



# **Laramie Energy, LLC**

**Mesa County, CO**

**Gunderson 13-11 Pad**

**Gunderson 0994-13-10W**

**Wellbore #1**

**Design: Wellbore #1**

## **QES Survey Report**

**12 March, 2018**





# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well Gunderson 0994-13-10W
<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 0994-13-10W	<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 0994-13-10W					
Well Position	+N/-S	0.0 usft	Northing:	1,533,151.76 usft	Latitude:	39.273918
	+E/-W	0.0 usft	Easting:	2,339,092.13 usft	Longitude:	-107.834871
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	3/6/2018	9.45	65.41	51,321.90000000

<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	355.66	

<b>Survey Program</b>	<b>Date</b>	3/12/2018			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
323.0	7,767.0	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 @ 323.0' MD / 322.6' TVD</b>									
323.0	4.70	358.70	322.6	13.2	-0.3	13.2	1.46	1.46	0.00
384.0	7.10	1.40	383.3	19.5	-0.3	19.5	3.96	3.93	4.43
475.0	9.40	0.40	473.4	32.6	-0.1	32.5	2.53	2.53	-1.10
567.0	11.60	345.40	563.8	49.0	-2.4	49.1	3.80	2.39	-16.30
657.0	14.10	347.80	651.6	68.5	-7.0	68.8	2.84	2.78	2.67
748.0	16.10	350.60	739.4	91.8	-11.4	92.4	2.34	2.20	3.08
840.0	19.00	351.30	827.1	119.2	-15.7	120.0	3.16	3.15	0.76
931.0	19.70	0.00	913.0	149.2	-17.9	150.1	3.26	0.77	9.56
1,022.0	18.30	356.50	999.1	178.8	-18.8	179.7	1.98	-1.54	-3.85



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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 0994-13-10W	<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)
1,116.0	15.60	354.20	1,089.0	206.1	-21.0	207.1	2.96	-2.87	-2.45
1,210.0	15.30	353.50	1,179.6	231.0	-23.7	232.1	0.38	-0.32	-0.74
1,304.0	15.00	354.60	1,270.3	255.4	-26.2	256.7	0.44	-0.32	1.17
1,399.0	14.60	357.20	1,362.2	279.6	-28.0	280.9	0.82	-0.42	2.74
1,493.0	15.50	357.40	1,452.9	304.0	-29.1	305.3	0.96	0.96	0.21
1,509.0	15.80	357.10	1,468.3	308.3	-29.3	309.6	1.94	1.88	-1.88
1,603.0	15.60	358.80	1,558.8	333.7	-30.2	335.1	0.53	-0.21	1.81
1,697.0	15.30	358.60	1,649.4	358.8	-30.8	360.1	0.32	-0.32	-0.21
1,791.0	15.00	357.50	1,740.2	383.3	-31.6	384.6	0.44	-0.32	-1.17
1,885.0	15.80	358.90	1,830.8	408.3	-32.4	409.5	0.94	0.85	1.49
1,979.0	15.40	358.20	1,921.3	433.5	-33.1	434.8	0.47	-0.43	-0.74
2,073.0	14.90	357.40	2,012.1	458.1	-34.0	459.3	0.58	-0.53	-0.85
2,167.0	15.50	359.10	2,102.8	482.7	-34.7	483.9	0.80	0.64	1.81
2,262.0	14.70	358.10	2,194.5	507.4	-35.3	508.7	0.89	-0.84	-1.05
2,356.0	16.20	356.40	2,285.1	532.5	-36.6	533.7	1.67	1.60	-1.81
2,450.0	15.40	355.60	2,375.5	558.0	-38.3	559.3	0.88	-0.85	-0.85
2,544.0	14.50	355.50	2,466.4	582.2	-40.2	583.5	0.96	-0.96	-0.11
2,638.0	16.40	356.40	2,557.0	607.1	-42.0	608.6	2.04	2.02	0.96
2,733.0	16.10	356.40	2,648.2	633.7	-43.6	635.2	0.32	-0.32	0.00
2,827.0	15.60	354.20	2,738.6	659.3	-45.7	660.8	0.83	-0.53	-2.34
2,921.0	15.20	353.30	2,829.2	684.1	-48.5	685.8	0.50	-0.43	-0.96
3,016.0	16.40	355.60	2,920.6	709.8	-50.9	711.6	1.42	1.26	2.42
3,110.0	16.00	354.10	3,010.9	735.9	-53.3	737.8	0.62	-0.43	-1.60
3,204.0	15.70	353.00	3,101.3	761.4	-56.2	763.5	0.45	-0.32	-1.17
3,298.0	16.10	355.50	3,191.7	787.1	-58.7	789.2	0.84	0.43	2.66
3,392.0	16.00	355.00	3,282.1	813.0	-60.9	815.2	0.18	-0.11	-0.53
3,487.0	15.50	354.60	3,373.5	838.6	-63.2	841.0	0.54	-0.53	-0.42
3,581.0	16.30	0.40	3,463.9	864.3	-64.3	866.7	1.89	0.85	6.17
3,675.0	15.90	359.20	3,554.2	890.4	-64.4	892.7	0.55	-0.43	-1.28
3,769.0	15.20	357.90	3,644.8	915.6	-65.0	917.9	0.83	-0.74	-1.38
3,864.0	14.90	357.00	3,736.5	940.2	-66.1	942.5	0.40	-0.32	-0.95
3,958.0	16.20	356.60	3,827.1	965.4	-67.5	967.7	1.39	1.38	-0.43
4,052.0	15.40	355.30	3,917.5	990.9	-69.3	993.3	0.93	-0.85	-1.38
4,146.0	14.90	354.40	4,008.2	1,015.4	-71.5	1,017.9	0.59	-0.53	-0.96
4,241.0	16.10	355.20	4,099.8	1,040.7	-73.8	1,043.3	1.28	1.26	0.84
4,335.0	15.80	353.10	4,190.2	1,066.4	-76.5	1,069.1	0.69	-0.32	-2.23
4,429.0	15.10	352.10	4,280.8	1,091.2	-79.7	1,094.1	0.80	-0.74	-1.06
4,523.0	14.00	352.20	4,371.8	1,114.6	-82.9	1,117.7	1.17	-1.17	0.11
4,617.0	13.80	352.80	4,463.0	1,137.0	-85.9	1,140.2	0.26	-0.21	0.64
4,712.0	13.00	358.00	4,555.4	1,158.9	-87.7	1,162.2	1.52	-0.84	5.47
4,806.0	14.30	3.00	4,646.8	1,181.1	-87.4	1,184.3	1.87	1.38	5.32
4,900.0	15.40	2.90	4,737.6	1,205.1	-86.2	1,208.2	1.17	1.17	-0.11
4,994.0	13.40	1.50	4,828.7	1,228.5	-85.3	1,231.4	2.16	-2.13	-1.49



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Survey										
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5,088.0	13.80	0.80	4,920.0	1,250.6	-84.8	1,253.4	0.46	0.43	-0.74	
5,182.0	12.10	1.00	5,011.6	1,271.6	-84.5	1,274.4	1.81	-1.81	0.21	
5,277.0	11.20	0.90	5,104.7	1,290.8	-84.2	1,293.5	0.95	-0.95	-0.11	
5,371.0	10.40	1.00	5,197.0	1,308.4	-83.9	1,311.0	0.85	-0.85	0.11	
5,465.0	9.50	359.60	5,289.6	1,324.7	-83.8	1,327.2	0.99	-0.96	-1.49	
5,559.0	8.70	356.90	5,382.4	1,339.5	-84.2	1,342.1	0.96	-0.85	-2.87	
5,653.0	7.10	354.00	5,475.5	1,352.4	-85.2	1,355.0	1.75	-1.70	-3.09	
5,747.0	6.40	347.60	5,568.9	1,363.3	-87.0	1,366.0	1.09	-0.74	-6.81	
5,842.0	5.00	352.20	5,663.4	1,372.6	-88.7	1,375.3	1.55	-1.47	4.84	
5,936.0	2.60	342.30	5,757.2	1,378.7	-89.9	1,381.5	2.64	-2.55	-10.53	
6,030.0	2.10	313.60	5,851.1	1,381.9	-91.7	1,384.9	1.34	-0.53	-30.53	
6,124.0	1.90	315.00	5,945.1	1,384.2	-94.1	1,387.3	0.22	-0.21	1.49	
6,219.0	1.80	312.90	6,040.0	1,386.3	-96.3	1,389.6	0.13	-0.11	-2.21	
6,313.0	1.50	302.70	6,134.0	1,388.0	-98.4	1,391.4	0.45	-0.32	-10.85	
6,407.0	1.30	292.80	6,227.9	1,389.0	-100.4	1,392.7	0.33	-0.21	-10.53	
6,501.0	1.70	289.30	6,321.9	1,389.9	-102.7	1,393.7	0.44	0.43	-3.72	
6,595.0	1.40	274.10	6,415.9	1,390.5	-105.2	1,394.4	0.54	-0.32	-16.17	
6,689.0	1.50	279.50	6,509.8	1,390.7	-107.6	1,394.9	0.18	0.11	5.74	
6,783.0	1.50	267.20	6,603.8	1,390.9	-110.0	1,395.2	0.34	0.00	-13.09	
6,878.0	1.40	259.30	6,698.8	1,390.6	-112.4	1,395.1	0.24	-0.11	-8.32	
6,972.0	1.60	245.00	6,792.7	1,389.8	-114.7	1,394.5	0.45	0.21	-15.21	
7,066.0	1.80	239.90	6,886.7	1,388.5	-117.2	1,393.4	0.27	0.21	-5.43	
7,160.0	2.10	243.20	6,980.7	1,387.0	-120.0	1,392.1	0.34	0.32	3.51	
7,255.0	1.80	242.30	7,075.6	1,385.6	-122.9	1,390.9	0.32	-0.32	-0.95	
7,349.0	1.40	245.40	7,169.6	1,384.4	-125.2	1,389.9	0.44	-0.43	3.30	
7,443.0	1.20	243.30	7,263.5	1,383.5	-127.1	1,389.1	0.22	-0.21	-2.23	
7,537.0	1.60	245.70	7,357.5	1,382.5	-129.2	1,388.3	0.43	0.43	2.55	
7,632.0	1.20	250.20	7,452.5	1,381.6	-131.4	1,387.6	0.44	-0.42	4.74	
7,707.0	1.60	248.60	7,527.5	1,381.0	-133.1	1,387.1	0.54	0.53	-2.13	
Projection to TD @ 7767.0' MD / 7587.4' TVD										
7,767.0	1.60	248.60	7,587.4	1,380.3	-134.6	1,386.6	0.00	0.00	0.00	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
323.0	322.6	13.2	-0.3	First MWD Survey @ 323.0' MD / 322.6' TVD	
7,767.0	7,587.4	1,380.3	-134.6	Projection to TD @ 7767.0' MD / 7587.4' TVD	