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west virginia department of environmental protection

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Office of Oil and Gas  
601 57th Street SE  
Charleston, WV 25304  
(304) 926-0450  
(304) 926-0452 fax

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
[www.dep.wv.gov](http://www.dep.wv.gov)

## PERMIT MODIFICATION APPROVAL

March 28, 2014

NOBLE ENERGY, INC.  
333 TECHNOLOGY DRIVE, SUITE 110  
CANONSBURG, PA 15317

Re: Permit Modification Approval for API Number 8510055 , Well #: PEN2CHS  
**Extended Lateral**

Oil and Gas Operator:

The Office of Oil and Gas has reviewed the attached permit modification for the above referenced permit. The attached modification has been approved and well work may begin. Please be reminded that the oil and gas inspector is to be notified twenty-four (24) hours before permitted well work is commenced.

Please call James Martin at 304-926-0499, extension 1654 if you have any questions.

Sincerely,

for

Gene Smith

Regulatory/Compliance Manager  
Office of Oil and Gas



January 29, 2014

West Virginia Department of Environmental Protection  
601 57<sup>th</sup> Street, SE  
Charleston, WV 25304-2345

Re: PEN2 Wells API 47-085-10067 AHS/ 47-085-10068 BHS/ 47-085-10055 CHS

Dear Sirs:

Enclosed please find permit modifications to extend the lateral legs on the above referenced wells. I have enclosed a new casing program signed by the inspector, new survey plat and revised mineral exhibits. These wells are located in Ritchie County, WV.

Should you have any questions, or desire any additional information, please do not hesitate to contact me at 724-820-3061 or via email at [dswiger@nobleenergyinc.com](mailto:dswiger@nobleenergyinc.com).

Sincerely,

A handwritten signature in black ink, appearing to read 'Dee Swiger', written over a horizontal line.

Dee Swiger

Regulatory Analyst III

DS/

Enclosures:

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## Noble Energy Addendum

## Pennsboro PEN-2 site proposed well procedures

- Intermediate casing has been revised to extend below the Alexander and CTS.
- Southern laterals will be fractured while surrounding Consol offset wells are being pressure monitored
- Northern laterals will be fractured while surrounding Consol offset wells are being pressure monitored
- Operators of all offset wells will be contacted for monitoring as per tables below:

## Southern lateral offsets:

API	TD	Lease	Current Operator	TVD_SS
4708508880	5057	Walnut Investment Co 2	Key Oil Co.	3997
4708507336	5128	Mary Jo Stephens	Consol Gas Company	4059
4708507979	5130	J Ralph Hammond	Consol Gas Company	4060
4708508068	5158	Howard D Owings	Consol Gas Company	4069
4708507343	5352	WV Pulp&Papr	Consol Gas Company	4240
4708507977	5453	John A Smith 9	Pardee Exploration Co	4391
4708507534	5400	Harlan Hogue	Consol Gas Company	4470
4708503611	5985	James A Hogue	Consol Gas Company	4877
4708506894	5992	Richard L Goff	Seneca-Upshur Petroleum, LLC	5012
4708507211	5911	James H Kiger	Seneca-Upshur Petroleum, LLC	5086
4708509672	6300	Russell Fox Sr	Antero Resources Appalachian Corp.	5238
4708510042	6600	SCHMIDLE UNIT	Antero Resources Appalachian Corp.	5480
4708510043	6600	SCHMIDLE UNIT	Antero Resources Appalachian Corp.	5480
4708506974	5995	Hufford, Dwight & Eleanor	Seneca-Upshur Petroleum, LLC	4877

## Northern lateral offsets:

API	TD	Lease	Current Operator	TVD_SS
4707331065	4200	WV FARMING COMM	Hanlon Oil & Gas Co.	3560
4707302089	5015	Laura Whaley 1	Consol Gas Company	4015
4708507972	5054	Robert P Jackson 3	Consol Gas Company	4026
4708507993	5005	HERSCHEL H PIFER 2	Consol Gas Company	4036
4708507992	5032	Herschel H Pifer 1	Consol Gas Company	4041
4707301356	4880	Mary Elizabeth Jones 1	Pardee Exploration Co.	4042
4707302092	5095	Coastal Lumber 1	Consol Gas Company	4076
4707302088	5124	Mary Elizabeth Jones 3	Pardee Exploration Co	4093
4708507995	5006	Richard/Kenda Jones 1	Consol Gas Company	4176
4708507976	5300	John A Smith 8	Pardee Exploration Co	4246
4707302081	5026	Mary E Jones 2	Paulico Resources, Inc.	4248

4707302080	5234	Edna V Smith 1	Glass Development Company	4259
4708507985	5176	Edna V Smith 6	Pardee Exploration Co	4301
4708507974	5399	John A Smith 2	Pardee Exploration Co	4378
4708507975	5296	John A Smith 3	Pardee Exploration Co	4421
4708505456	5500	Edna Smith 4	Triad Hunter LLC	4505

- Noble will contact these operators prior to fracturing and guarantee that we can monitor all of the Consol operated offset wells unless the WVDEP deems it unnecessary based on the results from the PENS-1 neighboring pad pressure monitoring results.

Description of Pressure Monitoring

Pressure transducers, on both the tubing and annulus, shall monitor the flowing tubing pressures unless it is deemed necessary to shut in the well for safety reasons. For the deepest wells in the Rhinestreet and Marcellus we will recommend shutting in the wells for pressure monitoring.

- We anticipate setting low and high pressure triggers in our automated pressure monitoring system. Anything more than 100 psi above expected pressures or at 0 psi would trigger an event.
- Our fracturing treatments will be designed to reach close to 90 bpm, use a slick water formulation. Typically our sand volumes will be between 300,000 and 500,000 pounds of sand per stage.
- The plan is to fracture all of the laterals prior to flowback procedures. However, in the event of a trigger, we will cease pumping that frac stage and continue with the following stage until that lateral is fully stimulated. If we see high pressure in any monitor well, we will immediately cease fracing operations and flow back the well to alleviate pressure seen in the offset well.

Noble will audit the surrounding wells to be pressure monitored and install temporary 3000 psi wellheads as necessary.

Contingency:

- 1) Offset wells watering out – We are recommending that an affected offset operator wait for Noble to complete operations on that particular lateral including flowback to alleviate potential pressure surges before any offset operator intervenes.

STATE OF WEST VIRGINIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS  
WELL WORK PERMIT APPLICATION

1) Well Operator: Noble Energy, Inc. 494501907 085 Clay Pennsboro  
Operator ID County District Quadrangle

2) Operator's Well Number: PEN2CHS Well Pad Name: PEN2

3 Elevation, current ground: 1074.85 Elevation, proposed post-construction: 1075.4

4) Well Type: (a) Gas  Oil  Underground Storage   
Other \_\_\_\_\_  
(b) If Gas: Shallow  Deep   
Horizontal

5) Existing Pad? Yes or No: No

6) Proposed Target Formation(s), Depth(s), Anticipated Thicknesses and Associated Pressure(s):  
Target-Marcellus, Depth- 6262-6324; Thickness- 62"; Pressure- 4174 # psi

7) Proposed Total Vertical Depth: 6423'

8) Formation at Total Vertical Depth: Onondaga (99' into the Onondaga)

9) Proposed Total Measured Depth: 16598'

10) Approximate Fresh Water Strata Depths: 454'

11) Method to Determine Fresh Water Depth: Closest well & Seneca Technology data base

12) Approximate Saltwater Depths: 1244'

13) Approximate Coal Seam Depths: no coal

14) Approximate Depth to Possible Void (coal mine, karst, other): none

15) Does proposed well location contain coal seams directly overlying or adjacent to an active mine? If so, indicate name and depth of mine: no

16) Describe proposed well work: Drill the vertical depth to aprox. 99' but not more than 100' into the Onondaga, plug back with a solid cement plug to the base of the Marcellus (KOP) at an estimated total vertical depth of approximately 6324feet. Drill Horizontal leg - stimulate and produce the Marcellus Formation. Should we encounter a unanticipated void we will install a minimum of 20' of casing below the void but not more than 50' set a basket and grout to surface.

17) Describe fracturing/stimulating methods in detail:  
The stimulation will be multiple stages divided over the lateral length of the well. Stage spacing is dependent upon engineering design. Slickwater fracturing technique will be utilized on each stage using sand, water, and chemicals.

18) Total area to be disturbed, including roads, stockpile area, pits, etc, (acres): 8.43

19) Area to be disturbed for well pad only, less access road (acres): 8.0

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20)

CASING AND TUBING PROGRAM

TYPE	Size	New or Used	Grade	Weight per ft.	FOOTAGE: For Drilling	INTERVALS: Left in Well	CEMENT: Fill -up (Cu. Ft.)
Conductor	20"	N	LS	94	40'	40'	CTS
Fresh Water	13 3/8"	N	J-55	54.5	650'	650'	CTS
Coal							
Intermediate	9 5/8"	N	J-55	36.0	5410'	5410'	CTS
Production	5 1/2"	N	P-110	20.0	16598'	16598'	200' above 9.625 shoe
Tubing							
Liners							

*DL*

TYPE	Size	Wellbore Diameter	Wall Thickness	Burst Pressure	Cement Type	Cement Yield
Conductor	20"	24"	.438	2730	Type 1	1.2
Fresh Water	13 3/8"	17 1/2"	.380	2730	Type 1	1.18
Coal						
Intermediate	9 5/8"	12 3/8"	.352	3520	Class A	1.19
Production	5 1/2"	8.75"	.361	12,640	Class A	1.27
Tubing						
Liners						

PACKERS

Kind:				
Sizes:				
Depths Set:				

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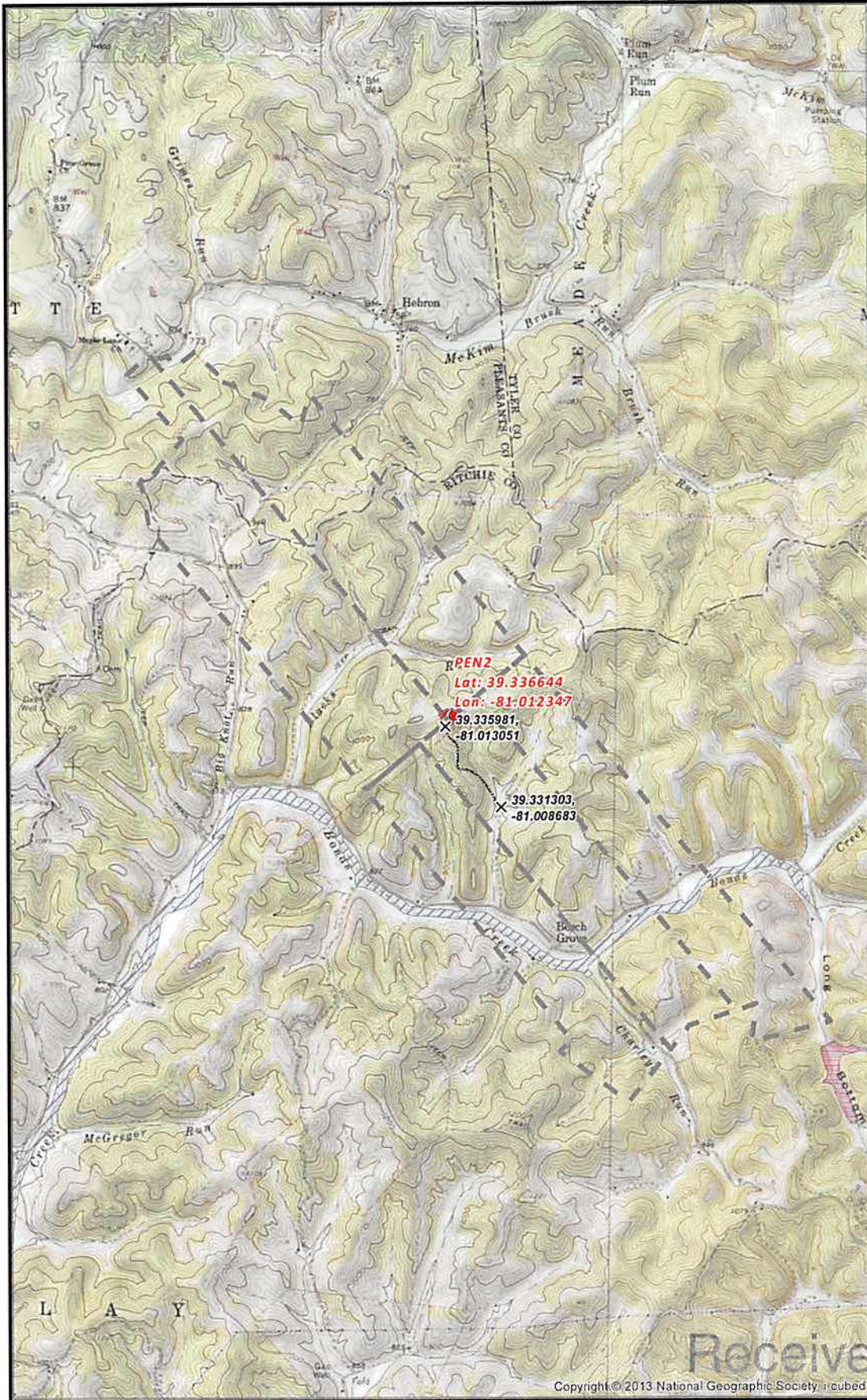
**PENS-2 WELLBORE DIAGRAM**  
Marcellus Shale Horizontal  
Ritchie County, WV  
Ground Elevation 1076'

		<b>PENS-2C Pilot SHL (Lat/Long)</b>	<b>(308280.93N, 1572150.38E) (NAD27)</b>
<b>Ground Elevation</b>	<b>1076'</b>	<b>PENS-2C Pilot LP (Lat/Long)</b>	<b>(307793.3N, 1571819.23E) (NAD27)</b>
<b>Azm</b>	<b>139.06°</b>	<b>PENS-2C Pilot BHL (Lat/Long)</b>	<b>(300239.54N, 1578154.87E) (NAD27)</b>

HOLE	CASING	GEOLOGY	TVD Top	TVD Bottom	MUD	CEMENT	CENTRALIZERS	CONDITIONING	COMMENTS
26"	20" 52#				AIR	Grouted to surface	N/A	Ensure the hole is clean at TD.	Stabilize surface fill/soil. Conductor casing = 0.25" wall thickness
		Conductor		40					
17.5"	13-3/8" 54.5# J-55 BTC				AIR	15.6 ppg Type 1 + 2% CaCl <sub>2</sub> 0.25# Lost Circ 40% Excess Yield = 1.18 <i>CTS</i>	Bow Spring every 3 joints to surface	Fill with KCl water once drilled to TD. Once casing is at setting depth, circulate a minimum of one hole volume prior to pumping cement.	Protect freshwater. Surface casing = 0.380" thick. Burst=2730 psi
		Surface Casing		579					
12.25"	9-5/8" 38# HCK-55 BTC				SOBM 8.0 - 8.5 ppg	50 bbls 10 ppg spacer, 12.0 ppg lead slurry, (800') of 15.6 ppg Class A tail slurry cemented to surface.	Bow Spring centralizers on every joint to KOP, one every third joint from KOP to 100' from surface	Once at TD, circulate at least 2x bottoms up. Once casing is at setting depth, circulate a minimum of one hole volume prior to pumping cement	Casing to be ran below the Alexander. Intermediate casing = 0.352" wall thickness Burst=3520 psi, Collapse 2980 psi
		Maxton	1929	1973					
		Big Lime	2005	2082					
		Big Injun	2082	2130					
		Weir	2449	2465					
		Fifth	2921	2927					
		Gordon	2950	2952					
		Warren	3532	3566					
		Speechley	3850	4404					
		Riley	4601	4615					
		Benson	4955	4961					
Alexander	5204	5210							
	Intermediate Casing		5410						
8.75/8.5"	5-1/2" 20# HCP-110 TXP BTC	Rhinestreet	5740	5908	SOBM 12.5- 13.0 ppg	120 bbls spacer with density and rheology hierarchy, lead slurry to 2000' to recover SOBM, 14.8 ppg Class A tail slurry to inside intermediate casing	Rigid Bow Spring every third joint from KOP to TOC	Once at TD, circulate at max allowable pump rate for at least 6x bottoms up. Once on bottom with casing, circulate a minimum of one hole volume prior to pumping cement.	Production casing = 0.361" wall thickness Burst=12640 psi Note:Actual centralizer schedules may be changed due to hole conditions
		Marcellus	6262	6324			Rigid Bow Spring every joint to KOP		
		TD		16598					

8.75/8.5" Hole - Cemented Long String 5-1/2" 20# HCP-110 TXP BTC

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*1-21-14*



**PEN2 SITE SAFETY PLAN**  
- FLOODPLAIN ZONES -

0 1,250 2,500 5,000 Feet

Scale 1" = 2,500'

Projection: NAD\_1983\_StatePlane\_Virginia\_North\_FIPS\_4701  
Unit: Feet US

**noble energy**

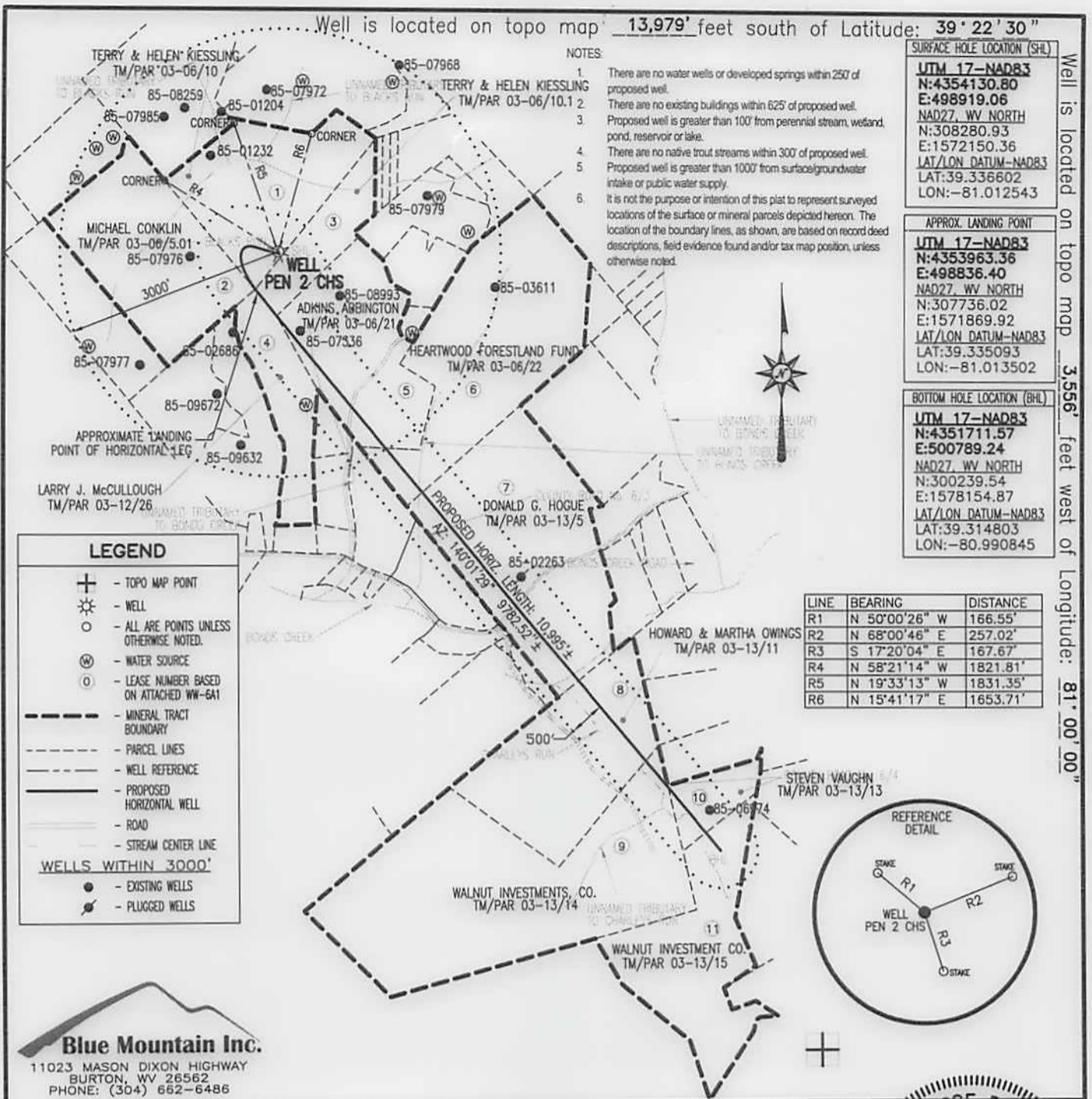
Date: 7/16/2013  
Author: Christopher Gkwer

Disclaimer: All data is licensed for use by Noble Energy Inc. only

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FILE #: PEN 2 CHS  
 DRAWING #: PEN 2 CHS  
 SCALE: 1" = 2000'  
 MINIMUM DEGREE OF ACCURACY: 1/2500  
 PROVEN SOURCE OF ELEVATION: U.S.G.S. MONUMENT THOMAS 1498.81'

I, THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAT IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE REGULATIONS ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.

Signed: [Signature]  
 R.P.E.: \_\_\_\_\_ L.L.S.: P.S. No. 2000



(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS WVDEP  
 OFFICE OF OIL & GAS  
 601 57TH STREET  
 CHARLESTON, WV 25304

DATE: MARCH 25, 2014  
 OPERATOR'S WELL #: PEN 2 CHS  
 API WELL #: 47 85 MOD 10055 H6A  
 STATE COUNTY PERMIT

Well Type:  Oil  Waste Disposal  Production  Deep  
 Gas  Liquid Injection  Storage  Shallow

WATERSHED: NORTH FORK HUGHES RIVER ELEVATION: 1084'±  
 COUNTY/DISTRICT: RITCHIE / CLAY QUADRANGLE: ELLENBORO, WV 7.5'  
 SURFACE OWNER: TERRY & HELEN KIESSLING ACREAGE: 79.242±  
 OIL & GAS ROYALTY OWNER: SEE ATTACHED WW-6A1 ACREAGE: 992.959±

DRILL  CONVERT  DRILL DEEPER  REDRILL  FRACTURE OR STIMULATE   
 PLUG OFF OLD FORMATION  PERFORATE NEW FORMATION  PLUG & ABANDON   
 CLEAN OUT & REPLUG  OTHER CHANGE  (SPECIFY): \_\_\_\_\_

TARGET FORMATION: MARCELLUS ESTIMATED DEPTH: TVD: 6,423'± TMD: 16,598'±

WELL OPERATOR NOBLE ENERGY, INC. DESIGNATED AGENT STEVEN M. GREEN  
 Address 333 TECHNOLOGY DRIVE, SUITE 116 Address 500 VIRGINIA STREET EAST, UNITED CENTER SUITE 590  
 City CANONSBURG State PA Zip Code 15317 City CHARLESTON State WV Zip Code 25301

**03/28/2014**