

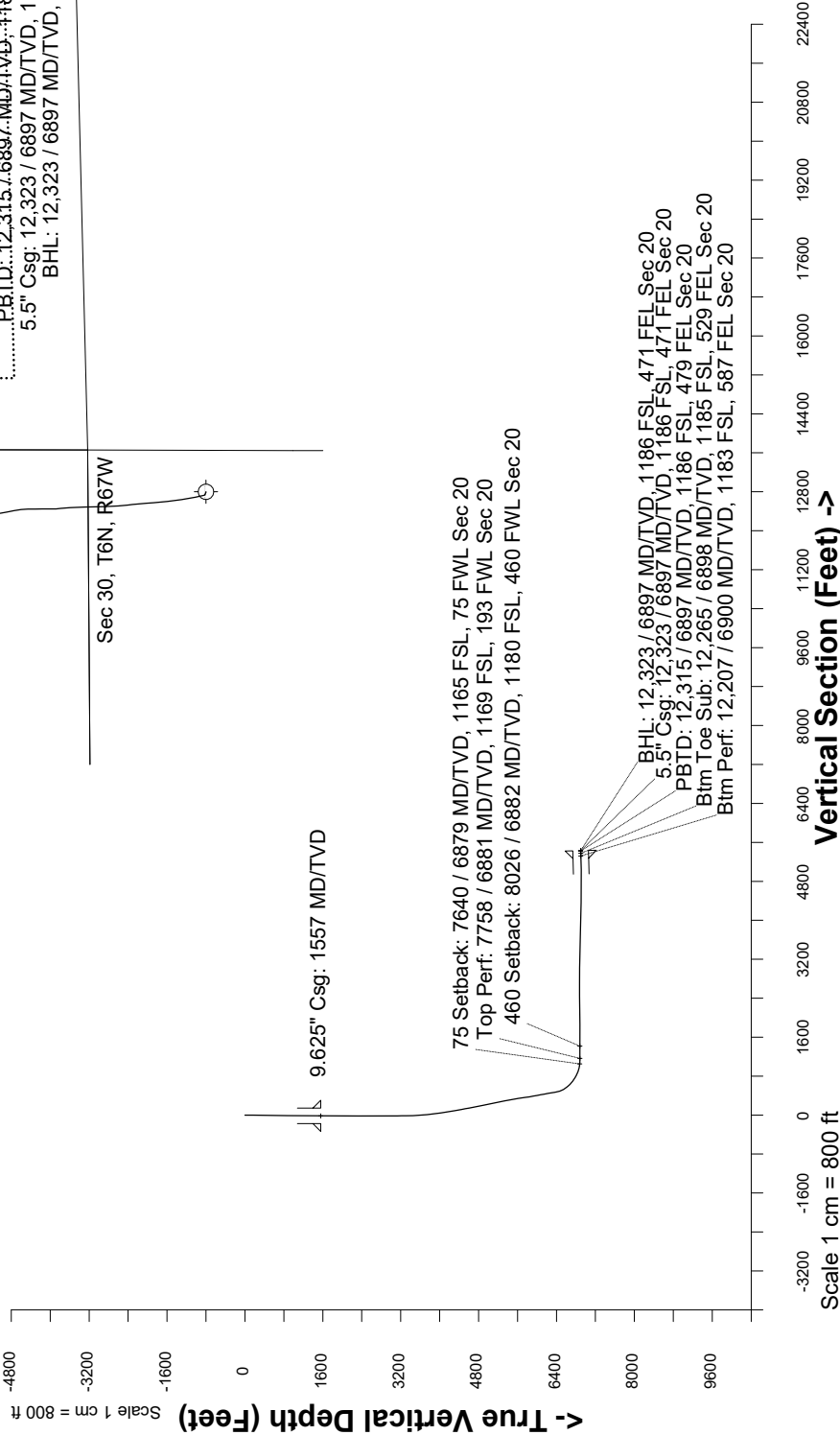
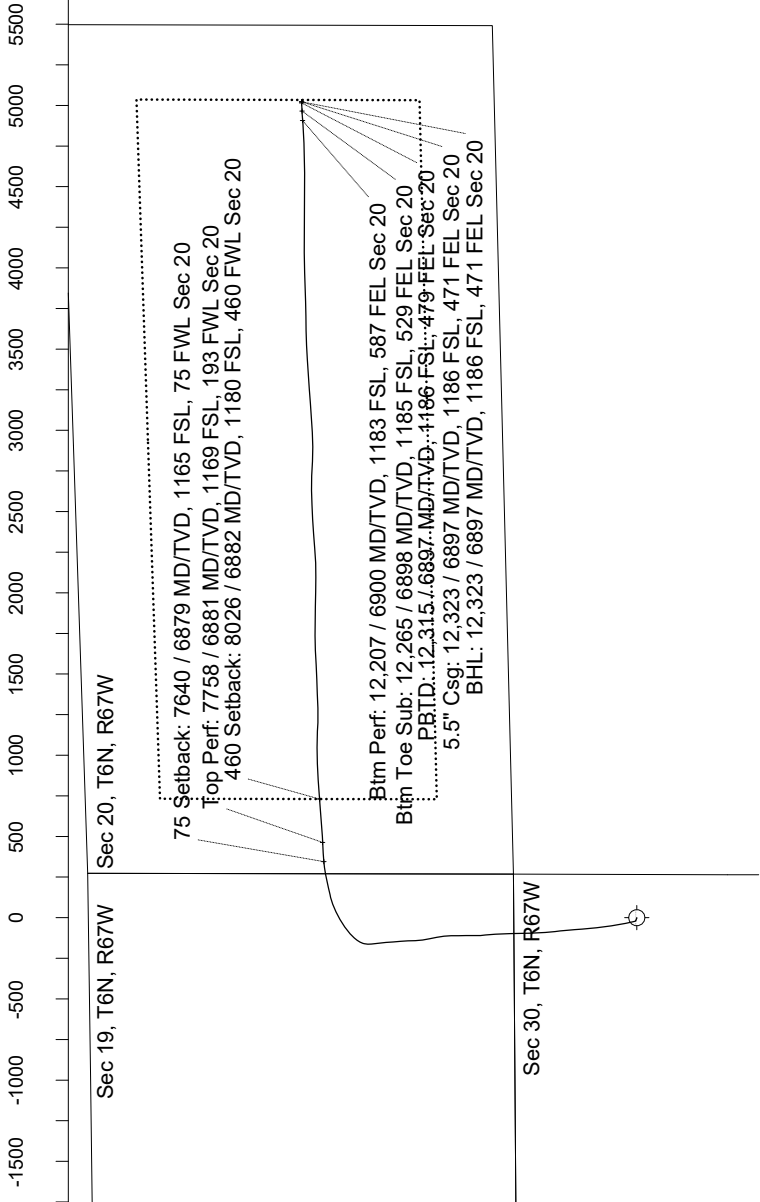
Great Western Operating Company, LLC

Created by	admin
Date plotted	15-Jul-2019
Plot reference is	Raindance FD 20-319HNX (AWB).
Ref wellpath is	Raindance FD 20-319HNX (AWP#1).
Coordinates are in	Feet reference Slot W-10 - Raindance FD 20-319HNX.
True Vertical Depths are	reference Rig Datum.
Measured Depths are	reference Rig Datum.
Rig Datum:	Actual Datum #1
Rig Datum to Mean Sea Level:	4808.40 ft.
Plot North is	aligned to TRUE North.

Location	Colorado	Slot	Slot W-10 - Raindance FD 20-319HNX
Field	Wattenburg	Well	Raindance FD 20-319HNX
Installation	Raindance	Wellbore	Raindance FD 20-319HNX (AWB)

Scale 1 cm = 250 ft

East (Feet) ->



Vertical Section (Feet) ->

Scale 1 cm = 800 ft

Azimuth 67.66 with reference 0.00 N, 0.00 E from Slot W-10 - Raindance FD 20-319HNX

Great Western Operating Co, LLC
Directional Survey Report
Wellpath: Raindance FD 20-319HNX
MDs and TVDs are from Rig Floor 4808.4ft above Mean Sea Level

Wellbore Information

Date Created	Date Revised	API #	RKB above GL	Well Name
Oct-16-2017	Jul-10-2019	05-123-44990	20.00	Raindance FD 20-319HNX

Slot Coordinates

Latitude	Longitude
40.46291100	-104.92741700

Pad Information

Pad Name	Ground Elev.
Raindance	4788.40

Field

Name
Wattenburg

Wellpath Report

MD[ft]	Inc[deg]	Azi[deg]	TVD[ft]	North[ft]	East[ft]	Dogleg [deg/100ft]	Vertical Section[ft]	Lat - NAD 83	Long - NAD 83
0.00	0.00	0.000	0.00	0.00	0.00		0.00	40.46291100	-104.92741700
20.00	0.00	288.880	20.00	0.00	0.00	==>	0.00	40.46291100	-104.92741700
107.00	0.46	275.420	107.00	0.03	-0.35	0.53	-0.31	40.46291109	-104.92741825
168.00	0.66	283.890	168.00	0.14	-0.93	0.35	-0.81	40.46291139	-104.92742035
259.00	0.89	279.580	258.99	0.38	-2.14	0.26	-1.83	40.46291205	-104.92742468
350.00	0.96	271.250	349.98	0.52	-3.60	0.17	-3.13	40.46291242	-104.92742993
441.00	0.80	302.450	440.97	0.88	-4.90	0.55	-4.20	40.46291340	-104.92743459
531.00	0.81	294.080	530.96	1.47	-6.01	0.13	-5.00	40.46291504	-104.92743859
620.00	0.84	300.350	619.95	2.06	-7.14	0.11	-5.83	40.46291665	-104.92744267
709.00	1.05	286.190	708.94	2.62	-8.49	0.35	-6.86	40.46291818	-104.92744751
799.00	0.97	295.780	798.92	3.18	-9.97	0.21	-8.01	40.46291972	-104.92745282
888.00	1.27	284.910	887.90	3.76	-11.60	0.41	-9.30	40.46292132	-104.92745868
978.00	1.29	284.410	977.88	4.27	-13.54	0.03	-10.91	40.46292271	-104.92746567
1067.00	1.54	293.600	1066.86	5.00	-15.61	0.38	-12.54	40.46292471	-104.92747310
1156.00	0.60	296.760	1155.84	5.68	-17.12	1.06	-13.68	40.46292660	-104.92747853
1246.00	0.53	293.030	1245.83	6.06	-17.93	0.09	-14.28	40.46292763	-104.92748142
1335.00	0.83	283.320	1334.83	6.37	-18.93	0.36	-15.09	40.46292848	-104.92748504
1424.00	0.26	314.980	1423.82	6.66	-19.70	0.70	-15.69	40.46292928	-104.92748781
1506.00	0.07	287.600	1505.82	6.81	-19.88	0.24	-15.80	40.46292968	-104.92748845
1557.00	0.10	287.470	1556.82	6.83	-19.96	0.07	-15.86	40.46292975	-104.92748871
1613.00	0.14	287.400	1612.82	6.87	-20.07	0.07	-15.95	40.46292984	-104.92748912
1702.00	0.13	23.610	1701.82	6.99	-20.13	0.23	-15.96	40.46293019	-104.92748935
1792.00	0.07	346.900	1791.82	7.14	-20.10	0.09	-15.88	40.46293059	-104.92748925
1881.00	0.13	344.760	1880.82	7.29	-20.14	0.07	-15.86	40.46293100	-104.92748939
1971.00	0.09	321.130	1970.82	7.44	-20.21	0.07	-15.87	40.46293142	-104.92748964
2060.00	0.13	316.890	2059.82	7.57	-20.33	0.05	-15.92	40.46293178	-104.92749005
2149.00	0.15	352.040	2148.82	7.76	-20.41	0.10	-15.93	40.46293230	-104.92749035
2239.00	0.06	105.230	2238.82	7.86	-20.38	0.20	-15.86	40.46293258	-104.92749025
2328.00	0.11	16.310	2327.82	7.93	-20.31	0.14	-15.77	40.46293277	-104.92749000
2417.00	0.04	154.440	2416.82	7.99	-20.28	0.16	-15.72	40.46293292	-104.92748987
2507.00	0.09	353.650	2506.82	8.03	-20.27	0.14	-15.70	40.46293304	-104.92748985
2596.00	0.11	230.740	2595.82	8.04	-20.34	0.20	-15.76	40.46293308	-104.92749011
2685.00	0.07	319.320	2684.82	8.03	-20.45	0.14	-15.86	40.46293304	-104.92749048
2775.00	0.13	271.440	2774.82	8.08	-20.58	0.11	-15.97	40.46293317	-104.92749097
2864.00	0.06	330.870	2863.82	8.12	-20.71	0.13	-16.07	40.46293328	-104.92749142
2954.00	0.06	25.340	2953.82	8.20	-20.71	0.06	-16.04	40.46293351	-104.92749143
3043.00	0.19	312.640	3042.82	8.34	-20.80	0.20	-16.07	40.46293390	-104.92749175
3133.00	2.48	340.610	3132.79	10.28	-21.56	2.57	-16.03	40.46293922	-104.92749446
3222.00	4.86	344.880	3221.60	15.74	-23.18	2.69	-15.46	40.46295420	-104.92750030
3311.00	7.33	344.420	3310.09	24.85	-25.69	2.78	-14.31	40.46297921	-104.92750931
3401.00	10.05	345.720	3399.05	37.99	-29.17	3.03	-12.54	40.46301528	-104.92752182
3490.00	15.60	349.260	3485.80	57.29	-33.32	6.30	-9.04	40.46306825	-104.92753673
3580.00	18.79	351.970	3571.77	83.54	-37.60	3.65	-3.02	40.46314030	-104.92755211
3669.00	18.75	349.250	3656.03	111.79	-42.27	0.98	3.39	40.46321784	-104.92756890
3759.00	19.78	348.950	3740.99	140.94	-47.88	1.15	9.28	40.46329787	-104.92758908
3848.00	21.33	353.850	3824.33	171.82	-52.50	2.60	16.74	40.46338263	-104.92760569
3937.00	26.16	353.480	3905.77	207.43	-56.47	5.43	26.61	40.46348036	-104.92761994
4026.00	29.73	352.980	3984.38	248.84	-61.40	4.02	37.79	40.46359402	-104.92763764
4116.00	29.92	353.090	4062.46	293.27	-66.82	0.22	49.66	40.46371598	-104.92765715
4205.00	30.00	356.030	4139.57	337.50	-71.03	1.65	62.57	40.46383740	-104.92767228
4295.00	30.13	356.510	4217.46	382.49	-73.97	0.30	76.96	40.46396090	-104.92768282
4384.00	29.98	355.070	4294.50	426.94	-77.24	0.83	90.83	40.46408291	-104.92769458
4474.00	30.00	353.730	4372.45	471.71	-81.63	0.74	103.79	40.46420579	-104.92771035
4563.00	30.09	354.170	4449.49	516.03	-86.32	0.27	116.28	40.46432742	-104.92772723
4653.00	30.16	356.150	4527.34	561.03	-90.13	1.11	129.87	40.46445095	-104.92774092
4742.00	29.88	356.340	4604.40	605.46	-93.05	0.33	144.06	40.46457291	-104.92775141
4831.00	30.02	357.170	4681.51	649.82	-95.56	0.49	158.59	40.46469467	-104.92776044
4921.00	30.09	357.480	4759.41	694.85	-97.67	0.19	173.76	40.46481826	-104.92776800
5010.00	29.72	1.230	4836.57	739.20	-98.18	2.14	190.14	40.46494000	-104.92776983
5100.00	30.27	1.230	4914.51	784.18	-97.21	0.61	208.14	40.46506347	-104.92776636
5189.00	29.87	356.740	4991.55	828.74	-97.99	2.57	224.35	40.46518577	-104.92776916
5279.00	30.12	353.470	5069.50	873.55	-101.83	1.84	237.83	40.46530878	-104.92778297
5368.00	29.77	353.150	5146.62	917.67	-107.01	0.43	249.81	40.46542989	-104.92780157
5457.00	30.06	359.580	5223.78	961.91	-109.81	3.62	264.04	40.46555132	-104.92781163
5547.00	30.49	0.300	5301.50	1007.29	-109.85	0.63	281.24	40.46567587	-104.92781179
5636.00	30.19	358.850	5378.32	1052.24	-110.18	0.89	298.02	40.46579925	-104.92781298
5726.00	30.26	0.240	5456.08	1097.54	-110.54	0.78	314.91	40.46592360	-104.92781427
5815.00	30.17	359.210	5532.99	1142.33	-110.76	0.59	331.73	40.46604653	-104.92781505
5905.00	30.17	353.310	5610.82	1187.41	-113.70	3.29	346.14	40.46617029	-104.92782564
5994.00	30.35	348.370	5687.70	1231.65	-120.84	2.80	356.35	40.46629173	-104.92785130
6083.00	29.79	347.640	5764.72	1275.27	-130.11	0.75	364.36	40.46641146	-104.92788460
6173.00	29.89	353.320	5842.81	1319.39	-137.50	3.14	374.29	40.46653256	-104.92791118
6262.00	30.50	357.520	5919.74	1363.99	-141.06	2.47	387.95	40.46665497	-104.92792396
6351.00	30.14	358.020	5996.57	1408.88	-142.81	0.49	403.39	40.46677820	-104.92793025
6441.00	30.47	354.950	6074.27	1454.20	-145.60	1.76	418.04	40.46690259	-104.92794028
6530.00	30.04	356.360	6151.15	1498.91	-149.00	0.93	431.89	40.46702531	-104.92795250
6620.00	30.45	355.060	6228.90	1544.11	-152.39	0.86	445.93	40.46714939	-104.92796470
6709.00	29.86	353.540	6305.86	1588.60	-156.83	1.08	458.73	40.46727149	-104.92798064
6798.00	30.35	352.800	6382.85	1632.92	-162.14	0.69	470.67	40.46739315	-104.92799973
6888.00	30.01	12.520	6460.85	1677.56	-160.11	10.98	489.52	40.46751568	-104.92799242
6977.00	33.74	35.200	6536.69	1719.65	-140.96	14.01	523.22	40.46763122	-104.92792360
7067.00	39.43	48.210	6609.03	1759.22	-105.16	10.66	571.38	40.46773981	-104.92779493
7156.00	45.55	54.460	6674.66	1796.57	-58.17	8.35	629.03	40.46784234	-104.92762606

MD[ft]	Inc[deg]	Azi[deg]	TVD[ft]	North[ft]	East[ft]	Dogleg [deg/100ft]	Vertical Section[ft]	Lat - NAD 83	Long - NAD 83
7246.00	52.80	59.470	6733.48	1833.51	-1.06	9.09	695.90	40.46794375	-104.92742080
7335.00	59.53	69.660	6783.10	1864.94	65.63	12.14	769.53	40.46803002	-104.92718111
7424.00	66.76	76.220	6823.31	1888.06	141.48	10.45	848.47	40.46809348	-104.92690854
7514.00	72.98	77.780	6854.27	1907.04	223.77	7.10	931.81	40.46814557	-104.92661276
7603.00	81.16	81.980	6874.18	1922.21	309.08	10.28	1016.48	40.46818722	-104.92630615
7639.80	84.71	84.100	6878.70	1926.64	345.33	11.21	1051.68	40.46819935	-104.92617589
7692.00	89.75	87.070	6881.23	1930.64	397.29	11.21	1101.27	40.46821036	-104.92598914
7758.00	89.89	86.780	6881.43	1934.18	463.19	0.48	1163.57	40.46822006	-104.92575228
7782.00	89.94	86.680	6881.47	1935.55	487.15	0.48	1186.26	40.46822382	-104.92566616
7871.00	90.12	85.440	6881.42	1941.67	575.94	1.41	1270.71	40.46824060	-104.92534706
7960.00	89.66	87.160	6881.59	1947.41	664.75	2.00	1355.04	40.46825636	-104.92502787
8025.77	90.02	85.190	6881.78	1951.79	730.37	3.04	1417.40	40.46826839	-104.92479203
8049.00	90.15	84.500	6881.74	1953.88	753.51	3.04	1439.59	40.46827411	-104.92470888
8139.00	89.94	84.660	6881.67	1962.38	843.11	0.29	1525.69	40.46829744	-104.92438686
8228.00	90.09	88.880	6881.65	1967.40	931.94	4.74	1609.77	40.46831119	-104.92406758
8317.00	90.12	90.670	6881.48	1967.74	1020.94	2.01	1692.22	40.46831214	-104.92374772
8406.00	90.37	91.820	6881.10	1965.81	1109.92	1.32	1773.79	40.46830682	-104.92342794
8496.00	90.31	91.190	6880.57	1963.45	1199.88	0.70	1856.10	40.46830032	-104.92310460
8586.00	90.37	88.770	6880.03	1963.48	1289.88	2.69	1939.35	40.46830040	-104.92278117
8675.00	90.18	87.230	6879.61	1966.58	1378.82	1.74	2022.80	40.46830891	-104.92246151
8764.00	90.00	88.180	6879.47	1970.15	1467.75	1.09	2106.41	40.46831868	-104.92214190
8854.00	90.80	86.910	6878.84	1974.00	1557.66	1.67	2191.04	40.46832924	-104.92181875
8943.00	91.05	87.410	6877.40	1978.41	1646.54	0.63	2274.92	40.46834133	-104.92149932
9033.00	90.99	89.930	6875.80	1980.50	1736.49	2.80	2358.92	40.46834704	-104.92117602
9122.00	90.12	91.020	6874.94	1979.76	1825.48	1.57	2440.95	40.46834500	-104.92085619
9211.00	90.28	90.750	6874.63	1978.39	1914.47	0.35	2522.74	40.46834121	-104.92053636
9301.00	90.37	91.110	6874.12	1976.93	2004.46	0.41	2605.42	40.46833718	-104.92021295
9391.00	90.28	90.680	6873.61	1975.52	2094.44	0.49	2688.12	40.46833330	-104.91988953
9480.00	88.43	87.200	6874.61	1977.17	2183.41	4.43	2771.03	40.46833780	-104.91956980
9569.00	88.12	85.430	6877.29	1982.88	2272.18	2.02	2855.31	40.46835347	-104.91925075
9659.00	88.55	85.530	6879.90	1989.97	2361.86	0.49	2940.96	40.46837291	-104.91892843
9749.00	89.82	87.090	6881.18	1995.77	2451.66	2.23	3026.22	40.46838878	-104.91860569
9838.00	89.85	87.740	6881.44	1999.78	2540.57	0.73	3109.98	40.46839977	-104.91828615
9928.00	90.09	88.390	6881.49	2002.82	2630.52	0.77	3194.34	40.46840809	-104.91796287
10017.00	90.25	93.370	6881.22	2001.45	2719.48	5.60	3276.10	40.46840431	-104.91764315
10106.00	90.03	92.830	6881.01	1996.64	2808.35	0.66	3356.47	40.46839107	-104.91732375
10196.00	90.22	89.380	6880.81	1994.90	2898.32	3.84	3439.03	40.46838628	-104.91700040
10285.00	88.03	87.000	6882.17	1997.71	2987.25	3.63	3522.36	40.46839396	-104.91668077
10375.00	88.31	86.200	6885.04	2003.05	3077.04	0.94	3607.44	40.46840857	-104.91635804
10464.00	88.25	85.750	6887.71	2009.29	3165.78	0.51	3691.89	40.46842568	-104.91603911
10554.00	88.22	85.690	6890.49	2016.01	3255.49	0.07	3777.42	40.46844408	-104.91571670
10643.00	88.34	85.750	6893.16	2022.65	3344.20	0.15	3862.00	40.46846227	-104.91539786
10733.00	88.09	86.930	6895.96	2028.39	3433.97	1.34	3947.22	40.46847800	-104.91507522
10822.00	88.12	86.980	6898.90	2033.11	3522.80	0.07	4031.17	40.46849093	-104.91475597
10912.00	88.34	89.740	6901.68	2035.69	3612.71	3.07	4115.31	40.46849796	-104.91443283
11001.00	88.25	89.230	6904.33	2036.49	3701.67	0.58	4197.90	40.46850012	-104.91411311
11091.00	88.19	87.760	6907.13	2038.85	3791.59	1.63	4281.97	40.46850657	-104.91378993
11180.00	89.94	87.870	6908.58	2042.24	3880.51	1.97	4365.51	40.46851584	-104.91347035
11270.00	89.75	88.480	6908.82	2045.11	3970.46	0.71	4449.80	40.46852367	-104.91314705
11359.00	89.75	89.040	6909.21	2047.03	4059.44	0.63	4532.83	40.46852892	-104.91282726
11448.00	89.88	89.770	6909.50	2047.96	4148.44	0.83	4615.50	40.46853142	-104.91250741
11538.00	89.72	90.130	6909.81	2048.04	4238.44	0.44	4698.77	40.46853159	-104.91218395
11627.00	90.18	90.990	6909.89	2047.17	4327.43	1.10	4780.76	40.46852916	-104.91186410
11717.00	90.09	91.410	6909.68	2045.28	4417.41	0.48	4863.27	40.46852394	-104.91154071
11806.00	90.25	90.960	6909.41	2043.44	4506.39	0.54	4944.87	40.46851885	-104.91122092
11895.00	91.63	88.450	6907.95	2043.90	4595.37	3.22	5027.35	40.46852006	-104.91090113
11985.00	91.48	87.340	6905.51	2047.20	4685.27	1.24	5111.76	40.46852908	-104.91057801
12074.00	91.51	87.510	6903.19	2051.20	4774.15	0.19	5195.49	40.46854001	-104.91025857
12163.00	91.51	87.060	6900.84	2055.41	4863.02	0.51	5279.29	40.46855153	-104.90993917
12207.00	91.47	86.950	6899.70	2057.71	4906.95	0.26	5320.79	40.46855781	-104.90978130
12253.00	91.42	86.840	6898.54	2060.20	4952.86	0.26	5364.21	40.46856462	-104.90961627
12265.00	91.39	86.880	6898.25	2060.86	4964.84	0.41	5375.54	40.46856641	-104.90957321
12299.00	91.32	87.000	6897.44	2062.67	4998.78	0.41	5407.62	40.46857137	-104.90945122
12315.49	91.32	87.000	6897.06	2063.54	5015.25	==>	5423.18	40.46857373	-104.90939206
12323.00	91.32	87.000	6896.89	2063.93	5022.75	==>	5430.26	40.46857481	-104.90936511

Comments

MD[ft]	TVD[ft]	North[ft]	East[ft]	Lat - NAD 83	Long - NAD 83	Comment
1557.00	1556.82	6.83	-19.96	40.46292975	-104.92748871	9.625" Csg: 1557 MD/TVD
7639.80	6878.70	1926.64	345.33	40.46819935	-104.92617589	75 Setback: 7640 / 6879 MD/TVD, 1165 FSL, 75 FWL Sec 20
7758.00	6881.43	1934.18	463.19	40.46822006	-104.92575228	Top Perf: 7758 / 6881 MD/TVD, 1169 FSL, 193 FWL Sec 20
8025.77	6881.78	1951.79	730.37	40.46826839	-104.92479203	460 Setback: 8026 / 6882 MD/TVD, 1180 FSL, 460 FWL Sec 20
12207.00	6899.70	2057.71	4906.95	40.46855781	-104.90978130	Btm Perf: 12,207 / 6900 MD/TVD, 1183 FSL, 587 FEL Sec 20
12265.00	6898.25	2060.86	4964.84	40.46856641	-104.90957321	Btm Toe Sub: 12,265 / 6898 MD/TVD, 1185 FSL, 529 FEL Sec 20
12315.49	6897.06	2063.54	5015.25	40.46857373	-104.90939206	PBTD: 12,315 / 6897 MD/TVD, 1186 FSL, 479 FEL Sec 20
12323.00	6896.89	2063.93	5022.75	40.46857481	-104.90936511	5.5" Csg: 12,323 / 6897 MD/TVD, 1186 FSL, 471 FEL Sec 20
12323.00	6896.89	2063.93	5022.75	40.46857481	-104.90936511	BHL: 12,323 / 6897 MD/TVD, 1186 FSL, 471 FEL Sec 20

Hole Sections

Diameter [in]	Start MD[ft]	Start TVD[ft]	Start North[ft]	Start East[ft]	End MD[ft]	End TVD[ft]	End North[ft]	End East[ft]
13.500	0.00	0.00	0.00	0.00	1557.00	1556.82	6.83	-19.96
8.500	1557.00	1556.82	6.83	-19.96	12323.00	6896.89	2063.93	5022.75

Casings

Name	Top MD[ft]	Top TVD[ft]	Top North[ft]	Top East[ft]	Shoe MD[ft]	Shoe TVD[ft]	Shoe North[ft]	Shoe East[ft]
9 5/8in Casing	0.00	0.00	0.00	0.00	1557.00	1556.82	6.83	-19.96
5 1/2in Casing	0.00	0.00	0.00	0.00	12323.00	6896.89	2063.93	5022.75

Survey Tool Program

Reference	Survey Name	MD[ft]	TVD[ft]	Survey Tool
307770	As Drilled - 20171016	12323.00	6896.89	MWD

Coordinates are from Slot
MD's and TVD's are from Rig Floor 4808.4ft above Mean Sea Level
Vertical Section is from 0.00 0.00 on azimuth 67.660 degrees
Bottom hole distance is 5430.26 Feet on azimuth 67.66 degrees from Wellhead
Calculation method uses Minimum Curvature method
Prepared by Great Western Operating Co.
Date Printed: