



NM OIL CONSERVATION

ARTESIA DISTRICT

DEC 21 2015

RECEIVED

I Michael Cook certify that I am employed by Vaughn Energy Services. That I did on the day(s) of 08/30/15 through 08/30/15 conduct or supervise the taking of a HA Rate Gyro survey from a depth of 0 feet to a depth of 3412 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 Bose Ikard 4 State Com 1V6 Well # 016H API # 30-015-42884 in Eddy 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 Vaughn Energy Services

A handwritten signature in black ink, appearing to read "M COOK", is written over a horizontal line.

Michael Cook
Service Technician
Vaughn Energy Services



NM OIL CONSERVATION
ARTESIA DISTRICT

DEC 21 2015

RECEIVED

September 3, 2015

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

Attn: Kanicia Castillo

RE: **Bose Ikard 4 State Com No 016H**

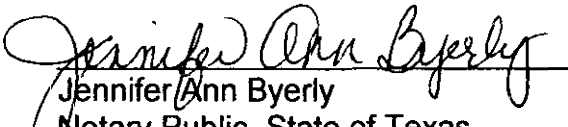
Please find enclosed a copy of the survey from 0' to 3412' ran on the above referenced well.

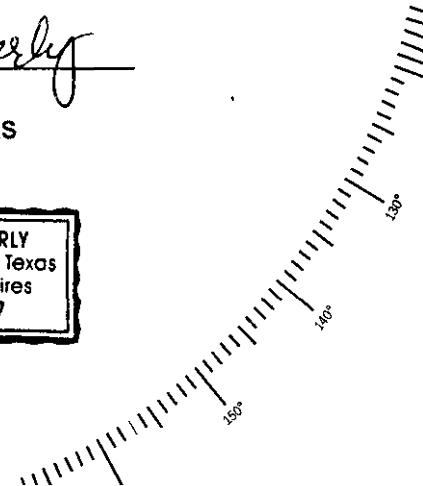
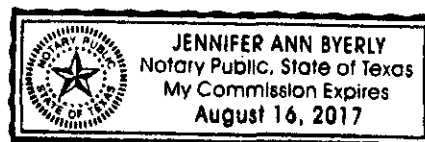
Sincerely,


Keith Havelka
Operations

STATE OF TEXAS §
 §
COUNTY OF NUECES §

This instrument was acknowledged before me on the 3 day of September
A.D., 2015, by Keith Havelka.

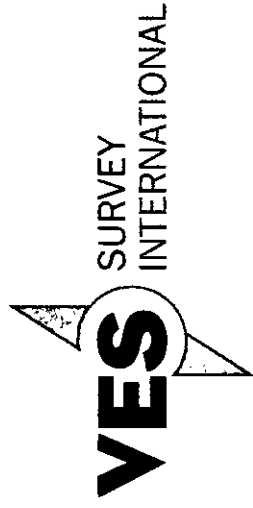

Jennifer Ann Byerly
Notary Public, State of Texas





Company: CONCHO

Lease/Well: BOSE IKARD 4 STATE COM NO/016H



Rig Name: SILVER OAK 3

State/County: NEW MEXICO/EDDY

VS-Azi: 90.40 Degrees

Latitude: 32.86097, Longitude: -104.08680

Grid North = True North -0.13 degs (NAD 27)

Grid Correction Applied = -0.13 degs

Depth Reference : RKB 18 FEET

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: e-line gyro-de_01.ut

Minimum Curvature Method

Report Date/Time: 9/3/2015 / 15:27

VES Survey International
Midland, Texas

432-563-5444

Surveyor: Michael Cook

Bose Ikard 4 State Com No 016H / API 30-015-42884

NM OIL CONSERVATION
ARTESIA DISTRICT

DEC 21 2015

RECEIVED

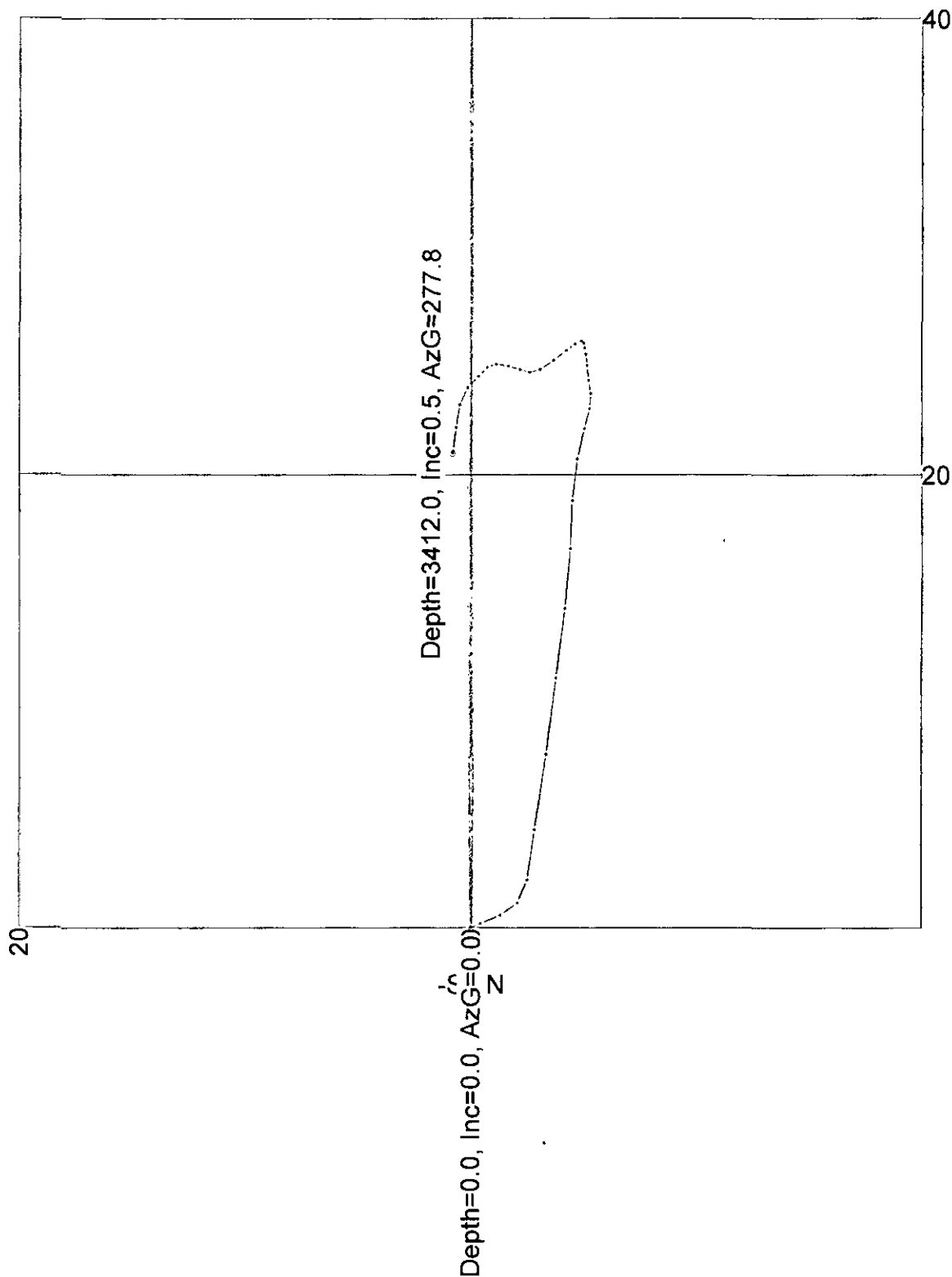
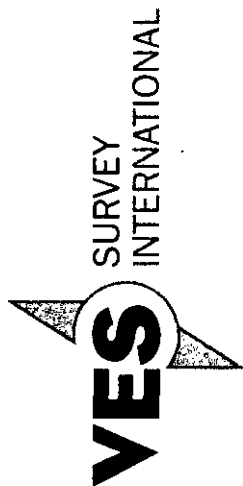
Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
100.00	0.51	155.19	100.00	-0.41	0.19	0.19	0.45	155.19	0.51
200.00	0.58	157.60	199.99	-1.28	0.57	0.58	1.40	156.06	0.07
300.00	0.51	131.11	299.99	-2.04	1.10	1.11	2.32	151.74	0.26
400.00	0.81	101.01	399.98	-2.47	2.13	2.15	3.26	139.27	0.45
500.00	1.78	97.39	499.96	-2.81	4.36	4.38	5.19	122.76	0.97
600.00	2.09	99.30	599.90	-3.30	7.71	7.73	8.38	113.20	0.32
700.00	1.79	95.65	699.84	-3.75	11.06	11.08	11.68	108.74	0.33
800.00	1.75	98.90	799.79	-4.14	14.12	14.15	14.72	106.35	0.11
900.00	1.28	90.49	899.76	-4.39	16.75	16.78	17.31	104.68	0.52
1000.00	1.15	94.53	999.74	-4.48	18.86	18.89	19.38	103.35	0.15
1100.00	0.96	100.01	1099.72	-4.70	20.68	20.71	21.21	102.81	0.22
1200.00	0.61	107.05	1199.71	-5.00	22.02	22.05	22.58	102.80	0.36
1300.00	0.44	101.82	1299.71	-5.24	22.90	22.94	23.49	102.89	0.18
1400.00	0.32	83.63	1399.70	-5.29	23.56	23.59	24.14	102.65	0.16
1500.00	0.36	79.36	1499.70	-5.20	24.15	24.18	24.70	102.15	0.04
1600.00	0.38	87.94	1599.70	-5.13	24.79	24.82	25.31	101.69	0.06

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	0.19	75.31	1699.70	-5.07	25.28	25.32	25.79	101.34	0.20
1800.00	0.13	81.26	1799.70	-5.01	25.56	25.59	26.05	101.09	0.06
1900.00	0.12	84.37	1899.70	-4.98	25.78	25.81	26.25	100.94	0.02
2000.00	0.12	354.31	1999.70	-4.87	25.87	25.90	26.32	100.67	0.16
2100.00	0.25	324.99	2099.70	-4.60	25.73	25.77	26.14	100.13	0.16
2200.00	0.31	321.62	2199.70	-4.21	25.45	25.47	25.79	99.40	0.06
2300.00	0.50	322.98	2299.69	-3.65	25.01	25.04	25.28	98.30	0.20
2400.00	0.32	331.80	2399.69	-3.05	24.62	24.64	24.80	97.07	0.19
2500.00	0.23	5.07	2499.69	-2.60	24.50	24.52	24.64	96.05	0.18
2600.00	0.28	22.01	2599.69	-2.17	24.61	24.63	24.71	95.03	0.09
2700.00	0.34	11.88	2699.69	-1.65	24.76	24.78	24.82	93.80	0.08
2800.00	0.28	6.48	2799.69	-1.11	24.85	24.86	24.88	92.55	0.06
2900.00	0.27	310.27	2899.68	-0.71	24.70	24.71	24.71	91.65	0.26
3000.00	0.36	319.08	2999.68	-0.32	24.32	24.32	24.32	90.76	0.10
3100.00	0.43	309.98	3099.68	0.16	23.83	23.82	23.83	89.63	0.10
3200.00	0.54	282.50	3199.68	0.50	23.08	23.07	23.08	88.76	0.25
3300.00	0.63	276.74	3299.67	0.67	22.07	22.07	22.08	88.27	0.10
3400.00	0.56	278.31	3399.67	0.80	21.05	21.04	21.06	87.82	0.06
3412.00	0.46	277.84	3411.67	0.82	20.94	20.94	20.96	87.77	0.88



VES Survey International
Midland, Texas
432-563-5444

Surveyor: Michael Cook
Bose I kard 4 State Com No 016H / API 30-015-42884



-W/+E

VES Survey Date: 8/29/2015



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

WILDLIFE CONSERVATION
ARTESIA DISTRICT

DEC 21 2015

RECEIVED

September 7, 2015

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

RE: Bose Ikard 4 State Com #16H
1730' FSL & 330' FWL
Sec. 4, T17S, R29E
Eddy County, New Mexico

Dear Sir,

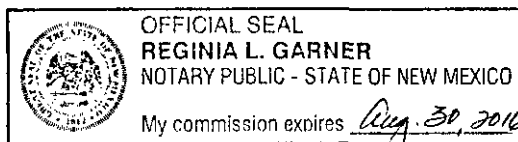
The attached is the Deviation Survey for the above captioned well.

Very truly yours,

Chris Graham
Drilling Superintendent

State of New Mexico }
County of Eddy }

The foregoing was acknowledged before me this 7th day of September, 2015.

Notary Public

Bose Ikard 4 State Com #16H

Date	Depth	Deviation	Direction	TVD	Horiz Disp
8/25/2015	311	0.70			
8/27/2015	420	0.80			
8/27/2015	686	2.10			
8/27/2015	780	2.20			
8/27/2015	876	1.90			
8/28/2015	1115	1.10			
8/29/2015	1557	0.80			
8/29/2015	1999	0.70			
8/29/2015	2442	0.60			
8/29/2015	2882	0.70			
8/30/2015	3323	0.10			
8/30/2015	3496	0.40	290.20	3495.70	20.30
8/30/2015	3528	0.20	283.80	3527.70	2.16
8/30/2015	3559	1.30	88.20	3558.60	20.46
8/30/2015	3594	4.00	91.90	3590.63	
8/30/2015	3623	7.30	90.70	3622.46	25.17
8/30/2015	3654	11.50	90.00	3653.02	30.32
8/30/2015	3686	15.50	89.50	3684.13	
8/30/2015	3717	19.30	93.00	3713.71	47.05
8/31/2015	3749	23.00	96.10	3743.00	
8/31/2015	3780	26.90	98.60	3771.00	
8/31/2015	3812	30.50	99.90	3799.00	
8/31/2015	3844	33.20	100.70	3826.00	
8/31/2015	3875	35.20	99.50	3852.00	
8/31/2015	3907	37.10	97.60	3878.00	
8/31/2015	3938	39.90	96.40	3902.00	
8/31/2015	3970	43.20	94.60	3926.00	
8/31/2015	4001	46.40	73.30	3948.00	
8/31/2015	4033	49.50	93.70		
8/31/2015	4045	55.50	94.00		
8/31/2015	4064	52.10	93.90		
8/31/2015	4126	59.60	94.60		
8/31/2015	4157	63.90	95.10		
8/31/2015	4188	67.00	95.80		
8/31/2015	4220	74.10	96.60		
8/31/2015	4252	74.10	96.60		
8/31/2015	4284	77.80	97.20		
8/31/2015	4315	81.50	96.10		
8/31/2015	4347	84.80	96.10		
9/1/2015	4406	87.80	93.10	4094.00	
9/1/2015	4438	88.20	92.90	4095.00	
9/1/2015	4531	89.30	91.30	4097.00	
9/1/2015	4626	90.50	89.00	4097.00	

Date	Depth	Deviation	Direction	TVD	Horiz Disp
9/1/2015	4721	90.30	88.30	4096.00	
9/1/2015	4909	90.90	88.60		
9/1/2015	5004	91.50	89.70		
9/1/2015	5098	91.30	89.30		
9/1/2015	5193	92.00	91.10		
9/1/2015	5288	91.70	91.00		
9/1/2015	5382	91.30	91.30		
9/1/2015	5382	91.30	91.30		
9/1/2015	5477	91.00	91.50		
9/1/2015	5572	91.80	89.80		
9/1/2015	5667	91.60	90.20		
9/2/2015	5760	91.30	90.00	4074.00	
9/2/2015	5854	91.00	89.80	4072.00	
9/2/2015	6043	90.40	89.60	4070.00	
9/2/2015	6233	89.90	89.20	4069.00	
9/2/2015	6327	91.80	89.60		
9/2/2015	6422	91.60	89.40		
9/2/2015	6517	91.20	89.10		
9/2/2015	6611	91.30	89.00		
9/2/2015	6705	91.60	89.60		
9/2/2015	6800	91.20	89.00		
9/2/2015	6894	90.50	88.40		
9/2/2015	6987	90.00	88.20		
9/3/2015	7270	91.30	89.70	4048.00	
9/3/2015	7365	90.80	89.40	4046.00	
9/3/2015	7459	91.50	91.00	4044.00	
9/3/2015	7553	91.00	90.40	4042.00	
9/3/2015	7647	90.70	89.80	4041.00	
9/3/2015	7742	90.40	89.60	4040.00	
9/3/2015	7838	89.80	89.10		
9/3/2015	7931	91.00	89.70		
9/3/2015	8025	91.00	89.50		
9/3/2015	8119	90.90	89.10		
9/4/2015	8308	90.40	89.20		

NM OIL CONSERVATION
ARTESIA DISTRICT

DEC 21 2015

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9/8/15

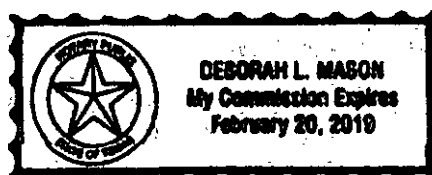
State of New Mexico
County of Eddy

I, Donald D. Mason, certify that: I am employed by Terra Directional Services LLC; that I did on the day(s) of 08/30/2015 through 09/04/2015 conduct or supervise the taking of a MWD survey from a depth of 3496 feet to a depth of 8390 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 Bose Ikard 4 State Corn #16H Well API 30-015-42884 in Eddy 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



Customer Name: COG
 Well Name: Bose Ikard 4 State Com #16H
 API Number: 30-015-42884
 County / Parish: Eddy Co.

M.W.D. Operator: Justin Campos
 Directional Driller: Corey Owens
 Total Magnetic Correction: 7.3
 Job #: NM-566

Vertical Section: 90.40

Tie In Survey(s) Provided By:

	Meas. Depth	Inc.	Azm.	T.V.D.	Ver. Sect.	+N / -S	+E / -W	Dist.	Angle	DLS
Tie - In										
0	3412.00	0.46	277.84	3411.67	20.94	0.82	20.94	20.96	87.77	0.88
1	3496.00	0.40	290.20	3495.67	20.32	0.97	20.33	20.35	87.28	0.13
2	3528.00	0.20	283.80	3527.67	20.16	1.02	20.17	20.20	87.11	0.63
3	3559.00	1.30	88.20	3558.66	20.46	1.04	20.47	20.50	87.08	4.82
4	3591.00	4.00	91.90	3590.63	21.94	1.02	21.95	21.97	87.35	8.45
5	3623.00	7.60	90.70	3622.46	25.17	0.95	25.18	25.20	87.83	11.26
6	3654.00	11.50	90.00	3653.02	30.32	0.93	30.32	30.34	88.24	12.59
7	3686.00	15.50	89.50	3684.13	37.78	0.97	37.79	37.80	88.53	12.51
8	3717.00	19.30	93.00	3713.71	47.05	0.73	47.05	47.06	89.11	12.71
9	3749.00	23.00	96.10	3743.55	58.56	-0.21	58.56	58.56	90.20	12.08
10	3780.00	26.90	98.60	3771.65	71.53	-1.90	71.52	71.54	91.52	13.03
11	3812.00	30.50	99.90	3799.72	86.71	-4.38	86.68	86.79	92.89	11.42
12	3844.00	33.20	100.70	3826.90	103.34	-7.40	103.29	103.56	94.10	8.54
13	3875.00	35.20	99.50	3852.53	120.51	-10.45	120.44	120.90	94.96	6.81
14	3907.00	37.10	97.60	3878.37	139.20	-13.25	139.11	139.74	95.44	6.89
15	3938.00	39.90	96.40	3902.63	158.37	-15.60	158.26	159.03	95.63	9.35
16	3970.00	43.20	94.60	3926.58	179.50	-17.62	179.39	180.25	95.61	10.97
17	4001.00	46.40	93.30	3948.57	201.30	-19.12	201.17	202.08	95.43	10.74
18	4033.00	49.50	93.70	3970.00	225.03	-20.57	224.89	225.83	95.23	9.73
19	4064.00	52.10	93.90	3989.59	249.01	-22.16	248.86	249.84	95.09	8.40
20	4095.00	55.50	94.00	4007.90	273.97	-23.89	273.81	274.85	94.99	10.97
21	4126.00	59.60	94.60	4024.53	300.06	-25.85	299.89	301.00	94.93	13.33
22	4157.00	63.70	95.10	4039.25	327.26	-28.16	327.07	328.28	94.92	13.30
23	4188.00	67.00	95.80	4052.17	355.32	-30.84	355.11	356.45	94.96	10.84
24	4220.00	70.00	96.20	4063.90	384.95	-33.95	384.72	386.21	95.04	9.45
25	4252.00	74.10	96.60	4073.76	415.21	-37.34	414.96	416.64	95.14	12.87
26	4284.00	77.80	97.20	4081.53	446.05	-41.07	445.78	447.66	95.26	11.70
27	4315.00	81.50	97.30	4087.10	476.32	-44.92	476.02	478.14	95.39	11.94
28	4347.00	84.80	96.10	4090.91	507.90	-48.63	507.57	509.90	95.47	10.96
29	4378.00	87.20	93.30	4093.08	538.73	-51.16	538.39	540.81	95.43	11.88
30	4406.00	87.80	93.10	4094.30	566.67	-52.72	566.32	568.77	95.32	2.26
31	4438.00	88.20	92.90	4095.41	598.62	-54.39	598.25	600.72	95.20	1.40
32	4531.00	89.30	91.30	4097.44	691.55	-57.80	691.16	693.58	94.78	2.09
33	4626.00	90.50	89.00	4097.61	786.54	-58.05	786.16	788.30	94.22	2.73
34	4721.00	90.30	88.30	4096.95	881.49	-55.81	881.13	882.89	93.62	0.77
35	4816.00	89.70	87.90	4096.95	976.42	-52.66	976.07	977.49	93.09	0.76
36	4909.00	90.90	88.60	4096.46	1069.35	-49.82	1069.03	1070.19	92.67	1.49
37	5004.00	91.50	89.70	4094.47	1164.30	-48.41	1163.99	1165.00	92.38	1.32
38	5098.00	91.30	89.30	4092.17	1258.26	-47.59	1257.96	1258.86	92.17	0.48
39	5193.00	92.00	91.10	4089.44	1353.22	-47.92	1352.92	1353.77	92.03	2.03
40	5288.00	91.70	91.00	4086.37	1448.16	-49.66	1447.85	1448.70	91.96	0.33

41	5382.00	91.30	91.30	4083.91	1542.12	-51.55	1541.80	1542.66	91.91	0.53
42	5477.00	91.00	91.50	4082.00	1637.09	-53.87	1636.75	1637.64	91.89	0.38
43	5572.00	91.80	89.80	4079.68	1732.06	-54.95	1731.71	1732.59	91.82	1.98
44	5667.00	91.60	90.20	4076.86	1827.01	-54.95	1826.67	1827.50	91.72	0.47
45	5760.00	91.30	90.00	4074.51	1919.98	-55.11	1919.64	1920.43	91.64	0.39
46	5854.00	91.00	89.80	4072.62	2013.96	-54.95	2013.62	2014.37	91.56	0.38
47	5949.00	90.70	89.70	4071.21	2108.94	-54.53	2108.61	2109.32	91.48	0.33
48	6043.00	90.40	89.60	4070.31	2202.93	-53.96	2202.60	2203.27	91.40	0.34
49	6138.00	90.30	89.50	4069.73	2297.92	-53.21	2297.60	2298.22	91.33	0.15
50	6233.00	89.90	89.20	4069.57	2392.90	-52.13	2392.59	2393.16	91.25	0.53
51	6327.00	91.80	89.60	4068.17	2486.87	-51.15	2486.57	2487.10	91.18	2.07
52	6422.00	91.60	89.40	4065.35	2581.82	-50.32	2581.53	2582.02	91.12	0.30
53	6517.00	91.20	89.10	4063.03	2676.77	-49.08	2676.49	2676.94	91.05	0.53
54	6611.00	91.30	89.00	4060.98	2770.72	-47.52	2770.46	2770.86	90.98	0.15
55	6705.00	91.60	89.60	4058.60	2864.67	-46.37	2864.42	2864.79	90.93	0.71
56	6800.00	91.20	89.00	4056.28	2959.63	-45.21	2959.38	2959.73	90.88	0.76
57	6894.00	90.50	88.40	4054.89	3053.57	-43.08	3053.35	3053.65	90.81	0.98
58	6987.00	90.00	88.20	4054.48	3146.51	-40.32	3146.30	3146.56	90.73	0.58
59	7081.00	91.70	88.40	4053.09	3240.43	-37.53	3240.25	3240.47	90.66	1.82
60	7176.00	91.30	87.50	4050.60	3335.31	-34.13	3335.15	3335.33	90.59	1.04
61	7270.00	91.30	89.70	4048.47	3429.24	-31.84	3429.10	3429.24	90.53	2.34
62	7365.00	90.80	89.40	4046.73	3524.21	-31.09	3524.08	3524.21	90.51	0.61
63	7459.00	91.50	91.00	4044.84	3618.19	-31.42	3618.05	3618.19	90.50	1.86
64	7553.00	91.00	90.40	4042.79	3712.16	-32.57	3712.02	3712.17	90.50	0.83
65	7647.00	90.70	89.80	4041.39	3806.15	-32.73	3806.01	3806.15	90.49	0.71
66	7742.00	90.40	89.60	4040.48	3901.14	-32.24	3901.01	3901.14	90.47	0.38
67	7836.00	89.80	89.10	4040.32	3995.12	-31.17	3995.00	3995.12	90.45	0.83
68	7931.00	91.00	89.70	4039.66	4090.10	-30.17	4089.99	4090.10	90.42	1.41
69	8025.00	91.00	89.50	4038.01	4184.08	-29.52	4183.97	4184.08	90.40	0.21
70	8119.00	90.90	89.10	4036.46	4278.05	-28.37	4277.95	4278.05	90.38	0.44
71	8214.00	90.50	89.00	4035.30	4373.01	-26.79	4372.93	4373.02	90.35	0.43
72	8308.00	90.40	89.20	4034.56	4466.99	-25.32	4466.92	4466.99	90.32	0.24
PTB	8390.00	90.40	89.20	4033.98	4548.97	-24.17	4548.91	4548.97	90.30	0.00



NM OIL CONSERVATION
ARTESIA DISTRICT
DEC 21 2015

RECEIVED

COG Operating LLC

Eddy County, NM

Bose Ikard 4 State Com #16H

SHL: 1730' FSL, 330' FWL, Sec 4, T17S, R29E, Unit L

PP: 1730' FSL, 330' FWL, Sec 4, T17S, R29E, Unit L

BHL: 1670' FSL, 350' FEL, Sec 4, T17S, R29E, Unit I

Design: BHL: 1670' FSL, 350' FEL, Sec 4, T17S, R29E, Unit I

Standard Survey Report

04 September, 2015





TDS
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Bose Ikard 4 State Com #16H
Project:	Eddy County, NM	TVD Reference:	RKB @ 3615.00usft (Silver Oak 3)
Site:	Bose Ikard 4 State Com #16H	MD Reference:	RKB @ 3615.00usft (Silver Oak 3)
Well:	SHL: 1730' FSL, 330' FWL, Sec 4, T17S, R29E, Unit L	North Reference:	Grid
Wellbore:	BHL: 1670' FSL, 350' FEL, Sec 4, T17S, R29E, Unit I	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 1670' FSL, 350' FEL, Sec 4, T17S, R29E, Unit I	Database:	EDM 5000.1 Single User Db

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	Bose Ikard 4 State Com #16H		
Site Position:	From: Map	Northing: 677,020.80 usft	Latitude: 32° 51' 39.494 N
		Easting: 575,701.50 usft	Longitude: 104° 5' 12.479 W
Position Uncertainty:	0.00 usft	Slot Radius: 13-3/16 "	Grid Convergence: 0.13 °

Well	SHL: 1730' FSL, 330' FWL, Sec 4, T17S, R29E, Unit L		
Well Position	+N/-S 0.00 usft	Northing: 677,020.80 usft	Latitude: 32° 51' 39.494 N
	+E/-W 0.00 usft	Easting: 575,701.50 usft	Longitude: 104° 5' 12.479 W
Position Uncertainty	0.00 usft	Wellhead Elevation: 0.00 usft	Ground Level: 3,597.00 usft

Wellbore	BHL: 1670' FSL-350' FEL, Sec 4, T17S, R29E, Unit I				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	8/19/2015	7.44	60.59	48,448

Design	BHL: 1670' FSL, 350' FEL, Sec 4, T17S, R29E, Unit I				
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	90.40	

Survey Program	Date	9/4/2015			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.00	3,412.00	Gyro #1 (BHL: 1670' FSL, 350' FEL, Sec 4	VES-ISCWSA-GYRO-3	Biaxial Semi-Cont. Gyro	
3,496.00	8,390.00	MWD #2 (BHL: 1670' FSL, 350' FEL, Sec	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	0.51	155.19	100.00	-0.40	0.19	0.19	0.51	0.51	0.00	
200.00	0.58	157.60	199.99	-1.28	0.57	0.58	0.07	0.07	2.41	
300.00	0.51	131.11	299.99	-2.04	1.09	1.11	0.26	-0.07	-26.49	
400.00	0.81	101.01	399.98	-2.46	2.12	2.14	0.45	0.30	-30.10	
500.00	1.78	97.39	499.96	-2.80	4.36	4.38	0.97	0.97	-3.62	
600.00	2.09	99.30	599.90	-3.29	7.70	7.72	0.32	0.31	1.91	

Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Bose Ikard 4 State Com #16H
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Site:	Bose Ikard 4 State Com #16H	MD Reference:	RKB @ 3615.00usft (Silver Oak 3)
Well:	SHL: 1730' FSL, 330' FWL, Sec 4, T17S, R29E, Unit L	North Reference:	Grid
Wellbore:	BHL: 1670' FSL, 350' FEL, Sec 4, T17S, R29E, Unit I	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 1670' FSL, 350' FEL, Sec 4, T17S, R29E, Unit I	Database:	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)
700.00	1.79	95.65	699.84	-3.74	11.05	11.08	0.32	-0.30	-3.65
800.00	1.75	98.90	799.79	-4.13	14.11	14.14	0.11	-0.04	3.25
900.00	1.28	90.49	899.76	-4.38	16.74	16.77	0.52	-0.47	-8.41
1,000.00	1.15	94.53	999.74	-4.47	18.86	18.89	0.16	-0.13	4.04
1,100.00	0.96	100.01	1,099.72	-4.69	20.68	20.71	0.21	-0.19	5.48
1,200.00	0.61	107.05	1,199.71	-4.99	22.02	22.05	0.36	-0.35	7.04
1,300.00	0.44	101.82	1,299.71	-5.23	22.90	22.94	0.18	-0.17	-5.23
1,400.00	0.32	83.63	1,399.70	-5.28	23.55	23.59	0.17	-0.12	-18.19
1,500.00	0.36	79.36	1,499.70	-5.19	24.14	24.18	0.05	0.04	-4.27
1,600.00	0.38	87.94	1,599.70	-5.12	24.78	24.82	0.06	0.02	8.58
1,700.00	0.19	75.31	1,699.70	-5.06	25.27	25.31	0.20	-0.19	-12.63
1,800.00	0.13	81.26	1,799.70	-5.00	25.54	25.58	0.06	-0.06	5.95
1,900.00	0.12	84.37	1,899.70	-4.98	25.76	25.79	0.01	-0.01	3.11
2,000.00	0.12	354.31	1,999.70	-4.86	25.85	25.89	0.17	0.00	-90.06
2,100.00	0.25	324.99	2,099.70	-4.58	25.72	25.75	0.16	0.13	-29.32
2,200.00	0.31	321.62	2,199.70	-4.19	25.43	25.45	0.06	0.06	-3.37
2,300.00	0.50	322.98	2,299.69	-3.63	25.00	25.02	0.19	0.19	1.36
2,400.00	0.32	331.80	2,399.69	-3.03	24.60	24.62	0.19	-0.18	8.82
2,500.00	0.23	5.07	2,499.69	-2.59	24.49	24.50	0.18	-0.09	33.27
2,600.00	0.28	22.01	2,599.69	-2.16	24.60	24.61	0.09	0.05	16.94
2,700.00	0.34	11.88	2,699.69	-1.64	24.75	24.76	0.08	0.06	-10.13
2,800.00	0.28	6.48	2,799.69	-1.11	24.84	24.84	0.07	-0.06	-5.40
2,900.00	0.27	310.27	2,899.69	-0.71	24.69	24.69	0.26	-0.01	-56.21
3,000.00	0.36	319.08	2,999.68	-0.33	24.30	24.30	0.10	0.09	8.81
3,100.00	0.43	309.98	3,099.68	0.15	23.81	23.80	0.09	0.07	-9.10
3,200.00	0.54	282.50	3,199.68	0.50	23.06	23.05	0.25	0.11	-27.48
3,300.00	0.63	276.74	3,299.67	0.66	22.05	22.05	0.11	0.09	-5.76
3,400.00	0.56	278.31	3,399.67	0.80	21.02	21.02	0.07	-0.07	1.57
3,412.00	0.46	277.84	3,411.67	0.81	20.92	20.91	0.83	-0.83	-3.92
TIE-IN to VES Gyro									
3,496.00	0.40	290.20	3,495.66	0.96	20.31	20.30	0.13	-0.07	14.71
3,528.00	0.20	283.80	3,527.66	1.01	20.15	20.14	0.63	-0.63	-20.00
3,559.00	1.30	88.20	3,558.66	1.04	20.45	20.44	4.82	3.55	530.32
3,591.00	4.00	91.90	3,590.62	1.01	21.93	21.92	8.45	8.44	11.56
3,623.00	7.60	90.70	3,622.46	0.95	25.16	25.15	11.26	11.25	-3.75
3,654.00	11.50	90.00	3,653.02	0.92	30.30	30.29	12.59	12.58	-2.26
3,686.00	15.50	89.50	3,684.13	0.96	37.77	37.76	12.51	12.50	-1.56
3,717.00	19.30	93.00	3,713.71	0.73	47.03	47.03	12.71	12.26	11.29
3,749.00	23.00	96.10	3,743.55	-0.21	58.53	58.53	12.08	11.56	9.69
3,780.00	26.90	98.60	3,771.65	-1.91	71.49	71.51	13.03	12.58	8.06
3,812.00	30.50	99.90	3,799.71	-4.39	86.66	86.68	11.42	11.25	4.06
3,844.00	33.20	100.70	3,826.89	-7.41	103.27	103.32	8.54	8.44	2.50



TDS
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Bose Ikard 4 State Com #16H
Project:	Eddy County, NM	TVD Reference:	RKB @ 3615.00usft (Silver Oak 3)
Site:	Bose Ikard 4 State Com #16H	MD Reference:	RKB @ 3615.00usft (Silver Oak 3)
Well:	SHL: 1730' FSL, 330' FWL, Sec 4, T17S, R29E, Unit L	North Reference:	Grid
Wellbore:	BHL: 1670' FSL, 350' FEL, Sec 4, T17S, R29E, Unit I	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 1670' FSL, 350' FEL, Sec 4, T17S, R29E, Unit I	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)	
3,875.00	35.20	99.50	3,852.53	-10.46	120.42	120.49	6.81	6.45	-3.87	
3,907.00	37.10	97.60	3,878.37	-13.26	139.09	139.18	6.89	5.94	-5.94	
3,938.00	39.90	96.40	3,902.63	-15.60	158.24	158.34	9.35	9.03	-3.87	
3,970.00	43.20	94.60	3,926.57	-17.63	179.36	179.48	10.97	10.31	-5.63	
4,001.00	46.40	93.30	3,948.57	-19.13	201.15	201.28	10.74	10.32	-4.19	
4,033.00	49.50	93.70	3,970.00	-20.58	224.87	225.00	9.73	9.69	1.25	
4,064.00	52.10	93.90	3,989.59	-22.17	248.83	248.98	8.40	8.39	0.65	
4,095.00	55.50	94.00	4,007.90	-23.89	273.79	273.95	10.97	10.97	0.32	
4,126.00	59.60	94.60	4,024.53	-25.86	299.87	300.04	13.33	13.23	1.94	
4,157.00	63.70	95.10	4,039.24	-28.17	327.04	327.23	13.30	13.23	1.61	
4,188.00	67.00	95.80	4,052.17	-30.84	355.09	355.29	10.84	10.65	2.26	
4,220.00	70.00	96.20	4,063.90	-33.96	384.69	384.92	9.45	9.38	1.25	
4,252.00	74.10	96.60	4,073.76	-37.35	414.94	415.19	12.87	12.81	1.25	
4,284.00	77.80	97.20	4,081.53	-41.08	445.75	446.03	11.70	11.56	1.88	
4,315.00	81.50	97.30	4,087.09	-44.93	476.00	476.30	11.94	11.94	0.32	
4,347.00	84.80	96.10	4,090.91	-48.63	507.55	507.87	10.96	10.31	-3.75	
4,378.00	87.20	93.30	4,093.07	-51.17	538.36	538.71	11.88	7.74	-9.03	
4,406.00	87.80	93.10	4,094.29	-52.73	566.29	566.65	2.26	2.14	-0.71	
4,438.00	88.20	92.90	4,095.41	-54.40	598.23	598.59	1.40	1.25	-0.63	
4,531.00	89.30	91.30	4,097.44	-57.81	691.14	691.52	2.09	1.18	-1.72	
4,626.00	90.50	89.00	4,097.61	-58.06	786.13	786.52	2.73	1.26	-2.42	
4,721.00	90.30	88.30	4,096.94	-55.82	881.10	881.47	0.77	-0.21	-0.74	
4,816.00	89.70	87.90	4,096.94	-52.67	976.05	976.39	0.76	-0.63	-0.42	
4,909.00	90.90	88.60	4,096.46	-49.83	1,069.00	1,069.32	1.49	1.29	0.75	
5,004.00	91.50	89.70	4,094.47	-48.42	1,163.97	1,164.28	1.32	0.63	1.16	
5,098.00	91.30	89.30	4,092.17	-47.60	1,257.94	1,258.24	0.48	-0.21	-0.43	
5,193.00	92.00	91.10	4,089.43	-47.93	1,352.89	1,353.19	2.03	0.74	1.89	
5,288.00	91.70	91.00	4,086.37	-49.67	1,447.83	1,448.14	0.33	-0.32	-0.11	
5,382.00	91.30	91.30	4,083.91	-51.56	1,541.78	1,542.10	0.53	-0.43	0.32	
5,477.00	91.00	91.50	4,082.00	-53.88	1,636.73	1,637.06	0.38	-0.32	0.21	
5,572.00	91.80	89.80	4,079.68	-54.96	1,731.69	1,732.03	1.98	0.84	-1.79	
5,667.00	91.60	90.20	4,076.86	-54.96	1,826.65	1,826.99	0.47	-0.21	0.42	
5,760.00	91.30	90.00	4,074.51	-55.12	1,919.62	1,919.95	0.39	-0.32	-0.22	
5,854.00	91.00	89.80	4,072.62	-54.95	2,013.60	2,013.93	0.38	-0.32	-0.21	
5,949.00	90.70	89.70	4,071.21	-54.54	2,108.59	2,108.91	0.33	-0.32	-0.11	
6,043.00	90.40	89.60	4,070.31	-53.96	2,202.58	2,202.90	0.34	-0.32	-0.11	
6,138.00	90.30	89.50	4,069.73	-53.22	2,297.58	2,297.89	0.15	-0.11	-0.11	
6,233.00	89.90	89.20	4,069.56	-52.14	2,392.57	2,392.87	0.53	-0.42	-0.32	
6,327.00	91.80	89.60	4,068.17	-51.16	2,486.55	2,486.85	2.07	2.02	0.43	
6,422.00	91.60	89.40	4,065.35	-50.33	2,581.51	2,581.79	0.30	-0.21	-0.21	
6,517.00	91.20	89.10	4,063.03	-49.08	2,676.47	2,676.74	0.53	-0.42	-0.32	
6,611.00	91.30	89.00	4,060.98	-47.53	2,770.43	2,770.70	0.15	0.11	-0.11	

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Survey										
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6,705.00	91.60	89.60	4,058.60	-46.38	2,864.40	2,864.65	0.71	0.32	0.64	
6,800.00	91.20	89.00	4,056.28	-45.22	2,959.36	2,959.60	0.76	-0.42	-0.63	
6,894.00	90.50	88.40	4,054.88	-43.09	3,053.32	3,053.55	0.98	-0.74	-0.64	
6,987.00	90.00	88.20	4,054.48	-40.33	3,146.28	3,146.49	0.58	-0.54	-0.22	
7,081.00	91.70	88.40	4,053.08	-37.54	3,240.23	3,240.41	1.82	1.81	0.21	
7,176.00	91.30	87.50	4,050.60	-34.14	3,335.13	3,335.29	1.04	-0.42	-0.95	
7,270.00	91.30	89.70	4,048.46	-31.85	3,429.07	3,429.21	2.34	0.00	2.34	
7,365.00	90.80	89.40	4,046.72	-31.10	3,524.05	3,524.19	0.61	-0.53	-0.32	
7,459.00	91.50	91.00	4,044.84	-31.43	3,618.03	3,618.16	1.86	0.74	1.70	
7,553.00	91.00	90.40	4,042.79	-32.58	3,712.00	3,712.14	0.83	-0.53	-0.64	
7,647.00	90.70	89.80	4,041.39	-32.74	3,805.99	3,806.13	0.71	-0.32	-0.64	
7,742.00	90.40	89.60	4,040.48	-32.24	3,900.98	3,901.11	0.38	-0.32	-0.21	
7,836.00	89.80	89.10	4,040.32	-31.18	3,994.98	3,995.10	0.83	-0.64	-0.53	
7,931.00	91.00	89.70	4,039.65	-30.18	4,089.97	4,090.08	1.41	1.26	0.63	
8,025.00	91.00	89.50	4,038.01	-29.52	4,183.95	4,184.06	0.21	0.00	-0.21	
8,119.00	90.90	89.10	4,036.45	-28.38	4,277.93	4,278.03	0.44	-0.11	-0.43	
8,214.00	90.50	89.00	4,035.29	-26.80	4,372.91	4,372.99	0.43	-0.42	-0.11	
8,308.00	90.40	89.20	4,034.55	-25.33	4,466.90	4,466.96	0.24	-0.11	0.21	
Final MWD Survey										
8,390.00	90.40	89.20	4,033.98	-24.18	4,548.89	4,548.94	0.00	0.00	0.00	
Projection to Bit/TD										

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
3,412.00	3,411.67	0.81	20.92	TIE-IN to VES Gyro	
8,308.00	4,034.55	-25.33	4,466.90	Final MWD Survey	
8,390.00	4,033.98	-24.18	4,548.89	Projection to Bit/TD	

Checked By: _____	Approved By: _____	Date: _____
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