



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

PERMIT MODIFICATION APPROVAL

March 18, 2014

EQT PRODUCTION COMPANY
POST OFFICE BOX 280
BRIDGEPORT, WV 26330

Re: Permit Modification Approval for API Number 9703813 , Well #: 511416 - HIGGINBOTHAM
Lateral Extended

Oil and Gas Operator:

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.

Please call James Martin at 304-926-0499, extension 1654 if you have any questions.

Sincerely,

for

Gene Smith

Regulatory/Compliance Manager

Office of Oil and Gas



December 17, 2013

Mr. Gene Smith
West Virginia Department of Environmental Protection
Office of Oil and Gas
601 57th Street SE
Charleston, WV 25304

Re: Modification of ADR125 (47-097-03813)

Dear Mr. Smith,

Attached is a modification to the casing program for the above well. EQT is extending the lateral section on this well. A new WW-6B, well schematics, WW-6A1 and Mylar plat is enclosed for your review.

If you have any questions, please do not hesitate to contact me at (304) 848-0076.

Sincerely,

Vicki Roark
Permitting Supervisor-WV

Enc.

cc: Bill Hatfield
P.O. Box 522
Buckhannon, WV 26201

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Environmental Protection

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CASING AND TUBING PROGRAM

18)

| TYPE | Size | New or Used | Grade | Weight per ft. | FOOTAGE: for Drilling | INTERVALS: Left in Well | CEMENT: Fill-up (Cu. Ft.) |
|--------------|--------|-------------|-------|----------------|-----------------------|-------------------------|--|
| Conductor | 20 | New | MC-50 | 81# | 40 | 40 | 38 |
| Fresh Water | 13 3/8 | New | MC-50 | 54# | 958 | 958 | 833 |
| Coal | | | | | | | |
| Intermediate | 9 5/8 | New | MC-50 | 40# | 2,904 | 2,904 | 1,135 |
| Production | 5 1/2 | New | P-110 | 20# | 15,737 | 15,737 | See Note 1 |
| Tubing | 2 3/8 | | J-55 | 4.6 | | | May not be run, if run will be set 100' less than TD |
| Liners | | | | | | | |

| TYPE | Size | Wellbore Diameter | Wall Thickness | Burst Pressure | Cement Type | Cement Yield (cu. ft./ft) |
|--------------|--------|-------------------|----------------|----------------|--------------|---------------------------|
| Conductor | 20 | 24 | 0.375 | - | Construction | 1.18 |
| Fresh Water | 13 3/8 | 17 1/2 | 0.38 | 2,480 | 1 | 1.21 |
| Coal | | | | | | |
| Intermediate | 9 5/8 | 12 3/8 | 0.395 | 3,590 | 1 | 1.21 |
| Production | 5 1/2 | 8 1/2 | 0.361 | 12,640 | - | 1.27/1.86 |
| Tubing | | | | | | |
| Liners | | | | | | |

Packers

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

Note 1: EQT plans to bring the TOC on the production casing cement job 1,000' above kick off point, which is at least 500' above the shallowest production zone, to avoid communication.

Bill Natfield 3/13/2014

WW - 6B

(3/13)

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

Drill and complete a new horizontal well in the Marcellus formation. The vertical drill to go down to an approximate depth of 7773', tag the Onondaga not more than 100', run logs, then plug back to approximately 7063', then kick off the horizontal leg into the Marcellus formation using a slick water frac.

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

Hydraulic fracturing is completed in accordance with state regulations using water recycled from previously fractured wells and obtained from freshwater sources. This water is mixed with sand and a small percentage (less than 0.3%) of chemicals (including 15% Hydrochloric acid, gelling agent, gel breaker, friction reducer, biocide, and scale inhibitor), referred to in the industry as a "slickwater" completion. Maximum anticipated treating pressures are expected to average approximately 8500 psi, maximum anticipated treating rates are expected to average approximately 100 bpm. Stage lengths vary from 150 to 300 feet. Average approximately 200,000 barrels of water per stage. Sand sizes vary from 100 mesh to 20/40 mesh. Average approximately 200,000 pounds of sand per stage.

21) Total area to be disturbed, including roads, stockpile area, pits, etc, (acres): 16.6 ac22) Area to be disturbed for well pad only, less access road (acres): 12.9 ac

23) Describe centralizer placement for each casing string.

- Surface: Bow spring centralizers – One at the shoe and one spaced every 500'.
- Intermediate: Bow spring centralizers – One cent at the shoe and one spaced every 500'.
- Production: One spaced every 1000' from KOP to Int csg shoe

24) Describe all cement additives associated with each cement type. Surface (Type 1 Cement): 0-3% Calcium Chloride
Used to speed the setting of cement slurries.

0.4% flake. Loss Circulation Material (LCM) is used to combat the loss of the cement slurry to a thief zone.
Intermediate (Type 1 Cement): 0-3% Calcium Chloride. Salt is used in shallow, low temperature formations to speed the setting of cement slurries. 0.4% flake. Loss Circulation Material (LCM) is used to combat the loss of whole drilling fluid or cement slurry (not filtrate) to a thief zone.

Production:Lead (Type 1 Cement): 0.2-0.7% Lignosulfonate (Retarder). Lengthens thickening time.

0.3% CFR (dispersant). Makes cement easier to mix.

Tail (Type H Cement): 0.25-0.40% Lignosulfonate (Retarder). Lengthens thickening time.

0.2-0.3% CFR (dispersant). This is to make the cement easier to mix.

60 % Calcium Carbonate. Acid solubility.

0.4-0.6% Halad (fluid loss). Reduces amount of water lost to formation.

25) Proposed borehole conditioning procedures. Surface: Circulate hole clean (Approximately 30-45 minutes) rotating & reciprocating

one full joint until cuttings diminish at surface. When cuttings returning to surface diminish, continue to circulate an additional 5

minutes. To ensure that there is no fill, short trip two stands with no circulation. If there is fill, bring compressors back on

and circulate hole clean. A constant rate of higher than expected cuttings volume likely indicates washouts that will not clean up.

Intermediate: Circulate hole clean (Approximately 30-45 minutes) rotating & reciprocating one full joint until cuttings diminish at

surface. When cuttings returning to surface diminish, continue to circulate an additional 5 minutes. If foam drilling, to enhance

hole cleaning use a soap sweep or increase injection rate & foam concentration.

Production: Pump marker sweep with nut plug to determine actual hole washout. Calculate a gauge holes bottoms up volume.

Perform a cleanup cycle by pumping 3-5 bottoms up or until the shakers are clean. Check volume of cuttings coming across

the shakers every 15 minutes.

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*Note: Attach additional sheets as needed.

WV Department of
Environmental Protection

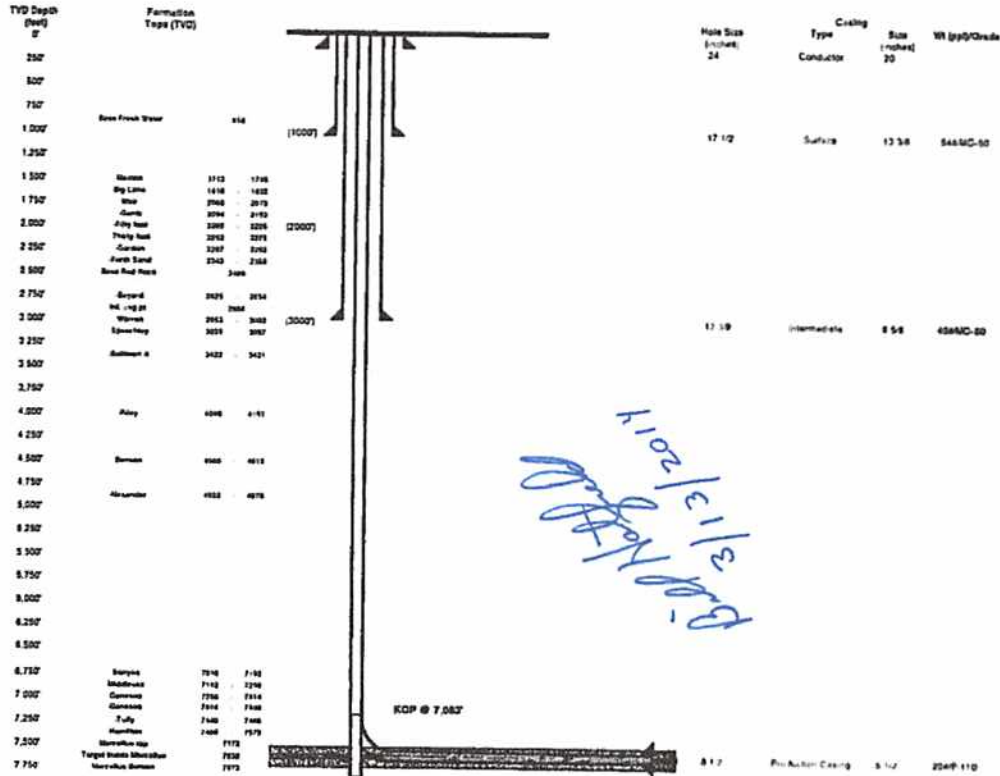
Page 3 of 3

03/21/2014

4709703813 MON

Well 511416 (ADR12SH1)
 EQT Production
 Adrian
 Upshur
 West Virginia

Approx 348
 Vertical Section Feet



Handwritten: 11/13/2014
 P. Hoffmann

KOP @ 7,087

8 1/2 Production Casing 8 1/2 204P-110

Proposed Well Work
 Drill and complete a new horizontal well in the Marcellus formation
 The vertical drill to go down to an approximate depth of 7772'
 Tag the Chronicle not more than 100' feet deep, then plug back to approximately 7242'
 Then kick off the horizontal leg into the Marcellus formation using a slick water frac.

Land curve @ 7,632' RTVD
 7,632' RMD
 Est TD @ 7,852' RTVD
 7,852' RMD

7,852' RMD

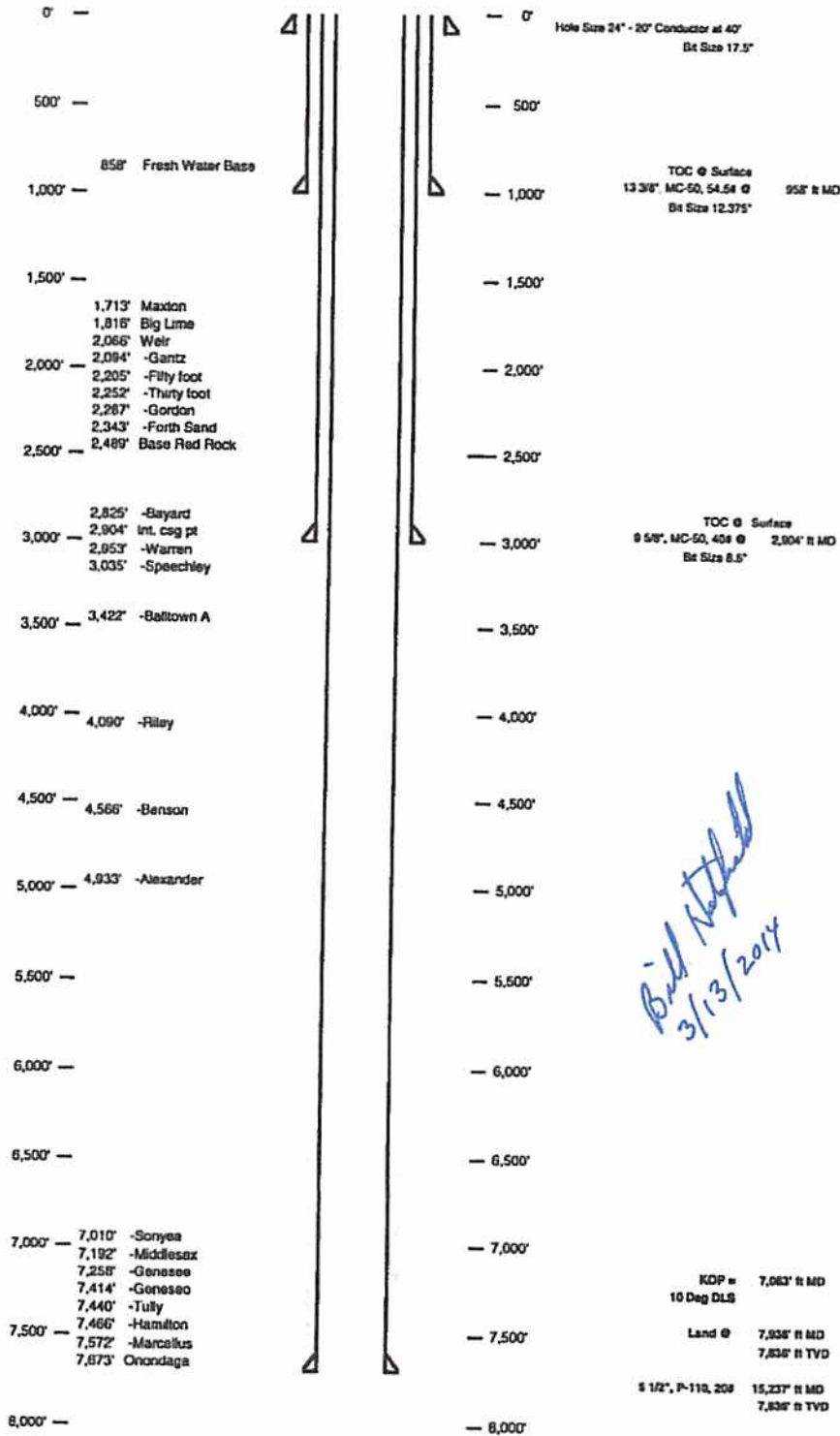
4709703813 MOD

Well Schematic
EQT Production

Well Name 511416 (ADR125H1)
County Upshur
State West Virginia

Elevation KB:
Target
Prospect
Azimuth
Vertical Section

| |
|-----------|
| 1585 |
| Marcellus |
| 340 |
| 7847 |



03/21/2014

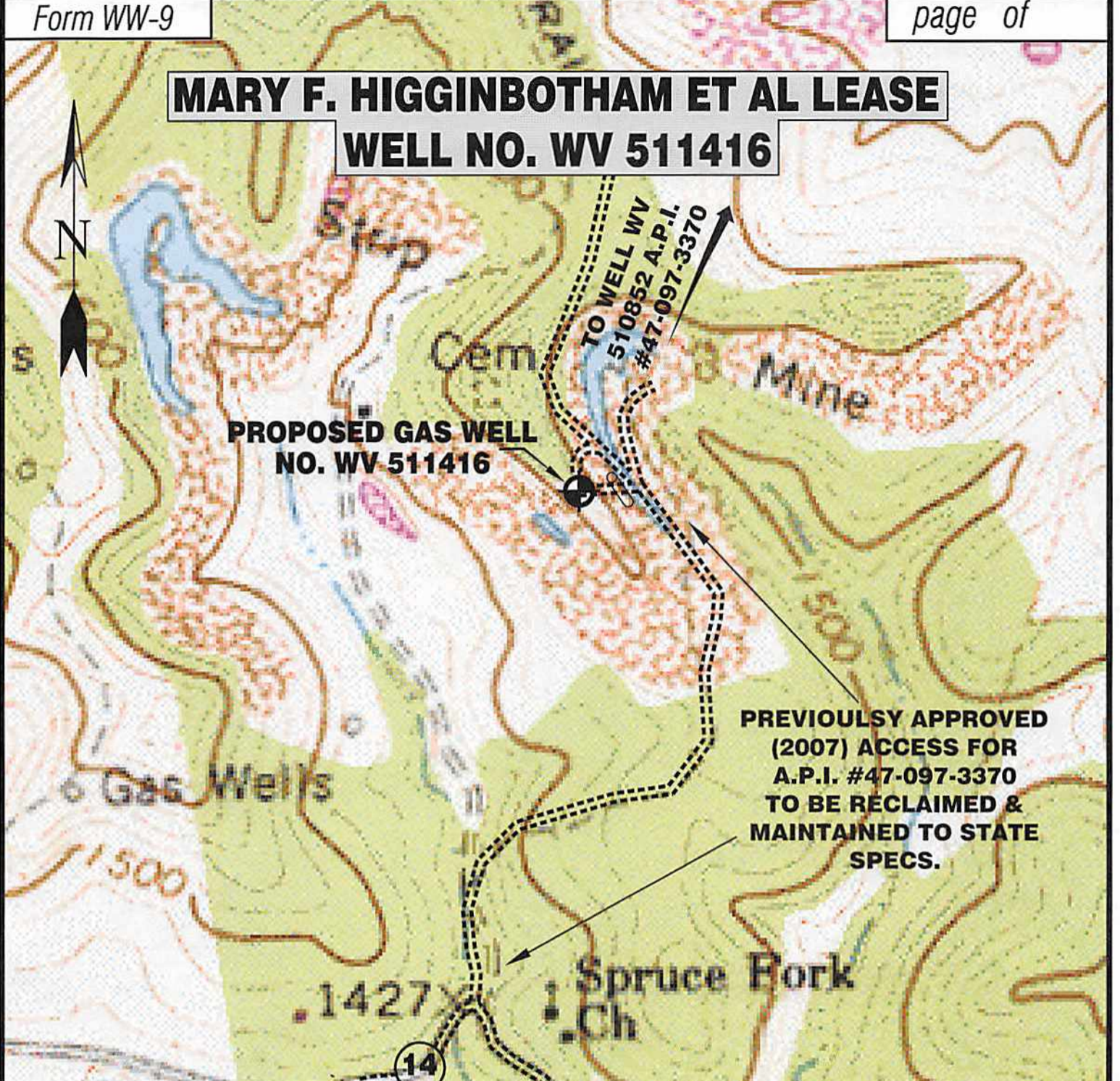
MARY F. HIGGINBOTHAM ET AL LEASE

WELL NO. WV 511416

**PROPOSED GAS WELL
NO. WV 511416**

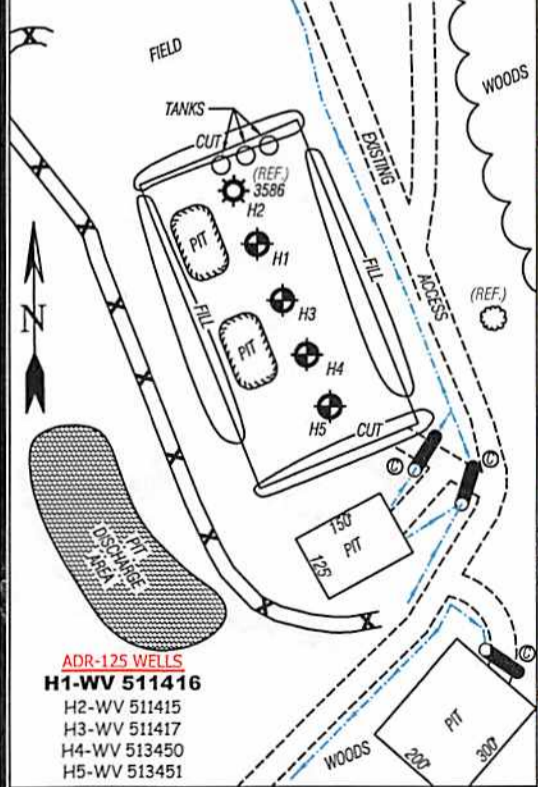
TO WELL WV
510852 A.P.I.
#47-097-3370

**PREVIOUSLY APPROVED
(2007) ACCESS FOR
A.P.I. #47-097-3370
TO BE RECLAIMED &
MAINTAINED TO STATE
SPECS.**



Detail Sketch for Proposed Well WV 511416

NOT TO SCALE



- ADR-125 WELLS**
- H1-WV 511416
 - H2-WV 511415
 - H3-WV 511417
 - H4-WV 513450
 - H5-WV 513451

ALL ROADS SHOWN HEREON ARE EXISTING UNLESS OTHERWISE NOTED AND SHALL BE MAINTAINED IN ACCORDANCE WITH WV D.E.P. OIL AND GAS BMP MANUAL ENTRANCES AT COUNTY/STATE ROADS SHALL BE MAINTAINED IN ACCORDANCE WITH WV D.O.T. REGULATION. SEPARATE PERMITS MAY BE REQUIRED BY THE D.O.T.

SEDIMENT BASINS (TRAPS) AND APPROPRIATE EROSION CONTROL BARRIERS ARE TO BE CONSTRUCTED AT ALL CULVERT AND CROSS DRAIN INLETS AND OUTLETS AS REQUIRED IN THE WV D.E.P. OIL AND GAS BMP MANUAL. FIELD CONDITIONS (ROCK OUTCROPS AND BEDROCK) MAY PROHIBIT INLET TRAPS BEING INSTALLED. WHEN THESE CONDITIONS EXIST ADDITIONAL EROSION CONTROL MEASURES SHALL BE EVALUATED AND UTILIZED AS NEEDED.

EARTHWORK CONTRACTORS ARE RESPONSIBLE FOR NOTIFICATION TO THE OPERATOR AND INSPECTOR PRIOR TO ANY DEVIATION FROM THIS PLAN.

TEMPORARY SEED & MULCH ALL SLOPES AFTER CONSTRUCTION OF LOCATION. **03/21/2014**

CUT & STACK ALL MARKETABLE TIMBER.

STACKED BRUSH MAY BE USED FOR SEDIMENT CONTROL.

APPLICATIONS FOR SEPARATE PLC PERMITS ON THE ACCESS ROAD STREAM CROSSINGS HAVE BEEN PREPARED (IF APPLIES).

SCALE: 1"=500'



- = EXISTING CULVERT
- = PROPOSED CULVERT 12" MIN. UNLESS OTHERWISE NOTED
- = PROPOSED STREAM CROSSING (IF APPLIES) *SEE TABLE FOR CULVERT DETAIL



SMITH LAND SURVEYING, INC.
P.O. BOX 150 GLENVILLE, WV, 26351
PH: (304)462-5634 FAX: (304)462-5656 E-MAIL: sls@sissurveys.com

| | | | |
|--------------------|------------------|------------------|-------------------------------------|
| DRAWN BY C.J.P. | FILE NO. 6282 | DATE 04/28/11 | CADD FILE: 6282RECWP511416R3.DWG |
|--------------------|------------------|------------------|-------------------------------------|

TOPO SECTION OF
USGS ADRIAN 7.5' QUADRANGLE

MARY F. HIGGINBOTHAM ET AL LEASE

500 ACRES±

WELL NO. WV 511416

LATITUDE 39°00'00"

LONGITUDE 80°17'30"

BOTTOM HOLE
WELL NO. WV 511416
STATE PLANE COORDINATES
(SOUTH ZONE)

N. 732,324
E. 2,197,266

LAT=(N) 39.00904
LONG=(W) 80.30585

UTM (NAD83)(METERS)

N. 4,318,020
E. 560,117

BOTTOM HOLE
WELL NO. WV 511416
STATE PLANE COORDINATES
(SOUTH ZONE) (NAD27)

N. 724,950
E. 2,199,950

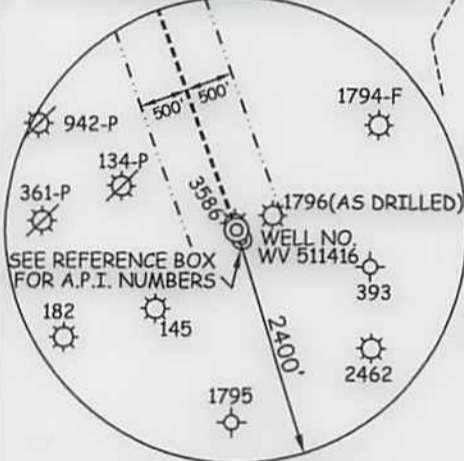
LAT=(N) 38.98874
LONG=(W) 80.29660

UTM (NAD83)(METERS)

N. 4,315,773
E. 560,935

| OWNER | ACRES± |
|-----------------------------------|---------|
| A JAMES LEROY MEHR | 24.39 |
| B CHARLES J & JEAN C. JOHNSON | 86.15 |
| C BLAIRE SNYDER | 3.49 |
| D STEVEN M. CASTO | 146.915 |
| E EDWIN M. QUEEN | 80 |
| F DORIS JEAN ARNOVITZ | 66.76 |
| G EVA KATHRYN HOWES | 80 |
| H ERIC S. & SHERRY L. CLAUS | 2.33 |
| I ERIC S. & SHERRY L. CLAUS | 1.38 |
| J JOSEPH & BELINDA GONTAREK | 2.383 |
| K RICHARD CARL CURRY | 14.5 |
| L KATHERINE L. & MIKE J. CRAWFORD | 1.23 |
| M RICHARD BOOTH ET AL. | 78.87 |
| N DARRYL D. BEVERLIN | 2.30 |
| O JACK A. & SHARON L. LEWIS | 3.09 |
| P JOAN D. STILTNER | 2.0 |
| Q TIMOTHY S. RATLIFF | 1.19 |
| R CLIFFORD & ALDA E. SUMMERS | 1.96 |
| S JAMES E. DOWELL | 9.59 |
| T BRADFORD KNIGHT, JR. | 1.48 |
| U JO ANN HOOVER | 1.0 |
| V JO ANN HOOVER | 18.5 |
| W SHARON WILLIAMS | 20.00 |
| X GARY L. DOWELL | 3.12 |
| Z JACKIE A. OR SHARON L. LEWIS | 2.45 |
| AA RANDAL G. & BARBARA SHIPLEY | 100 |
| BB GARY L. DOWELL | 47.18 |
| CC MAMIE STARKEY | 44.96 |
| DD LYNN & ARMILDA HARRIS | 57.95 |
| EE JOHN SKRUCK | 7.98 |
| FF MIKE ROSS INC | 77.50 |
| GG RICHARD C. CURRY ET AL | LOT |

NORTH

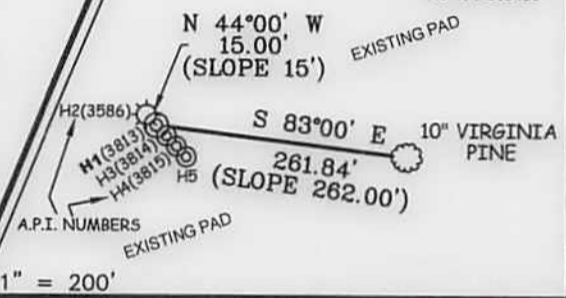


NOTES ON SURVEY

1. TIES TO WELLS AND CORNERS ARE BASED ON GRID NORTH FOR THE WV STATE PLANE COORDINATE SYSTEM SOUTH ZONE NAD '27.
2. TIES TO REFERENCES ARE BASED ON MAGNETIC NORTH 06/18/10.
3. LEASE BOUNDARY SHOWN HEREON TAKEN FROM A DEED RECORDED IN DEED BOOK 399 AT PAGE 785.
4. SURFACE OWNER AND ADJOINER INFORMATION TAKEN FROM THE ASSESSOR AND COUNTY CLERK RECORDS OF UPSHUR COUNTY IN JULY, 2011. PARCELS AFFECTED BY CURRENT CHANGES CHECKED JULY, 2013.
5. WELL LAT./LONG. (NAD'27) ESTABLISHED BY DGPS(SUBMETER MAPPING GRADE).
6. ORIGINAL PLAT DATED 11/10/11 REVISED 07/29/11 TO UPDATE SPOT CIRCLE & ADJOINER INFORMATION & 11/13/13 TO EXTEND LEG & UPDATE, ETC.
7. NO WATER WELLS WERE FOUND WITHIN 250 FEET OF PROPOSED GAS WELL. NO AGRICULTURAL BUILDINGS (GREATER THAN 2500 SQUARE FEET) OR DWELLINGS WERE FOUND WITHIN 625 FEET OF CENTER OF PROPOSED WELL PAD.

REFERENCES

- ADR-125 WELLS
H1-WV 511416
 H2-WV 511415
 H3-WV 511417
 H4-WV 513450
 H5-WV 513451



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 DIVISION OF ENVIRONMENTAL PROTECTION.

P.S. 849 *C. Victor Moyers*



(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS.
 DATE NOVEMBER 13, 20 13
 OPERATORS WELL NO. WV 511416
 A.P.I. NO. 47 - 097 - 03813 H6A
 STATE COUNTY PERMIT

MINIMUM DEGREE OF ACCURACY 1 / 2500 FILE NO. 6282P511416R2
 PROVEN SOURCE OF ELEVATION DGPS (SUBMETER MAPPING GRADE) SCALE 1" = 2000'

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

WELL TYPE: OIL GAS INJECTION WASTE DISPOSAL IF "GAS" PRODUCTION STORAGE DEEP SHALLOW

LOCATION: ELEVATION 1,572' (ACTUAL PAD) WATERSHED TRIBUTARY OF SPRUCE FORK
 DISTRICT BUCKHANNON COUNTY UPSHUR QUADRANGLE ADRIAN 7.5'
 SURFACE OWNER CHARLES R. BELL, SR. ACREAGE 357.639±
 ROYALTY OWNER BISHOP OF THE PROTESTANT EPISCOPAL CHURCH OF THE DIOCESE OF W.V. (500 AC±) / WINDAMAR, INC. ET AL (151.12 AC±)
 PROPOSED WORK: LEASE NO. 121717 / 991894
 DRILL CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE PLUG OFF OLD FORMATION
 PERFORATE NEW FORMATION PLUG AND ABANDON CLEAN OUT AND REPLUG OTHER
 PHYSICAL CHANGE IN WELL (SPECIFY) _____ TARGET FORMATION MARCELLUS
 ESTIMATED DEPTH _____

WELL OPERATOR EQT PRODUCTION COMPANY DESIGNATED AGENT REX C. RAY
 ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330 ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330

COUNTY NAME PERMIT

03/21/2014

**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:

| Lease Name or Number | Grantor, Lessor, etc. | Grantee, Lessee, etc. | Royalty | Book/Page |
|----------------------|---|---|------------|------------------|
| ✓ 121717 | | | 1/8 Min Pd | |
| | Mary F Higginbotham, et al | Pittsburgh & West Virginia Gas Company | | LB 14X/403 |
| | Pittsburgh & West Virginia Gas Company | Equitable Gas Company | | DB 137/226 |
| | Equitable Gas Company | Equitrans, Inc | | DB 137/404 |
| | Equitrans, Inc | Equitable Production-Eastern States, Inc. | | Assign BK 44/7 |
| | Equitable Production-Eastern States, Inc. | Equitable Production Company | | CB 13/14 Wetzel |
| | Equitable Production Company | EQT Production Company | | CB 13/14 Wetzel |
| ✓ 991894 | M & R Investments, Inc. | EQT Production Company | | Assign Bk 54/386 |

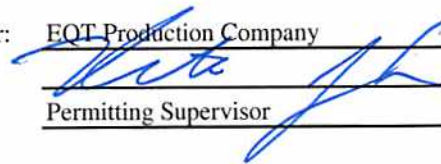
Upon information and belief, Operator's lease and/or other real property rights permit it to conduct drilling operations for the subject well in the location shown on the plat, including under any public roads that the well lateral crosses.

**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: EQT Production Company
By: 
Its: Permitting Supervisor