

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

Well Name: **Sandau K25-66-1HN**

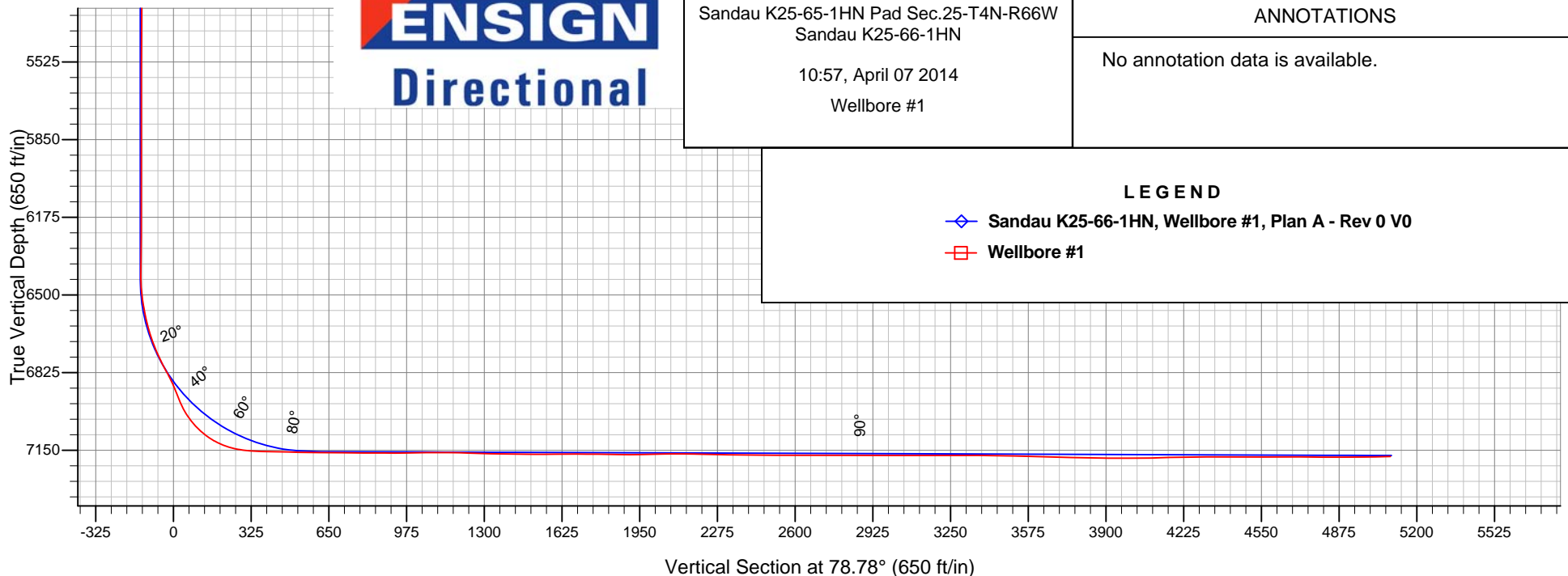
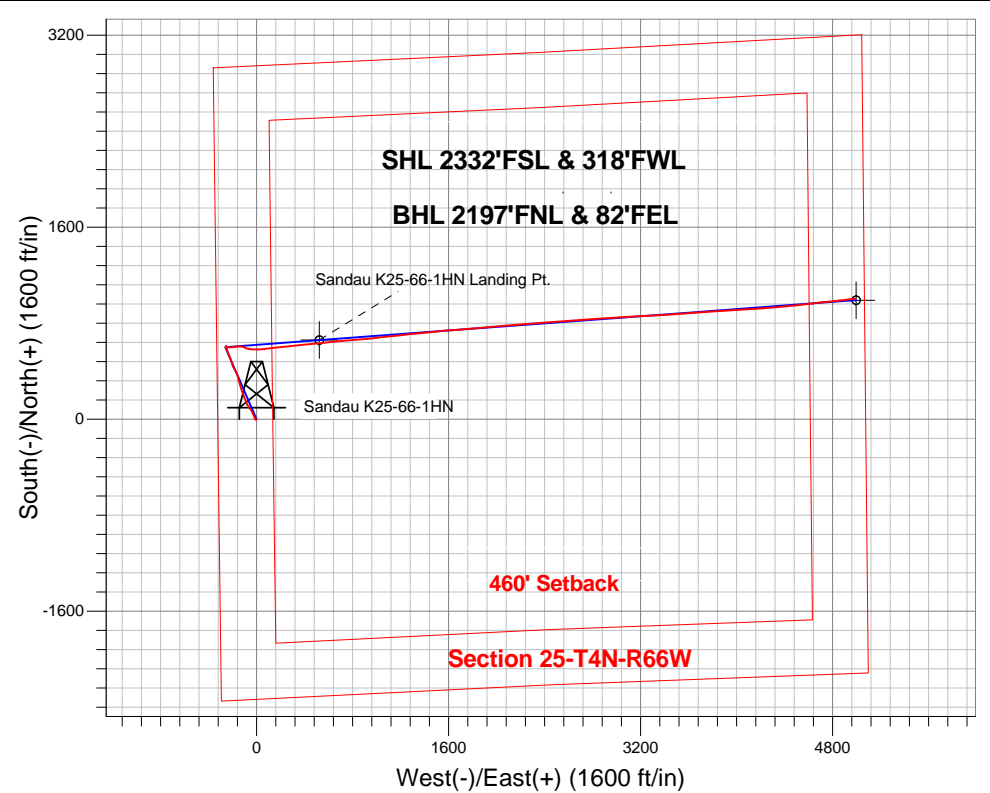
Surface Location: Sandau K25-65-1HN Pad Sec.25-T4N-R66W  
North American Datum 1983 , US State Plane 1983 , Colorado Northern Zone

Ground Elevation: 4780.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	1346548.54	3213779.70	40.282140	-104.733740	
Precision 829 RKB - 16' WELL @ 4796.0ft (Precision 829 RKB - 16')						

## FINAL SURVEY

Projected Bottom Hole Location  
12230'MD 7177'TVD 1004'N & 4990'E of SHL  
91.1 degree Incl @ 82.9 degree AZM





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

**Sec.25-T4N-R66W**

**Sandau K25-65-1HN Pad Sec.25-T4N-R66W**

**Sandau K25-66-1HN**

**Wellbore #1**

**Design: Wellbore #1**

## **Standard Survey Report**

**07 April, 2014**

<b>Company:</b>	Noble Energy Inc.- Weld County, CO (Grid North)	<b>Local Co-ordinate Reference:</b>	Well Sandau K25-66-1HN
<b>Project:</b>	Sec.25-T4N-R66W	<b>TVD Reference:</b>	WELL @ 4796.0ft (Precision 829 RKB - 16')
<b>Site:</b>	Sandau K25-65-1HN Pad Sec.25-T4N-R66W	<b>MD Reference:</b>	WELL @ 4796.0ft (Precision 829 RKB - 16')
<b>Well:</b>	Sandau K25-66-1HN	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	Landmark

<b>Project</b>	Sec.25-T4N-R66W, Weld County, CO		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		Using Well Reference Point
<b>Map Zone:</b>	Colorado Northern Zone		Using geodetic scale factor

Site		Sandau K25-65-1HN Pad Sec.25-T4N-R66W			
Site Position:		Northing:	1,346,526.69ft	Latitude:	40.282080
From:	Lat/Long	Easting:	3,213,779.89ft	Longitude:	-104.733740
Position Uncertainty:	0.0 ft	Slot Radius:	"	Grid Convergence:	0.50 °

Well	Sandau K25-66-1HN					
Well Position	+N-S	0.0 ft	Northing:	1,346,548.54 ft	Latitude:	40.282140
	+E-W	0.0 ft	Easting:	3,213,779.70 ft	Longitude:	-104.733740
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,780.0 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	1/27/2014	8.49	66.87	52,797

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	78.78	

Survey Program		Date	4/7/2014		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
671.0	671.0	Surface (Wellbore #1)	Flexi-Shot	VES Flexi-Shot Tool	
705.0	7,379.0	Intermediate (Wellbore #1)	MWD+IFR1+MS_WY	Fixed:v2:Rockies, crustal dec + 3-axis correction	
7,456.0	12,230.0	Lateral (Wellbore #1)	MWD+IFR1+MS_WY	Fixed:v2:Rockies, crustal dec + 3-axis correction	

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
671.0	0.70	229.30	671.0	-2.7	-3.1	-3.6	0.10	0.10	0.00
705.0	0.70	212.60	705.0	-3.0	-3.4	-3.9	0.60	0.00	-49.12
795.0	0.80	216.50	795.0	-4.0	-4.0	-4.7	0.12	0.11	4.33
884.0	0.80	218.00	884.0	-4.9	-4.8	-5.7	0.02	0.00	1.69
974.0	0.80	209.60	974.0	-6.0	-5.5	-6.6	0.13	0.00	-9.33
1,063.0	0.40	188.50	1,063.0	-6.8	-5.8	-7.1	0.51	-0.45	-23.71
1,172.0	1.10	307.20	1,171.9	-6.6	-6.7	-7.9	1.23	0.64	108.90
1,267.0	3.20	323.50	1,266.9	-3.9	-9.0	-9.6	2.28	2.21	17.16
1,363.0	4.40	335.60	1,362.7	1.6	-12.2	-11.6	1.50	1.25	12.60

<b>Company:</b>	Noble Energy Inc.- Weld County, CO (Grid North)	<b>Local Co-ordinate Reference:</b>	Well Sandau K25-66-1HN
<b>Project:</b>	Sec.25-T4N-R66W	<b>TVD Reference:</b>	WELL @ 4796.0ft (Precision 829 RKB - 16')
<b>Site:</b>	Sandau K25-65-1HN Pad Sec.25-T4N-R66W	<b>MD Reference:</b>	WELL @ 4796.0ft (Precision 829 RKB - 16')
<b>Well:</b>	Sandau K25-66-1HN	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	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)
1,456.0	5.70	339.90	1,455.3	9.2	-15.2	-13.1	1.45	1.40	4.62
1,549.0	5.70	338.50	1,547.8	17.8	-18.5	-14.7	0.15	0.00	-1.51
1,641.0	6.20	337.40	1,639.3	26.7	-22.1	-16.5	0.56	0.54	-1.20
1,734.0	7.40	339.70	1,731.7	36.9	-26.1	-18.4	1.32	1.29	2.47
1,827.0	8.60	337.40	1,823.8	49.0	-30.8	-20.7	1.34	1.29	-2.47
1,919.0	9.70	326.70	1,914.6	61.8	-37.7	-25.0	2.20	1.20	-11.63
2,012.0	10.20	324.40	2,006.2	75.0	-46.8	-31.3	0.69	0.54	-2.47
2,105.0	10.90	326.20	2,097.6	89.0	-56.5	-38.1	0.83	0.75	1.94
2,197.0	12.80	327.00	2,187.7	104.8	-66.9	-45.2	2.07	2.07	0.87
2,291.0	13.50	328.30	2,279.2	122.9	-78.3	-52.9	0.81	0.74	1.38
2,384.0	12.00	339.20	2,369.9	141.2	-87.5	-58.4	3.04	-1.61	11.72
2,479.0	13.50	342.90	2,462.6	161.0	-94.3	-61.1	1.80	1.58	3.89
2,586.0	15.50	340.00	2,566.2	186.4	-102.8	-64.6	1.99	1.87	-2.71
2,676.0	16.30	336.50	2,652.7	209.3	-112.0	-69.1	1.39	0.89	-3.89
2,766.0	16.40	338.30	2,739.1	232.6	-121.7	-74.1	0.57	0.11	2.00
2,855.0	17.10	343.70	2,824.3	256.9	-130.0	-77.6	1.92	0.79	6.07
2,945.0	16.80	344.80	2,910.4	282.1	-137.1	-79.6	0.49	-0.33	1.22
3,035.0	16.20	344.60	2,996.7	306.8	-143.9	-81.5	0.67	-0.67	-0.22
3,124.0	15.20	346.40	3,082.4	330.1	-149.9	-82.9	1.25	-1.12	2.02
3,214.0	13.50	345.10	3,169.6	351.7	-155.4	-84.0	1.92	-1.89	-1.44
3,304.0	12.30	343.40	3,257.3	371.1	-160.8	-85.6	1.40	-1.33	-1.89
3,393.0	11.30	332.70	3,344.4	387.9	-167.6	-88.9	2.70	-1.12	-12.02
3,483.0	10.20	326.30	3,432.9	402.4	-176.0	-94.4	1.80	-1.22	-7.11
3,573.0	10.00	326.70	3,521.5	415.5	-184.7	-100.4	0.24	-0.22	0.44
3,662.0	10.30	338.80	3,609.1	429.4	-191.9	-104.7	2.41	0.34	13.60
3,752.0	10.20	342.20	3,697.6	444.5	-197.2	-107.0	0.68	-0.11	3.78
3,842.0	9.90	341.40	3,786.3	459.4	-202.1	-108.9	0.37	-0.33	-0.89
3,931.0	10.00	340.00	3,873.9	473.9	-207.2	-111.0	0.29	0.11	-1.57
4,021.0	10.30	339.00	3,962.5	488.8	-212.7	-113.6	0.39	0.33	-1.11
4,111.0	9.80	339.70	4,051.1	503.5	-218.3	-116.2	0.57	-0.56	0.78
4,201.0	8.50	335.10	4,140.0	516.7	-223.7	-119.0	1.66	-1.44	-5.11
4,291.0	8.00	339.70	4,229.1	528.6	-228.7	-121.5	0.92	-0.56	5.11
4,380.0	7.60	339.70	4,317.2	539.9	-232.9	-123.4	0.45	-0.45	0.00
4,470.0	6.80	341.40	4,406.5	550.6	-236.7	-125.1	0.92	-0.89	1.89
4,560.0	6.40	340.20	4,495.9	560.3	-240.1	-126.5	0.47	-0.44	-1.33
4,650.0	6.40	336.30	4,585.4	569.6	-243.8	-128.3	0.48	0.00	-4.33
4,739.0	6.20	343.60	4,673.8	578.8	-247.1	-129.8	0.93	-0.22	8.20
4,829.0	5.60	349.50	4,763.4	587.8	-249.3	-130.2	0.95	-0.67	6.56
4,919.0	4.20	337.10	4,853.0	595.1	-251.4	-130.8	1.94	-1.56	-13.78
5,008.0	3.60	329.70	4,941.8	600.5	-254.1	-132.4	0.88	-0.67	-8.31
5,098.0	2.40	353.60	5,031.7	604.8	-255.7	-133.2	1.90	-1.33	26.56
5,187.0	1.00	27.00	5,120.7	607.4	-255.6	-132.5	1.86	-1.57	37.53
5,277.0	0.20	72.30	5,210.7	608.1	-255.0	-131.9	0.97	-0.89	50.33
5,367.0	1.30	203.60	5,300.6	607.3	-255.3	-132.3	1.60	1.22	145.89
5,456.0	1.10	202.10	5,389.6	605.5	-256.0	-133.4	0.23	-0.22	-1.69
5,546.0	0.90	180.40	5,479.6	604.0	-256.4	-134.0	0.47	-0.22	-24.11
5,636.0	0.80	174.50	5,569.6	602.7	-256.3	-134.2	0.15	-0.11	-6.56
5,725.0	1.00	177.30	5,658.6	601.3	-256.2	-134.4	0.23	0.22	3.15
5,815.0	0.50	158.30	5,748.6	600.2	-256.0	-134.4	0.61	-0.56	-21.11
5,905.0	0.50	185.20	5,838.6	599.4	-255.9	-134.4	0.26	0.00	29.89
5,994.0	0.60	167.20	5,927.6	598.6	-255.9	-134.5	0.22	0.11	-20.22
6,083.0	0.70	149.50	6,016.6	597.6	-255.5	-134.3	0.25	0.11	-19.89
6,174.0	0.70	171.50	6,107.6	596.6	-255.1	-134.2	0.29	0.00	24.18
6,263.0	0.40	196.80	6,196.6	595.8	-255.1	-134.4	0.43	-0.34	28.43

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<b>Site:</b>	Sandau K25-65-1HN Pad Sec.25-T4N-R66W	<b>MD Reference:</b>	WELL @ 4796.0ft (Precision 829 RKB - 16')
<b>Well:</b>	Sandau K25-66-1HN	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	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)
6,353.0	0.70	276.90	6,286.6	595.5	-255.8	-135.0	0.83	0.33	89.00
6,442.0	0.60	251.60	6,375.5	595.5	-256.7	-136.0	0.34	-0.11	-28.43
6,487.0	0.20	176.40	6,420.5	595.3	-257.0	-136.2	1.29	-0.89	-167.11
6,532.0	3.60	82.00	6,465.5	595.4	-255.6	-134.8	8.05	7.56	-209.78
6,577.0	7.20	81.50	6,510.3	596.0	-251.4	-130.6	8.00	8.00	-1.11
6,622.0	10.40	81.30	6,554.8	597.1	-244.6	-123.7	7.11	7.11	-0.44
6,667.0	12.90	86.00	6,598.8	598.0	-235.5	-114.7	5.94	5.56	10.44
6,712.0	15.60	87.10	6,642.5	598.7	-224.5	-103.7	6.03	6.00	2.44
6,757.0	19.00	86.60	6,685.4	599.4	-211.1	-90.5	7.56	7.56	-1.11
6,801.0	22.50	83.40	6,726.6	600.8	-195.6	-75.0	8.36	7.95	-7.27
6,846.0	25.80	84.60	6,767.6	602.7	-177.3	-56.7	7.41	7.33	2.67
6,891.0	28.80	84.10	6,807.6	604.8	-156.8	-36.1	6.69	6.67	-1.11
6,936.0	27.60	92.20	6,847.3	605.5	-135.5	-15.2	8.91	-2.67	18.00
6,981.0	25.50	106.40	6,887.6	602.3	-115.8	3.6	14.82	-4.67	31.56
7,026.0	25.50	116.40	6,928.2	595.3	-97.8	19.8	9.56	0.00	22.22
7,070.0	28.80	105.90	6,967.4	588.2	-79.1	36.8	13.20	7.50	-23.86
7,115.0	35.00	98.30	7,005.6	583.3	-55.9	58.6	16.39	13.78	-16.89
7,160.0	41.90	92.70	7,040.8	580.8	-28.1	85.4	17.16	15.33	-12.44
7,205.0	49.00	89.40	7,072.4	580.2	3.9	116.7	16.62	15.78	-7.33
7,250.0	56.70	85.90	7,099.5	581.8	39.7	152.1	18.20	17.11	-7.78
7,294.0	65.00	82.90	7,120.9	585.5	77.9	190.4	19.78	18.86	-6.82
7,339.0	73.20	82.00	7,137.0	591.1	119.6	232.3	18.32	18.22	-2.00
7,379.0	79.90	85.00	7,146.3	595.5	158.2	271.0	18.27	16.75	7.50
7,456.0	88.10	84.30	7,154.3	602.6	234.4	347.1	10.69	10.65	-0.91
7,501.0	88.40	84.47	7,155.7	607.0	279.1	391.9	0.77	0.67	0.38
7,546.0	88.80	83.88	7,156.8	611.6	323.9	436.7	1.58	0.89	-1.31
7,591.0	89.00	82.63	7,157.6	616.8	368.6	481.5	2.81	0.44	-2.78
7,636.0	88.90	84.65	7,158.5	621.8	413.3	526.4	4.49	-0.22	4.49
7,725.0	89.50	84.13	7,159.7	630.5	501.9	614.9	0.89	0.67	-0.58
7,749.9	89.47	84.03	7,159.9	633.1	526.6	639.7	0.42	-0.11	-0.40
Sandau K25-66-1HN Landing Pt.									
7,815.0	89.40	83.77	7,160.6	640.0	591.4	704.6	0.42	-0.11	-0.40
7,904.0	89.90	85.03	7,161.1	648.7	679.9	793.1	1.52	0.56	1.42
7,994.0	89.50	85.05	7,161.6	656.5	769.6	882.6	0.45	-0.44	0.02
8,084.0	90.80	85.82	7,161.4	663.6	859.3	972.0	1.68	1.44	0.86
8,173.0	90.60	84.32	7,160.3	671.3	948.0	1,060.4	1.70	-0.22	-1.69
8,263.0	89.70	83.47	7,160.0	680.9	1,037.4	1,150.1	1.38	-1.00	-0.94
8,353.0	87.90	83.08	7,161.9	691.4	1,126.8	1,239.8	2.05	-2.00	-0.43
8,442.0	88.60	84.53	7,164.6	701.0	1,215.2	1,328.4	1.81	0.79	1.63
8,532.0	89.50	83.51	7,166.1	710.4	1,304.7	1,418.0	1.51	1.00	-1.13
8,622.0	89.50	84.57	7,166.9	719.7	1,394.2	1,507.6	1.18	0.00	1.18
8,712.0	90.70	84.17	7,166.8	728.5	1,483.8	1,597.2	1.41	1.33	-0.44
8,801.0	90.20	84.96	7,166.1	737.0	1,572.4	1,685.7	1.05	-0.56	0.89
8,891.0	88.90	85.61	7,166.8	744.4	1,662.1	1,775.1	1.61	-1.44	0.72
8,980.0	89.50	85.54	7,168.0	751.2	1,750.8	1,863.5	0.68	0.67	-0.08
9,070.0	90.70	85.35	7,167.9	758.4	1,840.5	1,952.9	1.35	1.33	-0.21
9,160.0	91.60	84.96	7,166.0	766.0	1,930.2	2,042.3	1.09	1.00	-0.43
9,250.0	89.40	84.45	7,165.3	774.3	2,019.8	2,131.8	2.51	-2.44	-0.57
9,339.0	88.20	85.82	7,167.1	781.8	2,108.5	2,220.3	2.05	-1.35	1.54
9,429.0	89.10	85.57	7,169.2	788.6	2,198.2	2,309.6	1.04	1.00	-0.28
9,518.0	89.80	85.38	7,170.1	795.6	2,286.9	2,398.0	0.81	0.79	-0.21
9,608.0	89.50	85.97	7,170.7	802.4	2,376.6	2,487.3	0.74	-0.33	0.66
9,697.0	90.30	86.31	7,170.8	808.4	2,465.4	2,575.6	0.98	0.90	0.38

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<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	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)
9,787.0	89.40	85.67	7,171.0	814.7	2,555.2	2,664.9	1.23	-1.00	-0.71
9,877.0	90.30	85.38	7,171.3	821.7	2,644.9	2,754.3	1.05	1.00	-0.32
9,967.0	89.70	84.86	7,171.3	829.4	2,734.6	2,843.7	0.88	-0.67	-0.58
10,056.0	89.90	85.25	7,171.6	837.0	2,823.3	2,932.2	0.49	0.22	0.44
10,146.0	89.80	87.24	7,171.8	842.9	2,913.1	3,021.4	2.21	-0.11	2.21
10,236.0	90.30	87.67	7,171.7	846.9	3,003.0	3,110.4	0.73	0.56	0.48
10,325.0	89.60	87.31	7,171.8	850.8	3,091.9	3,198.3	0.88	-0.79	-0.40
10,415.0	90.70	87.09	7,171.6	855.2	3,181.8	3,287.4	1.25	1.22	-0.24
10,505.0	89.90	86.61	7,171.1	860.2	3,271.7	3,376.5	1.04	-0.89	-0.53
10,594.0	88.10	86.63	7,172.7	865.4	3,360.5	3,464.6	2.02	-2.02	0.02
10,684.0	88.50	85.57	7,175.3	871.5	3,450.2	3,553.9	1.26	0.44	-1.18
10,774.0	89.10	84.74	7,177.2	879.1	3,539.9	3,643.3	1.14	0.67	-0.92
10,863.0	88.60	85.56	7,179.0	886.7	3,628.6	3,731.7	1.08	-0.56	0.92
10,953.0	88.20	86.48	7,181.5	892.9	3,718.3	3,821.0	1.11	-0.44	1.02
11,043.0	89.40	87.25	7,183.4	897.8	3,808.1	3,910.0	1.58	1.33	0.86
11,133.0	90.30	87.24	7,183.6	902.1	3,898.0	3,999.1	1.00	1.00	-0.01
11,222.0	91.20	86.95	7,182.5	906.7	3,986.9	4,087.1	1.06	1.01	-0.33
11,312.0	91.80	86.82	7,180.1	911.5	4,076.8	4,176.2	0.68	0.67	-0.14
11,402.0	91.00	85.03	7,177.9	917.9	4,166.5	4,265.5	2.18	-0.89	-1.99
11,491.0	89.20	84.87	7,177.8	925.8	4,255.1	4,353.9	2.03	-2.02	-0.18
11,581.0	90.00	84.83	7,178.4	933.8	4,344.8	4,443.4	0.89	0.89	-0.04
11,671.0	90.50	84.56	7,178.0	942.2	4,434.4	4,533.0	0.63	0.56	-0.30
11,760.0	90.40	82.82	7,177.3	952.0	4,522.8	4,621.6	1.96	-0.11	-1.96
11,850.0	89.20	83.33	7,177.6	962.8	4,612.2	4,711.4	1.45	-1.33	0.57
11,940.0	89.50	84.69	7,178.6	972.2	4,701.7	4,801.0	1.55	0.33	1.51
12,029.0	90.00	84.30	7,179.0	980.7	4,790.3	4,889.5	0.71	0.56	-0.44
12,119.0	90.70	83.35	7,178.5	990.4	4,879.7	4,979.2	1.31	0.78	-1.06
12,168.0	91.10	82.94	7,177.7	996.3	4,928.4	5,028.0	1.17	0.82	-0.84
12,230.0	91.10	82.94	7,176.5	1,003.9	4,989.9	5,089.9	0.00	0.00	0.00
Sandau K25-66-1HN BHL 2210°FNL & 75°FEL									

Checked By: _____	Approved By: _____	Date: _____
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