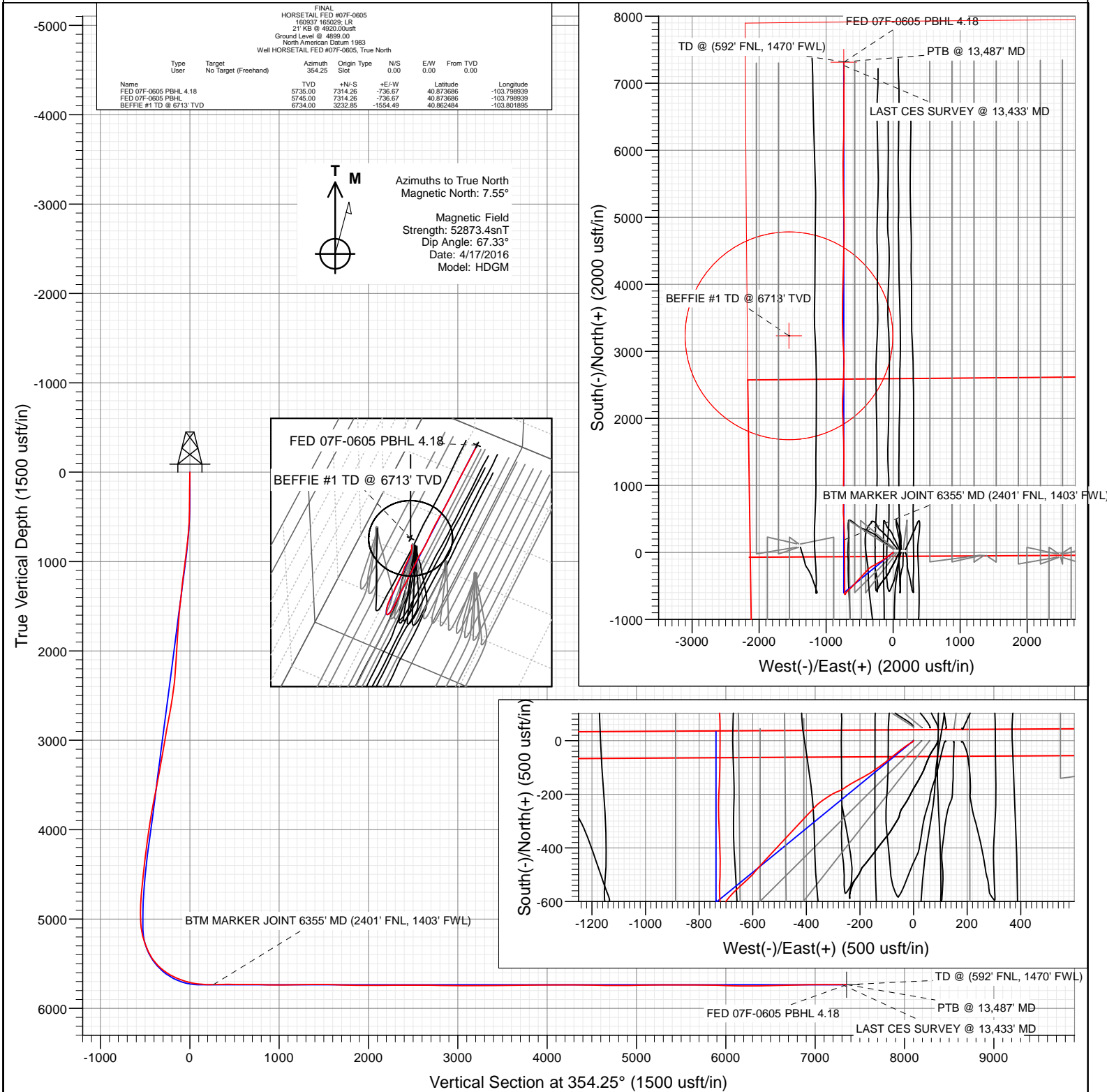




Project: Weld County, CO
Site: S7-T10N-R57W
Well: HORSETAIL FED #07F-0605
Wellbore: OH
Design: FINAL



WELL DETAILS: HORSETAIL FED #07F-0605

+N/-S	+E/-W	Northing	Ground Level:	4899.00	Latitude	Longitude
0.00	0.00	1558347.16	Easting	3471300.85	40.853611	-103.796275



Survey Report

Company:	Whiting Petroleum Corporation	Local Co-ordinate Reference:	Well HORSETAIL FED #07F-0605
Project:	Weld County, CO	TVD Reference:	21' KB @ 4920.00usft
Site:	S7-T10N-R57W	MD Reference:	21' KB @ 4920.00usft
Well:	HORSETAIL FED #07F-0605	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Project	Weld County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site		S7-T10N-R57W			
Site Position:		Northing:	1,558,398.55 usft	Latitude:	40.853828
From:	Lat/Long	Easting:	3,469,859.44 usft	Longitude:	-103.801481
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	1.10 °

Well	HORSETAIL FED #07F-0605					
Well Position	+N/-S	0.00 usft	Northing:	1,558,347.16 usft	Latitude:	40.853611
	+E/-W	0.00 usft	Easting:	3,471,300.85 usft	Longitude:	-103.796275
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	4,899.00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	4/17/2016	7.55	67.33	52,873

Design	FINAL				
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	354.25	

Survey Program	Date	5/23/2016			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
222.00	13,487.00	Survey #1 (OH)	MWD+IFR1+SAG+MS	MWD + IFR1 + Sag + Multi-Station Correction	

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
222.00	0.90	201.58	221.99	-1.62	-0.64	-1.55	0.41	0.41		
314.00	0.64	195.51	313.98	-2.79	-1.04	-2.67	0.30	-0.28		
405.00	1.75	238.83	404.96	-4.00	-2.37	-3.74	1.49	1.22		
497.00	4.05	245.62	496.84	-6.07	-6.53	-5.38	2.52	2.50		
589.00	6.71	235.17	588.43	-10.48	-13.90	-9.03	3.07	2.89		
680.00	9.44	236.99	678.52	-17.58	-24.53	-15.04	3.01	3.00		
772.00	12.99	232.88	768.75	-27.93	-39.10	-23.88	3.95	3.86		
864.00	14.21	230.39	858.17	-41.37	-56.05	-35.55	1.47	1.33		
955.00	12.75	232.79	946.66	-54.57	-72.65	-47.02	1.72	-1.60		
1,047.00	13.07	231.73	1,036.33	-67.15	-88.90	-57.91	0.43	0.35		
1,138.00	12.34	232.69	1,125.10	-79.42	-104.72	-68.53	0.84	-0.80		
1,228.00	11.98	231.96	1,213.08	-91.00	-119.72	-78.55	0.43	-0.40		

Survey Report

Company:	Whiting Petroleum Corporation	Local Co-ordinate Reference:	Well HORSETAIL FED #07F-0605
Project:	Weld County, CO	TVD Reference:	21' KB @ 4920.00usft
Site:	S7-T10N-R57W	MD Reference:	21' KB @ 4920.00usft
Well:	HORSETAIL FED #07F-0605	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments
1,319.00	13.19	234.19	1,301.90	-102.90	-135.58	-88.80	1.43	1.33	
1,411.00	13.02	236.12	1,391.50	-114.82	-152.70	-98.94	0.51	-0.18	
1,502.00	12.83	239.10	1,480.20	-125.72	-169.88	-108.07	0.76	-0.21	
1,595.00	12.69	241.74	1,570.90	-135.86	-187.74	-116.37	0.64	-0.15	
1,687.00	12.96	241.30	1,660.61	-145.60	-205.68	-124.26	0.31	0.29	
1,778.00	11.37	241.99	1,749.56	-154.71	-222.56	-131.64	1.75	-1.75	
1,869.00	8.94	238.57	1,839.13	-162.61	-236.51	-138.10	2.75	-2.67	
1,961.00	7.61	237.87	1,930.17	-169.58	-247.77	-143.90	1.45	-1.45	
2,057.00	5.81	229.32	2,025.51	-176.13	-256.84	-149.51	2.14	-1.87	
2,152.00	8.49	242.69	2,119.77	-182.48	-266.72	-154.84	3.30	2.82	
2,245.00	11.73	247.78	2,211.31	-189.21	-281.57	-160.05	3.61	3.48	
2,339.00	14.43	241.37	2,302.87	-198.44	-300.70	-167.31	3.26	2.87	
2,434.00	15.67	236.17	2,394.61	-211.25	-321.75	-177.95	1.93	1.31	
2,528.00	14.43	235.77	2,485.39	-224.91	-341.98	-189.51	1.32	-1.32	
2,622.00	16.32	225.10	2,576.04	-240.82	-361.03	-203.44	3.61	2.01	
2,717.00	15.81	223.66	2,667.33	-259.61	-379.42	-220.29	0.68	-0.54	
2,811.00	15.11	223.12	2,757.93	-277.81	-396.63	-236.68	0.76	-0.74	
2,905.00	14.56	222.58	2,848.79	-295.46	-413.00	-252.59	0.60	-0.59	
2,999.00	15.69	223.78	2,939.54	-313.34	-429.79	-268.70	1.25	1.20	
3,094.00	14.82	223.54	3,031.19	-331.42	-447.05	-284.96	0.92	-0.92	
3,188.00	13.73	221.83	3,122.28	-348.44	-462.77	-300.33	1.24	-1.16	
3,282.00	15.83	224.00	3,213.17	-365.98	-479.12	-316.14	2.31	2.23	
3,376.00	14.30	221.99	3,303.94	-383.83	-495.79	-332.23	1.72	-1.63	
3,470.00	16.88	223.40	3,394.47	-402.38	-512.94	-348.97	2.77	2.74	
3,565.00	15.97	223.23	3,485.59	-421.92	-531.36	-366.57	0.96	-0.96	
3,659.00	15.70	221.91	3,576.03	-440.81	-548.72	-383.62	0.48	-0.29	
3,754.00	15.86	222.13	3,667.45	-460.00	-566.01	-400.98	0.18	0.17	
3,848.00	15.16	221.30	3,758.02	-478.76	-582.74	-417.97	0.78	-0.74	
3,943.00	13.74	220.05	3,850.02	-496.73	-598.20	-434.30	1.53	-1.49	
4,037.00	14.53	228.15	3,941.18	-513.15	-614.17	-449.03	2.26	0.84	
4,225.00	12.48	227.09	4,123.97	-542.72	-646.62	-475.20	1.10	-1.09	
4,320.00	11.69	225.36	4,216.86	-556.47	-660.98	-487.45	0.91	-0.83	
4,414.00	10.75	225.32	4,309.07	-569.32	-673.99	-498.93	1.00	-1.00	
4,508.00	9.31	222.30	4,401.63	-581.11	-685.34	-509.52	1.63	-1.53	
4,602.00	8.11	217.24	4,494.54	-592.01	-694.47	-519.46	1.51	-1.28	
4,696.00	7.58	213.35	4,587.66	-602.47	-701.89	-529.12	0.80	-0.56	
4,791.00	7.15	210.56	4,681.88	-612.80	-708.34	-538.75	0.59	-0.45	
4,885.00	4.85	214.43	4,775.36	-621.11	-713.57	-546.50	2.48	-2.45	
4,980.00	2.00	235.17	4,870.18	-625.37	-717.20	-550.37	3.22	-3.00	
5,014.00	1.95	241.42	4,904.16	-625.99	-718.19	-550.89	0.65	-0.15	
5,108.00	0.72	15.45	4,998.15	-626.19	-719.44	-550.96	2.66	-1.31	
5,202.00	6.26	349.68	5,091.94	-620.57	-720.20	-545.29	5.98	5.89	
5,296.00	14.85	356.86	5,184.26	-603.47	-721.78	-528.12	9.23	9.14	
5,391.00	18.31	356.35	5,275.30	-576.41	-723.40	-501.04	3.65	3.64	
5,486.00	25.01	2.36	5,363.55	-541.41	-723.52	-466.20	7.42	7.05	
5,579.00	34.36	2.19	5,444.26	-495.44	-721.71	-420.64	10.05	10.05	
5,673.00	44.55	359.10	5,516.75	-435.80	-721.21	-361.35	11.04	10.84	
5,720.00	50.28	357.80	5,548.54	-401.23	-722.16	-326.86	12.36	12.19	
5,767.00	54.22	357.57	5,577.31	-364.10	-723.67	-289.77	8.39	8.38	
5,814.00	56.03	357.54	5,604.18	-325.58	-725.31	-251.27	3.85	3.85	
5,862.00	59.99	358.53	5,629.61	-284.90	-726.70	-210.66	8.43	8.25	
5,909.00	64.81	0.32	5,651.38	-243.27	-727.10	-169.20	10.80	10.26	
5,956.00	68.58	1.97	5,669.97	-200.12	-726.23	-126.35	8.64	8.02	

Survey Report

Company:	Whiting Petroleum Corporation	Local Co-ordinate Reference:	Well HORSETAIL FED #07F-0605
Project:	Weld County, CO	TVD Reference:	21' KB @ 4920.00usft
Site:	S7-T10N-R57W	MD Reference:	21' KB @ 4920.00usft
Well:	HORSETAIL FED #07F-0605	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments
6,003.00	70.85	2.65	5,686.26	-156.07	-724.45	-82.71	5.02	4.83	
6,050.00	74.06	1.67	5,700.43	-111.30	-722.77	-38.33	7.11	6.83	
6,097.00	77.59	0.01	5,711.94	-65.74	-722.11	6.93	8.25	7.51	
6,144.00	81.28	0.40	5,720.55	-19.55	-721.94	52.88	7.89	7.85	
6,191.00	83.50	0.03	5,726.78	27.03	-721.76	99.21	4.79	4.72	
6,239.00	85.91	358.76	5,731.21	74.82	-722.27	146.81	5.67	5.02	
6,333.00	90.70	358.01	5,733.99	168.72	-724.92	240.49	5.16	5.10	
6,355.20	90.83	357.93	5,733.69	190.90	-725.70	262.65	0.67	0.57	BTM MARKER JOINT 6355' MD (2401' FNL, 140'
6,427.00	91.24	357.69	5,732.40	262.64	-728.44	334.30	0.67	0.57	
6,521.00	89.99	358.33	5,731.39	356.57	-731.71	428.09	1.49	-1.33	
6,615.00	89.59	357.02	5,731.73	450.49	-735.52	521.91	1.46	-0.43	
6,709.00	89.25	356.32	5,732.68	544.33	-740.98	615.83	0.83	-0.36	
6,803.00	90.96	0.79	5,732.51	638.27	-743.35	709.53	5.09	1.82	
6,897.00	87.64	0.95	5,733.66	732.24	-741.92	802.89	3.54	-3.53	
6,991.00	87.98	0.40	5,737.25	826.16	-740.82	896.23	0.69	0.36	
7,085.00	90.18	0.74	5,738.76	920.14	-739.88	989.64	2.37	2.34	
7,180.00	91.27	0.52	5,737.56	1,015.12	-738.84	1,084.04	1.17	1.15	
7,274.00	92.25	0.25	5,734.67	1,109.08	-738.21	1,177.46	1.08	1.04	
7,368.00	91.07	1.22	5,731.95	1,203.03	-737.00	1,270.81	1.62	-1.26	
7,463.00	89.18	0.09	5,731.74	1,298.01	-735.92	1,365.21	2.32	-1.99	
7,557.00	90.55	0.03	5,731.96	1,392.01	-735.82	1,458.73	1.46	1.46	
7,652.00	89.18	359.83	5,732.19	1,487.01	-735.93	1,553.26	1.46	-1.44	
7,745.00	87.73	358.92	5,734.69	1,579.97	-736.95	1,645.85	1.84	-1.56	
7,840.00	88.21	358.50	5,738.06	1,674.88	-739.08	1,740.50	0.67	0.51	
7,934.00	88.42	358.11	5,740.82	1,768.80	-741.86	1,834.23	0.47	0.22	
8,029.00	89.42	358.05	5,742.61	1,863.73	-745.05	1,929.00	1.05	1.05	
8,120.00	90.39	358.41	5,742.76	1,954.68	-747.86	2,019.78	1.14	1.07	
8,211.00	91.70	357.78	5,741.10	2,045.62	-750.88	2,110.55	1.60	1.44	
8,303.00	90.53	358.81	5,739.31	2,137.56	-753.62	2,202.30	1.69	-1.27	
8,395.00	89.15	0.69	5,739.57	2,229.55	-754.02	2,293.87	2.53	-1.50	
8,487.00	90.35	0.55	5,739.97	2,321.54	-753.02	2,385.30	1.31	1.30	
8,578.00	89.45	2.96	5,740.13	2,412.49	-750.24	2,475.52	2.83	-0.99	
8,670.00	90.25	2.96	5,740.37	2,504.37	-745.49	2,566.45	0.87	0.87	
8,761.00	90.41	4.24	5,739.85	2,595.18	-739.77	2,656.24	1.42	0.18	
8,853.00	89.01	2.36	5,740.31	2,687.02	-734.48	2,747.09	2.55	-1.52	
8,945.00	89.01	0.45	5,741.90	2,778.98	-732.22	2,838.35	2.08	0.00	
9,036.00	88.70	358.02	5,743.72	2,869.94	-733.44	2,928.99	2.69	-0.34	
9,128.00	89.78	357.30	5,744.94	2,961.86	-737.19	3,020.81	1.41	1.17	
9,217.00	89.72	356.81	5,745.33	3,050.74	-741.76	3,109.70	0.55	-0.07	
9,309.00	90.16	358.31	5,745.43	3,142.65	-745.68	3,201.55	1.70	0.48	
9,401.00	90.05	356.66	5,745.26	3,234.56	-749.72	3,293.40	1.80	-0.12	
9,492.00	89.64	357.70	5,745.51	3,325.45	-754.19	3,384.28	1.23	-0.45	
9,584.00	91.09	359.92	5,744.92	3,417.42	-756.11	3,475.98	2.88	1.58	
9,676.00	91.01	0.96	5,743.23	3,509.40	-755.40	3,567.42	1.13	-0.09	
9,767.00	91.96	0.04	5,740.87	3,600.36	-754.60	3,657.85	1.45	1.04	
9,859.00	89.79	0.64	5,739.47	3,692.34	-754.06	3,749.31	2.45	-2.36	
9,950.00	91.39	0.73	5,738.53	3,783.33	-752.97	3,839.73	1.76	1.76	
10,041.00	89.39	0.67	5,737.91	3,874.32	-751.86	3,930.15	2.20	-2.20	
10,132.00	89.44	0.96	5,738.84	3,965.30	-750.57	4,020.55	0.32	0.05	
10,222.00	91.35	0.79	5,738.22	4,055.29	-749.19	4,109.94	2.13	2.12	
10,313.00	89.48	1.94	5,737.56	4,146.25	-747.02	4,200.23	2.41	-2.05	
10,405.00	90.76	2.50	5,737.37	4,238.18	-743.46	4,291.34	1.52	1.39	
10,495.00	89.79	2.34	5,736.94	4,328.10	-739.66	4,380.43	1.09	-1.08	

Survey Report

Company:	Whiting Petroleum Corporation	Local Co-ordinate Reference:	Well HORSETAIL FED #07F-0605
Project:	Weld County, CO	TVD Reference:	21' KB @ 4920.00usft
Site:	S7-T10N-R57W	MD Reference:	21' KB @ 4920.00usft
Well:	HORSETAIL FED #07F-0605	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments
10,586.00	88.18	1.30	5,738.55	4,419.03	-736.77	4,470.61	2.11	-1.77	
10,678.00	89.27	1.00	5,740.60	4,510.99	-734.92	4,561.92	1.23	1.18	
10,770.00	88.87	359.46	5,742.09	4,602.97	-734.55	4,653.41	1.73	-0.43	
10,861.00	89.59	4.14	5,743.31	4,693.90	-731.70	4,743.59	5.20	0.79	
10,952.00	90.47	359.76	5,743.27	4,784.82	-728.60	4,833.74	4.91	0.97	
11,044.00	90.85	358.97	5,742.21	4,876.81	-729.62	4,925.37	0.95	0.41	
11,137.00	90.93	358.19	5,740.76	4,969.77	-731.92	5,018.09	0.84	0.09	
11,232.00	91.65	357.74	5,738.62	5,064.68	-735.30	5,112.87	0.89	0.76	
11,326.00	89.44	359.39	5,737.73	5,158.64	-737.65	5,206.59	2.93	-2.35	
11,420.00	89.82	359.18	5,738.34	5,252.63	-738.82	5,300.22	0.46	0.40	
11,514.00	90.27	358.65	5,738.26	5,346.61	-740.60	5,393.91	0.74	0.48	
11,609.00	91.36	358.57	5,736.91	5,441.57	-742.91	5,488.62	1.15	1.15	
11,703.00	88.67	359.83	5,736.89	5,535.55	-744.22	5,582.26	3.16	-2.86	
11,797.00	89.02	359.31	5,738.78	5,629.53	-744.93	5,675.84	0.67	0.37	
11,891.00	89.72	359.08	5,739.82	5,723.52	-746.25	5,769.48	0.78	0.74	
11,986.00	89.84	0.00	5,740.18	5,818.51	-747.01	5,864.08	0.98	0.13	
12,080.00	87.85	1.88	5,742.07	5,912.47	-745.47	5,957.41	2.91	-2.12	
12,175.00	88.24	1.67	5,745.32	6,007.37	-742.53	6,051.54	0.47	0.41	
12,269.00	89.18	1.58	5,747.43	6,101.31	-739.86	6,144.73	1.00	1.00	
12,363.00	89.85	1.34	5,748.23	6,195.27	-737.47	6,237.99	0.76	0.71	
12,457.00	90.43	1.26	5,748.00	6,289.25	-735.33	6,331.27	0.62	0.62	
12,551.00	90.56	0.41	5,747.19	6,383.23	-733.96	6,424.65	0.91	0.14	
12,645.00	91.38	359.12	5,745.59	6,477.22	-734.35	6,518.20	1.63	0.87	
12,739.00	92.20	359.06	5,742.66	6,571.16	-735.84	6,611.82	0.87	0.87	
12,833.00	91.50	0.24	5,739.62	6,665.10	-736.42	6,705.35	1.46	-0.74	
12,927.00	92.08	1.34	5,736.69	6,759.05	-735.12	6,798.69	1.32	0.62	
13,021.00	90.53	0.62	5,734.55	6,853.01	-733.51	6,892.01	1.82	-1.65	
13,115.00	90.13	0.59	5,734.01	6,947.00	-732.52	6,985.44	0.43	-0.43	
13,209.00	90.64	0.16	5,733.37	7,040.99	-731.91	7,078.90	0.71	0.54	
13,303.00	89.44	359.53	5,733.31	7,134.99	-732.16	7,172.45	1.44	-1.28	
13,397.00	89.68	359.17	5,734.03	7,228.98	-733.23	7,266.07	0.46	0.26	
13,433.00	89.87	359.50	5,734.17	7,264.98	-733.64	7,301.93	1.06	0.53	LAST CES SURVEY @ 13,433' MD
13,487.00	89.87	359.50	5,734.29	7,318.98	-734.12	7,355.70	0.00	0.00	PTB @ 13,487' MD - TD @ (592' FNL, 1470' FWL)

Survey Report

Company:	Whiting Petroleum Corporation	Local Co-ordinate Reference:	Well HORSETAIL FED #07F-0605
Project:	Weld County, CO	TVD Reference:	21' KB @ 4920.00usft
Site:	S7-T10N-R57W	MD Reference:	21' KB @ 4920.00usft
Well:	HORSETAIL FED #07F-0605	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Targets									
Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
FED 07F-0605 PBHL 4. - actual wellpath misses target center by 2.70usft at 13482.31usft MD (5734.28 TVD, 7314.29 N, -734.07 E) - Point	0.00	0.00	5,735.00	7,314.26	-736.67	1,565,645.92	3,470,423.79	40.873686	-103.798939
BEFFIE #1 TD @ 6713' - actual wellpath misses target center by 1274.15usft at 9441.56usft MD (5745.29 TVD, 3275.06 N, -751.92 E) - Circle (radius 1,550.00)	0.00	0.00	6,734.00	3,232.85	-1,554.49	1,561,549.55	3,469,684.54	40.862484	-103.801895
FED 07F-0605 PBHL - actual wellpath misses target center by 11.03usft at 13482.33usft MD (5734.28 TVD, 7314.31 N, -734.07 E) - Point	0.00	0.00	5,745.00	7,314.26	-736.67	1,565,645.92	3,470,423.79	40.873686	-103.798939

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
6,355.20	5,733.69	190.90	-725.70	BTM MARKER JOINT 6355' MD (2401' FNL, 1403' FWL)
13,433.00	5,734.17	7,264.98	-733.64	LAST CES SURVEY @ 13,433' MD
13,487.00	5,734.29	7,318.98	-734.12	PTB @ 13,487' MD
13,487.00	5,734.29	7,318.98	-734.12	TD @ (592' FNL, 1470' FWL)

Checked By: _____	Approved By: _____	Date: _____
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