

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

API 47-085-10340 County Ritchie District Clay  
Quad Pennsboro 7.5' Pad Name Hichman Pad Field/Pool Name -----  
Farm name Radall Bond et al Well Number Short Run 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 4354358m Easting 509971m  
Landing Point of Curve Northing 4353964m Easting 509534m  
Bottom Hole Northing 4350754m Easting 510586m

Elevation (ft) 1250' 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 1/17/2018 Date drilling commenced 1/31/2018 Date drilling ceased 7/23/2018  
Date completion activities began 1/5/2019 Date completion activities ceased 3/23/2019  
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

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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"	488'	New	54.5#, J-55	N/A	Y
Coal							
Intermediate 1	12-1/4"	9-5/8"	2607'	New	36#, J-55	N/A	Y
Intermediate 2							
Intermediate 3							
Production	8-3/4"/8-1/2"	5-1/2"	18917'	New	23#, P-110	N/A	Y
Tubing		2-3/8"	7024'		4.7#, L-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	204 sx	15.6	1.18	241	0'	8 Hrs.
Surface	Class A	577 sx	15.6	1.20	692	0'	8 Hrs.
Coal							
Intermediate 1	Class A	883 sx	15.6	1.20	1060	0'	8 Hrs.
Intermediate 2							
Intermediate 3							
Production	Class H	830sx (Lead) 2035sx (Tail)	14 (Lead), 15.2 (Tail)	1.45 (Lead), 1.83(Tail)	5001	-500' into Intermediate Casing	8 Hrs.
Tubing							

Drillers TD (ft) 18397' MD, 6679' TVD (BHL), 6682' (Deepest Point Drilled) Loggers TD (ft) 18397' MD  
 Deepest formation penetrated Marcellus Plug back to (ft) N/A  
 Plug back procedure N/A

Kick off depth (ft) 6300'

\*\* This is a subsequent Well. Antero only runs wireline logs on one well on a multi-well pad (Centerville Unit 2H API#47-085-10338). A Cement Bond Log has been included with this submittal.

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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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>								

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Please insert additional pages as applicable.

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PRODUCING FORMATION(S)	DEPTHS		
Marcellus	6578' (TOP)	TVD	7089' (TOP) 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 11967.89 mcfpd Oil 145.98 bpd NGL --- bpd Water 849.52 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 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 Jane Lew State WV Zip 26378

Stimulating Company CalFrac Well Services  
Address 171 17th Street, Wuite 1445 City Denver State CO Zip 80202

Please insert additional pages as applicable.

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Completed by Karin Cox Telephone 303-357-6820 WV Department of  
Signature  Title Permitting Agent Date 6/7/2019 Environmental Protection

## EXHIBIT 1

Stage No.	Perforation Date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formations
1	1/5/2019	18755	18807	60	Marcellus
2	1/5/2019	18554.618	18723.603	60	Marcellus
3	1/6/2019	18354.236	18523.221	60	Marcellus
4	1/6/2019	18153.854	18322.839	60	Marcellus
5	1/7/2019	17953.472	18122.457	60	Marcellus
6	1/7/2019	17753.09	17922.075	60	Marcellus
7	1/7/2019	17552.708	17721.693	60	Marcellus
8	1/8/2019	17352.326	17521.311	60	Marcellus
9	1/8/2019	17151.944	17320.929	60	Marcellus
10	1/9/2019	16951.562	17120.547	60	Marcellus
11	1/9/2019	16751.18	16920.165	60	Marcellus
12	1/10/2019	16550.798	16719.783	60	Marcellus
13	1/10/2019	16350.416	16519.401	60	Marcellus
14	1/11/2019	16150.034	16319.019	60	Marcellus
15	1/11/2019	15949.652	16118.637	60	Marcellus
16	1/12/2019	15749.27	15918.255	60	Marcellus
17	1/12/2019	15548.888	15717.873	60	Marcellus
18	1/12/2019	15348.506	15517.491	60	Marcellus
19	1/13/2019	15148.124	15317.109	60	Marcellus
20	1/13/2019	14947.742	15116.727	60	Marcellus
21	1/14/2019	14747.36	14916.345	60	Marcellus
22	1/14/2019	14546.978	14715.963	60	Marcellus
23	1/15/2019	14346.596	14515.581	60	Marcellus
24	1/15/2019	14146.214	14315.199	60	Marcellus
25	1/16/2019	13945.832	14114.817	60	Marcellus
26	1/16/2019	13745.45	13914.435	60	Marcellus
27	1/16/2019	13545.068	13714.053	60	Marcellus
28	1/17/2019	13344.686	13513.671	60	Marcellus
29	1/17/2019	13144.304	13313.289	60	Marcellus
30	1/18/2019	12943.922	13112.907	60	Marcellus
31	1/18/2019	12743.54	12912.525	60	Marcellus
32	1/19/2019	12543.158	12712.143	60	Marcellus
33	1/19/2019	12342.776	12511.761	60	Marcellus
34	1/20/2019	12142.394	12311.379	60	Marcellus
35	1/20/2019	11942.012	12110.997	60	Marcellus
36	1/21/2019	11741.63	11910.615	60	Marcellus
37	1/22/2019	11541.248	11710.233	60	Marcellus
38	1/22/2019	11340.866	11509.851	60	Marcellus
39	1/23/2019	11140.484	11309.469	60	Marcellus
40	1/23/2019	10940.102	11109.087	60	Marcellus
41	1/24/2019	10739.72	10908.705	60	Marcellus
42	1/24/2019	10539.338	10708.323	60	Marcellus
43	1/25/2019	10338.956	10507.941	60	Marcellus
44	1/25/2019	10138.574	10307.559	60	Marcellus
45	1/26/2019	9938.192	10107.177	60	Marcellus
46	1/26/2019	9737.81	9906.795	60	Marcellus
47	1/27/2019	9537.428	9706.413	60	Marcellus
48	1/27/2019	9337.046	9506.031	60	Marcellus
49	1/28/2019	9136.664	9305.649	60	Marcellus
50	1/28/2019	8936.282	9105.267	60	Marcellus
51	1/28/2019	8735.9	8904.885	60	Marcellus
52	1/29/2019	8535.518	8704.503	60	Marcellus
53	1/29/2019	8335.136	8504.121	60	Marcellus
54	1/30/2019	8134.754	8303.739	60	Marcellus
55	1/30/2019	7934.372	8103.357	60	Marcellus
56	1/30/2019	7733.99	7902.975	60	Marcellus
57	1/30/2019	7533.608	7702.593	60	Marcellus
58	1/31/2019	7333.226	7502.211	60	Marcellus
59	1/31/2019	7132.844	7301.829	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	1/5/2019	69.1	7556	6849	4576	143550	5733	N/A
2	1/5/2019	73.4	7769	5266	4514	400050	8282.93	N/A
3	1/6/2019	77.7	8039	5717	4640	401250	8210	N/A
4	1/6/2019	77.3	8252	5672	4220	400900	8428.48	N/A
5	1/7/2019	77.2	8120	5751	4731	402000	8292	N/A
6	1/7/2019	76	8406	5712	4154	401300	8171	N/A
7	1/7/2019	74.1	8096	7631	5028	401150	7806	N/A
8	1/8/2019	71.7	7941	6022	4033	401100	8261.8	N/A
9	1/8/2019	75	7620	5546	4190	401400	8129.2	N/A
10	1/9/2019	76.5	8061	6021	4742	402450	8171	N/A
11	1/9/2019	76	8117	5871	4285	400400	7876	N/A
12	1/10/2019	72.8	8351	6420	3254	401300	8128	N/A
13	1/10/2019	77.9	7970	5908	4330	399900	8015	N/A
14	1/11/2019	77.8	8216	5811	4068	401900	8382	N/A
15	1/11/2019	73.6	8178	6505	3812	400750	8234	N/A
16	1/12/2019	69.9	8069	6454	4521	401750	8270	N/A
17	1/12/2019	79.3	8453	5787	3501	401050	8145	N/A
18	1/12/2019	75.1	7981	7131	4507	399850	8159.3	N/A
19	1/13/2019	75.5	8265	6222	4271	402250	8178	N/A
20	1/13/2019	75.8	7940	5848	3734	399750	8372.5	N/A
21	1/14/2019	79.4	8179	6395	4634	403250	8183	N/A
22	1/14/2019	77.2	8330	6364	3285	401600	9363	N/A
23	1/15/2019	77.2	7842	4716	3371	400350	8224	N/A
24	1/15/2019	76.6	8085	5528	3922	401950	8180	N/A
25	1/16/2019	80.1	8216	6972	3549	402350	8161.61	N/A
26	1/16/2019	78.8	7901	6266	3715	401500	8076	N/A
27	1/16/2019	79.4	7685	5301	3845	401400	7969	N/A
28	1/17/2019	81.5	7879	5839	3710	401200	7860	N/A
29	1/17/2019	80.8	8105	5481	3966	402000	8260	N/A
30	1/18/2019	84.4	7837	6219	4314	402700	8021	N/A
31	1/18/2019	78.8	7914	6598	3751	401600	8196	N/A
32	1/19/2019	76	7951	6878	3661	401800	8001	N/A
33	1/19/2019	79.3	8025	6556	4243	401300	8940	N/A
34	1/20/2019	76.4	7762	6010	4302	401350	9164	N/A
35	1/20/2019	74.2	7480	5625	3911	401550	8672	N/A
36	1/21/2019	78	7641	5744	3305	401750	8601	N/A
37	1/22/2019	81.3	7778	4485	3481	402350	8026	N/A
38	1/22/2019	82.1	7855	6060	2989	400500	8042	N/A
39	1/23/2019	74.2	7387	6825	3460	401100	8143	N/A
40	1/23/2019	81.6	7597	5493	3558	401600	8071	N/A
41	1/24/2019	79	8034	6844	4511	400400	8333.25	N/A
42	1/24/2019	78.6	7845	6016	3794	402200	8082	N/A
43	1/25/2019	82.5	7809	5308	3935	401050	8088	N/A
44	1/25/2019	84	7481	6624	3725	399700	8074	N/A
45	1/26/2019	76.1	7606	5945	4138	401350	8302	N/A
46	1/26/2019	80.7	7975	6436	3540	398650	7887	N/A
47	1/27/2019	76.3	7938	7063	4044	401300	8050	N/A
48	1/27/2019	81.7	7859	6036	3621	399650	7952.81	N/A
49	1/28/2019	78.9	7770	5797	3794	401400	8078	N/A
50	1/28/2019	83.4	7609	5218	3782	400800	7744	N/A
51	1/28/2019	79.1	7289	5072	3446	401900	7980	N/A
52	1/29/2019	80.2	7256	6376	3560	398400	7840.5	N/A
53	1/29/2019	76.9	7106	6813	3558	400600	8031	N/A
54	1/30/2019	80.3	7175	5530	3924	401350	7980	N/A
55	1/30/2019	78.4	7028	6068	3683	398900	7919	N/A
56	1/30/2019	79	7123	6441	3624	400450	8039	N/A
57	1/30/2019	83.18682	7201.722	6245	4243	401800	7901.01	N/A
58	1/31/2019	74.7	6756	6438	3935	399400	8211.63	N/A
59	1/31/2019	80.94104	7177.325	7061	4055	400750	7811.75	N/A
	AVG=	78	7,812	6,082	3,949	23,407,300	479,704	TOTAL

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LITHOLOGY/ FORMATION	TOP DEPTH (TVD)	BOTTOM DEPTH (TVD)	TOP DEPTH (MD)	BOTTOM DEPTH (MD)
	From Surface	From Surface	From Surface	From Surface
No Data collected	0	445	0	445
Silty Shale	est 445	505	est 445	505
Shaly Siltstone	est 505	685	est 505	685
Sandy Siltstone	est 685	765	est 685	765
Silty Sandstone	est 765	845	est 765	845
Sandy Siltstone	est 845	905	est 845	905
Shaly Sandstone	est 905	945	est 905	945
Sandy Shale	est 945	1,085	est 945	1,085
Shaly sandstone tr coal	est 1,085	1,145	est 1,085	1,145
Shaly Sandstone	est 1,145	1,265	est 1,145	1,265
Silty Shale with intermittend SS	est 1,265	1,625	est 1,265	1,625
Sandstone	est 1,625	1,785	est 1,625	1,785
Sandy Shale	est 1,785	2,099	est 1,785	2,146
Big Lime	2,099	2,966	2,146	3,063
Fifty Foot Sandstone	2,966	3,068	3,063	3,170
Gordon	3,068	3,236	3,170	3,347
Fifth Sandstone	3,236	3,443	3,347	3,566
Bayard	3,443	3,971	3,566	4,125
Speechley	3,971	4,217	4,125	4,385
Balltown	4,217	4,715	4,385	4,913
Bradford	4,715	5,037	4,913	5,254
Benson	5,037	5,289	5,254	5,522
Alexander	5,289	6,284	5,522	6,596
Sycamore	6,284	6,405	6,596	6,754
Middlesex	6,405	6,515	6,754	6,936
Burkett	6,515	6,546	6,936	7,002
Tully	6,546	6,578	7,002	7,089
Marcellus	6,578	NA	7,089	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.

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# ANTERO RESOURCES CORPORATION

Location: Ritchie County, WV  
 Field: Ritchie  
 Facility: Hichman Pad

Slot: Slot #07  
 Well: Short Run Unit 2H  
 Wellbore: Short Run Unit 2H PWB



API: 47-085-10340-0000

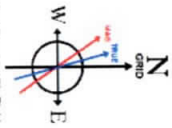
BHI Job #: 109301663

Rig: Frontier 22

Duration: 07/15/2018-07/18/2018

BHI AT Curve <-8.1/2"> (6892.507\2063.18913) : 67.29° Inc. 7063.00ft MD. 6586.21ft TVD. 81.65ft VS  
 Marcellus POE: 7113 MD : 73.02° Inc. 7113.00ft MD. 6603.18ft TVD. 128.65ft VS

Gyrodapa MS Gyro <-17.1/2"> (100°-480) : 109.50ft MD. 590.46ft TVD. 9.28ft S. 9.28ft W  
 WFT EM <-8.3/4"> (2522)\2654-6973) : 2587.45ft TVD. 26.53ft S. 509.39ft W



User specified Dip: 66.47° Field: 51905 nT  
 Magnetic North is 7.68 degrees West of True North (at 13/Jul/2018)  
 Grid North is 0.07 degrees East of True North  
 To correct azimuth from True to Grid subtract 7.75 degrees  
 To correct azimuth from Magnetic to Grid subtract 7.75 degrees

Plot reference wellpath is Short Run Unit 2H PWB Rev.A.0	Grid System: NAD27 / UTM Zone 17 North, US feet
True vertical depths are referenced to Frontier 22 (RKB)	North Reference: Grid north
Measured depths are referenced to Frontier 22 (RKB)	Scale: True distance
Frontier 22 (RKB) to Mean Sea Level: 1274.5 feet	Depths are in feet
Mean Sea Level to Ground level (At Slot: Slot #07) : -1250 feet	Created by: delaban on 2018-09-03
Coordinates are in feet referenced to Slot	Database: WVA_MPL_EasternUS_Datn

Gyrodapa MS Gyro <-17.1/2"> (100°-480) : 0.54° Inc. 109.50ft MD. 109.50ft TVD. 0.18ft VS  
 WFT EM <-8.3/4"> (480)\581-2522) : 0.59° Inc. 590.50ft MD. 590.46ft TVD. 5.11ft VS

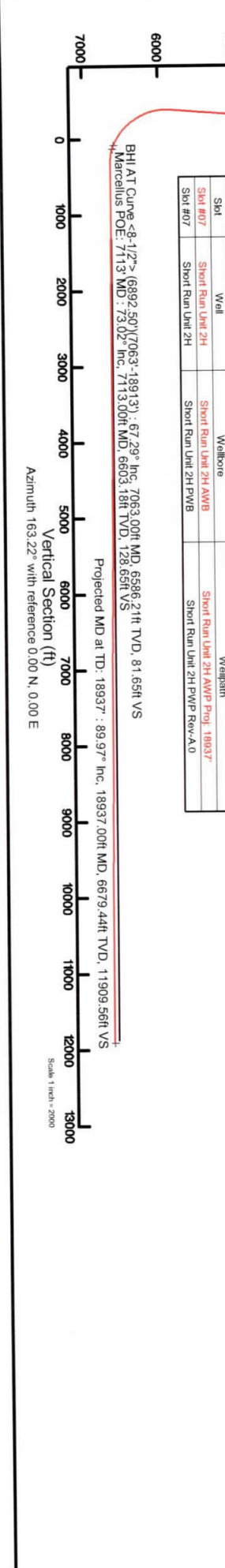
### Location Information

Facility Name	Grid East (US ft)	Grid North (US ft)	Latitude	Longitude
Hichman Pad	1673097.617	14295967.289	39°20'19.220"N	80°53'03.890"W
Slot	Local E (ft)	Grid East (US ft)	Latitude	Longitude
Slot #07	-57.69	1673081.983	39°20'18.650"N	80°53'04.090"W
Frontier 22 (RKB) to Ground level (At Slot: Slot #07)			24.5ft	
Mean Sea Level to Ground level (At Slot: Slot #07)			-1250ft	
Frontier 22 (RKB) to Mean Sea Level			1274.5ft	

### Well Profile Data

Design Comment	MD (ft)	Inc (°)	Az (°)	TVD (ft)	Local N (ft)	Local E (ft)	D.S. (7/100ft)	VS (ft)
Tie On	6982.50	60.560	166.320	6550.86	-520.62	-1693.79	8.07	9.46
Proj. To Bottom	7097.50	70.340	163.600	6594.42	-612.72	-1668.96	9.59	104.81
POE	7122.05	74.005	163.001	6605.00	-644.22	-1659.50	10.74	137.69
Landing Pt.	7273.39	90.000	158.299	6626.00	-785.08	-1609.91	11.00	296.88
Lateral Shift	7959.04	90.000	144.623	6626.00	-1395.12	-1293.59	2.00	955.57
New Lateral Azimuth	8899.02	90.000	163.219	6626.00	-2217.64	-876.12	2.00	1870.28
BHL	18899.02	90.000	163.219	6626.00	-11801.38	2013.89	0.00	11890.28

Projected MD at TD: 18937° : 89.97° Inc. 18937.00ft MD. 6679.44ft TVD. 11909.56ft VS



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# Hydraulic Fracturing Fluid Product Component Information Disclosure

Job Start Date:	1/5/2019
Job End Date:	2/1/2019
State:	West Virginia
County:	Ritchie
API Number:	47088-10340-00-00
Operator Name:	Antero Resources Corporation
Well Name and Number:	Short Run Unit 2H
Latitude:	39.33851400
Longitude:	-80.88446900
Datum:	NAD83
Federal Well:	NO
Indian Well:	NO
True Vertical Depth:	6,682
Total Base Water Volume (gal):	20,855,041
Total Base Non Water Volume:	0

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West Virginia  
Department of Environmental Protection  
47088-10340-00-00

## 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	87.81830	
DWP-641	CWS	Friction Reducer		Listed Below			



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SaniFrac 8844	CWS	Biocide		Listed Below				
Calbreak 5501	CWS	Breaker		Listed Below				
DAP-902	CWS	Scale Inhibitor		Listed Below				
DAP-103	CWS	Iron Control		Listed Below				
Hydrochloric Acid	CWS	Clean Perforations		Listed Below				
Cl-9100G	CWS	Corrosion Inhibitor		Listed Below				
Sand (Proppant)	CWS	Propping Agent		Listed Below				
Other Chemical (s)	Listed Above	See Trade Name (s) List		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	11.81432		
		Calcite		471-34-1	1.00000	0.08222		

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	Hydrochloric acid	7647-01-0	37.00000	0.05525	
	Illite	12173-60-3	1.00000	0.03590	
	Guar gum	9000-30-0	60.00000	0.03584	
	Distillates (petroleum), hydroreated middle	64742-46-7	60.00000	0.03584	
	Polymer	26100-47-0	45.00000	0.02840	
	Distillates (petroleum), hydroreated light	64742-47-8	30.00000	0.01893	
	Apatite	64476-38-6	0.10000	0.01181	
	Goethite	1310-14-1	0.10000	0.01181	
	Biotite	1302-27-8	0.10000	0.01181	
	Ammonium chloride	12125-02-9	11.00000	0.00694	
	2-Propenoic acid, homopolymer, sodium salt	9003-04-7	40.00000	0.00604	
	Polyethylene glycol mixture	25322-68-3	54.50000	0.00585	
	Ilmenite	98072-94-7	0.10000	0.00359	
	Quaternary ammonium compounds, bis (hydrogenated tallow alkyl)dimethyl, salts with bentonite	68953-58-2	5.00000	0.00299	
	Sorbitan monooleate	1338-43-8	4.00000	0.00252	
	2,2-Dibromo-3- Nitrioproionamide	10222-01-2	20.00000	0.00215	
	Polyethylene glycol monooleate	9004-96-0	3.00000	0.00189	
	1,2-Propanediol	57-55-6	10.00000	0.00151	
	Ammonium Persulfate	64742-47-8	100.00000	0.00133	
	Sorbitol tetraoleate	61723-83-9	2.00000	0.00126	
	Oxirane, 2-methyl-, polymer with oxirane, monodecyl ether	37251-67-5	1.50000	0.00090	
	Amines, tallow alkyl, ethoxylated	61791-26-2	1.00000	0.00063	
	Citric acid	77-92-9	60.00000	0.00050	



**Calibration Report**

Database File     antero\_shorrun\_unit\_2h\_rcbl.db  
 Dataset Pathname     pass4.1  
 Dataset Creation     Sat Nov 03 05:09:02 2018

**Gamma Ray Calibration Report**

Serial Number:                    0111  
 Tool Model:                      Tek-Co 2 3/4  
 Performed:                      Mon May 09 16:17:57 2016

Calibrator Value:                1.0                                GAPI

Background Reading:            0.0                                cps  
 Calibrator Reading:            1.0                                cps

Sensitivity:                      0.7500                            GAPI/cps

**Segmented Cement Bond Log Calibration Report**

Serial Number:                    001  
 Tool Model:                      325

Calibration Casing Diameter:    5.500                            in  
 Calibration Depth:              340.167                            ft

**Master Calibration, performed (Derived):**

	Raw (v)		Calibrated (mv)		Results	
	Zero	Cal	Zero	Cal	Gain	Offset
3'	0.026	0.769	1.000	72.000	95.586	-1.522
CAL	0.018	0.627				
5'	0.014	0.951	1.000	72.000	75.730	-0.035
SUM						
S1	0.055	0.542	0.000	100.000	205.335	-11.221
S2	0.047	0.676	0.000	100.000	158.793	-7.420
S3	0.044	0.697	0.000	100.000	153.058	-6.671
S4	0.064	0.725	0.000	100.000	151.309	-9.662
S5	0.082	0.643	0.000	100.000	178.210	-14.565
S6	0.002	0.539	0.000	100.000	186.189	-0.345
S7	0.083	0.620	0.000	100.000	186.206	-15.531
S8	0.049	0.558	0.000	100.000	196.645	-9.646

**Internal Reference Calibration, performed (Not Performed):**

	Raw (v)		Calibrated (v)		Results	
	Zero	Cal	Zero	Cal	Gain	Offset
CAL	0.000	0.000	0.018	0.627	1.000	0.000

**Air Zero Calibration, performed Fri Nov 02 13:29:34 2018:**

	Raw (v)		Calibrated (v)		Results	
	Zero		Zero		Gain	Offset
3'	0.000		0.000			0.000
5'	0.000		0.000			0.000
SUM						
S1	0.000		0.000			0.000
S2	0.000		0.000			0.000


S4	0.000	0.000	0.000
S5	0.000	0.000	0.000
S6	0.000	0.000	0.000
S7	0.000	0.000	0.000
S8	0.000	0.000	0.000

### Temperature Calibration Report

Serial Number: 001  
 Tool Model: 325  
 Performed: Thu Nov 20 16:15:53 2008

	Reference		Reading
Low Reference:	0.00 degF	0.00	usec
High Reference:	1.00 degF	1.00	usec
Gain:	0.33		
Offset:	0.00		
Delta Spacing:	1		

Sensor	Offset (ft)	Schematic	Description	Length (ft)	O.D. (in)	Weight (lb)	
			Cable_Head-1_7/16 Titan 1 7/16" Cable Head	1.02	1.44	3.31	
CCL	19.51		CCL-312tekco (101) Tekco 3 1/8" 450°F SmCo Logging CCL	1.82	1.69	25.00	
			CENT-Probe275 Probe 2.75" 4 Arm Bow Spring Centralizer	2.88	1.69	36.00	
WVFSYNC	14.32						
WVFCAL	14.32						
TEMP	13.19						
WVFS8	11.90						
WVFS7	11.90						
WVFS6	11.90						
WVFS5	11.90						
WVFS4	11.90						
WVFS3	11.90						
WVFS2	11.90						
WVFS1	11.90						
WVF3FT	11.15						
WVF5FT	10.15						
WVFTEMP	6.82						
			SCBLTEKSECT-325 (001) Tekco 3 1/4" 400°F RIB w/ Temp	9.13	1.69	120.00	

GR	1.31		CENT-Probe275 Probe 2.75" 4 Arm Bow Spring Centralizer	2.88	1.69	36.00
			GR-Tek-Co 2 3/4 (0111) Tekco 2 3/4" 400 Deg. F Logging Gamma Ray	3.67	1.69	20.00
			Bull_Plug-1_7/16_GO Titan 1 7/16" Female Bull Plug	0.27	1.44	1.00

Dataset: antero\_shortrun\_unit\_2h\_rcbl.db: field/well/run1/pass4.1  
 Total length: 21.66 ft  
 Total weight: 241.31 lb  
 O.D.: 1.69 in

	Company	Antero Resources	
	Well	Short Run Unit 2H	
	Field	Mountain	
	County	Ritchie County	
	State	West Virginia	
		Country	USA

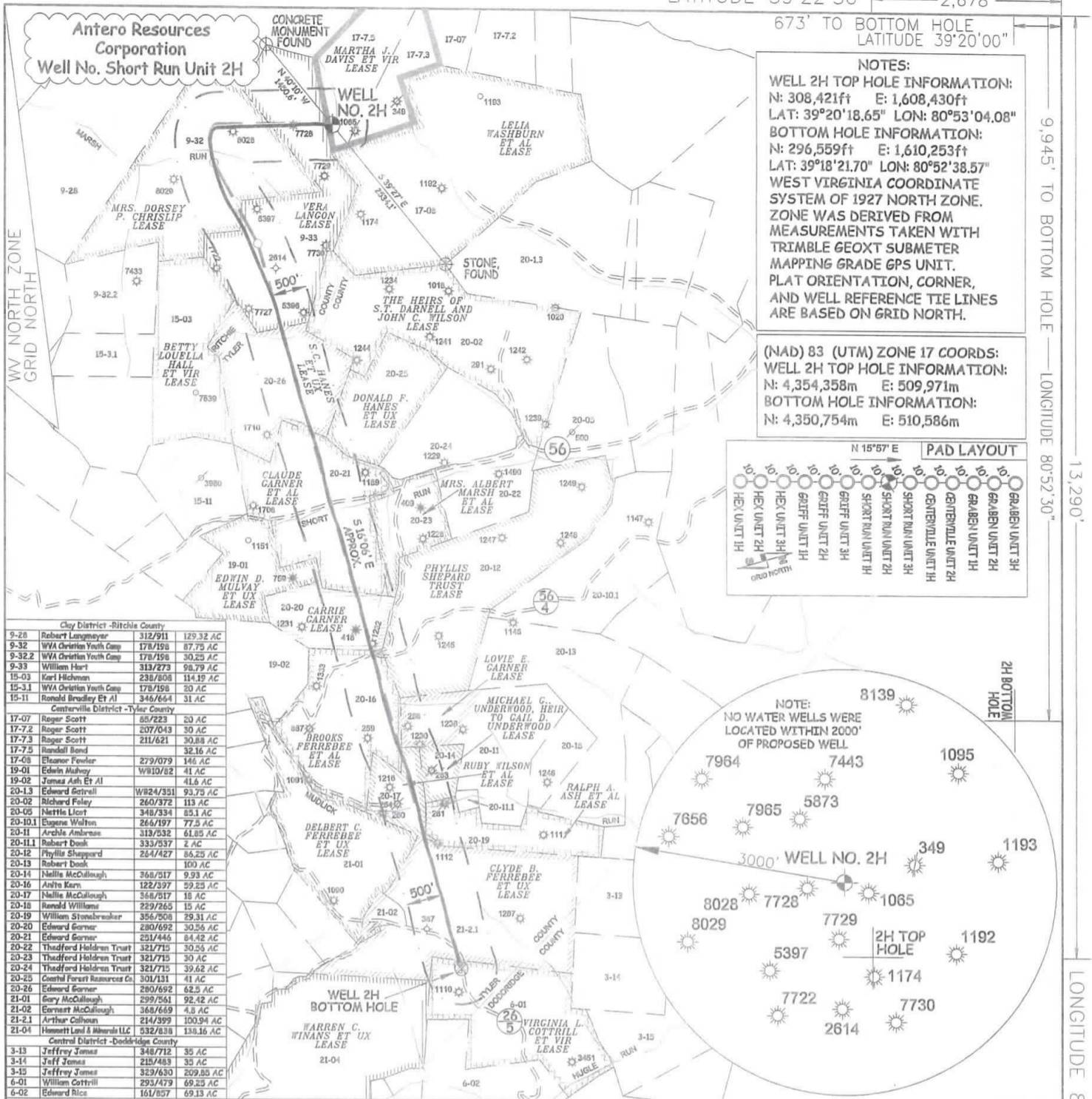
LATITUDE 39°22'30" 2,678'

673' TO BOTTOM HOLE  
LATITUDE 39°20'00"

9,945' TO BOTTOM HOLE  
LONGITUDE 80°52'30"

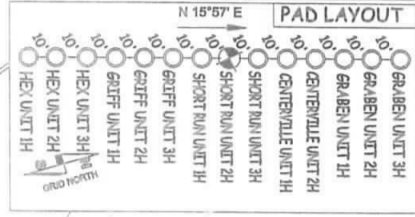
13,290'

LONGITUDE 80°52'30"



**NOTES:**  
WELL 2H TOP HOLE INFORMATION:  
N: 308,421ft E: 1,608,430ft  
LAT: 39°20'18.65" LON: 80°53'04.08"  
BOTTOM HOLE INFORMATION:  
N: 296,559ft E: 1,610,253ft  
LAT: 39°18'21.70" LON: 80°52'38.57"  
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: 4,354,358m E: 509,971m  
BOTTOM HOLE INFORMATION:  
N: 4,350,754m E: 510,586m



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.

- 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.
  - TOP HOLE DATA SHOWN HEREON WAS PROVIDED BY ALLEGHENY SURVEYS, INC.
  - AS DRILLED DATA WAS PROVIDED BY ANTERO RESOURCES CORPORATION.
  - 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.
  - WLS IS BY NO MEANS RESPONSIBLE FOR ANY ERRORS OR INACCURACIES WITH THE DATA AND INFORMATION THAT HAS BEEN PROVIDED.



STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS  
WILLOW LAND SURVEYING PLLC  
220 MASONIC AVE. PENNSBORO WEST VIRGINIA 26415



JOB # 17-008WA  
DRAWING # SHORTRUN2HAD  
SCALE 1" = 2000'  
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

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

DOUGLAS R. ROWE P.S. 2202  
DATE 06/03/19  
OPERATOR'S WELL# SHORT RUN UNIT #2H

WELL TYPE: OIL \_\_\_ GAS  LIQUID INJECTION \_\_\_ WASTE DISPOSAL \_\_\_ 47 - 085 - 10340  
(IF "GAS") PRODUCTION  STORAGE \_\_\_ DEEP \_\_\_ SHALLOW  STATE COUNTY PERMIT  
LOCATION: ELEVATION 1,250' AS BUILT WATERSHED NORTH FORK HUGHES RIVER  
QUADRANGLE PENNSBORO 7.5' DISTRICT CLAY COUNTY RITCHIE  
SURFACE OWNER RADALL BOND ET AL ACREAGE 32.16 ACRES +/-  
OIL & GAS ROYALTY OWNER MARTHA J. DAVIS ET VIR; VERA LANGON; MRS. DORSEY P. CHRISLIP; LEASE ACREAGE 70 AC±; 98.79 AC±; 87.75 AC±;  
S.C. HANES ET UX; CLAUDE GARNER ET AL; CARRIE GARNER; BROOKS FERREBEE ET AL; 64 AC±; 85 AC±; 30 AC±; 59.25 AC±;  
RUBY WILSON ET AL; CLYDE B. FERREBEE ET UX; VIRGINIA L. COTTRILL ET VIR 18 AC±; 105 AC±; 70 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 6,679' TVD 18,937' MD  
WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM  
ADDRESS 1615 WYNKOOP ST. ADDRESS 5400 D BIG TYLER ROAD  
FORM WW-6 DENVER, CO 80202 CHARLESTON, WV 25313