



Marathon Oil

Marathon Oil

Lea County, NM

Flowmaster 24-34-15 (3-6-7)

WD #3H

ST01

Design: ST01

Survey Report

28 December, 2018





Professional Directional Survey Report



Company: Marathon Oil
Project: Lea County, NM
Site: Flowmaster 24-34-15 (3-6-7)
Well: WD #3H
Wellbore: ST01
Design: ST01

Local Co-ordinate Reference: Well WD #3H
TVD Reference: Well @ 3549.50usft (GL: 3523' + KB: 26.5' (H&P498))
MD Reference: Well @ 3549.50usft (GL: 3523' + KB: 26.5' (H&P498))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: WellPlanner1

Survey Program		Date	12/28/2018		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
177.00	1,086.00	Survey #1 (OH)	MWD+HDGM	OWSG MWD + HRGM	
1,218.00	13,420.00	Survey #2 (OH)	MWD+HDGM	OWSG MWD + HRGM	
13,468.00	16,489.00	Survey #1 (ST01)	MWD+HDGM	OWSG MWD + HRGM	

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (usft)	Easting (usft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	446,202.44	768,687.84	
177.00	0.40	288.10	177.00	-0.20	0.19	-0.59	0.62	288.10	446,202.63	768,687.25	
239.00	0.40	264.50	239.00	-0.25	0.24	-1.01	1.04	283.30	446,202.68	768,686.83	
329.00	0.70	288.80	328.99	-0.40	0.39	-1.84	1.88	281.82	446,202.83	768,686.00	
420.00	0.60	301.10	419.99	-0.83	0.81	-2.78	2.89	286.28	446,203.25	768,685.06	
511.00	0.60	297.30	510.98	-1.30	1.28	-3.81	3.83	289.47	446,203.72	768,684.23	
603.00	0.40	278.80	602.98	-1.58	1.55	-4.35	4.62	289.55	446,203.99	768,683.49	
694.00	0.50	260.00	693.98	-1.56	1.53	-5.06	5.28	286.78	446,203.97	768,682.78	
785.00	0.50	264.50	784.97	-1.46	1.42	-5.84	6.01	283.64	446,203.86	768,682.00	
876.00	0.40	300.40	875.97	-1.59	1.54	-6.51	6.69	283.31	446,203.98	768,681.33	
967.00	0.60	314.30	966.97	-2.09	2.03	-7.13	7.41	285.93	446,204.47	768,680.71	
1,063.00	0.40	294.30	1,062.96	-2.58	2.52	-7.79	8.19	287.94	446,204.96	768,680.05	
1,086.00	0.60	317.90	1,085.96	-2.71	2.65	-7.95	8.38	288.41	446,205.09	768,679.89	
1,218.00	0.50	322.20	1,217.96	-3.68	3.61	-8.76	9.48	292.41	446,206.05	768,679.08	
1,312.00	0.50	313.50	1,311.95	-4.29	4.22	-9.31	10.22	294.38	446,206.66	768,678.53	
1,407.00	0.50	313.30	1,406.95	-4.87	4.79	-9.91	11.01	295.78	446,207.23	768,677.93	
1,501.00	0.70	306.60	1,500.94	-5.50	5.41	-10.67	11.97	296.89	446,207.85	768,677.17	
1,596.00	0.80	300.10	1,595.94	-6.18	6.09	-11.71	13.20	297.48	446,208.53	768,676.13	
1,690.00	1.00	117.70	1,689.93	-6.13	6.04	-11.56	13.04	297.59	446,208.48	768,676.28	
1,784.00	2.40	113.10	1,783.89	-4.96	4.89	-9.02	10.26	298.45	446,207.33	768,678.82	



Professional Directional Survey Report



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Project: Lea County, NM
Site: Flowmaster 24-34-15 (3-6-7)
Well: WD #3H
Wellbore: ST01
Design: ST01

Local Co-ordinate Reference: Well WD #3H
TVD Reference: Well @ 3549.50usft (GL: 3523' + KB: 26.5' (H&P498))
MD Reference: Well @ 3549.50usft (GL: 3523' + KB: 26.5' (H&P498))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: WellPlanner1

Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (usft)	Easting (usft)	
4,430.00	0.50	58.10	4,429.67	-3.99	4.05	6.86	7.97	59.46	446,206.49	768,694.70	
4,525.00	0.90	67.30	4,524.66	-4.49	4.56	7.90	9.12	60.04	446,207.00	768,695.74	
4,619.00	1.50	90.70	4,618.64	-4.75	4.82	9.81	10.94	63.82	446,207.26	768,697.65	
4,714.00	2.00	96.00	4,713.60	-4.54	4.64	12.71	13.53	69.95	446,207.08	768,700.55	
4,808.00	1.00	134.60	4,807.57	-3.77	3.89	14.92	15.42	75.39	446,206.33	768,702.76	
4,903.00	1.50	141.70	4,902.54	-2.20	2.33	16.28	16.45	81.85	446,204.77	768,704.12	
4,998.00	2.20	128.60	4,997.49	-0.07	0.22	18.48	18.48	89.32	446,202.66	768,706.32	
5,092.00	1.90	127.00	5,091.43	2.01	-1.85	21.13	21.21	94.99	446,200.59	768,708.97	
5,187.00	1.40	129.00	5,186.39	3.71	-3.52	23.29	23.56	98.60	446,198.92	768,711.13	
5,259.00	1.40	125.70	5,258.37	4.78	-4.59	24.69	25.11	100.53	446,197.85	768,712.53	
5,370.00	1.40	117.80	5,369.34	6.23	-6.01	26.99	27.65	102.56	446,196.43	768,714.83	
5,465.00	1.30	110.10	5,464.31	7.15	-6.93	29.03	29.84	103.42	446,195.51	768,716.87	
5,560.00	1.50	23.30	5,559.29	6.39	-6.15	30.53	31.15	101.40	446,196.29	768,718.37	
5,654.00	3.00	352.90	5,653.22	2.82	-2.58	30.72	30.82	94.81	446,199.86	768,718.56	
5,749.00	3.50	349.30	5,748.07	-2.50	2.73	29.87	30.00	84.77	446,205.17	768,717.71	
5,843.00	3.60	348.20	5,841.89	-8.22	8.44	28.73	29.95	73.63	446,210.88	768,716.57	
5,938.00	4.60	343.80	5,936.64	-14.81	15.02	27.06	30.95	60.97	446,217.46	768,714.90	
6,031.00	5.10	342.70	6,029.31	-22.35	22.55	24.79	33.51	47.71	446,224.99	768,712.63	
6,126.00	5.70	355.80	6,123.89	-31.10	31.28	23.19	38.94	36.55	446,233.72	768,711.03	
6,220.00	5.80	2.00	6,217.42	-40.50	40.69	23.01	46.74	29.49	446,243.13	768,710.85	
6,315.00	5.90	7.50	6,311.93	-50.14	50.32	23.82	55.68	25.33	446,252.76	768,711.66	
6,409.00	5.80	16.90	6,405.44	-59.45	59.66	25.83	65.01	23.41	446,262.10	768,713.67	
6,504.00	5.70	14.90	6,499.96	-68.59	68.81	28.44	74.46	22.45	446,271.25	768,716.28	
6,598.00	5.40	14.70	6,593.52	-77.36	77.60	30.76	83.48	21.62	446,280.04	768,718.60	
6,693.00	5.40	13.10	6,688.10	-86.02	86.28	32.91	92.34	20.88	446,288.72	768,720.75	
6,787.00	5.60	14.50	6,781.67	-94.75	95.03	35.06	101.29	20.25	446,297.47	768,722.90	
6,882.00	5.40	13.60	6,876.23	-103.56	103.86	37.27	110.34	19.74	446,306.30	768,725.11	



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Survey											
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9,527.00	0.60	10.60	9,514.52	-264.31	265.02	89.27	279.65	18.62	446,467.46	768,777.11	
9,621.00	0.90	18.50	9,608.51	-265.49	266.21	89.60	280.88	18.60	446,468.65	768,777.44	
9,716.00	1.10	16.40	9,703.49	-267.07	267.79	90.09	282.54	18.59	446,470.23	768,777.93	
9,811.00	0.80	124.20	9,798.49	-267.57	268.29	90.90	283.27	18.72	446,470.73	768,778.74	
9,905.00	0.40	224.70	9,892.48	-266.96	267.69	91.21	282.80	18.82	446,470.13	768,779.05	
10,000.00	1.50	305.00	9,987.47	-267.45	268.16	89.98	282.85	18.54	446,470.60	768,777.80	
10,094.00	1.60	335.30	10,081.44	-269.36	270.06	88.40	284.16	18.12	446,472.50	768,776.24	
10,188.00	3.20	343.00	10,175.35	-273.07	273.76	87.08	287.28	17.65	446,476.20	768,774.92	
10,283.00	1.10	357.60	10,270.28	-276.53	277.21	86.27	290.33	17.29	446,479.65	768,774.11	
10,378.00	0.70	149.10	10,365.27	-276.94	277.62	86.53	290.80	17.31	446,480.06	768,774.37	
10,472.00	0.70	189.90	10,459.27	-275.88	276.57	86.73	289.85	17.41	446,479.01	768,774.57	
10,567.00	1.80	310.40	10,554.25	-276.28	276.96	85.49	289.86	17.15	446,479.40	768,773.33	
10,662.00	0.80	256.30	10,649.23	-277.11	277.77	83.71	290.11	16.77	446,480.21	768,771.55	
10,756.00	1.70	175.20	10,743.21	-275.56	276.23	83.19	288.48	16.76	446,478.67	768,771.03	
10,851.00	1.10	199.30	10,838.19	-273.30	273.96	83.00	286.26	16.86	446,476.40	768,770.84	
10,945.00	0.80	196.00	10,932.17	-271.82	272.48	82.53	284.70	16.85	446,474.92	768,770.37	
11,040.00	1.00	227.00	11,027.16	-270.63	271.28	81.74	283.32	16.77	446,473.72	768,769.58	
11,134.00	0.90	224.90	11,121.15	-269.55	270.19	80.62	281.96	16.61	446,472.63	768,768.46	
11,229.00	1.20	222.20	11,216.13	-268.30	268.93	79.42	280.41	16.45	446,471.37	768,767.26	
11,323.00	2.10	247.00	11,310.09	-266.91	267.53	77.17	278.44	16.09	446,469.97	768,765.01	
11,418.00	1.60	296.80	11,405.05	-266.85	267.44	74.39	277.60	15.54	446,469.88	768,762.23	
11,513.00	0.70	332.00	11,500.03	-267.97	268.55	72.93	278.28	15.19	446,470.99	768,760.77	
11,607.00	0.80	333.70	11,594.02	-269.07	269.65	72.37	279.19	15.02	446,472.09	768,760.21	
11,638.00	1.00	343.30	11,625.02	-269.53	270.10	72.20	279.59	14.97	446,472.54	768,760.04	
11,722.00	1.50	323.40	11,709.00	-271.12	271.69	71.33	280.90	14.71	446,474.13	768,759.17	
11,816.00	1.00	97.30	11,802.99	-272.00	272.57	71.41	281.77	14.68	446,475.01	768,759.25	
11,910.00	1.90	146.90	11,896.96	-270.58	271.16	73.08	280.84	15.08	446,473.60	768,760.92	



Professional Directional Survey Report



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Project: Lea County, NM
Site: Flowmaster 24-34-15 (3-6-7)
Well: WD #3H
Wellbore: ST01
Design: ST01

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Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVD (usft)	V. Sec (usft)	N/S (usft)	E/W (usft)	Closure Distance (usft)	Closure Azimuth (°)	Northing (usft)	Easting (usft)
13,751.00	78.30	187.80	13,345.17	375.87	-375.92	-3.92	375.94	180.60	445,826.52	768,683.92
13,798.00	79.30	187.50	13,354.30	421.52	-421.61	-10.06	421.73	181.37	445,780.83	768,677.78
13,845.00	80.00	187.50	13,362.75	467.31	-467.45	-16.09	467.73	181.97	445,734.99	768,671.75
13,892.00	79.90	188.60	13,370.95	513.08	-513.27	-22.57	513.77	182.52	445,689.17	768,665.27
13,939.00	80.80	188.30	13,378.83	558.86	-559.10	-29.38	559.87	183.01	445,643.34	768,658.46
13,986.00	80.80	188.20	13,386.34	604.72	-605.02	-36.04	606.09	183.41	445,597.42	768,651.80
14,033.00	80.00	188.00	13,394.18	650.54	-650.90	-42.57	652.29	183.74	445,551.54	768,645.27
14,104.00	80.00	185.10	13,406.51	719.94	-720.35	-50.54	722.13	184.01	445,482.09	768,637.30
14,174.00	81.00	184.30	13,418.06	788.70	-789.16	-56.20	791.16	184.07	445,413.28	768,631.64
14,257.00	90.50	183.70	13,424.21	871.12	-871.64	-61.96	873.84	184.07	445,330.80	768,625.88
14,280.00	90.07	183.68	13,424.10	894.08	-894.59	-63.44	896.84	184.06	445,307.85	768,624.40
ENTER: 14280'MD										
14,363.00	88.50	183.60	13,425.13	976.84	-977.41	-68.71	979.82	184.02	445,225.03	768,619.13
14,457.00	93.60	186.60	13,423.41	1,070.34	-1,070.98	-77.06	1,073.75	184.12	445,131.46	768,610.78
14,552.00	93.80	184.20	13,417.28	1,164.65	-1,165.36	-85.98	1,168.52	184.22	445,037.08	768,601.86
14,646.00	91.70	180.00	13,412.77	1,258.42	-1,259.16	-89.42	1,262.33	184.06	444,943.28	768,598.42
14,741.00	87.30	180.30	13,413.60	1,353.39	-1,354.13	-89.67	1,357.10	183.79	444,848.31	768,598.17
14,855.00	90.70	181.10	13,415.59	1,467.33	-1,468.09	-91.06	1,470.91	183.55	444,734.35	768,596.78
14,949.00	92.60	179.60	13,412.88	1,561.27	-1,562.04	-91.63	1,564.73	183.36	444,640.40	768,596.21
15,045.00	93.20	179.90	13,408.02	1,657.15	-1,657.92	-91.21	1,660.42	183.15	444,544.52	768,596.63
15,139.00	93.30	180.20	13,402.69	1,750.99	-1,751.77	-91.30	1,754.14	182.98	444,450.67	768,596.54
15,233.00	96.00	180.30	13,395.07	1,844.67	-1,845.45	-91.71	1,847.72	182.84	444,356.99	768,596.13
15,331.00	91.50	181.60	13,388.67	1,942.40	-1,943.20	-93.33	1,945.44	182.75	444,259.24	768,594.51
15,425.00	92.50	181.50	13,385.39	2,036.29	-2,037.10	-95.87	2,039.36	182.69	444,165.34	768,591.97
15,519.00	92.20	181.60	13,381.53	2,130.15	-2,130.99	-98.41	2,133.26	182.64	444,071.45	768,589.43
15,614.00	90.60	180.10	13,379.21	2,225.09	-2,225.94	-99.82	2,228.18	182.57	443,976.50	768,588.02
15,708.00	90.00	178.70	13,378.72	2,319.09	-2,319.94	-98.83	2,322.04	182.44	443,882.50	768,589.01



Marathon Oil
Lea County, NM
Flowmaster 24-34-16 (3-6-7)
WD #3H
ST01-Plan #5
GL: 3523' + KB: 26.5' (H&P498)

US State Plane 1927 (Exact solution)
NAD 1927 (NADCON CONUS)
Clarke 1866
New Mexico East 3001
Mean Sea Level

RKB Elevation: Well @ 3549.50usft (GL: 3523' + KB: 26.5' (H&P498))

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Spot
0.00	0.00	448202.44	788887.84	32.223741	-103.464482	

SECTION DETAILS

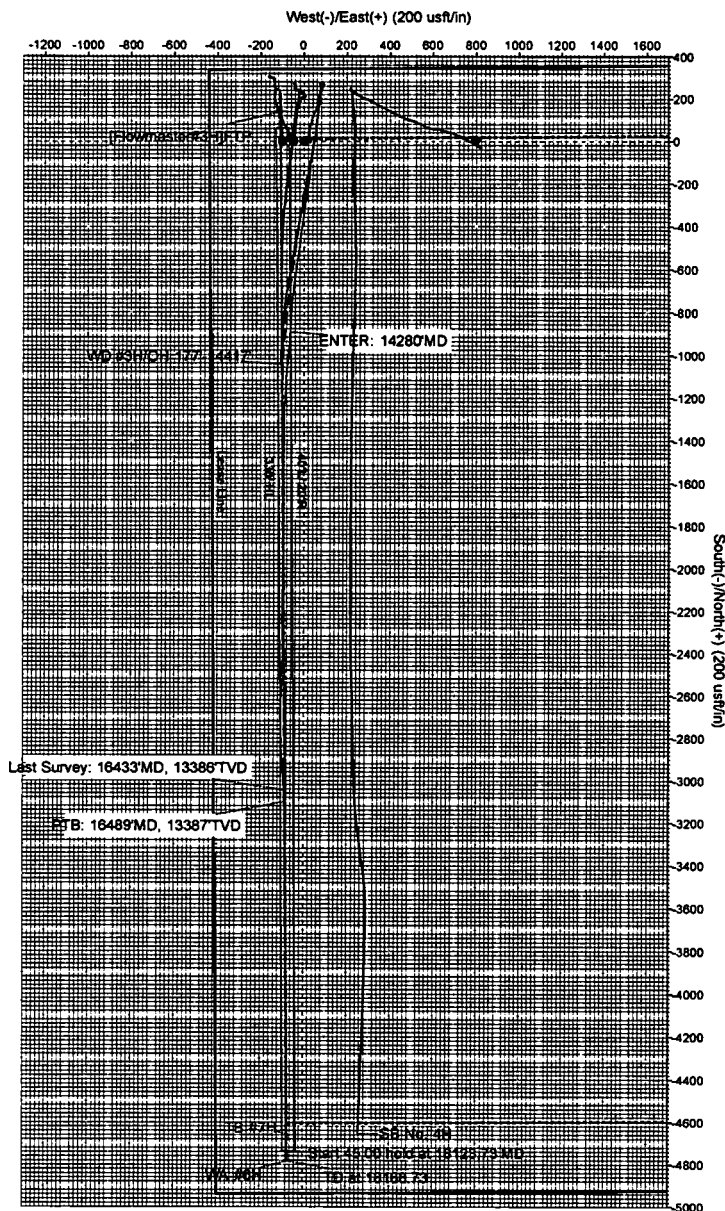
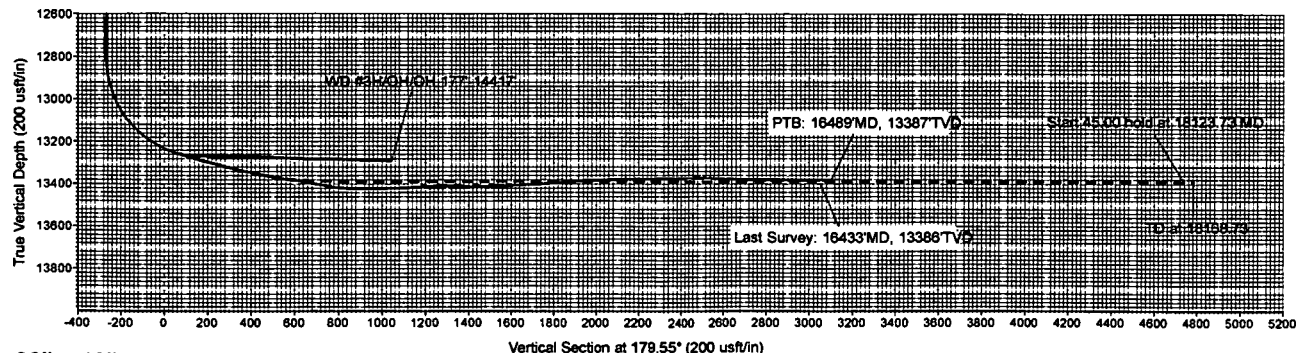
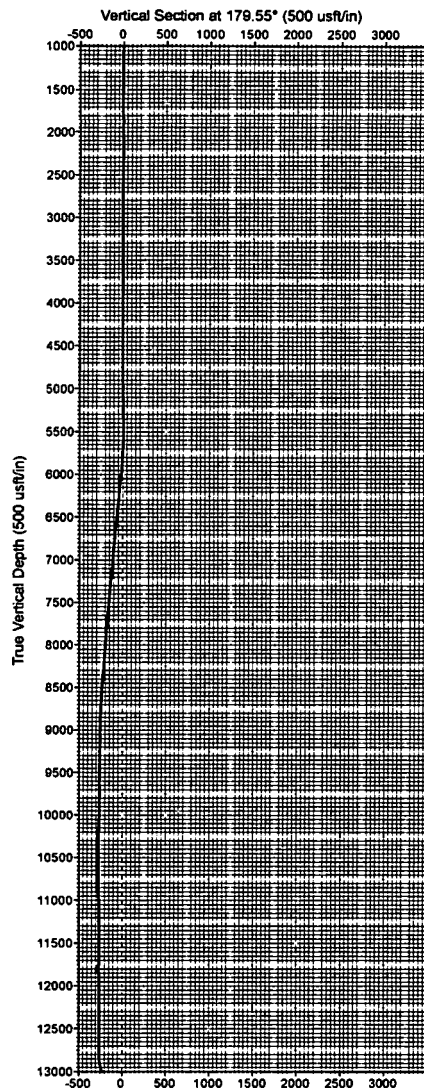
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	Vsect
1	13425.00	75.38	190.19	13258.54	-64.58	37.55	0.00	64.87
2	13450.00	74.84	191.54	13265.00	-88.29	33.00	6.00	88.55
3	13475.00	74.84	191.54	13271.83	-111.91	28.18	0.00	112.13
4	13501.00	74.84	191.54	13305.01	-230.98	3.88	0.00	230.88
5	13711.28	76.00	188.42	13332.87	-336.01	-14.59	3.00	335.88
6	14179.71	90.00	187.19	13389.92	-795.50	-77.50	3.00	794.88
7	14581.59	90.00	179.55	13389.92	-1178.43	-99.94	2.00	1175.61
8	18123.73	90.00	179.55	13390.00	-4738.46	-72.11	0.00	4737.75
9	18168.73	90.00	179.55	13390.00	-4783.46	-71.78	0.00	4782.75

WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	+N/-S	+E/-W	Northing	Easting
[Flowmaster#3H]FTP	0.00	139.14	-110.79	448341.58	788577.05
[Flowmaster#3H]ST01-LTP/BHL	13390.00	-4738.46	-72.11	441463.88	788615.73



Target Line: 13390' TVD @ 0' VS: 90° INC



Last Survey: 16433'MD, 13386'TVD

PTB: 16489'MD, 13387'TVD



Azimuth to Grid North
True North: -0.46°
Magnetic North: 6.24°

Magnetic Field
Strength: 47666.8nT
Dip Angle: 59.92°
Date: 10/31/2018
Model: HDGM

Azimuth Corrections

Total Magnetic Corr. (M to G): 6.24°
Declination (M to T): 6.70° East