

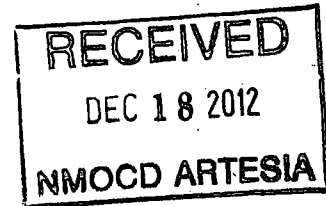
CRESCENT

DIRECTIONAL DRILLING

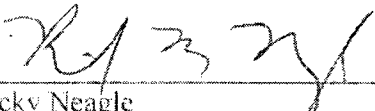
December 12, 2012

STATE OF NEW MEXICO

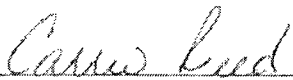
COUNTY OF LEA



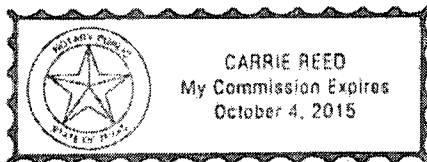
I, Ricky Neagle, certify that; I am employed by Crescent Directional Drilling, L.P.; that on the day(s) of August 15, 2012-August 23, 2012 we conducted and or supervised the taking of a MWD survey for Bufflehead 10 Federal #2H from a depth of 8995 feet to a depth of 13812 feet; that the data is true, correct, complete and within the limitations of the tool as set forth by Crescent Directional Drilling Services, L.P.; that I am authorized and qualified to make this report; that this survey was conducted at the request of Concho; that I reviewed this report and find it conforms to the principles and procedures as set forth by Crescent Directional.



Ricky Neagle
Coordinator of MWD Operations
Crescent Directional Drilling, L.P.



NOTARY 12-12-12
DATE



Crescent Directional Drilling L.P.
2040 Aldine Western Rd Houston, TX 77038
Phone (281) 668-9500 Fax (281) 668-9539

COG Operating LLC

Lea County, NM

Bufflehead 10 Federal 2H

Bufflehead 10 Federal 2H

Wellbore #1

Survey: MWD Surveys

Standard Survey Report

22 August, 2012



COG Operating LLC
Bufflehead 10 Federal 2H
Lea County, NM
Plan #2



Surface Location		Ground Elev: 3243.00 WELL @ 3263.50ft (Original Well Elev)			
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.00	0.00	367657.40	710038.80	32.063970	-103.655318

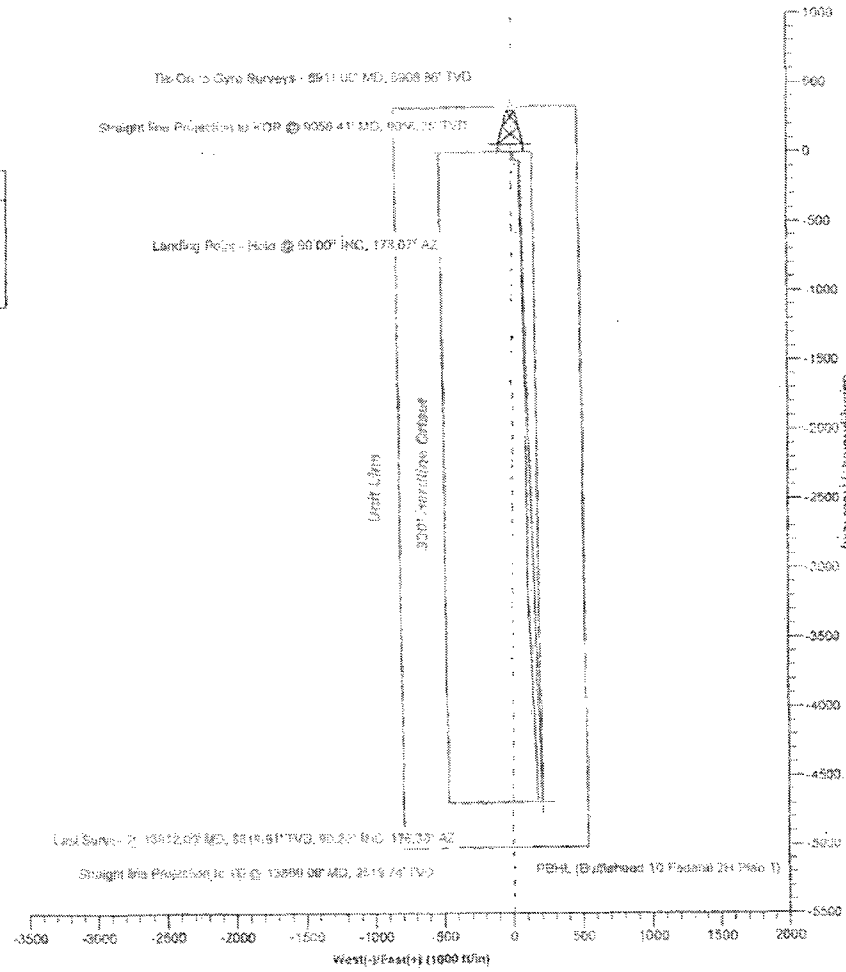
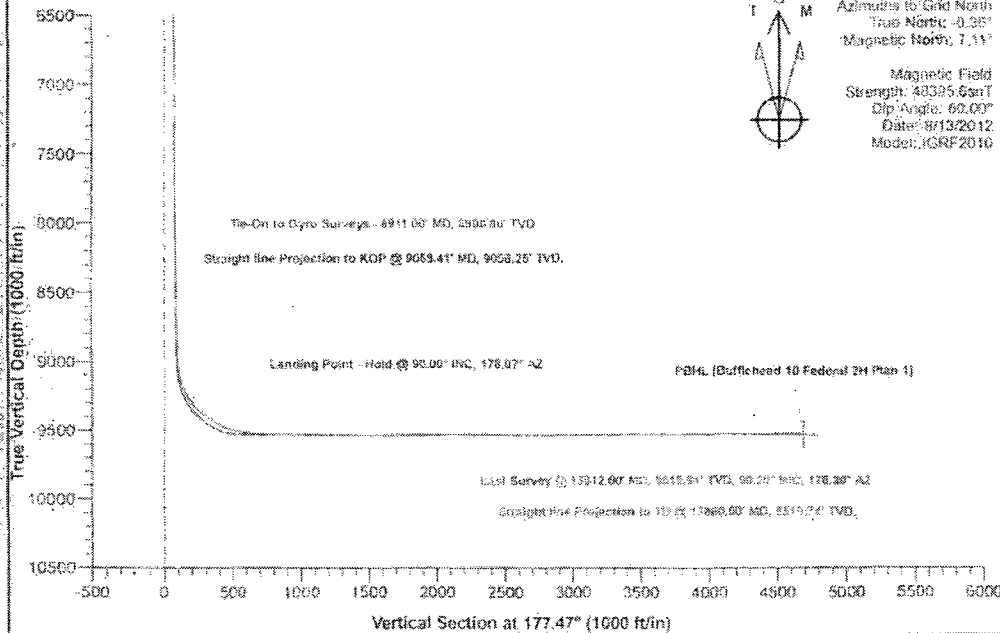
TARGET DETAILS							
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
PBHL (Bufflehead 10 Federal 2H Plan 1)	9530.00	-4686.50	206.70	362970.90	710745.50	32.051084	-103.654746

SECTION DETAILS											
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Annotation	
1	8911.00	1.00	242.94	8906.86	-89.74	61.78	0.00	0.00	92.37	Tie-On to Gyro Surveys - 8911.00' MD, 8906.86' TVD	
2	9058.41	1.00	242.04	9050.25	-90.25	58.91	0.00	0.00	93.48	Straight line Projection to KOP @ 9058.41' MD, 9056.25' TVD.	
3	9604.75	95.00	178.07	5530.60	-569.33	68.14	12.60	-63.97	576.83	Landing Point - Hold @ 90.00' INC, 178.07' AZ	
4	13925.21	95.00	178.07	9530.00	-4686.50	206.70	0.00	0.00	4691.06	TD @ 13925.21' MD, 9530.00' TVD	



Azimuths to Grid North
True North: -0.35°
Magnetic North: 7.11°

Magnetic Field
Strength: 48395.6nT
Dip Angle: 60.00°
Date: 8/13/2012
Model: IGRF2010



Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Bufilehead 10 Federal 2H
Project:	Lea County, NM	TVD Reference:	WELL @ 3263.50ft (Original Well Elev)
Site:	Bufilehead 10 Federal 2H	MD Reference:	WELL @ 3263.50ft (Original Well Elev)
Well:	Bufilehead 10 Federal 2H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Houston R5000 Database

Project:	Lea 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:	Bufilehead 10 Federal 2H				
Site Position:		Northings:	387,657.40 ft	Latitude:	32.063970
From:	Map	Easting:	710,038.80 ft	Longitude:	-103.655318
Position Uncertainty:	0.00 ft	Spot Radius:	13,200 in	Grid Convergence:	0.36 °

Well:	Buttehead 10 Federal 2H					
Well Position	+N-S	0.00 ft	Northings:	387,657.40 ft	Latitude:	32.063970
	+E-W	0.00 ft	Easting:	710,038.80 ft	Longitude:	-103.655318
Position Uncertainty	0.00 ft	Wellhead Elevation:	ft	Ground Level:	3,243.00 ft	

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	8/13/2012	7.47	60.00	48,396

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	177.47	

Survey Program		Date	8/22/2012		
From	To	Survey (Wellbore)	Tool Name	Description	
(ft)	(ft)				
100.00	8,911.00	Gyro Surveys (Wellbore #1)	MWD	MWD - Standard	
8,995.00	13,860.00	MWD Surveys (Wellbore #1)	MWD	MWD - Standard	

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)
8,911.00	1.00	242.04	8,908.86	-89.74	61.78	92.38	0.00	0.00	0.00
8,995.00	0.70	231.80	8,992.85	-90.40	60.73	92.99	0.40	-0.36	-12.19
9,027.00	3.60	171.10	9,024.83	-91.51	60.73	94.11	10.36	9.06	-189.69
9,058.00	7.80	171.20	9,055.67	-94.56	61.20	97.17	13.55	13.55	0.32
9,090.00	11.40	171.70	9,087.21	-99.63	61.99	102.47	11.25	11.25	1.56
9,122.00	15.20	174.00	9,118.35	-107.14	62.89	109.81	11.99	11.88	7.19
9,152.00	17.90	173.70	9,147.11	-115.63	63.80	118.34	9.00	9.00	-1.00
9,183.00	22.70	175.90	9,176.17	-126.34	64.75	129.08	15.88	15.48	7.10
9,215.00	25.10	176.90	9,205.31	-139.53	65.58	142.29	10.70	10.83	3.13
9,246.00	29.20	179.30	9,232.77	-153.91	66.04	156.87	10.62	10.00	7.74

Survey Report

Company:	QOG Operating LLC	Local Co-ordinate Reference:	Site: Bufflehead 10 Federal 2H
Project:	Lea County, NM	TVD Reference:	WELL @ 3263.50ft (Original Well Elev)
Site:	Bufflehead 10 Federal 2H	MD Reference:	WELL @ 3263.50ft (Original Well Elev)
Well:	Bufflehead 10 Federal 2H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Houston R5000 Database

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Buid Rate (°/100ft)	Turn Rate (°/100ft)	
9,278.00	32.80	179.40	9,280.18	-170.38	66.22	173.14	11.25	11.25	0.31	
9,310.00	36.30	179.60	9,286.54	-188.53	66.38	181.27	10.94	10.94	0.63	
9,341.00	40.00	179.20	9,310.82	-207.67	88.58	210.41	11.96	11.94	-1.29	
9,373.00	43.80	177.90	9,334.73	-229.03	87.13	231.77	12.18	11.88	-4.08	
9,404.00	47.20	177.10	9,356.46	-251.12	86.10	253.88	11.12	10.97	-2.58	
9,438.00	51.20	176.60	9,377.36	-275.30	89.44	278.10	12.56	12.50	-1.56	
9,467.00	53.90	176.20	9,396.21	-299.86	70.98	302.70	8.77	8.71	-1.29	
9,499.00	55.80	176.30	9,414.63	-323.97	72.69	328.86	5.94	5.94	0.31	
9,531.00	57.80	177.80	9,432.16	-352.70	74.07	355.63	7.38	6.29	4.99	
9,562.00	62.10	180.00	9,447.68	-379.52	74.57	382.45	15.17	13.87	7.10	
9,594.00	66.60	181.00	9,461.52	-408.38	74.32	411.24	14.34	14.08	3.13	
9,625.00	68.00	181.00	9,473.49	-436.96	73.82	439.79	4.52	4.52	0.00	
9,657.00	70.30	180.60	9,484.88	-466.86	73.40	469.64	7.28	7.19	-1.25	
9,689.00	73.10	179.20	9,494.92	-497.23	73.46	499.99	9.89	8.76	-4.38	
9,720.00	76.20	178.20	9,503.13	-527.12	74.14	529.67	10.47	10.00	-3.23	
9,752.00	78.70	177.50	9,510.08	-558.33	75.31	561.11	8.10	7.81	-2.19	
9,783.00	80.90	177.80	9,515.97	-588.81	75.53	591.61	7.21	7.10	1.29	
9,815.00	82.70	178.70	9,519.86	-620.50	77.47	623.32	9.09	8.75	2.50	
9,846.00	86.00	179.00	9,522.64	-651.37	78.09	654.18	7.46	7.42	0.97	
9,879.00	88.70	179.60	9,524.12	-683.33	76.48	686.13	8.64	8.44	1.88	
9,973.00	88.60	179.90	9,526.36	-778.30	78.90	781.03	0.33	-0.11	0.32	
10,067.00	90.90	180.20	9,528.77	-872.30	78.82	874.92	2.47	2.45	0.32	
10,162.00	90.00	179.40	9,528.02	-967.29	79.15	969.84	1.27	-0.95	-0.84	
10,257.00	89.40	179.00	9,526.62	-1,062.28	80.47	1,064.60	0.76	-0.63	-0.42	
10,352.00	88.20	177.90	9,528.51	-1,157.22	83.04	1,159.76	1.71	-1.26	-1.16	
10,446.00	89.60	179.40	9,530.40	-1,251.17	85.26	1,253.71	2.11	1.38	1.60	
10,541.00	89.60	178.80	9,531.23	-1,346.15	86.75	1,348.67	0.63	0.00	-0.63	
10,636.00	89.10	178.80	9,532.39	-1,441.13	88.74	1,443.64	0.42	-0.42	0.00	
10,731.00	90.00	178.50	9,533.13	-1,536.10	90.98	1,538.61	1.00	0.95	-0.32	
10,825.00	89.90	178.80	9,533.21	-1,630.07	93.19	1,632.58	0.34	-0.11	0.32	
10,920.00	89.10	177.50	9,534.04	-1,725.01	95.26	1,727.56	1.61	-0.84	-1.37	
11,013.00	91.40	179.60	9,533.64	-1,817.97	98.61	1,820.55	3.35	2.47	2.26	
11,108.00	92.20	180.00	9,530.65	-1,912.92	98.94	1,915.43	0.94	0.84	0.42	
11,203.00	92.90	180.30	9,526.43	-2,007.89	98.69	2,010.23	0.90	0.74	0.32	
11,297.00	91.00	180.20	9,523.23	-2,101.77	98.28	2,104.06	2.02	-2.02	-0.11	
11,392.00	89.30	179.40	9,522.98	-2,196.76	96.61	2,198.98	1.98	-1.79	-0.84	
11,487.00	88.90	178.80	9,524.47	-2,291.74	100.11	2,293.92	0.76	-0.42	-0.63	
11,582.00	88.40	179.30	9,526.71	-2,386.68	102.51	2,388.88	0.74	-0.53	-0.53	
11,676.00	89.10	179.40	9,528.78	-2,480.64	104.40	2,482.83	1.39	0.74	1.17	
11,771.00	89.50	178.30	9,529.92	-2,575.63	105.47	2,577.77	0.43	0.42	-0.11	
11,866.00	89.30	179.80	9,530.92	-2,670.62	106.22	2,672.70	0.57	-0.21	0.53	
11,961.00	89.30	179.50	9,532.08	-2,766.61	106.80	2,767.63	0.32	0.00	-0.32	
12,056.00	89.70	180.00	9,532.90	-2,859.60	107.21	2,861.55	0.88	0.43	0.53	

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Bufflehead 10 Federal 2H
Project:	Lea County, NM	TVD Reference:	WELL @ 3263.50ft (Original Well Elev)
Site:	Bufflehead 10 Federal 2H	MD Reference:	WELL @ 3263.50ft (Original Well Elev)
Well:	Bufflehead 10 Federal 2H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Houston R5000 Database

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)
12,130.00	90.40	179.70	9,532.81	-2,954.80	107.46	2,956.47	0.80	0.74	-0.32
12,245.00	90.30	178.80	9,532.23	-3,046.59	108.70	3,051.42	0.95	-0.11	-0.95
12,339.00	90.00	178.20	9,531.99	-3,143.58	111.16	3,145.40	0.71	-0.32	-0.84
12,434.00	90.90	177.40	9,531.24	-3,238.46	114.81	3,240.39	1.27	0.95	-0.84
12,529.00	91.30	177.00	9,529.42	-3,333.35	119.43	3,335.36	0.80	0.42	-0.42
12,624.00	90.10	177.20	9,528.26	-3,428.22	124.26	3,430.39	1.28	-1.26	0.21
12,718.00	89.70	177.30	9,526.42	-3,522.11	128.77	3,524.36	0.44	-0.43	0.11
12,813.00	89.40	177.00	9,529.17	-3,616.89	133.49	3,619.35	0.45	-0.32	-0.32
12,908.00	89.30	176.50	9,530.24	-3,711.85	138.87	3,714.35	0.54	-0.11	-0.53
13,002.00	89.80	176.50	9,530.88	-3,805.74	142.97	3,808.34	2.19	0.53	2.13
13,097.00	91.50	176.70	9,529.91	-3,900.70	145.29	3,903.31	1.80	1.79	0.21
13,192.00	91.10	176.00	9,527.75	-3,995.63	148.03	3,998.27	0.85	-0.42	-0.74
13,287.00	90.80	177.10	9,526.18	-4,090.52	152.09	4,093.26	1.00	-0.32	-0.95
13,381.00	90.90	176.60	9,524.78	-4,184.39	157.09	4,187.24	0.34	0.11	-0.32
13,476.00	90.40	178.30	9,523.70	-4,279.20	161.16	4,282.23	1.66	-0.53	1.58
13,571.00	91.30	178.50	9,522.29	-4,374.24	163.80	4,377.21	0.97	0.05	0.21
13,666.00	90.50	177.40	9,520.80	-4,468.17	167.20	4,472.19	1.43	-0.84	-1.16
13,812.00	90.20	176.30	9,519.91	-4,514.94	175.22	4,616.19	0.78	-0.21	-0.75
Last Survey @ 13812.00' MD, 9519.91' TVD, 90.20° INC, 176.30° AZ									
13,860.00	90.20	176.30	9,519.74	-4,662.84	178.32	4,666.17	0.00	0.00	0.00
Straight line Projection to TD @ 13860.00' MD, 9519.74' TVD.									

Survey Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
13,812.00	9,519.91	-4,514.94	175.22	Last Survey @ 13812.00' MD, 9519.91' TVD, 90.20° INC, 176.30° AZ
13,860.00	9,519.74	-4,662.84	178.32	Straight line Projection to TD @ 13860.00' MD, 9519.74' TVD.

Checked By: _____	Approved By: _____	Date: _____
-------------------	--------------------	-------------