



# **Laramie Energy, LLC**

**Mesa County, CO**

**Gunderson 13-11 Pad**

**Gunderson 0994-13-16W**

**Wellbore #1**

**Design: Wellbore #1**

## **QES Survey Report**

**11 May, 2018**





# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well Gunderson 0994-13-16W
<b>Project:</b>	Mesa County, CO	<b>TVD Reference:</b>	well @ 7302.0usft (H&P #522)
<b>Site:</b>	Gunderson 13-11 Pad	<b>MD Reference:</b>	well @ 7302.0usft (H&P #522)
<b>Well:</b>	Gunderson 0994-13-16W	<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 13-11 Pad							
Site Position:		Northing:	1,533,162.26	usft	Latitude:	39.273948			
From:	Lat/Long	Easting:	2,339,102.68	usft	Longitude:	-107.834835			
Position Uncertainty:		0.0	usft	Slot Radius:	13-3/16	"	Grid Convergence:	-1.47	°

Well	Gunderson 0994-13-16W					
Well Position	+N/-S	0.0 usft	Northing:	1,533,109.50 usft	Latitude:	39.273799
	+E/-W	0.0 usft	Easting:	2,339,049.41 usft	Longitude:	-107.835018
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	7,272.0 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	4/24/2018	9.44	65.41	51,306.40000000

<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	190.91	

<b>Survey Program</b>	<b>Date</b>	5/11/2018			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
470.0	8,166.0	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 @ 470.0' MD / 469.9' TVD</b>										
470.0	1.90	222.10	469.9	-5.8	-5.2	6.7	0.40	0.40	0.00	
562.0	3.30	206.90	561.8	-9.3	-7.4	10.5	1.68	1.52	-16.52	
653.0	3.80	204.90	652.6	-14.3	-9.9	16.0	0.57	0.55	-2.20	
744.0	3.50	202.50	743.5	-19.6	-12.2	21.6	0.37	-0.33	-2.64	
835.0	3.80	206.60	834.3	-24.9	-14.6	27.2	0.44	0.33	4.51	
926.0	4.90	199.30	925.0	-31.3	-17.3	34.0	1.35	1.21	-8.02	
1,017.0	4.80	195.50	1,015.7	-38.6	-19.6	41.6	0.37	-0.11	-4.18	
1,112.0	4.90	186.20	1,110.3	-46.5	-21.1	49.6	0.83	0.11	-9.79	
1,206.0	5.50	184.80	1,204.0	-55.0	-21.9	58.1	0.65	0.64	-1.49	



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<b>Site:</b>	Gunderson 13-11 Pad	<b>MD Reference:</b>	well @ 7302.0usft (H&P #522)
<b>Well:</b>	Gunderson 0994-13-16W	<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)
1,300.0	5.60	189.00	1,297.5	-64.0	-23.0	67.2	0.44	0.11	4.47
1,394.0	5.50	188.10	1,391.1	-73.0	-24.3	76.3	0.14	-0.11	-0.96
1,488.0	5.20	189.50	1,484.7	-81.6	-25.7	85.0	0.35	-0.32	1.49
1,525.0	5.30	184.80	1,521.5	-85.0	-26.1	88.4	1.19	0.27	-12.70
1,677.0	5.40	196.70	1,672.9	-98.8	-28.7	102.5	0.73	0.07	7.83
1,771.0	5.50	194.70	1,766.4	-107.4	-31.2	111.4	0.23	0.11	-2.13
1,865.0	5.10	192.30	1,860.0	-115.9	-33.2	120.0	0.49	-0.43	-2.55
1,960.0	5.00	194.30	1,954.7	-124.0	-35.1	128.4	0.21	-0.11	2.11
2,054.0	4.80	194.20	2,048.3	-131.8	-37.1	136.4	0.21	-0.21	-0.11
2,148.0	4.70	192.90	2,142.0	-139.3	-38.9	144.2	0.16	-0.11	-1.38
2,242.0	4.50	193.40	2,235.7	-146.7	-40.6	151.7	0.22	-0.21	0.53
2,336.0	2.40	147.70	2,329.5	-151.9	-40.4	156.8	3.52	-2.23	-48.62
2,430.0	2.60	147.30	2,423.4	-155.4	-38.2	159.8	0.21	0.21	-0.43
2,524.0	2.40	149.50	2,517.4	-158.9	-36.1	162.8	0.24	-0.21	2.34
2,618.0	2.40	145.50	2,611.3	-162.2	-34.0	165.7	0.18	0.00	-4.26
2,712.0	2.50	73.30	2,705.2	-163.2	-30.9	166.1	3.07	0.11	-76.81
2,807.0	2.60	62.50	2,800.1	-161.6	-27.0	163.8	0.52	0.11	-11.37
2,901.0	2.80	62.10	2,894.0	-159.6	-23.1	161.1	0.21	0.21	-0.43
2,995.0	2.60	62.70	2,987.9	-157.5	-19.1	158.3	0.21	-0.21	0.64
3,089.0	2.50	58.40	3,081.8	-155.5	-15.5	155.6	0.23	-0.11	-4.57
3,184.0	2.40	63.70	3,176.7	-153.5	-12.0	153.0	0.26	-0.11	5.58
3,278.0	2.00	62.20	3,270.7	-151.9	-8.7	150.8	0.43	-0.43	-1.60
3,372.0	2.10	63.20	3,364.6	-150.3	-5.7	148.7	0.11	0.11	1.06
3,467.0	1.10	16.20	3,459.6	-148.7	-3.9	146.7	1.65	-1.05	-49.47
3,561.0	0.80	7.50	3,553.5	-147.2	-3.6	145.2	0.35	-0.32	-9.26
3,655.0	1.00	358.80	3,647.5	-145.7	-3.5	143.7	0.26	0.21	-9.26
3,749.0	0.80	5.00	3,741.5	-144.2	-3.5	142.3	0.24	-0.21	6.60
3,843.0	0.70	16.30	3,835.5	-143.0	-3.3	141.0	0.19	-0.11	12.02
3,938.0	0.20	268.40	3,930.5	-142.5	-3.3	140.5	0.83	-0.53	-113.58
4,032.0	0.30	279.40	4,024.5	-142.4	-3.7	140.5	0.12	0.11	11.70
4,126.0	0.40	331.40	4,118.5	-142.1	-4.1	140.3	0.34	0.11	55.32
4,220.0	0.50	331.60	4,212.5	-141.4	-4.4	139.7	0.11	0.11	0.21
4,315.0	0.50	302.70	4,307.5	-140.9	-5.0	139.3	0.26	0.00	-30.42
4,409.0	0.50	315.40	4,401.5	-140.3	-5.6	138.9	0.12	0.00	13.51
4,503.0	0.80	318.10	4,495.5	-139.6	-6.3	138.2	0.32	0.32	2.87
4,597.0	0.70	323.80	4,589.5	-138.6	-7.1	137.5	0.13	-0.11	6.06
4,692.0	0.50	179.90	4,684.5	-138.6	-7.5	137.5	1.20	-0.21	-151.47
4,786.0	0.70	214.00	4,778.5	-139.4	-7.8	138.4	0.43	0.21	36.28
4,880.0	1.10	222.30	4,872.5	-140.6	-8.7	139.7	0.45	0.43	8.83
4,974.0	1.20	212.50	4,966.4	-142.1	-9.8	141.4	0.23	0.11	-10.43
5,068.0	1.10	209.70	5,060.4	-143.7	-10.8	143.2	0.12	-0.11	-2.98
5,163.0	1.10	217.70	5,155.4	-145.2	-11.8	144.8	0.16	0.00	8.42
5,257.0	1.10	235.90	5,249.4	-146.4	-13.1	146.3	0.37	0.00	19.36



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Survey										
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5,351.0	1.40	238.00	5,343.4	-147.5	-14.9	147.7	0.32	0.32	2.23	
5,445.0	1.10	221.10	5,437.3	-148.8	-16.4	149.3	0.50	-0.32	-17.98	
5,539.0	1.40	223.70	5,531.3	-150.3	-17.8	151.0	0.32	0.32	2.77	
5,633.0	1.40	227.80	5,625.3	-151.9	-19.5	152.9	0.11	0.00	4.36	
5,728.0	1.80	229.30	5,720.3	-153.7	-21.4	155.0	0.42	0.42	1.58	
5,822.0	1.50	233.70	5,814.2	-155.4	-23.6	157.0	0.35	-0.32	4.68	
5,916.0	1.70	235.80	5,908.2	-156.9	-25.7	158.9	0.22	0.21	2.23	
6,010.0	1.80	234.40	6,002.1	-158.5	-28.1	161.0	0.12	0.11	-1.49	
6,104.0	1.70	238.70	6,096.1	-160.1	-30.4	163.0	0.18	-0.11	4.57	
6,198.0	1.10	214.10	6,190.1	-161.6	-32.1	164.8	0.89	-0.64	-26.17	
6,293.0	1.10	199.80	6,285.1	-163.2	-33.0	166.5	0.29	0.00	-15.05	
6,387.0	1.20	206.80	6,379.0	-164.9	-33.7	168.3	0.18	0.11	7.45	
6,481.0	1.30	231.70	6,473.0	-166.5	-35.0	170.1	0.58	0.11	26.49	
6,575.0	1.50	244.30	6,567.0	-167.7	-36.9	171.6	0.39	0.21	13.40	
6,669.0	1.60	241.30	6,660.9	-168.8	-39.2	173.2	0.14	0.11	-3.19	
6,764.0	1.10	235.10	6,755.9	-170.0	-41.1	174.7	0.55	-0.53	-6.53	
6,858.0	1.30	263.20	6,849.9	-170.6	-42.9	175.7	0.65	0.21	29.89	
6,952.0	1.40	261.70	6,943.9	-170.9	-45.1	176.4	0.11	0.11	-1.60	
7,046.0	1.20	257.20	7,037.9	-171.3	-47.2	177.2	0.24	-0.21	-4.79	
7,140.0	1.00	243.10	7,131.8	-171.9	-48.9	178.1	0.36	-0.21	-15.00	
7,235.0	0.60	248.90	7,226.8	-172.5	-50.1	178.8	0.43	-0.42	6.11	
7,329.0	1.00	277.20	7,320.8	-172.5	-51.4	179.1	0.59	0.43	30.11	
7,423.0	1.10	270.70	7,414.8	-172.4	-53.1	179.4	0.17	0.11	-6.91	
7,517.0	1.00	269.30	7,508.8	-172.4	-54.8	179.7	0.11	-0.11	-1.49	
7,611.0	1.60	262.50	7,602.8	-172.6	-56.9	180.3	0.66	0.64	-7.23	
7,706.0	1.70	257.10	7,697.7	-173.1	-59.6	181.2	0.19	0.11	-5.68	
7,800.0	1.80	246.70	7,791.7	-174.0	-62.3	182.6	0.35	0.11	-11.06	
7,894.0	2.10	249.60	7,885.6	-175.2	-65.3	184.4	0.34	0.32	3.09	
7,988.0	2.20	249.40	7,979.6	-176.4	-68.6	186.2	0.11	0.11	-0.21	
8,082.0	2.20	246.50	8,073.5	-177.8	-71.9	188.2	0.12	0.00	-3.09	
8,106.0	2.30	246.60	8,097.5	-178.1	-72.8	188.7	0.42	0.42	0.42	
Projection to TD @ 8166.0' MD / 8157.4' TVD										
8,166.0	2.30	246.60	8,157.4	-179.1	-75.0	190.1	0.00	0.00	0.00	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
470.0	469.9	-5.8	-5.2	First MWD Survey @ 470.0' MD / 469.9' TVD	
8,166.0	8,157.4	-179.1	-75.0	Projection to TD @ 8166.0' MD / 8157.4' TVD	

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