





Directional Survey Certification

2948 I-70 Business Loop
Grand Junction, CO 81504
(970)-245-9447 Fax (970)-245-9454

Operator	TEP Rocky Mountain, LLC.
Well Name & No.	RWF 512-17
County & State	Garfield County, CO
SDI Job No.	OP.018890
Rig	H&P 318

I, Mel Mireles Jr., having personal knowledge of all the facts, hereby certify that the attached directional survey run from a measured depth of 120 feet to a measured depth of 8,973 feet is true and correct as determined from all available records.

A handwritten signature in black ink, appearing to read 'Mel Mireles Jr.', written over a horizontal line.

Signature

03-Jun-19

Date

Mel Mireles Jr.

Grand Junction Assistant Well Planner
Scientific Drilling - Colorado District

Company:	TEP Rocky Mountain LLC	Local Co-ordinate Reference:	Well RWF 512-17 - Slot RWF 512-17 (A6)
Project:	Garfield County, CO NAD83	TVD Reference:	GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
Site:	DOE 1-M-18 Pad	MD Reference:	GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
Well:	RWF 512-17	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Grand Junction District

Project	Garfield County, CO NAD83		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Central Zone		

Site		DOE 1-M-18 Pad			
Site Position:		Northing:	1,627,441.60 usft	Latitude:	39.5311260
From:	Map	Easting:	2,317,141.30 usft	Longitude:	-107.9212595
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in	Grid Convergence:	-1.53 °

Well	RWF 512-17 - Slot RWF 512-17 (A6)					
Well Position	+N/-S	0.00 usft	Northing:	1,627,383.30 usft	Latitude:	39.5309673
	+E/-W	0.00 usft	Easting:	2,317,158.50 usft	Longitude:	-107.9211930
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	6,174.50 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	5/26/2019	9.33	65.75	51,481

Design	OH				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	147.04	

Survey Program	Date	6/3/2019			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
120.00	579.00	Survey #1 - Gyro MWD Survey (OH)	Gyro MWD 105	Gyro MWD Error Model Ver 1.0.5	
650.00	1,080.00	Survey #2 - Surface MWD Survey (OH)	MWD+HDGM	OWSG MWD + HDGM	
1,171.00	8,973.00	Survey #3 - Production MWD Survey (OH)	MWD+HDGM	OWSG MWD + HDGM	

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)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
120.00	0.62	185.71	120.00	-0.65	-0.06	0.51	0.52	0.52	0.00	
First SDI Gyro MWD Survey										
212.00	2.90	167.52	211.95	-3.41	0.39	3.08	2.52	2.48	-19.77	
304.00	5.10	148.97	303.72	-9.19	3.00	9.34	2.74	2.39	-20.16	
395.00	7.65	146.60	394.15	-17.72	8.42	19.45	2.82	2.80	-2.60	
487.00	10.12	144.76	485.04	-29.43	16.46	33.65	2.70	2.68	-2.00	
579.00	12.40	143.88	575.26	-44.01	26.94	51.59	2.49	2.48	-0.96	

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Site:	DOE 1-M-18 Pad	MD Reference:	GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
Well:	RWF 512-17	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Grand Junction District

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)	
Last SDI Gyro MWD Survey										
650.00	13.01	142.22	644.53	-56.49	36.33	67.16	1.00	0.86	-2.34	
First SDI Surface MWD Survey										
744.00	13.63	145.75	736.00	-74.01	49.05	88.78	1.09	0.66	3.76	
839.00	14.60	146.55	828.13	-93.25	61.95	111.94	1.04	1.02	0.84	
933.00	14.21	147.41	919.17	-112.85	74.69	135.33	0.47	-0.41	0.91	
1,028.00	14.86	146.44	1,011.13	-132.83	87.71	159.17	0.73	0.68	-1.02	
1,080.00	15.74	144.33	1,061.29	-144.12	95.51	172.88	2.00	1.69	-4.06	
Last SDI Surface MWD Survey										
1,171.00	16.31	145.37	1,148.75	-164.66	109.97	197.98	0.70	0.63	1.14	
First SDI Production MWD Survey										
1,266.00	14.70	148.51	1,240.30	-185.92	123.84	223.37	1.91	-1.69	3.31	
1,360.00	14.73	146.85	1,331.21	-206.09	136.61	247.24	0.45	0.03	-1.77	
1,454.00	13.31	147.29	1,422.41	-225.20	148.99	270.02	1.51	-1.51	0.47	
1,549.00	12.95	145.06	1,514.93	-243.13	161.00	291.59	0.65	-0.38	-2.35	
1,643.00	13.28	144.34	1,606.48	-260.54	173.32	312.90	0.39	0.35	-0.77	
1,737.00	12.53	154.06	1,698.11	-278.48	184.08	333.81	2.44	-0.80	10.34	
1,832.00	12.40	151.10	1,790.87	-296.68	193.52	354.21	0.69	-0.14	-3.12	
1,926.00	12.13	148.29	1,882.73	-313.91	203.59	374.15	0.70	-0.29	-2.99	
2,021.00	11.52	146.09	1,975.71	-330.28	214.13	393.62	0.80	-0.64	-2.32	
2,115.00	13.10	152.24	2,067.55	-347.50	224.32	413.61	2.18	1.68	6.54	
2,210.00	13.03	151.22	2,160.09	-366.41	234.49	435.01	0.25	-0.07	-1.07	
2,304.00	12.75	148.81	2,251.72	-384.57	244.97	455.95	0.64	-0.30	-2.56	
2,398.00	12.40	146.26	2,343.47	-401.84	255.95	476.41	0.70	-0.37	-2.71	
2,493.00	12.40	144.68	2,436.25	-418.64	267.51	496.80	0.36	0.00	-1.66	
2,588.00	12.49	143.98	2,529.02	-435.27	279.45	517.25	0.18	0.09	-0.74	
2,682.00	12.57	142.48	2,620.78	-451.61	291.65	537.60	0.36	0.09	-1.60	
2,776.00	12.61	148.39	2,712.53	-468.46	303.26	558.05	1.37	0.04	6.29	
2,871.00	12.49	148.99	2,805.26	-486.09	313.99	578.69	0.19	-0.13	0.63	
2,966.00	12.13	143.98	2,898.08	-502.97	325.15	598.92	1.19	-0.38	-5.27	
3,060.00	13.01	148.07	2,989.82	-519.94	336.56	619.36	1.33	0.94	4.35	
3,155.00	12.93	148.46	3,082.40	-538.07	347.77	640.68	0.12	-0.08	0.41	
3,249.00	12.93	147.85	3,174.02	-555.94	358.87	661.71	0.15	0.00	-0.65	
3,344.00	12.66	144.07	3,266.66	-573.37	370.63	682.73	0.93	-0.28	-3.98	
3,439.00	13.48	152.90	3,359.21	-591.66	381.79	704.15	2.27	0.86	9.29	
3,533.00	13.01	149.34	3,450.71	-610.51	392.17	725.62	1.00	-0.50	-3.79	
3,627.00	12.48	147.15	3,542.39	-628.15	403.08	746.35	0.76	-0.56	-2.33	
3,722.00	12.31	146.44	3,635.18	-645.21	414.25	766.74	0.24	-0.18	-0.75	
3,816.00	11.96	144.86	3,727.08	-661.53	425.39	786.49	0.51	-0.37	-1.68	
3,910.00	11.96	144.24	3,819.04	-677.39	436.69	805.95	0.14	0.00	-0.66	
4,005.00	12.06	151.25	3,911.96	-694.08	447.22	825.68	1.54	0.11	7.38	
4,100.00	11.48	147.63	4,004.97	-710.77	457.05	845.03	0.99	-0.61	-3.81	
4,194.00	10.99	146.09	4,097.16	-726.11	467.06	863.35	0.61	-0.52	-1.64	
4,289.00	10.82	145.21	4,190.45	-740.95	477.20	881.31	0.25	-0.18	-0.93	

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Site:	DOE 1-M-18 Pad	MD Reference:	GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
Well:	RWF 512-17	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Grand Junction District

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)
4,383.00	12.05	150.31	4,282.58	-756.72	487.09	899.93	1.69	1.31	5.43
4,477.00	11.26	146.97	4,374.65	-772.93	496.95	918.90	1.10	-0.84	-3.55
4,572.00	10.56	144.73	4,467.93	-787.82	507.04	936.87	0.86	-0.74	-2.36
4,667.00	12.50	152.33	4,561.01	-804.03	516.84	955.81	2.59	2.04	8.00
4,761.00	11.92	150.79	4,652.89	-821.52	526.30	975.63	0.71	-0.62	-1.64
4,855.00	11.25	149.95	4,744.97	-837.93	535.63	994.47	0.73	-0.71	-0.89
4,950.00	10.84	148.67	4,838.21	-853.58	544.92	1,012.66	0.50	-0.43	-1.35
5,044.00	10.46	147.70	4,930.59	-868.34	554.07	1,030.03	0.45	-0.40	-1.03
5,139.00	10.25	150.79	5,024.04	-883.01	562.80	1,047.08	0.62	-0.22	3.25
5,233.00	9.66	146.51	5,116.63	-896.88	571.24	1,063.32	1.01	-0.63	-4.55
5,328.00	8.88	146.26	5,210.39	-909.63	579.71	1,078.62	0.82	-0.82	-0.26
5,422.00	8.21	148.31	5,303.35	-921.37	587.26	1,092.58	0.78	-0.71	2.18
5,516.00	7.95	146.61	5,396.41	-932.51	594.37	1,105.79	0.38	-0.28	-1.81
5,611.00	7.83	143.80	5,490.51	-943.22	601.80	1,118.82	0.43	-0.13	-2.96
5,706.00	7.60	143.37	5,584.65	-953.48	609.37	1,131.55	0.25	-0.24	-0.45
5,800.00	6.77	141.78	5,677.91	-962.82	616.51	1,143.27	0.91	-0.88	-1.69
5,894.00	5.73	138.57	5,771.35	-970.70	623.04	1,153.43	1.17	-1.11	-3.41
5,989.00	5.28	145.65	5,865.92	-977.86	628.65	1,162.49	0.86	-0.47	7.45
6,083.00	4.87	149.69	5,959.55	-984.88	633.10	1,170.80	0.58	-0.44	4.30
6,178.00	5.19	130.27	6,054.19	-991.14	638.42	1,178.95	1.81	0.34	-20.44
6,272.00	4.48	132.64	6,147.85	-996.37	644.36	1,186.57	0.78	-0.76	2.52
6,366.00	3.91	124.76	6,241.60	-1,000.68	649.70	1,193.09	0.86	-0.61	-8.38
6,461.00	3.52	123.41	6,336.40	-1,004.14	654.79	1,198.76	0.42	-0.41	-1.42
6,555.00	3.34	122.27	6,430.24	-1,007.19	659.52	1,203.89	0.20	-0.19	-1.21
6,570.84	3.30	121.85	6,446.04	-1,007.67	660.29	1,204.72	0.28	-0.24	-2.64
RWF 512-17 KMV									
6,649.00	3.12	119.64	6,524.09	-1,009.91	664.05	1,208.65	0.28	-0.23	-2.83
6,744.00	1.14	107.24	6,619.02	-1,011.47	667.20	1,211.67	2.13	-2.08	-13.05
6,838.00	0.50	188.72	6,713.01	-1,012.16	668.03	1,212.70	1.25	-0.68	86.68
6,933.00	0.64	146.50	6,808.00	-1,013.01	668.26	1,213.54	0.45	0.15	-44.44
7,028.00	0.52	185.68	6,903.00	-1,013.88	668.52	1,214.40	0.43	-0.13	41.24
7,122.00	0.03	319.40	6,997.00	-1,014.29	668.46	1,214.71	0.58	-0.52	142.26
7,217.00	0.44	133.08	7,092.00	-1,014.52	668.71	1,215.04	0.49	0.43	182.82
7,311.00	0.56	146.26	7,185.99	-1,015.14	669.23	1,215.85	0.18	0.13	14.02
7,406.00	1.14	149.08	7,280.98	-1,016.34	669.97	1,217.26	0.61	0.61	2.97
7,500.00	1.14	157.51	7,374.96	-1,018.01	670.81	1,219.11	0.18	0.00	8.97
7,594.00	1.41	173.86	7,468.94	-1,020.02	671.29	1,221.07	0.48	0.29	17.39
7,689.00	0.79	10.21	7,563.93	-1,020.54	671.53	1,221.63	2.29	-0.65	-172.26
7,783.00	0.44	45.19	7,657.93	-1,019.65	671.90	1,221.09	0.53	-0.37	37.21
7,878.00	0.20	114.06	7,752.93	-1,019.46	672.31	1,221.15	0.43	-0.25	72.49
7,972.00	0.74	121.24	7,846.92	-1,019.84	672.98	1,221.83	0.58	0.57	7.64
8,067.00	0.90	135.54	7,941.91	-1,020.69	674.03	1,223.12	0.27	0.17	15.05
8,161.00	1.20	149.78	8,035.90	-1,022.07	675.04	1,224.82	0.42	0.32	15.15
8,256.00	1.64	145.04	8,130.87	-1,024.04	676.32	1,227.18	0.48	0.46	-4.99

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Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	Grand Junction District

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)
8,350.00	1.48	148.12	8,224.83	-1,026.17	677.73	1,229.73	0.19	-0.17	3.28
8,445.00	1.87	183.45	8,319.80	-1,028.76	678.29	1,232.21	1.14	0.41	37.19
8,539.00	1.13	174.36	8,413.76	-1,031.22	678.28	1,234.27	0.82	-0.79	-9.67
8,634.00	0.83	194.12	8,508.75	-1,032.82	678.21	1,235.57	0.47	-0.32	20.80
8,728.00	1.58	200.58	8,602.73	-1,034.69	677.59	1,236.80	0.81	0.80	6.87
8,822.00	2.11	227.74	8,696.68	-1,037.07	675.85	1,237.85	1.07	0.56	28.89
8,916.00	2.20	217.96	8,790.61	-1,039.65	673.46	1,238.72	0.40	0.10	-10.40
Last SDI Production MWD Survey									
8,973.00	2.20	217.96	8,847.57	-1,041.38	672.11	1,239.43	0.00	0.00	-0.01
Projection to TD - RWF 512-17 PBHL									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
120.00	120.00	-0.65	-0.06	First SDI Gyro MWD Survey
579.00	575.26	-44.01	26.94	Last SDI Gyro MWD Survey
650.00	644.53	-56.49	36.33	First SDI Surface MWD Survey
1,080.00	1,061.29	-144.12	95.51	Last SDI Surface MWD Survey
1,171.00	1,148.75	-164.66	109.97	First SDI Production MWD Survey
8,916.00	8,790.61	-1,039.65	673.46	Last SDI Production MWD Survey
8,973.00	8,847.57	-1,041.38	672.11	Projection to TD

Checked By: _____	Approved By: _____	Date: _____
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