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 07, 2013

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

Re: Permit Modification Approval for API Number 3305690 , Well #: CARPENTER 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

33-05690MOD

ANTERO
RESOURCES

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

June 11, 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 Appalachian Corporation (Antero) would like to submit the following permit modifications for two approved wells on the Washbourne Pad. We are requesting to extend the horizontal lateral length which will change the bottom hole locations of the Carpenter Unit 1H (API# 47-033-05689) and Carpenter Unit 2H (API# 47-033-05690).

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 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 Appalachian Corporation

Enclosures

Received
Office of Oil & Gas

JUN 13 2013

API# 47-033-05690 PERMIT MODIFICATION

WW - 6B
(3/13)

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

1) Well Operator: Antero Resources Appalachian Corporation | 494488557 (Operator ID) | 033-Harrison (County) | Union (District) | Big Isaac (Quadrangle)

2) Operator's Well Number: Carpenter Unit 2H Well Pad Name: Existing Washbourne Pad

3 Elevation, current ground: 1292' Elevation, proposed post-construction: 1292'

4) Well Type: (a) Gas ■ Oil _____ Underground Storage _____

Other _____

(b) If Gas: Shallow ■ Deep _____

Horizontal ■

5) Existing Pad? Yes or No: Yes

6) Proposed Target Formation(s), Depth(s), Anticipated Thicknesses and Associated Pressure(s):

Marcellus Shale: 7400' TVD, Anticipated Thickness- 60' feet, Associated Pressure- 3250#

7) Proposed Total Vertical Depth: 7,400' TVD

8) Formation at Total Vertical Depth: Marcellus Shale

9) Proposed Total Measured Depth: 17,500' MD

10) Approximate Fresh Water Strata Depths: 119', 423'

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

12) Approximate Saltwater Depths: 1334'

13) Approximate Coal Seam Depths: 67', 619'

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

*Antero will be air drilling the fresh water string which makes it difficult to determine when freshwater 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.

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): 15.45 acres (existing)

19) Area to be disturbed for well pad only, less access road (acres): 3.05 acres (existing)

JUN 13 2013

WW - 6B
(3/13)

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#	40'	40'	CTS, 38 Cu. Ft.
Fresh Water	13-3/8"	New	J-55/H-40	54.5#/ 48#	480'	480' *see above	CTS, 667 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2595'	2595'	CTS, 1057 Cu Ft.
Intermediate							
Production	5-1/2"	New	P-110	20#	17500'	17500'	4384 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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JUN 13 2013

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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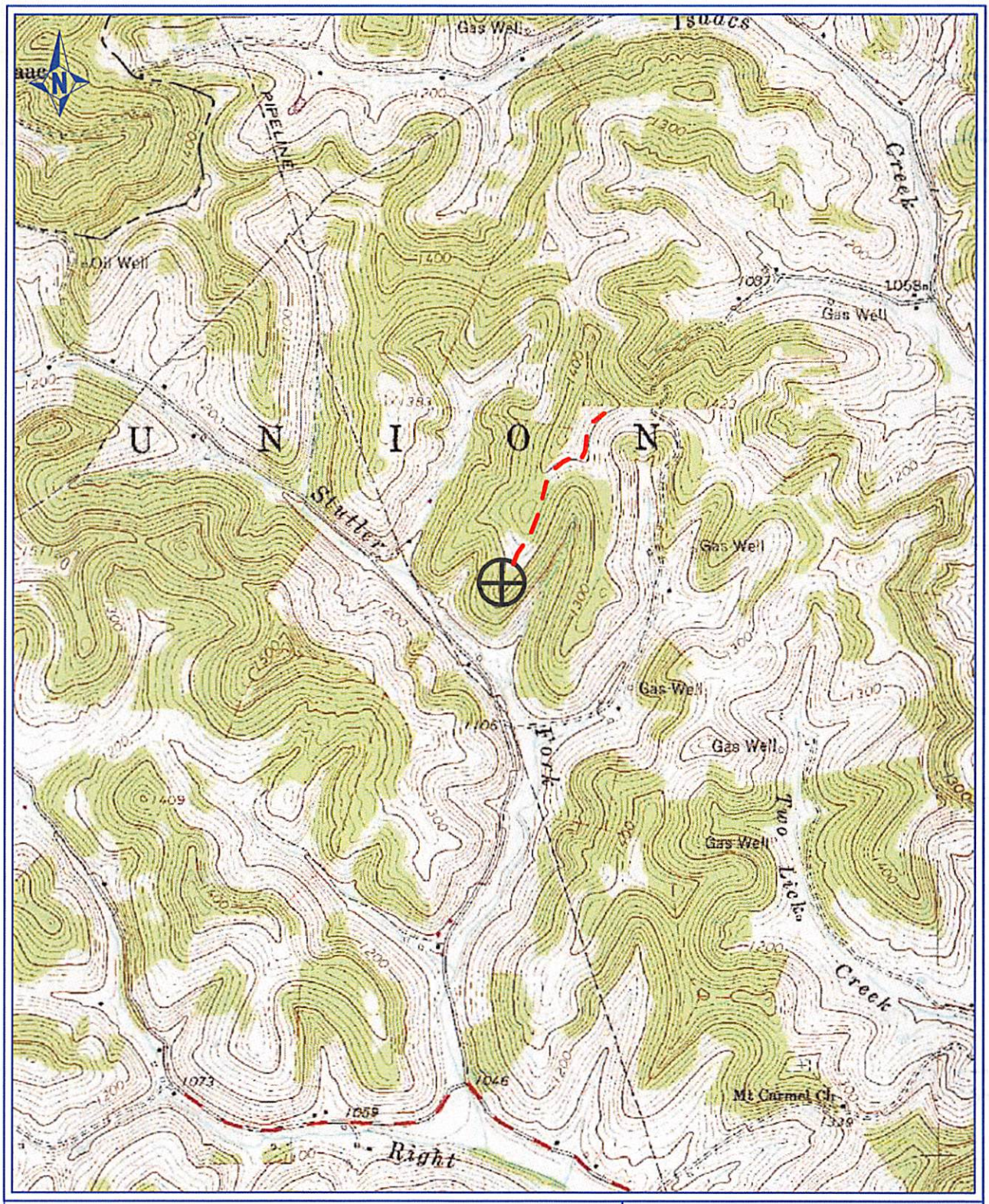


33-5690

PETRA 9/6/2012 10:12:07 AM

Antero Resources Corporation

Appalachia Basin

Washbourne Pad

Carpenter Unit 2H

Doddridge County

0 2,000

FEET

REMARKS

QUADRANGLE: BIG ISAAC
DISTRICT: UNION
WATERSHED: STUTLER FORK

By: ECM

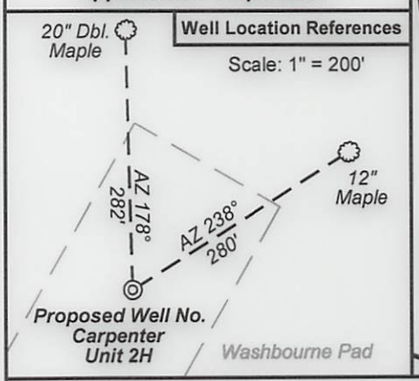
September 6, 2012

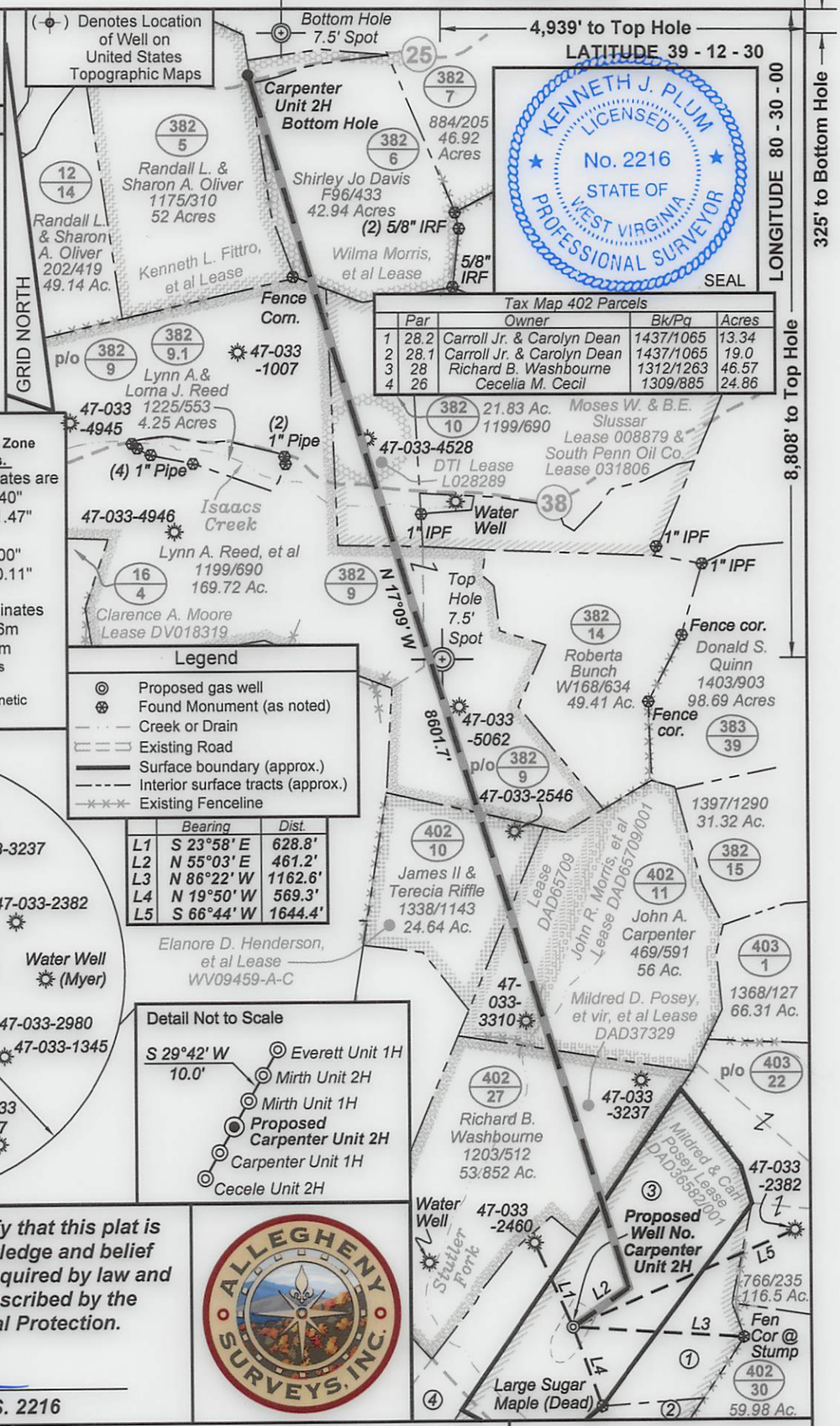
RECEIVED
Office of Oil & Gas
SEP 28 2012
WV Department of
Environmental Protection

Antero Resources
Well No. Carpenter Unit 2H
Antero Resources
Appalachian Corporation

(-⊕-) Denotes Location of Well on United States Topographic Maps

7,097' to Bottom Hole
4,939' to Top Hole
LATITUDE 39 - 12 - 30
LONGITUDE 80 - 30 - 00
325' to Bottom Hole
8,808' to Top Hole



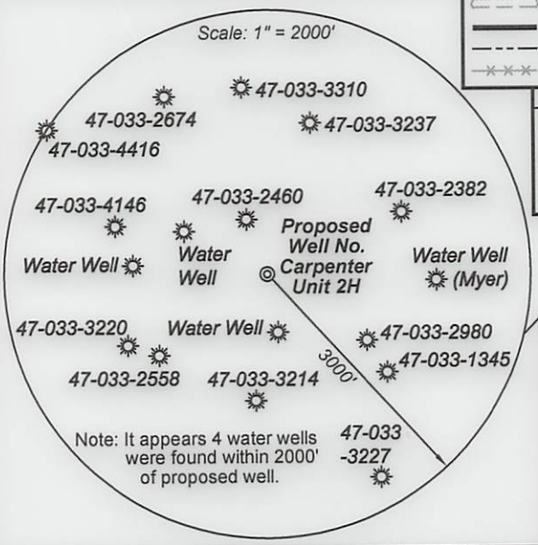


Tax Map 402 Parcels				
	Par	Owner	Bk/Pg	Acres
1	28.2	Carroll Jr. & Carolyn Dean	1437/1065	13.34
2	28.1	Carroll Jr. & Carolyn Dean	1437/1065	19.0
3	28	Richard B. Washbourne	1312/1263	46.57
4	26	Cecelia M. Cecil	1309/885	24.86

Notes:
West Virginia Coordinate System of 1927, North Zone based upon Differential GPS Measurements.
Well No. Carpenter Unit 2H Top Hole coordinates are
N: 250,758.51' Latitude: 39°11'02.40"
E: 1,711,697.63' Longitude: 80°31'01.47"
Bottom Hole coordinates are
N: 259,242.04' Latitude: 39°12'26.00"
E: 1,709,539.57' Longitude: 80°31'30.11"
UTM Zone 17, NAD 1983
Top Hole Coordinates Bottom Hole Coordinates
N: 4,337,316.647m N: 4,339,890.206m
E: 541,724.618m E: 541,024.087m
Plat orientation and corner and well references are based upon the grid north meridian.
Well location references are based upon the magnetic meridian.

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

	Bearing	Dist.
L1	S 23°58' E	628.8'
L2	N 55°03' E	461.2'
L3	N 86°22' W	1162.6'
L4	N 19°50' W	569.3'
L5	S 66°44' W	1644.4'



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.

Kenneth J. Plum, P.S. 2216

ALLEGHENY SURVEYS, INC.

FILE NO: 186-36-U-12
DRAWING NO: 186-12 Carpenter 2H Well
SCALE: 1" = 1000'
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: June 6 2013
OPERATOR'S WELL NO. Carpenter Unit 2H
API WELL NO MOD
47 - 033 - 05690 H6A
STATE COUNTY PERMIT

WELL TYPE: ☐ OIL ☒ GAS ☐ LIQUID INJECTION ☐ WASTE DISPOSAL
(IF GAS) PRODUCTION: ☐ STORAGE ☐ DEEP ☒ SHALLOW
LOCATION: ELEVATION: 1292' WATERSHED: Stutler Fork QUADRANGLE: Big Isaac
DISTRICT: Union COUNTY: Harrison
SURFACE OWNER: Richard B. Washbourne; Betty Jean Lee, et al & John R. Morris, et al; Moses W. & B.E. Slussar & South Penn Oil Co.; Elanore D. Henderson, et al; Wilma Morris, et al; Clarence A. Moore; Mildred D. Posey, et vir, et al; Dominion Transmission, Inc. ACREAGE: 46.57 (52; 107; 184; 24.64; 6.49; 87.35)
ROYALTY OWNER: Mildred D. & Carl N. Posey; John R. Morris, et al; Kenneth L. Fittro et al LEASE NO: DAD36582/001; 008879 & 031806; DAD65709; DAD37329; DAD65709/001; L028289; WV09459-A-C; DV018319 ACREAGE: 102; 53.852; 56; 15
PROPOSED WORK: ☒ DRILL ☐ CONVERT ☐ DRILL DEEPER ☒ FRACTURE OR STIMULATE ☐ PLUG OFF OLD FORMATION
☒ PERFORATE NEW FORMATION ☐ OTHER PHYSICAL CHANGE IN WELL (SPECIFY) _____
☐ PLUG AND ABANDON ☐ CLEAN OUT AND REPLUG TARGET FORMATION: Marcellus Shale ESTIMATED DEPTH: 7,400' TVD 17,500' MD

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