



Actual Wellpath Report

PEN-20F-HS AWP Proj: 13384'
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REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY	Slot	Slot F
Area	Ritchie County, WV	Well	PEN-20F-HS
Field	Ritchie	Wellbore	PEN-20F-HS AWB
Facility	PEN-20 Pad		

REPORT SETUP INFORMATION

Projection System	NAD27 / Lambert West Virginia SP, Northern Zone (4701), US feet	Software System	WellArchitect® 4.0.1
North Reference	Grid	User	Edsaryar
Scale	0.999954	Report Generated	15/Jan/2015 at 15:44
Convergence at slot	0.97° West	Database/Source file	WellArchitectEasternDB/PEN-20F-HS_AWB.xml

WELLPATH LOCATION

	Local coordinates		Grid coordinates		Geographic coordinates	
	North[ft]	East[ft]	Easting[US ft]	Northing[US ft]	Latitude	Longitude
Slot Location	-67.90	73.26	1568279.06	305207.68	39°19'40.465"N	81°01'34.360"W
Facility Reference Pt			1568205.80	305275.58	39°19'41.124"N	81°01'35.306"W
Field Reference Pt			0.00	0.00	38°17'12.460"N	86°28'23.077"W

WELLPATH DATUM

Calculation method	Minimum curvature	Nomac 78 (RKB) to Facility Vertical Datum	1055.00ft
Horizontal Reference Pt	Slot	Nomac 78 (RKB) to Mean Sea Level	1055.00ft
Vertical Reference Pt	Nomac 78 (RKB)	Nomac 78 (RKB) to Mud Line at Slot (Slot F)	26.00ft
MD Reference Pt	Nomac 78 (RKB)	Section Origin	N 0.00, E 0.00 ft
Field Vertical Reference	Mean Sea Level	Section Azimuth	320.00°

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WELLPATH DATA (143 stations) † = interpolated/extrapolated station															
MD [ft]	Inclination [°]	Azimuth [°]	TVD [ft]	Vert Sect [ft]	North [ft]	East [ft]	Grid East [US ft]	Grid North [US ft]	Latitude	Longitude	Closure Dist [ft]	Closure Dir [°]	DLS [°/100ft]	Build Rate [°/100ft]	Turn Rate [°/100ft]
0.00†	0.000	184.620	0.00	0.00	0.00	0.00	1568279.06	305207.68	39°19'40.465"N	81°01'34.360"W	0.00	0.000	0.00	0.00	0.00
26.00	0.000	184.620	26.00	0.00	0.00	0.00	1568279.06	305207.68	39°19'40.465"N	81°01'34.360"W	0.00	0.000	0.00	0.00	0.00
100.00	0.230	184.620	100.00	-0.11	-0.15	-0.01	1568279.05	305207.53	39°19'40.464"N	81°01'34.360"W	0.15	184.620	0.31	0.31	0.00
200.00	0.380	243.820	200.00	-0.17	-0.49	-0.33	1568278.73	305207.19	39°19'40.460"N	81°01'34.364"W	0.59	213.377	0.33	0.15	59.20
300.00	0.380	235.580	300.00	-0.06	-0.83	-0.90	1568278.16	305206.85	39°19'40.457"N	81°01'34.371"W	1.22	227.281	0.05	0.00	-8.24
400.00	0.170	162.920	400.00	-0.16	-1.16	-1.13	1568277.93	305206.52	39°19'40.454"N	81°01'34.374"W	1.62	224.233	0.37	-0.21	-72.66
500.00	0.260	46.910	500.00	-0.29	-1.14	-0.92	1568278.14	305206.54	39°19'40.454"N	81°01'34.371"W	1.47	218.727	0.37	0.09	-116.01
600.00	0.320	21.740	599.99	-0.14	-0.73	-0.65	1568278.41	305206.95	39°19'40.458"N	81°01'34.368"W	0.98	221.621	0.14	0.06	-25.17
700.00	0.280	7.100	699.99	0.16	-0.23	-0.51	1568278.55	305207.45	39°19'40.463"N	81°01'34.366"W	0.56	246.115	0.09	-0.04	-14.64
800.00	0.280	313.810	799.99	0.57	0.18	-0.66	1568278.40	305207.86	39°19'40.467"N	81°01'34.368"W	0.69	285.529	0.25	0.00	-53.29
900.00	0.160	230.340	899.99	0.81	0.26	-0.94	1568278.12	305207.94	39°19'40.468"N	81°01'34.372"W	0.98	285.595	0.31	-0.12	-83.47
1000.00	0.210	182.970	999.99	0.68	-0.01	-1.06	1568278.00	305207.67	39°19'40.465"N	81°01'34.373"W	1.06	269.545	0.16	0.05	-47.37
1100.00	0.320	42.360	1099.99	0.58	0.01	-0.88	1568278.18	305207.69	39°19'40.465"N	81°01'34.371"W	0.88	270.967	0.50	0.11	-140.61
1200.00	0.290	80.130	1199.99	0.49	0.26	-0.45	1568278.61	305207.94	39°19'40.468"N	81°01'34.365"W	0.52	300.704	0.20	-0.03	37.77
1300.00	0.260	123.310	1299.99	0.14	0.18	-0.01	1568279.05	305207.86	39°19'40.467"N	81°01'34.360"W	0.18	357.921	0.20	-0.03	43.18
1400.00	0.240	123.150	1399.99	-0.27	-0.06	0.36	1568279.42	305207.62	39°19'40.465"N	81°01'34.355"W	0.36	98.840	0.02	-0.02	-0.16
1500.00	0.150	178.920	1499.99	-0.58	-0.30	0.54	1568279.60	305207.38	39°19'40.462"N	81°01'34.353"W	0.61	119.322	0.20	-0.09	55.77
1600.00	0.340	249.490	1599.99	-0.58	-0.54	0.26	1568279.32	305207.14	39°19'40.460"N	81°01'34.356"W	0.60	154.061	0.32	0.19	70.57
1700.00	0.430	274.610	1699.98	-0.22	-0.61	-0.39	1568278.67	305207.07	39°19'40.459"N	81°01'34.364"W	0.72	212.685	0.19	0.09	25.12
1800.00	0.290	309.110	1799.98	0.30	-0.42	-0.96	1568278.10	305207.26	39°19'40.461"N	81°01'34.372"W	1.05	246.408	0.25	-0.14	34.50
1900.00	0.240	58.910	1899.98	0.51	-0.15	-0.98	1568278.08	305207.53	39°19'40.464"N	81°01'34.372"W	0.99	261.156	0.43	-0.05	109.83
2000.00	0.210	68.800	1999.98	0.32	-0.22	-0.76	1568278.30	305207.46	39°19'40.463"N	81°01'34.369"W	0.80	253.652	0.37	-0.03	109.86
2100.00	0.080	21.610	1999.98	0.23	-0.35	-0.77	1568278.29	305207.33	39°19'40.462"N	81°01'34.369"W	0.85	245.654	0.28	-0.13	152.82
2200.00	0.370	87.700	1999.98	0.10	-0.28	-0.49	1568278.57	305207.40	39°19'40.462"N	81°01'34.366"W	0.57	240.241	0.42	0.29	126.08
2300.00	0.330	131.110	2299.98	-0.38	-0.46	0.05	1568279.11	305207.22	39°19'40.461"N	81°01'34.359"W	0.46	174.252	0.26	-0.04	43.81
2400.00	0.220	13.900	2399.98	-0.55	-0.46	0.31	1568279.37	305207.22	39°19'40.461"N	81°01'34.356"W	0.56	146.411	0.47	-0.11	-117.62
2500.00	0.350	86.660	2499.98	-0.62	-0.26	0.66	1568279.72	305207.42	39°19'40.463"N	81°01'34.351"W	0.71	111.498	0.35	0.13	72.77
2600.00	0.280	200.010	2599.98	-0.93	-0.47	0.88	1568279.94	305207.21	39°19'40.461"N	81°01'34.348"W	1.00	118.167	0.53	-0.07	113.35
2700.00	0.350	267.720	2699.97	-0.89	-0.75	0.50	1568279.56	305206.93	39°19'40.458"N	81°01'34.353"W	0.90	146.570	0.32	0.07	60.71
2800.00	0.220	314.150	2799.97	-0.55	-0.67	0.06	1568279.12	305207.01	39°19'40.459"N	81°01'34.359"W	0.67	175.188	0.28	-0.13	53.43

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Operator	NOBLE ENERGY
Area	Ritchie County, WV
Field	Ritchie
Facility	PEN-20 Pad
Slot	Slot F
Well	PEN-20F-HS
Wellbore	PEN-20F-HS AWB

MID	Inclination	TVD	Vert Sect	North	East	Grid East	Grid North	Latitude	Longitude	Closure Dist	Closure Dir	DLS	Build Rate	Turn Rate
[ft]	[°]	[ft]	[ft]	[ft]	[ft]	[US ft]	[US ft]	[ft]	[ft]	[ft]	[°]	[°/100ft]	[°/100ft]	[°/100ft]
2900.00	0.220	180.080	2899.97	-0.50	-0.72	-0.08	1568278.98	305206.96	39°19'40.458"N	81°01'34.360"W	0.73	186.461	0.41	-134.07
3000.00	0.330	189.740	2999.97	-0.83	-1.20	-0.13	1568278.93	305206.48	39°19'40.453"N	81°01'34.361"W	1.21	186.230	0.12	0.11
3100.00	0.290	264.220	3099.97	-0.88	-1.51	-0.43	1568278.63	305206.17	39°19'40.450"N	81°01'34.365"W	1.57	195.956	0.38	-0.04
3200.00	0.150	62.710	3199.97	-0.77	-1.47	-0.57	1568278.49	305206.21	39°19'40.451"N	81°01'34.366"W	1.58	201.030	0.43	-0.14
3300.00	0.260	178.720	3299.97	-0.97	-1.64	-0.45	1568278.61	305206.04	39°19'40.449"N	81°01'34.365"W	1.70	195.186	0.35	0.11
3400.00	0.200	351.090	3399.97	-1.00	-1.70	-0.47	1568278.59	305205.98	39°19'40.448"N	81°01'34.365"W	1.76	195.412	0.46	-0.06
3500.00	0.310	122.620	3499.97	-1.11	-1.67	-0.27	1568278.79	305206.01	39°19'40.449"N	81°01'34.363"W	1.69	189.077	0.47	0.11
3600.00	0.240	214.820	3599.97	-1.42	-1.99	-0.16	1568278.90	305205.69	39°19'40.446"N	81°01'34.361"W	1.99	184.558	0.40	-0.07
3700.00	0.060	222.330	3699.97	-1.48	-2.20	-0.31	1568278.75	305205.48	39°19'40.443"N	81°01'34.363"W	2.22	188.113	0.18	-0.18
3786.00	0.190	60.340	3785.97	-1.51	-2.16	-0.22	1568278.84	305205.52	39°19'40.444"N	81°01'34.362"W	2.17	185.806	0.29	-0.15
3797.00	0.480	80.970	3796.97	-1.54	-2.14	-0.16	1568278.90	305205.54	39°19'40.444"N	81°01'34.361"W	2.15	184.223	2.81	2.64
3892.00	3.940	59.950	3891.88	-2.31	-0.45	3.06	1568282.12	305207.23	39°19'40.461"N	81°01'34.321"W	3.09	98.304	3.68	3.64
3987.00	9.510	56.600	3986.19	-3.78	5.51	12.45	1568291.50	305213.19	39°19'40.522"N	81°01'34.202"W	13.61	66.110	5.88	-3.53
4081.00	14.200	52.470	4078.16	-5.17	16.82	28.08	1568307.14	305224.50	39°19'40.636"N	81°01'34.006"W	32.73	59.083	5.07	-4.39
4175.00	17.170	55.390	4168.65	-6.97	31.72	48.65	1568327.71	305239.40	39°19'40.787"N	81°01'33.747"W	58.08	56.890	3.27	3.16
4270.00	19.430	57.030	4258.84	-10.22	48.29	73.45	1568352.51	305255.97	39°19'40.955"N	81°01'33.435"W	87.90	56.676	2.44	2.38
4364.00	20.880	63.750	4347.10	-16.12	64.21	101.59	1568380.65	305271.89	39°19'41.117"N	81°01'33.081"W	120.19	57.706	2.90	1.54
4459.00	21.050	72.800	4435.83	-26.75	76.75	133.08	1568412.14	305284.42	39°19'41.246"N	81°01'32.683"W	153.63	60.029	3.41	0.18
4554.00	24.900	70.100	4523.28	-40.24	88.60	168.20	1568447.25	305296.28	39°19'41.369"N	81°01'32.239"W	190.11	62.221	4.20	-2.84
4649.00	28.820	68.000	4608.02	-54.20	104.00	208.25	1568487.30	305311.67	39°19'41.528"N	81°01'31.732"W	232.78	63.464	4.24	-2.21
4743.00	30.330	66.340	4689.80	-65.46	124.24	249.90	1568528.95	305331.91	39°19'41.735"N	81°01'31.207"W	279.08	63.566	4.33	-1.61
4838.00	32.070	65.550	4771.06	-73.08	149.64	292.03	1568571.08	305357.31	39°19'41.993"N	81°01'30.676"W	328.14	62.869	2.38	-1.83
4933.00	33.630	64.630	4850.88	-82.27	175.17	336.75	1568615.79	305382.84	39°19'42.253"N	81°01'30.113"W	379.58	62.518	3.47	-1.64
5028.00	33.60	63.60	4929.25	-97.22	196.85	385.84	1568664.88	305404.52	39°19'42.475"N	81°01'29.493"W	433.15	62.970	4.18	1.72
5123.00	39.510	62.00	5004.72	-117.03	216.48	440.06	1568719.10	305424.15	39°19'42.678"N	81°01'28.807"W	490.42	63.806	4.57	4.47
5212.00	44.760	61.500	5074.41	-137.72	238.90	498.96	1568778.00	305446.57	39°19'42.910"N	81°01'28.063"W	553.20	64.415	6.02	5.59
5312.00	48.520	60.500	5139.02	-157.25	266.88	562.69	1568841.73	305474.54	39°19'43.197"N	81°01'27.258"W	622.77	64.626	5.41	-2.78
5360.00	47.600	60.600	5174.09	-167.27	283.92	598.58	1568877.61	305491.59	39°19'43.371"N	81°01'26.805"W	662.50	64.624	3.83	-3.62
5480.00	43.370	61.880	5254.71	-185.51	321.31	671.53	1568950.56	305528.97	39°19'43.753"N	81°01'25.885"W	744.44	64.430	4.03	-3.68
5530.00	42.120	63.180	5300.97	-194.64	341.17	709.39	1568988.42	305548.83	39°19'43.956"N	81°01'25.407"W	787.17	64.316	2.70	-1.98

WELLPATH DATA (143 stations)

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REFERENCE WELLPATH IDENTIFICATION

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Area	Ritchie County, WV
Field	Ritchie
Facility	PEN-20 Pad
Slot	Slot F
Well	PEN-20F-HS
Wellbore	PEN-20F-HS AWB

MD	Inclination	Azimuth	TVD	Vert Sect	North	East	Grid East	Grid North	Latitude	Longitude	Closure Dist	Closure Dir	DLS	Build Rate	Turn Rate
[ft]	[°]	[°]	[ft]	[ft]	[ft]	[ft]	[US ft]	[US ft]	[ft]	[ft]	[ft]	[°]	[°/100ft]	[°/100ft]	[°/100ft]
5638.00	42.000	68.960	5371.53	-212.23	366.96	767.51	1569046.53	305574.63	39°19'44.220"N	81°01'24.673"W	850.72	64.446	4.08	-0.13	6.08
5732.00	39.940	68.180	5442.51	-231.87	389.47	824.88	1569103.90	305597.13	39°19'44.452"N	81°01'23.948"W	912.20	64.725	2.26	-2.19	-0.83
5827.00	39.770	63.800	5515.45	-248.63	414.23	880.46	1569159.48	305621.89	39°19'44.706"N	81°01'23.246"W	973.04	64.805	2.96	-0.18	-4.61
5922.00	39.800	62.870	5588.45	-262.66	441.51	934.79	1569213.80	305649.17	39°19'44.985"N	81°01'22.561"W	1033.81	64.718	0.63	0.03	-0.98
6016.00	39.650	66.580	5660.76	-277.92	467.15	989.09	1569268.10	305674.81	39°19'45.248"N	81°01'21.876"W	1093.86	64.718	2.53	-0.16	3.95
6112.00	39.910	62.750	5734.55	-293.46	493.43	1044.58	1569323.59	305701.09	39°19'45.517"N	81°01'21.175"W	1155.26	64.715	2.57	0.27	-3.99
6206.00	36.750	46.060	5808.48	-298.19	526.85	1091.78	1569370.79	305734.50	39°19'45.855"N	81°01'20.582"W	1212.25	64.240	11.48	-3.36	-17.76
6302.00	37.750	30.010	5885.07	-286.14	572.33	1127.24	1569406.25	305779.99	39°19'46.310"N	81°01'20.140"W	1264.22	63.082	10.15	1.04	-16.72
6396.00	42.330	17.120	5957.04	-259.00	627.74	1151.04	1569430.05	305835.39	39°19'46.862"N	81°01'19.849"W	1311.09	61.393	10.18	5.09	-13.71
6490.00	49.250	4.230	6022.57	-216.09	693.83	1163.06	1569442.07	305901.48	39°19'47.517"N	81°01'19.711"W	1354.29	59.181	12.14	7.15	-13.71
6585.00	58.910	353.320	6078.35	-156.06	770.45	1160.97	1569439.98	305978.10	39°19'48.274"N	81°01'19.754"W	1393.36	56.431	13.76	10.17	-11.48
6680.00	65.140	346.950	6122.93	-83.52	852.99	1146.48	1569425.49	306060.63	39°19'49.087"N	81°01'19.956"W	1428.99	53.351	8.83	6.56	-6.71
6775.00	68.560	341.620	6160.29	-3.93	937.01	1122.79	1569401.80	306144.64	39°19'49.913"N	81°01'20.276"W	1462.41	50.154	6.29	3.60	-5.61
6870.00	72.930	333.700	6191.72	81.43	1019.81	1088.67	1569367.68	306227.44	39°19'50.726"N	81°01'20.728"W	1491.72	46.871	9.07	4.52	-8.34
6965.00	77.930	327.840	6215.69	171.68	1099.94	1043.77	1569322.78	306307.57	39°19'51.510"N	81°01'21.316"W	1516.35	43.499	8.01	5.35	-6.17
7061.00	85.010	321.090	6229.94	266.21	1177.07	988.62	1569267.63	306384.69	39°19'52.263"N	81°01'22.035"W	1537.16	40.027	10.13	7.37	-7.03
7156.00	89.880	318.920	6234.17	361.09	1249.75	927.64	1569206.66	306457.37	39°19'52.971"N	81°01'22.826"W	1556.41	36.585	5.61	5.13	-2.28
7252.00	91.020	323.120	6233.42	457.04	1324.36	867.27	1569146.29	306531.97	39°19'53.698"N	81°01'23.610"W	1583.06	33.219	4.33	1.19	4.37
7348.00	91.200	319.730	6231.38	552.98	1399.38	807.43	1569086.46	306606.99	39°19'54.430"N	81°01'24.388"W	1615.62	29.985	3.55	0.42	-3.53
7444.00	91.880	316.950	6229.28	648.91	1471.08	743.64	1569022.67	306678.69	39°19'55.128"N	81°01'25.215"W	1648.36	26.817	2.92	-0.35	-2.90
7539.00	91.680	314.140	6227.82	743.60	1538.87	677.12	1568965.15	306746.48	39°19'55.786"N	81°01'26.076"W	1681.26	23.750	2.99	-0.42	-2.96
7634.00	91.060	314.430	6227.21	838.12	1605.20	609.12	1568888.15	306812.81	39°19'56.430"N	81°01'26.956"W	1716.89	20.780	0.72	-0.65	0.31
7730.00	91.180	318.330	6227.01	933.91	1674.69	542.90	1568821.94	306882.29	39°19'57.106"N	81°01'27.813"W	1760.49	17.962	4.06	0.12	4.06
7825.00	90.280	320.500	6226.63	1028.90	1746.83	481.10	1568760.14	306954.43	39°19'57.809"N	81°01'28.615"W	1811.87	15.398	2.29	0.11	2.28
7921.00	89.880	318.870	6226.49	1124.90	1820.00	418.99	1568698.03	307027.62	39°19'58.521"N	81°01'29.422"W	1867.63	12.964	1.75	-0.42	-1.70
8016.00	90.030	320.970	6226.62	1219.89	1892.72	357.84	1568636.88	307100.31	39°19'59.230"N	81°01'30.215"W	1926.25	10.706	2.22	0.09	2.22
8112.00	90.280	324.820	6226.36	1315.75	1969.27	299.94	1568578.99	307176.86	39°19'59.976"N	81°01'30.969"W	1991.98	8.660	4.00	0.06	4.00
8207.00	90.280	326.990	6226.36	1410.24	2047.93	246.68	1568525.73	307255.51	39°20'00.745"N	81°01'31.663"W	2062.73	6.868	2.29	0.26	2.27
8303.00	90.520	329.990	6225.69	1505.29	2129.37	195.87	1568474.92	307336.95	39°20'01.541"N	81°01'32.328"W	2138.36	5.255	2.21	0.25	2.20
8399.00	90.650	326.610	6224.71	1600.38	2210.64	144.79	1568423.84	307418.21	39°20'02.336"N	81°01'32.995"W	2215.37	3.747	2.59	0.14	-2.58

WELLPATH DATA (143 stations)

Office of Citizens
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 Environmental Protection



Actual Wellpath Report

PEN-20F-HS AWP Proj: 13384'

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REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY	Slot	Slot F
Area	Ritchie County, WV	Well	PEN-20F-HS
Field	Ritchie	Wellbore	PEN-20F-HS AWB
Facility	PEN-20 Pad		

WELLPATH DATA (143 stations)

MD [ft]	Inclination [°]	Azimuth [°]	TVD [ft]	Vert Sect [ft]	North [ft]	East [ft]	Grid East [US ft]	Grid North [US ft]	Latitude	Longitude	Closure Dist [ft]	Closure Dir [°]	DLS [%/100ft]	Build Rate [%/100ft]	Turn Rate [%/100ft]
8494.00	90.920	321.460	6223.41	1695.10	2287.49	89.02	1568368.07	307495.07	39°20'03.086"N	81°01'33.721"W	2289.23	2.229	5.43	0.28	-5.42
8590.00	90.680	315.870	6222.06	1791.03	2359.54	25.65	1568304.70	307567.11	39°20'03.787"N	81°01'34.543"W	2359.68	0.623	5.83	-0.25	-5.82
8685.00	90.250	316.300	6221.29	1885.80	2427.97	-40.24	1568238.82	307635.54	39°20'04.452"N	81°01'35.397"W	2428.31	359.050	0.64	-0.45	0.45
8781.00	89.970	319.570	6221.11	1981.73	2499.23	-104.55	1568174.51	307706.79	39°20'05.146"N	81°01'36.230"W	2501.42	357.605	3.42	-0.29	3.41
8876.00	90.340	320.760	6220.85	2076.73	2572.18	-165.41	1568113.66	307779.74	39°20'05.856"N	81°01'37.020"W	2577.49	356.321	1.31	0.39	1.25
8971.00	89.970	319.950	6220.59	2171.72	2645.33	-226.02	1568053.05	307852.88	39°20'06.569"N	81°01'37.808"W	2654.97	355.117	0.94	-0.39	-0.85
9066.00	90.000	318.310	6220.62	2266.71	2717.17	-288.18	1567990.90	307924.72	39°20'07.269"N	81°01'38.614"W	2732.41	353.946	1.73	0.03	-1.73
9162.00	90.060	313.460	6220.57	2362.43	2786.07	-354.98	1567924.09	307993.62	39°20'07.938"N	81°01'39.479"W	2808.59	352.739	5.05	0.06	-5.05
9258.00	89.600	312.540	6220.85	2457.71	2851.54	-425.19	1567853.89	308059.08	39°20'08.573"N	81°01'40.387"W	2883.07	351.519	1.07	-0.48	-0.96
9353.00	89.970	317.130	6221.21	2552.30	2918.50	-492.54	1567786.54	308126.04	39°20'09.224"N	81°01'41.258"W	2959.77	350.421	4.85	0.39	4.83
9449.00	89.880	324.020	6221.34	2648.24	2992.61	-553.47	1567725.61	308200.15	39°20'09.946"N	81°01'42.050"W	3043.37	349.522	7.18	-0.09	7.18
9545.00	90.030	322.870	6221.41	2744.07	3069.73	-610.65	1567668.44	308277.26	39°20'10.698"N	81°01'42.794"W	3129.88	348.749	1.21	0.16	-1.20
9641.00	90.280	319.650	6221.15	2840.03	3144.60	-670.72	1567608.38	308352.13	39°20'11.428"N	81°01'43.574"W	3215.33	347.960	3.36	0.26	-3.35
9736.00	90.180	320.230	6220.77	2935.03	3217.31	-731.86	1567547.24	308424.83	39°20'12.136"N	81°01'44.368"W	3299.50	347.185	0.62	-0.11	0.61
9832.00	90.220	320.310	6220.44	3031.03	3291.14	-793.22	1567485.88	308498.66	39°20'12.856"N	81°01'45.165"W	3385.38	346.449	0.09	0.04	0.08
9927.00	90.150	321.690	6220.13	3126.01	3364.96	-853.00	1567426.10	308572.48	39°20'13.575"N	81°01'45.942"W	3471.40	345.775	1.45	-0.07	1.45
10022.00	90.180	323.560	6219.86	3220.90	3440.45	-910.66	1567368.44	308647.97	39°20'14.312"N	81°01'46.692"W	3558.94	345.174	1.97	0.03	1.97
10117.00	90.400	323.580	6219.37	3315.72	3516.89	-967.08	1567312.03	308724.40	39°20'15.057"N	81°01'47.426"W	3647.43	344.625	0.23	0.23	0.02
10213.00	90.370	322.030	6218.73	3411.60	3593.36	-1025.11	1567254.00	308800.86	39°20'15.803"N	81°01'48.181"W	3736.72	344.078	1.61	-0.03	-1.61
10309.00	90.280	317.520	6218.18	3507.57	3666.63	-1087.09	1567192.02	308874.14	39°20'16.517"N	81°01'48.986"W	3824.39	343.486	4.70	-0.09	-4.70
10404.00	90.250	315.880	6217.75	3602.41	3735.77	-1152.24	1567126.88	308943.27	39°20'17.189"N	81°01'49.830"W	3909.43	342.858	1.73	-0.03	-1.73
10500.00	90.430	316.140	6217.18	3698.18	3804.84	-1218.91	1567060.21	309012.33	39°20'17.861"N	81°01'50.693"W	3995.31	342.237	0.33	0.19	0.27
10595.00	90.310	317.130	6216.56	3793.01	3873.90	-1284.14	1566994.98	309081.39	39°20'18.532"N	81°01'51.538"W	4081.19	341.660	1.05	-0.13	1.04
10691.00	90.550	319.690	6215.84	3888.96	3945.69	-1347.86	1566931.27	309153.18	39°20'19.231"N	81°01'52.365"W	4169.56	341.140	2.68	0.25	2.67
10787.00	90.520	323.190	6214.94	3984.91	4020.74	-1407.69	1566871.44	309228.23	39°20'19.962"N	81°01'53.143"W	4260.04	340.705	3.65	-0.03	3.65
10882.00	90.650	326.500	6213.97	4079.55	4098.40	-1462.38	1566816.75	309305.88	39°20'20.721"N	81°01'53.855"W	4351.49	340.363	3.49	0.14	3.48
10978.00	90.740	324.860	6212.81	4175.07	4177.68	-1516.50	1566762.64	309385.16	39°20'21.495"N	81°01'54.561"W	4444.41	340.049	1.71	0.09	-1.71
11073.00	90.590	321.290	6211.71	4269.91	4253.61	-1573.56	1566705.58	309461.08	39°20'22.236"N	81°01'55.304"W	4535.33	339.699	3.76	-0.16	-3.76
11168.00	90.520	318.790	6210.79	4364.90	4326.41	-1634.56	1566644.58	309533.89	39°20'22.945"N	81°01'56.096"W	4624.89	339.303	2.63	-0.07	-2.63
11264.00	90.250	319.230	6210.14	4460.88	4398.87	-1697.53	1566581.61	309606.34	39°20'23.650"N	81°01'56.913"W	4715.05	338.898	0.54	-0.28	0.46



Actual Wellpath Report

PEN-20F-HS AWP Proj: 13384'

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REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY	Slot	Slot F
Area	Ritchie County, WV	Well	PEN-20F-HS
Field	Ritchie	Wellbore	PEN-20F-HS AWB
Facility	PEN-20 Pad		

WELLPATH DATA (143 stations)

MD [ft]	Inclination [°]	Azimuth [°]	TVD [ft]	Vert Sect [ft]	North [ft]	East [ft]	Grid East [US ft]	Grid North [US ft]	Latitude	Longitude	Closure Dist [ft]	Closure Dir [°]	DLS [°/100ft]	Build Rate [°/100ft]	Turn Rate [°/100ft]
11360.00	90.150	319.770	6209.81	4556.88	4471.87	-1759.88	1566519.27	309679.34	39°20'24.361"N	81°01'57.722"W	4805.71	338.518	0.57	-0.10	0.56
11455.00	90.340	319.300	6209.40	4651.88	4544.15	-1821.53	1566457.62	309751.61	39°20'25.065"N	81°01'58.523"W	4895.64	338.157	0.53	0.20	-0.49
11551.00	90.370	317.200	6208.81	4747.82	4615.76	-1885.45	1566393.70	309823.22	39°20'25.762"N	81°01'59.352"W	4986.00	337.781	2.19	0.03	-2.19
11646.00	90.460	317.430	6208.12	4842.72	4685.60	-1949.85	1566329.30	309893.05	39°20'26.441"N	81°02'00.186"W	5075.11	337.406	0.26	0.09	0.24
11742.00	90.620	319.160	6207.21	4938.67	4757.26	-2013.72	1566265.44	309964.71	39°20'27.139"N	81°02'01.015"W	5165.91	337.057	1.81	0.17	1.80
11838.00	90.220	317.880	6206.51	5034.63	4829.18	-2077.30	1566201.86	310036.63	39°20'27.839"N	81°02'01.839"W	5257.01	336.725	1.40	-0.42	-1.33
11933.00	90.250	318.960	6206.12	5129.59	4900.24	-2140.35	1566138.81	310107.69	39°20'28.530"N	81°02'02.657"W	5347.28	336.405	1.14	0.03	1.14
12029.00	89.850	320.980	6206.04	5225.59	4973.74	-2202.09	1566077.07	310181.19	39°20'29.246"N	81°02'03.459"W	5439.42	336.119	2.15	-0.42	2.10
12124.00	90.060	323.760	6206.11	5320.50	5048.97	-2260.09	1566019.08	310256.41	39°20'29.980"N	81°02'04.213"W	5531.74	335.885	2.93	0.22	2.93
12220.00	90.400	325.750	6205.72	5416.16	5127.37	-2315.48	1565963.69	310334.81	39°20'30.745"N	81°02'04.935"W	5625.96	335.696	2.10	0.35	2.07
12315.00	90.770	322.250	6204.75	5510.91	5204.21	-2371.31	1565907.86	310411.64	39°20'31.495"N	81°02'05.663"W	5719.00	335.504	3.70	0.39	-3.68
12411.00	90.370	318.940	6203.80	5606.88	5278.38	-2432.24	1565846.94	310485.80	39°20'32.218"N	81°02'06.454"W	5811.80	335.260	3.47	-0.42	-3.45
12507.00	90.340	317.810	6203.20	5702.84	5350.13	-2496.01	1565783.17	310557.56	39°20'32.916"N	81°02'07.281"W	5903.73	334.989	1.18	-0.03	-1.18
12603.00	90.770	319.710	6202.27	5798.81	5422.31	-2559.29	1565719.90	310629.74	39°20'33.619"N	81°02'08.102"W	5995.95	334.733	2.03	0.45	1.98
12699.00	90.650	319.560	6201.08	5894.80	5495.45	-2621.46	1565657.73	310702.87	39°20'34.331"N	81°02'08.909"W	6088.68	334.498	0.20	-0.12	-0.16
12794.00	90.680	316.880	6199.98	5989.74	5566.28	-2684.75	1565594.44	310773.69	39°20'35.020"N	81°02'09.730"W	6179.91	334.251	2.83	0.03	-2.83
12890.00	90.680	315.880	6198.84	6085.54	5635.75	-2750.99	1565528.20	310843.16	39°20'35.696"N	81°02'10.588"W	6271.33	333.981	1.06	0.00	-1.06
12985.00	90.590	318.280	6197.79	6180.40	5705.28	-2815.71	1565463.49	310912.69	39°20'36.372"N	81°02'11.427"W	6362.27	333.732	2.54	-0.09	2.54
13081.00	90.650	322.330	6196.75	6276.37	5779.12	-2877.02	1565402.18	310986.52	39°20'37.091"N	81°02'12.223"W	6455.65	333.534	4.24	0.06	4.24
13176.00	90.370	321.650	6195.90	6371.31	5853.96	-2935.52	1565343.68	311061.36	39°20'37.821"N	81°02'12.984"W	6548.75	333.368	0.77	-0.29	-0.72
13272.00	90.250	319.840	6195.39	6467.30	5928.30	-2996.26	1565282.94	311135.69	39°20'38.545"N	81°02'13.773"W	6642.46	333.187	1.89	-0.13	-1.89
13356.00	90.250	316.580	6195.02	6551.25	5990.92	-3052.22	1565226.98	311198.32	39°20'39.154"N	81°02'14.499"W	6723.63	333.002	3.87	0.00	-3.87
13384.00	90.250	316.580	6194.90	6579.20	6011.26	-3071.47	1565207.74	311218.66	39°20'39.352"N	81°02'14.749"W	6750.50	332.935	0.00	0.00	0.00

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Actual Wellpath Report

PEN-20F-HS AWP Proj: 13384'
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REFERENCE WELLPATH IDENTIFICATION			
Operator	NOBLE ENERGY	Slot	Slot F
Area	Ritchie County, WV	Well	PEN-20F-HS
Field	Ritchie	Wellbore	PEN-20F-HS AWB
Facility	PEN-20 Pad		

TARGETS									
Name	MD [ft]	TVD [ft]	North [ft]	East [ft]	Grid East [US ft]	Grid North [US ft]	Latitude	Longitude	Shape
PEN-20F-HS BHL Rev-3		6202.27	6014.59	-3066.43	1565212.78	311221.98	39°20'39.386"N	81°02'14.685"W	point
PEN-20F-HS LP Rev-3		6237.00	1200.00	973.50	1569252.51	306407.62	39°19'52.487"N	81°01'22.232"W	point
PEN-20 ALT Vertices		6948.00	-3.50	-30.34	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 Cokely Tract 1		6948.00	-3.50	-30.34	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 Cokely Tract 2		6948.00	-3.50	-30.34	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 LL		6948.00	-3.50	-30.34	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 Parcel 3.12-1.2		6948.00	-3.50	-30.34	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon

WELLPATH COMPOSITION - Ref Wellbore: PEN-20F-HS AWB Ref Wellpath: PEN-20F-HS AWP Proj: 13384'				
Start MD [ft]	End MD [ft]	Positional Uncertainty Model	Log Name/Comment	Wellbore
26.00	3786.00	Generic gyro - northseeking (Standard)	01_MS Gyro <12-3/4"> (100'-3786')	PEN-20F-HS AWB
3786.00	5365.00	ISCWSA MWD, Rev. 2 (Standard)	02_Scientific EM <12-3/4"> (3786')(3797'-5365') Proj:5455'	PEN-20F-HS AWB
5365.00	13356.00	NaviTrak (AT Curve Short Spaced)	03_BHI AT Curve <8-3/4"> (5365')(5480'-13356')	PEN-20F-HS AWB
13356.00	13384.00	Blind Drilling (std)	Projection to bit	PEN-20F-HS AWB



Actual Wellpath Report

PEN-20F-HS AWP Proj: 13384'

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REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY	Slot	Slot F
Area	Ritchie County, WV	Well	PEN-20F-HS
Field	Ritchie	Wellbore	PEN-20F-HS AWB
Facility	PEN-20 Pad		

COMMENTS

Wellpath general comments

API: 47-085-10123-0000

BHI Job #: 6697417

Rig: Nomac 78

Duration: 1/6/2015-1/11/2015

MS Gyro <12-3/4"> (100'-3786')

Scientific EM <12-3/4"> (3786')(3797'-5365')

BHI AT Curve <8-3/4"> (5365')(5480'-13356')

Projected MD at TD: 13384'



NOBLE ENERGY

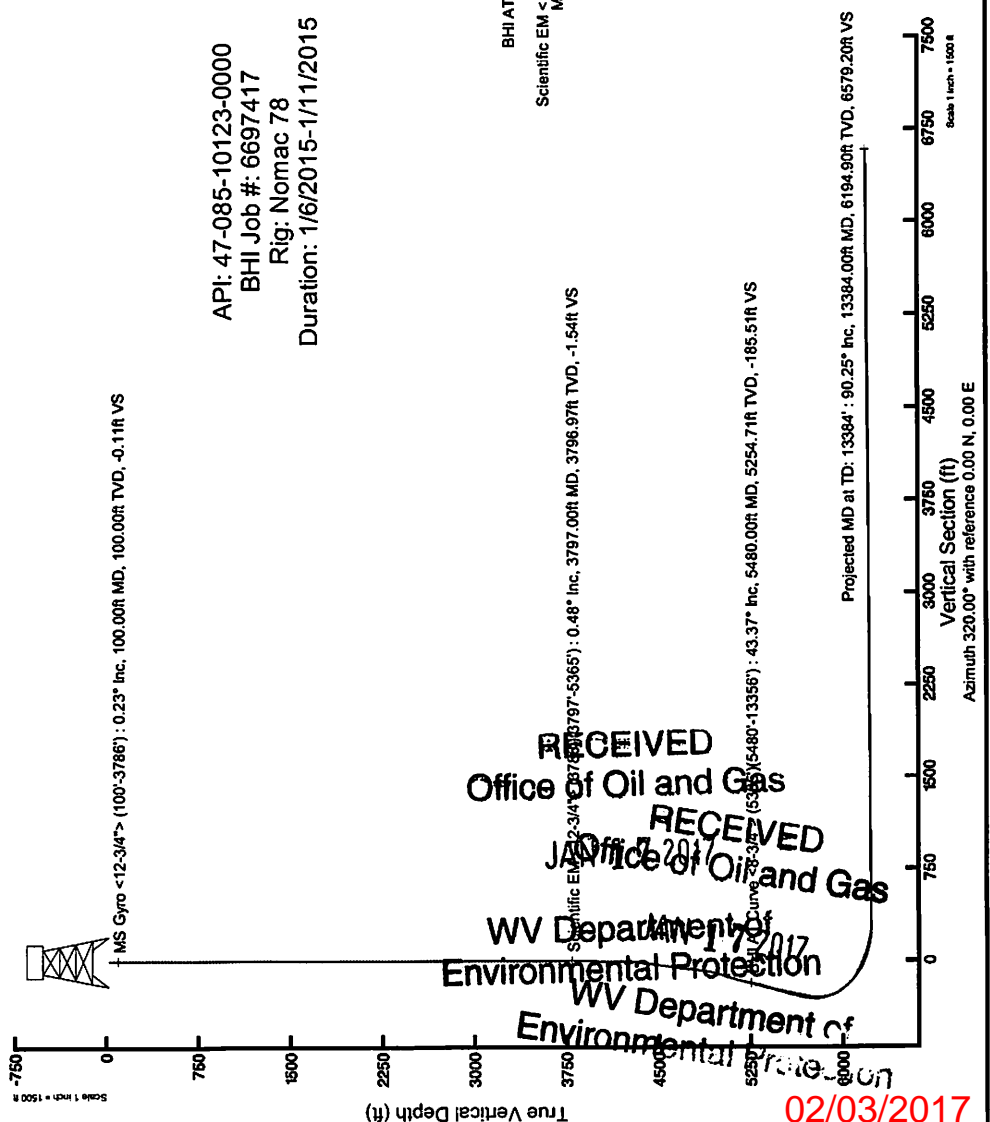


Location: Ritchie County, WV
 Field: Ritchie
 Facility: PEN-20 Pad

Slot: Slot F
 Well: PEN-20F-HS
 Wellbore: PEN-20F-HS PWB

Plot reference system is PEN-20F-HS PWB Rev-0.0
 True vertical depths are referenced to Normac 78 (RKB)
 Measured depths are referenced to Normac 78 (RKB)
 Normac 78 (RKB) to Mean Sea Level: 1026 feet
 Mean Sea Level to Mud line (At Slot, Slot F): -1026 feet
 Coordinates are in feet referenced to Slot
 Created by: abeyan on 19/Jun/2015

Location Information			
Facility Name	Grid East (US ft)	Grid North (US ft)	Longitude
PEN-20 Pad	1588205.800	305275.500	81°01'35.308"W
Local N (ft)	Local E (ft)	Grid North (US ft)	Longitude
Slot F	-67.90	73.26	81°01'34.360"W
Slot F	1588270.060	305207.880	
Normac 78 (RKB) to Mud line (At Slot, Slot F)	26ft		
Mean Sea Level to Mud line (At Slot, Slot F)	-1026ft		
Normac 78 (RKB) to Mean Sea Level	1055ft		



API: 47-085-10123-0000
 BHI Job #: 6697417
 Rig: Normac 78
 Duration: 1/6/2015-1/11/2015

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 WV Department of Environmental Protection

02/03/2017

User specified (HDGM) Dip: 66.78° Field: 52155 nT
 Magnetic North is 7.90 degrees West of True North (at 28/Dec/2014)
 To correct azimuth from True to Grid add 0.97 degrees
 To correct azimuth from Magnetic to Grid subtract 6.98 degrees