



Red Willow Production Co.

**Archuleta County, CO NAD83
North Carracas 7F Pad
NC 32-4 7F-1**

**Lateral 1
Plan #5**

Anticollision Report

05 February, 2019





Scientific Drilling, Intl

Anticollision Report



Company:	Red Willow Production Co.	Local Co-ordinate Reference:	Well NC 32-4 7F-1 - Slot 7F-1
Project:	Archuleta County, CO NAD83	TVD Reference:	GL 6159.10' & RKB 14' @ 6173.10usft
Reference Site:	North Carracas 7F Pad	MD Reference:	GL 6159.10' & RKB 14' @ 6173.10usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	NC 32-4 7F-1	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	Lateral 1	Database:	Grand Junction District
Reference Design:	Plan #5	Offset TVD Reference:	Offset Datum

Reference	Plan #5		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	MD + Stations Interval 100.00usft	Error Model:	ISCWSA
Depth Range:	0.00 to 3,500.00usft	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 15,000.00 usft	Error Surface:	Sperry Type
Warning Levels Evaluated at:	2.00 Sigma	Casing Method:	Not applied

Survey Tool Program		Date	2/5/2019		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
3,133.12	8,495.41	Plan #5 (Lateral 1)	SDI MWD	SDI MWD - Standard ver 1.0.1	

Summary						
Site Name	Reference Measured Depth (usft)	Offset Measured Depth (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
Offset Well - Wellbore - Design						
North Carracas 7F Pad						
NC 32-4 7F-1 - Lateral 2 - Plan #5	3,133.12	3,092.30	19.03	11.50	2.528	CC
NC 32-4 7F-1 - Lateral 2 - Plan #5	3,150.00	3,108.66	19.43	11.13	2.341	ES
NC 32-4 7F-1 - Lateral 2 - Plan #5	3,225.00	3,177.78	31.89	17.36	2.195	SF
NC 32-4 7F-1 - Lateral 3 - Plan #5	3,133.12	3,093.00	19.04			
NC 32-4 7F-1 - Lateral 3 - Plan #5	3,134.53	3,093.81	19.05	19.03	1,200.953	ES
NC 32-4 7F-1 - Lateral 3 - Plan #5	3,225.00	3,168.50	50.11	46.65	14.499	SF
NC 32-4 7F-1 - Lateral 4 - Plan #5	3,133.12	3,091.50	19.57	19.50	289.571	CC, ES
NC 32-4 7F-1 - Lateral 4 - Plan #5	3,225.00	3,163.77	58.40	54.87	16.567	SF
NC 32-4 7F-1 - Pilot - Plan #3	3,133.12	3,092.30	19.03	11.50	2.528	CC
NC 32-4 7F-1 - Pilot - Plan #3	3,150.00	3,108.66	19.43	11.13	2.341	ES
NC 32-4 7F-1 - Pilot - Plan #3	3,225.00	3,179.47	30.16	13.35	1.794	SF

Offset Design		North Carracas 7F Pad - NC 32-4 7F-1 - Lateral 2 - Plan #5											Offset Site Error:	0.00 usft
Survey Program:		0-MWD+HDGM, 3113-SDI MWD											Offset Well Error:	0.00 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		
3,133.12	2,805.01	3,092.30	2,787.76	0.00	16.08	6.28	235.08	-653.39	19.03	11.50	7.53	2.528	CC	
3,133.85	2,805.32	3,093.01	2,788.06	0.08	16.09	6.81	235.57	-653.80	19.04	11.49	7.56	2.520		
3,150.00	2,811.87	3,108.66	2,794.67	1.91	16.36	18.81	246.44	-662.91	19.43	11.13	8.30	2.341	ES	
3,175.00	2,821.03	3,132.04	2,804.26	1.91	16.61	37.13	262.77	-676.62	21.35	12.06	9.28	2.299		
3,200.00	2,828.96	3,155.04	2,812.84	1.91	16.78	52.61	279.12	-690.34	25.60	14.02	11.58	2.210		
3,225.00	2,835.63	3,177.78	2,820.46	1.95	16.80	64.07	295.53	-704.11	31.89	17.36	14.53	2.195	SF	
3,250.00	2,841.01	3,200.00	2,827.07	2.53	16.83	72.01	311.78	-717.74	39.80	22.96	16.84	2.363		
3,275.00	2,845.08	3,222.43	2,832.88	3.14	16.88	77.62	328.37	-731.66	49.01	30.47	18.54	2.644		
3,300.00	2,847.84	3,244.30	2,837.72	3.76	16.94	81.40	344.71	-745.38	59.31	39.57	19.73	3.006		
3,325.00	2,849.26	3,265.87	2,841.68	4.38	17.01	83.94	360.95	-759.00	70.56	49.86	20.70	3.409		
3,341.33	2,849.46	3,279.79	2,843.80	4.78	17.07	85.09	371.49	-767.84	78.37	57.12	21.25	3.688		
3,400.00	2,849.17	3,330.07	2,848.64	6.25	17.30	89.51	409.82	-800.01	107.50	84.52	22.99	4.677		
3,500.00	2,848.69	3,424.65	2,848.64	8.75	17.95	89.84	481.28	-861.92	156.21	129.95	26.26	5.948		

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



Scientific Drilling, Intl

Anticollision Report



Company:	Red Willow Production Co.	Local Co-ordinate Reference:	Well NC 32-4 7F-1 - Slot 7F-1
Project:	Archuleta County, CO NAD83	TVD Reference:	GL 6159.10' & RKB 14' @ 6173.10usft
Reference Site:	North Carracas 7F Pad	MD Reference:	GL 6159.10' & RKB 14' @ 6173.10usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	NC 32-4 7F-1	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	Lateral 1	Database:	Grand Junction District
Reference Design:	Plan #5	Offset TVD Reference:	Offset Datum

Offset Design North Carracas 7F Pad - NC 32-4 7F-1 - Lateral 3 - Plan #5												Offset Site Error:	0.00 usft
Survey Program: 3093-SDI MWD												Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Distance							
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	Warning
3,133.12	2,805.01	3,093.00	2,788.06	0.00	0.00	6.77	235.56	-653.79	19.04				
3,134.53	2,805.61	3,093.81	2,788.40	0.16	0.22	7.93	236.23	-654.10	19.05	19.03	0.02	1,200.953 ES	
3,150.00	2,811.87	3,107.07	2,793.86	1.91	1.92	26.28	247.18	-659.21	20.47	19.97	0.50	40.937	
3,175.00	2,821.03	3,128.08	2,802.02	1.91	1.92	49.20	264.73	-667.39	27.32	25.83	1.49	18.287	
3,200.00	2,828.96	3,148.57	2,809.36	1.91	1.92	63.02	282.06	-675.47	37.71	35.34	2.38	15.854	
3,225.00	2,835.63	3,168.50	2,815.93	1.95	1.86	71.17	299.12	-683.43	50.11	46.65	3.46	14.499 SF	
3,250.00	2,841.01	3,187.89	2,821.76	2.53	1.90	76.11	315.87	-691.24	63.84	59.55	4.29	14.884	
3,275.00	2,845.08	3,206.71	2,826.89	3.14	2.15	79.13	332.28	-698.89	78.62	73.51	5.11	15.373	
3,300.00	2,847.84	3,224.96	2,831.37	3.76	2.51	80.88	348.32	-706.37	94.28	88.31	5.97	15.784	
3,325.00	2,849.26	3,242.64	2,835.23	4.38	2.88	81.73	363.96	-713.66	110.72	103.89	6.83	16.216	
3,341.33	2,849.46	3,253.88	2,837.43	4.78	3.12	81.90	373.95	-718.32	121.84	114.46	7.37	16.528	
3,400.00	2,849.17	3,294.26	2,843.80	6.25	3.96	87.06	410.08	-735.17	162.79	153.52	9.28	17.552	
3,500.00	2,848.69	3,364.50	2,848.94	8.75	5.43	89.81	473.54	-764.76	233.41	220.81	12.60	18.523	



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Anticollision Report



Company:	Red Willow Production Co.	Local Co-ordinate Reference:	Well NC 32-4 7F-1 - Slot 7F-1
Project:	Archuleta County, CO NAD83	TVD Reference:	GL 6159.10' & RKB 14' @ 6173.10usft
Reference Site:	North Carracas 7F Pad	MD Reference:	GL 6159.10' & RKB 14' @ 6173.10usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	NC 32-4 7F-1	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	Lateral 1	Database:	Grand Junction District
Reference Design:	Plan #5	Offset TVD Reference:	Offset Datum

Offset Design North Carracas 7F Pad - NC 32-4 7F-1 - Lateral 4 - Plan #5												Offset Site Error:	0.00 usft
Survey Program: 3073-SDI MWD												Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Distance							
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	Warning
3,133.12	2,805.01	3,091.50	2,787.22	0.00	1.33	18.36	237.02	-649.14	19.57	19.50	0.07	289.571	CC, ES
3,134.70	2,805.67	3,092.85	2,787.76	0.18	1.42	20.20	238.15	-649.64	19.79	19.68	0.11	180.006	
3,150.00	2,811.87	3,105.77	2,792.81	1.91	1.93	36.29	249.04	-654.41	23.17	22.36	0.81	28.572	
3,175.00	2,821.03	3,126.10	2,800.34	1.91	1.93	54.56	266.45	-661.72	32.36	30.60	1.76	18.392	
3,200.00	2,828.96	3,145.44	2,807.04	1.91	1.93	65.31	283.30	-668.47	44.44	41.84	2.60	17.123	
3,225.00	2,835.63	3,163.77	2,812.95	1.95	1.88	71.69	299.50	-674.65	58.40	54.87	3.52	16.567	SF
3,250.00	2,841.01	3,181.06	2,818.13	2.53	1.90	75.49	315.00	-680.31	73.77	69.47	4.30	17.159	
3,275.00	2,845.08	3,197.32	2,822.66	3.14	2.16	77.63	329.74	-685.46	90.31	85.29	5.03	17.963	
3,300.00	2,847.84	3,212.54	2,826.58	3.76	2.46	78.58	343.68	-690.13	107.86	102.12	5.74	18.806	
3,325.00	2,849.26	3,226.72	2,829.97	4.38	2.74	78.59	356.79	-694.35	126.29	119.88	6.41	19.711	
3,341.33	2,849.46	3,235.43	2,831.92	4.78	2.91	78.16	364.90	-696.88	138.75	131.93	6.82	20.343	
3,400.00	2,849.17	3,265.26	2,837.84	6.25	3.51	83.73	392.93	-705.16	185.06	176.86	8.21	22.549	
3,500.00	2,848.69	3,312.86	2,844.83	8.75	4.45	88.09	438.46	-717.13	266.89	256.49	10.39	25.680	

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



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Company:	Red Willow Production Co.	Local Co-ordinate Reference:	Well NC 32-4 7F-1 - Slot 7F-1
Project:	Archuleta County, CO NAD83	TVD Reference:	GL 6159.10' & RKB 14' @ 6173.10usft
Reference Site:	North Carracas 7F Pad	MD Reference:	GL 6159.10' & RKB 14' @ 6173.10usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	NC 32-4 7F-1	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	Lateral 1	Database:	Grand Junction District
Reference Design:	Plan #5	Offset TVD Reference:	Offset Datum

Offset Design North Carracas 7F Pad - NC 32-4 7F-1 - Pilot - Plan #3													Offset Site Error:	0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 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		
3,133.12	2,805.01	3,092.30	2,787.76	0.00	16.08	6.28	235.08	-653.39	19.03	11.50	7.53	2.528 CC		
3,133.85	2,805.32	3,093.01	2,788.06	0.08	16.09	6.81	235.57	-653.80	19.04	11.49	7.56	2.520		
3,150.00	2,811.87	3,108.66	2,794.67	1.91	16.36	18.81	246.44	-662.91	19.43	11.13	8.30	2.341 ES		
3,175.00	2,821.03	3,132.65	2,804.81	1.91	16.78	38.05	263.09	-676.89	21.06	11.24	9.83	2.143		
3,200.00	2,828.96	3,156.28	2,814.80	1.91	17.20	56.13	279.50	-690.66	24.54	11.60	12.94	1.897		
3,225.00	2,835.63	3,179.47	2,824.60	1.95	17.61	71.21	295.60	-704.17	30.16	13.35	16.81	1.794 SF		
3,250.00	2,841.01	3,202.13	2,834.17	2.53	18.01	82.82	311.33	-717.36	37.85	18.04	19.80	1.911		
3,275.00	2,845.08	3,224.16	2,843.49	3.14	18.42	91.48	326.63	-730.20	47.40	25.88	21.52	2.203		
3,300.00	2,847.84	3,245.50	2,852.51	3.76	18.81	97.87	341.44	-742.63	58.63	36.11	22.51	2.604		
3,325.00	2,849.26	3,266.06	2,861.19	4.38	19.19	102.58	355.72	-754.61	71.36	48.19	23.17	3.079		
3,341.33	2,849.46	3,279.04	2,866.68	4.78	19.43	104.94	364.72	-762.17	80.44	56.92	23.52	3.421		
3,400.00	2,849.17	3,324.96	2,886.09	6.25	20.29	113.41	396.61	-788.92	114.96	90.25	24.71	4.652		
3,500.00	2,848.69	3,403.24	2,919.17	8.75	21.79	120.25	450.96	-834.53	175.65	148.55	27.11	6.480		

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

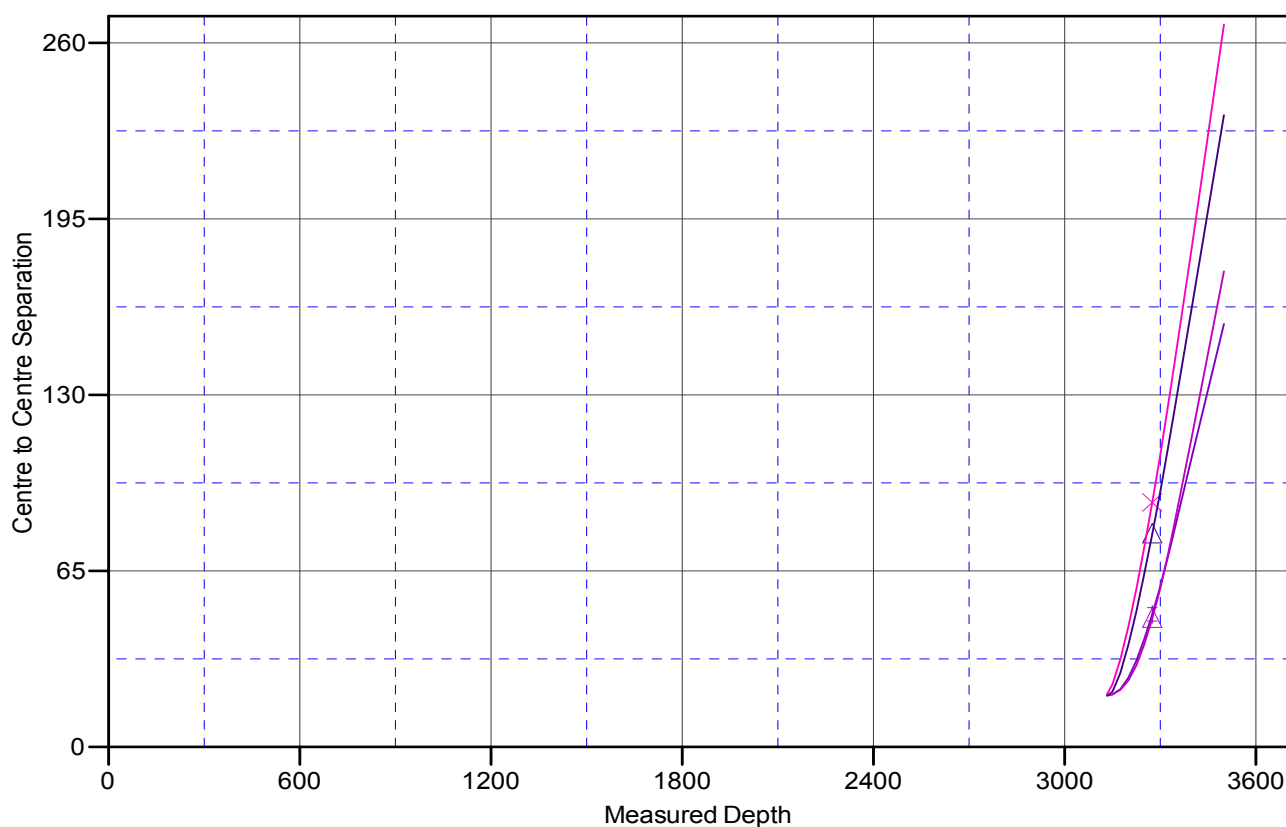


Company:	Red Willow Production Co.	Local Co-ordinate Reference:	Well NC 32-4 7F-1 - Slot 7F-1
Project:	Archuleta County, CO NAD83	TVD Reference:	GL 6159.10' & RKB 14' @ 6173.10usft
Reference Site:	North Carracas 7F Pad	MD Reference:	GL 6159.10' & RKB 14' @ 6173.10usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	NC 32-4 7F-1	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	Lateral 1	Database:	Grand Junction District
Reference Design:	Plan #5	Offset TVD Reference:	Offset Datum

Reference Depths are relative to GL 6159.10' & RKB 14' @ 6173.10usft
Offset Depths are relative to Offset Datum
Central Meridian is -105.5000000

Coordinates are relative to: NC 32-4 7F-1 - Slot 7F-1
Coordinate System is US State Plane 1983, Colorado Southern Zone
Grid Convergence at Surface is: -1.12°

Ladder Plot



LEGEND

- NC 32-4 7F-1, Lateral 2, Plan #5 V0
- NC 32-4 7F-1, Lateral 3, Plan #5 V0
- NC 32-4 7F-1, Pilot, Plan #3 V0
- NC 32-4 7F-1, Lateral 4, Plan #5 V0



Company:	Red Willow Production Co.	Local Co-ordinate Reference:	Well NC 32-4 7F-1 - Slot 7F-1
Project:	Archuleta County, CO NAD83	TVD Reference:	GL 6159.10' & RKB 14' @ 6173.10usft
Reference Site:	North Carracas 7F Pad	MD Reference:	GL 6159.10' & RKB 14' @ 6173.10usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	NC 32-4 7F-1	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	Lateral 1	Database:	Grand Junction District
Reference Design:	Plan #5	Offset TVD Reference:	Offset Datum

Reference Depths are relative to GL 6159.10' & RKB 14' @ 6173.10usf

Offset Depths are relative to Offset Datum

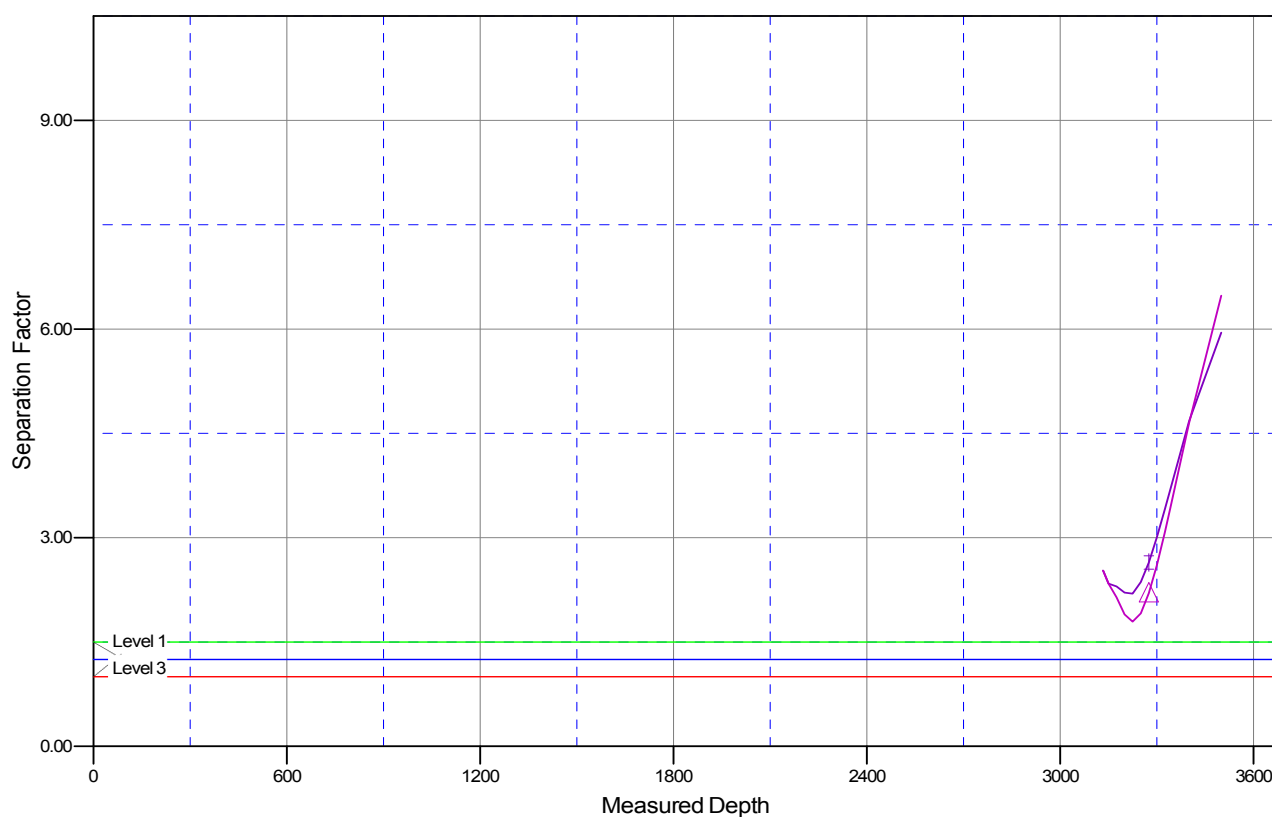
Central Meridian is -105.5000000

Coordinates are relative to: NC 32-4 7F-1 - Slot 7F-1

Coordinate System is US State Plane 1983, Colorado Southern Zone

Grid Convergence at Surface is: -1.12°

Separation Factor Plot



LEGEND

- NC 32-4 7F-1, Lateral 2, Plan #5 V0
- NC 32-4 7F-1, Lateral 3, Plan #5 V0
- NC 32-4 7F-1, Pilot, Plan #3 V0
- NC 32-4 7F-1, Lateral 4, Plan #5 V0