

Results of Directional Survey

DD

API number:	30-025-40125			
OGRID:		Operator:	COG OPERATING LLC	
		Property:	MC FEDERAL	# 64

surface	ULSTR:	J	21	T 17S	R 32E
				1891 FSL	2146 FEL

BH Loc	ULSTR:	J	21	T 17S	R 32E
7109	MD	7098.4	TVD	1688 FSL	2296 FEL

Top Perf/OH	ULSTR:	J	21	T 17S	R 32E
5430	MD	5419.4	TVD	1717 FSL	2277 FEL

Bot Perf/OH	ULSTR:	J	21	T 17S	R 32E
6800	MD	6789.4	TVD	1693 FSL	2292 FEL

	MD	N/S	E/W	VD
	5394	-173.10	-130.60	5383.4
TOP PERFS/OH	5430	-173.73	-131.00	5419.40
	5457	-174.20	-131.30	5446.40
	5394	-173.10	-130.60	5383.4
BOT PERFS/OH	6800	-197.65	-146.22	6789.40
	5457	-174.20	-131.30	5446.40

NEXT TO LAST	5394	-173.10	-130.60	5383.4
LAST READING	5457	-174.20	-131.30	5446.40
TD	7109	-203.04	-149.66	7098.40

Surface Location	1891	FS	2146	FE
Projected BHL	1688	FS	2296	FE
Location of				
Top Perfs/OH	1717	FS	2277	FE
Bottom Perfs/OH	1693	FS	2292	FE

SUMMARY of Subsurface Locations

Surface Location	J-21-17S-32E	1891	FS	2146	FE	Vert. Depth
Top Perfs/OH	J-21-17S-32E	1717	FS	2277	FE	5419.40
Bottom Perfs/OH	J-21-17S-32E	1693	FS	2292	FE	6789.40
Projected TD	J-21-17S-32E	1688	FS	2296	FE	7098.40

JAN 11 2012

CAVALOZ DRILLING

P.O BOX 1500 (575) 3910699 FAX (575) 391- 3824 HOBBS, NEW MEXICO 88241

HOBBS OCD**JAN 06 2012****INCLINATION REPORT**

DATE: 11/1/11

WELL NAME AND NUMBER M.C FED #64
LOCATION LEA COUNTY
OPERATOR: COG LLC
DRILLING CONTRACTOR: CAVALOZ DRILLING RIG #1

RECEIVED

SUR: J-21-17s-32e. 1891/S & 2146/E
BHL: J-21-17s-32e, 1688/S & 2296/E
API # 30-025-40125

THE UNDERSIGNED HEREBY CERTIFIES THAT HE IS AN AUTHORIZED REPRESENTATIVE OF THE DRILLING CONTRACTOR WHO DRILLED THE ABOVE DESCRIBED WELL AND THAT HE HAS CONDUCTED DEVIATION TEST AND OBTAINED THE FOLLOWING RESULTS:

DEGREE	DEPTH	DEGREE	DEPTH	DEGREE	DEPTH
<u>0.5</u>	<u>83</u>	<u>0.9</u>	<u>1611</u>	<u> </u>	<u> </u>
<u>0.9</u>	<u>175</u>	<u>1.6</u>	<u>1892</u>	<u> </u>	<u> </u>
<u>0.9</u>	<u>266</u>	<u>1.6</u>	<u>1934</u>	<u> </u>	<u> </u>
<u>0.5</u>	<u>357</u>	<u>2.2</u>	<u>2076</u>	<u> </u>	<u> </u>
<u>0.6</u>	<u>539</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>0.6</u>	<u>631</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>0.8</u>	<u>725</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>0.5</u>	<u>794</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>0.7</u>	<u>1080</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>0.6</u>	<u>1360</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

DRILLING CONTRACTOR:
CAVALOZ DRILLING

BY: Bob Wegner
BOB WEGNER
DRILLING SUPERINTENDENT

SUBSCRIBED AND SWORN TO BEFORE ME ON THE 1st DAY OF Nov., 2011

MY COMMISSION EXPIRES:

3/01/15[Signature]

OFFICIAL SEAL
JESSICA BUENO
NOTARY PUBLIC - STATE OF NEW MEXICO
My commission expires: 3/01/15



HOBBS OCD

JAN 06 2012

RECEIVED

COG OPERATING LLC

Lea County, NM (NAD27 NME)

MC Federal #64

MC Federal #64

OH - Job #32D10111018

SUR: J-21-17s-32e, 1891/S & 2146/E
BHL: J-21-17s-32e, 1688/S & 2296/E
API # 30-025-40125

Survey: MWD Survey

SDI Standard Survey Report

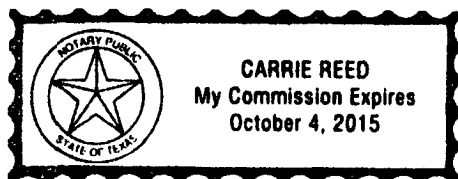
This survey is correct to the best of my knowledge and is supported by actual field data.

K. Wharton

Notarized this date 16th of November, 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 MC Federal #64
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4055 0usft (Cavaloz #1)
Site:	MC Federal #64	MD Reference:	KB Elev (13') @ 4055 0usft (Cavaloz #1)
Well:	MC Federal #64	North Reference:	Grid
Wellbore:	OH - Job #32D10111018	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		MC Federal #64			
Site Position:		Northing:	661,690 70 usft	Latitude:	32° 49' 4 098 N
From:	Map	Easting:	673,253 10 usft	Longitude:	103° 46' 9 782 W
Position Uncertainty:	0 0 usft	Slot Radius:	13-3/16"	Grid Convergence:	0 31 °

Well	MC Federal #64					
Well Position	+N/-S	0 0 usft	Northing:	661,690 70 usft	Latitude:	32° 49' 4 098 N
	+E/-W	0 0 usft	Easting:	673,253 10 usft	Longitude:	103° 46' 9 782 W
Position Uncertainty		0 0 usft	Wellhead Elevation:	usft	Ground Level:	4,042 0 usft

Wellbore	OH - Job #32D10111018				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	10/21/2011	7 68	60 69	48,913

Design	Actual				
Audit Notes:					
Version:	1 0	Phase:	ACTUAL	Tie On Depth:	0 0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(usft)	(usft)	(usft)	(°)	
	0 0	0 0	0 0	216 44	

Survey Program	Date	11/16/2011		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100 0	2,071 0	Gyro Survey (OH - Job #32D10111018)	Keeper	Standard Wireline Keeper ver 1 0 2
2,154 0	5,525 0	MWD Survey (OH - Job #32D10111018)	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 16	320.12	100 0	0 1	-0 1	320 12	0 1	
200 0	0 02	95 77	200 0	0 2	-0 2	322 74	0 3	
300 0	0 12	320 40	300 0	0 3	-0 2	324 09	0 4	
400 0	0 45	345 54	400 0	0 8	-0 4	333 45	0 8	
500 0	0 07	62 79	500 0	1 2	-0 4	340 12	1 2	
600 0	0 13	57 70	600 0	1 2	-0 3	347 83	1 3	
700 0	0 13	49 09	700 0	1 4	-0 1	356 37	1 4	
800 0	0 06	201 55	800 0	1 4	0 0	359 14	1 4	
900 0	0 05	72 78	900 0	1 4	0 0	0 05	1 4	
1,000 0	0 38	145 88	1,000 0	1 1	0 2	11 63	1.1	



Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well MC Federal #64
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4055 0usft (Cavaloz #1)
Site:	MC Federal #64	MD Reference:	KB Elev (13') @ 4055 0usft (Cavaloz #1)
Well:	MC Federal #64	North Reference:	Grid
Wellbore:	OH - Job #32D10111018	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 38	155 73	1,100 0	0 5	0 6	45 83	0 8
1,200 0	0 13	115 35	1,200 0	0 2	0 8	76 85	0 8
1,300 0	0 32	182 14	1,300 0	-0 1	0 9	99 21	0 9
1,400 0	0 29	106 17	1,400 0	-0 5	1 1	113 84	1 2
1,500 0	0 29	66 00	1,500 0	-0 5	1 6	106 15	1 7
1,600 0	0 72	77 76	1,600 0	-0 2	2 4	95 26	2 4
1,700 0	1 12	61 61	1,700 0	0 4	3 9	84 53	3 9
1,800 0	1 47	65 59	1,799 9	1 4	5 9	77 02	6 1
1,900 0	1 89	66 27	1,899 9	2 6	8 6	73 43	9 0
2,000 0	2 13	63 04	1,999 8	4 1	11 8	70 95	12 5
2,071 0	1 76	56 09	2,070 8	5 3	13 9	69 16	14 8



Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well MC Federal #64
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4055 0usft (Cavaloz #1)
Site:	MC Federal #64	MD Reference:	KB Elev (13') @ 4055 0usft (Cavaloz #1)
Well:	MC Federal #64	North Reference:	Grid
Wellbore:	OH - Job #32D10111018	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	MC Federal #64		
Site Position:	Map	Northings:	661,690 70 usft
From:		Easting:	673,253 10 usft
Position Uncertainty:	0 0 usft	Slot Radius:	13-3/16"
		Latitude:	32° 49' 4 098 N
		Longitude:	103° 46' 9 782 W
		Grid Convergence:	0 31 °

Well	MC Federal #64		
Well Position	+N/-S	0 0 usft	Northings:
	+E/-W	0 0 usft	Easting:
Position Uncertainty	0 0 usft	Wellhead Elevation:	usft
		Latitude:	32° 49' 4 098 N
		Longitude:	103° 46' 9 782 W
		Ground Level:	4,042 0 usft

Wellbore	OH - Job #32D10111018				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	10/21/2011	7 68	60 69	48,913

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	216 44	

Survey Program	Date	11/16/2011			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100 0	2,071 0	Gyro Survey (OH - Job #32D10111018)	Keeper	Standard Wireline Keeper ver 1 0 2	
2,154 0	5,525 0	MWD Survey (OH - Job #32D10111018)	MWD	MWD - Standard	

Survey								
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)	
2,071 0	1 76	56 09	2,070 8	5 3	13 9	69 16	14 8	
Gyro Tie-in								
2,154 0	2 30	68 05	2,153 7	6 6	16 5	68 13	17 7	
2,218 0	1 81	77 83	2,217 7	7 3	18 6	68 61	20 0	
2,280 0	1 29	95 24	2,279 7	7 4	20 3	69 86	21 6	
2,342 0	1 16	114 95	2,341 7	7 1	21 6	71 73	22 7	
2,437 0	1 01	187 22	2,436 7	5 9	22 3	75 25	23 1	
2,500 0	1 22	219 74	2,499 6	4 8	21 8	77 56	22 4	
2,562 0	1 66	230 53	2,561 6	3 7	20 7	79 78	21 0	
2,624 0	2 15	226 88	2,623 6	2 4	19 2	82 96	19 3	
2,686 0	2 84	226 78	2,685 5	0 5	17 2	88 26	17 2	



Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well MC Federal #64
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB Elev (13') @ 4055 0usft (Cavaloz #1)
Site:	MC Federal #64	MD Reference:	KB Elev (13') @ 4055 0usft (Cavaloz #1)
Well:	MC Federal #64	North Reference:	Grid
Wellbore:	OH - Job #32D10111018	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)
2,749 0	3 81	226 53	2,748 4	-2 0	14 5	97 78	14 7
2,813 0	4 18	222 69	2,812 3	-5 2	11 4	114 33	12 5
2,875 0	4 71	223 26	2,874 1	-8 7	8 1	136 82	11 9
2,938 0	4 97	223 30	2,936 9	-12 5	4 5	160 28	13 3
3,030 0	5 07	217 01	3,028 5	-18 7	-0 7	182 09	18 7
3,124 0	5 61	214 67	3,122 1	-25 8	-5 8	192 66	26 4
3,216 0	4 92	213 05	3,213 7	-32 8	-10 5	197 76	34 4
3,312 0	4 94	221 06	3,309 4	-39 4	-15 5	201 45	42 3
3,406 0	5 26	220 23	3,403 0	-45 7	-20 9	204 58	50 3
3,501 0	6 14	217 32	3,497 5	-53 1	-26 8	206 79	59 5
3,595 0	6 06	221 32	3,591 0	-60 8	-33 1	208 58	69 2
3,690 0	6 03	222 13	3,685 5	-68 3	-39 8	210 23	79 0
3,782 0	5 71	218 78	3,777 0	-75 4	-45 9	211 32	88 3
3,876 0	5 50	218 97	3,870 5	-82 6	-51 7	212 03	97 4
3,969 0	5 97	218 16	3,963 1	-89 8	-57 4	212 60	106 6
4,065 0	5 54	221 58	4,058 6	-97 2	-63 6	213 19	116 2
4,158 0	5 84	220 85	4,151 1	-104 2	-69 7	213 78	125 3
4,252 0	6 16	219 25	4,244 6	-111 7	-76 0	214 23	135 1
4,345 0	6 35	220 07	4,337 0	-119 5	-82 5	214 61	145 2
4,439 0	5 45	222 52	4,430 5	-126 7	-88 8	215 02	154 8
4,533 0	5 11	223 92	4,524 1	-133 1	-94 7	215 45	163 3
4,627 0	4 86	226 57	4,617 8	-138 8	-100 5	215 92	171 4
4,722 0	3 43	229 58	4,712 5	-143 4	-105 6	216 37	178 1
4,816 0	3 77	220 06	4,806 4	-147 6	-109 8	216 63	183 9
4,885 0	3 44	218 13	4,875 2	-151 0	-112 5	216 69	188 3
4,980 0	3 59	218 49	4,970 0	-155 5	-116 1	216 74	194 1
5,074 0	3 31	223 77	5,063 9	-159 8	-119 8	216 86	199 7
5,137 0	3 42	214 98	5,126 8	-162 7	-122 2	216 91	203 4
5,206 0	3 37	219 76	5,195 6	-165 9	-124 6	216 91	207 5
5,274 0	3 42	219 76	5,263 5	-169 0	-127 2	216 97	211 5
5,332 0	2 49	220 84	5,321 4	-171 3	-129 1	217 01	214 5
5,394 0	1 80	213 47	5,383 4	-173 1	-130 6	217 02	216 8
5,457 0	0 60	226 13	5,446 4	-174 2	-131 3	217 02	218 1
Last MWD Survey							
5,525 0	0 60	226 13	5,514 4	-174 7	-131 8	217 05	218 8
Projection to Bit							

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,071 0	2,070 8	5 3	13 9	Gyro Tie-in
5,457 0	5,446 4	-174 2	-131 3	Last MWD Survey
5,525 0	5,514 4	-174 7	-131 8	Projection to Bit