



COG Operating, LLC

Lea County, NM

Sec 35, T20S, R34E

Mas Federal Com #1H

Wellbore #1

Plan: Plan #1

HOBBS OCD

OCT 03 2017

RECEIVED

QES Well Planning Report

07 July, 2017



Database: EDM5002
Company: COG Operating, LLC
Project: Lea County, NM
Site: Sec 35, T20S, R34E
Well: Mas Federal Com #1H
Wellbore: Wellbore #1
Design: Plan #1

Local Co-ordinate Reference: Well Mas Federal Com #1H
TVD Reference: RKB @ 3751.0usft (Noram #21)
MD Reference: RKB @ 3751.0usft (Noram #21)
North Reference: Grid
Survey Calculation Method: Minimum Curvature

Project Lea County, NM
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 35, T20S, R34E
Site Position: Northing: 559,699.50 usft Latitude: 32° 32' 10.321 N
From: Map Easting: 745,455.60 usft Longitude: 103° 32' 12.727 W
Position Uncertainty: 0.0 usft Slot Radius: 13-3/16 " Grid Convergence: 0.43 °

Well Mas Federal Com #1H
Well Position +N/-S 0.0 usft Northing: 559,699.50 usft Latitude: 32° 32' 10.321 N
 +E/-W 0.0 usft Easting: 745,455.60 usft Longitude: 103° 32' 12.727 W
Position Uncertainty 0.0 usft Wellhead Elevation: 0.0 usft Ground Level: 3,722.0 usft

Wellbore	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	7/7/2017	6.95	60.35	48,119

Design Plan #1
Audit Notes:
Version: Phase: PLAN Tie On Depth: 0.0
Vertical Section: Depth From (TVD) +N/-S +E/-W Direction
 (usft) (usft) (usft) (°)
 0.0 0.0 0.0 179.64

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
10,853.7	0.00	0.00	10,853.7	0.0	0.0	0.00	0.00	0.00	0.00	
11,594.5	88.90	179.64	11,331.1	-468.3	3.0	12.00	12.00	24.25	179.64	
16,016.8	88.90	179.64	11,416.0	-4,889.7	31.0	0.00	0.00	0.00	0.00	PBHL - Mas Federal C

Database:	EDM5002	Local Co-ordinate Reference:	Well Mas Federal Com #1H
Company:	COG Operating, LLC	TVD Reference:	RKB @ 3751.0usft (Noram #21)
Project:	Lea County, NM	MD Reference:	RKB @ 3751.0usft (Noram #21)
Site:	Sec 35, T20S, R34E	North Reference:	Grid
Well:	Mas Federal Com #1H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1		

Planned 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)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	0.00
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	0.00
300.0	0.00	0.00	300.0	0.0	0.0	0.0	0.00	0.00	0.00
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	0.00
500.0	0.00	0.00	500.0	0.0	0.0	0.0	0.00	0.00	0.00
600.0	0.00	0.00	600.0	0.0	0.0	0.0	0.00	0.00	0.00
700.0	0.00	0.00	700.0	0.0	0.0	0.0	0.00	0.00	0.00
800.0	0.00	0.00	800.0	0.0	0.0	0.0	0.00	0.00	0.00
900.0	0.00	0.00	900.0	0.0	0.0	0.0	0.00	0.00	0.00
1,000.0	0.00	0.00	1,000.0	0.0	0.0	0.0	0.00	0.00	0.00
1,100.0	0.00	0.00	1,100.0	0.0	0.0	0.0	0.00	0.00	0.00
1,200.0	0.00	0.00	1,200.0	0.0	0.0	0.0	0.00	0.00	0.00
1,300.0	0.00	0.00	1,300.0	0.0	0.0	0.0	0.00	0.00	0.00
1,400.0	0.00	0.00	1,400.0	0.0	0.0	0.0	0.00	0.00	0.00
1,500.0	0.00	0.00	1,500.0	0.0	0.0	0.0	0.00	0.00	0.00
1,600.0	0.00	0.00	1,600.0	0.0	0.0	0.0	0.00	0.00	0.00
Rustler									
1,626.0	0.00	0.00	1,626.0	0.0	0.0	0.0	0.00	0.00	0.00
1,700.0	0.00	0.00	1,700.0	0.0	0.0	0.0	0.00	0.00	0.00
TOS									
1,716.0	0.00	0.00	1,716.0	0.0	0.0	0.0	0.00	0.00	0.00
1,800.0	0.00	0.00	1,800.0	0.0	0.0	0.0	0.00	0.00	0.00
1,900.0	0.00	0.00	1,900.0	0.0	0.0	0.0	0.00	0.00	0.00
2,000.0	0.00	0.00	2,000.0	0.0	0.0	0.0	0.00	0.00	0.00
2,100.0	0.00	0.00	2,100.0	0.0	0.0	0.0	0.00	0.00	0.00
2,200.0	0.00	0.00	2,200.0	0.0	0.0	0.0	0.00	0.00	0.00
2,300.0	0.00	0.00	2,300.0	0.0	0.0	0.0	0.00	0.00	0.00
2,400.0	0.00	0.00	2,400.0	0.0	0.0	0.0	0.00	0.00	0.00
2,500.0	0.00	0.00	2,500.0	0.0	0.0	0.0	0.00	0.00	0.00
2,600.0	0.00	0.00	2,600.0	0.0	0.0	0.0	0.00	0.00	0.00
2,700.0	0.00	0.00	2,700.0	0.0	0.0	0.0	0.00	0.00	0.00
2,800.0	0.00	0.00	2,800.0	0.0	0.0	0.0	0.00	0.00	0.00
2,900.0	0.00	0.00	2,900.0	0.0	0.0	0.0	0.00	0.00	0.00
3,000.0	0.00	0.00	3,000.0	0.0	0.0	0.0	0.00	0.00	0.00
3,100.0	0.00	0.00	3,100.0	0.0	0.0	0.0	0.00	0.00	0.00
3,200.0	0.00	0.00	3,200.0	0.0	0.0	0.0	0.00	0.00	0.00
3,300.0	0.00	0.00	3,300.0	0.0	0.0	0.0	0.00	0.00	0.00
BOS (Castle)									
3,351.0	0.00	0.00	3,351.0	0.0	0.0	0.0	0.00	0.00	0.00
3,400.0	0.00	0.00	3,400.0	0.0	0.0	0.0	0.00	0.00	0.00
3,500.0	0.00	0.00	3,500.0	0.0	0.0	0.0	0.00	0.00	0.00
Yates									
3,501.0	0.00	0.00	3,501.0	0.0	0.0	0.0	0.00	0.00	0.00
3,600.0	0.00	0.00	3,600.0	0.0	0.0	0.0	0.00	0.00	0.00
3,700.0	0.00	0.00	3,700.0	0.0	0.0	0.0	0.00	0.00	0.00
3,800.0	0.00	0.00	3,800.0	0.0	0.0	0.0	0.00	0.00	0.00
Reef									
3,841.0	0.00	0.00	3,841.0	0.0	0.0	0.0	0.00	0.00	0.00
3,900.0	0.00	0.00	3,900.0	0.0	0.0	0.0	0.00	0.00	0.00
4,000.0	0.00	0.00	4,000.0	0.0	0.0	0.0	0.00	0.00	0.00
4,100.0	0.00	0.00	4,100.0	0.0	0.0	0.0	0.00	0.00	0.00
4,200.0	0.00	0.00	4,200.0	0.0	0.0	0.0	0.00	0.00	0.00
4,300.0	0.00	0.00	4,300.0	0.0	0.0	0.0	0.00	0.00	0.00

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Planned 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)
4,400.0	0.00	0.00	4,400.0	0.0	0.0	0.0	0.00	0.00	0.00
4,500.0	0.00	0.00	4,500.0	0.0	0.0	0.0	0.00	0.00	0.00
4,600.0	0.00	0.00	4,600.0	0.0	0.0	0.0	0.00	0.00	0.00
4,700.0	0.00	0.00	4,700.0	0.0	0.0	0.0	0.00	0.00	0.00
4,800.0	0.00	0.00	4,800.0	0.0	0.0	0.0	0.00	0.00	0.00
4,900.0	0.00	0.00	4,900.0	0.0	0.0	0.0	0.00	0.00	0.00
5,000.0	0.00	0.00	5,000.0	0.0	0.0	0.0	0.00	0.00	0.00
5,100.0	0.00	0.00	5,100.0	0.0	0.0	0.0	0.00	0.00	0.00
5,200.0	0.00	0.00	5,200.0	0.0	0.0	0.0	0.00	0.00	0.00
5,300.0	0.00	0.00	5,300.0	0.0	0.0	0.0	0.00	0.00	0.00
5,400.0	0.00	0.00	5,400.0	0.0	0.0	0.0	0.00	0.00	0.00
5,500.0	0.00	0.00	5,500.0	0.0	0.0	0.0	0.00	0.00	0.00
5,600.0	0.00	0.00	5,600.0	0.0	0.0	0.0	0.00	0.00	0.00
5,700.0	0.00	0.00	5,700.0	0.0	0.0	0.0	0.00	0.00	0.00
Base of Reef (BLCN)									
5,741.0	0.00	0.00	5,741.0	0.0	0.0	0.0	0.00	0.00	0.00
CYCN									
5,796.0	0.00	0.00	5,796.0	0.0	0.0	0.0	0.00	0.00	0.00
5,800.0	0.00	0.00	5,800.0	0.0	0.0	0.0	0.00	0.00	0.00
5,900.0	0.00	0.00	5,900.0	0.0	0.0	0.0	0.00	0.00	0.00
6,000.0	0.00	0.00	6,000.0	0.0	0.0	0.0	0.00	0.00	0.00
6,100.0	0.00	0.00	6,100.0	0.0	0.0	0.0	0.00	0.00	0.00
6,200.0	0.00	0.00	6,200.0	0.0	0.0	0.0	0.00	0.00	0.00
6,300.0	0.00	0.00	6,300.0	0.0	0.0	0.0	0.00	0.00	0.00
6,400.0	0.00	0.00	6,400.0	0.0	0.0	0.0	0.00	0.00	0.00
6,500.0	0.00	0.00	6,500.0	0.0	0.0	0.0	0.00	0.00	0.00
6,600.0	0.00	0.00	6,600.0	0.0	0.0	0.0	0.00	0.00	0.00
6,700.0	0.00	0.00	6,700.0	0.0	0.0	0.0	0.00	0.00	0.00
BYCN									
6,751.0	0.00	0.00	6,751.0	0.0	0.0	0.0	0.00	0.00	0.00
6,800.0	0.00	0.00	6,800.0	0.0	0.0	0.0	0.00	0.00	0.00
6,900.0	0.00	0.00	6,900.0	0.0	0.0	0.0	0.00	0.00	0.00
7,000.0	0.00	0.00	7,000.0	0.0	0.0	0.0	0.00	0.00	0.00
7,100.0	0.00	0.00	7,100.0	0.0	0.0	0.0	0.00	0.00	0.00
7,200.0	0.00	0.00	7,200.0	0.0	0.0	0.0	0.00	0.00	0.00
7,300.0	0.00	0.00	7,300.0	0.0	0.0	0.0	0.00	0.00	0.00
7,400.0	0.00	0.00	7,400.0	0.0	0.0	0.0	0.00	0.00	0.00
7,500.0	0.00	0.00	7,500.0	0.0	0.0	0.0	0.00	0.00	0.00
7,600.0	0.00	0.00	7,600.0	0.0	0.0	0.0	0.00	0.00	0.00
7,700.0	0.00	0.00	7,700.0	0.0	0.0	0.0	0.00	0.00	0.00
7,800.0	0.00	0.00	7,800.0	0.0	0.0	0.0	0.00	0.00	0.00
7,900.0	0.00	0.00	7,900.0	0.0	0.0	0.0	0.00	0.00	0.00
8,000.0	0.00	0.00	8,000.0	0.0	0.0	0.0	0.00	0.00	0.00
8,100.0	0.00	0.00	8,100.0	0.0	0.0	0.0	0.00	0.00	0.00
8,200.0	0.00	0.00	8,200.0	0.0	0.0	0.0	0.00	0.00	0.00
8,300.0	0.00	0.00	8,300.0	0.0	0.0	0.0	0.00	0.00	0.00
8,400.0	0.00	0.00	8,400.0	0.0	0.0	0.0	0.00	0.00	0.00
8,500.0	0.00	0.00	8,500.0	0.0	0.0	0.0	0.00	0.00	0.00
Bone Sprg (BSGL)									
8,591.0	0.00	0.00	8,591.0	0.0	0.0	0.0	0.00	0.00	0.00
8,600.0	0.00	0.00	8,600.0	0.0	0.0	0.0	0.00	0.00	0.00
8,700.0	0.00	0.00	8,700.0	0.0	0.0	0.0	0.00	0.00	0.00
8,800.0	0.00	0.00	8,800.0	0.0	0.0	0.0	0.00	0.00	0.00

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Well: Mas Federal Com #1H
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Local Co-ordinate Reference:
TVD Reference:
MD Reference:
North Reference:
Survey Calculation Method:

Well Mas Federal Com #1H
RKB @ 3751.0usft (Noram #21)
RKB @ 3751.0usft (Noram #21)
Grid
Minimum Curvature

Planned 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)
8,900.0	0.00	0.00	8,900.0	0.0	0.0	0.0	0.00	0.00	0.00
9,000.0	0.00	0.00	9,000.0	0.0	0.0	0.0	0.00	0.00	0.00
U Avalon Sh									
9,051.0	0.00	0.00	9,051.0	0.0	0.0	0.0	0.00	0.00	0.00
9,100.0	0.00	0.00	9,100.0	0.0	0.0	0.0	0.00	0.00	0.00
L Avalon Sh									
9,171.0	0.00	0.00	9,171.0	0.0	0.0	0.0	0.00	0.00	0.00
9,200.0	0.00	0.00	9,200.0	0.0	0.0	0.0	0.00	0.00	0.00
9,300.0	0.00	0.00	9,300.0	0.0	0.0	0.0	0.00	0.00	0.00
9,400.0	0.00	0.00	9,400.0	0.0	0.0	0.0	0.00	0.00	0.00
9,500.0	0.00	0.00	9,500.0	0.0	0.0	0.0	0.00	0.00	0.00
9,600.0	0.00	0.00	9,600.0	0.0	0.0	0.0	0.00	0.00	0.00
9,700.0	0.00	0.00	9,700.0	0.0	0.0	0.0	0.00	0.00	0.00
FBSG_sand									
9,711.0	0.00	0.00	9,711.0	0.0	0.0	0.0	0.00	0.00	0.00
9,800.0	0.00	0.00	9,800.0	0.0	0.0	0.0	0.00	0.00	0.00
9,900.0	0.00	0.00	9,900.0	0.0	0.0	0.0	0.00	0.00	0.00
10,000.0	0.00	0.00	10,000.0	0.0	0.0	0.0	0.00	0.00	0.00
10,100.0	0.00	0.00	10,100.0	0.0	0.0	0.0	0.00	0.00	0.00
10,200.0	0.00	0.00	10,200.0	0.0	0.0	0.0	0.00	0.00	0.00
SBSG_sand									
10,294.0	0.00	0.00	10,294.0	0.0	0.0	0.0	0.00	0.00	0.00
10,300.0	0.00	0.00	10,300.0	0.0	0.0	0.0	0.00	0.00	0.00
10,400.0	0.00	0.00	10,400.0	0.0	0.0	0.0	0.00	0.00	0.00
10,500.0	0.00	0.00	10,500.0	0.0	0.0	0.0	0.00	0.00	0.00
10,600.0	0.00	0.00	10,600.0	0.0	0.0	0.0	0.00	0.00	0.00
10,700.0	0.00	0.00	10,700.0	0.0	0.0	0.0	0.00	0.00	0.00
10,800.0	0.00	0.00	10,800.0	0.0	0.0	0.0	0.00	0.00	0.00
Build 12°/100'									
10,853.7	0.00	0.00	10,853.7	0.0	0.0	0.0	0.00	0.00	0.00
10,875.0	2.56	179.64	10,875.0	-0.5	0.0	0.5	12.00	12.00	0.00
10,900.0	5.56	179.64	10,899.9	-2.2	0.0	2.2	12.00	12.00	0.00
10,925.0	8.56	179.64	10,924.7	-5.3	0.0	5.3	12.00	12.00	0.00
10,950.0	11.56	179.64	10,949.3	-9.7	0.1	9.7	12.00	12.00	0.00
10,975.0	14.56	179.64	10,973.7	-15.3	0.1	15.3	12.00	12.00	0.00
11,000.0	17.56	179.64	10,997.7	-22.2	0.1	22.2	12.00	12.00	0.00
11,025.0	20.56	179.64	11,021.3	-30.4	0.2	30.4	12.00	12.00	0.00
11,050.0	23.56	179.64	11,044.5	-39.8	0.3	39.8	12.00	12.00	0.00
11,075.0	26.56	179.64	11,067.2	-50.4	0.3	50.4	12.00	12.00	0.00
11,100.0	29.56	179.64	11,089.2	-62.1	0.4	62.1	12.00	12.00	0.00
TBSG_sand									
11,113.7	31.19	179.64	11,101.0	-69.0	0.4	69.0	12.00	12.00	0.00
11,125.0	32.56	179.64	11,110.6	-75.0	0.5	75.0	12.00	12.00	0.00
11,150.0	35.56	179.64	11,131.3	-89.0	0.6	89.0	12.00	12.00	0.00
11,175.0	38.56	179.64	11,151.3	-104.1	0.7	104.1	12.00	12.00	0.00
11,200.0	41.56	179.64	11,170.4	-120.2	0.8	120.2	12.00	12.00	0.00
11,225.0	44.56	179.64	11,188.7	-137.2	0.9	137.2	12.00	12.00	0.00
11,250.0	47.56	179.64	11,206.0	-155.2	1.0	155.2	12.00	12.00	0.00
11,275.0	50.56	179.64	11,222.4	-174.1	1.1	174.1	12.00	12.00	0.00
11,300.0	53.56	179.64	11,237.8	-193.8	1.2	193.8	12.00	12.00	0.00
11,325.0	56.56	179.64	11,252.1	-214.3	1.4	214.3	12.00	12.00	0.00
11,350.0	59.56	179.64	11,265.3	-235.5	1.5	235.5	12.00	12.00	0.00
11,375.0	62.56	179.64	11,277.4	-257.4	1.6	257.4	12.00	12.00	0.00

Database:	EDM5002	Local Co-ordinate Reference:	Well Mas Federal Com #1H
Company:	COG Operating, LLC	TVD Reference:	RKB @ 3751.0usft (Noram #21)
Project:	Lea County, NM	MD Reference:	RKB @ 3751.0usft (Noram #21)
Site:	Sec 35, T20S, R34E	North Reference:	Grid
Well:	Mas Federal Com #1H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1		

Planned 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)
WFMP									
11,382.9	63.50	179.64	11,281.0	-264.4	1.7	264.4	12.00	12.00	0.00
11,400.0	65.56	179.64	11,288.4	-279.9	1.8	279.9	12.00	12.00	0.00
11,425.0	68.56	179.64	11,298.1	-302.9	1.9	302.9	12.00	12.00	0.00
11,450.0	71.56	179.64	11,306.6	-326.4	2.1	326.4	12.00	12.00	0.00
11,475.0	74.56	179.64	11,313.9	-350.3	2.2	350.3	12.00	12.00	0.00
11,500.0	77.56	179.64	11,319.9	-374.6	2.4	374.6	12.00	12.00	0.00
11,525.0	80.56	179.64	11,324.7	-399.1	2.5	399.1	12.00	12.00	0.00
11,550.0	83.56	179.64	11,328.1	-423.9	2.7	423.9	12.00	12.00	0.00
11,575.0	86.56	179.64	11,330.3	-448.8	2.8	448.8	12.00	12.00	0.00
EOC @ 88.90° Inc / 179.64° Azm / 11331.1' TVD									
11,594.5	88.90	179.64	11,331.1	-468.3	3.0	468.3	12.00	12.00	0.00
11,600.0	88.90	179.64	11,331.2	-473.8	3.0	473.8	0.00	0.00	0.00
11,700.0	88.90	179.64	11,333.1	-573.7	3.6	573.7	0.00	0.00	0.00
11,800.0	88.90	179.64	11,335.0	-673.7	4.3	673.7	0.00	0.00	0.00
11,900.0	88.90	179.64	11,336.9	-773.7	4.9	773.7	0.00	0.00	0.00
12,000.0	88.90	179.64	11,338.9	-873.7	5.5	873.7	0.00	0.00	0.00
12,100.0	88.90	179.64	11,340.8	-973.7	6.2	973.7	0.00	0.00	0.00
12,200.0	88.90	179.64	11,342.7	-1,073.6	6.8	1,073.7	0.00	0.00	0.00
12,300.0	88.90	179.64	11,344.6	-1,173.6	7.4	1,173.6	0.00	0.00	0.00
12,400.0	88.90	179.64	11,346.5	-1,273.6	8.1	1,273.6	0.00	0.00	0.00
12,500.0	88.90	179.64	11,348.5	-1,373.6	8.7	1,373.6	0.00	0.00	0.00
12,600.0	88.90	179.64	11,350.4	-1,473.6	9.3	1,473.6	0.00	0.00	0.00
12,700.0	88.90	179.64	11,352.3	-1,573.5	10.0	1,573.6	0.00	0.00	0.00
12,800.0	88.90	179.64	11,354.2	-1,673.5	10.6	1,673.5	0.00	0.00	0.00
12,900.0	88.90	179.64	11,356.1	-1,773.5	11.2	1,773.5	0.00	0.00	0.00
13,000.0	88.90	179.64	11,358.1	-1,873.5	11.9	1,873.5	0.00	0.00	0.00
13,100.0	88.90	179.64	11,360.0	-1,973.4	12.5	1,973.5	0.00	0.00	0.00
13,200.0	88.90	179.64	11,361.9	-2,073.4	13.1	2,073.5	0.00	0.00	0.00
13,300.0	88.90	179.64	11,363.8	-2,173.4	13.8	2,173.5	0.00	0.00	0.00
13,400.0	88.90	179.64	11,365.7	-2,273.4	14.4	2,273.4	0.00	0.00	0.00
13,500.0	88.90	179.64	11,367.7	-2,373.4	15.0	2,373.4	0.00	0.00	0.00
13,600.0	88.90	179.64	11,369.6	-2,473.3	15.7	2,473.4	0.00	0.00	0.00
13,700.0	88.90	179.64	11,371.5	-2,573.3	16.3	2,573.4	0.00	0.00	0.00
13,800.0	88.90	179.64	11,373.4	-2,673.3	16.9	2,673.4	0.00	0.00	0.00
13,900.0	88.90	179.64	11,375.3	-2,773.3	17.6	2,773.3	0.00	0.00	0.00
14,000.0	88.90	179.64	11,377.3	-2,873.3	18.2	2,873.3	0.00	0.00	0.00
14,100.0	88.90	179.64	11,379.2	-2,973.2	18.8	2,973.3	0.00	0.00	0.00
14,200.0	88.90	179.64	11,381.1	-3,073.2	19.5	3,073.3	0.00	0.00	0.00
14,300.0	88.90	179.64	11,383.0	-3,173.2	20.1	3,173.3	0.00	0.00	0.00
14,400.0	88.90	179.64	11,385.0	-3,273.2	20.8	3,273.2	0.00	0.00	0.00
14,500.0	88.90	179.64	11,386.9	-3,373.2	21.4	3,373.2	0.00	0.00	0.00
14,600.0	88.90	179.64	11,388.8	-3,473.1	22.0	3,473.2	0.00	0.00	0.00
14,700.0	88.90	179.64	11,390.7	-3,573.1	22.7	3,573.2	0.00	0.00	0.00
14,800.0	88.90	179.64	11,392.6	-3,673.1	23.3	3,673.2	0.00	0.00	0.00
14,900.0	88.90	179.64	11,394.6	-3,773.1	23.9	3,773.2	0.00	0.00	0.00
15,000.0	88.90	179.64	11,396.5	-3,873.1	24.6	3,873.1	0.00	0.00	0.00
15,100.0	88.90	179.64	11,398.4	-3,973.0	25.2	3,973.1	0.00	0.00	0.00
15,200.0	88.90	179.64	11,400.3	-4,073.0	25.8	4,073.1	0.00	0.00	0.00
15,300.0	88.90	179.64	11,402.2	-4,173.0	26.5	4,173.1	0.00	0.00	0.00
15,400.0	88.90	179.64	11,404.2	-4,273.0	27.1	4,273.1	0.00	0.00	0.00
15,500.0	88.90	179.64	11,406.1	-4,373.0	27.7	4,373.0	0.00	0.00	0.00
15,600.0	88.90	179.64	11,408.0	-4,472.9	28.4	4,473.0	0.00	0.00	0.00
15,700.0	88.90	179.64	11,409.9	-4,572.9	29.0	4,573.0	0.00	0.00	0.00

Database:	EDMS002	Local Co-ordinate Reference:	Well Mas Federal Com #1H
Company:	COG Operating, LLC	TVD Reference:	RKB @ 3751.0usft (Noram #21)
Project:	Lea County, NM	MD Reference:	RKB @ 3751.0usft (Noram #21)
Site:	Sec 35, T20S, R34E	North Reference:	Grid
Well:	Mas Federal Com #1H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1		

Planned 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)
15,800.0	88.90	179.64	11,411.8	-4,672.9	29.6	4,673.0	0.00	0.00	0.00
15,900.0	88.90	179.64	11,413.8	-4,772.9	30.3	4,773.0	0.00	0.00	0.00
16,000.0	88.90	179.64	11,415.7	-4,872.9	30.9	4,873.0	0.00	0.00	0.00
TD @ 16016.8' MD / 11416.0' TVD									
16,016.8	88.90	179.64	11,416.0	-4,889.7	31.0	4,889.8	0.00	0.00	0.00

Design Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
PBHL - Mas Federal Cor	0.00	0.00	11,416.0	-4,889.7	31.0	554,809.80	745,486.60	32° 31' 21.935 N	103° 32' 12.792 W
- plan hits target center									
- Point									

Formations						
Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)	
1,626.0	1,626.0	Rustler				
1,716.0	1,716.0	TOS				
3,351.0	3,351.0	BOS (Castle)				
3,501.0	3,501.0	Yates				
3,841.0	3,841.0	Reef				
5,741.0	5,741.0	Base of Reef (BLCN)				
5,796.0	5,796.0	CYCN				
6,751.0	6,751.0	BYCN				
8,591.0	8,591.0	Bone Sprg (BSGL)				
9,051.0	9,051.0	U Avalon Sh				
9,171.0	9,171.0	L Avalon Sh				
9,711.0	9,711.0	FBSG_sand				
10,294.0	10,294.0	SBSG_sand				
11,113.7	11,101.0	TBSG_sand				
11,382.9	11,281.0	WFMP				

Plan Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
10,853.7	10,853.7	0.0	0.0	Build 12°/100'
11,594.5	11,331.1	-468.3	3.0	EOC @ 88.90° Inc / 179.64° Azm / 11331.1' TVD
16,016.8	11,416.0	-4,889.7	31.0	TD @ 16016.8' MD / 11416.0' TVD



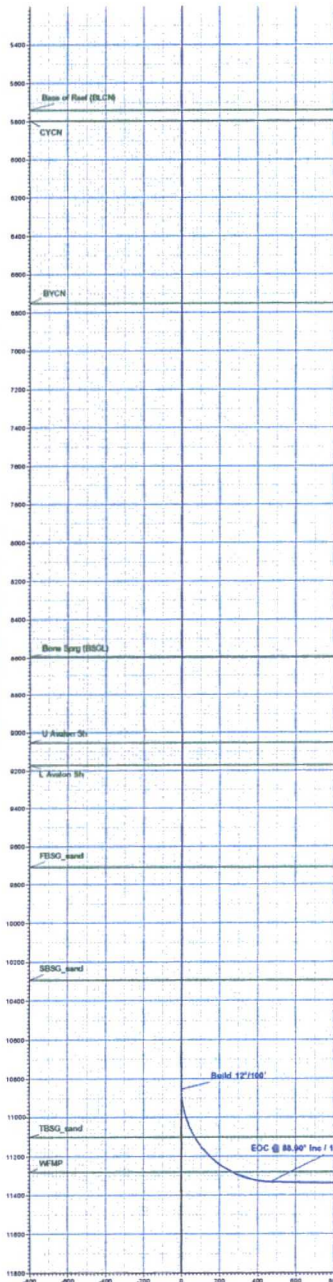
Mas Federal Com #1H
Lea County, NM
Q170*** & WT-170***
Plan #1

Company Name: COG Operating, LLC
Mas Federal Com #1H
Lea County, NM
Rig: Noram #21
Created By: Shelly Peterkin
Date: 7/7/2017

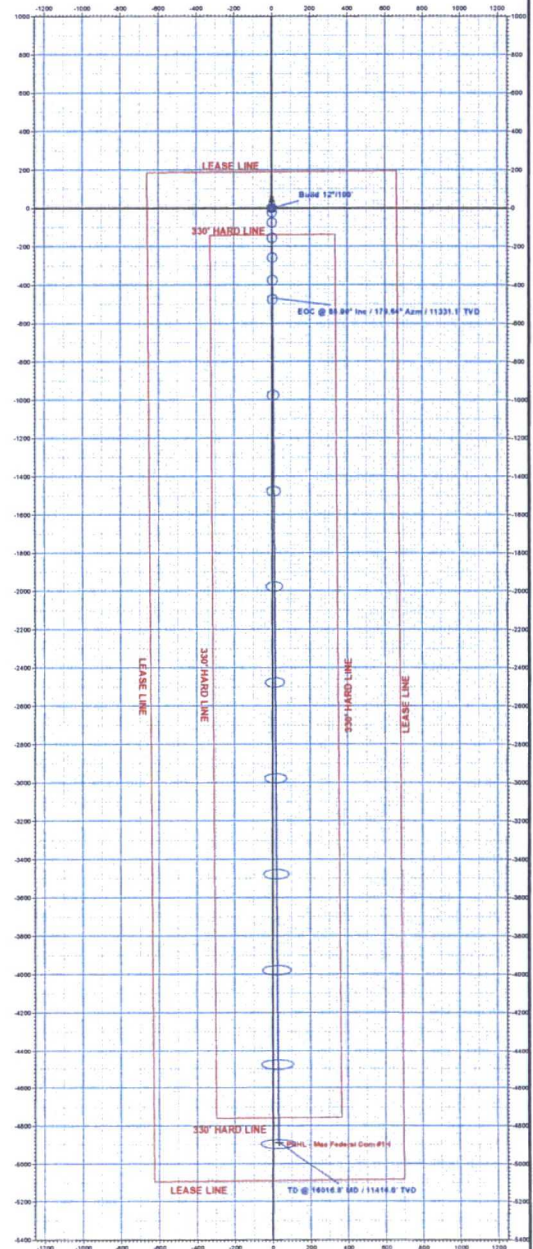
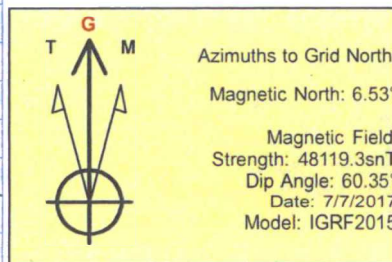
WELL DETAILS: Mas Federal Com #1H						
+N/-S	+E/-W	Northing	Ground Level:	Easting	Latitude	Longitude
0.0	0.0	55969.50	3722.0	745455.80	32° 32' 10.321 N	103° 32' 12.727 W

DESIGN TARGET DETAILS						
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude
PBHL - Mas Federal Com #1H	11416.0	-4889.7	31.0	554889.80	745488.80	32° 31' 21.935 N

ANNOTATIONS									
MD	Inc	Azi	TVD	+N/-S	+E/-W	VSec	Departure	Annotation	
10853.7	0.00	0.00	10853.7	0.0	0.0	0.0	0.0	Build 12°/100'	
11594.5	88.90	179.64	11331.1	-488.3	3.0	488.3	488.3	EOC @ 88.90° Inc / 179.64° Azm / 11331.1' TVD	
16016.8	88.90	179.64	11416.0	-4889.7	31.0	4889.8	4889.8	TD @ 16016.8' MD / 11416.0' TVD	



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



Vertical Section at 179.64° (200 us/in)