



west virginia department of environmental protection

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

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

PERMIT MODIFICATION APPROVAL
Horizontal 6A / Horizontal 6A Well - 1

ANTERO RESOURCES CORPORATION
1615 WYNKOOP STREET

DENVER, CO 80202

Re: Permit Modification Approval for EMERGER UNIT 4H
47-095-02356-00-00

Extending Lateral Length and Estimated Measured Depth

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: EMERGER UNIT 4H
Farm Name: THOMAS, VERA O.
U.S. WELL NUMBER: 47-095-02356-00-00
Horizontal 6A / Horizontal 6A Well - 1
Date Issued: 1/20/2017

Promoting a healthy environment.

01/27/2017



August 5, 2016

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

West Virginia Department of Environmental Protection
Office of Oil and Gas
Attn: Ms. Melanie Hankins
601 57th Street
Charleston, WV 25304

Ms. Hankins:

Antero Resources Corporation (Antero) would like to submit the following permit modification for an approved well on the new Vera Pad. We are requesting to extend the lateral length and associated Estimated Measured Depth for the Emerger Unit 4H (API# 47-095-02356).

Attached you will find the following documents:

- REVISED Form WW-6B, which shows the updated BHL and Measured Depth
- REVISED Mylar Plat, which shows the new Lateral Length and Estimated Measured Depth
- REVISED Form WW-6A1, which shows the new leases we will be drilling through

If you have any questions please feel free to contact me at (303) 357-7233.

Thank you in advance for your consideration.

Sincerely,

A handwritten signature in blue ink that reads "Kara Quackenbush".

Kara Quackenbush
Permitting Agent
Antero Resources Corporation

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Office of Oil and Gas
AUG 09 2016
WV Department of
Environmental Protection

Enclosures

01/27/2017

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

1) Well Operator: Antero Resources Corpora 494507062 095 - Tyler Centerville Middlebourne 7.5'
Operator ID County District Quadrangle

2) Operator's Well Number: Emerger Unit 4H Well Pad Name: Vera Pad

3) Farm Name/Surface Owner: Vera O. Thomas Public Road Access: CR 30/1

4) Elevation, current ground: 1168' Elevation, proposed post-construction: 1145'

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: 6800' TVD, Anticipated Thickness- 55 feet, Associated Pressure- 2800#

8) Proposed Total Vertical Depth: 6800' TVD

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 16500' MD

11) Proposed Horizontal Leg Length: 8722'

12) Approximate Fresh Water Strata Depths: 65', 215', 261', 399', 620'

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

14) Approximate Saltwater Depths: 1614', 1974'

15) Approximate Coal Seam Depths: 620', 879'

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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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#	40'	40'	CTS, 38 Cu. Ft.
Fresh Water	13-3/8"	New	J-55/H-40	54.5#/48#	670' *see #19	670' *see #19	CTS, 931 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2450'	2450'	CTS, 998 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	16500'	16500'	4145 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7100'	
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	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 fresh water 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): 25.48 acres

22) Area to be disturbed for well pad only, less access road (acres): 7.64 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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JAN 19 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>Norman H. Thomas, et ux Lease</u>			
Norman Thomas	Dominion Appalachian Development, Inc.	1/8	0330/0021
Dominion Appalachian Development, Inc.	Dominion Appalachian Development, LLC	Name Change	Exhibit 1
Dominion Appalachian Development, LLC	CONSOL Gas Appalachian Development, LLC	Certificate of Amendment	COI 0009/0131
CONSOL Gas Appalachian Development, LLC	CONSOL Gas Reserves, Inc.	Merger	COI 0009/0144
CONSOL Gas Reserves, Inc.	CONSOL Gas Company	Merger	COI 0009/0156
CONSOL Gas Company	CNX Gas Company, LLC	Affidavit of Name Change & Mergers	0384/0191
CNX Gas Company, LLC	Antero Resources Corporation	Notice of Agreement	0468/0496
<u>Patricia A. Racer Lease</u>			
Patricia A. Racer	Antero Resources Corporation	1/8+	0500/0629
<u>Cathy J. Ash Lease</u>			
Cathy Jo Ash & Patsy Jean Heaster	Antero Resources Corporation	1/8+	0481/0801
<u>Melvin Wiley, et ux Lease</u>			
Melvin Wiley, et ux	Sancho Oil and Gas Corporation	1/8	0337/0078
Sancho Oil and Gas Corporation	Antero Resources Corporation	Assignment	0436/0177
<u>Elizabeth Sowards Lease</u>			
Elizabeth J. Sowards	Antero Resources Corporation	1/8+	0483/0235
<u>Alfred Stracha Lease</u>			
Alfred Stracha	Antero Resources Corporation	1/8+	0483/0449
<u>Larry L. Neff Lease</u>			
Larry L. Neff, et ux	Dominion Appalachian Development, Inc.	1/8	0336/0553
<u>BRC Appalachia Minerals I, LLC Lease</u>			
BRC Appalachian Minerals I, LLC	BRC Working Interest Co., LLC	1/8	369/300
BRC Working Interest Co., LLC	Chesapeake Appalachian, LLC	Assignment	369/784
Chesapeake Appalachian, LLC	SWN Production Co., LLC	Assignment	465/463
SWN Production Co., LLC	Antero Resources Corporation	Assignment	0540/0767
<u>John W. Mullett, et ux Lease</u>			
John W. Mullett, et ux	EOG Resources, Inc.	1/8	353/293
EOG Resources, Inc.	Phillips Exploration, Inc.	Assignment	355/817
Phillips Exploration, Inc.	Chesapeake Appalachian, LLC.	Assignment	375/312
Chesapeake Appalachian, LLC	SWN Production Co., LLC	Assignment	465/463
SWN Production Co., LLC	Antero Resources Corporation	Assignment	0540/0767

*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

01/27/2017

WW-6A1
(5/13)

Operator's Well No. Emerger Unit 4H

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Chapter 22, Article 6A, Section 5(a)(5)
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- (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
Carl W. Ash Lease	Carl W. Ash, et ux Chesapeake Appalachian, LLC SWN Production Co., LLC	Chesapeake Appalachian, LLC SWN Production Co., LLC Antero Resources Corporation	1/8 Assignment Assignment	368/631 465/463 0540/0767


*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: Robert S. Tucker 
 Its: VP Geology

LATITUDE 39°27'30"

8,185'

2,767' TO BOTTOM HOLE

LATITUDE 39°25'00"

LONGITUDE 80°52'30"

12,101'

LONGITUDE 80°52'30"

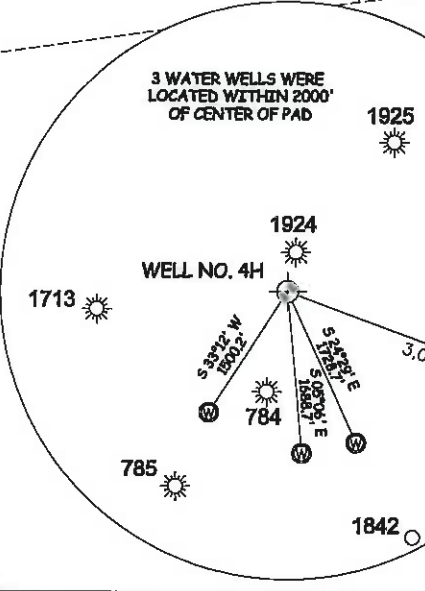
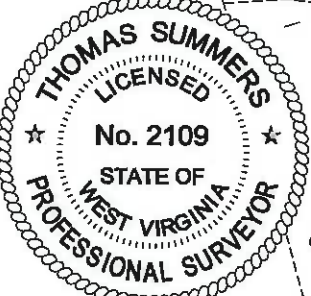
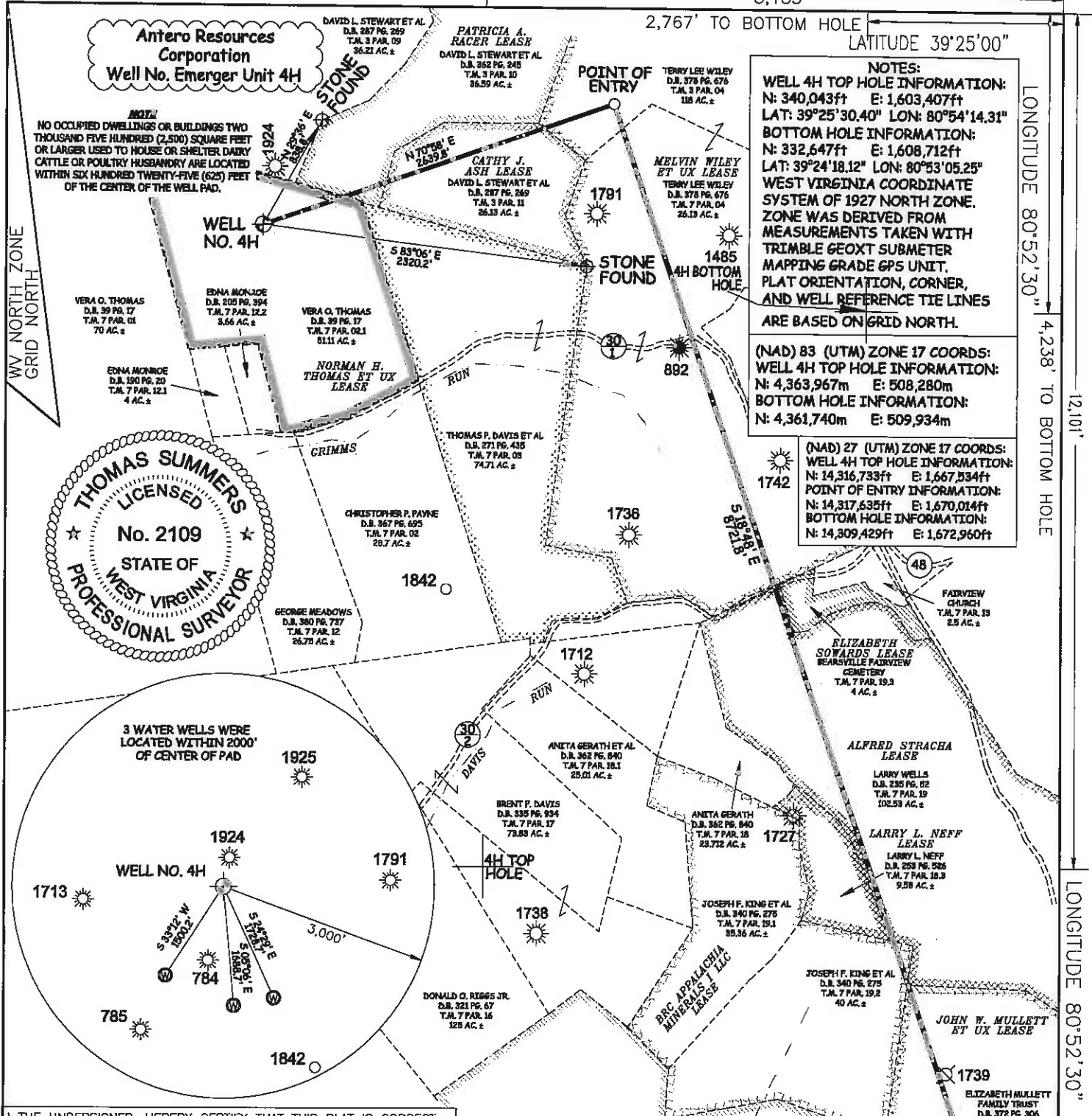
Antero Resources Corporation Well No. Emerger Unit 4H

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.

NOTES: WELL 4H TOP HOLE INFORMATION: N: 340,043ft E: 1,603,407ft LAT: 39°25'30.40" LON: 80°54'14.31" BOTTOM HOLE INFORMATION: N: 332,647ft E: 1,608,712ft LAT: 39°24'18.12" LON: 80°53'05.25" 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 4H TOP HOLE INFORMATION: N: 4,363,967m E: 508,280m BOTTOM HOLE INFORMATION: N: 4,361,740m E: 509,934m

(NAD) 27 (UTM) ZONE 17 COORDS: WELL 4H TOP HOLE INFORMATION: N: 14,316,733ft E: 1,667,334ft POINT OF ENTRY INFORMATION: N: 14,317,635ft E: 1,670,014ft BOTTOM HOLE INFORMATION: N: 14,309,429ft E: 1,672,960ft



I THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAT IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE RULES ISSUED AND PERSCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.

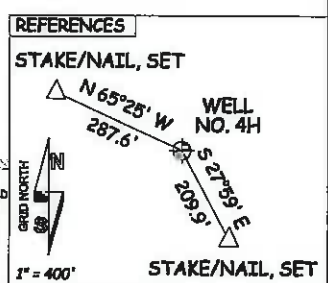


STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS. WILLLOW LAND SURVEYING PLLC 220 MASONIC AVE. PENNSBORO WEST VIRGINIA 26415

PAD LAYOUT NOT TO SCALE. Table listing well units: MYSTIS UNIT 1H-3H, ANT UNIT 1H-3H, SAN JUAN UNIT 1H-3H, EMERGER UNIT 1H-3H.

JOB # 16-020WA DRAWING # EMERGER4H SCALE 1" = 1000' MINIMUM DEGREE OF ACCURACY SUBMETER PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS

LEGEND: Surface Owner Boundary Lines +/-, Interior Surface Tracts +/-, Existing Fence, Found monument, as noted. THOMAS SUMMERS P.S. 2109 DATE 07/20/16 OPERATOR'S WELL# EMERGER UNIT #4H



WELL TYPE: OIL GAS X LIQUID INJECTION WASTE DISPOSAL 47 - 095 (IF "GAS") PRODUCTION X STORAGE DEEP SHALLOW X LOCATION: ELEVATION 1,168' - ORIGINAL 1,145' - PROPOSED WATERSHED OUTLET MIDDLE ISLAND CREEK QUADRANGLE MIDDLEBOURNE 7.5' DISTRICT CENTERTVILLE COUNTY TYLER 01/27/2017 SURFACE OWNER VERA O. THOMAS ACREAGE 51.11 ACRES +/- OIL & GAS ROYALTY OWNER NORMAN H. THOMAS ET UX; PATRICIA A. RACER; CATHY J. ASH; MELVIN WILEY ET UX; ALFRED STRACHA; BRC APPALACHIA MINERALS I LLC; JOHN W. MULLETT ET UX; CARL W. ASH LEASE ACREAGE 125 AC +/- 36.59 AC +/- 30 AC +/- 553.18 AC +/- 101.2 AC +/- 79.74 AC +/- 45 AC +/- 362.8 AC +/- PROPOSED WORK: DRILL X CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE X PLUG OFF OLD FORMATION PERFORATE NEW FORMATION X OTHER PHYSICAL CHANGE IN WELL (SPECIFY) PLUG & ABANDON CLEAN OUT & REPLUG TARGET FORMATION MARCELLUS ESTIMATED DEPTH 6,800' TVD 16,500' 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

LATITUDE 39°27'30"

8,185'

2,767' TO BOTTOM HOLE

LATITUDE 39°25'00"

LONGITUDE 80°52'30" 4,238' TO BOTTOM HOLE

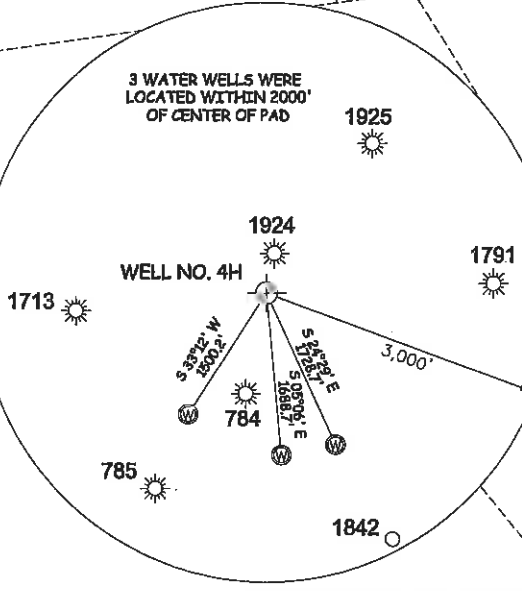
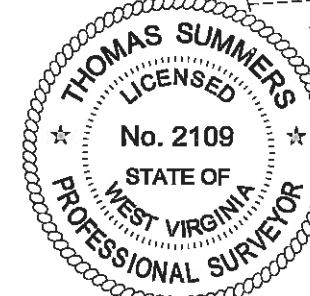
12,01'

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WV NORTH ZONE GRID NORTH

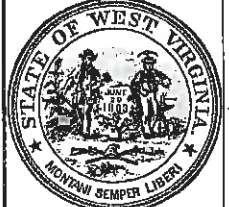


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WILLOW LAND SURVEYING PLLC 220 MASONIC AVE. PENNSBORO WEST VIRGINIA 26415

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LEGEND: Surface Owner Boundary Lines +/-, Interior Surface Tracts +/-, Existing Fence, Found monument, as noted. THOMAS SUMMERS P.S. 2109 DATE 07/20/16 OPERATOR'S WELL# EMERGER UNIT #4H

REFERENCES: STAKE/NAIL, SET. Includes stamps for 'Office of Oil and Gas', 'WV Department of Environmental Protection', and 'JUG 09 2018'.

WELL TYPE: OIL GAS X LIQUID INJECTION WASTE DISPOSAL (IF "GAS") PRODUCTION X STORAGE DEEP SHALLOW X LOCATION: ELEVATION 1,168' - ORIGINAL 1,145' - PROPOSED WATERSHED OUTLET MIDDLE ISLAND CREEK QUADRANGLE MIDDLEBOURNE 7.5' DISTRICT CENTERVILLE COUNTY TYLER 01/27/2017 SURFACE OWNER VERA O. THOMAS ACREAGE 51.11 ACRES +/- OIL & GAS ROYALTY OWNER NORMAN H. THOMAS ET UX; PATRICIA A. RACER; CATHY J. ASH; LEASE ACREAGE 125 AC.±; 36.59 AC.±; 30 AC.±; MELVIN WILEY ET UX; ALFRED STRACHA; BRC APPALACHIA MINERALS I LLC; JOHN W. MULLETT ET UX; CARL W. ASH 553.16 AC.±; 101.2 AC.±; 79.74 AC.±; 45 AC.±; 382.8 AC.± PROPOSED WORK: DRILL X CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE X PLUG OFF OLD FORMATION PERFORATE NEW FORMATION X OTHER PHYSICAL CHANGE IN WELL (SPECIFY) PLUG & ABANDON CLEAN OUT & REPLUG TARGET FORMATION MARCELLUS ESTIMATED DEPTH 6,800' TVD 16,500' MD WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM ADDRESS 1615 WYNKOOP ST. DENVER, CO 80202 ADDRESS 5400 D BIG TYLER ROAD CHARLESTON, WV 25313

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Operator ID County District Quadrangle

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Other

(b) If Gas Shallow Deep
Horizontal

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15) Approximate Coal Seam Depths: 620', 879'

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Office of Oil and Gas

17) Does Proposed well location contain coal seams directly overlying or adjacent to an active mine? Yes No AUG 09 2016

(a) If Yes, provide Mine Info: Name: _____
Depth: _____
Seam: _____
Owner: _____
WV Department of Environmental Protection



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#	40'	40'	CTS, 38 Cu. Ft.
Fresh Water	13-3/8"	New	J-55/H-40	54.5#/48#	450' *see #19	450' *see #19	CTS, 625 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2450'	2450'	CTS, 998 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	16500'	16500'	4145 Cu. Ft
Tubing	2-3/8"	New	N-80	4.7#		7100'	
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	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-HPOZ & Tail - H	H/POZ-1.44 & H-1.8
Tubing	2-3/8"	4.778"	0.19"	11,200			
Liners							

PACKERS

Kind:	N/A			RECEIVED Office of Oil and Gas
Sizes:	N/A			AUG 09 2016
Depths Set:	N/A			WV Department of Environmental Protection

VOID

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 fresh water 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): 25.48 acres

22) Area to be disturbed for well pad only, less access road (acres): 7.64 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.

