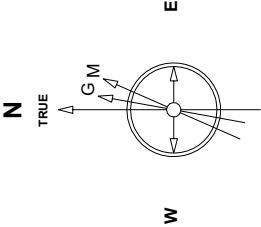


Great Western Operating Company, LLC

Created by	mmount
Date plotted	9-Sep-2019
Plot reference is Rio LC 12-332HN (AWB).	
Ref wellpath is Rio LC 12-332HN (AWP#1).	
Coordinates are in Feet reference E03 - Rio LC 12-332HN.	
True Vertical Depths are reference Rig Datum.	
Measured Depths are reference Rig Datum.	
Rig Datum: Actual Datum #1	
Rig Datum to Mean Sea Level: 5088.40 ft.	
Plot North is aligned to TRUE North.	

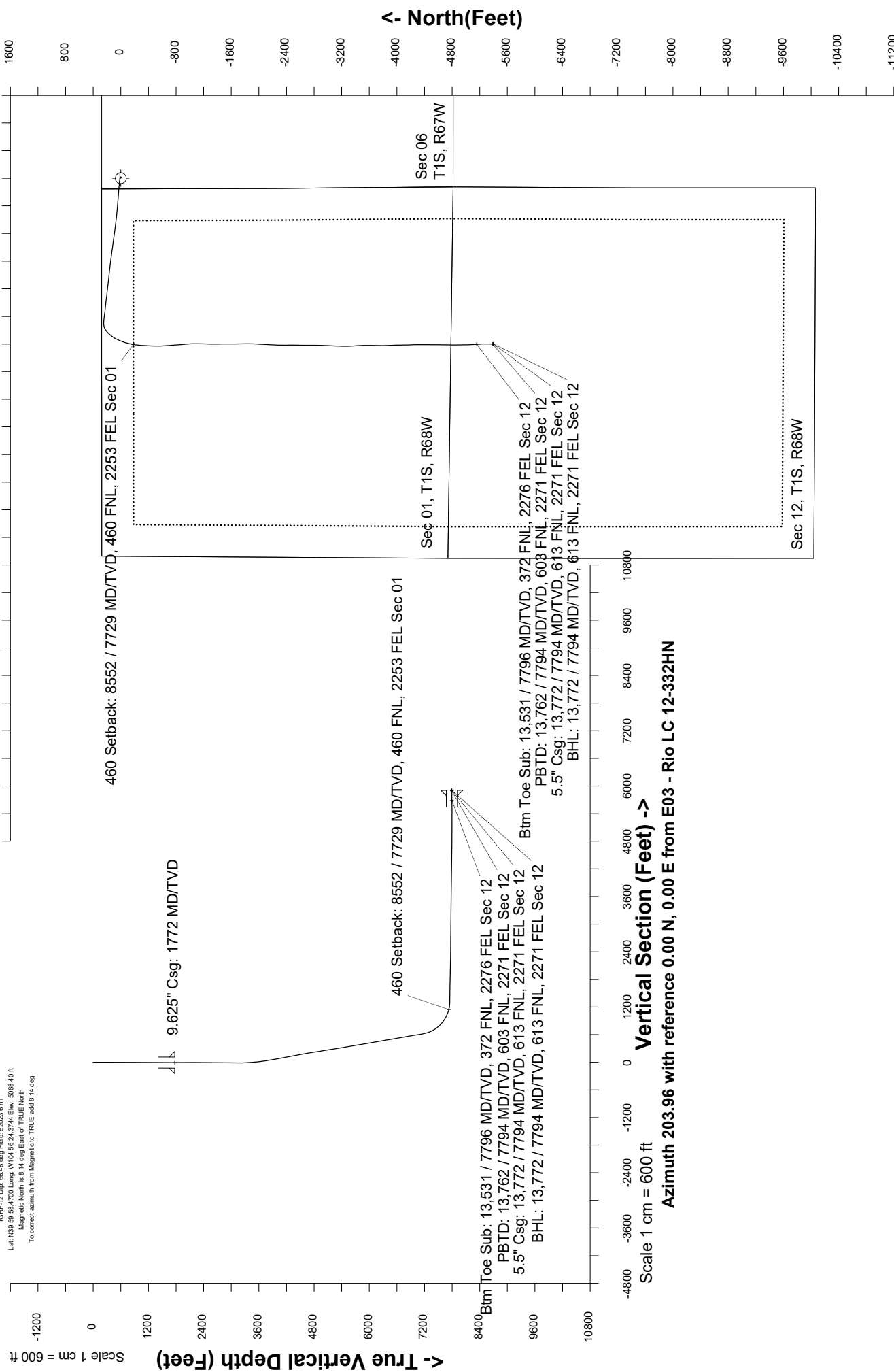
Location	Colorado	Slot	E03 - Rio LC 12-332HN
Field	Wattenburg	Well	Rio LC 12-332HN
Installation	Rio	Wellbore	Rio LC 12-332HN (AWB)



Sept-10-2018  
IGRF-12 Dec 68.43 deg Field 52023.6 nT  
Lat: N19 59 58.4700 Long: W104 56 24.3744 Elev: 5088.40 ft  
Magnetic North is 8.14 deg East of TRUE North.  
To correct azimuth from Magnetic to TRUE add 8.14 deg

Scale 1 cm = 400 ft

East (Feet) ->



Great Western Operating Co, LLC  
Directional Survey Report  
Wellpath: Rio LC 12-332HN  
MDs and TVDs are from Rig Floor 5088.4ft above Mean Sea Level

**Wellbore Information**

Date Created	Date Revised	API #	RKB above GL	Well Name
Aug-27-2019	Sep-9-2019	05-001-10461	20.00	Rio LC 12-332HN

**Slot Coordinates**

Latitude	Longitude
39.99957800	-104.93978300

**Pad Information**

Pad Name	Ground Elev.
Rio	5068.40

**Field**

Name
Wattenburg

**Wellpath Report**

MD[ft]	Inc[deg]	Azi[deg]	TVD[ft]	North[ft]	East[ft]	DLS [deg/100ft]	Vertical Section[ft]	Lat - NAD 83	Long - NAD 83
0.00	0.00	0.00	0.00	0.00	0.00		0.00	39.99957800	-104.93978300
12.40	0.00	130.67	12.40	0.00	0.00	0.00	0.00	39.99957800	-104.93978300
94.40	0.31	130.67	94.40	-0.14	0.17	0.38	0.06	39.99957760	-104.93978240
184.40	0.13	302.05	184.40	-0.25	0.27	0.49	0.12	39.99957732	-104.93978205
273.40	0.62	48.14	273.40	0.13	0.54	0.75	-0.33	39.99957835	-104.93978107
362.40	0.53	68.27	362.39	0.60	1.28	0.25	-1.07	39.99957965	-104.93977843
452.40	0.22	117.22	452.39	0.67	1.82	0.47	-1.36	39.99957985	-104.93977650
542.40	0.31	82.68	542.39	0.63	2.22	0.20	-1.47	39.99957972	-104.93977509
632.40	1.19	100.78	632.38	0.48	3.38	1.00	-1.81	39.99957933	-104.93977095
722.40	0.92	127.50	722.37	-0.13	4.87	0.62	-1.86	39.99957764	-104.93976563
812.40	0.48	143.32	812.36	-0.87	5.67	0.53	-1.50	39.99957560	-104.93976278
902.40	0.44	81.89	902.36	-1.13	6.23	0.52	-1.50	39.99957490	-104.93976075
992.40	0.75	76.35	992.35	-0.94	7.15	0.35	-2.04	39.99957542	-104.93975749
1082.40	0.31	107.38	1082.35	-0.87	7.95	0.57	-2.43	39.99957560	-104.93975462
1172.40	0.53	57.28	1172.35	-0.72	8.53	0.45	-2.81	39.99957602	-104.93975254
1262.40	0.79	92.52	1262.34	-0.52	9.50	0.52	-3.38	39.99957656	-104.93974908
1352.40	1.01	87.60	1352.33	-0.52	10.92	0.26	-3.96	39.99957658	-104.93974403
1442.40	0.62	53.06	1442.32	-0.19	12.10	0.68	-4.74	39.99957747	-104.93973982
1532.40	0.35	48.14	1532.32	0.28	12.69	0.30	-5.41	39.99957878	-104.93973770
1622.40	0.35	55.61	1622.32	0.62	13.12	0.05	-5.90	39.99957971	-104.93973616
1719.40	0.35	87.34	1719.31	0.80	13.66	0.20	-6.28	39.99958021	-104.93973423
1772.00	0.34	77.67	1771.91	0.84	13.98	0.11	-6.45	39.99958032	-104.93973311
1798.00	0.34	72.77	1797.91	0.88	14.13	0.11	-6.55	39.99958043	-104.93973258
1888.00	0.10	175.46	1887.91	0.89	14.39	0.42	-6.65	39.99958043	-104.93973164
1978.00	0.98	237.18	1977.91	0.39	13.75	1.04	-5.94	39.99957907	-104.93973393
2067.00	0.71	218.59	2066.90	-0.45	12.76	0.43	-4.77	39.99957675	-104.93973744
2156.00	0.54	60.01	2155.90	-0.68	12.78	1.38	-4.57	39.99957615	-104.93973737
2246.00	0.53	175.95	2245.89	-0.88	13.18	1.01	-4.55	39.99957559	-104.93973596
2335.00	0.72	107.73	2334.89	-1.46	13.74	0.81	-4.25	39.99957399	-104.93973395
2425.00	1.14	77.11	2424.88	-1.43	15.15	0.71	-4.85	39.99957407	-104.93972891
2514.00	2.25	64.35	2513.84	-0.48	17.59	1.31	-6.71	39.99957669	-104.93972021
2604.00	0.65	3.34	2603.81	0.80	19.21	2.24	-8.53	39.99958019	-104.93971442
2693.00	0.60	118.70	2692.81	1.08	19.65	1.19	-8.97	39.99958096	-104.93971286
2783.00	0.65	328.92	2782.81	1.29	19.80	1.34	-9.22	39.99958153	-104.93971232
2872.00	0.59	9.74	2871.80	2.17	19.62	0.49	-9.95	39.99958396	-104.93971297
2962.00	0.83	332.63	2961.79	3.21	19.40	0.56	-10.81	39.99958680	-104.93971376
3051.00	2.18	309.09	3050.76	4.85	17.79	1.64	-11.65	39.99959131	-104.93971951
3141.00	5.73	311.18	3140.53	8.89	13.08	3.95	-13.43	39.99960239	-104.93973633
3230.00	7.17	275.84	3229.00	12.38	4.20	4.65	-13.02	39.99961198	-104.93976800
3320.00	10.03	275.22	3317.98	13.66	-9.19	3.18	-8.75	39.99961551	-104.93981581
3409.00	12.51	278.20	3405.26	15.74	-26.45	2.86	-3.64	39.99962122	-104.93987742
3499.00	15.20	274.75	3492.63	18.11	-47.86	3.13	2.89	39.99962772	-104.93995384
3588.00	17.69	277.28	3577.99	20.79	-72.91	2.91	10.61	39.99963507	-104.94004324
3678.00	20.71	275.01	3662.97	23.91	-102.33	3.46	19.71	39.99964365	-104.94014826
3767.00	23.08	273.90	3745.55	26.48	-135.42	2.70	30.81	39.99965068	-104.94026635
3857.00	26.13	275.75	3827.37	29.66	-172.75	3.49	43.06	39.99965942	-104.94039959
3946.00	29.51	274.04	3906.07	33.17	-214.12	3.90	56.65	39.99966905	-104.94054728
4035.00	30.02	272.84	3983.33	35.82	-258.23	0.88	72.15	39.99967632	-104.94070469
4125.00	30.03	275.28	4061.25	39.01	-303.14	1.36	87.48	39.99968507	-104.94086500
4214.00	29.11	276.38	4138.66	43.46	-346.83	1.20	101.15	39.99969730	-104.94102095
4304.00	30.00	275.15	4216.95	47.91	-391.00	1.20	115.02	39.99970952	-104.94117860
4393.00	29.79	273.95	4294.11	51.43	-435.21	0.71	129.76	39.99971918	-104.94133642
4483.00	30.07	274.07	4372.11	54.57	-480.01	0.32	145.08	39.99972780	-104.94149631
4572.00	29.26	275.46	4449.44	58.23	-523.90	1.19	159.57	39.99973782	-104.94165298
4661.00	30.14	277.38	4526.75	63.17	-567.72	1.46	172.85	39.99975138	-104.94180936
4751.00	30.14	274.80	4604.59	67.96	-612.64	1.44	186.72	39.99976453	-104.94196972
4840.00	30.15	279.06	4681.56	73.35	-656.98	2.40	199.81	39.99977933	-104.94212799
4930.00	29.96	278.14	4759.46	80.09	-701.55	0.55	211.75	39.99979783	-104.94228707
5020.00	30.14	276.72	4837.36	85.92	-746.24	0.81	224.57	39.99981382	-104.94244657
5109.00	30.15	278.22	4914.33	91.73	-790.55	0.85	237.26	39.99982976	-104.94260474
5198.00	30.47	277.86	4991.16	98.01	-835.02	0.41	249.58	39.99984700	-104.94276348
5288.00	30.28	276.82	5068.81	103.82	-880.16	0.62	262.60	39.99986296	-104.94292458
5377.00	29.89	278.27	5145.82	109.68	-924.38	0.93	275.21	39.99987903	-104.94308244
5467.00	30.02	277.24	5223.80	115.74	-968.91	0.59	287.76	39.99989567	-104.94324137
5556.00	30.02	278.62	5300.86	121.88	-1013.01	0.78	300.05	39.99991252	-104.94339877

MD[ft]	Inc[deg]	Azi[deg]	TVD[ft]	North[ft]	East[ft]	DLS [deg/100ft]	Vertical Section[ft]	Lat - NAD 83	Long - NAD 83
5646.00	30.16	277.64	5378.73	128.26	-1057.68	0.57	312.36	39.99993003	-104.94355821
5736.00	30.12	277.15	5456.56	134.08	-1102.49	0.28	325.25	39.99994599	-104.94371817
5825.00	30.03	277.18	5533.58	139.64	-1146.74	0.10	328.14	39.99996126	-104.94387612
5915.00	30.00	278.35	5611.51	145.73	-1191.35	0.65	350.70	39.99997795	-104.94403533
6004.00	29.87	276.90	5688.64	151.62	-1235.37	0.83	363.19	39.99999412	-104.94419245
6094.00	30.06	276.47	5766.61	156.85	-1280.01	0.32	376.54	40.00000848	-104.94435180
6183.00	29.84	276.15	5843.72	161.74	-1324.18	0.31	390.02	40.00002188	-104.94450944
6272.00	30.44	276.37	5920.69	166.61	-1368.60	0.69	403.60	40.00003525	-104.94466800
6361.00	29.98	276.66	5997.60	171.69	-1413.09	0.54	417.03	40.00004919	-104.94482681
6451.00	29.96	276.40	6075.57	176.80	-1457.76	0.15	430.50	40.00006322	-104.94498624
6540.00	29.95	276.19	6152.68	181.67	-1501.93	0.12	443.99	40.00007659	-104.94514391
6629.00	29.97	275.96	6229.79	186.38	-1546.13	0.13	457.64	40.00008949	-104.94530166
6719.00	29.99	276.80	6307.75	191.38	-1590.82	0.47	471.23	40.00010320	-104.94546119
6808.00	29.22	275.69	6385.13	196.16	-1634.52	1.06	484.60	40.00011634	-104.94561718
6898.00	29.84	277.90	6463.44	201.42	-1678.56	1.39	497.69	40.00013076	-104.94577438
6987.00	29.94	276.15	6540.60	206.84	-1722.58	0.99	510.61	40.00014564	-104.94593148
7077.00	28.73	276.89	6619.06	211.84	-1766.38	1.40	523.83	40.00015936	-104.94608784
7166.00	30.03	276.34	6696.61	216.87	-1809.76	1.49	536.85	40.00017314	-104.94624265
7256.00	30.25	275.91	6774.44	221.69	-1854.69	0.34	550.69	40.00018637	-104.94640303
7345.00	29.94	275.95	6851.45	226.30	-1899.08	0.35	564.51	40.00019902	-104.94656147
7434.00	29.15	277.63	6928.87	231.48	-1942.65	1.29	577.47	40.00021323	-104.94671701
7524.00	28.96	276.94	7007.55	237.02	-1986.01	0.43	590.02	40.00022843	-104.94687176
7613.00	29.99	275.98	7085.03	241.95	-2029.52	1.27	603.19	40.00024193	-104.94702708
7703.00	30.46	276.18	7162.79	246.74	-2074.57	0.53	617.10	40.00025510	-104.94718788
7792.00	29.65	264.90	7239.89	247.22	-2118.96	6.40	634.70	40.00026538	-104.94734633
7882.00	29.66	248.85	7318.22	237.19	-2161.97	8.80	661.34	40.00022884	-104.94749984
7971.00	33.67	235.00	7394.06	215.05	-2202.79	9.30	698.14	40.00016807	-104.94764553
8060.00	39.99	226.39	7465.31	181.12	-2243.77	9.15	745.80	40.00007491	-104.94779181
8150.00	44.72	217.09	7531.87	135.84	-2283.87	8.71	803.45	39.99995061	-104.94793492
8240.00	51.53	209.57	7591.95	79.83	-2320.43	9.79	869.48	39.99979685	-104.94806537
8329.00	58.93	202.59	7642.72	14.19	-2352.33	10.51	942.43	39.99961665	-104.94817923
8419.00	65.77	196.65	7684.49	-60.85	-2378.95	9.58	1021.81	39.99941064	-104.94827420
8508.00	72.07	191.53	7716.50	-141.34	-2399.07	8.88	1103.54	39.99918968	-104.94834599
8551.96	75.61	189.27	7728.74	-182.86	-2406.68	9.44	1144.57	39.99907570	-104.94837315
8597.00	79.25	187.02	7738.54	-226.37	-2412.90	9.44	1186.85	39.99895627	-104.94839533
8687.00	87.97	183.58	7748.55	-315.33	-2421.13	10.41	1271.49	39.99871206	-104.94842467
8731.00	89.72	182.35	7749.44	-359.26	-2423.40	4.86	1312.56	39.99859147	-104.94843278
8776.00	89.38	182.97	7749.79	-404.21	-2425.49	1.57	1354.48	39.99846808	-104.94844022
8865.00	89.85	181.70	7750.39	-493.13	-2429.12	1.52	1437.21	39.99822398	-104.94845313
8954.00	89.29	178.34	7751.06	-582.12	-2429.15	3.83	1518.54	39.99797971	-104.94845321
9044.00	89.63	174.39	7751.90	-671.92	-2423.44	4.40	1598.28	39.99773321	-104.94843281
9133.00	88.55	176.14	7753.32	-760.60	-2416.10	2.31	1676.33	39.99748977	-104.94840657
9223.00	88.98	175.52	7755.26	-850.34	-2409.55	0.84	1755.68	39.99724343	-104.94838318
9312.00	87.94	174.75	7757.65	-938.98	-2402.01	1.45	1833.62	39.99700009	-104.94835622
9402.00	88.65	178.40	7760.33	-1028.77	-2396.64	4.13	1913.48	39.99675363	-104.94833701
9491.00	89.11	180.83	7762.07	-1117.74	-2396.04	2.78	1994.54	39.99650939	-104.94833485
9581.00	89.26	181.92	7763.35	-1207.70	-2398.20	1.22	2077.63	39.99626243	-104.94834253
9671.00	89.17	180.86	7764.58	-1297.67	-2400.38	1.18	2160.73	39.99601547	-104.94835029
9760.00	89.63	179.41	7765.51	-1386.66	-2400.59	1.71	2242.13	39.99577118	-104.94835100
9849.00	89.35	179.53	7766.31	-1475.65	-2399.77	0.34	2323.12	39.99552689	-104.94834804
9939.00	89.17	179.50	7767.47	-1565.64	-2399.01	0.20	2405.04	39.99527986	-104.94834529
10028.00	89.57	180.00	7768.45	-1654.63	-2398.62	0.72	2486.21	39.99503556	-104.94834387
10118.00	89.38	178.93	7769.27	-1744.62	-2397.78	1.21	2568.10	39.99478853	-104.94834084
10207.00	89.60	178.87	7770.06	-1833.60	-2396.07	0.26	2648.72	39.99454427	-104.94833471
10297.00	89.38	181.97	7770.86	-1923.59	-2396.73	3.45	2731.21	39.99429726	-104.94833703
10386.00	89.42	184.30	7771.80	-2012.44	-2401.60	2.62	2814.39	39.99405334	-104.94835437
10476.00	89.20	182.68	7772.88	-2102.27	-2407.07	1.82	2898.69	39.99380677	-104.94837389
10565.00	89.57	183.60	7773.84	-2191.13	-2411.95	1.11	2981.88	39.99356284	-104.94839126
10655.00	89.48	181.21	7774.58	-2281.04	-2415.72	2.66	3065.57	39.99331602	-104.94840471
10745.00	89.35	178.83	7775.50	-2371.03	-2415.76	2.65	3147.82	39.99306899	-104.94840479
10834.00	89.51	179.90	7776.39	-2460.02	-2414.77	1.22	3228.73	39.99282471	-104.94840124
10924.00	89.45	182.36	7777.20	-2549.99	-2416.54	2.73	3311.67	39.99257773	-104.94840754
11013.00	89.38	179.77	7778.11	-2638.96	-2418.20	2.91	3393.65	39.99233349	-104.94841341
11103.00	89.42	179.83	7779.05	-2728.95	-2417.88	0.08	3475.76	39.99208645	-104.94841226
11192.00	89.45	180.65	7779.93	-2817.95	-2418.26	0.92	3557.23	39.99184215	-104.94841356
11282.00	89.51	181.24	7780.75	-2907.93	-2419.74	0.66	3640.06	39.99159514	-104.94841882
11371.00	89.35	182.57	7781.63	-2996.88	-2422.70	1.51	3722.54	39.99135098	-104.94842935
11460.00	89.51	182.75	7782.52	-3085.78	-2426.83	0.27	3805.46	39.99110694	-104.94844406
11550.00	89.51	181.06	7783.29	-3175.72	-2429.82	1.88	3888.86	39.99086003	-104.94845471
11640.00	89.57	181.61	7784.01	-3265.69	-2431.92	0.61	3971.93	39.99061305	-104.94846216
11729.00	89.48	174.63	7784.75	-3354.59	-2429.00	7.84	4051.98	39.99036903	-104.94845171
11818.00	89.42	176.55	7785.61	-3443.31	-2422.16	2.16	4130.28	39.99012546	-104.94842726
11908.00	89.38	180.29	7786.55	-3533.26	-2419.68	4.16	4211.47	39.98987856	-104.94841838
11998.00	89.38	180.13	7787.52	-3623.25	-2420.01	0.18	4293.84	39.98963151	-104.94841952
12086.00	89.05	181.77	7788.73	-3711.23	-2421.47	1.90	4374.82	39.98939001	-104.94842470
12176.00	88.98	179.42	7790.28	-3801.21	-2422.40	2.61	4457.42	39.98914302	-104.94842800
12266.00	88.86	177.92	7791.97	-3891.16	-2420.31	1.67	4538.78	39.98889608	-104.94842052
12355.00	88.89	176.68	7793.72	-3980.05	-2416.12	1.39	4618.30	39.98865209	-104.94840553
12444.00	88.89	181.19	7795.44	-4068.99	-2414.47	5.07	4698.90	39.98840793	-104.94839959
12534.00	89.38	178.18	7796.80	-4158.97	-2413.97	3.39	4780.92	39.98816093	-104.94839780
12624.00	89.38	178.73	7797.78	-4248.93	-2411.54	0.61	4862.15	39.98791398	-104.94838911
12714.00	89.35	179.07	7798.77	-4338.91	-2409.82	0.38	4943.67	39.98766698	-104.94838291
12803.00	90.09	179.96	7799.21	-4427.90	-2409.06	1.30	5024.69	39.98742268	-104.94838019
12892.00	89.94	179.19	7799.19	-4516.90	-2408.40	0.88	5105.74	39.98717838	-104.94837780
12982.00	89.97	181.20	7799.26	-4606.89	-2408.71	2.23	5188.11	39.98693134	-104.94837887
13071.00	90.00	181.81	7799.28	-4695.86	-2411.05	0.69	5270.36	39.98668711	-104.94838718
13161.00	90.37	182.18	7798.99	-4785.81	-2414.18	0.58	5353.82	39.98644020	-104.94839833
13250.00	90.52	178.50	7798.30	-4874.79	-2414.71	4.14	5435.35	39.98619594	-104.94840018

MD[ft]	Inc[deg]	Azi[deg]	TVD[ft]	North[ft]	East[ft]	DLS [deg/100ft]	Vertical Section[ft]	Lat - NAD 83	Long - NAD 83
13340.00	90.65	179.75	7797.38	-4964.77	-2413.33	1.40	5517.01	39.98594893	-104.94839525
13429.00	90.31	175.48	7796.63	-5053.67	-2409.63	4.81	5596.75	39.98570489	-104.94838200
13519.00	90.37	176.43	7796.10	-5143.44	-2403.28	1.06	5676.20	39.98545846	-104.94835931
13531.13	90.42	176.70	7796.02	-5155.55	-2402.56	2.29	5686.97	39.98479243	-104.94834201
13608.00	90.71	178.44	7795.26	-5232.34	-2399.30	2.29	5755.83	39.98521442	-104.94834507
13698.00	90.49	180.39	7794.32	-5322.33	-2398.38	2.18	5837.68	39.98496740	-104.94834176
13748.00	90.34	179.86	7793.96	-5372.33	-2398.49	1.10	5883.42	39.98483015	-104.94834213
13761.74	90.34	179.86	7793.87	-5386.07	-2398.46	0.00	5895.96	39.98476427	-104.94834192
13772.00	90.34	179.86	7793.81	-5396.33	-2398.43	0.00	5905.32	39.98476427	-104.94834192

## Comments

MD[ft]	TVD[ft]	North[ft]	East[ft]	Lat - NAD 83	Long - NAD 83	Comment
1772.00	1771.91	0.84	13.98	39.99958032	-104.93973311	9.625" Csg: 1772 MD/TVD
8551.96	7728.74	-182.86	-2406.68	39.99907570	-104.94837315	460 Setback: 8552 / 7729 MD/TVD, 460 FNL, 2253 FEL Sec 01
13531.13	7796.02	-5155.55	-2402.56	39.98542522	-104.94835672	Btm Toe Sub: 13,531 / 7796 MD/TVD, 372 FNL, 2276 FEL Sec 12
13761.74	7793.87	-5386.07	-2398.46	39.98479243	-104.94834201	PBTD: 13,762 / 7794 MD/TVD, 603 FNL, 2271 FEL Sec 12
13772.00	7793.81	-5396.33	-2398.43	39.98476427	-104.94834192	5.5" Csg: 13,772 / 7794 MD/TVD, 613 FNL, 2271 FEL Sec 12
13772.00	7793.81	-5396.33	-2398.43	39.98476427	-104.94834192	BHL: 13,772 / 7794 MD/TVD, 613 FNL, 2271 FEL Sec 12

## 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	1772.00	1771.91	0.84	13.98
8.500	1772.00	1771.91	0.84	13.98	13772.00	7793.81	-5396.33	-2398.43

## 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	1772.00	1771.91	0.84	13.98
5 1/2in Casing	0.00	0.00	0.00	0.00	13772.00	7793.81	-5396.33	-2398.43

## Survey Tool Program

Reference	Survey Name	MD[ft]	TVD[ft]	Survey Tool
605285	As Drilled - 20190827	13772.00	7793.81	MWD

Coordinates are from Slot  
MD's and TVD's are from Rig Floor 5088.4ft above Mean Sea Level  
Vertical Section is from Wellhead on azimuth 203.96 degrees  
Bottom hole distance is 5905.32 Feet on azimuth 203.96 degrees from Wellhead  
Survey calculation uses Minimum Curvature method