



west virginia department of environmental protection

Office of Oil and Gas
601 57th Street, S.E.
Charleston, WV 25304
(304) 926-0450
fax: (304) 926-0452

Jim Justice, Governor
Austin Caperton, Cabinet Secretary
www.dep.wv.gov

PERMIT MODIFICATION APPROVAL
Horizontal 6A / Horizontal 6A Well - 1

ANTERO RESOURCES CORPORATION
1615 WYNKOOP STREET

DENVER, CO 80202

Re: Permit Modification Approval for LUCY UNIT 2H
47-095-02277-00-00

Change point of entry, horizontal leg length, TMD, and TVD.

ANTERO RESOURCES CORPORATION

The Office of Oil and Gas has reviewed the attached permit modification for the above referenced permit. The attached modification has been approved and well work may begin. Please be reminded that the oil and gas inspector is to be notified twenty-four (24) hours before permitted well work is commenced.

If there are any questions, please feel free to contact me at (304) 926- 0450.



James A. Martin
Chief

Operator's Well Number: LUCY UNIT 2H
Farm Name: MONROE, EDNA
U.S. WELL NUMBER: 47-095-02277-00-00
Horizontal 6A / Horizontal 6A Well - 1
Date Issued: 8/4/2017

Promoting a healthy environment.

08/04/2017



July 17, 2017

Antero Resources
1615 Wynkoop Street
Denver, CO 80202
Office 303.357.7310
Fax 303.357.7315

West Virginia Department of Environmental Protection
Office of Oil and Gas
Attn: Mr. Wade Stansberry
601 57th Street
Charleston, WV 25304

Mr. Stansberry:

Antero Resources Corporation (Antero) would like to submit the following permit modification for one approved well on the Estlack Pad. We are requesting to change the point of entry which will change the horizontal leg length, Total Measured Depth and Total Vertical Depth of the Lucy Unit 2H (API# 47-095-02277).

Attached you will find the following documents:

- REVISED Form WW-6B, which shows the revised Horizontal Leg Length, Measured Depth and Production Casing/Cement Program
- REVISED Form WW-6A1, which shows the new lease we will be drilling into
- REVISED Mylar Plats, which shows the new wellbore path

If you have any questions please feel free to contact me at (303) 357-6759.

Thank you in advance for your consideration.

Sincerely,

A handwritten signature in blue ink that reads "Samantha Klaas". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Samantha Klaas
Permitting Agent
Antero Resources Corporation

Enclosures

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47095022770000
ANTERO LUCY UNIT 2H

47095018640000
TKI WILEY MELVIN 12

47095007030001
SANCHO OIL & GAS NOL

47095006990001
SANCHO OIL & GAS NOL

47095007000001
SANCHO OIL & GAS NOL

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0 1,189
FEET
08/04/2017

PERMIT MODIFICATION (API# 47-095-02277)

UWI (APINum)	Well Name	Well Number	Operator	Hist Oper
47095007000001	NOLAN	2	SANCHO OIL & GAS	SANCHO OIL & GAS
47095018640000	WILEY MELVIN	12	TEXAS KEYSTONE INC	SANCHO OIL & GAS
47095007030001	NOLAN	5	TEXAS KEYSTONE INC	SANCHO OIL & GAS
47095006990001	NOLAN CARL W	1	SANCHO OIL & GAS	HAUGHT G L & SONS

ELEV_GR	TD	TD(SSTVD)	Perf Interval	Perforated Formations	Producible not perforated
1159	5375	-4216	2202-5127	Big Injun, Benson	Big Lime, Keener, Gordon, Riley
878	5010	-4132	4431-4831	Riley, Benson	Big Lime, Keener, Gordon
1038	5178	-4140	2978-4980	Gordon, Benson	Big Lime, Keener, Riley
891	5054	-4163	1802-4852	Big Lime, Keener, Gordon, Benson	Riley

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45-02277 MOD

WW-6B
(04/15)

API NO. 47-095 -
OPERATOR WELL NO. Lucy Unit 2H
Well Pad Name: Existing Estlack Pad

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
WELL WORK PERMIT APPLICATION

1) Well Operator: Antero Resources Corporation 494488557 095 - Tyler Centerville Middlebourne 7.5'
Operator ID County District Quadrangle

2) Operator's Well Number: Lucy Unit 2H Well Pad Name: Existing Estlack Pad

3) Farm Name/Surface Owner: Edna Monroe Public Road Access: CR 30/1

4) Elevation, current ground: 1142' Elevation, proposed post-construction: 1142'

5) Well Type (a) Gas Oil Underground Storage
Other
(b) If Gas Shallow Deep
Horizontal

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):
Marcellus Shale: 6800' TVD, Anticipated Thickness- 55 feet, Associated Pressure- 2800#

8) Proposed Total Vertical Depth: 6800' TVD

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 17309' MD

11) Proposed Horizontal Leg Length: 10230'

12) Approximate Fresh Water Strata Depths: 131', 161', 208'

13) Method to Determine Fresh Water Depths: Offset well records. Depths have been adjusted according to surface elevations.

14) Approximate Saltwater Depths: 772', 847', 1890', 1968'

15) Approximate Coal Seam Depths: 200'

16) Approximate Depth to Possible Void (coal mine, karst, other): None Anticipated

17) Does Proposed well location contain coal seams directly overlying or adjacent to an active mine? Yes No

(a) If Yes, provide Mine Info: Name: _____
Depth: _____
Seam: _____
Owner: _____

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WW-6B
(04/15)

API NO. 47- 095 -
OPERATOR WELL NO. Lucy Unit 2H
Well Pad Name: Existing Estlack Pad

18) CASING AND TUBING PROGRAM

TYPE	Size (in)	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill-up (Cu. Ft.)/CTS
Conductor	20"	New	H-40	94#	40'	40'	CTS, 38 Cu. Ft.
Fresh Water	13-3/8"	New	J-55	54.5#	300'	300'	CTS, 417 Cu. Ft.
Coal	9-5/8"	New	J-55	36#	2500'	2500'	CTS, 1018 Cu. Ft.
Intermediate							
Production	5-1/2"	New	P-110	23#	17,309'	17,309'	CTS, 4352 Cu. Ft.
Tubing	2-3/8"	New	N-80	4.7#		7100'	
Liners							

TYPE	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	30"	24"	0.438"	1530	50	Class A	~1.18
Fresh Water	13-3/8"	17-1/2"	0.38"	2730	1000	Class A	~1.18
Coal	9-5/8"	12-1/4"	0.352"	3520	1500	Class A	~1.18
Intermediate							
Production	5-1/2"	8-3/4" & 8-1/2"	0.415"	12,630	2500	Lead-H/POZ & Tail - H	H/POZ~1.44 & H~1.8
Tubing	2-3/8"	4.778"	0.19"	11,200			
Liners							

PACKERS

Kind:	N/A			
Sizes:	N/A			
Depths Set:	N/A			

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Environmental Protection
Page 2 of 3
08/04/2017

WW-6B
(10/14)

API NO. 47-095 - _____
 OPERATOR WELL NO. Lucy Unit 2H
 Well Pad Name: Existing Estlack Pad

19) Describe proposed well work, including the drilling and plugging back of any pilot hole:

Drill, perforate, fracture a new horizontal shallow well and complete Marcellus Shale.

20) Describe fracturing/stimulating methods in detail, including anticipated max pressure and max rate:

Antero plans to pump Slickwater into the Marcellus Shale formation in order to ready the well for production. The fluid will be comprised of approximately 99 percent water and sand, with less than 1 percent special-purpose additives as shown in the attached "List of Anticipated Additives Used for Fracturing or Stimulating Well."

Anticipated Max Pressure - 9300 lbs
 Anticipated Max Rate - 80 bpm

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 38.12 acres

22) Area to be disturbed for well pad only, less access road (acres): 13.58 acres

23) Describe centralizer placement for each casing string:

Conductor: no centralizers
 Surface Casing: one centralizer 10' above the float shoe, one on the insert float collar and one every 4th joint spaced up the hole to surface.
 Intermediate Casing: one centralizer above float joint, one centralizer 5' above float collar and one every 4th collar to surface.
 Production Casing: one centralizer at shoe joint and one every 3 joints to top of cement in intermediate casing.

24) Describe all cement additives associated with each cement type:

Conductor: no additives, Class A cement.
 Surface: Class A cement with 2-3% calcium chloride and 1/4 lb of flake
 Intermediate: Class A cement with 1/4 lb of flake, 5 gallons of clay treat
 Production: Lead cement- 50/50 Class H/Poz + 1.5% salt + 1% C-45 + 0.5% C-16a + 0.2% C-12 + 0.45% C-20 + 0.05% C-51
 Production: Tail cement- Class H + 45 PPS Calcium Carbonate + 1.0% FL-160 + 0.2% ACGB-47 + 0.05% ACSA-51 + 0.2% ACR-20

25) Proposed borehole conditioning procedures:

Conductor: blowhole clean with air, run casing, 10 bbls fresh water.
 Surface: blowhole clean with air, trip to conductor shoe, trip to bottom, blowhole clean with air, trip out, run casing, circulate pipe capacity + 40 bbls fresh water followed by 25 bbls bentonite mud, 10 bbls fresh water spacer.
 Intermediate: blowhole clean with air, trip to surface casing shoe, trip to bottom, blowhole clean with air, trip out, run casing, circulate 40 bbls brine water followed by 10 bbls fresh water and 25 bbls bentonite mud, pump 10 bbls fresh water.
 Production: circulate with 14 lb/gal NaCl mud, trip to middle of lateral, circulate, pump high viscosity sweep, trip to base of curve, pump high viscosity sweep, trip to top of curve, trip to bottom, circulate, pump high viscosity sweep, trip out, run casing, circulate 10 bbls fresh water, pump 48 bbls barite pill, pump 10 bbls fresh water followed by 48 bbls mud flush and 10 bbls water.

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*Note: Attach additional sheets as needed.

INFORMATION SUPPLIED UNDER WEST VIRGINIA CODE
 Chapter 22, Article 6A, Section 5(a)(5)
 IN LIEU OF FILING LEASE(S) AND OTHER CONTINUING CONTRACT(S)

Under the oath required to make the verification on page 1 of this Notice and Application, I depose and say that I am the person who signed the Notice and Application for the Applicant, and that –

- (1) the tract of land is the same tract described in this Application, partly or wholly depicted in the accompanying plat, and described in the Construction and Reclamation Plan;
- (2) the parties and recordation data (if recorded) for lease(s) or other continuing contract(s) by which the Applicant claims the right to extract, produce or market the oil or gas are as follows:

Grantor, lessor, etc.	Grantee, lessee, etc.	Royalty	Book/Page
Carl W. Nolan Lease (TM 1-8-5 & 1-8-6)			
Carl W. Nolan	Warren R. Haught	1/8	0214/0578
Warren R. Haught, as an individual	Sancho Oil and Gas Corporation	Assignment	0376/0182
Sancho Oil and Gas Corporation	Antero Resources Corporation	Assignment	0436/0177
Carl Baker Lease			
Carl Baker, et al	Sancho Oil and Gas Corporation	1/8	0333/0908
Sancho Oil and Gas Corporation	Antero Resources Corporation	Assignment	0436/0177
State of West Virginia Lease			
West Virginia Division of Natural Resources	Antero Resources Corporation	1/8+	0467/0249
Melvin Wiley et ux Lease			
Melvin Wiley et ux	Sancho Oil and Gas Corporation	1/8	0337/0078
Sancho Oil and Gas Corporation	Antero Resources Corporation	Assignment	0436/0177
Regina M. Buck Lease			
Regina M. Buck	Antero Resources Appalachian Corporation	1/8+	0416/0430
Antero Resources Appalachian Corporation	Antero Resources Corporation	Name Change	Exhibit 1

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 Environmental Protection

*Partial Assignments to Antero Resources Corporation include 100% rights to extract, produce and market the oil and gas from the Marcellus and any other formations completed with this well.

WW-6A1
(5/13)

Operator's Well No. Lucy Unit 2H

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Lease Name or Number	Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page
<u>Janice B. White Lease</u>	Janice B. White	Antero Resources Corporation	1/8+	0422/0320


*Partial Assignments to Antero Resources Corporation include 100% rights to extract, produce and market the oil and gas from the Marcellus and any other formations completed with this well.

**Acknowledgement of Possible Permitting/Approval
In Addition to the Office of Oil and Gas**

The permit applicant for the proposed well work addressed in this application hereby acknowledges the possibility of the need for permits and/or approvals from local, state, or federal entities in addition to the DEP, Office of Oil and Gas, including but not limited to the following:

- WV Division of Water and Waste Management
- WV Division of Natural Resources WV Division of Highways
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- County Floodplain Coordinator

The applicant further acknowledges that any Office of Oil and Gas permit in no way overrides, replaces, or nullifies the need for other permits/approvals that may be necessary and further affirms that all needed permits/approvals should be acquired from the appropriate authority before the affected activity is initiated.

Well Operator: Antero Resources Corporation
 By: Robert S. Tucker 
 Its: Vice President of Geology

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Page 1 of 18 2017
08/04/2017
WV Department of
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FORM WW-6A1
EXHIBIT 1

95-02277 MOD

FILED

JUN 10 2013



Penney Barker, Manager
Corporations Division
Tel: (304)558-8000
Fax: (304)558-8381
Website: www.wvsof.com
E-mail: business@wvsof.com

Natalie E. Tennant,
Secretary of State
1900 Kanawha Blvd E
Bldg 1, Suite 157-K
Charleston, WV 25305

APPLICATION FOR
AMENDED CERTIFICATE
OF AUTHORITY

Office Hours: Monday - Friday
8:30 a.m. - 5:00 p.m. ET

FILE ONE ORIGINAL
(Two if you want a filed
stamped copy returned to you)
FEE: \$25.00

**** In accordance with the provisions of the West Virginia Code, the undersigned corporation hereby ****
applies for an Amended Certificate of Authority and submits the following statement:

- Name under which the corporation was authorized to transact business in WV: Antero Resources Appalachian Corporation
- Date Certificate of Authority was issued in West Virginia: 6/25/2008
- Corporate name has been changed to: Antero Resources Corporation
(Attach one Certified Copy of Name Change as filed in home State of incorporation.)
- Name the corporation elects to use in WV: Antero Resources Corporation
(due to home state name not being available)
- Other amendments: (attach additional pages if necessary)
- Name and phone number of contact person. (This is optional, however, if there is a problem with the filing, listing a contact person and phone number may avoid having to return or reject the document.)
Alvyn A. Schopp (303) 357-7310
Contact Name Phone Number
- Signature information (See below *Important Legal Notice Regarding Signature*):
Print Name of Signer: Alvyn A. Schopp Title/Capacity: Authorized Person
Signature: [Handwritten Signature] Date: June 10, 2013

***Important Legal Notice Regarding Signature:** For West Virginia Code §31D-1-122. Penalty for signing false document. Any person who signs a document he or she knows is false in any material respect and knows that the document is to be delivered to the secretary of state for filing is guilty of a misdemeanor and, upon conviction thereof, shall be fined not more than one thousand dollars or confined in the county or regional jail not more than one year, or both.

Form CF-4

Issued by the Office of the Secretary of State

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JUL 18 2013

WV011 - 04/16/2012 Website: www.wvsof.com

WV Department of
Environmental Protection
08/04/2017

LATITUDE 39°25'00" ← 932'

LATITUDE 39°27'30"

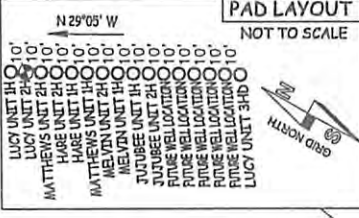
LONGITUDE 80°52'30"

LONGITUDE 80°52'30"

Antero Resources Corporation
Well No. Lucy Unit 2H
47-095-02277 (AS DRILLED)

AS DRILLED DATA:
WELL 2H TOP HOLE INFORMATION:
N: 336,047ft E: 1,610,599ft
LAT: 39°24'52.01" LON: 80°52'41.88"
BOTTOM HOLE INFORMATION:
N: 346,373ft E: 1,608,290ft
LAT: 39°26'33.71" LON: 80°53'13.33"
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: 4,362,786m E: 510,491m
BOTTOM HOLE INFORMATION:
N: 4,365,920m E: 509,735m

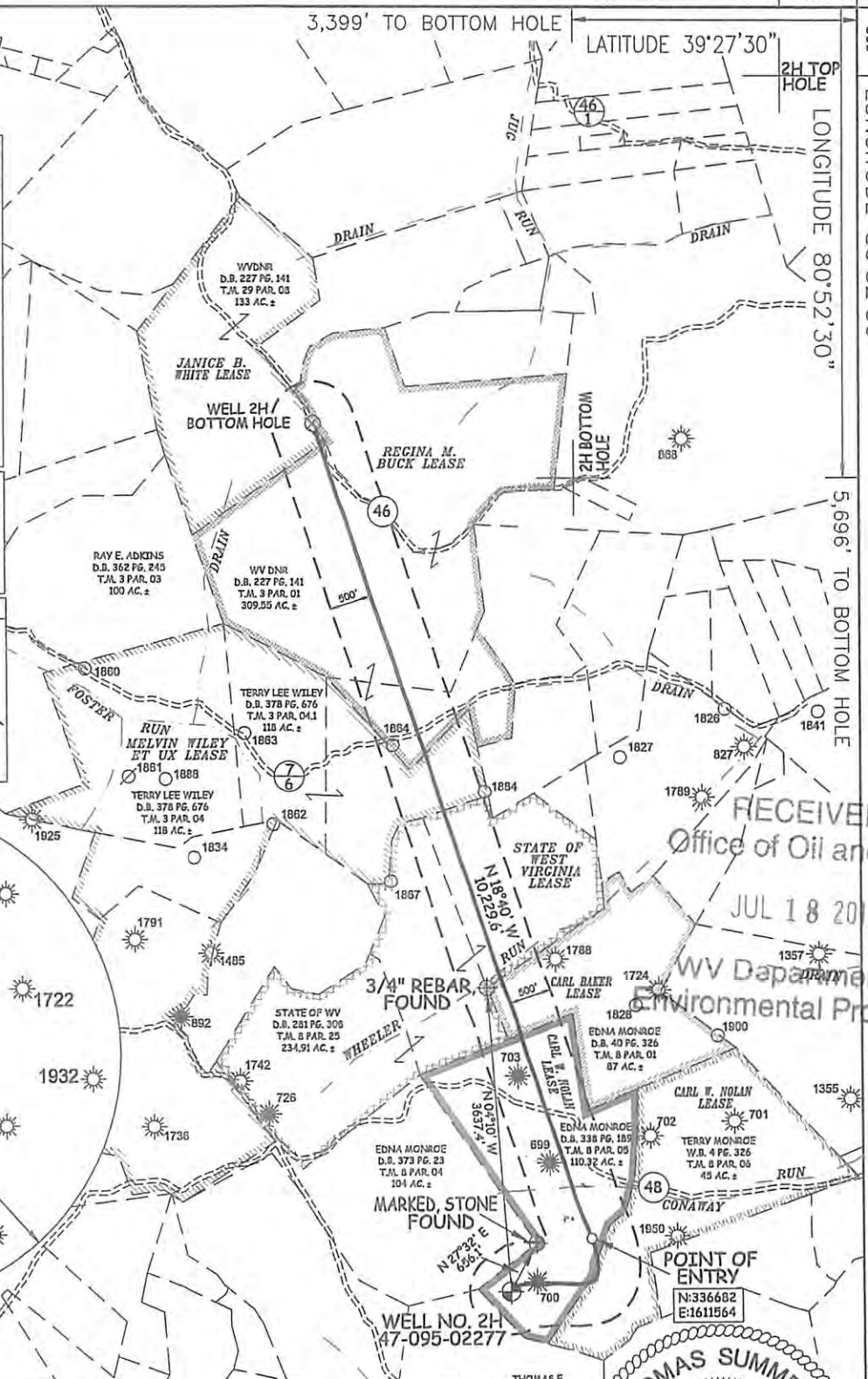


WV NORTH ZONE GRID NORTH

3,399' TO BOTTOM HOLE

2H TOP HOLE

2H BOTTOM HOLE



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JUL 18 2017

WV Department of Environmental Protection



STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS

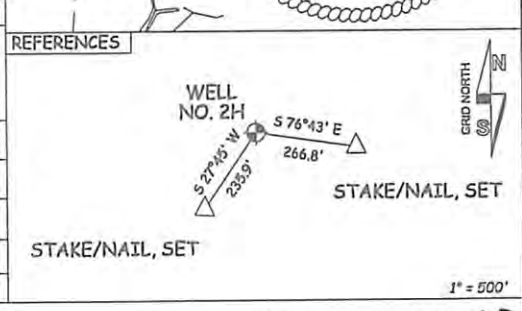
WILLOW LAND SURVEYING PLLC
220 MASONIC AVE. PENNSBORO WEST VIRGINIA 26415

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.



JOB # 15-008WA
DRAWING # LUCY2HADMOD
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 +/-
X Existing Fence
Found monument, as noted
THOMAS SUMMERS P.S. 2109
DATE 06/30/17
OPERATOR'S WELL# LUCY UNIT #2H



WELL TYPE: OIL ___ GAS X LIQUID INJECTION ___ WASTE DISPOSAL ___ 47 ___ 095 ___ 02277 MOD
(IF "GAS") PRODUCTION X STORAGE ___ DEEP ___ SHALLOW X STATE COUNTY PERMIT
LOCATION: ELEVATION 1,142' - AS-DRILLED WATERSHED HEADWATERS MIDDLE ISLAND CREEK
QUADRANGLE MIDDLEBOURNE 7.5' DISTRICT CENTERVILLE COUNTY TYLER
SURFACE OWNER EDNA MONROE ACREAGE 110.32 ACRES +/-
OIL & GAS ROYALTY OWNER CARL W. NOLAN; CARL W. NOLAN; CARL BAKER; LEASE ACREAGE 116 AC.±; 170 AC.±; 87 AC.±;
STATE OF WEST VIRGINIA; MELVIN WILEY ET UX; REGINA M. BUCK; JANICE B. WHITE 234.91 AC.±; 378 AC.±; 309.55 AC.±; 133 AC.±
PROPOSED WORK: DRILL ___ CONVERT ___ DRILL DEEPER ___ REDRILL ___ FRACTURE OR STIMULATE ___
PLUG OFF OLD FORMATION ___ PERFORATE NEW FORMATION ___ OTHER PHYSICAL CHANGE IN WELL
(SPECIFY) POE MOD PLUG & ABANDON CLEAN OUT & REPLUG
TARGET FORMATION MARCELLUS ESTIMATED DEPTH 6,627' TVD 17,309' MD
WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM
ADDRESS 1615 WYNKOOP ST. ADDRESS 5400 D BIG TYLER ROAD
DENVER, CO 80202 CHARLESTON, WV 25313

08/04/2017

LATITUDE 39°25'00" -932'

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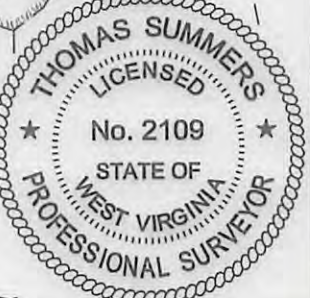
5,696' TO BOTTOM HOLE



STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS

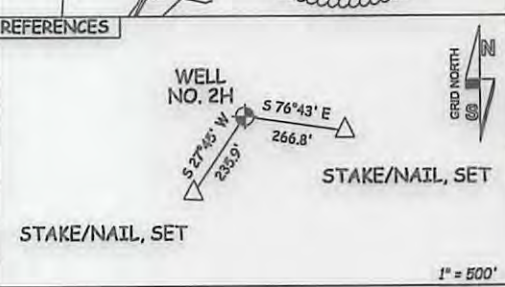
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