

DRILLING CONTRACTOR *United Drilling, Inc.*

K2



30-025-39873

COG OPERATING LLC

Lea County, NM (NAD27 NME)

JC Federal #48

JC Federal #48

OH

RECEIVED

APR 12 2011
HOBBSOCD

Survey: MWD Survey

SDI Standard Survey Report

21 February, 2011

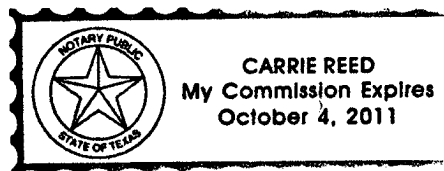
This survey is correct to the best of my knowledge and is supported by actual field data.

Subarto

Notarized this date 21st of February, 2011.

Carrie Reed

Notary Signature
County of Midland
State of Texas



Scientific Drilling
Directional Drilling Operations



Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well JC Federal #48
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (20') @ 4019.0usft (United #42)
Site:	JC Federal #48	MD Reference:	KB Elev (20') @ 4019.0usft (United #42)
Well:	JC Federal #48	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

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	JC Federal #48		
Site Position:		Northing:	662,359.50 usft
From:	Map	Easting:	678,708.70 usft
Position Uncertainty:	0.0 usft	Slot Radius:	0"
		Latitude:	32° 49' 10.424 N
		Longitude:	103° 45' 5.812 W
		Grid Convergence:	0.32 °

Well	JC Federal #48		
Well Position	+N/-S	0.0 usft	Northing:
	+E/-W	0.0 usft	Easting:
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft
		Latitude:	32° 49' 10.424 N
		Longitude:	103° 45' 5.812 W
		Ground Level:	3,999.0 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	1/28/2011	7.76	60.72	48,989

Design	Actual			
Audit Notes:				
Version:	1.0	Phase:	ACTUAL	Tie On Depth: 0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	239.08

Survey Program	Date 2/21/2011			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100.0	2,093.0	Gyro Survey (OH)	Keeper	Standard Wireline Keeper ver 1.0.2
2,169.0	5,982.0	MWD Survey (OH)	MWD	MWD - Standard

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.0
100.0	0.28	81.71	100.0	0.0	0.2	81.71	0.2
200.0	0.33	101.68	200.0	0.0	0.8	89.09	0.8
300.0	0.50	124.59	300.0	-0.3	1.4	101.80	1.4
400.0	0.83	145.95	400.0	-1.1	2.2	117.73	2.5
500.0	1.45	155.41	500.0	-2.9	3.1	132.98	4.2
600.0	2.03	159.75	599.9	-5.7	4.2	143.36	7.1
700.0	2.39	157.41	699.8	-9.3	5.7	148.66	10.9
800.0	3.04	157.09	799.7	-13.7	7.5	151.26	15.6
900.0	3.40	157.99	899.6	-18.9	9.6	152.93	21.2
1,000.0	3.18	160.20	999.4	-24.2	11.7	154.24	26.9



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Well:	JC Federal #48	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
1,100.0	2.80	160.15	1,099.3	-29.1	13.5	155.20	32.1
1,200.0	2.33	157.87	1,199.2	-33.3	15.0	155.68	36.5
1,300.0	1.91	155.86	1,299.1	-36.7	16.5	155.80	40.2
1,400.0	1.71	150.47	1,399.1	-39.5	17.9	155.62	43.4
1,500.0	1.25	143.47	1,499.0	-41.7	19.3	155.16	45.9
1,600.0	0.96	119.91	1,599.0	-43.0	20.7	154.32	47.7
1,700.0	1.12	101.95	1,699.0	-43.6	22.4	152.86	49.0
1,800.0	1.31	95.97	1,799.0	-43.9	24.4	150.90	50.3
1,900.0	1.44	82.69	1,898.9	-43.9	26.8	148.56	51.4
2,000.0	1.56	68.08	1,998.9	-43.2	29.3	145.83	52.2
2,093.0	1.57	59.25	2,091.9	-42.1	31.6	143.10	52.6



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Well:	JC Federal #48	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

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	JC Federal #48		
Site Position:		Northing:	662,359.50 usft
From:	Map	Easting:	678,708.70 usft
Position Uncertainty:	0.0 usft	Slot Radius:	0"
		Latitude:	32° 49' 10.424 N
		Longitude:	103° 45' 5.812 W
		Grid Convergence:	0.32 °

Well	JC Federal #48		
Well Position	+N/-S	0.0 usft	Northing: 662,359.50 usft
	+E/-W	0.0 usft	Easting: 678,708.70 usft
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft
		Latitude:	32° 49' 10.424 N
		Longitude:	103° 45' 5.812 W
		Ground Level:	3,999.0 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	1/28/2011	7.76	60.72	48,989

Design	Actual			
Audit Notes:				
Version:	1.0	Phase:	ACTUAL	Tie On Depth: 0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	239.08

Survey Program	Date	2/21/2011		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100.0	2,093.0	Gyro Survey (OH)	Keeper	Standard Wireline Keeper ver 1.0.2
2,169.0	5,933.0	MWD Survey (OH)	MWD	MWD - Standard

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
2,093.0	1.57	59.25	2,091.9	-42.1	31.6	143.10	52.6
2,169.0	1.27	60.98	2,167.8	-41.2	33.2	141.07	52.9
2,264.0	1.52	321.34	2,262.8	-39.7	33.4	139.92	51.8
2,359.0	3.66	285.13	2,357.7	-37.9	29.7	141.94	48.1
2,454.0	5.48	273.59	2,452.4	-36.8	22.2	148.90	43.0
2,549.0	7.30	262.30	2,546.8	-37.3	11.7	162.61	39.1
2,644.0	8.64	251.48	2,640.9	-40.4	-1.1	181.49	40.4
2,739.0	8.00	251.70	2,734.9	-44.8	-14.1	197.48	46.9
2,834.0	7.65	238.50	2,829.0	-50.1	-25.8	207.20	56.4
2,929.0	6.86	237.30	2,923.3	-56.5	-35.9	212.45	67.0
3,024.0	5.98	239.90	3,017.7	-62.0	-45.0	215.94	76.6



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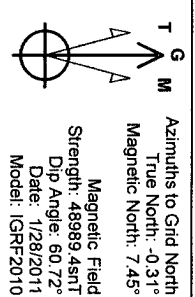
Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well JC Federal #48
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (20') @ 4019.0usft (United #42)
Site:	JC Federal #48	MD Reference:	KB Elev (20') @ 4019.0usft (United #42)
Well:	JC Federal #48	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
3,119.0	6.61	242.00	3,112.1	-67.1	-54.1	218.88	86.2
3,214.0	6.71	243.70	3,206.5	-72.1	-63.9	221.54	96.4
3,309.0	6.73	242.11	3,300.8	-77.2	-73.8	223.71	106.8
3,404.0	7.56	242.25	3,395.1	-82.7	-84.2	225.53	118.1
3,498.0	7.01	243.28	3,488.3	-88.2	-94.8	227.09	129.5
3,593.0	9.22	241.60	3,582.4	-94.4	-106.7	228.51	142.5
3,688.0	9.11	240.70	3,676.2	-101.7	-120.0	229.72	157.3
3,783.0	8.44	240.10	3,770.0	-108.8	-132.6	230.61	171.5
3,878.0	8.09	241.50	3,864.1	-115.5	-144.5	231.36	185.0
3,973.0	8.47	241.00	3,958.1	-122.1	-156.5	232.04	198.5
4,068.0	8.00	241.30	4,052.1	-128.7	-168.4	232.62	211.9
4,163.0	7.83	236.70	4,146.2	-135.4	-179.6	232.99	224.9
4,258.0	7.65	251.07	4,240.3	-141.0	-191.0	233.57	237.4
4,353.0	7.42	251.38	4,334.5	-145.0	-202.8	234.44	249.3
4,448.0	7.38	252.21	4,428.7	-148.8	-214.4	235.24	261.0
4,543.0	8.26	237.79	4,522.8	-154.3	-226.0	235.67	273.7
4,638.0	8.25	238.27	4,616.9	-161.5	-237.6	235.79	287.3
4,733.0	8.08	238.90	4,710.9	-168.6	-249.1	235.91	300.8
4,828.0	8.21	238.80	4,804.9	-175.5	-260.6	236.04	314.2
4,923.0	8.01	240.80	4,899.0	-182.3	-272.2	236.19	327.6
5,018.0	7.93	237.70	4,993.1	-189.0	-283.5	236.31	340.7
5,113.0	6.51	244.10	5,087.3	-194.9	-293.9	236.45	352.6
5,208.0	4.40	245.50	5,181.9	-198.7	-302.0	236.66	361.6
5,303.0	4.51	244.87	5,276.6	-201.8	-308.7	236.83	368.9
5,397.0	2.84	242.40	5,370.4	-204.5	-314.2	236.94	374.8
5,491.0	2.48	242.40	5,464.3	-206.5	-318.0	237.00	379.2
5,587.0	1.52	277.40	5,560.2	-207.3	-321.1	237.16	382.2
5,682.0	1.01	234.30	5,655.2	-207.6	-323.1	237.27	384.0
5,776.0	0.64	219.70	5,749.2	-208.5	-324.1	237.24	385.3
5,871.0	0.58	196.67	5,844.2	-209.4	-324.5	237.17	386.2
5,933.0	0.77	190.04	5,906.2	-210.1	-324.7	237.10	386.7

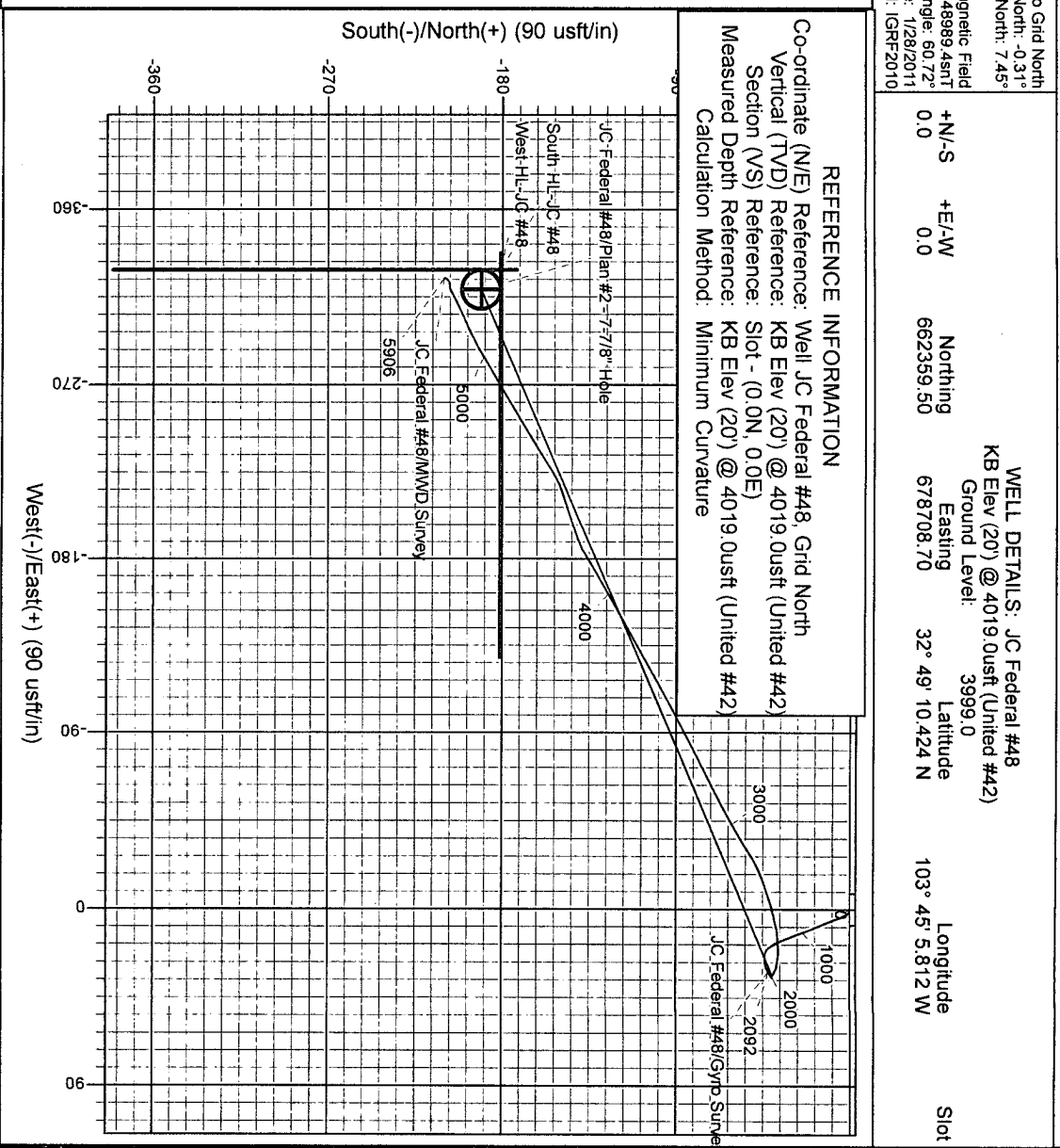
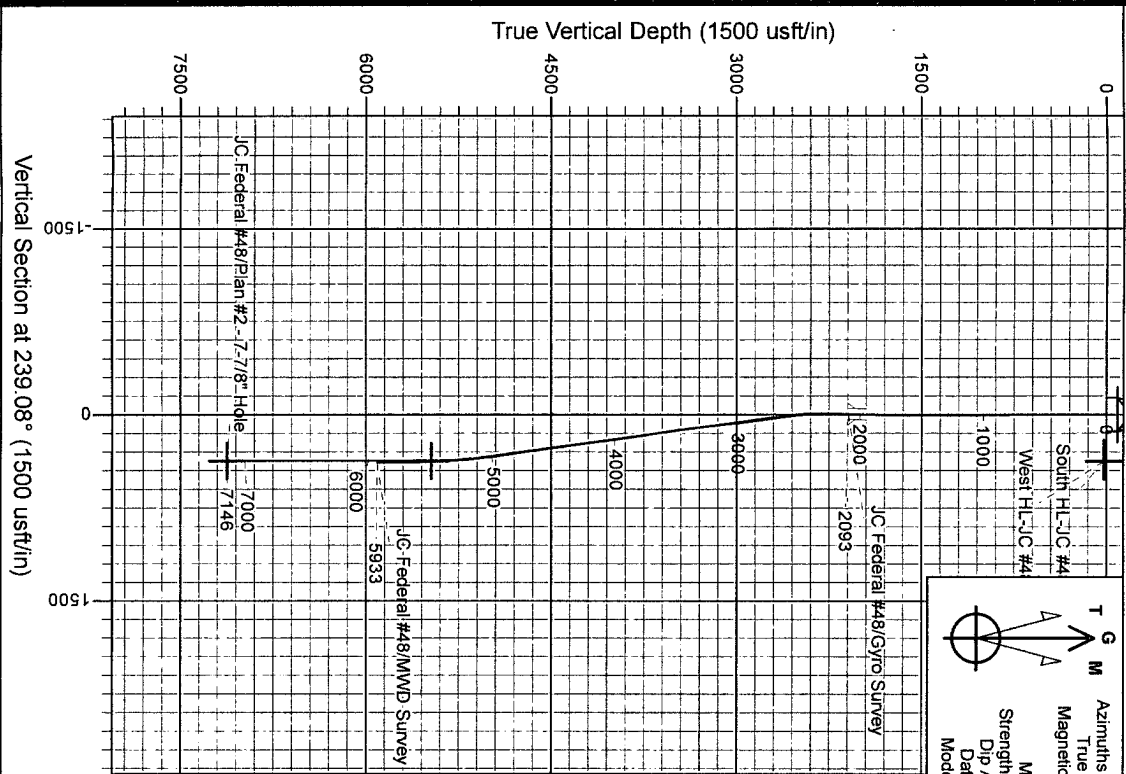
Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,093.0	2,091.9	-42.1	31.6	Gyro Tie-in
5,933.0	5,906.2	-210.1	-324.7	Last MWD Survey
5,982.0	5,955.2	-210.7	-324.8	Projection to Bit



Project: Lea County, NM (NAD27 NME)
Site: JC Federal #48
Well: JC Federal #48
Wellbore: OH
Design: Plan #2 - 7-7/8" Hole



Azimuths to Grid North		WELL DETAILS: JC Federal #48	
True North: -0.31°		KB Elev (20') @ 4019.0usft (United #42)	
Magnetic North: 7.45°		Ground Level: 3999.0	
Magnetic Field		Easting	Latitude
Strength: 48989.45nT		678708.70	32° 49' 10.424 N
Dip Angle: 60.72°			103° 45' 5.812 W
Date: 1/28/2011			
Model: IGRF2010			
+N-/S	+E-/W	Nothing	Slot
0.0	0.0	662359.50	



REFERENCE INFORMATION
Co-ordinate (N/E) Reference: Well JC Federal #48, Grid North
Vertical (TVD) Reference: KB Elev (20') @ 4019.0usft (United #42)
Section (VS) Reference: Slot - (0.0N, 0.0E)
Measured Depth Reference: KB Elev (20') @ 4019.0usft (United #42)
Calculation Method: Minimum Curvature

COMPANY DETAILS: COG OPERATING LLC
223032
Calculation Method: Minimum Curvature
Error System: ISCWSA
Scan Method: Closest Approach 3D
Error Surface: Elliptical Conic
Warning Method: Error Ratio

PROJECT DETAILS: Lea County, NM (NAD27 NME)
Geodetic System: State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001
System Datum: Mean Sea Level

SITE DETAILS: JC Federal #48
Site Centre Latitude: 32° 49' 10.424 N
Longitude: 103° 45' 5.812 W
Positional Uncertainty: 0.0
Convergence: 0.32
Local North: Grid