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west virginia department of environmental protection

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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](http://www.dep.wv.gov)

## PERMIT MODIFICATION APPROVAL

March 31, 2014

EQT PRODUCTION COMPANY  
POST OFFICE BOX 280  
BRIDGEPORT, WV 26330

Re: Permit Modification Approval for API Number 10302937, Well #: 514563

**Horizontal 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,

Gene Smith  
Regulatory/Compliance Manager  
Office of Oil and Gas



47 10302937

January 31, 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 (BIG367)514563, 47-10302937

Dear Mr. Smith,

Attached is a modification for the above well. EQT would like to extend the length of the horizontal section. A new WW-6B, well schematics and mylar plat are enclosed for your review.

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

Sincerely,

A handwritten signature in blue ink, appearing to read 'Vicki Roark'.

Vicki Roark  
Permitting Supervisor-WV

Enc.

Cc: Derek Haught  
P.O. Box 85  
Smithville, WV 26178

Received

FEB 19 2014

Office of Oil and Gas  
WV Dept. of Environmental Protection



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	26	New	MC-50	77	80	80	98 CTS
Fresh Water	13 3/8	New	MC-50	54	956	956	832 CTS
Coal							
Intermediate	9 5/8	New	MC-50	40	2,900	2,900	1134 CTS
Production	5 1/2	New	P-110	20	15,849	15,849	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	26	30	0.312	-	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	3,600	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.

DMH  
2-12-14

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WV Dept. of Environmental Protection

04/04/2014



47 10302937  
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 7711', tag the Onondaga not more than 100', run logs, then plug back to approximately 6718'.

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): 16.2

22) Area to be disturbed for well pad only, less access road (acres): 15.42

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.

DmH  
2-12-14

FEB 19 2014

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Office of Oil and Gas  
WV Dept. of Environmental Protection

04/04/2014



47 10302937  
MOD

January 31, 2014

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

Re: Casing on BIG367(514563) 47-10302937

Dear Mr. Smith,

EQT is requesting the 13 3/8" surface casing to be set 50' below the deepest red rock show to cover potential red rock issues. The proposed casing set depth is above ground elevation. The reason for this is the red rock swells during drilling of the intermediate section causing many drilling problems such as but not limited to lost drilling assemblies and casing running issues.

In reviewing the BIG367, we would like to request to set the surface casing deeper on each well. The 13 3/8" casing will be set at a depth of approximately 956' KB (50' below the anticipated red rock show).

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

Sincerely,

Vicki Roark  
Permitting Supervisor-WV

Enc.

DMH  
2-12-14

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WV Dept. of Environmental Protection

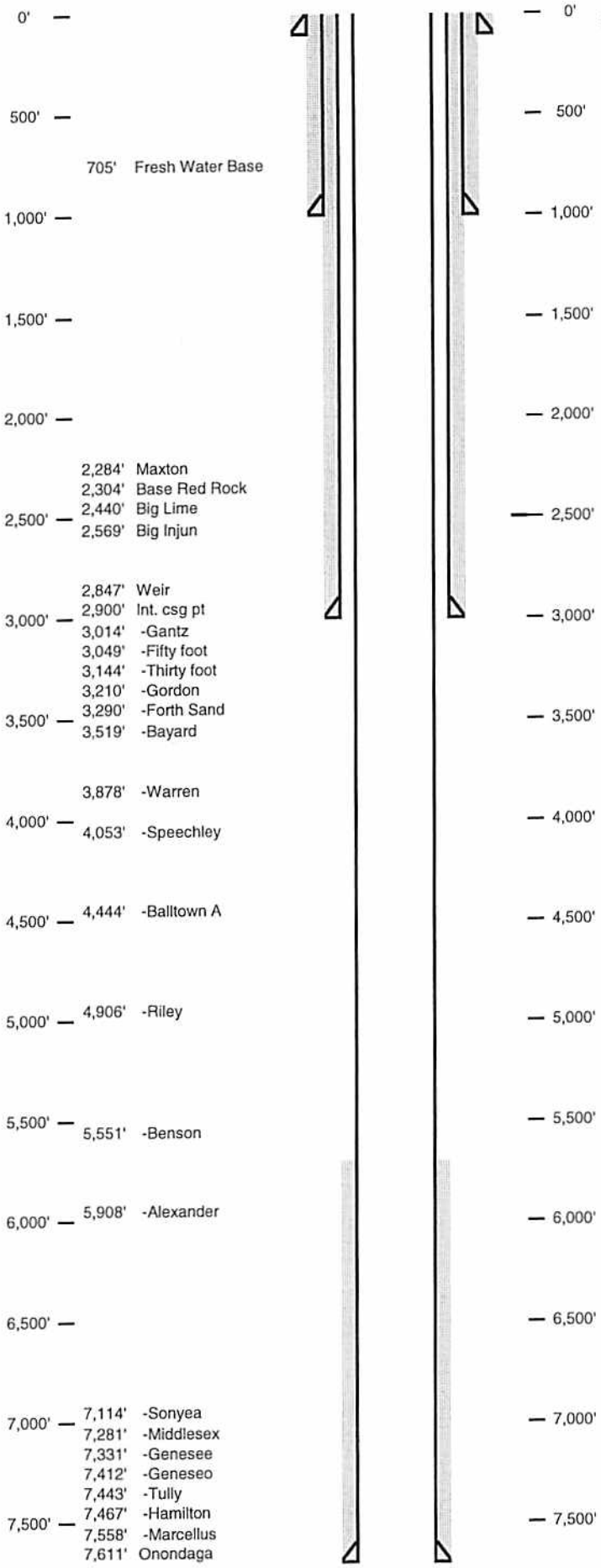
04/04/2014

4710302937 MOD

Well Schematic  
EQT Production

Well Name 514553 (BIG367H2)  
County Wetzel  
State West Virginia

Elevation KB: 1456  
Target Marcellus  
Prospect 162  
Azimuth 8026  
Vertical Section



0' Hole Size 30" - 26" Conductor at 80'  
Bit Size 17.5"  
500'  
705' Fresh Water Base  
1,000'  
TOC @ Surface  
13 3/8", MC-50, 54.5# @ 956 ft MD  
Bit Size 12.375"

TOC @ Surface  
9 5/8", MC-50, 40# @ 2,900 ft MD  
Bit Size 8.5"

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KOP = 5,718 ft MD  
10 Deg DLS

Land @ 8,052 ft MD  
7,574 ft TVD

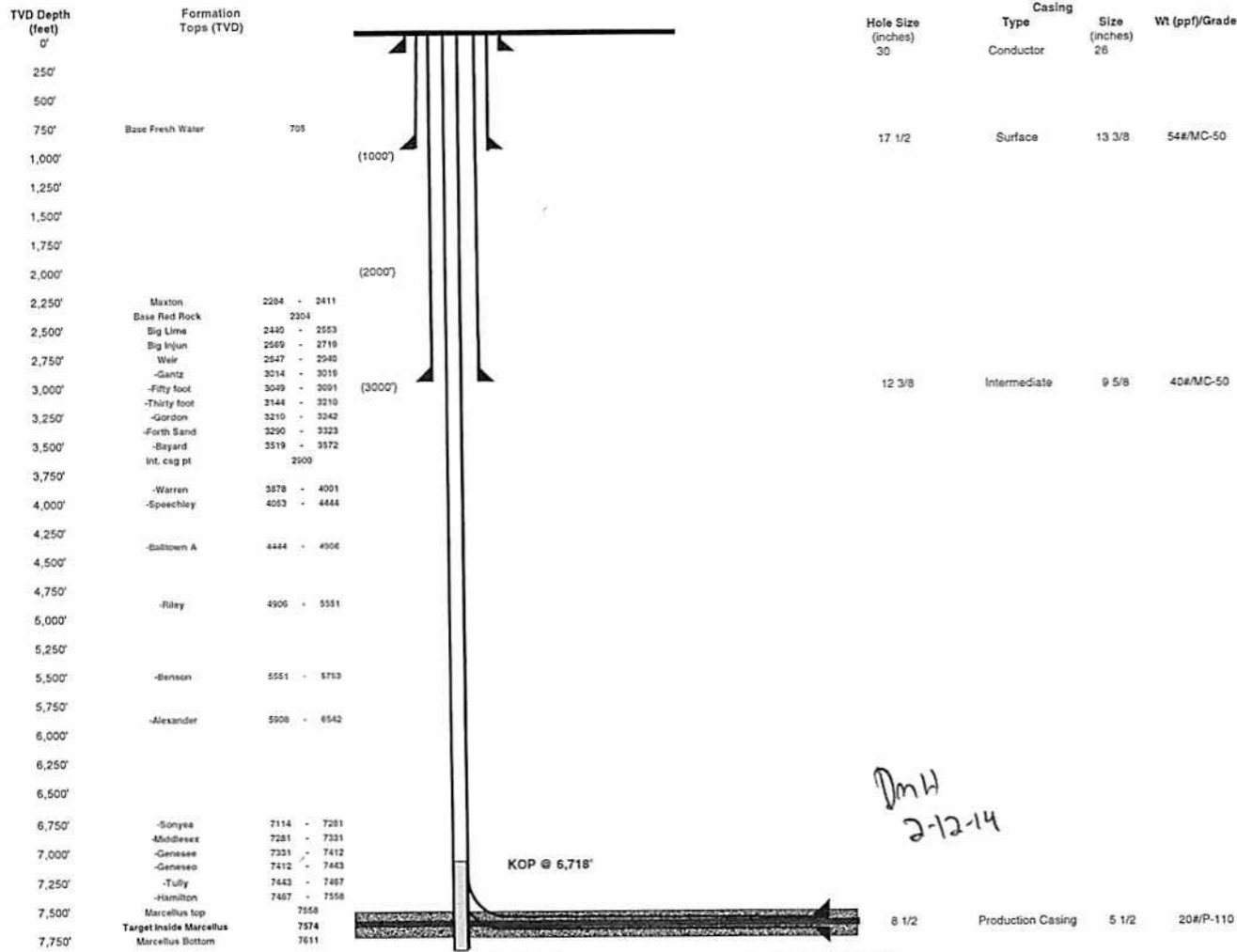
5 1/2", P-110, 20# 15,349 ft MD  
7,574 ft TVD

04/04/2014

4710302937 MOD

Well 514563 (BIG367H2)  
 EQT Production  
 Big Run  
 Wetzel West Virginia

Azimuth 192  
 Vertical Section 8026



Land curve @ 7,674' ft TVD / 8,032' ft MD      Est. TD @ 7,574' ft TVD / 15,348' ft MD

7,753' 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 7711'.  
 Tag the Onondaga not more than 100', run logs, then plug back to approximately 6718'.

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FEB 19 2014

Office of Oil and Gas  
 WV Dept. of Environmental Protection

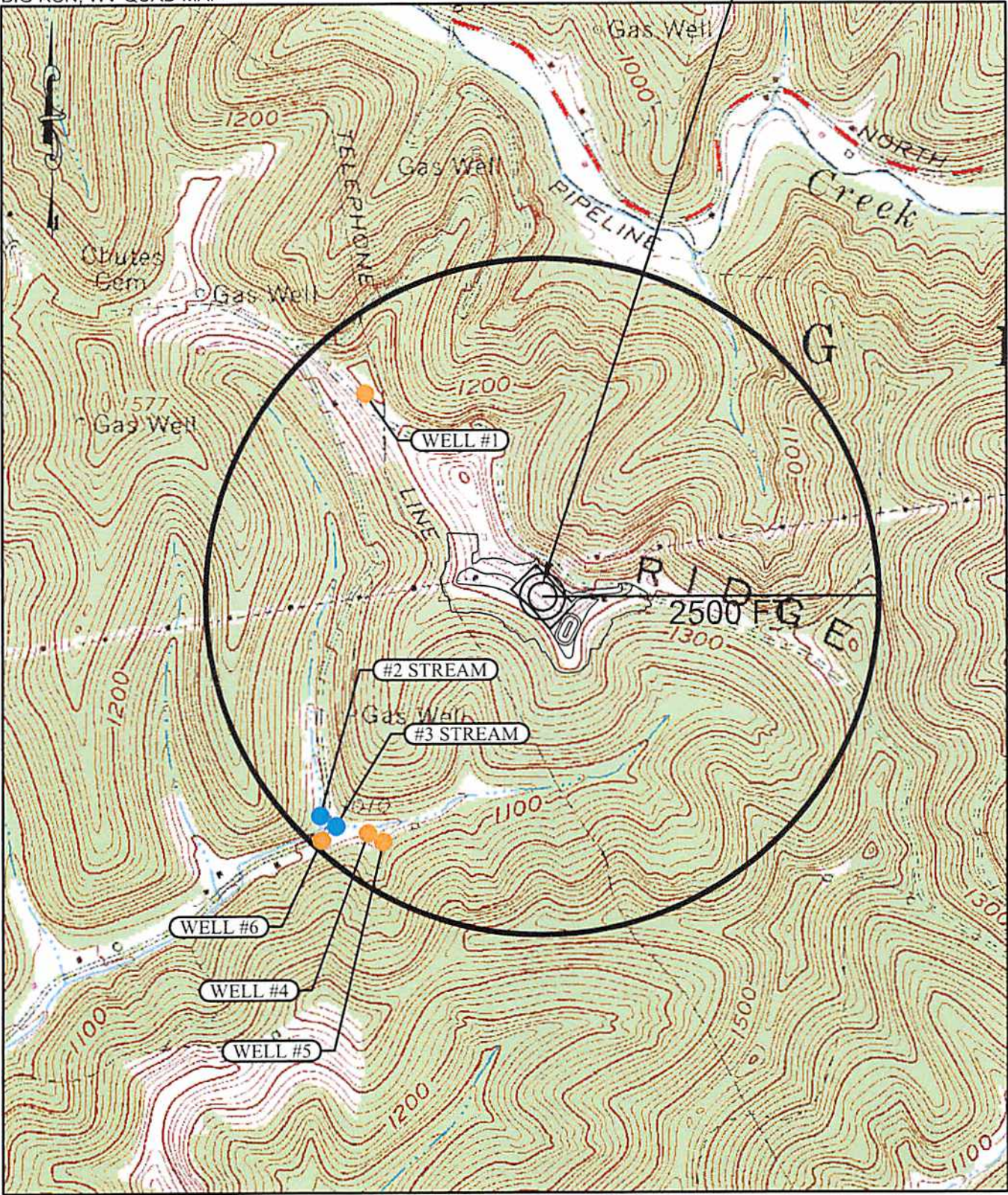


10302937

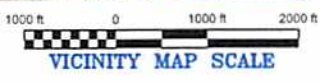
# EQT PRODUCTION BIG 367 WELL PAD AND ACCESS ROAD WETZEL COUNTY, WV

BIG RUN, WV QUAD MAP

PROJECT LOCATION



- EXISTING WELL
- EXISTING STREAM



04/04/2014

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Office of Oil & Gas  
SEP 12 2013  
WV Department of  
Environmental Protection



# EQT WELL 514563

LATITUDE 39° 35' 00"

LONGITUDE 80° 32' 30"

**NOTES:**  
 - PLAT ORIENTATION, CORNERS, AND WELL REFERENCES ARE BASED UPON THE GRID NORTH MERIDIAN FOR THE WV STATE PLANE COORDINATE SYSTEM, NORTH ZONE NAD 27. WELL LOCATION REFERENCE TIES ARE BASED UPON THE MAGNETIC MERIDIAN.  
 - THERE ARE NO (0) WATER WELL(S) LOCATED WITHIN 250' OF WELL H2.  
 - THERE ARE NO (0) STRUCTURE(S) LOCATED WITHIN 625' OF WELL H2.

MONUMENT FOUND IRON REBAR UNLESS NOTED OTHERWISE.

HENTHORN TM 18 PAR 8 39.4 AC±  
 L/N 988543  
 HOSTUTLER TM 18 PAR 18 43.4 AC±

KINZCEL TM 18 PAR 21 23.8 AC±

MCCOY TM 18 PAR 5 39 AC±

GOODRICH TM 18 PAR 9 38.6 AC±

COASTAL LUMBER CO. TM 13 PAR 38 58 AC±  
 MCCOY

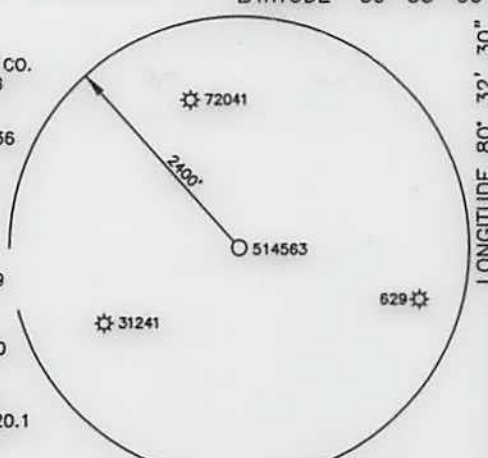
TM 18 PAR 36 40 AC±

GOODRICH TM 18 PAR 10 2.4 AC±

GOODRICH TM 18 PAR 19 4.48 AC±

GOODRICH TM 18 PAR 20 30 AC±

GOODRICH TM 18 PAR 20.1 26.8 AC±



PLOT DATE/TIME: 1/7/2014 - 2:24pm

USER: kpoth

LAYOUT: H2 (2)

NORTH

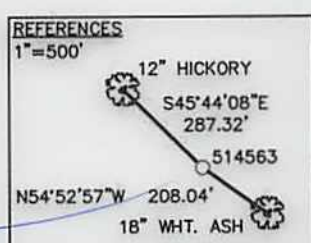
THBH DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAP

LEASE BOUNDARY 500' BUFFER

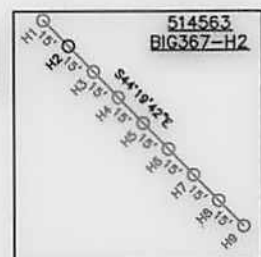
**WELL 514563 TOP HOLE**  
 STATE PLANE COORDINATES (NAD 27 NORTH ZONE)  
 N:386666.419  
 E:1695450.216  
 LAT:39.556681  
 LON:80.579967  
 UTM COORDINATES (NAD 83-METER)  
 N:4378639.320  
 E:536084.755

**WELL 514563 LAUNCH POINT**  
 STATE PLANE COORDINATES (NAD 27 NORTH ZONE)  
 N:385848.441  
 E:1695254.487  
 LAT:39.554429  
 LON:80.580626  
 UTM COORDINATES (NAD 83-METER)  
 N:4378389.116  
 E:536029.272

**WELL 514563 BOTTOM HOLE**  
 STATE PLANE COORDINATES (NAD 27 NORTH ZONE)  
 N:378909.746  
 E:1697509.249  
 LAT:39°32'07.638"  
 LON:80°34'20.413"  
 UTM COORDINATES (NAD 83-METER)  
 N:4376286.644  
 E:536751.414



LINE	BEARING	DIST.
T1	S88°58'45"E	727.7'
T2	N81°50'26"E	927.58'



KENNETH P. MORAN P.S. 1333  
 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 RULES ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.

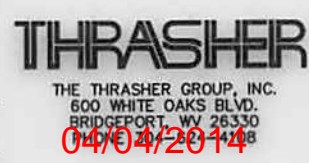
FILE NO. 030-2259  
 SCALE: 1"=2000'  
 MINIMUM DEGREE OF ACCURACY: 1 in 2500  
 PROVEN SOURCE OF ELEVATION: OPUS SURVEY GRADE GPS

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

DATE JANUARY 3, 2014  
 OPERATOR'S WELL NO. 514563  
 API WELL NO. MOD  
 47 - 103 - 02937 H6A  
 STATE COUNTY PERMIT

WELL TYPE: OIL  GAS  LIQUID INJECTION  WASTE DISPOSAL  (IF "GAS"), PRODUCTION  STORAGE  DEEP  SHALLOW

LOCATION: ELEVATION: EG: 1,474.4' PROP: 1,442.90' WATER SHED: NORTH FORK OF FISHING CREEK  
 DISTRICT: GRANT COUNTY: WETZEL  
 QUADRANGLE: BIG RUN ACREAGE: 39.4 AC±  
 SURFACE OWNER: DENCIL HENTHORN ET AL LEASE ACREAGE: 1,928.60 AC±  
 OIL & GAS ROYALTY OWNER: SHIBEN ESTATE, INC., CNX GAS CO., LLC LEASE NO. 988543/988542/796 797/090506



PROPOSED WORK: DRILL  CONVERT  DRILL DEEPER  REDRILL  FRACTURE OR STIMULATE   
 PERFORATE NEW FORMATION  PLUG OFF OLD FORMATION  OTHER PHYSICAL CHANGE IN WELL (SPECIFY)

PLUG AND ABANDON CLEAN OUT AND REPLUG  
 TARGET FORMATION: MARCELLUS SHALE ESTIMATED DEPTH: TVD/MD

WELL OPERATOR: EQT PRODUCTION DESIGNATED AGENT: REX C. RAY  
 ADDRESS: 115 PROFESSIONAL PLACE ADDRESS: 115 PROFESSIONAL PLACE  
 BRIDGEPORT, WV 26330 BRIDGEPORT, WV 26330

CAD FILE: R:\030-2259 EQT BIG367 Well Pad and Access Rd\Survey\030-2259 BIG 367 -EQT 2000.dwg