



30-015-40944

COG Operating LLC

Eddy County, New Mexico (NAD 27 NME)

Hearse 36 State #2H

Wellbore #1 / Job #1310152

Survey: Phoenix MWD Survey

Phoenix Final Survey Report

23 February, 2013





Phoenix Technology Services
Phoenix Final Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #2H
Project:	Eddy County, New Mexico (NAD 27-NME)	TVD Reference:	KB @ 3439.00usft (JW 4)
Site:	Hearse 36 State	MD Reference:	KB @ 3439.00usft (JW 4)
Well:	#2H	North Reference:	Grid
Wellbore:	Wellbore #1/ Job #1310152	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (JW 4)	Database:	GCR DB

Project: Eddy County, New Mexico (NAD 27: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		Hearse 36 State											
Site Position:		Northing:		585,673.59	usft	Latitude:		32° 36' 36.2634 N					
From:	Map:	Easting:		466,182.10	usft	Longitude:		104° 26' 35.3708 W					
Position Uncertainty:		0.00		usft		Slot Radius:		13-3/16 "		Grid Convergence:		-0.06 °	

Well		#2H				
Well Position	+N/-S	0.00 usft	Northing:	585,673.60 usft	Latitude:	32° 36' 36.2635 N
	+E/-W	0.00 usft	Easting:	466,182.10 usft	Longitude:	104° 26' 35.3708 W
Position Uncertainty	0.00 usft		Wellhead Elevation:	usft	Ground Level:	3,426.00 usft

Wellbore		Wellbore #1/ Job #1310152			
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	01/31/13	7.81	60.35	48,588

Design		Surveys (JW 4)			
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	0.02	



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Site:	Hearse 36 State.	MD Reference:	KB @ 3439.00usft (JW 4)
Well:	#2H	North Reference:	Grid
Wellbore:	Wellbore #1 / Job #1310152	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (JW 4)	Database:	GCR DB

Survey Program		Date 02/23/13		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
100.00	2,407.00	VES Gyro Survey (Wellbore #1 / Job #131	VES-ISCWSA-GYRO-3	Biaxial Semi-Cont. Gyro
2,495.00	7,590.00	Phoenix MWD Survey (Wellbore #1 / Job #	MWD	MWD - Standard

Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)
2,407.00	0.75	318.41	1,032.40	2,406.60	36.30	-16.51	36.30	0.00	585,709.90	466,165.59
First Phoenix MWD Survey										
2,495.00	0.90	315.80	944.41	2,494.59	37.23	-17.38	37.22	0.18	585,710.83	466,164.72
2,526.00	1.80	340.40	913.42	2,525.58	37.86	-17.71	37.86	3.39	585,711.46	466,164.39
2,557.00	4.10	350.10	882.46	2,556.54	39.41	-18.06	39.41	7.57	585,713.01	466,164.04
2,588.00	7.00	353.20	851.61	2,587.39	42.38	-18.48	42.37	9.40	585,715.98	466,163.62
2,620.00	9.90	355.50	819.96	2,619.04	47.06	-18.92	47.05	9.12	585,720.66	466,163.18
2,651.00	12.80	356.50	789.57	2,649.43	53.15	-19.34	53.14	9.38	585,726.75	466,162.76
2,682.00	16.10	356.00	759.55	2,679.45	60.86	-19.85	60.86	10.65	585,734.46	466,162.25
2,714.00	19.40	355.40	729.08	2,709.92	70.59	-20.59	70.58	10.33	585,744.19	466,161.51
2,745.00	22.70	354.30	700.15	2,738.85	81.68	-21.60	81.67	10.72	585,755.28	466,160.50
2,776.00	26.40	354.00	671.96	2,767.04	94.49	-22.91	94.48	11.94	585,768.09	466,159.19
2,807.00	30.10	354.40	644.66	2,794.34	109.08	-24.39	109.07	11.95	585,782.68	466,157.71
2,838.00	33.80	355.20	618.36	2,820.64	125.42	-25.87	125.41	12.01	585,799.02	466,156.23
2,869.00	37.30	356.40	593.14	2,845.86	143.39	-27.18	143.38	11.51	585,816.99	466,154.92
2,904.00	41.20	357.90	566.04	2,872.96	165.50	-28.27	165.49	11.47	585,839.10	466,153.83
2,932.00	44.00	358.70	545.43	2,893.57	184.44	-28.83	184.43	10.19	585,858.04	466,153.27
2,963.00	47.30	359.40	523.77	2,915.23	206.60	-29.19	206.59	10.77	585,880.20	466,152.91
2,994.00	50.10	359.70	503.31	2,935.69	229.89	-29.37	229.88	9.06	585,903.49	466,152.73
3,025.00	52.90	359.80	484.01	2,954.99	254.15	-29.48	254.14	9.04	585,927.75	466,152.62
3,056.00	55.40	359.70	465.86	2,973.14	279.27	-29.59	279.26	8.07	585,952.87	466,152.51



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Site:	Hearse 36 State	MD Reference:	KB @ 3439.00usft (JW 4)
Well:	#2H	North Reference:	Grid
Wellbore:	Wellbore #17 Job #1310152	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (JW 4)	Database:	GCR DB

Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)
3,087.00	58.20	359.80	448.88	2,990.12	305.21	-29.70	305.20	9.04	585,978.81	466,152.40
3,119.00	60.40	0.10	432.55	3,006.45	332.72	-29.73	332.71	6.92	586,006.32	466,152.37
3,150.00	62.70	0.90	417.78	3,021.22	359.98	-29.49	359.97	7.76	586,033.58	466,152.61
3,181.00	65.40	1.50	404.22	3,034.78	387.84	-28.90	387.83	8.88	586,061.44	466,153.20
3,212.00	68.10	2.20	391.98	3,047.02	416.31	-27.98	416.30	8.95	586,089.91	466,154.12
3,243.00	70.40	2.50	381.00	3,058.00	445.27	-26.79	445.26	7.47	586,118.87	466,155.31
3,274.00	72.60	2.60	371.16	3,067.84	474.64	-25.48	474.63	7.10	586,148.24	466,156.62
3,306.00	76.30	2.40	362.59	3,076.41	505.43	-24.14	505.42	11.58	586,179.03	466,157.96
3,337.00	80.30	2.30	356.30	3,082.70	535.76	-22.89	535.75	12.91	586,209.36	466,159.21
3,369.00	84.40	1.50	352.04	3,086.96	567.45	-21.84	567.44	13.05	586,241.05	466,160.26
3,400.00	88.30	0.30	350.07	3,088.93	598.37	-21.36	598.37	13.16	586,271.97	466,160.74
3,462.00	89.90	359.70	349.09	3,089.91	660.36	-21.36	660.36	2.76	586,333.96	466,160.74
3,555.00	90.20	0.20	349.18	3,089.82	753.36	-21.44	753.36	0.63	586,426.96	466,160.66
3,649.00	90.70	359.60	349.91	3,089.09	847.36	-21.60	847.35	0.83	586,520.96	466,160.50
3,744.00	91.00	359.10	351.32	3,087.68	942.34	-22.68	942.33	0.61	586,615.94	466,159.42
3,837.00	91.20	359.00	353.11	3,085.89	1,035.31	-24.22	1,035.30	0.24	586,708.91	466,157.88
3,930.00	91.00	359.60	354.89	3,084.11	1,128.29	-25.36	1,128.28	0.68	586,801.89	466,156.74
4,025.00	92.10	360.00	357.46	3,081.54	1,223.25	-25.69	1,223.24	1.23	586,896.85	466,156.41
4,119.00	92.90	359.20	361.56	3,077.44	1,317.16	-26.35	1,317.15	1.20	586,990.76	466,155.75
4,212.00	93.30	359.90	366.59	3,072.41	1,410.02	-27.08	1,410.01	0.87	587,083.62	466,155.02
4,302.00	92.70	1.90	371.30	3,067.70	1,499.88	-25.66	1,499.87	2.32	587,173.48	466,156.44
4,396.00	90.60	1.60	374.01	3,064.99	1,593.79	-22.79	1,593.78	2.26	587,267.39	466,159.31
4,489.00	90.20	1.10	374.66	3,064.34	1,686.76	-20.60	1,686.75	0.69	587,360.36	466,161.50
4,583.00	90.20	359.70	374.99	3,064.01	1,780.76	-19.95	1,780.75	1.49	587,454.36	466,162.15
4,677.00	90.70	359.30	375.73	3,063.27	1,874.75	-20.77	1,874.74	0.68	587,548.35	466,161.33
4,770.00	89.80	0.50	376.13	3,062.87	1,967.75	-20.93	1,967.74	1.61	587,641.35	466,161.17
4,864.00	91.20	0.10	376.95	3,062.05	2,061.74	-20.44	2,061.73	1.55	587,735.34	466,161.66



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Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (%/100usft)	Northing (usft)	Easting (usft)
4,958.00	91.40	0.50	379.08	3,059.92	2,155.71	-19.95	2,155.71	0.48	587,829.31	466,162.15
5,051.00	92.30	0.80	382.09	3,056.91	2,248.66	-18.89	2,248.65	1.02	587,922.26	466,163.21
5,145.00	90.90	0.60	384.71	3,054.29	2,342.61	-17.74	2,342.60	1.50	588,016.21	466,164.36
5,238.00	91.90	0.60	386.98	3,052.02	2,435.58	-16.77	2,435.57	1.08	588,109.18	466,165.33
5,332.00	91.40	0.90	389.69	3,049.31	2,529.53	-15.54	2,529.52	0.62	588,203.13	466,166.56
5,426.00	92.60	0.30	392.97	3,046.03	2,623.46	-14.56	2,623.46	1.43	588,297.06	466,167.54
5,520.00	91.30	0.50	396.17	3,042.83	2,717.41	-13.90	2,717.40	1.40	588,391.01	466,168.20
5,613.00	90.00	359.80	397.22	3,041.78	2,810.40	-13.66	2,810.39	1.59	588,484.00	466,168.44
5,707.00	90.40	0.10	397.55	3,041.45	2,904.40	-13.74	2,904.39	0.53	588,578.00	466,168.36
5,800.00	90.40	0.20	398.20	3,040.80	2,997.39	-13.50	2,997.39	0.11	588,670.99	466,168.60
5,894.00	89.40	360.00	398.04	3,040.96	3,091.39	-13.33	3,091.39	1.08	588,764.99	466,168.77
5,987.00	91.60	0.10	398.85	3,040.15	3,184.38	-13.25	3,184.38	2.37	588,857.98	466,168.85
6,081.00	92.10	359.90	401.88	3,037.12	3,278.33	-13.25	3,278.33	0.57	588,951.93	466,168.85
6,174.00	93.80	359.70	406.67	3,032.33	3,371.21	-13.57	3,371.20	1.84	589,044.81	466,168.53
6,268.00	92.70	359.00	412.00	3,027.00	3,465.05	-14.64	3,465.04	1.39	589,138.65	466,167.46
6,362.00	91.80	0.40	415.69	3,023.31	3,558.97	-15.13	3,558.96	1.77	589,232.57	466,166.97
6,455.00	90.50	1.20	417.56	3,021.44	3,651.94	-13.83	3,651.93	1.64	589,325.54	466,168.27
6,548.00	89.00	0.30	417.15	3,021.85	3,744.93	-12.62	3,744.92	1.88	589,418.53	466,169.48
6,642.00	89.20	360.00	415.67	3,023.33	3,838.91	-12.37	3,838.91	0.38	589,512.51	466,169.73
6,736.00	89.60	359.30	414.69	3,024.31	3,932.91	-12.94	3,932.90	0.86	589,606.51	466,169.16
6,829.00	90.80	359.50	415.01	3,023.99	4,025.90	-13.92	4,025.89	1.31	589,699.50	466,168.18
6,923.00	91.70	359.90	417.06	3,021.94	4,119.87	-14.41	4,119.87	1.05	589,793.47	466,167.69
7,016.00	92.00	0.20	420.07	3,018.93	4,212.83	-14.33	4,212.82	0.46	589,886.43	466,167.77
7,110.00	91.70	0.70	423.10	3,015.90	4,306.77	-13.59	4,306.77	0.62	589,980.37	466,168.51
7,203.00	91.50	1.20	425.70	3,013.30	4,399.72	-12.05	4,399.72	0.58	590,073.32	466,170.05
7,297.00	90.10	0.50	427.01	3,011.99	4,493.70	-10.65	4,493.70	1.67	590,167.30	466,171.45
7,391.00	91.00	0.30	427.91	3,011.09	4,587.69	-10.00	4,587.69	0.98	590,261.29	466,172.10



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Wellbore:	Wellbore #1 / Job #1310152	Survey Calculation Method:	Minimum Curvature
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MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	V. Sec (usft)	DLeg (°/100usft)	Northing (usft)	Easting (usft)
7,484.00	90.30	1.00	428.97	3,010.03	4,680.68	-8.94	4,680.68	1.06	590,354.28	466,173.16
7,536.00	90.60	0.80	429.38	3,009.62	4,732.67	-8.13	4,732.67	0.69	590,406.27	466,173.97
Current MWD Survey										
7,590.00	90.60	0.80	429.94	3,009.06	4,786.67	-7.37	4,786.66	0.00	590,460.27	466,174.73
Projection to Bit										

Survey Annotations:				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N-S (usft)	+E-W (usft)	
2,407.00	2,406.60	36.30	-16.51	First Phoenix MWD Survey
7,536.00	3,009.62	4,732.67	-8.13	Current MWD Survey
7,590.00	3,009.06	4,786.67	-7.37	Projection to Bit

Checked By: _____ Approved By: _____ Date: _____



Company: COG Operating LLC (Concho)
Lease/Well: Hearse 36 State/No 002H
Location: Sec 36 T195 R25E
Rig Name: JW #4
State/County: New Mexico/Eddy
Latitude: 32.61, Longitude: -104.44
GRID North is 0.06 Degrees West of True North
VS-Azi: 0.00 Degrees



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NMOCD ARTESIA

Depth Reference : 18 Feet

DRILLOG HA GYRO SURVEY CALCULATIONS

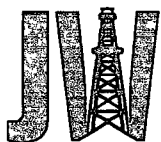
Filename: gyro survey.ut
Minimum Curvature Method
Report Date/Time: 2/21/2013 / 10:03

Vaughn Energy Services
Fort Worth, Texas
817-741-3610

Surveyor: Jason Wilson
Hearse 36 State No 002H / API 30-015-40944

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W 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	****
100.00	0.40	17.85	100.00	0.33	0.11	0.35	17.85	0.40
200.00	1.13	19.56	199.99	1.58	0.54	1.67	18.85	0.73
300.00	1.32	20.92	299.97	3.58	1.28	3.80	19.66	0.19
400.00	1.61	345.83	399.94	6.02	1.35	6.17	12.60	0.93
500.00	1.42	338.62	499.90	8.54	0.55	8.56	3.68	0.27
600.00	1.02	330.76	599.88	10.47	-0.34	10.48	358.15	0.43
700.00	1.10	324.78	699.86	12.03	-1.33	12.10	353.71	0.13
800.00	1.10	323.60	799.84	13.58	-2.45	13.80	349.80	0.02
900.00	0.85	318.21	899.83	14.90	-3.50	15.31	346.77	0.27
1000.00	0.95	317.54	999.82	16.06	-4.55	16.70	344.17	0.10
1100.00	1.13	316.12	1099.80	17.39	-5.80	18.33	341.56	0.18
1200.00	1.21	323.43	1199.78	18.94	-7.11	20.23	339.43	0.17
1300.00	1.33	323.82	1299.75	20.73	-8.42	22.37	337.89	0.12
1400.00	1.23	315.12	1399.73	22.43	-9.86	24.50	336.26	0.22
1500.00	1.09	305.50	1499.71	23.74	-11.39	26.33	334.36	0.24
1600.00	0.84	324.96	1599.70	24.89	-12.58	27.89	333.18	0.41
1700.00	1.16	339.25	1699.68	26.43	-13.36	29.62	333.18	0.40
1800.00	0.57	340.84	1799.67	27.85	-13.88	31.12	333.50	0.59

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
1900.00	1.02	355.66	1899.66	29.20	-14.11	32.43	334.20	0.49
2000.00	0.85	338.66	1999.65	30.78	-14.45	34.00	334.85	0.32
2100.00	0.86	349.26	2099.63	32.20	-14.86	35.47	335.23	0.16
2200.00	1.02	347.12	2199.62	33.80	-15.20	37.06	335.79	0.16
2300.00	0.69	328.44	2299.61	35.18	-15.71	38.52	335.93	0.42
2400.00	0.73	320.05	2399.60	36.18	-16.44	39.74	335.57	0.11
2407.00	0.75	318.41	2406.60	36.25	-16.49	39.82	335.53	0.41



DRILLING INC. Oil Well Drilling Contractor

Post Office Box 160 Artesia, New Mexico 88211-0160 Office (575) 748-8704 Fax (575) 748-8719

February 18, 2013

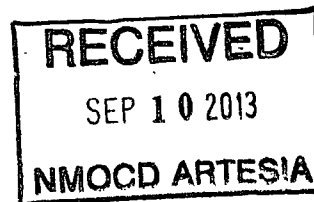
COG Operating, LLC
One Concho Center 600 W. Illinois Ave
Midland, Texas 79701

Re: Hearse 36 State # 2 H
Sec. 26, T-19-S, R-25-E
Eddy County, New Mexico

Attn: Jim Evans

The following is a Deviation Survey on the referenced well in Eddy County, New Mexico:

228' - 1°	794' - 1°	1282' - 0.75°	2188' - 0.5°
486' - 1°	1044' - 1°	1719' - 0.75°	



Sincerely,

Gary W. Chappell
Contracts Manager

STATE OF NEW MEXICO)
COUNTY OF EDDY)

The foregoing was acknowledged before me this 18th day of February, 2013 by Gary W. Chappell.

NOTARY PUBLIC

