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

October 07, 2013

ANTERO RESOURCES APPALACHIAN CORPORATION
1625 17TH STREET, SUITE 300
DENVER, CO 80202

Re: Permit Modification Approval for API Number 8509987 , Well #: LEFT FORK UNIT #3H
extended lateral

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
Regulatory/Compliance Manager
Office of Oil and Gas

85-09987 MOD

ANTERO RESOURCES

Antero Resources
1625 17th Street
Denver, Colorado 80202
Office 303.357.7310
Fax 303.357.7315

May 3, 2013

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 Appalachian Corporation (Antero) would like to submit the following permit modifications for three approved wells on the Lockhart Heirs West Pad. We are requesting to extend the horizontal lateral which will change the bottom hole locations of the Left Fork Unit 1H (API# 47-085-09985), Left Fork Unit 2H (API# 47-085-09986) and Left Fork Unit 3H (API# 47-085-09987).

Attached you will find the following documents:

- REVISED Forms WW-6B, which show the revised MDs and Production Casing/Cement programs
- REVISED Forms WW-6A1, which show the additional leases we will be drilling into
- REVISED Mylar Plats, which show the new bottom hole locations

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

Thank you in advance for your consideration.

Sincerely,

Ashlie Mihalcin
Permit Representative
Antero Resources Appalachian Corporation

Enclosures

Received
Office of Oil & Gas

MAY - 9 2013

WW - 6B
(3/13)

API# 47-085-09987 PERMIT MODIFICATION

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

1) Well Operator:	Antero Resources Appalachian Corporation	494488557	085-Ritchie	Union	Pullman 7.5'
		Operator ID	County	District	Quadrangle

2) Operator's Well Number: Left Fork Unit 3H Well Pad Name: Lockhart Heirs West Pad

3 Elevation, current ground: 1022' Elevation, proposed post-construction: 1022'

4) Well Type: (a) Gas ■ Oil _____ Underground Storage _____

Other _____

(b) If Gas: Shallow ■ Deep _____

Horizontal ■

5) Existing Pad? Yes or No: Yes

6) Proposed Target Formation(s), Depth(s), Anticipated Thicknesses and Associated Pressure(s):

Marcellus Shale: 66700' TVD, Anticipated Thickness- 50 Feet, Associated Pressure- 3,000#

7) Proposed Total Vertical Depth: 6700' TVD

8) Formation at Total Vertical Depth: Marcellus

9) Proposed Total Measured Depth: 16,400' MD

10) Approximate Fresh Water Strata Depths: 190', 258'

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

12) Approximate Saltwater Depths: 1712', 2040'

13) Approximate Coal Seam Depths: None available

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

15) Does proposed well location contain coal seams directly overlying or adjacent to an active mine? If so, indicate name and depth of mine: No

16) Describe proposed well work: 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.

17) Describe fracturing/stimulating methods in detail:

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
Office of Oil & Gas
MAY - 9 2013

18) Total area to be disturbed, including roads, stockpile area, pits, etc, (acres): 18.21 acres

19) Area to be disturbed for well pad only, less access road (acres): 6.14 acres

API# 47-085-09987 PERMIT MODIFICATION

20) **CASING AND TUBING PROGRAM**

TYPE	Size	New or Used	Grade	Weight per 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#	405'	405'	CTS, 563 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2505'	2505'	CTS, 1020 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	16400'	16400'	4106 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7200'	
Liners							

TYPE	Size	Wellbore Diameter	Wall Thickness	Burst Pressure	Cement Type	Cement Yield
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			

Received
Office of Oil & Gas

MAY - 9 2013

21) 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.

22) 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

23) 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.

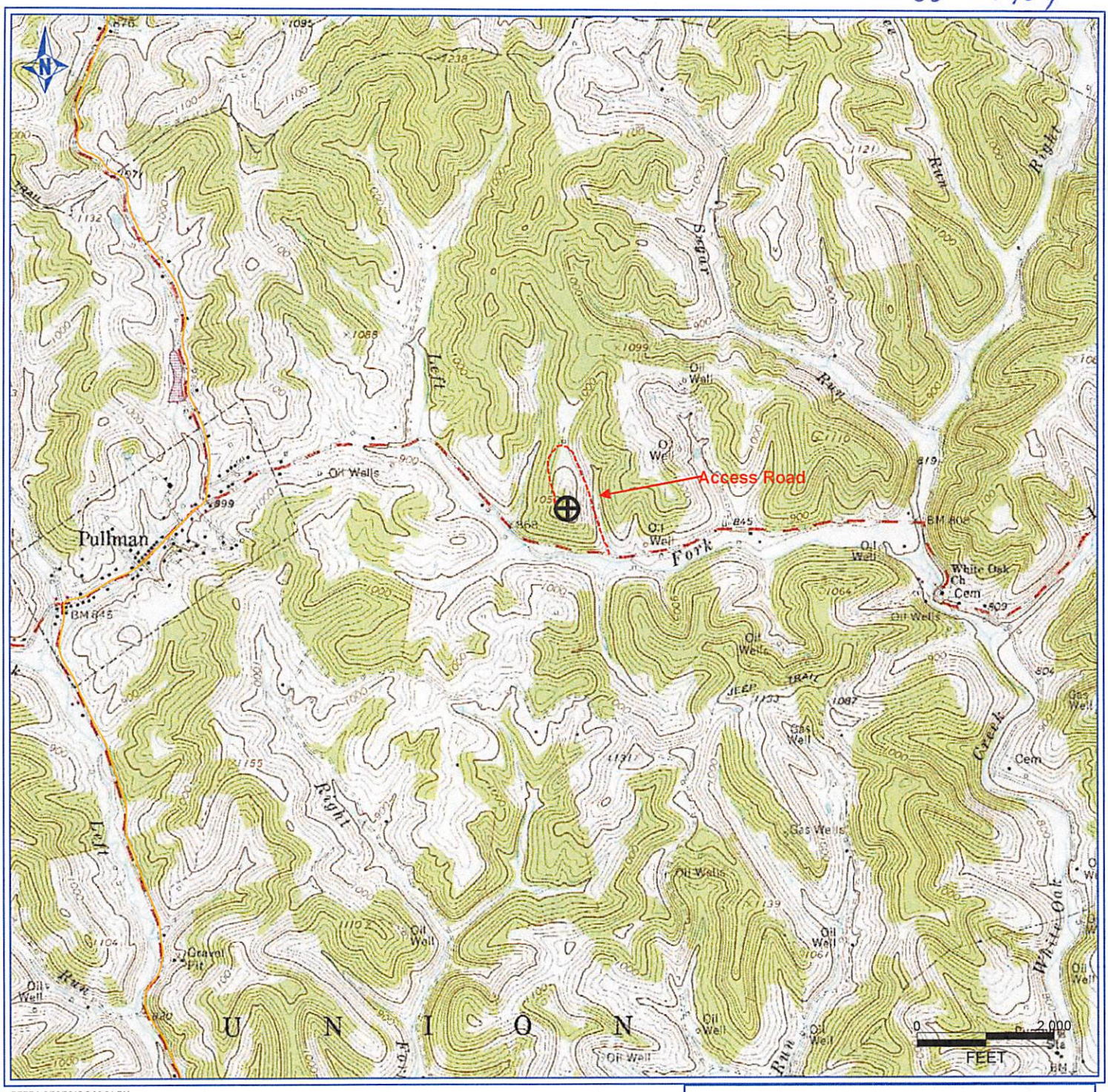
Production: circulate with 14 lb/gal NaCl mud, trip to middle of lateral, circulate, pump high viscosity sweep, trip to base of curve, pump high viscosity sweep, trip to top of curve, trip to bottom, circulate, pump high viscosity sweep, trip out, run casing, circulate 10 bbls fresh water, pump 48 bbls barite pill, pump 10 bbls fresh water followed by 48 bbls mud flush and 10 bbls water.

*Note: Attach additional sheets as needed.

Received
Office of Oil & Gas

MAY - 9 2013

85-09987



PETRA 6/26/2012 2:36:01 PM

Antero Resources Corporation

APPALACHIAN BASIN

Left Fork Unit 3H

Ritchie County

0 2,000 4,000

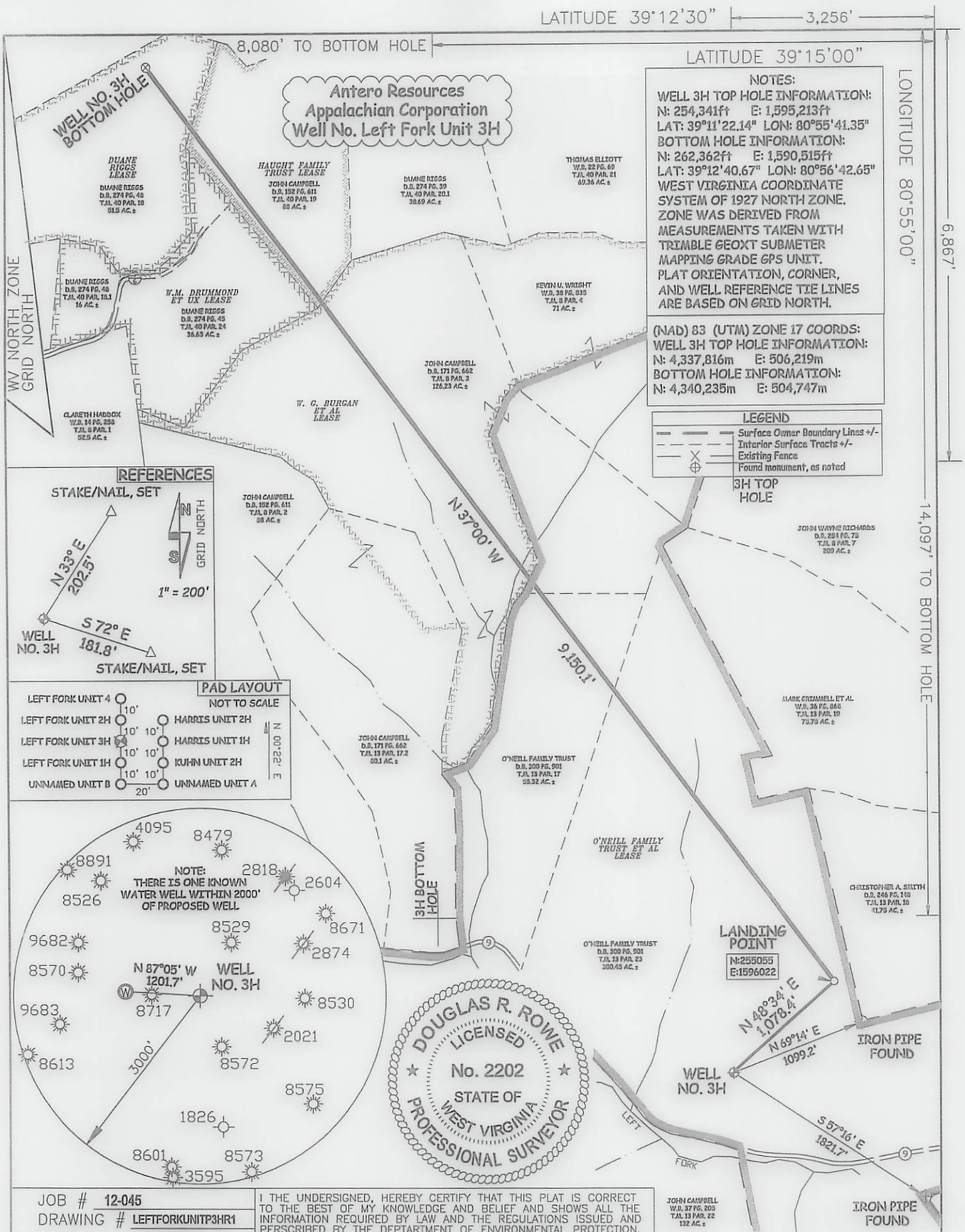
FEET

REMARKS

QUADRANGLE: PULLMAN
WATERSHED: LEFT FORK
DISTRICT: UNION

Date: 7/05/2012

RECEIVED
Office of Oil & Gas
JUL 13 2012
WV Department of
Environmental Protection



JOB # 12-045
DRAWING # LEFTFORKUNITP3HR1
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 REGULATIONS ISSUED AND PERSCRIBED BY THE DEPTARTMENT OF ENVIRONMENTAL PROTECTION.

STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS

WILLOW LAND SURVEYING PLLC
266 HUSHERS RUN RD PENNSBORO
WEST VIRGINIA 26415

DOUGLAS R. ROWE P.S. 2202

STATE OF WEST VIRGINIA
DEPARTMENT OF ENERGY
DIVISION OF OIL AND GAS

DATE 04/29/13
OPERATOR'S WELL# LEFT FORK UNIT #3H
API WELL # 47 – 085 – 09987 MOD H6A
STATE COUNTY PERMIT

WELL TYPE: OIL ___ GAS X LIQUID INJECTION ___ WASTE DISPOSAL ___
(IF "GAS") PRODUCTION X STORAGE ___ DEEP ___ SHALLOW X
LOCATION: ELEVATION 1,022' WATERSHED LEFT FORK
QUADRANGLE PULLMAN 7.5' DISTRICT UNION COUNTY RITCHIE
SURFACE OWNER O'NEILL FAMILY TRUST ET AL ACREAGE 300.45 ACRES +/-
OIL & GAS ROYALTY OWNER O'NEILL FAMILY TRUST ET AL; W. G. BURGAN ET AL; HAUGHT FAMILY TRUST; DUANE RIGGS LEASE ACREAGE 517.83 ACRES±; 126.23 ACRES±; 38.7 ACRES±; 52 ACRES±
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) BHL - Permit Modification PLUG & ABANDON ___ CLEAN OUT & REPLUG ___
TARGET FORMATION MARCELLUS ESTIMATED DEPTH 6,700' TVD 16,400' MD

WELL OPERATOR ANTERO RESOURCES APPALACHIAN CORP.
ADDRESS 1625 17TH STREET DENVER, CO 80202
DESIGNATED AGENT DIANNA STAMPER
ADDRESS CT CORPORATION SYSTEM 5400 D BIG TYLER ROAD CHARLESTON, WV 25313

FORM WW-6

COUNTY NAME PERMIT