



## **Noble Energy Inc.**

**Weld County, CO**

**Sec 9, T9N, R58W**

**Rohn State LD10-67HN**

**Wellbore #1**

**Design: Wellbore #1** FINAL

## **DDC Survey Report**

**29 September, 2014**



<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Rohn State LD10-67HN
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	WELL @ 4760.0usft (H&P #326)
<b>Site:</b>	Sec 9, T9N, R58W	<b>MD Reference:</b>	WELL @ 4760.0usft (H&P #326)
<b>Well:</b>	Rohn State LD10-67HN	<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>	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 9, T9N, R58W					
Site Position:		Northing:	1,523,890.74	usft	Latitude:	40° 45' 35.850 N	
From:	Map	Easting:	3,453,841.03	usft	Longitude:	103° 51' 42.040 W	
Position Uncertainty:		0.0	usft	Slot Radius:	13-3/16 "	Grid Convergence:	1.06 °

Well	Rohn State LD10-67HN					
Well Position	+N/-S	0.0 usft	Northing:	1,527,052.31 usft	Latitude:	40° 46' 7.068 N
	+E/-W	0.0 usft	Easting:	3,453,931.60 usft	Longitude:	103° 51' 40.104 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	4,730.0 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	9/12/2014	7.96	67.38	53,073

<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	84.76	

<b>Survey Program</b>	<b>Date</b>	9/29/2014			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
265.0	1,190.0	Surface Surveys (Wellbore #1)	Flexi-Shot	VES Flexi-Shot Tool	
1,244.0	6,154.0	MWD Surveys - Vert/Build (Wellbore #1)	MWD default	MWD - Standard	
6,250.0	9,637.0	MWD Surveys - Lateral (Wellbore #1)	MWD+IFR1+MS WY Fixed:v2:Rockies, crustal dec + 3-axis correction		

<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	
265.0	0.20	41.10	265.0	0.3	0.3	0.3	0.08	0.08	0.00	
656.0	0.50	60.70	656.0	1.7	2.2	2.4	0.08	0.08	5.01	
1,007.0	0.20	140.70	1,007.0	2.0	4.0	4.1	0.14	-0.09	22.79	
<b>TIE IN @ 1190' MD / 1190' TVD END OF SURFACE HOLE / BEGIN INT HOLE</b>										
1,190.0	0.30	150.70	1,190.0	1.3	4.4	4.5	0.06	0.05	5.46	
1,244.0	0.18	67.70	1,244.0	1.2	4.5	4.6	0.61	-0.22	-153.70	
1,306.0	0.32	112.97	1,306.0	1.2	4.8	4.9	0.37	0.23	73.02	
1,400.0	0.31	31.30	1,400.0	1.3	5.2	5.3	0.44	-0.01	-86.88	

<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Rohn State LD10-67HN
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<b>Site:</b>	Sec 9, T9N, R58W	<b>MD Reference:</b>	WELL @ 4760.0usft (H&P #326)
<b>Well:</b>	Rohn State LD10-67HN	<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>	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)
1,492.0	4.41	196.41	1,491.9	-1.9	4.3	4.1	5.12	4.46	179.47
1,584.0	6.05	191.60	1,583.5	-10.0	2.3	1.4	1.84	1.78	-5.23
1,609.0	7.90	191.22	1,608.3	-13.0	1.7	0.5	7.40	7.40	-1.52
1,677.0	7.09	195.10	1,675.7	-21.6	-0.3	-2.2	1.40	-1.19	5.71
1,770.0	4.49	175.96	1,768.3	-30.8	-1.5	-4.3	3.45	-2.80	-20.58
1,863.0	1.68	175.70	1,861.1	-35.8	-1.2	-4.4	3.02	-3.02	-0.28
1,956.0	0.03	204.33	1,954.1	-37.2	-1.1	-4.5	1.78	-1.77	30.78
2,048.0	3.13	73.37	2,046.1	-36.5	1.3	-2.0	3.42	3.37	-142.35
2,141.0	6.03	61.72	2,138.8	-33.4	8.1	5.0	3.26	3.12	-12.53
2,234.0	5.70	53.44	2,231.3	-28.4	16.1	13.4	0.98	-0.35	-8.90
2,327.0	5.72	54.01	2,323.8	-22.9	23.5	21.4	0.06	0.02	0.61
2,421.0	7.79	70.09	2,417.2	-18.0	33.3	31.5	2.96	2.20	17.11
2,512.0	9.88	77.50	2,507.1	-14.2	46.7	45.3	2.61	2.30	8.14
2,604.0	12.15	73.56	2,597.4	-9.7	63.7	62.6	2.60	2.47	-4.28
2,696.0	14.99	69.04	2,686.8	-2.7	84.1	83.5	3.29	3.09	-4.91
2,791.0	16.48	65.74	2,778.2	7.2	107.9	108.1	1.83	1.57	-3.47
2,885.0	15.99	64.25	2,868.5	18.3	131.7	132.8	0.68	-0.52	-1.59
2,980.0	14.68	62.25	2,960.1	29.6	154.2	156.2	1.49	-1.38	-2.11
3,074.0	15.82	66.26	3,050.8	40.3	176.4	179.4	1.65	1.21	4.27
3,168.0	17.43	71.83	3,140.9	49.8	201.5	205.2	2.41	1.71	5.93
3,263.0	17.60	70.77	3,231.5	59.0	228.6	233.1	0.38	0.18	-1.12
3,357.0	18.16	69.49	3,320.9	68.8	255.8	261.0	0.73	0.60	-1.36
3,452.0	16.29	65.96	3,411.7	79.4	281.8	287.9	2.25	-1.97	-3.72
3,546.0	16.38	64.90	3,501.9	90.4	305.8	312.8	0.33	0.10	-1.13
<b>CROSSED LEASE LINE @ 3631.1' MD / 3583.7' TVD</b>									
3,631.0	15.31	68.70	3,583.7	99.6	327.1	334.9	1.75	-1.26	4.47
3,641.0	15.19	69.18	3,593.3	100.5	329.6	337.4	1.75	-1.21	4.81
3,735.0	14.62	67.97	3,684.1	109.4	352.1	360.6	0.69	-0.61	-1.29
3,830.0	15.61	76.61	3,775.9	116.8	375.7	384.8	2.59	1.04	9.09
3,924.0	14.89	76.07	3,866.6	122.7	399.7	409.2	0.78	-0.77	-0.57
4,019.0	14.67	70.73	3,958.4	129.6	422.9	433.0	1.45	-0.23	-5.62
4,114.0	16.27	68.50	4,050.0	138.4	446.6	457.4	1.80	1.68	-2.35
4,208.0	15.82	66.73	4,140.3	148.3	470.7	482.2	0.71	-0.48	-1.88
4,302.0	14.77	65.40	4,231.0	158.3	493.3	505.7	1.18	-1.12	-1.41
4,396.0	15.35	69.82	4,321.7	167.6	515.9	529.0	1.37	0.62	4.70
4,491.0	14.21	68.76	4,413.6	176.2	538.6	552.4	1.23	-1.20	-1.12
4,586.0	15.64	65.08	4,505.4	185.8	561.0	575.7	1.81	1.51	-3.87
4,680.0	14.24	63.31	4,596.2	196.3	582.9	598.4	1.57	-1.49	-1.88
4,775.0	15.54	66.89	4,688.0	206.6	605.0	621.4	1.68	1.37	3.77
4,869.0	14.24	65.67	4,778.9	216.3	627.1	644.3	1.42	-1.38	-1.30
4,964.0	16.51	71.98	4,870.5	225.3	650.6	668.5	2.97	2.39	6.64
5,058.0	15.59	69.04	4,960.8	233.9	675.1	693.7	1.31	-0.98	-3.13
5,153.0	24.07	82.87	5,050.1	240.9	706.3	725.4	10.14	8.93	14.56

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<b>Design:</b>	Wellbore #1	<b>Database:</b>	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)
5,247.0	30.15	84.72	5,133.8	245.5	748.9	768.2	6.53	6.47	1.97
5,342.0	36.14	86.30	5,213.3	249.5	800.7	820.1	6.37	6.31	1.66
5,437.0	40.25	84.76	5,287.9	254.1	859.2	878.8	4.44	4.33	-1.62
5,531.0	38.70	84.09	5,360.5	259.9	918.7	938.6	1.71	-1.65	-0.71
<b>CROSSED 600' HARD LINE @ 5538.7' MD / 5366.5' TVD</b>									
5,538.7	39.45	84.04	5,366.5	260.4	923.5	943.4	9.78	9.77	-0.64
5,626.0	47.98	83.57	5,429.5	266.9	983.4	1,003.7	9.78	9.77	-0.54
5,720.0	49.57	82.10	5,491.5	275.8	1,053.6	1,074.4	2.06	1.69	-1.56
5,815.0	61.84	79.44	5,544.9	288.4	1,130.9	1,152.5	13.12	12.92	-2.80
5,910.0	71.22	80.42	5,582.7	303.6	1,216.6	1,239.2	9.92	9.87	1.03
6,005.0	73.00	79.94	5,611.9	319.1	1,305.6	1,329.3	1.93	1.87	-0.51
6,099.0	79.24	80.14	5,634.4	334.8	1,395.5	1,420.2	6.64	6.64	0.21
6,154.0	85.28	82.26	5,641.8	343.2	1,449.3	1,474.6	11.63	10.98	3.85
<b>7" CASING POINT @ 6210' MD / 5646.2' TVD / END OF INT HOLE / BEGIN LATERAL</b>									
6,210.0	85.82	81.37	5,646.2	351.1	1,504.6	1,530.3	1.85	0.96	-1.58
6,250.0	86.20	80.74	5,648.9	357.3	1,544.0	1,570.2	1.85	0.96	-1.58
6,342.0	86.70	87.14	5,654.6	367.0	1,635.2	1,661.9	6.96	0.54	6.96
6,435.0	87.52	86.97	5,659.3	371.8	1,728.0	1,754.7	0.90	0.88	-0.18
6,530.0	88.53	89.09	5,662.6	375.0	1,822.9	1,849.5	2.47	1.06	2.23
6,624.0	88.57	89.61	5,665.0	376.1	1,916.9	1,943.2	0.55	0.04	0.55
6,719.0	88.71	89.79	5,667.2	376.6	2,011.8	2,037.8	0.24	0.15	0.19
6,813.0	89.65	89.30	5,668.6	377.3	2,105.8	2,131.5	1.13	1.00	-0.52
6,907.0	90.38	88.23	5,668.6	379.4	2,199.8	2,225.2	1.38	0.78	-1.14
7,002.0	91.13	89.44	5,667.3	381.3	2,294.8	2,320.0	1.50	0.79	1.27
7,096.0	91.96	89.40	5,664.8	382.3	2,388.7	2,413.6	0.88	0.88	-0.04
7,190.0	89.18	89.44	5,663.8	383.2	2,482.7	2,507.3	2.96	-2.96	0.04
7,285.0	89.73	87.58	5,664.7	385.7	2,577.7	2,602.1	2.04	0.58	-1.96
7,380.0	89.19	89.16	5,665.6	388.4	2,672.6	2,696.9	1.76	-0.57	1.66
7,474.0	90.35	90.64	5,666.0	388.5	2,766.6	2,790.5	2.00	1.23	1.57
7,569.0	91.78	88.11	5,664.2	389.6	2,861.6	2,885.2	3.06	1.51	-2.66
7,663.0	89.29	88.46	5,663.4	392.4	2,955.5	2,979.0	2.67	-2.65	0.37
7,757.0	89.22	88.37	5,664.6	395.0	3,049.5	3,072.8	0.12	-0.07	-0.10
7,852.0	89.45	88.45	5,665.7	397.6	3,144.4	3,167.6	0.26	0.24	0.08
7,946.0	90.08	87.71	5,666.1	400.8	3,238.4	3,261.4	1.03	0.67	-0.79
8,040.0	90.42	86.71	5,665.7	405.3	3,332.3	3,355.4	1.12	0.36	-1.06
8,134.0	90.91	85.40	5,664.6	411.8	3,426.0	3,449.3	1.49	0.52	-1.39
8,229.0	89.89	86.42	5,663.9	418.6	3,520.8	3,544.3	1.52	-1.07	1.07
8,323.0	88.91	89.64	5,664.9	421.8	3,614.7	3,638.1	3.58	-1.04	3.43
8,417.0	89.20	89.49	5,666.4	422.5	3,708.7	3,731.8	0.35	0.31	-0.16
8,511.0	89.51	88.34	5,667.5	424.3	3,802.7	3,825.5	1.27	0.33	-1.22
8,606.0	90.62	88.02	5,667.4	427.3	3,897.6	3,920.4	1.22	1.17	-0.34
8,701.0	89.36	89.67	5,667.4	429.2	3,992.6	4,015.1	2.19	-1.33	1.74
8,795.0	89.76	89.49	5,668.1	429.9	4,086.6	4,108.8	0.47	0.43	-0.19
8,890.0	90.15	89.26	5,668.2	431.0	4,181.6	4,203.5	0.48	0.41	-0.24

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<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	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)	
8,984.0	90.52	88.43	5,667.7	432.9	4,275.6	4,297.2	0.97	0.39	-0.88	
9,079.0	91.22	88.03	5,666.2	435.8	4,370.5	4,392.0	0.85	0.74	-0.42	
9,174.0	89.17	88.73	5,665.9	438.5	4,465.5	4,486.8	2.28	-2.16	0.74	
9,268.0	88.84	88.22	5,667.5	441.0	4,559.4	4,580.6	0.65	-0.35	-0.54	
9,363.0	88.88	87.64	5,669.4	444.4	4,654.3	4,675.5	0.61	0.04	-0.61	
9,457.0	88.45	87.49	5,671.6	448.4	4,748.2	4,769.3	0.48	-0.46	-0.16	
9,552.0	88.10	87.24	5,674.5	452.8	4,843.1	4,864.2	0.45	-0.37	-0.26	
9,575.0	88.01	87.15	5,675.3	453.9	4,866.0	4,887.2	0.55	-0.39	-0.39	
TD WELL @ 9637' MD / 5677.4' TVD - PBHL Rohn State LD10-67HN										
9,637.0	88.01	87.15	5,677.4	457.0	4,927.9	4,949.1	0.00	0.00	0.00	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
1,190.0	1,190.0	1.3	4.4	TIE IN @ 1190' MD / 1190' TVD END OF SURFACE HOLE / BEGIN INT HOLE	
3,631.0	3,583.7	99.6	327.1	CROSSED LEASE LINE @ 3631.1' MD / 3583.7' TVD	
5,538.7	5,366.5	260.4	923.5	CROSSED 600' HARD LINE @ 5538.7' MD / 5366.5' TVD	
6,210.0	5,646.2	351.1	1,504.6	7" CASING POINT @ 6210' MD / 5646.2' TVD / END OF INT HOLE / BEGIN L/	
9,637.0	5,677.4	457.0	4,927.9	TD WELL @ 9637' MD / 5677.4' TVD	

Checked By: _____	Approved By: _____	Date: _____
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## Survey Certification Sheet

Noble Energy Inc  
Company

RM-140937  
Job Number

9/30/14  
Date

Sec9,T9N,R58W,6<sup>TH</sup> PM  
Lease

Rohn State LD10-67HN  
Well Name

Weld, CO  
County & State

API: 05-123-37618

Surveyed from a depth of: 1190' to 9637' MD (DDC Certified Survey Data)

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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.

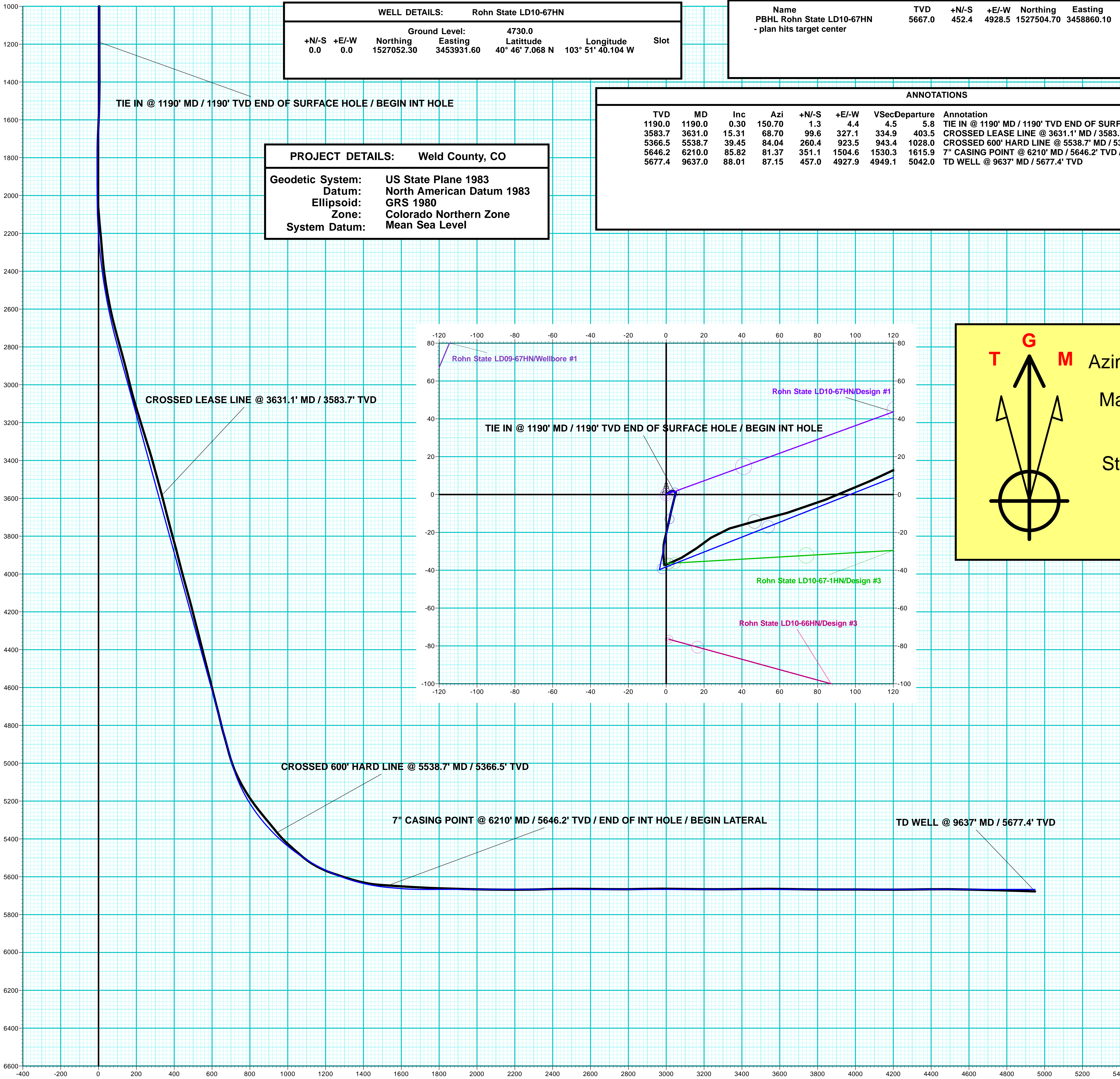
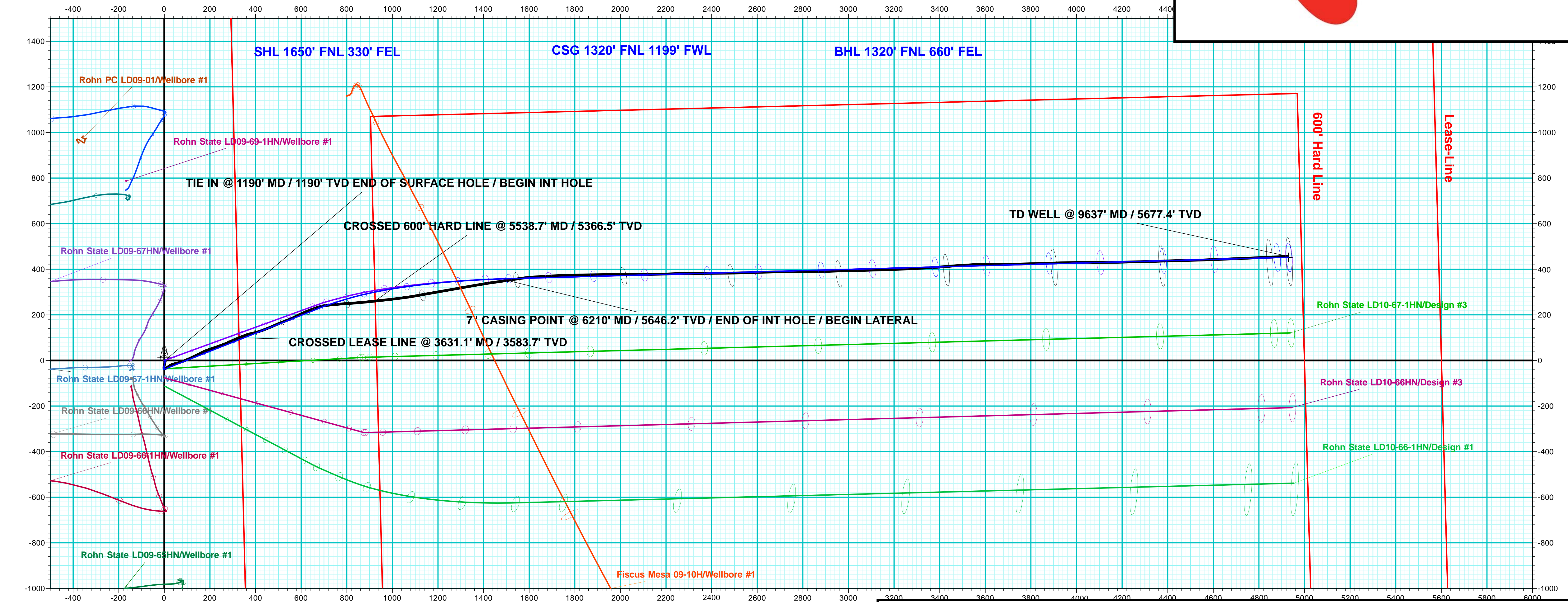
Digitally signed by Larry Wright  
DN: cn=Larry Wright, o=The  
Directional Drilling Company,  
ou=GM of Guidance Services,  
email=larryw@directionaldriller  
s.com, c=US  
Date: 2014.10.17 10:52:30  
-05'00'

Larry Wright  
MWD General Manager



Company Name: Noble Energy Inc.  
Rohn State LD10-67HN  
Weld County, CO  
Rig: H&P #326  
Created By: Kris Ray  
Date: 9/29/2014

Rohn State LD10-67HN  
Weld County, CO  
Q140861 & RM-140937  
Design #2

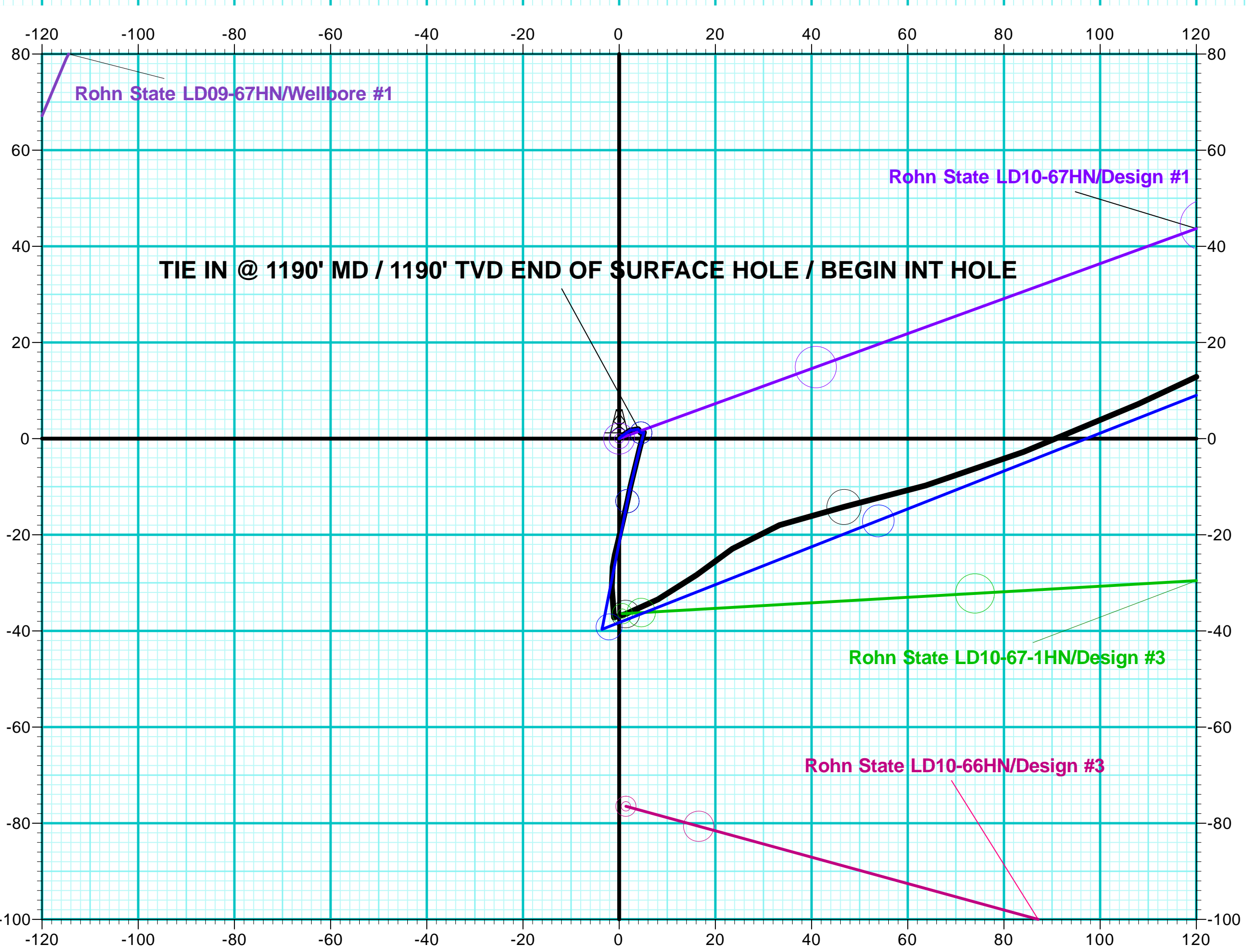


WELL DETAILS: Rohn State LD10-67HN					
Ground Level:		4730.0			
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.0	0.0	1527052.30	3453931.60	40° 46' 7.068 N	103° 51' 40.104 W

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
PBHL Rohn State LD10-67HN - plan hits target center	5667.0	452.4	4928.5	1527504.70	3458860.10	40° 46' 10.632 N	103° 50' 35.952 W

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

ANNOTATIONS								
TVD	MD	Inc	Azi	+N/-S	+E/-W	VSecDeparture	Annotation	
1190.0	1190.0	0.30	150.70	1.3	4.4	4.5	5.8	TIE IN @ 1190' MD / 1190' TVD END OF SURFACE HOLE / BEGIN INT HOLE
3583.7	3631.0	15.31	68.70	99.6	327.1	334.9	403.5	CROSSED LEASE LINE @ 3631.1' MD / 3583.7' TVD
5366.5	5538.7	39.45	84.04	260.4	923.5	943.4	1028.0	CROSSED 600' HARD LINE @ 5538.7' MD / 5366.5' TVD
5646.2	6210.0	85.82	81.37	351.1	1504.6	1530.3	1615.9	7\"/>
5677.4	9637.0	88.01	87.15	457.0	4927.9	4949.1	5042.0	TD WELL @ 9637' MD / 5677.4' TVD



T

G

M

Azimuths to Grid North

Magnetic North: 6.90°

Magnetic Field

Strength: 53072.5snT

Dip Angle: 67.38°

Date: 9/12/2014

Model: IGRF2010

Vertical Section at 84.76° (200 usf/in)