



30-015-39123

COG OPERATING LLC

Eddy County, NM (NAN27 NME)

Foster Eddy #23

Foster Eddy #23

OH - Job #32D0811740

Survey: MWD Survey

SDI Standard Survey Report

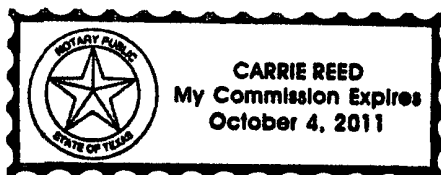
This survey is correct to the best of my knowledge and is supported by actual field data.

Richard

Notarized this date 27th of September, 2011.

Carrie Reed

Notary Signature
County of Midland
State of Texas





Scientific Drilling International, Inc.
SDI Standard Survey Report



Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well Foster Eddy #23
Project:	Eddy County, NM (NAN27 NME)	TVD Reference:	KB Elev (13') @ 3771 0usft (JW #4)
Site:	Foster Eddy #23	MD Reference:	KB Elev (13') @ 3771 0usft (JW #4)
Well:	Foster Eddy #23	North Reference:	Grid
Wellbore:	OH - Job #32D0811740	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

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	Foster Eddy #23				
Site Position:		Northing:	669,104 30 usft	Latitude:	32° 50' 19 163 N
From:	Map	Easting:	637,180 30 usft	Longitude:	103° 53' 12 111 W
Position Uncertainty:	0 0 usft	Slot Radius:	13-3/16"	Grid Convergence:	0 24 °

Well		Foster Eddy #23				
Well Position	+N/-S	0 0 usft	Northing:	669,104 30 usft	Latitude:	32° 50' 19 163 N
	+E/-W	0 0 usft	Easting:	637,180 30 usft	Longitude:	103° 53' 12 111 W
Position Uncertainty	0 0 usft	Wellhead Elevation:	usft	Ground Level:	3,758 0 usft	

Wellbore	OH - Job #32D0811740				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	8/7/2011	7 76	60 70	48,935

Design	Actual			
Audit Notes:				
Version:	1 0	Phase:	ACTUAL	Tie On Depth: 0 0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0 0	0 0	0 0	61 59

Survey Program	Date	10/9/2011			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100 0	1,762 0	Gyro Survey (OH - Job #32D0811740)	Keeper	Standard Wireline Keeper ver 1 0 2	
1,896 0	5,205 0	MWD Survey (OH - Job #32D0811740)	MWD	MWD - Standard	

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
0 0	0 00	0 00	0 0	0 0	0 0	0 00	0 0
100 0	0 51	201 18	100 0	-0 4	-0 2	201 18	0 4
200 0	0 60	210 07	200 0	-1 3	-0 6	204 47	1 4
300 0	0 70	193 05	300 0	-2 3	-1 0	202 89	2 5
400 0	0 74	196 80	400 0	-3 5	-1 3	200 27	3 8
500 0	0 74	195 37	500 0	-4 8	-1 7	199 20	5 1
600 0	0 76	186 40	600 0	-6 1	-1 9	197 49	6 4
700 0	0 62	199 75	700 0	-7 2	-2 2	196 68	7 6
800 0	0 46	204 36	800 0	-8 1	-2 5	197 24	8 5
900 0	0 22	214 32	899 9	-8 6	-2 8	197 91	9 1
1,000 0	0 24	30 83	999 9	-8 6	-2 8	197 96	9 1



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Project:	Eddy County, NM (NAN27 NME)	TVD Reference:	KB Elev (13') @ 3771 0usft (JW #4)
Site:	Foster Eddy #23	MD Reference:	KB Elev (13') @ 3771 0usft (JW #4)
Well:	Foster Eddy #23	North Reference:	Grid
Wellbore:	OH - Job #32D0811740	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°) *	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
1,100 0	0 49	24 10	1,099 9	-8 0	-2 5	197 33	8 4
1,200 0	0 61	29 57	1,199 9	-7 2	-2 1	196 08	7 5
1,300 0	0 67	36 47	1,299 9	-6 3	-1 5	193 15	6 4
1,400 0	0 60	56 07	1,399 9	-5 5	-0 7	187 06	5 5
1,500 0	0 30	42 84	1,499 9	-5 0	-0 1	180 77	5 0
1,600 0	0 28	53 79	1,599 9	-4 7	0 3	176 24	4 7
1,700 0	0 24	289 04	1,699 9	-4 5	0 3	176 07	4 5
1,762 0	0 26	295 83	1,761 9	-4 4	0 1	179 25	4 4



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Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well Foster Eddy #23
Project:	Eddy County, NM (NAN27 NME)	TVD Reference:	KB Elev (13') @ 3771 0usft (JW #4)
Site:	Foster Eddy #23	MD Reference:	KB Elev (13') @ 3771 0usft (JW #4)
Well:	Foster Eddy #23	North Reference:	Grid
Wellbore:	OH - Job #32D0811740	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

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	Foster Eddy #23		
Site Position:		Northing:	669,104 30 usft
From:	Map	Easting:	637,180 30 usft
Position Uncertainty:	0 0 usft	Slot Radius:	13-3/16"
		Latitude:	32° 50' 19 163 N
		Longitude:	103° 53' 12 111 W
		Grid Convergence:	0 24 °

Well	Foster Eddy #23		
Well Position	+N/-S	0 0 usft	Northing:
	+E/-W	0 0 usft	Easting:
Position Uncertainty	0 0 usft	Wellhead Elevation:	usft
		Latitude:	32° 50' 19 163 N
		Longitude:	103° 53' 12 111 W
		Ground Level:	3,758 0 usft

Wellbore	OH - Job #32D0811740		
Magnetics	Model Name	Sample Date	Declination
			(°)
	IGRF2010	8/7/2011	7 76
			Dip Angle
			(°)
			60 70
			Field Strength
			(nT)
			48,935

Design	Actual		
Audit Notes:			
Version:	1 0	Phase:	ACTUAL
		Tie On Depth:	0 0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0 0	0 0	0 0
			Direction
			(°)
			61 59

Survey Program	Date 10/9/2011		
From	To	Survey (Wellbore)	Tool Name
(usft)	(usft)		
100 0	1,762 0	Gyro Survey (OH - Job #32D0811740)	Keeper
1,896 0	5,205 0	MWD Survey (OH - Job #32D0811740)	MWD
			Description
			Standard Wireline Keeper ver 1 0 2
			MWD - Standard

Survey			
Measured Depth	Inclination	Azimuth	True Vertical
(usft)	(°)	(°)	Depth
1,762 0	0 26	295 83	1,761 9
			North/South
			(usft)
			East/West
			(usft)
			Closure Azimuth
			(°)
			Closure Distance
			(usft)
Gyro Tie-in			
1,896 0	0 24	335 96	1,895 9
1,958 0	0 24	98 43	1,957 9
2,021 0	0 59	73 27	2,020 9
2,083 0	1 60	53 48	2,082 9
2,146 0	2 10	62 37	2,145 9
2,209 0	2 94	57 45	2,208 8
2,270 0	3 49	60 01	2,269 7
2,333 0	3 55	67 81	2,332 6
2,394 0	4 37	75 66	2,393 5
			-4 4
			-0 3
			-0 3
			0 2
			1 2
			2 9
			5 3
			8 2
			11 7
			15 7
			179 25
			184 76
			183 77
			177 19
			159 57
			126 13
			97 78
			82 76
			76 81
			75 60
			4 0



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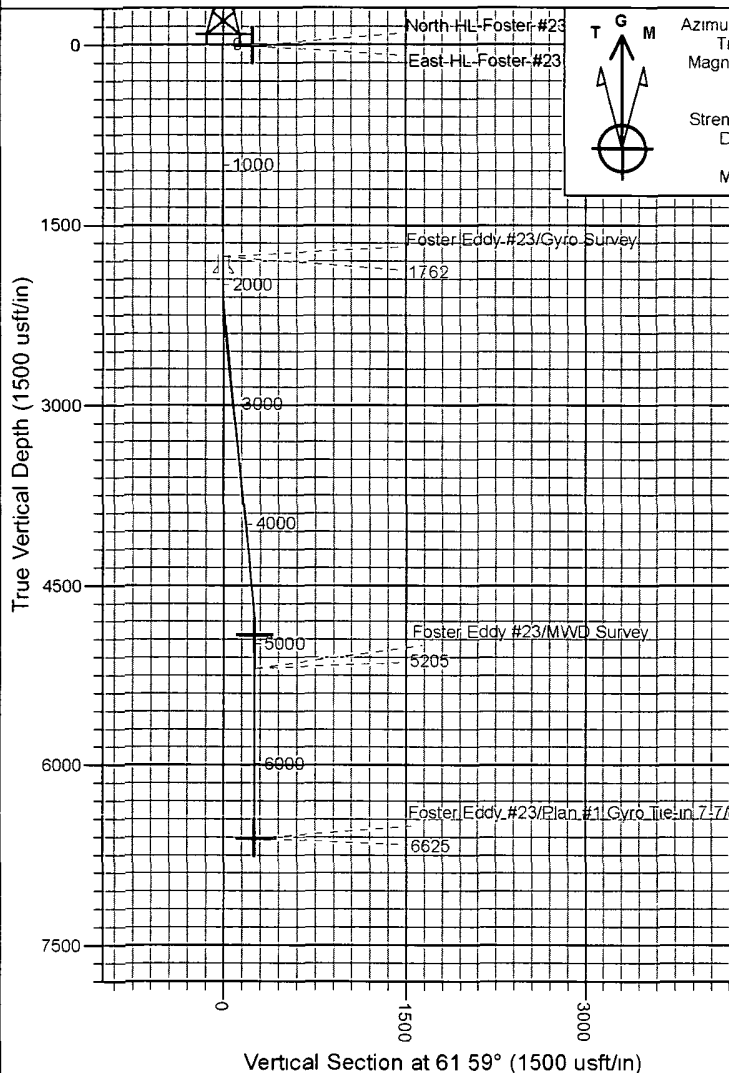
Company:	COG OPERATING LLC	Local Co-ordinate Reference:	Well Foster Eddy #23
Project:	Eddy County, NM (NAN27 NME)	TVD Reference:	KB Elev (13') @ 3771 0usft (JW #4)
Site:	Foster Eddy #23	MD Reference:	KB Elev (13') @ 3771 0usft (JW #4)
Well:	Foster Eddy #23	North Reference:	Grid
Wellbore:	OH - Job #32D0811740	Survey Calculation Method:	Minimum Curvature
Design:	Actual	Database:	EDM-Regulatory

Survey							
Measured Depth (usft)	Inclination (°)	Azimuth (°)	True Vertical Depth	North/South (usft)	East/West (usft)	Closure Azimuth (°)	Closure Distance (usft)
2,456 0	5 12	71 72	2,455 2	5.5	20 6	75 11	21 3
2,518 0	5 81	65 50	2,517 0	7 7	26 1	73 66	27 2
2,661 0	6 37	61 65	2,659 2	14 4	39 7	70 02	42 2
2,706 0	6 23	61 83	2,703 9	16 8	44 0	69 15	47.1
2,799 0	5 78	58 31	2,796 4	21 6	52 4	67 61	56 7
2,894 0	5 23	60 66	2,890 9	26 2	60 3	66 48	65 7
2,987 0	5 85	52 45	2,983 5	31 2	67 7	65 27	74 6
3,081 0	6 65	55 11	3,076 9	37 2	76 0	63 90	84 6
3,174 0	6 24	52 95	3,169.4	43 4	84 5	62 82	94 9
3,268 0	6 19	52 31	3,262 8	49 5	92 5	61 84	105 0
3,361 0	6 50	58 19	3,355 2	55 4	101 0	61 26	115 2
3,456 0	6 13	59 18	3,449 7	60 8	109 9	61 05	125 6
3,548 0	6 60	61 00	3,541 1	65 9	118 8	60 98	135 8
3,642 0	6 31	58 54	3,634 5	71 2	127 9	60 89	146 4
3,736 0	6 02	65 33	3,727 9	76 0	136 8	60 95	156 4
3,860 0	5 73	63 54	3,851 3	81 4	148 2	61 22	169 1
3,954 0	5 53	63 04	3,944 8	85 6	156 5	61 32	178 3
4,047 0	5 07	62 67	4,037 4	89 5	164 1	61 39	186 9
4,140.0	4 90	63 47	4,130 1	93 2	171 3	61 46	195 0
4,235 0	5 17	61 10	4,224 7	97 0	178 7	61 50	203 3
4,329 0	5 50	59 18	4,318 3	101 4	186 3	61 44	212 1
4,422 0	5 96	59 54	4,410 9	106 1	194 2	61 35	221 3
4,578 0	5 25	61 63	4,566 1	113 6	207 5	61 30	236 6
4,641 0	4 62	63 44	4,628 9	116 1	212 3	61 32	242 0
4,702 0	3 78	57 28	4,689 7	118 3	216 2	61 31	246 5
4,765 0	2 84	75 01	4,752 6	119 8	219 5	61 36	250 0
4,827 0	2 03	78 25	4,814 6	120 5	222 0	61 52	252 6
4,889 0	1 07	42 40	4,876 5	121 1	223 5	61 55	254 2
4,985 0	0 98	22 40	4,972 5	122 5	224 4	61 37	255 7
5,016 0	0 95	20 37	5,003 5	123 0	224 6	61 29	256 1
5,078 0	0 96	43 13	5,065 5	123 9	225 1	61 18	257 0
5,141 0	0 81	77 61	5,128 5	124 4	225 9	61 17	257 9
5,156 0	0 80	74 58	5,143 5	124 4	226 1	61 18	258 1
Last MWD Survey							
5,205 0	0 73	77 13	5,192 5	124 6	226 8	61 22	258 7
Projection to Bit							

Survey Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,762 0	1,761 9	-4 4	0 1	Gyro Tie-in
5,156 0	5,143 5	124 4	226 1	Last MWD Survey
5,205 0	5,192 5	124 6	226 8	Projection to Bit



Project: Eddy County, NM (NAN27 NME)
 Site: Foster Eddy #23
 Well: Foster Eddy #23
 Wellbore: OH - Job #32D0811740
 Design: Plan #1 Gyro Tie-in 7-7/8" Hole

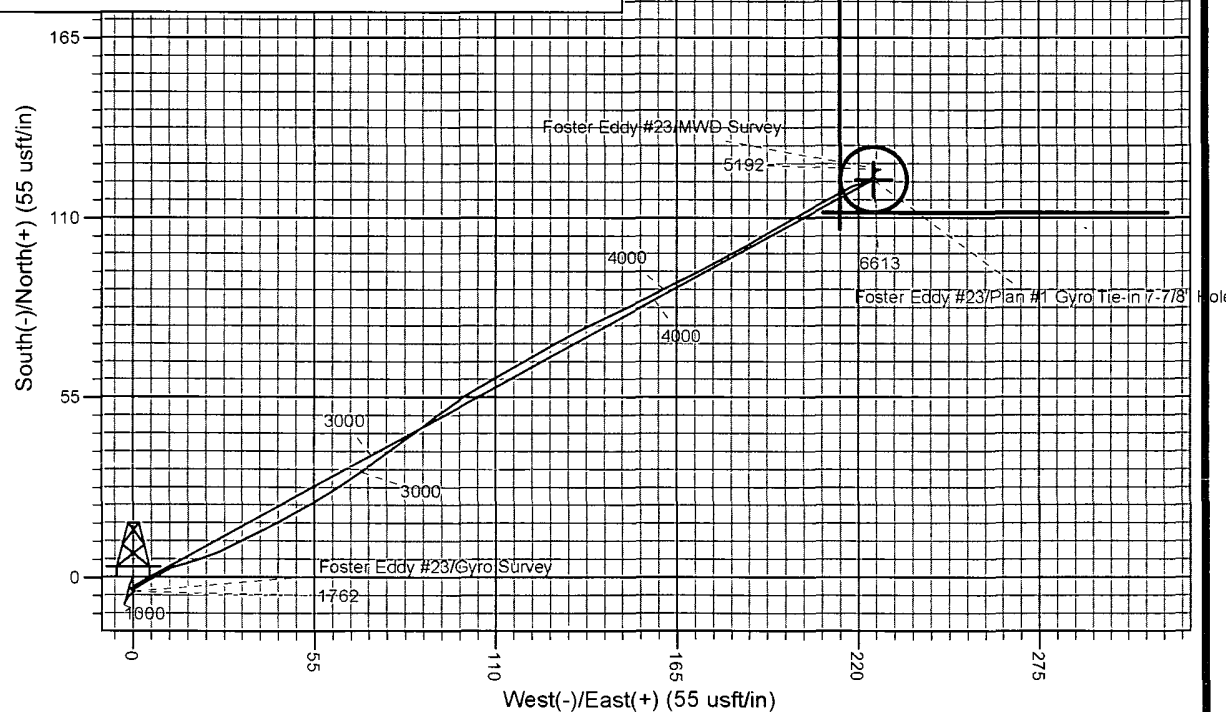


Azimuths to Grid North
 True North -0.24°
 Magnetic North 7.52°
 Magnetic Field
 Strength 48934.9nT
 Dip Angle 60.70°
 Date 8/7/2011
 Model IGRF2010

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	669104.30	637180.30	32° 50' 19.163 N	103° 53' 12.111 W	

WELL DETAILS Foster Eddy #23
 KB Elev (13') @ 3771.0usft (JW #4)
 Ground Level 3758.0
 Easting 637180.30
 Latitude 32° 50' 19.163 N

REFERENCE INFORMATION
 Co-ordinate (N/E) Reference: Well Foster Eddy #23, Grid North
 Vertical (TVD) Reference: KB Elev (13') @ 3771.0usft (JW #4)
 Section (VS) Reference: Slot - (0.0N, 0.0E)
 Measured Depth Reference: KB Elev (13') @ 3771.0usft (JW #4)
 Calculation Method: Minimum Curvature



COMPANY DETAILS: COG OPERATING LLC
 223032
 Calculation Method: Minimum Curvature
 Error System: ISCWSA
 Scan Method: Closest Approach 3D
 Error Surface: Elliptical Conic
 Warning Method: Error Ratio

PROJECT DETAILS: Eddy County, NM (NAN27 NME)
 Geodetic System: NAD State Plane 1927 (Exact solution)
 Datum: NAD 1927 (NADCON CONUS)
 Ellipsoid: Clarke 1866
 Zone: New Mexico East 3001
 System Datum: Mean Sea Level

SITE DETAILS: Foster Eddy #23
 Site Centre Latitude: 32° 50' 19.163 N
 Longitude: 103° 53' 12.111 W
 Positional Uncertainty: 0.0
 Convergence: 0.24
 Local North: Grid