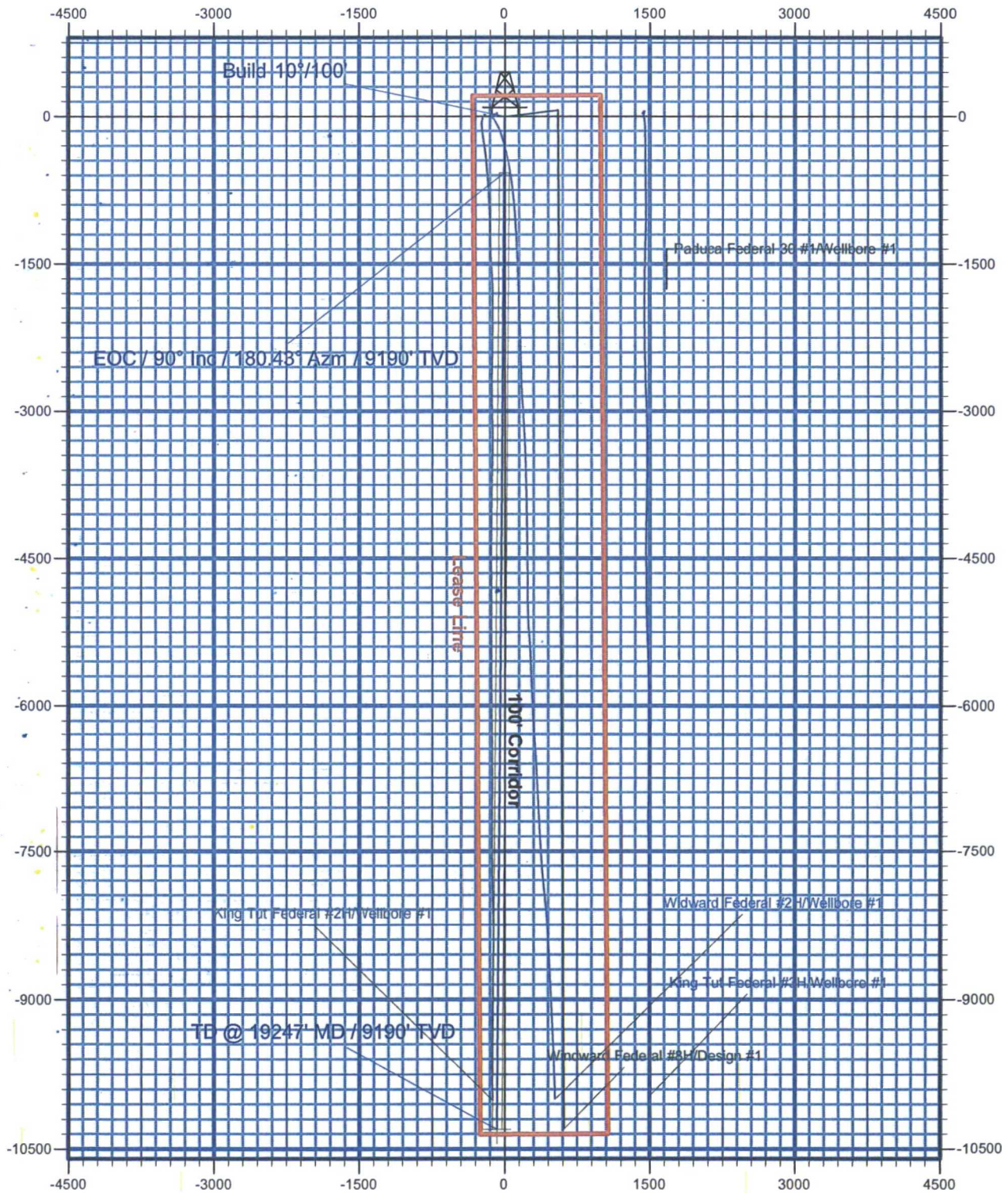


Lea County, New Mexico
Sec 30 T24-S R32-E
Windward Federal #7H
Design #1



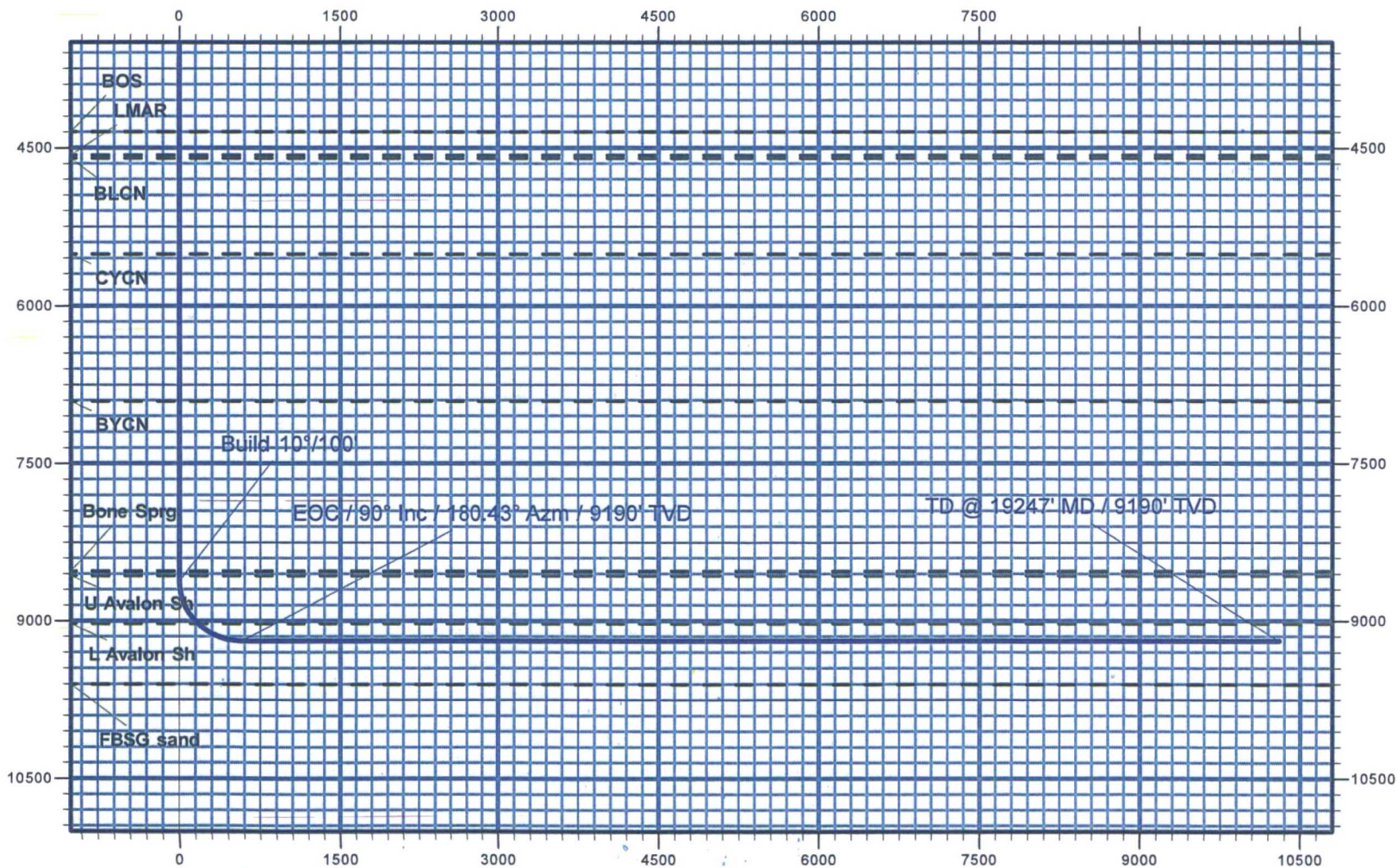


Lea County, New Mexico
Sec 30 T24-S R32-E
Windward Federal #7H

Design #1



DIRECTIONAL DRILLING





COG Production LLC

**Lea County, New Mexico
Sec 30 T24-S R32-E
Windward Federal #7H**

HOBBS OCD

DEC 27 2016

RECEIVED

Wellbore #1

Plan: Design #1

QES Well Planning Report

02 May, 2016





QES Directional Drilling, LLC
Well Planning Report



Database:	EDM5002	Local Co-ordinate Reference:	Well Windward Federal #7H
Company:	COG Production LLC	TVD Reference:	Well @ 3569.0usft (McVay 8)
Project:	Lea County, New Mexico	MD Reference:	Well @ 3569.0usft (McVay 8)
Site:	Sec 30 T24-S R32-E	North Reference:	Grid
Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #1		

Project	Lea County, New Mexico		
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 30 T24-S R32-E		
Site Position:		Northing:	435,185.29 usft
From:	Map	Easting:	692,144.40 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 11' 41.697 N
		Longitude:	103° 42' 43.883 W
		Grid Convergence:	0.33 °

Well	Windward Federal #7H		
Well Position	+N/-S	-10.6 usft	Northing:
	+E/-W	-1,336.8 usft	Easting:
Position Uncertainty	0.0 usft	Wellhead Elevation:	0.0 usft
		Latitude:	32° 11' 41.669 N
		Longitude:	103° 42' 59.440 W
		Ground Level:	3,543.0 usft

Wellbore	Wellbore #1		
Magnetics	Model Name	Sample Date	Declination
			(°)
	IGRF2015	4/28/2016	7.14
			Dip Angle
			(°)
			60.03
			Field Strength
			(nT)
			48,021

Design	Design #1		
Audit Notes:			
Version:	Phase:	PLAN	Tie On Depth:
			0.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.0	0.0	0.0
			Direction
			(°)
			180.43

Plan Sections										
Measured Depth	Inclination	Azimuth	Vertical Depth	+N/-S	+E/-W	Dogleg Rate	Build Rate	Turn Rate	TFO	Target
(usft)	(°)	(°)	(usft)	(usft)	(usft)	(°/100usft)	(°/100usft)	(°/100usft)	(°)	
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
8,617.0	0.00	0.00	8,617.0	0.0	0.0	0.00	0.00	0.00	0.00	
9,517.0	90.00	180.43	9,190.0	-572.9	-4.3	10.00	10.00	-19.95	180.43	
19,246.5	90.00	180.43	9,190.0	-10,302.2	-77.2	0.00	0.00	0.00	0.00	PBHL Windward Fed



QES Directional Drilling, LLC
Well Planning Report



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Project:	Lea County, New Mexico	MD Reference:	Well @ 3569.0usft (McVay 8)
Site:	Sec 30 T24-S R32-E	North Reference:	Grid
Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #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
Rustler									
784.0	0.00	0.00	784.0	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
TOS									
1,108.0	0.00	0.00	1,108.0	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
1,700.0	0.00	0.00	1,700.0	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
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
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
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
BOS									
4,346.0	0.00	0.00	4,346.0	0.0	0.0	0.0	0.00	0.00	0.00
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
LMAR									
4,570.0	0.00	0.00	4,570.0	0.0	0.0	0.0	0.00	0.00	0.00



QES Directional Drilling, LLC
Well Planning Report



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Project:	Lea County, New Mexico	MD Reference:	Well @ 3569.0usft (McVay 8)
Site:	Sec 30 T24-S R32-E	North Reference:	Grid
Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #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)
BLCN									
4,595.0	0.00	0.00	4,595.0	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
CYCN									
5,512.0	0.00	0.00	5,512.0	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
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
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
BYCN									
6,905.0	0.00	0.00	6,905.0	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									
8,524.0	0.00	0.00	8,524.0	0.0	0.0	0.0	0.00	0.00	0.00
U Avalon Sh									
8,566.0	0.00	0.00	8,566.0	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
Build 10°/100'									
8,617.0	0.00	0.00	8,617.0	0.0	0.0	0.0	0.00	0.00	0.00



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Well Planning Report



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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)
8,700.0	8.30	180.43	8,699.7	-6.0	0.0	6.0	10.00	10.00	0.00
8,800.0	18.30	180.43	8,796.9	-29.0	-0.2	29.0	10.00	10.00	0.00
8,900.0	28.30	180.43	8,888.6	-68.5	-0.5	68.5	10.00	10.00	0.00
9,000.0	38.30	180.43	8,972.1	-123.3	-0.9	123.3	10.00	10.00	0.00
L Avalon Sh									
9,071.1	45.41	180.43	9,025.0	-170.7	-1.3	170.7	10.00	10.00	0.00
9,100.0	48.30	180.43	9,044.8	-191.8	-1.4	191.8	10.00	10.00	0.00
9,200.0	58.30	180.43	9,104.5	-271.9	-2.0	271.9	10.00	10.00	0.00
9,300.0	68.30	180.43	9,149.4	-361.1	-2.7	361.1	10.00	10.00	0.00
9,400.0	78.30	180.43	9,178.1	-456.8	-3.4	456.8	10.00	10.00	0.00
9,500.0	88.30	180.43	9,189.7	-555.9	-4.2	556.0	10.00	10.00	0.00
EOC / 90° Inc / 180.43° Azm / 9190' TVD									
9,517.0	90.00	180.43	9,190.0	-572.9	-4.3	573.0	10.00	10.00	0.00
9,600.0	90.00	180.43	9,190.0	-655.9	-4.9	656.0	0.00	0.00	0.00
9,700.0	90.00	180.43	9,190.0	-755.9	-5.7	756.0	0.00	0.00	0.00
9,800.0	90.00	180.43	9,190.0	-855.9	-6.4	856.0	0.00	0.00	0.00
9,900.0	90.00	180.43	9,190.0	-955.9	-7.2	956.0	0.00	0.00	0.00
10,000.0	90.00	180.43	9,190.0	-1,055.9	-7.9	1,056.0	0.00	0.00	0.00
10,100.0	90.00	180.43	9,190.0	-1,155.9	-8.7	1,156.0	0.00	0.00	0.00
10,200.0	90.00	180.43	9,190.0	-1,255.9	-9.4	1,256.0	0.00	0.00	0.00
10,300.0	90.00	180.43	9,190.0	-1,355.9	-10.2	1,356.0	0.00	0.00	0.00
10,400.0	90.00	180.43	9,190.0	-1,455.9	-10.9	1,456.0	0.00	0.00	0.00
10,500.0	90.00	180.43	9,190.0	-1,555.9	-11.7	1,556.0	0.00	0.00	0.00
10,600.0	90.00	180.43	9,190.0	-1,655.9	-12.4	1,656.0	0.00	0.00	0.00
10,700.0	90.00	180.43	9,190.0	-1,755.9	-13.2	1,756.0	0.00	0.00	0.00
10,800.0	90.00	180.43	9,190.0	-1,855.9	-13.9	1,856.0	0.00	0.00	0.00
10,900.0	90.00	180.43	9,190.0	-1,955.9	-14.7	1,956.0	0.00	0.00	0.00
11,000.0	90.00	180.43	9,190.0	-2,055.9	-15.4	2,056.0	0.00	0.00	0.00
11,100.0	90.00	180.43	9,190.0	-2,155.9	-16.2	2,156.0	0.00	0.00	0.00
11,200.0	90.00	180.43	9,190.0	-2,255.9	-16.9	2,256.0	0.00	0.00	0.00
11,300.0	90.00	180.43	9,190.0	-2,355.9	-17.7	2,356.0	0.00	0.00	0.00
11,400.0	90.00	180.43	9,190.0	-2,455.9	-18.4	2,456.0	0.00	0.00	0.00
11,500.0	90.00	180.43	9,190.0	-2,555.9	-19.2	2,556.0	0.00	0.00	0.00
11,600.0	90.00	180.43	9,190.0	-2,655.9	-19.9	2,656.0	0.00	0.00	0.00
11,700.0	90.00	180.43	9,190.0	-2,755.9	-20.7	2,756.0	0.00	0.00	0.00
11,800.0	90.00	180.43	9,190.0	-2,855.9	-21.4	2,856.0	0.00	0.00	0.00
11,900.0	90.00	180.43	9,190.0	-2,955.9	-22.1	2,956.0	0.00	0.00	0.00
12,000.0	90.00	180.43	9,190.0	-3,055.9	-22.9	3,056.0	0.00	0.00	0.00
12,100.0	90.00	180.43	9,190.0	-3,155.9	-23.6	3,156.0	0.00	0.00	0.00
12,200.0	90.00	180.43	9,190.0	-3,255.9	-24.4	3,256.0	0.00	0.00	0.00
12,300.0	90.00	180.43	9,190.0	-3,355.9	-25.1	3,356.0	0.00	0.00	0.00
12,400.0	90.00	180.43	9,190.0	-3,455.9	-25.9	3,456.0	0.00	0.00	0.00
12,500.0	90.00	180.43	9,190.0	-3,555.9	-26.6	3,556.0	0.00	0.00	0.00
12,600.0	90.00	180.43	9,190.0	-3,655.9	-27.4	3,656.0	0.00	0.00	0.00
12,700.0	90.00	180.43	9,190.0	-3,755.9	-28.1	3,756.0	0.00	0.00	0.00
12,800.0	90.00	180.43	9,190.0	-3,855.8	-28.9	3,856.0	0.00	0.00	0.00
12,900.0	90.00	180.43	9,190.0	-3,955.8	-29.6	3,956.0	0.00	0.00	0.00
13,000.0	90.00	180.43	9,190.0	-4,055.8	-30.4	4,056.0	0.00	0.00	0.00
13,100.0	90.00	180.43	9,190.0	-4,155.8	-31.1	4,156.0	0.00	0.00	0.00
13,200.0	90.00	180.43	9,190.0	-4,255.8	-31.9	4,256.0	0.00	0.00	0.00
13,300.0	90.00	180.43	9,190.0	-4,355.8	-32.6	4,356.0	0.00	0.00	0.00
13,400.0	90.00	180.43	9,190.0	-4,455.8	-33.4	4,456.0	0.00	0.00	0.00
13,500.0	90.00	180.43	9,190.0	-4,555.8	-34.1	4,556.0	0.00	0.00	0.00
13,600.0	90.00	180.43	9,190.0	-4,655.8	-34.9	4,656.0	0.00	0.00	0.00



QES Directional Drilling, LLC
Well Planning Report



Database:	EDM5002	Local Co-ordinate Reference:	Well Windward Federal #7H
Company:	COG Production LLC	TVD Reference:	Well @ 3569.0usft (McVay 8)
Project:	Lea County, New Mexico	MD Reference:	Well @ 3569.0usft (McVay 8)
Site:	Sec 30 T24-S R32-E	North Reference:	Grid
Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #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)
13,700.0	90.00	180.43	9,190.0	-4,755.8	-35.6	4,756.0	0.00	0.00	0.00
13,800.0	90.00	180.43	9,190.0	-4,855.8	-36.4	4,856.0	0.00	0.00	0.00
13,900.0	90.00	180.43	9,190.0	-4,955.8	-37.1	4,956.0	0.00	0.00	0.00
14,000.0	90.00	180.43	9,190.0	-5,055.8	-37.9	5,056.0	0.00	0.00	0.00
14,100.0	90.00	180.43	9,190.0	-5,155.8	-38.6	5,156.0	0.00	0.00	0.00
14,200.0	90.00	180.43	9,190.0	-5,255.8	-39.4	5,256.0	0.00	0.00	0.00
14,300.0	90.00	180.43	9,190.0	-5,355.8	-40.1	5,356.0	0.00	0.00	0.00
14,400.0	90.00	180.43	9,190.0	-5,455.8	-40.9	5,456.0	0.00	0.00	0.00
14,500.0	90.00	180.43	9,190.0	-5,555.8	-41.6	5,556.0	0.00	0.00	0.00
14,600.0	90.00	180.43	9,190.0	-5,655.8	-42.4	5,656.0	0.00	0.00	0.00
14,700.0	90.00	180.43	9,190.0	-5,755.8	-43.1	5,756.0	0.00	0.00	0.00
14,800.0	90.00	180.43	9,190.0	-5,855.8	-43.9	5,856.0	0.00	0.00	0.00
14,900.0	90.00	180.43	9,190.0	-5,955.8	-44.6	5,956.0	0.00	0.00	0.00
15,000.0	90.00	180.43	9,190.0	-6,055.8	-45.4	6,056.0	0.00	0.00	0.00
15,100.0	90.00	180.43	9,190.0	-6,155.8	-46.1	6,156.0	0.00	0.00	0.00
15,200.0	90.00	180.43	9,190.0	-6,255.8	-46.9	6,256.0	0.00	0.00	0.00
15,300.0	90.00	180.43	9,190.0	-6,355.8	-47.6	6,356.0	0.00	0.00	0.00
15,400.0	90.00	180.43	9,190.0	-6,455.8	-48.4	6,456.0	0.00	0.00	0.00
15,500.0	90.00	180.43	9,190.0	-6,555.8	-49.1	6,556.0	0.00	0.00	0.00
15,600.0	90.00	180.43	9,190.0	-6,655.8	-49.9	6,656.0	0.00	0.00	0.00
15,700.0	90.00	180.43	9,190.0	-6,755.8	-50.6	6,756.0	0.00	0.00	0.00
15,800.0	90.00	180.43	9,190.0	-6,855.8	-51.4	6,856.0	0.00	0.00	0.00
15,900.0	90.00	180.43	9,190.0	-6,955.8	-52.1	6,956.0	0.00	0.00	0.00
16,000.0	90.00	180.43	9,190.0	-7,055.8	-52.9	7,056.0	0.00	0.00	0.00
16,100.0	90.00	180.43	9,190.0	-7,155.8	-53.6	7,156.0	0.00	0.00	0.00
16,200.0	90.00	180.43	9,190.0	-7,255.8	-54.4	7,256.0	0.00	0.00	0.00
16,300.0	90.00	180.43	9,190.0	-7,355.8	-55.1	7,356.0	0.00	0.00	0.00
16,400.0	90.00	180.43	9,190.0	-7,455.7	-55.9	7,456.0	0.00	0.00	0.00
16,500.0	90.00	180.43	9,190.0	-7,555.7	-56.6	7,556.0	0.00	0.00	0.00
16,600.0	90.00	180.43	9,190.0	-7,655.7	-57.4	7,656.0	0.00	0.00	0.00
16,700.0	90.00	180.43	9,190.0	-7,755.7	-58.1	7,756.0	0.00	0.00	0.00
16,800.0	90.00	180.43	9,190.0	-7,855.7	-58.9	7,856.0	0.00	0.00	0.00
16,900.0	90.00	180.43	9,190.0	-7,955.7	-59.6	7,956.0	0.00	0.00	0.00
17,000.0	90.00	180.43	9,190.0	-8,055.7	-60.4	8,056.0	0.00	0.00	0.00
17,100.0	90.00	180.43	9,190.0	-8,155.7	-61.1	8,156.0	0.00	0.00	0.00
17,200.0	90.00	180.43	9,190.0	-8,255.7	-61.9	8,256.0	0.00	0.00	0.00
17,300.0	90.00	180.43	9,190.0	-8,355.7	-62.6	8,356.0	0.00	0.00	0.00
17,400.0	90.00	180.43	9,190.0	-8,455.7	-63.4	8,456.0	0.00	0.00	0.00
17,500.0	90.00	180.43	9,190.0	-8,555.7	-64.1	8,556.0	0.00	0.00	0.00
17,600.0	90.00	180.43	9,190.0	-8,655.7	-64.9	8,656.0	0.00	0.00	0.00
17,700.0	90.00	180.43	9,190.0	-8,755.7	-65.6	8,756.0	0.00	0.00	0.00
17,800.0	90.00	180.43	9,190.0	-8,855.7	-66.4	8,856.0	0.00	0.00	0.00
17,900.0	90.00	180.43	9,190.0	-8,955.7	-67.1	8,956.0	0.00	0.00	0.00
18,000.0	90.00	180.43	9,190.0	-9,055.7	-67.9	9,056.0	0.00	0.00	0.00
18,100.0	90.00	180.43	9,190.0	-9,155.7	-68.6	9,156.0	0.00	0.00	0.00
18,200.0	90.00	180.43	9,190.0	-9,255.7	-69.4	9,256.0	0.00	0.00	0.00
18,300.0	90.00	180.43	9,190.0	-9,355.7	-70.1	9,356.0	0.00	0.00	0.00
18,400.0	90.00	180.43	9,190.0	-9,455.7	-70.9	9,456.0	0.00	0.00	0.00
18,500.0	90.00	180.43	9,190.0	-9,555.7	-71.6	9,556.0	0.00	0.00	0.00
18,600.0	90.00	180.43	9,190.0	-9,655.7	-72.4	9,656.0	0.00	0.00	0.00
18,700.0	90.00	180.43	9,190.0	-9,755.7	-73.1	9,756.0	0.00	0.00	0.00
18,800.0	90.00	180.43	9,190.0	-9,855.7	-73.9	9,856.0	0.00	0.00	0.00
18,900.0	90.00	180.43	9,190.0	-9,955.7	-74.6	9,956.0	0.00	0.00	0.00
19,000.0	90.00	180.43	9,190.0	-10,055.7	-75.4	10,056.0	0.00	0.00	0.00



QES Directional Drilling, LLC
Well Planning Report



Database:	EDM5002	Local Co-ordinate Reference:	Well Windward Federal #7H
Company:	COG Production LLC	TVD Reference:	Well @ 3569.0usft (McVay 8)
Project:	Lea County, New Mexico	MD Reference:	Well @ 3569.0usft (McVay 8)
Site:	Sec 30 T24-S R32-E	North Reference:	Grid
Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #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)
19,100.0	90.00	180.43	9,190.0	-10,155.7	-76.1	10,156.0	0.00	0.00	0.00
19,200.0	90.00	180.43	9,190.0	-10,255.7	-76.9	10,256.0	0.00	0.00	0.00
TD @ 19247' MD / 9190' TVD									
19,246.5	90.00	180.43	9,190.0	-10,302.2	-77.2	10,302.5	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 Windward Federa	90.00	180.43	9,190.0	-10,302.2	-77.2	424,872.50	690,730.40	32° 9' 59.724 N	103° 43' 1.026 W
- plan hits target center									
- Rectangle (sides W100.0 H0.0 D9,729.5)									

Formations						
Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)	
784.0	-2,204.0	Rustler		0.00	180.43	
1,108.0	-1,880.0	TOS		0.00	180.43	
1,989.0	0.0	FBSG sand		0.00	180.43	
4,346.0	1,358.0	BOS		0.00	180.43	
4,570.0	1,582.0	LMAR		0.00	180.43	
4,595.0	1,607.0	BLCN		0.00	180.43	
5,512.0	2,524.0	CYCN		0.00	180.43	
6,905.0	3,917.0	BYCN		0.00	180.43	
8,524.0	5,536.0	Bone Sprg		0.00	180.43	
8,566.0	5,578.0	U Avalon Sh		0.00	180.43	
9,071.1	6,037.0	L Avalon Sh		0.00	180.43	

Plan Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
8,617.0	8,617.0	0.0	0.0	Build 10°/100'	
9,517.0	9,190.0	-572.9	-4.3	EOC / 90° Inc / 180.43° Azm / 9190' TVD	
19,246.5	9,190.0	-10,302.2	-77.2	TD @ 19247' MD / 9190' TVD	



COG Production LLC

Lea County, New Mexico

Sec 30 T24-S R32-E

Windward Federal #7H

Wellbore #1

Design #1

H

DEC 27 2016

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QES Anticollision Report

02 May, 2016





QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Reference	Design #1		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	Stations	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 10,000.0 usft	Error Surface:	Elliptical Conic
Warning Levels Evaluated at:	2.00 Sigma		

Survey Tool Program		Date		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
0.0	19,246.5	Design #1 (Wellbore #1)	MWD default	MWD - Standard

Summary	Reference Measured Depth (usft)	Offset Measured Depth (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
Site Name						
Offset Well - Wellbore - Design						
Sec 30 T24-S R32-E						
King Tut Federal #2H - Wellbore #1 - Wellbore #1	5,791.1	5,795.2	198.3	182.4	12.475	CC
King Tut Federal #2H - Wellbore #1 - Wellbore #1	6,000.0	6,003.7	198.5	182.1	12.052	ES
King Tut Federal #2H - Wellbore #1 - Wellbore #1	19,000.0	18,142.0	781.2	634.6	5.328	SF
King Tut Federal #3H - Wellbore #1 - Wellbore #1	5,896.9	5,905.9	1,424.2	1,398.9	56.383	CC
King Tut Federal #3H - Wellbore #1 - Wellbore #1	7,900.0	7,899.2	1,430.3	1,396.3	42.151	ES
King Tut Federal #3H - Wellbore #1 - Wellbore #1	19,000.0	18,230.0	1,763.2	1,435.6	5.381	SF
Paduca Federal 30 #1 - Wellbore #1 - Wellbore #1	10,433.3	9,203.0	1,681.4	827.9	1.970	CC, ES
Paduca Federal 30 #1 - Wellbore #1 - Wellbore #1	10,500.0	9,202.6	1,682.7	828.2	1.969	SF
Windward Federal #2H - Wellbore #1 - Wellbore #1	2,950.5	2,956.0	75.9	67.8	9.452	CC, ES
Windward Federal #2H - Wellbore #1 - Wellbore #1	8,650.0	8,655.1	102.8	78.9	4.308	SF
Windward Federal #8H - Wellbore #1 - Design #1	964.2	971.2	50.0	45.9	12.333	CC
Windward Federal #8H - Wellbore #1 - Design #1	1,000.0	1,006.9	50.0	45.8	11.867	ES
Windward Federal #8H - Wellbore #1 - Design #1	19,246.5	19,328.1	690.0	312.8	1.829	SF

Offset Design										Offset Site Error:		0.0 usft
Survey Program: 100-Good_gyro, 7835-MWD default										Offset Well Error:		0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
0.0	0.0	3.9	3.9	0.0	0.0	-84.70	18.6	-200.5	201.4			
100.0	100.0	103.6	103.6	0.1	0.0	-84.74	18.5	-200.6	201.4	201.3	1,654.532	
200.0	200.0	203.5	203.5	0.3	0.1	-84.82	18.2	-200.8	201.6	201.2	505.334	
300.0	300.0	303.1	303.1	0.5	0.1	-84.87	18.1	-201.1	201.9	201.2	298.714	
400.0	400.0	402.9	402.9	0.8	0.2	-84.90	18.0	-201.5	202.3	201.4	212.317	
500.0	500.0	501.9	501.9	1.0	0.2	-84.99	17.7	-202.3	203.1	201.8	165.138	
600.0	600.0	601.3	601.3	1.2	0.3	-85.15	17.3	-203.5	204.2	202.7	135.525	
700.0	700.0	701.0	700.9	1.4	0.4	-85.32	16.8	-204.9	205.6	203.8	115.230	
800.0	800.0	801.8	801.8	1.7	0.4	-85.49	16.3	-206.2	206.8	204.8	100.297	
900.0	900.0	902.6	902.6	1.9	0.5	-85.62	15.9	-207.0	207.6	205.3	88.749	
1,000.0	1,000.0	1,003.2	1,003.2	2.1	0.5	-85.70	15.6	-207.5	208.1	205.5	79.522	
1,100.0	1,100.0	1,103.5	1,103.4	2.3	0.6	-85.81	15.2	-207.9	208.4	205.5	72.003	
1,200.0	1,200.0	1,204.4	1,204.4	2.6	0.6	-85.82	15.2	-207.8	208.4	205.2	65.701	
1,300.0	1,300.0	1,304.2	1,304.2	2.8	0.7	-85.86	15.0	-207.7	208.2	204.8	60.370	
1,400.0	1,400.0	1,404.9	1,404.8	3.0	0.7	-85.91	14.8	-207.4	207.9	204.2	55.793	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - King Tut Federal #2H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-Good_gyro, 7835-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning		
1,479.6	1,479.6	1,483.6	1,483.5	3.2	0.8	-85.78	15.3	-207.2	207.7	203.8	52.641		
1,500.0	1,500.0	1,503.6	1,503.6	3.2	0.8	-85.72	15.5	-207.2	207.7	203.7	51.905		
1,600.0	1,600.0	1,600.6	1,600.5	3.5	0.8	-85.47	16.5	-207.9	208.6	204.3	48.770		
1,700.0	1,700.0	1,702.2	1,702.1	3.7	0.9	-85.53	16.4	-209.2	209.9	205.3	46.065		
1,800.0	1,800.0	1,805.7	1,805.6	3.9	0.9	-85.75	15.6	-209.3	209.8	205.0	43.402		
1,900.0	1,900.0	1,905.9	1,905.9	4.1	1.0	-85.77	15.4	-208.4	208.9	203.8	40.872		
1,997.3	1,997.3	2,001.3	2,001.2	4.3	1.0	-85.58	16.1	-207.9	208.5	203.1	38.748		
2,000.0	2,000.0	2,003.9	2,003.8	4.4	1.0	-85.57	16.1	-207.9	208.5	203.1	38.695		
2,100.0	2,100.0	2,101.4	2,101.3	4.6	1.1	-85.36	16.9	-208.4	209.1	203.5	36.927		
2,200.0	2,200.0	2,203.3	2,203.2	4.8	1.1	-85.32	17.1	-209.2	209.9	204.0	35.329		
2,300.0	2,300.0	2,303.6	2,303.5	5.0	1.2	-85.41	16.8	-209.5	210.2	204.0	33.797		
2,400.0	2,400.0	2,405.5	2,405.4	5.3	1.2	-85.39	16.9	-209.2	209.9	203.4	32.306		
2,500.0	2,500.0	2,504.9	2,504.8	5.5	1.3	-85.22	17.5	-208.6	209.3	202.5	30.901		
2,553.8	2,553.8	2,557.8	2,557.7	5.6	1.3	-85.08	17.9	-208.4	209.2	202.3	30.220		
2,600.0	2,600.0	2,603.2	2,603.1	5.7	1.3	-84.95	18.4	-208.5	209.3	202.2	29.685		
2,700.0	2,700.0	2,702.3	2,702.2	5.9	1.4	-84.73	19.3	-209.0	209.9	202.5	28.646		
2,800.0	2,800.0	2,802.7	2,802.6	6.2	1.5	-84.73	19.4	-209.7	210.6	203.0	27.696		
2,900.0	2,900.0	2,904.1	2,904.0	6.4	1.5	-84.90	18.7	-210.1	210.9	203.0	26.758		
3,000.0	3,000.0	3,004.9	3,004.8	6.6	1.6	-85.06	18.1	-209.9	210.7	202.5	25.818		
3,100.0	3,100.0	3,105.2	3,105.1	6.8	1.6	-85.17	17.7	-209.4	210.2	201.7	24.911		
3,200.0	3,200.0	3,205.8	3,205.6	7.1	1.7	-85.21	17.5	-208.7	209.5	200.7	24.037		
3,300.0	3,300.0	3,305.3	3,305.2	7.3	1.7	-85.02	18.1	-207.9	208.7	199.7	23.213		
3,342.9	3,342.9	3,346.9	3,346.8	7.4	1.7	-84.88	18.6	-207.7	208.6	199.5	22.898		
3,400.0	3,400.0	3,402.4	3,402.3	7.5	1.8	-84.73	19.2	-207.9	208.8	199.5	22.534		
3,500.0	3,500.0	3,502.8	3,502.7	7.7	1.8	-84.61	19.7	-208.5	209.5	199.9	21.949		
3,600.0	3,600.0	3,602.8	3,602.7	7.9	1.9	-84.69	19.4	-209.2	210.1	200.2	21.389		
3,700.0	3,700.0	3,704.5	3,704.4	8.2	1.9	-84.90	18.7	-209.4	210.2	200.1	20.817		
3,800.0	3,800.0	3,805.8	3,805.6	8.4	2.0	-84.92	18.6	-208.8	209.7	199.3	20.205		
3,900.0	3,900.0	3,904.4	3,904.2	8.6	2.0	-84.68	19.4	-208.3	209.2	198.5	19.635		
3,923.1	3,923.1	3,927.1	3,927.0	8.7	2.0	-84.62	19.6	-208.2	209.2	198.4	19.517		
4,000.0	4,000.0	4,003.1	4,002.9	8.8	2.1	-84.49	20.1	-208.4	209.3	198.4	19.154		
4,100.0	4,100.0	4,103.5	4,103.4	9.1	2.1	-84.47	20.2	-208.7	209.7	198.5	18.712		
4,200.0	4,200.0	4,204.5	4,204.3	9.3	2.2	-84.55	19.9	-208.8	209.7	198.2	18.261		
4,300.0	4,300.0	4,305.8	4,305.7	9.5	2.2	-84.71	19.3	-208.3	209.2	197.4	17.785		
4,400.0	4,400.0	4,407.0	4,406.8	9.7	2.3	-84.93	18.4	-207.2	208.0	196.0	17.277		
4,500.0	4,500.0	4,505.9	4,505.7	10.0	2.3	-85.13	17.6	-206.1	206.9	194.6	16.796		
4,600.0	4,600.0	4,605.2	4,605.0	10.2	2.4	-85.26	17.0	-205.5	206.2	193.6	16.371		
4,700.0	4,700.0	4,705.3	4,705.1	10.4	2.4	-85.38	16.6	-204.9	205.6	192.7	15.974		
4,800.0	4,800.0	4,806.0	4,805.8	10.6	2.5	-85.51	16.0	-204.2	204.8	191.7	15.578		
4,900.0	4,900.0	4,906.8	4,906.6	10.9	2.6	-85.74	15.1	-203.1	203.7	190.2	15.170		
5,000.0	5,000.0	5,006.4	5,006.2	11.1	2.6	-86.03	14.0	-201.9	202.4	188.7	14.773		
5,100.0	5,100.0	5,106.2	5,105.9	11.3	2.7	-86.32	12.9	-200.9	201.3	187.4	14.402		
5,200.0	5,200.0	5,205.2	5,205.0	11.5	2.7	-86.51	12.2	-200.2	200.6	186.3	14.070		
5,300.0	5,300.0	5,305.7	5,305.5	11.8	2.8	-86.63	11.8	-199.6	199.9	185.4	13.755		
5,400.0	5,400.0	5,405.1	5,404.9	12.0	2.8	-86.76	11.3	-199.0	199.3	184.5	13.455		
5,500.0	5,500.0	5,504.7	5,504.4	12.2	2.9	-86.90	10.8	-198.6	198.9	183.8	13.183		
5,600.0	5,600.0	5,604.5	5,604.3	12.4	2.9	-87.01	10.4	-198.4	198.7	183.3	12.930		
5,700.0	5,700.0	5,704.7	5,704.5	12.7	3.0	-87.15	9.9	-198.2	198.4	182.8	12.685		
5,791.1	5,791.1	5,795.2	5,795.0	12.9	3.0	-87.26	9.5	-198.1	198.3	182.4	12.475 CC		
5,800.0	5,800.0	5,804.1	5,803.9	12.9	3.0	-87.27	9.5	-198.1	198.3	182.4	12.456		
5,900.0	5,900.0	5,903.8	5,903.6	13.1	3.1	-87.40	9.0	-198.2	198.4	182.2	12.248		
6,000.0	6,000.0	6,003.7	6,003.5	13.3	3.1	-87.57	8.4	-198.4	198.5	182.1	12.052 ES		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - King Tut Federal #2H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-Good_gyro, 7835-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning	
6,100.0	6,100.0	6,103.2	6,103.0	13.6	3.2	-87.76	7.8	-198.7	198.9	182.1	11.873		
6,200.0	6,200.0	6,202.8	6,202.5	13.8	3.2	-87.92	7.2	-199.3	199.4	182.4	11.713		
6,300.0	6,300.0	6,302.3	6,302.0	14.0	3.3	-88.09	6.7	-200.1	200.3	182.9	11.572		
6,400.0	6,400.0	6,401.1	6,400.8	14.2	3.3	-88.29	6.0	-201.4	201.5	183.9	11.461		
6,500.0	6,500.0	6,501.2	6,501.0	14.5	3.4	-88.48	5.4	-202.9	203.0	185.1	11.366		
6,600.0	6,600.0	6,600.6	6,600.3	14.7	3.4	-88.68	4.7	-204.5	204.6	186.4	11.280		
6,700.0	6,700.0	6,700.1	6,699.8	14.9	3.5	-88.92	3.9	-206.4	206.4	188.0	11.212		
6,800.0	6,800.0	6,799.9	6,799.6	15.1	3.5	-89.26	2.7	-208.4	208.5	189.8	11.154		
6,900.0	6,900.0	6,900.0	6,899.6	15.4	3.6	-89.60	1.5	-210.5	210.5	191.6	11.099		
7,000.0	7,000.0	7,000.9	7,000.5	15.6	3.7	-89.91	0.3	-212.3	212.4	193.1	11.034		
7,100.0	7,100.0	7,101.0	7,100.6	15.8	3.7	-90.23	-0.9	-213.9	213.9	194.4	10.958		
7,200.0	7,200.0	7,200.0	7,199.6	16.0	3.8	-90.58	-2.2	-215.6	215.7	195.9	10.893		
7,300.0	7,300.0	7,299.3	7,298.8	16.3	3.8	-91.00	-3.8	-217.7	217.8	197.8	10.849		
7,400.0	7,400.0	7,399.5	7,399.0	16.5	3.9	-91.42	-5.4	-220.0	220.1	199.8	10.814		
7,500.0	7,500.0	7,499.9	7,499.4	16.7	3.9	-91.82	-7.1	-222.1	222.3	201.6	10.771		
7,600.0	7,600.0	7,601.2	7,600.6	16.9	4.0	-92.23	-8.7	-223.8	224.0	203.1	10.712		
7,700.0	7,700.0	7,701.1	7,700.5	17.2	4.0	-92.63	-10.3	-225.2	225.5	204.3	10.642		
7,800.0	7,800.0	7,799.0	7,798.4	17.4	4.1	-93.07	-12.2	-226.9	227.3	205.8	10.572		
7,900.0	7,900.0	7,893.6	7,892.3	17.6	4.1	-93.35	-21.5	-229.5	230.8	209.0	10.579		
8,000.0	8,000.0	7,976.2	7,971.6	17.8	4.1	-100.70	-44.2	-233.7	240.0	217.9	10.851		
8,100.0	8,100.0	8,074.2	8,061.8	18.1	4.3	-109.06	-82.0	-237.4	254.6	232.1	11.294		
8,200.0	8,200.0	8,153.6	8,128.4	18.3	4.6	-118.06	-124.8	-234.2	275.9	252.9	11.952		
8,300.0	8,300.0	8,224.6	8,183.1	18.5	5.1	-126.63	-169.7	-228.3	309.0	285.3	13.039		
8,400.0	8,400.0	8,281.2	8,223.7	18.7	5.5	-133.19	-208.7	-222.3	354.2	329.9	14.604		
8,500.0	8,500.0	8,326.3	8,253.7	19.0	6.0	-138.10	-241.9	-217.1	410.2	385.5	16.582		
8,600.0	8,600.0	8,368.0	8,279.0	19.2	6.4	-142.32	-274.7	-212.1	475.4	450.2	18.865		
8,617.0	8,617.0	8,368.0	8,279.0	19.2	6.4	-142.32	-274.7	-212.1	487.2	461.9	19.303		
8,650.0	8,650.0	8,385.4	8,289.1	19.3	6.6	33.88	-288.7	-210.2	509.9	485.3	20.691		
8,700.0	8,699.7	8,409.8	8,303.2	19.4	6.9	29.83	-308.5	-208.0	543.2	518.6	22.065		
8,750.0	8,748.8	8,431.0	8,315.1	19.5	7.1	26.72	-325.9	-206.0	574.7	550.3	23.487		
8,800.0	8,796.9	8,454.1	8,327.6	19.5	7.4	24.07	-345.3	-203.8	604.5	580.3	24.960		
8,850.0	8,843.6	8,475.4	8,338.4	19.6	7.7	21.95	-363.5	-201.7	632.5	608.6	26.537		
8,900.0	8,888.6	8,494.0	8,347.5	19.7	7.9	20.27	-379.6	-199.9	658.5	635.2	28.240		
8,950.0	8,931.6	8,525.0	8,361.8	19.8	8.4	18.57	-407.0	-197.1	682.3	659.6	30.024		
9,000.0	8,972.1	8,541.7	8,369.0	19.9	8.6	17.47	-422.0	-195.7	704.0	682.0	32.046		
9,050.0	9,009.9	8,557.0	8,375.2	20.0	8.8	16.57	-435.9	-194.5	723.6	702.5	34.298		
9,100.0	9,044.8	8,588.0	8,386.5	20.2	9.3	15.54	-464.6	-191.7	741.0	720.8	36.703		
9,150.0	9,076.4	8,599.4	8,390.2	20.3	9.5	14.95	-475.3	-190.6	756.2	737.1	39.544		
9,200.0	9,104.5	8,615.0	8,394.7	20.5	9.7	14.38	-490.2	-189.0	769.4	751.4	42.723		
9,250.0	9,128.9	8,647.0	8,402.6	20.8	10.3	13.69	-521.0	-185.5	780.3	763.4	46.132		
9,300.0	9,149.4	8,663.5	8,406.1	21.0	10.5	13.30	-537.0	-183.6	788.6	772.8	50.033		
9,350.0	9,165.8	8,690.8	8,411.2	21.3	11.0	12.86	-563.6	-180.3	794.3	779.6	54.061		
9,400.0	9,178.1	8,723.7	8,416.5	21.6	11.5	12.47	-595.9	-176.5	797.0	783.3	57.890		
9,450.0	9,186.0	8,759.7	8,421.8	22.0	12.1	12.20	-631.4	-172.9	796.5	783.4	60.828		
9,500.0	9,189.7	8,793.2	8,426.2	22.4	12.7	12.10	-664.4	-170.1	792.6	779.8	62.014		
9,517.0	9,190.0	8,804.0	8,427.5	22.5	12.9	12.10	-675.1	-169.4	790.5	777.7	61.888		
9,600.0	9,190.0	8,853.9	8,432.8	23.2	13.7	11.92	-724.7	-166.1	781.0	767.6	58.166		
9,700.0	9,190.0	8,898.0	8,434.5	24.1	14.5	11.74	-768.6	-163.5	775.7	761.5	54.655		
9,763.6	9,190.0	8,947.8	8,434.3	24.8	15.3	11.54	-818.4	-161.2	775.2	760.4	52.315		
9,800.0	9,190.0	8,977.7	8,434.0	25.2	15.8	11.45	-848.2	-160.2	775.4	760.2	51.037		
9,900.0	9,190.0	9,085.9	8,432.6	26.3	17.6	11.15	-956.4	-157.3	776.0	759.6	47.281		
10,000.0	9,190.0	9,194.2	8,432.9	27.5	19.2	10.89	-1,064.7	-154.4	775.0	757.3	43.814		

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - King Tut Federal #2H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-Good_gyro, 7835-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
10,059.2	9,190.0	9,243.6	8,432.9	28.3	20.0	10.78	-1,114.1	-153.2	774.6	756.2	42.131		
10,100.0	9,190.0	9,278.8	8,432.6	28.8	20.6	10.69	-1,149.2	-152.3	774.8	755.9	41.056		
10,200.0	9,190.0	9,384.0	8,431.5	30.1	22.4	10.38	-1,254.4	-149.0	775.0	754.8	38.401		
10,300.0	9,190.0	9,477.7	8,430.2	31.5	24.0	10.06	-1,347.9	-145.5	775.6	754.2	36.191		
10,400.0	9,190.0	9,586.0	8,428.5	32.9	25.8	9.59	-1,456.2	-140.3	776.2	753.5	34.134		
10,500.0	9,190.0	9,704.7	8,429.2	34.4	27.8	9.09	-1,574.6	-134.2	774.6	750.5	32.118		
10,600.0	9,190.0	9,796.5	8,430.6	35.8	29.3	8.67	-1,666.3	-128.9	772.2	746.8	30.466		
10,700.0	9,190.0	9,889.4	8,430.4	37.4	30.9	8.33	-1,759.1	-124.9	771.6	745.0	28.989		
10,775.4	9,190.0	9,960.8	8,430.4	38.5	32.1	8.11	-1,830.5	-122.5	771.2	743.6	27.939		
10,800.0	9,190.0	9,981.0	8,430.3	38.9	32.4	8.08	-1,850.6	-122.2	771.2	743.3	27.627		
10,900.0	9,190.0	10,070.5	8,428.9	40.5	34.0	8.09	-1,940.2	-123.2	772.8	743.5	26.367		
11,000.0	9,190.0	10,181.4	8,427.2	42.1	35.8	8.10	-2,051.0	-124.4	774.4	743.5	25.093		
11,100.0	9,190.0	10,288.1	8,427.4	43.7	37.6	8.09	-2,157.7	-125.1	774.2	741.8	23.910		
11,171.4	9,190.0	10,356.9	8,427.6	44.8	38.8	8.14	-2,226.5	-126.3	774.0	740.6	23.144		
11,200.0	9,190.0	10,383.9	8,427.7	45.3	39.2	8.17	-2,253.5	-126.9	774.1	740.2	22.856		
11,300.0	9,190.0	10,468.1	8,426.9	46.9	40.7	8.23	-2,337.7	-128.5	775.1	739.9	21.979		
11,400.0	9,190.0	10,581.0	8,424.7	48.6	42.6	8.29	-2,450.6	-130.4	777.3	740.4	21.075		
11,500.0	9,190.0	10,692.7	8,425.1	50.2	44.5	8.33	-2,562.2	-131.7	776.9	738.5	20.190		
11,600.0	9,190.0	10,787.0	8,425.7	51.9	46.1	8.35	-2,656.5	-132.6	776.4	736.5	19.435		
11,700.0	9,190.0	10,885.9	8,425.8	53.6	47.8	8.32	-2,755.4	-132.9	776.2	734.8	18.735		
11,702.7	9,190.0	10,888.2	8,425.8	53.6	47.8	8.31	-2,757.7	-132.9	776.2	734.7	18.719		
11,800.0	9,190.0	10,972.9	8,424.9	55.3	49.3	8.24	-2,842.4	-132.6	777.1	734.3	18.157		
11,900.0	9,190.0	11,085.6	8,424.2	57.0	51.2	8.09	-2,955.1	-131.6	777.4	733.1	17.542		
11,900.6	9,190.0	11,086.1	8,424.2	57.0	51.3	8.09	-2,955.6	-131.5	777.4	733.1	17.539		
12,000.0	9,190.0	11,176.2	8,423.1	58.7	52.8	7.92	-3,045.7	-130.1	778.2	732.6	17.043		
12,100.0	9,190.0	11,286.3	8,421.9	60.4	54.7	7.64	-3,155.7	-127.2	778.9	731.8	16.542		
12,200.0	9,190.0	11,389.9	8,422.2	62.1	56.5	7.41	-3,259.3	-124.9	778.2	729.7	16.048		
12,300.0	9,190.0	11,494.9	8,422.5	63.8	58.2	7.37	-3,364.3	-124.9	777.8	727.8	15.555		
12,400.0	9,190.0	11,595.2	8,424.4	65.6	59.9	7.50	-3,464.6	-127.2	776.2	724.6	15.048		
12,465.0	9,190.0	11,650.8	8,424.9	66.7	60.9	7.57	-3,520.1	-128.6	775.7	723.2	14.767		
12,500.0	9,190.0	11,678.4	8,424.8	67.3	61.4	7.60	-3,547.8	-129.2	775.9	722.9	14.633		
12,600.0	9,190.0	11,784.3	8,423.5	69.0	63.2	7.68	-3,653.6	-131.3	777.4	722.8	14.232		
12,700.0	9,190.0	11,887.4	8,424.1	70.8	65.0	7.77	-3,756.7	-133.2	776.9	720.7	13.819		
12,719.8	9,190.0	11,905.9	8,424.2	71.1	65.3	7.79	-3,775.2	-133.6	776.9	720.3	13.746		
12,800.0	9,190.0	11,973.1	8,423.8	72.5	66.4	7.84	-3,842.3	-134.9	777.5	719.8	13.482		
12,900.0	9,190.0	12,086.1	8,422.3	74.3	68.4	7.93	-3,955.3	-137.0	779.0	719.6	13.128		
12,982.3	9,190.0	12,167.8	8,422.6	75.7	69.8	7.97	-4,037.1	-138.3	778.8	718.2	12.849		
13,000.0	9,190.0	12,184.8	8,422.6	76.0	70.1	7.98	-4,054.1	-138.4	778.8	718.0	12.794		
13,100.0	9,190.0	12,300.7	8,423.8	77.8	72.0	7.95	-4,169.9	-138.8	777.7	715.2	12.443		
13,180.0	9,190.0	12,365.9	8,424.4	79.2	73.2	7.92	-4,235.1	-138.8	776.9	713.3	12.219		
13,200.0	9,190.0	12,380.0	8,424.4	79.5	73.4	7.91	-4,249.2	-138.8	776.9	713.1	12.171		
13,300.0	9,190.0	12,474.0	8,423.3	81.3	75.1	7.83	-4,343.2	-138.6	777.9	712.7	11.923		
13,400.0	9,190.0	12,590.6	8,423.1	83.1	77.1	7.73	-4,459.8	-138.0	777.8	711.0	11.642		
13,421.1	9,190.0	12,608.1	8,423.2	83.4	77.4	7.71	-4,477.3	-137.9	777.7	710.6	11.592		
13,500.0	9,190.0	12,684.1	8,422.6	84.8	78.7	7.66	-4,553.3	-137.8	778.2	710.0	11.406		
13,600.0	9,190.0	12,808.6	8,425.2	86.6	80.8	7.62	-4,677.7	-137.8	775.9	706.0	11.100		
13,700.0	9,190.0	12,888.8	8,426.9	88.4	82.2	7.59	-4,757.9	-137.9	773.8	702.5	10.861		
13,709.1	9,190.0	12,895.0	8,426.9	88.5	82.3	7.59	-4,764.1	-137.9	773.8	702.4	10.843		
13,800.0	9,190.0	12,969.2	8,425.5	90.2	83.6	7.57	-4,838.3	-138.3	775.3	702.7	10.680		
13,900.0	9,190.0	13,079.8	8,424.5	91.9	85.5	7.51	-4,949.0	-138.5	776.1	701.9	10.468		
14,000.0	9,190.0	13,184.2	8,423.2	93.7	87.3	7.43	-5,053.3	-138.4	777.2	701.5	10.276		
14,072.2	9,190.0	13,257.4	8,423.4	95.0	88.5	7.36	-5,126.5	-138.0	776.9	700.2	10.133		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - King Tut Federal #2H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-Good_gyro, 7835-MWD default												Offset Well Error:	0.0 usft
Measured Depth (usft)	Reference Vertical Depth (usft)	Measured Depth (usft)	Offset Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
14,100.0	9,190.0	13,279.9	8,423.2	95.5	88.9	7.33	-5,149.1	-137.8	777.0	700.0	10.088		
14,200.0	9,190.0	13,385.9	8,421.7	97.3	90.7	7.14	-5,255.0	-136.1	778.2	699.8	9.922		
14,300.0	9,190.0	13,495.8	8,422.5	99.0	92.6	7.05	-5,364.9	-135.7	777.3	697.4	9.723		
14,361.8	9,190.0	13,547.8	8,422.9	100.1	93.5	7.07	-5,416.9	-136.2	776.9	696.0	9.612		
14,400.0	9,190.0	13,578.3	8,422.8	100.8	94.0	7.07	-5,447.4	-136.5	777.0	695.7	9.553		
14,500.0	9,190.0	13,689.8	8,421.9	102.6	95.9	7.04	-5,558.8	-137.0	777.9	695.0	9.382		
14,600.0	9,190.0	13,786.7	8,422.1	104.4	97.6	6.95	-5,655.7	-136.5	777.5	693.2	9.221		
14,615.6	9,190.0	13,801.7	8,422.1	104.7	97.9	6.93	-5,670.8	-136.3	777.5	693.0	9.198		
14,700.0	9,190.0	13,884.0	8,421.7	106.2	99.3	6.85	-5,753.1	-135.9	777.7	692.0	9.072		
14,800.0	9,190.0	13,972.9	8,420.7	108.0	100.8	6.78	-5,842.0	-135.6	778.7	691.6	8.942		
14,900.0	9,190.0	14,085.8	8,419.8	109.8	102.8	6.66	-5,954.9	-135.0	779.4	690.8	8.797		
15,000.0	9,190.0	14,172.5	8,418.6	111.6	104.3	6.55	-6,041.6	-134.2	780.4	690.5	8.681		
15,100.0	9,190.0	14,290.6	8,418.7	113.3	106.3	6.35	-6,159.6	-132.4	780.0	688.7	8.537		
15,115.8	9,190.0	14,302.9	8,418.7	113.6	106.5	6.33	-6,171.9	-132.2	780.0	688.4	8.518		
15,200.0	9,190.0	14,385.7	8,417.8	115.1	107.9	6.20	-6,254.7	-131.1	780.6	687.9	8.420		
15,300.0	9,190.0	14,493.0	8,419.5	116.9	109.8	6.06	-6,362.0	-129.9	778.8	684.6	8.272		
15,322.5	9,190.0	14,509.2	8,419.5	117.3	110.0	6.04	-6,378.1	-129.8	778.7	684.3	8.246		
15,400.0	9,190.0	14,580.5	8,418.7	118.7	111.3	5.97	-6,449.5	-129.4	779.4	683.9	8.163		
15,474.2	9,190.0	14,660.2	8,418.7	120.1	112.6	5.95	-6,529.2	-129.8	779.4	682.8	8.066		
15,500.0	9,190.0	14,682.2	8,418.6	120.5	113.0	5.94	-6,551.1	-129.8	779.5	682.5	8.038		
15,600.0	9,190.0	14,798.9	8,418.0	122.3	115.0	5.83	-6,667.9	-129.2	780.1	681.6	7.919		
15,695.2	9,190.0	14,881.4	8,419.2	124.0	116.4	5.73	-6,750.4	-128.3	778.6	678.8	7.806		
15,700.0	9,190.0	14,884.9	8,419.2	124.1	116.5	5.72	-6,753.9	-128.3	778.6	678.8	7.801		
15,800.0	9,190.0	14,997.0	8,418.6	125.9	118.4	5.63	-6,866.0	-127.8	779.2	677.8	7.691		
15,886.4	9,190.0	15,072.7	8,419.4	127.5	119.7	5.61	-6,941.6	-128.1	778.2	675.7	7.592		
15,900.0	9,190.0	15,083.5	8,419.4	127.7	119.9	5.61	-6,952.4	-128.2	778.2	675.6	7.579		
16,000.0	9,190.0	15,173.6	8,418.3	129.5	121.5	5.61	-7,042.5	-128.9	779.4	675.3	7.487		
16,100.0	9,190.0	15,319.8	8,420.3	131.3	124.0	5.55	-7,188.7	-129.0	777.9	672.0	7.346		
16,200.0	9,190.0	15,409.8	8,423.5	133.1	125.5	5.55	-7,278.6	-129.4	774.3	667.0	7.215		
16,300.0	9,190.0	15,507.4	8,426.2	134.9	127.2	5.53	-7,376.2	-129.6	771.5	662.7	7.093		
16,400.0	9,190.0	15,606.2	8,428.8	136.7	129.0	5.40	-7,474.9	-128.3	768.8	658.6	6.979		
16,500.0	9,190.0	15,692.6	8,430.4	138.5	130.6	5.25	-7,561.3	-126.8	766.8	655.4	6.882		
16,521.5	9,190.0	15,708.1	8,430.4	138.9	130.7	5.23	-7,576.8	-126.6	766.7	655.0	6.866		
16,600.0	9,190.0	15,764.0	8,429.5	140.3	131.7	5.17	-7,632.7	-126.3	767.8	655.2	6.818		
16,700.0	9,190.0	15,861.0	8,426.4	142.1	133.4	5.05	-7,729.6	-125.7	770.9	656.9	6.753		
16,800.0	9,190.0	15,956.7	8,422.7	143.9	135.1	4.87	-7,825.3	-124.3	774.6	659.3	6.718		
16,900.0	9,190.0	16,076.6	8,419.3	145.7	137.1	4.69	-7,945.0	-123.1	777.3	660.5	6.656		
17,000.0	9,190.0	16,203.6	8,419.5	147.5	139.3	4.39	-8,072.1	-120.0	776.9	658.6	6.571		
17,100.0	9,190.0	16,300.4	8,421.5	149.3	140.9	4.10	-8,168.8	-116.6	774.5	655.0	6.482		
17,172.3	9,190.0	16,359.3	8,422.0	150.6	142.0	3.99	-8,227.6	-115.5	773.7	653.4	6.428		
17,200.0	9,190.0	16,380.6	8,421.9	151.1	142.3	3.95	-8,248.9	-115.1	773.9	653.2	6.411		
17,300.0	9,190.0	16,466.2	8,420.0	152.9	143.8	3.80	-8,334.5	-113.9	775.9	653.9	6.362		
17,400.0	9,190.0	16,575.7	8,417.2	154.7	145.7	3.78	-8,444.0	-114.5	778.4	654.9	6.303		
17,500.0	9,190.0	16,679.8	8,416.4	156.5	147.5	3.83	-8,548.1	-116.1	779.3	654.2	6.232		
17,600.0	9,190.0	16,782.9	8,415.5	158.3	149.2	3.80	-8,651.2	-116.5	780.1	653.6	6.166		
17,700.0	9,190.0	16,892.0	8,415.7	160.1	151.1	3.74	-8,760.2	-116.5	779.9	651.9	6.092		
17,767.4	9,190.0	16,953.8	8,416.0	161.4	152.2	3.77	-8,822.0	-117.4	779.6	650.6	6.043		
17,800.0	9,190.0	16,986.0	8,415.9	161.9	152.7	3.82	-8,854.2	-118.3	779.7	650.2	6.020		
17,900.0	9,190.0	17,089.1	8,415.9	163.8	154.5	4.00	-8,957.3	-121.5	779.9	648.7	5.946		
17,926.2	9,190.0	17,113.4	8,416.0	164.2	154.9	4.04	-8,981.5	-122.3	779.8	648.3	5.927		
18,000.0	9,190.0	17,181.3	8,415.9	165.6	156.0	4.13	-9,049.4	-124.1	780.1	647.4	5.879		
18,100.0	9,190.0	17,273.1	8,414.7	167.4	157.6	4.22	-9,141.2	-126.0	781.5	647.3	5.824		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - King Tut Federal #2H - Wellbore #1 - Wellbore #1											Offset Site Error:	0.0 usft
Survey Program: 100-Good_gyro, 7835-MWD default											Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning
18,200.0	9,190.0	17,400.6	8,415.4	169.2	159.8	4.34	-9,268.7	-128.5	780.9	644.9	5.743	
18,300.0	9,190.0	17,493.9	8,416.9	171.0	161.4	4.42	-9,361.9	-130.3	779.3	641.8	5.668	
18,339.7	9,190.0	17,526.9	8,417.1	171.7	162.0	4.45	-9,394.9	-130.9	779.1	641.1	5.644	
18,400.0	9,190.0	17,584.5	8,416.9	172.8	163.0	4.50	-9,452.6	-132.0	779.4	640.4	5.608	
18,500.0	9,190.0	17,688.6	8,417.0	174.6	164.7	4.54	-9,556.6	-133.2	779.4	638.9	5.546	
18,584.1	9,190.0	17,771.3	8,417.1	176.1	166.2	4.50	-9,639.4	-133.4	779.2	637.5	5.498	
18,600.0	9,190.0	17,786.4	8,417.1	176.4	166.4	4.49	-9,654.4	-133.3	779.2	637.3	5.490	
18,700.0	9,190.0	17,882.7	8,416.6	178.2	168.1	4.37	-9,750.7	-132.5	779.6	636.3	5.441	
18,800.0	9,190.0	17,980.4	8,415.5	180.0	169.8	4.06	-9,848.4	-129.0	780.4	635.9	5.401	
18,900.0	9,190.0	18,098.4	8,414.9	181.8	171.9	3.57	-9,966.2	-123.3	780.5	634.8	5.357	
18,954.4	9,190.0	18,142.0	8,415.4	182.8	172.6	3.40	-10,009.7	-121.2	779.9	633.6	5.331	
19,000.0	9,190.0	18,142.0	8,415.4	183.6	172.6	3.40	-10,009.7	-121.2	781.2	634.6	5.328 SF	
19,100.0	9,190.0	18,142.0	8,415.4	185.5	172.6	3.40	-10,009.7	-121.2	793.3	646.0	5.383	
19,200.0	9,190.0	18,142.0	8,415.4	187.3	172.6	3.40	-10,009.7	-121.2	817.6	669.5	5.521	
19,246.5	9,190.0	18,142.0	8,415.4	188.1	172.6	3.40	-10,009.7	-121.2	832.8	684.3	5.610	



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design												Offset Site Error:	0.0 usft
Survey Program: 196-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
0.0	0.0	7.6	7.6	0.0	0.0	88.74	31.7	1,437.1	1,437.5				
100.0	100.0	102.4	102.4	0.1	0.1	88.73	31.9	1,437.3	1,437.7	1,437.5	7,846.426		
200.0	200.0	197.3	197.3	0.3	0.2	88.71	32.4	1,437.8	1,438.2	1,437.7	2,864.365		
300.0	300.0	298.9	298.9	0.5	0.4	88.68	33.1	1,438.5	1,438.9	1,438.0	1,542.390		
400.0	400.0	400.7	400.7	0.8	0.6	88.66	33.5	1,439.1	1,439.5	1,438.2	1,053.415		
500.0	500.0	506.8	506.8	1.0	0.8	88.66	33.8	1,439.3	1,439.7	1,437.9	793.574		
600.0	600.0	601.3	601.3	1.2	1.0	88.64	34.2	1,439.6	1,440.0	1,437.8	643.924		
700.0	700.0	700.3	700.3	1.4	1.2	88.62	34.7	1,440.1	1,440.5	1,437.8	539.343		
800.0	800.0	803.6	803.6	1.7	1.5	88.62	34.7	1,440.6	1,441.0	1,437.9	462.394		
900.0	900.0	909.3	909.3	1.9	1.7	88.63	34.5	1,440.7	1,441.1	1,437.5	404.210		
1,000.0	1,000.0	1,009.5	1,009.5	2.1	1.9	88.64	34.3	1,440.5	1,440.9	1,436.9	360.327		
1,100.0	1,100.0	1,113.5	1,113.5	2.3	2.1	88.65	34.0	1,440.3	1,440.8	1,436.3	324.461		
1,200.0	1,200.0	1,209.6	1,209.6	2.6	2.3	88.66	33.6	1,440.1	1,440.5	1,435.6	296.051		
1,300.0	1,300.0	1,308.8	1,308.8	2.8	2.5	88.67	33.4	1,440.0	1,440.4	1,435.1	271.979		
1,334.8	1,334.8	1,342.7	1,342.7	2.9	2.6	88.67	33.4	1,440.0	1,440.4	1,434.9	264.512		
1,400.0	1,400.0	1,405.0	1,405.0	3.0	2.7	88.68	33.3	1,440.0	1,440.4	1,434.7	251.698		
1,500.0	1,500.0	1,503.8	1,503.8	3.2	2.9	88.67	33.4	1,440.3	1,440.7	1,434.5	234.121		
1,600.0	1,600.0	1,603.5	1,603.5	3.5	3.1	88.66	33.6	1,440.5	1,440.9	1,434.4	218.841		
1,700.0	1,700.0	1,697.9	1,697.9	3.7	3.3	88.66	33.7	1,441.0	1,441.5	1,434.5	205.717		
1,800.0	1,800.0	1,796.4	1,796.4	3.9	3.5	88.65	34.0	1,441.7	1,442.2	1,434.7	193.857		
1,900.0	1,900.0	1,890.6	1,890.6	4.1	3.7	88.62	34.7	1,442.7	1,443.2	1,435.4	183.549		
2,000.0	2,000.0	1,997.8	1,997.7	4.4	4.0	88.56	36.2	1,443.9	1,444.4	1,436.1	173.724		
2,100.0	2,100.0	2,117.7	2,117.6	4.6	4.2	88.48	38.3	1,443.5	1,444.0	1,435.2	164.272		
2,199.2	2,199.2	2,207.3	2,207.2	4.8	4.4	88.39	40.6	1,443.0	1,443.6	1,434.4	156.842		
2,200.0	2,200.0	2,208.0	2,207.9	4.8	4.4	88.39	40.6	1,443.0	1,443.6	1,434.4	156.786		
2,300.0	2,300.0	2,299.0	2,298.9	5.0	4.6	88.27	43.5	1,443.3	1,444.0	1,434.4	150.003		
2,400.0	2,400.0	2,398.0	2,397.9	5.3	4.8	88.18	45.9	1,443.9	1,444.7	1,434.6	143.601		
2,500.0	2,500.0	2,493.2	2,493.0	5.5	5.0	88.09	48.1	1,444.6	1,445.5	1,435.0	137.823		
2,600.0	2,600.0	2,586.9	2,586.6	5.7	5.2	88.00	50.6	1,445.7	1,446.8	1,435.9	132.574		
2,700.0	2,700.0	2,694.6	2,694.3	5.9	5.4	87.95	51.9	1,447.2	1,448.2	1,436.8	127.455		
2,800.0	2,800.0	2,791.4	2,791.1	6.2	5.6	87.93	52.4	1,448.0	1,449.0	1,437.3	122.919		
2,900.0	2,900.0	2,891.5	2,891.2	6.4	5.8	87.91	52.9	1,449.3	1,450.3	1,438.1	118.655		
3,000.0	3,000.0	3,027.3	3,027.0	6.6	6.1	87.94	52.1	1,449.3	1,450.3	1,437.6	113.961		
3,100.0	3,100.0	3,126.3	3,126.0	6.8	6.3	87.99	50.9	1,448.0	1,449.0	1,435.8	110.154		
3,200.0	3,200.0	3,216.1	3,215.8	7.1	6.5	87.99	50.7	1,447.2	1,448.1	1,434.6	106.743		
3,300.0	3,300.0	3,316.4	3,316.1	7.3	6.7	87.97	51.2	1,446.8	1,447.8	1,433.8	103.390		
3,400.0	3,400.0	3,435.6	3,435.3	7.5	7.0	87.98	51.0	1,445.1	1,446.3	1,431.8	99.906		
3,500.0	3,500.0	3,534.1	3,533.8	7.7	7.2	87.98	50.9	1,443.2	1,444.4	1,429.5	96.893		
3,600.0	3,600.0	3,632.3	3,632.0	7.9	7.4	87.96	51.4	1,441.6	1,442.7	1,427.3	94.051		
3,700.0	3,700.0	3,732.2	3,731.9	8.2	7.6	87.94	51.8	1,439.9	1,441.0	1,425.2	91.354		
3,800.0	3,800.0	3,834.5	3,834.1	8.4	7.8	88.00	50.3	1,438.2	1,439.3	1,423.1	88.792		
3,900.0	3,900.0	3,924.3	3,923.9	8.6	8.0	88.08	48.1	1,436.8	1,437.7	1,421.1	86.500		
4,000.0	4,000.0	4,017.7	4,017.2	8.8	8.2	88.15	46.3	1,436.2	1,437.0	1,419.9	84.317		
4,100.0	4,100.0	4,108.6	4,108.2	9.1	8.4	88.21	44.9	1,435.9	1,436.6	1,419.1	82.278		
4,101.3	4,101.3	4,109.7	4,109.3	9.1	8.4	88.21	44.8	1,435.9	1,436.6	1,419.1	82.253		
4,200.0	4,200.0	4,194.1	4,193.6	9.3	8.6	88.26	43.5	1,436.3	1,437.0	1,419.2	80.436		
4,300.0	4,300.0	4,282.2	4,281.6	9.5	8.8	88.35	41.3	1,437.7	1,438.5	1,420.2	78.713		
4,400.0	4,400.0	4,393.2	4,392.6	9.7	9.0	88.52	37.1	1,439.8	1,440.3	1,421.6	76.896		
4,500.0	4,500.0	4,503.7	4,503.0	10.0	9.2	88.69	33.0	1,440.5	1,440.8	1,421.7	75.112		
4,600.0	4,600.0	4,602.5	4,601.7	10.2	9.4	88.83	29.4	1,440.9	1,441.2	1,421.6	73.476		
4,700.0	4,700.0	4,719.5	4,718.6	10.4	9.7	88.95	26.5	1,440.9	1,441.1	1,421.0	71.746		
4,800.0	4,800.0	4,819.2	4,818.4	10.6	9.9	88.99	25.4	1,440.2	1,440.4	1,419.9	70.191		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design: Sec 30 T24-S R32-E - King Tut Federal #3H - Wellbore #1 - Wellbore #1													Offset Site Error:	0.0 usft
Survey Program: 196-MWD default													Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning		
4,900.0	4,900.0	4,922.8	4,921.9	10.9	10.1	89.04	24.2	1,439.3	1,439.6	1,418.6	68.674			
5,000.0	5,000.0	5,026.1	5,025.3	11.1	10.3	89.10	22.5	1,438.3	1,438.6	1,417.2	67.219			
5,100.0	5,100.0	5,134.4	5,133.5	11.3	10.5	89.11	22.4	1,436.6	1,437.0	1,415.1	65.758			
5,200.0	5,200.0	5,234.8	5,233.9	11.5	10.7	89.07	23.3	1,434.7	1,435.2	1,412.9	64.389			
5,300.0	5,300.0	5,335.1	5,334.2	11.8	11.0	89.02	24.6	1,432.9	1,433.4	1,410.6	63.076			
5,400.0	5,400.0	5,434.4	5,433.5	12.0	11.2	88.98	25.5	1,431.1	1,431.5	1,408.4	61.822			
5,500.0	5,500.0	5,533.9	5,532.9	12.2	11.4	88.95	26.3	1,429.3	1,429.8	1,406.2	60.618			
5,600.0	5,600.0	5,631.3	5,630.3	12.4	11.6	88.91	27.1	1,427.7	1,428.1	1,404.1	59.468			
5,700.0	5,700.0	5,730.0	5,729.0	12.7	11.8	88.86	28.3	1,426.2	1,426.6	1,402.2	58.352			
5,800.0	5,800.0	5,831.6	5,830.6	12.9	12.0	88.82	29.5	1,424.6	1,425.1	1,400.2	57.264			
5,896.9	5,896.9	5,905.9	5,904.9	13.1	12.1	88.78	30.2	1,423.9	1,424.2	1,398.9	56.383	CC		
5,900.0	5,900.0	5,908.1	5,907.1	13.1	12.2	88.78	30.2	1,423.9	1,424.2	1,398.9	56.357			
6,000.0	6,000.0	5,998.7	5,997.7	13.3	12.3	88.75	31.1	1,424.5	1,424.9	1,399.2	55.475			
6,100.0	6,100.0	6,095.7	6,094.7	13.6	12.5	88.72	31.7	1,425.2	1,425.6	1,399.5	54.595			
6,200.0	6,200.0	6,199.5	6,198.5	13.8	12.8	88.70	32.3	1,426.2	1,426.6	1,400.0	53.723			
6,300.0	6,300.0	6,310.9	6,309.8	14.0	13.0	88.67	33.2	1,426.5	1,426.8	1,399.8	52.826			
6,400.0	6,400.0	6,409.7	6,408.6	14.2	13.2	88.63	34.0	1,426.3	1,426.7	1,399.3	51.991			
6,500.0	6,500.0	6,509.7	6,508.7	14.5	13.4	88.60	34.8	1,426.3	1,426.7	1,398.8	51.179			
6,600.0	6,600.0	6,611.8	6,610.7	14.7	13.6	88.57	35.5	1,426.1	1,426.5	1,398.2	50.384			
6,654.5	6,654.5	6,663.5	6,662.5	14.8	13.7	88.56	35.8	1,426.0	1,426.5	1,397.9	49.976			
6,700.0	6,700.0	6,707.4	6,706.3	14.9	13.8	88.56	35.9	1,426.1	1,426.5	1,397.8	49.640			
6,800.0	6,800.0	6,806.6	6,805.6	15.1	14.0	88.55	36.1	1,426.2	1,426.6	1,397.5	48.907			
6,900.0	6,900.0	6,900.8	6,899.7	15.4	14.2	88.55	36.2	1,426.5	1,427.0	1,397.4	48.221			
7,000.0	7,000.0	6,996.3	6,995.3	15.6	14.4	88.55	36.2	1,427.2	1,427.8	1,397.7	47.560			
7,100.0	7,100.0	7,095.9	7,094.8	15.8	14.6	88.55	36.2	1,428.2	1,428.7	1,398.3	46.913			
7,200.0	7,200.0	7,201.9	7,200.8	16.0	14.9	88.55	36.1	1,428.9	1,429.4	1,398.5	46.257			
7,300.0	7,300.0	7,305.3	7,304.2	16.3	15.1	88.54	36.3	1,429.4	1,429.8	1,398.5	45.622			
7,400.0	7,400.0	7,406.5	7,405.5	16.5	15.3	88.54	36.4	1,429.5	1,429.9	1,398.1	44.998			
7,500.0	7,500.0	7,503.5	7,502.4	16.7	15.5	88.54	36.3	1,429.8	1,430.2	1,398.0	44.409			
7,600.0	7,600.0	7,607.5	7,606.5	16.9	15.7	88.56	36.0	1,430.1	1,430.6	1,397.9	43.817			
7,700.0	7,700.0	7,712.5	7,711.4	17.2	15.9	88.58	35.4	1,430.0	1,430.5	1,397.4	43.228			
7,800.0	7,800.0	7,812.4	7,811.3	17.4	16.1	88.61	34.8	1,429.8	1,430.2	1,396.7	42.661			
7,846.4	7,846.4	7,855.5	7,854.4	17.5	16.2	88.62	34.4	1,429.7	1,430.1	1,396.4	42.413			
7,900.0	7,900.0	7,899.2	7,898.2	17.6	16.3	88.65	33.6	1,429.8	1,430.3	1,396.3	42.151	ES		
8,000.0	8,000.0	7,965.3	7,964.0	17.8	16.5	88.85	28.8	1,431.2	1,432.1	1,397.8	41.758			
8,100.0	8,100.0	8,035.9	8,033.7	18.1	16.6	89.28	18.0	1,434.4	1,436.4	1,401.8	41.432			
8,200.0	8,200.0	8,113.0	8,108.3	18.3	16.8	90.04	-1.0	1,438.8	1,442.2	1,407.2	41.135			
8,300.0	8,300.0	8,194.4	8,183.5	18.5	17.0	91.25	-31.5	1,444.3	1,450.0	1,414.5	40.874			
8,400.0	8,400.0	8,274.7	8,252.8	18.7	17.2	92.82	-71.5	1,449.7	1,459.7	1,423.8	40.648			
8,500.0	8,500.0	8,385.0	8,335.3	19.0	17.5	95.67	-144.2	1,452.9	1,470.2	1,433.7	40.284			
8,600.0	8,600.0	8,423.0	8,359.8	19.2	17.7	96.80	-173.2	1,453.1	1,484.3	1,447.4	40.256			
8,617.0	8,617.0	8,435.1	8,367.2	19.2	17.8	97.17	-182.8	1,453.2	1,487.2	1,450.2	40.235			
8,650.0	8,650.0	8,447.9	8,374.9	19.3	17.8	-82.28	-193.0	1,453.3	1,493.1	1,455.9	40.214			
8,700.0	8,699.7	8,466.1	8,385.3	19.4	17.9	-80.81	-207.9	1,453.5	1,502.5	1,465.2	40.318			
8,750.0	8,748.8	8,486.0	8,396.1	19.5	18.0	-79.26	-224.6	1,453.7	1,512.4	1,475.0	40.447			
8,800.0	8,796.9	8,502.3	8,404.4	19.5	18.1	-77.81	-238.7	1,453.8	1,522.7	1,485.2	40.621			
8,850.0	8,843.6	8,517.0	8,411.4	19.6	18.2	-76.40	-251.6	1,454.0	1,533.2	1,495.7	40.820			
8,900.0	8,888.6	8,540.0	8,421.5	19.7	18.3	-74.82	-272.2	1,454.2	1,543.8	1,506.2	41.010			
8,950.0	8,931.6	8,560.3	8,429.4	19.8	18.4	-73.35	-290.9	1,454.3	1,554.4	1,516.7	41.252			
9,000.0	8,972.1	8,580.0	8,436.2	19.9	18.5	-71.95	-309.4	1,454.3	1,564.6	1,527.0	41.531			
9,050.0	9,009.9	8,602.1	8,442.7	20.0	18.7	-70.58	-330.5	1,454.2	1,574.6	1,536.9	41.824			
9,100.0	9,044.8	8,612.0	8,445.3	20.2	18.8	-69.49	-340.1	1,454.1	1,584.1	1,546.6	42.198			

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - King Tut Federal #3H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 196-MWD default												Offset Well Error:	0.0 usft
Measured Depth (usft)	Reference Vertical Depth (usft)	Offset Measured Depth (usft)	Offset Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning	
9,150.0	9,076.4	8,644.0	8,451.8	20.3	19.0	-68.12	-371.4	1,453.8	1,593.3	1,555.8	42.473		
9,200.0	9,104.5	8,644.0	8,451.8	20.5	19.0	-67.32	-371.4	1,453.8	1,601.8	1,564.5	42.889		
9,250.0	9,128.9	8,660.0	8,453.8	20.8	19.1	-66.36	-387.3	1,453.6	1,609.8	1,572.6	43.199		
9,300.0	9,149.4	8,684.5	8,456.0	21.0	19.3	-65.42	-411.7	1,453.5	1,617.1	1,579.8	43.394		
9,350.0	9,165.8	8,703.7	8,457.1	21.3	19.5	-64.66	-430.8	1,453.5	1,623.5	1,586.2	43.530		
9,400.0	9,178.1	8,736.0	8,457.7	21.6	19.7	-63.95	-463.1	1,453.9	1,629.2	1,591.7	43.470		
9,450.0	9,186.0	8,750.3	8,457.6	22.0	19.8	-63.50	-477.4	1,454.1	1,633.6	1,595.9	43.363		
9,500.0	9,189.7	8,794.1	8,457.2	22.4	20.2	-63.14	-521.2	1,454.9	1,636.6	1,598.4	42.834		
9,517.0	9,190.0	8,809.1	8,457.1	22.5	20.4	-63.08	-536.2	1,455.2	1,637.2	1,598.7	42.606		
9,600.0	9,190.0	8,933.3	8,457.7	23.2	21.5	-63.15	-660.3	1,457.2	1,638.8	1,598.7	40.834		
9,700.0	9,190.0	9,034.2	8,460.0	24.1	22.5	-63.24	-761.2	1,457.9	1,639.1	1,597.1	39.059		
9,800.0	9,190.0	9,120.6	8,460.2	25.2	23.5	-63.26	-847.7	1,458.1	1,639.9	1,596.0	37.400		
9,900.0	9,190.0	9,208.0	8,458.9	26.3	24.6	-63.23	-935.0	1,458.2	1,641.3	1,595.4	35.781		
10,000.0	9,190.0	9,302.0	8,456.2	27.5	25.8	-63.16	-1,029.0	1,458.3	1,643.4	1,595.3	34.183		
10,100.0	9,190.0	9,474.6	8,455.5	28.8	28.0	-63.13	-1,201.6	1,456.6	1,643.3	1,592.1	32.086		
10,200.0	9,190.0	9,567.5	8,455.0	30.1	29.3	-63.08	-1,294.4	1,453.5	1,641.2	1,587.7	30.632		
10,300.0	9,190.0	9,640.8	8,453.5	31.5	30.3	-63.01	-1,367.7	1,451.4	1,640.3	1,584.5	29.405		
10,302.7	9,190.0	9,642.7	8,453.4	31.5	30.3	-63.01	-1,369.6	1,451.4	1,640.3	1,584.4	29.374		
10,400.0	9,190.0	9,730.3	8,449.9	32.9	31.6	-62.88	-1,457.0	1,449.5	1,640.9	1,582.7	28.200		
10,500.0	9,190.0	9,822.4	8,447.4	34.4	32.9	-62.79	-1,549.1	1,448.2	1,641.5	1,580.8	27.060		
10,600.0	9,190.0	9,939.1	8,444.3	35.8	34.6	-62.69	-1,665.8	1,447.2	1,642.7	1,579.2	25.866		
10,662.4	9,190.0	10,000.8	8,444.1	36.8	35.4	-62.68	-1,727.5	1,446.5	1,642.6	1,577.4	25.201		
10,700.0	9,190.0	10,030.8	8,444.0	37.4	35.9	-62.68	-1,757.4	1,446.3	1,642.7	1,576.6	24.855		
10,800.0	9,190.0	10,115.7	8,443.3	38.9	37.2	-62.67	-1,842.4	1,446.4	1,643.8	1,575.1	23.938		
10,900.0	9,190.0	10,197.7	8,440.9	40.5	38.5	-62.60	-1,924.4	1,446.3	1,645.8	1,574.5	23.102		
11,000.0	9,190.0	10,289.0	8,436.2	42.1	39.9	-62.47	-2,015.5	1,446.4	1,648.9	1,574.9	22.308		
11,100.0	9,190.0	10,427.7	8,431.2	43.7	41.9	-62.33	-2,154.1	1,446.2	1,651.2	1,574.0	21.397		
11,200.0	9,190.0	10,503.3	8,430.1	45.3	43.1	-62.30	-2,229.7	1,446.2	1,652.6	1,572.9	20.737		
11,300.0	9,190.0	10,624.0	8,429.2	46.9	45.0	-62.31	-2,350.4	1,447.2	1,654.3	1,571.4	19.955		
11,400.0	9,190.0	10,701.4	8,429.9	48.6	46.2	-62.35	-2,427.8	1,448.0	1,655.6	1,570.1	19.353		
11,500.0	9,190.0	10,786.6	8,429.0	50.2	47.6	-62.36	-2,512.9	1,449.8	1,658.6	1,570.3	18.783		
11,600.0	9,190.0	10,903.0	8,429.3	51.9	49.4	-62.43	-2,629.3	1,452.8	1,661.5	1,570.0	18.153		
11,700.0	9,190.0	10,990.2	8,431.2	53.6	50.8	-62.55	-2,716.4	1,455.8	1,664.1	1,569.7	17.630		
11,800.0	9,190.0	11,070.4	8,432.6	55.3	52.1	-62.66	-2,796.5	1,459.1	1,667.7	1,570.5	17.158		
11,900.0	9,190.0	11,198.3	8,434.1	57.0	54.2	-62.79	-2,924.4	1,464.1	1,671.3	1,570.6	16.588		
12,000.0	9,190.0	11,291.7	8,434.9	58.7	55.7	-62.87	-3,017.7	1,466.6	1,674.0	1,570.3	16.135		
12,100.0	9,190.0	11,383.5	8,434.4	60.4	57.3	-62.90	-3,109.5	1,469.1	1,677.4	1,570.6	15.713		
12,200.0	9,190.0	11,521.1	8,434.1	62.1	59.5	-62.94	-3,247.1	1,470.7	1,679.0	1,568.6	15.208		
12,300.0	9,190.0	11,612.1	8,434.5	63.8	61.0	-62.97	-3,338.0	1,471.7	1,680.4	1,567.0	14.824		
12,400.0	9,190.0	11,721.5	8,434.3	65.6	62.8	-63.00	-3,447.5	1,472.9	1,682.1	1,565.5	14.424		
12,500.0	9,190.0	11,836.9	8,433.5	67.3	64.7	-62.98	-3,562.9	1,472.4	1,682.8	1,562.8	14.034		
12,600.0	9,190.0	11,925.6	8,433.6	69.0	66.2	-62.99	-3,651.5	1,472.3	1,683.3	1,560.5	13.704		
12,700.0	9,190.0	12,042.4	8,432.7	70.8	68.1	-62.97	-3,768.3	1,471.7	1,683.8	1,557.7	13.344		
12,800.0	9,190.0	12,157.2	8,431.2	72.5	70.0	-62.90	-3,883.1	1,469.5	1,683.4	1,554.0	13.007		
12,900.0	9,190.0	12,291.4	8,432.6	74.3	72.2	-62.91	-4,017.2	1,466.4	1,681.6	1,548.6	12.643		
13,000.0	9,190.0	12,390.7	8,436.5	76.0	73.8	-63.00	-4,116.4	1,464.1	1,678.4	1,542.2	12.324		
13,100.0	9,190.0	12,464.5	8,438.2	77.8	75.1	-63.04	-4,190.2	1,462.5	1,676.1	1,537.1	12.061		
13,200.0	9,190.0	12,542.7	8,437.5	79.5	76.4	-63.01	-4,268.4	1,461.1	1,675.5	1,533.8	11.820		
13,217.9	9,190.0	12,559.3	8,437.4	79.9	76.7	-63.00	-4,284.9	1,460.9	1,675.5	1,533.3	11.776		
13,300.0	9,190.0	12,633.2	8,436.8	81.3	77.9	-62.98	-4,358.8	1,460.2	1,675.7	1,531.0	11.580		
13,400.0	9,190.0	12,718.3	8,436.5	83.1	79.3	-62.99	-4,444.0	1,460.3	1,676.6	1,529.0	11.359		
13,500.0	9,190.0	12,790.0	8,436.0	84.8	80.5	-62.99	-4,515.7	1,461.0	1,678.6	1,528.3	11.166		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - King Tut Federal #3H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 196-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore +N-S (usft)	Centre +E-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
13,600.0	9,190.0	12,885.0	8,434.6	86.6	82.2	-62.99	-4,610.6	1,462.9	1,681.7	1,528.3	10.960		
13,700.0	9,190.0	13,007.9	8,433.5	88.4	84.2	-63.00	-4,733.5	1,465.2	1,684.4	1,527.5	10.731		
13,800.0	9,190.0	13,117.7	8,432.9	90.2	86.1	-63.02	-4,843.3	1,466.4	1,686.3	1,526.1	10.522		
13,900.0	9,190.0	13,230.0	8,434.1	91.9	87.9	-63.08	-4,955.5	1,467.2	1,687.2	1,523.5	10.309		
14,000.0	9,190.0	13,310.8	8,435.1	93.7	89.3	-63.13	-5,036.4	1,468.1	1,688.2	1,521.7	10.135		
14,100.0	9,190.0	13,388.1	8,434.3	95.5	90.6	-63.14	-5,113.6	1,469.4	1,690.9	1,521.5	9.982		
14,200.0	9,190.0	13,479.0	8,433.5	97.3	92.1	-63.16	-5,204.5	1,471.8	1,694.3	1,521.9	9.825		
14,300.0	9,190.0	13,581.4	8,433.0	99.0	93.9	-63.21	-5,306.9	1,475.1	1,698.1	1,522.4	9.664		
14,400.0	9,190.0	13,685.1	8,433.4	100.8	95.6	-63.28	-5,410.5	1,478.3	1,701.3	1,522.3	9.503		
14,500.0	9,190.0	13,778.6	8,433.6	102.6	97.2	-63.34	-5,503.9	1,481.5	1,704.9	1,522.7	9.357		
14,600.0	9,190.0	13,879.9	8,433.4	104.4	99.0	-63.40	-5,605.2	1,484.7	1,708.6	1,523.1	9.212		
14,700.0	9,190.0	13,983.6	8,434.0	106.2	100.7	-63.48	-5,708.8	1,488.4	1,712.1	1,523.3	9.067		
14,800.0	9,190.0	14,094.6	8,433.7	108.0	102.6	-63.53	-5,819.8	1,491.3	1,715.3	1,523.1	8.923		
14,900.0	9,190.0	14,225.2	8,432.8	109.8	104.8	-63.53	-5,950.4	1,492.5	1,717.1	1,521.2	8.765		
15,000.0	9,190.0	14,316.8	8,432.6	111.6	106.3	-63.55	-6,041.9	1,493.0	1,718.3	1,519.3	8.636		
15,100.0	9,190.0	14,408.2	8,432.3	113.3	107.9	-63.56	-6,133.3	1,494.0	1,720.1	1,518.0	8.512		
15,200.0	9,190.0	14,518.2	8,432.8	115.1	109.8	-63.61	-6,243.3	1,495.3	1,721.6	1,516.1	8.378		
15,300.0	9,190.0	14,616.4	8,432.9	116.9	111.4	-63.64	-6,341.6	1,496.4	1,723.2	1,514.5	8.257		
15,400.0	9,190.0	14,717.8	8,433.2	118.7	113.2	-63.67	-6,442.9	1,497.0	1,724.3	1,512.4	8.135		
15,500.0	9,190.0	14,809.1	8,432.7	120.5	114.7	-63.68	-6,534.3	1,498.2	1,726.3	1,511.3	8.027		
15,600.0	9,190.0	14,928.3	8,432.7	122.3	116.8	-63.70	-6,653.4	1,498.8	1,727.4	1,508.8	7.902		
15,700.0	9,190.0	15,080.1	8,431.5	124.1	119.3	-63.65	-6,805.2	1,496.3	1,727.1	1,504.6	7.762		
15,800.0	9,190.0	15,202.0	8,432.7	125.9	121.4	-63.63	-6,927.0	1,491.9	1,724.1	1,498.1	7.629		
15,900.0	9,190.0	15,299.8	8,433.4	127.7	123.0	-63.60	-7,024.7	1,487.7	1,720.6	1,491.5	7.510		
16,000.0	9,190.0	15,388.4	8,435.5	129.5	124.5	-63.63	-7,113.3	1,485.0	1,717.5	1,485.3	7.398		
16,100.0	9,190.0	15,458.9	8,437.2	131.3	125.7	-63.67	-7,183.7	1,483.6	1,715.5	1,480.5	7.301		
16,129.9	9,190.0	15,475.4	8,437.4	131.8	126.0	-63.68	-7,200.2	1,483.5	1,715.3	1,479.6	7.276		
16,200.0	9,190.0	15,526.0	8,437.9	133.1	126.9	-63.70	-7,250.8	1,484.0	1,715.9	1,478.2	7.218		
16,300.0	9,190.0	15,596.9	8,438.0	134.9	128.1	-63.74	-7,321.8	1,485.4	1,718.1	1,477.6	7.142		
16,400.0	9,190.0	15,685.4	8,437.5	136.7	129.7	-63.76	-7,410.2	1,487.5	1,721.1	1,477.4	7.063		
16,500.0	9,190.0	15,814.6	8,435.8	138.5	131.9	-63.76	-7,539.4	1,489.6	1,724.0	1,476.6	6.970		
16,600.0	9,190.0	15,927.0	8,435.0	140.3	133.8	-63.75	-7,651.8	1,489.7	1,725.0	1,474.3	6.880		
16,700.0	9,190.0	16,016.5	8,434.1	142.1	135.3	-63.73	-7,741.3	1,489.9	1,726.3	1,472.6	6.803		
16,800.0	9,190.0	16,124.5	8,435.3	143.9	137.2	-63.80	-7,849.2	1,491.2	1,727.6	1,470.4	6.717		
16,900.0	9,190.0	16,220.5	8,437.8	145.7	138.8	-63.91	-7,945.2	1,492.8	1,728.6	1,468.0	6.635		
17,000.0	9,190.0	16,305.3	8,439.3	147.5	140.2	-63.99	-8,029.9	1,494.6	1,730.4	1,466.7	6.562		
17,100.0	9,190.0	16,402.5	8,439.4	149.3	141.9	-64.03	-8,127.2	1,496.5	1,732.7	1,465.8	6.491		
17,200.0	9,190.0	16,509.9	8,438.9	151.1	143.8	-64.04	-8,234.6	1,497.8	1,734.7	1,464.4	6.417		
17,300.0	9,190.0	16,613.3	8,437.3	152.9	145.5	-64.02	-8,337.9	1,498.4	1,736.6	1,463.1	6.349		
17,400.0	9,190.0	16,703.3	8,436.5	154.7	147.1	-64.01	-8,427.9	1,499.1	1,738.3	1,461.7	6.285		
17,500.0	9,190.0	16,781.1	8,434.0	156.5	148.4	-63.96	-8,505.7	1,499.8	1,741.3	1,461.9	6.233		
17,600.0	9,190.0	16,946.5	8,428.5	158.3	151.3	-63.83	-8,670.9	1,501.0	1,744.8	1,461.4	6.157		
17,700.0	9,190.0	17,060.9	8,430.1	160.1	153.2	-63.88	-8,785.3	1,500.1	1,744.2	1,457.2	6.079		
17,800.0	9,190.0	17,165.1	8,432.6	161.9	154.9	-63.95	-8,889.4	1,499.2	1,743.0	1,452.7	6.004		
17,900.0	9,190.0	17,251.5	8,434.5	163.8	156.4	-64.00	-8,975.9	1,498.4	1,741.9	1,448.4	5.936		
17,920.5	9,190.0	17,264.3	8,434.6	164.1	156.6	-64.01	-8,988.7	1,498.3	1,741.8	1,447.8	5.925		
18,000.0	9,190.0	17,323.0	8,434.1	165.6	157.6	-64.00	-9,047.3	1,498.2	1,742.5	1,446.3	5.883		
18,100.0	9,190.0	17,402.8	8,432.4	167.4	159.0	-63.96	-9,127.1	1,498.7	1,744.6	1,445.5	5.833		
18,200.0	9,190.0	17,502.7	8,430.7	169.2	160.7	-63.94	-9,227.0	1,499.8	1,746.9	1,444.7	5.780		
18,300.0	9,190.0	17,595.3	8,430.5	171.0	162.3	-63.97	-9,319.6	1,501.5	1,749.4	1,444.0	5.729		
18,400.0	9,190.0	17,717.9	8,432.0	172.8	164.4	-64.06	-9,442.1	1,504.2	1,751.5	1,442.3	5.665		
18,500.0	9,190.0	17,813.8	8,432.4	174.6	166.0	-64.10	-9,538.0	1,505.4	1,753.1	1,440.7	5.612		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - King Tut Federal #3H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 196-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
- 18,600.0	9,190.0	17,913.6	8,433.3	176.4	167.7	-64.16	-9,637.8	- 1,506.9	1,754.7	1,439.0	5.557		
18,700.0	9,190.0	18,011.1	8,435.0	178.2	169.4	-64.25	-9,735.3	- 1,608.9	1,756.5	1,437.4	5.504		
18,800.0	9,190.0	18,115.7	8,435.6	180.0	171.2	-64.30	-9,839.9	1,510.4	1,758.3	1,435.7	5.451		
18,900.0	9,190.0	18,223.9	8,435.1	181.8	173.0	-64.31	-9,948.0	1,511.0	1,759.6	1,433.7	5.399		
19,000.0	9,190.0	18,230.0	8,435.1	183.6	173.1	-64.31	-9,954.2	1,511.1	1,763.2	1,435.6	5.381 SF		
19,100.0	9,190.0	18,230.0	8,435.1	185.5	173.1	-64.31	-9,954.2	1,511.1	1,772.5	1,443.1	5.382		
19,200.0	9,190.0	18,230.0	8,435.1	187.3	173.1	-64.31	-9,954.2	1,511.1	1,787.3	1,456.3	5.400		
19,246.5	9,190.0	18,230.0	8,435.1	188.1	173.1	-64.31	-9,954.2	1,511.1	1,796.0	1,464.3	5.413		



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - Paduca Federal 30 #1 - Wellbore #1 - Wellbore #1											Offset Site Error:	0.0 usft
Survey Program: 285-INC											Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
0.0	0.0	8.2	8.2	0.0	0.1	136.44	-1,756.0	1,670.2	2,423.5			
100.0	100.0	111.0	111.0	0.1	1.5	136.43	-1,755.9	1,670.2	2,423.4	2,421.9	1,605.721	
200.0	200.0	213.7	213.7	0.3	2.9	136.43	-1,755.7	1,670.2	2,423.2	2,420.2	793.343	
300.0	300.0	316.8	316.8	0.5	5.0	136.42	-1,755.3	1,670.2	2,422.9	2,417.8	470.547	
400.0	400.0	420.4	420.4	0.8	8.7	136.41	-1,754.6	1,670.2	2,422.5	2,414.0	285.009	
500.0	500.0	524.1	524.1	1.0	12.5	136.40	-1,753.8	1,670.2	2,421.9	2,410.0	204.253	
600.0	600.0	627.7	627.7	1.2	16.2	136.38	-1,752.7	1,670.2	2,421.2	2,405.9	159.099	
700.0	700.0	731.2	731.2	1.4	20.0	136.36	-1,751.5	1,670.2	2,420.3	2,401.6	129.789	
800.0	800.0	833.4	833.4	1.7	25.2	136.34	-1,750.1	1,670.2	2,419.3	2,396.6	106.821	
900.0	900.0	935.6	935.6	1.9	30.3	136.31	-1,748.5	1,670.2	2,418.2	2,391.5	90.648	
1,000.0	1,000.0	1,037.8	1,037.8	2.1	35.4	136.28	-1,746.8	1,670.2	2,417.0	2,386.3	78.668	
1,100.0	1,100.0	1,138.5	1,138.5	2.3	40.9	136.26	-1,745.1	1,670.2	2,415.7	2,380.7	68.947	
1,200.0	1,200.0	1,238.5	1,238.4	2.6	46.7	136.23	-1,743.3	1,670.2	2,414.5	2,375.0	61.151	
1,300.0	1,300.0	1,338.5	1,338.4	2.8	52.4	136.20	-1,741.6	1,670.2	2,413.2	2,369.3	54.916	
1,400.0	1,400.0	1,438.5	1,438.4	3.0	58.1	136.17	-1,739.8	1,670.2	2,412.0	2,363.5	49.819	
1,500.0	1,500.0	1,538.5	1,538.3	3.2	63.9	136.14	-1,738.1	1,670.2	2,410.7	2,357.8	45.545	
1,600.0	1,600.0	1,638.5	1,638.3	3.5	69.7	136.11	-1,736.4	1,670.2	2,409.4	2,352.0	41.928	
1,700.0	1,700.0	1,738.4	1,738.3	3.7	75.6	136.08	-1,734.6	1,670.2	2,408.2	2,346.2	38.837	
1,800.0	1,800.0	1,838.4	1,838.2	3.9	81.4	136.05	-1,732.9	1,670.2	2,406.9	2,340.4	36.164	
1,900.0	1,900.0	1,940.0	1,939.8	4.1	87.3	136.03	-1,731.1	1,670.2	2,405.7	2,334.4	33.779	
2,000.0	2,000.0	2,054.4	2,054.2	4.4	97.9	135.98	-1,728.5	1,670.2	2,404.1	2,325.1	30.461	
2,100.0	2,100.0	2,169.6	2,169.3	4.6	111.2	135.92	-1,724.9	1,670.2	2,401.8	2,313.4	27.161	
2,200.0	2,200.0	2,284.7	2,284.3	4.8	124.5	135.85	-1,720.3	1,670.2	2,398.9	2,300.9	24.476	
2,300.0	2,300.0	2,398.4	2,397.9	5.0	137.9	135.76	-1,714.8	1,670.2	2,395.5	2,287.6	22.216	
2,400.0	2,400.0	2,498.2	2,497.6	5.3	154.1	135.67	-1,709.6	1,670.2	2,391.7	2,272.3	20.025	
2,500.0	2,500.0	2,598.1	2,597.3	5.5	170.3	135.58	-1,704.4	1,670.2	2,388.0	2,256.8	18.211	
2,600.0	2,600.0	2,698.0	2,697.0	5.7	186.6	135.49	-1,699.1	1,670.2	2,384.2	2,241.3	16.686	
2,700.0	2,700.0	2,816.2	2,815.1	5.9	208.8	135.37	-1,691.9	1,670.2	2,379.8	2,220.9	14.973	
2,800.0	2,800.0	2,906.7	2,905.4	6.2	226.0	135.28	-1,686.4	1,670.2	2,375.5	2,204.0	13.852	
2,900.0	2,900.0	3,004.9	3,003.4	6.4	243.5	135.18	-1,680.9	1,670.2	2,371.5	2,187.2	12.865	
3,000.0	3,000.0	3,111.1	3,109.5	6.6	262.9	135.08	-1,674.7	1,670.2	2,367.3	2,168.7	11.916	
3,100.0	3,100.0	3,206.6	3,204.8	6.8	280.6	134.98	-1,669.0	1,670.2	2,363.2	2,151.5	11.163	
3,200.0	3,200.0	3,307.4	3,305.4	7.1	299.2	134.88	-1,663.0	1,670.2	2,359.0	2,133.4	10.460	
3,300.0	3,300.0	3,404.3	3,402.1	7.3	316.7	134.78	-1,657.5	1,670.2	2,354.9	2,116.3	9.870	
3,400.0	3,400.0	3,510.0	3,507.7	7.5	336.0	134.67	-1,651.3	1,670.2	2,350.8	2,097.7	9.289	
3,500.0	3,500.0	3,605.7	3,603.2	7.7	353.8	134.58	-1,645.6	1,670.2	2,346.7	2,080.2	8.808	
3,600.0	3,600.0	3,707.9	3,705.3	7.9	372.7	134.47	-1,639.7	1,670.2	2,342.6	2,061.9	8.347	
3,700.0	3,700.0	3,810.8	3,807.9	8.2	392.1	134.36	-1,633.5	1,670.2	2,338.4	2,043.0	7.917	
3,800.0	3,800.0	3,910.6	3,907.5	8.4	411.2	134.26	-1,627.4	1,670.2	2,334.1	2,024.2	7.532	
3,900.0	3,900.0	4,007.2	4,004.0	8.6	429.4	134.15	-1,621.5	1,670.2	2,329.8	2,006.1	7.196	
4,000.0	4,000.0	4,097.0	4,093.6	8.8	445.5	134.06	-1,616.5	1,670.2	2,325.9	1,989.9	6.921	
4,100.0	4,100.0	4,192.0	4,188.5	9.1	460.7	133.98	-1,611.7	1,670.2	2,322.4	1,974.5	6.676	
4,200.0	4,200.0	4,284.8	4,281.2	9.3	474.8	133.90	-1,607.2	1,670.2	2,319.0	1,960.3	6.464	
4,300.0	4,300.0	4,370.2	4,366.5	9.5	486.0	133.84	-1,603.7	1,670.2	2,316.2	1,948.6	6.301	
4,400.0	4,400.0	4,474.2	4,470.5	9.7	499.1	133.77	-1,599.8	1,670.2	2,313.6	1,935.8	6.124	
4,500.0	4,500.0	4,581.0	4,577.2	10.0	512.4	133.69	-1,595.4	1,670.2	2,310.8	1,922.5	5.951	
4,600.0	4,600.0	4,675.4	4,671.5	10.2	524.2	133.62	-1,591.5	1,670.2	2,307.9	1,910.3	5.804	
4,700.0	4,700.0	4,769.8	4,765.8	10.4	536.0	133.55	-1,587.9	1,670.2	2,305.3	1,898.3	5.665	
4,800.0	4,800.0	4,865.8	4,861.8	10.6	546.9	133.49	-1,584.5	1,670.2	2,302.9	1,887.3	5.541	
4,900.0	4,900.0	4,963.1	4,959.0	10.9	557.1	133.43	-1,581.3	1,670.2	2,300.6	1,876.8	5.429	
5,000.0	5,000.0	5,060.4	5,056.2	11.1	567.3	133.38	-1,578.3	1,670.2	2,298.4	1,866.5	5.322	
5,100.0	5,100.0	5,160.3	5,156.1	11.3	577.0	133.32	-1,575.2	1,670.2	2,296.3	1,856.6	5.222	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - Paduca Federal 30 #1 - Wellbore #1 - Wellbore #1											Offset Site Error:	0.0 usft
Survey Program: 285-INC											Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning
5,200.0	5,200.0	5,260.3	5,256.0	11.5	586.8	133.27	-1,572.2	1,670.2	2,294.2	1,846.6	5.125	
5,300.0	5,300.0	5,360.2	5,355.9	11.8	596.6	133.21	-1,569.1	1,670.2	2,292.1	1,836.6	5.032	
5,400.0	5,400.0	5,460.0	5,455.7	12.0	606.4	133.16	-1,566.1	1,670.2	2,290.1	1,826.6	4.941	
5,500.0	5,500.0	5,558.7	5,554.3	12.2	615.4	133.10	-1,563.1	1,670.2	2,288.0	1,817.2	4.860	
5,600.0	5,600.0	5,657.2	5,652.8	12.4	624.4	133.05	-1,560.2	1,670.2	2,286.0	1,807.9	4.781	
5,700.0	5,700.0	5,755.7	5,751.3	12.7	633.4	133.00	-1,557.4	1,670.2	2,284.1	1,798.6	4.705	
5,800.0	5,800.0	5,854.2	5,849.7	12.9	642.3	132.95	-1,554.7	1,670.2	2,282.2	1,789.4	4.631	
5,900.0	5,900.0	5,952.6	5,948.1	13.1	650.9	132.90	-1,552.2	1,670.2	2,280.4	1,780.6	4.562	
6,000.0	6,000.0	6,050.6	6,046.0	13.3	658.6	132.86	-1,549.7	1,670.2	2,278.7	1,772.6	4.502	
6,100.0	6,100.0	6,148.6	6,144.0	13.6	666.2	132.81	-1,547.3	1,670.2	2,277.1	1,764.6	4.443	
6,200.0	6,200.0	6,246.6	6,242.0	13.8	673.8	132.77	-1,545.1	1,670.2	2,275.6	1,756.8	4.386	
6,300.0	6,300.0	6,347.8	6,343.1	14.0	681.7	132.73	-1,542.9	1,670.2	2,274.0	1,748.7	4.329	
6,400.0	6,400.0	6,449.5	6,444.8	14.2	689.6	132.69	-1,540.5	1,670.2	2,272.5	1,740.6	4.273	
6,500.0	6,500.0	6,551.1	6,546.4	14.5	697.5	132.64	-1,538.0	1,670.2	2,270.8	1,732.4	4.217	
6,600.0	6,600.0	6,652.8	6,648.1	14.7	705.4	132.59	-1,535.4	1,670.2	2,269.1	1,724.0	4.163	
6,700.0	6,700.0	6,751.4	6,746.6	14.9	713.1	132.55	-1,532.9	1,670.2	2,267.3	1,715.9	4.112	
6,800.0	6,800.0	6,849.7	6,844.9	15.1	720.7	132.50	-1,530.5	1,670.2	2,265.7	1,707.8	4.061	
6,900.0	6,900.0	6,948.0	6,943.2	15.4	728.4	132.46	-1,528.1	1,670.2	2,264.1	1,699.8	4.013	
7,000.0	7,000.0	7,046.4	7,041.5	15.6	736.0	132.42	-1,525.9	1,670.2	2,262.6	1,691.9	3.965	
7,100.0	7,100.0	7,143.3	7,138.4	15.8	741.9	132.38	-1,523.9	1,670.2	2,261.1	1,685.4	3.928	
7,200.0	7,200.0	7,240.0	7,235.2	16.0	747.5	132.34	-1,522.1	1,670.2	2,259.9	1,679.3	3.893	
7,300.0	7,300.0	7,336.8	7,331.9	16.3	753.1	132.31	-1,520.4	1,670.2	2,258.7	1,673.4	3.859	
7,400.0	7,400.0	7,433.5	7,428.6	16.5	758.6	132.29	-1,519.0	1,670.2	2,257.7	1,667.7	3.826	
7,500.0	7,500.0	7,532.8	7,527.9	16.7	763.3	132.26	-1,517.7	1,670.2	2,256.9	1,662.7	3.798	
7,600.0	7,600.0	7,632.8	7,627.9	16.9	767.8	132.24	-1,516.4	1,670.2	2,256.0	1,657.9	3.772	
7,700.0	7,700.0	7,732.8	7,727.8	17.2	772.2	132.21	-1,515.1	1,670.2	2,255.1	1,653.1	3.746	
7,800.0	7,800.0	7,832.7	7,827.8	17.4	776.6	132.19	-1,513.8	1,670.2	2,254.2	1,648.3	3.720	
7,900.0	7,900.0	7,932.5	7,927.6	17.6	780.9	132.16	-1,512.5	1,670.2	2,253.3	1,643.6	3.695	
8,000.0	8,000.0	8,030.8	8,025.9	17.8	784.6	132.14	-1,511.3	1,670.2	2,252.5	1,639.4	3.674	
8,100.0	8,100.0	8,129.2	8,124.2	18.1	788.3	132.12	-1,510.2	1,670.2	2,251.8	1,635.3	3.653	
8,200.0	8,200.0	8,227.5	8,222.6	18.3	792.0	132.10	-1,509.2	1,670.2	2,251.1	1,631.2	3.632	
8,300.0	8,300.0	8,326.1	8,321.2	18.5	795.6	132.08	-1,508.3	1,670.2	2,250.5	1,627.4	3.612	
8,400.0	8,400.0	8,426.1	8,421.2	18.7	798.7	132.07	-1,507.4	1,670.2	2,249.9	1,623.9	3.594	
8,500.0	8,500.0	8,526.1	8,521.1	19.0	801.8	132.05	-1,506.5	1,670.2	2,249.3	1,620.4	3.577	
8,600.0	8,600.0	8,626.1	8,621.1	19.2	804.9	132.03	-1,505.6	1,670.2	2,248.7	1,617.0	3.559	
8,617.0	8,617.0	8,643.1	8,638.1	19.2	805.5	132.03	-1,505.5	1,670.2	2,248.6	1,616.4	3.557	
8,650.0	8,650.0	8,676.1	8,671.1	19.3	806.5	-48.48	-1,505.2	1,670.2	2,247.8	1,617.7	3.567	
8,700.0	8,699.7	8,725.7	8,720.7	19.4	808.0	-48.86	-1,504.8	1,670.2	2,244.2	1,609.7	3.537	
8,750.0	8,748.8	8,773.9	8,768.9	19.5	809.2	-49.54	-1,504.4	1,670.2	2,237.7	1,596.6	3.491	
8,800.0	8,796.9	8,821.2	8,816.2	19.5	810.3	-50.52	-1,504.0	1,670.2	2,228.5	1,578.4	3.428	
8,850.0	8,843.6	8,867.0	8,862.0	19.6	811.4	-51.81	-1,503.7	1,670.2	2,216.6	1,555.3	3.352	
8,900.0	8,888.6	8,911.2	8,906.2	19.7	812.5	-53.42	-1,503.4	1,670.2	2,202.3	1,527.4	3.263	
8,950.0	8,931.6	8,953.3	8,948.3	19.8	813.5	-55.34	-1,503.1	1,670.2	2,185.7	1,495.1	3.165	
9,000.0	8,972.1	8,993.1	8,988.1	19.9	814.5	-57.58	-1,502.8	1,670.2	2,167.0	1,458.9	3.061	
9,050.0	9,009.9	9,030.2	9,025.2	20.0	815.4	-60.12	-1,502.6	1,670.2	2,146.4	1,419.6	2.953	
9,100.0	9,044.8	9,064.4	9,059.4	20.2	816.3	-62.95	-1,502.5	1,670.2	2,124.2	1,378.0	2.847	
9,150.0	9,076.4	9,095.3	9,090.3	20.3	817.0	-66.02	-1,502.3	1,670.2	2,100.7	1,335.0	2.744	
9,200.0	9,104.5	9,125.0	9,120.0	20.5	817.7	-69.36	-1,502.2	1,670.2	2,076.1	1,291.6	2.646	
9,250.0	9,128.9	9,147.5	9,142.5	20.8	818.4	-72.74	-1,502.1	1,670.2	2,050.7	1,249.5	2.560	
9,300.0	9,149.4	9,168.2	9,163.2	21.0	819.1	-76.24	-1,502.0	1,670.2	2,024.9	1,209.2	2.482	
9,350.0	9,165.8	9,184.8	9,179.8	21.3	819.6	-79.72	-1,501.9	1,670.2	1,998.9	1,171.8	2.417	
9,400.0	9,178.1	9,197.0	9,192.0	21.6	820.0	-83.10	-1,501.8	1,670.2	1,973.1	1,137.7	2.362	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - Paduca Federal 30 #1 - Wellbore #1 - Wellbore #1											Offset Site Error:	0.0 usft
Survey Program: 285-INC											Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning	
9,450.0	9,186.0	9,204.8	9,199.9	22.0	820.2	-86.29	-1,501.8	1,670.2	1,947.7	1,107.3	2.318	
9,500.0	9,189.7	9,208.3	9,203.3	22.4	820.3	-89.25	-1,501.7	1,670.2	1,923.0	1,080.4	2.282	
9,517.0	9,190.0	9,208.4	9,203.4	22.5	820.3	-90.19	-1,501.7	1,670.2	1,914.8	1,072.0	2.272	
9,600.0	9,190.0	9,207.9	9,202.9	23.2	820.3	-90.17	-1,501.8	1,670.2	1,876.5	1,033.1	2.225	
9,700.0	9,190.0	9,207.3	9,202.3	24.1	820.3	-90.15	-1,501.8	1,670.2	1,834.3	989.9	2.172	
9,800.0	9,190.0	9,206.7	9,201.8	25.2	820.3	-90.13	-1,501.8	1,670.2	1,796.7	951.3	2.125	
9,900.0	9,190.0	9,206.1	9,201.2	26.3	820.3	-90.11	-1,501.8	1,670.2	1,763.9	917.4	2.084	
10,000.0	9,190.0	9,205.6	9,200.6	27.5	820.3	-90.09	-1,501.8	1,670.2	1,736.3	888.6	2.048	
10,100.0	9,190.0	9,205.0	9,200.0	28.8	820.2	-90.07	-1,501.8	1,670.2	1,714.1	865.1	2.019	
10,200.0	9,190.0	9,204.4	9,199.4	30.1	820.2	-90.05	-1,501.8	1,670.2	1,697.5	847.2	1.996	
10,300.0	9,190.0	9,203.8	9,198.8	31.5	820.2	-90.03	-1,501.8	1,670.2	1,686.7	835.0	1.980	
10,400.0	9,190.0	9,203.2	9,198.2	32.9	820.2	-90.01	-1,501.8	1,670.2	1,681.7	828.7	1.971	
10,433.3	9,190.0	9,203.0	9,198.0	33.4	820.2	-90.00	-1,501.8	1,670.2	1,681.4	827.9	1.970	CC, ES
10,500.0	9,190.0	9,202.6	9,197.6	34.4	820.2	-89.99	-1,501.8	1,670.2	1,682.7	828.2	1.969	SF
10,600.0	9,190.0	9,202.1	9,197.1	35.8	820.1	-89.97	-1,501.8	1,670.2	1,689.7	833.7	1.974	
10,700.0	9,190.0	9,201.5	9,196.5	37.4	820.1	-89.95	-1,501.8	1,670.2	1,702.4	845.0	1.985	
10,800.0	9,190.0	9,200.9	9,195.9	38.9	820.1	-89.93	-1,501.8	1,670.2	1,720.9	861.9	2.003	
10,900.0	9,190.0	9,200.3	9,195.4	40.5	820.1	-89.91	-1,501.8	1,670.2	1,745.0	884.4	2.028	
11,000.0	9,190.0	9,199.8	9,194.8	42.1	820.1	-89.89	-1,501.8	1,670.2	1,774.3	912.2	2.058	
11,100.0	9,190.0	9,199.2	9,194.2	43.7	820.1	-89.87	-1,501.8	1,670.2	1,808.8	945.1	2.094	
11,200.0	9,190.0	9,198.6	9,193.7	45.3	820.0	-89.85	-1,501.8	1,670.2	1,848.0	982.7	2.136	
11,300.0	9,190.0	9,198.1	9,193.1	46.9	820.0	-89.83	-1,501.8	1,670.2	1,891.6	1,024.7	2.182	
11,400.0	9,190.0	9,197.5	9,192.5	48.6	820.0	-89.81	-1,501.8	1,670.2	1,939.5	1,071.0	2.233	
11,500.0	9,190.0	9,197.0	9,192.0	50.2	820.0	-89.80	-1,501.8	1,670.2	1,991.2	1,124.0	2.288	
11,600.0	9,190.0	9,196.4	9,191.4	51.9	820.0	-89.78	-1,501.8	1,670.2	2,046.5	1,174.7	2.347	
11,700.0	9,190.0	9,195.8	9,190.9	53.6	820.0	-89.76	-1,501.8	1,670.2	2,105.2	1,231.7	2.410	
11,800.0	9,190.0	9,195.3	9,190.3	55.3	819.9	-89.74	-1,501.8	1,670.2	2,166.8	1,291.6	2.476	
11,900.0	9,190.0	9,194.7	9,189.8	57.0	819.9	-89.72	-1,501.8	1,670.2	2,231.2	1,354.4	2.545	
12,000.0	9,190.0	9,194.2	9,189.2	58.7	819.9	-89.70	-1,501.8	1,670.2	2,298.2	1,419.7	2.616	
12,100.0	9,190.0	9,193.6	9,188.7	60.4	819.9	-89.68	-1,501.8	1,670.2	2,367.5	1,487.3	2.690	
12,200.0	9,190.0	9,193.1	9,188.1	62.1	819.9	-89.66	-1,501.8	1,670.2	2,438.9	1,557.0	2.765	
12,300.0	9,190.0	9,192.6	9,187.6	63.8	819.8	-89.65	-1,501.8	1,670.2	2,512.3	1,628.7	2.843	
12,400.0	9,190.0	9,192.0	9,187.0	65.6	819.8	-89.63	-1,501.8	1,670.2	2,587.5	1,702.1	2.923	
12,500.0	9,190.0	9,191.5	9,186.5	67.3	819.8	-89.61	-1,501.8	1,670.2	2,664.3	1,777.2	3.003	
12,600.0	9,190.0	9,190.9	9,186.0	69.0	819.8	-89.59	-1,501.8	1,670.2	2,742.6	1,853.8	3.086	
12,700.0	9,190.0	9,190.4	9,185.4	70.8	819.8	-89.57	-1,501.9	1,670.2	2,822.2	1,931.7	3.169	
12,800.0	9,190.0	9,189.9	9,184.9	72.5	819.8	-89.55	-1,501.9	1,670.2	2,903.2	2,010.9	3.254	
12,900.0	9,190.0	9,189.3	9,184.4	74.3	819.7	-89.54	-1,501.9	1,670.2	2,985.2	2,091.3	3.339	
13,000.0	9,190.0	9,188.8	9,183.8	76.0	819.7	-89.52	-1,501.9	1,670.2	3,068.4	2,172.7	3.426	
13,100.0	9,190.0	9,188.3	9,183.3	77.8	819.7	-89.50	-1,501.9	1,670.2	3,152.5	2,255.1	3.513	
13,200.0	9,190.0	9,187.8	9,182.8	79.5	819.7	-89.48	-1,501.9	1,670.2	3,237.5	2,338.4	3.601	
13,300.0	9,190.0	9,187.2	9,182.2	81.3	819.7	-89.46	-1,501.9	1,670.2	3,323.4	2,422.5	3.689	
13,400.0	9,190.0	9,186.7	9,181.7	83.1	819.7	-89.45	-1,501.9	1,670.2	3,410.0	2,507.4	3.778	
13,500.0	9,190.0	9,186.2	9,181.2	84.8	819.6	-89.43	-1,501.9	1,670.2	3,497.4	2,593.0	3.867	
13,600.0	9,190.0	9,185.7	9,180.7	86.6	819.6	-89.41	-1,501.9	1,670.2	3,585.4	2,679.2	3.957	
13,700.0	9,190.0	9,185.2	9,180.2	88.4	819.6	-89.39	-1,501.9	1,670.2	3,674.0	2,766.1	4.047	
13,800.0	9,190.0	9,184.6	9,179.7	90.2	819.6	-89.38	-1,501.9	1,670.2	3,763.2	2,853.5	4.137	
13,900.0	9,190.0	9,184.1	9,179.1	91.9	819.6	-89.36	-1,501.9	1,670.2	3,852.9	2,941.5	4.227	
14,000.0	9,190.0	9,183.6	9,178.6	93.7	819.6	-89.34	-1,501.9	1,670.2	3,943.1	3,029.9	4.318	
14,100.0	9,190.0	9,183.1	9,178.1	95.5	819.6	-89.32	-1,501.9	1,670.2	4,033.8	3,118.9	4.409	
14,200.0	9,190.0	9,182.6	9,177.6	97.3	819.5	-89.31	-1,501.9	1,670.2	4,124.9	3,208.2	4.500	
14,300.0	9,190.0	9,182.1	9,177.1	99.0	819.5	-89.29	-1,501.9	1,670.2	4,216.4	3,298.0	4.591	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - Paduca Federal 30 #1 - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 285-INC												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Tooface (")	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
14,400.0	9,190.0	9,181.6	9,176.6	100.8	819.5	-89.27	-1,501.9	1,670.2	4,308.3	3,388.1	4.682		
14,500.0	9,190.0	9,181.1	9,176.1	102.6	819.5	-89.25	-1,501.9	1,670.2	4,400.6	3,478.6	4.773		
14,600.0	9,190.0	9,180.6	9,175.6	104.4	819.5	-89.24	-1,501.9	1,670.2	4,493.1	3,569.4	4.864		
14,700.0	9,190.0	9,180.1	9,175.1	106.2	819.5	-89.22	-1,501.9	1,670.2	4,586.0	3,660.5	4.955		
14,800.0	9,190.0	9,179.6	9,174.6	108.0	819.4	-89.20	-1,501.9	1,670.2	4,679.2	3,751.9	5.046		
14,900.0	9,190.0	9,179.1	9,174.1	109.8	819.4	-89.19	-1,501.9	1,670.2	4,772.7	3,843.6	5.137		
15,000.0	9,190.0	9,178.6	9,173.6	111.6	819.4	-89.17	-1,501.9	1,670.2	4,866.4	3,935.5	5.228		
15,100.0	9,190.0	9,178.1	9,173.1	113.3	819.4	-89.15	-1,501.9	1,670.2	4,960.3	4,027.7	5.319		
15,200.0	9,190.0	9,177.6	9,172.6	115.1	819.4	-89.14	-1,501.9	1,670.2	5,054.5	4,120.1	5.409		
15,300.0	9,190.0	9,177.1	9,172.1	116.9	819.4	-89.12	-1,501.9	1,670.2	5,148.9	4,212.8	5.500		
15,400.0	9,190.0	9,176.6	9,171.6	118.7	819.4	-89.10	-1,501.9	1,670.2	5,243.6	4,305.6	5.590		
15,500.0	9,190.0	9,176.2	9,171.2	120.5	819.3	-89.09	-1,501.9	1,670.2	5,338.4	4,398.7	5.681		
15,600.0	9,190.0	9,175.7	9,170.7	122.3	819.3	-89.07	-1,501.9	1,670.2	5,433.4	4,491.9	5.771		
15,700.0	9,190.0	9,175.2	9,170.2	124.1	819.3	-89.05	-1,501.9	1,670.2	5,528.5	4,585.3	5.861		
15,800.0	9,190.0	9,174.7	9,169.7	125.9	819.3	-89.04	-1,501.9	1,670.2	5,623.9	4,678.8	5.951		
15,900.0	9,190.0	9,174.2	9,169.2	127.7	819.3	-89.02	-1,501.9	1,670.2	5,719.4	4,772.6	6.041		
16,000.0	9,190.0	9,173.7	9,168.8	129.5	819.3	-89.00	-1,501.9	1,670.2	5,815.0	4,866.4	6.130		
16,100.0	9,190.0	9,173.3	9,168.3	131.3	819.2	-88.99	-1,501.9	1,670.2	5,910.8	4,960.5	6.219		
16,200.0	9,190.0	9,172.8	9,167.8	133.1	819.2	-88.97	-1,501.9	1,670.2	6,006.8	5,054.6	6.309		
16,300.0	9,190.0	9,172.3	9,167.3	134.9	819.2	-88.96	-1,501.9	1,670.2	6,102.8	5,148.9	6.398		
16,400.0	9,190.0	9,171.9	9,166.9	136.7	819.2	-88.94	-1,502.0	1,670.2	6,199.0	5,243.3	6.486		
16,500.0	9,190.0	9,171.4	9,166.4	138.5	819.2	-88.92	-1,502.0	1,670.2	6,295.3	5,337.8	6.575		
16,600.0	9,190.0	9,170.9	9,165.9	140.3	819.2	-88.91	-1,502.0	1,670.2	6,391.8	5,432.5	6.663		
16,700.0	9,190.0	9,170.4	9,165.5	142.1	819.2	-88.89	-1,502.0	1,670.2	6,488.3	5,527.2	6.751		
16,800.0	9,190.0	9,170.0	9,165.0	143.9	819.1	-88.88	-1,502.0	1,670.2	6,584.9	5,622.1	6.839		
16,900.0	9,190.0	9,169.5	9,164.5	145.7	819.1	-88.86	-1,502.0	1,670.2	6,681.7	5,717.0	6.927		
17,000.0	9,190.0	9,169.1	9,164.1	147.5	819.1	-88.85	-1,502.0	1,670.2	6,778.5	5,812.1	7.014		
17,100.0	9,190.0	9,168.6	9,163.6	149.3	819.1	-88.83	-1,502.0	1,670.2	6,875.4	5,907.2	7.101		
17,200.0	9,190.0	9,168.1	9,163.1	151.1	819.1	-88.81	-1,502.0	1,670.2	6,972.4	6,002.4	7.188		
17,300.0	9,190.0	9,167.7	9,162.7	152.9	819.1	-88.80	-1,502.0	1,670.2	7,069.5	6,097.7	7.275		
17,400.0	9,190.0	9,167.2	9,162.2	154.7	819.1	-88.78	-1,502.0	1,670.2	7,166.7	6,193.1	7.361		
17,500.0	9,190.0	9,166.8	9,161.8	156.5	819.0	-88.77	-1,502.0	1,670.2	7,263.9	6,288.6	7.448		
17,600.0	9,190.0	9,166.3	9,161.3	158.3	819.0	-88.75	-1,502.0	1,670.2	7,361.2	6,384.1	7.534		
17,700.0	9,190.0	9,165.9	9,160.9	160.1	819.0	-88.74	-1,502.0	1,670.2	7,458.6	6,479.7	7.619		
17,800.0	9,190.0	9,165.4	9,160.4	161.9	819.0	-88.72	-1,502.0	1,670.2	7,556.1	6,575.4	7.705		
17,900.0	9,190.0	9,165.0	9,160.0	163.8	819.0	-88.71	-1,502.0	1,670.2	7,653.6	6,671.1	7.790		
18,000.0	9,190.0	9,164.5	9,159.5	165.6	819.0	-88.69	-1,502.0	1,670.2	7,751.2	6,766.9	7.875		
18,100.0	9,190.0	9,164.1	9,159.1	167.4	819.0	-88.68	-1,502.0	1,670.2	7,848.8	6,862.8	7.960		
18,200.0	9,190.0	9,163.6	9,158.6	169.2	818.9	-88.66	-1,502.0	1,670.2	7,946.5	6,958.7	8.044		
18,300.0	9,190.0	9,163.2	9,158.2	171.0	818.9	-88.65	-1,502.0	1,670.2	8,044.3	7,054.7	8.129		
18,400.0	9,190.0	9,162.7	9,157.8	172.8	818.9	-88.63	-1,502.0	1,670.2	8,142.1	7,150.7	8.213		
18,500.0	9,190.0	9,162.3	9,157.3	174.6	818.9	-88.62	-1,502.0	1,670.2	8,240.0	7,246.8	8.296		
18,600.0	9,190.0	9,161.9	9,156.9	176.4	818.9	-88.60	-1,502.0	1,670.2	8,337.9	7,342.9	8.380		
18,700.0	9,190.0	9,161.4	9,156.4	178.2	818.9	-88.59	-1,502.0	1,670.2	8,435.9	7,439.1	8.463		
18,800.0	9,190.0	9,161.0	9,156.0	180.0	818.9	-88.57	-1,502.0	1,670.2	8,533.9	7,535.3	8.546		
18,900.0	9,190.0	9,160.6	9,155.6	181.8	818.8	-88.56	-1,502.0	1,670.2	8,632.0	7,631.6	8.629		
19,000.0	9,190.0	9,160.1	9,155.1	183.6	818.8	-88.54	-1,502.0	1,670.2	8,730.1	7,727.9	8.711		
19,100.0	9,190.0	9,159.7	9,154.7	185.5	818.8	-88.53	-1,502.0	1,670.2	8,828.2	7,824.3	8.794		
19,200.0	9,190.0	9,159.3	9,154.3	187.3	818.8	-88.51	-1,502.0	1,670.2	8,926.4	7,920.7	8.876		
19,246.5	9,190.0	9,159.1	9,154.1	188.1	818.8	-88.50	-1,502.0	1,670.2	8,972.1	7,965.5	8.914		



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - Windward Federal #2H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-Good_gyro, 9743-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
0.0	0.0	4.9	4.9	0.0	0.0	-79.08	19.4	-100.5	102.4				
100.0	100.0	104.6	104.6	0.1	0.0	-79.48	18.7	-100.8	102.5	102.4	831.691		
200.0	200.0	204.2	204.1	0.3	0.1	-80.20	17.5	-101.5	103.0	102.6	256.633		
300.0	300.0	304.4	304.4	0.5	0.1	-80.87	16.4	-102.3	103.6	102.9	152.421		
400.0	400.0	404.4	404.4	0.8	0.2	-81.51	15.4	-102.9	104.1	103.1	108.685		
500.0	500.0	504.5	504.4	1.0	0.3	-82.12	14.3	-103.6	104.6	103.3	84.623		
600.0	600.0	604.5	604.5	1.2	0.3	-82.66	13.4	-104.1	105.0	103.5	69.368		
700.0	700.0	704.2	704.1	1.4	0.4	-83.15	12.6	-104.8	105.5	103.7	58.920		
800.0	800.0	803.5	803.4	1.7	0.4	-83.75	11.6	-106.0	106.6	104.5	51.525		
900.0	900.0	904.6	904.5	1.9	0.5	-84.70	9.9	-107.0	107.5	105.1	45.744		
1,000.0	1,000.0	1,005.5	1,005.4	2.1	0.5	-85.83	7.8	-107.1	107.4	104.8	40.847		
1,100.0	1,100.0	1,105.9	1,105.8	2.3	0.6	-86.87	5.8	-106.6	106.8	103.9	36.711		
1,200.0	1,200.0	1,207.0	1,206.9	2.6	0.6	-87.80	4.0	-105.3	105.4	102.2	33.056		
1,300.0	1,300.0	1,306.4	1,306.2	2.8	0.7	-88.93	1.9	-103.8	103.9	100.4	29.950		
1,400.0	1,400.0	1,406.8	1,406.6	3.0	0.7	-89.85	0.3	-102.4	102.4	98.7	27.342		
1,500.0	1,500.0	1,507.1	1,506.9	3.2	0.8	-90.52	-0.9	-100.6	100.6	96.6	25.003		
1,600.0	1,600.0	1,607.1	1,606.9	3.5	0.8	-91.14	-2.0	-98.6	98.7	94.4	22.932		
1,700.0	1,700.0	1,706.8	1,706.6	3.7	0.9	-91.54	-2.6	-96.8	96.8	92.2	21.141		
1,800.0	1,800.0	1,806.5	1,806.2	3.9	1.0	-91.75	-2.9	-95.2	95.3	90.4	19.620		
1,900.0	1,900.0	1,906.1	1,905.8	4.1	1.0	-91.64	-2.7	-94.1	94.1	89.0	18.350		
2,000.0	2,000.0	2,006.4	2,006.1	4.4	1.1	-91.14	-1.8	-93.0	93.0	87.6	17.210		
2,100.0	2,100.0	2,106.2	2,105.9	4.6	1.1	-90.34	-0.5	-91.8	91.8	86.2	16.172		
2,200.0	2,200.0	2,206.5	2,206.2	4.8	1.2	-89.27	1.2	-90.6	90.6	84.7	15.220		
2,300.0	2,300.0	2,307.4	2,307.0	5.0	1.2	-87.86	3.3	-88.6	88.7	82.5	14.242		
2,400.0	2,400.0	2,407.3	2,406.9	5.3	1.3	-86.34	5.5	-86.2	86.4	79.9	13.288		
2,500.0	2,500.0	2,507.4	2,506.9	5.5	1.3	-85.08	7.2	-83.7	84.1	77.3	12.399		
2,600.0	2,600.0	2,607.3	2,606.7	5.7	1.4	-84.03	8.5	-81.2	81.7	74.7	11.580		
2,700.0	2,700.0	2,706.9	2,706.3	5.9	1.4	-82.98	9.7	-79.1	79.7	72.4	10.875		
2,800.0	2,800.0	2,807.3	2,806.7	6.2	1.5	-81.94	10.9	-76.9	77.6	70.0	10.203		
2,900.0	2,900.0	2,906.1	2,905.5	6.4	1.5	-81.00	11.9	-75.1	76.1	68.2	9.646		
2,950.5	2,950.5	2,956.0	2,955.4	6.5	1.5	-80.56	12.4	-74.8	75.9	67.8	9.452 CC, ES		
3,000.0	3,000.0	3,004.9	3,004.3	6.6	1.6	-80.13	13.0	-74.9	76.1	67.9	9.319		
3,100.0	3,100.0	3,104.6	3,103.9	6.8	1.6	-79.18	14.5	-75.7	77.1	68.6	9.132		
3,200.0	3,200.0	3,204.3	3,203.7	7.1	1.7	-78.11	16.2	-76.8	78.5	69.8	9.007		
3,300.0	3,300.0	3,304.8	3,304.1	7.3	1.7	-76.99	18.0	-77.7	79.8	70.8	8.870		
3,400.0	3,400.0	3,404.3	3,403.7	7.5	1.8	-75.80	19.9	-78.6	81.1	71.8	8.744		
3,500.0	3,500.0	3,504.5	3,503.8	7.7	1.8	-74.53	22.0	-79.5	82.5	72.9	8.639		
3,600.0	3,600.0	3,604.6	3,603.9	7.9	1.9	-73.27	24.1	-80.2	83.7	73.9	8.524		
3,700.0	3,700.0	3,704.4	3,703.6	8.2	1.9	-71.96	26.4	-80.9	85.1	75.0	8.424		
3,800.0	3,800.0	3,804.3	3,803.5	8.4	2.0	-70.50	28.9	-81.7	86.7	76.3	8.347		
3,900.0	3,900.0	3,904.6	3,903.8	8.6	2.0	-69.01	31.6	-82.3	88.1	77.5	8.266		
4,000.0	4,000.0	4,005.7	4,004.8	8.8	2.1	-68.01	33.3	-82.3	88.8	77.8	8.116		
4,100.0	4,100.0	4,105.9	4,105.0	9.1	2.1	-67.38	34.1	-81.9	88.8	77.6	7.915		
4,200.0	4,200.0	4,206.2	4,205.3	9.3	2.2	-66.74	34.9	-81.3	88.5	77.0	7.699		
4,300.0	4,300.0	4,306.7	4,305.8	9.5	2.3	-66.43	35.1	-80.4	87.8	76.0	7.454		
4,400.0	4,400.0	4,407.2	4,406.3	9.7	2.3	-66.59	34.3	-79.2	86.4	74.3	7.167		
4,500.0	4,500.0	4,506.7	4,505.8	10.0	2.4	-66.90	33.4	-78.2	85.0	72.7	6.899		
4,600.0	4,600.0	4,606.4	4,605.5	10.2	2.4	-67.13	32.7	-77.5	84.1	71.5	6.677		
4,700.0	4,700.0	4,706.2	4,705.2	10.4	2.5	-67.26	32.3	-77.1	83.6	70.7	6.490		
4,800.0	4,800.0	4,806.3	4,805.4	10.6	2.5	-67.61	31.6	-76.8	83.1	69.9	6.314		
4,900.0	4,900.0	4,906.1	4,905.2	10.9	2.6	-68.21	30.7	-76.7	82.6	69.1	6.148		
4,977.8	4,977.8	4,983.6	4,982.7	11.0	2.6	-68.66	30.0	-76.8	82.4	68.8	6.040		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - Windward Federal #2H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-Good_gyro, 9743-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
5,000.0	5,000.0	5,005.7	5,004.8	11.1	2.6	-68.78	29.8	-76.9	82.4	68.7	6.014		
5,100.0	5,100.0	5,105.4	5,104.5	11.3	2.7	-69.36	29.2	-77.4	82.7	68.7	5.916		
5,200.0	5,200.0	5,205.5	5,204.6	11.5	2.7	-69.86	28.6	-78.0	83.1	68.9	5.829		
5,300.0	5,300.0	5,305.1	5,304.2	11.8	2.8	-70.32	28.2	-78.8	83.7	69.2	5.760		
5,400.0	5,400.0	5,405.3	5,404.3	12.0	2.8	-70.78	27.8	-79.8	84.5	69.7	5.702		
5,500.0	5,500.0	5,505.2	5,504.3	12.2	2.9	-71.45	27.1	-80.8	85.2	70.1	5.645		
5,600.0	5,600.0	5,605.4	5,604.5	12.4	2.9	-72.36	26.0	-81.8	85.8	70.4	5.583		
5,700.0	5,700.0	5,704.8	5,703.9	12.7	3.0	-73.26	25.0	-83.0	86.7	71.0	5.540		
5,800.0	5,800.0	5,805.0	5,804.0	12.9	3.0	-73.92	24.3	-84.4	87.8	71.9	5.515		
5,900.0	5,900.0	5,905.1	5,904.1	13.1	3.1	-74.51	23.7	-85.5	88.8	72.6	5.481		
6,000.0	6,000.0	6,004.6	6,003.6	13.3	3.1	-75.18	23.0	-87.0	90.0	73.5	5.462		
6,100.0	6,100.0	6,104.2	6,103.2	13.6	3.2	-75.88	22.4	-88.9	91.7	74.9	5.472		
6,200.0	6,200.0	6,204.1	6,203.1	13.8	3.2	-76.55	21.8	-91.0	93.6	76.5	5.495		
6,300.0	6,300.0	6,304.6	6,303.5	14.0	3.3	-76.81	21.7	-92.7	95.3	78.0	5.505		
6,400.0	6,400.0	6,405.4	6,404.3	14.2	3.3	-77.20	21.3	-93.9	96.3	78.7	5.475		
6,500.0	6,500.0	6,504.9	6,503.8	14.5	3.4	-77.85	20.5	-95.0	97.2	79.3	5.441		
6,600.0	6,600.0	6,605.0	6,603.9	14.7	3.4	-78.39	19.8	-96.2	98.2	80.1	5.415		
6,700.0	6,700.0	6,704.2	6,703.1	14.9	3.5	-78.61	19.7	-97.7	99.6	81.2	5.411		
6,800.0	6,800.0	6,804.0	6,802.9	15.1	3.5	-78.65	20.0	-99.6	101.6	82.9	5.434		
6,900.0	6,900.0	6,904.5	6,903.4	15.4	3.6	-78.70	20.2	-101.2	103.3	84.3	5.444		
7,000.0	7,000.0	7,004.1	7,003.0	15.6	3.7	-78.72	20.5	-102.9	104.9	85.7	5.452		
7,100.0	7,100.0	7,104.4	7,103.2	15.8	3.7	-78.71	20.9	-104.5	106.6	87.1	5.462		
7,200.0	7,200.0	7,204.4	7,203.3	16.0	3.8	-78.66	21.3	-106.0	108.2	88.4	5.463		
7,300.0	7,300.0	7,304.8	7,303.6	16.3	3.8	-78.48	21.8	-107.3	109.5	89.4	5.455		
7,400.0	7,400.0	7,406.3	7,405.1	16.5	3.9	-77.96	22.9	-107.5	109.9	89.6	5.402		
7,500.0	7,500.0	7,506.4	7,505.2	16.7	3.9	-77.24	24.2	-107.0	109.7	89.1	5.317		
7,600.0	7,600.0	7,606.7	7,605.5	16.9	4.0	-76.59	25.3	-106.3	109.3	88.4	5.226		
7,700.0	7,700.0	7,707.4	7,706.2	17.2	4.0	-76.02	26.2	-105.2	108.4	87.2	5.117		
7,800.0	7,800.0	7,808.1	7,806.9	17.4	4.1	-75.69	26.4	-103.5	106.8	85.4	4.978		
7,900.0	7,900.0	7,908.0	7,906.7	17.6	4.1	-75.55	26.2	-101.7	105.0	83.3	4.830		
8,000.0	8,000.0	8,007.4	8,006.2	17.8	4.2	-75.74	25.5	-100.3	103.5	81.5	4.701		
8,100.0	8,100.0	8,106.7	8,105.5	18.1	4.2	-76.02	24.8	-99.6	102.6	80.3	4.603		
8,200.0	8,200.0	8,206.5	8,205.2	18.3	4.3	-76.29	24.2	-99.3	102.2	79.6	4.526		
8,300.0	8,300.0	8,306.2	8,304.9	18.5	4.3	-76.83	23.3	-99.3	102.0	79.2	4.466		
8,400.0	8,400.0	8,407.0	8,405.7	18.7	4.4	-77.51	22.0	-99.2	101.6	78.5	4.393		
8,479.2	8,479.2	8,485.4	8,484.1	18.9	4.4	-78.21	20.7	-99.1	101.3	77.9	4.338		
8,500.0	8,500.0	8,506.0	8,504.7	19.0	4.4	-78.44	20.3	-99.2	101.3	77.9	4.328		
8,600.0	8,600.0	8,605.0	8,603.6	19.2	4.5	-79.59	18.4	-100.4	102.0	78.4	4.310		
8,617.0	8,617.0	8,622.0	8,620.7	19.2	4.5	-79.79	18.1	-100.6	102.2	78.5	4.310		
8,650.0	8,650.0	8,655.1	8,653.7	19.3	4.5	99.84	17.5	-101.1	102.8	78.9	4.308 SF		
8,700.0	8,699.7	8,704.9	8,703.5	19.4	4.5	101.79	16.4	-101.9	104.3	80.2	4.330		
8,750.0	8,748.8	8,753.3	8,752.0	19.5	4.6	105.67	15.5	-102.8	107.2	82.9	4.403		
8,800.0	8,796.9	8,800.8	8,799.4	19.5	4.6	110.99	14.7	-104.0	112.6	87.9	4.564		
8,850.0	8,843.6	8,847.8	8,846.3	19.6	4.6	117.13	13.9	-105.4	121.3	96.3	4.852		
8,900.0	8,888.6	8,893.0	8,891.6	19.7	4.6	123.29	13.1	-106.8	134.0	108.8	5.306		
8,950.0	8,931.6	8,936.0	8,934.5	19.8	4.7	128.86	12.4	-108.2	151.3	125.9	5.962		
9,000.0	8,972.1	8,976.4	8,974.9	19.9	4.7	133.53	11.9	-109.6	173.4	148.1	6.840		
9,050.0	9,009.9	9,014.2	9,012.6	20.0	4.7	137.18	11.5	-110.9	200.2	175.0	7.945		
9,100.0	9,044.8	9,049.0	9,047.4	20.2	4.7	139.83	11.2	-112.0	231.2	206.2	9.269		
9,150.0	9,076.4	9,080.4	9,078.9	20.3	4.7	141.44	11.0	-113.0	266.0	241.3	10.789		
9,200.0	9,104.5	9,108.5	9,106.9	20.5	4.8	142.03	10.9	-113.9	304.1	279.7	12.463		
9,250.0	9,128.9	9,133.3	9,131.7	20.8	4.8	141.53	10.8	-114.6	345.1	320.8	14.209		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - Windward Federal #2H - Wellbore #1 - Wellbore #1												Offset Site Error:	0.0 usft
Survey Program: 100-Good_gyro, 9743-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore +N/-S (usft)	Centre +E/-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning	
9,300.0	9,149.4	9,154.2	9,152.6	21.0	4.8	139.62	10.7	-115.3	388.5	364.1	15.889		
9,350.0	9,165.8	9,171.0	9,169.4	21.3	4.8	135.76	10.7	-115.7	433.9	408.8	17.319		
9,400.0	9,178.1	9,183.7	9,182.1	21.6	4.8	128.90	10.6	-116.1	480.8	454.6	18.348		
9,450.0	9,186.0	9,192.1	9,190.4	22.0	4.8	117.14	10.6	-116.3	528.8	501.1	19.089		
9,500.0	9,189.7	9,196.0	9,194.4	22.4	4.8	98.11	10.5	-116.5	577.5	549.3	20.502		
9,517.0	9,190.0	9,196.4	9,194.8	22.5	4.8	89.96	10.5	-116.5	594.2	566.6	21.548		
9,600.0	9,190.0	9,196.9	9,195.2	23.2	4.8	90.19	10.5	-116.5	675.7	647.4	23.829		
9,700.0	9,190.0	9,197.4	9,195.8	24.1	4.8	90.46	10.5	-116.5	774.4	745.0	26.341		
9,800.0	9,190.0	9,198.0	9,196.4	25.2	4.8	90.74	10.5	-116.5	873.4	842.9	28.600		
9,900.0	9,190.0	9,198.5	9,196.9	26.3	4.8	91.02	10.5	-116.5	972.6	940.9	30.621		
10,000.0	9,190.0	9,199.1	9,197.5	27.5	4.8	91.29	10.5	-116.5	1,072.0	1,038.9	32.425		
10,100.0	9,190.0	9,199.7	9,198.1	28.8	4.8	91.57	10.5	-116.6	1,171.4	1,137.0	34.032		
10,200.0	9,190.0	9,200.0	9,198.4	30.1	4.8	91.73	10.5	-116.6	1,271.0	1,235.1	35.477		
10,300.0	9,190.0	9,200.8	9,199.2	31.5	4.8	92.12	10.5	-116.6	1,370.6	1,333.3	36.742		
10,400.0	9,190.0	11,919.6	10,595.8	32.9	28.6	-174.08	-1,530.7	133.8	1,410.4	1,387.4	61.316		
10,500.0	9,190.0	11,986.0	10,592.5	34.4	29.7	-173.95	-1,596.9	136.1	1,406.0	1,381.8	58.134		
10,600.0	9,190.0	12,056.4	10,590.5	35.8	30.8	-173.82	-1,667.2	138.7	1,403.9	1,378.4	55.249		
10,633.8	9,190.0	12,080.0	10,590.0	36.4	31.2	-173.77	-1,690.8	139.6	1,403.8	1,377.9	54.360		
10,700.0	9,190.0	12,146.5	10,590.1	37.4	32.3	-173.64	-1,757.2	142.3	1,403.9	1,377.1	52.403		
10,751.4	9,190.0	12,197.8	10,589.8	38.2	33.2	-173.54	-1,808.5	144.3	1,403.8	1,376.3	50.968		
10,800.0	9,190.0	12,242.0	10,589.6	38.9	33.9	-173.46	-1,852.7	146.0	1,403.9	1,375.7	49.738		
10,900.0	9,190.0	12,348.9	10,589.3	40.5	35.7	-173.26	-1,959.5	150.1	1,404.2	1,374.4	47.182		
10,966.0	9,190.0	12,412.4	10,588.8	41.5	36.8	-173.13	-2,023.0	152.8	1,404.1	1,373.3	45.686		
11,000.0	9,190.0	12,443.8	10,588.7	42.1	37.3	-173.06	-2,054.3	154.2	1,404.1	1,372.9	44.967		
11,100.0	9,190.0	12,568.3	10,587.1	43.7	39.4	-172.83	-2,178.7	158.9	1,403.4	1,370.5	42.622		
11,200.0	9,190.0	12,661.8	10,585.5	45.3	41.0	-172.68	-2,272.1	161.5	1,402.1	1,367.7	40.772		
11,300.0	9,190.0	12,766.0	10,584.0	46.9	42.7	-172.54	-2,376.3	164.2	1,401.2	1,365.2	38.986		
11,400.0	9,190.0	12,903.0	10,579.6	48.6	45.1	-172.35	-2,513.1	167.2	1,398.3	1,360.6	37.035		
11,500.0	9,190.0	12,980.5	10,576.6	50.2	46.4	-172.23	-2,590.6	169.1	1,394.9	1,355.8	35.654		
11,600.0	9,190.0	13,068.0	10,574.7	51.9	47.9	-172.07	-2,678.0	172.1	1,393.3	1,352.7	34.329		
11,700.0	9,190.0	13,168.3	10,572.4	53.6	49.6	-171.86	-2,778.2	176.2	1,391.7	1,349.5	32.996		
11,800.0	9,190.0	13,247.6	10,570.9	55.3	50.9	-171.67	-2,857.4	180.1	1,390.7	1,347.1	31.884		
11,800.1	9,190.0	13,247.7	10,570.9	55.3	50.9	-171.67	-2,857.5	180.1	1,390.7	1,347.1	31.883		
11,900.0	9,190.0	13,322.7	10,571.1	57.0	52.2	-171.48	-2,932.4	184.2	1,391.8	1,346.7	30.904		
12,000.0	9,190.0	13,431.6	10,572.1	58.7	54.1	-171.18	-3,041.1	190.9	1,393.8	1,347.0	29.795		
12,100.0	9,190.0	13,558.8	10,570.6	60.4	56.3	-170.85	-3,168.1	197.9	1,393.5	1,344.8	28.614		
12,200.0	9,190.0	13,672.8	10,568.0	62.1	58.3	-170.54	-3,281.8	204.2	1,392.3	1,341.8	27.555		
12,300.0	9,190.0	13,766.2	10,565.7	63.8	59.9	-170.31	-3,375.1	208.7	1,390.8	1,338.6	26.663		
12,400.0	9,190.0	13,852.3	10,564.3	65.6	61.3	-170.14	-3,461.2	212.1	1,390.0	1,336.3	25.878		
12,500.0	9,190.0	13,970.5	10,562.6	67.3	63.4	-169.93	-3,579.3	216.1	1,389.3	1,333.7	25.010		
12,600.0	9,190.0	14,088.6	10,559.0	69.0	65.4	-169.75	-3,697.3	219.0	1,388.8	1,329.4	24.171		
12,700.0	9,190.0	14,184.0	10,555.8	70.8	67.1	-169.61	-3,792.6	221.1	1,384.1	1,325.1	23.460		
12,800.0	9,190.0	14,276.1	10,553.2	72.5	68.6	-169.47	-3,884.7	223.3	1,381.8	1,321.2	22.801		
12,900.0	9,190.0	14,363.4	10,551.3	74.3	70.1	-169.35	-3,971.9	225.2	1,380.2	1,318.1	22.203		
12,965.8	9,190.0	14,415.0	10,550.7	75.4	70.9	-169.29	-4,023.5	226.3	1,379.9	1,316.8	21.856		
13,000.0	9,190.0	14,443.7	10,550.7	76.0	71.4	-169.26	-4,052.2	226.9	1,380.0	1,316.3	21.679		
13,100.0	9,190.0	14,543.5	10,550.8	77.8	73.1	-169.15	-4,151.9	228.7	1,380.6	1,315.3	21.139		
13,200.0	9,190.0	14,654.5	10,549.6	79.5	75.0	-169.03	-4,262.9	230.7	1,379.9	1,312.8	20.571		
13,216.7	9,190.0	14,666.2	10,549.5	79.8	75.2	-169.01	-4,274.6	230.9	1,379.9	1,312.6	20.498		
13,300.0	9,190.0	14,734.6	10,549.7	81.3	76.4	-168.94	-4,343.0	232.3	1,380.6	1,312.0	20.130		
13,400.0	9,190.0	14,861.7	10,548.6	83.1	78.6	-168.81	-4,470.1	234.3	1,380.0	1,309.5	19.576		
13,488.5	9,190.0	14,938.0	10,547.9	84.6	79.9	-168.75	-4,546.4	235.1	1,379.5	1,307.7	19.198		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - Windward Federal #2H - Wellbore #1 - Wellbore #1											Offset Site Error:	0.0 usft
Survey Program: 100-Good_gyro, 9743-MWD default											Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning
13,500.0	9,190.0	14,946.8	10,547.9	84.8	80.0	-168.74	-4,555.2	235.1	1,379.5	1,307.5	19.154	
13,600.0	9,190.0	15,023.6	10,548.5	86.6	81.3	-168.72	-4,632.0	235.4	1,380.6	1,307.1	18.797	
13,700.0	9,190.0	15,096.0	10,550.5	88.4	82.6	-168.73	-4,704.4	234.8	1,383.3	1,308.5	18.495	
13,800.0	9,190.0	15,180.7	10,554.1	90.2	84.0	-168.76	-4,789.0	234.2	1,387.5	1,311.3	18.205	
13,900.0	9,190.0	15,259.5	10,558.5	91.9	85.3	-168.74	-4,867.7	234.9	1,393.3	1,315.6	17.943	
14,000.0	9,190.0	15,491.7	10,557.8	93.7	89.3	-168.37	-5,099.5	242.4	1,392.2	1,311.5	17.250	
14,100.0	9,190.0	15,590.9	10,553.5	95.5	91.0	-168.07	-5,198.5	248.1	1,389.2	1,306.6	16.810	
14,200.0	9,190.0	15,688.6	10,549.1	97.3	92.7	-167.75	-5,295.9	254.4	1,386.3	1,301.7	16.381	
14,300.0	9,190.0	15,772.3	10,546.0	99.0	94.2	-167.49	-5,379.3	259.5	1,384.1	1,297.7	16.012	
14,400.0	9,190.0	15,853.0	10,544.3	100.8	95.6	-167.28	-5,459.9	263.8	1,383.4	1,295.2	15.687	
14,500.0	9,190.0	15,993.6	10,539.8	102.6	98.0	-166.94	-5,600.3	270.0	1,381.2	1,290.6	15.246	
14,600.0	9,190.0	16,098.1	10,535.1	104.4	99.8	-166.69	-5,704.6	274.4	1,378.1	1,285.4	14.878	
14,700.0	9,190.0	16,191.0	10,530.9	106.2	101.5	-166.45	-5,797.4	278.5	1,374.8	1,280.2	14.540	
14,800.0	9,190.0	16,294.4	10,526.9	108.0	103.2	-166.22	-5,900.6	282.4	1,372.1	1,275.5	14.209	
14,900.0	9,190.0	16,385.5	10,522.9	109.8	104.8	-165.99	-5,991.5	286.4	1,369.1	1,270.6	13.900	
15,000.0	9,190.0	16,480.8	10,519.4	111.6	106.5	-165.72	-6,086.7	291.5	1,367.0	1,266.5	13.595	
15,100.0	9,190.0	16,582.8	10,515.4	113.3	108.2	-165.41	-6,188.3	297.4	1,364.9	1,262.1	13.284	
15,200.0	9,190.0	16,680.6	10,511.3	115.1	109.9	-165.07	-6,285.9	304.0	1,362.7	1,257.8	12.981	
15,300.0	9,190.0	16,755.8	10,508.7	116.9	111.3	-164.80	-6,360.8	309.4	1,361.5	1,254.5	12.732	
15,307.6	9,190.0	16,761.0	10,508.6	117.1	111.3	-164.78	-6,366.0	309.8	1,361.5	1,254.4	12.716	
15,400.0	9,190.0	16,845.7	10,507.5	118.7	112.8	-164.51	-6,450.6	315.4	1,362.1	1,253.1	12.491	
15,500.0	9,190.0	16,946.8	10,506.0	120.5	114.6	-164.22	-6,551.5	321.4	1,362.4	1,251.1	12.243	
15,600.0	9,190.0	17,041.3	10,504.9	122.3	116.2	-163.96	-6,645.8	327.0	1,363.2	1,249.8	12.016	
15,700.0	9,190.0	17,133.9	10,504.3	124.1	117.8	-163.70	-6,738.2	332.4	1,364.4	1,248.8	11.803	
15,800.0	9,190.0	17,238.5	10,504.0	125.9	119.6	-163.43	-6,842.6	338.4	1,365.9	1,248.1	11.586	
15,900.0	9,190.0	17,352.4	10,502.8	127.7	121.6	-163.14	-6,956.4	344.1	1,366.6	1,246.3	11.358	
16,000.0	9,190.0	17,462.9	10,500.7	129.5	123.5	-162.87	-7,066.7	349.6	1,366.5	1,243.7	11.134	
16,100.0	9,190.0	17,594.4	10,495.4	131.3	125.8	-162.51	-7,197.9	355.8	1,364.1	1,238.6	10.869	
16,200.0	9,190.0	17,679.5	10,491.6	133.1	127.3	-162.26	-7,282.9	360.2	1,361.6	1,233.9	10.664	
16,300.0	9,190.0	17,762.4	10,488.9	134.9	128.7	-161.99	-7,365.5	365.5	1,360.7	1,230.8	10.474	
16,400.0	9,190.0	17,863.3	10,485.7	136.7	130.5	-161.66	-7,466.2	371.9	1,359.9	1,227.5	10.269	
16,431.0	9,190.0	17,888.4	10,485.1	137.3	130.9	-161.58	-7,491.2	373.5	1,359.8	1,226.7	10.215	
16,500.0	9,190.0	17,954.5	10,483.7	138.5	132.0	-161.38	-7,557.2	377.7	1,360.0	1,225.2	10.088	
16,600.0	9,190.0	18,068.8	10,479.6	140.3	134.0	-160.95	-7,671.1	386.1	1,359.2	1,221.4	9.867	
16,685.2	9,190.0	18,142.3	10,476.9	141.8	135.3	-160.65	-7,744.3	392.3	1,358.8	1,218.8	9.710	
16,700.0	9,190.0	18,154.4	10,476.5	142.1	135.5	-160.59	-7,756.3	393.4	1,358.8	1,218.5	9.684	
16,800.0	9,190.0	18,241.1	10,474.1	143.9	137.0	-160.21	-7,842.6	401.6	1,359.7	1,216.7	9.509	
16,900.0	9,190.0	18,333.8	10,471.7	145.7	138.7	-159.77	-7,934.8	411.0	1,360.9	1,215.1	9.330	
17,000.0	9,190.0	18,404.0	10,470.8	147.5	139.9	-159.45	-8,004.6	418.2	1,363.7	1,215.4	9.197	
17,100.0	9,190.0	18,488.3	10,471.3	149.3	141.4	-159.10	-8,088.5	426.8	1,368.1	1,217.2	9.065	
17,200.0	9,190.0	18,575.9	10,473.1	151.1	142.9	-158.78	-8,175.6	435.1	1,373.8	1,220.2	8.947	
17,300.0	9,190.0	18,672.3	10,476.3	152.9	144.6	-158.50	-8,271.7	442.8	1,380.1	1,223.9	8.837	
17,400.0	9,190.0	18,802.4	10,479.9	154.7	146.8	-158.18	-8,401.5	451.6	1,385.4	1,226.2	8.700	
17,500.0	9,190.0	18,924.9	10,481.6	156.5	149.0	-157.93	-8,523.7	457.9	1,388.9	1,226.9	8.571	
17,600.0	9,190.0	19,058.4	10,480.3	158.3	151.3	-157.60	-8,657.1	464.9	1,390.3	1,225.1	8.414	
17,700.0	9,190.0	19,184.2	10,475.8	160.1	153.5	-157.25	-8,782.6	471.2	1,389.1	1,220.7	8.247	
17,800.0	9,190.0	19,276.4	10,472.7	161.9	155.1	-157.02	-8,874.6	475.4	1,388.0	1,217.1	8.118	
17,900.0	9,190.0	19,413.2	10,465.7	163.8	157.4	-156.61	-9,011.2	482.2	1,385.5	1,211.0	7.938	
18,000.0	9,190.0	19,497.7	10,460.5	165.6	158.9	-156.36	-9,095.4	485.9	1,382.0	1,204.9	7.802	
18,100.0	9,190.0	19,573.4	10,457.2	167.4	160.2	-156.13	-9,170.9	489.8	1,380.4	1,200.8	7.688	
18,200.0	9,190.0	19,679.7	10,454.1	169.2	162.1	-155.85	-9,277.0	495.0	1,380.1	1,197.6	7.563	
18,300.0	9,190.0	19,777.7	10,450.1	171.0	163.7	-155.62	-9,374.9	498.8	1,378.3	1,193.1	7.442	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design												Offset Site Error:	0.0 usft
Sec 30 T24-S R32-E - Windward Federal #2H - Wellbore #1 - Wellbore #1												Offset Well Error:	0.0 usft
Survey Program: 100-Good_gyro, 9743-MWD default													
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
18,400.0	9,190.0	19,883.3	10,447.1	172.8	165.6	-155.37	-9,480.3	502.9	1,377.6	1,189.5	7.326		
18,500.0	9,190.0	19,976.5	10,443.5	174.6	167.2	-155.16	-9,573.4	506.4	1,376.0	1,185.3	7.216		
18,567.1	9,190.0	20,030.3	10,442.2	175.8	168.1	-155.05	-9,627.2	508.2	1,375.7	1,183.4	7.155		
18,600.0	9,190.0	20,056.1	10,441.7	176.4	168.6	-155.00	-9,652.9	509.2	1,375.8	1,182.7	7.127		
18,700.0	9,190.0	20,143.7	10,440.8	178.2	170.1	-154.82	-9,740.4	512.9	1,376.9	1,181.4	7.042		
18,800.0	9,190.0	20,233.1	10,440.4	180.0	171.6	-154.64	-9,829.8	516.6	1,378.6	1,180.5	6.961		
18,900.0	9,190.0	20,319.1	10,441.4	181.8	173.1	-154.53	-9,915.7	519.5	1,381.4	1,181.1	6.896		
19,000.0	9,190.0	20,401.0	10,442.9	183.6	174.5	-154.44	-9,997.6	521.9	1,384.8	1,182.3	6.840		
19,100.0	9,190.0	20,401.0	10,442.9	185.5	174.5	-154.44	-9,997.6	521.9	1,392.9	1,189.4	6.846		
19,200.0	9,190.0	20,401.0	10,442.9	187.3	174.5	-154.44	-9,997.6	521.9	1,408.1	1,203.6	6.886		
19,246.5	9,190.0	20,401.0	10,442.9	188.1	174.5	-154.44	-9,997.6	521.9	1,417.5	1,212.5	6.916		



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - Windward Federal #8H - Wellbore #1 - Design #1												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default												Offset Well Error:	0.0 usft
Measured Depth (usft)	Reference Vertical Depth (usft)	Offset Measured Depth (usft)	Offset Vertical Depth (usft)	Semi Major Axis Reference (usft)	Semi Major Axis Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning	
0.0	0.0	7.0	7.0	0.0	0.0	89.54	0.4	50.0	50.0				
100.0	100.0	107.0	107.0	0.1	0.1	89.54	0.4	50.0	50.0	49.8	294.649		
200.0	200.0	207.0	207.0	0.3	0.3	89.54	0.4	50.0	50.0	49.4	80.748		
300.0	300.0	307.0	307.0	0.5	0.5	89.54	0.4	50.0	50.0	48.9	46.785		
400.0	400.0	407.0	407.0	0.8	0.8	89.54	0.4	50.0	50.0	48.5	32.933		
500.0	500.0	507.0	507.0	1.0	1.0	89.54	0.4	50.0	50.0	48.0	25.410		
600.0	600.0	607.0	607.0	1.2	1.2	89.54	0.4	50.0	50.0	47.6	20.684		
700.0	700.0	707.0	707.0	1.4	1.4	89.54	0.4	50.0	50.0	47.1	17.441		
800.0	800.0	807.0	807.0	1.7	1.7	89.54	0.4	50.0	50.0	46.7	15.077		
900.0	900.0	907.0	907.0	1.9	1.9	89.54	0.4	50.0	50.0	46.2	13.277		
964.2	964.2	971.2	971.2	2.0	2.0	89.54	0.4	50.0	50.0	45.9	12.333 CC		
1,000.0	1,000.0	1,006.9	1,006.9	2.1	2.1	89.54	0.4	50.0	50.0	45.8	11.867 ES		
1,100.0	1,100.0	1,105.1	1,105.1	2.3	2.3	89.29	0.6	51.9	52.0	47.3	11.179		
1,200.0	1,200.0	1,203.3	1,203.1	2.6	2.5	88.69	1.3	57.1	57.3	52.2	11.295		
1,300.0	1,300.0	1,303.1	1,302.7	2.8	2.7	88.06	2.2	63.8	64.0	58.5	11.633		
1,400.0	1,400.0	1,402.9	1,402.2	3.0	3.0	87.55	3.0	70.5	70.8	64.8	11.916		
1,500.0	1,500.0	1,502.6	1,501.8	3.2	3.2	87.13	3.9	77.2	77.5	71.1	12.156		
1,600.0	1,600.0	1,602.4	1,601.3	3.5	3.4	86.78	4.7	83.9	84.2	77.4	12.362		
1,700.0	1,700.0	1,702.2	1,700.9	3.7	3.7	86.48	5.6	90.6	91.0	83.7	12.540		
1,800.0	1,800.0	1,801.9	1,800.4	3.9	3.9	86.22	6.4	97.3	97.7	90.0	12.696		
1,900.0	1,900.0	1,901.7	1,899.9	4.1	4.1	86.00	7.3	104.0	104.5	96.3	12.833		
2,000.0	2,000.0	2,001.5	1,999.5	4.4	4.4	85.80	8.1	110.7	111.2	102.7	12.955		
2,100.0	2,100.0	2,101.3	2,099.0	4.6	4.6	85.63	9.0	117.4	118.0	109.0	13.063		
2,200.0	2,200.0	2,201.0	2,198.6	4.8	4.9	85.47	9.8	124.1	124.7	115.3	13.160		
2,300.0	2,300.0	2,300.8	2,298.1	5.0	5.1	85.33	10.7	130.8	131.5	121.6	13.248		
2,400.0	2,400.0	2,400.6	2,397.7	5.3	5.3	85.20	11.5	137.5	138.3	127.9	13.328		
2,500.0	2,500.0	2,500.3	2,497.2	5.5	5.6	85.09	12.4	144.2	145.0	134.2	13.399		
2,600.0	2,600.0	2,600.1	2,596.7	5.7	5.8	84.99	13.2	150.9	151.8	140.5	13.463		
2,700.0	2,700.0	2,699.9	2,696.3	5.9	6.1	84.89	14.1	157.5	158.5	146.8	13.522		
2,800.0	2,800.0	2,799.7	2,795.8	6.2	6.3	84.80	14.9	164.2	165.3	153.1	13.577		
2,900.0	2,900.0	2,899.4	2,895.4	6.4	6.6	84.72	15.8	170.9	172.1	159.4	13.626		
3,000.0	3,000.0	2,999.2	2,994.9	6.6	6.8	84.65	16.6	177.6	178.8	165.7	13.672		
3,100.0	3,100.0	3,099.0	3,094.5	6.8	7.1	84.58	17.5	184.3	185.6	172.0	13.714		
3,200.0	3,200.0	3,198.7	3,194.0	7.1	7.3	84.51	18.3	191.0	192.3	178.3	13.754		
3,300.0	3,300.0	3,298.5	3,293.5	7.3	7.6	84.45	19.2	197.7	199.1	184.7	13.790		
3,400.0	3,400.0	3,298.3	3,293.1	7.5	7.8	84.40	20.1	204.4	205.9	191.0	13.824		
3,500.0	3,500.0	3,498.0	3,492.6	7.7	8.1	84.34	20.9	211.1	212.6	197.3	13.856		
3,600.0	3,600.0	3,497.8	3,492.2	7.9	8.3	84.29	21.8	217.8	219.4	203.6	13.885		
3,700.0	3,700.0	3,497.6	3,491.7	8.2	8.6	84.25	22.6	224.5	226.1	209.9	13.913		
3,800.0	3,800.0	3,497.4	3,491.3	8.4	8.8	84.21	23.5	231.2	232.9	216.2	13.939		
3,900.0	3,900.0	3,497.1	3,489.8	8.6	9.1	84.16	24.3	237.9	239.7	222.5	13.963		
4,000.0	4,000.0	3,496.9	3,490.3	8.8	9.3	84.12	25.2	244.6	246.4	228.8	13.986		
4,100.0	4,100.0	4,096.7	4,089.9	9.1	9.6	84.09	26.0	251.3	253.2	235.1	14.007		
4,200.0	4,200.0	4,196.4	4,189.4	9.3	9.8	84.05	26.9	257.9	259.9	241.4	14.027		
4,300.0	4,300.0	4,296.2	4,289.0	9.5	10.1	84.02	27.7	264.6	266.7	247.7	14.046		
4,400.0	4,400.0	4,296.0	4,288.5	9.7	10.3	83.99	28.6	271.3	273.5	254.0	14.064		
4,500.0	4,500.0	4,495.8	4,488.1	10.0	10.6	83.96	29.4	278.0	280.2	260.3	14.081		
4,600.0	4,600.0	4,495.5	4,487.6	10.2	10.8	83.93	30.3	284.7	287.0	266.6	14.097		
4,700.0	4,700.0	4,495.3	4,487.1	10.4	11.1	83.90	31.1	291.4	293.7	272.9	14.112		
4,800.0	4,800.0	4,495.1	4,486.7	10.6	11.4	83.88	32.0	298.1	300.5	279.2	14.126		
4,900.0	4,900.0	4,494.8	4,486.2	10.9	11.6	83.85	32.8	304.8	307.3	285.5	14.140		
5,000.0	5,000.0	4,494.6	4,485.8	11.1	11.9	83.83	33.7	311.5	314.0	291.8	14.153		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - Windward Federal #8H - Wellbore #1 - Design #1												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
5,100.0	5,100.0	5,094.4	5,085.3	11.3	12.1	83.81	34.5	318.2	320.8	298.1	14.165		
5,200.0	5,200.0	5,194.2	5,184.9	11.5	12.4	83.78	35.4	324.9	327.6	304.5	14.177		
5,300.0	5,300.0	5,293.9	5,284.4	11.8	12.6	83.76	36.2	331.6	334.3	310.8	14.187		
5,400.0	5,400.0	5,393.7	5,383.9	12.0	12.9	83.74	37.1	338.3	341.1	317.1	14.198		
5,500.0	5,500.0	5,493.5	5,483.5	12.2	13.1	83.72	37.9	345.0	347.8	323.4	14.208		
5,600.0	5,600.0	5,593.2	5,583.0	12.4	13.4	83.70	38.8	351.7	354.6	329.7	14.217		
5,700.0	5,700.0	5,693.0	5,682.6	12.7	13.6	83.69	39.7	358.4	361.4	336.0	14.226		
5,800.0	5,800.0	5,792.8	5,782.1	12.9	13.9	83.67	40.5	365.0	368.1	342.3	14.235		
5,900.0	5,900.0	5,892.6	5,881.6	13.1	14.1	83.65	41.4	371.7	374.9	348.6	14.243		
6,000.0	6,000.0	5,992.3	5,981.2	13.3	14.4	83.64	42.2	378.4	381.7	354.9	14.251		
6,100.0	6,100.0	6,092.1	6,080.7	13.6	14.6	83.62	43.1	385.1	388.4	361.2	14.258		
6,200.0	6,200.0	6,191.9	6,180.3	13.8	14.9	83.61	43.9	391.8	395.2	367.5	14.265		
6,300.0	6,300.0	6,291.6	6,279.8	14.0	15.1	83.59	44.8	398.5	401.9	373.8	14.272		
6,400.0	6,400.0	6,391.4	6,379.4	14.2	15.4	83.58	45.6	405.2	408.7	380.1	14.278		
6,500.0	6,500.0	6,491.2	6,478.9	14.5	15.7	83.56	46.5	411.9	415.5	386.4	14.284		
6,600.0	6,600.0	6,591.0	6,578.4	14.7	15.9	83.55	47.3	418.6	422.2	392.7	14.290		
6,700.0	6,700.0	6,690.7	6,678.0	14.9	16.2	83.54	48.2	425.3	429.0	399.0	14.295		
6,800.0	6,800.0	6,790.5	6,777.5	15.1	16.4	83.53	49.0	432.0	435.8	405.3	14.301		
6,900.0	6,900.0	6,890.3	6,877.1	15.4	16.7	83.51	49.9	438.7	442.5	411.6	14.306		
7,000.0	7,000.0	6,990.0	6,976.6	15.6	16.9	83.50	50.7	445.4	449.3	417.9	14.310		
7,100.0	7,100.0	7,089.8	7,076.2	15.8	17.2	83.49	51.6	452.1	456.0	424.2	14.315		
7,200.0	7,200.0	7,189.6	7,175.7	16.0	17.4	83.48	52.4	458.8	462.8	430.5	14.319		
7,300.0	7,300.0	7,289.3	7,275.2	16.3	17.7	83.47	53.3	465.5	466.6	436.8	14.323		
7,400.0	7,400.0	7,389.1	7,374.8	16.5	17.9	83.46	54.1	472.1	476.3	443.1	14.327		
7,500.0	7,500.0	7,488.9	7,474.3	16.7	18.2	83.45	55.0	478.8	483.1	449.4	14.331		
7,600.0	7,600.0	7,588.7	7,573.9	16.9	18.4	83.44	55.8	485.5	489.9	455.7	14.335		
7,700.0	7,700.0	7,688.4	7,673.4	17.2	18.7	83.43	56.7	492.2	496.6	462.0	14.338		
7,800.0	7,800.0	7,788.2	7,773.0	17.4	19.0	83.42	57.5	498.9	503.4	468.3	14.341		
7,900.0	7,900.0	7,888.0	7,872.5	17.6	19.2	83.41	58.4	505.6	510.1	474.6	14.344		
8,000.0	8,000.0	7,987.7	7,972.0	17.8	19.5	83.40	59.2	512.3	516.9	480.9	14.347		
8,100.0	8,100.0	8,087.5	8,071.6	18.1	19.7	83.39	60.1	519.0	523.7	487.2	14.350		
8,200.0	8,200.0	8,187.3	8,171.1	18.3	20.0	83.39	61.0	525.7	530.4	493.5	14.352		
8,300.0	8,300.0	8,287.1	8,270.7	18.5	20.2	83.38	61.8	532.4	537.2	499.8	14.355		
8,400.0	8,400.0	8,386.8	8,370.2	18.7	20.5	83.37	62.7	539.1	544.0	506.1	14.357		
8,500.0	8,500.0	8,496.5	8,479.7	19.0	20.7	83.36	63.5	546.0	550.3	512.0	14.346		
8,600.0	8,600.0	8,620.3	8,603.4	19.2	21.0	83.36	64.0	549.4	553.2	514.3	14.253		
8,617.0	8,617.0	8,641.1	8,624.2	19.2	21.0	83.36	64.0	549.5	553.2	514.3	14.227		
8,650.0	8,650.0	8,678.0	8,661.1	19.3	21.0	-97.04	62.6	549.5	553.2	514.6	14.331		
8,700.0	8,699.7	8,733.9	8,716.5	19.4	21.1	-96.95	56.1	549.5	553.2	514.4	14.269		
8,750.0	8,748.8	8,789.6	8,771.0	19.5	21.2	-96.80	44.3	549.6	553.2	514.2	14.210		
8,781.4	8,779.1	8,824.4	8,804.3	19.5	21.3	-96.68	34.2	549.7	553.2	514.1	14.172		
8,800.0	8,796.9	8,845.1	8,823.8	19.5	21.3	-96.60	27.3	549.7	553.2	514.1	14.152		
8,850.0	8,843.6	8,900.4	8,874.5	19.6	21.4	-96.34	5.3	549.9	553.2	513.9	14.093		
8,900.0	8,888.6	8,955.4	8,922.7	19.7	21.5	-96.02	-21.3	550.0	553.2	513.8	14.031		
8,950.0	8,931.6	9,010.1	8,967.8	19.8	21.6	-95.66	-52.1	550.2	553.3	513.7	13.963		
9,000.0	8,972.1	9,064.4	9,009.5	19.9	21.7	-95.25	-86.9	550.4	553.4	513.5	13.886		
9,050.0	9,009.9	9,118.3	9,047.4	20.0	21.8	-94.80	-125.1	550.7	553.5	513.4	13.798		
9,100.0	9,044.8	9,171.7	9,081.3	20.2	21.9	-94.31	-166.4	550.9	553.7	513.3	13.696		
9,150.0	9,076.4	9,224.7	9,111.0	20.3	22.1	-93.80	-210.3	551.2	554.0	513.2	13.579		
9,200.0	9,104.5	9,277.3	9,136.2	20.5	22.3	-93.25	-256.3	551.5	554.3	513.0	13.447		
9,250.0	9,128.9	9,329.3	9,157.0	20.8	22.5	-92.68	-304.0	551.7	554.6	512.9	13.299		
9,300.0	9,149.4	9,380.8	9,173.3	21.0	22.8	-92.10	-352.9	552.0	555.1	512.8	13.136		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - Windward Federal #8H - Wellbore #1 - Design #1												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
9,350.0	9,165.8	9,431.9	9,185.0	21.3	23.0	-91.50	-402.6	552.3	555.6	512.7	12.960		
9,400.0	9,178.1	9,482.5	9,192.2	21.6	23.4	-90.89	-452.7	552.7	556.1	512.6	12.773		
9,450.0	9,186.0	9,532.6	9,194.9	22.0	23.7	-90.28	-502.7	553.0	556.8	512.5	12.578		
9,500.0	9,189.7	9,582.5	9,195.0	22.4	24.1	-89.84	-552.5	553.3	557.4	512.4	12.375		
9,517.0	9,190.0	9,599.5	9,195.0	22.5	24.2	-89.79	-569.5	553.4	557.7	512.4	12.306		
9,600.0	9,190.0	9,682.5	9,195.0	23.2	24.9	-89.79	-652.5	553.9	558.8	512.0	11.952		
9,700.0	9,190.0	9,782.5	9,195.0	24.1	25.9	-89.80	-752.5	554.5	560.2	511.5	11.509		
9,800.0	9,190.0	9,882.4	9,195.0	25.2	26.9	-89.80	-852.5	555.1	561.5	510.7	11.058		
9,900.0	9,190.0	9,982.4	9,195.0	26.3	28.0	-89.80	-952.5	555.7	562.9	509.8	10.610		
10,000.0	9,190.0	10,082.4	9,195.0	27.5	29.2	-89.80	-1,052.5	556.3	564.2	508.8	10.172		
10,100.0	9,190.0	10,182.4	9,195.0	28.8	30.4	-89.80	-1,152.5	556.9	565.6	507.6	9.749		
10,200.0	9,190.0	10,282.4	9,195.0	30.1	31.7	-89.80	-1,252.5	557.5	567.0	506.3	9.344		
10,300.0	9,190.0	10,382.4	9,195.0	31.5	33.1	-89.80	-1,352.4	558.1	568.3	504.9	8.959		
10,400.0	9,190.0	10,482.4	9,195.0	32.9	34.4	-89.80	-1,452.4	558.8	569.7	503.4	8.595		
10,500.0	9,190.0	10,582.4	9,195.0	34.4	35.9	-89.80	-1,552.4	559.4	571.0	501.8	8.253		
10,600.0	9,190.0	10,682.4	9,195.0	35.8	37.3	-89.80	-1,652.4	560.0	572.4	500.2	7.930		
10,700.0	9,190.0	10,782.4	9,195.0	37.4	38.8	-89.80	-1,752.4	560.6	573.8	498.5	7.628		
10,800.0	9,190.0	10,882.3	9,195.0	38.9	40.3	-89.80	-1,852.4	561.2	575.1	496.8	7.344		
10,900.0	9,190.0	10,982.3	9,195.0	40.5	41.9	-89.80	-1,952.4	561.8	576.5	495.0	7.077		
11,000.0	9,190.0	11,082.3	9,195.0	42.1	43.5	-89.80	-2,052.4	562.4	577.8	493.2	6.828		
11,100.0	9,190.0	11,182.3	9,195.0	43.7	45.0	-89.80	-2,152.4	563.0	579.2	491.4	6.593		
11,200.0	9,190.0	11,282.3	9,195.0	45.3	46.6	-89.80	-2,252.3	563.6	580.6	489.5	6.373		
11,300.0	9,190.0	11,382.3	9,195.0	46.9	48.3	-89.80	-2,352.3	564.3	581.9	487.5	6.166		
11,400.0	9,190.0	11,482.3	9,195.0	48.6	49.9	-89.80	-2,452.3	564.9	583.3	485.6	5.972		
11,500.0	9,190.0	11,582.3	9,195.0	50.2	51.5	-89.80	-2,552.3	565.5	584.6	483.6	5.788		
11,600.0	9,190.0	11,682.3	9,195.0	51.9	53.2	-89.80	-2,652.3	566.1	586.0	481.7	5.616		
11,700.0	9,190.0	11,782.3	9,195.0	53.6	54.9	-89.80	-2,752.3	566.7	587.4	479.6	5.453		
11,800.0	9,190.0	11,882.3	9,195.0	55.3	56.5	-89.81	-2,852.3	567.3	588.7	477.6	5.299		
11,900.0	9,190.0	11,982.2	9,195.0	57.0	58.2	-89.81	-2,952.3	567.9	590.1	475.6	5.154		
12,000.0	9,190.0	12,082.2	9,195.0	58.7	59.9	-89.81	-3,052.3	568.5	591.4	473.5	5.016		
12,100.0	9,190.0	12,182.2	9,195.0	60.4	61.6	-89.81	-3,152.2	569.1	592.8	471.5	4.885		
12,200.0	9,190.0	12,282.2	9,195.0	62.1	63.3	-89.81	-3,252.2	569.8	594.2	469.4	4.762		
12,300.0	9,190.0	12,382.2	9,195.0	63.8	65.0	-89.81	-3,352.2	570.4	595.5	467.3	4.644		
12,400.0	9,190.0	12,482.2	9,195.0	65.6	66.7	-89.81	-3,452.2	571.0	596.9	465.2	4.532		
12,500.0	9,190.0	12,582.2	9,195.0	67.3	68.5	-89.81	-3,552.2	571.6	598.2	463.1	4.426		
12,600.0	9,190.0	12,682.2	9,195.0	69.0	70.2	-89.81	-3,652.2	572.2	599.6	461.0	4.325		
12,700.0	9,190.0	12,782.2	9,195.0	70.8	71.9	-89.81	-3,752.2	572.8	601.0	458.8	4.228		
12,800.0	9,190.0	12,882.2	9,195.0	72.5	73.7	-89.81	-3,852.2	573.4	602.3	456.7	4.136		
12,900.0	9,190.0	12,982.2	9,195.0	74.3	75.4	-89.81	-3,952.2	574.0	603.7	454.6	4.048		
13,000.0	9,190.0	13,082.1	9,195.0	76.0	77.2	-89.81	-4,052.1	574.6	605.0	452.4	3.964		
13,100.0	9,190.0	13,182.1	9,195.0	77.8	78.9	-89.81	-4,152.1	575.3	606.4	450.2	3.883		
13,200.0	9,190.0	13,282.1	9,195.0	79.5	80.7	-89.81	-4,252.1	575.9	607.8	448.1	3.806		
13,300.0	9,190.0	13,382.1	9,195.0	81.3	82.4	-89.81	-4,352.1	576.5	609.1	445.9	3.732		
13,400.0	9,190.0	13,482.1	9,195.0	83.1	84.2	-89.81	-4,452.1	577.1	610.5	443.7	3.661		
13,500.0	9,190.0	13,582.1	9,195.0	84.8	85.9	-89.81	-4,552.1	577.7	611.8	441.6	3.593		
13,600.0	9,190.0	13,682.1	9,195.0	86.6	87.7	-89.81	-4,652.1	578.3	613.2	439.4	3.528		
13,700.0	9,190.0	13,782.1	9,195.0	88.4	89.5	-89.81	-4,752.1	578.9	614.6	437.2	3.465		
13,800.0	9,190.0	13,882.1	9,195.0	90.2	91.2	-89.81	-4,852.1	579.5	615.9	435.0	3.405		
13,900.0	9,190.0	13,982.1	9,195.0	91.9	93.0	-89.81	-4,952.0	580.1	617.3	432.8	3.346		
14,000.0	9,190.0	14,082.1	9,195.0	93.7	94.8	-89.81	-5,052.0	580.7	618.6	430.6	3.290		
14,100.0	9,190.0	14,182.0	9,195.0	95.5	96.6	-89.82	-5,152.0	581.4	620.0	428.4	3.236		
14,200.0	9,190.0	14,282.0	9,195.0	97.3	98.3	-89.82	-5,252.0	582.0	621.4	426.2	3.184		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



QES Directional Drilling, LLC
Anticollision Report



Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Offset Design Sec 30 T24-S R32-E - Windward Federal #8H - Wellbore #1 - Design #1												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default												Offset Well Error:	0.0 usft
Measured Depth (usft)	Reference Vertical Depth (usft)	Offset Measured Depth (usft)	Offset Vertical Depth (usft)	Semi Major Axis Reference (usft)	Semi Major Axis Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning	
14,300.0	9,190.0	14,382.0	9,195.0	99.0	100.1	-89.82	-5,352.0	582.6	622.7	424.0	3.134		
14,400.0	9,190.0	14,482.0	9,195.0	100.8	101.9	-89.82	-5,452.0	583.2	624.1	421.8	3.085		
14,500.0	9,190.0	14,582.0	9,195.0	102.6	103.7	-89.82	-5,552.0	583.8	625.4	419.6	3.038		
14,600.0	9,190.0	14,682.0	9,195.0	104.4	105.5	-89.82	-5,652.0	584.4	626.8	417.4	2.993		
14,700.0	9,190.0	14,782.0	9,195.0	106.2	107.2	-89.82	-5,752.0	585.0	628.2	415.2	2.949		
14,800.0	9,190.0	14,882.0	9,195.0	108.0	109.0	-89.82	-5,851.9	585.6	629.5	413.0	2.907		
14,900.0	9,190.0	14,982.0	9,195.0	109.8	110.8	-89.82	-5,951.9	586.2	630.9	410.7	2.866		
15,000.0	9,190.0	15,082.0	9,195.0	111.6	112.6	-89.82	-6,051.9	586.9	632.2	408.5	2.826		
15,100.0	9,190.0	15,182.0	9,195.0	113.3	114.4	-89.82	-6,151.9	587.5	633.6	406.3	2.787		
15,200.0	9,190.0	15,281.9	9,195.0	115.1	116.2	-89.82	-6,251.9	588.1	635.0	404.1	2.750		
15,300.0	9,190.0	15,381.9	9,195.0	116.9	118.0	-89.82	-6,351.9	588.7	636.3	401.8	2.714		
15,400.0	9,190.0	15,481.9	9,195.0	118.7	119.8	-89.82	-6,451.9	589.3	637.7	399.6	2.678		
15,500.0	9,190.0	15,581.9	9,195.0	120.5	121.6	-89.82	-6,551.9	589.9	639.1	397.4	2.644		
15,600.0	9,190.0	15,681.9	9,195.0	122.3	123.3	-89.82	-6,651.9	590.5	640.4	395.1	2.611		
15,700.0	9,190.0	15,781.9	9,195.0	124.1	125.1	-89.82	-6,751.8	591.1	641.8	392.9	2.578		
15,800.0	9,190.0	15,881.9	9,195.0	125.9	126.9	-89.82	-6,851.8	591.7	643.1	390.6	2.547		
15,900.0	9,190.0	15,981.9	9,195.0	127.7	128.7	-89.82	-6,951.8	592.4	644.5	388.4	2.517		
16,000.0	9,190.0	16,081.9	9,195.0	129.5	130.5	-89.82	-7,051.8	593.0	645.9	386.1	2.487		
16,100.0	9,190.0	16,181.9	9,195.0	131.3	132.3	-89.82	-7,151.8	593.6	647.2	383.9	2.458		
16,200.0	9,190.0	16,281.8	9,195.0	133.1	134.1	-89.82	-7,251.8	594.2	648.6	381.7	2.430		
16,300.0	9,190.0	16,381.8	9,195.0	134.9	135.9	-89.82	-7,351.8	594.8	649.9	379.4	2.402		
16,400.0	9,190.0	16,481.8	9,195.0	136.7	137.7	-89.82	-7,451.8	595.4	651.3	377.2	2.376		
16,500.0	9,190.0	16,581.8	9,195.0	138.5	139.5	-89.82	-7,551.8	596.0	652.7	374.9	2.350		
16,600.0	9,190.0	16,681.8	9,195.0	140.3	141.3	-89.82	-7,651.7	596.6	654.0	372.7	2.324		
16,700.0	9,190.0	16,781.8	9,195.0	142.1	143.1	-89.83	-7,751.7	597.2	655.4	370.4	2.300		
16,800.0	9,190.0	16,881.8	9,195.0	143.9	144.9	-89.83	-7,851.7	597.9	656.7	368.1	2.276		
16,900.0	9,190.0	16,981.8	9,195.0	145.7	146.7	-89.83	-7,951.7	598.5	658.1	365.9	2.252		
17,000.0	9,190.0	17,081.8	9,195.0	147.5	148.5	-89.83	-8,051.7	599.1	659.5	363.6	2.229		
17,100.0	9,190.0	17,181.8	9,195.0	149.3	150.3	-89.83	-8,151.7	599.7	660.8	361.4	2.207		
17,200.0	9,190.0	17,281.8	9,195.0	151.1	152.1	-89.83	-8,251.7	600.3	662.2	359.1	2.185		
17,300.0	9,190.0	17,381.7	9,195.0	152.9	153.9	-89.83	-8,351.7	600.9	663.5	356.9	2.164		
17,400.0	9,190.0	17,481.7	9,195.0	154.7	155.8	-89.83	-8,451.7	601.5	664.9	354.6	2.143		
17,500.0	9,190.0	17,581.7	9,195.0	156.5	157.6	-89.83	-8,551.6	602.1	666.3	352.4	2.122		
17,600.0	9,190.0	17,681.7	9,195.0	158.3	159.4	-89.83	-8,651.6	602.7	667.6	350.1	2.103		
17,700.0	9,190.0	17,781.7	9,195.0	160.1	161.2	-89.83	-8,751.6	603.3	669.0	347.8	2.083		
17,800.0	9,190.0	17,881.7	9,195.0	161.9	163.0	-89.83	-8,851.6	604.0	670.3	345.6	2.064		
17,900.0	9,190.0	17,981.7	9,195.0	163.8	164.8	-89.83	-8,951.6	604.6	671.7	343.3	2.045		
18,000.0	9,190.0	18,081.7	9,195.0	165.6	166.6	-89.83	-9,051.6	605.2	673.1	341.0	2.027		
18,100.0	9,190.0	18,181.7	9,195.0	167.4	168.4	-89.83	-9,151.6	605.8	674.4	338.8	2.009		
18,200.0	9,190.0	18,281.7	9,195.0	169.2	170.2	-89.83	-9,251.6	606.4	675.8	336.5	1.992		
18,300.0	9,190.0	18,381.7	9,195.0	171.0	172.0	-89.83	-9,351.6	607.0	677.1	334.3	1.975		
18,400.0	9,190.0	18,481.6	9,195.0	172.8	173.8	-89.83	-9,451.5	607.6	678.5	332.0	1.958		
18,500.0	9,190.0	18,581.6	9,195.0	174.6	175.6	-89.83	-9,551.5	608.2	679.9	329.7	1.942		
18,600.0	9,190.0	18,681.6	9,195.0	176.4	177.4	-89.83	-9,651.5	608.8	681.2	327.5	1.926		
18,700.0	9,190.0	18,781.6	9,195.0	178.2	179.2	-89.83	-9,751.5	609.5	682.6	325.2	1.910		
18,800.0	9,190.0	18,881.6	9,195.0	180.0	181.1	-89.83	-9,851.5	610.1	683.9	322.9	1.895		
18,900.0	9,190.0	18,981.6	9,195.0	181.8	182.9	-89.83	-9,951.5	610.7	685.3	320.7	1.879		
19,000.0	9,190.0	19,081.6	9,195.0	183.6	184.7	-89.83	-10,051.5	611.3	686.7	318.4	1.865		
19,100.0	9,190.0	19,181.6	9,195.0	185.5	186.5	-89.83	-10,151.5	611.9	688.0	316.1	1.850		
19,200.0	9,190.0	19,281.6	9,195.0	187.3	188.3	-89.83	-10,251.5	612.5	689.4	313.9	1.836		
19,246.5	9,190.0	19,328.1	9,195.0	188.1	189.1	-89.83	-10,298.0	612.8	690.0	312.8	1.829 SF		



QES Directional Drilling, LLC
Anticollision Report



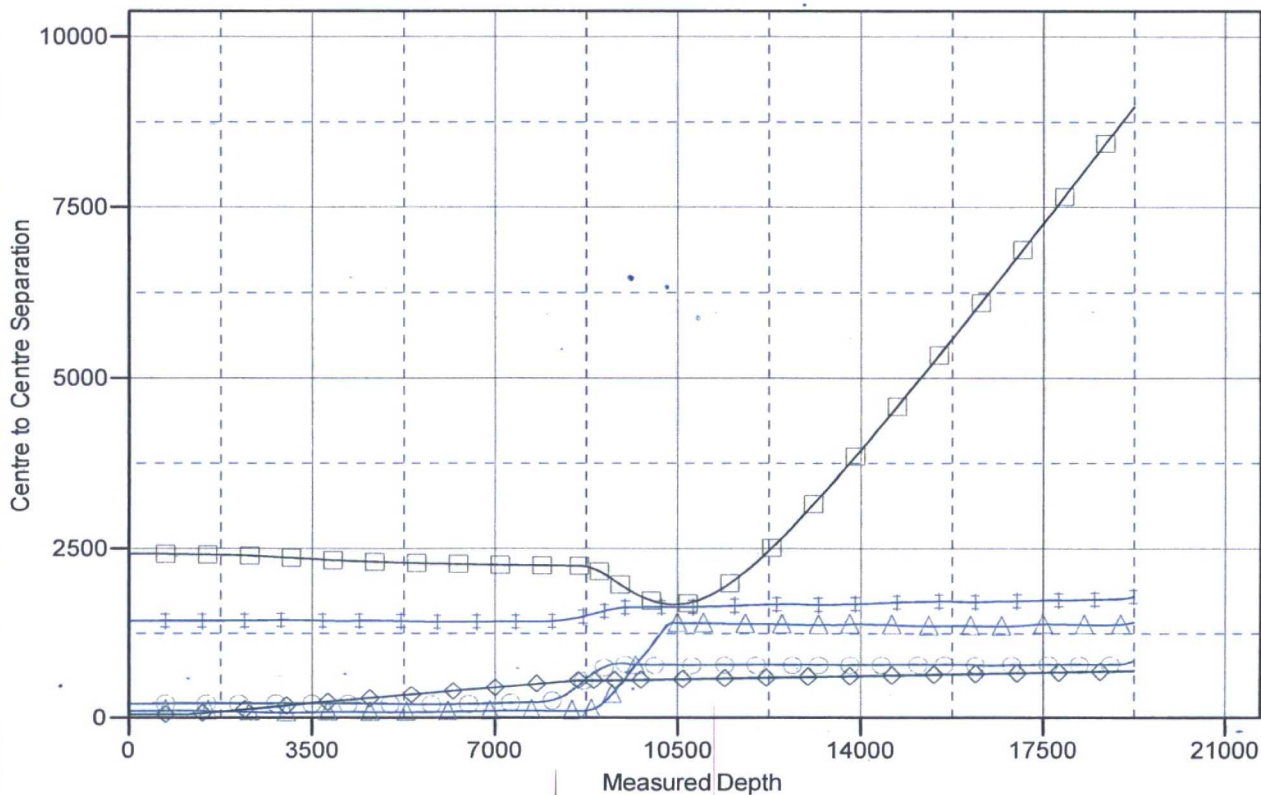
Company: COG Production LLC
Project: Lea County, New Mexico
Reference Site: Sec 30 T24-S R32-E
Site Error: 0.0 usft
Reference Well: Windward Federal #7H
Well Error: 0.0 usft
Reference Wellbore: Wellbore #1
Reference Design: Design #1

Local Co-ordinate Reference: Well Windward Federal #7H
TVD Reference: Well @ 3569.0usft (McVay 8)
MD Reference: Well @ 3569.0usft (McVay 8)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM5002
Offset TVD Reference: Offset Datum

Reference Depths are relative to Well @ 3569.0usft (McVay 8)
Offset Depths are relative to Offset Datum
Central Meridian is 104° 20' 0.000 W

Coordinates are relative to: Windward Federal #7H
Coordinate System is US State Plane 1927 (Exact solution), New Mexico East 3001
Grid Convergence at Surface is: 0.33°

Ladder Plot



LEGEND

ig Tut Federal #2H, Wellbore #1, Wellbore #1 V0 ▣ Paduca Federal 30 #1, Wellbore #1, Wellbore #1 V0 ◆ Windward Federal #8H, Wellbore #1, Design
ig Tut Federal #3H, Wellbore #1, Wellbore #1 V0 ▲ Windward Federal #2H, Wellbore #1, Wellbore #1 V0



QES Directional Drilling, LLC
Anticollision Report

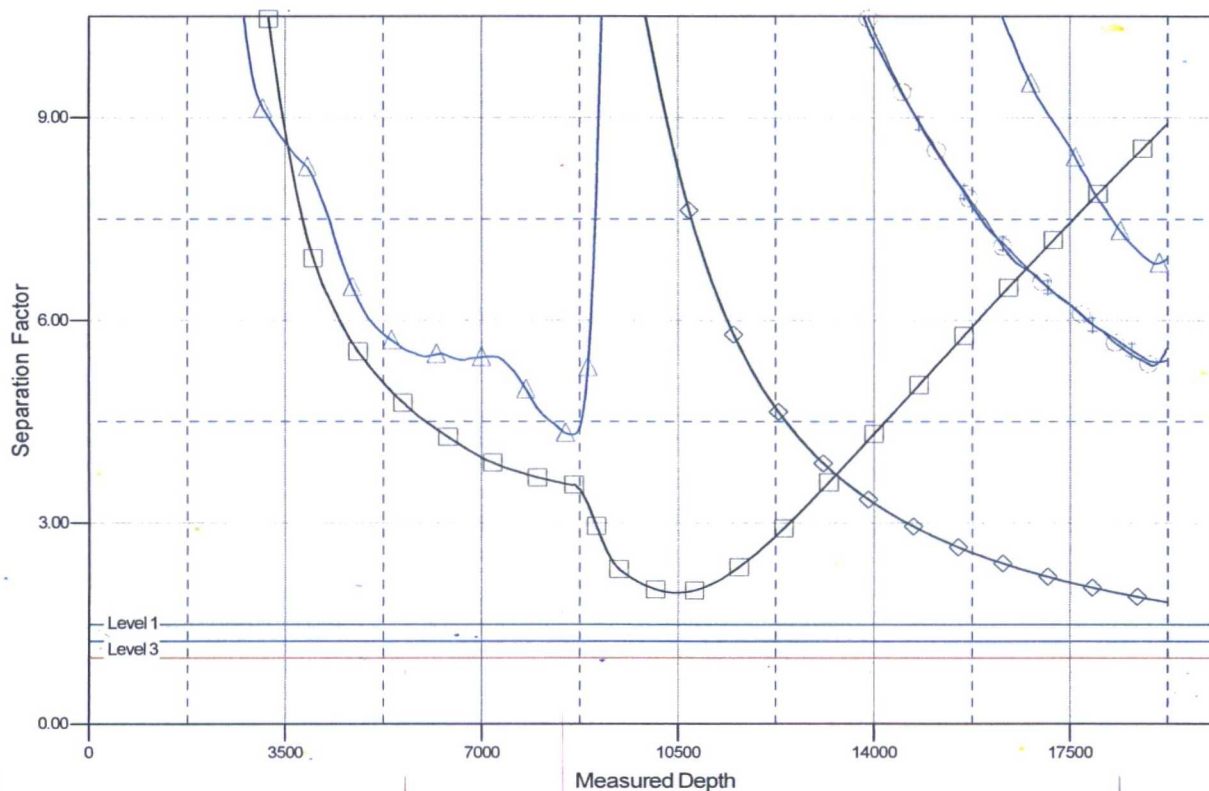


Company:	COG Production LLC	Local Co-ordinate Reference:	Well Windward Federal #7H
Project:	Lea County, New Mexico	TVD Reference:	Well @ 3569.0usft (McVay 8)
Reference Site:	Sec 30 T24-S R32-E	MD Reference:	Well @ 3569.0usft (McVay 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Windward Federal #7H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM5002
Reference Design:	Design #1	Offset TVD Reference:	Offset Datum

Reference Depths are relative to Well @ 3569.0usft (McVay 8)
Offset Depths are relative to Offset Datum
Central Meridian is 104° 20' 0.000 W

Coordinates are relative to: Windward Federal #7H
Coordinate System is US State Plane 1927 (Exact solution), New Mexico East 3001
Grid Convergence at Surface is: 0.33°

Separation Factor Plot



LEGEND

ig Tut Federal #2H, Wellbore #1, Wellbore #1 V0 Paduca Federal 30 #1, Wellbore #1, Wellbore #1 V0 Windward Federal #8H, Wellbore #1, Design
ig Tut Federal #3H, Wellbore #1, Wellbore #1 V0 Widward Federal #2H, Wellbore #1, Wellbore #1 V0