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HOBBS OCD

MAR 28 2016

RECEIVED

## COG Operating LLC

Lea County, NM

Ivar the Boneless Federal #11H

SHL: 75' FNL, 330' FWL, Sec 22, T17S, R32E, Unit D

EOC: 6057.3' MD, 5750.0' TVD, 479.6' N, 15.6' E, 479.5' VS

BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D

Design: BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D

## Standard Survey Report

23 July, 2015



MAR 29 2016



TDS  
Survey Report



<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well SHL 75' FNL 330' FWL, Sec 22, T17S, R32E, Unit D
<b>Project:</b>	Lea County, NM	<b>TVD Reference:</b>	KB @ 4028.0usft (United 43)
<b>Site:</b>	Ivar the Boneless Federal #11H	<b>MD Reference:</b>	KB @ 4028.0usft (United 43)
<b>Well:</b>	SHL 75' FNL, 330' FWL, Sec 22, T17S, R32E, Unit D	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	BHL 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	BHL 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	<b>Database:</b>	EDM 5000.1 Single User Db

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

<b>Site</b>	Ivar the Boneless Federal #11H				
<b>Site Position:</b>		<b>Northing:</b>	665,061.60 usft	<b>Latitude:</b>	32° 49' 37.322 N
<b>From:</b>	Map	<b>Easting:</b>	675,728.90 usft	<b>Longitude:</b>	103° 45' 40.557 W
<b>Position Uncertainty:</b>	0 0 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b>	0.31 "

<b>Well</b>	SHL 75' FNL, 330' FWL, Sec 22, T17S, R32E, Unit D					
<b>Well Position</b>	+N-S	0.0 usft	<b>Northing:</b>	665,061.60 usft	<b>Latitude:</b>	32° 49' 37.322 N
	+E-W	0.0 usft	<b>Easting:</b>	675,728.90 usft	<b>Longitude:</b>	103° 45' 40.557 W
<b>Position Uncertainty</b>		0.0 usft	<b>Wellhead Elevation:</b>	0.0 usft	<b>Ground Level:</b>	4,016.0 usft

<b>Wellbore</b>	BHL 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (")</b>	<b>Dip Angle (")</b>	<b>Field Strength (nT)</b>
	IGRF2015	7/6/2015	7.30	60.61	48,473

<b>Design</b>	BHL 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N-S (usft)</b>	<b>+E-W (usft)</b>	<b>Direction (")</b>	
	0.0	0.0	0.0	359.88	

<b>Survey Program</b>	<b>Date</b>	7/23/2015			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
100.0	5,050.0	Gyro #1 (BHL 350' FNL, 350' FWL, Sec 15)	NS-GYRO-SS	NS Gyro single shots	
5,130.0	10,536.0	MWD #2 (BHL 350' FNL, 350' FWL, Sec 1)	MWD	MWD - Standard	

<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (")</b>	<b>Azimuth (")</b>	<b>Vertical Depth (usft)</b>	<b>+N-S (usft)</b>	<b>+E-W (usft)</b>	<b>Vertical Section (usft)</b>	<b>Dogleg Rate ("/100usft)</b>	<b>Build Rate ("/100usft)</b>	<b>Turn Rate ("/100usft)</b>	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	
100.0	0.36	320.57	100.0	0.2	-0.2	0.2	0.36	0.36	0.00	
200.0	0.40	1.97	200.0	0.8	-0.4	0.8	0.27	0.04	41.40	
300.0	0.33	3.76	300.0	1.5	-0.4	1.5	0.07	-0.07	1.79	
400.0	0.31	312.94	400.0	1.9	-0.5	1.9	0.28	-0.02	-50.82	
500.0	0.42	221.68	500.0	1.9	-1.0	1.9	0.53	0.11	-91.26	
600.0	0.21	191.30	600.0	1.4	-1.3	1.4	0.26	-0.21	-30.38	



TDS  
Survey Report



<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well SHL: 75' FNL, 330' FWL, Sec 22, T17S, R32E, Unit D
<b>Project:</b>	Lea County, NM	<b>TVD Reference:</b>	KB @ 4028.0usft (United 43)
<b>Site:</b>	Ivar the Boneless Federal #11H	<b>MD Reference:</b>	KB @ 4028.0usft (United 43)
<b>Well:</b>	SHL 75' FNL, 330' FWL, Sec 22, T17S, R32E, Unit D	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	BHL 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	BHL 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	<b>Database:</b>	EDM 5000.1 Single User Db

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)
700.0	0.35	244.04	700.0	1.1	-1.6	1.1	0.28	0.14	52.74
800.0	0.26	155.28	800.0	0.7	-1.7	0.7	0.43	-0.09	-88.76
900.0	0.13	150.82	900.0	0.4	-1.6	0.4	0.13	-0.13	-4.46
1,000.0	0.29	162.81	1,000.0	0.1	-1.5	0.1	0.17	0.16	11.99
1,100.0	0.37	176.18	1,100.0	-0.5	-1.4	-0.5	0.11	0.08	13.37
1,200.0	0.62	193.20	1,200.0	-1.3	-1.5	-1.3	0.29	0.25	17.02
1,300.0	0.49	164.62	1,300.0	-2.3	-1.5	-2.2	0.30	-0.13	-28.58
1,400.0	0.71	157.65	1,400.0	-3.2	-1.1	-3.2	0.23	0.22	-6.97
1,500.0	0.45	105.72	1,500.0	-3.9	-0.5	-3.9	0.56	-0.26	-51.93
1,600.0	0.59	81.46	1,600.0	-3.9	0.4	-3.9	0.26	0.14	-24.26
1,700.0	1.24	83.64	1,700.0	-3.8	2.0	-3.8	0.65	0.65	2.18
1,800.0	1.66	77.70	1,799.9	-3.3	4.4	-3.3	0.45	0.42	-5.94
1,900.0	1.74	74.88	1,899.9	-2.6	7.3	-2.6	0.12	0.08	-2.82
2,000.0	1.63	76.07	1,999.8	-1.9	10.2	-1.9	0.12	-0.11	1.19
2,100.0	1.63	79.61	2,099.8	-1.3	12.9	-1.3	0.10	0.00	3.54
2,200.0	1.09	92.98	2,199.8	-1.1	15.3	-1.1	0.62	-0.54	13.37
2,300.0	1.11	120.15	2,299.7	-1.6	17.1	-1.6	0.52	0.02	27.17
2,400.0	1.07	134.82	2,399.7	-2.8	18.6	-2.8	0.28	-0.04	14.67
2,500.0	1.08	157.48	2,499.7	-4.3	19.6	-4.3	0.42	0.01	22.66
2,600.0	0.86	178.01	2,599.7	-5.9	20.0	-5.9	0.41	-0.22	20.53
2,700.0	0.90	192.57	2,699.7	-7.4	19.9	-7.5	0.23	0.04	14.56
2,800.0	0.96	202.82	2,799.7	-9.0	19.4	-9.0	0.18	0.06	10.25
2,900.0	1.02	201.58	2,899.7	-10.6	18.7	-10.6	0.06	0.06	-1.24
3,000.0	1.02	202.66	2,999.6	-12.2	18.0	-12.2	0.02	0.00	1.08
3,100.0	0.84	202.71	3,099.6	-13.7	17.4	-13.7	0.18	-0.18	0.05
3,200.0	1.29	203.32	3,199.6	-15.4	16.7	-15.4	0.45	0.45	0.61
3,300.0	1.26	191.41	3,299.6	-17.5	16.0	-17.6	0.27	-0.03	-11.91
3,400.0	1.32	206.82	3,399.6	-19.6	15.3	-19.7	0.35	0.06	15.41
3,500.0	1.41	197.27	3,499.5	-21.8	14.4	-21.9	0.24	0.09	-9.55
3,600.0	1.46	217.43	3,599.5	-24.0	13.3	-24.0	0.50	0.05	20.16
3,700.0	1.42	199.57	3,699.5	-26.2	12.1	-26.2	0.45	-0.04	-17.86
3,800.0	1.53	203.83	3,799.4	-28.6	11.1	-28.6	0.16	0.11	4.26
3,900.0	1.53	208.12	3,899.4	-31.0	9.9	-31.0	0.11	0.00	4.29
4,000.0	1.50	207.40	3,999.4	-33.3	8.7	-33.3	0.04	-0.03	-0.72
4,100.0	1.16	204.33	4,099.3	-35.4	7.7	-35.4	0.35	-0.34	-3.07
4,200.0	1.16	208.54	4,199.3	-37.2	6.8	-37.2	0.09	0.00	4.21
4,300.0	1.44	209.57	4,299.3	-39.2	5.7	-39.2	0.28	0.28	1.03
4,400.0	0.96	225.28	4,399.3	-40.9	4.5	-40.9	0.58	-0.48	15.71
4,500.0	0.79	229.49	4,499.3	-41.9	3.4	-41.9	0.18	-0.17	4.21
4,600.0	0.95	212.73	4,599.2	-43.1	2.4	-43.1	0.30	0.16	-16.76
4,700.0	0.86	215.59	4,699.2	-44.4	1.5	-44.4	0.10	-0.09	2.86



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<b>Well:</b>	SHL 75' FNL, 330' FWL, Sec 22, T17S, R32E, Unit D	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	BHL 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	BHL 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	<b>Database:</b>	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)	
4,800.0	0.73	218.48	4,799.2	-45.5	0.7	-45.5	0.14	-0.13	2.89	
4,900.0	0.63	212.47	4,899.2	-46.4	0.0	-46.4	0.12	-0.10	-6.01	
5,050.0	0.69	188.38	5,049.2	-48.0	-0.6	-48.0	0.19	0.04	-16.06	
TIE-IN to VES Gyro										
5,130.0	0.80	199.40	5,129.2	-49.0	-0.9	-49.0	0.23	0.14	13.78	
5,163.0	0.70	202.30	5,162.2	-49.4	-1.0	-49.4	0.32	-0.30	8.79	
5,195.0	0.50	205.50	5,194.2	-49.8	-1.1	-49.7	0.63	-0.63	10.00	
5,227.0	1.80	2.90	5,226.2	-49.4	-1.2	-49.4	7.09	4.06	491.88	
5,260.0	5.30	6.20	5,259.1	-47.3	-1.0	-47.3	10.62	10.81	10.00	
5,292.0	9.60	5.80	5,290.8	-43.2	-0.6	-43.2	13.44	13.44	-1.25	
5,324.0	14.40	4.90	5,322.1	-36.6	0.0	-36.6	15.01	15.00	-2.81	
5,356.0	18.00	6.70	5,352.9	-27.7	1.0	-27.7	11.36	11.25	5.63	
5,388.0	19.90	9.80	5,383.1	-17.4	2.5	-17.4	6.72	5.94	9.89	
5,420.0	22.70	8.70	5,412.9	-6.0	4.3	-6.0	8.84	8.75	-3.44	
5,452.0	26.50	6.60	5,442.0	7.2	6.1	7.2	12.18	11.88	-6.56	
5,484.0	30.90	4.20	5,470.1	22.5	7.5	22.5	14.21	13.75	-7.50	
5,516.0	35.60	3.30	5,498.8	40.0	8.6	40.0	14.77	14.69	-2.81	
5,548.0	39.40	2.90	5,522.2	59.5	9.7	59.5	11.90	11.88	-1.25	
5,580.0	42.70	2.40	5,546.4	80.5	10.7	80.4	10.36	10.31	-1.56	
5,612.0	45.80	2.50	5,569.3	102.8	11.6	102.8	9.69	9.69	0.31	
5,644.0	49.10	2.40	5,590.9	126.3	12.6	126.3	10.32	10.31	-0.31	
5,677.0	52.20	1.40	5,611.8	151.8	13.5	151.8	9.68	9.39	-3.03	
5,708.0	55.00	0.30	5,630.2	176.8	13.8	176.7	9.47	9.03	-3.55	
5,740.0	56.80	0.30	5,648.2	203.3	14.0	203.2	5.63	5.63	0.00	
5,771.0	58.20	358.70	5,664.8	229.4	13.7	229.4	6.27	4.52	-5.16	
5,803.0	60.50	359.80	5,681.1	256.9	13.4	256.9	7.77	7.19	3.44	
5,835.0	62.80	0.80	5,696.3	285.1	13.5	285.1	7.70	7.19	3.13	
5,867.0	64.90	358.60	5,710.4	313.8	13.4	313.8	9.01	6.56	-8.88	
5,899.0	70.10	356.80	5,722.7	343.3	12.2	343.3	17.06	16.25	-5.63	
5,923.0	75.40	356.10	5,729.8	366.2	10.8	366.2	22.26	22.06	-2.92	
5,956.0	82.20	356.10	5,736.2	398.5	8.6	398.5	20.61	20.61	0.00	
5,988.0	85.50	357.50	5,739.6	430.3	6.8	430.2	11.19	10.31	4.38	
6,019.0	87.60	359.20	5,741.5	461.2	5.9	461.2	8.71	6.77	5.48	
6,051.0	90.60	2.00	5,742.0	493.2	6.2	493.2	12.82	9.38	8.75	
6,148.0	90.90	2.40	5,740.7	590.1	10.0	590.1	0.52	0.31	0.41	
6,244.0	90.70	2.70	5,739.4	686.0	14.2	686.0	0.36	-0.21	0.31	
6,341.0	90.30	359.60	5,738.5	782.9	16.2	782.9	3.22	-0.41	-3.20	
6,437.0	89.80	359.10	5,738.5	878.9	15.1	878.9	0.74	-0.52	-0.52	
6,533.0	92.10	358.80	5,736.9	974.9	13.3	974.9	2.42	2.40	-0.31	
6,629.0	92.00	359.10	5,733.4	1,070.8	11.6	1,070.8	0.33	-0.10	0.31	
6,724.0	90.80	1.20	5,731.1	1,165.8	11.8	1,165.8	2.55	-1.26	2.21	



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<b>Wellbore:</b>	BHL 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	<b>Survey Calculation Method:</b>	Minimum Curvature
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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)	
6,820.0	91.10	0.70	5,729.5	1,261.8	13.4	1,261.7	0.61	0.31	-0.52	
6,917.0	90.30	1.20	5,728.3	1,358.7	15.0	1,358.7	0.97	-0.82	0.52	
7,013.0	90.10	0.60	5,728.0	1,454.7	16.5	1,454.7	0.66	-0.21	-0.63	
7,107.0	89.80	0.30	5,728.1	1,548.7	17.3	1,548.7	0.45	-0.32	-0.32	
7,203.0	89.40	359.90	5,728.7	1,644.7	17.4	1,644.7	0.59	-0.42	-0.42	
7,298.0	90.50	359.40	5,728.8	1,739.7	16.8	1,739.7	1.27	1.16	-0.53	
7,394.0	89.90	359.30	5,728.5	1,835.7	15.8	1,835.7	0.63	-0.63	-0.10	
7,491.0	91.20	359.10	5,727.6	1,932.7	14.4	1,932.7	1.36	1.34	-0.21	
7,587.0	91.00	358.90	5,725.7	2,028.7	12.7	2,028.6	0.29	-0.21	-0.21	
7,682.0	91.00	358.70	5,724.1	2,123.6	10.7	2,123.6	0.21	0.00	-0.21	
7,776.0	91.00	358.60	5,722.4	2,217.6	8.5	2,217.6	0.11	0.00	-0.11	
7,872.0	90.90	358.60	5,720.8	2,313.5	6.2	2,313.5	0.10	-0.10	0.00	
7,967.0	90.90	359.30	5,719.3	2,408.5	4.4	2,408.5	0.74	0.00	0.74	
8,063.0	90.90	359.10	5,717.8	2,504.5	3.1	2,504.5	0.21	0.00	-0.21	
8,159.0	90.50	359.30	5,716.7	2,600.5	1.8	2,600.5	0.47	-0.42	0.21	
8,254.0	90.50	359.40	5,715.8	2,695.5	0.7	2,695.5	0.11	0.00	0.11	
8,350.0	90.10	359.30	5,715.3	2,791.5	-0.4	2,791.5	0.43	-0.42	-0.10	
8,447.0	90.20	359.90	5,715.1	2,888.5	-1.1	2,888.5	0.63	0.10	0.62	
8,544.0	91.40	0.30	5,713.7	2,985.4	-0.9	2,985.4	1.30	1.24	0.41	
8,641.0	90.70	359.70	5,711.9	3,082.4	-0.9	3,082.4	0.95	-0.72	-0.62	
8,737.0	90.90	359.60	5,710.6	3,178.4	-1.5	3,178.4	0.23	0.21	-0.10	
8,834.0	91.00	359.30	5,709.0	3,275.4	-2.4	3,275.4	0.33	0.10	-0.31	
8,931.0	90.90	359.20	5,707.4	3,372.4	-3.7	3,372.4	0.15	-0.10	-0.10	
9,027.0	92.00	359.90	5,705.0	3,468.3	-4.5	3,468.3	1.36	1.15	0.73	
9,123.0	91.80	359.70	5,701.8	3,564.3	-4.8	3,564.3	0.29	-0.21	-0.21	
9,220.0	91.30	359.30	5,699.1	3,661.3	-5.6	3,661.3	0.66	-0.52	-0.41	
9,316.0	90.90	358.70	5,697.3	3,757.2	-7.3	3,757.2	0.75	-0.42	-0.63	
9,413.0	92.40	359.30	5,694.5	3,854.2	-9.0	3,854.2	1.67	1.55	0.62	
9,510.0	92.00	358.90	5,690.8	3,951.1	-10.5	3,951.1	0.58	-0.41	-0.41	
9,607.0	91.80	359.70	5,687.6	4,048.0	-11.7	4,048.0	0.85	-0.21	0.82	
9,703.0	91.20	359.70	5,685.1	4,144.0	-12.2	4,144.0	0.63	-0.63	0.00	
9,799.0	92.40	0.90	5,682.0	4,239.9	-11.7	4,239.9	1.77	1.25	1.25	
9,896.0	92.90	0.60	5,677.6	4,336.8	-10.4	4,336.8	0.60	0.52	-0.31	
9,993.0	92.30	0.70	5,673.2	4,433.7	-9.3	4,433.7	0.63	-0.62	0.10	
10,089.0	90.60	1.10	5,670.7	4,529.7	-7.8	4,529.7	1.82	-1.77	0.42	
10,185.0	91.20	0.90	5,669.2	4,625.6	-6.2	4,625.6	0.66	0.63	-0.21	
10,282.0	90.90	1.20	5,667.4	4,722.6	-4.4	4,722.6	0.44	-0.31	0.31	
10,379.0	92.00	0.60	5,665.0	4,819.6	-2.9	4,819.6	1.29	1.13	-0.62	
10,482.0	93.50	0.50	5,660.0	4,922.4	-1.9	4,922.4	1.46	1.46	-0.10	
<b>Final MWD Survey</b>										
10,536.0	93.50	0.50	5,656.8	4,976.3	-1.4	4,976.3	0.00	0.00	0.00	



TDS  
Survey Report



<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well SHL: 75' FNL, 330' FWL, Sec 22, T17S, R32E, Unit D
<b>Project:</b>	Lea County, NM	<b>TVD Reference:</b>	KB @ 4028.0usft (United 43)
<b>Site:</b>	Ivar the Boneless Federal #11H	<b>MD Reference:</b>	KB @ 4028.0usft (United 43)
<b>Well:</b>	SHL: 75' FNL, 330' FWL, Sec 22, T17S, R32E, Unit D	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	BHL: 350' FNL, 350' FWL, Sec 15, T17S, R32E, Unit D	<b>Database:</b>	EDM 5000.1 Single User Db

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)
Projection to Bi/VD									

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N-S (usft)	+E-W (usft)	
5 050.0	5 049.2	-48.0	-0.6	TIE-IN to VES Gyro
10 482.0	5 660.0	4 922.4	-1.9	Final MWD Survey
10 536.0	5 656.8	4 976.3	-1.4	Projection to Bi/VD

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_