



PHOENIX
TECHNOLOGY SERVICES

20-015-45110

NM OIL CONSERVATION

ARTESIA DISTRICT

OCT 18 2019

RECEIVED

COG Operating LLC

Eddy County, NM (NAD83 NME)

Dodd Federal Unit

#924H

OH / 63609

Survey: Phoenix MWD Surveys

Standard Survey Report

07 October, 2018



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #924H
Project:	Eddy County, NM (NAD83 NME)	TVD Reference:	RKB @ 3588.50usft (Trinidad 436)
Site:	Dodd Federal Unit	MD Reference:	RKB @ 3588.50usft (Trinidad 436)
Well:	#924H	North Reference:	Grid
Wellbore:	OH / 63609	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Trinidad 436)	Database:	USA Compass

Project	Eddy County, NM (NAD83 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		Dodd Federal Unit			
Site Position:		Northing:	669,073.16 usft	Latitude:	32° 50' 20.39158 N
From:	Map	Easting:	626,883.92 usft	Longitude:	104° 3' 17.28311 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.15 °

Well	#924H					
Well Position	+N/-S	0.00 usft	Northing:	664,991.58 usft	Latitude:	32° 49' 40.05480 N
	+E/-W	0.00 usft	Easting:	624,929.18 usft	Longitude:	104° 3' 40.31820 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	3,572.00 usft

Wellbore	OH / 63609				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
			(°)	(°)	(nT)
	MVHD	10/31/2018	7.48	60.59	48,114.59038624

Design	Surveys (Trinidad 436)				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(usft)	(usft)	(usft)	(°)	
	0.00	0.00	0.00	359.80	

Survey Program	Date 10/7/2018			
From	To	Survey (Wellbore)	Tool Name	Description
(usft)	(usft)			
929.00	9,543.00	Phoenix MWD Surveys (OH / 63609)	MWD+HDGM	OWSG Rev.2 MWD + HDGM

Survey										
Measured	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Vertical	Dogleg	Build	Turn	
Depth	(°)	(°)	Depth	(usft)	(usft)	Section	Rate	Rate	Rate	
(usft)			(usft)			(usft)	(°/100usft)	(°/100usft)	(°/100usft)	
781.00	0.85	85.79	780.97	-2.96	2.91	-2.97	0.00	0.00	0.00	
Tie In										
929.00	0.71	82.32	928.96	-2.76	4.91	-2.78	0.10	-0.09	-2.34	
First Phoenix MWD Survey										
992.00	0.68	94.98	991.95	-2.74	5.67	-2.76	0.25	-0.05	20.10	
1,056.00	0.79	91.12	1,055.95	-2.78	6.49	-2.81	0.19	0.17	-6.03	
1,119.00	0.76	88.11	1,118.94	-2.78	7.34	-2.80	0.08	-0.05	-4.78	
1,182.00	0.72	81.48	1,181.94	-2.70	8.15	-2.73	0.15	-0.06	-10.52	
1,244.00	0.74	80.91	1,243.93	-2.58	8.93	-2.61	0.03	0.03	-0.92	
1,307.00	0.78	86.32	1,306.92	-2.49	9.76	-2.53	0.13	0.06	8.59	

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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)
1,370.00	0.74	87.44	1,369.92	-2.45	10.59	-2.48	0.07	-0.06	1.78
1,433.00	0.65	82.58	1,432.91	-2.38	11.35	-2.42	0.17	-0.14	-7.71
1,496.00	0.52	106.27	1,495.91	-2.42	11.98	-2.46	0.43	-0.21	37.60
1,559.00	0.38	112.25	1,558.91	-2.58	12.45	-2.62	0.23	-0.22	9.49
1,622.00	0.13	161.53	1,621.91	-2.72	12.67	-2.77	0.49	-0.40	78.22
1,685.00	0.23	247.79	1,684.91	-2.84	12.57	-2.88	0.41	0.16	136.92
1,748.00	0.48	276.28	1,747.91	-2.86	12.19	-2.90	0.47	0.40	45.22
1,811.00	0.36	245.44	1,810.91	-2.91	11.75	-2.95	0.40	-0.19	-48.95
1,874.00	0.31	248.82	1,873.90	-3.05	11.41	-3.09	0.09	-0.08	5.37
1,938.00	0.33	254.15	1,937.90	-3.17	11.07	-3.21	0.06	0.03	8.33
2,001.00	0.48	279.96	2,000.90	-3.17	10.64	-3.21	0.37	0.24	40.97
2,064.00	0.45	284.55	2,063.90	-3.06	10.14	-3.10	0.08	-0.05	7.29
2,127.00	0.42	277.77	2,126.90	-2.97	9.67	-3.00	0.09	-0.05	-10.76
2,190.00	0.54	281.86	2,189.90	-2.88	9.15	-2.91	0.20	0.19	6.49
2,253.00	0.42	264.45	2,252.89	-2.84	8.63	-2.87	0.30	-0.19	-27.63
2,316.00	0.53	270.47	2,315.89	-2.86	8.11	-2.89	0.19	0.17	9.56
2,380.00	0.57	273.92	2,379.89	-2.83	7.50	-2.86	0.08	0.06	5.39
2,443.00	0.62	265.01	2,442.89	-2.84	6.84	-2.87	0.17	0.08	-14.14
2,507.00	0.56	268.98	2,506.88	-2.88	6.19	-2.90	0.11	-0.09	6.20
2,569.00	0.51	280.46	2,568.88	-2.83	5.61	-2.85	0.19	-0.08	18.52
2,629.00	0.50	263.50	2,628.88	-2.81	5.09	-2.83	0.25	-0.02	-28.27
2,692.00	0.50	277.42	2,691.87	-2.81	4.54	-2.83	0.19	0.00	22.10
2,756.00	0.36	264.26	2,755.87	-2.79	4.07	-2.81	0.27	-0.22	-20.56
2,819.00	0.34	262.97	2,818.87	-2.84	3.69	-2.85	0.03	-0.03	-2.05
2,882.00	0.35	250.65	2,881.87	-2.92	3.32	-2.94	0.12	0.02	-19.56
2,945.00	0.27	258.27	2,944.87	-3.02	2.99	-3.03	0.14	-0.13	12.10
3,008.00	0.16	210.64	3,007.87	-3.12	2.80	-3.13	0.32	-0.17	-75.60
3,071.00	0.09	231.81	3,070.87	-3.23	2.72	-3.24	0.13	-0.11	33.60
3,134.00	0.13	261.38	3,133.87	-3.27	2.61	-3.28	0.11	0.06	46.94
3,197.00	0.18	182.17	3,196.87	-3.38	2.53	-3.39	0.32	0.08	-125.73
3,260.00	0.22	261.58	3,259.87	-3.50	2.41	-3.51	0.41	0.06	126.05
3,323.00	0.24	230.27	3,322.87	-3.60	2.19	-3.61	0.20	0.03	-49.70
3,386.00	0.14	219.94	3,385.87	-3.74	2.04	-3.75	0.17	-0.16	-16.40
3,449.00	0.14	204.55	3,448.87	-3.87	1.96	-3.88	0.06	0.00	-24.43
3,512.00	0.16	243.62	3,511.87	-3.98	1.85	-3.99	0.16	0.03	62.02
3,575.00	0.14	282.26	3,574.87	-4.00	1.69	-4.01	0.16	-0.03	61.33
3,638.00	0.17	269.85	3,637.87	-3.99	1.52	-3.99	0.07	0.05	-19.70
3,701.00	0.06	326.60	3,700.87	-3.96	1.41	-3.96	0.23	-0.17	90.08
3,764.00	0.06	225.71	3,763.87	-3.96	1.37	-3.96	0.15	0.00	-160.14
3,827.00	0.01	67.50	3,826.87	-3.98	1.35	-3.98	0.11	-0.08	-251.13
3,890.00	0.14	48.32	3,889.87	-3.92	1.41	-3.93	0.21	0.21	-30.44
3,953.00	0.05	48.79	3,952.87	-3.85	1.49	-3.86	0.14	-0.14	0.75
3,984.00	0.11	283.71	3,983.87	-3.84	1.47	-3.84	0.47	0.19	-403.48

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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)
4,016.00	2.15	354.72	4,015.86	-3.23	1.39	-3.24	6.61	6.38	221.91
4,047.00	5.97	358.41	4,046.78	-1.04	1.29	-1.05	12.35	12.32	11.90
4,079.00	9.79	3.20	4,078.47	3.34	1.40	3.34	12.10	11.94	14.97
4,110.00	14.47	1.34	4,108.77	9.85	1.63	9.84	15.15	15.10	-6.00
4,142.00	18.66	0.21	4,139.43	18.97	1.75	18.96	13.13	13.09	-3.53
4,173.00	23.61	359.35	4,168.34	30.14	1.69	30.13	16.00	15.97	-2.77
4,205.00	27.95	358.16	4,197.15	44.05	1.38	44.05	13.66	13.56	-3.72
4,236.00	31.95	355.83	4,224.00	59.50	0.55	59.50	13.44	12.90	-7.52
4,268.00	35.72	356.12	4,250.58	77.27	-0.70	77.27	11.79	11.78	0.91
4,330.00	43.26	357.34	4,298.39	116.61	-2.91	116.62	12.23	12.16	1.97
4,362.00	44.60	0.02	4,321.44	138.80	-3.42	138.81	7.16	4.19	8.38
4,394.00	44.83	0.63	4,344.18	161.31	-3.29	161.32	1.52	0.72	1.91
4,456.00	44.97	0.34	4,388.10	205.07	-2.92	205.08	0.40	0.23	-0.47
4,519.00	45.04	0.15	4,432.64	249.62	-2.73	249.63	0.24	0.11	-0.30
4,582.00	45.09	359.72	4,477.14	294.22	-2.78	294.23	0.49	0.08	-0.68
4,614.00	45.17	359.53	4,499.71	316.90	-2.93	316.91	0.49	0.25	-0.59
4,646.00	47.23	359.29	4,521.86	339.99	-3.17	340.00	6.46	6.44	-0.75
4,677.00	50.67	358.58	4,542.22	363.36	-3.60	363.37	11.23	11.10	-2.29
4,708.00	53.31	357.65	4,561.30	387.77	-4.41	387.79	8.84	8.52	-3.00
4,740.00	57.58	357.81	4,579.45	414.10	-5.45	414.12	13.35	13.34	0.50
4,771.00	60.89	358.59	4,595.31	440.72	-6.29	440.74	10.89	10.68	2.52
4,803.00	63.78	359.96	4,610.16	469.06	-6.64	469.08	9.79	9.03	4.28
4,835.00	65.02	1.60	4,623.99	497.91	-6.25	497.93	6.03	3.88	5.13
4,866.00	68.16	2.95	4,636.31	526.33	-5.11	526.35	10.89	10.13	4.35
4,898.00	70.78	3.86	4,647.53	556.24	-3.33	556.25	8.61	8.19	2.84
4,929.00	73.86	3.95	4,656.94	585.71	-1.32	585.71	9.94	9.94	0.29
4,961.00	76.79	3.88	4,665.05	616.59	0.79	616.58	9.16	9.16	-0.22
4,993.00	78.82	4.98	4,671.81	647.77	3.21	647.76	7.18	6.34	3.44
5,024.00	81.00	5.00	4,677.24	678.17	5.86	678.15	7.03	7.03	0.06
5,056.00	84.54	4.18	4,681.26	709.81	8.40	709.78	11.35	11.06	-2.56
5,087.00	86.47	3.70	4,683.69	740.64	10.53	740.60	6.41	6.23	-1.55
5,119.00	88.39	2.20	4,685.13	772.57	12.17	772.52	7.61	6.00	-4.69
5,150.00	89.35	0.39	4,685.74	803.55	12.87	803.50	6.61	3.10	-5.84
5,214.00	90.47	358.94	4,685.84	867.55	12.50	867.50	2.86	1.75	-2.27
5,276.00	91.04	358.52	4,685.02	929.52	11.12	929.48	1.14	0.92	-0.68
5,340.00	90.45	358.56	4,684.19	993.50	9.49	993.46	0.92	-0.92	0.06
5,403.00	89.15	358.53	4,684.41	1,056.48	7.89	1,056.44	2.06	-2.06	-0.05
5,466.00	89.42	358.47	4,685.20	1,119.45	6.24	1,119.42	0.44	0.43	-0.10
5,529.00	89.90	358.29	4,685.57	1,182.42	4.46	1,182.40	0.81	0.76	-0.29
5,592.00	90.22	357.50	4,685.50	1,245.38	2.15	1,245.36	1.35	0.51	-1.25
5,654.00	90.75	357.07	4,684.98	1,307.31	-0.79	1,307.30	1.10	0.85	-0.69
5,717.00	90.73	357.12	4,684.17	1,370.22	-3.98	1,370.23	0.09	-0.03	0.08
5,781.00	89.76	356.92	4,683.89	1,434.13	-7.31	1,434.15	1.55	-1.52	-0.31
5,844.00	89.78	357.26	4,684.14	1,497.05	-10.51	1,497.08	0.54	0.03	0.54

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5,906.00	90.13	356.54	4,684.19	1,558.96	-13.86	1,559.00	1.29	0.56	-1.16	
5,970.00	90.28	356.72	4,683.96	1,622.85	-17.62	1,622.90	0.37	0.23	0.28	
6,033.00	90.44	358.44	4,683.57	1,685.79	-20.28	1,685.85	2.74	0.25	2.73	
6,096.00	90.27	3.35	4,683.18	1,748.76	-19.30	1,748.82	7.80	-0.27	7.79	
6,158.00	90.22	4.92	4,682.91	1,810.60	-14.83	1,810.64	2.53	-0.08	2.53	
6,221.00	90.62	4.71	4,682.45	1,873.37	-9.54	1,873.40	0.72	0.63	-0.33	
6,284.00	90.13	2.76	4,682.04	1,936.24	-5.43	1,936.24	3.19	-0.78	-3.10	
6,347.00	90.55	2.56	4,681.67	1,999.17	-2.51	1,999.16	0.74	0.67	-0.32	
6,410.00	89.59	0.57	4,681.59	2,062.14	-0.79	2,062.13	3.51	-1.52	-3.16	
6,473.00	90.21	0.94	4,681.70	2,125.13	0.04	2,125.12	1.15	0.98	0.59	
6,537.00	90.76	1.23	4,681.16	2,189.12	1.25	2,189.10	0.97	0.86	0.45	
6,600.00	89.81	0.24	4,680.84	2,252.11	2.06	2,252.09	2.18	-1.51	-1.57	
6,663.00	90.25	359.44	4,680.81	2,315.11	1.88	2,315.09	1.45	0.70	-1.27	
6,726.00	90.47	358.28	4,680.41	2,378.10	0.63	2,378.08	1.87	0.35	-1.84	
6,789.00	91.02	358.28	4,679.59	2,441.06	-1.26	2,441.05	0.87	0.87	0.00	
6,853.00	91.52	358.41	4,678.18	2,505.02	-3.11	2,505.01	0.81	0.78	0.20	
6,916.00	91.92	358.76	4,676.29	2,567.97	-4.66	2,567.97	0.84	0.63	0.56	
6,979.00	91.02	359.10	4,674.67	2,630.94	-5.84	2,630.94	1.53	-1.43	0.54	
7,042.00	88.99	359.42	4,674.66	2,693.93	-6.65	2,693.94	3.26	-3.22	0.51	
7,105.00	89.50	359.67	4,675.49	2,756.92	-7.15	2,756.93	0.90	0.81	0.40	
7,168.00	89.59	359.33	4,675.99	2,819.92	-7.70	2,819.93	0.56	0.14	-0.54	
7,231.00	89.70	359.46	4,676.38	2,882.91	-8.37	2,882.92	0.27	0.17	0.21	
7,295.00	89.95	359.34	4,676.58	2,946.91	-9.04	2,946.92	0.43	0.39	-0.19	
7,357.00	90.21	358.96	4,676.49	3,008.90	-9.96	3,008.92	0.74	0.42	-0.61	
7,421.00	90.35	359.22	4,676.18	3,072.89	-10.97	3,072.91	0.46	0.22	0.41	
7,484.00	90.90	359.72	4,675.49	3,135.89	-11.56	3,135.91	1.18	0.87	0.79	
7,547.00	91.33	359.80	4,674.27	3,198.87	-11.82	3,198.90	0.69	0.68	0.13	
7,610.00	91.78	0.13	4,672.56	3,261.85	-11.86	3,261.87	0.89	0.71	0.52	
7,673.00	89.93	0.77	4,671.62	3,324.84	-11.37	3,324.86	3.11	-2.94	1.02	
7,736.00	89.18	1.27	4,672.11	3,387.83	-10.24	3,387.84	1.43	-1.19	0.79	
7,799.00	89.52	0.95	4,672.82	3,450.81	-9.02	3,450.82	0.74	0.54	-0.51	
7,862.00	89.90	0.74	4,673.14	3,513.80	-8.09	3,513.81	0.69	0.60	-0.33	
7,925.00	90.47	0.44	4,672.94	3,576.80	-7.45	3,576.80	1.02	0.90	-0.48	
7,988.00	91.04	0.40	4,672.11	3,639.79	-6.98	3,639.79	0.91	0.90	-0.06	
8,051.00	91.42	0.07	4,670.75	3,702.77	-6.73	3,702.78	0.80	0.60	-0.52	
8,115.00	92.01	0.26	4,668.84	3,766.75	-6.54	3,766.75	0.97	0.92	0.30	
8,178.00	91.30	359.13	4,667.02	3,829.72	-6.88	3,829.72	2.12	-1.13	-1.79	
8,242.00	90.33	358.89	4,666.11	3,893.70	-7.98	3,893.70	1.56	-1.52	-0.38	
8,305.00	89.22	358.69	4,666.36	3,956.68	-9.31	3,956.69	1.79	-1.76	-0.32	
8,368.00	89.72	358.78	4,666.94	4,019.67	-10.70	4,019.68	0.81	0.79	0.14	
8,431.00	90.42	358.80	4,666.86	4,082.65	-12.03	4,082.67	1.11	1.11	0.03	
8,494.00	91.05	358.97	4,666.05	4,145.63	-13.26	4,145.66	1.04	1.00	0.27	
8,558.00	91.76	358.87	4,664.49	4,209.60	-14.47	4,209.63	1.12	1.11	-0.16	

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #924H
Project:	Eddy County, NM (NAD83 NME)	TVD Reference:	RKB @ 3588.50usft (Trinidad 436)
Site:	Dodd Federal Unit	MD Reference:	RKB @ 3588.50usft (Trinidad 436)
Well:	#924H	North Reference:	Grid
Wellbore:	OH / 63609	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Trinidad 436)	Database:	USA Compass

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)	
8,621.00	91.55	359.10	4,662.67	4,272.57	-15.58	4,272.60	0.49	-0.33	0.37	
8,684.00	90.81	359.65	4,661.37	4,335.55	-16.27	4,335.58	1.46	-1.17	0.87	
8,748.00	90.85	0.14	4,660.44	4,399.54	-16.39	4,399.57	0.77	0.06	0.77	
8,811.00	89.73	0.37	4,660.12	4,462.54	-16.10	4,462.57	1.81	-1.78	0.37	
8,874.00	90.62	0.57	4,659.93	4,525.54	-15.59	4,525.56	1.45	1.41	0.32	
8,937.00	89.99	1.18	4,659.59	4,588.53	-14.63	4,588.55	1.39	-1.00	0.97	
9,000.00	88.59	1.62	4,660.38	4,651.50	-13.09	4,651.52	2.33	-2.22	0.70	
9,062.00	89.59	1.63	4,661.36	4,713.47	-11.33	4,713.48	1.61	1.61	0.02	
9,126.00	89.11	0.74	4,662.09	4,777.45	-10.01	4,777.46	1.58	-0.75	-1.39	
9,189.00	88.90	359.56	4,663.18	4,840.44	-9.84	4,840.44	1.90	-0.33	-1.87	
9,252.00	89.59	359.53	4,664.01	4,903.43	-10.34	4,903.44	1.10	1.10	-0.05	
9,316.00	90.22	359.39	4,664.12	4,967.43	-10.94	4,967.44	1.01	0.98	-0.22	
9,379.00	90.84	359.38	4,663.53	5,030.42	-11.62	5,030.43	0.98	0.98	-0.02	
9,442.00	91.90	359.35	4,662.03	5,093.40	-12.32	5,093.41	1.68	1.68	-0.05	
9,491.00	92.49	359.07	4,660.15	5,142.36	-12.99	5,142.37	1.33	1.20	-0.57	
Final Phoenix MWD Survey										
9,543.00	92.49	359.07	4,657.89	5,194.31	-13.83	5,194.32	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	
781.00	780.97	-2.96	2.91	Tie In	
929.00	928.96	-2.76	4.91	First Phoenix MWD Survey	
9,491.00	4,660.15	5,142.36	-12.99	Final Phoenix MWD Survey	
9,543.00	4,657.89	5,194.32	-13.83	Projection to TD	