

State of West Virginia  
Department of Environmental Protection - Office of Oil and Gas  
Well Operator's Report of Well Work

API 47 - 017 - 06798 County Doddridge District Central  
Quad West Union 7.5' Pad Name Balli Pad Field/Pool Name -----  
Farm name Jeffrey K. Jones Sr. et al Well Number Boulder Unit 1H  
Operator (as registered with the OOG) Antero Resources Corporation  
Address 1615 Wynkoop Street City Denver State CO Zip 80202

As Drilled location NAD 83/UTM Attach an as-drilled plat, profile view, and deviation survey  
Top hole Northing 4350343m Easting 513466m  
Landing Point of Curve Northing 4350380.83m Easting 512733.31m  
Bottom Hole Northing 4352774m Easting 511963m

Elevation (ft) 1135.5' GL Type of Well  New  Existing Type of Report  Interim  Final  
Permit Type  Deviated  Horizontal  Horizontal 6A  Vertical Depth Type  Deep  Shallow  
Type of Operation  Convert  Deepen  Drill  Plug Back  Redrilling  Rework  Stimulate  
Well Type  Brine Disposal  CBM  Gas  Oil  Secondary Recovery  Solution Mining  Storage  Other \_\_\_\_\_  
Type of Completion  Single  Multiple Fluids Produced  Brine  Gas  NGL  Oil  Other \_\_\_\_\_  
Drilled with  Cable  Rotary

Drilling Media Surface hole  Air  Mud  Fresh Water Intermediate hole  Air  Mud  Fresh Water  Brine  
Production hole  Air  Mud  Fresh Water  Brine  
Mud Type(s) and Additive(s)  
Air - Foam & 4% KCL  
Mud - Polymer

Date permit issued 2/7/2017 Date drilling commenced 2/24/2017 Date drilling ceased 6/2/2017  
Date completion activities began 9/23/2017 Date completion activities ceased 4/2/2018  
Verbal plugging (Y/N) N/A Date permission granted N/A Granted by N/A

Please note: Operator is required to submit a plugging application within 5 days of verbal permission to plug

Freshwater depth(s) ft 107', 192' Open mine(s) (Y/N) depths No  
Salt water depth(s) ft 737' Void(s) encountered (Y/N) depths No  
Coal depth(s) ft None Identified Cavern(s) encountered (Y/N) depths No  
Is coal being mined in area (Y/N) No

**Reviewed**  
*Jul Ann 1/2/20*

RECEIVED  
Office of Oil and Gas

SEP 10 2018

WV Department of  
Environmental Protection

Reviewed by: \_\_\_\_\_

API 47- 017 - 06798 Farm name Jeffrey K. Jones Sr. et al Well number Boulder Unit 1H

CASING STRINGS	Hole Size	Casing Size	Depth	New or Used	Grade w/ft	Basket Depth(s)	Did cement circulate (Y/ N) * Provide details below*
Conductor	24"	20"	72'	New	94#, H-40	N/A	Y
Surface	17-1/2"	13-3/8"	386'	New	54.5#, J-55	N/A	Y
Coal							
Intermediate 1	12-1/4"	9-5/8"	2543'	New	36#, J-55	N/A	Y
Intermediate 2							
Intermediate 3							
Production	8-3/4"/8-1/2"	5-1/2"	15970'	New	23#, P-110	N/A	Y
Tubing		2-3/8"	7371'		4.7#, N-80		
Packer type and depth set		N/A					

Comment Details \_\_\_\_\_

CEMENT DATA	Class/Type of Cement	Number of Sacks	Slurry wt (ppg)	Yield (ft <sup>3</sup> /sks)	Volume (ft <sup>3</sup> )	Cement Top (MD)	WOC (hrs)
Conductor	Class A	102 sx	15.6	1.18	120	0'	8 Hrs.
Surface	Class A	380 sx	15.6	1.19	452	0'	8 Hrs.
Coal							
Intermediate 1	Class A	910 sx	15.6	1.18	1074	0'	8 Hrs.
Intermediate 2							
Intermediate 3							
Production	Class H	660sx (Lead) 1417sx (Tail)	13.5(Lead), 15.2 (Tail)	1.44 (Lead), 1.87 (Tail)	3600	-500' into Intermediate Casing	8 Hrs.
Tubing							

Drillers TD (ft) 15970' MD, 6610' TVD (BHL), 6621' (Deepest Point Drilled) Loggers TD (ft) 15970' MD

Deepest formation penetrated Marcellus Plug back to (ft) N/A

Plug back procedure N/A

Kick off depth (ft) 6499'

Check all wireline logs run  caliper  density  deviated/directional  induction  
 neutron  resistivity  gamma ray  temperature  sonic

Well cored  Yes  No Conventional Sidewall Were cuttings collected  Yes  No

DESCRIBE THE CENTRALIZER PLACEMENT USED FOR EACH CASING STRING \_\_\_\_\_

Conductor - 0  
Surface - 1 above guide shoe, 1 above insert float, 1 every 4th joint to surface  
Intermediate - 1 above float joint, 1 above float collar, 1 every 4th joint to surface  
Production - 1 above float joint, 1 below float collar, 1 every 3rd joint to top of cement

WAS WELL COMPLETED AS SHOT HOLE  Yes  No DETAILS \_\_\_\_\_

WAS WELL COMPLETED OPEN HOLE?  Yes  No DETAILS \_\_\_\_\_

RECEIVED  
Office of Oil and Gas

WERE TRACERS USED  Yes  No TYPE OF TRACER(S) USED N/A

SEP 10 2018

API 47-017 - 06798 Farm name Jeffrey K. Jones Sr. et al Well number Boulder Unit 1H

PERFORATION RECORD

Stage No.	Perforation date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formation(s)
<b>*PLEASE SEE ATTACHED EXHIBIT 1</b>					

Please insert additional pages as applicable.

STIMULATION INFORMATION PER STAGE

Complete a separate record for each stimulation stage.

Stage No.	Stimulations Date	Ave Pump Rate (BPM)	Ave Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (bbls)	Amount of Nitrogen/other (units)
<b>*PLEASE SEE ATTACHED EXHIBIT 2</b>								

Please insert additional pages as applicable.

RECEIVED  
 Office of Oil and Gas  
 SEP 10 2018  
 WV Department of  
 Environmental Protection

API 47- 017 - 06798 Farm name Jeffrey K. Jones Sr. et al Well number Boulder Unit 1H

<u>PRODUCING FORMATION(S)</u>	<u>DEPTHS</u>	
<u>Marcellus</u>	<u>6553' (TOP)</u> TVD	<u>7391' (TOP)</u> MD
_____	_____	_____
_____	_____	_____
_____	_____	_____

Please insert additional pages as applicable.

GAS TEST  Build up  Drawdown  Open Flow OIL TEST  Flow  Pump

SHUT-IN PRESSURE Surface 3600 psi Bottom Hole --- psi DURATION OF TEST --- hrs

OPEN FLOW Gas 9143.61 mcfpd Oil 39.79 bpd NGL --- bpd Water 250.47 bpd GAS MEASURED BY  Estimated  Orifice  Pilot

LITHOLOGY/ FORMATION	TOP	BOTTOM	TOP	BOTTOM	DESCRIBE ROCK TYPE AND RECORD QUANTITY AND TYPE OF FLUID (FRESHWATER, BRINE, OIL, GAS, H <sub>2</sub> S, ETC)
	DEPTH IN FT NAME TVD	DEPTH IN FT TVD	DEPTH IN FT MD	DEPTH IN FT MD	

**\*PLEASE SEE ATTACHED EXHIBIT 3**

					RECEIVED Office of Oil and Gas
					SEP 10 2018
					WV Department of Environmental Protection

Please insert additional pages as applicable.


Drilling Contractor Frontier Drilling LLC  
Address 207 Carlton Drive City Eighty Four State PA Zip 15330

Logging Company Allied Horizontal Wireline Services  
Address 381 Colonial Manor Rd City North Huntington State PA Zip 15642

Cementing Company C&J Energy Services  
Address 1650 Hackers Creek City Lane Jew State WV Zip 26378

Stimulating Company CalFrac Well Services  
Address 717 17th Street, Suite 1445 City Denver State CO Zip 80202

Please insert additional pages as applicable.

Completed by Karin Cox Telephone 303-357-6820  
Signature  Title Permitting Agent Date 9/7/2018

API 47-017-06798 Farm Name Jeffrey K. Jones Sr. et al Well Number Boulder Unit 1H

**EXHIBIT 1**

Stage No.	Perforation Date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formations
1	9/23/2017	15816	0	48	Marcellus
2	2/4/2018	15612	15784	48	Marcellus
3	2/5/2018	15408	15580	48	Marcellus
4	2/5/2018	15204	15376	48	Marcellus
5	2/6/2018	14999	15172	48	Marcellus
6	2/6/2018	14795	14967	48	Marcellus
7	2/6/2018	14591	14763	48	Marcellus
8	2/7/2018	14387	14559	48	Marcellus
9	2/7/2018	14182	14355	48	Marcellus
10	2/8/2018	13978	14150	48	Marcellus
11	2/8/2018	13774	13946	48	Marcellus
12	2/8/2018	13570	13742	48	Marcellus
13	2/9/2018	13366	13538	48	Marcellus
14	2/9/2018	13161	13334	48	Marcellus
15	2/9/2018	12957	13129	48	Marcellus
16	2/10/2018	12753	12925	48	Marcellus
17	2/10/2018	12549	12721	48	Marcellus
18	2/10/2018	12344	12517	48	Marcellus
19	2/11/2018	12140	12312	48	Marcellus
20	2/11/2018	11936	12108	48	Marcellus
21	2/11/2018	11732	11904	48	Marcellus
22	2/12/2018	11528	11700	48	Marcellus
23	2/12/2018	11323	11495	48	Marcellus
24	2/13/2018	11119	11291	48	Marcellus
25	2/13/2018	10915	11087	48	Marcellus
26	2/13/2018	10711	10883	48	Marcellus
27	2/14/2018	10506	10679	48	Marcellus
28	2/14/2018	10302	10474	48	Marcellus
29	2/14/2018	10098	10270	48	Marcellus
30	2/15/2018	9894	10066	48	Marcellus
31	2/16/2018	9689	9862	48	Marcellus
32	2/16/2018	9485	9657	48	Marcellus
33	2/16/2018	9281	9453	48	Marcellus
34	2/17/2018	9077	9249	48	Marcellus
35	2/17/2018	8873	9045	48	Marcellus
36	2/18/2018	8668	8841	48	Marcellus
37	2/18/2018	8464	8636	48	Marcellus
38	2/19/2018	8260	8432	48	Marcellus
39	2/19/2018	8056	8228	48	Marcellus
40	2/19/2018	7851	8024	48	Marcellus
41	2/20/2018	7647	7819	48	Marcellus
42	2/20/2018	7443	7615	48	Marcellus

RECEIVED  
Office of Oil and Gas

SEP 10 2018

WV Department of  
Environmental Protection

## EXHIBIT 2

Stage No.	Stimulations Date	Avg Pump Rate	Avg Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (bbls)	Amount of Nitrogen/ other (units)
1	9/23/2017	41.7	7959	0	4301	14800	7937	N/A
2	2/4/2018	69.3	7984	5751	4467	415200	8369	N/A
3	2/5/2018	74.8	7827	6012	3928	416100	8347	N/A
4	2/5/2018	74	7672	5717	5244	413300	11006	N/A
5	2/6/2018	72.8	7368	5778	4438	415500	8524	N/A
6	2/6/2018	75.6	7526	5672	4296	415850	8272	N/A
7	2/6/2018	76	7519	5910	5546	415550	8278	N/A
8	2/7/2018	76.8	7629	5787	5259	416250	8443	N/A
9	2/7/2018	67.8	7672	5347	5492	414800	12136	N/A
10	2/8/2018	74.8	7316	5382	5385	416500	8349	N/A
11	2/8/2018	76.6	7451	5979	5362	417150	8211	N/A
12	2/8/2018	74.2	7453	5649	6100	410100	8224	N/A
13	2/9/2018	75.8	7263	5535	5166	417150	8268	N/A
14	2/9/2018	76.1	7174	6015	5096	416300	8303	N/A
15	2/9/2018	75.4	6853	6097	5026	416350	8150	N/A
16	2/10/2018	75.6	7163	5668	5582	415850	8310	N/A
17	2/10/2018	76.3	7193	5988	5086	415450	8129	N/A
18	2/10/2018	74.7	6844	5635	5103	415100	8239	N/A
19	2/11/2018	74.5	6908	5766	4360	415450	8297	N/A
20	2/11/2018	80.6	6772	6370	4911	415900	8227	N/A
21	2/11/2018	75.2	6951	6005	5223	415500	8213	N/A
22	2/12/2018	75.1	7030	5816	4676	415900	8174	N/A
23	2/12/2018	71.8	7708	6204	4726	395900	9445	N/A
24	2/13/2018	71.7	7777	6336	5288	415250	10167	N/A
25	2/13/2018	74.3	7038	6236	5728	417250	8244	N/A
26	2/13/2018	80.9	7396	5873	4812	415200	8347	N/A
27	2/14/2018	77.8	7650	6219	3932	415100	8773	N/A
28	2/14/2018	77.7	7256	6239	4470	416100	8054	N/A
29	2/14/2018	75.5	7127	6167	5703	415450	8591	N/A
30	2/15/2018	79.4	6991	6622	4692	416650	8486	N/A
31	2/16/2018	71.5	7278	6633	5289	416500	11342	N/A
32	2/16/2018	78.1	6838	6222	5414	415910	7996	N/A
33	2/16/2018	78.3	7163	6134	5834	415400	10046	N/A
34	2/17/2018	80.3	7257	6224	5667	418550	8230	N/A
35	2/17/2018	78.5	7052	6143	5390	416250	8483	N/A
36	2/18/2018	77.6	7024	6550	5088	416000	8269	N/A
37	2/18/2018	78.6	7128	6920	5798	415710	8378	N/A
38	2/19/2018	80.2	7236	6591	5691	415800	8204	N/A
39	2/19/2018	77.9	6827	5711	5716	416100	8002	N/A
40	2/19/2018	63.3	7990	6292	5246	416650	11032	
41	2/20/2018	78.3	6392	6153	5329	415250	7976	
42	2/20/2018	77.7	7071	6115	4401	415350	10304	N/A
	AVG=	75	7,279	5,892	5,101	17,040,420	366,775	TOTAL

RECEIVED  
Office of Oil and Gas

SEP 10 2018

WV Department of  
Environmental Protection

## EXHIBIT 3

LITHOLOGY/ FORMATION	TOP DEPTH (TVD)	BOTTOM DEPTH (TVD)	TOP DEPTH (MD)	BOTTOM DEPTH (MD)
	From Surface	From Surface	From Surface	From Surface
Freshwater	107'	N/A	107'	N/A
Freshwater	192'	N/A	192'	N/A
Siltstone/Sandstone	0	147	0	147
Sandstone	est. 147	205	est. 147	205
Sandstone/Siltstone/Shale	est. 205	327	est. 205	327
Sandstone/Shale/Trace Coal	est. 327	447	est. 327	447
Sandstone	est. 447	547	est. 447	547
Sandstone/Shale	est. 547	607	est. 547	607
Sandstone	est. 607	687	est. 607	687
Siltstone	est. 687	727	est. 687	727
Shale	est. 727	767	est. 727	767
Limestone	est. 767	787	est. 767	787
Siltstone	est. 787	907	est. 787	907
Shale	est. 907	1,147	est. 907	1,147
Shale/Tr Coal	est. 1147	1,167	est. 1147	1,167
Shale	est. 1167	1,207	est. 1167	1,207
Sandstone	est. 1207	1,227	est. 1207	1,227
Shale	est. 1227	1,245	est. 1227	1,245
Sandstone	est. 1245	1,307	est. 1245	1,307
Shale/Siltstone	est. 1307	1,367	est. 1307	1,367
Limestone	est. 1367	1,387	est. 1367	1,387
Sandstone	est. 1387	1,447	est. 1387	1,447
Siltstone	est. 1447	1,489	est. 1447	1,489
Sandstone/Shale/Siltstone	est. 1489	2,020	est. 1489	2,022
Big Lime	2,020	2,682	2,022	2,698
Fifty Foot Sandstone	2,682	2,737	2,698	2,755
Gordon	2,737	3,066	2,755	3,096
Fifth Sandstone	3,066	3,093	3,096	3,124
Bayard	3,093	3,761	3,124	3,878
Speechley	3,761	4,098	3,878	4,265
Balltown	4,098	4,529	4,265	4,772
Bradford	4,529	5,001	4,772	5,310
Benson	5,001	5,283	5,310	5,632
Alexander	5,283	6,205	5,632	6,723
Sycamore	6,205	6,370	6,723	6,955
Middlesex	6,370	6,492	6,955	7,196
Burkett	6,492	6,521	7,196	7,271
Tully	6,521	6,553	7,271	7,391
Marcellus	6,553	NA	7,391	NA

\*Please note Antero determines formation tops based on mud logs that are only run on one well on a multi-well pad. The measured depth (MD) data on subsequent wells may be slightly different due to the well's unique departure.

RECEIVED  
Office of Oil and Gas

SEP 10 2018

WV Department of  
Environmental Protection



# ANTERO RESOURCES CORPORATION

Location: Doddridge Co., WV  
 Field: Doddridge  
 Facility: Balli Pad



Slot: Slot #07  
 Well: Boulder Unit 1H  
 Wellbore: Boulder Unit 1H PWB

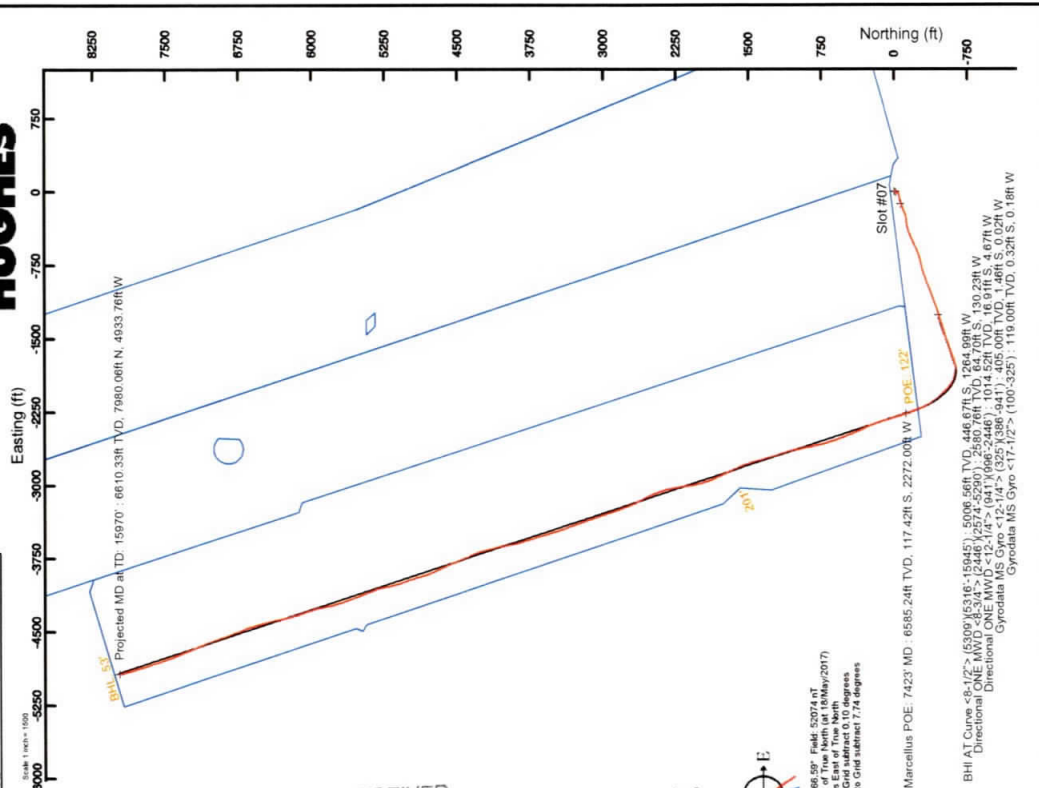
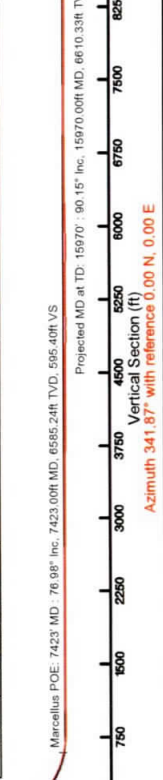
API: 47-017-06798-0000  
 BHI Job #: 8565009  
 Rig: Frontier 32  
 Duration: 05/26/2017-05/31/2017

Grid System: NAD83 / UTM Zone 17 North, US feet
- = Wellbath was transformed from a different geospatial datum
True vertical depths are referenced to Frontier 32 (RKB)
Measured depths are referenced to Frontier 32 (RKB)
North Reference: Grid north
Scale: True distance
Mean Sea Level to Mudline (M Slot: Slot #07): -1135 feet
Depths are in feet
Created by: deland on 2017-06-05
Database: VA_MPL_EasternUS_Dein

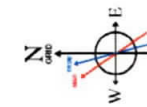
Location Information			
Facility Name	Grid East (US ft)	Grid North (US ft)	Longitude
Balli Pad	14272033.240	3911808.1987N	80°57'03.1207W
Slot #07	Grid East (US ft)	Grid North (US ft)	Longitude
1.34	1864500.290	3911808.2107N	80°57'03.3607W
Comment	Boulder Unit 1H		
Frontier 32 (RKB) to Mudline (M Slot: Slot #07)	32ft		
Mean Sea Level to Mudline (M Slot: Slot #07)	-1135ft		
Frontier 32 (RKB) to Mean Sea Level	1167ft		
Directional ONE MWD <12-1/4"> (041°/906°-2446°) 4.47° Inc. 1015.00ft MD, 1014.52ft TVD, -14.61ft VS			
Gyrodatta MS Gyro <17-1/2"> (100°-325°) 0.48° Inc. 119.00ft MD, 119.00ft TVD, -0.24ft VS			
Gyrodatta MS Gyro <12-1/4"> (325°/386°-941°) 0.32° Inc. 405.00ft MD, 405.00ft TVD, -1.38ft VS			

Well Profile Data					
Design Comment	MD (ft)	Inc. (°)	Az. (°)	TVD (ft)	Local E (ft)
The On	5309.00	25.620	255.220	5090.24	-445.90
Proj. To Bottom	5392.00	25.620	255.220	5075.08	-1296.78
End of 3D Arc	5600.89	31.581	251.199	5258.24	-484.20
Curve KOP	6397.78	31.581	251.199	5937.29	-418.73
POE	7989.24	75.125	341.872	6577.00	-195.10
Landing PL	7955.17	90.000	341.873	6601.00	-113.36
BHL	15970.17	90.000	341.873	1995.97	-4922.32
				DLS (1/100ft)	VS (ft)
				2.64	-31.03
				0.00	-28.84
				3.00	-26.84
				8.00	-21.82
				8.00	-22.34
				0.00	70.16
				0.00	9121.19

Well Data		
Well	Wellbath	
Slot #07	Boulder Unit 1H	Boulder Unit 1H PWB
Slot #07	Boulder Unit 1H	Boulder Unit 1H PWB Rev-A0



RECEIVED  
 Office of Oil and Gas  
 SEP 10 2018  
 WV Department of  
 Environmental Protection



User specified (HOGM) Dip: 66.50° Field: 53074 nt  
 Magnetic North is 7.54 degrees West of True North (at 10/05/2017)  
 To correct azimuth from True to Grid subtract 0.10 degrees  
 To correct azimuth from Magnetic to Grid subtract 7.74 degrees

Marcellus POE: 7423 MD, 6585.24ft TVD, 117.42ft S, 2272.00ft W  
 BHI AT Curve <8-1/2"> (5309°/6316°-15945°) 25.34° Inc. 5316.00ft MD, 5006.56ft TVD, -30.87ft VS  
 Directional ONE MWD <12-1/4"> (041°/906°-2446°) 4.47° Inc. 1015.00ft MD, 1014.52ft TVD, -14.61ft VS  
 Directional ONE MWD <17-1/2"> (100°-325°) 0.48° Inc. 119.00ft MD, 119.00ft TVD, -0.24ft VS  
 Gyrodatta MS Gyro <12-1/4"> (325°/386°-941°) 0.32° Inc. 405.00ft MD, 405.00ft TVD, -1.38ft VS  
 Gyrodatta MS Gyro <17-1/2"> (100°-325°) 0.48° Inc. 119.00ft MD, 119.00ft TVD, -0.24ft VS

Projected MD at TD: 15970 - 90.15° Inc. 15970.00ft MD, 6610.33ft TVD, 9119.13ft VS  
 Azimuth 341.87° with reference 0.00 N, 0.00 E



# Hydraulic Fracturing Fluid Product Component Information Disclosure

Job Start Date:	2/4/2018
Job End Date:	2/20/2018
State:	West Virginia
County:	Doddridge
API Number:	47-017-06798-00-00
Operator Name:	Antero Resources Corporation
Well Name and Number:	Boulder 1H
Latitude:	39.30236300
Longitude:	-80.84381700
Datum:	NAD83
Federal Well:	NO
Indian Well:	NO
True Vertical Depth:	6,611
Total Base Water Volume (gal):	15,891,421
Total Base Non Water Volume:	0



RECEIVED  
Office of Oil and Gas

SEP 10 2018

## Hydraulic Fracturing Fluid Composition:

Trade Name	Supplier	Purpose	Ingredients	Chemical Abstract Service Number (CAS #)	Maximum Ingredient Concentration in Additive (% by mass)**	Maximum Ingredient Concentration in HF Fluid (% by mass)**	Comments
Water	Supplied by Operator	Base Fluid					
			Water	7732-18-5	70.00000	88.24971	
DAP-902	CWS	Scale Inhibitor					
				Listed Below			

WV Department of Environmental Protection

DWP-111	CWS	Gel Slurry								
					Listed Below					
DAP-103	CWS	Iron Control								
					Listed Below					
SANIFRAC 8844	CWS	Biocide								
					Listed Below					
Hydrochloric Acid	CWS	Clean Perforations								
					Listed Below					
DWP-641	CWS	Friction Reducer								
					Listed Below					
Sand (Proppant)	CWS	Propping Agent								
					Listed Below					
CI-9100G	CWS	Corrosion Inhibitor								
					Listed Below					
Calbreak 5501	CWS	Breaker								
					Listed Below					
Other Chemical (s)	Listed Above	See Trade Name (s) List								

RECEIVED  
Office of Oil and Gas

SEP 10 2010

WV Department of  
Environmental Protection

					Listed Below			
Items above are Trade Names with the exception of Base Water . Items below are the individual ingredients.								
					Crystalline silica (Quartz)	14808-60-7	100.00000	11.35042
					Calcite	471-34-1	1.00000	0.08207
					Hydrochloric acid	7647-01-0	37.00000	0.05962
					Guar gum	9000-30-0	60.00000	0.04613
					Distillates (petroleum), hydrotreated middle	64742-46-7	60.00000	0.04613
					Illite	12173-60-3	1.00000	0.03140
					Polymer	26100-47-0	45.00000	0.02862
					Distillates (petroleum), hydrotreated light	64742-47-8	30.00000	0.01908
					Apatite	64476-38-6	0.10000	0.01135
					Biotite	1302-27-8	0.10000	0.01135
					Goethite	1310-14-1	0.10000	0.01135
					Ammonium Persulfate	64742-47-8	100.00000	0.01120
					Ammonium chloride	12125-02-9	11.00000	0.00700
					Polyethylene glycol mixture	25322-68-3	54.50000	0.00616
					2-Propenoic acid, homopolymer, sodium salt	9003-04-7	40.00000	0.00612
					Quaternary ammonium compounds, bis (hydrogenated tallow alkyl)dimethyl, salts with bentonite	68953-58-2	5.00000	0.00384
					Ilmenite	98072-94-7	0.10000	0.00314
					Sorbitan monooleate	1338-43-8	4.00000	0.00254
					2,2-Dibromo-3-Nitripropionamide	10222-01-2	20.00000	0.00226
					Vinylidene chloride-methyl acrylate copolymer	69418-26-4	20.00000	0.00224
					Polyethylene glycol monooleate	9004-96-0	3.00000	0.00191

RECEIVED  
Office of Oil and Gas

SEP 10 2018

WV Department of  
Environmental Protection

					1,2-Propanediol	57-55-6	10.00000	0.00153	
					Sorbitol tetraoleate	61723-83-9	2.00000	0.00127	
					Oxirane, 2-methyl-, polymer with oxirane, monodecyl ether	37251-67-5	1.50000	0.00115	
					Amines, tallow alkyl, ethoxylated	61791-26-2	1.00000	0.00064	
					Citric acid	77-92-9	60.00000	0.00054	
					Sodium bromide	7647-15-6	4.00000	0.00045	
					Dibromoacetonitrile	3252-43-5	3.00000	0.00034	
					Alkyloxypolyethyleneoxy ethanol	84133-50-6	0.50000	0.00032	
					Acrylamide	79-06-1	0.10000	0.00006	
					Ethylene glycol	107-21-1	40.00000	0.00003	
					Diethylene glycol (mono) methyl ether	34590-94-8	20.00000	0.00002	
					Ethoxylated alcohols	Proprietary	10.00000	0.00001	Proprietary CAS
					Isopropanol	67-63-0	5.00000	0.00001	
					Diethylene glycol	111-46-6	1.00000	0.00001	
					Tar bases, quinolone derivs	68513-87-1	1.00000	0.00001	
					Cinnamaldehyde	104-55-2	10.00000	0.00001	
					Tar bases, quinolone derivs, benzyl chloride- quaternized	72480-70-7	10.00000	0.00001	
					Formic Acid	64-18-6	10.00000	0.00001	

\* Total Water Volume sources may include various types of water including fresh water, produced water, and recycled water  
\*\* Information is based on the maximum potential for concentration and thus the total may be over 100%  
\*\*\* If you are calculating a percentage of total ingredients do not add the water volume below the green line to the water volume above the green line  
Note: For Field Development Products (products that begin with FDP), MSDS level only information has been provided.  
Ingredient information for chemicals subject to 29 CFR 1910.1200(i) and Appendix D are obtained from suppliers Material Safety Data Sheets (MSDS)

LATITUDE 39°20'00" 3,016'  
 7,934' TO BOTTOM HOLE  
 LATITUDE 39°20'00"

LONGITUDE 80°50'00" 3,323' TO BOTTOM HOLE  
 11,311'

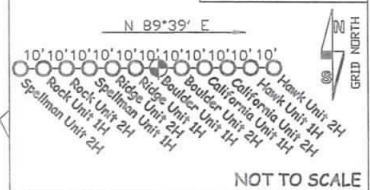
LONGITUDE 80°50'00"

**Antero Resources Corporation**  
**Well No. Boulder Unit 1H**  
**47-017-06798**

**AS DRILLED DATA:**  
**WELL 1H TOP HOLE INFORMATION:**  
 N: 295,052ft E: 1,619,681ft  
 LAT: 39°18'08.21" LON: 80°50'38.36"  
**BOTTOM HOLE INFORMATION:**  
 N: 303,113ft E: 1,614,881ft  
 LAT: 39°19'27.16" LON: 80°51'40.97"  
**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.

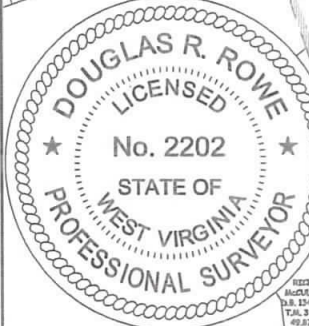
**(NAD) 83 (UTM) ZONE 17 COORDS:**  
**WELL 1H TOP HOLE INFORMATION:**  
 N: 4,350,343m E: 513,466m  
**BOTTOM HOLE INFORMATION:**  
 N: 4,352,774m E: 511,963m

**PAD LAYOUT**



- NOTE**
1. 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.
  2. TOP HOLE DATA SHOWN HEREON WAS PROVIDED BY ALLEGHENY SURVEYS, INC.
  3. AS DRILLED DATA WAS PROVIDED BY ANTERO RESOURCES CORPORATION.
  4. WLS IS NOT CERTIFYING THE DATA AND INFORMATION PROVIDED LISTED IN NOTES 2 AND 3, ONLY THE RELATIONSHIP TO THE DATA AND INFORMATION PROVIDED TO THE LEASE BOUNDARIES.
  5. WLS IS BY NO MEANS RESPONSIBLE FOR ANY ERRORS OR INACCURACIES WITH THE DATA AND INFORMATION THAT HAS BEEN PROVIDED.

WV NORTH ZONE GRID NORTH



JOB # **16-059WA**  
 DRAWING # **BOULDER1HAD**  
 SCALE **1" = 2000'**  
 MINIMUM DEGREE OF ACCURACY **SUBMETER**  
 PROVEN SOURCE OF ELEV. **SUBMETER**  
 SUBMETER MAPPING GRADE GPS

STATE OF WEST VIRGINIA  
 DEPARTMENT OF ENERGY  
 DIVISION OF OIL AND GAS

WELL TYPE: OIL \_\_\_ GAS **X** LIQUID INJECTION \_\_\_ WASTE DISPOSAL \_\_\_  
 (IF "GAS") PRODUCTION **X** STORAGE \_\_\_ DEEP \_\_\_ SHALLOW **X**

LOCATION: ELEVATION **1,135.5' AS BUILT** WATERSHED **HEADWATERS MIDDLE ISLAND CREEK**  
 QUADRANGLE **WEST UNION 7.5'** DISTRICT **CENTRAL** COUNTY **DODDRIDGE**

SURFACE OWNER **JEFFREY K. JONES SR. ET AL** ACREAGE **77.32 ACRES +/-**  
 OIL & GAS ROYALTY OWNER **DONALD L. PIGGOTT; C. BURKE MORRIS ET AL; MICHAEL D. HARRIS; NELL ALLEN; CINDA L. FLEMING ET VIR; RICHARD F. MCCULLOUGH ET UX; JOHN STATLER ET UX; DAVID BOWYER; RICHARD MCCULLOUGH; EUGENE R. WALTON** LEASE ACREAGE **81 AC±; 94 AC±; 32.25 AC±; 176 AC±; 99.25 AC±; 63.5 AC±; 56 AC±; 1.25 AC±; 26 AC±; 137 AC±**

PROPOSED WORK: DRILL \_\_\_ CONVERT \_\_\_ DRILL DEEPER \_\_\_ REDRILL \_\_\_ FRACTURE OR STIMULATE \_\_\_  
 PLUG OFF OLD FORMATION \_\_\_ PERFORATE NEW FORMATION \_\_\_ OTHER PHYSICAL CHANGE IN WELL (SPECIFY) **AS DRILLED** PLUG & ABANDON \_\_\_ CLEAN OUT & REPLUG \_\_\_

TARGET FORMATION **MARCELLUS** ESTIMATED DEPTH **6,610' TVD 15,970' MD**  
 WELL OPERATOR **ANTERO RESOURCES CORP.** DESIGNATED AGENT **DIANNA STAMPER - CT CORPORATION SYSTEM**  
 ADDRESS **1615 WYNKOOP STREET** ADDRESS **5400 D BIG TYLER ROAD**  
**DENVER, CO 80202** **CHARLESTON, WV 25313**

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

DATE **07/17/18**

OPERATOR'S WELL # **BOULDER UNIT #1H**

API WELL # **47 - 017 - 06798**

STATE COUNTY PERMIT



**LEGEND**

- Surface Owner Boundary Lines +/-
- - - Interior Surface Tracts +/-
- Proposed Well Path
- ⊗ As Drilled Well Path

*DR*

DOUGLAS R. ROWE P.S. 2202

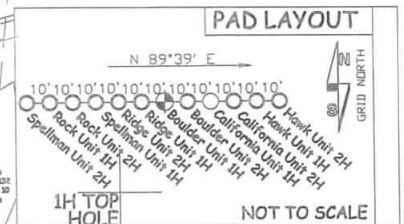
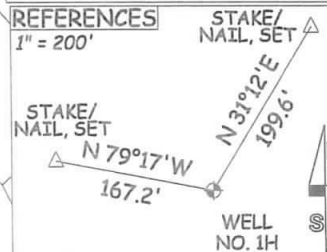
LATITUDE 39°20'00" 3,016'  
 7,934' TO BOTTOM HOLE  
 LATITUDE 39°20'00"

LONGITUDE 80°50'00" 3,323' TO BOTTOM HOLE  
 11,311'

**Antero Resources Corporation**  
**Well No. Boulder Unit 1H**  
**47-017-06798**

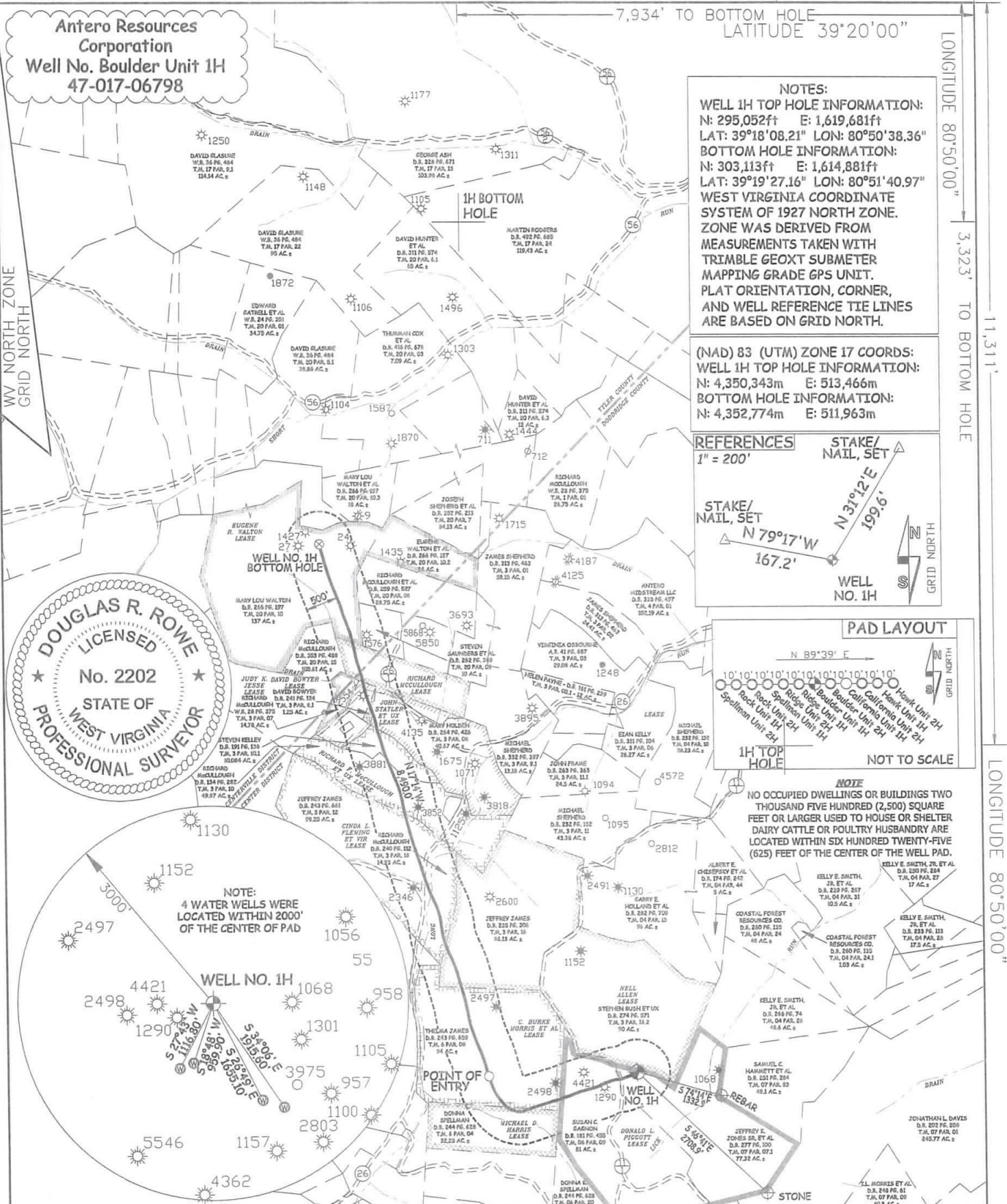
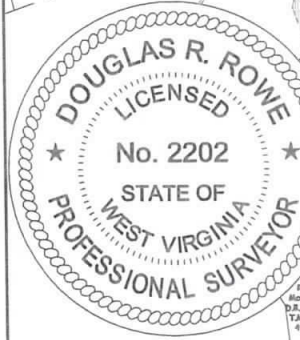
**NOTES:**  
**WELL 1H TOP HOLE INFORMATION:**  
 N: 295,052ft E: 1,619,681ft  
 LAT: 39°18'08.21" LON: 80°50'38.36"  
**BOTTOM HOLE INFORMATION:**  
 N: 303,113ft E: 1,614,881ft  
 LAT: 39°19'27.16" LON: 80°51'40.97"  
**WEST VIRGINIA COORDINATE SYSTEM OF 1927 NORTH ZONE. ZONE WAS DERIVED FROM MEASUREMENTS 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 1H TOP HOLE INFORMATION:**  
 N: 4,350,343m E: 513,466m  
**BOTTOM HOLE INFORMATION:**  
 N: 4,352,774m E: 511,963m



**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.

WV NORTH ZONE  
 GRID NORTH



**NOTE:**  
 4 WATER WELLS WERE LOCATED WITHIN 2000' OF THE CENTER OF PAD

JOB # 16-059WA  
 DRAWING # BOULDER1HMOD  
 SCALE 1" = 2000'  
 MINIMUM DEGREE OF ACCURACY SUBMETER  
 PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS

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

**LEGEND**

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

DOUGLAS R. ROWE P.S. 2202

DATE 07/16/18

OPERATOR'S WELL# BOULDER UNIT #1H

API WELL # 47 - 017 - 06798

STATE            COUNTY            PERMIT           

STATE OF WEST VIRGINIA DEPARTMENT OF ENERGY DIVISION OF OIL AND GAS  
 WELL TYPE: OIL            GAS X LIQUID INJECTION            WASTE DISPOSAL             
 (IF "GAS") PRODUCTION X STORAGE            DEEP            SHALLOW X  
 LOCATION: ELEVATION 1,135.5' AS BUILT WATERSHED HEADWATERS MIDDLE ISLAND CREEK  
 QUADRANGLE WEST UNION 7.5' DISTRICT CENTRAL COUNTY DODDRIDGE

SURFACE OWNER JEFFREY K. JONES SR. ET AL ACREAGE 77.32 ACRES +/-  
 OIL & GAS ROYALTY OWNER DONALD L. PIGGOTT; C. BURKE MORRIS ET AL; MICHAEL D. HARRIS; LEASE ACREAGE 81 AC±; 94 AC±; 32.25 AC±;  
NELL ALLEN; CINDA L. FLEMING ET VIR; RICHARD F. MCCULLOUGH ET UX; JOHN STATLER ET UX;  
DAVID BOWYER; RICHARD MCCULLOUGH; EUGENE R. WALTON 176 AC±; 99.25 AC±; 63.5 AC±; 56 AC±;  
 1.25 AC±; 26 AC±; 137 AC±

PROPOSED WORK: DRILL            CONVERT            DRILL DEEPER            REDRILL            FRACTURE OR STIMULATE X  
 PLUG OFF OLD FORMATION            PERFORATE NEW FORMATION X OTHER PHYSICAL CHANGE IN WELL  
 (SPECIFY) MOD POE PLUG & ABANDON            CLEAN OUT & REPLUG             
 TARGET FORMATION MARCELLUS ESTIMATED DEPTH 6,810' TVD 15,970' MD  
 WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM  
 ADDRESS 1615 WYNKOOP STREET ADDRESS 5400 D BIG TYLER ROAD  
DENVER, CO 80202 CHARLESTON, WV 25313