

# US ROCKIES WATTENBERG PLANNING

WELD-NAD83-UTMFT13N  
2N-66W-33 THERMO 37N-33HZ PAD  
THERMO 38N-33HZ

Plan A

Plan: Permit Rev-5

## Sperry Drilling Services

### Proposal Report

24 June, 2015

Well Coordinates: 14,562,569.67 N, 1,702,870.51 E (40° 05' 53.51" N, 104° 46' 36.02" W)

Ground Level: 4,984.00 usft

Local Coordinate Origin:

Centered on Well THERMO 38N-33HZ

Viewing Datum:

RKB = 25' @ 5009.00usft (HP 307)

TVDs to System:

N

North Reference:

True

Unit System:

Dec-Deg - API - US Survey Feet - Custom

Version: 5000.1 Build: 73

**HALLIBURTON**

Project: WELD-NAD83-UTMFT13N  
 Site: 2N-66W-33 THERMO 37N-33HZ PAD  
 Well: THERMO 38N-33HZ  
 Wellbore: Plan A  
 Design: Permit Rev-5

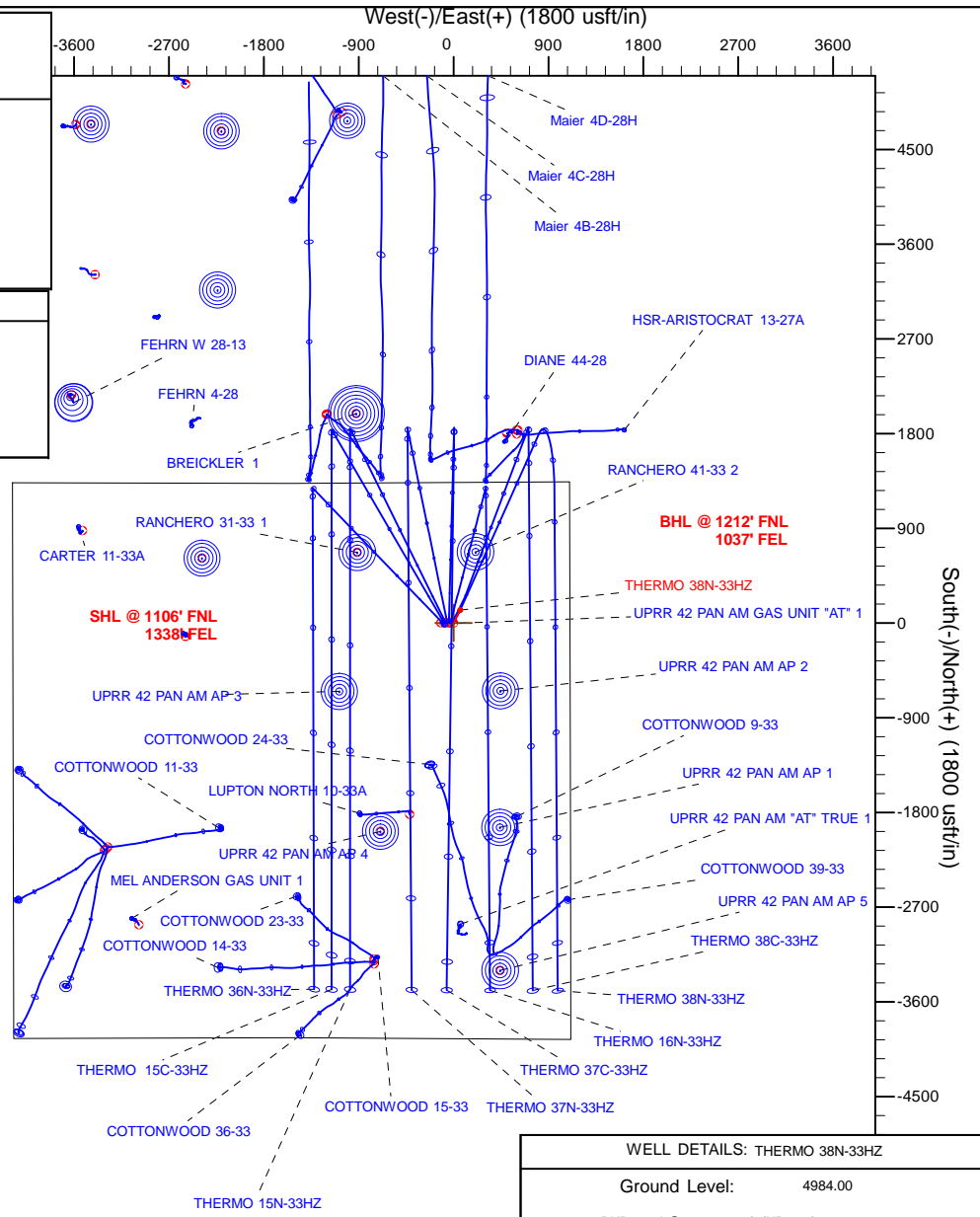
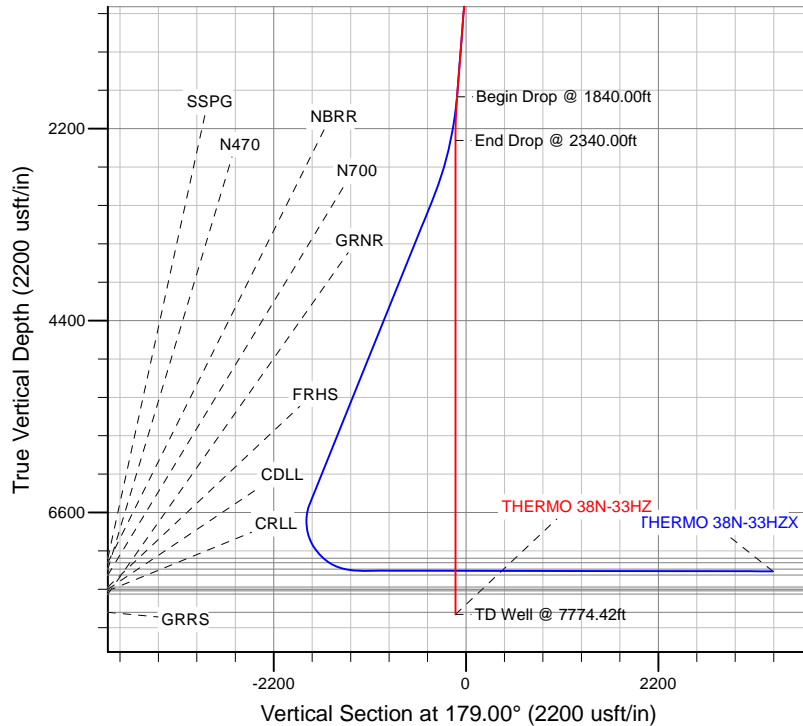


SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Target
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	250.00	0.00	0.00	250.00	0.00	0.00	0.00	0.00	0.00	
3	750.00	5.00	27.00	749.37	19.43	9.90	1.00	27.00	-19.25	
4	1840.00	5.00	27.00	1835.22	104.07	53.03	0.00	0.00	-103.13	
5	2340.00	0.00	0.00	2334.58	123.50	62.93	1.00	180.00	-122.38	
6	7774.42	0.00	0.00	7769.00	123.50	62.93	0.00	0.00	-122.38	

WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude	Shape Point
Thermo 38N-33HZ_SHL	0.00	0.00	0.00	40.098197	-104.776671	



WELL DETAILS: THERMO 38N-33HZ	
Ground Level:	4984.00
RKB = 25' @ 5009.00usft (HP 307)	
Plan: Permit Rev-5 (THERMO 38N-33HZ/Plan A)	
Created By: Clint Eshelman	Date: 6/24/2015
Reviewed:	Date:

**Plan Report for THERMO 38N-33HZ - Permit Rev-5**

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)	Toolface Azimuth (°)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Thermo 38N-33HZ_SHL</b>										
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
250.00	0.00	0.00	250.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Begin Nudge @ 250.00ft</b>										
300.00	0.50	27.00	300.00	0.19	0.10	-0.19	1.00	1.00	0.00	27.00
400.00	1.50	27.00	399.98	1.75	0.89	-1.73	1.00	1.00	0.00	0.00
500.00	2.50	27.00	499.92	4.86	2.48	-4.81	1.00	1.00	0.00	0.00
600.00	3.50	27.00	599.78	9.52	4.85	-9.44	1.00	1.00	0.00	0.00
700.00	4.50	27.00	699.54	15.74	8.02	-15.59	1.00	1.00	0.00	0.00
750.00	5.00	27.00	749.37	19.43	9.90	-19.25	1.00	1.00	0.00	0.00
<b>End Nudge @ 750.00ft</b>										
800.00	5.00	27.00	799.18	23.31	11.88	-23.10	0.00	0.00	0.00	0.00
900.00	5.00	27.00	898.79	31.07	15.83	-30.79	0.00	0.00	0.00	0.00
1,000.00	5.00	27.00	998.41	38.84	19.79	-38.49	0.00	0.00	0.00	0.00
1,100.00	5.00	27.00	1,098.03	46.61	23.75	-46.18	0.00	0.00	0.00	0.00
1,200.00	5.00	27.00	1,197.65	54.37	27.70	-53.88	0.00	0.00	0.00	0.00
1,300.00	5.00	27.00	1,297.27	62.14	31.66	-61.58	0.00	0.00	0.00	0.00
1,400.00	5.00	27.00	1,396.89	69.90	35.62	-69.27	0.00	0.00	0.00	0.00
1,500.00	5.00	27.00	1,496.51	77.67	39.57	-76.97	0.00	0.00	0.00	0.00
1,600.00	5.00	27.00	1,596.13	85.43	43.53	-84.66	0.00	0.00	0.00	0.00
1,700.00	5.00	27.00	1,695.75	93.20	47.49	-92.36	0.00	0.00	0.00	0.00
1,800.00	5.00	27.00	1,795.37	100.97	51.44	-100.05	0.00	0.00	0.00	0.00
1,804.65	5.00	27.00	1,800.00	101.33	51.63	-100.41	0.00	0.00	0.00	0.00
<b>9 5/8"</b>										
1,840.00	5.00	27.00	1,835.22	104.07	53.03	-103.13	0.00	0.00	0.00	0.00
<b>Begin Drop @ 1840.00ft</b>										
1,900.00	4.40	27.00	1,895.02	108.45	55.26	-107.47	1.00	-1.00	0.00	180.00
2,000.00	3.40	27.00	1,994.78	114.51	58.35	-113.48	1.00	-1.00	0.00	-180.00
2,100.00	2.40	27.00	2,094.65	119.02	60.64	-117.94	1.00	-1.00	0.00	180.00
2,200.00	1.40	27.00	2,194.60	121.97	62.15	-120.87	1.00	-1.00	0.00	180.00
2,300.00	0.40	27.00	2,294.58	123.37	62.86	-122.26	1.00	-1.00	0.00	-180.00
2,340.00	0.00	0.00	2,334.58	123.50	62.93	-122.38	1.00	-1.00	0.00	-180.00
<b>End Drop @ 2340.00ft</b>										
2,400.00	0.00	0.00	2,394.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
2,500.00	0.00	0.00	2,494.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
2,600.00	0.00	0.00	2,594.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
2,700.00	0.00	0.00	2,694.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
2,800.00	0.00	0.00	2,794.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
2,900.00	0.00	0.00	2,894.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
3,000.00	0.00	0.00	2,994.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
3,100.00	0.00	0.00	3,094.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
3,200.00	0.00	0.00	3,194.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
3,300.00	0.00	0.00	3,294.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
3,400.00	0.00	0.00	3,394.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
3,500.00	0.00	0.00	3,494.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
3,600.00	0.00	0.00	3,594.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
3,700.00	0.00	0.00	3,694.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
3,800.00	0.00	0.00	3,794.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
3,900.00	0.00	0.00	3,894.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
4,000.00	0.00	0.00	3,994.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
4,100.00	0.00	0.00	4,094.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
4,200.00	0.00	0.00	4,194.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
4,300.00	0.00	0.00	4,294.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
4,400.00	0.00	0.00	4,394.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
4,500.00	0.00	0.00	4,494.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
4,600.00	0.00	0.00	4,594.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00



Plan Report for THERMO 38N-33HZ - Permit Rev-5

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)	Toolface Azimuth (°)
4,700.00	0.00	0.00	4,694.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
4,800.00	0.00	0.00	4,794.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
4,900.00	0.00	0.00	4,894.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
5,000.00	0.00	0.00	4,994.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
5,100.00	0.00	0.00	5,094.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
5,200.00	0.00	0.00	5,194.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
5,300.00	0.00	0.00	5,294.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
5,400.00	0.00	0.00	5,394.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
5,500.00	0.00	0.00	5,494.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
5,600.00	0.00	0.00	5,594.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
5,700.00	0.00	0.00	5,694.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
5,800.00	0.00	0.00	5,794.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
5,900.00	0.00	0.00	5,894.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
6,000.00	0.00	0.00	5,994.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
6,100.00	0.00	0.00	6,094.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
6,200.00	0.00	0.00	6,194.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
6,300.00	0.00	0.00	6,294.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
6,400.00	0.00	0.00	6,394.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
6,500.00	0.00	0.00	6,494.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
6,600.00	0.00	0.00	6,594.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
6,700.00	0.00	0.00	6,694.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
6,800.00	0.00	0.00	6,794.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
6,900.00	0.00	0.00	6,894.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
7,000.00	0.00	0.00	6,994.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
7,100.00	0.00	0.00	7,094.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
7,128.42	0.00	0.00	7,123.00	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
<b>SSPG</b>										
7,181.42	0.00	0.00	7,176.00	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
<b>NBRR</b>										
7,200.00	0.00	0.00	7,194.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
7,254.42	0.00	0.00	7,249.00	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
<b>N470</b>										
7,300.00	0.00	0.00	7,294.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
7,323.42	0.00	0.00	7,318.00	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
<b>N700</b>										
7,400.00	0.00	0.00	7,394.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
7,460.42	0.00	0.00	7,455.00	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
<b>FRHS</b>										
7,485.42	0.00	0.00	7,480.00	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
<b>CDLL</b>										
7,500.00	0.00	0.00	7,494.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
7,502.42	0.00	0.00	7,497.00	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
<b>CRLL</b>										
7,540.42	0.00	0.00	7,535.00	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
<b>GRNR</b>										
7,600.00	0.00	0.00	7,594.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
7,700.00	0.00	0.00	7,694.58	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
7,749.42	0.00	0.00	7,744.00	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
<b>GRRS</b>										
7,774.42	0.00	0.00	7,769.00	123.50	62.93	-122.38	0.00	0.00	0.00	0.00
<b>TD Well @ 7774.42ft</b>										



Plan Report for THERMO 38N-33HZ - Permit Rev-5

**Plan Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
250.00	250.00	0.00	0.00	Begin Nudge @ 250.00ft
750.00	749.37	19.43	9.90	End Nudge @ 750.00ft
1,840.00	1,835.22	104.07	53.03	Begin Drop @ 1840.00ft
2,340.00	2,334.58	123.50	62.93	End Drop @ 2340.00ft
7,774.42	7,769.00	123.50	62.93	TD Well @ 7774.42ft

**Vertical Section Information**

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
User	No Target (Freehand)	179.00	Slot	0.00	0.00	0.00

**Survey tool program**

From (usft)	To (usft)	Survey/Plan	Survey Tool
0.00	7,774.42	Permit Rev-5	APC_ISCWSA REV 2 MWD+IFR1

**Casing Details**

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,804.65	1,800.00	9 5/8"	9-5/8	13-1/2

**Formation Details**

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
7,128.42	7,123.00	SSPG		0.00	
7,181.42	7,176.00	NBRR		0.00	
7,254.42	7,249.00	N470		0.00	
7,323.42	7,318.00	N700		0.00	
7,460.42	7,455.00	FRHS		0.00	
7,485.42	7,480.00	CDLL		0.00	
7,502.42	7,497.00	CRLL		0.00	
7,540.42	7,535.00	GRNR		0.00	
7,749.42	7,744.00	GRRS		0.00	

**Targets associated with this wellbore**

Target Name	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Shape
Thermo 38N-33HZ_SHL	0.00	0.00	0.00	Point

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**Plan Report for THERMO 38N-33HZ - Permit Rev-5**

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**Directional Difficulty Index**

Average Dogleg over Survey:	0.13 °/100usft	Maximum Dogleg over Survey:	1.00 °/100usft at 750.00 usft
Net Tortosity applicable to Plans:	0.13 °/100usft	Directional Difficulty Index:	3.784

**Audit Info**

**North Reference Sheet for 2N-66W-33 THERMO 37N-33HZ PAD - THERMO 38N-33HZ - Plan A**

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.

Vertical Depths are relative to RKB = 25' @ 5009.00usft (HP 307). Northing and Easting are relative to THERMO 38N-33HZ

Coordinate System is Universal Transverse Mercator (US Survey Feet), Zone 13N (108 W to 102 W) using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Transverse Mercator (Gauss-Kruger)

Central Meridian is -105.00°, Longitude Origin:0.000000°, Latitude Origin:0.000000°

False Easting: 1,640,416.67usft, False Northing: 0.00usft, Scale Reduction: 0.99960446

Grid Coordinates of Well: 14,562,569.67 usft N, 1,702,870.51 usft E

Geographical Coordinates of Well: 40° 05' 53.51" N, 104° 46' 36.02" W

Grid Convergence at Surface is: 0.14°

Based upon Minimum Curvature type calculations, at a Measured Depth of 7,774.42usft the Bottom Hole Displacement is 138.61usft in the Direction of 27.00° ( True).

Magnetic Convergence at surface is: -8.22° (22 January 2015, , IGRF2010)

