

30-015- 37881

COG OPERATING LLC

Eddy County, NM (NAN27 NME)

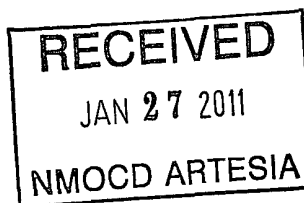
Skelly Unit #672

Skelly Unit #672

OH

Survey: MWD Survey

SDI Standard Survey Report



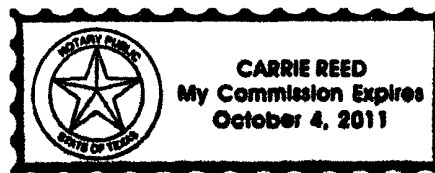
This survey is correct to the best of my knowledge and is supported by actual field data.

Richard

Notarized this date 17th of January, 2011.

Carrie Reed

Notary Signature
County of Midland
State of Texas



Scientific Drilling International, Inc.
SDI Standard Survey Report

Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Site Skelly Unit #672
Project:	Eddy County, NM (NAN27 NME)	TVD Reference:	KB Elev. (12') @ 3919.0usft (Silver Oak #1)
Site:	Skelly Unit #672	MD Reference:	KB Elev. (12') @ 3919.0usft (Silver Oak #1)
Well:	Skelly Unit #672	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

Project	Eddy County, NM (NAN27 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		Skelly Unit #672			
Site Position:		Northing:	666,889.10 usft	Latitude:	32° 49' 56.579 N
From:	Map	Easting:	652,239.70 usft	Longitude:	103° 50' 15.727 W
Position Uncertainty:	0.0 usft	Slot Radius:	0"	Grid Convergence:	0.27 °

Well	Skelly Unit #672					
Well Position	+N/-S	0.0 usft	Northing:	666,889.10 usft	Latitude:	32° 49' 56.579 N
	+E/-W	0.0 usft	Easting:	652,239.70 usft	Longitude:	103° 50' 15.727 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	3,907.0 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF200510	12/7/2010	7.81	60.74	49,036

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	267.24

Survey Program	Date 1/11/2011				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	1,825.0	Gyro Survey (OH)	Keeper	Standard Wireline Keeper ver 1.0.2	
1,903.0	5,632.0	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	0.26	224.16	100.0	-0.2	-0.2	224.16	0.2	
200.0	0.46	211.34	200.0	-0.7	-0.5	218.14	0.8	
300.0	0.40	216.04	300.0	-1.3	-0.9	215.98	1.6	
400.0	0.48	167.43	400.0	-2.0	-1.1	207.96	2.2	
500.0	0.55	169.83	500.0	-2.9	-0.9	197.02	3.0	
600.0	0.66	184.77	600.0	-3.9	-0.8	192.13	4.0	
700.0	0.57	202.46	700.0	-4.9	-1.1	192.30	5.1	
800.0	0.62	200.56	800.0	-5.9	-1.5	193.86	6.1	
900.0	0.52	197.57	900.0	-6.9	-1.8	194.61	7.1	
1,000.0	0.34	205.10	1,000.0	-7.6	-2.0	195.17	7.8	

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Well:	Skelly Unit #672	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	0.31	220.59	1,100.0	-8.0	-2.4	196.32	8.4
1,200.0	0.20	225.86	1,200.0	-8.4	-2.7	197.61	8.8
1,300.0	0.20	295.17	1,300.0	-8.4	-2.9	199.26	8.9
1,400.0	0.69	41.78	1,400.0	-7.9	-2.7	198.86	8.3
1,500.0	0.84	53.00	1,499.9	-7.0	-1.7	193.71	7.2
1,600.0	1.26	52.70	1,599.9	-5.9	-0.2	182.38	5.9
1,700.0	1.54	49.80	1,699.9	-4.3	1.7	159.14	4.7
1,800.0	1.59	43.21	1,799.9	-2.5	3.6	124.20	4.4
1,825.0	1.48	50.86	1,824.9	-2.0	4.1	116.02	4.6

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SDI Standard Survey Report

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Site:	Skelly Unit #672	MD Reference:	KB Elev. (12') @ 3919.0usft (Silver Oak #1)
Well:	Skelly Unit #672	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

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From:	Map	Easting:	652,239.70 usft	Longitude:	103° 50' 15.727 W
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Well	Skelly Unit #672					
Well Position	+N-S	0.0 usft	Northing:	666,889.10 usft	Latitude:	32° 49' 56.579 N
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	IGRF200510	12/7/2010	7.81	60.74	49,036

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	267.24

Survey Program	Date	1/11/2011			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	1,825.0	Gyro Survey (OH)	Keeper	Standard Wireline Keeper ver 1.0.2	
1,903.0	5,632.0	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)	
1,825.0	1.48	50.86	1,824.9	-2.0	4.1	116.02	4.6	
1,903.0	1.60	51.06	1,902.8	-0.7	5.7	96.86	5.8	
1,966.0	0.65	67.44	1,965.8	0.0	6.8	90.01	6.8	
2,028.0	1.19	109.60	2,027.8	-0.1	7.7	90.61	7.7	
2,091.0	2.45	113.78	2,090.8	-0.8	9.5	95.06	9.6	
2,153.0	3.69	117.92	2,152.7	-2.3	12.5	100.47	12.7	
2,216.0	4.44	118.71	2,215.5	-4.4	16.4	105.09	17.0	
2,279.0	5.43	118.52	2,278.3	-7.0	21.2	108.34	22.3	
2,342.0	6.68	115.86	2,340.9	-10.1	27.1	110.33	28.9	
2,404.0	7.73	117.60	2,402.4	-13.6	34.1	111.70	36.7	
2,467.0	7.99	116.65	2,464.9	-17.5	41.7	112.73	45.2	

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Well:	Skelly Unit #672	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)
2,530.0	7.96	117.95	2,527.2	-21.5	49.5	113.47	54.0
2,593.0	7.95	117.79	2,589.6	-25.6	57.2	114.08	62.7
2,656.0	8.22	120.15	2,652.0	-29.9	65.0	114.69	71.5
2,718.0	8.01	121.87	2,713.4	-34.4	72.5	115.38	80.2
2,812.0	8.06	121.68	2,806.5	-41.3	83.6	116.28	93.3
2,906.0	7.94	122.31	2,899.6	-48.2	94.7	116.98	106.3
2,969.0	7.98	122.10	2,961.9	-52.9	102.1	117.37	115.0
3,031.0	8.01	121.25	3,023.3	-57.4	109.4	117.67	123.6
3,094.0	7.98	121.46	3,085.7	-62.0	116.9	117.92	132.3
3,157.0	7.86	122.16	3,148.1	-66.5	124.3	118.16	141.0
3,219.0	7.86	120.58	3,209.6	-70.9	131.5	118.34	149.5
3,283.0	8.05	121.31	3,272.9	-75.5	139.1	118.48	158.3
3,345.0	8.37	122.20	3,334.3	-80.2	146.7	118.66	167.1
3,408.0	8.68	121.90	3,396.6	-85.1	154.6	118.84	176.5
3,471.0	8.56	122.39	3,458.9	-90.1	162.6	119.01	185.9
3,534.0	8.66	123.85	3,521.2	-95.3	170.5	119.20	195.3
3,627.0	8.21	118.79	3,613.2	-102.4	182.1	119.35	208.9
3,721.0	7.30	116.99	3,706.3	-108.3	193.3	119.27	221.6
3,784.0	6.98	118.51	3,768.8	-112.0	200.2	119.21	229.4
3,846.0	7.25	119.98	3,830.4	-115.7	206.9	119.22	237.1
3,909.0	7.38	120.09	3,892.8	-119.7	213.9	119.24	245.1
3,971.0	7.81	121.15	3,954.3	-123.9	220.9	119.29	253.3
4,034.0	8.31	121.20	4,016.7	-128.5	228.5	119.35	262.1
4,128.0	7.82	116.99	4,109.7	-134.9	240.0	119.34	275.3
4,223.0	7.99	116.77	4,203.8	-140.8	251.7	119.23	288.4
4,317.0	7.53	118.64	4,297.0	-146.7	262.9	119.16	301.1
4,411.0	7.06	121.53	4,390.2	-152.7	273.2	119.20	313.0
4,504.0	7.24	122.37	4,482.5	-158.8	283.0	119.30	324.6
4,567.0	7.85	121.42	4,544.9	-163.2	290.1	119.36	332.8
4,629.0	7.58	123.66	4,606.4	-167.7	297.1	119.44	341.1
4,692.0	6.76	122.04	4,668.9	-171.9	303.7	119.52	349.0
4,755.0	6.47	121.50	4,731.5	-175.7	309.9	119.56	356.2
4,818.0	6.84	120.73	4,794.1	-179.5	316.1	119.59	363.5
4,849.0	7.22	120.65	4,824.8	-181.5	319.4	119.60	367.3
4,880.0	7.29	120.13	4,855.6	-183.4	322.7	119.61	371.2
4,912.0	6.67	119.70	4,887.3	-185.4	326.1	119.62	375.1
4,943.0	5.85	121.08	4,918.1	-187.1	329.0	119.62	378.5
4,975.0	5.31	123.48	4,950.0	-188.7	331.7	119.64	381.6
5,006.0	4.82	123.29	4,980.9	-190.2	334.0	119.67	384.3
5,038.0	3.98	120.75	5,012.8	-191.6	336.0	119.69	386.8
5,070.0	3.12	126.64	5,044.7	-192.6	337.7	119.70	388.8
5,131.0	1.09	168.81	5,105.7	-194.2	339.1	119.80	390.8
5,162.0	1.11	176.88	5,136.7	-194.8	339.2	119.87	391.2
5,225.0	1.40	180.37	5,199.7	-196.2	339.2	120.04	391.9

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SDI Standard Survey Report

Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Site Skelly Unit #672
Project:	Eddy County, NM (NAN27 NME)	TVD Reference:	KB Elev. (12') @ 3919.0usft (Silver Oak #1)
Site:	Skelly Unit #672	MD Reference:	KB Elev. (12') @ 3919.0usft (Silver Oak #1)
Well:	Skelly Unit #672	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

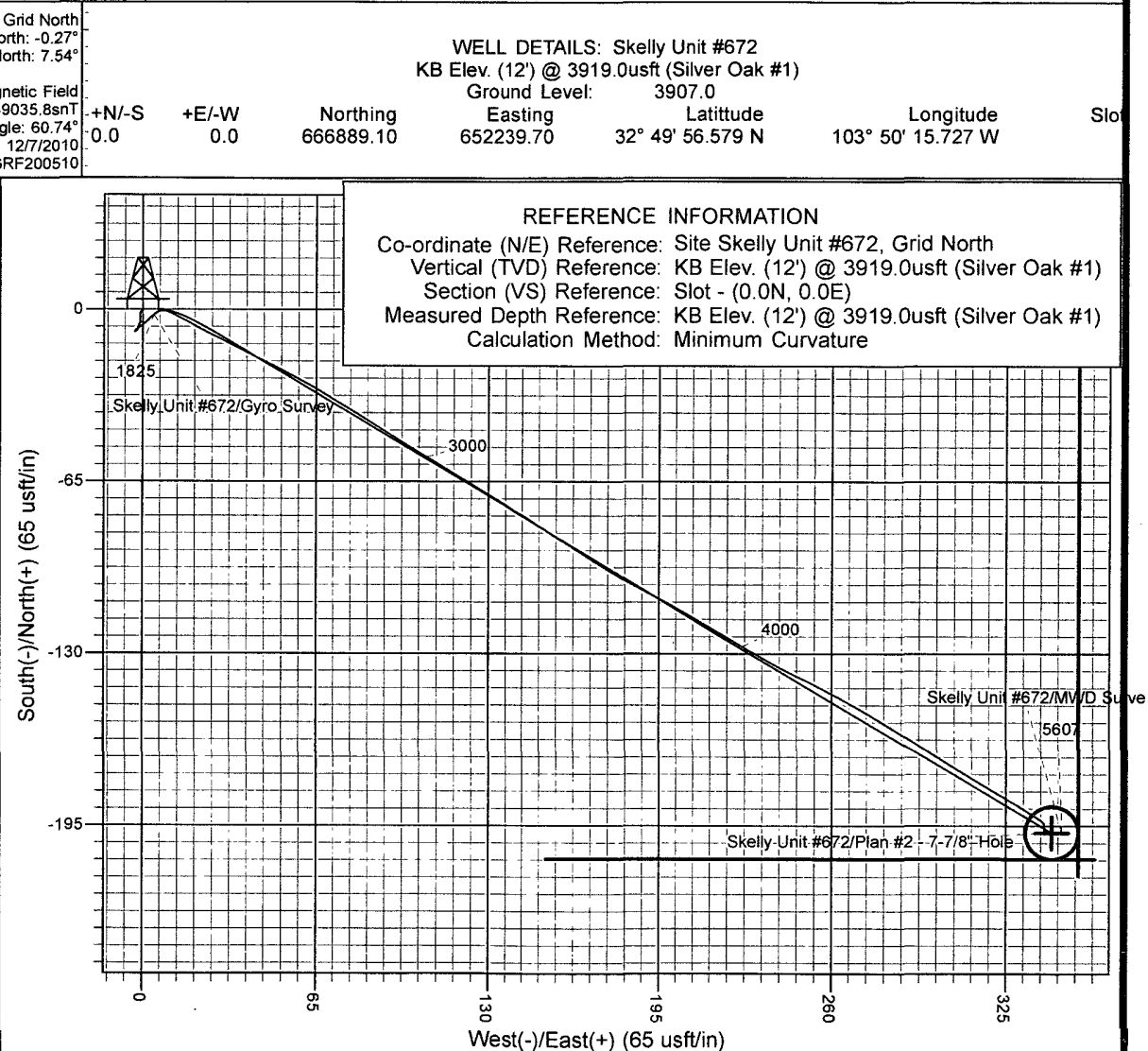
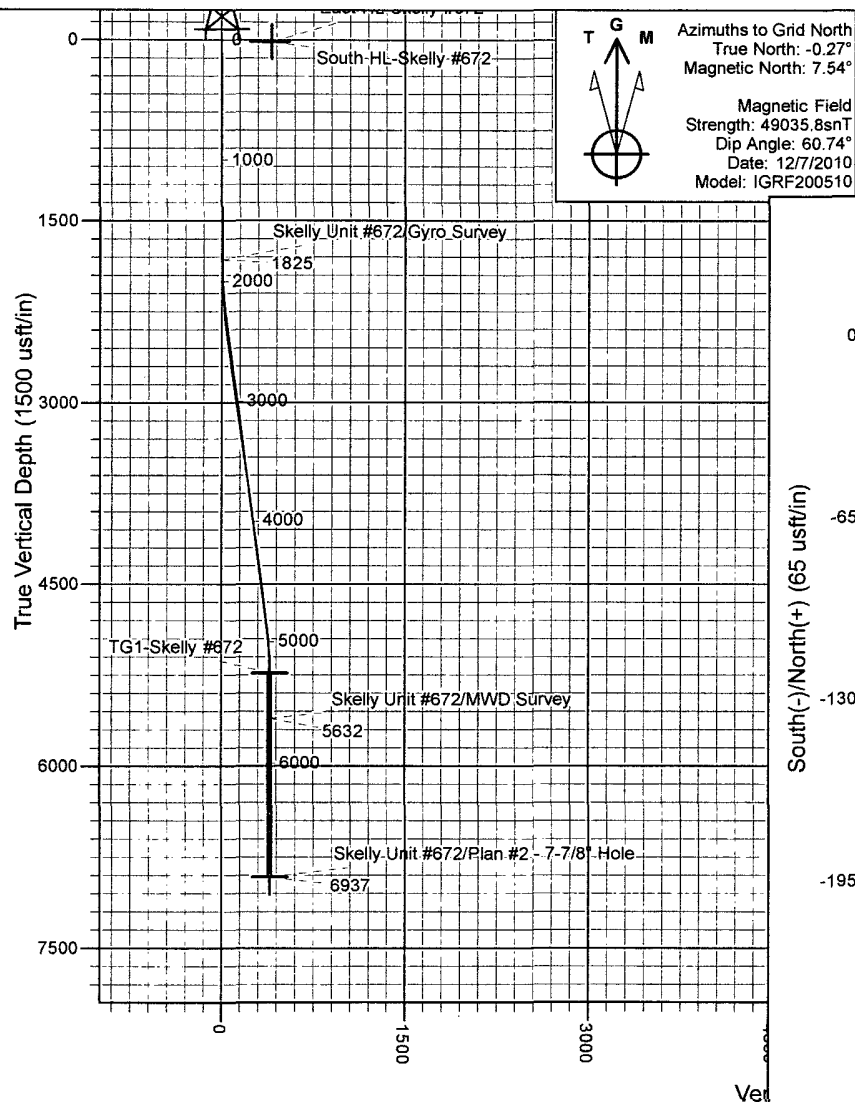
Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
5,297.0	0.53	100.10	5,271.6	-197.1	339.6	120.13	392.6
5,381.0	1.76	94.50	5,355.6	-197.3	341.2	120.03	394.1
5,444.0	1.77	99.99	5,418.6	-197.5	343.1	119.93	395.9
5,538.0	0.84	96.36	5,512.6	-197.8	345.3	119.81	397.9
5,632.0	0.27	333.46	5,606.6	-197.7	345.8	119.76	398.4

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,825.0	1,824.9	-2.0	4.1	Gyro Tie-in
5,632.0	5,606.6	-197.7	345.8	Last MWD Survey
5,688.0	5,662.6	-197.6	345.7	Projection to Bit



Scientific Drilling
Directional Drilling Operations

Project: Eddy County, NM (NAN27 NME)
Site: Skelly Unit #672
Well: Skelly Unit #672
Wellbore: OH
Design: Plan #2 - 7-7/8" Hole



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: Eddy County, NM (NAN27 NME)
Geodetic System: NAD 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001
System Datum: Mean Sea Level

SITE DETAILS: Skelly Unit #672
Site Centre Latitude: 32° 49' 56.579 N
Longitude: 103° 50' 15.727 W
Positional Uncertainty: 0.0
Convergence: 0.27
Local North: Grid