

Great Western Operating Company, LLC

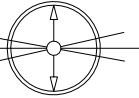
Created by	admin
Date plotted	15-Jul-2019
Plot reference is Raindance FD 20-319HN (AWB).	
Ref wellpath is Raindance FD 20-319HN (AWP#1).	
Coordinates are in Feet reference Slot W-11 - Raindance FD 20-319HN.	
True Vertical Depths are reference Rig Datum.	
Measured Depths are reference Rig Datum.	
Rig Datum: Actual Datum #1	
Rig Datum to Mean Sea Level: 4805.40 ft.	
Plot North is aligned to TRUE North.	

Location	Colorado	Slot	Slot W-11 - Raindance FD 20-319HN
Field	Wattenburg	Well	Raindance FD 20-319HN
Installation	Raindance	Wellbore	Raindance FD 20-319HN (AWB)

N

TRUE

M  
G



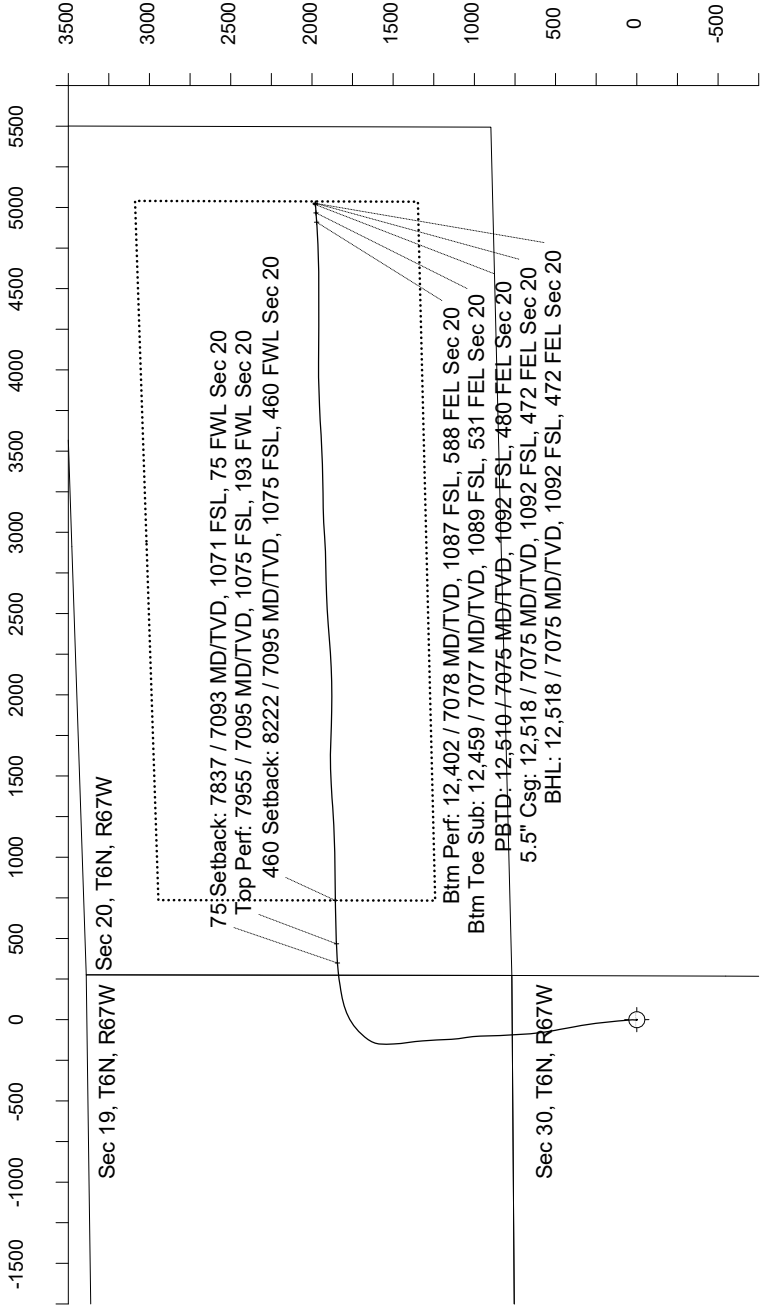
W

E

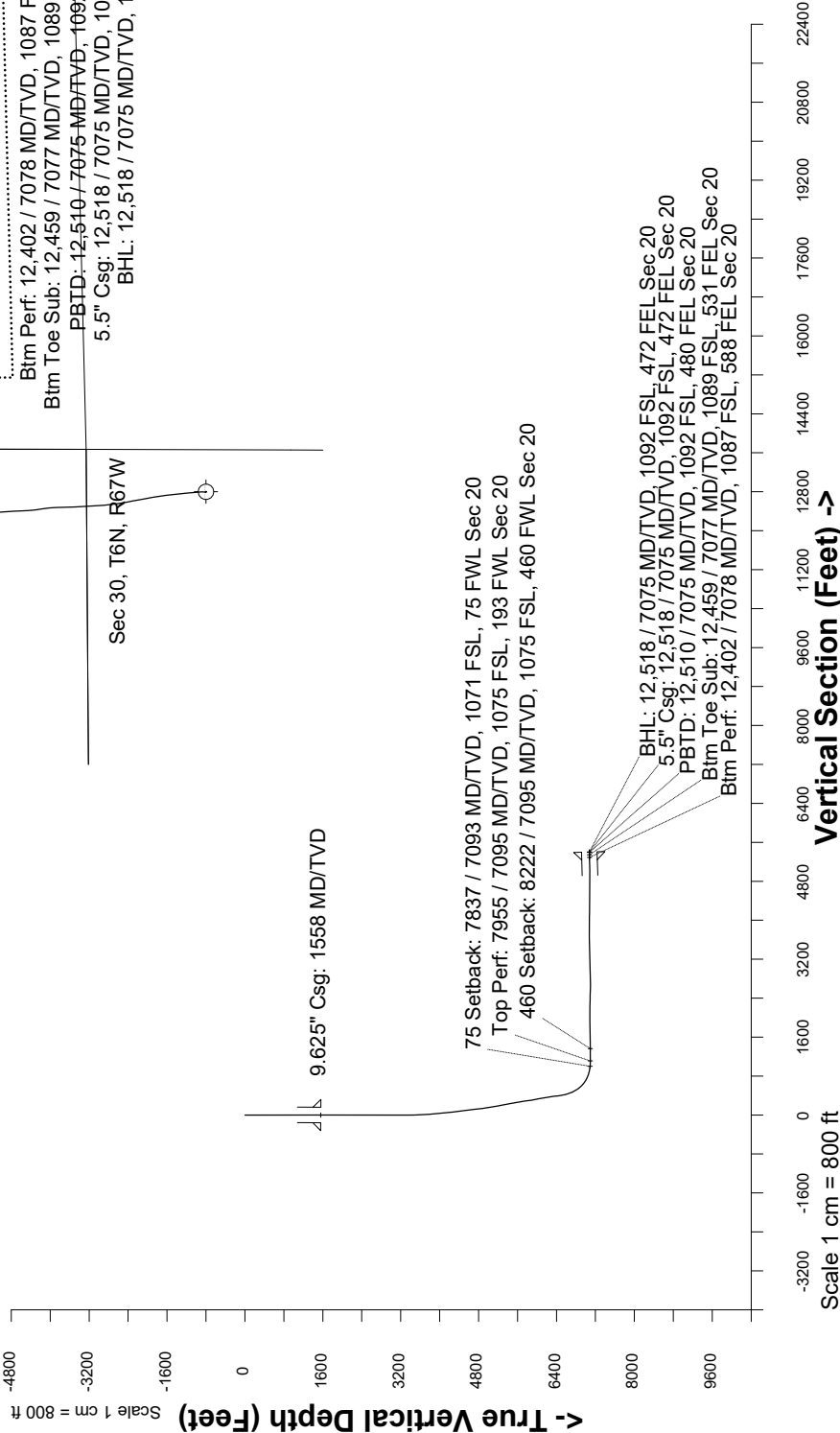
Nov-14-2016  
Dip: -29.88 deg Field: 32205.0 nT  
Lat: S0 0.0000 Long: E3 0.0000 Elev: 4789.00 ft  
Magnetic North is 4.17 deg West of TRUE North  
To correct azimuth from Magnetic to TRUE subtract 4.17 deg

Scale 1 cm = 250 ft

East (Feet) ->



<- True Vertical Depth (Feet)



Scale 1 cm = 800 ft

Vertical Section (Feet) ->

Azimuth 68.50 with reference 0.00 N, 0.00 E from Slot W-11 - Raindance FD 20-319HN

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

Date Created	Date Revised	API #	RKB above GL	Well Name
Aug-18-2017	Jul-10-2019	05-001-44989	20.00	Raindance FD 20-319HN

Slot Coordinates

Latitude	Longitude
40.46288500	-104.92743000

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	40.46288500	-104.92743000
20.00	0.00	0.000	20.00	0.00	0.00	==>	0.00	40.46288500	-104.92743000
107.00	0.72	342.230	107.00	0.52	-0.17	0.83	0.04	40.46288643	-104.92743060
168.00	0.47	336.090	167.99	1.11	-0.39	0.42	0.05	40.46288806	-104.92743138
259.00	0.40	320.830	258.99	1.70	-0.74	0.15	-0.06	40.46288967	-104.92743265
350.00	0.25	293.400	349.99	2.03	-1.12	0.23	-0.30	40.46289056	-104.92743402
441.00	0.32	281.920	440.99	2.16	-1.55	0.10	-0.65	40.46289092	-104.92743557
531.00	0.51	277.770	530.99	2.26	-2.19	0.21	-1.21	40.46289122	-104.92743788
620.00	0.71	137.090	619.98	1.91	-2.21	1.29	-1.36	40.46289025	-104.92743794
709.00	0.77	161.980	708.98	0.94	-1.65	0.36	-1.19	40.46288758	-104.92743593
799.00	0.38	106.150	798.97	0.28	-1.18	0.71	-0.99	40.46288578	-104.92743423
888.00	0.49	91.750	887.97	0.19	-0.51	0.17	-0.41	40.46288552	-104.92743184
978.00	0.52	62.700	977.97	0.37	0.24	0.28	0.35	40.46288600	-104.92742916
1067.00	0.37	48.700	1066.96	0.74	0.81	0.21	1.02	40.46288703	-104.92742709
1156.00	0.26	93.660	1155.96	0.92	1.23	0.29	1.48	40.46288752	-104.92742559
1246.00	0.18	117.260	1245.96	0.84	1.56	0.13	1.76	40.46288730	-104.92742441
1335.00	0.18	70.110	1334.96	0.82	1.81	0.16	1.99	40.46288726	-104.92742349
1424.00	0.62	203.560	1423.96	0.43	1.75	0.85	1.79	40.46288618	-104.92742371
1507.00	1.06	231.740	1506.95	-0.46	0.97	0.71	0.73	40.46288374	-104.92742652
1558.00	0.50	230.420	1557.95	-0.89	0.43	1.09	0.07	40.46288255	-104.92742847
1612.00	0.09	67.110	1611.95	-1.03	0.28	1.09	-0.11	40.46288218	-104.92742899
1701.00	0.04	274.390	1700.95	-1.00	0.32	0.14	-0.07	40.46288226	-104.92742886
1791.00	0.09	271.730	1790.95	-0.99	0.21	0.06	-0.17	40.46288227	-104.92742923
1881.00	0.03	36.600	1880.95	-0.97	0.16	0.12	-0.21	40.46288233	-104.92742943
1970.00	0.03	17.580	1969.95	-0.93	0.18	==>	-0.18	40.46288244	-104.92742936
2059.00	0.07	15.330	2058.95	-0.86	0.20	0.04	-0.13	40.46288265	-104.92742928
2149.00	0.03	37.630	2148.95	-0.79	0.23	0.05	-0.08	40.46288284	-104.92742918
2238.00	0.11	290.770	2237.95	-0.74	0.16	0.14	-0.12	40.46288298	-104.92742941
2327.00	0.07	321.590	2326.95	-0.66	0.05	0.07	-0.20	40.46288318	-104.92742982
2417.00	0.14	297.030	2416.95	-0.57	-0.08	0.09	-0.29	40.46288343	-104.92743030
2506.00	0.11	231.250	2505.95	-0.57	-0.25	0.16	-0.44	40.46288342	-104.92743089
2595.00	0.11	167.210	2594.95	-0.71	-0.29	0.13	-0.53	40.46288305	-104.92743106
2685.00	0.13	245.280	2684.95	-0.84	-0.37	0.17	-0.65	40.46288270	-104.92743132
2774.00	0.22	199.640	2773.95	-1.04	-0.52	0.18	-0.86	40.46288214	-104.92743186
2863.00	0.12	214.830	2862.94	-1.28	-0.63	0.12	-1.05	40.46288149	-104.92743226
2953.00	0.10	305.880	2952.94	-1.31	-0.74	0.18	-1.17	40.46288140	-104.92743268
3042.00	0.16	170.560	3041.94	-1.39	-0.79	0.27	-1.24	40.46288119	-104.92743283
3132.00	0.14	219.430	3131.94	-1.60	-0.84	0.14	-1.36	40.46288062	-104.92743301
3221.00	0.09	306.930	3220.94	-1.64	-0.96	0.18	-1.50	40.46288050	-104.92743346
3310.00	0.12	228.050	3309.94	-1.66	-1.09	0.15	-1.62	40.46288045	-104.92743391
3400.00	0.69	349.920	3399.94	-1.19	-1.25	0.84	-1.60	40.46288174	-104.92743450
3490.00	4.09	355.420	3489.85	2.55	-1.60	3.78	-0.56	40.46289199	-104.92743576
3579.00	7.76	2.900	3578.36	11.71	-1.55	4.21	2.85	40.46291715	-104.92743558
3669.00	12.28	3.260	3666.97	27.35	-0.70	5.02	9.37	40.46296006	-104.92743252
3758.00	12.40	356.930	3753.91	46.34	-0.67	1.53	16.35	40.46301219	-104.92743242
3847.00	11.97	353.300	3840.91	65.05	-2.26	0.99	21.73	40.46306354	-104.92743813
3936.00	14.92	352.280	3927.46	85.57	-4.88	3.33	26.82	40.46311988	-104.92744753
4026.00	17.78	352.440	4013.81	110.68	-8.24	3.18	32.89	40.46318880	-104.92745963
4115.00	20.54	353.710	4097.87	139.67	-11.74	3.14	40.26	40.46326839	-104.92747220
4205.00	23.74	356.090	4181.23	173.45	-14.71	3.69	49.88	40.46336110	-104.92748286
4294.00	26.85	355.640	4261.69	211.38	-17.46	3.50	61.22	40.46346520	-104.92749274
4384.00	29.74	352.180	4340.93	253.77	-22.04	3.69	72.49	40.46358156	-104.92750922
4473.00	29.58	350.800	4418.27	297.32	-28.56	0.79	82.38	40.46370111	-104.92753263
4562.00	29.59	349.620	4495.67	340.62	-36.03	0.65	91.30	40.46381996	-104.92755948
4652.00	30.32	349.740	4573.64	384.83	-44.08	0.81	100.01	40.46394132	-104.92758841
4741.00	30.27	350.010	4650.49	429.03	-51.97	0.16	108.87	40.46406263	-104.92761678
4831.00	30.24	349.120	4728.23	473.63	-60.19	0.50	117.57	40.46418504	-104.92764629
4920.00	30.39	349.500	4805.06	517.77	-68.52	0.27	125.99	40.46430621	-104.92767624
5010.00	30.27	351.170	4882.75	562.57	-76.15	0.95	135.31	40.46442917	-104.92770366
5099.00	30.49	353.570	4959.53	607.17	-82.12	1.39	146.10	40.46455161	-104.92772513
5189.00	30.24	356.070	5037.18	652.47	-86.23	1.43	158.87	40.46467595	-104.92773990
5278.00	30.29	357.020	5114.05	697.25	-88.93	0.54	172.76	40.46479885	-104.92774961
5367.00	30.04	356.770	5191.00	741.90	-91.36	0.31	186.88	40.46492142	-104.92775832
5457.00	29.79	356.330	5269.01	786.70	-94.06	0.37	200.78	40.46504440	-104.92776802
5546.00	29.77	354.900	5346.26	830.78	-97.44	0.80	213.79	40.46516537	-104.92778017
5636.00	29.73	357.240	5424.40	875.32	-100.50	1.29	227.26	40.46528764	-104.92779117
5725.00	29.87	1.280	5501.64	919.53	-101.06	2.26	242.94	40.46540898	-104.92779321
5814.00	30.00	359.280	5578.77	963.93	-100.85	1.13	259.41	40.46553087	-104.92779244
5904.00	30.17	353.360	5656.66	1008.90	-103.75	3.30	273.19	40.46565431	-104.92780285
5993.00	30.08	350.350	5733.64	1053.11	-110.07	1.70	283.51	40.46577565	-104.92782559
6083.00	29.72	352.400	5811.67	1097.46	-116.80	1.20	293.50	40.46589738	-104.92784978
6172.00	30.07	356.280	5888.83	1141.58	-121.17	2.21	305.60	40.46601849	-104.92786547
6261.00	30.04	358.380	5965.87	1186.10	-123.25	1.18	319.99	40.46614069	-104.92787293
6351.00	29.83	357.420	6043.86	1230.98	-124.89	0.58	334.90	40.46626388	-104.92787884
6440.00	30.08	356.170	6120.97	1275.35	-127.38	0.76	348.85	40.46638566	-104.92788778
6530.00	30.05	355.760	6198.86	1320.33	-130.55	0.23	362.38	40.46650912	-104.92789918
6619.00	29.92	353.810	6275.95	1364.62	-134.59	1.10	374.85	40.46663069	-104.92791370
6708.00	29.41	351.090	6353.29	1408.27	-140.37	1.62	385.47	40.46675052	-104.92793447
6797.00	29.56	352.470	6430.77	1451.63	-146.63	0.78	395.53	40.46686952	-104.92795698
6887.00	30.56	359.820	6508.69	1496.53	-149.61	4.24	409.21	40.46699278	-104.92796769
6976.00	30.43	356.980	6585.38	1541.67	-150.87	1.63	424.58	40.46711667	-104.92797222
7066.00	30.82	6.850	6662.88	1587.35	-149.32	5.60	442.77	40.46724206	-104.92796665
7156.00	32.67	26.450	6739.61	1632.11	-135.71	11.60	471.83	40.46736492	-104.92791775
7245.00	38.27	39.960	6812.18	1674.84	-107.24	10.79	513.98	40.46748222	-104.92781544
7334.00	43.76	47.770	6879.35	1716.71	-66.70	8.43	567.05	40.46759715	-104.92766970

MD[ft]	Inc[deg]	Azi[deg]	TVD[ft]	North[ft]	East[ft]	Dogleg [deg/100ft]	Vertical Section[ft]	Lat - NAD 83	Long - NAD 83
7424.00	51.46	56.270	6940.04	1757.28	-14.25	11.03	630.72	40.46770850	-104.92748120
7513.00	57.19	69.460	6992.08	1789.85	49.96	13.63	702.40	40.46779790	-104.92725043
7602.00	65.47	78.460	7034.81	1811.14	124.90	12.84	779.92	40.46785635	-104.92698110
7691.00	73.15	80.470	7066.23	1826.32	206.70	8.88	861.59	40.46789800	-104.92668713
7781.00	80.98	84.270	7086.37	1837.91	293.56	9.62	946.66	40.46792981	-104.92637495
7836.81	86.04	85.660	7092.68	1842.77	348.78	9.40	999.82	40.46794315	-104.92617649
7870.00	89.05	86.480	7094.10	1845.04	381.86	9.40	1031.42	40.46794938	-104.92605761
7955.00	90.01	87.880	7094.79	1849.22	466.75	2.00	1111.94	40.46796085	-104.92575251
7959.00	90.06	87.950	7094.79	1849.36	470.74	2.00	1115.71	40.46796124	-104.92573814
8048.00	89.85	89.360	7094.86	1851.45	559.72	1.60	1199.26	40.46796697	-104.92541838
8138.00	89.82	87.990	7095.12	1853.53	649.69	1.52	1283.74	40.46797268	-104.92509501
8222.14	89.93	89.370	7095.30	1855.47	733.81	1.65	1362.71	40.46797799	-104.92479270
8227.00	89.94	89.450	7095.30	1855.52	738.67	1.65	1367.25	40.46797813	-104.92477523
8317.00	89.88	89.470	7095.44	1856.37	828.66	0.07	1451.30	40.46798045	-104.92445179
8406.00	92.00	89.380	7093.98	1857.26	917.64	2.38	1534.42	40.46798289	-104.92413200
8495.00	91.94	88.740	7090.93	1858.72	1006.58	0.72	1617.70	40.46798689	-104.92381237
8585.00	92.00	88.630	7087.83	1860.79	1096.50	0.14	1702.12	40.46799254	-104.92348918
8674.00	89.85	85.980	7086.39	1864.97	1185.38	3.83	1786.35	40.46800402	-104.92316976
8764.00	90.06	86.150	7086.47	1871.15	1275.16	0.30	1872.15	40.46802096	-104.92284706
8853.00	89.88	86.930	7086.51	1876.52	1364.00	0.90	1956.78	40.46803569	-104.92252778
8942.00	89.88	86.590	7086.70	1881.55	1452.86	0.38	2041.30	40.46804948	-104.92220843
9032.00	89.82	88.590	7086.93	1885.33	1542.77	2.22	2126.35	40.46805985	-104.92188527
9121.00	89.85	90.820	7087.19	1885.79	1631.77	2.51	2209.32	40.46806110	-104.92156543
9211.00	88.89	92.030	7088.18	1883.55	1721.73	1.72	2292.20	40.46805494	-104.92124210
9300.00	88.65	91.830	7090.09	1880.56	1810.66	0.35	2373.85	40.46804669	-104.92092249
9390.00	88.62	91.310	7092.23	1878.09	1900.60	0.58	2456.63	40.46803991	-104.92059924
9479.00	88.74	89.850	7094.28	1877.19	1989.57	1.65	2539.08	40.46803742	-104.92027949
9569.00	88.52	88.600	7096.44	1878.41	2079.53	1.41	2623.23	40.46804074	-104.91995616
9658.00	89.02	87.390	7098.35	1881.52	2168.46	1.47	2707.11	40.46804926	-104.91963657
9748.00	89.94	86.620	7099.16	1886.22	2258.33	1.33	2792.45	40.46806215	-104.91931357
9838.00	92.52	85.020	7097.23	1892.78	2348.06	3.37	2878.34	40.46808012	-104.91899108
9927.00	92.77	85.240	7093.12	1900.33	2436.64	0.37	2963.53	40.46810082	-104.91867270
10016.00	92.68	87.520	7088.89	1905.94	2525.36	2.56	3048.13	40.46811620	-104.91835385
10105.00	92.49	87.910	7084.88	1909.48	2614.20	0.49	3132.09	40.46812590	-104.91803457
10195.00	89.88	88.240	7083.02	1912.51	2704.12	2.92	3216.86	40.46813417	-104.91771138
10285.00	91.17	89.120	7082.19	1914.58	2794.09	1.74	3301.33	40.46813983	-104.91738803
10374.00	91.26	88.140	7080.31	1916.71	2883.04	1.11	3384.88	40.46814564	-104.91706833
10463.00	91.02	85.990	7078.53	1921.26	2971.90	2.43	3469.22	40.46815812	-104.91674897
10553.00	91.08	86.340	7076.89	1927.28	3061.69	0.39	3554.97	40.46817461	-104.91642628
10642.00	89.78	89.310	7076.22	1930.66	3150.61	3.64	3638.94	40.46818385	-104.91610670
10732.00	89.54	89.590	7076.75	1931.52	3240.60	0.41	3722.99	40.46818619	-104.91578326
10822.00	90.00	88.360	7077.11	1933.13	3330.58	1.46	3807.30	40.46819057	-104.91545986
10911.00	90.09	88.140	7077.04	1935.85	3419.54	0.27	3891.07	40.46819800	-104.91514014
11000.00	90.03	87.380	7076.95	1939.33	3508.47	0.86	3975.09	40.46820752	-104.91482051
11090.00	90.15	86.930	7076.81	1943.80	3598.36	0.52	4060.36	40.46821974	-104.91449745
11180.00	88.98	86.600	7077.49	1948.87	3688.21	1.35	4145.82	40.46823365	-104.91417452
11269.00	88.83	87.980	7079.19	1953.08	3777.10	1.56	4230.06	40.46824516	-104.91385507
11358.00	88.86	87.910	7080.99	1956.27	3866.02	0.09	4313.97	40.46825388	-104.91353548
11447.00	89.08	89.020	7082.59	1958.66	3954.97	1.27	4397.61	40.46826038	-104.91321578
11537.00	90.00	90.190	7083.31	1959.28	4044.97	1.65	4481.57	40.46826204	-104.91289234
11626.00	90.06	90.520	7083.26	1958.72	4133.96	0.38	4564.17	40.46826049	-104.91257248
11716.00	89.94	90.300	7083.26	1958.08	4223.96	0.28	4647.67	40.46825868	-104.91224903
11805.00	89.78	90.210	7083.48	1957.68	4312.96	0.21	4730.34	40.46825755	-104.91192917
11895.00	89.75	90.110	7083.85	1957.43	4402.96	0.12	4813.98	40.46825682	-104.91160571
11984.00	89.88	90.770	7084.14	1956.75	4491.96	0.76	4896.54	40.46825490	-104.91128586
12073.00	89.97	89.660	7084.25	1956.42	4580.95	1.25	4979.22	40.46825394	-104.91096600
12163.00	90.86	86.910	7083.60	1959.11	4670.90	3.21	5063.90	40.46826128	-104.91064272
12252.00	91.38	86.770	7081.86	1964.01	4759.75	0.61	5148.36	40.46827470	-104.91032340
12342.00	91.38	87.590	7079.69	1968.44	4849.61	0.91	5233.60	40.46828680	-104.91000043
12402.00	91.59	86.980	7078.14	1971.28	4909.52	1.08	5290.38	40.46829457	-104.90978510
12431.00	91.69	86.680	7077.31	1972.89	4938.47	1.08	5317.90	40.46829896	-104.90968107
12459.00	91.64	86.080	7076.50	1974.65	4966.40	2.13	5344.54	40.46830379	-104.90958068
12494.00	91.57	85.340	7075.52	1977.27	5001.29	2.13	5377.96	40.46831095	-104.90945529
12510.00	91.57	85.340	7075.08	1978.57	5017.23	==>	5393.27	40.46831451	-104.90939800
12518.00	91.57	85.340	7074.86	1979.22	5025.20	==>	5400.92	40.46831629	-104.90936935

Comments

MD[ft]	TVD[ft]	North[ft]	East[ft]	Lat - NAD 83	Long - NAD 83	Comment
1558.00	1557.95	-0.89	0.43	40.46288255	-104.92742847	9.625" Csg: 1558 MD/TVD
7836.81	7092.68	1842.77	348.78	40.46794315	-104.92617649	75 Setback: 7837 / 7093 MD/TVD, 1071 FSL, 75 FWL Sec 20
7955.00	7094.79	1849.22	466.75	40.46796085	-104.92575251	Top Perf: 7955 / 7095 MD/TVD, 1075 FSL, 193 FWL Sec 20
8222.14	7095.30	1855.47	733.81	40.46797799	-104.92479270	460 Setback: 8222 / 7095 MD/TVD, 1075 FSL, 460 FWL Sec 20
12402.00	7078.14	1971.28	4909.52	40.46829457	-104.90978510	Btm Perf: 12,402 / 7078 MD/TVD, 1087 FSL, 588 FEL Sec 20
12459.00	7076.50	1974.65	4966.40	40.46830379	-104.90958068	Btm Toe Sub: 12,459 / 7077 MD/TVD, 1089 FSL, 531 FEL Sec 20
12510.00	7075.08	1978.57	5017.23	40.46831451	-104.90939800	PBTD: 12,510 / 7075 MD/TVD, 1092 FSL, 480 FEL Sec 20
12518.00	7074.86	1979.22	5025.20	40.46831629	-104.90936935	5.5" Csg: 12,518 / 7075 MD/TVD, 1092 FSL, 472 FEL Sec 20
12518.00	7074.86	1979.22	5025.20	40.46831629	-104.90936935	BHL: 12,518 / 7075 MD/TVD, 1092 FSL, 472 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	1558.00	1557.95	-0.89	0.43
8.500	1558.00	1557.95	-0.89	0.43	12518.00	7074.86	1979.22	5025.20

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	1558.00	1557.95	-0.89	0.43
5 1/2in Casing	0.00	0.00	0.00	0.00	12518.00	7074.86	1979.22	5025.20

Survey Tool Program

Reference	Survey Name	MD[ft]	TVD[ft]	Survey Tool
290221	As Drilled - 20170818	12518.00	7074.86	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 68.500 degrees  
Bottom hole distance is 5400.92 Feet on azimuth 68.50 degrees from Wellhead  
Calculation method uses Minimum Curvature method  
Prepared by Great Western Operating Co.  
Date Printed: