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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

Austin Caperton, Cabinet Secretary  
[www.dep.wv.gov](http://www.dep.wv.gov)

Friday, March 1, 2019  
PERMIT MODIFICATION APPROVAL  
Horizontal 6A / New Drill

ANTERO RESOURCES CORPORATION  
1615 WYNKOOP STREET

DENVER, CO 80202

Re: Permit Modification Approval for SWARTZMILLER UNIT 2H  
47-085-10350-00-00

Modified Well Bore Point of Entry

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.

A handwritten signature in blue ink, appearing to read 'James A. Martin', is positioned above the printed name and title.

James A. Martin  
Chief

Operator's Well Number: SWARTZMILLER UNIT 2H  
Farm Name: DAVID L. WEEKLEY REVOCABLE TRUST  
U.S. WELL NUMBER: 47-085-10350-00-00  
Horizontal 6A New Drill  
Date Modification Issued: March 1, 2019

Promoting a healthy environment.

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

1) Well Operator: Antero Resources Corpora 494507062 085 - Ritchie Clay Pennsboro 7.5'  
Operator ID County District Quadrangle

2) Operator's Well Number: Swartzmiller Unit 2H Well Pad Name: Weekley Trust

3) Farm Name/Surface Owner: David L. Weekley Public Road Access: CR 74-2

4) Elevation, current ground: 1235' Elevation, proposed post-construction: \_\_\_\_\_

5) Well Type (a) Gas  Oil \_\_\_\_\_ Underground Storage \_\_\_\_\_

Other \_\_\_\_\_

(b)If Gas Shallow  Deep \_\_\_\_\_

Horizontal

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):  
Marcellus Shale: 7000' TVD, Anticipated Thickness- 75 feet, Associated Pressure- 2800#

8) Proposed Total Vertical Depth: 7000' TVD

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 15900' MD

11) Proposed Horizontal Leg Length: 7388'

12) Approximate Fresh Water Strata Depths: 338', 375'

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

14) Approximate Saltwater Depths: None Identified

15) Approximate Coal Seam Depths: 887'

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**

<b>TYPE</b>	<b>Size (in)</b>	<b>New or Used</b>	<b>Grade</b>	<b>Weight per ft. (lb/ft)</b>	<b>FOOTAGE: For Drilling (ft)</b>	<b>INTERVALS: Left in Well (ft)</b>	<b>CEMENT: Fill-up (Cu. Ft.)/CTS</b>
Conductor	20"	New	H-40	94#	80	80	CTS, 77 Cu. Ft.
Fresh Water	13-3/8"	New	J-55	54.5#	425 *see # 19	425 *see # 19	CTS, 590 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#	15900	15900	3965 Cu. Ft
Tubing	2-3/8"	New	N-80	4.7#			
Liners							

<b>TYPE</b>	<b>Size (in)</b>	<b>Wellbore Diameter (in)</b>	<b>Wall Thickness (in)</b>	<b>Burst Pressure (psi)</b>	<b>Anticipated Max. Internal Pressure (psi)</b>	<b>Cement Type</b>	<b>Cement Yield (cu. ft./k)</b>
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							

**PACKERS**

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

WW-6B  
(10/14)

Permit Modification API# 47-085-10350 MDO  
API NO. 47- 085 - 10350 03/01/2019  
OPERATOR WELL NO. Swartzmiller Unit 2H  
Well Pad Name: Weekley Trust

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): Existing 32.87 acres

22) Area to be disturbed for well pad only, less access road (acres): Existing 8.15 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

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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.

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\*Note: Attach additional sheets as needed.



47095024100000



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Antero Resources Corporation

Swartzmiller Unit 2H - AOR



WELL SYMBOLS  
Waiting on Big Rig

03/01/2019

SWARTZMILLER UNIT 2H (WEEKLEY TRUST PAD) - AREA OF REVIEW 35-8-5.11 PAGE 2

Permit Modification API# 47-085-10350 MOD

UWI (API/Num)	Well Name	Well Number	Operator	Historical Operator	TD	Perforated Interval (shallowest, deepest)	Perforated Formation(s)	Productible Formation(s) not perf'd
47095024100000	JIM UNIT	3H	ANTERO RESOURCES CORPORATION	ANTERO RESOURCES CORPORATION	6428	N/A	Marcellus Fm	N/A

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LATITUDE 39°22'30" 2,072'

LATITUDE 39°25'00"

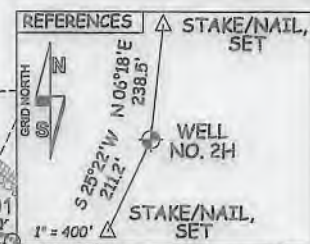
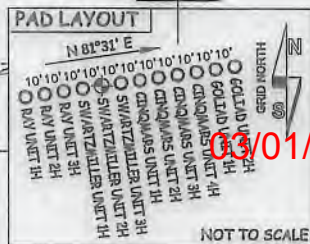
LONGITUDE 80°55'00" 9,077' TO BOTTOM HOLE

Antero Resources Corporation  
Well No. Swartzmiller Unit 2H  
47-085-10350

NOTES:  
WELL 2H TOP HOLE INFORMATION:  
N: 320,634ft E: 1,597,442ft  
LAT: 39°22'17.65" LON: 80°55'26.39"  
BOTTOM HOLE INFORMATION:  
N: 328,005ft E: 1,596,124ft  
LAT: 39°23'30.29" LON: 80°55'44.66"  
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.

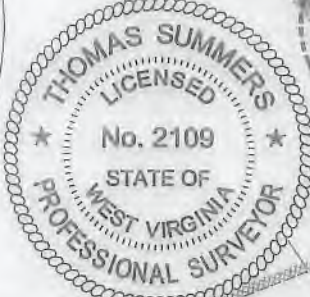
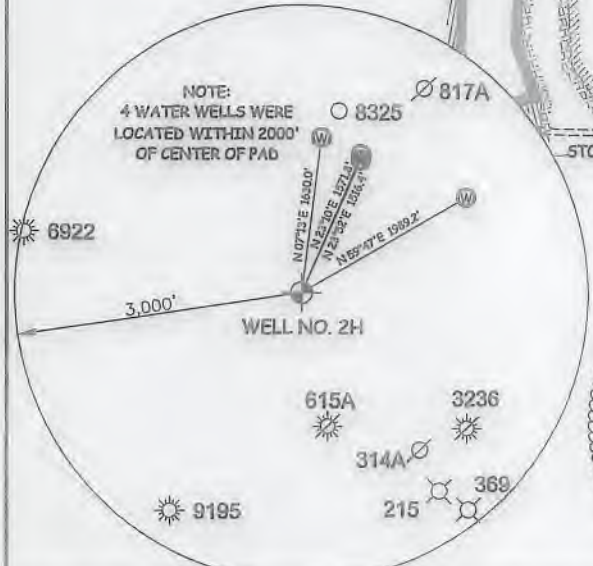
(NAD) 83 (UTM) ZONE 17 COORDS:  
WELL 2H TOP HOLE INFORMATION:  
N: 4,358,023m E: 506,561m  
BOTTOM HOLE INFORMATION:  
N: 4,360,262m E: 506,122m

(NAD) 27 (UTM) ZONE 17 COORDS:  
WELL 2H TOP HOLE INFORMATION:  
N: 14,297,235ft E: 1,661,896ft  
POINT OF ENTRY INFORMATION:  
N: 14,297,495ft E: 1,662,547ft  
BOTTOM HOLE INFORMATION:  
N: 14,304,379ft E: 1,660,456ft



WV NORTH ZONE GRID NORTH

Clay District - Ritchie County		
PAR.	SURFACE OWNER	OIL & GAS ROYALTY OWNER
1-08	CLIFF PERKINS ET AL	CLIFF WM. PERKINS ET UX
1-09	CLIFF PERKINS ET AL	CLIFF WM. PERKINS ET UX
1-11	CLIFF PERKINS ET AL	CLIFF WM. PERKINS ET UX
1-12	CLIFF PERKINS ET AL	LAURA ULAM
1-13	CLIFF PERKINS ET AL	CLIFF WM. PERKINS ET UX
1-14	CLIFF PERKINS ET AL	CLIFF WM. PERKINS ET UX
1-15	CLIFF PERKINS ET AL	CLIFF WM. PERKINS ET UX
1-16	CLIFF PERKINS ET AL	CLIFF WM. PERKINS ET UX
1-17	CLIFF PERKINS ET AL	CLIFF WM. PERKINS ET UX
1-18	CLIFF PERKINS ET AL	CLIFF WM. PERKINS ET UX
1-19	MICHAEL DER	GARY MICHAEL DER ET UX
1-20	TONY PERKINS ET AL	TONY ADRIAN PERKINS
3-03	BRIAN JONES	BRIAN KEITH JONES
3-04	BRIAN JONES	BRIAN KEITH JONES
3-05	DENNY COWGER	DENNY COWGER ET UX
3-06	CLIFF PERKINS ET AL	TONY ADRIAN PERKINS



JOB # 17-04AWA  
DRAWING # SWARTMILLER2HR1  
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

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.

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

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

LEGEND  
----- Surface Owner Boundary Lines +/-  
----- Interior Surface Tracts +/-  
----- Existing Fence  
⊕ Found monument, as noted

THOMAS SUMMERS P.S. 2109  
*Thomas Summers*  
DATE 02/19/19  
OPERATOR'S WELL# SWARTZMILLER UNIT #2H

WELL TYPE: OIL \_\_\_ GAS X LIQUID INJECTION \_\_\_ WASTE DISPOSAL \_\_\_  
(IF "GAS") PRODUCTION X STORAGE \_\_\_ DEEP \_\_\_ SHALLOW X  
LOCATION: ELEVATION 1,235' AS BUILT WATERSHED NORTH FORK HUGHES RIVER  
QUADRANGLE PENNSBORO 7.5' - TH MIDDLEBOURNE 7.5' - BH DISTRICT CLAY COUNTY RITCHIE

SURFACE OWNER DAVID L. WEEKLEY REVOCABLE TRUST ACREAGE 203.38 ACRES +/-  
OIL & GAS ROYALTY OWNER DAVID L. WEEKLEY REVOCABLE TRUST; TONY ADRIAN PERKINS; LEASE ACREAGE 229 AC±; 26.11 AC±;  
TONY ADRIAN PERKINS; CLIFF WM. PERKINS ET UX; CLIFF WM. PERKINS ET UX; CLIFF WM. PERKINS ET UX; 2 AC±; 16.35 AC±; 17 AC±; 18.5 AC±;  
IRENE NUTTER HAYMOND TRUST; CLIFF WM. PERKINS ET UX; ROBERT A. DAVIS ET UX 375 AC±; 75.08 AC±; 284.33 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-POE  
TARGET FORMATION MARCELLUS PLUG & ABANDON \_\_\_ CLEAN OUT & REPLUG \_\_\_  
WELL OPERATOR ANTERO RESOURCES CORP. ESTIMATED DEPTH 7,000' TVD 15,900' MD  
ADDRESS 1615 WYNKOOP ST. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM  
FORM WW-6 DENVER, CO 80202 ADDRESS 5400 D BIG TYLER ROAD CHARLESTON, WV 25313

03/01/2019

COUNTY NAME PERMIT