



# **Laramie Energy, LLC**

**Mesa County, CO**

**Gunderson 13-11 Pad**

**Gunderson 0994-14-17E**

**Wellbore #1**

**Design: Wellbore #1**

## **QES Survey Report**

**01 May, 2018**





# Survey Report



<b>Company:</b>	Laramie Energy, LLC	<b>Local Co-ordinate Reference:</b>	Well Gunderson 0994-14-17E
<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 0994-14-17E	<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 0994-14-17E					
Well Position	+N/-S	0.0 usft	Northing:	1,533,114.83 usft	Latitude:	39.273814
	+E/-W	0.0 usft	Easting:	2,339,054.65 usft	Longitude:	-107.835000
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	4/20/2018	9.44	65.41	51,307.60000000

<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	258.01	

<b>Survey Program</b>	<b>Date</b>	5/1/2018			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
382.0	8,314.0	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 @ 382.0' MD / 380.4' TVD</b>									
382.0	9.10	257.10	380.4	-6.8	-29.5	30.3	2.38	2.38	0.00
473.0	9.80	257.50	470.2	-10.0	-44.1	45.2	0.77	0.77	0.44
564.0	10.20	257.90	559.8	-13.4	-59.5	61.0	0.45	0.44	0.44
655.0	13.10	257.80	648.9	-17.3	-77.5	79.4	3.19	3.19	-0.11
746.0	15.70	260.80	737.0	-21.4	-99.7	102.0	2.97	2.86	3.30
837.0	18.90	258.20	823.9	-26.4	-126.3	129.0	3.62	3.52	-2.86
929.0	22.10	255.60	910.1	-33.8	-157.7	161.2	3.62	3.48	-2.83
1,020.0	24.70	255.60	993.6	-42.7	-192.7	197.3	2.86	2.86	0.00
1,114.0	28.70	257.20	1,077.5	-52.6	-233.7	239.6	4.32	4.26	1.70



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<b>Well:</b>	Gunderson 0994-14-17E	<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)
1,208.0	31.90	257.60	1,158.7	-63.0	-280.0	287.0	3.41	3.40	0.43
1,302.0	33.00	259.60	1,238.0	-72.9	-329.4	337.4	1.63	1.17	2.13
1,397.0	33.00	259.50	1,317.7	-82.3	-380.3	389.1	0.06	0.00	-0.11
1,500.0	34.50	258.00	1,403.3	-93.5	-436.4	446.3	1.67	1.46	-1.46
1,602.0	34.90	258.50	1,487.2	-105.3	-493.3	504.4	0.48	0.39	0.49
1,696.0	33.90	257.40	1,564.7	-116.4	-545.2	557.5	1.25	-1.06	-1.17
1,790.0	35.40	258.30	1,642.1	-127.6	-597.5	610.9	1.69	1.60	0.96
1,884.0	35.10	258.80	1,718.8	-138.4	-650.6	665.2	0.44	-0.32	0.53
1,978.0	34.30	257.80	1,796.1	-149.3	-703.0	718.7	1.04	-0.85	-1.06
2,072.0	33.80	257.20	1,874.0	-160.6	-754.4	771.3	0.64	-0.53	-0.64
2,166.0	35.90	259.40	1,951.1	-171.5	-807.0	825.0	2.60	2.23	2.34
2,261.0	35.00	258.40	2,028.5	-182.1	-861.1	880.1	1.13	-0.95	-1.05
2,355.0	34.30	259.00	2,105.9	-192.6	-913.5	933.6	0.83	-0.74	0.64
2,449.0	33.70	257.90	2,183.8	-203.1	-965.0	986.1	0.91	-0.64	-1.17
2,543.0	32.20	257.40	2,262.7	-214.0	-1,014.9	1,037.3	1.62	-1.60	-0.53
2,638.0	33.80	260.20	2,342.3	-224.1	-1,065.7	1,089.0	2.33	1.68	2.95
2,732.0	32.00	259.10	2,421.3	-233.2	-1,115.9	1,140.0	2.02	-1.91	-1.17
2,826.0	33.50	259.50	2,500.3	-242.7	-1,165.9	1,190.8	1.61	1.60	0.43
2,920.0	34.50	259.00	2,578.2	-252.5	-1,217.5	1,243.4	1.10	1.06	-0.53
3,015.0	33.90	258.80	2,656.8	-262.7	-1,269.9	1,296.8	0.64	-0.63	-0.21
3,109.0	35.80	259.90	2,734.0	-272.7	-1,322.7	1,350.5	2.13	2.02	1.17
3,203.0	34.50	260.10	2,810.8	-282.0	-1,376.0	1,404.6	1.39	-1.38	0.21
3,297.0	33.50	260.70	2,888.7	-290.8	-1,427.8	1,457.1	1.12	-1.06	0.64
3,392.0	35.10	259.40	2,967.2	-300.1	-1,480.5	1,510.6	1.85	1.68	-1.37
3,486.0	33.60	259.80	3,044.8	-309.7	-1,532.7	1,563.6	1.61	-1.60	0.43
3,580.0	36.00	258.10	3,122.0	-320.0	-1,585.3	1,617.2	2.75	2.55	-1.81
3,674.0	34.80	258.40	3,198.6	-331.1	-1,638.7	1,671.7	1.29	-1.28	0.32
3,768.0	33.50	258.30	3,276.4	-341.7	-1,690.3	1,724.4	1.38	-1.38	-0.11
3,863.0	35.30	257.10	3,354.8	-353.2	-1,742.8	1,778.1	2.02	1.89	-1.26
3,957.0	34.20	257.20	3,432.0	-365.1	-1,795.0	1,831.7	1.17	-1.17	0.11
4,051.0	33.10	257.50	3,510.3	-376.5	-1,845.8	1,883.8	1.18	-1.17	0.32
4,145.0	34.90	257.90	3,588.2	-387.7	-1,897.2	1,936.3	1.93	1.91	0.43
4,240.0	34.00	258.00	3,666.5	-398.9	-1,949.7	1,990.1	0.95	-0.95	0.11
4,334.0	35.60	258.40	3,743.7	-409.9	-2,002.2	2,043.7	1.72	1.70	0.43
4,428.0	34.20	257.40	3,820.8	-421.1	-2,054.8	2,097.5	1.61	-1.49	-1.06
4,522.0	34.10	257.20	3,898.6	-432.7	-2,106.3	2,150.3	0.16	-0.11	-0.21
4,617.0	32.80	256.10	3,977.9	-444.8	-2,157.3	2,202.6	1.51	-1.37	-1.16
4,711.0	34.50	255.90	4,056.1	-457.4	-2,207.8	2,254.7	1.81	1.81	-0.21
4,805.0	34.00	258.80	4,133.8	-469.0	-2,259.4	2,307.5	1.82	-0.53	3.09
4,899.0	33.00	258.30	4,212.2	-479.3	-2,310.3	2,359.4	1.10	-1.06	-0.53
4,993.0	31.60	258.00	4,291.7	-489.6	-2,359.4	2,409.6	1.50	-1.49	-0.32
5,087.0	30.20	258.20	4,372.3	-499.6	-2,406.6	2,457.9	1.49	-1.49	0.21
5,182.0	29.00	256.90	4,454.9	-509.7	-2,452.5	2,504.8	1.43	-1.26	-1.37



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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)	
5,276.0	27.60	255.50	4,537.7	-520.3	-2,495.7	2,549.4	1.65	-1.49	-1.49	
5,370.0	25.80	254.30	4,621.7	-531.3	-2,536.5	2,591.5	2.00	-1.91	-1.28	
5,464.0	23.30	258.00	4,707.2	-540.7	-2,574.4	2,630.6	3.12	-2.66	3.94	
5,558.0	21.80	256.70	4,794.0	-548.6	-2,609.6	2,666.6	1.68	-1.60	-1.38	
5,652.0	18.10	258.00	4,882.3	-555.6	-2,640.9	2,698.7	3.96	-3.94	1.38	
5,747.0	15.70	260.80	4,973.2	-560.7	-2,668.0	2,726.3	2.67	-2.53	2.95	
5,841.0	14.30	260.30	5,064.0	-564.7	-2,692.0	2,750.6	1.50	-1.49	-0.53	
5,935.0	13.00	256.40	5,155.4	-569.2	-2,713.7	2,772.7	1.69	-1.38	-4.15	
6,029.0	10.60	262.50	5,247.4	-572.8	-2,732.6	2,791.9	2.87	-2.55	6.49	
6,123.0	8.30	263.90	5,340.1	-574.6	-2,747.9	2,807.3	2.46	-2.45	1.49	
6,218.0	4.40	267.40	5,434.5	-575.5	-2,758.3	2,817.7	4.12	-4.11	3.68	
6,312.0	1.50	272.80	5,528.3	-575.6	-2,763.2	2,822.5	3.10	-3.09	5.74	
6,406.0	0.10	170.60	5,622.3	-575.7	-2,764.4	2,823.7	1.62	-1.49	-108.72	
6,500.0	0.40	197.70	5,716.3	-576.0	-2,764.5	2,823.8	0.33	0.32	28.83	
6,594.0	1.00	230.60	5,810.3	-576.9	-2,765.2	2,824.7	0.74	0.64	35.00	
6,689.0	1.00	236.60	5,905.3	-577.9	-2,766.5	2,826.2	0.11	0.00	6.32	
6,783.0	1.50	224.80	5,999.3	-579.2	-2,768.1	2,828.0	0.60	0.53	-12.55	
6,877.0	1.90	227.90	6,093.2	-581.1	-2,770.1	2,830.4	0.44	0.43	3.30	
6,971.0	2.00	225.10	6,187.2	-583.3	-2,772.4	2,833.1	0.15	0.11	-2.98	
7,065.0	2.20	228.00	6,281.1	-585.7	-2,774.9	2,836.1	0.24	0.21	3.09	
7,160.0	2.60	234.30	6,376.0	-588.1	-2,778.0	2,839.6	0.50	0.42	6.63	
7,254.0	2.90	239.50	6,469.9	-590.6	-2,781.8	2,843.8	0.41	0.32	5.53	
7,348.0	3.20	229.80	6,563.8	-593.5	-2,785.9	2,848.4	0.63	0.32	-10.32	
7,442.0	2.10	199.30	6,657.7	-596.8	-2,788.4	2,851.6	1.86	-1.17	-32.45	
7,536.0	2.10	187.40	6,751.6	-600.2	-2,789.2	2,853.1	0.46	0.00	-12.66	
7,631.0	2.30	210.80	6,846.6	-603.5	-2,790.4	2,854.9	0.96	0.21	24.63	
7,725.0	2.10	191.10	6,940.5	-606.8	-2,791.7	2,856.9	0.83	-0.21	-20.96	
7,819.0	2.30	210.90	7,034.4	-610.1	-2,793.0	2,858.8	0.83	0.21	21.06	
7,913.0	2.50	224.20	7,128.4	-613.2	-2,795.4	2,861.8	0.63	0.21	14.15	
8,007.0	2.50	229.60	7,222.3	-616.0	-2,798.4	2,865.3	0.25	0.00	5.74	
8,101.0	2.30	232.70	7,316.2	-618.5	-2,801.5	2,868.9	0.25	-0.21	3.30	
8,195.0	2.50	238.80	7,410.1	-620.7	-2,804.7	2,872.5	0.34	0.21	6.49	
8,254.0	2.60	239.90	7,469.0	-622.0	-2,807.0	2,875.0	0.19	0.17	1.86	
Projection to Bit @ 8314.0' MD / 7529.0' TVD										
8,314.0	2.60	239.00	7,529.0	-623.4	-2,809.3	2,877.6	0.07	0.00	-1.50	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
382.0	380.4	-6.8	-29.5	First MWD Survey @ 382.0' MD / 380.4' TVD	
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Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_