



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

PERMIT MODIFICATION APPROVAL

January 21, 2016

ANTERO RESOURCES CORPORATION
1615 WYNKOOP STREET
DENVER, CO 80202

Re: Permit Modification Approval for API Number 8510173, Well #: PRITCHARD UNIT 3H

Modifying lateral spacing and length

Oil and Gas Operator:

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.

Please call James Martin at 304-926-0499, extension 1654 if you have any questions.

Sincerely,

A handwritten signature in black ink that reads "Gene Smith".

Handwritten initials in black ink, appearing to be "GS".
Gene Smith
Assistant Chief of Permitting
Office of Oil and Gas

Promoting a healthy environment.

01/22/2016

API# 47-085-10173 PERMIT MODIFICATION

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

1) Well Operator: Antero Resources Corporation 494488557 085- Ritchie Union Pullman 7.5'
Operator ID County District Quadrangle

2) Operator's Well Number: Pritchard Unit 3H Well Pad Name: Ireland North Pad

3) Farm Name/Surface Owner: Ireland, Lynwood, et al Public Road Access: CR 9

4) Elevation, current ground: ~951' Elevation, proposed post-construction: 947'

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: 6500' TVD, Anticipated Thickness- 50 feet, Associated Pressure- 3000#

8) Proposed Total Vertical Depth: 6500' TVD

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 19260' MD

11) Proposed Horizontal Leg Length: 12235'

12) Approximate Fresh Water Strata Depths: 69', 279', 359'

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

14) Approximate Saltwater Depths: 1451, 1807'

15) Approximate Coal Seam Depths: 343'

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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DEC 11 2015

WV Department of
Environmental Protection

WW-6B
(04/15)

API NO. 47- 085 - 10173 MOD

OPERATOR WELL NO. Pritchard Unit 3H

Well Pad Name: Ireland North Pad

API# 47-085-10173 PERMIT MODIFICATION

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#	410'	410'	CTS, 570 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2460'	2460'	CTS, 1002 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	19260'	19260'	4901 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. RECEIVED
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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): 28.25 acres

22) Area to be disturbed for well pad only, less access road (acres): 3.56 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
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.

LATITUDE 39°12'30"

6,926'

11,769' TO BOTTOM HOLE

LATITUDE 39°12'30"

LONGITUDE 80°52'30"

12,955'

LONGITUDE 80°52'30"

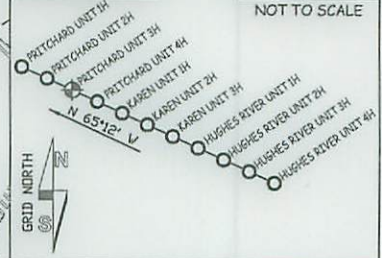
COUNTY NAME PERMIT

Antero Resources Corporation
Well No. Pritchard Unit 3H
A.P.I. 47-085-10173

NOTES:
WELL 3H TOP HOLE INFORMATION:
N: 248,126ft E: 1,603,259ft
LAT: 39°10'21.96" LON: 80°53'57.95"
BOTTOM HOLE INFORMATION:
N: 259,554ft E: 1,598,591ft
LAT: 39°12'14.18" LON: 80°54'59.50"
WEST VIRGINIA COORDINATE SYSTEM OF 1927 NORTH ZONE. MEASUREMENTS TAKEN WITH TRIMBLE GEOXT SUBMETER MAPPING GRADE GPS UNIT. PLAT ORIENTATION, CORNER, AND WELL REFERENCE TIE LINES ARE BASED ON GRID NORTH.

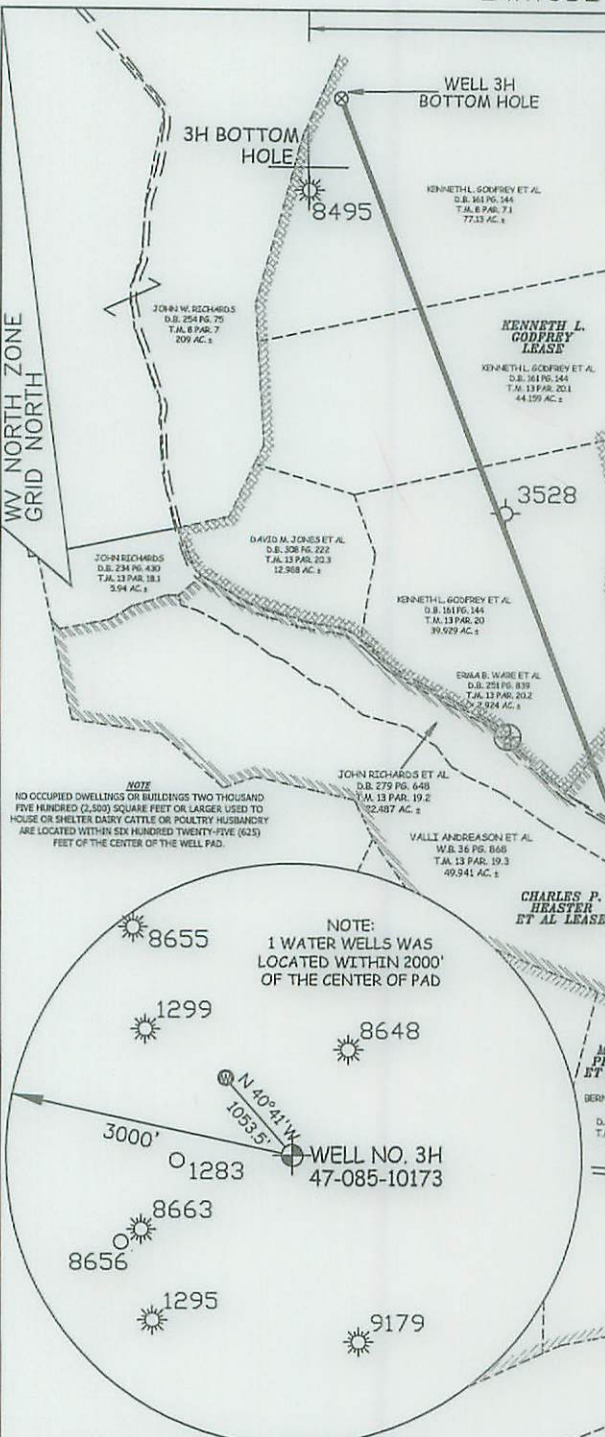
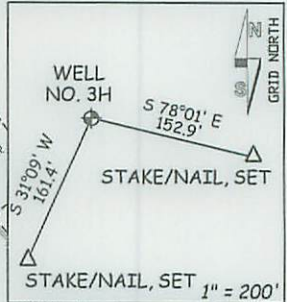
(NAD) 83 (UTM) ZONE 17 COORDS:
WELL 3H TOP HOLE INFORMATION:
N: 4,335,963m E: 508,702m
BOTTOM HOLE INFORMATION:
N: 4,339,421m E: 507,222m

REFERENCES



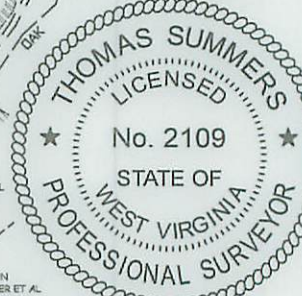
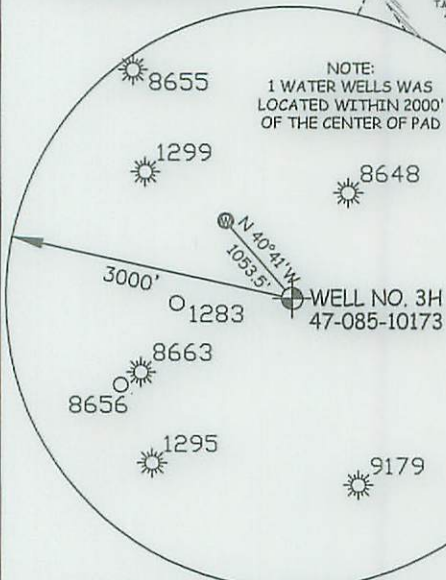
PAD LAYOUT

NOT TO SCALE



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.

NOTE:
1 WATER WELLS WAS LOCATED WITHIN 2000' OF THE CENTER OF PAD



47 - 085 - 10173 MDD
STATE COUNTY PERMIT

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

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

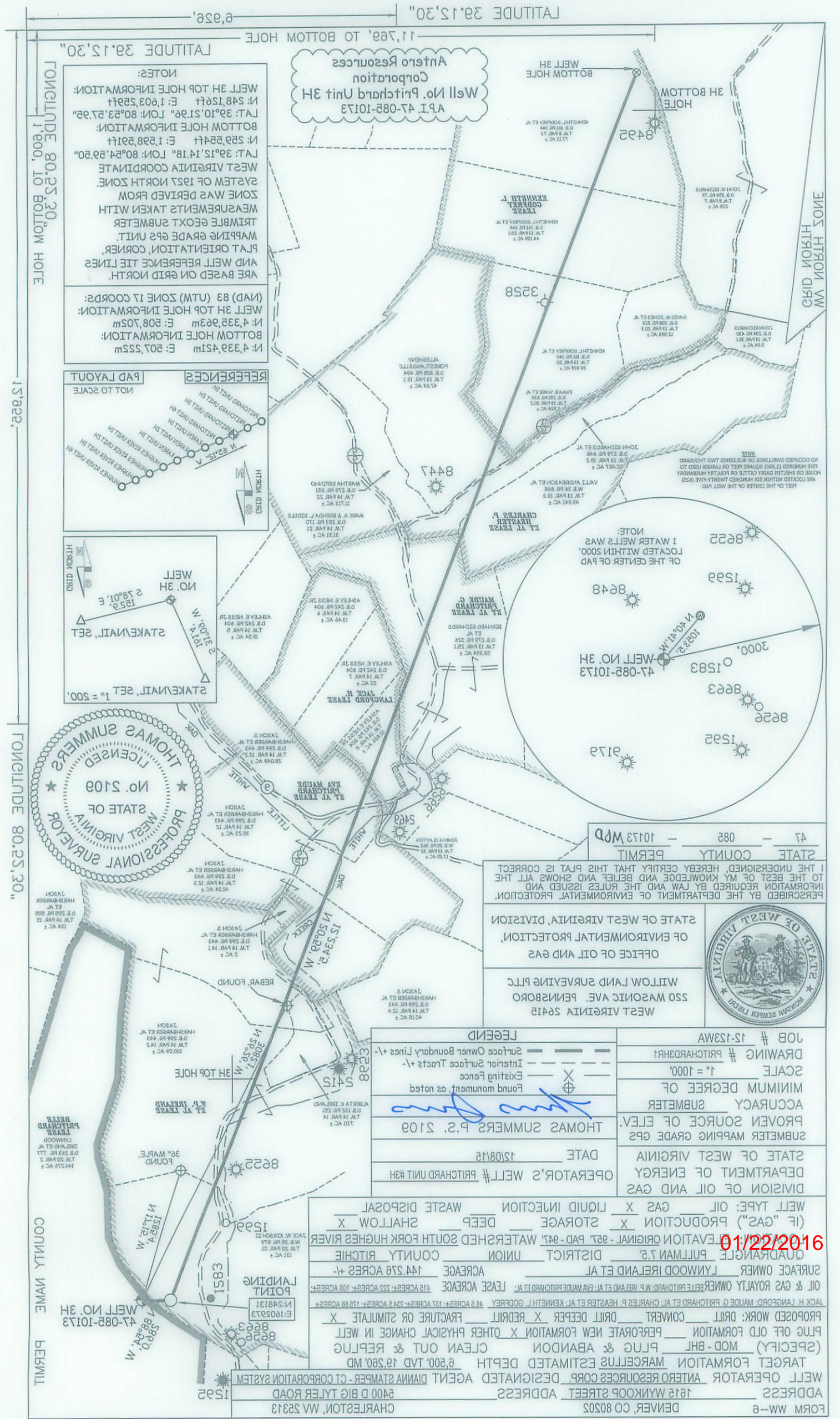
JOB # 12-123WA
DRAWING # PRITCHARD3HR1
SCALE 1" = 1000'
MINIMUM DEGREE OF ACCURACY SUBMETER
PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS
STATE OF WEST VIRGINIA DEPARTMENT OF ENERGY DIVISION OF OIL AND GAS

LEGEND
- - - Surface Owner Boundary Lines +/-
- - - Interior Surface Tracts +/-
X Existing Fence
⊕ Found monument, as noted
THOMAS SUMMERS P.S. 2109
DATE 12/08/15
OPERATOR'S WELL# PRITCHARD UNIT #3H

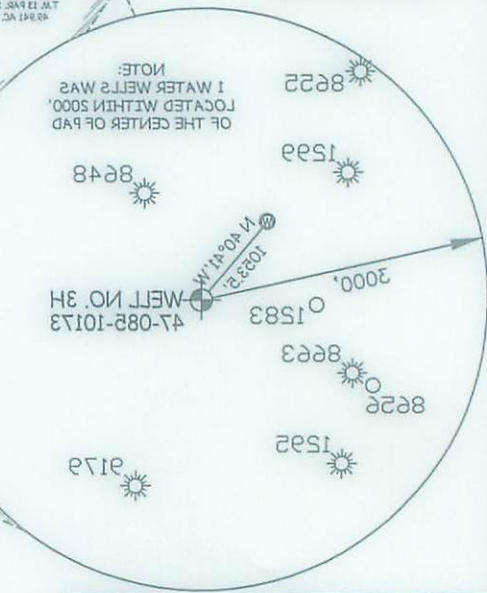
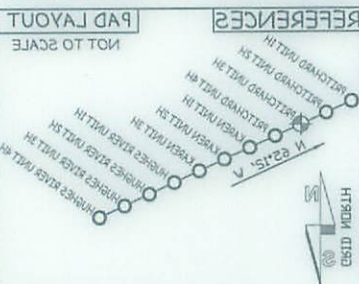
WELL TYPE: OIL GAS LIQUID INJECTION WASTE DISPOSAL
(IF "GAS") PRODUCTION STORAGE DEEP SHALLOW
LOCATION: ELEVATION ORIGINAL -957' PAD -947' WATERSHED SOUTH FORK HUGHES RIVER
QUADRANGLE PULLMAN 7.5' DISTRICT UNION COUNTY RITCHIE
SURFACE OWNER LYNWOOD IRELAND ET AL ACREAGE 144.276 ACRES +/-
OIL & GAS ROYALTY OWNER BELLE PRITCHARD; W.P. IRELAND ET AL; EVA MAUDE PRITCHARD ET AL LEASE ACREAGE 415 ACRES +/- 222 ACRES +/- 108 ACRES +/-
JACK H. LANGFORD; MAUDE G. PRITCHARD ET AL; CHARLES P. HEASTER ET AL; KENNETH L. GODFREY 46.5 ACRES +/- 137 ACRES +/- 234.5 ACRES +/- 175.68 ACRES +/-
PROPOSED WORK: DRILL CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE
PLUG OFF OLD FORMATION PERFORATE NEW FORMATION OTHER PHYSICAL CHANGE IN WELL (SPECIFY) MOD-BHL PLUG & ABANDON CLEAN OUT & REPLUG
TARGET FORMATION MARCELLUS ESTIMATED DEPTH 6,500' TVD 19,260' MD
WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM
ADDRESS 1615 WYNKOOP STREET ADDRESS 5400 D BIG TYLER ROAD
FORM WW-6 DENVER, CO 80202 CHARLESTON, WV 25313



01/22/2016



NOTES:
 WELL 3H TOP HOLE INFORMATION:
 N: 248.1524ft E: 1.603.259ft
 LAT: 39°10'51.94" LON: 80°53'57.95"
 BOTTOM HOLE INFORMATION:
 N: 252.554ft E: 1.598.291ft
 LAT: 39°12'14.18" LON: 80°54'39.50"
 WEST VIRGINIA COORDINATE SYSTEM OF 1927 NORTH ZONE WAS DERIVED FROM MEASUREMENT TAKEN WITH TRIMBLE GEOXT SUBMETER MAPPING GRADE GPS UNIT. PLAT ORIENTATION CORNER, AND WELL REFERENCE TIE LINES ARE BASED ON GRID NORTH.



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

PERMIT 47 - 088 - 1073 Wpd

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.



JOB # 15-153WA	STATE OF WEST VIRGINIA
DRAWING # PRITCHARD3H1	DEPARTMENT OF ENERGY
SCALE 1" = 1000'	DIVISION OF OIL AND GAS
MINIMUM DEGREE OF ACCURACY SUBMETER	PROVEN SOURCE OF ELEV.
THOMAS SUMMERS P.S. 2109	THOMAS SUMMERS P.S. 2109
DATE 12/08/15	DATE 12/08/15
OPERATOR'S WELL # PRITCHARD UNIT 3H	OPERATOR'S WELL # PRITCHARD UNIT 3H

WELL TYPE: OIL X GAS X LIQUID INJECTION	WELL TYPE: OIL X GAS X LIQUID INJECTION
(IF "GAS") PRODUCTION X STORAGE DEEP SHALLOW X	(IF "GAS") PRODUCTION X STORAGE DEEP SHALLOW X
ELEVATION ORIGINAL - 927. PAD - 947. WATERSHED SOUTH FORK HUGHES RIVER	ELEVATION ORIGINAL - 927. PAD - 947. WATERSHED SOUTH FORK HUGHES RIVER
QUADRANGLE PULLMAN 73. DISTRICT UNION	QUADRANGLE PULLMAN 73. DISTRICT UNION
SURFACE OWNER LYNWOOD IRELAND ET AL	SURFACE OWNER LYNWOOD IRELAND ET AL
OIL & GAS ROYALTY OWNER BELLE PRITCHARD, W. IRELAND ET AL; GINA MAUDE PRITCHARD ET AL; LEASE ACRES 412 ACRES; 222 ACRES; 108 ACRES; 44.278 ACRES +/-	OIL & GAS ROYALTY OWNER BELLE PRITCHARD, W. IRELAND ET AL; GINA MAUDE PRITCHARD ET AL; LEASE ACRES 412 ACRES; 222 ACRES; 108 ACRES; 44.278 ACRES +/-
PROPOSED WORK: DRILL CONVERT X REDRILL X DEEPER X REDRILL X FRACTURE OR STIMULATE X	PROPOSED WORK: DRILL CONVERT X REDRILL X DEEPER X REDRILL X FRACTURE OR STIMULATE X
PLUG OFF OLD FORMATION X PERFORATE NEW FORMATION X OTHER PHYSICAL CHANGE IN WELL	PLUG OFF OLD FORMATION X PERFORATE NEW FORMATION X OTHER PHYSICAL CHANGE IN WELL
(SPECIFY) MOD - BHJ & ABANDON CLEAN OUT & REPLUG	(SPECIFY) MOD - BHJ & ABANDON CLEAN OUT & REPLUG
TARGET FORMATION MARCELLUS ESTIMATED DEPTH 8,500 TVD +/- 250 MD	TARGET FORMATION MARCELLUS ESTIMATED DEPTH 8,500 TVD +/- 250 MD
WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM	WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM
ADDRESS 1615 WYNKOP STREET ADDRESS	ADDRESS 1615 WYNKOP STREET ADDRESS
DENVER, CO 80202	DENVER, CO 80202
CHARLESTON, WV 25313	CHARLESTON, WV 25313
5400 D BIG TYLER ROAD	5400 D BIG TYLER ROAD
LANDING POINT	LANDING POINT
E: 16029.23 E: 16029.23	E: 16029.23 E: 16029.23
N: 24811.11 N: 24811.11	N: 24811.11 N: 24811.11

01/22/2016

FORM WW-6
 DENVER, CO 80202
 CHARLESTON, WV 25313
 5400 D BIG TYLER ROAD
 WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM
 TARGET FORMATION MARCELLUS ESTIMATED DEPTH 8,500 TVD +/- 250 MD
 (SPECIFY) MOD - BHJ & ABANDON CLEAN OUT & REPLUG
 PLUG OFF OLD FORMATION X PERFORATE NEW FORMATION X OTHER PHYSICAL CHANGE IN WELL
 PROPOSED WORK: DRILL CONVERT X REDRILL X DEEPER X REDRILL X FRACTURE OR STIMULATE X
 OIL & GAS ROYALTY OWNER BELLE PRITCHARD, W. IRELAND ET AL; GINA MAUDE PRITCHARD ET AL; LEASE ACRES 412 ACRES; 222 ACRES; 108 ACRES; 44.278 ACRES +/-
 SURFACE OWNER LYNWOOD IRELAND ET AL
 QUADRANGLE PULLMAN 73. DISTRICT UNION
 ELEVATION ORIGINAL - 927. PAD - 947. WATERSHED SOUTH FORK HUGHES RIVER
 (IF "GAS") PRODUCTION X STORAGE DEEP SHALLOW X
 WELL TYPE: OIL X GAS X LIQUID INJECTION
 STATE OF WEST VIRGINIA
 DEPARTMENT OF ENERGY
 DIVISION OF OIL AND GAS
 PROVEN SOURCE OF ELEV.
 THOMAS SUMMERS P.S. 2109
 THOMAS SUMMERS P.S. 2109
 DATE 12/08/15
 DATE 12/08/15
 OPERATOR'S WELL # PRITCHARD UNIT 3H
 OPERATOR'S WELL # PRITCHARD UNIT 3H
 SCALE 1" = 1000'
 DRAWING # PRITCHARD3H1
 JOB # 15-153WA

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WV Department of
Environmental Protection



December 10, 2015

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 one approved well on the new Ireland North Pad. We are requesting to extend the lateral length and slightly change the spacing of the horizontal lateral for the Pritchard Unit 3H (API# 47-085-10173). Please note that the extended bottom hole location will not be drilling through any new leases; therefore, a revised Form WW-6A1 has not been included.

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

If you have any questions please feel free to contact me at (303) 357-7323.

Thank you in advance for your consideration.

Sincerely,

A handwritten signature in blue ink that reads "Ashlie Steele". The signature is written in a cursive, flowing style.

Ashlie Steele
Permitting Supervisor
Antero Resources Corporation

Enclosures

01/22/2016