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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

March 31, 2014

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

Re: Permit Modification Approval for API Number 1706342 , Well #: CORDER UNIT 2H  
**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



December 18, 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 modification for an approved well on the Reed Pad. We are requesting to extend the horizontal lateral length which will change the bottom hole location of the Corder Unit 2H (API# 47-017-06342).

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

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Enclosures

04/04/2014

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 Greenbrier Big Isaac  
Operator ID County District Quadrangle

2) Operator's Well Number: Corder Unit 2H Well Pad Name: Reed Pad (existing)

3) Farm Name/Surface Owner: Reed, Linn A., et al Public Road Access: CR 48

4) Elevation, current ground: 1358' Elevation, proposed post-construction: 1358'

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: 7400' TVD, Anticipated Thickness- 50 Feet feet, Associated Pressure- 3200#

8) Proposed Total Vertical Depth: 7400' TVD

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 17,000' MD

11) Proposed Horizontal Leg Length: 9278'

12) Approximate Fresh Water Strata Depths: 80'

13) Method to Determine Fresh Water Depths: Furbey Unit 2H (API#47-017-06138) on same pad

14) Approximate Saltwater Depths: 2026', 2242'

15) Approximate Coal Seam Depths: 347', 382', 700', 1,467'

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, 86 Cu. Ft.
Fresh Water	13-3/8"	New	J-55/H-40	54.5#/ 48#	325'	325'	CTS, 451 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2490'	2490'	CTS, 1,014 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	17,000'	17,000'	4,270 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7,100'	
Liners							

<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): 9.16 existing acres

22) Area to be disturbed for well pad only, less access road (acres): 2.52 existing 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

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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 top 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.

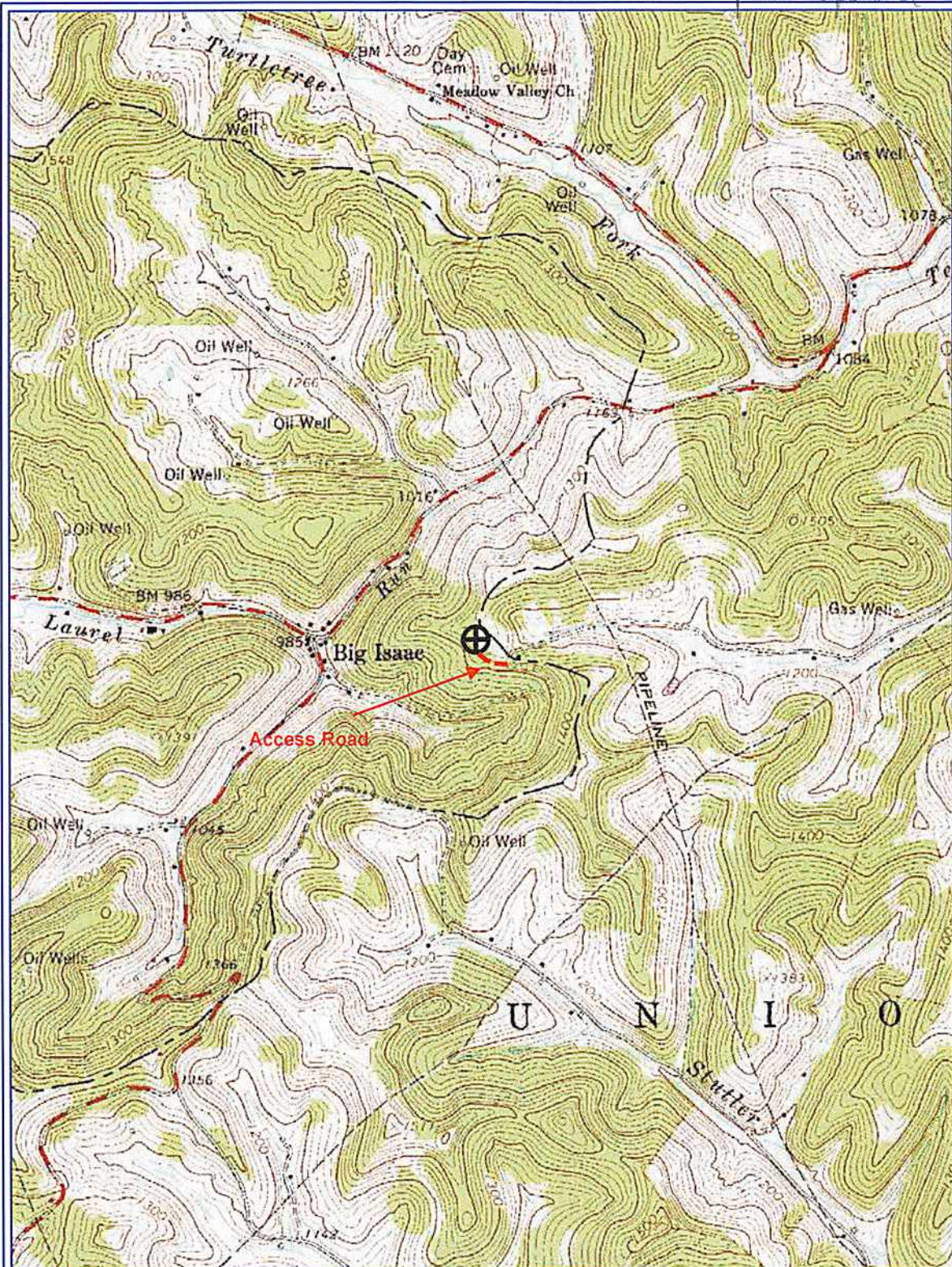
DEC 20 2013  
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\*Note: Attach additional sheets as needed.



plat spotted

17-06342



PETRA 6/3/2013 4:22:23 PM

*DCW  
8-15-2013*

**Received**

AUG 16 2013

Office of Oil and Gas  
WV Dept. of Environmental Protection

**Antero Resources Corp**

APPALACHIAN BASIN

Corder Unit 2H

Doddridge County



REMARKS  
QUADRANGLE: BIG ISAAC  
WATERSHED: LAUREL RUN OF  
MEATHOUSE FORK  
DISTRICT: GREENBRIER

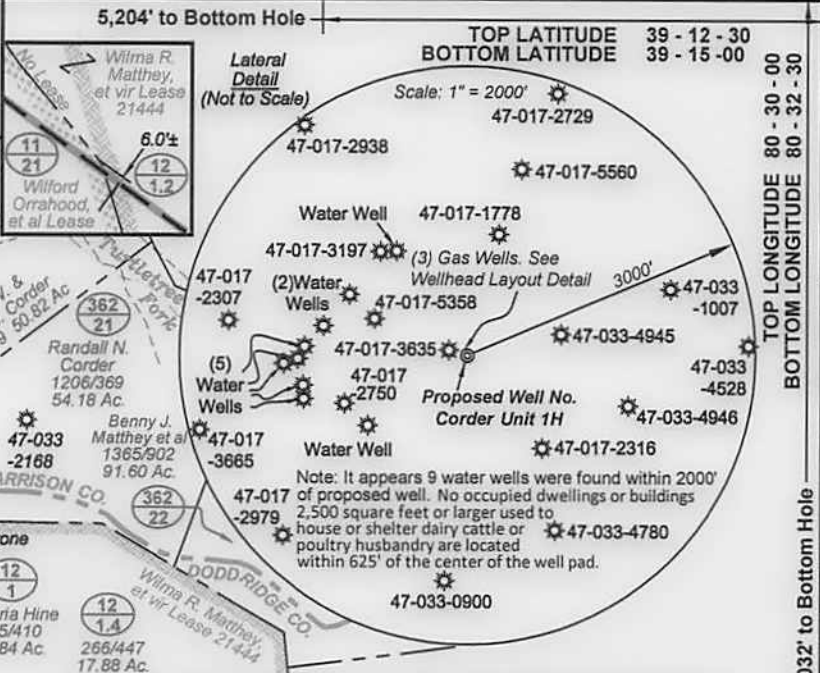
04/04/2014

June 3, 2013





**Antero Resources**  
Well No. Corder Unit 2H  
Antero Resources Corporation



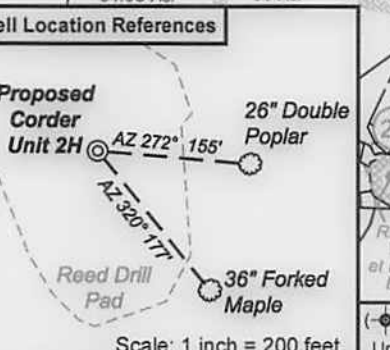
- Legend**
- ⊙ Proposed gas well
  - ⊛ Found corner, as noted
  - Creek or Drain
  - Existing Road
  - Surface boundary (approx.)
  - - - Interior surface tracts (approx.)
  - - - County Line (approx.)
  - - - Existing Fenceline

**Notes:**  
West Virginia Coordinate System of 1927, North Zone based upon Differential GPS Measurements.  
Well No. Corder Unit 2H Top Hole coordinates are  
N: 256,667.06' Latitude: 39°12'00.31"  
E: 1,707,358.94' Longitude: 80°31'57.43"  
Bottom Hole coordinates are  
N: 262,842.95' Latitude: 39°13'00.48"  
E: 1,699,802.15' Longitude: 80°33'34.34"  
UTM Zone 17, NAD 1983  
Top Hole Coordinates Bottom Hole Coordinates  
N: 4,339,094.655m N: 4,340,937.751m  
E: 540,372.819m E: 538,039.243m  
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**

Bearing	Dist.
L1 N 01°11' W	771.4'
L2 S 71°10' E	205.3'
L3 S 76°39' W	994.4'
L4 S 86°24' W	1389.8'
L5 S 19°02' W	699.3'



Tax Map	Par	Owner	Bk/Pg	Acres
1	382	9 Linn A. Reed, et al	1199/690	169.72
2	12	4.2 Lawrence Corder, Sr., et al	248/340	30.00
3	12	3.2 Donald B. Corder	218/213	5.95
4	11	4 C. Lee & Sue A. Corder	243/191	73.25
5	12	14.1 Donald B. Corder	WB 40/689	0.70

FILE NO: 309-30-G-12  
DRAWING NO: 309-12 Corder 2H Well Plat  
SCALE: 1" = 1200'  
MINIMUM DEGREE OF ACCURACY: Submeter  
PROVEN SOURCE OF ELEVATION: WVDOT, Bridgeport, WV

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

DATE: July 17 20 13  
OPERATOR'S WELL NO. Corder Unit 2H  
API WELL NO. MOD  
47 - 017 - 06342 H6A  
STATE COUNTY PERMIT

WELL TYPE:  OIL  GAS  LIQUID INJECTION  WASTE DISPOSAL  
(IF GAS) PRODUCTION:  STORAGE  DEEP  SHALLOW  
LOCATION: ELEVATION: 1358' WATERSHED: Laurel Run of Meathouse Fork QUADRANGLE: Big Isaac  
DISTRICT: Greenbrier COUNTY: Doddridge  
SURFACE OWNER: Linn A. Reed, et al ACREAGE: 169.72  
ROYALTY OWNER: Clarence A. Moore; J. E. Greynolds; Geo T. Richards, et ux (2) LEASE NO: 21444; DV017732 ACREAGE: 105; 69.268  
PROPOSED WORK:  DRILL  CONVERT  DRILL DEEPER  FRACTURE OR STIMULATE  PLUG OFF OLD FORMATION  
 PERFORATE NEW FORMATION  OTHER PHYSICAL CHANGE IN WELL (SPECIFY)  
 PLUG AND ABANDON  CLEAN OUT AND REPLUG TARGET FORMATION: Marcellus Shale ESTIMATED DEPTH: 7,400' TVD 17,000' 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