



Well Details: PA 413-24

TVD Reference: GL 5371' & RKB 24' @ 5395.00usft (H&P 318) Level: 5371.00					
+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
0.00	0.00	1618371.15	2310465.65	39.5057420	-107.9440533PA 413-24 (B3)

REFERENCE INFORMATION

Co-ordinate (N/E) Reference: Well PA 413-24 - Slot PA 413-24 (B3), True North
 Vertical (TVD) Reference: GL 5371' & RKB 24' @ 5395.00usft (H&P 318)
 Section (VS) Reference: Slot - PA 413-24 (B3)(0.00N, 0.00E)
 Measured Depth Reference: GL 5371' & RKB 24' @ 5395.00usft (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



Scientific Drilling, Intl

Survey Report

Company: TEP Rocky Mountain LLC	Local Co-ordinate Reference: Well PA 413-24 - Slot PA 413-24 (B3)
Project: Garfield County, CO NAD83	TVD Reference: GL 5371' & RKB 24' @ 5395.00usft (H&P 318)
Site: PA 34-24 Pad	MD Reference: GL 5371' & RKB 24' @ 5395.00usft (H&P 318)
Well: PA 413-24	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 PA 34-24 Pad					
Site Position:		Northing:	1,618,371.20 usft	Latitude:	39.5057421
From: Map		Easting:	2,310,465.70 usft	Longitude:	-107.9440532
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in	Grid Convergence:	-1.54 °

Well PA 413-24 - Slot PA 413-24 (B3)						
Well Position	+N/-S	0.00 usft	Northing:	1,618,371.15 usft	Latitude:	39.5057420
	+E/-W	0.00 usft	Easting:	2,310,465.65 usft	Longitude:	-107.9440534
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	5,371.00 usft

Wellbore OH					
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	8/25/2018	9.35	65.75	51,590

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	286.21	

Survey Program		Date 9/3/2019
From (usft)	To (usft)	Survey (Wellbore)
122.00	761.00	Survey #1 - Gyro MWD Survey (OH)
837.00	1,064.00	Survey #2 - Surface MWD Survey (OH)
1,166.00	8,935.00	Survey #3 - Production MWD Survey (OH)
		Tool Name
		Gyro MWD 105
		MWD+HDGM
		MWD+HDGM
		Description
		Gyro MWD Error Model Ver 1.0.5
		OWSG 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	0.00
122.00	0.35	177.63	122.00	-0.37	0.02	-0.12	0.29	0.29	0.00	0.00
First SDI Gyro MWD Survey										
213.00	1.67	281.34	212.99	-0.39	-1.27	1.11	1.96	1.45	113.97	
304.00	3.78	288.11	303.88	0.80	-5.42	5.43	2.34	2.32	7.44	
395.00	6.33	294.17	394.52	3.79	-12.85	13.40	2.86	2.80	6.66	
486.00	9.68	293.55	484.62	8.90	-24.45	25.96	3.68	3.68	-0.68	
578.00	13.28	292.76	574.76	16.08	-41.29	44.14	3.92	3.91	-0.86	
669.00	16.45	287.05	662.71	23.91	-63.25	67.41	3.83	3.48	-6.27	



Scientific Drilling, Intl Survey Report

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Project:	Garfield County, CO NAD83	TVD Reference:	GL 5371' & RKB 24' @ 5395.00usft (H&P 318)
Site:	PA 34-24 Pad	MD Reference:	GL 5371' & RKB 24' @ 5395.00usft (H&P 318)
Well:	PA 413-24	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)	
761.00	20.23	284.68	750.02	31.76	-91.10	96.35	4.19	4.11	-2.58	
Last SDI Gyro MWD Survey										
837.00	23.73	284.04	820.49	38.80	-118.66	124.77	4.62	4.61	-0.84	
First SDI Surface MWD Survey										
931.00	27.18	286.32	905.35	49.43	-157.62	165.15	3.81	3.67	2.43	
1,026.00	31.22	286.47	988.26	62.51	-202.07	211.49	4.25	4.25	0.16	
1,064.00	32.45	286.38	1,020.55	68.18	-221.30	231.53	3.24	3.24	-0.24	
Last SDI Surface MWD Survey										
1,166.00	34.38	286.38	1,105.68	84.02	-275.19	287.70	1.89	1.89	0.00	
First SDI Production MWD Survey										
1,260.00	34.47	286.21	1,183.22	98.93	-326.20	340.84	0.14	0.10	-0.18	
1,354.00	34.47	285.33	1,260.72	113.39	-377.39	394.04	0.53	0.00	-0.94	
1,448.00	35.00	284.98	1,337.96	127.39	-429.09	447.59	0.60	0.56	-0.37	
1,543.00	34.12	283.92	1,416.20	140.84	-481.27	501.46	1.12	-0.93	-1.12	
1,637.00	33.06	283.22	1,494.50	153.05	-531.82	553.40	1.20	-1.13	-0.74	
1,731.00	33.59	286.38	1,573.05	166.24	-581.73	605.02	1.93	0.56	3.36	
1,826.00	33.33	285.33	1,652.31	180.55	-632.12	657.39	0.67	-0.27	-1.11	
1,920.00	34.73	286.64	1,730.21	195.05	-682.68	709.99	1.68	1.49	1.39	
2,015.00	34.29	285.24	1,808.49	209.83	-734.43	763.81	0.95	-0.46	-1.47	
2,109.00	33.33	284.18	1,886.60	223.12	-785.02	816.10	1.20	-1.02	-1.13	
2,204.00	34.03	285.50	1,965.65	236.62	-835.94	868.76	1.07	0.74	1.39	
2,298.00	33.24	284.18	2,043.91	249.96	-886.26	920.81	1.15	-0.84	-1.40	
2,392.00	34.12	286.12	2,122.14	263.59	-936.57	972.92	1.48	0.94	2.06	
2,487.00	35.53	287.35	2,200.12	279.22	-988.52	1,027.17	1.66	1.48	1.29	
2,582.00	35.40	287.26	2,277.50	295.62	-1,041.14	1,082.28	0.15	-0.14	-0.09	
2,676.00	34.55	287.37	2,354.52	311.65	-1,092.58	1,136.15	0.91	-0.90	0.12	
2,770.00	35.78	288.45	2,431.36	328.31	-1,144.09	1,190.26	1.47	1.31	1.15	
2,864.00	35.49	288.98	2,507.76	345.88	-1,195.96	1,244.97	0.45	-0.31	0.56	
2,958.00	34.21	288.14	2,584.90	362.98	-1,246.88	1,298.64	1.45	-1.36	-0.89	
3,053.00	35.20	289.77	2,663.00	380.56	-1,298.03	1,352.66	1.43	1.04	1.72	
3,147.00	34.20	290.35	2,740.28	398.91	-1,348.29	1,406.05	1.12	-1.06	0.62	
3,242.00	36.32	290.24	2,817.85	417.93	-1,399.73	1,460.75	2.23	2.23	-0.12	
3,336.00	35.39	290.70	2,894.04	437.18	-1,451.31	1,515.66	1.03	-0.99	0.49	
3,431.00	36.23	287.61	2,971.08	455.40	-1,503.81	1,571.15	2.10	0.88	-3.25	
3,526.00	35.13	288.61	3,048.25	472.62	-1,556.47	1,626.53	1.31	-1.16	1.05	
3,620.00	35.66	285.94	3,124.88	488.78	-1,608.45	1,680.95	1.74	0.56	-2.84	
3,714.00	34.49	285.37	3,201.81	503.35	-1,660.46	1,734.97	1.29	-1.24	-0.61	
3,809.00	34.91	283.48	3,279.91	516.82	-1,712.84	1,789.02	1.22	0.44	-1.99	
3,903.00	32.93	283.31	3,357.91	528.97	-1,763.86	1,841.41	2.11	-2.11	-0.18	
3,998.00	34.75	283.54	3,436.82	541.26	-1,815.32	1,894.25	1.92	1.92	0.24	
4,092.00	35.57	285.87	3,513.67	555.01	-1,867.66	1,948.35	1.67	0.87	2.48	
4,187.00	34.12	286.14	3,591.63	569.97	-1,919.84	2,002.63	1.53	-1.53	0.28	
4,282.00	34.62	287.58	3,670.05	585.53	-1,971.16	2,056.25	1.00	0.53	1.52	
4,376.00	35.14	288.67	3,747.16	602.25	-2,022.24	2,109.97	0.86	0.55	1.16	



Scientific Drilling, Intl Survey Report

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Project:	Garfield County, CO NAD83	TVD Reference:	GL 5371' & RKB 24' @ 5395.00usft (H&P 318)
Site:	PA 34-24 Pad	MD Reference:	GL 5371' & RKB 24' @ 5395.00usft (H&P 318)
Well:	PA 413-24	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)	
4,471.00	33.72	289.74	3,825.52	619.91	-2,072.97	2,163.61	1.62	-1.49	1.13	
4,565.00	33.91	290.41	3,903.62	637.87	-2,122.10	2,215.80	0.45	0.20	0.71	
4,660.00	31.94	290.76	3,983.36	656.02	-2,170.44	2,267.28	2.08	-2.07	0.37	
4,754.00	32.93	290.14	4,062.69	673.63	-2,217.68	2,317.56	1.11	1.05	-0.66	
4,849.00	32.00	287.09	4,142.85	689.92	-2,265.98	2,368.50	1.98	-0.98	-3.21	
4,943.00	30.78	288.57	4,223.09	704.90	-2,312.59	2,417.43	1.54	-1.30	1.57	
5,038.00	28.34	287.30	4,305.72	719.35	-2,357.17	2,464.27	2.65	-2.57	-1.34	
5,132.00	28.50	287.63	4,388.39	732.78	-2,399.84	2,509.00	0.24	0.17	0.35	
5,227.00	25.85	287.52	4,472.90	745.88	-2,441.20	2,552.37	2.79	-2.79	-0.12	
5,321.00	24.27	286.47	4,558.05	757.53	-2,479.27	2,592.18	1.75	-1.68	-1.12	
5,416.00	25.06	285.76	4,644.38	768.53	-2,517.36	2,631.82	0.89	0.83	-0.75	
5,510.00	25.27	287.45	4,729.46	779.95	-2,555.66	2,671.79	0.80	0.22	1.80	
5,605.00	24.23	288.19	4,815.73	792.12	-2,593.52	2,711.54	1.14	-1.09	0.78	
5,699.00	22.86	285.50	4,901.90	803.02	-2,629.45	2,749.08	1.85	-1.46	-2.86	
5,794.00	20.09	285.60	4,990.30	812.34	-2,662.95	2,783.86	2.92	-2.92	0.11	
5,888.00	17.50	284.80	5,079.28	820.29	-2,692.17	2,814.13	2.77	-2.76	-0.85	
5,982.00	16.34	284.33	5,169.21	827.17	-2,718.65	2,841.48	1.24	-1.23	-0.50	
6,077.00	14.07	284.18	5,260.88	833.31	-2,742.79	2,866.38	2.39	-2.39	-0.16	
6,171.00	13.81	281.90	5,352.11	838.42	-2,764.85	2,888.98	0.65	-0.28	-2.43	
6,266.00	12.57	280.32	5,444.60	842.61	-2,786.11	2,910.57	1.36	-1.31	-1.66	
6,360.00	11.05	281.12	5,536.61	846.18	-2,805.02	2,929.72	1.63	-1.62	0.85	
6,455.00	10.82	282.05	5,629.89	849.80	-2,822.67	2,947.69	0.31	-0.24	0.98	
6,471.79	10.41	281.93	5,646.38	850.44	-2,825.70	2,950.77	2.45	-2.45	-0.69	
PA 413-24 BTV										
6,549.00	8.52	281.26	5,722.54	853.00	-2,838.13	2,963.42	2.45	-2.45	-0.87	
6,644.00	7.21	279.70	5,816.65	855.38	-2,850.91	2,976.36	1.40	-1.38	-1.64	
6,738.00	4.31	286.47	5,910.17	857.38	-2,860.11	2,985.75	3.16	-3.09	7.20	
6,832.00	1.36	252.64	6,004.04	858.05	-2,864.57	2,990.22	3.48	-3.14	-35.99	
6,927.00	0.99	255.40	6,099.02	857.50	-2,866.44	2,991.86	0.39	-0.39	2.91	
7,021.00	1.05	223.58	6,193.01	856.67	-2,867.82	2,992.95	0.60	0.06	-33.85	
7,116.00	1.37	235.02	6,287.99	855.39	-2,869.35	2,994.07	0.42	0.34	12.04	
7,210.00	0.29	187.66	6,381.98	854.51	-2,870.30	2,994.74	1.27	-1.15	-50.38	
7,305.00	0.53	147.69	6,476.98	853.90	-2,870.10	2,994.37	0.38	0.25	-42.07	
7,399.00	0.94	133.10	6,570.97	853.01	-2,869.30	2,993.36	0.48	0.44	-15.52	
7,494.00	0.89	126.52	6,665.96	852.04	-2,868.14	2,991.97	0.12	-0.05	-6.93	
7,588.00	1.23	157.38	6,759.94	850.67	-2,867.16	2,990.65	0.69	0.36	32.83	
7,683.00	1.32	152.44	6,854.92	848.76	-2,866.27	2,989.26	0.15	0.09	-5.20	
7,777.00	0.63	243.08	6,948.91	847.57	-2,866.23	2,988.88	1.56	-0.73	96.43	
7,872.00	0.47	200.50	7,043.90	846.97	-2,866.83	2,989.30	0.45	-0.17	-44.82	
7,966.00	0.57	194.56	7,137.90	846.15	-2,867.08	2,989.31	0.12	0.11	-6.32	
8,061.00	0.37	169.97	7,232.90	845.39	-2,867.15	2,989.16	0.29	-0.21	-25.88	
8,155.00	0.66	195.51	7,326.89	844.57	-2,867.24	2,989.02	0.39	0.31	27.17	
8,250.00	0.84	190.87	7,421.88	843.36	-2,867.52	2,988.95	0.20	0.19	-4.88	



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Site: PA 34-24 Pad	MD Reference: GL 5371' & RKB 24' @ 5395.00usft (H&P 318)
Well: PA 413-24	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)	
8,344.00	1.51	185.03	7,515.86	841.45	-2,867.75	2,988.64	0.72	0.71	-6.21	
8,438.00	1.44	161.71	7,609.83	839.10	-2,867.49	2,987.74	0.64	-0.07	-24.81	
8,533.00	0.72	134.16	7,704.82	837.55	-2,866.69	2,986.53	0.91	-0.76	-29.00	
8,627.00	0.70	125.63	7,798.81	836.80	-2,865.80	2,985.47	0.11	-0.02	-9.07	
8,722.00	1.06	172.04	7,893.80	835.59	-2,865.21	2,984.56	0.81	0.38	48.85	
8,816.00	1.41	217.56	7,987.78	833.81	-2,865.79	2,984.63	1.07	0.37	48.43	
8,875.00	1.67	238.04	8,046.76	832.78	-2,866.96	2,985.46	1.02	0.44	34.71	
Last SDI Production MWD Survey										
8,935.00	1.67	238.04	8,106.73	831.86	-2,868.45	2,986.63	0.00	0.00	0.00	
Projection to TD - PA 413-24 PBHL										

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
122.00	122.00	-0.37	0.02	First SDI Gyro MWD Survey	
761.00	750.02	31.76	-91.10	Last SDI Gyro MWD Survey	
837.00	820.49	38.80	-118.66	First SDI Surface MWD Survey	
1,064.00	1,020.55	68.18	-221.30	Last SDI Surface MWD Survey	
1,166.00	1,105.68	84.02	-275.19	First SDI Production MWD Survey	
8,875.00	8,046.76	832.78	-2,866.96	Last SDI Production MWD Survey	
8,935.00	8,106.73	831.86	-2,868.45	Projection to TD	

Checked By: _____	Approved By: _____	Date: _____
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