

Great Western Operating Company, LLC

Created by	admin
Date plotted	15-Jul-2019
Plot reference is Raindance FD 20-322HN (AWB).	
Ref wellpath is Raindance FD 20-322HN (AWP#1).	
Coordinates are in Feet reference Slot W-12 - Raindance FD 20-322HN.	
True Vertical Depths are reference Rg Datum.	
Measured Depths are reference Rg Datum.	
Rg Datum: Actual Datum #1	
Rg Datum to Mean Sea Level: 4805.40 ft.	
Plot North is aligned to TRUE North.	

Location	Colorado	Slot	Slot W-12 - Raindance FD 20-322HN
Field	Wattenburg	Well	Raindance FD 20-322HN
Installation	Raindance	Wellbore	Raindance FD 20-322HN (AWB)

N

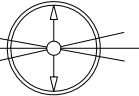
TRUE

M

G

W

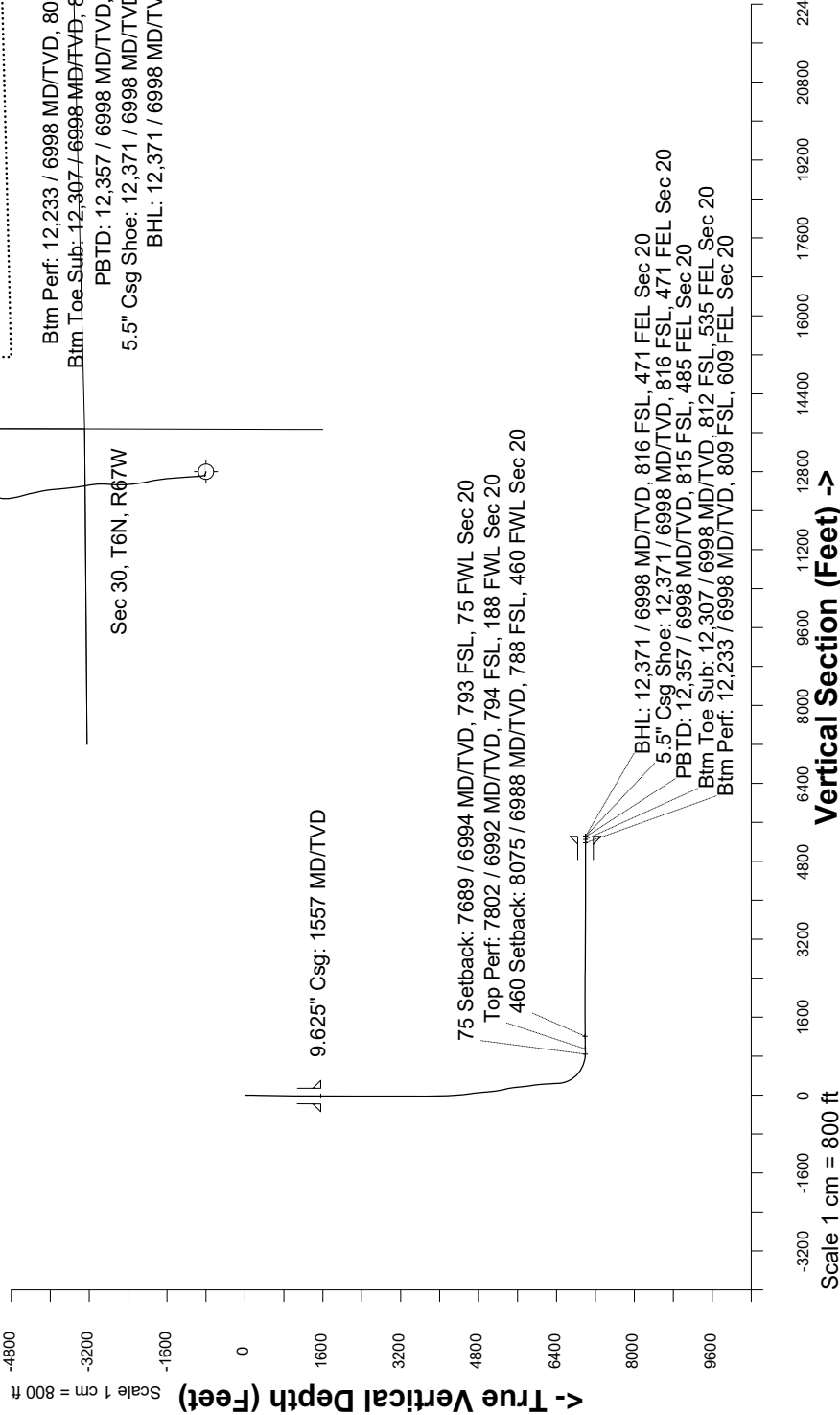
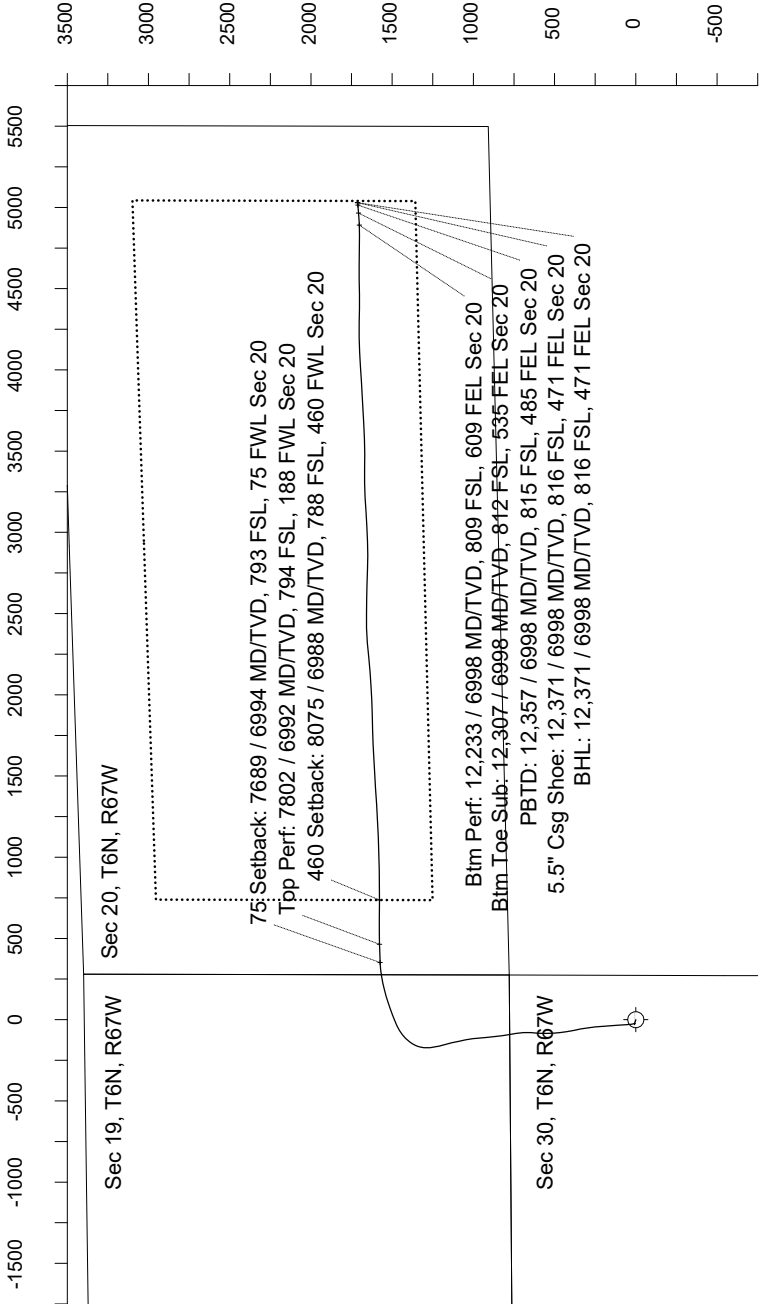
E



Nov-14-2016
Dip: -29.88 deg Field: 32205.0 nT
Lat: 50.0 0.0000 Long: E3.0 0.0000 Elev: 4785.40 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) ->



Azimuth 71.19 with reference 0.00 N, 0.00 E from Slot W-12 - Raindance FD 20-322HN

Great Western Operating Co, LLC
Directional Survey Report
Wellpath: Raindance FD 20-322HN
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
Aug-18-2017	Jul-12-2019	05-123-44984	20.00	Raindance FD 20-322HN

Slot Coordinates

Latitude	Longitude
40.46285900	-104.92744300

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	40.46285900	-104.92744300
138.00	1.80	278.690	137.98	0.33	-2.14	1.30	-1.92	40.46285990	-104.92745070
168.00	1.88	278.810	167.96	0.47	-3.09	0.27	-2.78	40.46286030	-104.92745412
259.00	1.57	281.000	258.92	0.94	-5.79	0.35	-5.18	40.46286158	-104.92746382
350.00	1.56	305.290	349.89	1.89	-8.03	0.72	-6.99	40.46286420	-104.92747185
441.00	0.97	287.590	440.87	2.84	-9.77	0.77	-8.34	40.46286680	-104.92747812
531.00	1.02	284.170	530.85	3.27	-11.28	0.09	-9.62	40.46286797	-104.92748352
620.00	0.73	321.930	619.84	3.91	-12.39	0.71	-10.47	40.46286973	-104.92748754
709.00	0.77	307.180	708.83	4.72	-13.22	0.22	-10.99	40.46287195	-104.92749051
799.00	0.88	275.620	798.83	5.15	-14.39	0.51	-11.96	40.46287314	-104.92749471
888.00	1.08	276.300	887.81	5.31	-15.90	0.23	-13.34	40.46287357	-104.92750015
978.00	1.41	290.960	977.79	5.80	-17.78	0.51	-14.96	40.46287491	-104.92750690
1067.00	0.81	301.740	1066.77	6.52	-19.34	0.71	-16.20	40.46287690	-104.92751250
1156.00	0.46	227.680	1155.77	6.61	-20.14	0.91	-16.93	40.46287715	-104.92751537
1246.00	0.89	269.910	1245.76	6.37	-21.10	0.70	-17.92	40.46287648	-104.92751884
1335.00	1.23	296.980	1334.75	6.80	-22.65	0.67	-19.25	40.46287766	-104.92752438
1424.00	0.39	326.240	1423.74	7.48	-23.67	1.02	-19.99	40.46287954	-104.92752805
1506.00	0.22	295.070	1505.74	7.78	-23.96	0.28	-20.18	40.46288036	-104.92752912
1557.00	0.18	293.450	1556.74	7.86	-24.12	0.08	-20.30	40.46288056	-104.92752970
1615.00	0.13	290.320	1614.74	7.91	-24.27	0.08	-20.42	40.46288072	-104.92753022
1704.00	0.18	241.810	1703.74	7.88	-24.49	0.15	-20.64	40.46288064	-104.92753100
1794.00	0.62	238.970	1793.74	7.57	-25.03	0.49	-21.25	40.46287977	-104.92753295
1883.00	0.12	135.250	1882.73	7.25	-25.38	0.74	-21.68	40.46287890	-104.92753419
1973.00	0.25	29.510	1972.73	7.36	-25.21	0.34	-21.50	40.46287919	-104.92753361
2062.00	0.19	53.680	2061.73	7.61	-25.00	0.12	-21.21	40.46287989	-104.92753284
2151.00	0.33	330.540	2150.73	7.92	-25.01	0.41	-21.12	40.46288075	-104.92753286
2241.00	0.26	223.400	2240.73	8.00	-25.27	0.53	-21.35	40.46288096	-104.92753382
2330.00	0.09	52.970	2329.73	7.89	-25.36	0.39	-21.46	40.46288067	-104.92753412
2419.00	0.03	310.160	2418.73	7.95	-25.32	0.11	-21.40	40.46288083	-104.92753399
2509.00	0.03	97.750	2508.73	7.96	-25.31	0.06	-21.39	40.46288086	-104.92753397
2598.00	0.04	289.560	2597.73	7.97	-25.32	0.08	-21.40	40.46288088	-104.92753399
2687.00	0.03	152.490	2686.73	7.96	-25.34	0.07	-21.42	40.46288085	-104.92753406
2777.00	0.06	348.050	2776.73	7.99	-25.34	0.10	-21.41	40.46288092	-104.92753405
2866.00	0.03	158.830	2865.73	8.01	-25.34	0.10	-21.40	40.46288099	-104.92753406
2956.00	0.07	131.420	2955.73	7.95	-25.29	0.05	-21.37	40.46288083	-104.92753388
3045.00	0.03	240.990	3044.73	7.90	-25.27	0.10	-21.37	40.46288070	-104.92753380
3135.00	0.06	193.680	3134.73	7.85	-25.30	0.05	-21.42	40.46288054	-104.92753392
3224.00	0.28	176.790	3223.73	7.58	-25.30	0.25	-21.50	40.46287982	-104.92753391
3313.00	0.10	134.080	3312.73	7.31	-25.23	0.24	-21.53	40.46287908	-104.92753367
3403.00	0.09	158.610	3402.73	7.19	-25.15	0.05	-21.49	40.46287874	-104.92753337
3492.00	0.11	272.510	3491.73	7.13	-25.21	0.19	-21.56	40.46287858	-104.92753359
3582.00	0.07	37.880	3581.73	7.18	-25.26	0.18	-21.60	40.46287871	-104.92753378
3671.00	0.14	277.030	3670.73	7.24	-25.33	0.21	-21.65	40.46287886	-104.92753405
3761.00	0.07	159.840	3760.73	7.20	-25.42	0.20	-21.75	40.46287876	-104.92753437
3850.00	1.70	10.070	3849.72	8.45	-25.18	1.98	-21.11	40.46288218	-104.92753347
3939.00	4.51	351.700	3938.58	13.21	-25.45	3.31	-19.83	40.46289526	-104.92753446
4028.00	7.96	348.940	4027.04	22.72	-27.14	3.89	-18.36	40.46292137	-104.92754052
4118.00	8.89	353.520	4116.07	35.75	-29.12	1.27	-16.04	40.46295713	-104.92754764
4208.00	13.14	357.160	4204.39	52.88	-30.41	4.78	-11.74	40.46300416	-104.92755229
4297.00	16.23	356.940	4290.47	75.41	-31.58	3.47	-5.58	40.46306600	-104.92755647
4386.00	18.19	355.600	4375.48	101.69	-33.31	2.25	1.25	40.46313812	-104.92756269
4476.00	21.63	355.660	4460.09	132.24	-35.64	3.82	8.89	40.46322199	-104.92757108
4565.00	23.98	355.940	4542.13	166.64	-38.16	2.64	17.59	40.46331641	-104.92758014
4655.00	26.56	356.530	4623.51	204.98	-40.67	2.88	27.57	40.46342163	-104.92758917
4744.00	29.82	355.270	4701.94	246.90	-43.70	3.72	38.22	40.46353671	-104.92760006
4833.00	30.12	351.080	4779.05	291.02	-48.99	2.38	47.44	40.46365782	-104.92761907
4923.00	30.01	348.860	4856.95	335.41	-56.84	1.24	54.31	40.46377967	-104.92764728
5012.00	30.06	348.900	4933.99	379.12	-65.43	0.06	60.27	40.46389965	-104.92767815
5102.00	29.53	350.830	5012.10	423.14	-73.31	1.22	67.01	40.46402047	-104.92770645
5191.00	30.07	353.580	5089.33	466.95	-79.30	1.65	75.46	40.46414073	-104.92772798
5281.00	30.19	356.250	5167.18	511.94	-83.30	1.50	86.18	40.46426422	-104.92774236
5370.00	29.93	359.790	5244.21	556.48	-84.84	2.01	99.07	40.46438646	-104.92774791
5460.00	30.37	4.450	5322.05	601.62	-83.16	2.65	115.21	40.46451037	-104.92774186
5549.00	30.60	3.950	5398.74	646.65	-79.85	0.38	132.86	40.46463397	-104.92772998
5638.00	30.56	356.220	5475.40	691.84	-79.79	4.42	147.49	40.46475802	-104.92772973
5728.00	30.50	351.050	5552.93	737.24	-84.85	2.92	157.34	40.46488263	-104.92774793
5817.00	30.43	350.940	5629.65	781.81	-91.91	0.10	165.02	40.46500496	-104.92777331
5907.00	30.26	351.840	5707.32	826.76	-98.72	0.54	173.06	40.46512836	-104.92779778
5996.00	30.15	353.970	5784.23	871.19	-104.25	1.21	182.15	40.46525030	-104.92781766
6086.00	29.74	353.470	5862.22	915.85	-109.16	0.53	191.89	40.46537287	-104.92783531
6175.00	29.58	355.960	5939.56	959.69	-113.22	1.40	202.19	40.46549322	-104.92784990
6264.00	29.94	354.260	6016.82	1003.70	-116.99	1.03	212.81	40.46561403	-104.92786345
6353.00	29.95	347.750	6093.96	1047.52	-123.93	3.65	220.36	40.46573431	-104.92788838
6443.00	30.05	347.730	6171.91	1091.50	-133.48	0.11	225.49	40.46585501	-104.92792272
6532.00	30.15	346.530	6248.91	1135.01	-143.42	0.69	230.11	40.46597445	-104.92795845
6622.00	30.05	346.390	6326.77	1178.89	-153.99	0.14	234.25	40.46609489	-104.92799643
6711.00	30.10	347.950	6403.79	1222.37	-163.89	0.88	238.89	40.46621425	-104.92803202
6800.00	30.10	350.830	6480.79	1266.23	-172.11	1.62	245.25	40.46633464	-104.92806155
6890.00	29.35	8.460	6559.10	1310.42	-172.46	9.72	259.16	40.46645591	-104.92806282
6979.00	31.76	25.530	6635.88	1353.21	-159.13	10.09	285.58	40.46657339	-104.92801491
7069.00	36.89	36.910	6710.26	1396.26	-132.66	9.11	324.52	40.46669154	-104.92791975
7158.00	43.52	51.500	6778.35	1436.83	-92.50	12.90	375.61	40.46680291	-104.92777543
7248.00	50.19	65.130	6840.01	1470.78	-36.68	13.28	439.39	40.46689610	-104.92757483

MD[ft]	Inc[deg]	Azi[deg]	TVD[ft]	North[ft]	East[ft]	Dogleg [deg/100ft]	Vertical Section[ft]	Lat - NAD 83	Long - NAD 83
7337.00	57.39	70.070	6892.58	1497.98	29.69	9.24	510.98	40.46697076	-104.92733631
7426.00	64.82	71.390	6935.55	1523.65	103.20	8.45	588.85	40.46704121	-104.92707211
7516.00	72.49	75.340	6968.30	1547.55	183.46	9.45	672.53	40.46710681	-104.92678366
7605.00	81.79	81.050	6988.10	1565.19	268.27	12.17	758.50	40.46715524	-104.92647883
7689.39	90.39	86.990	6993.85	1573.93	351.90	12.37	840.48	40.46717923	-104.92617830
7694.00	90.86	87.310	6993.80	1574.16	356.50	12.37	844.91	40.46717986	-104.92616176
7784.00	91.05	88.720	6992.30	1577.28	446.43	1.58	931.04	40.46718841	-104.92583855
7802.00	91.01	88.910	6991.98	1577.65	464.42	1.06	948.20	40.46718943	-104.92577388
7873.00	90.83	89.640	6990.84	1578.55	535.41	1.06	1015.68	40.46719190	-104.92551877
7962.00	90.86	89.640	6989.53	1579.11	624.40	0.03	1100.10	40.46719343	-104.92519894
8051.00	91.08	91.170	6988.03	1578.48	713.38	1.74	1184.13	40.46719169	-104.92487915
8074.53	90.80	90.770	6987.64	1578.08	736.90	2.08	1206.27	40.46719060	-104.92479460
8141.00	90.00	89.640	6987.18	1577.84	803.37	2.08	1269.11	40.46718994	-104.92455573
8230.00	89.91	89.270	6987.25	1578.69	892.36	0.43	1353.63	40.46719226	-104.92423588
8319.00	90.00	88.430	6987.32	1580.48	981.35	0.95	1438.44	40.46719715	-104.92391609
8409.00	90.06	88.190	6987.27	1583.13	1071.31	0.27	1524.45	40.46720442	-104.92359277
8498.00	89.88	87.240	6987.32	1586.68	1160.24	1.09	1609.78	40.46721415	-104.92327317
8588.00	89.97	86.490	6987.43	1591.60	1250.10	0.84	1696.43	40.46722765	-104.92295020
8677.00	89.91	86.530	6987.53	1597.02	1338.93	0.08	1782.27	40.46724251	-104.92263093
8766.00	90.00	86.720	6987.60	1602.26	1427.78	0.24	1868.06	40.46725688	-104.92231162
8856.00	89.91	86.470	6987.67	1607.61	1517.62	0.30	1954.83	40.46727154	-104.92198873
8945.00	90.06	86.810	6987.69	1612.82	1606.47	0.42	2040.62	40.46728584	-104.92166942
9035.00	89.97	87.180	6987.67	1617.54	1696.34	0.42	2127.21	40.46729877	-104.92134641
9124.00	90.03	88.850	6987.67	1620.62	1785.29	1.88	2212.40	40.46730722	-104.92102675
9213.00	89.66	89.350	6987.91	1622.02	1874.28	0.70	2297.09	40.46731103	-104.92070692
9303.00	89.66	87.080	6988.44	1624.82	1964.22	2.52	2383.14	40.46731871	-104.92038365
9393.00	89.60	86.300	6989.02	1630.02	2054.07	0.87	2469.87	40.46733295	-104.92006074
9482.00	89.63	85.400	6989.62	1636.46	2142.84	1.01	2555.97	40.46735061	-104.91974173
9571.00	89.54	84.540	6990.27	1644.26	2231.49	0.97	2642.41	40.46737201	-104.91942310
9661.00	89.45	85.080	6991.06	1652.40	2321.12	0.61	2729.87	40.46739433	-104.91910098
9751.00	89.48	88.560	6991.90	1657.40	2410.96	3.87	2816.53	40.46740801	-104.91877809
9840.00	89.75	90.740	6992.50	1657.94	2499.95	2.47	2900.95	40.46740948	-104.91845826
9930.00	89.91	90.330	6992.77	1657.10	2589.95	0.49	2985.87	40.46740714	-104.91813482
10019.00	90.00	92.070	6992.84	1655.23	2678.92	1.96	3069.49	40.46740200	-104.91781504
10108.00	89.91	92.370	6992.91	1651.79	2767.86	0.35	3152.57	40.46739251	-104.91749542
10198.00	90.03	89.500	6992.95	1650.32	2857.84	3.19	3237.27	40.46738845	-104.91717204
10287.00	90.06	88.410	6992.88	1651.94	2946.82	1.23	3322.03	40.46739288	-104.91685223
10377.00	90.28	86.760	6992.62	1655.73	3036.74	1.85	3408.37	40.46740326	-104.91652907
10466.00	89.14	86.380	6993.07	1661.06	3125.57	1.35	3494.18	40.46741784	-104.91620979
10556.00	88.98	86.960	6994.54	1666.29	3215.41	0.67	3580.90	40.46743216	-104.91588692
10645.00	89.20	88.910	6995.96	1669.49	3304.34	2.20	3666.12	40.46744093	-104.91556732
10735.00	90.37	91.180	6996.29	1669.42	3394.33	2.84	3751.28	40.46744070	-104.91524389
10824.00	90.09	89.520	6995.94	1668.88	3483.32	1.89	3835.35	40.46743917	-104.91492405
10914.00	90.00	88.030	6995.87	1670.80	3573.30	1.66	3921.14	40.46744442	-104.91460067
11003.00	90.15	87.280	6995.75	1674.44	3662.22	0.86	4006.50	40.46745438	-104.91428108
11093.00	90.15	86.710	6995.51	1679.16	3752.10	0.63	4093.09	40.46746729	-104.91395807
11182.00	89.82	86.600	6995.54	1684.35	3840.95	0.39	4178.87	40.46748151	-104.91363875
11272.00	89.85	86.620	6995.80	1689.68	3930.79	0.04	4265.64	40.46749608	-104.91331585
11361.00	89.66	86.560	6996.18	1694.97	4019.63	0.22	4351.44	40.46751057	-104.91299656
11450.00	89.85	87.340	6996.56	1699.71	4108.50	0.90	4437.10	40.46752353	-104.91267715
11540.00	89.69	88.680	6996.92	1702.83	4198.45	1.50	4523.25	40.46753206	-104.91235389
11629.00	89.85	91.570	6997.28	1702.64	4287.44	3.25	4607.42	40.46753149	-104.91203407
11719.00	90.03	90.790	6997.37	1700.78	4377.42	0.89	4692.00	40.46752636	-104.91171068
11808.00	89.91	88.580	6997.42	1701.27	4466.41	2.49	4776.40	40.46752766	-104.91139084
11898.00	89.88	89.150	6997.58	1703.06	4556.39	0.63	4862.15	40.46753251	-104.91106745
11987.00	89.82	90.390	6997.81	1703.41	4645.39	1.39	4946.52	40.46753344	-104.91074760
12076.00	90.03	90.960	6997.93	1702.36	4734.38	0.68	5030.42	40.46753052	-104.91042776
12166.00	90.18	90.210	6997.77	1701.44	4824.38	0.85	5115.32	40.46752795	-104.91010432
12233.00	90.09	87.970	6997.61	1702.51	4891.36	3.35	5179.07	40.46753084	-104.90986357
12255.00	90.06	87.230	6997.58	1703.43	4913.34	3.35	5200.17	40.46753335	-104.90978457
12307.00	90.04	85.590	6997.53	1706.69	4965.24	3.14	5250.35	40.46754226	-104.90959806
12345.00	90.03	84.400	6997.51	1710.00	5003.09	3.14	5287.25	40.46755133	-104.90946201
12357.00	90.03	84.400	6997.50	1711.17	5015.04	==>	5298.93	40.46755454	-104.90941908
12371.00	90.03	84.400	6997.50	1712.54	5028.97	==>	5312.56	40.46755828	-104.90936901

Comments

MD[ft]	TVD[ft]	North[ft]	East[ft]	Lat - NAD 83	Long - NAD 83	Comment
1557.00	1556.74	7.86	-24.12	40.46288056	-104.92752970	9.625" Csg: 1557 MD/TVD
7689.39	6993.85	1573.93	351.90	40.46717923	-104.92617830	75 Setback: 7689 / 6994 MD/TVD, 793 FSL, 75 FWL Sec 20
7802.00	6991.98	1577.65	464.42	40.46718943	-104.92577388	Top Perf: 7802 / 6992 MD/TVD, 794 FSL, 188 FWL Sec 20
8074.53	6987.64	1578.08	736.90	40.46719060	-104.92479460	460 Setback: 8075 / 6988 MD/TVD, 788 FSL, 460 FWL Sec 20
12233.00	6997.61	1702.51	4891.36	40.46753084	-104.90986357	Btm Perf: 12,233 / 6998 MD/TVD, 809 FSL, 609 FEL Sec 20
12307.00	6997.53	1706.69	4965.24	40.46754226	-104.90959806	Btm Toe Sub: 12,307 / 6998 MD/TVD, 812 FSL, 535 FEL Sec 20
12357.00	6997.50	1711.17	5015.04	40.46755454	-104.90941908	PBTD: 12,357 / 6998 MD/TVD, 815 FSL, 485 FEL Sec 20
12371.00	6997.50	1712.54	5028.97	40.46755828	-104.90936901	5.5" Csg Shoe: 12,371 / 6998 MD/TVD, 816 FSL, 471 FEL Sec 20
12371.00	6997.50	1712.54	5028.97	40.46755828	-104.90936901	BHL: 12,371 / 6998 MD/TVD, 816 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	1556.74	7.86	-24.12
8.500	1557.00	1556.74	7.86	-24.12	12371.00	6997.50	1712.54	5028.97

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	1556.74	7.86	-24.12
5 1/2in Casing	0.00	0.00	0.00	0.00	12371.00	6997.50	1712.54	5028.97

Survey Tool Program

Reference	Survey Name	MD[ft]	TVD[ft]	Survey Tool
289910	As Drilled - 20170818	12371.00	6997.50	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 71.190 degrees
Bottom hole distance is 5312.56 Feet on azimuth 71.19 degrees from Wellhead
Calculation method uses Minimum Curvature method
Prepared by Great Western Operating Co.
Date Printed: