

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

API 47 - 017 - 06818 County Doddridge District West Union  
 Quad West Union 7.5' Pad Name Middle Pad Field/Pool Name ----  
 Farm name Antero Resources Corporation Well Number Chalk 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 4352584.207m Easting 516702.091m  
 Landing Point of Curve Northing 4352408.75m Easting 517095.67m  
 Bottom Hole Northing 4350194.639m Easting 518037.876m

Elevation (ft) 843' 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 6/19/2017 Date drilling commenced 9/29/2017 Date drilling ceased 3/3/2018  
 Date completion activities began 6/5/2018 Date completion activities ceased 9/20/2018  
 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 None Identified Open mine(s) (Y/N) depths No  
 Salt water depth(s) ft None Identified 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 by:

WR-35  
Rev. 8/23/13

API 47-017 - 06818 Farm name Antero Resources Corporation Well number Chalk Unit 1H

CASING STRINGS	Hole Size	Casing Size	Depth	New or Used	Grade wt/ft	Basket Depth(s)	Did cement circulate (Y/N) * Provide details below*
Conductor	24"	20"	95'	New	94#, H-40	N/A	Y
Surface	17-1/2"	13-3/8"	531'	New	54#, J-55	N/A	Y
Coal							
Intermediate 1	12-1/4"	9-5/8"	2610'	New	36#, J-55	N/A	Y
Intermediate 2							
Intermediate 3							
Production	8-3/4"/8-1/2"	5-1/2"	15475'	New	23#, HCP-110	N/A	Y
Tubing		2-3/8"	6649'		4.7#, P-110		
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	204 sx	15.6	1.18	241	0'	8 Hrs.
Surface	Class A	480 sx	15.6	1.21	581	0'	8 Hrs.
Coal							
Intermediate 1	Class A	880 sx	15.6	1.21	1065	0'	8 Hrs.
Intermediate 2							
Intermediate 3							
Production	Class H	651 sx (Lead) 1425 sx (Tail)	13.5(Lead), 15.2 (Tail)	1.53 (Lead), 1.83 (Tail)	3604	~500' into Intermediate Casing	8 Hrs.
Tubing							

Drillers TD (ft) 15475' MD, 6551' TVD (BHL), 6554' (Deepest Point Drilled) Loggers TD (ft) 15475' MD

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

Plug back procedure N/A

Kick off depth (ft) 5797'

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 \_\_\_\_\_

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



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<u>PRODUCING FORMATION(S)</u>	<u>DEPTHS</u>		
Marcellus	6366' (TOP)	TVD	6672' (TOP) 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 13461.74 mcfpd Oil 174.13 bpd NGL --- bpd Water 652.22 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**


Please insert additional pages as applicable.

Drilling Contractor Frontier Drilling LLC  
Address 562 Spring Run Road City Pennsboro State WV Zip 26415

Logging Company Nine Energy Service  
Address 125 Museum Rd City Washington State PA Zip 15301

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

Stimulating Company Haliburton  
Address 121 Champion Way City Canonsburg State PA Zip 15317

Please insert additional pages as applicable.

Completed by Karin Cox Telephone 303-357-6820  
Signature \_\_\_\_\_ Title Permitting Agent Date \_\_\_\_\_

## API 47-017-06818 Farm Name Antero Resources Corp Well Number Chalk Unit 1H

## EXHIBIT 1

Stage No.	Perforation Date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formations
1	6/5/2018	15270.7	15370.9	60	Marcellus
2	6/7/2018	15071.944	15239.574	60	Marcellus
3	6/7/2018	14873.188	15040.818	60	Marcellus
4	6/8/2018	14674.432	14842.062	60	Marcellus
5	6/8/2018	14475.676	14643.306	60	Marcellus
6	6/8/2018	14276.92	14444.55	60	Marcellus
7	6/9/2018	14078.164	14245.794	60	Marcellus
8	6/9/2018	13879.408	14047.038	60	Marcellus
9	6/9/2018	13680.652	13848.282	60	Marcellus
10	6/10/2018	13481.896	13649.526	60	Marcellus
11	6/10/2018	13283.14	13450.77	60	Marcellus
12	6/19/2018	13084.384	13252.014	60	Marcellus
13	6/20/2018	12885.628	13053.258	60	Marcellus
14	6/21/2018	12686.872	12854.502	60	Marcellus
15	6/21/2018	12488.116	12655.746	60	Marcellus
16	6/22/2018	12289.36	12456.99	60	Marcellus
17	6/22/2018	12090.604	12258.234	60	Marcellus
18	6/23/2018	11891.848	12059.478	60	Marcellus
19	6/23/2018	11693.092	11860.722	60	Marcellus
20	6/24/2018	11494.336	11661.966	60	Marcellus
21	6/24/2018	11295.58	11463.21	60	Marcellus
22	6/24/2018	11096.824	11264.454	60	Marcellus
23	6/25/2018	10898.068	11065.698	60	Marcellus
24	6/26/2018	10699.312	10866.942	60	Marcellus
25	6/28/2018	10500.556	10668.186	60	Marcellus
26	6/29/2018	10301.8	10469.43	60	Marcellus
27	6/29/2018	10103.044	10270.674	60	Marcellus
28	6/30/2018	9904.288	10071.918	60	Marcellus
29	6/30/2018	9705.532	9873.162	60	Marcellus
30	6/30/2018	9506.776	9674.406	60	Marcellus
31	7/1/2018	9308.02	9475.65	60	Marcellus
32	7/2/2018	9109.264	9276.894	60	Marcellus
33	7/2/2018	8910.508	9078.138	60	Marcellus
34	7/2/2018	8711.752	8879.382	60	Marcellus
35	7/2/2018	8512.996	8680.626	60	Marcellus
36	7/3/2018	8314.24	8481.87	60	Marcellus
37	7/3/2018	8115.484	8283.114	60	Marcellus
38	7/3/2018	7916.728	8084.358	60	Marcellus
39	7/4/2018	7717.972	7885.602	60	Marcellus
40	7/4/2018	7519.216	7686.846	60	Marcellus
41	7/5/2018	7320.46	7488.09	60	Marcellus
42	7/5/2018	7121.704	7289.334	60	Marcellus
43	7/5/2018	6922.948	7090.578	60	Marcellus
44	7/6/2018	6724.192	6891.822	60	Marcellus

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**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	6/5/2018	73.1	7741	5381	3885	258270	5859.214	N/A
2	6/7/2018	75.46	8119	5725	5621	397440	7964.881	N/A
3	6/7/2018	76.8	7954	5152	3813	395760	7871.31	N/A
4	6/8/2018	77.27	7617	5759	4095	401680	8374.524	N/A
5	6/8/2018	77.8	7551	6068	4110	402100	7897.762	N/A
6	6/8/2018	77.16	7780	6005	4350	398920	8244.286	N/A
7	6/9/2018	76.93	7829	6039	3964	396140	8111.19	N/A
8	6/9/2018	77.7	7716	5999	3899	400920	8178.595	N/A
9	6/9/2018	64.03	8197	5532	4746	403240	11341.6	N/A
10	6/10/2018	71.9	7924	5077	4157	399140	8330.619	N/A
11	6/10/2018	55.65	8233	5854	0	359780	12501.5	N/A
12	6/19/2018	71.14	7431	9589	4057	406540	12862.93	N/A
13	6/20/2018	67	6484	6484	8709	179940	7494.548	N/A
14	6/21/2018	79.52	7463	5856	4492	405330	9435.31	N/A
15	6/21/2018	75.4	7025	5866	3749	396900	10055.74	N/A
16	6/22/2018	56.14	8018	5786	4433	398140	11748.19	N/A
17	6/22/2018	66.58	8510	6134	6169	403760	10264.26	N/A
18	6/23/2018	74.55	7431	6007	4034	411200	8568.643	N/A
19	6/23/2018	66.45	7621	6112	3836	403960	9072.762	N/A
20	6/24/2018	71.71	7087	5957	4831	384260	8132.833	N/A
21	6/24/2018	73.38	6223	6223	3779	406980	8141.905	N/A
22	6/24/2018	70.96	7627	6339	7116	339110	8291.5	N/A
23	6/25/2018	79.18	7750	6103	4814	423780	9132.548	N/A
24	6/26/2018	74.38	7141	6020	4439	423920	8771.024	N/A
25	6/28/2018	75.29	7370	5051	3700	420650	8512.5	N/A
26	6/29/2018	77.57	7210	5750	5105	403220	9143.286	N/A
27	6/29/2018	75.6	7382	6109	5209	238360	6285.048	N/A
28	6/30/2018	71.18	6778	5289	5545	400520	8114.5	N/A
29	6/30/2018	74.41	6876	5960	4843	421390	8725	N/A
30	6/30/2018	74.47	7109	5893	4196	404920	8186	N/A
31	7/1/2018	78.2	6520	5986	4443	397460	8080.429	N/A
32	7/2/2018	77.2	6977	6290	3783	419450	8727	N/A
33	7/2/2018	73.78	6986	5754	5033	419840	8757.357	N/A
34	7/2/2018	65.23	6690	6450	4255	398700	9184.31	N/A
35	7/2/2018	75.6	6645	5931	4127	418340	8382	N/A
36	7/3/2018	77.26	6553	5952	4442	423530	8513.476	N/A
37	7/3/2018	71.6	6552	5776	4888	401520	10975.1	N/A
38	7/3/2018	77	6650	5701	5089	423390	8380	N/A
39	7/4/2018	75	6456	5963	4049	422390	8566	N/A
40	7/4/2018	71.86	6602	5535	3986	417590	8321.595	N/A
41	7/5/2018	76.6	6538	5559	4647	416630	8185.31	N/A
42	7/5/2018	76.56	6614	5987	4056	403480	7969.143	N/A
43	7/5/2018	76	6798	5958	3822	402860	7884.286	N/A
44	7/6/2018	77	6826	6599	3715	400760	8265.619	N/A
<b>AVG=</b>		<b>73</b>	<b>7,241</b>	<b>5,967</b>	<b>4,455</b>	<b>17,252,210</b>	<b>385,806</b>	<b>TOTAL</b>

API 47-017-06818 Farm Name Antero Resources Corp Well Number Chalk Unit 1H				
EXHIBIT 3				
LITHOLOGY/ FORMATION	TOP DEPTH (TVD) From Surface	BOTTOM DEPTH (TVD) From Surface	TOP DEPTH (MD) From Surface	BOTTOM DEPTH (MD) From Surface
Sandstone	0	177	0	177
Sandstone tr coal	est. 177	217	est. 177	217
Sandy shale	est. 217	232	est. 217	232
Calcareous Shale	est. 232	319	est. 232	319
Sandstone	est. 319	373	est. 319	373
Calcareous Shale	est. 373	1,065	est. 373	1,065
Silty Sandstone	est. 1065	1,137	est. 1065	1,137
Silty shale	est. 1137	1,287	est. 1137	1,287
Sandy Shale	est. 1287	1,357	est. 1287	1,357
Shale	est. 1357	1,557	est. 1357	1,567
Big Lime	1,557	2,192	1,567	2,213
Fifty Foot Sandstone	2,192	2,444	2,213	2,470
Gordon	2,444	2,664	2,470	2,694
Fifth Sandstone	2,664	2,729	2,694	2,761
Bayard	2,729	3,531	2,761	3,578
Speechley	3,531	3,817	3,578	3,870
Balltown	3,817	4,328	3,870	4,388
Bradford	4,328	4,743	4,388	4,810
Benson	4,743	4,998	4,810	5,068
Alexander	4,998	5,979	5,068	6,077
Sycamore	5,979	6,164	6,077	6,298
Middlesex	6,164	6,296	6,298	6,509
Burkett	6,296	6,325	6,509	6,569
Tully	6,325	6,366	6,569	6,672
Marcellus	6,366	NA	6,672	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.

# Hydraulic Fracturing Fluid Product Component Information Disclosure

Job Start Date:	7/6/2018
Job End Date:	7/6/2018
State:	West Virginia
County:	Doddridge
API Number:	47-017-06818-00-00
Operator Name:	Antero Resources Corporation
Well Name and Number:	Chalk 1H
Latitude:	39.32241667
Longitude:	-80.79103000
Datum:	NAD83
Federal Well:	NO
Indian Well:	NO
True Vertical Depth:	6,554
Total Base Water Volume (gal):	16,568,373
Total Base Non Water Volume:	0



## 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
Fresh Water	Operator	Base Fluid					
			Water	7732-18-5	100.00000	88.68543	Density = 8.330
Ingredients	Listed Above	Listed Above					
			Water	7732-18-5	100.00000	0.16757	



WG-36 GELLING AGENT	Halliburton	Gelling Agent						
EXCELERATE PS-2	Halliburton	Friction Reducer				Listed Below		
SP BREAKER	Halliburton	Breaker				Listed Below		
MC B-8614	Halliburton	Biocide				Listed Below		
SAND-PREMIUM WHITE-40/70, BULK	Halliburton	Proppant				Listed Below		
HAI-OS ACID INHIBITOR	Halliburton	Corrosion Inhibitor				Listed Below		
SAND-COMMON WHITE-100 MESH, SSA-2, BULK (100003676)	Halliburton	Proppant				Listed Below		
SCALECHEK LP-70	Halliburton	Scale Inhibitor				Listed Below		

HYDROCHLORIC ACID	Halliburton	Solvent							
					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		11.08602	
			Guar gum	9000-30-0		100.00000		0.03067	
			Hydrochloric acid	7647-01-0		15.00000		0.01775	
			Acrylamide acrylate polymer	Proprietary		30.00000		0.01692	Denise Tuck, Halliburton, 3000 N. Sam Houston Pkwy E., Houston, TX 77032, 281-871-6226
			Inorganic salt	Proprietary		30.00000		0.01692	
			Hydrotreated light petroleum distillate	64742-47-8		30.00000		0.01692	
			Ethylene glycol	107-21-1		60.00000		0.00819	
			Glutaraldehyde	111-30-8		30.00000		0.00262	
			Telmer	Proprietary		10.00000		0.00136	
			Sodium persulfate	7775-27-1		100.00000		0.00060	
			Quaternary ammonium compounds, benzyl-C12-16-alkyldimethyl chlorides	68424-85-1		5.00000		0.00044	
			Methanol	67-56-1		60.00000		0.00014	
			Sodium polyacrylate	9003-04-7		1.00000		0.00014	
			Ethanol	64-17-5		1.00000		0.00009	
			Modified thiourea polymer	Proprietary		30.00000		0.00006	
			Ethoxylated alcohols	Proprietary		30.00000		0.00006	
			Fatty acids, tall oil	Proprietary		30.00000		0.00006	
			Olefins	Proprietary		5.00000		0.00003	
			Propargyl alcohol	107-19-7		10.00000		0.00002	
			Phosphoric acid	7664-38-2		0.10000		0.00001	
			Acrylic acid	79-10-7		0.01000		0.00000	



11,759' to Bottom Hole

4,227' to Top Hole

LATITUDE 39 - 20 - 00

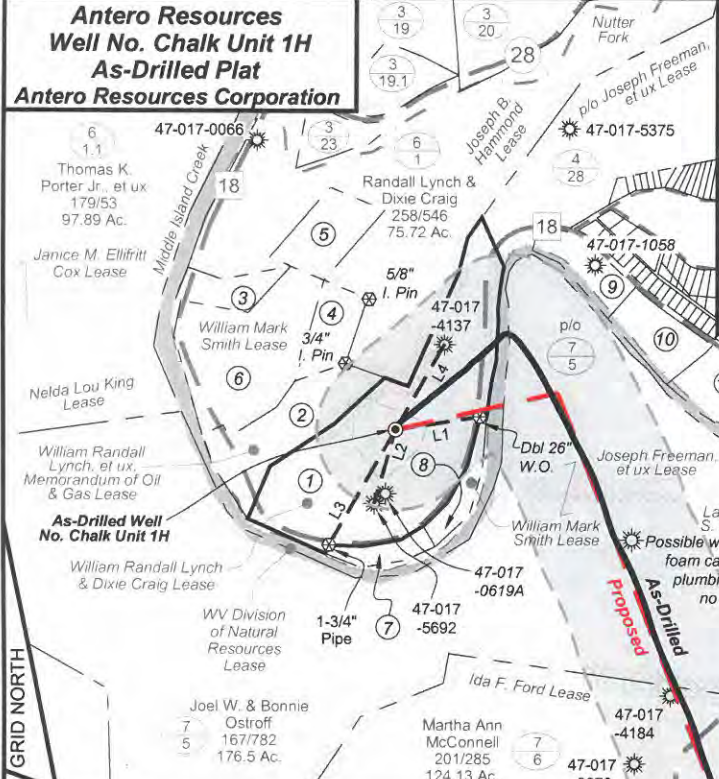
02/08/2019

TOP LONGITUDE 80 - 47 - 30

BTM LONGITUDE 80 - 45 - 00

3,913' to Top Hole

11,661' to Bottom Hole



TM/Par	Bk / Pg	Acres	Owner(s)
1	6/2	214 / 279	32.19
2	6/2.5	253 / 222	8.66
3	6/2.8	305 / 419	2.68
4	6/2.6	266 / 36	3.52
5	6/1.3	305 / 416	4.68
6	6/2.4	163 / 44	12.30
7	6/2.3	197 / 659	1.82
8	6/2.7	294 / 473	2.16
9	6/7	AP 35 / 212	3.46
10	7/4.2	293 / 340	4.19
11	7/4.1	301 / 466	5.49
12	7/4	301 / 464	6.14
13	6/3.1	237 / 371	8.78
14	7/23	129 / 38	99.52

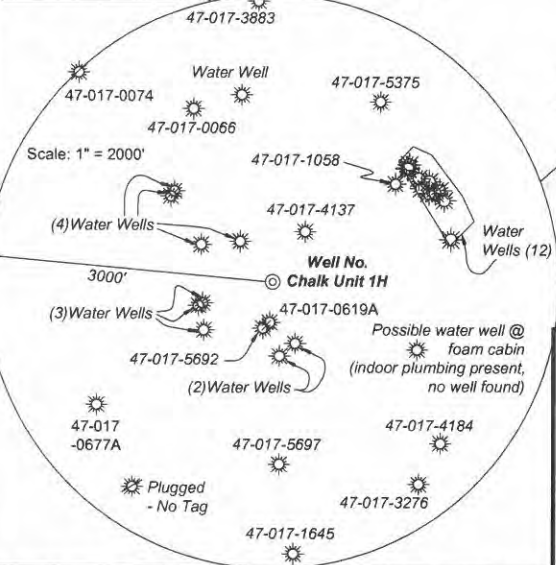
I, the undersigned, hereby certify that this plat is correct to the best of my knowledge and belief and shows all the information required by law and the rules issued and prescribed by the Department of Environmental Protection.

*Bradley D. Miller*  
**Bradley D. Miller, P.S. 2167**

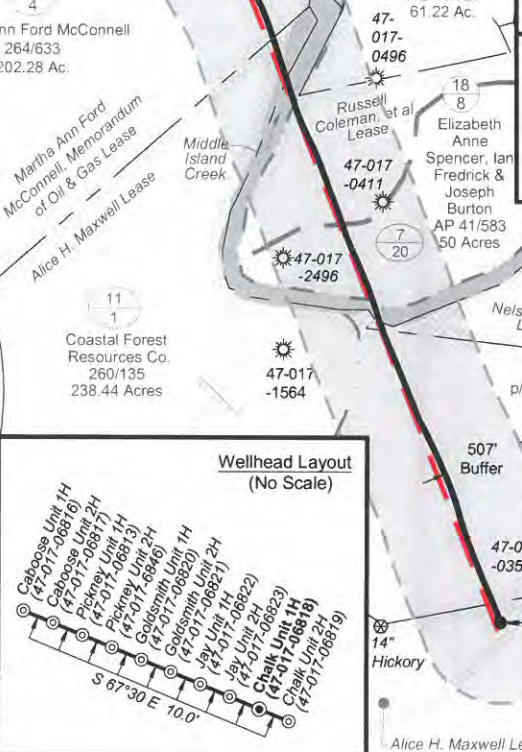
**Notes:**  
 West Virginia Coordinate System of 1927, North Zone based upon Differential GPS Measurements.  
 Well No. Chalk Unit 1H Top Hole coordinates are N: 302,230.16' Longitude: 39°19'20.72" E: 1,630,421.50' Longitude: 80°48'23.06"  
 Bottom Hole coordinates are N: 294,315.49' Longitude: 39°18'03.11" E: 1,634,674.12' Longitude: 80°47'27.51"  
 UTM Zone 17, NAD 1983  
 Top Hole Coordinates Bottom Hole Coordinates  
 N: 4,352,584.207m N: 4,350,194.639m  
 E: 516,702.091m E: 518,037.876m  
 Plat orientation and corner and well references are based upon the grid north meridian.  
 Well location references are based upon the magnetic meridian.

Top Hole Coordinates, As-drilled data and information was provided by Antero Resources Corporation. Allegheny Surveys Inc. (ASI) is not certifying the data and information provided. ASI is not responsible for any errors or inaccuracies with the data and information that has been provided.

(+ ⊙) Denotes Location of Well on United States Topographic Maps



Note: It appears 23 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.



**Legend**

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

	Bearing	Dist.
L1	S 80°10' W	533.7'
L2	N 15°50' E	484.4'
L3	N 29°37' E	835.8'
L4	S 29°47' W	619.4'



FILE NO: 237-30-WU-14  
 DRAWING NO: Chalk 1H As-Drilled Well Plat  
 SCALE: 1" = 1200'  
 MINIMUM DEGREE OF ACCURACY: Submeter  
 PROVEN SOURCE OF ELEVATION: CORS, Marietta, OH

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

DATE: January 16 2019  
 Operator's Well No. Chalk Unit 1H  
**API WELL NO**  
 47 - 017 - 06818  
**STATE COUNTY PERMIT**

WELL TYPE:  OIL  GAS  LIQUID INJECTION  WASTE DISPOSAL  
 (IF GAS) PRODUCTION:  STORAGE  DEEP  SHALLOW  
 LOCATION: ELEVATION: As-Built Grade - 843' WATERSHED: Headwaters Middle Island Creek QUADRANGLE: West Union  
 DISTRICT: West Union COUNTY: Doddridge 100; 32.15;  
 SURFACE OWNER: William Randall Lynch & Dixie Craig ACREAGE: 32.19 600; 180; 56.07;  
 ROYALTY OWNER: William Randall Lynch & Dixie Craig; Joseph Freeman, et ux; Ida F. Ford (2) LEASE NO: ACREAGE: 50; 420; 102.85  
 PROPOSED WORK:  DRILL  CONVERT  DRILL DEEPER  FRACTURE OR STIMULATE  PLUG OFF OLD FORMATION  
 PERFORATE NEW FORMATION  OTHER PHYSICAL CHANGE IN WELL (SPECIFY) As-Drilled 6,551' TVD  
 PLUG AND ABANDON  CLEAN OUT AND REPLUG TARGET FORMATION: Marcellus Shale ESTIMATED DEPTH: 15,475' MD

WELL OPERATOR: Antero Resources Corporation DESIGNATED AGENT: Dianna Stamper - CT Corporation System  
 ADDRESS: 1615 Wynkoop Street ADDRESS: 5400 D Big Tyler Road  
 Denver, CO 80202 Charleston, WV 25313