

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

February 12, 2015

WELL WORK PERMIT Horizontal 6A Well

This permit, API Well Number: 47-8510181, issued to ANTERO RESOURCES CORPORATION, is evidence of permission granted to perform the specified well work at the location described on the attached pages and located on the attached plat, subject to the provisions of Chapter 22 of the West Virginia Code of 1931, as amended, and all rules and regulations promulgated thereunder, and to all conditions and provisions outlined in the pages attached hereto. Notification shall be given by the operator to the Oil and Gas Inspector at least 24 hours prior to the construction of roads, locations, and/or pits for any permitted work. In addition, the well operator shall notify the same inspector 24 hours before any actual well work is commenced and prior to running and cementing casing. Spills or emergency discharges must be promptly reported by the operator to 1-800-642-3074 and to the Oil and Gas inspector.

Please be advised that form WR-35, Well Operators Report of Well Work is to be submitted to this office within 90 days completion of permitted well work, as should form WR-34 Discharge Monitoring Report within 30 days of discharge of pits, if applicable. Failure to abide by all statutory and regulatory provisions governing all duties and operations hereunder may result in suspension or revocation of this permit and, in addition, may result in civil and/or criminal penalties being imposed upon the operators.

In addition to the applicable requirements of this permit, and the statutes and rules governing oil and gas activity in WV, this permit may contain specific conditions which must be followed. Permit conditions are attached to this cover letter.

Per 35CSR-4-5.2.g this permit will expire in two (2) years from the issue date unless permitted well work is commenced. If there are any questions, please feel free to contact me at (304) 926-0499 ext. 1654.

James Martin

Chief

Operator's Well No: KNOLL UNIT 2H

Farm Name: NOLAND, DARRELL A. ET AL

API Well Number: 47-8510181

Permit Type: Horizontal 6A Well

Date Issued: 02/12/2015

API Number: ____

PERMIT CONDITIONS

West Virginia Code § 22-6A-8(d) allows the Office of Oil and Gas to place specific conditions upon this permit. Permit conditions have the same effect as law. <u>Failure to adhere to the specified permit</u> conditions may result in enforcement action.

CONDITIONS

- Operator shall take additional measures with this permitted activity to avoid communication with offset wells.
 Such additional measures are described in the attached addendum. This addendum is part of the terms of the well work permit, and includes a description of depth and completed formations of offset wells. Also included is a description of monitoring activities that will take place during fracturing operations of the permitted well work.
- 1. This proposed activity may require permit coverage from the United States Army Corps of Engineers (USACOE). Through this permit, you are hereby being advised to consult with USACOE regarding this proposed activity.
- 2. If the operator encounters an unanticipated void, or an anticipated void at an unanticipated depth, the operator shall notify the inspector within 24 hours. Modifications to the casing program may be necessary to comply with W. Va. Code § 22-6A-5a (12), which requires drilling to a minimum depth of thirty feet below the bottom of the void, and installing a minimum of twenty (20) feet of casing. Under no circumstance should the operator drill more than fifty (50) feet below the bottom of the void or install less than twenty (20) feet of casing below the bottom of the void.
- 3. When compacting fills, each lift before compaction shall not be more than 12 inches in height, and the moisture content of the fill material shall be within limits as determined by the Standard Proctor Density test of the actual soils used in specific engineered fill, ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort, to achieve 95 % compaction of the optimum density. Each lift shall be tested for compaction, with a minimum of two tests per lift per acre of fill. All test results shall be maintained on site and available for review.
- 4. Operator shall install signage per § 22-6A-8g (6) (B) at all source water locations included in their approved water management plan within 24 hours of water management plan activation.
- 5. Oil and gas water supply wells will be registered with the Office of Oil and Gas and all such wells will be constructed and plugged in accordance with the standards of the Bureau for Public Health set forth in its Legislative rule entitled *Water Well Regulations*, 64 C.S.R. 19. Operator is to contact the Bureau of Public Health regarding permit requirements. In lieu of plugging, the operator may transfer the well to the surface owner upon agreement of the parties. All drinking water wells within fifteen hundred feet of the water supply well shall be flow tested by the operator upon request of the drinking well owner prior to operating the water supply well.

API Number: <u>85-10181</u>

PERMIT CONDITIONS

- 6. Pursuant to the requirements pertaining to the sampling of domestic water supply wells/springs the operator shall, no later than thirty (30) days after receipt of analytical data provide a written copy to the Chief and any of the users who may have requested such analyses.
- 7. If any explosion or other accident causing loss of life or serious personal injury occurs in or about a well or well work on a well, the well operator or its contractor shall give notice, stating the particulars of the explosion or accident, to the oil and gas inspector and the Chief, within 24 hours of said accident.
- 8. During the casing and cementing process, in the event cement does not return to the surface, the oil and gas inspector shall be notified within 24 hours.
- Operator shall provide the Office of Oil & Gas notification of the date that drilling commenced on this well. Such notice shall be provided by sending an email to <u>DEPOOGNotify@wv.gov</u> within 30 days of commencement of drilling.



Addendum for Antero pads in Ritchie County, WV

Knoll Unit 2H Noland Pad

The following outlines the process to be undertaken by Antero Resources prior to and during completion process of wells in Ritchie County.

- •Investigate all wells within 1320' of new wells for all identified Marcellus vertical wells and any existing well(s) with an interval that is <u>less than</u> 1500 feet from the deepest formation drilled (including, but not specific to the Alexander formation) to the top of Marcellus:
 - Contact operator of all wells
 - Confirm well status, producing horizon, well completion/stimulation information
 - Discuss plans to stimulate the horizontal Marcellus wells and the plans for monitoring potential impact on shallow wells
 - Make sure all vertical wells (with an interval that is less than 1500 feet from the deepest formation drilled to the top of Marcellus) have adequate wellhead equipment, Including pressure gauges
 - Provide shallow well operator with frac dates and develop plan for monitoring during stimulation
 - If well waters out during frac, shut it in until after stimulation, and install adequate well control equipment prior to swabbing in the impacted shallow well
- •Control fracturing parameters during job to limit fracture height growth
 - Limit rate and limit pressures for each segment of fracturing stages
- *Tracers demonstrate that we rarely reach offset wells at 660' offset
 - -Will use tracers at each lateral

RECEIVED
Office of Oil and Gas

NOV 1 0 2014

WV Department of Environmental Protection

85-1981 4708510181

WW-6B (9/13)

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

1) Well Operat	tor: Antero R	esources Corpora	ation	494488557	085 - Ritchie	Clay	Pennsboro 7.5'
				Operator ID	County	District	Quadrangle
2) Operator's V	Well Number:	Knoll Unit 2H		Well Pad	Name: Nolon	d Pad	
3) Farm Name	/Surface Own	Darrell A. No	oland	, et al Public Road	d Access: CR	50/22	
4) Elevation, c	urrent ground	: ~1154'	Ele	evation, proposed j	post-construction	on: 1143'	
5) Well Type	(a) Gas	Oi	1	Unde	rground Storag	е	
	Other _						
	(b)If Gas	Shallow		Deep			
		Horizontal _					
6) Existing Pac	i: Yes or No	No					
				pated Thickness at 75 feet, Associated		Pressure(s):	
		Depth: 6500' TVI					
9) Formation a		•		Shale			
35.		•					
10) Proposed T	otal Measure	d Depth: 14,20	O. ML) Names de			
11) Proposed F	Horizontal Leg	g Length: 7084'					
12) Approxima	ate Fresh Wate	er Strata Depths:		137', 227', 300', 459)'		
13) Method to	Determine Fro	esh Water Depth	s: C	Offset well records. Dep	oths have been adj	usted accordi	ng to surface elevations.
14) Approxima	ite Saltwater I	Depths: 1658',	1705',	, 1747'			
15) Approxima	ite Coal Seam	Depths: 798', 1	225'		Tak		
16) Approxima	ate Depth to P	ossible Void (co	al mi	ne, karst, other):	None anticipated		
and the second of the second o		tion contain coal at to an active mi		ns Yes	No	√	
(a) If Yes, pro	ovide Mine In	fo: Name:			-14-		
1		Depth:					
		Seam:					
		Owner:					
Receive	d	_					

Office of Oil & Gas

DEC 1 2 2014

02/13/2015

Page 1 of 3

WW-6B (9/13)

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	H-40	94#	40'	40'	CTS, 38 Cu. Ft.
Fresh Water	13-3/8"	New	J-55/H-40	54.5#/48#	510' *see #19	510' *see #19	CTS, 708 Cu. Ft
Coal	9-5/8"	New	J-55	36#	2460'	2460'	CTS, 1002 Cu. Ft.
Intermediate				-			
Production	5-1/2"	New	P-110	20#	14,200'	14,200'	3510 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7,100'	
Liners							

TYPE	Size	Wellbore Diameter	Wall Thickness	Burst Pressure	Cement Type	Cement Yield (cu. ft./k)
Conductor	20"	24"	0.438"	1530	Class A	1.18
Fresh Water	13-3/8"	17-1/2"	0.38"/0.33"	2730/1730	Class A	1.18
Coal	9-5/8"	12-1/4"	0.352"	3520	Class A	1.18
Intermediate						
Production	5-1/2"	8-3/4" & 8-1/2"	0.361"	12630	Lead-H/POZ & Tail - H	H/POZ-1.44 & H-1.8
Tubing	2-3/8"	4.778"	0.19"	11200		
Liners						

PACKERS

Kind:	N/A		
Sizes:	N/A		
Depths Set:	N/A		

Page 2 of 3

02/1/3/2015

WW-6B (9/13)

19) Describe proposed well work, including the drilling and plugging back of any pilot hole:
Drill, perforate, fracture a new horizontal shallow well and complete Marcellus Shale. *Antero will be air drilling the fresh water string which makes it difficult to determine when freshwater is encountered, therefore we have built in a buffer for the casing setting depth which helps to ensure that all fresh water zones are covered.
20) Describe fracturing/stimulating methods in detail, including anticipated max pressure and max rate:
Antero plans to pump Slickwater into the Marcellus Shale formation in order to ready the well for production. The fluid will be comprised of approximately 99 percent water and sand, with less than 1 percent special-purpose additives as shown in the attached "List of Anticipated Additives Used for Fracturing or Stimulating Well."
21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 17.17 acres
0.50 aaraa
22) Area to be disturbed for well pad only, less access road (acres): 6.53 acres
23) Describe centralizer placement for each casing string:
Conductor: no centralizers Surface Casing: one centralizer 10' above the float shoe, one on the insert float collar and one every 4th joint spaced up the hole
to surface. Intermediate Casing: one centralizer above float joint, one centralizer 5' above float collar and one every 4th collar to surface. Production Casing: one centralizer at shoe joint and one every 3 joints to top of cement in intermediate casing.
24) Describe all cement additives associated with each cement type:
Conductor: no additives, Class A cement. Surface: Class A cement with 2-3% calcium chloride and 1/4 lb of flake
Intermediate: Class A cement with 1/4 lb of flake, 5 gallons of clay treat
Production: Lead cement- 50/50 Class H/Poz + 1.5% salt + 1% C-45 + 0.5% C-16a + 0.2% C-12 + 0.45% C-20 + 0.05% C-51 Production: Tail cement- Class H + 45 PPS Calcium Carbonate + 1.0% FL-160 + 0.2% ACGB-47 + 0.05% ACSA-51 + 0.2% ACR-20
25) Proposed borehole conditioning procedures:
Conductor: blowhole clean with air, run casing, 10 bbls fresh water. Surface: blowhole clean with air, trip to conductor shoe, trip to bottom, blowhole clean with air, trip out, run casing, circulate pipe capacity + 40 bbls
fresh water followed by 25 bbls bentonite mud, 10 bbls fresh water spacer.
Intermediate: blowhole clean with air, trip to surface casing shoe, trip to bottom, blowhole clean with air, trip out, the easing circulate (1) and the control of the cont
fresh water followed by 25 bbls bentonite mud, 10 bbls fresh water spacer. Intermediate: blowhole clean with air, trip to surface casing shoe, trip to bottom, blowhole clean with air, trip out, in the easing circulate water followed by 10 bbls fresh water and 25 bbls bentonite mud, pump 10 bbls fresh water. Production: circulate with 14 lb/gal NaCl mud, trip to middle of lateral, circulate, pump high viscosity sweep, with to base of curve, pump high viscosity

sweep, trip to top of curve, trip to bottom, circulate, pump high viscosity sweep, trip out, run casing, circulate 10 bbls fresh water followed by 48 bbls mud flush and 10 bbls water.

barite pill, pump 10 bbls fresh water followed by 48 bbls mud flush and 10 bbls water.

*Note: Attach additional sheets as needed.

WV Department of Environmental Protection Page 3.0f 3 3/2015

API Number	47 -	085		~	-
Ope	rator's	Well	No. Knoll Unit 2H		

STATE OF WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION OFFICE OF OIL AND GAS

FLUIDS/ CUTTINGS DISPOSAL & RECLAMATION PLAN

Operator NameAntero Resources Corporation	OP Code 494488557
Watershed (HUC 10)_Horner Run Quadrangle	Pennsboro 7.5'
Elevation 1143' County_Ritchie	District Clay
Do you anticipate using more than 5,000 bbls of water to complete the proposed Will a pit be used? Yes No V	well work? Yes No
11 so, please describe anticipated pit waste.	wback Fluids will be stored in tanks. Cuttings will be tanked and hauled off site.)
Will a synthetic liner be used in the pit? Yes No If	so, what ml.? N/A
Proposed Disposal Method For Treated Pit Wastes:	
Land Application Underground Injection (UIC Permit Number Reuse (at API Number Future permitted well locations when an Off Site Disposal (Supply form WW-9 for disposal locations of the Carplain State of the Carplain Stat	cation) (Meadowfill Landfill Permit #SWF-1032-98)
Will closed loop system be used? If so, describe: Yes	
Drilling medium anticipated for this well (vertical and horizontal)? Air, freshwar	Surface - Air/Freshwater, Intermediate - ter, oil based, etc., Dust/Stiff Foam, Production - Water Based Mud
-If oil based, what type? Synthetic, petroleum, etc. N/A	
Additives to be used in drilling medium? Please See Attachment	
Drill cuttings disposal method? Leave in pit, landfill, removed offsite, etc. Stored	I in tanks, removed offsite and taken to landfill.
-If left in pit and plan to solidify what medium will be used? (cement, l	
-Landfill or offsite name/permit number? Meadowfill Landfill (Permit #SWF-	
I certify that I understand and agree to the terms and conditions of the on August 1, 2005, by the Office of Oil and Gas of the West Virginia Department provisions of the permit are enforceable by law. Violations of any term or conclaw or regulation can lead to enforcement action. I certify under penalty of law that I have personally examined and application form and all attachments thereto and that, based on my inquiry obtaining the information, I believe that the information is true, accurate, an penalties for submitting false information, including the possibility of fine or impossibility of fine or impossibility.	at of Environmental Protection. I understand that the addition of the general permit and/or other applicable arm familiar with the information submitted on this of those individuals immediately responsible for d complete. I am aware that there are significant prisonment.
Company Official Signature	NATALIE KOMP Oil and Gas
Company Official (Typed Name) Cole Kilstrom	STATE OF CULORADO NOTARY ID # 20144028170 0 1014
Company Official Title Environmental Representative	WY COMMISSION EXPIRES PHILY 18 12018 14
Subscribed and sworn before me this 7th day of November 15 day of Nove	
My commission expires WWX 18, 2018	02/13/2015

Form WW-9		Operator's W	ell No Knoll Unit 2F	
Antero Resources C	orporation	Operator's W	en 140.	
Proposed Revegetation Treatment	t: Acres Disturbed 17.17 Tons/acre or to correct to pH	Prevegetation pH	6.0	
Fertilizer type Hay or str	aw or Wood Fiber (will be used w	here needed)		
Fertilizer amount 500		/acre		
Mulch 2-3	Tons/ac	cre		
	Access Road B (1.56) + Staging Area (1.90)	+ Well Pad (8.53) + Excess/Topsoil Material Stock	piles (3,50) = 17.17 Acres	
	Seed	Mixtures		
Tempo	orary	Perman	nent	
Seed Type	lbs/acre	Seed Type	lbs/acre	
Annual Ryegrass	40	Annual Ryegrass	40	
See attached Table 3 for additional seed type	e (Noland Pad Design Page 17)	See attached Table 4a for additional seed t	ype (Nolad Pad Design Page 17)	
*or type of grass seed reques	sted by surface owner	*or type of grass seed requested by surface owner		
** N	o Fescue or Timothy	Grass shall be used		
Attach: Drawing(s) of road, location, pit a provided) Photocopied section of involved 7 Plan Approved by: Comments: Provided		lication (unless engineered plans inc	luding this info have been	
I fan fin act	e mintani a	el 148 dury of	Dralei	
Title: as Aga	s empular	Date: 12-11-1	4	

Received Office of Oil & Gas

Form WW-9 Additives Attachment

SURFACE INTERVAL

- 1. Fresh Water
- 2. Soap –Foamer AC
- 3. Air

INTERMEDIATE INTERVAL

STIFF FOAM RECIPE:

- 1) 1 ppb Soda Ash / Sodium Carbonate-Alkalinity Control Agent
- 2) 1 ppb Conqor 404 (11.76 ppg) / Corrosion Inhibitor
- 3) 4 ppb KLA-Gard (9.17 ppg) / Amine Acid Complex-Shale Stabilizer
- 4) 1ppb Mil Pac R / Sodium Carboxymethylcellulose-Filtration Control Agent
- 5) 12 ppb KCL / Potassium Chloride-inorganic Salt
- 6) Fresh Water 80 bbls
- 7) Air

PRODUCTION INTERVAL

1. Alpha 1655

Salt Inhibitor

2. Mil-Carb

Calcium Carbonate

3. Cottonseed Hulls

Cellulose-Cottonseed Pellets - LCM

4. Mil-Seal

6. Xan-Plex

Vegetable, Cotton & Cellulose-Based Fiber Blend – LCM RECEIVED

5. Clay-Trol

Office of Oil and Gas

NOV 1 0 2014

Amine Acid Complex – Shale Stabilizer

Viscosifier For Water Based Muds

7. Mil-Pac (All Grades)

WV Department of c (All Grades)
Sodium Carboxymethylcellulose – Filtration Committee intental Protection

8. New Drill

Anionic Polyacrylamide Copolymer Emulsion – Shale Stabilizer

9. Caustic Soda

Sodium Hydroxide - Alkalinity Control

10. Mil-Lime

Calcium Hydroxide - Lime

11. LD-9

Polyether Polyol – Drilling Fluid Defoamer

12. Mil Mica

Hydro-Biotite Mica – LCM

13. Escaid 110

Drilling Fluild Solvent – Aliphatic Hydrocarbon

14. Ligco

Highly Oxidized Leonardite - Filteration Control Agent

15. Super Sweep

Polypropylene – Hole Cleaning Agent

16. Sulfatrol K

Drilling Fluid Additive – Sulfonated Asphalt Residuum

17. Sodium Chloride, Anhydrous

Inorganic Salt

18. D-D

Drilling Detergent – Surfactant

19. Terra-Rate

Organic Surfactant Blend

20. W.O. Defoam

Alcohol-Based Defoamer

21. Perma-Lose HT

Fluid Loss Reducer For Water-Based Muds

22. Xan-Plex D

Polysaccharide Polymer – Drilling Fluid Viscosifier

23. Walnut Shells

Ground Cellulosic Material - Ground Walnut Shells - LCM

24. Mil-Graphite

Natural Graphite - LCM

25. Mil Bar

Barite - Weighting Agent

26. X-Cide 102

Biocide

27. Soda Ash

Sodium Carbonate - Alkalinity Control Agent

28. Clay Trol

Amine Acid complex – Shale Stabilizer

29. Sulfatrol

Sulfonated Asphalt – Shale Control Additive

30. Xanvis

Viscosifier For Water-Based Muds

31. Milstarch

Starch - Fluid Loss Reducer For Water Based Muds

32. Mil-Lube

RECEIVED
Office of Oil and Gas

Drilling Fluid Lubricant

NOV 1 0 2014

WV Department of Environmental Protection



Well Site Safety Plan Antero Resources

Well Name: Penns Park Unit 1H, Penns Park Unit 2H, Penns

Park Unit 3H, Knoll Unit 1H, Knoll Unit 2H, Piper Unit 1H, Piper Unit 2H, Piper Unit 3H, Western

Unit 1H and Western Unit 2H

Pad Location: NOLAND PAD

Ritchie County/ Clay District

GPS Coordinates: Lat 39°17′56.82″/Long -80°58′41.56″ (NAD83)

Driving Directions:

FROM US 50 Near Clarksburg, WV:

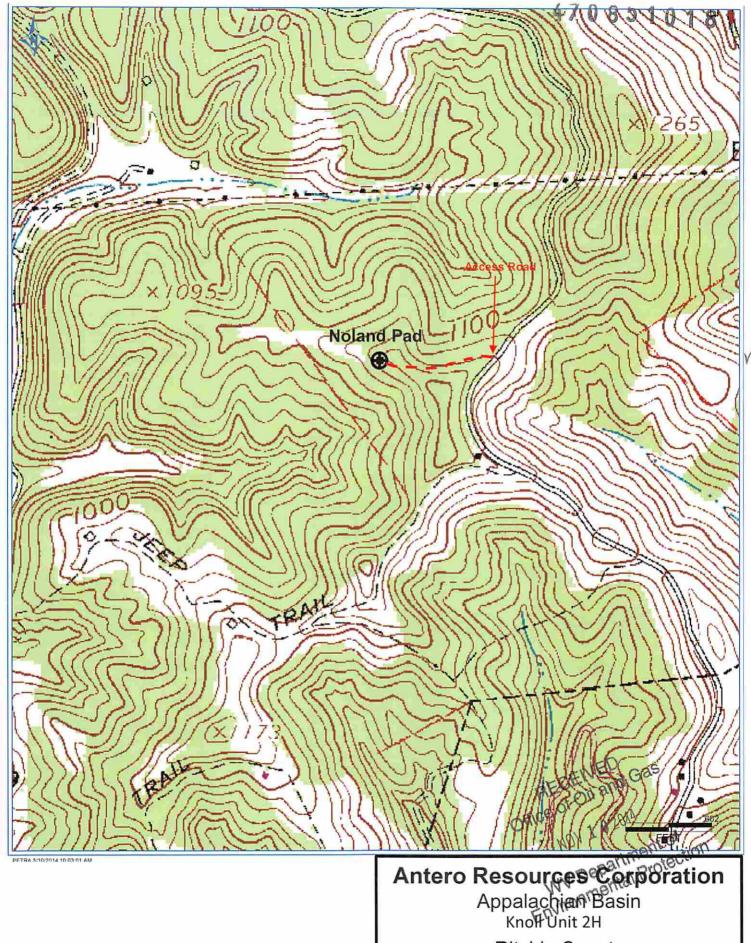
Head west on US 50 for 36.5 miles. Turn right onto WV 74/Pullman Dr. and continue for 0.4 miles. Turn Left onto E Myles Ave/Old US 50 E and continue for 0.9 miles. Turn right onto Eagle Dr. and continue for 450 ft. Turn right onto Collins Ave/Co RD 50/25 and continue for 240 ft. Take the first left onto Rose Hill/Co RD 50/22 and continue for 1.1 Miles. Access road will be on your left.

Received
Office of Oil & Gas

DEC 1 2 2014

SSP Page 1

David culleur 5-2-14



Ritchie County

Quadrangle: Pennsboro Watershed: Horner Run

District: Clay Date: 3-10-2014

02/13/2015

