



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

August 28, 2014

ANTERO RESOURCES CORPORATION
1615 WYNKOOP STREET
DENVER, CO 80202

Re: Permit Modification Approval for API Number 1706402 , Well #: TWYFORD UNIT 1H

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
Assistant Chief of Permitting
Office of Oil and Gas



Antero Resources
1615 Wynkoop Street
Denver, CO 80202
Office 303.357.7310
Fax 303.357.7315

August 28, 2014

West Virginia Department of Environmental Protection
Office of Oil and Gas
Attn: Ms. Laura Cooper
601 57th Street
Charleston, WV 25304

Ms. Laura Cooper:

Antero Resources Corporation (Antero) would like to submit the following permit modification for an approved well on the existing Diane Davis Pad. We are requesting to move the horizontal lateral which will change the bottom hole location of the Twyford Unit 1H (API #47-017-06402).

Attached you will find the following documents:

- REVISED Form WW-6B, which shows the revised MD and Production Casing/Cement program,
- REVISED Form WW-6A1, which shows the leases we will be drilling into, and
- REVISED Mylar Plat, which shows the new bottom hole location.

If you have any questions, please feel free to contact me at (303)357-7323.

Thank you in advance for your consideration.

Sincerely,

A handwritten signature in blue ink that reads "Ashlie Steele".

Ashlie Steele
Permitting Supervisor
Antero Resources Corporation

Enclosures

09/24/2021

WW-6B
(9/13)

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

1) Well Operator: Antero Resources Corporation 494488557 017-Doddridge Central West Union 7.5'
Operator ID County District Quadrangle

2) Operator's Well Number: Twyford Unit 1H Well Pad Name: Diane Davis Pad

3) Farm Name/Surface Owner: Davis, Jonathan et al Public Road Access: CR 11

4) Elevation, current ground: 824' Elevation, proposed post-construction: 824'

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 Associated Pressure(s):
Marcellus Shale: 6600' TVD, Anticipated Thickness- 60 Feet, Associated Pressure- 3100#

8) Proposed Total Vertical Depth: 6600' TVD

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 16,100' MD

11) Proposed Horizontal Leg Length: 8,468.3'

12) Approximate Fresh Water Strata Depths: 18', 275', 375'

13) Method to Determine Fresh Water Depths: Offset well records. Depths have been adjusted according to surface elevations.

14) Approximate Saltwater Depths: 1218' 1269'

15) Approximate Coal Seam Depths: 221', 613'

16) Approximate Depth to Possible Void (coal mine, karst, other): None anticipated

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: _____
Depth: _____
Seam: _____
Owner: AUG 12 2014

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#	80'	80'	CTS, 77 Cu. Ft.
Fresh Water	13-3/8"	New	J-55/H-40	54.5#/ 48#	435'	435' *see #19	CTS, 597 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2460'	2460'	CTS, 998 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	16100'	16100'	4032 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7100'	
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			

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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."

Received

AUG 12 2014

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 9.17 acres Office of Oil and Gas
WV Dept. of Environmental Protection

22) Area to be disturbed for well pad only, less access road (acres): 3.55 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.

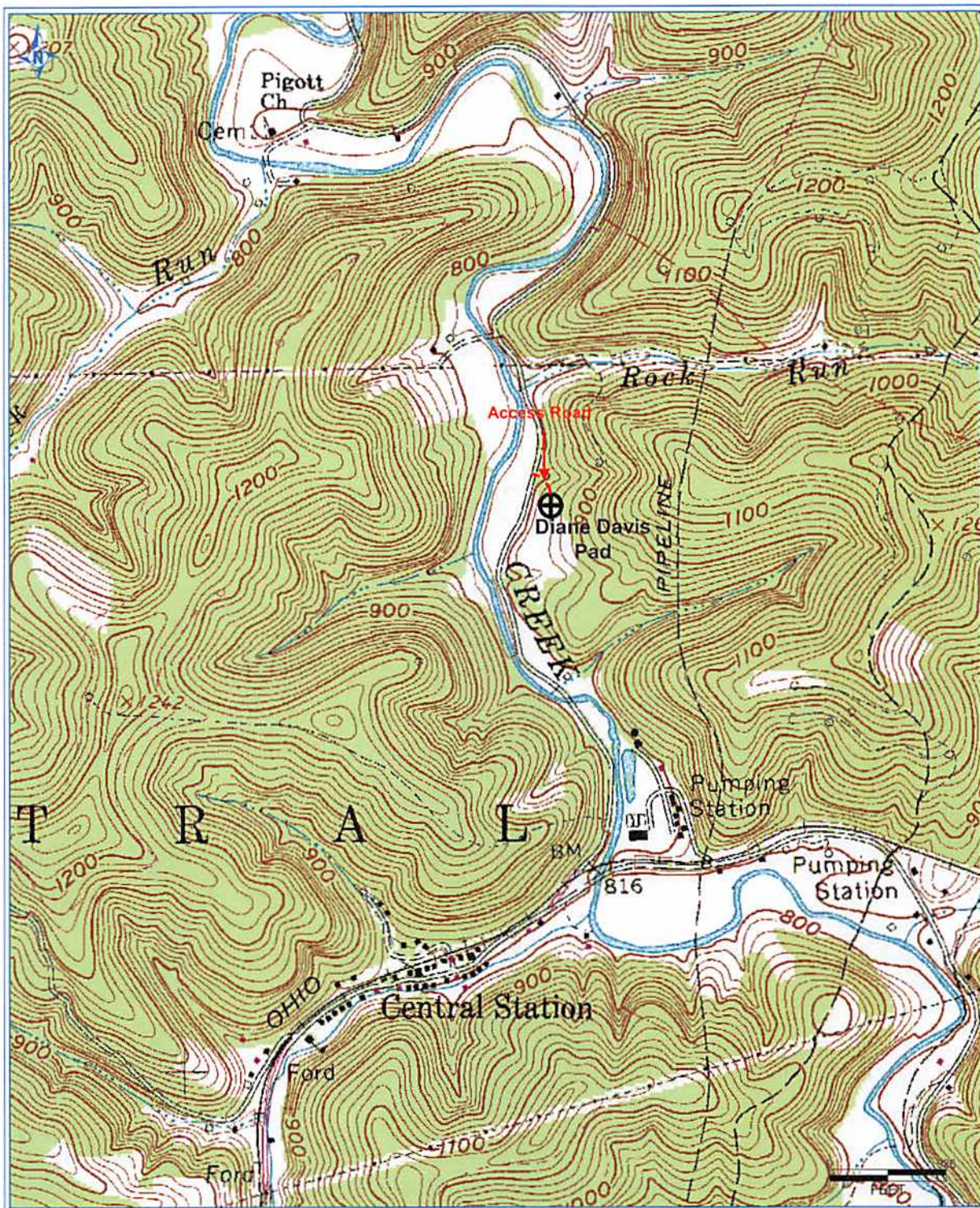
24) Describe all cement additives associated with each cement type:

Conductor: no additives, Class A cement.
Surface: Class A cement with 2% calcium and 1/4 lb flake, 5 gallons of clay treat
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, run casing, circulate 40 bbls brine 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, trip 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, pump 48 bbls barite pill, pump 10 bbls fresh water followed by 48 bbls mud flush and 10 bbls water.

*Note: Attach additional sheets as needed.



Antero Resources Corporation
Appalachian Basin
Twyford Unit 1H
Doddridge County

Quadrangle: West Union
Watershed: Arnold Creek
District: Central
Date: 8-21-2013

LATITUDE 39°20'00"

8,836'

4,332' TO BOTTOM HOLE

LATITUDE 39°17'30"

LONGITUDE 80°47'30"

3,709' TO BOTTOM HOLE

10,715'

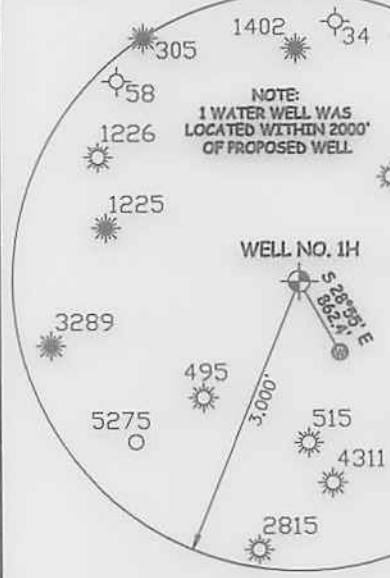
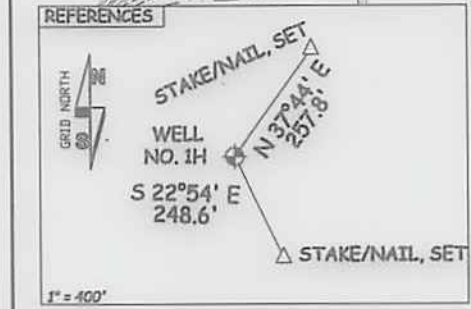
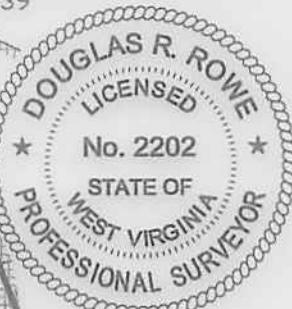
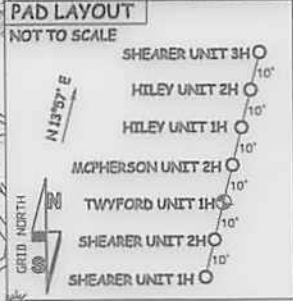
LONGITUDE 80°47'30"

Antero Resources Corporation
Well No. Twyford Unit 1H

NOTES:
WELL 1H TOP HOLE INFORMATION:
N: 295,559ft E: 1,625,659ft
LAT: 39°18'14.10" LON: 80°49'22.41"
BOTTOM HOLE INFORMATION:
N: 287,324ft E: 1,630,045ft
LAT: 39°16'53.35" LON: 80°48'25.09"
WEST VIRGINIA COORDINATE SYSTEM OF 1927 NORTH ZONE. ZONE WAS DERIVED FROM MEASUREMENTS TAKEN WITH TRIMBLE GEOXT SUBMETER MAPPING GRADE GPS UNIT. PLAT ORIENTATION, CORNER, AND WELL REFERENCE TIE LINES ARE BASED ON GRID NORTH.

(NAD) 83 (UTM) ZONE 17 COORDS:
WELL 1H TOP HOLE INFORMATION:
N: 4,350,527m E: 515,285m
BOTTOM HOLE INFORMATION:
N: 4,348,041m E: 516,663m

NOTE:
NO OCCUPIED DWELLINGS OR BUILDINGS TWO THOUSAND FIVE HUNDRED (2,000) SQUARE FEET OR LARGER USED TO HOUSE OR SHELTER CATTLE OR POULTRY OR HORSEMANRY ARE LOCATED WITHIN SIX HUNDRED TWENTY-FIVE (625) FEET OF THE CENTER OF THE WELL PAD.



JOB # 13-080WA
DRAWING # TWYFORD1HR1
SCALE 1" = 1000'
MINIMUM DEGREE OF ACCURACY SUBMETER
PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS

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 RULES ISSUED AND PERSCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.



STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
WILLOW LAND SURVEYING PLLC
220 MASONIC AVE. PENNSBORO WEST VIRGINIA 26415

LEGEND
--- Surface Owner Boundary Lines +/-
--- Interior Surface Tracts +/-
--- Existing Fence
--- Found monument, as noted

DOUGLAS R. ROWE P.S. 2202
DATE 07/30/14
OPERATOR'S WELL# TWYFORD UNIT#1H
API WELL # 47 - 017 - MOD
STATE COUNTY PERMIT 06402#6A

STATE OF WEST VIRGINIA DEPARTMENT OF ENERGY DIVISION OF OIL AND GAS
WELL TYPE: OIL GAS X LIQUID INJECTION WASTE DISPOSAL
(IF "GAS") PRODUCTION X STORAGE DEEP SHALLOW X
LOCATION: ELEVATION 824' WATERSHED ARNOLD CREEK
QUADRANGLE WEST UNION 7.5' DISTRICT CENTRAL COUNTY WYNDHAM
SURFACE OWNER JONATHAN DAVIS ET AL ACREAGE 35.21 ACRES +/-
OIL & GAS ROYALTY OWNERS: V. KARIN OSBOURN HOLLIS; FLORA SWEENEY; WILLIAM JOHN WILSON; LEASE ACREAGE 79.09 AC.; 103 AC.; 29.4 AC.;
CORLIS P. HUDSON ET AL; WVSRA; ROBERTA WALKER ET AL; RUBY FARR MAXWELL ET AL; RUTH D. ROGERS; MAYME TWYFORD 488.7 AC.; 301.19 AC.; 103 AC.; 45 AC.; 20 AC.; 71 AC.;
PROPOSED WORK: DRILL X CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE X
PLUG OFF OLD FORMATION PERFORATE NEW FORMATION X OTHER PHYSICAL CHANGE IN WELL
(SPECIFY) PLUG & ABANDON CLEAN OUT & REPLUG
TARGET FORMATION MARCELLUS ESTIMATED DEPTH 6,600' TVD 16,100' MD
WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM
ADDRESS 1615 WYNKOOP STREET ADDRESS 5400 D BIG TYLER ROAD
DENVER, CO 80202 CHARLESTON, WV 25313

MOD

**INFORMATION SUPPLIED UNDER WEST VIRGINIA CODE
Chapter 22, Article 6A, Section 5(a)(5)
IN LIEU OF FILING LEASE(S) AND OTHER CONTINUING CONTRACT(S)**

Under the oath required to make the verification on page 1 of this Notice and Application, I depose and say that I am the person who signed the Notice and Application for the Applicant, and that –

- (1) the tract of land is the same tract described in this Application, partly or wholly depicted in the accompanying plat, and described in the Construction and Reclamation Plan;
- (2) the parties and recordation data (if recorded) for lease(s) or other continuing contract(s) by which the Applicant claims the right to extract, produce or market the oil or gas are as follows:

Lease Name or Number	Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page
Ruth Rogers Lease	Ruth D. Rogers Clarence W. Mutschelknaus Bluestone Energy Partners	Clarence W. Mutschelknaus Bluestone Energy Partners Antero Resources Bluestone, LLC, a wholly owned subsidiary of Antero Resources Appalachian Corporation	1/8 Assignment Affidavit Regarding Merger	0132/0506 0249/0295 DB 0288/0001
	Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1

*Partial Assignments to Antero Resources Corporation include 100% rights to extract, produce and market the oil and gas from the Marcellus and any other formations completed with this well.

**Acknowledgement of Possible Permitting/Approval
In Addition to the Office of Oil and Gas**

The permit applicant for the proposed well work addressed in this application hereby acknowledges the possibility of the need for permits and/or approvals from local, state, or federal entities in addition to the DEP, Office of Oil and Gas, including but not limited to the following:

- WV Division of Water and Waste Management
- WV Division of Natural Resources WV Division of Highways
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- County Floodplain Coordinator

Received

AUG 12 2014

Office of Oil and Gas
WV Dept. of Environmental Protection

The applicant further acknowledges that any Office of Oil and Gas permit in no way overrides, replaces, or nullifies the need for other permits/approvals that may be necessary and further affirms that all needed permits/approvals should be acquired from the appropriate authority before the affected activity is initiated.

Well Operator: Antero Resources Corporation
 By: Randy Kloberdanz
 Its: Director of Environmental & Regulatory Affairs

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Grantor, lessor, etc.	Grantee, lessee, etc.	Royalty	Book/Page
<u>V. Karin Osbourn Hollis Lease</u>			
V. Karin Osbourn Hollis Antero Resources Appalachian Corporation	Antero Resources Appalachian Corporation Antero Resources Corporation	1/8+ Name Change	0280/0229 Exhibit 1
<u>Flora Sweeney Lease</u>			
Flora Furbee Sweeney Jan Elizabeth Lincicome, Administratrix, C.T.A. of the Estate of Joseph H. Cutlip, deceased Misco Industries, Inc. Clarence W. Mutschelknaus Bluestone Energy Partners	Joseph H. Cutlip Misco Industries, Inc. Clarence W. Mutschelknaus Bluestone Energy Partners Antero Resources Bluestone, LLC, a wholly owned subsidiary of Antero Resources Appalachian Corporation	1/8 Assignment Assignment Assignment Affidavit Regarding Merger	0087/0005 0094/0184 0138/0355 0240/0322 DB 0288/0001
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1
<u>William John Wilson Lease</u>			
William John Wilson Antero Resources Appalachian Corporation	Antero Resources Appalachian Corporation Antero Resources Corporation	1/8+ Name Change	0259/0396 Exhibit 1
<u>Corlis P. Hudson et al Lease</u>			
Corlis P. Hudson, et al James I. Shearer Key Oil Company	James I. Shearer Key Oil Company Antero Resources Appalachian Corporation	1/8 Assignment *Partial Assignment of Oil and Gas Leases Name Change	0067/0370 0178/0023 0256/0285 Exhibit 1
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1
<u>WVSRRA Lease</u>			
West Virginia State Rail Authority Antero Resources Appalachian Corporation	Antero Resources Appalachian Corporation Antero Resources Corporation	1/8 Name Change	0253/0409 Exhibit 1
<u>Roberta Walker et al Lease</u>			
Roberta Ann Walker, et al Trio Petroleum Corp. Waco Holding Company Waco Oil and Gas Company, Inc. Linn Energy, LLC Linn Energy Holdings, LLC, et al XTO Energy, Inc.	Trio Petroleum Corp. Waco Holding Company Waco Oil and Gas Company, Inc. Linn Energy, LLC Linn Energy Holdings, LLC, et al XTO Energy, Inc. Antero Resources Appalachian Corporation Antero Resources Corporation	1/8 Merger Merger Assignment and Bill of Sale Certificate of Amendment Assignment and Bill of Sale Notice of Agreement Name Change	0167/0513 Exhibit 2 Exhibit 3 0195/0541 DB 0262/0483 0224/0155 0316/0727 Exhibit 1
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1
<u>Ruby Farr Maxwell et al Lease</u>			
Ruby Farr Maxwell, et al Warren R. Haught Glenn L. Haught, et al V-H Joint Venture Virgil Gas Associates Key Oil Company	Warren R. Haught Glenn L. Haught, et al V-H Joint Venture Virgil Gas Associates Key Oil Company Antero Resources Appalachian Corporation	1/8 Assignment Assignment Assignment Assignment *Partial Assignment of Oil and Gas Leases Name Change	0103/0723 0107/0262 0110/0576 0127/0778 0208/0614 0256/0285 Exhibit 1
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1

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AUG 12 2014

CONTINUED ON NEXT PAGE

09/24/2021

Operator's Well Number Twyford Unit 1H

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Grantor, lessor, etc.	Grantee, lessee, etc.	Royalty	Book/Page
<u>Ruth Rogers Lease</u>			
Ruth D. Rogers	Clarence W. Mutschelknaus	1/8	0132/0506
Clarence W. Mutschelknaus	Bluestone Energy Partners	Assignment	0249/0295
Bluestone Energy Partners	Antero Resources Bluestone, LLC, a wholly owned subsidiary of Antero	Affidavit Regarding Merger	DB 0288/0001
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1

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09/24/2021

FORM WW-6A1
EXHIBIT 1

4701706402 MOD

FILED

JUN 10 2013

Natalie E. Tennant
Secretary of State
1900 Kanawha Blvd E
Bldg 1, Suite 157-K
Charleston, WV 25305



Penny Barker, Manager
IN THE OFFICE OF Corporations Division
SECRETARY OF STATE Tel: (304)558-8000
Fax: (304)558-8381
Website: www.wvscos.com
E-mail: business@wvscos.com

APPLICATION FOR
AMENDED CERTIFICATE
OF AUTHORITY

Office Hours: Monday - Friday
8:30 a.m. - 5:00 p.m. ET

FILE ONE ORIGINAL
(Two if you want a filed
stamped copy returned to you)
FEE: \$25.00

**** In accordance with the provisions of the West Virginia Code, the undersigned corporation hereby ****
applies for an Amended Certificate of Authority and submits the following statement:

- Name under which the corporation was authorized to transact business in WV: Antero Resources Appalachian Corporation
- Date Certificate of Authority was issued in West Virginia: 6/25/2008
- Corporate name has been changed to: Antero Resources Corporation
(Attach one Certified Copy of Name Change as filed in home State of incorporation.)
- Name the corporation elects to use in WV: Antero Resources Corporation
(due to home state name not being available)
- Other amendments: _____
(attach additional pages if necessary)
- Name and phone number of contact person. (This is optional; however, if there is a problem with the filing, listing a contact person and phone number may avoid having to return or reject the document.)
Alwyn A. Schopp (303) 357-7310
Contact Name Phone Number
- Signature Information (See below *Important Legal Notice Regarding Signature*):
Print Name of Signer: Alwyn A. Schopp Title/Capacity: Authorized Person
Signature: [Handwritten Signature] Date: June 10, 2013

***Important Legal Notice Regarding Signature:** For West Virginia Code §31D-1-129. Penalty for signing false document. Any person who signs a document he or she knows is false in any material respect and knows that the document is to be delivered to the secretary of state for filing is guilty of a misdemeanor and, upon conviction thereof, shall be fined not more than one thousand dollars or confined in the county or regional jail not more than one year, or both.

Received

AUG 12 2014