



Noble Energy Inc.

**Weld County, CO
Sec 15, T9N, R58W, 6th PM
Castor Federal LD15-74HN**

Wellbore #1

Design: Wellbore #1 FINAL

DDC Survey Report

31 January, 2014



Company:	Noble Energy Inc.	Local Co-ordinate Reference:	Well Castor Federal LD15-74HN
Project:	Weld County, CO	TVD Reference:	WELL @ 4737.0usft (H&P #326)
Site:	Sec 15, T9N, R58W, 6th PM	MD Reference:	WELL @ 4737.0usft (H&P #326)
Well:	Castor Federal LD15-74HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Single User Db

Project	Weld County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site		Sec 15, T9N, R58W, 6th PM					
Site Position:		Northing:	1,522,978.05	usft	Latitude:	40° 45' 26.190 N	
From:	Lat/Long	Easting:	3,457,350.77	usft	Longitude:	103° 50' 56.660 W	
Position Uncertainty:	0.0	usft	Slot Radius:	13-3/16	"	Grid Convergence:	1.07 °

Well		Castor Federal LD15-74HN				
Well Position	+N/-S	0.0 usft	Northing:	1,522,926.83 usft	Latitude:	40° 45' 25.668 N
	+E/-W	0.0 usft	Easting:	3,457,438.24 usft	Longitude:	103° 50' 55.536 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,707.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	10/30/2013	8.07	67.40	53,161

Design	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	174.77	

Survey Program	Date	1/31/2014			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
276.0	1,238.0	SURFACE (Wellbore #1)	Flexi-Shot	VES Flexi-Shot Tool	
1,303.0	6,007.0	MWD Surveys- Vert/Build (Wellbore #1)	MWD default	MWD - Standard	
6,072.0	9,978.0	MWD Surveys- Lateral (Wellbore #1)	MWD default	MWD - Standard	

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)	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	
276.0	0.60	40.80	276.0	1.1	0.9	-1.0	0.22	0.22	0.00	
564.0	0.50	288.20	564.0	2.6	0.7	-2.5	0.32	-0.03	-39.10	
843.0	0.80	141.00	843.0	1.5	0.8	-1.4	0.45	0.11	-52.76	
TIE IN @ 1238' MD / 1238' TVD End of Surface Hole / Begin INT Hole										
1,238.0	0.30	3.20	1,238.0	0.4	2.6	-0.1	0.26	-0.13	-34.89	
1,303.0	0.60	224.10	1,303.0	0.3	2.4	-0.1	1.31	0.46	-214.01	
1,395.0	0.70	213.90	1,395.0	-0.5	1.7	0.7	0.17	0.11	-11.09	
1,489.0	0.30	217.70	1,489.0	-1.2	1.3	1.3	0.43	-0.43	4.04	

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Well:	Castor Federal LD15-74HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Single User Db

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)
1,581.0	2.60	21.40	1,580.9	0.6	1.9	-0.4	3.14	2.50	177.94
1,674.0	4.80	16.10	1,673.7	6.3	3.7	-5.9	2.39	2.37	-5.70
1,767.0	6.20	13.30	1,766.3	14.9	5.9	-14.3	1.53	1.51	-3.01
1,859.0	7.20	19.10	1,857.7	25.2	9.0	-24.3	1.31	1.09	6.30
1,952.0	9.00	17.90	1,949.7	37.6	13.1	-36.3	1.94	1.94	-1.29
2,044.0	11.30	17.90	2,040.3	53.0	18.1	-51.2	2.50	2.50	0.00
2,137.0	12.40	26.50	2,131.3	70.7	25.4	-68.1	2.23	1.18	9.25
2,229.0	13.40	25.60	2,221.0	89.1	34.4	-85.6	1.11	1.09	-0.98
2,322.0	14.40	20.20	2,311.3	109.7	43.0	-105.3	1.76	1.08	-5.81
2,414.0	16.40	19.50	2,400.0	132.7	51.3	-127.4	2.18	2.17	-0.76
2,507.0	16.40	19.50	2,489.2	157.4	60.1	-151.3	0.00	0.00	0.00
2,601.0	16.60	20.00	2,579.3	182.5	69.1	-175.5	0.26	0.21	0.53
2,696.0	16.70	19.50	2,670.3	208.2	78.3	-200.2	0.18	0.11	-0.53
2,790.0	15.00	19.50	2,760.7	232.4	86.9	-223.5	1.81	-1.81	0.00
2,885.0	13.70	17.40	2,852.8	254.7	94.3	-245.0	1.47	-1.37	-2.21
2,979.0	13.50	20.20	2,944.1	275.6	101.5	-265.2	0.73	-0.21	2.98
3,074.0	14.10	22.10	3,036.4	296.7	109.6	-285.5	0.79	0.63	2.00
3,169.0	15.20	25.10	3,128.3	318.7	119.3	-306.5	1.41	1.16	3.16
3,263.0	15.90	25.30	3,218.9	341.5	130.0	-328.3	0.75	0.74	0.21
3,358.0	16.90	25.80	3,310.0	365.7	141.6	-351.3	1.06	1.05	0.53
3,452.0	15.50	26.70	3,400.3	389.3	153.2	-373.7	1.51	-1.49	0.96
3,547.0	14.50	21.90	3,492.0	411.6	163.3	-395.0	1.68	-1.05	-5.05
3,642.0	12.50	24.20	3,584.4	432.0	172.0	-414.6	2.18	-2.11	2.42
3,737.0	9.60	20.90	3,677.6	448.8	179.0	-430.6	3.12	-3.05	-3.47
3,831.0	7.80	22.50	3,770.6	462.0	184.2	-443.3	1.93	-1.91	1.70
3,926.0	6.80	22.80	3,864.8	473.2	188.9	-454.0	1.05	-1.05	0.32
4,020.0	5.40	20.20	3,958.2	482.5	192.6	-462.9	1.52	-1.49	-2.77
4,115.0	3.50	28.10	4,053.0	489.2	195.5	-469.4	2.10	-2.00	8.32
4,210.0	1.90	38.40	4,147.8	493.0	197.8	-472.9	1.75	-1.68	10.84
4,305.0	0.60	61.10	4,242.8	494.5	199.2	-474.3	1.44	-1.37	23.89
4,399.0	0.90	51.50	4,336.8	495.2	200.2	-474.9	0.34	0.32	-10.21
4,494.0	1.40	132.50	4,431.8	494.9	201.7	-474.4	1.62	0.53	85.26
4,588.0	1.40	129.90	4,525.8	493.4	203.4	-472.8	0.07	0.00	-2.77
4,683.0	0.80	216.90	4,620.8	492.1	203.9	-471.4	1.66	-0.63	91.58
4,778.0	0.30	253.80	4,715.8	491.5	203.3	-470.9	0.62	-0.53	38.84
4,873.0	0.50	263.80	4,810.8	491.4	202.6	-470.9	0.22	0.21	10.53
4,968.0	0.80	215.60	4,905.7	490.8	201.8	-470.3	0.63	0.32	-50.74
5,062.0	9.20	175.70	4,999.3	482.7	202.0	-462.3	9.15	8.94	-42.45
5,156.0	14.80	181.20	5,091.2	463.2	202.3	-442.9	6.07	5.96	5.85
5,251.0	24.90	180.80	5,180.5	431.0	201.8	-410.8	10.63	10.63	-0.42
5,346.0	30.00	174.50	5,264.8	387.3	203.8	-367.2	6.17	5.37	-6.63
5,440.0	33.60	172.60	5,344.6	338.1	209.4	-317.6	3.97	3.83	-2.02
5,535.0	44.60	177.10	5,418.3	278.6	214.5	-257.9	11.95	11.58	4.74

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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)
5,629.0	52.70	177.10	5,480.3	208.1	218.0	-187.4	8.62	8.62	0.00
5,724.0	55.30	173.10	5,536.2	131.6	224.6	-110.6	4.37	2.74	-4.21
5,818.0	60.70	172.70	5,586.0	52.5	234.5	-30.9	5.76	5.74	-0.43
5,913.0	70.90	175.70	5,624.9	-33.6	243.1	55.6	11.11	10.74	3.16
CROSSED HARD LINE @ 5919' MD / 5627' TVD									
5,919.1	71.81	175.75	5,626.8	-39.3	243.6	61.4	14.91	14.89	0.79
6,007.0	84.90	176.40	5,644.5	-125.0	249.5	147.2	14.91	14.89	0.74
7" Casing @ 6053' MD / 5646.5' TVD / End of INT Hole / Begin Lateral									
6,053.0	90.07	177.18	5,646.5	-170.9	252.0	193.2	11.36	11.23	1.69
6,072.0	92.20	177.50	5,646.2	-189.9	252.9	212.1	11.36	11.23	1.69
6,165.0	90.00	178.50	5,644.4	-282.8	256.1	304.9	2.60	-2.37	1.08
6,258.0	90.80	178.20	5,643.7	-375.7	258.8	397.8	0.92	0.86	-0.32
6,350.0	89.10	178.70	5,643.8	-467.7	261.3	489.6	1.93	-1.85	0.54
6,443.0	90.20	178.90	5,644.4	-560.7	263.3	582.3	1.20	1.18	0.22
6,535.0	88.60	178.00	5,645.3	-652.6	265.8	674.1	2.00	-1.74	-0.98
6,629.0	88.90	178.40	5,647.4	-746.6	268.7	767.9	0.53	0.32	0.43
6,724.0	88.70	178.00	5,649.4	-841.5	271.7	862.8	0.47	-0.21	-0.42
6,819.0	88.70	177.50	5,651.5	-936.4	275.4	957.6	0.53	0.00	-0.53
6,913.0	89.80	177.80	5,652.8	-1,030.3	279.3	1,051.5	1.21	1.17	0.32
7,008.0	88.00	178.40	5,654.6	-1,125.2	282.4	1,146.3	2.00	-1.89	0.63
7,102.0	89.20	178.40	5,656.9	-1,219.2	285.0	1,240.1	1.28	1.28	0.00
7,197.0	89.50	178.20	5,658.0	-1,314.1	287.9	1,334.9	0.38	0.32	-0.21
7,291.0	89.80	177.80	5,658.5	-1,408.1	291.1	1,428.7	0.53	0.32	-0.43
7,385.0	89.60	177.50	5,659.0	-1,502.0	295.0	1,522.6	0.38	-0.21	-0.32
7,480.0	89.50	177.10	5,659.8	-1,596.9	299.5	1,617.5	0.43	-0.11	-0.42
7,574.0	89.30	176.80	5,660.8	-1,690.7	304.5	1,711.4	0.38	-0.21	-0.32
7,669.0	89.20	178.40	5,662.0	-1,785.6	308.4	1,806.3	1.69	-0.11	1.68
7,764.0	88.70	178.40	5,663.7	-1,880.6	311.1	1,901.1	0.53	-0.53	0.00
7,859.0	87.40	178.00	5,667.0	-1,975.5	314.1	1,995.9	1.43	-1.37	-0.42
7,953.0	88.90	177.80	5,670.0	-2,069.4	317.5	2,089.7	1.61	1.60	-0.21
8,047.0	89.00	177.50	5,671.7	-2,163.3	321.4	2,183.6	0.34	0.11	-0.32
8,142.0	88.80	177.50	5,673.6	-2,258.2	325.5	2,278.4	0.21	-0.21	0.00
8,237.0	89.20	179.80	5,675.2	-2,353.1	327.8	2,373.2	2.46	0.42	2.42
8,331.0	89.80	179.40	5,676.0	-2,447.1	328.4	2,466.9	0.77	0.64	-0.43
8,426.0	91.40	180.10	5,675.0	-2,542.1	328.8	2,561.5	1.84	1.68	0.74
8,520.0	92.00	180.10	5,672.2	-2,636.1	328.7	2,655.0	0.64	0.64	0.00
8,615.0	90.90	181.40	5,669.8	-2,731.0	327.4	2,749.5	1.79	-1.16	1.37
8,710.0	89.10	180.30	5,669.8	-2,826.0	326.0	2,843.9	2.22	-1.89	-1.16
8,804.0	88.70	180.10	5,671.6	-2,920.0	325.7	2,937.5	0.48	-0.43	-0.21
8,899.0	88.70	179.60	5,673.8	-3,015.0	325.9	3,032.1	0.53	0.00	-0.53
8,993.0	88.80	178.50	5,675.9	-3,108.9	327.5	3,125.8	1.17	0.11	-1.17
9,088.0	89.40	177.70	5,677.3	-3,203.9	330.6	3,220.7	1.05	0.63	-0.84
9,183.0	89.90	176.60	5,677.9	-3,298.7	335.4	3,315.6	1.27	0.53	-1.16
9,277.0	90.70	175.70	5,677.4	-3,392.5	341.7	3,409.5	1.28	0.85	-0.96

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Well:	Castor Federal LD15-74HN	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Single User Db

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)
9,371.0	89.60	177.10	5,677.2	-3,486.3	347.6	3,503.5	1.89	-1.17	1.49
9,466.0	85.10	177.80	5,681.6	-3,581.1	351.8	3,598.3	4.79	-4.74	0.74
9,561.0	87.10	178.20	5,688.0	-3,675.8	355.1	3,692.9	2.15	2.11	0.42
9,655.0	89.10	177.00	5,691.2	-3,769.7	359.0	3,786.7	2.48	2.13	-1.28
9,750.0	89.50	177.30	5,692.3	-3,864.6	363.8	3,881.6	0.53	0.42	0.32
9,844.0	90.20	177.10	5,692.6	-3,958.4	368.4	3,975.5	0.77	0.74	-0.21
9,925.0	90.50	177.50	5,692.1	-4,039.4	372.2	4,056.5	0.62	0.37	0.49
9,978.0	90.50	177.50	5,691.6	-4,092.3	374.5	4,109.4	0.00	0.00	0.00

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,238.0	1,238.0	0.4	2.6	TIE IN @ 1238' MD / 1238' TVD End of Surface Hole / Begin INT Hole
5,919.1	5,626.8	-39.3	243.6	CROSSED HARD LINE @ 5919' MD / 5627' TVD
6,053.0	5,646.5	-170.9	252.0	7" Casing @ 6053' MD / 5646.5' TVD / End of INT Hole / Begin Lateral
9,978.0	5,691.6	-4,092.3	374.5	TD @ 9978' MD / 5691.6' TVD

Checked By: _____ Approved By: _____ Date: _____



Survey Certification Sheet

Noble Energy Inc
Company

RM-131019
Job Number

2/3/14
Date

Sec15,T9N,R58W,6TH PM
Lease

Castor Federal LD15-74HN
Well Name

Weld, CO
County & State

API: 05-123-37486

Surveyed from a depth of: 1238 feet to 9978 feet MD

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@directionaldrillers.co
m, c=US
Date: 2014.02.03 16:31:54 -06'00'

Larry Wright
MWD General Manager

Company Name: Noble Energy Inc.
Castor Federal LD15-74HN
Weld County, CO
Rig: H&P #326
Created By: James Dawson
Date: 1/06/2014

Castor Federal LD15-74HN
Weld County, CO
Q130940 & RM-131019
Design #1

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



WELL DETAILS: Castor Federal LD15-74HN						
		Ground Level: 4707.0				
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	
0.0	0.0	1522926.83	3457438.24	40° 45' 25.668 N	103° 50' 55.536 W	

T

G

M

Azimuths to Grid North

Correction: 7.00°

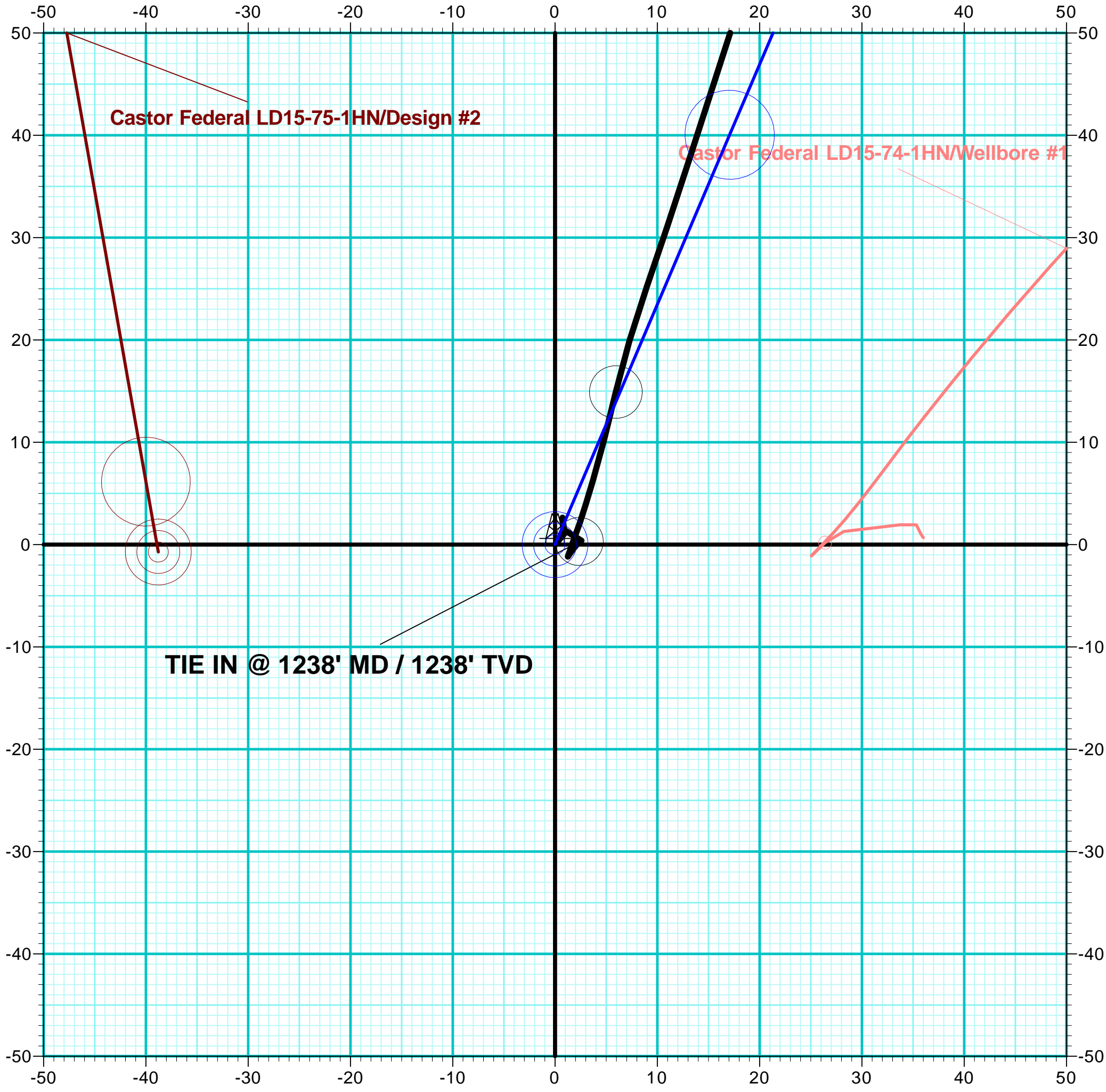
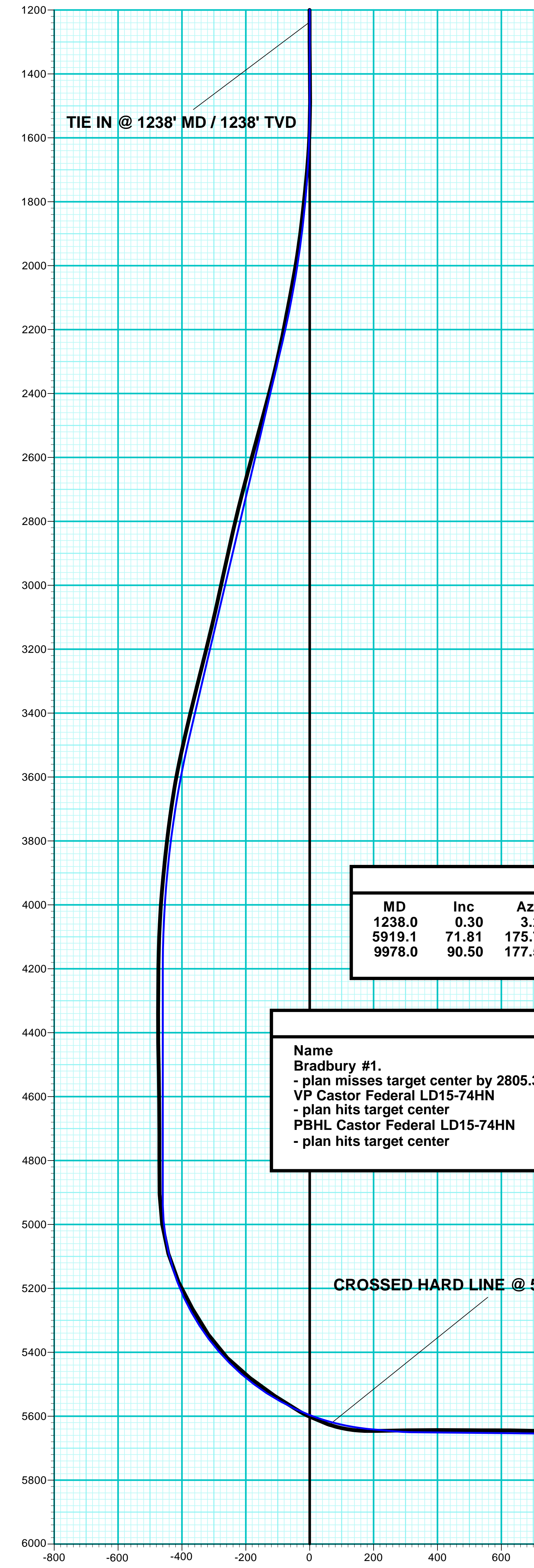
Magnetic Field

Strength: 53160.5snT

Dip Angle: 67.40°

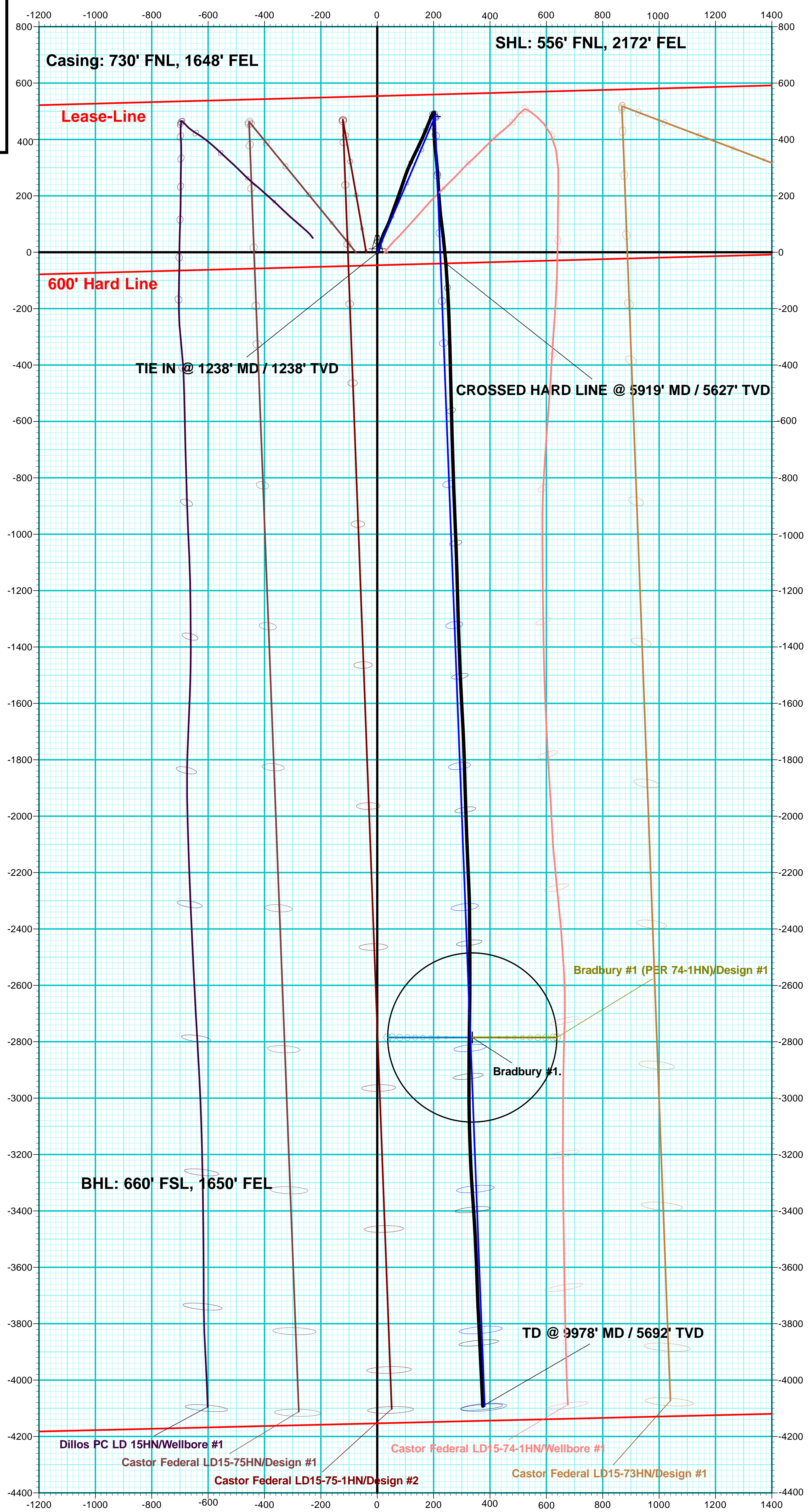
Date: 12/20/2013

Model: IGRF2010



ANNOTATIONS									
MD	Inc	Azi	TVD	+N/-S	+E/-W	VSect	Departure	Annotation	
1238.0	0.30	3.20	1238.0	0.4	2.6	-0.1	11.2	TIE IN @ 1238' MD / 1238' TVD	
5919.1	71.81	175.75	5626.8	-39.3	243.6	61.4	1091.3	CROSSED HARD LINE @ 5919' MD / 5627' TVD	
9978.0	90.50	177.50	5691.6	-4092.3	374.5	4109.4	5147.0	TD @ 9978' MD / 5692' TVD	

DESIGN TARGET DETAILS							
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
Bradbury #1.	0.0	-2785.0	337.3	1520141.85	3457775.54	40° 44' 58.092 N	103° 50' 51.828 W
- plan misses target center by 2805.3usft at 0.0usft MD (0.0 TVD, 0.0 N, 0.0 E)							
VP Castor Federal LD15-74HN	4205.0	481.0	205.0	1523407.83	3457643.24	40° 45' 30.382 N	103° 50' 52.756 W
- plan hits target center							
PBHL Castor Federal LD15-74HN	5690.0	-4092.3	381.1	1518834.49	3457819.30	40° 44' 45.168 N	103° 50' 51.576 W
- plan hits target center							



Vertical Section at 174.68° (200 usft/in)