

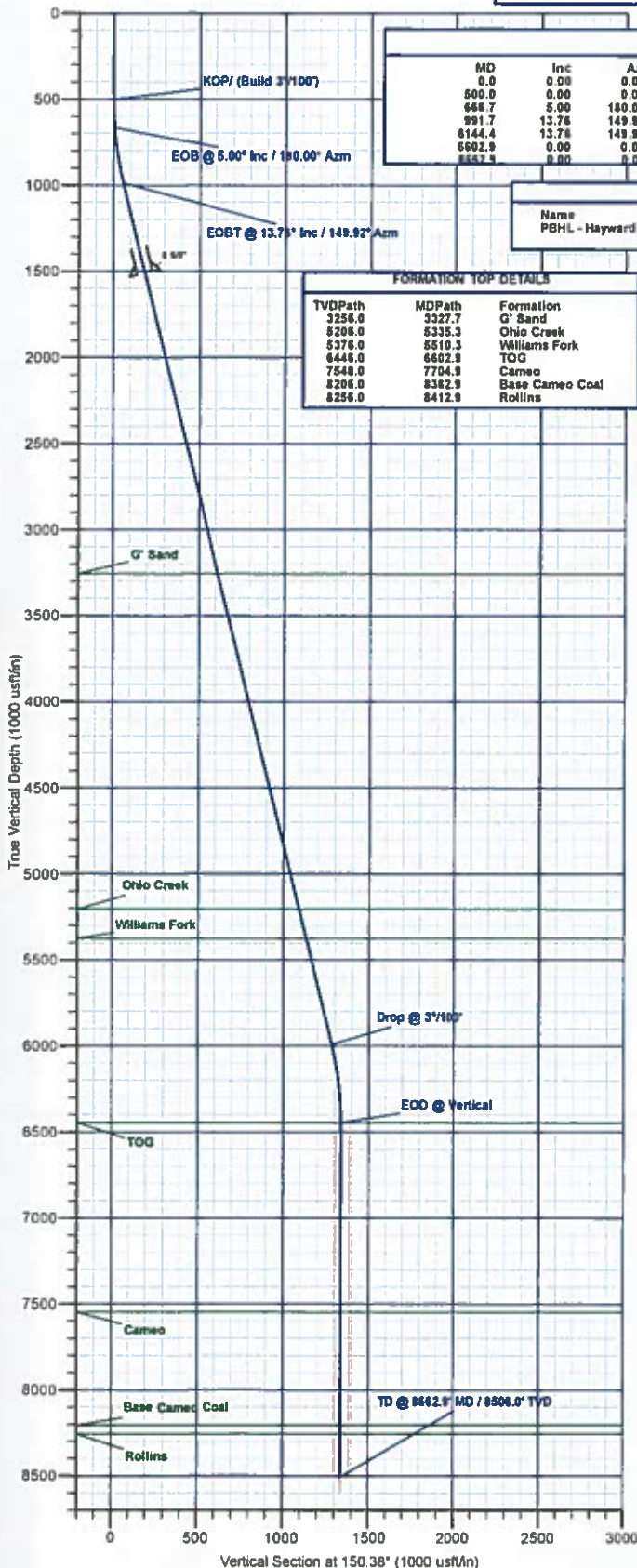


Project: Mesa County, CO  
 Site: Hayward 0993 25-09 Pad  
 Well: Hayward 0993-25-15E  
 Wellbore: A-5  
 Design: Design #1  
 Latitude: 39.244822  
 Longitude: -107.715874  
 Ground Level: 8008.0  
 well @ 8038.0ustf (H&P 522)



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

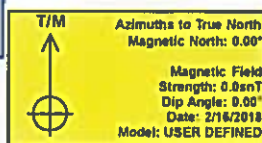


SECTION DETAILS									
MD	Inc	Azi	TVD	+N-S	+E-W	Diag	Tface	VSect	Annotation
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.0	KOP/ (Build 3°/100°)
500.0	0.00	0.00	500.0	0.0	0.0	0.00	0.00	0.0	EOB @ 5.00° Inc / 180.00° Azm
666.7	5.00	180.00	666.5	-7.3	0.0	3.00	180.00	6.3	EOBT @ 13.76° Inc / 149.92° Azm
991.7	13.76	149.92	987.0	-55.0	19.4	3.00	-44.73	67.4	Drop @ 3°/100°
8144.4	13.76	149.92	8991.9	-1115.2	633.6	0.00	0.00	1282.6	EOO @ Vertical
8602.9	0.00	0.00	8446.0	-1162.6	661.0	3.00	180.00	1337.4	TD @ 8462.9' MD / 8506.0' TVD
8462.9	0.00	0.00	8506.0	-1162.6	661.0	3.00	0.00	1337.4	

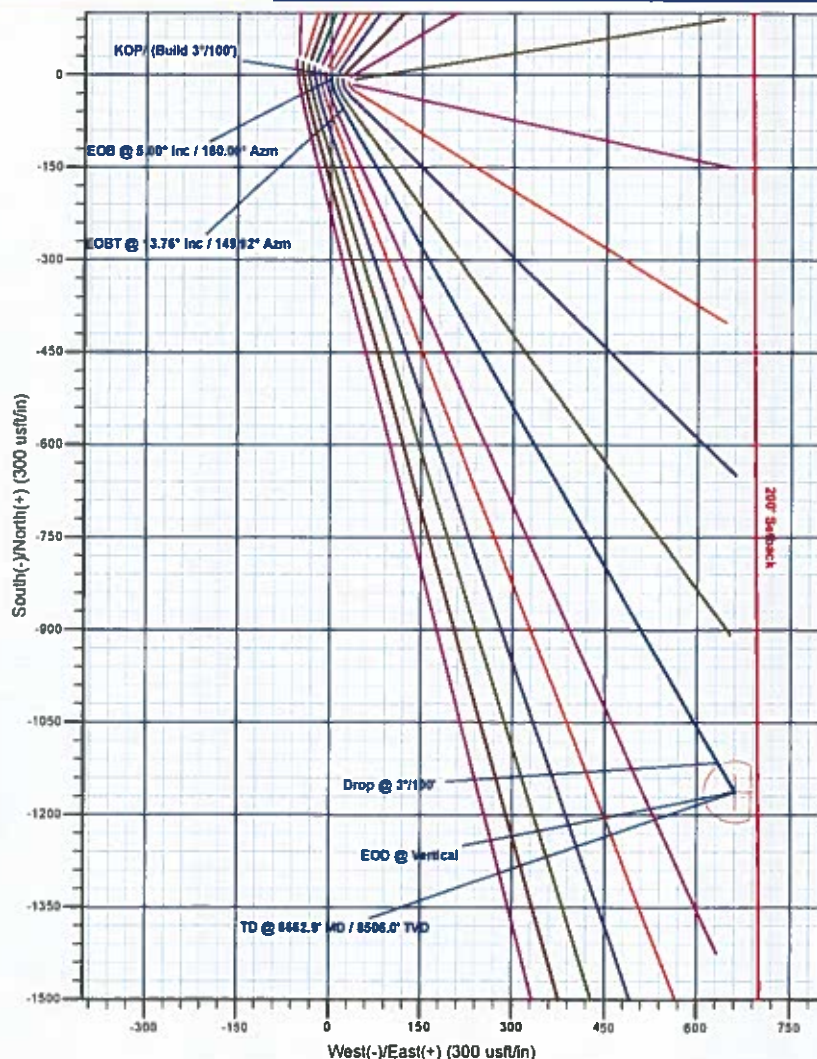
DESIGN TARGET DETAILS						
Name	TVD	+N-S	+E-W	Northing	Easting	Latitude
PBHL - Hayward 0993-25-15E	8506.0	-1162.6	661.0	152635.64	2373142.65	39.244822
						Longitude
						-107.715874

FORMATION TOP DETAILS		
TVDPath	MDPath	Formation
3256.0	3327.7	G' Sand
5206.0	5335.3	Ohio Creek
5376.0	5510.3	Williams Fork
6446.0	6602.9	TOG
7548.0	7704.9	Cameo
8206.0	8362.9	Base Cameo Coal
8256.0	8412.9	Rollins

WELL DETAILS: Hayward 0993-25-15E					
+N-S	+E-W	Northing	Easting	Latitude	Longitude
0.0	0.0	1521713.98	2372510.06	39.244822	-107.715874



REFERENCE INFORMATION	
Co-ordinate (N/E) Reference:	Well Hayward 0993-25-15E, True North
Vertical (TVD) Reference:	well @ 8038.0ustf (H&P 522)
Section (VS) Reference:	Slot - (0.0N, 0.0E)
Measured Depth Reference:	well @ 8038.0ustf (H&P 522)
Calculation Method:	Minimum Curvature



Plan: Design #1 (Hayward 0993-25-15E/A-5)

Created By:

Date: 10:32, February 22 2018



# **Laramie Energy, LLC**

**Mesa County, CO**

**Hayward 0993 25-09 Pad**

**Hayward 0993-25-15E**

**A-5**

**Plan: Design #1**

## **QES Well Planning Report**

**22 February, 2018**





## Well Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Hayward 0993-25-15E
Company:	Laramie Energy, LLC	TVD Reference:	well @ 8038 0usft (H&P 522)
Project:	Mesa County, CO	MD Reference:	well @ 8038 0usft (H&P 522)
Site:	Hayward 0993 25-09 Pad	North Reference:	True
Well:	Hayward 0993-25-15E	Survey Calculation Method:	Minimum Curvature
Wellbore:	A-5		
Design:	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		Hayward 0993 25-09 Pad			
Site Position:		Northing:	1,519,030.59 usft	Latitude:	39.237495
From:	Lat/Long	Easting:	2,373,084.06 usft	Longitude:	-107.713617
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16"	Grid Convergence:	-1.40°

Well	Hayward 0993-25-15E					
Well Position	+N/-S	2,668.6 usft	Northing:	1,521,713.89 usft	Latitude:	39.244822
	+E/-W	-639.2 usft	Easting:	2,372,510.06 usft	Longitude:	-107.715874
Position Uncertainty		0.0 usft	Wellhead Elevation:		Ground Level:	8,008.0 usft

Wellbore	A-5				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	User Defined	2/16/2018	0.00	0.00	0.00000000

Design	Design #1			
Audit Notes:				
Version:	Phase:	PROTOTYPE	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	150.38

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	
500.0	0.00	0.00	500.0	0.0	0.0	0.00	0.00	0.00	0.00	
666.7	5.00	180.00	666.5	-7.3	0.0	3.00	3.00	0.00	180.00	
991.7	13.76	149.92	987.0	-55.0	19.4	3.00	2.69	-9.26	-44.73	
6,144.4	13.76	149.92	5,991.9	-1,115.2	633.6	0.00	0.00	0.00	0.00	
6,602.9	0.00	0.00	6,446.0	-1,162.6	661.0	3.00	-3.00	0.00	180.00	
8,662.9	0.00	0.00	8,506.0	-1,162.6	661.0	0.00	0.00	0.00	0.00	PBHL - Hayward 099:





## Well Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Hayward 0993-25-15E
Company:	Laramie Energy, LLC	TVD Reference:	well @ 8038.0usft (H&P 522)
Project:	Mesa County, CO	MD Reference:	well @ 8038.0usft (H&P 522)
Site:	Hayward 0993 25-09 Pad	North Reference:	True
Well:	Hayward 0993-25-15E	Survey Calculation Method:	Minimum Curvature
Wellbore:	A-5		
Design:	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
300.0	0.00	0.00	300.0	0.0	0.0	0.0	0.00	0.00	0.00
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	0.00
<b>KOP/ (Build 3°/100')</b>									
500.0	0.00	0.00	500.0	0.0	0.0	0.0	0.00	0.00	0.00
600.0	3.00	180.00	600.0	-2.6	0.0	2.3	3.00	3.00	0.00
<b>EOB @ 5.00° Inc / 180.00° Azm</b>									
666.7	5.00	180.00	666.5	-7.3	0.0	6.3	3.00	3.00	0.00
700.0	5.75	172.96	699.6	-10.4	0.2	9.1	3.00	2.26	-21.11
800.0	8.33	160.19	798.9	-22.2	3.3	20.9	3.00	2.56	-12.77
900.0	11.12	153.60	897.4	-37.6	10.0	37.7	3.00	2.79	-6.60
<b>EOBT @ 13.76° Inc / 149.92° Azm</b>									
991.7	13.76	149.92	987.0	-55.0	19.4	57.4	3.00	2.87	-4.01
1,000.0	13.76	149.92	995.0	-56.7	20.4	59.4	0.00	0.00	0.00
1,100.0	13.76	149.92	1,092.2	-77.3	32.3	83.1	0.00	0.00	0.00
1,200.0	13.76	149.92	1,189.3	-97.8	44.2	106.9	0.00	0.00	0.00
1,300.0	13.76	149.92	1,286.4	-118.4	56.2	130.7	0.00	0.00	0.00
1,400.0	13.76	149.92	1,383.6	-139.0	68.1	154.5	0.00	0.00	0.00
1,500.0	13.76	149.92	1,480.7	-159.6	80.0	178.3	0.00	0.00	0.00
<b>8 5/8"</b>									
1,530.0	13.76	149.92	1,509.8	-165.7	83.6	185.4	0.00	0.00	0.00
1,600.0	13.76	149.92	1,577.8	-180.1	91.9	202.0	0.00	0.00	0.00
1,700.0	13.76	149.92	1,675.0	-200.7	103.8	225.8	0.00	0.00	0.00
1,800.0	13.76	149.92	1,772.1	-221.3	115.8	249.6	0.00	0.00	0.00
1,900.0	13.76	149.92	1,869.2	-241.9	127.7	273.4	0.00	0.00	0.00
2,000.0	13.76	149.92	1,966.4	-262.4	139.6	297.1	0.00	0.00	0.00
2,100.0	13.76	149.92	2,063.5	-283.0	151.5	320.9	0.00	0.00	0.00
2,200.0	13.76	149.92	2,160.6	-303.6	163.4	344.7	0.00	0.00	0.00
2,300.0	13.76	149.92	2,257.8	-324.2	175.4	368.5	0.00	0.00	0.00
2,400.0	13.76	149.92	2,354.9	-344.7	187.3	392.3	0.00	0.00	0.00
2,500.0	13.76	149.92	2,452.0	-365.3	199.2	416.0	0.00	0.00	0.00
2,600.0	13.76	149.92	2,549.2	-385.9	211.1	439.8	0.00	0.00	0.00
2,700.0	13.76	149.92	2,646.3	-406.5	223.0	463.6	0.00	0.00	0.00
2,800.0	13.76	149.92	2,743.4	-427.0	235.0	487.4	0.00	0.00	0.00
2,900.0	13.76	149.92	2,840.5	-447.6	246.9	511.1	0.00	0.00	0.00
3,000.0	13.76	149.92	2,937.7	-468.2	258.8	534.9	0.00	0.00	0.00
3,100.0	13.76	149.92	3,034.8	-488.8	270.7	558.7	0.00	0.00	0.00
3,200.0	13.76	149.92	3,131.9	-509.3	282.6	582.5	0.00	0.00	0.00
3,300.0	13.76	149.92	3,229.1	-529.9	294.6	606.3	0.00	0.00	0.00
<b>G' Sand</b>									
3,327.7	13.76	149.92	3,256.0	-535.6	297.9	612.8	0.00	0.00	0.00
3,400.0	13.76	149.92	3,326.2	-550.5	306.5	630.0	0.00	0.00	0.00
3,500.0	13.76	149.92	3,423.3	-571.1	318.4	653.8	0.00	0.00	0.00
3,600.0	13.76	149.92	3,520.5	-591.7	330.3	677.6	0.00	0.00	0.00
3,700.0	13.76	149.92	3,617.6	-612.2	342.2	701.4	0.00	0.00	0.00
3,800.0	13.76	149.92	3,714.7	-632.8	354.1	725.1	0.00	0.00	0.00
3,900.0	13.76	149.92	3,811.8	-653.4	366.1	748.9	0.00	0.00	0.00
4,000.0	13.76	149.92	3,909.0	-674.0	378.0	772.7	0.00	0.00	0.00
4,100.0	13.76	149.92	4,006.1	-694.5	389.9	796.5	0.00	0.00	0.00
4,200.0	13.76	149.92	4,103.3	-715.1	401.8	820.3	0.00	0.00	0.00
4,300.0	13.76	149.92	4,200.4	-735.7	413.7	844.0	0.00	0.00	0.00
4,400.0	13.76	149.92	4,297.5	-756.3	425.7	867.8	0.00	0.00	0.00



## Well Planning Report



Database: EDM 5000.1 Single User Db  
 Company: Laramie Energy, LLC  
 Project: Mesa County, CO  
 Site: Hayward 0993 25-09 Pad  
 Well: Hayward 0993-25-15E  
 Wellbore: A-5  
 Design: Design #1

Local Co-ordinate Reference:  
 TVD Reference:  
 MD Reference:  
 North Reference:  
 Survey Calculation Method:

Well Hayward 0993-25-15E  
 well @ 8038.0usft (H&P 522)  
 well @ 8038.0usft (H&P 522)  
 True  
 Minimum Curvature

## 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)
4,500.0	13.76	149.92	4,394.7	-776.8	437.6	891.8	0.00	0.00	0.00
4,600.0	13.76	149.92	4,491.8	-797.4	449.5	915.4	0.00	0.00	0.00
4,700.0	13.76	149.92	4,588.9	-818.0	461.4	939.1	0.00	0.00	0.00
4,800.0	13.76	149.92	4,686.1	-838.6	473.3	962.9	0.00	0.00	0.00
4,900.0	13.76	149.92	4,783.2	-859.1	485.3	986.7	0.00	0.00	0.00
5,000.0	13.76	149.92	4,880.3	-879.7	497.2	1,010.5	0.00	0.00	0.00
5,100.0	13.76	149.92	4,977.4	-900.3	509.1	1,034.3	0.00	0.00	0.00
5,200.0	13.76	149.92	5,074.6	-920.9	521.0	1,058.0	0.00	0.00	0.00
5,300.0	13.76	149.92	5,171.7	-941.4	532.9	1,081.8	0.00	0.00	0.00
<b>Ohio Creek</b>									
5,335.3	13.76	149.92	5,206.0	-948.7	537.1	1,090.2	0.00	0.00	0.00
5,400.0	13.76	149.92	5,268.8	-962.0	544.9	1,105.6	0.00	0.00	0.00
5,500.0	13.76	149.92	5,366.0	-982.6	556.8	1,129.4	0.00	0.00	0.00
<b>Williams Fork</b>									
5,510.3	13.76	149.92	5,376.0	-984.7	558.0	1,131.8	0.00	0.00	0.00
5,600.0	13.76	149.92	5,463.1	-1,003.2	568.7	1,153.1	0.00	0.00	0.00
5,700.0	13.76	149.92	5,560.2	-1,023.7	580.6	1,176.9	0.00	0.00	0.00
5,800.0	13.76	149.92	5,657.4	-1,044.3	592.5	1,200.7	0.00	0.00	0.00
5,900.0	13.76	149.92	5,754.5	-1,064.9	604.5	1,224.5	0.00	0.00	0.00
6,000.0	13.76	149.92	5,851.6	-1,085.5	616.4	1,248.2	0.00	0.00	0.00
6,100.0	13.76	149.92	5,948.8	-1,106.0	628.3	1,272.0	0.00	0.00	0.00
<b>Drop @ 3°/100'</b>									
6,144.4	13.76	149.92	5,991.9	-1,115.2	633.6	1,282.6	0.00	0.00	0.00
6,200.0	12.09	149.92	6,048.1	-1,125.9	639.8	1,295.0	3.00	-3.00	0.00
6,300.0	9.09	149.92	6,144.4	-1,141.8	649.0	1,313.4	3.00	-3.00	0.00
6,400.0	6.09	149.92	6,243.5	-1,153.2	655.6	1,326.6	3.00	-3.00	0.00
6,500.0	3.09	149.92	6,343.2	-1,160.2	659.6	1,334.6	3.00	-3.00	0.00
<b>EOD @ Vertical - TOG</b>									
6,602.9	0.00	0.00	6,446.0	-1,162.6	661.0	1,337.4	3.00	-3.00	0.00
6,700.0	0.00	0.00	6,543.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
6,800.0	0.00	0.00	6,643.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
6,900.0	0.00	0.00	6,743.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
7,000.0	0.00	0.00	6,843.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
7,100.0	0.00	0.00	6,943.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
7,200.0	0.00	0.00	7,043.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
7,300.0	0.00	0.00	7,143.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
7,400.0	0.00	0.00	7,243.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
7,500.0	0.00	0.00	7,343.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
7,600.0	0.00	0.00	7,443.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
7,700.0	0.00	0.00	7,543.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
<b>Cameo</b>									
7,704.9	0.00	0.00	7,548.0	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
7,800.0	0.00	0.00	7,643.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
7,900.0	0.00	0.00	7,743.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
8,000.0	0.00	0.00	7,843.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
8,100.0	0.00	0.00	7,943.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
8,200.0	0.00	0.00	8,043.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
8,300.0	0.00	0.00	8,143.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
<b>Base Cameo Coal</b>									
8,362.9	0.00	0.00	8,208.0	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
8,400.0	0.00	0.00	8,243.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
<b>Rollins</b>									
8,412.9	0.00	0.00	8,256.0	-1,162.6	661.0	1,337.4	0.00	0.00	0.00



## Well Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Hayward 0993-25-15E
Company:	Laramie Energy, LLC	TVD Reference:	well @ 8038.0usft (H&P 522)
Project:	Mesa County, CO	MD Reference:	well @ 8038.0usft (H&P 522)
Site:	Hayward 0993 25-09 Pad	North Reference:	True
Well:	Hayward 0993-25-15E	Survey Calculation Method:	Minimum Curvature
Wellbore:	A-5		
Design:	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)
8,500.0	0.00	0.00	8,343.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
8,600.0	0.00	0.00	8,443.1	-1,162.6	661.0	1,337.4	0.00	0.00	0.00
TD @ 8662.9' MD / 8506.0' TVD									
8,662.9	0.00	0.00	8,506.0	-1,162.6	661.0	1,337.4	0.00	0.00	0.00

## Design Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
PBHL - Hayward 0993-2	0.00	0.00	8,506.0	-1,162.6	661.0	1,520,535.65	2,373,142.55	39.241630	-107.713540
- plan hits target center									
- Circle (radius 50.0)									

## Casing Points

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,530.0	1,509.8	8 5/8"	8-5/8	11

## Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
3,327.7	3,256.0	G' Sand			
5,335.3	5,206.0	Ohio Creek			
5,510.3	5,378.0	Williams Fork			
6,602.9	6,446.0	TOG			
7,704.9	7,548.0	Cameo			
8,362.9	8,206.0	Base Cameo Coal			
8,412.9	8,256.0	Rollins			

## Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
500.0	500.0	0.0	0.0	KOP/ (Build 3°/100')
666.7	666.5	-7.3	0.0	EOB @ 5.00° Inc / 180.00° Azm
991.7	987.0	-55.0	19.4	EOBT @ 13.76° Inc / 149.92° Azm
6,144.4	5,991.9	-1,115.2	633.6	Drop @ 3°/100'
6,602.9	6,446.0	-1,162.6	661.0	EOD @ Vertical
8,662.9	8,506.0	-1,162.6	661.0	TD @ 8662.9' MD / 8506.0' TVD