



Laramie Energy, LLC

Mesa County, CO

Gunderson 13-11 Pad

Gunderson 0994-14-10E

Wellbore #1

Design: Wellbore #1

QES Survey Report

28 March, 2018





Survey Report



Company:	Laramie Energy, LLC	Local Co-ordinate Reference:	Well Gunderson 0994-14-10E
Project:	Mesa County, CO	TVD Reference:	well @ 7302.0usft (H&P #522)
Site:	Gunderson 13-11 Pad	MD Reference:	well @ 7302.0usft (H&P #522)
Well:	Gunderson 0994-14-10E	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Single User Db

Project	Mesa County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	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 0994-14-10E					
Well Position	+N/-S	0.0 usft	Northing:	1,533,141.10 usft	Latitude:	39.273888
	+E/-W	0.0 usft	Easting:	2,339,081.37 usft	Longitude:	-107.834908
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	7,272.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	User Defined	3/22/2018	9.45	65.41	51,316.80000000

Design	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	297.15	

Survey Program	Date	3/28/2018			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
472.0	8,870.0	QES MWD Surveys (Wellbore #1)	MWD default	MWD - Standard	

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)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
First MWD Survey @ 472.0' MD / 470.8' TVD									
472.0	7.00	307.40	470.8	17.5	-22.9	28.3	1.48	1.48	0.00
563.0	9.60	300.10	560.9	24.7	-33.8	41.4	3.08	2.86	-8.02
654.0	13.20	294.60	650.1	32.8	-49.9	59.3	4.13	3.96	-6.04
745.0	17.00	295.80	737.9	42.9	-71.3	83.0	4.19	4.18	1.32
836.0	20.10	296.00	824.2	55.6	-97.3	112.0	3.41	3.41	0.22
927.0	23.00	297.50	908.8	70.6	-127.2	145.4	3.24	3.19	1.65
1,018.0	25.60	295.80	991.7	87.4	-160.6	182.8	2.96	2.86	-1.87
1,113.0	29.80	294.70	1,075.8	106.2	-200.6	226.9	4.45	4.42	-1.16
1,207.0	33.40	293.40	1,155.9	126.2	-245.6	276.1	3.90	3.83	-1.38



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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)
1,301.0	33.40	296.30	1,234.4	148.0	-292.5	327.8	1.70	0.00	3.09
1,395.0	34.00	296.80	1,312.6	171.3	-339.2	380.0	0.70	0.64	0.53
1,490.0	34.20	295.40	1,391.2	194.7	-387.0	433.2	0.85	0.21	-1.47
1,512.0	34.00	295.30	1,409.4	200.0	-398.1	445.5	0.94	-0.91	-0.45
1,604.0	33.50	294.70	1,485.9	221.6	-444.5	496.6	0.65	-0.54	-0.65
1,698.0	34.20	295.60	1,564.0	243.9	-491.8	548.9	0.92	0.74	0.96
1,792.0	35.00	298.80	1,641.4	268.3	-539.3	602.3	2.11	0.85	3.40
1,886.0	34.50	298.70	1,718.6	294.0	-586.3	655.9	0.54	-0.53	-0.11
1,980.0	33.80	297.70	1,796.4	319.0	-632.8	708.6	0.95	-0.74	-1.06
2,074.0	34.80	299.80	1,874.1	344.5	-679.2	761.6	1.65	1.06	2.23
2,168.0	33.60	299.90	1,951.8	370.8	-725.0	814.3	1.28	-1.28	0.11
2,263.0	35.20	299.90	2,030.2	397.5	-771.6	867.9	1.68	1.68	0.00
2,357.0	34.00	299.10	2,107.6	423.8	-818.0	921.3	1.36	-1.28	-0.85
2,451.0	34.90	299.60	2,185.1	449.9	-864.4	974.4	1.00	0.96	0.53
2,545.0	35.90	299.60	2,261.7	476.8	-911.7	1,028.8	1.06	1.06	0.00
2,640.0	33.60	298.50	2,339.8	503.1	-959.0	1,082.9	2.51	-2.42	-1.16
2,734.0	34.60	297.00	2,417.6	527.6	-1,005.7	1,135.6	1.39	1.06	-1.60
2,828.0	35.90	297.80	2,494.4	552.6	-1,053.8	1,189.9	1.47	1.38	0.85
2,922.0	36.60	299.00	2,570.2	579.0	-1,102.7	1,245.4	1.06	0.74	1.28
3,017.0	35.70	299.90	2,646.9	606.6	-1,151.5	1,301.4	1.10	-0.95	0.95
3,111.0	36.90	299.00	2,722.6	633.9	-1,200.0	1,357.0	1.40	1.28	-0.96
3,205.0	36.30	297.40	2,798.1	660.4	-1,249.4	1,413.1	1.20	-0.64	-1.70
3,299.0	35.50	297.30	2,874.2	685.7	-1,298.3	1,468.2	0.85	-0.85	-0.11
3,393.0	34.90	297.00	2,951.0	710.5	-1,346.5	1,522.4	0.66	-0.64	-0.32
3,488.0	33.90	297.80	3,029.4	735.1	-1,394.2	1,576.0	1.16	-1.05	0.84
3,582.0	32.40	296.90	3,108.1	758.8	-1,439.8	1,627.4	1.68	-1.60	-0.96
3,676.0	33.00	297.50	3,187.2	782.0	-1,485.0	1,678.2	0.73	0.64	0.64
3,770.0	33.80	297.90	3,265.7	806.0	-1,530.8	1,730.0	0.88	0.85	0.43
3,865.0	34.50	298.90	3,344.3	831.4	-1,577.7	1,783.3	0.94	0.74	1.05
3,959.0	35.10	298.90	3,421.5	857.3	-1,624.7	1,836.9	0.64	0.64	0.00
4,053.0	36.10	298.50	3,497.9	883.6	-1,672.7	1,891.6	1.09	1.06	-0.43
4,147.0	35.90	297.60	3,574.0	909.6	-1,721.4	1,946.8	0.60	-0.21	-0.96
4,242.0	34.40	297.40	3,651.7	934.8	-1,770.0	2,001.5	1.58	-1.58	-0.21
4,336.0	36.30	296.10	3,728.3	959.3	-1,818.5	2,055.9	2.17	2.02	-1.38
4,430.0	36.10	296.30	3,804.2	983.8	-1,868.3	2,111.4	0.25	-0.21	0.21
4,524.0	35.00	296.10	3,880.7	1,007.9	-1,917.4	2,166.1	1.18	-1.17	-0.21
4,619.0	33.90	297.20	3,959.0	1,032.0	-1,965.4	2,219.8	1.33	-1.16	1.16
4,713.0	34.40	297.70	4,036.8	1,056.4	-2,012.2	2,272.6	0.61	0.53	0.53
4,807.0	33.20	295.50	4,114.9	1,079.8	-2,059.0	2,324.8	1.82	-1.28	-2.34
4,901.0	32.30	296.90	4,194.0	1,102.2	-2,104.6	2,375.7	1.25	-0.96	1.49
4,995.0	30.10	294.40	4,274.4	1,123.3	-2,148.5	2,424.3	2.72	-2.34	-2.66
5,089.0	28.40	298.30	4,356.4	1,143.7	-2,189.6	2,470.2	2.72	-1.81	4.15
5,183.0	29.70	298.90	4,438.6	1,165.5	-2,229.7	2,515.9	1.42	1.38	0.64



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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)	
5,278.0	28.40	299.00	4,521.6	1,187.9	-2,270.1	2,562.0	1.37	-1.37	0.11	
5,372.0	26.90	298.20	4,604.9	1,208.7	-2,308.4	2,605.6	1.64	-1.60	-0.85	
5,466.0	24.40	296.80	4,689.6	1,227.6	-2,344.4	2,646.3	2.74	-2.66	-1.49	
5,560.0	22.50	295.10	4,775.8	1,243.9	-2,378.1	2,683.7	2.15	-2.02	-1.81	
5,654.0	21.00	293.50	4,863.1	1,258.3	-2,409.8	2,718.4	1.72	-1.60	-1.70	
5,748.0	19.50	291.70	4,951.3	1,270.8	-2,439.8	2,750.9	1.73	-1.60	-1.91	
5,843.0	18.10	289.90	5,041.3	1,281.7	-2,468.4	2,781.3	1.60	-1.47	-1.89	
5,938.0	17.10	288.10	5,131.8	1,291.1	-2,495.6	2,809.7	1.20	-1.05	-1.89	
6,031.0	15.60	291.50	5,221.1	1,299.9	-2,520.2	2,835.7	1.91	-1.61	3.66	
6,125.0	13.30	298.00	5,312.1	1,309.6	-2,541.5	2,859.1	2.99	-2.45	6.91	
6,220.0	10.60	300.60	5,405.0	1,319.2	-2,558.7	2,878.7	2.90	-2.84	2.74	
6,314.0	7.30	301.80	5,497.9	1,326.7	-2,571.2	2,893.3	3.52	-3.51	1.28	
6,408.0	5.70	309.70	5,591.3	1,332.9	-2,579.9	2,903.8	1.95	-1.70	8.40	
6,502.0	4.30	330.60	5,684.9	1,338.9	-2,585.2	2,911.3	2.42	-1.49	22.23	
6,596.0	4.30	2.90	5,778.6	1,345.5	-2,586.8	2,915.7	2.54	0.00	34.36	
6,691.0	3.70	5.00	5,873.4	1,352.1	-2,586.3	2,918.3	0.65	-0.63	2.21	
6,785.0	3.60	1.80	5,967.2	1,358.1	-2,586.0	2,920.7	0.24	-0.11	-3.40	
6,879.0	3.30	357.90	6,061.1	1,363.7	-2,586.0	2,923.3	0.41	-0.32	-4.15	
6,973.0	2.90	347.40	6,154.9	1,368.8	-2,586.6	2,926.2	0.74	-0.43	-11.17	
7,067.0	2.50	340.90	6,248.8	1,373.0	-2,587.8	2,929.2	0.54	-0.43	-6.91	
7,162.0	2.60	328.70	6,343.7	1,376.8	-2,589.6	2,932.5	0.58	0.11	-12.84	
7,256.0	1.10	314.50	6,437.7	1,379.3	-2,591.3	2,935.2	1.66	-1.60	-15.11	
7,350.0	1.60	278.40	6,531.6	1,380.1	-2,593.3	2,937.3	1.02	0.53	-38.40	
7,444.0	1.90	265.40	6,625.6	1,380.2	-2,596.1	2,939.9	0.53	0.32	-13.83	
7,539.0	2.10	265.60	6,720.5	1,379.9	-2,599.4	2,942.7	0.21	0.21	0.21	
7,633.0	2.40	230.50	6,814.5	1,378.5	-2,602.6	2,944.9	1.47	0.32	-37.34	
7,727.0	3.00	228.80	6,908.4	1,375.6	-2,606.0	2,946.6	0.64	0.64	-1.81	
7,821.0	3.20	238.00	7,002.2	1,372.6	-2,610.1	2,948.9	0.57	0.21	9.79	
7,915.0	3.60	242.50	7,096.1	1,369.9	-2,614.9	2,951.9	0.51	0.43	4.79	
8,010.0	2.70	224.80	7,190.9	1,366.9	-2,619.2	2,954.3	1.38	-0.95	-18.63	
8,104.0	2.70	219.40	7,284.8	1,363.6	-2,622.1	2,955.5	0.27	0.00	-5.74	
8,198.0	2.70	220.90	7,378.7	1,360.2	-2,625.0	2,956.5	0.08	0.00	1.60	
8,293.0	2.70	226.50	7,473.6	1,357.0	-2,628.1	2,957.7	0.28	0.00	5.89	
8,387.0	2.70	232.00	7,567.5	1,354.1	-2,631.4	2,959.4	0.28	0.00	5.85	
8,481.0	2.70	232.00	7,661.4	1,351.4	-2,634.9	2,961.3	0.00	0.00	0.00	
8,575.0	2.60	235.20	7,755.3	1,348.8	-2,638.4	2,963.2	0.19	-0.11	3.40	
8,670.0	2.70	238.70	7,850.2	1,346.4	-2,642.1	2,965.4	0.20	0.11	3.68	
8,761.0	2.80	238.90	7,941.1	1,344.2	-2,645.8	2,967.7	0.11	0.11	0.22	
8,810.0	2.70	235.50	7,990.0	1,342.9	-2,647.8	2,968.8	0.39	-0.20	-6.94	
Projection to TD @ 8870.0' MD / 8050.0' TVD										
8,870.0	2.70	235.50	8,050.0	1,341.3	-2,650.1	2,970.2	0.00	0.00	0.00	



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Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Single User Db

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
472.0	470.8	17.5	-22.9	First MWD Survey @ 472.0' MD / 470.8' TVD
8,870.0	8,050.0	1,341.3	-2,650.1	Projection to TD @ 8870.0' MD / 8050.0' TVD