

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

WELL DETAILS: BCU 0993-21-10E

+N/-S 0.0 +E/-W 0.0 Northing 1529627.99 Easting 2354608.90 7256.0 Latitude 39.265321 Longitude -107.760117

Project: Mesa County, CO
Site: Gunderson 0993 21-05 Pad
Well: BCU 0993-21-10E
Wellbore: Wellbore #1
Design: Design #1
Latitude: 39.265321
Longitude: -107.760117
Ground Level: 7256.0
well @ 7286.0usft (H&P #522)

REFERENCE INFORMATION

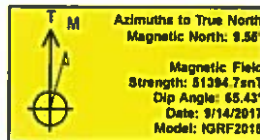
Co-ordinate (N/E) Reference: Well BCU 0993-21-10E, True North
Vertical (TVD) Reference: well @ 7286.0usft (H&P #522)
Section (VS) Reference: Slot - (0.0N, 0.0E)
Measured Depth Reference: well @ 7286.0usft (H&P #522)
Calculation Method: Minimum Curvature



DIRECTIONAL DRILLING

FORMATION TOP DETAILS

TVDPath	MDPath	Formation
2624.0	2968.8	G' Sand
4474.0	5181.3	Williams Fork
5724.0	6533.0	TOG
6774.0	7683.0	Cameo
7434.0	8243.0	Base Cameo Coal
7474.0	8283.0	Rollins

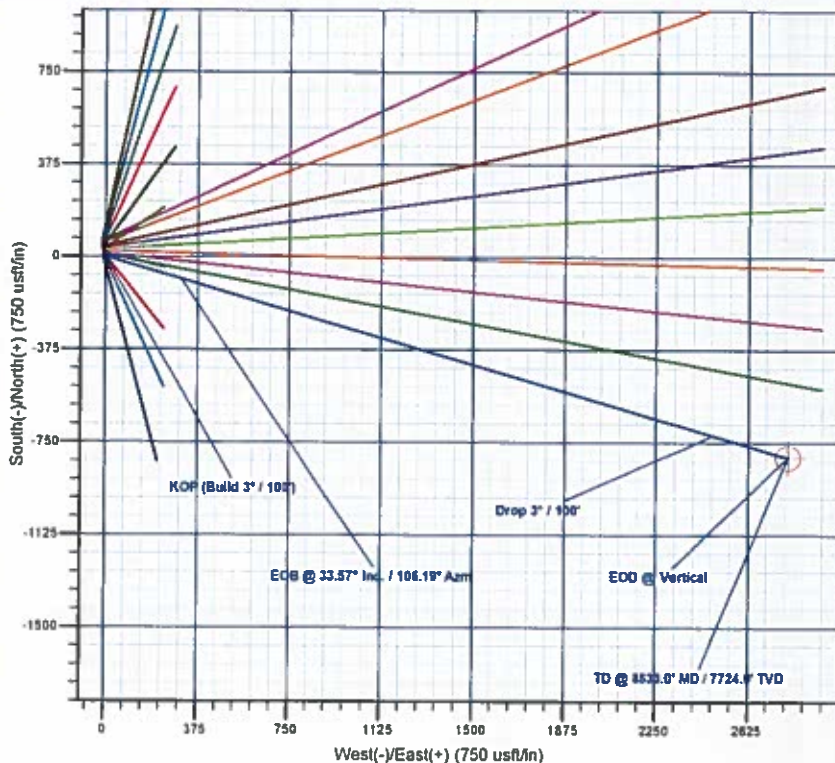
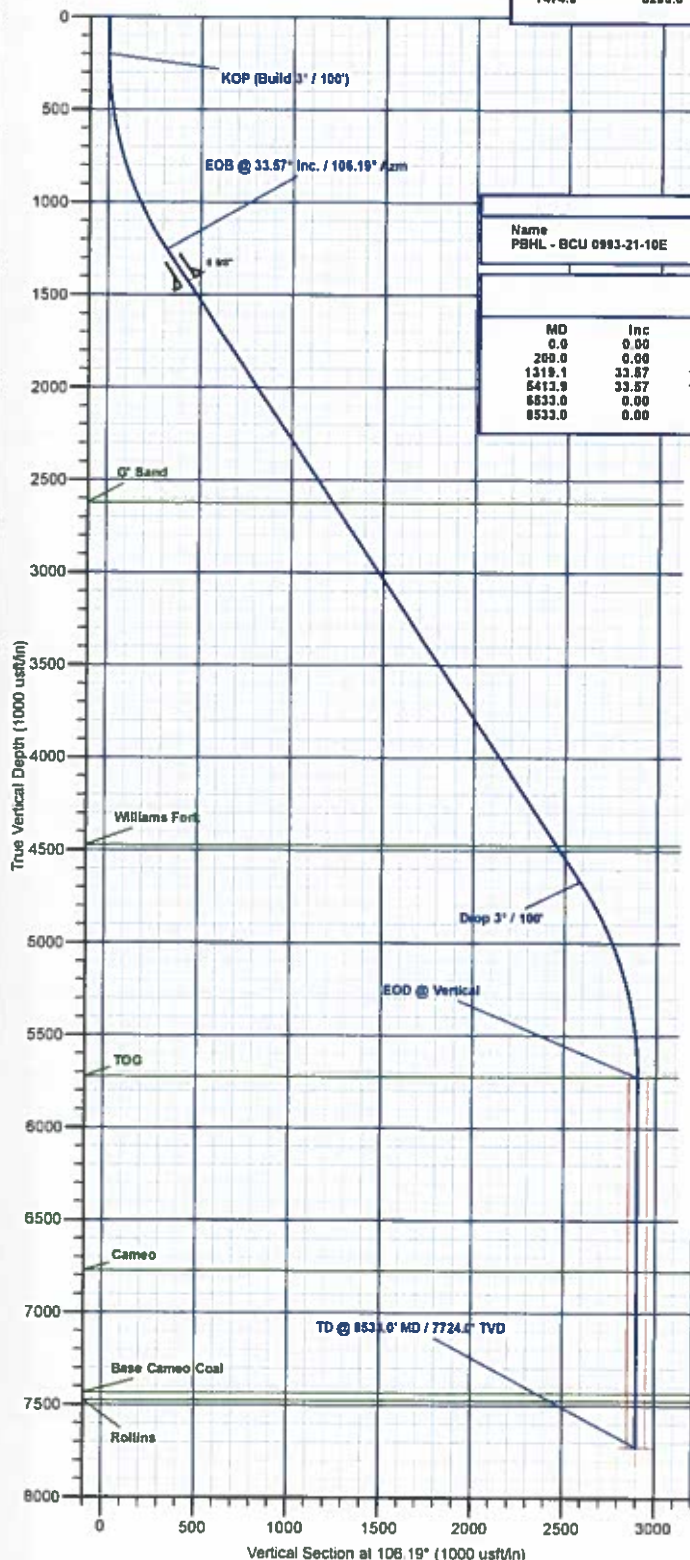


DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
PBHL - BCU 0993-21-10E	7724.0	-809.1	2786.6	1528749.08	2357274.32	39.263099	-107.770276

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	KOP (Build 3° / 100°)
269.0	0.00	0.00	269.0	0.0	0.0	0.00	0.00	0.0	EOB @ 33.57° Inc. / 106.19° Azm
1319.1	33.57	106.19	1256.2	-88.8	306.0	3.00	106.19	318.6	Drop 3° / 100°
5413.9	33.57	106.19	4687.8	-720.3	2489.6	0.00	0.00	2583.1	EOD @ Vertical
6533.0	0.00	0.00	5724.0	-809.1	2786.6	3.00	160.00	2901.7	TD @ 8533.0' MD / 7724.0' TVD
8533.0	0.00	0.00	7724.0	-809.1	2786.6	0.00	0.00	2901.7	



Plan: Design #1 (BCU 0993-21-10E/Wellbore #1)

Created By: Will Jircik Date: 14:03, September 18 2017



Laramie Energy, LLC

Mesa County, CO

Gunderson 0993 21-05 Pad

BCU 0993-21-10E

Wellbore #1

Plan: Design #1

QES Well Planning Report

18 September, 2017





Well Planning Report



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well BCU 0993-21-10E
Company:	Laramie Energy, LLC	TVD Reference:	well @ 7286.0usft (H&P #522)
Project:	Mesa County, CO	MD Reference:	well @ 7286.0usft (H&P #522)
Site:	Gunderson 0993 21-05 Pad	North Reference:	True
Well:	BCU 0993-21-10E	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
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		Gunderson 0993 21-05 Pad			
Site Position:		Northing:	1,529,627.90 usft	Latitude:	39.265321
From:	Lat/Long	Easting:	2,354,508.90 usft	Longitude:	-107.780117
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-1.44

Well	BCU 0993-21-10E					
Well Position	+N/-S	0.0 usft	Northing:	1,529,627.90 usft	Latitude:	39.265321
	+E/-W	0.0 usft	Easting:	2,354,508.90 usft	Longitude:	-107.780117
Position Uncertainty		0.0 usft	Wellhead Elevation:		Ground Level:	7,256.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	9/14/2017	9.55	65.43	51,394.66967486

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	106.19

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	
200.0	0.00	0.00	200.0	0.0	0.0	0.00	0.00	0.00	0.00	
1,319.1	33.57	106.19	1,256.2	-88.8	306.0	3.00	3.00	0.00	106.19	
5,413.9	33.57	106.19	4,667.8	-720.3	2,480.6	0.00	0.00	0.00	0.00	
6,533.0	0.00	0.00	5,724.0	-809.1	2,786.6	3.00	-3.00	0.00	180.00	
8,533.0	0.00	0.00	7,724.0	-809.1	2,786.6	0.00	0.00	0.00	0.00	PBHL - BCU 0993-21-



Well Planning Report



Database:	EDM 5000 1 Single User Db	Local Co-ordinate Reference:	Well BCU 0993-21-10E
Company:	Laramie Energy, LLC	TVD Reference:	well @ 7286.0usft (H&P #522)
Project:	Mesa County, CO	MD Reference:	well @ 7286.0usft (H&P #522)
Site:	Gunderson 0993 21-05 Pad	North Reference:	True
Well:	BCU 0993-21-10E	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
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
KOP (Build 3° / 100')									
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	0.00
300.0	3.00	106.19	300.0	-0.7	2.5	2.6	3.00	3.00	0.00
400.0	6.00	106.19	399.6	-2.9	10.0	10.5	3.00	3.00	0.00
500.0	9.00	106.19	498.8	-6.6	22.6	23.5	3.00	3.00	0.00
600.0	12.00	106.19	597.1	-11.6	40.1	41.7	3.00	3.00	0.00
700.0	15.00	106.19	694.3	-18.1	62.5	65.1	3.00	3.00	0.00
800.0	18.00	106.19	790.2	-26.1	89.8	93.5	3.00	3.00	0.00
900.0	21.00	106.19	884.4	-35.4	121.8	128.9	3.00	3.00	0.00
1,000.0	24.00	106.19	976.8	-46.0	158.6	165.1	3.00	3.00	0.00
1,100.0	27.00	106.19	1,067.1	-58.0	199.9	208.2	3.00	3.00	0.00
1,200.0	30.00	106.19	1,154.9	-71.3	245.7	255.9	3.00	3.00	0.00
1,300.0	33.00	106.19	1,240.2	-85.9	295.9	308.1	3.00	3.00	0.00
EOB @ 33.57° Inc. / 106.19° Azm									
1,319.1	33.57	106.19	1,256.2	-88.8	306.0	318.6	3.00	3.00	0.00
1,400.0	33.57	106.19	1,323.6	-101.3	348.9	363.3	0.00	0.00	0.00
1,500.0	33.57	106.19	1,406.9	-116.7	402.0	418.6	0.00	0.00	0.00
8 5/8"									
1,530.0	33.57	106.19	1,431.9	-121.4	418.0	435.2	0.00	0.00	0.00
1,600.0	33.57	106.19	1,490.2	-132.2	455.1	473.9	0.00	0.00	0.00
1,700.0	33.57	106.19	1,573.5	-147.6	508.3	529.2	0.00	0.00	0.00
1,800.0	33.57	106.19	1,656.8	-163.0	561.4	584.5	0.00	0.00	0.00
1,900.0	33.57	106.19	1,740.1	-178.4	614.5	639.8	0.00	0.00	0.00
2,000.0	33.57	106.19	1,823.5	-193.8	667.6	695.1	0.00	0.00	0.00
2,100.0	33.57	106.19	1,906.8	-209.3	720.7	750.4	0.00	0.00	0.00
2,200.0	33.57	106.19	1,990.1	-224.7	773.8	805.7	0.00	0.00	0.00
2,300.0	33.57	106.19	2,073.4	-240.1	826.9	861.1	0.00	0.00	0.00
2,400.0	33.57	106.19	2,156.7	-255.5	880.0	916.4	0.00	0.00	0.00
2,500.0	33.57	106.19	2,240.0	-270.9	933.1	971.7	0.00	0.00	0.00
2,600.0	33.57	106.19	2,323.4	-286.4	986.2	1,027.0	0.00	0.00	0.00
2,700.0	33.57	106.19	2,406.7	-301.8	1,039.3	1,082.3	0.00	0.00	0.00
2,800.0	33.57	106.19	2,490.0	-317.2	1,092.4	1,137.6	0.00	0.00	0.00
2,900.0	33.57	106.19	2,573.3	-332.6	1,145.5	1,192.9	0.00	0.00	0.00
G' Sand									
2,960.8	33.57	106.19	2,624.0	-342.0	1,177.9	1,226.5	0.00	0.00	0.00
3,000.0	33.57	106.19	2,656.6	-348.0	1,198.7	1,248.2	0.00	0.00	0.00
3,100.0	33.57	106.19	2,739.9	-363.5	1,251.8	1,303.5	0.00	0.00	0.00
3,200.0	33.57	106.19	2,823.3	-378.9	1,304.9	1,358.8	0.00	0.00	0.00
3,300.0	33.57	106.19	2,906.6	-394.3	1,358.0	1,414.1	0.00	0.00	0.00
3,400.0	33.57	106.19	2,989.9	-409.7	1,411.1	1,469.4	0.00	0.00	0.00
3,500.0	33.57	106.19	3,073.2	-425.2	1,464.2	1,524.7	0.00	0.00	0.00
3,600.0	33.57	106.19	3,156.5	-440.6	1,517.3	1,580.0	0.00	0.00	0.00
3,700.0	33.57	106.19	3,239.8	-456.0	1,570.4	1,635.3	0.00	0.00	0.00
3,800.0	33.57	106.19	3,323.2	-471.4	1,623.5	1,690.6	0.00	0.00	0.00
3,900.0	33.57	106.19	3,406.5	-486.8	1,676.6	1,745.9	0.00	0.00	0.00
4,000.0	33.57	106.19	3,489.8	-502.3	1,729.7	1,801.2	0.00	0.00	0.00
4,100.0	33.57	106.19	3,573.1	-517.7	1,782.8	1,856.5	0.00	0.00	0.00
4,200.0	33.57	106.19	3,656.4	-533.1	1,835.9	1,911.8	0.00	0.00	0.00
4,300.0	33.57	106.19	3,739.8	-548.5	1,889.1	1,967.1	0.00	0.00	0.00
4,400.0	33.57	106.19	3,823.1	-563.9	1,942.2	2,022.4	0.00	0.00	0.00
4,500.0	33.57	106.19	3,906.4	-579.4	1,995.3	2,077.7	0.00	0.00	0.00
4,600.0	33.57	106.19	3,989.7	-594.8	2,048.4	2,133.0	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: Gunderson 0993 21-05 Pad
 Well: BCU 0993-21-10E
 Wellbore: Wellbore #1
 Design: Design #1

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

Well BCU 0993-21-10E
 well @ 7286.0usft (H&P #522)
 well @ 7286.0usft (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)
4,700.0	33.57	106.19	4,073.0	-610.2	2,101.5	2,188.3	0.00	0.00	0.00
4,800.0	33.57	106.19	4,156.3	-625.6	2,154.6	2,243.6	0.00	0.00	0.00
4,900.0	33.57	106.19	4,239.7	-641.0	2,207.7	2,298.9	0.00	0.00	0.00
5,000.0	33.57	106.19	4,323.0	-656.5	2,260.8	2,354.2	0.00	0.00	0.00
5,100.0	33.57	106.19	4,406.3	-671.9	2,313.9	2,409.5	0.00	0.00	0.00
Williams Fork									
5,181.3	33.57	106.19	4,474.0	-684.4	2,357.1	2,454.4	0.00	0.00	0.00
5,200.0	33.57	106.19	4,489.6	-687.3	2,367.0	2,464.6	0.00	0.00	0.00
5,300.0	33.57	106.19	4,572.9	-702.7	2,420.1	2,520.1	0.00	0.00	0.00
5,400.0	33.57	106.19	4,656.2	-718.1	2,473.2	2,575.4	0.00	0.00	0.00
Drop 3° / 100'									
5,413.9	33.57	106.19	4,667.8	-720.3	2,480.6	2,583.1	0.00	0.00	0.00
5,500.0	30.99	106.19	4,740.6	-733.1	2,524.8	2,629.1	3.00	-3.00	0.00
5,600.0	27.99	106.19	4,827.6	-746.8	2,572.1	2,678.3	3.00	-3.00	0.00
5,700.0	24.99	106.19	4,917.1	-759.3	2,614.9	2,722.9	3.00	-3.00	0.00
5,800.0	21.99	106.19	5,008.8	-770.4	2,653.2	2,762.7	3.00	-3.00	0.00
5,900.0	18.99	106.19	5,102.5	-780.1	2,686.8	2,797.7	3.00	-3.00	0.00
6,000.0	15.99	106.19	5,197.9	-788.5	2,715.6	2,827.8	3.00	-3.00	0.00
6,100.0	12.99	106.19	5,294.7	-795.5	2,739.7	2,852.8	3.00	-3.00	0.00
6,200.0	9.99	106.19	5,392.6	-801.1	2,758.8	2,872.7	3.00	-3.00	0.00
6,300.0	6.99	106.19	5,491.5	-805.2	2,773.0	2,887.5	3.00	-3.00	0.00
6,400.0	3.99	106.19	5,591.1	-807.8	2,782.2	2,897.1	3.00	-3.00	0.00
6,500.0	0.99	106.19	5,691.0	-809.1	2,786.3	2,901.4	3.00	-3.00	0.00
EOD @ Vertical - TOG									
6,533.0	0.00	0.00	5,724.0	-809.1	2,786.6	2,901.7	3.00	-3.00	0.00
6,600.0	0.00	0.00	5,781.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
6,700.0	0.00	0.00	5,891.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
6,800.0	0.00	0.00	5,991.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
6,900.0	0.00	0.00	6,091.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
7,000.0	0.00	0.00	6,191.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
7,100.0	0.00	0.00	6,291.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
7,200.0	0.00	0.00	6,391.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
7,300.0	0.00	0.00	6,491.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
7,400.0	0.00	0.00	6,591.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
7,500.0	0.00	0.00	6,691.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
Cameo									
7,583.0	0.00	0.00	6,774.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
7,600.0	0.00	0.00	6,791.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
7,700.0	0.00	0.00	6,891.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
7,800.0	0.00	0.00	6,991.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
7,900.0	0.00	0.00	7,091.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
8,000.0	0.00	0.00	7,191.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
8,100.0	0.00	0.00	7,291.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
8,200.0	0.00	0.00	7,391.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
Base Cameo Coal									
8,243.0	0.00	0.00	7,434.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
Rollins									
8,283.0	0.00	0.00	7,474.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
8,300.0	0.00	0.00	7,491.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
8,400.0	0.00	0.00	7,591.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
8,500.0	0.00	0.00	7,691.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00
TD @ 8533.0' MD / 7724.0' TVD									
8,533.0	0.00	0.00	7,724.0	-809.1	2,786.6	2,901.7	0.00	0.00	0.00



Well Planning Report



Database:	EDM 5000 1 Single User Db	Local Co-ordinate Reference:	Well BCU 0993-21-10E
Company:	Laramie Energy, LLC	TVD Reference:	well @ 7286.0usft (H&P #522)
Project:	Mesa County, CO	MD Reference:	well @ 7286.0usft (H&P #522)
Site:	Gunderson 0993 21-05 Pad	North Reference:	True
Well:	BCU 0993-21-10E	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
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)
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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 - BCU 0993-21-10	0.00	0.00	7,724.0	-809.1	2,786.6	1,528,749.08	2,357,274.33	39.263099	-107.770275
- plan hits target center									
- Circle (radius 50.0)									

Casing Points

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,530.0	1,431.9	8 5/8"	8-5/8	11

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
2,960.8	2,624.0	G' Sand			
5,181.3	4,474.0	Williams Fork			
6,533.0	5,724.0	TOG			
7,583.0	6,774.0	Cameo			
8,243.0	7,434.0	Base Cameo Coal			
8,283.0	7,474.0	Rollins			

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
200.0	200.0	0.0	0.0	KOP (Build 3" / 100')
1,318.1	1,256.2	-88.8	306.0	EOB @ 33.57° Inc / 106.19° Azm
5,413.9	4,667.8	-720.3	2,480.6	Drop 3" / 100'
6,533.0	5,724.0	-809.1	2,786.6	EOD @ Vertical
8,533.0	7,724.0	-809.1	2,786.6	TD @ 8533.0' MD / 7724.0' TVD