



# **Laramie Energy, LLC**

**Mesa County, CO**

**Gunderson 0993 21-05 Pad**

**BCU 0993-21-07E**

**Wellbore #1**

**Design: Wellbore #1**

## **QES Survey Report**

**19 September, 2018**





# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well BCU 0993-21-07E
<b>Project:</b>	Mesa County, CO	<b>TVD Reference:</b>	Well @ 7287.0usft (H&P #522)
<b>Site:</b>	Gunderson 0993 21-05 Pad	<b>MD Reference:</b>	Well @ 7287.0usft (H&P #522)
<b>Well:</b>	BCU 0993-21-07E	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db

<b>Project</b>	Mesa County, CO		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	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 0993-21-07E					
Well Position	+N/-S	0.0 usft	Northing:	1,529,650.47 usft	Latitude:	39.265383
	+E/-W	0.0 usft	Easting:	2,354,508.62 usft	Longitude:	-107.780120
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	7,257.0 usft

<b>Wellbore</b>	Wellbore #1				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	User Defined	9/3/2018	9.48	65.43	51,386.50000000

<b>Design</b>	Wellbore #1				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>	
	0.0	0.0	0.0	91.29	

<b>Survey Program</b>	<b>Date</b>	9/19/2018			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
301.0	8,554.0	QES MWD Surveys (Wellbore #1)	MWD default	MWD - Standard	

<b>Survey</b>									
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Vertical Section (usft)</b>	<b>Dogleg Rate (°/100usft)</b>	<b>Build Rate (°/100usft)</b>	<b>Turn Rate (°/100usft)</b>
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
<b>First MWD Survey @ 301.0' MD / 300.5' TVD</b>									
301.0	5.70	88.40	300.5	0.4	15.0	14.9	1.89	1.89	0.00
393.0	7.80	88.30	391.9	0.7	25.8	25.7	2.28	2.28	-0.11
486.0	10.50	93.20	483.7	0.4	40.5	40.5	3.02	2.90	5.27
579.0	13.30	92.40	574.7	-0.5	59.7	59.7	3.02	3.01	-0.86
671.0	16.00	91.70	663.7	-1.3	82.9	82.9	2.94	2.93	-0.76
764.0	18.80	90.30	752.4	-1.8	110.7	110.8	3.04	3.01	-1.51
856.0	21.70	90.00	838.7	-1.8	142.6	142.6	3.15	3.15	-0.33
949.0	24.40	91.00	924.3	-2.2	179.0	179.0	2.93	2.90	1.08
1,043.0	27.50	90.90	1,008.8	-2.8	220.1	220.1	3.30	3.30	-0.11



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<b>Site:</b>	Gunderson 0993 21-05 Pad	<b>MD Reference:</b>	Well @ 7287.0usft (H&P #522)
<b>Well:</b>	BCU 0993-21-07E	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	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)
1,138.0	31.30	91.70	1,091.5	-3.9	266.7	266.7	4.02	4.00	0.84
1,232.0	33.10	92.10	1,171.1	-5.6	316.8	316.8	1.93	1.91	0.43
1,327.0	33.40	90.30	1,250.5	-6.7	368.9	368.9	1.09	0.32	-1.89
1,421.0	34.00	87.70	1,328.7	-5.8	421.0	421.0	1.66	0.64	-2.77
1,495.0	33.40	88.60	1,390.3	-4.4	462.0	462.0	1.05	-0.81	1.22
1,622.0	32.20	87.70	1,497.0	-2.2	530.8	530.7	1.02	-0.94	-0.71
1,716.0	34.70	89.50	1,575.5	-1.0	582.6	582.4	2.86	2.66	1.91
1,811.0	34.70	89.80	1,653.6	-0.6	636.7	636.5	0.18	0.00	0.32
1,905.0	34.10	89.80	1,731.1	-0.5	689.8	689.6	0.64	-0.64	0.00
2,000.0	34.20	91.70	1,809.8	-1.2	743.1	742.9	1.13	0.11	2.00
2,094.0	33.30	91.60	1,887.9	-2.7	795.3	795.1	0.96	-0.96	-0.11
2,189.0	32.70	91.10	1,967.6	-3.9	847.0	846.9	0.69	-0.63	-0.53
2,283.0	33.30	93.40	2,046.4	-5.9	898.2	898.1	1.48	0.64	2.45
2,377.0	32.70	93.20	2,125.3	-8.9	949.3	949.2	0.65	-0.64	-0.21
2,472.0	32.10	92.70	2,205.5	-11.5	1,000.1	1,000.1	0.69	-0.63	-0.53
2,566.0	34.10	93.00	2,284.2	-14.0	1,051.4	1,051.4	2.13	2.13	0.32
2,661.0	33.70	92.20	2,363.1	-16.4	1,104.3	1,104.4	0.63	-0.42	-0.84
2,755.0	32.40	91.20	2,441.9	-18.0	1,155.5	1,155.6	1.50	-1.38	-1.06
2,850.0	33.80	92.80	2,521.4	-19.8	1,207.4	1,207.5	1.74	1.47	1.68
2,944.0	33.10	93.00	2,599.9	-22.4	1,259.1	1,259.3	0.75	-0.74	0.21
3,039.0	32.70	93.10	2,679.6	-25.2	1,310.7	1,310.9	0.42	-0.42	0.11
3,133.0	35.10	93.20	2,757.6	-28.0	1,363.0	1,363.3	2.55	2.55	0.11
3,228.0	34.80	92.70	2,835.5	-30.8	1,417.3	1,417.7	0.44	-0.32	-0.53
3,322.0	34.10	93.20	2,913.0	-33.6	1,470.5	1,470.8	0.80	-0.74	0.53
3,417.0	33.30	93.60	2,992.1	-36.7	1,523.1	1,523.5	0.87	-0.84	0.42
3,511.0	36.00	92.90	3,069.4	-39.7	1,576.4	1,576.9	2.90	2.87	-0.74
3,606.0	35.50	92.80	3,146.5	-42.5	1,631.9	1,632.4	0.53	-0.53	-0.11
3,700.0	34.80	93.10	3,223.3	-45.3	1,685.9	1,686.5	0.77	-0.74	0.32
3,795.0	33.70	92.90	3,301.9	-48.1	1,739.3	1,739.9	1.16	-1.16	-0.21
3,890.0	33.00	93.30	3,381.2	-50.9	1,791.4	1,792.1	0.77	-0.74	0.42
3,984.0	34.10	90.20	3,459.6	-52.4	1,843.4	1,844.1	2.17	1.17	-3.30
4,079.0	33.10	89.70	3,538.7	-52.4	1,895.9	1,896.6	1.09	-1.05	-0.53
4,173.0	32.40	89.80	3,617.7	-52.2	1,946.8	1,947.5	0.75	-0.74	0.11
4,267.0	31.90	90.00	3,697.3	-52.1	1,996.8	1,997.5	0.54	-0.53	0.21
4,362.0	30.90	89.50	3,778.4	-51.9	2,046.3	2,046.9	1.09	-1.05	-0.53
4,456.0	33.00	91.40	3,858.2	-52.3	2,096.0	2,096.7	2.48	2.23	2.02
4,551.0	32.70	91.00	3,938.0	-53.4	2,147.5	2,148.2	0.39	-0.32	-0.42
4,645.0	31.00	90.30	4,017.8	-53.9	2,197.1	2,197.8	1.85	-1.81	-0.74
4,739.0	30.70	89.40	4,098.5	-53.8	2,245.3	2,246.0	0.59	-0.32	-0.96
4,834.0	32.40	91.70	4,179.5	-54.3	2,295.0	2,295.7	2.19	1.79	2.42
4,928.0	31.30	91.10	4,259.3	-55.5	2,344.6	2,345.3	1.22	-1.17	-0.64
5,023.0	31.90	93.90	4,340.3	-57.7	2,394.3	2,395.0	1.67	0.63	2.95
5,117.0	30.80	93.10	4,420.5	-60.7	2,443.2	2,443.9	1.25	-1.17	-0.85



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Survey										
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5,211.0	29.00	92.40	4,502.0	-63.0	2,490.0	2,490.7	1.95	-1.91	-0.74	
5,306.0	27.80	91.90	4,585.6	-64.7	2,535.1	2,535.9	1.29	-1.26	-0.53	
5,400.0	27.50	92.00	4,668.8	-66.1	2,578.7	2,579.5	0.32	-0.32	0.11	
5,494.0	26.00	91.80	4,752.8	-67.6	2,621.0	2,621.8	1.60	-1.60	-0.21	
5,588.0	24.30	91.50	4,837.9	-68.7	2,660.9	2,661.8	1.81	-1.81	-0.32	
5,683.0	22.80	91.30	4,925.0	-69.6	2,698.9	2,699.8	1.58	-1.58	-0.21	
5,777.0	20.70	90.60	5,012.3	-70.2	2,733.7	2,734.6	2.25	-2.23	-0.74	
5,871.0	19.00	90.00	5,100.7	-70.4	2,765.6	2,766.5	1.82	-1.81	-0.64	
5,965.0	18.10	89.70	5,189.8	-70.3	2,795.5	2,796.4	0.96	-0.96	-0.32	
6,059.0	14.60	90.40	5,280.0	-70.3	2,822.0	2,822.8	3.73	-3.72	0.74	
6,153.0	13.30	90.40	5,371.2	-70.5	2,844.6	2,845.5	1.38	-1.38	0.00	
6,247.0	12.30	91.70	5,462.9	-70.9	2,865.4	2,866.3	1.11	-1.06	1.38	
6,342.0	8.30	91.20	5,556.3	-71.3	2,882.4	2,883.3	4.21	-4.21	-0.53	
6,436.0	4.50	73.70	5,649.7	-70.4	2,892.8	2,893.6	4.50	-4.04	-18.62	
6,530.0	2.90	64.30	5,743.5	-68.3	2,898.4	2,899.2	1.81	-1.70	-10.00	
6,624.0	2.20	54.40	5,837.4	-66.3	2,902.0	2,902.8	0.88	-0.74	-10.53	
6,718.0	1.80	53.10	5,931.4	-64.3	2,904.7	2,905.4	0.43	-0.43	-1.38	
6,813.0	1.70	64.80	6,026.3	-62.8	2,907.2	2,907.8	0.39	-0.11	12.32	
6,907.0	1.30	76.30	6,120.3	-62.0	2,909.5	2,910.1	0.53	-0.43	12.23	
7,001.0	1.30	72.10	6,214.3	-61.4	2,911.5	2,912.2	0.10	0.00	-4.47	
7,095.0	1.00	83.00	6,308.2	-61.0	2,913.3	2,914.0	0.39	-0.32	11.60	
7,189.0	0.70	70.70	6,402.2	-60.7	2,914.7	2,915.3	0.37	-0.32	-13.09	
7,284.0	0.40	83.60	6,497.2	-60.5	2,915.6	2,916.2	0.34	-0.32	13.58	
7,378.0	0.30	65.90	6,591.2	-60.3	2,916.1	2,916.7	0.16	-0.11	-18.83	
7,472.0	0.50	11.20	6,685.2	-59.8	2,916.4	2,917.0	0.43	0.21	-58.19	
7,566.0	0.40	332.30	6,779.2	-59.1	2,916.4	2,916.9	0.33	-0.11	-41.38	
7,660.0	0.90	253.70	6,873.2	-59.0	2,915.5	2,916.1	0.97	0.53	-83.62	
7,755.0	1.00	239.70	6,968.2	-59.7	2,914.1	2,914.7	0.27	0.11	-14.74	
7,849.0	0.80	249.90	7,062.2	-60.3	2,912.7	2,913.4	0.27	-0.21	10.85	
7,944.0	1.10	250.70	7,157.2	-60.8	2,911.3	2,911.9	0.32	0.32	0.84	
8,038.0	1.90	252.20	7,251.1	-61.6	2,908.9	2,909.6	0.85	0.85	1.60	
8,132.0	2.20	247.80	7,345.1	-62.8	2,905.8	2,906.4	0.36	0.32	-4.68	
8,226.0	2.10	269.40	7,439.0	-63.5	2,902.4	2,903.1	0.86	-0.11	22.98	
8,320.0	2.20	274.30	7,533.0	-63.4	2,898.9	2,899.5	0.22	0.11	5.21	
8,414.0	2.00	279.50	7,626.9	-62.9	2,895.4	2,896.1	0.29	-0.21	5.53	
8,494.0	2.00	283.00	7,706.8	-62.4	2,892.7	2,893.4	0.15	0.00	4.38	
Projection to TD @ 8554.0' MD / 7766.8' TVD										
8,554.0	2.00	283.00	7,766.8	-61.9	2,890.7	2,891.3	0.00	0.00	0.00	



## Survey Report



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<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db

### Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
301.0	300.5	0.4	15.0	First MWD Survey @ 301.0' MD / 300.5' TVD
8,554.0	7,766.8	-61.9	2,890.7	Projection to TD @ 8554.0' MD / 7766.8' TVD

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_