

15-43442



Apache Corporation

Eddy County, NM (NAD27 NME)

NFE Federal COM

#48H

OH / Job #1514802

Design: Surveys (Capstar 119)

Standard Survey Report

03 January, 2016



Company:	Apache Corporation	Local Co-ordinate Reference:	Well #48H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3774.00usft (Capstar 119)
Site:	NFE Federal COM	MD Reference:	KB @ 3774.00usft (Capstar 119)
Well:	#48H	North Reference:	Grid
Wellbore:	OH / Job #1514802	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	NFE Federal COM		
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Site Position:		Northing:	673,264.70 usft	Latitude:	32° 51' 0.49036 N
From:	Map	Easting:	633,303.50 usft	Longitude:	103° 53' 57.34966 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.24 °

Well	#48H					
Well Position	+N/-S	0.00 usft	Northing:	678,787.90 usft	Latitude:	32° 51' 55.33914 N
	+E/-W	0.00 usft	Easting:	628,390.40 usft	Longitude:	103° 54' 54.68576 W
Position Uncertainty	0.00 usft	Wellhead Elevation:	usft	Ground Level:	3,763.00 usft	

Wellbore	OH / Job #1514802				
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	12/21/2015	7.63	60.78	48,531

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	89.61	

Survey Program	Date 1/3/2016				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
113.00	4,612.00	Scientific Gyro Surveys (OH / Job #1514802)	NS-GYRO-MS	North sensing gyrocompassing m/s	
4,693.00	10,170.00	Phoenix MWD Surveys (OH / Job #1514802)	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)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
113.00	0.26	136.42	113.00	-0.19	0.18	0.18	0.23	0.23	0.00
142.00	0.27	180.44	142.00	-0.30	0.22	0.22	0.69	0.03	151.79
229.00	0.35	150.75	229.00	-0.74	0.35	0.34	0.20	0.09	-34.13
319.00	0.52	156.35	319.00	-1.35	0.65	0.64	0.19	0.19	6.22
495.00	0.78	138.61	494.98	-2.98	1.76	1.74	0.19	0.15	-10.08
526.00	0.80	136.67	525.98	-3.30	2.05	2.03	0.11	0.06	-6.26
611.00	0.76	138.47	610.97	-4.15	2.83	2.80	0.06	-0.05	2.12
696.00	0.79	133.29	695.97	-4.98	3.63	3.60	0.09	0.04	-6.09
781.00	0.73	124.10	780.96	-5.68	4.50	4.47	0.16	-0.07	-10.81

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Well:	#48H	North Reference:	Grid
Wellbore:	OH / Job #1514802	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)
952.00	0.83	108.62	951.94	-6.69	6.58	6.53	0.14	0.06	-9.05
1,122.00	0.88	90.36	1,121.92	-7.09	9.05	9.00	0.16	0.03	-10.74
1,208.00	1.28	93.29	1,207.91	-7.15	10.67	10.62	0.47	0.47	3.41
1,293.00	1.35	88.44	1,292.89	-7.18	12.62	12.57	0.15	0.08	-5.71
1,378.00	1.34	69.99	1,377.86	-6.81	14.56	14.51	0.51	-0.01	-21.71
1,463.00	1.26	95.62	1,462.84	-6.56	16.42	16.37	0.68	-0.09	30.15
1,549.00	1.25	99.77	1,548.82	-6.81	18.28	18.24	0.11	-0.01	4.83
1,634.00	0.99	101.81	1,633.80	-7.12	19.92	19.87	0.31	-0.31	2.40
1,719.00	0.76	99.24	1,718.80	-7.36	21.19	21.14	0.27	-0.27	-3.02
1,804.00	0.65	109.29	1,803.79	-7.61	22.20	22.15	0.19	-0.13	11.82
1,889.00	0.56	111.37	1,888.78	-7.92	23.05	22.99	0.11	-0.11	2.45
2,060.00	0.27	105.03	2,059.78	-8.33	24.21	24.16	0.17	-0.17	-3.71
2,145.00	0.14	95.84	2,144.78	-8.39	24.51	24.45	0.16	-0.15	-10.81
2,315.00	0.06	76.26	2,314.78	-8.39	24.80	24.75	0.05	-0.05	-11.52
2,485.00	0.08	325.59	2,484.78	-8.27	24.82	24.77	0.07	0.01	-65.10
2,656.00	0.31	276.77	2,655.78	-8.12	24.30	24.24	0.15	0.13	-28.55
2,741.00	0.38	269.91	2,740.78	-8.09	23.79	23.73	0.10	0.08	-8.07
2,826.00	0.39	272.20	2,825.77	-8.08	23.21	23.16	0.02	0.01	2.69
2,911.00	0.41	263.87	2,910.77	-8.10	22.62	22.57	0.07	0.02	-9.80
2,996.00	0.42	280.61	2,995.77	-8.08	22.01	21.96	0.14	0.01	19.69
3,081.00	0.48	281.98	3,080.77	-7.95	21.36	21.31	0.07	0.07	1.61
3,167.00	0.69	277.51	3,166.76	-7.80	20.49	20.44	0.25	0.24	-5.20
3,252.00	0.84	288.41	3,251.75	-7.54	19.40	19.34	0.25	0.18	12.82
3,422.00	1.23	344.76	3,421.73	-5.39	17.73	17.70	0.61	0.23	33.15
3,508.00	1.23	342.61	3,507.71	-3.62	17.21	17.19	0.05	0.00	-2.50
3,593.00	1.01	340.73	3,592.69	-2.04	16.70	16.68	0.26	-0.26	-2.21
3,678.00	0.70	332.76	3,677.69	-0.87	16.21	16.20	0.39	-0.36	-9.38
3,848.00	0.53	328.52	3,847.68	0.72	15.32	15.33	0.10	-0.10	-2.49
3,933.00	0.46	327.72	3,932.67	1.35	14.94	14.95	0.08	-0.08	-0.94
4,018.00	0.45	334.85	4,017.67	1.94	14.61	14.63	0.07	-0.01	8.39
4,104.00	0.39	343.29	4,103.67	2.53	14.39	14.40	0.10	-0.07	9.81
4,189.00	0.35	13.07	4,188.67	3.05	14.36	14.38	0.23	-0.05	35.04
4,274.00	0.23	8.21	4,273.66	3.48	14.44	14.47	0.14	-0.14	-5.72
4,359.00	0.33	12.66	4,358.66	3.88	14.52	14.55	0.12	0.12	5.24
4,444.00	0.45	19.35	4,443.66	4.44	14.69	14.72	0.15	0.14	7.87
4,529.00	0.70	26.71	4,528.66	5.22	15.03	15.07	0.31	0.29	8.66
4,612.00	0.71	39.31	4,611.65	6.07	15.58	15.62	0.19	0.01	15.18
Tie In to Scientific Gyro Surveys									
4,693.00	1.70	72.60	4,692.63	6.82	17.05	17.09	1.45	1.22	41.10
First Phoenix MWD Survey									
4,735.00	6.50	96.40	4,734.51	6.74	20.01	20.05	11.89	11.43	56.67
4,778.00	12.30	97.80	4,776.92	5.84	26.97	27.01	13.50	13.49	3.26
4,820.00	18.30	96.80	4,817.41	4.45	37.96	37.99	14.30	14.29	-2.38



Phoenix Technology Services LP

Survey Report



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Wellbore:	OH / Job #1514802	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)
4,863.00	23.70	97.40	4,857.54	2.54	53.24	53.26	12.57	12.56	1.40
4,906.00	27.50	97.70	4,896.31	0.10	71.66	71.66	8.84	8.84	0.70
4,948.00	31.10	95.50	4,932.94	-2.24	92.07	92.05	8.95	8.57	-5.24
4,991.00	35.60	93.90	4,968.85	-4.16	115.63	115.59	10.66	10.47	-3.72
5,033.00	39.10	91.50	5,002.23	-5.34	141.07	141.03	9.02	8.33	-5.71
5,076.00	43.30	89.80	5,034.58	-5.64	169.38	169.34	10.11	9.77	-3.95
5,119.00	47.30	89.30	5,064.82	-5.40	199.94	199.90	9.34	9.30	-1.16
5,161.00	50.70	88.60	5,092.37	-4.81	231.63	231.59	8.19	8.10	-1.67
5,203.00	54.50	88.20	5,117.87	-3.88	264.97	264.94	9.08	9.05	-0.95
5,246.00	59.40	88.70	5,141.32	-2.91	300.99	300.97	11.44	11.40	1.16
5,289.00	65.40	89.40	5,161.23	-2.28	339.08	339.05	14.03	13.95	1.63
5,331.00	68.40	90.70	5,177.71	-2.32	377.70	377.68	7.69	7.14	3.10
5,374.00	74.30	91.10	5,191.45	-2.96	418.42	418.39	13.75	13.72	0.93
5,417.00	80.30	90.80	5,200.90	-3.66	460.35	460.31	13.97	13.95	-0.70
5,460.00	86.60	90.00	5,205.80	-3.95	503.04	503.00	14.77	14.65	-1.86
5,502.00	88.50	90.30	5,207.60	-4.06	545.00	544.96	4.58	4.52	0.71
5,630.00	90.20	91.90	5,209.05	-6.52	672.96	672.90	1.82	1.33	1.25
5,758.00	89.10	90.50	5,209.83	-9.20	800.93	800.84	1.39	-0.86	-1.09
5,886.00	87.70	88.80	5,213.41	-8.42	928.87	928.79	1.72	-1.09	-1.33
6,014.00	88.90	89.40	5,217.20	-6.41	1,056.79	1,056.72	1.05	0.94	0.47
6,142.00	87.60	88.10	5,221.11	-3.62	1,184.69	1,184.64	1.44	-1.02	-1.02
6,269.00	88.90	88.50	5,224.99	0.15	1,311.58	1,311.55	1.07	1.02	0.31
6,397.00	86.60	88.20	5,230.02	3.83	1,439.42	1,439.41	1.81	-1.80	-0.23
6,525.00	87.80	89.30	5,236.27	6.62	1,567.23	1,567.24	1.27	0.94	0.86
6,653.00	88.10	89.00	5,240.85	8.51	1,695.13	1,695.15	0.33	0.23	-0.23
6,780.00	88.40	88.20	5,244.73	11.61	1,822.03	1,822.07	0.67	0.24	-0.63
6,908.00	89.80	88.60	5,246.74	15.19	1,949.96	1,950.02	1.14	1.09	0.31
7,036.00	87.70	89.40	5,249.53	17.42	2,077.91	2,077.98	1.76	-1.64	0.63
7,164.00	88.50	89.40	5,253.77	18.76	2,205.83	2,205.90	0.63	0.63	0.00
7,292.00	89.10	90.80	5,256.45	18.54	2,333.80	2,333.87	1.19	0.47	1.09
7,420.00	88.20	91.30	5,259.47	16.19	2,461.74	2,461.79	0.80	-0.70	0.39
7,547.00	87.10	90.20	5,264.68	14.53	2,588.62	2,588.65	1.22	-0.87	-0.87
7,675.00	87.60	88.60	5,270.60	15.87	2,716.47	2,716.51	1.31	0.39	-1.25
7,803.00	89.10	89.20	5,274.28	18.33	2,844.39	2,844.45	1.26	1.17	0.47
7,931.00	90.40	90.00	5,274.84	19.22	2,972.38	2,972.44	1.19	1.02	0.63
8,058.00	88.60	89.20	5,275.95	20.11	3,099.36	3,099.43	1.55	-1.42	-0.63
8,186.00	89.40	90.10	5,278.18	20.89	3,227.34	3,227.41	0.94	0.63	0.70
8,314.00	90.30	90.60	5,278.52	20.11	3,355.34	3,355.39	0.80	0.70	0.39
8,442.00	90.60	90.40	5,277.51	18.99	3,483.33	3,483.38	0.28	0.23	-0.16
8,570.00	90.40	89.80	5,276.39	18.77	3,611.32	3,611.36	0.49	-0.16	-0.47
8,697.00	89.00	89.80	5,277.06	19.21	3,738.32	3,738.36	1.10	-1.10	0.00
8,825.00	90.00	90.30	5,278.18	19.10	3,866.31	3,866.35	0.87	0.78	0.39
8,953.00	89.20	90.00	5,279.07	18.76	3,994.30	3,994.34	0.67	-0.63	-0.23
9,081.00	86.90	87.30	5,283.43	21.77	4,122.17	4,122.23	2.77	-1.80	-2.11

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Well:	#48H	North Reference:	Grid
Wellbore:	OH / Job #1514802	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)
9,208.00	88.00	87.80	5,289.08	27.20	4,248.93	4,249.02	0.95	0.87	0.39
9,336.00	88.40	87.60	5,293.10	32.33	4,376.76	4,376.88	0.35	0.31	-0.16
9,464.00	89.40	87.10	5,295.55	38.25	4,504.60	4,504.76	0.87	0.78	-0.39
9,592.00	87.30	89.00	5,299.24	42.60	4,632.46	4,632.64	2.21	-1.64	1.48
9,719.00	89.20	89.90	5,303.12	43.82	4,759.39	4,759.58	1.66	1.50	0.71
9,847.00	90.40	90.70	5,303.57	43.15	4,887.38	4,887.56	1.13	0.94	0.63
9,974.00	91.40	91.30	5,301.57	40.93	5,014.34	5,014.51	0.92	0.79	0.47
10,095.00	92.30	91.90	5,297.66	37.56	5,135.23	5,135.37	0.89	0.74	0.50
Final Phoenix MWD Survey									
10,170.00	92.30	91.90	5,294.65	35.07	5,210.13	5,210.25	0.00	0.00	0.00
Projection to TD									

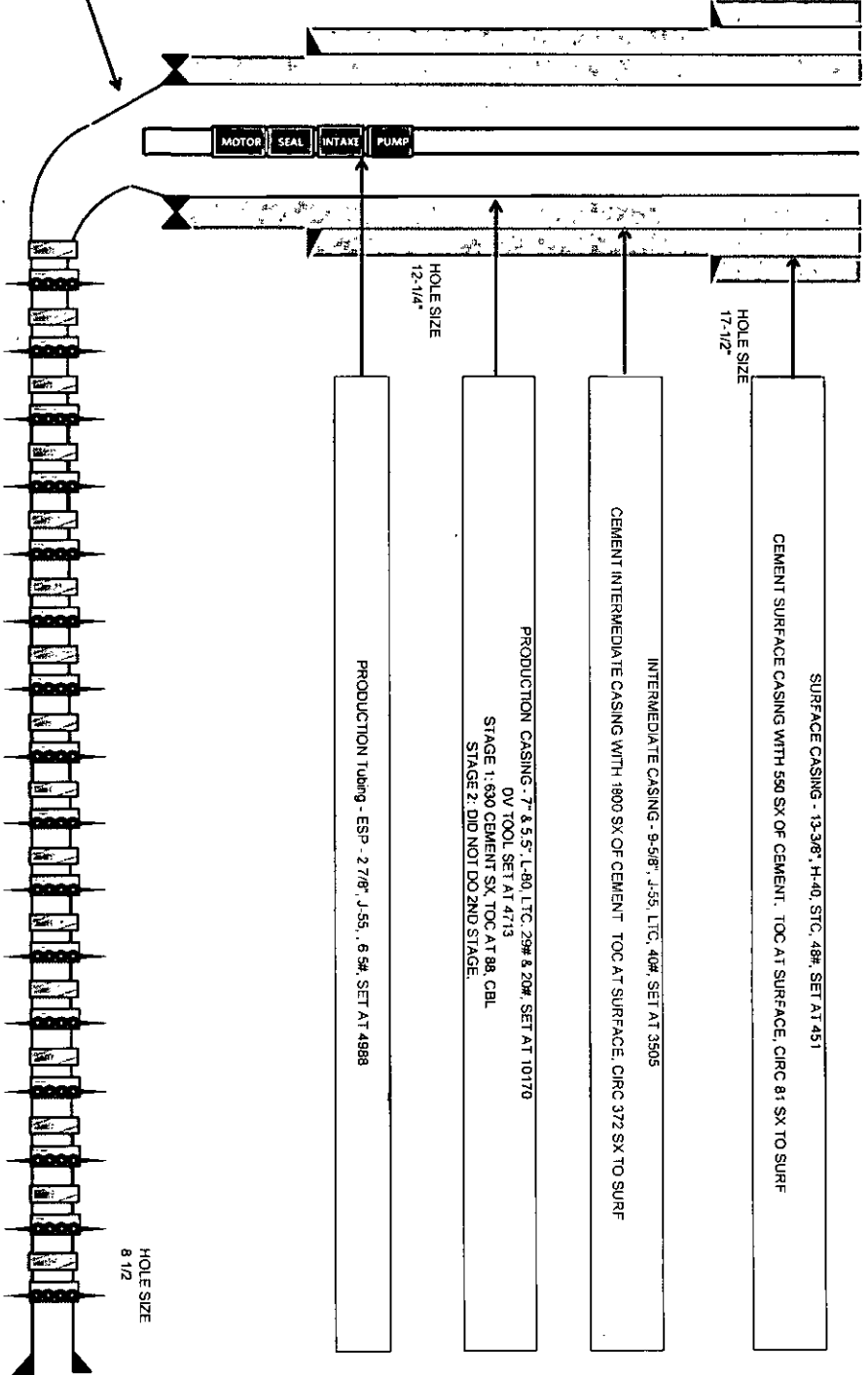
Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
4,612.00	4,611.65	6.07	15.58	Tie In to Scientific Gyro Surveys
4,693.00	4,692.63	6.82	17.05	First Phoenix MWD Survey
10,095.00	5,297.66	37.56	5,135.23	Final Phoenix MWD Survey
10,170.00	5,294.65	35.07	5,210.13	Projection to TD

WELL NAME: CEDAR LAKE FEDERAL CA 648H
API: 30-015-43442
SPUD DATE: 12/23/2015
PRODUCING FORMATION: YESO UPPER BLINERBY
FIELD: CEDAR LAKE (BP)
COUNTY: EDDY
STATE: NEW MEXICO
WORKING INTEREST: 59.92%

SURFACE LOC.: 1915 FNL & 330' FWL
SECTION: 6
TOWNSHIP: 17-S
RANGE: 31-E
SURVEY: RONALD J. EDSON
BOTTOM HOLE LOC.: 1915 FNL & 547' 4' FWL
SECTION: 5
TOWNSHIP: 17-S
RANGE: 31-E
SURVEY: RONALD J. EDSON
DRILL RIG: CAPSTAR 119
RIG RELEASE: 1/5/2016
KB (ft): 3,774.00
GL (ft): 3,763.00
KBGL DIFF (ft): 11.00
TMD (ft): 10,170.00
TD OF PILOT HOLE (ft): N/A
FC DEPTH (ft): 10,140.00
PBMD (ft): 10,170.00
RDV DEPTH (ft): N/A
ORIO VALVE (ft): N/A
DEEPEST TVD (ft): 5,303.00

TAPERED CASING STRING:
7" 29# L-80 TO X-OVER @ 4,715'
TAPERING TO 5.5" 20# L-80 SET @ 10,170'

KOP (ft): 4,694
LATERAL LENGTH (ft): 4,667
TD OF PILOT HOLE (ft): N/A



PACKERS & SLEEVES
TOP PERF (MD): 5,503
BOTTOM PERF (MD): 10,140

TMD (ft): 10,170
FC DEPTH (ft): 10,140
PBMD (ft): 10,170
RDV DEPTH (ft): N/A
ORIO VALVE (ft): N/A

LAST UPDATED BY: HILLARI GOULD
LAST UPDATED: 8/25/2016

COMPLETION:					
STIMULATION:					
STATUS:					
COMMENTS:					
PACKERS & SLEEVES - 17 STAGES					
TOTAL ACID (bbl)	2,987	TOTAL LTR (bbl)	78,521	TOTAL PROPANT (lbs)	4,819,688
PRODUCTION METHOD	Pumping	LIFT TYPE	ESP	SETTING DEPTH	4688
CROSSOVER SUB @ 4,715'					
MAX WH RATE (bpm)					
92.40					
MAX WH PRESSURE (psi)					
6,446					