



COG Operating LLC

Lea County, NM (NAD-27 2015)

Ivar the Boneless Fed #22H

API #: 30-025-42998

SHL: 105' FNL, 1423' FWL, Sec 22, T17S, R32E, Unit C

PP: 330' FSL, 971' FWL, Sec 15, T17S, R32E, Unit M

BHL: 351' FNL, 971' FWL, Sec 15, T17S, R32E, Unit D

Design: BHL: 350' FNL, 969' FWL, Sec 15, T17S, R32E, Unit D

Standard Survey Report

04 April, 2016



Company: COG Operating LLC
Project: Lea County, NM (NAD-27 2015)
Site: Ivar the Boneless Fed #22H
Well: SHL 105' FNL, 1423' FWL, Sec 22, T17S, R32E, Unit C
Wellbore: BHL 350' FNL, 969' FWL, Sec 15, T17S, R32E, Unit D
Design: BHL 350' FNL, 969' FWL, Sec 15, T17S, R32E, Unit D

Local Co-ordinate Reference: Site Ivar the Boneless Fed #22H
TVD Reference: KB @ 4032.00usft (Silver Oak 3)
MD Reference: KB @ 4032.00usft (Silver Oak 3)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User Db

Project Lea County, NM (NAD-27 2015)

Map System: US State Plane 1927 (Exact solution)
Geo Datum: NAD 1927 (NADCON CONUS)
Map Zone: New Mexico East 3001

System Datum: Mean Sea Level

Site Ivar the Boneless Fed #22H

Site Position: Northing: 665,035.90 usft Latitude: 32° 49' 37.009 N
From: Map Easting: 676,822.00 usft Longitude: 103° 45' 27.749 W
Position Uncertainty: 0.00 usft Slot Radius: 13.20 in Grid Convergence: 0.31 °

Well SHL 105' FNL, 1423' FWL, Sec 22, T17S, R32E, Unit C

Well Position: +N/-S 0.00 usft Northing: 665,035.90 usft Latitude: 32° 49' 37.009 N
+E/-W 0.00 usft Easting: 676,822.00 usft Longitude: 103° 45' 27.749 W
Position Uncertainty: 0.00 usft Wellhead Elevation: 0.00 usft Ground Level: 4,014.00 usft

Wellbore BHL 350' FNL, 969' FWL, Sec 15, T17S, R32E, Unit D

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	1/7/2016	7.24	60.60	48,421

Design BHL 350' FNL, 969' FWL, Sec 15, T17S, R32E, Unit D

Audit Notes:
Version: 1.0 Phase: ACTUAL Tie On Depth: 0.00
Vertical Section: Depth From (TVD) +N/-S +E/-W Direction
(usft) (usft) (usft) (°)
0.00 0.00 0.00 354.50

Survey Program Date 4/4/2016

From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100.00	2,090.00	VES Gyro #1 (BHL 350' FNL, 969' FWL, S	VES-ISCWSA-GYRO-3	Biaxial Semi-Cont. Gyro
2,162.00	11,140.00	TDS MWD #2 (BHL 350' FNL, 969' FWL	MWD	MWD - Standard

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)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.48	46.29	100.00	0.29	0.30	0.26	0.48	0.48	0.00
200.00	0.82	71.09	199.99	0.81	1.28	0.68	0.43	0.34	24.80
300.00	1.41	65.67	299.97	1.55	3.08	1.25	0.60	0.59	-5.42
400.00	2.15	64.31	399.92	2.87	5.89	2.29	0.74	0.74	-1.36
500.00	2.15	75.20	499.85	4.16	9.40	3.24	0.41	0.00	10.89
600.00	2.17	70.62	599.78	5.27	13.00	4.00	0.17	0.02	-4.58



TDS
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700.00	1.78	53.66	699.72	6.82	16.03	5.25	0.70	-0.39	-16.96
800.00	1.30	51.86	799.69	8.44	18.18	6.66	0.48	-0.48	-1.80
900.00	0.62	32.10	899.67	9.60	19.36	7.70	0.75	-0.68	-19.76
1,000.00	0.33	35.87	999.67	10.29	19.81	8.34	0.29	-0.29	3.77
1,100.00	0.39	38.34	1,099.67	10.79	20.19	8.80	0.06	0.06	2.47
1,200.00	0.55	43.00	1,199.66	11.41	20.73	9.37	0.16	0.16	4.66
1,300.00	0.50	34.76	1,299.66	12.12	21.31	10.02	0.09	-0.05	-8.24
1,400.00	0.56	38.36	1,399.66	12.86	21.86	10.70	0.07	0.06	3.60
1,500.00	0.40	39.18	1,499.65	13.51	22.38	11.31	0.16	-0.16	0.82
1,600.00	1.11	60.81	1,599.64	14.26	23.45	11.94	0.75	0.71	21.83
1,700.00	1.13	55.37	1,699.62	15.29	25.11	12.81	0.11	0.02	-5.44
1,800.00	1.58	54.00	1,799.60	16.66	27.03	13.99	0.45	0.45	-1.37
1,900.00	1.45	53.76	1,899.56	18.22	29.17	15.34	0.13	-0.13	-0.24
2,000.00	1.49	62.62	1,999.53	19.56	31.34	16.47	0.23	0.04	8.86
2,090.00	1.33	60.35	2,089.50	20.62	33.29	17.33	0.19	-0.18	-2.52
Tie-In to VES Gyro									
2,162.00	1.00	82.30	2,161.49	21.12	34.64	17.70	0.76	-0.46	30.49
First TDS MWD Survey									
2,256.00	0.70	72.20	2,255.48	21.40	36.00	17.85	0.36	-0.32	-10.74
2,351.00	0.70	220.30	2,350.47	21.14	36.17	17.57	1.42	0.00	155.89
2,445.00	2.30	241.60	2,444.44	19.80	34.14	16.44	1.77	1.70	22.66
2,540.00	4.20	254.70	2,539.28	17.98	29.11	15.10	2.13	2.00	13.79
2,634.00	6.30	262.10	2,632.88	16.36	20.88	14.30	2.34	2.23	7.87
2,728.00	7.30	263.30	2,726.22	14.95	9.64	13.96	1.07	1.06	1.28
2,823.00	6.90	271.00	2,820.50	14.35	-2.06	14.48	1.09	-0.42	8.11
2,917.00	7.30	274.40	2,913.77	14.90	-13.66	16.15	0.62	0.43	3.62
3,011.00	6.30	274.10	3,007.11	15.73	-24.76	18.03	1.06	-1.06	-0.32
3,106.00	6.40	272.50	3,101.53	16.34	-35.25	19.64	0.21	0.11	-1.68
3,200.00	7.20	272.90	3,194.87	16.86	-46.36	21.23	0.85	0.85	0.43
3,295.00	6.30	276.60	3,289.21	17.76	-57.49	23.19	1.05	-0.95	3.89
3,389.00	6.50	278.70	3,382.62	19.16	-67.87	25.58	0.33	0.21	2.23
3,484.00	7.30	279.50	3,476.93	20.97	-79.14	28.46	0.85	0.84	0.84
3,578.00	6.70	280.80	3,570.23	22.98	-90.42	31.54	0.66	-0.64	1.38
3,673.00	7.10	280.60	3,664.54	25.10	-101.63	34.73	0.42	0.42	-0.21
3,767.00	6.30	275.40	3,757.90	26.66	-112.48	37.31	1.07	-0.85	-5.53
3,862.00	6.50	273.20	3,852.31	27.45	-123.03	39.11	0.33	0.21	-2.32
3,956.00	7.00	274.50	3,945.66	28.19	-134.06	40.91	0.56	0.53	1.38
4,050.00	6.40	271.50	4,039.02	28.78	-145.00	42.54	0.74	-0.64	-3.19
4,145.00	6.40	268.70	4,133.43	28.80	-155.59	43.58	0.33	0.00	-2.95
4,239.00	7.30	269.10	4,226.75	28.58	-166.80	44.44	0.96	0.96	0.43
4,334.00	7.10	263.60	4,321.01	27.84	-178.67	44.83	0.76	-0.21	-5.79
4,428.00	6.50	262.60	4,414.34	26.50	-189.72	44.56	0.65	-0.64	-1.06



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4 523.00	7.10	262.70	4 508.68	25.06	-200.87	44.20	0.63	0.63	0.11
4 618.00	7.00	264.50	4 602.96	23.76	-212.46	44.02	0.26	-0.11	1.89
4 712.00	6.80	274.50	4 696.28	23.65	-223.71	44.98	1.29	-0.21	10.64
4 807.00	6.50	286.10	4 790.64	25.58	-234.48	47.94	1.45	-0.32	12.21
4 901.00	7.00	288.10	4 883.99	28.84	-245.04	52.19	0.59	0.53	2.13
4 996.00	7.00	282.20	4 978.29	31.86	-256.20	56.27	0.76	0.00	-6.21
5 090.00	7.00	273.60	5 071.59	33.43	-267.52	58.92	1.11	0.00	-9.15
5 184.00	6.50	269.50	5 164.94	33.74	-278.55	60.29	0.74	-0.53	-4.36
5 279.00	5.80	269.60	5 259.39	33.66	-288.73	61.18	0.74	-0.74	0.11
5 373.00	6.10	269.00	5 352.88	33.54	-298.47	62.00	0.33	0.32	-0.64
5 468.00	6.50	268.10	5 447.31	33.28	-308.89	62.73	0.43	0.42	-0.95
5 562.00	7.30	267.10	5 540.63	32.80	-320.18	63.33	0.86	0.85	-1.06
5 657.00	7.20	269.10	5 634.87	32.40	-332.16	64.09	0.29	-0.11	2.11
5 751.00	7.90	267.70	5 728.05	32.05	-344.50	64.92	0.77	0.74	-1.49
5 783.00	8.90	271.70	5 759.71	32.03	-349.17	65.35	3.62	3.13	12.50
5 814.00	9.90	278.80	5 790.29	32.51	-354.20	66.31	4.93	3.23	22.90
5 846.00	11.20	286.90	5 821.75	33.84	-359.90	68.17	6.15	4.06	25.31
5 877.00	12.50	295.00	5 852.09	36.13	-365.82	71.02	6.80	4.19	26.13
5 909.00	13.80	302.80	5 883.26	39.66	-372.17	75.15	6.87	4.06	24.38
5 940.00	15.30	308.40	5 913.26	44.20	-378.48	80.28	6.63	4.64	18.06
5 972.00	17.40	315.80	5 943.97	50.26	-385.13	86.94	9.23	6.56	23.13
6 004.00	19.40	325.30	5 974.34	58.06	-391.49	95.32	11.24	6.25	29.69
6 035.00	22.10	331.40	6 003.33	67.42	-397.21	105.18	11.15	8.71	19.88
6 066.00	25.30	335.80	6 031.71	76.57	-402.74	116.81	11.67	10.32	13.55
6 098.00	29.10	338.20	6 060.17	92.03	-408.46	130.75	12.44	11.88	8.13
6 129.00	33.00	340.30	6 086.73	106.98	-414.11	146.18	13.06	12.58	6.77
6 161.00	36.80	342.50	6 112.97	124.33	-419.93	164.01	12.51	11.88	6.88
6 193.00	40.80	344.70	6 137.90	143.57	-425.57	183.70	13.22	12.50	6.88
6 224.00	44.60	347.20	6 160.68	163.96	-430.66	204.48	13.42	12.26	8.06
6 256.00	48.00	350.20	6 182.79	186.64	-435.17	227.49	12.60	10.63	9.38
6 287.00	51.50	352.80	6 202.82	210.04	-438.65	251.11	12.98	11.29	8.39
6 319.00	54.90	355.30	6 221.99	235.51	-441.30	276.73	12.33	10.63	7.81
6 350.00	58.60	357.40	6 238.98	261.38	-442.94	302.63	13.21	11.94	6.77
6 382.00	62.70	358.50	6 254.66	289.25	-443.93	330.47	13.16	12.81	3.44
6 416.00	67.20	359.20	6 269.06	320.04	-444.54	361.17	13.37	13.24	2.08
6 448.00	70.90	358.00	6 280.50	349.91	-445.28	390.97	12.08	11.58	-3.75
6 479.00	74.40	356.50	6 289.74	379.46	-446.70	420.52	12.20	11.29	-4.84
6 511.00	76.60	357.20	6 297.75	410.39	-448.40	451.48	7.19	6.88	2.19
6 534.57	77.66	357.35	6 303.00	433.34	-449.49	474.43	4.56	4.52	0.65
As-Drilled PP									
6 542.00	78.00	357.40	6 304.57	440.60	-449.83	481.68	4.56	4.52	0.64
6 574.00	79.30	357.60	6 310.86	471.94	-451.20	513.01	4.11	4.08	0.63



TDS
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6,605.00	80.60	357.80	6,316.27	502.44	-452.42	543.49	4.24	4.19	0.65
6,637.00	81.90	357.60	6,321.14	534.04	-453.69	575.07	4.11	4.08	-0.63
6,668.00	82.30	357.40	6,325.40	564.72	-455.03	605.73	1.44	1.29	-0.65
6,700.00	83.40	357.40	6,329.38	596.43	-456.47	637.44	3.44	3.44	0.00
6,731.00	85.00	357.40	6,332.52	627.24	-457.87	668.24	5.16	5.16	0.00
6,763.00	86.80	357.60	6,334.80	659.13	-459.28	700.11	5.66	5.63	0.63
6,825.00	88.20	357.40	6,337.51	721.01	-461.96	761.97	2.28	2.26	-0.32
6,920.00	89.50	358.40	6,339.42	815.92	-465.44	856.78	1.73	1.37	1.05
7,014.00	90.20	358.80	6,339.66	909.89	-467.74	950.54	0.86	0.74	0.43
7,109.00	91.20	0.20	6,338.50	1,004.88	-468.57	1,045.16	1.81	1.05	1.47
7,203.00	91.50	1.00	6,336.29	1,098.85	-467.58	1,138.60	0.91	0.32	0.85
7,297.00	90.30	0.30	6,334.81	1,192.83	-466.52	1,232.05	1.48	-1.28	-0.74
7,392.00	90.60	0.90	6,334.06	1,287.82	-465.52	1,326.51	0.71	0.32	0.63
7,486.00	90.30	359.70	6,333.33	1,381.81	-465.03	1,420.02	1.32	-0.32	-1.28
7,581.00	90.90	0.30	6,332.33	1,476.81	-465.03	1,514.58	0.89	0.63	0.63
7,675.00	91.10	1.00	6,330.69	1,570.79	-463.96	1,608.02	0.77	0.21	0.74
7,770.00	90.80	0.20	6,329.11	1,665.77	-462.97	1,702.47	0.90	-0.32	-0.84
7,864.00	91.10	359.50	6,327.56	1,759.75	-463.22	1,796.05	0.81	0.32	-0.74
7,958.00	91.10	359.60	6,325.75	1,853.73	-463.95	1,889.67	0.11	0.00	0.11
8,053.00	90.70	358.10	6,324.26	1,948.70	-465.86	1,984.38	1.63	-0.42	-1.58
8,147.00	91.30	358.70	6,322.62	2,042.65	-468.49	2,078.15	0.90	0.64	0.64
8,241.00	91.90	359.50	6,319.99	2,136.60	-469.96	2,171.80	1.06	0.64	0.85
8,336.00	90.40	358.10	6,318.09	2,231.55	-471.95	2,266.51	2.16	-1.58	-1.47
8,430.00	90.90	357.90	6,317.02	2,325.49	-475.23	2,360.33	0.57	0.53	-0.21
8,524.00	92.00	358.80	6,314.64	2,419.42	-477.94	2,454.09	1.51	1.17	0.96
8,618.00	90.50	358.80	6,312.59	2,513.37	-479.90	2,547.80	1.60	-1.60	0.00
8,713.00	92.30	358.90	6,310.27	2,608.32	-481.81	2,642.49	1.90	1.69	0.11
8,808.00	91.50	359.70	6,307.12	2,703.26	-482.97	2,737.10	1.19	-0.84	0.84
8,902.00	90.60	0.30	6,305.40	2,797.24	-482.97	2,830.66	1.15	-0.96	0.64
8,997.00	92.00	0.50	6,303.24	2,892.21	-482.31	2,925.13	1.49	1.47	0.21
9,091.00	91.60	0.30	6,300.29	2,986.16	-481.65	3,018.58	0.48	-0.43	-0.21
9,185.00	92.90	0.50	6,296.60	3,080.09	-481.00	3,112.01	1.40	1.38	0.21
9,280.00	92.00	0.30	6,292.54	3,175.00	-480.33	3,206.42	0.97	-0.95	-0.21
9,374.00	93.10	0.40	6,288.38	3,268.90	-479.76	3,299.83	1.18	1.17	0.11
9,469.00	91.80	0.90	6,284.30	3,363.81	-478.68	3,394.20	1.47	-1.37	0.53
9,563.00	92.80	1.20	6,280.52	3,457.71	-476.96	3,487.51	1.11	1.06	0.32
9,658.00	92.10	0.20	6,276.46	3,552.62	-475.80	3,581.87	1.28	-0.74	-1.05
9,752.00	93.10	0.30	6,272.20	3,646.52	-475.39	3,675.29	1.07	1.08	0.11
9,847.00	91.50	0.30	6,268.39	3,741.44	-474.90	3,769.73	1.68	-1.68	0.00
9,941.00	89.80	359.50	6,267.32	3,835.43	-475.06	3,863.30	2.00	-1.81	-0.85
10,036.00	90.60	359.50	6,266.99	3,930.42	-475.89	3,957.94	0.84	0.84	0.00
10,130.00	91.60	359.60	6,265.18	4,024.40	-476.63	4,051.56	1.07	1.06	0.11



TDS
Survey Report



Company: COG Operating LLC
Project: Lea County, NM (NAD-27 2015)
Site: Ivar the Boneless Fed #22H
Well: SHL 105' FNL, 1423' FWL, Sec 22 T17S,
R32E, Unit C
Wellbore: BHL 350' FNL 969' FWL, Sec 15, T17S, R32E,
Unit D
Design: BHL 350' FNL 969' FWL, Sec 15, T17S, R32E,
Unit D

Local Co-ordinate Reference: Site Ivar the Boneless Fed #22H
TVD Reference: KB @ 4032.00usft (Silver Oak 3)
MD Reference: KB @ 4032.00usft (Silver Oak 3)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
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)
10,225.00	90.50	359.60	6,263.44	4,119.38	-477.29	4,146.16	1.16	-1.16	0.00
10,319.00	91.40	359.70	6,261.88	4,213.37	-477.86	4,239.77	0.96	0.96	0.11
10,414.00	91.30	0.20	6,259.65	4,308.34	-477.95	4,334.31	0.54	-0.11	0.53
10,508.00	91.40	0.00	6,257.43	4,402.31	-477.78	4,427.84	0.24	0.11	-0.21
10,603.00	91.60	0.30	6,254.95	4,497.28	-477.53	4,522.34	0.38	0.21	0.32
10,697.00	91.40	359.50	6,252.48	4,591.25	-477.70	4,615.89	0.88	-0.21	-0.85
10,792.00	91.30	359.50	6,250.25	4,686.22	-478.53	4,710.51	0.11	-0.11	0.00
10,886.00	89.00	359.20	6,250.00	4,780.20	-479.59	4,804.16	2.47	-2.45	-0.32
10,980.00	89.60	359.50	6,251.15	4,874.19	-480.66	4,897.82	0.71	0.64	0.32
11,075.00	90.30	359.50	6,251.23	4,969.19	-481.49	4,992.46	0.74	0.74	0.00
Final MWD Survey									
11,140.00	90.30	359.50	6,250.89	5,034.18	-482.06	5,057.21	0.00	0.00	0.00
Projection to Bit/VD									

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,090.00	2,089.50	20.62	33.29	Tie-In to VES Gyro
2,162.00	2,161.49	21.12	34.64	First TDS MWD Survey
6,534.57	6,303.00	433.34	-449.49	As-Drilled PP
11,075.00	6,251.23	4,969.19	-481.49	Final MWD Survey
11,140.00	6,250.89	5,034.18	-482.06	Projection to Bit/VD

Checked By: _____

Approved By: _____

Date: _____



Company: Concho
Lease/Well: Ivar The Boneless Federal No/022H

Rig Name: Silver Oak 3
State/County: New Mexico/Lea
VS-Azi: 0.00 Degrees
Latitude: 32.82694, Longitude: -103.75770
Grid North = True North -0.31 degs (NAD 27)
Grid Correction Applied = -0.31 degs



Depth Reference : RKB= 18 ft

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: gyro survey-de_01.ut
Minimum Curvature Method
Report Date/Time: 2/5/2016 / 15:56

VES Survey International
Fort Worth, Texas
Office 817-741-3810
Surveyor: Gregg Wilson
Ivar the Boneless Federal No 022H / API 30-025-42998

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	0.48	46.29	100.00	0.29	0.30	0.29	0.42	46.29	0.48
200.00	0.82	71.09	199.99	0.81	1.28	0.81	1.52	57.72	0.43
300.00	1.41	65.67	299.97	1.55	3.08	1.55	3.44	63.31	0.59
400.00	2.15	64.31	399.92	2.87	5.89	2.87	6.55	64.04	0.75
500.00	2.15	75.20	499.85	4.16	9.39	4.16	10.27	66.11	0.41
600.00	2.17	70.62	599.78	5.26	12.99	5.26	14.01	67.93	0.17
700.00	1.78	53.66	699.72	6.81	16.02	6.81	17.41	66.96	0.70
800.00	1.30	51.86	799.69	8.43	18.17	8.43	20.03	65.10	0.48
900.00	0.62	32.10	899.67	9.59	19.35	9.59	21.59	63.62	0.75
1000.00	0.33	35.87	999.67	10.29	19.80	10.29	22.31	62.55	0.29
1100.00	0.39	38.34	1099.67	10.78	20.18	10.78	22.88	61.88	0.06
1200.00	0.55	43.00	1199.67	11.40	20.72	11.40	23.65	61.18	0.17
1300.00	0.50	34.76	1299.66	12.11	21.30	12.11	24.50	60.37	0.09
1400.00	0.56	38.36	1399.66	12.86	21.85	12.86	25.35	59.53	0.07
1500.00	0.40	39.18	1499.65	13.51	22.37	13.51	26.14	58.87	0.17
1600.00	1.11	60.81	1599.64	14.25	23.44	14.25	27.43	58.70	0.76
1700.00	1.13	55.37	1699.62	15.29	25.10	15.29	29.39	58.66	0.11
1800.00	1.58	54.00	1799.60	16.66	27.03	16.66	31.75	58.35	0.45

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	1.45	53.76	1899.56	18.22	29.16	18.22	34.39	58.01	0.14
2000.00	1.49	62.62	1999.53	19.56	31.34	19.56	36.94	58.03	0.23
2090.00	1.33	60.35	2089.50	20.62	33.28	20.62	39.15	58.22	0.19



VES Survey International
Fort Worth, Texas
Office 817-741-3610
Surveyor: Gregg Wilson
Ivar the Boneless Federal No 022H / API 30-025-42998



40

N+/S-
20

Depth=2090.0, Inc=1.3, AzG=60.3

Depth=0.0, Inc=0.0, AzG=0.0

20

40

-W/+E

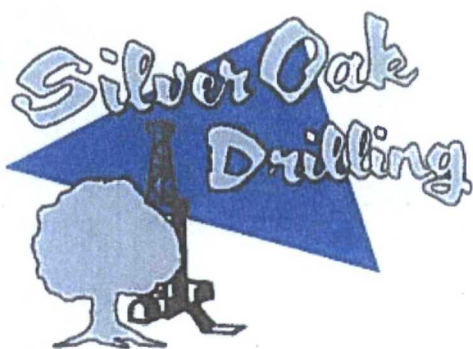
V.E.S. Survey Date: 1/31/2016



I Gregg Wilson certify that I am employed by VES Survey International. That I did on the day(s) of 01/31/16 through 01/31/16 conduct or supervise the taking of a Rate Gyro survey from a depth of 0.00 feet to a depth of 2,090.00 feet; that the data is true, correct, complete and within the limitations of the tool as set forth by Vaughn Energy Services, that I am authorized and qualified to make this report; that this survey was conducted at the request of Concho for the Ivar The Boneless Federal Well # 022H API # 30-025-42998 in Lea County / Parish New Mexico; and that I have reviewed this report and find that it conforms to the principles and procedures as set forth by VES Survey International.



Gregg Wilson
Service Technician
VES Survey International



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

February 16, 2016

COG, LLC
One Concho Center
600 W. Illinois Ave.
Midland, TX 79701

RE: Ivar the Boneless Fed 22H
105' FNL & 1423' FWL
Sec. 22, T17S, R32E
Lea 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 16th day of February, 2016.

Notary Public

Ivar the Boneless Fed 22H

Date	Depth	Deviation	Direction
1/28/2016	444	2.10	
1/28/2016	503	3.10	
1/29/2016	564	3.00	
1/29/2016	626	1.90	
1/29/2016	747	1.90	
1/29/2016	873	0.60	
1/31/2016	1095	0.40	
1/31/2016	1568	1.10	
1/31/2016	1976	1.50	
2/1/2016	2162	1.00	82.30
2/2/2016	2256	0.70	72.20
2/2/2016	2351	0.70	220.30
2/2/2016	2445	2.30	241.60
2/2/2016	2540	4.20	254.70
2/2/2016	2634	6.30	262.10
2/2/2016	2728	7.30	263.30
2/2/2016	2823	6.90	271.00
2/2/2016	2917	7.30	274.40
2/2/2016	3011	6.30	274.10
2/2/2016	3106	6.40	272.50
2/2/2016	3295	6.30	216.60
2/2/2016	3389	6.50	278.70
2/2/2016	3484	7.30	279.50
2/2/2016	3518	6.70	280.80
2/2/2016	3673	7.10	280.60
2/2/2016	3767	6.30	275.40
2/2/2016	3767	6.30	255.40
2/2/2016	3862	6.50	273.20
2/3/2016	3956	7.00	274.50
2/3/2016	4050	6.40	271.50
2/3/2016	4145	6.40	258.70
2/3/2016	4259	7.30	269.10
2/3/2016	4334	7.10	263.60
2/3/2016	4428	6.50	262.60
2/3/2016	4523	7.10	262.70
2/3/2016	4618	7.00	264.80
2/3/2016	4712	6.80	274.50
2/3/2016	4807	6.50	286.10
2/3/2016	4901	7.00	288.10
2/3/2016	4996	7.00	282.20
2/3/2016	5090	7.00	275.60
2/3/2016	5184	6.50	269.50

Date	Depth	Deviation	Direction
2/3/2016	5279	5.80	269.60
2/3/2016	5373	6.10	269.00
2/3/2016	5468	6.50	268.10
2/3/2016	5657	7.20	269.10
2/3/2016	5751	7.90	261.70
2/3/2016	5783	8.90	271.70
2/4/2016	5814	10.00	278.80
2/4/2016	5846	11.20	286.90
2/4/2016	5877	12.50	295.00
2/4/2016	5909	13.80	302.80
2/4/2016	5940	15.30	308.40
2/4/2016	5972	17.40	315.80
2/4/2016	6004	19.40	325.30
2/4/2016	6035	22.10	331.40
2/4/2016	6066	25.30	335.60
2/4/2016	6098	29.10	338.20
2/4/2016	6129	33.00	340.30
2/4/2016	6161	36.80	342.50
2/4/2016	6193	40.80	344.70
2/5/2016	6224	44.60	347.20
2/5/2016	6256	48.00	350.20
2/5/2016	6287	51.50	352.80
2/5/2016	6319	54.90	355.30
2/5/2016	6350	58.60	358.40
2/5/2016	6382	62.40	358.50
2/5/2016	6416	67.20	359.90
2/5/2016	6448	70.90	358.00
2/5/2016	6542	78.00	357.40
2/5/2016	6605	80.60	357.80
2/5/2016	6637	81.90	357.60
2/5/2016	6700	83.40	357.40
2/6/2016	6731	85.00	357.40
2/6/2016	6763	86.80	357.60
2/6/2016	6826	88.20	357.40
2/6/2016	6920	89.50	358.40
2/6/2016	7014	90.20	358.80
2/6/2016	7109	91.20	0.20
2/6/2016	7203	91.50	1.00
2/6/2016	7297	90.30	0.30
2/6/2016	7392	90.60	0.90
2/6/2016	7486	90.30	359.70
2/6/2016	7675	91.10	1.00
2/6/2016	7770	90.80	0.20
2/7/2016	7864	91.10	359.50
2/7/2016	7958	91.10	359.60

Date	Depth	Deviation	Direction
2/7/2016	8053	90.70	358.10
2/7/2016	8147	91.30	358.70
2/7/2016	8241	91.90	359.50
2/7/2016	8336	90.40	358.10
2/8/2016	8430	90.90	357.90
2/8/2016	8524	92.00	358.80
2/8/2016	8618	90.50	358.80
2/8/2016	8713	92.30	358.90
2/8/2016	8808	91.50	359.70
2/8/2016	8902	90.60	0.30
2/9/2016	9091	91.60	0.30
2/9/2016	9185	92.90	0.50
2/9/2016	9280	92.00	0.30
2/9/2016	9374	93.10	0.40
2/9/2016	9469	91.80	0.90
2/9/2016	9563	92.80	0.00
2/9/2016	9658	92.10	0.20
2/9/2016	9752	93.10	0.30
2/9/2016	9847	91.50	0.30
2/10/2016	9941	89.80	359.50
2/10/2016	10030	90.60	359.50
2/10/2016	10130	91.60	359.60
2/10/2016	10225	90.50	359.60
2/10/2016	10319	91.40	359.70
2/10/2016	10414	91.30	0.20
2/10/2016	10508	91.40	360.00
2/10/2016	10603	91.60	0.30
2/10/2016	10697	91.40	359.50
2/10/2016	10792	91.30	359.50
2/10/2016	10886	89.00	359.20
2/11/2016	10980	89.60	359.50
2/11/2016	11075	90.30	359.50



2/12/16

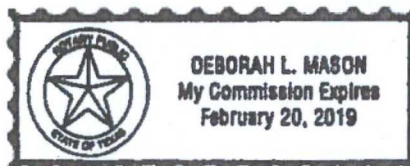
State of New Mexico
County of Lea

I, Donald D. Mason, certify that: I am employed by Terra Directional Services LLC; that I did on the day(s) of 02/01/2016 through 02/10/2016 conduct or supervise the taking of a MWD survey from a depth of 2162 feet to a depth of 11140 feet; that the data is true, correct, complete and within the limitations of the tool as set forth by Terra Directional Services LLC; that I am authorized and qualified to make this report; that this survey was conducted at the request of COG Operating LLC for the Ivar the Boneless Fed #22H Well API 30-025-42998 in Lea County, New Mexico; and that I have reviewed this report and find that it conforms to the principles and procedures as set forth by Terra Directional Services LLC.

Donald D. Mason
President

State of Texas
County of Burnet

Before me, a notary public, on this day personally appeared Donald D. Mason, known to me to be the person whose name is subscribed to the foregoing document and, being by me first duly sworn, declared that the statements therein contained are true and correct.



Notary Public's Signature

February 5, 2016

Concho Resources, Inc.
One Concho Center
600 W. Illinois Avenue
Midland, Texas 79701

Attn: Kanicia Castillo

RE: Ivar The Boneless Federal No 022H

Please find enclosed a copy of the survey from 0' to 2090' ran on the above referenced well.

Sincerely,

Keith Havelka
Operations

STATE OF TEXAS §
 §
COUNTY OF NUECES §

This instrument was acknowledged before me on the 5 day of February
A.D., 2016, by Keith Havelka.


Jennifer Ann Byerly
Notary Public, State of Texas

