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west virginia department of environmental protection

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Office of Oil and Gas  
601 57<sup>th</sup> Street, S.E.  
Charleston, WV 25304  
(304) 926-0450  
fax: (304) 926-0452

Jim Justice , Governor  
Austin Caperton , Cabinet Secretary  
www.dep.wv.gov

Monday, June 19, 2017  
WELL WORK PERMIT  
Horizontal 6A / New Drill

ANTERO RESOURCES CORPORATION (A)  
1615 WYNKOOP STREET

DENVER, CO 80202

Re: Permit approval for JAY UNIT 1H  
47-017-06822-00-00

This well work permit 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 any additional specific 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 of 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.

Per 35 CSR 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- 0450.

  
James A. Martin  
Chief

Operator's Well Number: JAY UNIT 1H  
Farm Name: WILLIAM RANDALL LYNCH & DIXIE CRAIG  
U.S. WELL NUMBER: 47-017-06822-00-00  
Horizontal 6A / New Drill  
Date Issued: 6/19/2017

Promoting a healthy environment.

06/23/2017

# 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

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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 one hundred (100) 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. 24 hours prior to the initiation of the completion process the operator shall notify the Chief or his designee.
8. During the completion process the operator shall monitor annular pressures and report any anomaly noticed to the chief or his designee immediately.
9. 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.
10. 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.

## PERMIT CONDITIONS

11. The operator shall provide to the Office of Oil and Gas the dates of each of the following within 30 days of their occurrence: completion of construction of the well pad, commencement of drilling, cessation of drilling, completion of any other permitted well work, and completion of the well. Such notice shall be provided by sending an email to [DEPOOGNotify@wv.gov](mailto:DEPOOGNotify@wv.gov).

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

1) Well Operator: Antero Resources Corporation 494507062 017 - Doddri West Uni West Union 7.5'  
Operator ID County District Quadrangle

2) Operator's Well Number: Jay Unit 1H Well Pad Name: Middle Pad

3) Farm Name/Surface Owner: William Randall Lynch & Dixie Craig Public Road Access: WV-18

4) Elevation, current ground: 848' Elevation, proposed post-construction: 843'

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 Expected Pressure(s):  
Marcellus Shale: 6600' TVD, Anticipated Thickness- 60 feet, Associated Pressure- 3100#

8) Proposed Total Vertical Depth: 6600' TVD

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 17900' MD

11) Proposed Horizontal Leg Length: 10112'

12) Approximate Fresh Water Strata Depths: 97', 223', 388'

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

14) Approximate Saltwater Depths: 1161'

15) Approximate Coal Seam Depths: 174', 478'

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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*3/23/17*

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Environmental Protection  
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**06/23/2017**

18)

**CASING AND TUBING PROGRAM**

<b>TYPE</b>	<u>Size (in)</u>	<u>New or Used</u>	<u>Grade</u>	<u>Weight per ft. (lb/ft)</u>	<u>FOOTAGE: For Drilling (ft)</u>	<u>INTERVALS: Left in Well (ft)</u>	<u>CEMENT: Fill-up (Cu. Ft.)/CTS</u>
Conductor	20"	New	H-40	94#	80'	80'	CTS, 77 Cu. Ft.
Fresh Water	13-3/8"	New	J-55/H-40	54.5#/48#	440' *see #19	440' *see #19	CTS, 611 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2500'	2500'	CTS, 1018 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	17900'	17900'	4515 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7100'	
Liners							

<b>TYPE</b>	<u>Size (in)</u>	<u>Wellbore Diameter (in)</u>	<u>Wall Thickness (in)</u>	<u>Burst Pressure (psi)</u>	<u>Anticipated Max. Internal Pressure (psi)</u>	<u>Cement Type</u>	<u>Cement Yield (cu. ft./k)</u>
Conductor	20" 30"	24"	0.438"	1530	50	Class A	1.18
Fresh Water	13-3/8"	17-1/2"	0.38"/0.33"	2730/1730	1000	Class A	1.18
Coal	9-5/8"	12-1/4"	0.352"	3520	1500	Class A	1.18
Intermediate							
Production	5-1/2"	8-3/4" & 8-1/2"	0.361"	12,630	2500	Lead-H/POZ & Tail - H	H/Poz-1.44 & H-1.8
Tubing	2-3/8"	4.778"	0.19"	11,200			
Liners							

**PACKERS**

Kind:	N/A			
Sizes:	N/A			
Depths Set:	N/A			

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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.

\*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.

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."

Anticipated Max Pressure - 9300 lbs  
Anticipated Max Rate - 80 bpm

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 19.05 acres

22) Area to be disturbed for well pad only, less access road (acres): 5.53 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

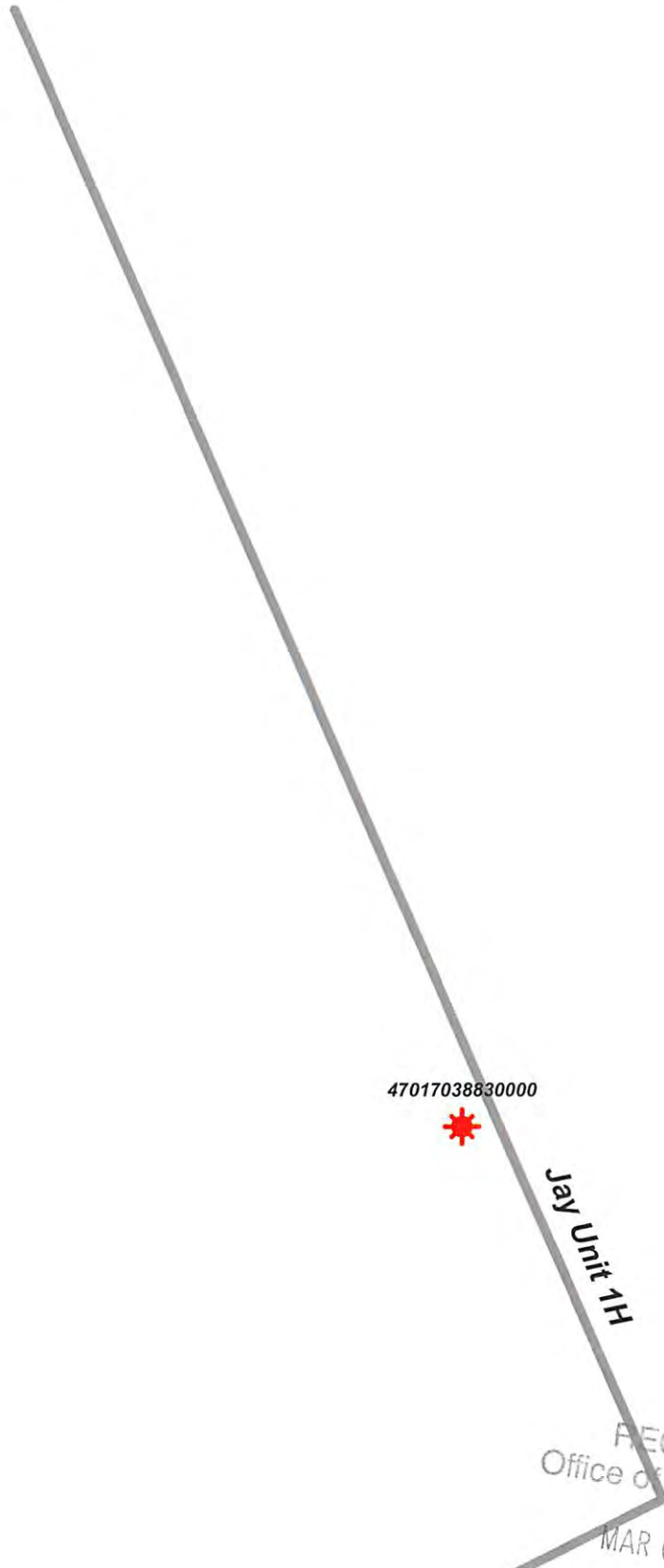
25) Proposed borehole conditioning procedures:

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 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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4701706822



47017038830000



Jay Unit 1H



Jay Unit 1H - AOR



WELL SYMBOLS  
Gas Well

February 21, 2017

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JAY UNIT 1H (MIDDLE PAD) - AREA OF REVIEW 35-8-5.11 PAGE 2

4701706822

UWI (API#um)	Well Name	Well Number	Operator	Hist Oper	TD	Approx distance to well	ELEV GR TD (SSVD)	Perforated Interval (shallowest, deepest)	Perforated Formation(s)	Productive Formation(s) (last part)
4701703863000	WELCH MARY ADMIX	COTRILLA	TERM ENERGY	TERM ENERGY	5.175	215	855 -4320	3819-5060	Blk Inj, Weir, Gordon, Bradford, Banson, Alexander	Warren, Speechley,Balktown, Riley

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WW-9  
(4/16)

API Number 47 - 017 -  
Operator's Well No. Jay Unit 1H

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 494507062

Watershed (HUC 10) Headwaters Middle Island Creek Quadrangle West Union 7.5'

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 tarked and hauled off site.)

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

Proposed Disposal Method For Treated Pit Wastes:

- Land Application
- Underground Injection ( UIC Permit Number                      \*UIC Permit # will be provided on Form WR-34 )
- 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                      Northwestern Landfill Permit #SWF-1025/ WV0109410)

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/Scuff 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.

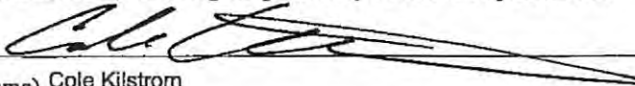
-If left in pit and plan to solidify what medium will be used? (cement, lime, sawdust) N/A

-Landfill or offsite name/permit number? Meadowfill Landfill (Permit #SWF-1032-98), Northwestern Landfill (Permit # SWF-1025/WV0109410)

Permittee shall provide written notice to the Office of Oil and Gas of any load of drill cuttings or associated waste rejected at any West Virginia solid waste facility. The notice shall be provided within 24 hours of rejection and the permittee shall also disclose where it was properly disposed.

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) Cole Kilstrom  
Company Official Title Environmental & Regulatory Manager

Subscribed and sworn before me this 3rd day of March, 2017



Notary Public

My commission expires 7/8/2020



06/23/2017

Form WW-9

Operator's Well No. Jay Unit 1H

**Antero Resources Corporation**

Proposed Revegetation Treatment: Acres Disturbed 19.05 acres Prevegetation pH \_\_\_\_\_

Lime 2-4 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 Road A - 644' (4.29 acres) + Access Road B - 492' (0.98 acres) + Access Road C - 232' (0.42 acres) + Well Pad (5.53 acres) + Water Containment Pad (3.30 acres) + Excess/Topsoil Material Stockpiles (4.53 acres) = 19.05 Total Affected Acres

Seed Mixtures

Temporary		Permanent	
Seed Type	lbs/acre	Seed Type	lbs/acre
Annual Ryegrass	40	Crownvetch	10 - 15
Field Bromegrass	40	Tall Fescue	30
<small>See attached Table IV-3 for additional seed type (Middle Pad Design Pg 23)</small>		<small>See attached Table IV-4A for additional seed type (Middle Pad Design Pg 23)</small>	
*or type of grass seed requested by surface owner		*or type of grass seed requested by surface owner	

**Attach:**

Maps(s) of road, location, pit and proposed area for land application (unless engineered plans including this info have been provided). If water from the pit will be land applied, include dimensions (L x W x D) of the pit, and dimensions (L x W), and area in acreage, of the land application area.

Photocopied section of involved 7.5' topographic sheet.

Plan Approved by: [Signature]

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Title: Oil & Gas Inspector Date: 3/23/17

Field Reviewed? ( ) Yes ( ) No

**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 Fluid Solvent – Aliphatic Hydrocarbon
14. Ligco  
Highly Oxidized Leonardite – Filtration 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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**911 Address**  
**4978 WV Rt 18 N**  
**West Union, WV 26456**

## **Well Site Safety Plan**

### **Antero Resources**

**Well Name:** Chalk Unit 1H & 2H, Caboose Unit 1H & 2H,  
Goldsmith Unit 1H & 2H, Pickney 1H & 2H, Jay  
Unit 1H & 2H

**Pad Location:** MIDDLE PAD  
Doddridge County/West Union District

#### **GPS Coordinates:**

**Entrance** - Lat 39°19'20.3622"/Long -80°48'16.491" (NAD83)

**Pad Center** - Lat 39°19'20.6724"/Long -80°48'23.3202" (NAD83)

#### **Driving Directions:**

From intersection of WV-18 and HWY 50 (exit for West Union, WV): Turn off of HWY 50 onto WV-18 N and follow for ~0.6mi, when you come to a T at Main St turn right. Take your first left immediately after the bridge onto Davis St./Old U.S. 50 W and follow for 0.4 mi. Take the 2<sup>nd</sup> right onto WV-18N/ Sistersville Pike and follow for ~4.1 mi. You will pass Crystal Lake on the right. Access Road for Middle Pad will be on the right hand side and pad will be up on ridge.

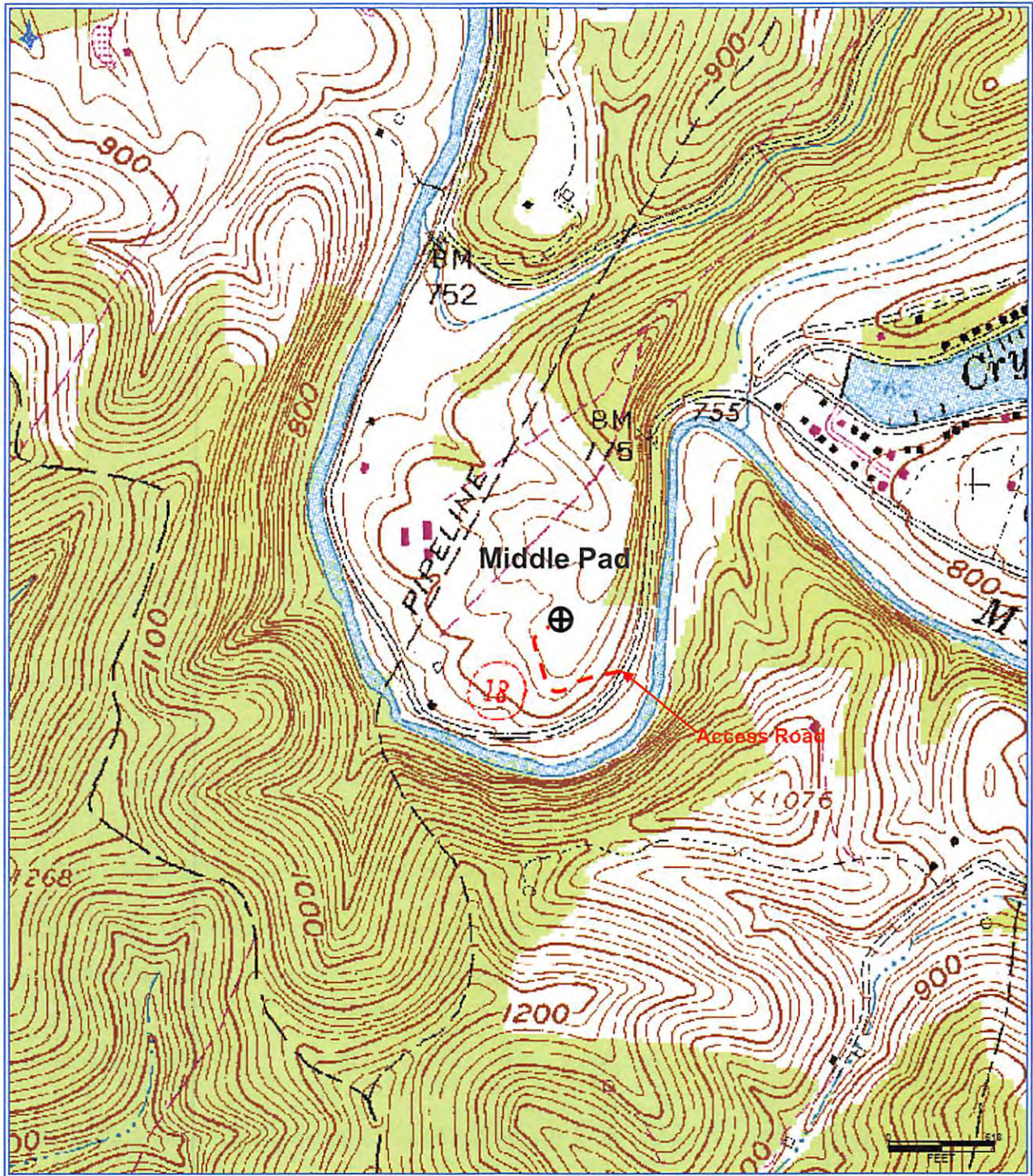
#### **Alternate Route:**

From the town of Pennsboro, WV: Head northeast on WV-74 N/Mountain Dr 10.8 miles. Turn right onto WV-18 S for 8.0 miles. The access road will be on the left.

**EMERGENCY (24 HOUR) CONTACT 1-800-878-1373**

*John C. ...*  
5/23/17

06/23/2017



**Antero Resources Corporation**  
Appalachian Basin  
Jay Unit 1H  
Doddridge County  
Quadrangle: West Union  
Watershed: Middle Island Creek  
District: West Union  
Date: 2-24-2017

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>James Douglas White Lease</u> James Douglas White	Antero Resources Corporation	1/8+	0313/0688
<u>Lewis Maxwell et al Lease</u> Lewis Maxwell et al G.H. Trainer and J.E. Trainer W.W. Hepburn Eastern Petroleum Company Clifton Oil and Gas Company Quaker State Refining Corporation Quaker State Refining Corporation QSE&P, Inc. Belden & Blake Corporation Peake Energy, Inc. North Coast Energy Eastern, Inc. Exco-North Coast Energy Eastern Inc	G.H. Trainer and J.E. Trainer W.W. Hepburn Eastern Petroleum Company Clifton Oil & Gas Company Quaker State Refining Corporation QSE&P, Inc Belden & Blake Corporation Peake Energy, Inc. North Coast Energy Eastern, Inc Exco-North Coast Energy Eastern, Inc Exco Resources WV, LLC	1/8 Assignment Assignment Assignment Assignment Assignment Assignment Assignment Assignment Name Change Name Change Certificate of Amendment to the Certificate of Authority Merger Assignment Name Change	0030/0068 0034/0244 0034/0256 DB 0081/0114 0056/0165 0159/0595 0175/0466 0181/0114 DB 0249/0343 DB 0277/0068 Exhibit 2 DB 0285/0083 0285/0084 Exhibit 1
Exco Resources WV, LLC. Exco Production Company (WV), LLC Antero Resources Appalachian Corporation	EXCO Production Company WV, LLC Antero Resources Appalachian Corporation Antero Resources Corporation		
<u>R.E. McCabe, Jr. Trustee &amp; Brooke F. McCabe, Jr. Agent Lease</u> R.E. McCabe, Jr Trustee & Brooke F. McCabe, Jr Agent Bojaque Incorporation Stonewall Gas Company Stonewall Gas Company Dominion Reserve, Inc CNX Gas Company	Bojaque Incorporation Stonewall Gas Company Dominion Reserve, Inc CNX Gas Company Antero Resources Corporation	1/8 Assignment Assignment Merger Assignment	0154/0376 0157/0297 166/0053 0292/0469 0317/0379
<u>Dwight Robert Husk, et ux Lease</u> Dwight Robert Husk and or wife Jacquelin Ann Husk Antero Resources Appalachian Corporation	Antero Resources Appalachian Corporation Antero Resources Corporation	1/8+ Name Change	0290/0393 Exhibit 1
<u>Clarence W. Mutschelknaus, et ux Lease</u> Clarence W. Mutschelknaus and Mary F. Mutschelknaus Stonewall Gas Company Clarence W. Mutschelknaus	Stonewall Gas Company Clarence W. Mutschelknaus Antero Resources Corporation	1/8 Assignment Assignment	0149/0618 0166/0033 0327/0470

\*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.

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\*\*CONTINUED ON NEXT PAGE\*\*  
06/23/2017

Operator's Well Number Jay Unit 1H

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
<b><u>Mary M. Welch Lease</u></b>			
Mary M. Welch	Petroleum Services Inc	1/8	222/36
Petroleum Services Inc	J & J Enterprises Inc	Assignment	226/501
J & J Enterprises Inc	Eastern American Energy Corp	Assignment	282/296
Eastern American Energy Corp	Energy Corp of America	Assignment	371/528
Energy Corp of America	Antero Resources Appalachian Corporation	Assignment	398/433
Antero Resources Appalachian Corporation	CNX Gas Co. LLC	Assignment	503/754
CNX Gas Co. LLC	Antero Resources Corporation	Assignment	434/513

\*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.

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MAR 06 2017

WV Department of  
 Environmental Protection



**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>Ralph Mount, et ux Lease</u>	Ralph Mount et ux Clarence W. Mutschelknaus	Clarence W. Mutschelknaus Antero Resources Corporation	1/8 Assignment	147/219 0327/0470

\*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: Senior Vice President, Production

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Page 1 of \_\_\_\_\_

FILED

JUN 10 2013



Penney Barker, Manager  
Corporations Division  
Tel: (304)558-8000  
Fax: (304)558-8381  
Website: [www.wvsos.com](http://www.wvsos.com)  
E-mail: [business@wvsos.com](mailto:business@wvsos.com)

Natalie E. Tennant  
Secretary of State  
1900 Kanawha Blvd E  
Bldg 1, Suite 157-K  
Charleston, WV 25305

APPLICATION FOR  
AMENDED CERTIFICATE  
OF AUTHORITY

Office Hours: Monday - Friday  
8:30 a.m. - 5:00 p.m. ET

FILE ONE ORIGINAL  
(Two if you want a filed  
stamped copy returned to you)  
FEE: \$25.00

\*\*\*\* In accordance with the provisions of the West Virginia Code, the undersigned corporation hereby \*\*\*\*  
applies for an Amended Certificate of Authority and submits the following statement:

- Name under which the corporation was authorized to transact business in WV: Antero Resources Appalachian Corporation
- Date Certificate of Authority was issued in West Virginia: 6/25/2008
- Corporate name has been changed to: Antero Resources Corporation  
(Attach one Certified Copy of Name Change as filed in home State of incorporation.)
- Name the corporation elects to use in WV: Antero Resources Corporation  
(due to home state name not being available)
- Other amendments: \_\_\_\_\_  
(attach additional pages if necessary)

6. Name and phone number of contact person. (This is optional, however, if there is a problem with the filing, listing a contact person and phone number may avoid having to return or reject the document.)

Alvyn A. Schopp (303) 357-7310  
Contact Name Phone Number

7. Signature information (See below \*Important Legal Notice Regarding Signature\*):

Print Name of Signer: Alvyn A. Schopp Title/Capacity: Authorized Person  
Signature: [Signature] Date: June 10, 2013

\*Important Legal Notice Regarding Signature: For West Virginia Code §31D-1-129. Penalty for signing false document. Any person who signs a document he or she knows is false in any material respect and knows that the document is to be delivered to the secretary of state for filing is guilty of a misdemeanor and, upon conviction thereof, shall be fined not more than one thousand dollars or confined in the county or regional jail not more than one year, or both.

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Revised 4/13

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Environmental Protection



## Certificate

*I, Natalie E. Tennant, Secretary of State of the  
State of West Virginia, hereby certify that*

an Amended Certificate of Authority of

**EXCO - NORTH COAST ENERGY EASTERN, INC.**

was filed in my office as required by the provisions of the West Virginia Code and was found to conform to law.

Therefore I issue this

### CERTIFICATE OF AMENDMENT TO THE CERTIFICATE OF AUTHORITY

changing the name of the corporation to

**EXCO RESOURCES (WV) , INC.**



*Given under my hand and the  
Great Seal of the State of  
West Virginia on this day of  
December 2, 2009*

RECEIVED  
Office of Oil and Gas  
*Natalie E. Tennant*

Secretary of State  
WV Department of  
Environmental Protection  
06/23/2017

4701706822



Antero Resources  
1615 Wynkoop Street  
Denver, CO 80202  
Office 303.357.7310  
Fax 303.357.7315

March 3, 2017

West Virginia Department of Environmental Protection  
Chief, Office of Oil and Gas  
Attn: Mr. James Martin  
601 57<sup>th</sup> Street SE  
Charleston, WV 25304

RE: Jay Unit 1H  
Quadrangle: West Union 7.5'  
Doddridge County/West Union District, West Virginia

Mr. Martin:

Antero Resources Corporation (Antero) is submitting the following application for a new well work permit for the Jay Unit 1H horizontal shallow well. As an authorized representative, I certify that Antero has the right to extract, produce or market the oil or gas for all leases through which the Jay Unit 1H horizontal lateral will drill through including any and all roads crossed under as identified on the attached survey plat.

Sincerely,

A handwritten signature in blue ink, appearing to read "Jared Hurst", is written over a light blue horizontal line.

Jared Hurst  
SR Landman

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Environmental Protection

06/23/2017

**STATE OF WEST VIRGINIA**  
**DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS**  
**NOTICE CERTIFICATION**

**Date of Notice Certification:** 03/02/2017

**API No.** 47- 017 -

**Operator's Well No.** Jay Unit 1H

**Well Pad Name:** Middle Pad

**Notice has been given:**

Pursuant to the provisions in West Virginia Code § 22-6A, the Operator has provided the required parties with the Notice Forms listed below for the tract of land as follows:

State:	<u>West Virginia</u>	UTM NAD 83	Easting:	<u>516696.324m</u>
County:	<u>Doddridge</u>		Northing:	<u>4352586.454m</u>
District:	<u>West Union</u>	Public Road Access:		<u>WV-18</u>
Quadrangle:	<u>West Union 7.5'</u>	Generally used farm name:		<u>William Randall Lynch &amp; Dixie Craig</u>
Watershed:	<u>Headwaters Middle Island Creek</u>			

Pursuant to West Virginia Code § 22-6A-7(b), every permit application filed under this section shall be on a form as may be prescribed by the secretary, shall be verified and shall contain the following information: (14) A certification from the operator that (i) it has provided the owners of the surface described in subdivisions (1), (2) and (4), subsection (b), section ten of this article, the information required by subsections (b) and (c), section sixteen of this article; (ii) that the requirement was deemed satisfied as a result of giving the surface owner notice of entry to survey pursuant to subsection (a), section ten of this article six-a; or (iii) the notice requirements of subsection (b), section sixteen of this article were waived in writing by the surface owner; and Pursuant to West Virginia Code § 22-6A-11(b), the applicant shall tender proof of and certify to the secretary that the notice requirements of section ten of this article have been completed by the applicant.

<p>Pursuant to West Virginia Code § 22-6A, the Operator has attached proof to this Notice Certification that the Operator has properly served the required parties with the following:</p> <p>*PLEASE CHECK ALL THAT APPLY</p> <p><input type="checkbox"/> 1. NOTICE OF SEISMIC ACTIVITY or <input checked="" type="checkbox"/> NOTICE NOT REQUIRED BECAUSE NO SEISMIC ACTIVITY WAS CONDUCTED</p> <p><input type="checkbox"/> 2. NOTICE OF ENTRY FOR PLAT SURVEY or <input checked="" type="checkbox"/> NO PLAT SURVEY WAS CONDUCTED</p> <p><input checked="" type="checkbox"/> 3. NOTICE OF INTENT TO DRILL or <input type="checkbox"/> NOTICE NOT REQUIRED BECAUSE NOTICE OF ENTRY FOR PLAT SURVEY WAS CONDUCTED or</p> <p style="padding-left: 100px;"><input type="checkbox"/> WRITTEN WAIVER BY SURFACE OWNER (PLEASE ATTACH)</p> <p><input checked="" type="checkbox"/> 4. NOTICE OF PLANNED OPERATION</p> <p><input checked="" type="checkbox"/> 5. PUBLIC NOTICE</p> <p><input checked="" type="checkbox"/> 6. NOTICE OF APPLICATION</p>	<p><b>OOG OFFICE USE ONLY</b></p> <p><input checked="" type="checkbox"/> RECEIVED/ NOT REQUIRED</p> <p><input checked="" type="checkbox"/> RECEIVED</p> <p><input checked="" type="checkbox"/> RECEIVED/ NOT REQUIRED</p> <p><input checked="" type="checkbox"/> RECEIVED</p> <p><input checked="" type="checkbox"/> RECEIVED</p> <p><input checked="" type="checkbox"/> RECEIVED</p>
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**Required Attachments:**

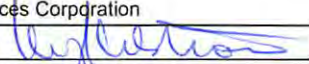
The Operator shall attach to this Notice Certification Form all Notice Forms and Certifications of Notice that have been provided to the required parties and/or any associated written waivers. For the Public Notice, the operator shall attach a copy of the Class II Legal Advertisement with publication date verification or the associated Affidavit of Publication. The attached Notice Forms and Certifications of Notice shall serve as proof that the required parties have been noticed as required under West Virginia Code § 22-6A. Pursuant to West Virginia Code § 22-6A-11(b), the Certification of Notice to the person may be made by affidavit of personal service, the return receipt card or other postal receipt for certified mailing.

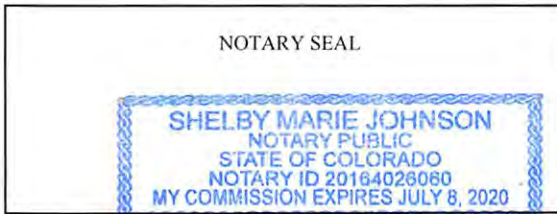
  
 WV Department of  
 Environmental Protection  
**06/23/2017**


4701706822

**Certification of Notice is hereby given:**

THEREFORE, I Kevin Kilstrom, have read and understand the notice requirements within West Virginia Code § 22-6A. I certify that as required under West Virginia Code § 22-6A, I have served the attached copies of the Notice Forms, identified above, to the required parties through personal service, by registered mail or by any method of delivery that requires a receipt or signature confirmation. I certify under penalty of law that I have personally examined and am familiar with the information submitted in this Notice Certification and all attachments, 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 and imprisonment.

Well Operator:	<u>Antero Resources Corporation</u>	Address:	<u>1615 Wynkoop Street</u>
By:	<u>Kevin Kilstrom</u> 		<u>Denver, CO 80202</u>
Its:	<u>Senior Vice President - Production</u>	Facsimile:	<u>303-357-7315</u>
Telephone:	<u>303-357-7310</u>	Email:	<u>shjohnson@anteroresources.com</u>



Subscribed and sworn before me this 2 day of March 2017  
 Notary Public  
 My Commission Expires 7/8/2020

**Oil and Gas Privacy Notice:**

The Office of Oil and Gas processes your personal information, such as name, address and telephone number, as part of our regulatory duties. Your personal information may be disclosed to other State agencies or third parties in the normal course of business or as needed to comply with statutory or regulatory requirements, including Freedom of Information Act requests. Our office will appropriately secure your personal information. If you have any questions about our use or your personal information, please contact DEP's Chief Privacy Officer at [deprivacyofficer@wv.gov](mailto:deprivacyofficer@wv.gov).

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MAR 06 2017

WV Department of  
Environmental Protection

06/23/2017

**STATE OF WEST VIRGINIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS  
NOTICE OF APPLICATION**

**Notice Time Requirement:** notice shall be provided no later than the **filing date of permit application.**

**Date of Notice:** 3/3/2017    **Date Permit Application Filed:** 3/3/2017

Notice of:

- PERMIT FOR ANY WELL WORK
- CERTIFICATE OF APPROVAL FOR THE CONSTRUCTION OF AN IMPOUNDMENT OR PIT

**Delivery method pursuant to West Virginia Code § 22-6A-10(b)**

- PERSONAL SERVICE
- REGISTERED MAIL
- METHOD OF DELIVERY THAT REQUIRES A RECEIPT OR SIGNATURE CONFIRMATION

Pursuant to W. Va. Code § 22-6A-10(b) no later than the filing date of the application, the applicant for a permit for any well work or for a certificate of approval for the construction of an impoundment or pit as required by this article shall deliver, by personal service or by registered mail or by any method of delivery that requires a receipt or signature confirmation, copies of the application, the erosion and sediment control plan required by section seven of this article, and the well plat to each of the following persons: (1) The owners of record of the surface of the tract on which the well is or is proposed to be located; (2) The owners of record of the surface tract or tracts overlying the oil and gas leasehold being developed by the proposed well work, if the surface tract is to be used for roads or other land disturbance as described in the erosion and sediment control plan submitted pursuant to subsection (c), section seven of this article; (3) The coal owner, operator or lessee, in the event the tract of land on which the well proposed to be drilled is located [sic] is known to be underlain by one or more coal seams; (4) The owners of record of the surface tract or tracts overlying the oil and gas leasehold being developed by the proposed well work, if the surface tract is to be used for the placement, construction, enlargement, alteration, repair, removal or abandonment of any impoundment or pit as described in section nine of this article; (5) Any surface owner or water purveyor who is known to the applicant to have a water well, spring or water supply source located within one thousand five hundred feet of the center of the well pad which is used to provide water for consumption by humans or domestic animals; and (6) The operator of any natural gas storage field within which the proposed well work activity is to take place. (c)(1) If more than three tenants in common or other co-owners of interests described in subsection (b) of this section hold interests in the lands, the applicant may serve the documents required upon the person described in the records of the sheriff required to be maintained pursuant to section eight, article one, chapter eleven-a of this code. (2) Notwithstanding any provision of this article to the contrary, notice to a lien holder is not notice to a landowner, unless the lien holder is the landowner. W. Va. Code R. § 35-8-5.7.a requires, in part, that the operator shall also provide the Well Site Safety Plan ("WSSP") to the surface owner and any water purveyor or surface owner subject to notice and water testing as provided in section 15 of this rule.

Application Notice    WSSP Notice    E&S Plan Notice    Well Plat Notice   is hereby provided to:

SURFACE OWNER(s)  
Name: PLEASE SEE ATTACHMENT  
Address: \_\_\_\_\_

Name: \_\_\_\_\_  
Address: \_\_\_\_\_

SURFACE OWNER(s) (Road and/or Other Disturbance)  
Name: PLEASE SEE ATTACHMENT  
Address: \_\_\_\_\_

Name: \_\_\_\_\_  
Address: \_\_\_\_\_

SURFACE OWNER(s) (Impoundments or Pits)  
Name: \_\_\_\_\_  
Address: \_\_\_\_\_

COAL OWNER OR LESSEE  
Name: NO DECLARATIONS ON RECORD WITH COUNTY  
Address: \_\_\_\_\_

COAL OPERATOR  
Name: NO DECLARATIONS ON RECORD WITH COUNTY  
Address: \_\_\_\_\_

WATER PURVEYOR(s)/OWNER(s) OF WATER WELL,  
SPRING OR OTHER WATER SUPPLY SOURCE  
Name: PLEASE SEE ATTACHMENT  
Address: \_\_\_\_\_

OPERATOR OF ANY NATURAL GAS STORAGE FIELD  
Name: \_\_\_\_\_  
Address: \_\_\_\_\_

\*Please attach additional forms if necessary

**Notice is hereby given:**

Pursuant to West Virginia Code § 22-6A-10(b), notice is hereby given that the undersigned well operator has applied for a permit for well work or for a certificate of approval for the construction of an impoundment or pit.

**This Notice Shall Include:**

Pursuant to W. Va. Code § 22-6A-10(b), this notice shall include: (1) copies of the application; (2) the erosion and sediment control plan required by section seven of this article; and (3) the well plat.

Pursuant to W. Va. Code § 22-6A-10(f), this notice shall include: (1) a statement of the time limits for filing written comments; (2) who may file written comments; (3) the name and address of the secretary for the purpose of filing the comments and obtaining additional information; and (4) a statement that the persons may request, at the time of submitting written comments, notice of the permit decision and a list of persons qualified to test water.

Pursuant to W. Va. Code R. § 35-8-5.7.a, the operator shall provide the Well Site Safety Plan to the surface owner and any water purveyor or surface owner subject to notice and water testing as provided in section 15 of this rule.

Pursuant to W. Va. Code R. § 35-8-15.2.c, this notice shall: (1) contain a statement of the surface owner's and water purveyor's right to request sampling and analysis; (2) advise the surface owner and water purveyor of the rebuttable presumption for contamination or deprivation of a fresh water source or supply; advise the surface owner and water purveyor that refusal to allow the operator to conduct a pre-drilling water well test constitutes a method to rebut the presumption of liability; (3) advise the surface owner and water purveyor of his or her independent right to sample and analyze any water supply at his or her own expense; advise the surface owner and water purveyor whether or not the operator will utilize an independent laboratory to analyze any sample; and (4) advise the surface owner and or water purveyor that he or she can obtain from the Chief a list of water testing laboratories in the subject area capable of and qualified to test water supplies in accordance with standard acceptable methods.

Additional information related to horizontal drilling may be obtained from the Secretary, at the WV Department of Environmental Protection headquarters, located at 601 57<sup>th</sup> Street, SE, Charleston, WV 25304 (304-926-0450) or by visiting [www.dep.wv.gov/oil-and-gas/pages/default.aspx](http://www.dep.wv.gov/oil-and-gas/pages/default.aspx).

**Well Location Restrictions**

Pursuant to W. Va. Code § 22-6A-12, Wells may not be drilled within two hundred fifty feet measured horizontally from any existing water well or developed spring used for human or domestic animal consumption. The center of well pads may not be located within six hundred twenty-five feet of an occupied dwelling structure, or a building two thousand five hundred square feet or larger used to house or shelter dairy cattle or poultry husbandry. This limitation is applicable to those wells, developed springs, dwellings or agricultural buildings that existed on the date a notice to the surface owner of planned entry for surveying or staking as provided in section ten of this article or a notice of intent to drill a horizontal well as provided in subsection (b), section sixteen of this article was provided, whichever occurs first, and to any dwelling under construction prior to that date. This limitation may be waived by written consent of the surface owner transmitted to the department and recorded in the real property records maintained by the clerk of the county commission for the county in which such property is located. Furthermore, the well operator may be granted a variance by the secretary from these distance restrictions upon submission of a plan which identifies the sufficient measures, facilities or practices to be employed during well site construction, drilling and operations. The variance, if granted, shall include terms and conditions the department requires to ensure the safety and protection of affected persons and property. The terms and conditions may include insurance, bonding and indemnification, as well as technical requirements. (b) No well pad may be prepared or well drilled within one hundred feet measured horizontally from any perennial stream, natural or artificial lake, pond or reservoir, or a wetland, or within three hundred feet of a naturally reproducing trout stream. No well pad may be located within one thousand feet of a surface or ground water intake of a public water supply. The distance from the public water supply as identified by the department shall be measured as follows: (1) For a surface water intake on a lake or reservoir, the distance shall be measured from the boundary of the lake or reservoir. (2) For a surface water intake on a flowing stream, the distance shall be measured from a semicircular radius extending upstream of the surface water intake. (3) For a groundwater source, the distance shall be measured from the wellhead or spring. The department may, in its discretion, waive these distance restrictions upon submission of a plan identifying sufficient measures, facilities or practices to be employed during well site construction, drilling and operations to protect the waters of the state. A waiver, if granted, shall impose any permit conditions as the secretary considers necessary. (c) Notwithstanding the foregoing provisions of this section, nothing contained in this section prevents an operator from conducting the activities permitted or authorized by a Clean Water Act Section 404 permit or other approval from the United States Army Corps of Engineers within any waters of the state or within the restricted areas referenced in this section. (d) The well location restrictions set forth in this section shall not apply to any well on a multiple well pad if at least one of the wells was permitted prior to the effective date of this article. (e) The secretary shall, by December 31, 2012, report to the Legislature on the noise, light, dust and volatile organic compounds generated by the drilling of horizontal wells as they relate to the well location restrictions regarding occupied dwelling structures pursuant to this section. Upon a finding, if any, by the secretary that the well location restrictions regarding occupied dwelling structures are inadequate or otherwise require alteration to address the items



examined in the study required by this subsection, the secretary shall have the authority to propose for promulgation legislative rules establishing guidelines and procedures regarding reasonable levels of noise, light, dust and volatile organic compounds relating to drilling horizontal wells, including reasonable means of mitigating such factors, if necessary.

**Water Well Testing:**

Pursuant to West Virginia Code § 22-6A-10(d), notification shall be made, with respect to surface landowners identified in subsection (b) or water purveyors identified in subdivision (5), subsection (b) of this section, of the opportunity for testing their water well. The operator shall provide an analysis to such surface landowner or water purveyor at their request.

**Water Testing Laboratories:**

Pursuant to West Virginia Code § 22-6A-10(i), persons entitled to notice pursuant to subsection (b) of this section may contact the department to ascertain the names and locations of water testing laboratories in the subject area capable and qualified to test water supplies in accordance with standard accepted methods. In compiling that list of names the department shall consult with the state Bureau for Public Health and local health departments. A surface owner and water purveyor has an independent right to sample and analyze any water supply at his or her own expense. The laboratory utilized by the operator shall be approved by the agency as being certified and capable of performing sample analyses in accordance with this section.

**Rebuttable Presumption for Contamination or Deprivation of a Fresh Water Source or Supply:**

W. Va. Code § 22-6A-18 requires that (b) unless rebutted by one of the defenses established in subsection (c) of this section, in any action for contamination or deprivation of a fresh water source or supply within one thousand five hundred feet of the center of the well pad for horizontal well, there is a rebuttable presumption that the drilling and the oil or gas well or either was the proximate cause of the contamination or deprivation of the fresh water source or supply. (c) In order to rebut the presumption of liability established in subsection (b) of this section, the operator must prove by a preponderance of the evidence one of the following defenses: (1) The pollution existed prior to the drilling or alteration activity as determined by a predrilling or prealteration water well test. (2) The landowner or water purveyor refused to allow the operator access to the property to conduct a predrilling or prealteration water well test. (3) The water supply is not within one thousand five hundred feet of the well. (4) The pollution occurred more than six months after completion of drilling or alteration activities. (5) The pollution occurred as the result of some cause other than the drilling or alteration activity. (d) Any operator electing to preserve its defenses under subdivision (1), subsection (c) of this section shall retain the services of an independent certified laboratory to conduct the predrilling or prealteration water well test. A copy of the results of the test shall be submitted to the department and the surface owner or water purveyor in a manner prescribed by the secretary. (e) Any operator shall replace the water supply of an owner of interest in real property who obtains all or part of that owner's supply of water for domestic, agricultural, industrial or other legitimate use from an underground or surface source with a comparable water supply where the secretary determines that the water supply has been affected by contamination, diminution or interruption proximately caused by the oil or gas operation, unless waived in writing by that owner. (f) The secretary may order the operator conducting the oil or gas operation to: (1) Provide an emergency drinking water supply within twenty-four hours; (2) Provide temporary water supply within seventy-two hours; (3) Within thirty days begin activities to establish a permanent water supply or submit a proposal to the secretary outlining the measures and timetables to be used in establishing a permanent supply. The total time in providing a permanent water supply may not exceed two years. If the operator demonstrates that providing a permanent replacement water supply cannot be completed within two years, the secretary may extend the time frame on case-by-case basis; and (4) Pay all reasonable costs incurred by the real property owner in securing a water supply. (g) A person as described in subsection (b) of this section aggrieved under the provisions of subsections (b), (e) or (f) of this section may seek relief in court... (i) Notwithstanding the denial of the operator of responsibility for the damage to the real property owner's water supply or the status of any appeal on determination of liability for the damage to the real property owner's water supply, the operator may not discontinue providing the required water service until authorized to do so by the secretary or a court of competent jurisdiction.

**Written Comment:**

Pursuant to West Virginia Code § 22-6A-11(a), all persons described in subsection (b), section ten of this article may file written comments with the secretary as to the location or construction of the applicant's proposed well work within thirty days after the application is filed with the secretary. All persons described in West Virginia Code § 22-6A-10(b) may file written comments as to the location or construction of the applicant's proposed well work to the Secretary at:

Chief, Office of Oil and Gas  
Department of Environmental Protection  
601 57<sup>th</sup> St. SE  
Charleston, WV 25304  
(304) 926-0450

Such persons may request, at the time of submitting written comments, notice of the permit decision and a list of persons qualified to test water. **NOTE: YOU ARE NOT REQUIRED TO FILE ANY COMMENT.**

**Time Limits and Methods for Filing Comments.**

The law requires these materials to be served on or before the date the operator files its Application. You have **THIRTY (30) DAYS** after the filing date to file your comments. Comments must be filed in person or received in the mail by the Chief's office by the time stated above. You may call the Chief's office to be sure of the date. Check with your postmaster to ensure adequate delivery time or to arrange special expedited handling. If you have been contacted by the well operator and you have signed a "voluntary statement of no objection" to the planned work described in these materials, then the permit may be issued at any time.

Pursuant to West Virginia Code § 22-6A-11(c)(2), Any objections of the affected coal operators and coal seam owners and lessees shall be addressed through the processes and procedures that exist under sections fifteen, seventeen and forty, article six of this chapter, as applicable and as incorporated into this article by section five of this article. The written comments filed by the parties entitled to notice under subdivisions (1), (2), (4), (5) and (6), subsection (b), section ten of this article shall be considered by the secretary in the permit issuance process, but the parties are not entitled to participate in the processes and proceedings that exist under sections fifteen, seventeen or forty, article six of this chapter, as applicable and as incorporated into this article by section five of this article.

**Comment Requirements**

Your comments must be in writing and include your name, address and telephone number, the well operator's name and well number and the approximate location of the proposed well site including district and county from the application. You may add other documents, such as sketches, maps or photographs to support your comments.

Disclaimer: All comments received will be placed on our web site <http://www.dep.wv.gov/oil-and-gas/Horizontal-Permits/Pages/default.aspx> and the applicant will automatically be forwarded an email notice that such comments have been submitted. The applicant will be expected to provide a response to comments submitted by any surface owner, water purveyor or natural gas storage operator noticed within the application.

**Permit Denial or Condition**

The Chief has the power to deny or condition a well work permit. Pursuant to West Virginia Code § 22-6A-8(d), the permit may not be issued or be conditioned, including conditions with respect to the location of the well and access roads prior to issuance if the director determines that:

- (1) The proposed well work will constitute a hazard to the safety of persons;
- (2) The plan for soil erosion and sediment control is not adequate or effective;
- (3) Damage would occur to publicly owned lands or resources; or
- (4) The proposed well work fails to protect fresh water sources or supplies.

A permit may also be denied under West Virginia Code § 22-6A-7(k), the secretary shall deny the issuance of a permit if the secretary determines that the applicant has committed a substantial violation of a previously issued permit for a horizontal well, including the applicable erosion and sediment control plan associated with the previously issued permit, or a substantial violation of one or more of the rules promulgated under this article, and in each instance has failed to abate or seek review of the violation within the time prescribed by the secretary pursuant to the provisions of subdivisions (1) and (2), subsection (a), section five of this article and the rules promulgated hereunder, which time may not be unreasonable.

Pursuant to West Virginia Code § 22-6A-10(g), any person entitled to submit written comments to the secretary pursuant to subsection (a), section eleven of this article, shall also be entitled to receive from the secretary a copy of the permit as issued or a copy of the order modifying or denying the permit if the person requests receipt of them as a part of the written comments submitted concerning the permit application. Such persons may request, at the time of submitting written comments, notice of the permit decision and a list of persons qualified to test water.

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06/23/2017

WW-6A  
(8-13)

4701706822  
API NO. 47-017 -  
OPERATOR WELL NO. Jay Unit 1H  
Well Pad Name: Middle Pad

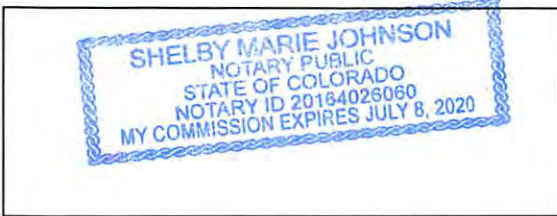
**Notice is hereby given by:**

Well Operator: Antero Resources Corporation  
Telephone: (303) 357-7310  
Email: shjohnson@anteroresources.com

Address: 1615 Wynkoop Street  
Denver, CO 80202  
Facsimile: 303-357-7315

**Oil and Gas Privacy Notice:**

The Office of Oil and Gas processes your personal information, such as name, address and telephone number, as part of our regulatory duties. Your personal information may be disclosed to other State agencies or third parties in the normal course of business or as needed to comply with statutory or regulatory requirements, including Freedom of Information Act requests. Our office will appropriately secure your personal information. If you have any questions about our use or your personal information, please contact DEP's Chief Privacy Officer at [depprivacyofficer@wv.gov](mailto:depprivacyofficer@wv.gov).



Subscribed and sworn before me this 3 day of March 2017

*[Signature]*

Notary Public

My Commission Expires 7/8/2020

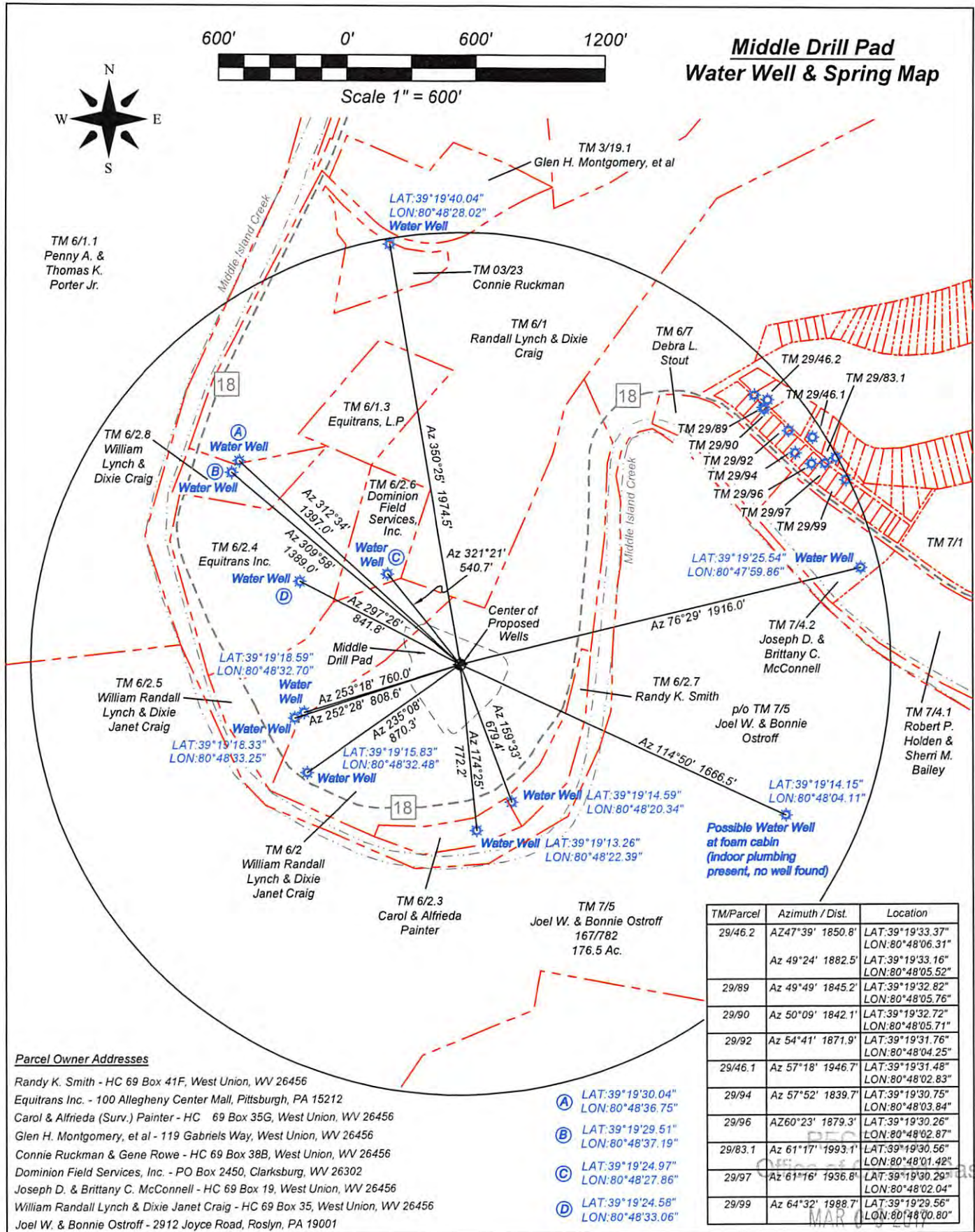
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**WW-6A Notice of Application Attachment (Jay Unit 1H):** 4701706822

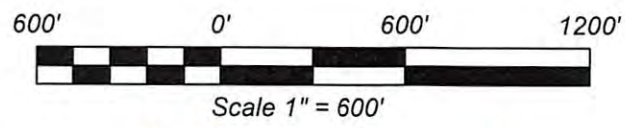
**List of Owners with Proposed Disturbance associated with Jay Unit 1H (Middle Pad):**

<b>SURFACE OWNERS –</b>	
<b>Owner:</b> William Randall Lynch & Dixie Janet Craig <b>Address:</b> HC 69 Box 35 West Union, WV 26456	✓
<b>Owner:</b> Randall Lynch & Dixie Craig (2 <sup>nd</sup> Address) <b>Address:</b> 5534 WV Rt 18 N West Union, WV 26456	✓
<b>SURFACE OWNERS (Roads and/or Other Disturbances) –</b>	
<b>Owner:</b> William Randall Lynch & Dixie Janet Craig <b>Address:</b> HC 69 Box 35 West Union, WV 26456	✓
<b>Owner:</b> Randall Lynch & Dixie Craig <b>Address:</b> 5534 WV Rt 18 N West Union, WV 26456	✓
<b>WATER SOURCE OWNERS –</b>	
<b>Owner:</b> Randy K. Smith <b>Address:</b> HC 69 Box 41F West Union, WV 26456	<div style="border: 1px solid black; padding: 5px;">*Please note there are 14 additional water sources listed on the attached map, however they are located greater than 1500' from the proposed well location.</div>
<b>Owner:</b> Carol & Alfreda (Surv.) Painter <b>Address:</b> HC 69 Box 35G West Union, WV 26456	
<b>Owner:</b> Dominion Field Services, Inc. <b>Address:</b> PO Box 2450 Clarksburg, WV 26302	✓
<b>Owner:</b> Equitrans, Inc <b>Address:</b> 100 Allegheny Center Mall Pittsburgh, PA 15212	
<b>Owner:</b> William Randall Lynch & Dixie Janet Craig <b>Address:</b> HC 69 Box 35 West Union, WV 26456	

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**Middle Drill Pad  
Water Well & Spring Map**



TM 6/1.1  
Penny A. &  
Thomas K.  
Porter Jr.

TM 3/19.1  
Glen H. Montgomery, et al

TM 03/23  
Connie Ruckman

TM 6/1  
Randall Lynch & Dixie  
Craig

TM 6/7  
Debra L.  
Stout

TM 29/46.2

TM 29/83.1

TM 6/2.8  
William  
Lynch &  
Dixie Craig

TM 6/1.3  
Equitrans, L.P.

TM 6/2.6  
Dominion  
Field  
Services,  
Inc.

TM 29/89

TM 29/90

TM 29/92

TM 29/94

TM 29/96

TM 29/97

TM 29/99

TM 6/2.4  
Equitrans Inc.

TM 6/2.5  
William Randall  
Lynch & Dixie  
Janet Craig

TM 6/2.7  
Randy K. Smith

TM 7/4.2  
Joseph D. &  
Brittany C.  
McConnell

TM 6/2.7  
Randy K. Smith

p/o TM 7/5  
Joel W. & Bonnie  
Ostroff

TM 7/4.1  
Robert P.  
Holden &  
Sherri M.  
Bailey

TM 6/2.5  
William Randall  
Lynch & Dixie  
Janet Craig

TM 6/2.5  
William Randall  
Lynch & Dixie  
Janet Craig

TM 6/2  
William Randall  
Lynch & Dixie  
Janet Craig

TM 6/2.3  
Carol & Alfrieda  
Painter

TM 7/5  
Joel W. & Bonnie Ostroff  
167/782  
176.5 Ac.

Possible Water Well  
at foam cabin  
(indoor plumbing  
present, no well found)

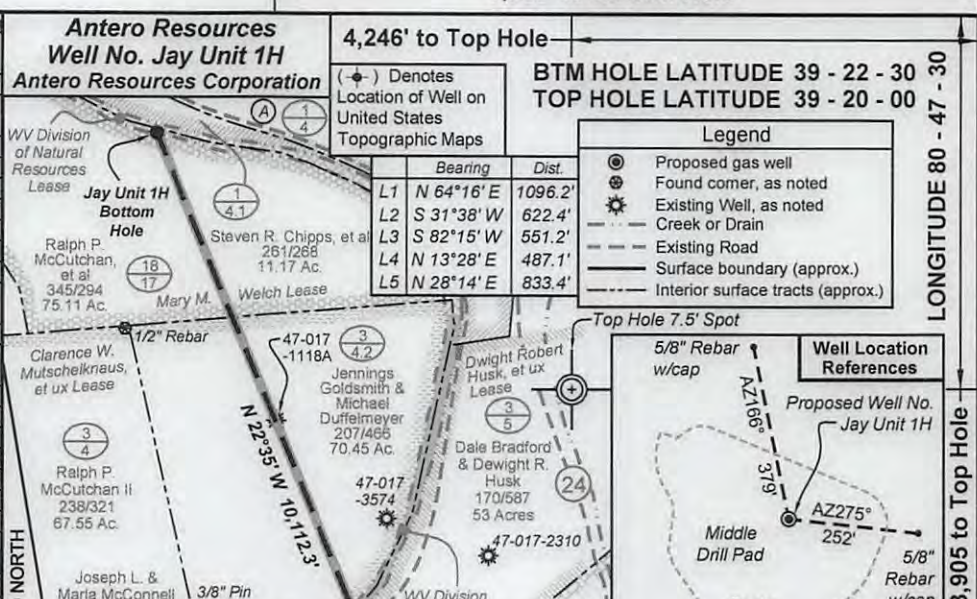
TM/Parcel	Azimuth / Dist.	Location
29/46.2	AZ47°39' 1850.8'	LAT:39°19'33.37" LON:80°48'06.31"
	Az 49°24' 1882.5'	LAT:39°19'33.16" LON:80°48'05.52"
29/89	Az 49°49' 1845.2'	LAT:39°19'32.82" LON:80°48'05.76"
29/90	Az 50°09' 1842.1'	LAT:39°19'32.72" LON:80°48'05.71"
29/92	Az 54°41' 1871.9'	LAT:39°19'31.76" LON:80°48'04.25"
29/46.1	Az 57°18' 1946.7'	LAT:39°19'31.48" LON:80°48'02.83"
29/94	Az 57°52' 1839.7'	LAT:39°19'30.75" LON:80°48'03.84"
29/96	AZ60°23' 1879.3'	LAT:39°19'30.26" LON:80°48'02.87"
29/83.1	Az 61°17' 1993.1'	LAT:39°19'30.56" LON:80°48'01.42"
29/97	Az 61°16' 1936.8'	LAT:39°19'30.29" LON:80°48'02.04"
29/99	Az 64°32' 1988.7'	LAT:39°19'29.56" LON:80°48'00.80"

**Parcel Owner Addresses**

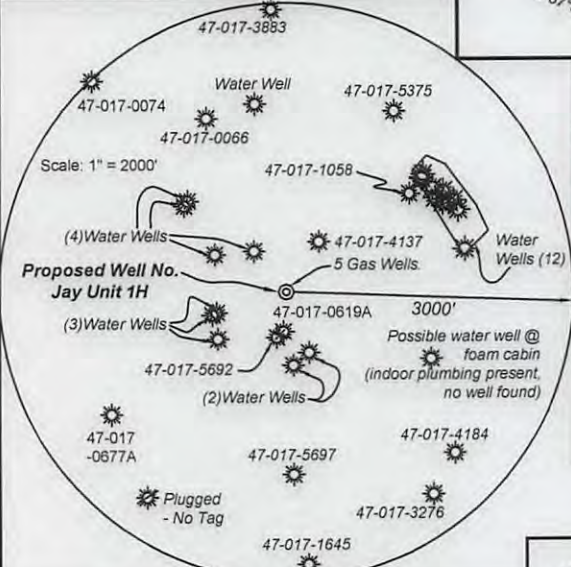
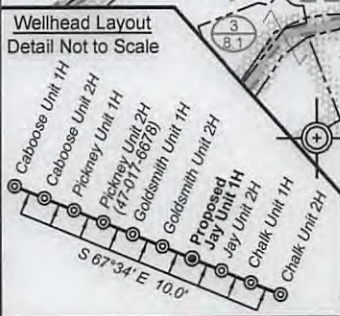
- Randy K. Smith - HC 69 Box 41F, West Union, WV 26456
- Equitrans Inc. - 100 Allegheny Center Mall, Pittsburgh, PA 15212
- Carol & Alfrieda (Surv.) Painter - HC 69 Box 35G, West Union, WV 26456
- Glen H. Montgomery, et al - 119 Gabniels Way, West Union, WV 26456
- Connie Ruckman & Gene Rowe - HC 69 Box 38B, West Union, WV 26456
- Dominion Field Services, Inc. - PO Box 2450, Clarksburg, WV 26302
- Joseph D. & Brittany C. McConnell - HC 69 Box 19, West Union, WV 26456
- William Randall Lynch & Dixie Janet Craig - HC 69 Box 35, West Union, WV 26456
- Joel W. & Bonnie Ostroff - 2912 Joyce Road, Roslyn, PA 19001

- (A) LAT:39°19'30.04"  
LON:80°48'36.75"
- (B) LAT:39°19'29.51"  
LON:80°48'37.19"
- (C) LAT:39°19'24.97"  
LON:80°48'27.86"
- (D) LAT:39°19'24.58"  
LON:80°48'33.06"

TM/Par	Bk/Pg	Acres	Owner(s)	
1	6/2.5	253/222	8.66	William Randall Lynch & Dixie Janet Craig
2	6/2.8	305/419	2.68	Dominion Field Services, Inc.
3	6/2.6	266/36	3.52	Equitrans, L.P.
4	6/1.3	305/416	4.68	Carol & Alfreda Painter
5	6/2.4	163/44	14.98	David J. & Debra S. Smith
6	6/2.3	197/659	6.00	Debra L. Stout
7	3/18.2	232/135	357.75	Joseph D. & Brittany C. McConnell
8	6/7	AP 35/212	3.46	Crystal Lake Club
9	7/4.2	293/340	4.19	Ronald O. & Barbara C. Moran
10	29/46	-/-	Lot 231	Shaun L. & Mary K. Cass
11	29/46.2	302/278	plb Lot 231	Janet M. Esposito & Scarlett C. Dennison
12	29/90	249/639	Lot 204	James L. & Patricia Reed
13	29/91	256/408	Lot 205	Douglas L. & Joyce M. Hall
14	29/92	260/127	Lot 206	Connie Ruckman
15	29/93	162/328	Lot 207	Glen H. Montgomery, et al
16	29/94	219/583	Lot 208	James W. & Lynda S. Beatty
17	29/95	219/583	Lot 209	William R. Lynch & Dixie J. Craig
18	3/23	WB 47/723	3.00	Randy K. Smith
19	3/19.1	265/582	7.00	Joel W. & Bonnie Ostroff
20	3/10.1	259/312	0.25	Antero Resources Corporation
21	6/2	214/279	32.19	Ronald Perry Gains, Perry Blackburn, Ryan Webb
22	6/2.7	294/473	2.16	John & Jennifer Layton
23	7/5	167/782	176.5	
24	3/17	349/553	25.9	
25	3/11	283/682	43.0	
26	3/18.4	286/473	16.58	



**Notes:**  
 West Virginia Coordinate System of 1927, North Zone based upon Differential GPS Measurements.  
 Well No. Jay Unit 1H Top Hole coordinates are N: 302,237.85' Latitude: 39°19'20.80" E: 1,630,402.70' Longitude: 80°48'23.31"  
 Bottom Hole coordinates are N: 312,050.79' Latitude: 39°20'57.36" E: 1,627,506.90' Longitude: 80°49'01.98"  
 UTM Zone 17, NAD 1983  
 Top Hole Coordinates N: 4,352,586.454m E: 4,355,561.243m  
 Bottom Hole Coordinates N: 4,352,586.454m E: 516,696.324m  
 Plat orientation and corner and well references are based upon the grid north meridian.  
 Well location references are based upon the magnetic meridian.



**Notes:**  
 Note: It appears 23 water wells were found within 2000' of proposed well. No occupied dwellings or buildings 2,500 square feet or larger used to house or shelter dairy cattle or poultry husbandry are located within 625' of the center of the well pad.

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**

**Notes:**  
 Well No. Jay Unit 1H UTM Zone 17, NAD 1927  
 Top Hole Coordinates N: 14,279,396.07' E: 1,695,147.19'  
 Point of Entry Coordinates N: 14,279,888.29' E: 1,696,126.27'  
 Bottom Hole Coordinates N: 14,289,155.91' E: 1,692,089.15'

FILE NO: 36-30-WU-15  
 DRAWING NO: Jay 1H Well Plat Mod New  
 SCALE: 1" = 1200'  
 MINIMUM DEGREE OF ACCURACY: Submeter  
 PROVEN SOURCE OF ELEVATION: CORS, Marietta, OH

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

DATE: January 4 20 17  
 Operator's Well No. Jay Unit 1H  
 API WELL NO  
 47 - 017 - 06822  
 STATE COUNTY PERMIT

WELL TYPE:  OIL  GAS  LIQUID INJECTION  WASTE DISPOSAL  
 (IF GAS) PRODUCTION:  STORAGE  DEEP  SHALLOW  
 LOCATION: ELEVATION: Existing Grade - 848' Proposed Grade - 843' WATERSHED: Headwaters Middle Island Creek QUADRANGLE: West Union 5.15; 80  
 DISTRICT: West Union James Douglas White; Lewis Maxwell, et al; (2) WV Div. of Natural Resource COUNTY: Doddridge 56.07; 105  
 SURFACE OWNER: William Randall Lynch & Dixie Craig Joseph Freeman, et ux; William Randall Lynch & Dixie Craig ACREAGE: 32.19 82.21; 290  
 ROYALTY OWNER: R.E. McCabe Jr., Trustee & Brooke F. McCabe Jr. Agent; Joseph B. Hammond Mary M. Welch LEASE NO: ACREAGE: 75; 150; 168; 600  
 PROPOSED WORK:  DRILL  CONVERT  DRILL DEEPER  FRACTURE OR STIMULATE  PLUG OFF OLD FORMATION  
 PERFORATE NEW FORMATION  OTHER PHYSICAL CHANGE IN WELL (SPECIFY) \_\_\_\_\_ 6,600' TVD  
 PLUG AND ABANDON  CLEAN OUT AND REPLUG TARGET FORMATION: Marcellus Shale ESTIMATED DEPTH: 17,900' MD

WELL OPERATOR: Antero Resources Corporation DESIGNATED AGENT: Dianna Stamper - CT Corporation System  
 ADDRESS: 1615 Wynkoop Street ADDRESS: 5400 D Big Tyler Road  
 Denver, CO 80202 Charleston, WV 25313

**STATE OF WEST VIRGINIA**  
**DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS**  
**NOTICE OF INTENT TO DRILL**

Pursuant to W. Va. Code § 22-6A-16(b), the Notice of Intent to Drill is only required if the notice requirements of W. Va. Code § 22-6A-10(a) have NOT been met or if the Notice of Intent to Drill requirement has NOT been waived in writing by the surface owner.

**Notice Time Requirement:** Notice shall be provided at least **TEN (10)** days prior to filing a permit application.

**Date of Notice:** 05/20/2016      **Date Permit Application Filed:** 03/03/2017

**Delivery method pursuant to West Virginia Code § 22-6A-16(b)**

- HAND DELIVERY       CERTIFIED MAIL RETURN RECEIPT REQUESTED

Pursuant to W. Va. Code § 22-6A-16(b), at least ten days prior to filing a permit application, an operator shall, by certified mail return receipt requested or hand delivery, give the surface owner notice of its intent to enter upon the surface owner's land for the purpose of drilling a horizontal well: *Provided*, That notice given pursuant to subsection (a), section ten of this article satisfies the requirements of this subsection as of the date the notice was provided to the surface owner: *Provided, however*, That the notice requirements of this subsection may be waived in writing by the surface owner. The notice, if required, shall include the name, address, telephone number, and if available, facsimile number and electronic mail address of the operator and the operator's authorized representative.

**Notice is hereby provided to the SURFACE OWNER(s):**

Name: William Randall Lynch & Dixie Janet Craig  
Address: HC 69, Box 35  
West Union, WV 26456

Name: William Randall Lynch & Dixie Janet Craig (2nd Address)  
Address: 5534 WV Route 18 N  
West Union, WV 26456

**Notice is hereby given:**

Pursuant to West Virginia Code § 22-6A-16(b), notice is hereby given that the undersigned well operator has an intent to enter upon the surface owner's land for the purpose of drilling a horizontal well on the tract of land as follows:

State: West Virginia      UTM NAD 83      Easting: 516681.13m (Approximate Pad Center)  
County: Doddridge      Northing: 4352573.53m (Approximate Pad Center)  
District: West Union      Public Road Access: WV 18  
Quadrangle: West Union 7.5'      Generally used farm name: William Randall Lynch & Dixie Craig  
Watershed: Headwaters Middle Island Creek

**This Notice Shall Include:**

Pursuant to West Virginia Code § 22-6A-16(b), this notice shall include the name, address, telephone number, and if available, facsimile number and electronic mail address of the operator and the operator's authorized representative. Additional information related to horizontal drilling may be obtained from the Secretary, at the WV Department of Environmental Protection headquarters, located at 601 57<sup>th</sup> Street, SE, Charleston, WV 25304 (304-926-0450) or by visiting [www.dep.wv.gov/oil-and-gas/pages/default.aspx](http://www.dep.wv.gov/oil-and-gas/pages/default.aspx).

**Notice is hereby given by:**

Well Operator: Antero Resources Appalachian Corporation  
Address: 1615 Wynkoop St.  
Denver, CO 80202  
Telephone: 303-357-7323  
Email: asteele@anteroresources.com  
Facsimile: 303-357-7315

Authorized Representative: Ashlie Steele  
Address: 1615 Wynkoop St.  
Denver, CO 80202  
Telephone: 303-357-7323  
Email: asteele@anteroresources.com  
Facsimile: 303-357-7315

**Oil and Gas Privacy Notice:**

The Office of Oil and Gas processes your personal information, such as name, address and telephone number, as part of our regulatory duties. Your personal information may be disclosed to other State agencies or third parties in the normal course of business or as needed to comply with statutory or regulatory requirements, including Freedom of Information Act requests. Our office will appropriately secure your personal information. If you have any questions about our use of your personal information, please contact DEP's Chief Privacy Officer at [depprivacyofficer@wv.gov](mailto:depprivacyofficer@wv.gov).

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

Division of Highways

1900 Kanawha Boulevard East • Building Five • Room 110  
Charleston, West Virginia 25305-0430 • (304) 558-3505

Earl Ray Tomblin  
Governor

Paul A. Mattox, Jr., P. E.  
Secretary of Transportation/  
Commissioner of Highways

Reissued November 4, 2016

James A. Martin, Chief  
Office of Oil and Gas  
Department of Environmental Protection  
601 57<sup>th</sup> Street, SE  
Charleston, WV 25304

Subject: DOH Permit for the Middle Pad, Doddridge County  
Jay Unit 1H Well site 47-017-06822

Dear Mr. Martin,

This well site will be accessed from a DOH permit #04-2013-0352 which has been issued to Antero Resources Corporation for access to the State Road for a well site located off of WV route 18 F in Doddridge County.

The operator has signed a STATEWIDE OIL AND GAS ROAD MAINTENANCE BONDING AGREEMENT and provided the required Bond. This operator is currently in compliance with the DOH OIL AND GAS POLICY dated January 3, 2012.

Very Truly Yours,

Gary K. Clayton, P.E.  
Regional Maintenance Engineer  
Central Office O&G Coordinator

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Cc: Samantha Marsh  
Antero Resources Corporation  
CH, OM, D-4  
File

MAR 06 2012

WV Department of Environmental Protection



# List of Anticipated Additives Used for Fracturing or Stimulating Well

4701706822

Additives	Chemical Abstract Service Number (CAS #)
Fresh Water	7732-18-5
2 Phosphobutane 1,2,4 tricarboxylic acid	37971-36-1
Ammonium Persulfate	7727-54-0
Anionic copolymer	Proprietary
Anionic polymer	Proprietary
BTEX Free Hydrotreated Heavy Naphtha	64742-48-9
Cellulase enzyme	Proprietary
Demulsifier Base	Proprietary
Ethoxylated alcohol blend	Mixture
Ethoxylated Nonylphenol	68412-54-4
Ethoxylated oleylamine	26635-93-8
Ethylene Glycol	107-21-1
Glycol Ethers	111-76-2
Guar gum	9000-30-0
Hydrogen Chloride	7647-01-0
Hydrotreated light distillates, non-aromatic, BTEX free	64742-47-8
Isopropyl alcohol	67-63-0
liquid, 2,2-dibromo-3-nitrilopropionamide	10222-01-2
Microparticle	Proprietary
Petroleum Distillates (BTEX Below Detect)	64742-47-8
Polyacrylamide	57-55-6
Propargyl Alcohol	107-19-7
Propylene Glycol	57-55-6
Quartz	14808-60-7
Sillica, crystalline quartz	7631-86-9
Sodium Chloride	7647-14-5
Sodium Hydroxide	1310-73-2
Sugar	57-50-1
Surfactant	68439-51-0
Suspending agent (solid)	14808-60-7
Tar bases, quinoline derivs, benzyl chloride-quaternized	72480-70-7
Solvent Naphtha, petroleum, heavy aliph	64742-96-7
Soybean Oil, Me ester	67784-80-9
Copolymer of Maleic and Acrylic Acid	52255-49-9
DETA phosphonate	15827-60-8
Hexamethylene Triamine Penta	34690-00-1
Phosphino Carboxylic acid polymer	71050-62-9
Hexamethylene Diamine Tetra	23605-75-5
2-Propenoic acid, polymer with 2 propenamide	9003-06-9
Hexamethylene diamine penta (methylene phosphonic acid)	23605-74-5
Diethylene Glycol	111-46-6
Methenamine	100-97-0
Polyethylene polyamine	68603-67-8
Coco amine	61791-14-8
2-Propyn-1-olcompound with methyloxirane	38172-91-7

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W/V Depa  
Division

**LOCATION COORDINATES:**

ACCESS ROAD ENTRANCE  
 LATITUDE: 39.322323 LONGITUDE: -80.804581 (NAD 83)  
 N 4352564.36 E 516844.60 (UTM ZONE 17 METERS)

CENTER OF TANK  
 LATITUDE: 39.323633 LONGITUDE: -80.806236 (NAD 83)  
 N 4352709.35 E 516701.67 (UTM ZONE 17 METERS)

CENTROID OF WELL PAD  
 LATITUDE: 39.322409 LONGITUDE: -80.806478 (NAD 83)  
 N 4352573.53 E 516681.13 (UTM ZONE 17 METERS)



# MIDDLE WELL PAD & WATER CONTAINMENT PAD SITE DESIGN & CONSTRUCTION EROSION & SEDIMENT CONTROL

WEST UNION DISTRICT, DODDRIDGE COUNTY  
 MIDDLE ISLAND CREEK WATERSHED  
 USGS 7.5 WEST UNION QUADRANGLE

**GENERAL DESCRIPTION:**

THE WELL PAD, WATER CONTAINMENT PAD, AND ACCESS ROAD(S) ARE BEING CONSTRUCTED TO AID IN THE DEVELOPMENT OF INDIVIDUAL MARCELLUS SHALE GAS WELLS.

**FLOODPLAIN NOTES:**

THE PROPOSED SITE IS LOCATED IN FLOODZONE "X" PER FEMA FLOOD MAP #54017C0110C.

**MISS UTILITY STATEMENT:**

ANTERO RESOURCES CORPORATION WILL NOTIFY MISS UTILITY OF WEST VIRGINIA FOR THE LOCATING OF UTILITIES PRIOR TO THIS PROJECT DESIGN; TICKET #1309921758. IN ADDITION, MISS UTILITY WILL BE CONTACTED BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION FOR THIS PROJECT.

**ENTRANCE PERMIT:**

ANTERO RESOURCES CORPORATION WILL OBTAIN AN ENCROACHMENT PERMIT (FORM MM-109) FROM THE WEST VIRGINIA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS, PRIOR TO COMMENCEMENT OF CONSTRUCTION ACTIVITIES.

**ENVIRONMENTAL NOTES:**

WETLAND DELINEATIONS WERE PERFORMED ON APRIL 2012, FEBRUARY 2014 & DECEMBER 2016 BY ALLSTAR ECOLOGY, LLC TO REVIEW THE SITE FOR WATERS AND WETLANDS THAT ARE MOST LIKELY WITHIN THE REGULATORY PURVIEW OF THE U.S. ARMY CORPS OF ENGINEERS (USACE) AND/OR THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (WVDEP). THE DECEMBER 5, 2016 WETLAND DELINEATION AND STREAM IDENTIFICATION REPORT WAS PREPARED BY ALLSTAR ECOLOGY, LLC AND SUMMARIZES THE RESULTS OF THE FIELD DELINEATION. THE REPORT DOES NOT, IN ANY WAY, REPRESENT A JURISDICTIONAL DETERMINATION OF THE LANDWARD LIMITS OF WATERS AND WETLANDS WHICH MAY BE REGULATED BY THE USACE OR THE WVDEP.

Stream and Impact Cause	MIDDLE JURISDICTIONAL DITCH IMPACT (LINEAR FEET)				Total Disturbance (LF)
	Permanent Impacts Culvert/Fill (LF)	Inlets/Outlets Structures (LF)	Temp. Impacts Cofferdam/E&S Controls (LF)	Temp. Disturb. Distance to L.O.D. (LF)	
Ditch 1 (Access Road "A")	214	28	0	10	252
Ditch 2 (Access Road "A")	13	0	0	0	13

**GEOTECHNICAL NOTES:**

A SUBSURFACE INVESTIGATION OF THE PROPOSED SITE WAS PERFORMED BY TERRA TESTING, INC. UNDER THE TECHNICAL SUPERVISION OF KLEINFELDER ON JULY 11, 2013-OCTOBER 10, 2013 AND REVISITED BY PENNSYLVANIA SOIL & ROCK, INC. ON MARCH 28-29, 2016. THE REPORT PREPARED BY PENNSYLVANIA SOIL & ROCK, INC., DATED APRIL 18, 2016, REVISED DECEMBER 6, 2016, REFLECTS THE RESULTS OF THE SUBSURFACE INVESTIGATION. THE INFORMATION AND RECOMMENDATIONS CONTAINED IN THEIR REPORT WAS USED IN THE PREPARATION OF THESE PLANS. HOWEVER, ADDITIONAL INVESTIGATION IS NECESSARY TO CONFIRM THE ESTIMATED TOE KEY DEPTHS. PLEASE REFER TO THE SUBSURFACE INVESTIGATION REPORT BY PENNSYLVANIA SOIL & ROCK, INC. FOR ADDITIONAL INFORMATION, AS NEEDED.

**PROJECT CONTACTS:**

**OPERATOR:**

ANTERO RESOURCES CORPORATION  
 535 WHITE OAKS BLVD.  
 BRIDGEPORT, WV 26330  
 PHONE: (304) 842-4100  
 FAX: (304) 842-4102

ELI WAGONER - ENVIRONMENTAL ENGINEER  
 OFFICE: (304) 842-4068 CELL: (304) 476-9770

JON McEVERS - OPERATIONS SUPERINTENDENT  
 OFFICE: (303) 357-6799 CELL: (303) 808-2423

AARON KUNZLER - CONSTRUCTION SUPERVISOR  
 CELL: (405) 227-8344

ROBERT B. WIRKS - FIELD ENGINEER  
 OFFICE: (304) 842-4100 CELL: (304) 627-7405

CHARLES E. COMPTON, III - SURVEYING COORDINATOR  
 CELL: (304) 719-6449

DAVE CAVA - LAND AGENT  
 CELL: (304) 641-5814

**ENGINEER/SURVEYOR:**

NAVITUS ENGINEERING, INC.  
 CYRUS S. KUMP, PE - PROJECT MANAGER/ENGINEER  
 OFFICE: (888) 662-4185 CELL: (540) 686-6747

**ENVIRONMENTAL:**

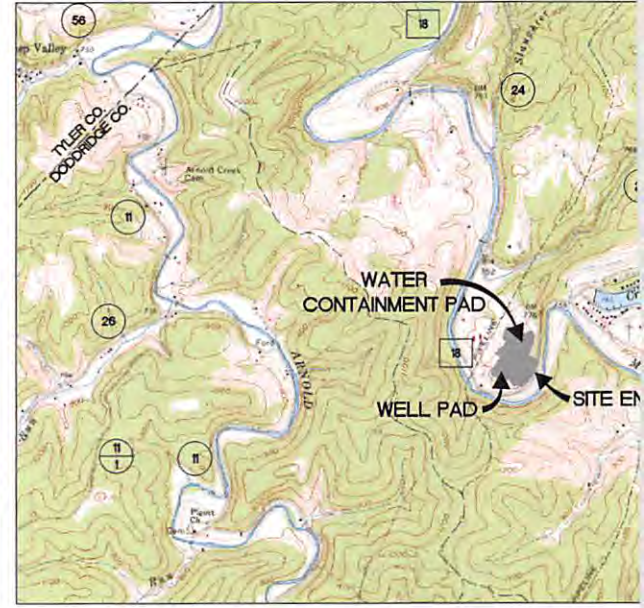
ALLSTAR ECOLOGY, LLC  
 RYAN L. WARD - ENVIRONMENTAL SCIENTIST  
 OFFICE: (866) 213-2666 CELL: (304) 692-7477

**GEOTECHNICAL:**

PENNSYLVANIA SOIL & ROCK, INC.  
 CHRISTOPHER W. SAMIOS - PROJECT ENGINEER  
 OFFICE: (412) 372-4000 CELL: (412) 589-0662

**RESTRICTIONS NOTES:**

1. THERE ARE NO LAKES, PONDS, OR RESERVOIRS WITHIN 100 FEET OF THE WELL PAD AND LOD. THERE ARE 2 EXISTING WETLANDS AND A PERENNIAL STREAM WITHIN 100' OF THE ACCESS ROAD "A" LOD THAT WILL REMAIN UNDISTURBED.
2. THERE ARE NO NATURALLY PRODUCING TROUT STREAMS WITHIN 300 FEET OF THE WELL PAD AND LOD.
3. THERE ARE NO GROUNDWATER INTAKE OR PUBLIC WATER SUPPLY FACILITIES WITHIN 1000 FEET OF THE WELL PAD AND LOD.
4. THERE ARE NO APPARENT EXISTING WATER WELLS OR DEVELOPED SPRINGS WITHIN 250 FEET OF THE WELL(S) BEING DRILLED.
5. THERE ARE NO OCCUPIED DWELLING STRUCTURES WITHIN 625 FEET OF THE CENTER OF THE WELL PAD.
6. THERE ARE NO AGRICULTURAL BUILDINGS LARGER THAN 2,500 SQUARE FEET WITHIN 625 FEET OF THE CENTER OF THE WELL PAD.



**REPRODUCTION NOTE**

THESE PLANS WERE CREATED TO BE PLOTTED ON 22"x34" (ANSI D) PAPER. HALF SCALE DRAWINGS ARE ON 11"x17" (ANSI B) PAPER.

THESE PLANS WERE CREATED FOR COLOR PLOTTING AND ANY REPRODUCTIONS IN GRAY SCALE OR COLOR MAY RESULT IN A LOSS OF INFORMATION AND SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES.

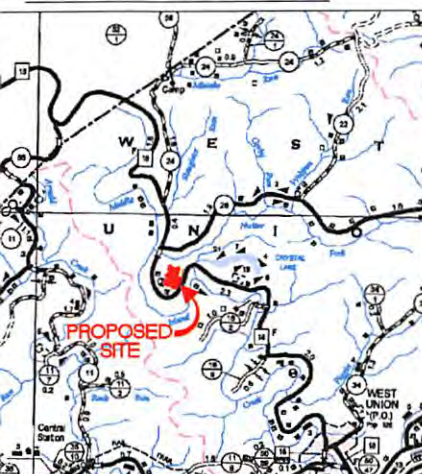
**06/23/2017**

# WATER CONTAINMENT PAD CONSTRUCTION PLAN, CONTROL PLANS

WVDOH COUNTY, WEST VIRGINIA  
WATERSHED  
ROAD MAP



WVDOH COUNTY ROAD MAP



MISS Utility of West Virginia  
1-800-245-4848  
West Virginia State Law  
(Section XIV: Chapter 24-C)  
Requires that you call two  
business days before you dig in  
the state of West Virginia.  
**IT'S THE LAW!!**

WEST VIRGINIA STATE PLANE COORDINATE SYSTEM  
NORTH ZONE, NAD 83  
ELEVATION BASED ON NAVD83  
ESTABLISHED BY SURVEY GRADE GPS & OPUS  
POST-PROCESSING

## SHEET INDEX:

- 1 - COVER SHEET
  - 2 - CONSTRUCTION AND E&S CONTROL NOTES
  - 3 - LEGEND
  - 4 - MATERIAL QUANTITIES
  - 5 - STORM DRAINAGE COMPUTATIONS
  - 6 - EXISTING CONDITIONS
  - 7 - EXISTING STRUCTURES & FEATURES
  - 8 - OVERALL PLAN SHEET INDEX & VOLUMES
  - 9 - WELL PAD & WATER CONTAINMENT PAD PLAN
  - 10 - WELL PAD GRADING PLAN
  - 11 - WATER CONTAINMENT GRADING PLAN
  - 12 - ACCESS ROAD PROFILES
  - 13- ACCESS ROAD SECTIONS
  - 14 - ACCESS ROAD SECTIONS & STOCKPILE SECTIONS
  - 15 - WELL PAD & WATER CONTAINMENT PAD SECTIONS
  - 16-23 - CONSTRUCTION DETAILS
  - 24 - WELL PAD & WATER CONTAINMENT PAD RECLAMATION PLAN
  - 25 - FIRM EXHIBIT
- GE500-GE503 - GEOTECHNICAL DETAILS

*Handwritten signature and date: 3/23/17*

**NAVITUS**  
ENERGY ENGINEERING

Telephone: (888) 662-4185 | www.NavitusEng.com

Proposed Well Name	WV North NAD 27	WV North NAD 83	UTM (METERS) Zone 17	NAD 83 Lat & Long
Caboose Unit 1H	N 302260.74 E 1630347.23	N 302295.90 E 1598908.05	N 4352593.14 E 516679.31	LAT 39-19-21.3098 LONG -80-48-23.3938
Caboose Unit 2H	N 302256.92 E 1630356.48	N 302292.08 E 1598915.29	N 4352592.03 E 516682.15	LAT 39-19-21.2734 LONG -80-48-23.2755
Pickney Unit 1H	N 302253.11 E 1630385.72	N 302288.27 E 1598924.53	N 4352590.91 E 516684.98	LAT 39-19-21.2370 LONG -80-48-23.1572
Pickney Unit 2H	N 302249.29 E 1630374.97	N 302284.45 E 1598933.78	N 4352589.80 E 516687.82	LAT 39-19-21.2007 LONG -80-48-23.0388
Goldsmith Unit 1H	N 302245.48 E 1630384.21	N 302280.64 E 1598943.02	N 4352588.68 E 516690.65	LAT 39-19-21.1643 LONG -80-48-22.9205
Goldsmith Unit 2H	N 302241.66 E 1630393.45	N 302278.82 E 1598952.26	N 4352587.57 E 516693.49	LAT 39-19-21.1279 LONG -80-48-22.8022
Jay Unit 1H	N 302237.85 E 1630402.70	N 302273.01 E 1598961.51	N 4352586.45 E 516696.32	LAT 39-19-21.0915 LONG -80-48-22.6839
Jay Unit 2H	N 302234.03 E 1630411.94	N 302269.19 E 1598970.75	N 4352585.34 E 516699.16	LAT 39-19-21.0551 LONG -80-48-22.5656
Chalk Unit 1H	N 302230.22 E 1630421.18	N 302265.38 E 1598979.99	N 4352584.22 E 516701.99	LAT 39-19-21.0188 LONG -80-48-22.4472
Chalk Unit 2H	N 302228.40 E 1630430.43	N 302261.56 E 1598989.24	N 4352583.11 E 516704.83	LAT 39-19-20.9824 LONG -80-48-22.3289
Well Pad Elevation	843.0			

MIDDLE LIMITS OF DISTURBANCE AREA (AC)			
Total Site	Permitted	Modification	Total
Access Road "A" (644')	3.29	1.00	4.29
Access Road "B" (499')	0.98	0.00	0.98
Access Road "C" (232')	0.42	0.00	0.42
Well Pad	5.53	0.00	5.53
Water Containment Pad	3.30	0.00	3.30
Excess/Topsoil Material Stockpiles	4.53	0.00	4.53
<b>Total Affected Area</b>	<b>18.05</b>	<b>1.00</b>	<b>19.05</b>
Total Wooded Acres Disturbed	3.62	0.76	4.38
<b>Impacts to William R Lynch &amp; Dixie J. Craig TM 6-2</b>			
Access Road "A" (644')	3.29	1.00	4.29
Access Road "B" (499')	0.98	0.00	0.98
Well Pad	5.01	0.00	5.01
Water Containment Pad	0.73	0.00	0.73
Excess/Topsoil Material Stockpiles	4.53	0.00	4.53
<b>Total Affected Area</b>	<b>14.54</b>	<b>1.00</b>	<b>15.54</b>
Total Wooded Acres Disturbed	2.31	0.76	3.07
<b>Impacts to William R Lynch &amp; Dixie J. Craig TM 6-2.5</b>			
Access Road "C" (218')	0.40	0.00	0.40
Well Pad	0.52	0.00	0.52
Water Containment Pad	0.14	0.00	0.14
<b>Total Affected Area</b>	<b>1.06</b>	<b>0.00</b>	<b>1.06</b>
Total Wooded Acres Disturbed	0.02	0.00	0.02
<b>Impacts to Randall Lynch &amp; Dixie Craig TM 6-1</b>			
Access Road "C" (14')	0.02	0.00	0.02
Water Containment Pad	2.43	0.00	2.43
<b>Total Affected Area</b>	<b>2.45</b>	<b>0.00</b>	<b>2.45</b>
Total Wooded Acres Disturbed	1.29	0.00	1.29

REVISION	DATE	REVISION
REVISED PER DRILLING COMMENTS	01/28/2016	
REVISED PER CONSTRUCTION	04/19/2016	
REVISED ENTRANCE LOCATION	12/09/2016	

**Antero**  
THIS DOCUMENT WAS PREPARED FOR:  
ANTERO RESOURCES CORPORATION

COVER SHEET  
**MIDDLE**  
WELL PAD & WATER CONTAINMENT PAD  
WEST UNION DISTRICT  
DODDRIDGE COUNTY, WEST VIRGINIA



DATE: 12/09/2016  
SCALE: AS SHOWN  
SHEET: 06/23/2017

# OVERALL PLAN SHEET

## NOTES:

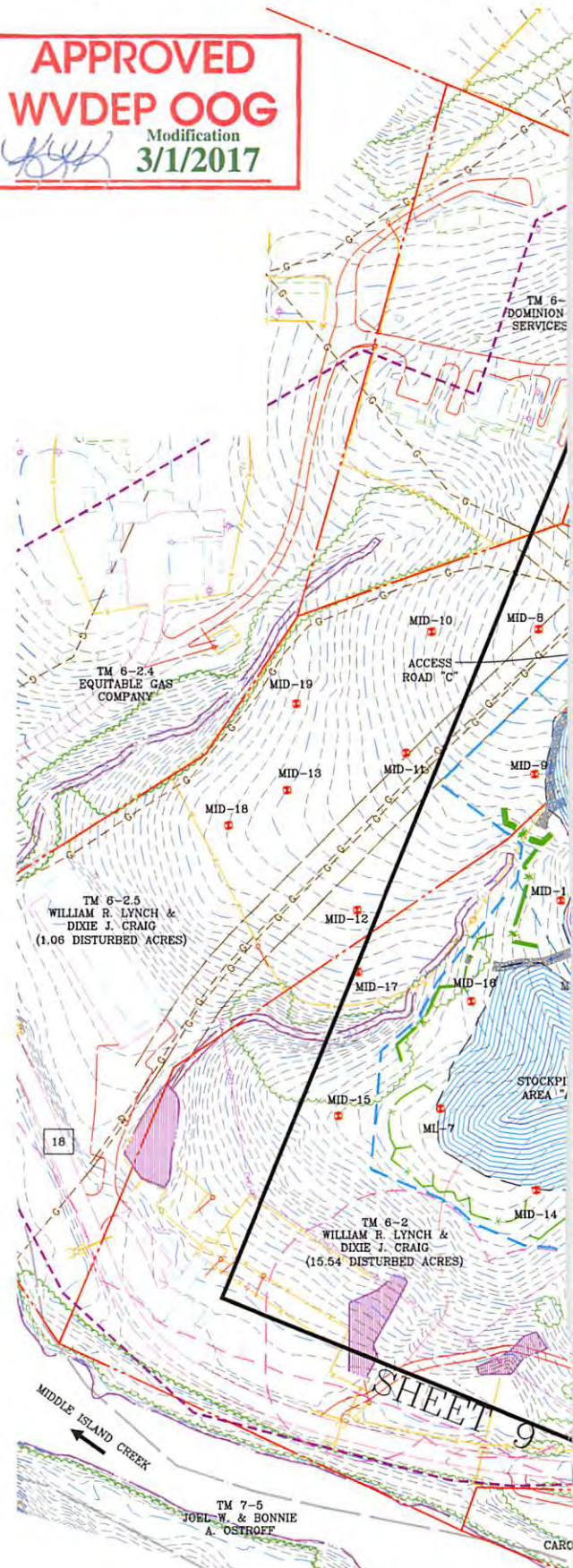
1. THE EARTHWORK QUANTITIES PROVIDED ARE AN ESTIMATE FOR CONSIDERATION. THE QUANTITIES SHOWN ARE CALCULATED USING A 1:1 CUT/SWELL & FILL SHRINK FACTOR. THE EXCESS MATERIAL & TOPSOIL STOCKPILES ARE SIZED TO ACCOMMODATE A CUT/SWELL FACTOR OF 1.1:1. THIS ADDITIONAL MATERIAL IS REFLECTED IN THE TOTAL SPOIL SHOWN ON THE MATERIAL QUANTITIES TABLE. IF THE CALCULATED SWELL IS LESS THAN 1.1:1, THE STOCKPILES SIZES CAN BE REDUCED DURING CONSTRUCTION. THE QUANTITIES SHOWN MAY BE GREATER OR LESSER THAN ACTUALLY EXCAVATED. THE ENGINEER IS NOT RESPONSIBLE FOR VARIANCES FROM THE ESTIMATED QUANTITIES AND DOES NOT CERTIFY THEIR ACCURACY.
2. THE TOE BENCH DEPTHS AND QUANTITIES PROVIDED IN THE TABLE ARE AN ESTIMATE, CALCULATED FROM THE RECOMMENDATIONS PROVIDED IN THE GEOTECHNICAL REPORT PREPARED BY PENNSYLVANIA SOIL & ROCK, INC. SEE PAGES GE500-GE503 & GEOTECHNICAL INVESTIGATION REPORT PROVIDED BY PENNSYLVANIA SOIL & ROCK, INC. FOR TOE BENCH DETAILS, VOLUMES, AND SPECIFICATIONS.



MIDDLE WELL PAD & WATER CONTAINMENT PAD						
Description	Cut (CY)	Fill (CY)	Spoil (CY)	Borrow (CY)	Max. Slope (%)	Length of Slope (FT)
Access Road "A"	12,205.8	6,337.7	5,868.1	0.0	15.0	290.0
Access Road "B"	286.2	789.9	0.0	503.7	10.0	50.0
Access Road "C"	52.5	328.0	0.0	275.5	11.5	125.0
Well Pad	21,565.6	16,309.0	5,256.6	0.0	n/a	n/a
Water Containment Pad	877.0	1,511.2	0.0	634.2	n/a	n/a
Stripped Topsoil (12")	13,355.5	0.0	13,355.5	0.0	n/a	n/a
Material Stockpiles	0.0	32,180.0	0.0	32,180.0	n/a	n/a
<b>Totals</b>	<b>48,342.6</b>	<b>57,455.8</b>	<b>24,480.2</b>	<b>33,593.4</b>	<b>n/a</b>	<b>n/a</b>
Total Spoil (CY) =			-9,113.2			

MATERIAL STOCKPILES			
Name	Excess	Topsoil	
3" Topsoil Respread	N/A	1,000	
A	5,910	14,990	
B	10,280	0	
<b>TOTAL</b>	<b>16,190</b>	<b>15,990</b>	

MIDDLE TOE BENCH QUANTITIES				
Description	Keyway		Total	
	#1A	#1B		
Drainage Method	D2	D1	N/A	
<b>Toe Bench</b>				
Approximate Depth (LF)	15	6	N/A	
Approximate Width (15' min.) (LF)	15	15	N/A	
Length (LF)	560	750	1,310	
Perimeter Drain (LF)	560	750	1,310	
AASHTO #57 Gravel (TONS)	85	1,105	1,190	
6 oz. Non-woven Geotextile (SF)	3,606	22,137	25,744	
Overexcavation (CY)	12,320	6,125	18,445	
<b>Toe Bench Outlet Drain</b>				
Average Length of Outlet Drain Pipe (LF)	60	55	N/A	
Outlet Drain Pipe (LF)	360	440	800	
6 oz. Non-woven Geotextile (SF)	2,520	3,080	5,600	
AASHTO #57 Gravel (TONS)	40	49	89	
<b>Bonding Bench</b>				
Approximate Depth (LF)	0	0	N/A	
Approximate Width (LF)	10	0	N/A	
Number of Benches (EA)	2	0	N/A	
Length (LF)	420	0	420	
Perimeter Drain (LF)	840	0	840	
AASHTO #57 Gravel (TONS)	64	0	64	
6 oz. Non-woven Geotextile (SF)	5,410	0	5,410	
Overexcavation (CY)	4,340	0	4,340	
<b>Bonding Bench Outlet Drain</b>				
Average Length of Outlet Drain Pipe (LF)	55	0	N/A	
Outlet Drain Pipe (LF)	495	0	495	
6 oz. Non-woven Geotextile (SF)	3,465	0	3,465	
AASHTO #57 Gravel (TONS)	55	0	55	
<b>Additional Excavation</b>				
Collumium Material Rework (CY)	N/A	N/A	0	



06/23/2017

# INDEX & VOLUMES



**NAVITUS**  
ENERGY ENGINEERING  
Telephone: (888) 662-4185 | www.NavitusEng.com

DATE	REVISION	REVISED PER DRILLING COMMENTS
01/26/2016		
04/19/2016		
12/09/2016		

**Antero Resources**

THIS DOCUMENT WAS PREPARED FOR:  
ANTERO RESOURCES CORPORATION

OVERALL PLAN SHEET INDEX & VOLUMES

**MIDDLE**

**WELL PAD & WATER CONTAINMENT PAD**

WEST UNION DISTRICT  
DODDRIDGE COUNTY, WEST VIRGINIA



RECEIVED  
Office of Oil and Gas  
MAR 24 2017

DATE: 12/09/2016  
SCALE: 1" = 100'  
SHEET: 9

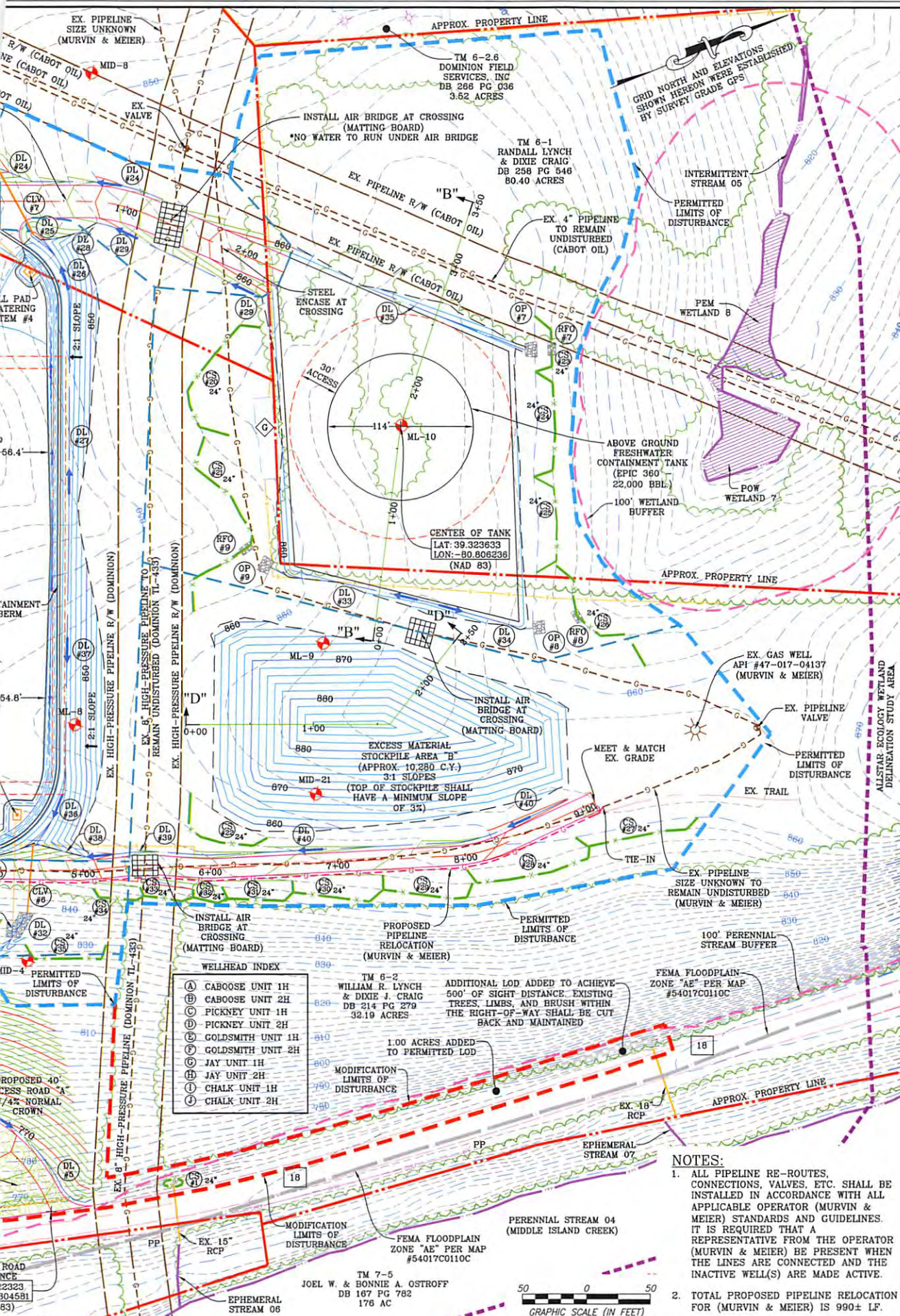
06/29/2017

# WELL PAD & WATER CONTAINMENT PAD PLAN

**APPROVED**  
**WV DEP OOG**  
Modification  
**3/1/2017**



06/23/2017



DATE	REVISION
01/26/2016	REVISED PER DRILLING COMMENTS
04/19/2016	REVISED PER CONSTRUCTION
12/09/2016	REVISED ENTRANCE LOCATION

THIS DOCUMENT WAS PREPARED FOR:  
ANTERO RESOURCES CORPORATION

WELL PAD AND WATER CONTAINMENT PAD PLAN  
**MIDDLE**  
WELL PAD & WATER CONTAINMENT PAD  
WEST UNION DISTRICT  
DODDRIDGE COUNTY, WEST VIRGINIA



DATE: 12/09/2016  
SCALE: 1" = 50'  
SHEET 9 OF 20

06/23/2017

- NOTES:**
- ALL PIPELINE RE-ROUTES, CONNECTIONS, VALVES, ETC. SHALL BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE OPERATOR (MURVIN & MEIER) STANDARDS AND GUIDELINES. IT IS REQUIRED THAT A REPRESENTATIVE FROM THE OPERATOR (MURVIN & MEIER) BE PRESENT WHEN THE LINES ARE CONNECTED AND THE INACTIVE WELL(S) ARE MADE ACTIVE.
  - TOTAL PROPOSED PIPELINE RELOCATION FOR (MURVIN & MEIER) IS 990± LF.

