



COG Operating LLC

Eddy County, NM (NAD27 NME)

Dodd Federal Unit

#636

30-015-40893

WB1 / Job #1412049

Design: Surveys (Basic 38)

Standard Survey Report

31 October, 2014



PHOENIX
TECHNOLOGY SERVICES



Phoenix Technology Services
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #636
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3611.00usft (Basic 38)
Site:	Dodd Federal Unit	MD Reference:	KB @ 3611.00usft (Basic 38)
Well:	#636	North Reference:	Grid
Wellbore:	WB1 / Job #1412049	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Basic 38)	Database:	Compass 5000 GCR epdm

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:		Dodd Federal Unit			
Site Position:		Northing:	669,009.70 usft	Latitude:	32° 50' 19.97600 N
From:	Map	Easting:	585,704.90 usft	Longitude:	104° 3' 15.44871 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.15 °

Well:	#636					
Well Position	+N-S	0.00 usft	Northings:	664,901.40 usft	Latitude:	32° 49' 39.29080 N
	+E-W	0.00 usft	Easting:	586,934.80 usft	Longitude:	104° 3' 1.16210 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	3,599.00 usft

Wellbore:	WB1 / Job #1412049
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Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
	IGRF2010_14	10/27/2014	(μ) 7.44	($^\circ$) 60.58	(nT) 48,588

Design:		Surveys (Basic 38)			
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)	($^\circ$)	
	0.00	0.00	0.00	359.65	

Survey Program		Date	10/31/2014		
From	To	Survey (Wellbore)	Tool Name	Description	
(usft)	(usft)				
100.00	900.00	VES Gyro Survey (WB1 / Job #1412049)	VES-ISCWSA-GYRO-3	Biaxial Semi-Cont. Gyro	
900.00	4,581.00	Phoenix MWD Survey (WB1 / Job #14120	PHX+MWD+IGRF	PHX+MWD+IGRF v3:standard declination	

Survey									
Measured Depth (usft)	Inclination ($^{\circ}$)	Azimuth ($^{\circ}$)	Vertical Depth (usft)	+N-S (usft)	+E-W (usft)	Vertical Section (usft)	Dogleg Rate ($^{\circ}$ /100usft)	Build Rate ($^{\circ}$ /100usft)	Turn Rate ($^{\circ}$ /100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.17	161.99	100.00	-0.14	0.05	-0.14	0.17	0.17	0.00
200.00	0.17	174.69	200.00	-0.43	0.11	-0.43	0.04	0.00	12.70
300.00	0.38	331.51	300.00	-0.29	-0.04	-0.29	0.54	0.21	156.82
400.00	0.21	15.12	400.00	0.18	-0.15	0.18	0.27	-0.17	43.61
500.00	0.13	266.51	500.00	0.35	-0.21	0.35	0.28	-0.08	-108.61
600.00	0.15	141.51	600.00	0.24	-0.25	0.24	0.25	0.02	-124.90
700.00	0.22	85.85	700.00	0.15	0.03	0.15	0.18	0.07	-55.76
800.00	0.71	51.91	799.99	0.55	0.71	0.55	0.54	0.49	-33.94
900.00	0.45	42.88	899.99	1.22	1.46	1.22	0.27	-0.26	-9.03



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Survey Report



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Site:	Dodd Federal Unit	MD Reference:	KB @ 3611.00usft (Basic 38)
Well:	#636	North Reference:	Grid
Wellbore:	WVB1 / Job #1412049	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Basic 38)	Database:	Compass 5000 GCR epdm

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)
Tie-on to VES Gyro Survey									
1,019.00	0.80	20.20	1,018.98	2.34	2.06	2.34	0.35	0.29	-19.06
First Phoenix MWD Survey									
1,083.00	1.80	350.20	1,082.96	3.75	2.05	3.75	1.84	1.56	-46.88
1,146.00	3.40	347.20	1,145.90	6.55	1.47	6.55	2.55	2.54	-4.76
1,209.00	4.30	349.00	1,208.75	10.69	0.60	10.69	1.44	1.43	2.86
1,272.00	4.80	355.30	1,271.56	15.63	-0.07	15.63	1.12	0.79	10.00
1,335.00	4.80	355.50	1,334.34	20.89	-0.49	20.89	0.03	0.00	0.32
1,399.00	4.90	8.00	1,398.11	26.27	-0.32	26.27	1.66	0.16	19.53
1,462.00	4.40	4.60	1,460.90	31.34	0.25	31.34	0.91	-0.79	-5.40
1,525.00	3.90	3.59	1,523.74	35.89	0.58	35.88	0.80	-0.79	-1.60
1,589.00	3.60	359.70	1,587.60	40.07	0.70	40.07	0.61	-0.47	-6.08
1,652.00	3.50	0.80	1,650.48	43.97	0.72	43.97	0.19	-0.16	1.75
1,715.00	3.40	1.00	1,713.36	47.76	0.78	47.76	0.16	-0.16	0.32
1,779.00	3.20	1.20	1,777.26	51.44	0.85	51.44	0.31	-0.31	0.31
1,842.00	3.10	0.40	1,840.16	54.90	0.90	54.90	0.17	-0.16	-1.27
1,905.00	3.30	358.20	1,903.06	58.42	0.85	58.42	0.37	0.32	-3.49
1,968.00	3.30	356.50	1,965.96	62.04	0.59	62.04	0.16	0.00	-2.70
2,032.00	3.50	355.70	2,029.85	65.83	0.43	65.83	0.32	0.31	-1.25
2,095.00	3.90	357.80	2,092.72	69.89	0.20	69.89	0.67	0.63	3.33
2,158.00	3.90	359.60	2,155.57	74.17	0.10	74.17	0.19	0.00	2.86
2,222.00	3.60	358.30	2,219.43	78.36	0.03	78.36	0.49	-0.47	-2.03
2,285.00	3.60	358.30	2,282.31	82.31	-0.09	82.31	0.00	0.00	0.00
2,411.00	3.50	355.60	2,408.07	90.10	-0.50	90.10	0.15	-0.08	-2.14
2,474.00	3.70	356.90	2,470.94	94.05	-0.76	94.05	0.34	0.32	2.06
2,538.00	3.80	357.70	2,534.80	98.23	-0.95	98.23	0.18	0.16	1.25
2,601.00	3.80	359.20	2,597.67	102.40	-1.07	102.40	0.16	0.00	2.38
2,665.00	4.00	358.60	2,661.52	106.75	-1.15	106.75	0.32	0.31	-0.94
2,728.00	3.90	0.80	2,724.37	111.09	-1.18	111.09	0.29	-0.16	3.49
2,791.00	3.80	0.30	2,787.23	115.32	-1.13	115.32	0.17	-0.16	-0.79
2,855.00	3.80	3.30	2,851.09	119.56	-1.00	119.56	0.31	0.00	4.69
2,918.00	3.80	3.90	2,913.95	123.73	-0.74	123.73	0.06	0.00	0.95
2,981.00	3.70	0.30	2,976.81	127.84	-0.59	127.84	0.41	-0.16	-5.71
3,045.00	3.70	0.20	3,040.68	131.97	-0.57	131.97	0.01	0.00	-0.16
3,108.00	3.90	0.60	3,103.54	136.15	-0.54	136.15	0.32	0.32	0.63
3,171.00	3.80	2.40	3,166.40	140.37	-0.43	140.38	0.25	-0.16	2.85
3,235.00	3.80	1.70	3,230.26	144.61	-0.28	144.61	0.07	0.00	-1.09
3,298.00	3.90	0.30	3,293.12	148.84	-0.20	148.84	0.22	0.16	-2.22
3,361.00	3.80	1.00	3,355.97	153.07	-0.16	153.07	0.18	-0.16	1.11
3,424.00	3.80	358.70	3,418.83	157.25	-0.17	157.25	0.24	0.00	-3.65
3,487.00	3.90	0.10	3,481.69	161.48	-0.21	161.48	0.22	0.18	2.22
3,550.00	4.00	1.60	3,544.54	165.82	-0.15	165.82	0.23	0.16	2.38
3,613.00	3.70	359.00	3,607.40	170.04	-0.12	170.04	0.55	-0.48	-4.13



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3,676.00	3.80	359.70	3,670.27	174.16	-0.17	174.16	0.17	0.16	1.11
3,803.00	4.00	359.00	3,796.97	182.80	-0.27	182.80	0.16	0.16	-0.55
3,866.00	4.00	1.00	3,859.82	187.20	-0.27	187.20	0.22	0.00	3.17
3,929.00	3.70	1.30	3,922.68	191.42	-0.18	191.42	0.48	-0.48	0.48
3,992.00	3.50	357.50	3,985.55	195.38	-0.22	195.38	0.49	-0.32	-6.03
4,056.00	3.20	358.30	4,049.44	199.12	-0.36	199.12	0.47	-0.47	1.25
4,119.00	3.60	1.20	4,112.33	202.85	-0.37	202.85	0.69	0.63	4.60
4,183.00	3.40	0.30	4,176.21	206.76	-0.32	206.76	0.32	-0.31	-1.41
4,247.00	3.60	4.70	4,240.09	210.66	-0.14	210.66	0.52	0.31	6.88
4,310.00	3.40	356.10	4,302.98	214.49	-0.11	214.49	0.89	-0.32	-13.65
4,373.00	3.30	355.10	4,365.87	218.16	-0.39	218.16	0.18	-0.16	-1.59
4,436.00	3.30	355.30	4,428.76	221.78	-0.69	221.78	0.02	0.00	0.32
4,499.00	3.60	359.30	4,491.65	225.56	-0.87	225.56	0.61	0.48	6.35
4,531.00	3.70	359.50	4,523.58	227.60	-0.89	227.60	0.32	0.31	0.63
Last Phoenix MWD Survey									
4,581.00	3.70	359.50	4,573.48	230.83	-0.91	230.83	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)	
900.00	899.99	1.22	1.46	Tie-on to VES Gyro Survey
1,019.00	1,018.98	2.34	2.06	First Phoenix MWD Survey
4,531.00	4,523.58	227.60	-0.89	Last Phoenix MWD Survey
4,581.00	4,573.48	230.83	-0.91	Projection to TD

Checked By: _____ Approved By: _____ Date: _____