



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

March 26, 2014

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

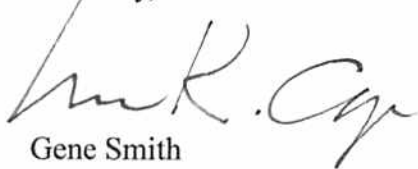
Re: Permit Modification Approval for API Number 1706231 , Well #: RIKK UNIT 2H
Changed Bottom Hole

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



March 13, 2014

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

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 modifications for three approved wells on the existing Leonard Pad. We are requesting to change the orientation of the horizontal laterals which will change the bottom hole locations of the Rikk Unit 1H (API# 47-017-06228), Rikk Unit 2H (API# 47-017-06231) and Irons Unit 2H (API#47-017-06232).

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
- REVISED Mylar Plat, which shows the new bottom hole location

If you have any questions please feel free to contact me at (303) 357-6817.

Thank you in advance for your consideration.

Sincerely,

A handwritten signature in cursive script that reads "Lisa Bottinelli".

Lisa Bottinelli
Permit Representative
Antero Resources Corporation

Enclosures

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03/28/2014

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 New Milton New Milton 7.5'
Operator ID County District Quadrangle

2) Operator's Well Number: Rikk Unit 2H Well Pad Name: Leonard Pad (Existing)

3) Farm Name/Surface Owner: Walter V. & Leonard J. Davidson Public Road Access: CR 42

4) Elevation, current ground: 1318' Elevation, proposed post-construction: 1318'

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

(b) If Gas Shallow Deep _____
Horizontal

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Associated Pressure(s):
Marcellus Shale: 7650' TVD, Anticipated Thickness- 50 Feet, Associated Pressure- 3200#

8) Proposed Total Vertical Depth: 7650' TVD

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 18,500' MD

11) Proposed Horizontal Leg Length: 7272'

12) Approximate Fresh Water Strata Depths: 87', 230'

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

14) Approximate Saltwater Depths: 842', 1789', 2051'

15) Approximate Coal Seam Depths: 263', 960', 1726'

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: _____

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WW-6B
(9/13)

18)

CASING AND TUBING PROGRAM

<u>TYPE</u>	<u>Size</u>	<u>New or Used</u>	<u>Grade</u>	<u>Weight per ft. (lb/ft)</u>	<u>FOOTAGE: For Drilling</u>	<u>INTERVALS: Left in Well</u>	<u>CEMENT: Fill-up (Cu. Ft.)</u>
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#	305'	305'	CTS, 424 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2570'	2570'	CTS, 1046 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	18500'	18500'	4653 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7200'	
Liners							

UKC
3.26.14

<u>TYPE</u>	<u>Size</u>	<u>Wellbore Diameter</u>	<u>Wall Thickness</u>	<u>Burst Pressure</u>	<u>Cement Type</u>	<u>Cement Yield (cu. ft./k)</u>
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.

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): 18.18 acres

22) Area to be disturbed for well pad only, less access road (acres): 4.51 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:

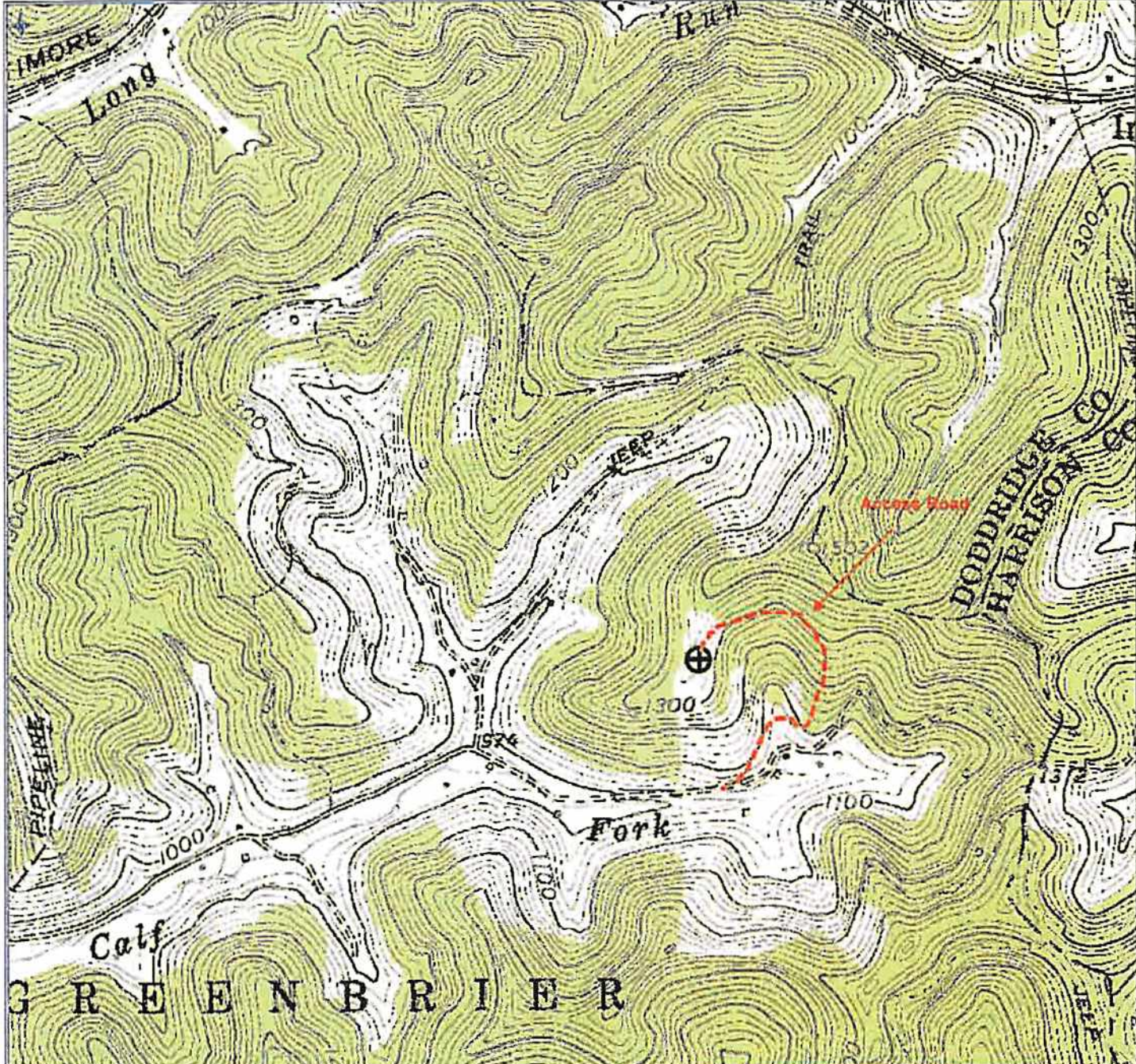
✓ Conductor: no additives, Class A cement.
 Surface: Class A cement with 2-3% calcium chloride
 Intermediate: Class A cement with 1/4 lb of flake, 5 gallons of clay treat
 Production: Lead cement- 50/50 Class H/Poz + 1.5% salt + 1% C-45 + 0.5% C-16a + 0.2% C-12 + 0.45% C-20 + 0.05% C-51
 Production: 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 pipe capacity + 40 bbls fresh 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.

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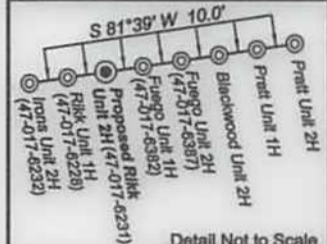
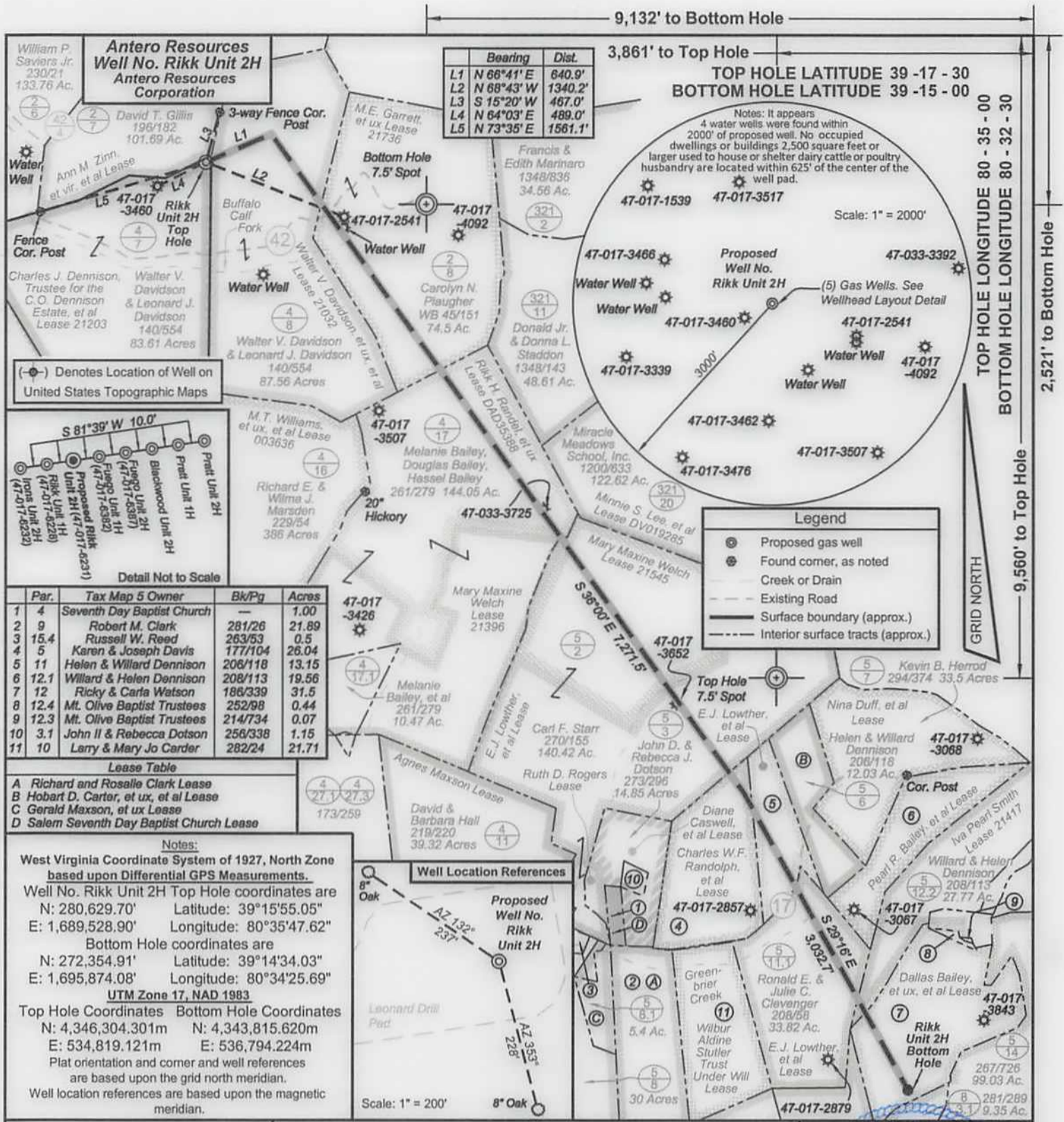
17-06231 H6A RIKK UNIT 2H
 ANTERO RESOURCES

PAD NAME: LEONARD

Received
 Office of Oil & Gas
 MAY 16 2013
DLW
5-14-2013

Antero Resources Corporation
APPALACHIAN BASIN
Rikk Unit 2H
Doddridge County
0 2,000 4,000 FEET
REMARKS QUADRANGLE: SALEM & BIG ISAAC WATERSHED: BUFFALO CALF FORK DISTRICT: GREENBRIER
January 9, 2009

03/28/2014



Par.	Tax Map 5 Owner	Bk/Pg	Acres
1	4 Seventh Day Baptist Church	—	1.00
2	9 Robert M. Clark	281/26	21.89
3	15.4 Russell W. Reed	263/53	0.5
4	5 Karen & Joseph Davis	177/104	26.04
5	11 Helen & Willard Dennison	206/118	13.15
6	12.1 Willard & Helen Dennison	208/113	19.56
7	12 Ricky & Carla Watson	186/339	31.5
8	12.4 Mt. Olive Baptist Trustees	252/98	0.44
9	12.3 Mt. Olive Baptist Trustees	214/734	0.07
10	3.1 John II & Rebecca Dotson	256/338	1.15
11	10 Larry & Mary Jo Carder	282/24	21.71

Lease Table	
A	Richard and Rosalie Clark Lease
B	Hobart D. Carter, et ux, et al Lease
C	Gerald Maxson, et ux Lease
D	Salem Seventh Day Baptist Church Lease

Notes:
 West Virginia Coordinate System of 1927, North Zone based upon Differential GPS Measurements.
 Well No. Rikk Unit 2H Top Hole coordinates are
 N: 280,629.70' Latitude: 39°15'55.05"
 E: 1,689,528.90' Longitude: 80°35'47.62"
 Bottom Hole coordinates are
 N: 272,354.91' Latitude: 39°14'34.03"
 E: 1,695,874.08' Longitude: 80°34'25.69"
 UTM Zone 17, NAD 1983
 Top Hole Coordinates Bottom Hole Coordinates
 N: 4,346,304.301m N: 4,343,815.620m
 E: 534,819.121m E: 536,794.224m
 Plat orientation and corner and well references are based upon the grid north meridian.
 Well location references are based upon the magnetic meridian.



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 prescribed by the Department of Environmental Protection.

Kenneth J. Plum
 Kenneth J. Plum, P.S. 2216



FILE NO: 41-30-GR-13
 DRAWING NO: 41-13 Rikk 2H Well Plat
 SCALE: 1" = 1200'
 MINIMUM DEGREE OF ACCURACY: Submeter
 PROVEN SOURCE OF ELEVATION: WV DOT, Bridgeport, WV

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

DATE: March 10 2014
 OPERATOR'S WELL NO. Rikk Unit 2H
 API WELL NO. MOD
 47 - 017 - 06231H 64
 STATE COUNTY PERMIT

WELL TYPE: OIL GAS LIQUID INJECTION WASTE DISPOSAL
 (IF GAS) PRODUCTION: STORAGE DEEP SHALLOW
 LOCATION: ELEVATION: 1318' WATERSHED: Buffalo Calf Fork QUADRANGLE: Salem & Big Isaac
 DISTRICT: Greenbrier Charles W.F. Randolph, et al; E.J. Lowther, et al (3) COUNTY: Doddridge 03/28/2014 35
 SURFACE OWNER: Leonard J. Davidson Walter V. Davidson & Mary Maxine Welch (2); Dallas Bailey, et ux, et al; Iva Pearl Smith 21417 ACREAGE: 83.61 47; 47; 27.12
 ROYALTY OWNER: Charles J. Dennison, Trustee for the C.O. Dennison Estate, et al LEASE NO: 21736; DAD35388; 21545 ACREAGE: 84; 87; 74.5; 65; 90
 PROPOSED WORK: DRILL CONVERT DRILL DEEPER FRACTURE OR STIMULATE PLUG OFF OLD FORMATION
 PERFORATE NEW FORMATION OTHER PHYSICAL CHANGE IN WELL (SPECIFY) Modification - BHL 7,650' TVD
 PLUG AND ABANDON CLEAN OUT AND REPLUG TARGET FORMATION: Marcellus Shale ESTIMATED DEPTH: 18,500' MD

WELL OPERATOR: Antero Resources Corporation DESIGNATED AGENT: Dianna Stamper - CT Corporation System
 ADDRESS: 1625 17th Street ADDRESS: 5400 D Big Tyler Road
 Denver, CO 80202 Charleston, WV 25313