



TVD Reference: GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318) Level: 6174.50					
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
-13.28	12.06	1627428.00	2317153.00	39.5310895	-107.9212167

REFERENCE INFORMATION

Co-ordinate (N/E) Reference: Site DOE 1-M-18 Pad, True North
 Vertical (TVD) Reference: GL 6174.5' & RKB 24' @ 6198.50usft (H&P 318)
 Section (VS) Reference: Slot - RWF 324-8 (A12) (-13.28N, 12.06E)
 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

16:25, July 18 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 324-8
County & State	Garfield County, CO
SDI Job No.	OP.019737
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 151 feet to a measured depth of 9,073 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

18-Jul-19

Date

Mel Mireles Jr.

Grand Junction Assistant Well Planner
Scientific Drilling - Colorado District

Company:	TEP Rocky Mountain LLC	Local Co-ordinate Reference:	Site DOE 1-M-18 Pad
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 324-8	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 324-8 - Slot RWF 324-8 (A12)					
Well Position	+N/-S	-13.28 usft	Northing:	1,627,428.00 usft	Latitude:	39.5310896
	+E/-W	12.06 usft	Easting:	2,317,153.00 usft	Longitude:	-107.9212167
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	7/8/2019	9.32	65.75	51,469

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	-13.28	12.06	33.44	

Survey Program	Date	7/18/2019			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
151.00	1,049.00	Survey #1 - Gyro MWD Survey (OH)	Gyro MWD 105	Gyro MWD Error Model Ver 1.0.5	
1,172.00	9,073.00	Survey #2 - 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	-13.28	12.06	0.00	0.00	0.00	0.00	
151.00	1.06	47.90	150.99	-12.35	13.09	1.35	0.70	0.70	0.00	
First SDI Gyro MWD Survey										
212.00	2.64	47.64	211.96	-11.02	14.55	3.26	2.59	2.59	-0.43	
304.00	5.01	36.39	303.75	-6.36	18.50	9.33	2.69	2.58	-12.23	
396.00	7.13	32.52	395.23	1.69	23.95	19.05	2.35	2.30	-4.21	
487.00	9.77	38.67	485.23	12.48	31.82	32.39	3.06	2.90	6.76	
579.00	10.91	38.41	575.74	25.40	42.10	48.84	1.24	1.24	-0.28	
671.00	11.52	37.09	665.98	39.55	53.05	66.68	0.72	0.66	-1.43	
765.00	12.05	36.65	758.00	54.91	64.57	85.84	0.57	0.56	-0.47	

Company:	TEP Rocky Mountain LLC	Local Co-ordinate Reference:	Site DOE 1-M-18 Pad
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 324-8	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)
860.00	12.84	35.24	850.77	71.49	76.58	106.29	0.89	0.83	-1.48
954.00	13.37	35.51	942.32	88.86	88.92	127.59	0.57	0.56	0.29
1,049.00	14.52	34.28	1,034.52	107.65	102.01	150.48	1.25	1.21	-1.29
Last SDI Gyro MWD Survey									
1,172.00	15.88	34.22	1,153.21	134.30	120.16	182.72	1.11	1.11	-0.05
First SDI Production MWD Survey									
1,266.00	14.16	37.18	1,244.00	154.10	134.34	207.06	2.00	-1.83	3.15
1,361.00	13.04	33.87	1,336.33	172.26	147.33	229.37	1.44	-1.18	-3.48
1,455.00	12.31	32.00	1,428.04	189.56	158.55	249.99	0.89	-0.78	-1.99
1,550.00	12.49	30.15	1,520.83	207.03	169.08	270.37	0.46	0.19	-1.95
1,644.00	12.91	26.99	1,612.53	225.18	178.95	290.96	0.86	0.45	-3.36
1,738.00	11.96	30.50	1,704.32	242.93	188.66	311.12	1.29	-1.01	3.73
1,833.00	12.03	31.80	1,797.25	259.82	198.87	330.85	0.29	0.07	1.37
1,927.00	11.87	30.85	1,889.21	276.45	208.99	350.29	0.27	-0.17	-1.01
2,022.00	11.52	32.87	1,982.24	292.80	219.15	369.54	0.57	-0.37	2.13
2,116.00	10.55	34.37	2,074.50	307.79	229.11	387.53	1.08	-1.03	1.60
2,211.00	9.76	32.52	2,168.01	321.76	238.34	404.28	0.90	-0.83	-1.95
2,305.00	10.11	31.56	2,260.60	335.51	246.95	420.49	0.41	0.37	-1.02
2,399.00	11.87	28.83	2,352.88	351.01	255.93	438.38	1.95	1.87	-2.90
2,494.00	12.66	25.76	2,445.71	368.94	265.16	458.43	1.08	0.83	-3.23
2,588.00	12.40	24.53	2,537.47	387.40	273.83	478.61	0.40	-0.28	-1.31
2,682.00	12.40	24.79	2,629.28	405.75	282.25	498.56	0.06	0.00	0.28
2,777.00	12.49	25.93	2,722.04	424.25	291.02	518.83	0.28	0.09	1.20
2,871.00	12.93	32.96	2,813.75	442.21	301.19	539.42	1.71	0.47	7.48
2,966.00	12.61	30.28	2,906.40	460.09	312.20	560.41	0.71	-0.34	-2.82
3,061.00	12.40	34.11	2,999.14	477.49	323.15	580.96	0.90	-0.22	4.03
3,155.00	11.96	32.61	3,091.03	494.05	334.06	600.79	0.58	-0.47	-1.60
3,250.00	12.05	39.73	3,183.96	509.97	345.70	620.49	1.56	0.09	7.49
3,344.00	11.78	37.80	3,275.93	525.09	357.85	639.81	0.51	-0.29	-2.05
3,439.00	11.87	38.85	3,368.91	540.37	369.92	659.21	0.25	0.09	1.11
3,533.00	11.78	38.76	3,460.92	555.38	382.00	678.39	0.10	-0.10	-0.10
3,628.00	11.27	36.64	3,554.00	570.39	393.61	697.31	0.70	-0.54	-2.23
3,722.00	10.99	34.63	3,646.24	585.13	404.18	715.44	0.51	-0.30	-2.14
3,817.00	10.07	33.75	3,739.64	599.49	413.94	732.80	0.98	-0.97	-0.93
3,911.00	11.19	36.93	3,832.02	613.61	423.99	750.12	1.34	1.19	3.38
4,006.00	10.90	34.28	3,925.26	628.40	434.58	768.30	0.62	-0.31	-2.79
4,100.00	10.14	33.04	4,017.68	642.68	444.10	785.46	0.84	-0.81	-1.32
4,194.00	9.94	32.00	4,110.24	656.50	452.91	801.85	0.29	-0.21	-1.11
4,289.00	11.11	34.22	4,203.64	671.02	462.41	819.20	1.30	1.23	2.34
4,383.00	10.64	34.37	4,295.96	685.67	472.40	836.93	0.50	-0.50	0.16
4,478.00	10.29	35.25	4,389.37	699.84	482.25	854.18	0.41	-0.37	0.93
4,572.00	12.75	35.16	4,481.47	715.18	493.07	872.94	2.62	2.62	-0.10
4,667.00	12.05	32.17	4,574.26	732.15	504.38	893.34	1.00	-0.74	-3.15

Company:	TEP Rocky Mountain LLC	Local Co-ordinate Reference:	Site DOE 1-M-18 Pad
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 324-8	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)
4,761.00	11.78	30.22	4,666.23	748.74	514.44	912.73	0.52	-0.29	-2.07
4,856.00	11.44	30.19	4,759.29	765.27	524.06	931.81	0.36	-0.36	-0.03
4,950.00	10.90	31.20	4,851.51	780.93	533.35	950.00	0.61	-0.57	1.07
5,045.00	11.70	30.78	4,944.67	796.88	542.93	968.60	0.85	0.84	-0.44
5,139.00	11.29	28.58	5,036.78	813.15	552.21	987.29	0.64	-0.44	-2.34
5,234.00	10.73	29.36	5,130.03	829.03	560.99	1,005.38	0.61	-0.59	0.82
5,328.00	9.92	31.52	5,222.51	843.56	569.52	1,022.20	0.95	-0.86	2.30
5,423.00	9.15	29.62	5,316.20	857.10	577.53	1,037.91	0.88	-0.81	-2.00
5,517.00	8.97	30.06	5,409.02	869.94	584.89	1,052.68	0.21	-0.19	0.47
5,612.00	9.06	34.81	5,502.85	882.49	592.87	1,067.56	0.79	0.09	5.00
5,706.00	9.07	41.77	5,595.68	894.09	602.03	1,082.29	1.17	0.01	7.40
5,801.00	8.86	40.49	5,689.52	905.24	611.77	1,096.96	0.30	-0.22	-1.35
5,895.00	8.35	40.35	5,782.46	915.95	620.89	1,110.92	0.54	-0.54	-0.15
5,990.00	8.13	37.93	5,876.48	926.50	629.49	1,124.46	0.43	-0.23	-2.55
6,084.00	7.65	37.97	5,969.59	936.68	637.42	1,137.32	0.51	-0.51	0.04
6,178.00	6.97	35.48	6,062.83	946.26	644.58	1,149.26	0.80	-0.72	-2.65
6,273.00	6.07	36.21	6,157.21	955.00	650.90	1,160.04	0.95	-0.95	0.77
6,368.00	4.01	39.93	6,251.84	961.60	656.00	1,168.36	2.19	-2.17	3.92
6,462.00	3.25	18.96	6,345.65	966.64	658.97	1,174.20	1.61	-0.81	-22.31
6,556.00	2.90	8.35	6,439.52	971.52	660.18	1,178.94	0.71	-0.37	-11.29
6,630.41	2.89	15.38	6,513.84	975.19	660.95	1,182.43	0.48	-0.01	9.45
RWF 324-8 KMV									
6,651.00	2.90	17.32	6,534.40	976.19	661.25	1,183.42	0.48	0.03	9.43
6,745.00	2.73	16.26	6,628.28	980.61	662.58	1,187.84	0.19	-0.18	-1.13
6,840.00	2.64	4.75	6,723.18	984.96	663.40	1,191.93	0.57	-0.09	-12.12
6,934.00	2.11	4.84	6,817.10	988.84	663.72	1,195.34	0.56	-0.56	0.10
7,029.00	1.58	351.57	6,912.05	991.88	663.68	1,197.85	0.71	-0.56	-13.97
7,123.00	1.27	294.38	7,006.03	993.59	662.54	1,198.66	1.48	-0.33	-60.84
7,218.00	1.67	256.03	7,101.00	993.69	660.24	1,197.47	1.09	0.42	-40.37
7,312.00	2.29	231.16	7,194.94	992.18	657.44	1,194.67	1.11	0.66	-26.46
7,406.00	2.55	215.16	7,288.86	989.30	654.78	1,190.79	0.77	0.28	-17.02
7,501.00	2.73	198.72	7,383.76	985.43	652.83	1,186.49	0.82	0.19	-17.31
7,596.00	1.92	211.87	7,478.68	981.93	651.27	1,182.71	1.02	-0.85	13.84
7,690.00	0.76	209.61	7,572.65	980.05	650.13	1,180.52	1.24	-1.23	-2.40
7,784.00	0.70	213.75	7,666.65	979.03	649.50	1,179.32	0.08	-0.06	4.40
7,878.00	0.77	179.35	7,760.64	977.92	649.19	1,178.22	0.47	0.07	-36.60
7,973.00	1.49	186.24	7,855.62	976.06	649.06	1,176.60	0.77	0.76	7.25
8,067.00	1.50	189.67	7,949.59	973.63	648.72	1,174.38	0.10	0.01	3.65
8,162.00	2.17	195.46	8,044.54	970.67	648.03	1,171.54	0.73	0.71	6.09
8,256.00	2.99	199.52	8,138.44	966.64	646.74	1,167.46	0.89	0.87	4.32
8,351.00	2.55	202.42	8,233.33	962.35	645.11	1,162.98	0.49	-0.46	3.05
8,445.00	3.34	218.41	8,327.21	958.28	642.61	1,158.20	1.20	0.84	17.01
8,540.00	5.19	214.02	8,421.94	952.55	638.48	1,151.15	1.98	1.95	-4.62
8,634.00	5.72	215.34	8,515.52	945.20	633.40	1,142.22	0.58	0.56	1.40

Company:	TEP Rocky Mountain LLC	Local Co-ordinate Reference:	Site DOE 1-M-18 Pad
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 324-8	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)	
8,729.00	5.98	217.97	8,610.02	937.44	627.61	1,132.55	0.39	0.27	2.77	
8,823.00	6.24	218.94	8,703.49	929.60	621.39	1,122.58	0.30	0.28	1.03	
8,918.00	6.51	220.87	8,797.90	921.52	614.62	1,112.11	0.36	0.28	2.03	
9,010.00	6.51	216.30	8,889.31	913.37	608.12	1,101.73	0.56	0.00	-4.97	
Last SDI Production MWD Survey										
9,073.00	6.51	216.30	8,951.90	907.61	603.89	1,094.59	0.00	0.00	0.00	
Projection to TD - RWF 324-8 PBHL										

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
151.00	150.99	-12.35	13.09	First SDI Gyro MWD Survey	
1,049.00	1,034.52	107.65	102.01	Last SDI Gyro MWD Survey	
1,172.00	1,153.21	134.30	120.16	First SDI Production MWD Survey	
9,010.00	8,889.31	913.37	608.12	Last SDI Production MWD Survey	
9,073.00	8,951.90	907.61	603.89	Projection to TD	

Checked By: _____ Approved By: _____ Date: _____