233.73	0.91	-0.53	-0.74
6,883.00	87.48	88.78	5,881.61	15.19	1,296.58	1,296.65	0.94	0.75	-0.57
6,945.00	87.81	89.14	5,884.15	16.31	1,358.51	1,358.60	0.79	0.53	0.58
7,007.00	88.26	89.03	5,886.28	17.30	1,420.47	1,420.56	0.75	0.73	-0.18
7,069.00	88.85	89.66	5,887.84	18.01	1,482.45	1,482.54	1.39	0.95	1.02
7,131.00	89.58	89.40	5,888.69	18.52	1,544.44	1,544.53	1.25	1.18	-0.42
7,193.00	89.27	89.26	5,889.31	19.25	1,606.43	1,606.53	0.55	-0.50	-0.23
7,255.00	89.64	89.30	5,889.90	20.02	1,668.42	1,668.52	0.60	0.60	0.06
7,317.00	90.59	89.48	5,889.78	20.68	1,730.42	1,730.52	1.56	1.53	0.29
7,379.00	89.91	89.99	5,889.51	20.97	1,792.42	1,792.52	1.37	-1.10	0.82
7,441.00	89.10	90.26	5,890.05	20.84	1,854.41	1,854.52	1.38	-1.31	0.44
7,504.00	89.52	90.00	5,890.80	20.69	1,917.41	1,917.51	0.78	0.67	-0.41
7,566.00	88.93	89.38	5,891.64	21.03	1,979.40	1,979.50	1.38	-0.95	-1.00
7,629.00	89.52	90.46	5,892.49	21.12	2,042.39	2,042.49	1.95	0.94	1.71
7,691.00	88.71	91.34	5,893.45	20.14	2,104.38	2,104.47	1.93	-1.31	1.42
7,753.00	90.03	91.11	5,894.13	18.82	2,166.36	2,166.44	2.16	2.13	-0.37
7,816.00	90.50	91.20	5,893.84	17.55	2,229.34	2,229.41	0.76	0.75	0.14
7,878.00	89.08	91.17	5,894.07	16.27	2,291.33	2,291.39	2.29	-2.29	-0.05
7,940.00	88.23	90.63	5,895.53	15.29	2,353.30	2,353.35	1.62	-1.37	-0.87
8,002.00	89.47	91.51	5,896.77	14.13	2,415.28	2,415.32	2.45	2.00	1.42
8,064.00	90.45	91.43	5,896.81	12.54	2,477.26	2,477.28	1.59	1.58	-0.13
8,127.00	89.11	90.74	5,897.05	11.35	2,540.24	2,540.26	2.39	-2.13	-1.10
8,189.00	87.81	90.21	5,898.72	10.84	2,602.22	2,602.23	2.26	-2.10	-0.85
8,252.00	88.46	90.14	5,900.77	10.64	2,665.18	2,665.19	1.04	1.03	-0.11



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8,314.00	89.52	90.23	5,901.86	10.44	2,727.17	2,727.18	1.72	1.71	0.15
8,377.00	90.22	89.81	5,902.01	10.42	2,790.17	2,790.17	1.30	1.11	-0.67
8,438.00	89.72	89.15	5,902.04	10.98	2,851.17	2,851.17	1.36	-0.82	-1.08
8,501.00	89.75	88.54	5,902.33	12.25	2,914.16	2,914.17	0.97	0.05	-0.97
8,563.00	90.67	88.16	5,902.10	14.03	2,976.13	2,976.15	1.61	1.48	-0.61
8,625.00	89.27	88.05	5,902.14	16.08	3,038.09	3,038.13	2.27	-2.26	-0.18
8,687.00	88.15	87.20	5,903.53	18.65	3,100.02	3,100.08	2.27	-1.81	-1.37
8,750.00	87.48	87.93	5,905.93	21.32	3,162.92	3,162.99	1.57	-1.06	1.16
8,812.00	88.21	88.76	5,908.26	23.11	3,224.85	3,224.93	1.78	1.18	1.34
8,874.00	87.31	89.20	5,910.69	24.22	3,286.79	3,286.88	1.62	-1.45	0.71
8,937.00	87.87	89.36	5,913.34	25.01	3,349.73	3,349.82	0.92	0.89	0.25
8,999.00	88.23	89.58	5,915.45	25.58	3,411.69	3,411.79	0.68	0.58	0.35
9,061.00	88.51	88.84	5,917.21	26.43	3,473.66	3,473.76	1.28	0.45	-1.19
9,124.00	90.20	89.86	5,917.92	27.15	3,536.65	3,536.75	3.13	2.68	1.62
9,186.00	90.64	89.40	5,917.47	27.55	3,598.64	3,598.75	1.03	0.71	-0.74
9,246.00	91.34	89.58	5,916.43	28.08	3,658.63	3,658.74	1.20	1.17	0.30
9,308.00	89.89	89.11	5,915.76	28.79	3,720.62	3,720.73	2.46	-2.34	-0.76
9,370.00	89.52	89.05	5,916.08	29.79	3,782.61	3,782.73	0.60	-0.60	-0.10
9,432.00	90.28	89.01	5,916.19	30.84	3,844.61	3,844.73	1.23	1.23	-0.06
9,495.00	88.93	89.03	5,916.62	31.92	3,907.59	3,907.72	2.14	-2.14	0.03
9,557.00	89.36	89.24	5,917.55	32.85	3,969.58	3,969.71	0.77	0.69	0.34
9,620.00	89.16	89.58	5,918.36	33.50	4,032.57	4,032.71	0.63	-0.32	0.54
9,682.00	89.33	89.64	5,919.18	33.92	4,094.56	4,094.70	0.29	0.27	0.10
9,744.00	88.57	89.70	5,920.32	34.28	4,156.55	4,156.69	1.23	-1.23	0.10
9,806.00	89.27	89.61	5,921.49	34.65	4,218.54	4,218.68	1.14	1.13	-0.15
9,868.00	89.97	89.77	5,921.90	34.99	4,280.54	4,280.68	1.16	1.13	0.26
9,930.00	89.66	90.22	5,922.10	34.99	4,342.54	4,342.68	0.88	-0.50	0.73
9,993.00	90.31	89.79	5,922.11	34.99	4,405.54	4,405.67	1.24	1.03	-0.68
10,055.00	90.00	89.39	5,921.95	35.43	4,467.53	4,467.67	0.82	-0.50	-0.65
10,117.00	89.80	89.49	5,922.05	36.04	4,529.53	4,529.67	0.36	-0.32	0.16
10,179.00	88.66	89.99	5,922.89	36.32	4,591.52	4,591.67	2.01	-1.84	0.81
10,241.00	87.56	89.80	5,924.93	36.43	4,653.49	4,653.63	1.80	-1.77	-0.31
10,303.00	87.96	90.16	5,927.35	36.45	4,715.44	4,715.58	0.87	0.65	0.58
10,360.00	88.38	90.61	5,929.18	36.07	4,772.41	4,772.55	1.08	0.74	0.79
Final Phoenix MWD Survey									
10,429.00	88.90	88.80	5,930.81	36.43	4,841.39	4,841.52	2.73	0.75	-2.62
Projection to TD									



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Survey Annotations

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