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west virginia department of environmental protection

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Office of Oil and Gas  
601 57<sup>th</sup> Street, S.E.  
Charleston, WV 25304  
(304) 926-0450  
fax: (304) 926-0452

Austin Caperton, Cabinet Secretary  
[www.dep.wv.gov](http://www.dep.wv.gov)

Wednesday, October 24, 2018  
PERMIT MODIFICATION APPROVAL  
Horizontal 6A / New Drill

HG ENERGY II APPALACHIA, LLC  
5260 DUPONT ROAD

PARKERSBURG, WV 26101

Re: Permit Modification Approval for MND 20 BU  
47-051-02012-00-00


**Modified Casing**

HG ENERGY II APPALACHIA, LLC

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.

If there are any questions, please feel free to contact me at (304) 926- 0450.

James A. Martin  
Chief

Operator's Well Number: MND 20 BU  
Farm Name: CONSOLIDATION COAL COMPANY / MURRAY   
U.S. WELL NUMBER: 47-051-02012-00-00  
Horizontal 6A New Drill  
Date Modification Issued: October 24, 2018

Promoting a healthy environment.

WW-6B  
(04/15)

MOD  
51 - 02012  
API NO. 47-~~02~~  
OPERATOR WELL NO. MND20 BU  
Well Pad Name: MND20

18)

CASING AND TUBING PROGRAM

TYPE	Size (in)	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill-up (Cu. Ft.)/CTS
Conductor	30"	New	LS	157.5#	60'	60'	NA
Fresh Water	20"	New	J-55	94#	950'	950'	CTS
Coal	13 3/8"	New	J-55	68#	2700'	2700'	CTS
Intermediate	9 5/8"	New	P-110	47#	9303'	9303'	CTS
Production	6 5/8"	New	Q-125	28.6#	9000'	9000'	20% excess, yield = 1.7669, CTS
Production	5 1/2"	New	P-110	23#	25434'	25434'	20% excess, yield = 1.7669, CTS

*JN 9/18/18*

TYPE	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	30"	30"	0.5"			Class A	CTS
Fresh Water	20"	26"	0.438"	2110 psi		Class A	40% Excess Yield = 1.1924, CTS
Coal	13 3/8"	17.5"	0.480"	3450 psi		Class A	30% Excess Yield = 1.18, CTS
Intermediate	9 5/8"	12.25"	0.472"	9440 psi		Stage 1, Class H, Stage 2	30% Excess Yield = 1.1744, CTS
Production	6 5/8"	8.5"	0.432"	15410 psi	11,500	Class H	20% Excess Yield = 1.7669, CTS
Production	5 1/2"	8.5"	0.415"	14520 psi	11.500	Class H	20% Excess Yield = 1.7669, CTS

PACKERS

Kind:				
Sizes:				
Depths Set:				

MDD  
47-51-02012



MND20BUHS  
Utica Shale Horizontal  
Marshall County, WV

Ground Elevation		1058'		MND20BUHS SHL				494948.47N 1634085.19E			
Azm		144.906°		MND20BUHS LP				493830.2N 1632306.59E			
WELLBORE DIAGRAM		144.906°		MND20BUHS BHL				482456.7N 1640298.24E			
HOLE	CASING	GEOLOGY	TOP	BASE	MUD	CEMENT	CENTRALIZERS	CONDITIONING	COMMENTS		
30"	30" 157.5# LS	Conductor	0	60	AIR	N/A, Casing to be drilled in w/ Dual Rotary Rig	N/A	Ensure the hole is clean at TD.	Conductor casing = 0.5" wall thickness		
26"	20" 94# J-55	Fresh Water		445, 708, 805	AIR	15.6 ppg Class A 40% Excess Yield = 1.1924 / CTS	Centralized every 3 joints to surface	Once casing is at setting depth, circulate a minimum of one hole volume with Fresh Water prior to pumping cement.	Surface casing = 0.438" wall thickness Burst=2110 psi		
		Pittsburgh Coal	526	536							
		Surface Casing	0	950							
17.5"	13-3/8" 66# J-55 BTC	Big Lime	1625	1741	AIR	Lead: 15.0 ppg / Class A / 30% Excess / Yield=1.2883 Tail: 15.6 ppg / Class A / 30% Excess / Yield=1.18 CTS	Bow Spring on first 2 joints then every third joint to 100' form surface	Once casing is at setting depth, Circulate and condition at TD. Circulate a minimum of one hole volume prior to pumping cement.	Intermediate casing = 0.480" wall thickness Burst=3450 psi		
		Big Injun	1741	1854							
		1st Intermediate Casing	0	2700							
12.25"	9-5/8" 47# P-110 BTC	5th Sand	2599	3156	AIR / KCL Salt Polymer / 8.0ppg SOBAM	Stage 1: 15.2 ppg / 35:65 Class H / 30% Excess / Yield=1.1313 Stage 2: 14.5 ppg / 50:50 Class A / 30% Excess / Yield=1.1744 CTS	Bow Spring on first 8 joints then every third joint to 100' form surface	Once casing is at setting depth, Circulate and condition mud at TD. Circulate a minimum of one hole volume prior to pumping cement.	Intermediate casing = 0.472" wall thickness Burst=9440 psi		
		Speecheley	3158	3770							
		Warren	3770	4707							
		Java	4707	4802							
		Pipe Creek	4802	4889							
		Angola	4889	5471							
		Rhinestreet	5471	5792							
		Cashoqua	5792	5864							
		Middlesex	5864	5887							
		West River	5887	5948							
		Burkett	5948	5973							
		Tully LS	5973	5997							
		Hamilton	5997	6032							
		Marcellus	6032	6087							
		Onondaga	6087	6095							
		Huntsville	6095	6309							
		Oriskany	6309	6421							
		Helderberg	6421	6681							
		Base Island	6681	6760							
		Selina G	6760	6960							
		Selina F	6960	7759							
		Lockport	7759	8081							
		Rochester	8081	8385							
Packer Shell	8385	8492									
Clinton	8492	8575									
Medina	8575	8874									
Queenston	8874	9431									
2nd Intermediate	0	8000 TVD 9303 MD									
8.5" Curve and 8.5" Lateral	6-5/8" 28.6# Q-125HP EAGLE SFH to 9,000' (CHANGEOVER) 5-1/2" 23# P-110HC CDC HTQ to TMD	Reedsville	9431	10049	10.5ppg-14.5ppg SOBAM	Lead: 15.0 ppg / 35:65 Class H / 20% Excess / Yield=1.1475 Tail: 15.6 ppg / Class H - Acid Soluble / 20% Excess / Yield=1.7669 TOC @ 6,000'	Run 1 spiral centralizer every 5 joints from the top of the curve to surface. Run 1 spiral centralizer every 3 joints from the 1st 5.5' long joint to the top of the curve.	Once on bottom/TD with casing, circulate at max allowable pump rate for at least 2x bottoms up, or until returns and pump pressures indicate the hole is clean. Circulate a minimum of one hole volume prior to pumping cement.	(6-5/8") Production casing = 0.432" wall thickness Burst = 15410 psi (5-1/2") Production casing = 0.415" wall thickness Burst = 14520 psi Note: Actual centralizer schedules may be changed due to hole conditions		
		Utica	10049	10662							
		Point Pleasant	10662	10782							
		Target	10782	10782							

LP @ 10700' TVD / 11533' MD 8.5" Hole - Cemented Long String 8.5" Hole - Cemented Long String to 9,000' (CHANGEOVER) 5-1/2" 23# P-110HC CDC HTQ to TMD +1-13900' ft Lateral TD @ +/-10700' TVD +/-25433' MD

JW 9/18/18