



# **Laramie Energy, LLC**

**Mesa County, CO**

**Gunderson 13-11 Pad**

**Gunderson 0994-13-05W**

**Wellbore #1**

**Design: Wellbore #1**

## **QES Survey Report**

**28 February, 2018**





# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well Gunderson 0994-13-05W
<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 0994-13-05W	<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 0994-13-05W					
Well Position	+N/-S	0.0 usft	Northing:	1,533,155.31 usft	Latitude:	39.273929
	+E/-W	0.0 usft	Easting:	2,339,109.77 usft	Longitude:	-107.834809
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	2/15/2018	9.46	65.41	51,327.90000000

<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	356.53	

<b>Survey Program</b>	<b>Date</b>	2/28/2018			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
111.0	8,220.0	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 @ 111.0' MD / 111.0' TVD</b>									
111.0	0.50	234.40	111.0	-0.3	-0.4	-0.3	0.45	0.45	0.00
202.0	0.80	52.30	202.0	-0.1	-0.2	-0.1	1.43	0.33	195.49
293.0	2.60	35.50	293.0	1.9	1.5	1.9	2.03	1.98	-18.46
384.0	4.90	27.50	383.8	7.1	4.5	6.8	2.59	2.53	-8.79
475.0	7.30	22.10	474.2	15.9	8.5	15.3	2.71	2.64	-5.93
567.0	10.20	15.80	565.2	29.1	12.9	28.3	3.32	3.15	-6.85
657.0	12.80	11.40	653.3	46.6	17.0	45.5	3.05	2.89	-4.89
748.0	15.60	6.90	741.6	68.6	20.5	67.2	3.31	3.08	-4.95
840.0	18.50	3.50	829.5	95.5	22.9	93.9	3.33	3.15	-3.70



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<b>Well:</b>	Gunderson 0994-13-05W	<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)
931.0	21.70	359.70	915.0	126.7	23.6	125.0	3.80	3.52	-4.18
1,022.0	24.90	356.90	998.5	162.7	22.5	161.0	3.72	3.52	-3.08
1,116.0	27.80	357.00	1,082.7	204.3	20.3	202.7	3.09	3.09	0.11
1,210.0	28.30	357.20	1,165.7	248.5	18.1	246.9	0.54	0.53	0.21
1,304.0	28.80	356.70	1,248.3	293.3	15.7	291.9	0.59	0.53	-0.53
1,399.0	29.40	357.20	1,331.3	339.5	13.2	338.1	0.68	0.63	0.53
1,501.0	29.30	357.40	1,420.2	389.4	10.9	388.0	0.14	-0.10	0.20
1,611.0	29.20	357.70	1,516.2	443.1	8.6	441.8	0.16	-0.09	0.27
1,705.0	29.70	356.10	1,598.0	489.3	6.1	488.0	0.99	0.53	-1.70
1,800.0	29.50	355.30	1,680.6	536.1	2.5	534.9	0.47	-0.21	-0.84
1,894.0	28.70	355.70	1,762.8	581.6	-1.0	580.6	0.88	-0.85	0.43
1,988.0	30.30	355.70	1,844.6	627.8	-4.5	626.9	1.70	1.70	0.00
2,082.0	29.60	354.60	1,926.0	674.5	-8.5	673.8	0.95	-0.74	-1.17
2,176.0	28.70	354.40	2,008.1	720.1	-12.9	719.6	0.96	-0.96	-0.21
2,270.0	30.80	355.50	2,089.7	766.6	-17.0	766.2	2.31	2.23	1.17
2,365.0	29.50	354.90	2,171.9	814.1	-20.9	813.9	1.40	-1.37	-0.63
2,459.0	28.30	354.50	2,254.2	859.4	-25.1	859.3	1.29	-1.28	-0.43
2,553.0	30.20	355.90	2,336.2	905.1	-29.0	905.2	2.15	2.02	1.49
2,648.0	29.40	355.70	2,418.6	952.2	-32.4	952.4	0.85	-0.84	-0.21
2,742.0	27.70	354.70	2,501.2	997.0	-36.2	997.3	1.88	-1.81	-1.06
2,836.0	27.60	355.00	2,584.4	1,040.4	-40.1	1,040.9	0.18	-0.11	0.32
2,930.0	28.70	357.00	2,667.3	1,084.7	-43.2	1,085.3	1.54	1.17	2.13
3,025.0	29.50	357.00	2,750.3	1,130.8	-45.6	1,131.5	0.84	0.84	0.00
3,119.0	29.90	356.20	2,832.0	1,177.3	-48.3	1,178.0	0.60	0.43	-0.85
3,213.0	29.20	355.60	2,913.7	1,223.5	-51.7	1,224.4	0.81	-0.74	-0.64
3,307.0	28.40	355.10	2,996.1	1,268.7	-55.3	1,269.7	0.89	-0.85	-0.53
3,401.0	28.70	355.00	3,078.7	1,313.4	-59.2	1,314.6	0.32	0.32	-0.11
3,496.0	30.10	355.50	3,161.5	1,359.9	-63.1	1,361.2	1.50	1.47	0.53
3,590.0	29.20	354.40	3,243.1	1,406.2	-67.1	1,407.7	1.12	-0.96	-1.17
3,684.0	29.90	355.10	3,324.9	1,452.4	-71.4	1,454.0	0.83	0.74	0.74
3,778.0	29.40	354.20	3,406.6	1,498.7	-75.7	1,500.5	0.71	-0.53	-0.96
3,873.0	30.80	356.50	3,488.8	1,546.1	-79.6	1,548.1	1.91	1.47	2.42
3,967.0	30.10	355.60	3,569.8	1,593.7	-82.8	1,595.8	0.89	-0.74	-0.96
4,061.0	29.40	355.20	3,651.4	1,640.2	-86.6	1,642.4	0.77	-0.74	-0.43
4,156.0	28.20	354.70	3,734.7	1,685.8	-90.6	1,688.1	1.29	-1.26	-0.53
4,250.0	28.60	356.90	3,817.4	1,730.3	-93.9	1,732.8	1.19	0.43	2.34
4,344.0	28.40	355.80	3,900.0	1,775.1	-96.7	1,777.7	0.60	-0.21	-1.17
4,438.0	29.70	356.50	3,982.2	1,820.6	-99.8	1,823.3	1.43	1.38	0.74
4,532.0	29.90	356.10	4,063.7	1,867.3	-102.8	1,870.1	0.30	0.21	-0.43
4,627.0	29.30	355.70	4,146.3	1,914.1	-106.2	1,917.0	0.66	-0.63	-0.42
4,720.0	28.50	353.80	4,227.8	1,958.8	-110.3	1,961.9	1.31	-0.86	-2.04
4,815.0	28.80	356.40	4,311.1	2,004.2	-114.1	2,007.4	1.35	0.32	2.74
4,909.0	29.00	356.70	4,393.4	2,049.5	-116.9	2,052.8	0.26	0.21	0.32



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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)	
5,003.0	29.00	356.40	4,475.6	2,095.0	-119.6	2,098.4	0.15	0.00	-0.32	
5,097.0	28.30	355.30	4,558.1	2,140.0	-122.9	2,143.5	0.93	-0.74	-1.17	
5,191.0	27.80	355.50	4,641.1	2,184.0	-126.4	2,187.7	0.54	-0.53	0.21	
5,285.0	26.20	354.60	4,724.8	2,226.5	-130.1	2,230.3	1.76	-1.70	-0.96	
5,379.0	25.00	354.80	4,809.6	2,267.0	-133.8	2,270.9	1.28	-1.28	0.21	
5,474.0	24.20	353.20	4,896.0	2,306.3	-138.0	2,310.4	1.10	-0.84	-1.68	
5,568.0	22.40	352.00	4,982.3	2,343.2	-142.7	2,347.5	1.98	-1.91	-1.28	
5,662.0	20.40	351.20	5,069.8	2,377.1	-147.7	2,381.7	2.15	-2.13	-0.85	
5,756.0	18.30	356.20	5,158.5	2,408.0	-151.2	2,412.8	2.84	-2.23	5.32	
5,850.0	16.20	358.30	5,248.3	2,435.9	-152.6	2,440.6	2.33	-2.23	2.23	
5,945.0	13.20	357.60	5,340.2	2,460.0	-153.4	2,464.7	3.16	-3.16	-0.74	
6,039.0	10.10	5.90	5,432.2	2,478.9	-153.0	2,483.6	3.74	-3.30	8.83	
6,133.0	7.80	11.20	5,525.1	2,493.3	-151.0	2,497.9	2.60	-2.45	5.64	
6,227.0	5.80	17.80	5,618.4	2,504.1	-148.3	2,508.5	2.28	-2.13	7.02	
6,322.0	4.90	18.80	5,713.0	2,512.5	-145.5	2,516.7	0.95	-0.95	1.05	
6,416.0	4.40	14.80	5,806.7	2,519.8	-143.3	2,523.9	0.63	-0.53	-4.26	
6,510.0	4.10	13.40	5,900.4	2,526.6	-141.6	2,530.5	0.34	-0.32	-1.49	
6,604.0	3.40	7.70	5,994.2	2,532.6	-140.4	2,536.5	0.84	-0.74	-6.06	
6,698.0	2.90	357.90	6,088.1	2,537.7	-140.1	2,541.6	0.78	-0.53	-10.43	
6,793.0	2.50	344.70	6,183.0	2,542.1	-140.8	2,546.0	0.78	-0.42	-13.89	
6,887.0	2.00	318.10	6,276.9	2,545.3	-142.4	2,549.3	1.22	-0.53	-28.30	
6,981.0	1.90	309.30	6,370.9	2,547.6	-144.7	2,551.6	0.34	-0.11	-9.36	
7,075.0	1.90	304.50	6,464.8	2,549.4	-147.2	2,553.7	0.17	0.00	-5.11	
7,169.0	1.40	270.20	6,558.8	2,550.3	-149.6	2,554.7	1.15	-0.53	-36.49	
7,264.0	1.10	270.50	6,653.7	2,550.3	-151.7	2,554.8	0.32	-0.32	0.32	
7,358.0	1.20	267.50	6,747.7	2,550.3	-153.6	2,554.9	0.12	0.11	-3.19	
7,452.0	1.40	276.20	6,841.7	2,550.4	-155.7	2,555.1	0.30	0.21	9.26	
7,546.0	1.80	287.50	6,935.7	2,550.9	-158.3	2,555.8	0.54	0.43	12.02	
7,641.0	1.30	254.90	7,030.6	2,551.1	-160.7	2,556.2	1.05	-0.53	-34.32	
7,735.0	1.60	254.30	7,124.6	2,550.5	-163.0	2,555.7	0.32	0.32	-0.64	
7,829.0	1.50	270.50	7,218.6	2,550.1	-165.5	2,555.5	0.48	-0.11	17.23	
7,923.0	1.60	277.60	7,312.5	2,550.3	-168.0	2,555.8	0.23	0.11	7.55	
8,018.0	1.70	275.50	7,407.5	2,550.6	-170.8	2,556.3	0.12	0.11	-2.21	
8,112.0	1.70	278.40	7,501.5	2,551.0	-173.5	2,556.8	0.09	0.00	3.09	
8,160.0	1.60	274.80	7,549.4	2,551.1	-174.9	2,557.0	0.30	-0.21	-7.50	
Projection to TD @ 8220.0' MD / 7609.4' TVD										
8,220.0	1.60	274.80	7,609.4	2,551.3	-176.6	2,557.3	0.00	0.00	0.00	



## Survey Report



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Design Annotations					
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		+N/-S (usft)	+E/-W (usft)	Comment	
111.0	111.0	-0.3	-0.4	First MWD Survey @ 111.0' MD / 111.0' TVD	
8,220.0	7,609.4	2,551.3	-176.6	Projection to TD @ 8220.0' MD / 7609.4' TVD	