



west virginia department of environmental protection

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

Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

March 02, 2015

WELL WORK PERMIT

Horizontal 6A Well

This permit, API Well Number: 47-10303072, issued to AMERICAN ENERGY-MARCELLUS, LLC, is evidence of permission granted to perform the specified well work at the location described on the attached pages and located on the attached plat, subject to the provisions of Chapter 22 of the West Virginia Code of 1931, as amended, and all rules and regulations promulgated thereunder, and to all conditions and provisions outlined in the pages attached hereto. Notification shall be given by the operator to the Oil and Gas Inspector at least 24 hours prior to the construction of roads, locations, and/or pits for any permitted work. In addition, the well operator shall notify the same inspector 24 hours before any actual well work is commenced and prior to running and cementing casing. Spills or emergency discharges must be promptly reported by the operator to 1-800-642-3074 and to the Oil and Gas inspector.

Please be advised that form WR-35, Well Operators Report of Well Work is to be submitted to this office within 90 days completion of permitted well work, as should form WR-34 Discharge Monitoring Report within 30 days of discharge of pits, if applicable. Failure to abide by all statutory and regulatory provisions governing all duties and operations hereunder may result in suspension or revocation of this permit and, in addition, may result in civil and/or criminal penalties being imposed upon the operators.

In addition to the applicable requirements of this permit, and the statutes and rules governing oil and gas activity in WV, this permit may contain specific conditions which must be followed. Permit conditions are attached to this cover letter.

Per 35CSR-4-5.2.g this permit will expire in two (2) years from the issue date unless permitted well work is commenced. If there are any questions, please feel free to contact me at (304) 926-0499 ext. 1654.

James Martin

Chief

Operator's Well No: MARY MILLER GRT WZ 5H
Farm Name: DELANEY, DALE K.

API Well Number: 47-10303072

Permit Type: Horizontal 6A Well

Date Issued: 03/02/2015

PERMIT CONDITIONS

West Virginia Code § 22-6A-8(d) allows the Office of Oil and Gas to place specific conditions upon this permit. Permit conditions have the same effect as law. Failure to adhere to the specified permit conditions may result in enforcement action.

CONDITIONS

1. This proposed activity may require permit coverage from the United States Army Corps of Engineers (USACE). Through this permit, you are hereby being advised to consult with USACE regarding this proposed activity.
2. If the operator encounters an unanticipated void, or an anticipated void at an unanticipated depth, the operator shall notify the inspector within 24 hours. Modifications to the casing program may be necessary to comply with W. Va. Code § 22-6A-5a (12), which requires drilling to a minimum depth of thirty feet below the bottom of the void, and installing a minimum of twenty (20) feet of casing. Under no circumstance should the operator drill more than fifty (50) feet below the bottom of the void or install less than twenty (20) feet of casing below the bottom of the void.
3. When compacting fills, each lift before compaction shall not be more than 12 inches in height, and the moisture content of the fill material shall be within limits as determined by the Standard Proctor Density test of the actual soils used in specific engineered fill, ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort, to achieve 95 % compaction of the optimum density. Each lift shall be tested for compaction, with a minimum of two tests per lift per acre of fill. All test results shall be maintained on site and available for review.
4. Operator shall install signage per § 22-6A-8g (6) (B) at all source water locations included in their approved water management plan within 24 hours of water management plan activation.
5. Oil and gas water supply wells will be registered with the Office of Oil and Gas and all such wells will be constructed and plugged in accordance with the standards of the Bureau for Public Health set forth in its Legislative rule entitled *Water Well Regulations*, 64 C.S.R. 19. Operator is to contact the Bureau of Public Health regarding permit requirements. In lieu of plugging, the operator may transfer the well to the surface owner upon agreement of the parties. All drinking water wells within fifteen hundred feet of the water supply well shall be flow tested by the operator upon request of the drinking well owner prior to operating the water supply well.
6. Pursuant to the requirements pertaining to the sampling of domestic water supply wells/springs the operator shall, no later than thirty (30) days after receipt of analytical data provide a written copy to the Chief and any of the users who may have requested such analyses.
7. If any explosion or other accident causing loss of life or serious personal injury occurs in or about a well or well work on a well, the well operator or its contractor shall give notice, stating the particulars of the explosion or accident, to the oil and gas inspector and the Chief, within 24 hours of said accident.
8. During the casing and cementing process, in the event cement does not return to the surface, the oil and gas inspector shall be notified within 24 hours.
9. Operator shall provide the Office of Oil & Gas notification of the date that drilling commenced on this well. Such notice shall be provided by sending an email to DEPOOGNotify@wv.gov within 30 days of commencement of drilling.

WW-6B
(9/13)

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

1) Well Operator: American Energy-Marcellus, LLC

| | | | |
|------------------|---------------|---------------|----------------|
| <u>494510050</u> | <u>Wetzel</u> | <u>Center</u> | <u>Big Run</u> |
|------------------|---------------|---------------|----------------|

Operator ID County District Quadrangle

2) Operator's Well Number: Mary Miller GRT WZ 5H Well Pad Name: Mary Miller GRT WZ

3) Farm Name/Surface Owner: MA Miller Public Road Access: SLS 58

4) Elevation, current ground: 1364' Elevation, proposed post-construction: 1364'

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 Associated Pressure(s):
Marcellus, Approximate TVD 7439', approximate thickness 50', +/- 4600 psi

*DMH
2-19-15*

8) Proposed Total Vertical Depth: 7439' *Onondaga*

9) Formation at Total Vertical Depth: Onondaga (less than 50')

10) Proposed Total Measured Depth: 16900'

11) Proposed Horizontal Leg Length: 9010'

12) Approximate Fresh Water Strata Depths: 539'

13) Method to Determine Fresh Water Depths: Based on drilling history in nearby wells

14) Approximate Saltwater Depths: 2175'

15) Approximate Coal Seam Depths: 1265'

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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Environmental Protection

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
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Operator ID County District Quadrangle

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Depth: _____

Seam: _____

Owner: RECEIVED
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WW-6B
(10/14)

4710303072
API NO. 47-

OPERATOR WELL NO. Mary Miller GRT WZ 5H

Well Pad Name: Mary Miller GRT WZ

18)

CASING AND TUBING PROGRAM

| <u>TYPE</u> | <u>Size (in)</u> | <u>New or Used</u> | <u>Grade</u> | <u>Weight per ft. (lb/ft)</u> | <u>FOOTAGE: For Drilling (ft)</u> | <u>INTERVALS: Left in Well (ft)</u> | <u>CEMENT: Fill-up (Cu. Ft.)/CTS</u> |
|--------------|------------------|--------------------|--------------|-------------------------------|-----------------------------------|-------------------------------------|--------------------------------------|
| Conductor | 20" | New | J-55 | 94# | 100' | 100' | 330, CTS |
| Fresh Water | 13-3/8" | New | J-55 | 54.5# | 1350' | 1350' | 625, CTS |
| Coal | | | | | | | |
| Intermediate | 9-5/8" | New | J-55 | 40# | 3500' | 3500' | 1650, CTS |
| Production | 5-1/2" | New | P-110 | 20# | 16900' | 16900' | 4260 |
| Tubing | 2-3/8" | New | N-80 | 4.7# | | | |
| Liners | | | | | | | |

| <u>TYPE</u> | <u>Size (in)</u> | <u>Wellbore Diameter (in)</u> | <u>Wall Thickness (in)</u> | <u>Burst Pressure (psi)</u> | <u>Max. Associated Surface Pressure (psi)</u> | <u>Cement Type</u> | <u>Cement Yield (cu. ft./k)</u> |
|--------------|------------------|-------------------------------|----------------------------|-----------------------------|---|----------------------|---------------------------------|
| Conductor | 20" | 24" | 0.438 | 2110 | 50 | Class A | 1.2 |
| Fresh Water | 13-3/8" | 17-1/2" | 0.38 | 2740 | 600 | Class A | 1.2 |
| Coal | | | | | | | |
| Intermediate | 9-5/8" | 12-1/4" | 0.395 | 3950 | 1500 | Premium H50-50 Poz H | Tail 1.27, Lead 1.51 |
| Production | 5-1/2" | 8-3/4" | 0.361 | 12640 | 5000 | Premium H50-50 Poz H | Tail 1.27, Lead 1.51 |
| Tubing | 2-3/8" | 4.778" | 0.19 | 11200 | | | |
| Liners | | | | | | | |

PACKERS

| | | | | |
|-------------|--|--|--|--|
| Kind: | | | | |
| Sizes: | | | | |
| Depths Set: | | | | |

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

Drill, case, cement, and complete a horizontal Marcellus well. No pilot holes planned. Conductor rig will be used to set conductor and then another rig will move in to drill out of conductor to proposed total depth.

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

Plan we hydraulically fracture/stimulate the well with "slickwater" frac technique. Will utilize a plug and perforation technique through cased hole. Max surface pressure during the frac will be 10,000 psi. Max BHP (bottom hole pressure) would be 13,500 psi at 8,000 ft TVD.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 0

22) Area to be disturbed for well pad only, less access road (acres): 4.32

23) Describe centralizer placement for each casing string:

Conductor: N/A
Surface: Centralizer every 3 joints or 120'
Intermediate: Centralizer every 3 joints or 120'
Production: Run 1 spiral centralizer every 120' from the first 5.5" long joint to the top of the curve
Run 1 spiral centralizer every 200' from the top of the curve to surface

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

Conductor: Class A Cement(see attachment for complete description)
Surface: Class A Cement (see attachment for complete description)
Intermediate: Premium H/50-50 Poz H Cement (see attachment for complete description)
Productions: Premium H/50-50 Poz H Cement (see attachment for complete description)

25) Proposed borehole conditioning procedures:

The wellbore will be properly circulated at TD of each section until as much of the residual drill cuttings have been removed from the wellbore as possible, residual drilling gas has been circulated out and until the mud and wellbore are both constant and stable. Mud properties will be adjusted if needed. Hole cleaning times may vary from well to well, hole section to hole section.

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*Note: Attach additional sheets as needed.

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Cement Additives for WW-6B

Class A – Neat + 2% BWOC Calcium + Chloride + .25% BWOC Flo-Seal Additives are Polyflake LCM

Class H Premium + 0.75% FI 17 + 0.1% C41P + 0.15% C45 + 3pps gilsonite + 0.2% C20 Additives are FL-17, C41-P, C-45, Gilsoite, and C-20

50/50 Poz H + 0.5 %FL 17 + 5% Gyp + 0.1% C41P + 0.15% C51 + 0.1% C20 Additives are FL-17, Gypsum, C41-P, C-51, and C-20

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03/06/2015

WW-9
(9/13)

4710303072

API Number 47 - _____
Operator's Well No. Mary Miller GRT WZ 5H

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

FLUIDS/ CUTTINGS DISPOSAL & RECLAMATION PLAN

Operator Name American Energy - Marcellus, LLC OP Code 4945100500

Watershed (HUC 10) Fishing Creek Quadrangle Big Run

Elevation 1364' County Wetzel District Center

Do you anticipate using more than 5,000 bbls of water to complete the proposed well work? Yes No

Will a pit be used? Yes No

If so, please describe anticipated pit waste: Closed loop system no pits will be used

Will a synthetic liner be used in the pit? Yes No If so, what ml.? _____

Proposed Disposal Method For Treated Pit Wastes:

- Land Application
- Underground Injection (UIC Permit Number see attached sheet titled UIC Wells and Landfills)
- Reuse (at API Number next anticipated well)
- Off Site Disposal (Supply form WW-9 for disposal location)
- Other (Explain _____)

DMH
2-19-15

Will closed loop system be used? If so, describe: yes; see attached sheet titled Closed loop typical description

Drilling medium anticipated for this well (vertical and horizontal)? Air, freshwater, oil based, etc. Air, Freshwater mist, and Synthetic based oil

-If oil based, what type? Synthetic, petroleum, etc. Synthetic oil based drilling mud

Additives to be used in drilling medium? see attached sheet titled drilling additives

Drill cuttings disposal method? Leave in pit, landfill, removed offsite, etc. Landfill

-If left in pit and plan to solidify what medium will be used? (cement, lime, sawdust) _____

-Landfill or offsite name/permit number? see attached sheet titled UIC Wells and Landfills

I certify that I understand and agree to the terms and conditions of the GENERAL WATER POLLUTION PERMIT issued on August 1, 2005, by the Office of Oil and Gas of the West Virginia Department of Environmental Protection. I understand that the provisions of the permit are enforceable by law. Violations of any term or condition of the general permit and/or other applicable law or regulation can lead to enforcement action.

I certify under penalty of law that I have personally examined and am familiar with the information submitted on this application form and all attachments thereto and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment.

Company Official Signature *John Curran*

Company Official (Typed Name) American Energy - Marcellus, LLC

Company Official Title Field Coordinator

Subscribed and sworn before me this 16 day of Dec 20 14

Chris Hill

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My commission expires 1/23/18

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Form WW-9

Operator's Well No. Mary Miller GRT WZSH

American Energy - Marcellus, LLC

Proposed Revegetation Treatment: Acres Disturbed 9.22 Prevegetation pH _____

Lime 3 Tons/acre or to correct to pH 6.5

Fertilizer type 10-20-20

Fertilizer amount 500 lbs/acre

Mulch minimum of 2-3 Tons/acre

Seed Mixtures

| Temporary | | Permanent | |
|--------------|----------|--------------|----------|
| Seed Type | lbs/acre | Seed Type | lbs/acre |
| See attached | | See attached | |
| | | | |
| | | | |

Attach:

Drawing(s) of road, location, pit and proposed area for land application (unless engineered plans including this info have been provided)

Photocopied section of involved 7.5' topographic sheet.

Plan Approved by: [Signature]

Comments: _____

Title: Oil + Gas Inspector

Date: 2-19-15

Field Reviewed? Yes No

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UIC WELLS and Landfills

| <u>Disposal Location</u> | <u>Type</u> | <u>Permit No.</u> |
|--------------------------|-------------|---------------------|
| Wetzel County Landfill – | Landfill | SWF-1021/WV010985 |
| Short Creek Landfill – | Landfill | SWP-1034/WV0109517 |
| Brooke County – | Landfill | SWF-1013/WV0109029 |
| Kemble - | UIC Well | 34-119-2-8780-00-00 |
| Elkhead- | UIC Well | 34-157-2-5511-00-00 |
| Kent Injection Well | UIC Well | 34-119-2-7350-00-00 |
| Moran Well | UIC Well | 34-089-2-4412-00-00 |

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4710303072

Drilling Additives

Air mist system additives are commonly; Rock Drill Oil, Drilling Foam, Drilling Soap, and occasionally Shale Stabilizer (KCl).

Synthetic Oil Based Additives

The base oil is the main ingredient, and it will run approx. 70% of the fluid volume, water will make up about 25%, the remaining 5% by volume will include a mixture of the following:

| | |
|-----------------------|---------------------|
| ANCO Gel | Anco Mul OW |
| Cottonseed Hulls | Anco Mul P |
| D294 | Anco Mul S |
| Anco Bar | Anco Mul Thin |
| Petrogel 100 | Anco Thunder Plug |
| Claytone | Calcium Carbonate M |
| Lime | Cedar Fiber |
| Calcium Chloride | LCF Blend |
| Anco Trol | Mica Fine |
| Base Oil (Kensol 48H) | Walnut Shell Med |
| Anco Mul Mod | Anco Drill A |

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WV Dept. of Environmental Protection

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4710303072

Temporary and Permanent Seed Mix

250 lbs. /acre

Mix Details

| | |
|---------------------|-----|
| Medium red clover | 4% |
| Alsike clover | 4% |
| Birds foot trefoil | 5% |
| Forage tall fescue | 45% |
| Forage perineal rye | 20% |
| Annual rye | 11% |
| Winter wheat | 10% |

Straw

Winter – 3 ton per acre

Summer – 2 ton per acre

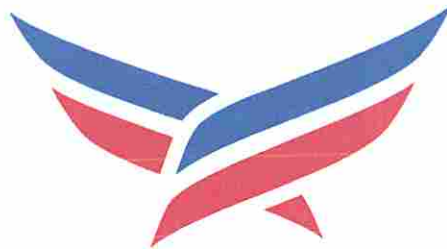
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Mary Miller GRT WZ 1H, 3H, 5H & 7H Site Safety Plan



AMERICAN ENERGY
MARCELLUS

*DMH
2-19-15*

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Closed Loop Typical Description

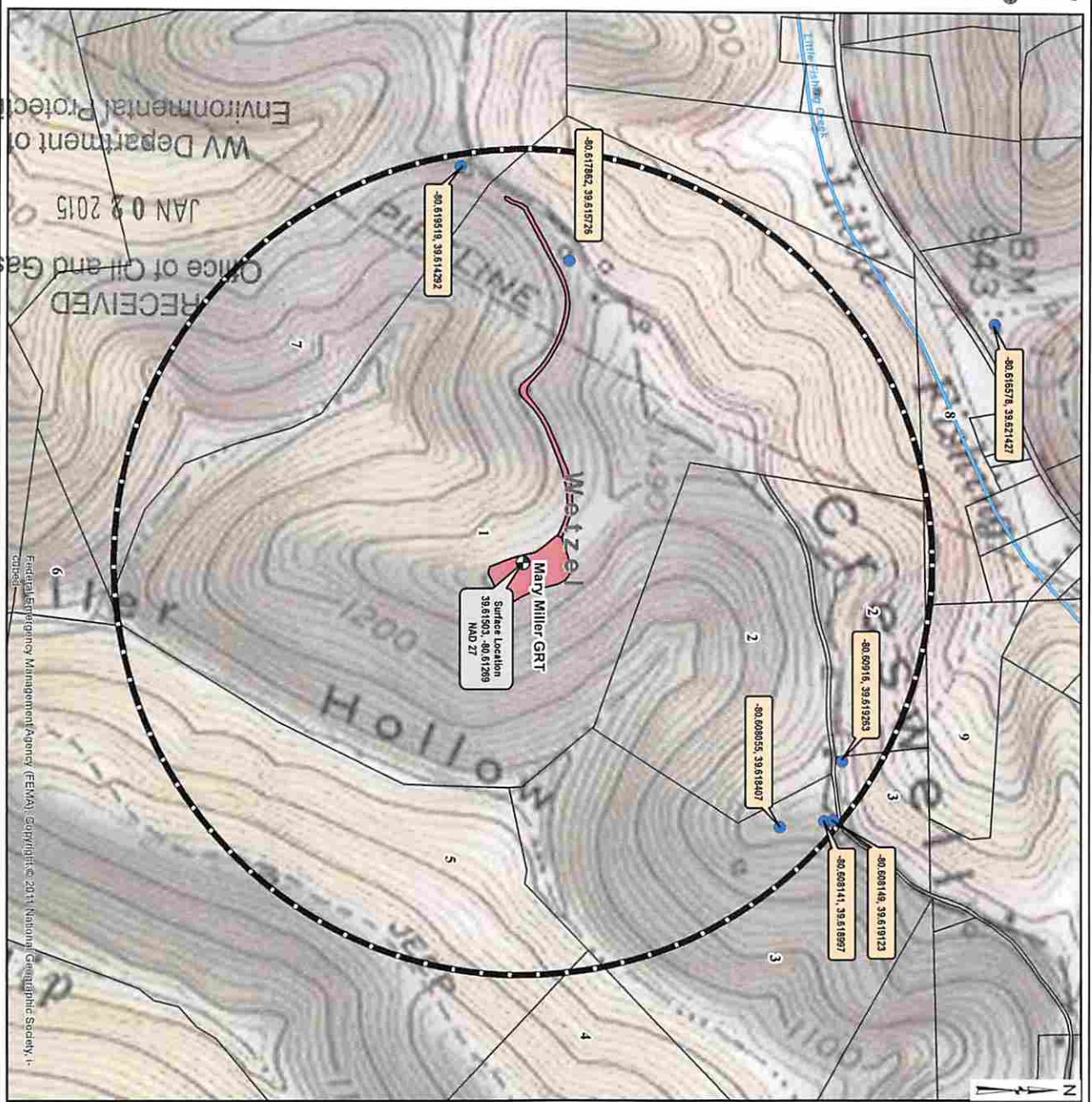
A series of storage tanks that separate liquids and solids along with screen shakers, hydro cyclones, centrifuges and collection equipment (e.g., vacuum trucks, shale barges) may be on site. The wastes created are minimized and transferred off-site for disposal.

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Federal Emergency Management Agency (FEMA) Geographic 2011 National Geographic Society

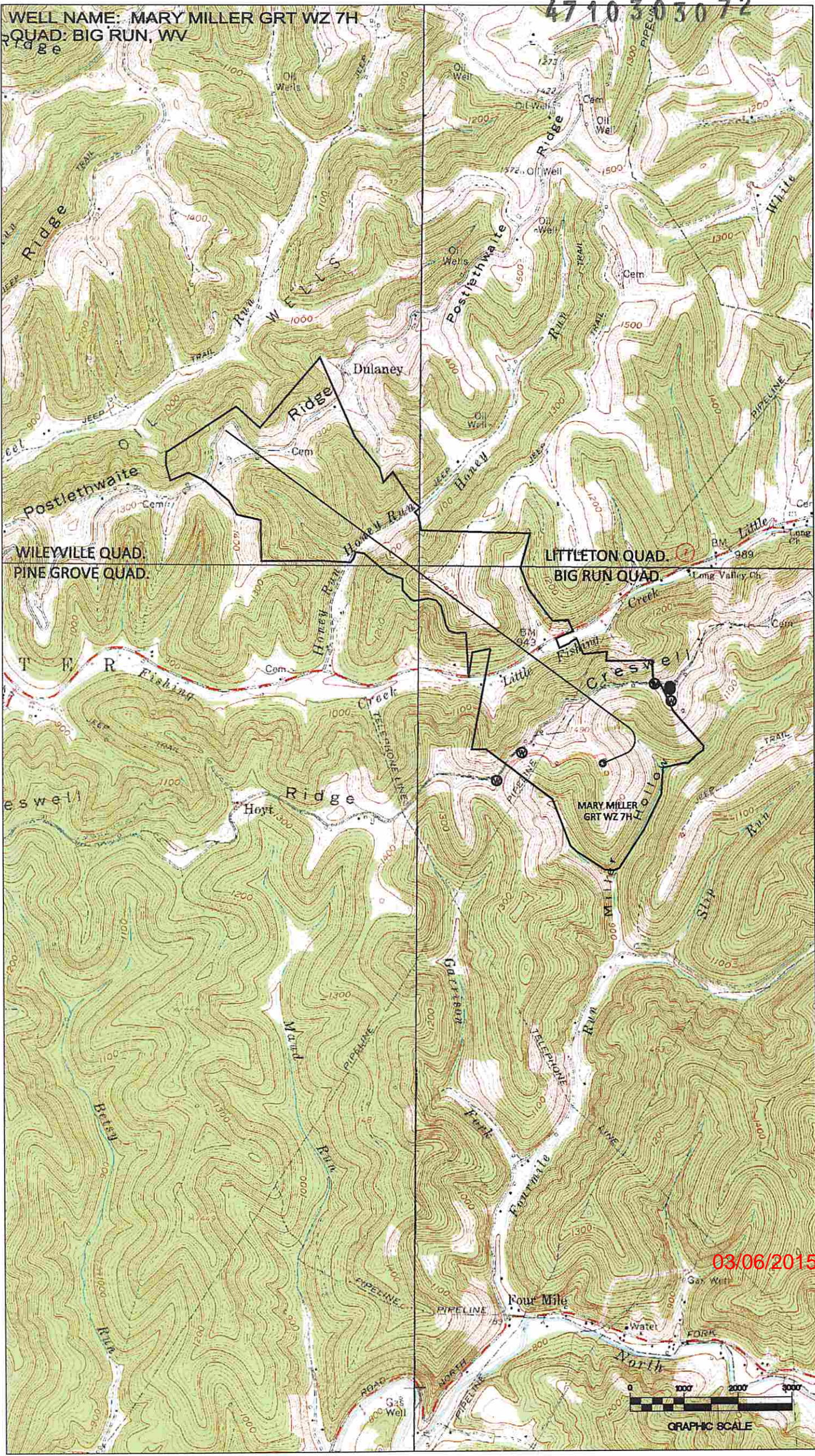
| PROPERTY NO. | PARCEL NO. | OWNER | OWNER ADDRESS |
|--------------|-------------|---------------------------|------------------------------------|
| 1 | 03130220000 | STATE OF WEST VIRGINIA | STATE OF WEST VIRGINIA |
| 2 | 04200050001 | MARSHALL LEE BUELL, TRUST | 1000 N. 1ST ST. MARSHALL, WV 24646 |
| 3 | 03130220000 | TRUST OF BUELL, TRUST | 1000 N. 1ST ST. MARSHALL, WV 24646 |
| 4 | 04200050000 | JOHN C. BUELL COMPANY | ALLEGANY PLACE MARSHALL, WV 24646 |
| 5 | 04200050000 | JOHN C. BUELL COMPANY | ALLEGANY PLACE MARSHALL, WV 24646 |
| 6 | 04200050000 | JOHN C. BUELL COMPANY | ALLEGANY PLACE MARSHALL, WV 24646 |
| 7 | 03130220000 | DAVE R. BUELL COMPANY | 1000 N. 1ST ST. MARSHALL, WV 24646 |
| 8 | 03130220000 | HAROLD BUELL | 1000 N. 1ST ST. MARSHALL, WV 24646 |
| 9 | 03130220000 | FRANK BUELL | 1000 N. 1ST ST. MARSHALL, WV 24646 |

● Water Well Location WV
● AEU Surface Location
■ AEU Testing Radius (2000')
■ Miller Well Pad NAD83
■ Miller Access Road NAD83
— Streams and Rivers
— 100 Year Flood Zones
 Wetzel County Parcel Line
 WV County Lines

250 0 250 500
 Feet

4710303072

WELL NAME: MARY MILLER GRT WZ 7H
QUAD: BIG RUN, WV

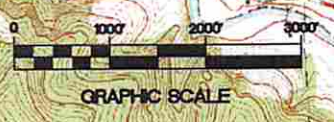


WILEYVILLE QUAD.
PINE GROVE QUAD.

LITTLETON QUAD.
BIG RUN QUAD.

MARY MILLER GRT WZ 7H

03/06/2015

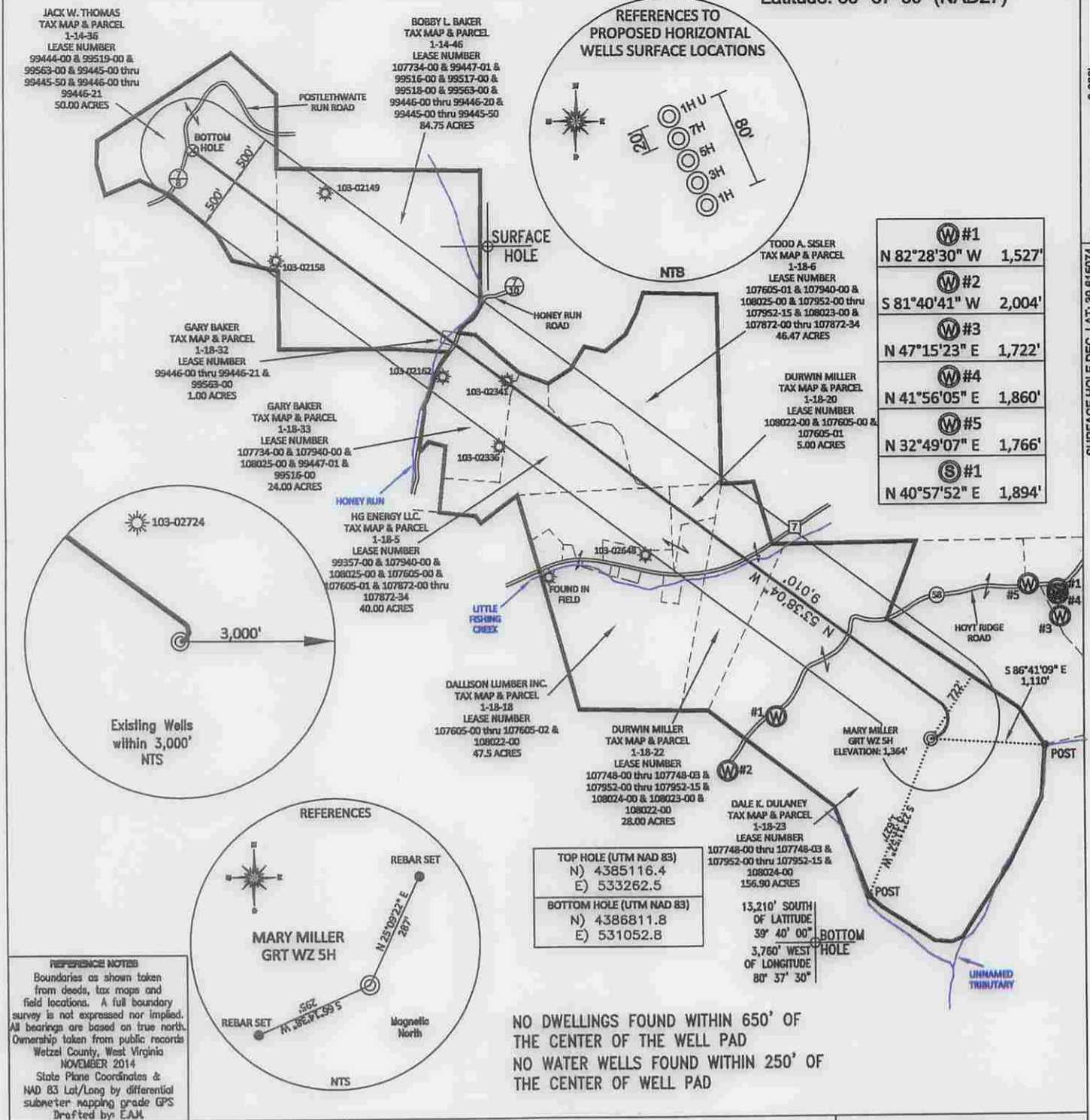


SURFACE HOLE DEC. LONG: 80.612680
SURVEYED LONG: 80° 36' 45.7"

8,270'

Latitude: 39° 37' 30" (NAD27)

SURFACE HOLE DEC. LAT: 39.615074
SURVEYED LAT: 39° 36' 54.3"

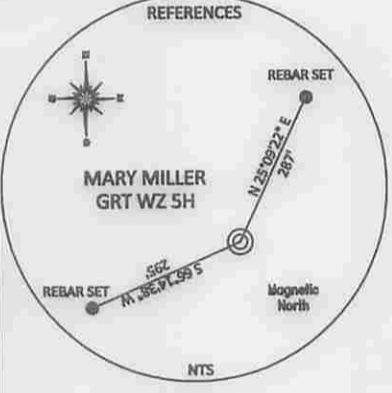


| | | |
|-----|---------------|--------|
| W#1 | N 82°28'30" W | 1,527' |
| W#2 | S 81°40'41" W | 2,004' |
| W#3 | N 47°15'23" E | 1,722' |
| W#4 | N 41°56'05" E | 1,860' |
| W#5 | N 32°49'07" E | 1,766' |
| S#1 | N 40°57'52" E | 1,894' |

| | |
|--------------------------|--------------|
| TOP HOLE (UTM NAD 83) | N) 4385116.4 |
| | E) 533262.5 |
| BOTTOM HOLE (UTM NAD 83) | N) 4386811.8 |
| | E) 531052.8 |

NO DWELLINGS FOUND WITHIN 650' OF THE CENTER OF THE WELL PAD
NO WATER WELLS FOUND WITHIN 250' OF THE CENTER OF WELL PAD

REFERENCE NOTES
Boundaries as shown taken from deeds, tax maps and field locations. A full boundary survey is not expressed nor implied. All bearings are based on true north. Ownership taken from public records Wetzel County, West Virginia NOVEMBER 2014
State Plane Coordinates & NAD 83 Lat/Long by differential submeter mapping grade GPS
Drafted by: EAJ



FILE #: AE001
DRAWING #: 2456
SCALE: PLAT - 1" = 1400'
TICK MARK - 1" = 2000'
MINIMUM DEGREE OF ACCURACY: 1/200
PROVEN SOURCE OF ELEVATION: SUBMETER MAPPING GRADE GPS

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 REGULATIONS ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.
Signed: *[Signature]*
L.L.S. #2124 : Ernest J. Benchek III



(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS WVDEP
OFFICE OF OIL & GAS
601 57TH STREET
CHARLESTON, WV 25304

DATE: FEBRUARY 23, 2015
OPERATOR'S WELL #: MARY MILLER GRT WZ 5H
API WELL #: 47 103 **03072H6A**
STATE COUNTY PERMIT

Well Type: Oil Waste Diposal Production Deep
 Gas Liquid Injection Storage Shallow

WATERSHED: FISHING CREEK
COUNTY/DISTRICT: WETZEL / CENTER
SURFACE OWNER: DALE K. DULANEY
OIL & GAS ROYALTY OWNER: PATSY C. FISH, ARTHUR R. & JOAN E. MILLER, CONNIE S. WHITE, KEITH R. MOORE
LEASE NUMBERS:

ASBUILT ELEVATION: 1,364'
QUADRANGLE: BIG RUN, WV
ACREAGE: 156.90 + / 03/06/2015
ACREAGE: 479.62 +/-

DRILL CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE
PLUG OFF FORMATION PERFORATE NEW FORMATION PLUG & ABANDON
CLEAN OUT & REPLUG OTHER CHANGE (SPECIFY):

TARGET FORMATION: MARCELLUS
ESTIMATED DEPTH: TVD: 7,439' TMD: 16,900'
WELL OPERATOR: American Energy-Marcellus LLC.
DESIGNATED AGENT: Eric B. Gillespie
ADDRESS: 3501 NW 63rd Street
CITY: Oklahoma City STATE: OK ZIP CODE: 73116
ADDRESS: 103 Taryn Lane
CITY: Cross Lanes STATE: WV ZIP CODE: 25313