



Laramie Energy, LLC

Mesa County, CO

Gunderson 0993 21-05 Pad

BCU 0993-21-02W

Wellbore #1

Design: Wellbore #1

QES Survey Report

22 October, 2018





Survey Report



Company:	Laramie Energy, LLC	Local Co-ordinate Reference:	Well BCU 0993-21-02W
Project:	Mesa County, CO	TVD Reference:	Well @ 7287.0usft (H&P #522)
Site:	Gunderson 0993 21-05 Pad	MD Reference:	Well @ 7287.0usft (H&P #522)
Well:	BCU 0993-21-02W	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Single User Db

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 0993-21-02W					
Well Position	+N/-S	0.0 usft	Northing:	1,529,687.91 usft	Latitude:	39.265485
	+E/-W	0.0 usft	Easting:	2,354,497.67 usft	Longitude:	-107.780162
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	7,257.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	User Defined	10/3/2018	9.37	65.39	51,267.20000000

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	14.23	

Survey Program	Date	10/21/2018			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
241.0	7,805.0	QES MWD Surveys (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
First MWD Survey @ 241.0' MD / 241.0' TVD									
241.0	1.60	274.00	241.0	0.2	-3.4	-0.6	0.66	0.66	0.00
302.0	1.50	284.50	301.9	0.5	-5.0	-0.7	0.49	-0.16	17.21
395.0	2.20	340.90	394.9	2.5	-6.7	0.8	1.99	0.75	60.65
488.0	3.40	23.20	487.8	6.7	-6.2	5.0	2.48	1.29	45.48
580.0	5.20	21.10	579.5	13.1	-3.7	11.8	1.96	1.96	-2.28
673.0	8.10	21.20	671.9	23.1	0.2	22.5	3.12	3.12	0.11
765.0	10.70	16.70	762.7	37.4	5.0	37.5	2.93	2.83	-4.89
858.0	12.90	16.00	853.7	55.6	10.4	56.5	2.37	2.37	-0.75
951.0	14.60	14.60	944.0	76.9	16.2	78.6	1.86	1.83	-1.51



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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)
1,045.0	16.70	17.20	1,034.5	101.3	23.2	103.9	2.35	2.23	2.77
1,139.0	17.40	18.60	1,124.4	127.5	31.6	131.4	0.86	0.74	1.49
1,234.0	18.10	16.00	1,214.9	155.2	40.2	160.3	1.11	0.74	-2.74
1,328.0	18.90	14.00	1,304.0	184.0	47.9	190.1	1.09	0.85	-2.13
1,423.0	18.10	13.40	1,394.1	213.3	55.1	220.3	0.87	-0.84	-0.63
1,492.0	18.10	12.60	1,459.7	234.2	59.9	241.7	0.36	0.00	-1.16
1,599.0	18.70	11.00	1,561.2	267.2	66.8	275.5	0.73	0.56	-1.50
1,693.0	17.60	13.30	1,650.6	295.9	73.0	304.7	1.40	-1.17	2.45
1,788.0	16.30	15.10	1,741.4	322.7	79.7	332.4	1.48	-1.37	1.89
1,882.0	14.30	16.70	1,832.1	346.6	86.5	357.2	2.17	-2.13	1.70
1,977.0	12.90	13.60	1,924.4	368.1	92.4	379.5	1.66	-1.47	-3.26
2,071.0	12.60	12.40	2,016.1	388.3	97.0	400.3	0.43	-0.32	-1.28
2,165.0	12.00	11.90	2,107.9	407.9	101.3	420.3	0.65	-0.64	-0.53
2,260.0	11.70	12.60	2,200.9	427.0	105.4	439.8	0.35	-0.32	0.74
2,354.0	10.90	13.10	2,293.1	444.9	109.5	458.2	0.86	-0.85	0.53
2,448.0	12.20	12.80	2,385.2	463.3	113.7	477.0	1.38	1.38	-0.32
2,543.0	11.80	12.00	2,478.1	482.5	117.9	496.7	0.46	-0.42	-0.84
2,637.0	10.90	10.90	2,570.3	500.7	121.6	515.2	0.98	-0.96	-1.17
2,732.0	12.40	12.60	2,663.3	519.5	125.5	534.4	1.62	1.58	1.79
2,826.0	14.10	15.30	2,754.8	540.3	130.8	555.9	1.92	1.81	2.87
2,921.0	14.00	14.80	2,847.0	562.6	136.8	579.0	0.17	-0.11	-0.53
3,015.0	13.60	14.50	2,938.3	584.3	142.4	601.4	0.43	-0.43	-0.32
3,109.0	13.20	14.80	3,029.7	605.4	147.9	623.2	0.43	-0.43	0.32
3,203.0	12.50	14.60	3,121.3	625.6	153.2	644.1	0.75	-0.74	-0.21
3,298.0	14.00	15.30	3,213.8	646.6	158.9	665.9	1.59	1.58	0.74
3,393.0	13.60	14.40	3,306.1	668.5	164.7	688.5	0.48	-0.42	-0.95
3,487.0	13.00	14.30	3,397.5	689.5	170.0	710.1	0.64	-0.64	-0.11
3,582.0	13.70	21.10	3,490.0	710.3	176.7	732.0	1.81	0.74	7.16
3,676.0	13.30	21.30	3,581.4	730.8	184.7	753.8	0.43	-0.43	0.21
3,771.0	12.70	21.20	3,674.0	750.7	192.4	775.0	0.63	-0.63	-0.11
3,865.0	13.30	15.30	3,765.5	770.8	199.0	796.1	1.55	0.64	-6.28
3,960.0	12.80	12.40	3,858.1	791.6	204.1	817.5	0.87	-0.53	-3.05
4,054.0	12.50	12.00	3,949.8	811.7	208.5	838.1	0.33	-0.32	-0.43
4,149.0	14.10	15.00	4,042.3	833.0	213.6	859.9	1.83	1.68	3.16
4,243.0	14.00	14.30	4,133.5	855.0	219.4	882.7	0.21	-0.11	-0.74
4,338.0	13.50	12.80	4,225.7	877.0	224.7	905.3	0.65	-0.53	-1.58
4,433.0	13.20	17.40	4,318.2	898.2	230.4	927.2	1.16	-0.32	4.84
4,527.0	12.40	17.70	4,409.8	918.0	236.7	948.0	0.85	-0.85	0.32
4,622.0	11.90	20.50	4,502.7	936.9	243.2	967.9	0.81	-0.53	2.95
4,716.0	12.30	17.30	4,594.6	955.5	249.6	987.6	0.83	0.43	-3.40
4,811.0	11.60	15.50	4,687.6	974.4	255.1	1,007.2	0.83	-0.74	-1.89
4,905.0	10.50	14.20	4,779.8	991.8	259.8	1,025.2	1.20	-1.17	-1.38
5,000.0	9.40	12.40	4,873.4	1,007.8	263.6	1,041.6	1.20	-1.16	-1.89



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Survey										
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5,094.0	8.60	12.60	4,966.2	1,022.1	266.7	1,056.3	0.85	-0.85	0.21	
5,188.0	8.20	13.00	5,059.2	1,035.5	269.8	1,070.1	0.43	-0.43	0.43	
5,283.0	7.50	11.50	5,153.3	1,048.2	272.5	1,083.0	0.77	-0.74	-1.58	
5,377.0	7.00	9.80	5,246.6	1,059.9	274.7	1,094.9	0.58	-0.53	-1.81	
5,471.0	6.20	21.70	5,340.0	1,070.2	277.6	1,105.6	1.68	-0.85	12.66	
5,566.0	5.30	22.60	5,434.5	1,079.0	281.2	1,115.0	0.95	-0.95	0.95	
5,660.0	4.80	19.50	5,528.1	1,086.8	284.2	1,123.3	0.61	-0.53	-3.30	
5,754.0	4.00	20.20	5,621.8	1,093.5	286.6	1,130.4	0.85	-0.85	0.74	
5,848.0	3.60	16.70	5,715.6	1,099.4	288.6	1,136.6	0.49	-0.43	-3.72	
5,943.0	3.40	18.20	5,810.4	1,105.0	290.3	1,142.4	0.23	-0.21	1.58	
6,037.0	2.90	10.60	5,904.3	1,110.0	291.6	1,147.6	0.69	-0.53	-8.09	
6,132.0	2.60	8.90	5,999.2	1,114.5	292.4	1,152.1	0.33	-0.32	-1.79	
6,226.0	2.40	354.50	6,093.1	1,118.5	292.5	1,156.1	0.70	-0.21	-15.32	
6,320.0	2.50	346.40	6,187.0	1,122.5	291.9	1,159.8	0.38	0.11	-8.62	
6,414.0	2.30	342.20	6,280.9	1,126.3	290.8	1,163.2	0.28	-0.21	-4.47	
6,509.0	2.10	353.90	6,375.9	1,129.8	290.0	1,166.4	0.52	-0.21	12.32	
6,603.0	2.10	341.20	6,469.8	1,133.1	289.3	1,169.5	0.49	0.00	-13.51	
6,697.0	1.70	341.20	6,563.8	1,136.1	288.3	1,172.1	0.43	-0.43	0.00	
6,791.0	1.80	335.00	6,657.7	1,138.8	287.2	1,174.4	0.23	0.11	-6.60	
6,885.0	2.00	333.30	6,751.7	1,141.6	285.9	1,176.8	0.22	0.21	-1.81	
6,979.0	2.00	333.20	6,845.6	1,144.5	284.4	1,179.3	0.00	0.00	-0.11	
7,073.0	1.80	335.90	6,939.5	1,147.3	283.0	1,181.7	0.23	-0.21	2.87	
7,168.0	1.20	3.80	7,034.5	1,149.7	282.5	1,183.8	0.98	-0.63	29.37	
7,262.0	0.30	285.30	7,128.5	1,150.7	282.3	1,184.8	1.25	-0.96	-83.51	
7,356.0	1.30	202.70	7,222.5	1,149.8	281.7	1,183.7	1.38	1.06	-87.87	
7,450.0	1.20	193.10	7,316.5	1,147.8	281.0	1,181.7	0.25	-0.11	-10.21	
7,544.0	0.80	190.20	7,410.5	1,146.2	280.7	1,180.1	0.43	-0.43	-3.09	
7,638.0	0.80	212.30	7,504.5	1,145.0	280.2	1,178.8	0.33	0.00	23.51	
7,733.0	0.50	219.50	7,599.4	1,144.2	279.6	1,177.8	0.33	-0.32	7.58	
7,745.0	0.80	212.40	7,611.4	1,144.0	279.5	1,177.7	2.58	2.50	-59.17	
Projection to TD @ 7805.0' MD / 7671.4' TVD										
7,805.0	0.80	212.40	7,671.4	1,143.3	279.1	1,176.9	0.00	0.00	0.00	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
241.0	241.0	0.2	-3.4	First MWD Survey @ 241.0' MD / 241.0' TVD	
7,805.0	7,671.4	1,143.3	279.1	Projection to TD @ 7805.0' MD / 7671.4' TVD	