

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

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Office of Oil and Gas

OCT 23 2019

WV Department of
Environmental Protection

API 47 - 085 - 10366 County Ritchie District Clay
Quad Middlebourne 7.5' Pad Name Lettie Pad Field/Pool Name -----
Farm name Daniel M. Haymond IV et al Well Number Hayes 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 4357277m Easting 507731m
Landing Point of Curve Northing 4357334.86m Easting 508225.77m
Bottom Hole Northing 4354181m Easting 509335m

Elevation (ft) 970' 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 10/24/2018 Date drilling commenced 7/5/2018 Date drilling ceased 12/31/2018
Date completion activities began 3/31/2019 Date completion activities ceased 6/25/2019
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 85, 156, 408 Open mine(s) (Y/N) depths No
Salt water depth(s) ft 1158, 1760, 1840 Void(s) encountered (Y/N) depths No
Coal depth(s) ft 320, 348, 390, 500 Cavern(s) encountered (Y/N) depths No
Is coal being mined in area (Y/N) No

Reviewed by: _____

Reviewed

API 47-085 - 10366 Farm name Daniel M. Haymond IV et al Well number Hayes 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"	95'	New	94#, H-40	N/A	Y
Surface	17-1/2"	13-3/8"	513'	New	48#, H-40	N/A	Y
Coal							
Intermediate 1	12-1/4"	9-5/8"	2649'	New	36#, J-55	N/A	Y
Intermediate 2							
Intermediate 3							
Production	8-3/4"/8-1/2"	5-1/2"	18136'	New	23#, P-110	N/A	Y
Tubing		2-3/8"	6826'		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	204 sx	15.6	1.18	120	0'	8 Hrs.
Surface	Class A	425 sx	15.6	1.18	826	0'	8 Hrs.
Coal							
Intermediate 1	Class A	915 sx	15.6	1.18	1181	0'	8 Hrs.
Intermediate 2							
Intermediate 3							
Production	Class H	690 sx (Lead) 1709 sx (Tail)	14.0 (Lead), 15.2 (Tail)	1.47 (Lead), 1.83 (Tail)		~500' into Intermediate Casing	8 Hrs.
Tubing							

Drillers TD (ft) 20500' MD, 6800' TVD (BHL), 6357' (Deepest Point Drilled) Loggers TD (ft) 20500' MD

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

Plug back procedure N/A

Kick off depth (ft) 5812'

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 _____

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WERE TRACERS USED Yes No TYPE OF TRACER(S) USED N/A OCT 23 2019

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EXHIBIT 1

Stage No.	Perforation Date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formations
1	4/1/2019	18029	17936	60	Marcellus
2	4/1/2019	17896.963	17732.278	60	Marcellus
3	4/1/2019	17696.941	17532.256	60	Marcellus
4	4/2/2019	17496.919	17332.234	60	Marcellus
5	4/2/2019	17296.897	17132.212	60	Marcellus
6	4/2/2019	17096.875	16932.19	60	Marcellus
7	4/3/2019	16896.853	16732.168	60	Marcellus
8	4/3/2019	16696.831	16532.146	60	Marcellus
9	4/3/2019	16496.809	16332.124	60	Marcellus
10	4/4/2019	16296.787	16132.102	60	Marcellus
11	4/5/2019	16096.765	15932.08	60	Marcellus
12	4/5/2019	15896.743	15732.058	60	Marcellus
13	4/5/2019	15696.721	15532.036	60	Marcellus
14	4/5/2019	15496.699	15332.014	60	Marcellus
15	4/6/2019	15296.677	15131.992	60	Marcellus
16	4/6/2019	15096.655	14931.97	60	Marcellus
17	4/6/2019	14896.633	14731.948	60	Marcellus
18	4/7/2019	14696.611	14531.926	60	Marcellus
19	4/7/2019	14496.589	14331.904	60	Marcellus
20	4/7/2019	14296.567	14131.882	60	Marcellus
21	4/7/2019	14096.545	13931.86	60	Marcellus
22	4/8/2019	13896.523	13731.838	60	Marcellus
23	4/8/2019	13696.501	13531.816	60	Marcellus
24	4/8/2019	13496.479	13331.794	60	Marcellus
25	4/9/2019	13296.457	13131.772	60	Marcellus
26	4/9/2019	13096.435	12931.75	60	Marcellus
27	4/9/2019	12896.413	12731.728	60	Marcellus
28	4/10/2019	12696.391	12531.706	60	Marcellus
29	4/10/2019	12496.369	12331.684	60	Marcellus
30	4/10/2019	12296.347	12131.662	60	Marcellus
31	4/10/2019	12096.325	11931.64	60	Marcellus
32	4/11/2019	11896.303	11731.618	60	Marcellus
33	4/11/2019	11696.281	11531.596	60	Marcellus
34	4/11/2019	11496.259	11331.574	60	Marcellus
35	4/12/2019	11296.237	11131.552	60	Marcellus
36	4/12/2019	11096.215	10931.53	60	Marcellus
37	4/12/2019	10896.193	10731.508	60	Marcellus
38	4/13/2019	10696.171	10531.486	60	Marcellus
39	4/13/2019	10496.149	10331.464	60	Marcellus
40	4/13/2019	10296.127	10131.442	60	Marcellus
41	4/13/2019	10096.105	9931.42	60	Marcellus
42	4/14/2019	9896.083	9731.398	60	Marcellus
43	4/14/2019	9696.061	9531.376	60	Marcellus
44	4/14/2019	9496.039	9331.354	60	Marcellus
45	4/15/2019	9296.017	9131.332	60	Marcellus
46	4/15/2019	9095.995	8931.31	60	Marcellus
47	4/15/2019	8895.973	8731.288	60	Marcellus
48	4/16/2019	8695.951	8531.266	60	Marcellus
49	4/16/2019	8495.929	8331.244	60	Marcellus
50	4/16/2019	8295.907	8131.222	60	Marcellus
51	4/16/2019	8095.885	7931.2	60	Marcellus
52	4/17/2019	7895.863	7731.178	60	Marcellus
53	4/17/2019	7695.841	7531.156	60	Marcellus
54	4/17/2019	7495.819	7331.134	60	Marcellus
55	4/17/2019	7295.797	7131.112	60	Marcellus
56	4/17/2019	7095.775	6931.09	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	4/1/2019	74.15	7978		3795	278310	9009.2	N/A
2	4/1/2019	75.6	7941	5567	3628	413480	9065.9	N/A
3	4/1/2019	76.34	7768	5960	3862	398420	8782.8	N/A
4	4/2/2019	75.4	7801	5615	3631	410400	8828.5	N/A
5	4/2/2019	72.8	7622	5923	3549	412320	10110	N/A
6	4/2/2019	73.93	7741	6137	3172	405700	9092	N/A
7	4/3/2019	74.41	7727	6208	3304	415000	8996	N/A
8	4/3/2019	78.3	7982	5675	3460	406600	8843	N/A
9	4/3/2019	73.31	7776	5672	3356	401960	8682	N/A
10	4/4/2019	77.86	7951	5656	3608	415020	8861	N/A
11	4/5/2019	76.89	7823	6334	3349	417880	8817	N/A
12	4/5/2019	75.52	7947	6324	3603	414060	8975	N/A
13	4/5/2019	78.48	7924	5574	4320	411060	8858	N/A
14	4/5/2019	72.52	7533	5960	3473	416700	8982	N/A
15	4/6/2019	78.59	7918	5123	3424	400980	8903	N/A
16	4/6/2019	77.01	7955	5672	4570	364600	9128	N/A
17	4/6/2019	75.92	7895	5820	3348	365340	7982	N/A
18	4/7/2019	76.44	7511	5829	3675	415320	8925	N/A
19	4/7/2019	77.49	7758	5824	3608	414900	8922	N/A
20	4/7/2019	80.28	7808	5513	3704	412180	9051	N/A
21	4/7/2019	77.925	7775	5908	3571	406840	8825	N/A
22	4/8/2019	73.42	7141	5701	3542	399320	8801	N/A
23	4/8/2019	80.44	7564	5562	3502	401660	8853	N/A
24	4/8/2019	76.98	7274	5549	3483	399460	8691	N/A
25	4/9/2019	77.22	7335	5844	3518	395260	8520	N/A
26	4/9/2019	77.04	7502	5460	3613	394280	8725	N/A
27	4/9/2019	75.31	7371	5269	3490	399240	8607	N/A
28	4/10/2019	77.56	7537	6098	3604	397120	8934	N/A
29	4/10/2019	77.88	7399	5853	3735	392640	8547	N/A
30	4/10/2019	76.98	7245	5715	3385	392080	8707	N/A
31	4/10/2019	78.89	6964	4735	3530	399700	9069	N/A
32	4/11/2019	75.84	7145	6578	3489	394620	8631	N/A
33	4/11/2019	77.59	7188	5657	3445	400900	8634	N/A
34	4/11/2019	79.39	7140	6510	3336	398140	8488	N/A
35	4/12/2019	79.08	7321	6055	3340	392540	8640	N/A
36	4/12/2019	81.1	7480	5540	3324	404680	8685	N/A
37	4/12/2019	79.6	7408	7907	3431	401540	8627	N/A
38	4/13/2019	78.91	7453	6097	3592	402220	8697	N/A
39	4/13/2019	77.79	7334	5778	3411	402740	8582	N/A
40	4/13/2019	79.14	7246	5717	3277	403200	8585	N/A
41	4/13/2019	76.2	6819	5826	3486	402020	8718	N/A
42	4/14/2019	77.76	6993	5971	3457	400500	8696	N/A
43	4/14/2019	72.46	7167	5647	3586	398900	9943	N/A
44	4/14/2019	77.18	7083	6049	3456	402460	8576	N/A
45	4/15/2019	79.52	7207	6296	3478	404100	8540	N/A
46	4/15/2019	78.25	7377	6039	3452	403880	9585	N/A
47	4/15/2019	77.15	7015	6095	3315	404120	8554	N/A
48	4/16/2019	77.63	7002	6075	3367	402940	8553	N/A
49	4/16/2019	78.05	6885	6288	3373	402800	8532	N/A
50	4/16/2019	78.62	6988	5353	4561	341740	8757	N/A
51	4/16/2019	77.48	6868	5973	3437	400980	8479	N/A
52	4/17/2019	78.19	6767	6259	3872	400380	8476	N/A
53	4/17/2019	77.44	6840	6115	3623	404180	8542	N/A
54	4/17/2019	78.4	6766	5785	3395	403720	8359	N/A
55	4/17/2019	76.1	6356	5472	3627	411470	8445	N/A
56	4/17/2019	78.85	6477	6199	3520	415790	8670	N/A
AVG		76.9	7,521	5,857	3,545	17,976,390	397,134	TOTAL

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EXHIBIT 3

LITHOLOGY/ FORMATION	TOP DEPTH (TVD)	BOTTOM DEPTH (TVD)	TOP DEPTH (MD)	BOTTOM DEPTH (MD)
	From Surface	From Surface	From Surface	From Surface
Silty Sandstone	75	215	75	215
Silty Shale	215	255	215	255
shaly sand	255	395	255	395
Shale	395	455	395	455
Dolomitic Shale	455	735	455	735
Shaly Siltstone	735	855	735	855
Silty Sandstone	855	895	855	895
Shaly Sand	895	1,015	895	1,015
Sandstone	1,015	1,055	1,015	1,055
Silty, Shaly, Sandstone	1,055	1,095	1,055	1,095
Sandstone, Tr Shale, Tr Coal	1,095	1,495	1,095	1,495
Silty Sandstone	1,495	1,675	1,495	1,675
Shaly Siltstone	1,675	1,832	1,675	1,865
Big Lime	1,857	2,614	1,890	2,691
Fifty Foot Sandstone	2,614	2,707	2,691	2,789
Gordon	2,707	3,013	2,789	3,114
Fifth Sandstone	3,013	3,064	3,114	3,169
Bayard	3,064	3,805	3,169	3,954
Speechley	3,805	4,102	3,954	4,269
Balltown	4,102	4,508	4,269	4,699
Bradford	4,508	4,746	4,699	5,010
Benson	4,746	5,167	5,010	5,440
Alexander	5,167	6,184	5,440	6,545
Sycamore	6,051	6,159	6,366	6,520
Middlesex	6,159	6,260	6,520	6,708
Burkett	6,260	6,297	6,708	6,800
Tully	6,297	6,322	6,800	6,884
Marcellus	6,322	NA	6,884	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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Hydraulic Fracturing Fluid Product Component Information Disclosure

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Frac Focus
Chemical Disclosure Registry



Job Start Date:	4/1/2019
Job End Date:	5/2/2019
State:	West Virginia
County:	Ritchie
API Number:	47-085-10366-00-00
Operator Name:	Antero Resources Corporation
Well Name and Number:	Hayes 2H
Latitude:	39.36483889
Longitude:	-80.91042500
Datum:	NAD83
Federal Well:	NO
Indian Well:	NO
True Vertical Depth:	6,367
Total Base Water Volume (gal):	21,406,465
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	88.65142	Density = 8.340
Ingredients	Listed Above	Listed Above					
			Water	7732-18-5	100.00000	0.19653	

SCALECHEK LP-70	Halliburton	Scale Inhibitor						
				Listed Below				
SAND-COMMON WHITE - 100 MESH, 3307 LB BAG	Halliburton	Proppant						
				Listed Below				
HYDROCHLORIC ACID	Halliburton	Solvent						
				Listed Below				
SAND-PREMIUM WHITE-40/70, BULK	Halliburton	Proppant						
				Listed Below				
EXCELERATE PS-2	Halliburton	Friction Reducer						
				Listed Below				
MC B-8614	Halliburton	Biocide						
				Listed Below				
SP BREAKER	Halliburton	Breaker						
				Listed Below				
FDP-S1296-17	Halliburton	Corrosion Inhibitor						
				Listed Below				

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WG-36 GELLING AGENT	Halliburton	Gelling Agent						
				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	11.11778		
			Hydrochloric acid	7647-01-0	15.00000	0.02302		
			Acrylamide acrylate polymer	Proprietary	30.00000	0.01401		
			Hydrotreated light petroleum distillate	64742-47-8	30.00000	0.01401		
			Inorganic salt	Proprietary	30.00000	0.01401		
			Guar gum	9000-30-0	100.00000	0.00852		
			Ethylene glycol	107-21-1	60.00000	0.00791		
			Glutaraldehyde	111-30-8	30.00000	0.00258		
			Telmer	Proprietary	10.00000	0.00132		
			Quaternary ammonium compounds, benzyl-C12-16-alkyldimethyl chlorides	68424-85-1	5.00000	0.00043		
			Sodium persulfate	7775-27-1	100.00000	0.00023		
			Sodium polyacrylate	9003-04-7	1.00000	0.00013		
			Methanol	67-56-1	100.00000	0.00012		
			Ethanol	64-17-5	1.00000	0.00009		
			Modified thiourea polymer	Proprietary	30.00000	0.00003		
			Phosphoric acid	7664-38-2	0.10000	0.00001		
			Propargyl alcohol	107-19-7	5.00000	0.00001		
			Ethoxylated alcohols	Proprietary	5.00000	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)

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10,016' TO TOP HOLE

LATITUDE 39°22'30"

Antero Resources Corporation Well No. Hayes Unit 2H

Table with columns: TM-Par, Surface Owner, Book/Pg, Acreage. Lists various landowners and their respective acreages.

Royalty Owner table listing names and acreages: The Irene Nutter Haymond Trust, Gary R. Davis Et Ux, Candice Wenzler Nigollan, etc.

AS DRILLED DATA: WELL 2H TOP HOLE INFORMATION: N: 318,122ft E: 1,601,240ft... BOTTOM HOLE INFORMATION: N: 307,873ft E: 1,606,332ft...

(NAD) 83 (UTM) ZONE 17 COORDS: WELL 2H TOP HOLE INFORMATION: N: 4,357,277m E: 507,731m... BOTTOM HOLE INFORMATION: N: 4,354,181m E: 509,335m

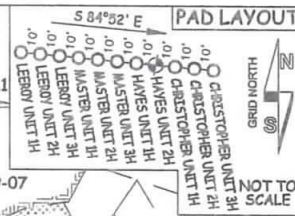
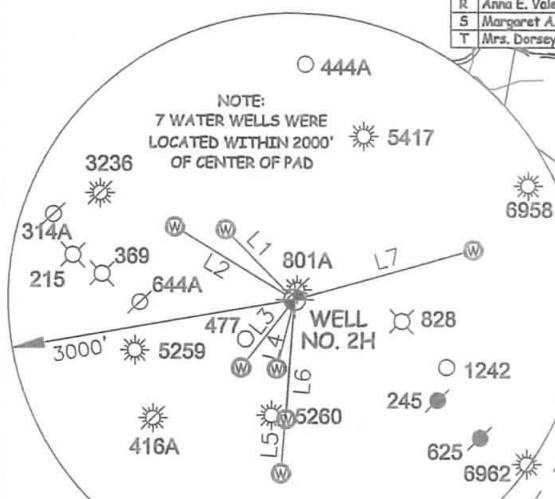


Table with columns: LINE, BEARING, DIST. Lists boundary lines L1 through L7 with bearings and distances.



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 AVE. PENNSBORO WEST VIRGINIA 26415



Form with fields: JOB # 17-014WA, DRAWING # HAYES2HAD, 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, DATE 09/04/19, OPERATOR'S WELL# HAYES UNIT #2H

LEGEND: Surface Owner Boundary Lines +/-, Interior Surface Tracts +/-, Proposed Well Path, As Drilled Well Path. 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.

Form with fields: WELL TYPE: OIL GAS X LIQUID INJECTION WASTE DISPOSAL 47 - 085 - 10366, LOCATION: ELEVATION 970' AS BUILT, QUADRANGLE PENNSBORO 7.5, DISTRICT CLAY COUNTY RITCHIE, SURFACE OWNER DANIEL M. HAYMOND IV ET AL, ACREAGE 111.48 ACRES +/-, LEASE ACREAGE 375 AC±; 94.0 AC±; 120 AC±; 60 AC±; 151 AC±; 29.21 AC±; 24 AC±; 34 AC±; 18 AC±; 57 AC±; 16.91 AC±; 76.8 AC±; 28 AC±; 135 AC±; 87.75 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, TARGET FORMATION MARCELLUS, ESTIMATED DEPTH 6,357' TVD 18,156' MD, WELL OPERATOR ANTERO RESOURCES CORP., DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM, ADDRESS 1615 WYNKOOP ST. DENVER, CO 80202, ADDRESS 5400 D BIG TYLER ROAD CHARLESTON, WV 25313