

# **Extraction Oil & Gas**

**Weld County, CO (NAD83)**

**Sec 26-T07N-R67W**

**Launer 12**

**Wellbore #1**

**Design: Wellbore #1**

## **Standard Survey Report**

**16 November, 2017**

## Survey Report

<b>Company:</b>	Extraction Oil & Gas	<b>Local Co-ordinate Reference:</b>	Well Launer 12
<b>Project:</b>	Weld County, CO (NAD83)	<b>TVD Reference:</b>	KB=25 @ 4951.00ft (Patterson 346)
<b>Site:</b>	Sec 26-T07N-R67W	<b>MD Reference:</b>	KB=25 @ 4951.00ft (Patterson 346)
<b>Well:</b>	Launer 12	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1

<b>Project</b>	Weld County, CO (NAD83)		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Ground Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	Colorado Northern Zone		

Site		Sec 26-T07N-R67W			
Site Position:		Northing:	1,444,245.2190 usft	Latitude:	40.551051
From:	Map	Easting:	3,179,860.1010 usft	Longitude:	-104.852759
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.42 °

Well	Launer 12					
Well Position	+N/-S	0.00 ft	Northing:	1,440,082.6244 usf	Latitude:	40.539624
	+E/-W	0.00 ft	Easting:	3,179,932.7013 usf	Longitude:	-104.852607
Position Uncertainty		0.00 ft	Wellhead Elevation:	0.00 ft	Ground Level:	4,926.00 ft

<b>Wellbore</b>	Wellbore #1				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	HDGM	10/12/2017	8.33	66.95	52,389

<b>Design</b>	Wellbore #1				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Direction (°)</b>	
	0.00	0.00	0.00	147.81	

<b>Survey Program</b>	<b>Date</b>	11/16/2017			
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
492.00	1,511.00	Surface Surveys (Wellbore #1)	NS-GYRO-MS	North sensing gyrocompassing m/s	
1,647.00	14,580.00	MWD Surveys (Wellbore #1)	MWD	MWD - Standard	

<b>Survey</b>										
<b>Measured Depth (ft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Vertical Section (ft)</b>	<b>Dogleg Rate (°/100usft)</b>	<b>Build Rate (°/100usft)</b>	<b>Turn Rate (°/100usft)</b>	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
492.00	0.83	200.71	491.98	-3.33	-1.26	2.15	0.17	0.17	0.00	
588.00	0.62	183.84	587.98	-4.50	-1.54	2.99	0.31	-0.22	-17.57	
684.00	1.27	200.53	683.96	-6.02	-1.95	4.05	0.73	0.68	17.39	
779.00	0.88	134.44	778.95	-7.51	-1.80	5.40	1.28	-0.41	-69.57	
875.00	1.36	137.69	874.93	-8.87	-0.50	7.24	0.50	0.50	3.39	
971.00	0.57	72.92	970.92	-9.57	0.72	8.49	1.28	-0.82	-67.47	
1,067.00	0.40	65.10	1,066.91	-9.29	1.48	8.65	0.19	-0.18	-8.15	
1,163.00	0.53	32.22	1,162.91	-8.78	2.02	8.50	0.30	0.14	-34.25	
1,258.00	0.53	45.94	1,257.91	-8.10	2.57	8.22	0.13	0.00	14.44	

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<b>Site:</b>	Sec 26-T07N-R67W	<b>MD Reference:</b>	KB=25 @ 4951.00ft (Patterson 346)
<b>Well:</b>	Launer 12	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1

### Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,354.00	1.49	33.02	1,353.89	-6.74	3.57	7.61	1.02	1.00	-13.46
1,448.00	0.88	325.08	1,447.87	-5.13	3.82	6.38	1.51	-0.65	-72.28
1,511.00	0.97	307.41	1,510.87	-4.41	3.12	5.39	0.47	0.14	-28.05
1,647.00	1.10	301.25	1,646.84	-3.03	1.09	3.15	0.13	0.10	-4.53
<b>First MWD Survey @ 1647'MD</b>									
1,742.00	1.28	301.64	1,741.82	-2.00	-0.59	1.38	0.19	0.19	0.41
1,835.00	1.10	217.34	1,834.81	-2.16	-2.02	0.76	1.72	-0.19	-90.65
1,930.00	1.10	222.63	1,929.79	-3.56	-3.19	1.32	0.11	0.00	5.57
2,024.00	1.02	131.94	2,023.78	-4.78	-3.18	2.36	1.61	-0.09	-96.48
2,119.00	0.88	124.84	2,118.77	-5.77	-1.95	3.84	0.19	-0.15	-7.47
2,214.00	3.80	136.74	2,213.68	-8.48	0.81	7.60	3.10	3.07	12.53
2,308.00	3.40	135.64	2,307.49	-12.74	4.89	13.38	0.43	-0.43	-1.17
2,403.00	5.21	133.04	2,402.22	-17.70	10.01	20.31	1.92	1.91	-2.74
2,591.00	6.72	130.53	2,589.20	-30.67	24.61	39.07	0.81	0.80	-1.34
2,780.00	8.22	138.73	2,776.59	-48.01	41.93	62.97	0.97	0.79	4.34
2,874.00	9.41	137.45	2,869.48	-58.72	51.56	77.17	1.28	1.27	-1.36
3,063.00	10.52	134.14	3,055.63	-82.12	74.39	109.13	0.66	0.59	-1.75
3,157.00	11.18	135.73	3,147.95	-94.63	86.91	126.38	0.77	0.70	1.69
3,346.00	10.52	133.13	3,333.57	-119.54	112.29	160.99	0.43	-0.35	-1.38
3,441.00	11.18	135.42	3,426.87	-132.03	125.09	178.37	0.83	0.69	2.41
3,535.00	9.81	133.53	3,519.30	-144.04	137.29	195.03	1.50	-1.46	-2.01
3,629.00	8.79	128.63	3,612.06	-154.04	148.71	209.58	1.37	-1.09	-5.21
3,724.00	9.99	131.54	3,705.79	-164.03	160.55	224.35	1.36	1.26	3.06
3,912.00	10.12	130.62	3,890.90	-185.60	185.29	255.78	0.11	0.07	-0.49
4,006.00	10.91	137.62	3,983.33	-197.55	197.55	272.42	1.60	0.84	7.45
4,100.00	11.09	135.73	4,075.60	-210.59	209.86	290.02	0.43	0.19	-2.01
4,194.00	9.50	137.84	4,168.08	-222.82	221.38	306.50	1.74	-1.69	2.24
4,289.00	10.38	137.05	4,261.66	-234.89	232.47	322.63	0.94	0.93	-0.83
4,383.00	11.62	133.13	4,353.93	-247.56	245.15	340.11	1.54	1.32	-4.17
4,477.00	10.78	132.73	4,446.14	-260.00	258.52	357.75	0.90	-0.89	-0.43
4,571.00	12.02	133.92	4,538.28	-272.76	272.03	375.74	1.34	1.32	1.27
4,666.00	10.21	134.14	4,631.50	-285.48	285.20	393.53	1.91	-1.91	0.23
4,760.00	11.00	131.15	4,723.89	-297.19	297.93	410.22	1.02	0.84	-3.18
4,854.00	12.28	132.82	4,815.95	-309.88	312.01	428.46	1.41	1.36	1.78
5,042.00	12.51	133.13	4,999.57	-337.39	341.54	467.47	0.13	0.12	0.16
5,136.00	10.52	133.61	5,091.68	-350.27	355.18	485.64	2.12	-2.12	0.51
5,230.00	10.21	131.63	5,184.14	-361.73	367.62	501.96	0.50	-0.33	-2.11
5,325.00	10.30	136.21	5,277.63	-373.45	379.79	518.37	0.86	0.09	4.82
5,419.00	11.31	142.65	5,369.96	-386.84	391.20	535.78	1.67	1.07	6.85
5,513.00	9.50	143.04	5,462.41	-400.37	401.46	552.69	1.93	-1.93	0.41
5,607.00	10.21	146.04	5,555.03	-413.48	410.78	568.75	0.93	0.76	3.19
5,701.00	8.31	151.64	5,647.80	-426.37	418.66	583.86	2.23	-2.02	5.96
5,796.00	6.50	153.84	5,742.00	-437.24	424.29	596.06	1.93	-1.91	2.32

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<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1

### Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
5,890.00	4.42	155.12	5,835.57	-445.30	428.16	604.94	2.22	-2.21	1.36
5,984.00	3.09	126.92	5,929.37	-450.11	431.71	610.90	2.38	-1.41	-30.00
6,078.00	1.41	57.42	6,023.31	-451.01	434.71	613.26	3.10	-1.79	-73.94
6,172.00	1.19	22.52	6,117.29	-449.48	436.06	612.69	0.86	-0.23	-37.13
6,266.00	1.19	347.03	6,211.27	-447.63	436.21	611.20	0.77	0.00	-37.76
6,361.00	1.28	309.53	6,306.25	-445.99	435.17	609.26	0.84	0.09	-39.47
6,454.00	1.81	298.73	6,399.22	-444.63	433.09	606.99	0.65	0.57	-11.61
6,478.00	2.12	294.55	6,423.20	-444.26	432.35	606.29	1.42	1.29	-17.42
6,573.00	11.00	278.95	6,517.49	-442.12	421.78	598.84	9.45	9.35	-16.42
6,668.00	21.39	276.35	6,608.60	-438.78	395.53	582.04	10.96	10.94	-2.74
6,761.00	28.41	271.24	6,692.91	-436.42	356.51	559.26	7.89	7.55	-5.49
6,856.00	38.71	268.24	6,771.97	-436.85	304.08	531.69	10.98	10.84	-3.16
6,950.00	39.59	265.73	6,844.87	-439.98	244.82	502.77	1.93	0.94	-2.67
7,043.00	51.08	267.45	6,910.14	-443.81	178.90	470.90	12.42	12.35	1.85
7,138.00	58.22	270.13	6,965.07	-445.36	101.50	430.98	7.86	7.52	2.82
7,232.00	65.18	270.75	7,009.61	-444.71	18.79	386.37	7.43	7.40	0.66
7,326.00	71.50	271.02	7,044.29	-443.36	-68.52	338.72	6.73	6.72	0.29
7,388.94	76.05	271.17	7,061.87	-442.21	-128.93	305.56	7.24	7.23	0.24
<b>Hardline Crossing @ 7388.94'MD (188'FSL &amp; 591'FEL)</b>									
7,420.00	78.30	271.24	7,068.76	-441.57	-159.20	288.89	7.24	7.23	0.23
7,514.00	83.21	270.31	7,083.86	-440.32	-251.95	238.43	5.31	5.22	-0.99
7,608.00	89.40	270.05	7,089.91	-440.03	-345.70	188.24	6.59	6.59	-0.28
7,702.00	93.28	269.74	7,087.72	-440.20	-439.66	138.33	4.14	4.13	-0.33
7,796.00	93.81	269.34	7,081.90	-440.95	-533.48	88.99	0.71	0.56	-0.43
7,985.00	92.89	269.52	7,070.86	-442.83	-722.14	-9.92	0.50	-0.49	0.10
8,173.00	93.02	269.65	7,061.17	-444.19	-909.89	-108.78	0.10	0.07	0.07
8,362.00	93.90	269.69	7,049.76	-445.27	-1,098.54	-208.36	0.47	0.47	0.02
8,456.00	92.18	269.21	7,044.78	-446.18	-1,192.40	-257.59	1.90	-1.83	-0.51
8,645.00	92.49	269.12	7,037.08	-448.93	-1,381.22	-355.85	0.17	0.16	-0.05
8,740.00	93.28	268.94	7,032.30	-450.53	-1,476.09	-405.03	0.85	0.83	-0.19
8,835.00	92.40	270.75	7,027.59	-450.79	-1,570.96	-455.35	2.12	-0.93	1.91
8,929.00	92.40	271.54	7,023.65	-448.91	-1,664.86	-506.96	0.84	0.00	0.84
9,024.00	92.80	271.63	7,019.34	-446.29	-1,759.73	-559.71	0.43	0.42	0.09
9,118.00	90.50	271.94	7,016.64	-443.36	-1,853.64	-612.22	2.47	-2.45	0.33
9,213.00	90.50	271.81	7,015.81	-440.25	-1,948.58	-665.43	0.14	0.00	-0.14
9,307.00	90.90	272.03	7,014.66	-437.10	-2,042.52	-718.13	0.49	0.43	0.23
9,402.00	88.82	271.94	7,014.89	-433.81	-2,137.46	-771.49	2.19	-2.19	-0.09
9,496.00	88.29	272.43	7,017.26	-430.23	-2,231.36	-824.54	0.77	-0.56	0.52
9,590.00	88.51	270.31	7,019.89	-427.99	-2,325.29	-876.48	2.27	0.23	-2.26
9,685.00	90.50	270.53	7,020.71	-427.29	-2,420.28	-927.67	2.11	2.09	0.23
9,779.00	90.41	271.24	7,019.96	-425.84	-2,514.27	-978.97	0.76	-0.10	0.76
9,873.00	91.30	270.13	7,018.56	-424.71	-2,608.25	-1,029.98	1.51	0.95	-1.18
9,968.00	92.18	270.84	7,015.67	-423.91	-2,703.20	-1,081.24	1.19	0.93	0.75
10,062.00	92.89	270.62	7,011.52	-422.71	-2,797.10	-1,132.28	0.79	0.76	-0.23

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10,156.00	90.99	271.54	7,008.33	-420.94	-2,891.02	-1,183.81	2.25	-2.02	0.98
10,250.00	91.21	271.94	7,006.53	-418.09	-2,984.96	-1,236.26	0.49	0.23	0.43
10,344.00	91.38	272.34	7,004.40	-414.58	-3,078.87	-1,289.26	0.46	0.18	0.43
10,438.00	90.90	272.25	7,002.53	-410.82	-3,172.78	-1,342.47	0.52	-0.51	-0.10
10,533.00	90.10	272.25	7,001.71	-407.09	-3,267.70	-1,396.19	0.84	-0.84	0.00
10,627.00	92.31	270.44	6,999.73	-404.88	-3,361.64	-1,448.10	3.04	2.35	-1.93
10,722.00	92.62	270.75	6,995.64	-403.89	-3,456.55	-1,499.49	0.46	0.33	0.33
10,816.00	93.02	270.62	6,991.02	-402.77	-3,550.43	-1,550.45	0.45	0.43	-0.14
10,910.00	91.21	268.94	6,987.55	-403.13	-3,644.36	-1,600.18	2.63	-1.93	-1.79
11,004.00	89.09	269.43	6,987.30	-404.47	-3,738.34	-1,649.12	2.31	-2.26	0.52
11,098.00	89.31	269.34	6,988.62	-405.48	-3,832.33	-1,698.33	0.25	0.23	-0.10
11,193.00	88.82	269.34	6,990.17	-406.57	-3,927.31	-1,748.00	0.52	-0.52	0.00
11,287.00	90.81	268.64	6,990.47	-408.23	-4,021.29	-1,796.66	2.24	2.12	-0.74
11,381.00	91.21	267.71	6,988.81	-411.22	-4,115.22	-1,844.17	1.08	0.43	-0.99
11,475.00	91.38	270.05	6,986.69	-413.06	-4,209.17	-1,892.66	2.50	0.18	2.49
11,569.00	91.91	269.74	6,983.99	-413.23	-4,303.14	-1,942.57	0.65	0.56	-0.33
11,664.00	90.59	271.02	6,981.92	-412.60	-4,398.11	-1,993.69	1.94	-1.39	1.35
11,759.00	89.40	270.53	6,981.92	-411.32	-4,493.10	-2,045.38	1.35	-1.25	-0.52
11,853.00	90.28	270.84	6,982.19	-410.19	-4,587.09	-2,096.40	0.99	0.94	0.33
11,947.00	88.51	271.15	6,983.18	-408.56	-4,681.06	-2,147.84	1.91	-1.88	0.33
12,042.00	88.91	271.24	6,985.32	-406.58	-4,776.02	-2,200.10	0.43	0.42	0.09
12,092.85	89.02	271.45	6,986.24	-405.39	-4,826.85	-2,228.19	0.47	0.21	0.42
<b>Sec 26/27 Crossing @ 12092.85'MD</b>									
12,230.00	89.31	272.03	6,988.24	-401.22	-4,963.92	-2,304.74	0.47	0.21	0.42
12,324.00	89.62	271.63	6,989.12	-398.22	-5,057.87	-2,357.32	0.54	0.33	-0.43
12,418.00	91.30	274.01	6,988.36	-393.59	-5,151.74	-2,411.24	3.10	1.79	2.53
12,513.00	90.19	272.73	6,987.13	-388.01	-5,246.56	-2,466.48	1.78	-1.17	-1.35
12,607.00	89.40	270.31	6,987.46	-385.51	-5,340.52	-2,518.64	2.71	-0.84	-2.57
12,701.00	88.38	268.42	6,989.28	-386.56	-5,434.49	-2,567.82	2.28	-1.09	-2.01
12,796.00	88.69	268.81	6,991.71	-388.85	-5,529.43	-2,616.45	0.52	0.33	0.41
12,890.00	90.10	269.52	6,992.71	-390.22	-5,623.42	-2,665.36	1.68	1.50	0.76
12,984.00	88.60	268.15	6,993.77	-392.13	-5,717.39	-2,713.80	2.16	-1.60	-1.46
13,079.00	88.82	268.42	6,995.91	-394.97	-5,812.32	-2,761.96	0.37	0.23	0.28
13,173.00	89.09	268.42	6,997.62	-397.57	-5,906.27	-2,809.82	0.29	0.29	0.00
13,268.00	89.79	269.52	6,998.55	-399.27	-6,001.25	-2,858.97	1.37	0.74	1.16
13,362.00	90.10	269.34	6,998.64	-400.21	-6,095.24	-2,908.25	0.38	0.33	-0.19
13,457.00	90.50	270.05	6,998.15	-400.71	-6,190.24	-2,958.42	0.86	0.42	0.75
13,551.00	91.30	270.13	6,996.67	-400.57	-6,284.22	-3,008.62	0.86	0.85	0.09
13,645.00	89.79	269.34	6,995.78	-401.00	-6,378.22	-3,058.32	1.81	-1.61	-0.84
13,739.00	89.40	268.42	6,996.44	-402.84	-6,472.19	-3,106.83	1.06	-0.41	-0.98
13,833.00	91.38	270.05	6,995.80	-404.09	-6,566.18	-3,155.83	2.73	2.11	1.73
13,928.00	88.51	268.64	6,995.89	-405.18	-6,661.16	-3,205.51	3.37	-3.02	-1.48
14,022.00	88.60	269.43	6,998.26	-406.76	-6,755.11	-3,254.22	0.85	0.10	0.84

## Survey Report

<b>Company:</b>	Extraction Oil & Gas	<b>Local Co-ordinate Reference:</b>	Well Launer 12
<b>Project:</b>	Weld County, CO (NAD83)	<b>TVD Reference:</b>	KB=25 @ 4951.00ft (Patterson 346)
<b>Site:</b>	Sec 26-T07N-R67W	<b>MD Reference:</b>	KB=25 @ 4951.00ft (Patterson 346)
<b>Well:</b>	Launer 12	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1

### Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
14,116.00	89.22	270.05	7,000.05	-407.19	-6,849.09	-3,303.92	0.93	0.66	0.66
14,211.00	89.48	269.83	7,001.13	-407.29	-6,944.09	-3,354.44	0.36	0.27	-0.23
14,305.00	89.88	270.84	7,001.65	-406.74	-7,038.08	-3,404.98	1.16	0.43	1.07
14,494.00	89.79	271.02	7,002.20	-403.67	-7,227.06	-3,508.24	0.11	-0.05	0.10
<b>Final MWD Survey @ 14494'MD</b>									
14,580.00	89.80	271.02	7,002.50	-402.14	-7,313.04	-3,555.34	0.01	0.01	0.00
<b>PTD @ 14580'MD (289'FSL &amp; 2487'FEL)</b>									

### Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
1,647.00	1,646.84	-3.03	1.09	First MWD Survey @ 1647'MD
7,388.94	7,061.87	-442.21	-128.93	Hardline Crossing @ 7388.94'MD (188'FSL & 591'FEL)
12,092.85	6,986.24	-405.39	-4,826.85	Sec 26/27 Crossing @ 12092.85'MD
14,494.00	7,002.20	-403.67	-7,227.06	Final MWD Survey @ 14494'MD
14,580.00	7,002.50	-402.14	-7,313.04	PTD @ 14580'MD (289'FSL & 2487'FEL)

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_