



# **Laramie Energy, LLC**

**Garfield County, CO**

**CC 604-41-32 Pad**

**CC Federal 0697-03-06W**

**Wellbore #1**

**Design: Wellbore #1**

## **QES Survey Report**

**02 August, 2019**





# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well CC Federal 0697-03-06W
<b>Project:</b>	Garfield County, CO	<b>TVD Reference:</b>	Well @ 8639.0usft (H&P #522)
<b>Site:</b>	CC 604-41-32 Pad	<b>MD Reference:</b>	Well @ 8639.0usft (H&P #522)
<b>Well:</b>	CC Federal 0697-03-06W	<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		

Site		CC 604-41-32 Pad							
Site Position:		Northing:	1,639,464.67	usft	Latitude:	39.557630			
From:	Lat/Long	Easting:	2,233,548.14	usft	Longitude:	-108.218770			
Position Uncertainty:		0.0	usft	Slot Radius:	13-3/16	"	Grid Convergence:	-1.71	°

Well	CC Federal 0697-03-06W					
Well Position	+N/-S	0.0 usft	Northing:	1,639,440.00 usft	Latitude:	39.557562
	+E/-W	0.0 usft	Easting:	2,233,549.86 usft	Longitude:	-108.218761
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	8,609.0 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>
	HDGM	7/28/2019	9.57	65.78	51,415.80000000

<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	62.71	

<b>Survey Program</b>	<b>Date</b>	8/2/2019			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
295.0	10,666.0	QES MWD Surveys (Wellbore #1)	MWD	OWSG 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 @ 295.0' MD / 295.0' TVD</b>									
295.0	0.50	117.40	295.0	-0.6	1.1	0.7	0.17	0.17	0.00
386.0	1.20	68.30	386.0	-0.4	2.4	1.9	1.04	0.77	-53.96
509.0	3.00	81.10	508.9	0.6	6.8	6.3	1.50	1.46	10.41
600.0	4.00	73.60	599.7	1.8	12.2	11.6	1.21	1.10	-8.24
661.0	4.80	65.30	660.5	3.5	16.5	16.3	1.67	1.31	-13.61
752.0	5.90	66.90	751.2	6.9	24.3	24.7	1.22	1.21	1.76
844.0	6.20	62.00	842.6	11.1	33.0	34.4	0.65	0.33	-5.33
935.0	7.30	61.30	933.0	16.2	42.4	45.1	1.21	1.21	-0.77
1,027.0	8.10	56.70	1,024.2	22.5	53.0	57.4	1.10	0.87	-5.00



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<b>Site:</b>	CC 604-41-32 Pad	<b>MD Reference:</b>	Well @ 8639.0usft (H&P #522)
<b>Well:</b>	CC Federal 0697-03-06W	<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)
1,122.0	9.00	62.40	1,118.1	29.7	65.1	71.5	1.30	0.95	6.00
1,216.0	10.40	62.90	1,210.8	36.9	79.2	87.3	1.49	1.49	0.53
1,311.0	10.50	58.30	1,304.2	45.4	94.2	104.5	0.88	0.11	-4.84
1,406.0	12.20	62.60	1,397.3	54.6	110.5	123.2	2.00	1.79	4.53
1,500.0	13.80	63.40	1,488.9	64.2	129.3	144.4	1.71	1.70	0.85
1,595.0	15.90	65.40	1,580.8	74.6	151.3	168.7	2.28	2.21	2.11
1,690.0	17.90	68.00	1,671.6	85.5	176.7	196.2	2.25	2.11	2.74
1,784.0	19.70	67.20	1,760.6	97.1	204.7	226.4	1.93	1.91	-0.85
1,879.0	21.80	67.60	1,849.5	110.0	235.7	259.9	2.22	2.21	0.42
1,974.0	22.60	66.40	1,937.4	124.0	268.8	295.7	0.97	0.84	-1.26
2,068.0	22.80	65.20	2,024.1	138.9	301.9	332.0	0.54	0.21	-1.28
2,163.0	23.80	62.70	2,111.4	155.4	335.6	369.5	1.48	1.05	-2.63
2,258.0	24.50	58.80	2,198.1	174.4	369.5	408.3	1.83	0.74	-4.11
2,352.0	24.80	58.40	2,283.5	194.8	403.0	447.4	0.37	0.32	-0.43
2,447.0	23.90	58.60	2,370.1	215.3	436.4	486.5	0.95	-0.95	0.21
2,530.0	21.70	60.70	2,446.6	231.6	464.1	518.6	2.83	-2.65	2.53
2,674.0	17.60	58.60	2,582.2	256.0	505.9	567.0	2.89	-2.85	-1.46
2,769.0	18.60	59.20	2,672.5	271.2	531.2	596.4	1.07	1.05	0.63
2,864.0	20.30	62.60	2,762.0	286.6	558.8	628.0	2.15	1.79	3.58
2,958.0	23.00	64.10	2,849.4	302.1	589.8	662.7	2.93	2.87	1.60
3,052.0	25.30	65.20	2,935.2	318.5	624.6	701.1	2.49	2.45	1.17
3,148.0	24.00	65.50	3,022.4	335.2	661.0	741.1	1.36	-1.35	0.31
3,242.0	24.40	62.90	3,108.2	352.0	695.7	779.6	1.21	0.43	-2.77
3,337.0	24.50	62.00	3,194.6	370.2	730.5	818.9	0.41	0.11	-0.95
3,432.0	23.10	63.60	3,281.6	387.7	764.6	857.3	1.62	-1.47	1.68
3,527.0	22.90	61.30	3,369.0	404.9	797.5	894.4	0.97	-0.21	-2.42
3,621.0	23.50	62.00	3,455.4	422.5	830.1	931.4	0.70	0.64	0.74
3,716.0	25.40	63.20	3,541.9	440.5	865.0	970.7	2.07	2.00	1.26
3,811.0	23.20	62.60	3,628.5	458.3	899.8	1,009.8	2.33	-2.32	-0.63
3,905.0	24.90	62.90	3,714.3	475.9	933.9	1,048.1	1.81	1.81	0.32
4,000.0	23.50	63.60	3,800.9	493.4	968.6	1,087.1	1.50	-1.47	0.74
4,094.0	22.60	62.70	3,887.4	510.0	1,001.5	1,123.9	1.03	-0.96	-0.96
4,189.0	22.50	63.00	3,975.2	526.7	1,033.9	1,160.3	0.16	-0.11	0.32
4,284.0	22.90	63.60	4,062.8	543.1	1,066.7	1,197.0	0.49	0.42	0.63
4,378.0	22.70	65.60	4,149.5	558.8	1,099.6	1,233.4	0.85	-0.21	2.13
4,473.0	23.30	65.60	4,236.9	574.1	1,133.4	1,270.4	0.63	0.63	0.00
4,568.0	24.30	65.60	4,323.8	589.9	1,168.3	1,308.7	1.05	1.05	0.00
4,662.0	22.90	65.80	4,410.0	605.4	1,202.6	1,346.3	1.49	-1.49	0.21
4,757.0	23.40	64.20	4,497.3	621.2	1,236.4	1,383.6	0.85	0.53	-1.68
4,851.0	22.80	63.80	4,583.8	637.4	1,269.6	1,420.5	0.66	-0.64	-0.43
4,946.0	23.20	62.30	4,671.2	654.2	1,302.6	1,457.6	0.75	0.42	-1.58
5,041.0	21.90	61.80	4,759.0	671.3	1,334.8	1,494.0	1.38	-1.37	-0.53
5,135.0	23.00	62.60	4,845.9	688.0	1,366.6	1,529.9	1.21	1.17	0.85



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Survey										
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5,230.0	21.10	62.20	4,933.9	704.5	1,398.2	1,565.6	2.01	-2.00	-0.42	
5,325.0	22.30	62.40	5,022.2	720.8	1,429.3	1,600.7	1.27	1.26	0.21	
5,419.0	22.70	63.00	5,109.0	737.3	1,461.3	1,636.7	0.49	0.43	0.64	
5,514.0	21.80	62.00	5,196.9	753.9	1,493.2	1,672.7	1.03	-0.95	-1.05	
5,609.0	21.00	64.90	5,285.4	769.4	1,524.2	1,707.3	1.40	-0.84	3.05	
5,704.0	21.80	64.20	5,373.8	784.3	1,555.5	1,741.9	0.88	0.84	-0.74	
5,798.0	21.40	61.30	5,461.2	800.2	1,586.2	1,776.5	1.21	-0.43	-3.09	
5,893.0	22.50	60.30	5,549.4	817.5	1,617.2	1,812.0	1.22	1.16	-1.05	
5,988.0	24.60	59.70	5,636.4	836.5	1,650.1	1,849.9	2.22	2.21	-0.63	
6,082.0	24.00	59.40	5,722.1	856.1	1,683.4	1,888.6	0.65	-0.64	-0.32	
6,177.0	24.50	59.40	5,808.7	876.0	1,717.0	1,927.5	0.53	0.53	0.00	
6,272.0	23.60	59.10	5,895.5	895.8	1,750.3	1,966.2	0.96	-0.95	-0.32	
6,366.0	24.30	60.90	5,981.4	914.8	1,783.3	2,004.3	1.08	0.74	1.91	
6,461.0	23.00	60.60	6,068.4	933.4	1,816.6	2,042.4	1.37	-1.37	-0.32	
6,556.0	24.40	62.10	6,155.4	951.7	1,850.1	2,080.5	1.60	1.47	1.58	
6,650.0	23.60	61.50	6,241.3	969.8	1,883.8	2,118.8	0.89	-0.85	-0.64	
6,745.0	24.30	62.90	6,328.1	987.8	1,917.9	2,157.3	0.95	0.74	1.47	
6,839.0	22.80	62.20	6,414.3	1,005.1	1,951.2	2,194.9	1.62	-1.60	-0.74	
6,934.0	23.00	64.30	6,501.8	1,021.7	1,984.2	2,231.8	0.89	0.21	2.21	
7,029.0	21.00	66.40	6,589.8	1,036.6	2,016.6	2,267.4	2.26	-2.11	2.21	
7,124.0	20.70	65.70	6,678.6	1,050.3	2,047.5	2,301.1	0.41	-0.32	-0.74	
7,218.0	20.30	63.80	6,766.7	1,064.3	2,077.2	2,334.0	0.83	-0.43	-2.02	
7,313.0	18.80	61.70	6,856.2	1,078.9	2,105.5	2,365.8	1.74	-1.58	-2.21	
7,408.0	16.90	61.40	6,946.6	1,092.7	2,131.1	2,394.9	2.00	-2.00	-0.32	
7,503.0	16.30	63.20	7,037.7	1,105.4	2,155.1	2,422.1	0.83	-0.63	1.89	
7,597.0	13.80	64.30	7,128.4	1,116.2	2,177.0	2,446.5	2.68	-2.66	1.17	
7,692.0	13.10	66.70	7,220.8	1,125.3	2,197.1	2,468.5	0.94	-0.74	2.53	
7,787.0	12.10	68.00	7,313.5	1,133.3	2,216.2	2,489.2	1.09	-1.05	1.37	
7,881.0	11.00	66.70	7,405.6	1,140.6	2,233.6	2,507.9	1.20	-1.17	-1.38	
7,976.0	9.10	69.00	7,499.2	1,146.9	2,248.9	2,524.4	2.04	-2.00	2.42	
8,071.0	7.90	70.10	7,593.1	1,151.8	2,262.1	2,538.4	1.27	-1.26	1.16	
8,165.0	7.20	65.70	7,686.3	1,156.4	2,273.5	2,550.7	0.97	-0.74	-4.68	
8,259.0	5.80	64.50	7,779.7	1,160.9	2,283.2	2,561.3	1.50	-1.49	-1.28	
8,353.0	4.80	65.10	7,873.3	1,164.6	2,291.0	2,570.0	1.07	-1.06	0.64	
8,447.0	4.50	55.20	7,967.0	1,168.3	2,297.6	2,577.6	0.91	-0.32	-10.53	
8,541.0	4.00	49.30	8,060.7	1,172.6	2,303.1	2,584.4	0.71	-0.53	-6.28	
8,635.0	2.80	50.10	8,154.6	1,176.2	2,307.4	2,589.8	1.28	-1.28	0.85	
8,728.0	2.00	44.70	8,247.5	1,178.8	2,310.3	2,593.6	0.89	-0.86	-5.81	
8,823.0	1.50	35.10	8,342.4	1,181.0	2,312.2	2,596.3	0.61	-0.53	-10.11	
8,918.0	0.70	64.00	8,437.4	1,182.3	2,313.4	2,598.0	1.00	-0.84	30.42	
9,012.0	0.40	235.40	8,531.4	1,182.3	2,313.6	2,598.2	1.17	-0.32	182.34	
9,107.0	1.10	217.70	8,626.4	1,181.4	2,312.8	2,597.1	0.77	0.74	-18.63	
9,202.0	1.50	226.60	8,721.4	1,179.8	2,311.4	2,595.0	0.47	0.42	9.37	



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9,296.0	1.60	231.40	8,815.4	1,178.2	2,309.4	2,592.6	0.17	0.11	5.11	
9,391.0	2.10	243.30	8,910.3	1,176.6	2,306.8	2,589.5	0.66	0.53	12.53	
9,485.0	2.50	249.20	9,004.2	1,175.1	2,303.4	2,585.8	0.49	0.43	6.28	
9,580.0	3.00	245.50	9,099.1	1,173.3	2,299.2	2,581.2	0.56	0.53	-3.89	
9,675.0	3.70	249.40	9,194.0	1,171.2	2,294.1	2,575.7	0.77	0.74	4.11	
9,769.0	3.70	256.60	9,287.8	1,169.4	2,288.3	2,569.7	0.49	0.00	7.66	
9,864.0	4.60	255.40	9,382.5	1,167.7	2,281.6	2,563.1	0.95	0.95	-1.26	
9,958.0	5.10	249.20	9,476.2	1,165.3	2,274.0	2,555.2	0.77	0.53	-6.60	
10,053.0	5.40	247.20	9,570.8	1,162.1	2,266.0	2,546.6	0.37	0.32	-2.11	
10,148.0	5.60	245.70	9,665.3	1,158.4	2,257.6	2,537.5	0.26	0.21	-1.58	
10,242.0	5.30	245.60	9,758.9	1,154.8	2,249.5	2,528.6	0.32	-0.32	-0.11	
10,337.0	5.00	241.20	9,853.5	1,150.9	2,241.9	2,520.0	0.52	-0.32	-4.63	
10,432.0	5.00	237.20	9,948.2	1,146.7	2,234.8	2,511.8	0.37	0.00	-4.21	
10,526.0	5.10	240.90	10,041.8	1,142.5	2,227.7	2,503.5	0.36	0.11	3.94	
10,606.0	4.70	244.60	10,121.5	1,139.3	2,221.6	2,496.7	0.64	-0.50	4.63	
TD @ 10666.0' MD / 10181.3' TVD										
10,666.0	4.70	244.60	10,181.3	1,137.2	2,217.2	2,491.8	0.00	0.00	0.00	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
295.0	295.0	-0.6	1.1	First MWD Survey @ 295.0' MD / 295.0' TVD	
10,666.0	10,181.3	1,137.2	2,217.2	TD @ 10666.0' MD / 10181.3' TVD	

Checked By: _____	Approved By: _____	Date: _____
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