



Project: Mesa County, CO  
 Site: Gunderson 29-09 Pad  
 Well: Piceance Federal 29-18W  
 Wellbore: Wellbore #1  
 Design: Design #1  
 Latitude: 39° 14' 54.560 N  
 Longitude: 107° 47' 18.010 W  
 Ground Level: 7531.0  
 well @ 7561.0usft (H&P #522)



#### PROJECT DETAILS: Mesa County, CO

Geodetic System: US State Plane 1983  
 Datum: North American Datum 1983  
 Ellipsoid: GRS 1980  
 Zone: Colorado Central Zone  
 System Datum: Mean Sea Level

#### REFERENCE INFORMATION

Co-ordinate (N/E) Reference: Well Piceance Federal 29-18W, True North  
 Vertical (TVD) Reference: well @ 7561.0usft (H&P #522)  
 Section (VS) Reference: Slot - (0.0N, 0.0E)  
 Measured Depth Reference: well @ 7561.0usft (H&P #522)  
 Calculation Method: Minimum Curvature

#### WELL DETAILS: Piceance Federal 29-18W

+N/-S	+E/-W	Northing	Ground Level:	7531.0	Longitude
0.0	0.0	1523857.81	Easting	2352028.22	39° 14' 54.560 N 107° 47' 18.010 W

#### WELLBORE TARGET DETAILS (MAP CO-ORDINATES AND LAT/LONG)

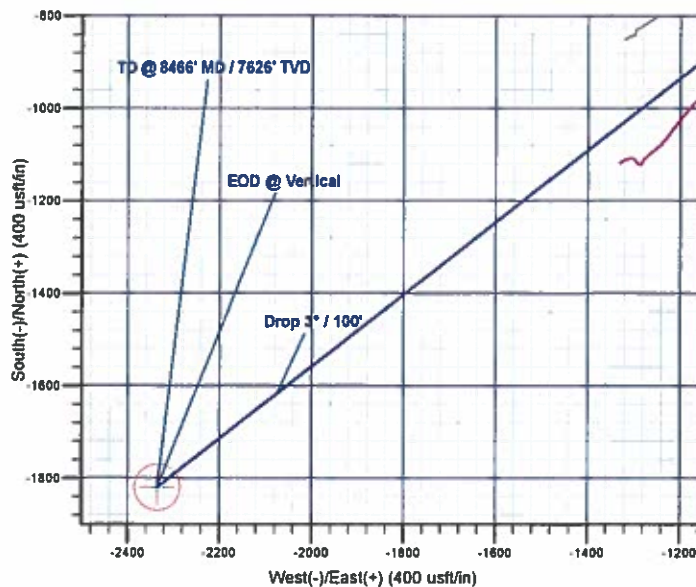
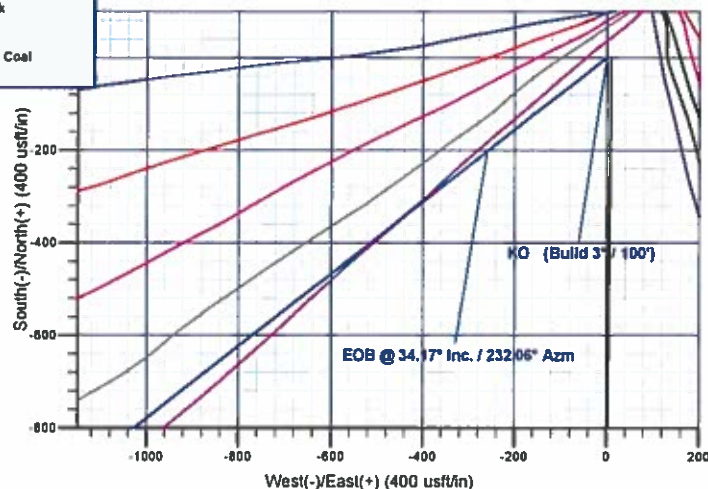
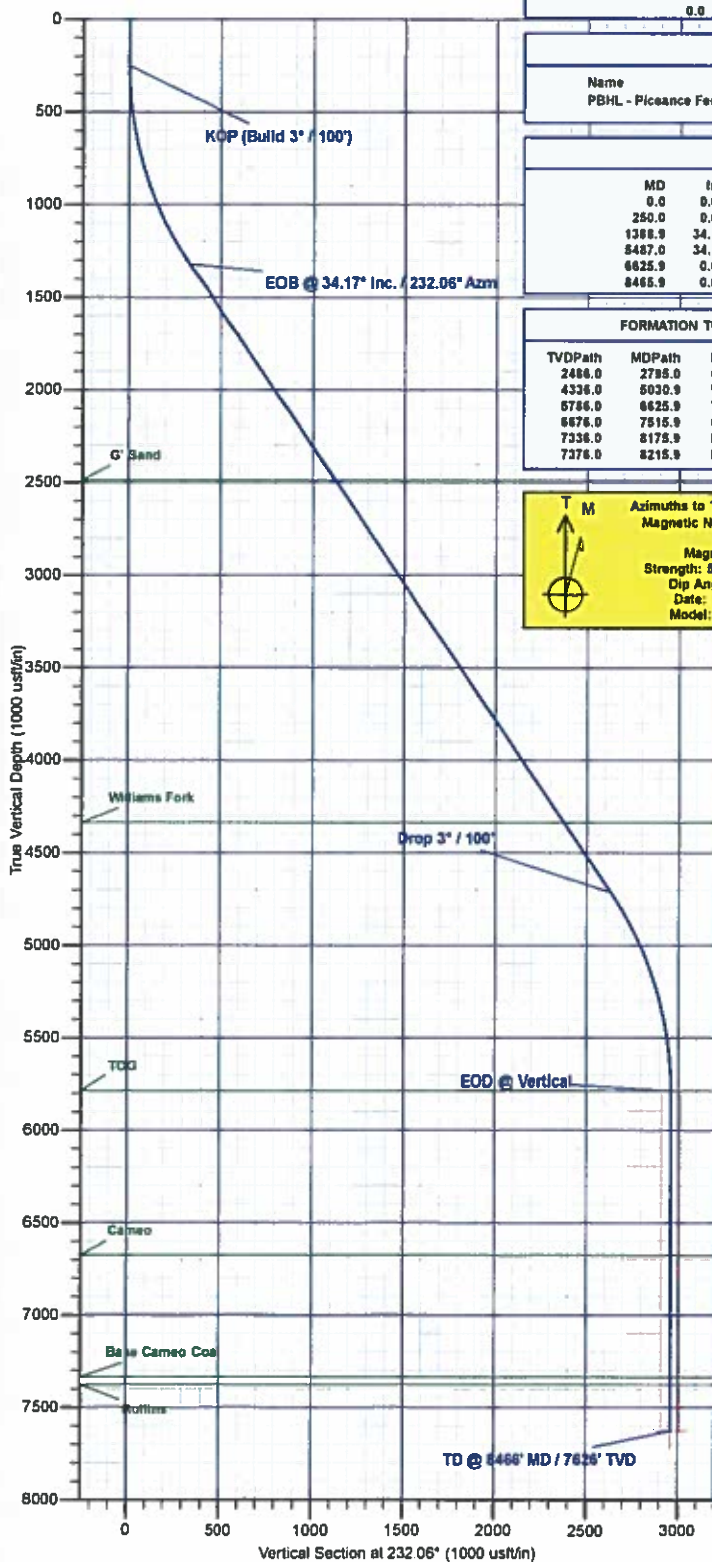
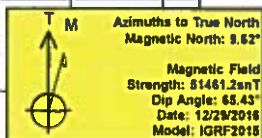
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
PBHL - Piceance Federal 29-18W	7626.0	-1820.2	-2335.1	1521796.98	2349648.03	39° 14' 38.568 N	107° 47' 47.692 W

#### SECTION DETAILS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Annotation
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.0	
250.0	0.00	0.00	250.0	0.0	0.0	0.00	0.00	0.0	KOP (Build 3° / 100')
1388.9	34.17	232.06	1322.6	-282.6	-360.0	3.00	232.06	329.6	EOB @ 34.17° Inc. / 232.06° Azm
8487.0	34.17	232.06	4713.4	-1617.6	-2075.1	0.00	0.00	2631.1	Drop 3° / 100'
8625.9	0.00	0.00	8786.0	-1820.2	-2335.1	3.00	180.00	2960.7	EOD @ Vertical
8465.9	0.00	0.00	7626.0	-1820.2	-2335.1	0.00	0.00	2960.7	TD @ 8466' MD / 7626' TVD

#### FORMATION TOP DETAILS

TVDPath	MDPath	Formation
2486.0	2785.9	G' Sand
4336.0	5030.9	Williams Fork
5746.0	6625.9	TOG
6876.0	7515.9	Cameo
7336.0	8175.9	Base Cameo Coal
7376.0	8215.9	Rollins



Plan: Design #1 (Piceance Federal 29-18W Wellbore #1)

Created By: Will Jircik Date: 14:05, December 29 2016



# **Laramie Energy, LLC**

**Mesa County, CO**

**Gunderson 29-09 Pad**

**Piceance Federal 29-18W**

**Wellbore #1**

**Plan: Design #1**

## **QES Well Planning Report**

**29 December, 2016**





# Well Planning Report



<b>Database:</b>	EDM5002	<b>Local Co-ordinate Reference:</b>	Well Piceance Federal 29-18W
<b>Company:</b>	Laramie Energy, LLC	<b>TVD Reference:</b>	well @ 7561.0usft (H&P #522)
<b>Project:</b>	Mesa County, CO	<b>MD Reference:</b>	well @ 7561.0usft (H&P #522)
<b>Site:</b>	Gunderson 29-09 Pad	<b>North Reference:</b>	True
<b>Well:</b>	Piceance Federal 29-18W	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	Design #1		

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

Site		Gunderson 29-09 Pad			
Site Position:		Northing:	1,523,671.42 usft	Latitude:	39° 14' 55.692 N
From:	Lat/Long	Easting:	2,352,063.75 usft	Longitude:	107° 47' 17.595 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-1.44

Well	Piceance Federal 29-18W					
Well Position	+N/-S	-114.5 usft	Northing:	1,523,557.81 usft	Latitude:	39° 14' 54.560 N
	+E/-W	-32.7 usft	Easting:	2,352,028.23 usft	Longitude:	107° 47' 18.010 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	7,531.0 usft

<b>Wellbore</b>	Wellbore #1
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	12/29/2016	9.62	65.43	51,461

Design	Design #1			
Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	232.06

Plan Sections										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
250.0	0.00	0.00	250.0	0.0	0.0	0.00	0.00	0.00	0.00	
1,388.9	34.17	232.06	1,322.6	-202.6	-260.0	3.00	3.00	0.00	232.06	
5,487.0	34.17	232.06	4,713.4	-1,617.6	-2,075.1	0.00	0.00	0.00	0.00	
6,625.9	0.00	0.00	5,786.0	-1,820.2	-2,335.1	3.00	-3.00	0.00	180.00	
8,465.9	0.00	0.00	7,626.0	-1,820.2	-2,335.1	0.00	0.00	0.00	0.00	PBHL - Piceance Fed





## Well Planning Report



<b>Database:</b>	EDM5002	<b>Local Co-ordinate Reference:</b>	Well Piceance Federal 29-18W
<b>Company:</b>	Laramie Energy, LLC	<b>TVD Reference:</b>	well @ 7561.0usft (H&P #522)
<b>Project:</b>	Mesa County, CO	<b>MD Reference:</b>	well @ 7561.0usft (H&P #522)
<b>Site:</b>	Gunderson 29-09 Pad	<b>North Reference:</b>	True
<b>Well:</b>	Piceance Federal 29-18W	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	Design #1		

## Planned 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
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	0.00
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	0.00
<b>KOP (Build 3° / 100')</b>									
250.0	0.00	0.00	250.0	0.0	0.0	0.0	0.00	0.00	0.00
300.0	1.50	232.06	300.0	-0.4	-0.5	0.7	3.00	3.00	0.00
400.0	4.50	232.06	399.8	-3.6	-4.6	5.9	3.00	3.00	0.00
500.0	7.50	232.06	499.3	-10.0	-12.9	16.3	3.00	3.00	0.00
600.0	10.50	232.06	598.0	-19.7	-25.2	32.0	3.00	3.00	0.00
700.0	13.50	232.06	695.8	-32.4	-41.6	52.8	3.00	3.00	0.00
800.0	16.50	232.06	792.4	-48.4	-62.0	78.6	3.00	3.00	0.00
900.0	19.50	232.06	887.5	-67.3	-86.4	109.5	3.00	3.00	0.00
1,000.0	22.50	232.06	980.9	-89.4	-114.7	145.4	3.00	3.00	0.00
1,100.0	25.50	232.06	1,072.2	-114.4	-146.7	186.0	3.00	3.00	0.00
1,200.0	28.50	232.06	1,161.3	-142.3	-182.5	231.4	3.00	3.00	0.00
1,300.0	31.50	232.06	1,247.9	-173.0	-222.0	281.4	3.00	3.00	0.00
<b>EOB @ 34.17° Inc. / 232.06° Azm</b>									
1,388.9	34.17	232.06	1,322.6	-202.6	-260.0	329.6	3.00	3.00	0.00
1,400.0	34.17	232.06	1,331.8	-206.5	-264.9	335.9	0.00	0.00	0.00
1,500.0	34.17	232.06	1,414.5	-241.0	-309.2	392.0	0.00	0.00	0.00
<b>8 5/8"</b>									
1,530.0	34.17	232.06	1,439.3	-251.4	-322.5	408.9	0.00	0.00	0.00
1,600.0	34.17	232.06	1,497.3	-275.5	-353.5	448.2	0.00	0.00	0.00
1,700.0	34.17	232.06	1,580.0	-310.1	-397.8	504.3	0.00	0.00	0.00
1,800.0	34.17	232.06	1,662.7	-344.6	-442.1	560.5	0.00	0.00	0.00
1,900.0	34.17	232.06	1,745.5	-379.1	-486.4	616.7	0.00	0.00	0.00
2,000.0	34.17	232.06	1,828.2	-413.6	-530.6	672.8	0.00	0.00	0.00
2,100.0	34.17	232.06	1,911.0	-448.2	-574.9	729.0	0.00	0.00	0.00
2,200.0	34.17	232.06	1,993.7	-482.7	-619.2	785.1	0.00	0.00	0.00
2,300.0	34.17	232.06	2,076.4	-517.2	-663.5	841.3	0.00	0.00	0.00
2,400.0	34.17	232.06	2,159.2	-551.7	-707.8	897.5	0.00	0.00	0.00
2,500.0	34.17	232.06	2,241.9	-586.3	-752.1	953.6	0.00	0.00	0.00
2,600.0	34.17	232.06	2,324.7	-620.8	-796.4	1,009.8	0.00	0.00	0.00
2,700.0	34.17	232.06	2,407.4	-655.3	-840.7	1,065.9	0.00	0.00	0.00
<b>G' Sand</b>									
2,795.0	34.17	232.06	2,486.0	-688.1	-882.8	1,119.3	0.00	0.00	0.00
2,800.0	34.17	232.06	2,490.2	-689.9	-885.0	1,122.1	0.00	0.00	0.00
2,900.0	34.17	232.06	2,572.9	-724.4	-929.3	1,178.3	0.00	0.00	0.00
3,000.0	34.17	232.06	2,655.6	-758.9	-973.6	1,234.4	0.00	0.00	0.00
3,100.0	34.17	232.06	2,738.4	-793.4	-1,017.9	1,290.6	0.00	0.00	0.00
3,200.0	34.17	232.06	2,821.1	-828.0	-1,062.2	1,346.7	0.00	0.00	0.00
3,300.0	34.17	232.06	2,903.9	-862.5	-1,106.4	1,402.9	0.00	0.00	0.00
3,400.0	34.17	232.06	2,986.6	-897.0	-1,150.7	1,459.0	0.00	0.00	0.00
3,500.0	34.17	232.06	3,069.3	-931.5	-1,195.0	1,515.2	0.00	0.00	0.00
3,600.0	34.17	232.06	3,152.1	-966.1	-1,239.3	1,571.4	0.00	0.00	0.00
3,700.0	34.17	232.06	3,234.8	-1,000.6	-1,283.6	1,627.5	0.00	0.00	0.00
3,800.0	34.17	232.06	3,317.6	-1,035.1	-1,327.9	1,683.7	0.00	0.00	0.00
3,900.0	34.17	232.06	3,400.3	-1,069.6	-1,372.2	1,739.8	0.00	0.00	0.00
4,000.0	34.17	232.06	3,483.1	-1,104.2	-1,416.5	1,796.0	0.00	0.00	0.00
4,100.0	34.17	232.06	3,565.8	-1,138.7	-1,460.8	1,852.2	0.00	0.00	0.00
4,200.0	34.17	232.06	3,648.5	-1,173.2	-1,505.1	1,908.3	0.00	0.00	0.00
4,300.0	34.17	232.06	3,731.3	-1,207.7	-1,549.4	1,964.5	0.00	0.00	0.00
4,400.0	34.17	232.06	3,814.0	-1,242.3	-1,593.7	2,020.6	0.00	0.00	0.00
4,500.0	34.17	232.06	3,896.8	-1,276.8	-1,638.0	2,076.8	0.00	0.00	0.00



# Well Planning Report



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<b>Project:</b>	Mesa County, CO	<b>MD Reference:</b>	well @ 7561.0usft (H&P #522)
<b>Site:</b>	Gunderson 29-09 Pad	<b>North Reference:</b>	True
<b>Well:</b>	Piceance Federal 29-18W	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	Design #1		

## Planned 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)
4,600.0	34.17	232.06	3,979.5	-1,311.3	-1,682.2	2,133.0	0.00	0.00	0.00
4,700.0	34.17	232.06	4,062.2	-1,345.8	-1,726.5	2,189.1	0.00	0.00	0.00
4,800.0	34.17	232.06	4,145.0	-1,380.4	-1,770.8	2,245.3	0.00	0.00	0.00
4,900.0	34.17	232.06	4,227.7	-1,414.9	-1,815.1	2,301.4	0.00	0.00	0.00
5,000.0	34.17	232.06	4,310.5	-1,449.4	-1,859.4	2,357.6	0.00	0.00	0.00
<b>Williams Fork</b>									
5,030.9	34.17	232.06	4,336.0	-1,460.1	-1,873.1	2,374.9	0.00	0.00	0.00
5,100.0	34.17	232.06	4,393.2	-1,484.0	-1,903.7	2,413.8	0.00	0.00	0.00
5,200.0	34.17	232.06	4,476.0	-1,518.5	-1,948.0	2,469.9	0.00	0.00	0.00
5,300.0	34.17	232.06	4,558.7	-1,553.0	-1,992.3	2,526.1	0.00	0.00	0.00
5,400.0	34.17	232.06	4,641.4	-1,587.5	-2,036.6	2,582.2	0.00	0.00	0.00
<b>Drop 3° / 100'</b>									
5,487.0	34.17	232.06	4,713.4	-1,617.6	-2,075.1	2,631.1	0.00	0.00	0.00
5,500.0	33.78	232.06	4,724.2	-1,622.0	-2,080.8	2,638.4	3.00	-3.00	0.00
5,600.0	30.78	232.06	4,808.7	-1,654.9	-2,123.0	2,691.7	3.00	-3.00	0.00
5,700.0	27.78	232.06	4,896.0	-1,684.9	-2,161.5	2,740.6	3.00	-3.00	0.00
5,800.0	24.78	232.06	4,985.6	-1,712.1	-2,196.4	2,784.9	3.00	-3.00	0.00
5,900.0	21.78	232.06	5,077.5	-1,738.4	-2,227.6	2,824.4	3.00	-3.00	0.00
6,000.0	18.78	232.06	5,171.3	-1,757.7	-2,254.9	2,859.1	3.00	-3.00	0.00
6,100.0	15.78	232.06	5,266.7	-1,776.0	-2,278.3	2,888.8	3.00	-3.00	0.00
6,200.0	12.78	232.06	5,363.6	-1,791.1	-2,297.8	2,913.4	3.00	-3.00	0.00
6,300.0	9.78	232.06	5,461.7	-1,803.2	-2,313.2	2,933.0	3.00	-3.00	0.00
6,400.0	6.78	232.06	5,560.6	-1,812.0	-2,324.6	2,947.4	3.00	-3.00	0.00
6,500.0	3.78	232.06	5,660.2	-1,817.7	-2,331.8	2,956.6	3.00	-3.00	0.00
6,600.0	0.78	232.06	5,760.1	-1,820.1	-2,335.0	2,960.5	3.00	-3.00	0.00
<b>EOD @ Vertical - TOG</b>									
6,625.9	0.00	0.00	5,786.0	-1,820.2	-2,335.1	2,960.7	3.00	-3.00	494.18
6,700.0	0.00	0.00	5,860.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
6,800.0	0.00	0.00	5,960.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
6,900.0	0.00	0.00	6,060.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
7,000.0	0.00	0.00	6,160.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
7,100.0	0.00	0.00	6,260.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
7,200.0	0.00	0.00	6,360.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
7,300.0	0.00	0.00	6,460.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
7,400.0	0.00	0.00	6,560.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
7,500.0	0.00	0.00	6,660.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
<b>Cameo</b>									
7,515.9	0.00	0.00	6,676.0	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
7,600.0	0.00	0.00	6,760.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
7,700.0	0.00	0.00	6,860.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
7,800.0	0.00	0.00	6,960.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
7,900.0	0.00	0.00	7,060.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
8,000.0	0.00	0.00	7,160.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
8,100.0	0.00	0.00	7,260.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
<b>Base Cameo Coal</b>									
8,175.9	0.00	0.00	7,336.0	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
8,200.0	0.00	0.00	7,360.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
<b>Rollins</b>									
8,215.9	0.00	0.00	7,376.0	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
8,300.0	0.00	0.00	7,460.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
8,400.0	0.00	0.00	7,560.1	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00
<b>TD @ 8466' MD / 7626' TVD</b>									
8,465.9	0.00	0.00	7,626.0	-1,820.2	-2,335.1	2,960.7	0.00	0.00	0.00



## Well Planning Report



<b>Database:</b>	EDM5002	<b>Local Co-ordinate Reference:</b>	Well Piceance Federal 29-18W
<b>Company:</b>	Laramie Energy, LLC	<b>TVD Reference:</b>	well @ 7561.0usft (H&P #522)
<b>Project:</b>	Mesa County, CO	<b>MD Reference:</b>	well @ 7561.0usft (H&P #522)
<b>Site:</b>	Gunderson 29-09 Pad	<b>North Reference:</b>	True
<b>Well:</b>	Piceance Federal 29-18W	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	Design #1		

## Planned 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)
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## Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N-S (usft)	+E-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
PBHL - Piceance Federal - plan hits target center - Circle (radius 50.0)	0.00	0.00	7,626.0	-1,820.2	-2,335.1	1,521,796.98	2,349,648.03	39° 14' 36.568 N	107° 47' 47.692 W

## Casing Points

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,530.0	1,439.3	8 5/8"	8-5/8	11

## Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
2,795.0	2,486.0	G' Sand			
5,030.9	4,336.0	Williams Fork			
6,625.9	5,786.0	TOG			
7,515.9	6,676.0	Cameo			
8,175.9	7,336.0	Base Cameo Coal			
8,215.9	7,376.0	Rollins			

## Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N-S (usft)	+E-W (usft)	
250.0	250.0	0.0	0.0	KOP (Build 3" / 100')
1,388.9	1,322.6	-202.6	-260.0	EOB @ 34.17° Inc. / 232.06° Azm
5,487.0	4,713.4	-1,617.6	-2,075.1	Drop 3" / 100'
6,625.9	5,786.0	-1,820.2	-2,335.1	EOD @ Vertical
8,465.9	7,626.0	-1,820.2	-2,335.1	TD @ 8466' MD / 7626' TVD