

VERDAD RESOURCES

WATTENBERG FIELD

ARNOLD 02N-64W-24

HELEN 24-17H

Wellbore #1

Plan: Design #1

Standard Planning Report

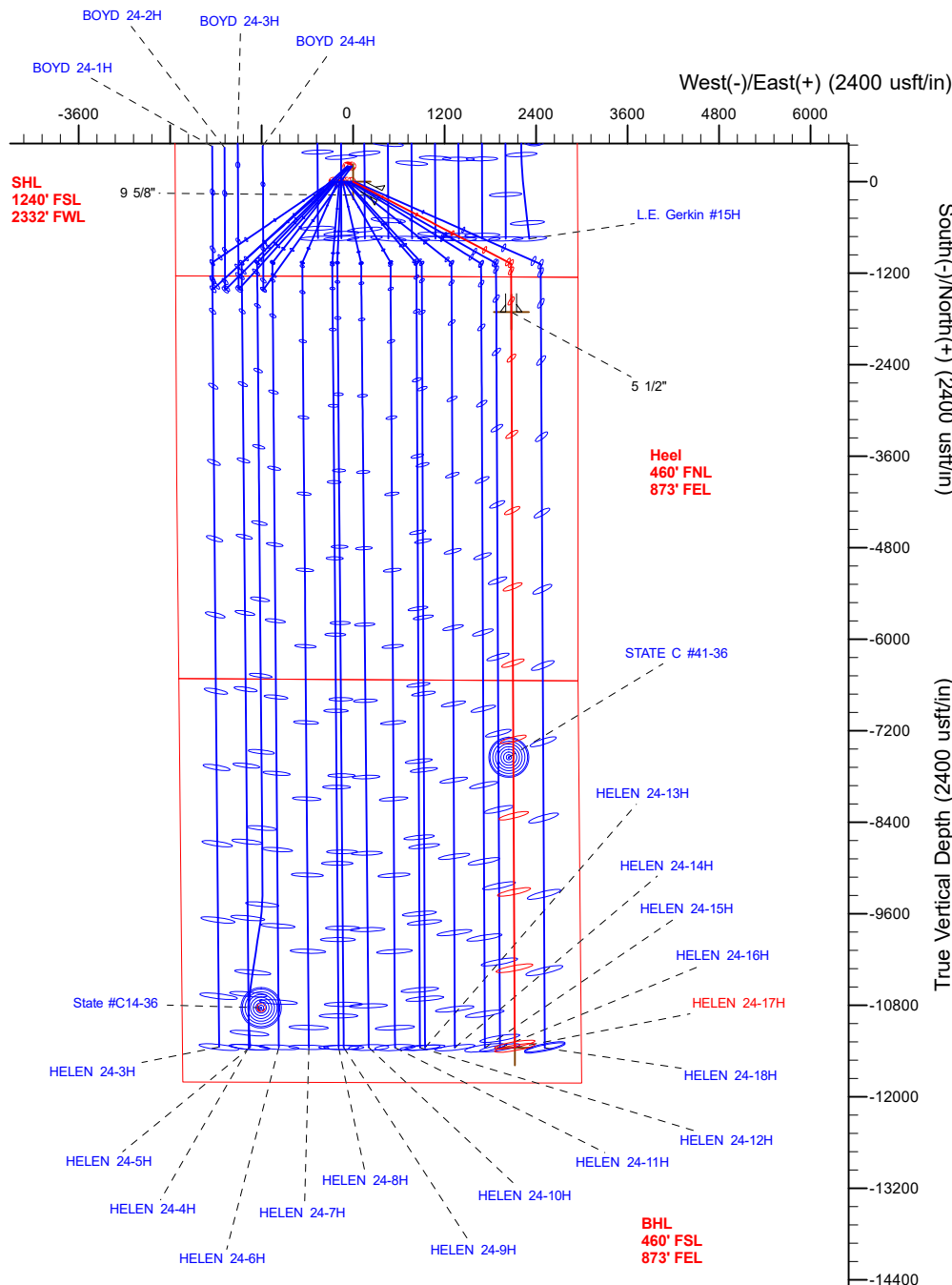
02 November, 2017

Project: WATTENBERG FIELD
Site: ARNOLD 02N-64W-24
Well: HELEN 24-17H
Wellbore: Wellbore #1
Design: Design #1

VERDAD RESOURCES

CASING DETAILS

TVD	MD	Name	Size
1700.00	1770.37	9 5/8"	9-5/8
6850.00	7796.55	5 1/2"	5-1/2

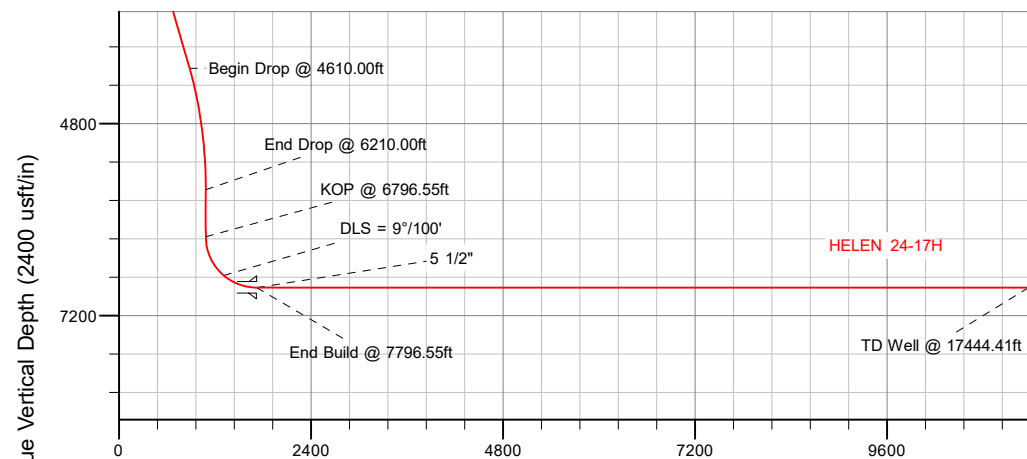


SECTION DETAILS

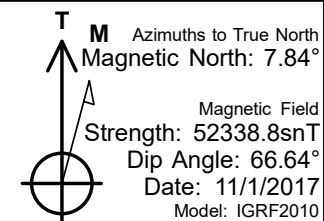
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Target
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	250.00	0.00	0.00	250.00	0.00	0.00	0.00	0.00	0.00	
3	1850.00	32.00	117.40	1768.11	-200.33	386.48	2.00	117.40	202.22	
4	4610.00	32.00	117.40	4108.72	-873.41	1694.97	0.00	0.00	881.63	
5	6210.00	0.00	0.00	5626.93	-1073.74	2071.45	2.00	180.00	1083.85	
6	6796.55	0.00	0.00	6213.38	-1073.74	2071.45	0.00	0.00	1083.85	
7	7796.55	90.00	179.72	6850.00	-1710.35	2074.56	9.00	179.72	1720.47	
8	17444.41	90.00	179.72	6850.00	-11358.09	2121.64	0.00	0.00	11368.33	HELEN 24-17H_BHL

WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude
HELEN 24-17H_SHL	0.00	0.00	0.00	40.120050	-104.500793
HELEN 24-17H_BHL	6850.00	-11358.09	2121.64	40.088870	-104.493210



Vertical Section at 179.72° (2400 usft/in)



WELL DETAILS: HELEN 24-17H

GL = 4923'

RKB = 20' @ 4943.00usft (Drilling Rig)

Plan: Design #1 (HELEN 24-17H/Wellbore #1)

Created By: _____ Date: 11/03/2017
Reviewed: _____ Date: _____

Project	WATTENBERG FIELD		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site		ARNOLD 02N-64W-24				
Site Position:		Northing:	1,288,352.76 usft	Latitude:	40.120602	
From:	Lat/Long	Easting:	3,279,352.74 usft	Longitude:	-104.501071	
Position Uncertainty:		0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.65 °

Well	HELEN 24-17H					
Well Position	+N/-S	-201.09 usft	Northing:	1,288,152.56 usft	Latitude:	40.120050
	+E/-W	77.75 usft	Easting:	3,279,432.74 usft	Longitude:	-104.500793
Position Uncertainty		3.28 usft	Wellhead Elevation:		Ground Level:	4,923.00 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	11/1/2017	7.84	66.64	52,338.79636859

Design	Design #1				
Audit Notes:					
Version:		Phase:	PLAN	Tie On Depth:	0.00
Vertical Section:		Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
		0.00	0.00	0.00	179.72

Plan Survey Tool Program		Date	11/2/2017		
Depth From (usft)	Depth To (usft)	Survey (Wellbore)	Tool Name	Remarks	
1	0.00	1,700.00	Design #1 (Wellbore #1)	ISCWSA REV 2 MWD Fixed:v2:standard declination	
2	1,700.00	17,444.41	Design #1 (Wellbore #1)	ISCWSA REV 2 MWD Fixed:v2:standard declination	

Plan Sections										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
250.00	0.00	0.00	250.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,850.00	32.00	117.40	1,768.11	-200.33	386.48	2.00	2.00	0.00	117.40	
4,610.00	32.00	117.40	4,108.72	-873.41	1,684.97	0.00	0.00	0.00	0.00	
6,210.00	0.00	0.00	5,626.83	-1,073.74	2,071.45	2.00	-2.00	0.00	180.00	
6,796.55	0.00	0.00	6,213.38	-1,073.74	2,071.45	0.00	0.00	0.00	0.00	
7,796.55	90.00	179.72	6,850.00	-1,710.35	2,074.56	9.00	9.00	17.97	179.72	
17,444.41	90.00	179.72	6,850.00	-11,358.09	2,121.64	0.00	0.00	0.00	0.00	HELEN 24-17H_BHL

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)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00
250.00	0.00	0.00	250.00	0.00	0.00	0.00	0.00	0.00	0.00
Begin Nudge @ 250.00ft									
300.00	1.00	117.40	300.00	-0.20	0.39	0.20	2.00	2.00	0.00
400.00	3.00	117.40	399.93	-1.81	3.49	1.82	2.00	2.00	0.00
500.00	5.00	117.40	499.68	-5.02	9.68	5.06	2.00	2.00	0.00
600.00	7.00	117.40	599.13	-9.83	18.96	9.92	2.00	2.00	0.00
700.00	9.00	117.40	698.15	-16.23	31.31	16.38	2.00	2.00	0.00
800.00	11.00	117.40	796.63	-24.22	46.73	24.45	2.00	2.00	0.00
900.00	13.00	117.40	894.44	-33.79	65.19	34.11	2.00	2.00	0.00
1,000.00	15.00	117.40	991.46	-44.92	86.66	45.35	2.00	2.00	0.00
1,100.00	17.00	117.40	1,087.58	-57.61	111.13	58.15	2.00	2.00	0.00
1,200.00	19.00	117.40	1,182.68	-71.83	138.57	72.50	2.00	2.00	0.00
1,300.00	21.00	117.40	1,276.65	-87.57	168.93	88.39	2.00	2.00	0.00
1,400.00	23.00	117.40	1,369.36	-104.80	202.19	105.79	2.00	2.00	0.00
1,500.00	25.00	117.40	1,460.71	-123.52	238.30	124.68	2.00	2.00	0.00
1,600.00	27.00	117.40	1,550.59	-143.69	277.21	145.05	2.00	2.00	0.00
1,700.00	29.00	117.40	1,638.88	-165.30	318.89	166.85	2.00	2.00	0.00
1,770.37	30.41	117.40	1,700.00	-181.35	349.85	183.05	2.00	2.00	0.00
9 5/8"									
1,800.00	31.00	117.40	1,725.48	-188.31	363.28	190.08	2.00	2.00	0.00
1,850.00	32.00	117.40	1,768.11	-200.33	386.48	202.22	2.00	2.00	0.00
End Nudge @ 1850.00ft									
1,900.00	32.00	117.40	1,810.51	-212.52	410.00	214.52	0.00	0.00	0.00
2,000.00	32.00	117.40	1,895.31	-236.91	457.05	239.14	0.00	0.00	0.00
2,100.00	32.00	117.40	1,980.12	-261.30	504.09	263.76	0.00	0.00	0.00
2,200.00	32.00	117.40	2,064.92	-285.68	551.14	288.37	0.00	0.00	0.00
2,300.00	32.00	117.40	2,149.73	-310.07	598.19	312.99	0.00	0.00	0.00
2,400.00	32.00	117.40	2,234.53	-334.46	645.23	337.61	0.00	0.00	0.00
2,500.00	32.00	117.40	2,319.34	-358.84	692.28	362.22	0.00	0.00	0.00
2,600.00	32.00	117.40	2,404.14	-383.23	739.33	386.84	0.00	0.00	0.00
2,700.00	32.00	117.40	2,488.95	-407.62	786.37	411.46	0.00	0.00	0.00
2,800.00	32.00	117.40	2,573.75	-432.00	833.42	436.07	0.00	0.00	0.00
2,900.00	32.00	117.40	2,658.56	-456.39	880.47	460.69	0.00	0.00	0.00
3,000.00	32.00	117.40	2,743.36	-480.78	927.52	485.31	0.00	0.00	0.00
3,100.00	32.00	117.40	2,828.17	-505.17	974.56	509.92	0.00	0.00	0.00
3,200.00	32.00	117.40	2,912.97	-529.55	1,021.61	534.54	0.00	0.00	0.00
3,300.00	32.00	117.40	2,997.78	-553.94	1,068.66	559.16	0.00	0.00	0.00
3,400.00	32.00	117.40	3,082.58	-578.33	1,115.70	583.77	0.00	0.00	0.00
3,500.00	32.00	117.40	3,167.39	-602.71	1,162.75	608.39	0.00	0.00	0.00
3,600.00	32.00	117.40	3,252.19	-627.10	1,209.80	633.00	0.00	0.00	0.00
3,700.00	32.00	117.40	3,337.00	-651.49	1,256.85	657.62	0.00	0.00	0.00
3,800.00	32.00	117.40	3,421.80	-675.87	1,303.89	682.24	0.00	0.00	0.00
3,900.00	32.00	117.40	3,506.61	-700.26	1,350.94	706.85	0.00	0.00	0.00
4,000.00	32.00	117.40	3,591.41	-724.65	1,397.99	731.47	0.00	0.00	0.00
4,100.00	32.00	117.40	3,676.22	-749.03	1,445.03	756.09	0.00	0.00	0.00
4,200.00	32.00	117.40	3,761.02	-773.42	1,492.08	780.70	0.00	0.00	0.00
4,300.00	32.00	117.40	3,845.82	-797.81	1,539.13	805.32	0.00	0.00	0.00
4,400.00	32.00	117.40	3,930.63	-822.19	1,586.17	829.94	0.00	0.00	0.00
4,500.00	32.00	117.40	4,015.43	-846.58	1,633.22	854.55	0.00	0.00	0.00
4,600.00	32.00	117.40	4,100.24	-870.97	1,680.27	879.17	0.00	0.00	0.00
4,610.00	32.00	117.40	4,108.72	-873.41	1,684.97	881.63	0.00	0.00	0.00
Begin Drop @ 4610.00ft									
4,700.00	30.20	117.40	4,185.78	-894.80	1,726.24	903.23	2.00	-2.00	0.00
4,800.00	28.20	117.40	4,273.07	-917.25	1,769.56	925.89	2.00	-2.00	0.00
4,900.00	26.20	117.40	4,362.01	-938.28	1,810.14	947.12	2.00	-2.00	0.00
5,000.00	24.20	117.40	4,452.48	-957.88	1,847.93	966.90	2.00	-2.00	0.00
5,100.00	22.20	117.40	4,544.39	-976.01	1,882.91	985.20	2.00	-2.00	0.00
5,200.00	20.20	117.40	4,637.62	-992.65	1,915.01	1,001.99	2.00	-2.00	0.00
5,300.00	18.20	117.40	4,732.05	-1,007.78	1,944.21	1,017.27	2.00	-2.00	0.00
5,400.00	16.20	117.40	4,827.58	-1,021.39	1,970.46	1,031.01	2.00	-2.00	0.00
5,500.00	14.20	117.40	4,924.07	-1,033.45	1,993.74	1,043.19	2.00	-2.00	0.00
5,600.00	12.20	117.40	5,021.43	-1,043.96	2,014.01	1,053.79	2.00	-2.00	0.00
5,700.00	10.20	117.40	5,119.52	-1,052.90	2,031.25	1,062.81	2.00	-2.00	0.00

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)
5,800.00	8.20	117.40	5,218.22	-1,060.26	2,045.45	1,070.24	2.00	-2.00	0.00
5,900.00	6.20	117.40	5,317.43	-1,066.03	2,056.57	1,076.06	2.00	-2.00	0.00
6,000.00	4.20	117.40	5,417.01	-1,070.20	2,064.62	1,080.27	2.00	-2.00	0.00
6,100.00	2.20	117.40	5,516.85	-1,072.77	2,069.57	1,082.87	2.00	-2.00	0.00
6,200.00	0.20	117.40	5,616.83	-1,073.73	2,071.43	1,083.84	2.00	-2.00	0.00
6,210.00	0.00	0.00	5,626.83	-1,073.74	2,071.45	1,083.85	2.00	-2.00	-1,174.00
End Drop @ 6210.00ft									
6,300.00	0.00	0.00	5,716.83	-1,073.74	2,071.45	1,083.85	0.00	0.00	0.00
6,400.00	0.00	0.00	5,816.83	-1,073.74	2,071.45	1,083.85	0.00	0.00	0.00
6,500.00	0.00	0.00	5,916.83	-1,073.74	2,071.45	1,083.85	0.00	0.00	0.00
6,600.00	0.00	0.00	6,016.83	-1,073.74	2,071.45	1,083.85	0.00	0.00	0.00
6,700.00	0.00	0.00	6,116.83	-1,073.74	2,071.45	1,083.85	0.00	0.00	0.00
6,796.55	0.00	0.00	6,213.38	-1,073.74	2,071.45	1,083.85	0.00	0.00	0.00
KOP @ 6796.55ft									
6,800.00	0.31	179.72	6,216.83	-1,073.75	2,071.45	1,083.86	9.00	9.00	0.00
6,850.00	4.81	179.72	6,266.76	-1,075.98	2,071.46	1,086.09	9.00	9.00	0.00
6,900.00	9.31	179.72	6,316.37	-1,082.12	2,071.49	1,092.23	9.00	9.00	0.00
6,950.00	13.81	179.72	6,365.35	-1,092.14	2,071.54	1,102.25	9.00	9.00	0.00
7,000.00	18.31	179.72	6,413.38	-1,105.97	2,071.61	1,116.08	9.00	9.00	0.00
7,050.00	22.81	179.72	6,460.18	-1,123.53	2,071.69	1,133.64	9.00	9.00	0.00
7,100.00	27.31	179.72	6,505.47	-1,144.70	2,071.79	1,154.81	9.00	9.00	0.00
7,150.00	31.81	179.72	6,548.95	-1,169.36	2,071.92	1,179.47	9.00	9.00	0.00
7,200.00	36.31	179.72	6,590.36	-1,197.35	2,072.05	1,207.47	9.00	9.00	0.00
7,250.00	40.81	179.72	6,629.45	-1,228.51	2,072.20	1,238.63	9.00	9.00	0.00
7,300.00	45.31	179.72	6,665.97	-1,262.64	2,072.37	1,272.75	9.00	9.00	0.00
7,350.00	49.81	179.72	6,699.70	-1,299.53	2,072.55	1,309.64	9.00	9.00	0.00
DLS = 9°/100'									
7,400.00	54.31	179.72	6,730.43	-1,338.95	2,072.74	1,349.07	9.00	9.00	0.00
7,450.00	58.81	179.72	6,757.98	-1,380.67	2,072.95	1,390.78	9.00	9.00	0.00
7,500.00	63.31	179.72	6,782.17	-1,424.41	2,073.16	1,434.53	9.00	9.00	0.00
7,550.00	67.81	179.72	6,802.85	-1,469.92	2,073.38	1,480.03	9.00	9.00	0.00
7,600.00	72.31	179.72	6,819.90	-1,516.91	2,073.61	1,527.02	9.00	9.00	0.00
7,650.00	76.81	179.72	6,833.20	-1,565.09	2,073.85	1,575.21	9.00	9.00	0.00
7,700.00	81.31	179.72	6,842.69	-1,614.17	2,074.09	1,624.29	9.00	9.00	0.00
7,750.00	85.81	179.72	6,848.30	-1,663.84	2,074.33	1,673.96	9.00	9.00	0.00
7,796.55	90.00	179.72	6,850.00	-1,710.35	2,074.56	1,720.47	9.00	9.00	0.00
End Build @ 7796.55ft - 5 1/2"									
7,800.00	90.00	179.72	6,850.00	-1,713.80	2,074.57	1,723.92	0.00	0.00	0.00
7,900.00	90.00	179.72	6,850.00	-1,813.80	2,075.06	1,823.92	0.00	0.00	0.00
8,000.00	90.00	179.72	6,850.00	-1,913.80	2,075.55	1,923.92	0.00	0.00	0.00
8,100.00	90.00	179.72	6,850.00	-2,013.80	2,076.04	2,023.92	0.00	0.00	0.00
8,200.00	90.00	179.72	6,850.00	-2,113.79	2,076.52	2,123.92	0.00	0.00	0.00
8,300.00	90.00	179.72	6,850.00	-2,213.79	2,077.01	2,223.92	0.00	0.00	0.00
8,400.00	90.00	179.72	6,850.00	-2,313.79	2,077.50	2,323.92	0.00	0.00	0.00
8,500.00	90.00	179.72	6,850.00	-2,413.79	2,077.99	2,423.92	0.00	0.00	0.00
8,600.00	90.00	179.72	6,850.00	-2,513.79	2,078.48	2,523.92	0.00	0.00	0.00
8,700.00	90.00	179.72	6,850.00	-2,613.79	2,078.96	2,623.92	0.00	0.00	0.00
8,800.00	90.00	179.72	6,850.00	-2,713.79	2,079.45	2,723.92	0.00	0.00	0.00
8,900.00	90.00	179.72	6,850.00	-2,813.79	2,079.94	2,823.92	0.00	0.00	0.00
9,000.00	90.00	179.72	6,850.00	-2,913.78	2,080.43	2,923.92	0.00	0.00	0.00
9,100.00	90.00	179.72	6,850.00	-3,013.78	2,080.92	3,023.92	0.00	0.00	0.00
9,200.00	90.00	179.72	6,850.00	-3,113.78	2,081.40	3,123.92	0.00	0.00	0.00
9,300.00	90.00	179.72	6,850.00	-3,213.78	2,081.89	3,223.92	0.00	0.00	0.00
9,400.00	90.00	179.72	6,850.00	-3,313.78	2,082.38	3,323.92	0.00	0.00	0.00
9,500.00	90.00	179.72	6,850.00	-3,413.78	2,082.87	3,423.92	0.00	0.00	0.00
9,600.00	90.00	179.72	6,850.00	-3,513.78	2,083.36	3,523.92	0.00	0.00	0.00
9,700.00	90.00	179.72	6,850.00	-3,613.78	2,083.84	3,623.92	0.00	0.00	0.00
9,800.00	90.00	179.72	6,850.00	-3,713.78	2,084.33	3,723.92	0.00	0.00	0.00
9,900.00	90.00	179.72	6,850.00	-3,813.77	2,084.82	3,823.92	0.00	0.00	0.00
10,000.00	90.00	179.72	6,850.00	-3,913.77	2,085.31	3,923.92	0.00	0.00	0.00
10,100.00	90.00	179.72	6,850.00	-4,013.77	2,085.80	4,023.92	0.00	0.00	0.00
10,200.00	90.00	179.72	6,850.00	-4,113.77	2,086.28	4,123.92	0.00	0.00	0.00
10,300.00	90.00	179.72	6,850.00	-4,213.77	2,086.77	4,223.92	0.00	0.00	0.00
10,400.00	90.00	179.72	6,850.00	-4,313.77	2,087.26	4,323.92	0.00	0.00	0.00
10,500.00	90.00	179.72	6,850.00	-4,413.77	2,087.75	4,423.92	0.00	0.00	0.00
10,600.00	90.00	179.72	6,850.00	-4,513.77	2,088.24	4,523.92	0.00	0.00	0.00

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)
10,700.00	90.00	179.72	6,850.00	-4,613.76	2,088.72	4,623.92	0.00	0.00	0.00
10,800.00	90.00	179.72	6,850.00	-4,713.76	2,089.21	4,723.92	0.00	0.00	0.00
10,900.00	90.00	179.72	6,850.00	-4,813.76	2,089.70	4,823.92	0.00	0.00	0.00
11,000.00	90.00	179.72	6,850.00	-4,913.76	2,090.19	4,923.92	0.00	0.00	0.00
11,100.00	90.00	179.72	6,850.00	-5,013.76	2,090.68	5,023.92	0.00	0.00	0.00
11,200.00	90.00	179.72	6,850.00	-5,113.76	2,091.16	5,123.92	0.00	0.00	0.00
11,300.00	90.00	179.72	6,850.00	-5,213.76	2,091.65	5,223.92	0.00	0.00	0.00
11,400.00	90.00	179.72	6,850.00	-5,313.76	2,092.14	5,323.92	0.00	0.00	0.00
11,500.00	90.00	179.72	6,850.00	-5,413.76	2,092.63	5,423.92	0.00	0.00	0.00
11,600.00	90.00	179.72	6,850.00	-5,513.75	2,093.12	5,523.92	0.00	0.00	0.00
11,700.00	90.00	179.72	6,850.00	-5,613.75	2,093.60	5,623.92	0.00	0.00	0.00
11,800.00	90.00	179.72	6,850.00	-5,713.75	2,094.09	5,723.92	0.00	0.00	0.00
11,900.00	90.00	179.72	6,850.00	-5,813.75	2,094.58	5,823.92	0.00	0.00	0.00
12,000.00	90.00	179.72	6,850.00	-5,913.75	2,095.07	5,923.92	0.00	0.00	0.00
12,100.00	90.00	179.72	6,850.00	-6,013.75	2,095.56	6,023.92	0.00	0.00	0.00
12,200.00	90.00	179.72	6,850.00	-6,113.75	2,096.04	6,123.92	0.00	0.00	0.00
12,300.00	90.00	179.72	6,850.00	-6,213.75	2,096.53	6,223.92	0.00	0.00	0.00
12,400.00	90.00	179.72	6,850.00	-6,313.74	2,097.02	6,323.92	0.00	0.00	0.00
12,500.00	90.00	179.72	6,850.00	-6,413.74	2,097.51	6,423.92	0.00	0.00	0.00
12,600.00	90.00	179.72	6,850.00	-6,513.74	2,098.00	6,523.92	0.00	0.00	0.00
12,700.00	90.00	179.72	6,850.00	-6,613.74	2,098.48	6,623.92	0.00	0.00	0.00
12,800.00	90.00	179.72	6,850.00	-6,713.74	2,098.97	6,723.92	0.00	0.00	0.00
12,900.00	90.00	179.72	6,850.00	-6,813.74	2,099.46	6,823.92	0.00	0.00	0.00
13,000.00	90.00	179.72	6,850.00	-6,913.74	2,099.95	6,923.92	0.00	0.00	0.00
13,100.00	90.00	179.72	6,850.00	-7,013.74	2,100.44	7,023.92	0.00	0.00	0.00
13,200.00	90.00	179.72	6,850.00	-7,113.73	2,100.92	7,123.92	0.00	0.00	0.00
13,300.00	90.00	179.72	6,850.00	-7,213.73	2,101.41	7,223.92	0.00	0.00	0.00
13,400.00	90.00	179.72	6,850.00	-7,313.73	2,101.90	7,323.92	0.00	0.00	0.00
13,500.00	90.00	179.72	6,850.00	-7,413.73	2,102.39	7,423.92	0.00	0.00	0.00
13,600.00	90.00	179.72	6,850.00	-7,513.73	2,102.88	7,523.92	0.00	0.00	0.00
13,700.00	90.00	179.72	6,850.00	-7,613.73	2,103.36	7,623.92	0.00	0.00	0.00
13,800.00	90.00	179.72	6,850.00	-7,713.73	2,103.85	7,723.92	0.00	0.00	0.00
13,900.00	90.00	179.72	6,850.00	-7,813.73	2,104.34	7,823.92	0.00	0.00	0.00
14,000.00	90.00	179.72	6,850.00	-7,913.73	2,104.83	7,923.92	0.00	0.00	0.00
14,100.00	90.00	179.72	6,850.00	-8,013.72	2,105.32	8,023.92	0.00	0.00	0.00
14,200.00	90.00	179.72	6,850.00	-8,113.72	2,105.80	8,123.92	0.00	0.00	0.00
14,300.00	90.00	179.72	6,850.00	-8,213.72	2,106.29	8,223.92	0.00	0.00	0.00
14,400.00	90.00	179.72	6,850.00	-8,313.72	2,106.78	8,323.92	0.00	0.00	0.00
14,500.00	90.00	179.72	6,850.00	-8,413.72	2,107.27	8,423.92	0.00	0.00	0.00
14,600.00	90.00	179.72	6,850.00	-8,513.72	2,107.76	8,523.92	0.00	0.00	0.00
14,700.00	90.00	179.72	6,850.00	-8,613.72	2,108.24	8,623.92	0.00	0.00	0.00
14,800.00	90.00	179.72	6,850.00	-8,713.72	2,108.73	8,723.92	0.00	0.00	0.00
14,900.00	90.00	179.72	6,850.00	-8,813.71	2,109.22	8,823.92	0.00	0.00	0.00
15,000.00	90.00	179.72	6,850.00	-8,913.71	2,109.71	8,923.92	0.00	0.00	0.00
15,100.00	90.00	179.72	6,850.00	-9,013.71	2,110.20	9,023.92	0.00	0.00	0.00
15,200.00	90.00	179.72	6,850.00	-9,113.71	2,110.68	9,123.92	0.00	0.00	0.00
15,300.00	90.00	179.72	6,850.00	-9,213.71	2,111.17	9,223.92	0.00	0.00	0.00
15,400.00	90.00	179.72	6,850.00	-9,313.71	2,111.66	9,323.92	0.00	0.00	0.00
15,500.00	90.00	179.72	6,850.00	-9,413.71	2,112.15	9,423.92	0.00	0.00	0.00
15,600.00	90.00	179.72	6,850.00	-9,513.71	2,112.64	9,523.92	0.00	0.00	0.00
15,700.00	90.00	179.72	6,850.00	-9,613.71	2,113.12	9,623.92	0.00	0.00	0.00
15,800.00	90.00	179.72	6,850.00	-9,713.70	2,113.61	9,723.92	0.00	0.00	0.00
15,900.00	90.00	179.72	6,850.00	-9,813.70	2,114.10	9,823.92	0.00	0.00	0.00
16,000.00	90.00	179.72	6,850.00	-9,913.70	2,114.59	9,923.92	0.00	0.00	0.00
16,100.00	90.00	179.72	6,850.00	-10,013.70	2,115.08	10,023.92	0.00	0.00	0.00
16,200.00	90.00	179.72	6,850.00	-10,113.70	2,115.56	10,123.92	0.00	0.00	0.00
16,300.00	90.00	179.72	6,850.00	-10,213.70	2,116.05	10,223.92	0.00	0.00	0.00
16,400.00	90.00	179.72	6,850.00	-10,313.70	2,116.54	10,323.92	0.00	0.00	0.00
16,500.00	90.00	179.72	6,850.00	-10,413.70	2,117.03	10,423.92	0.00	0.00	0.00
16,600.00	90.00	179.72	6,850.00	-10,513.69	2,117.52	10,523.92	0.00	0.00	0.00
16,700.00	90.00	179.72	6,850.00	-10,613.69	2,118.00	10,623.92	0.00	0.00	0.00
16,800.00	90.00	179.72	6,850.00	-10,713.69	2,118.49	10,723.92	0.00	0.00	0.00
16,900.00	90.00	179.72	6,850.00	-10,813.69	2,118.98	10,823.92	0.00	0.00	0.00
17,000.00	90.00	179.72	6,850.00	-10,913.69	2,119.47	10,923.92	0.00	0.00	0.00
17,100.00	90.00	179.72	6,850.00	-11,013.69	2,119.96	11,023.92	0.00	0.00	0.00
17,200.00	90.00	179.72	6,850.00	-11,113.69	2,120.44	11,123.92	0.00	0.00	0.00

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)
17,300.00	90.00	179.72	6,850.00	-11,213.69	2,120.93	11,223.92	0.00	0.00	0.00
17,400.00	90.00	179.72	6,850.00	-11,313.68	2,121.42	11,323.92	0.00	0.00	0.00
17,444.41	90.00	179.72	6,850.00	-11,358.09	2,121.64	11,368.33	0.00	0.00	0.00
TD Well @ 17444.41ft									

Casing Points					
Measured Depth (usft)	Vertical Depth (usft)	Name		Casing Diameter (")	Hole Diameter (")
1,770.37	1,700.00	9 5/8"		9-5/8	13-1/2
7,796.55	6,850.00	5 1/2"		5-1/2	8-1/2

Plan Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
250.00	250.00	+N/-S (usft)	+E/-W (usft)	Begin Nudge @ 250.00ft
1,850.00	1,768.11	-200.33	386.48	End Nudge @ 1850.00ft
4,610.00	4,108.72	-873.41	1,684.97	Begin Drop @ 4610.00ft
6,210.00	5,626.83	-1,073.74	2,071.45	End Drop @ 6210.00ft
6,796.55	6,213.38	-1,073.74	2,071.45	KOP @ 6796.55ft
7,350.00	6,699.70	-1,299.53	2,072.55	DLS = 9°/100'
7,796.55	6,850.00	-1,710.35	2,074.56	End Build @ 7796.55ft
17,444.41	6,850.00	-11,358.09	2,121.64	TD Well @ 17444.41ft

VERDAD RESOURCES

WATTENBERG FIELD

ARNOLD 02N-64W-24

HELEN 24-17H

Wellbore #1

Design #1

Anticollision Summary Report

02 November, 2017

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 9,999.98 usft	Error Surface:	Pedal Curve		
Warning Levels Evaluated at:	2.45 Sigma	Casing Method:	Added to Error Values		

Survey Tool Program	Date 11/2/2017				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
0.00	1,700.00	Design #1 (Wellbore #1)	ISCWSA REV 2 MWD	Fixed:v2:standard declination	
1,700.00	17,444.41	Design #1 (Wellbore #1)	ISCWSA REV 2 MWD	Fixed:v2:standard declination	

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						
2N-64W-13 L.E. GERKIN EAST PAD						
L.E. Gerkin #12H - Red Hawk Petroleum Planned Well - P	7,141.34	16,446.50	838.44	623.30	3.897	CC, ES, SF
L.E. Gerkin #9H - Red Hawk Petroleum Planned Well - P	7,139.07	16,541.50	1,681.17	1,428.71	6.659	CC, ES
L.E. Gerkin #9H - Red Hawk Petroleum Planned Well - P	7,150.00	16,541.50	1,681.23	1,428.75	6.659	SF
L.E. Gerkin #10H - Red Hawk Petroleum Planned Well - P	7,139.51	16,489.70	1,387.44	1,141.55	5.643	CC, ES, SF
L.E. Gerkin #11H - Red Hawk Petroleum Planned Well - P	7,139.89	16,457.40	1,104.96	870.04	4.704	CC, ES, SF
L.E. Gerkin #13H - Red Hawk Petroleum Planned Well - P	7,141.73	16,448.80	613.60	439.90	3.533	CC, ES, SF
L.E. Gerkin #14H - Red Hawk Petroleum Planned Well - P	7,050.00	16,481.10	504.76	399.61	4.800	SF
L.E. Gerkin #14H - Red Hawk Petroleum Planned Well - P	7,142.20	16,481.10	489.72	390.34	4.928	CC, ES
L.E. Gerkin #15H - Red Hawk Petroleum Planned Well - P	7,142.67	16,511.10	540.52	367.05	3.116	CC
L.E. Gerkin #15H - Red Hawk Petroleum Planned Well - P	7,150.00	16,511.10	540.60	366.99	3.114	ES, SF
2N-64W-13 L.E. GERKIN WEST PAD						
L.E. Gerkin #6H - Red Hawk Petroleum Planned Well - P	7,100.00	16,431.70	2,576.32	2,321.12	10.095	SF
L.E. Gerkin #6H - Red Hawk Petroleum Planned Well - P	7,118.60	16,431.70	2,576.21	2,321.02	10.096	CC, ES
L.E. Gerkin #7H - Red Hawk Petroleum Planned Well - P	7,100.00	16,464.00	2,273.98	2,021.50	9.006	SF
L.E. Gerkin #7H - Red Hawk Petroleum Planned Well - P	7,119.13	16,464.00	2,273.84	2,021.43	9.008	CC, ES
L.E. Gerkin #8H - Red Hawk Petroleum Planned Well - P	7,100.00	16,517.20	1,974.77	1,725.75	7.930	SF
L.E. Gerkin #8H - Red Hawk Petroleum Planned Well - P	7,120.50	16,517.20	1,974.58	1,725.71	7.934	CC, ES
2N-64W-13 Offsets						
ARNOLD #1 - Barrett Resources P/A Well - No Surveys	250.00	179.00	7,872.92	7,863.18	808.397	CC
ARNOLD #1 - Barrett Resources P/A Well - No Surveys	700.00	627.15	7,881.03	7,855.75	311.739	ES
ARNOLD #1 - Barrett Resources P/A Well - No Surveys	7,300.00	6,605.03	8,895.07	8,610.13	31.217	SF
DARYL L ARNOLD #1 - Amoco D/A Well - No Surveys	250.00	210.00	8,316.38	8,305.71	779.949	CC
DARYL L ARNOLD #1 - Amoco D/A Well - No Surveys	400.00	359.93	8,318.49	8,302.83	531.402	ES
DARYL L ARNOLD #1 - Amoco D/A Well - No Surveys	7,350.00	6,659.70	9,987.19	9,708.94	35.893	SF
2N-64W-24 Offsets						
MCCLINTOCK ET AL #1 - Juniper Oil & Gas D/A Well - N	4,371.58	3,857.53	1,742.73	1,562.99	9.696	CC
MCCLINTOCK ET AL #1 - Juniper Oil & Gas D/A Well - N	4,610.00	4,059.72	1,747.30	1,557.13	9.188	ES
MCCLINTOCK ET AL #1 - Juniper Oil & Gas D/A Well - N	6,950.00	6,316.35	1,849.13	1,571.15	6.652	SF
2N-64W-36 Offsets						
State #C14-36 - Noble Energy PR Well - No Surveys	16,902.59	6,821.00	3,324.89	2,831.86	6.744	CC, ES
State #C14-36 - Noble Energy PR Well - No Surveys	17,100.00	6,821.00	3,330.75	2,836.14	6.734	SF
STATE C #41-36 - Prima Exploration P/A Well - No Surveys	13,634.11	6,779.00	60.06	-355.28	0.145	Level 1, CC, ES, SF

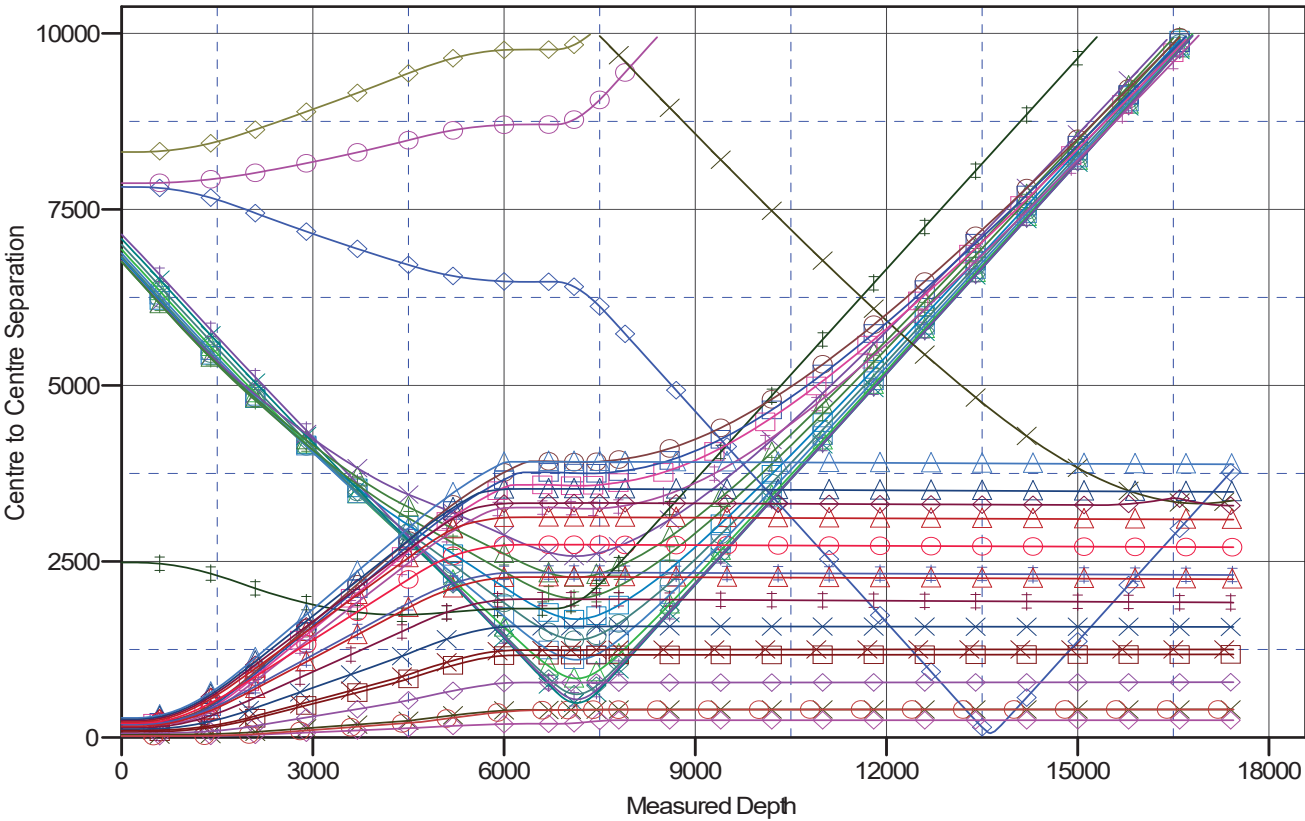
Summary

Site Name Offset Well - Wellbore - Design	Reference	Offset	Distance		Separation Factor	Warning
	Measured Depth (usft)	Measured Depth (usft)	Between Centres (usft)	Between Ellipses (usft)		
ARNOLD 02N-64W-24						
BOYD 24-1H - Wellbore #1 - Design #1	250.00	250.00	215.59	207.99	28.344	CC, ES
BOYD 24-1H - Wellbore #1 - Design #1	600.00	606.18	226.30	218.14	27.715	SF
BOYD 24-2H - Wellbore #1 - Design #1	250.00	250.00	208.82	201.22	27.454	CC, ES
BOYD 24-2H - Wellbore #1 - Design #1	700.00	708.81	223.06	214.59	26.317	SF
BOYD 24-3H - Wellbore #1 - Design #1	327.38	330.82	203.87	196.19	26.550	CC
BOYD 24-3H - Wellbore #1 - Design #1	400.00	406.45	203.93	196.16	26.264	ES
BOYD 24-3H - Wellbore #1 - Design #1	800.00	811.09	220.64	211.76	24.851	SF
BOYD 24-4H - Wellbore #1 - Design #1	598.81	615.13	198.30	190.16	24.339	CC
BOYD 24-4H - Wellbore #1 - Design #1	600.00	616.36	198.30	190.15	24.330	ES
BOYD 24-4H - Wellbore #1 - Design #1	900.00	915.84	214.35	204.98	22.861	SF
HELEN 24-10H - Wellbore #1 - Design #1	250.36	251.38	139.84	132.23	18.383	CC, ES
HELEN 24-10H - Wellbore #1 - Design #1	17,430.54	16,946.74	1,917.45	1,389.32	3.631	SF
HELEN 24-11H - Wellbore #1 - Design #1	251.40	252.46	119.98	112.38	15.771	CC, ES
HELEN 24-11H - Wellbore #1 - Design #1	17,436.98	17,065.35	1,571.25	1,041.98	2.969	SF
HELEN 24-12H - Wellbore #1 - Design #1	253.19	254.29	99.84	92.23	13.121	CC, ES
HELEN 24-12H - Wellbore #1 - Design #1	17,444.41	17,257.01	1,252.00	725.39	2.377	SF
HELEN 24-13H - Wellbore #1 - Design #1	250.00	250.00	79.99	72.38	10.516	CC, ES
HELEN 24-13H - Wellbore #1 - Design #1	17,444.41	17,041.57	1,180.58	652.99	2.238	SF
HELEN 24-14H - Wellbore #1 - Design #1	250.00	250.00	59.85	52.25	7.869	CC
HELEN 24-14H - Wellbore #1 - Design #1	300.00	300.84	59.89	52.24	7.829	ES
HELEN 24-14H - Wellbore #1 - Design #1	17,444.41	17,214.03	785.07	255.01	1.481	Level 3, SF
HELEN 24-15H - Wellbore #1 - Design #1	250.00	250.00	39.99	32.39	5.258	CC
HELEN 24-15H - Wellbore #1 - Design #1	17,444.41	17,248.68	399.36	-121.25	0.767	Level 1, ES, SF
HELEN 24-16H - Wellbore #1 - Design #1	250.00	250.00	19.86	12.25	2.611	CC
HELEN 24-16H - Wellbore #1 - Design #1	17,444.41	17,527.00	246.91	-197.88	0.555	Level 1, ES, SF
HELEN 24-18H - Wellbore #1 - Design #1	293.91	292.64	20.13	12.48	2.633	CC
HELEN 24-18H - Wellbore #1 - Design #1	17,444.41	17,511.28	399.72	-125.99	0.760	Level 1, ES, SF
HELEN 24-3H - Wellbore #1 - Design #1	250.00	253.00	279.96	272.35	36.800	CC, ES
HELEN 24-3H - Wellbore #1 - Design #1	17,444.41	17,266.86	3,880.12	3,352.44	7.353	SF
HELEN 24-4H - Wellbore #1 - Design #1	250.00	252.00	259.82	252.21	34.155	CC, ES
HELEN 24-4H - Wellbore #1 - Design #1	17,444.41	17,093.67	3,488.15	2,960.60	6.612	SF
HELEN 24-5H - Wellbore #1 - Design #1	250.00	252.00	239.97	232.36	31.545	CC, ES
HELEN 24-5H - Wellbore #1 - Design #1	17,444.41	17,336.26	3,294.49	2,769.69	6.278	SF
HELEN 24-6H - Wellbore #1 - Design #1	250.00	252.00	219.83	212.22	28.897	CC, ES
HELEN 24-6H - Wellbore #1 - Design #1	17,444.41	17,092.09	3,095.31	2,567.41	5.863	SF
HELEN 24-7H - Wellbore #1 - Design #1	250.00	252.00	199.97	192.36	26.287	CC, ES
HELEN 24-7H - Wellbore #1 - Design #1	17,444.41	16,959.80	2,703.30	2,175.35	5.120	SF
HELEN 24-8H - Wellbore #1 - Design #1	250.00	252.00	179.83	172.23	23.640	CC, ES
HELEN 24-8H - Wellbore #1 - Design #1	17,444.41	17,013.55	2,309.10	1,780.61	4.369	SF
HELEN 24-9H - Wellbore #1 - Design #1	250.00	251.00	159.98	152.37	21.031	CC, ES
HELEN 24-9H - Wellbore #1 - Design #1	17,426.74	17,171.79	2,249.06	1,721.06	4.260	SF

Reference Depths are relative to RKB = 20' @ 4943.00usft (Drilling Rig)
Offset Depths are relative to Offset Datum
Central Meridian is -105.500000

Coordinates are relative to: HELEN 24-17H
Coordinate System is US State Plane 1983, Colorado Northern Zone
Grid Convergence at Surface is: 0.65°

Ladder Plot



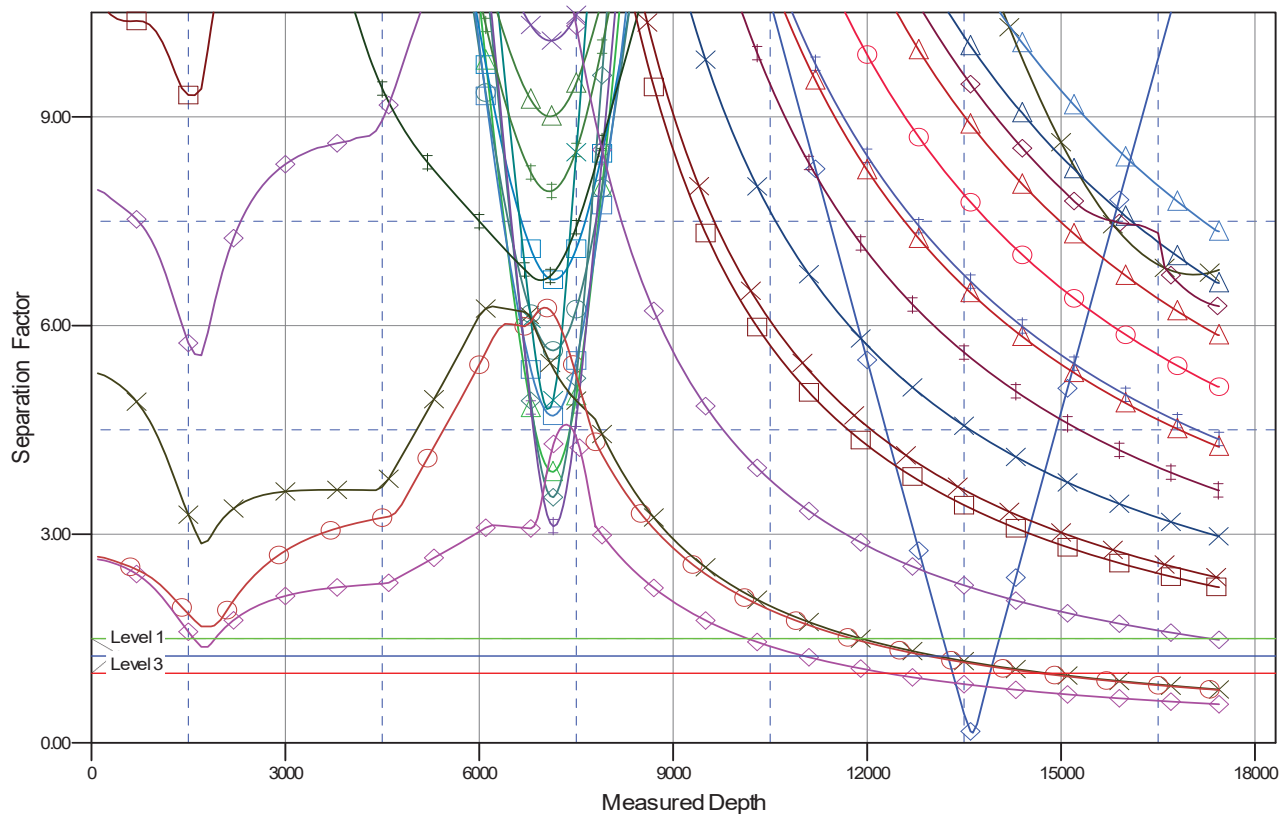
LEGEND

- | | | |
|---|---|---------------------------------------|
| L.E. Geikin #12H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | DARVIL LARNOLD #1, Amoco DAW Well, No Surveys V0 | HELEN24-15H Wellbore #1, Design #1 V0 |
| L.E. Geikin #9H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | State #C14-36, Noble Energy PRW Well, No Surveys V0 | HELEN24-16H Wellbore #1, Design #1 V0 |
| L.E. Geikin #10H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | STATE #241-36, Prima Exploration PA Well, No Surveys V0 | HELEN24-18H Wellbore #1, Design #1 V0 |
| L.E. Geikin #11H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | BOVD24-1H Wellbore #1, Design #1 V0 | HELEN24-3H Wellbore #1, Design #1 V0 |
| L.E. Geikin #13H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | BOVD24-2H Wellbore #1, Design #1 V0 | HELEN24-4H Wellbore #1, Design #1 V0 |
| L.E. Geikin #14H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | BOVD24-3H Wellbore #1, Design #1 V0 | HELEN24-5H Wellbore #1, Design #1 V0 |
| L.E. Geikin #15H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | BOVD24-4H Wellbore #1, Design #1 V0 | HELEN24-6H Wellbore #1, Design #1 V0 |
| L.E. Geikin #9H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | HELEN24-10H Wellbore #1, Design #1 V0 | HELEN24-7H Wellbore #1, Design #1 V0 |
| L.E. Geikin #7H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | HELEN24-11H Wellbore #1, Design #1 V0 | HELEN24-8H Wellbore #1, Design #1 V0 |
| L.E. Geikin #8H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | HELEN24-12H Wellbore #1, Design #1 V0 | HELEN24-9H Wellbore #1, Design #1 V0 |
| MOZLINDOCK ET AL #1, Aniper Oil & Gas DAW Well, No Surveys V0 | HELEN24-13H Wellbore #1, Design #1 V0 | |
| ARNOLD #1, Barrett Resources PA Well, No Surveys V0 | HELEN24-14H Wellbore #1, Design #1 V0 | |

Reference Depths are relative to RKB = 20' @ 4943.00usft (Drilling Rig)
Offset Depths are relative to Offset Datum
Central Meridian is -105.500000

Coordinates are relative to: HELEN 24-17H
Coordinate System is US State Plane 1983, Colorado Northern Zone
Grid Convergence at Surface is: 0.65°

Separation Factor Plot



LEGEND

L.E. Gein #12H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	DARYL LARNOLD #1, Amoco DAW Well, No Surveys V0	HELEN24-15H Wellbore #1, Design #1 V0
L.E. Gein #9H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	State CI 4-36, Noble Energy PRR Well, No Surveys V0	HELEN24-16H Wellbore #1, Design #1 V0
L.E. Gein #10H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	STATE CI 41-36, Prima Exploration PRR Well, No Surveys V0	HELEN24-18H Wellbore #1, Design #1 V0
L.E. Gein #11H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	BOYD24-1H Wellbore #1, Design #1 V0	HELEN24-3H Wellbore #1, Design #1 V0
L.E. Gein #13H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	BOYD24-2H Wellbore #1, Design #1 V0	HELEN24-4H Wellbore #1, Design #1 V0
L.E. Gein #14H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	BOYD24-3H Wellbore #1, Design #1 V0	HELEN24-5H Wellbore #1, Design #1 V0
L.E. Gein #15H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	BOYD24-4H Wellbore #1, Design #1 V0	HELEN24-6H Wellbore #1, Design #1 V0
L.E. Gein #9H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	HELEN24-10H Wellbore #1, Design #1 V0	HELEN24-7H Wellbore #1, Design #1 V0
L.E. Gein #7H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	HELEN24-11H Wellbore #1, Design #1 V0	HELEN24-8H Wellbore #1, Design #1 V0
L.E. Gein #6H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	HELEN24-12H Wellbore #1, Design #1 V0	HELEN24-9H Wellbore #1, Design #1 V0
MOQJ, INDOCK ET AL #1, Juniper Oil & Gas DAW Well, No Surveys V0	HELEN24-13H Wellbore #1, Design #1 V0	
ARNOLD #1, Barrett Resources PRR Well, No Surveys V0	HELEN24-14H Wellbore #1, Design #1 V0	