

Project: WELD-NAD83-UTMFT13N  
 Site: 3N-65W-29 RW 15-29HZ Pad  
 Well: RW 1N-5HZ  
 Wellbore: Original Wellbore  
 Design: Final Surveys

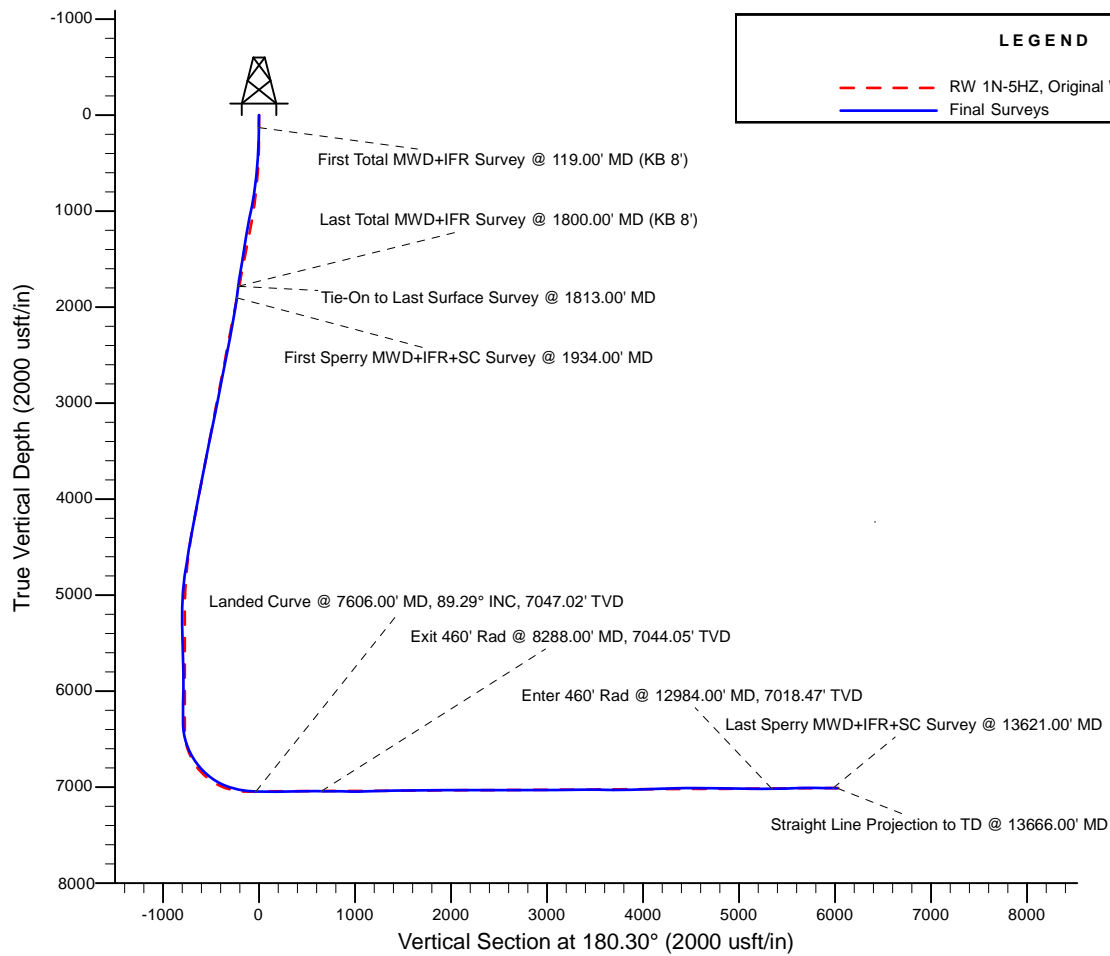
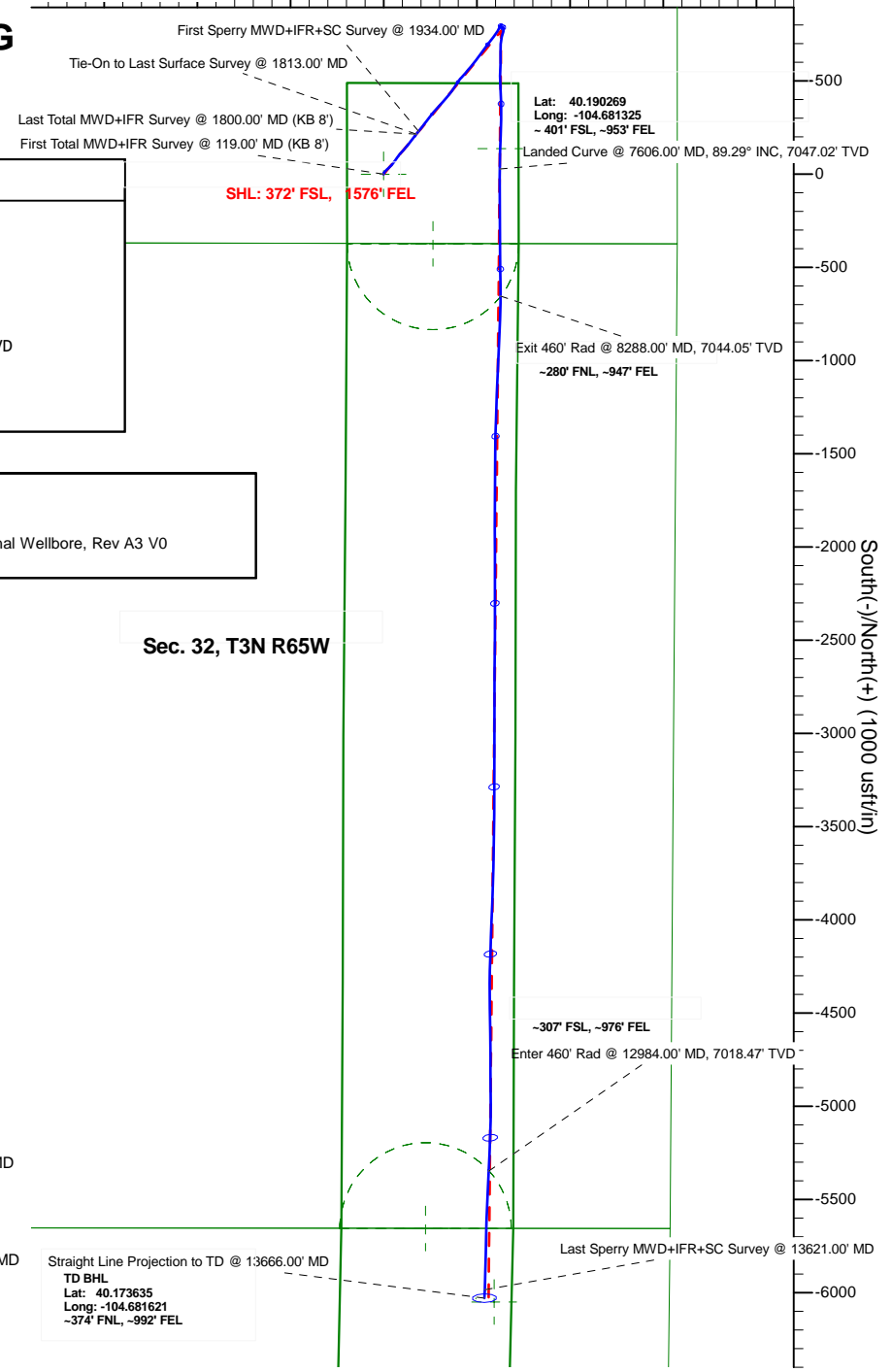


# US ROCKIES WATTENBERG PLANNING

West(-)/East(+) (1000 usft/in)  
 -500 0 500 1000 1500 2000

WELL DETAILS: RW 1N-5HZ		Design: Final Surveys (RW 1N-5HZ/Original Wellbore)	
Ground Level: 4869.00 RKB 21' @ 4890.00usft (Precision 464)		Created By: Jerry Popp Date: 19:42, September 28 2017	

ANNOTATIONS						
TVD	MD	Inc	Azi	+N/-S	+E/-W	Annotation
13.00	13.00	0.00	0.00	0.00	0.00	Tie-On to Last Surface Survey @ 0.00' MD (KB 8')
131.99	132.00	1.10	326.50	0.95	-0.63	First Total MWD+IFR Survey @ 119.00' MD (KB 8')
1785.39	1813.00	9.67	35.31	214.75	175.53	Last Total MWD+IFR Survey @ 1800.00' MD (KB 8')
1785.39	1813.00	9.67	35.31	214.75	175.53	Tie-On to Last Surface Survey @ 1813.00' MD
1904.83	1934.00	8.74	36.09	230.47	186.82	First Sperry MWD+IFR+SC Survey @ 1934.00' MD
7047.02	7606.00	89.29	180.60	28.89	622.96	Landed Curve @ 7606.00' MD, 89.29° INC, 7047.02' TVD
7044.05	8288.00	89.39	179.74	-653.01	626.49	Exit 460' Rad @ 8288.00' MD, 7044.05' TVD
7018.47	12984.00	91.57	182.28	-5347.14	562.92	Enter 460' Rad @ 12984.00' MD, 7018.47' TVD
7011.51	13621.00	89.35	182.53	-5983.65	542.34	Last Sperry MWD+IFR+SC Survey @ 13621.00' MD
7012.04	13666.00	89.35	182.53	-6028.60	540.35	Straight Line Projection to TD @ 13666.00' MD



Straight Line Projection to TD @ 13666.00' MD  
 TD BHL  
 Lat: 40.173635  
 Long: -104.681621  
 -374' FNL, -992' FEL

Sec. 32, T3N R65W

Job# 904218782  
Precision 464

# US ROCKIES WATTENBERG PLANNING

WELD-NAD83-UTMFT13N 3N-65W-29 RW 15-29HZ Pad

API# 05-123-44751

RW 1N-5HZ

Original Wellbore

Design: Final Surveys

## Sperry Drilling Services

### Combo Report

28 September, 2017

Well Coordinates: 40° 11' 24.68" N  
104° 41' 00.80" W

North American Datum 1983  
Zone 13N (108 W to 102 W)  
14,596,147.97 N  
1,728,791.11 E

Ground Level: 4,869.00 usft

Local Coordinate Origin:

Centered on Well RW 1N-5HZ

Viewing Datum:

RKB 21' @ 4890.00usft (Precision 464)

TVDs to System:

N

**North Reference:**

**True**

Unit System:

Dec-Deg - API - US Survey Feet - Custom

Version: 5000.1 Build: 81D

Report Version: Midcon Combo v1.11

**HALLIBURTON**



Design Report for RW 1N-5HZ - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	TVD below System (usft)	Vertical Depth (usft)	Local Coordinates (usft)		Map Coordinates (usft)		Dogleg Rate (°/100usft)	Vertical Section (usft)	Comments
					Northing	Easting	Northing	Easting			
0.00	0.00	0.00	-4,890.00	0.00	0.00 N	0.00 E	14,596,147.97	1,728,791.11	0.00	0.00	
13.00	0.00	0.00	-4,877.00	13.00	0.00 N	0.00 E	14,596,147.97	1,728,791.11	0.00	0.00	Tie-On to Last Surface Survey @ 0.00' MD (KB 8')
132.00	1.10	326.50	-4,758.01	131.99	0.95 N	0.63 W	14,596,148.92	1,728,790.47	0.92	-0.95	First Total MWD+IFR Survey @ 119.00' MD (KB 8')
163.00	0.79	328.08	-4,727.01	162.99	1.38 N	0.91 W	14,596,149.35	1,728,790.20	1.00	-1.38	
195.00	1.49	347.06	-4,695.02	194.98	1.97 N	1.12 W	14,596,149.94	1,728,789.98	2.46	-1.97	
227.00	1.19	18.00	-4,663.03	226.97	2.70 N	1.11 W	14,596,150.66	1,728,789.99	2.41	-2.69	
259.00	1.80	12.20	-4,631.04	258.96	3.50 N	0.90 W	14,596,151.47	1,728,790.20	1.96	-3.50	
290.00	1.63	20.55	-4,600.05	289.95	4.39 N	0.64 W	14,596,152.36	1,728,790.45	0.97	-4.39	
322.00	2.37	31.54	-4,568.07	321.93	5.38 N	0.14 W	14,596,153.35	1,728,790.95	2.59	-5.38	
354.00	2.64	37.34	-4,536.10	353.90	6.53 N	0.66 E	14,596,154.50	1,728,791.74	1.16	-6.54	
385.00	3.21	32.42	-4,505.14	384.86	7.83 N	1.56 E	14,596,155.81	1,728,792.64	2.01	-7.84	
417.00	4.31	35.93	-4,473.21	416.79	9.56 N	2.74 E	14,596,157.54	1,728,793.82	3.51	-9.58	
449.00	5.05	41.73	-4,441.32	448.68	11.59 N	4.38 E	14,596,159.57	1,728,795.45	2.74	-11.61	
512.00	5.89	39.89	-4,378.61	511.39	16.14 N	8.30 E	14,596,164.14	1,728,799.35	1.36	-16.18	
544.00	6.72	41.91	-4,346.80	543.20	18.79 N	10.61 E	14,596,166.80	1,728,801.65	2.68	-18.85	
575.00	7.25	45.92	-4,316.03	573.97	21.50 N	13.22 E	14,596,169.52	1,728,804.26	2.32	-21.57	
607.00	8.13	47.80	-4,284.32	605.68	24.43 N	16.35 E	14,596,172.45	1,728,807.37	2.86	-24.51	
638.00	8.75	46.39	-4,253.65	636.35	27.52 N	19.68 E	14,596,175.56	1,728,810.69	2.11	-27.63	
670.00	9.40	48.06	-4,222.05	667.95	30.95 N	23.39 E	14,596,179.00	1,728,814.39	2.19	-31.07	
702.00	9.98	44.90	-4,190.51	699.49	34.66 N	27.29 E	14,596,182.73	1,728,818.27	2.46	-34.80	
734.00	10.50	47.27	-4,159.02	730.98	38.60 N	31.39 E	14,596,186.68	1,728,822.36	2.09	-38.77	
765.00	11.03	47.62	-4,128.57	761.43	42.52 N	35.65 E	14,596,190.62	1,728,826.61	1.72	-42.70	
797.00	10.85	43.05	-4,097.15	792.85	46.78 N	39.97 E	14,596,194.90	1,728,830.91	2.77	-46.99	
829.00	11.38	39.71	-4,065.75	824.25	51.41 N	44.04 E	14,596,199.54	1,728,834.97	2.61	-51.64	
860.00	11.91	40.15	-4,035.38	854.62	56.21 N	48.06 E	14,596,204.35	1,728,838.97	1.73	-56.46	
892.00	12.30	38.92	-4,004.10	885.90	61.39 N	52.33 E	14,596,209.54	1,728,843.22	1.46	-61.66	
955.00	13.93	35.49	-3,942.74	947.26	72.78 N	60.95 E	14,596,220.97	1,728,851.80	2.87	-73.10	
987.00	14.63	34.26	-3,911.73	978.27	79.26 N	65.46 E	14,596,227.46	1,728,856.29	2.38	-79.60	
1,018.00	14.06	34.35	-3,881.70	1,008.30	85.60 N	69.79 E	14,596,233.82	1,728,860.59	1.84	-85.97	
1,050.00	14.50	35.58	-3,850.68	1,039.32	92.07 N	74.31 E	14,596,240.30	1,728,865.09	1.67	-92.46	
1,082.00	14.41	36.55	-3,819.70	1,070.30	98.53 N	79.02 E	14,596,246.78	1,728,869.77	0.81	-98.94	
1,113.00	14.06	39.36	-3,789.65	1,100.35	104.54 N	83.70 E	14,596,252.81	1,728,874.44	2.50	-104.97	
1,145.00	13.67	41.73	-3,758.58	1,131.42	110.37 N	88.68 E	14,596,258.65	1,728,879.40	2.15	-110.83	
1,177.00	12.79	41.12	-3,727.43	1,162.57	115.86 N	93.53 E	14,596,264.16	1,728,884.22	2.78	-116.34	
1,208.00	12.61	43.40	-3,697.19	1,192.81	120.90 N	98.11 E	14,596,269.22	1,728,888.79	1.72	-121.41	
1,240.00	11.87	44.11	-3,665.92	1,224.08	125.80 N	102.80 E	14,596,274.14	1,728,893.46	2.36	-126.34	
1,272.00	11.73	43.67	-3,634.59	1,255.41	130.52 N	107.34 E	14,596,278.87	1,728,897.98	0.52	-131.08	
1,303.00	12.35	41.64	-3,604.28	1,285.72	135.27 N	111.72 E	14,596,283.64	1,728,902.34	2.42	-135.86	
1,335.00	12.44	38.30	-3,573.02	1,316.98	140.54 N	116.13 E	14,596,288.92	1,728,906.73	2.26	-141.14	
1,366.00	12.74	39.29	-3,542.77	1,347.23	145.80 N	120.36 E	14,596,294.20	1,728,910.95	1.19	-146.43	
1,398.00	12.26	40.94	-3,511.52	1,378.48	151.10 N	124.82 E	14,596,299.51	1,728,915.39	1.87	-151.75	



Design Report for RW 1N-5HZ - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	TVD below System (usft)	Vertical Depth (usft)	Local Coordinates (usft)		Map Coordinates (usft)		Dogleg Rate (°/100usft)	Vertical Section (usft)	Comments
					Northing	Easting	Northing	Easting			
1,430.00	11.03	40.68	-3,480.18	1,409.82	155.99 N	129.04 E	14,596,304.42	1,728,919.60	3.85	-156.66	
1,461.00	11.34	38.30	-3,449.77	1,440.23	160.63 N	132.87 E	14,596,309.07	1,728,923.40	1.79	-161.32	
1,493.00	10.72	36.81	-3,418.36	1,471.64	165.48 N	136.60 E	14,596,313.94	1,728,927.12	2.13	-166.19	
1,525.00	11.38	37.33	-3,386.96	1,503.04	170.37 N	140.30 E	14,596,318.84	1,728,930.80	2.09	-171.10	
1,557.00	11.34	37.07	-3,355.58	1,534.42	175.39 N	144.11 E	14,596,323.88	1,728,934.59	0.20	-176.15	
1,588.00	11.47	36.46	-3,325.20	1,564.80	180.30 N	147.78 E	14,596,328.80	1,728,938.24	0.57	-181.08	
1,620.00	12.08	36.63	-3,293.87	1,596.13	185.55 N	151.67 E	14,596,334.06	1,728,942.11	1.91	-186.34	
1,650.00	12.04	40.33	-3,264.53	1,625.47	190.45 N	155.56 E	14,596,338.98	1,728,945.99	2.58	-191.27	
1,682.00	11.87	40.59	-3,233.23	1,656.77	195.50 N	159.87 E	14,596,344.04	1,728,950.28	0.56	-196.33	
1,746.00	11.25	39.36	-3,170.52	1,719.48	205.32 N	168.11 E	14,596,353.89	1,728,958.48	1.04	-206.20	
1,778.00	10.37	38.66	-3,139.09	1,750.91	209.99 N	171.89 E	14,596,358.57	1,728,962.24	2.78	-210.88	
1,809.00	9.45	36.55	-3,108.55	1,781.45	214.21 N	175.14 E	14,596,362.80	1,728,965.49	3.19	-215.12	
1,813.00	9.67	35.31	-3,104.61	1,785.39	214.75 N	175.53 E	14,596,363.34	1,728,965.88	7.53	-215.66	
1,934.00	8.74	36.09	-2,985.17	1,904.83	230.47 N	186.82 E	14,596,379.10	1,728,977.11	0.78	-231.44	Last Total MWD+IFR Survey @ 1800.00' MD (KB 8') - Tie-On to Last Surface Survey @ 1813.00' MD First Sperry MWD+IFR+SC Survey @ 1934.00' MD
2,023.00	10.61	43.45	-2,897.44	1,992.56	241.88 N	196.44 E	14,596,390.55	1,728,986.69	2.52	-242.91	
2,113.00	12.16	35.58	-2,809.20	2,080.80	255.61 N	207.66 E	14,596,404.32	1,728,997.85	2.43	-256.69	
2,202.00	12.69	37.29	-2,722.29	2,167.71	271.01 N	219.03 E	14,596,419.76	1,729,009.17	0.72	-272.15	
2,291.00	14.02	37.19	-2,635.70	2,254.30	287.38 N	231.47 E	14,596,436.17	1,729,021.56	1.49	-288.58	
2,381.00	14.51	38.79	-2,548.47	2,341.53	304.85 N	245.13 E	14,596,453.69	1,729,035.15	0.70	-306.13	
2,471.00	13.33	36.14	-2,461.12	2,428.88	322.02 N	258.31 E	14,596,470.91	1,729,048.27	1.49	-323.36	
2,560.00	14.72	44.18	-2,374.76	2,515.24	338.41 N	272.24 E	14,596,487.35	1,729,062.14	2.69	-339.83	
2,650.00	13.21	40.47	-2,287.42	2,602.58	354.44 N	286.89 E	14,596,503.43	1,729,076.73	1.95	-355.94	
2,739.00	15.22	42.57	-2,201.15	2,688.85	370.78 N	301.39 E	14,596,519.82	1,729,091.18	2.33	-372.35	
2,829.00	15.06	41.05	-2,114.28	2,775.72	388.30 N	317.06 E	14,596,537.40	1,729,106.78	0.48	-389.95	
2,918.00	14.71	40.92	-2,028.26	2,861.74	405.56 N	332.06 E	14,596,554.71	1,729,121.72	0.40	-407.29	
3,008.00	14.06	39.18	-1,941.08	2,948.92	422.66 N	346.45 E	14,596,571.87	1,729,136.05	0.87	-424.47	
3,097.00	13.67	37.54	-1,854.68	3,035.32	439.38 N	359.69 E	14,596,588.63	1,729,149.23	0.62	-441.26	
3,187.00	15.89	37.21	-1,767.66	3,122.34	457.63 N	373.62 E	14,596,606.93	1,729,163.09	2.47	-459.58	
3,277.00	14.07	32.38	-1,680.72	3,209.28	476.68 N	386.93 E	14,596,626.03	1,729,176.34	2.45	-478.70	
3,366.00	13.01	30.66	-1,594.19	3,295.81	494.44 N	397.83 E	14,596,643.82	1,729,187.18	1.27	-496.52	
3,456.00	14.68	44.36	-1,506.79	3,383.21	511.31 N	410.98 E	14,596,660.74	1,729,200.26	4.07	-513.46	
3,546.00	13.21	40.05	-1,419.44	3,470.56	527.34 N	425.57 E	14,596,676.82	1,729,214.79	2.00	-529.56	
3,635.00	13.94	41.53	-1,332.93	3,557.07	543.15 N	439.22 E	14,596,692.68	1,729,228.39	0.91	-545.44	
3,725.00	14.86	40.05	-1,245.76	3,644.24	560.10 N	453.83 E	14,596,709.68	1,729,242.94	1.10	-562.47	
3,815.00	13.84	38.12	-1,158.56	3,731.44	577.40 N	467.90 E	14,596,727.04	1,729,256.95	1.25	-579.84	
3,993.00	14.75	38.11	-986.08	3,903.92	611.98 N	495.03 E	14,596,761.71	1,729,283.95	0.51	-614.56	
4,083.00	13.98	37.46	-898.89	3,991.11	629.63 N	508.71 E	14,596,779.40	1,729,297.58	0.87	-632.28	
4,172.00	14.14	36.59	-812.56	4,077.44	646.89 N	521.73 E	14,596,796.71	1,729,310.53	0.30	-649.61	
4,262.00	13.53	36.98	-725.17	4,164.83	664.12 N	534.62 E	14,596,814.00	1,729,323.36	0.69	-666.91	
4,441.00	10.99	34.75	-550.27	4,339.73	694.88 N	556.94 E	14,596,844.83	1,729,345.57	1.44	-697.78	



Design Report for RW 1N-5HZ - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	TVD below System (usft)	Vertical Depth (usft)	Local Coordinates (usft)		Map Coordinates (usft)		Dogleg Rate (°/100usft)	Vertical Section (usft)	Comments
					Northing	Easting	Northing	Easting			
4,531.00	13.18	39.17	-462.26	4,427.74	709.88 N	568.32 E	14,596,859.87	1,729,356.89	2.64	-712.85	
4,621.00	12.19	37.90	-374.46	4,515.54	725.33 N	580.63 E	14,596,875.37	1,729,369.15	1.14	-728.36	
4,710.00	11.60	37.94	-287.37	4,602.63	739.81 N	591.91 E	14,596,889.88	1,729,380.37	0.66	-742.89	
4,826.00	10.13	32.66	-173.45	4,716.55	757.59 N	604.58 E	14,596,907.71	1,729,392.99	1.53	-760.75	
4,915.00	8.64	31.21	-85.65	4,804.35	769.90 N	612.27 E	14,596,920.05	1,729,400.63	1.69	-773.10	
5,005.00	7.41	23.56	3.47	4,893.47	781.00 N	618.10 E	14,596,931.17	1,729,406.42	1.81	-784.23	
5,095.00	5.58	35.89	92.90	4,982.90	789.87 N	622.98 E	14,596,940.05	1,729,411.27	2.55	-793.12	
5,185.00	3.00	48.81	182.64	5,072.64	794.97 N	627.32 E	14,596,945.17	1,729,415.59	3.04	-798.24	
5,274.00	1.63	282.75	271.60	5,161.60	796.78 N	627.84 E	14,596,946.98	1,729,416.10	4.69	-800.06	
5,364.00	2.06	141.10	361.58	5,251.58	795.80 N	627.60 E	14,596,946.00	1,729,415.87	3.88	-799.08	
5,454.00	1.69	142.36	451.53	5,341.53	793.49 N	629.43 E	14,596,943.70	1,729,417.71	0.41	-796.78	
5,543.00	1.55	148.41	540.50	5,430.50	791.43 N	630.86 E	14,596,941.64	1,729,419.15	0.25	-794.72	
5,723.00	1.25	150.35	720.44	5,610.44	787.65 N	633.11 E	14,596,937.87	1,729,421.41	0.17	-790.95	
5,813.00	1.05	146.39	810.42	5,700.42	786.11 N	634.05 E	14,596,936.33	1,729,422.35	0.24	-789.42	
5,902.00	0.65	117.55	899.41	5,789.41	785.20 N	634.95 E	14,596,935.42	1,729,423.26	0.64	-788.51	
5,992.00	0.63	46.22	989.41	5,879.41	785.30 N	635.76 E	14,596,935.53	1,729,424.07	0.83	-788.62	
6,082.00	0.76	68.88	1,079.40	5,969.40	785.86 N	636.67 E	14,596,936.09	1,729,424.98	0.33	-789.18	
6,171.00	0.97	68.85	1,168.39	6,058.39	786.34 N	637.93 E	14,596,936.58	1,729,426.23	0.24	-789.67	
6,261.00	0.82	61.28	1,258.38	6,148.38	786.93 N	639.20 E	14,596,937.17	1,729,427.50	0.21	-790.26	
6,351.00	0.68	78.04	1,348.37	6,238.37	787.35 N	640.29 E	14,596,937.60	1,729,428.59	0.29	-790.69	
6,440.00	0.48	85.24	1,437.37	6,327.37	787.49 N	641.18 E	14,596,937.74	1,729,429.48	0.24	-790.84	
6,530.00	8.64	169.54	1,527.03	6,417.03	780.86 N	642.78 E	14,596,931.12	1,729,431.10	9.56	-784.21	
6,620.00	13.08	196.36	1,615.45	6,505.45	764.42 N	641.14 E	14,596,914.67	1,729,429.52	7.35	-767.77	
6,709.00	23.61	195.31	1,699.80	6,589.80	737.49 N	633.58 E	14,596,887.72	1,729,422.05	11.84	-740.80	
6,799.00	28.73	183.22	1,780.61	6,670.61	698.46 N	627.60 E	14,596,848.66	1,729,416.21	8.19	-701.74	
6,889.00	35.86	179.57	1,856.65	6,746.65	650.44 N	626.58 E	14,596,800.63	1,729,415.36	8.21	-653.71	
6,978.00	44.34	181.20	1,924.66	6,814.66	593.17 N	626.12 E	14,596,743.36	1,729,415.11	9.60	-596.44	
7,068.00	49.48	181.43	1,986.13	6,876.13	527.48 N	624.61 E	14,596,677.67	1,729,413.83	5.71	-530.74	
7,158.00	56.88	176.22	2,040.05	6,930.05	455.55 N	626.24 E	14,596,605.74	1,729,415.72	9.43	-458.82	
7,247.00	65.87	178.03	2,082.65	6,972.65	377.60 N	630.10 E	14,596,527.82	1,729,419.86	10.26	-380.90	
7,337.00	72.22	181.70	2,114.83	7,004.83	293.62 N	630.24 E	14,596,443.83	1,729,420.30	8.02	-296.91	
7,427.00	79.43	181.97	2,136.85	7,026.85	206.46 N	627.45 E	14,596,356.67	1,729,417.82	8.02	-209.74	
7,517.00	82.71	181.61	2,150.82	7,040.82	117.61 N	624.67 E	14,596,267.80	1,729,415.36	3.67	-120.88	
7,606.00	89.29	180.60	2,157.02	7,047.02	28.89 N	622.96 E	14,596,179.08	1,729,413.96	7.48	-32.15	Landed Curve @ 7606.00' MD, 89.29° INC, 7047.02' TVD
7,695.00	89.94	180.08	2,157.62	7,047.62	60.11 S	622.44 E	14,596,090.08	1,729,413.75	0.94	56.85	
7,785.00	88.83	179.44	2,158.59	7,048.59	150.10 S	622.81 E	14,596,000.09	1,729,414.45	1.42	146.83	
7,875.00	91.14	179.76	2,158.61	7,048.61	240.09 S	623.44 E	14,595,910.10	1,729,415.40	2.59	236.82	
7,965.00	91.17	179.59	2,156.80	7,046.80	330.07 S	623.95 E	14,595,820.13	1,729,416.23	0.19	326.80	
8,054.00	91.76	179.14	2,154.52	7,044.52	419.03 S	624.94 E	14,595,731.17	1,729,417.53	0.83	415.76	
8,144.00	89.85	179.76	2,153.26	7,043.26	509.02 S	625.80 E	14,595,641.19	1,729,418.72	2.23	505.73	



Design Report for RW 1N-5HZ - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	TVD below System (usft)	Vertical Depth (usft)	Local Coordinates (usft)		Map Coordinates (usft)		Dogleg Rate (°/100usft)	Vertical Section (usft)	Comments
					Northing	Easting	Northing	Easting			
8,234.00	89.69	179.70	2,153.62	7,043.62	599.02 S	626.22 E	14,595,551.19	1,729,419.46	0.19	595.73	
8,288.00	89.39	179.74	2,154.05	7,044.05	653.01 S	626.49 E	14,595,497.19	1,729,419.92	0.56	649.72	Exit 460' Rad @ 8288.00' MD, 7044.05' TVD
8,323.00	89.20	179.77	2,154.48	7,044.48	688.01 S	626.64 E	14,595,462.20	1,729,420.19	0.56	684.72	
8,413.00	89.51	182.50	2,155.49	7,045.49	777.98 S	624.85 E	14,595,372.22	1,729,418.73	3.05	774.70	
8,502.00	89.94	182.82	2,155.92	7,045.92	866.88 S	620.72 E	14,595,283.31	1,729,414.92	0.60	863.62	
8,592.00	89.63	182.68	2,156.26	7,046.26	956.78 S	616.41 E	14,595,193.40	1,729,410.92	0.38	953.54	
8,682.00	89.94	182.51	2,156.60	7,046.60	1,046.68 S	612.33 E	14,595,103.48	1,729,407.17	0.39	1,043.46	
8,772.00	91.91	182.14	2,155.14	7,045.14	1,136.59 S	608.68 E	14,595,013.55	1,729,403.84	2.23	1,133.39	
8,861.00	91.63	182.09	2,152.40	7,042.40	1,225.49 S	605.40 E	14,594,924.65	1,729,400.87	0.32	1,222.30	
8,951.00	91.82	181.90	2,149.69	7,039.69	1,315.39 S	602.27 E	14,594,834.73	1,729,398.06	0.30	1,312.22	
9,041.00	91.02	181.10	2,147.46	7,037.46	1,405.33 S	599.91 E	14,594,744.78	1,729,396.02	1.26	1,402.17	
9,130.00	90.86	180.96	2,146.00	7,036.00	1,494.31 S	598.31 E	14,594,655.80	1,729,394.74	0.24	1,491.15	
9,220.00	90.52	180.58	2,144.91	7,034.91	1,584.29 S	597.10 E	14,594,565.82	1,729,393.85	0.57	1,581.14	
9,310.00	90.37	180.27	2,144.21	7,034.21	1,674.29 S	596.43 E	14,594,475.82	1,729,393.51	0.38	1,671.14	
9,399.00	90.09	179.82	2,143.86	7,033.86	1,763.29 S	596.36 E	14,594,386.82	1,729,393.75	0.60	1,760.14	
9,489.00	90.09	180.35	2,143.71	7,033.71	1,853.29 S	596.23 E	14,594,296.82	1,729,393.94	0.59	1,850.14	
9,579.00	89.97	180.04	2,143.67	7,033.67	1,943.29 S	595.92 E	14,594,206.82	1,729,393.96	0.37	1,940.14	
9,668.00	89.82	179.71	2,143.83	7,033.83	2,032.28 S	596.12 E	14,594,117.82	1,729,394.47	0.41	2,029.14	
9,758.00	90.12	179.82	2,143.88	7,033.88	2,122.28 S	596.49 E	14,594,027.83	1,729,395.16	0.36	2,119.13	
9,847.00	89.94	179.80	2,143.83	7,033.83	2,211.28 S	596.78 E	14,593,938.83	1,729,395.77	0.20	2,208.13	
9,937.00	89.94	180.38	2,143.93	7,033.93	2,301.28 S	596.64 E	14,593,848.83	1,729,395.95	0.64	2,298.13	
10,027.00	89.85	180.21	2,144.09	7,034.09	2,391.28 S	596.18 E	14,593,758.83	1,729,395.81	0.21	2,388.13	
10,116.00	89.72	179.90	2,144.42	7,034.42	2,480.28 S	596.09 E	14,593,669.83	1,729,396.04	0.38	2,477.13	
10,206.00	90.96	180.34	2,143.89	7,033.89	2,570.28 S	595.90 E	14,593,579.83	1,729,396.17	1.46	2,567.12	
10,295.00	90.89	180.20	2,142.45	7,032.45	2,659.26 S	595.48 E	14,593,490.85	1,729,396.07	0.18	2,656.11	
10,385.00	90.37	180.32	2,141.46	7,031.46	2,749.26 S	595.08 E	14,593,400.85	1,729,395.98	0.59	2,746.10	
10,474.00	90.28	179.91	2,140.96	7,030.96	2,838.26 S	594.90 E	14,593,311.85	1,729,396.12	0.47	2,835.10	
10,564.00	90.09	180.45	2,140.67	7,030.67	2,928.25 S	594.61 E	14,593,221.85	1,729,396.16	0.64	2,925.10	
10,654.00	90.40	180.19	2,140.28	7,030.28	3,018.25 S	594.11 E	14,593,131.85	1,729,395.97	0.45	3,015.10	
10,743.00	90.77	180.42	2,139.37	7,029.37	3,107.25 S	593.64 E	14,593,042.86	1,729,395.82	0.49	3,104.10	
10,922.00	90.25	180.31	2,137.78	7,027.78	3,286.23 S	592.50 E	14,592,863.87	1,729,395.32	0.30	3,283.09	
11,012.00	89.94	180.03	2,137.63	7,027.63	3,376.23 S	592.23 E	14,592,773.87	1,729,395.37	0.46	3,373.09	
11,102.00	90.31	180.22	2,137.44	7,027.44	3,466.23 S	592.03 E	14,592,683.87	1,729,395.49	0.46	3,463.09	
11,236.00	88.55	180.21	2,138.77	7,028.77	3,600.22 S	591.53 E	14,592,549.88	1,729,395.47	1.31	3,597.07	
11,281.00	88.52	181.44	2,139.92	7,029.92	3,645.20 S	590.88 E	14,592,504.90	1,729,394.98	2.73	3,642.06	
11,371.00	90.68	181.61	2,140.55	7,030.55	3,735.16 S	588.49 E	14,592,414.93	1,729,392.91	2.41	3,732.03	
11,460.00	91.26	181.67	2,139.04	7,029.04	3,824.11 S	585.94 E	14,592,325.97	1,729,390.68	0.66	3,820.99	
11,550.00	91.54	182.47	2,136.84	7,026.84	3,914.02 S	582.69 E	14,592,236.05	1,729,387.75	0.94	3,910.92	
11,640.00	92.00	182.84	2,134.06	7,024.06	4,003.88 S	578.53 E	14,592,146.17	1,729,383.90	0.66	4,000.80	
11,729.00	91.23	181.68	2,131.55	7,021.55	4,092.78 S	575.02 E	14,592,057.27	1,729,380.71	1.56	4,089.71	
11,819.00	91.70	181.59	2,129.25	7,019.25	4,182.71 S	572.45 E	14,591,967.33	1,729,378.46	0.53	4,179.66	



Design Report for RW 1N-5HZ - Final Surveys

Measured Depth (usft)	Inclination (°)	True Azimuth (°)	TVD below System (usft)	Vertical Depth (usft)	Local Coordinates (usft)		Map Coordinates (usft)		Dogleg Rate (°/100usft)	Vertical Section (usft)	Comments
					Northing	Easting	Northing	Easting			
11,909.00	92.53	181.75	2,125.93	7,015.93	4,272.61 S	569.83 E	14,591,877.42	1,729,376.16	0.94	4,269.57	
11,998.00	91.97	179.44	2,122.44	7,012.44	4,361.53 S	568.91 E	14,591,788.49	1,729,375.56	2.67	4,358.49	
12,088.00	90.74	179.46	2,120.31	7,010.31	4,451.50 S	569.77 E	14,591,698.53	1,729,376.74	1.37	4,448.46	
12,178.00	89.57	179.10	2,120.07	7,010.07	4,541.49 S	570.90 E	14,591,608.54	1,729,378.19	1.36	4,538.44	
12,267.00	89.08	179.13	2,121.11	7,011.11	4,630.47 S	572.28 E	14,591,519.56	1,729,379.89	0.55	4,627.41	
12,357.00	89.11	180.36	2,122.54	7,012.54	4,720.46 S	572.68 E	14,591,429.58	1,729,380.61	1.37	4,717.40	
12,536.00	89.23	179.35	2,125.13	7,015.13	4,899.44 S	573.13 E	14,591,250.61	1,729,381.70	0.57	4,896.37	
12,626.00	89.20	178.88	2,126.36	7,016.36	4,989.42 S	574.52 E	14,591,160.63	1,729,383.41	0.52	4,986.34	
12,716.00	89.41	181.31	2,127.45	7,017.45	5,079.41 S	574.37 E	14,591,070.64	1,729,383.58	2.71	5,076.33	
12,805.00	89.57	182.63	2,128.25	7,018.25	5,168.35 S	571.31 E	14,590,981.69	1,729,380.84	1.49	5,165.29	
12,895.00	89.29	182.92	2,129.14	7,019.14	5,258.24 S	566.95 E	14,590,891.79	1,729,376.80	0.45	5,255.20	
12,984.00	91.57	182.28	2,128.47	7,018.47	5,347.14 S	562.92 E	14,590,802.87	1,729,373.08	2.66	5,344.12	Enter 460' Rad @ 12984.00' MD, 7018.47' TVD
13,164.00	91.60	182.14	2,123.49	7,013.49	5,526.93 S	555.98 E	14,590,623.05	1,729,366.78	0.08	5,523.95	
13,253.00	91.42	182.07	2,121.15	7,011.15	5,615.84 S	552.71 E	14,590,534.13	1,729,363.83	0.22	5,612.87	
13,343.00	90.89	181.61	2,119.33	7,009.33	5,705.78 S	549.82 E	14,590,444.19	1,729,361.26	0.78	5,702.82	
13,433.00	89.63	181.69	2,118.93	7,008.93	5,795.74 S	547.23 E	14,590,354.22	1,729,358.99	1.40	5,792.79	
13,522.00	88.92	180.85	2,120.05	7,010.05	5,884.71 S	545.26 E	14,590,265.24	1,729,357.34	1.24	5,881.77	
13,621.00	89.35	182.53	2,121.55	7,011.55	5,983.65 S	542.34 E	14,590,166.29	1,729,354.77	1.75	5,980.73	Last Sperry MWD+IFR+SC Survey @ 13621.00' MD
13,666.00	89.35	182.53	2,122.06	7,012.06	6,028.60 S	540.35 E	14,590,121.33	1,729,352.94	0.00	6,025.69	Straight Line Projection to TD @ 13666.00' MD

**Design Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates (usft)		Comment
		+N/-S	+E/-W	
13.00	13.00	0.00	0.00	Tie-On to Last Surface Survey @ 0.00' MD (KB 8')
132.00	131.99	0.95	-0.63	First Total MWD+IFR Survey @ 119.00' MD (KB 8')
1,813.00	1,785.39	214.75	175.53	Last Total MWD+IFR Survey @ 1800.00' MD (KB 8')
1,813.00	1,785.39	214.75	175.53	Tie-On to Last Surface Survey @ 1813.00' MD
1,934.00	1,904.83	230.47	186.82	First Sperry MWD+IFR+SC Survey @ 1934.00' MD
7,606.00	7,047.02	28.89	622.96	Landed Curve @ 7606.00' MD, 89.29° INC, 7047.02' TVD
8,288.00	7,044.05	-653.01	626.49	Exit 460' Rad @ 8288.00' MD, 7044.05' TVD
12,984.00	7,018.47	-5,347.14	562.92	Enter 460' Rad @ 12984.00' MD, 7018.47' TVD
13,621.00	7,011.55	-5,983.65	542.34	Last Sperry MWD+IFR+SC Survey @ 13621.00' MD
13,666.00	7,012.06	-6,028.60	540.35	Straight Line Projection to TD @ 13666.00' MD

**Design Report for RW 1N-5HZ - Final Surveys**

**Vertical Section Information**

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
User	No Target (Freehand)	180.30	Slot	0.00	0.00	0.00

**Survey tool program**

From (usft)	To (usft)	Survey/Plan	Survey Tool
13.00	1,813.00	Total MWD+IFR Surface Surveys	APC_ISCWSA REV 2 MWD+IFR1
1,813.00	13,621.00	Sperry MWD+IFR Surveys	APC_ISCWSA REV 2 MWD+IFR1+SC
13,666.00	13,666.00	PTB	APC_BLIND

**Design 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
RW 1N-5HZ SHL () - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	14,596,147.97	1,728,791.11	40.190190	-104.683555
RW 1N-5HZ HEEL PLAT () - actual wellpath misses target center by 640.73usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	137.29	625.85	14,596,287.49	1,729,416.47	40.190567	-104.681314
RW 1N-5HZ BHL PLAT () - actual wellpath misses target center by 6078.87usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	-6,049.94	592.33	14,590,100.18	1,729,405.00	40.173576	-104.681435
RW 1N-5HZ_460 S () - actual wellpath misses target center by 5659.72usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Circle (radius 460.00)	0.00	0.00	0.00	-5,655.28	224.34	14,590,493.53	1,729,035.60	40.174660	-104.682752
RW 1N-5HZ_460 N () - actual wellpath misses target center by 457.02usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Circle (radius 460.00)	0.00	0.00	0.00	-373.06	264.01	14,595,775.86	1,729,056.44	40.189166	-104.682610

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**Design Report for RW 1N-5HZ - Final Surveys**

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**Directional Difficulty Index**

Average Dogleg over Survey:	1.82 °/100usft	Maximum Dogleg over Survey:	11.84 °/100usft at 6,709.00 usft
Net Tortosity applicable to Plans:	0.95 °/100usft	Directional Difficulty Index:	6.578

**Audit Info**

**North Reference Sheet for 3N-65W-29 RW 15-29HZ Pad - RW 1N-5HZ - Original Wellbore**

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.

Vertical Depths are relative to RKB 21' @ 4890.00usft (Precision 464). Northing and Easting are relative to RW 1N-5HZ

Coordinate System is Universal Transverse Mercator (US Survey Feet), Zone 13N (108 W to 102 W) using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Transverse Mercator (Gauss-Kruger)

Central Meridian is -105.000000°, Longitude Origin:0.000000°, Latitude Origin:0.000000°

False Easting: 1,640,416.67usft, False Northing: 0.00usft, Scale Reduction: 0.99960893

Grid Coordinates of Well: 14,596,147.97 usft N, 1,728,791.11 usft E

Geographical Coordinates of Well: 40° 11' 24.68" N, 104° 41' 00.80" W

Grid Convergence at Surface is: 0.20°

Based upon Minimum Curvature type calculations, at a Measured Depth of 13,666.00usft the Bottom Hole Displacement is 6,052.77usft in the Direction of 174.88° ( True).

Magnetic Convergence at surface is: -8.10° ( 4 September 2017, , BGGM2017)

