



Laramie Energy, LLC

Mesa County, CO

Gunderson 0993 21-05 Pad

BCU 0993-21-09E

Wellbore #1

Design: Wellbore #1

QES Survey Report

03 September, 2018





Survey Report



Company:	Laramie Energy, LLC	Local Co-ordinate Reference:	Well BCU 0993-21-09E
Project:	Mesa County, CO	TVD Reference:	Well @ 7287.0usft (H&P #522)
Site:	Gunderson 0993 21-05 Pad	MD Reference:	Well @ 7287.0usft (H&P #522)
Well:	BCU 0993-21-09E	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 0993 21-05 Pad				
Site Position:		Northing:	1,529,627.90 usft	Latitude:	39.265321
From:	Lat/Long	Easting:	2,354,508.90 usft	Longitude:	-107.780117
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-1.44 °

Well	BCU 0993-21-09E					
Well Position	+N/-S	0.0 usft	Northing:	1,529,635.54 usft	Latitude:	39.265342
	+E/-W	0.0 usft	Easting:	2,354,508.53 usft	Longitude:	-107.780119
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	7,257.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	User Defined	8/9/2018	9.48	65.43	51,394.30000000

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	100.59	

Survey Program	Date	9/3/2018			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
238.0	9,140.0	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 @ 238.0' MD / 237.9' TVD									
238.0	2.60	118.00	237.9	-2.5	4.8	5.2	1.09	1.09	0.00
301.0	4.90	111.60	300.8	-4.2	8.5	9.2	3.71	3.65	-10.16
393.0	8.60	107.20	392.1	-7.7	18.8	19.9	4.06	4.02	-4.78
486.0	13.10	107.30	483.4	-12.9	35.5	37.2	4.84	4.84	0.11
579.0	15.60	101.20	573.5	-18.4	57.8	60.2	3.14	2.69	-6.56
671.0	18.60	95.50	661.5	-22.2	84.6	87.2	3.73	3.26	-6.20
764.0	18.60	95.30	749.6	-25.0	114.1	116.7	0.07	0.00	-0.22
856.0	20.50	98.90	836.3	-28.9	144.6	147.5	2.44	2.07	3.91
949.0	24.50	100.80	922.2	-35.0	179.7	183.0	4.37	4.30	2.04



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Well:	BCU 0993-21-09E	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	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)
1,043.0	28.20	100.60	1,006.4	-42.8	220.6	224.7	3.94	3.94	-0.21
1,138.0	29.20	100.60	1,089.8	-51.2	265.5	270.4	1.05	1.05	0.00
1,232.0	29.90	100.60	1,171.5	-59.7	311.1	316.7	0.74	0.74	0.00
1,327.0	30.50	99.80	1,253.6	-68.1	358.1	364.5	0.76	0.63	-0.84
1,421.0	31.30	100.70	1,334.3	-76.7	405.6	412.8	0.98	0.85	0.96
1,491.0	32.10	99.50	1,393.8	-83.2	441.8	449.6	1.46	1.14	-1.71
1,623.0	31.20	98.30	1,506.2	-93.9	510.2	518.8	0.83	-0.68	-0.91
1,717.0	30.80	97.90	1,586.8	-100.7	558.2	567.2	0.48	-0.43	-0.43
1,812.0	30.40	97.50	1,668.6	-107.2	606.1	615.5	0.47	-0.42	-0.42
1,906.0	29.20	99.80	1,750.1	-114.2	652.3	662.1	1.76	-1.28	2.45
2,001.0	28.20	99.10	1,833.5	-121.7	697.3	707.8	1.11	-1.05	-0.74
2,095.0	27.90	100.50	1,916.4	-129.2	740.8	751.9	0.77	-0.32	1.49
2,189.0	28.40	100.70	1,999.3	-137.4	784.4	796.3	0.54	0.53	0.21
2,284.0	28.50	101.90	2,082.8	-146.3	828.8	841.5	0.61	0.11	1.26
2,378.0	29.80	103.00	2,164.9	-156.1	873.5	887.3	1.50	1.38	1.17
2,473.0	30.10	103.00	2,247.2	-166.8	919.7	934.7	0.32	0.32	0.00
2,567.0	29.70	102.20	2,328.7	-177.0	965.4	981.5	0.60	-0.43	-0.85
2,662.0	29.80	101.30	2,411.2	-186.6	1,011.6	1,028.6	0.48	0.11	-0.95
2,756.0	30.10	100.40	2,492.6	-195.5	1,057.7	1,075.6	0.57	0.32	-0.96
2,851.0	30.80	99.60	2,574.5	-203.8	1,105.1	1,123.7	0.85	0.74	-0.84
2,945.0	31.70	99.80	2,654.9	-212.0	1,153.1	1,172.5	0.96	0.96	0.21
3,040.0	30.50	99.30	2,736.3	-220.2	1,201.5	1,221.5	1.29	-1.26	-0.53
3,134.0	31.60	99.80	2,816.8	-228.2	1,249.3	1,270.0	1.20	1.17	0.53
3,229.0	30.40	99.70	2,898.2	-236.5	1,297.6	1,318.9	1.26	-1.26	-0.11
3,323.0	29.50	99.10	2,979.7	-244.2	1,343.9	1,365.9	1.01	-0.96	-0.64
3,418.0	28.80	99.20	3,062.6	-251.5	1,389.6	1,412.1	0.74	-0.74	0.11
3,512.0	29.60	101.00	3,144.7	-259.6	1,434.7	1,458.0	1.26	0.85	1.91
3,607.0	28.70	100.30	3,227.6	-268.1	1,480.2	1,504.2	1.01	-0.95	-0.74
3,702.0	29.50	102.10	3,310.7	-277.1	1,525.5	1,550.4	1.25	0.84	1.89
3,796.0	28.50	102.30	3,392.9	-286.8	1,570.0	1,596.0	1.07	-1.06	0.21
3,891.0	29.50	103.00	3,476.0	-296.8	1,615.0	1,642.0	1.11	1.05	0.74
3,985.0	28.90	102.50	3,558.0	-307.0	1,659.7	1,687.8	0.69	-0.64	-0.53
4,079.0	27.80	101.90	3,640.7	-316.4	1,703.3	1,732.5	1.21	-1.17	-0.64
4,174.0	28.70	102.10	3,724.4	-325.8	1,747.3	1,777.4	0.95	0.95	0.21
4,268.0	29.20	102.90	3,806.7	-335.6	1,791.7	1,822.9	0.67	0.53	0.85
4,363.0	29.00	103.00	3,889.7	-346.0	1,836.7	1,869.0	0.22	-0.21	0.11
4,457.0	27.50	102.50	3,972.5	-355.8	1,880.1	1,913.5	1.62	-1.60	-0.53
4,551.0	28.20	101.70	4,055.6	-365.0	1,923.1	1,957.4	0.84	0.74	-0.85
4,646.0	29.10	99.70	4,139.0	-373.4	1,967.8	2,002.9	1.38	0.95	-2.11
4,740.0	30.60	99.90	4,220.5	-381.4	2,013.9	2,049.7	1.60	1.60	0.21
4,835.0	30.20	100.10	4,302.4	-389.7	2,061.3	2,097.8	0.43	-0.42	0.21
4,929.0	29.00	98.10	4,384.2	-397.1	2,107.1	2,144.2	1.65	-1.28	-2.13
5,023.0	28.60	99.90	4,466.5	-404.2	2,151.8	2,189.5	1.02	-0.43	1.91



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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)	
5,118.0	28.70	97.20	4,549.9	-410.9	2,196.9	2,235.0	1.37	0.11	-2.84	
5,212.0	30.40	97.10	4,631.7	-416.7	2,242.9	2,281.2	1.81	1.81	-0.11	
5,306.0	29.10	96.70	4,713.3	-422.3	2,289.2	2,327.8	1.40	-1.38	-0.43	
5,400.0	29.30	99.00	4,795.3	-428.6	2,334.6	2,373.6	1.21	0.21	2.45	
5,495.0	28.50	100.10	4,878.5	-436.2	2,379.9	2,419.5	1.01	-0.84	1.16	
5,589.0	29.00	101.30	4,960.9	-444.6	2,424.3	2,464.7	0.81	0.53	1.28	
5,683.0	29.20	101.20	5,043.1	-453.5	2,469.1	2,510.4	0.22	0.21	-0.11	
5,777.0	29.20	101.20	5,125.1	-462.4	2,514.1	2,556.3	0.00	0.00	0.00	
5,871.0	29.00	101.90	5,207.3	-471.6	2,558.9	2,602.0	0.42	-0.21	0.74	
5,965.0	29.30	101.80	5,289.3	-481.0	2,603.7	2,647.8	0.32	0.32	-0.11	
6,059.0	27.20	101.40	5,372.1	-489.9	2,647.3	2,692.2	2.24	-2.23	-0.43	
6,153.0	25.30	100.90	5,456.5	-498.0	2,688.1	2,733.8	2.03	-2.02	-0.53	
6,248.0	21.80	99.20	5,543.5	-504.6	2,725.4	2,771.8	3.75	-3.68	-1.79	
6,342.0	19.30	98.00	5,631.5	-509.6	2,758.1	2,804.7	2.70	-2.66	-1.28	
6,436.0	17.10	97.20	5,720.8	-513.5	2,787.1	2,834.0	2.36	-2.34	-0.85	
6,530.0	15.70	96.80	5,811.0	-516.7	2,813.5	2,860.5	1.49	-1.49	-0.43	
6,625.0	14.50	95.90	5,902.7	-519.5	2,838.1	2,885.2	1.29	-1.26	-0.95	
6,719.0	12.00	97.20	5,994.2	-521.9	2,859.5	2,906.7	2.68	-2.66	1.38	
6,813.0	9.50	101.20	6,086.6	-524.6	2,876.8	2,924.2	2.77	-2.66	4.26	
6,907.0	6.60	106.10	6,179.6	-527.6	2,889.6	2,937.3	3.17	-3.09	5.21	
7,001.0	4.40	97.80	6,273.2	-529.6	2,898.4	2,946.3	2.48	-2.34	-8.83	
7,096.0	3.70	96.60	6,367.9	-530.5	2,905.0	2,953.0	0.74	-0.74	-1.26	
7,190.0	3.00	103.90	6,461.8	-531.4	2,910.4	2,958.5	0.87	-0.74	7.77	
7,284.0	2.20	117.90	6,555.7	-532.8	2,914.4	2,962.7	1.08	-0.85	14.89	
7,378.0	1.80	126.90	6,649.6	-534.6	2,917.2	2,965.7	0.54	-0.43	9.57	
7,472.0	1.20	132.60	6,743.6	-536.1	2,919.1	2,967.9	0.66	-0.64	6.06	
7,567.0	1.00	137.80	6,838.6	-537.4	2,920.4	2,969.4	0.24	-0.21	5.47	
7,661.0	1.20	128.00	6,932.6	-538.6	2,921.7	2,970.9	0.29	0.21	-10.43	
7,755.0	1.10	149.80	7,026.5	-540.0	2,922.9	2,972.4	0.47	-0.11	23.19	
7,850.0	0.80	163.90	7,121.5	-541.4	2,923.6	2,973.3	0.40	-0.32	14.84	
7,944.0	0.50	216.50	7,215.5	-542.4	2,923.5	2,973.4	0.68	-0.32	55.96	
8,038.0	0.70	252.90	7,309.5	-542.9	2,922.7	2,972.7	0.45	0.21	38.72	
8,132.0	1.10	276.10	7,403.5	-543.0	2,921.3	2,971.3	0.57	0.43	24.68	
8,227.0	1.60	295.10	7,498.5	-542.3	2,919.2	2,969.1	0.70	0.53	20.00	
8,321.0	2.10	299.10	7,592.4	-540.9	2,916.5	2,966.2	0.55	0.53	4.26	
8,415.0	2.20	301.70	7,686.4	-539.1	2,913.4	2,962.9	0.15	0.11	2.77	
8,509.0	2.10	301.60	7,780.3	-537.3	2,910.4	2,959.6	0.11	-0.11	-0.11	
8,603.0	1.90	298.40	7,874.2	-535.6	2,907.6	2,956.5	0.24	-0.21	-3.40	
8,697.0	2.00	298.20	7,968.2	-534.1	2,904.8	2,953.5	0.11	0.11	-0.21	
8,792.0	1.90	299.40	8,063.1	-532.6	2,901.9	2,950.4	0.11	-0.11	1.26	
8,886.0	1.90	310.90	8,157.1	-530.8	2,899.4	2,947.6	0.40	0.00	12.23	
8,980.0	1.80	308.20	8,251.0	-528.8	2,897.1	2,944.9	0.14	-0.11	-2.87	
9,080.0	2.00	284.23	8,351.0	-527.4	2,894.1	2,941.8	0.81	0.20	-23.97	



Survey Report



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Site:	Gunderson 0993 21-05 Pad	MD Reference:	Well @ 7287.0usft (H&P #522)
Well:	BCU 0993-21-09E	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 5000.1 Single User Db

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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)
Projection to TD @ 9140.0' MD / 8410.9' TVD									
9,140.0	2.00	284.23	8,410.9	-526.9	2,892.1	2,939.7	0.00	0.00	0.00

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
238.0	237.9	-2.5	4.8	First MWD Survey @ 238.0' MD / 237.9' TVD	
9,140.0	8,410.9	-526.9	2,892.1	Projection to TD @ 9140.0' MD / 8410.9' TVD	

Checked By: _____	Approved By: _____	Date: _____
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