



PATRIOT DRILLING, LLC

OPERATOR: COG Operating, LLC
WELL/LEASE: Lusk Deep Unit A #33H
COUNTY: Lea Co., New Mexico
Sec. 18, T 19S, R 32E

**STATE OF NEW MEXICO
DEVIATION REPORT**

<u>Depth</u>	<u>Deviation</u>	<u>Depth</u>	<u>Deviation</u>
478	1/2	843	1/2
687	1/2	929	1 1/2

HOBBS OCD
NOV 28 2016
RECEIVED

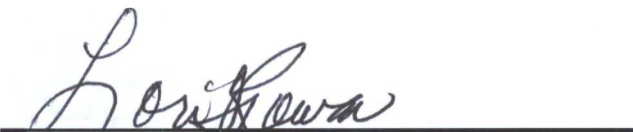
Patriot Drilling, LLC



M. Leroy Peterson, Executive Vice-President

The foregoing instrument was acknowledged before me on this 26th day of September 2016 by M. Leroy Peterson, Executive Vice-President of Patriot Drilling, LLC.

My Commission Expires: 02/01/2019



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



SURVEY CERTIFICATION FORM

3610 Elkins Road Midland, TX 79705 t:432-684-0057 f: 432-686-7964



PHOENIX
TECHNOLOGY SERVICES

Company: COG

Job #: 60328

Well Name: Lusk Deep Unit A 33H

County/State: Lea/ NM

Survey Instrument Type: North Seek Rate Gyro

API # 30-025-43390

TIE-IN DATA

Measure Depth (ft)	Vertical Depth (ft)	Inclination (°)	Azimuth (°)	N-S Coordinates	E-W Coordinates	Data Source
0	0	0	0	0	0	Surface

First Survey

Date	Depth (ft)	Inclination (°)	Azimuth (°)
2016-09-02	0	0	0

Last Survey

Date	Depth (ft)	Inclination (°)	Azimuth (°)
2016-09-02	820	0.09	212.48

Projected TD Survey

Date	Depth (ft)	Inclination (°)	Azimuth (°)
0	0	0	0

Grid Correction
-0.29

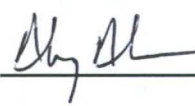
Gyro Operator: Phoenix Technology Services USA Ltd.

Gyro Supervisor: Jaime Stephenson

To the best of my knowledge I certify this survey data to be correct and true

Date: 9-2-16

Print Name: Andy Askew

Signature: 



Company: COG
 Well: Lusk Deep Unit A 33H
 Location: Lea Co., NM
 Rig: Patriot 2

Job Number: 60328
 Grid Corr.: -0.29
 Lat: 32.65
 Long: -103.80

Date: 09-02-16
 Calculation Method: Minimum Curvature
 Proposed Azimuth:
 RKB - MSL in feet: 20
 Tie Into: Surface

Survey Tool Type	Survey Depth (ft)	Inclina- tion (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates		Closure		Dogleg Severity (d/100')	Build Rate (d/100')	Walk Rate (d/100')
							N/S (ft)	E/W (ft)	Distance (ft)	Angle (deg)			
Enter Tie-In Survey on Line 10													
FIELD COPY, NON-DEFINITIVE													
TIE IN	0			0	0	0	0	0					
Gyro	100.00	0.15	58.00	100	100.00	0.07	0.07 N	0.11 E	0.13	58.00	0.15	0.15	58.00
	200.00	0.13	286.60	100	200.00	0.17	0.17 N	0.11 E	0.21	33.51	0.26	-0.02	228.60
	300.00	0.15	27.65	100	300.00	0.32	0.32 N	0.07 E	0.33	11.56	0.22	0.02	-258.95
	400.00	0.28	266.23	100	400.00	0.42	0.42 N	0.12 W	0.44	344.32	0.38	0.13	238.58
	500.00	0.19	192.05	100	500.00	0.24	0.24 N	0.40 W	0.46	301.33	0.29	-0.09	-74.18
	600.00	0.25	250.19	100	600.00	0.01	0.01 N	0.64 W	0.64	270.46	0.22	0.06	58.14
	700.00	0.15	169.57	100	700.00	-0.20	0.20 S	0.82 W	0.84	256.41	0.27	-0.10	-80.62
	800.00	0.08	69.93	100	800.00	-0.30	0.30 S	0.73 W	0.79	247.45	0.18	-0.07	-99.64
	820.00	0.09	212.48	20	820.00	-0.31	0.31 S	0.72 W	0.79	246.75	0.81	0.05	712.75



COG Operating L L C

Lea County, NM (NAD27 NME)

Sec. 18, T 19 S. , R 32 E

Lusk Deep Unit A #33H

Wellbore #1

HOBBS OCD

NOV 28 2016

Design: Wellbore #1

RECEIVED

Survey Report - Geographic

21 September, 2016





Integrity Directional Services, LLC
Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Lusk Deep Unit A #33H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3605.20ft (Patriot 2)
Site:	Sec. 18, T 19 S. , R 32 E	MD Reference:	KB=20' @ 3605.20ft (Patriot 2)
Well:	Lusk Deep Unit A #33H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Project	Lea County, NM (NAD27 NME)		
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	Sec. 18, T 19 S. , R 32 E		
Site Position:		Northing:	602,092.30 usft
From:	Map	Easting:	664,064.90 usft
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "
		Latitude:	32° 39' 14.836 N
		Longitude:	103° 48' 0.961 W
		Grid Convergence:	0.29 °

Well	Lusk Deep Unit A #33H		
Well Position	+N/-S	0.00 ft	Northing:
	+E/-W	0.00 ft	Easting:
Position Uncertainty	0.00 ft	Wellhead Elevation:	0.00 ft
		Latitude:	32° 39' 14.836 N
		Longitude:	103° 48' 0.961 W
		Ground Level:	3,585.20 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	7/6/2016	7.19	60.43	48,266

Design	Wellbore #1			
Audit Notes:				
Version:	1.0	Phase:	ACTUAL	Tie On Depth: 0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	187.87

Survey Program	Date 9/21/2016			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
100.00	820.00	Phoenix Gyros (Wellbore #1)	Keeper	Standard Wireline Keeper ver 1.0.2
929.00	14,630.00	IDS MWD (Wellbore #1)	MWD	MWD - Standard

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
0.00	0.00	0.00	0.00	0.00	0.00	602,092.30	664,064.90	32° 39' 14.836 N	103° 48' 0.961 W
100.00	0.15	58.00	100.00	0.07	0.11	602,092.37	664,065.02	32° 39' 14.837 N	103° 48' 0.959 W
200.00	0.13	286.60	200.00	0.17	0.11	602,092.47	664,065.02	32° 39' 14.838 N	103° 48' 0.959 W
300.00	0.15	27.65	300.00	0.32	0.07	602,092.62	664,064.97	32° 39' 14.839 N	103° 48' 0.960 W
400.00	0.28	266.23	400.00	0.42	-0.12	602,092.72	664,064.79	32° 39' 14.840 N	103° 48' 0.962 W
500.00	0.19	192.05	500.00	0.24	-0.40	602,092.54	664,064.51	32° 39' 14.839 N	103° 48' 0.965 W
600.00	0.25	250.19	600.00	0.01	-0.64	602,092.31	664,064.27	32° 39' 14.836 N	103° 48' 0.968 W
700.00	0.15	169.57	700.00	-0.20	-0.82	602,092.11	664,064.09	32° 39' 14.834 N	103° 48' 0.970 W
800.00	0.08	69.93	800.00	-0.30	-0.73	602,092.00	664,064.18	32° 39' 14.833 N	103° 48' 0.969 W
820.00	0.09	212.48	820.00	-0.31	-0.72	602,091.99	664,064.18	32° 39' 14.833 N	103° 48' 0.969 W



Integrity Directional Services, LLC

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Well:	Lusk Deep Unit A #33H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
929.00	1.50	95.30	928.99	-0.51	0.65	602,091.79	664,065.56	32° 39' 14.831 N	103° 48' 0.953 W
First IDS MWD Survey									
1,022.00	0.60	290.40	1,021.98	-0.46	1.41	602,091.85	664,066.31	32° 39' 14.832 N	103° 48' 0.944 W
1,117.00	2.20	284.30	1,116.95	0.17	-0.83	602,092.47	664,064.08	32° 39' 14.838 N	103° 48' 0.970 W
1,211.00	3.60	273.50	1,210.82	0.79	-5.52	602,093.10	664,059.38	32° 39' 14.844 N	103° 48' 1.025 W
1,305.00	4.40	275.60	1,304.59	1.32	-12.06	602,093.63	664,052.85	32° 39' 14.850 N	103° 48' 1.102 W
1,400.00	5.60	276.70	1,399.23	2.22	-20.29	602,094.52	664,044.62	32° 39' 14.859 N	103° 48' 1.198 W
1,494.00	5.20	274.60	1,492.81	3.10	-29.09	602,095.40	664,035.82	32° 39' 14.868 N	103° 48' 1.301 W
1,588.00	5.10	276.80	1,586.43	3.93	-37.48	602,096.24	664,027.42	32° 39' 14.877 N	103° 48' 1.399 W
1,682.00	4.60	278.20	1,680.10	4.97	-45.36	602,097.27	664,019.54	32° 39' 14.888 N	103° 48' 1.491 W
1,777.00	3.50	283.80	1,774.86	6.20	-51.95	602,098.50	664,012.96	32° 39' 14.900 N	103° 48' 1.568 W
1,871.00	2.90	287.00	1,868.71	7.58	-57.01	602,099.88	664,007.90	32° 39' 14.914 N	103° 48' 1.627 W
1,966.00	4.20	279.30	1,963.53	8.85	-62.74	602,101.15	664,002.17	32° 39' 14.927 N	103° 48' 1.694 W
2,060.00	4.20	279.00	2,057.28	9.94	-69.54	602,102.24	663,995.37	32° 39' 14.938 N	103° 48' 1.774 W
2,155.00	3.30	280.90	2,152.07	11.00	-75.66	602,103.31	663,989.25	32° 39' 14.949 N	103° 48' 1.845 W
2,249.00	4.40	266.90	2,245.86	11.32	-81.92	602,103.62	663,982.99	32° 39' 14.952 N	103° 48' 1.918 W
2,344.00	4.50	265.10	2,340.57	10.80	-89.27	602,103.11	663,975.64	32° 39' 14.948 N	103° 48' 2.004 W
2,438.00	4.80	264.90	2,434.26	10.14	-96.86	602,102.44	663,968.05	32° 39' 14.941 N	103° 48' 2.093 W
2,533.00	4.80	264.00	2,528.93	9.37	-104.77	602,101.67	663,960.13	32° 39' 14.934 N	103° 48' 2.186 W
2,627.00	4.50	265.00	2,622.62	8.64	-112.36	602,100.94	663,952.55	32° 39' 14.927 N	103° 48' 2.274 W
2,722.00	5.20	262.30	2,717.28	7.74	-120.33	602,100.04	663,944.57	32° 39' 14.919 N	103° 48' 2.368 W
2,816.00	5.20	262.60	2,810.89	6.62	-128.78	602,098.92	663,936.13	32° 39' 14.908 N	103° 48' 2.467 W
2,911.00	4.80	264.50	2,905.53	5.68	-137.01	602,097.98	663,927.90	32° 39' 14.899 N	103° 48' 2.563 W
3,011.00	4.90	263.70	3,005.17	4.81	-145.42	602,097.11	663,919.49	32° 39' 14.891 N	103° 48' 2.661 W
3,125.00	6.00	261.80	3,118.66	3.43	-156.15	602,095.73	663,908.75	32° 39' 14.878 N	103° 48' 2.787 W
3,219.00	6.90	265.10	3,212.06	2.24	-166.64	602,094.55	663,898.26	32° 39' 14.867 N	103° 48' 2.910 W
3,377.00	7.00	263.30	3,368.90	0.31	-185.66	602,092.61	663,879.25	32° 39' 14.849 N	103° 48' 3.132 W
3,471.00	6.70	255.80	3,462.23	-1.70	-196.66	602,090.60	663,868.24	32° 39' 14.829 N	103° 48' 3.261 W
3,565.00	7.40	252.70	3,555.52	-4.85	-207.76	602,087.45	663,857.15	32° 39' 14.799 N	103° 48' 3.391 W
3,660.00	7.30	247.60	3,649.74	-8.97	-219.18	602,083.34	663,845.72	32° 39' 14.758 N	103° 48' 3.525 W
3,754.00	7.10	245.00	3,743.00	-13.70	-229.97	602,078.60	663,834.94	32° 39' 14.712 N	103° 48' 3.651 W
3,848.00	6.60	236.80	3,836.33	-19.11	-239.75	602,073.19	663,825.15	32° 39' 14.659 N	103° 48' 3.766 W
3,943.00	5.40	229.80	3,930.81	-24.99	-247.74	602,067.32	663,817.17	32° 39' 14.601 N	103° 48' 3.860 W
4,037.00	5.70	230.70	4,024.37	-30.80	-254.73	602,061.50	663,810.18	32° 39' 14.544 N	103° 48' 3.942 W
4,132.00	6.60	235.30	4,118.82	-36.90	-262.87	602,055.41	663,802.04	32° 39' 14.484 N	103° 48' 4.038 W
4,227.00	6.50	231.50	4,213.20	-43.35	-271.56	602,048.95	663,793.34	32° 39' 14.421 N	103° 48' 4.140 W
4,349.00	7.50	225.70	4,334.29	-53.21	-282.67	602,039.09	663,782.24	32° 39' 14.324 N	103° 48' 4.270 W
4,454.00	8.40	222.50	4,438.28	-63.65	-292.75	602,028.65	663,772.15	32° 39' 14.221 N	103° 48' 4.389 W
4,517.00	9.40	226.30	4,500.52	-70.60	-299.58	602,021.70	663,765.33	32° 39' 14.153 N	103° 48' 4.469 W
4,617.00	11.20	232.30	4,598.91	-82.18	-313.17	602,010.12	663,751.74	32° 39' 14.039 N	103° 48' 4.629 W
4,711.00	9.40	229.70	4,691.39	-92.73	-326.25	601,999.57	663,738.66	32° 39' 13.935 N	103° 48' 4.782 W
4,806.00	7.40	228.40	4,785.37	-101.81	-336.74	601,990.49	663,728.16	32° 39' 13.846 N	103° 48' 4.905 W
4,900.00	5.40	226.10	4,878.78	-108.90	-344.46	601,983.41	663,720.45	32° 39' 13.776 N	103° 48' 4.996 W
4,995.00	4.00	221.60	4,973.46	-114.47	-349.88	601,977.83	663,715.03	32° 39' 13.721 N	103° 48' 5.060 W
5,089.00	3.70	237.60	5,067.25	-118.55	-354.61	601,973.75	663,710.29	32° 39' 13.681 N	103° 48' 5.115 W
5,183.00	3.40	250.90	5,161.07	-121.09	-359.81	601,971.22	663,705.10	32° 39' 13.656 N	103° 48' 5.176 W
5,277.00	3.10	254.30	5,254.92	-122.69	-364.89	601,969.62	663,700.01	32° 39' 13.640 N	103° 48' 5.236 W
5,372.00	2.90	286.90	5,349.80	-122.69	-369.66	601,969.62	663,695.24	32° 39' 13.641 N	103° 48' 5.292 W
5,466.00	3.20	287.40	5,443.66	-121.21	-374.44	601,971.09	663,690.46	32° 39' 13.655 N	103° 48' 5.348 W
5,560.00	2.90	288.10	5,537.53	-119.69	-379.21	601,972.62	663,685.70	32° 39' 13.671 N	103° 48' 5.403 W
5,655.00	2.70	286.60	5,632.42	-118.30	-383.63	601,974.00	663,681.27	32° 39' 13.685 N	103° 48' 5.455 W
5,749.00	3.30	279.00	5,726.29	-117.24	-388.43	601,975.06	663,676.48	32° 39' 13.695 N	103° 48' 5.511 W
5,843.00	3.00	279.80	5,820.14	-116.40	-393.52	601,975.90	663,671.38	32° 39' 13.704 N	103° 48' 5.570 W
5,938.00	3.20	296.10	5,915.01	-114.81	-398.36	601,977.49	663,666.55	32° 39' 13.720 N	103° 48' 5.627 W
6,032.00	4.40	291.30	6,008.80	-112.35	-404.07	601,979.96	663,660.83	32° 39' 13.745 N	103° 48' 5.694 W



Integrity Directional Services, LLC

Survey Report - Geographic



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Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3605.20ft (Patriot 2)
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Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
6,127.00	4.40	291.30	6,103.52	-109.70	-410.86	601,982.60	663,654.04	32° 39' 13.771 N	103° 48' 5.773 W
6,221.00	3.80	290.50	6,197.28	-107.30	-417.14	601,985.00	663,647.77	32° 39' 13.795 N	103° 48' 5.846 W
6,315.00	4.00	287.60	6,291.06	-105.22	-423.18	601,987.09	663,641.72	32° 39' 13.816 N	103° 48' 5.917 W
6,410.00	3.90	293.20	6,385.83	-102.94	-429.31	601,989.36	663,635.60	32° 39' 13.839 N	103° 48' 5.988 W
6,504.00	3.50	294.90	6,479.64	-100.48	-434.85	601,991.83	663,630.06	32° 39' 13.864 N	103° 48' 6.053 W
6,599.00	4.70	300.20	6,574.39	-97.30	-440.84	601,995.01	663,624.06	32° 39' 13.895 N	103° 48' 6.123 W
6,693.00	4.40	305.50	6,668.10	-93.27	-447.11	601,999.04	663,617.80	32° 39' 13.936 N	103° 48' 6.196 W
6,788.00	4.40	307.10	6,762.82	-88.95	-452.98	602,003.35	663,611.92	32° 39' 13.979 N	103° 48' 6.264 W
6,882.00	4.20	305.80	6,856.55	-84.76	-458.65	602,007.54	663,606.26	32° 39' 14.020 N	103° 48' 6.330 W
6,976.00	4.00	305.80	6,950.31	-80.83	-464.10	602,011.47	663,600.81	32° 39' 14.059 N	103° 48' 6.394 W
7,071.00	3.70	303.10	7,045.10	-77.22	-469.36	602,015.08	663,595.55	32° 39' 14.095 N	103° 48' 6.455 W
7,165.00	4.30	284.00	7,138.87	-74.71	-475.32	602,017.59	663,589.59	32° 39' 14.121 N	103° 48' 6.525 W
7,259.00	3.90	278.90	7,232.63	-73.36	-481.89	602,018.94	663,583.01	32° 39' 14.134 N	103° 48' 6.601 W
7,354.00	3.30	270.40	7,327.45	-72.84	-487.82	602,019.46	663,577.09	32° 39' 14.140 N	103° 48' 6.671 W
7,448.00	3.00	268.40	7,421.30	-72.89	-492.98	602,019.41	663,571.92	32° 39' 14.139 N	103° 48' 6.731 W
7,542.00	2.80	273.10	7,515.18	-72.84	-497.74	602,019.46	663,567.17	32° 39' 14.140 N	103° 48' 6.787 W
7,637.00	3.50	285.00	7,610.04	-71.96	-502.85	602,020.34	663,562.05	32° 39' 14.149 N	103° 48' 6.847 W
7,731.00	3.70	281.80	7,703.85	-70.60	-508.59	602,021.70	663,556.31	32° 39' 14.163 N	103° 48' 6.914 W
7,825.00	3.50	276.80	7,797.67	-69.64	-514.41	602,022.66	663,550.49	32° 39' 14.173 N	103° 48' 6.982 W
7,920.00	4.50	281.10	7,892.44	-68.58	-520.95	602,023.72	663,543.96	32° 39' 14.183 N	103° 48' 7.058 W
8,014.00	3.20	280.40	7,986.22	-67.40	-527.15	602,024.91	663,537.76	32° 39' 14.196 N	103° 48' 7.130 W
8,108.00	5.00	277.40	8,079.98	-66.39	-533.79	602,025.91	663,531.11	32° 39' 14.206 N	103° 48' 7.208 W
8,202.00	4.90	277.30	8,173.63	-65.36	-541.84	602,026.95	663,523.07	32° 39' 14.216 N	103° 48' 7.302 W
8,297.00	4.80	280.50	8,268.29	-64.12	-549.77	602,028.19	663,515.14	32° 39' 14.229 N	103° 48' 7.395 W
8,391.00	4.50	277.70	8,361.98	-62.91	-557.29	602,029.40	663,507.62	32° 39' 14.241 N	103° 48' 7.483 W
8,485.00	4.30	278.60	8,455.70	-61.88	-564.43	602,030.42	663,500.48	32° 39' 14.252 N	103° 48' 7.566 W
8,580.00	4.20	279.70	8,550.44	-60.77	-571.38	602,031.54	663,493.53	32° 39' 14.263 N	103° 48' 7.647 W
8,675.00	3.80	279.30	8,645.21	-59.67	-577.91	602,032.63	663,486.99	32° 39' 14.274 N	103° 48' 7.724 W
8,758.00	3.30	282.30	8,728.05	-58.72	-582.96	602,033.59	663,481.94	32° 39' 14.284 N	103° 48' 7.803 W
8,789.00	4.50	252.50	8,758.98	-58.89	-584.99	602,033.41	663,479.91	32° 39' 14.282 N	103° 48' 7.877 W
8,821.00	8.40	233.00	8,790.78	-60.68	-588.06	602,031.62	663,476.85	32° 39' 14.265 N	103° 48' 7.843 W
8,852.00	12.50	231.70	8,821.25	-64.12	-592.50	602,028.18	663,472.40	32° 39' 14.231 N	103° 48' 7.895 W
8,883.00	16.60	229.60	8,851.25	-69.07	-598.51	602,023.23	663,466.40	32° 39' 14.182 N	103° 48' 7.965 W
8,915.00	18.90	227.60	8,881.73	-75.53	-605.82	602,016.77	663,459.09	32° 39' 14.119 N	103° 48' 8.051 W
8,947.00	22.40	225.20	8,911.67	-83.33	-613.98	602,008.98	663,450.93	32° 39' 14.042 N	103° 48' 8.147 W
8,978.00	25.60	223.80	8,939.99	-92.32	-622.81	601,999.98	663,442.10	32° 39' 13.954 N	103° 48' 8.251 W
9,009.00	30.10	221.40	8,967.39	-102.99	-632.59	601,989.31	663,432.32	32° 39' 13.848 N	103° 48' 8.366 W
9,041.00	34.40	218.90	8,994.45	-116.05	-643.58	601,976.25	663,421.33	32° 39' 13.720 N	103° 48' 8.495 W
9,072.00	37.70	215.90	9,019.51	-130.55	-654.64	601,961.75	663,410.27	32° 39' 13.577 N	103° 48' 8.625 W
9,104.00	40.30	211.40	9,044.38	-147.32	-665.77	601,944.99	663,399.14	32° 39' 13.412 N	103° 48' 8.756 W
9,135.00	43.60	208.10	9,067.44	-165.31	-676.03	601,926.99	663,388.87	32° 39' 13.234 N	103° 48' 8.878 W
9,167.00	47.70	206.00	9,089.80	-185.69	-686.42	601,906.61	663,378.48	32° 39' 13.033 N	103° 48' 9.000 W
9,199.00	52.50	203.50	9,110.32	-207.98	-696.68	601,884.32	663,368.23	32° 39' 12.813 N	103° 48' 9.122 W
9,230.00	55.80	202.10	9,128.48	-231.15	-706.41	601,861.16	663,358.50	32° 39' 12.584 N	103° 48' 9.237 W
9,262.00	57.50	199.10	9,146.07	-256.16	-715.80	601,836.14	663,349.10	32° 39' 12.337 N	103° 48' 9.348 W
9,294.00	60.10	195.90	9,162.65	-282.26	-724.02	601,810.04	663,340.88	32° 39' 12.079 N	103° 48' 9.446 W
9,325.00	63.10	192.50	9,177.40	-308.69	-730.70	601,783.61	663,334.21	32° 39' 11.818 N	103° 48' 9.525 W
9,357.00	66.80	190.00	9,190.94	-337.12	-736.34	601,755.18	663,328.56	32° 39' 11.537 N	103° 48' 9.593 W
9,388.00	69.80	188.00	9,202.41	-365.57	-740.84	601,726.74	663,324.06	32° 39' 11.256 N	103° 48' 9.647 W
9,399.92	70.69	187.14	9,206.44	-376.69	-742.32	601,715.62	663,322.59	32° 39' 11.146 N	103° 48' 9.665 W
Enter Sec 19 - 9399.92' MD / 9206.44' TVD									
9,420.00	72.20	185.70	9,212.83	-395.60	-744.45	601,696.70	663,320.46	32° 39' 10.959 N	103° 48' 9.691 W
9,451.00	74.90	183.10	9,221.60	-425.24	-746.72	601,667.06	663,318.18	32° 39' 10.665 N	103° 48' 9.720 W
9,483.00	77.50	180.60	9,229.24	-456.29	-747.72	601,636.01	663,317.18	32° 39' 10.358 N	103° 48' 9.733 W
9,514.00	80.60	178.30	9,235.13	-486.72	-747.43	601,605.58	663,317.48	32° 39' 10.057 N	103° 48' 9.731 W



Integrity Directional Services, LLC

Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Lusk Deep Unit A #33H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3605.20ft (Patriot 2)
Site:	Sec. 18, T 19 S. , R 32 E	MD Reference:	KB=20' @ 3605.20ft (Patriot 2)
Well:	Lusk Deep Unit A #33H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
9,546.00	83.30	178.10	9,239.61	-518.39	-746.43	601,573.92	663,318.48	32° 39' 9.744 N	103° 48' 9.722 W
9,582.00	86.80	179.00	9,242.71	-554.24	-745.52	601,538.07	663,319.38	32° 39' 9.389 N	103° 48' 9.713 W
9,614.00	88.00	178.00	9,244.16	-586.19	-744.69	601,506.11	663,320.22	32° 39' 9.073 N	103° 48' 9.705 W
9,645.00	88.30	177.70	9,245.17	-617.15	-743.53	601,475.15	663,321.38	32° 39' 8.766 N	103° 48' 9.693 W
9,734.64	89.05	177.04	9,247.23	-706.68	-739.41	601,385.63	663,325.49	32° 39' 7.880 N	103° 48' 9.651 W
Sec 19 North 330' Crossing - 9734.64'MD / 9247.23'TVD									
9,740.00	89.10	177.00	9,247.32	-712.03	-739.13	601,380.28	663,325.77	32° 39' 7.827 N	103° 48' 9.648 W
9,835.00	88.40	176.30	9,249.39	-806.84	-733.58	601,285.46	663,331.32	32° 39' 6.889 N	103° 48' 9.588 W
9,930.00	88.30	176.30	9,252.13	-901.60	-727.46	601,190.70	663,337.45	32° 39' 5.951 N	103° 48' 9.522 W
10,024.00	87.90	175.90	9,255.25	-995.33	-721.07	601,096.97	663,343.84	32° 39' 5.023 N	103° 48' 9.453 W
10,119.00	89.30	175.60	9,257.57	-1,090.04	-714.03	601,002.26	663,350.88	32° 39' 4.085 N	103° 48' 9.376 W
10,214.00	90.40	175.50	9,257.82	-1,184.75	-706.66	600,907.55	663,358.25	32° 39' 3.148 N	103° 48' 9.295 W
10,308.00	88.60	176.50	9,258.64	-1,278.52	-700.10	600,813.79	663,364.81	32° 39' 2.220 N	103° 48' 9.224 W
10,403.00	88.30	176.80	9,261.21	-1,373.32	-694.55	600,718.99	663,370.35	32° 39' 1.281 N	103° 48' 9.165 W
10,498.00	87.80	175.60	9,264.44	-1,468.05	-688.26	600,624.25	663,376.65	32° 39' 0.344 N	103° 48' 9.097 W
10,592.00	87.90	175.30	9,267.96	-1,561.69	-680.81	600,530.62	663,384.10	32° 38' 59.417 N	103° 48' 9.015 W
10,687.00	89.00	176.10	9,270.53	-1,656.39	-673.69	600,435.92	663,391.22	32° 38' 58.479 N	103° 48' 8.937 W
10,782.00	89.20	176.40	9,272.03	-1,751.17	-667.48	600,341.14	663,397.43	32° 38' 57.541 N	103° 48' 8.870 W
10,878.00	89.50	176.20	9,273.12	-1,846.97	-661.28	600,245.34	663,403.63	32° 38' 56.593 N	103° 48' 8.803 W
10,966.00	90.20	176.60	9,273.35	-1,934.79	-655.75	600,157.52	663,409.15	32° 38' 55.724 N	103° 48' 8.744 W
11,060.00	90.40	178.50	9,272.85	-2,028.70	-651.74	600,063.61	663,413.17	32° 38' 54.794 N	103° 48' 8.702 W
11,154.00	91.60	178.90	9,271.21	-2,122.66	-649.60	599,969.65	663,415.30	32° 38' 53.864 N	103° 48' 8.683 W
11,249.00	91.10	179.00	9,268.97	-2,217.62	-647.86	599,874.69	663,417.04	32° 38' 52.924 N	103° 48' 8.668 W
11,343.00	90.00	178.80	9,268.07	-2,311.59	-646.06	599,780.72	663,418.85	32° 38' 51.994 N	103° 48' 8.653 W
11,437.00	90.90	179.00	9,267.33	-2,405.57	-644.26	599,686.74	663,420.65	32° 38' 51.064 N	103° 48' 8.637 W
11,532.00	89.50	179.20	9,267.00	-2,500.56	-642.76	599,591.75	663,422.14	32° 38' 50.124 N	103° 48' 8.625 W
11,626.00	90.80	179.10	9,266.76	-2,594.54	-641.37	599,497.76	663,423.54	32° 38' 49.194 N	103° 48' 8.614 W
11,720.00	89.20	179.40	9,266.76	-2,688.53	-640.14	599,403.78	663,424.77	32° 38' 48.264 N	103° 48' 8.605 W
11,815.00	90.50	179.50	9,267.01	-2,783.53	-639.23	599,308.78	663,425.68	32° 38' 47.324 N	103° 48' 8.600 W
11,909.00	89.40	179.50	9,267.09	-2,877.52	-638.41	599,214.79	663,426.50	32° 38' 46.394 N	103° 48' 8.596 W
12,003.00	90.10	179.50	9,267.50	-2,971.52	-637.59	599,120.79	663,427.32	32° 38' 45.464 N	103° 48' 8.592 W
12,098.00	89.00	180.20	9,268.24	-3,066.51	-637.34	599,025.80	663,427.57	32° 38' 44.524 N	103° 48' 8.595 W
12,192.00	89.90	180.50	9,269.15	-3,160.50	-637.91	598,931.81	663,426.99	32° 38' 43.594 N	103° 48' 8.607 W
12,287.00	89.00	180.10	9,270.06	-3,255.50	-638.41	598,836.81	663,426.50	32° 38' 42.654 N	103° 48' 8.618 W
12,381.00	90.20	180.20	9,270.71	-3,349.49	-638.65	598,742.82	663,426.25	32° 38' 41.724 N	103° 48' 8.627 W
12,475.00	89.30	180.40	9,271.12	-3,443.49	-639.15	598,648.82	663,425.76	32° 38' 40.794 N	103° 48' 8.638 W
12,570.00	90.60	180.70	9,271.21	-3,538.48	-640.06	598,553.83	663,424.85	32° 38' 39.854 N	103° 48' 8.654 W
12,664.00	89.10	179.40	9,271.45	-3,632.48	-640.14	598,459.83	663,424.77	32° 38' 38.924 N	103° 48' 8.661 W
12,759.00	90.30	179.50	9,271.95	-3,727.47	-639.23	598,364.84	663,425.68	32° 38' 37.984 N	103° 48' 8.655 W
12,853.00	91.60	179.60	9,270.39	-3,821.45	-638.49	598,270.86	663,426.42	32° 38' 37.054 N	103° 48' 8.652 W
12,948.00	91.50	178.70	9,267.82	-3,916.41	-637.08	598,175.91	663,427.82	32° 38' 36.114 N	103° 48' 8.641 W
13,042.00	90.20	178.00	9,266.43	-4,010.35	-634.38	598,081.96	663,430.53	32° 38' 35.184 N	103° 48' 8.615 W
13,136.00	89.20	177.70	9,266.92	-4,104.29	-630.85	597,988.03	663,434.06	32° 38' 34.255 N	103° 48' 8.579 W
13,231.00	90.40	177.30	9,267.25	-4,199.19	-626.71	597,893.12	663,438.20	32° 38' 33.315 N	103° 48' 8.537 W
13,325.00	89.40	177.70	9,267.42	-4,293.10	-622.61	597,799.21	663,442.30	32° 38' 32.386 N	103° 48' 8.494 W
13,420.00	89.80	177.50	9,268.08	-4,388.02	-618.63	597,704.30	663,446.28	32° 38' 31.446 N	103° 48' 8.453 W
13,515.00	89.40	178.50	9,268.74	-4,482.95	-615.31	597,609.36	663,449.59	32° 38' 30.507 N	103° 48' 8.420 W
13,609.00	88.60	179.10	9,270.38	-4,576.92	-613.34	597,515.39	663,451.56	32° 38' 29.577 N	103° 48' 8.402 W
13,703.00	88.00	180.00	9,273.17	-4,670.87	-612.61	597,421.44	663,452.30	32° 38' 28.647 N	103° 48' 8.399 W
13,798.00	88.90	180.00	9,275.74	-4,765.84	-612.61	597,326.48	663,452.30	32° 38' 27.707 N	103° 48' 8.405 W
13,892.00	90.10	180.10	9,276.56	-4,859.83	-612.69	597,232.48	663,452.22	32° 38' 26.777 N	103° 48' 8.411 W
13,987.00	89.20	180.60	9,277.14	-4,954.83	-613.27	597,137.49	663,451.64	32° 38' 25.837 N	103° 48' 8.424 W
14,082.00	90.60	180.80	9,277.31	-5,049.82	-614.43	597,042.50	663,450.48	32° 38' 24.897 N	103° 48' 8.443 W
14,176.00	89.40	180.20	9,277.31	-5,143.81	-615.25	596,948.50	663,449.66	32° 38' 23.967 N	103° 48' 8.458 W
14,271.00	90.70	180.30	9,277.22	-5,238.81	-615.66	596,853.51	663,449.24	32° 38' 23.027 N	103° 48' 8.468 W



Integrity Directional Services, LLC

Survey Report - Geographic



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Lusk Deep Unit A #33H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=20' @ 3605.20ft (Patriot 2)
Site:	Sec. 18, T 19 S. , R 32 E	MD Reference:	KB=20' @ 3605.20ft (Patriot 2)
Well:	Lusk Deep Unit A #33H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Multi User Db

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
14,350.03	90.03	180.05	9,276.72	-5,317.84	-615.90	596,774.48	663,449.00	32° 38' 22.245 N	103° 48' 8.476 W
Sec 19 South 330' Crossing - 14350.03'MD / 9276.72'TVD									
14,365.00	89.90	180.00	9,276.73	-5,332.81	-615.91	596,759.51	663,449.00	32° 38' 22.097 N	103° 48' 8.477 W
14,460.00	90.90	179.80	9,276.07	-5,427.80	-615.74	596,664.51	663,449.16	32° 38' 21.157 N	103° 48' 8.480 W
14,575.00	92.40	180.20	9,272.76	-5,542.75	-615.74	596,549.56	663,449.16	32° 38' 20.020 N	103° 48' 8.487 W
Final IDS MWD Survey									
14,630.00	92.40	180.20	9,270.45	-5,597.70	-615.94	596,494.61	663,448.97	32° 38' 19.476 N	103° 48' 8.492 W
Projection to TD									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
929.00	928.99	-0.51	0.65	First IDS MWD Survey
9,399.92	9,206.44	-376.69	-742.32	Enter Sec 19 - 9399.92'MD / 9206.44' TVD
9,734.64	9,247.23	-706.68	-739.41	Sec 19 North 330' Crossing - 9734.64'MD / 9247.23'TVD
14,350.03	9,276.72	-5,317.84	-615.90	Sec 19 South 330' Crossing - 14350.03'MD / 9276.72'TVD
14,575.00	9,272.76	-5,542.75	-615.74	Final IDS MWD Survey
14,630.00	9,270.45	-5,597.70	-615.94	Projection to TD

Checked By: _____ Approved By: _____ Date: _____