

NM OIL CONSERVATION
ARTESIA DISTRICT

SEP 25 2017

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Apache Corporation

Eddy County, NM (NAD 83 NME)

Palmillo 14-15 State

#2H

30-015-44043

OH / Job #61176

Design: Surveys (H&P 482)

Standard Survey Report

01 June, 2017

Please provide signature
page for directional survey





Phoenix Technology Services LP Survey Report



Company: Apache Corporation
Project: Eddy County, NM (NAD 83 NME)
Site: Palmillo 14-15 State
Well: #2H
Wellbore: OH / Job #61176
Design: Surveys (H&P 482)

Local Co-ordinate Reference: Well #2H
TVD Reference: GL + KB @ 3446.00usft (H&P 482)
MD Reference: GL + KB @ 3446.00usft (H&P 482)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: Compass 5000 GCR

Project	Eddy County, NM (NAD 83 NME)		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Eastern Zone		

Site	Palmillo 14-15 State		
Site Position:		Northing:	601,823.50 usft
From:	Map	Easting:	595,664.40 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16"
		Latitude:	32° 39' 15.60896 N
		Longitude:	104° 9' 24.52874 W
		Grid Convergence:	0.10°

Well	#2H		
Well Position	+N/-S	0.00 usft	Northing: 601,823.50 usft
	+E/-W	0.00 usft	Easting: 595,664.40 usft
Position Uncertainty	0.00 usft	Wellhead Elevation:	0.00 usft
		Latitude:	32° 39' 15.60896 N
		Longitude:	104° 9' 24.52874 W
		Ground Level:	3,420.00 usft

Wellbore	OH / Job #61176		
Magnetics	Model Name	Sample Date	Declination
	HDGM	6/10/2017	(°) 7.42
			Dip Angle
			(°) 60.52
			Field Strength
			(nT) 48,189

Design	Surveys (H&P 482)		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.00	0.00	0.00
		Direction	(°) 87.97

Survey Program	Date 6/1/2017		
From	To	Survey (Wellbore)	Tool Name
(usft)	(usft)		
100.00	6,500.00	Phoenix Gyro Surveys (OH / Job #61176)	SPT_GTD
6,500.00	12,300.00	Phoenix MWD Surveys (OH / Job #61176)	MWD+HDGM
			Description
			Continuous north-seeking gyro
			OWSG Rev.2 MWD + HDGM

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)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.50	146.38	100.00	-0.36	0.24	0.23	0.50	0.50	0.00
200.00	0.42	162.04	200.00	-1.08	0.60	0.56	0.15	-0.08	15.66
300.00	0.74	135.85	299.99	-1.89	1.16	1.09	0.41	0.32	-26.19
400.00	0.79	152.74	399.98	-2.96	1.92	1.82	0.23	0.05	16.89
500.00	1.07	184.54	499.97	-4.51	2.17	2.01	0.58	0.28	31.80
600.00	1.42	173.32	599.95	-6.67	2.24	2.00	0.42	0.35	-11.22
700.00	1.30	169.58	699.92	-9.01	2.59	2.27	0.15	-0.12	-3.74
800.00	1.27	166.53	799.89	-11.21	3.05	2.65	0.07	-0.03	-3.05
900.00	1.36	169.60	899.87	-13.45	3.52	3.04	0.11	0.09	3.07



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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)
1,000.00	1.38	176.88	999.84	-15.82	3.80	3.24	0.18	0.02	7.28
1,100.00	2.49	176.97	1,099.78	-19.19	3.98	3.30	1.11	1.11	0.09
1,200.00	2.56	171.31	1,199.68	-23.57	4.43	3.60	0.26	0.07	-5.66
1,300.00	2.72	166.54	1,299.58	-28.09	5.32	4.33	0.27	0.16	-4.77
1,400.00	2.71	170.24	1,399.46	-32.72	6.28	5.11	0.18	-0.01	3.70
1,500.00	3.00	176.18	1,499.34	-37.66	6.85	5.51	0.41	0.29	5.94
1,600.00	2.78	169.03	1,599.21	-42.66	7.49	5.97	0.42	-0.22	-7.15
1,700.00	3.05	174.20	1,699.08	-47.68	8.22	6.52	0.38	0.27	5.17
1,800.00	2.68	176.56	1,798.96	-52.66	8.63	6.76	0.39	-0.37	2.36
1,900.00	3.01	173.13	1,898.83	-57.60	9.08	7.04	0.37	0.33	-3.43
2,000.00	2.01	164.51	1,998.74	-61.90	9.86	7.67	1.07	-1.00	-8.62
2,100.00	0.73	50.75	2,098.72	-63.19	10.83	8.58	2.40	-1.28	-113.76
2,200.00	2.13	355.72	2,198.69	-60.93	11.18	9.02	1.81	1.40	-55.03
2,300.00	2.98	348.24	2,298.59	-56.53	10.51	8.50	0.91	0.85	-7.48
2,400.00	3.40	348.18	2,398.43	-51.09	9.37	7.56	0.42	0.42	-0.06
2,500.00	3.62	347.58	2,498.24	-45.10	8.09	6.49	0.22	0.22	-0.60
2,600.00	3.52	352.83	2,598.05	-38.97	7.03	5.64	0.34	-0.10	5.25
2,700.00	3.75	355.24	2,697.85	-32.67	6.37	5.21	0.28	0.23	2.41
2,800.00	3.53	347.16	2,797.65	-26.41	5.42	4.48	0.56	-0.22	-8.06
2,900.00	3.90	344.78	2,897.44	-20.12	3.84	3.13	0.40	0.37	-2.40
3,000.00	3.86	349.42	2,997.21	-13.53	2.33	1.85	0.32	-0.04	4.64
3,100.00	3.55	355.66	3,097.00	-7.14	1.48	1.22	0.51	-0.31	6.24
3,200.00	0.74	7.99	3,196.92	-3.41	1.33	1.21	2.83	-2.81	12.33
3,300.00	0.86	343.46	3,296.91	-2.05	1.21	1.14	0.36	0.12	-24.53
3,400.00	0.54	346.92	3,396.90	-0.87	0.89	0.86	0.32	-0.32	3.46
3,500.00	1.00	343.00	3,496.89	0.42	0.53	0.54	0.46	0.46	-3.92
3,600.00	0.83	12.91	3,596.88	1.96	0.43	0.50	0.50	-0.17	29.91
3,700.00	0.54	325.54	3,696.88	3.06	0.33	0.44	0.61	-0.29	-47.37
3,800.00	0.31	3.48	3,796.87	3.71	0.08	0.21	0.35	-0.23	37.94
3,900.00	0.36	306.09	3,896.87	4.17	-0.16	-0.01	0.32	0.05	-57.39
4,000.00	0.27	187.59	3,996.87	4.12	-0.44	-0.30	0.54	-0.09	-118.50
4,100.00	0.30	347.59	4,096.87	4.14	-0.53	-0.38	0.56	0.03	160.00
4,200.00	0.49	285.38	4,196.87	4.51	-1.00	-0.84	0.44	0.19	-62.21
4,300.00	0.41	255.92	4,296.87	4.54	-1.76	-1.60	0.24	-0.08	-29.46
4,400.00	0.35	169.95	4,396.86	4.15	-2.05	-1.90	0.52	-0.06	-85.97
4,500.00	0.23	173.89	4,496.86	3.65	-1.98	-1.85	0.12	-0.12	3.94
4,600.00	0.21	141.21	4,596.86	3.31	-1.84	-1.72	0.13	-0.02	-32.68
4,700.00	0.30	232.64	4,696.86	3.01	-1.93	-1.83	0.37	0.09	91.43
4,800.00	0.57	183.33	4,796.86	2.35	-2.17	-2.09	0.44	0.27	-49.31
4,900.00	0.41	161.58	4,896.86	1.51	-2.09	-2.03	0.24	-0.16	-21.75
5,000.00	0.28	221.58	4,996.85	0.99	-2.14	-2.10	0.36	-0.13	60.00
5,100.00	0.52	194.35	5,096.85	0.37	-2.41	-2.40	0.30	0.24	-27.23
5,200.00	0.13	283.38	5,196.85	-0.04	-2.63	-2.63	0.53	-0.39	89.03



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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)	Bulld Rate (°/100usft)	Turn Rate (°/100usft)
5,300.00	0.53	323.27	5,296.85	0.35	-3.02	-3.01	0.44	0.40	39.89
5,400.00	0.54	325.37	5,396.84	1.11	-3.57	-3.52	0.02	0.01	2.10
5,500.00	0.53	348.26	5,496.84	1.95	-3.93	-3.86	0.21	-0.01	22.89
5,600.00	0.97	7.40	5,596.83	3.24	-3.91	-3.80	0.50	0.44	19.14
5,700.00	0.59	41.82	5,696.82	4.47	-3.46	-3.30	0.59	-0.38	34.42
5,800.00	0.16	22.21	5,796.82	4.98	-3.06	-2.89	0.44	-0.43	-19.61
5,900.00	0.09	62.97	5,896.82	5.15	-2.94	-2.76	0.11	-0.07	40.76
6,000.00	0.23	45.93	5,996.82	5.32	-2.73	-2.54	0.15	0.14	-17.04
6,100.00	0.49	242.55	6,096.82	5.26	-2.96	-2.77	0.71	0.25	-163.38
6,200.00	0.77	179.45	6,196.81	4.39	-3.34	-3.18	0.70	0.28	-63.10
6,300.00	0.77	225.45	6,296.80	3.25	-3.81	-3.69	0.60	0.00	46.00
6,400.00	1.28	209.80	6,396.79	1.81	-4.84	-4.77	0.58	0.51	-15.65
6,500.00	0.98	209.10	6,496.77	0.09	-5.81	-5.81	0.30	-0.30	-0.70
Tie In									
6,636.00	1.62	222.06	6,632.73	-2.35	-7.67	-7.74	0.51	0.47	9.53
First Phoenix MWD Survey									
6,751.00	3.09	98.99	6,747.68	-4.04	-5.69	-5.83	3.65	1.28	-107.02
6,782.00	7.25	85.21	6,778.55	-4.01	-2.92	-3.06	13.91	13.42	-44.45
6,814.00	10.93	79.42	6,810.14	-3.28	2.08	1.96	11.84	11.50	-18.09
6,845.00	14.72	78.61	6,840.36	-1.96	8.83	8.76	12.24	12.23	-2.61
6,877.00	18.87	83.17	6,870.99	-0.55	17.96	17.93	13.60	12.97	14.25
6,908.00	22.29	85.10	6,900.01	0.55	28.80	28.80	11.25	11.03	6.23
6,940.00	24.06	85.53	6,929.42	1.58	41.35	41.38	5.56	5.53	1.34
6,971.00	25.66	88.31	6,957.55	2.27	54.36	54.41	6.39	5.16	8.97
7,003.00	28.38	85.75	6,986.06	3.04	68.87	68.94	9.24	8.50	-8.00
7,034.00	30.67	83.37	7,013.03	4.50	84.08	84.18	8.30	7.39	-7.68
7,066.00	33.15	83.17	7,040.19	6.48	100.87	101.04	7.76	7.75	-0.63
7,097.00	33.65	83.57	7,066.07	8.45	117.82	118.05	1.76	1.61	1.29
7,129.00	35.92	81.18	7,092.35	10.88	135.91	136.21	8.27	7.09	-7.47
7,160.00	39.15	78.61	7,116.94	14.21	154.50	154.90	11.58	10.42	-8.29
7,192.00	42.21	75.95	7,141.20	18.82	174.83	175.39	10.99	9.56	-8.31
7,223.00	45.63	73.32	7,163.53	24.53	195.56	196.30	12.50	11.03	-8.48
7,255.00	48.77	71.81	7,185.27	31.57	217.95	218.93	10.40	9.81	-4.72
7,286.00	51.99	71.49	7,205.04	39.09	240.61	241.85	10.42	10.39	-1.03
7,318.00	54.63	72.12	7,224.15	47.10	264.99	266.49	8.40	8.25	1.97
7,319.00	54.75	72.18	7,224.73	47.35	265.77	267.28	12.71	11.80	5.78
Hardline Crossing: 7319°MD, 54.75° Inc, 72.18° Azm									
7,349.00	58.30	73.84	7,241.28	54.65	289.69	291.45	12.71	11.84	5.54
7,381.00	62.45	75.84	7,257.09	61.91	316.54	318.53	14.06	12.97	6.25
7,412.00	66.45	77.59	7,270.46	68.33	343.75	345.96	13.87	12.90	5.65
7,444.00	70.75	80.20	7,282.14	74.06	372.98	375.37	15.43	13.44	8.16
7,475.00	72.47	80.55	7,291.92	78.98	401.98	404.53	5.65	5.55	1.13
7,507.00	75.12	80.81	7,300.85	83.95	432.30	435.00	8.32	8.28	0.81
7,538.00	76.82	80.72	7,308.36	88.78	461.99	464.84	5.49	5.48	-0.29



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7,575.00	81.03	81.80	7,315.47	94.29	497.87	500.89	11.73	11.38	2.92
7,607.00	85.04	82.77	7,319.35	98.55	529.34	532.49	12.89	12.53	3.03
7,701.00	89.75	81.30	7,323.62	111.56	622.30	625.86	5.25	5.01	-1.56
7,796.00	90.92	80.58	7,323.06	126.52	716.12	720.15	1.45	1.23	-0.76
7,890.00	91.59	81.36	7,321.00	141.27	808.93	813.42	1.09	0.71	0.83
7,985.00	91.43	82.67	7,318.50	154.46	902.97	907.87	1.39	-0.17	1.38
8,079.00	89.50	85.63	7,317.74	164.04	996.46	1,001.65	3.76	-2.05	3.15
8,174.00	87.01	88.33	7,320.63	169.05	1,091.27	1,096.57	3.87	-2.62	2.84
8,269.00	85.91	90.08	7,326.50	170.36	1,186.08	1,191.36	2.17	-1.16	1.84
8,363.00	85.29	91.40	7,333.71	169.15	1,279.79	1,284.98	1.55	-0.66	1.40
8,458.00	83.54	92.02	7,342.95	166.33	1,374.29	1,379.32	1.95	-1.84	0.65
8,552.00	84.25	91.93	7,352.95	163.11	1,467.70	1,472.56	0.76	0.76	-0.10
8,647.00	84.98	92.46	7,361.87	159.49	1,562.21	1,566.88	0.95	0.77	0.56
8,741.00	84.98	90.88	7,370.09	156.76	1,655.81	1,660.32	1.67	0.00	-1.68
8,836.00	85.49	90.22	7,377.98	155.85	1,750.48	1,754.90	0.88	0.54	-0.69
8,930.00	86.05	89.83	7,384.92	155.81	1,844.22	1,848.58	0.73	0.60	-0.41
9,025.00	84.98	89.17	7,392.35	156.64	1,938.92	1,943.25	1.32	-1.13	-0.69
9,119.00	85.18	88.88	7,400.41	158.23	2,032.56	2,036.89	0.37	0.21	-0.31
9,213.00	84.25	88.20	7,409.07	160.61	2,126.13	2,130.48	1.22	-0.99	-0.72
9,308.00	85.15	87.92	7,417.84	163.82	2,220.67	2,225.08	0.99	0.95	-0.29
9,402.00	86.41	87.47	7,424.76	167.59	2,314.34	2,318.82	1.42	1.34	-0.48
9,496.00	86.38	88.22	7,430.67	171.12	2,408.08	2,412.63	0.80	-0.03	0.80
9,591.00	85.96	89.13	7,437.02	173.31	2,502.84	2,507.41	1.05	-0.44	0.96
9,686.00	86.83	89.01	7,442.99	174.85	2,597.64	2,602.21	0.92	0.92	-0.13
9,780.00	86.53	88.23	7,448.43	177.11	2,691.46	2,696.04	0.89	-0.32	-0.83
9,875.00	85.37	88.74	7,455.14	179.61	2,786.19	2,790.80	1.33	-1.22	0.54
9,969.00	84.75	88.99	7,463.24	181.47	2,879.82	2,884.44	0.71	-0.66	0.27
10,064.00	84.76	89.21	7,471.92	182.95	2,974.41	2,979.02	0.23	0.01	0.23
10,159.00	85.37	89.74	7,480.09	183.82	3,069.05	3,073.64	0.85	0.64	0.56
10,253.00	85.65	90.61	7,487.45	183.53	3,162.76	3,167.28	0.97	0.30	0.93
10,348.00	86.41	90.59	7,494.03	182.54	3,257.53	3,261.95	0.80	0.80	-0.02
10,443.00	85.91	91.03	7,500.39	181.20	3,352.30	3,356.62	0.70	-0.53	0.46
10,537.00	84.73	90.95	7,508.06	179.58	3,445.97	3,450.17	1.26	-1.26	-0.09
10,632.00	85.49	90.82	7,516.16	178.12	3,540.62	3,544.70	0.81	0.80	-0.14
10,727.00	87.68	90.60	7,521.82	176.95	3,635.43	3,639.42	2.32	2.31	-0.23
10,821.00	87.39	91.26	7,525.86	175.42	3,729.33	3,733.21	0.77	-0.31	0.70
10,916.00	88.21	90.96	7,529.51	173.58	3,824.25	3,827.99	0.92	0.86	-0.32
11,010.00	89.33	90.76	7,531.53	172.17	3,918.21	3,921.85	1.21	1.19	-0.21
11,105.00	87.68	90.14	7,534.00	171.43	4,013.17	4,016.73	1.86	-1.74	-0.65
11,200.00	87.17	90.19	7,538.27	171.15	4,108.08	4,111.56	0.54	-0.54	0.05
11,294.00	88.74	90.15	7,541.63	170.87	4,202.01	4,205.43	1.67	1.67	-0.04
11,389.00	91.04	89.89	7,541.81	170.84	4,297.01	4,300.36	2.44	2.42	-0.27
11,484.00	92.49	89.87	7,538.88	171.04	4,391.86	4,395.26	1.53	1.53	-0.02



Phoenix Technology Services LP Survey Report



Company: Apache Corporation
Project: Eddy County, NM (NAD 83 NME)
Site: Palmillo 14-15 State
Well: #2H
Wellbore: OH / Job #61176
Design: Surveys (H&P 482)

Local Co-ordinate Reference: Well #2H
TVD Reference: GL + KB @ 3446.00usft (H&P 482)
MD Reference: GL + KB @ 3446.00usft (H&P 482)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
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)
11,578.00	92.30	89.49	7,534.95	171.56	4,485.88	4,489.14	0.45	-0.20	-0.40
11,673.00	89.47	89.90	7,533.49	172.07	4,580.85	4,584.07	3.01	-2.98	0.43
11,768.00	86.10	90.64	7,537.16	171.62	4,675.77	4,678.91	3.63	-3.55	0.78
11,862.00	86.19	91.25	7,543.48	170.08	4,769.54	4,772.57	0.65	0.10	0.65
11,957.00	86.95	91.05	7,549.16	168.17	4,864.35	4,867.25	0.83	0.80	-0.21
12,051.00	86.02	90.46	7,554.93	166.94	4,958.16	4,960.97	1.17	-0.99	-0.63
12,146.00	83.63	89.33	7,563.49	167.11	5,052.77	5,055.52	2.78	-2.52	-1.19
12,232.00	83.97	89.12	7,572.78	168.26	5,138.26	5,140.99	0.46	0.40	-0.24
Final Phoenix MWD Survey									
12,273.00	83.97	89.12	7,577.09	168.89	5,179.03	5,181.76	0.00	0.00	0.00
Hardline Crossing: 12273'MD, 83.97° Inc, 89.12° Azm									
12,300.00	83.97	89.12	7,579.92	169.30	5,205.87	5,208.60	0.00	0.00	0.00
PTD: 12300'MD, 83.97° Inc, 89.12° Azm									

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
6,500.00	6,496.77	0.09	-5.81	Tie In
6,636.00	6,632.73	-2.35	-7.67	First Phoenix MWD Survey
7,319.00	7,224.73	47.35	265.77	Hardline Crossing: 7319'MD, 54.75° Inc 72.18° Azm
12,232.00	7,572.78	168.26	5,138.26	Final Phoenix MWD Survey
12,273.00	7,577.09	168.89	5,179.03	Hardline Crossing: 12273'MD, 83.97° Inc, 89.12° Azm
12,300.00	7,579.92	169.30	5,205.87	PTD: 12300'MD, 83.97° Inc, 89.12° Azm