

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

RECEIVED  
Office of Oil and Gas

OCT 12 2017

WV Department of  
Environmental Protection

API 47-085-10275 County Ritchie District Clay  
Quad Pennsboro 7.5' Pad Name Zinn Pad Field/Pool Name ----  
Farm name Ernest E. Zinn et al Well Number Alliance Unit 2H  
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 4352303m Easting 505343m  
Landing Point of Curve Northing 4352122.232m Easting 505300.446m  
Bottom Hole Northing 4349792m Easting 506251m

Elevation (ft) 1120' 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 01/29/2016 Date drilling commenced 02/07/2016 Date drilling ceased 05/12/2016  
Date completion activities began 12/12/2016 Date completion activities ceased 03/26/2017  
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' Open mine(s) (Y/N) depths No  
Salt water depth(s) ft 1567' 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

**APPROVED**

NAME: Michael Duff

DATE: 10-25-17

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

API 47- 085 - 10275 Farm name Ernest E. Zinn et al Well number Alliance Unit 2H

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"	40'	New	94#, K-55	N/A	Y
Surface	17-1/2"	13-3/8"	593'	New	48#, H-40	N/A	Y
Coal							
Intermediate 1	12-1/4"	9-5/8"	2539'	New	36#, J-55	N/A	Y
Intermediate 2							
Intermediate 3							
Production	8-3/4"/8-1/2"	5-1/2"	15114'	New	23#, P-110	N/A	Y
Tubing		2-3/8"	6586'		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	95 sx	15.5	1.19	113	0'	8 Hrs.
Surface	Class A	702 sx	15.6	1.19	835	0'	8 Hrs.
Coal							
Intermediate 1	Class A	960 sx	15.6	1.18	1133	0'	8 Hrs.
Intermediate 2							
Intermediate 3							
Production	Class H	782 sx (Lead) 1389 sx (Tail)	13.5 (Lead), 15.2 (Tail)	1.44 (Lead), 1.83 (Tail)	3668	~500' into Intermediate Casing	8 Hrs.
Tubing							

Drillers TD (ft) 15114' MD, 6434' TVD (BHL), 6440' (Deepest Point Drilled) Loggers TD (ft) 15101' MD  
 Deepest formation penetrated Marcellus Plug back to (ft) N/A  
 Plug back procedure N/A

\*\* This is a subsequent well. Antero only runs wireline logs on one well on a multi-well pad (Norma Unit 1H API #47-085-10169). Please reference the wireline logs submitted with Form WR-35 for Norma Unit 1H. A Cement Bond Log has been included with this submittal.

Kick off depth (ft) 5569'

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



API 47- 085 - 10275 Farm name Ernest E. Zinn et al Well number Alliance Unit 2H

<u>PRODUCING FORMATION(S)</u>	<u>DEPTHS</u>	
<u>Marcellus</u>	<u>6382' (TOP)</u> TVD	<u>6641' (TOP)</u> MD
_____	_____	_____
_____	_____	_____
_____	_____	_____

Please insert additional pages as applicable.

GAS TEST  Build up  Drawdown  Open Flow OIL TEST  Flow  Pump

SHUT-IN PRESSURE Surface 3000 psi Bottom Hole --- psi DURATION OF TEST --- hrs

OPEN FLOW Gas 8651 mcfpd Oil 114 bpd NGL --- bpd Water 753 bpd GAS MEASURED BY  Estimated  Orifice  Pilot

LITHOLOGY/ FORMATION	TOP DEPTH IN FT NAME TVD	BOTTOM DEPTH IN FT TVD	TOP DEPTH IN FT MD	BOTTOM DEPTH IN FT MD	DESCRIBE ROCK TYPE AND RECORD QUANTITY AND TYPE OF FLUID (FRESHWATER, BRINE, OIL, GAS, H <sub>2</sub> S, ETC)
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**\*PLEASE SEE ATTACHED EXHIBIT 3**


Please insert additional pages as applicable.

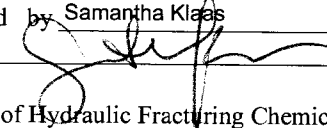
Drilling Contractor Patterson – UTI Drilling Company LLC  
Address 207 Carlton Drive City Eighty Four State PA Zip 15330

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

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

Stimulating Company Halliburton  
Address 121 Champion Way Suite 200 City Canonsburg State PA Zip 15317

Please insert additional pages as applicable.

Completed by Samantha Klaps Telephone 303-357-6759  
Signature  Title Permitting Agent Date 10/11/2017

Submittal of Hydraulic Fracturing Chemical Disclosure Information Attach copy of FRACFOCUS Registry

**API 47-085-10275 Farm Name Ernest E. Zinn et al Well Number Alliance Unit 2H**

**EXHIBIT 1**

Stage No.	Perforation Date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formations
1	12/12/2016	14746	14912	60	Marcellus
2	12/14/2016	14550	14715	60	Marcellus
3	12/24/2016	14353	14519	60	Marcellus
4	12/27/2016	14156	14322	60	Marcellus
5	12/28/2016	13960	14126	60	Marcellus
6	12/28/2016	13763	13929	60	Marcellus
7	12/29/2016	13567	13732	60	Marcellus
8	12/30/2016	13370	13536	60	Marcellus
9	12/31/2016	13174	13339	60	Marcellus
10	12/31/2016	12977	13143	60	Marcellus
11	1/1/2017	12780	12946	60	Marcellus
12	1/2/2017	12584	12750	60	Marcellus
13	1/2/2017	12387	12553	60	Marcellus
14	1/3/2017	12191	12356	60	Marcellus
15	1/4/2017	11994	12160	60	Marcellus
16	1/5/2017	11797	11963	60	Marcellus
17	1/5/2017	11601	11767	60	Marcellus
18	1/7/2017	11404	11570	60	Marcellus
19	1/8/2017	11208	11373	60	Marcellus
20	1/9/2017	11011	11177	60	Marcellus
21	1/10/2017	10815	10980	60	Marcellus
22	1/11/2017	10618	10784	60	Marcellus
23	1/12/2017	10421	10587	60	Marcellus
24	1/12/2017	10225	10391	60	Marcellus
25	1/12/2017	10028	10194	60	Marcellus
26	1/13/2017	9832	9997	60	Marcellus
27	1/13/2017	9635	9801	60	Marcellus
28	1/14/2017	9438	9604	60	Marcellus
29	1/15/2017	9242	9408	60	Marcellus
30	1/15/2017	9045	9211	60	Marcellus
31	1/16/2017	8849	9014	60	Marcellus
32	1/16/2017	8652	8818	60	Marcellus
33	1/17/2017	8455	8621	60	Marcellus
34	1/17/2017	8259	8425	60	Marcellus
35	1/18/2017	8062	8228	60	Marcellus
36	1/18/2017	7866	8032	60	Marcellus
37	1/19/2017	7669	7835	60	Marcellus
38	1/19/2017	7473	7638	60	Marcellus
39	1/20/2017	7276	7442	60	Marcellus
40	1/20/2017	7079	7245	60	Marcellus
41	1/21/2017	6883	7049	60	Marcellus
42	1/21/2017	6686	6852	60	Marcellus

API 47-085-10275 Farm Name Ernest E. Zinn et al Well Number Alliance Unit 2H

**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 (bbbls)	Amount of Nitrogen/ other (units)
1	12/13/2016	73.1	7475	5389.0	3019.0	511966	10725	N/A
2	12/14/2016	71.6	7476	5558.0	3055.0	518626	10875	N/A
3	12/24/2016	73.1	7489	5744.0	3505.0	504660	10554	N/A
4	12/27/2016	74.9	7617	5846.0	4181.0	506591	13178	N/A
5	12/28/2016	75.8	6875	5188.0	3517.0	507730	10422	N/A
6	12/28/2016	79.0	7091	5335.0	3757.0	508342	10265	N/A
7	12/29/2016	76.5	6894	5229.0	3853.0	507665	10349	N/A
8	12/30/2016	76.2	7090	5516.0	3953.0	507943	10422	N/A
9	12/31/2016	76.4	7036	5869.0	3640.0	508534	10966	N/A
10	12/31/2016	77.5	6915	5366.0	3843.0	507429	10248	N/A
11	1/1/2017	76.4	7092	5411.0	3520.0	506906	10302	N/A
12	1/2/2017	77.0	7089	5737.0	3720.0	508005	10441	N/A
13	1/2/2017	77.6	6911	5739.0	3622.0	508064	10334	N/A
14	1/3/2017	75.5	6915	5390.0	3667.0	508344	10431	N/A
15	1/4/2017	78.5	7207	5387.0	3735.0	505810	10355	N/A
16	1/5/2017	77.5	7090	5394.0	3676.0	506916	10455	N/A
17	1/5/2017	76.4	6952	5512.0	3227.0	509217	10529	N/A
18	1/7/2017	73.0	7435	5728.0	3108.0	506336	11749	N/A
19	1/8/2017	78.7	7395	5547.0	2920.0	508968	10489	N/A
20	1/9/2017	78.6	7172	5486.0	3311.0	506013	10389	N/A
21	1/10/2017	73.0	7664	5551.0	4111.0	507450	12424	N/A
22	1/11/2017	75.4	6689	5352.0	3625.0	510407	10305	N/A
23	1/12/2017	76.3	7003	5391.0	3112.0	508310	10370	N/A
24	1/12/2017	78.7	6996	5357.0	3895.0	507100	10274	N/A
25	1/12/2017	79.0	6768	5340.0	3999.0	507310	10329	N/A
26	1/13/2017	79.7	6524	5307.0	3436.0	507693	10969	N/A
27	1/13/2017	80.0	6632	5883.0	3091.0	505716	10293	N/A
28	1/14/2017	79.2	6825	5630.0	3431.0	499239	10848	N/A
29	1/15/2017	78.8	6559	5952.0	3426.0	507491	10208	N/A
30	1/15/2017	78.8	6723	6411.0	3584.0	507620	10272	N/A
31	1/16/2017	77.9	6550	6818.0	3211.0	506575	10231	N/A
32	1/16/2017	78.3	6884	7278.0	4114.0	508316	10401	N/A
33	1/17/2017	78.9	6815	6270.0	5539.0	449187	11440	N/A
34	1/17/2017	79.3	6645	5465.0	3955.0	506391	10186	N/A
35	1/18/2017	67.7	7441	5522.0	4021.0	505557	13005	N/A
36	1/18/2017	78.6	6501	5536.0	3754.0	508968	10239	N/A
37	1/19/2017	76.5	6153	5243.0	3573.0	507091	10161	N/A
38	1/19/2017	80.0	6361	5988.0	3756.0	508401	10049	N/A
39	1/20/2017	77.5	6338	6271.0	3615.0	506670	12351	N/A
40	1/20/2017	80.0	6374	5672.0	3605.0	506025	10129	N/A
41	1/21/2017	73.4	6279	5788.0	3800.0	509173	12365	N/A
42	1/21/2017	79.8	6464	5363.0	3058.0	509537	10455	N/A
	AVG=	<b>76.9</b>	<b>6,914</b>	<b>5,661</b>	<b>3,632</b>	<b>21,264,292</b>	<b>450,783</b>	TOTAL

## EXHIBIT 3

LITHOLOGY/ FORMATION	TOP DEPTH (TVD)	BOTTOM DEPTH (TVD)	TOP DEPTH (MD)	BOTTOM DEPTH (MD)
	From Surface	From Surface	From Surface	From Surface
Fresh Water	107'	N/A	107'	N/A
Shale/ Siltstone	est. 30	30	est. 30	285
Sandstone	est. 285	285	est. 285	425
Shale/ Siltstone	est. 425	425	est. 425	645
Sandstone	est. 645	645	est. 645	725
Limestone	est. 725	725	est. 725	805
Sandstone/ Shale	est. 805	805	est. 805	905
Shale	est. 905	905	est. 905	985
Sandstone	est. 985	985	est. 985	1305
Siltstone	est. 1305	1305	est. 1305	1405
Sandstone	est. 1405	1405	est. 1405	1465
Sandstone	est. 1465	1465	est. 1465	1625
Shale / Sandstone	est. 1625	1625	est. 1625	1685
Sandstone	est. 1685	1685	est. 1685	1983
Big Lime	1983	1983	1983	2551
Gantz	2551	2551	2551	2852
Fifty Foot Sandstone	2852	2852	2852	2970
Gordon	2970	2970	2970	3341
Fifth Sandstone	3340	3340	3341	3415
Bayard	3415	3415	3415	3910
Speechley	3910	3910	3910	4160
Baltown	4160	4160	4160	4636
Bradford	4635	4635	4636	4995
Benson	4995	4995	4995	5229
Alexander	5228	5228	5229	5521
Elk	5520	5520	5521	5783
Rhinestreet	5778	5778	5783	6211
Sycamore	6133	6133	6211	6338
Middlesex	6229	6229	6338	6517
Burkett	6334	6334	6517	6582
Tully	6362	6362	6582	6641
Marcellus	6382	6382	6641	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:** 1/22/2017  
**Job End Date:** 1/22/2017  
**State:** West Virginia  
**County:** Ritchie  
**API Number:** 47-085-10275-00-00  
**Operator Name:** Antero Resources Corporation  
**Well Name and Number:** Alliance 2H  
**Latitude:** 39.32011700  
**Longitude:** -80.93801700  
**Datum:** NAD27  
**Federal Well:** NO  
**Indian Well:** NO  
**True Vertical Depth:** 6,434  
**Total Base Water Volume (gal):** 19,471,584  
**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	88.22909	Density = 8.340
Ingredients	Listed Above	Listed Above					
			Water	7732-18-5	100.00000	0.17465	





					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	11.55306	
					Hydrochloric acid	7647-01-0	30.00000	0.03574	
					Inorganic salt	Proprietary	30.00000	0.01995	
					Hydrotreated light petroleum distillate	64742-47-8	30.00000	0.01995	
					Acrylamide acrylate copolymer	Proprietary	30.00000	0.01995	Denise Tuck, Halliburton, 3000 N. Sam Houston Pkwy E., Houston, TX 77032, 281-871-6226
					Guar gum	9000-30-0	100.00000	0.00931	
					Ethylene glycol	107-21-1	60.00000	0.00843	
					Glutaraldehyde	111-30-8	30.00000	0.00259	
					Telmer	Proprietary	10.00000	0.00141	
					Quaternary ammonium compounds, benzyl-C12-16-alkyldimethyl chlorides	68424-85-1	5.00000	0.00043	
					Sodium polyacrylate	9003-04-7	1.00000	0.00014	
					Sodium persulfate	7775-27-1	100.00000	0.00010	
					Ethanol	64-17-5	1.00000	0.00009	
					Methanol	67-56-1	60.00000	0.00007	
					Ethoxylated alcohols	Proprietary	30.00000	0.00003	
					Reaction product of acetophenone, formaldehyde, thiourea and oleic acid in dimethyl formamide	68527-49-1	30.00000	0.00003	
					Fatty acids, tall oil	Proprietary	30.00000	0.00003	
					Olefins	Proprietary	5.00000	0.00001	
					Phosphoric acid	7664-38-2	0.10000	0.00001	
					Propargyl alcohol	107-19-7	10.00000	0.00001	
					Acrylic acid	79-10-7	0.01000	0.00000	

			Sodium sulfate	7757-82-6	0.10000	0.00000
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\* 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"

6,088'

3,117' TO BOTTOM HOLE

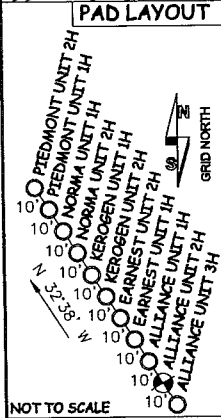
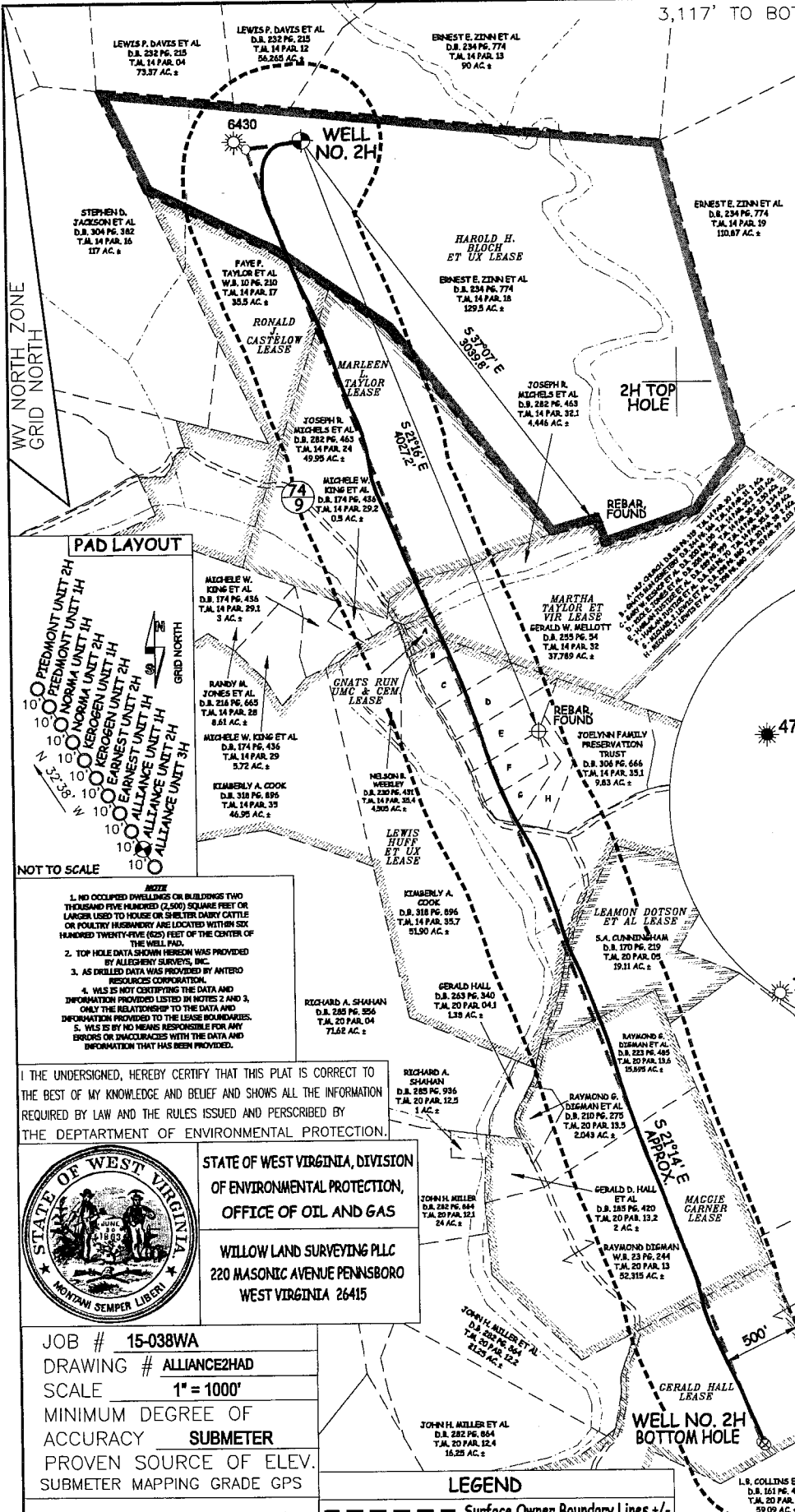
LATITUDE 39°20'00"

LONGITUDE 80°55'00" 13,088' TO BOTTOM HOLE

4,845' LONGITUDE 80°55'00"

Antero Resources Corporation  
Well No. Alliance Unit 2H  
47-085-10275 AS DRILLED

AS DRILLED DATA:  
WELL 2H TOP HOLE INFORMATION:  
N: 301,930ft E: 1,593,131ft  
LAT: 39°19'12.12" LON: 80°56'17.47"  
BOTTOM HOLE INFORMATION:  
N: 293,640ft E: 1,595,971ft  
LAT: 39°17'50.65" LON: 80°55'39.65"  
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: 4,352,303m E: 505,343m  
BOTTOM HOLE INFORMATION:  
N: 4,349,792m E: 506,251m

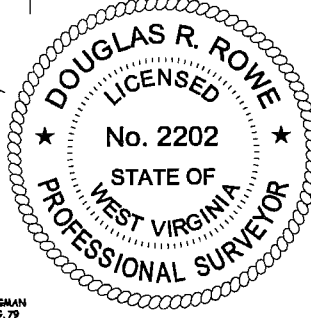


NOTE  
1. NO OCCUPIED DWELLINGS OR BUILDINGS TWO THOUSAND FIVE HUNDRED (2,500) SQUARE FEET OR LARGER USED TO HOUSE OR SHELTER DAIRY CATTLE OR POULTRY HUSBANDRY ARE LOCATED WITHIN SIX HUNDRED TWENTY-FIVE (625) FEET OF THE CENTER OF THE WELL PAD.  
2. TOP HOLE DATA SHOWN HEREON WAS PROVIDED BY ALLEGHENY SURVEYS, INC.  
3. AS DRILLED DATA WAS PROVIDED BY ANTERO RESOURCES CORPORATION.  
4. WLS IS NOT COPYING 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.

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 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 AVENUE PENNSBORO WEST VIRGINIA 26415



JOB # 15-038WA  
DRAWING # ALLIANCE2HAD  
SCALE 1" = 1000'  
MINIMUM DEGREE OF ACCURACY SUBMETER  
PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS

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

DOUGLAS R. ROWE P.S. 2202  
DATE 09/29/17  
OPERATOR'S WELL# ALLIANCE UNIT #2H

STATE OF WEST VIRGINIA DEPARTMENT OF ENERGY DIVISION OF OIL AND GAS  
WELL TYPE: OIL GAS LIQUID INJECTION WASTE DISPOSAL API WELL #