



# **Laramie Energy, LLC**

**Garfield County, CO**

**CC 604-41-32 Pad**

**CC 0697-04-10E**

**Wellbore #1**

**Design: Wellbore #1**

## **QES Survey Report**

**10 May, 2019**





# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well CC 0697-04-10E
<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 0697-04-10E	<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 604-41-32 Pad			
<b>Site Position:</b>		<b>Northing:</b>	1,639,464.67 usft	<b>Latitude:</b> 39.557630
<b>From:</b>	Lat/Long	<b>Easting:</b>	2,233,548.14 usft	<b>Longitude:</b> -108.218770
<b>Position Uncertainty:</b>	0.0 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b> -1.71 °

<b>Well</b>	CC 0697-04-10E			
<b>Well Position</b>	<b>+N/-S</b>	0.0 usft	<b>Northing:</b>	1,639,386.97 usft
	<b>+E/-W</b>	0.0 usft	<b>Easting:</b>	2,233,519.78 usft
<b>Position Uncertainty</b>	0.0 usft		<b>Wellhead Elevation:</b>	usft
			<b>Ground Level:</b>	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	5/3/2019	9.58	65.80	51,442.10000000

<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	218.93	

<b>Survey Program</b>	<b>Date</b>	5/10/2019			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
202.0	10,088.0	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 @ 202.0' MD / 202.0' TVD</b>									
202.0	1.90	200.40	202.0	-3.1	-1.2	3.2	0.94	0.94	0.00
295.0	2.80	198.70	294.9	-6.7	-2.4	6.8	0.97	0.97	-1.83
386.0	2.90	223.80	385.8	-10.5	-4.7	11.1	1.36	0.11	27.58
478.0	4.10	214.50	477.6	-14.9	-8.2	16.7	1.44	1.30	-10.11
569.0	4.40	212.00	568.4	-20.5	-11.9	23.5	0.39	0.33	-2.75
661.0	5.50	215.10	660.0	-27.1	-16.3	31.4	1.23	1.20	3.37
752.0	7.00	223.50	750.5	-34.7	-22.6	41.2	1.93	1.65	9.23
844.0	7.70	216.30	841.7	-43.8	-30.1	53.0	1.26	0.76	-7.83
936.0	6.90	220.20	933.0	-52.9	-37.4	64.7	1.02	-0.87	4.24



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<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 0697-04-10E	<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)
1,027.0	7.10	218.50	1,023.3	-61.5	-44.4	75.8	0.32	0.22	-1.87
1,122.0	7.30	216.30	1,117.5	-71.0	-51.6	87.7	0.36	0.21	-2.32
1,217.0	6.40	215.30	1,211.9	-80.2	-58.2	99.0	0.96	-0.95	-1.05
1,311.0	6.60	222.10	1,305.3	-88.5	-64.9	109.6	0.85	0.21	7.23
1,406.0	6.60	221.40	1,399.6	-96.6	-72.2	120.5	0.08	0.00	-0.74
1,501.0	6.30	217.40	1,494.0	-104.8	-78.9	131.2	0.57	-0.32	-4.21
1,595.0	6.20	209.90	1,587.5	-113.3	-84.6	141.3	0.87	-0.11	-7.98
1,690.0	6.10	232.30	1,681.9	-120.9	-91.2	151.3	2.51	-0.11	23.58
1,785.0	5.40	228.40	1,776.5	-126.9	-98.5	160.6	0.84	-0.74	-4.11
1,879.0	5.50	220.60	1,870.0	-133.3	-104.7	169.5	0.79	0.11	-8.30
1,974.0	4.60	228.30	1,964.7	-139.3	-110.5	177.8	1.18	-0.95	8.11
2,068.0	5.10	216.50	2,058.3	-145.1	-115.8	185.7	1.18	0.53	-12.55
2,163.0	5.10	213.80	2,153.0	-152.0	-120.7	194.1	0.25	0.00	-2.84
2,258.0	5.00	212.10	2,247.6	-159.1	-125.3	202.4	0.19	-0.11	-1.79
2,352.0	5.10	219.70	2,341.2	-165.7	-130.1	210.7	0.72	0.11	8.09
2,447.0	4.00	216.70	2,435.9	-171.6	-134.8	218.2	1.18	-1.16	-3.16
2,542.0	3.50	219.80	2,530.7	-176.5	-138.6	224.4	0.57	-0.53	3.26
2,634.0	3.50	217.40	2,622.5	-180.9	-142.1	230.0	0.16	0.00	-2.61
2,729.0	3.30	217.70	2,717.4	-185.4	-145.5	235.7	0.21	-0.21	0.32
2,823.0	4.20	224.30	2,811.2	-190.0	-149.6	241.8	1.06	0.96	7.02
2,918.0	4.30	224.60	2,905.9	-195.0	-154.5	248.8	0.11	0.11	0.32
3,013.0	4.20	225.50	3,000.7	-200.0	-159.5	255.8	0.13	-0.11	0.95
3,107.0	4.00	214.10	3,094.4	-205.1	-163.8	262.5	0.89	-0.21	-12.13
3,202.0	3.60	211.80	3,189.2	-210.4	-167.2	268.8	0.45	-0.42	-2.42
3,297.0	4.00	222.00	3,284.0	-215.4	-171.0	275.0	0.83	0.42	10.74
3,391.0	3.50	221.00	3,377.8	-220.0	-175.1	281.2	0.54	-0.53	-1.06
3,486.0	3.20	218.80	3,472.6	-224.3	-178.7	286.7	0.34	-0.32	-2.32
3,581.0	4.00	220.80	3,567.4	-228.8	-182.5	292.7	0.85	0.84	2.11
3,675.0	4.10	224.40	3,661.2	-233.7	-187.0	299.3	0.29	0.11	3.83
3,770.0	3.90	223.90	3,756.0	-238.5	-191.6	305.9	0.21	-0.21	-0.53
3,865.0	3.90	225.10	3,850.8	-243.1	-196.1	312.3	0.09	0.00	1.26
3,959.0	3.60	225.60	3,944.6	-247.4	-200.5	318.4	0.32	-0.32	0.53
4,054.0	4.40	213.30	4,039.3	-252.5	-204.6	325.0	1.23	0.84	-12.95
4,149.0	4.10	215.20	4,134.1	-258.3	-208.6	332.0	0.35	-0.32	2.00
4,244.0	4.00	215.60	4,228.8	-263.8	-212.5	338.7	0.11	-0.11	0.42
4,339.0	4.00	216.90	4,323.6	-269.2	-216.4	345.4	0.10	0.00	1.37
4,433.0	4.00	215.20	4,417.4	-274.5	-220.3	351.9	0.13	0.00	-1.81
4,528.0	3.90	218.20	4,512.1	-279.7	-224.2	358.4	0.24	-0.11	3.16
4,623.0	3.80	224.80	4,606.9	-284.5	-228.4	364.8	0.48	-0.11	6.95
4,717.0	4.40	223.90	4,700.7	-289.3	-233.1	371.5	0.64	0.64	-0.96
4,812.0	4.10	209.80	4,795.4	-294.9	-237.3	378.5	1.14	-0.32	-14.84
4,906.0	4.10	208.00	4,889.2	-300.7	-240.5	385.1	0.14	0.00	-1.91
5,001.0	4.00	212.90	4,984.0	-306.5	-243.9	391.7	0.38	-0.11	5.16



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<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)	
5,096.0	3.80	202.10	5,078.7	-312.2	-246.9	398.0	0.80	-0.21	-11.37	
5,190.0	2.80	196.50	5,172.6	-317.3	-248.7	403.1	1.12	-1.06	-5.96	
5,285.0	2.90	189.80	5,267.5	-321.9	-249.8	407.4	0.37	0.11	-7.05	
5,379.0	4.60	200.50	5,361.3	-327.8	-251.5	413.0	1.95	1.81	11.38	
5,474.0	5.10	204.70	5,455.9	-335.2	-254.6	420.8	0.65	0.53	4.42	
5,569.0	5.00	209.80	5,550.5	-342.6	-258.5	428.9	0.48	-0.11	5.37	
5,663.0	5.00	211.30	5,644.2	-349.7	-262.6	437.0	0.14	0.00	1.60	
5,758.0	5.30	213.50	5,738.8	-356.9	-267.2	445.5	0.38	0.32	2.32	
5,852.0	5.30	215.90	5,832.4	-364.0	-272.1	454.2	0.24	0.00	2.55	
5,947.0	4.80	204.10	5,927.0	-371.2	-276.3	462.4	1.21	-0.53	-12.42	
6,042.0	4.80	205.30	6,021.7	-378.4	-279.7	470.1	0.11	0.00	1.26	
6,137.0	4.70	220.90	6,116.4	-384.9	-283.9	477.8	1.36	-0.11	16.42	
6,231.0	3.40	200.00	6,210.2	-390.5	-287.4	484.3	2.07	-1.38	-22.23	
6,326.0	1.60	195.20	6,305.1	-394.4	-288.7	488.2	1.91	-1.89	-5.05	
6,421.0	1.30	192.70	6,400.0	-396.7	-289.3	490.4	0.32	-0.32	-2.63	
6,515.0	1.90	207.30	6,494.0	-399.2	-290.2	492.9	0.77	0.64	15.53	
6,610.0	1.20	197.50	6,589.0	-401.5	-291.2	495.3	0.79	-0.74	-10.32	
6,705.0	0.10	305.40	6,683.9	-402.4	-291.6	496.3	1.30	-1.16	113.58	
6,800.0	0.40	298.60	6,778.9	-402.2	-292.0	496.3	0.32	0.32	-7.16	
6,894.0	1.10	259.90	6,872.9	-402.2	-293.1	497.1	0.88	0.74	-41.17	
6,989.0	0.80	208.40	6,967.9	-402.9	-294.4	498.4	0.91	-0.32	-54.21	
7,083.0	0.70	189.00	7,061.9	-404.1	-294.8	499.6	0.29	-0.11	-20.64	
7,178.0	0.50	17.30	7,156.9	-404.3	-294.7	499.7	1.26	-0.21	-180.74	
7,273.0	0.90	326.80	7,251.9	-403.2	-295.0	499.1	0.73	0.42	-53.16	
7,368.0	0.40	260.50	7,346.9	-402.7	-295.8	499.1	0.87	-0.53	-69.79	
7,462.0	1.40	210.70	7,440.9	-403.7	-296.7	500.5	1.26	1.06	-52.98	
7,557.0	1.30	223.80	7,535.9	-405.5	-298.0	502.7	0.34	-0.11	13.79	
7,651.0	0.70	256.00	7,629.9	-406.4	-299.3	504.2	0.85	-0.64	34.26	
7,746.0	1.20	237.70	7,724.8	-407.1	-300.7	505.6	0.61	0.53	-19.26	
7,841.0	0.70	232.80	7,819.8	-408.0	-302.0	507.1	0.53	-0.53	-5.16	
7,936.0	0.70	272.20	7,914.8	-408.3	-303.0	508.0	0.50	0.00	41.47	
8,030.0	1.00	273.60	8,008.8	-408.2	-304.4	508.8	0.32	0.32	1.49	
8,125.0	1.10	248.30	8,103.8	-408.5	-306.1	510.1	0.49	0.11	-26.63	
8,220.0	1.80	244.60	8,198.8	-409.5	-308.3	512.3	0.74	0.74	-3.89	
8,315.0	1.80	254.90	8,293.7	-410.5	-311.1	514.8	0.34	0.00	10.84	
8,409.0	0.70	202.10	8,387.7	-411.4	-312.7	516.6	1.58	-1.17	-56.17	
8,504.0	1.10	202.40	8,482.7	-412.8	-313.3	518.0	0.42	0.42	0.32	
8,599.0	1.90	235.50	8,577.7	-414.5	-314.9	520.4	1.21	0.84	34.84	
8,693.0	1.60	232.00	8,671.6	-416.2	-317.3	523.1	0.34	-0.32	-3.72	
8,788.0	0.70	113.40	8,766.6	-417.3	-317.8	524.3	2.14	-0.95	-124.84	
8,883.0	0.30	290.30	8,861.6	-417.4	-317.5	524.2	1.05	-0.42	186.21	
8,978.0	2.20	295.00	8,956.6	-416.6	-319.4	524.7	2.00	2.00	4.95	
9,072.0	3.10	281.20	9,050.5	-415.3	-323.5	526.3	1.17	0.96	-14.68	



# Survey Report



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9,167.0	1.80	250.20	9,145.4	-415.3	-327.4	528.8	1.91	-1.37	-32.63	
9,262.0	2.50	237.80	9,240.3	-416.9	-330.6	532.0	0.88	0.74	-13.05	
9,356.0	2.20	247.60	9,334.2	-418.7	-334.0	535.6	0.53	-0.32	10.43	
9,451.0	2.60	243.50	9,429.2	-420.4	-337.6	539.1	0.46	0.42	-4.32	
9,545.0	3.50	240.10	9,523.0	-422.7	-342.0	543.7	0.98	0.96	-3.62	
9,640.0	3.40	239.60	9,617.8	-425.6	-346.9	549.1	0.11	-0.11	-0.53	
9,735.0	3.60	240.00	9,712.7	-428.5	-351.9	554.5	0.21	0.21	0.42	
9,829.0	4.00	245.20	9,806.5	-431.4	-357.5	560.2	0.56	0.43	5.53	
9,924.0	5.90	246.60	9,901.1	-434.7	-365.0	567.5	2.00	2.00	1.47	
10,019.0	5.80	239.70	9,995.6	-439.1	-373.6	576.3	0.75	-0.11	-7.26	
10,028.0	5.80	241.30	10,004.6	-439.5	-374.4	577.2	1.80	0.00	17.78	
Projection to TD @ 10088.0' MD / 10064.3' TVD										
10,088.0	5.80	241.30	10,064.3	-442.4	-379.7	582.8	0.00	0.00	0.00	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
202.0	202.0	-3.1	-1.2	First MWD Survey @ 202.0' MD / 202.0' TVD	
10,088.0	10,064.3	-442.4	-379.7	Projection to TD @ 10088.0' MD / 10064.3' TVD	