

# **VERDAD RESOURCES**

**WATTENBERG FIELD**

**ARNOLD 02N-64W-24**

**HELEN 24-12H**

**Wellbore #1**

**Plan: Design #1**

## **Standard Planning Report**

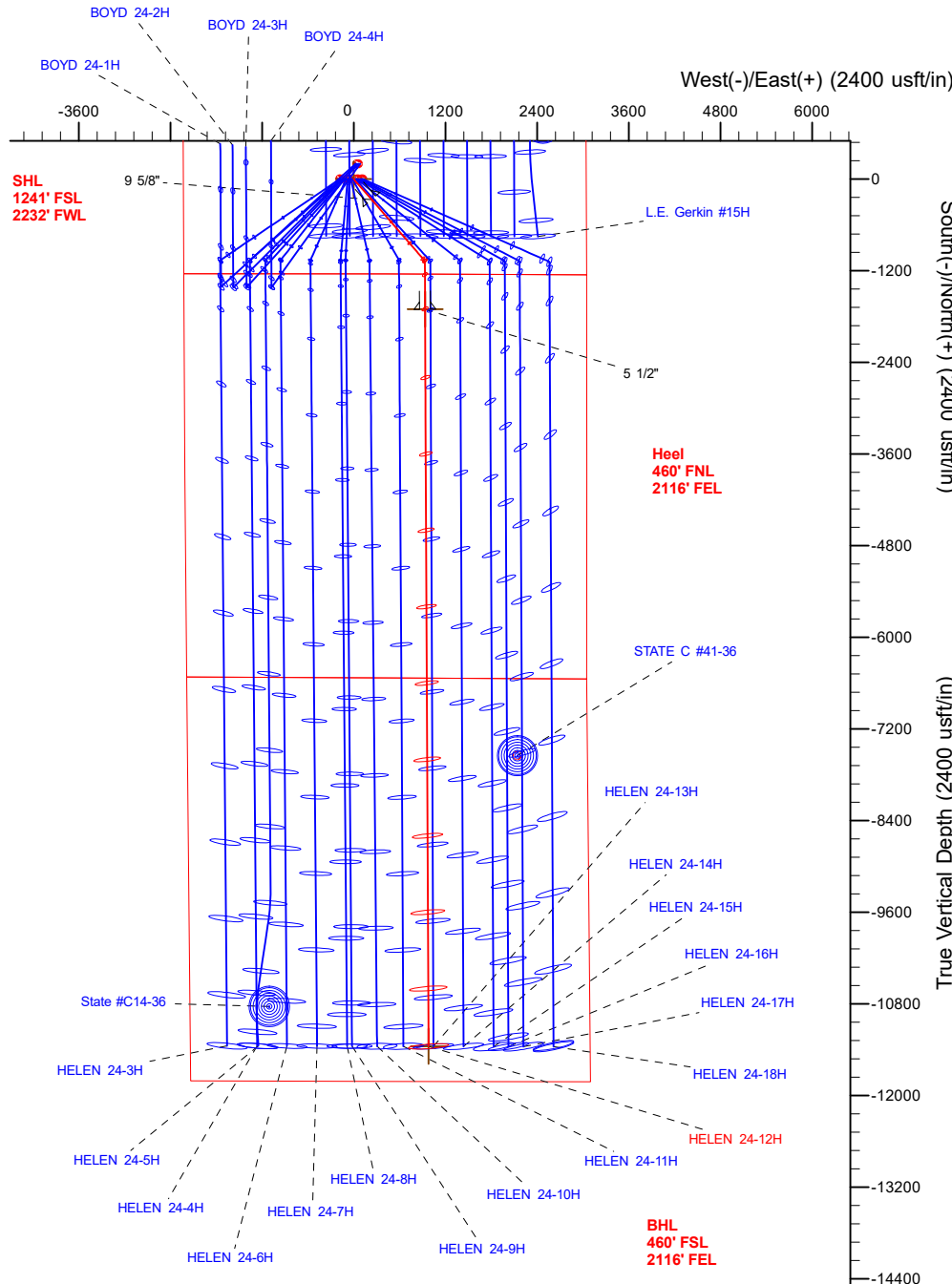
**02 November, 2017**

Project: WATTENBERG FIELD  
Site: ARNOLD 02N-64W-24  
Well: HELEN 24-12H  
Wellbore: Wellbore #1  
Design: Design #1

# VERDAD RESOURCES

## CASING DETAILS

TVD	MD	Name	Size
1700.00	1755.26	9 5/8"	9-5/8
7000.00	7608.00	5 1/2"	5-1/2

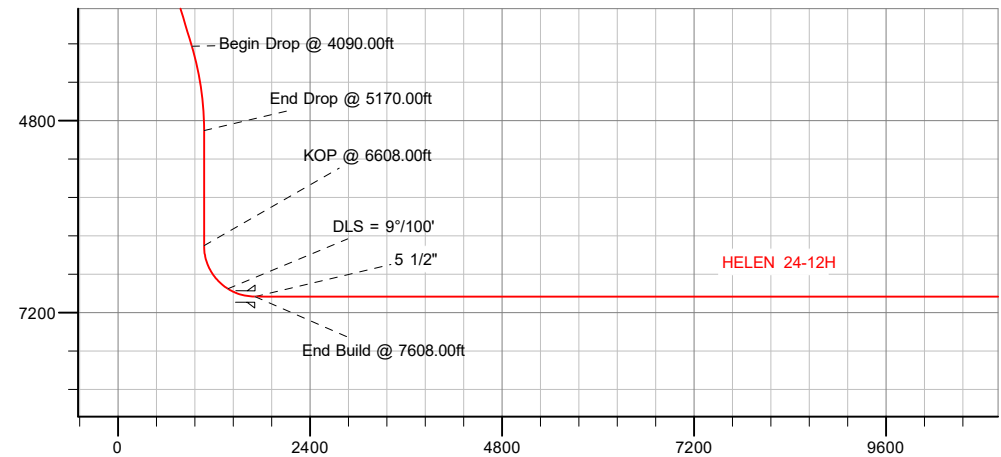


## SECTION DETAILS

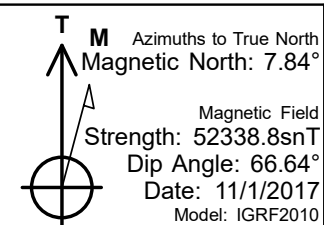
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Target
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	250.00	0.00	0.00	250.00	0.00	0.00	0.00	0.00	0.00	
3	1330.00	21.60	139.00	1304.60	-151.83	131.98	2.00	139.00	152.45	
4	4090.00	21.60	139.00	3870.78	-918.63	798.55	0.00	0.00	922.38	
5	5170.00	0.00	0.00	4925.38	-1070.46	930.54	2.00	180.00	1074.83	
6	6608.00	0.00	0.00	6363.38	-1070.46	930.54	0.00	0.00	1074.83	
7	7608.00	90.00	179.73	7000.00	-1707.07	933.50	9.00	179.73	1711.45	
8	17257.01	90.00	179.73	7000.00	-11355.98	978.42	0.00	0.00	11360.46	HELEN 24-12H_BHL

## WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude
HELEN 24-12H_SHL	0.00	0.00	0.00	40.120053	-104.501150
HELEN 24-12H_BHL	7000.00	-11355.98	978.42	40.088879	-104.497653



Vertical Section at 179.73° (2400 usft/in)



## WELL DETAILS: HELEN 24-12H

GL = 4924'

RKB = 20' @ 4944.00usft (Drilling Rig)

Plan: Design #1 (HELEN 24-12H/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
From:	Lat/Long	Easting:	3,279,352.74 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "
		Latitude:	40.120602
		Longitude:	-104.501071
		Grid Convergence:	0.65 °

Well	HELEN 24-12H		
Well Position	+N/-S	-200.00 usft	Northing:
	+E/-W	-22.09 usft	Easting:
Position Uncertainty	3.28 usft	Wellhead Elevation:	
		Latitude:	40.120053
		Longitude:	-104.501150
		Ground Level:	4,924.00 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	11/1/2017	7.84	66.64	52,338.75430746

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	179.73	

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	17,257.01	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	
1,330.00	21.60	139.00	1,304.60	-151.83	131.98	2.00	2.00	0.00	139.00	
4,090.00	21.60	139.00	3,870.78	-918.63	798.55	0.00	0.00	0.00	0.00	
5,170.00	0.00	0.00	4,925.38	-1,070.46	930.54	2.00	-2.00	0.00	180.00	
6,608.00	0.00	0.00	6,363.38	-1,070.46	930.54	0.00	0.00	0.00	0.00	
7,608.00	90.00	179.73	7,000.00	-1,707.07	933.50	9.00	9.00	17.97	179.73	
17,257.01	90.00	179.73	7,000.00	-11,355.98	978.42	0.00	0.00	0.00	0.00	HELEN 24-12H_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	139.00	300.00	-0.33	0.29	0.33	2.00	2.00	0.00	
400.00	3.00	139.00	399.93	-2.96	2.58	2.98	2.00	2.00	0.00	
500.00	5.00	139.00	499.68	-8.23	7.15	8.26	2.00	2.00	0.00	
600.00	7.00	139.00	599.13	-16.12	14.01	16.18	2.00	2.00	0.00	
700.00	9.00	139.00	698.15	-26.62	23.14	26.73	2.00	2.00	0.00	
800.00	11.00	139.00	796.63	-39.72	34.53	39.89	2.00	2.00	0.00	
900.00	13.00	139.00	894.44	-55.41	48.17	55.64	2.00	2.00	0.00	
1,000.00	15.00	139.00	991.46	-73.67	64.04	73.97	2.00	2.00	0.00	
1,100.00	17.00	139.00	1,087.58	-94.47	82.12	94.86	2.00	2.00	0.00	
1,200.00	19.00	139.00	1,182.68	-117.79	102.40	118.27	2.00	2.00	0.00	
1,300.00	21.00	139.00	1,276.65	-143.60	124.83	144.19	2.00	2.00	0.00	
1,330.00	21.60	139.00	1,304.60	-151.83	131.98	152.45	2.00	2.00	0.00	
End Nudge @ 1330.00ft										
1,400.00	21.60	139.00	1,369.68	-171.28	148.89	171.98	0.00	0.00	0.00	
1,500.00	21.60	139.00	1,462.66	-199.06	173.04	199.87	0.00	0.00	0.00	
1,600.00	21.60	139.00	1,555.64	-226.84	197.19	227.77	0.00	0.00	0.00	
1,700.00	21.60	139.00	1,648.62	-254.63	221.34	255.67	0.00	0.00	0.00	
1,755.26	21.60	139.00	1,700.00	-269.98	234.69	271.08	0.00	0.00	0.00	
9 5/8"										
1,800.00	21.60	139.00	1,741.59	-282.41	245.49	283.56	0.00	0.00	0.00	
1,900.00	21.60	139.00	1,834.57	-310.19	269.64	311.46	0.00	0.00	0.00	
2,000.00	21.60	139.00	1,927.55	-337.97	293.80	339.35	0.00	0.00	0.00	
2,100.00	21.60	139.00	2,020.53	-365.76	317.95	367.25	0.00	0.00	0.00	
2,200.00	21.60	139.00	2,113.50	-393.54	342.10	395.15	0.00	0.00	0.00	
2,300.00	21.60	139.00	2,206.48	-421.32	366.25	423.04	0.00	0.00	0.00	
2,400.00	21.60	139.00	2,299.46	-449.10	390.40	450.94	0.00	0.00	0.00	
2,500.00	21.60	139.00	2,392.44	-476.89	414.55	478.84	0.00	0.00	0.00	
2,600.00	21.60	139.00	2,485.42	-504.67	438.70	506.73	0.00	0.00	0.00	
2,700.00	21.60	139.00	2,578.39	-532.45	462.85	534.63	0.00	0.00	0.00	
2,800.00	21.60	139.00	2,671.37	-560.23	487.00	562.52	0.00	0.00	0.00	
2,900.00	21.60	139.00	2,764.35	-588.02	511.16	590.42	0.00	0.00	0.00	
3,000.00	21.60	139.00	2,857.33	-615.80	535.31	618.32	0.00	0.00	0.00	
3,100.00	21.60	139.00	2,950.30	-643.58	559.46	646.21	0.00	0.00	0.00	
3,200.00	21.60	139.00	3,043.28	-671.37	583.61	674.11	0.00	0.00	0.00	
3,300.00	21.60	139.00	3,136.26	-699.15	607.76	702.00	0.00	0.00	0.00	
3,400.00	21.60	139.00	3,229.24	-726.93	631.91	729.90	0.00	0.00	0.00	
3,500.00	21.60	139.00	3,322.21	-754.71	656.06	757.80	0.00	0.00	0.00	
3,600.00	21.60	139.00	3,415.19	-782.50	680.21	785.69	0.00	0.00	0.00	
3,700.00	21.60	139.00	3,508.17	-810.28	704.37	813.59	0.00	0.00	0.00	
3,800.00	21.60	139.00	3,601.15	-838.06	728.52	841.49	0.00	0.00	0.00	
3,900.00	21.60	139.00	3,694.12	-865.84	752.67	869.38	0.00	0.00	0.00	
4,000.00	21.60	139.00	3,787.10	-893.63	776.82	897.28	0.00	0.00	0.00	
4,090.00	21.60	139.00	3,870.78	-918.63	798.55	922.38	0.00	0.00	0.00	
Begin Drop @ 4090.00ft										
4,100.00	21.40	139.00	3,880.09	-921.40	800.96	925.16	2.00	-2.00	0.00	
4,200.00	19.40	139.00	3,973.81	-947.70	823.83	951.58	2.00	-2.00	0.00	
4,300.00	17.40	139.00	4,068.69	-971.52	844.53	975.49	2.00	-2.00	0.00	
4,400.00	15.40	139.00	4,164.62	-992.83	863.06	996.89	2.00	-2.00	0.00	
4,500.00	13.40	139.00	4,261.47	-1,011.60	879.37	1,015.73	2.00	-2.00	0.00	
4,600.00	11.40	139.00	4,359.13	-1,027.81	893.46	1,032.00	2.00	-2.00	0.00	
4,700.00	9.40	139.00	4,457.49	-1,041.43	905.30	1,045.68	2.00	-2.00	0.00	
4,800.00	7.40	139.00	4,556.41	-1,052.45	914.88	1,056.75	2.00	-2.00	0.00	
4,900.00	5.40	139.00	4,655.78	-1,060.87	922.20	1,065.20	2.00	-2.00	0.00	
5,000.00	3.40	139.00	4,755.48	-1,066.66	927.23	1,071.01	2.00	-2.00	0.00	
5,100.00	1.40	139.00	4,855.39	-1,069.82	929.98	1,074.19	2.00	-2.00	0.00	
5,170.00	0.00	0.00	4,925.38	-1,070.46	930.54	1,074.83	2.00	-2.00	0.00	
End Drop @ 5170.00ft										
5,200.00	0.00	0.00	4,955.38	-1,070.46	930.54	1,074.83	0.00	0.00	0.00	
5,300.00	0.00	0.00	5,055.38	-1,070.46	930.54	1,074.83	0.00	0.00	0.00	
5,400.00	0.00	0.00	5,155.38	-1,070.46	930.54	1,074.83	0.00	0.00	0.00	
5,500.00	0.00	0.00	5,255.38	-1,070.46	930.54	1,074.83	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)
5,600.00	0.00	0.00	5,355.38	-1,070.46	930.54	1,074.83	0.00	0.00	0.00
5,700.00	0.00	0.00	5,455.38	-1,070.46	930.54	1,074.83	0.00	0.00	0.00
5,800.00	0.00	0.00	5,555.38	-1,070.46	930.54	1,074.83	0.00	0.00	0.00
5,900.00	0.00	0.00	5,655.38	-1,070.46	930.54	1,074.83	0.00	0.00	0.00
6,000.00	0.00	0.00	5,755.38	-1,070.46	930.54	1,074.83	0.00	0.00	0.00
6,100.00	0.00	0.00	5,855.38	-1,070.46	930.54	1,074.83	0.00	0.00	0.00
6,200.00	0.00	0.00	5,955.38	-1,070.46	930.54	1,074.83	0.00	0.00	0.00
6,300.00	0.00	0.00	6,055.38	-1,070.46	930.54	1,074.83	0.00	0.00	0.00
6,400.00	0.00	0.00	6,155.38	-1,070.46	930.54	1,074.83	0.00	0.00	0.00
6,500.00	0.00	0.00	6,255.38	-1,070.46	930.54	1,074.83	0.00	0.00	0.00
6,608.00	0.00	0.00	6,363.38	-1,070.46	930.54	1,074.83	0.00	0.00	0.00
KOP @ 6608.00ft									
6,650.00	3.78	179.73	6,405.35	-1,071.85	930.54	1,076.22	9.00	9.00	0.00
6,700.00	8.28	179.73	6,455.06	-1,077.10	930.57	1,081.47	9.00	9.00	0.00
6,750.00	12.78	179.73	6,504.21	-1,086.23	930.61	1,090.61	9.00	9.00	0.00
6,800.00	17.28	179.73	6,552.48	-1,099.19	930.67	1,103.57	9.00	9.00	0.00
6,850.00	21.78	179.73	6,599.60	-1,115.91	930.75	1,120.28	9.00	9.00	0.00
6,900.00	26.28	179.73	6,645.25	-1,136.26	930.84	1,140.63	9.00	9.00	0.00
6,950.00	30.78	179.73	6,689.17	-1,160.14	930.96	1,164.51	9.00	9.00	0.00
7,000.00	35.28	179.73	6,731.08	-1,187.38	931.08	1,191.76	9.00	9.00	0.00
7,050.00	39.78	179.73	6,770.72	-1,217.83	931.22	1,222.21	9.00	9.00	0.00
7,100.00	44.28	179.73	6,807.85	-1,251.30	931.38	1,255.67	9.00	9.00	0.00
7,150.00	48.78	179.73	6,842.24	-1,287.58	931.55	1,291.95	9.00	9.00	0.00
7,200.00	53.28	179.73	6,873.67	-1,326.44	931.73	1,330.82	9.00	9.00	0.00
7,250.00	57.78	179.73	6,901.97	-1,367.65	931.92	1,372.03	9.00	9.00	0.00
DLS = 9°/100'									
7,300.00	62.28	179.73	6,926.94	-1,410.95	932.12	1,415.33	9.00	9.00	0.00
7,350.00	66.78	179.73	6,948.43	-1,456.08	932.33	1,460.46	9.00	9.00	0.00
7,400.00	71.28	179.73	6,966.32	-1,502.76	932.55	1,507.13	9.00	9.00	0.00
7,450.00	75.78	179.73	6,980.50	-1,550.69	932.77	1,555.07	9.00	9.00	0.00
7,500.00	80.28	179.73	6,990.86	-1,599.59	933.00	1,603.97	9.00	9.00	0.00
7,550.00	84.78	179.73	6,997.36	-1,649.15	933.23	1,653.53	9.00	9.00	0.00
7,600.00	89.28	179.73	6,999.95	-1,699.07	933.46	1,703.45	9.00	9.00	0.00
7,608.00	90.00	179.73	7,000.00	-1,707.07	933.50	1,711.45	9.00	9.00	0.00
End Build @ 7608.00ft - 5 1/2"									
7,700.00	90.00	179.73	7,000.00	-1,799.07	933.93	1,803.45	0.00	0.00	0.00
7,800.00	90.00	179.73	7,000.00	-1,899.07	934.40	1,903.45	0.00	0.00	0.00
7,900.00	90.00	179.73	7,000.00	-1,999.07	934.86	2,003.45	0.00	0.00	0.00
8,000.00	90.00	179.73	7,000.00	-2,099.07	935.33	2,103.45	0.00	0.00	0.00
8,100.00	90.00	179.73	7,000.00	-2,199.07	935.79	2,203.45	0.00	0.00	0.00
8,200.00	90.00	179.73	7,000.00	-2,299.07	936.26	2,303.45	0.00	0.00	0.00
8,300.00	90.00	179.73	7,000.00	-2,399.07	936.72	2,403.45	0.00	0.00	0.00
8,400.00	90.00	179.73	7,000.00	-2,499.07	937.19	2,503.45	0.00	0.00	0.00
8,500.00	90.00	179.73	7,000.00	-2,599.06	937.65	2,603.45	0.00	0.00	0.00
8,600.00	90.00	179.73	7,000.00	-2,699.06	938.12	2,703.45	0.00	0.00	0.00
8,700.00	90.00	179.73	7,000.00	-2,799.06	938.58	2,803.45	0.00	0.00	0.00
8,800.00	90.00	179.73	7,000.00	-2,899.06	939.05	2,903.45	0.00	0.00	0.00
8,900.00	90.00	179.73	7,000.00	-2,999.06	939.52	3,003.45	0.00	0.00	0.00
9,000.00	90.00	179.73	7,000.00	-3,099.06	939.98	3,103.45	0.00	0.00	0.00
9,100.00	90.00	179.73	7,000.00	-3,199.06	940.45	3,203.45	0.00	0.00	0.00
9,200.00	90.00	179.73	7,000.00	-3,299.06	940.91	3,303.45	0.00	0.00	0.00
9,300.00	90.00	179.73	7,000.00	-3,399.06	941.38	3,403.45	0.00	0.00	0.00
9,400.00	90.00	179.73	7,000.00	-3,499.05	941.84	3,503.45	0.00	0.00	0.00
9,500.00	90.00	179.73	7,000.00	-3,599.05	942.31	3,603.45	0.00	0.00	0.00
9,600.00	90.00	179.73	7,000.00	-3,699.05	942.77	3,703.45	0.00	0.00	0.00
9,700.00	90.00	179.73	7,000.00	-3,799.05	943.24	3,803.45	0.00	0.00	0.00
9,800.00	90.00	179.73	7,000.00	-3,899.05	943.71	3,903.45	0.00	0.00	0.00
9,900.00	90.00	179.73	7,000.00	-3,999.05	944.17	4,003.45	0.00	0.00	0.00
10,000.00	90.00	179.73	7,000.00	-4,099.05	944.64	4,103.45	0.00	0.00	0.00
10,100.00	90.00	179.73	7,000.00	-4,199.05	945.10	4,203.45	0.00	0.00	0.00
10,200.00	90.00	179.73	7,000.00	-4,299.05	945.57	4,303.45	0.00	0.00	0.00
10,300.00	90.00	179.73	7,000.00	-4,399.04	946.03	4,403.45	0.00	0.00	0.00
10,400.00	90.00	179.73	7,000.00	-4,499.04	946.50	4,503.45	0.00	0.00	0.00
10,500.00	90.00	179.73	7,000.00	-4,599.04	946.96	4,603.45	0.00	0.00	0.00
10,600.00	90.00	179.73	7,000.00	-4,699.04	947.43	4,703.45	0.00	0.00	0.00
10,700.00	90.00	179.73	7,000.00	-4,799.04	947.90	4,803.45	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)
10,800.00	90.00	179.73	7,000.00	-4,899.04	948.36	4,903.45	0.00	0.00	0.00
10,900.00	90.00	179.73	7,000.00	-4,999.04	948.83	5,003.45	0.00	0.00	0.00
11,000.00	90.00	179.73	7,000.00	-5,099.04	949.29	5,103.45	0.00	0.00	0.00
11,100.00	90.00	179.73	7,000.00	-5,199.04	949.76	5,203.45	0.00	0.00	0.00
11,200.00	90.00	179.73	7,000.00	-5,299.04	950.22	5,303.45	0.00	0.00	0.00
11,300.00	90.00	179.73	7,000.00	-5,399.03	950.69	5,403.45	0.00	0.00	0.00
11,400.00	90.00	179.73	7,000.00	-5,499.03	951.15	5,503.45	0.00	0.00	0.00
11,500.00	90.00	179.73	7,000.00	-5,599.03	951.62	5,603.45	0.00	0.00	0.00
11,600.00	90.00	179.73	7,000.00	-5,699.03	952.09	5,703.45	0.00	0.00	0.00
11,700.00	90.00	179.73	7,000.00	-5,799.03	952.55	5,803.45	0.00	0.00	0.00
11,800.00	90.00	179.73	7,000.00	-5,899.03	953.02	5,903.45	0.00	0.00	0.00
11,900.00	90.00	179.73	7,000.00	-5,999.03	953.48	6,003.45	0.00	0.00	0.00
12,000.00	90.00	179.73	7,000.00	-6,099.03	953.95	6,103.45	0.00	0.00	0.00
12,100.00	90.00	179.73	7,000.00	-6,199.03	954.41	6,203.45	0.00	0.00	0.00
12,200.00	90.00	179.73	7,000.00	-6,299.02	954.88	6,303.45	0.00	0.00	0.00
12,300.00	90.00	179.73	7,000.00	-6,399.02	955.34	6,403.45	0.00	0.00	0.00
12,400.00	90.00	179.73	7,000.00	-6,499.02	955.81	6,503.45	0.00	0.00	0.00
12,500.00	90.00	179.73	7,000.00	-6,599.02	956.28	6,603.45	0.00	0.00	0.00
12,600.00	90.00	179.73	7,000.00	-6,699.02	956.74	6,703.45	0.00	0.00	0.00
12,700.00	90.00	179.73	7,000.00	-6,799.02	957.21	6,803.45	0.00	0.00	0.00
12,800.00	90.00	179.73	7,000.00	-6,899.02	957.67	6,903.45	0.00	0.00	0.00
12,900.00	90.00	179.73	7,000.00	-6,999.02	958.14	7,003.45	0.00	0.00	0.00
13,000.00	90.00	179.73	7,000.00	-7,099.02	958.60	7,103.45	0.00	0.00	0.00
13,100.00	90.00	179.73	7,000.00	-7,199.01	959.07	7,203.45	0.00	0.00	0.00
13,200.00	90.00	179.73	7,000.00	-7,299.01	959.53	7,303.45	0.00	0.00	0.00
13,300.00	90.00	179.73	7,000.00	-7,399.01	960.00	7,403.45	0.00	0.00	0.00
13,400.00	90.00	179.73	7,000.00	-7,499.01	960.46	7,503.45	0.00	0.00	0.00
13,500.00	90.00	179.73	7,000.00	-7,599.01	960.93	7,603.45	0.00	0.00	0.00
13,600.00	90.00	179.73	7,000.00	-7,699.01	961.40	7,703.45	0.00	0.00	0.00
13,700.00	90.00	179.73	7,000.00	-7,799.01	961.86	7,803.45	0.00	0.00	0.00
13,800.00	90.00	179.73	7,000.00	-7,899.01	962.33	7,903.45	0.00	0.00	0.00
13,900.00	90.00	179.73	7,000.00	-7,999.01	962.79	8,003.45	0.00	0.00	0.00
14,000.00	90.00	179.73	7,000.00	-8,099.00	963.26	8,103.45	0.00	0.00	0.00
14,100.00	90.00	179.73	7,000.00	-8,199.00	963.72	8,203.45	0.00	0.00	0.00
14,200.00	90.00	179.73	7,000.00	-8,299.00	964.19	8,303.45	0.00	0.00	0.00
14,300.00	90.00	179.73	7,000.00	-8,399.00	964.65	8,403.45	0.00	0.00	0.00
14,400.00	90.00	179.73	7,000.00	-8,499.00	965.12	8,503.45	0.00	0.00	0.00
14,500.00	90.00	179.73	7,000.00	-8,599.00	965.59	8,603.45	0.00	0.00	0.00
14,600.00	90.00	179.73	7,000.00	-8,699.00	966.05	8,703.45	0.00	0.00	0.00
14,700.00	90.00	179.73	7,000.00	-8,799.00	966.52	8,803.45	0.00	0.00	0.00
14,800.00	90.00	179.73	7,000.00	-8,899.00	966.98	8,903.45	0.00	0.00	0.00
14,900.00	90.00	179.73	7,000.00	-8,999.00	967.45	9,003.45	0.00	0.00	0.00
15,000.00	90.00	179.73	7,000.00	-9,098.99	967.91	9,103.45	0.00	0.00	0.00
15,100.00	90.00	179.73	7,000.00	-9,198.99	968.38	9,203.45	0.00	0.00	0.00
15,200.00	90.00	179.73	7,000.00	-9,298.99	968.84	9,303.45	0.00	0.00	0.00
15,300.00	90.00	179.73	7,000.00	-9,398.99	969.31	9,403.45	0.00	0.00	0.00
15,400.00	90.00	179.73	7,000.00	-9,498.99	969.78	9,503.45	0.00	0.00	0.00
15,500.00	90.00	179.73	7,000.00	-9,598.99	970.24	9,603.45	0.00	0.00	0.00
15,600.00	90.00	179.73	7,000.00	-9,698.99	970.71	9,703.45	0.00	0.00	0.00
15,700.00	90.00	179.73	7,000.00	-9,798.99	971.17	9,803.45	0.00	0.00	0.00
15,800.00	90.00	179.73	7,000.00	-9,898.99	971.64	9,903.45	0.00	0.00	0.00
15,900.00	90.00	179.73	7,000.00	-9,998.98	972.10	10,003.45	0.00	0.00	0.00
16,000.00	90.00	179.73	7,000.00	-10,098.98	972.57	10,103.45	0.00	0.00	0.00
16,100.00	90.00	179.73	7,000.00	-10,198.98	973.03	10,203.45	0.00	0.00	0.00
16,200.00	90.00	179.73	7,000.00	-10,298.98	973.50	10,303.45	0.00	0.00	0.00
16,300.00	90.00	179.73	7,000.00	-10,398.98	973.97	10,403.45	0.00	0.00	0.00
16,400.00	90.00	179.73	7,000.00	-10,498.98	974.43	10,503.45	0.00	0.00	0.00
16,500.00	90.00	179.73	7,000.00	-10,598.98	974.90	10,603.45	0.00	0.00	0.00
16,600.00	90.00	179.73	7,000.00	-10,698.98	975.36	10,703.45	0.00	0.00	0.00
16,700.00	90.00	179.73	7,000.00	-10,798.98	975.83	10,803.45	0.00	0.00	0.00
16,800.00	90.00	179.73	7,000.00	-10,898.97	976.29	10,903.45	0.00	0.00	0.00
16,900.00	90.00	179.73	7,000.00	-10,998.97	976.76	11,003.45	0.00	0.00	0.00
17,000.00	90.00	179.73	7,000.00	-11,098.97	977.22	11,103.45	0.00	0.00	0.00
17,100.00	90.00	179.73	7,000.00	-11,198.97	977.69	11,203.45	0.00	0.00	0.00
17,200.00	90.00	179.73	7,000.00	-11,298.97	978.15	11,303.45	0.00	0.00	0.00
17,257.01	90.00	179.73	7,000.00	-11,355.98	978.42	11,360.46	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)
TD Well @ 17257.01ft									

Casing Points					
Measured Depth (usft)	Vertical Depth (usft)	Name		Casing Diameter (")	Hole Diameter (")
1,755.26	1,700.00	9 5/8"		9-5/8	13-1/2
7,608.00	7,000.00	5 1/2"		5-1/2	8-1/2

Plan Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
250.00	250.00	0.00	0.00	Begin Nudge @ 250.00ft
1,330.00	1,304.60	-151.83	131.98	End Nudge @ 1330.00ft
4,090.00	3,870.78	-918.63	798.55	Begin Drop @ 4090.00ft
5,170.00	4,925.38	-1,070.46	930.54	End Drop @ 5170.00ft
6,608.00	6,363.38	-1,070.46	930.54	KOP @ 6608.00ft
7,250.00	6,901.97	-1,367.65	931.92	DLS = 9°/100'
7,608.00	7,000.00	-1,707.07	933.50	End Build @ 7608.00ft
17,257.01	7,000.00	-11,355.98	978.42	TD Well @ 17257.01ft

# **VERDAD RESOURCES**

**WATTENBERG FIELD**

**ARNOLD 02N-64W-24**

**HELEN 24-12H**

**Wellbore #1**

**Design #1**

## **Anticollision Summary Report**

**02 November, 2017**



<b>Reference</b>	Design #1				
<b>Filter type:</b>	NO GLOBAL FILTER: Using user defined selection & filtering criteria				
<b>Interpolation Method:</b>	Stations	<b>Error Model:</b>	ISCWSA		
<b>Depth Range:</b>	Unlimited	<b>Scan Method:</b>	Closest Approach 3D		
<b>Results Limited by:</b>	Maximum center-center distance of 9,999.98 usft	<b>Error Surface:</b>	Pedal Curve		
<b>Warning Levels Evaluated at:</b>	2.45 Sigma	<b>Casing Method:</b>	Added to Error Values		

<b>Survey Tool Program</b>	<b>Date</b>	11/2/2017			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
0.00	1,700.00	Design #1 (Wellbore #1)	ISCWSA REV 2 MWD	Fixed:v2:standard declination	
1,700.00	17,257.01	Design #1 (Wellbore #1)	ISCWSA REV 2 MWD	Fixed:v2:standard declination	

<b>Summary</b>						
<b>Site Name</b>	<b>Reference Measured Depth (usft)</b>	<b>Offset Measured Depth (usft)</b>	<b>Distance Between Centres (usft)</b>	<b>Distance Between Ellipses (usft)</b>	<b>Separation Factor</b>	<b>Warning</b>
<b>Offset Well - Wellbore - Design</b>						
2N-64W-13 L.E. GERKIN EAST PAD						
L.E. Gerkin #12H - Red Hawk Petroleum Planned Well -	6,878.13	16,446.50	692.65	470.99	3.125	CC, ES, SF
L.E. Gerkin #9H - Red Hawk Petroleum Planned Well - P	6,876.25	16,541.50	554.50	368.42	2.980	CC, ES, SF
L.E. Gerkin #10H - Red Hawk Petroleum Planned Well - P	6,800.00	16,489.70	430.29	340.98	4.818	SF
L.E. Gerkin #10H - Red Hawk Petroleum Planned Well - P	6,850.00	16,489.70	420.28	334.60	4.906	ES
L.E. Gerkin #10H - Red Hawk Petroleum Planned Well - P	6,876.61	16,489.70	418.88	335.26	5.009	CC
L.E. Gerkin #11H - Red Hawk Petroleum Planned Well - P	6,850.00	16,457.40	485.45	332.21	3.168	SF
L.E. Gerkin #11H - Red Hawk Petroleum Planned Well - P	6,876.91	16,457.40	484.22	331.44	3.169	CC, ES
L.E. Gerkin #13H - Red Hawk Petroleum Planned Well - P	6,878.44	16,448.80	958.05	712.70	3.905	CC, ES
L.E. Gerkin #13H - Red Hawk Petroleum Planned Well - P	6,900.00	16,448.80	958.45	712.92	3.904	SF
L.E. Gerkin #14H - Red Hawk Petroleum Planned Well - P	6,878.84	16,481.10	1,242.74	992.87	4.973	CC, ES
L.E. Gerkin #14H - Red Hawk Petroleum Planned Well - P	6,900.00	16,481.10	1,243.04	992.89	4.969	SF
L.E. Gerkin #15H - Red Hawk Petroleum Planned Well - P	6,879.21	16,511.10	1,536.16	1,279.50	5.985	CC
L.E. Gerkin #15H - Red Hawk Petroleum Planned Well - P	6,900.00	16,511.10	1,536.39	1,279.42	5.979	ES
L.E. Gerkin #15H - Red Hawk Petroleum Planned Well - P	6,950.00	16,511.10	1,538.82	1,281.26	5.975	SF
2N-64W-13 L.E. GERKIN WEST PAD						
L.E. Gerkin #6H - Red Hawk Petroleum Planned Well - P	6,850.00	16,431.70	1,353.19	1,109.53	5.553	SF
L.E. Gerkin #6H - Red Hawk Petroleum Planned Well - P	6,853.68	16,431.70	1,353.19	1,109.52	5.554	CC, ES
L.E. Gerkin #7H - Red Hawk Petroleum Planned Well - P	6,850.00	16,464.00	1,062.82	829.36	4.552	ES, SF
L.E. Gerkin #7H - Red Hawk Petroleum Planned Well - P	6,854.10	16,464.00	1,062.80	829.38	4.553	CC
L.E. Gerkin #8H - Red Hawk Petroleum Planned Well - P	6,850.00	16,517.20	786.53	573.28	3.688	ES, SF
L.E. Gerkin #8H - Red Hawk Petroleum Planned Well - P	6,855.24	16,517.20	786.51	573.35	3.690	CC
2N-64W-13 Offsets						
ARNOLD #1 - Barrett Resources P/A Well - No Surveys	250.00	178.00	7,897.00	7,887.29	813.271	CC
ARNOLD #1 - Barrett Resources P/A Well - No Surveys	400.00	327.93	7,899.20	7,884.63	542.150	ES
ARNOLD #1 - Barrett Resources P/A Well - No Surveys	7,200.00	6,801.67	9,024.43	8,755.57	33.566	SF
DARYL L ARNOLD #1 - Amoco D/A Well - No Surveys	250.00	209.00	8,307.00	8,296.37	781.315	CC
DARYL L ARNOLD #1 - Amoco D/A Well - No Surveys	400.00	358.93	8,310.15	8,294.53	532.093	ES
DARYL L ARNOLD #1 - Amoco D/A Well - No Surveys	7,200.00	6,832.67	9,736.49	9,472.25	36.847	SF
2N-64W-24 Offsets						
MCCLINTOCK ET AL #1 - Juniper Oil & Gas D/A Well - N	3,695.33	3,453.83	2,347.13	2,200.93	16.054	CC
MCCLINTOCK ET AL #1 - Juniper Oil & Gas D/A Well - N	6,650.00	6,355.35	2,373.61	2,115.96	9.213	ES
MCCLINTOCK ET AL #1 - Juniper Oil & Gas D/A Well - N	6,900.00	6,604.75	2,422.71	2,155.24	9.058	SF
2N-64W-36 Offsets						
State #C14-36 - Noble Energy PR Well - No Surveys	16,724.93	6,970.00	2,081.95	1,584.93	4.189	CC, ES
State #C14-36 - Noble Energy PR Well - No Surveys	16,800.00	6,970.00	2,083.30	1,585.36	4.184	SF
STATE C #41-36 - Prima Exploration P/A Well - No Surve	13,455.70	6,928.00	1,182.14	763.01	2.820	CC
STATE C #41-36 - Prima Exploration P/A Well - No Surve	13,500.00	6,928.00	1,182.97	762.23	2.812	ES, SF

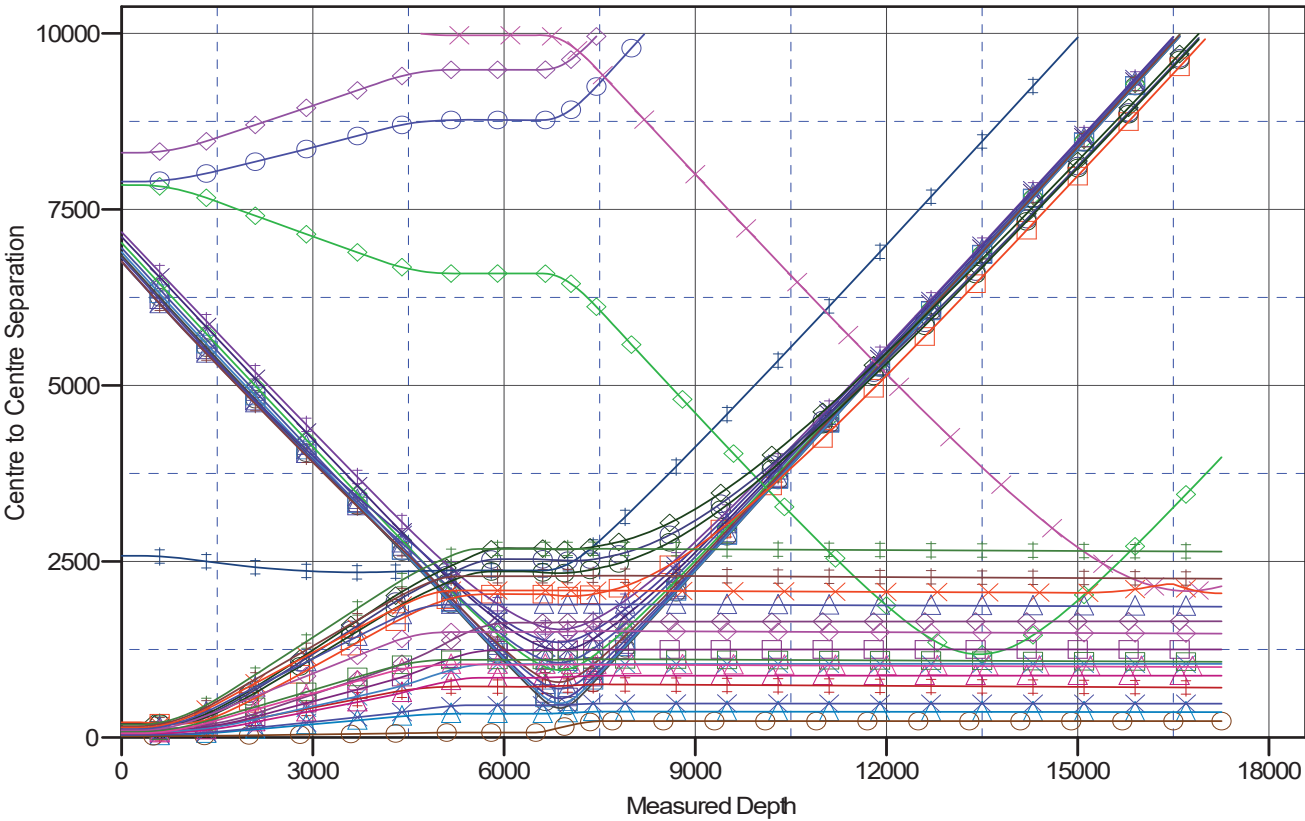
## Summary

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	496.50	508.20	200.65	192.73	25.351	CC
BOYD 24-1H - Wellbore #1 - Design #1	500.00	511.86	200.65	192.73	25.330	ES
BOYD 24-1H - Wellbore #1 - Design #1	900.00	917.48	220.21	210.87	23.572	SF
BOYD 24-2H - Wellbore #1 - Design #1	652.81	673.11	200.03	191.75	24.153	CC, ES
BOYD 24-2H - Wellbore #1 - Design #1	1,000.00	1,020.35	222.66	212.72	22.395	SF
BOYD 24-3H - Wellbore #1 - Design #1	769.64	796.71	198.17	189.51	22.869	CC, ES
BOYD 24-3H - Wellbore #1 - Design #1	1,100.00	1,122.73	225.26	214.61	21.142	SF
BOYD 24-4H - Wellbore #1 - Design #1	906.76	942.23	192.10	182.86	20.796	CC, ES
BOYD 24-4H - Wellbore #1 - Design #1	1,200.00	1,229.22	218.31	206.88	19.104	SF
HELEN 24-10H - Wellbore #1 - Design #1	250.00	250.00	39.99	32.39	5.258	CC, ES
HELEN 24-10H - Wellbore #1 - Design #1	17,252.51	16,950.04	709.49	206.38	1.410	Level 3, SF
HELEN 24-11H - Wellbore #1 - Design #1	250.00	250.00	20.14	12.53	2.648	CC
HELEN 24-11H - Wellbore #1 - Design #1	17,257.01	17,062.52	360.84	-124.22	0.744	Level 1, ES, SF
HELEN 24-13H - Wellbore #1 - Design #1	290.94	289.75	19.85	12.21	2.598	CC
HELEN 24-13H - Wellbore #1 - Design #1	17,257.01	17,041.30	233.22	-4.98	0.979	Level 1, ES, SF
HELEN 24-14H - Wellbore #1 - Design #1	250.00	249.00	39.99	32.39	5.258	CC
HELEN 24-14H - Wellbore #1 - Design #1	17,257.01	17,205.21	481.63	-26.07	0.949	Level 1, ES, SF
HELEN 24-15H - Wellbore #1 - Design #1	250.00	249.00	59.85	52.25	7.869	CC, ES
HELEN 24-15H - Wellbore #1 - Design #1	17,257.01	17,239.42	879.81	364.40	1.707	SF
HELEN 24-16H - Wellbore #1 - Design #1	250.00	249.00	79.99	72.38	10.516	CC, ES
HELEN 24-16H - Wellbore #1 - Design #1	17,257.01	17,517.75	1,046.94	517.91	1.979	SF
HELEN 24-17H - Wellbore #1 - Design #1	250.00	249.00	99.84	92.24	13.127	CC, ES
HELEN 24-17H - Wellbore #1 - Design #1	17,257.01	17,435.14	1,251.97	725.09	2.376	SF
HELEN 24-18H - Wellbore #1 - Design #1	250.00	248.00	119.98	112.37	15.775	CC, ES
HELEN 24-18H - Wellbore #1 - Design #1	17,257.01	17,501.59	1,651.01	1,124.35	3.135	SF
HELEN 24-3H - Wellbore #1 - Design #1	250.00	252.00	180.11	172.51	23.677	CC, ES
HELEN 24-3H - Wellbore #1 - Design #1	17,257.01	17,266.86	2,641.39	2,115.69	5.025	SF
HELEN 24-4H - Wellbore #1 - Design #1	250.00	251.00	159.98	152.37	21.031	CC, ES
HELEN 24-4H - Wellbore #1 - Design #1	17,257.01	17,093.67	2,255.54	1,731.39	4.303	SF
HELEN 24-5H - Wellbore #1 - Design #1	250.00	251.00	140.12	132.52	18.421	CC, ES
HELEN 24-5H - Wellbore #1 - Design #1	17,257.01	17,336.26	2,048.06	1,524.25	3.910	SF
HELEN 24-6H - Wellbore #1 - Design #1	250.00	251.00	119.98	112.38	15.773	CC, ES
HELEN 24-6H - Wellbore #1 - Design #1	17,257.01	17,092.09	1,858.35	1,333.31	3.539	SF
HELEN 24-7H - Wellbore #1 - Design #1	250.00	251.00	100.12	92.52	13.163	CC, ES
HELEN 24-7H - Wellbore #1 - Design #1	17,246.66	16,965.75	1,476.45	955.07	2.832	SF
HELEN 24-8H - Wellbore #1 - Design #1	250.00	251.00	79.99	72.38	10.516	CC, ES
HELEN 24-8H - Wellbore #1 - Design #1	17,257.01	17,013.55	1,076.64	554.30	2.061	SF
HELEN 24-9H - Wellbore #1 - Design #1	250.00	250.00	60.13	52.53	7.905	CC, ES
HELEN 24-9H - Wellbore #1 - Design #1	17,252.19	17,171.32	1,001.05	473.68	1.898	SF

Reference Depths are relative to RKB = 20' @ 4944.00usft (Drilling Rig)  
Offset Depths are relative to Offset Datum  
Central Meridian is -105.500000

Coordinates are relative to: HELEN 24-12H  
Coordinate System is US State Plane 1983, Colorado Northern Zone  
Grid Convergence at Surface is: 0.65°

Ladder Plot



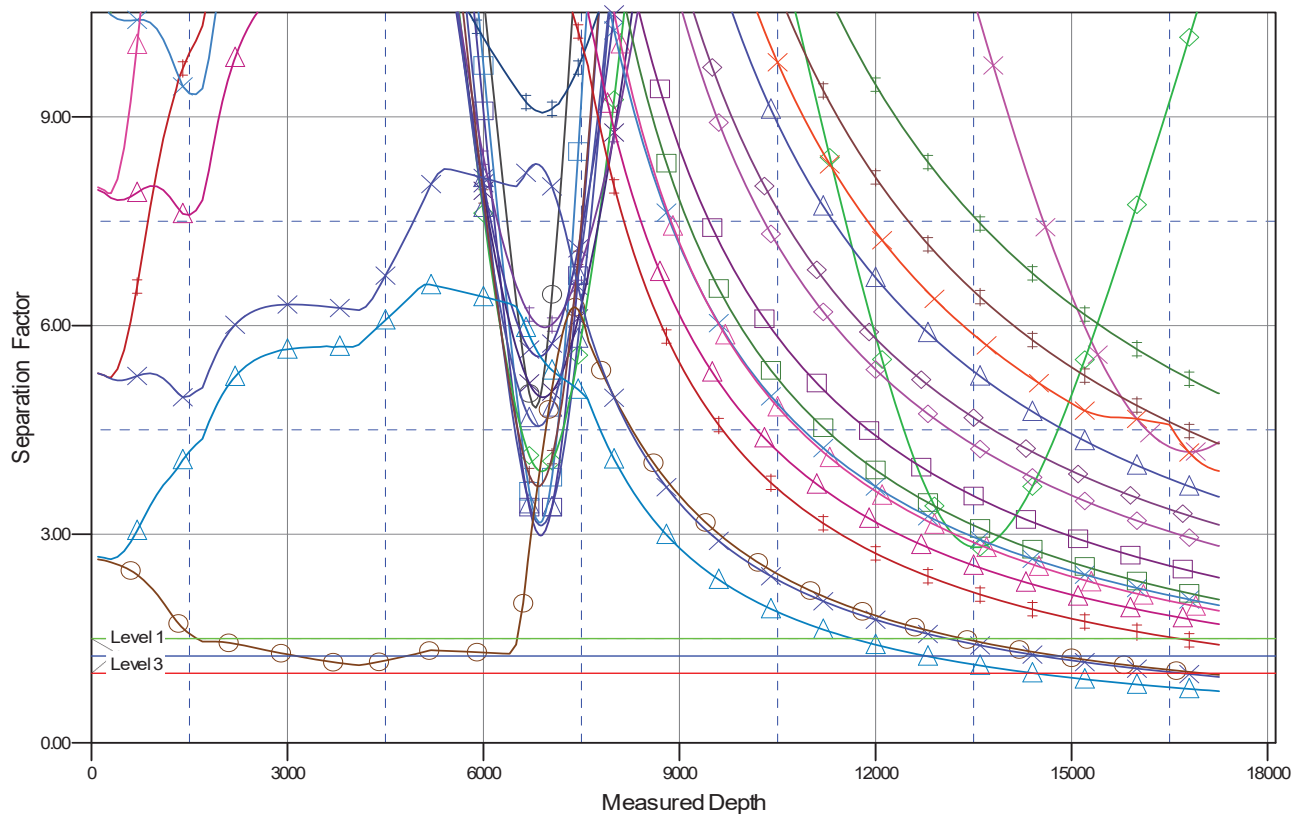
LEGEND

- |   |   |                                       |
|---|---|---------------------------------------|
| LE Gein #12H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | MOCLINTOCK ET AL #1, Junior Oil & Gas DAW Well, No Surveys V0 | HELEN24-16H Wellbore #1, Design #1 V0 |
| LE Gein #9H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0  | State C14-36, Noble Energy PR Well No Surveys V0              | HELEN24-17H Wellbore #1, Design #1 V0 |
| LE Gein #10H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0 | STATE C41-36, Prima Exploration PA Well No Surveys V0         | HELEN24-18H Wellbore #1, Design #1 V0 |
| LE 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  |
| LE 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  |
| LE 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  |
| LE 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  |
| LE 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  |
| LE 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  |
| LE Gein #9H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0  | HELEN24-13H Wellbore #1, Design #1 V0                         | HELEN24-9H Wellbore #1, Design #1 V0  |
| ARNOLD #1, Barret Resources PA Well No Surveys V0                         | HELEN24-14H Wellbore #1, Design #1 V0                         |                                       |
| DARYL LARNOLD #1, Amoco DAW Well, No Surveys V0                           | HELEN24-15H Wellbore #1, Design #1 V0                         |                                       |

Reference Depths are relative to RKB = 20' @ 4944.00usft (Drilling Rig)  
Offset Depths are relative to Offset Datum  
Central Meridian is -105.500000

Coordinates are relative to: HELEN 24-12H  
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	MOCLINTOCK ET AL #1, Junior Oil & Gas DAW Well, No Surveys V0	HELEN24-16H 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	HELEN24-17H Wellbore #1, Design #1 V0
L.E. Gein #10H Red Hawk Petroleum Planned Well Planned Cathedral Surveys V0	STATE 041-36, 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	HELEN24-13H Wellbore #1, Design #1 V0	HELEN24-9H Wellbore #1, Design #1 V0
ARNOLD #1 Barret Resources PRR Well, No Surveys V0	HELEN24-14H Wellbore #1, Design #1 V0	
DARYL LARNOLD #1, Amoco DAW Well, No Surveys V0	HELEN24-15H Wellbore #1, Design #1 V0	