

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

API 47-017-06429 County Doddridge District New Milton
Quad New Milton Pad Name Snake Run Pad Field/Pool Name _____
Farm name Dufflemeyer, Michael B. et al & Hyre, Justine Paula et al Well Number Asena 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 4,339,582.178m Easting 530,165.153m
Landing Point of Curve Northing 4,339,749.62m Easting 529,978.73m
Bottom Hole Northing 4,341,464.884m Easting 529,452.432m

Elevation (ft) 1,081' 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 01/21/2014 Date drilling commenced 07/04/2014 Date drilling ceased 09/20/2014
Date completion activities began 10/24/2014 Date completion activities ceased 12/20/2014
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', 132' Open mine(s) (Y/N) depths No
Salt water depth(s) ft 968', 1864' Void(s) encountered (Y/N) depths None
Coal depth(s) ft None Identified Cavern(s) encountered depths None
Is coal being mined in area (Y/N) No

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Reviewed by:
JL - 7/24/15
✓ 07/24/2015 n

API 47-017 - 06429

Farm name Dufflemeyer, Michael B. et al & Hyre, Justine Paula et al

Well number Asena 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#; J-55	N/A	Yes
Surface	17 1/2"	13 3/8"	359'	New	48#; H-40	N/A	Yes
Coal							
Intermediate 1	12 1/4"	9 5/8"	2,513'	New	36#; J-55	N/A	Yes
Intermediate 2							
Intermediate 3							
Production	8 3/4" & 8 1/2"	5 1/2"	13,578'	New	20#; P-110	N/A	Yes
Tubing		2 3/8"	7,203'		4.7#; 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 ³ /sks)	Volume (ft ³)	Cement Top (MD)	WOC (hrs)
Conductor	Class A	196 sx	15.6	1.18	38	0'	8 Hrs.
Surface	Class A	426 sx	15.6	1.18	249	0'	8 Hrs.
Coal							
Intermediate 1	Class A	986 sx	15.6	1.18	787	0'	8 Hrs.
Intermediate 2							
Intermediate 3							
Production	Class H	960 sx (Lead); 1,075 sx (Tail)	13.5 (Lead); 15.2 (Tail)	1.3 (Lead); 1.86 (Tail)	2,650	~500' into Intermediate Casing	8 Hrs.
Tubing							

Drillers TD (ft) 13,578' MD; 7071' TVD (BHL); 7,084' TVD (Deepest Point Drilled)

Loggers TD (ft) 13,520'

Deepest formation penetrated Marcellus

Plug back to (ft) N/A

Plug back procedure N/A

Kick off depth (ft) 6,391'

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 _____

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W
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Protection

API 47- 017 - 06429

Farm name Dufflemeyer, Michael B. et al & Hyre, Justine Paula et al

Well number Asena Unit 2H

PERFORATION RECORD

Stage No.	Perforation date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formation(s)
* PLEASE SEE ATTACHED EXHIBIT 1					

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)
* PLEASE SEE ATTACHED EXHIBIT 2								

Please insert additional pages as applicable.

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PRODUCING FORMATION(S)	DEPTHS	
Marcellus	7,023' (top) TVD	7,282' (top) MD

Please insert additional pages as applicable.

GAS TEST Build up Drawdown Open Flow OIL TEST Flow Pump

SHUT-IN PRESSURE Surface 3,950 psi Bottom Hole _____ psi DURATION OF TEST _____ hrs

OPEN FLOW Gas Oil NGL Water GAS MEASURED BY

11,775 mcfpd _____ bpd _____ bpd _____ bpd Estimated Orifice Pilot

LITHOLOGY/ FORMATION	TOP	BOTTOM	TOP	BOTTOM	DESCRIBE ROCK TYPE AND RECORD QUANTITY AND TYPE OF FLUID (FRESHWATER, BRINE, OIL, GAS, H ₂ S, ETC)
	DEPTH IN FT NAME TVD	DEPTH IN FT TVD	DEPTH IN FT MD	DEPTH IN FT MD	
	0		0		

*** 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 STRC
Address 1560 Good Hope Pike City Clarksburg State WV Zip 26301

Cementing Company Allied Oil & Gas Services, LLC
Address 1036 East Main Street City Bridgeport State WV Zip 26330

Stimulating Company US Well Services
Address 533 Industrial Park Drive City Jane Lew State WV Zip 26378

Please insert additional pages as applicable.

Completed by Megan Darling Telephone 303-357-7230
Signature *Megan C. Darling* Title Permitting Agent Date 06/26/2015

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EXHIBIT 1

Stage No.	Perforation Date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formations
1	24-Oct-14	13,318	13,487	60	Marcellus
2	16-Nov-14	13,119	13,287	60	Marcellus
3	16-Nov-14	12,919	13,087	60	Marcellus
4	17-Nov-14	12,719	12,888	60	Marcellus
5	17-Nov-14	12,519	12,688	60	Marcellus
6	17-Nov-14	12,320	12,488	60	Marcellus
7	17-Nov-14	12,120	12,288	60	Marcellus
8	18-Nov-14	11,920	12,089	60	Marcellus
9	18-Nov-14	11,721	11,889	60	Marcellus
10	18-Nov-14	11,521	11,689	60	Marcellus
11	19-Nov-14	11,321	11,490	60	Marcellus
12	20-Nov-14	11,121	11,290	60	Marcellus
13	20-Nov-14	10,922	11,090	60	Marcellus
14	20-Nov-14	10,722	10,890	60	Marcellus
15	20-Nov-14	10,522	10,691	60	Marcellus
16	21-Nov-14	10,323	10,491	60	Marcellus
17	21-Nov-14	10,123	10,291	60	Marcellus
18	21-Nov-14	9,923	10,092	60	Marcellus
19	22-Nov-14	9,723	9,892	60	Marcellus
20	22-Nov-14	9,524	9,692	60	Marcellus
21	22-Nov-14	9,324	9,493	60	Marcellus
22	22-Nov-14	9,124	9,293	60	Marcellus
23	23-Nov-14	8,925	9,093	60	Marcellus
24	23-Nov-14	8,725	8,893	60	Marcellus
25	23-Nov-14	8,525	8,694	60	Marcellus
26	24-Nov-14	8,326	8,494	60	Marcellus
27	24-Nov-14	8,126	8,294	60	Marcellus
28	24-Nov-14	7,926	8,095	60	Marcellus
29	25-Nov-14	7,726	7,895	60	Marcellus
30	25-Nov-14	7,527	7,695	60	Marcellus
31	25-Nov-14	7,327	7,495	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	15-Nov-14	64.6	7,526	N/A	4,674	224,880	7,186	N/A
2	16-Nov-14	64.7	7,569	6,690	5,525	186,080	5,878	N/A
3	16-Nov-14	63.2	7,371	6,508	6,146	178,060	5,843	N/A
4	17-Nov-14	65.0	7,509	6,566	5,771	185,980	5,834	N/A
5	17-Nov-14	63.0	7,377	6,214	5,405	244,265	6,325	N/A
6	17-Nov-14	64.1	7,255	5,933	5,807	230,910	6,468	N/A
7	17-Nov-14	62.4	7,496	6,268	5,146	225,220	6,460	N/A
8	18-Nov-14	68.4	7,533	6,018	5,546	237,800	6,434	N/A
9	18-Nov-14	64.9	7,416	6,136	5,659	243,020	6,458	N/A
10	18-Nov-14	67.5	7,379	6,211	5,718	239,860	6,437	N/A
11	19-Nov-14	67.4	7,292	6,392	5,598	247,300	7,002	N/A
12	20-Nov-14	66.7	7,157	6,238	5,739	238,920	6,367	N/A
13	20-Nov-14	67.2	7,208	6,100	5,658	243,180	6,340	N/A
14	20-Nov-14	68.0	7,161	6,111	5,832	246,585	6,335	N/A
15	20-Nov-14	68.5	7,425	5,845	4,956	231,180	6,781	N/A
16	21-Nov-14	65.8	7,312	6,163	5,738	230,080	6,312	N/A
17	21-Nov-14	66.1	7,406	6,102	5,453	244,820	6,335	N/A
18	21-Nov-14	65.4	7,868	5,990	5,206	230,240	6,393	N/A
19	22-Nov-14	68.9	7,117	6,307	4,999	242,640	6,229	N/A
20	22-Nov-14	66.2	7,267	5,977	5,674	237,320	6,290	N/A
21	22-Nov-14	66.8	7,190	5,969	5,368	243,260	6,230	N/A
22	22-Nov-14	69.5	7,087	5,969	5,235	238,060	6,841	N/A
23	23-Nov-14	68.7	6,937	5,781	5,207	246,280	6,183	N/A
24	23-Nov-14	68.4	6,996	5,817	5,542	224,480	6,133	N/A
25	23-Nov-14	67.2	6,938	5,643	4,920	244,660	5,731	N/A
26	24-Nov-14	67.8	6,997	6,296	5,156	243,730	6,151	N/A
27	24-Nov-14	68.7	6,824	6,262	5,168	245,000	6,089	N/A
28	24-Nov-14	66.2	6,744	5,844	5,382	237,940	6,137	N/A
29	25-Nov-14	68.4	6,543	5,501	4,878	218,390	6,061	N/A
30	25-Nov-14	67.8	6,642	5,906	5,383	244,005	6,038	N/A
31	25-Nov-14	67.9	6,732	6,686	5,163	232,220	6,021	N/A
	AVG=	66.6	7,202	6,115	5,408	7,206,365	195,322	TOTAL

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EXHIBIT 3

LITHOLOGY/ FORMATION	TOP DEPTH (TVD) From Surface	BOTTOM DEPTH (TVD) From Surface	TOP DEPTH (MD) From Surface	BOTTOM DEPTH (MD) From Surface
Fresh Water	107'	N/A	107'	N/A
Fresh Water	132'	N/A	132'	N/A
Shale	0	367	0	367
Siltstone/ Sandstone	367	467	367	467
Shale	467	607	467	607
Siltstone/ Sandstone	607	687	607	687
Shale	687	727	687	727
Siltstone/ Shale	727	1,387	727	1,387
Sandstone/ Siltstone	1,387	1,427	1,387	1,427
Shale/ Limestone	1,427	1,467	1,427	1,467
Sandstone	1,467	1,527	1,467	1,527
Siltstone/ Sandstone	1,527	1,947	1,527	1,947
Shale	1,947	1,967	1,947	1,967
Siltstone	1,967	2,072	1,967	2,072
Big Lime	2,072	2,194	2,072	2,194
Big Injun	2,194	2,430	2,194	2,430
Gantz Sand	2,430	2,575	2,430	2,575
Fifty Foot Sandstone	2,575	2,778	2,575	2,778
Gordon	2,778	3,124	2,778	3,124
Fifth Sandstone	3,124	3,200	3,124	3,200
Bayard	3,200	3,466	3,200	3,466
Warren	3,466	3,750	3,466	3,750
Speechley	3,750	3,931	3,750	3,931
Baltown	3,931	4,567	3,931	4,567
Bradford	4,567	5,053	4,567	5,053
Benson	5,053	5,314	5,053	5,314
Alexander	5,314	5,538	5,314	5,538
Elk	5,538	6,042	5,538	6,042
Rhinestreet	6,042	6,584	6,042	6,593
Sycamore	6,584	6,744	6,593	6,790
Middlesex	6,744	6,887	6,790	6,994
Burkett	6,887	6,925	6,994	7,056
Tully	6,925	7,023	7,056	7,282
Marcellus	7,023	NA	7,282	NA

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Hydraulic Fracturing Fluid Product Component Information Disclosure

Job Start Date:	11/15/2014
Job End Date:	11/25/2014
State:	West Virginia
County:	Doddridge
API Number:	47-017-06429-00-00
Operator Name:	Antero Resources Corporation
Well Name and Number:	Asena Unit 2H
Longitude:	-80.65062800
Latitude:	39.20498300
Datum:	NAD83
Federal/Tribal Well:	NO
True Vertical Depth:	7,084
Total Base Water Volume (gal):	8,203,524
Total Base Non Water Volume:	366,234

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	Antero Resources	Base Fluid	Water	7732-18-5	100.00000	90.10429	
Sand	U.S. Well Services, LLC	Proppant	Crystalline Silica, quartz	14808-60-7	100.00000	9.54746	
GC-15	U.S. Well Services, LLC	Gelling Agents	Guar Gum	9000-30-0	50.00000	0.05273	
			Petroleum Distillates	64742-47-8	60.00000	0.04994	
			Suspending agent (solid)	14808-60-7	3.00000	0.00807	
			Surfactant	68439-51-0	3.00000	0.00316	
HCL Acid (12.6%-18.0%)	U.S. Well Services, LLC	Bulk Acid	Water	7732-18-5	87.50000	0.09121	
			Hydrogen Chloride	7647-01-1	18.00000	0.02179	
WFR-405	U.S. Well Services, LLC	Friction Reducer	Anionic Polyacrylamide	Proprietary	40.00000	0.02751	
			Water	7732-18-5	40.00000	0.02751	
			Petroleum Distillates	64742-47-8	40.00000	0.02215	
			Ethoxylated alcohol blend	Proprietary	5.00000	0.00344	



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SI-1100	U.S. Well Services	Scale Inhibitor	Crystalline Salt	12125-02-9	5.00000	0.00344
			DI Water	7732-18-5	80.00000	0.01147
			Ethylene Glycol	107-21-1	40.00000	0.00648
			Potassium salt of diethylene triamine penta (methylene phosphonic acid)	15827-60-8	10.00000	0.00194
			2-Phosphonobutane 1,2,4 tricarboxylic salt	37971-36-1	10.00000	0.00185
			hexamethylenediamine tetra (methylene phosphonic acid)	38820-59-6	10.00000	0.00179
			Copolymer of Maleic and Acrylic acid	26677-99-6	10.00000	0.00169
			bis (hexamethylene) triamine penta (methylene phosphonic acid) - phosphate acid	40623-75-4	10.00000	0.00165
			Acrylic polymer	52255-49-9	5.00000	0.00072
K-BAC 1020	U.S. Well Services, LLC	Anti-Bacterial Agent				
			2,2-dibromo-3-nitropropionamide	10222-01-2	20.00000	0.00489
			Deionized Water	7732-18-5	28.00000	0.00280
AP One	U.S. Well Services, LLC	Gel Breakers				
			Ammonium Persulfate	7727-54-0	100.00000	0.00167
AI-301	U.S. Well Services, LLC	Acid Corrosion Inhibitors				
			Diethylene Glycol	111-46-6	30.00000	0.00014
			Methenamine	100-97-0	20.00000	0.00011
			Hydrogen Chloride	7647-01-0	10.00000	0.00005
			Polyethylene polyamine	68603-67-8	10.00000	0.00004
			Coco amine	61791-14-8	5.00000	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.

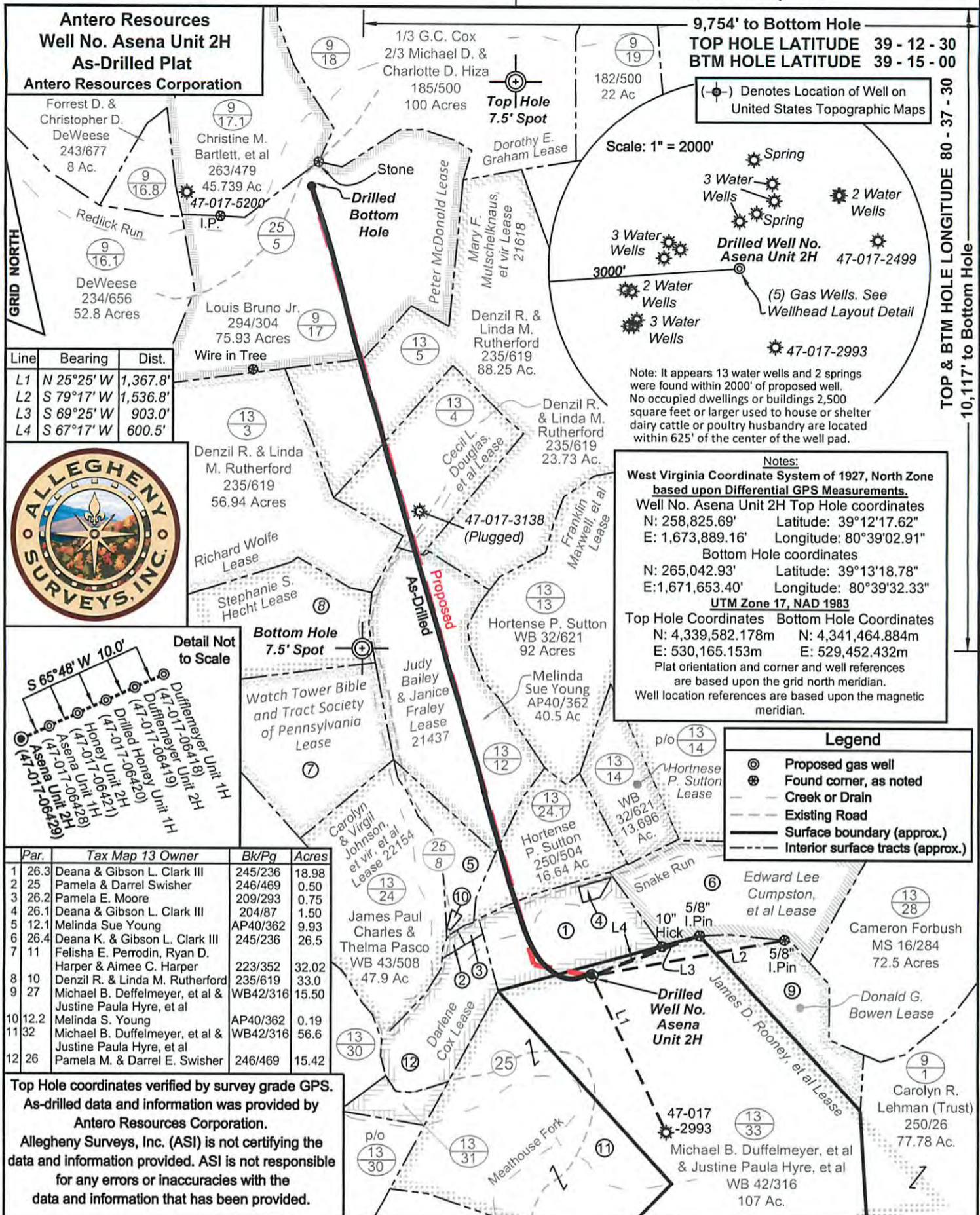
* Total Water Volume sources may include fresh water, produced water, and/or recycled water

** Information is based on the maximum potential for concentration and thus the total may be over 100%

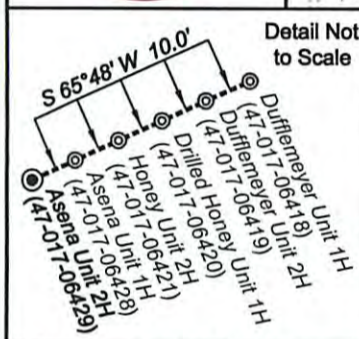
Note: For Field Development Products (products that begin with FDP), MSDS level only information has been provided. Ingredient information for chemicals subject to 29 CFR 1910.1200(i) and Appendix D are obtained from suppliers Material Safety Data Sheets (MSDS)

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Line	Bearing	Dist.
L1	N 25°25' W	1,367.8'
L2	S 79°17' W	1,536.8'
L3	S 69°25' W	903.0'
L4	S 67°17' W	600.5'



Par.	Tax Map 13 Owner	Bk/Pg	Acres
1	26.3 Deana & Gibson L. Clark III	245/236	18.98
2	25 Pamela & Darrel Swisher	246/469	0.50
3	26.2 Pamela E. Moore	209/293	0.75
4	26.1 Deana & Gibson L. Clark III	204/87	1.50
5	12.1 Melinda Sue Young	AP40/362	9.93
6	26.4 Deana K. & Gibson L. Clark III	245/236	26.5
7	11 Felisha E. Perrodin, Ryan D. Harper & Aimee C. Harper	223/352	32.02
8	10 Denzil R. & Linda M. Rutherford	235/619	33.0
9	27 Michael B. Duffelmeyer, et al & Justine Paula Hyre, et al	WB42/316	15.50
10	12.2 Melinda S. Young	AP40/362	0.19
11	32 Michael B. Duffelmeyer, et al & Justine Paula Hyre, et al	WB42/316	56.6
12	26 Pamela M. & Darrel E. Swisher	246/469	15.42

Top Hole coordinates verified by survey grade GPS.
As-drilled data and information was provided by Antero Resources Corporation.
 Allegheny Surveys, Inc. (ASI) is not certifying the data and information provided. ASI is not responsible for any errors or inaccuracies with the data and information that has been provided.

FILE NO: 132-30-NM-13
 DRAWING NO: Asena Unit 2H Well Plat As-Drill
 SCALE: 1" = 1000'
 MINIMUM DEGREE OF ACCURACY: Submeter
 PROVEN SOURCE OF ELEVATION: WVDOT, Bridgeport, WV

STATE OF WEST VIRGINIA
 DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS DIVISION

DATE: March 30 2015
 OPERATOR'S WELL NO. Asena Unit 2H
 API WELL NO 47 - 017 - 06429
 STATE COUNTY PERMIT

WELL TYPE: OIL GAS LIQUID INJECTION WASTE DISPOSAL
 (IF GAS) PRODUCTION: STORAGE DEEP SHALLOW
 Existing Grade - 1081'
 LOCATION: ELEVATION: Original Grade - 1112' WATERSHED: Headwaters Middle Island Creek QUADRANGLE: New Milton
 DISTRICT: New Milton COUNTY: Doddridge
 SURFACE OWNER: Michael B. Duffelmeyer, et al & Justine Paula Hyre, et al Judy Bailey & Janice Fraley; Carolyn & Virgil Johnson, et vir, et al; Darlene Cox; James D. Rooney, et al; ACREAGE: 107.46; 41.1003; 163.85; 72.54;
 ROYALTY OWNER: Cecil L. Douglas, et al; Mary F. Mutschelknaus, et vir; Peter McDonald; LEASE NO: 21437, 21618, 22154 ACREAGE: 23.73; 82.387; 122
 PROPOSED WORK: DRILL CONVERT DRILL DEEPER FRACTURE OR STIMULATE PLUG OFF OLD FORMATION
 PERFORATE NEW FORMATION OTHER PHYSICAL CHANGE IN WELL (SPECIFY) As-Drilled
 PLUG AND ABANDON CLEAN OUT AND REPLUG TARGET FORMATION: Marcellus Shale DEPTH: 7,071' TVD 13,578' MD

WELL OPERATOR: Antero Resources Corporation DESIGNATED AGENT: Dianna Stamper - CT Corporation System
 ADDRESS: 1615 Wynkoop Street ADDRESS: 5400 D Big Tyler Road
 Denver, CO 80202 Charleston, WV 25313