



COG Operating L L C
 Project: Lea County, NM (NAD27 NME)
 Site: Sec. 34, T 25 S., R 33 E
 Well: Columbus Fee 23H
 Wellbore: Wellbore #1
 Plan: Plan #2 (Columbus Fee 23H/Wellbore #1)
 Scandril Freedom



WELL DETAILS: Columbus Fee 23H

Ground Elevation:: 3326.00
 RKB Elevation: KB=26' @ 3352.00ft (Scandril Freedom)
 Rig Name: Scandril Freedom

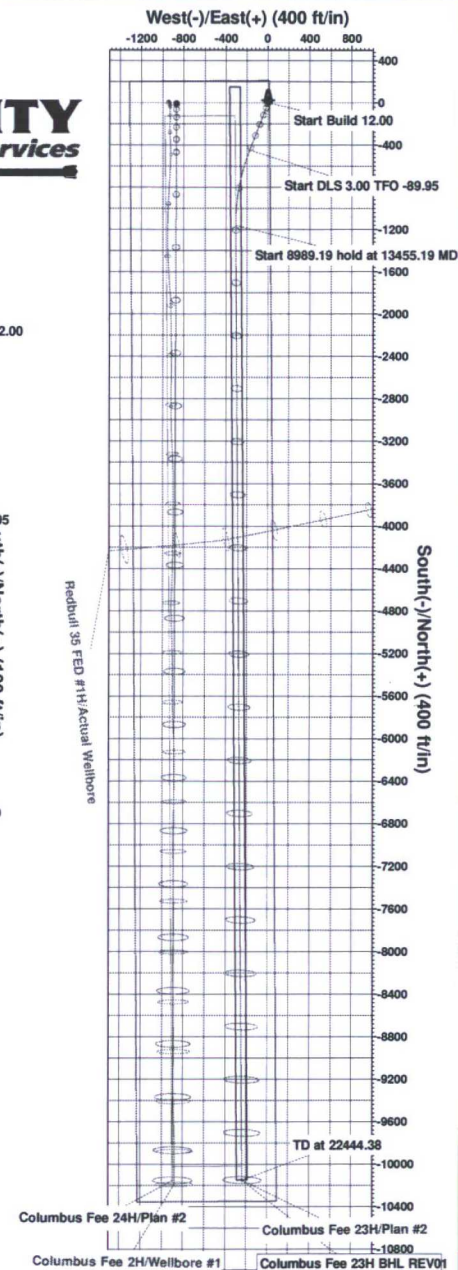
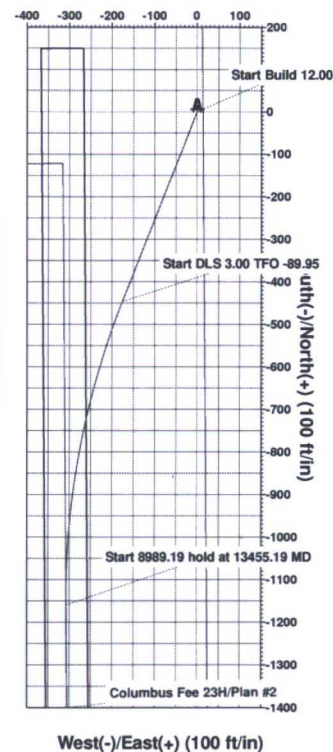
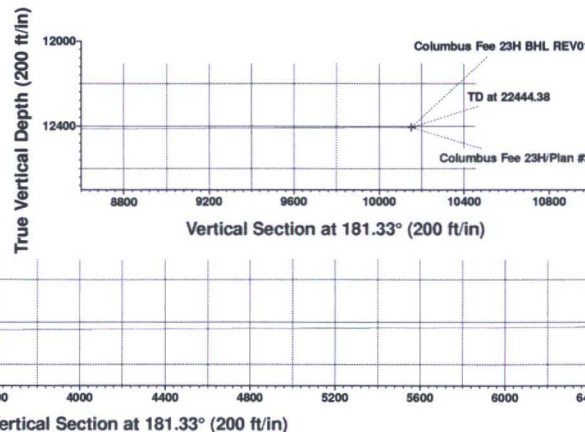
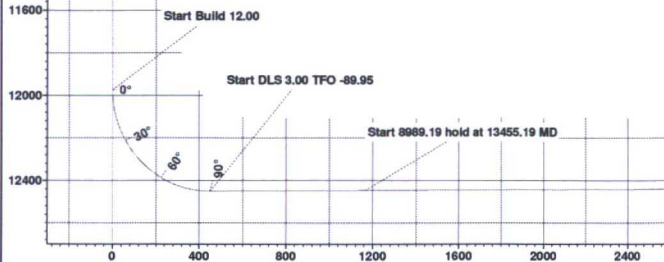
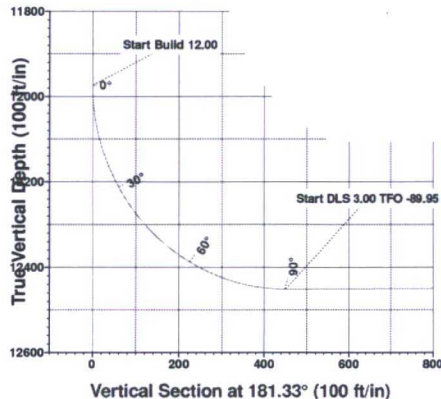
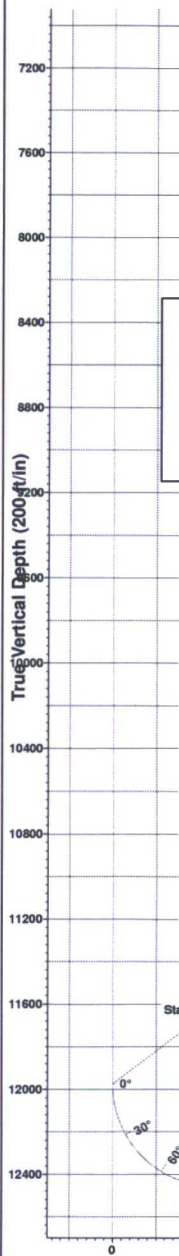
Northing Easting Latitude Longitude
 398630.3000 740877.7000 32° 5' 36.825 N 103° 33' 19.853 W

Planned Section Details

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	11973.54	0.00	0.00	11973.54	0.00	0.00	0.00	0.00	0.00
3	12725.75	90.27	201.43	12451.00	-446.51	-175.26	12.00	201.43	450.47
4	13455.19	90.27	179.55	12447.58	-1159.41	-307.23	3.00	-89.95	1166.24
5	22444.38	90.27	179.55	12406.00	-10148.22	-236.10	0.00	0.00	10150.97

PROJECT DETAILS: Lea County, NM (NAD27 NME)
 Geodetic System: US State Plane 1927 (Exact solution)
 Datum: NAD 1927 (NADCON CONUS)
 Ellipsoid: Clarke 1866
 Zone: New Mexico East 3001
 System Datum: Mean Sea Level
 Local North: Grid

T M Azimuths to Grid North
 True North: -0.41°
 Magnetic North: 6.59°
 Magnetic Field
 Strength: 47924.8snT
 Dip Angle: 59.95°
 Date: 11/9/2016
 Model: IGRF2015



Columbus Fee 24H/Plan #2
 Columbus Fee 2H/Wellbore #1
 Columbus Fee 23H/Plan #2
 Columbus Fee 23H BHL REV01



COG Operating L L C

Lea County, NM (NAD27 NME)

Sec. 34, T 25 S. , R 33 E

Columbus Fee 23H

Wellbore #1

Plan: Plan #2

Standard Survey Report

11 November, 2016





Integrity Directional Services, LLC

Survey Report



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Columbus Fee 23H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=26' @ 3352.00ft (Scandril Freedom)
Site:	Sec. 34, T 25 S. , R 33 E	MD Reference:	KB=26' @ 3352.00ft (Scandril Freedom)
Well:	Columbus Fee 23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Plan #2	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. 34, T 25 S. , R 33 E		
Site Position:		Northing:	398,623.8000 usft
From:	Map	Easting:	739,904.9000 usft
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "
		Latitude:	32° 5' 36.830 N
		Longitude:	103° 33' 31.161 W
		Grid Convergence:	0.41 °

Well	Columbus Fee 23H		
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° 5' 36.825 N
		Longitude:	103° 33' 19.853 W
		Ground Level:	3,326.00 ft

Wellbore	Wellbore #1		
Magnetics	Model Name	Sample Date	Declination
			(°)
	IGRF2015	11/9/2016	7.00
			Dip Angle
			(°)
			59.95
			Field Strength
			(nT)
			47,925

Design	Plan #2		
Audit Notes:			
Version:	Phase:	PLAN	Tie On Depth:
			0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(ft)	(ft)	(ft)
	0.00	0.00	0.00
			Direction
			(°)
			181.33

Survey Tool Program	Date 11/11/2016		
From	To	Survey (Wellbore)	Tool Name
(ft)	(ft)		
0.00	22,444.38	Plan #2 (Wellbore #1)	MWD
			Description
			MWD - Standard

Planned Survey									
Measured	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Vertical	Dogleg	Build	Turn
Depth	(°)	(°)	Depth	(ft)	(ft)	Section	Rate	Rate	Rate
(ft)			(ft)			(ft)	(°/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	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00
900.00	0.00	0.00	900.00	0.00	0.00	0.00	0.00	0.00	0.00



Integrity Directional Services, LLC

Survey Report



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Columbus Fee 23H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=26' @ 3352.00ft (Scandril Freedom)
Site:	Sec. 34, T 25 S. , R 33 E	MD Reference:	KB=26' @ 3352.00ft (Scandril Freedom)
Well:	Columbus Fee 23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Plan #2	Database:	EDM 5000.1 Multi User Db

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00
1,100.00	0.00	0.00	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00
1,200.00	0.00	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00
1,400.00	0.00	0.00	1,400.00	0.00	0.00	0.00	0.00	0.00	0.00
1,500.00	0.00	0.00	1,500.00	0.00	0.00	0.00	0.00	0.00	0.00
1,600.00	0.00	0.00	1,600.00	0.00	0.00	0.00	0.00	0.00	0.00
1,700.00	0.00	0.00	1,700.00	0.00	0.00	0.00	0.00	0.00	0.00
1,800.00	0.00	0.00	1,800.00	0.00	0.00	0.00	0.00	0.00	0.00
1,900.00	0.00	0.00	1,900.00	0.00	0.00	0.00	0.00	0.00	0.00
2,000.00	0.00	0.00	2,000.00	0.00	0.00	0.00	0.00	0.00	0.00
2,100.00	0.00	0.00	2,100.00	0.00	0.00	0.00	0.00	0.00	0.00
2,200.00	0.00	0.00	2,200.00	0.00	0.00	0.00	0.00	0.00	0.00
2,300.00	0.00	0.00	2,300.00	0.00	0.00	0.00	0.00	0.00	0.00
2,400.00	0.00	0.00	2,400.00	0.00	0.00	0.00	0.00	0.00	0.00
2,500.00	0.00	0.00	2,500.00	0.00	0.00	0.00	0.00	0.00	0.00
2,600.00	0.00	0.00	2,600.00	0.00	0.00	0.00	0.00	0.00	0.00
2,700.00	0.00	0.00	2,700.00	0.00	0.00	0.00	0.00	0.00	0.00
2,800.00	0.00	0.00	2,800.00	0.00	0.00	0.00	0.00	0.00	0.00
2,900.00	0.00	0.00	2,900.00	0.00	0.00	0.00	0.00	0.00	0.00
3,000.00	0.00	0.00	3,000.00	0.00	0.00	0.00	0.00	0.00	0.00
3,100.00	0.00	0.00	3,100.00	0.00	0.00	0.00	0.00	0.00	0.00
3,200.00	0.00	0.00	3,200.00	0.00	0.00	0.00	0.00	0.00	0.00
3,300.00	0.00	0.00	3,300.00	0.00	0.00	0.00	0.00	0.00	0.00
3,400.00	0.00	0.00	3,400.00	0.00	0.00	0.00	0.00	0.00	0.00
3,500.00	0.00	0.00	3,500.00	0.00	0.00	0.00	0.00	0.00	0.00
3,600.00	0.00	0.00	3,600.00	0.00	0.00	0.00	0.00	0.00	0.00
3,700.00	0.00	0.00	3,700.00	0.00	0.00	0.00	0.00	0.00	0.00
3,800.00	0.00	0.00	3,800.00	0.00	0.00	0.00	0.00	0.00	0.00
3,900.00	0.00	0.00	3,900.00	0.00	0.00	0.00	0.00	0.00	0.00
4,000.00	0.00	0.00	4,000.00	0.00	0.00	0.00	0.00	0.00	0.00
4,100.00	0.00	0.00	4,100.00	0.00	0.00	0.00	0.00	0.00	0.00
4,200.00	0.00	0.00	4,200.00	0.00	0.00	0.00	0.00	0.00	0.00
4,300.00	0.00	0.00	4,300.00	0.00	0.00	0.00	0.00	0.00	0.00
4,400.00	0.00	0.00	4,400.00	0.00	0.00	0.00	0.00	0.00	0.00
4,500.00	0.00	0.00	4,500.00	0.00	0.00	0.00	0.00	0.00	0.00
4,600.00	0.00	0.00	4,600.00	0.00	0.00	0.00	0.00	0.00	0.00
4,700.00	0.00	0.00	4,700.00	0.00	0.00	0.00	0.00	0.00	0.00
4,800.00	0.00	0.00	4,800.00	0.00	0.00	0.00	0.00	0.00	0.00
4,900.00	0.00	0.00	4,900.00	0.00	0.00	0.00	0.00	0.00	0.00
5,000.00	0.00	0.00	5,000.00	0.00	0.00	0.00	0.00	0.00	0.00
5,100.00	0.00	0.00	5,100.00	0.00	0.00	0.00	0.00	0.00	0.00
5,200.00	0.00	0.00	5,200.00	0.00	0.00	0.00	0.00	0.00	0.00
5,300.00	0.00	0.00	5,300.00	0.00	0.00	0.00	0.00	0.00	0.00



Integrity Directional Services, LLC

Survey Report



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Columbus Fee 23H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=26' @ 3352.00ft (Scandril Freedom)
Site:	Sec. 34, T 25 S. , R 33 E	MD Reference:	KB=26' @ 3352.00ft (Scandril Freedom)
Well:	Columbus Fee 23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Plan #2	Database:	EDM 5000.1 Multi User Db

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
5,400.00	0.00	0.00	5,400.00	0.00	0.00	0.00	0.00	0.00	0.00
5,500.00	0.00	0.00	5,500.00	0.00	0.00	0.00	0.00	0.00	0.00
5,600.00	0.00	0.00	5,600.00	0.00	0.00	0.00	0.00	0.00	0.00
5,700.00	0.00	0.00	5,700.00	0.00	0.00	0.00	0.00	0.00	0.00
5,800.00	0.00	0.00	5,800.00	0.00	0.00	0.00	0.00	0.00	0.00
5,900.00	0.00	0.00	5,900.00	0.00	0.00	0.00	0.00	0.00	0.00
6,000.00	0.00	0.00	6,000.00	0.00	0.00	0.00	0.00	0.00	0.00
6,100.00	0.00	0.00	6,100.00	0.00	0.00	0.00	0.00	0.00	0.00
6,200.00	0.00	0.00	6,200.00	0.00	0.00	0.00	0.00	0.00	0.00
6,300.00	0.00	0.00	6,300.00	0.00	0.00	0.00	0.00	0.00	0.00
6,400.00	0.00	0.00	6,400.00	0.00	0.00	0.00	0.00	0.00	0.00
6,500.00	0.00	0.00	6,500.00	0.00	0.00	0.00	0.00	0.00	0.00
6,600.00	0.00	0.00	6,600.00	0.00	0.00	0.00	0.00	0.00	0.00
6,700.00	0.00	0.00	6,700.00	0.00	0.00	0.00	0.00	0.00	0.00
6,800.00	0.00	0.00	6,800.00	0.00	0.00	0.00	0.00	0.00	0.00
6,900.00	0.00	0.00	6,900.00	0.00	0.00	0.00	0.00	0.00	0.00
7,000.00	0.00	0.00	7,000.00	0.00	0.00	0.00	0.00	0.00	0.00
7,100.00	0.00	0.00	7,100.00	0.00	0.00	0.00	0.00	0.00	0.00
7,200.00	0.00	0.00	7,200.00	0.00	0.00	0.00	0.00	0.00	0.00
7,300.00	0.00	0.00	7,300.00	0.00	0.00	0.00	0.00	0.00	0.00
7,400.00	0.00	0.00	7,400.00	0.00	0.00	0.00	0.00	0.00	0.00
7,500.00	0.00	0.00	7,500.00	0.00	0.00	0.00	0.00	0.00	0.00
7,600.00	0.00	0.00	7,600.00	0.00	0.00	0.00	0.00	0.00	0.00
7,700.00	0.00	0.00	7,700.00	0.00	0.00	0.00	0.00	0.00	0.00
7,800.00	0.00	0.00	7,800.00	0.00	0.00	0.00	0.00	0.00	0.00
7,900.00	0.00	0.00	7,900.00	0.00	0.00	0.00	0.00	0.00	0.00
8,000.00	0.00	0.00	8,000.00	0.00	0.00	0.00	0.00	0.00	0.00
8,100.00	0.00	0.00	8,100.00	0.00	0.00	0.00	0.00	0.00	0.00
8,200.00	0.00	0.00	8,200.00	0.00	0.00	0.00	0.00	0.00	0.00
8,300.00	0.00	0.00	8,300.00	0.00	0.00	0.00	0.00	0.00	0.00
8,400.00	0.00	0.00	8,400.00	0.00	0.00	0.00	0.00	0.00	0.00
8,500.00	0.00	0.00	8,500.00	0.00	0.00	0.00	0.00	0.00	0.00
8,600.00	0.00	0.00	8,600.00	0.00	0.00	0.00	0.00	0.00	0.00
8,700.00	0.00	0.00	8,700.00	0.00	0.00	0.00	0.00	0.00	0.00
8,800.00	0.00	0.00	8,800.00	0.00	0.00	0.00	0.00	0.00	0.00
8,900.00	0.00	0.00	8,900.00	0.00	0.00	0.00	0.00	0.00	0.00
9,000.00	0.00	0.00	9,000.00	0.00	0.00	0.00	0.00	0.00	0.00
9,100.00	0.00	0.00	9,100.00	0.00	0.00	0.00	0.00	0.00	0.00
9,200.00	0.00	0.00	9,200.00	0.00	0.00	0.00	0.00	0.00	0.00
9,300.00	0.00	0.00	9,300.00	0.00	0.00	0.00	0.00	0.00	0.00
9,400.00	0.00	0.00	9,400.00	0.00	0.00	0.00	0.00	0.00	0.00
9,500.00	0.00	0.00	9,500.00	0.00	0.00	0.00	0.00	0.00	0.00
9,600.00	0.00	0.00	9,600.00	0.00	0.00	0.00	0.00	0.00	0.00



Integrity Directional Services, LLC
Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 34, T 25 S. , R 33 E
Well: Columbus Fee 23H
Wellbore: Wellbore #1
Design: Plan #2

Local Co-ordinate Reference: Well Columbus Fee 23H
TVD Reference: KB=26' @ 3352.00ft (Scandril Freedom)
MD Reference: KB=26' @ 3352.00ft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Multi User Db

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
9,700.00	0.00	0.00	9,700.00	0.00	0.00	0.00	0.00	0.00	0.00
9,800.00	0.00	0.00	9,800.00	0.00	0.00	0.00	0.00	0.00	0.00
9,900.00	0.00	0.00	9,900.00	0.00	0.00	0.00	0.00	0.00	0.00
10,000.00	0.00	0.00	10,000.00	0.00	0.00	0.00	0.00	0.00	0.00
10,100.00	0.00	0.00	10,100.00	0.00	0.00	0.00	0.00	0.00	0.00
10,200.00	0.00	0.00	10,200.00	0.00	0.00	0.00	0.00	0.00	0.00
10,300.00	0.00	0.00	10,300.00	0.00	0.00	0.00	0.00	0.00	0.00
10,400.00	0.00	0.00	10,400.00	0.00	0.00	0.00	0.00	0.00	0.00
10,500.00	0.00	0.00	10,500.00	0.00	0.00	0.00	0.00	0.00	0.00
10,600.00	0.00	0.00	10,600.00	0.00	0.00	0.00	0.00	0.00	0.00
10,700.00	0.00	0.00	10,700.00	0.00	0.00	0.00	0.00	0.00	0.00
10,800.00	0.00	0.00	10,800.00	0.00	0.00	0.00	0.00	0.00	0.00
10,900.00	0.00	0.00	10,900.00	0.00	0.00	0.00	0.00	0.00	0.00
11,000.00	0.00	0.00	11,000.00	0.00	0.00	0.00	0.00	0.00	0.00
11,100.00	0.00	0.00	11,100.00	0.00	0.00	0.00	0.00	0.00	0.00
11,200.00	0.00	0.00	11,200.00	0.00	0.00	0.00	0.00	0.00	0.00
11,300.00	0.00	0.00	11,300.00	0.00	0.00	0.00	0.00	0.00	0.00
11,400.00	0.00	0.00	11,400.00	0.00	0.00	0.00	0.00	0.00	0.00
11,500.00	0.00	0.00	11,500.00	0.00	0.00	0.00	0.00	0.00	0.00
11,600.00	0.00	0.00	11,600.00	0.00	0.00	0.00	0.00	0.00	0.00
11,700.00	0.00	0.00	11,700.00	0.00	0.00	0.00	0.00	0.00	0.00
11,800.00	0.00	0.00	11,800.00	0.00	0.00	0.00	0.00	0.00	0.00
11,900.00	0.00	0.00	11,900.00	0.00	0.00	0.00	0.00	0.00	0.00
11,973.54	0.00	0.00	11,973.54	0.00	0.00	0.00	0.00	0.00	0.00
Start Build 12.00									
12,000.00	3.18	201.43	11,999.99	-0.68	-0.27	0.69	12.00	12.00	0.00
12,100.00	15.18	201.43	12,098.53	-15.50	-6.08	15.64	12.00	12.00	0.00
12,200.00	27.18	201.43	12,191.60	-49.06	-19.26	49.50	12.00	12.00	0.00
12,300.00	39.18	201.43	12,275.15	-99.91	-39.21	100.79	12.00	12.00	0.00
12,400.00	51.18	201.43	12,345.52	-165.81	-65.08	167.28	12.00	12.00	0.00
12,500.00	63.18	201.43	12,399.63	-243.89	-95.73	246.05	12.00	12.00	0.00
12,600.00	75.18	201.43	12,435.11	-330.73	-129.81	333.66	12.00	12.00	0.00
12,700.00	87.18	201.43	12,450.43	-422.55	-165.85	426.29	12.00	12.00	0.00
12,725.75	90.27	201.43	12,451.00	-446.51	-175.26	450.47	12.00	12.00	0.00
Start DLS 3.00 TFO -89.95									
12,800.00	90.27	199.20	12,450.66	-516.14	-201.03	520.67	3.00	0.00	-3.00
12,900.00	90.27	196.20	12,450.19	-611.39	-231.44	616.61	3.00	0.00	-3.00
13,000.00	90.27	193.20	12,449.72	-708.10	-256.81	713.89	3.00	0.00	-3.00
13,100.00	90.27	190.20	12,449.25	-806.01	-277.09	812.24	3.00	0.00	-3.00
13,200.00	90.27	187.20	12,448.78	-904.85	-292.22	911.40	3.00	0.00	-3.00
13,300.00	90.27	184.20	12,448.31	-1,004.34	-302.16	1,011.10	3.00	0.00	-3.00
13,400.00	90.27	181.20	12,447.84	-1,104.22	-306.87	1,111.06	3.00	0.00	-3.00
13,455.19	90.27	179.55	12,447.58	-1,159.41	-307.23	1,166.24	3.00	0.00	-3.00
Start 8989.19 hold at 13455.19 MD									



Integrity Directional Services, LLC

Survey Report



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Columbus Fee 23H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=26' @ 3352.00ft (Scandril Freedom)
Site:	Sec. 34, T 25 S. , R 33 E	MD Reference:	KB=26' @ 3352.00ft (Scandril Freedom)
Well:	Columbus Fee 23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Plan #2	Database:	EDM 5000.1 Multi User Db

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
13,500.00	90.27	179.55	12,447.38	-1,204.21	-306.88	1,211.02	0.00	0.00	0.00
13,600.00	90.27	179.55	12,446.91	-1,304.21	-306.09	1,310.98	0.00	0.00	0.00
13,700.00	90.27	179.55	12,446.45	-1,404.20	-305.30	1,410.93	0.00	0.00	0.00
13,800.00	90.27	179.55	12,445.99	-1,504.20	-304.50	1,510.88	0.00	0.00	0.00
13,900.00	90.27	179.55	12,445.53	-1,604.20	-303.71	1,610.83	0.00	0.00	0.00
14,000.00	90.27	179.55	12,445.06	-1,704.19	-302.92	1,710.78	0.00	0.00	0.00
14,100.00	90.27	179.55	12,444.60	-1,804.19	-302.13	1,810.73	0.00	0.00	0.00
14,200.00	90.27	179.55	12,444.14	-1,904.18	-301.34	1,910.68	0.00	0.00	0.00
14,300.00	90.27	179.55	12,443.68	-2,004.18	-300.55	2,010.63	0.00	0.00	0.00
14,400.00	90.27	179.55	12,443.21	-2,104.18	-299.76	2,110.58	0.00	0.00	0.00
14,500.00	90.27	179.55	12,442.75	-2,204.17	-298.97	2,210.53	0.00	0.00	0.00
14,600.00	90.27	179.55	12,442.29	-2,304.17	-298.17	2,310.48	0.00	0.00	0.00
14,700.00	90.27	179.55	12,441.83	-2,404.16	-297.38	2,410.43	0.00	0.00	0.00
14,800.00	90.27	179.55	12,441.36	-2,504.16	-296.59	2,510.38	0.00	0.00	0.00
14,900.00	90.27	179.55	12,440.90	-2,604.15	-295.80	2,610.33	0.00	0.00	0.00
15,000.00	90.27	179.55	12,440.44	-2,704.15	-295.01	2,710.28	0.00	0.00	0.00
15,100.00	90.27	179.55	12,439.98	-2,804.15	-294.22	2,810.23	0.00	0.00	0.00
15,200.00	90.27	179.55	12,439.51	-2,904.14	-293.43	2,910.18	0.00	0.00	0.00
15,300.00	90.27	179.55	12,439.05	-3,004.14	-292.63	3,010.13	0.00	0.00	0.00
15,400.00	90.27	179.55	12,438.59	-3,104.13	-291.84	3,110.08	0.00	0.00	0.00
15,500.00	90.27	179.55	12,438.12	-3,204.13	-291.05	3,210.03	0.00	0.00	0.00
15,600.00	90.27	179.55	12,437.66	-3,304.12	-290.26	3,309.98	0.00	0.00	0.00
15,700.00	90.27	179.55	12,437.20	-3,404.12	-289.47	3,409.93	0.00	0.00	0.00
15,800.00	90.27	179.55	12,436.74	-3,504.12	-288.68	3,509.88	0.00	0.00	0.00
15,900.00	90.27	179.55	12,436.27	-3,604.11	-287.89	3,609.83	0.00	0.00	0.00
16,000.00	90.27	179.55	12,435.81	-3,704.11	-287.10	3,709.78	0.00	0.00	0.00
16,100.00	90.27	179.55	12,435.35	-3,804.10	-286.30	3,809.73	0.00	0.00	0.00
16,200.00	90.27	179.55	12,434.89	-3,904.10	-285.51	3,909.68	0.00	0.00	0.00
16,300.00	90.27	179.55	12,434.42	-4,004.10	-284.72	4,009.63	0.00	0.00	0.00
16,400.00	90.27	179.55	12,433.96	-4,104.09	-283.93	4,109.58	0.00	0.00	0.00
16,500.00	90.27	179.55	12,433.50	-4,204.09	-283.14	4,209.54	0.00	0.00	0.00
16,600.00	90.27	179.55	12,433.04	-4,304.08	-282.35	4,309.49	0.00	0.00	0.00
16,700.00	90.27	179.55	12,432.57	-4,404.08	-281.56	4,409.44	0.00	0.00	0.00
16,800.00	90.27	179.55	12,432.11	-4,504.07	-280.77	4,509.39	0.00	0.00	0.00
16,900.00	90.27	179.55	12,431.65	-4,604.07	-279.97	4,609.34	0.00	0.00	0.00
17,000.00	90.27	179.55	12,431.19	-4,704.07	-279.18	4,709.29	0.00	0.00	0.00
17,100.00	90.27	179.55	12,430.72	-4,804.06	-278.39	4,809.24	0.00	0.00	0.00
17,200.00	90.27	179.55	12,430.26	-4,904.06	-277.60	4,909.19	0.00	0.00	0.00
17,300.00	90.27	179.55	12,429.80	-5,004.05	-276.81	5,009.14	0.00	0.00	0.00
17,400.00	90.27	179.55	12,429.34	-5,104.05	-276.02	5,109.09	0.00	0.00	0.00
17,500.00	90.27	179.55	12,428.87	-5,204.05	-275.23	5,209.04	0.00	0.00	0.00
17,600.00	90.27	179.55	12,428.41	-5,304.04	-274.43	5,308.99	0.00	0.00	0.00
17,700.00	90.27	179.55	12,427.95	-5,404.04	-273.64	5,408.94	0.00	0.00	0.00



Integrity Directional Services, LLC

Survey Report



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Columbus Fee 23H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=26' @ 3352.00ft (Scandril Freedom)
Site:	Sec. 34, T 25 S. , R 33 E	MD Reference:	KB=26' @ 3352.00ft (Scandril Freedom)
Well:	Columbus Fee 23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Plan #2	Database:	EDM 5000.1 Multi User Db

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
17,800.00	90.27	179.55	12,427.48	-5,504.03	-272.85	5,508.89	0.00	0.00	0.00
17,900.00	90.27	179.55	12,427.02	-5,604.03	-272.06	5,608.84	0.00	0.00	0.00
18,000.00	90.27	179.55	12,426.56	-5,704.02	-271.27	5,708.79	0.00	0.00	0.00
18,100.00	90.27	179.55	12,426.10	-5,804.02	-270.48	5,808.74	0.00	0.00	0.00
18,200.00	90.27	179.55	12,425.63	-5,904.02	-269.69	5,908.69	0.00	0.00	0.00
18,300.00	90.27	179.55	12,425.17	-6,004.01	-268.90	6,008.64	0.00	0.00	0.00
18,400.00	90.27	179.55	12,424.71	-6,104.01	-268.10	6,108.59	0.00	0.00	0.00
18,500.00	90.27	179.55	12,424.25	-6,204.00	-267.31	6,208.54	0.00	0.00	0.00
18,600.00	90.27	179.55	12,423.78	-6,304.00	-266.52	6,308.49	0.00	0.00	0.00
18,700.00	90.27	179.55	12,423.32	-6,403.99	-265.73	6,408.44	0.00	0.00	0.00
18,800.00	90.27	179.55	12,422.86	-6,503.99	-264.94	6,508.39	0.00	0.00	0.00
18,900.00	90.27	179.55	12,422.40	-6,603.99	-264.15	6,608.34	0.00	0.00	0.00
19,000.00	90.27	179.55	12,421.93	-6,703.98	-263.36	6,708.29	0.00	0.00	0.00
19,100.00	90.27	179.55	12,421.47	-6,803.98	-262.56	6,808.24	0.00	0.00	0.00
19,200.00	90.27	179.55	12,421.01	-6,903.97	-261.77	6,908.19	0.00	0.00	0.00
19,300.00	90.27	179.55	12,420.55	-7,003.97	-260.98	7,008.14	0.00	0.00	0.00
19,400.00	90.27	179.55	12,420.08	-7,103.97	-260.19	7,108.10	0.00	0.00	0.00
19,500.00	90.27	179.55	12,419.62	-7,203.96	-259.40	7,208.05	0.00	0.00	0.00
19,600.00	90.27	179.55	12,419.16	-7,303.96	-258.61	7,308.00	0.00	0.00	0.00
19,700.00	90.27	179.55	12,418.70	-7,403.95	-257.82	7,407.95	0.00	0.00	0.00
19,800.00	90.27	179.55	12,418.23	-7,503.95	-257.03	7,507.90	0.00	0.00	0.00
19,900.00	90.27	179.55	12,417.77	-7,603.94	-256.23	7,607.85	0.00	0.00	0.00
20,000.00	90.27	179.55	12,417.31	-7,703.94	-255.44	7,707.80	0.00	0.00	0.00
20,100.00	90.27	179.55	12,416.85	-7,803.94	-254.65	7,807.75	0.00	0.00	0.00
20,200.00	90.27	179.55	12,416.38	-7,903.93	-253.86	7,907.70	0.00	0.00	0.00
20,300.00	90.27	179.55	12,415.92	-8,003.93	-253.07	8,007.65	0.00	0.00	0.00
20,400.00	90.27	179.55	12,415.46	-8,103.92	-252.28	8,107.60	0.00	0.00	0.00
20,500.00	90.27	179.55	12,414.99	-8,203.92	-251.49	8,207.55	0.00	0.00	0.00
20,600.00	90.27	179.55	12,414.53	-8,303.91	-250.70	8,307.50	0.00	0.00	0.00
20,700.00	90.27	179.55	12,414.07	-8,403.91	-249.90	8,407.45	0.00	0.00	0.00
20,800.00	90.27	179.55	12,413.61	-8,503.91	-249.11	8,507.40	0.00	0.00	0.00
20,900.00	90.27	179.55	12,413.14	-8,603.90	-248.32	8,607.35	0.00	0.00	0.00
21,000.00	90.27	179.55	12,412.68	-8,703.90	-247.53	8,707.30	0.00	0.00	0.00
21,100.00	90.27	179.55	12,412.22	-8,803.89	-246.74	8,807.25	0.00	0.00	0.00
21,200.00	90.27	179.55	12,411.76	-8,903.89	-245.95	8,907.20	0.00	0.00	0.00
21,300.00	90.27	179.55	12,411.29	-9,003.89	-245.16	9,007.15	0.00	0.00	0.00
21,400.00	90.27	179.55	12,410.83	-9,103.88	-244.36	9,107.10	0.00	0.00	0.00
21,500.00	90.27	179.55	12,410.37	-9,203.88	-243.57	9,207.05	0.00	0.00	0.00
21,600.00	90.27	179.55	12,409.91	-9,303.87	-242.78	9,307.00	0.00	0.00	0.00
21,700.00	90.27	179.55	12,409.44	-9,403.87	-241.99	9,406.95	0.00	0.00	0.00
21,800.00	90.27	179.55	12,408.98	-9,503.86	-241.20	9,506.90	0.00	0.00	0.00
21,900.00	90.27	179.55	12,408.52	-9,603.86	-240.41	9,606.85	0.00	0.00	0.00
22,000.00	90.27	179.55	12,408.06	-9,703.86	-239.62	9,706.80	0.00	0.00	0.00
22,100.00	90.27	179.55	12,407.59	-9,803.85	-238.83	9,806.75	0.00	0.00	0.00



Integrity Directional Services, LLC
Survey Report



Company:	COG Operating L L C	Local Co-ordinate Reference:	Well Columbus Fee 23H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB=26' @ 3352.00ft (Scandril Freedom)
Site:	Sec. 34, T 25 S. , R 33 E	MD Reference:	KB=26' @ 3352.00ft (Scandril Freedom)
Well:	Columbus Fee 23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Plan #2	Database:	EDM 5000.1 Multi User Db

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
22,200.00	90.27	179.55	12,407.13	-9,903.85	-238.03	9,906.70	0.00	0.00	0.00
22,300.00	90.27	179.55	12,406.67	-10,003.84	-237.24	10,006.66	0.00	0.00	0.00
22,400.00	90.27	179.55	12,406.21	-10,103.84	-236.45	10,106.61	0.00	0.00	0.00
22,444.38	90.27	179.55	12,406.00	-10,148.22	-236.10	10,150.97	0.00	0.00	0.00
TD at 22444.38									

Design Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
23H Drilling Window (	0.00	0.00	0.00	-10,148.22	-236.10	388,482.1003	740,641.6005	32° 3' 56.418 N	103° 33' 23.447 W
- plan misses target center by 10150.97ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Rectangle (sides W100.00 H10,298.22 D0.00)									
Columbus Fee 23H B	0.00	0.00	12,406.00	-10,148.22	-236.10	388,482.1000	740,641.6000	32° 3' 56.418 N	103° 33' 23.447 W
- plan hits target center									
- Point									

Plan Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	+E/-W (ft)	Comment
11,974	11,974	0	0	Start Build 12.00
12,726	12,451	-447	-175	Start DLS 3.00 TFO -89.95
13,455	12,448	-1159	-307	Start 8989.19 hold at 13455.19 MD
22,444	12,406	-10,148	-236	TD at 22444.38

Checked By: _____ Approved By: _____ Date: _____