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

October 18, 2013

ANTERO RESOURCES APPALACHIAN CORPORATION
1625 17TH STREET, SUITE 300
DENVER, CO 80202

Re: Permit Modification Approval for API Number 1706230 , Well #: GOLDEN UNIT 2H
Extended lateral

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,

for Gene Smith
Regulatory/Compliance Manager
Office of Oil and Gas

17-06230 MOD

ANTERO RESOURCES

Antero Resources
1625 17th Street
Denver, Colorado 80202
Office 303.357.7310
Fax 303.357.7315

October 16, 2013

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

Ms. Laura Cooper:

Antero Resources Corporation (Antero) would like to submit the following permit modifications for three approved wells on the existing Marsden Pad. We are requesting to modify the horizontal lateral orientation which will change the bottom hole location of the Golden Unit 2H (API# 47-017-06230).

Attached you will find the following documents:

- REVISED Form WW-6B, which shows the revised MD and Production Casing/Cement program
- REVISED Form WW-6A1, which shows the new leases we will be drilling into
- REVISED Mylar Plat, which shows the new bottom hole location

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

Thank you in advance for your consideration.

Sincerely,

Ashlie Mihalcin
Permit Representative
Antero Resources Corporation

Enclosures

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WV Department of
Environmental Protection

API# 47-017-06230 PERMIT MODIFICATION

WW - 6B
(3/13)

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

4 252

1) Well Operator:	Antero Resources Corporation	494488557	017- Doddridge	Greenbrier	Big Isaac
		Operator ID	County	District	Quadrangle

2) Operator's Well Number: Golden Unit 2H Well Pad Name: Marsden Pad

3 Elevation, current ground: ~975' Elevation, proposed post-construction: 971'

4) Well Type: (a) Gas ■ Oil _____ Underground Storage _____
Other _____
(b) If Gas: Shallow ■ Deep _____
Horizontal ■

5) Existing Pad? Yes or No: No

6) Proposed Target Formation(s), Depth(s), Anticipated Thicknesses and Associated Pressure(s):
Marcellus Shale: 7,300' TVD, Anticipated Thickness- 50' feet, Associated Pressure- 3,200#

7) Proposed Total Vertical Depth: 7,300' TVD

8) Formation at Total Vertical Depth: Marcellus Shale

9) Proposed Total Measured Depth: 17,400' MD

10) Approximate Fresh Water Strata Depths: 29', 40'

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

12) Approximate Saltwater Depths: 427', 1131'

13) Approximate Coal Seam Depths: 92', 136', 686'

14) Approximate Depth to Possible Void (coal mine, karst, other): None anticipated

15) Does proposed well location contain coal seams directly overlying or adjacent to an active mine? If so, indicate name and depth of mine: No

16) Describe proposed well work: Drill, perforate, fracture a new horizontal shallow well and complete Marcellus Shale

17) Describe fracturing/stimulating methods in detail:
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."

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18) Total area to be disturbed, including roads, stockpile area, pits, etc, (acres): 6.13 acres

19) Area to be disturbed for well pad only, less access road (acres): 3.32 acres

WW - 6B
(3/13)

API# 47-017-06230 PERMIT MODIFICATION

20) **CASING AND TUBING PROGRAM**

TYPE	Size	New or Used	Grade	Weight per ft.	FOOTAGE: For Drilling	INTERVALS: Left in Well	CEMENT: Fill -up (Cu. Ft.)
Conductor	20"	New	H-40	94#	90'	90'	CTS, 86 Cu. Ft.
Fresh Water	13-3/8"	New	J-55/H-40	54.5#/48#	300'	300'	CTS, 417 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2510'	2510'	CTS, 1022 Cu Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	17400'	17400'	4380 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7200'	
Liners							

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

PACKERS

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

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WW - 6B
(3/13)

21) 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.

22) Describe all cement additives associated with each cement type.

Conductor: no additives, Class A cement.

Surface: Class A cement with 2% calcium and 1/4 lb flake, 5 gallons of clay treat

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

23) 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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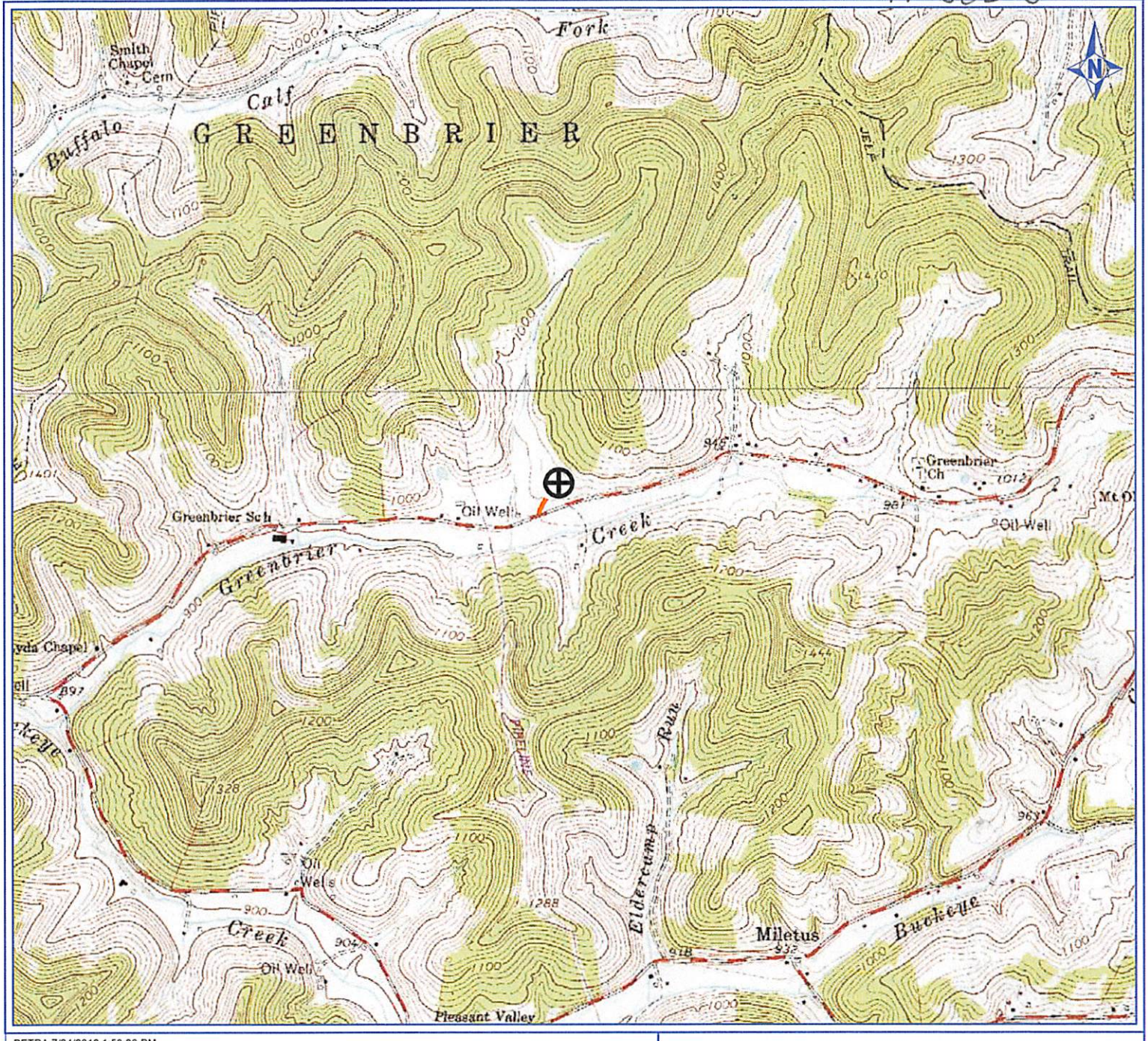
17-06230



PETRA 7/24/2012 1:53:29 PM

Antero Resources Corporation

APPALACHIAN BASIN

Golden Unit 2H

Doddridge County

REMARKS

QUADRANGLE: BIG ISAAC
WATERSHED: UPPER MIDDLE ISL. CR.
DISTRICT: GREENBRIER

0 2,000 4,000

FEET

July 24, 2012

Antero Resources
Well No. Golden Unit 2H
Antero Resources Corporation

(⊕) Denotes Location of Well on United States Topographical Maps

Wellhead Layout
Detail Not to Scale

- White Unit 1H (47-17-6182)
- Welling Unit 1H (47-17-6181)
- Welling Unit 2H (47-17-6183)
- Golden Unit 1H (47-17-6227)
- **Proposed Golden Unit 2H (47-17-6230)**
- Perkins Unit 1H (47-17-6229)
- Flossie Unit 1H (47-17-6180)
- Flossie Unit 2H (47-17-6144)

S 44°41' E 10.0'

223' to Bottom Hole
4,384' to Top Hole
LATITUDE 39 - 15 - 00
LONGITUDE 80 - 35 - 00
1,021' to Top Hole
9,786' to Bottom Hole

Top Hole 7.5' Spot

M	Isaac Eddy, et ux Lease L012454 and James Romine Lease DV011162
L	Franklin Maxwell Heirs, et ux Lease DAD41038/001
K	Charles W. Wellings Jr., et ux Lease 21312
J	Leo G. King, et ux, Memorandum of Oil and Gas Lease
I	Pamela D. Clevenger, Memorandum of Oil & Gas Lease
H	Timothy J. Goldsmith, et ux, Memorandum of Oil and Gas Lease
G	Glenville State College Foundation Lease
F	Eddy Cemetery Assoc. Public Burying Ground, Memorandum of Oil and Gas Lease
E	Robert E. Currey, et ux, Memorandum of Oil and Gas Lease
D	Gregory M. Pigg, et ux, Memorandum of Oil and Gas Lease
C	Charles W. Wellings Jr., et ux, Memorandum of Oil & Gas Lease
B	Charles W. Wellings Jr., et ux, Memorandum of Oil & Gas Lease
A	Jennings A. Snider, et ux Lease 21814

Tag	TM/PAR	OWNER	BK / PG	AC.
32	8/25.5	Leo G. & Martha L. King	260/596	0.71
31	4/13.5	Rodney G. & Bonnie Kelly	229/439	21.59
30	8/17	Jason T. Powell	285/347	10.24
29	8/32.2	Jimmy D. Clevenger	262/152	0.75
28	8/25.2	Timothy J. & Julie R. Goldsmith	273/129	4.61
27	8/18.8	Kevin L. & Lisa A. Swann	276/364	2.01
26	8/25.1	Thomas Edward & Mary Jo Hickman	282/83	1.00
25	8/25.4	Thomas Edward & Mary Jo Hickman	282/83	7.00
24	8/25	Pamela Clevenger	WB 40/199	1.16
23	8/6.1	August J. & Rhonie L. Jordan	240/680	2.29
22	8/34	Gregory M. & Tessa M. Pigg	281/276	0.83
21	8/34.1	D. Duane & Leah L. Perkins	273/298	0.14
20	8/7.1	Rebecca S. Choco	254/537	15.78
19	7/14.4	Phoonsombat Smith	271/219	1.01
18	8/33	D. Duane & Leah Perkins	227/200	1.10
17	7/46	Charles W. Jr. & Barbara L. Wellings	203/229	Lot #7
16	7/30	Robert Marshall & Vernie Mae Hilling	280/347	-
15	4/13	Clifford D. & Polly F. Wilfong	218/1	24.54
14	7/31	Timothy J. & Julie Goldsmith	273/126	3.76
13	7/14.3	Judy D. Martin (Tract 2)	204/518	1.27
12	4/9.2	Rodney L. & Crystal D. Clark	226/334	0.85
11	4/9.1	James M. & Cathy Sue Clark	179/777	1.50
10	7/14.3	Judy D. Martin (Tract 1)	204/518	10.39
9	7/14.6	Shawn K. & Penny J. Dahlheimer	249/217	1.54
8	7/51	Trustees of the Eddy Cemetery Assoc.	249/650	1.70
7	7/14.8	William & Lanita Stewart	281/311	1.00
6	7/47	Judith K. Mohr & Rocky L. Romanello	254/459	Lot #6
5	7/50	Green Meadow Sewage Treat. Plant	220/449	-
4	7/49	Howard & Muriel Van Buren	191/192	Lot #4
3	7/48	Carrie J. & William J. Curran II	273/399	Lot #5
2	7/14-1	Jason C. Ridenour	244/613	23.26
1	4/27.3	Ronnie & Betty Perkins	173/259	40.2

	Bearing	Distance
L1	N 51°36' E	1,342.7'
L2	N 46°54' E	617.5'
L3	N 05°04' E	389.3'
L4	N 15°44' W	533.1'
L5	N 84°27' E	1,206.6'

Notes:

West Virginia Coordinate System of 1927, North Zone based upon Differential GPS Measurements.

Well No. Golden Unit 2H Top Hole coordinates are
N: 273,994.16' Latitude: 39°14'49.38"
E: 1,688,822.42' Longitude: 80°35'55.57"
Bottom Hole coordinates are
N: 265,228.87' Latitude: 39°13'23.25"
E: 1,692,983.77' Longitude: 80°35'01.34"

UTM Zone 17, NAD 1983

Top Hole Coordinates	Bottom Hole Coordinates
N: 4,344,279.172m	N: 4,341,629.971m
E: 534,637.569m	E: 535,949.872m

Plat orientation and corner and well references are based upon the grid north meridian. Well location references are based upon the magnetic meridian.

Tangent Point
N: 274,111.01'
E: 1,690,023.34'

Proposed Well No. Golden Unit 2H

Capped Well (No Tag)

Fence corner

Richard E. & Wilma J. Marsden 229 / 54 386 Ac.

Loretta Marsh, et al Lease

Rodney L. & Crystal Clark (Rosalie Clark LE) 287/593 57.34 Ac.

Greenbrier Creek

William B. & Melissa Clark (Rosalie Clark LE) 287/595 98.13 Ac.

J.D. Tinsley (Rosalie Clark LE) 287/598 4.00 Ac.

Okey Clark, et ux Lease

Cleo Mae Maxson Lease

Chad W. Johnson Lease

Robert W. & Loretta C. Kelley 253/105 0.72 Ac.

Robert W. & Loretta C. Kelley 156/387 50 Ac.

Robert W. & Loretta C. Kelley 156/387 116.57 Acres

Alastair B. & Edith Park Martin Lease 21674

Nicholas A. & Linda Chirlkos 174/157 28 Ac.

Nicholas A. & Linda Chirlkos 174/157 31.5 Ac.

Ora Virginia White Lease DAD61820/002

Ora Virginia White Lease DAD37957/002

John & Betty Prusakowski 248/696 45.309 Ac.

Jason C. Ridenour 244/613 55.67 Ac.

Shawn K. & Penny J. Dahlheimer 249/217 30.38 Ac.

Lease DAD36472/001

John E. Mason Estate Lease

Vanessa Richter 249/635 82.6 Ac.

Jason T. Powell Lease

Thomas E. Hickman Lease

Buckeye Creek

Lease 22045

266/588 9.12 Ac.

Homer L. Ford Lease DVO19229

Homer Leroy Ford WB 11/556 33 Ac.

Homer Ford WB 11/556 54.25 Ac.

Darrell Ford, et ux, et al Lease John K. & Mary J. Davis 200/338 66.17 Ac.

Gladys & Raymond Yerkey Lease 21675

Well (no tag)

Well (no tag)

Well (No Tag)

Water Wells

Water Wells

Water Wells

47-017-1807
47-017-1867
47-017-1371
47-017-2278
47-017-2358
47-017-2357
47-017-62
47-017-3394
47-017-3658
47-017-3566
47-017-3509
47-017-3316
47-017-4268
47-017-3202
47-017-3214
47-017-3000
47-017-5807
47-017-3424
47-017-3461

8 Gas Wells. See Wellhead Layout Detail Above

Proposed Well No. Golden Unit 2H

3000'

Scale: 1" = 2000'

Note: It appears 6 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.

Well Location References

Proposed Well No. Golden Unit 2H

5/8" Rebar w/ Cap

AZ 125° 194'

AZ 338° 261'

Scale: 1" = 300'

Marsden Pad

5/8" Rebar w/ Cap

Golden Unit 2H Bottom Hole

Bottom Hole 7.5' Spot

BRADLEY D. MILLER LICENSED No. 2167 STATE OF WEST VIRGINIA PROFESSIONAL SURVEYOR

SEAL

Legend

- Proposed gas well
- Found Monument (as noted)
- Creek or Drain
- Existing Road
- Surface boundary (approx.)
- Interior surface tracts (approx.)

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 regulations issued and prescribed by the Department of Environmental Protection.

Bradley D. Miller

Bradley D. Miller, P.S. 2167

FILE NO: 229-30-G-12
DRAWING NO: 229-12 Golden 2H Well
SCALE: 1" = 1200'
MINIMUM DEGREE OF ACCURACY: Submeter
PROVEN SOURCE OF ELEVATION: WVDOT, Bridgeport, WV

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

DATE: October 4 2013
OPERATOR'S WELL NO. Golden Unit 2H
API WELL NO MOD
47 - 017 - 06230 H6A
STATE COUNTY PERMIT

WELL TYPE: ☐ OIL ☒ GAS ☐ LIQUID INJECTION ☐ WASTE DISPOSAL
(IF GAS) PRODUCTION : ☐ STORAGE ☐ DEEP ☒ SHALLOW

LOCATION: ELEVATION: 971' WATERSHED: Greenbrier Creek QUADRANGLE: Big Isaac
DISTRICT: Greenbrier COUNTY: Doddridge
SURFACE OWNER: Richard E. & Wilma J. Marsden
ROYALTY OWNER: M.T. Williams, et al; Ruby Sadler, et al; Chad W. Johnson; Okey Clark, et ux
Darrell Ford, et ux, et al; Pamela D. Clevenger, Memorandum of Oil and Gas; Leo G. King, et ux, Memorandum of Oil and Gas; Isaac Eddy, et ux & James Romine; Homer L. Ford; Ora Virginia White; Jason T. Powell
LEASE NO: DVO19229; L012454 & DV011162; DAD61820/002; 003636
ACREAGE: 386 (0.71; 70; 50; 10; 92; 1.161)
ACREAGE: 350; 51; 100; 50; 221
PROPOSED WORK: ☒ DRILL ☐ CONVERT ☐ DRILL DEEPER ☒ FRACTURE OR STIMULATE ☐ PLUG OFF OLD FORMATION
☒ PERFORATE NEW FORMATION ☒ OTHER PHYSICAL CHANGE IN WELL (SPECIFY) Modification - BHL
☐ PLUG AND ABANDON ☐ CLEAN OUT AND REPLUG TARGET FORMATION: Marcellus Shale ESTIMATED DEPTH: 7,300' TVD 17,400' MD

WELL OPERATOR: Antero Resources Corporation
ADDRESS: 1625 17th Street, Denver, CO 80202
DESIGNATED AGENT: Dianna Stamper - CT Corporation System
ADDRESS: 5400 D Big Tyler Road, Charleston, WV 25313