



## **Noble Energy Inc.**

**Weld County, CO**

**Sec 1, T9, R58W**

**Smith State LD12-73-1BHN**

**Wellbore #1**

**Design: Wellbore #1** FINAL

## **DDC Survey Report**

**07 January, 2015**



<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Smith State LD12-73-1BHN
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	well @ 4683.0usft (H&P #326)
<b>Site:</b>	Sec 1, T9, R58W	<b>MD Reference:</b>	well @ 4683.0usft (H&P #326)
<b>Well:</b>	Smith State LD12-73-1BHN	<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>	EDM Compass

<b>Project</b>	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		
<b>Map Zone:</b>	Colorado Northern Zone		

Site		Sec 1, T9, R58W			
Site Position:		Northing:	1,529,389.05 usft	Latitude:	40° 46' 27.372 N
From:	Lat/Long	Easting:	3,468,913.97 usft	Longitude:	103° 48' 24.840 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	1.09 °

Well		Smith State LD12-73-1BHN				
Well Position	+N/-S	0.0 usft	Northing:	1,529,240.49 usft	Latitude:	40° 46' 25.896 N
	+E/-W	0.0 usft	Easting:	3,468,958.36 usft	Longitude:	103° 48' 24.300 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	4,653.0 usft

<b>Wellbore</b>	Wellbore #1				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	12/6/2014	7.89	67.38	53,056

<b>Design</b>	Wellbore #1				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>	
	0.0	0.0	0.0	176.40	

<b>Survey Program</b>	<b>Date</b>	1/7/2015			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
270.0	917.0	Surface (Wellbore #1)	Flexi-Shot	VES Flexi-Shot Tool	
1,302.0	5,809.0	MWD Survey - Vert/Build (Wellbore #1)	MWD default	MWD - Standard	
5,847.0	10,286.0	MWD Survey - Lateral (Wellbore #1)	MWD default	MWD - Standard	

<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Vertical Section (usft)</b>	<b>Dogleg Rate (°/100usft)</b>	<b>Build Rate (°/100usft)</b>	<b>Turn Rate (°/100usft)</b>	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	
270.0	0.80	95.51	270.0	-0.2	1.9	0.3	0.30	0.30	0.00	
638.0	0.40	230.81	638.0	-1.2	3.4	1.5	0.30	-0.11	36.77	
<b>Tie-In @ 917' MD / 917' TVD</b>										
917.0	0.80	136.41	917.0	-3.3	4.0	3.5	0.33	0.14	-33.84	
1,302.0	0.35	159.39	1,301.9	-6.3	6.3	6.7	0.13	-0.12	5.97	
1,394.0	0.44	191.56	1,393.9	-6.9	6.3	7.3	0.26	0.10	34.97	

<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Smith State LD12-73-1BHN
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	well @ 4683.0usft (H&P #326)
<b>Site:</b>	Sec 1, T9, R58W	<b>MD Reference:</b>	well @ 4683.0usft (H&P #326)
<b>Well:</b>	Smith State LD12-73-1BHN	<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>	EDM Compass

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)	
1,486.0	0.09	292.63	1,485.9	-7.2	6.2	7.6	0.51	-0.38	109.86	
1,581.0	4.13	131.26	1,580.9	-9.5	8.7	10.0	4.44	4.25	-169.86	
1,673.0	2.90	134.08	1,672.7	-13.3	12.8	14.1	1.35	-1.34	3.07	
1,766.0	4.84	96.11	1,765.5	-15.3	18.4	16.5	3.35	2.09	-40.83	
1,859.0	6.33	73.43	1,858.1	-14.3	27.3	16.0	2.83	1.60	-24.39	
1,953.0	9.76	88.02	1,951.1	-12.5	40.2	15.0	4.22	3.65	15.52	
2,045.0	8.97	83.27	2,041.9	-11.4	55.1	14.9	1.20	-0.86	-5.16	
2,139.0	8.53	84.51	2,134.8	-9.9	69.3	14.2	0.51	-0.47	1.32	
2,232.0	8.18	82.57	2,226.8	-8.4	82.8	13.6	0.48	-0.38	-2.09	
2,418.0	9.41	91.36	2,410.6	-7.0	111.1	14.0	0.98	0.66	4.73	
2,510.0	10.55	98.22	2,501.2	-8.4	126.9	16.4	1.79	1.24	7.46	
2,602.0	10.46	96.46	2,591.7	-10.6	143.6	19.5	0.36	-0.10	-1.91	
2,790.0	9.50	95.05	2,776.9	-13.8	176.0	24.9	0.53	-0.51	-0.75	
2,978.0	8.27	89.25	2,962.6	-15.0	205.0	27.9	0.81	-0.65	-3.09	
3,073.0	9.76	100.85	3,056.4	-16.5	219.7	30.2	2.47	1.57	12.21	
3,168.0	9.85	99.80	3,150.0	-19.4	235.6	34.1	0.21	0.09	-1.11	
3,263.0	10.11	98.39	3,243.6	-22.0	251.9	37.7	0.38	0.27	-1.48	
3,452.0	9.76	96.99	3,429.8	-26.3	284.2	44.1	0.22	-0.19	-0.74	
3,642.0	8.44	98.04	3,617.4	-30.2	314.0	49.9	0.70	-0.69	0.55	
3,737.0	7.83	98.22	3,711.4	-32.1	327.3	52.6	0.64	-0.64	0.19	
3,831.0	6.86	77.83	3,804.7	-31.9	339.1	53.1	2.94	-1.03	-21.69	
3,926.0	4.48	26.85	3,899.2	-27.4	346.3	49.0	5.61	-2.51	-53.66	
4,021.0	4.48	24.39	3,994.0	-20.7	349.5	42.6	0.20	0.00	-2.59	
4,115.0	4.57	21.75	4,087.7	-13.8	352.4	35.9	0.24	0.10	-2.81	
4,210.0	4.48	22.45	4,182.4	-6.9	355.3	29.2	0.11	-0.09	0.74	
4,304.0	2.20	150.60	4,276.3	-5.1	357.6	27.5	6.48	-2.43	136.33	
4,399.0	1.67	156.40	4,371.2	-7.9	359.0	30.5	0.59	-0.56	6.11	
4,493.0	1.58	159.74	4,465.2	-10.4	360.0	33.0	0.14	-0.10	3.55	
4,588.0	1.41	171.69	4,560.2	-12.8	360.6	35.4	0.37	-0.18	12.58	
4,682.0	1.41	167.30	4,654.1	-15.1	361.0	37.7	0.11	0.00	-4.67	
4,777.0	1.32	147.61	4,749.1	-17.1	361.9	39.8	0.50	-0.09	-20.73	
4,872.0	14.25	193.49	4,843.1	-29.5	359.7	52.0	14.07	13.61	48.29	
4,966.0	20.93	190.33	4,932.6	-57.3	354.0	79.4	7.18	7.11	-3.36	
5,061.0	25.59	185.58	5,019.9	-94.4	349.0	116.1	5.28	4.91	-5.00	
5,155.0	33.68	178.20	5,101.5	-140.8	347.8	162.3	9.43	8.61	-7.85	
5,250.0	39.13	173.98	5,178.0	-197.0	351.8	218.7	6.31	5.74	-4.44	
CROSSED LEASELINE @ 5326' MD / 5235' TVD										
5,326.3	44.84	173.54	5,234.7	-247.7	357.4	269.6	7.50	7.49	-0.58	
5,344.0	46.17	173.45	5,247.1	-260.2	358.8	282.2	7.50	7.49	-0.51	
5,438.0	52.58	174.15	5,308.2	-331.1	366.5	353.5	6.84	6.82	0.74	
5,533.0	51.70	175.63	5,366.6	-405.8	373.2	428.4	1.54	-0.93	1.56	
5,628.0	59.53	176.44	5,420.2	-484.0	378.5	506.8	8.27	8.24	0.85	
5,722.0	68.24	181.36	5,461.5	-568.2	380.0	591.0	10.39	9.27	5.23	
5,809.0	76.77	182.59	5,487.6	-651.1	377.1	673.5	9.90	9.80	1.41	

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<b>Site:</b>	Sec 1, T9, R58W	<b>MD Reference:</b>	well @ 4683.0usft (H&P #326)
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<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM Compass

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)
<b>7" CASING POINT @ 5847' MD / 5495' TVD / END OF INT HOLE / BEGIN LATERAL</b>									
5,847.0	79.58	182.95	5,495.4	-688.2	375.4	710.4	7.44	7.38	0.95
<b>CROSSED 460' HARDLINE @ 5867' MD / 5499' TVD</b>									
5,866.8	81.04	183.14	5,498.8	-707.7	374.3	729.8	7.44	7.38	0.93
5,903.0	83.71	183.47	5,503.6	-743.5	372.2	765.4	7.44	7.38	0.92
5,995.0	83.71	183.47	5,513.7	-834.8	366.7	856.2	0.00	0.00	0.00
6,087.0	86.70	184.17	5,521.3	-926.3	360.6	947.1	3.34	3.25	0.76
6,274.0	91.36	182.42	5,524.5	-1,112.9	349.9	1,132.7	2.66	2.49	-0.94
6,366.0	91.54	181.54	5,522.2	-1,204.8	346.7	1,224.2	0.98	0.20	-0.96
6,460.0	91.80	181.01	5,519.4	-1,298.7	344.6	1,317.8	0.63	0.28	-0.56
6,554.0	90.92	181.36	5,517.2	-1,392.7	342.7	1,411.4	1.01	-0.94	0.37
6,646.0	88.46	182.06	5,517.7	-1,484.6	339.9	1,503.0	2.78	-2.67	0.76
6,739.0	88.81	181.18	5,519.9	-1,577.6	337.3	1,595.6	1.02	0.38	-0.95
6,833.0	89.69	181.01	5,521.2	-1,671.5	335.5	1,689.3	0.95	0.94	-0.18
6,926.0	90.13	180.31	5,521.3	-1,764.5	334.4	1,782.1	0.89	0.47	-0.75
7,018.0	90.13	178.90	5,521.1	-1,856.5	335.0	1,873.9	1.53	0.00	-1.53
7,111.0	88.46	179.78	5,522.2	-1,949.5	336.1	1,966.8	2.03	-1.80	0.95
7,202.0	88.90	178.90	5,524.3	-2,040.5	337.2	2,057.6	1.08	0.48	-0.97
7,296.0	89.34	178.02	5,525.8	-2,134.4	339.7	2,151.6	1.05	0.47	-0.94
7,391.0	89.43	176.97	5,526.8	-2,229.3	343.8	2,246.5	1.11	0.09	-1.11
7,485.0	90.48	177.14	5,526.9	-2,323.2	348.7	2,340.5	1.13	1.12	0.18
7,580.0	90.04	179.95	5,526.4	-2,418.2	351.1	2,435.4	2.99	-0.46	2.96
7,675.0	89.78	178.37	5,526.6	-2,513.2	352.5	2,530.3	1.69	-0.27	-1.66
7,769.0	90.57	180.66	5,526.3	-2,607.1	353.3	2,624.2	2.58	0.84	2.44
7,864.0	91.63	180.31	5,524.5	-2,702.1	352.5	2,718.9	1.18	1.12	-0.37
7,958.0	93.21	179.78	5,520.5	-2,796.0	352.4	2,812.6	1.77	1.68	-0.56
8,053.0	91.19	182.06	5,516.9	-2,890.9	350.9	2,907.3	3.21	-2.13	2.40
8,147.0	88.90	183.12	5,516.8	-2,984.8	346.6	3,000.7	2.68	-2.44	1.13
8,242.0	89.43	182.59	5,518.2	-3,079.7	341.9	3,095.1	0.79	0.56	-0.56
8,336.0	90.13	182.94	5,518.5	-3,173.6	337.4	3,188.5	0.83	0.74	0.37
8,431.0	87.67	181.89	5,520.4	-3,268.5	333.4	3,283.0	2.82	-2.59	-1.11
8,525.0	88.02	180.83	5,523.9	-3,362.4	331.1	3,376.6	1.19	0.37	-1.13
8,620.0	88.02	180.48	5,527.2	-3,457.3	330.0	3,471.2	0.37	0.00	-0.37
8,714.0	88.29	179.43	5,530.2	-3,551.3	330.1	3,565.0	1.15	0.29	-1.12
8,808.0	90.31	178.90	5,531.3	-3,645.3	331.5	3,658.9	2.22	2.15	-0.56
8,903.0	89.87	179.60	5,531.2	-3,740.3	332.7	3,753.8	0.87	-0.46	0.74
8,998.0	89.96	178.20	5,531.3	-3,835.2	334.5	3,848.7	1.48	0.09	-1.47
9,093.0	90.57	178.90	5,530.9	-3,930.2	337.0	3,943.6	0.98	0.64	0.74
9,187.0	90.40	177.85	5,530.1	-4,024.2	339.6	4,037.5	1.13	-0.18	-1.12
9,281.0	91.28	179.25	5,528.7	-4,118.1	342.0	4,131.5	1.76	0.94	1.49
9,376.0	90.57	177.49	5,527.2	-4,213.1	344.7	4,226.4	2.00	-0.75	-1.85
9,471.0	90.40	183.47	5,526.4	-4,308.0	343.9	4,321.1	6.30	-0.18	6.29
9,565.0	90.66	185.76	5,525.5	-4,401.7	336.3	4,414.1	2.45	0.28	2.44

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<b>Site:</b>	Sec 1, T9, R58W	<b>MD Reference:</b>	well @ 4683.0usft (H&P #326)
<b>Well:</b>	Smith State LD12-73-1BHN	<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>	EDM Compass

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)	
9,754.0	91.01	185.76	5,522.8	-4,589.7	317.4	4,600.6	0.19	0.19	0.00	
9,849.0	91.71	184.70	5,520.5	-4,684.3	308.7	4,694.4	1.34	0.74	-1.12	
9,944.0	88.81	183.12	5,520.1	-4,779.1	302.2	4,788.6	3.48	-3.05	-1.66	
10,038.0	86.79	179.95	5,523.7	-4,872.9	299.7	4,882.1	4.00	-2.15	-3.37	
10,133.0	87.23	179.25	5,528.6	-4,967.8	300.4	4,976.9	0.87	0.46	-0.74	
<b>CROSSED 460' HARDLINE @ 10157' MD / 5530' TVD</b>										
10,157.4	88.20	178.87	5,529.6	-4,992.2	300.8	5,001.2	4.26	3.97	-1.55	
10,235.0	91.28	177.67	5,530.0	-5,069.7	303.1	5,078.8	4.26	3.97	-1.55	
<b>TD @ 10286' MD / 5529' TVD</b>										
10,286.0	91.28	177.67	5,528.8	-5,120.7	305.2	5,129.7	0.00	0.00	0.00	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
270.0	270.0	-0.2	1.9	Tie In @ 270' MD / 270' TVD / END OF SUR HOLE / BEGIN INT HOLE	
917.0	917.0	-3.3	4.0	Tie-In @ 917' MD / 917' TVD	
5,326.3	5,234.7	-247.7	357.4	CROSSED LEASELINE @ 5326' MD / 5235' TVD	
5,847.0	5,495.4	-688.2	375.4	7" CASING POINT @ 5847' MD / 5495' TVD / END OF INT HOLE / BEGIN LAT	
5,866.8	5,498.8	-707.7	374.3	CROSSED 460' HARDLINE @ 5867' MD / 5499' TVD	
10,157.4	5,529.6	-4,992.2	300.8	CROSSED 460' HARDLINE @ 10157' MD / 5530' TVD	
10,286.0	5,528.8	-5,120.7	305.2	TD @ 10286' MD / 5529' TVD	

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_



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## Survey Certification Sheet

Noble Energy Inc  
Company

RM-141265  
Job Number

12/22/14  
Date

Sec1,T9N,R58W,6<sup>TH</sup> PM  
Lease

Smith State LD12-73-1BHN  
Well Name

Weld, CO  
County & State

API: 05-123-39703

Surveyed from a depth of: 917' to 5722' MD (DDC Certified Survey Data  
5722' to 10286' MD (DDC Certified Survey Data

Type of Survey: MWD

Directional Supervisor/Surveyor: Bob Kubistek

The data and calculations for this survey have been checked by me and conform to the standards and procedures set forth by **The Directional Drilling Company (DDC)**. This report represents a true and correct Directional survey of this well based on the original data obtained at the well site. Wellbore Coordinates are calculated using minimum curvature.

Bryon Reed  
MWD General Manager

**Bryon  
Reed**

Digitally signed by Bryon Reed  
DN: cn=Bryon Reed, o=The  
Directional Drilling Company,  
ou=DDC-MWD,  
email=bryon.reed@directional  
drillers.com, c=US  
Date: 2014.12.22 13:42:25  
-06'00'



Company Name: Noble Energy Inc.  
Smith State LD12-73-1BHN  
Weld County, CO  
Rig: H&P #326  
Created By: Jerry Arsenault  
Date: 1/7/2015



Smith State LD12-73-1BHN  
Weld County, CO  
Q141233 & RM-141265  
Design #2



T

G

M

Azimuths to Grid North

Correction: 6.80°

Magnetic Field

Strength: 53056.3snT

Dip Angle: 67.38°

Date: 12/6/2014

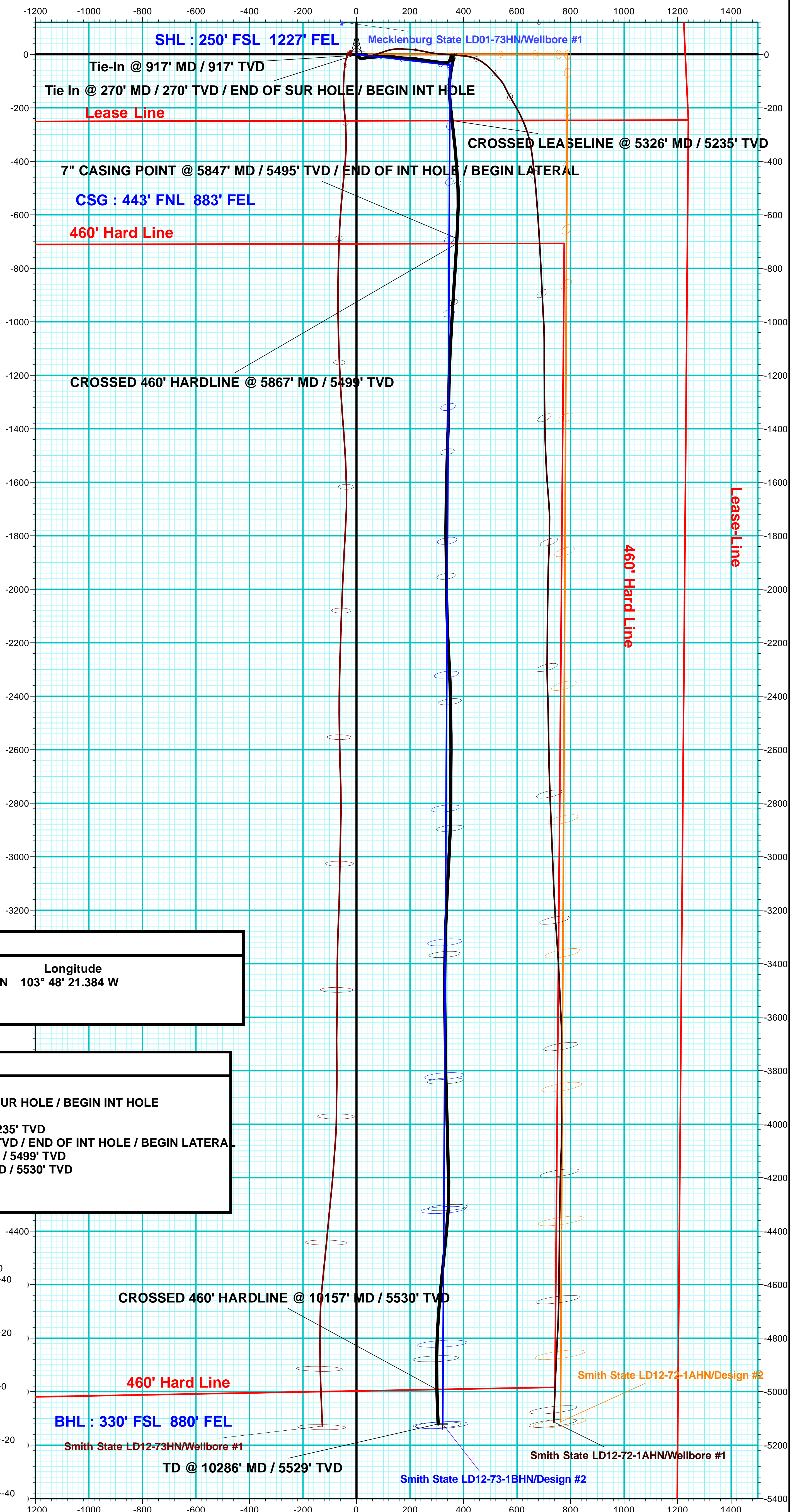
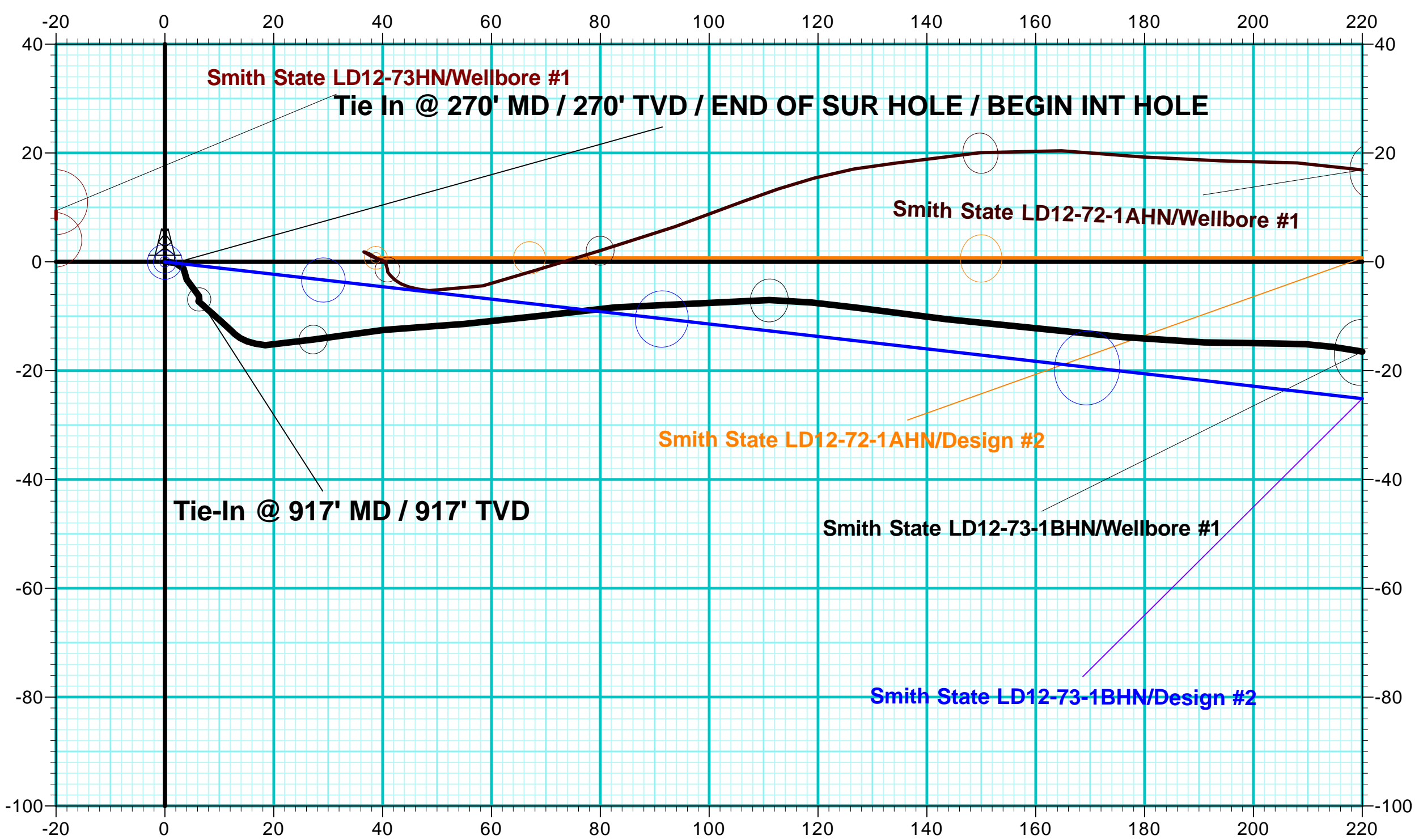
Model: IGRF2010

PROJECT DETAILS:	Weld County, CO
Geodetic System:	US State Plane 1983
Datum:	North American Datum 1983
Ellipsoid:	GRS 1980
Zone:	Colorado Northern Zone
System Datum:	Mean Sea Level

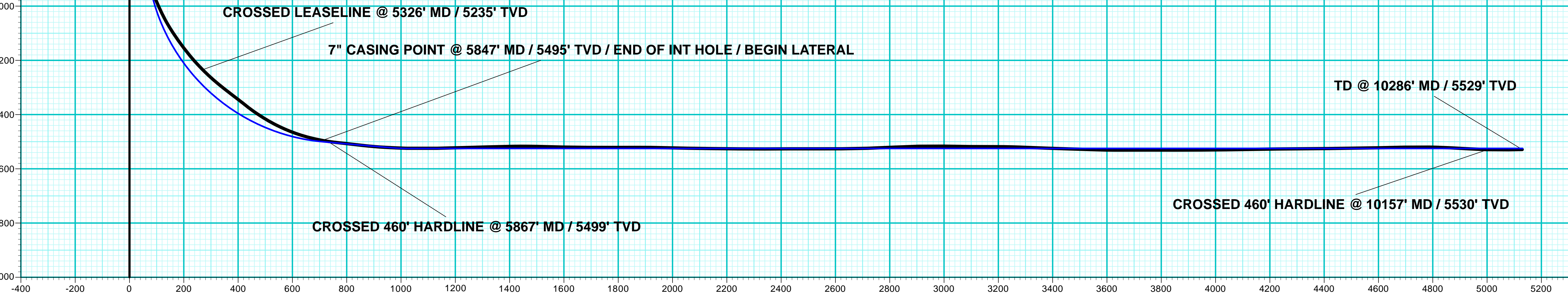


DESIGN TARGET DETAILS							
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
PBHL Smith State LD12-73-1BHN - plan hits target center	5525.0	-5120.9	322.2	1524119.54	3469280.60	40° 45' 35.244 N	103° 48' 21.384 W

ANNOTATIONS									
MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Departure	Annotation	
270.0	0.80	95.51	270.0	-0.2	1.9	0.3	1.9	Tie In @ 270' MD / 270' TVD / END OF SUR HOLE / BEGIN INT HOLE	
917.0	0.80	136.41	917.0	-3.3	4.0	3.5	8.7	Tie-In @ 917' MD / 917' TVD	
5326.3	44.84	173.54	5234.7	-247.7	357.4	269.6	635.7	CROSSED LEASELINE @ 5326' MD / 5235' TVD	
5847.0	79.58	182.95	5495.4	-688.2	375.4	710.4	1077.0	7" CASING POINT @ 5847' MD / 5495' TVD / END OF INT HOLE / BEGIN LATERAL	
5866.8	81.04	183.14	5498.8	-707.7	374.3	729.8	1096.5	CROSSED 460' HARDLINE @ 5867' MD / 5499' TVD	
10157.4	88.20	178.87	5529.6	-4992.2	300.8	5001.2	5384.7	CROSSED 460' HARDLINE @ 10157' MD / 5530' TVD	
10286.0	91.28	177.67	5528.8	-5120.7	305.2	5129.7	5513.3	TD @ 10286' MD / 5529' TVD	



WELL DETAILS: Smith State LD12-73-1BHN							
+N/-S	+E/-W	Northing	Easting	Ground Level:	4653.0	Latitude	Longitude
0.0	0.0	1529240.49	3468958.37			40° 46' 25.896 N	103° 48' 24.300 W



Vertical Section at 176.40° (200 usft/in)