



30-015-40448

COG Operating LLC

Eddy County, NM

Blue Duck Federal 1H

Blue Duck Federal 1H

Wellbore #1

Design: surveys

Standard Survey Report

01 October, 2012



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well Blue Duck Federal 1H
Project:	Eddy County, NM	TVD Reference:	WELL @ 3725.0usft (UDI #40)
Site:	Blue Duck Federal 1H	MD Reference:	WELL @ 3725.0usft (UDI #40)
Well:	Blue Duck Federal 1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	surveys	Database:	Houston R5000 Database

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		Blue Duck Federal 1H			
Site Position:		Northing:	686,263.42 usft	Latitude:	32° 53' 10.397 N
From:	Map	Easting:	596,787.61 usft	Longitude:	104° 1' 4.946 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.17 °

Well	Blue Duck Federal 1H				
Well Position	+N/-S	0.0 usft	Northing:	686,263.42 usft	Latitude: 32° 53' 10.397 N
	+E/-W	0.0 usft	Easting:	596,787.61 usft	Longitude: 104° 1' 4.946 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level: 3,711.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	7/30/2012	7.70	60.69	48,851

Design:	surveys				
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	89.83	

Survey Program		Date	10/1/2012		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	3,700.0	Gyro Surveys (Wellbore #1)	MWD	MWD - Standard	
3,700.0	8,570.0	MWD Surveys (Wellbore #1)	MWD	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)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
100.0	0.19	226.03	100.0	-0.1	-0.1	-0.1	0.19	0.19	0.00
200.0	0.48	232.41	200.0	-0.5	-0.6	-0.6	0.29	0.29	6.38
300.0	0.56	234.38	300.0	-1.0	-1.3	-1.3	0.08	0.08	1.97
400.0	0.76	190.01	400.0	-2.0	-1.8	-1.8	0.53	0.20	-44.37
500.0	0.95	180.77	500.0	-3.4	-1.9	-1.9	0.23	0.19	-9.24
600.0	0.83	173.74	600.0	-5.0	-1.9	-1.9	0.16	-0.12	-7.03
700.0	0.60	141.69	700.0	-6.1	-1.5	-1.5	0.45	-0.23	-32.05
800.0	1.02	119.72	799.9	-7.0	-0.4	-0.4	0.52	0.42	-21.97
900.0	1.68	88.71	899.9	-7.4	1.9	1.8	0.96	0.66	-31.01

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Well:	Blue Duck Federal 1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	surveys	Database:	Houston R5000 Database

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)
1,000.0	2.19	94.23	999.9	-7.5	5.2	5.2	0.54	0.51	5.52
1,100.0	1.68	88.41	1,099.8	-7.6	8.6	8.6	0.55	-0.51	-5.82
1,200.0	1.67	88.28	1,199.8	-7.5	11.5	11.5	0.01	-0.01	-0.13
1,300.0	1.30	98.05	1,299.7	-7.6	14.1	14.1	0.45	-0.37	9.77
1,400.0	0.99	107.72	1,399.7	-8.0	16.1	16.0	0.36	-0.31	9.67
1,500.0	0.85	106.23	1,499.7	-8.5	17.6	17.6	0.14	-0.14	-1.49
1,600.0	0.58	97.18	1,599.7	-8.8	18.8	18.8	0.29	-0.27	-9.05
1,700.0	0.41	86.12	1,699.7	-8.8	19.7	19.6	0.19	-0.17	-11.06
1,800.0	0.30	74.81	1,799.7	-8.7	20.3	20.3	0.13	-0.11	-11.31
1,900.0	0.42	72.72	1,899.7	-8.6	20.9	20.9	0.12	0.12	-2.09
2,000.0	0.44	53.39	1,999.7	-8.2	21.5	21.5	0.15	0.02	-19.33
2,100.0	0.41	43.06	2,099.7	-7.7	22.1	22.1	0.08	-0.03	-10.33
2,200.0	0.39	68.39	2,199.7	-7.3	22.7	22.6	0.18	-0.02	25.33
2,300.0	0.67	32.29	2,299.7	-6.7	23.3	23.3	0.42	0.28	-36.10
2,400.0	0.44	33.86	2,399.7	-5.9	23.8	23.8	0.23	-0.23	1.57
2,500.0	0.37	40.62	2,499.7	-5.3	24.2	24.2	0.08	-0.07	6.76
2,600.0	0.59	40.06	2,599.7	-4.7	24.8	24.8	0.22	0.22	-0.56
2,700.0	0.45	14.30	2,699.6	-3.9	25.2	25.2	0.27	-0.14	-25.76
2,800.0	0.21	46.59	2,799.6	-3.4	25.4	25.4	0.29	-0.24	32.29
2,900.0	0.24	8.28	2,899.6	-3.1	25.6	25.6	0.15	0.03	-38.31
3,000.0	0.11	96.95	2,999.6	-2.9	25.7	25.7	0.26	-0.13	88.67
3,100.0	0.04	93.05	3,099.6	-2.9	25.8	25.8	0.07	-0.07	-3.90
3,200.0	0.18	89.78	3,199.6	-2.9	26.0	26.0	0.14	0.14	-3.27
3,300.0	0.16	108.91	3,299.6	-3.0	26.3	26.3	0.06	-0.02	19.13
3,400.0	0.14	107.67	3,399.6	-3.0	26.6	26.6	0.02	-0.02	-1.24
3,500.0	0.13	45.49	3,499.6	-3.0	26.8	26.8	0.14	-0.01	-62.18
3,600.0	0.03	94.94	3,599.6	-2.9	26.9	26.9	0.11	-0.10	49.45
3,700.0	0.20	38.42	3,699.6	-2.8	27.0	27.0	0.19	0.17	-56.52
Tie into Gyro @ 3700.00'									
3,753.0	0.40	58.30	3,752.6	-2.6	27.2	27.2	0.42	0.38	37.51
Begin MWD @ 3753.00' MD									
3,785.0	1.10	79.40	3,784.6	-2.5	27.6	27.6	2.32	2.19	65.94
3,816.0	3.40	86.80	3,815.6	-2.4	28.8	28.8	7.46	7.42	23.87
3,848.0	6.40	88.60	3,847.5	-2.3	31.6	31.6	9.39	9.38	5.63
3,880.0	10.00	89.10	3,879.2	-2.2	36.1	36.1	11.25	11.25	1.56
3,912.0	14.00	88.20	3,910.5	-2.0	42.8	42.8	12.51	12.50	-2.81
3,943.0	16.80	88.60	3,940.3	-1.8	51.0	51.0	9.04	9.03	1.29
3,975.0	20.00	90.10	3,970.7	-1.7	61.1	61.1	10.11	10.00	4.69
4,007.0	23.70	92.40	4,000.4	-2.0	73.0	73.0	11.87	11.56	7.19
4,038.0	27.10	94.00	4,028.4	-2.7	86.3	86.3	11.19	10.97	5.16
4,070.0	30.30	93.70	4,056.5	-3.8	101.6	101.6	10.01	10.00	-0.94
4,102.0	33.60	92.80	4,083.6	-4.7	118.5	118.5	10.42	10.31	-2.81
4,134.0	37.00	91.50	4,109.7	-5.4	137.0	137.0	10.88	10.63	-4.06

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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)
4,165.0	40.30	90.70	4,133.9	-5.8	156.3	156.3	10.77	10.65	-2.58
4,197.0	43.50	90.30	4,157.7	-6.0	177.7	177.7	10.03	10.00	-1.25
4,229.0	46.90	89.40	4,180.3	-5.9	200.4	200.4	10.81	10.63	-2.81
4,260.0	50.20	89.30	4,200.8	-5.6	223.6	223.6	10.65	10.65	-0.32
4,292.0	53.40	89.40	4,220.6	-5.4	248.8	248.8	10.00	10.00	0.31
4,324.0	56.70	90.10	4,238.9	-5.2	275.0	275.0	10.47	10.31	2.19
4,356.0	60.00	90.80	4,255.7	-5.5	302.3	302.2	10.48	10.31	2.19
4,387.0	62.50	91.90	4,270.6	-6.1	329.4	329.4	8.64	8.06	3.55
4,419.0	65.40	92.40	4,284.7	-7.2	358.1	358.1	9.17	9.06	1.56
4,451.0	69.20	91.70	4,297.0	-8.2	387.6	387.6	12.05	11.88	-2.19
4,482.0	72.50	90.80	4,307.2	-8.9	416.9	416.9	10.99	10.65	-2.90
4,514.0	74.80	90.00	4,316.2	-9.1	447.6	447.6	7.58	7.19	-2.50
4,546.0	77.40	89.60	4,323.9	-9.0	478.7	478.6	8.22	8.13	-1.25
4,577.0	79.30	89.80	4,330.1	-8.8	509.0	509.0	6.16	6.13	0.65
4,609.0	81.00	89.60	4,335.6	-8.6	540.6	540.5	5.35	5.31	-0.63
4,641.0	82.50	89.80	4,340.2	-8.5	572.2	572.2	4.73	4.69	0.63
4,673.0	84.20	89.40	4,343.9	-8.3	604.0	604.0	5.46	5.31	-1.25
4,704.0	86.40	89.60	4,346.5	-8.0	634.9	634.9	7.13	7.10	0.65
4,736.0	87.90	89.80	4,348.0	-7.8	666.9	666.8	4.73	4.69	0.63
4,768.0	88.20	89.60	4,349.1	-7.7	698.8	698.8	1.13	0.94	-0.63
4,799.0	88.50	89.40	4,350.0	-7.4	729.8	729.8	1.16	0.97	-0.65
4,831.0	88.50	89.30	4,350.9	-7.0	761.8	761.8	0.31	0.00	-0.31
4,926.0	88.60	88.60	4,353.3	-5.3	856.8	856.8	0.74	0.11	-0.74
5,021.0	88.80	88.20	4,355.4	-2.6	951.7	951.7	0.47	0.21	-0.42
5,212.0	88.70	87.30	4,359.6	4.9	1,142.5	1,142.5	0.47	-0.05	-0.47
5,307.0	89.00	88.00	4,361.5	8.8	1,237.4	1,237.4	0.80	0.32	0.74
5,402.0	89.30	90.10	4,362.9	10.3	1,332.4	1,332.4	2.23	0.32	2.21
5,497.0	89.80	90.00	4,363.6	10.3	1,427.4	1,427.4	0.54	0.53	-0.11
5,592.0	90.00	89.80	4,363.8	10.4	1,522.4	1,522.4	0.30	0.21	-0.21
5,687.0	90.70	90.00	4,363.2	10.6	1,617.4	1,617.4	0.77	0.74	0.21
5,782.0	89.80	90.10	4,362.8	10.5	1,712.4	1,712.4	0.95	-0.95	0.11
5,878.0	90.60	90.30	4,362.5	10.2	1,808.4	1,808.4	0.86	0.83	0.21
5,973.0	89.50	89.40	4,362.4	10.4	1,903.4	1,903.4	1.50	-1.16	-0.95
6,068.0	90.10	89.30	4,362.7	11.5	1,998.4	1,998.4	0.64	0.63	-0.11
6,163.0	89.90	90.00	4,362.7	12.1	2,093.4	2,093.4	0.77	-0.21	0.74
6,258.0	89.50	90.30	4,363.2	11.8	2,188.4	2,188.4	0.53	-0.42	0.32
6,354.0	90.10	90.00	4,363.6	11.6	2,284.4	2,284.4	0.70	0.63	-0.31
6,449.0	89.40	90.30	4,364.0	11.3	2,379.4	2,379.4	0.80	-0.74	0.32
6,543.0	89.70	90.10	4,364.7	11.0	2,473.4	2,473.4	0.38	0.32	-0.21
6,638.0	89.00	90.70	4,365.8	10.3	2,568.3	2,568.4	0.97	-0.74	0.63
6,734.0	89.70	90.50	4,366.9	9.3	2,664.3	2,664.3	0.76	0.73	-0.21
6,829.0	88.80	90.10	4,368.1	8.8	2,759.3	2,759.3	1.04	-0.95	-0.42
6,924.0	89.40	90.30	4,369.6	8.5	2,854.3	2,854.3	0.67	0.63	0.21
7,019.0	89.30	90.10	4,370.7	8.2	2,949.3	2,949.3	0.24	-0.11	-0.21

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Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Houston R5000 Database

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)
7,114.0	89.00	90.30	4,372.1	7.8	3,044.3	3,044.3	0.38	-0.32	0.21
7,209.0	89.70	90.70	4,373.2	7.0	3,139.3	3,139.3	0.85	0.74	0.42
7,305.0	89.00	90.50	4,374.3	6.0	3,235.3	3,235.3	0.76	-0.73	-0.21
7,400.0	89.60	90.50	4,375.4	5.2	3,330.3	3,330.3	0.63	0.63	0.00
7,495.0	89.30	89.80	4,376.3	4.9	3,425.3	3,425.3	0.80	-0.32	-0.74
7,590.0	88.50	89.60	4,378.2	5.4	3,520.2	3,520.2	0.87	-0.84	-0.21
7,685.0	89.20	89.60	4,380.1	6.1	3,615.2	3,615.2	0.74	0.74	0.00
7,781.0	89.70	89.60	4,381.0	6.8	3,711.2	3,711.2	0.52	0.52	0.00
7,876.0	89.70	89.40	4,381.5	7.6	3,806.2	3,806.2	0.21	0.00	-0.21
7,971.0	88.80	89.60	4,382.7	8.4	3,901.2	3,901.2	0.97	-0.95	0.21
8,066.0	90.50	90.30	4,383.3	8.5	3,996.2	3,996.2	1.94	1.79	0.74
8,161.0	89.10	90.00	4,383.7	8.2	4,091.2	4,091.2	1.51	-1.47	-0.32
8,256.0	87.80	90.00	4,386.2	8.2	4,186.1	4,186.2	1.37	-1.37	0.00
8,352.0	88.00	89.80	4,389.7	8.4	4,282.1	4,282.1	0.29	0.21	-0.21
8,447.0	88.50	89.40	4,392.6	9.1	4,377.0	4,377.0	0.67	0.53	-0.42
8,515.0	89.00	89.30	4,394.1	9.8	4,445.0	4,445.0	0.75	0.74	-0.15
8,570.0	89.00	89.30	4,395.1	10.5	4,500.0	4,500.0	0.00	0.00	0.00
BHL - 8570.0' MD, 4395.1' TVD, 89.00° INC, 89.30° AZI, 10.5' N, 4500.0' E, 4500.0' VS									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
3,700.0	3,699.6	-2.8	27.0	Tie into Gyro @ 3700.00'
3,753.0	3,752.6	-2.6	27.2	Begin MWD @ 3753.00' MD
8,570.0	4,395.1	10.5	4,500.0	BHL - 8570.0' MD, 4395.1' TVD, 89.00° INC, 89.30° AZI, 10.5' N, 4500.0' E, 450

Checked By: _____	Approved By: _____	Date: _____
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Company: COG OPERATING LLC (CONCHO)

Lease/Well: BLUE DUCK FEDERAL/1H



Rig Name: UDI 40

State/County: NEW MEXICO/EDDY

Latitude: 32.89

GRID North is 0.17 Degrees East of True North

VS-Azi: 0.00 Degrees



Depth Reference : 15 FEET

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: blue duck#1h_ed.ut

Minimum Curvature Method

Report Date/Time: 8/9/2012 / 16:38

Vaughn Energy Services

Woodward, OK

580-254-5000

Surveyor: Nick Harding

Blue Duck Federal 1H / API 30-015-40448



Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W 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	****
100.00	0.19	226.03	100.00	-0.11	-0.12	0.16	226.03	0.19
200.00	0.48	232.41	200.00	-0.48	-0.57	0.74	229.61	0.29
300.00	0.56	234.38	299.99	-1.02	-1.29	1.65	231.74	0.09
400.00	0.76	190.01	399.99	-1.96	-1.81	2.66	222.73	0.53
500.00	0.95	180.77	499.98	-3.43	-1.93	3.94	209.38	0.24
600.00	0.83	173.74	599.96	-4.98	-1.87	5.32	200.54	0.16
700.00	0.60	141.69	699.96	-6.11	-1.46	6.29	193.44	0.45
800.00	1.02	119.72	799.95	-6.97	-0.36	6.98	182.99	0.51
900.00	1.68	88.71	899.92	-7.37	1.87	7.61	165.74	0.96
1000.00	2.19	94.23	999.86	-7.48	5.24	9.14	144.97	0.54
1100.00	1.68	88.41	1099.81	-7.58	8.61	11.47	131.36	0.55
1200.00	1.67	88.28	1199.76	-7.50	11.53	13.75	123.03	0.01
1300.00	1.30	98.05	1299.73	-7.61	14.11	16.04	118.34	0.45
1400.00	0.99	107.72	1399.71	-8.03	16.06	17.96	116.57	0.37
1500.00	0.85	106.23	1499.70	-8.50	17.59	19.54	115.79	0.14
1600.00	0.58	97.18	1599.69	-8.77	18.81	20.76	115.00	0.29
1700.00	0.41	86.12	1699.68	-8.81	19.68	21.56	114.13	0.19
1800.00	0.30	74.81	1799.68	-8.72	20.29	22.08	113.26	0.14

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
1900.00	0.42	72.72	1899.68	-8.54	20.89	22.57	112.24	0.13
2000.00	0.44	53.39	1999.68	-8.21	21.55	23.06	110.84	0.15
2100.00	0.41	43.06	2099.68	-7.71	22.10	23.41	109.24	0.08
2200.00	0.39	68.39	2199.67	-7.33	22.67	23.82	107.92	0.18
2300.00	0.67	32.29	2299.67	-6.71	23.29	24.24	106.07	0.42
2400.00	0.44	33.86	2399.66	-5.90	23.82	24.54	103.91	0.23
2500.00	0.37	40.62	2499.66	-5.33	24.25	24.82	102.41	0.08
2600.00	0.59	40.06	2599.66	-4.69	24.79	25.23	100.72	0.21
2700.00	0.45	14.30	2699.65	-3.92	25.22	25.52	98.83	0.27
2800.00	0.21	46.59	2799.65	-3.41	25.44	25.67	97.64	0.30
2900.00	0.24	8.28	2899.65	-3.08	25.61	25.79	96.87	0.15
3000.00	0.11	96.95	2999.65	-2.89	25.73	25.90	96.41	0.26
3100.00	0.04	93.05	3099.65	-2.91	25.87	26.03	96.41	0.07
3200.00	0.18	89.78	3199.65	-2.91	26.07	26.23	96.36	0.14
3300.00	0.16	108.91	3299.65	-2.95	26.35	26.52	96.39	0.06
3400.00	0.14	107.67	3399.65	-3.03	26.60	26.77	96.50	0.01
3500.00	0.13	45.49	3499.65	-2.99	26.80	26.96	96.37	0.14
3600.00	0.03	94.94	3599.65	-2.92	26.90	27.06	96.19	0.11
3700.00	0.20	38.42	3699.65	-2.79	27.04	27.18	95.89	0.18
3800.00	0.21	5.65	3799.65	-2.47	27.16	27.27	95.19	0.12
3900.00	0.18	30.83	3899.65	-2.15	27.26	27.34	94.51	0.09
4000.00	0.27	21.23	3999.65	-1.80	27.42	27.48	93.75	0.10
4100.00	0.30	25.81	4099.65	-1.34	27.62	27.66	92.78	0.04
4200.00	0.06	301.47	4199.65	-1.07	27.69	27.71	92.22	0.30
4300.00	0.21	273.99	4299.65	-1.03	27.46	27.48	92.15	0.16
4400.00	0.26	244.01	4399.65	-1.12	27.07	27.10	92.36	0.13
4500.00	0.41	230.71	4499.64	-1.44	26.59	26.63	93.10	0.17
4532.00	0.45	240.14	4531.64	-1.58	26.40	26.44	93.42	0.25