

Results of Directional Survey

API number:	30-025-40186		
OGRID:		Operator:	COG OPERATING LLC
		Property:	LAZY J 27 STATE # 1H

surface	ULSTR:	M	27	T	13S	R	33E
				1310	FSL	330	FWL

BH Loc	ULSTR:	P	27	T	13S	R	33E
13398	MD	9114.5	TVD	1292	FSL	4941	FWL
						339	FEL

Top Perf/OH	ULSTR:	M	27	T	13S	R	33E
9417	MD	9053.2	TVD	1301	FSL	963	FWL

Bot Perf/OH	ULSTR:	P	27	T	13S	R	33E
12931	MD	9125.1	TVD	1306	FSL	4474	FWL
						806	FEL

	MD	N/S	E/W	VD
	9360	-8.07	576.24	9051.58
TOP PERFS/OH	9417	-8.66	633.22	9053.17
	9456	-9.07	672.20	9054.26
	12892	-2.97	4104.93	9126.04
BOT PERFS/OH	12931	-3.65	4143.91	9125.12
	12986	-4.61	4198.88	9123.82

NEXT TO LAST	13338	-16.13	4550.60	9113.76
LAST READING	13398	-17.91	4610.52	9114.46
TD	13398	-17.91	4610.52	9114.46

Surface Location	1310	FS	330	FW
Projected BHL	1292	FS	4941	FW
Location of				
Top Perfs/OH	1301	FS	963	FW
Bottom Perfs/OH	1306	FS	4474	FW

SUMMARY of Subsurface Locations

Surface Location	M-27-13S-33E	1310	FS	330	FW	Vert. Depth
Top Perfs/OH	M-27-13S-33E	1301	FS	963	FW	9053.17
Bottom Perfs/OH	P-27-13S-33E	1306	FS	4474	FW	9125.12
Projected TD	P-27-13S-33E	1292	FS	4941	FW	9114.46

MAR 22 2012



PO Box 1370
Artesia, NM 88211-1370
(575) 748-1288

HOBBS OCD

FEB 01 2012

RECEIVED

October 14, 2011

COG, LLC
Fasken Center, Tower II
550 West Texas Ave, Suite 1300
Midland, TX 79701

RE: Lazy J-27 State #1H
1310' FSL & 330' FWL
Sec. 27, T13S, R33E
Lea County, New Mexico

Dear Sir,

The attached is the Deviation Survey for the above captioned well.

Very truly yours,

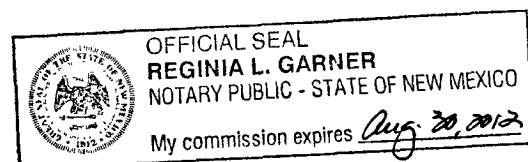
Eddie C. LaRue
Operations Manager

State of New Mexico }
County of Eddy }

The foregoing was acknowledged before me this 14th day of October, 2011.

Notary Public

SUR: M-27-13s-33e, 1310/S & 330/W
BHL: P-27-13s-33e, 1292/S & 4941/W
API # 30-025-40186



Pason DataHub Deviation Survey

Well Dossier 1314900238 - LAZY J 27 STATE

#

# Date	Depth	Deviation	Direction	TVD
9/2/2011	265	0.50	0	0
9/2/2011	407	0.70	0	0
9/4/2011	615	0.90	0	0
9/4/2011	922	0.90	0	0
9/4/2011	1243	0.80	0	0
9/5/2011	1527	0.30	0	0
9/5/2011	1874	0.70	0	0
9/5/2011	2191	1.00	0	0
9/7/2011	2539	2.00	0	0
9/7/2011	2791	1.50	0	0
9/8/2011	3044	1.20	0	0
9/8/2011	3298	0.60	0	0
9/8/2011	3647	0.90	0	0
9/9/2011	3899	1.00	0	0
9/11/2011	4324	0.60	0	0
9/12/2011	4742	0.40	0	0
9/12/2011	5089	0.50	0	0
9/12/2011	5469	1.10	0	0
9/12/2011	5753	1.50	0	0
9/13/2011	6069	1.50	0	0
9/13/2011	6450	1.50	0	0
9/13/2011	6861	1.30	0	0
9/14/2011	7302	1.70	0	0
9/15/2011	7714	1.40	0	0
9/15/2011	8189	0.40	0	0
9/21/2011	8648	0.90	0	0
9/21/2011	9095	2.00	0	0
9/22/2011	9318	2.30	0	0
9/29/2011	8626	10.00	102.90	0
9/29/2011	8658	16.30	101.50	0
9/29/2011	8690	20.00	101.50	0
9/29/2011	8722	24.10	101.70	0
9/30/2011	8753	28.30	102.40	8744.58
9/30/2011	8818	35.10	103.40	8798.81
9/30/2011	8850	38.30	101.10	8824.50
9/30/2011	8882	41.20	98.20	8849.00
9/30/2011	8914	43.70	94.50	8872.00
9/30/2011	8946	46.20	92.20	8895.00
9/30/2011	8977	42.20	90.90	8916.00
10/1/2011	9009	52.00	89.90	8936.00
10/1/2011	9041	55.30	90.20	8955.00
10/1/2011	9072	58.40	91.30	8973.00
10/1/2011	9105	61.70	92.40	8997.00
10/1/2011	9137	65.20	93.10	9003.00
10/1/2011	9169	68.30	93.40	9015.90
10/1/2011	9200	72.00	93.80	9026.40
10/1/2011	9232	75.80	93.60	9035.00
10/1/2011	9264	79.70	93.80	9042.00
10/1/2011	9296	83.00	93.40	9046.00

#	Date	Depth	Deviation	Direction	TVD
10/2/2011	9328	82.20	92.20	9049.00	
10/2/2011	9360	87.80	90.80	9051.00	
10/2/2011	9456	89.00	90.40	9054.00	
10/2/2011	9551	89.60	90.40	9055.00	
10/2/2011	9646	91.70	91.10	9054.00	
10/3/2011	9742	91.50	89.70	9051.00	
10/3/2011	9837	89.90	88.80	9050.00	
10/3/2011	9933	89.60	88.70	9050.43	
10/3/2011	10029	91.10	88.50	9050.34	
10/3/2011	10124	92.70	88.10	9047.19	
10/3/2011	10219	91.80	88.10	9043.00	
10/3/2011	10315	91.00	88.70	9041.00	
10/4/2011	10410	88.50	89.40	9041.57	
10/4/2011	10506	87.40	90.10	9047.00	
10/4/2011	10602	87.60	89.70	9049.15	
10/4/2011	10696	86.70	89.50	9053.83	
10/4/2011	10792	86.00	90.40	9056.94	
10/5/2011	10888	88.20	92.50	9064.00	
10/5/2011	10982	88.90	92.50	9067.00	
10/5/2011	11078	89.20	92.20	9068.77	
10/5/2011	11174	88.90	91.30	9070.00	
10/5/2011	11268	88.70	91.70		
10/6/2011	11363	88.20	90.20	9074.00	
10/6/2011	11458	87.30	88.70	9078.00	
10/7/2011	11652	85.70	87.60	9092.49	
10/7/2011	11747	86.00	89.20	9099.36	
10/7/2011	11843	86.60	89.70	9106.00	
10/7/2011	11938	89.20	90.20	9109.00	
10/8/2011	12034	89.60	89.50	9110.00	
10/8/2011	12129	87.40	89.70	9112.00	
10/8/2011	12320	86.20	90.20	9123.00	
10/8/2011	12416	89.40	90.80	9127.00	
10/8/2011	12512	89.40	90.20	9128.00	
10/8/2011	12607	89.20	90.20	9129.00	
10/9/2011	12702	90.30	89.90	9129.61	
10/9/2011	12797	90.80	90.40	9128.70	
10/9/2011	12986	90.30	91.80	9124.00	
10/9/2011	13082	90.40	92.20	9123.00	
10/9/2011	13178	91.50	91.80		
10/10/2011	13272	91.70	91.70	9119.00	
10/10/2011	13338	92.20	91.70	9116.00	

EOF

90.20 9074.00

90.80 9127.00

COG OPERATING

Wildcat (Lea County, NM)

Lea County, NM

Lazy J 27 State #1H

VH - Job #32K0911909

HOBBS OCD

FEB 01 2012

RECEIVED

SUR: M-27-13s-33e, 1310/S & 330/W

BHL: P-27-13s-33e, 1292/S & 4941/W

API # 30-025-40186

Survey: Actual

SDI Standard Survey Report

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

Richardson

Notarized this date 4th of October, 2011.

Carrie Reed

Notary Signature
County of Midland
State of Texas



Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Lazy J 27 State #1H
Project:	Wildcat (Lea County, NM)	TVD Reference:	WELL @ 0 0usft (Original Well Elev)
Site:	Lea County, NM	MD Reference:	WELL @ 0 0usft (Original Well Elev)
Well:	Lazy J 27 State #1H	North Reference:	Grid
Wellbore:	VH - Job #32K0911909	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0911909	Database:	EDM-Regulatory

Project: Wildcat (Lea County, NM)	
Map System:	US State Plane 1927 (Exact solution)
Geo Datum:	NAD 1927 (NADCON CONUS)
Map Zone:	New Mexico East 3001
System Datum:	Mean Sea Level

Site		Lea County, NM			
Site Position:		Northing:	764,295 41 usft	Latitude:	33° 5' 52 800 N
From:	Lat/Long	Easting:	769,294 77 usft	Longitude:	103° 27' 14 400 W
Position Uncertainty:	0 0 usft	Slot Radius:	0"	Grid Convergence:	0 48 °

Well	Lazy J 27 State #1H, Directional (Crescent)					
Well Position	+N/-S	0 0 usft	Northing:	786,124 39 usft	Latitude:	33° 9' 32 400 N
	+E/-W	0 0 usft	Easting:	721,365 68 usft	Longitude:	103° 36' 36 000 W
Position Uncertainty		0 0 usft	Wellhead Elevation:	usft	Ground Level:	0 0 usft

Wellbore	VH - Job #32K0911909				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	9/22/2011	7 64	61 04	49,174

Design		VH - Job #32K0911909		
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	89 52

Survey Program		Date	10/23/2011		
From	To	Survey (Wellbore)	Tool Name	Description	
(usft)	(usft)				
100 0	9,480 0	Actual (VH - Job #32K0911909)	Keeper	Keeper Gyro	

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 57	229 08	100 0	-0 3	-0 4	229 08	0 5
200 0	0 62	224 87	200 0	-1 0	-1 1	227 60	1 5
300 0	0 59	236 76	300 0	-1 7	-1 9	228 84	2 6
400 0	0 72	256 12	400 0	-2 1	-3 0	234 46	3 7
500 0	0 79	263 06	500 0	-2 4	-4 3	241 05	4 9
600 0	0 78	266 70	600 0	-2 5	-5 6	246 19	6 2
700 0	0 72	262 60	700 0	-2 6	-6 9	249 41	7 4
800 0	0 61	263 20	799 9	-2 8	-8 1	251 22	8 6
900 0	0 49	246 39	899 9	-3 0	-9 0	251 67	9 5
1,000 0	0 40	252 57	999 9	-3 3	-9 7	251 48	10 3
1,100 0	0 31	257 13	1,099 9	-3 4	-10 3	251 65	10 9

Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Lazy J 27 State #1H
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Site:	Lea County, NM	MD Reference:	WELL @ 0.0usft (Original Well Elev)
Well:	Lazy J 27 State #1H	North Reference:	Grid
Wellbore:	VH - Job #32K0911909	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0911909	Database:	EDM-Regulatory

Survey								
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)	
1,200.0	0.31	246.78	1,199.9	-3.6	-10.9	251.67	11.4	
1,300.0	0.57	225.10	1,299.9	-4.1	-11.5	250.51	12.2	
1,400.0	0.77	218.56	1,399.9	-4.9	-12.2	248.04	13.2	
1,500.0	0.73	217.95	1,499.9	-6.0	-13.0	245.44	14.3	
1,600.0	0.57	223.50	1,599.9	-6.8	-13.8	243.65	15.4	
1,700.0	0.35	238.32	1,699.9	-7.3	-14.4	242.94	16.1	
1,800.0	0.20	320.72	1,799.9	-7.4	-14.7	243.45	16.5	
1,900.0	0.25	342.28	1,899.9	-7.0	-14.9	244.79	16.5	
2,000.0	0.28	342.85	1,999.9	-6.6	-15.1	246.38	16.4	
2,100.0	0.37	345.52	2,099.9	-6.0	-15.2	248.35	16.4	
2,200.0	0.48	40.31	2,199.9	-5.4	-15.0	250.21	16.0	
2,300.0	0.62	55.75	2,299.9	-4.8	-14.3	251.51	15.1	
2,400.0	0.64	53.49	2,399.9	-4.1	-13.4	252.82	14.0	
2,500.0	0.70	49.12	2,499.9	-3.4	-12.5	254.72	13.0	
2,600.0	0.83	43.13	2,599.9	-2.5	-11.5	257.85	11.8	
2,700.0	0.77	41.32	2,699.9	-1.5	-10.6	262.21	10.7	
2,800.0	0.76	43.28	2,799.9	-0.5	-9.7	267.26	9.7	
2,900.0	0.70	25.88	2,899.8	0.6	-9.0	273.62	9.0	
3,000.0	0.77	2.93	2,999.8	1.8	-8.7	281.65	8.9	
3,100.0	0.79	355.15	3,099.8	3.1	-8.7	289.88	9.3	
3,200.0	0.74	337.96	3,199.8	4.4	-9.0	296.21	10.0	
3,300.0	0.47	318.39	3,299.8	5.3	-9.5	299.29	10.9	
3,400.0	0.11	274.63	3,399.8	5.7	-9.9	299.76	11.4	
3,500.0	0.14	125.30	3,499.8	5.6	-9.9	299.49	11.4	
3,600.0	0.07	116.44	3,599.8	5.5	-9.7	299.45	11.2	
3,700.0	0.18	79.80	3,699.8	5.5	-9.5	299.99	11.0	
3,800.0	0.18	86.99	3,799.8	5.5	-9.2	300.98	10.7	
3,900.0	0.24	81.29	3,899.8	5.6	-8.8	302.20	10.5	
4,000.0	0.18	79.26	3,999.8	5.6	-8.5	303.57	10.2	
4,100.0	0.17	74.10	4,099.8	5.7	-8.2	304.85	10.0	
4,200.0	0.16	44.61	4,199.8	5.8	-7.9	306.32	9.9	
4,300.0	0.13	23.43	4,299.8	6.0	-7.8	307.76	9.9	
4,400.0	0.14	6.54	4,399.8	6.3	-7.7	309.00	10.0	
4,500.0	0.25	354.60	4,499.8	6.6	-7.7	310.45	10.2	
4,600.0	0.26	358.66	4,599.8	7.1	-7.8	312.21	10.5	
4,700.0	0.31	359.31	4,699.8	7.5	-7.8	314.12	10.8	
4,800.0	0.29	32.09	4,799.8	8.0	-7.7	316.39	11.1	
4,900.0	0.35	59.65	4,899.8	8.4	-7.3	319.19	11.1	
5,000.0	0.28	58.48	4,999.8	8.7	-6.8	322.01	11.0	
5,100.0	0.22	29.83	5,099.8	9.0	-6.5	324.19	11.1	
5,200.0	0.18	32.81	5,199.8	9.3	-6.3	325.83	11.2	
5,300.0	0.28	24.67	5,299.8	9.6	-6.1	327.61	11.4	
5,400.0	0.36	27.34	5,399.8	10.1	-5.9	329.94	11.7	
5,500.0	0.47	21.49	5,499.8	10.8	-5.6	332.70	12.1	

Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Lazy J 27 State #1H
Project:	Wildcat (Lea County, NM)	TVD Reference:	WELL @ 0 0usft (Original Well Elev)
Site:	Lea County, NM	MD Reference:	WELL @ 0 0usft (Original Well Elev)
Well:	Lazy J 27 State #1H	North Reference:	Grid
Wellbore:	VH - Job #32K0911909	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0911909	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
5,600 0	0 50	26 21	5,599 8	11 6	-5 2	335 68	12 7
5,700 0	0 61	33 24	5,699 8	12 4	-4 7	339 08	13 3
5,800 0	0 93	47 07	5,799 8	13 4	-3 9	343 95	13 9
5,900 0	1 18	52 30	5,899 8	14 6	-2 4	350 47	14 8
6,000 0	1 46	58 38	5,999 7	15 9	-0 5	358 02	15 9
6,100 0	1 48	56 75	6,099 7	17 3	1 6	5 35	17 3
6,200 0	1 26	54 44	6,199 7	18 6	3 6	10 93	18 9
6,300 0	1 18	51 65	6,299 7	19 9	5 3	14 91	20 6
6,400 0	0 96	48 79	6,399 6	21 1	6 7	17 71	22 1
6,500 0	0 83	45 49	6,499 6	22 1	7 9	19 59	23 5
6,600 0	0 82	46 40	6,599 6	23 1	8 9	21 07	24 8
6,700 0	0 68	50 97	6,699 6	24 0	9 9	22 40	26 0
6,800 0	0 65	47 74	6,799 6	24 8	10 8	23 52	27 0
6,900 0	0 67	51 80	6,899 6	25 5	11 7	24 56	28 0
7,000 0	0 66	53 26	6,999 6	26 2	12 6	25 63	29 1
7,100 0	0 67	54 58	7,099 6	26 9	13 5	26 68	30 1
7,200 0	0 65	45 69	7,199 6	27 6	14 4	27 52	31 1
7,300 0	0 68	54 30	7,299 6	28 4	15 3	28 31	32 2
7,400 0	0 73	42 74	7,399 6	29 2	16 2	29 03	33 4
7,500 0	0 75	52 08	7,499 5	30 1	17 1	29 70	34 6
7,600 0	0 87	48 91	7,599 5	31 0	18 2	30 50	35 9
7,700 0	1 01	56 01	7,699 5	31 9	19 5	31 45	37 4
7,800 0	0 95	59 87	7,799 5	32 9	21 0	32 57	39 0
7,900 0	1 22	73 67	7,899 5	33 6	22 7	34 09	40 5
8,000 0	1 14	70 65	7,999 5	34 2	24 7	35 82	42 2
8,100 0	1 12	68 13	8,099 5	34 9	26 5	37 25	43 8
8,200 0	1 21	70 61	8,199 4	35 6	28 4	38 61	45 6
8,300 0	1 12	72 72	8,299 4	36 2	30 4	39 95	47 3
8,400 0	1 03	73 40	8,399 4	36 8	32 2	41 15	48 9
8,500 0	1 11	77 12	8,499 4	37 3	34 0	42 34	50 4
8,600 0	1 25	78 91	8,599 4	37 7	36 0	43 66	52 1
8,700 0	1 41	78 96	8,699 3	38 1	38 3	45 09	54 0
8,800 0	1 66	81 22	8,799 3	38 6	40 9	46 66	56 2
8,900 0	2 05	84 07	8,899 2	39 0	44 1	48 51	58 9
9,000 0	2 05	86 65	8,999 2	39 3	47 7	50 50	61 8
9,100 0	2 26	91 29	9,099 1	39 3	51 4	52 58	64 8
9,200 0	2 50	92 74	9,199 0	39 2	55 6	54 80	68 0
9,300 0	2 46	92 89	9,298 9	39 0	59 9	56 94	71 5
9,400 0	2 90	96 05	9,398 8	38 6	64 6	59 11	75 2
9,480 0	2 79	93 18	9,478 7	38 3	68 5	60 80	78 5

COG Operating LLC

Lea County, NM

Lazy J 27 State #1H

Lazy J 27 State #1H

Wellbore #1

SUR: M-27-13s-33e, 1310/S & 330/W
BHL: P-27-13s-33e, 1292/S & 4941/W
API # 30-025-40186

Survey: MWD Surveys

Standard Survey Report

10 October, 2011

Crescent Directional Drilling

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Lazy J 27 State #1H
Project:	Lea County, NM	TVD Reference:	WELL @ 4253 70ft (Silver Oak #12)
Site:	Lazy J 27 State #1H	MD Reference:	WELL @ 4253 70ft (Silver Oak #12)
Well:	Lazy J 27 State #1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass R5000 DB Server

Project: Lea County -NM	
Map System:	US State Plane 1927 (Exact solution)
Geo Datum:	NAD 1927 (NADCON CONUS)
Map Zone:	New Mexico East 3001

Site		Lazy J 27 State #1H			
Site Position:		Northing:	786,152 04 ft	Latitude:	33 158213
From:	Map	Easting:	762,758 67 ft	Longitude:	-103 474761
Position Uncertainty:	0 00 ft	Slot Radius:	13 200 in	Grid Convergence:	0 47 °

Well	Lazy J 27 State #1H				
Well Position	+N/-S	0 00 ft	Northing:	786,152 04 ft	Latitude: 33 158213
	+E/-W	0 00 ft	Easting:	762,758 67 ft	Longitude: -103 474761
Position Uncertainty		0 00 ft	Wellhead Elevation:	ft	Ground Level: 4,235 70 ft

Wellbore		Wellbore #1			
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF200510	9/16/2011	7 57	61 08	49,192

Design:	Wellbore #1				
Audit Notes:					
Version:	1 0	Phase:	ACTUAL	Tie On Depth:	0 00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(ft)	(ft)	(ft)	(°)	
	0 00	0 00	0 00	90 14	

Survey Program		Date	10/10/2011		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
100 00	8,500 00	Gyro Surveys (Wellbore #1)			
8,626 00	13,398 00	MWD Surveys (Wellbore #1)			

Survey										
Measured Depth	Inclination	Azimuth	Vertical Depth	+N/-S	+E/-W	Vertical Section	Dogleg Rate	Build Rate	Turn Rate	
(ft)	(°)	(°)	(ft)	(ft)	(ft)	(ft)	(°/100ft)	(°/100ft)	(°/100ft)	
8,500 00	1 11	77 12	8,499 38	37 27	33 96	33 87	0 00	0 00	0 00	
8,626 00	10 00	102 90	8,624 67	35 09	45 84	45 75	7 15	7 06	20 46	
8,658 00	16 30	101 50	8,655 81	33 57	52 95	52 87	19 71	19 69	-4 38	
8,690 00	20 00	101 50	8,686 21	31 59	62 72	62 64	11 56	11 56	0 00	
8,722 00	24 10	101 70	8,715 87	29 17	74 48	74 41	12 81	12 81	0 63	
8,754 00	28 30	102 40	8,744 57	26 21	88 30	88 23	13 16	13 13	2 19	
8,786 00	32 20	103 80	8,772 21	22 55	103 99	103 94	12 38	12 19	4 38	
8,818 00	35 10	103 40	8,798 85	18 38	121 22	121 18	9 09	9 06	-1 25	
8,850 00	38 30	101 10	8,824 50	14 34	139 91	139 88	10 88	10 00	-7 19	
8,857 22	38 95	100 41	8,830 14	13 50	144 34	144 31	10 75	8 97	-9 50	

Crescent Directional Drilling

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Lazy J 27 State #1H
Project:	Lea County, NM	TVD Reference:	WELL @ 4253 70ft (Silver Oak #12)
Site:	Lazy J 27 State #1H	MD Reference:	WELL @ 4253 70ft (Silver Oak #12)
Well:	Lazy J 27 State #1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass R5000 DB Server

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/S (ft)	+E/W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
Interpolated Hardline Crossing at Heel @ 8857.22 MD, 8830.14 TVD, 38.95 INC, 100.41 AZ, 144.31 VS									
8,882.00	41.20	98.20	8,849.10	10.93	160.08	160.05	10.75	9.09	-8.94
8,914.00	43.70	94.50	8,872.72	8.56	181.54	181.52	11.04	7.81	-11.56
8,946.00	46.20	92.20	8,895.36	7.25	204.10	204.08	9.32	7.81	-7.19
8,977.00	49.20	90.90	8,916.22	6.63	227.02	227.00	10.16	9.68	-4.19
9,009.00	52.00	89.90	8,936.53	6.46	251.74	251.73	9.08	8.75	-3.13
9,041.00	55.30	90.20	8,955.50	6.44	277.51	277.50	10.34	10.31	0.94
9,073.00	58.40	91.30	8,973.00	6.08	304.30	304.28	10.11	9.69	3.44
9,105.00	61.70	92.40	8,988.97	5.19	332.01	331.99	10.73	10.31	3.44
9,137.00	65.20	93.10	9,003.27	3.81	360.59	360.58	11.11	10.94	2.19
9,169.00	68.30	93.40	9,015.90	2.14	389.94	389.94	9.73	9.69	0.94
9,200.00	72.00	93.80	9,026.43	0.31	419.04	419.04	12.00	11.94	1.29
9,232.00	75.80	93.60	9,035.30	-1.67	449.71	449.72	11.89	11.88	-0.63
9,264.00	79.70	93.80	9,042.09	-3.69	480.91	480.92	12.20	12.19	0.63
9,296.00	83.00	93.40	9,046.90	-5.68	512.48	512.50	10.39	10.31	-1.25
9,328.00	86.20	92.20	9,049.91	-7.23	544.30	544.32	10.67	10.00	-3.75
9,360.00	87.80	90.80	9,051.58	-8.07	576.24	576.26	6.64	5.00	-4.38
9,456.00	89.00	90.40	9,054.26	-9.07	672.20	672.22	1.32	1.25	-0.42
9,551.00	89.60	90.40	9,055.43	-9.74	767.19	767.21	0.63	0.63	0.00
9,646.00	91.70	91.10	9,054.35	-10.98	862.17	862.19	2.33	2.21	0.74
9,742.00	91.50	89.70	9,051.67	-11.65	958.13	958.15	1.47	-0.21	-1.46
9,837.00	89.90	88.80	9,050.51	-10.41	1,053.11	1,053.13	1.93	-1.68	-0.95
9,933.00	89.60	88.70	9,050.93	-8.31	1,149.08	1,149.10	0.33	-0.31	-0.10
10,029.00	91.10	88.50	9,050.34	-5.97	1,245.05	1,245.06	1.58	1.56	-0.21
10,124.00	92.70	88.10	9,047.19	-3.15	1,339.95	1,339.96	1.74	1.68	-0.42
10,219.00	91.80	88.10	9,043.46	0.00	1,434.83	1,434.82	0.95	-0.95	0.00
10,315.00	91.00	88.70	9,041.11	2.68	1,530.76	1,530.75	1.04	-0.83	0.63
10,410.00	88.50	89.00	9,041.53	4.58	1,625.73	1,625.71	2.65	-2.63	0.32
10,506.00	87.40	90.10	9,044.96	5.34	1,721.66	1,721.64	1.62	-1.15	1.15
10,602.00	87.60	89.70	9,049.15	5.51	1,817.57	1,817.55	0.47	0.21	-0.42
10,696.00	86.70	89.50	9,053.82	6.16	1,911.45	1,911.43	0.98	-0.96	-0.21
10,792.00	86.00	90.40	9,059.94	6.24	2,007.26	2,007.23	1.19	-0.73	0.94
10,888.00	88.20	92.50	9,064.79	3.82	2,103.09	2,103.07	3.17	2.29	2.19
10,982.00	88.90	92.50	9,067.17	-0.28	2,196.97	2,196.96	0.74	0.74	0.00
11,078.00	89.20	92.20	9,068.76	-4.22	2,292.88	2,292.88	0.44	0.31	-0.31
11,174.00	88.90	91.30	9,070.35	-7.15	2,388.82	2,388.83	0.99	-0.31	-0.94
11,268.00	88.70	91.70	9,072.32	-9.61	2,482.76	2,482.78	0.48	-0.21	0.43
11,363.00	88.30	90.20	9,074.81	-11.18	2,577.72	2,577.74	1.63	-0.42	-1.58
11,458.00	87.30	88.70	9,078.46	-10.27	2,672.64	2,672.65	1.90	-1.05	-1.58
11,556.00	85.20	88.00	9,084.87	-7.46	2,770.38	2,770.39	2.26	-2.14	-0.71
11,652.00	85.70	87.60	9,092.48	-3.78	2,866.01	2,866.01	0.67	0.52	-0.42
11,747.00	86.00	89.20	9,099.36	-1.14	2,960.72	2,960.71	1.71	0.32	1.68
11,843.00	86.60	89.70	9,105.55	-0.22	3,056.51	3,056.50	0.81	0.63	0.52

Crescent Directional Drilling

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Lazy J-27 State #1H
Project:	Lea County, NM	TVD Reference:	WELL @ 4253 70ft (Silver Oak #12)
Site:	Lazy J 27 State #1H	MD Reference:	WELL @ 4253 70ft (Silver Oak #12)
Well:	Lazy J-27 State #1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Compass R5000 DB Server

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
11,938 00	89 20	90 20	9,109 03	-0 14	3,151 44	3,151 43	2 79	2 74	0 53	
12,034 00	89 60	89 50	9,110 04	0 11	3,247 43	3,247 42	0 84	0 42	-0 73	
12,129 00	87 40	89 70	9,112 53	0 78	3,342 39	3,342 38	2 33	-2 32	0 21	
12,226 00	86 70	90 60	9,117 52	0 52	3,439 26	3,439 25	1 17	-0 72	0 93	
12,320 00	86 20	90 20	9,123 34	-0 13	3,533 08	3,533 07	0 68	-0 53	-0 43	
12,416 00	89 40	90 80	9,127 02	-0 97	3,628 99	3,628 98	3 39	3 33	0 63	
12,512 00	89 40	90 20	9,128 03	-1 81	3,724 98	3,724 98	0 62	0 00	-0 63	
12,607 00	89 20	90 20	9,129 19	-2 14	3,819 98	3,819 97	0 21	-0 21	0 00	
12,702 00	90 30	89 90	9,129 60	-2 22	3,914 97	3,914 97	1 20	1 16	-0 32	
12,797 00	90 80	90 40	9,128 69	-2 47	4,009 97	4,009 96	0 74	0 53	0 53	
12,892 00	92 40	90 20	9,126 04	-2 97	4,104 93	4,104 92	1 70	1 68	-0 21	
12,986 00	90 30	91 80	9,123 82	-4 61	4,198 88	4,198 88	2 81	-2 23	1 70	
13,082 00	90 40	92 20	9,123 24	-7 96	4,294 82	4,294 82	0 43	0 10	0 42	
13,177 00	91 50	91 80	9,121 66	-11 27	4,389 74	4,389 76	1 23	1 16	-0 42	
13,272 00	91 70	91 70	9,119 01	-14 17	4,484 66	4,484 68	0 24	0 21	-0 11	
13,338 00	92 20	91 70	9,116 76	-16 13	4,550 60	4,550 62	0 76	0 76	0 00	
Last Survey @ 13338.00 MD, 9116.76 TVD, 92.20 INC, 91.70 AZ										
13,398 00	92 20	91 70	9,114 46	-17 91	4,610 52	4,610 55	0 00	0 00	0 00	
Straight line Projection to TD @ 13398.00' MD, 9114.46' TVD										

Survey Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
8,857 22	8,830 14	13 50	144 34	Interpolated Hardline Crossing at Heel @ 8857 22 MD, 8830 14 TVD, 38 95 INC
13,338 00	9,116 76	-16 13	4,550 60	Last Survey @ 13338 00 MD, 9116 76 TVD, 92 20 INC, 91 70 AZ
13,398 00	9,114 46	-17 91	4,610 52	Straight line Projection to TD @ 13398 00' MD, 9114 46' TVD

Checked By _____	Approved By: _____	Date: _____
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Minimum Curvature Calculation

Client Concho
Well Lazy J 27 State #1H
County Lea
Rig Silver Oak #12

M.W.D. OPERATOR: Matthew Rainey/CJ Hall
DIRECTIONAL DRILLERS: Brent Harris/ Barry Calcote
Tool Azimuth to Grid North:
Job #: HO-11661

Vertical Section Angle: 90.14

Sur #	Meas. Depth	Inc.	Azm.	T.V.D.	Ver.Sect.	+N / -S	+E / -W	DLS
Tie In	8500.00	1.11	77.12	8499.38	33.87	37.27	33.96	0.00
1	8626.00	10.00	102.90	8624.67	45.75	35.10	45.84	7.15
2	8658.00	16.30	101.50	8655.81	52.87	33.58	52.95	19.71
3	8690.00	20.00	101.50	8686.22	62.64	31.59	62.72	11.56
4	8722.00	24.10	101.70	8715.87	74.41	29.17	74.49	12.81
5	8754.00	28.30	102.40	8744.58	88.23	26.22	88.30	13.16
6	8786.00	32.20	103.80	8772.21	103.94	22.56	103.99	12.38
7	8818.00	35.10	103.40	8798.85	121.18	18.39	121.23	9.09
8	8850.00	38.30	101.10	8824.50	139.88	14.35	139.91	10.88
9	8882.00	41.20	98.20	8849.11	160.05	10.93	160.08	10.75
10	8914.00	43.70	94.50	8872.72	181.52	8.56	181.54	11.04
11	8946.00	46.20	92.20	8895.37	204.08	7.25	204.10	9.32
12	8977.00	49.20	90.90	8916.23	227.00	6.64	227.02	10.16
13	9009.00	52.00	89.90	8936.54	251.73	6.47	251.74	9.08
14	9041.00	55.30	90.20	8955.50	277.50	6.44	277.51	10.34
15	9073.00	58.40	91.30	8973.00	304.28	6.09	304.30	10.11
16	9105.00	61.70	92.40	8988.97	331.99	5.19	332.01	10.73
17	9137.00	65.20	93.10	9003.27	360.58	3.81	360.59	11.11
18	9169.00	68.30	93.40	9015.90	389.94	2.15	389.94	9.73
19	9200.00	72.00	93.80	9026.43	419.04	0.31	419.04	12.00
20	9232.00	75.80	93.60	9035.30	449.72	-1.67	449.71	11.89
21	9264.00	79.70	93.80	9042.09	480.92	-3.69	480.92	12.20
22	9296.00	83.00	93.40	9046.90	512.50	-5.67	512.48	10.39
23	9328.00	86.20	92.20	9049.91	544.32	-7.23	544.30	10.67
24	9360.00	87.80	90.80	9051.59	576.26	-8.06	576.24	6.64
25	9456.00	89.00	90.40	9054.27	672.22	-9.07	672.20	1.32
26	9551.00	89.60	90.40	9055.43	767.21	-9.73	767.19	0.63
27	9646.00	91.70	91.10	9054.35	862.19	-10.97	862.17	2.33
28	9742.00	91.50	89.70	9051.67	958.15	-11.64	958.13	1.47
29	9837.00	89.90	88.80	9050.51	1053.13	-10.40	1053.11	1.93
30	9933.00	89.60	88.70	9050.93	1149.10	-8.31	1149.08	0.33
31	10029.00	91.10	88.50	9050.34	1245.06	-5.96	1245.05	1.58
32	10124.00	92.70	88.10	9047.19	1339.96	-3.14	1339.95	1.74
33	10219.00	91.80	88.10	9043.46	1434.82	0.00	1434.83	0.95
34	10315.00	91.00	88.70	9041.12	1530.75	2.68	1530.76	1.04
35	10410.00	88.50	89.00	9041.53	1625.71	4.59	1625.73	2.65
36	10506.00	87.40	90.10	9044.97	1721.65	5.34	1721.66	1.62
37	10602.00	87.60	89.70	9049.15	1817.55	5.51	1817.57	0.47

PTB/TD