

west virginia department of environmental protection

Office of Oil and Gas 601 57th Street SE Charleston, WV 25304 (304) 926-0450 (304) 926-0452 fax Earl Ray Tomblin, Governor Randy C. Huffman, Cabinet Secretary www.dep.wv.gov

January 26, 2015

WELL WORK PERMIT Horizontal 6A Well

This permit, API Well Number: 47-1706659, issued to ANTERO RESOURCES CORPORATION, is evidence of permission granted to perform the specified well work at the location described on the attached pages and located on the attached plat, subject to the provisions of Chapter 22 of the West Virginia Code of 1931, as amended, and all rules and regulations promulgated thereunder, and to all conditions and provisions outlined in the pages attached hereto. Notification shall be given by the operator to the Oil and Gas Inspector at least 24 hours prior to the construction of roads, locations, and/or pits for any permitted work. In addition, the well operator shall notify the same inspector 24 hours before any actual well work is commenced and prior to running and cementing casing. Spills or emergency discharges must be promptly reported by the operator to 1-800-642-3074 and to the Oil and Gas inspector.

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

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

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

James Martin

Chief

Operator's Well No: HILEMAN UNIT 1H

Farm Name: HORTON, JUDY A.

API Well Number: 47-1706659

Permit Type: Horizontal 6A Well

Date Issued: 01/26/2015

Promoting a healthy environment.

PERMIT CONDITIONS

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

CONDITIONS

- 1. This proposed activity may require permit coverage from the United States Army Corps of Engineers (USACE). Through this permit, you are hereby being advised to consult with USACE regarding this proposed activity.
- 2. If the operator encounters an unanticipated void, or an anticipated void at an unanticipated depth, the operator shall notify the inspector within 24 hours. Modifications to the casing program may be necessary to comply with W. Va. Code § 22-6A-5a (12), which requires drilling to a minimum depth of thirty feet below the bottom of the void, and installing a minimum of twenty (20) feet of casing. Under no circumstance should the operator drill more than fifty (50) feet below the bottom of the void or install less than twenty (20) feet of casing below the bottom of the void.
- 3. When compacting fills, each lift before compaction shall not be more than 12 inches in height, and the moisture content of the fill material shall be within limits as determined by the Standard Proctor Density test of the actual soils used in specific engineered fill, ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort, to achieve 95 % compaction of the optimum density. Each lift shall be tested for compaction, with a minimum of two tests per lift per acre of fill. All test results shall be maintained on site and available for review.
- 4. Operator shall install signage per § 22-6A-8g (6) (B) at all source water locations included in their approved water management plan within 24 hours of water management plan activation.
- 5. Oil and gas water supply wells will be registered with the Office of Oil and Gas and all such wells will be constructed and plugged in accordance with the standards of the Bureau for Public Health set forth in its Legislative rule entitled *Water Well Regulations*, 64 C.S.R. 19. Operator is to contact the Bureau of Public Health regarding permit requirements. In lieu of plugging, the operator may transfer the well to the surface owner upon agreement of the parties. All drinking water wells within fifteen hundred feet of the water supply well shall be flow tested by the operator upon request of the drinking well owner prior to operating the water supply well.
- 6. Pursuant to the requirements pertaining to the sampling of domestic water supply wells/springs the operator shall, no later than thirty (30) days after receipt of analytical data provide a written copy to the Chief and any of the users who may have requested such analyses.
- 7. If any explosion or other accident causing loss of life or serious personal injury occurs in or about a well or well work on a well, the well operator or its contractor shall give notice, stating the particulars of the explosion or accident, to the oil and gas inspector and the Chief, within 24 hours of said accident.
- 8. During the casing and cementing process, in the event cement does not return to the surface, the oil and gas inspector shall be notified within 24 hours.
- 9. Operator shall provide the Office of Oil & Gas notification of the date that drilling commenced on this well. Such notice shall be provided by sending an email to DEPOOGNotify@wv.gov within 30 days of commencement of drilling.

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

| | | WELL WORK I | SKWIII AIT LICA | TION | 0 | 526 |
|--------------------|----------------------|---|------------------------|-------------------|-------------|-------------|
| 1) Well Operator | : Antero Res | ources Corporation | 494488557 | 017 -Doddridge | Central | Oxford 7.5' |
| • | - | | Operator ID | County | District | Quadrangle |
| 2) Operator's We | ıll Number: <u>F</u> | lileman Unit 1H | Well Pac | d Name: Fritz F | Pad | |
| 3) Farm Name/Su | arface Owner | Horton, Judy A. | Public Roa | ad Access: CR | 11/3 | |
| 4) Elevation, curr | rent ground: | 1053' E | levation, proposed | post-construction | on: 1053' | |
| 5) Well Type (| a) Gas | Oil _ | Und | erground Storag | ge | |
| C | Other | | | | | |
| (| b)If Gas Sl | hallow | Deep | | | 10.21.201it |
| | Н | orizontal | | | | Vol. 20 |
| 6) Existing Pad: ` | Yes or No Y | es | | ± | | 10/2 |
| | | (s), Depth(s), Antic | | | | : " |
| Marcellus Shale | ∍: 7,200' TVD, / | Anticipated Thickness | s- 60 feet, Associated | d Pressure- 3100# | <i>‡</i> | |
| 8) Proposed Tota | l Vertical Dep | pth: _7,200' TVD | | | | |
| 9) Formation at T | otal Vertical | Depth: Marcellus | Shale | | | |
| 10) Proposed Tot | al Measured | Depth: 17,700' MI | D | | | |
| 11) Proposed Ho | rizontal Leg I | Length: 9498' | | | | |
| 12) Approximate | Fresh Water | Strata Depths: | 108' | | | |
| 13) Method to De | etermine Fres | h Water Depths: | Washington Unit 2H | (API# 47-017-063 | 371) on sam | e pad. |
| 14) Approximate | Saltwater De | epths: 451', 923', 1 | 1,952' | | | |
| 15) Approximate | Coal Seam D | Depths: 1067' | | | | |
| 16) Approximate | Depth to Pos | ssible Void (coal m | ine, karst, other): | None anticipated | | |
| | | on contain coal sea to an active mine? | ms Yes | No | √ | |
| (a) If Yes, prov | ide Mine Info | o: Name: | | | | |
| (a) II 1 05, prov | and think init | Depth: | | Por | pivo | d |
| | | Seam: | | | 75115 | 0; |
| | | Owner: | | OCT | 2 4 2014 | |

Office of Oil and Gas WV Dept. of Environmental Protection WW-6B (9/13)

18)

CASING AND TUBING PROGRAM

| TYPE | Size | New | Grade | Weight per ft. | FOOTAGE: For | INTERVALS: | CEMENT: |
|--------------|---------|-----------|-----------|----------------|-----------------|--------------|--------------------|
| | | <u>or</u> | | <u>(lb/ft)</u> | <u>Drilling</u> | Left in Well | Fill-up (Cu. |
| | | Used | | | | | <u>Ft.)</u> |
| Conductor | 20" | New | H-40 | 94# | 40' | 40' | CTS, 38 Cu. Ft. |
| Fresh Water | 13-3/8" | New | J-55/H-40 | 54.5#/48# | 300' | 300' | CTS, 417Cu. Ft |
| Coal | 9-5/8" | New | J-55 | 36# | 2455' | 2455' | CTS, 1,000 Cu. Ft. |
| Intermediate | | | | | | | |
| Production | 5-1/2" | New | P-110 | 20# | 17,700' | 17,700' | 4,473 Cu. Ft. |
| Tubing | 2-3/8" | New | N-80 | 4.7# | | 7,100' | |
| Liners | | | | | | | |
| | | | | | | | pe |
| | | | | | | | 1) |
| | | | | | | | lo. |
| TVDE | Ciro | 77 | Vallbara | Wall | Buret Praceura | Coment Type | Coment Vield |

Size Cement Yield TYPE Wellbore Wall Burst Pressure Cement Type Thickness (cu. ft./k) Diameter Conductor 20" 24" 0.438" 1530 Class A 1.18 Fresh Water 0.38"/0.33" 2730/1730 Class A 1.18 13-3/8" 17-1/2" Coal 9-5/8" 12-1/4" 0.352" 3520 Class A 1.18 Intermediate Production 5-1/2" Lead-H/POZ & Tail - H H/POZ-1.44 & H-1.8 8-3/4" & 8-1/2" 0.361" 12630 Tubing 2-3/8" 4.778" 0.19" 11200 Liners

PACKERS

| Kind: | N/A | | |
|-------------|-----|-------|-----|
| Sizes: | N/A | | |
| Depths Set: | N/A | Hocei | ved |

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WW-6B (9/13)

*Note: Attach additional sheets as needed.

| 19) Describe proposed well work, including the drilling and plugging back of any pilot hole: |
|--|
| Drill, perforate, fracture a new horizontal shallow well and complete Marcellus Shale. |
| |
| |
| |
| |
| |
| |
| 20) Describe fracturing/stimulating methods in detail, including anticipated max pressure and max rate: |
| Antero plans to pump Slickwater into the Marcellus Shale formation in order to ready the well for production. The fluid will |
| be comprised of approximately 99 percent water and sand, with less than 1 percent special-purpose additives as shown in the attached "List of Anticipated Additives Used for Fracturing or Stimulating Well." |
| |
| |
| 11 21 evicting cores |
| 21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): |
| 22) Area to be disturbed for well pad only, less access road (acres): 3.72 existing acres |
| 23) Describe centralizer placement for each casing string: |
| Conductor: no centralizers Surface Casing: one centralizer 10' above the float shoe, one on the insert float collar and one every 4th joint spaced up the hole to surface. |
| Intermediate Casing: one centralizer above float joint, one centralizer 5' above float collar and one every 4th collar to surface. Production Casing: one centralizer at shoe joint and one every 3 joints to top of cement in intermediate casing. |
| |
| 24) Describe all cement additives associated with each cement type: |
| Conductor: no additives, Class A cement. |
| Surface: Class A cement with 2-3% calcium chloride and 1/4 lb of flake |
| Intermediate: Class A cement with 1/4 ib of flake, 5 gallons of clay freat |
| 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 |
| Office of Oil and Gas WV Dept. of Environmental Protection |
| |
| 25) Proposed borehole conditioning procedures: |
| Conductor: blowhole clean with air, run casing, 10 bbls fresh water. Surface: blowhole clean with air, trip to conductor shoe, trip to bottom, blowhole clean with air, trip out, run casing, circulate pipe capacity + 40 bbls |
| fresh water followed by 25 bbls bentonite mud, 10 bbls fresh water spacer. Intermediate: blowhole clean with air, trip to surface casing shoe, trip to bottom, blowhole clean with air, trip out, run casing, circulate 40 bbls brine water followed by 10 bbls fresh water and 25 bbls bentonite mud, pump 10 bbls fresh water. |
| Production: circulate with 14 lb/gal NaCl mud, trip to middle of lateral, circulate, pump high viscosity sweep, trip to top of curve, 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. |

WW-9 (9/13)

| API Number 47 - | 017 | • |
|-----------------|----------|-----------------|
| Operator's | Well No. | Hileman 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 494488557 |
|---|
| Watershed (HUC 10) Tributary of Cabin Run Quadrangle Oxford 7.5 |
| Elevation 1053' County Doddridge District Central |
| Do you anticipate using more than 5,000 bbls of water to complete the proposed well work? Yes No Will a pit be used? Yes No V |
| Will a pit be used? Yes No No No No Pit will be used at this site (Drilling and Flowback Fluids will be stored in tanks. Cuttings will be tanked and hauled off site.) Will a synthetic liner be used in the pit? Yes No If so, what ml.? N/A Proposed Disposal Method For Treated Pit Wastes: Land Application |
| Proposed Disposal Method For Treated Pit Wastes: |
| Land Application |
| Underground Injection (UIC Permit Number) |
| Reuse (at API Number Future permitted well locations when applicable. API# will be provided on Form WR-34 |
| Off Site Disposal (Supply form WW-9 for disposal location) (Meadowfill Landfill Permit #SWF-1032-98) Other (Explain |
| Will closed loop system be used? If so, describe: Yes |
| Drilling medium anticipated for this well (vertical and horizontal)? Air, freshwater, oil based, etc. Dust/Stiff Foam, Production-Water Based Mud |
| -If oil based, what type? Synthetic, petroleum, etc. N/A |
| Additives to be used in drilling medium? Please See Attachment |
| Drill cuttings disposal method? Leave in pit, landfill, removed offsite, etc. Stored in tanks, removed offsite and taken to landfill. |
| -If left in pit and plan to solidify what medium will be used? (cement, lime, sawdust)_N/A |
| -Landfill or offsite name/permit number? Meadowfill Landfill (Permit #SWF-1032-98) |
| I certify that I understand and agree to the terms and conditions of the GENERAL WATER POLLUTION PERMIT issued on August 1, 2005, by the Office of Oil and Gas of the West Virginia Department of Environmental Protection. I understand that the provisions of the permit are enforceable by law. Violations of any term or condition of the general permit and/or other applicable law or regulation can lead to enforcement action. I certify under penalty of law that I have personally examined and am familiar with the information submitted on this application form and all attachments thereto and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment. Company Official Signature Company Official (Typed Name) Cole Kilstrom Company Official Title Environmental Representative |
| Heceived |
| Subscribed and sworn before me this 16th day of 0CtOber . 20 14 **Modern Public** Notary Public** |
| My commission expires JULY 21, 2018 Office 01/30/2015 WV Dept. of Environmental Protection |

Form WW-9

Operator's Well No. Hileman Unit 1H

| Proposed Revegetation Treats | | | |
|------------------------------|---------------------------------------|--|---|
| (C) | ment: Acres Disturbed 11.21 | (existing) Prevegetation p. | Н |
| Lime 2-4 | Tons/acre or to correct to pH | 6.5 | |
| Fertilizer type Hay o | r straw or Wood Fiber (will be used w | where needed) | |
| Fertilizer amount_50 | 00Ib | os/acre | |
| Mulch 2-3 | Tons/a | acre | |
| | | Road to Water Containment Pad (0.53) + Existing g Spoil Pad 2 (1.42) = 11.21 Existing Acres | Water Containment Pad (3.41) + |
| Тег | mporary | Perm | anent |
| Seed Type | lbs/acre | Seed Type | lbs/acre |
| Tall Fescue | 45 | Tall Fescue | 45 |
| Perennial Rye Gra | iss 20 | Perennial Rye Grass | s 20 |
| *or type of grass seed rec | quested by surface owner | *or type of grass seed requ | ested by surface owner |
| | ved 7.5' topographic sheet. | | |
| | uglas Newlo | disturbed areas | maintain |
| | 1 1 2 | distorbed areas | Receiv |
| | uglas Newlo | distorbed areas | Maintain PECCIV OCT 24 |
| | mylas Newlong any a Dop regulation | Date: 10-21-2 | Office of Oil an WV Dept. of Environme |

Form WW-9 Additives Attachment

SURFACE INTERVAL

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

INTERMEDIATE INTERVAL

STIFF FOAM RECIPE:

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

PRODUCTION INTERVAL

1. Alpha 1655

Salt Inhibitor

2. Mil-Carb

Calcium Carbonate

3. Cottonseed Hulls

Cellulose-Cottonseed Pellets – LCM

4. Mil-Seal

Vegetable, Cotton & Cellulose-Based Fiber Blend – LCM

5. Clay-Trol

Amine Acid Complex - Shale Stabilizer

6. Xan-Plex

Viscosifier For Water Based Muds

7. Mil-Pac (All Grades)

Sodium Carboxymethylcellulose - Filtration Control Agent

8. New Drill

Anionic Polyacrylamide Copolymer Emulsion – Shale Stabilizer

9. Caustic Soda

Sodium Hydroxide – Alkalinity Control

10. Mil-Lime

Calcium Hydroxide - Lime

11. LD-9

Polyether Polyol – Drilling Fluid Defoamer

12. Mil Mica

Hydro-Biotite Mica - LCM

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13. Escaid 110

Drilling Fluild Solvent - Aliphatic Hydrocarbon

14. Ligco

Highly Oxidized Leonardite - Filteration Control Agent

15. Super Sweep

Polypropylene - Hole Cleaning Agent

16. Sulfatrol K

Drilling Fluid Additive - Sulfonated Asphalt Residuum

17. Sodium Chloride, Anhydrous

Inorganic Salt

18. D-D

Drilling Detergent - Surfactant

19. Terra-Rate

Organic Surfactant Blend

20. W.O. Defoam

Alcohol-Based Defoamer

21. Perma-Lose HT

Fluid Loss Reducer For Water-Based Muds

22. Xan-Plex D

Polysaccharide Polymer - Drilling Fluid Viscosifier

23. Walnut Shells

Ground Cellulosic Material - Ground Walnut Shells - LCM

24. Mil-Graphite

Natural Graphite - LCM

25. Mil Bar

Barite - Weighting Agent

26. X-Cide 102

Biocide

27. Soda Ash

Sodium Carbonate - Alkalinity Control Agent

28. Clay Trol

Amine Acid complex – Shale Stabilizer

29. Sulfatrol

Sulfonated Asphalt – Shale Control Additive

30. Xanvis

Viscosifier For Water-Based Muds

31. Milstarch

Starch - Fluid Loss Reducer For Water Based Muds

32. Mil-Lube

Drilling Fluid Lubricant

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WV Dept. or Environmental Protection



Well Site Safety Plan Antero Resources

Well Name: Washington Unit 1H, Washington 2H,

Washington Unit 4H, Hayden Unit 1H, Hayden Unit 2H, Hileman Unit 1H, Hileman Unit 2H, Sheep Run Unit 1H & Sheep Run Unit 2H

Pad Location: FRITZ PAD

Doddridge County/ Central District

GPS Coordinates: Lat 39°14′0.02″/ Long 80°50′23.89″ (NAD83)

Driving Directions:

From Pullman, WV head northeast on Main St./Co Rd 9. Follow Co Rd. 9/ Harrisville-Pullman Odford for 5.4 miles. Continue on S Fork of Hughes River for ~1.7 mi. Continue on Route 21 for ~1.6 mi. Turn right onto Co. Route 11/3 and follow for ~0/4 mi. Access road will be on left.

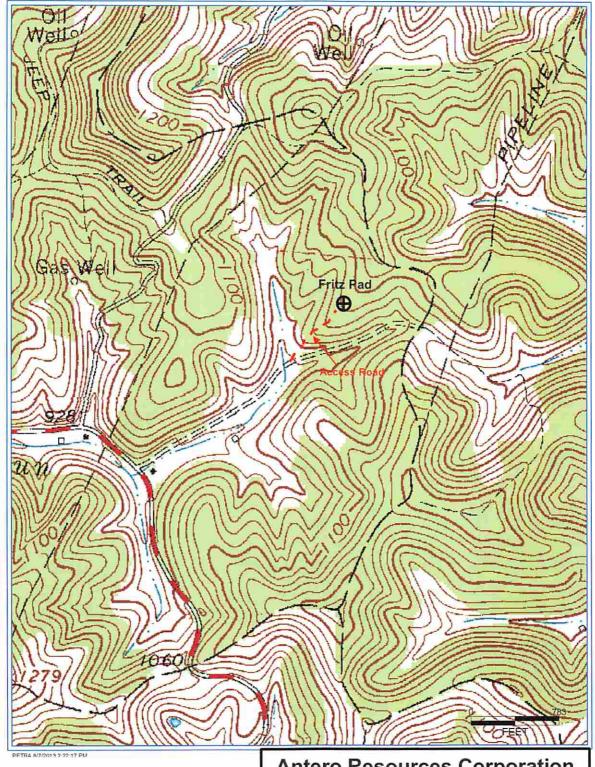
EMERGENCY (24 HOUR) CONTACT 1-800-878-1373

DCV 10-21-2014

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Antero Resources Corporation

Appalachian Basin Hileman Unit 1H

Doddridge County

Quadrangle: Oxford 7.5'

Watershed: Tributary of Cabin Run

District: Central Date: 8-7-2013

