

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

API 47-017-06816 County Doddridge District West Union  
 Quad West Union 7.5' Pad Name Middle Pad Field/Pool Name -----  
 Farm name Antero Resources Corporation Well Number Caboose 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 4352593.142m Easting 516679.464m  
 Landing Point of Curve Northing 4352597.76m Easting 516157.5m  
 Bottom Hole Northing 4355050.782m Easting 515098.474m

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 4/11/2017 Date drilling commenced 9/29/2017 Date drilling ceased 4/14/2018  
 Date completion activities began 7/16/2018 Date completion activities ceased 9/13/2018  
 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 - 06816 Farm name Antero Resources Corporation Well number Caboose 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"	112'	New	94#, H-40	N/A	Y
Surface	17-1/2"	13-3/8"	551'	New	54#, J-55	N/A	Y
Coal							
Intermediate 1	12-1/4"	9-5/8"	2666'	New	36#, J-55	N/A	Y
Intermediate 2							
Intermediate 3							
Production	8-3/4"/8-1/2"	5-1/2"	15798'	New	23#, HCP-110	N/A	Y
Tubing		2-3/8"	6690'		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	490 sx	15.6	1.21	593	0'	8 Hrs.
Coal							
Intermediate 1	Class A	890 sx	15.6	1.22	1086	0'	8 Hrs.
Intermediate 2							
Intermediate 3							
Production	Class H	716 sx (Lead) 1435 sx (Tail)	14(Lead), 15.2 (Tail)	1.45 (Lead), 1.83 (Tail)	3664	-500' into Intermediate Casing	8 Hrs.
Tubing							

Drillers TD (ft) 15798' MD, 6406' TVD (BHL), 6408' (Deepest Point Drilled) Loggers TD (ft) 15798' MD  
 Deepest formation penetrated Marcellus Plug back to (ft) N/A  
 Plug back procedure N/A

Kick off depth (ft) 5622'

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



WR-35  
Rev. 8/23/13

API 47- 017 - 06816 Farm name Antero Resources Corporation Well number Caboose Unit 1H

PRODUCING FORMATION(S)	DEPTHS	
Marcellus	6333' (TOP) TVD	6745' (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 11983.41 mcfpd Oil 98.08 bpd NGL --- bpd Water 578.62 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 47-017-06816 Farm Name Antero Resources Corp Well Number Caboose Unit 1H

**EXHIBIT 1**

Stage No.	Perforation Date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formations
1	7/16/2018	15595.6	15695	60	Marcellus
2	8/9/2018	15395.626	15564.271	60	Marcellus
3	8/9/2018	15195.652	15364.297	60	Marcellus
4	8/10/2018	14995.678	15164.323	60	Marcellus
5	8/10/2018	14795.704	14964.349	60	Marcellus
6	8/10/2018	14595.73	14764.375	60	Marcellus
7	8/11/2018	14395.756	14564.401	60	Marcellus
8	8/11/2018	14195.782	14364.427	60	Marcellus
9	8/11/2018	13995.808	14164.453	60	Marcellus
10	8/12/2018	13795.834	13964.479	60	Marcellus
11	8/12/2018	13595.86	13764.505	60	Marcellus
12	8/12/2018	13395.886	13564.531	60	Marcellus
13	8/13/2018	13195.912	13364.557	60	Marcellus
14	8/13/2018	12995.938	13164.583	60	Marcellus
15	8/14/2018	12795.964	12964.609	60	Marcellus
16	8/14/2018	12595.99	12764.635	60	Marcellus
17	8/14/2018	12396.016	12564.661	60	Marcellus
18	8/15/2018	12196.042	12364.687	60	Marcellus
19	8/15/2018	11996.068	12164.713	60	Marcellus
20	8/15/2018	11796.094	11964.739	60	Marcellus
21	8/15/2018	11596.12	11764.765	60	Marcellus
22	8/16/2018	11396.146	11564.791	60	Marcellus
23	8/16/2018	11196.172	11364.817	60	Marcellus
24	8/16/2018	10996.198	11164.843	60	Marcellus
25	8/16/2018	10796.224	10964.869	60	Marcellus
26	8/17/2018	10596.25	10764.895	60	Marcellus
27	8/17/2018	10396.276	10564.921	60	Marcellus
28	8/17/2018	10196.302	10364.947	60	Marcellus
29	8/17/2018	9996.328	10164.973	60	Marcellus
30	8/18/2018	9796.354	9964.999	60	Marcellus
31	8/18/2018	9596.38	9765.025	60	Marcellus
32	8/18/2018	9396.406	9565.051	60	Marcellus
33	8/19/2018	9196.432	9365.077	60	Marcellus
34	8/19/2018	8996.458	9165.103	60	Marcellus
35	8/19/2018	8796.484	8965.129	60	Marcellus
36	8/19/2018	8596.51	8765.155	60	Marcellus
37	8/20/2018	8396.536	8565.181	60	Marcellus
38	8/20/2018	8196.562	8365.207	60	Marcellus
39	8/20/2018	7996.588	8165.233	60	Marcellus
40	8/21/2018	7796.614	7965.259	60	Marcellus
41	8/21/2018	7596.64	7765.285	60	Marcellus
42	8/21/2018	7396.666	7565.311	60	Marcellus
43	8/21/2018	7196.692	7365.337	60	Marcellus
44	8/21/2018	6996.718	7165.363	60	Marcellus
45	8/22/2018	6796.744	6965.389	60	Marcellus

## API 47-017-06816 Farm Name Antero Resources Corp Well Number Caboose Unit 1H

## 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	7/16/2018	75.46	7228	0	3518	265500	6207.262	N/A
2	8/9/2018	71.47	7998	5721	3285	404600	8676.762	N/A
3	8/9/2018	74.9	7899	4257	3333	406820	8737.31	N/A
4	8/10/2018	73.4	7949	4204	3473	407580	8620.476	N/A
5	8/10/2018	72.29	7970	6837	3694	413680	8597.69	N/A
6	8/10/2018	71.2	8030	6116	3767	406920	8572.167	N/A
7	8/11/2018	69.2	8002	5936	4540	404360	8392.929	N/A
8	8/11/2018	70.69	8018	5704	3565	406020	8580.119	N/A
9	8/11/2018	70.38	7956	6233	3651	401440	8604.476	N/A
10	8/12/2018	74.6	7987	5718	3942	403100	8285.19	N/A
11	8/12/2018	72.01	7969	5650	3734	404400	8467.071	N/A
12	8/12/2018	70.9	7770	5865	5178	403480	8293.476	N/A
13	8/13/2018	71.6	7915	5762	4608	402280	8240.762	N/A
14	8/13/2018	72.67	8012	5664	3763	405920	8359.286	N/A
15	8/14/2018	72.34	8078	5807	4200	407280	8952.119	N/A
16	8/14/2018	71.76	8075	6298	4924	402180	8549.786	N/A
17	8/14/2018	70	7677	6062	4982	407900	8286.095	N/A
18	8/15/2018	71.2	7904	6475	4293	405320	8302.143	N/A
19	8/15/2018	70.7	7558	6073	4108	402360	8163.81	N/A
20	8/15/2018	71.36	7573	6329	4038	403200	8278.714	N/A
21	8/15/2018	71	7758	6172	3902	407060	8266.81	N/A
22	8/16/2018	67.6	7701	6426	3880	404900	8138.429	N/A
23	8/16/2018	69.67	7667	4565	3844	405060	8249.381	N/A
24	8/16/2018	66.51	7838	6432	3969	403060	8295.071	N/A
25	8/16/2018	69.5	7846	5874	4064	406020	8179.643	N/A
26	8/17/2018	69.3	7746	6003	4017	405780	8188.357	N/A
27	8/17/2018	69.87	7858	6172	4037	406920	8144.738	N/A
28	8/17/2018	64.88	7695	6059	4892	361584	7539.881	N/A
29	8/17/2018	71.7	7741	5851	5163	327460	7253.381	N/A
30	8/18/2018	69.5	7419	5582	4001	403000	7956.143	N/A
31	8/18/2018	70.55	7433	6171	4210	407200	8330.786	N/A
32	8/18/2018	72.3	7684	5654	5220	407180	9680.048	N/A
33	8/19/2018	70.3	7704	5885	4044	401620	8135.857	N/A
34	8/19/2018	72.76	7274	5945	4261	405780	8188.952	N/A
35	8/19/2018	71.34	7735	6231	4457	407900	8094.786	N/A
36	8/19/2018	71	7811	6273	5318	405400	9043.286	N/A
37	8/20/2018	72.19	7355	5748	4524	396460	7949.286	N/A
38	8/20/2018	73.8	7066	6131	4825	401720	7955.238	N/A
39	8/20/2018	75.4	7424	6138	4201	402770	8022.548	N/A
40	8/21/2018	76.53	7110	6176	4358	402440	7912.905	N/A
41	8/21/2018	74.8	7385	6249	4706	404600	7809.857	N/A
42	8/21/2018	73.23	7330	6203	4425	392430	7993.929	N/A
43	8/21/2018	77.92	7052	6487	5344	402300	7841.548	N/A
44	8/21/2018	78.51	7055	6143	4299	407260	8049.048	N/A
45	8/22/2018	76.36	7095	6042	4190	401200	8726.786	N/A
	AVG=	72	7,674	5,807	4,239	17,941,444	371,114	TOTAL

API 47-017-06816 Farm Name Antero Resources Corp Well Number Caboose 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	1,546	est. 1357	1,564
Big Lime	1,546	2,196	1,564	2,240
Fifty Foot Sandstone	2,196	2,470	2,240	2,523
Gordon	2,470	2,661	2,523	2,721
Fifth Sandstone	2,661	2,722	2,721	2,785
Bayard	2,722	3,511	2,785	3,610
Speechley	3,511	3,813	3,610	3,924
Balltown	3,813	4,304	3,924	4,436
Bradford	4,304	4,733	4,436	4,883
Benson	4,733	4,982	4,883	5,144
Alexander	4,982	5,953	5,144	6,164
Sycamore	5,953	6,139	6,164	6,389
Middlesex	6,139	6,263	6,389	6,586
Burkett	6,263	6,293	6,586	6,647
Tully	6,293	6,333	6,647	6,745
Marcellus	6,333	NA	6,745	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:	8/9/2018
Job End Date:	8/22/2018
State:	West Virginia
County:	Doddridge
API Number:	47-017-06816-00-00
Operator Name:	Antero Resources Corporation
Well Name and Number:	Caboose 1H
Latitude:	39.32232300
Longitude:	-80 80458100
Datum:	NAD27
Federal Well:	NO
Indian Well:	NO
True Vertical Depth:	6,408
Total Base Water Volume (gal):	15,913,452
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	87.94246	Density = 8.330
Ingredients	Listed Above	Listed Above					
			Water	7732-18-5	100.00000	0.11948	





Items above are Trade Names with the exception of Base Water. Items below are the individual ingredients.						
				Crystalline silica, quartz	14808-60-7	11.90294
				Hydroreated light petroleum distillate	64742-47-8	0.01654
				Inorganic salt	Proprietary	0.01654
				Acrylamide acrylate polymer	Proprietary	0.01654
				Hydrochloric acid	7647-01-0	0.01058
				Ethylene glycol	107-21-1	0.00851
				Guar gum	9000-30-0	0.00532
				Glutaraldehyde	111-30-8	0.00267
				Telmer	Proprietary	0.00142
				Sodium persulfate	7775-27-1	0.00056
				Quaternary ammonium compounds, benzyl-C12-16-alkyldimethyl chlorides	68424-85-1	0.00045
				Sodium polyacrylate	9003-04-7	0.00014
				Ethanol	64-17-5	0.00009
				Methanol	67-56-1	0.00001
				Phosphoric acid	7664-38-2	0.00001
				Acrylic acid	79-10-7	0.00000
				Sodium sulfate	7757-82-6	0.00000

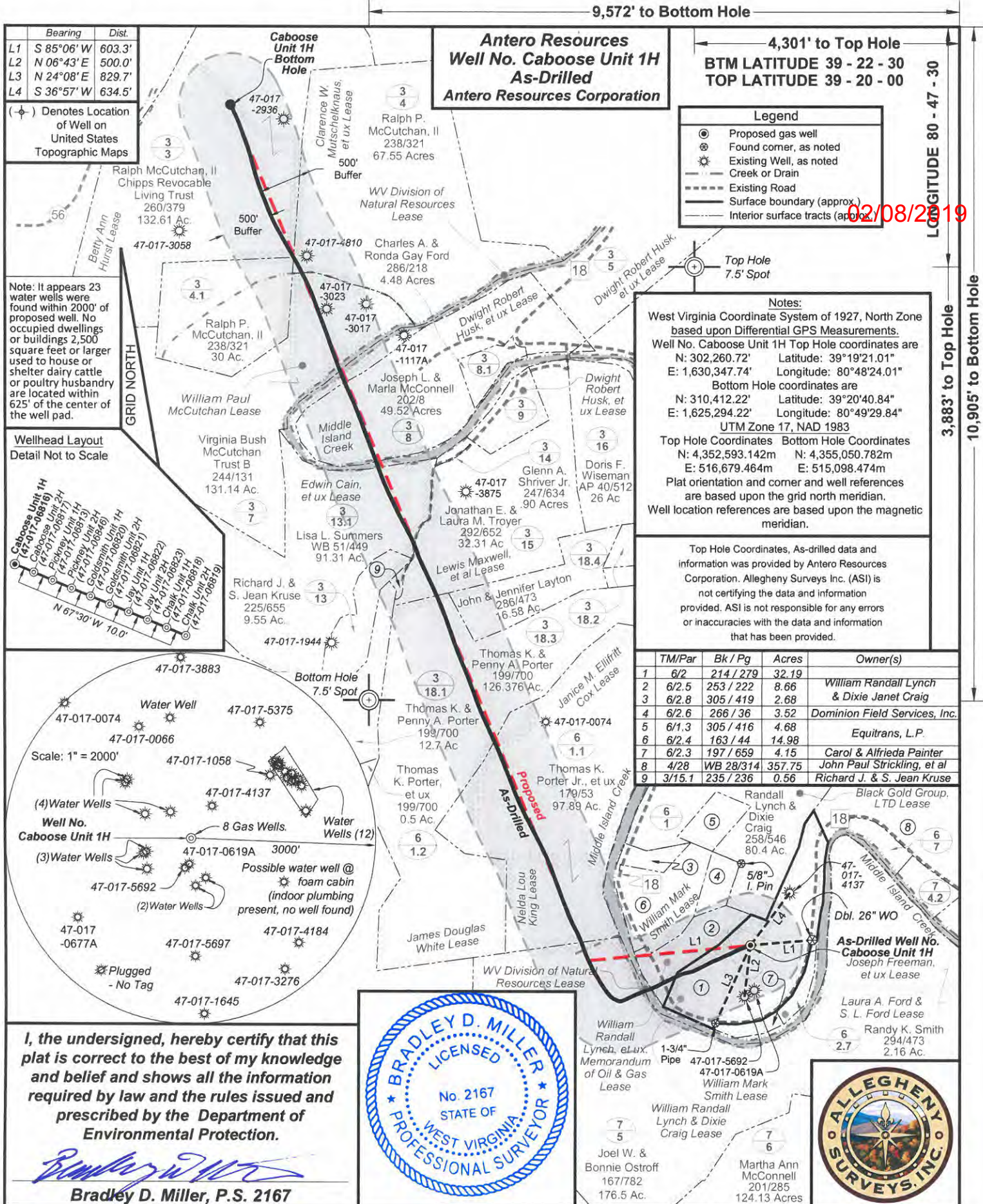
\* Total Water Volume sources may include various types of water including fresh water, produced water, and recycled water

\*\* 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.

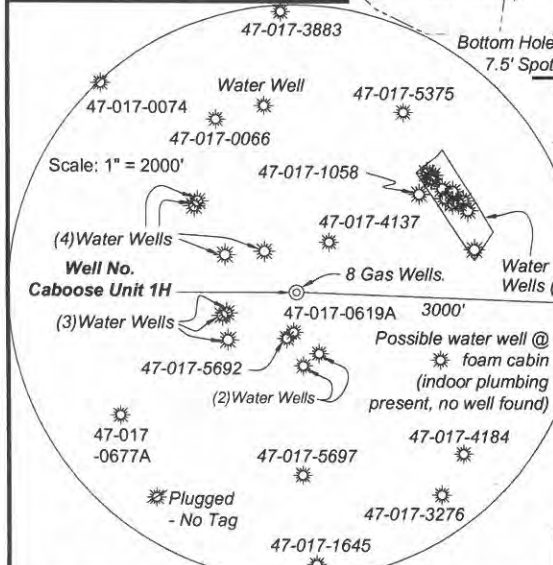
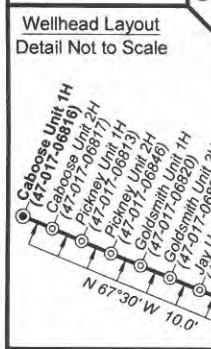
Ingredient information for chemicals subject to 29 CFR 1910.1200(f) and Appendix D are obtained from suppliers Material Safety Data Sheets (MSDS)



Bearing	Dist.
L1 S 85°06' W	603.3'
L2 N 06°43' E	500.0'
L3 N 24°08' E	829.7'
L4 S 36°57' W	634.5'

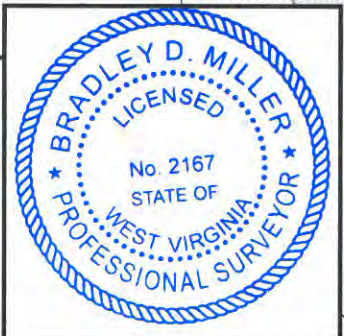
(⊕) Denotes Location of Well on United States Topographic Maps

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.



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**



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

**Notes:**  
 West Virginia Coordinate System of 1927, North Zone based upon Differential GPS Measurements.  
 Well No. Caboose Unit 1H Top Hole coordinates are  
 N: 302,260.72' Latitude: 39°19'21.01"  
 E: 1,630,347.74' Longitude: 80°48'24.01"  
 Bottom Hole coordinates are  
 N: 310,412.22' Latitude: 39°20'40.84"  
 E: 1,625,294.22' Longitude: 80°49'29.84"  
 UTM Zone 17, NAD 1983  
 Top Hole Coordinates Bottom Hole Coordinates  
 N: 4,352,593.142m N: 4,355,050.782m  
 E: 516,679.464m E: 515,098.474m  
 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.

TM/Par	Bk / Pg	Acres	Owner(s)
1 6/2	214 / 279	32.19	William Randall Lynch & Dixie Janet Craig
2 6/2.5	253 / 222	8.66	
3 6/2.8	305 / 419	2.68	Dominion Field Services, Inc.
4 6/2.6	266 / 36	3.52	
5 6/1.3	305 / 416	4.68	Equitrans, L.P.
6 6/2.4	163 / 44	14.98	
7 6/2.3	197 / 659	4.15	Carol & Alfreda Painter John Paul Strickling, et al
8 4/28	WB 28/314	357.75	
9 3/15.1	235 / 236	0.56	Richard J. & S. Jean Kruse

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

DATE: January 16 2019  
 OPERATOR'S WELL NO. Caboose Unit 1H  
 API WELL NO  
47 - 017 - 06816  
 STATE COUNTY PERMIT

WELL TYPE:  OIL  GAS  LIQUID INJECTION  WASTE DISPOSAL  
 (IF GAS) PRODUCTION:  STORAGE  DEEP  SHALLOW  
 LOCATION ELEVATION: As-Drilled Grade - 843' WATERSHED: Headwaters Middle Island Creek QUADRANGLE: West Union  
 DISTRICT: West Union CLARENCE W. MUTSCHELKNAUS, et ux; WV Div. of Natural Resources; COUNTY: Doddridge 56.07; 86.5;  
 SURFACE OWNER: William Randall Lynch & Dixie Craig William Randall Lynch, et ux, Memorandum of Oil & Gas Lease; 97; 8.66; 32.15;  
 ROYALTY OWNER: Lewis Maxwell, et al; Dwight Robert Husk, et ux; Edwin Cain, et ux; William Paul McCutchan; James Douglas White; Betty Ann Hurst; 168; 180; 20.25;  
 PROPOSED WORK:  DRILL  CONVERT  DRILL DEEPER  FRACTURE OR STIMULATE  PLUG OFF OLD FORMATION ACREAGE: 32.19 78.75; 32.75; 150;  
 PERFORATE NEW FORMATION  OTHER PHYSICAL CHANGE IN WELL (SPECIFY) As-Drilled ESTIMATED DEPTH: 15,798' MD  
 PLUG AND ABANDON  CLEAN OUT AND REPLUG TARGET FORMATION: Marcellus Shale

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