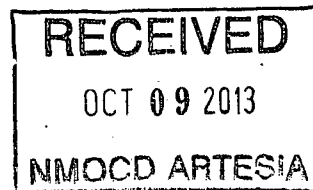


PO Box 261021
Corpus Christi, Texas 78426
(361) 767-0602 • (800) 606-GYRO • Fax (361) 767-0612

July 18, 2013

COG Operating LLC (Concho)
One Concho Center
600 W. Illinois Avenue
Midland, TX 79701



1541274

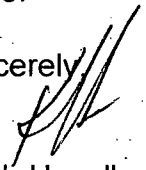
Attn: Kanicia Castillo

Re: **SRO State Unit No 020H**

Please find enclosed a copy of the survey from 0' to 9,460' ran on the above referenced well.

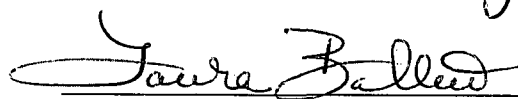
If I can be of any further service, please do not hesitate to call me at 800-606-4976.

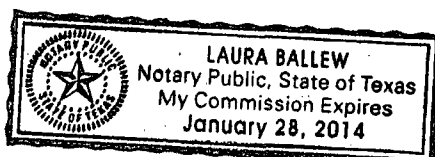
Sincerely,


Keith Havelka
Operations

STATE OF TEXAS §
COUNTY OF NUECES §

This instrument was acknowledged before me on the 18th day of July, A.D., 2013, by Keith Havelka.


Laura Balley
Notary Public, State of Texas





Company: COG Operating LLC-Concho
Lease/Well: SRO State Unit/No 020H
Location: Sec 3 T26S R28E
Rig Name: Patterson 79
State/County: New Mexico/Eddy
Latitude: 32.08, Longitude: -104.07
GRID North is 0.14 Degrees East of True North
VS-Azi: 0.00 Degrees



Depth Reference : RKB 17.5 Feet

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: sro state unit #2h-de_01.ut

Minimum Curvature Method

Report Date/Time: 7/18/2013 / 12:52

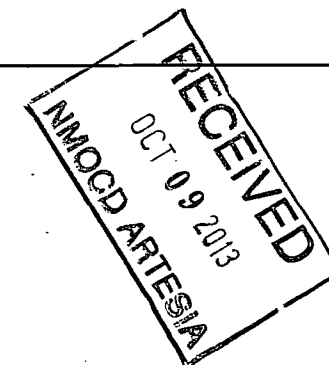
Vaughn Energy Services

West Texas

432-563-5444

Surveyor: Chris Bankson

SRO State Unit No 020H / API 30-015-41274



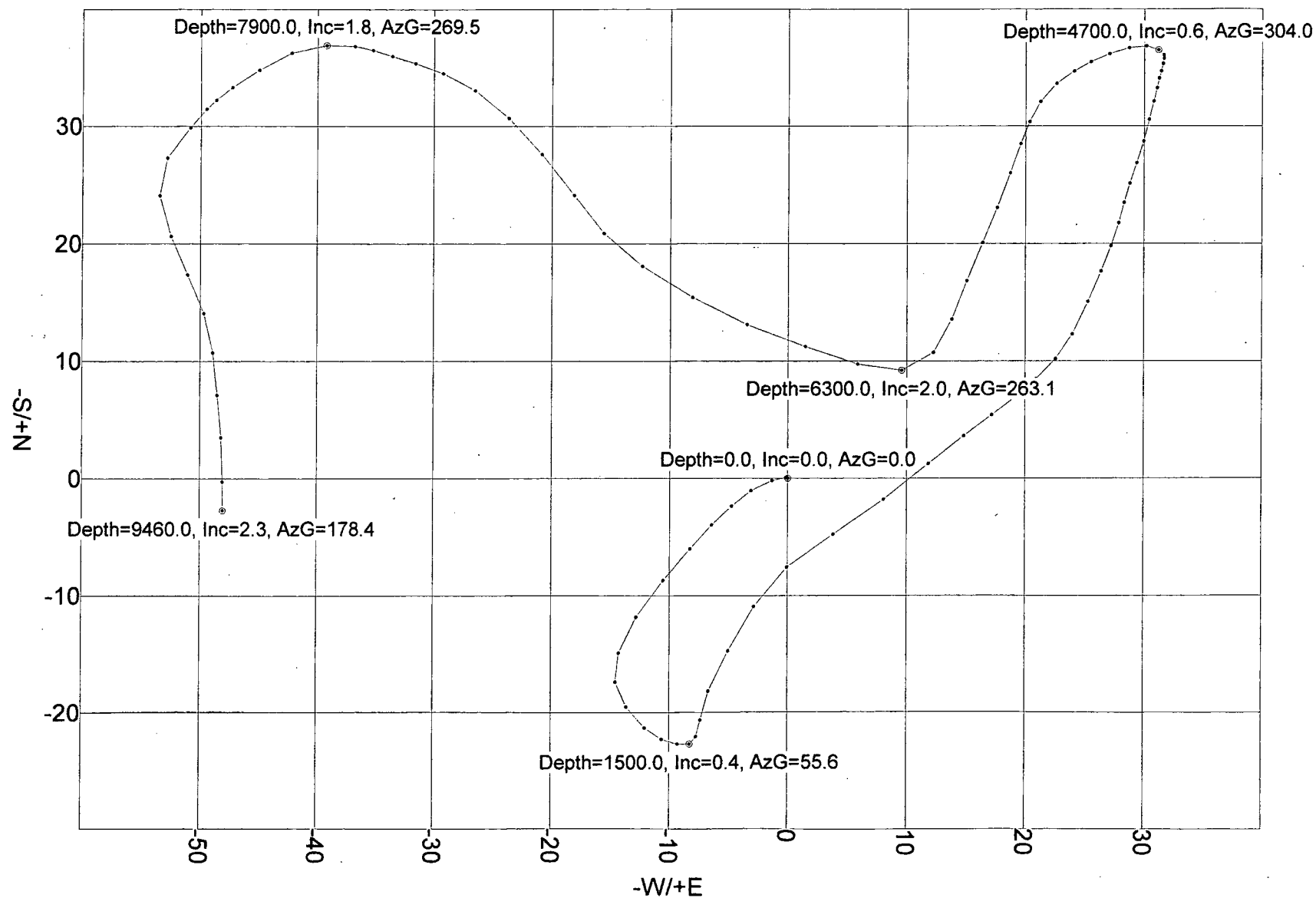
Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
100.00	0.21	285.02	100.00	0.05	-0.18	0.05	0.18	285.02	0.21
200.00	1.17	253.41	199.99	-0.20	-1.33	-0.20	1.35	261.66	0.99
300.00	1.12	233.49	299.97	-1.07	-3.09	-1.07	3.27	250.96	0.40
400.00	1.31	230.14	399.95	-2.38	-4.75	-2.38	5.32	243.41	0.20
500.00	1.37	223.82	499.92	-3.98	-6.46	-3.98	7.58	238.39	0.16
600.00	1.76	219.87	599.88	-6.02	-8.28	-6.02	10.24	233.96	0.40
700.00	2.24	220.25	699.82	-8.69	-10.52	-8.69	13.65	230.44	0.47
800.00	2.23	211.23	799.75	-11.84	-12.79	-11.84	17.43	227.20	0.35
900.00	1.69	199.08	899.69	-14.90	-14.28	-14.90	20.64	223.78	0.68
1000.00	1.28	169.70	999.66	-17.39	-14.56	-17.39	22.69	219.94	0.85
1100.00	1.44	143.72	1099.63	-19.51	-13.62	-19.51	23.79	214.92	0.63
1200.00	1.31	134.10	1199.60	-21.32	-12.05	-21.32	24.49	209.48	0.27
1300.00	0.73	107.61	1299.59	-22.31	-10.63	-22.31	24.71	205.47	0.73
1400.00	0.85	106.74	1399.58	-22.72	-9.31	-22.72	24.55	202.28	0.12
1500.00	0.43	55.61	1499.57	-22.72	-8.29	-22.72	24.18	200.04	0.67
1600.00	0.57	28.82	1599.57	-22.07	-7.74	-22.07	23.39	199.32	0.27
1700.00	1.13	7.45	1699.55	-20.66	-7.37	-20.66	21.93	199.63	0.63
1800.00	1.83	20.10	1799.52	-18.19	-6.69	-18.19	19.38	200.21	0.77

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
1900.00	2.57	29.56	1899.45	-14.74	-5.04	-14.74	15.58	198.88	0.82
2000.00	2.48	30.86	1999.35	-10.93	-2.83	-10.93	11.29	194.49	0.10
2100.00	2.58	47.78	2099.25	-7.56	-0.05	-7.56	7.56	180.37	0.75
2200.00	2.91	59.43	2199.14	-4.76	3.80	-4.76	6.09	141.39	0.65
2300.00	3.04	51.09	2299.01	-1.80	8.05	-1.80	8.25	102.61	0.45
2400.00	2.53	50.95	2398.89	1.26	11.83	1.26	11.90	83.94	0.51
2500.00	1.82	52.25	2498.81	3.62	14.81	3.62	15.24	76.26	0.71
2600.00	1.58	54.28	2598.77	5.40	17.18	5.40	18.01	72.56	0.25
2700.00	1.30	51.21	2698.74	6.91	19.18	6.91	20.39	70.19	0.29
2800.00	1.39	45.61	2798.71	8.47	20.93	8.47	22.58	67.97	0.16
2900.00	1.31	41.45	2898.68	10.18	22.56	10.18	24.74	65.72	0.13
3000.00	1.65	27.18	2998.65	12.31	23.97	12.31	26.95	62.81	0.50
3100.00	1.85	24.08	3098.60	15.07	25.29	15.07	29.43	59.21	0.22
3200.00	1.38	21.77	3198.56	17.65	26.39	17.65	31.75	56.22	0.48
3300.00	1.30	20.53	3298.54	19.83	27.23	19.83	33.69	53.94	0.09
3400.00	1.04	15.78	3398.52	21.77	27.88	21.77	35.37	52.02	0.27
3500.00	1.01	13.22	3498.50	23.50	28.33	23.50	36.81	50.32	0.06
3600.00	0.93	19.49	3598.49	25.13	28.80	25.13	38.22	48.90	0.14
3700.00	1.18	17.94	3698.47	26.87	29.39	26.87	39.82	47.56	0.25
3800.00	1.04	16.12	3798.45	28.72	29.95	28.72	41.50	46.21	0.15
3900.00	1.14	12.66	3898.43	30.56	30.42	30.56	43.12	44.87	0.12
4000.00	0.71	14.37	3998.42	32.13	30.80	32.13	44.50	43.79	0.43
4100.00	0.63	11.57	4098.41	33.27	31.06	33.27	45.51	43.03	0.08
4200.00	0.34	12.64	4198.41	34.10	31.23	34.10	46.24	42.49	0.29
4300.00	0.39	16.80	4298.41	34.71	31.40	34.71	46.80	42.13	0.06
4400.00	0.36	10.95	4398.40	35.34	31.55	35.34	47.37	41.76	0.05
4500.00	0.16	6.26	4498.40	35.78	31.63	35.78	47.75	41.48	0.20
4600.00	0.18	350.21	4598.40	36.07	31.62	36.07	47.96	41.24	0.05
4700.00	0.58	304.03	4698.40	36.50	31.17	36.50	48.00	40.49	0.47
4800.00	0.67	275.78	4798.39	36.85	30.17	36.85	47.62	39.31	0.32
4900.00	1.01	256.05	4898.38	36.69	28.72	36.69	46.60	38.05	0.44
5000.00	0.97	249.33	4998.37	36.18	27.07	36.18	45.19	36.80	0.12
5100.00	0.99	244.26	5098.35	35.50	25.50	35.50	43.71	35.68	0.09
5200.00	0.88	237.33	5198.34	34.71	24.07	34.71	42.24	34.74	0.16
5300.00	1.18	232.09	5298.32	33.66	22.60	33.66	40.55	33.88	0.32
5400.00	1.20	210.59	5398.30	32.12	21.26	32.12	38.52	33.49	0.45
5500.00	1.04	203.89	5498.28	30.39	20.35	30.39	36.58	33.81	0.21
5600.00	1.29	200.69	5598.26	28.50	19.59	28.50	34.58	34.50	0.26
5700.00	1.73	198.33	5698.23	26.01	18.71	26.01	32.05	35.73	0.44

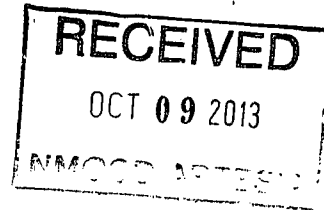
Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
5800.00	1.87	202.43	5798.18	23.07	17.62	23.07	29.03	37.36	0.19
5900.00	1.84	202.85	5898.13	20.08	16.37	20.08	25.91	39.18	0.03
6000.00	2.17	201.76	5998.06	16.84	15.04	16.84	22.58	41.77	0.33
6100.00	1.87	200.61	6098.00	13.55	13.76	13.55	19.32	45.44	0.31
6200.00	1.86	216.46	6197.95	10.72	12.23	10.72	16.26	48.75	0.51
6300.00	1.96	263.07	6297.90	9.21	9.57	9.21	13.28	46.09	1.51
6400.00	2.46	289.97	6397.83	9.74	5.85	9.74	11.36	31.00	1.14
6500.00	2.89	287.61	6497.72	11.24	1.43	11.24	11.33	7.26	0.44
6600.00	3.12	293.73	6597.58	13.09	-3.46	13.09	13.54	345.19	0.39
6700.00	2.87	299.98	6697.45	15.44	-8.12	15.44	17.44	332.26	0.41
6800.00	2.86	304.23	6797.32	18.09	-12.34	18.09	21.90	325.69	0.21
6900.00	2.14	319.48	6897.23	20.91	-15.62	20.91	26.10	323.24	0.97
7000.00	2.56	323.73	6997.14	24.14	-18.16	24.14	30.20	323.04	0.46
7100.00	2.49	320.83	7097.04	27.62	-20.85	27.62	34.61	322.95	0.15
7200.00	2.29	314.53	7196.96	30.71	-23.65	30.71	38.76	322.40	0.33
7300.00	2.00	303.54	7296.89	33.07	-26.53	33.07	42.40	321.27	0.50
7400.00	1.55	292.00	7396.84	34.54	-29.24	34.54	45.26	319.76	0.57
7500.00	1.30	287.27	7496.81	35.39	-31.58	35.39	47.43	318.26	0.27
7600.00	1.07	287.98	7596.79	36.01	-33.55	36.01	49.22	317.03	0.24
7700.00	0.90	286.23	7696.77	36.52	-35.19	36.52	50.72	316.06	0.17
7800.00	0.99	276.92	7796.76	36.85	-36.81	36.85	52.08	315.03	0.17
7900.00	1.81	269.47	7896.73	36.93	-39.24	36.93	53.89	313.27	0.84
8000.00	1.78	245.11	7996.68	36.27	-42.23	36.27	55.66	310.66	0.76
8100.00	1.82	239.34	8096.63	34.80	-45.00	34.80	56.89	307.72	0.19
8200.00	1.32	234.46	8196.59	33.32	-47.31	33.32	57.87	305.16	0.52
8300.00	0.69	226.47	8296.58	32.24	-48.68	32.24	58.39	303.51	0.65
8400.00	0.61	227.94	8396.57	31.47	-49.51	31.47	58.67	302.44	0.08
8500.00	1.80	218.73	8496.55	29.89	-50.89	29.89	59.02	300.43	1.21
8600.00	1.89	215.05	8596.50	27.31	-52.82	27.31	59.46	297.34	0.15
8700.00	2.15	169.86	8696.44	24.11	-53.43	24.11	58.62	294.29	1.57
8800.00	2.00	159.12	8796.37	20.63	-52.48	20.63	56.39	291.46	0.42
8900.00	2.09	154.22	8896.31	17.35	-51.06	17.35	53.93	288.77	0.20
9000.00	2.00	160.91	8996.25	14.06	-49.70	14.06	51.65	285.80	0.26
9100.00	1.96	173.15	9096.19	10.72	-48.93	10.72	50.09	282.36	0.42
9200.00	2.19	174.08	9196.12	7.12	-48.53	7.12	49.04	278.35	0.23
9300.00	1.98	175.71	9296.06	3.50	-48.20	3.50	48.33	274.15	0.21
9400.00	2.35	179.89	9395.98	-0.28	-48.07	-0.28	48.07	269.67	0.40
9460.00	2.34	178.39	9455.93	-2.73	-48.03	-2.73	48.11	266.75	0.10



Vaughn Energy Services
West Texas
432-563-5444
Surveyor: Chris Bankson
SRO State Unit No 020H / API 30-015-41274



VES Survey Date: 07/10/2013



COG Operating, LLC

Eddy County, NM (NAD 27)

Sec 3, T26S, R28E

SRO State Unit #20H

Wellbore #1

Survey: DDC MWD Surveys

DDC Survey Report

01 August, 2013





Survey Certification Sheet

COG Operating, LLC
Company

WT-13543
Job Number

8/01/13
Date

Sec3,T26S,R28E
Lease

SRO State Unit # 20H
Well Name

Eddy, NM
County & State

API: 30-015-41274

Surveyed from a depth of OH: 7400 feet to 11727 feet MD
Surveyed from a depth of ST#1: 11516 feet to 15303 feet MD

Type of Survey: MWD

Directional Supervisor/Surveyor: Mike Valentine

The data and calculations for this survey have been checked by me and conform to the standards and procedures set forth by **The Directional Drilling Company (DDC)**. This report represents a true and correct Directional survey of this well based on the original data obtained at the well site. Wellbore Coordinates are calculated using minimum curvature.

Digitally signed by Larry Wright
DN: cn=Larry Wright, o=The
Directional Drilling Company,
ou=GM of Guidance Services,
email=larryw@directionaldrillers.
com, c=US
Date: 2013.08.07 16:12:36 -05'00'

Larry Wright
MWD General Manager



DDC Survey Report



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well SRO State Unit #20H
Project:	Eddy County, NM (NAD 27)	TVD Reference:	WELL @ 2935.0usft (Patriot #3)
Site:	Sec 3, T26S, R28E	MD Reference:	WELL @ 2935.0usft (Patriot #3)
Well:	SRO State Unit #20H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Single User Db

Project:	Eddy County, NM (NAD 27)		
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:	Sec 3, T26S, R28E		
Site Position:		Northing:	392,310.50 usft
From:	Map	Easting:	581,716.40 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 4' 41.889 N
		Longitude:	104° 4' 10.213 W
		Grid Convergence:	0.14 °

Well:	SRO State Unit #20H		
Well Position	+N-S	0.0 usft	Northing: 392,310.50 usft
	+E-W	0.0 usft	Easting: 581,716.40 usft
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft
		Latitude:	32° 4' 41.889 N
		Longitude:	104° 4' 10.213 W
		Ground Level:	2,918.1 usft

Wellbore:	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
			(°)	(°)	(nT)
	IGRF2010	6/25/2013	7.55	59.92	48,275

Design:	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	7,400.0
Vertical Section:	Depth From (TVD)	+N-S	+E-W	Direction	
	(usft)	(usft)	(usft)	(°)	
	0.0	0.0	0.0	176.56	

Survey Program	Date	7/22/2013			
From	To	Survey (Wellbore)	Tool Name	Description	
(usft)	(usft)				
100.0	7,400.0	VES Gyro Survey (Pilot Hole)	Good_gyro	Good Gyro	
7,514.0	11,727.0	DDC MWD Surveys (Wellbore #1)	MWD default	MWD - Standard	

Survey:										
Measured	Inclination	Azimuth	Vertical	+N-S	+E-W	Vertical	Dogleg	Build	Turn	
Depth	(°)	(°)	Depth	(usft)	(usft)	Section	Rate	Rate	Rate	
(usft)			(usft)			(usft)	(°/100usft)	(°/100usft)	(°/100usft)	
Tie into Gyro @ 7400' MD										
7,400.0	1.55	292.00	7,396.8	34.6	-29.2	-36.3	0.00	0.00	0.00	
7,514.0	1.50	197.50	7,510.8	33.8	-31.1	-35.6	1.96	-0.04	-82.89	
7,545.0	4.50	153.30	7,541.8	32.3	-30.7	-34.1	11.55	9.68	-142.58	
7,577.0	8.40	147.20	7,573.6	29.2	-28.8	-30.9	12.36	12.19	-19.06	
7,608.0	12.80	151.40	7,604.0	24.3	-26.0	-25.8	14.40	14.19	13.55	
7,640.0	15.70	151.70	7,635.0	17.4	-22.2	-18.7	9.07	9.06	0.94	
7,671.0	18.80	153.70	7,664.6	9.2	-18.0	-10.3	10.18	10.00	6.45	
7,703.0	22.00	153.50	7,694.6	-0.8	-13.0	0.0	10.00	10.00	-0.63	
7,734.0	24.50	153.50	7,723.1	-11.8	-7.6	11.3	8.06	8.06	0.00	



DDC
Survey Report



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well SRO State Unit #20H
Project:	Eddy County, NM (NAD 27)	TVD Reference:	WELL @ 2935.0usft (Patriot #3)
Site:	Sec 3, T26S, R28E	MD Reference:	WELL @ 2935.0usft (Patriot #3)
Well:	SRO State Unit #20H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Single User Db

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)
7,765.0	26.90	153.00	7,751.0	-23.8	-1.5	23.6	7.77	7.74	-1.61
7,797.0	29.80	153.70	7,779.2	-37.3	5.3	37.6	9.12	9.06	2.19
7,828.0	33.20	154.50	7,805.6	-51.9	12.3	52.6	11.05	10.97	2.58
7,860.0	36.70	154.70	7,831.9	-68.5	20.2	69.6	10.94	10.94	0.63
7,891.0	39.50	154.20	7,856.2	-85.7	28.5	87.3	9.09	9.03	-1.61
7,922.0	42.40	153.70	7,879.7	-104.0	37.4	106.0	9.41	9.35	-1.61
7,954.0	45.60	153.00	7,902.7	-123.8	47.4	126.5	10.11	10.00	-2.19
7,986.0	47.60	152.30	7,924.7	-144.5	58.0	147.7	6.45	6.25	-2.19
8,017.0	49.40	153.50	7,945.2	-165.1	68.6	169.0	6.49	5.81	3.87
8,049.0	52.10	154.50	7,965.4	-187.4	79.5	191.9	8.78	8.44	3.13
8,080.0	55.50	154.70	7,983.8	-210.0	90.2	215.0	10.98	10.97	0.65
8,112.0	58.10	154.20	8,001.3	-234.2	101.7	239.9	8.23	8.13	-1.56
8,143.0	59.60	154.20	8,017.3	-258.1	113.3	264.4	4.84	4.84	0.00
8,175.0	62.20	154.40	8,032.9	-283.2	125.4	290.3	8.14	8.13	0.63
8,207.0	65.30	156.60	8,047.0	-309.4	137.3	317.0	11.48	9.69	6.88
8,238.0	68.20	157.70	8,059.3	-335.6	148.4	343.9	9.91	9.35	3.55
8,270.0	70.90	159.50	8,070.4	-363.5	159.3	372.4	9.95	8.44	5.63
8,301.0	73.20	160.50	8,080.0	-391.2	169.4	400.7	8.03	7.42	3.23
8,332.0	74.80	160.90	8,088.5	-419.4	179.2	429.4	5.31	5.16	1.29
8,348.0	76.70	161.80	8,092.5	-434.0	184.2	444.3	13.07	11.88	5.63
8,380.0	78.80	165.60	8,099.3	-464.1	193.0	474.8	13.33	6.56	11.88
8,411.0	82.00	168.60	8,104.4	-493.8	199.8	504.9	14.06	10.32	9.68
8,443.0	84.30	171.10	8,108.3	-525.1	205.4	536.5	10.57	7.19	7.81
8,474.0	85.70	173.90	8,111.0	-555.7	209.4	567.3	10.07	4.52	9.03
8,506.0	86.40	174.10	8,113.2	-587.5	212.7	599.2	2.27	2.19	0.63
8,537.0	87.40	176.90	8,114.8	-618.3	215.2	630.1	9.58	3.23	9.03
8,569.0	89.20	178.30	8,115.8	-650.3	216.5	662.1	7.12	5.63	4.38
8,664.0	90.10	179.00	8,116.4	-745.3	218.8	757.0	1.20	0.95	0.74
8,759.0	88.90	179.90	8,117.2	-840.2	219.7	851.9	1.58	-1.26	0.95
8,854.0	89.00	179.10	8,118.9	-935.2	220.5	946.8	0.85	0.11	-0.84
8,949.0	89.20	179.30	8,120.4	-1,030.2	221.8	1,041.7	0.30	0.21	0.21
9,043.0	89.30	178.30	8,121.7	-1,124.2	223.8	1,135.6	1.07	0.11	-1.06
9,139.0	89.40	179.00	8,122.7	-1,220.1	226.0	1,231.5	0.74	0.10	0.73
9,234.0	89.80	178.30	8,123.4	-1,315.1	228.3	1,326.4	0.85	0.42	-0.74
9,329.0	89.60	177.00	8,123.9	-1,410.0	232.2	1,421.4	1.38	-0.21	-1.37
9,425.0	89.70	178.10	8,124.5	-1,505.9	236.3	1,517.4	1.15	0.10	1.15
9,520.0	90.80	177.20	8,124.1	-1,600.9	240.2	1,612.4	1.50	1.16	-0.95
9,615.0	89.60	176.30	8,123.7	-1,695.7	245.6	1,707.4	1.58	-1.26	-0.95
9,710.0	90.20	177.60	8,123.9	-1,790.6	250.6	1,802.4	1.51	0.63	1.37
9,804.0	89.70	177.90	8,124.0	-1,884.5	254.3	1,896.4	0.62	-0.53	0.32
9,900.0	91.20	177.40	8,123.2	-1,980.4	258.2	1,992.3	1.65	1.56	-0.52
9,995.0	91.60	177.20	8,120.9	-2,075.3	262.7	2,087.3	0.47	0.42	-0.21
10,089.0	90.10	176.90	8,119.5	-2,169.1	267.6	2,181.3	1.63	-1.60	-0.32



DDC
Survey Report



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well SRO State Unit #20H
Project:	Eddy County, NM (NAD 27)	TVD Reference:	WELL @ 2935.0usft (Patriot #3)
Site:	Sec 3, T26S, R28E	MD Reference:	WELL @ 2935.0usft (Patriot #3)
Well:	SRO State Unit #20H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM-5000.1 Single User Db

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)	
10,185.0	89.90	178.10	8,119.5	-2,265.0	271.7	2,277.3	1.27	-0.21	1.25	
10,280.0	89.80	177.90	8,119.8	-2,360.0	275.1	2,372.2	0.24	-0.11	-0.21	
10,375.0	89.20	176.50	8,120.6	-2,454.9	279.7	2,467.2	1.60	-0.63	-1.47	
10,470.0	89.40	178.40	8,121.8	-2,549.8	283.9	2,562.2	2.01	0.21	2.00	
10,566.0	90.60	177.90	8,121.8	-2,645.7	287.0	2,658.2	1.35	1.25	-0.52	
10,661.0	90.90	177.60	8,120.5	-2,740.6	290.8	2,753.1	0.45	0.32	-0.32	
10,756.0	91.10	177.60	8,118.9	-2,835.5	294.7	2,848.1	0.21	0.21	0.00	
10,851.0	90.80	176.90	8,117.3	-2,930.4	299.3	2,943.1	0.80	-0.32	-0.74	
10,946.0	88.60	177.00	8,117.8	-3,025.3	304.3	3,038.1	2.32	-2.32	0.11	
11,041.0	88.30	177.90	8,120.4	-3,120.1	308.6	3,133.0	1.00	-0.32	0.95	
11,136.0	87.90	177.70	8,123.5	-3,215.0	312.2	3,227.9	0.47	-0.42	-0.21	
11,231.0	89.30	177.60	8,125.8	-3,309.9	316.1	3,322.9	1.48	1.47	-0.11	
11,326.0	89.30	177.40	8,127.0	-3,404.8	320.3	3,417.9	0.21	0.00	-0.21	
11,421.0	89.80	176.90	8,127.7	-3,499.7	325.0	3,512.9	0.74	0.53	-0.53	
11,516.0	90.00	177.60	8,127.9	-3,594.6	329.5	3,607.9	0.77	0.21	0.74	
11,610.0	90.80	179.50	8,127.2	-3,688.5	331.9	3,701.8	2.19	0.85	2.02	
TD OH @ 11727' MD / 8125.6' TVD										
11,727.0	90.80	179.50	8,125.6	-3,805.5	332.9	3,818.6	0.00	0.00	0.00	

Survey Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
7,400.0	7,396.8	34.6	-29.2	Tie into Gyro @ 7400' MD	
11,727.0	8,125.6	-3,805.5	332.9	TD OH @ 11727' MD / 8125.6' TVD	

Checked By: _____	Approved By: _____	Date: _____
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COG Operating, LLC

Eddy County, NM (NAD 27)

Sec 3, T26S, R28E

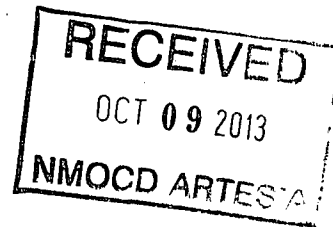
SRO State Unit #20H

Sidetrack #1

Survey: MWD

DDC Survey Report

01 August, 2013





DDC
Survey Report



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well SRO State Unit #20H
Project:	Eddy County, NM (NAD 27)	TVD Reference:	WELL @ 2935.0usft (Patriot #3)
Site:	Sec 3, T26S, R28E	MD Reference:	WELL @ 2935.0usft (Patriot #3)
Well:	SRO State Unit #20H	North Reference:	Grid
Wellbore:	Sidetrack #1	Survey Calculation Method:	Minimum Curvature
Design:	Sidetrack #1	Database:	EDM 5000.1 Single User Db

Project:	Eddy County, NM (NAD 27)		
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:	Sec 3, T26S, R28E		
Site Position:		Northing:	392,310.50 usft
From:	Map	Easting:	581,716.40 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 4' 41.889 N
		Longitude:	104° 4' 10.213 W
		Grid Convergence:	0.14 °

Well:	SRO State Unit #20H		
Well Position	+N/-S	0.0 usft	Northing:
	+E/-W	0.0 usft	Easting:
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft
		Latitude:	32° 4' 41.889 N
		Longitude:	104° 4' 10.213 W
		Ground Level:	2,918.1 usft

Wellbore:	Sidetrack #1		
Magnetics	Model Name	Sample Date	Declination
			(°)
	IGRF2010	7/22/2013	7.55
			Dip Angle
			(°)
			59.91
			Field Strength
			(nT)
			48,267

Design:	Sidetrack #1		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	11,421.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.0	0.0	0.0
			Direction
			(°)
			176.56

Survey Program	Date 7/30/2013		
From	To	Survey (Wellbore)	Tool Name
(usft)	(usft)		
100.0	7,400.0	VES Gyro Survey (Pilot Hole)	Good_gyro
7,514.0	11,421.0	DDC MWD Surveys (Wellbore #1)	MWD default
11,516.0	15,303.0	MWD (Sidetrack #1)	MWD default
			Description
			Good Gyro
			MWD - Standard
			MWD - Standard

Survey									
Measured	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Vertical	Dogleg	Build	Turn
Depth	(°)	(°)	Depth	(usft)	(usft)	Section	Rate	Rate	Rate
(usft)			(usft)			(usft)	(°/100usft)	(°/100usft)	(°/100usft)
TIE IN @ 11516' MD / 8127.9' TVD									
11,516.0	90.00	177.60	8,127.9	-3,594.6	329.5	3,607.9	0.77	0.21	0.74
11,614.0	84.30	181.20	8,132.8	-3,692.4	330.6	3,705.6	6.88	-5.82	3.67
11,645.0	84.20	181.40	8,135.9	-3,723.2	329.9	3,736.3	0.72	-0.32	0.65
11,677.0	84.90	183.90	8,138.9	-3,755.0	328.4	3,768.0	8.08	2.19	7.81
11,708.0	85.20	182.00	8,141.6	-3,785.9	326.8	3,798.7	6.18	0.97	-6.13
11,740.0	86.20	182.10	8,144.0	-3,817.8	325.7	3,830.4	3.14	3.13	0.31
11,772.0	86.40	182.30	8,146.1	-3,849.7	324.4	3,862.2	0.88	0.63	0.63
11,804.0	88.30	182.10	8,147.5	-3,881.6	323.2	3,894.0	5.97	5.94	-0.63



DDC Survey Report



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well SRO State Unit #20H
Project:	Eddy County, NM (NAD 27)	TVD Reference:	WELL @ 2935.0usft (Patriot #3)
Site:	Sec 3, T26S, R28E	MD Reference:	WELL @ 2935.0usft (Patriot #3)
Well:	SRO State Unit #20H	North Reference:	Grid
Wellbore:	Sidetrack #1	Survey Calculation Method:	Minimum Curvature
Design:	Sidetrack #1	Database:	EDM 5000.1 Single User Db

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)	
11,835.0	88.70	182.00	8,148.3	-3,912.6	322.1	3,924.9	1.33	1.29	-0.32	
11,867.0	88.90	182.00	8,149.0	-3,944.6	321.0	3,956.7	0.63	0.63	0.00	
11,899.0	90.10	181.60	8,149.3	-3,976.5	320.0	3,988.6	3.95	3.75	-1.25	
11,930.0	90.50	180.70	8,149.1	-4,007.5	319.4	4,019.5	3.18	1.29	-2.90	
11,962.0	90.60	181.10	8,148.8	-4,039.5	318.9	4,051.4	1.29	0.31	1.25	
11,993.0	90.70	180.70	8,148.5	-4,070.5	318.4	4,082.3	1.33	0.32	-1.29	
12,025.0	90.80	180.20	8,148.1	-4,102.5	318.1	4,114.2	1.59	0.31	-1.56	
12,056.0	91.00	180.00	8,147.6	-4,133.5	318.1	4,145.2	0.91	0.65	-0.65	
12,088.0	91.30	179.90	8,146.9	-4,165.5	318.1	4,177.1	0.99	0.94	-0.31	
12,119.0	90.50	179.30	8,146.4	-4,196.5	318.3	4,208.0	3.23	-2.58	-1.94	
12,151.0	90.20	179.00	8,146.2	-4,228.5	318.8	4,240.0	1.33	-0.94	-0.94	
12,180.0	90.00	178.60	8,146.2	-4,257.5	319.4	4,269.0	1.54	-0.69	-1.38	
12,274.0	90.40	176.70	8,145.9	-4,351.4	323.2	4,363.0	2.07	0.43	-2.02	
12,367.0	90.80	177.00	8,144.9	-4,444.3	328.4	4,456.0	0.54	0.43	0.32	
12,463.0	90.50	174.90	8,143.8	-4,540.0	335.1	4,551.9	2.21	-0.31	-2.19	
12,557.0	90.20	174.10	8,143.2	-4,633.6	344.1	4,645.9	0.91	-0.32	-0.85	
12,653.0	92.00	174.80	8,141.4	-4,729.1	353.4	4,741.8	2.01	1.88	0.73	
12,748.0	91.00	174.60	8,138.9	-4,823.7	362.2	4,836.7	1.07	-1.05	-0.21	
12,843.0	90.50	174.20	8,137.7	-4,918.2	371.5	4,931.6	0.67	-0.53	-0.42	
12,938.0	92.00	176.20	8,135.6	-5,012.8	379.4	5,026.6	2.63	1.58	2.11	
13,033.0	92.50	177.90	8,131.9	-5,107.6	384.3	5,121.5	1.86	0.53	1.79	
13,129.0	91.80	178.30	8,128.3	-5,203.5	387.5	5,217.4	0.84	-0.73	0.42	
13,224.0	91.00	179.50	8,125.9	-5,298.5	389.3	5,312.3	1.52	-0.84	1.26	
13,319.0	90.80	179.00	8,124.4	-5,393.5	390.5	5,407.2	0.57	-0.21	-0.53	
13,412.0	91.00	178.60	8,123.0	-5,486.4	392.5	5,500.1	0.48	0.22	-0.43	
13,507.0	91.30	178.80	8,121.1	-5,581.4	394.6	5,595.0	0.38	0.32	0.21	
13,601.0	90.80	179.90	8,119.3	-5,675.4	395.7	5,688.9	1.29	-0.53	1.17	
13,695.0	90.80	180.00	8,118.0	-5,769.3	395.8	5,782.7	0.11	0.00	0.11	
13,789.0	89.80	180.60	8,117.5	-5,863.3	395.3	5,876.5	1.24	-1.06	0.64	
13,883.0	89.70	180.70	8,118.0	-5,957.3	394.2	5,970.3	0.15	-0.11	0.11	
13,978.0	89.80	180.70	8,118.4	-6,052.3	393.1	6,065.0	0.11	0.11	0.00	
14,074.0	90.00	180.20	8,118.5	-6,148.3	392.3	6,160.8	0.56	0.21	-0.52	
14,166.0	88.60	179.10	8,119.7	-6,240.3	392.9	6,252.6	1.94	-1.52	-1.20	
14,261.0	89.40	178.80	8,121.3	-6,335.3	394.6	6,347.5	0.90	0.84	-0.32	
14,354.0	90.40	179.50	8,121.5	-6,428.3	396.0	6,440.4	1.31	1.08	0.75	
14,449.0	89.30	177.60	8,121.7	-6,523.2	398.4	6,535.4	2.31	-1.16	-2.00	
14,543.0	88.80	176.90	8,123.3	-6,617.1	402.9	6,629.4	0.92	-0.53	-0.74	
14,638.0	89.30	176.90	8,124.9	-6,712.0	408.1	6,724.3	0.53	0.53	0.00	
14,733.0	90.90	177.00	8,124.7	-6,806.8	413.1	6,819.3	1.69	1.68	0.11	
14,828.0	91.40	176.30	8,122.8	-6,901.6	418.7	6,914.3	0.91	0.53	-0.74	
14,924.0	89.50	176.20	8,122.0	-6,997.4	424.9	7,010.3	1.98	-1.98	-0.10	
15,019.0	90.00	175.80	8,122.5	-7,092.2	431.6	7,105.3	0.67	0.53	-0.42	
15,114.0	89.10	176.70	8,123.2	-7,187.0	437.8	7,200.3	1.34	-0.95	0.95	



DDC
Survey Report



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well SRO State Unit #20H
Project:	Eddy County, NM (NAD 27)	TVD Reference:	WELL @ 2935.0usft (Patriot #3)
Site:	Sec 3, T26S, R28E	MD Reference:	WELL @ 2935.0usft (Patriot #3)
Well:	SRO State Unit #20H	North Reference:	Grid
Wellbore:	Sidetrack #1	Survey Calculation Method:	Minimum Curvature
Design:	Sidetrack #1	Database:	EDM 5000.1 Single User Db

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)
15,209.0	89.30	176.70	8,124.5	-7,281.8	443.2	7,295.3	0.21	0.21	0.00
15,253.0	89.30	177.00	8,125.1	-7,325.7	445.7	7,339.3	0.68	0.00	0.68
TD @ 15303' MD / 8125.7' TVD									
15,303.0	89.30	177.00	8,125.7	-7,375.7	448.3	7,389.3	0.00	0.00	0.00

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
11,516.0	8,127.9	-3,594.6	329.5	TIE IN @ 11516' MD / 8127.9' TVD
15,303.0	8,125.7	-7,375.7	448.3	TD @ 15303' MD / 8125.7' TVD

Checked By: _____	Approved By: _____	Date: _____
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