



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

January 29, 2015

EQT PRODUCTION COMPANY
303 SAND CUT ROAD
CLARKSBURG, WV 26301

Re: Permit Modification Approval for API Number 8510137 , Well #: 513761

Modify formation and azimuth,

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,

Gene Smith
Assistant Chief of Permitting
Office of Oil and Gas



47 08510137 MW

December 18, 2014

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

Re: Modification of well 513761 and 513758
47-085-10134, 10137

Dear Mr. Smith,

Enclosed is a new WW-6B, schematics, Mylar plat and rec plan for the above API #. EQT would like to request a modification, to API# 47-085-10137, to change the target formation from Geneseo to Marcellus and to change the azimuth, which would change the landing point and bottom hole.

The modification to API # 47-085-10134 is to change the target formation from Marcellus to Geneseo and to change the azimuth, which would change the landing point and bottom hole.

We have changed the formations because well 513758 is the best candidate for the Geneseo landing zone test. It will need to be bounded by two Marcellus wells and that is why the change to the 513761 well. This way the 513758 will be almost fully bounded by the two Marcellus wells 513759 and 513761.

In order to get meaningful history matched results from Rate Transient Analysis the well needs to be bounded, and the wells on either side need to have had the same completion pumped, that way we can then make the assumption that the effective reservoir boundary is the mid-point between the wells. While there are natural deviations from this assumption, on average the results we get are very consistent with this approach. This then allows us to take the analysis to the next step of predicting how the completion and/or well spacing might be optimized.

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

Sincerely,

Vicki Roark
Permitting Supervisor-WV

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Office of Oil & Gas

DEC 22 2014

Enc.

01/30/2015

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

306686	085	4	526
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Operator ID County District Quadrangle

2) Operator's Well Number: 513761 Well Pad Name: OXF163

3) Farm Name/Surface Owner : Pierce Public Road Access: CR 7/18

4) Elevation, current ground: 1,175.0 Elevation, proposed post-construction: 1,158.5

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 6527' with the anticipated thickness to be 53 feet and anticipated target pressure of 2190 PSI

8) Proposed Total Vertical Depth: 6,527

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 13,593

11) Proposed Horizontal Leg Length: 5,730

12) Approximate Fresh Water Strata Depths: 173, 450, & 514

13) Method to Determine Fresh Water Depth: By offset wells

14) Approximate Saltwater Depths: 1,153

15) Approximate Coal Seam Depths: No Coal Seams Present

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: _____

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CASING AND TUBING PROGRAM

18)

<u>TYPE</u>	<u>Size</u>	<u>New or Used</u>	<u>Grade</u>	<u>Weight per ft.</u>	<u>FOOTAGE: for Drilling</u>	<u>INTERVALS: Left in Well</u>	<u>CEMENT: Fill-up (Cu.Ft.)</u>
Conductor	20	New	MC-50	81	40	40	38 C.T.S.
Fresh Water	13 3/8	New	MC-50	54	1,055	1,055	914 C.T.S.
Coal	-	-	-	-	-	-	-
Intermediate	9 5/8	New	MC-50	40	2,955	2,955	1,152 C.T.S.
Production	5 1/2	New	P-110	20	13,593	13,593	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							

<u>TYPE</u>	<u>Size</u>	<u>Wellbore Diameter</u>	<u>Wall Thickness</u>	<u>Burst Pressure</u>	<u>Cement Type</u>	<u>Cement Yield (cu. ft./k)</u>
Conductor	20	24	0.375	-	Construction	1.18
Fresh Water	13 3/8	17 1/2	0.38	2,480	* See Note 2	1.21
Coal	-	-	-	-	-	-
Intermediate	9 5/8	12 3/8	0.395	3,590	* See Note 2	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.

Note 2: Reference Variance 2014-17.

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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 4682'. 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): 24.622) Area to be disturbed for well pad only, less access road (acres): 14.6

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 & reciprocatingone full joint until cuttings diminish at surface. When cuttings returning to surface diminish, continue to circulate an additional 5minutes. To ensure that there is no fill, short trip two stands with no circulation. If there is fill, bring compressors back onand 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 atsurface. When cuttings returning to surface diminish, continue to circulate an additional 5 minutes. If foam drilling, to enhancehole 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 acrossthe shakers every 15 minutes.

*Note: Attach additional sheets as needed.

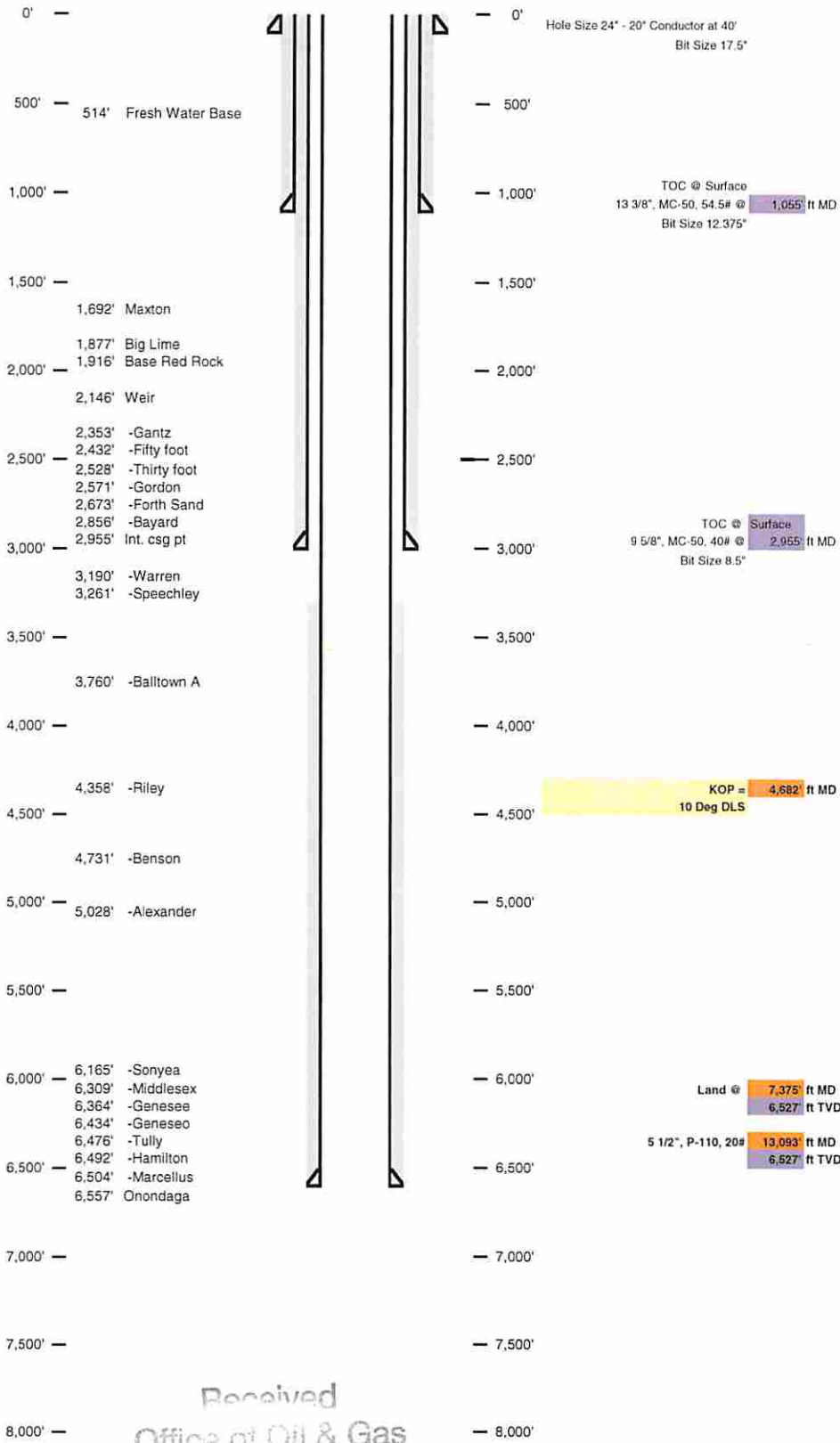
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Office of Oil & Gas

DEC 22 2014

Well Schematic
EQT Production

Well Name: 513761 (OXF163H6)
County: Ritchie
State: West Virginia

Elevation KB: 1189
Target: Marcellus
Prospect:
Azimuth: 162
Vertical Section: 6603

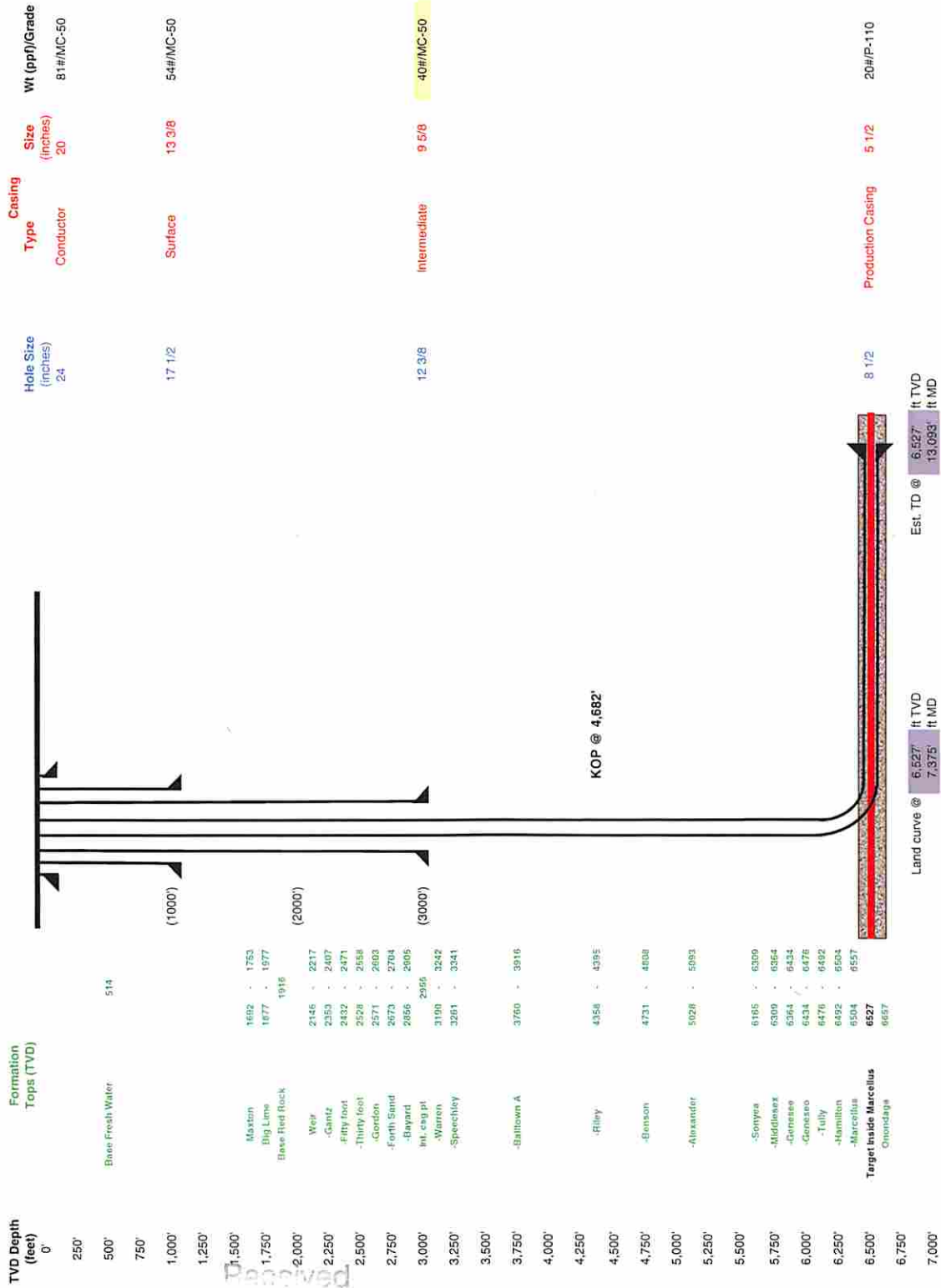


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Well 513761 (OXF163H6)
 EQT Production
 Oxford
 Ritchie

Azimuth 102
 Vertical Section 8603

West Virginia



Office of Oil & Gas
 DEC 22 2014

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 4682'.
 Then kick off the horizontal leg into the Marcellus formation using a slick water frac.

ROYALTY OWNERS

B.M. PIERCE ET UX	84.50 AC±	LEASE NO. 118210
CRAIG H. WILLIAMS	243.83 AC±	LEASE NO. 987447
J.P. SMITH ET UX	130 AC±	LEASE NO. 107857

NOTES ON SURVEY

1. NO WATER WELLS WERE FOUND WITHIN 250' OF PROPOSED GAS WELL. NO AGRICULTURAL BUILDINGS ≥ 2500 SQ. FT. OR DWELLINGS WERE FOUND WITHIN 625' OF THE CENTER OF PROPOSED WELL PAD.

**EQT PRODUCTION COMPANY
J.E. PIERCE ET AL LEASE
108 (98.73±) ACRES±
WELL NO. WV 513761**

(S.P.C. NORTH ZONE) (UTM(M) ZONE 17 NORTH)

NAD'27 S.P.C. (FT)	N. 234,445.3	E. 1,619,075.4
NAD'27 GEO.	LAT-(N) 39.135873	LONG-(W) 80.842926
NAD'83 UTM (M)	N. 4,331,876.0	E. 513,590.2

LANDING POINT

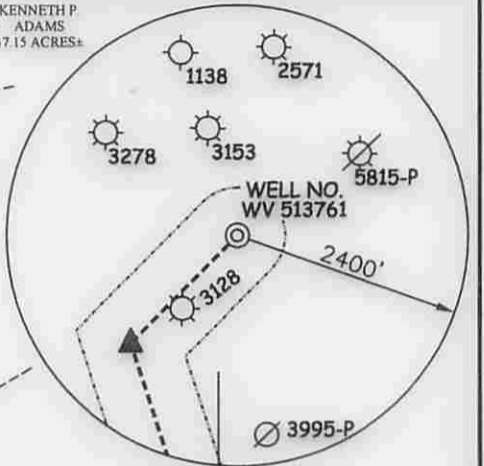
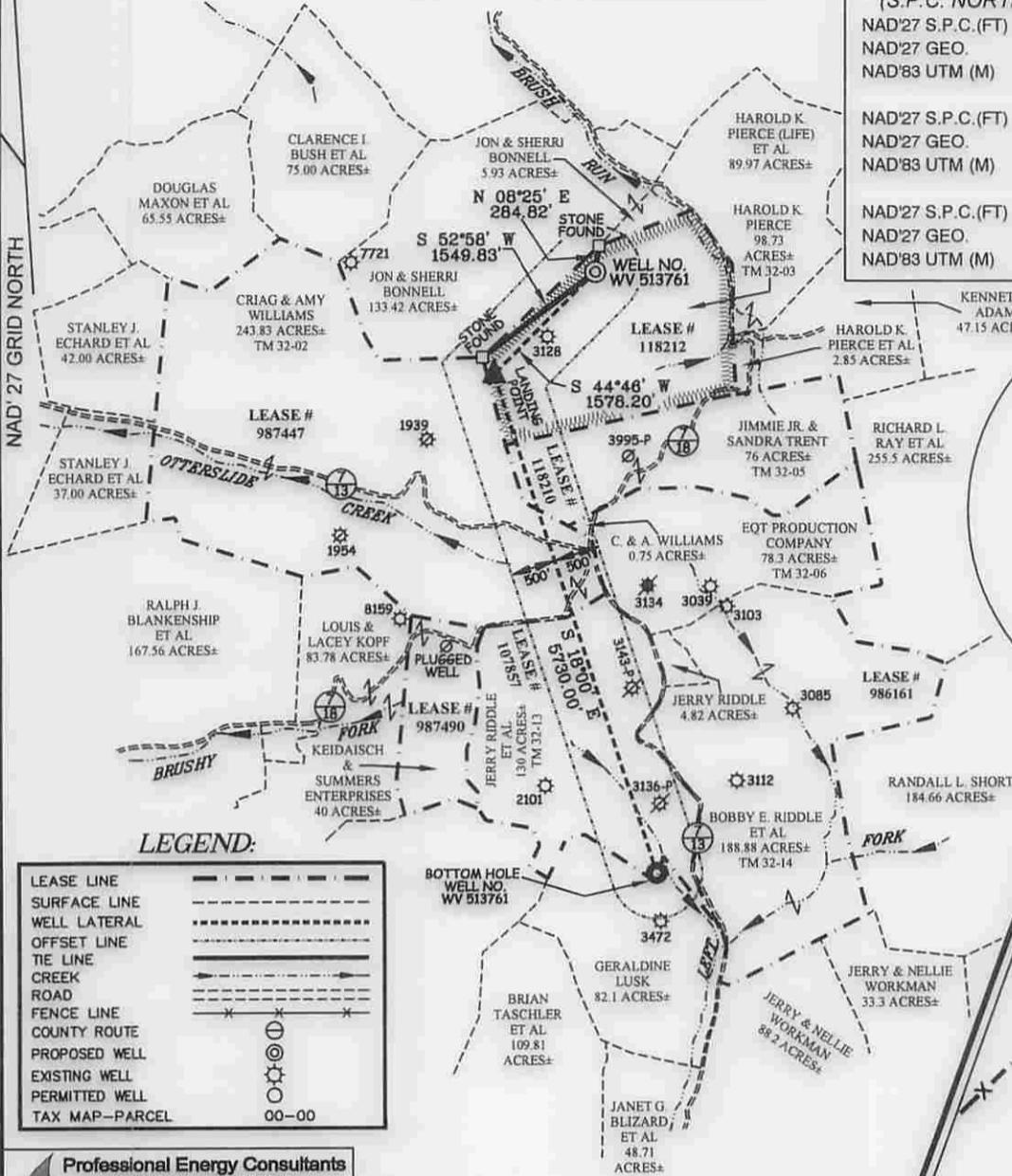
NAD'27 S.P.C. (FT)	N. 233,325.0	E. 1,617,963.9
NAD'27 GEO.	LAT-(N) 39.132752	LONG-(W) 80.846785
NAD'83 UTM (M)	N. 4,331,529.0	E. 513,257.2

BOTTOM HOLE

NAD'27 S.P.C. (FT)	N. 227,875.4	E. 1,619,734.6
NAD'27 GEO.	LAT-(N) 39.117863	LONG-(W) 80.840257
NAD'83 UTM (M)	N. 4,329,877.9	E. 513,824.4

LONGITUDE 80°50'00"

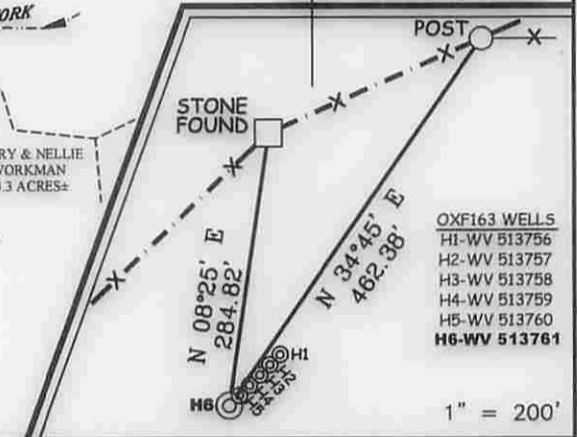
11,216'



LEGEND:

LEASE LINE	---
SURFACE LINE	----
WELL LATERAL
OFFSET LINE	-----
TIE LINE	-----
CREEK	~~~~~
ROAD	=====
FENCE LINE	x-----x
COUNTY ROUTE	○-----○
PROPOSED WELL	☉
EXISTING WELL	⊙
PERMITTED WELL	⊙
TAX MAP--PARCEL	00--00

REFERENCES



1" = 200'

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING, INC.

SLS SURVEYORS
ENGINEERS
ENVIRONMENTAL
PROJECT MGMT.

(304) 482-5834 WWW.SLSURVEYS.COM

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 JUNE 3, 20 14

REVISED 08/22/14, 10/27/14, 10/31/14 & 12/05/14

OPERATORS WELL NO. WV 513761

API WELL NO. 47-085-10137

STATE WV COUNTY MAD PERMIT 10137

MINIMUM DEGREE OF ACCURACY 1/2500 FILE NO. 7698P51376R5

HORIZONTAL & VERTICAL CONTROL DETERMINED BY 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 LIQUID INJECTION WASTE DISPOSAL IF "GAS" PRODUCTION STORAGE DEEP SHALLOW

LOCATION: ELEVATION 1,173'(GROUND) 1,158.5'(PROPOSED) WATERSHED BRUSH RUN OF MIDDLE FORK

DISTRICT UNION COUNTY RITCHIE QUADRANGLE OXFORD 7.5'

SURFACE OWNER HAROLD K. PIERCE ACREAGE 98.73±

ROYALTY OWNER J.E. PIERCE ET AL ACREAGE 108± (98.73±)

PROPOSED WORK: 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 TVD 6495'

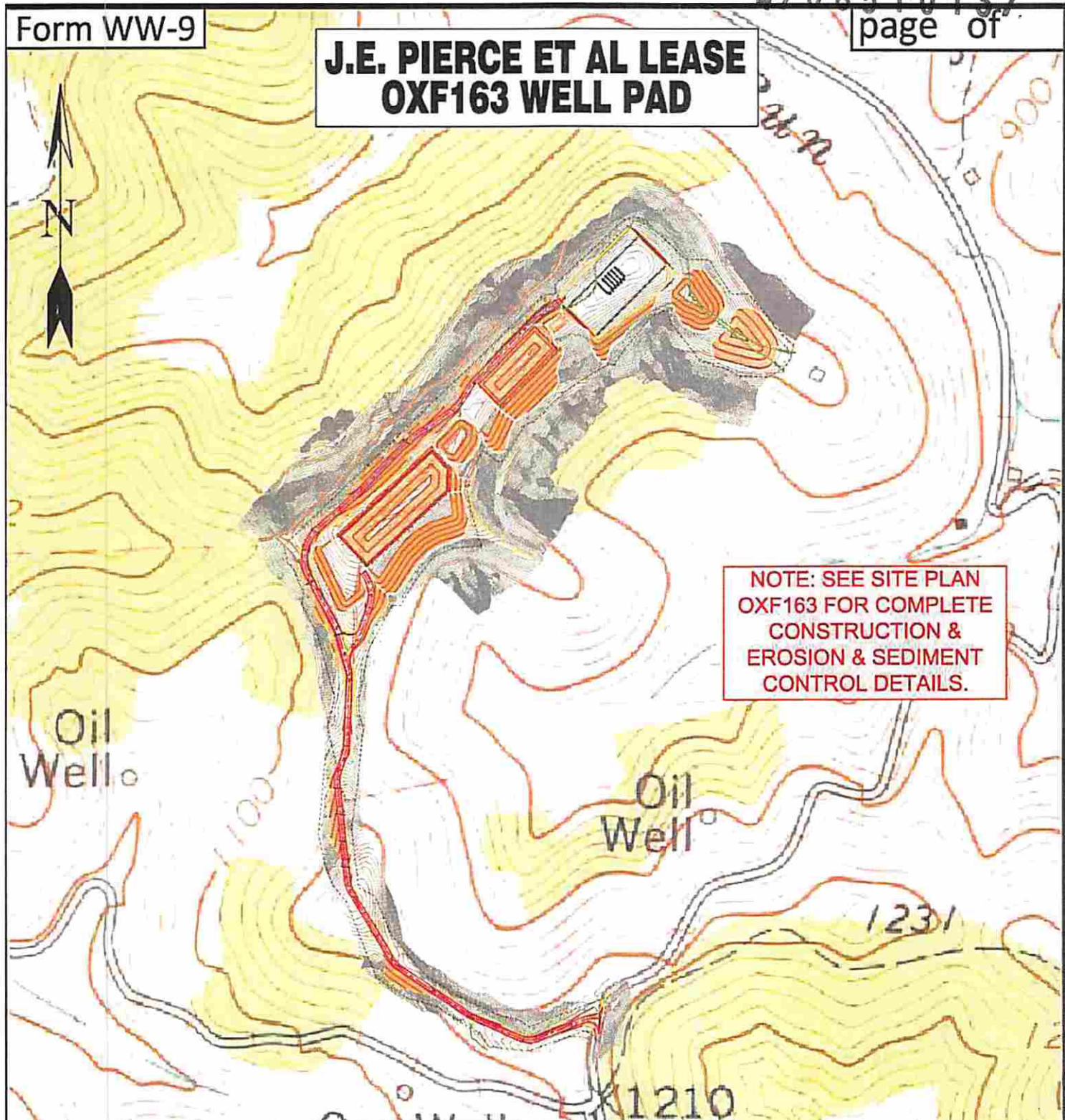
WELL OPERATOR EQT PRODUCTION COMPANY DESIGNATED AGENT REX C. RAY

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

01/30/2014

J.E. PIERCE ET AL LEASE OXF163 WELL PAD



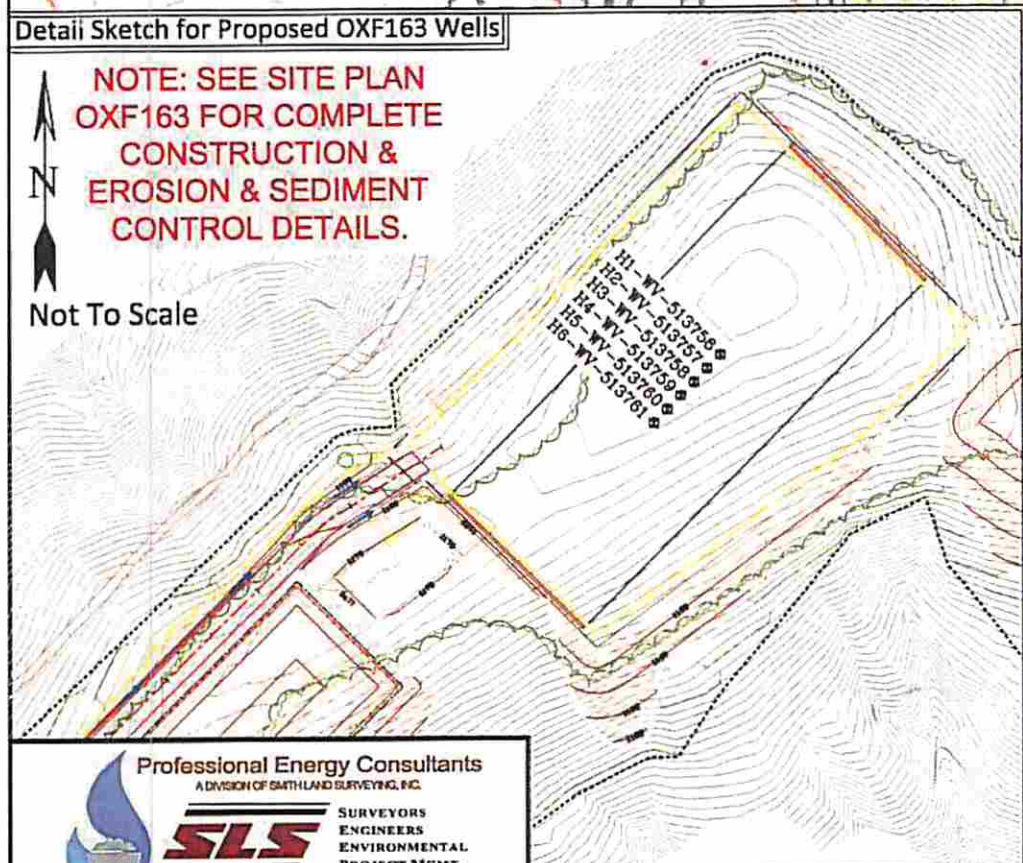
NOTE: SEE SITE PLAN
OXF163 FOR COMPLETE
CONSTRUCTION &
EROSION & SEDIMENT
CONTROL DETAILS.

Detail Sketch for Proposed OXF163 Wells



NOTE: SEE SITE PLAN
OXF163 FOR COMPLETE
CONSTRUCTION &
EROSION & SEDIMENT
CONTROL DETAILS.

Not To Scale



OXFORD QUAD
AUBURN QUAD

01/30/2015

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TOPO SECTION OF OXFORD 7.5' AND
AUBURN 7.5' USGS TOPO QUADRANGLE

SCALE: 1"=500'

