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west virginia department of environmental protection

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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](http://www.dep.wv.gov)

## PERMIT MODIFICATION APPROVAL

February 12, 2014

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

Re: Permit Modification Approval for API Number 1706362 , Well #: FARROW UNIT 2H  
**Orientation of Lateral Changed**

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



December 11, 2013

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 57<sup>th</sup> 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 Cline Pad. We are requesting to move the horizontal lateral which will change the bottom hole location of the Nickers Unit 2H (API# 47-017-06311), Farrow Unit 2H (API# 47-017-06362) and Farrow Unit 3H (API# 47-017-06366).

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) 357-7323.

Thank you in advance for your consideration.

Sincerely, -

Ashlie Mihalcin  
Permit Representative  
Antero Resources Corporation

Enclosures

**Received**

DEC 13 2013

Office of Oil and Gas  
WV Dept. of Environmental Protection

02/14/2014

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: Farrow Unit 2H Well Pad Name: Cline Pad

3) Farm Name/Surface Owner: Johnnie Cline et al Public Road Access: CR-18

4) Elevation, current ground: ~1105 Elevation, proposed post-construction: 1096'

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: 7200' TVD, Anticipated Thickness- 60 Feet, Associated Pressure- 3250#

8) Proposed Total Vertical Depth: 7200' TVD

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 15,900' MD

11) Proposed Horizontal Leg Length: 8,336'

12) Approximate Fresh Water Strata Depths: 203', 214'

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

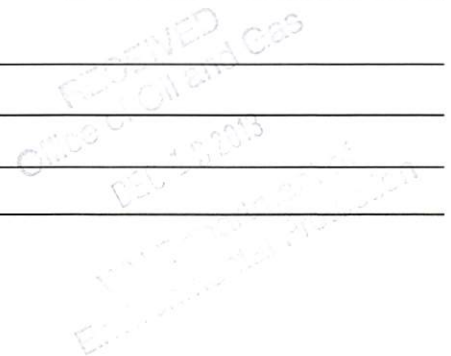
14) Approximate Saltwater Depths: 612', 1595'

15) Approximate Coal Seam Depths: 258', 809'

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: \_\_\_\_\_



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#                    | 300'                         | 300'                           | CTS, 417 Cu. Ft.                 |
| Coal         | 9-5/8"      | New                | J-55         | 36#                           | 2450'                        | 2450'                          | CTS, 998 Cu. Ft.                 |
| Intermediate |             |                    |              |                               |                              |                                |                                  |
| Production   | 5-1/2"      | New                | P-110        | 20#                           | 15,900'                      | 15,900'                        | 3980 Cu. Ft.                     |
| Tubing       | 2-3/8"      | New                | N-80         | 4.7#                          |                              | 7100'                          |                                  |
| Liners       |             |                    |              |                               |                              |                                |                                  |

*AL & BN*  
*2/12/14*

| <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 |  |  |  |

PROCESSED  
 Oklahoma Oil and Gas  
 FEB 13 2014  
 Oklahoma Department of  
 Environmental Protection

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): 11.97 acres

22) Area to be disturbed for well pad only, less access road (acres): 5.55 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 2-3% 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 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.

WW-6A1

Operator's Well Number Farrow Unit 2H

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:

| Grantor, lessor, etc.   | Grantee, lessee, etc.   | Royalty   | Book/Page   |
|---|---|---|---|
| ✓ <u>Frank Hinter et al Lease</u><br>Frank Hinter, et al<br>Bill D. Haught, et ux<br>South Triangle Oil Company<br>Randy F. Gearhart heirs of Floyd A. Gearhart, et ux<br>Antero Resources Appalachian Corporation  | Bill D. Haught<br>South Triangle Oil Company<br>Floyd A. Gearhart<br>Antero Resources Appalachian Corporation<br>Antero Resources Corporation   | 1/8<br>Assignment<br>Assignment<br>Assignment<br>Name Change  | 0068/0306<br>0068/0314<br>0081/0203<br>0271/0216<br>Exhibit 1   |
| ✓ <u>Joan R. Farrow Lease</u><br>Joan R. Farrow, a widow<br>Antero Resources Appalachian Corporation  | Antero Resources Appalachian Corporation<br>Antero Resources Corporation  | 1/8+<br>Name Change   | 0297/0555<br>Exhibit 1  |
| ✓ <u>Denver Junior Cox Lease</u><br>Denver Junior Cox<br>Antero Resources Appalachian Corporation   | Antero Resources Appalachian Corporation<br>Antero Resources Corporation  | 1/8+<br>Name Change   | 0294/0226<br>Exhibit 1  |
| ✓ <u>Grover Johnson et ux Lease</u><br>Grover J. Johnson, et ux<br>George J. Buff Jr.<br><br>Helen Buff, et al<br><br>Ila Powell<br>P. & M. Oil Company, Inc.<br><br>P & M Oil Company, et al<br><br>R & K Oil and Gas, Inc.<br>Bluestone Energy Partners | Richard C. Bachelor<br>Helen K. Buff, Ila Powell<br><br>Ila Powell<br><br>P. & M. Oil Company, Inc.<br>R & K Oil and Gas, Inc.<br><br>R & K Oil and Gas, Inc.<br><br>Bluestone Energy Partners<br>Antero Resources Bluestone, LLC a wholly owned<br>Subsidiary of Antero Resources Appalachian<br>Corporation | 1/8<br>Last Will and<br>Testament<br>Assignment<br>Assignment<br>Assignment and<br>Bill of Sale<br>Corrective<br>Assignment<br>Assignment<br>Affidavid Regarding<br>Merger<br><br>Name Change | 0065/0421<br>WB 0014/0548<br><br>Recital In<br>0162/0695-A<br>0162/0695-A<br>0190/0371<br>0233/0053<br>0234/0721<br>DB 0288/0001<br><br>Exhibit 1 |
| ✓ <u>Antero Resources Appalachian Corporation</u>   | Antero Resources Corporation  | Name Change   | Exhibit 1   |
| ✓ <u>Udella Mae Proudfoot Barnett Lease</u><br>Udella Mae Proudfoot Barnett<br>Antero Resources Appalachian Corporation   | Antero Resources Appalachian Corporation<br>Antero Resources Corporation  | 1/8+<br>Name Change   | 0282/0050<br>Exhibit 1  |
| ✓ <u>Ruby Gene Dicks Lease</u><br>Ruby Gene Dicks<br>Antero Resources Appalachian Corporation   | Antero Resources Appalachian Corporation<br>Antero Resources Corporation  | 1/8<br>Name Change  | 0301/0021<br>Exhibit 1  |
| ✓ <u>Karen M. Henderson Lease</u><br>Karen M. Henderson<br>Antero Resources Appalachian Corporation   | Antero Resources Appalachian Corporation<br>Antero Resources Corporation  | 1/8+<br>Name Change   | 0303/0348<br>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.

\*\*CONTINUED ON NEXT PAGE\*\*

02/14/2014

WW-6A1  
(5/13)

Operator's Well No. Farrow Unit 2H

**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        |
|---------------------------------|---|---|--------------------|------------------|
| <u>Karen M. Henderson Lease</u> | Karen M. Henderson                                  | Antero Resources<br>Appalachian Corporation | 1/8 +              | 0306/0504        |
|                                 | <b>Antero Resources<br/>Appalachian Corporation</b> | <b>Antero Resources Corporation</b>         | <b>Name Change</b> | <b>Exhibit 1</b> |

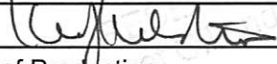
\*Partial Assignments to Antero Resources Corporation include 100% rights to extract, produce and market the oil and gas from the Marcellus and any other formations completed with this well.

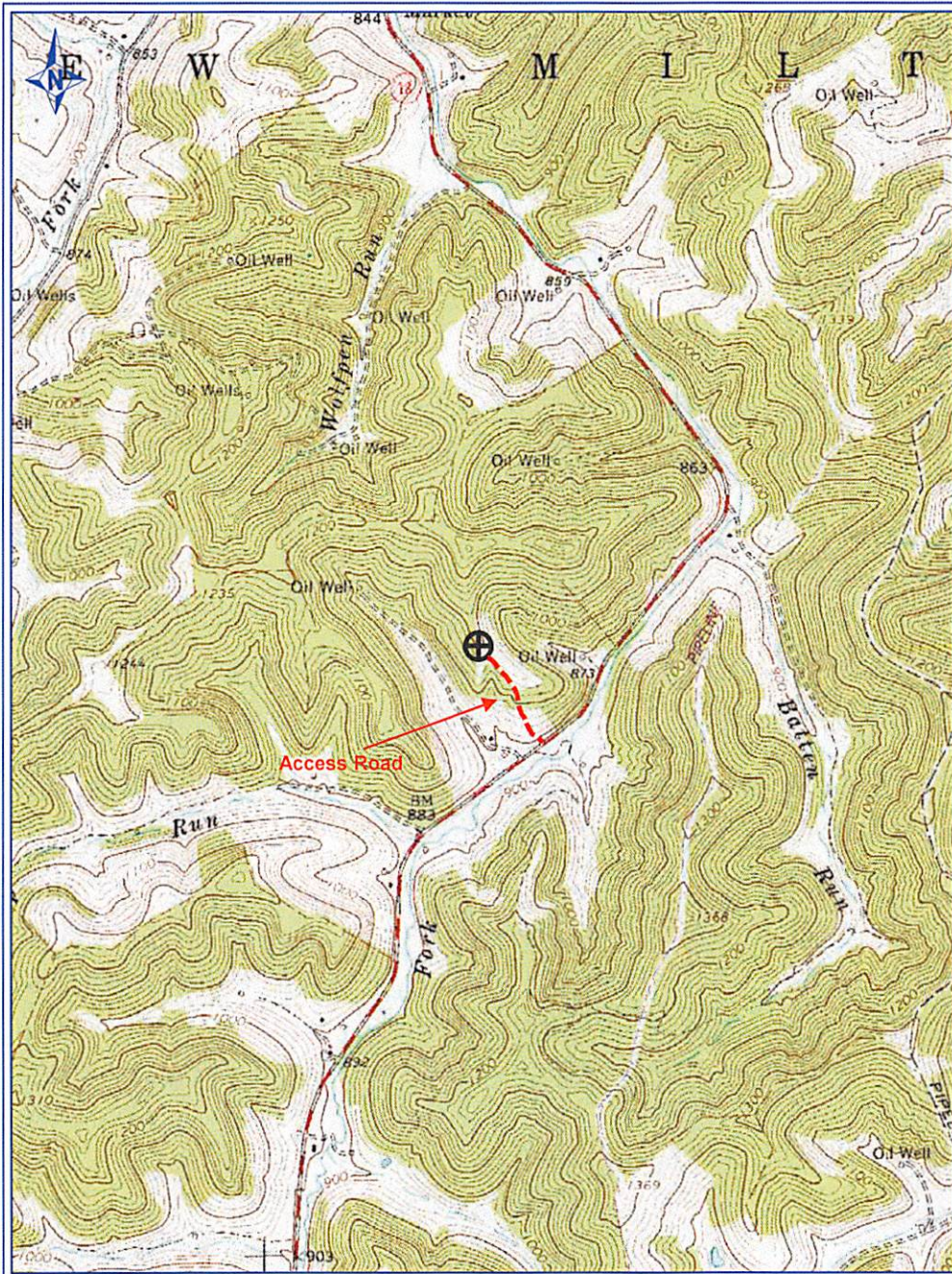
**Acknowledgement of Possible Permitting/Approval  
In Addition to the Office of Oil and Gas**

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

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: Kevin Kilstrom   
 Its: Vice President of Production



PETRA 6/3/2013 2:37:31 PM

**Antero Resources Corp**

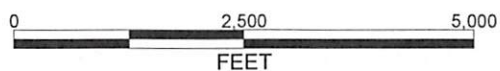
APPALACHIAN BASIN

Farrow Unit 2H

**REMARKS**

QUADRANGLE: NEW MILTON  
WATERSHED: TOM'S FORK  
DISTRICT: NEW MILTON

By: ECM



Received

AUG 30 2013

Office of Oil and Gas  
WV Dept. of Environmental Protection



LATITUDE 39°12'30"

9,383'

11,181' TO BOTTOM HOLE

LATITUDE 39°12'30"

LONGITUDE 80°40'00"

8,225'

LONGITUDE 80°40'00"

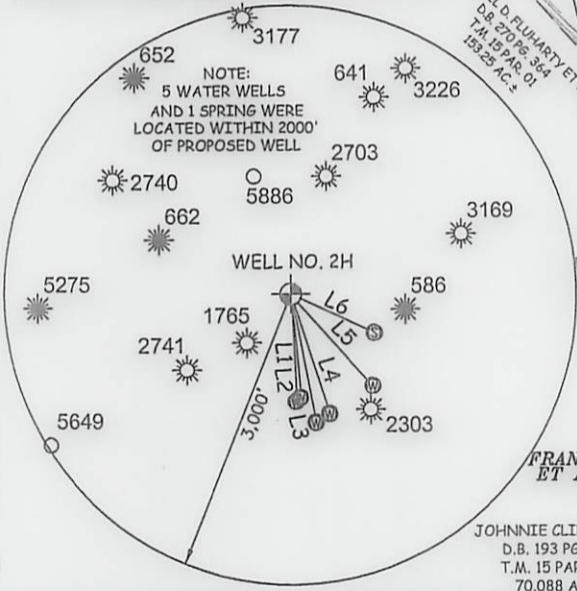
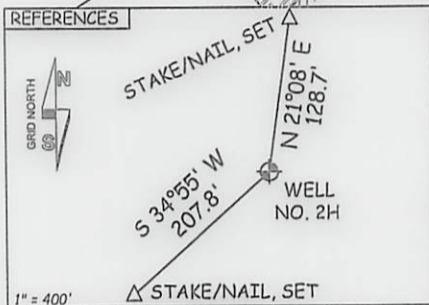
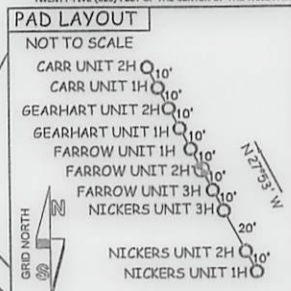
Antero Resources Corporation Well No. Farrow Unit 2H

| LINE | BEARING    | DISTANCE |
|------|------------|----------|
| L1   | S 03°23' E | 1153.1'  |
| L2   | S 05°55' E | 1114.4'  |
| L3   | S 11°19' E | 1393.0'  |
| L4   | S 18°06' E | 1342.8'  |
| L5   | S 41°34' E | 1320.7'  |
| L6   | S 63°31' E | 1001.4'  |

NOTES:  
 WELL 2H TOP HOLE INFORMATION:  
 N: 252,035ft E: 1,659,922ft  
 LAT: 39°11'08.70" LON: 80°41'59.17"  
 BOTTOM HOLE INFORMATION:  
 N: 260,266ft E: 1,658,231ft  
 LAT: 39°12'29.82" LON: 80°42'22.05"  
 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 2H TOP HOLE INFORMATION:  
 N: 4,337,443m E: 525,945m  
 BOTTOM HOLE INFORMATION:  
 N: 4,339,941m E: 525,388m

NOTE  
 NO OCCUPIED DWELLINGS OR BUILDINGS TWO THOUSAND FIVE HUNDRED (2,500) SQUARE FEET OR LARGER USED TO HOUSE OR SHELTER DAIRY CATTLE OR POULTRY FEEDING ARE LOCATED WITHIN SIX HUNDRED TWENTY-FIVE (625) FEET OF THE CENTER OF THE WELL PAD.



JOB # 13-067WA  
 DRAWING # FARROW2HR1  
 SCALE 1" = 1000'  
 MINIMUM DEGREE OF ACCURACY SUBMETER  
 PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS

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 1,096' WATERSHED TOMS FORK  
 QUADRANGLE NEW MILTON 7.5' DISTRICT NEW MILTON COUNTY DODDRIDGE

SURFACE OWNER JOHNNIE CLINE ET AL ACREAGE 70.088 ACRES +/-

OIL & GAS ROYALTY OWNER FRANK HINTER ET AL; JOAN R. FARROW; DENVER JUNIOR COX; GROVER JOHNSON ET UX; UDELLA MAE PROUDFOOT BARNETT; RUBY GENE DICKS; KAREN M. HENDERSON; KAREN M. HENDERSON LEASE ACREAGE 329.73 ACRES+; 67 ACRES+; 80 ACRES+; 81 ACRES+; 22.485 ACRES+; 117.197 ACRES+; 84.96 ACRES+; 38.34 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) Modification - BHL PLUG & ABANDON \_\_\_ CLEAN OUT & REPLUG \_\_\_  
 TARGET FORMATION MARCELLUS ESTIMATED DEPTH 7,200' TVD 15,900' MD

WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER  
 ADDRESS 1625 17TH STREET ADDRESS 5400 D BIG TYLER ROAD  
 FORM WW-6 DENVER, CO 80202 CHARLESTON, WV 25313

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 09/12/13

OPERATOR'S WELL# FARROW UNIT #2H

API WELL # 47 - 017 - MOD 06362 H6A

STATE COUNTY PERMIT

