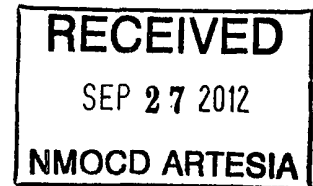
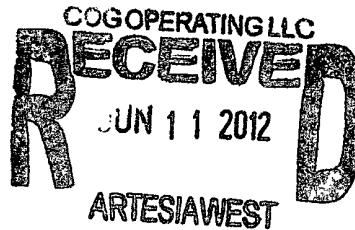




PO Box 1370
Artesia, NM 88211-1370
(575) 748-1288



June 4, 2012

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

30-015-36776

RE: Patron 23 Federal #1H
990' FNL & 560' FWL
Sec. 23, T25S, R29E
Eddy County, New Mexico

Dear Sir,

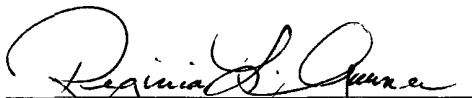
The attached is the Deviation Survey for the above captioned well.

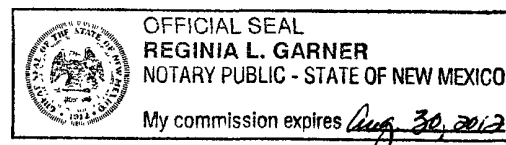
Very truly yours,


Eddie C. LaRue
Operations Manager

State of New Mexico }
County of Eddy }

The foregoing was acknowledged before me this 4th day of June, 2012.


Regina L. Garner
Notary Public



Pason DataHub Deviation Survey

Well Dossier 1336785489 - PATRON 23 FEDERAL 1H

# Date	Depth	Deviation	Direction	TVD	Horiz
5/12/2012	206	0.3	0	0	0.00
5/12/2012	479	0.3	0	0	0.00
5/14/2012	902	0.2	0	0	0.00
5/14/2012	1409	0.8	0	0	0.00
5/14/2012	1792	0.8	0	0	0.00
5/14/2012	2237	1.2	0	0	0.00
5/15/2012	2714	1.9	0	0	0.00
5/15/2012	3080	3.1	0	0	0.00
5/17/2012	3541	1.0	0	3621	0.00
5/17/2012	3987	1.1	0	4067	0.00
5/17/2012	4464	0.8	0	4544	0.00
5/18/2012	4942	0.2	0	5022	0.00
5/18/2012	5419	0.8	0	5499	0.00
5/18/2012	5893	0.7	0	0	0.00
5/18/2012	6406	1.1	0	0	0.00
5/19/2012	6948	0.8	0	0	0.00
5/20/2012	7487	2.7	0	0	0.00
5/20/2012	7987	3.9	0	0	0.00
5/21/2012	8500	1.4	0	0	0.00
5/22/2012	8990	1.5	0	0	0.00
5/23/2012	9489	1.4	0	0	0.00
5/23/2012	9962	0.9	0	0	0.00
5/27/2012	7154	1.8	278.2	7151	53.88
5/27/2012	7218	1.5	126.8	7216	0.00
5/27/2012	7249	6.2	140.7	7247	0.00
5/28/2012	4663	45.5	164.4	7613	227.00
5/28/2012	7281	9.2	153.7	7278	0.00
5/28/2012	7472	26.2	168.3	7459	0.00
5/28/2012	7568	35.9	164.6	7541	0.00
5/28/2012	7759	58.3	161.8	7672	299.16
5/28/2012	7855	70.3	171.6	7714	383.00
5/29/2012	8171	89.5	175.8	7746	695.00
5/29/2012	8267	89.5	178.7	7747	791.00
5/29/2012	8363	90.2	178.8	1747	887.00
5/29/2012	8458	91.9	178.7	7745	982.00
5/29/2012	8553	91.3	177.3	7742	1077.00
5/29/2012	8648	91.9	178	7740	1172.00
5/29/2012	8839	87.1	178.7	7739	1363.00
5/29/2012	8935	88.9	179.6	7742	1459.00
5/29/2012	9031	90.2	178.7	7743	1555.16
5/29/2012	9127	90.6	4179.9	7742	1651.14
5/29/2012	9222	90.0	180.8	7742	1746.07

#	Date	Depth	Deviation	Direction	TVD	Horiz
	5/29/2012	9318	87.8	179	7743	1842.00
	5/29/2012	9413	89.3	180.3	7746	0.00
	5/29/2012	9509	88.1	179.5	7748	2032.87
	5/30/2012	9700	91.0	181.6	7752	0.00
	5/30/2012	9985	91.3	181.9	7747	0.00
	5/30/2012	10177	88.5	177.6	7750	0.00
	5/30/2012	10464	91.7	177.4	0	0.00
	5/30/2012	10560	89.8	177.4	0	0.00
	5/30/2012	11037	91.7	174.5	0	0.00
	5/30/2012	1227	91.0	174.7	7742	3748.89
	5/30/2012	11232	90.0	175.1	7742	3844.73
	5/30/2012	11418	90.6	175.3	7741	3939.67

COG OPERATING, LLC
RECEIVED

JUL 09 2012

ARTESIA WEST

COG OPERATING

Corral Draw
Eddy County, NM
Patron "23" Federal #1H
VH - Job #32K0512598

RECEIVED
SEP 27 2012
NMOCD ARTESIA

Survey: Gyro

SDI Standard Survey Report

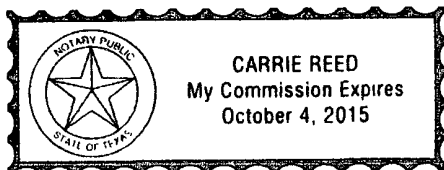
This survey is correct to the best of my knowledge and is supported by actual field data.

Hubert

Notarized this date 15th of June, 2012.

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 Patron "23" Federal #1H
Project:	Corral Draw	TVD Reference:	WELL @ 0 00usft (Original Well Elev)
Site:	Eddy County, NM	MD Reference:	WELL @ 0.00usft (Original Well Elev)
Well:	Patron "23" Federal #1H	North Reference:	Grid
Wellbore:	VH - Job #32K0512598	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0512598	Database:	EDM-Regulatory

Project	Corral Draw		
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	Eddy County, NM		
Site Position:	Northing:	407,549 94 usft	Latitude: 32° 7' 11 730 N
From: Lat/Long	Easting:	615,137 49 usft	Longitude: 103° 57' 41 155 W
Position Uncertainty: 0 00 usft	Slot Radius:	13-3/16"	Grid Convergence: 0 20 °

Well	Patron "23" Federal #1H, Directional (Unknown)		
Well Position	+N/-S 0 00 usft	Northing: 407,549 94 usft	Latitude: 32° 7' 11 730 N
	+E/-W 0 00 usft	Easting: 615,137 49 usft	Longitude: 103° 57' 41 155 W
Position Uncertainty	0 00 usft	Wellhead Elevation: usft	Ground Level: 0 00 usft

Wellbore	VH - Job #32K0512598				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	2012/05/23	7 64	60 00	48,442

Design	VH - Job #32K0512598			
Audit Notes:				
Version: 1 0	Phase:	ACTUAL	Tie On Depth:	0 00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0 00	0 00	0 00	217 36

Survey Program	Date	2012/06/12		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100 00	10,228 00	Gyro (VH - Job #32K0512598)	Keeper	Keeper Gyro

Survey								
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)	
0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
100 00	0 56	27 61	100 00	0 43	0 23	27 61	0 49	
200 00	0 45	36 28	199 99	1 18	0 69	30 09	1 37	
300 00	0 50	19 13	299 99	1 91	1 06	29 03	2 19	
400 00	0 28	127 31	399 99	2 18	1 40	32 73	2 59	
500 00	1 22	183 92	499 98	0 97	1 52	57 57	1 80	
600 00	1 49	184 37	599 95	-1 39	1 35	135 95	1 94	
700 00	1 43	211 63	699 92	-3 75	0 59	171 00	3 80	
800 00	0 70	226 01	799 90	-5 24	-0 50	185 45	5 26	
900 00	0 29	135 05	899 90	-5 84	-0 76	187 41	5 89	
1,000 00	0 06	74 60	999 90	-6 01	-0 53	185 05	6 03	
1,100 00	0 15	44 12	1,099 90	-5 90	-0 39	183 78	5 91	

Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Patron "23" Federal #1H
Project:	Corral Draw	TVD Reference:	WELL @ 0 00usft (Original Well Elev)
Site:	Eddy County, NM	MD Reference:	WELL @ 0 00usft (Original Well Elev)
Well:	Patron "23" Federal #1H	North Reference:	Grid
Wellbore:	VH - Job #32K0512598	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0512598	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 00	0 78	320 24	1,199 90	-5 28	-0.73	187 91	5 33
1,300 00	0 91	295 70	1,299 89	-4.41	-1 88	203 12	4 80
1,400 00	0 94	284 17	1,399 87	-3 87	-3 40	221 27	5 15
1,500 00	0 97	211 96	1,499 86	-4 39	-4 64	226 60	6 38
1,600 00	1 01	205 94	1,599 85	-5 90	-5 47	222 86	8 05
1,700 00	0 76	181 44	1,699 84	-7 35	-5 87	218 62	9 41
1,800 00	0 72	173.63	1,799 83	-8 64	-5 82	213 97	10 42
1,900 00	0 81	164 77	1,899 82	-9 95	-5 57	209 23	11 40
2,000 00	0 83	169.35	1,999 81	-11 34	-5 25	204 83	12 50
2,100 00	0 79	229 68	2,099 80	-12 50	-5 64	204 28	13 71
2,200 00	0.89	259 24	2,199 79	-13 09	-6 93	207 89	14 81
2,300 00	0 97	256.58	2,299 78	-13 43	-8 51	212 37	15 90
2,400 00	0 92	253 51	2,399 76	-13 86	-10 11	216 11	17 15
2,500 00	0 79	136 83	2,499 76	-14 59	-10 40	215 50	17 92
2,600 00	2 46	118 37	2,599 71	-16 11	-8 04	206 54	18 01
2,700 00	2 37	133 65	2,699 63	-18 56	-4 66	194 10	19 13
2,800 00	3 42	133 07	2,799 50	-22 02	-0 98	182 56	22 04
2,900 00	4 78	126 14	2,899 24	-26 51	4 56	170 24	26 90
3,000 00	5 21	123 60	2,998 86	-31 48	11 71	159 60	33 59
3,100 00	3 30	115 49	3,098 58	-35 24	18 09	152 83	39 61
3,200 00	1 93	111 52	3,198 47	-37 09	22 25	149 04	43 25
3,300 00	1 23	120 69	3,298 44	-38 26	24 74	147 11	45 56
3,400 00	0 88	126.29	3,398 42	-39 26	26 28	146 20	47 25
3,500 00	0 62	124 88	3,498 41	-40.02	27 35	145 66	48 47
3,600 00	0 53	132 84	3,598 40	-40 65	28 13	145 32	49 43
3,700 00	0 32	159 84	3,698 40	-41 22	28 56	145 28	50 15
3,800 00	0 24	199 88	3,798 40	-41 68	28 59	145 56	50 55
3,900 00	0 28	165 08	3,898 40	-42 12	28 58	145 84	50 90
4,000 00	0 24	233 44	3,998 40	-42 48	28 48	146 16	51 14
4,100 00	0 22	298 40	4,098 40	-42 51	28 14	146 50	50 98
4,200 00	0 56	261 89	4,198 40	-42 49	27 49	147 10	50 60
4,300 00	0 36	275 04	4,298 39	-42 53	26 69	147 89	50 21
4,400 00	0 56	268 21	4,398 39	-42 52	25 89	148 66	49 78
4,500 00	0 46	258 93	4,498 39	-42 61	25 00	149 59	49 40
4,600 00	0.42	264 32	4,598 38	-42 72	24 25	150 42	49 12
4,700 00	0 72	260 67	4,698.38	-42 86	23 26	151 51	48 77
4,800 00	0 75	270 79	4,798 37	-42 95	21 99	152 89	48 25
4,900 00	0 83	277 93	4,898 36	-42 85	20 62	154 31	47 55
5,000 00	1 04	256 91	4,998 35	-42 95	19 01	156 12	46 97
5,100 00	0 85	263 79	5,098 33	-43 24	17 39	158 09	46 60
5,200 00	0 85	271 00	5,198 32	-43 30	15 91	159 82	46 14
5,300 00	0 87	276 82	5,298 31	-43 20	14 42	161 54	45 54
5,400 00	0 85	282 52	5,398 30	-42 95	12 94	163 23	44 86
5,500 00	1 12	251 50	5,498 29	-43 10	11 29	165 32	44 55

Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Patron "23" Federal #1H
Project:	Corral Draw	TVD Reference:	WELL @ 0 00usft (Original Well Elev)
Site:	Eddy County, NM	MD Reference:	WELL @ 0 00usft (Original Well Elev)
Well:	Patron "23" Federal #1H	North Reference:	Grid
Wellbore:	VH - Job #32K0512598	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0512598	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 00	1 22	252 30	5,598 26	-43 73	9 35	167 93	44 72	
5,700 00	1 25	248 95	5,698 24	-44 45	7 32	170 65	45 05	
5,800 00	1 36	241 55	5,798 22	-45 41	5 25	173 40	45 71	
5,900 00	1 39	242 75	5,898 19	-46 53	3 13	176 15	46 63	
6,000 00	1 31	248 26	5,998 16	-47 50	0 99	178 80	47 52	
6,100 00	1 18	253 14	6,098 14	-48 23	-1 05	181 25	48 24	
6,200 00	1 26	260 27	6,198 11	-48 71	-3 12	183 67	48 81	
6,300 00	1 28	255 36	6,298 09	-49 18	-5 29	186 14	49 46	
6,400 00	1 08	256 56	6,398 07	-49 68	-7 28	188 34	50 21	
6,500 00	0 97	246 92	6,498 05	-50 23	-8 98	190 14	51 03	
6,600 00	0 85	233 09	6,598 04	-51 01	-10 35	191 47	52 05	
6,700 00	0 77	240 17	6,698 03	-51 79	-11 53	192 55	53 06	
6,800 00	0 89	225 77	6,798 02	-52 66	-12 67	193 52	54 17	
6,900 00	0 90	222 48	6,898 01	-53 79	-13 75	194 34	55 52	
7,000 00	0 95	242 24	6,997 99	-54 75	-15 02	195 34	56 77	
7,100 00	1 35	286 26	7,097 97	-54 81	-16 88	197 12	57 35	
7,200 00	1 96	281 27	7,197 93	-54 14	-19 69	199 99	57 61	
7,300 00	2 33	274 31	7,297 86	-53 66	-23 39	203 56	58 53	
7,400 00	2 36	275 16	7,397 78	-53 32	-27 47	207 26	59 98	
7,500 00	2 49	278 39	7,497 69	-52 82	-31 67	210 95	61 58	
7,600 00	2 42	277 30	7,597 60	-52 23	-35 92	214 51	63 39	
7,700 00	2 76	263 98	7,697 50	-52 22	-40 40	217 73	66 02	
7,800 00	3 25	250 19	7,797 36	-53 43	-45 46	220 40	70 15	
7,900 00	4 07	222 98	7,897 16	-56 99	-50 55	221 58	76 18	
8,000 00	3 98	213 32	7,996 92	-62 48	-54 88	221 29	83 16	
8,100 00	2 72	221 13	8,096 74	-67 17	-58 34	220 98	88 97	
8,200 00	2 54	221 12	8,196 64	-70 63	-61 36	220 99	93 56	
8,300 00	2 50	215 34	8,296 54	-74 07	-64 08	220 86	97 95	
8,400 00	1 92	217 44	8,396 47	-77 18	-66 36	220 69	101 79	
8,500 00	1 51	224 85	8,496 42	-79 45	-68 31	220 69	104 78	
8,600 00	1 22	215 47	8,596 39	-81 25	-69 86	220 69	107 15	
8,700 00	1 68	223 32	8,696 36	-83 18	-71 48	220 67	109 67	
8,800 00	1 83	189 79	8,796 32	-85 82	-72 76	220 29	112 51	
8,900 00	1 70	194 47	8,896 27	-88 83	-73 40	219 57	115 23	
9,000 00	1 62	193 01	8,996 23	-91 65	-74 09	218 95	117 85	
9,100 00	0 74	196 21	9,096 21	-93 64	-74 59	218 54	119 72	
9,200 00	1 20	142 65	9,196 19	-95 10	-74 13	217 94	120 58	
9,300 00	1 36	173 10	9,296 17	-97 11	-73 35	217 07	121 70	
9,400 00	1 24	182 65	9,396 14	-99 36	-73 26	216 40	123 45	
9,500 00	1 19	206 81	9,496 12	-101 37	-73 78	216 05	125 38	
9,600 00	1 17	232 07	9,596 10	-102 93	-75 05	216 10	127 38	
9,700 00	1 11	244 44	9,696 08	-103 97	-76 73	216 43	129 22	
9,800 00	0 90	239 88	9,796 07	-104 78	-78 28	216 76	130 80	
9,900 00	0 77	250 09	9,896 06	-105 41	-79 60	217 06	132 08	

Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING	Local Co-ordinate Reference:	Well Patron "23" Federal #1H
Project:	Corral Draw	TVD Reference:	WELL @ 0 00usft (Original Well Elev)
Site:	Eddy County, NM	MD Reference:	WELL @ 0 00usft (Original Well Elev)
Well:	Patron "23" Federal #1H	North Reference:	Grid
Wellbore:	VH - Job #32K0512598	Survey Calculation Method:	Minimum Curvature
Design:	VH - Job #32K0512598	Database:	EDM-Regulatory

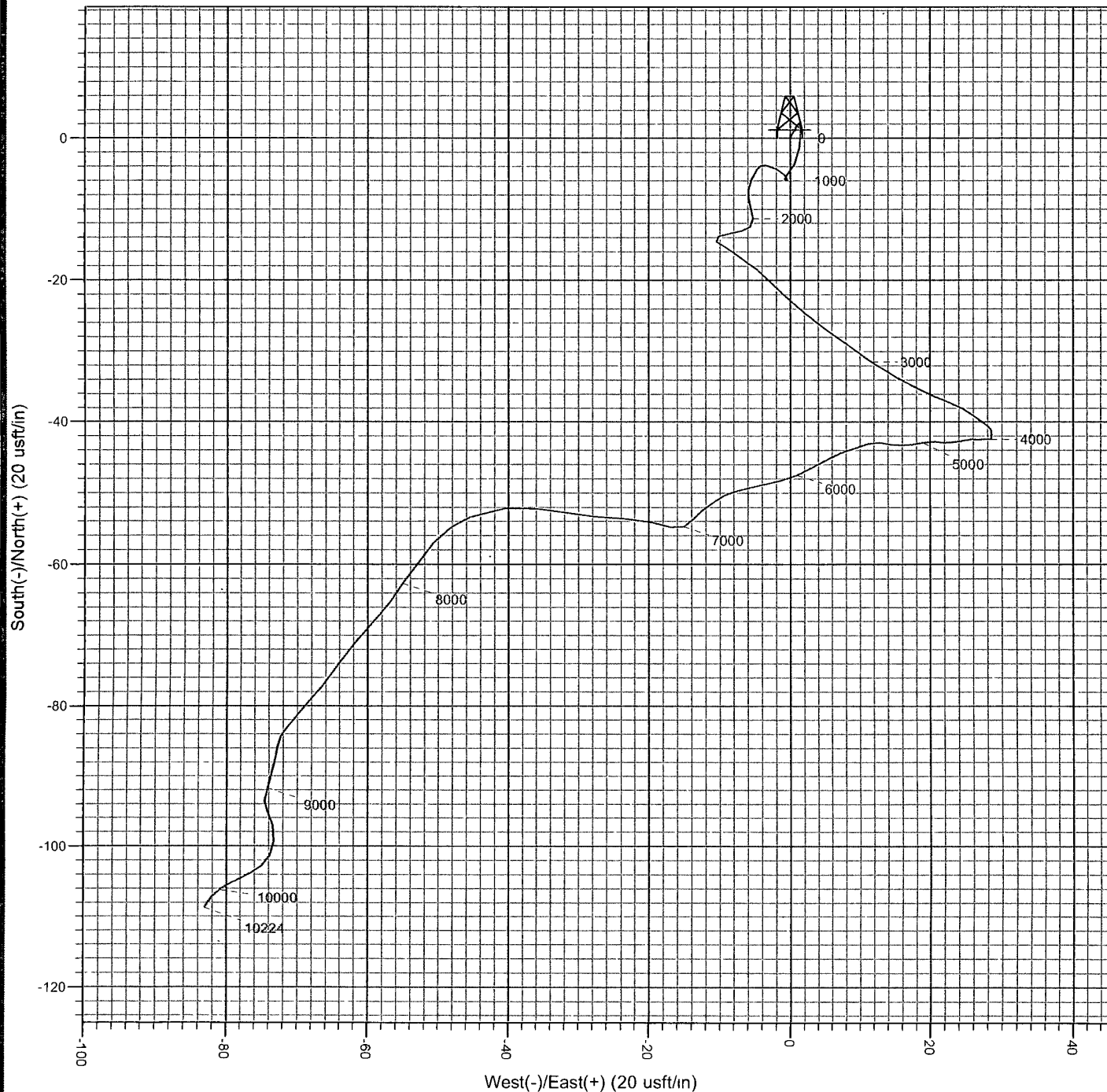
Survey								
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)	
10,000 00	0 93	227 12	9,996 05	-106 19	-80 82	217 28	133 45	
10,100 00	0 78	229 77	10,096 03	-107 18	-81 94	217 40	134 91	
10,200 00	0 96	205 79	10,196 02	-108 37	-82 82	217 39	136 40	
10,228 00	0 81	212 57	10,224 02	-108 75	-83 03	217 36	136 82	



Project Corral Draw
Eddy County, NM
Well: Patron "23" Federal #1H
Wellbore: VH - Job #32K0512598
Design VH - Job #32K0512598

WELL DETAILS Patron "23" Federal #1H
WELL @ 0.00usft (Original Well Elev)

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.00	0.00	407549.94	615137.49	32° 7' 11.730 N	103° 57' 41.155 W	



PROJECT DETAILS: Corral Draw		SITE DETAILS: Eddy County, NM	
Geodetic System: US State Plane 1927 (Exact solution)	Datum: NAD 1927 (NADCON CONUS)	Site Centre Latitude: 32° 7' 11.730 N	Longitude: 103° 57' 41.155 W
Ellipsoid: Clarke 1866	Zone: New Mexico East 3001	Positional Uncertainty: 0.00	Convergence: 0.20
System Datum: Mean Sea Level		Local North: Grid	

COG Operating LLC

Eddy County, NM

Patron 23 Federal 1H

Patron 23 Federal 1H

Wellbore #1

Survey: MWD Surveys

Standard Survey Report

01 June, 2012

Crescent Directional Drilling

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Patron 23 Federal 1H
Project:	Eddy County, NM	TVD Reference:	Well @ 3121.50ft (Silver Oak #7)
Site:	Patron 23 Federal 1H	MD Reference:	Well @ 3121.50ft (Silver Oak #7)
Well:	Patron 23 Federal 1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	R5000 Houston DB

Project:	Eddy County, NM		
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						Patron 23 Federal 1H					
Site Position:		Northing:		407,549 90 ft		Latitude:		32 11992266			
From:		Map		Easting:		615,137 50 ft		Longitude:		-103 96143594	
Position Uncertainty:		0 00 ft		Slot Radius:		13 200 in		Grid Convergence:		0 20 °	

Well	Patron 23 Federal 1H					
Well Position	+N-S	0.00 ft	Northing:	407,549.90 ft	Latitude:	32.11992266
	+E-W	0.00 ft	Easting:	615,137.50 ft	Longitude:	-103.96143594
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	3,104.00 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
			(°)	(°)	(nT)
	IGRF2010	5/8/2012	7.65	60 00	48,423

Design:	Wellbore #1				
Audit Notes:					
Version:	1 0	Phase:	ACTUAL	Tie On Depth:	0 00
Vertical Section:	Depth From (TVD) (ft)	+N-S (ft)	+E-W (ft)	Direction (°)	
	0 00	0 00	0 00	178 20	

Survey Program		Date	6/1/2012		
From	To				
(ft)	(ft)	Survey (Wellbore)	Tool Name	Description	
100 00	7,100 00	Gyro Surveys (Wellbore #1)	MWD	MWD - Standard	
7,100 00	11,471 00	MWD Surveys (Wellbore #1)	MWD	MWD - Standard	

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)
7,100 00	1.35	286.26	7,097 98	-54 81	-16.88	54.25	0 00	0 00	0 00
7,154.00	1 80	278 20	7,151 95	-54 51	-18.33	53.91	0 93	0 83	-14.93
7,218 00	1 50	126 80	7,215 94	-54 87	-18 66	54 25	5 00	-0 47	-236.56
7,249 00	6 20	140 70	7,246 87	-56 41	-17 27	55.84	15 35	15 16	44 84
7,281 00	9.20	153 70	7,278.58	-60 04	-15 04	59 54	10 78	9 38	40 63
7,313 00	12 70	166 50	7,309.99	-65 75	-13 09	65 31	13 25	10 94	40.00
7,345.00	15.20	172 30	7,341 05	-73.33	-11.70	72 93	8 94	7 81	18.13
7,377.00	19 00	168 50	7,371 63	-82 60	-10.10	82.24	12 37	11 88	-11.88
7,408 00	21 60	168.80	7,400 70	-93 14	-7 99	92 85	8 39	8 39	0 97
7,440 00	24 20	166 00	7,430 18	-105 29	-5 26	105 07	8 81	8 13	-8 75

Crescent Directional Drilling

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Patron 23 Federal 1H
Project:	Eddy County, NM	TVD Reference:	Well @ 3121 50ft (Silver Oak #7)
Site:	Patron 23 Federal 1H	MD Reference:	Well @ 3121 50ft (Silver Oak #7)
Well:	Patron 23 Federal 1H	North Reference:	Grd
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	R5000 Houston DB

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)
7,472.00	26.20	168.30	7,459.13	-118.57	-2.24	118.44	6.96	6.25	7.19
7,504.00	29.80	165.80	7,487.38	-133.20	1.15	133.17	11.83	11.25	-7.81
7,536.00	33.00	164.40	7,514.69	-149.31	5.44	149.40	10.26	10.00	-4.38
7,568.00	35.90	164.60	7,541.08	-166.75	10.28	166.99	9.07	9.06	0.63
7,600.00	39.20	165.70	7,566.44	-185.60	15.27	185.99	10.52	10.31	3.44
7,631.00	42.10	164.80	7,589.96	-205.12	20.41	205.66	9.54	9.35	-2.90
7,663.00	45.40	164.40	7,613.07	-226.45	26.29	227.17	10.35	10.31	-1.25
7,695.00	48.60	163.20	7,634.90	-248.92	32.83	249.83	10.37	10.00	-3.75
7,727.00	53.40	162.00	7,655.03	-272.64	40.27	273.77	15.28	15.00	-3.75
7,759.00	58.30	161.80	7,672.99	-297.81	48.50	299.18	15.32	15.31	-0.63
7,791.00	62.90	163.70	7,688.69	-324.43	56.75	326.05	15.28	14.38	5.94
7,823.00	66.80	167.60	7,702.29	-352.48	63.91	354.31	16.44	12.19	12.19
7,855.00	70.30	171.60	7,714.00	-381.76	69.27	383.75	15.97	10.94	12.50
7,886.00	73.00	174.30	7,723.76	-410.96	72.88	413.05	12.01	8.71	8.71
7,918.00	76.50	175.30	7,732.17	-441.70	75.67	443.86	11.35	10.94	3.13
7,950.00	80.60	176.20	7,738.53	-472.97	78.00	475.19	13.11	12.81	2.81
7,982.00	84.80	175.80	7,742.59	-504.63	80.21	506.90	13.18	13.13	-1.25
8,014.00	88.20	175.30	7,744.54	-536.47	82.69	538.80	10.74	10.63	-1.56
8,076.00	89.80	174.20	7,745.63	-598.19	88.36	600.67	3.13	2.58	-1.77
8,171.00	89.50	175.80	7,746.21	-692.83	96.64	695.52	1.71	-0.32	1.68
8,267.00	89.50	178.70	7,747.04	-788.70	101.24	791.49	3.02	0.00	3.02
8,363.00	90.20	178.80	7,747.30	-884.68	103.34	887.49	0.74	0.73	0.10
8,458.00	91.90	178.70	7,745.56	-979.64	105.41	982.46	1.79	1.79	-0.11
8,553.00	91.30	177.30	7,742.90	-1,074.54	108.73	1,077.42	1.60	-0.63	-1.47
8,648.00	91.90	178.00	7,740.25	-1,169.42	112.62	1,172.38	0.97	0.63	0.74
8,744.00	91.20	179.90	7,737.65	-1,265.37	114.38	1,268.33	2.11	-0.73	1.98
8,839.00	87.10	178.70	7,739.06	-1,360.33	115.54	1,363.28	4.50	-4.32	-1.26
8,935.00	88.90	179.60	7,742.41	-1,456.25	116.96	1,459.21	2.10	1.88	0.94
9,031.00	90.20	178.70	7,743.17	-1,552.24	118.38	1,555.19	1.65	1.35	-0.94
9,127.00	90.60	179.90	7,742.50	-1,648.22	119.56	1,651.17	1.32	0.42	1.25
9,222.00	90.00	180.80	7,742.00	-1,743.22	118.98	1,746.10	1.14	-0.63	0.95
9,318.00	87.80	179.00	7,743.84	-1,839.19	119.14	1,842.03	2.96	-2.29	-1.88
9,413.00	89.30	180.30	7,746.25	-1,934.15	119.72	1,936.96	2.09	1.58	1.37
9,509.00	88.10	179.50	7,748.42	-2,030.13	119.89	2,032.89	1.50	-1.25	-0.83
9,604.00	87.80	179.40	7,751.82	-2,125.06	120.80	2,127.81	0.33	-0.32	-0.11
9,700.00	91.00	181.60	7,752.83	-2,221.03	119.96	2,223.71	4.04	3.33	2.29
9,795.00	91.80	182.70	7,750.51	-2,315.94	116.40	2,318.45	1.43	0.84	1.16
9,890.00	90.20	181.40	7,748.85	-2,410.86	113.00	2,413.22	2.17	-1.68	-1.37
9,985.00	91.30	181.90	7,747.60	-2,505.81	110.27	2,508.03	1.27	1.16	0.53
10,081.00	88.50	178.80	7,747.77	-2,601.78	109.68	2,603.95	4.35	-2.92	-3.23
10,177.00	88.50	177.60	7,750.29	-2,697.70	112.70	2,699.91	1.25	0.00	-1.25
10,272.00	90.00	178.90	7,751.53	-2,792.65	115.60	2,794.90	2.09	1.58	1.37
10,368.00	90.70	179.30	7,750.94	-2,888.63	117.10	2,890.88	0.84	0.73	0.42

Crescent Directional Drilling

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Patron 23 Federal 1H
Project:	Eddy County, NM	TVD Reference:	Well @ 3121.50ft (Silver Oak #7)
Site:	Patron 23 Federal 1H	MD Reference:	Well @ 3121.50ft (Silver Oak #7)
Well:	Patron 23 Federal 1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	R5000 Houston.DB

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)
10,464.00	91.70	177.40	7,748.93	-2,984.56	119.87	2,986.86	2.24	1.04	-1.98
10,560.00	89.80	177.40	7,747.68	-3,080.45	124.22	3,082.83	1.98	-1.98	0.00
10,655.00	89.30	176.60	7,748.42	-3,175.32	129.19	3,177.81	0.99	-0.53	-0.84
10,750.00	90.00	177.10	7,749.00	-3,270.17	134.41	3,272.78	0.91	0.74	0.53
10,846.00	89.90	175.20	7,749.09	-3,365.95	140.86	3,368.72	1.98	-0.10	-1.98
10,942.00	91.00	174.40	7,748.33	-3,461.55	149.56	3,464.54	1.42	1.15	-0.83
11,037.00	91.70	174.50	7,746.09	-3,556.08	158.74	3,559.31	0.74	0.74	0.11
11,132.00	90.40	174.70	7,744.35	-3,650.64	167.68	3,654.11	1.38	-1.37	0.21
11,227.00	91.00	174.70	7,743.19	-3,745.23	176.46	3,748.92	0.63	0.63	0.00
11,323.00	90.00	175.10	7,742.35	-3,840.84	184.99	3,844.76	1.12	-1.04	0.42
11,418.00	90.60	175.30	7,741.86	-3,935.51	192.94	3,939.62	0.67	0.63	0.21
Last Survey @ 11418.00' MD, 7741.86' TVD, 90.60° INC, 175.30° AZ									
11,471.00	90.60	175.30	7,741.30	-3,988.32	197.28	3,992.55	0.00	0.00	0.00
Straight line Projection to TD @ 11471.00' MD, 7741.30' TVD.									

Measured Depth (ft)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Comment
11,418.00	7,741.86	-3,935.51	192.94	Last Survey @ 11418.00' MD, 7741.86' TVD, 90.60° INC, 175.30° AZ
11,471.00	7,741.30	-3,988.32	197.28	Straight line Projection to TD @ 11471.00' MD, 7741.30' TVD

Checked By: _____ Approved By: _____ Date: _____



COG Operating LLC
Patron 23 Federal 1H
Eddy County, NM
Plan #1



Surface Location		Ground Elev: 3104.00 Well @ 3121.50ft (Silver Oak #7)			
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.00	0.00	407549.90	615137.50	32.11992267	-103.96143594

TARGET DETAILS							
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
PBHL (Patron 23 Federal 1Hm Plan 1)	7745.00	-3990.70	125.10	403559.20	615262.60	32.10895113	-103.96107639

Section Details							
TVD	MD	Inc	Azi	+N/-S	+E/-W	Vsect	Annotation
7265.09	7267.20	2.21	276.33	-53.78	-22.10	53.06	Start Build @ 12 00°/100'
7265.09	7267.20	2.21	276.33	-53.78	-22.10	53.06	Tie-On to Gyro Surveys - 7267.20' MD, 7265.09' TVD
7745.00	8019.99	90.00	177.59	-531.58	-20.30	530.68	Landing Point - Hold @ 90.00° INC, 177.59° AZ
7745.00	11482.17	90.00	177.59	-3990.70	125.10	3992.66	TD @ 11482.17' MD, 7745.00' TVD



Azimuths to Gnd North
True North: -0.20°
Magnetic North: 7.45°

Magnetic Field
Strength: 48422.8snT
Dip Angle: 60.00°
Date: 5/8/2012
Model: IGRF2010

