



# **Laramie Energy, LLC**

**Mesa County, CO  
Gunderson 29-09 Pad  
Piceance Federal 29-18W**

**Wellbore #1**

**Design: Wellbore #1**

## **QES Survey Report**

**19 May, 2017**





Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well Piceance Federal 29-18W
<b>Project:</b>	Mesa County, CO	<b>TVD Reference:</b>	well @ 7561.0usft (H&P #522)
<b>Site:</b>	Gunderson 29-09 Pad	<b>MD Reference:</b>	well @ 7561.0usft (H&P #522)
<b>Well:</b>	Piceance Federal 29-18W	<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>	EDM5002

<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		

<b>Site</b>	Gunderson 29-09 Pad				
<b>Site Position:</b>		<b>Northing:</b>	1,523,671.42 usft	<b>Latitude:</b>	39.248803
<b>From:</b>	Lat/Long	<b>Easting:</b>	2,352,063.75 usft	<b>Longitude:</b>	-107.788221
<b>Position Uncertainty:</b>	0.0 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b>	-1.44 °

<b>Well</b>	Piceance Federal 29-18W					
<b>Well Position</b>	<b>+N/-S</b>	0.0 usft	<b>Northing:</b>	1,523,557.78 usft	<b>Latitude:</b>	39.248489
	<b>+E/-W</b>	0.0 usft	<b>Easting:</b>	2,352,028.19 usft	<b>Longitude:</b>	-107.788336
<b>Position Uncertainty</b>		0.0 usft	<b>Wellhead Elevation:</b>	0.0 usft	<b>Ground Level:</b>	7,531.0 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>
	IGRF2015	12/29/2016	9.62	65.43	51,461

<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	232.51	

<b>Survey Program</b>	<b>Date</b>	5/19/2017			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
142.0	8,477.0	MWD Survey #1 (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 @ 142.0' MD / TVD</b>										
142.0	0.10	174.60	142.0	-0.1	0.0	0.1	0.07	0.07	0.00	
204.0	0.30	99.60	204.0	-0.2	0.2	0.0	0.47	0.32	-120.97	
296.0	2.30	246.40	296.0	-1.0	-1.3	1.6	2.78	2.17	159.57	
387.0	5.50	242.00	386.8	-3.8	-6.8	7.7	3.53	3.52	-4.84	
479.0	8.50	240.90	478.1	-9.1	-16.6	18.8	3.26	3.26	-1.20	
570.0	11.90	235.90	567.6	-17.7	-30.3	34.8	3.86	3.74	-5.49	
661.0	14.90	232.40	656.1	-30.1	-47.3	55.9	3.41	3.30	-3.85	
753.0	17.70	232.20	744.4	-45.9	-67.8	81.7	3.04	3.04	-0.22	
844.0	20.30	233.00	830.5	-63.8	-91.3	111.3	2.87	2.86	0.88	



Survey Report



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<b>Site:</b>	Gunderson 29-09 Pad	<b>MD Reference:</b>	well @ 7561.0usft (H&P #522)
<b>Well:</b>	Piceance Federal 29-18W	<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>	EDM5002

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)	
936.0	22.70	232.00	916.0	-84.4	-118.0	145.0	2.64	2.61	-1.09	
1,030.0	25.60	232.20	1,001.8	-108.0	-148.4	183.5	3.09	3.09	0.21	
1,124.0	27.60	231.00	1,085.9	-134.2	-181.4	225.5	2.20	2.13	-1.28	
1,218.0	30.20	231.20	1,168.1	-162.7	-216.7	271.0	2.77	2.77	0.21	
1,312.0	33.00	231.60	1,248.2	-193.4	-255.2	320.2	2.99	2.98	0.43	
1,407.0	34.00	231.10	1,327.4	-226.2	-296.1	372.6	1.09	1.05	-0.53	
1,496.0	34.60	232.30	1,400.9	-257.2	-335.5	422.8	1.02	0.67	1.35	
1,656.0	34.60	230.90	1,532.6	-313.7	-406.7	513.6	0.50	0.00	-0.88	
1,750.0	34.30	229.90	1,610.2	-347.6	-447.7	566.7	0.68	-0.32	-1.06	
1,844.0	34.00	229.00	1,687.9	-381.9	-487.8	619.4	0.63	-0.32	-0.96	
1,939.0	33.50	229.50	1,766.9	-416.3	-527.8	672.1	0.60	-0.53	0.53	
2,033.0	33.80	231.60	1,845.2	-449.4	-568.0	724.2	1.28	0.32	2.23	
2,127.0	34.70	232.30	1,922.9	-482.0	-609.6	777.1	1.05	0.96	0.74	
2,221.0	34.20	231.90	2,000.4	-514.7	-651.6	830.3	0.58	-0.53	-0.43	
2,316.0	34.40	232.40	2,078.9	-547.5	-693.9	883.8	0.36	0.21	0.53	
2,410.0	33.60	232.30	2,156.8	-579.6	-735.5	936.3	0.85	-0.85	-0.11	
2,504.0	34.00	231.60	2,234.9	-611.9	-776.7	988.6	0.59	0.43	-0.74	
2,599.0	34.40	230.80	2,313.5	-645.3	-818.3	1,042.0	0.63	0.42	-0.84	
2,693.0	34.80	231.40	2,390.9	-678.8	-859.8	1,095.4	0.56	0.43	0.64	
2,787.0	33.50	231.50	2,468.7	-711.7	-901.1	1,148.1	1.38	-1.38	0.11	
2,881.0	34.10	232.40	2,546.8	-743.9	-942.3	1,200.4	0.83	0.64	0.96	
2,976.0	34.00	233.20	2,625.5	-776.1	-984.6	1,253.6	0.48	-0.11	0.84	
3,070.0	34.70	234.40	2,703.1	-807.4	-1,027.4	1,306.6	1.04	0.74	1.28	
3,164.0	34.20	233.90	2,780.6	-838.6	-1,070.5	1,359.8	0.61	-0.53	-0.53	
3,258.0	33.90	234.10	2,858.5	-869.5	-1,113.1	1,412.4	0.34	-0.32	0.21	
3,352.0	33.00	233.70	2,936.9	-900.0	-1,155.0	1,464.2	0.99	-0.96	-0.43	
3,447.0	33.50	234.40	3,016.4	-930.6	-1,197.1	1,516.3	0.66	0.53	0.74	
3,541.0	34.20	234.40	3,094.4	-961.1	-1,239.7	1,568.6	0.74	0.74	0.00	
3,635.0	33.80	233.90	3,172.4	-991.9	-1,282.3	1,621.1	0.52	-0.43	-0.53	
3,729.0	33.20	233.60	3,250.7	-1,022.5	-1,324.2	1,673.0	0.66	-0.64	-0.32	
3,824.0	34.00	233.30	3,329.9	-1,053.8	-1,366.4	1,725.6	0.86	0.84	-0.32	
3,918.0	34.80	233.00	3,407.4	-1,085.7	-1,408.9	1,778.7	0.87	0.85	-0.32	
4,012.0	34.30	232.20	3,484.9	-1,118.1	-1,451.2	1,832.0	0.72	-0.53	-0.85	
4,106.0	33.50	231.70	3,562.9	-1,150.4	-1,492.5	1,884.4	0.90	-0.85	-0.53	
4,201.0	34.60	231.10	3,641.6	-1,183.6	-1,534.1	1,937.6	1.21	1.16	-0.63	
4,295.0	34.00	229.90	3,719.2	-1,217.3	-1,575.0	1,990.5	0.96	-0.64	-1.28	
4,389.0	34.20	230.50	3,797.1	-1,251.0	-1,615.5	2,043.2	0.42	0.21	0.64	
4,484.0	34.80	231.20	3,875.4	-1,285.0	-1,657.2	2,097.0	0.76	0.63	0.74	
4,578.0	33.80	231.40	3,953.0	-1,318.1	-1,698.5	2,149.9	1.07	-1.06	0.21	
4,672.0	34.40	232.60	4,030.9	-1,350.5	-1,740.1	2,202.6	0.96	0.64	1.28	
4,767.0	33.90	232.00	4,109.5	-1,383.1	-1,782.3	2,256.0	0.63	-0.53	-0.63	
4,861.0	33.40	230.40	4,187.7	-1,415.8	-1,822.8	2,308.0	1.08	-0.53	-1.70	
4,955.0	32.80	233.00	4,266.5	-1,447.6	-1,863.1	2,359.3	1.64	-0.64	2.77	



Survey Report



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<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM5002

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)	
5,049.0	31.50	232.60	4,346.1	-1,477.8	-1,903.0	2,409.4	1.40	-1.38	-0.43	
5,144.0	30.40	232.60	4,427.5	-1,507.5	-1,941.8	2,458.2	1.16	-1.16	0.00	
5,238.0	29.30	232.20	4,509.1	-1,536.0	-1,978.8	2,505.0	1.19	-1.17	-0.43	
5,332.0	28.90	232.20	4,591.2	-1,564.1	-2,015.0	2,550.7	0.43	-0.43	0.00	
5,426.0	27.20	233.20	4,674.2	-1,590.9	-2,050.1	2,594.9	1.88	-1.81	1.06	
5,521.0	25.20	233.60	4,759.4	-1,615.9	-2,083.8	2,636.9	2.11	-2.11	0.42	
5,615.0	23.00	235.80	4,845.2	-1,638.1	-2,115.1	2,675.2	2.53	-2.34	2.34	
5,709.0	21.00	235.10	4,932.3	-1,658.0	-2,144.1	2,710.4	2.15	-2.13	-0.74	
5,803.0	19.80	234.30	5,020.4	-1,677.0	-2,170.8	2,743.1	1.31	-1.28	-0.85	
5,897.0	18.30	233.40	5,109.3	-1,695.0	-2,195.6	2,773.8	1.63	-1.60	-0.96	
5,992.0	17.00	233.40	5,199.8	-1,712.2	-2,218.7	2,802.6	1.37	-1.37	0.00	
6,086.0	15.70	233.60	5,290.0	-1,728.0	-2,240.0	2,829.0	1.38	-1.38	0.21	
6,180.0	13.60	233.00	5,381.0	-1,742.2	-2,259.1	2,852.8	2.24	-2.23	-0.64	
6,274.0	12.00	236.20	5,472.6	-1,754.2	-2,276.0	2,873.6	1.86	-1.70	3.40	
6,369.0	10.90	238.80	5,565.7	-1,764.4	-2,291.9	2,892.4	1.28	-1.16	2.74	
6,463.0	8.90	237.30	5,658.3	-1,772.9	-2,305.6	2,908.5	2.15	-2.13	-1.60	
6,557.0	6.40	235.00	5,751.5	-1,779.9	-2,316.0	2,921.0	2.68	-2.66	-2.45	
6,652.0	4.80	231.90	5,846.0	-1,785.4	-2,323.5	2,930.2	1.71	-1.68	-3.26	
6,746.0	3.40	213.90	5,939.8	-1,790.1	-2,328.2	2,936.8	2.01	-1.49	-19.15	
6,840.0	1.80	202.30	6,033.7	-1,793.8	-2,330.3	2,940.7	1.78	-1.70	-12.34	
6,934.0	0.90	173.30	6,127.7	-1,795.9	-2,330.8	2,942.4	1.17	-0.96	-30.85	
7,029.0	1.00	162.50	6,222.7	-1,797.4	-2,330.4	2,943.0	0.22	0.11	-11.37	
7,123.0	1.10	167.30	6,316.6	-1,799.1	-2,330.0	2,943.7	0.14	0.11	5.11	
7,217.0	1.10	171.10	6,410.6	-1,800.8	-2,329.6	2,944.5	0.08	0.00	4.04	
7,311.0	1.00	179.30	6,504.6	-1,802.6	-2,329.5	2,945.4	0.19	-0.11	8.72	
7,405.0	1.90	186.60	6,598.6	-1,804.9	-2,329.7	2,947.0	0.98	0.96	7.77	
7,499.0	1.90	189.90	6,692.5	-1,808.0	-2,330.1	2,949.2	0.12	0.00	3.51	
7,594.0	2.40	198.00	6,787.5	-1,811.4	-2,331.0	2,952.0	0.61	0.53	8.53	
7,688.0	2.40	204.80	6,881.4	-1,815.1	-2,332.4	2,955.4	0.30	0.00	7.23	
7,782.0	2.50	208.60	6,975.3	-1,818.7	-2,334.2	2,959.0	0.20	0.11	4.04	
7,876.0	3.30	192.40	7,069.2	-1,823.1	-2,335.8	2,963.0	1.21	0.85	-17.23	
7,970.0	3.60	192.30	7,163.0	-1,828.7	-2,337.0	2,967.3	0.32	0.32	-0.11	
8,065.0	3.00	203.50	7,257.8	-1,833.9	-2,338.6	2,971.7	0.92	-0.63	11.79	
8,159.0	3.40	211.50	7,351.7	-1,838.5	-2,341.1	2,976.5	0.64	0.43	8.51	
8,253.0	3.40	221.50	7,445.5	-1,842.9	-2,344.4	2,981.8	0.63	0.00	10.64	
8,347.0	3.30	224.10	7,539.4	-1,847.0	-2,348.1	2,987.2	0.19	-0.11	2.77	
8,429.0	3.20	222.40	7,621.2	-1,850.4	-2,351.3	2,991.8	0.17	-0.12	-2.07	
<b>Projection to TD @ 8477.0' MD / 7669.2' TVD</b>										
8,477.0	3.20	222.40	7,669.2	-1,852.3	-2,353.1	2,994.5	0.00	0.00	0.00	



Survey Report



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<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM5002

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
142.0	142.0	-0.1	0.0	First MWD Survey @ 142.0' MD / TVD
8,477.0	7,669.2	-1,852.3	-2,353.1	Projection to TD @ 8477.0' MD / 7669.2' TVD

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