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WV GEOLOGICAL SURVEY  
MORGANTOWN, WV

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

API 47-017-06486 County Doddridge District Grant  
Quad Smithburg 7.5' Pad Name Pearl Jean Pad Field/Pool Name \_\_\_\_\_  
Farm name Pennington, Dean R. et al Well Number Manser 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 4,348,478m Easting 528,202m  
Landing Point of Curve Northing 4,348,630.85m Easting 528,290.32m  
Bottom Hole Northing 4,350,571m Easting 527,613m

Elevation (ft) 1,141' 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 06/10/2014 Date drilling commenced 07/04/2014 Date drilling ceased 11/09/2014  
Date completion activities began 12/03/2014 Date completion activities ceased 02/10/2015  
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 108', 238' Open mine(s) (Y/N) depths No  
Salt water depth(s) ft 1,253' Void(s) encountered (Y/N) depths None  
Coal depth(s) ft None Identified Cavern(s) encountered (Y/N) depths None  
Is coal being mined in area (Y/N) No

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

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API 47-017 - 06486 Farm name Pennington, Dean R. et al Well number Manser 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#; H-40	N/A	Yes
Surface	17 1/2"	13 3/8"	370'	New	48#; H-40	N/A	Yes
Coal							
Intermediate 1	12 1/4"	9 5/8"	2,577'	New	36#; J-55	N/A	Yes
Intermediate 2							
Intermediate 3							
Production	8 3/4" & 8 1/2"	5 1/2"	14,080'	New	20#; P-110	N/A	Yes
Tubing		2 3/8"	7,162'		5.95#; N-80	N/A	
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	150 sx	15.6	1.18	38	0'	8 Hrs.
Surface	Class A	428 sx	15.6	1.18	257	0'	8 Hrs.
Coal							
Intermediate 1	Class A	1,010 sx	15.6	1.18	807	0'	8 Hrs.
Intermediate 2							
Intermediate 3							
Production	Class H	930 sx (Lead); 1,165 sx (Tail)	13.5 (Lead); 15.2 (Tail)	1.44 (Lead); 1.8 (Tail)	2,750	~500' into Intermediate Casing	8 Hrs.
Tubing							

Drillers TD (ft) 14,080' MD; 6,972' TVD (BHL); 6,998' TVD (Deepest Point Drilled)      Loggers TD (ft) 14,034'

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

Plug back procedure N/A

Kick off depth (ft) 6,192'

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 \_\_\_\_\_





API 47-017-06486 Farm Name Pennington, Dean R. et al Well Number Manser Unit 2H

**EXHIBIT 1**

Stage No.	Perforation Date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formations
1	3-Dec-14	13,819	13,989	60	Marcellus
2	9-Jan-15	13,617	13,787	60	Marcellus
3	10-Jan-15	13,414	13,585	60	Marcellus
4	11-Jan-15	13,212	13,383	60	Marcellus
5	11-Jan-15	13,010	13,181	60	Marcellus
6	12-Jan-15	12,808	12,978	60	Marcellus
7	12-Jan-15	12,606	12,776	60	Marcellus
8	13-Jan-15	12,404	12,574	60	Marcellus
9	13-Jan-15	12,201	12,372	60	Marcellus
10	14-Jan-15	11,999	12,170	60	Marcellus
11	14-Jan-15	11,797	11,967	60	Marcellus
12	15-Jan-15	11,595	11,765	60	Marcellus
13	15-Jan-15	11,393	11,563	60	Marcellus
14	15-Jan-15	11,190	11,361	60	Marcellus
15	16-Jan-15	10,988	11,159	60	Marcellus
16	16-Jan-15	10,786	10,957	60	Marcellus
17	17-Jan-15	10,584	10,754	60	Marcellus
18	17-Jan-15	10,382	10,552	60	Marcellus
19	17-Jan-15	10,180	10,350	60	Marcellus
20	18-Jan-15	9,977	10,148	60	Marcellus
21	18-Jan-15	9,775	9,946	60	Marcellus
22	19-Jan-15	9,573	9,743	60	Marcellus
23	19-Jan-15	9,371	9,541	60	Marcellus
24	19-Jan-15	9,169	9,339	60	Marcellus
25	20-Jan-15	8,966	9,137	60	Marcellus
26	20-Jan-15	8,764	8,935	60	Marcellus
27	21-Jan-15	8,562	8,733	60	Marcellus
28	21-Jan-15	8,360	8,530	60	Marcellus
29	22-Jan-15	8,158	8,328	60	Marcellus
30	22-Jan-15	7,956	8,126	60	Marcellus
31	22-Jan-15	7,753	7,924	60	Marcellus
32	23-Jan-15	7,551	7,722	60	Marcellus
33	23-Jan-15	7,349	7,519	60	Marcellus
34	23-Jan-15	7,147	7,317	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	8-Jan-15	63.4	7,101	5,706	4,928	201,803	7,363	N/A
2	9-Jan-15	62.9	6,801	5,676	5,168	250,562	6,899	N/A
3	10-Jan-15	64.5	6,785	5,633	5,259	252,160	6,592	N/A
4	11-Jan-15	62.3	6,689	5,598	5,187	247,867	6,713	N/A
5	11-Jan-15	65.8	6,815	5,658	5,294	251,313	6,629	N/A
6	12-Jan-15	65.1	6,648	5,607	5,318	249,182	6,493	N/A
7	12-Jan-15	65.6	6,768	5,606	5,061	248,215	6,655	N/A
8	13-Jan-15	64.8	6,790	5,715	5,200	249,842	6,585	N/A
9	13-Jan-15	67.1	6,780	5,415	5,178	249,697	6,636	N/A
10	14-Jan-15	62.9	6,397	5,474	5,092	247,538	6,522	N/A
11	14-Jan-15	68.3	6,624	5,736	5,018	247,995	6,742	N/A
12	15-Jan-15	67.2	6,585	5,510	5,054	247,520	6,586	N/A
13	15-Jan-15	65.2	6,872	5,368	5,063	250,555	6,568	N/A
14	15-Jan-15	68.2	6,707	5,338	5,106	247,771	6,628	N/A
15	16-Jan-15	62.7	6,692	5,414	5,058	241,763	6,436	N/A
16	16-Jan-15	64.4	6,529	5,504	5,284	251,054	6,429	N/A
17	17-Jan-15	66.5	6,557	5,569	5,121	250,994	6,494	N/A
18	17-Jan-15	64.1	6,353	5,488	5,446	251,144	6,356	N/A
19	17-Jan-15	67.8	6,660	5,578	5,319	250,486	6,358	N/A
20	18-Jan-15	63.5	6,417	5,731	5,026	250,160	6,264	N/A
21	18-Jan-15	67.4	6,226	5,624	5,095	246,747	6,282	N/A
22	19-Jan-15	64.1	6,099	5,019	5,104	250,161	6,298	N/A
23	19-Jan-15	64.2	6,198	5,607	5,213	251,037	6,253	N/A
24	19-Jan-15	66.9	6,485	5,956	5,200	251,551	6,278	N/A
25	20-Jan-15	64.8	6,326	5,712	5,234	248,450	6,278	N/A
26	20-Jan-15	67.8	6,641	5,661	5,313	246,572	6,176	N/A
27	21-Jan-15	61.4	6,559	5,767	5,419	243,239	6,701	N/A
28	21-Jan-15	68.7	6,181	5,305	5,338	250,061	6,176	N/A
29	22-Jan-15	68.7	6,190	5,572	5,201	248,004	6,121	N/A
30	22-Jan-15	65.2	6,177	5,369	5,280	248,780	6,138	N/A
31	22-Jan-15	69.4	6,380	5,720	5,301	249,826	6,097	N/A
32	23-Jan-15	65.0	6,469	5,663	5,288	249,619	6,182	N/A
33	23-Jan-15	64.9	6,374	5,543	5,398	247,334	6,065	N/A
34	23-Jan-15	68.7	6,732	6,351	4,991	223,948	6,544	N/A
	AVG=	65.6	6,547	5,594	5,193	8,392,950	219,535	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
Fresh Water	108'	N/A	108'	N/A
Fresh Water	238'	N/A	238'	N/A
Shale	0	168	0	168
Shale/ Trace Coal	est. 168	188	est. 168	188
Shale	est. 188	228	est. 188	228
Sandstone/ Siltstone	est. 228	288	est. 228	288
Shale/ Coal	est. 288	368	est. 288	368
Limestone/ Shale	est. 368	408	est. 368	408
Siltstone/ Shale	est. 408	568	est. 408	568
Shale/ Coal	est. 568	588	est. 568	588
Siltstone/ Limestone	est. 588	628	est. 588	628
Shale/ Limestone	est. 628	788	est. 628	788
Shale/ Siltstone	est. 788	988	est. 788	988
Shale/ Sandstone	est. 988	1,228	est. 988	1,228
Sandstone	est. 1228	1,408	est. 1228	1,408
Sandstone/ Coal	est. 1408	1,448	est. 1408	1,448
Sandstone	est. 1448	1,688	est. 1448	1,688
Siltstone	est. 1688	1,890	est. 1688	1,892
Big Lime	1,890	2,001	1,892	2,003
Big Injun	2,001	2,398	2,003	2,400
Gantz Sand	2,398	2,514	2,400	2,515
Fifty Foot Sandstone	2,514	2,583	2,515	2,584
Gordon	2,583	2,913	2,584	2,914
Fifth Sandstone	2,913	2,930	2,914	2,931
Bayard	2,930	3,331	2,931	3,332
Warren	3,331	3,650	3,332	3,651
Speechley	3,650	3,961	3,651	3,963
Baltown	3,961	4,430	3,963	4,431
Bradford	4,430	4,936	4,431	4,937
Benson	4,936	5,205	4,937	5,207
Alexander	5,205	5,416	5,207	5,418
Elk	5,416	5,971	5,418	5,973
Rhinstreet	5,971	6,391	5,973	6,400
Sycamore	6,391	6,627	6,400	6,685
Middlesex	6,627	6,770	6,685	6,873
Burkett	6,770	6,796	6,873	6,912
Tully	6,796	6,906	6,912	7,104
Marcellus	6,906	NA	7,104	NA

\*Please note Antero determines shallow 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**

Job Start Date:	1/8/2015
Job End Date:	1/23/2015
State:	West Virginia
County:	Doddridge
API Number:	47-017-06486-08-00
Operator Name:	Antero Resources Corporation
Well Name and Number:	Manser Unit 2H
Longitude:	-80.67299400
Latitude:	39.28519700
Datum:	NAD83
Federal/Tribal Well:	NO
True Vertical Depth:	6,998
Total Base Water Volume (gal):	9,725,499
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					
SAND - PREMIUM - 40/70, BULK, SK (100064018)	Halliburton	Proppant	Fresh Water	7732-18-5	100.00000	90.3374	Density = 8.330
SAND - PREMIUM - 20/40, BULK, SK (101272933)	Halliburton	Proppant	Crystalline silica, quartz	14808-60-7	100.00000	5.20989	
SAND - PREMIUM - 100 MESH, 100 LB, SK (100002158)	Halliburton	Proppant	Crystalline silica, quartz	14808-60-7	100.00000	3.39388	
HYDROCHLORIC ACID 10-30%	Halliburton	Solvent	Crystalline silica, quartz	14808-60-7	100.00000	0.73174	
WG-36 GELLING AGENT	Halliburton	Gelling Agent	Hydrochloric acid	7647-01-0	30.00000	0.06138	
FR-66	Halliburton	Friction Reducer	Guar gum	9000-30-0	100.00000	0.03722	
			Hydrotreated light petroleum distillate	64742-47-8	30.00000	0.01822	



LP-65	Halliburton	Scale Inhibitor	Ammonium chloride	12125-02-9	10.00000	0.00142	
SP BREAKER	Halliburton	Breaker	Sodium persulfate	7775-27-1	100.00000	0.00132	
CA-1	Halliburton	Solvent	Paraffinic solvent	Confidential	100.00000	0.00089	Denise Tuck, Halliburton 3000 N. Sam Houston Pkwy E., Houston, TX 77032 281-871-6226
BE-9W	Halliburton	Biocide	Tributyl tetradecyl phosphonium chloride	81741-28-8	10.00000	0.00079	
HAI-OS ACID INHIBITOR	Halliburton	Corrosion Inhibitor	Methanol	67-56-1	60.00000	0.00010	
			Propargyl alcohol	107-19-7	10.00000	0.00002	
Ingredients shown above are subject to 29 CFR 1910.1200(i) and appear on Material Safety Data Sheets (MSDS). Ingredients shown below are Non-MSDS.							
		Other Ingredient(s)	Water	7732-18-5		0.25750	
		Other Ingredient(s)	Polyacrylamide copolymer	Confidential		0.01822	
		Other Ingredient(s)	Organic phosphonate	Confidential		0.00854	
		Other Ingredient(s)	Propylene glycol	57-55-6		0.00476	
		Other Ingredient(s)	Alcohols, C12-16, ethoxylated	88551-12-2		0.00304	
		Other Ingredient(s)	Ammonium chloride	12125-02-9		0.00304	
		Other Ingredient(s)	Sodium chloride	7647-14-5		0.00304	
		Other Ingredient(s)	Fatty acid tall oil amide	Confidential		0.00304	
		Other Ingredient(s)	Bentonite, benzy(hydrogenated tallow alkyl) dimethylammonium stearate complex	121888-68-4		0.00186	
		Other Ingredient(s)	Sorbitan monooleate polyoxyethylene derivative	9005-65-6		0.00061	
		Other Ingredient(s)	Sorbitan, mono-9-octadecenoate, (Z)	1338-43-8		0.00061	
		Other Ingredient(s)	Silica gel	112926-00-8		0.00037	
		Other Ingredient(s)	Surfactant mixture	Confidential		0.00037	

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	Other Ingredient(s)	Surfactant mixture	Confidential	0.00037
	Other Ingredient(s)	Formaldehyde	50-00-0	0.00014
	Other Ingredient(s)	Reaction product of acetophenone, formaldehyde, thiourea and oleic acid in dimethyl formamide	68527-49-1	0.00005
	Other Ingredient(s)	Fatty acids, tall oil	Confidential	0.00005
	Other Ingredient(s)	Alcohols, C14-C15, ethoxylated	68951-67-7	0.00005
	Other Ingredient(s)	Crystalline Silica, Quartz	14808-60-7	0.00004
	Other Ingredient(s)	Olefins	Confidential	0.00001
	Other Ingredient(s)	Olefins	Confidential	0.00001
	Other Ingredient(s)	Olefins	Confidential	0.00000
	Other Ingredient(s)	Olefins	Confidential	0.00000
	Other Ingredient(s)	Sodium sulfate	7757-82-6	0.00000

\* Total Water Volume sources may include fresh water, produced water, and/or recycled water  
 \*\* Information is based on the maximum potential for concentration and thus the total may be over 100%

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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