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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

Harold D. Ward, Cabinet Secretary  
[www.dep.wv.gov](http://www.dep.wv.gov)

Tuesday, February 16, 2021  
PERMIT MODIFICATION APPROVAL  
Horizontal 6A / New Drill

ANTERO RESOURCES CORPORATION  
1615 WYNKOOP STREET  
DENVER, CO 80202

Re: Permit Modification Approval for VISHNU UNIT 1H  
47-095-02716-00-00

**Extend lateral length 9200' to 25300' Total Measured Depth. Extend horizontal length 0' to 16070'.  
Updated Leases included.**

ANTERO RESOURCES CORPORATION

The Office of Oil and Gas has reviewed the attached permit modification for the above referenced permit. The attached modification has been approved and well work may begin. Please be reminded that the oil and gas inspector is to be notified twenty-four (24) hours before permitted well work is commenced.

If there are any questions, please feel free to contact me at (304) 926- 0450.

James A. Martin  
Chief

Operator's Well Number: VISHNU UNIT 1H  
Farm Name: KENNETH TOMBLIN ET AL  
U.S. WELL NUMBER: 47-095-02716-00-00  
Horizontal 6A New Drill  
Date Modification Issued: 02/16/2021

Promoting a healthy environment.

WW-6B  
(04/15)

API NO. 47-095 - 02716  
OPERATOR WELL NO. Vishnu Unit 1H  
Well Pad Name: Grand Pad

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

1) Well Operator: Antero Resources Corporation Operator ID: 494507062 County: 095-Tyler District: Ellsworth Quadrangle: Porter Falls 7.5'

2) Operator's Well Number: Vishnu Unit 1H Well Pad Name: Grand Pad

3) Farm Name/Surface Owner: Kenneth Tomblin et al Public Road Access: Gorrells Run Road

4) Elevation, current ground: 1268' Elevation, proposed post-construction: ~1243'

5) Well Type (a) Gas X Oil Underground Storage

Other

(b) If Gas Shallow X Deep

Horizontal X

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):  
Marcellus Shale: 7300' TVD, Anticipated Thickness- 55 feet, Associated Pressure- 2800#

8) Proposed Total Vertical Depth: 7300' TVD

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 25300' MD ✓

11) Proposed Horizontal Leg Length: 16070' ✓

12) Approximate Fresh Water Strata Depths: 25'

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13) Method to Determine Fresh Water Depths: 47-095-02267

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14) Approximate Saltwater Depths: 2305'

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15) Approximate Coal Seam Depths: 431'

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 X

(a) If Yes, provide Mine Info: Name: \_\_\_\_\_  
Depth: \_\_\_\_\_  
Seam: \_\_\_\_\_  
Owner: \_\_\_\_\_

WW-6B  
(04/15)

API NO. 47- 095 - 02716  
OPERATOR WELL NO. Vishnu Unit 1H  
Well Pad Name: Grand Pad

18) **CASING AND TUBING PROGRAM**

TYPE	Size (in)	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill-up (Cu. Ft.)/CTS
Conductor	20"	New	H-40	94#	80	80 ✓	CTS, 218 Cu. Ft.
Fresh Water	13-3/8"	New	J-55	54.5#	300	300 ✓	CTS, 417 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2500	2500 ✓	CTS, 1018 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	23#	25300	25300 ✓	6549 Cu. Ft
Tubing	2-3/8"	New	N-80	4.7#			
Liners							

TYPE	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	20"	24"	0.438"	1530	50	Class A	~1.18
Fresh Water	13-3/8"	17-1/2"	0.38"	2730	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"	0.415"	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							

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**PACKERS**

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

WW-6B  
(10/14)

API NO. 47- 095 - 02716  
OPERATOR WELL NO. Vishnu Unit 1H  
Well Pad Name: Grand Pad

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."

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

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): Existing 44.34 acres

22) Area to be disturbed for well pad only, less access road (acres): Existing 13.72 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-

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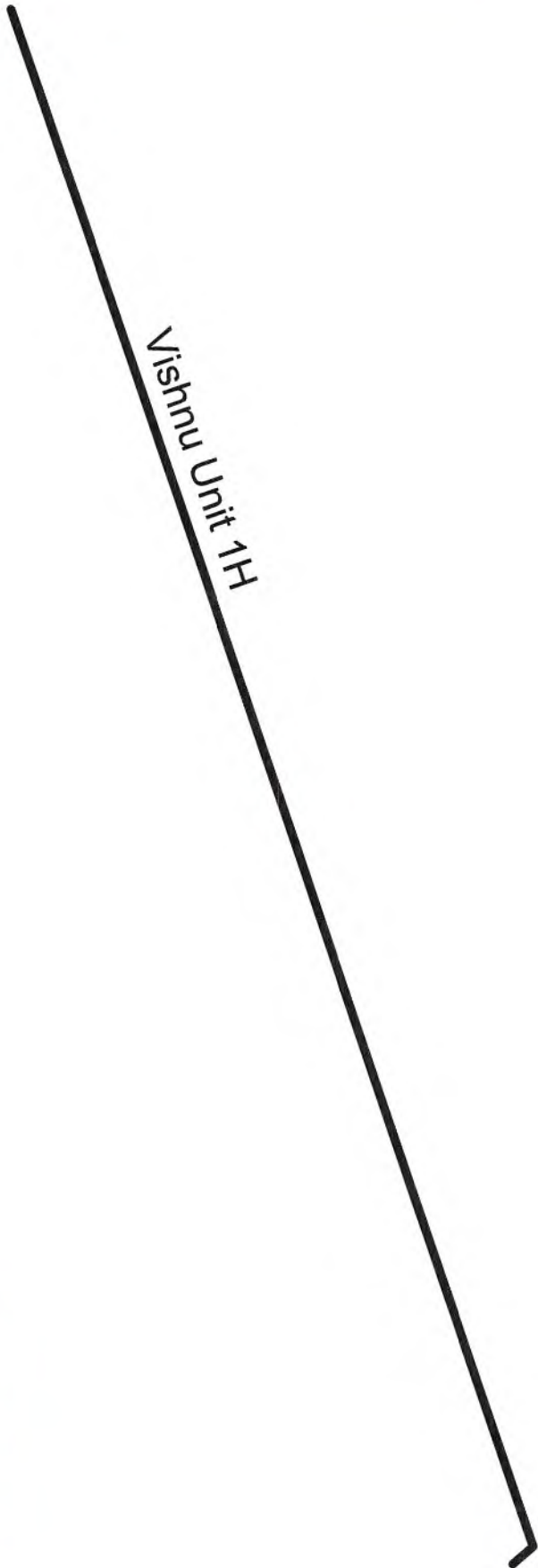
25) Proposed borehole conditioning procedures:

Conductor: blowhole clean with air, run casing, 10 bbls fresh water.  
Surface: blowhole clean with air, trip to conductor shoe, trip to bottom, blowhole clean with air, trip out, run casing, circulate pipe capacity + 40 bbls fresh water followed by 25 bbls bentonite mud, 10 bbls fresh water spacer.  
Intermediate: blowhole clean with air, trip to surface casing shoe, trip to bottom, blowhole clean with air, trip out, run casing, circulate 40 bbls brine water followed by 10 bbls fresh water and 25 bbls bentonite mud, pump 10 bbls fresh water.  
Production: circulate with 14 lb/gal NaCl mud, trip to middle of lateral, circulate, pump high viscosity sweep, trip to 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.



PERMIT MODIFICATION API # 47-095-02716



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Antero Resources Corporation

Vishnu Unit 1H - AOR



REMARKS

No Wells of Interest

September 28, 2020

LATITUDE 39°32'30"

5,367'

LATITUDE 39°35'00"

10,427' TO BOTTOM HOLE

Antero Resources Corporation Well No. Vishnu Unit 1H

NOTES: WELL 1H TOP HOLE INFORMATION: N: 369,527ft E: 1,630,192ft LAT: 39°30'25.79" LON: 80°48'38.48" BOTTOM HOLE INFORMATION: N: 384,980ft E: 1,625,354ft LAT: 39°32'57.80" LON: 80°49'43.12" WEST VIRGINIA COORDINATE SYSTEM OF 1927 NORTH ZONE. ZONE WAS DERIVED FROM MEASUREMENTS TAKEN WITH TRIMBLE GEOXT SUBMETER MAPPING GRADE GPS UNIT. PLAT ORIENTATION, CORNER, AND WELL REFERENCE TIE LINES ARE BASED ON GRID NORTH.

(NAD) 83 (UTM) ZONE 17 COORDS: WELL 1H TOP HOLE INFORMATION: N: 4,373,085m E: 516,290m BOTTOM HOLE INFORMATION: N: 4,377,769m E: 514,738m

(NAD) 27 (UTM) ZONE 17 COORDS: WELL 1H TOP HOLE INFORMATION: N: 14,346,650ft E: 1,693,814ft POINT OF ENTRY INFORMATION: N: 14,346,817ft E: 1,693,925ft BOTTOM HOLE INFORMATION: N: 14,362,015ft E: 1,688,720ft

WV NORTH ZONE GRID NORTH

12,363' TO BOTTOM HOLE

12,568'

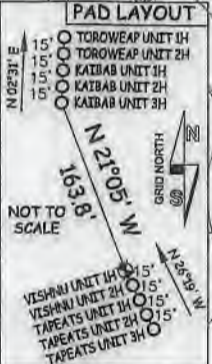
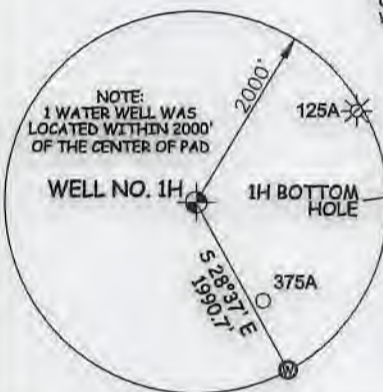
LONGITUDE 80°47'30"

LONGITUDE 80°47'30"

Table listing landowners and lease numbers in Ellsworth District - Tyler County, including names like Josh Amos, Albert Rice Est., Wash Beauty Et Al, etc.

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

Table listing landowners in Ellsworth District - Tyler County, including names like Michael Martin, Darrell Sole, Jean Neal Et Al, etc.



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 PERSERIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.



STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS

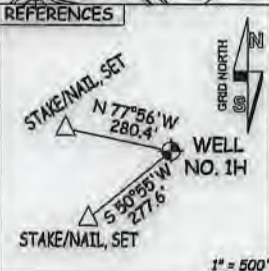
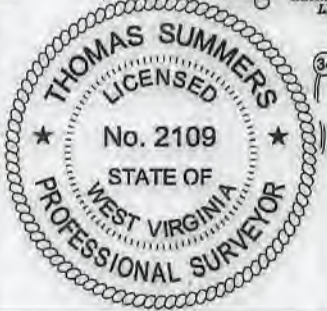
WILLOW LAND SURVEYING PLLC 220 MASONIC AVE. PENNSBORO WEST VIRGINIA 26415

JOB # 20-009WA DRAWING # VISHNU1H SCALE 1" = 2000' MINIMUM DEGREE OF ACCURACY SUBMETER PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS

LEGEND: Surface Owner Boundary Lines +/-, Adjoining Surface Tracts +/-, Found monument, as noted. Signature of Thomas Summers P.S. 2109.

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

DATE 02/03/21 OPERATOR'S WELL# VISHNU UNIT #1H



WELL TYPE: OIL \_\_\_ GAS X LIQUID INJECTION \_\_\_ WASTE DISPOSAL \_\_\_ 47 - 095 - 02716 (IF "GAS") PRODUCTION X STORAGE \_\_\_ DEEP \_\_\_ SHALLOW X STATE COUNTY PERMIT LOCATION: ELEVATION 1,268'-ORIGINAL 1,243'-PROPOSED WATERSHED OUTLET MIDDLE ISLAND CREEK QUADRANGLE PORTER FALLS 7.5' DISTRICT ELLSWORTH COUNTY TYLER SURFACE OWNER KENNETH TOMBLIN ET AL ACREAGE 290.32 ACRES +/- OIL & GAS ROYALTY OWNER S.A. SMITH AND C.B. MORRIS HEIRS TRUST; HARVEY MILLER; BRC APPALACHIAN MINERALS I LLC; LEASE ACREAGE 290.32 AC +/-; 70 AC +/-; 51.5 AC +/-; ANTERO MINERALS; JOHN E. VALENTOUR ET UX; MARGARET M. BURTON; NILE DEAN HARRIS; GARY A. SOLE; GARY A. SOLE; HERITAGE RESOURCES-MARCELLUS 57.75 AC +/-; 80 AC +/-; 40 AC +/-; 53.75 AC +/-; 45.34 AC +/-; 61.82 AC +/-; MINERALS LLC; RALPH D. THACKER; BOUNTY MINERALS LLC; CLARENCE DUANE CLARK ET UX; RICHARD MOORE; STAR FURNITURE CO. OF WEST UNION INC. 39.41 AC +/-; 33 AC +/-; 33 AC +/-; 25 AC +/-; 111.52 AC +/-; 54.7 AC +/- PROPOSED WORK: DRILL \_\_\_ CONVERT \_\_\_ DRILL DEEPER X REDRILL \_\_\_ FRACTURE OR STIMULATE X PLUG OFF OLD FORMATION \_\_\_ PERFORATE NEW FORMATION X OTHER PHYSICAL CHANGE IN WELL (SPECIFY) MOD-BHL PLUG & ABANDON CLEAN OUT & REPLUG TARGET FORMATION MARCELLUS ESTIMATED DEPTH 7,300' TVD 25,300' MD WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM ADDRESS 1615 WYNKOOP ST. ADDRESS 5400 D BIG TYLER ROAD DENVER, CO 80202 CHARLESTON, WV 25313

COUNTY NAME PERMIT

LATITUDE 39°32'30"

5,367'

LATITUDE 39°35'00"

10,427' TO BOTTOM HOLE

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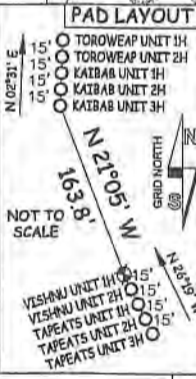
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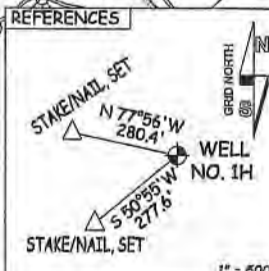
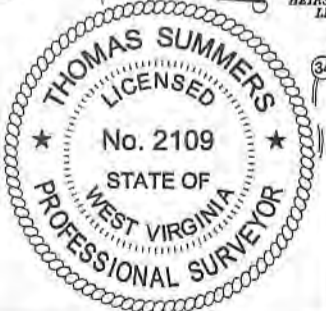


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DATE 02/03/21 OPERATOR'S WELL# VISHNU UNIT #1H



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WW-6A1

Operator's Well Number Vishnu 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
✓ <u>S.A. Smith &amp; C. B. Morris Heirs Trust Lease</u> S.A. Smith & C. B. Morris Trust Heirs	Antero Resources Corporation	1/8+	0022/0268 ✓
✓ <u>Harvey Miller Lease</u> Harvey Miller	Antero Resources Corporation	1/8+	0070/0213
✓ <u>BRC Appalachian Minerals I LLC Lease</u> BRC Appalachian Minerals I LLC Chesapeake Appalachia LLC Statoil USA Onshore Properties Inc. EQT Production Company	Chesapeake Appalachia LLC Statoil USA Onshore Properties Inc. EQT Production Company Antero Resources Corporation	Assignment Assignment Assignment Assignment	0369/0784 0378/0764 0539/0239 0663/0001
<u>Antero Minerals Lease</u>			
✓ <u>John E. Valentour et ux Lease</u> John E. Valentour et ux EQT Production Company	EQT Production Company Antero Resources Corporation	1/8 Assignment	0624/0600 0663/0001
✓ <u>Margaret M. Burton Lease</u> Margaret M. Burton EQT Production Company	EQT Production Company Antero Resources Corporation	1/8 Assignment	0619/0472 0663/0001
✓ <u>Nile Dean Harris Lease</u> Nile Dean Harris EQT Production Company	EQT Production Company Antero Resources Corporation	1/8 Assignment	0546/0539 0663/0001
✓ <u>Gary A. Sole Lease (TM 11 PCL 26)</u> Gary A. Sole	Antero Resources Corporation	1/8+	0066/0150
✓ <u>Gary A. Sole Lease (TM 11 PCL 27)</u> Gary A. Sole	Antero Resources Corporation	1/8+	0066/0150
✓ <u>Gary A. Sole Lease (TM 11 PCL 23)</u> Gary A. Sole	Antero Resources Corporation	1/8+	0066/0150
✓ <u>Heritage Resources Marcellus Minerals LLC Lease</u> Heritage Resources Marcellus Minerals LLC	Antero Resources Corporation	1/8+	0065/0018

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Environmental Protection

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

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



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<u>Ralph D. Thacker Lease</u> Ralph D. Thacker	Antero Resources Corporation	1/8+	0032/0432
<u>Bounty Minerals Lease</u> Bounty Minerals	Antero Resources Corporation	1/8+	0508/0274
<u>Clarence Duane Clark et ux Lease</u> Clarence Duane Clark et ux EQT Production Company	EQT Production Company Antero Resources Corporation	1/8 Assignment	0552/0183 0663/0001
<u>Richard Moore Lease</u> Richard Moore	Antero Resources Corporation	1/8+	0617/0114

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 Office of Oil and Gas

FEB 16 2021

WV Department of  
 Environmental Protection

\*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.

WW-6A1  
(5/13)

Operator's Well No. Vishnu Unit 1H

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Lease Name or Number	Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page
Star Furniture Co. of West Union Inc. Lease	Star Furniture Co. of West Union Inc.	Antero Resources Corporation	1/8+	0489/0018

\*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

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WV Department of  
Environmental Protection

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: Tim Rady  
Its: VP of Land

\*Co-tenancy utilization – At least 7 mineral owners in tract. At least 75% of the royalty owners have executed a lease on the tract. The interests of the remaining co-tenants were acquired pursuant to the Co-tenancy Modernization and Majority Protection Act



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

February 5, 2021

West Virginia Department of Environmental Protection  
Office of Oil and Gas  
Attn: Ms. Laura Adkins  
601 57<sup>th</sup> Street  
Charleston, WV 25304

Ms. Laura Adkins:

Antero Resources Corporation (Antero) would like to submit the following permit modifications for the following approved wells on the existing Grand Pad: Vishnu Unit 1H (API # 47-095-02716).

Attached you will find the following documents:

- REVISED Form WW-6B, which shows the updated POE & Measured Depth
- REVISED Form WW-6A1, which shows the new leases we will be drilling into
- REVISED Mylar Plat, which shows the new Lateral Length & Estimated Measured Depth
- AOR & As-Built Design

If you have any questions please feel free to contact me at (303) 357-7223.

Thank you in advance for your consideration.

Sincerely,

A handwritten signature in black ink, appearing to read "Megan Griffith", with a long horizontal flourish extending to the right.

Megan Griffith  
Permitting Agent  
Antero Resources Corporation

Enclosures

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Office of Oil and Gas

FEB 09 2021

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:

Grantor, lessor, etc.	Grantee, lessee, etc.	Royalty	Book/Page
✓ <u>Bounty Minerals Lease</u> Bounty Minerals	Antero Resources Corporation	1/8+	0508/0274
✓ <u>Clarence Duane Clark et ux Lease</u> Clarence Duane Clark et ux EQT Production Company	EQT Production Company Antero Resources Corporation	1/8 Assignment	0552/0183 0663/0001
✓ <u>Richard Moore Lease</u> Richard Moore	Antero Resources Corporation	1/8+	0617/0114



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\*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.