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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)

Friday, January 11, 2019  
PERMIT MODIFICATION APPROVAL  
Horizontal 6A / New Drill

AMERICAN PETROLEUM PARTNERS OPERATING, LLC  
4600 J. BARRY COURT SUITE 310

CANONSBURG, PA 15317

Re: Permit Modification Approval for CASTERLY ROCK-2UH  
47-051-02018-00-00

**Modified Casing due to Red Rock Issues**

AMERICAN PETROLEUM PARTNERS OPERATING, 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: CASTERLY ROCK-2UH  
Farm Name: LESLIE B. & LORI D. SCHABER  
U.S. WELL NUMBER: 47-051-02018-00-00  
Horizontal 6A New Drill  
Date Modification Issued: January 11, 2019

Promoting a healthy environment.

WW-6B  
(04/15)

JAN 7 REC'D

API NO. 47-03-0201 **47051020** 01/11/2019

OPERATOR WELL NO. Casterly Rock-2UH (CRN2-UH)

Well Pad Name: Casterly Rock

WV Department of  
Environmental Protection  
STATE OF WEST VIRGINIA

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

1) Well Operator: American Petroleum Partners 494521257 Marshall Union Moundsville  
Operator ID County District Quadrangle

2) Operator's Well Number: Casterly Rock-2UH (CRN2-UH) Well Pad Name: Casterly Rock

3) Farm Name/Surface Owner: Leslie B. & Lori D. Schaber Public Road Access: State Route 88

4) Elevation, current ground: 1,337.89' Elevation, proposed post-construction: 1311.38

5) Well Type (a) Gas  Oil  Underground Storage   
Other

(b) If Gas Shallow  Deep   
Horizontal

6) Existing Pad: Yes or No No

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):  
Point Pleasant Formation 11,395' / 130' thick 10,141 or .89 psi per foot / Utica Formation 11,212 150' thick / 10,000 psi or .89 psi per foot.

8) Proposed Total Vertical Depth: 11,595' pilot hole into the Trenton-Plug back, land and TD lateral in Point Pleasant.

9) Formation at Total Vertical Depth: Point Pleasant

10) Proposed Total Measured Depth: 21,549'

11) Proposed Horizontal Leg Length: 9,613'

12) Approximate Fresh Water Strata Depths: 130', 1125'

13) Method to Determine Fresh Water Depths: Nearest offset well

14) Approximate Saltwater Depths: Na

15) Approximate Coal Seam Depths: 625', 825'

16) Approximate Depth to Possible Void (coal mine, karst, other): None anticipated. 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: The Ohio County Mine  
Depth: 625' - 825'  
Seam: Sewickley and Pittsburgh  
Owner: Murray American Energy & Consolidation Coal Company

WW-6B  
(04/15)

RECEIVED  
Office of Oil and Gas

4705102018 01/11/2019  
API NO. 47-051-02046

OPERATOR WELL NO. Casterly Rock-2UH (CRN2-UH)

Well Pad Name: Casterly Rock

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18)

WV Department of  
**CASING AND TUBING PROGRAM**  
Environmental Protection

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	81.3#	60'	60'	CTS
Fresh Water	20"	New	J-55	94#	1248'	1248'	CTS 15.6ppg to sur 521 ex w/30% OH ex
Coal	13 3/8"	New	J-55	54.5#	2660'	2660'	CTS 15.2ppg to sur 556 ex w/30% OH Ex
Intermediate	9 5/8"	New	HCP-110	40#	10070'	10070'	CTS 15.4ppg to sur 526 ex w/30% OH ex
Production	5 1/2"	New	HCP-110	23#	21,549'	21,549'	14.8ppg TOC w/200' above 9.625 shoe
Tubing	2 7/8"	New	J-55	6.5#	11,400'	11,400'	CTS
Liners							

*Jan 14/19*

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"	36"		300		Type 1	Lead yield 2.38 Tail 521 ex Yield 1.18
Fresh Water	20"	24"	.438	2110	400	Class A	Lead yield 2.38 Tail 556 ex Yield 1.27
Coal	13 3/8"	17.5"	.380	2730	688	Class A	Lead Yield 2.38 Tail 556 ex Yield 1.27
Intermediate	9 5/8"	12.38"	.395	7870	3166	Class A	Lead Yield 1.28 Tail 536 ex Yield 1.28
Production	5 1/2"	8.75"	.415	16,510	13000	Class H	Lead Yield 1.27 Tail 4714 ex Yield 1.27
Tubing	2 7/8"	5.14"	.217	10570	8000		
Liners							

**PACKERS**

Kind:				
Sizes:				
Depths Set:				

WW-6B  
(10/14)

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API NO. 47- 051 - 02018  
OPERATOR WELL NO. Casterly Rock-2UJH(GRZ21JH)  
Well Pad Name: Casterly Rock

WV Department of  
Environmental Protection

*Handwritten signature*  
1/4/19

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

Drill the vertical depth (Pilot Hole) into the Trenton at an estimated Total vertical depth of approximately 11,595', plug back above the Point Pleasant by placing two 800' cement plugs to KOP. Drill and land well in the Point Pleasant to drill horizontal leg and TD in the same Point Pleasant formation. Should we encounter a unanticipated void we will install a minimum of 20' of casing 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 in 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. Our maximum pressure is not to exceed 10,000 lbs.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 22.5 acres

22) Area to be disturbed for well pad only, less access road (acres): 9.9 acres

23) Describe centralizer placement for each casing string:

Conductor- No centralizers used. Freshwater/Surface- Bow Spring centralizers every 3 joints to 100' from surface. 1st Intermediate - Bow Spring centralizers every 3 joints to 100' from surface. 2nd Intermediate - Bow Spring centralizers every 3 joints to 100' from surface. Production - Rigid bow springs every third joint from KOP to TOC. Rigid every joint to KOP.

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

Type 1 to Surface. Surface/Freshwater - 15.6 Class A +2% CaCl, 30% OH Excess Yield =1.18. 1st Intermediate - 15.6 ppg Class A +2% CaCl, 0.25 Lost Circ. 30% Yield =1.27. 2nd Intermediate- 2 Stage cement job with 15.4 ppg Class A lead + additives (antisetling, antifoam, fluid loss retarder, salt, viscosifer) & 15.4 Class A tail with additives (antisetling, antifoam, fluid loss retarder, salt, dispersant or 12.0 Class A lead + additives (+/-5% dispersant, 10% light weight additive, 75% fluid loss additive, and 1.15% fluid loss additive, Yield=1.28) 15.4 ppg Class A Tail + additives (+/- fluid loss additive, & .5% light weight additive, Yield 1.28), 0.125#/SK lost circ 30% excess to Surface. Production- 12.5ppg Class H Lead +additives and 14.8 ppg Class H Tail + additives (antifoam, antisetling, extender,dispersant) 15%excess 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 hole is clean via air circulation at TD, there are no other conditioning procedures. Freshwater/Surface- The hole is drilled w/air or Freshwater based mud and casing is run on air. Once casing is at setting depth, fill with KCl water circulate a minimum of one hole volume prior to pumping cement. First Intermediate- Drilled on Air. Once casing is at a setting depth, circulate a minimum of one hole volume prior to pumping cement. Second Intermediate - Drilled on air. Fill with salt saturated water once drilled to TD. Once casing is at setting depth, circulate a minimum of one hole volume prior to pumping cement. Production- drilled on +/- 14.8ppg SOB.M. Once at TD, circulate at max allowable pump rate for at least 6x bottoms up. Once on bottom with casing, circulate minimum of one hole volume prior to pumping cement.

\*Note: Attach additional sheets as needed.



**DRILLING WELL PLAN**

**Casterly Rock-2UH  
Vertical Pilot, Utica HZ  
Marshall Co, WV**

**Horizontal Well Plan with Cemented Long String Completion**

HOLE	RIG	CASING	GEOLOGY	Top TVD	MD	MUD	CEMENT	DIRECTIONAL	LOGS	BITS	COMMENTS
36"	Conductor Rig	30" 81.3# LS				AIR	To Surface	N/A	N/A		Stabilize surface fill/soil
			Conductor	60	60						
24"	Top-Hole	20" 94-133# J-55 BTC	Sewickley Coal	770	774	AIR	15.8ppg to surface 2055sx w/ 30% OH excess	20" Air Hammer Totco at TD	GR at Pilot TD in Pilot Well only	Carbide hammer bit	Protect fresh groundwater
			Pittsburgh Coal	840	848						
			Surf. Casing	1248	1248						
17.5"	Top-Hole	13-3/8" 54.5# J-55 BTC	Big Lime	1940	2140	AIR	15.2ppg to surface 1756sx w/ 30% OH excess	Center Rock 15" Air Hammer Gyro above Coal, (Mine Approval) Totco at TD		Hammer bit w/ diamond gage Test casing to 800psi	
			Big Injun	2140	2380						
			Int. Casing	2660	2660						
12.375" 12.25"	Horizontal Rig	9-5/8" 43.5# P110-IC BTC	Berea	4063	4078	AIR	15.4ppg to surface 1025sx w/ 30% OH excess	12" Air Hammer Totco every 400ft	MWD surveys Mud Logger - 90 ft samples	Tricone	PU clean assembly, dress and displace to 125ppg SOBM, PU Curve time drill / KO cement plug. Expect Seepage to curve
			Burkett	6338	6363						
			Tully LS	6363	6413						
			Hamilton	6413	6438						
			Marcellus Shale	6438	6488						
			Onondaga Ls	6488	6713						
			Oriskany Sandstone	6713	6750						
			Salina Group	7163	7904						
			Lockport Dolomite	8288	8610						
			Clinton Group	9013	9138						
Medina Group	9138	9213									
Queenston Shale	9216	9970									
8.5" Curve Lateral	Horizontal Rig	5-1/2" 23# Wedge 563 P111 Surface to LP	Int. Casing	10070	10070	+/- 14.5 ppg SOB	14.8ppg TOC >= 200' Above 9.625' shoe 4106sx w/ 15% OH excess	6.75" PDM & MWD 2.38" ADJ Bend (10" Build DLS)	MWD Surveys Mud Logger - 30 ft samples (Curve) 90 ft samples (Lateral)	PDC 5 - 25 WOB 100 - 120 RPM 450 - 500 GPM	Geosteering
			Utica Shale	11212							
			Point Pleasant Formation	11395							
			Curve LP								
			TARGET								
8.5 Hole - Cemented Long String 5-1/2" 23# Wedge XP P110 LP to TD											
8.5" Pilot	H2T Rig	Isolation/ Sidetrack Cement Plugs	Trenton Limestone			+/- 14.5 ppg SOB	17.5ppg Class H from TD to 200' above KOP (2) 800'	8" Air Hammer Totco every 400ft	OH logs, as directed by APP Operations Dir. Surveys TD to shoe	Hammer bit w/ full face diamond	
			Pilot Hole TD	11595							
Lateral Targets	Landing Point 11395 TVD 11936 MD		90.5 degrees	9609 ft Lateral Length	90.5 Inc 325 Az	Total Depth 11395 TVD 21549 TD					

WV Department of Environmental Protection

JAN 7 REC'D

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Office of Oil and Gas

4705102018

*Jm*  
1/4/19

Form WW-9

JAN 7 REC'D

Operator's Well No. Casterly Rock-2UH (CRN2-UH)

American Petroleum Partners Operating, LLC

WV Department of  
Environmental Protection

Proposed Revegetation Treatment: Acres Disturbed \_\_\_\_\_ Prevegetation pH 6.0

Lime 2-3 Tons/acre or to correct to pH \_\_\_\_\_

Fertilizer type 10-20-20 or Equal

Fertilizer amount 500 lbs/acre

Mulch Hay or Straw at 2 Tons/acre

Seed Mixtures

Temporary		Permanent	
Seed Type	lbs/acre	Seed Type	lbs/acre
Annual Rye Grass	40	Crownvetch	10-15
Filed Bromegrass	40	Tall Fescue	30
Spring Oats	96	Perennial Ryegrass	20

\*Refer to attached Reclamation Plan for further detail.

Attach:

Maps(s) of road, location, pit and proposed area for land application (unless engineered plans including this info have been provided). If water from the pit will be land applied, include dimensions (L x W x D) of the pit, and dimensions (L x W), and area in acreage, of the land application area.

Photocopied section of involved 7.5' topographic sheet.

Plan Approved by: *Jan Nicholas*

Comments: \_\_\_\_\_

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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Title: WV DEP Oil and Gas Inspector Date: 1/4/19

Field Reviewed?  Yes  No