

CONCHO

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MAY 30 2017
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COG Operating LLC

Lea County, NM (NAD-27 2015)

Ragnar Federal Com #16H

API #: 30-025-43272

SHL: 100' FNL, 1870' FEL, Sec 22, T17S, R32E, Unit B

PP: 330' FSL, 1669' FEL, Sec 15, T17S, R32E, Unit O

BHL: 250' FNL, 1674' FEL, Sec 15, T17S, R32E, Unit B

Design: BHL: 220' FNL, 1667' FEL, Sec 15, T17S, R32E, Unit B

Standard Survey Report

27 February, 2017



4016/4033/4034

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 100' FNL, 1870' FEL, Sec 22, T17S, R32E, Unit B
Project:	Lea County, NM (NAD-27 2015)	TVD Reference:	KB @ 4034.00usft (Silver Oak 3)
Site:	Ragnar Federal Com #16H	MD Reference:	KB @ 4034.00usft (Silver Oak 3)
Well:	SHL: 100' FNL, 1870' FEL, Sec 22, T17S, R32E, Unit B	North Reference:	Grid
Wellbore:	BHL: 220' FNL, 1667' FEL, Sec 15, T17S, R32E, Unit B	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 220' FNL, 1667' FEL, Sec 15, T17S, R32E, Unit B	Database:	EDM 5000.1 Single User Db

Project	Lea County, NM (NAD-27 2015)		
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		Ragnar Federal Com #16H			
Site Position:		Northing:	665,048.50 usft	Latitude:	32° 49' 37.026 N
From:	Map	Easting:	678,802.00 usft	Longitude:	103° 45' 4.545 W
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in	Grid Convergence:	0.32 °

Well	SHL: 100' FNL, 1870' FEL, Sec 22, T17S, R32E, Unit B					
Well Position	+N/-S	0.00 usft	Northing:	665,048.50 usft	Latitude:	32° 49' 37.026 N
	+E/-W	0.00 usft	Easting:	678,802.00 usft	Longitude:	103° 45' 4.545 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	4,016.00 usft

Wellbore	BHL: 220' FNL, 1667' FEL, Sec 15, T17S, R32E, Unit B				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	5/16/2016	7.20	60.60	48,385

Design	BHL: 220' FNL, 1667' FEL, Sec 15, T17S, R32E, Unit B				
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	1.90	

Survey Program	Date	2/27/2017			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.00	2,136.00	VES Gyro #1 (BHL: 220' FNL, 1667' FEL,	VES-ISCWSA-GYRO-3	Biaxial Semi-Cont. Gyro	
2,136.00	10,718.00	TDS MWD #2 (BHL: 220' FNL, 1667' FEL,	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	0.29	43.39	100.00	0.18	0.17	0.19	0.29	0.29	0.00	
200.00	0.24	24.43	200.00	0.56	0.43	0.57	0.10	-0.05	-18.96	
300.00	0.22	26.72	300.00	0.92	0.61	0.94	0.02	-0.02	2.29	
400.00	0.18	40.33	400.00	1.21	0.80	1.24	0.06	-0.04	13.61	
500.00	0.09	261.11	500.00	1.32	0.82	1.35	0.26	-0.09	-139.22	
600.00	0.16	208.56	600.00	1.18	0.67	1.21	0.13	0.07	-52.55	

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 100' FNL, 1870' FEL, Sec 22, T17S, R32E, Unit B
Project:	Lea County, NM (NAD-27 2015)	TVD Reference:	KB @ 4034.00usft (Silver Oak 3)
Site:	Ragnar Federal Com #16H	MD Reference:	KB @ 4034.00usft (Silver Oak 3)
Well:	SHL: 100' FNL, 1870' FEL, Sec 22, T17S, R32E, Unit B	North Reference:	Grid
Wellbore:	BHL: 220' FNL, 1667' FEL, Sec 15, T17S, R32E, Unit B	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 220' FNL, 1667' FEL, Sec 15, T17S, R32E, Unit B	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)	
700.00	0.27	216.88	700.00	0.87	0.47	0.89	0.11	0.11	8.32	
800.00	0.38	215.66	799.99	0.42	0.13	0.42	0.11	0.11	-1.22	
900.00	0.33	220.33	899.99	-0.07	-0.25	-0.08	0.06	-0.05	4.67	
1,000.00	0.27	230.76	999.99	-0.44	-0.62	-0.46	0.08	-0.06	10.43	
1,100.00	0.27	177.55	1,099.99	-0.83	-0.79	-0.85	0.24	0.00	-53.21	
1,200.00	0.32	178.98	1,199.99	-1.34	-0.77	-1.37	0.05	0.05	1.43	
1,300.00	0.27	205.95	1,299.99	-1.83	-0.87	-1.86	0.15	-0.05	26.97	
1,400.00	0.49	198.58	1,399.99	-2.45	-1.11	-2.48	0.22	0.22	-7.37	
1,500.00	0.70	193.69	1,499.98	-3.45	-1.39	-3.49	0.22	0.21	-4.89	
1,600.00	0.78	204.26	1,599.97	-4.66	-1.82	-4.72	0.16	0.08	10.57	
1,700.00	0.55	207.58	1,699.96	-5.71	-2.32	-5.78	0.23	-0.23	3.32	
1,800.00	0.40	155.71	1,799.96	-6.45	-2.40	-6.53	0.44	-0.15	-51.87	
1,900.00	0.37	146.35	1,899.96	-7.04	-2.07	-7.10	0.07	-0.03	-9.36	
2,000.00	0.70	119.83	1,999.96	-7.61	-1.37	-7.65	0.40	0.33	-26.52	
2,100.00	0.84	116.75	2,099.95	-8.24	-0.18	-8.25	0.15	0.14	-3.08	
2,136.00	0.67	118.20	2,135.94	-8.46	0.24	-8.45	0.48	-0.47	4.03	
Tie-In to VES Gyro										
2,245.00	0.50	127.20	2,244.94	-9.05	1.18	-9.01	0.18	-0.16	8.26	
First TDS MWD Survey										
2,340.00	2.40	119.90	2,339.90	-10.29	3.24	-10.18	2.01	2.00	-7.68	
2,435.00	4.30	125.10	2,434.74	-13.33	7.87	-13.07	2.02	2.00	5.47	
2,530.00	4.70	121.20	2,529.44	-17.40	14.12	-16.92	0.53	0.42	-4.11	
2,625.00	4.10	118.50	2,624.16	-21.03	20.43	-20.35	0.67	-0.63	-2.84	
2,720.00	4.30	122.80	2,718.91	-24.58	26.41	-23.70	0.39	0.21	4.53	
2,815.00	5.10	123.60	2,813.59	-28.85	32.92	-27.74	0.84	0.84	0.84	
2,909.00	5.10	123.20	2,907.22	-33.45	39.90	-32.11	0.04	0.00	-0.43	
3,004.00	5.50	120.40	3,001.81	-38.07	47.36	-36.48	0.50	0.42	-2.95	
3,099.00	5.70	118.90	3,096.36	-42.65	55.41	-40.79	0.26	0.21	-1.58	
3,194.00	4.80	119.90	3,190.96	-46.91	62.99	-44.80	0.95	-0.95	1.05	
3,288.00	6.20	119.60	3,284.52	-51.38	70.81	-49.00	1.49	1.49	-0.32	
3,382.00	5.90	118.50	3,378.00	-56.19	79.47	-53.53	0.34	-0.32	-1.17	
3,477.00	4.90	118.60	3,472.58	-60.46	87.32	-57.54	1.05	-1.05	0.11	
3,572.00	5.60	118.10	3,567.18	-64.59	94.98	-61.40	0.74	0.74	-0.53	
3,667.00	5.40	119.50	3,661.74	-68.97	102.96	-65.52	0.25	-0.21	1.47	
3,761.00	5.10	121.50	3,755.34	-73.33	110.37	-69.64	0.37	-0.32	2.13	
3,856.00	5.00	123.20	3,849.98	-77.81	117.43	-73.87	0.19	-0.11	1.79	
3,950.00	4.60	123.20	3,943.65	-82.11	124.01	-77.96	0.43	-0.43	0.00	
4,044.00	6.20	117.90	4,037.23	-86.55	131.65	-82.14	1.78	1.70	-5.64	
4,138.00	5.70	119.40	4,130.72	-91.22	140.21	-86.52	0.56	-0.53	1.60	
4,233.00	5.30	120.50	4,225.28	-95.76	148.10	-90.80	0.44	-0.42	1.16	
4,328.00	5.10	120.60	4,319.89	-100.14	155.51	-94.93	0.21	-0.21	0.11	

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Site:	Ragnar Federal Com #16H	MD Reference:	KB @ 4034.00usft (Silver Oak 3)
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Wellbore:	BHL: 220' FNL, 1667' FEL, Sec 15, T17S, R32E, Unit B	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 220' FNL, 1667' FEL, Sec 15, T17S, R32E, Unit B	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)	
4,422.00	5.10	122.80	4,413.52	-104.53	162.62	-99.08	0.21	0.00	2.34	
4,517.00	5.00	123.10	4,508.15	-109.08	169.64	-103.39	0.11	-0.11	0.32	
4,612.00	5.10	122.00	4,602.78	-113.58	176.69	-107.66	0.15	0.11	-1.16	
4,706.00	4.20	121.80	4,696.47	-117.60	183.16	-111.47	0.96	-0.96	-0.21	
4,800.00	2.00	112.90	4,790.33	-120.06	187.59	-113.77	2.39	-2.34	-9.47	
4,894.00	1.80	121.80	4,884.28	-121.47	190.36	-115.10	0.38	-0.21	9.47	
4,989.00	1.00	88.10	4,979.25	-122.23	192.46	-115.78	1.17	-0.84	-35.47	
5,084.00	1.40	45.40	5,074.23	-121.39	194.11	-114.89	1.00	0.42	-44.95	
5,116.00	4.00	15.20	5,106.19	-120.04	194.68	-113.52	8.99	8.13	-94.38	
5,148.00	7.30	8.30	5,138.03	-116.95	195.27	-110.41	10.51	10.31	-21.56	
5,179.00	10.70	5.70	5,168.65	-112.13	195.84	-105.58	11.04	10.97	-8.39	
5,211.00	13.70	4.50	5,199.92	-105.40	196.43	-98.83	9.41	9.38	-3.75	
5,242.00	16.70	3.50	5,229.83	-97.29	196.99	-90.71	9.71	9.68	-3.23	
5,274.00	19.80	3.10	5,260.22	-87.29	197.56	-80.69	9.70	9.69	-1.25	
5,306.00	22.80	1.90	5,290.03	-75.68	198.06	-69.07	9.47	9.38	-3.75	
5,336.00	25.50	1.30	5,317.40	-63.41	198.40	-56.80	9.04	9.00	-2.00	
5,368.00	28.70	1.30	5,345.89	-48.84	198.73	-42.22	10.00	10.00	0.00	
5,399.00	31.80	2.00	5,372.66	-33.23	199.19	-26.61	10.06	10.00	2.26	
5,430.00	34.60	2.50	5,398.60	-16.27	199.86	-9.63	9.08	9.03	1.61	
5,462.00	37.80	2.00	5,424.42	2.61	200.59	9.26	10.04	10.00	-1.56	
5,493.00	40.40	1.10	5,448.47	22.15	201.12	28.81	8.58	8.39	-2.90	
5,523.00	43.20	359.90	5,470.84	42.15	201.29	48.80	9.71	9.33	-4.00	
5,555.00	43.90	359.10	5,494.03	64.19	201.09	70.83	2.78	2.19	-2.50	
5,587.00	43.90	359.20	5,517.09	86.38	200.77	92.99	0.22	0.00	0.31	
5,617.00	44.00	359.60	5,538.68	107.20	200.55	113.79	0.98	0.33	1.33	
5,649.00	44.00	359.70	5,561.70	129.43	200.41	136.00	0.22	0.00	0.31	
5,681.00	44.00	359.80	5,584.72	151.66	200.31	158.21	0.22	0.00	0.31	
5,712.00	44.10	359.80	5,607.00	173.21	200.24	179.75	0.32	0.32	0.00	
5,743.00	46.60	359.60	5,628.79	195.26	200.12	201.79	8.08	8.06	-0.65	
5,774.00	50.10	359.30	5,649.39	218.42	199.90	224.93	11.31	11.29	-0.97	
5,805.00	53.10	359.40	5,668.64	242.71	199.62	249.20	9.68	9.68	0.32	
5,837.00	56.50	359.60	5,687.08	268.86	199.40	275.32	10.64	10.63	0.63	
5,869.00	60.00	359.80	5,703.92	296.06	199.26	302.51	10.95	10.94	0.63	
5,900.00	63.60	359.60	5,718.57	323.38	199.11	329.80	11.63	11.61	-0.65	
5,932.00	67.50	359.50	5,731.81	352.50	198.88	358.90	12.19	12.19	-0.31	
5,963.00	71.60	359.70	5,742.64	381.54	198.68	387.92	13.24	13.23	0.65	
5,994.00	75.60	359.30	5,751.39	411.27	198.42	417.62	12.96	12.90	-1.29	
6,014.13	77.68	359.10	5,756.04	430.85	198.15	437.19	10.37	10.32	-0.97	
As-Drilled PP										
6,025.00	78.80	359.00	5,758.25	441.49	197.97	447.82	10.37	10.32	-0.96	
6,056.00	81.50	358.30	5,763.56	472.03	197.25	478.31	8.99	8.71	-2.26	

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Design:	BHL: 220' FNL, 1667' FEL, Sec 15, T17S, R32E, Unit B	Database:	EDM 5000.1 Single User Db

Survey									
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6,088.00	84.50	358.00	5,767.46	503.77	196.23	510.00	9.42	9.38	-0.94
6,120.00	88.40	358.40	5,769.44	535.68	195.22	541.86	12.25	12.19	1.25
6,151.00	90.00	358.90	5,769.87	566.67	194.49	572.81	5.41	5.16	1.61
6,214.00	89.90	358.70	5,769.93	629.66	193.17	635.72	0.35	-0.16	-0.32
6,308.00	89.70	0.50	5,770.25	723.65	192.52	729.64	1.93	-0.21	1.91
6,339.00	89.80	0.50	5,770.39	754.65	192.79	760.63	0.32	0.32	0.00
6,434.00	89.40	359.90	5,771.05	849.65	193.12	855.58	0.76	-0.42	-0.63
6,527.00	89.30	0.30	5,772.11	942.64	193.28	948.53	0.44	-0.11	0.43
6,622.00	90.30	0.40	5,772.44	1,037.64	193.86	1,043.49	1.06	1.05	0.11
6,716.00	90.20	359.20	5,772.03	1,131.63	193.53	1,137.43	1.28	-0.11	-1.28
6,811.00	89.80	359.30	5,772.03	1,226.62	192.29	1,232.32	0.43	-0.42	0.11
6,906.00	89.70	359.30	5,772.44	1,321.62	191.13	1,327.23	0.11	-0.11	0.00
7,000.00	89.50	359.50	5,773.10	1,415.61	190.14	1,421.13	0.30	-0.21	0.21
7,094.00	89.40	0.10	5,774.00	1,509.60	189.82	1,515.07	0.65	-0.11	0.64
7,188.00	89.10	0.40	5,775.23	1,603.59	190.23	1,609.02	0.45	-0.32	0.32
7,284.00	89.90	359.20	5,776.07	1,699.59	189.89	1,704.95	1.50	0.83	-1.25
7,379.00	90.50	359.50	5,775.74	1,794.58	188.81	1,799.85	0.71	0.63	0.32
7,474.00	90.10	359.30	5,775.24	1,889.57	187.82	1,894.76	0.47	-0.42	-0.21
7,569.00	90.00	359.80	5,775.16	1,984.57	187.07	1,989.68	0.54	-0.11	0.53
7,664.00	89.70	359.80	5,775.41	2,079.57	186.74	2,084.62	0.32	-0.32	0.00
7,759.00	89.30	0.10	5,776.24	2,174.56	186.66	2,179.56	0.53	-0.42	0.32
7,854.00	89.80	359.30	5,776.98	2,269.56	186.16	2,274.48	0.99	0.53	-0.84
7,949.00	91.10	359.50	5,776.24	2,364.55	185.17	2,369.39	1.38	1.37	0.21
8,044.00	91.50	0.40	5,774.08	2,459.52	185.08	2,464.31	1.04	0.42	0.95
8,138.00	90.20	358.60	5,772.69	2,553.50	184.26	2,558.21	2.36	-1.38	-1.91
8,234.00	90.30	359.10	5,772.27	2,649.48	182.34	2,654.07	0.53	0.10	0.52
8,328.00	90.20	359.40	5,771.86	2,743.47	181.11	2,747.97	0.34	-0.11	0.32
8,423.00	90.40	359.80	5,771.36	2,838.47	180.44	2,842.89	0.47	0.21	0.42
8,518.00	90.40	0.30	5,770.70	2,933.47	180.53	2,937.84	0.53	0.00	0.53
8,613.00	89.60	0.20	5,770.70	3,028.47	180.94	3,032.80	0.85	-0.84	-0.11
8,708.00	89.50	0.60	5,771.44	3,123.46	181.60	3,127.76	0.43	-0.11	0.42
8,802.00	89.50	1.70	5,772.26	3,217.44	183.49	3,221.75	1.17	0.00	1.17
8,896.00	89.70	0.40	5,772.92	3,311.42	185.21	3,315.74	1.40	0.21	-1.38
8,992.00	90.30	359.70	5,772.92	3,407.42	185.30	3,411.69	0.96	0.63	-0.73
9,086.00	90.00	358.60	5,772.67	3,501.40	183.90	3,505.58	1.21	-0.32	-1.17
9,181.00	90.50	359.40	5,772.26	3,596.39	182.24	3,600.45	0.99	0.53	0.84
9,275.00	90.20	0.10	5,771.68	3,690.38	181.83	3,694.38	0.81	-0.32	0.74
9,370.00	89.40	359.80	5,772.02	3,785.38	181.75	3,789.33	0.90	-0.84	-0.32
9,464.00	89.50	358.60	5,772.92	3,879.37	180.44	3,883.22	1.28	0.11	-1.28
9,558.00	88.80	358.80	5,774.31	3,973.33	178.31	3,977.06	0.77	-0.74	0.21
9,652.00	90.50	359.50	5,774.89	4,067.32	176.91	4,070.94	1.96	1.81	0.74

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 100' FNL, 1870' FEL, Sec 22, T17S, R32E, Unit B
Project:	Lea County, NM (NAD-27 2015)	TVD Reference:	KB @ 4034.00usft (Silver Oak 3)
Site:	Ragnar Federal Com #16H	MD Reference:	KB @ 4034.00usft (Silver Oak 3)
Well:	SHL: 100' FNL, 1870' FEL, Sec 22, T17S, R32E, Unit B	North Reference:	Grid
Wellbore:	BHL: 220' FNL, 1667' FEL, Sec 15, T17S, R32E, Unit B	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 220' FNL, 1667' FEL, Sec 15, T17S, R32E, Unit B	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)
9,747.00	90.80	0.40	5,773.81	4,162.31	176.83	4,165.88	1.00	0.32	0.95
9,842.00	89.40	359.80	5,773.64	4,257.31	176.99	4,260.83	1.60	-1.47	-0.63
9,936.00	89.50	0.20	5,774.55	4,351.30	176.99	4,354.78	0.44	0.11	0.43
10,031.00	90.20	2.50	5,774.79	4,446.27	179.23	4,449.76	2.53	0.74	2.42
10,125.00	89.20	0.00	5,775.29	4,540.23	181.28	4,543.75	2.86	-1.06	-2.66
10,220.00	89.00	358.80	5,776.78	4,635.22	180.29	4,638.64	1.28	-0.21	-1.26
10,314.00	89.10	357.70	5,778.34	4,729.16	177.42	4,732.44	1.17	0.11	-1.17
10,409.00	89.90	358.40	5,779.17	4,824.10	174.19	4,827.22	1.12	0.84	0.74
10,504.00	90.10	358.60	5,779.17	4,919.06	171.70	4,922.05	0.30	0.21	0.21
10,597.00	90.10	359.20	5,779.00	5,012.05	169.91	5,014.93	0.65	0.00	0.65
10,661.00	90.40	359.50	5,778.72	5,076.04	169.19	5,078.86	0.66	0.47	0.47
Last TDS MWD Survey									
10,718.00	90.40	359.50	5,778.33	5,133.04	168.69	5,135.81	0.00	0.00	0.00
Projection to Bit/TD									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,136.00	2,135.94	-8.46	0.24	Tie-In to VES Gyro
2,245.00	2,244.94	-9.05	1.18	First TDS MWD Survey
6,014.13	5,756.04	430.85	198.15	As-Drilled PP
10,661.00	5,778.72	5,076.04	169.19	Last TDS MWD Survey
10,718.00	5,778.33	5,133.04	168.69	Projection to Bit/TD

Checked By: _____ Approved By: _____ Date: _____

February 27, 2017

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

Attn: Kanicia Castillo

RE: **Ragnar Federal Com No. 016H**

Please find enclosed a copy of the survey from 0' to 2136' ran on the above referenced well.

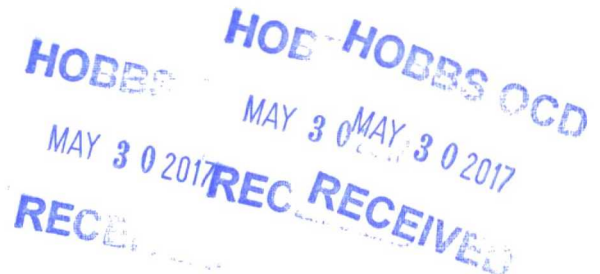
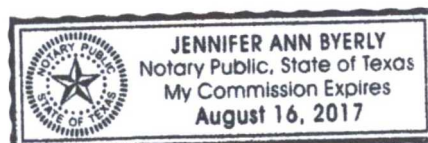
Sincerely,

Keith Havelka
Operations

STATE OF TEXAS §
 §
COUNTY OF NUECES §

This instrument was acknowledged before me on the 27 day of February, A.D., 2017, by Keith Havelka.


Jennifer Ann Byerly
Notary Public, State of Texas





Company: COG OPERATING
Lease/Well: RAGNAR FEDERAL COM No./016H



Rig Name: PATRIOT 6
State/County: NEW MEXICO/LEA
VS-Azi: 0.00 Degrees
Latitude: 32.82695, Longitude: -103.75126
Grid North = True North -0.32 degs (NAD 27)
Grid Correction Applied = -0.32 degs

Depth Reference : RKB 18 FEET

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: eline-de_01.ut
Minimum Curvature Method
Report Date/Time: 2/27/2017 / 08:48

VES Survey International
West Texas
432-563-5444

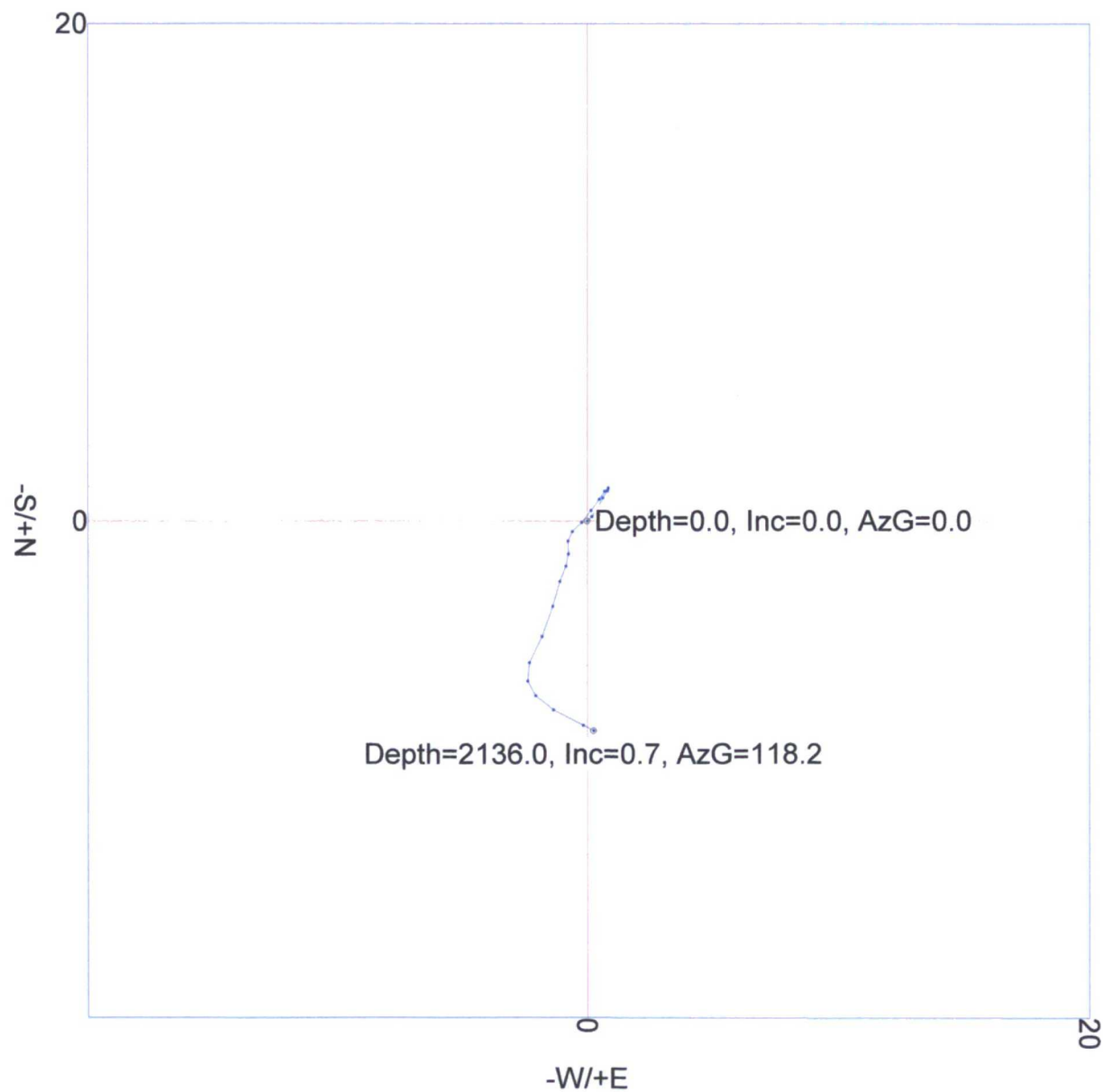
Surveyor: Dustin Byers
Ragnar Federal Com No. 016H / API 30-025-43272

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	0.29	43.39	100.00	0.19	0.18	0.19	0.26	43.39	0.29
200.00	0.24	24.43	200.00	0.57	0.44	0.57	0.72	37.84	0.10
300.00	0.22	26.72	300.00	0.93	0.61	0.93	1.12	33.41	0.03
400.00	0.18	40.33	400.00	1.22	0.80	1.22	1.46	33.31	0.06
500.00	0.09	261.11	500.00	1.33	0.83	1.33	1.57	31.94	0.26
600.00	0.16	208.56	600.00	1.20	0.69	1.20	1.38	29.87	0.13
700.00	0.27	216.88	700.00	0.88	0.48	0.88	1.00	28.41	0.11
800.00	0.38	215.66	799.99	0.43	0.15	0.43	0.45	18.73	0.10
900.00	0.33	220.33	899.99	-0.06	-0.23	-0.06	0.24	256.26	0.05
1000.00	0.27	230.76	999.99	-0.42	-0.60	-0.42	0.74	234.70	0.08
1100.00	0.27	177.55	1099.99	-0.81	-0.77	-0.81	1.12	223.82	0.24
1200.00	0.32	178.98	1199.99	-1.32	-0.76	-1.32	1.52	209.94	0.05
1300.00	0.27	205.95	1299.99	-1.81	-0.86	-1.81	2.00	205.35	0.15
1400.00	0.49	198.58	1399.99	-2.42	-1.10	-2.42	2.66	204.32	0.23
1500.00	0.70	193.69	1499.98	-3.42	-1.38	-3.42	3.69	201.90	0.22
1600.00	0.78	204.26	1599.97	-4.64	-1.80	-4.64	4.97	201.22	0.16

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
1700.00	0.55	207.58	1699.96	-5.68	-2.30	-5.68	6.13	202.05	0.23
1800.00	0.40	155.71	1799.96	-6.43	-2.38	-6.43	6.85	200.31	0.44
1900.00	0.37	146.35	1899.96	-7.01	-2.06	-7.01	7.31	196.34	0.07
2000.00	0.70	119.83	1999.96	-7.58	-1.35	-7.58	7.70	190.10	0.40
2100.00	0.84	116.75	2099.95	-8.21	-0.17	-8.21	8.22	181.18	0.15
2136.00	0.67	118.20	2135.94	-8.43	0.25	-8.43	8.44	178.30	0.48



VES Survey International
West Texas
432-563-5444
Surveyor: Dustin Byers
Ragnar Federal Com No. 016H / API 30-025-43272



VES Survey Date: 2/17/2017



I Dustin Byers certify that I am employed by VES Survey International. That I did on the day(s) of 02/17/17 through 02/17/17 conduct or supervise the taking of a Rate Gyro survey from a depth of 0.00 feet to a depth of 2,136.00 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 COG Operating for the Ragnar Fed Com Well # 16H API # 30-025-43272 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.

A handwritten signature in blue ink, appearing to read "Dustin Byers", is written over a horizontal line.

Dustin Byers
Service Technician
VES Survey International



PATRIOT DRILLING, LLC

OPERATOR: COG Operating, LLC
WELL/LEASE: Ragnar Federal Com # 16H
COUNTY: Lea County, New Mexico
Section 22, T17S, R32E

**STATE OF NEW MEXICO
DEVIATION REPORT**

<u>Depth</u>	<u>Deviation</u>	<u>Depth</u>	<u>Deviation</u>
475	1/2	1,067	1/2
836	1 1/2	1,382	1

Patriot Drilling, LLC

M. Leroy Peterson, Executive Vice-
President

The foregoing instrument was acknowledged before me on this 26th day of
February, 2017 by M. Leroy Peterson, Executive Vice-President of Patriot Drilling,

My Commission Expires: 02/01/2019
ID Number 12200842

Lori T. Rowan
Notary Public for Ector Co., Texas

