



CONCHO

HOBBS OCD
MAR 22 2017
RECEIVED

COG PRODUCTION LLC

LEA COUNTY, NM

BULLDOG

WINDWARD FEDERAL #12H

OWB

Plan: PWP1

Survey Report - Geographic

20 December, 2016



COG PRODUCTION LLC

Survey Report - Geographic

Company:	COG PRODUCTION LLC	Local Co-ordinate Reference:	Well WINDWARD FEDERAL #12H
Project:	LEA COUNTY, NM	TVD Reference:	RKB=3548+26 @ 3574.0usft (McVay 8)
Site:	BULLDOG	MD Reference:	RKB=3548+26 @ 3574.0usft (McVay 8)
Well:	WINDWARD FEDERAL #12H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	PWP1	Database:	EDM_Users

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	BULLDOG		
Site Position:		Northing:	398,637.10 usft
From:	Map	Easting:	741,887.40 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 5' 36.820 N
		Longitude:	103° 33' 8.116 W
		Grid Convergence:	0.42 °

Well	WINDWARD FEDERAL #12H		
Well Position	+N/-S	0.0 usft	Northing:
	+E/-W	0.0 usft	Easting:
Position Uncertainty	3.0 usft	Wellhead Elevation:	0.0 usf
		Latitude:	32° 11' 41.775 N
		Longitude:	103° 42' 23.285 W
		Ground Level:	3,548.0 usf

Wellbore	OWB		
Magnetics	Model Name	Sample Date	Declination (°)
	WMM2015	8/29/2016	7.12
			Dip Angle (°)
			60.01
			Field Strength (nT)
			47,978.71082036

Design	PWP1		
Audit Notes:			
Version:	Phase:	PROTOTYPE	Tie On Depth: 0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)
	9,192.0	0.0	0.0
			Direction (°)
			178.45

Survey Tool Program	Date 12/20/2016		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name
0.0	8,714.5	PWP1 (OWB)	Standard Keeper 104
8,714.5	19,160.8	PWP1 (OWB)	MWD
			Description
			Standard Wireline Keeper ver 1.0.4
			OWSG MWD - Standard

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
0.0	0.00	0.00	0.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
100.0	0.00	0.00	100.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
200.0	0.00	0.00	200.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
300.0	0.00	0.00	300.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
400.0	0.00	0.00	400.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
500.0	0.00	0.00	500.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
600.0	0.00	0.00	600.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
700.0	0.00	0.00	700.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
800.0	0.00	0.00	800.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
900.0	0.00	0.00	900.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
1,000.0	0.00	0.00	1,000.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W



COG PRODUCTION LLC

Survey Report - Geographic

Company:	COG PRODUCTION LLC	Local Co-ordinate Reference:	Well WINDWARD FEDERAL #12H
Project:	LEA COUNTY, NM	TVD Reference:	RKB=3548+26 @ 3574.0usft (McVay 8)
Site:	BULLDOG	MD Reference:	RKB=3548+26 @ 3574.0usft (McVay 8)
Well:	WINDWARD FEDERAL #12H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	PWP1	Database:	EDM_Users

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
1,100.0	0.00	0.00	1,100.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
1,200.0	0.00	0.00	1,200.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
1,300.0	0.00	0.00	1,300.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
1,400.0	0.00	0.00	1,400.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
1,500.0	0.00	0.00	1,500.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
1,600.0	0.00	0.00	1,600.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
1,700.0	0.00	0.00	1,700.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
1,800.0	0.00	0.00	1,800.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
1,900.0	0.00	0.00	1,900.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
2,000.0	0.00	0.00	2,000.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
2,100.0	0.00	0.00	2,100.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
2,200.0	0.00	0.00	2,200.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
2,300.0	0.00	0.00	2,300.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
2,400.0	0.00	0.00	2,400.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
2,500.0	0.00	0.00	2,500.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
2,600.0	0.00	0.00	2,600.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
2,700.0	0.00	0.00	2,700.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
2,800.0	0.00	0.00	2,800.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
2,900.0	0.00	0.00	2,900.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
3,000.0	0.00	0.00	3,000.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
3,100.0	0.00	0.00	3,100.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
3,200.0	0.00	0.00	3,200.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
3,300.0	0.00	0.00	3,300.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
3,400.0	0.00	0.00	3,400.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
3,500.0	0.00	0.00	3,500.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
3,600.0	0.00	0.00	3,600.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
3,700.0	0.00	0.00	3,700.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
3,800.0	0.00	0.00	3,800.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
3,900.0	0.00	0.00	3,900.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
4,000.0	0.00	0.00	4,000.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
4,100.0	0.00	0.00	4,100.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
4,200.0	0.00	0.00	4,200.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
4,300.0	0.00	0.00	4,300.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
4,400.0	0.00	0.00	4,400.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
4,500.0	0.00	0.00	4,500.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
4,600.0	0.00	0.00	4,600.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
4,700.0	0.00	0.00	4,700.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
4,800.0	0.00	0.00	4,800.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
4,900.0	0.00	0.00	4,900.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
5,000.0	0.00	0.00	5,000.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
5,100.0	0.00	0.00	5,100.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
5,200.0	0.00	0.00	5,200.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
5,300.0	0.00	0.00	5,300.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
5,400.0	0.00	0.00	5,400.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
5,500.0	0.00	0.00	5,500.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
5,600.0	0.00	0.00	5,600.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
5,700.0	0.00	0.00	5,700.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
5,800.0	0.00	0.00	5,800.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
5,900.0	0.00	0.00	5,900.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
6,000.0	0.00	0.00	6,000.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
6,100.0	0.00	0.00	6,100.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
6,200.0	0.00	0.00	6,200.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
6,300.0	0.00	0.00	6,300.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
6,400.0	0.00	0.00	6,400.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W
6,500.0	0.00	0.00	6,500.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W



COG PRODUCTION LLC

Survey Report - Geographic

Company:	COG PRODUCTION LLC	Local Co-ordinate Reference:	Well WINDWARD FEDERAL #12H
Project:	LEA COUNTY, NM	TVD Reference:	RKB=3548+26 @ 3574.0usft (McVay 8)
Site:	BULLDOG	MD Reference:	RKB=3548+26 @ 3574.0usft (McVay 8)
Well:	WINDWARD FEDERAL #12H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	PWP1	Database:	EDM_Users

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
6,600.0	0.00	0.00	6,600.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
6,700.0	0.00	0.00	6,700.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
6,800.0	0.00	0.00	6,800.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
6,900.0	0.00	0.00	6,900.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
7,000.0	0.00	0.00	7,000.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
7,100.0	0.00	0.00	7,100.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
7,200.0	0.00	0.00	7,200.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
7,300.0	0.00	0.00	7,300.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
7,400.0	0.00	0.00	7,400.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
7,500.0	0.00	0.00	7,500.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
7,600.0	0.00	0.00	7,600.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
7,700.0	0.00	0.00	7,700.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
7,800.0	0.00	0.00	7,800.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
7,900.0	0.00	0.00	7,900.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
8,000.0	0.00	0.00	8,000.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
8,100.0	0.00	0.00	8,100.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
8,200.0	0.00	0.00	8,200.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
8,300.0	0.00	0.00	8,300.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
8,400.0	0.00	0.00	8,400.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
8,500.0	0.00	0.00	8,500.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
8,600.0	0.00	0.00	8,600.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
8,700.0	0.00	0.00	8,700.0	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
8,714.5	0.00	0.00	8,714.5	0.0	0.0	435,203.40	693,914.30	32° 11' 41.775 N	103° 42' 23.285 W	
8,800.0	10.26	162.70	8,799.5	-7.3	2.3	435,196.11	693,916.57	32° 11' 41.703 N	103° 42' 23.260 W	
8,900.0	22.26	162.70	8,895.4	-34.0	10.6	435,169.43	693,924.88	32° 11' 41.438 N	103° 42' 23.165 W	
9,000.0	34.26	162.70	8,983.3	-79.1	24.6	435,124.31	693,938.93	32° 11' 40.991 N	103° 42' 23.004 W	
9,100.0	46.26	162.70	9,059.5	-140.7	43.8	435,062.72	693,958.11	32° 11' 40.380 N	103° 42' 22.785 W	
9,200.0	58.26	162.70	9,120.6	-216.0	67.3	434,987.36	693,981.58	32° 11' 39.633 N	103° 42' 22.517 W	
9,300.0	70.25	162.70	9,163.9	-301.9	94.0	434,901.52	694,008.32	32° 11' 38.782 N	103° 42' 22.212 W	
9,400.0	82.25	162.70	9,187.6	-394.5	122.9	434,808.95	694,037.15	32° 11' 37.864 N	103° 42' 21.883 W	
9,464.6	90.00	162.70	9,192.0	-455.9	142.0	434,747.50	694,056.29	32° 11' 37.255 N	103° 42' 21.664 W	
9,500.0	90.00	164.12	9,192.0	-489.9	152.1	434,713.53	694,066.41	32° 11' 36.918 N	103° 42' 21.549 W	
9,600.0	90.00	168.12	9,192.0	-586.9	176.1	434,616.47	694,090.40	32° 11' 35.957 N	103° 42' 21.276 W	
9,700.0	90.00	172.12	9,192.0	-685.4	193.3	434,517.98	694,107.56	32° 11' 34.981 N	103° 42' 21.083 W	
9,800.0	90.00	176.12	9,192.0	-784.9	203.5	434,418.52	694,117.81	32° 11' 33.996 N	103° 42' 20.971 W	
9,886.6	90.00	179.58	9,192.0	-871.4	206.8	434,331.96	694,121.05	32° 11' 33.139 N	103° 42' 20.939 W	
9,900.0	90.00	179.58	9,192.0	-884.8	206.9	434,318.60	694,121.15	32° 11' 33.007 N	103° 42' 20.938 W	
10,000.0	90.00	179.58	9,192.0	-984.8	207.6	434,218.60	694,121.88	32° 11' 32.017 N	103° 42' 20.937 W	
10,100.0	90.00	179.58	9,192.0	-1,084.8	208.3	434,118.60	694,122.61	32° 11' 31.028 N	103° 42' 20.935 W	
10,200.0	90.00	179.58	9,192.0	-1,184.8	209.0	434,018.61	694,123.33	32° 11' 30.038 N	103° 42' 20.933 W	
10,300.0	90.00	179.58	9,192.0	-1,284.8	209.8	433,918.61	694,124.06	32° 11' 29.049 N	103° 42' 20.932 W	
10,400.0	90.00	179.58	9,192.0	-1,384.8	210.5	433,818.61	694,124.79	32° 11' 28.059 N	103° 42' 20.930 W	
10,500.0	90.00	179.58	9,192.0	-1,484.8	211.2	433,718.61	694,125.51	32° 11' 27.069 N	103° 42' 20.928 W	
10,600.0	90.00	179.58	9,192.0	-1,584.8	211.9	433,618.62	694,126.24	32° 11' 26.080 N	103° 42' 20.927 W	
10,700.0	90.00	179.58	9,192.0	-1,684.8	212.7	433,518.62	694,126.97	32° 11' 25.090 N	103° 42' 20.925 W	
10,800.0	90.00	179.58	9,192.0	-1,784.8	213.4	433,418.62	694,127.70	32° 11' 24.101 N	103° 42' 20.923 W	
10,900.0	90.00	179.58	9,192.0	-1,884.8	214.1	433,318.63	694,128.42	32° 11' 23.111 N	103° 42' 20.922 W	
11,000.0	90.00	179.58	9,192.0	-1,984.8	214.9	433,218.63	694,129.15	32° 11' 22.121 N	103° 42' 20.920 W	
11,100.0	90.00	179.58	9,192.0	-2,084.8	215.6	433,118.63	694,129.88	32° 11' 21.132 N	103° 42' 20.918 W	
11,200.0	90.00	179.58	9,192.0	-2,184.8	216.3	433,018.63	694,130.61	32° 11' 20.142 N	103° 42' 20.917 W	
11,300.0	90.00	179.58	9,192.0	-2,284.8	217.0	432,918.64	694,131.33	32° 11' 19.153 N	103° 42' 20.915 W	
11,400.0	90.00	179.58	9,192.0	-2,384.8	217.8	432,818.64	694,132.06	32° 11' 18.163 N	103° 42' 20.913 W	
11,500.0	90.00	179.58	9,192.0	-2,484.8	218.5	432,718.64	694,132.79	32° 11' 17.173 N	103° 42' 20.912 W	
11,600.0	90.00	179.58	9,192.0	-2,584.8	219.2	432,618.64	694,133.51	32° 11' 16.184 N	103° 42' 20.910 W	
11,700.0	90.00	179.58	9,192.0	-2,684.8	219.9	432,518.65	694,134.24	32° 11' 15.194 N	103° 42' 20.908 W	



COG PRODUCTION LLC

Survey Report - Geographic

Company:	COG PRODUCTION LLC	Local Co-ordinate Reference:	Well WINDWARD FEDERAL #12H
Project:	LEA COUNTY, NM	TVD Reference:	RKB=3548+26 @ 3574.0usft (McVay 8)
Site:	BULLDOG	MD Reference:	RKB=3548+26 @ 3574.0usft (McVay 8)
Well:	WINDWARD FEDERAL #12H	North Reference:	Grid
Wellbore:	OWB	Survey Calculation Method:	Minimum Curvature
Design:	PWP1	Database:	EDM_Users

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
11,800.0	90.00	179.58	9,192.0	-2,784.8	220.7	432,418.65	694,134.97	32° 11' 14.205 N	103° 42' 20.907 W	
11,900.0	90.00	179.58	9,192.0	-2,884.7	221.4	432,318.65	694,135.70	32° 11' 13.215 N	103° 42' 20.905 W	
12,000.0	90.00	179.58	9,192.0	-2,984.7	222.1	432,218.65	694,136.42	32° 11' 12.225 N	103° 42' 20.903 W	
12,100.0	90.00	179.58	9,192.0	-3,084.7	222.9	432,118.66	694,137.15	32° 11' 11.236 N	103° 42' 20.902 W	
12,200.0	90.00	179.58	9,192.0	-3,184.7	223.6	432,018.66	694,137.88	32° 11' 10.246 N	103° 42' 20.900 W	
12,300.0	90.00	179.58	9,192.0	-3,284.7	224.3	431,918.66	694,138.60	32° 11' 9.257 N	103° 42' 20.898 W	
12,400.0	90.00	179.58	9,192.0	-3,384.7	225.0	431,818.66	694,139.33	32° 11' 8.267 N	103° 42' 20.897 W	
12,500.0	90.00	179.58	9,192.0	-3,484.7	225.8	431,718.67	694,140.06	32° 11' 7.277 N	103° 42' 20.895 W	
12,600.0	90.00	179.58	9,192.0	-3,584.7	226.5	431,618.67	694,140.79	32° 11' 6.288 N	103° 42' 20.893 W	
12,700.0	90.00	179.58	9,192.0	-3,684.7	227.2	431,518.67	694,141.51	32° 11' 5.298 N	103° 42' 20.892 W	
12,800.0	90.00	179.58	9,192.0	-3,784.7	227.9	431,418.68	694,142.24	32° 11' 4.309 N	103° 42' 20.890 W	
12,900.0	90.00	179.58	9,192.0	-3,884.7	228.7	431,318.68	694,142.97	32° 11' 3.319 N	103° 42' 20.888 W	
13,000.0	90.00	179.58	9,192.0	-3,984.7	229.4	431,218.68	694,143.69	32° 11' 2.329 N	103° 42' 20.887 W	
13,100.0	90.00	179.58	9,192.0	-4,084.7	230.1	431,118.68	694,144.42	32° 11' 1.340 N	103° 42' 20.885 W	
13,200.0	90.00	179.58	9,192.0	-4,184.7	230.9	431,018.69	694,145.15	32° 11' 0.350 N	103° 42' 20.883 W	
13,300.0	90.00	179.58	9,192.0	-4,284.7	231.6	430,918.69	694,145.88	32° 10' 59.361 N	103° 42' 20.881 W	
13,400.0	90.00	179.58	9,192.0	-4,384.7	232.3	430,818.69	694,146.60	32° 10' 58.371 N	103° 42' 20.880 W	
13,500.0	90.00	179.58	9,192.0	-4,484.7	233.0	430,718.69	694,147.33	32° 10' 57.381 N	103° 42' 20.878 W	
13,600.0	90.00	179.58	9,192.0	-4,584.7	233.8	430,618.70	694,148.06	32° 10' 56.392 N	103° 42' 20.876 W	
13,700.0	90.00	179.58	9,192.0	-4,684.7	234.5	430,518.70	694,148.78	32° 10' 55.402 N	103° 42' 20.875 W	
13,800.0	90.00	179.58	9,192.0	-4,784.7	235.2	430,418.70	694,149.51	32° 10' 54.413 N	103° 42' 20.873 W	
13,900.0	90.00	179.58	9,192.0	-4,884.7	235.9	430,318.70	694,150.24	32° 10' 53.423 N	103° 42' 20.871 W	
14,000.0	90.00	179.58	9,192.0	-4,984.7	236.7	430,218.71	694,150.97	32° 10' 52.433 N	103° 42' 20.870 W	
14,100.0	90.00	179.58	9,192.0	-5,084.7	237.4	430,118.71	694,151.69	32° 10' 51.444 N	103° 42' 20.868 W	
14,200.0	90.00	179.58	9,192.0	-5,184.7	238.1	430,018.71	694,152.42	32° 10' 50.454 N	103° 42' 20.866 W	
14,300.0	90.00	179.58	9,192.0	-5,284.7	238.9	429,918.72	694,153.15	32° 10' 49.465 N	103° 42' 20.865 W	
14,400.0	90.00	179.58	9,192.0	-5,384.7	239.6	429,818.72	694,153.88	32° 10' 48.475 N	103° 42' 20.863 W	
14,500.0	90.00	179.58	9,192.0	-5,484.7	240.3	429,718.72	694,154.60	32° 10' 47.485 N	103° 42' 20.861 W	
14,600.0	90.00	179.58	9,192.0	-5,584.7	241.0	429,618.72	694,155.33	32° 10' 46.496 N	103° 42' 20.860 W	
14,700.0	90.00	179.58	9,192.0	-5,684.7	241.8	429,518.73	694,156.06	32° 10' 45.506 N	103° 42' 20.858 W	
14,800.0	90.00	179.58	9,192.0	-5,784.7	242.5	429,418.73	694,156.78	32° 10' 44.517 N	103° 42' 20.856 W	
14,900.0	90.00	179.58	9,192.0	-5,884.7	243.2	429,318.73	694,157.51	32° 10' 43.527 N	103° 42' 20.855 W	
15,000.0	90.00	179.58	9,192.0	-5,984.7	243.9	429,218.73	694,158.24	32° 10' 42.537 N	103° 42' 20.853 W	
15,100.0	90.00	179.58	9,192.0	-6,084.7	244.7	429,118.74	694,158.97	32° 10' 41.548 N	103° 42' 20.851 W	
15,200.0	90.00	179.58	9,192.0	-6,184.7	245.4	429,018.74	694,159.69	32° 10' 40.558 N	103° 42' 20.850 W	
15,300.0	90.00	179.58	9,192.0	-6,284.7	246.1	428,918.74	694,160.42	32° 10' 39.569 N	103° 42' 20.848 W	
15,400.0	90.00	179.58	9,192.0	-6,384.7	246.9	428,818.74	694,161.15	32° 10' 38.579 N	103° 42' 20.846 W	
15,500.0	90.00	179.58	9,192.0	-6,484.7	247.6	428,718.75	694,161.87	32° 10' 37.589 N	103° 42' 20.845 W	
15,600.0	90.00	179.58	9,192.0	-6,584.7	248.3	428,618.75	694,162.60	32° 10' 36.600 N	103° 42' 20.843 W	
15,700.0	90.00	179.58	9,192.0	-6,684.6	249.0	428,518.75	694,163.33	32° 10' 35.610 N	103° 42' 20.841 W	
15,800.0	90.00	179.58	9,192.0	-6,784.6	249.8	428,418.75	694,164.06	32° 10' 34.621 N	103° 42' 20.840 W	
15,900.0	90.00	179.58	9,192.0	-6,884.6	250.5	428,318.76	694,164.78	32° 10' 33.631 N	103° 42' 20.838 W	
16,000.0	90.00	179.58	9,192.0	-6,984.6	251.2	428,218.76	694,165.51	32° 10' 32.641 N	103° 42' 20.836 W	
16,100.0	90.00	179.58	9,192.0	-7,084.6	251.9	428,118.76	694,166.24	32° 10' 31.652 N	103° 42' 20.835 W	
16,200.0	90.00	179.58	9,192.0	-7,184.6	252.7	428,018.77	694,166.96	32° 10' 30.662 N	103° 42' 20.833 W	
16,300.0	90.00	179.58	9,192.0	-7,284.6	253.4	427,918.77	694,167.69	32° 10' 29.673 N	103° 42' 20.831 W	
16,400.0	90.00	179.58	9,192.0	-7,384.6	254.1	427,818.77	694,168.42	32° 10' 28.683 N	103° 42' 20.830 W	
16,500.0	90.00	179.58	9,192.0	-7,484.6	254.9	427,718.77	694,169.15	32° 10' 27.693 N	103° 42' 20.828 W	
16,600.0	90.00	179.58	9,192.0	-7,584.6	255.6	427,618.78	694,169.87	32° 10' 26.704 N	103° 42' 20.826 W	
16,700.0	90.00	179.58	9,192.0	-7,684.6	256.3	427,518.78	694,170.60	32° 10' 25.714 N	103° 42' 20.825 W	
16,800.0	90.00	179.58	9,192.0	-7,784.6	257.0	427,418.78	694,171.33	32° 10' 24.725 N	103° 42' 20.823 W	
16,900.0	90.00	179.58	9,192.0	-7,884.6	257.8	427,318.78	694,172.05	32° 10' 23.735 N	103° 42' 20.821 W	
17,000.0	90.00	179.58	9,192.0	-7,984.6	258.5	427,218.79	694,172.78	32° 10' 22.745 N	103° 42' 20.820 W	
17,100.0	90.00	179.58	9,192.0	-8,084.6	259.2	427,118.79	694,173.51	32° 10' 21.756 N	103° 42' 20.818 W	
17,200.0	90.00	179.58	9,192.0	-8,184.6	259.9	427,018.79	694,174.24	32° 10' 20.766 N	103° 42' 20.816 W	



COG PRODUCTION LLC

Survey Report - Geographic

Company: COG PRODUCTION LLC
Project: LEA COUNTY, NM
Site: BULLDOG
Well: WINDWARD FEDERAL #12H
Wellbore: OWB
Design: PWP1

Local Co-ordinate Reference: Well WINDWARD FEDERAL #12H
TVD Reference: RKB=3548+26 @ 3574.0usft (McVay 8)
MD Reference: RKB=3548+26 @ 3574.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM_Users

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
17,300.0	90.00	179.58	9,192.0	-8,284.6	260.7	426,918.79	694,174.96	32° 10' 19.777 N	103° 42' 20.815 W
17,400.0	90.00	179.58	9,192.0	-8,384.6	261.4	426,818.80	694,175.69	32° 10' 18.787 N	103° 42' 20.813 W
17,500.0	90.00	179.58	9,192.0	-8,484.6	262.1	426,718.80	694,176.42	32° 10' 17.797 N	103° 42' 20.811 W
17,600.0	90.00	179.58	9,192.0	-8,584.6	262.8	426,618.80	694,177.15	32° 10' 16.808 N	103° 42' 20.810 W
17,700.0	90.00	179.58	9,192.0	-8,684.6	263.6	426,518.80	694,177.87	32° 10' 15.818 N	103° 42' 20.808 W
17,800.0	90.00	179.58	9,192.0	-8,784.6	264.3	426,418.81	694,178.60	32° 10' 14.829 N	103° 42' 20.806 W
17,900.0	90.00	179.58	9,192.0	-8,884.6	265.0	426,318.81	694,179.33	32° 10' 13.839 N	103° 42' 20.804 W
18,000.0	90.00	179.58	9,192.0	-8,984.6	265.8	426,218.81	694,180.05	32° 10' 12.849 N	103° 42' 20.803 W
18,100.0	90.00	179.58	9,192.0	-9,084.6	266.5	426,118.82	694,180.78	32° 10' 11.860 N	103° 42' 20.801 W
18,200.0	90.00	179.58	9,192.0	-9,184.6	267.2	426,018.82	694,181.51	32° 10' 10.870 N	103° 42' 20.799 W
18,300.0	90.00	179.58	9,192.0	-9,284.6	267.9	425,918.82	694,182.24	32° 10' 9.881 N	103° 42' 20.798 W
18,400.0	90.00	179.58	9,192.0	-9,384.6	268.7	425,818.82	694,182.96	32° 10' 8.891 N	103° 42' 20.796 W
18,500.0	90.00	179.58	9,192.0	-9,484.6	269.4	425,718.83	694,183.69	32° 10' 7.901 N	103° 42' 20.794 W
18,600.0	90.00	179.58	9,192.0	-9,584.6	270.1	425,618.83	694,184.42	32° 10' 6.912 N	103° 42' 20.793 W
18,700.0	90.00	179.58	9,192.0	-9,684.6	270.8	425,518.83	694,185.14	32° 10' 5.922 N	103° 42' 20.791 W
18,800.0	90.00	179.58	9,192.0	-9,784.6	271.6	425,418.83	694,185.87	32° 10' 4.933 N	103° 42' 20.789 W
18,900.0	90.00	179.58	9,192.0	-9,884.6	272.3	425,318.84	694,186.60	32° 10' 3.943 N	103° 42' 20.788 W
19,000.0	90.00	179.58	9,192.0	-9,984.6	273.0	425,218.84	694,187.33	32° 10' 2.953 N	103° 42' 20.786 W
19,100.0	90.00	179.58	9,192.0	-10,084.6	273.8	425,118.84	694,188.05	32° 10' 1.964 N	103° 42' 20.784 W
19,160.8	90.00	179.58	9,192.0	-10,145.4	274.2	425,058.00	694,188.50	32° 10' 1.362 N	103° 42' 20.783 W

Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
PBHL-Windward - plan hits target center - Point	0.00	0.00	9,192.0	-10,145.4	274.2	425,058.00	694,188.50	32° 10' 1.362 N	103° 42' 20.783 W

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Comment
8715	8715	0	0	Start Build 12.00
9465	9192	-456	142	Start DLS 4.00 TFO 90.00
9887	9192	-871	207	Start 9424.2 hold at 9886.6 MD
19,311				TD at 19310.8

Checked By: _____ Approved By: _____ Date: _____



WELL DETAILS: **WINDWARD FEDERAL #12H**
 Ground Level: 3548.0
 Northing 435203.40 Easting 693914.30 Latitude 32° 11' 41.775 N Longitude 103° 42' 23.285 W Slot

SECTION DETAILS									
MD	Inc	Azi	TVD	+N-S	+E-W	Dleg	TFace	Vsect	Annotation
1	0.00	0.00	0.00	0.0	0.0	0.00	0.00	0.0	
2	8714.5	0.00	8714.5	0.0	0.0	0.00	0.00	0.0	Start Build 12.00
3	9464.6	90.00	9192.0	-455.9	142.0	12.00	162.70	459.6	Start DLS 4.00 TFO 90.00
4	9886.6	90.00	9192.0	-871.4	206.8	4.00	90.00	876.7	Start 9424.2 hold at 9886.6 MD
5	19160.8	90.00	9192.0	-10145.4	274.2	0.00	0.00	10149.1	

Project: LEA COUNTY, NM
 Site: BULLDOG
 Well: WINDWARD FEDERAL #12H
 Wellbore: OWB
 Design: **PWP1**

LEGEND

- WINDWARD FEDERAL #11H, OWB, PWP1 V0
- WINDWARD FEDERAL #4H, OWB, ACTUAL WELLPATH V0
- KING TUT FEDERAL #4H, OWB, ACTUAL WELLPATH V0
- PWP1

