



COG Operating LLC

30-015 38326

Eddy County, NM (NAN27 NME)

Foran State #4

Foran State #4

OH

Design: Actual

Standard Survey Report

01 August, 2011



Scientific Drilling
Directional Drilling Operations



Scientific Drilling

Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Site Foran State #4
Project:	Eddy County, NM (NAN27 NME)	TVD Reference:	KB Elev (12') @ 3873 00usft (Basic #35)
Site:	Foran State #4	MD Reference:	KB Elev (12') @ 3873 00usft (Basic #35)
Well:	Foran State #4	North Reference:	Grid
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Julio

Project	Eddy County, NM (NAN27 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	Foran State #4		
Site Position:	Map	Northing:	668,230 00 usft
From:		Easting:	643,188 70 usft
Position Uncertainty:	0 00 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 50' 10 255 N
		Longitude:	103° 52' 1 734 W
		Grid Convergence:	0 25 °

Well	Foran State #4		
Well Position	+N/-S	0 00 usft	Northing:
	+E/-W	0 00 usft	Easting:
Position Uncertainty	0 00 usft	Wellhead Elevation:	usft
		Latitude:	32° 50' 10 255 N
		Longitude:	103° 52' 1 734 W
		Ground Level:	3,861 00 usft

Wellbore	OH		
Magnetics	Model Name	Sample Date	Declination
			(°)
	IGRF2010	2011/07/28	7 75
			Dip Angle
			(°)
			60 70
			Field Strength
			(nT)
			48,938

Design	Actual		
Audit Notes:			
Version:	1 0	Phase:	ACTUAL
		Tie On Depth:	0 00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0 00	0 00	0 00
			Direction
			(°)
			152 97

Survey Program	Date 2011/08/01		
From	To	Survey (Wellbore)	Tool Name
(usft)	(usft)		
100 00	1,815 00	Gyro Survey (OH)	Keeper
1,905 00	5,318 00	MWD Survey (OH)	MWD
			Description
			Standard Wireline Keeper ver 1 0 2
			MWD - Standard

Survey									
Measured	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Vertical	Dogleg	Build	Turn
Depth	(°)	(°)	Depth	(usft)	(usft)	Section	Rate	Rate	Rate
(usft)			(usft)			(usft)	(°/100usft)	(°/100usft)	(°/100usft)
0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
100 00	0 79	263 04	100 00	-0 08	-0 68	-0 24	0 79	0 79	0 00
200 00	0 49	264 07	199 99	-0 21	-1 79	-0 63	0 30	-0 30	1 03
300 00	0 46	262 55	299 99	-0 31	-2 62	-0 92	0 03	-0 03	-1 52
400 00	0 46	273 20	399 98	-0 34	-3 42	-1 25	0 09	0 00	10 65
500 00	0 53	279 88	499 98	-0 24	-4 27	-1 73	0 09	0 07	6 68
600 00	0 51	283 94	599 98	-0 05	-5 16	-2 30	0 04	-0 02	4 06
700 00	0 58	283 55	699 97	0 18	-6 08	-2 92	0 07	0 07	-0 39
800 00	0 59	298 96	799 97	0 54	-7 03	-3 68	0 16	0 01	15 41
900 00	0 61	302 96	899 96	1 08	-7 92	-4 57	0 05	0 02	4 00



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Well: Foran State #4
Wellbore: OH
Design: Actual

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TVD Reference: KB Elev (12') @ 3873 00usft (Basic #35)
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North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM-Julio

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)
1,000 00	0 51	340 03	999 96	1 79	-8 52	-5 47	0 37	-0 10	37 07
1,100 00	0 50	355 96	1,099 95	2 65	-8 71	-6 31	0 14	-0 01	15 93
1,200 00	0 69	22 78	1,199 95	3 64	-8 50	-7 10	0 33	0 19	26 82
1,300 00	1 06	43 88	1,299 94	4 86	-7 63	-7 79	0 48	0 37	21 10
1,400 00	1 48	38 91	1,399 91	6 53	-6 18	-8 62	0 43	0 42	-4 97
1,500 00	1 73	40 64	1,499 87	8 68	-4 38	-9 72	0 25	0 25	1 73
1,600 00	1 81	48 90	1,599 82	10 86	-2 21	-10 68	0 27	0 08	8 26
1,700 00	1 77	52 50	1,699 78	12 84	0 21	-11 34	0 12	-0 04	3 60
1,800 00	1 46	54 79	1,799 74	14 52	2 47	-11 81	0 32	-0 31	2 29
1,815 00	1 38	51 44	1,814 73	14 74	2 77	-11 87	0 77	-0 53	-22 33
Gyro Tie-in									
1,905 00	1 12	56 51	1,904 71	15 90	4 35	-12 19	0 31	-0 29	5 63
1,969 00	0 85	88 05	1,968 70	16 26	5 35	-12 05	0 93	-0 42	49 28
2,033 00	0 84	141 80	2,032 69	15 91	6 11	-11 39	1 19	-0 02	83 98
2,096 00	1 19	159 18	2,095 68	14 93	6 63	-10 29	0 73	0 56	27 59
2,160 00	1 80	164 84	2,159 66	13 34	7 13	-8 65	0 98	0 95	8 84
2,223 00	2 75	161 11	2,222 61	10 96	7 88	-6 18	1 53	1 51	-5 92
2,287 00	3 53	154 84	2,286 52	7 72	9 21	-2 69	1 33	1 22	-9 80
2,351 00	4 10	156 62	2,350 37	3 84	10 96	1 56	0 91	0 89	2 78
2,414 00	4 78	159 05	2,413 18	-0 68	12 79	6 42	1 12	1 08	3 86
2,477 00	5 24	160 00	2,475 94	-5 84	14 71	11 88	0 74	0 73	1 51
2,540 00	5 45	157 73	2,538 67	-11 31	16 83	17 72	0 47	0 33	-3 60
2,604 00	5 79	155 85	2,602 36	-17 07	19 30	23 97	0 60	0 53	-2 94
2,667 00	6 32	156 26	2,665 01	-23 14	22 00	30 61	0 84	0 84	0 65
2,730 00	6 66	151 57	2,727 61	-29 53	25 13	37 72	1 00	0 54	-7 44
2,794 00	7 40	149 75	2,791 13	-36 35	28 98	45 55	1 21	1 16	-2 84
2,858 00	7 49	149 58	2,854 59	-43 51	33 17	53 83	0 14	0 14	-0 27
2,954 00	7 05	151 99	2,949 81	-54 10	39 10	65 96	0 56	-0 46	2 51
3,050 00	7 08	150 09	3,045 09	-64 43	44 82	77 76	0 25	0 03	-1 98
3,145 00	8 17	155 56	3,139 25	-75 65	50 53	90 35	1 38	1 15	5 76
3,240 00	8 11	154 37	3,233 29	-87 84	56 22	103 80	0 19	-0 06	-1 25
3,335 00	7 94	155 76	3,327 36	-99 87	61 81	117 05	0 27	-0 18	1 46
3,429 00	7 95	152 54	3,420 46	-111 55	67 48	130 03	0 47	0 01	-3 43
3,524 00	7 82	151 98	3,514 56	-123 09	73 54	143 07	0 16	-0 14	-0 59
3,619 00	7 77	152 52	3,608 68	-134 49	79 54	155 95	0 09	-0 05	0 57
3,714 00	7 60	151 48	3,702 83	-145 71	85 50	168 65	0 23	-0 18	-1 09
3,809 00	7 59	153 55	3,796 99	-156 85	91 30	181 20	0 29	-0 01	2 18
3,904 00	7 41	152 09	3,891 18	-167 88	96 96	193 60	0 28	-0 19	-1 54
4,000 00	7 93	155 62	3,986 32	-179 38	102 59	206 41	0 73	0 54	3 68
4,096 00	8 05	154 29	4,081 39	-191 47	108 24	219 74	0 23	0 13	-1 39
4,191 00	8 04	154 72	4,175 46	-203 47	113 96	233 03	0 06	-0 01	0 45
4,286 00	7 84	156 15	4,269 54	-215 40	119 42	246 14	0 30	-0 21	1 51
4,379 00	7 89	155 33	4,361 67	-227 00	124 65	258 86	0 13	0 05	-0 88



Scientific Drilling

Survey Report



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Site: Foran State #4
Well: Foran State #4
Wellbore: OH
Design: Actual

Local Co-ordinate Reference: Site Foran State #4
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North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM-Julio

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)
4,475.00	7.15	156.08	4,456.84	-238.45	129.82	271.40	0.78	-0.77	0.78
4,570.00	7.05	157.53	4,551.12	-249.24	134.45	283.12	0.22	-0.11	1.53
4,634.00	6.58	155.64	4,614.66	-256.21	137.46	290.70	0.81	-0.73	-2.95
4,698.00	5.91	157.55	4,678.28	-262.60	140.23	297.65	1.10	-1.05	2.98
4,761.00	5.12	158.46	4,740.99	-268.21	142.50	303.68	1.26	-1.25	1.44
4,824.00	4.34	159.00	4,803.78	-273.05	144.39	308.85	1.24	-1.24	0.86
4,888.00	3.10	165.51	4,867.64	-276.99	145.69	312.94	2.04	-1.94	10.17
4,951.00	2.04	165.85	4,930.58	-279.73	146.39	315.70	1.68	-1.68	0.54
5,015.00	1.34	149.74	4,994.55	-281.48	147.05	317.56	1.31	-1.09	-25.17
5,078.00	0.57	164.23	5,057.54	-282.41	147.50	318.60	1.27	-1.22	23.00
5,141.00	0.40	160.17	5,120.54	-282.92	147.66	319.12	0.28	-0.27	-6.44
5,235.00	0.36	137.87	5,214.53	-283.45	147.97	319.74	0.16	-0.04	-23.72
Last MWD Survey									
5,318.00	0.36	137.87	5,297.53	-283.84	148.32	320.24	0.00	0.00	0.00
Projection to Bit									

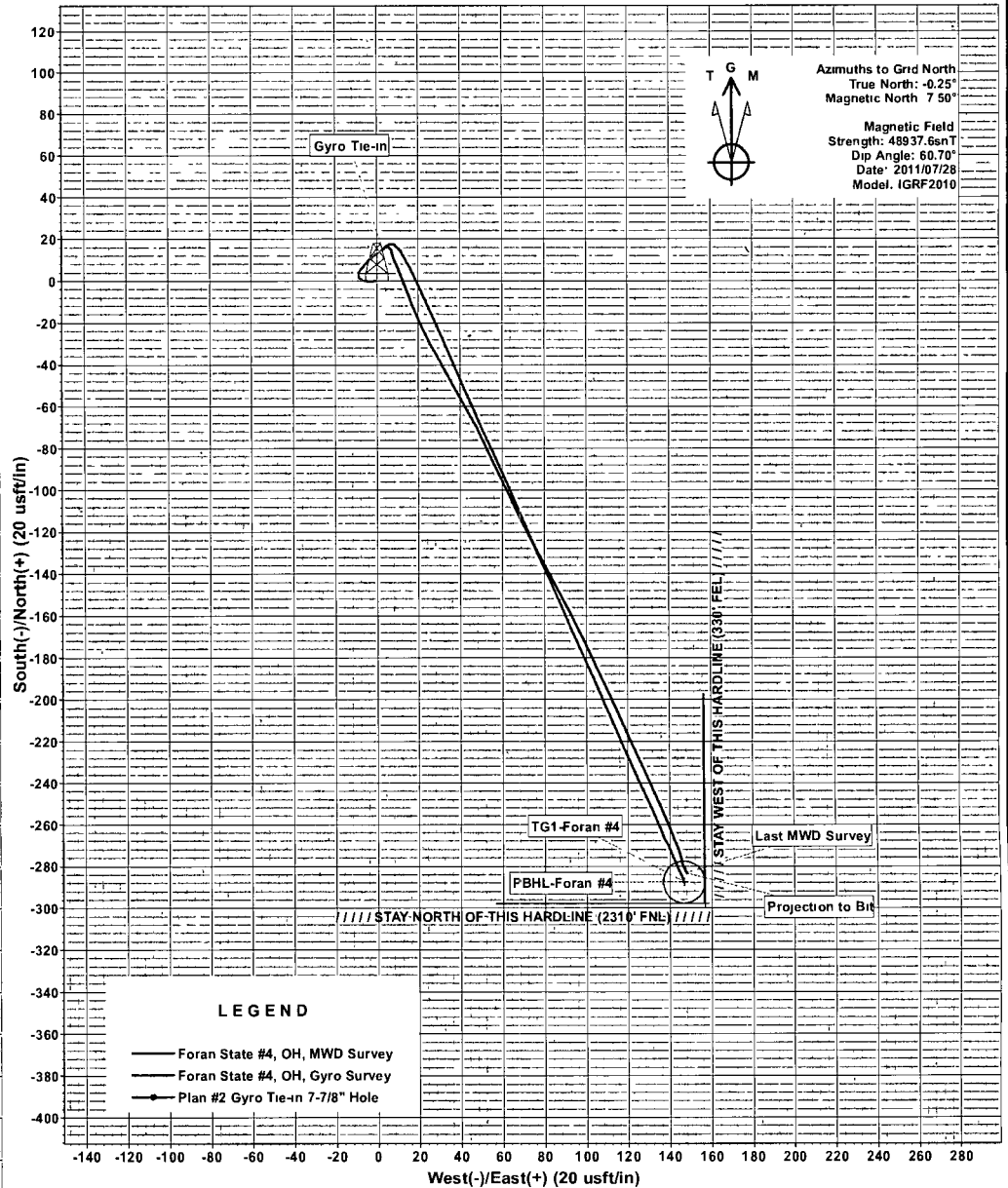
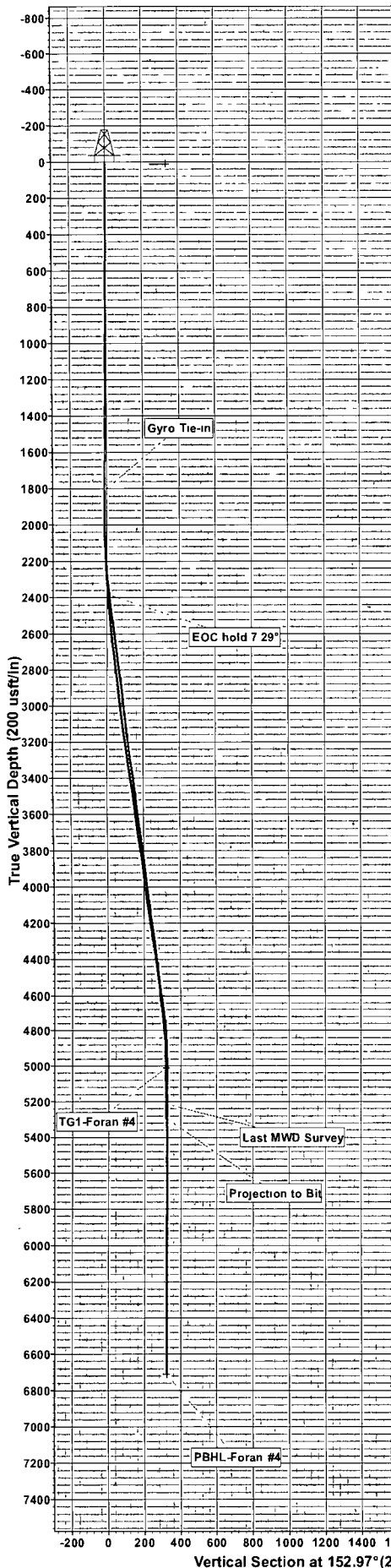
Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,815.00	1,814.73	14.74	2.77	Gyro Tie-in
5,235.00	5,214.53	-283.45	147.97	Last MWD Survey
5,318.00	5,297.53	-283.84	148.32	Projection to Bit

Checked By: _____ Approved By: _____ Date: _____



Scientific Drilling for COG Operating LLC
Site: Eddy County, NM (NAN27 NME)
Well: Foran State #4
Wellbore: OH
Design: Plan #2 Gyro Tie-in 7-7/8" Hole



WELLBORE TARGET DETAILS (MAP CO-ORDINATES)									
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape	
East HL-Foran #4	12.00	-297.70	156.80	667932.30	643345.50	32°50' 7.302 N	103°51' 59.912 W	Rectangle (Sides	L100 00 W0 00)
South HL-Foran #4	12.00	-297.70	156.80	667932.30	643345.50	32°50' 7.302 N	103°51' 59.912 W	Rectangle (Sides	L0 00 W100 00)
TG1-Foran #4	5012.00	-287.70	146.80	667942.30	643335.50	32°50' 7.402 N	103°52' 0.028 W	Point	
PBHL-Foran #4	6712.00	-287.70	146.80	667942.30	643335.50	32°50' 7.402 N	103°52' 0.028 W	Circle (Radius	10.0 0)

SECTION DETAILS											
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VFace	Target	
1	1815.00	1.38	51.44	1814.73	14.74	2.77	0.00	0.00	-11.87		
2	2000.00	1.38	51.44	1999.68	17.52	6.25	0.00	0.00	-12.76		
3	2387.65	7.29	156.05	2386.29	-2.08	19.91	2.00	114.47	10.90		
4	4668.29	7.29	156.05	4648.50	-266.54	137.40	0.00	0.00	299.87		
5	5032.77	0.00	0.00	5012.00	-287.70	146.80	2.00	180.00	322.99	TG1-Foran #4	
6	6732.77	0.00	0.00	6712.00	-287.70	146.80	0.00	0.00	322.99	PBHL-Foran #4	

WELL DETAILS Foran State #4							
Ground Level				3861 00			
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot	
0 00	0 00	668230 00	643188 70	32°50' 10.255 N	103°52' 1.734 W		

PROJECT DETAILS: Eddy County, NM (NAN27 NME) Plan Plan #2 Gyro Tie-in 7-7/8" Hole (Foran State #4/OH)

Geodetic System: US State Plane 1927 (Exact solution) Created By Julio Pina Date: 28-Jul-11
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001
System Datum: Mean Sea Level
Checked: _____ Date: _____
Reviewed: _____ Date: _____
Approved: _____ Date: _____