west virginia department of environmental protection

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

PERMIT MODIFICATION APPROVAL

May 01, 2015

NOBLE ENERGY, INC.
333 TECHNOLOGY DRIVE, SUITE 116
CANONSBURG, PA 15317

Re: Permit Modification Approval for API Number 5101768 , Well #: MND 1 BHS
Casing Revised

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,

Per Gene Smith

Gene Smith
Assistant Chief of Permitting
Office of Oil and Gas

05/01/2015

4705101768 MOD

noble energy

Office of Oil & Gas
601 57th street, SE
Charleston, WV 25304-2345

April 22, 2015

Re: *MND 1 AHS and BHS Permit Modifications*

Dear Office of Oil & Gas:

Enclosed please find request for casing modifications for the MND 1 AHS API # 47-051-01810 and MND 1 BHS API# 47-051-01768.

Should you have any questions or desire additional information, please do not hesitate to contact me at dswiger@nobleenergyinc.com or 724-820-3061.

Sincerely,

Dee Swiger
Regulatory Analyst III

DS/

Enclosures:

05/01/2015

WW-6B
(9/13)

4705101768 MOD

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

1) Well Operator: Noble Energy, Inc.	494501907	Marshall	Clay	Powhatan Point
	Operator ID	County	District	Quadrangle

2) Operator's Well Number: MND 1 BHS Well Pad Name: MND 1

3) Farm Name/Surface Owner: Murray Energy Corporation (formerly Consol) Public Road Access: County Highway 88/8

4) Elevation, current ground: 1152.08 Elevation, proposed post-construction: 1152.08'

5) Well Type (a) Gas ■ Oil _____ Underground Storage _____
Other _____
(b)If Gas Shallow ■ Deep _____
Horizontal ■

JW 4/21/15

6) Existing Pad: Yes or No No

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Associated Pressure(s):
Marcellus at 6315'-6370' and 55' in thickness. Anticipated pressure at 4204 psi.

8) Proposed Total Vertical Depth: 6360'

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 15,774'

11) Proposed Horizontal Leg Length: 8274'

12) Approximate Fresh Water Strata Depths: 538', 801', 898', 947'

13) Method to Determine Fresh Water Depths: Offset well data

14) Approximate Saltwater Depths: none

15) Approximate Coal Seam Depths: 687'-697'

16) Approximate Depth to Possible Void (coal mine, karst, other): None anticipated, drilling in pillar-mine maps attached

17) Does Proposed well location contain coal seams directly overlying or adjacent to an active mine? Yes ☑ No ☐

(a) If Yes, provide Mine Info: Name: Wells are located in abandoned area of McElroy Mine
Depth: 692' to seam base
Seam: Pittsburgh #8
Owner: Consol Mining Company, LLC

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18) **CASING AND TUBING PROGRAM**

TYPE	Size	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling	INTERVALS: Left in Well	CEMENT: Fill-up (Cu. Ft.)
Conductor	20"	New	LS	94#	40'	40'	surface to TD
Fresh Water	13 3/8"	New	J-55	54.5#	1097'	1097'	CTS
Coal	13 3/8""	New	J-55	54.5#	1097'	1097'	CTS
Intermediate	9 5/8"	New	J-55	36#	2437'	2437'	CTS
Production	5 1/2"	New	P110	20#	15774'	15774'	TOC 200' above 9.625 casing shoe
Tubing							
Liners							

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TYPE	Size	Wellbore Diameter	Wall Thickness	Burst Pressure	Cement Type	Cement Yield (cu. ft./k)
Conductor	20"	26"	0.438		Type III	surface to TD
Fresh Water	13 3/8"	17 1/2"	0.380	2730	Type 1	1.18
Coal	13 3/8"	17 1/2"	0.380	2730	Type 1	1.18
Intermediate	9 5/8"	12 3/8"	0.352	3520	Class A	1.18
Production	5 1/2"	8 3/4" & 8 1/2"	0.361	12,640	Class A	1.27
Tubing				Max Associated Surface Pressure (psi) 13 3/8) Freshwater casing 1200		
Liners						

PACKERS

Kind:				
Sizes:			Received	
Depths Set:			APR 27 2015	

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19) Describe proposed well work, including the drilling and plugging back of any pilot hole:

Drill the vertical depth to the Marcellus at an estimated total vertical depth of approximately 6360 feet. Drill Horizontal leg - stimulate and produce the Marcellus Formation. If we should encounter an unanticipated void we will install casing at a minimum of 20' below the void but not more than 100' below the void, set a basket and grout to surface.

20) Describe fracturing/stimulating methods in detail, including anticipated max pressure and max rate:

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. See attached list. Maximum pressure not to exceed 10,000 lb.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 9.0

22) Area to be disturbed for well pad only, less access road (acres): 7.6

23) Describe centralizer placement for each casing string:

No centralizers will be used with conductor casing. Surface casing will have bow spring centralizers every 3 joints to surface. First Intermediate casing will have bow spring centralizers on first 2 joints then every third joint to 100' from surface. Second Intermediate will have bow spring centralizers every three joints to 100' from surface. Production string will have a rigid bow spring every third joint to KOP to TOC. Rigid bow spring every joint to KOP.

24) Describe all cement additives associated with each cement type:

Conductor Type III surface to TD. Freshwater/Coal 15.6 Type 1 +2% CaCl, (CA-100), 0.25# lost circ. 30% Excess Yield =1. 18. Intermediate 15.6ppg Class A +0.25% bwoc (CLC-CPF) cellophane flakes 30% Excess Yield=1.18 to Surface. Production 14.6ppg 65/35 Class A/Poz +/-0.5% fluid Loss additive, +/-.03% retarder, +/-0.6% dispersant, +/-0.2% antifoam, +/-0.1% anitsettling 10% Excess Yield=1.27 TOC>=200' above 9.625" shoe.

25) Proposed borehole conditioning procedures:

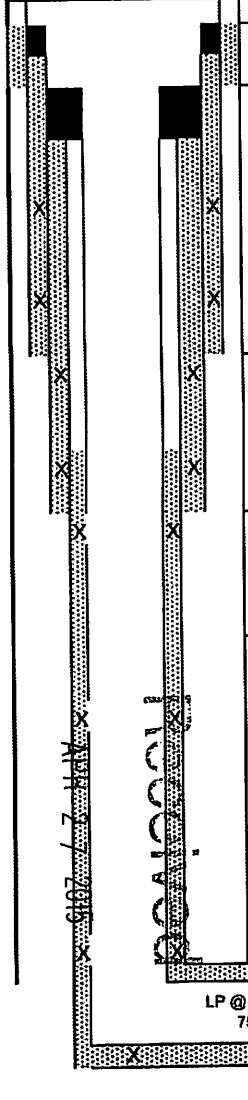
Conductor-The hole is drilled w/air and casing is run on air. Apart from insuring the hole is clean via air circulation at TD, there are no other conditioning procedures. Surface-The hole is drilled w/air and casing is run on air. Fill with KCl water once drilled to TD. Once casing is at setting depth, circulate a minimum of one hole volume prior to pumping cement Coal-The hole is drilled and cased w/air or on Freshwater based mud. Once casing is at setting depth, the hole is filled w/KCl water and a minimum of one hole volume is circulated prior to pumping cement. Intermediate-Once surface casing is set and cemented, intermediate hole is drilled either on air or SOBM and filled with KCl water once drilled to TD. Production-The hole is drilled with SOBM and once to TD, circulated at maximum 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.

*Note: Attach additional sheets as needed.

DRILLING WELL PLAN
MND-1B-HS (Marcellus HZ)
Macellus Shale Horizontal
Marshall County, WV

		MND-1B SHL (Lat/Long)	(494203.93N, 1642174.67E) (NAD27)
Ground Elevation	1152'	MND-1B LP (Lat/Long)	(495358.65N, 1642844.14E) (NAD27)
Azm	325°	MND-1B BHL (Lat/Long)	(500876.79N, 1638980.3E) (NAD27)

WELLBORE DIAGRAM	HOLE	CASING	GEOLOGY	TOP	BOTTOM	MUD	CEMENT	CENTRALIZERS	CONDITIONING	COMMENTS
	26	20" 94#	Conductor	40	40	AIR	Type III Surface to TD	N/A	Ensure the hole is clean at TD.	Conductor casing = 0.438" wall thickness
	17 1/2	13-3/8" 54.5# J-55 BTC	FW Show	538,801,898	538,801,898	Air or Fresh Water Based Mud	15.6 ppg Type 1 + 2% CaCl, 0.25# Lost Circ 30% Excess Yield = 1.18	Bow Spring on first 2 joints then every third joint to 100' form surface	Fill with <3% KCl water once casing is at setting depth, circulate a minimum of one hole volume prior to pumping cement.	Surface casing = 0.380" wall thickness Burst=2730 psi
			Pittsburgh Coal	687	697					
			Int. Casing	1097	1097					
	12 3/8	9-5/8" 36# HCK-55 BTC	Big Lime	1908	2024	Air or SOBM	15.6ppg Class A +0.25% bwoc cellophane flakes 30% Excess Yield=1.18 To Surface	Bow spring centralizers every third joint to 100' feet from surface.	Once casing is at setting depth, circulate a minimum of one hole volume prior to pumping cement.	Intermediate casing = 0.352" wall thickness Burst=3520 psi
			Big Injun	2024	2137					
			Price Formation	2137	2652					
			Int. Casing	2437	2437					
	8.75" Vertical	5-1/2" 20# HCP-110 TXP BTC	Speechley	3439	3485	Air or SOBM	14.6ppg 65/35 Class A/Poz +/-0.5% fluid Loss additive, +/-0.3% retarder, +/-0.6% dispersant, +/-0.2% antifoam, +/- 0.1% antisettling 10% Excess Yield=1.27 TOC >= 200' above 9.625" shoe	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
			Java	4990	5085					
			Pipe Creek	5085	5172					
			Angola	5172	5754					
	8.75" Curve		Rheinstreet	5754	6075	SOBM		Rigid Bow Spring every joint to KOP		
			Cashaqua	6075	6147					
			Middlesex	6147	6170					
			West River	6170	6231					
			Burkett	6231	6256					
			Tully Limestone	6256	6280					
			Hamilton	6280	6315					
	8.75" - 8.5" Lateral		Marcellus	6315	6370	SOBM				
			TD	15774	6360					
			Onondaga	6370						



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