



## Actual Wellpath Report

PEN-20E-HS AWP Proj: 14382'

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### REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY	Slot	Slot E
Area	Ritchie County, WV	Well	PEN-20E-HS
Field	Ritchie	Wellbore	PEN-20E-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	Kroschr
Scale	0.999954	Report Generated	12/16/2014 at 1:29:20 PM
Convergence at slot	0.97° West	Database/Source file	WA_NorthEast/PEN-20E-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	-54.54	58.77	1568264.57	305221.04	39°19'40.595"N	81°01'34.547"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 E)	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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Field	Ritchie	Wellbore	PEN-20E-HS AWB
Facility	PEN-20 Pad		

## WELLPATH DATA (154 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 [p/100ft]
0.00†	0.000	197.880	0.00	0.00	0.00	0.00	1568264.57	305221.04	39°19'40.595"N	81°01'34.547"W	0.00	0.000	0.00
26.00	0.000	197.880	26.00	0.00	0.00	0.00	1568264.57	305221.04	39°19'40.595"N	81°01'34.547"W	0.00	0.000	0.00
100.00	0.270	197.880	100.00	-0.09	-0.17	-0.05	1568264.52	305220.87	39°19'40.593"N	81°01'34.547"W	0.17	197.880	0.36
200.00	0.270	239.950	200.00	-0.18	-0.51	-0.33	1568264.24	305220.53	39°19'40.590"N	81°01'34.551"W	0.61	212.985	0.19
300.00	0.050	58.240	300.00	-0.14	-0.60	-0.50	1568264.07	305220.44	39°19'40.589"N	81°01'34.553"W	0.78	219.469	0.32
400.00	0.220	83.160	400.00	-0.25	-0.56	-0.27	1568264.30	305220.48	39°19'40.589"N	81°01'34.550"W	0.62	205.760	0.18
500.00	0.130	142.610	500.00	-0.47	-0.62	-0.01	1568264.56	305220.42	39°19'40.589"N	81°01'34.547"W	0.62	180.860	0.19
515.00	0.060	116.040	515.00	-0.50	-0.64	0.01	1568264.58	305220.40	39°19'40.589"N	81°01'34.547"W	0.64	179.290	0.54
689.00	1.120	321.790	688.99	1.12	0.65	-0.96	1568263.61	305221.69	39°19'40.601"N	81°01'34.559"W	1.16	304.233	0.67
779.00	0.740	62.350	778.98	1.87	1.62	-0.99	1568263.58	305222.66	39°19'40.611"N	81°01'34.560"W	1.90	328.465	1.61
874.00	2.300	78.710	873.94	0.83	2.27	1.42	1568265.99	305223.31	39°19'40.618"N	81°01'34.529"W	2.68	32.017	1.69
970.00	4.540	75.310	969.77	-1.72	3.61	6.99	1568271.56	305224.65	39°19'40.632"N	81°01'34.459"W	7.87	62.647	2.34
1066.00	7.730	62.460	1065.21	-4.74	7.56	16.39	1568280.96	305228.60	39°19'40.672"N	81°01'34.340"W	18.05	65.225	3.60
1161.00	11.880	60.510	1158.80	-7.90	15.34	30.37	1568295.14	305236.37	39°19'40.752"N	81°01'34.161"W	34.20	63.361	4.38
1257.00	15.490	65.210	1252.06	-13.07	25.58	50.82	1568315.39	305246.62	39°19'40.856"N	81°01'33.906"W	56.89	63.283	3.93
1352.00	16.890	68.150	1343.29	-20.70	36.03	75.15	1568339.71	305257.07	39°19'40.964"N	81°01'33.598"W	83.34	64.381	1.71
1448.00	16.770	69.670	1435.18	-29.71	46.04	101.08	1568365.64	305267.07	39°19'41.067"N	81°01'33.271"W	111.07	65.513	0.48
1544.00	17.470	71.590	1526.93	-39.67	55.40	127.74	1568392.30	305276.44	39°19'41.164"N	81°01'32.934"W	139.23	66.554	0.94
1639.00	21.290	74.560	1616.53	-52.09	64.50	157.90	1568422.47	305285.53	39°19'41.259"N	81°01'32.552"W	170.57	67.782	4.15
1735.00	25.010	76.190	1704.79	-68.30	73.99	194.42	1568458.98	305295.02	39°19'41.359"N	81°01'32.089"W	208.02	69.166	3.93
1830.00	24.460	74.450	1791.07	-85.30	84.05	232.87	1568497.43	305305.09	39°19'41.465"N	81°01'31.602"W	247.58	70.154	0.96
1926.00	22.430	72.990	1879.14	-100.68	94.74	269.54	1568530.09	305315.77	39°19'41.576"N	81°01'31.138"W	285.70	70.634	2.20
2022.00	24.010	71.080	1967.37	-114.86	106.43	305.53	1568570.08	305327.46	39°19'41.698"N	81°01'30.682"W	323.54	70.794	1.82
2117.00	28.370	73.900	2052.60	-130.96	118.96	345.52	1568610.07	305340.00	39°19'41.828"N	81°01'30.176"W	365.42	71.001	4.77
2212.00	27.770	71.410	2136.42	-148.19	132.28	388.18	1568652.73	305353.31	39°19'41.967"N	81°01'29.636"W	410.10	71.183	1.39
2307.00	25.420	68.550	2221.37	-162.76	146.79	428.14	1568692.69	305367.82	39°19'42.117"N	81°01'29.131"W	452.61	71.075	2.82
2403.00	22.320	62.070	2309.16	-173.13	162.87	463.44	1568727.99	305383.90	39°19'42.282"N	81°01'28.685"W	491.23	70.636	4.23
2499.00	20.740	59.030	2398.46	-179.61	180.16	494.12	1568758.67	305401.19	39°19'42.458"N	81°01'28.299"W	525.94	69.968	2.01
2594.00	21.830	60.920	2486.98	-185.59	197.40	523.99	1568788.53	305418.43	39°19'42.634"N	81°01'27.922"W	559.93	69.357	1.36
2691.00	20.220	60.670	2576.59	-192.05	214.20	554.05	1568818.59	305435.23	39°19'42.805"N	81°01'27.544"W	594.01	68.863	1.68

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REFERENCE WELLPATH IDENTIFICATION			
Operator	NOBLE ENERGY	Slot	Slot E
Area	Ritchie County, WV	Well	PEN-20E-HS
Field	Ritchie	Wellbore	PEN-20E-HS AWB
Facility	PEN-20 Pad		

## WELLPATH DATA (154 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]
2786.00	18.860	62.990	2667.06	-198.61	229.38	582.34	1568846.88	305450.41	39°19'42.959"N	81°01'27.187"W	625.88	68.501	1.63
2881.00	18.180	70.850	2757.15	-207.33	241.21	610.02	1568874.56	305462.24	39°19'43.081"N	81°01'26.837"W	655.98	68.425	2.72
2976.00	19.210	74.410	2847.14	-219.07	250.28	639.08	1568903.62	305471.30	39°19'43.175"N	81°01'26.469"W	686.34	68.614	1.62
3072.00	19.850	73.200	2937.62	-232.02	259.23	669.90	1568934.43	305480.26	39°19'43.269"N	81°01'26.079"W	718.30	68.845	0.79
3167.00	20.660	71.690	3026.74	-244.57	269.16	701.25	1568965.78	305490.19	39°19'43.372"N	81°01'25.683"W	751.13	69.002	1.01
3263.00	22.130	73.460	3116.13	-258.02	279.63	734.66	1568999.20	305500.65	39°19'43.481"N	81°01'25.260"W	786.08	69.162	1.67
3358.00	25.000	74.950	3203.20	-273.62	289.94	771.21	1569035.74	305510.96	39°19'43.589"N	81°01'24.797"W	823.91	69.396	3.09
3453.00	22.380	73.190	3290.19	-289.21	300.38	807.91	1569072.44	305521.41	39°19'43.699"N	81°01'24.332"W	861.95	69.605	2.86
3549.00	20.930	72.390	3379.41	-302.94	310.85	841.75	1569106.28	305531.88	39°19'43.808"N	81°01'23.904"W	897.32	69.731	1.54
3645.00	19.980	74.400	3469.35	-316.25	320.45	873.90	1569138.42	305541.48	39°19'43.908"N	81°01'23.497"W	930.80	69.862	1.23
3739.00	20.290	74.030	3557.61	-329.52	329.26	905.03	1569169.56	305550.28	39°19'44.000"N	81°01'23.103"W	963.06	70.008	0.36
3835.00	22.160	71.880	3647.10	-343.05	339.47	938.25	1569202.77	305560.49	39°19'44.107"N	81°01'22.682"W	997.77	70.109	2.11
3929.00	23.750	72.680	3733.65	-356.95	350.62	973.17	1569237.69	305571.64	39°19'44.223"N	81°01'22.240"W	1034.40	70.187	1.72
4024.00	22.050	73.500	3821.16	-371.44	361.38	1008.53	1569273.05	305582.40	39°19'44.335"N	81°01'21.793"W	1071.32	70.286	1.82
4119.00	22.160	73.310	3909.18	-385.64	371.59	1042.79	1569307.31	305592.61	39°19'44.442"N	81°01'21.359"W	1107.02	70.387	0.14
4213.00	21.230	72.590	3996.52	-399.19	381.77	1076.01	1569340.53	305602.79	39°19'44.548"N	81°01'20.938"W	1141.73	70.465	1.03
4305.00	22.310	72.810	4081.95	-412.36	391.92	1108.59	1569373.11	305612.94	39°19'44.654"N	81°01'20.526"W	1175.83	70.530	1.18
4399.00	22.750	72.130	4168.78	-426.13	402.77	1142.93	1569407.45	305623.79	39°19'44.767"N	81°01'20.091"W	1211.83	70.588	0.54
4491.00	22.080	71.690	4253.83	-439.22	413.66	1176.28	1569440.80	305634.68	39°19'44.880"N	81°01'19.669"W	1246.90	70.625	0.75
4586.00	20.710	71.050	4342.28	-451.85	424.72	1209.12	1569473.63	305645.74	39°19'44.995"N	81°01'19.254"W	1281.55	70.645	1.46
4681.00	19.140	72.260	4431.59	-463.78	434.93	1239.84	1569504.36	305655.94	39°19'45.101"N	81°01'18.865"W	1313.92	70.670	1.71
4775.00	19.780	78.370	4520.23	-477.18	442.83	1270.10	1569534.61	305666.85	39°19'45.184"N	81°01'18.482"W	1345.09	70.779	2.27
4870.00	19.930	80.050	4609.58	-492.93	448.87	1301.80	1569566.30	305669.88	39°19'45.249"N	81°01'18.080"W	1377.01	70.976	0.62
4965.00	16.700	80.250	4699.76	-507.92	453.98	1331.21	1569595.71	305674.99	39°19'45.304"N	81°01'17.707"W	1406.49	71.169	3.40
5060.00	14.420	79.190	4791.27	-520.56	458.51	1356.28	1569620.79	305679.53	39°19'45.353"N	81°01'17.389"W	1431.69	71.322	2.42
5155.00	11.750	81.160	4883.35	-532.30	462.50	1379.29	1569643.80	305683.52	39°19'45.397"N	81°01'17.097"W	1454.77	71.463	0.64
5250.00	9.690	82.850	4975.17	-545.23	465.87	1403.44	1569667.94	305686.89	39°19'45.434"N	81°01'16.790"W	1478.74	71.636	1.79
5345.00	8.540	84.170	5066.20	-560.24	468.92	1430.42	1569694.93	305689.94	39°19'45.469"N	81°01'16.448"W	1505.32	71.850	1.99
5439.00	7.550	81.350	5155.58	-575.98	472.61	1459.30	1569723.80	305693.63	39°19'45.510"N	81°01'16.081"W	1533.92	72.055	1.42
5497.00	7.260	81.060	5174.55	-579.25	473.58	1465.54	1569730.04	305694.59	39°19'45.520"N	81°01'16.002"W	1540.16	72.092	1.52

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Area	Ritchie County, WV	Well	PEN-20E-HS
Field	Ritchie	Wellbore	PEN-20E-HS_AWB
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5544.00	15.080	81.110	5255.97	-591.84	477.35	1489.62	1569754.12	305698.37	39°19'45.562"N	81°00'15.696"W	1564.24	72.232	3.74
5639.00	17.830	77.760	5347.07	-605.00	482.35	1516.05	1569780.55	305703.37	39°19'45.616"N	81°00'13.361"W	1590.94	72.351	3.06
5733.00	22.970	69.690	5435.17	-617.89	491.77	1547.35	1569811.84	305712.79	39°19'45.714"N	81°00'14.965"W	1623.61	72.369	6.22
5828.00	32.380	74.580	5519.21	-634.76	505.00	1589.35	1569853.85	305726.02	39°19'45.852"N	81°00'14.433"W	1667.65	72.373	10.18
5923.00	39.280	62.420	5596.29	-651.85	525.74	1640.66	1569905.15	305746.76	39°19'46.065"N	81°00'13.785"W	1722.84	72.232	10.41
6018.00	40.610	44.940	5669.35	-655.61	561.67	1689.31	1569953.80	305782.68	39°19'46.428"N	81°00'13.174"W	1780.23	71.609	11.87
6113.00	40.320	28.780	5741.83	-641.72	610.63	1726.05	1569990.54	305831.64	39°19'46.918"N	81°00'12.717"W	1830.88	70.518	11.02
6207.00	40.680	25.950	5813.31	-618.22	664.83	1754.10	1570018.58	305885.84	39°19'47.459"N	81°00'12.371"W	1875.86	69.242	1.99
6303.00	42.940	21.900	5884.88	-590.06	723.33	1779.99	1570044.48	305944.33	39°19'48.041"N	81°00'12.055"W	1921.35	67.885	3.67
6397.00	49.360	13.550	5950.02	-553.72	787.83	1800.33	1570064.82	306008.83	39°19'48.682"N	81°00'11.810"W	1965.17	66.366	9.35
6491.00	56.110	6.620	6006.95	-505.64	861.40	1813.21	1570077.69	306082.40	39°19'49.411"N	81°00'11.662"W	2007.42	64.589	9.27
6586.00	58.370	1.950	6058.37	-448.45	941.03	1819.14	1570083.62	306162.02	39°19'50.199"N	81°00'11.603"W	2048.12	62.648	4.77
6681.00	62.990	354.980	6104.93	-383.60	1023.73	1816.81	1570081.29	306244.72	39°19'51.016"N	81°00'11.651"W	2085.38	60.600	8.03
6776.00	66.950	347.210	6145.16	-309.93	1108.65	1803.40	1570067.89	306329.64	39°19'51.853"N	81°00'11.840"W	2116.92	58.419	8.50
6871.00	71.950	337.790	6178.56	-227.84	1193.30	1776.59	1570041.07	306414.29	39°19'52.685"N	81°00'12.199"W	2140.15	56.111	10.67
6966.00	76.840	330.640	6204.14	-139.22	1275.58	1736.77	1570001.25	306496.56	39°19'53.491"N	81°00'12.724"W	2154.87	53.704	8.89
7062.00	83.020	323.960	6220.94	-45.56	1355.00	1685.71	1569950.20	306575.98	39°19'54.268"N	81°00'13.390"W	2162.79	51.207	9.40
7157.00	88.000	316.340	6228.38	49.04	1427.62	1625.07	1569889.57	306648.59	39°19'54.975"N	81°00'14.177"W	2163.09	48.701	9.56
7253.00	90.030	311.250	6230.04	144.43	1494.03	1555.81	1569820.31	306714.99	39°19'55.620"N	81°00'15.073"W	2157.01	46.161	5.71
7349.00	90.090	306.670	6229.94	238.63	1554.37	1481.19	1569745.69	306775.34	39°19'56.204"N	81°00'16.036"W	2147.09	43.619	4.77
7445.00	89.970	307.000	6229.89	332.11	1611.93	1404.35	1569668.85	306832.89	39°19'56.760"N	81°00'17.026"W	2137.87	41.063	0.37
7540.00	89.910	310.320	6229.98	425.24	1671.26	1330.18	1569594.69	306892.22	39°19'57.334"N	81°00'17.982"W	2136.00	38.517	3.50
7635.00	89.940	313.690	6230.11	519.30	1734.83	1259.60	1569524.11	306955.78	39°19'57.950"N	81°00'18.894"W	2143.88	35.982	3.55
7730.00	90.030	318.030	6230.13	615.03	1803.70	1192.76	1569457.27	307024.66	39°19'58.619"N	81°00'19.760"W	2162.41	33.476	4.52
7825.00	90.180	317.460	6229.96	709.95	1874.02	1128.88	1569393.39	307094.97	39°19'59.304"N	81°00'20.588"W	2187.76	31.064	0.62
7920.00	89.910	318.890	6229.88	805.90	1945.55	1064.86	156929.38	307166.50	39°20'00.000"N	81°00'21.418"W	2217.91	28.693	1.52
8015.00	90.400	322.620	6229.63	900.88	2019.11	1004.77	1569269.29	307240.06	39°20'00.717"N	81°00'22.198"W	2255.30	26.456	3.96
8110.00	90.310	328.680	6229.03	996.36	2098.33	950.63	1569215.15	307319.27	39°20'01.491"N	81°00'22.904"W	2303.63	24.372	6.31
8205.00	90.860	334.210	6228.05	1090.41	2182.62	904.76	1569169.29	307403.55	39°20'02.316"N	81°00'23.506"W	2362.71	22.515	5.79
8300.00	90.740	333.060	6226.72	1182.73	2267.73	862.58	1569127.11	307488.66	39°20'03.150"N	81°00'24.061"W	2426.24	20.825	1.22

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 02/03/2017





# Actual Wellpath Report

PEN-20E-HS AWP Proj: 14382'

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REFERENCE WELLPATH IDENTIFICATION			
Operator	NOBLE ENERGY	Slot	Slot E
Area	Ritchie County, WV	Well	PEN-20E-HS
Field	Ritchie	Wellbore	PEN-20E-HS AWB
Facility	PEN-20 Pad		

**WELLPATH DATA (154 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]
8400.00	90.650	332.250	6225.56	1276.39	2352.99	818.48	1569083.01	307573.92	39°20'03.985"N	81°01'24.641"W	2491.28	19.180	0.85
8495.00	90.400	329.450	6224.69	1369.67	2435.95	772.22	1569036.75	307656.87	39°20'04.797"N	81°01'25.247"W	2555.42	17.589	2.96
8591.00	90.250	325.820	6224.15	1464.81	2517.02	720.84	1568985.37	307737.94	39°20'05.590"N	81°01'25.918"W	2618.21	15.981	3.78
8686.00	90.430	320.790	6223.58	1559.62	2593.17	664.09	1568928.62	307814.08	39°20'06.333"N	81°01'26.657"W	2676.85	14.364	5.30
8782.00	89.820	313.790	6223.37	1655.45	2663.66	599.01	1568863.55	307884.58	39°20'07.018"N	81°01'27.500"W	2730.19	12.674	7.32
8877.00	89.880	312.240	6223.62	1749.74	2728.47	529.55	1568794.10	307949.38	39°20'07.647"N	81°01'28.398"W	2779.38	10.984	1.63
8972.00	90.150	312.910	6223.60	1843.94	2792.74	459.60	1568724.14	308013.65	39°20'08.271"N	81°01'29.302"W	2830.31	9.345	0.76
9068.00	90.120	313.450	6223.37	1939.26	2858.43	389.59	1568654.14	308079.34	39°20'08.908"N	81°01'30.207"W	2884.86	7.761	0.56
9163.00	89.850	317.160	6223.39	2033.93	2925.95	322.79	1568587.34	308146.85	39°20'09.564"N	81°01'31.072"W	2943.71	6.295	3.92
9259.00	89.970	318.520	6223.54	2129.86	2997.12	258.35	1568522.91	308218.01	39°20'10.256"N	81°01'31.907"W	3008.23	4.927	1.42
9354.00	89.820	318.060	6223.72	2224.81	3068.03	195.14	1568459.71	308288.93	39°20'10.947"N	81°01'32.727"W	3074.23	3.639	0.51
9450.00	89.820	319.230	6224.02	2320.79	3140.09	131.72	1568396.28	308360.98	39°20'11.648"N	81°01'33.550"W	3142.85	2.402	1.22
9546.00	89.940	320.690	6224.22	2416.78	3213.59	69.96	1568334.53	308434.47	39°20'12.364"N	81°01'34.351"W	3214.35	1.247	1.53
9642.00	89.940	320.140	6224.32	2512.78	3287.57	8.79	1568273.36	308508.46	39°20'13.085"N	81°01'35.146"W	3287.59	0.153	0.57
9737.00	90.590	320.110	6223.88	2607.78	3360.48	-52.12	1568212.45	308581.36	39°20'13.795"N	81°01'35.937"W	3360.88	359.111	0.68
9833.00	89.880	318.330	6223.49	2703.76	3433.17	-114.82	1568149.76	308654.04	39°20'14.503"N	81°01'36.750"W	3435.09	358.085	2.00
9928.00	89.880	317.230	6223.69	2798.69	3503.52	-178.65	1568085.92	308724.39	39°20'15.187"N	81°01'37.578"W	3508.07	357.081	1.16
10023.00	90.250	316.950	6223.58	2893.57	3573.10	-243.34	1568021.25	308793.97	39°20'15.864"N	81°01'38.416"W	3581.38	356.104	0.49
10118.00	90.860	320.960	6222.66	2988.53	3644.73	-305.70	1567958.88	308865.60	39°20'16.562"N	81°01'39.225"W	3657.53	355.206	4.27
10214.00	90.220	321.550	6221.75	3084.50	3719.60	-365.78	1567898.81	308940.46	39°20'17.291"N	81°01'40.006"W	3737.54	354.384	0.91
10310.00	90.890	327.930	6220.82	3180.12	3797.94	-421.17	1567843.42	309018.80	39°20'18.056"N	81°01'40.728"W	3821.23	353.672	6.68
10405.00	90.920	327.130	6219.32	3274.28	3878.08	-472.16	1567792.43	309098.94	39°20'18.840"N	81°01'41.394"W	3906.72	353.058	0.84
10501.00	90.250	322.700	6218.34	3369.90	3956.62	-527.33	1567737.27	309177.47	39°20'19.606"N	81°01'42.113"W	3991.60	352.409	4.67
10597.00	90.430	318.100	6217.77	3465.87	4030.56	-588.50	1567676.10	309251.41	39°20'20.327"N	81°01'42.907"W	4073.30	351.693	4.80
10692.00	90.220	314.640	6217.23	3560.67	4099.31	-654.04	1567610.56	309320.16	39°20'20.995"N	81°01'43.756"W	4151.16	350.935	3.65
10788.00	89.750	311.540	6217.26	3655.96	4164.89	-724.14	1567540.47	309385.73	39°20'21.632"N	81°01'44.662"W	4227.37	350.137	3.27
10883.00	90.090	314.110	6217.39	3750.22	4229.58	-793.70	1567470.91	309450.42	39°20'22.259"N	81°01'45.562"W	4303.41	349.372	2.94
10979.00	90.150	317.140	6217.19	3845.95	4298.31	-860.71	1567403.91	309519.14	39°20'22.927"N	81°01'46.429"W	4383.64	348.677	2.95
11075.00	90.310	319.890	6216.81	3940.91	4369.47	-923.63	1567340.98	309590.30	39°20'23.620"N	81°01'47.245"W	4466.02	348.064	2.90
11169.00	90.520	322.610	6216.12	4035.87	4443.55	-983.09	1567281.53	309664.38	39°20'24.342"N	81°01'48.018"W	4551.00	347.525	2.87

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# Actual Wellpath Report

PEN-20E-HS AWP Proj: 14382'  
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REFERENCE WELLPATH IDENTIFICATION			
Operator	NOBLE ENERGY	Slot	Slot E
Area	Ritchie County, WV	Well	PEN-20E-HS
Field	Ritchie	Wellbore	PEN-20E-HS AWB
Facility	PEN-20 Pad		

**WELLPATH DATA (154 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]
11265.00	90.460	322.300	6215.30	4131.78	4519.66	-1041.58	1567223.04	309740.49	39°20'25.084"N	81°01'48.779"W	4638.13	347.022	0.33
11361.00	90.250	320.320	6214.70	4227.75	4594.59	-1101.59	1567163.03	309815.41	39°20'25.814"N	81°01'49.559"W	4724.80	346.517	2.07
11456.00	89.910	320.440	6214.57	4322.75	4667.77	-1162.17	1567102.45	309888.58	39°20'26.527"N	81°01'50.346"W	4810.27	346.019	0.38
11552.00	89.970	320.610	6214.67	4418.74	4741.87	-1223.20	1567041.43	309962.68	39°20'27.249"N	81°01'51.139"W	4897.10	345.535	0.19
11647.00	89.940	320.060	6214.75	4513.74	4815.00	-1283.84	1566980.79	310035.81	39°20'27.962"N	81°01'51.926"W	4983.22	345.070	0.58
11743.00	90.000	321.300	6214.80	4609.73	4889.26	-1344.67	1566919.97	310110.07	39°20'28.685"N	81°01'52.716"W	5070.80	344.622	1.29
11839.00	90.280	322.030	6214.56	4705.69	4964.57	-1404.21	1566860.42	310185.37	39°20'29.420"N	81°01'53.490"W	5159.33	344.207	0.81
11934.00	90.370	322.610	6214.02	4800.61	5039.75	-1462.28	1566802.36	310260.55	39°20'30.153"N	81°01'54.246"W	5247.60	343.820	0.62
12030.00	90.250	323.010	6213.50	4896.49	5116.23	-1520.31	1566744.33	310337.02	39°20'30.899"N	81°01'55.001"W	5337.33	343.450	0.44
12125.00	90.220	323.280	6213.12	4991.35	5192.24	-1577.29	1566687.36	310413.03	39°20'31.640"N	81°01'55.742"W	5426.53	343.102	0.29
12221.00	90.250	323.120	6212.72	5087.20	5269.11	-1634.79	1566629.85	310489.90	39°20'32.390"N	81°01'56.491"W	5516.89	342.763	0.17
12316.00	90.310	322.900	6212.26	5182.07	5344.99	-1691.95	1566572.70	310565.77	39°20'33.131"N	81°01'57.235"W	5606.39	342.435	0.24
12412.00	90.400	321.940	6211.66	5277.98	5421.07	-1750.50	1566514.16	310641.85	39°20'33.872"N	81°01'57.996"W	5696.68	342.104	1.00
12508.00	90.280	318.700	6211.09	5373.96	5494.94	-1811.78	1566452.87	310715.72	39°20'34.592"N	81°01'58.792"W	5785.92	341.752	3.38
12604.00	90.430	315.590	6210.50	5469.83	5565.31	-1877.07	1566387.59	310786.08	39°20'35.277"N	81°01'59.638"W	5873.33	341.362	3.24
12700.00	90.340	313.850	6209.85	5565.41	5632.85	-1945.28	1566319.38	310853.62	39°20'35.933"N	81°02'00.521"W	5959.29	340.948	1.81
12795.00	90.220	311.810	6209.39	5659.67	5697.43	-2014.94	1566249.72	310918.20	39°20'36.559"N	81°02'01.422"W	6043.24	340.523	2.15
12891.00	90.520	314.560	6208.77	5754.98	5763.12	-2084.93	1566179.74	310983.89	39°20'37.196"N	81°02'02.327"W	6128.66	340.111	2.88
12986.00	88.740	313.810	6209.38	5849.48	5829.33	-2153.05	1566111.62	311050.09	39°20'37.839"N	81°02'03.208"W	6214.23	339.728	2.03
13082.00	90.250	319.340	6210.23	5945.27	5899.02	-2219.01	1566045.66	311119.78	39°20'38.517"N	81°02'04.063"W	6302.58	339.385	5.97
13177.00	90.490	327.110	6209.61	6040.04	5975.05	-2275.84	1565988.84	311195.81	39°20'39.258"N	81°02'04.802"W	6393.80	339.149	8.18
13273.00	90.280	341.410	6208.97	6132.84	6061.30	-2317.43	1565947.26	311282.05	39°20'40.104"N	81°02'05.350"W	6489.21	339.077	14.90
13368.00	90.180	349.630	6208.58	6218.50	6153.21	-2341.16	1565923.52	311373.95	39°20'41.008"N	81°02'05.672"W	6583.54	339.169	8.65
13463.00	90.740	349.550	6207.82	6301.10	6246.64	-2358.32	1565906.36	311467.38	39°20'41.928"N	81°02'05.911"W	6676.99	339.317	0.60
13559.00	91.660	343.210	6205.81	6387.04	6339.87	-2380.91	1565883.77	311560.61	39°20'42.846"N	81°02'06.219"W	6772.20	339.417	6.67
13655.00	90.890	333.400	6203.67	6478.05	6428.94	-2416.35	1565848.34	311649.67	39°20'43.720"N	81°02'06.689"W	6868.04	339.401	10.25
13750.00	90.460	324.570	6202.55	6571.79	6510.27	-2465.25	1565799.44	311731.00	39°20'44.516"N	81°02'07.329"W	6961.40	339.260	9.31
13845.00	90.680	323.000	6201.60	6666.57	6586.91	-2521.37	1565743.32	311807.63	39°20'45.263"N	81°02'08.060"W	7052.99	339.054	1.67
13940.00	91.260	323.900	6199.99	6761.38	6663.21	-2577.94	1565686.76	311883.94	39°20'46.008"N	81°02'08.797"W	7144.52	338.849	1.13
14036.00	90.550	320.320	6198.48	6857.29	6738.95	-2636.88	1565627.82	311959.67	39°20'46.746"N	81°02'09.563"W	7236.48	338.630	3.80

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## Actual Wellpath Report

PEN-20E-HS AWP Proj: 14382'

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### REFERENCE WELLPATH IDENTIFICATION

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

### WELLPATH DATA (154 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]
14132.00	90.830	312.070	6197.32	6952.99	6808.17	-2703.27	1565561.43	312028.89	39°20'47.419"N	81°02'10.423"W	7325.22	338.344	8.60
14227.00	91.010	310.100	6195.79	7046.82	6870.59	-2774.86	1565489.84	312091.30	39°20'48.024"N	81°02'11.348"W	7409.78	338.007	2.08
14323.00	90.430	307.220	6194.59	7140.93	6930.55	-2849.81	1565414.90	312151.26	39°20'48.604"N	81°02'12.315"W	7493.59	337.648	3.06
14382.00	90.430	307.220	6194.14	7198.47	6966.24	-2896.79	1565367.92	312186.95	39°20'48.949"N	81°02'12.921"W	7544.53	337.421	0.00



# Actual Wellpath Report

PEN-20E-HS AWP Proj: 14382'

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## REFERENCE WELLPATH IDENTIFICATION

Operator	NOBLE ENERGY	Slot	Slot E
Area	Ritchie County, WV	Well	PEN-20E-HS
Field	Ritchie	Wellbore	PEN-20E-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-20E-HS LP Plat		6168.00	1650.00	1382.76	1569647.26	306870.96	39°19'57.132"N	81°01'17.309"W	point
PEN-20E-HS BHL Rev-2		6233.00	6877.48	-3003.63	1565261.08	312098.19	39°20'48.053"N	81°02'14.261"W	point
PEN-20E-HS LP Rev-2		6233.00	1361.97	1624.45	1569888.94	306582.94	39°19'54.326"N	81°01'14.171"W	point
PEN-20 ALT Vertices		6948.00	-16.86	-15.85	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 Cokely Tract 1		6948.00	-16.86	-15.85	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 Cokely Tract 2		6948.00	-16.86	-15.85	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 LL		6948.00	-16.86	-15.85	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon
PEN-20 Parcel 3.12-1.2		6948.00	-16.86	-15.85	1568248.72	305204.18	39°19'40.426"N	81°01'34.745"W	polygon

## WELLPATH COMPOSITION - Ref Wellbore: PEN-20E-HS AWB Ref Wellpath: PEN-20E-HS AWP Proj: 14382'

Start MD [ft]	End MD [ft]	Positional Uncertainty Model	Log Name/Comment	Wellbore
26.00	515.00	Generic gyro - northseeking (Standard)	01_MS Gyro <17-1/2"> (100'-515')	PEN-20E-HS AWB
515.00	5459.00	ISCWSA MWD, Rev. 2 (Standard)	02_APS EM <12-1/4"> (515')(689'-5459') Proj:5525'	PEN-20E-HS AWB
5459.00	14323.00	NaviTrak (AT Curve Short Spaced)	03_BHI AT Curve <8-3/4"> (5459')(5544'-14323')	PEN-20E-HS AWB
14323.00	14323.00	Blind Drilling (std)	Projection to bit	PEN-20E-HS AWB

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## Actual Wellpath Report

PEN-20E-HS AWP Proj: 14382'

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REFERENCE WELLPATH IDENTIFICATION			
Operator	NOBLE ENERGY	Slot	Slot E
Area	Ritchie County, WV	Well	PEN-20E-HS
Field	Ritchie	Wellbore	PEN-20E-HS AWB
Facility	PEN-20 Pad		

### COMMENTS

#### Wellpath general comments

API: 47-085-10122-0000

BHI Job #: 6697381

Rig: Nomac 78

Duration: 12.01.2014 – 12.14.2014

MS Gyro <17-1/2"> (100'-515')

APS EM <12-1/4"> (515')(689'-5459')

BHI AT Curve <8-3/4"> (5459')(5544'-14323')

Projected MD at TD: 14382'

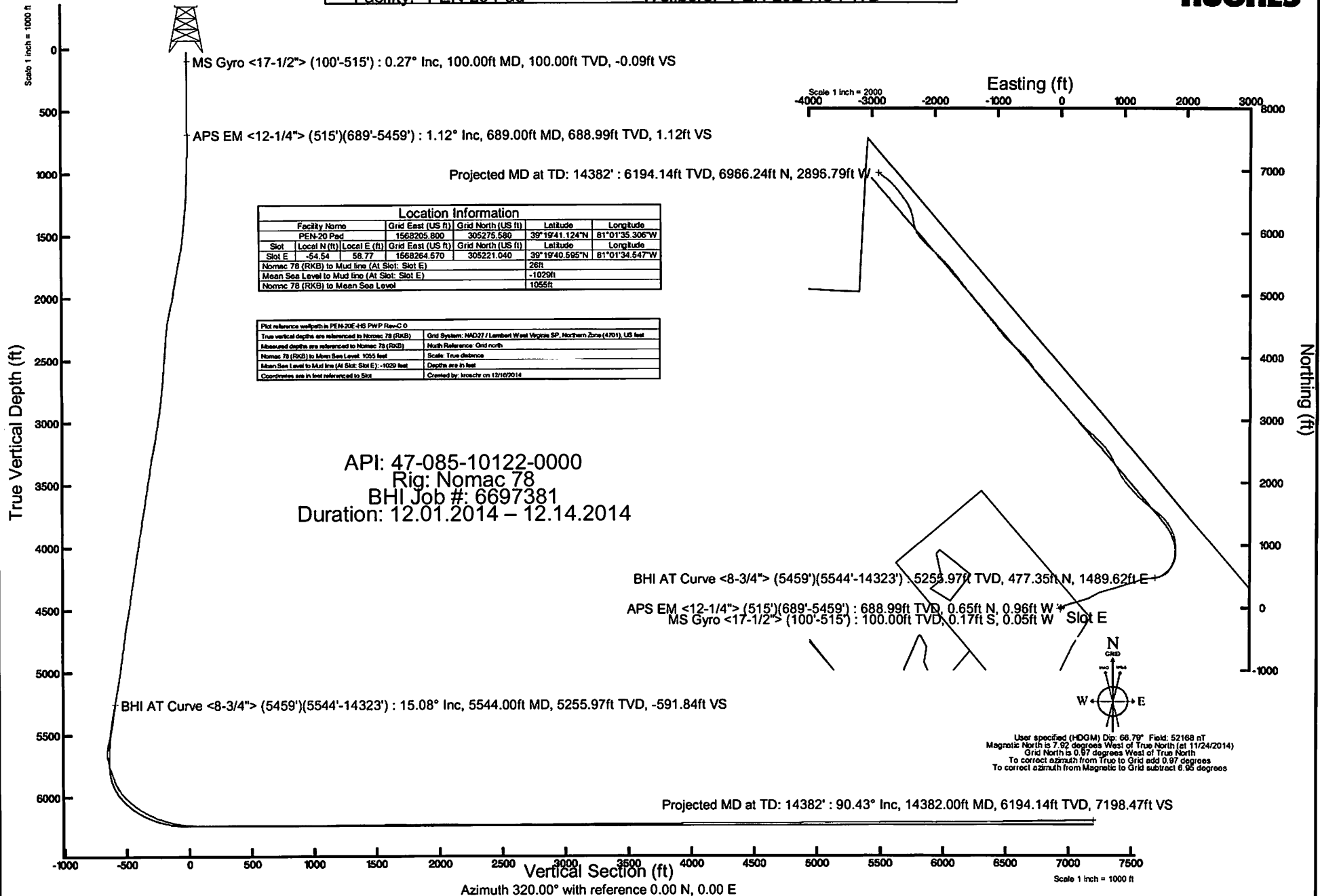
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# NOBLE ENERGY

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

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



Location Information			
Facility Name	Grid East (US ft)	Grid North (US ft)	Latitude Longitude
PEN-20 Pad	1568205.800	305275.580	39°19'41.124"N 81°01'35.306"W
Slot	Local N (ft)	Local E (ft)	Grid East (US ft) Grid North (US ft) Latitude Longitude
Slot E	-54.54	58.77	1568284.570 305221.040 39°19'40.585"N 81°01'34.547"W
Nomac 78 (RKB) to Mud line (At Slot: Slot E)	26ft		
Mean Sea Level to Mud line (At Slot: Slot E)	-1029ft		
Nomac 78 (RKB) to Mean Sea Level	1055ft		

Plot reference wellpath in PEN-20E-HS PWP Rev-C-0	
True vertical depths are referenced to Nomac 78 (RKB)	Grid System: NAD83 / Lambert West Virginia SP, Northern Zone (4/01), US feet
Measured depths are referenced to Nomac 78 (RKB)	North Reference: Grid north
Nomac 78 (RKB) to Mean Sea Level: 1055 feet	Scale: True distance
Mean Sea Level to Mud line (At Slot: Slot E): -1029 feet	Depth are in feet
Coordinates are in feet referenced to Slot	Created by: Inroch on 12/16/2014

User specified (HOGM) Dip: 68.79° Field: 52168 nT  
 Magnetic North is 7.92 degrees West of True North (at 11/24/2014)  
 Grid North is 0.97 degrees West of True North  
 To correct azimuth from True to Grid add 0.97 degrees  
 To correct azimuth from Magnetic to Grid subtract 6.95 degrees