

Noble Energy Inc.- Weld County, CO (Grid North)

Well Name: **Heartland C31-78-1HN**

Surface Location: Heartland C30-79-1HN Pad Sec.25-T4N-R65W
North American Datum 1983 , US State Plane 1983 , Colorado Northern Zone

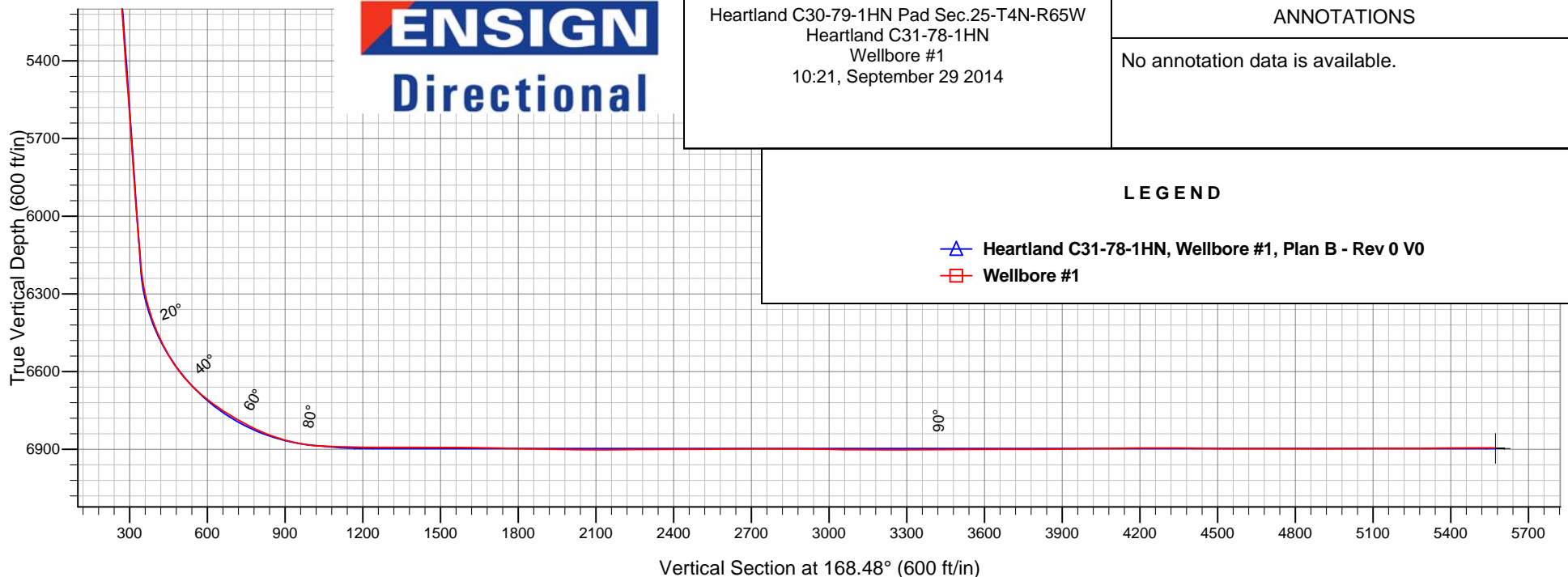
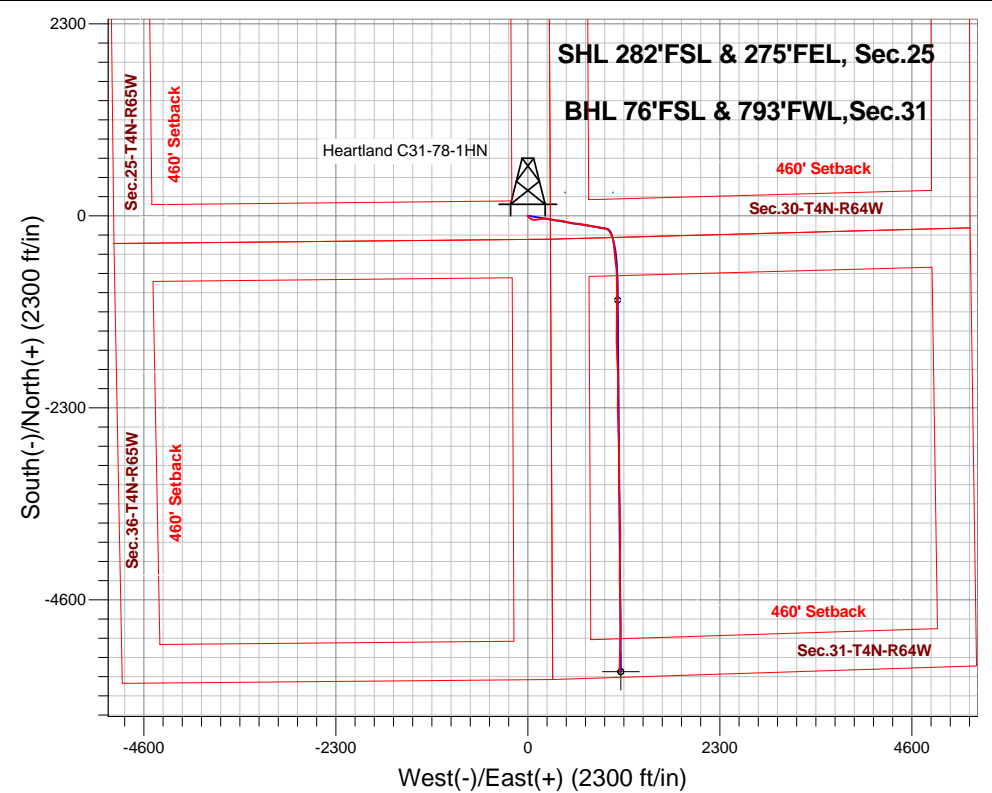
Ground Elevation: 4846.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	1344919.02	3250184.50	40.276730	-104.603320	

Precision 828 RKB - 16' WELL @ 4862.0ft (Precision 828 RKB - 16')

FINAL SURVEY

Projected Bottom Hole Location
11987'MD 6895'TVD 5460'S & 1098'E of SHL
90.2 degree Incl @ 181.5 degree AZM





Noble Energy Inc.- Weld County, CO (Grid North)

Sec.25-T4N-R65W

Heartland C30-79-1HN Pad Sec.25-T4N-R65W

Heartland C31-78-1HN

Wellbore #1

Design: Wellbore #1

Standard Survey Report

29 September, 2014

Company:	Noble Energy Inc.- Weld County, CO (Grid North)	Local Co-ordinate Reference:	Well Heartland C31-78-1HN
Project:	Sec.25-T4N-R65W	TVD Reference:	WELL @ 4862.0ft (Precision 828 RKB - 16')
Site:	Heartland C30-79-1HN Pad Sec.25-T4N-R65W	MD Reference:	WELL @ 4862.0ft (Precision 828 RKB - 16')
Well:	Heartland C31-78-1HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Landmark

Project	Sec.25-T4N-R65W, Weld County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		Using Well Reference Point
Map Zone:	Colorado Northern Zone		Using geodetic scale factor

Site		Heartland C30-79-1HN Pad Sec.25-T4N-R65W			
Site Position:		Northing:	1,344,918.58ft	Latitude:	40.276730
From:	Lat/Long	Easting:	3,250,139.86ft	Longitude:	-104.603480
Position Uncertainty:	0.0 ft	Slot Radius:	"	Grid Convergence:	0.58 °

Well	Heartland C31-78-1HN					
Well Position	+N-S	0.0 ft	Northing:	1,344,919.02 ft	Latitude:	40.276730
	+E-W	0.0 ft	Easting:	3,250,184.50 ft	Longitude:	-104.603320
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,846.0 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	9/18/2014	8.33	66.86	52,740

Design	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.0	0.0	0.0	168.48	

Survey Program	Date	9/29/2014			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
718.0	718.0	Surface (Wellbore #1)	Flexi-Shot	VES Flexi-Shot Tool	
799.0	7,302.0	Curve/Intermediate (Wellbore #1)	MWD	MWD - Standard	
7,389.0	11,987.0	Lateral (Wellbore #1)	MWD	MWD - Standard	

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
718.0	0.20	236.35	718.0	-0.7	-1.0	0.5	0.03	0.03	0.00
799.0	0.60	286.30	799.0	-0.7	-1.6	0.3	0.61	0.49	61.67
889.0	0.40	308.80	889.0	-0.3	-2.3	-0.1	0.31	-0.22	25.00
979.0	0.40	270.80	979.0	-0.1	-2.8	-0.4	0.29	0.00	-42.22
1,068.0	2.10	117.50	1,068.0	-0.9	-1.7	0.5	2.77	1.91	-172.25
1,163.0	4.80	114.70	1,162.8	-3.3	3.5	4.0	2.85	2.84	-2.95
1,257.0	4.60	147.80	1,256.5	-8.2	9.1	9.8	2.85	-0.21	35.21
1,351.0	6.10	159.80	1,350.1	-16.0	12.8	18.3	1.98	1.60	12.77
1,445.0	9.70	135.90	1,443.2	-26.4	20.0	29.9	5.11	3.83	-25.43

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Site:	Heartland C30-79-1HN Pad Sec.25-T4N-R65W	MD Reference:	WELL @ 4862.0ft (Precision 828 RKB - 16')
Well:	Heartland C31-78-1HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Landmark

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
1,539.0	12.60	120.70	1,535.4	-37.4	34.4	43.5	4.37	3.09	-16.17
1,633.0	13.70	102.80	1,627.0	-45.1	54.0	54.9	4.47	1.17	-19.04
1,728.0	12.30	94.70	1,719.6	-48.4	75.1	62.4	2.42	-1.47	-8.53
1,823.0	14.40	82.30	1,812.0	-47.6	96.9	66.0	3.73	2.21	-13.05
1,918.0	12.00	84.70	1,904.5	-45.1	118.4	67.9	2.59	-2.53	2.53
2,013.0	10.90	79.60	1,997.6	-42.6	137.1	69.1	1.57	-1.16	-5.37
2,105.0	10.40	80.00	2,088.0	-39.6	153.8	69.5	0.55	-0.54	0.43
2,195.0	9.60	84.00	2,176.7	-37.4	169.3	70.4	1.18	-0.89	4.44
2,285.0	10.20	86.20	2,265.3	-36.1	184.7	72.2	0.79	0.67	2.44
2,375.0	10.50	89.00	2,353.9	-35.4	200.9	74.8	0.65	0.33	3.11
2,464.0	10.50	89.30	2,441.4	-35.2	217.1	77.8	0.06	0.00	0.34
2,554.0	10.90	94.10	2,529.8	-35.7	233.8	81.6	1.08	0.44	5.33
2,644.0	11.80	100.70	2,618.1	-38.0	251.3	87.4	1.75	1.00	7.33
2,734.0	12.50	104.40	2,706.0	-42.1	269.8	95.2	1.16	0.78	4.11
2,823.0	12.30	101.10	2,793.0	-46.3	288.4	103.0	0.83	-0.22	-3.71
2,913.0	12.10	100.50	2,880.9	-49.9	307.1	110.2	0.26	-0.22	-0.67
3,003.0	12.30	99.40	2,968.9	-53.2	325.8	117.2	0.34	0.22	-1.22
3,093.0	11.90	94.10	3,056.9	-55.4	344.5	123.1	1.31	-0.44	-5.89
3,183.0	11.30	95.50	3,145.1	-56.9	362.6	128.2	0.74	-0.67	1.56
3,273.0	12.10	95.60	3,233.2	-58.7	380.7	133.6	0.89	0.89	0.11
3,362.0	10.40	98.20	3,320.5	-60.8	398.0	139.0	1.99	-1.91	2.92
3,452.0	10.50	100.80	3,409.0	-63.4	414.1	144.9	0.54	0.11	2.89
3,542.0	11.10	105.10	3,497.4	-67.2	430.5	151.9	1.12	0.67	4.78
3,632.0	11.40	102.60	3,585.7	-71.4	447.5	159.4	0.64	0.33	-2.78
3,722.0	11.90	101.40	3,673.8	-75.2	465.3	166.6	0.62	0.56	-1.33
3,812.0	10.20	103.40	3,762.1	-78.9	482.2	173.6	1.94	-1.89	2.22
3,902.0	10.20	105.30	3,850.7	-82.8	497.6	180.6	0.37	0.00	2.11
3,992.0	10.90	102.30	3,939.2	-86.8	513.6	187.6	0.99	0.78	-3.33
4,082.0	10.90	100.70	4,027.6	-90.2	530.3	194.2	0.34	0.00	-1.78
4,171.0	10.40	100.60	4,115.0	-93.2	546.4	200.4	0.56	-0.56	-0.11
4,261.0	11.20	92.90	4,203.4	-95.1	563.2	205.7	1.83	0.89	-8.56
4,351.0	11.80	96.60	4,291.6	-96.6	581.0	210.7	1.06	0.67	4.11
4,441.0	11.30	93.20	4,379.8	-98.2	599.0	215.8	0.94	-0.56	-3.78
4,531.0	11.80	98.00	4,468.0	-100.0	616.9	221.1	1.20	0.56	5.33
4,621.0	11.30	96.30	4,556.2	-102.2	634.8	226.9	0.67	-0.56	-1.89
4,711.0	10.90	93.10	4,644.5	-103.6	652.0	231.8	0.82	-0.44	-3.56
4,801.0	10.90	97.00	4,732.9	-105.1	669.0	236.6	0.82	0.00	4.33
4,891.0	11.30	102.10	4,821.2	-108.0	686.0	242.8	1.18	0.44	5.67
4,981.0	10.80	101.00	4,909.5	-111.5	702.9	249.6	0.60	-0.56	-1.22
5,070.0	9.80	96.90	4,997.1	-114.0	718.6	255.2	1.39	-1.12	-4.61
5,160.0	10.60	103.80	5,085.7	-116.9	734.3	261.2	1.62	0.89	7.67
5,250.0	10.90	101.50	5,174.1	-120.5	750.7	268.0	0.58	0.33	-2.56
5,340.0	11.50	100.60	5,262.4	-123.9	767.8	274.7	0.69	0.67	-1.00
5,430.0	10.50	96.30	5,350.7	-126.4	784.8	280.6	1.44	-1.11	-4.78
5,520.0	10.40	106.10	5,439.2	-129.6	800.7	286.9	1.98	-0.11	10.89
5,610.0	10.20	102.90	5,527.8	-133.6	816.3	294.0	0.67	-0.22	-3.56
5,700.0	10.90	101.90	5,616.3	-137.1	832.4	300.6	0.80	0.78	-1.11
5,790.0	10.00	100.70	5,704.8	-140.4	848.4	307.0	1.03	-1.00	-1.33
5,879.0	10.40	98.90	5,792.4	-143.0	863.9	312.7	0.57	0.45	-2.02
5,969.0	11.40	99.90	5,880.7	-145.8	880.7	318.8	1.13	1.11	1.11
6,059.0	11.60	100.10	5,968.9	-148.9	898.4	325.4	0.23	0.22	0.22
6,149.0	11.80	103.90	6,057.1	-152.7	916.2	332.6	0.88	0.22	4.22
6,239.0	11.60	101.50	6,145.2	-156.7	934.0	340.1	0.58	-0.22	-2.67
6,284.0	10.80	100.70	6,189.3	-158.4	942.6	343.5	1.81	-1.78	-1.78

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Site:	Heartland C30-79-1HN Pad Sec.25-T4N-R65W	MD Reference:	WELL @ 4862.0ft (Precision 828 RKB - 16')
Well:	Heartland C31-78-1HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Landmark

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
6,329.0	11.90	118.20	6,233.5	-161.4	950.9	348.1	8.00	2.44	38.89
6,374.0	13.90	132.20	6,277.3	-167.2	959.0	355.4	8.21	4.44	31.11
6,419.0	15.30	137.90	6,320.9	-175.3	966.9	364.9	4.45	3.11	12.67
6,464.0	18.20	142.30	6,364.0	-185.2	975.2	376.3	7.03	6.44	9.78
6,509.0	21.00	146.40	6,406.4	-197.5	984.0	390.1	6.93	6.22	9.11
6,554.0	24.20	149.10	6,447.9	-212.2	993.2	406.2	7.47	7.11	6.00
6,599.0	26.90	155.20	6,488.5	-229.3	1,002.2	424.8	8.37	6.00	13.56
6,644.0	29.50	160.60	6,528.2	-249.0	1,010.1	445.7	8.09	5.78	12.00
6,689.0	33.30	167.00	6,566.6	-271.5	1,016.6	469.1	11.22	8.44	14.22
6,734.0	37.50	169.40	6,603.3	-297.0	1,021.9	495.1	9.83	9.33	5.33
6,778.0	42.10	172.40	6,637.1	-324.8	1,026.3	523.3	11.33	10.45	6.82
6,823.0	47.10	173.10	6,669.1	-356.2	1,030.3	554.8	11.16	11.11	1.56
6,868.0	51.00	173.90	6,698.6	-389.9	1,034.1	588.6	8.77	8.67	1.78
6,913.0	54.10	174.60	6,725.9	-425.5	1,037.7	624.1	7.00	6.89	1.56
6,958.0	56.60	173.30	6,751.5	-462.3	1,041.6	661.0	6.04	5.56	-2.89
7,003.0	59.00	174.00	6,775.5	-500.1	1,045.8	698.9	5.49	5.33	1.56
7,048.0	61.50	172.70	6,797.8	-538.9	1,050.4	737.8	6.10	5.56	-2.89
7,093.0	64.40	173.00	6,818.3	-578.7	1,055.4	777.8	6.47	6.44	0.67
7,138.0	67.40	174.30	6,836.7	-619.5	1,059.9	818.7	7.17	6.67	2.89
7,183.0	71.30	176.20	6,852.5	-661.5	1,063.4	860.5	9.52	8.67	4.22
7,228.0	74.80	178.70	6,865.7	-704.4	1,065.3	903.0	9.42	7.78	5.56
7,273.0	78.50	179.10	6,876.0	-748.2	1,066.1	946.1	8.27	8.22	0.89
7,302.0	81.70	179.50	6,881.0	-776.8	1,066.5	974.1	11.12	11.03	1.38
7,389.0	88.00	179.50	6,888.8	-863.4	1,067.2	1,059.1	7.24	7.24	0.00
7,484.0	88.90	180.20	6,891.4	-958.3	1,067.5	1,152.2	1.20	0.95	0.74
7,535.2	89.18	180.37	6,892.3	-1,009.5	1,067.2	1,202.3	0.63	0.54	0.32
Heartland C31-78-1HN Landing Pt.									
7,577.0	89.40	180.50	6,892.8	-1,051.3	1,066.9	1,243.2	0.63	0.54	0.32
7,672.0	90.20	180.50	6,893.1	-1,146.3	1,066.1	1,336.1	0.84	0.84	0.00
7,764.0	89.40	178.60	6,893.4	-1,238.3	1,066.8	1,426.4	2.24	-0.87	-2.07
7,858.0	90.60	182.70	6,893.4	-1,332.3	1,065.7	1,518.3	4.54	1.28	4.36
7,951.0	89.20	180.50	6,893.6	-1,425.2	1,063.1	1,608.9	2.80	-1.51	-2.37
8,045.0	88.90	178.10	6,895.2	-1,519.2	1,064.3	1,701.2	2.57	-0.32	-2.55
8,135.0	88.30	178.30	6,897.4	-1,609.1	1,067.1	1,789.8	0.70	-0.67	0.22
8,225.0	89.20	177.40	6,899.3	-1,699.1	1,070.5	1,878.6	1.41	1.00	-1.00
8,315.0	89.40	177.50	6,900.4	-1,789.0	1,074.5	1,967.5	0.25	0.22	0.11
8,405.0	88.60	177.60	6,902.0	-1,878.9	1,078.3	2,056.4	0.90	-0.89	0.11
8,494.0	90.50	179.20	6,902.7	-1,967.8	1,080.8	2,144.0	2.79	2.13	1.80
8,584.0	91.00	181.50	6,901.5	-2,057.8	1,080.3	2,232.1	2.62	0.56	2.56
8,674.0	90.30	180.50	6,900.5	-2,147.8	1,078.7	2,319.9	1.36	-0.78	-1.11
8,764.0	90.20	181.20	6,900.1	-2,237.8	1,077.4	2,407.9	0.79	-0.11	0.78
8,853.0	90.10	179.20	6,899.9	-2,326.8	1,077.0	2,495.0	2.25	-0.11	-2.25
8,943.0	90.20	177.50	6,899.6	-2,416.7	1,079.6	2,583.7	1.89	0.11	-1.89
9,033.0	90.60	177.70	6,899.0	-2,506.6	1,083.4	2,672.5	0.50	0.44	0.22
9,123.0	90.10	178.30	6,898.4	-2,596.6	1,086.5	2,761.3	0.87	-0.56	0.67
9,212.0	90.00	178.90	6,898.4	-2,685.6	1,088.7	2,848.9	0.68	-0.11	0.67
9,302.0	88.60	179.00	6,899.5	-2,775.5	1,090.4	2,937.4	1.56	-1.56	0.11
9,392.0	88.80	178.60	6,901.5	-2,865.5	1,092.3	3,025.9	0.50	0.22	-0.44
9,482.0	90.50	180.10	6,902.1	-2,955.5	1,093.3	3,114.3	2.52	1.89	1.67
9,572.0	89.80	179.80	6,901.8	-3,045.5	1,093.4	3,202.5	0.85	-0.78	-0.33
9,661.0	89.60	180.00	6,902.3	-3,134.5	1,093.5	3,289.7	0.32	-0.22	0.22
9,751.0	90.20	179.00	6,902.4	-3,224.5	1,094.3	3,378.1	1.30	0.67	-1.11
9,841.0	91.40	179.40	6,901.2	-3,314.5	1,095.6	3,466.5	1.41	1.33	0.44

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Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Landmark

Survey									
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9,930.0	89.80	178.60	6,900.3	-3,403.4	1,097.1	3,554.0	2.01	-1.80	-0.90
10,020.0	90.40	178.30	6,900.1	-3,493.4	1,099.5	3,642.6	0.75	0.67	-0.33
10,110.0	89.50	178.00	6,900.2	-3,583.3	1,102.4	3,731.3	1.05	-1.00	-0.33
10,200.0	90.90	179.80	6,899.9	-3,673.3	1,104.2	3,819.8	2.53	1.56	2.00
10,290.0	90.60	179.00	6,898.7	-3,763.3	1,105.1	3,908.2	0.95	-0.33	-0.89
10,380.0	90.70	179.70	6,897.7	-3,853.3	1,106.1	3,996.6	0.79	0.11	0.78
10,470.0	90.50	180.70	6,896.7	-3,943.3	1,105.8	4,084.7	1.13	-0.22	1.11
10,560.0	90.30	181.30	6,896.1	-4,033.3	1,104.2	4,172.6	0.70	-0.22	0.67
10,649.0	90.40	180.20	6,895.6	-4,122.3	1,103.1	4,259.5	1.24	0.11	-1.24
10,739.0	89.60	180.80	6,895.6	-4,212.3	1,102.3	4,347.5	1.11	-0.89	0.67
10,829.0	89.40	181.20	6,896.3	-4,302.2	1,100.7	4,435.4	0.50	-0.22	0.44
10,919.0	89.10	178.60	6,897.5	-4,392.2	1,100.9	4,523.6	2.91	-0.33	-2.89
11,009.0	90.40	178.20	6,897.9	-4,482.2	1,103.4	4,612.3	1.51	1.44	-0.44
11,099.0	90.20	178.20	6,897.4	-4,572.1	1,106.2	4,701.0	0.22	-0.22	0.00
11,189.0	89.80	178.90	6,897.4	-4,662.1	1,108.5	4,789.6	0.90	-0.44	0.78
11,279.0	89.50	179.50	6,898.0	-4,752.1	1,109.8	4,878.0	0.75	-0.33	0.67
11,369.0	90.80	179.80	6,897.8	-4,842.1	1,110.3	4,966.3	1.48	1.44	0.33
11,458.0	90.30	180.10	6,896.9	-4,931.1	1,110.4	5,053.5	0.66	-0.56	0.34
11,548.0	90.20	181.60	6,896.5	-5,021.1	1,109.1	5,141.4	1.67	-0.11	1.67
11,638.0	89.80	181.90	6,896.5	-5,111.0	1,106.3	5,229.0	0.56	-0.44	0.33
11,728.0	90.50	181.00	6,896.3	-5,201.0	1,104.0	5,316.7	1.27	0.78	-1.00
11,818.0	90.40	181.50	6,895.6	-5,291.0	1,102.1	5,404.5	0.57	-0.11	0.56
11,927.0	90.20	181.50	6,895.0	-5,399.9	1,099.2	5,510.7	0.18	-0.18	0.00
11,987.0	90.20	181.50	6,894.8	-5,459.9	1,097.6	5,569.1	0.00	0.00	0.00
Heartland C31-78-1HN BHL 75'FSL & 808'FWL									

Checked By: _____	Approved By: _____	Date: _____
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