

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

API 47 - 095 - 02389 County Tyler District Meade
Quad Pennsboro 7.5' Pad Name Ritchie Petroleum Pad Field/Pool Name -----
Farm name David M. Hartley Well Number Hopper 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 4356655m Easting 502137m
Landing Point of Curve Northing 4356536.83m Easting 501936.84m
Bottom Hole Northing 4354457m Easting 502797m

Elevation (ft) 1176' 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 12/20/2016 Date drilling commenced 3/5/2017 Date drilling ceased 10/4/2017
Date completion activities began 6/9/2018 Date completion activities ceased 7/28/2018
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 N/A Open mine(s) (Y/N) depths No
Salt water depth(s) ft N/A 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:

API 47-095 - 02389 Farm name David M. Hartley Well number Hopper 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"	112'	New	94#, H-40	N/A	Y
Surface	17-1/2"	13-3/8"	377'	New	48#, H-40	N/A	Y
Coal							
Intermediate 1	12-1/4"	9-5/8"	2559'	New	36#, J-55	N/A	Y
Intermediate 2							
Intermediate 3							
Production	8-3/4"/8-1/2"	5-1/2"	14246'	New	23#, P-110	N/A	Y
Tubing		2-3/8"	6593'		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 ³ /sks)	Volume (ft ³)	Cement Top (MD)	WOC (hrs)
Conductor	Class A	202 sx	15.6	1.21	244	0'	8 Hrs.
Surface	Class A	332 sx	15.6	1.21	402	0'	8 Hrs.
Coal							
Intermediate 1	Class A	880 sx	15.6	1.19	1047	0'	8 Hrs.
Intermediate 2							
Intermediate 3							
Production	Class H	750sx (Lead) 1110 sx (Tail)	13.5 (Lead), 15.2 (Tail)	1.39 (Lead), 1.60 (Tail)	2819	~500' into Intermediate Casing	8 Hrs.
Tubing							

Drillers TD (ft) 14246' MD, 6442' TVD (BHL), 6446' (Deepest Point Drilled) Loggers TD (ft) 14246' MD

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

Plug back procedure N/A

Kick off depth (ft) 5935'

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- 095 - 02389 Farm name David M. Hartley Well number Hopper Unit 2H

PRODUCING FORMATION(S)	DEPTHS	
Marcellus	6360' (TOP) TVD	6612' (TOP) MD

Please insert additional pages as applicable.

GAS TEST Build up Drawdown Open Flow OIL TEST Flow Pump

SHUT-IN PRESSURE Surface 2800 psi Bottom Hole --- psi DURATION OF TEST --- hrs

OPEN FLOW Gas 5449 mcfpd Oil 45 bpd NGL --- bpd Water 520 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 ₂ S, ETC)
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***PLEASE SEE ATTACHED EXHIBIT 3**

Please insert additional pages as applicable.

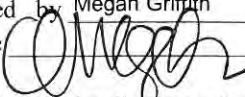
Drilling Contractor Frontier Drilling LLC
Address 562 Spring Run Road City Pennsboro State WV Zip 26415

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

Cementing Company BJ Services
Address 1036 East Main Street City Bridgeport State WV Zip 26330

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

Please insert additional pages as applicable.

Completed by Megan Griffith Telephone 303-357-7223
Signature  Title Permitting Agent Date

API 47-095-02389 Farm Name David M. Hartley Well Number Hopper Unit 2H

EXHIBIT 1

Stage No.	Perforation Date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formations
1	6/9/2018	14047	14144	60	Marcellus
2	6/23/2018	13847	14016	60	Marcellus
3	6/24/2018	13648	13816	60	Marcellus
4	6/26/2018	13448	13617	60	Marcellus
5	6/27/2018	13249	13417	60	Marcellus
6	6/27/2018	13049	13217	60	Marcellus
7	6/28/2018	12850	13018	60	Marcellus
8	6/28/2018	12650	12818	60	Marcellus
9	6/28/2018	12450	12619	60	Marcellus
10	6/29/2018	12251	12419	60	Marcellus
11	6/30/2018	12051	12220	60	Marcellus
12	6/30/2018	11852	12020	60	Marcellus
13	6/30/2018	11652	11821	60	Marcellus
14	6/30/2018	11453	11621	60	Marcellus
15	7/1/2018	11253	11421	60	Marcellus
16	7/1/2018	11054	11222	60	Marcellus
17	7/1/2018	10854	11022	60	Marcellus
18	7/2/2018	10654	10823	60	Marcellus
19	7/2/2018	10455	10623	60	Marcellus
20	7/2/2018	10255	10424	60	Marcellus
21	7/3/2018	10056	10224	60	Marcellus
22	7/3/2018	9856	10024	60	Marcellus
23	7/4/2018	9657	9825	60	Marcellus
24	7/4/2018	9457	9625	60	Marcellus
25	7/4/2018	9257	9426	60	Marcellus
26	7/4/2018	9058	9226	60	Marcellus
27	7/5/2018	8858	9027	60	Marcellus
28	7/5/2018	8659	8827	60	Marcellus
29	7/5/2018	8459	8627	60	Marcellus
30	7/6/2018	8260	8428	60	Marcellus
31	7/6/2018	8060	8228	60	Marcellus
32	7/6/2018	7860	8029	60	Marcellus
33	7/6/2018	7661	7829	60	Marcellus
34	7/6/2018	7461	7630	60	Marcellus
35	7/7/2018	7262	7430	60	Marcellus
36	7/7/2018	7062	7230	60	Marcellus
37	7/7/2018	6863	7031	60	Marcellus
38	7/7/2018	6663	6831	60	Marcellus

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	6/9/2018	40.6	8037	5938	5938	4368	8801	N/A
2	6/23/2018	65.4	7283	5432	5837	357400	10211	N/A
3	6/24/2018	75.7	7506	5273	4746	363930	8848	N/A
4	6/26/2018	75.6	6905	5212	3724	355710	8119	N/A
5	6/27/2018	75.7	7004	5600	3805	362230	8370	N/A
6	6/27/2018	60.1	7496	4800	4077	359090	15860	N/A
7	6/28/2018	71.4	6819	5182	3738	364420	8423	N/A
8	6/28/2018	77.5	6966	5210	5048	358940	8466	N/A
9	6/28/2018	75.4	6919	4805	4561	358990	8295	N/A
10	6/29/2018	77	7146	5462	4136	361340	8010	N/A
11	6/30/2018	79.2	7232	5329	3894	363710	8071	N/A
12	6/30/2018	77.9	6815	5766	4138	362610	8343	N/A
13	6/30/2018	77.1	7005	5431	4199	363880	8285	N/A
14	6/30/2018	76.6	7139	5581	3966	362770	8015	N/A
15	7/1/2018	77.9	7084	5137	4874	360190	9131	N/A
16	7/1/2018	76.8	6815	5553	4043	360360	8109	N/A
17	7/1/2018	79.1	6967	5319	4063	357380	7921	N/A
18	7/2/2018	77.2	6997	6019	4545	360650	8248	N/A
19	7/2/2018	78.5	6793	5042	4237	365040	8304	N/A
20	7/2/2018	69	6939	4656	3982	359630	8465	N/A
21	7/3/2018	76	6797	5340	4003	365096	8094	N/A
22	7/3/2018	78	6819	5337	4115	365200	8366	N/A
23	7/4/2018	78	6807	5688	3984	356530	7910	N/A
24	7/4/2018	77.4	6880	5474	3997	368750	8175	N/A
25	7/4/2018	78.4	6846	5225	3974	358750	8259	N/A
26	7/4/2018	72.2	7439	5749	3850	363620	10334	N/A
27	7/5/2018	70.5	7409	5408	3744	356370	8041	N/A
28	7/5/2018	76.5	6958	5352	3701	353540	8046	N/A
29	7/5/2018	71.5	7250	6169	3948	363600	9058	N/A
30	7/6/2018	79.2	6977	6484	3879	355350	8833	N/A
31	7/6/2018	77	7077	6203	4205	361210	8044	N/A
32	7/6/2018	77.9	7245	5521	4267	358720	9256	N/A
33	7/6/2018	74.7	7175	5163	4641	359220	8876	N/A
34	7/6/2018	78.4	6859	5770	4723	364340	8053	N/A
35	7/7/2018	77.8	6730	5759	5120	361720	8124	N/A
36	7/7/2018	77	6460	5516	5192	360870	7959	N/A
37	7/7/2018	78.4	6227	5311	4943	367090	8056	N/A
38	7/7/2018	79.5	6440	5561	3969	365340	8006	N/A
	AVG=	74.8	7,007	5,468	4,311	13,367,954	327,785	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
Shale w/intbd Sandstone and	-32	228	-32	228
Sandy shale and coal	228	528	228	528
Sandy shale	528	708	528	708
Calcareous shale	708	848	708	848
Limy shale with coal	848	1,048	848	1,048
Sandy shale	1,048	1,208	1,048	1,208
Sandy shale with coal	1,208	1,348	1,208	1,348
sandstone	1,348	1,488	1,348	1,488
Sandy shale	1,488	1,568	1,488	1,568
Shaly sandstone	1,568	1,648	1,568	1,648
Silty shale	1,648	1,708	1,648	1,708
Sandy shale	1,708	1,808	1,708	1,808
Sandy shale/coal	1,808	2,033	1,808	2,034
Big Lime	2,065	2,170	2,066	2,171
Big Injun	2,170	2,614	2,171	2,616
Gantz Sand	2,614	2,936	2,616	2,938
Fifty Foot Sandstone	2,936	3,054	2,938	3,058
Gordon	3,054	3,274	3,058	3,282
Fifth Sandstone	3,274	3,443	3,282	3,454
Bayard	3,443	3,686	3,454	3,704
Warren	3,686	4,014	3,704	4,046
Speechley	4,014	4,497	4,046	4,546
Balltown	4,336	4,871	4,379	4,934
Bradford	4,497	4,871	4,546	4,934
Benson	4,871	5,292	4,934	5,373
Alexander	5,292	5,818	5,373	5,920
Rhinestreet	5,786	6,144	5,888	6,284
Sycamore	6,144	6,241	6,284	6,416
Middlesex	6,241	6,337	6,416	6,567
Burkett	6,337	6,354	6,567	6,600
Tully	6,354	6,360	6,600	6,612
Marcellus	6,360	N/A	6,612	N/A

*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:	6/9/2018
Job End Date:	7/7/2018
State:	West Virginia
County:	Tyler
API Number:	47-095-02389-00-00
Operator Name:	Antero Resources Corporation
Well Name and Number:	Hopper 2H
Latitude:	39.35926700
Longitude:	-80.97536100
Datum:	NAD83
Federal Well:	NO
Indian Well:	NO
True Vertical Depth:	6,441
Total Base Water Volume (gal):	14,050,508
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	89.48902	Density = 8.330
Ingredients	Listed Above	Listed Above					
			Water	7732-18-5	100.00000	0.21474	

HYDROCHLORIC ACID	Halliburton	Solvent								
FR-76	Halliburton	Friction Reducer				Listed Below				
FightR EC-3	MultiChem	Friction Reducer				Listed Below				
WG-36 GELLING AGENT	Halliburton	Gelling Agent				Listed Below				
SP BREAKER	Halliburton	Breaker				Listed Below				
SAND-COMMON WHITE - 100 MESH, 3307 LB BAG	Halliburton	Proppant				Listed Below				
HAI-OS ACID INHIBITOR	Halliburton	Corrosion Inhibitor				Listed Below				
SAND-PREMIUM WHITE-40/70, BULK	Halliburton	Proppant				Listed Below				

MC S-2510T	Halliburton	Scale Inhibitor								
				Listed Below						
MC B-8614	Halliburton	Biocide								
				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			10.22102		
			Hydrochloric acid	7647-01-0	15.00000			0.02900		
			Hydrotreated light petroleum distillate	64742-47-8	30.00000			0.02022		
			Ethylene Glycol	107-21-1	60.00000			0.00825		
			Sodium persulfate	7775-27-1	100.00000			0.00575		
			Inorganic salt	Proprietary	30.00000			0.00301		
			Acrylamide acrylate copolymer	Proprietary	30.00000			0.00301		Denise Tuck, Halliburton, 3000 N. Sam Houston Pkwy E., Houston, TX 77032, 281-871-6226
			Poly (oxy-1, 2-ethanediyl), .alpha.-tridecyl-.omega.-hydroxy-, branched	69011-36-5	5.00000			0.00287		
			Glutaraldehyde	111-30-8	30.00000			0.00258		
			Neutralized Polyacrylic Emulsion	Proprietary	10.00000			0.00137		
			Guar gum	9000-30-0	100.00000			0.00099		
			Quaternary ammonium compounds, benzyl-C12-16-alkyldimethyl chlorides	68424-85-1	5.00000			0.00043		
			Methanol	67-56-1	60.00000			0.00010		
			Ethanol	64-17-5	1.00000			0.00009		
			Ethoxylated alcohols	Proprietary	30.00000			0.00004		
			Fatty acids, tall oil	Proprietary	30.00000			0.00004		

			Modified thiourea polymer	Proprietary	30.00000	0.00004	
			Olefins	Proprietary	5.00000	0.00002	
			Propargyl alcohol	107-19-7	10.00000	0.00001	
			Phosphoric acid	7664-38-2	0.10000	0.00001	
			Sodium sulfate	7757-82-6	0.10000	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°22'30"

4,815'

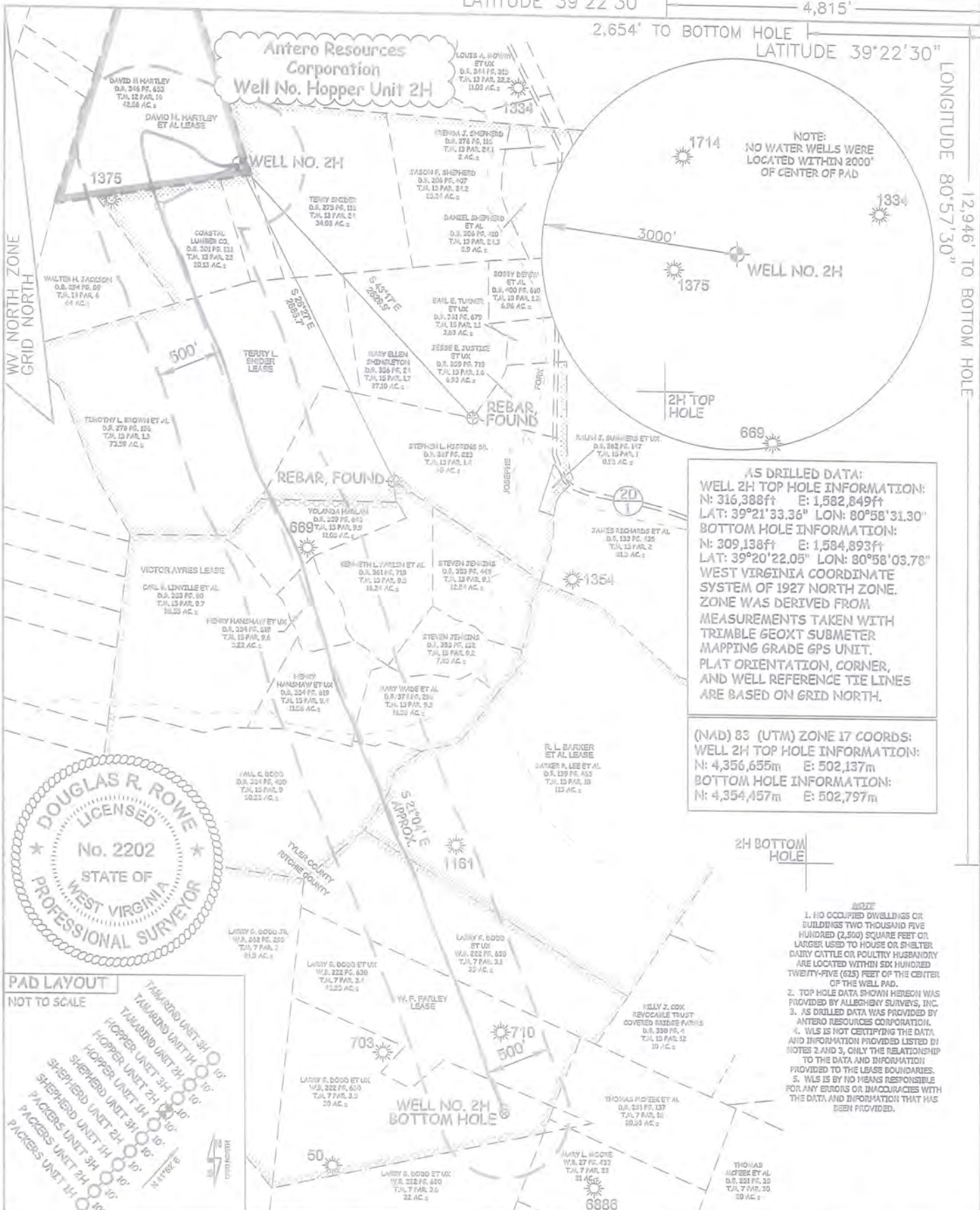
2,654' TO BOTTOM HOLE

LATITUDE 39°22'30"

LONGITUDE 80°57'30"

5,731'

LONGITUDE 80°57'30"



AS DRILLED DATA:
WELL 2H TOP HOLE INFORMATION:
 N: 316,388ft E: 1,582,849ft
 LAT: 39°21'33.36" LON: 80°58'31.30"
BOTTOM HOLE INFORMATION:
 N: 309,138ft E: 1,584,893ft
 LAT: 39°20'22.05" LON: 80°58'03.78"
 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: 4,356,655m E: 502,137m
BOTTOM HOLE INFORMATION:
 N: 4,354,457m E: 502,797m

- 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 SURVYS, 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.



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

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

DOUGLAS R. ROWE P.S. 2202

JOB # 15-042WA
 DRAWING # HOPPER2HAD
 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

DATE 11/07/18
 OPERATOR'S WELL# HOPPER 2H

WELL TYPE: OIL GAS LIQUID INJECTION WASTE DISPOSAL API WELL # 47 - 095 - 02389
 (IF "GAS") PRODUCTION STORAGE DEEP SHALLOW
 LOCATION: ELEVATION 1,176' AS BUILT WATERSHED OUTLET MIDDLE ISLAND CREEK STATE COUNTY PERMIT
 QUADRANGLE PENNSBORO 7.5' DISTRICT MEADE COUNTY TYLER
 SURFACE OWNER DAVID M. HARTLEY ACREAGE 42.56 ACRES +/-
 OIL & GAS ROYALTY OWNER DAVID M. HARTLEY ET AL; TERRY L. SNIDER; VICTOR AYRES; R.L. BARKER ET AL; W. F. FARLEY LEASE ACREAGE 42.56 AC±; 221.24 AC±; 167.5 AC±; 115 AC±; 192 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 6,442' TVD 14,246' MD
 WELL OPERATOR ANTERO RESOURCES CORPORATION DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM
 ADDRESS 1615 WYNKOOP STREET ADDRESS 5400 D BIG TYLER ROAD CHARLESTON, WV 25313
 FORM WW-6 DENVER, CO 80202

COUNTY NAME PERMIT