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

July 15, 2014

WELL WORK PERMIT

Horizontal 6A Well

This permit, API Well Number: 47-1706509, issued to ANTERO RESOURCES CORPORATION, is evidence of permission granted to perform the specified well work at the location described on the attached pages and located on the attached plat, subject to the provisions of Chapter 22 of the West Virginia Code of 1931, as amended, and all rules and regulations promulgated thereunder, and to all conditions and provisions outlined in the pages attached hereto. Notification shall be given by the operator to the Oil and Gas Inspector at least 24 hours prior to the construction of roads, locations, and/or pits for any permitted work. In addition, the well operator shall notify the same inspector 24 hours before any actual well work is commenced and prior to running and cementing casing. Spills or emergency discharges must be promptly reported by the operator to 1-800-642-3074 and to the Oil and Gas inspector.

Please be advised that form WR-35, Well Operators Report of Well Work is to be submitted to this office within 90 days completion of permitted well work, as should form WR-34 Discharge Monitoring Report within 30 days of discharge of pits, if applicable. Failure to abide by all statutory and regulatory provisions governing all duties and operations hereunder may result in suspension or revocation of this permit and, in addition, may result in civil and/or criminal penalties being imposed upon the operators.

In addition to the applicable requirements of this permit, and the statutes and rules governing oil and gas activity in WV, this permit may contain specific conditions which must be followed. Permit conditions are attached to this cover letter.

Per 35CSR-4-5.2.g this permit will expire in two (2) years from the issue date unless permitted well work is commenced. If there are any questions, please feel free to contact me at (304) 926-0499 ext. 1654.

James Martin
Chief

Operator's Well No: WENTZ UNIT 2H
Farm Name: LAMBERT, GEORGE D.
API Well Number: 47-1706509
Permit Type: Horizontal 6A Well
Date Issued: 07/15/2014

Promoting a healthy environment.

API Number: 4701706509

PERMIT CONDITIONS

West Virginia Code § 22-6A-8(d) allows the Office of Oil and Gas to place specific conditions upon this permit. Permit conditions have the same effect as law. Failure to adhere to the specified permit conditions may result in enforcement action.

CONDITIONS

1. This proposed activity may require permit coverage from the United States Army Corps of Engineers (USACE). Through this permit, you are hereby being advised to consult with USACE regarding this proposed activity.

2. If the operator encounters an unanticipated void, or an anticipated void at an unanticipated depth, the operator shall notify the inspector within 24 hours. Modifications to the casing program may be necessary to comply with W. Va. Code § 22-6A-5a (12), which requires drilling to a minimum depth of thirty feet below the bottom of the void, and installing a minimum of twenty (20) feet of casing. Under no circumstance should the operator drill more than fifty (50) feet below the bottom of the void or install less than twenty (20) feet of casing below the bottom of the void.

3. When compacting fills, each lift before compaction shall not be more than 12 inches in height, and the moisture content of the fill material shall be within limits as determined by the Standard Proctor Density test of the actual soils used in specific engineered fill, ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort, to achieve 95 % compaction of the optimum density. Each lift shall be tested for compaction, with a minimum of two tests per lift per acre of fill. All test results shall be maintained on site and available for review.

4. Operator shall install signage per § 22-6A-8g (6) (B) at all source water locations included in their approved water management plan within 24 hours of water management plan activation.

5. Oil and gas water supply wells will be registered with the Office of Oil and Gas and all such wells will be constructed and plugged in accordance with the standards of the Bureau for Public Health set forth in its Legislative rule entitled *Water Well Regulations,* 64 C.S.R. 19. Operator is to contact the Bureau of Public Health regarding permit requirements. In lieu of plugging, the operator may transfer the well to the surface owner upon agreement of the parties. All drinking water wells within fifteen hundred feet of the water supply well shall be flow tested by the operator upon request of the drinking well owner prior to operating the water supply well.

6. Pursuant to the requirements pertaining to the sampling of domestic water supply wells/springs the operator shall, no later than thirty (30) days after receipt of analytical data provide a written copy to the Chief and any of the users who may have requested such analyses.

7. If any explosion or other accident causing loss of life or serious personal injury occurs in or about a well or well work on a well, the well operator or its contractor shall give notice, stating the particulars of the explosion or accident, to the oil and gas inspector and the Chief, within 24 hours of said accident.

8. During the casing and cementing process, in the event cement does not return to the surface, the oil and gas inspector shall be notified within 24 hours.

9. Operator shall provide the Office of Oil & Gas notification of the date that drilling commenced on this well. Such notice shall be provided by sending an email to DEPOOGNotify@wv.gov within 30 days of commencement of drilling.

4701706509

WW-6B
(9/13)

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

1 671

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

2) Operator's Well Number: Wentz Unit 2H Well Pad Name: Rock Run Pad

3) Farm Name/Surface Owner: George D. Lambert Public Road Access: CR 11/8

4) Elevation, current ground: ~1185' Elevation, proposed post-construction: 1171'

5) Well Type (a) Gas ■ Oil _____ Underground Storage _____
Other _____
(b)If Gas Shallow ■ Deep _____
Horizontal ■

DLW 5-14-2014

6) Existing Pad: Yes or No No

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Associated Pressure(s):
Marcellus Shale: 7900' TVD, Anticipated Thickness- 60 feet, Associated Pressure- 3100#

8) Proposed Total Vertical Depth: 7900' TVD

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 16,700' MD

11) Proposed Horizontal Leg Length: 8225'

12) Approximate Fresh Water Strata Depths: 115', 201', 277'

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

14) Approximate Saltwater Depths: 1458', 1557', 4699'

15) Approximate Coal Seam Depths: 65', 616'

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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(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#	40'	40'	CTS, 38 Cu. Ft.
Fresh Water	13-3/8"	New	J-55/H-40	54.5#/ 48#	345'	345'	CTS, 479 Cu. Ft
Coal	9-5/8"	New	J-55	36#	2460'	2460'	CTS, 1002 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	16700'	16700'	4197 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7100'	
Liners							

DCN 5-14-2014

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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4701706509

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): 50.15 acres

22) Area to be disturbed for well pad only, less access road (acres): 6.81 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 and 1/4 lb of flake
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 100 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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WW-9
(9/13)

API Number 47 - 017 4701706509
Operator's Well No. Wentz Unit 2H

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

FLUIDS/ CUTTINGS DISPOSAL & RECLAMATION PLAN

Operator Name Antero Resources Corporation OP Code 494488557

Watershed (HUC 10) Arnold Creek Quadrangle West Union 7.5'

Elevation 1171' County Doddridge District Central

Do you anticipate using more than 5,000 bbls of water to complete the proposed well work? Yes ☑ No ☐

Will a pit be used? Yes ☐ No ☑

If so, please describe anticipated pit waste: No pit will be used at this site (Drilling and Flowback Fluids will be stored in tanks. Cuttings will be tanked and hauled off site.

Will a synthetic liner be used in the pit? Yes ☐ No ☑ If so, what ml.? N/A

DCW 5-14-2014

Proposed Disposal Method For Treated Pit Wastes:

_____ Land Application
_____ Underground Injection (UIC Permit Number _____)
■ Reuse (at API Number Future permitted well locations when applicable. API# will be provided on Form WR-34)
■ Off Site Disposal (Supply form WW-9 for disposal location) (Meadowfill Landfill Permit #SWF-1032-98)
_____ Other (Explain _____

Will closed loop system be used? If so, describe: Yes

Drilling medium anticipated for this well (vertical and horizontal)? Air, freshwater, oil based, etc. Surface - Air/Freshwater, Intermediate - Dust/Stiff Foam, Production - Water Based Mud

-If oil based, what type? Synthetic, petroleum, etc. N/A

Additives to be used in drilling medium? Please See Attachment

Drill cuttings disposal method? Leave in pit, landfill, removed offsite, etc. Stored in tanks, removed offsite and taken to landfill.

-If left in pit and plan to solidify what medium will be used? (cement, lime, sawdust) N/A

-Landfill or offsite name/permit number? Meadowfill Landfill (Permit #SWF-1032-98)

I certify that I understand and agree to the terms and conditions of the GENERAL WATER POLLUTION PERMIT issued on August 1, 2005, by the Office of Oil and Gas of the West Virginia Department of Environmental Protection. I understand that the provisions of the permit are enforceable by law. Violations of any term or condition of the general permit and/or other applicable law or regulation can lead to enforcement action.

I certify under penalty of law that I have personally examined and am familiar with the information submitted on this application form and all attachments thereto and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment.

Company Official Signature _____

Company Official (Typed Name) Evan Foster

Company Official Title Environmental Specialist

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WV Department of Environmental Protection

Subscribed and sworn before me this 9 day of May 20 14

_____ Notary Public

My commission expires 11/9/2016

LISA ROTTENBORN
Notary Public
State of Colorado
Notary ID 20124072365
My Commission Expires Nov 9, 2016

4701706509

Form WW-9

Operator's Well No. Wentz Unit 2H

Antero Resources Corporation

Proposed Revegetation Treatment: Acres Disturbed 50.15 Prevegetation pH _____

Lime 2-3 Tons/acre or to correct to pH 6.5

Fertilizer type Hay or straw or Wood Fiber (will be used where needed)

Fertilizer amount 500 lbs/acre

Mulch 2-3 Tons/acre

Access Roads (24.12) + Staging Areas (5.09) + Well Pad (6.81) + Water Containment Pad (2.27) + Excess/Topsoil Material Stockpiles (11.86)= 50.15 Acres

Seed Mixtures

Temporary		Permanent	
Seed Type	lbs/acre	Seed Type	lbs/acre
Annual Ryegrass	40	Crownvetch	10-15
*See attached Table 3 for additional seed type (Rock Run Pad Design Page 28)		*See attached Table 4a for additional seed type (Rock Run Pad Design Page 28)	
*or type of grass seed requested by surface owner		*or type of grass seed requested by surface owner	

*No Fescue or Timothy Grass shall be used

Attach:
Drawing(s) of road, location, pit and proposed area for land application (unless engineered plans including this info have been provided)

Photocopied section of involved 7.5' topographic sheet.

Plan Approved by: Douglas Newton

Comments: Preseed + Mulch any disturbed areas install + maintain E+S to WV Dep regulations.

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Title: Oil + Gas inspector Date: 5-14-2014

Field Reviewed? (☑) Yes (☐) No

4701706509

Form WW-9 Additives Attachment

SURFACE INTERVAL

1. Fresh Water
2. Soap –Foamer AC
3. Air

INTERMEDIATE INTERVAL

STIFF FOAM RECIPE:

1) 1 ppb Soda Ash / Sodium Carbonate-Alkalinity Control Agent
2) 1 ppb Conqor 404 (11.76 ppg) / Corrosion Inhibitor
3) 4 ppb KLA-Gard (9.17 ppg) / Amine Acid Complex-Shale Stabilizer
4) 1ppb Mil Pac R / Sodium Carboxymethylcellulose-Filtration Control Agent
5) 12 ppb KCL / Potassium Chloride-inorganic Salt
6) Fresh Water 80 bbls
7) Air

PRODUCTION INTERVAL

1. Alpha 1655
   Salt Inhibitor
2. Mil-Carb
   Calcium Carbonate
3. Cottonseed Hulls
   Cellulose-Cottonseed Pellets – LCM
4. Mil-Seal
   Vegetable, Cotton & Cellulose-Based Fiber Blend – LCM
5. Clay-Trol
   Amine Acid Complex – Shale Stabilizer
6. Xan-Plex
   Viscosifier For Water Based Muds
7. Mil-Pac (All Grades)
   Sodium Carboxymethylcellulose – Filtration Control Agent
8. New Drill
   Anionic Polyacrylamide Copolymer Emulsion – Shale Stabilizer
9. Caustic Soda
   Sodium Hydroxide – Alkalinity Control
10. Mil-Lime
    Calcium Hydroxide – Lime
11. LD-9
    Polyether Polyol – Drilling Fluid Defoamer
12. Mil Mica
    Hydro-Biotite Mica – LCM

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13. Escaid 110
    Drilling Fluild Solvent – Aliphatic Hydrocarbon
14. Ligco
    Highly Oxidized Leonardite – Filteration Control Agent
15. Super Sweep
    Polypropylene – Hole Cleaning Agent
16. Sulfatrol K
    Drilling Fluid Additive – Sulfonated Asphalt Residuum
17. Sodium Chloride, Anhydrous
    Inorganic Salt
18. D-D
    Drilling Detergent – Surfactant
19. Terra-Rate
    Organic Surfactant Blend
20. W.O. Defoam
    Alcohol-Based Defoamer
21. Perma-Lose HT
    Fluid Loss Reducer For Water-Based Muds
22. Xan-Plex D
    Polysaccharide Polymer – Drilling Fluid Viscosifier
23. Walnut Shells
    Ground Cellulosic Material – Ground Walnut Shells – LCM
24. Mil-Graphite
    Natural Graphite – LCM
25. Mil Bar
    Barite – Weighting Agent
26. X-Cide 102
    Biocide
27. Soda Ash
    Sodium Carbonate – Alkalinity Control Agent
28. Clay Trol
    Amine Acid complex – Shale Stabilizer
29. Sulfatrol
    Sulfonated Asphalt – Shale Control Additive
30. Xanvis
    Viscosifier For Water-Based Muds
31. Milstarch
    Starch – Fluid Loss Reducer For Water Based Muds
32. Mil-Lube
    Drilling Fluid Lubricant

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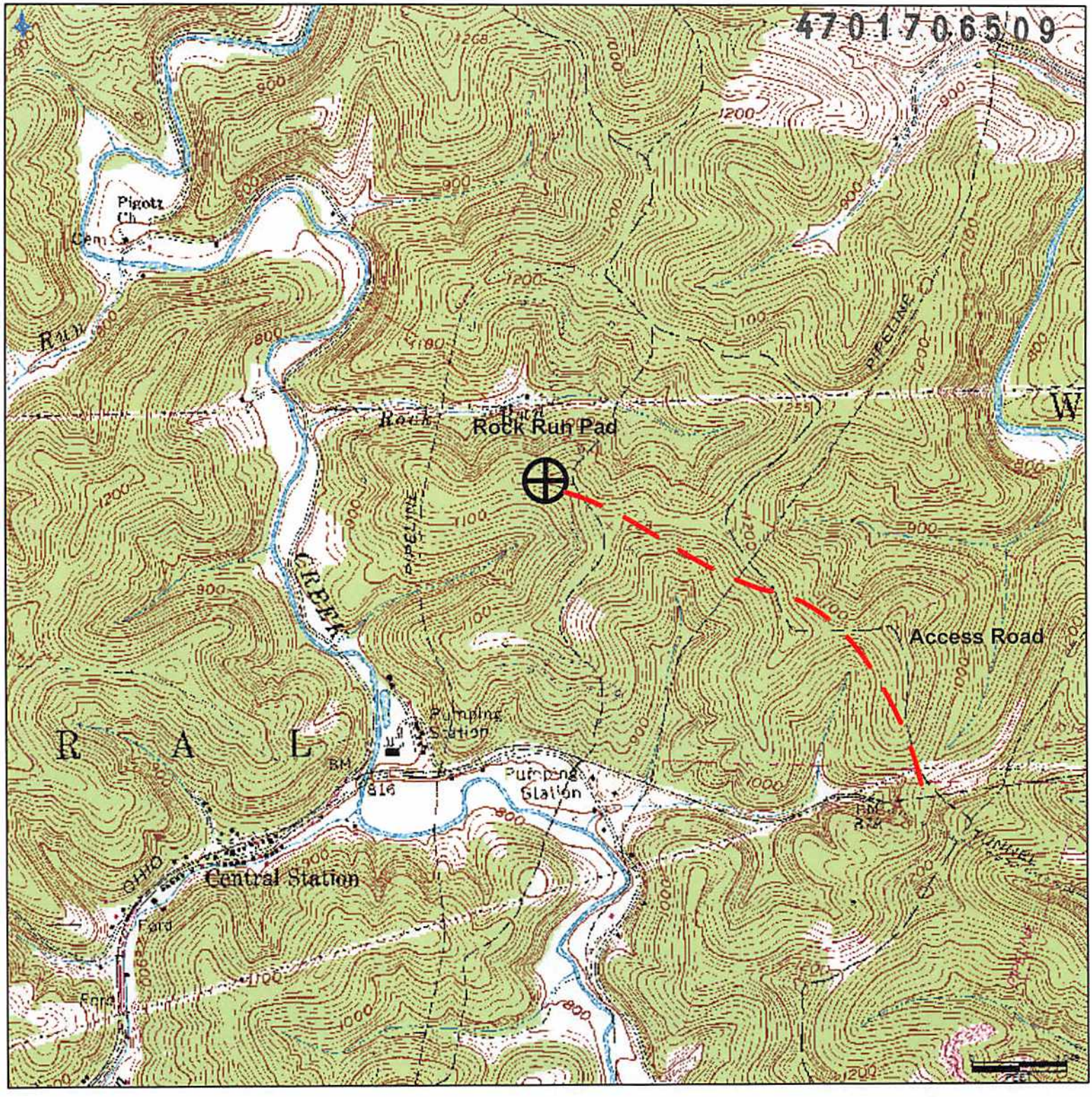

Antero Resources Corporation

Appalachian Basin

Wentz Unit 2H

Doddridge County

Quadrangle: West Union
Watershed: Headwaters Middle Island Creek
District: Central and West Union Districts
Date: 11/12/13

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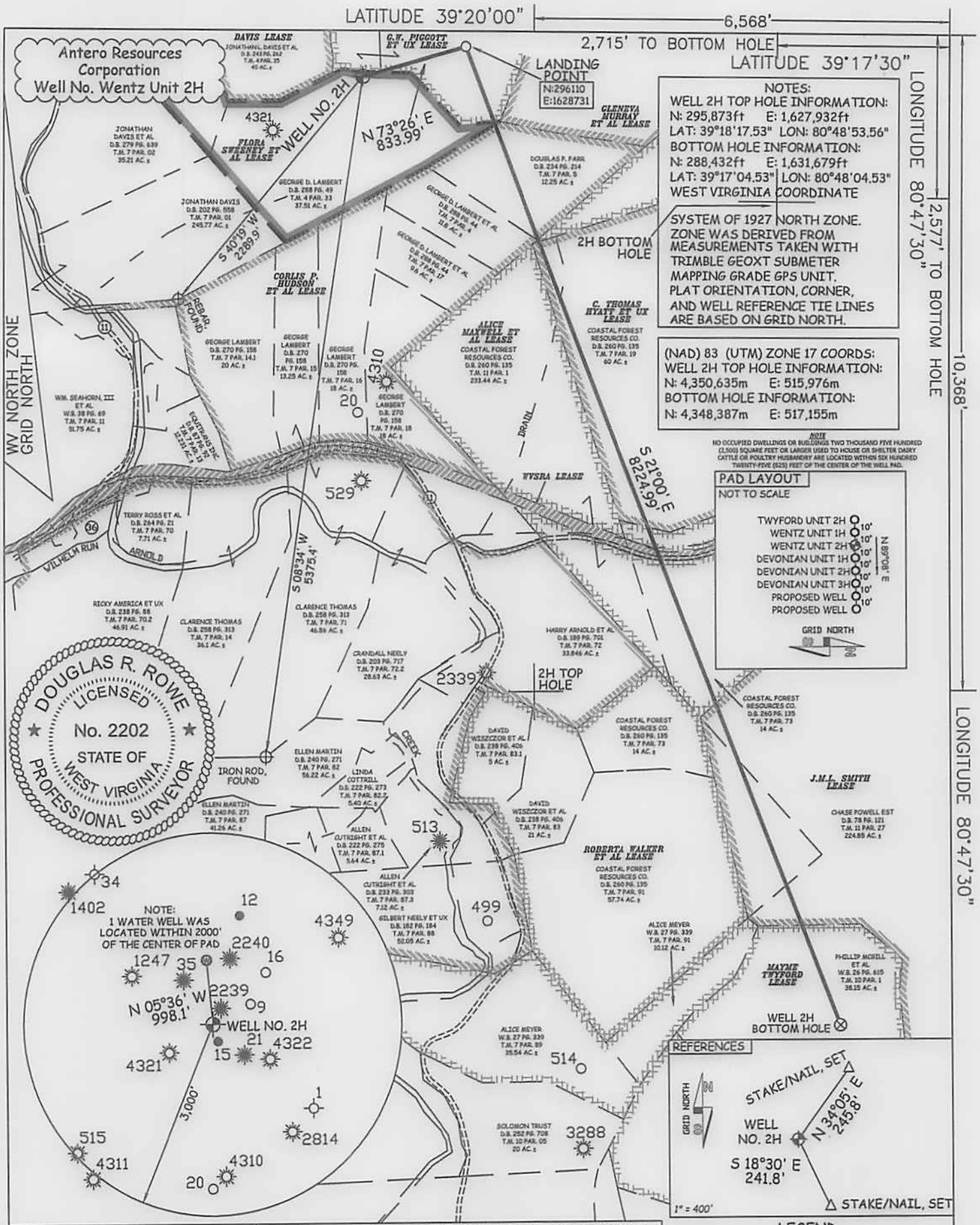

JOB # 13-099WA
DRAWING # WENTZ 2H
SCALE 1" = 1000'
MINIMUM DEGREE OF ACCURACY SUBMETER
PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS

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 DEPTARTMENT OF ENVIRONMENTAL PROTECTION.

STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION,

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 03/04/14
OPERATOR'S WELL# WENTZ UNIT #2H

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

API WELL # 47 – 017 – 06509 H6A
STATE COUNTY PERMIT

WELL TYPE: OIL ___ GAS X LIQUID INJECTION ___ WASTE DISPOSAL ___
(IF "GAS") PRODUCTION X STORAGE ___ DEEP ___ SHALLOW X
LOCATION: ELEVATION 1,171' WATERSHED ARNOLD CREEK
QUADRANGLE WEST UNION 7.5' DISTRICT CENTRAL COUNTY DODDRIDGE
SURFACE OWNER GEORGE D. LAMBERT ACREAGE 37.51 ACRES +/-
OIL & GAS ROYALTY OWNER FLORA SWEENEY ET AL; G.W. PIGGOTT ET UX; CORLIS HUDSON ET AL; ALICE MAXWELL ET AL; C. THOMAS HYATT ET UX; WVSRA; J.M.L. SMITH; MAYME TWYFORD LEASE ACREAGE 103 ACRES±; 124.5 ACRES±; 488.7 ACRES±; 420 ACRES±; 60 ACRES±; 301.19 ACRES±; 404 ACRES±; 71 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) ___ PLUG & ABANDON CLEAN OUT & REPLUG
TARGET FORMATION MARCELLUS ESTIMATED DEPTH 7,900' TVD 16,700' MD
WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM
ADDRESS 1625 17TH STREET ADDRESS 5400 D BIG TYLER ROAD
DENVER, CO 80202 CHARLESTON, WV 25313

COUNTY NAME PERMIT

FORM WW-6