



30-025-39858

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COG Operating LLC

Lea County, NM (NAD27 NME)

GC Federal #43

GC Federal #43

MAR 28 2011

HOBBSOCD

OH

Design: Actual

Standard Survey Report

16 February, 2011



Scientific Drilling
Directional Drilling Operations



Scientific Drilling
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well GC Federal #43
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 3972.00usft (JW #4)
Site:	GC Federal #43	MD Reference:	KB Elev (13') @ 3972.00usft (JW #4)
Well:	GC Federal #43	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Julio

Project	Lea 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		GC Federal #43			
Site Position:		Northing:	660,209.10 usft	Latitude:	32° 48' 49.770 N
From:	Map	Easting:	666,841.00 usft	Longitude:	103° 47' 25.007 W
Position Uncertainty:	0.00 usft	Slot Radius:	0 "	Grid Convergence:	0.29 °

Well	GC Federal #43					
Well Position	+N/-S	0.00 usft	Northing:	660,209.10 usft	Latitude:	32° 48' 49.770 N
	+E/-W	0.00 usft	Easting:	666,841.00 usft	Longitude:	103° 47' 25.007 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	3,959.00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	2011/01/27	7.78	60.70	48,982

Design	Actual				
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	332.36	

Survey Program	Date 2011/02/16			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100.00	2,107.00	Gyro Survey (OH)	Keeper	Standard Wireline Keeper ver 1.0.2
2,176.00	7,067.00	MWD Survey (OH)	MWD	MWD - Standard

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
100.00	0.41	71.74	100.00	0.11	0.34	-0.06	0.41	0.41	0.00
200.00	0.27	48.88	200.00	0.38	0.86	-0.06	0.19	-0.14	-22.86
300.00	0.45	38.70	300.00	0.84	1.28	0.15	0.19	0.18	-10.18
400.00	0.45	351.15	399.99	1.54	1.47	0.68	0.36	0.00	-47.55
500.00	0.74	342.22	499.99	2.54	1.21	1.69	0.30	0.29	-8.93
600.00	0.78	345.95	599.98	3.81	0.85	2.99	0.06	0.04	3.73
700.00	0.69	347.28	699.97	5.06	0.55	4.23	0.09	-0.09	1.33
800.00	0.69	341.49	799.96	6.22	0.22	5.41	0.07	0.00	-5.79
900.00	0.67	11.30	899.96	7.36	0.15	6.45	0.35	-0.02	29.81



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Site:	GC Federal #43	MD Reference:	KB Elev (13') @ 3972.00usft (JW #4)
Well:	GC Federal #43	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Julio

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	0.50	37.71	999.95	8.28	0.53	7.09	0.31	-0.17	26.41
1,100.00	0.43	55.96	1,099.95	8.84	1.11	7.32	0.16	-0.07	18.25
1,200.00	0.37	61.99	1,199.95	9.20	1.70	7.36	0.07	-0.06	6.03
1,300.00	0.45	66.12	1,299.94	9.51	2.35	7.34	0.09	0.08	4.13
1,400.00	0.59	87.32	1,399.94	9.69	3.22	7.09	0.24	0.14	21.20
1,500.00	0.81	77.88	1,499.93	9.87	4.43	6.69	0.25	0.22	-9.44
1,600.00	0.90	72.98	1,599.92	10.24	5.87	6.35	0.12	0.09	-4.90
1,700.00	1.20	66.63	1,699.90	10.89	7.58	6.13	0.32	0.30	-6.35
1,800.00	1.74	64.98	1,799.87	11.95	9.92	5.98	0.54	0.54	-1.65
1,900.00	2.01	60.32	1,899.82	13.46	12.82	5.98	0.31	0.27	-4.66
2,000.00	1.99	53.45	1,999.76	15.36	15.73	6.31	0.24	-0.02	-6.87
2,100.00	1.61	48.10	2,099.71	17.33	18.17	6.92	0.42	-0.38	-5.35
2,107.00	1.60	50.22	2,106.70	17.46	18.32	6.97	0.86	-0.14	30.29
Gyro Tie-in									
2,176.00	1.55	51.08	2,175.68	18.66	19.79	7.35	0.08	-0.07	1.25
2,238.00	2.71	353.89	2,237.64	20.65	20.29	8.88	3.68	1.87	-92.24
2,301.00	4.18	345.81	2,300.52	24.35	19.56	12.50	2.45	2.33	-12.83
2,364.00	5.42	334.33	2,363.30	29.26	17.71	17.70	2.48	1.97	-18.22
2,426.00	6.12	336.49	2,424.99	34.93	15.13	23.93	1.18	1.13	3.48
2,488.00	6.53	335.03	2,486.61	41.16	12.32	30.75	0.71	0.66	-2.35
2,581.00	6.68	336.71	2,578.99	50.92	7.95	41.42	0.26	0.16	1.81
2,675.00	7.49	330.49	2,672.28	61.27	2.77	53.00	1.19	0.86	-6.62
2,768.00	8.53	329.29	2,764.37	72.48	-3.74	65.94	1.13	1.12	-1.29
2,862.00	9.56	328.43	2,857.20	85.12	-11.39	80.69	1.11	1.10	-0.91
2,955.00	10.63	327.38	2,948.76	98.93	-20.05	96.94	1.17	1.15	-1.13
3,049.00	12.77	327.13	3,040.80	114.96	-30.37	115.93	2.28	2.28	-0.27
3,142.00	12.23	327.73	3,131.59	131.92	-41.21	135.98	0.60	-0.58	0.65
3,236.00	11.24	326.69	3,223.63	148.00	-51.55	155.02	1.08	-1.05	-1.11
3,329.00	10.99	327.55	3,314.88	163.05	-61.29	172.87	0.32	-0.27	0.92
3,423.00	11.84	325.66	3,407.02	178.57	-71.53	191.38	0.99	0.90	-2.01
3,516.00	12.63	329.80	3,497.91	195.24	-82.03	211.01	1.27	0.85	4.45
3,610.00	12.23	329.42	3,589.71	212.69	-92.27	231.22	0.43	-0.43	-0.40
3,703.00	11.81	329.24	3,680.67	229.35	-102.14	250.56	0.45	-0.45	-0.19
3,796.00	12.49	329.99	3,771.59	246.24	-112.04	270.12	0.75	0.73	0.81
3,889.00	12.19	327.92	3,862.44	263.27	-122.29	289.95	0.57	-0.32	-2.23
3,989.00	11.45	328.03	3,960.32	280.63	-133.15	310.38	0.74	-0.74	0.11
4,052.00	11.23	329.27	4,022.09	291.21	-139.59	322.74	0.52	-0.35	1.97
4,145.00	12.83	325.62	4,113.04	307.52	-150.05	342.04	1.90	1.72	-3.92
4,239.00	12.31	327.16	4,204.79	324.55	-161.38	362.38	0.66	-0.55	1.64
4,333.00	11.86	327.35	4,296.71	341.10	-172.03	381.98	0.48	-0.48	0.20
4,427.00	12.07	329.70	4,388.67	357.72	-182.20	401.42	0.56	0.22	2.50
4,520.00	11.82	328.52	4,479.65	374.24	-192.08	420.64	0.38	-0.27	-1.27
4,614.00	11.70	329.52	4,571.68	390.66	-201.94	439.76	0.25	-0.13	1.06



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Well:	GC Federal #43	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Julio

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)
4,709.00	11.55	331.95	4,664.73	407.36	-211.30	458.90	0.54	-0.16	2.56
4,804.00	11.33	330.70	4,757.84	423.89	-220.34	477.73	0.35	-0.23	-1.32
4,896.00	10.43	331.79	4,848.19	439.11	-228.69	495.09	1.00	-0.98	1.18
4,990.00	9.54	333.89	4,940.76	453.60	-236.15	511.39	1.02	-0.95	2.23
5,083.00	9.46	332.77	5,032.49	467.32	-243.03	526.74	0.22	-0.09	-1.20
5,179.00	8.76	334.34	5,127.28	480.92	-249.81	541.93	0.77	-0.73	1.64
5,271.00	7.48	327.86	5,218.36	492.31	-256.03	554.90	1.71	-1.39	-7.04
5,364.00	6.46	331.79	5,310.67	502.05	-261.72	566.17	1.21	-1.10	4.23
5,459.00	5.60	332.09	5,405.14	510.85	-266.42	576.15	0.91	-0.91	0.32
5,546.00	4.69	332.92	5,491.79	517.77	-270.02	583.95	1.05	-1.05	0.95
5,639.00	4.92	322.33	5,584.46	524.31	-274.19	591.68	0.98	0.25	-11.39
5,732.00	3.44	320.20	5,677.21	529.61	-278.42	598.33	1.60	-1.59	-2.29
5,825.00	2.66	319.90	5,770.08	533.41	-281.59	603.17	0.84	-0.84	-0.32
5,919.00	3.60	286.09	5,863.95	535.89	-285.83	607.34	2.16	1.00	-35.97
6,012.00	2.47	339.80	5,956.83	538.58	-289.33	611.35	3.14	-1.22	57.75
6,106.00	2.62	336.28	6,050.74	542.45	-290.90	615.50	0.23	0.16	-3.74
6,200.00	2.61	337.37	6,144.64	546.39	-292.58	619.77	0.05	-0.01	1.16
6,294.00	2.80	338.28	6,238.54	550.50	-294.26	624.19	0.21	0.20	0.97
6,387.00	2.57	335.80	6,331.44	554.52	-295.95	628.53	0.28	-0.25	-2.67
6,480.00	2.66	335.55	6,424.34	558.38	-297.70	632.77	0.10	0.10	-0.27
6,572.00	2.66	335.55	6,516.24	562.27	-299.47	637.03	0.00	0.00	0.00
6,667.00	3.81	348.20	6,611.09	567.37	-301.02	642.27	1.42	1.21	13.32
6,760.00	3.78	349.12	6,703.88	573.40	-302.23	648.17	0.07	-0.03	0.99
6,854.00	3.80	346.18	6,797.68	579.47	-303.56	654.17	0.21	0.02	-3.13
6,947.00	3.68	347.82	6,890.48	585.38	-304.93	660.04	0.17	-0.13	1.76
7,017.00	3.61	346.00	6,960.34	589.71	-305.94	664.34	0.19	-0.10	-2.60
Last MWD Survey									
7,067.00	3.61	346.00	7,010.24	592.77	-306.70	667.40	0.00	0.00	0.00
Projection to Bit									

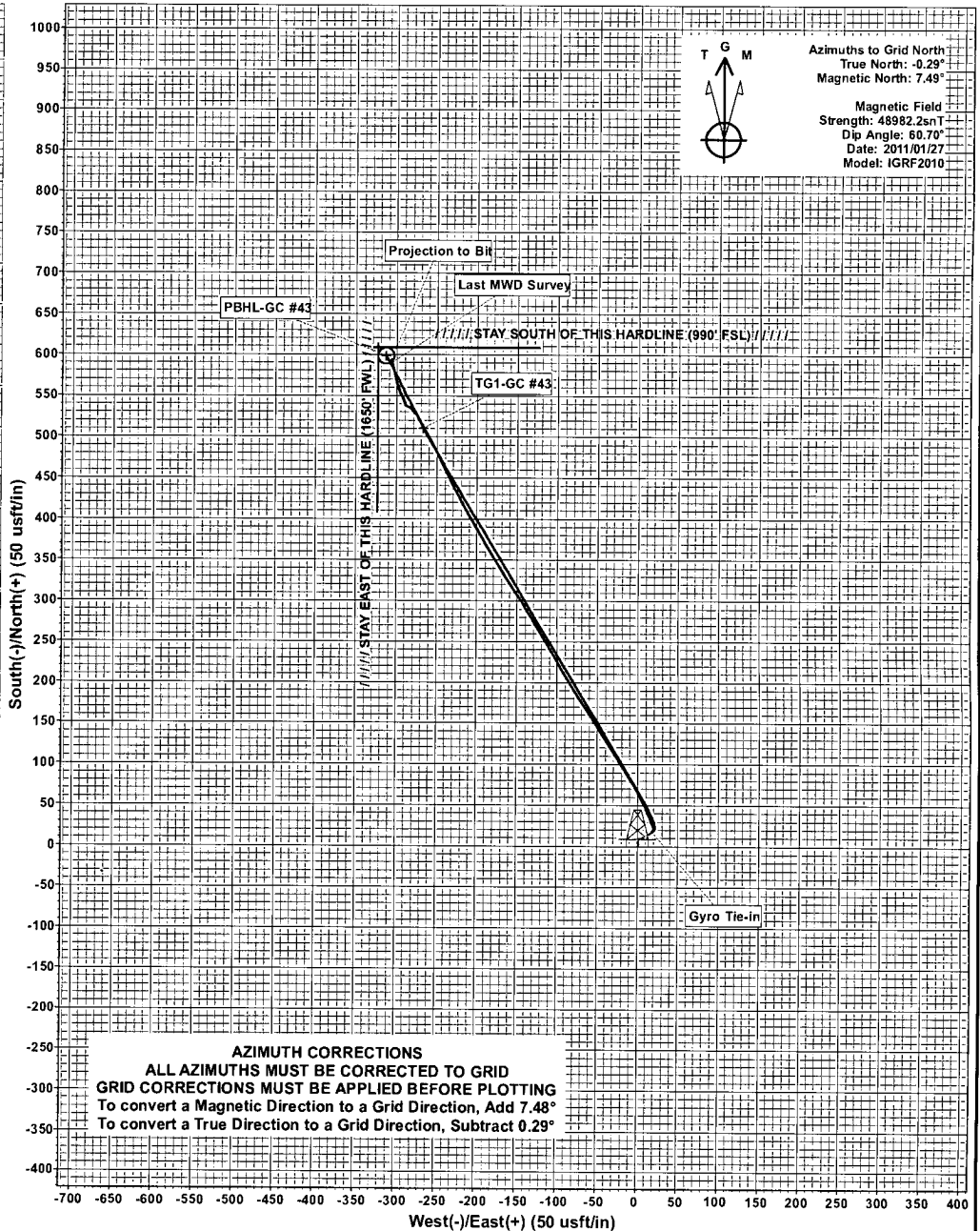
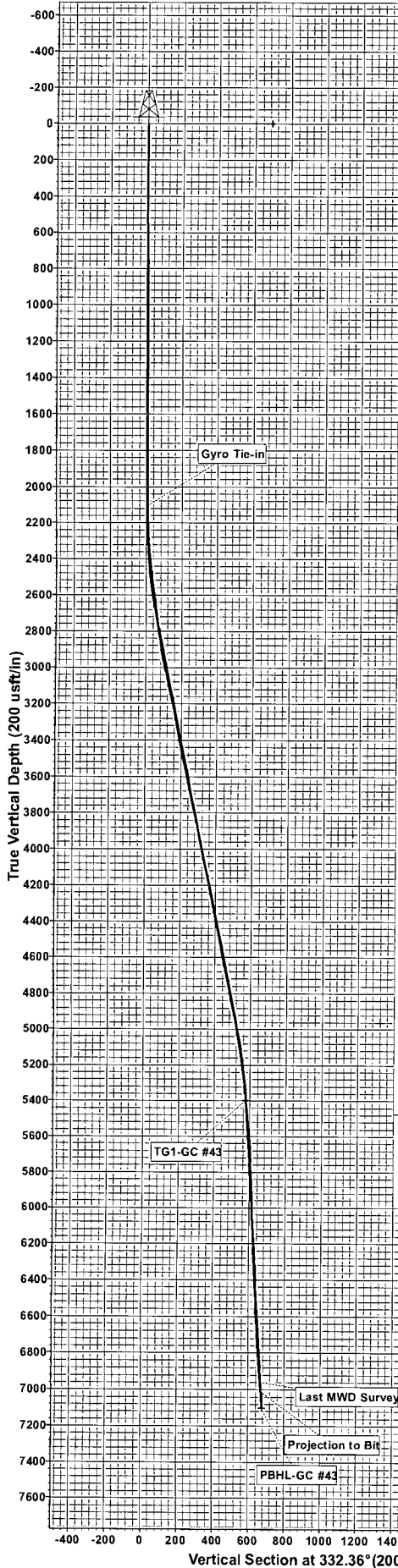
Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		
		+N/-S (usft)	+E/-W (usft)	Comment
2,107.00	2,106.70	17.46	18.32	Gyro Tie-in
7,017.00	6,960.34	589.71	-305.94	Last MWD Survey
7,067.00	7,010.24	592.77	-306.70	Projection to Bit

Checked By: _____ Approved By: _____ Date: _____



Scientific Drilling for COG Operating LLC
Site: Lea County, NM (NAD27 NME)
Well: GC Federal #43
Wellbore: OH
Design: Plan #2 vs Actual - 7-7/8" Hole



AZIMUTH CORRECTIONS
ALL AZIMUTHS MUST BE CORRECTED TO GRID
GRID CORRECTIONS MUST BE APPLIED BEFORE PLOTTING
To convert a Magnetic Direction to a Grid Direction, Add 7.48°
To convert a True Direction to a Grid Direction, Subtract 0.29°

WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape
South HL-GC #43	0.00	608.20	-323.30	660817.30	666517.70	32°48' 55.805 N	103°47' 28.758 W	Rectangle (Sides: L 0.00 W200.00)
West HL-GC #43	0.00	608.20	-323.30	660817.30	666517.70	32°48' 55.805 N	103°47' 28.758 W	Rectangle (Sides: L2 00.00 W00.00)
TG1-GC #43	5400.00	509.62	-266.91	660718.72	666574.09	32°48' 54.826 N	103°47' 28.103 W	Point
PBHL-GC #43	7100.00	598.20	-313.30	660807.30	666527.70	32°48' 55.705 N	103°47' 28.642 W	Circle (Radius: 10.0 0)

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VFace	Target
1	2107.00	1.60	50.22	2106.70	17.46	18.32	0.00	0.00	6.97	
2	2200.00	1.60	50.22	2199.67	19.12	20.32	0.00	0.00	7.51	
3	2772.84	11.59	328.77	2768.45	73.61	-3.44	2.00	-89.28	66.80	
4	5043.03	11.59	328.77	4992.38	463.50	-239.83	0.00	0.00	521.87	
5	5454.49	3.37	332.36	5400.00	509.62	-266.91	2.00	178.53	575.28	TG1-GC #43
6	7157.43	3.37	332.36	7100.00	598.20	-313.30	0.00	0.00	675.28	PBHL-GC #43

WELL DETAILS: GC Federal #43

+N/-S	+E/-W	Northing	Ground Level:	Easting	Latitude	Longitude	Slot
0.00	0.00	660209.10	3959.00	666841.00	32°48' 49.770 N	103°47' 25.007 W	

PROJECT DETAILS: Lea County, NM (NAD27 NME)

Plan: Plan #2 - 7-7/8" Hole (GC Federal #43/OH)

Geodetic System: US State Plane 1927 (Exact solution)	Created By: Julio Pina	Date: 27-Jan-11
Datum: NAD 1927 (NADCON CONUS)	Checked: _____	Date: _____
Ellipsoid: Clarke 1866	Reviewed: _____	Date: _____
Zone: New Mexico East 3001	Approved: _____	Date: _____
System Datum: Mean Sea Level		