



CONCHO

COG PRODUCTION LLC

LEA COUNTY, NM

BULLDOG

WINDWARD FEDERAL #9H

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 #9H
Project:	LEA COUNTY, NM	TVD Reference:	RKB=3551+26 @ 3577.0usft (McVay 8)
Site:	BULLDOG	MD Reference:	RKB=3551+26 @ 3577.0usft (McVay 8)
Well:	WINDWARD FEDERAL #9H	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 #9H		
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' 41.711 N
		Longitude:	103° 42' 40.392 W
		Ground Level:	3,551.0 usf

Wellbore	OWB		
Magnetics	Model Name	Sample Date	Declination (°)
	WMM2015	8/29/2016	7.12
			Dip Angle (°)
			60.01
			Field Strength (nT)
			47,978.16613576

Design	PWP1		
Audit Notes:			
Version:	Phase:	PROTOTYPE	Tie On Depth: 0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)
	0.0	0.0	0.0
			Direction (°)
			181.89

Survey Tool Program	Date 12/20/2016		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name
0.0	8,727.5 PWP1 (OWB)		Standard Keeper 104
8,727.5	19,244.8 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	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
100.0	0.00	0.00	100.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
200.0	0.00	0.00	200.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
300.0	0.00	0.00	300.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
400.0	0.00	0.00	400.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
500.0	0.00	0.00	500.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
600.0	0.00	0.00	600.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
700.0	0.00	0.00	700.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
800.0	0.00	0.00	800.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
900.0	0.00	0.00	900.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
1,000.0	0.00	0.00	1,000.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W



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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	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
1,200.0	0.00	0.00	1,200.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
1,300.0	0.00	0.00	1,300.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
1,400.0	0.00	0.00	1,400.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
1,500.0	0.00	0.00	1,500.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
1,600.0	0.00	0.00	1,600.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
1,700.0	0.00	0.00	1,700.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
1,800.0	0.00	0.00	1,800.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
1,900.0	0.00	0.00	1,900.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
2,000.0	0.00	0.00	2,000.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
2,100.0	0.00	0.00	2,100.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
2,200.0	0.00	0.00	2,200.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
2,300.0	0.00	0.00	2,300.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
2,400.0	0.00	0.00	2,400.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
2,500.0	0.00	0.00	2,500.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
2,600.0	0.00	0.00	2,600.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
2,700.0	0.00	0.00	2,700.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
2,800.0	0.00	0.00	2,800.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
2,900.0	0.00	0.00	2,900.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
3,000.0	0.00	0.00	3,000.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
3,100.0	0.00	0.00	3,100.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
3,200.0	0.00	0.00	3,200.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
3,300.0	0.00	0.00	3,300.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
3,400.0	0.00	0.00	3,400.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
3,500.0	0.00	0.00	3,500.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
3,600.0	0.00	0.00	3,600.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
3,700.0	0.00	0.00	3,700.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
3,800.0	0.00	0.00	3,800.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
3,900.0	0.00	0.00	3,900.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
4,000.0	0.00	0.00	4,000.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
4,100.0	0.00	0.00	4,100.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
4,200.0	0.00	0.00	4,200.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
4,300.0	0.00	0.00	4,300.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
4,400.0	0.00	0.00	4,400.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
4,500.0	0.00	0.00	4,500.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
4,600.0	0.00	0.00	4,600.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
4,700.0	0.00	0.00	4,700.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
4,800.0	0.00	0.00	4,800.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
4,900.0	0.00	0.00	4,900.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
5,000.0	0.00	0.00	5,000.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
5,100.0	0.00	0.00	5,100.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
5,200.0	0.00	0.00	5,200.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
5,300.0	0.00	0.00	5,300.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
5,400.0	0.00	0.00	5,400.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
5,500.0	0.00	0.00	5,500.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
5,600.0	0.00	0.00	5,600.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
5,700.0	0.00	0.00	5,700.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
5,800.0	0.00	0.00	5,800.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
5,900.0	0.00	0.00	5,900.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
6,000.0	0.00	0.00	6,000.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
6,100.0	0.00	0.00	6,100.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
6,200.0	0.00	0.00	6,200.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
6,300.0	0.00	0.00	6,300.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
6,400.0	0.00	0.00	6,400.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
6,500.0	0.00	0.00	6,500.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W



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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	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
6,700.0	0.00	0.00	6,700.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
6,800.0	0.00	0.00	6,800.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
6,900.0	0.00	0.00	6,900.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
7,000.0	0.00	0.00	7,000.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
7,100.0	0.00	0.00	7,100.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
7,200.0	0.00	0.00	7,200.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
7,300.0	0.00	0.00	7,300.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
7,400.0	0.00	0.00	7,400.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
7,500.0	0.00	0.00	7,500.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
7,600.0	0.00	0.00	7,600.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
7,700.0	0.00	0.00	7,700.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
7,800.0	0.00	0.00	7,800.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
7,900.0	0.00	0.00	7,900.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
8,000.0	0.00	0.00	8,000.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
8,100.0	0.00	0.00	8,100.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
8,200.0	0.00	0.00	8,200.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
8,300.0	0.00	0.00	8,300.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
8,400.0	0.00	0.00	8,400.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
8,500.0	0.00	0.00	8,500.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
8,600.0	0.00	0.00	8,600.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
8,700.0	0.00	0.00	8,700.0	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
8,727.5	0.00	0.01	8,727.5	0.0	0.0	435,188.40	692,444.40	32° 11' 41.711 N	103° 42' 40.392 W
8,800.0	8.70	208.50	8,799.7	-4.8	-2.6	435,183.57	692,441.77	32° 11' 41.663 N	103° 42' 40.423 W
8,900.0	20.70	208.50	8,896.3	-27.1	-14.7	435,161.31	692,429.69	32° 11' 41.444 N	103° 42' 40.565 W
9,000.0	32.70	208.50	8,985.4	-66.5	-36.1	435,121.90	692,408.29	32° 11' 41.055 N	103° 42' 40.817 W
9,100.0	44.70	208.50	9,063.4	-121.3	-65.9	435,067.06	692,378.51	32° 11' 40.514 N	103° 42' 41.167 W
9,200.0	56.70	208.50	9,126.6	-189.2	-102.7	434,999.18	692,341.66	32° 11' 39.844 N	103° 42' 41.600 W
9,300.0	68.69	208.50	9,172.4	-267.2	-145.1	434,921.23	692,299.34	32° 11' 39.075 N	103° 42' 42.098 W
9,400.0	80.69	208.50	9,198.7	-351.8	-191.0	434,836.62	692,253.40	32° 11' 38.241 N	103° 42' 42.638 W
9,477.6	90.00	208.50	9,205.0	-419.6	-227.8	434,768.76	692,216.55	32° 11' 37.571 N	103° 42' 43.072 W
9,500.0	90.00	207.60	9,205.0	-439.4	-238.4	434,748.96	692,206.00	32° 11' 37.376 N	103° 42' 43.196 W
9,600.0	90.01	203.60	9,205.0	-529.6	-281.6	434,658.79	692,162.79	32° 11' 36.486 N	103° 42' 43.704 W
9,700.0	90.02	199.60	9,205.0	-622.6	-318.4	434,565.84	692,125.99	32° 11' 35.568 N	103° 42' 44.139 W
9,800.0	90.03	195.60	9,204.9	-717.9	-348.6	434,470.54	692,095.75	32° 11' 34.627 N	103° 42' 44.497 W
9,900.0	90.04	191.60	9,204.9	-815.0	-372.2	434,373.36	692,072.24	32° 11' 33.667 N	103° 42' 44.777 W
10,000.0	90.04	187.60	9,204.8	-913.6	-388.8	434,274.78	692,055.56	32° 11' 32.692 N	103° 42' 44.978 W
10,100.0	90.05	183.60	9,204.7	-1,013.1	-398.6	434,175.28	692,045.80	32° 11' 31.708 N	103° 42' 45.098 W
10,200.0	90.06	179.60	9,204.6	-1,113.1	-401.4	434,075.34	692,043.00	32° 11' 30.719 N	103° 42' 45.138 W
10,200.6	90.06	179.58	9,204.6	-1,113.7	-401.4	434,074.72	692,043.01	32° 11' 30.713 N	103° 42' 45.138 W
10,300.0	90.06	179.58	9,204.5	-1,213.1	-400.7	433,975.34	692,043.74	32° 11' 29.730 N	103° 42' 45.136 W
10,400.0	90.06	179.58	9,204.4	-1,313.1	-399.9	433,875.35	692,044.48	32° 11' 28.740 N	103° 42' 45.134 W
10,500.0	90.06	179.58	9,204.3	-1,413.1	-399.2	433,775.35	692,045.22	32° 11' 27.750 N	103° 42' 45.132 W
10,600.0	90.06	179.58	9,204.2	-1,513.1	-398.4	433,675.35	692,045.95	32° 11' 26.761 N	103° 42' 45.130 W
10,700.0	90.06	179.58	9,204.1	-1,613.0	-397.7	433,575.35	692,046.69	32° 11' 25.771 N	103° 42' 45.128 W
10,800.0	90.06	179.58	9,204.0	-1,713.0	-397.0	433,475.36	692,047.43	32° 11' 24.782 N	103° 42' 45.126 W
10,900.0	90.06	179.58	9,203.9	-1,813.0	-396.2	433,375.36	692,048.17	32° 11' 23.792 N	103° 42' 45.125 W
11,000.0	90.06	179.58	9,203.8	-1,913.0	-395.5	433,275.36	692,048.90	32° 11' 22.802 N	103° 42' 45.123 W
11,100.0	90.06	179.58	9,203.7	-2,013.0	-394.8	433,175.37	692,049.64	32° 11' 21.813 N	103° 42' 45.121 W
11,200.0	90.06	179.58	9,203.5	-2,113.0	-394.0	433,075.37	692,050.38	32° 11' 20.823 N	103° 42' 45.119 W
11,300.0	90.06	179.58	9,203.4	-2,213.0	-393.3	432,975.37	692,051.12	32° 11' 19.834 N	103° 42' 45.117 W
11,400.0	90.06	179.58	9,203.3	-2,313.0	-392.5	432,875.37	692,051.85	32° 11' 18.844 N	103° 42' 45.115 W
11,500.0	90.06	179.58	9,203.2	-2,413.0	-391.8	432,775.38	692,052.59	32° 11' 17.854 N	103° 42' 45.113 W
11,600.0	90.06	179.58	9,203.1	-2,513.0	-391.1	432,675.38	692,053.33	32° 11' 16.865 N	103° 42' 45.112 W
11,700.0	90.06	179.58	9,203.0	-2,613.0	-390.3	432,575.38	692,054.06	32° 11' 15.875 N	103° 42' 45.110 W



COG PRODUCTION LLC

Survey Report - Geographic

Company:	COG PRODUCTION LLC	Local Co-ordinate Reference:	Well WINDWARD FEDERAL #9H
Project:	LEA COUNTY, NM	TVD Reference:	RKB=3551+26 @ 3577.0usft (McVay 8)
Site:	BULLDOG	MD Reference:	RKB=3551+26 @ 3577.0usft (McVay 8)
Well:	WINDWARD FEDERAL #9H	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	90.06	179.58	9,202.9	-2,713.0	-389.6	432,475.38	692,054.80	32° 11' 14.886 N	103° 42' 45.108 W
11,900.0	90.06	179.58	9,202.8	-2,813.0	-388.9	432,375.39	692,055.54	32° 11' 13.896 N	103° 42' 45.106 W
12,000.0	90.06	179.58	9,202.7	-2,913.0	-388.1	432,275.39	692,056.28	32° 11' 12.906 N	103° 42' 45.104 W
12,100.0	90.06	179.58	9,202.6	-3,013.0	-387.4	432,175.39	692,057.01	32° 11' 11.917 N	103° 42' 45.102 W
12,200.0	90.06	179.58	9,202.5	-3,113.0	-386.6	432,075.40	692,057.75	32° 11' 10.927 N	103° 42' 45.100 W
12,300.0	90.06	179.58	9,202.4	-3,213.0	-385.9	431,975.40	692,058.49	32° 11' 9.938 N	103° 42' 45.099 W
12,400.0	90.06	179.58	9,202.3	-3,313.0	-385.2	431,875.40	692,059.23	32° 11' 8.948 N	103° 42' 45.097 W
12,500.0	90.06	179.58	9,202.2	-3,413.0	-384.4	431,775.40	692,059.96	32° 11' 7.958 N	103° 42' 45.095 W
12,600.0	90.06	179.58	9,202.1	-3,513.0	-383.7	431,675.41	692,060.70	32° 11' 6.969 N	103° 42' 45.093 W
12,700.0	90.06	179.58	9,202.0	-3,613.0	-383.0	431,575.41	692,061.44	32° 11' 5.979 N	103° 42' 45.091 W
12,800.0	90.06	179.58	9,201.8	-3,713.0	-382.2	431,475.41	692,062.18	32° 11' 4.990 N	103° 42' 45.089 W
12,900.0	90.06	179.58	9,201.7	-3,813.0	-381.5	431,375.42	692,062.91	32° 11' 4.000 N	103° 42' 45.087 W
13,000.0	90.06	179.58	9,201.6	-3,913.0	-380.7	431,275.42	692,063.65	32° 11' 3.010 N	103° 42' 45.085 W
13,100.0	90.06	179.58	9,201.5	-4,013.0	-380.0	431,175.42	692,064.39	32° 11' 2.021 N	103° 42' 45.084 W
13,200.0	90.06	179.58	9,201.4	-4,113.0	-379.3	431,075.42	692,065.12	32° 11' 1.031 N	103° 42' 45.082 W
13,300.0	90.06	179.58	9,201.3	-4,213.0	-378.5	430,975.43	692,065.86	32° 11' 0.042 N	103° 42' 45.080 W
13,400.0	90.06	179.58	9,201.2	-4,313.0	-377.8	430,875.43	692,066.60	32° 10' 59.052 N	103° 42' 45.078 W
13,500.0	90.06	179.58	9,201.1	-4,413.0	-377.1	430,775.43	692,067.34	32° 10' 58.062 N	103° 42' 45.076 W
13,600.0	90.06	179.58	9,201.0	-4,513.0	-376.3	430,675.43	692,068.07	32° 10' 57.073 N	103° 42' 45.074 W
13,700.0	90.06	179.58	9,200.9	-4,613.0	-375.6	430,575.44	692,068.81	32° 10' 56.083 N	103° 42' 45.072 W
13,800.0	90.06	179.58	9,200.8	-4,713.0	-374.8	430,475.44	692,069.55	32° 10' 55.094 N	103° 42' 45.071 W
13,900.0	90.06	179.58	9,200.7	-4,813.0	-374.1	430,375.44	692,070.29	32° 10' 54.104 N	103° 42' 45.069 W
14,000.0	90.06	179.58	9,200.6	-4,913.0	-373.4	430,275.45	692,071.02	32° 10' 53.114 N	103° 42' 45.067 W
14,100.0	90.06	179.58	9,200.5	-5,013.0	-372.6	430,175.45	692,071.76	32° 10' 52.125 N	103° 42' 45.065 W
14,200.0	90.06	179.58	9,200.4	-5,112.9	-371.9	430,075.45	692,072.50	32° 10' 51.135 N	103° 42' 45.063 W
14,300.0	90.06	179.58	9,200.3	-5,212.9	-371.2	429,975.45	692,073.24	32° 10' 50.146 N	103° 42' 45.061 W
14,400.0	90.06	179.58	9,200.1	-5,312.9	-370.4	429,875.46	692,073.97	32° 10' 49.156 N	103° 42' 45.059 W
14,500.0	90.06	179.58	9,200.0	-5,412.9	-369.7	429,775.46	692,074.71	32° 10' 48.166 N	103° 42' 45.058 W
14,600.0	90.06	179.58	9,199.9	-5,512.9	-368.9	429,675.46	692,075.45	32° 10' 47.177 N	103° 42' 45.056 W
14,700.0	90.06	179.58	9,199.8	-5,612.9	-368.2	429,575.47	692,076.18	32° 10' 46.187 N	103° 42' 45.054 W
14,800.0	90.06	179.58	9,199.7	-5,712.9	-367.5	429,475.47	692,076.92	32° 10' 45.198 N	103° 42' 45.052 W
14,900.0	90.06	179.58	9,199.6	-5,812.9	-366.7	429,375.47	692,077.66	32° 10' 44.208 N	103° 42' 45.050 W
15,000.0	90.06	179.58	9,199.5	-5,912.9	-366.0	429,275.47	692,078.40	32° 10' 43.218 N	103° 42' 45.048 W
15,100.0	90.06	179.58	9,199.4	-6,012.9	-365.3	429,175.48	692,079.13	32° 10' 42.229 N	103° 42' 45.046 W
15,200.0	90.06	179.58	9,199.3	-6,112.9	-364.5	429,075.48	692,079.87	32° 10' 41.239 N	103° 42' 45.044 W
15,300.0	90.06	179.58	9,199.2	-6,212.9	-363.8	428,975.48	692,080.61	32° 10' 40.250 N	103° 42' 45.043 W
15,400.0	90.06	179.58	9,199.1	-6,312.9	-363.0	428,875.48	692,081.35	32° 10' 39.260 N	103° 42' 45.041 W
15,500.0	90.06	179.58	9,199.0	-6,412.9	-362.3	428,775.49	692,082.08	32° 10' 38.270 N	103° 42' 45.039 W
15,600.0	90.06	179.58	9,198.9	-6,512.9	-361.6	428,675.49	692,082.82	32° 10' 37.281 N	103° 42' 45.037 W
15,700.0	90.06	179.58	9,198.8	-6,612.9	-360.8	428,575.49	692,083.56	32° 10' 36.291 N	103° 42' 45.035 W
15,800.0	90.06	179.58	9,198.7	-6,712.9	-360.1	428,475.50	692,084.30	32° 10' 35.302 N	103° 42' 45.033 W
15,900.0	90.06	179.58	9,198.6	-6,812.9	-359.4	428,375.50	692,085.03	32° 10' 34.312 N	103° 42' 45.031 W
16,000.0	90.06	179.58	9,198.4	-6,912.9	-358.6	428,275.50	692,085.77	32° 10' 33.322 N	103° 42' 45.030 W
16,100.0	90.06	179.58	9,198.3	-7,012.9	-357.9	428,175.50	692,086.51	32° 10' 32.333 N	103° 42' 45.028 W
16,200.0	90.06	179.58	9,198.2	-7,112.9	-357.2	428,075.51	692,087.24	32° 10' 31.343 N	103° 42' 45.026 W
16,300.0	90.06	179.58	9,198.1	-7,212.9	-356.4	427,975.51	692,087.98	32° 10' 30.354 N	103° 42' 45.024 W
16,400.0	90.06	179.58	9,198.0	-7,312.9	-355.7	427,875.51	692,088.72	32° 10' 29.364 N	103° 42' 45.022 W
16,500.0	90.06	179.58	9,197.9	-7,412.9	-354.9	427,775.52	692,089.46	32° 10' 28.374 N	103° 42' 45.020 W
16,600.0	90.06	179.58	9,197.8	-7,512.9	-354.2	427,675.52	692,090.19	32° 10' 27.385 N	103° 42' 45.018 W
16,700.0	90.06	179.58	9,197.7	-7,612.9	-353.5	427,575.52	692,090.93	32° 10' 26.395 N	103° 42' 45.016 W
16,800.0	90.06	179.58	9,197.6	-7,712.9	-352.7	427,475.52	692,091.67	32° 10' 25.406 N	103° 42' 45.015 W
16,900.0	90.06	179.58	9,197.5	-7,812.9	-352.0	427,375.53	692,092.41	32° 10' 24.416 N	103° 42' 45.013 W
17,000.0	90.06	179.58	9,197.4	-7,912.9	-351.3	427,275.53	692,093.14	32° 10' 23.426 N	103° 42' 45.011 W
17,100.0	90.06	179.58	9,197.3	-8,012.9	-350.5	427,175.53	692,093.88	32° 10' 22.437 N	103° 42' 45.009 W
17,200.0	90.06	179.58	9,197.2	-8,112.9	-349.8	427,075.53	692,094.62	32° 10' 21.447 N	103° 42' 45.007 W



COG PRODUCTION LLC

Survey Report - Geographic

Company:	COG PRODUCTION LLC	Local Co-ordinate Reference:	Well WINDWARD FEDERAL #9H
Project:	LEA COUNTY, NM	TVD Reference:	RKB=3551+26 @ 3577.0usft (McVay 8)
Site:	BULLDOG	MD Reference:	RKB=3551+26 @ 3577.0usft (McVay 8)
Well:	WINDWARD FEDERAL #9H	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
17,300.0	90.06	179.58	9,197.1	-8,212.9	-349.0	426,975.54	692,095.36	32° 10' 20.457 N	103° 42' 45.005 W
17,400.0	90.06	179.58	9,197.0	-8,312.9	-348.3	426,875.54	692,096.09	32° 10' 19.468 N	103° 42' 45.003 W
17,500.0	90.06	179.58	9,196.9	-8,412.9	-347.6	426,775.54	692,096.83	32° 10' 18.478 N	103° 42' 45.002 W
17,600.0	90.06	179.58	9,196.7	-8,512.9	-346.8	426,675.55	692,097.57	32° 10' 17.489 N	103° 42' 45.000 W
17,700.0	90.06	179.58	9,196.6	-8,612.9	-346.1	426,575.55	692,098.31	32° 10' 16.499 N	103° 42' 44.998 W
17,800.0	90.06	179.58	9,196.5	-8,712.8	-345.4	426,475.55	692,099.04	32° 10' 15.509 N	103° 42' 44.996 W
17,900.0	90.06	179.58	9,196.4	-8,812.8	-344.6	426,375.55	692,099.78	32° 10' 14.520 N	103° 42' 44.994 W
18,000.0	90.06	179.58	9,196.3	-8,912.8	-343.9	426,275.56	692,100.52	32° 10' 13.530 N	103° 42' 44.992 W
18,100.0	90.06	179.58	9,196.2	-9,012.8	-343.1	426,175.56	692,101.25	32° 10' 12.541 N	103° 42' 44.990 W
18,200.0	90.06	179.58	9,196.1	-9,112.8	-342.4	426,075.56	692,101.99	32° 10' 11.551 N	103° 42' 44.989 W
18,300.0	90.06	179.58	9,196.0	-9,212.8	-341.7	425,975.57	692,102.73	32° 10' 10.561 N	103° 42' 44.987 W
18,400.0	90.06	179.58	9,195.9	-9,312.8	-340.9	425,875.57	692,103.47	32° 10' 9.572 N	103° 42' 44.985 W
18,500.0	90.06	179.58	9,195.8	-9,412.8	-340.2	425,775.57	692,104.20	32° 10' 8.582 N	103° 42' 44.983 W
18,600.0	90.06	179.58	9,195.7	-9,512.8	-339.5	425,675.57	692,104.94	32° 10' 7.593 N	103° 42' 44.981 W
18,700.0	90.06	179.58	9,195.6	-9,612.8	-338.7	425,575.58	692,105.68	32° 10' 6.603 N	103° 42' 44.979 W
18,800.0	90.06	179.58	9,195.5	-9,712.8	-338.0	425,475.58	692,106.42	32° 10' 5.613 N	103° 42' 44.977 W
18,900.0	90.06	179.58	9,195.4	-9,812.8	-337.2	425,375.58	692,107.15	32° 10' 4.624 N	103° 42' 44.975 W
19,000.0	90.06	179.58	9,195.3	-9,912.8	-336.5	425,275.58	692,107.89	32° 10' 3.634 N	103° 42' 44.974 W
19,100.0	90.06	179.58	9,195.2	-10,012.8	-335.8	425,175.59	692,108.63	32° 10' 2.645 N	103° 42' 44.972 W
19,200.0	90.06	179.58	9,195.0	-10,112.8	-335.0	425,075.59	692,109.37	32° 10' 1.655 N	103° 42' 44.970 W
19,244.8	90.06	179.58	9,195.0	-10,157.6	-334.7	425,030.80	692,109.70	32° 10' 1.212 N	103° 42' 44.969 W

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-Windward	0.00	0.00	9,195.0	-10,157.6	-334.7	425,030.80	692,109.70	32° 10' 1.212 N	103° 42' 44.969 W
- plan hits target center									
- Point									

Plan Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
8728	8728	0	0	Start Build 12.00
9478	9205	-420	-228	Start DLS 4.00 TFO -89.88
10,201	9205	-1114	-401	Start 9194.1 hold at 10200.6 MD
19,395				TD at 19394.7

Checked By: _____ Approved By: _____ Date: _____



+N/-S
0.0

+E/-W
0.0

Northing
435188.40

WELL DETAILS: **WINDWARD FEDERAL #9H**
 Ground Level: 3551.0
 Easting 692444.40 32° 11' 41.711 N 103° 42' 40.392 W
 Longitude

Slot

SECTION DETAILS										
MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Annotation	
1	0.0	0.00	0.0	0.0	0.0	0.00	0.00	0.0		
2	8727.5	0.00	8727.5	0.0	0.0	0.00	0.00	0.0	Start Build 12.00	
3	9477.6	90.00	208.50	-419.6	-227.8	12.00	208.50	426.9	Start DLS 4.00 TFO -89.88	
4	10200.6	90.06	179.58	-1113.7	-401.4	4.00	-89.87	1126.3	Start 9194.1 hold at 10200.6 MD	
5	19244.8	90.06	179.58	9195.0	-10157.6	-334.7	0.00	10163.1		

Project: LEA COUNTY, NM
 Site: BULLDOG
 Well: WINDWARD FEDERAL #9H
 Wellbore: OWB
 Design: **PWP1**

LEGEND

- PADUCA FEDERAL #1, OWB, INC ONLY - WELLPATH V0
- △ WINDWARD FEDERAL #3H, OWB, ACTUAL WELLPATH V0
- KING TUT FEDERAL #3H, OWB, ACTUAL WELLPATH V0
- × WINDWARD FEDERAL #10H, OWB, PWP1 V0
- PWP1

