

Great Western Operating Company, LLC

Location	Colorado	Slot	Slot W-16 - Raindance FD 20-399HC
Field	Wattenburg	Well	Raindance FD 20-399HC
Installation	Raindance	Wellbore	Raindance FD 20-399HC (AWB)

Created by admin

Date plotted 15-Jul-2019

Plot reference is Raindance FD 20-399HC (AWB).

Ref wellpath is Raindance FD 20-399HC (AWP#1).

Coordinates are in Feet reference Slot W-16 - Raindance FD 20-399HC.

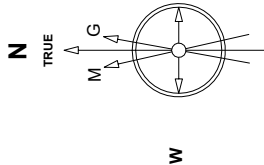
True Vertical Depths are reference Rig Datum.

Measured Depths are reference Rig Datum.

Rig Datum: Actual Datum #1

Rig Datum to Mean Sea Level: 4805.40 ft.

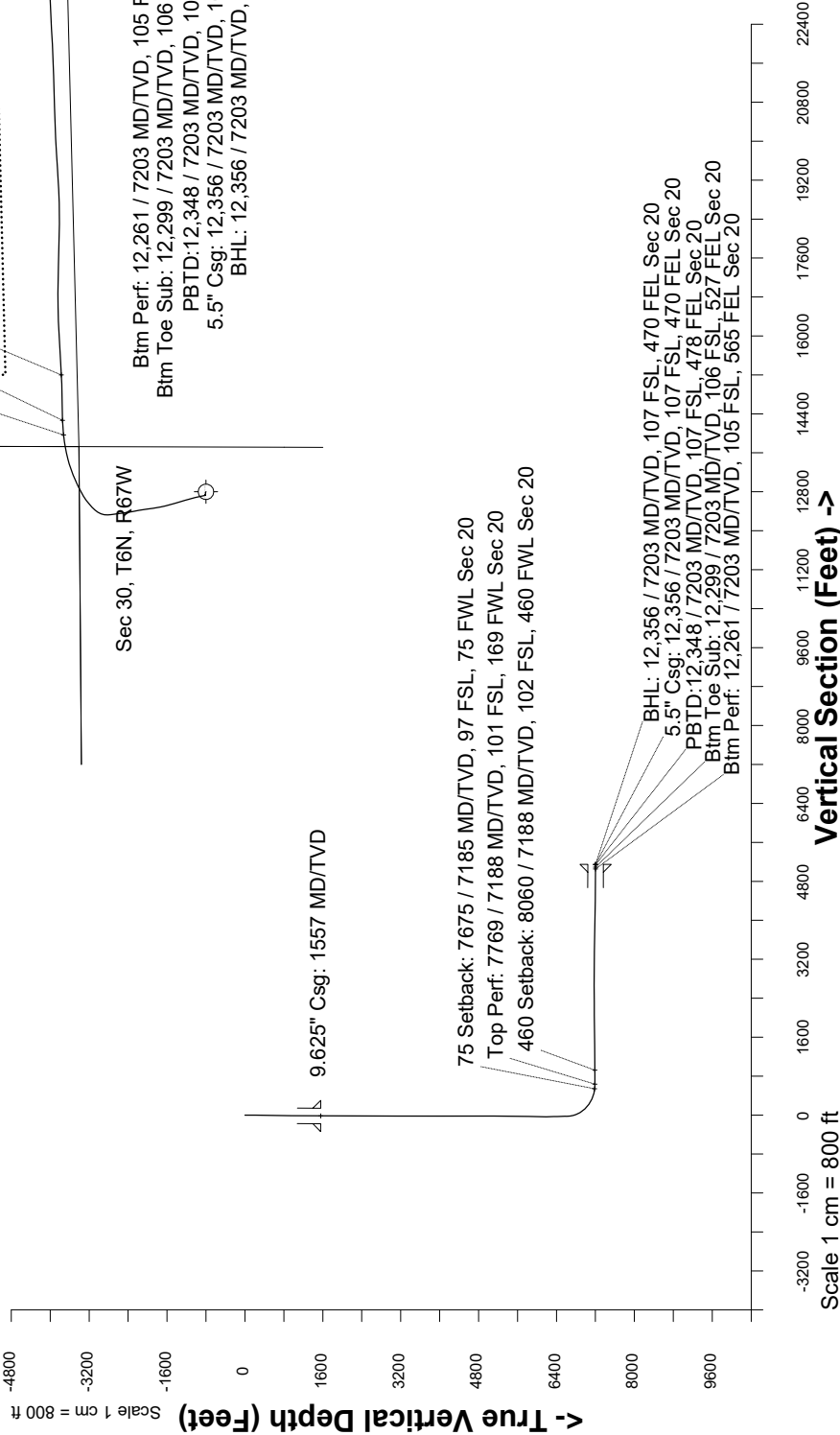
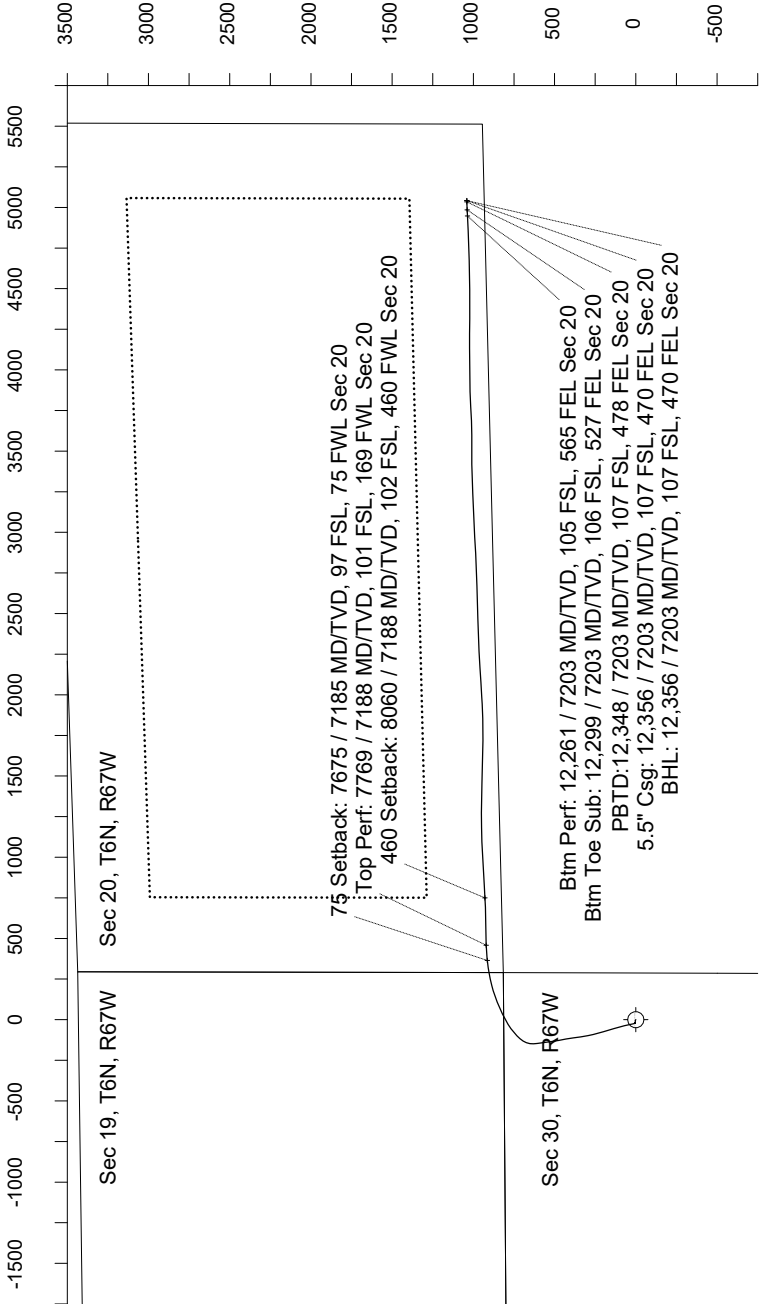
Plot North is aligned to TRUE North.



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 78.34 with reference 0.00 N, 0.00 E from Slot W-16 - Raindance FD 20-399HC

Great Western Operating Co, LLC
Directional Survey Report
Wellpath: Raindance FD 20-399HC
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-12-2019	05-123-45196	20.00	Raindance FD 20-399HC

Slot Coordinates

Latitude	Longitude
40.46275800	-104.92749400

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	40.46275800	-104.92749400
20.00	0.00	265.200	20.00	0.00	0.00	==>	0.00	40.46275800	-104.92749400
105.00	0.40	265.200	105.00	-0.02	-0.30	0.47	-0.29	40.46275793	-104.92749506
221.00	0.60	315.000	221.00	0.37	-1.13	0.40	-1.03	40.46275902	-104.92749806
311.00	1.10	311.100	310.99	1.27	-2.11	0.56	-1.81	40.46276149	-104.92750159
400.00	0.70	298.600	399.97	2.09	-3.23	0.50	-2.74	40.46276375	-104.92750562
490.00	1.30	288.600	489.96	2.68	-4.68	0.69	-4.05	40.46276536	-104.92751083
579.00	0.30	289.000	578.95	3.08	-5.86	1.12	-5.12	40.46276646	-104.92751506
668.00	1.40	270.000	667.94	3.16	-7.17	1.26	-6.38	40.46276666	-104.92751976
758.00	1.50	267.100	757.91	3.10	-9.44	0.14	-8.62	40.46276650	-104.92752794
847.00	1.40	275.800	846.88	3.15	-11.69	0.27	-10.81	40.46276664	-104.92753601
937.00	0.80	288.400	936.87	3.46	-13.38	0.71	-12.41	40.46276749	-104.92754208
1026.00	0.40	245.200	1025.86	3.52	-14.25	0.65	-13.25	40.46276767	-104.92754522
1115.00	0.60	241.000	1114.86	3.17	-14.94	0.23	-13.99	40.46276669	-104.92754769
1204.00	0.20	274.500	1203.85	2.95	-15.50	0.50	-14.59	40.46276611	-104.92754972
1294.00	0.60	259.100	1293.85	2.88	-16.12	0.46	-15.21	40.46276589	-104.92755194
1383.00	1.00	290.600	1382.84	3.06	-17.31	0.65	-16.33	40.46276640	-104.92755620
1496.00	1.20	320.900	1495.82	4.33	-18.98	0.54	-17.71	40.46276988	-104.92756220
1557.00	0.55	317.790	1556.82	5.04	-19.58	1.07	-18.15	40.46277183	-104.92756435
1612.00	0.07	194.850	1611.82	5.20	-19.76	1.07	-18.30	40.46277228	-104.92756502
1701.00	0.03	216.100	1700.82	5.13	-19.79	0.05	-18.34	40.46277208	-104.92756511
1790.00	0.07	238.810	1789.82	5.08	-19.85	0.05	-18.41	40.46277195	-104.92756533
1880.00	0.06	259.940	1879.82	5.05	-19.94	0.03	-18.51	40.46277185	-104.92756567
1970.00	0.06	179.750	1969.82	4.99	-19.99	0.09	-18.57	40.46277170	-104.92756583
2059.00	0.06	251.620	2058.82	4.93	-20.03	0.08	-18.62	40.46277153	-104.92756599
2148.00	0.10	189.940	2147.82	4.84	-20.09	0.10	-18.70	40.46277128	-104.92756620
2238.00	0.06	35.010	2237.82	4.80	-20.08	0.17	-18.69	40.46277117	-104.92756615
2327.00	0.00	98.440	2326.82	4.84	-20.05	0.07	-18.66	40.46277128	-104.92756605
2416.00	0.14	0.310	2415.82	4.95	-20.05	0.16	-18.64	40.46277158	-104.92756605
2506.00	0.03	280.920	2505.82	5.06	-20.07	0.15	-18.64	40.46277189	-104.92756613
2595.00	0.03	351.120	2594.82	5.09	-20.10	0.04	-18.66	40.46277197	-104.92756623
2684.00	0.03	46.520	2683.82	5.13	-20.09	0.03	-18.63	40.46277207	-104.92756618
2773.00	0.04	252.910	2772.82	5.13	-20.10	0.08	-18.65	40.46277209	-104.92756623
2863.00	0.13	288.770	2862.82	5.16	-20.22	0.11	-18.77	40.46277216	-104.92756668
2952.00	0.07	42.410	2951.82	5.23	-20.28	0.19	-18.81	40.46277236	-104.92756689
3042.00	0.03	202.190	3041.81	5.25	-20.26	0.11	-18.78	40.46277241	-104.92756679
3131.00	0.07	154.330	3130.81	5.18	-20.24	0.06	-18.78	40.46277221	-104.92756674
3221.00	0.11	343.120	3220.81	5.21	-20.24	0.20	-18.77	40.46277230	-104.92756674
3310.00	0.06	47.390	3309.81	5.32	-20.23	0.11	-18.74	40.46277262	-104.92756671
3400.00	0.03	152.720	3399.81	5.34	-20.19	0.08	-18.69	40.46277265	-104.92756655
3489.00	0.19	236.910	3488.81	5.23	-20.30	0.21	-18.82	40.46277237	-104.92756695
3579.00	0.03	227.220	3578.81	5.14	-20.44	0.18	-18.98	40.46277210	-104.92756746
3668.00	0.00	98.440	3667.81	5.12	-20.46	0.03	-19.00	40.46277206	-104.92756752
3758.00	0.11	237.210	3757.81	5.07	-20.53	0.12	-19.08	40.46277193	-104.92756779
3847.00	0.10	232.280	3846.81	4.98	-20.67	==>	-19.23	40.46277167	-104.92756826
3936.00	0.06	122.240	3935.81	4.91	-20.69	0.15	-19.27	40.46277147	-104.92756834
4025.00	0.04	166.950	4024.81	4.85	-20.64	0.05	-19.23	40.46277132	-104.92756818
4115.00	0.06	193.720	4114.81	4.78	-20.64	0.03	-19.25	40.46277111	-104.92756819
4204.00	0.07	335.500	4203.81	4.78	-20.68	0.14	-19.29	40.46277112	-104.92756831
4294.00	0.07	235.540	4293.81	4.80	-20.75	0.12	-19.35	40.46277117	-104.92756856
4383.00	0.13	146.240	4382.81	4.68	-20.74	0.17	-19.36	40.46277086	-104.92756852
4473.00	0.07	25.400	4472.81	4.65	-20.65	0.20	-19.29	40.46277076	-104.92756823
4562.00	0.03	319.060	4561.81	4.72	-20.65	0.07	-19.27	40.46277095	-104.92756820
4651.00	0.10	242.390	4650.81	4.70	-20.73	0.11	-19.35	40.46277090	-104.92756850
4741.00	0.04	130.970	4740.81	4.64	-20.78	0.13	-19.41	40.46277074	-104.92756867
4830.00	0.09	246.440	4829.81	4.59	-20.82	0.13	-19.46	40.46277061	-104.92756881
4920.00	0.04	7.710	4919.81	4.60	-20.88	0.13	-19.52	40.46277061	-104.92756903
5009.00	0.07	96.290	5008.81	4.62	-20.82	0.09	-19.46	40.46277068	-104.92756882
5099.00	0.79	330.790	5098.81	5.16	-21.07	0.93	-19.59	40.46277215	-104.92756971
5188.00	3.74	336.550	5187.73	8.36	-22.52	3.32	-20.37	40.46278093	-104.92757494
5278.00	5.19	339.170	5277.46	14.85	-25.14	1.63	-21.62	40.46279877	-104.92758434
5367.00	7.83	349.580	5365.88	24.58	-27.67	3.24	-22.13	40.46282547	-104.92759343
5456.00	10.24	349.910	5453.77	38.33	-30.15	2.71	-21.78	40.46286322	-104.92760235
5546.00	12.87	347.290	5541.94	55.99	-33.76	2.98	-21.75	40.46291168	-104.92761531
5635.00	15.77	344.840	5628.16	77.34	-39.10	3.33	-22.67	40.46297028	-104.92763452
5724.00	19.21	343.830	5713.03	103.08	-46.34	3.88	-24.56	40.46304094	-104.92766055
5814.00	22.29	344.360	5797.19	133.74	-55.07	3.43	-26.91	40.46312511	-104.92769191
5903.00	25.59	343.410	5878.52	168.43	-65.11	3.73	-29.73	40.46322031	-104.92772800
5993.00	28.58	343.160	5958.64	207.67	-76.90	3.32	-33.35	40.46332803	-104.92777036
6082.00	30.69	346.130	6036.00	250.10	-88.52	2.89	-36.15	40.46344450	-104.92781210
6171.00	30.71	348.640	6112.53	294.43	-98.44	1.44	-36.91	40.46356618	-104.92784776
6261.00	30.59	352.730	6189.96	339.69	-105.86	2.32	-35.03	40.46369039	-104.92787444
6350.00	30.70	352.450	6266.53	384.67	-111.71	0.20	-31.67	40.46381388	-104.92789547
6440.00	30.69	348.960	6343.93	429.99	-119.13	1.98	-29.78	40.46393828	-104.92792213
6529.00	30.65	349.290	6420.48	474.58	-127.70	0.19	-29.16	40.46406065	-104.92795291
6619.00	30.43	352.520	6498.00	519.72	-134.93	1.84	-27.12	40.46418456	-104.92797890
6708.00	29.96	353.100	6574.93	564.13	-140.53	0.62	-23.63	40.46430646	-104.92799904
6797.00	30.02	351.170	6652.01	608.19	-146.62	1.09	-20.69	40.46442740	-104.92802092
6887.00	29.18	7.850	6730.40	652.25	-147.08	9.18	-12.23	40.46454834	-104.92802257
6976.00	31.88	31.650	6807.34	693.91	-131.72	13.84	11.22	40.46466269	-104.92796739
7066.00	36.98	48.080	6881.71	732.33	-99.02	11.73	51.02	40.46476816	-104.92784985
7155.00	41.28	52.930	6950.75	767.94	-55.64	5.93	100.69	40.46486589	-104.92769398
7244.00	47.60	61.860	7014.32	801.20	-3.14	9.98	158.84	40.46495719	-104.92750527

MD[ft]	Inc[deg]	Azi[deg]	TVD[ft]	North[ft]	East[ft]	Dogleg [deg/100ft]	Vertical Section[ft]	Lat - NAD 83	Long - NAD 83
7334.00	55.62	65.640	7070.18	832.25	60.12	9.50	227.06	40.46504242	-104.92727796
7423.00	63.64	68.780	7115.15	861.88	130.87	9.51	302.34	40.46512376	-104.92702367
7513.00	70.55	75.680	7150.19	887.03	209.75	10.43	384.67	40.46519278	-104.92674020
7602.00	78.19	80.560	7174.17	904.59	293.54	10.08	470.29	40.46524097	-104.92643905
7674.75	85.42	83.980	7184.53	914.25	364.84	10.97	542.07	40.46526748	-104.92618282
7691.00	87.04	84.730	7185.60	915.84	380.98	10.97	558.19	40.46527186	-104.92612483
7769.00	89.44	88.310	7187.99	920.57	458.78	5.53	635.34	40.46528483	-104.92584522
7780.00	89.78	88.820	7188.07	920.84	469.77	5.53	646.17	40.46528558	-104.92580570
7870.00	90.03	88.570	7188.22	922.89	559.75	0.39	734.70	40.46529120	-104.92548234
7959.00	90.09	88.160	7188.12	925.43	648.71	0.47	822.34	40.46529817	-104.92516262
8048.00	90.06	87.830	7188.01	928.55	737.66	0.37	910.08	40.46530671	-104.92484296
8060.22	90.06	87.740	7188.00	929.02	749.87	0.71	922.14	40.46530800	-104.92479908
8138.00	90.03	87.190	7187.94	932.46	827.57	0.71	998.93	40.46531743	-104.92451982
8227.00	90.03	86.260	7187.89	937.54	916.43	1.04	1086.98	40.46533138	-104.92420049
8316.00	90.18	86.550	7187.73	943.12	1005.25	0.37	1175.10	40.46534669	-104.92388127
8405.00	91.42	87.750	7186.49	947.55	1094.13	1.94	1263.04	40.46535882	-104.92356185
8495.00	91.54	89.220	7184.16	949.92	1184.07	1.64	1351.60	40.46536534	-104.92323864
8584.00	90.58	89.960	7182.51	950.56	1273.05	1.36	1438.87	40.46536707	-104.92291885
8674.00	90.03	90.790	7182.03	949.97	1363.04	1.11	1526.89	40.46536544	-104.92259542
8763.00	89.85	92.020	7182.13	947.79	1452.01	1.40	1613.59	40.46535944	-104.92227567
8853.00	90.06	92.020	7182.20	944.62	1541.96	0.23	1701.04	40.46535072	-104.92195242
8942.00	90.12	91.570	7182.06	941.83	1630.91	0.51	1787.59	40.46534305	-104.92163273
9031.00	91.72	90.250	7180.63	940.42	1719.89	2.33	1874.44	40.46533915	-104.92131298
9121.00	91.32	88.540	7178.24	941.37	1809.85	1.95	1962.74	40.46534174	-104.92098967
9210.00	89.85	87.560	7177.33	944.39	1898.79	1.99	2050.46	40.46535004	-104.92067003
9300.00	89.91	87.230	7177.52	948.48	1988.69	0.37	2139.34	40.46536125	-104.92034692
9389.00	90.06	86.370	7177.55	953.45	2077.55	0.98	2227.37	40.46537486	-104.92002757
9479.00	89.94	86.300	7177.55	959.21	2167.37	0.15	2316.49	40.46539063	-104.91970478
9568.00	89.94	86.670	7177.64	964.66	2256.20	0.42	2404.59	40.46540559	-104.91938553
9658.00	89.91	87.740	7177.76	969.05	2346.09	1.19	2493.52	40.46541761	-104.91906247
9747.00	89.91	88.840	7177.90	971.71	2435.05	1.24	2581.18	40.46542488	-104.91874276
9837.00	90.06	88.610	7177.92	973.71	2525.03	0.31	2669.70	40.46543035	-104.91841939
9927.00	89.97	88.390	7177.90	976.07	2615.00	0.26	2758.29	40.46543679	-104.91809606
10016.00	89.97	87.900	7177.94	978.95	2703.95	0.55	2845.99	40.46544467	-104.91777637
10105.00	89.97	87.150	7177.99	982.79	2792.87	0.84	2933.85	40.46545519	-104.91745682
10194.00	90.00	87.140	7178.01	987.22	2881.76	0.04	3021.80	40.46546733	-104.91713736
10284.00	89.94	87.340	7178.06	991.56	2971.65	0.23	3110.72	40.46547920	-104.91681428
10374.00	90.00	87.430	7178.11	995.66	3061.56	0.12	3199.60	40.46549044	-104.91649117
10463.00	89.91	87.360	7178.18	999.71	3150.47	0.13	3287.49	40.46550151	-104.91617164
10552.00	89.60	87.620	7178.56	1003.61	3239.38	0.45	3375.36	40.46551218	-104.91585210
10642.00	89.63	87.860	7179.16	1007.15	3329.31	0.27	3464.15	40.46552189	-104.91552891
10731.00	89.60	89.380	7179.76	1009.30	3418.28	1.71	3551.72	40.46552774	-104.91520916
10821.00	89.51	90.340	7180.46	1009.52	3508.27	1.07	3639.90	40.46552831	-104.91488573
10911.00	89.63	89.880	7181.13	1009.34	3598.27	0.53	3728.00	40.46552780	-104.91456229
11000.00	89.45	87.230	7181.85	1011.59	3687.23	2.98	3815.58	40.46553392	-104.91424258
11089.00	88.77	86.340	7183.23	1016.58	3776.08	1.26	3903.61	40.46554758	-104.91392327
11179.00	88.52	88.930	7185.36	1020.29	3865.97	2.89	3992.39	40.46555774	-104.91360021
11268.00	86.80	89.540	7188.99	1021.48	3954.88	2.05	4079.71	40.46556096	-104.91328066
11358.00	88.12	89.220	7192.98	1022.45	4044.79	1.51	4167.96	40.46556359	-104.91295756
11447.00	88.18	89.430	7195.86	1023.50	4133.74	0.25	4255.28	40.46556642	-104.91263789
11536.00	88.09	90.250	7198.75	1023.75	4222.69	0.93	4342.45	40.46556706	-104.91231821
11626.00	88.28	90.770	7201.60	1022.95	4312.64	0.61	4430.38	40.46556482	-104.91199494
11715.00	90.06	90.220	7202.89	1022.18	4401.62	2.09	4517.37	40.46556267	-104.91167515
11805.00	89.97	89.500	7202.87	1022.40	4491.62	0.81	4605.56	40.46556323	-104.91135170
11894.00	89.88	89.330	7202.99	1023.31	4580.62	0.22	4692.90	40.46556568	-104.91103186
11984.00	90.12	88.160	7202.99	1025.28	4670.59	1.33	4781.42	40.46557104	-104.91070850
12073.00	89.88	87.900	7202.99	1028.34	4759.54	0.40	4869.15	40.46557939	-104.91038883
12162.00	89.88	87.370	7203.17	1032.01	4848.46	0.60	4956.98	40.46558943	-104.91006925
12252.00	90.06	87.650	7203.22	1035.92	4938.38	0.37	5045.83	40.46560011	-104.90974610
12261.00	90.04	87.620	7203.21	1036.29	4947.37	0.38	5054.72	40.46560112	-104.90971379
12299.00	89.94	87.520	7203.22	1037.90	4985.34	0.38	5092.22	40.46560553	-104.90957734
12322.00	89.88	87.450	7203.26	1038.91	5008.32	0.38	5114.93	40.46560829	-104.90949476
12348.00	89.88	87.450	7203.31	1040.07	5034.29	==>	5140.60	40.46561145	-104.90940141
12356.00	89.88	87.450	7203.33	1040.43	5042.28	==>	5148.50	40.46561242	-104.90937269

Comments						
MD[ft]	TVD[ft]	North[ft]	East[ft]	Lat - NAD 83	Long - NAD 83	Comment
1557.00	1556.82	5.04	-19.58	40.46277183	-104.92756435	9.625" Csg: 1557 MD/TVD
7674.75	7184.53	914.25	364.84	40.46526748	-104.92618282	75 Setback: 7675 / 7185 MD/TVD, 97 FSL, 75 FWL Sec 20
7769.00	7187.99	920.57	458.78	40.46528483	-104.92584522	Top Perf: 7769 / 7188 MD/TVD, 101 FSL, 169 FWL Sec 20
8060.22	7188.00	929.02	749.87	40.46530800	-104.92479908	460 Setback: 8060 / 7188 MD/TVD, 102 FSL, 460 FWL Sec 20
12261.00	7203.21	1036.29	4947.37	40.46560112	-104.90971379	Btm Perf: 12,261 / 7203 MD/TVD, 105 FSL, 565 FEL Sec 20
12299.00	7203.22	1037.90	4985.34	40.46560553	-104.90957734	Btm Toe Sub: 12,299 / 7203 MD/TVD, 106 FSL, 527 FEL Sec 20
12348.00	7203.31	1040.07	5034.29	40.46561145	-104.90940141	PBTD:12,348 / 7203 MD/TVD, 107 FSL, 478 FEL Sec 20
12356.00	7203.33	1040.43	5042.28	40.46561242	-104.90937269	5.5" Csg: 12,356 / 7203 MD/TVD, 107 FSL, 470 FEL Sec 20
12356.00	7203.33	1040.43	5042.28	40.46561242	-104.90937269	BHL: 12,356 / 7203 MD/TVD, 107 FSL, 470 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	5.04	-19.58
8.500	1557.00	1556.82	5.04	-19.58	12356.00	7203.33	1040.43	5042.28

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	5.04	-19.58
5 1/2in Casing	0.00	0.00	0.00	0.00	12356.00	7203.33	1040.43	5042.28

Survey Tool Program				
Reference	Survey Name	MD[ft]	TVD[ft]	Survey Tool
307461	As Drilled - 20171016	12356.00	7203.33	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 78.340 degrees Bottom hole distance is 5148.50 Feet on azimuth 78.34 degrees from Wellhead Calculation method uses Minimum Curvature method Prepared by Great Western Operating Co. Date Printed:
