



# **Laramie Energy, LLC**

**Garfield County, CO**

**CC 0697-03-07 Pad**

**CC 0697-03-17W**

**Wellbore #1**

**Design: Wellbore #1**

## **QES Survey Report**

**03 August, 2018**





# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well CC 0697-03-17W
<b>Project:</b>	Garfield County, CO	<b>TVD Reference:</b>	well @ 8458.0usft (30' RKB)
<b>Site:</b>	CC 0697-03-07 Pad	<b>MD Reference:</b>	well @ 8458.0usft (30' RKB)
<b>Well:</b>	CC 0697-03-17W	<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>	Garfield 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		

<b>Site</b>	CC 0697-03-07 Pad			
<b>Site Position:</b>		<b>Northing:</b>	1,638,132.66 usft	<b>Latitude:</b> 39.554247
<b>From:</b>	Lat/Long	<b>Easting:</b>	2,236,874.96 usft	<b>Longitude:</b> -108.206835
<b>Position Uncertainty:</b>	0.0 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b> -1.71 °

<b>Well</b>	CC 0697-03-17W			
<b>Well Position</b>	<b>+N/-S</b>	0.0 usft	<b>Northing:</b>	1,639,565.25 usft
	<b>+E/-W</b>	0.0 usft	<b>Easting:</b>	2,237,388.87 usft
<b>Position Uncertainty</b>	0.0 usft		<b>Wellhead Elevation:</b>	usft
			<b>Ground Level:</b>	8,428.0 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	7/26/2018	9.62	65.58	51,396.10000000

<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	220.96	

<b>Survey Program</b>	<b>Date</b>	8/3/2018			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
408.0	10,382.0	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 @ 408.0' MD / 407.8' TVD</b>										
408.0	3.20	238.70	407.8	-5.9	-9.7	10.8	0.78	0.78	0.00	
534.0	4.70	232.70	533.5	-10.9	-16.8	19.3	1.23	1.19	-4.76	
590.0	6.00	224.50	589.2	-14.4	-20.7	24.4	2.69	2.32	-14.64	
681.0	7.30	219.50	679.6	-22.2	-27.7	34.9	1.56	1.43	-5.49	
771.0	9.60	214.80	768.6	-32.8	-35.7	48.1	2.67	2.56	-5.22	
862.0	12.70	219.00	857.9	-46.8	-46.3	65.7	3.52	3.41	4.62	
953.0	16.50	219.90	946.0	-64.5	-60.9	88.6	4.18	4.18	0.99	
1,044.0	19.10	217.70	1,032.6	-86.2	-78.3	116.4	2.95	2.86	-2.42	
1,138.0	20.10	218.30	1,121.2	-111.0	-97.7	147.9	1.09	1.06	0.64	



# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well CC 0697-03-17W
<b>Project:</b>	Garfield County, CO	<b>TVD Reference:</b>	well @ 8458.0usft (30' RKB)
<b>Site:</b>	CC 0697-03-07 Pad	<b>MD Reference:</b>	well @ 8458.0usft (30' RKB)
<b>Well:</b>	CC 0697-03-17W	<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)	
1,233.0	21.80	221.40	1,209.9	-137.1	-119.5	181.8	2.14	1.79	3.26	
1,327.0	21.50	222.10	1,297.2	-162.9	-142.6	216.5	0.42	-0.32	0.74	
1,422.0	21.10	222.10	1,385.8	-188.5	-165.7	251.0	0.42	-0.42	0.00	
1,516.0	21.10	223.10	1,473.5	-213.5	-188.6	284.8	0.38	0.00	1.06	
1,610.0	20.50	223.40	1,561.3	-237.8	-211.5	318.2	0.65	-0.64	0.32	
1,706.0	22.40	222.60	1,650.7	-263.5	-235.4	353.3	2.00	1.98	-0.83	
1,800.0	21.50	221.90	1,737.9	-289.5	-259.0	388.4	1.00	-0.96	-0.74	
1,895.0	19.60	219.80	1,826.8	-314.7	-280.9	421.7	2.14	-2.00	-2.21	
1,989.0	18.50	217.70	1,915.7	-338.6	-300.1	452.4	1.38	-1.17	-2.23	
2,084.0	18.90	219.70	2,005.6	-362.3	-319.1	482.8	0.80	0.42	2.11	
2,178.0	20.00	219.40	2,094.3	-386.5	-339.0	514.1	1.18	1.17	-0.32	
2,273.0	21.80	218.80	2,183.0	-412.8	-360.4	548.0	1.91	1.89	-0.63	
2,367.0	21.20	216.70	2,270.5	-440.0	-381.5	582.4	1.04	-0.64	-2.23	
2,461.0	22.40	219.50	2,357.8	-467.5	-403.1	617.2	1.69	1.28	2.98	
2,480.0	22.90	220.40	2,375.3	-473.1	-407.8	624.5	3.20	2.63	4.74	
2,618.0	18.80	219.50	2,504.2	-510.7	-439.3	673.6	2.98	-2.97	-0.65	
2,713.0	21.90	224.50	2,593.3	-535.1	-461.5	706.6	3.74	3.26	5.26	
2,807.0	25.20	225.00	2,679.5	-561.8	-487.9	744.1	3.52	3.51	0.53	
2,903.0	25.40	221.90	2,766.3	-591.6	-516.1	785.1	1.40	0.21	-3.23	
2,997.0	25.90	222.40	2,851.0	-621.7	-543.4	825.8	0.58	0.53	0.53	
3,092.0	24.20	222.40	2,937.1	-651.4	-570.6	866.0	1.79	-1.79	0.00	
3,186.0	24.60	218.10	3,022.7	-681.1	-595.6	904.8	1.94	0.43	-4.57	
3,280.0	24.50	219.70	3,108.2	-711.5	-620.1	943.8	0.72	-0.11	1.70	
3,375.0	24.30	219.90	3,194.7	-741.6	-645.3	983.0	0.23	-0.21	0.21	
3,470.0	23.60	220.60	3,281.5	-771.1	-670.2	1,021.6	0.80	-0.74	0.74	
3,565.0	26.50	221.80	3,367.6	-801.3	-696.7	1,061.8	3.10	3.05	1.26	
3,660.0	24.90	220.80	3,453.2	-832.2	-723.9	1,103.0	1.74	-1.68	-1.05	
3,754.0	23.30	220.60	3,539.0	-861.3	-748.9	1,141.4	1.70	-1.70	-0.21	
3,848.0	22.30	220.90	3,625.6	-888.9	-772.7	1,177.8	1.07	-1.06	0.32	
3,943.0	20.40	220.80	3,714.1	-915.1	-795.3	1,212.4	2.00	-2.00	-0.11	
4,037.0	22.20	221.30	3,801.7	-940.8	-817.7	1,246.5	1.92	1.91	0.53	
4,132.0	21.00	221.70	3,890.0	-967.0	-840.9	1,281.5	1.27	-1.26	0.42	
4,226.0	23.30	222.10	3,977.1	-993.4	-864.6	1,316.9	2.45	2.45	0.43	
4,320.0	21.50	222.70	4,064.0	-1,019.9	-888.7	1,352.8	1.93	-1.91	0.64	
4,416.0	23.40	222.10	4,152.7	-1,046.9	-913.4	1,389.4	1.99	1.98	-0.63	
4,511.0	22.70	222.10	4,240.1	-1,074.5	-938.4	1,426.6	0.74	-0.74	0.00	
4,605.0	21.40	222.20	4,327.2	-1,100.7	-962.1	1,461.9	1.38	-1.38	0.11	
4,700.0	20.60	222.60	4,415.9	-1,125.8	-985.0	1,495.9	0.86	-0.84	0.42	
4,794.0	22.10	218.90	4,503.5	-1,151.8	-1,007.3	1,530.1	2.14	1.60	-3.94	
4,889.0	20.80	220.50	4,591.9	-1,178.5	-1,029.5	1,564.8	1.50	-1.37	1.68	
4,983.0	20.80	223.90	4,679.8	-1,203.2	-1,051.9	1,598.2	1.28	0.00	3.62	
5,078.0	21.70	223.30	4,768.3	-1,228.2	-1,075.6	1,632.6	0.97	0.95	-0.63	
5,173.0	22.40	220.60	4,856.3	-1,254.7	-1,099.5	1,668.2	1.30	0.74	-2.84	



# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well CC 0697-03-17W
<b>Project:</b>	Garfield County, CO	<b>TVD Reference:</b>	well @ 8458.0usft (30' RKB)
<b>Site:</b>	CC 0697-03-07 Pad	<b>MD Reference:</b>	well @ 8458.0usft (30' RKB)
<b>Well:</b>	CC 0697-03-17W	<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)	
5,267.0	21.90	219.90	4,943.4	-1,281.7	-1,122.4	1,703.7	0.60	-0.53	-0.74	
5,362.0	19.40	217.90	5,032.3	-1,307.8	-1,143.4	1,737.2	2.73	-2.63	-2.11	
5,456.0	18.10	220.60	5,121.3	-1,331.2	-1,162.5	1,767.3	1.66	-1.38	2.87	
5,550.0	19.70	223.70	5,210.2	-1,353.7	-1,183.0	1,797.8	2.01	1.70	3.30	
5,645.0	21.10	219.90	5,299.3	-1,378.4	-1,205.0	1,830.9	2.03	1.47	-4.00	
5,739.0	21.10	221.30	5,387.0	-1,404.1	-1,227.0	1,864.7	0.54	0.00	1.49	
5,833.0	20.40	220.30	5,474.9	-1,429.3	-1,248.8	1,898.0	0.83	-0.74	-1.06	
5,928.0	20.00	220.50	5,564.0	-1,454.3	-1,270.1	1,930.8	0.43	-0.42	0.21	
6,022.0	20.70	218.60	5,652.2	-1,479.5	-1,290.9	1,963.5	1.02	0.74	-2.02	
6,116.0	20.80	216.50	5,740.1	-1,505.9	-1,311.2	1,996.7	0.80	0.11	-2.23	
6,211.0	20.00	217.70	5,829.1	-1,532.3	-1,331.1	2,029.8	0.95	-0.84	1.26	
6,305.0	21.70	219.30	5,917.0	-1,558.5	-1,352.0	2,063.2	1.91	1.81	1.70	
6,400.0	21.30	218.90	6,005.4	-1,585.5	-1,373.9	2,098.0	0.45	-0.42	-0.42	
6,494.0	20.30	219.60	6,093.2	-1,611.4	-1,395.0	2,131.3	1.10	-1.06	0.74	
6,589.0	17.80	219.40	6,183.0	-1,635.3	-1,414.8	2,162.3	2.63	-2.63	-0.21	
6,683.0	16.90	221.60	6,272.7	-1,656.6	-1,432.9	2,190.4	1.18	-0.96	2.34	
6,777.0	14.40	222.50	6,363.2	-1,675.5	-1,449.9	2,215.7	2.67	-2.66	0.96	
6,872.0	13.10	222.40	6,455.5	-1,692.1	-1,465.2	2,238.3	1.37	-1.37	-0.11	
6,966.0	12.40	223.80	6,547.2	-1,707.3	-1,479.3	2,259.0	0.81	-0.74	1.49	
7,061.0	11.00	224.60	6,640.2	-1,721.1	-1,492.8	2,278.3	1.48	-1.47	0.84	
7,155.0	9.10	221.40	6,732.8	-1,733.0	-1,504.0	2,294.6	2.11	-2.02	-3.40	
7,250.0	7.10	222.30	6,826.8	-1,743.0	-1,512.9	2,308.0	2.11	-2.11	0.95	
7,344.0	6.50	223.80	6,920.2	-1,751.2	-1,520.5	2,319.1	0.67	-0.64	1.60	
7,439.0	4.50	222.60	7,014.7	-1,757.8	-1,526.7	2,328.2	2.11	-2.11	-1.26	
7,533.0	1.60	223.40	7,108.6	-1,761.5	-1,530.1	2,333.2	3.09	-3.09	0.85	
7,627.0	1.30	246.00	7,202.6	-1,762.8	-1,532.0	2,335.5	0.68	-0.32	24.04	
7,722.0	1.70	219.60	7,297.5	-1,764.4	-1,533.9	2,337.9	0.83	0.42	-27.79	
7,816.0	1.90	237.50	7,391.5	-1,766.3	-1,536.1	2,340.8	0.63	0.21	19.04	
7,910.0	1.70	209.40	7,485.4	-1,768.3	-1,538.1	2,343.6	0.95	-0.21	-29.89	
8,005.0	2.10	210.40	7,580.4	-1,771.1	-1,539.7	2,346.7	0.42	0.42	1.05	
8,099.0	1.10	204.60	7,674.3	-1,773.4	-1,540.9	2,349.3	1.08	-1.06	-6.17	
8,194.0	1.00	201.80	7,769.3	-1,775.0	-1,541.6	2,351.0	0.12	-0.11	-2.95	
8,288.0	1.30	206.50	7,863.3	-1,776.7	-1,542.4	2,352.8	0.33	0.32	5.00	
8,383.0	1.70	220.80	7,958.3	-1,778.7	-1,543.8	2,355.2	0.57	0.42	15.05	
8,477.0	1.50	214.10	8,052.2	-1,780.8	-1,545.4	2,357.8	0.29	-0.21	-7.13	
8,572.0	1.90	196.30	8,147.2	-1,783.3	-1,546.5	2,360.5	0.69	0.42	-18.74	
8,667.0	2.20	215.10	8,242.1	-1,786.3	-1,548.0	2,363.7	0.77	0.32	19.79	
8,761.0	2.70	210.60	8,336.0	-1,789.7	-1,550.2	2,367.7	0.57	0.53	-4.79	
8,856.0	2.80	224.30	8,430.9	-1,793.3	-1,552.9	2,372.2	0.70	0.11	14.42	
8,951.0	3.60	220.00	8,525.8	-1,797.2	-1,556.5	2,377.5	0.88	0.84	-4.53	
9,045.0	2.80	224.10	8,619.6	-1,801.2	-1,560.0	2,382.8	0.88	-0.85	4.36	
9,140.0	2.80	234.90	8,714.5	-1,804.2	-1,563.5	2,387.3	0.55	0.00	11.37	
9,234.0	4.20	237.30	8,808.4	-1,807.3	-1,568.2	2,392.9	1.50	1.49	2.55	



# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well CC 0697-03-17W
<b>Project:</b>	Garfield County, CO	<b>TVD Reference:</b>	well @ 8458.0usft (30' RKB)
<b>Site:</b>	CC 0697-03-07 Pad	<b>MD Reference:</b>	well @ 8458.0usft (30' RKB)
<b>Well:</b>	CC 0697-03-17W	<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)	
9,329.0	2.80	236.90	8,903.2	-1,810.5	-1,573.1	2,398.4	1.47	-1.47	-0.42	
9,423.0	1.50	165.40	8,997.1	-1,812.9	-1,574.7	2,401.3	2.90	-1.38	-76.06	
9,518.0	1.60	156.80	9,092.1	-1,815.3	-1,573.9	2,402.6	0.27	0.11	-9.05	
9,612.0	2.20	199.90	9,186.0	-1,818.2	-1,574.0	2,404.9	1.60	0.64	45.85	
9,707.0	2.00	210.90	9,281.0	-1,821.4	-1,575.5	2,408.2	0.47	-0.21	11.58	
9,801.0	2.80	222.10	9,374.9	-1,824.5	-1,577.8	2,412.1	0.98	0.85	11.91	
9,896.0	3.43	226.71	9,469.7	-1,828.2	-1,581.5	2,417.3	0.71	0.66	4.85	
9,991.0	3.34	236.55	9,564.6	-1,831.6	-1,585.9	2,422.8	0.62	-0.09	10.36	
10,085.0	3.87	239.88	9,658.4	-1,834.7	-1,590.9	2,428.4	0.61	0.56	3.54	
10,180.0	4.88	239.10	9,753.1	-1,838.4	-1,597.1	2,435.3	1.06	1.06	-0.82	
10,274.0	5.10	237.70	9,846.8	-1,842.7	-1,604.1	2,443.1	0.27	0.23	-1.49	
10,326.0	5.10	238.30	9,898.6	-1,845.2	-1,608.0	2,447.5	0.10	0.00	1.15	
Projection to TD @ 10382.0' MD / 9954.3' TVD										
10,382.0	5.10	238.30	9,954.3	-1,847.8	-1,612.2	2,452.3	0.00	0.00	0.00	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
408.0	407.8	-5.9	-9.7	First MWD Survey @ 408.0' MD / 407.8' TVD	
10,382.0	9,954.3	-1,847.8	-1,612.2	Projection to TD @ 10382.0' MD / 9954.3' TVD	