



Well Details: RWF 412-17

TVD Reference: GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318) Level: 6174.50
 +N/-S +E/-W Northing Easting Latitude Longitude Slot
 0.00 0.00 1627375.90 2317159.50 39.5309470 -107.9211887 RWF 412-17 (A5)

REFERENCE INFORMATION

Co-ordinate (N/E) Reference: Well RWF 412-17 - Slot RWF 412-17 (A5), True North
 Vertical (TVD) Reference: GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
 Section (VS) Reference: Slot - RWF 412-17 (A5)(0.00N, 0.00E)
 Measured Depth Reference: GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
 Calculation Method: Minimum Curvature

PROJECT DETAILS: Garfield County, CO NAD83

Geodetic System: US State Plane 1983
 Datum: North American Datum 1983
 Ellipsoid: GRS 1980
 Zone: Colorado Central Zone

System Datum: Mean Sea Level

Plan: OH

10:27, May 29 2019
 Created By: Mel Mireles Jr.



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 412-17
County & State	Garfield County, CO
SDI Job No.	OP.018768
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 121 feet to a measured depth of 9,051 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

29-May-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 412-17 - Slot RWF 412-17 (A5)
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 412-17	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 412-17 - Slot RWF 412-17 (A5)					
Well Position	+N/-S	0.00 usft	Northing:	1,627,375.90 usft	Latitude:	39.5309471
	+E/-W	0.00 usft	Easting:	2,317,159.50 usft	Longitude:	-107.9211888
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	5/20/2019	9.33	65.75	51,483

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	168.26	

Survey Program	Date	5/29/2019			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
121.00	579.00	Survey #1 - Gyro MWD Survey (OH)	SDI Gyro MWD 104	SDI Gyro MWD Error Model Ver 1.0.4	
650.00	1,070.00	Survey #2 - Surface MWD Survey (OH)	MWD+HDGM	OWSG MWD + HDGM	
1,180.00	9,051.00	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	
121.00	0.79	139.39	121.00	-0.63	0.54	0.73	0.65	0.65	0.00	
First SDI Gyro MWD Survey										
213.00	3.08	163.48	212.94	-3.48	1.66	3.75	2.59	2.49	26.18	
304.00	5.01	172.00	303.71	-9.76	2.91	10.15	2.22	2.12	9.36	
395.00	7.74	172.88	394.14	-19.78	4.22	20.23	3.00	3.00	0.97	
487.00	10.65	169.19	484.95	-34.28	6.58	34.90	3.23	3.16	-4.01	
579.00	14.43	166.82	574.74	-53.80	10.79	54.87	4.15	4.11	-2.58	

Company:	TEP Rocky Mountain LLC	Local Co-ordinate Reference:	Well RWF 412-17 - Slot RWF 412-17 (A5)
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 412-17	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	15.43	163.38	643.34	-71.47	15.51	73.13	1.88	1.41	-4.85
First SDI Surface MWD Survey									
744.00	15.99	167.07	733.83	-96.07	21.99	98.53	1.22	0.60	3.93
839.00	15.26	169.37	825.32	-121.11	27.22	124.11	1.01	-0.77	2.42
933.00	13.59	173.28	916.35	-144.24	30.79	147.49	2.06	-1.78	4.16
1,028.00	13.81	168.06	1,008.66	-166.42	34.45	169.94	1.32	0.23	-5.49
1,070.00	13.89	167.01	1,049.43	-176.23	36.62	180.00	0.63	0.19	-2.50
Last SDI Surface MWD Survey									
1,180.00	14.70	164.77	1,156.03	-202.56	43.25	207.13	0.89	0.74	-2.04
First SDI Production MWD Survey									
1,274.00	14.98	166.95	1,246.89	-225.91	49.13	231.18	0.66	0.30	2.32
1,369.00	14.30	164.11	1,338.81	-249.15	55.11	255.15	1.04	-0.72	-2.99
1,463.00	14.01	164.53	1,429.96	-271.28	61.32	278.09	0.33	-0.31	0.45
1,557.00	13.78	165.27	1,521.21	-293.08	67.21	300.62	0.31	-0.24	0.79
1,652.00	13.79	163.33	1,613.47	-314.87	73.33	323.20	0.49	0.01	-2.04
1,746.00	13.80	163.55	1,704.76	-336.35	79.72	345.54	0.06	0.01	0.23
1,840.00	13.73	160.86	1,796.06	-357.64	86.55	367.77	0.68	-0.07	-2.86
1,935.00	13.38	167.28	1,888.42	-379.02	92.67	389.94	1.63	-0.37	6.76
2,029.00	13.25	164.65	1,979.89	-400.01	97.92	411.57	0.66	-0.14	-2.80
2,124.00	12.95	162.11	2,072.42	-420.64	104.07	433.02	0.68	-0.32	-2.67
2,218.00	13.13	168.71	2,164.00	-441.14	109.39	454.17	1.59	0.19	7.02
2,312.00	13.14	167.43	2,255.54	-462.04	113.81	475.53	0.31	0.01	-1.36
2,407.00	12.88	164.62	2,348.10	-482.78	118.97	496.89	0.72	-0.27	-2.96
2,501.00	13.29	173.34	2,439.67	-503.62	123.00	518.11	2.14	0.44	9.28
2,596.00	13.62	172.61	2,532.07	-525.56	125.70	540.14	0.39	0.35	-0.77
2,691.00	13.10	172.94	2,624.49	-547.33	128.47	562.02	0.55	-0.55	0.35
2,785.00	12.87	172.59	2,716.09	-568.29	131.13	583.08	0.26	-0.24	-0.37
2,880.00	12.66	169.55	2,808.74	-589.02	134.38	604.04	0.74	-0.22	-3.20
2,974.00	12.05	167.09	2,900.57	-608.71	138.44	624.15	0.86	-0.65	-2.62
3,069.00	11.80	166.84	2,993.52	-627.84	142.87	643.77	0.27	-0.26	-0.26
3,163.00	12.05	167.62	3,085.49	-646.78	147.16	663.19	0.32	0.27	0.83
3,258.00	11.42	164.75	3,178.50	-665.54	151.76	682.49	0.90	-0.66	-3.02
3,352.00	13.38	169.38	3,270.31	-685.21	156.21	702.66	2.34	2.09	4.93
3,447.00	12.93	166.57	3,362.82	-706.35	160.71	724.27	0.82	-0.47	-2.96
3,541.00	12.56	167.29	3,454.50	-726.55	165.40	745.00	0.43	-0.39	0.77
3,636.00	12.18	165.49	3,547.29	-746.33	170.18	765.34	0.57	-0.40	-1.89
3,730.00	13.13	165.44	3,639.01	-766.26	175.35	785.91	1.01	1.01	-0.05
3,824.00	12.49	163.07	3,730.67	-786.32	180.99	806.70	0.88	-0.68	-2.52
3,919.00	13.53	164.54	3,823.23	-806.86	186.95	828.02	1.15	1.09	1.55
4,013.00	13.15	163.96	3,914.69	-827.74	192.83	849.65	0.43	-0.40	-0.62
4,108.00	13.17	164.85	4,007.20	-848.57	198.65	871.23	0.21	0.02	0.94
4,202.00	13.00	162.22	4,098.76	-868.97	204.67	892.44	0.66	-0.18	-2.80
4,297.00	14.32	168.93	4,191.08	-890.68	210.19	914.81	2.17	1.39	7.06

Company:	TEP Rocky Mountain LLC	Local Co-ordinate Reference:	Well RWF 412-17 - Slot RWF 412-17 (A5)
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 412-17	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)
4,392.00	14.28	168.50	4,283.13	-913.69	214.78	938.28	0.12	-0.04	-0.45
4,486.00	14.38	165.58	4,374.21	-936.35	220.00	961.53	0.78	0.11	-3.11
4,580.00	13.81	164.46	4,465.38	-958.47	225.92	984.38	0.67	-0.61	-1.19
4,675.00	13.73	164.45	4,557.65	-980.25	231.98	1,006.95	0.08	-0.08	-0.01
4,769.00	13.46	162.70	4,649.02	-1,001.45	238.22	1,028.97	0.52	-0.29	-1.86
4,864.00	12.89	160.80	4,741.51	-1,022.01	244.99	1,050.48	0.75	-0.60	-2.00
4,958.00	12.31	161.38	4,833.25	-1,041.41	251.64	1,070.82	0.63	-0.62	0.62
5,052.00	12.16	160.33	4,925.12	-1,060.23	258.17	1,090.58	0.29	-0.16	-1.12
5,147.00	11.69	173.37	5,018.08	-1,079.21	262.65	1,110.08	2.87	-0.49	13.73
5,241.00	10.75	156.19	5,110.31	-1,096.70	267.29	1,128.14	3.68	-1.00	-18.28
5,336.00	11.26	169.12	5,203.58	-1,113.91	272.62	1,146.08	2.65	0.54	13.61
5,430.00	9.85	170.26	5,295.98	-1,130.85	275.71	1,163.29	1.52	-1.50	1.21
5,525.00	9.65	168.79	5,389.61	-1,146.67	278.64	1,179.37	0.34	-0.21	-1.55
5,620.00	8.44	179.49	5,483.44	-1,161.45	280.25	1,194.18	2.18	-1.27	11.26
5,714.00	6.68	174.04	5,576.62	-1,173.79	280.87	1,206.38	2.02	-1.87	-5.80
5,808.00	5.28	178.78	5,670.10	-1,183.55	281.53	1,216.08	1.58	-1.49	5.04
5,903.00	3.61	192.93	5,764.82	-1,190.84	280.96	1,223.09	2.09	-1.76	14.89
5,997.00	2.95	191.32	5,858.66	-1,196.09	279.82	1,228.01	0.71	-0.70	-1.71
6,091.00	1.41	153.12	5,952.60	-1,199.50	279.87	1,231.35	2.17	-1.64	-40.64
6,186.00	1.11	120.50	6,047.57	-1,201.01	281.19	1,233.10	0.80	-0.32	-34.34
6,280.00	1.55	123.99	6,141.55	-1,202.18	283.03	1,234.62	0.48	0.47	3.71
6,374.00	1.14	201.20	6,235.53	-1,203.76	283.75	1,236.31	1.82	-0.44	82.14
6,469.00	1.49	205.68	6,330.50	-1,205.76	282.87	1,238.09	0.38	0.37	4.72
6,479.00	0.00	0.00	6,340.50	-1,205.87	282.81	1,238.19	14.90	-14.90	0.00
6,564.00	0.08	334.86	6,425.50	-1,205.82	282.79	1,238.13	0.09	0.09	0.00
6,588.35	0.19	356.29	6,449.86	-1,205.76	282.78	1,238.08	0.49	0.45	88.01
RWF 412-17 KMV									
6,658.00	0.53	5.37	6,519.50	-1,205.33	282.80	1,237.65	0.49	0.49	13.03
6,752.00	0.45	26.34	6,613.50	-1,204.56	283.00	1,236.95	0.21	-0.09	22.31
6,847.00	0.28	101.00	6,708.50	-1,204.27	283.40	1,236.74	0.49	-0.18	78.59
6,941.00	0.44	138.18	6,802.49	-1,204.59	283.86	1,237.15	0.29	0.17	39.55
7,036.00	0.70	165.51	6,897.49	-1,205.42	284.25	1,238.04	0.39	0.27	28.77
7,130.00	0.79	174.30	6,991.48	-1,206.62	284.46	1,239.26	0.15	0.10	9.35
7,225.00	0.97	174.30	7,086.47	-1,208.07	284.60	1,240.71	0.19	0.19	0.00
7,319.00	0.46	149.54	7,180.46	-1,209.19	284.88	1,241.86	0.62	-0.54	-26.34
7,414.00	0.44	108.86	7,275.46	-1,209.64	285.41	1,242.40	0.33	-0.02	-42.82
7,508.00	0.79	122.71	7,369.46	-1,210.10	286.30	1,243.04	0.40	0.37	14.73
7,603.00	1.02	129.81	7,464.44	-1,211.00	287.50	1,244.16	0.27	0.24	7.47
7,697.00	1.58	141.79	7,558.42	-1,212.55	288.95	1,245.98	0.66	0.60	12.74
7,792.00	0.74	181.35	7,653.40	-1,214.20	289.74	1,247.75	1.17	-0.88	41.64
7,886.00	1.01	197.80	7,747.39	-1,215.59	289.47	1,249.06	0.39	0.29	17.50
7,981.00	1.49	198.91	7,842.37	-1,217.56	288.82	1,250.85	0.51	0.51	1.17
8,075.00	1.32	191.35	7,936.34	-1,219.77	288.21	1,252.90	0.27	-0.18	-8.04
8,170.00	1.16	185.10	8,031.32	-1,221.81	287.91	1,254.83	0.22	-0.17	-6.58

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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)
8,264.00	1.23	206.64	8,125.30	-1,223.66	287.37	1,256.53	0.48	0.07	22.91
8,358.00	0.89	172.16	8,219.28	-1,225.28	287.02	1,258.05	0.75	-0.36	-36.68
8,453.00	0.29	17.79	8,314.28	-1,225.78	287.19	1,258.57	1.22	-0.63	-162.49
8,548.00	0.97	14.25	8,409.27	-1,224.77	287.46	1,257.64	0.72	0.72	-3.73
8,642.00	0.75	343.19	8,503.26	-1,223.41	287.48	1,256.31	0.54	-0.23	-33.04
8,736.00	0.18	56.74	8,597.26	-1,222.74	287.43	1,255.65	0.77	-0.61	78.24
8,831.00	0.34	335.26	8,692.26	-1,222.41	287.43	1,255.32	0.38	0.17	-85.77
8,925.00	0.70	195.66	8,786.25	-1,222.71	287.16	1,255.56	1.05	0.38	-148.51
8,996.00	0.62	173.25	8,857.25	-1,223.50	287.09	1,256.32	0.38	-0.11	-31.56
Last SDI Production MWD Survey									
9,051.00	0.62	173.25	8,912.25	-1,224.10	287.16	1,256.92	0.00	0.00	0.00
Projection to TD - RWF 412-17 PBHL									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
121.00	121.00	-0.63	0.54	First SDI Gyro MWD Survey
579.00	574.74	-53.80	10.79	Last SDI Gyro MWD Survey
650.00	643.34	-71.47	15.51	First SDI Surface MWD Survey
1,070.00	1,049.43	-176.23	36.62	Last SDI Surface MWD Survey
1,180.00	1,156.03	-202.56	43.25	First SDI Production MWD Survey
8,996.00	8,857.25	-1,223.50	287.09	Last SDI Production MWD Survey
9,051.00	8,912.25	-1,224.10	287.16	Projection to TD

Checked By: _____ Approved By: _____ Date: _____