

COG PRODUCTION LLC

LEA COUNTY, NM

AVALON SHALE

AZORES FEDERAL COM #5H

OWB

PWP0

Anticollision Report

12 September, 2016

COG PRODUCTION LLC

Anticollision Report

Company:	COG PRODUCTION LLC	Local Co-ordinate Reference:	Well AZORES FEDERAL COM #5H
Project:	LEA COUNTY, NM	TVD Reference:	RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
Reference Site:	AVALON SHALE	MD Reference:	RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	AZORES FEDERAL COM #5H	Survey Calculation Method:	Minimum Curvature
Well Error:	3.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	OWB	Database:	EDM_Users
Reference Design:	PWP0	Offset TVD Reference:	Offset Datum

Reference	PWP0		
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:	Circular Conic
Warning Levels Evaluated at:	2.00 Sigma	Casing Method:	Not applied

Survey Tool Program		Date	9/12/2016		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
0.0	8,800.0	PWP0 (OWB)	Standard Keeper 104	Standard Wireline Keeper ver 1.0.4	
8,800.0	14,108.4	PWP0 (OWB)	MWD	OWSG MWD - Standard	

Summary						
Site Name	Reference Measured Depth (usft)	Offset Measured Depth (usft)	Distance		Separation Factor	Warning
Offset Well - Wellbore - Design			Between Centres (usft)	Between Ellipses (usft)		
AVALON SHALE						
AZORES FEDERAL COM #10H - OWB - PWP0	1,500.0	1,500.0	50.1	43.0	7.060	CC, ES
AZORES FEDERAL COM #10H - OWB - PWP0	14,108.4	14,164.5	659.9	491.3	3.914	SF
BOMBAY FED COM #1H - OWB - ACTUAL WELLPATH	8,407.5	10,735.5	78.5	15.7	1.250	Shut in Produces, CC, ES,

Offset Design													Offset Site Error: 0.0 usft	
Survey Program: 0-Standard Keeper 104, 8800-MWD													Offset Well Error: 3.0 usft	
Reference		Offset		Semi Major Axis			Distance							Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
0.0	0.0	0.0	0.0	3.0	3.0	-90.57	-0.5	-50.1	50.1					
100.0	100.0	100.0	100.0	3.0	3.0	-90.57	-0.5	-50.1	50.1	44.1	6.00	8.349		
200.0	200.0	200.0	200.0	3.0	3.0	-90.57	-0.5	-50.1	50.1	44.1	6.01	8.335		
300.0	300.0	300.0	300.0	3.0	3.0	-90.57	-0.5	-50.1	50.1	44.1	6.03	8.305		
400.0	400.0	400.0	400.0	3.0	3.0	-90.57	-0.5	-50.1	50.1	44.0	6.07	8.260		
500.0	500.0	500.0	500.0	3.1	3.1	-90.57	-0.5	-50.1	50.1	44.0	6.11	8.201		
600.0	600.0	600.0	600.0	3.1	3.1	-90.57	-0.5	-50.1	50.1	43.9	6.16	8.127		
700.0	700.0	700.0	700.0	3.1	3.1	-90.57	-0.5	-50.1	50.1	43.9	6.23	8.041		
800.0	800.0	800.0	800.0	3.2	3.2	-90.57	-0.5	-50.1	50.1	43.8	6.31	7.944		
900.0	900.0	900.0	900.0	3.2	3.2	-90.57	-0.5	-50.1	50.1	43.7	6.39	7.837		
1,000.0	1,000.0	1,000.0	1,000.0	3.2	3.2	-90.57	-0.5	-50.1	50.1	43.6	6.49	7.721		
1,100.0	1,100.0	1,100.0	1,100.0	3.3	3.3	-90.57	-0.5	-50.1	50.1	43.5	6.59	7.599		
1,200.0	1,200.0	1,200.0	1,200.0	3.4	3.4	-90.57	-0.5	-50.1	50.1	43.4	6.71	7.470		
1,300.0	1,300.0	1,300.0	1,300.0	3.4	3.4	-90.57	-0.5	-50.1	50.1	43.3	6.83	7.336		
1,400.0	1,400.0	1,400.0	1,400.0	3.5	3.5	-90.57	-0.5	-50.1	50.1	43.1	6.96	7.200		
1,500.0	1,500.0	1,500.0	1,500.0	3.5	3.5	-90.57	-0.5	-50.1	50.1	43.0	7.10	7.060 CC, ES		
1,600.0	1,600.0	1,598.2	1,598.2	3.6	3.6	-90.55	-0.5	-51.8	51.8	44.6	7.21	7.183		
1,700.0	1,700.0	1,696.3	1,696.1	3.7	3.6	-90.50	-0.5	-56.8	57.0	49.6	7.31	7.787		
1,800.0	1,800.0	1,794.8	1,794.3	3.8	3.6	-90.44	-0.5	-64.9	65.2	57.7	7.42	8.780		
1,900.0	1,900.0	1,894.4	1,893.6	3.9	3.7	-90.39	-0.5	-73.6	73.9	66.3	7.54	9.803		
2,000.0	2,000.0	1,994.0	1,992.8	3.9	3.7	-90.35	-0.5	-82.3	82.6	74.9	7.66	10.785		
2,100.0	2,100.0	2,093.7	2,092.0	4.0	3.8	-90.31	-0.5	-91.0	91.3	83.5	7.79	11.726		
2,200.0	2,200.0	2,193.3	2,191.3	4.1	3.8	-90.29	-0.5	-99.6	100.0	92.1	7.92	12.626		

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

COG PRODUCTION LLC

Anticollision Report

Company: COG PRODUCTION LLC
 Project: LEA COUNTY, NM
 Reference Site: AVALON SHALE
 Site Error: 0.0 usft
 Reference Well: AZORES FEDERAL COM #5H
 Well Error: 3.0 usft
 Reference Wellbore: OWB
 Reference Design: PWP0

Local Co-ordinate Reference: Well AZORES FEDERAL COM #5H
 TVD Reference: RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
 MD Reference: RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Output errors are at 2.00 sigma
 Database: EDM_Users
 Offset TVD Reference: Offset Datum

Offset Design AVALON SHALE - AZORES FEDERAL COM #10H - OWB - PWP0													Offset Site Error: 0.0 usft
Survey Program: 0-Standard Keeper 104, 8800-MWD													Offset Well Error: 3.0 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)					
2,300.0	2,300.0	2,292.9	2,290.5	4.2	3.9	-90.26	-0.5	-108.3	108.7	100.7	8.06	13.486	
2,400.0	2,400.0	2,392.5	2,389.8	4.3	3.9	-90.24	-0.5	-117.0	117.4	109.2	8.21	14.306	
2,500.0	2,500.0	2,492.1	2,489.0	4.4	4.0	-90.23	-0.5	-125.7	126.2	117.8	8.36	15.087	
2,600.0	2,600.0	2,591.8	2,588.2	4.5	4.0	-90.21	-0.5	-134.4	134.9	126.4	8.52	15.830	
2,700.0	2,700.0	2,691.4	2,687.5	4.6	4.1	-90.20	-0.5	-143.0	143.6	134.9	8.68	16.537	
2,800.0	2,800.0	2,791.0	2,786.7	4.7	4.2	-90.19	-0.5	-151.7	152.3	143.5	8.85	17.209	
2,900.0	2,900.0	2,890.6	2,886.0	4.8	4.2	-90.18	-0.5	-160.4	161.0	152.0	9.02	17.847	
3,000.0	3,000.0	2,990.2	2,985.2	4.9	4.3	-90.17	-0.5	-169.1	169.7	160.5	9.20	18.452	
3,100.0	3,100.0	3,089.9	3,084.4	5.0	4.4	-90.16	-0.5	-177.8	178.5	169.1	9.38	19.027	
3,200.0	3,200.0	3,189.5	3,183.7	5.1	4.5	-90.15	-0.5	-186.5	187.2	177.6	9.56	19.573	
3,300.0	3,300.0	3,289.1	3,282.9	5.2	4.5	-90.15	-0.5	-195.1	195.9	186.1	9.75	20.091	
3,400.0	3,400.0	3,388.7	3,382.2	5.3	4.6	-90.14	-0.5	-203.8	204.6	194.7	9.94	20.582	
3,500.0	3,500.0	3,488.3	3,481.4	5.4	4.7	-90.13	-0.5	-212.5	213.3	203.2	10.13	21.049	
3,600.0	3,600.0	3,588.0	3,580.6	5.5	4.8	-90.13	-0.5	-221.2	222.0	211.7	10.33	21.492	
3,700.0	3,700.0	3,687.6	3,679.9	5.7	4.9	-90.12	-0.5	-229.9	230.8	220.2	10.53	21.913	
3,800.0	3,800.0	3,787.2	3,779.1	5.8	5.0	-90.12	-0.5	-238.6	239.5	228.7	10.73	22.312	
3,900.0	3,900.0	3,886.8	3,878.4	5.9	5.1	-90.12	-0.5	-247.2	248.2	237.2	10.94	22.692	
4,000.0	4,000.0	3,986.4	3,977.6	6.0	5.1	-90.11	-0.5	-255.9	256.9	245.8	11.14	23.053	
4,100.0	4,100.0	4,086.1	4,076.9	6.1	5.2	-90.11	-0.5	-264.6	265.6	254.3	11.35	23.396	
4,200.0	4,200.0	4,185.7	4,176.1	6.2	5.3	-90.10	-0.5	-273.3	274.3	262.8	11.56	23.722	
4,300.0	4,300.0	4,285.3	4,275.3	6.3	5.4	-90.10	-0.5	-282.0	283.0	271.3	11.78	24.033	
4,400.0	4,400.0	4,384.9	4,374.6	6.5	5.5	-90.10	-0.5	-290.6	291.8	279.8	11.99	24.329	
4,500.0	4,500.0	4,484.5	4,473.8	6.6	5.6	-90.10	-0.5	-299.3	300.5	288.3	12.21	24.610	
4,600.0	4,600.0	4,584.2	4,573.1	6.7	5.7	-90.09	-0.5	-308.0	309.2	296.8	12.43	24.879	
4,700.0	4,700.0	4,683.8	4,672.3	6.8	5.8	-90.09	-0.5	-316.7	317.9	305.3	12.65	25.135	
4,800.0	4,800.0	4,783.7	4,775.8	6.9	5.9	-90.09	-0.5	-325.5	326.4	313.5	12.87	25.354	
4,900.0	4,900.0	4,900.5	4,888.5	7.0	6.1	-90.09	-0.5	-331.6	331.8	318.7	13.11	25.315	
5,000.0	5,000.0	5,012.1	5,000.0	7.2	6.2	-90.09	-0.5	-333.4	333.4	320.0	13.32	25.019	
5,100.0	5,100.0	5,112.1	5,100.0	7.3	6.2	-90.09	-0.5	-333.4	333.4	319.8	13.52	24.657	
5,200.0	5,200.0	5,212.1	5,200.0	7.4	6.3	-90.09	-0.5	-333.4	333.4	319.7	13.72	24.301	
5,300.0	5,300.0	5,312.1	5,300.0	7.5	6.4	-90.09	-0.5	-333.4	333.4	319.5	13.92	23.951	
5,400.0	5,400.0	5,412.1	5,400.0	7.6	6.5	-90.09	-0.5	-333.4	333.4	319.2	14.12	23.609	
5,500.0	5,500.0	5,512.1	5,500.0	7.8	6.6	-90.09	-0.5	-333.4	333.4	319.0	14.32	23.272	
5,600.0	5,600.0	5,612.1	5,600.0	7.9	6.6	-90.09	-0.5	-333.4	333.4	318.8	14.53	22.942	
5,700.0	5,700.0	5,712.1	5,700.0	8.0	6.7	-90.09	-0.5	-333.4	333.4	318.6	14.74	22.619	
5,800.0	5,800.0	5,812.1	5,800.0	8.1	6.8	-90.09	-0.5	-333.4	333.4	318.4	14.95	22.302	
5,900.0	5,900.0	5,912.1	5,900.0	8.3	6.9	-90.09	-0.5	-333.4	333.4	318.2	15.16	21.991	
6,000.0	6,000.0	6,012.1	6,000.0	8.4	7.0	-90.09	-0.5	-333.4	333.4	318.0	15.37	21.687	
6,100.0	6,100.0	6,112.1	6,100.0	8.5	7.1	-90.09	-0.5	-333.4	333.4	317.8	15.59	21.389	
6,200.0	6,200.0	6,212.1	6,200.0	8.6	7.2	-90.09	-0.5	-333.4	333.4	317.6	15.80	21.097	
6,300.0	6,300.0	6,312.1	6,300.0	8.8	7.3	-90.09	-0.5	-333.4	333.4	317.4	16.02	20.812	
6,400.0	6,400.0	6,412.1	6,400.0	8.9	7.4	-90.09	-0.5	-333.4	333.4	317.1	16.24	20.532	
6,500.0	6,500.0	6,512.1	6,500.0	9.0	7.5	-90.09	-0.5	-333.4	333.4	316.9	16.46	20.258	
6,600.0	6,600.0	6,612.1	6,600.0	9.1	7.6	-90.09	-0.5	-333.4	333.4	316.7	16.68	19.990	
6,700.0	6,700.0	6,712.1	6,700.0	9.3	7.6	-90.09	-0.5	-333.4	333.4	316.5	16.90	19.727	
6,800.0	6,800.0	6,812.1	6,800.0	9.4	7.7	-90.09	-0.5	-333.4	333.4	316.2	17.12	19.470	
6,900.0	6,900.0	6,912.1	6,900.0	9.5	7.8	-90.09	-0.5	-333.4	333.4	316.0	17.35	19.218	
7,000.0	7,000.0	7,012.1	7,000.0	9.6	7.9	-90.09	-0.5	-333.4	333.4	315.8	17.57	18.972	
7,100.0	7,100.0	7,112.1	7,100.0	9.8	8.0	-90.09	-0.5	-333.4	333.4	315.6	17.80	18.731	
7,200.0	7,200.0	7,212.1	7,200.0	9.9	8.1	-90.09	-0.5	-333.4	333.4	315.3	18.03	18.494	
7,300.0	7,300.0	7,312.1	7,300.0	10.0	8.3	-90.09	-0.5	-333.4	333.4	315.1	18.25	18.263	
7,400.0	7,400.0	7,412.1	7,400.0	10.1	8.4	-90.09	-0.5	-333.4	333.4	314.9	18.48	18.037	

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 Well Error: 3.0 usft
 Reference Wellbore: OWB
 Reference Design: PWP0

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Offset Design AVALON SHALE - AZORES FEDERAL COM #10H - OWB - PWP0													Offset Site Error:	0.0 usft
Survey Program: 0-Standard Keeper 104, 8800-MWD													Offset Well Error:	3.0 usft
Reference		Offset		Semi Major Axis			Distance						Warning	
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
7,500.0	7,500.0	7,512.1	7,500.0	10.3	8.5	-90.09	-0.5	-333.4	333.4	314.7	18.71	17.815		
7,600.0	7,600.0	7,612.1	7,600.0	10.4	8.6	-90.09	-0.5	-333.4	333.4	314.4	18.94	17.598		
7,700.0	7,700.0	7,712.1	7,700.0	10.5	8.7	-90.09	-0.5	-333.4	333.4	314.2	19.18	17.385		
7,800.0	7,800.0	7,812.1	7,800.0	10.6	8.8	-90.09	-0.5	-333.4	333.4	314.0	19.41	17.177		
7,900.0	7,900.0	7,912.1	7,900.0	10.8	8.9	-90.09	-0.5	-333.4	333.4	313.7	19.64	16.973		
8,000.0	8,000.0	8,012.1	8,000.0	10.9	9.0	-90.09	-0.5	-333.4	333.4	313.5	19.88	16.773		
8,100.0	8,100.0	8,112.1	8,100.0	11.0	9.1	-90.09	-0.5	-333.4	333.4	313.3	20.11	16.577		
8,200.0	8,200.0	8,212.1	8,200.0	11.1	9.2	-90.09	-0.5	-333.4	333.4	313.0	20.35	16.386		
8,300.0	8,300.0	8,312.1	8,300.0	11.3	9.3	-90.09	-0.5	-333.4	333.4	312.8	20.58	16.198		
8,400.0	8,400.0	8,412.1	8,400.0	11.4	9.4	-90.09	-0.5	-333.4	333.4	312.6	20.82	16.014		
8,500.0	8,500.0	8,512.1	8,500.0	11.5	9.5	-90.09	-0.5	-333.4	333.4	312.3	21.06	15.833		
8,600.0	8,600.0	8,612.1	8,600.0	11.6	9.6	-90.09	-0.5	-333.4	333.4	312.1	21.29	15.656		
8,700.0	8,700.0	8,712.1	8,700.0	11.8	9.7	-90.09	-0.5	-333.4	333.4	311.8	21.53	15.487		
8,800.0	8,800.0	8,812.1	8,800.0	11.8	9.8	-90.09	-0.5	-333.4	333.4	311.7	21.64	15.404		
8,803.3	8,803.3	8,815.4	8,803.3	11.8	9.8	-90.09	-0.5	-333.4	333.4	311.7	21.64	15.403		
8,812.5	8,812.5	8,824.5	8,812.4	11.8	9.8	-90.09	-0.5	-333.4	333.4	311.7	21.64	15.403		
8,825.0	8,825.0	8,834.4	8,822.4	11.8	9.8	-90.12	-0.4	-333.4	333.4	311.8	21.65	15.399		
8,850.0	8,850.0	8,854.1	8,842.1	11.8	9.8	-90.12	0.3	-333.7	333.8	312.2	21.67	15.406		
8,875.0	8,874.8	8,875.0	8,862.9	11.9	9.8	-90.12	2.0	-334.4	334.6	312.9	21.69	15.430		
8,900.0	8,899.5	8,893.6	8,881.3	11.9	9.8	-90.12	4.1	-335.3	335.8	314.1	21.70	15.472		
8,925.0	8,924.0	8,913.3	8,900.7	11.9	9.8	-90.11	7.1	-336.5	337.4	315.7	21.72	15.532		
8,950.0	8,948.1	8,932.9	8,920.0	11.9	9.8	-90.11	10.8	-338.1	339.4	317.6	21.74	15.608		
8,975.0	8,971.9	8,952.6	8,939.0	11.9	9.8	-90.11	15.3	-339.9	341.7	320.0	21.76	15.702		
9,000.0	8,995.2	8,972.3	8,957.9	11.9	9.9	-90.10	20.4	-342.1	344.5	322.7	21.79	15.812		
9,025.0	9,018.1	8,991.9	8,976.5	11.9	9.9	-90.08	26.3	-344.5	347.6	325.8	21.82	15.935		
9,050.0	9,040.3	9,011.5	8,994.7	11.9	9.9	-90.06	32.9	-347.3	351.2	329.3	21.84	16.078		
9,075.0	9,062.0	9,031.1	9,012.7	12.0	9.9	-90.03	40.1	-350.3	355.1	333.2	21.87	16.235		
9,100.0	9,082.9	9,050.0	9,029.7	12.0	9.9	-89.97	47.7	-353.5	359.3	337.4	21.90	16.406		
9,125.0	9,103.2	9,070.3	9,047.5	12.0	9.9	-89.94	56.6	-357.1	363.9	342.0	21.94	16.589		
9,150.0	9,122.6	9,089.8	9,064.3	12.0	10.0	-89.88	65.8	-361.0	368.9	346.9	21.98	16.783		
9,175.0	9,141.2	9,109.3	9,080.7	12.1	10.0	-89.81	75.6	-365.1	374.2	352.2	22.03	16.990		
9,200.0	9,158.8	9,128.8	9,096.6	12.1	10.0	-89.72	86.0	-369.4	379.9	357.8	22.07	17.211		
9,225.0	9,175.6	9,150.0	9,113.3	12.1	10.0	-89.67	98.0	-374.4	385.9	363.8	22.12	17.442		
9,250.0	9,191.3	9,167.9	9,127.0	12.1	10.0	-89.50	108.6	-378.8	392.2	370.0	22.17	17.689		
9,275.0	9,206.0	9,187.4	9,141.4	12.2	10.1	-89.36	120.8	-383.9	398.8	376.6	22.22	17.947		
9,300.0	9,219.6	9,206.9	9,155.3	12.2	10.1	-89.21	133.5	-389.1	405.7	383.4	22.27	18.216		
9,325.0	9,232.1	9,225.0	9,167.6	12.2	10.1	-88.99	145.7	-394.2	412.9	390.6	22.32	18.499		
9,350.0	9,243.5	9,246.1	9,181.4	12.2	10.1	-88.86	160.4	-400.4	420.3	398.0	22.37	18.789		
9,375.0	9,253.6	9,265.8	9,193.5	12.3	10.2	-88.66	174.7	-406.3	428.0	405.6	22.43	19.087		
9,400.0	9,262.6	9,285.5	9,205.1	12.3	10.2	-88.45	189.4	-412.4	436.0	413.5	22.49	19.390		
9,425.0	9,270.3	9,305.3	9,216.0	12.3	10.2	-88.22	204.7	-418.8	444.2	421.6	22.55	19.701		
9,450.0	9,276.8	9,325.0	9,226.2	12.3	10.2	-87.97	220.3	-425.3	452.6	430.0	22.60	20.021		
9,475.0	9,282.0	9,345.1	9,235.9	12.3	10.3	-87.72	236.5	-432.0	461.1	438.5	22.66	20.347		
9,500.0	9,285.9	9,365.2	9,244.8	12.3	10.3	-87.45	253.2	-439.0	469.9	447.2	22.72	20.682		
9,525.0	9,288.5	9,385.5	9,253.0	12.3	10.3	-87.17	270.3	-446.1	478.8	456.0	22.78	21.023		
9,550.0	9,289.8	9,405.9	9,260.5	12.4	10.4	-86.89	287.8	-453.4	487.9	465.0	22.83	21.372		
9,562.6	9,290.0	9,416.2	9,264.0	12.4	10.4	-86.74	296.8	-457.1	492.5	469.6	22.85	21.550		
9,599.5	9,290.0	9,447.3	9,273.1	12.4	10.4	-87.94	324.2	-468.5	506.2	483.3	22.91	22.096		
9,700.0	9,290.0	9,537.1	9,288.5	12.4	11.1	-89.83	405.8	-502.5	544.6	521.2	23.44	23.237		
9,800.0	9,290.0	9,666.8	9,290.0	13.6	13.0	-90.00	526.5	-549.5	581.3	554.6	26.67	21.799		
9,900.0	9,290.0	9,831.5	9,290.0	15.1	15.7	-90.00	685.1	-593.9	608.3	577.5	30.78	19.763		
10,000.0	9,290.0	10,005.0	9,290.0	16.6	18.4	-90.00	856.4	-620.6	623.8	588.8	34.98	17.835		

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

COG PRODUCTION LLC

Anticollision Report

Company: COG PRODUCTION LLC
 Project: LEA COUNTY, NM
 Reference Site: AVALON SHALE
 Site Error: 0.0 usft
 Reference Well: AZORES FEDERAL COM #5H
 Well Error: 3.0 usft
 Reference Wellbore: OWB
 Reference Design: PWP0

Local Co-ordinate Reference: Well AZORES FEDERAL COM #5H
 TVD Reference: RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
 MD Reference: RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Output errors are at 2.00 sigma
 Database: EDM_Users
 Offset TVD Reference: Offset Datum

Offset Design AVALON SHALE - AZORES FEDERAL COM #10H - OWB - PWP0													Offset Site Error:	0.0 usft
Survey Program: 0-Standard Keeper 104, 8800-MWD													Offset Well Error:	3.0 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Minimum Separation (usft)	Separation Factor	Warning			
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)						
10,100.0	9,290.0	10,159.0	9,290.0	18.1	20.7	-90.00	1,010.2	-627.1	627.6	588.9	38.75	16.199		
10,200.0	9,290.0	10,259.0	9,290.0	19.6	22.1	-90.00	1,110.2	-627.8	628.4	586.7	41.73	15.058		
10,300.0	9,290.0	10,359.0	9,290.0	21.2	23.6	-90.00	1,210.2	-628.6	629.2	584.5	44.77	14.056		
10,400.0	9,290.0	10,459.0	9,290.0	22.8	25.1	-90.00	1,310.2	-629.3	630.1	582.2	47.84	13.170		
10,500.0	9,290.0	10,559.0	9,290.0	24.4	26.6	-90.00	1,410.2	-630.1	630.9	579.9	50.94	12.384		
10,600.0	9,290.0	10,659.0	9,290.0	25.9	28.1	-90.00	1,510.2	-630.8	631.7	577.6	54.07	11.683		
10,700.0	9,290.0	10,759.0	9,290.0	27.5	29.7	-90.00	1,610.2	-631.6	632.5	575.3	57.22	11.054		
10,800.0	9,290.0	10,859.0	9,290.0	29.2	31.2	-90.00	1,710.2	-632.3	633.3	572.9	60.39	10.487		
10,900.0	9,290.0	10,959.0	9,290.0	30.8	32.8	-90.00	1,810.2	-633.1	634.1	570.5	63.57	9.975		
11,000.0	9,290.0	11,059.0	9,290.0	32.4	34.4	-90.00	1,910.2	-633.8	634.9	568.1	66.77	9.509		
11,100.0	9,290.0	11,159.0	9,290.0	34.0	36.0	-90.00	2,010.2	-634.6	635.7	565.7	69.98	9.084		
11,200.0	9,290.0	11,259.0	9,290.0	35.6	37.6	-90.00	2,110.2	-635.3	636.5	563.3	73.20	8.696		
11,300.0	9,290.0	11,359.0	9,290.0	37.3	39.2	-90.00	2,210.2	-636.1	637.3	560.9	76.42	8.339		
11,400.0	9,290.0	11,459.0	9,290.0	38.9	40.8	-90.00	2,310.2	-636.8	638.1	558.5	79.66	8.010		
11,500.0	9,290.0	11,559.0	9,290.0	40.5	42.4	-90.00	2,410.2	-637.6	638.9	556.0	82.90	7.707		
11,600.0	9,290.0	11,659.0	9,290.0	42.2	44.0	-90.00	2,510.1	-638.3	639.7	553.6	86.15	7.425		
11,700.0	9,290.0	11,759.0	9,290.0	43.8	45.6	-90.00	2,610.1	-639.1	640.5	551.1	89.41	7.164		
11,800.0	9,290.0	11,859.0	9,290.0	45.5	47.2	-90.00	2,710.1	-639.8	641.3	548.7	92.67	6.921		
11,900.0	9,290.0	11,959.0	9,290.0	47.1	48.8	-90.00	2,810.1	-640.6	642.1	546.2	95.93	6.694		
12,000.0	9,290.0	12,059.0	9,290.0	48.7	50.5	-90.00	2,910.1	-641.3	642.9	543.7	99.20	6.481		
12,100.0	9,290.0	12,159.0	9,290.0	50.4	52.1	-90.00	3,010.1	-642.1	643.8	541.3	102.48	6.282		
12,200.0	9,290.0	12,259.0	9,290.0	52.0	53.7	-90.00	3,110.1	-642.8	644.6	538.8	105.75	6.095		
12,300.0	9,290.0	12,359.0	9,290.0	53.7	55.4	-90.00	3,210.1	-643.6	645.4	536.3	109.03	5.919		
12,400.0	9,290.0	12,459.0	9,290.0	55.3	57.0	-90.00	3,310.1	-644.3	646.2	533.9	112.31	5.753		
12,500.0	9,290.0	12,559.0	9,290.0	57.0	58.6	-90.00	3,410.1	-645.1	647.0	531.4	115.60	5.597		
12,600.0	9,290.0	12,659.0	9,290.0	58.6	60.3	-90.00	3,510.1	-645.8	647.8	528.9	118.88	5.449		
12,700.0	9,290.0	12,758.9	9,290.0	60.3	61.9	-90.00	3,610.1	-646.6	648.6	526.4	122.17	5.309		
12,800.0	9,290.0	12,858.9	9,290.0	61.9	63.5	-90.00	3,710.1	-647.3	649.4	523.9	125.46	5.176		
12,900.0	9,290.0	12,958.9	9,290.0	63.6	65.2	-90.00	3,810.1	-648.1	650.2	521.4	128.75	5.050		
13,000.0	9,290.0	13,058.9	9,290.0	65.2	66.8	-90.00	3,910.1	-648.8	651.0	519.0	132.05	4.930		
13,100.0	9,290.0	13,158.9	9,290.0	66.9	68.5	-90.00	4,010.1	-649.6	651.8	516.5	135.34	4.816		
13,200.0	9,290.0	13,258.9	9,290.0	68.5	70.1	-90.00	4,110.1	-650.3	652.6	514.0	138.64	4.707		
13,300.0	9,290.0	13,358.9	9,290.0	70.2	71.8	-90.00	4,210.0	-651.1	653.4	511.5	141.94	4.604		
13,400.0	9,290.0	13,458.9	9,290.0	71.8	73.4	-90.00	4,310.0	-651.8	654.2	509.0	145.24	4.504		
13,500.0	9,290.0	13,558.9	9,290.0	73.5	75.1	-90.00	4,410.0	-652.6	655.0	506.5	148.54	4.410		
13,600.0	9,290.0	13,658.9	9,290.0	75.1	76.7	-90.00	4,510.0	-653.3	655.8	504.0	151.84	4.319		
13,700.0	9,290.0	13,758.9	9,290.0	76.8	78.3	-90.00	4,610.0	-654.1	656.6	501.5	155.15	4.232		
13,800.0	9,290.0	13,858.9	9,290.0	78.5	80.0	-90.00	4,710.0	-654.8	657.5	499.0	158.45	4.149		
13,900.0	9,290.0	13,958.9	9,290.0	80.1	81.6	-90.00	4,810.0	-655.6	658.3	496.5	161.76	4.069		
14,000.0	9,290.0	14,058.9	9,290.0	81.8	83.3	-90.00	4,910.0	-656.3	659.1	494.0	165.06	3.993		
14,108.4	9,290.0	14,164.5	9,290.0	83.6	85.0	-90.00	5,015.6	-657.1	659.9	491.3	168.60	3.914 SF		

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

COG PRODUCTION LLC

Anticollision Report

Company: COG PRODUCTION LLC
 Project: LEA COUNTY, NM
 Reference Site: AVALON SHALE
 Site Error: 0.0 usft
 Reference Well: AZORES FEDERAL COM #5H
 Well Error: 3.0 usft
 Reference Wellbore: OWB
 Reference Design: PWP0

Local Co-ordinate Reference: Well AZORES FEDERAL COM #5H
 TVD Reference: RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
 MD Reference: RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Output errors are at: 2.00 sigma
 Database: EDM_Users
 Offset TVD Reference: Offset Datum

Offset Design AVALON SHALE - BOMBAY FED COM #1H - OWB - ACTUAL WELLPATH														Offset Site Error:	0.0 usft
Survey Program: 200-GYRO-NS, 7857-MWD														Offset Well Error:	3.0 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning		
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)							
0.0	0.0	0.0	0.0	3.0	3.0	-179.07	-2,520.6	-41.1	2,521.0						
100.0	100.0	75.9	75.9	3.0	3.0	-179.07	-2,520.8	-41.1	2,521.1	2,515.1	6.00	419.998			
200.0	200.0	163.7	163.7	3.0	3.0	-179.06	-2,521.4	-41.2	2,521.8	2,515.8	6.02	419.162			
300.0	300.0	259.5	259.5	3.0	3.0	-179.06	-2,522.4	-41.4	2,522.8	2,516.8	6.06	416.240			
400.0	400.0	360.8	360.8	3.0	3.1	-179.06	-2,523.4	-41.5	2,523.9	2,517.7	6.16	409.821			
500.0	500.0	462.6	462.6	3.1	3.2	-179.06	-2,524.4	-41.6	2,524.9	2,518.6	6.30	400.858			
600.0	600.0	564.6	564.6	3.1	3.4	-179.05	-2,525.3	-41.8	2,525.8	2,519.3	6.48	389.921			
700.0	700.0	663.7	663.7	3.1	3.6	-179.04	-2,526.2	-42.2	2,526.6	2,519.9	6.69	377.913			
800.0	800.0	761.3	761.3	3.2	3.8	-179.04	-2,527.1	-42.6	2,527.6	2,520.7	6.92	365.282			
900.0	900.0	862.5	862.5	3.2	4.0	-179.03	-2,528.1	-43.0	2,528.6	2,521.4	7.19	351.866			
1,000.0	1,000.0	966.1	966.0	3.2	4.2	-179.02	-2,529.0	-43.0	2,529.5	2,522.0	7.48	338.065			
1,100.0	1,100.0	1,065.8	1,065.7	3.3	4.5	-179.03	-2,529.8	-42.8	2,530.2	2,522.4	7.79	324.880			
1,200.0	1,200.0	1,163.6	1,163.6	3.4	4.8	-179.04	-2,530.6	-42.4	2,531.1	2,523.0	8.11	312.260			
1,300.0	1,300.0	1,261.6	1,261.5	3.4	5.0	-179.05	-2,531.6	-42.0	2,532.0	2,523.6	8.44	300.086			
1,400.0	1,400.0	1,359.6	1,359.6	3.5	5.3	-179.06	-2,532.6	-41.6	2,533.1	2,524.3	8.78	288.430			
1,500.0	1,500.0	1,462.3	1,462.2	3.5	5.6	-179.07	-2,533.7	-41.2	2,534.1	2,525.0	9.15	276.918			
1,600.0	1,600.0	1,568.2	1,568.1	3.6	5.9	-179.08	-2,534.6	-40.6	2,534.9	2,525.4	9.54	265.725			
1,700.0	1,700.0	1,674.1	1,674.0	3.7	6.2	-179.10	-2,535.2	-39.8	2,535.5	2,525.6	9.94	255.146			
1,800.0	1,800.0	1,780.0	1,779.9	3.8	6.6	-179.12	-2,535.6	-38.8	2,535.9	2,525.6	10.34	245.164			
1,900.0	1,900.0	1,886.8	1,886.7	3.9	6.9	-179.15	-2,535.8	-37.5	2,536.0	2,525.3	10.76	235.708			
2,000.0	2,000.0	1,993.7	1,993.6	3.9	7.2	-179.19	-2,535.6	-35.8	2,535.9	2,524.7	11.18	226.782			
2,100.0	2,100.0	2,098.2	2,098.0	4.0	7.6	-179.24	-2,535.3	-33.5	2,535.5	2,523.9	11.61	218.484			
2,200.0	2,200.0	2,200.0	2,199.8	4.1	7.9	-179.31	-2,534.8	-30.5	2,535.0	2,523.0	12.03	210.809			
2,300.0	2,300.0	2,298.6	2,298.4	4.2	8.2	-179.39	-2,534.3	-26.9	2,534.4	2,522.0	12.44	203.697			
2,400.0	2,400.0	2,395.0	2,394.7	4.3	8.6	-179.48	-2,533.9	-23.1	2,534.0	2,521.2	12.86	197.111			
2,500.0	2,500.0	2,492.7	2,492.3	4.4	8.9	-179.57	-2,533.7	-19.0	2,533.8	2,520.5	13.28	190.821			
2,600.0	2,600.0	2,590.4	2,589.9	4.5	9.2	-179.66	-2,533.5	-14.8	2,533.6	2,519.9	13.70	184.877			
2,700.0	2,700.0	2,688.5	2,687.9	4.6	9.5	-179.76	-2,533.5	-10.4	2,533.5	2,519.3	14.13	179.235			
2,773.1	2,773.1	2,760.1	2,759.5	4.7	9.8	-179.84	-2,533.4	-7.0	2,533.5	2,519.0	14.45	175.306			
2,800.0	2,800.0	2,786.6	2,785.9	4.7	9.9	-179.87	-2,533.4	-5.7	2,533.5	2,518.9	14.57	173.896			
2,900.0	2,900.0	2,896.3	2,895.4	4.8	10.3	-180.00	-2,533.3	0.0	2,533.3	2,518.3	15.05	168.353			
3,000.0	3,000.0	3,007.0	3,006.0	4.9	10.6	179.86	-2,532.7	6.3	2,532.7	2,517.2	15.53	163.056			
3,100.0	3,100.0	3,107.6	3,106.4	5.0	11.0	179.73	-2,531.9	11.8	2,532.0	2,516.0	15.98	158.423			
3,200.0	3,200.0	3,208.5	3,207.2	5.1	11.3	179.63	-2,531.0	16.2	2,531.2	2,514.7	16.43	154.013			
3,300.0	3,300.0	3,312.7	3,311.3	5.2	11.7	179.54	-2,530.1	20.3	2,530.3	2,513.4	16.90	149.753			
3,400.0	3,400.0	3,416.7	3,415.2	5.3	12.0	179.45	-2,528.9	24.4	2,529.2	2,511.8	17.36	145.701			
3,500.0	3,500.0	3,519.5	3,517.9	5.4	12.4	179.36	-2,527.6	28.4	2,528.0	2,510.2	17.82	141.870			
3,600.0	3,600.0	3,623.2	3,621.6	5.5	12.7	179.26	-2,526.2	32.7	2,526.7	2,508.4	18.28	138.190			
3,700.0	3,700.0	3,730.6	3,728.8	5.7	13.1	179.16	-2,524.5	36.8	2,525.2	2,506.4	18.76	134.585			
3,800.0	3,800.0	3,827.1	3,825.3	5.8	13.4	179.08	-2,522.8	40.3	2,523.4	2,504.2	19.21	131.392			
3,900.0	3,900.0	3,903.7	3,901.8	5.9	13.7	179.02	-2,521.9	43.3	2,522.3	2,502.7	19.58	128.815			
3,931.6	3,931.6	3,928.0	3,926.0	5.9	13.8	178.99	-2,521.8	44.3	2,522.2	2,502.5	19.70	128.029			
4,000.0	4,000.0	4,000.0	3,998.0	6.0	14.0	178.92	-2,521.8	47.6	2,522.3	2,502.3	20.03	125.954			
4,011.6	4,011.6	4,000.0	3,998.0	6.0	14.0	178.92	-2,521.8	47.6	2,522.3	2,502.2	20.04	125.869			
4,100.0	4,100.0	4,067.6	4,065.6	6.1	14.3	178.84	-2,522.2	50.9	2,522.8	2,502.4	20.37	123.823			
4,200.0	4,200.0	4,158.6	4,156.4	6.2	14.6	178.73	-2,523.0	55.9	2,523.8	2,503.0	20.80	121.308			
4,300.0	4,300.0	4,248.0	4,245.7	6.3	14.9	178.61	-2,524.1	61.2	2,525.2	2,504.0	21.23	118.942			
4,400.0	4,400.0	4,336.4	4,333.9	6.5	15.2	178.51	-2,525.6	65.6	2,527.0	2,505.4	21.65	116.711			
4,500.0	4,500.0	4,429.5	4,426.9	6.6	15.5	178.43	-2,527.7	69.3	2,529.3	2,507.2	22.09	114.500			
4,600.0	4,600.0	4,534.8	4,532.1	6.7	15.9	178.36	-2,530.0	72.6	2,531.6	2,509.0	22.57	112.176			
4,700.0	4,700.0	4,641.2	4,638.5	6.8	16.2	178.30	-2,532.0	75.0	2,533.6	2,510.6	23.05	109.918			
4,800.0	4,800.0	4,749.6	4,746.8	6.9	16.6	178.26	-2,533.9	76.9	2,535.3	2,511.8	23.54	107.709			

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

COG PRODUCTION LLC

Anticollision Report

Company: COG PRODUCTION LLC
 Project: LEA COUNTY, NM
 Reference Site: AVALON SHALE
 Site Error: 0.0 usft
 Reference Well: AZORES FEDERAL COM #5H
 Well Error: 3.0 usft
 Reference Wellbore: OWB
 Reference Design: PWP0

Local Co-ordinate Reference: Well AZORES FEDERAL COM #5H
 TVD Reference: RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
 MD Reference: RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Output errors are at: 2.00 sigma
 Database: EDM_Users
 Offset TVD Reference: Offset Datum

Offset Design AVALON SHALE - BOMBAY FED COM #1H - OWB - ACTUAL WELLPATH														Offset Site Error:	0.0 usft
Survey Program: 200-GYRO-NS, 7857-MWD														Offset Well Error:	3.0 usft
Reference		Offset		Semi Major Axis		Highside Tooface (")	Distance		Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning		
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore +N/-S (usft)	Centre +E/-W (usft)							
4,900.0	4,900.0	4,854.8	4,852.0	7.0	17.0	178.23	-2,535.3	78.5	2,536.8	2,512.7	24.02	105.621			
5,000.0	5,000.0	4,957.3	4,954.5	7.2	17.3	178.19	-2,536.6	80.0	2,538.1	2,513.6	24.49	103.647			
5,100.0	5,100.0	5,058.2	5,055.4	7.3	17.7	178.16	-2,537.8	81.5	2,539.3	2,514.3	24.95	101.762			
5,200.0	5,200.0	5,158.0	5,155.2	7.4	18.0	178.13	-2,539.0	83.1	2,540.5	2,515.1	25.42	99.958			
5,300.0	5,300.0	5,253.2	5,250.3	7.5	18.3	178.09	-2,540.1	84.5	2,541.8	2,515.9	25.86	98.279			
5,400.0	5,400.0	5,344.9	5,342.1	7.6	18.7	178.06	-2,541.5	86.1	2,543.4	2,517.1	26.30	96.709			
5,500.0	5,500.0	5,444.4	5,441.5	7.8	19.0	178.02	-2,543.3	88.0	2,545.2	2,518.5	26.76	95.103			
5,600.0	5,600.0	5,555.6	5,552.6	7.9	19.4	177.98	-2,545.0	89.9	2,546.8	2,519.5	27.27	93.401			
5,700.0	5,700.0	5,654.2	5,651.2	8.0	19.7	177.94	-2,546.1	91.4	2,548.0	2,520.3	27.73	91.892			
5,800.0	5,800.0	5,744.4	5,741.4	8.1	20.0	177.91	-2,547.5	92.8	2,549.6	2,521.4	28.16	90.534			
5,900.0	5,900.0	10,681.0	8,392.3	8.3	50.6	-127.06	-57.6	-76.2	2,507.7	2,448.8	58.90	42.575			
6,000.0	6,000.0	10,681.0	8,392.3	8.4	50.6	-127.06	-57.6	-76.2	2,407.8	2,348.8	59.02	40.794			
6,100.0	6,100.0	10,681.0	8,392.3	8.5	50.6	-127.06	-57.6	-76.2	2,307.9	2,248.7	59.15	39.019			
6,200.0	6,200.0	10,681.0	8,392.3	8.6	50.6	-127.06	-57.6	-76.2	2,208.0	2,148.7	59.27	37.252			
6,300.0	6,300.0	10,681.0	8,392.3	8.8	50.6	-127.06	-57.6	-76.2	2,108.1	2,048.7	59.39	35.493			
6,400.0	6,400.0	10,681.0	8,392.3	8.9	50.6	-127.06	-57.6	-76.2	2,008.2	1,948.6	59.52	33.740			
6,500.0	6,500.0	10,681.0	8,392.3	9.0	50.6	-127.06	-57.6	-76.2	1,908.3	1,848.6	59.64	31.995			
6,600.0	6,600.0	10,681.0	8,392.3	9.1	50.6	-127.06	-57.6	-76.2	1,808.4	1,748.7	59.77	30.258			
6,700.0	6,700.0	10,681.0	8,392.3	9.3	50.6	-127.06	-57.6	-76.2	1,708.6	1,648.7	59.89	28.528			
6,800.0	6,800.0	10,681.0	8,392.3	9.4	50.6	-127.06	-57.6	-76.2	1,608.7	1,548.7	60.02	26.805			
6,900.0	6,900.0	10,683.4	8,392.4	9.5	50.7	-125.84	-55.1	-76.3	1,508.9	1,448.7	60.18	25.075			
7,000.0	7,000.0	10,688.1	8,392.5	9.6	50.7	-123.40	-50.5	-76.5	1,409.1	1,348.8	60.37	23.342			
7,100.0	7,100.0	10,692.6	8,392.7	9.8	50.8	-120.96	-46.0	-76.7	1,309.3	1,248.8	60.56	21.622			
7,200.0	7,200.0	10,696.8	8,392.8	9.9	50.9	-118.52	-41.8	-76.9	1,209.6	1,148.9	60.74	19.914			
7,300.0	7,300.0	10,700.8	8,392.9	10.0	50.9	-116.10	-37.8	-77.1	1,109.9	1,048.9	60.93	18.217			
7,400.0	7,400.0	10,704.7	8,393.1	10.1	51.0	-113.71	-33.9	-77.2	1,010.2	949.1	61.11	16.532			
7,500.0	7,500.0	10,708.4	8,393.2	10.3	51.0	-111.34	-30.2	-77.4	910.6	849.3	61.28	14.858			
7,600.0	7,600.0	10,711.9	8,393.3	10.4	51.1	-109.02	-26.7	-77.5	811.0	749.6	61.46	13.196			
7,700.0	7,700.0	10,715.3	8,393.4	10.5	51.1	-106.74	-23.4	-77.7	711.6	650.0	61.63	11.546			
7,800.0	7,800.0	10,718.5	8,393.5	10.6	51.2	-104.51	-20.1	-77.8	612.4	550.6	61.81	9.908			
7,900.0	7,900.0	10,721.6	8,393.6	10.8	51.2	-102.34	-17.0	-77.9	513.4	451.4	61.98	8.284			
8,000.0	8,000.0	10,724.6	8,393.6	10.9	51.3	-100.23	-14.1	-78.0	414.9	352.7	62.15	6.676			
8,100.0	8,100.0	10,727.4	8,393.7	11.0	51.3	-98.18	-11.2	-78.1	317.3	255.0	62.31	5.092			
8,200.0	8,200.0	10,730.2	8,393.8	11.1	51.3	-96.19	-8.5	-78.3	221.8	159.3	62.48	3.550			
8,300.0	8,300.0	10,732.8	8,393.9	11.3	51.4	-94.27	-5.9	-78.4	133.1	70.5	62.64	2.125			
8,400.0	8,400.0	10,735.3	8,393.9	11.4	51.4	-92.42	-3.3	-78.5	78.9	16.1	62.81	1.256	Shut in Produces		
8,407.5	8,407.5	10,735.5	8,393.9	11.4	51.4	-92.28	-3.1	-78.5	78.5	15.7	62.82	1.250	Shut in Produces, CC, ES, SF		
8,500.0	8,500.0	10,737.8	8,394.0	11.5	51.4	-90.64	-0.9	-78.6	121.3	58.3	62.97	1.926	Advise and Monitor		
8,600.0	8,600.0	10,740.1	8,394.0	11.6	51.5	-88.92	1.5	-78.7	207.8	144.7	63.13	3.292			
8,700.0	8,700.0	10,742.4	8,394.1	11.8	51.5	-87.27	3.8	-78.7	302.8	239.5	63.29	4.784			
8,800.0	8,800.0	10,744.6	8,394.1	11.8	51.5	-85.68	6.0	-78.8	400.1	336.8	63.39	6.313			
8,812.5	8,812.5	10,744.9	8,394.1	11.8	51.5	-85.49	6.2	-78.8	412.4	349.0	63.39	6.506			
8,825.0	8,825.0	10,745.3	8,394.2	11.8	51.6	-77.59	6.6	-78.9	424.7	361.3	63.40	6.699			
8,850.0	8,850.0	10,747.0	8,394.2	11.8	51.6	-62.25	8.4	-78.9	449.2	385.8	63.43	7.082			
8,875.0	8,874.8	10,750.0	8,394.3	11.9	51.6	-49.27	11.3	-79.0	473.7	410.2	63.47	7.462			
8,900.0	8,899.5	10,754.1	8,394.3	11.9	51.7	-39.29	15.4	-79.2	498.0	434.4	63.54	7.837			
8,925.0	8,924.0	10,759.3	8,394.5	11.9	51.8	-31.90	20.6	-79.4	522.0	458.4	63.62	8.205			
8,950.0	8,948.1	10,765.6	8,394.6	11.9	51.8	-26.43	26.9	-79.7	545.8	482.1	63.72	8.565			
8,975.0	8,971.9	10,775.0	8,394.8	11.9	52.0	-22.16	36.3	-80.0	569.3	505.4	63.87	8.913			
9,000.0	8,995.2	10,775.0	8,394.8	11.9	52.0	-19.62	36.3	-80.0	592.3	528.4	63.88	9.271			
9,025.0	9,018.1	10,789.8	8,395.0	11.9	52.2	-16.83	51.1	-80.6	614.8	550.7	64.11	9.589			
9,050.0	9,040.3	10,799.4	8,395.1	11.9	52.3	-14.92	60.7	-80.9	636.8	572.6	64.27	9.909			

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

COG PRODUCTION LLC

Anticollision Report

Company: COG PRODUCTION LLC
 Project: LEA COUNTY, NM
 Reference Site: AVALON SHALE
 Site Error: 0.0 usft
 Reference Well: AZORES FEDERAL COM #5H
 Well Error: 3.0 usft
 Reference Wellbore: OWB
 Reference Design: PWP0

Local Co-ordinate Reference: Well AZORES FEDERAL COM #5H
 TVD Reference: RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
 MD Reference: RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Output errors are at 2.00 sigma
 Database: EDM_Users
 Offset TVD Reference: Offset Datum

Offset Design AVALON SHALE - BOMBAY FED COM #1H - OWB - ACTUAL WELLPATH														Offset Site Error:	0.0 usft
Survey Program: 200-GYRO-NS, 7857-MWD														Offset Well Error:	3.0 usft
Reference		Offset		Semi Major Axis			Distance							Warning	
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (")	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor			
9,075.0	9,062.0	10,809.9	8,395.2	12.0	52.5	-13.39	71.2	-81.3	658.3	593.8	64.44	10.215			
9,100.0	9,082.9	10,821.2	8,395.2	12.0	52.6	-12.13	82.4	-81.8	679.1	614.5	64.62	10.508			
9,125.0	9,103.2	10,833.2	8,395.2	12.0	52.8	-11.10	94.4	-82.2	699.2	634.4	64.82	10.788			
9,150.0	9,122.6	10,845.9	8,395.2	12.0	53.0	-10.24	107.2	-82.6	718.6	653.6	65.02	11.052			
9,175.0	9,141.2	10,859.3	8,395.1	12.1	53.2	-9.51	120.5	-83.1	737.3	672.1	65.24	11.301			
9,200.0	9,158.8	10,873.9	8,394.9	12.1	53.4	-8.89	135.1	-83.6	755.2	689.7	65.48	11.533			
9,225.0	9,175.6	10,891.1	8,394.6	12.1	53.6	-8.36	152.3	-84.2	772.1	706.4	65.75	11.743			
9,250.0	9,191.3	10,909.0	8,394.3	12.1	53.9	-7.91	170.2	-84.8	788.2	722.1	66.04	11.935			
9,275.0	9,206.0	10,927.6	8,394.0	12.2	54.2	-7.52	188.8	-85.4	803.2	736.9	66.33	12.109			
9,300.0	9,219.6	10,946.9	8,393.6	12.2	54.5	-7.20	208.1	-86.1	817.2	750.6	66.64	12.264			
9,325.0	9,232.1	10,966.9	8,393.1	12.2	54.7	-6.92	228.1	-86.7	830.2	763.3	66.95	12.400			
9,350.0	9,243.5	10,988.5	8,392.6	12.2	55.1	-6.69	249.7	-87.4	842.1	774.8	67.29	12.514			
9,375.0	9,253.6	11,010.7	8,392.1	12.3	55.4	-6.49	271.8	-87.9	852.8	785.2	67.63	12.609			
9,400.0	9,262.6	11,033.3	8,391.5	12.3	55.7	-6.32	294.4	-88.5	862.3	794.4	67.98	12.685			
9,425.0	9,270.3	11,056.4	8,391.0	12.3	56.0	-6.18	317.5	-89.0	870.7	802.4	68.34	12.741			
9,450.0	9,276.8	11,083.3	8,390.3	12.3	56.4	-6.06	344.4	-89.5	877.8	809.0	68.75	12.768			
9,475.0	9,282.0	11,111.1	8,389.7	12.3	56.8	-5.97	372.2	-89.8	883.5	814.3	69.17	12.773			
9,500.0	9,285.9	11,139.4	8,389.2	12.3	57.3	-5.90	400.5	-90.1	887.8	818.3	69.59	12.758			
9,525.0	9,288.5	11,165.0	8,388.8	12.3	57.6	-5.85	426.1	-90.1	890.8	820.9	69.97	12.731			
9,550.0	9,289.8	11,187.3	8,388.4	12.4	57.9	-5.81	448.4	-90.1	892.6	822.3	70.30	12.696			
9,562.6	9,290.0	11,198.6	8,388.2	12.4	58.1	-5.80	459.7	-90.0	893.0	822.5	70.47	12.672			
9,599.5	9,290.0	11,231.6	8,387.4	12.4	58.6	-5.76	492.6	-89.5	893.8	822.8	70.95	12.597			
9,700.0	9,290.0	11,336.0	8,384.6	12.4	60.1	-5.56	597.0	-86.5	896.2	823.7	72.48	12.364			
9,800.0	9,290.0	11,463.9	8,383.7	13.6	61.9	-5.14	724.7	-79.9	896.4	820.8	75.60	11.858			
9,900.0	9,290.0	11,564.4	8,384.3	15.1	63.4	-4.88	825.1	-75.6	895.3	816.8	78.51	11.405			
10,000.0	9,290.0	11,664.8	8,385.5	16.6	64.9	-4.80	925.5	-74.2	894.0	812.6	81.49	10.972			
10,100.0	9,290.0	11,762.0	8,386.4	18.1	66.4	-4.82	1,022.7	-74.5	893.2	808.7	84.47	10.574			
10,200.0	9,290.0	11,858.5	8,387.5	19.6	67.8	-4.94	1,119.1	-76.2	892.2	804.8	87.48	10.200			
10,228.1	9,290.0	11,882.5	8,387.6	20.1	68.2	-4.97	1,143.1	-76.7	892.2	803.9	88.28	10.106			
10,300.0	9,290.0	11,947.7	8,387.3	21.2	69.2	-5.04	1,208.4	-77.7	892.5	802.1	90.40	9.873			
10,400.0	9,290.0	12,048.8	8,386.7	22.8	70.8	-5.18	1,309.4	-79.9	893.3	799.8	93.52	9.552			
10,500.0	9,290.0	12,151.4	8,386.4	24.4	72.3	-5.18	1,412.0	-80.0	893.7	797.0	96.68	9.243			
10,600.0	9,290.0	12,250.2	8,385.8	25.9	73.8	-5.08	1,510.8	-78.3	894.1	794.3	99.79	8.960			
10,700.0	9,290.0	12,352.9	8,385.3	27.5	75.4	-4.99	1,613.4	-76.9	894.5	791.5	102.96	8.688			
10,800.0	9,290.0	12,456.6	8,385.2	29.2	77.0	-4.86	1,717.1	-74.8	894.5	788.3	106.16	8.425			
10,900.0	9,290.0	12,558.8	8,385.4	30.8	78.6	-4.76	1,819.3	-73.2	894.1	784.7	109.35	8.176			
11,000.0	9,290.0	12,658.1	8,385.9	32.4	80.1	-4.79	1,918.7	-73.5	893.6	781.1	112.52	7.942			
11,035.1	9,290.0	12,689.2	8,386.1	33.0	80.6	-4.82	1,949.7	-74.0	893.5	779.9	113.58	7.867			
11,100.0	9,290.0	12,739.3	8,385.7	34.0	81.4	-4.87	1,999.8	-74.8	894.1	778.6	115.42	7.746			
11,200.0	9,290.0	12,816.8	8,383.5	35.6	82.6	-4.94	2,077.3	-76.0	897.0	778.8	118.26	7.585			
11,300.0	9,290.0	12,837.0	8,382.6	37.3	82.9	-4.95	2,097.5	-76.3	904.8	784.6	120.21	7.527			
11,400.0	9,290.0	12,837.0	8,382.6	38.9	82.9	-4.95	2,097.5	-76.3	923.1	801.3	121.84	7.576			
11,500.0	9,290.0	12,837.0	8,382.6	40.5	82.9	-4.95	2,097.5	-76.3	951.7	828.2	123.48	7.707			
11,600.0	9,290.0	12,837.0	8,382.6	42.2	82.9	-4.95	2,097.5	-76.3	989.5	864.4	125.12	7.909			
11,700.0	9,290.0	12,837.0	8,382.6	43.8	82.9	-4.95	2,097.5	-76.3	1,035.7	908.9	126.76	8.171			
11,800.0	9,290.0	12,837.0	8,382.6	45.5	82.9	-4.95	2,097.5	-76.3	1,089.1	960.7	128.40	8.482			
11,900.0	9,290.0	12,837.0	8,382.6	47.1	82.9	-4.95	2,097.5	-76.3	1,148.8	1,018.7	130.04	8.834			
12,000.0	9,290.0	12,837.0	8,382.6	48.7	82.9	-4.95	2,097.5	-76.3	1,213.8	1,082.1	131.68	9.217			
12,100.0	9,290.0	12,837.0	8,382.6	50.4	82.9	-4.95	2,097.5	-76.3	1,283.2	1,149.9	133.33	9.625			
12,200.0	9,290.0	12,837.0	8,382.6	52.0	82.9	-4.95	2,097.5	-76.3	1,356.5	1,221.6	134.97	10.051			
12,300.0	9,290.0	12,837.0	8,382.6	53.7	82.9	-4.95	2,097.5	-76.3	1,433.1	1,296.5	136.62	10.490			
12,400.0	9,290.0	12,837.0	8,382.6	55.3	82.9	-4.95	2,097.5	-76.3	1,512.4	1,374.1	138.27	10.938			

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

COG PRODUCTION LLC

Anticollision Report

Company: COG PRODUCTION LLC
 Project: LEA COUNTY, NM
 Reference Site: AVALON SHALE
 Site Error: 0.0 usft
 Reference Well: AZORES FEDERAL COM #5H
 Well Error: 3.0 usft
 Reference Wellbore: OWB
 Reference Design: PWP0

Local Co-ordinate Reference: Well AZORES FEDERAL COM #5H
 TVD Reference: RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
 MD Reference: RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Output errors are at: 2.00 sigma
 Database: EDM_Users
 Offset TVD Reference: Offset Datum

Offset Design AVALON SHALE - BOMBAY FED COM #1H - OWB - ACTUAL WELLPATH													Offset Site Error:	0.0 usft
Survey Program: 200-GYRO-NS, 7857-MWD													Offset Well Error:	3.0 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning	
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)						
12,500.0	9,290.0	12,837.0	8,382.6	57.0	82.9	-4.95	2,097.5	-76.3	1,594.0	1,454.0	139.91	11.392		
12,600.0	9,290.0	12,837.0	8,382.6	58.6	82.9	-4.95	2,097.5	-76.3	1,677.6	1,536.0	141.56	11.850		
12,700.0	9,290.0	12,837.0	8,382.6	60.3	82.9	-4.95	2,097.5	-76.3	1,762.9	1,619.7	143.21	12.309		
12,800.0	9,290.0	12,837.0	8,382.6	61.9	82.9	-4.95	2,097.5	-76.3	1,849.7	1,704.8	144.86	12.768		
12,900.0	9,290.0	12,837.0	8,382.6	63.6	82.9	-4.95	2,097.5	-76.3	1,937.7	1,791.2	146.52	13.225		
13,000.0	9,290.0	12,837.0	8,382.6	65.2	82.9	-4.95	2,097.5	-76.3	2,026.9	1,878.7	148.17	13.680		
13,100.0	9,290.0	12,837.0	8,382.6	66.9	82.9	-4.95	2,097.5	-76.3	2,117.0	1,967.2	149.82	14.130		
13,200.0	9,290.0	12,837.0	8,382.6	68.5	82.9	-4.95	2,097.5	-76.3	2,208.0	2,056.5	151.47	14.577		
13,300.0	9,290.0	12,837.0	8,382.6	70.2	82.9	-4.95	2,097.5	-76.3	2,299.7	2,146.6	153.12	15.019		
13,400.0	9,290.0	12,837.0	8,382.6	71.8	82.9	-4.95	2,097.5	-76.3	2,392.1	2,237.3	154.78	15.455		
13,500.0	9,290.0	12,837.0	8,382.6	73.5	82.9	-4.95	2,097.5	-76.3	2,485.1	2,328.7	156.43	15.886		
13,600.0	9,290.0	12,837.0	8,382.6	75.1	82.9	-4.95	2,097.5	-76.3	2,578.6	2,420.5	158.09	16.311		
13,700.0	9,290.0	12,837.0	8,382.6	76.8	82.9	-4.95	2,097.5	-76.3	2,672.6	2,512.9	159.74	16.731		
13,800.0	9,290.0	12,837.0	8,382.6	78.5	82.9	-4.95	2,097.5	-76.3	2,767.0	2,605.6	161.40	17.144		
13,900.0	9,290.0	12,837.0	8,382.6	80.1	82.9	-4.95	2,097.5	-76.3	2,861.8	2,698.7	163.05	17.552		
14,000.0	9,290.0	12,837.0	8,382.6	81.8	82.9	-4.95	2,097.5	-76.3	2,956.9	2,792.2	164.71	17.953		
14,108.4	9,290.0	12,837.0	8,382.6	83.6	82.9	-4.95	2,097.5	-76.3	3,060.3	2,893.8	166.50	18.380		

COG PRODUCTION LLC

Anticollision Report

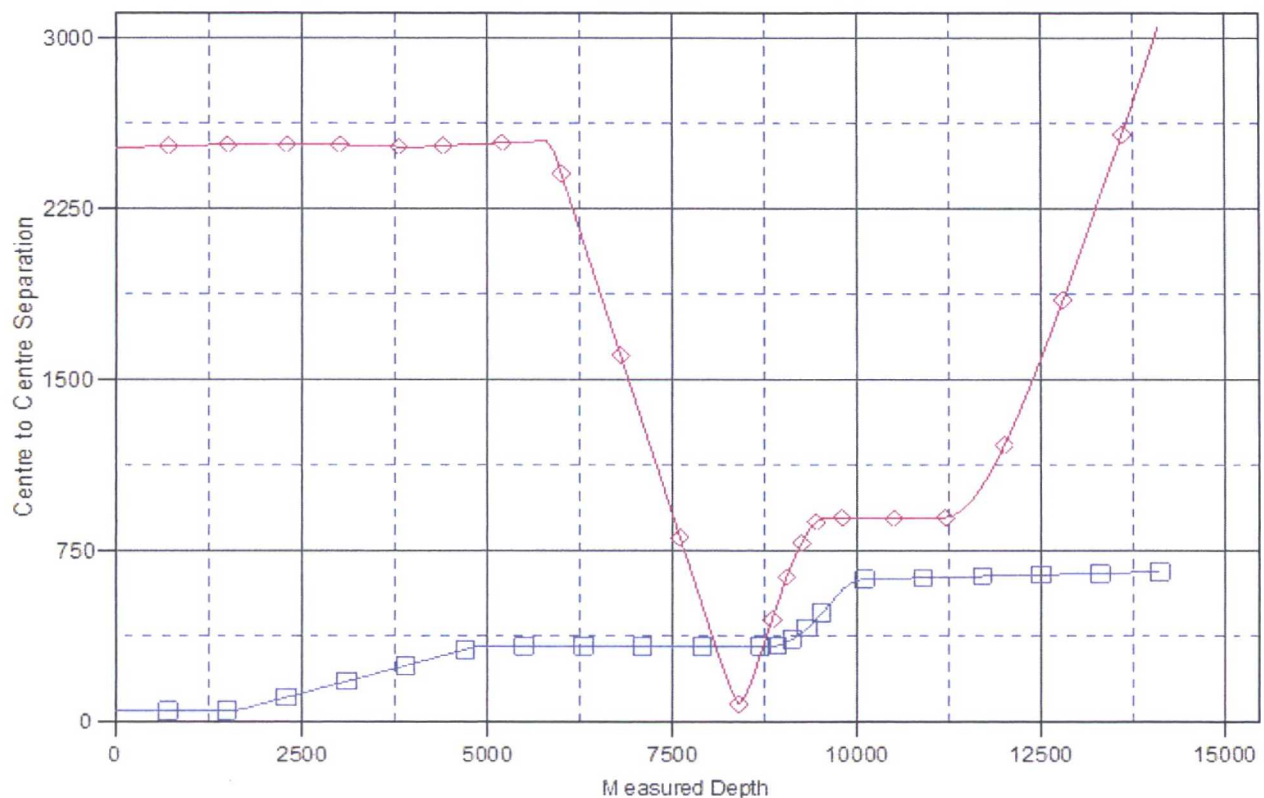
Company: COG PRODUCTION LLC
 Project: LEA COUNTY, NM
 Reference Site: AVALON SHALE
 Site Error: 0.0 usft
 Reference Well: AZORES FEDERAL COM #5H
 Well Error: 3.0 usft
 Reference Wellbore: OWB
 Reference Design: PWP0

Local Co-ordinate Reference: Well AZORES FEDERAL COM #5H
 TVD Reference: RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
 MD Reference: RKB=3508.6+26 @ 3534.6usft (MCVAY 8)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Output errors are at: 2.00 sigma
 Database: EDM_Users
 Offset TVD Reference: Offset Datum

Reference Depths are relative to RKB=3508.6+26 @ 3534.6usft (MCVA
 Offset Depths are relative to Offset Datum
 Central Meridian is 104° 20' 0.000 W

Coordinates are relative to: AZORES FEDERAL COM #5H
 Coordinate System is US State Plane 1927 (Exact solution), New Mexico East 30
 Grid Convergence at Surface is: 0.34°

Ladder Plot



LEGEND

FEDERAL COM #10H,OWB,PWP0 V0

BOMBAY FED COM #1H,OWB,ACTUAL WELL PATH V0

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

COG PRODUCTION LLC

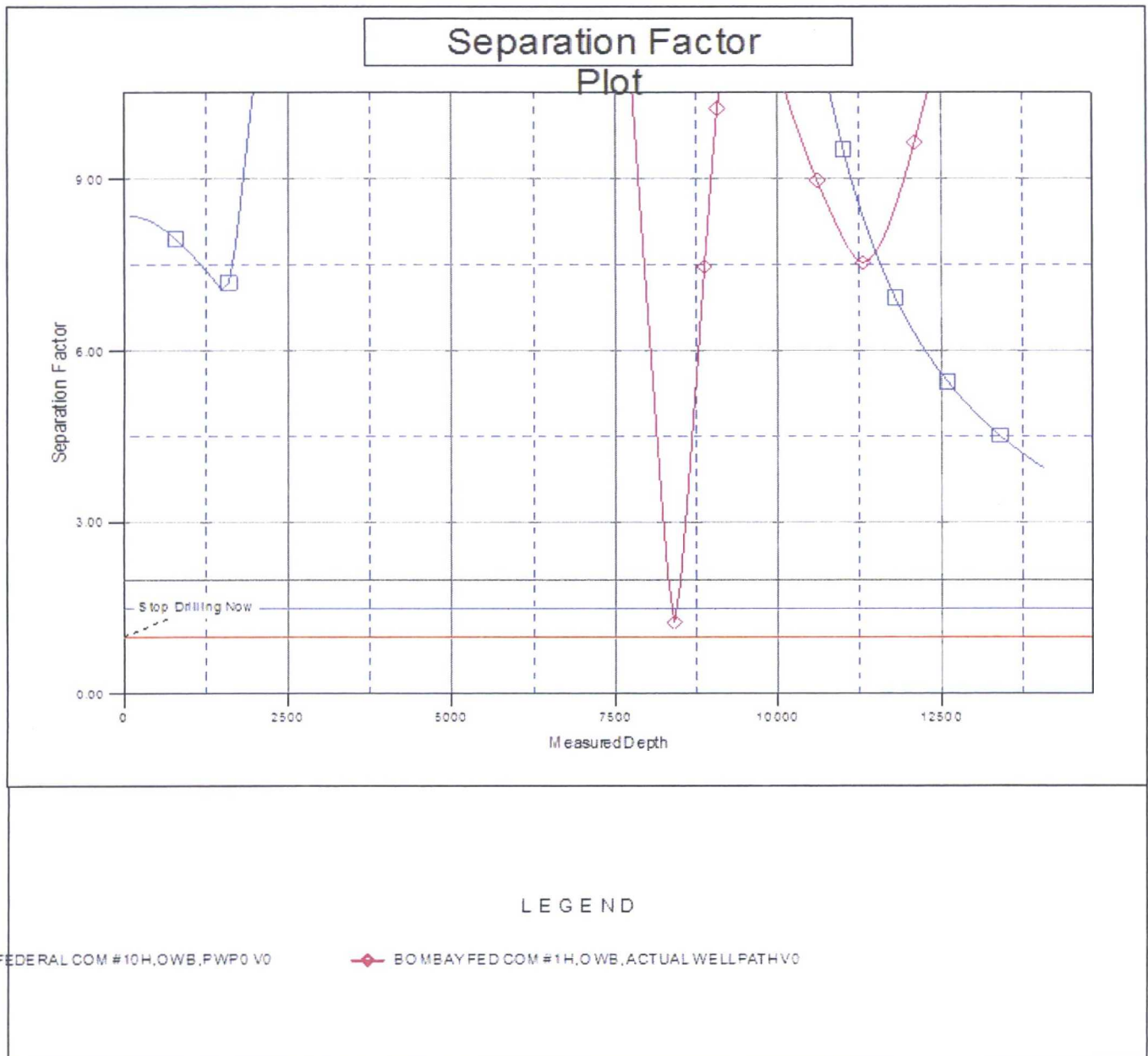
Anticollision Report

Company: COG PRODUCTION LLC
 Project: LEA COUNTY, NM
 Reference Site: AVALON SHALE
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 Reference Well: AZORES FEDERAL COM #5H
 Well Error: 3.0 usft
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Reference Depths are relative to RKB=3508.6+26 @ 3534.6usft (MCVA
 Offset Depths are relative to Offset Datum
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CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation