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 25, 2014

EQT PRODUCTION COMPANY
POST OFFICE BOX 280
BRIDGEPORT, WV 26330

Re: Permit Modification Approval for API Number 9703814 , Well #: 511417 - HIGGINBOTHA
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

MOD
4709703814

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 (47-097-03814)

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

RECEIVED
Office of Oil & Gas
DEC 19 2013
WV Department of
Environmental Protection

WW - 6B
(9/13)

4709703814

MOD

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
W.VA. CODE §22-6A - WELL WORK PERMIT APPLICATION

1) Well Operator: EQT Production Company

	097	2	203
Operator ID	County	District	Quadrangle

2) Operator's Well Number: 511417 Well Pad Name: ADR125

3) Farm Name/Surface Owner : Mary F Higginbotham et al Public Road Access: Spruce Fork Road

4) Elevation, current ground: 1,572.0 Elevation, proposed post-construction: 1,572.0

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 Thicknesses and Associated Pressure(s):

Target formation is Marcellus at a depth of 7636' with the anticipated thickness to be 101 feet and anticipated target pressure of 3376 PSI

8) Proposed Total Vertical Depth: 7636'
9) Formation at Total Vertical Depth: Marcellus
10) Proposed Total Measured Depth 15,852
11) Proposed Horizontal Leg Length 7,070
12) Approximate Fresh Water Strata Depths: 105, 822, 858
13) Method to Determine Fresh Water Depth: By offset wells
14) Approximate Saltwater Depths: n/a
15) Approximate Coal Seam Depths: 106, 521, 718, 835, 966
16) Approximate Depth to Possible Void (coal mine, karst, other): None reported
17) Does proposed well location contain coal seams directly overlying or adjacent to an active mine?
(a) If Yes, provide Mine Info: Name: _____
Depth: _____
Seam: _____
Owner: _____

RECEIVED
Office of Oil & Gas
DEC 19 2013
WV Department of
Environmental Protection

WW - 6B
(3/13)

4709703814
MOD

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#	15,852	15,852	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./k)
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 Hatfield
3/13/2014

4709703814

MOD

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 6660', 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 ac

22) 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 % Calcuim 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.

RECEIVED
Office of Oil & Gas
DEC 19 2013
WV Department of
Environmental Protection

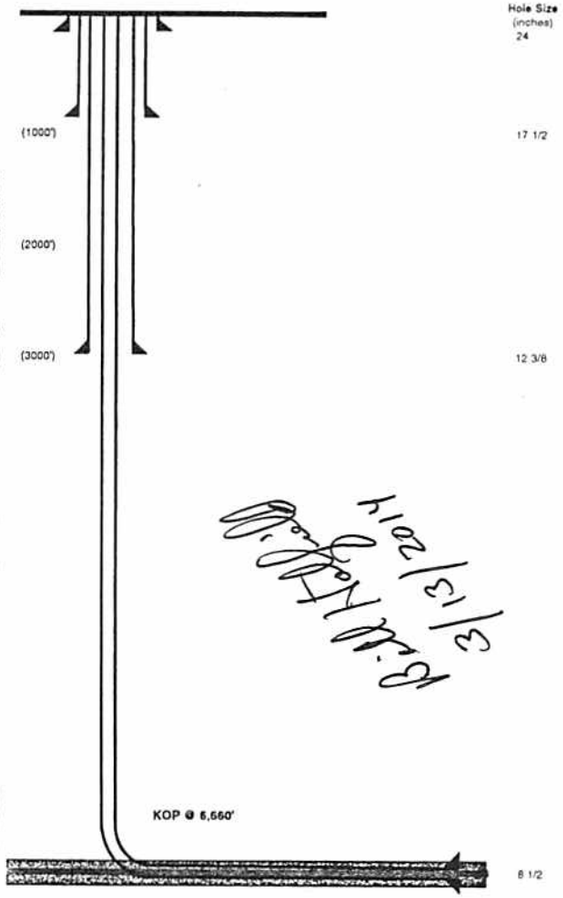
*Note: Attach additional sheets as needed.

4709703814 MOD

Well 511417 (ADR125 H3)
EQT Production
Adrian
Upshur **West Virginia**

Azimuth 340
Vertical Section 7542

TVD Depth (feet)	Formation Tops (TVD)			
0'				
250'				
500'				
750'	Base Fresh Water	658		
1,000'				(1000')
1,250'				
1,500'	Maxton	1713	- 1745	
	Big Lime	1616	- 1833	
1,750'	Weir	2068	- 2072	
	-Gantz	2094	- 2153	
2,000'	-Fifty foot	2205	- 2224	
	-Thirty foot	2252	- 2275	(2000')
2,250'	-Gordon	2287	- 2293	
	-Forth Sand	2343	- 2358	
2,500'	Base Red Rock	2489		
2,750'	-Bayard	2825	- 2854	
	Int. ceg pt	2904		
3,000'	-Warren	2953	- 3003	(3000')
	-Speechley	3035	- 3097	
3,250'	-Balltown A	3422	- 3431	
3,500'				
3,750'				
4,000'	-Riley	4090	- 4151	
4,250'				
4,500'	-Benson	4566	- 4613	
4,750'				
5,000'	-Alexander	4933	- 4978	
5,250'				
5,500'				
5,750'				
6,000'				
6,250'				
6,500'				
6,750'	-Sonyea	7010	- 7192	
	-Middlesex	7192	- 7258	
7,000'	-Genesee	7258	- 7414	
	-Geneseo	7414	- 7440	
7,250'	-Tully	7440	- 7466	
	-Hamilton	7466	- 7572	
7,500'	Marcellus top	7572		
	Target Inside Marcellus	7636		
7,750'	Marcellus Bottom	7673		



Hole Size (inches)	Casing Type	Size (inches)	Wt (ppf)/Grade
24	Conductor	20	
17 1/2	Surface	13 3/8	54#/MC-50
12 3/8	Intermediate	9 5/8	40#/MC-50
8 1/2	Production Casing	5 1/2	20#/P-110

Land curve @ 7,636' ft TVD
8,281' ft MD

Est. TD @ 7,636' ft TVD
15,352' ft MD

7,070' ft Lateral

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 6660'.
Then kick of the horizontal leg into the Marcellus using a slick water frac.

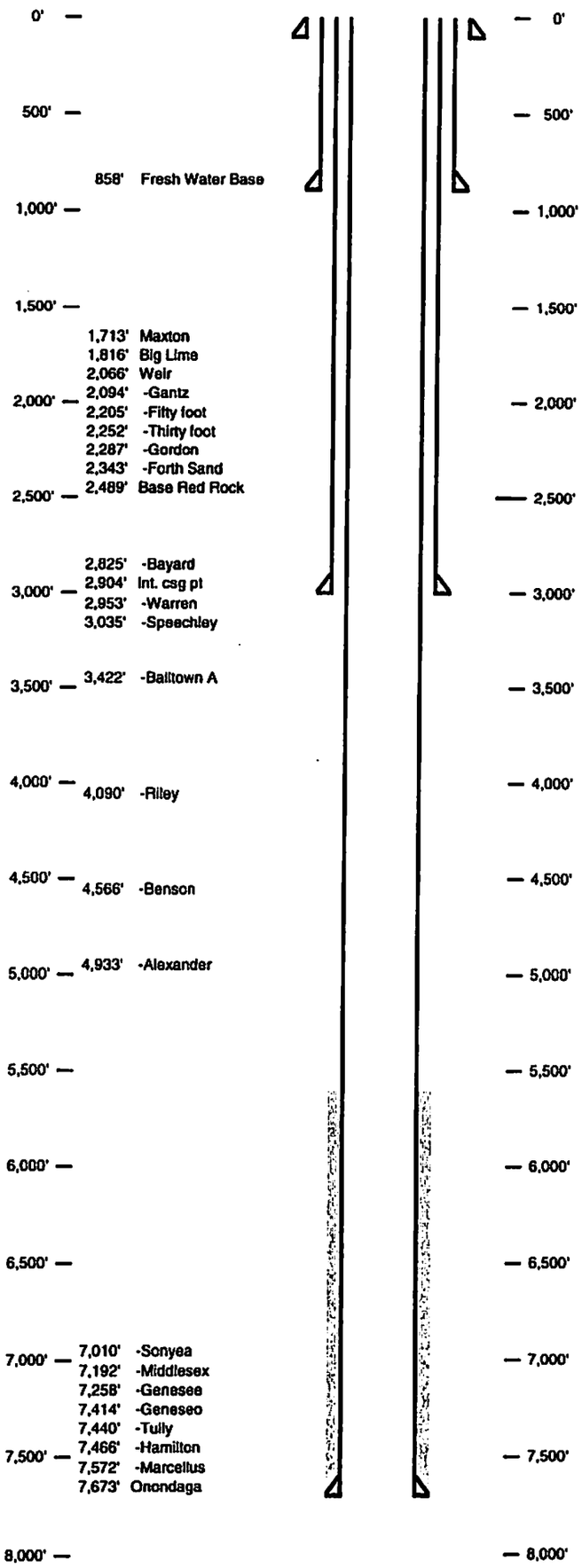
RECEIVED
Office of Oil and Gas
MAR 19 2014
WV Department of
Environmental Protection

4709703814
MOD

Well Schematic
EQT Production

Well Name	511417 (ADR125 H3)
County	Upshur
State	West Virgina

Elevation KB:	1585
Target	Marcellus
Prospect	
Azimuth	340
Vertical Section	7542



Hole Size 24" - 20" Conductor at 40'
Bit Size 17.5"

TOC @ Surface
13 3/8", MC-50, 54.5# @ 958' ft MD
Bit Size 12.375"

TOC @ Surface
9 5/8", MC-50, 40# @ 2,904' ft MD
Bit Size 8.5"

KOP = 6,660' ft MD
10 Deg DLS

Land @ 8,281' ft MD
7,636' ft TVD

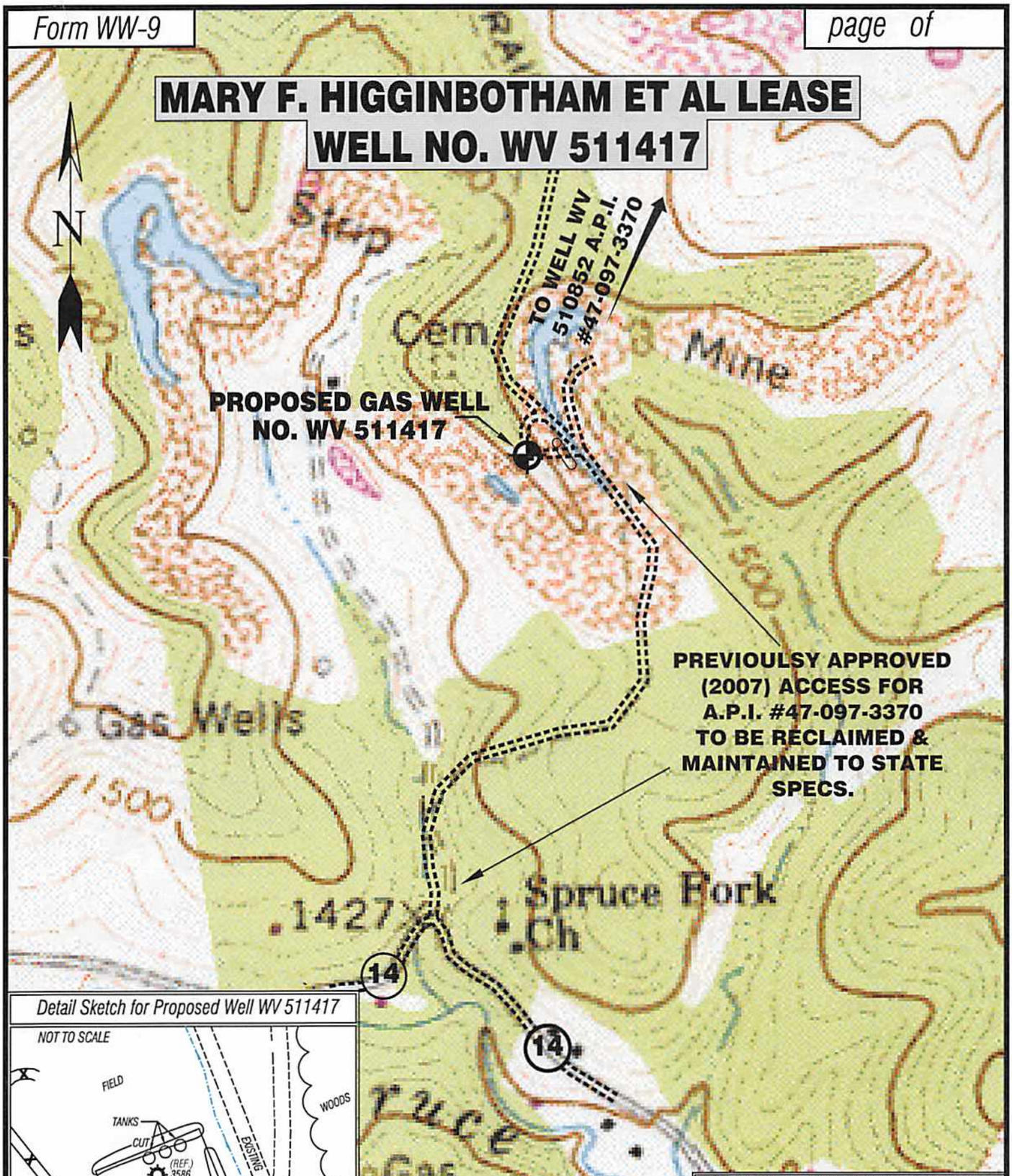
5 1/2", P-110, 20# 15,352' ft MD
7,636' ft TVD

Bill Hatfield
3/13/2014

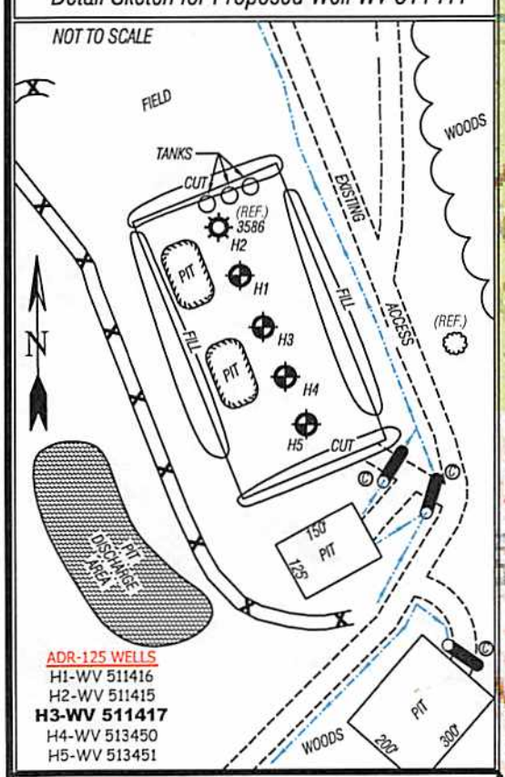
Form WW-9

page of

MARY F. HIGGINBOTHAM ET AL LEASE
WELL NO. WV 511417



Detail Sketch for Proposed Well WV 511417



SLS

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

DRAWN BY	FILE NO.	DATE	CADD FILE:
C.J.P.	6282	04/28/11	6282RECWV511417R3.DWG

SCALE: 1"=500'

0' 500' 1000'

TOPO SECTION OF
USGS ADRIAN 7.5' QUADRANGLE

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.

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).

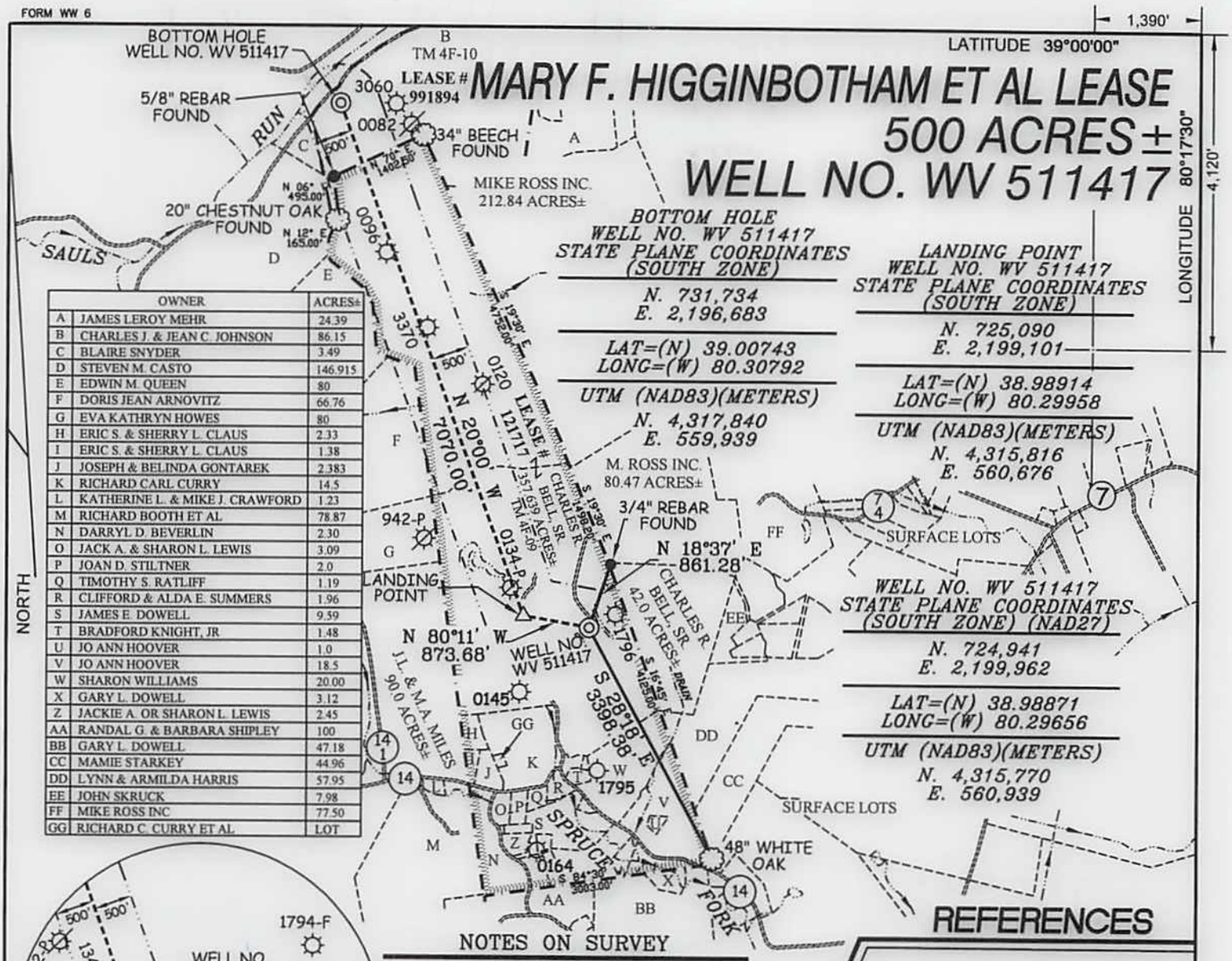
= EXISTING CULVERT

Ⓒ = PROPOSED CULVERT 12" MIN. UNLESS OTHERWISE NOTED

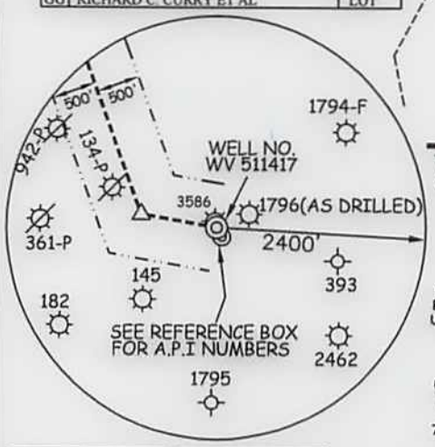
Ⓧ = PROPOSED STREAM CROSSING (IF APPLIES)
*SEE TABLE FOR CULVERT DETAIL

FORM WW 6

MARY F. HIGGINBOTHAM ET AL LEASE
500 ACRES±
WELL NO. WV 511417



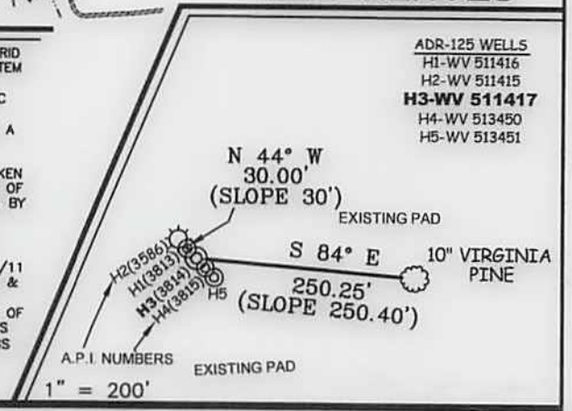
	OWNER	ACRES±
A	JAMES LEROY MEHR	24.39
B	CHARLES J. & JEAN C. JOHNSON	86.15
C	BLAIRE SNYDER	3.49
D	STEVEN M. CASTO	146.915
E	EDWIN M. QUEEN	80
F	DORIS JEAN ARNOVITZ	66.76
G	EVA KATHRYN HOWES	80
H	ERIC S. & SHERRY L. CLAUS	2.33
I	ERIC S. & SHERRY L. CLAUS	1.38
J	JOSEPH & BELINDA GONTAREK	2.383
K	RICHARD 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



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



SLS

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

C. VICTOR MOYERS LICENSED No. 849 STATE OF WEST VIRGINIA PROFESSIONAL SURVEYOR

(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS.

DATE NOVEMBER 13 , 20 13

OPERATORS WELL NO. WV 511417

API WELL NO. 47 — 097 — 03814 MOD H6A
STATE — COUNTY — PERMIT

MINIMUM DEGREE OF ACCURACY 1 / 2500 FILE NO. 6282P511417R3

PROVEN SOURCE OF ELEVATION DGPS (SURVEY GRADE TIE TO CORS NETWORK) SCALE 1" = 2000'

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

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

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 X CONVERT ____ DRILL DEEPER ____ REDRILL ____ FRACTURE OR STIMULATE X 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 ____

COUNTY NAME

PERMIT

WELL OPERATOR EQT PRODUCTION COMPANY
ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280
BRIDGEPORT, WV 26330

DESIGNATED AGENT REX C. RAY
ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280
BRIDGEPORT, WV 26330

SLS

4709703814

MOD

WW-6A1
(5/13)

Operator's Well No. 511417

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

RECEIVED
Office of Oil & Gas
DEC 19 2013
WV Department of
Environmental Protection

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